Status Summary
Volume 1
Potential Projects

MARCH 1969
STATE OF NEBRASKA
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Nebraska Soil and Water Conservation Commission
Warren D. Fairchild, Executive Secretary

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Report Prepared By The Planning Division

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State of Nebraska
Soil and Water Conservation Commission

January 8, 1969

Senator Jerome Warner
Speaker, Nebraska Legislature
Lincoln, Nebraska

Dear Senator Warner:

Transmitted herewith is Volume I of the Status Summary section of the State Water Plan. This section discusses the potential and existing water and related land resource development in the state. Volume I discusses the potential water resource projects currently planned or being planned in the state. A brief description of the features, costs, benefits, problems, and local interest and support is given for those projects which appear to have economic justification. We are hopeful that this Volume will provide the Legislature with reliable information upon which they can make rational decisions relative to the future development of water and land resources in Nebraska.

Very truly yours,

Dempsey McNeil, Chairman
Nebraska/Soil and Water Conservation Commission

COMMISSION MEMBERS
Counsel and guidance were received from the following groups who reviewed the report for clarity, accuracy and completeness.

Technical Advisory Committee

Keith Myers - U.S. Department of Agriculture
Charles Cocks - U.S. Department of Defense
Paul Harley - U.S. Department of Interior
James Monroe - Nebraska Department of Economic Development
John R. Davis - College of Engineering, University of Nebraska
William Rapp - Nebraska Department of Health
Marvin Nuernberger - Nebraska Department of Roads
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Howard Ottoson - Nebraska Experiment Station, University of Nebraska
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Don Thompson - Governor's Office
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Warren Fairchild - Chairman

Special Representative Committee

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Harold Slack - Nebraska State Grange
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LeRoy Bahensky - Nebraska Power Industries Committee
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Robert Colson - Nebraska Irrigation Association
Elton L. Berck - Farmers Union of Nebraska
Frank Phelps - American Water Works Association
Chet Ellis - Nebraska Assoc. of Soil & Water Conservation Districts
James R. Smith - Nebraska Assoc. of Commerce and Industry
Vance Anderson - Nebraska Well Drillers Association
Stanley Matzke - Nebraska Reclamation Association
Earl Luff - Chairman
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This table of contents includes the function and status as of Nov. 1, 1968, of each project in this summary. The function is coded as follows: FC - flood control; I - irrigation; R - recreation; FW - fish & wildlife; WQ - water quality; and P - power. The status coding is: 1 - awaiting congressional authorization for study and/or study funding; 2 - formal report published, awaiting congressional authorization for construction; 3 - authorized, awaiting funding for construction; 4 - formal report published but lacks local support; 5 - awaiting intra-agency approval; 6 - awaiting authorization for work plan study; 7 - awaiting completion of present study.

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THE STATE WATER PLAN

Nebr. Rev. Stat. § 2-1507 (8) (Supp. 1965) directs the Nebraska Soil and Water Conservation Commission to "plan, develop, and encourage the implementing 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."

Legislative Resolution #5 passed by the 1967 Legislature specifically directed the Nebraska Soil and Water Conservation Commission to prepare a State Water Plan, giving consideration to the full development of Nebraska's water resources.

The State Water Plan as developed by the Commission, will consist of four general parts which are briefly described below:

1. **Framework Plan** - The basic objective of the framework plan is to provide a broad guide to the best uses of water and land resources to meet current and anticipated needs. The framework plan will be based on reconnaissance type investigations and make maximum use of presently available planning data.

2. **Basin Reports** - Individual studies of the State's major river basins will be made in the detail necessary to identify potential projects, estimate the project costs and benefits, suggest the order of development, show the relationship of the project to the state's framework plan and recommend local action to accelerate water resource development.

3. **Status Summary** - This section of the State Water Plan will consist of a series of reports describing the significant water resource development projects which have been developed as well as those which are proposed for future development.

4. **Special Recommendations** - Recommendations for action by the Legislature, Governor and various units of government to improve the conservation, development, management, and utilization of water resources will be prepared as a part of the State Water Plan. The recommendations will include thorough study of the legal, social and economic aspects of major problems of water resource development.
THE STATUS SUMMARY

The Status Summary, the third Section of the State Water Plan, consists of a series of reports summarizing the status of water resource developments in Nebraska. Three volumes, of which this is the first, are planned for publication. This first volume deals with projects which are presently proposed for construction and provides for the Legislature, Governor and local leaders an informative guide to the current status of resource planning.

The second volume of this series will deal with the existing water resource developments in Nebraska. This volume will include not only a summary of the physical development which has taken place and is under construction but will also include a description of the many institutions which have been formed to sponsor, construct and operate resource development projects.

The third volume of the Status Summary will present in a form suitable for general public distribution the highlights of the first two volumes to enable the layman to observe, appreciate and better understand the water resource development being planned and initiated.

PURPOSE

The need for acceleration of land and water resource development in Nebraska has never been so evident as it is today. Floods, pollution, and erosion cost Nebraska many thousands of dollars annually. Resources once considered limitless are becoming seriously depleted, while some development opportunities go untapped.

The State Water Plan, as requested by the Legislature, is being developed by the Commission to provide a guide to the wise and efficient use of our land and water resources. A variety of federal agency projects has been proposed for construction and this volume is intended to provide the Legislature and the citizens of Nebraska with concise information regarding these potential water resource developments. Volume II of the Status Summary will summarize existing projects and projects now under construction.

Each potential project is briefly described and its current status is pointed out along with additional steps necessary prior to construction. A periodic updating of the reports in this summary is anticipated following the publication of Volumes I, II, and III.

SCOPE

This volume of the Status Summary summarizes the federal projects currently being considered for development in Nebraska. It includes all active projects for which a formal report of some type has been issued.

A brief description of the project features, the project location, benefits and costs is included in each entry. A resume of local support, local taxation for the project, remaining land and water resources problems of the area and financing arrangements is also included.

The information in this summary was compiled from the latest reports available at the date of publication. Footnotes giving the title and date of the report used and whom to contact for further information are provided for each report.

ACKNOWLEDGEMENT

The Nebraska Soil and Water Conservation Commission wishes to thank all those who supplied data, participated in review, or otherwise gave assistance in the preparation of this report.

To insure accuracy in this summary, the Army Corps of Engineers, the Bureau of Reclamation, and the Soil Conservation Service reviewed and verified the data compiled from their reports.

Assistance was also obtained from project sponsors in the reviewing of each report.

A Technical Advisory Committee composed of representatives of state and federal agencies and a Special Representative Committee made up of representatives from state-wide organizations interested in development of Nebraska's resources provided guidance in development of the report. These two groups also assisted in the review of the completed volume. Agencies and organizations represented on these two groups are shown on page ii.
As a preface to the summary, a separate section on procedures for each of the three major federal agencies involved in water resource planning and development is included. This is intended to provide the reader a basic explanation of the procedures followed in development and implementation of projects.

DEVELOPMENT OF A BUREAU OF RECLAMATION PROJECT

The development of a Bureau of Reclamation project usually begins with a request from other federal agencies, state and local governments, cooperating organizations, local interests, or by Congressional directive.

Based upon a determination that studies are needed and warranted, funds for a reconnaissance investigation are requested by the responsible Regional Director. Upon approval by the Commissioner of Reclamation, Secretary of the Interior, and the Bureau of the Budget, funds are included in the Department of Interior budget request to the Congress. When funds have been appropriated by the Congress, a reconnaissance investigation is undertaken and a reconnaissance report prepared. This investigation is done in collaboration with other federal and state agencies as appropriate and with a minimum use of time and money. Information is compiled largely from available data and little field work is involved.

The reconnaissance investigation is intended to show whether further study, planning and expenditure of federal, state and/or local funds is warranted and to recommend future action regarding the project.

Conclusions in the reconnaissance report sometimes are unfavorable, with a recommendation to conclude investigations - more often the recommendations are favorable. Local interest in the project is important in determining the desirability of further studies.

Where a reconnaissance investigation has shown that a potential project warrants further study, and state and local interests have endorsed the reconnaissance plan, a request for authorization to make a feasibility investigation is made to the Congress. This request is made through the Senate Interior Subcommittee on Water and Power Resources and the House Subcommittee on Irrigation and Reclamation. These subcommittees are divisions of a larger Committee on the Interior and Insular Affairs in each Congressional body. If authorized for study and money is made available by the Congress, the feasibility investigation is initiated.

The feasibility investigation is far more detailed than the reconnaissance study in that it includes specific engineering and operating plans as well as an examination of financial feasibility and economic justification for the project.

The feasibility investigation report, after review within the Bureau and adoption by the Secretary of the Interior as his proposed report, is sent to other federal agencies and to the governors of affected states for formal review and comment. A report for any unit of the Missouri River Basin Project is also sent to all of the states in the basin for review and comment.

Following this formal review, the Secretary of the Interior sends the report to the President through the Bureau of the Budget, then, with the Budget Bureau's concurrence, to the Congress for authorization to construct the project. The feasibility report must proceed through the same Congressional Committees which recommended authorization of the feasibility investigation.

Following Congressional hearings and project construction authorization, the Bureau of Reclamation through the Bureau of the Budget, requests that the Congress appropriate funds to permit a start on construction.

If considerable time has elapsed between the feasibility report and the project construction authorization, additional planning may be necessary to update the plan and estimates. Final plans, specifications and designs are then prepared and bids are invited for construction. With acceptance of bids, construction of the various project facilities begins. Execution of repayment contracts is generally required prior to the start of construction.

The operation and maintenance of the system normally is turned over to a local sponsor as soon as possible after the project works have been tested. Annual or periodic joint inspection with district personnel helps assure adequate attention to the proper operation and maintenance of project works. Operation of power facilities and sometimes dams, reservoirs and supply canals remains with the Bureau.

The Small Reclamation Projects Act of 1956, and amendments thereto, makes it possible for certain types of organizations to obtain interest-free loans for small reclamation projects. Grants are also made, along with the loans, for those portions of the projects that are non-reimbursable as a matter of national policy. The small project may be a complete new undertaking...
or may be a rehabilitation of an existing project. The maximum cost of projects under this Act can be no more than $10,000,000 with the federal government providing a loan and/or grant combination totaling no more than $6,500,000.

DEVELOPMENT OF A CORPS OF ENGINEERS PROJECT

Flood control project studies originate with a request from individuals or groups to their Senator or Congressman for assistance in handling a flood threat or problem. The member of Congress to whom the petition is submitted may recommend it to the Public Works Committee, and this Committee's authorization is necessary before the U.S. Army Corps of Engineers may investigate the problem.

A very brief investigation of the problem area to look at project possibilities and needs may be made, but Congressional provision of funds is necessary for a project study. The Corps' District office, in response to the Chief of Engineers through the Division Engineer, makes a study which is initiated by a public hearing to determine the extent of the problem and possible solutions. An engineering survey is then made to determine the general plan, and an estimate is made of the cost and the expected public and private benefits of the project. If the project required is for local protection or is a multi-purpose project including provision for water supply, the local cooperation and acceptance of payment and operation and maintenance responsibilities must be determined.

Toward the end of a study, public meetings are held to formally present the studies for the comment and views of concerned parties. Upon completion of the District Engineer's report on the findings of his survey, copies are submitted to federal and state agencies for review and comment. After all comments are received, the Secretary of the Army may recommend to the Public Works Committee that the Congress adopt the project for construction. The report is printed as a public document, included in a departmental flood control bill and submitted to Congress.

If the bill is passed by Congress, it is sent to the President for signature and the project becomes authorized for construction. Congressional funding is necessary for detailed project design and construction. After appropriation of funds for construction, the District Engineer prepares plans, specifications, cost estimates and secures evidence of local willingness to accept right-of-way and maintenance provisions. Awarding of the construction contracts is made through bidding. Upon completion of construction, local protection projects are turned over to the local sponsor for operation and maintenance.

Under special authority given to the Chief of Engineers, the Corps, without Congressional approval, can construct small localized projects if they meet certain limitations. These projects include small flood control projects, protection works, clearing of channels, small boat harbors, flood plain delineations and the repair of existing flood control works which were not constructed by the federal government.

DEVELOPMENT OF A SMALL WATERSHED PROJECT UNDER THE ADMINISTRATION OF THE SOIL CONSERVATION SERVICE

Public Law 566 watershed projects provide assistance in solving flood, drainage, erosion, sediment and irrigation problems which are beyond the scope of an individual effort and in development of facilities for recreation, fish and wildlife and municipal or rural water supplies. A request may be made to the local Soil and Water Conservation District, the Soil Conservation Service, Extension Service or the State Soil and Water Conservation Commission to arrange for a preliminary field study of a problem area to ascertain the nature of the local problem and determine the applicability of Public Law 566. At the time of these meetings, a local steering committee is usually formed to collect flood damage data and/or other pertinent information concerning the problem area and to make formal application to the Nebraska Soil and Water Conservation Commission for Public Law 566 planning assistance.

A field review is held with members of the Soil Conservation Service, Nebraska Soil and Water Conservation Commission, Fish and Wildlife Service, State Game and Parks Commission, other interested agency personnel, the local steering committee and the Soil and Water Conservation District board to examine watershed problems in the field and determine if the proposed project is potentially feasible. The application and recommendations are forwarded to the Watershed and Flood Control Subcommittee of the Nebraska Soil and Water Conservation Commission. If the application presents a need for watershed development and appears potentially feasible, the Subcommittee may recommend approval of the application by the full Commission, and forwarding of the application to the Secretary of Agriculture.
In general, the next step is formation by the local supporters of a legal entity to sponsor the project and assume non-federal responsibilities.

Priorities for planning are requested by the Nebraska Soil and Water Conservation Commission. If a Preliminary Investigation Report indicates a feasible watershed project and the plan proposed is acceptable to the sponsors, authorization for detailed investigation and preparation of the Work Plan Report is requested by the State Conservationist from the Administrator of the Soil Conservation Service. After receipt of this authorization, the detailed watershed work plan is developed by the local sponsors with technical assistance from the Soil Conservation Service and the Soil and Water Conservation Commission. When completed, the sponsors initiate a review by concerned state and federal agencies.

The work plan is then submitted by the State Conservationist to the Administrator of the Soil Conservation Service for review by federal agencies at the Washington level and by the Governor. The report is then transmitted through the Bureau of the Budget to the appropriate House and Senate Committees for authorization. Projects in which the Federal share of construction is less than $250,000 may be approved by the State Conservationist. After authorization, the Federal share of funds is released by the Administrator to the State Conservationist. The local organization must obtain needed land rights, water rights, construction permit, and enter into the construction contract, except that the Federal Government may, upon request of the local sponsor, enter into contracts for construction of structures.

Operation and maintenance of the completed structural works is the responsibility of the local sponsor.
The following definitions are provided to reduce repetition and to define many of the terms used in this summary. Included in this glossary are explanations covering such subjects as direct benefits, indirect benefits, State and Federal costs, and Missouri River Basin Power revenues.

Definitions and terms used in this publication and all State Water Plan publications conform, where possible, to those adopted by the Missouri Basin Interagency Committee in April, 1968.

DEFINITIONS

TERMS

Acre Foot - (abbr. AF) A unit for measuring the volume of water equal to the quantity required to cover one acre to a depth of one foot and is equal to 325,851 gallons or 43,560 cubic feet.

Activity Day - Participation by an individual in a specific outdoor recreation activity during any part of a day.

Ad Valorem Tax - A tax authorized by the state for use by small subdivisions of government. A tax on all tangible property within the subdivision boundary.

Aquifer - A rock formation, bed, or zone containing water that is available to wells. May be referred to as a water-bearing formation or bed.

Arable Lands - Lands which are capable of being cultivated (by presently accepted practices).

Average Annual Damages - Flood and related damages computed as a uniform annual series. Average annual flood damages are computed on the basis of expectancy in any one year of the various amounts of flood damages that would result from floods throughout the full range of potential magnitude.

Conservation Storage - Storage of water for later release for useful purposes such as irrigation, municipal water supply, power, recreation, water quality, or fish and wildlife.

Consumptive Use Requirement - The annual quantity of water in acre-feet per acre absorbed by the crop and transpired or used directly in the building of plant tissue, together with that evaporated from the cropped area.

Crop Irrigation Requirement - The amount of irrigation water in acre-feet per acre required by the crop; it is the difference between crop consumptive use requirement and effective precipitation.

Cubic Feet Per Second - (abbr. c.f.s.) A term used in measuring the rate of flow of water past a given point. One c.f.s. flowing for 24 hours equals 1.98 acre-feet.

Cutoff - Channel straightening procedure whereby a stream loop or meander is eliminated.

Direct Benefits - Those benefits which are derived as a direct result of the project features such as providing irrigation water for increased crop production.

Diversion Requirement - The amount of water (in acre-feet per acre) that is diverted from a stream to irrigate a given area of land, including an allowance for evaporation, seepage and farm waste.

Drainage Area - The drainage area is that area, measured in a horizontal plane, above a given point on a stream which is enclosed by a drainage divide.

Farm Delivery Requirement - The amount of water in acre-feet per acre required to serve an area from a canal turnout. It is the crop irrigation requirement plus farm waste and deep percolation losses.

Fisherman Day - Any part of a day spent fishing by an individual.

Flood Frequency - The probability of occurrence of a flood expressed as a percent or as a recurrence interval based on its ratio to the mean annual flood. Thus, a two percent chance flood would be essentially a 50-year flood when expressed on a recurrence interval.

Flood Plain - A strip of relatively smooth land bordering a stream and usually built of sediment carried by the stream.
Flood Storage - The volume of water in acre feet which can be stored in a reservoir to reduce the flow of flood waters below the reservoir. It is usually an increment of storage above the conservation pool.

Headworks - The initial canal section and diversion control features which permit or control passage of water.

Hunter Day - Any part of a day spent hunting by an individual.

Indirect Benefits - Indirect benefits are those benefits which are not derived directly from operation of project features but are realized from increased profits by local businesses, increased settlement opportunity and increased economic growth by reason of the direct production.

Initial Storage - The amount of water in acre feet that a newly constructed reservoir is capable of storing, including an allowance for sediment.

Intermittent Stream - A stream that flows only part of the time or through only part of its reach.

Irrigation Depletion - The amount of diverted water consumptively used in serving an area. It is the gross diversion minus the return flow.

Irrigable Lands - Lands that are capable of being irrigated and are in an area where water can be made available at costs presently conducive to private or public development.

Land Treatment - The application of conservation practices to the land, such as, terracing, contour farming, planting of grass, etc. It includes all types of management, vegetation, and mechanical practices.

Lateral - A small waterway or canal which usually branches from a larger canal and brings irrigation water to the fields which are to be irrigated.

Local Cost - Costs which are borne by a local unit or entity. On Bureau of Reclamation projects it is that portion of the project cost allocated to irrigation which is reimbursable and will be paid by a local body such as an irrigation district.

Maximum Water Surface - The highest water surface elevation for which the dam is designed.

Missouri River Basin Power Revenues - (M.R.B.P.) - Money which is derived from the generation and sale of power from federally-owned hydroelectric power plants located within the Missouri Basin and which is over and above that needed to cover the costs of repayment, operation and maintenance of the power facilities.

Multiple - Purpose Reservoir - A reservoir planned to be used for more than one purpose.

Non-Federal Costs - Project costs borne by a state or local body. May include recreation, irrigation, fish and wildlife, operation, maintenance, replacement and land and rights-of-way. For this report, it includes all non-federal costs except those associated with an irrigation project.

Operation, Maintenance and Replacement - (O.M.R.) - Average annual costs of project operation and normal maintenance, with allowance for replacement of worn parts.

Project Life - The economic life of the project indicating the number of years used in the economic analysis.

Recreation Day - A visit by an individual to a recreation area for a significant portion of a 24-hour day. A recreation day is assumed to consist of 2.5 activity days.

Return Flow - That part of irrigation water not consumed by evaporation, stored in the soil, or used by plants, which returns to either its source or another body of water.

Revetment - A river channel control structure usually consisting of stone filled forms extending out into the river to deflect the flow or extending along the bank to protect the bank line.
Sediment Capacity - The amount of reservoir capacity allowed for the deposition of sediment.

Separable Cost - The cost associated with a function of a multi purpose project which is the difference between the project cost with and without the function.

Side Channel Basin - Low depression areas along a river channel which can be used to store floodwater to reduce the flow in the river channel.

Spillway Capacity - The rate of flow in cubic feet per second that a spillway can discharge under maximum water surface conditions.

Spoil Bank Levees - A levee constructed from material excavated at the site from the channel for the purpose of preventing floodwater encroachment beyond this dike.

State Costs - Costs assigned to a state agency. Usually involves, but not limited to, one half of the separable cost of providing land and facilities for the enhancement of recreation, fish and wildlife and associated interest during construction.

Storm Event - The runoff producing storm usually expressed as a frequency or percent of chance. Soil Conservation Service design normally uses a 6-hour duration 25-year frequency storm.

Streamflow Depletion - Decrease in the amount of water within a certain stream reach. It is the inflow minus the outflow.

Surcharge Storage - Temporary reservoir storage from the maximum water surface elevation down to the highest of the following elevations.

a. Top of exclusive flood control capacity
b. Top of joint use capacity
c. Top of active conservation capacity
NEBRASKA RIVER BASINS

SCALE IN MILES

1. BIG BLUE
2. ELK Horn
3. LITTLE BLUE
4. NOBRARA
5. NEMAH
6. WHITE RIVER MAT CREEK
7. LOUP
8. MOODLE PLATTE
9. REPUBLICAN
10. LOWER PLATTE
11. NORTH PLATTE
12. MISSOURI TRIBUTARIES
13. SOUTH PLATTE

BASIN DELINEATION
BIG BLUE RIVER BASIN
The proposed Clatonia Creek Watershed Project encompasses 25,960 acres in Gage and Lancaster Counties. The Clatonia Creek Watershed Conservancy District and the Gage County and Lancaster Soil and Water Conservation Districts are sponsoring the watershed. The Soil Conservation Service and other state and federal agencies are supplying technical assistance in the planning of this watershed.

Primary watershed problems are flooding and soil erosion.

Current Status

The Clatonia Creek Watershed has undergone all necessary planning steps toward construction and is now awaiting construction start approval by the Bureau of the Budget. The project has been endorsed by the Nebraska Soil and Water Conservation Commission as part of Nebraska's State Water Plan.

Description of Project Area

Clatonia Creek begins in the southwest part of Lancaster County and flows southwesterly across the Gage County line and enters the Big Blue River one-half mile east of the Saline County line and Dewitt, Nebraska.

Topography varies from nearly level to gently sloping upland divides to moderately sloping areas along the more deeply entrenched stream.

The average annual precipitation at Beatrice is approximately 29 inches. The average length of the growing season is 168 days with 82 percent of the annual precipitation occurring during that time.

The economy of the watershed is based on dryland agriculture. The distribution of land use is approximately 68 percent cropland, 26 percent pasture and rangeland and 6 percent for other uses.

Extent of Project Investigations

This project has undergone both preliminary and work plan investigations.

Plan Features

This project would consist of land treatment and the installation of eight floodwater retarding structures. These structures would control runoff from 46 percent of the drainage area. All structures would have sufficient storage capacity to detain runoff from a 25-year frequency storm event without operation of the emergency spillway. In addition, two structures, 3-A and 7-A, would have capacity to detain runoff from a 50 and 100 year frequency storm, respectively.

These measures would provide reductions in floodwater damage to 31 farms.

Project Benefits

Project benefits come from agricultural, non-agricultural, indirect and downstream sources.

The project would reduce average annual dollar damages to crop and pasture by 70 percent. The project would also reduce the area inundated by the four-year frequency storm event from 1,360 acres to 608 acres or by 55 percent.

Remaining Water Resource Problems and Needs

Additional land treatment is needed to further reduce soil erosion and sedimentation. Remaining flood damages will be significant without adequate treatment.

Project Costs

Total costs of this proposed project are estimated to be $696,000. The local share includes $88,000 for land, easements and rights-of-way, and administration of contracts.

Financing Arrangements

The project would be jointly financed by the Federal Government under authority of the Watershed Protection and Flood Prevention Act, P.L. 566, as amended, and by local interests using taxing authorities and private funds.

During the past several years, a small levy has been in effect and about $14,200 has been collected.

Provisions for Operation and Maintenance

The Gage and Lancaster County Soil and Water Conservation Districts will review the adequacy of land treatment measures annually and will encourage landowners and operators to perform needed maintenance. The Clatonia Creek Watershed Conservancy District will operate and maintain the structural measures.

Local Interest and Support

The land treatment application has been accelerated since the application for assistance was made to the Nebraska Soil and Water Conservation Commission in 1962.

Existing Resource Development in the Area

The main existing water resource developments in the area are the projects completed by the Salt Valley Watershed District. Other watersheds in various stages of development in the area are Little Indian, Dry, Cub, and Upper Salt.

Effect on Water Supply in Project Area

The land treatment required for the project and the watershed's eight floodwater retarding structures are expected to greatly reduce the annual production of sediment entering the waterways.
LOCATION: Gage and Lancaster Counties

SPONSORS: Gage County and Lancaster Soil and Water Conservation Districts and Clatonia Creek Watershed Conservancy District

FEATURES: Eight Floodwater Retarding Structures

CONSTRUCTION PERIOD: 4 Years

AVERAGE ANNUAL COST: $22,410

BENEFIT-COST RATIO: 1.4 to 1.00

PROJECT LIFE: 50 Years

ANNUAL O,M,&R.: $1,640

COSTS BASED ON: 1965 Prices

COST OF RIGHT-OF-WAY: $85,100

---

Table 1 - Project Benefits, Costs and Repayment By Source

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Flood Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Project Cost</td>
<td>$696,000</td>
</tr>
<tr>
<td>Federal</td>
<td>$450,000</td>
</tr>
<tr>
<td>Non-Federal</td>
<td>$246,000</td>
</tr>
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</table>

Average Annual Project Benefits $31,870

---

Table 2 - Reservoir Data

<table>
<thead>
<tr>
<th>Number of Structures</th>
<th>Total Drainage Area Above Structures</th>
<th>Storage Capacity (Acre-Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Initial</td>
</tr>
<tr>
<td>8</td>
<td>12,032 acres</td>
<td>4,570</td>
</tr>
</tbody>
</table>
SUNBEAM UNIT*

The site for the potential Beaver Crossing Dam and Reservoir is located on the West Fork of the Big Blue River just above the town of Beaver Crossing in Seward and York Counties. The Big Blue River Watershed Planning Board has shown interest in this potential multi-purpose project. The U.S. Bureau of Reclamation is planning the project.

Current Status

A reconnaissance report has been published and a feasibility report is being prepared. The Sunbeam Unit has been recommended by the Nebraska Soil and Water Conservation Commission as a part of the State Water Plan.

Description of Project Area

The region is characterized by small meandering streams dissecting extensive areas of tablelands. The upland area near the proposed dam site is nearly level to gently rolling. At the dam site, the river valley is approximately 2.5 miles wide, while the more defined flood plain is about 7,000 feet in width. The stream channel is generally well entrenched with a width of approximately 40 feet and an average depth of about 12 feet.

