MINUTES

North Dakota State Water Commission
Held at the Ramada Inn
Grand Forks, North Dakota

May 9, 1973

The North Dakota State Water Commission held its meeting at the Ramada Inn, Grand Forks, North Dakota, on May 9, 1973. Governor-Chairman, Arthur A. Link, called the meeting to order at 1:45 p.m.

MEMBERS PRESENT:
Arthur A. Link, Governor-Chairman
Richard Gallagher, Vice Chairman, Mandan
James Jungroth, Member from Jamestown
Alvin Kramer, Member from Minot
Gordon Gray, Member from Valley City
Donald Noteboom, Member from McKenzie County
Vernon Fahy, State Engineer and Secretary, North Dakota State Water Commission, Bismarck

OTHERS PRESENT:
Delton D. Schulz, Office Engineer, North Dakota State Water Commission, Bismarck
Colonel Rodney Cox, St. Paul District Corps of Engineers
Robert Calton, St. Paul District Corps of Engineers
Russell Dushinske, Executive Vice President, North Dakota Water Users Association, Minot
Walter Dockter, Governor's Office, Bismarck
Murray Sagsveen, Governor's Office, Bismarck

CONSIDERATION OF MINUTES OF APRIL 24-25, 1973 MEETING - APPROVED

It was moved by Commissioner Jungroth, seconded by Commissioner Kramer and carried, that the reading of the minutes of April 24-25, 1973 meeting be dispensed with and approved as circulated by mail.

APPEARANCE OF FORMER GOVERNOR WILLIAM L. GUY POSTPONED TO ANOTHER MEETING

Governor Link informed Commission members that due to a previous commitment, former Governor William L. Guy will be unable to attend the meeting. Governor Guy was requested to attend the Commission meeting to extend his views and comments on matters pending before the State Water Commission.

REPORT ON STATUS OF PROJECTS IN NORTH DAKOTA UNDER THE JURISDICTION OF THE ST. PAUL DISTRICT CORPS OF ENGINEERS - COLONEL RODNEY COX (982)

Colonel Rodney Cox of the St. Paul District Corps of Engineers provided the Commission with a status report on various projects in North Dakota which fall within the drainage basins under the jurisdiction of the St. Paul District Corps of Engineers. The report provided by Colonel Cox is appended hereto. (See Appendix "A")

In the statement presented by Colonel Cox, he indicated that North Dakota was the only state of the seven states under the St. Paul District office which is loaning money for flood control construction. Governor-Chairman Link requested that Colonel Cox incorporate this statement in with the progress report. Governor-Chairman Link also indicated that close liaison should be maintained with the Corps of Engineers and other federal agencies in the water and related land resources fields.

REPORT ON MISSOURI RIVER BASIN COMMISSION MEETING (#1569)

Commissioner Gray reported on a meeting held with state members of the Missouri River Basin Commission. Commissioner Gray informed the members that consideration was being given by the states to employing a man to place in the Missouri River Basin Commission offices to keep abreast of states' interest. Commissioner Gray indicated that under this proposal, each of the 10 states would contribute $2500 toward meeting the salary and other expenses of hiring a man to represent the states. Further consideration by the states on this proposal will be forthcoming at a meeting scheduled for July at Great Falls. It was the general consensus of the upstream states' representatives that they should be better informed of Basin Commission activities. Apparently, there is a fear that the numerous federal agencies making up the Missouri River Basin Commission might make decisions which would not always be in concurrence with the states' desires.

The Commission staff is to provide a synopsis to State Water Commission members prior to the next meeting regarding North Dakota's general interests and the various problems facing North Dakota which should be considered by the Missouri River Basin Commission. It was the general consensus of the Commission members that we should proceed on such an endeavor. The final decision is to be made at the next Water Commission meeting.

Joe Grimes, State Engineer for South Dakota, is acting as Chairman for the state group.

INVITATIONS FROM SEVERAL CITIES FOR FUTURE STATE WATER COMMISSION MEETINGS

Secretary Vernon Fahy read a letter from Bob Stranik from Dickinson inviting the State Water Commission to Dickinson for a summer meeting. Secretary Fahy also read a letter from Gordon Berg, Chairman of the Sweetwater-Dry Lake Water Management District, Devils Lake, North Dakota, for a meeting to be held in Devils Lake in the near future by the State Water Commission.

After some discussion by the Commission members, it was moved by Commissioner Gray, seconded by Commissioner Jungroth and carried, that the next meeting of the State Water Commission be held in Devils Lake on June 12, 1973, beginning at 9:00 a.m., CDT. The meeting arrangements and agenda are to be developed by Secretary Fahy, Russell Dushinske, Executive Vice President of the North Dakota Water Users Association, and Gordon Berg.

MOORE ENGINEERING REQUEST FOR APPROVAL OF PLANS FOR WATER AND SEWER DISTRICTS BY THE BARNES COUNTY WATER MANAGEMENT DISTRICT AND THE RUSH RIVER WATER MANAGEMENT DISTRICT (#1360, 1397 and 716)

Secretary Fahy explained the different plans being advanced by Moore Engineering for the Barnes County Water Management District Sewer and Water Improvement District #1, and the Rush River Water Management District Sewer Improvement District #1.

It was moved by Commissioner Gray, seconded by Commissioner Jungroth and carried, to approve the plans and specifications as submitted by Moore Engineering for the above two noted projects, and that Resolution No. 73-5-340, Approval of Plans and Specifications for Barnes County Water Management District Sewer and Water Improvement District #1, and Resolution No. 73-5-341, Approval of Plans and Specifications for Rush River Water Management District Sewer Improvement District #1, be adopted. (See Appendix "B" and "C")

These resolutions refer to Resolution No. 73-3-338, Barnes County Water Management District's Proposal for Construction of Sewer and Water System, and Resolution No. 73-3-337, Rush River Water Management District's Proposal for Construction of Sewer System, Brooktree Wells Near Harwood, North Dakota, granting approval of the proposed projects, which were adopted by the State Water Commission at their March 28, 1973 meeting.

PRICE QUOTATION ON PRINTING 25,000 COLORING BOOKS

The coloring books which had been developed by the State Water Commission staff and distributed to the various schools throughout North Dakota have been quite popular in the schools' systems and a number of orders are now in the offices of the State Water Commission and cannot be fulfilled.

It was moved by Commissioner Kramer, seconded by Commissioner Jungroth and carried, that an additional 25,000 coloring books be ordered and that printing of such books be put out for bids.

ART GREENBERG WATER PERMIT NO. 1916

Secretary Fahy presented the application of Art Greenberg, water permit No. 1916, for the irrigation of 1906.0 acres of land.

After some discussion, it was moved by Commissioner Gallagher, seconded by Commissioner Gray and carried, that the permit be granted for application of 1906.0 acre-feet of water on 1906.0 acres of land, and that certain restrictions be placed on the permit. The restrictions provide that he be allowed to utilize this amount of water at a rate of not more than 6000 gallons per minute when flow in the Red River is equal to 200 cubic feet per second or more. He may, upon written approval of the State Water Commission, withdraw water when the water drops

below 200 cfs provided, however, that no withdrawals will be authorized when the flow in the river is less than 61 cfs.

ESTABLISHMENT OF DIVIDE COUNTY WATER MANAGEMENT DISTRICT (#1585)

Secretary Fahy indicated that a request had been received from the Divide County Commissioners for establishment of a county-wide water management district. Secretary Fahy pointed out that the Commission's Attorney met with the Divide County Commissioners on May 8, 1973, to proceed with establishment of such a district.

It was moved by Commissioner Kramer, seconded by Commissioner Noteboom and carried, that the State Water Commission adopt Resolution No. 73-5-342, Authorizing the Establishment of Divide County Water Management District, which authorizes the Governor to execute the State Water Commission's Order establishing the Divide County Water Management District. (See Appendix "D")

TESTIMONY OFFERED IN WASHINGTON, D. C. ON SENATE BILLS 1616 AND 806 (#576-1-1)

Secretary Fahy advised Commission members that he had appeared before the Senate Subcommittee on Public Works on a bill being presented by Senator Burdick to fund $9.5 million in monies for bank stabilization works in the reach of the Missouri River between Garrison Dam and the Oahe Reservoir tailwaters. Testimony was also offered on Senate Bill 806 to extend funding for several Corps of Engineers authorities.