Precipitation during the April through September period averages 21 inches, which is about 75 percent of the annual total.

Wheat, corn and livestock have been the primary sources of farm income with livestock producing an increasingly larger share of total farm income in recent years. The urban communities serve principally as trade and service centers for the surrounding agricultural area.

Extent of Project Investigations

In June of 1963, the Bureau of Reclamation initiated reconnaissance studies on the Big Blue River portion of the Blue Division. Sub-reconnaissance land classification was conducted on approximately 200,000 acres of land. In July 1965, the Bureau of Reclamation published a reconnaissance report on the Blue Division as a part of a basin-wide survey requested by the Nebraska Soil and Water Conservation Commission. The Sunbeam Unit was a principal feature of the division report. A feasibility study of the Sunbeam Unit is nearing completion and provided a source of more detailed information.

Plan Features

Beaver Crossing Dam and Reservoir, as planned, would store and regulate the flow of the West Fork of the Big Blue River. Flood control, irrigation, recreation and fish and wildlife enhancement are the primary functions of the project.

A morning glory type spillway would be located near the left abutment of the dam alongside flood control outlet works. The flood control outlet would discharge a maximum of 25,800 c.f.s. The Goehner Pumping Plant would lift irrigation water directly from the outlet works to the Goehner area through a 78-inch diameter, 3,500 foot long pipeline. The pumping plant would have a total capacity of 313 c.f.s.

The river outlet works would be capable of maximum releases of 1,060 c.f.s. The Dorchester Diversion Dam and Pumping Plant would be located on the West Fork of the Big Blue River approximately 20 stream miles below the Beaver Crossing Dam. Water would be diverted from the river to the pumping plant by means of a concrete river control section with a sluiceway for bypassing silt. Water from the pumping plant would be provided through a 66-inch diameter, 5,800 foot long pipeline. The pumping plant would have a total capacity of 180 c.f.s.

An estimated 480 acres would be purchased specifically to provide access and habitat for fish and wildlife purposes.

* "Blue Division, Nebraska-Kansas", Reconnaissance Report, July 1965, and unpublished feasibility report, "Beaver Crossing Dam & Reservoir". For information, write: Project Manager, Bureau of Reclamation, McCook, Nebraska.
Project Benefits

The benefits attributable to this project would be flood control, irrigation, recreation, and fish and wildlife. The irrigation function would likely be deferred initially, but would supply supplemental water for 30,000 acres upon development. The recreation, fish and wildlife features would provide 141,300 fisherman days, 325,000 recreation visitor days, and 6,150 hunter days annually.

Remaining Water Resource Problems and Needs

The most predominant remaining need in this area would be additional flood control upstream of the reservoir and stabilization of the ground water table. The extension of irrigation would stabilize agricultural production at higher and more profitable levels.

Project Costs

Project costs allocated to irrigation are reimbursable without interest and would be paid from Missouri River Basin Project power revenues pending development of irrigation. At the time irrigation facilities are constructed, the irrigation district would then pay for operation, maintenance and replacement and make payment within the irrigator's ability to pay on all the allocated irrigation construction costs. That portion of the irrigation allocation exceeding the district's ability to pay would be repaid by power revenues from the Missouri River Basin Project. Costs allocated to flood control would be non-reimbursable.

Operation, Maintenance, and Replacement

The dam and reservoir would be operated and maintained by the Federal Government. Irrigation facilities, including the pumping plants and diversion dam, would be operated and maintained by a local sponsor. Fish, wildlife and recreation areas and facilities would be managed by the Nebraska Game and Parks Commission. Revenues and income from the recreational lands or facilities would be used for development purposes or for operation expenses.

Local Interest and Support

No appropriate district has been formed to sponsor development of this project. There is widespread interest in this project throughout the basin, but concerted opposition has developed by those who would be displaced by the proposed reservoir.

Existing Resource Development in the Area

The extent of water resource development in the area is mostly limited to private ground water irrigation. A small watershed project has been constructed near Dorchester and several others are under construction downstream from the project area.

Effect of Project on Water Supply in the Area

Towns in the area obtain adequate municipal water supplies from wells and are not dependent upon surface flows. The project will measurably decrease the total annual flows below the reservoir but all commitments to prior water rights and interstate compacts will be met.
**SUNBEAM UNIT**

LOCATION: West Fork Big Blue River in Seward, Saline and York Counties

SPONSORS: Big Blue River Watershed Planning Board

FEATURES: Beaver Crossing Dam and Reservoir, Goehner Pumping Plant, and the Dorchester Diversion Dam and Pumping Plant

CONSTRUCTION PERIOD: 5 to 6 years | PROJECT LIFE: 100 Years
TOTAL ANNUAL COST: $2,701,300 | ANNUAL O.M.&R.: $211,600
BENEFIT-COST RATIO: 1.38 to 1.00 | COSTS BASED ON: 1968 Prices
PROJECT ACREAGE: 30,000 Acres

### Table 1 - Average Annual Project Benefits

<table>
<thead>
<tr>
<th></th>
<th>Irrigation</th>
<th>Flood Control</th>
<th>Recreation</th>
<th>Fish &amp; Wildlife</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Benefits</td>
<td>$1,492,900</td>
<td>$1,430,000</td>
<td>$325,000</td>
<td>$298,800</td>
<td>$3,546,700</td>
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<tr>
<td>Indirect Benefits</td>
<td>187,400</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>187,400</td>
</tr>
<tr>
<td>Total Benefits</td>
<td>$1,680,300</td>
<td>$1,430,000</td>
<td>$325,000</td>
<td>$298,800</td>
<td>$3,734,100</td>
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### Table 2 - Project Costs and Repayment By Source

<table>
<thead>
<tr>
<th>Share of Project Cost</th>
<th>Irrigation</th>
<th>Flood Control</th>
<th>Recreation</th>
<th>Fish &amp; Wildlife</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$32,628,700</td>
<td>$26,157,300</td>
<td>$5,239,700</td>
<td>$5,263,300</td>
<td>$69,289,000</td>
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<tr>
<td>Amount Reimb.</td>
<td>$32,628,700</td>
<td>0</td>
<td>325,900</td>
<td>138,800</td>
<td>33,093,400</td>
</tr>
</tbody>
</table>

Non-reimbursable: 0.86' - Goehner 1.55' - Goehner 1.50' - Dorchester

M.R.B.P. | -- | 0 | 0 | 0 | --
Non-Federal (State) | -- | 0 | 325,900 | 138,800 | 464,700
Local | -- | 0 | 0 | 0 | --

### Table 3 - Average Annual water Requirements

- **Crop Irrigation Requirement:** 0.86' - Goehner 1.32' - Dorchester
- **Farm Delivery Requirement:** 1.32' - Goehner 1.55' - Goehner
- **Diversion Requirement:** 1.50' - Goehner 1.50' - Dorchester

Total Diversion Requirement: 43,400 ac.ft.

Return Flow: 4,800 ac.ft.
Streamflow Depletion: 44,200 ac.ft.

### Beaver Crossing Dam
- Height: 112 feet
- Length: 15,650 feet
- Spillway Capacity: 45,930 cfs
- Drainage Area: 1,154 Square Miles

### Beaver Crossing Reservoir
- Capacity: 413,200 acre-feet
- Flood Control: 340,339
- Surcharge: 119,200
- Conservation: 17,686
- Sediment: 23,000/50 yr. - 46,000/100yr

### Table 4 - Dam and Reservoir Data

<table>
<thead>
<tr>
<th>Area</th>
<th>Acres</th>
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</thead>
<tbody>
<tr>
<td>Flood Control</td>
<td>413,200</td>
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<tr>
<td>Conservation</td>
<td>17,686</td>
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</tbody>
</table>

### Table 5 - Land Acquisition (Acres)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Fee</th>
<th>Easement</th>
<th>Total</th>
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<tr>
<td>Beaver Crossing Dam</td>
<td>22,450</td>
<td>1,520</td>
<td>23,970</td>
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<tr>
<td>Fish &amp; Wildlife</td>
<td>480</td>
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<tr>
<td>Recreation</td>
<td>120</td>
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<td>120</td>
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<tr>
<td><strong>Total Acres</strong></td>
<td><strong>23,050</strong></td>
<td><strong>1,520</strong></td>
<td><strong>24,570</strong></td>
</tr>
</tbody>
</table>

1-7
BEATRICE LOCAL FLOOD PROTECTION PROJECT*

This project was planned for and proposed to the city of Beatrice as a feasible project for local flood protection.

This proposed project would provide for protection of Beatrice against floods on the Blue River and Little Indian Creek. Features of this project would include levees, the removal of a low dam, bridge alterations and channel improvement on the Big Blue and levees and channel improvement on Indian Creek.

Current Status

This project is being restudied in connection with the Corps of Engineers survey investigation on the Big Blue River Basin (including the Little Blue River) in Nebraska and Kansas.

Project Costs

Total cost of this project has been previously estimated to be $1,208,000, based on 1960 price levels. The federal share of this total would be $684,000 and the local share $524,000. Estimated project benefits and costs are respectively $57,900 and $55,600 annually, yielding a 1.04 to 1.00 benefit-cost ratio.

The potential Bureau of Reclamation projects listed below are in various stages of planning and their completion depends greatly upon local interest and participation in the projects and the allocation of funds for continued project studies. These projects have been analyzed for their suitability for inclusion in the State Water Plan and further study has been recommended.

**SURPRISE DAM AND RESERVOIR***

This dam and reservoir would be located on the North Branch of the Big Blue River in Butler and Polk Counties in eastern Nebraska.

The dam would be a rolled earth-fill structure with an embankment height of 83 feet and crest length of 14,400 feet. The total initial, controlled storage capacity would be 176,700 acre-feet. The reservoir would provide full regulation of the historical flows of the North Branch Blue River.

This structure could provide irrigation water for 3,000 acres or augmentation flows to improve low flow conditions. Flood control benefits from this project are expected to total $110,000 annually. Total cost of this dam and reservoir is expected to be $16,643,000 based on October 1964 prices.

**SEWARD VIEW DAM AND RESERVOIR***

This dam and reservoir would be located on Lincoln Creek in Seward County.

The dam would be a rolled earth-fill structure with a maximum height of embankment of approximately 86 feet and crest length of 7,800 feet. The total initial controlled storage capacity of the reservoir would be 227,300 acre-feet.

The reservoir could provide irrigation water for 5,000 acres of basin land. Flood control benefits from the project are expected to total $556,000 annually. The total cost of this dam and reservoir is expected to be $16,546,000 based on October 1964 prices.

**SHESTAK DAM AND RESERVOIR***

This dam and reservoir would be located on Turkey Creek in Saline County.

The dam would be a rolled earth-fill structure with a maximum height of embankment of 85 feet and crest length of 6,200 feet. A dike approximately 7,600 feet long would also be required.

The initial total controlled storage capacity of the reservoir would be 180,500 acre-feet. This structure could provide irrigation water for 5,000 acres of basin land. Flood control benefits from this project are expected to total $182,000 annually. Total cost of this dam and reservoir is expected to be $13,034,000 based on October 1964 prices.

* "Blue Division, Nebraska-Kansas", July 1965. For information, write: Project Manager, Bureau of Reclamation, McCook, Nebraska.
LEGEND*

PROPOSED DAM & RESERVOIR SITE
PROPOSED CANAL
PROPOSED PUMPING PLANT
PROPOSED WATERSHED PROJECT
PROPOSED RIVER SIPHON
PROPOSED DIVERSION DAM
PROPOSED PROJECT IRRIGATION
EXISTING DAM & RESERVOIR

NOTE: ALL BASIN MAP LEGENDS WERE STANDARDIZED AND ALL FEATURES WILL NOT APPEAR ON EVERY MAP.
ELKHORN RIVER BASIN
CORPORATION GULCH WATERSHED*

The proposed Corporation Gulch Watershed Project containing 3,440 acres, is located in northeastern Madison County. The watershed includes a portion of the city of Norfolk and extends three miles northwest of the city. Erosion and flooding are the prevalent problems in the watershed.

The Madison County Soil and Water Conservation District, the Norfolk Drainage and Sanitary District and the City of Norfolk are sponsoring the watershed. The Soil Conservation Service and other state and federal agencies have provided assistance in the development of this project.

Current Status

The project has been approved and is authorized for construction. Upon receipt of needed land rights, construction can be initiated. This project has been endorsed as a part of Nebraska's State Water Plan by the Nebraska Soil and Water Conservation Commission.

Description of Project Area

Corporation Gulch is an intermittent stream flowing southeast through the west side of Norfolk to the southwest edge of town and to the Elkhorn River about one-half mile south of Norfolk.

Topography of the watershed varies from steeply sloping hills to relatively flat, nearly level flood plains that extend across the Elkhorn Valley. Upland soils are chiefly silt and clay mixtures derived from parent loess materials. Flood plain soils are a silt loam.

The area's precipitation often occurs in the form of high-intensity, short duration thunderstorms. The average annual precipitation is about 24 inches. The growing season is 155 days with 66 percent of the annual precipitation occurring during that time.

The economy of the watershed is based on dryland agriculture and urban employment. Land use distribution is 51 percent cropland, 26 percent urban, 11 percent pasture, and 12 percent other. The majority of farms are small with the owners quite often depending upon other sources for supplemental income.

Extent of Project Investigations

A work plan has been published for this project.

Plan Features

One multi-purpose structure would provide reduction in floodwater damages to 335 homes and business establishments, 9 city bridges, and also furnish water for recreation. Park and recreational facilities would also be provided on 120 acres of land adjacent to the reservoir.

Project Benefits

Benefits from the project would include the reduction in erosion and floodwater damage in the watershed plus recreation benefits and indirect benefits.

The structure would control runoff from 42 percent of the watershed and would retain runoff from a 200-year frequency storm event without operation of the emergency spillway.

Remaining Water Resource Problems and Needs

Remaining problems and needs of the project area include reduction of the pollution of the Elkhorn River and the sedimentation and soil erosion of the area. Increased land treatment is needed.

* "Corporation Gulch Watershed Work Plan", March 1968. For information, write: City Engineer, Norfolk, Nebraska; or, State Conservationist, Soil Conservation Service, Lincoln, Nebraska.
Project Costs

Land treatment costs for the project amount to $37,300; structural measures - $151,200; engineering services - $11,600; project administration - $17,700; and other costs including the land, easements and rights-of-way - $286,600.

Financing Arrangements

The City of Norfolk and the Norfolk Sanitary District would obtain the necessary land rights. Taxation in support of this project would be levied under the city's Flood Control Fund. Money for maintenance of recreation facilities would come from taxes levied under the Park Department Fund. The Norfolk Sanitary Drainage District would levy a tax to provide maintenance for the structure itself. Approximately two mills would be needed to amortize the investment and pay operation and maintenance costs. Some funds are anticipated through the State of Nebraska Small Watershed Control Fund.

Provisions for Operation and Maintenance

The City of Norfolk and the Norfolk Sanitary Drainage District will operate and maintain the project facilities.

Local Interest and Support

Application for the project was filed in August 1962. Since that time, great interest on the part of the sponsors has been evident.

Existing Resource Development in the Area

A local flood protection channel and levee project is being constructed around the north and east sides of Norfolk by the Corps of Engineers to provide protection along the North Fork of the Elkhorn River.

Effect on Water Supply in Project Area

The project is expected to reduce the sediment load delivered to the Elkhorn River. Ground water, to be pumped into the reservoir to maintain a recreation pool, is not expected to be significantly depleted.
LOCATION: Northeastern Madison County - Includes part of Norfolk

SPONSORS: Madison County Soil & Water Conservation District, The Norfolk Sanitary Drainage District and the City of Norfolk

FEATURES: One Multiple-Purpose Floodwater Retarding Structure and Basic Recreation Facilities

CONSTRUCTION PERIOD: 2 Years

AVERAGE ANNUAL COST: $40,760

BENEFIT-COST RATIO: 3.2 to 1.00

PROJECT LIFE: 50 Years

ANNUAL O. M. & R.: $21,740

COSTS BASED ON: 1967 Prices

COST OF RIGHT-OF-WAY: $286,600

Table 1 - Project Benefits, Costs and Repayment by Source

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Portion of Project Cost</th>
<th>Federal Share</th>
<th>Non-Federal Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flood Control</td>
<td>$132,000</td>
<td>$104,100</td>
<td>$27,900</td>
</tr>
<tr>
<td>Recreation</td>
<td>372,400</td>
<td>39,900</td>
<td>332,500</td>
</tr>
<tr>
<td>Total</td>
<td>$504,400</td>
<td>$144,000</td>
<td>$360,400</td>
</tr>
</tbody>
</table>

Average Annual Project Benefits: $131,730

Table 2 - Reservoir Data

<table>
<thead>
<tr>
<th>Number of Structures</th>
<th>Total Drainage Area Above Structures</th>
<th>Storage Capacity (Acre-Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Initial</td>
</tr>
<tr>
<td>1</td>
<td>1,440 acres</td>
<td>965</td>
</tr>
</tbody>
</table>
HIGHLAND UNIT*

Features of the potential Highland Unit are located in Holt, Antelope, Madison, and Platte Counties. The 50,500 irrigable acres planned for service are located in Platte, Madison, and Antelope Counties. The Elkhorn Valley Water Resources Association has shown an interest in the development of this multi-purpose project. The U. S. Bureau of Reclamation is planning this project.

Current Status

A favorable reconnaissance report has been prepared and feasibility studies have been authorized by the Congress. Before further steps toward construction can be taken, funds must be appropriated for the feasibility study of this project.

Description of Project Area

The project area lies within the loess hills and the sandhills regions. Rainfall averages 26 inches annually with about 19 to 20 inches occurring in the period of April through September.

The economy of the area is agriculturally based, with considerable livestock feeding practised. Most business activity stems from the processing and sale of farm products and associated retail trade. Manufacturing is a minor business activity in the area.

Extent of Project Investigations

During the late 1940's and early 1950's, the irrigation potential of this area was studied by the Bureau of Reclamation. In April of 1965, the Bureau completed and issued a reconnaissance report on this area.

Plan Features

Three diversion dams, one on the Elkhorn River near Inman, one on the South Fork near Ewing, and one on the Elkhorn River near Tilden, a feeder canal, an offstream dam and reservoir system and a canal and lateral system comprise the primary features of this potential project.

The two upper diversion dams, near Inman and Ewing, would divert flows of the Elkhorn River and South Fork into the feeder canal for storage in Saint Clair Reservoir. The third diversion dam would divert flows of the Elkhorn River to be used on 7,500 acres of valley lands and additional flows to be pumped into Saint Clair Reservoir for storage.

The Saint Clair Reservoir would be created by a series of four dams on Cedar, Saint Clair, and two unnamed creeks. The four impoundments would be interconnected by excavated channels and operate as a single reservoir. The top of the conservation pool would have a water surface area of about 9,600 acres and the total reservoir capacity would be 310,000 acre-feet.

A single spillway, located on Cedar Creek, would be an uncontrolled morning glory type with a maximum capacity of 1,760 c.f.s.

The river outlet works would have a capacity of 250 c.f.s. An outlet works for the Humphrey Canal would be located in a dike section along the east side of the reservoir and have a discharge capacity of 770 c.f.s.

The Inman Diversion Dam located on the Elkhorn River approximately one-half mile northeast of Inman, would have the capacity to divert 400 c.f.s. to the Saint Clair Feeder Canal.

The Holt Diversion Dam, located on the South Fork Elkhorn River approximately three miles west of Ewing, would have the capacity to divert 200 c.f.s. to the Saint Clair Feeder Canal.

The Tilden Diversion Dam would be on the Elkhorn River about three miles east of Oakdale. The diversion works would consist of a 370 c.f.s. headworks for diverting river flows to the Tilden Canal and the Oakdale Pumping Plant.

The Oakdale Pumping Plant would be located approximately two miles southeast of the Tilden Diversion works. This pumping plant would be designed to pump 250 c.f.s. against a total dynamic head of about 194 feet into the Saint Clair Reservoir.

The Saint Clair Feeder Canal would be about 40 miles in length and would originate at the canal outlet works of the Inman Diversion Works. It would have a capacity of 400 c.f.s. from its origin to the Holt Diversion Works, where the capacity would increase to 600 c.f.s.

The Humphrey Canal, originating at the canal outlet works of Saint Clair Reservoir, would be about 54 miles long and would serve about 48,000 irrigable acres. Its capacity would range from 4 to 700 c.f.s.

The Tilden Canal, beginning at a turnout from a settling basin below the Tilden Diversion Works, would extend about 24 miles and supply water for 7,500 irrigable acres. Its capacity would range from 18 to 120 c.f.s.

The laterals of the distribution system would have capacities of 4 to 100 c.f.s., with a combined length of about 250 miles. Several pumps would be included in the distribution system.

Project Benefits

Direct benefits would be derived from this project for irrigation, recreation, flood control and fish and wildlife. Irrigation would be the primary purpose of this multi-purpose project, but recreation and fish and wildlife benefits would be significant. The recreation, fish and wildlife features of this project would provide 422,000 recreation days and 60,000 fisherman days annually. The project would provide no dependable flood control benefits of consequence along the Elkhorn River because of the relatively small drainage area to be controlled. Saint Clair Reservoir, however, would provide incidental flood control benefits to Oakdale and to the lands immediately below the structures.

Remaining Water Resource Problems and Needs

Exclusive of the Sandhills area, flooding has occurred in the basin with regularity. Limited local flood protection works have been provided for some communities, but extensive additional measures are necessary to reduce flood damages.

Project Costs

The total estimated cost of this project would be $69,304,000. The share assigned to irrigation would be $62,114,000 and that assigned to recreation and fish and wildlife, $7,037,000. Flood control aspects of the project would involve an initial cost of $153,000.

Operation, Maintenance and Replacement

Operation, maintenance and replacement of the irrigation facilities would be the responsibility of a local sponsoring district. Operation, maintenance and replacement of recreation and fish and wildlife facilities would be the responsibility of a non-federal entity.

Local Interest and Support

Because of the drought of the 1950's, a group of individuals in the Elkhorn River Valley became interested in the irrigation potential of the Upper Basin and formed the Elkhorn Valley Water Resources Association.

During the spring of 1961, the Association requested that the Nebraska Soil and Water Conservation Commission coordinate planning activities for a basin-wide study of the soil and water resource development potential of the whole Elkhorn Valley.

At the present time, no legal entity capable of sponsoring the non-federal obligations has been formed.

Existing Resource Development in the Area

Present irrigation development is confined to pumping from wells and from the Elkhorn River and tributary streams.

Effect on Water Supply in Project Area

Private and public domestic water requirements are adequately served by pumping from ground water aquifers. Public waste treatment facilities are inadequate but are being improved. This proposed project would deplete the total runoff in the area about 50 percent, but should not have any serious adverse effects on the water supply downstream from the impoundment structures, with the exception of immediately below the structures where conditions may adversely affect the fishery.
HIGHLAND UNIT

LOCATION: Four Structures Located Near Oakdale, Ewing, Inman, and Tilden. Irrigable Areas Lie in Platte, Madison, and Antelope Counties.

SPONSORS: Elkhorn Valley Water Resources Association

FEATURES: Saint Clair Dam and Reservoir, Inman Diversion Works, Holt Diversion Works and Tilden Diversion Works

CONSTRUCTION PERIOD: 7 Years PROJECT LIFE: 100 Years

TOTAL ANNUAL COST: $2,727,000 ANNUAL O.M.&R.: $359,000

BENEFIT-COST RATIO: 1.28 to 1.00 COSTS BASED ON: 1965 Prices

TOTAL ANNUAL COST: $2,727,000 ANNUAL O.M.&R.: $359,000

Table 1 - Average Annual Project Benefits

<table>
<thead>
<tr>
<th>Irrigation</th>
<th>Recreation</th>
<th>Flood Control</th>
<th>Fish &amp; Wildlife</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Benefits</td>
<td>$2,804,000</td>
<td>$319,000</td>
<td>$7,000</td>
<td>$60,000</td>
</tr>
<tr>
<td>Indirect Benefits</td>
<td>301,000</td>
<td>-0-</td>
<td>-0-</td>
<td>-0-</td>
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<tr>
<td>Total Benefits</td>
<td>$3,105,000</td>
<td>$319,000</td>
<td>$7,000</td>
<td>$60,000</td>
</tr>
</tbody>
</table>

Table 2 - Project Costs and Repayment By Source

<table>
<thead>
<tr>
<th>Irrigation</th>
<th>Recreation</th>
<th>Flood Control</th>
<th>Fish &amp; Wildlife</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of Project Costs</td>
<td>$62,114,000</td>
<td>$5,727,000</td>
<td>$153,000</td>
<td>$1,310,000</td>
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<tr>
<td>Amount Reimburs.</td>
<td>62,114,000</td>
<td>584,000</td>
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<td>-0-</td>
</tr>
<tr>
<td>Non-reimbursable</td>
<td>-0-</td>
<td>$5,143,000</td>
<td>$153,000</td>
<td>$1,310,000</td>
</tr>
<tr>
<td>N.R.B.P. Not Available</td>
<td>-0-</td>
<td>-0-</td>
<td>-0-</td>
<td>-0-</td>
</tr>
<tr>
<td>Non-Federal (State)</td>
<td>-0-</td>
<td>584,000</td>
<td>-0-</td>
<td>-0-</td>
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<tr>
<td>Local Not Available</td>
<td>-0-</td>
<td>-0-</td>
<td>-0-</td>
<td>-0-</td>
</tr>
</tbody>
</table>

Table 3 - Average Annual Water Requirements

| Crop Irrigation Requirement: 0.90 ac. ft./ac. Farm Delivery Requirement: 1.29 ac. ft./ac. Diversion Requirement: 2.43 ac. ft./ac. Total Diversion Requirement: 129,000 ac. ft. Return Flow: Not Available Streamflow Depletion: Not Available |
| 60,000 | 210,000 | 310,000* | 11,000 | 5,600 |
| Total | 57,000 | 210,000 | 310,000* | 11,000 | 5,600 |
| Acre Feet | 60,000 | 210,000 | 310,000* | 11,000 | 5,600 |
| *Excludes Surcharge | 60,000 | 210,000 | 310,000* | 11,000 | 5,600 |

Table 4 - Dam and Reservoir Data

| Saint Clair Dam Height: 64 to 100 feet Length: Not Available Spillway Capacity: 1,760 c.f.s. Drainage Area: 109 square miles |
| 64 to 100 feet | 1,760 c.f.s. | 109 square miles |

Table 5 - Land Acquisition (Acres)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dam, Reservoir and Associated Distribution System</td>
<td>29,800</td>
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<tr>
<td>Recreation</td>
<td>500</td>
</tr>
<tr>
<td>TOTAL ACRES</td>
<td>29,300</td>
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</table>
LOGAN UNIT*

The potential Logan Unit of the Elkhorn Division would be located in the Logan Creek Valley of northeast Nebraska in Wayne, Dixon, Thurston, Cuming, and Burt Counties. This project would provide irrigation, flood control, recreation, and fish and wildlife benefits. The Elkhorn Valley Water Resources Association and the Lower Elkhorn Watershed Planning Board have shown interest in multi-purpose development of the Elkhorn Basin. The U.S. Bureau of Reclamation is planning this project.

Current Status

A reconnaissance report was published in April of 1966 but before any steps toward construction can be taken, local interest must be evident, a feasibility study must be authorized and money appropriated for further study of this project.

Description of Project Area

Irrigable lands comprise valley bottom lands, valley terraces and uplands. The valley lands are belts varying in width up to a maximum of three miles. The soil is developed mostly from loess. Poor drainage conditions exist in parts of the valley lands.
Rainfall averages 28 inches with approximately 21 inches falling during the months of April through September.

The economy of this area is basically agricultural. Most business activity stems from the processing and marketing of farm products.

Extent of Project Investigations

The Irrigation potential of the Elkhorn Basin was studied by the Bureau of Reclamation during the late 1940's and early 1950's. The drought of the middle 1950's adversely affected the local economy of this area and a group of individuals showed interest in irrigation and related resource development. This group was instrumental in securing the initiation of the reconnaissance investigations leading to this proposal and plan.

Plan Features

Pender Dam and Reservoir would be located on Logan Creek in Dixon, Wayne, and Thurston Counties. The dam structure would be located approximately two miles north of the town of Pender.
A gated overflow spillway would discharge 127,000 c.f.s. from the flood pool.
The outlet works to the Bancroft Canal would be located near the right end of the dam and have a design capacity of 200 c.f.s. Bancroft Canal would have a length of 36 miles and would serve the total irrigable area of 11,700 acres.
Irrigation and recreation are the major benefits of this project, but Pender Dam and Reservoir would also have a flood control capacity of 136,000 acre-feet and provide some benefits to fish and wildlife.

Project Benefits

Direct benefits derived from this project would include irrigation, enhancement of fish and wildlife and recreation, and flood control. The recreation, fish and wildlife features of this project will provide 750,000 recreation days and 42,500 fisherman days annually.

Remaining Water Resource Problems and Needs

This project would reduce flood damages downstream but substantially more protection from floods is needed. There is also need for additional land treatment measures and water based recreation.

* "Lower Basin, Elkhorn Division, Nebraska", Reconnaissance Report, April 1966. For information write: Area Engineer, Bureau of Reclamation, Grand Island, Nebraska.
Project Costs

The total cost of this project would be $31,190,000. Of this amount, $15,170,000 would be assigned to the irrigation function. Recreation and fish and wildlife costs would total $11,286,000 with the non-federal share being slightly over $2,000,000.

Operation, Maintenance and Replacement

Operation and maintenance of the irrigation distribution features would be the responsibility of local sponsors. Recreation and fish and wildlife operation, maintenance and replacement would be the responsibility of a non-federal entity.

Local Interest and Support

No legal sponsoring district has been formed. Local interest has been shown for the flood prevention and control associated with this project but interest in other functions is not widely evident.

Existing Resource Development in the Area

Water resource development is rather limited in this area. No project irrigation has been developed. A few flood-protection facilities have been developed in this area. Existing works are for local protection and consist mostly of channel straightening and some levee work around towns.

Effect on Water Supply in Project Area

This project should not affect municipal and domestic water supplies as private, public, and industrial water requirements are now adequately served by pumping from ground water aquifers and should continue to be met in the future. Project operation would provide for maintenance of natural stream flows sufficient to meet all existing water rights downstream. The decrease in stream flows due to project water depletions may reduce the stream's capacity to assimilate wastes and adversely affect the fishery. However, conditions during normal low flow periods would be improved by the regulated stream flow.
LOCATION: Logan Creek Valley in Wayne, Dixon, Thurston, Cuming and Burt Counties
SPONSORS: Elkhorn Valley Water Resources Association and Lower Elkhorn Watershed Planning Board
FEATURES: Pender Dam and Reservoir and Associated Distribution Works

LOGAN UNIT

LOCATION: Logan Creek Valley in Wayne, Dixon, Thurston, Cuming and Burt Counties
SPONSORS: Elkhorn Valley Water Resources Association and Lower Elkhorn Watershed Planning Board
FEATURES: Pender Dam and Reservoir and Associated Distribution Works

CONSTRUCTION PERIOD: 6 Years
PROJECT LIFE: 100 Years
TOTAL ANNUAL COST: $1,302,500
ANNUAL O&M: $227,000
BENEFIT-COST RATIO: 1.06 to 1.00
COSTS BASED ON: 1966 Prices
TOTAL ANNUAL COST: $1,302,500
ANNUAL O&M: $227,000
BENEFIT-COST RATIO: 1.06 to 1.00
COSTS BASED ON: 1966 Prices
TOTAL ANNUAL COST: $1,302,500
ANNUAL O&M: $227,000
BENEFIT-COST RATIO: 1.06 to 1.00
COSTS BASED ON: 1966 Prices

Table 1 - Average Annual Project Benefits

<table>
<thead>
<tr>
<th>Feature</th>
<th>Direct Benefits</th>
<th>Indirect Benefits</th>
<th>Total Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation</td>
<td>$591,000</td>
<td>0</td>
<td>$591,000</td>
</tr>
<tr>
<td>Recreation</td>
<td>$560,000</td>
<td>0</td>
<td>$560,000</td>
</tr>
<tr>
<td>Fish &amp; Wildlife</td>
<td>0</td>
<td>0</td>
<td>$0</td>
</tr>
<tr>
<td>Flood Control</td>
<td>$170,000</td>
<td>19,000</td>
<td>$189,000</td>
</tr>
<tr>
<td>Total</td>
<td>$1,261,000</td>
<td>19,000</td>
<td>$1,280,000</td>
</tr>
</tbody>
</table>

Table 2 - Project Costs and Repayment by Source

<table>
<thead>
<tr>
<th>Feature</th>
<th>Irrigation</th>
<th>Recreation</th>
<th>Fish &amp; Wildlife</th>
<th>Flood Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Costs</td>
<td>$1,170,000</td>
<td>$10,229,000</td>
<td>$1,057,000</td>
<td>$4,734,000</td>
<td>$14,000,000</td>
</tr>
<tr>
<td>Non-reimbursable</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>M.R.B.P.</td>
<td>Not Available</td>
<td>Not Available</td>
<td>Not Available</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
<tr>
<td>Non-Federal (State)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Local</td>
<td>Not Available</td>
<td>Not Available</td>
<td>Not Available</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
</tbody>
</table>

Table 3 - Average Annual Water Requirements

<table>
<thead>
<tr>
<th>Feature</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop Irrigation</td>
<td>0.95 ac.ft./ac.</td>
</tr>
<tr>
<td>Farm Delivery</td>
<td>1.38 ac.ft./ac.</td>
</tr>
<tr>
<td>Diversion Requirement</td>
<td>2.32 ac.ft./ac.</td>
</tr>
<tr>
<td>Total Diversion Requirement</td>
<td>25,500 ac.ft.</td>
</tr>
<tr>
<td>Return Flow</td>
<td>Not Available</td>
</tr>
<tr>
<td>Streamflow Depletion</td>
<td>Not Available</td>
</tr>
</tbody>
</table>

Table 4 - Dam and Reservoir Data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Capacity</th>
<th>Acre-Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pender Dam</td>
<td>Height</td>
<td>65 feet</td>
</tr>
<tr>
<td></td>
<td>Length</td>
<td>10,000</td>
</tr>
<tr>
<td>Pender Reservoir</td>
<td>Capacity</td>
<td>150,000</td>
</tr>
<tr>
<td></td>
<td>Surcharge</td>
<td>42,700</td>
</tr>
<tr>
<td></td>
<td>Conservation</td>
<td>77,100</td>
</tr>
<tr>
<td></td>
<td>Sediment</td>
<td>7,850-50 yr.</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>246,100*</td>
</tr>
</tbody>
</table>

Table 5 - Land Acquisition

<table>
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<tr>
<th>Feature</th>
<th>Fee</th>
<th>Easement</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logan Dam</td>
<td>--</td>
<td>--</td>
<td>15,600</td>
</tr>
<tr>
<td>Recreational</td>
<td>--</td>
<td>--</td>
<td>825</td>
</tr>
<tr>
<td>Canals</td>
<td>--</td>
<td>--</td>
<td>370</td>
</tr>
<tr>
<td>Laterals</td>
<td>--</td>
<td>--</td>
<td>320</td>
</tr>
<tr>
<td>Operating Facilities</td>
<td>--</td>
<td>--</td>
<td>10</td>
</tr>
<tr>
<td>Total Acres</td>
<td>--</td>
<td>--</td>
<td>17,125</td>
</tr>
</tbody>
</table>

LOGAN UNIT LOCATION:

LOCATION: Logan Creek Valley in Wayne, Dixon, Thurston, Cuming and Burt Counties
SPONSORS: Elkhorn Valley Water Resources Association and Lower Elkhorn Watershed Planning Board
FEATURES: Pender Dam and Reservoir and Associated Distribution Works

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<td>320</td>
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<td>10</td>
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<tr>
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<td>--</td>
<td>--</td>
<td>17,125</td>
</tr>
</tbody>
</table>
NORFOLK UNIT*

The potential Norfolk Unit is located in Madison, Stanton, Cuming and Dodge Counties. The Elkhorn Valley Water Resources Association and the Lower Elkhorn Watershed Planning Board have shown their interest in this multi-purpose development. The U. S. Bureau of Reclamation is planning this project.

Current Status

A reconnaissance report has been prepared on this unit but before further steps can be taken toward construction, local interest must be evident, and Congress must authorize a feasibility study and appropriate funds for further study.

Description of Project Area

The Norfolk Unit area is made up of valley bottom land, valley terraces and uplands. The upland areas are generally sloping and dissected by small drains. The soil is primarily silty loess. Poor drainage conditions exist in parts of the valley lands. However, these lands are not proposed for project irrigation.

Rainfall averages 28 inches, with approximately 21 inches falling during the months of April through September.

The economy of this area is basically agricultural. Most business stems from the processing and marketing of farm products.

Extent of Project Investigations

The potential for the development of irrigation in the area was studied by the Bureau of Reclamation during the late 1940's and early 1950's. The drought of the 1950's adversely affected the local economy of this area and stimulated local interest in the initiation of a reconnaissance investigation by the Bureau of Reclamation.

Plan Features

Major features of the Norfolk Unit would be the Monterey Dam and Reservoir and the Warnerville Diversion Works. Monterey Dam would be located on Pebble Creek, a tributary of the Elkhorn River, approximately seven miles southwest of West Point in Cuming County.

A 3500 c.f.s. uncontrolled morning-glory type spillway would be located on the right side of the dam embankment. The river outlet works, located near the center of the dam embankment, would have a discharge capacity of 900 c.f.s.

A 400 c.f.s. canal outlet works located near the right end of the dam embankment would serve 25,000 acres of upland between Pebble and Maple Creeks by gravity.

The Warnerville Diversion Dam, located on the Elkhorn River approximately four miles southeast of Norfolk, would consist primarily of an uncontrolled overflow spillway and two canal headworks.

A 500 c.f.s. headworks and sluiceway adjacent to the right end of the spillway would divert river flows to the Monterey Feeder Canal to both deliver water to the Monterey Reservoir and serve 2900 acres with irrigation water enroute. A 90 c.f.s. headworks and sluiceway adjacent to the left end of the spillway would divert river flows to the Norfolk Canal, to serve about 5100 acres of land on the north side of the river.

The project lands receiving irrigation service would be located from Norfolk to Wisner and in upland areas between Pebble and Maple Creek.

Project Benefits

Direct benefits are derived for this project from irrigation, recreation, fish and wildlife and flood control. The recreation, fish and wildlife features of this project will provide 924,000 recreation days and 43,700 fisherman days annually. The flood control benefits would be incidental to the operation of the reservoir and would reduce annual damages on Pebble Creek about 30 percent.

* "Lower Basin, Elkhorn Division, Nebraska", Reconnaissance Report, April 1966. For information, write: Area Engineer, Bureau of Reclamation, Grand Island, Nebraska.
Remaining Water Resource Problems and Needs

Additional flood control is needed as is land treatment to reduce siltation.

Project Costs

The estimated total cost of this project would be $54,970,000. The irrigation cost would be $41,910,000 and recreation costs would be $11,861,000 with $2,630,000 repaid by the state.

Operation, Maintenance and Replacement

Operation, maintenance and replacement of the irrigation facilities would be the responsibility of a local sponsor.

Operation, maintenance and replacement of the recreation and fish and wildlife facilities would be the responsibility of a non-federal entity.

Local Interest and Support

Local interest in this project is presently concerned with flood prevention and control and present interest in other functions is not widely evident.

Existing Resource Development in the Area

Water resource development is rather limited in this area. No nearby project irrigation has been developed.

A few flood protection facilities have been developed in this area. Existing works are for local protection and consist mostly of channel straightening and some diking around towns.

Effect on Water Supply in Project Area

Operation of this project would include sufficient releases to meet all existing downstream water rights. The installation of the project would decrease the average flow of the Elkhorn River below Warnerville Diversion Dam about 40 percent causing an adverse effect on the fishery immediately below the point of diversion.
NORFOLK UNIT
LOCATION: Madison, Stanton, Cuming and Dodge Counties with irrigable Acres from Norfolk to Wisner
FEATURES: Monterey Dam and Reservoir, Warnerville Diversion Works and Canals
CONSTRUCTION PERIOD: 8 Years PROJECT LIFE: 100 Years
TOTAL ANNUAL COST: $2,214,400 ANNUAL O.M.&R.: $351,700
BENEFIT-COST RATIO: 1.16 to 1.00 COSTS BASED ON: 1966 Prices
PROJECT ACREAGE: 33,000 Acres

Table 1 - Average Annual Project Benefits
<table>
<thead>
<tr>
<th>Feature</th>
<th>Irrigation</th>
<th>Recreation</th>
<th>Fish &amp; Wildlife</th>
<th>Flood Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Benefits</td>
<td>$1,668,000</td>
<td>$693,000</td>
<td>$43,700</td>
<td>$11,000</td>
<td>$2,415,700</td>
</tr>
<tr>
<td>Indirect Benefits</td>
<td>163,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>163,000</td>
</tr>
<tr>
<td>Total Benefits</td>
<td>$1,831,000</td>
<td>$693,000</td>
<td>$43,700</td>
<td>$11,000</td>
<td>$2,578,700</td>
</tr>
</tbody>
</table>

Table 2 - Project Costs and Repayment by Source
<table>
<thead>
<tr>
<th>Feature</th>
<th>Irrigation</th>
<th>Recreation</th>
<th>Fish &amp; Wildlife</th>
<th>Flood Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of Project Cost</td>
<td>$41,910,000</td>
<td>$11,861,000</td>
<td>$956,000</td>
<td>$243,000</td>
<td>$54,970,000</td>
</tr>
<tr>
<td>Amount Reimbursable</td>
<td>41,910,000</td>
<td>2,650,000</td>
<td>0</td>
<td>0</td>
<td>44,560,000</td>
</tr>
<tr>
<td>Non-reimbursable</td>
<td>0</td>
<td>9,231,000</td>
<td>956,000</td>
<td>0</td>
<td>10,430,000</td>
</tr>
<tr>
<td>M.R.R.P.</td>
<td>Not Available</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>--</td>
</tr>
<tr>
<td>Non-Federal(State)</td>
<td>0</td>
<td>2,650,000</td>
<td>0</td>
<td>0</td>
<td>2,650,000</td>
</tr>
<tr>
<td>Local</td>
<td>Not Available</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>--</td>
</tr>
</tbody>
</table>

Table 3 - Average Annual Water Requirements
<table>
<thead>
<tr>
<th>Feature</th>
<th>Crop Irrigation Requirement: 0.95 ac. ft./ac.</th>
<th>Farm Delivery Requirement: 1.38 ac. ft./ac.</th>
<th>Diversion Requirement: 2.41 ac. ft./ac.</th>
<th>Total Diversion Requirement: 76,600 ac. ft.</th>
<th>Return Flow: Not Available</th>
<th>Streamflow Depletion: Not Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monterey Dam</td>
<td>Height: 102 feet</td>
<td>Length: 10,100 ft.</td>
<td>Spillway Capacity: 3,500 c.f.s.</td>
<td>Drainage Area: 210 square miles</td>
<td>Monterey Reservoir</td>
<td>Capacity: 3,500 c.f.s.</td>
</tr>
<tr>
<td></td>
<td>Flood Control: 10</td>
<td>Surcharge: 10</td>
<td>Conservation: 115,500</td>
<td>Sediment: 5,000/50 yr, 10,000/100 yr</td>
<td>Total: 211,100</td>
<td>Area: 3,500</td>
</tr>
<tr>
<td></td>
<td>Surcharge: 0</td>
<td>Conservation: 0</td>
<td>Sediment: 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total: 0</td>
<td>Area: 3,500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4 - Dam and Reservoir Data

Table 5 - Land Acquisition (acres)
<table>
<thead>
<tr>
<th>Feature</th>
<th>Fee</th>
<th>Easement</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monterey</td>
<td>15,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warnerville</td>
<td>1200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canals</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loft &amp; Grains</td>
<td>1,200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Facilities</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreation Develop.</td>
<td>1,140</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Acres</strong></td>
<td><strong>21,515</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The following projects have been planned by the Corps of Engineers and were found to be economically feasible but at the present time are inactive because the plans were not accepted by the local people.

**BATTLE CREEK***

**Local Flood Protection Project**

This potential project would provide flood protection for the town of Battle Creek and the area downstream along Battle Creek to its confluence with the Elkhorn River. The project would include levees, nine channel cutoffs and enlargement of the existing channel.

**Current Status**

General design memorandum studies are completed but further study has been deferred at the request of local interests. If no change in local interest is noted within five years of January 1, 1967, renewal of the project will mean a repeat of all planning steps necessary for new project planning. Proposed project costs total $266,500 based on 1965 costs. The federal share would be $213,000 with non-federal share being $53,500.

**GILES CREEK - TILDEN, NEBRASKA***

**Local Flood Protection Project**

This potential project would provide flood protection for the town of Tilden and the area downstream along Giles Creek to the Elkhorn. The project would include a levee, diversion channel and floodway, and concrete spillway to reduce destructive water velocities.

**Current Status**

Further study has been deferred at the request of local interests. Cost of this proposed project would total $647,000 based on 1965 costs. The federal share would be $564,000, and the non-federal share $83,000.

* "Elkhorn River and Tributaries, Nebraska", House Document No. 215, 81st Congress, 1st Session, 1949. For information write: District Engineer, Army Corps of Engineers, Omaha, Nebraska.
LEGEND

PROPOSED DAM & RESERVOIR SITE
PROPOSED CANAL
PROPOSED PUMPING PLANT
PROPOSED WATERSHED PROJECT
PROPOSED RIVER SIPHON
PROPOSED DIVERSION DAM
PROPOSED PROJECT IRRIGATION
EXISTING DAM & RESERVOIR

NOTE: ALL BASIN MAP LEGENDS WERE STANDARDIZED AND ALL FEATURES WILL NOT APPEAR ON EVERY MAP.
LITTLE BLUE RIVER BASIN
LITTLE BLUE UNIT*

The potential Little Blue Unit is located on the Little Blue River in Clay, Nuckolls, Thayer and Jefferson Counties in south-central Nebraska.

The Little Blue Flood Control and Conservation Association and the Little Blue Irrigation District have shown interest in this potential multi-purpose project. The U.S. Bureau of Reclamation is planning the project.

Current Status

A feasibility report has been prepared on this project. Construction will depend upon construction authorization and provision of funds by the Congress. Prior to construction, fifteen months would be required to collect final design data.

Description of Project Area

The area encompassing the Little Blue Unit is comprised of loess mantled uplands with a well-developed drainage pattern, narrow terraces and narrow flood plains.

The average annual precipitation is 27 inches of which about 83 percent occurs during the six-month growing season from April through September.

The economy is agriculturally based with livestock, wheat, and corn being the chief exports of the area. Most of the few industrial concerns in the area are engaged in the processing of local agricultural products.

Extent of Project Investigations

In the fall of 1949, preliminary investigations were made by the Bureau of Reclamation to select a storage site on the Little Blue River and to locate arable areas. These studies were carried on into the early 1950's and an alternate body of arable lands was selected for potential development. In 1958, a reconnaissance report was published with detailed plans of the storage site and arable land. In 1962, an unpublished evaluation of the feasibility of the unit with irrigation was completed. In October of 1966, the Bureau of Reclamation published a detailed feasibility report of this area including Angus Dam and Reservoir and irrigable areas with the irrigation function deferred. This was updated in a January 1968 report.

Plan Features

Included in this plan is the Angus Dam and Reservoir which would be located approximately three miles northwest of the town of Angus. A combination spillway and river outlet works with a capacity of 158,800 c.f.s. would be located in the left abutment. The canal outlet works to be located in the right abutment would have a maximum capacity of 220 c.f.s. Construction of the canals and pumping plants associated with the future irrigation of 20,000 acres would be deferred. An estimated 1,920 acres of land would be purchased specifically for fish and wildlife purposes.

Project Benefits

Flood control is one of the primary functions of the proposed Angus Dam and Reservoir. This reservoir would significantly reduce the flooding of valley lands, several cities and towns, a number of roads and highways, and utilities and railroad lines. Other direct benefits for recreation, fish and wildlife would also be derived from this project. The recreation, fish and wildlife features of this project will provide 110,650 recreation days, 32,600 fisherman days, and 150 hunter days. Irrigation would provide direct benefits, but would be deferred for 20 years.

Remaining Water Resource Problems and Needs

The most predominant remaining needs in this area are additional flood control, the stabilization of ground water levels, and the extension of irrigation to stabilize agricultural production at higher and more profitable levels.

* "Angus Dam and Reservoir", Little Blue Unit, Nebraska, Blue Division, October 1966. For Information write: Project Manager, Bureau of Reclamation, McCook, Nebraska.
Project Costs

Project costs allocated to irrigation are reimbursable without interest and would be paid from Missouri River Basin Project power revenues pending development of irrigation. At the time irrigation facilities are constructed, the irrigation district would then pay annual operation, maintenance and replacement costs of $118,000 and make payment, within the irrigator's ability to pay, on the allocated irrigation construction costs. That portion of the irrigation allocation exceeding the district's ability to pay would be repaid by power revenues from the Missouri River Basin Project. $16,901,500 allocated to flood control would be non-reimbursable.

Operation, Maintenance and Replacement

Operation, maintenance and replacement of the irrigation distribution features would be the responsibility of the local district board. The operation and maintenance of the recreation facilities would likely be the responsibility of a state agency.

Local Interest and Support

Nuckolls, Thayer, and Jefferson Counties have assessed special tax levies to financially assist the sponsors in working for the unit. The Little Blue River Irrigation and Flood Control Committee was organized in 1956 and has actively supported the proposed project. The Little Blue Irrigation District was formed in 1961 to demonstrate the local interest in irrigation.

Development of this unit has received strong support as evidenced by the many petitions, resolutions, and numerous individual letters sent to the members of Congress and to the officials of the Department of Interior.

Existing Resource Developments in the Area

At present, there are 445 acres in the Ruskin area under irrigation. This water is being supplied by pumping from farm ponds and deep wells, but most of this land is receiving an inadequate water supply.

Effect on Water Supply in the Area

According to investigations by the Public Health Service, the proposed structures would not adversely affect water supplies. Most towns in the area obtain adequate municipal water supplies from wells and are not dependent on surface flows. Holders of existing prior water rights would be provided water.

Total depletions by the project would average about 26,400 acre-feet annually and consist of evaporation losses and irrigation depletions.
LITTLE BLUE UNIT

LOCATION: Little Blue River, South-central Nebraska in Clay, Nuckolls, Thayer and Jefferson Co.
SPONSORS: Little Blue Flood Control and Conservation Association & Little Blue Irrigation Dist.
FEATURES: Angus Dam and Reservoir

CONSTRUCTION PERIOD: 6 Years
PROJECT LIFE: 100 Years
TOTAL ANNUAL COST: $1,518,600
ANNUAL O.M.&R.: $152,300
BENEFIT-COST RATIO: 1.65 to 1.00
COSTS BASED ON: 1965 Prices
PROJECT ACREAGE: 20,000 Acres

Table 1 - Average Annual Project Benefits

<table>
<thead>
<tr>
<th></th>
<th>Flood Control</th>
<th>Recreation</th>
<th>Fish &amp; Wildlife</th>
<th>Irrigation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Benefits</td>
<td>$1,443,000</td>
<td>$137,300</td>
<td>$172,400</td>
<td>$614,200</td>
<td>$2,366,900</td>
</tr>
<tr>
<td>Indirect Benefits</td>
<td>-0-</td>
<td>Not Available</td>
<td>-0-</td>
<td>132,700</td>
<td>132,700</td>
</tr>
<tr>
<td>Total Benefits</td>
<td>$1,443,000</td>
<td>$137,300</td>
<td>$172,400</td>
<td>$746,900</td>
<td>$2,499,600</td>
</tr>
</tbody>
</table>

*Irrigation Benefits are deferred for 20 years

Table 2 - Project Costs and Payment by Source

<table>
<thead>
<tr>
<th>Share of Project Costs</th>
<th>Flood Control</th>
<th>Recreation</th>
<th>Fish &amp; Wildlife</th>
<th>Irrigation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount Reimbursed</td>
<td>$16,901,500</td>
<td>$2,120,700</td>
<td>$3,014,600</td>
<td>$17,981,200</td>
<td><strong>$40,128,000</strong></td>
</tr>
<tr>
<td>Non-reimbursable</td>
<td>$16,901,500</td>
<td>$2,042,700</td>
<td>$2,833,100</td>
<td>-0-</td>
<td><strong>$21,777,300</strong></td>
</tr>
<tr>
<td>M.R.B.P.</td>
<td>-0-</td>
<td>-0-</td>
<td>-0-</td>
<td>-0-</td>
<td>--</td>
</tr>
<tr>
<td>Non-Federal(State)</td>
<td>-0-</td>
<td>80,200</td>
<td>188,500</td>
<td>-0-</td>
<td>268,700</td>
</tr>
<tr>
<td>Local</td>
<td>-0-</td>
<td>-0-</td>
<td>-0-</td>
<td>-0-</td>
<td>--</td>
</tr>
</tbody>
</table>

**Includes $110,000 for Non-reimbursable Road Relocation

Table 3 - Average Annual Water Requirements

Crop Irrigation Requirement: Ruskin 0.80 a.f./ac.-Gladstone 0.71a.f./ac.
Farm Delivery Requirement: Ruskin 1.23 a.f./ac.-Gladstone 1.09a.f./ac.
Diversion Requirement: Ruskin 1.82 a.f./ac.-Gladstone 1.49a.f./ac.
Total Diversion Requirement: 31,600 acre feet
Return Flow: 11,300 acre feet
Streamflow Depletion: 26,400 acre feet

Table 4 - Dam and Reservoir Data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Flood Control</th>
<th>Surcharge</th>
<th>Conservation</th>
<th>Sediment</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angus Dam</td>
<td>337,000</td>
<td>56,000</td>
<td>94,800</td>
<td>13,000/50 years- 26,000/100 years</td>
<td></td>
</tr>
<tr>
<td>Total Area</td>
<td>440,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feature</th>
<th>Flood Control Pool</th>
<th>Surcharge Pool</th>
<th>Conservation Pool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angus Dam &amp; Res.</td>
<td>12,964</td>
<td>14,006</td>
<td>5,080</td>
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</table>

Table 5 - Land Acquisition (Acres)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Fee</th>
<th>Easement</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angus Dam &amp; Res.</td>
<td>21,179</td>
<td>110</td>
<td>21,289</td>
</tr>
<tr>
<td>Fish &amp; Wildlife</td>
<td>1,920</td>
<td>-0-</td>
<td>1,920</td>
</tr>
<tr>
<td>Total Acres</td>
<td>23,099</td>
<td>110</td>
<td>23,209</td>
</tr>
</tbody>
</table>

3-3
LEGEND*

PROPOSED DAM & RESERVOIR SITE
PROPOSED CANAL
PROPOSED PUMPING PLANT
PROPOSED WATERSHED PROJECT
PROPOSED RIVER SIPHON
PROPOSED DIVERSION DAM
PROPOSED PROJECT IRRIGATION
EXISTING DAM & RESERVOIR

*NOTE: ALL BASIN MAP LEGENDS WERE STANDARDIZED AND ALL FEATURES WILL NOT APPEAR ON EVERY MAP.
NIOBRARA RIVER BASIN
LAVACA FLATS UNIT*

The potential Lavaca Flats Unit is located in the Niobrara River Basin in Northwestern Nebraska, about 10 miles southeast of Gordon. The Bureau of Reclamation investigated this project as part of a basin study.