OAHE INTER-AGENCY COUNCIL MEETING

Secretary Fahy informed the Commission members that he had attended a recent meeting of the Oahe Inter-Agency Council and it had expressed considerable concern over erosion occurring south of Bismarck and also access for fishermen and others wanting to utilize the Oahe Reservoir take area. One of the county engineers indicated that he was going to open a section line and build a road into the Corps' take area. The Oahe Inter-Agency Council was to study this problem.

REQUEST FOR FURTHER GROUND-WATER STUDIES FOR THE CITY OF LANSFORD (#1357)

Secretary Fahy informed Commission members that a previous study for municipal ground-water supply for the city of Lansford was not extensive enough and that a request had been received from the city for further study of ground-water resources in the area. Estimated costs of the study was $5,000 and Secretary Fahy recommended that the Commission pick up $4,000 of the total.

It was moved by Commissioner Kramer, seconded by Commissioner Jungroth and carried, that the Commission participate in the ground-water for the city of Lansford in an amount not to exceed $4,000 of the total estimated cost of $5,000.

MICHIGAN-WISCONSIN PIPELINE COMPANY WATER PERMIT APPLICATION

Secretary Fahy stated that Delton Schulz, Office Engineer for the State Water Commission, and himself had met with representatives of the Michigan-Wisconsin Pipeline Company the previous evening to obtain further information on their application for industrial water use.

After considerable discussion regarding the different quantities now being advocated for the conversion of coal to gas, it was suggested by Commission members that the Commission staff prepare a detailed report on the application and that such report be made available to Commission members. If at all possible, a decision was to be made regarding the application prior to June 1, 1973.

There being no further business to come before the Commission, it was moved by Commissioner Kramer that the meeting be adjourned.

Vernon Fahy
Secretary

ATTEST:

Arthur A. Link
Governor-Chairman

APPENDIX "A"

PHASE II REPORT

ON

INTERIM SURVEY, PARK RIVER, NORTH DAKOTA

RED RIVER OF THE NORTH BASIN

FOR

FLOOD CONTROL AND RELATED PURPOSES

PRELIMINARY
TO BE REVISED

DEPARTMENT OF THE ARMY
St. Paul District, Corps of Engineers
St. Paul, Minnesota 55101

May 1973

DEPARTMENT OF THE ARMY
St. Paul District, Corps of Engineers
1210 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

NCSED-PB

SUBJECT: Interim Survey, Park River, North Dakota, Red River of the North Basin, for Flood Control and Related Purposes

Division Engineer
North Central Division
Chicago, Illinois

AUTHORITY

1. This report is submitted in accordance with authorizing resolutions of the congressional Public Works Committees adopted 15 June 1950 (Senate), 27 June 1950 (House), and 19 July 1950 (House), directing a general basin-wide review of prior reports on the Red River of the North.

15 June 1950. -

> "Resolved by the Committee on Public Works of the United States Senate, That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review the reports on the Red River of the North, Minnesota and North Dakota, submitted in House Document Numbered 185, Eighty-first Congress, and prior reports, with a view to determining if the recommendations contained therein should be modified at this time in view of the disastrous floods of April and May 1950 and in view of the international aspects of the flood problems on which much information may be obtained from Dominion, provincial, municipal, and other interests in Canada through the investigations already under way in accordance with Article IX of the Boundary Waters Treaty of January 1909."

27 June 1950. -

> "Resolved by the Committee on Public Works of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports on the Red River of the North drainage

Basin, Minnesota, South Dakota, and North Dakota, submitted in House Document No. 185, 81st Congress, 1st Session, and prior reports, with a view to determining whether the recommendations contained therein should be modified in any way at this time."

19 July 1950. -

"Resolved by the Committee on Public Works of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors, be, and is hereby, requested to review the reports on the Red River of the North drainage basin, Minnesota, South Dakota, and North Dakota, submitted in House Document No. 185, 81st Congress, 1st Session, and prior reports, with a view to determining if the recommendations contained therein should be modified at this time in view of the disastrous floods of April and May, 1950, and in view of the international aspects of the flood problem on which much information may be obtained from Dominion, provincial, municipal and other interests in Canada through the investigations already under way in accordance with Article IX of the Boundary Waters Treaty of January 1909.".

EXTENT OF INVESTIGATION

2. SCOPE

As part of the current basin-wide survey of the Red River of the North, the water management and related problems and needs in the Park River subbasin are considered in this interim survey. The Park River subbasin has several watersheds, the principal ones being the North, Middle, and South Branches which join to form the main stem Park River just west of Grafton, N. Dak., and Willow Creek which joins the main stem Park River near Oakwood, N. Dak. Since the Middle Branch Park River and Willow Creek have been studied and the North Branch Park River is being studied by the Soil Conservation Service, only the South Branch and main stem Park River have received the major study emphasis in this report. The present and foreseeable future problems and needs of the South Branch and main stem Park River are identified, and possible solutions to these problems and needs are analyzed. The analyses of possible solutions to the subbasin problems recognize their relationship with problems throughout the Red River of the North basin to insure compatibility with potential future basin-wide development.

3. SURVEYS AND INVESTIGATIONS

This survey is based upon field instrument surveys, aerial topographic maps, subsurface explorations, flood damage appraisals, and office analyses of the hydrologic, hydraulic, design, and economic factors involved. Reports of other agencies and organizations used in conjunction with this report include the following:

a. Water Supply and Water Quality Control Study, Red River of the North Basin, Minnesota-North Dakota, U.S. Public Health Service, July 1965.

b. Comprehensive Framework Study, Souris-Red-Rainy River Basins Commission, Field Review Draft, 1971.

c. Environmental, Social and Economic Considerations for Water Resource Planning in the Park River Subbasin, North Dakota, Research Reports Nos. 1 and 2, University of North Dakota, Grand Forks, North Dakota, February 1971.

d. Preliminary Report on Economic Projections for Selected Geographic Areas, 1929 to 2020, (OBERS) U.S. Water Resources Council, March 1968.

The District Engineer and members of his staff made a field reconnaissance of the study area. State and Federal agencies were consulted throughout the study, and public meetings with local interests and a Citizens Advisory Committee also provided valuable input to the survey investigation.

PRIOR REPORTS

4. Senate Document No. 194, 78th Congress, 2d session, contains a survey report dated 16 April 1942 evaluating the flood control and water supply needs of the Park River subbasin. This document authorized construction of Homme Dam and Lake to provide an assured water supply for the communities of Park River and Grafton, and to provide limited flood control to the areas along the South Branch and main stem Park River.

5. House Document No. 185, 81st Congress, 1st session, the report being reviewed, contains a survey report dated 24 September 1947 on the Red River of the North basin for flood control and other purposes. The document recommends construction of several improvements throughout the Red River of the North basin; however, it recognizes the above-mentioned document as adequately meeting the needs of the Park River subbasin and does not recommend any additional improvements for the Park River subbasin.

BASIN DESCRIPTION

6. LOCATION AND STREAMS

The Park River drains 1,010 square miles of the northeastern North Dakota counties of Walsh, Pembina, and Cavalier, with 52 percent, 26 percent, and 22 percent of the total basin located in the respective counties, as shown on plate 1. The headwaters rise in the drift prairie

of southeastern Cavalier County at an approximate elevation of 1600 feet above mean sea level.(1) The three principal headwater streams, the South, Middle, and North Branches, emerge from the drift prairie escarpment about 13 miles west of Grafton, and flow generally in a southeast and easterly direction to an almost common confluence 2 or 3 miles west of Grafton. From this point the Park River main stem follows a generally meandering course eastward across the very flat Red River Valley plain and joins the Red River of the North 36 miles south of the international boundary at about elevation 760. As the headwater branches emerge from the escarpment, the valleys diminish rapidly until the channel banks are at the same or somewhat higher elevation than the adjacent plains. The drainage area above Grafton is 695 square miles, with the South, Middle, and North Branches containing 297 square miles (43 percent), 165 square miles (24 percent), and 233 square miles (33 percent), respectively.