Current Status

A feasibility report was prepared on this project by the Bureau of Reclamation in 1956. No authorization or construction funding was sought because local interest diminished. Before further steps toward construction can be taken, firm indications of local interest and support must be evident. If interest and support is again demonstrated then this unit must be authorized by the Congress and funds made available before construction could begin.

Description of Project Area

The Lavaca Flats Unit has topography suitable for irrigation development. Pronounced drainageways afforded excellent drainage from the arable lands into the Niobrara River. Precipitation in the basin varies greatly in amount and distribution. The average annual precipitation is 17 inches of which about 80 percent is received during the April through October irrigation season. The economy of the area is primarily agricultural with cattle, hay and forage sorghum being the leading farm commodities.

Extent of Project Investigations

After public interest was expressed regarding irrigation of this area, the Bureau of Reclamation made a comprehensive investigation of the land and water resources of the Niobrara River Basin as described in a report published in 1953. The Bureau prepared a feasibility report on the Lavaca Flats Unit in September, 1956.

Plan Features

The plan for the Lavaca Flats Unit involves construction of a pumping plant, a main supply canal, distribution laterals, and a drainage system. These facilities would lift Niobrara River water a height of 110 feet and deliver it to 2,270 acres. The pumping plant would be located on the Niobrara River about 10 miles southeast of Gordon. The Lavaca Flats canal would extend 11.5 miles from the pumping plant to the project lands and will have an initial capacity of 42 c.f.s. Four small laterals totaling 3.4 miles in length would distribute the water throughout the irrigable area.

Project Benefits

A small direct benefit, in addition to irrigation, would accrue to wildlife from the increased habitat cover due to the development of this project.

Remaining Water Resource Problems and Needs

Erosion is a severe problem in this area and extensive land treatment is necessary. Sediment bedload is quite high in the Niobrara River.

Project Costs

The total cost of this project would be $1,250,700. The local irrigators' share would total $339,200 and be repaid over a 40-year period. The only function cost involved under the present proposal is irrigation.

* "Lavaca Flats Unit, Nebraska", Upper Niobrara Division Project, Sept. 1956. For information, write: Area Engineer, Bureau of Reclamation, Grand Island, Nebraska.
Operation, Maintenance and Replacement

Operation, maintenance and replacement would be the responsibility of a non-federal entity.

Local Interest and Support

There is little local support for this project and currently there are no known plans for formation of a contracting entity such as an irrigation district.

Existing Resource Development in the Area

Small tracts of land near Gordon are presently under pump irrigation.

Effect on Water Supply in Project Area

This unit would have capacity to divert 40 c.f.s., which is in excess of that allowed by state law on a project of this size. Further study would be required to resolve this problem. Diversion of water at the Lavaca Flats pump site would reduce the flow at the Niobrara and Spencer Power Plants by a small percentage.
LAVACA FLATS UNIT

LOCATION: Niobrara River, Ten Miles Southeast of Gordon

SPONSORS: Pumping Plant and Canals

FEATURES: Pumping Plant and Canals

CONSTRUCTION PERIOD: 1 Year

TOTAL ANNUAL COSTS: $57,020

BENEFIT-COST RATIO: 2.74 to 1.00

PROJECT ACREAGE: 2270 Acres

TOTAL ANNUAL COSTS: $57,020

ANNUAL O.M.&R.: $15,440

BENEFIT-COST RATIO: 2.74 to 1.00

COSTS BASED ON: 1956 Prices

PROJECT ACREAGE: 2270 Acres

Table 1 - Average Annual Project Benefits

<table>
<thead>
<tr>
<th></th>
<th>Irrigation</th>
<th>Fish &amp; Wildlife</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Benefits</td>
<td>$53,300</td>
<td>$230</td>
<td>$53,530</td>
</tr>
<tr>
<td>Indirect Benefits</td>
<td>80,100</td>
<td>-</td>
<td>80,100</td>
</tr>
<tr>
<td>Total Benefits</td>
<td>$133,400</td>
<td>$230</td>
<td>$133,630</td>
</tr>
</tbody>
</table>

Table 2 - Project Costs and Repayment by Source

<table>
<thead>
<tr>
<th></th>
<th>Irrigation</th>
<th>Fish &amp; Wildlife</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of Project Costs</td>
<td>$1,250,700</td>
<td>-</td>
<td>$1,250,700</td>
</tr>
<tr>
<td>Reimbursement</td>
<td>1,250,700</td>
<td>-</td>
<td>1,250,700</td>
</tr>
<tr>
<td>Payment by Fed.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>M.R.B.P.</td>
<td>911,500</td>
<td>-</td>
<td>911,500</td>
</tr>
<tr>
<td>State</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Local</td>
<td>339,200</td>
<td>-</td>
<td>339,200</td>
</tr>
</tbody>
</table>

Table 3 - Average Annual Water Requirements

Crop Irrigation Requirement: 1.20 ac.ft./ac.
Farm Delivery Requirement: 1.71 ac.ft./ac.
Diversion Requirement: 2.06 ac.ft./ac.
Total Diversion Requirement: 4,700 ac.ft.
Return Flow: 1,000 ac.ft.
Streamflow Depletion: 3,700 ac.ft.

Table 4 - Dam & Reservoir Data

NOT APPLICABLE

Table 5 - Land Acquisition (acres)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Fee</th>
<th>Easement</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pumping Plant</td>
<td>--</td>
<td>--</td>
<td>4</td>
</tr>
<tr>
<td>Canals</td>
<td>--</td>
<td>--</td>
<td>75</td>
</tr>
<tr>
<td>Lateral</td>
<td>--</td>
<td>--</td>
<td>15</td>
</tr>
<tr>
<td>Drains (Surface &amp; Subsurface)</td>
<td>--</td>
<td>--</td>
<td>25</td>
</tr>
<tr>
<td>Total Acres</td>
<td></td>
<td></td>
<td>119</td>
</tr>
</tbody>
</table>
The existing Mirage Flats Project is located in Northwestern Nebraska with storage works on the Niobrara River in Dawes County. Irrigated lands lie in Sheridan County approximately 12 miles south of Hay Springs, Nebraska. The Mirage Flats Irrigation Project has an inadequate water supply and the U.S. Bureau of Reclamation has developed a feasibility report proposing supplemental water for the existing project.

Current Status

A feasibility report was prepared on this proposal in 1965, but before any steps toward construction can be taken, the Congress must authorize the construction and appropriate funds necessary for construction.

Description of Project Area

Geographically, this portion of the Niobrara River Basin is characterized by flat table lands which have been modified severely by erosion at many points along the Niobrara River and its tributaries. At these points the terrain varies from rolling to rough. Irrigated lands of this project lie in a compact body on stream terraces in the Niobrara River Valley.

The average annual precipitation in this area is 16 inches with about three-fourths of the annual precipitation occurring during the growing season.

The economy of the general Mirage Flats area is typically agricultural.

Extent of Project Investigations

In 1962 the Bureau of Reclamation published a reconnaissance report proposing extension of the irrigation service to 6,200 additional acres and supplemental water for presently irrigated lands. Local support for irrigation of these new lands diminished so further studies were limited to provisions of supplemental water only and resulted in the December 1965 feasibility report.

Plan Features

The plan to supply supplemental water to the existing project lands by way of the present distribution system envisions pumping from 17 deep wells. The plan of development includes acquisition of additional rights-of-way surrounding Box Butte Reservoir to enhance recreation and fish and wildlife, and to alleviate existing and future operation and maintenance problems. The plan also includes minor drainage facilities and the acquisition of additional rights-of-way along canal operating roads.

Project Benefits

Benefits accruing from the proposed additions to the existing project would include irrigation, fish and wildlife, and recreation.

One of the benefits to fish and wildlife would come from the restocking and rehabilitation of Box Butte Reservoir with desirable game fish. In addition to land now available or to be acquired at the Box Butte Reservoir for irrigation purposes, 350 acres would be acquired specifically for fish and wildlife.

The National Park Service requested that portions of the reservoir lands to be acquired for other purposes be designated as recreation areas. To facilitate use of these lands, some additional basic facilities will be required.

The proposed additions will provide an additional 5,000 recreation days, and an additional 4,490 hunting, fishing, and nature study days annually.

* "Mirage Flats Project, Nebraska", December 1965. For information, write: Area Engineer, Bureau of Reclamation, Grand Island, Nebraska.
Remaining Water Resource Problems and Needs

There is a limited amount of surface water available for irrigation. Conjunctive use of surface and ground water is necessary to insure the most efficient use of available water.

Project Costs

The total estimated cost of this addition to the present Mirage Flats Project would be $708,000, of which $148,000 would be assigned to recreation and fish and wildlife.

Operation, Maintenance and Replacement

The operation and maintenance of this addition would be the responsibility of the Mirage Flats Irrigation District. Operation, maintenance and replacement of the recreation and fish and wildlife facilities would be the responsibility of a state agency.

Local Interest and Support

Local interest in this project has developed due to a lack of an adequate water supply to serve present project lands. The Mirage Flats Irrigation District Board requested the Bureau of Reclamation to complete the feasibility investigations at the earliest possible date. The district also supported requests for Congressional approval of funds and cooperated in the investigation program.

Existing Resource Development in the Area

The existing Mirage Flats Project irrigates 11,662 acres. Present development includes the Box Butte Dam and Reservoir, Dunlap Diversion Dam, and Mirage Flats Canal and laterals. Some recreation and fish and wildlife benefits are derived from the existing project.

Effect on Water Supply in Area

Additions to this existing project should not have any detrimental effect on the existing private, public and industrial water uses, as they are now and will continue to be adequately served by pumping from ground water aquifers. Use of these aquifers is not too extensive due to the sparse population in this area.
MIRAGE FLATS PROJECT

LOCATION: Northwestern Nebraska in the Niobrara River Basin Twelve Miles South of Hay Springs
SPONSORS: Mirage Flats Irrigation District
FEATURES: 17 Deep Irrigation Wells

CONSTRUCTION PERIOD: 2 Years PROJECT LIFE: 100 Years
TOTAL ANNUAL COST: $54,000 ANNUAL O.M.&R.: $33,100
BENEFIT-COST RATIO: 2.00 to 1.00 COSTS BASED ON: 1965 Prices
PROJECT ACREAGE: 11,662 Acres

Table 1 - Average Annual Project Benefits

<table>
<thead>
<tr>
<th>Feature</th>
<th>Irrigation</th>
<th>Fish &amp; Wildlife</th>
<th>Recreation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Benefits</td>
<td>$ 77,600</td>
<td>$ 8,500</td>
<td>$ 3,700</td>
<td>$ 89,800</td>
</tr>
<tr>
<td>Indirect Benefits</td>
<td>18,000</td>
<td>-0-</td>
<td>-0-</td>
<td>18,000</td>
</tr>
<tr>
<td>Total Benefits</td>
<td>$ 95,600</td>
<td>$ 8,500</td>
<td>$ 3,700</td>
<td>$ 107,800</td>
</tr>
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</table>

Table 2 - Project Costs and Repayment by Source

<table>
<thead>
<tr>
<th>Source</th>
<th>Irrigation</th>
<th>Fish &amp; Wildlife</th>
<th>Recreation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of Project Costs</td>
<td>$ 560,000</td>
<td>$ 110,000</td>
<td>$ 38,000</td>
<td>$ 708,000</td>
</tr>
<tr>
<td>Amount Reimburs.</td>
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<td>31,500</td>
<td>15,000</td>
<td>606,500</td>
</tr>
<tr>
<td>Non-reimbursable</td>
<td>-0-</td>
<td>$ 78,500</td>
<td>$ 23,000</td>
<td>$ 101,500</td>
</tr>
<tr>
<td>M.R.B.P.</td>
<td>-0-</td>
<td>-0-</td>
<td>-0-</td>
<td>-0-</td>
</tr>
<tr>
<td>Non-Federal (State)</td>
<td>-0-</td>
<td>31,500</td>
<td>15,000</td>
<td>46,500</td>
</tr>
<tr>
<td>Local</td>
<td>560,000</td>
<td>-0-</td>
<td>-0-</td>
<td>560,000</td>
</tr>
</tbody>
</table>

Table 3 - Average Annual Water Requirements

Crop Irrigation Requirement: 1.09 ac.ft./ac.
Farm Delivery Requirement: 1.56 ac.ft./ac.
Diversion Requirement: 2.32 ac.ft./ac.
Total Diversion Requirement: 26,200 ac.ft.

Table 4 - Dam and Reservoir Data

NOT APPLICABLE

Table 5 - Land Acquisition (acres)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Fee</th>
<th>Easement</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional Reservoir</td>
<td>520</td>
<td>40</td>
<td>560</td>
</tr>
<tr>
<td>Wells</td>
<td>5</td>
<td>-0-</td>
<td>5</td>
</tr>
<tr>
<td>Canal</td>
<td>11</td>
<td>-0-</td>
<td>11</td>
</tr>
<tr>
<td>Fish &amp; Wildlife</td>
<td>350</td>
<td>-0-</td>
<td>350</td>
</tr>
<tr>
<td>Total Acres</td>
<td>886</td>
<td>40</td>
<td>926</td>
</tr>
</tbody>
</table>
The potential O'NeiII Unit would be located in the Niobrara River Basin. The dam site for this unit would be located on the Niobrara River approximately 15 miles northwest of Ainsworth, Nebraska. Irrigable lands to be served would include a large area north of the towns of O'Neill and Atkinson in Holt County, and a small area south of Springview in Keya Paha County.

The North Central Nebraska Reclamation District has requested development of this potential multi-purpose project. The U. S. Bureau of Reclamation is planning the project.

Current Status

A feasibility report was prepared on this unit in 1964 by the Bureau of Reclamation. Development will depend upon reauthorization for construction and the appropriation of funds by Congress. The project has been endorsed by the Nebraska Soil and Water Conservation Commission as a part of Nebraska's State Water Plan. The plan was submitted to the Congress for authorization in August, 1968.

Description of Project Area

The terrain of this area is characterized by benchlands and terraces ranging in elevation from 50 to 500 feet above the river. The surface soils are sandy in nature and many rest upon sands and gravels. Most of the irrigable lands of the O'Neill Unit lie within the sandy tableland region of Northcentral Nebraska.

Livestock has been the major export commodity produced with feed and grain crops of lesser but rapidly increasing importance. Intensive ground water irrigation development has occurred in parts of the area during the last 15 years.

Annual precipitation averages about 21 inches, of which about 16 inches or 76 percent occurs during the months of April through September.

Extent of Project Investigations

A forerunner of the present plan for gravity irrigation service to the lands of the O'Neill area was a project developed by Inhabitants of the area in the 1890's. The Golden Irrigation District was organized consisting of 535,000 acres of "smooth land suitable for irrigation". The plan involved a diversion from the Niobrara River near the present Mirage Flats Project to the Snake River, and then through an extremely long canal and series of impoundments to the irrigable lands. The plan failed for lack of full support and the irrigation district was dissolved.

In 1946, the Bureau of Reclamation began a reconnaissance study of the Niobrara River Basin. Recommendations for the development of irrigation in the basin were included in Public Law 612, 83rd Congress, 1954, with the O'Neill Unit being one of the four units to receive authorization conditional on further investigation as a part of the Missouri River Basin Project. Further investigations of the unit were initiated for the O'Neill area in 1955 and for the Springview area in 1959. The Bureau of Reclamation completed a feasibility report in May of 1964 on this same area.

Plan Features

Major features of the O'Neill Unit would include the Norden Dam and Reservoir, O'Neill Canal, Springview Pumping Plant, and associated distribution systems. The primary function would be the irrigation of 77,000 acres of land with benefits also accruing to flood control, recreation, and fish and wildlife.

Norden Dam would be a rolled earthfill structure on the Niobrara River just below the mouth of Fairfield Creek. The reservoir would have an initial capacity of 411,000 acre-feet. A river outlet works will have a capacity of 3600 c.f.s.

A canal outlet works in the right abutment of the dam would deliver irrigation water to the O'Neill Canal at a maximum rate of 1400 c.f.s. The Springview Forebay Dam and Reservoir would be located four miles west of Springview in Keya Paha County on a tributary of Jewett Creek, and would receive water from Norden Reservoir by way of O'Neill Canal and Springview Sub-Canal through an inverted siphon beneath the Niobrara River. Water would be taken from the Springview Sub-Canal to irrigate 700 acres before it reaches the pumping plant.

* "O'Neill Unit, Nebraska", Lower Niobrara Division Report, Part I, May 1964. For information, write: Area Engineer, Bureau of Reclamation, Grand Island, Nebraska.
The Springview pumping plant would serve 7300 acres and would be located about 800 feet northeast of the Forebay Dam. This plant would contain six units with a total design capacity of 132 c.f.s.

The O'Neill Canal would be about 60 miles long and have an initial capacity of 1400 c.f.s. Five sub-canals would either deliver water to laterals or serve lands directly. Approximately 4,697 acres (including 880 acres on Fairfield Creek) are to be acquired and managed for wild turkeys, other wildlife species, and fish.

Project Benefits

The direct benefits of the project will be derived from irrigation, flood control, fish and wildlife and recreation. Irrigation of some 77,000 acres would constitute one of the primary functions of the proposed project. The recreation, fish and wildlife features of this project will provide 125,000 recreation days, 20,200 fisherman days and 3,800 hunter days annually.

Remaining Water Resource Problems and Needs

This project would help alleviate the present need for irrigation water in the area. Emerging problems of aquifer depletion need close watching and perhaps additional study.

Project Costs

The total estimated cost of the project would be $72,503,000. This cost would be assigned to the functions of irrigation, recreation, fish and wildlife, and flood control. The local irrigators would repay $15,235,000 of the irrigation cost. Allocated recreation and fish and wildlife costs would be $3,327,000.

Operation, Maintenance and Replacement

Operation, maintenance, and replacement will be the responsibility of a local contracting district for irrigation facilities and a state agency for recreation, fish and wildlife.

Local Interest and Support

Initial support for feasibility investigation came from officers and members of the Niobrara River Basin Development Association. The O'Neill Chamber of Commerce formed an irrigation committee in January 1960 and sponsored a series of educational meetings in an effort to inform the people of the purpose and progress on the proposed development. Farmers and landowners indicated interest in support of the proposed irrigation development by signing statements of intent to irrigate.

The North Central Nebraska Reclamation District was organized in 1963. This district has levied a tax upon all tangible property within the district resulting in the collection of a total assessment of $12,540 through 1967.

Existing Resource Development In the Area

About 300 acres of land were irrigated from wells in Holt County in 1948. On January 1, 1961, about 6800 acres of land in the O'Neill Unit area were developed for deep well irrigation. Since then, increased areas of irrigable land have been developed for irrigation from wells. The possibility of securing irrigation wells which produce sufficient quantities of water for irrigation over an extended period of time is limited to a relatively small area north and east of Atkinson. The Director of the Conservation and Survey Division, University of Nebraska, has indicated it is unlikely that intensive ground water pumping can be sustained in the area without ground water recharge from surface water.

Effect on Water Supply In Project Area

This project should not affect the municipal and domestic water supply, as existing private, public and industrial water requirements are now, and will continue to be, adequately served by pumping from ground water aquifers. The major problem associated with development of the O'Neill Unit results from water depletions which will interfere with the operation of a small downstream hydro-electric plant having a total installed capacity of 2,640 kilowatts. Repayment for lost power revenues will be subject to negotiation after project authorization and after construction funds become available.
O'NEILL UNIT

LOCATION: Northcentral Nebraska in Holt, Keya Paha, Rock, Cherry and Brown Counties
SPONSORS: North Central Nebraska Reclamation District
FEATURES: Norden Dam and Reservoir, Springview Forebay Dam and Reservoir and Associated Water Distribution Works

CONSTRUCTION PERIOD: 10 Years  PROJECT LIFE: 100 Years
TOTAL ANNUAL COST: $2,710,300  ANNUAL O.M.B.R.: $346,200
BENEFIT-COST RATIO: 2.17 to 1.00  COSTS BASED ON: 1963 Prices
PROJECT ACREAGE: 77,000 Acres

Table 1 - Average Annual Project Benefits

<table>
<thead>
<tr>
<th>Direct Benefits</th>
<th>Fish &amp; Wildlife</th>
<th>Recreation</th>
<th>Flood Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4,337,200</td>
<td>$55,300</td>
<td>$118,200</td>
<td>$13,800</td>
<td>$4,524,500</td>
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<tr>
<td>Indirect Benefits</td>
<td>1,356,600</td>
<td>0</td>
<td>0</td>
<td>1,356,600</td>
</tr>
<tr>
<td>Total Benefits</td>
<td>$5,693,800</td>
<td>$55,300</td>
<td>$118,200</td>
<td>$5,881,100</td>
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</table>

Table 2 - Project Costs and Repayment by Source

<table>
<thead>
<tr>
<th>Share of Project Costs</th>
<th>Irrigation</th>
<th>Fish &amp; Wildlife</th>
<th>Recreation</th>
<th>Flood Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>$68,856,000*</td>
<td>$1,249,000</td>
<td>$2,078,000</td>
<td>$320,000</td>
<td>$72,503,000</td>
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</tr>
<tr>
<td>Amount Reimbursed</td>
<td>68,856,000</td>
<td>134,000</td>
<td>142,000</td>
<td>69,132,000</td>
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<tr>
<td>Non-reimbursable</td>
<td>0</td>
<td>$1,115,000</td>
<td>$1,936,000</td>
<td>$3,371,000</td>
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</tr>
<tr>
<td>M.R.B.P.</td>
<td>53,621,000</td>
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</tr>
<tr>
<td>Non-Federal (State)</td>
<td>0</td>
<td>134,000</td>
<td>142,000</td>
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</tr>
<tr>
<td>Local</td>
<td>15,235,000</td>
<td>0</td>
<td>0</td>
<td>15,235,000</td>
<td></td>
</tr>
</tbody>
</table>

*This figure includes $2,759,000 for Pumping Power Costs

Table 3 - Average Annual Water Requirements

Crop Irrigation Requirement: 1.12 af/ac-O'Neill  1.13 af/ac-Springview
Farm Delivery Requirement: 1.87 af/ac-O'Neill  1.88 af/ac-Springview
Diversion Requirement: 3.07 af/ac-O'Neill  2.39 af/ac-Springview
Total Diversion Requirement: 231,100 acre feet
Return Flow: Not Available
Streamflow Depletion: 239,700 at Norden Dam

Table 4 - Dam and Reservoir Data

<table>
<thead>
<tr>
<th>Norden Dam</th>
<th>Springview Forebay Dam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height: 245 Feet</td>
<td>Height: 65 feet</td>
</tr>
<tr>
<td>Length: 3,700 feet</td>
<td>Length: 375 feet</td>
</tr>
<tr>
<td>Spillway Capacity: 8,600 c.f.s.</td>
<td>Spillway Capacity: 140 c.f.s.</td>
</tr>
<tr>
<td>Drainage Area: 6,610 square miles</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Norden Reservoir</th>
<th>Springview Forebay Reservoir</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>Acre-Feet</td>
</tr>
<tr>
<td>Surcharge</td>
<td>131,500</td>
</tr>
<tr>
<td>Sediment</td>
<td>55,000/50yr 110,000/100yr</td>
</tr>
<tr>
<td>Conservation</td>
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</tr>
<tr>
<td>Total</td>
<td>411,000*</td>
</tr>
<tr>
<td>Area</td>
<td>Acres</td>
</tr>
<tr>
<td>Surcharge Pool</td>
<td>7,500</td>
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<tr>
<td>Conservation Pool</td>
<td>6,300</td>
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| *Excludes Surcharge

Table 5 - Land Acquisition (Acres)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Fee</th>
<th>Easement</th>
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</thead>
<tbody>
<tr>
<td>Norden Dam</td>
<td>16,563</td>
<td>18</td>
<td>16,581</td>
</tr>
<tr>
<td>Fish &amp; Wildlife</td>
<td>4,697</td>
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<td>4,697</td>
</tr>
<tr>
<td>Recreation</td>
<td>817</td>
<td>0</td>
<td>817</td>
</tr>
<tr>
<td>O'Neill Canal</td>
<td>2,461</td>
<td>334</td>
<td>2,795</td>
</tr>
<tr>
<td>Springview</td>
<td>60</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>2,190</td>
<td>3,195</td>
<td>5,385</td>
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<tr>
<td>Total Acres</td>
<td>26,788</td>
<td>3,567</td>
<td>30,355</td>
</tr>
</tbody>
</table>

4-11
NOTE: ALL BASIN MAP LEGENDS WERE STANDARDIZED AND ALL FEATURES WILL NOT APPEAR ON EVERY MAP.
NEMAH RIVER BASIN
LITTLE NEMaha RIVER AND TRIBUTARIES*

Study of the Little Nemaha River Project proposed by the Army Corps of Engineers resulted from a request by local residents. The Little Nemaha Valley Levee District Number Three is sponsoring the proposed project.

Current Status

The Little Nemaha River Project has been authorized by Congress and endorsed by the Nebraska Soil and Water Conservation Commission.

Description of Project Area

The Little Nemaha River Basin encompasses 885 square miles of moderately hilly land. Annual precipitation averages 30 inches with a high of 57 inches recorded.