7. TOPOGRAPHY

The Park River watershed includes two well-defined topographic subdivisions of the great Interior Plains region of North America, the Drift Prairie Plateau in the west, and the Red River Valley in the east. The transition from the moderately rolling ground moraine of the Drift Prairie Plateau to the flat bed of glacial Lake Agassiz, which comprises the Red River Valley, occurs in two stages. The most significant transition is through the Pembina Escarpment northeast of Adams. After the escarpment, the river passes through a moderately dissected glacial outwash plain before reaching the beach ridges of glacial Lake Agassiz near Park River. The terrain slopes about 50, 30, and 5 feet per mile in the escarpment, the outwash plain, and the glacial lake bed, respectively, with very little defined terrain slope in the Drift Prairie region.

8. GEOLOGY AND SOILS

The Park River basin is covered with a mantle of glacial drift ranging from only a few feet in the escarpment and parts of the Drift Prairie areas to around 300 feet near the Red River of the North in the bed of Lake Agassiz. The glacial drift covers cretaceous shales of the Pierre, Niobrara, and Carlile Formations in and west of the escarpment. The glacial drift and lake sediments in the Red River Valley portion of the basin cover sedimentary deposits of the Cretaceous, Silurian, and Ordovician Periods.

9. The thin glacial till layer of soil in the Drift Prairie Plateau is composed of a heterogeneous mass of clays, sands, gravels, and boulders. In the river valleys and streams of the basin, the soils consist of alluvial deposits of clays, silts, and lenses of sands and gravels,

(1) All elevations in this report refer to feet above msl (mean sea level) datum, 1929 adjustment.

with numerous boulders strewn along the watercourses. The soils in the outwash delta between the escarpment and glacial lake bed are predominantly silty sands and gravels. In the lake bed, soils consist of upper alluvial sandy silts and lower lacustrine clays. Further information on geology and soils is given in appendix A.

10. STREAM CHARACTERISTICS

The stream characteristics of the South Branch and main stem Park River are quite varied, ranging from a broad shallow valley in the drift prairie area to a wide, deeply entranched valley in the escarpment and outwash plain area. In the glacial lake bed area, the river becomes a gently meandering stream with a shallow bed and streambanks at or slightly above the elevation of the adjacent plain. The main stem Park River has similar characteristics to the lowest reach of the South Branch, although the width of the stream is greater. The Middle and North Branches have characteristics also similar to the South Branch in the respective reaches.

11. The valley width and depths, respectively, are about one-fourth mile and 30 feet in the drift prairie area, one-half mile and 130 feet in the escarpment, one-half mile and 80 feet in the outwash plain, and 100 feet and 20 feet in the glacial lake bed area. The stream slopes are about 3 feet, 30 feet, 20 feet, 5 feet, and 1 foot per mile in the Drift Prairie, escarpment, outwash plain, and upper and lower glacial lake bed reaches, respectively. The channel capacities of the streams range from 500 to 1,000 cfs (cubic feet per second) in the lower reaches of the North, Middle, and South Branches and about 2,000 to 3,000 cfs along the main stem Park River.

12. TERRESTRIAL VEGETATION

The natural vegetation in the region is typical of the Eastern Deciduous Forest and Temperate Grassland Biomes of North America. Küchler(1) has mapped four potential climax communities for the general area including Northern Floodplain Forest, Oak Savanna, Bluestem Prairie, and Wheatgrass-Bluestem-Needlegrass Prairie. Vegetation in the actual study area consists mostly of deciduous forests along the river which are characterized by a dominance of bur oak on the slopes and bur oak, American elm, and green ash on the floodplain. The tree layer is continuous at the canopy level, providing coverage usually exceeding 80 percent. The trees reach heights of 30 to 40 feet on the slopes and 50 to 60 feet on the floodplain. The shrub and herbaceous layers are generally distinct where grazing is not excessive. The more common shrubs include chokecherry, hazel, wild rose, and snowberry. The limited grasslands within the actual study area are mostly deforested river valley slopes. No rare and endangered or otherwise unique plant species or plant communities have

(1) Küchler, A. W., Potential Natural Vegetation of the Conterminus United States, American Geographical Society, New York, 1964.

have been identified from the study area. However, the floodplain forests along the South Branch in the Grafton area, which apparently escaped the effects of a severe fire about 89 to 90 years ago, is generally a more mature biological system with larger trees and a lesser dominance of bur oak than forests in upstream areas. The natural vegetation in a 2-mile-wide strip of land along the South Branch and main stem Park River represents about 1 percent, 24 percent, and 8 percent of total lands in that strip in the Drift Prairie, the escarpment, and the lake bed reaches, respectively.

13. TERRESTRIAL WILDLIFE

The natural wildlife found in the forested areas of the basin is typical of other forested habitats of eastern North Dakota. The more prominent and noticeable species include white-tail deer, coyote, raccoon, skunk, mink, badger, fox, rabbit, and squirrel. Many other small nongame mammals are also known to exist in the area. The prime wildlife habitat is located in the escarpment area where the greatest amount of natural wooded areas exists. The birdlife of the basin, which appears to be typical of forested areas, includes great blue herons, various hawks, woodpeckers, and sparrows. Few reptile species occur in northeastern North Dakota including the Park River basin. Only one snake was identified and no turtles were observed in the stream. The lack of turtles is attributable to the intermittent nature of the streams.

14. AQUATIC BIOLOGICAL SYSTEMS

Biological systems of the South Branch Park River are limited by the intermittent nature of the stream. Flows are often reduced to a trickle by midsummer and much of the stream bed is dry by October. Few game fish are present but a few northern pike, walleye, and channel catfish are taken from lower reaches during spring high water. Most of the angler take, however, consists of small rough, and forage species. Homme Lake is the major fishery resource in the basin, supporting warmwater species above and below the dam. Homme Lake does not provide a high quality fishery because of problems related to turbidity and water level fluctuations.

15. MAPS

Available maps of the entire basin include: U.S. Army Corps of Engineers, Army Map Service maps, scale 1:250,000, contour interval 50 feet; County highway maps, scale 1:126,700; and U.S. Department of Agriculture aerial photographs, scale 1:20,000. Available maps of portions of the basin include U.S. Geological Survey quadrangle maps, scale 1:24,000, contour interval 5 feet; U.S. Army Corps of Engineers aerial topographic maps, damsites, upper South Branch Park River, scale 1:2,400, contour interval 5 feet; and U.S. Army Corps of Engineers maps, Homme Reservoir, scale 1:2,400, contour interval 5 feet.

ECONOMIC DEVELOPMENT

16. POPULATION

The population of the basin, as indicated by the population in Walsh County (see table 1), has slowly declined over the period from 1940 to 1970. This decline is attributed to migration from farms and small towns to urban areas. The city of Grafton shows a steady increase over the period 1940 to 1960, and a reduced increase from 1960 to 1970. The city of Park River, N. Dak., experienced a similar increase from 1940 to 1960, and then a decline in population from 1960 to 1970. The population of the basin is expected to stabilize and then increase, with the major increases attributed to continued growth at Grafton and Park River. The rural population is expected to continue declining for several years, but at a slower rate than in the past and at some time in the future the rural population will tend to stabilize.

Table 1 - Population of counties and principal communities in the Park River subbasin

Counties and communities	1940	1950	1960	1970	2030[1]
Grafton	4,070	4,901	5,885	5,946	10,900
Park River	1,408	1,692	1,813	1,680	2,680
Walsh County	20,747	18,859	17,997	16,251	19,200
Total Park River subbasin[2]	-	-	-	16,255	-

(1) Projected estimates.

(2) The cities of Grafton and Park River, and portions of the rest of Walsh County populations are included in the Park River subbasin figures. About 46 percent of Walsh County lies in the Park River subbasin.