The Little Nemaha Basin is primarily an agricultural area devoted to grain crops and livestock raising. The wide fertile flood plains of the main stem and larger tributaries are intensely cultivated.

Recurring flood damage to croplands has caused serious economic loss to the area.

Extent of Project Investigations

Flood control investigations were initiated in 1944 for both the Nemaha and Little Nemaha River Basins. Before a report of this investigation was submitted to the Congress, the flood of 1950 occurred. Since this flood was especially severe along the Little Nemaha River, subsequent studies were concentrated in this basin.

In May of 1965, a report was submitted to the Committee on Public Works in the U. S. Congress.

Plan Features

This plan would include construction of levees and appurtenant works along the Little Nemaha River extending downstream from the vicinity of Brock to the existing Missouri River Levee. Tributary tieback levees would be built along the tributary streams of the lower basin and interior drainage would be released through the levees by gated conduits.

This plan would protect the adjacent lands against floods that would occur on the average of once every 30 years.

Project Benefits

Direct project benefits would include the prevention of crop and other agricultural damages, damage to roads and railroads, and damages to urban lands. Average annual damages along the Little Nemaha River would be reduced 74 percent.

Remaining Water Resource Problems and Needs

Soil erosion and stream pollution would remain after construction as resource problems in the area. Additional flood protection may also be needed.

Project Costs

The 1963 cost estimate for this project was $1,760,000. The federal share totaled $1,524,000 and the non-federal share, $236,000.

Financing Arrangements

The structural costs would be assumed by the Federal Government with local interests furnishing rights-of-way, relocations, and operating and maintenance costs.

Provisions for Operation and Maintenance

Local interests must agree to maintain and operate the works after completion.

Local Interest and Support

Local residents are interested in flood control throughout the basin but the only concerted interest is along the main stem of the Little Nemaha below Brock.

Existing Resource Development in the Area

Brownell Creek Watershed constructed by the Soil Conservation Service for development and demonstration of land conservation practices is located in Brownell Creek subbasin. Construction has been initiated on Wilson Creek, Ziegler Creek, and Spring Creek Watersheds.

In addition to the above, districts have been organized in the subbasins of Upper Little Nemaha, South Branch and Lower Little Nemaha to sponsor watershed projects.

Effect on Water Supply in Project Area

The proposed project consists mainly of levees and would not affect the water supply in this area.
LITTLE NEMAHA RIVER AND TRIBUTARIES

LOCATION: Southeastern Nebraska, Otoe and Nemaha Counties

SPONSORS: Little Nemaha Valley Levee District No. 3

FEATURES: Twenty miles of channel improvement and levees

CONSTRUCTION PERIOD: Not Determined

TOTAL ANNUAL COST: $73,100

BENEFIT COST RATIO: 1.60 to 1.00

PROJECT LIFE: 100 Years

ANNUAL O. M. & R.: $4,700

COSTS BASED ON: 1963 Prices

TOTAL NUMBER OF FLOODS IN AREA SINCE 1881: 54

TOTAL NUMBER OF ACRES PROTECTED WITH PROJECT: 17,000

PROJECT DESIGNED TO WITHSTAND 30-YEAR FLOOD

Table 1 - Project Benefits, Costs and Repayment by Source

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Flood Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Project Cost</td>
<td>$1,760,000</td>
</tr>
<tr>
<td>Payment By Federal</td>
<td>1,524,000</td>
</tr>
<tr>
<td>Non-Federal</td>
<td>236,000</td>
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<tr>
<td>Total Annual Project Benefits</td>
<td>$118,200</td>
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</tbody>
</table>

Table 2 - Flood Damages

<table>
<thead>
<tr>
<th>Date</th>
<th>Peak* Flow, c.f.s.</th>
<th>Acres Damaged</th>
<th>Damage</th>
<th>Agr.</th>
<th>Transport.</th>
<th>Utilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-50</td>
<td>164,000</td>
<td>46,800</td>
<td>$7,148,000</td>
<td>56%</td>
<td>39%</td>
<td>5%</td>
</tr>
<tr>
<td>6-51</td>
<td>56,800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-60</td>
<td>48,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Little Nemaha at Auburn, Nebraska

5-3
The following projects have reached the final stage of planning by the Soil Conservation Service and appear to be feasible. This stage of planning is not advanced far enough for these projects to be fully described at this time.

South Fork Watershed*

This watershed is located in Pawnee County and extends over 32,480 acres. Watershed problems include gully erosion, floodwater and sediment damage. It was authorized for planning December 18, 1967.

Winnebago Bean Watershed*

This 12,100 acre watershed is located in Richardson County. Watershed problems include flooding, erosion, and sedimentation. It was authorized for planning October 23, 1967.

* For information, write: State Conservationist, Soil Conservation Service, Lincoln, Nebraska.
WHITE RIVER-HAT CREEK BASIN
No proposed projects are listed for the White River Basin because the basin has no project proposals in an advanced status comparable to the type presented in this volume. Volume 2 of the Status Summary will discuss the existing development of the basin.
NOTE: ALL BASIN MAP LEGENDS WERE STANDARDIZED AND ALL FEATURES WILL NOT APPEAR ON EVERY MAP.
LOUP RIVER BASIN
CEDAR RAPIDS DIVISION*

The potential Cedar Rapids Division is located in central Nebraska in Greeley, Boone, Nance and Wheeler Counties. The Division would extend along the Cedar River from Ericson to the confluence of the Cedar and Loup Rivers, then along the north side of the Loup River from Fullerton to Genoa.

The Cedar Valley Reclamation District is sponsoring development of this potential multi-purpose project. The U.S. Bureau of Reclamation is planning the project.

Current Status

A feasibility report is undergoing review within the Executive Branch of the Federal Government. The project was found to be economically feasible and development now depends upon construction authorization and appropriation of funds by the Congress.

Description of Project Area

Surface soils are generally silt and loess except north and west of the project lands in the Upper Cedar Valley, where the mantle is dune sand.

Annual precipitation has ranged from 13 to 38 inches, averaging about 24 inches. Precipitation from April through September averages about 19 inches, or 80 percent of the annual total. However, in the critical crop production months of July, August, and September, and occasionally June, there are extended periods of little or no moisture.

The economy of the area is built around agriculture and associated retail and service trades.

Extent of Project Investigations

The Cedar Valley Public Power and Irrigation District conducted a reconnaissance level study and published two reports in 1943. The first report described the general possibilities of irrigating approximately 35,000 acres of valley lands. A second report contained maps, reconnaissance plans, and cost estimates for the irrigation project.

The Bureau of Reclamation conducted preliminary investigations of the Cedar Rapids Division during the 1940's and the late 1950's. Further investigation in 1961 through 1965 resulted in the formulation of the feasibility plan by the Bureau of Reclamation.

Plan Features

The principal feature of the plan is the Spalding Dam and Reservoir, which would be located in Wheeler and Greeley Counties on the southeastern edge of the Sandhills area. A dike section will extend 2,920 feet from the north abutment of the dam. The Spalding Reservoir conservation pool would extend up the Cedar River approximately 17 miles.

The river outlet works would have a capacity of 810 c.f.s. at the maximum water surface elevation. During periods of normal operation, the river outlet works would be used to release water as needed for the Belgrade Diversion Dam and for bypasses if required. The canal outlet works in the left abutment of the dam would deliver irrigation water to the Spalding Canal at a maximum rate of 380 c.f.s. Spalding Canal would be about 45 miles long and would deliver the water to 51 laterals serving 21,300 acres of land. About 39 miles of the canal will be earthlined.

Fish and wildlife plans include fee acquisition of 255 acres at Spalding Reservoir for upland game management, and 210 acres of land adjacent to Spalding Canal for construction of three fish and wildlife subimpoundments. Four waterfowl habitat ponds are planned for construction. The recreation, fish and wildlife features of this project will provide 50,000 recreation days, 16,850 fisherman days and 450 hunter days annually.

A headworks to be located at the right abutment of the dam would divert flows up to 120 c.f.s. at normal water elevations and serve about 5,500 acres of irrigable land. The Timber Creek Canal Pumping Plant would receive water from Belgrade Canal and serve 1,085 irrigable acres in the Timber Creek Valley. It would include four vertical turbine pumps having a total capacity of 29 c.f.s.

* "Cedar Rapids Division Nebraska", March 1966. For Information, write: Area Engineer, Bureau of Reclamation, Grand Island, Nebraska.
Project Benefits

Direct benefits of this project include irrigation, fish and wildlife, recreation, and flood control.

Remaining Water Resource Problems and Needs

This project would alleviate many of the economic losses due to the periodically adverse weather, but there will remain a need for land treatment measures in this area. The August 1966 flood reemphasized need for flood control throughout this area.

Project Costs

The total estimated project cost would be $33,940,000 with costs being assigned to four functions—irrigation, fish and wildlife, flood control and recreation. The largest of these would be irrigation with $31,599,000 of which $6,885,000 would be repaid by the local irrigators.

Operation, Maintenance and Replacement

Operation and maintenance of the irrigation facilities will be the responsibility of the Cedar Valley Reclamation District or a similar irrigation district. Operation, maintenance and replacement of recreation and fish and wildlife facilities will be the responsibility of a non-federal entity.

Local Interest and Support

Development of this division has received strong support from its prospective beneficiaries and at the May 1968 election, district voters approved an ad valorem tax on tangible property.

Existing Resource Development in Area

Significant surface water irrigation has not developed in the Cedar River area because of several serious problems. Much of the land immediately adjacent to the river is not suitable for tilling or irrigation and to reach the better lands with surface water requires high pump lifts. Irrigation by pumping from ground water has developed rapidly in recent years in those parts of the area where an adequate aquifer is present.

Effect on Water Supply in Project Area

Operation of the Cedar Rapids Division would have some effect on the following hydroelectric power plants: Lake Ericson Plant, Ericson; Cedar Valley Plant, Spalding; Fullerton Plant, Fullerton—all on the Cedar River, and Monroe Plant, Monroe; and Columbus Plant, Columbus—on the Loup River. This will require power interference negotiations and agreements. The municipal and industrial water supply needs in this area are adequately served by pumping from ground water aquifers.
CEDAR RAPIDS DIVISION

LOCATION: Central Nebraska in Greeley, Boone, Nance and Wheeler Counties
SPONSORS: Cedar Valley Reclamation District
FEATURES: Spalding Dam and Reservoir, Belgrade Diversion Dam

CONSTRUCTION PERIOD: 7 Years (Partial Water Delivery after 4 years)
PROJECT LIFE: 100 years
TOTAL ANNUAL COST: $1,254,300
ANNUAL O.M.&R.: $133,800
BENEFIT-COST RATIO: 1.40 to 1.00
ANNUAL O.M.&R.: $133,800
TOTAL ANNUAL COST: $1,254,300
COSTS BASED ON: 1964 Prices
PROJECT ACREAGE: 26,800 Acres

| Table 1 - Average Annual Project Benefits |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                 | Irrigation      | Fish & Wildlife | Recreation      | Flood Cont.     | Total           |
| Direct Benefits | $1,207,600      | $58,900         | $37,000         | $14,000         | $1,317,500      |
| Indirect Benefits | 439,300        | -0-              | -0-              | -0-              | 439,300         |
| Total Benefits  | $1,646,900      | $58,900         | $37,000         | $14,000         | $1,756,800      |

| Table 2 - Project Costs and Repayment by Source |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Share of Project Costs | Irrigation | Fish & Wildlife | Recreation | Flood Cont. | Total |
| $31,599,000 | $1,414,000 | $576,000 | $351,000 | $33,940,000 |
| Amount Reimbursed | 31,599,000 | 72,000 | 119,000 | -0- | 31,790,000 |
| Non-reimbursable | -0- | $1,342,000 | $457,000 | $351,000 | $2,150,000 |
| M.R.B.P. | 24,714,000 | -0- | -0- | -0- | 24,714,000 |
| Non-Federal(State) | -0- | 72,000 | 119,000 | -0- | 191,000 |
| Local | 6,885,000 | -0- | -0- | -0- | 6,885,000 |

| Table 3 - Average Annual Water Requirements |
|---------------------------------|-----------------|-----------------|
| Crop Irrigation Requirement: | 1.03 ac.ft./ac.|
| Farm Delivery Requirement: | 1.47 ac.ft./ac.|
| Diversion Requirement: | 2.94 ac.ft./ac. Spalding |
| 3.45 ac.ft./ac. Belgrade |
| Total Diversion Requirement: | 76,800 ac.ft. |
| Return Flow: | Not Available |
| Streamflow Depletion: | 61,400 a.f. Spalding |
| | 17,400 a.f. Belgrade |

| Table 4 - Dam & Reservoir Data |
|---------------------------------|-----------------|-----------------|
| Spalding Dam | Height: 86 feet | Length: 4,860 feet |
| | Spillway Capacity: | 2,680 c.f.s. |
| | Drainage Area: | 630 Square miles |
| Capacit y | Acre-Feet |
| Surcharge | 26,820 |
| Sediment | 1,500/50 yr-3,200/100yr |
| Conservation | 46,000 |
| Total | 81,430* |
| Area | Acres |
| Surcharge Pool | 4,370 |
| Conservation Pool | 3,570 |
| *Excludes Surcharge |

| Table 5 - Land Acquisition (acres) |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Feature | Fee | Easement | Total |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Spalding | 7,963 | 4 | 7,967 |
| Pibel Lake | 67 | 67 | 67 |
| Belgrade | 650 | 33 | 683 |
| Other | 1,648 | 1,243 | 2,891 |
| Fish & Wildlife | 465 | 19 | 484 |
| Recreation | 160 | -- | 160 |
| Total Acres | 10,953 | 1,299 | 12,252 |

7-3
LOUP RIVER PROJECT AT COLUMBUS, NEBRASKA*

This potential project has been planned by the Army Corps of Engineers in response to a request from local interests in the Columbus area. Floods on the Loup River at Columbus occur as a result of runoff from 6,530 square miles of contributing area.

The purpose of this project would be to reduce flooding in the southwestern portion of Columbus where, in the past, many businesses, homes, transportation facilities and special use areas have been inundated by flood waters. The latest flood, in August of 1966, resulted in damages in the Columbus area estimated at $1,435,000.

Current Status

A detailed project report has been completed for this proposed project and has been approved by the Corps' Chief of Engineers. The Nebraska Soil and Water Conservation Commission has endorsed this project as a part of Nebraska's State Water Plan.

Description of Project Area

Columbus, Nebraska is located in the southern portion of Platte County along the left bank of the Loup River just upstream from its confluence with the Platte River. The city serves as a marketing and trade center for the surrounding agricultural area and has in recent years attracted several manufacturing companies of national prominence.

The Loup River flood plain is located in the western and southern portions of the city. Included in this area are 24 businesses and 634 residences. The Wagner Lake area, a recreational and residential development constructed around a group of former sand pits, is located at the southwest edge of the city adjacent to the Loup River. Natural and man-made controls on the Platte River above Columbus nearly eliminate the Platte Flood threat.

Extent of Project Investigations

In 1934, a report by the Corps of Engineers was published as House Document 197 in which the flood problem at Columbus was mentioned. The report concluded that the local flood problem was not serious at that time.

A reconnaissance study made by the Bureau of Reclamation in June of 1962 gave consideration to a potential multi-purpose reservoir on the Loup River upstream from Columbus near Fullerton, Nebraska. The study indicated that the project was not feasible. In August of 1963, the Corps of Engineers was requested to make a reconnaissance study of a potential reservoir at the Fullerton site. The study indicated that a storage project at the Fullerton site lacked economic feasibility by a wide margin and that further detailed studies were not warranted.

In 1962, the Corps of Engineers undertook a reconnaissance investigation of a potential section 205 flood protection project along Lost Creek in the northern section of Columbus. The investigation indicated that a feasible project could not be developed.

A review study of the Platte River Basin including the Loup River and its tributaries is currently under way. Results of this study indicate that the flood problem at Columbus can be isolated and consideration of the problem under the provisions of section 205 of the 1948 Flood Control Act, as amended, is warranted.

Plan Features

The project, as recommended in the report, would consist of a levee providing protection against a flood having a discharge of 150,000 cubic feet per second which is 62 percent of a standard project flood. The levee would be 28,450 feet long and would be constructed along the left bank of the Loup River. The upstream end of the levee would tie to the county road on the north side of Section 23 west of Columbus. Channel and levee riprap protection would be provided in the vicinity of the Union Pacific Railroad and U. S. Highways 30-81 bridges. Facilities would be provided at several locations to drain the area behind the levee. Gates would be provided on existing storm and sanitary sewer outfalls. Trees and shrubbery would be provided at selected locations along the levee area to beautify the project.

* "Loup River at Columbus, Nebraska", Detailed Project Report, June 1967. For information, write: District Engineer, Army Corps of Engineers, Omaha, Nebraska.
**Project Benefits**

The benefits from this project are for flood control and are attributed to flood damage reduction within the project area. The project as designed would provide complete protection up to the flood flow having a 0.5 percent chance of occurrence. The existing average annual damages total $121,400. With the project installed, this total would be reduced 90 percent. The future average annual benefits from this project would total $121,600.

**Remaining Water Resource Problems and Needs**

A small flood problem exists from Lost Creek on the north side of Columbus, but is not considered to be very serious at this time.

**Project Costs**

The total cost of this project is expected to be approximately $1,660,000. The federal share of this is $1,000,000 and the remaining non-federal share is $659,000.

**Financing Arrangements**

This project has been approved for construction and is scheduled to be built with federal funds allocated under Section 205 of the 1948 Flood Control Act, as amended, and non-federal funds from city and county sources.

**Provisions for Operation and Maintenance**

In accordance with provisions of the 1948 Flood Control Act, as amended, local interests will be required to maintain and operate all works after completion in accordance with the regulations prescribed by the Secretary of the Army. Operation and maintenance costs for this project are expected to total $20,000 per year and will be paid by the city of Columbus.

**Local Interest and Support**

Local interests have expressed their desire for acquiring flood protection for the city at the earliest possible date. During the regular meeting of the Columbus City Council held on April 5, 1967, the Council passed a resolution expressing a willingness and an ability to furnish the required local cooperation.

**Existing Resource Development in the Area**

There has been some channel improvement work done on the Platte River east of Columbus in the Schuyler area.

The Loup River Public Power District has its power generating facilities at Columbus and Monroe.

**Effect on Water Supply in Project Area**

The water supply in the project area will not be affected by the installation of this project.
LOUP RIVER AT COLUMBUS, NEBRASKA

LOCATION: Southeastern Platte County
SPONSORS: City of Columbus
FEATURES: 28,450 foot levee along the left bank of the Loup River. Channel and levee riprap protection and drains for area behind levee.
CONSTRUCTION PERIOD: Not determined
TOTAL ANNUAL COST: $84,460
BENEFIT COST RATIO: 1.40 to 1.00
PROJECT LIFE: 100 Years
ANNUAL O.M.&R.: $20,000
COSTS BASED ON: 1967 Prices
PROJECT DESIGNED TO WITHSTAND FLOOD OF 100-YEAR MAGNITUDE
PROJECT DESIGNED TO GIVE A 90 PERCENT REDUCTION IN FLOOD DAMAGES
TOTAL NUMBER OF FLOODS IN AREA SINCE 1894: 20

Table 1 - Project Benefits, Costs and Repayment by Source

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Flood Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Project Costs</td>
<td>$1,659,000</td>
</tr>
<tr>
<td>Payment by Federal</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Non-Federal</td>
<td>$659,000</td>
</tr>
<tr>
<td>Total Annual Project Benefits</td>
<td>$121,600</td>
</tr>
</tbody>
</table>

Table 2 - Flood Damages

<table>
<thead>
<tr>
<th>Date</th>
<th>Flow, c.f.s.*</th>
<th>Damage</th>
<th>Percent Damage To:</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/47</td>
<td>85,000</td>
<td>$388,000</td>
<td>Transport, Urban</td>
</tr>
<tr>
<td>8/66</td>
<td>119,000</td>
<td>$1,435,000</td>
<td></td>
</tr>
</tbody>
</table>

*Loup River at Columbus
NORTH LOUP DIVISION*

The potential North Loup Division of the Missouri River Basin Project is located in Central Nebraska along the North Loup, Calamus and Loup Rivers, in portions of Loup, Garfield, Valley, Greeley, Howard, Merrick and Nance Counties.

The Twin Loups Reclamation District and Twin Loups Irrigation District are local sponsors of the project. The Bureau of Reclamation is planning this multi-purpose project.

Current Status

A feasibility study on the North Loup Division Project has been completed and sent to Congress in 1962. The next step toward construction is congressional authorization and funding. This project has been endorsed by the Nebraska Soil and Water Conservation Commission as a part of Nebraska's State Water Plan.

Description of Project Area

This project area is made up of wide, flat river valleys and rolling hills. Surface soils are comprised of sand, gravel and clay with various types of loess being the dominant material. Soils are predominantly silt loam. Good surface drainage is well established.

The economy of the area is dependent upon agriculture and associated business. The area will reach its full potential for crop production only if adequate water is available.

The climate is suitable for the production of hay, grain, and livestock. Annual precipitation is near 21 inches with about 80 percent of this available during the growing season. A major part of the precipitation, however, falls in the early part of the growing season, leaving the later months short.

Extent of Project Investigations

In 1943, the Bureau undertook a reconnaissance investigation which included the North Loup River Basin. Flood control acts passed by the Congress in 1946 and 1950 authorized the area to be included in the Missouri River Basin Project. Changes in the plan since that time make it necessary that the North Loup Division be reauthorized.

In 1959, a feasibility investigation was concluded for the North Loup Division and a report was presented to the Congress in 1962. Since that time, several bills have been introduced into Congress seeking authorization. A re-evaluation of the project was made in April 1964 and again in March 1965.

Plan Features

The North Loup Division would supply irrigation water to 52,570 acres of land and also provide benefits for fish and wildlife enhancement and recreation.

The project would include two storage structures, the Calamus Dam and Reservoir 5 1/2 miles northwest of Burwell on the Calamus River and the Davis Creek Dam and Reservoir on Davis Creek.

The Calamus River receives most of its flow from ground water, with very few periods of high water except during local heavy rains.

Davis Creek Dam and Reservoir would be located on a tributary to Davis Creek approximately 5 3/4 miles south and one mile east of North Loup. Water would be diverted into Davis Creek Reservoir from Calamus Reservoir by way of the Mirdan Canal. Davis Creek Dam and Reservoir would supplement seasonal storage and re-regulate Calamus River waters in supplying the irrigation needs of the Elba and Fullerton areas of the project.

Five canals with a total length of 158 miles would be required to serve lands in the North Loup Division. Approximately 35 miles of canal would be lined with rolled earth or concrete to reduce seepage.

* "North Loup Division Nebraska", Lower Platte River, Feasibility Study, February 1959. For information write: Area Engineer, Bureau of Reclamation, Grand Island, Nebraska.
Project Benefits

In addition to irrigation, the water stored in Calamus and Davis Creek Reservoirs would provide recreation and fish and wildlife benefits for people in the area as well as for those in other parts of the state. The area is less than a 4-hour drive from Lincoln and Omaha and about an hour and a half from Grand Island. The recreation features of this project will provide 50,450 recreation days, 46,300 fisherman and hunter days annually.

Remaining Water Resource Problems and Needs

There are no serious water resource problems remaining in the project area. The domestic and municipal water supplies for the future appear to be physically and chemically adequate.

Project Costs

The total estimated cost of the North Loup Division would be $48,762,000, of which $46,911,000 would be reimbursable. The irrigation function costs would be $46,675,000, of which $14,655,000 would be paid by the local irrigators. State costs of $236,000 would be incurred for the cost-sharing portion of the recreation and fish and wildlife functions.

Operation, Maintenance and Replacement

Operation, maintenance, and replacement of the irrigation facilities would be the responsibility of the existing Twin Loups Reclamation District and the Twin Loups Irrigation District. Operation, maintenance and replacement of recreation and fish and wildlife facilities would be the responsibility of a state or local agency.

Local Interest and Support

Potential beneficiaries of this proposed project have actively supported the investigations and are pressing for construction. Taxes levied by the local district in support of this project, up to January 1, 1967, total approximately $90,000.

Existing Resource Development in the Area

The major existing resource development in the area is the North Loup River Public Power and Irrigation District with 30,600 acres of irrigated land and the Bureau of Reclamation's Farwell Unit with 52,530 acres of irrigated land in the adjacent Middle Loup Valley.