17. INDUSTRY AND EMPLOYMENT

The easterly half of the Park River basin is located in the fertile heart of the Red River Valley, which is capable of producing abundant high-value crops, particularly wheat, sugar beets, and potatoes. The major employment in the basin is agriculturally oriented. Services and agricultural, and wholesale and retail trade account for about 75 percent of the total basin employment. Although agricultural employment is expected to decline in the future as farm income and mechanization increase, farm-related commercial and industrial businesses are expected to increase.

18. NATURAL AND ECONOMIC RESOURCES

The most important natural resource in the basin is the rich agricultural land in the Red River Valley area. This land is capable of high production and is the mainstay of commerce in the basin. Also very important are the natural forested areas along the river corridors, as these systems provide the diversity to the basin that is essential to maintain a desirable place to live. Agricultural commodities are the essential element in the basin economy.

19. RECREATION

Recreation in the basin consists primarily of the parks and swimming pools at the communities throughout the basin and also the recreation facilities at Homme Lake. Homme Lake provides the only major fishing opportunity in the basin. Hunting, for both small and big game, is locally and regionally important in the escarpment area.

20. TRANSPORTATION

Excellent transportation facilities serve the needs in the basin. Railroad service which links the basin to markets in Duluth, Minneapolis-St. Paul, Minn., and other areas is provided by Burlington Northern, Inc., and the Soo Line Railroad. Several major State and Federal highways service the area, including Interstate Highway 29 which will soon be completed. Commercial airline service for the basin is available at Grand Forks, N. Dak., about 50 miles southeast of Grafton. Several small airfields throughout the basin are used mainly for private craft. The largest of these airfields is located at Grafton.

CLIMATOLOGY

21. The National Weather Service has daily climatology records for Grafton and Park River. The records indicate that the average monthly temperatures vary from about 70° F in July to 5° F in January, with extreme recorded temperatures of 108° F and -47° F. The average annual precipitation in the basin is about 18 inches. Snowfall averages inches per year, which represents about percent of the annual precipitation. Heavy local summer thunderstorms occur commonly in the Park River basin. More detailed information on climatology is presented in appendix B.

RUNOFF AND STREAMFLOW DATA

22. STREAMFLOW RECORDS

Streamflow data are obtained by the U.S. Geological Survey at Grafton and below Homme Dam on the South Branch Park River. The U.S. Geological Survey has maintained continuous water stage recorders at Grafton since 1931 and below Homme Dam since 1949. The records are classified as fair and good, respectively.

23. RUNOFF CHARACTERISTICS

The maximum discharges of the year for the Park River basin usually occur in late March or in April, following the spring snowmelt runoff. Occasionally these high flows are increased and prolonged by accompanying rains. Runoff in the basin decreases during the summer months and frequently cessation of flow occurs during the winter months. Drainage above the Red River Valley floor is well developed and consequently produces a large amount of runoff. Excluding the base flow, the largest runoff experienced was 3.3 inches in May 1950.

24. Low flows in the Park River basin occur during the late summer and fall months when evapotranspiration rates are high and during the midwinter months when the Park River is ice-covered. In the summer and fall, groundwater seepage accounts for all the streamflow during periods of little or no precipitation. Additional information on runoff and streamflow is given in appendix B.

WATER RESOURCE PROBLEMS

25. The water resource management and related problems of the Park River basin include flood control, water supply, and water-based recreation. The flood control problems are concentrated in the flat lake plain areas of the basin, particularly at Grafton where 82 percent of the flood damages occur. The principal water supply problem is providing Grafton and Park River with an assured water source during a drought period. Since water-based recreation is not abundant, an immediate need exists for additional recreational opportunities as well as the increased future recreational needs of the basin.

FLOODS

26. FLOOD CHARACTERISTICS

Floods on the Park River usually occur in the early spring when melting snow causes rapid runoff in the escarpment region along the headwater branches. Factors affecting the size of spring floods include the amount of snow on the ground, the depth of frost in the ground, temperatures during breakup, and spring rains. No known floods have occurred in the fall or winter seasons. Homme Dam and Lake and the upstream Soil Conservation Service reservoirs retard the runoff from the area above their outlets so that the flood peaks downstream are somewhat modified. Damaging floods occur primarily east of the escarpment. In this area, where the land is very flat and banks are low, flood flows inundate considerable rural area. The total duration of the large floods on the South Branch Park River at Park River and Grafton is usually about 25 and 30 days, respectively.

27. In addition to flooding in and adjacent to the Park River basin, flood flows contribute slightly to the magnitude and duration of floods on the Red River of the North. The Park River drainage area amounts to approximately 3 percent of the Red River of the North drainage area at the international boundary.

28. FLOODS OF RECORD

The largest flood of record on the Park River occurred in April 1950. The flood resulted from the rapid melting of a very heavy snow cover that was concentrated over the entire basin. Peak discharges observed were 5,200 cfs on 18 April 1950 below Homme Dam, and 12,600 cfs on 19 April 1950 at Grafton. Following a recession, additional snowmelt and spring rains caused a second discharge of record with peak flows of 5,030 cfs on 9 May 1950 below Homme Dam, and 8,730 cfs on 9 May 1950 at Grafton. In addition, a maximum discharge of 13,000 cfs on 24 April 1950 was recorded below Homme Dam but this was the result of failure of the emergency embankment used in construction of the dam. The variation in peak discharges of specific floods is shown in table 2. Data on these floods are given in appendix B.

Table 2 - Comparison of peak discharges at gaging stations for the South Branch Park River

Date	Peak discharge (cfs)	
	Below Homme Dam	At Grafton
May 1948		11,700
April 1950	5,200	12,600
May 1950	5,030	8,730
April 1962		5,900
April 1965	3,100	5,710
April 1969	2,900	4,990

29. FLOOD FREQUENCIES

Based upon analysis of discharge records on the Park River, frequencies of occurrence of peak discharges have been developed both at Grafton and at Park River. The discharge-frequency curves at Grafton for natural and existing conditions have also been modified to reflect both the operation of Homme Dam and Lake and the Soil Conservation reservoirs. Table 3 summarizes peak discharges to be expected at selected frequencies at the gaging station in Grafton. The procedures followed in the frequency determinations are included in appendix B with more detailed data.

Table 3 - Flood frequency data at U.S. Geological Survey station on the South Branch Park River, N. Dak.

Frequency (in percent)	Peak discharge (cfs)(1)	Remarks
50	1,470	
20	3,160	
5	8,800	Second peak, May 1950
2	15,300	
1	22,000	

(1) Existing conditions with Homme Dam and Lake and Soil Conservation Service reservoirs.

30. STANDARD PROJECT FLOOD

The standard project flood represents the discharge hydrograph that may be expected from the most severe combination of meteorologic and hydrologic conditions that are considered reasonably characteristic of the geographic region involved. It serves as a guide in the selection of the design flood for proposed flood control improvements. The standard project flood may be selected or approached where some degree of protection is justified by hazards to life and high property values within areas to be protected. The estimated peak discharge of the standard project flood at Grafton is 38,800 cfs, which is approximately three times greater than the discharge of the record flood at Grafton. More detailed information on the derivation of the standard project flood is given in appendix B.

31. MAXIMUM PROBABLE FLOOD

The maximum probable flood represents the discharge hydrograph that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are considered possible in the region. It exceeds the standard project flood and may be used, either directly or in some modified form, as the basis for project design. The all-season peak discharge for the maximum probable flood at Grafton is 93,600 cfs. A more complete description and derivation of the maximum probable flood is given in appendix B.

FLOOD DAMAGES

32. EXTENT AND CHARACTER OF FLOODED AREA

The floodplain of the Park River occurs primarily east or downstream of the escarpment in the glacial drift prairie area of the basin. This floodplain which encompasses 95,000 acres of land is utilized for cropland, pasture land, transportation, business, services, communities, and some wildlife. About 6,700 persons live in 1,500 residences in the floodplain. The most extensive urban floodplain development in the basin has occurred at Grafton, which is

located just downstream from the confluence of the North, South, and Middle Branches of the Park River. The city of Park River has a few low-lying developments located in the floodplain. Appendix C discusses the Park River basin floodplain with respect to historic conditions.

33. FLOOD DAMAGE SURVEYS

Estimated flood damages and flood-related costs at Grafton were obtained through field investigations which included interviews with property owners and public officials, published economic data, and on-site examination of structures and their contents. These surveys are correlated with property values and depths of flooding. Urban flood damage data at Grafton were obtained in 1963, 1970, and 1972 by these investigations. Agricultural flood damage evaluation was based on data provided by the U.S. Department of Agriculture, Soil Conservation Service. All flood damage evaluations are based on July 1972 price levels.

34. CHARACTER OF FLOOD DAMAGES

Of the total flood damages in the Park River basin, approximately 83 percent are urban damages of which 99 percent occur at Grafton and 1 percent at Park River. Flood damages to agricultural crops and rural developments constitute the remaining 17 percent. Table 4 presents a breakdown of the total flood damages into the various urban land-use types at Grafton for the standard project flood.

Table 4 - Summary of urban flood damages resulting from the standard project flood at Grafton, N. Dak.

Type of damage	Percent of total urban damages
Residential	59
Commercial	38
Industrial	2
Public and other	1
Total	100

35. Included in the business damages are losses to stocks, equipment, buildings, land, roads, wages, and business profits. Residential damages include the physical damage to dwellings, personal property, and real estate improvements along with costs of evacuation, emergency quarters, and reoccupation. Also, losses include damage to roads and bridges and disruption of highway and rail traffic. Other losses to the public in general include costs incurred during flood emergencies such as flood fighting, increased expense of normal municipal functions, and disaster relief.

36. EVALUATION OF FLOOD DAMAGES

The evaluation of the flood damage potential in the Park River basin was correlated with flood frequency data to obtain average annual damages. In this analysis, present condition flood damages are based on the damage potential espected in 1980, the earliest date that the proposed flood control improvement would be completed and in effective operation. Thus, estimates of average annual damages are based on 1980 conditions and are summarized in table 5. Further details of the evaluation of flood damages and the development of average annual damages are provided in appendix C.

Table 5 - Summary of average annual flood damages at Grafton

Type	Average annual equivalent (1980-2080)
Residential	$994,000
Commercial and industrial	828,000
Public	153,000
Total	1,975,000

WATER SUPPLY AND WATER QUALITY

37. WATER SUPPLY NEEDS

The major water supply needs in the basin exist at the communities of Park River and Grafton. The major industrial water users, mainly potato processors, are located at Grafton and use about 0.3 mgd (million gallons per day). The rural, domestic, and livestock water demand is estimated at about 0.2 mgd, including use by the small communities of Minto and Edinburg, N. Dak. No large demand currently exists for water for irrigation, although about 50,000 acres in the basin are suitable for irrigation. Municipal water supply needs for Grafton and Park River are shown in table 6.

Table 6 - Municipal water supply needs at Grafton and Park River, N. Dak. (1970-2030)

Community	Year	Population (1)	Per capita (2) water use (gpcd)	Total water use Mgd	Total water use Cfs	Acre-feet per day
Grafton	1970	5,950	115	0.7	1.1	2.1
	2000	7,900	125	1.0	1.5	3.0
	2030	10,900	150	1.6	2.5	5.0
Park River	1970	1,680	80	0.1	0.2	0.4
	2000	2,000	100	0.2	0.3	0.6
	2030	2,200	110	0.2	0.4	0.7

(1) Based on population and economic base studies, refer to appendix C.
(2) Gallons per capita daily. Based on Souris-Red-Rainy River Basins Commission Comprehensive Framework Study.

38. WATER QUALITY

The water quality of both the surface water and groundwater from the glacial drift aquifers in the basin is considered undesirable because of high concentrations of total dissolved solids (TDS) and hardness. The surface water is more desirable than the groundwater; however, both require extensive treatment to meet Public Health Service drinking water standards. Saline water from deep sedimentary deposits is available, but would require extensive and costly desalinization treatment to be suitable for domestic uses. This saline water is acceptable for industrial needs.

39. SOURCE AND ADEQUACY OF PRESENT WATER SUPPLY

Both Grafton and Park River depend on Homme Lake and the Park River for their source of water supply. Park River also uses some groundwater to supplement the supply from Homme Lake. Other communities in the basin rely mainly on groundwater. The industrial water users use the saline water from the bedrock aquifers. The rural water needs will be supplied from the Fordville glacial drift aquifer via an extensive pipeline network.

40. All water supply sources in the basin are considered adequate to meet present and future water demands, except Homme Lake and the Park River which are not considered adequate to meet the needs of Grafton. Due to the large water supply demand at Grafton, the high transmission loss of water in the natural river channel between Homme Dam and Grafton, and the reduced effective water supply storage in Homme Lake, Grafton could experience a water shortage with the occurrence of a major drought.

WATER-BASED RECREATION

41.

EXISTING AND AUTHORIZED WATER RESOURCE PROJECTS

42. CORPS OF ENGINEERS PROJECTS

Homme Dam, located on the South Branch Park River about 4 miles upstream of the city of Park River, was constructed and placed in operation in 1951. The reservoir has a total storage capacity of 3,650 acre-feet. It was authorized to provide water supply for the communities of Grafton and Park River and limited storage for regulation of spring flood flows. Currently, the city of Park River has a pipeline connected to an outlet valve at Homme Dam for its water supply, whereas Grafton relies on releases from the dam to be transferred by gravity flow in the natural river channel. The recreation area at the dam includes facilities for picnicking, camping, swimming, and boat launching.

43. In 1960, the Corps of Engineers completed channel improvement of the Park River which consisted of clearing the channels of obstructing trees and brush and snagging of fallen trees, brush and debris in the following reaches:

a. The North Branch from about 5 miles northwest of Hoople, N. Dak., to its junction with the Middle Branch.

b. The Middle Branch from about 6.5 miles southwest of Hoople to its junction with the South Branch.

c. The South Branch from the western limits of the city of Park River to its junction with the Middle Branch.

d. The Park River from the junction of the South and Middle Branches to a point about 10 miles above the mouth of the Park River.

44. SOIL CONSERVATION SERVICE IMPROVEMENTS

Flood control improvements planned by the Soil Conservation Service for the Middle Branch Park River under the Public Law 566 program were authorized for installation and are currently under construction. The structural improvements include five floodwater-retarding structures with a total flood control storage of 11,760 acre-feet and 37.6 miles of channel improvement. These flood control measures provide principal flood damage reduction along the Middle Branch Park River and limited flood stage reduction along the main stem Park River.

45. Additional flood control improvements are authorized for the Willow Creek watershed in the northeast portion of the basin, consisting of 56 miles of channel improvement and one floodwater-retarding structure with a flood control storage of 2,490 acre-feet. The flood damage reduction from these improvements occurs primarily along Willow Creek, with negligible effect on the main stem Park River.

46. OTHER IMPROVEMENTS

A survey of the eastern part of Walsh County was made in 1905 and plans were developed for a comprehensive drainage system for the Park River. By 1947, about 30 miles of this drainage system had been completed, which included a 3-mile cutoff channel on the South Branch Park River, located about 6 river miles upstream from Grafton.

IMPROVEMENTS DESIRED

47. Following the drought years of the 1930's, water supply became a major concern and Homme Dam was constructed to meet this basic need and to also provide some limited flood control. The large floods of 1948 and 1950, the latter occurring during construction of Homme Dam, emphasized the need for further flood control. Recognizing the remaining need for urban flood control at Grafton and rural flood control along with a need for additional water supply for Grafton and for additional water-based recreation in the basin, this study considers all alternatives to meet these needs.