Effect on Water Supply in Project Area

The project is not expected to adversely affect the present municipal or domestic water supplies in the immediate project area. General information obtained from the Bureau's investigations indicates that present ground water sources are now and will probably continue to be satisfactory in the future. There is concern by interests in the downstream area as to the reduction of water in the Loup River and its effect on industrial and agricultural water needs and the flow of water needed to maintain minimum flows. The project cost estimate includes a cost to compensate for power interference.
NORTH LOUP DIVISION

LOCATION: Howard, Loup, Garfield, Valley, Greeley, Merrick and Nance Counties
SPONSORS: Twin Loups Reclamation and Twin Loups Irrigation Districts
FEATURES: Calamus Dam and Reservoir, Davis Creek Dam and Reservoir, 158 Miles of Canal

CONSTRUCTION PERIOD: 9 Years
TOTAL ANNUAL COSTS: $1,836,800
BENEFIT-COST RATIO: 2.41 to 1.00
PROJECT ACREAGE: 52,570 Acres

Table 1 - Average Annual Project Benefits

<table>
<thead>
<tr>
<th></th>
<th>Irrigation</th>
<th>Recreation</th>
<th>Fish &amp; Wildlife</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Benefits</td>
<td>$2,207,100</td>
<td>$34,400</td>
<td>$75,000</td>
<td>$2,316,500</td>
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<tr>
<td>Total Benefits</td>
<td>$4,316,000</td>
<td>$34,400</td>
<td>$75,000</td>
<td>4,425,400</td>
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Table 2 - Project Costs and Repayment by Source

<table>
<thead>
<tr>
<th>Share of Costs</th>
<th>Irrigation</th>
<th>Recreation</th>
<th>Fish &amp; Wildlife</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Costs</td>
<td>$46,675,000</td>
<td>$344,000</td>
<td>$1,743,000</td>
<td>$48,762,000</td>
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<tr>
<td>Amount Reimburs.</td>
<td>46,675,000</td>
<td>150,000</td>
<td>86,000</td>
<td>46,911,000</td>
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<tr>
<td>Non-reimbursable</td>
<td>-0-</td>
<td>$194,000</td>
<td>$1,657,000</td>
<td>$1,851,000</td>
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<tr>
<td>M.R.B.P.</td>
<td>32,020,000</td>
<td>-0-</td>
<td>-0-</td>
<td>32,020,000</td>
</tr>
<tr>
<td>Non-Federal(State)</td>
<td>-0-</td>
<td>150,000</td>
<td>86,000</td>
<td>236,000</td>
</tr>
<tr>
<td>Local</td>
<td>14,655,000</td>
<td>-0-</td>
<td>-0-</td>
<td>14,655,000</td>
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Table 3 - Average Annual Water Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop Irrigation Requirement</td>
<td>1.03 to 1.07 acre ft/acre</td>
</tr>
<tr>
<td>Farm Delivery Requirement</td>
<td>1.47 to 1.53 acre ft/acre</td>
</tr>
<tr>
<td>Diversion Requirement</td>
<td>2.50 to 2.93 acre ft/acre</td>
</tr>
<tr>
<td>Total Diversion Requirement</td>
<td>133,300 acre ft</td>
</tr>
<tr>
<td>Return Flow</td>
<td>Not Available</td>
</tr>
<tr>
<td>Streamflow Depletion</td>
<td>Not Available</td>
</tr>
</tbody>
</table>
### Table 4 - Dam and Reservoir Data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Capacity (Acres-Feet)</th>
<th>Drainage (Square Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Calamus Dam</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height: 81 feet</td>
<td>Height: 6,300 feet</td>
<td></td>
</tr>
<tr>
<td>Spillway Capacity: 2,770 c.f.s.</td>
<td>Spillway Capacity: 6,500 c.f.s.</td>
<td></td>
</tr>
<tr>
<td>Drainage Area: 110</td>
<td>Drainage Area: 110</td>
<td></td>
</tr>
<tr>
<td><strong>Calamus Reservoir</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>Acre-Feet</td>
<td></td>
</tr>
<tr>
<td>Surcharge</td>
<td>24,000</td>
<td></td>
</tr>
<tr>
<td>Conservation</td>
<td>84,300</td>
<td></td>
</tr>
<tr>
<td>Sediment 3,250/50 yr. 6,500/100 yr.</td>
<td>Sediment 600/50 yr. 1,200/100 yr.</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>108,600*</td>
<td></td>
</tr>
<tr>
<td><strong>Davis Creek Dam</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height: 94 feet</td>
<td>Height: 2,700 feet</td>
<td></td>
</tr>
<tr>
<td>Spillway Capacity: 400 c.f.s.</td>
<td>Spillway Capacity: 1,200 c.f.s.</td>
<td></td>
</tr>
<tr>
<td>Drainage Area: 6.5</td>
<td>Drainage Area: 6.5</td>
<td></td>
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<tr>
<td><strong>Davis Creek Reservoir</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>Acre-Feet</td>
<td></td>
</tr>
<tr>
<td>Surcharge</td>
<td>7,900</td>
<td></td>
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<tr>
<td>Conservation</td>
<td>22,120</td>
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<tr>
<td>Sediment 600/50 yr. 1,200/100 yr.</td>
<td>Sediment 600/50 yr. 1,200/100 yr.</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>22,400*</td>
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</tr>
</tbody>
</table>

*Excludes Surcharge

### Table 5 - Land Acquisition (acres)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Fee</th>
<th>Easement</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calamus Dam</td>
<td>8,240</td>
<td>270</td>
<td>8,510</td>
</tr>
<tr>
<td>Davis Creek Dam</td>
<td>3,200</td>
<td>-0-</td>
<td>3,200</td>
</tr>
<tr>
<td>Canals</td>
<td>-0-</td>
<td>3,621</td>
<td>3,621</td>
</tr>
<tr>
<td>Drainage</td>
<td>-0-</td>
<td>1,384</td>
<td>1,384</td>
</tr>
<tr>
<td>Pump Sites</td>
<td>-0-</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total Acres</strong></td>
<td>11,440</td>
<td>5,300</td>
<td>16,740</td>
</tr>
</tbody>
</table>
The following local protection project is being planned by the Corps of Engineers for the town of Broken Bow, Nebraska. At the present time, this potential project is awaiting approval by the Corps' Chief of Engineers.

MUD CREEK - BROKEN BOW*

Local Protection

The project as planned would provide protection for the town of Broken Bow from Mud Creek flows having a two percent or greater chance of annual occurrence. The project would consist of channel enlargement and relocation. A 97 percent reduction in average annual flood damages is expected.

The costs and benefits for this project have been estimated and indicate a project benefit cost ratio of 1.3 to 1.00.

Current Status

A detailed project report has been completed for this proposed project and if approved by the Chief of Engineers, the project would then be ready for construction. This project has been endorsed by the Nebraska Soil and Water Conservation Commission as a part of Nebraska's State Water Plan.

* For information, write: District Engineer, Army Corps of Engineers, Omaha, Nebraska.
MIDDLE PLATTE RIVER BASIN
Proposed works of the Nebraska Mid-State Division will be located in Central Nebraska along the north side of the Platte River in Dawson, Buffalo, Hall and Merrick Counties. The project lands cover a width of from ten to twenty miles and extend eastward from Kearney, Nebraska, some one hundred miles to the vicinity of Silver Creek, Nebraska. The Bureau of Reclamation is planning the project.

**Current Status**

Nebraska Mid-State Division is the only authorized Reclamation project in Nebraska not under construction. Authorization of this project was given by the first session of the 90th Congress. The Nebraska Mid-State Reclamation District has provided funds for post-authorization studies. Completion of these studies will depend upon the availability of Federal funds. After completion of post-authorization investigation studies, construction will then depend upon the appropriation of construction funds by Congress.

**Description of Project Area**

The Platte Valley through the Mid-State area is characterized by three distinct terraces. To the north of the valley are loess hills dissected by steep ravines, or sandhills. The average annual precipitation is 22.62 inches of which about 65 percent occurs during the growing season. In the early part of the summer, the rainfall is fairly well distributed, but later in July, August, and September, it is not uncommon to have long periods without adequate rainfall for crop growth. The frost-free period is about 160 days.

The local economy is agriculturally based with corn, alfalfa, and cattle being the leading farm commodities. Principal Industries operating in the Mid-State area are related to the processing and shipping of farm products.

**Extent of Project Investigations**

Investigations and studies of this area were first made in 1943 by Adolph Meyer, Consulting Engineer. In 1952, an engineering report was concluded outlining the principal features of the project for the district by Mr. Meyer, and was revised by him in 1954. Appraisals of engineering and economic evaluations were made by Black and Veatch, Consultants, and the Bureau of Reclamation in the period from 1954-58. In 1958, R. W. Beck and Associates, Consulting Engineers, prepared a report on the project incorporating information from most of these previous reports. This report was presented to the Congress to secure project authorization.

Additional studies on engineering, hydrology and land classification are being conducted by the Bureau of Reclamation.

**Plan Features**

The plan is to divert water from the Platte River for the irrigation of 96,000 acres presently irrigated from ground water, and 44,000 acres of new lands.

A diversion dam would be located approximately seven miles southeast of Lexington. The water would be transported by a main supply canal with a capacity of 3,000 c.f.s. to a system of 23 interconnected ravine reservoirs. The combined capacity of these reservoirs would be in excess of 700,000 acre-feet, including conservation storage of 289,300 acre-feet for irrigation. The remaining capacity would be used for flood control, recreation, and fish and wildlife. The main supply canal and floodways at Kearney, Shelton, and Chapman would carry excess floodwaters to the Platte River. A distribution system of canals, laterals, pumps and drains would provide irrigation service to a total of 140,000 acres. Provisions for four power plants are also included in the plan but the authorization provides for only one with penstocks placed at the other three sites for later addition of power plants if required. Power from the one plant would be used for project purposes.

Fish and wildlife plans include the establishment of federal and state refuges and hunting areas in the vicinity of Chapman. Approximately 3,000 acres of additional land adjacent to the reservoirs would be purchased for waterfowl management.

**Project Benefits**

Benefits derived from this project would include irrigation, flood control, fish and wildlife, and recreation.

**Remaining Water Resource Problems and Needs**

This project would alleviate many flood damages, but additional protection would still be needed.

**Project Costs**

The latest estimated cost of the Mid-State Division is $106,135,000. The irrigation portion of this total is $76,831,000 or about 72 percent. Flood control costs would be $12,831,000 and would be a federal non-reimbursable cost.

**Operation, Maintenance and Replacement**

All operation and maintenance activities will be the responsibility of the Nebraska Mid-State Reclamation District and state agencies.

**Local Interest and Support**

The Nebraska Mid-State Reclamation District was formed in 1948. It has levied a tax on all tangible property within the district for several years. The total amount of revenue collected during the period 1948-67 was $1,930,250. Voluntary contributions from 1943 to 1948, prior to the organization of a district, totaled $180,000. Residents of this area are vitally interested in this project and have demonstrated outstanding interest and provided major funds in support of its investigation and development.

**Existing Resource Development in the Area**

Extensive private irrigation development has been accomplished by pumping from ground water aquifers. A limited amount of irrigation water is being provided from surface water sources.

**Effect on Water Supply in Project Area**

This project will materially decrease the average flows of the Platte River in this area with possible effects on the wildlife and fishery. However, diversions will be made during the winter and during peak runoff periods. Minimum flows may actually be increased because of return flows from the project. Municipal and industrial needs are now being adequately served by pumping from ground water aquifers. This aquifer is expected to be adequate for future demands.
NEBRASKA MID-STATE DIVISION

LOCATION: Central Nebraska in Dawson, Buffalo, Hall and Merrick Counties along the north side of the Platte River

SPONSORS: Nebraska Mid-State Reclamation District

FEATURES: Twenty-three Interconnected Ravine Reservoirs and associated Distribution Works

CONSTRUCTION PERIOD: 9 Years
PROJECT LIFE: 100 Years

TOTAL ANNUAL COST: $4,543,100
ANNUAL O.M.&R.: $863,100
BENEFIT-COST RATIO: 1.25 to 1.00
COSTS BASED ON: 1967 Prices

PROJECT ACREAGE: 140,000 Acres

Table 1 - Average Annual Project Benefits

<table>
<thead>
<tr>
<th></th>
<th>Irrigation</th>
<th>Flood Control</th>
<th>Recreation</th>
<th>Fish &amp; Wildlife</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Benefits</td>
<td>$4,339,000</td>
<td>$518,000</td>
<td>$175,500</td>
<td>$425,000</td>
<td>$5,457,500</td>
</tr>
<tr>
<td>Indirect Benefits</td>
<td>204,000</td>
<td>-0-</td>
<td>-0-</td>
<td>-0-</td>
<td>204,000</td>
</tr>
<tr>
<td>Total Benefits</td>
<td>$4,543,000</td>
<td>$518,000</td>
<td>$175,500</td>
<td>$425,000</td>
<td>$5,661,500</td>
</tr>
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</table>

Table 2 - Project Costs and Repayment by Source

<table>
<thead>
<tr>
<th>Share of Project Cost</th>
<th>Irrigation</th>
<th>Flood Control</th>
<th>Recreation</th>
<th>Fish &amp; Wildlife</th>
<th>Def. Power</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>$76,831,000</td>
<td>$12,831,000</td>
<td>$3,780,000</td>
<td>$11,151,000</td>
<td>$1,542,000</td>
<td>$106,135,000</td>
<td></td>
</tr>
<tr>
<td>Amount Reimb.</td>
<td>76,831,000</td>
<td>0-</td>
<td>115,000</td>
<td>407,000</td>
<td>1,542,000</td>
<td>78,895,000</td>
</tr>
<tr>
<td>Non-reimbursable</td>
<td>0-</td>
<td>$12,831,000</td>
<td>$3,665,000</td>
<td>$10,744,000</td>
<td>0-</td>
<td>27,240,000</td>
</tr>
<tr>
<td>M.R.B.P.</td>
<td>32,481,000</td>
<td>0-</td>
<td>0-</td>
<td>0-</td>
<td>1,542,000</td>
<td>34,023,000</td>
</tr>
<tr>
<td>Non-Federal (State)</td>
<td>0-</td>
<td>0-</td>
<td>115,000</td>
<td>407,000</td>
<td>0-</td>
<td>522,000</td>
</tr>
<tr>
<td>Local</td>
<td>44,350,000</td>
<td>0-</td>
<td>0-</td>
<td>0-</td>
<td>0-</td>
<td>44,350,000</td>
</tr>
</tbody>
</table>

Table 3 - Average Annual Water Requirements

Crop Irrigation Requirement: 1.08 ac.ft./ac.
Farm Delivery Requirement: 1.66 ac.ft./ac.
Diversion Requirement: 2.44 ac.ft./ac.
Total Diversion Requirement: 341,500 acre feet
Return Flow: Not Available
Streamflow Depletion: Not Available

Table 4 - Dam and Reservoir Data

INFORMATION NOT AVAILABLE

Table 5 - Land Acquisition

INFORMATION NOT AVAILABLE

8-3
SPRING CREEK WATERSHED*

The potential Spring Creek Watershed Project comprising 171,960 acres of land is located in Custer and Dawson Counties. Local sponsors of this proposed project are Dawson County, the city of Lexington, and the Custer County and Dawson County Soil and Water Conservation Districts. The Soil Conservation Service is providing technical assistance in the planning of this project. The main problems in the watershed are flooding and erosion.

Current Status

The Spring Creek Watershed Project was authorized by Congress in August of 1966. Some options have been obtained for easements and land rights maps for the structures have been discussed with the landowners in the area. When land rights have been obtained, construction may be initiated.

Description of Project Area

The topography of the watershed varies from well-defined drainage patterns in loess hills and table lands to level to gently-sloping areas in the low lands. Some watercourses interconnect during flood stages and some areas flooded are lower than the stream banks permitting storage of floodwater.

The average annual precipitation at Lexington is approximately 22 inches. The average length of the growing season is 148 days, with 70 percent of the annual precipitation occurring during that time.

The economy of the watershed is based primarily on dry land and irrigated agriculture. The land use in the watershed is 59 percent for crops, 36 percent for pasture and range, and 5 percent for other uses.

Extent of Project Investigations

Preliminary Investigation and Work Plan reports have been prepared for this project.

Plan Features

Structural works of improvement will consist of 11 floodwater retarding structures, 33.7 miles of channel improvement and 1.77 miles of dike. These measures will provide reductions in floodwater damage to 150 farms.

Channel improvement will include modifying the channel side slopes and depth. The dike on the north side of Lexington will average 2 feet in height.

The floodwater retarding structures will control runoff from 30 percent of the drainage area and have storage capacity to detain runoff from a 25-year frequency storm event without operation of the emergency spillway.

Project Benefits

Average annual project benefits total $217,000 with 57 percent attributed to agricultural, 31 percent urban and road, and the remainder indirect and secondary benefits.

Remaining Water Resource Problems and Needs

There is a need for some land use adjustment from cropland to rangeland on a number of acres in the area. Additional land treatment is also needed to reduce sediment and erosion damage.

Project Costs

Project costs include $774,310 for land treatment and $1,666,800 for structural measures.

Financing Arrangements

The city of Lexington and Dawson County will use their taxing authority to finance their share of the project costs.

Dawson County will provide $16,800 for bridge construction and rehabilitation.

* "Spring Creek Watershed Work Plan", August, 1965. For information, write: City Engineer, Lexington, Nebraska; or, State Conservationist, Soil Conservation Service, Lincoln, Nebraska.
Provisions for Operation and Maintenance

The city of Lexington and Dawson County will operate and maintain the structural measures.

Local Interest and Support

The city of Lexington has actively supported the project and has assisted in obtaining preliminary agreement for structure site locations. Land treatment measures have been accelerated since the application was filed in 1961.

Existing Resource Development in the Area

Irrigation is extensively practiced in the area. Canals supplying water to lands of the Platte Valley Irrigation District are located within the watershed and ground water development for irrigation has been accomplished throughout the lower confines of the watershed.

Effect on Water Supply in Project Area

Land treatment and structural measures of the Spring Creek Watershed will substantially reduce the amount of erosion on the upland area. This will reduce sediment pollution in local streams and to a lesser extent in the Platte River.
SPRING CREEK WATERSHED

LOCATION: Custer and Dawson Counties. Extends from approximately 25 miles southeast of Cozad to 25 miles northwest into Custer County

SPONSORS: Dawson County and Custer County Soil & Water Conservation Districts, City of Lexington and County of Dawson

FEATURES: Eleven Floodwater Retarding Structures, 33.7 miles of Channel Improvement, and 1.8 miles of Dike

CONSTRUCTION PERIOD: 5 Years

AVERAGE ANNUAL COST: $78,030

BENEFIT-COST RATIO: 2.80 to 1.00

PROJECT LIFE: 50 Years

ANNUAL O.M.&R.: $11,710

COSTS BASED ON: 1964 Prices

PERCENT OF LAND TREATMENT COMPLETED: 78% to August 1965

COST OF RIGHT-OF-WAY: $244,400

ESTIMATED ANNUAL REDUCTION OF FLOODWATER DAMAGE 75%

Table 1 - Project Benefits, Cost and Repayment by Source

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Flood Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Project Cost</td>
<td>$2,441,110</td>
</tr>
<tr>
<td>Payment by Federal</td>
<td>1,412,360</td>
</tr>
<tr>
<td>Non-Federal</td>
<td>$1,028,750</td>
</tr>
<tr>
<td>Average Annual Project Benefits</td>
<td>$217,050</td>
</tr>
</tbody>
</table>

Table 2 - Reservoir Data

<table>
<thead>
<tr>
<th>Number of Structures</th>
<th>Total Drainage Area Above Structures</th>
<th>Storage Capacity (Acre-Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initial</td>
<td>Sediment</td>
</tr>
<tr>
<td>11</td>
<td>51,660 acres</td>
<td>11,422</td>
</tr>
</tbody>
</table>
REPUBLICAN RIVER BASIN
The Lower Medicine Creek Watershed in Frontier and Lincoln Counties encompasses 152,700 acres of land.

The Frontier Soil and Water Conservation District and the Medicine Creek Watershed Conservancy District are jointly sponsoring the project and are being assisted in the development of the plan by the Soil Conservation Service and the State Soil and Water Conservation Commission.

Current Status

The planning of the Lower Medicine Creek Watershed Project has been completed and is now undergoing final review by the House or Senate Congressional Sub-Committee on Resource Development. After approval by this committee, the project must be authorized by the Congress and funds appropriated for construction.

Description of Project Area

The topography of the project area varies from nearly level to gently sloping ridge tops, to strongly sloping to very steep canyon walls, with very deeply entrenched valley floors. The average annual precipitation at Curtis is about 19 inches. The average length of the growing season is 150 days, with 70 percent of the rainfall normally occurring during that time. The economy of the watershed is based on dry land and irrigated agriculture. Approximately 50 percent of the land is used for cropland, 47 percent is used for rangeland, and the remainder for wildlife, pastureland, and urban areas. The majority of farming operations are cash grain and beef-producing operations.

Extent of Project Investigations

This project has undergone both preliminary and work plan investigations.

Plan Features

The plan for Lower Medicine Creek Watershed features three floodwater retarding structures with a total flood storage capacity of 11,219 acre-feet. These measures will provide reductions in floodwater damage to 50 farms and control the runoff from 49 percent of the drainage area.

Project Benefits

The principal benefits of the project would be for flood damage reduction to agricultural land and sediment reduction into Harry Strunk Reservoir. Average annual floodwater damages would be reduced 49 percent by the Upper and Lower Medicine Creek Watersheds. Sediment deposition in Harry Strunk Lake would be reduced about 30 percent.

Remaining Water Resource Problems and Needs

There is need for additional land treatment and flood protection in the area. In 1962, a sediment survey showed that 500,000 tons of sediment were being deposited in Harry Strunk Lake annually. The Lower Medicine Creek Watershed will help correct this problem, but additional work is needed to reduce sedimentation.

Project Costs

The total cost of the project includes land treatment costs of $879,400 and construction and installation costs of $555,600.

Financing Arrangements

The construction cost of the Lower Medicine Creek Watershed will be financed through Federal P.L. 566 funds and by state and local funds.

Provisions for Operation and Maintenance

The Medicine Creek Watershed Conservancy District will operate and maintain the structural measures. Farm owners and operators will operate and maintain land treatment measures.

Local Interest and Support

Watershed residents have organized the Lower Medicine Creek Watershed Conservancy District. Since formation of the district in April 1962, a total of $8,000 has been assessed.

Existing Resource Development in the Area

Medicine Creek Dam and Harry Strunk Reservoir are located just below the watershed. Other developments in the area are limited to privately developed irrigation.

Effect on Water Supply in Project Area

Construction of the project is expected to significantly reduce the amount of sediment flowing into Harry Strunk Reservoir.
LOWER MEDICINE CREEK WATERSHED

LOCATION: Frontier and Lincoln Counties Covering the Medicine Creek drainage area from below Curtis, Nebraska to Harry Strunk Reservoir.

SPONSORS: Frontier Soil & Water Conservation District and Medicine Creek Watershed Conservancy District

FEATURES: Three Floodwater Retarding Structures

CONSTRUCTION PERIOD: 5 Years

AVERAGE ANNUAL COST: $24,190

BENEFIT - COST RATIO: 1.20 to 1.00

PROJECT LIFE: 50 Years

ANNUAL O&M: $2,080

COSTS BASED ON: 1965 Prices

COST OF RIGHT-OF-WAY: $24,500

Table 1 - Project Benefits, Costs and Repayment by Source

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Flood Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Project Cost</td>
<td>$1,435,000</td>
</tr>
<tr>
<td>Payment by Federal</td>
<td>605,500</td>
</tr>
<tr>
<td>Non-Federal</td>
<td>829,500</td>
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<tr>
<td>Average Annual Project Benefits</td>
<td>$27,990</td>
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</table>

Table 2 - Reservoir Data

<table>
<thead>
<tr>
<th>Number of Structures</th>
<th>Total Drainage Area Above Structures</th>
<th>Storage Capacity (Acre Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Initial</td>
</tr>
<tr>
<td>3</td>
<td>74,234 acres</td>
<td>14,940</td>
</tr>
</tbody>
</table>
UPPER MEDICINE CREEK WATERSHED*

The Upper Medicine Creek Watershed is 219,140 acres in size and is located in Frontier, Hayes and Lincoln Counties. Watershed problems include flooding, sediment and erosion.

The Frontier Soil and Water Conservation District, the Lincoln County Soil and Water Conservation District, and the Medicine Creek Watershed Conservancy District are sponsoring the project. The Soil Conservation Service and other federal and state agencies are assisting the sponsors in the planning of this project.

Current Status

This project has been approved for construction and is now awaiting construction start approval and funding by the Bureau of the Budget.

Description of Project Area

Medicine Creek, a tributary of the Republican River, originates in south-central Lincoln County, approximately 10 miles north and west of Wellfleet, and 25 miles southwest of North Platte.

Topography varies from nearly level to very steep canyon walls. The valley floors are deeply entrenched.

The average annual precipitation at Curtis is about 19 inches. The average length of the growing season is 150 days with 70 percent of the annual rainfall normally occurring during that time.

The economy of the watershed is based primarily on dryland and irrigated agriculture. The distribution of land use is as follows: 37 percent cropland, 59 percent rangeland, and 4 percent other land.

Extent of Project Investigations

This project has undergone both preliminary and work plan investigations.

Plan Features

The structural works of improvement will consist of six floodwater retarding structures. These structures will have a total flood storage capacity of 13,358 acre-feet and control the runoff from 51 percent of the drainage area. Sediment storage provisions have been made which will allow 4,015 acre feet to be stored in 50 years.

Project Benefits

Project benefits include reduction of agricultural and non-agricultural flood damages as well as indirect and secondary benefits in Upper Medicine Creek and downstream benefits in the Lower Medicine Creek area. Structural measures in this watershed will provide reductions in floodwater damage to 40 farms in Upper Medicine Creek Watershed and an additional 40 farms in Lower Medicine Creek Watershed. Also included are long-range benefits to fish and wildlife.

Remaining Water Resource Problems and Needs

There is need for additional land treatment and flood protection in the area. In 1962, a sediment survey showed that 500,000 tons of sediment were being deposited in Harry Strunk Lake annually. The Lower Medicine Creek Watershed will help correct this problem, but a further need to reduce sedimentation will remain.

With the construction of both Upper and Lower Medicine Creek Watersheds, flood damages in the area will be decreased approximately 50 percent. Additional small structures would further reduce flood damages.

Project Costs

The total cost of the Upper Medicine Creek Watershed includes land treatment costs of $1,104,000, and structural costs of $762,300. Also included is $40,900 for land, easements and rights-of-way and administration of contracts.

Financing Arrangements

The Federal Government will finance part of the cost through P. L. 566 Funds and local interests using taxing authorities and private funds will provide the remainder.

Provisions for Operation and Maintenance

Farm owners and operators will operate and maintain the land treatment measures while the Medicine Creek Watershed Conservancy District will operate and maintain structural measures.

Local Interest and Support

Watershed residents have organized the Medicine Creek Watershed Conservancy District. The conservancy district will use its authority to finance the non-federal share of the project costs. Funds of $12,000 accumulated prior to project approval will be available for installation purposes.

Existing Resource Development in the Area

Medicine Creek Dam and Harry Strunk Reservoir are located near the lower end of Medicine Creek. This reservoir was constructed for flood control, irrigation and recreation. Storage water is used for irrigation on the Cambridge Irrigation District lands from Cambridge to Orleans. The Dry Creek Pilot Watershed Project has been completed a few miles southeast of this area.

Effect on Water Supply in Project Area

This project is expected to greatly reduce the amount of sediment flowing into Harry Strunk Reservoir. The amount of water flowing into the reservoir will be slightly reduced due to seepage and evaporation.
UPPER MEDICINE CREEK WATERSHED

LOCATION: Frontier, Lincoln and Hayes Counties extending north and west from Curtis, Nebraska

SPONSORS: Frontier and Lincoln County Soil and Water Conservation Districts and the Medicine Creek Watershed Conservancy District

FEATURES: Six Floodwater Retarding Structures

CONSTRUCTION PERIOD: 6 Years

AVERAGE ANNUAL COST: $33,170

BENEFIT-COST RATIO: 1.30 to 1.00

PROJECT LIFE: 50 Years

ANNUAL O,M,&R.: $2,840

COSTS BASED ON: 1965 Prices

Purpose Flood Control
Total Project Cost $ 1,866,300

Payment by Federal 816,100
Non-Federal 1,050,200

Average Annual Project Benefits $ 43,170

Table 2 - Reservoir Data

<table>
<thead>
<tr>
<th>Number of Structures</th>
<th>Total Drainage Area Above Structures</th>
<th>Storage Capacity (Acre-Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>110,995 acres</td>
<td>Initial 17,373, Sediment 4,015, Flood Control 13,358</td>
</tr>
</tbody>
</table>

MEDICINE CREEK WATERSHED
SOIL CONSERVATION SERVICE
This proposed project was planned by the Corps of Engineers and proposed to the local interest groups who felt that there was a need for increased channel capacity. A full report on this project is not included here because of a lack of local willingness to assume responsibility of operation and maintenance.