48. An opinion survey of the residents in the South Branch and main stem Park River area was conducted in 1970 to determine the views of the people. The opinion survey showed that the public supports the need for flood control, water supply, and water-based recreation in the basin. Due to conflicting local views on the possible alternative solutions to these problems, in August 1971 a Citizens Advisory Committee was appointed by former Governor William L. Guy of North Dakota to further investigate the alternative water management plan. After several meetings, in June 1972 the Citizens Advisory Committee made the following recommendations to the Governor:

a. Urban flood protection for Grafton. - The committee unanimously decided that a ring levee and flood bypass channel at Grafton appeared to be the most feasible method for eliminating the threat of flood damage at Grafton and that this plan should receive further study.

b. Rural flood protection. - The committee unanimously decided that channel enlargement along Sough Branch Park River, bridge raises in the same reach, and a modified operating plan for Homme Dam should be implemented.

c. Water supply, additional flood control in the basin, and water-based recreation. - By a majority vote, the committee favored construction of a multiple-purpose dam and lake on the South Branch of the Park River.

OBJECTIVES OF PLAN FORMULATION

49. The basic objectives of plan formulation are to develop a plan which will provide the best uses, or combination of uses, of water and related land resources to meet all foreseeable short- and long-term needs of the Park River basin. In pursuit of this general objective, the following specific planning principles and objectives guided formulation of the plan of improvement:

a. The plan must preserve to the maximum possible extent the quality of the natural and human environment.

b. The plan must be socially acceptable.

c. The plan must enhance the economic welfare of the local people and add to their security and well-being.

d. The plan must enhance national economic development by increasing the value of the Nation's output of goods and services and improving national economic efficiency.

e. The plan must fit integrally into an overall plan for water and related land resources management and development for the Red River of the North basin.

f. The plan must be technically feasible to implement.

In addition to these specific principles and objectives, the general guidelines of giving equal consideration to the economic development, social well-being, and natural environmental quality parameters was followed in evaluating the alternative water managements.

50. In the formulation of single-purpose and multiple-purpose alternatives, the provision of adequate flood protection, an assured water supply, and additional opportunities for water-based recreation were considered to be the major water and related needs for the South Branch and main stem Park River basin. Adequate flood protection for Grafton is considered to be at least the 1-percent chance level, with adequate room for future growth. Adequate flood protection for the rural areas is considered to be at about the 10-percent chance level. An assured water supply for the study area is considered to provide for Grafton's present and future water supply needs with occurrence of a 2-percent chance drought. A water surface area of about 500 to 600 acres would provide additional water-based recreation facilities needed in the area.

SINGLE-PURPOSE MEASURES CONSIDERED

51. FLOOD CONTROL

Single-purpose measures considered for reducing flood damages include both nonstructural and structural measures. The nonstructural measures include flood warning, floodplain evacuation, flood proofing, floodplain regulation, flood insurance, and the "do nothing" alternative. The structural measures include levees at Grafton, a flood bypass channel at Grafton, combination of a levee and flood bypass channel at Grafton, channel improvement in the rural reaches of the South Branch and main stem Park River, channel improvement through Grafton, and upstream reservoir storage.

52. NONSTRUCTURAL MEASURES

a. Do nothing. - The "do nothing" alternative does not solve the flood problems in the basin. The current flood-prone areas in the basin would remain subject to flood damage. The entire city of Grafton would remain in the floodplain classification along with the low-lying developments in Park River and almost the entire rural area east of the escarpment. In accordance with current Federal legislation, the future growth and development of the floodplain areas will be slowed somewhat due to the lack of Federal funding available to homes and businesses in the floodplain.

b. Flood warning. - Flood warning would consist of predicting the timing and size of floods and allowing for evacuation of flood-prone areas or erection of emergency flood protective measures. Flood warning is not effective as a means of preventing flood damages in the basin. The greatest flood hazard in the basin is from the spring snowmelt, a relatively slow-rising flood capable of being reasonably predicted by the methods which are currently available. Since the slow-rising nature of floods lessens the potential for loss of life, and most of the flood damages in the basin are associated with the actual inundation of the properties, the damages prevented by a flood warning system would be negligible. Flood warning is not considered to be socially or economically acceptable as an effective means of solving flood problems in the basin.

c. Floodplain evacuation. - Floodplain evacuation would consist of permanent evacuation of developed areas in the floodplain, including acquisition of lands by purchase, removal of improvements, and relocations of the population from these areas. Land acquired in this manner could be used for agriculture, parks, or other purposes which would not interfere with flood flows or result in major flood damage. The evacuation

of the floodplain would affect about 1,500 residences and about 6,700 people, the majority located in Grafton (1,200 homes, 250 businesses, and 6,000 people). The evacuation costs of moving only the homes and businesses at Grafton are estimated at over $35 million. Additional costs associated with providing comparable public facilities including communications and transportation are not available. The nearest contiguous high ground would be located in the escarpment area near Park River about 15 miles to the west, as lands to the north, south, and east are situated in the floodplain quite similar to that at Grafton. Although flood damages and flood damage potential would be eliminated from the urban and residential developments, the agricultural flood damages would not be appreciably reduced. Evacuation is not considered an acceptable alternative from economic and social well-being aspects. To be acceptable from the environmental standpoint, the city of Grafton would have to be moved to a biologically less sensitive area than exists in its current location.

d. Flood proofing. - Flood proofing would consist of a combination of structural changes and adjustments to properties subject to flooding primarily for the reduction and elimination of flood damages. Although best applied to new construction, it is also applicable to existing facilities. Due to the relatively low stages and velocities that are experienced, flood proofing could be used for the developments at Grafton and also the farmsteads in the rural areas. Flood proofing, although considered economically feasible, is very costly and would not completely solve the flood problems at Grafton. The large number of businesses and residences to be flood proofed would result in disruption of the current residents' way of life. This alternative is not acceptable as a complete solution to flooding in the basin from the social well-being standpoint.

e. Floodplain regulation. - Floodplain regulation consists primarily of regulating new development in existing floodplain areas. Floodplain regulations do not currently exist in the basin. Since the entire community of Grafton is located in the floodplain, and the nearest high ground is located over 15 miles away, floodplain regulations are not considered appropriate as an effective means of reducing existing flood damages in the basin. Floodplain regulation, although not a complete solution to flood damage reduction, should be part of any flood protection system and could be effective in Park River and rural areas.

f. Flood insurance. - Flood insurance would provide a supplement to other flood control measures in that it would assist in reimbursing the affected property owners for losses sustained from flood damages. Flood insurance is considered appropriate where limited protection is already provided, and additional flood protection is desired. This measure does not reduce flood damages in and of itself. It does, however, afford the individual affected some economic protection from flood loss by spreading his losses over a large group of persons. Flood insurance used as a supplement to floodplain regulations and other flood damage reduction measures could provide limited economic protection for existing developments. Federally subsidized flood insurance is not currently available in the basin. This measure is not considered an adequate solution to the flood problems of the basin.

53. STRUCTURAL MEASURES

a. Levees at Grafton. - Levees at Grafton would consist of a ring levee around the section of town north of the river and another ring levee around the section of town south of the river. The levee would be an earth embankment except the reaches adjacent to the river which would be a concrete floodwall. In the constricted reach of the river between the north and south levees, the channel would have to be shaped and riprapped to provide for more efficient flow of water. Construction of this levee system and channel improvement would require approximately 115 acres of land for rights-of-way, relocation of about 15 homes, three bridge raises, and two bridge removals. The channel improvement would disrupt about 1 mile of natural river channel. Construction of the floodwalls and levee would disrupt about 15 acres of natural wooded areas along the present river channel, about 10 percent of the natural wooded areas that presently exist in Grafton. Because the areas to the north and south of the river at Grafton are necessary for bank overflow for the larger floods, it is estimated that several feet of backwater effects could be caused by the levee plan of constricting the river to its natural channel. This backwater could cause significant adverse effects to upstream rural property owners. To provide adequate flow area in the natural river channel area for these larger floods, the levees and floodwall would have to be moved back from the river to such an extent that they would adversely affect existing developments in the area.

b. Flood bypass channel at Grafton. - The flood bypass channel at Grafton would consist of a combination of a bypass channel to the north of Grafton which is connected by tieback levees to an interceptor drain upstream and to the west of Grafton. This bypass channel, interceptor drain, and tieback levee system would prevent both river and overland floodwaters from affecting developments at Grafton. The bypass channel inlet structure would allow normal low flows through the natural river channel to Grafton and divert flows in excess of channel capacity at Grafton into the bypass channel. The interceptor drain would cut off the overland flows, diverting them back into the river, with the tieback levees containing these flows to the inlet of the bypass channel. The design capacity of the bypass channel would be about 14,500 cfs, with the river channel through Grafton carrying about 5,000 cfs. The bypass channel would cut off about 7 river miles from the normal flood channel. The bypass channel and associated features would require about 285 acres of rights-of-way, including 10 acres of natural woodlands, about 3 percent of the woodland in the vicinity. About 0.2 mile of natural river channel would be affected. The bypass channel would provide adequate flood protection for Grafton and adjacent rural areas.

c. Combination levee and bypass channel at Grafton. - The combination levee and bypass channel at Grafton would consist of a ring levee completely encircling Grafton, with the river through Grafton regulated by upstream and downstream gated control structures. The bypass channel would be located to the north of the levee, with a broad-crested weir as the control for flows entering the channel. The river length for flood flows would be reduced by about 5 miles. The upstream gated control structure in the levee would allow normal low flows to pass through Grafton. When flood flows occur, the upstream gated control structure would be closed, routing the entire river flow through the bypass channel. Flood protection provided existing agricultural areas would only be to those lands incorporated inside the levee boundaries. Lands outside the levee boundaries, either upstream or downstream, would not be appreciably affected by increased or decreased flood stages for larger flood flows. The levee would protect approximately 2,700 acres of land, including 750 acres developed within present city limits. The levee would provide adequate flood protection for Grafton. Large floods would exceed the capacity of the bypass channel and inundate the surrounding agricultural areas in a manner similar to what would occur without project construction. The levee and bypass channel would require about 235 acres in rights-of-way, including about 5 acres of natural wooded areas, about 2 percent of the natural wooded area in the vicinity. About 0.1 mile of natural stream channel would be disrupted. This measure has a benefit-cost ratio of 3.8.

d. Rural channel improvement. - Rural channel improvement would consist of increasing the channel capacity in the rural reaches of the South Branch and main stem Park River from the city of Park River to Oakwood. The channel would require varying degrees of modification to handle 10-percent design flows. About 290 acres of land would be required for rights-of-way, including 200 acres of natural wooded areas along the river, about 7 percent of the total natural areas along the reach to be improved. Channel improvement would alter about 32 miles of normal stream channel. Reduction of rural flood damages would be significant (53 percent). Rural channel improvement with a benefit-cost ratio of 0.3 is not economically feasible.

e. Channel improvement at Grafton. - Channel improvement at Grafton would require increasing the natural river channel capacity through Grafton to handle about 22,000 cfs and using tieback levees and an interceptor drain west of Grafton to contain and route the overland flows to the improved channel. About 4 miles of natural river channel would be modified, and 145 acres of land would be required for rights-of-way, including 45 acres of natural wooded area along the river, about 30 percent of the natural wooded area in the vicinity. Extensive spoil banks from channel excavation through the city would detract from the aesthetic nature of the river. Although channel improvement through Grafton with a benefit-cost ratio of 1.2 is economically feasible, the social well-being in the relocation and aesthetic impacts would be significant; and the environmental quality of both the stream and the natural wooded area in Grafton would be significantly affected.

f. Upstream reservoir storage. - Upstream reservoir storage was investigated at nine locations in the escarpment area west of Park River, including the raising of Homme Dam. Each has varying degrees of capability in meeting the downstream flood reduction needs, and also varying degrees of impacts on the environment and the residents in the reservoir areas. The most preferable reservoir alternatives appear to be one reservoir or a combination of reservoirs. Since information for the combination of reservoirs would be quite similar to that for the single reservoir, only the single reservoir alternative is evaluated here. Although upstream reservoir storage could provide major downstream flood damage reduction in the rural areas along the South Branch of the Park River and reduce total flood damages by 54 percent, flood damages at Grafton for the major floods would be only slightly reduced, and very little area would be removed from the floodplain. Flood stage reduction at Grafton for the large floods would not be significant. Construction of a single reservoir would modify to some degree about 10 miles of free-flowing stream and about 615 acres of natural woodland area. The total woodland affected represents about 28 percent of the natural wooded area in the vicinity, about 10 percent of the natural wooded area in the escarpment reaches, and about 7 percent of the total natural wooded area from the reservoir site down along the South Branch and main stem Park River to the Red River of the North. A total of 2,400 acres of private land would be required for dam and reservoir construction, including 1,800 acres of woodland. The aesthetic impact of a reservoir would be significant in that the natural wooded habitat would be replaced by an aquatic environment. The reservoir is economically feasible.

54. WATER SUPPLY

The major single-purpose measures considered for providing an assured water supply for the Park River basin include upstream reservoir storage along the South Branch Park River, off-channel storage at Grafton along the main stem Park River, groundwater from the Fordville aquifer transferred via pipeline, and water from the Red River of the North transferred via pipeline. Either the off-channel storage at Grafton or the water pumped from the Red River of the North are the more desirable and feasible alternatives. Water supply in upstream reservoirs along the South Branch Park River is desirable only if used in conjunction with a multiple-purpose reservoir (see appendix F).

55. WATER-BASED RECREATION

Due to the lack of natural water surface area in the basin, provision of major water-based recreation facilities would require construction of an impoundment. Such an undertaking would only be feasible in conjunction with a multiple-purpose project. (See appendix D.)

56. SUMMARY OF SINGLE-PURPOSE MEASURES

The single-purpose flood control measures deemed most acceptable from economic, social well-being, and environmental quality criteria include a flood bypass channel at Grafton, a combination levee and flood bypass channel at Grafton, and upstream reservoir storage. The "do nothing" alternative must always be considered as the alternative to an acceptable action plan. The flood control measures that are considered as possible supplements to any major measure include flood proofing, floodplain regulation, and flood insurance. The flood control measures considered least acceptable include flood warning, floodplain evacuation, levees at Grafton, and rural and urban channel improvement.

57. Evaluation of the water supply alternatives incidates that both off-channel storage at Grafton and water from the Red River of the North would be acceptable measures. Water supply in upstream reservoir storage, along with water-based recreation, should only be considered acceptable if included in a multiple-purpose reservoir.

WATER MANAGEMENT PLANS CONSIDERED

58. The water management plans considered reduction of flood damages and provision of assured water supply and additional water-based recreation opportunities as main objectives. Adequate reduction of flood damages for the basin must include some form of local protection at Grafton. Upstream reservoir storage, although providing flood damage reduction, does not significantly affect the stages of the larger floods at Grafton and would not remove any portion of Grafton from the floodplain. The most acceptable measures for preventing flood damages and providing an assured water supply are incorporated in the following considered alternative water management plans. Provision of additional water-based recreation was included only in plans involving upstream reservoir storage.

a. Plan 1 - Do nothing. - Should an acceptable water management plan not be selected, the "do nothing" alternative would be the inevitable result. All water-related problems in the basin would continue to exist in the future.

b. Plan 2 - Combination levee and flood bypass channel at Grafton. - The combination levee and flood bypass channel at Grafton would provide adequate flood protection for the city of Grafton, but would not reduce flood damages in other areas of the basin. The total flood damages in the study area would be reduced by 76 percent, and 90 percent of the persons living in the flood-prone areas would be protected. The bridge openings over the bypass channel would be larger than the channel area so that backwater effects upstream of the bridge would be slight for flood flows of the magnitude of the 1-percent chance and the standard project flood. This alternative

plan would be the most economical means of providing adequate flood protection for Grafton (first cost - $8.2 million; benefit-cost ratio = 3.8), and would also provide the greatest net return on the investment (net benefits = $1.37 million). The plan would require about 235 acres of private lands for construction, most of which are valuable croplands, and relocation of one farmstead. The plan would not appreciably change the flood threat to surrounding flood-plain areas. The direct environmental quality impacts of this plan would be small, as only 0.1 mile of natural stream bed and 5 acres of natural wooded river bottom habitat would be modified or disturbed. About 150 acres of woodland exist in the Grafton area within the levees and would be protected from flooding. As assured water supply for Grafton could be provided by an off-channel storage reservoir. Additional water-based recreation would not be provided with this plan.