This proposed project would reduce flooding and bank erosion, and increase the channel capacity of the Republican River from Trenton Dam to Milford Reservoir in Kansas. The project would include removal of willows and vegetation to 1951 bank lines, treatment of the cleared area to retard regrowth and the construction of sixteen channel cutoffs. In November, 1967, the Chief of Engineers, in forwarding the report on the Republican River to the Secretary of the Army for transmission to Congress, recommended that no improvement of the Republican River be authorized in view of the indicated unwillingness on the part of local interests to furnish the required assurances of cooperation. The Secretary of the Army transmitted the report to Congress in August, 1968. The cost of this proposed project was estimated to be $1,495,000 using 1962 prices. The federal cost share would be $1,463,000, and the non-federal share would be $32,000. The benefit cost ratio of this project was 2.22 to 1.00.

* "Republican River and Tributaries", Colorado, Kansas, Nebraska, May, 1963. For information, write: District Engineer, Army Corps of Engineers, Kansas City, Missouri.
LEGEND

- PROPOSED DAM & RESERVOIR SITE
- PROPOSED CANAL
- PROPOSED PUMPING PLANT
- PROPOSED WATERSHED PROJECT
- PROPOSED RIVER SIPHON
- PROPOSED DIVERSION DAM
- PROPOSED PROJECT IRRIGATION
- EXISTING DAM & RESERVOIR

NOTE: ALL BASIN MAP LEGENDS WERE STANDARDIZED AND NOT ALL FEATURES WILL NOT APPEAR ON EVERY MAP.
LOWER PLATTE RIVER BASIN
LINWOOD UNIT

The potential Linwood Unit is located along the south side of the Platte River between Bellwood and Morse Bluff in Butler and Saunders Counties.

The Nebraska Soil and Water Conservation Commission requested the U. S. Bureau of Reclamation to make a reconnaissance study on this unit in conjunction with a study by the Corps of Engineers of the feasibility of flood control storage on Skull Creek.

Current Status

A favorable reconnaissance report was released in August of 1966. Before other steps toward construction can be taken, the Congress must authorize and provide funds for a feasibility study.

Description of Project Area

Topography of the Linwood Unit area is characterized by valley lands walled by bluffs or rough loess hills. Bottomlands are only slightly above the river and much of this area has a high water table. The surface of the project area ranges from smooth to slightly undulating.

Periods of two or three weeks with little or no moisture often occur in the critical part of the growing season. Rainfall averages about 27 inches annually with about 75 percent of this falling during the months of April through September.

The economy of the area is basically agricultural. Most business activity stems from the processing and sale of farm products and associated retail trades.

Extent of Project Investigations

The irrigation potential of this area was explored briefly during the late 1940's and early 1950's by the Bureau of Reclamation. The Corps of Engineers investigated the possibility of a flood control reservoir on Skull Creek above the village of Linwood and requested the Bureau of Reclamation evaluate the desirability of including irrigation storage in this potential reservoir. In October of 1963, the Bureau of Reclamation issued a brief report titled, "Appraisal of Irrigation Possibilities".

A reconnaissance report by the Bureau was published in 1966.

Plan Features

This unit would consist of a diversion dam, two canals and a pumping plant for the irrigation of 10,600 acres of land. The construction and operation of these features would be integrated with the storage reservoir proposed by the U. S. Army Corps of Engineers on Skull Creek.

Water would be diverted into the Linwood Canal from the Columbus Diversion Dam to serve 7,700 acres of land south of the Platte River near Octavia, Linwood and Morse Bluff. A pumping plant near the proposed Skull Creek Dam two miles southeast of Linwood would lift water 92 feet to the Octavia Canal and also into the Skull Creek Reservoir for later release. The Octavia Canal would serve 2,900 acres lying above the Linwood Canal.

The potential Columbus Diversion Works would be located on the Platte River approximately eight miles southeast of Columbus, Nebraska. The diversion works would consist of an overflow spillway 1,250 feet in length, a dike about 13,450 feet long, headworks for diverting river flows to the Linwood Canal, and the initial reach of the Linwood Canal. The spillway would be designed to pass the peak fifty-year frequency flow of 90,000 c.f.s. with enough freeboard to pass the 100-year frequency flood. The diversion dam would extend across the Platte River below its confluence with the tailrace channel from the Loup River Public Power District's Columbus Power Plant.

The Octavia Pumping Plant would have a capacity of about 123 c.f.s. and operate against a dynamic head of 92 feet.

The Octavia Canal would have an initial capacity of 120 c.f.s. and the Linwood Canal would vary in capacity from 180 to 4 c.f.s.

* "Linwood Unit Nebraska", Reconnaissance Report, August 1966. For information, write: Area Engineer, Bureau of Reclamation, Grand Island, Nebraska.
Project Benefits

Direct benefits which would be derived from this project include irrigation, recreation, and fish and wildlife. The recreation, fish and wildlife features of this project would provide 12,000 recreation days and 5,400 fisherman days annually.

Remaining Water Resource Problems and Needs

There is a great need for increased land treatment measures and water based recreation in the area. A compelling need for flood control in this area has generated the main interest in resource development.

Project Costs

The total estimated costs of the project are $14,681,000 of which $14,347,000 would be assigned to irrigation. The non-federal costs would be $52,500 for part of the recreation function. The amount of irrigation costs to be borne by M.R.B.P. has not been determined.

Operation, Maintenance and Replacement

Operation, maintenance and replacement of the irrigation facilities would be the responsibility of a local entity, while that portion for recreation, fish and wildlife would be the responsibility of a non-federal entity.

Local Interest and Support

Up to the present time, no reclamation or other type of district has been formed. Local people are vitally interested in securing adequate flood control in the Skull Creek Basin. During 1965, indications of increasing interest in irrigation development were evident.

Existing Resource Development in the Area

Water resource development is limited in the Linwood Unit area. Flood and erosion control have been accomplished only on a very limited basis in the area. Present irrigation development is confined to pumping from wells and totals about 1,800 acres in the project area.

Effect on Water Supply in Project Area

The municipal and industrial water needs in this area are adequately served by pumping from ground water aquifers and will continue to be so served in the future. There are several small, scattered water rights below the proposed diversion dam; however, spills, natural inflow, and seepage returns from the project would be adequate to satisfy these prior rights.
LINWOOD UNIT

LOCATION: Eastern Nebraska between Bellwood and Morse Bluff in Butler and Saunders Counties
SPONSORS: Requested by Nebraska Soil and Water Conservation Commission
FEATURES: Columbus Diversion Dam and Octavia Pumping Plant
CONSTRUCTION PERIOD: 4 Years
PROJECT LIFE: 100 Years
TOTAL ANNUAL COST: $564,500
ANNUAL O.M.&R.: $62,300
COSTS BASED ON: 1966 Prices
BENEFIT-COST RATIO: 1.09 to 1.00
PROJECT ACREAGE: 10,600 Acres

Table 1 - Average Annual Project Benefits

<table>
<thead>
<tr>
<th></th>
<th>Irrigation</th>
<th>Recreation</th>
<th>Fish &amp; Wildlife</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Benefits</td>
<td>$529,500</td>
<td>$12,000</td>
<td>$5,400</td>
<td>$546,900</td>
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<tr>
<td>Indirect Benefits</td>
<td>66,200</td>
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<td>--</td>
<td>66,200</td>
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<tr>
<td>Total Benefits</td>
<td>$595,700</td>
<td>$12,000</td>
<td>$5,400</td>
<td>$613,100</td>
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Table 2 - Project Costs and Repayment by Source

<table>
<thead>
<tr>
<th>Source</th>
<th>Irrigation</th>
<th>Recreation</th>
<th>Fish &amp; Wildlife</th>
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<tr>
<td>Total Costs</td>
<td>$14,347,000</td>
<td>$193,000</td>
<td>$141,000</td>
<td>$14,681,000</td>
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<tr>
<td>Non-reimbursable</td>
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<td>$140,500</td>
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<tr>
<td>M.R.B.P.</td>
<td>Not Avail</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Non-Federal(State)</td>
<td>0</td>
<td>52,500</td>
<td>--</td>
<td>52,500</td>
</tr>
<tr>
<td>Local</td>
<td>Not Avail</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Table 3 - Average Annual Water Requirements

Crop Irrigation Requirement: 0.85 ac ft/acre
FARM Deliverance Requirement: 1.21 ac ft/acre
Diversion Requirement: 2.05 ac ft/acre
Total Diversion Requirement: 22,700 ac ft.
Return Flow: Not Available
Streamflow Depletion: Not Available

Table 4 - Dam and Reservoir Data

COLUMBUS DIVERSION DAM
Height: 20 feet  Length: 14,700 feet
Spillway Capacity: 90,000 c.f.s.
Drainage Area: Not Available
Capacity - Not Applicable

Table 5 - Land Acquisition (acres)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Fee</th>
<th>Easement</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbus Diversion Dam</td>
<td>--</td>
<td>--</td>
<td>1,100</td>
</tr>
<tr>
<td>Octavia Pumping Plant</td>
<td>--</td>
<td>--</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>--</td>
<td>--</td>
<td>945</td>
</tr>
<tr>
<td>Fish &amp; Wildlife</td>
<td>--</td>
<td>--</td>
<td>16</td>
</tr>
<tr>
<td>Recreation</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>2,066</td>
</tr>
</tbody>
</table>
Schuyler, Nebraska is located on the north bank of the Platte River about fifty miles west-northwest of Omaha. The city is a marketing center for the immediate agricultural area. This project has been planned by the Army Corps of Engineers in response to a request from the Platte Valley Drainage District.

The purpose of this project is to stop over-topping of the Platte River bank three and one-half miles southwest of Schuyler. At this point, Platte River overbank flows go into Lost Creek which is lower than the Platte River. Flows greater than 9,000 cubic feet per second in the Platte River now overtop the divide and enter Lost Creek.

Current Status

A detailed Project Report has been completed for this proposed project and has been approved by the Corps' Chief of Engineers. The Nebraska Soil and Water Conservation Commission has endorsed the project as a part of Nebraska's State Water Plan.

Description of Project Area

Lost Creek originates about 35 miles northwest of Schuyler and flows parallel to the Platte River in the lower reaches. It flows near the south edge of the city before entering the Platte about four miles east of Schuyler. High flows in the Platte tend to overtop the north bank on a curve of the river southwest of Schuyler and enter the Lost Creek channel. There is a definite threat of the Platte channel shifting to Lost Creek during prolonged high flows.

Extent of Project Investigations

A preliminary examination report on flood control of the Platte River in the vicinity of Schuyler, Nebraska, dated February 1938, stated that damages from floods in the vicinity of Schuyler had been nominal, but the Platte River threatened to relocate in the Lost Creek channel. At this time, local interests favored a plan for deepening and straightening the Platte River and raising its banks. This plan was found to be impractical and infeasible.

A review report entitled PLATTE RIVER IN THE VICINITY OF SCHUYLER, NEBRASKA published as a House document in 1940, recommended the construction of about 3,600 feet of lumber mattress and rip-rap on the left bank of the Platte River about three and one-half miles southwest of Schuyler. This work was completed in 1946 by the Corps of Engineers and is still intact.

A review study of the entire Platte River Basin is now in process and will be completed soon.

Plan Features

The project, as recommended, would consist of a stone fill dike and revetment 3,000 feet long and two levee segments of 3,820 feet and 5,110 feet. The revetment would begin at the downstream end of the revetment constructed in 1946 by the Corps of Engineers. The downstream levee segment would be a trail levee constructed about 300 feet landward of the revetment.

Project Benefits

The existing average annual flood damage totals $116,840. With the proposed levee project in operation, damages would be reduced by 72 percent.

The project would provide flood protection for 90 percent of the Platte Valley Drainage District for discharges having a 10 percent or greater chance of annual occurrence.

Remaining Water Resource Problems and Needs

The remaining average annual flood damage in the project area would be approximately $32,000.
**Project Costs**

Costs include $205,000 for levees and flood walls, $17,000 for plans and specifications, $35,000 for prior expenses, $17,200 for supervision and administration, and $19,800 for necessary lands.

**Financing Arrangements**

The structural costs would be assumed by the federal government with local interests furnishing rights-of-way, easements, and operating and maintenance costs.

**Provisions for Operation and Maintenance**

In accordance with provisions of the 1948 Flood Control Act as amended, local interests will be required to maintain and operate all works after completion in accordance with the regulations prescribed by the Secretary of the Army.

**Local Interest and Support**

Local interests have indicated strong support for this project.

**Existing Resource Development in the Area**

A Corps of Engineers project consisting of lumber mattress and rip-rap on the left bank of the Platte River was completed in 1946 and is still intact. There is extensive ground water development for irrigation in the area.

**Effect on Water Supply in Project Area**

This project is not expected to have any appreciable effect on the water supply in the project area.
PLATTE RIVER AND LOST CREEK PROJECT

LOCATION: Three and one-half miles southwest of Schuyler, Nebraska on the north bank of the Platte River

SPONSORS: Platte Valley Drainage District

FEATURES: 3,000 feet of stone fill dike and revetment, two levee segments of 3,820 feet and 5,110 feet located on the north bank of the Platte River.

CONSTRUCTION PERIOD: Not available

TOTAL ANNUAL COST: $19,790

BENEFIT COST RATIO: 4.30 to 1.00

PROJECT LIFE: 25 years

ANNUAL O&M. BR.: $4,500

COSTS BASED ON: 1967 Prices

TOTAL NUMBER OF MAJOR FLOODS IN AREA SINCE 1881: 8

TOTAL NUMBER OF ACRES PROTECTED WITH PROJECT: 8,000

Project designed to withstand 10 year flood

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Total Project Costs</th>
<th>Payment by Federal</th>
<th>Non-Federal</th>
<th>Total Annual Project Benefits</th>
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<tr>
<td>Flood Control</td>
<td>$294,000</td>
<td>273,000</td>
<td>21,000</td>
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**Table 2 - Flood Damage**

<table>
<thead>
<tr>
<th>Date</th>
<th>Peak Flow, c.f.s.*</th>
<th>Acres Damaged</th>
<th>Damage</th>
<th>Percent Damage To:</th>
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<tr>
<td>1960</td>
<td>112,000</td>
<td>N.A.</td>
<td>$400,000</td>
<td>Agr. 45 Transport 27 Utilities 30</td>
</tr>
<tr>
<td>1966</td>
<td>72,500+</td>
<td>$400,000</td>
<td>51</td>
<td>Agr. 45 Transport 27 Utilities 24</td>
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<tr>
<td>1967</td>
<td>74,300+</td>
<td>$610,000</td>
<td>64</td>
<td>Agr. 45 Transport 27 Utilities 24</td>
</tr>
</tbody>
</table>

* Platte River at North Bend
**SHELL CREEK AND TRIBUTARIES**

Shell Creek, draining about 471 square miles in east-central Nebraska, is a tributary of the Platte River entering that stream about five miles east of Schuyler, Nebraska. Channel capacities of the stream vary from 400 to 3500 cubic feet per second.

Local interest in this proposed project was expressed by the Shell Creek Flood Control Committee. The Corps of Engineers is planning this project.

**Current Status**

This project is inactive at the present time because of a lack of local interest. The next step taken depends upon local interest and willingness to cooperate in the project.

**Description of Project Area**

Shell Creek Basin lies entirely within east-central Nebraska with a major part of the basin located within the high plains section of Nebraska. Throughout the length of Shell Creek the bottomlands generally slope toward the creek. The channel is inadequate to carry the discharges of even the smaller, more frequent floods.

The basin is subject to high winds and rains of high intensity with average annual precipitation averaging 25 inches. Approximately 76 percent of the rainfall occurs during the growing season. Shell Creek Basin is predominantly an agricultural area. Approximately 96 percent of the basin is in farms.

**Extent of Project Investigations**

There have been no prior Corps of Engineers reports dealing specifically with the Shell Creek Basin other than the Preliminary Examination report of May 1947. This report recommended that a survey in the interest of flood control be made. The Bureau of Reclamation report on the Missouri River Basin prepared in 1944 and published as a Senate document pertained in part to the Shell Creek area. This report included improvements in the Shell Creek Basin for irrigation of areas in and adjacent to that basin and was proposed in conjunction with the plan of improvement recommended for the Lower Platte River Basin. Another report was prepared in 1951 by the Bureau of Reclamation in which certain modifications were made in the proposal of improvements which affected the Shell Creek Basin.

**Plan Features**

This plan as proposed involves channel clearing, channel enlargement and straightening and necessary bridge alterations along Shell Creek from Newman Grove to the mouth and along the lower reaches of the major tributaries. Intermittent low levees along Shell Creek and the lower reaches of the major tributaries and three detention basins along Shell Creek would provide temporary storage to reduce the peak discharges of floodwaters passing down the valley.

**Project Benefits**

The primary function of the proposed plan of improvement would be flood control. The principal benefits would accrue from the reduction in flood damages.

**Remaining Water Resource Problems and Needs**

The area near Platte Center is now subject to damage by water logging following floods. It is anticipated that the water table in the area would be lowered substantially as a result of the project. The only other serious or potentially serious surface water problem in Shell Creek Basin is the problem of sheet and gully erosion in the upland areas which has contributed to the degradation of the stream channel.

*"Shell Creek and Tributaries Nebraska", House Document No. 187, 85th Congress, First Session, 1957. For information, write: District Engineer, Army Corps of Engineers, Omaha.*
Project Costs

The total costs are estimated to be $2,211,000. The federal share of this is $1,763,000. The local costs of $448,000 would be principally for land, easements and rights-of-way.

Financing Arrangements

The structural costs would be borne by the federal government and local interests would provide all necessary lands, easements, and rights-of-way. Relocation costs and operation and maintenance costs would be the responsibility of local interests.

Provisions for Operation and Maintenance

A local sponsor must agree to maintain and operate the works after its completion in accordance with regulations prescribed by the Secretary of the Army.

Local Interest and Support

Interest in a flood protection project is strong only for a project which would give protection from the small, more frequent floods. Local interests are willing to risk occasional flooding rather than assume the obligation for a project providing a high degree of protection.

Existing Resource Development in the Area

The area around Schuyler has a considerable amount of private irrigation development and the Loup River Public Power hydro-electric plant is located at Columbus.

Effect on Water Supply in Project Area

The project is not expected to affect the water supply in the area.
SHELL CREEK FLOOD PROTECTION PROJECT

LOCATION: Platte and Colfax Counties. Extending from approximately 50 miles northwest to 20 miles east of Columbus.

SPONSORS: Shell Creek Flood Control Committee

FEATURES: Eight miles of cutoffs, eight miles of enlarged channel, intermittent spoil bank levees and three side channel basins

CONSTRUCTION PERIOD: Not Available

TOTAL ANNUAL COST: $137,800

BENEFIT COST RATIO: 1.58 to 1.00

PROJECT LIFE: 100 Years

ANNUAL O&M.: $17,240

COSTS BASED ON: 1953 Prices

NUMBER OF FLOODS IN AREA SINCE 1902: 37

Table 1 - Project Benefits, Costs and Repayment by Source

<table>
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<tr>
<th>Purpose</th>
<th>Flood Control</th>
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<tbody>
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<td>Total Project Costs</td>
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<tr>
<td>Payment by Federal</td>
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<tr>
<td>Non-Federal</td>
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<td>Total Annual Project Benefits</td>
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Table 2 - Flood Damage

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<tr>
<th>Date</th>
<th>Peak Flow, c.f.s.*</th>
<th>Acres Damaged</th>
<th>Damage</th>
<th>Percent Damage To:</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td>Agr. Transport. Utilities</td>
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<td>6-42</td>
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<td>79 21 0</td>
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<td>7-50</td>
<td>12,000</td>
<td>12,060</td>
<td>$68,600</td>
<td></td>
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*Shell Creek at Newman Grove
A work plan has been completed for the following project and has had an initial review by the Washington Soil Conservation Service office. As a result of this review, additional studies are being made to determine the needs for including channel improvement in this plan.

CLEAR CREEK WATERSHED*

This watershed is located in Saunders County and has 54,820 acres within its boundary. Watershed problems include floodwater, sediment and erosion damage. The following data pertain to the initial plan. Project features include three floodwater retarding structures and one grade stabilization structure. Total cost of this project is expected to be $856,700. The average annual cost is expected to be $17,800 and average annual benefits $28,100, giving the project a 1.6 to 1.00 benefit ratio.

It was authorized for planning December 19, 1966.

* For information, write: State Conservationist, Soil Conservation Service, Lincoln, Nebraska.
LEGEND:

PROPOSED DAM & RESERVOIR SITE

PROPOSED CANAL

PROPOSED PUMPING PLANT

PROPOSED WATERSHED PROJECT

PROPOSED RIVER SIPHON

PROPOSED DIVERSION DAM

PROPOSED PROJECT IRRIGATION

EXISTING DAM & RESERVOIR

*NOTE: ALL BASIN MAP LEGENDS WERE STANDARDIZED AND ALL FEATURES WILL NOT APPEAR ON EVERY MAP.
NORTH PLATTE RIVER BASIN
The following projects have reached the final stage of planning and appear to be feasible. Planning is not sufficiently advanced for these projects to be fully covered in this summary.

ASH PLUM WATERSHED*

This 19,450 acre watershed is located in Garden County. The problems of the watershed include floodwater, sediment and erosion damage.

WINTERS CREEK WATERSHED*

Winters Creek Watershed is located in the extreme western portion of the State of Nebraska in Scotts Bluff and Sioux Counties. The watershed contains 89,710 acres or 140 square miles. The main watershed problem is flood water damage to agricultural, transportation and urban properties. Damages are associated with storms which occur on a long term average of 1.4 times per year. Expanded urbanization and intensive industrial development has greatly increased the flood hazard and damage potential.

Project features will include one floodwater retarding structure located on Winters Creek, approximately 1,500 feet upstream from the Tri-State Canal; 4.10 miles of channel improvement on Winters Creek upstream from the Platte River bottom; 1.52 miles of channel realignment and improvement on Scottsbluff Drain outleting into Winters Creek about 1/4 mile north of 13th Street; and 2.3 miles of levee along the lower reaches of Winters Creek and Scottsbluff Drain. The total project costs are expected to be $1,405,400, with estimated annual costs of $62,580. The estimated annual cost for operation and maintenance is $5,340. P. L. 566 funds will pay for $877,800 of the total project cost and local interests will furnish the remainder. Preliminary project benefits are estimated at $101,189 annually, giving the project a total benefit cost ratio of 1.67 to 1 with a direct benefit cost ratio of 1.47 to 1.

* For further information, write: Nebraska Soil and Water Conservation Commission, Lincoln, Nebraska; or, State Conservationist, Soil Conservation Service, Lincoln, Nebraska.
MITCHELL IRRIGATION DISTRICT*

The Mitchell Irrigation District is in the west-central extremity of the panhandle of Nebraska in Scotts Bluff County with the district lands located in a strip along the south side of the North Platte River.

The district has applied for a loan through the Small Reclamation Projects Act of 1956, Public Law 984, for rehabilitation of its existing irrigation system.

The Bureau of Reclamation has completed its technical review of the loan application and report but has not forwarded the application to the Congress for authorization and funding.

The rehabilitation of the existing system will involve the construction of a new 14-foot by 150-foot concrete diversion dam across the North Platte River, a new headgate structure, rehabilitation of the main canal, and replacement of the 37 miles of open laterals with 30 miles of buried pipe.

The total cost is estimated to be $1,654,000 with a construction period of two and one-half years. The costs are based on 1966 prices.

The rehabilitation of the existing system will reduce seepage through the canal and laterals and provide an additional 1,550 acre feet of water annually.

* For further information, write: Region 7, Bureau of Reclamation, Denver, Colorado.
NORTH PLATTE RIVER BASIN

LEGEND

PROPOSED DAM & RESERVOIR SITE
PROPOSED CANAL
PROPOSED PUMPING PLANT
PROPOSED WATERSHED PROJECT
PROPOSED RIVER SIPHON
PROPOSED DIVERSION DAM
PROPOSED PROJECT IRRIGATION
EXISTING DAM & RESERVOIR

*NOTE: ALL BASIN MAP LEGENDS WERE STANDARDIZED AND ALL FEATURES WILL NOT APPEAR ON EVERY MAP.
PAPILLION CREEK WATERSHED*

Papillion Creek Watershed consists of 245,800 acres in Douglas, Sarpy, and Washington Counties. The watershed includes a large portion of the metropolitan area of Omaha. Watershed problems include flooding, grade stabilization, sediment and erosion damages.

Sponsors of this watershed are Douglas, Sarpy and Washington Counties, and the Sarpy, Papio, and Douglas County Soil and Water Conservation Districts. Assisting them in the planning of this watershed are the Soil Conservation Service and the Nebraska Soil and Water Conservation Commission.

Current Status

This project has undergone all necessary steps toward construction and is now awaiting construction start approval by the Bureau of the Budget. Construction will begin as soon as funds are available.

Description of Project Area

Little Papillion, Big Papillion and West Branch Papillion Creeks are the principal streams in the watershed. The Little Papillion and Big Papillion Creeks flow through Metropolitan Omaha.

Flood plain soils are predominantly deep and well drained. Steeper slopes are made up of loess and exposed glacial till. Topography varies from nearly level bottomland along the streams and major drains to moderately sloping upland.

Under present conditions, improper land use involves approximately 2,800 acres of the watershed area.

Average annual precipitation in Omaha is about 28 inches. The average length of the growing season is about 170 days with 75 percent of the precipitation occurring during that time.

The economy of the watershed is based on dryland agriculture and retail business trade in Metropolitan Omaha. The percentage land use distribution is 74 percent cropland, 16 percent urban and 10 percent other uses. The majority of farming operations are cash grain and cattle feeding enterprises.

Extent of Project Investigations

This project has undergone preliminary and work plan investigations. Included in the investigations were studies on land treatment, hydrology, geology, economics, and engineering.

Plan Features

Papillion Creek Watershed improvements will include the installation of 52 grade stabilization structures. Completion of 59,650 acres of land treatment in the watershed is another major improvement of the project.

Project Benefits

Land stabilization benefits from this project are expected to total $87,500 a year. This is made up of monetary benefits derived from reduction in damages from erosion and sedimentation, as well as indirect and secondary benefits.

Structural measures in this project will provide reductions in land damage to 1600 farm and urban properties. Application of an adequate conservation program will reduce soil erosion, runoff and sediment production.

Remaining Water Resource Problems and Needs

The Metropolitan Omaha area needs additional flood protection measures and enforcement of flood plain zoning.

Soil erosion is a significant problem within the metropolitan area. Many acres of land are stripped of cover in preparing for housing developments which may take two, three or more

* "Papillion Creek Watershed Work Plan", February 1967. For information, write: Papio Watershed Board, 4538 S. 84th Street, Omaha, Nebraska; or, State Conservationist, Soil Conservation Service, Lincoln, Nebraska.
years for full development. The asphalt and concrete paving associated with these developments produces additional runoff over that experienced historically.

Pollution of the channels and waterways in the Omaha area is a serious problem.

**Project Costs**

Total cost consists of $2,595,700 for land treatment and $1,263,800 for structural measures.

**Financing Arrangements**

The Federal Government, under the authority of the Watershed Protection and Flood Prevention Act, P. L. 566, and local interests using other authorities and private funds, will provide the financing.

**Provisions for Operation and Maintenance**

Farm owners and operators will operate and maintain land treatment measures. The counties of Douglas, Sarpy, and Washington will operate and maintain structural measures.

**Local Interest and Support**

The County Board of Commissioners of Douglas, Sarpy and Washington Counties appointed the Papio Watershed Board under authority of Nebraska Statutes for the purpose of carrying out a coordinated soil and water resource program and a program of flood control for the county. The board has been outstanding in its support of development.

**Existing Resource Development in the Area**

The Turtle Creek Watershed Project has been completed near the southern edge of this proposed watershed. Little Papio Creek channel improvements are under construction in Douglas County, Agriculture Levee Unit 4-613 is under construction at the junction of Papillion Creek and the Missouri River, and a seven-year channel maintenance program is under way on 22 miles of the Big Papio Creek in Douglas and Sarpy Counties.

**Effect on Water Supply in Project Area**

Installation of this project will greatly reduce the amount of sediment production in the area and reduce the rate of deposition and degradation within the Papio channels and flood plain properties. This in turn will reduce the flow of sediment into the Missouri River.
PAPILLION CREEK WATERSHED

LOCATION: In Washington, Douglas and Sarpy Counties, extending a few miles west of Highway 31, south to Gretna and north beyond Blair, Nebraska

SPONSORS: Douglas, Washington, and Sarpy Counties and Douglas County, Papio and Sarpy Soil and Water Conservation Districts

FEATURES: 52 grade stabilization structures with a drainage area above the structures of 29,585 acres

CONSTRUCTION PERIOD: 8 Years

AVERAGE ANNUAL COST: $52,990

BENEFIT-COST RATIO: 1.7 to 1.00

PROJECT LIFE: 50 Years

ANNUAL O.M.&R.: $2,700

COSTS BASED ON: 1965 Prices

PERCENT OF LAND TREATMENT COMPLETED: 45 to 50% to June, 1968

COST OF RIGHT-OF-WAY: $198,300

Table I - Project Benefits, Costs and Repayment by Source

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Flood Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of Project Costs</td>
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<tr>
<td>Non-Federal</td>
<td>$2,344,100</td>
</tr>
<tr>
<td>Average Annual Project Benefits</td>
<td>$ 87,500</td>
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LEGEND

PROPOSED STRUCTURE SITES
PAPILLION CREEK AND TRIBUTARIES

This proposed project covers the same area as the proposed Papillion Creek Watershed Project. The Papillion Creek Basin has a drainage area of 394 square miles and is located within Washington, Douglas and Sarpy Counties.

Papillion Creek is a minor right bank tributary of the Missouri River and joins the Missouri River in the vicinity of Offutt Air Force Base south of the city of Omaha.

Water problems of the basin have been studied in detail through joint and coordinated efforts by the Corps of Engineers and the Soil Conservation Service. The Corps' investigation has been aimed primarily at flood control needs, although appropriate consideration has been given to other related problems.

Current Status

The Papillion Creek and Tributaries Project has been authorized for construction by Congress and is now awaiting funding for construction. This project has been endorsed by the Nebraska Soil and Water Conservation Commission as a part of Nebraska's State Water Plan.

Description of Project Area

The Papillion Creek Basin lies entirely in the eastern part of Nebraska. The principal streams in the basin are Big Papillion Creek, Little Papillion Creek, West Branch Papillion Creek and Papillion Creek.

The Papillion Creek Basin has, in the last twenty years, experienced rapid economic changes. Within the past few years, Omaha and some of the small communities surrounding Omaha have grown to such an extent that they are encroaching on a number of flood prone areas. Current projections indicate that more of these flood prone areas will be utilized to reduce urban sprawl.

The basin has experienced many floods with some flooding occurring almost every year. During the 1964 flood, seven persons lost their lives by drowning. An estimated $4,960,000 in flood damages occurred from the 1964 flood. Eighty-seven percent of this was urban damage. The basin has experienced average annual flood damages of $373,000.

Extent of Project Investigations

The Papillion Creek Basin was included in the report published as House Document 238 in 1934. A preliminary investigation report was published by the Omaha District Engineer in March of 1948, along with a number of brief reports by local consulting engineers.

The preliminary investigation showed that a serious flood problem existed and channel improvements were needed along Little Papillion Creek and that construction of these improvements appeared economically feasible. The report also recommended a survey be made of the Papillion Creek Basin in the interest of flood control. The recommendation in that report was concurred in by higher authority and resulted in the authorization of the 1962 report. In February of 1968, a review report for Papillion Creek and Tributaries was published by the Corps and was sent to the Senate and the House where the project was authorized.

Plan Features

The plan as authorized by Congress will consist of 21 earth-fill dams and reservoirs. This system will provide flood control, water quality storage and recreation.

Project Benefits

The benefits attributed to the Papillion Creek Project would consist of a substantial reduction in flood damage potential, improvement of streamflow qualities and significant enhancement of opportunities to enjoy water-based recreational activities.

Flood control benefits would result from reduction in direct physical losses in the metropolitan and rural areas of the basin totaling $1,606,000 annually. This figure would tend to increase as the city of Omaha and the surrounding area continued to grow and expand.

The proposed plan for recreation development would support an ultimate level of annual visitors estimated to total 1,552,000 visitor days. The average annual benefits attributable to the project recreation functions are $990,000.

* "Papillion Creek and Tributaries, Nebraska", Review Report, February 1967. For information, write: District Engineer, Army Corps of Engineers, Omaha, Nebraska.

12-5
Water quality storage within the Papillion Creek Basin will provide a flow of 3 cubic feet per second in each of the major tributaries. Based on the costs of an alternate ground water pumping project, this storage is estimated to have an annual value of $10,700.

The structural measures of this project are expected to reduce average annual flood damages by 94 percent in the project area.

Remaining Water Resource Problems and Needs

The remaining water resource problems and needs of this project area include additional flood protection measures for the City of Omaha; enforcement of the flood plain zoning regulations; a reduction in the amount of erosion and soil loss resulting from development of the residential parts of Omaha; and increased reduction of the amount and type of pollutants being discharged into the waterways in the Omaha area.

Project Costs

The total cost of this project is estimated to be $26,800,000. Of this total, $15,743,000 will be for flood control and will be paid for by the federal government. $67,200 will be allocated to water quality control and will also be borne by the federal government. The remainder, or $10,989,000, will be allocated to recreation and in accordance with the provisions of the Federal Water Project Recreation Act, a nonfederal public body would be required to pay at least one-half of this cost.

Financing Arrangements

The federal share of the cost of installing this project will be provided through Congressional funding. The nonfederal share of the project cost will come from state, county and city funds.

Provisions for Operation and Maintenance

The estimated average annual costs for operating and maintaining the project for recreation and fish and wildlife enhancement, including the replacement of facilities, is $266,300. In accordance with the provisions of the Federal Water Project Recreation Act, all such costs must be borne by nonfederal public bodies.

Local Interest and Support

On several occasions, at the invitation of local civic groups in Omaha, public discussions were conducted on the flood problems of the basin and on plans for proposed improvements. The public views expressed at these meetings demonstrated a strong and wide-spread support for the proposed project from Sarpy and Douglas County residents, particularly from the residents of the Cities of Omaha, Papillion and Millard. Some opposition was raised from residents of Washington County.

Local interest in this project is represented by the City of Omaha and the Board of Commissioners of Douglas and Sarpy Counties. Coordination of this project between the Corps, the City of Omaha and county boards is being carried on by the Papio Watershed Advisory Board. A watershed advisory board was established under the laws of Nebraska to act as a local entity for formulation of the project and to assist in coordinating local cooperation upon project completion. The board endorsed the project by a vote of six to two. Washington County representatives opposed it.

Existing Resource Development in the Area

The Turtle Creek Watershed project has been completed near the southern edge of this proposed project. Little Papio Creek channel improvements are under construction in Douglas County, agricultural levee unit R-613 is under construction at the junction of Papillion Creek and the Missouri River, and a seven-year channel maintenance program is under way on 22 miles of the Big Papillion Creek in Douglas and Sarpy Counties.

Effect on Water Supply in the Project Area

The installation of this project is expected to affect the water supply in the project area in two ways. The first effect will be the reduction of flood flows and the second will be the provision of a minimum flow of 3 c.f.s. for water quality control.
PAPILLION CREEK AND TRIBUTARIES

LOCATION: Eastern Nebraska in Washington, Douglas and Sarpy Counties

SPONSORS: Papio Watershed Advisory Board, Douglas County and Sarpy Soil and Water Conservation Districts

FEATURES: Twenty-one earth-fill dams and reservoirs and appurtenant features

CONSTRUCTION PERIOD: 8 years

TOTAL ANNUAL COST: $1,322,600

BENEFIT-COST RATIO: 2.0 to 1.0

PROJECT LIFE: 100 Years

ANNUAL O.M.&R.: $358,300 (Joint use costs of $92,000 included)

COSTS BASED ON: 1966 Prices

PROJECT DESIGNED TO REDUCE ANNUAL FLOOD DAMAGES BY: 94%

TOTAL NUMBER OF FLOODS IN AREA SINCE 1929: 16

Table 1 - Project Benefits, Costs and Repayment by source

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Flood Control</th>
<th>Water Quality</th>
<th>Recreation</th>
<th>Total</th>
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<tbody>
<tr>
<td>Share of Project Costs</td>
<td>$15,743,000</td>
<td>$67,200</td>
<td>$10,989,800</td>
<td>$26,800,000</td>
</tr>
<tr>
<td>Amount Reimbursable</td>
<td>-0-</td>
<td>-0-</td>
<td>5,494,900</td>
<td>5,494,900</td>
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<tr>
<td>Payment by Federal</td>
<td>15,743,000</td>
<td>67,200</td>
<td>5,494,900</td>
<td>21,305,100</td>
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<tr>
<td>Non-Federal</td>
<td>-0-</td>
<td>-0-</td>
<td>5,494,900</td>
<td>5,494,900</td>
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<tr>
<td>Total</td>
<td>$15,743,000</td>
<td>$67,200</td>
<td>$10,989,800</td>
<td>$26,800,000</td>
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Total Annual Project Benefits: $2,606,800

Table 2 - Flood Damage

<table>
<thead>
<tr>
<th>Date</th>
<th>Peak Flow, c.f.s.*</th>
<th>Acres Damaged</th>
<th>Dollar Damage</th>
<th>Percent Damage to:</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Agriculture</td>
</tr>
<tr>
<td>1943</td>
<td>9,000</td>
<td>660</td>
<td>200,000</td>
<td>41</td>
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<tr>
<td>8/59</td>
<td>14,600</td>
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<td>1,090,000</td>
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<tr>
<td>6/64</td>
<td>32,300</td>
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</tr>
<tr>
<td>9/65</td>
<td>15,600</td>
<td></td>
<td>529,000</td>
<td>22</td>
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</table>

* Fort Crook Gauge
Table 3 - Dam and Reservoir Data

<table>
<thead>
<tr>
<th>NAME</th>
<th>HEIGHT IN FT</th>
<th>LENGTH IN FT</th>
<th>CAPACITY IN ACRE-FEET</th>
<th>DRAINAGE AREA IN SQ. MI.</th>
<th>AREA IN ACRES</th>
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<tbody>
<tr>
<td>East Kennard Dam #1</td>
<td>58</td>
<td>1,570</td>
<td>6,300</td>
<td>9,300</td>
<td>18,000</td>
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<tr>
<td>West Kennard Dam #2</td>
<td>47</td>
<td>1,600</td>
<td>5,000</td>
<td>6,600</td>
<td>12,600</td>
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<tr>
<td>County Line Dam #3</td>
<td>50</td>
<td>1,950</td>
<td>5,500</td>
<td>33,100</td>
<td>23,400</td>
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<tr>
<td>Washington Dam #4</td>
<td>68</td>
<td>1,900</td>
<td>2,700</td>
<td>4,000</td>
<td>7,100</td>
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<tr>
<td>Elk City Dam #5</td>
<td>45</td>
<td>1,100</td>
<td>770</td>
<td>1,360</td>
<td>1,460</td>
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<td>106th Street Dam #6</td>
<td>45</td>
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<td>750</td>
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<td>Highway 36 Dam #7</td>
<td>40</td>
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<td>725</td>
<td>765</td>
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<td>Bennington Dam #8</td>
<td>45</td>
<td>1,200</td>
<td>670</td>
<td>1,190</td>
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<td>Rainwood Drive Dam #9</td>
<td>40</td>
<td>1,550</td>
<td>500</td>
<td>900</td>
<td>950</td>
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<td>Thomas Creek Dam #10</td>
<td>50</td>
<td>1,000</td>
<td>1,270</td>
<td>2,260</td>
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<tr>
<td>Irvington Dam #11</td>
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<td>2,500</td>
<td>4,600</td>
<td>6,800</td>
<td>14,000</td>
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<tr>
<td>Elkhorn W.W. Dam #12</td>
<td>43</td>
<td>1,200</td>
<td>620</td>
<td>1,100</td>
<td>1,190</td>
</tr>
<tr>
<td>Chapel Hill Dam #13</td>
<td>43</td>
<td>1,100</td>
<td>500</td>
<td>900</td>
<td>950</td>
</tr>
<tr>
<td>Elkhorn East Dam #14</td>
<td>50</td>
<td>750</td>
<td>670</td>
<td>1,190</td>
<td>1,280</td>
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<tr>
<td>West Dodge Dam #15</td>
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<td>2,220</td>
<td>4,500</td>
<td>6,300</td>
<td>11,900</td>
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<tr>
<td>Military Dam #16</td>
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<td>1,750</td>
<td>1,440</td>
<td>2,560</td>
<td>2,100</td>
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<tr>
<td>Blondo Dam #17</td>
<td>50</td>
<td>930</td>
<td>460</td>
<td>810</td>
<td>730</td>
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<td>Millard Dam #18</td>
<td>74</td>
<td>3,300</td>
<td>4,700</td>
<td>6,900</td>
<td>12,400</td>
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<tr>
<td>Grotta Dam #19</td>
<td>40</td>
<td>1,750</td>
<td>1,050</td>
<td>1,900</td>
<td>1,850</td>
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<tr>
<td>Chalco Dam #20</td>
<td>52</td>
<td>1,860</td>
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<td>5,500</td>
<td>10,600</td>
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<tr>
<td>Papillion Dam #21</td>
<td>50</td>
<td>1,450</td>
<td>940</td>
<td>1,660</td>
<td>1,400</td>
</tr>
</tbody>
</table>
The following project has been planned and undergone in-service review. Its next step will be a review by federal agencies and then authorization for construction.

**ADWA CREEK WATERSHED**

This watershed is located in Dixon County and includes 55,350 acres. Watershed problems include gully erosion, floodwater and sediment damage. Project features include eight combination floodwater retarding and grade stabilization structures, one multiple purpose floodwater retarding and recreation structure, one multiple purpose floodwater retarding and fish and wildlife structure, and 55 grade stabilization structures. Total cost of this project is expected to be $3,429,000. The average annual cost is expected to be $109,490 and average annual benefits are estimated at $157,420, giving the project a benefit cost ratio of 1.4 to 1.00.

Authorized for planning September 19, 1966.

* For information, write: State Conservationist, Soil Conservation Service, Lincoln, Nebraska.
SOUTH PLATTE RIVER BASIN
The potential Brule Watershed Project is located in the southwest corner of Keith County. The watershed lies northwest of the town of Brule. Sponsors of this proposed watershed are Keith-Arthur Soil and Water Conservation District, Brule Watershed Conservancy District and the village of Brule. Assistance to the sponsors in planning this watershed is being provided by the Soil Conservation Service.

Current Status

The Brule Watershed Project has undergone all necessary steps toward construction and is authorized for operations. Construction funds are available and bids are now being requested for construction. The Nebraska Soil and Water Conservation Commission has endorsed this project as a part of Nebraska's State Water Plan.

Description of Project Area

Brule Watershed contains 8,640 acres of level to gently sloping table land and nearly level bottom land separated by canyons. The average annual precipitation in the area varies but is generally around 18 inches. The growing season averages 150 days with 70 percent of the annual rainfall occurring during that time.

The economy of the watershed area is based on dryland and irrigated agriculture and land use is divided equally between cropland and rangeland.

Extent of Project Investigations

This project has undergone preliminary and work plan investigations.

Plan Features

The project features would include one floodwater retarding structure controlling runoff from 58 percent of the drainage area, 3,445 feet of dike, and 5,730 feet of channel improvement. The dam would be located at the south end of Brule Canyon approximately one mile northwest of the town of Brule. Brule is expected to have complete protection from a 100-year frequency storm through the construction of this watershed.

Project Benefits

The total flood prevention benefits from the project, including secondary benefits, are estimated to be $9,610 annually. The estimated average annual flood damages without the project are $9,000. With the project installed, these average damages will be reduced $8,850 per year based on 1964 dollar values.

Remaining Water Resource Problems and Needs

The remaining resource problems and needs of the area include reduction of soil erosion through the use of increased land treatment and increased flood protection through the installation of other small structures.

Project Costs

The total cost of this potential project is $198,010 based on 1964 cost estimates and includes the costs of dike and channel improvement of $17,400, technical assistance from the Soil Conservation Service of $2,920 and structural installation costs of $171,700.

Local sponsors have the responsibility of obtaining the necessary land, easements and rights-of-way for the project. The Brule Watershed Conservancy District has requested funds for help in land acquisition from the Small Watershed Flood Control Fund administered by the State of Nebraska through the Nebraska Soil and Water Conservation Commission.

* "Brule Watershed Work Plan", May 1965. For information, write: Mr. Myron Van Velson, Chairman, Brule Watershed Conservancy District, Brule, Nebraska; or, State Conservationist, Soil Conservation Service, Lincoln, Nebraska.
Financing Arrangements

Local costs will be met by assessments levied against property within the conservancy district and donations from private sources.

Provisions for Operation and Maintenance

The Brule Watershed Conservancy District will operate and maintain the structural measures.

Local Interest and Support

Watershed residents have organized the Brule Watershed Conservancy District which has authority to levy ad valorem taxes on tangible property within the district boundaries.

Existing Resource Development in the Area

The only significant water resource developments in the area are the numerous canals and waterways supplying water to much of the irrigated land in the watershed.

Effect on Water Supply in Project Area

The effect of the project features and associated land treatment on the area water supply will be the reduction of sediment production; the decrease in the amount of water flowing out of the watershed; and a possible slight rise of the ground water table.
LOCATION: Southwest Corner of Keith County, Northwest of Brule

SPONSORS: Keith-Arthur Soil & Water Conservation District, Brule Watershed Conservancy District, and the Village of Brule

FEATURES: One Floodwater Retarding Structure, 0.6 Mile of Dike and 1.1 Miles of Channel Improvement

CONSTRUCTION PERIOD: 1 Year

TOTAL ANNUAL COST: $6,700

BENEFIT-COST RATIO: 1.4 to 1.00

PROJECT LIFE: 100 Years

ANNUAL O.M.&R.: $1,080

COSTS BASED ON: 1964 Prices

PERCENT OF LAND TREATMENT COMPLETED: 75% to December, 1967

COST OF RIGHT-OF-WAY: $7,900

Table 1 - Project Benefits, Costs, and Repayment by Source

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Flood Control</th>
</tr>
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<tbody>
<tr>
<td>Total Project Cost</td>
<td>$198,010</td>
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<tr>
<td>Payment by Federal</td>
<td>165,520</td>
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<tr>
<td>Non-Federal</td>
<td>32,490</td>
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<tr>
<td>Total Annual Project Benefits $9,610</td>
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</table>

Table 2 - Reservoir Data

<table>
<thead>
<tr>
<th>Number of Structures</th>
<th>Storage Capacity (Acre Feet)</th>
<th>Initial</th>
<th>Sediment</th>
<th>Flood Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5,062 acres</td>
<td>614</td>
<td>1,105</td>
<td></td>
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</tbody>
</table>
NOTE: ALL BASIN MAP LEGENDS WERE STANDARDIZED AND ALL FEATURES WILL NOT APPEAR ON EVERY MAP.
OTHER PROJECTS
INTER-STATE AND REGIONAL PROJECTS

There are a number of inter-state and inter-basin projects which have been proposed by individuals and groups. These include the R. W. Beck Plan, "A New Water Resource Plan For The Great Plains", the Parsons Company's "North American Water and Power Alliance" known as NAWAPA, and the plan proposed by Lewis G. Smith, "Western States Water Augmentation Concept."

Water needs continue to mount and during the next few years, inter-state and inter-basin project proposals will become more numerous and more important.

THE BECK PLAN

The Beck Plan involves the diversion of water from the Missouri River just below Fort Randall Reservoir and the transporting of this water through a series of dams and/or canals 200 miles up the Niobrara River to a point just north of Alliance, Nebraska. From this point, the water would flow by gravity in a major canal through Western Nebraska, across the Platte River and south through Kansas, Colorado, Oklahoma, Texas, and end near Hobbs, New Mexico. The canal would have an estimated capacity of 17,000 c.f.s. and would be approximately 60 feet wide, 22 feet deep and some 940 miles long.

The total estimated cost of this undertaking, based on present price levels, would be nearly 3.5 billion dollars.

NAWAPA

The North American Water and Power Alliance Plan involves the collection and distribution of water from the Yukon area to Southern Texas. The plan would also involve the stabilization and control of the level of the Great Lakes with an annual available water supply of 48 million acre feet.

The proponents of NAWAPA say it would deliver 78 million acre feet of water, make 30 million kilowatts of power available for sale and could increase national income from agriculture, mining and manufacturing by $30 billion dollars annually.

The total cost of this development is estimated to be $100 billion, based on present price levels, and the construction period is anticipated to be 30 years.

WESTERN STATES WATER AUGMENTATION CONCEPT

The Western States Water Augmentation Concept is similar to NAWAPA, but includes distribution to all 17 states west of the Iowa-Nebraska boundary.

Water would be collected in the Liard-MacKenzie Basin in Northern Canada and conveyed south within the Rocky Mountain Trench. Distribution of the water would be handled through natural channels, canals and tunnels.

The total cost of this system is estimated to be around $75 billion based on present price levels.
The projects and studies listed below represent potential projects for future consideration. They are only briefly listed here because at this time, no formal reports have been released.

### POTENTIAL BUREAU OF RECLAMATION PROJECTS

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<th>Development</th>
<th>Status</th>
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<tr>
<td>Fort Kearney Unit</td>
<td>Study Underway</td>
</tr>
<tr>
<td>Gordon Area</td>
<td>Study Underway</td>
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<tr>
<td>Page Area</td>
<td>Study Underway</td>
</tr>
<tr>
<td>Ponca Area</td>
<td>Study Underway</td>
</tr>
<tr>
<td>Keya Paha Area</td>
<td>Study Underway</td>
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<td>Nebraska Basin Units</td>
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### POTENTIAL CORPS OF ENGINEERS PROJECTS AND STUDIES

#### Section 205 Projects

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<tr>
<td>Grand Island, Nebraska</td>
<td>Survey Scope</td>
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<tr>
<td>Meadow Grove, Nebraska</td>
<td>*D. P. R. Study</td>
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<tr>
<td>Osmond, Nebraska</td>
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#### Survey Investigations:

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<th>Status</th>
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<tbody>
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<td>Missouri River, North Dakota, South Dakota and Nebraska</td>
<td>**Submitted to O. C. E.</td>
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<tr>
<td>Nenaha and Little Nenaha Rivers, Nebraska and Kansas</td>
<td>Underway</td>
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<tr>
<td>Platte River, Nebraska</td>
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<td>Elkhorn River, Nebraska</td>
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<td>Niobrara River, Gavins Point Res., Nebraska, South Dakota</td>
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<td>White River, South Dakota and Nebraska</td>
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<tr>
<td>Salt Creek, Nebraska</td>
<td>Underway</td>
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<tr>
<td>Niobrara River, Nebraska and Wyoming</td>
<td>Underway</td>
</tr>
<tr>
<td>Republican River Basin, Harlan County Reservoir and Beaver Creek, Nebraska and Kansas</td>
<td>Initiated</td>
</tr>
<tr>
<td>Loup River, Nebraska</td>
<td>Initiated</td>
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<tr>
<td>Lost-Dry and Twin Creeks, Nebraska</td>
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<tr>
<td>Big Blue River Basin (Including the Little Blue River), Nebraska and Kansas</td>
<td>Initiated</td>
</tr>
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*Detailed Project Report
**Office of Chief Engineer
## POTENTIAL SMALL WATERSHED PROJECTS

<table>
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<th>Project</th>
<th>Size</th>
<th>Planned</th>
<th>By Date</th>
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<td>75,000</td>
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<tr>
<td>Whitney-Big Cottonwood</td>
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<tr>
<td>Niobrara</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loup</td>
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<tr>
<td>Elkhorn</td>
<td>44,160</td>
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<td>5/68</td>
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<tr>
<td>Humbug</td>
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<tr>
<td>Upper Platte</td>
<td>32,000</td>
<td>25%</td>
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<tr>
<td>Creighton Valley</td>
<td></td>
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<td>Middle Platte</td>
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<tr>
<td>Box Elder</td>
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<td>Lost &amp; Dry Creeks</td>
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<td>Lower Platte</td>
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<td>Wahoo Creek</td>
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<td>Balls Branch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Big Blue</td>
<td>8,300</td>
<td>30%</td>
<td>10/67</td>
</tr>
<tr>
<td>Dry (Saline)</td>
<td>156,160</td>
<td>10%</td>
<td>2/68</td>
</tr>
<tr>
<td>Swan</td>
<td>17,980</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Dogtown</td>
<td>57,710</td>
<td>20%</td>
<td>7/68</td>
</tr>
<tr>
<td>Wolf-Wildcat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nemaha</td>
<td>126,720</td>
<td>15%</td>
<td>7/68</td>
</tr>
<tr>
<td>South Branch Little Nemaha</td>
<td>123,520</td>
<td>15%</td>
<td>11/67</td>
</tr>
<tr>
<td>Upper Little Nemaha</td>
<td>138,160</td>
<td>15%</td>
<td>11/67</td>
</tr>
<tr>
<td>Lower Little Nemaha</td>
<td>46,080</td>
<td>10%</td>
<td>3/68</td>
</tr>
<tr>
<td>Long Branch</td>
<td>133,280</td>
<td>10%</td>
<td>4/68</td>
</tr>
<tr>
<td>Turkey</td>
<td>179,420</td>
<td>5%</td>
<td>4/68</td>
</tr>
<tr>
<td>Lower Big Nemaha</td>
<td>46,080</td>
<td>5%</td>
<td>5/68</td>
</tr>
<tr>
<td>Minor Missouri Tributaries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antelope-Beaver</td>
<td>60,577</td>
<td>20%</td>
<td>3/68</td>
</tr>
<tr>
<td>Lime</td>
<td>44,700</td>
<td>10%</td>
<td>5/68</td>
</tr>
<tr>
<td>Tekamah-Mud</td>
<td>18,055</td>
<td>35%</td>
<td>6/68</td>
</tr>
</tbody>
</table>