c. Plan 3 - Flood bypass channel at Grafton. - This plan would consist of a flood bypass channel at Grafton, an interceptor drain west of Grafton, and tieback levees extending from the interceptor drain to the inlet of the bypass channel. This plan would provide adequate flood protection for both the development at Grafton and agricultural cropland in the adjacent area. About 77 percent of the flood damages in the study area would be eliminated and about 93 percent of the persons living in flood-prone areas would be protected. About 285 acres of private lands, mostly valuable cropland, would be required for construction, including about 10 acres of natural wooded area along the river channel. Only 0.2 mile of natural stream channel and 10 acres of natural wooded land adjacent to the river would be disrupted. This plan is economically feasible. An assured water supply could be provided by off-channel storage at Grafton. Additional water-based recreation would not be provided with this plan.

d. Plan 4 - Multiple-purpose reservoir and flood bypass channel at Grafton. - A multiple-purpose reservoir would reduce flood damages along the South Branch and main stem of the Park River, provide an assured water supply for both Park River and Grafton, and provide opportunities for water-based recreation. The flood bypass channel at Grafton would be similar in features as that listed in plan 3 except that it would be slightly smaller. The flood protection provided Grafton would be comparable to that provided by the other alternative plans. This plan would reduce total flood damages in the basin by about 90 percent and protect about 97 percent of the persons living in the flood-prone areas. This plan is socially acceptable because of its widespread social benefits, and relatively minor social disadvantages. The major social disadvantages would be relocation of four farmsteads and acquisition of over 2,600 acres of private lands, including about 875 acres of agricultural land. An additional 3,600 acres of private lands would probably be required for fish and wildlife mitigation. The impact of this plan on the existing environmental quality of the basin would be great, with about 625 acres of natural wooded area and

good wildlife habitat being disturbed or modified. About 7 miles of the natural free-flowing stream would be affected by construction or changed to a standing water system, with an additional 3 miles of natural stream bed subject to intermittent flooding changes. The 625 acres of wooded land represent about 7 percent of the total wooded area along a 2-mile strip adjacent to the entire reach of the South Branch and main stem of the Park River, and about 10 percent of the total wooded area along a comparable strip in the immediate project areas.

e. Plan 5 - Multiple-reservoir system and flood bypass channel at Grafton. - The multiple-reservoir system would include four reservoirs for flood control and a reservoir for water supply, water-based recreation, and limited flood control. The flood bypass channel at Grafton would be comparable in features and size to that described in plan 3. This plan would provide flood protection for Grafton comparable to the other plans, an assured water supply for Grafton and Park River, and additional water area for recreation. However, the flood protection provided Park River and the rural areas would be somewhat less than the 10-percent protection level. Three farmsteads would be affected and about 1,620 acres of total private lands would be acquired plus about 3,600 acres of additional lands for fish and wildlife mitigation. About 15 miles of natural stream bed would be modified, either permanently or intermittently, and about 585 acres of natural wooded area would also be modified. The environmental impact of this plan is significant.

f. Plan 6 - Multiple-purpose reservoir and combination levee and flood bypass channel at Grafton. - The multiple-purpose reservoir is similar in all respects to that described in plan 4, and the combination levee and flood bypass channel is similar to that described in plan 2. This plan is economically feasible (benefit-cost ratio = 1.8). Adequate flood protection for the entire study area, an assured water supply, and additional water-based recreation would be provided with this plan. The environmental impacts and social acceptability of this plan are comparable to those for plan 4.

g. Plan 7 - Multiple-reservoir system and combination levee and flood bypass channel at Grafton. - This plan combines the multiple-reservoir system described in plan 5 and the levee and flood bypass channel described in plan 2.

PLAN SELECTION

59. The seven alternative water management plans were all considered feasible alternatives; however, the plan selected must meet all of the planning objectives. Each plan was rated in comparison to the other plans in terms of the major beneficial or negative aspects by the planning objectives of economics, social well-being, and

environmental quality. The most attractive plan by the national economic development objective is plan 2, combination levee and flood diversion channel at Grafton; by the social well-being objective is plan 4, multiple-purpose reservoir and a flood bypass channel at Grafton; and by the environmental quality objective, plan 1, do nothing. Weighting each planning objective equally and comparing the alternative plans shows that plan 2 has the highest overall rating and would be considered as the plan which best meets the planning objectives.

60. Plan 2 is economically feasible and the most economically efficient plan with the highest benefit-cost ratio and the greatest net benefits. Aside from the "do nothing" alternative, it is the most environmentally acceptable plan with the least amount of natural area disturbed by construction (5 acres) and with the least impact of the considered plans on other natural systems. Plan 2 has a high degree of social acceptability as reduction of flood damages and protection of persons are both very high with this plan, even though relatively little agricultural land is protected from flood damages. The water needs of the area can be met, although additional water-based recreation opportunities are not provided.

SCALE OF SELECTED PLAN DEVELOPMENT

61. The scale of development of the combination levee and flood bypass channel was selected utilizing the three planning objective parameters. Various levee and diversion channel designs ranging from no levee to levee protection exceeding the standard project flood and from no bypass channel to bypass channel protection at about the 1-percent recurrence level were combined. All of the possible combinations were evaluated from economics, social well-being, and environmental quality.

62. The economic development evaluation of the combinations of various-sized levees and bypass channels was based on net benefits attributable to the project. The maximum net benefits occur at a high degree of levee protection combined with a small-sized bypass channel, and at a medium-sized bypass channel with no levee protection. Negative net benefits occur at lower levels of levee protection combined with either no diversion channel or a very large bypass channel. Other combinations of the levee and bypass channel have varying degrees of benefits in excess of costs.

63. The social well-being evaluation of combinations of various sizes of a levee and bypass channel was based on the criteria of flood protection provided, amount of lands required, visual aesthetic impacts, and transportation and other inconveniences. The importance of the parameter ranged from flood control as the most important to visual appeal as the least important. The degree to which the people were affected, the number of persons affected, and the relative importance of the parameters were all used to determine the acceptability of each combination plan. The relative acceptability of the various combination

plans shows that the most acceptable plan occurs with 1-percent levee protection and a medium-sized flood bypass channel. A larger levee is considered unnecessary and a smaller levee would be ineffective. No levee and a small channel are socially unacceptable.

64. The environmental quality aspects of the various combinations were evaluated based on the total acreage of natural wooded area that would be directly affected by a plan. The most desirable combination from environmental quality would be no levee or channel. The least desirable combination would be a levee of any size without any flood bypass channel.

65. In viewing the combination plans compositely from the three objectives, two areas appear to be most acceptable, either a levee providing 1-percent flood protection with a medium-sized bypass channel, or a levee providing standard project flood protection with a medium-sized channel.

66. The selected combination of levee and flood bypass channel includes a levee providing standard project flood protection and a flood bypass channel designed for near the 10-percent flow. This choice places the selected plan in the most economically efficient area, in a socially acceptable area, and also in an acceptable area from environmental quality. This plan was selected over the other most desirable combinations primarily because of the increased flood protection provided Grafton, recognizing that the social well-being and environmental quality parameters were still acceptable. Additional details of plan formulation are given in appendix H.

PLAN OF IMPROVEMENT

67.

(see paragraph 58. b.)

CONCLUSIONS

68. The selection of a plan to meet the basic needs of the South Branch and main stem Park River basin, recognizing the three planning objectives of economic development, social well-being, and environmental quality, resulted in the selection of a combination levee and flood bypass channel at Grafton to solve the major flood control needs of the basin. This plan would eliminate over 75 percent of the flood damages in the basin by the most economical means. Flood damages in other areas of the basin would not be reduced by this plan; however, it is felt that the flood damages to low-lying developments in Park River and to farmsteads in the rural reaches of the basin could best be solved by implementation of floodplain regulations.

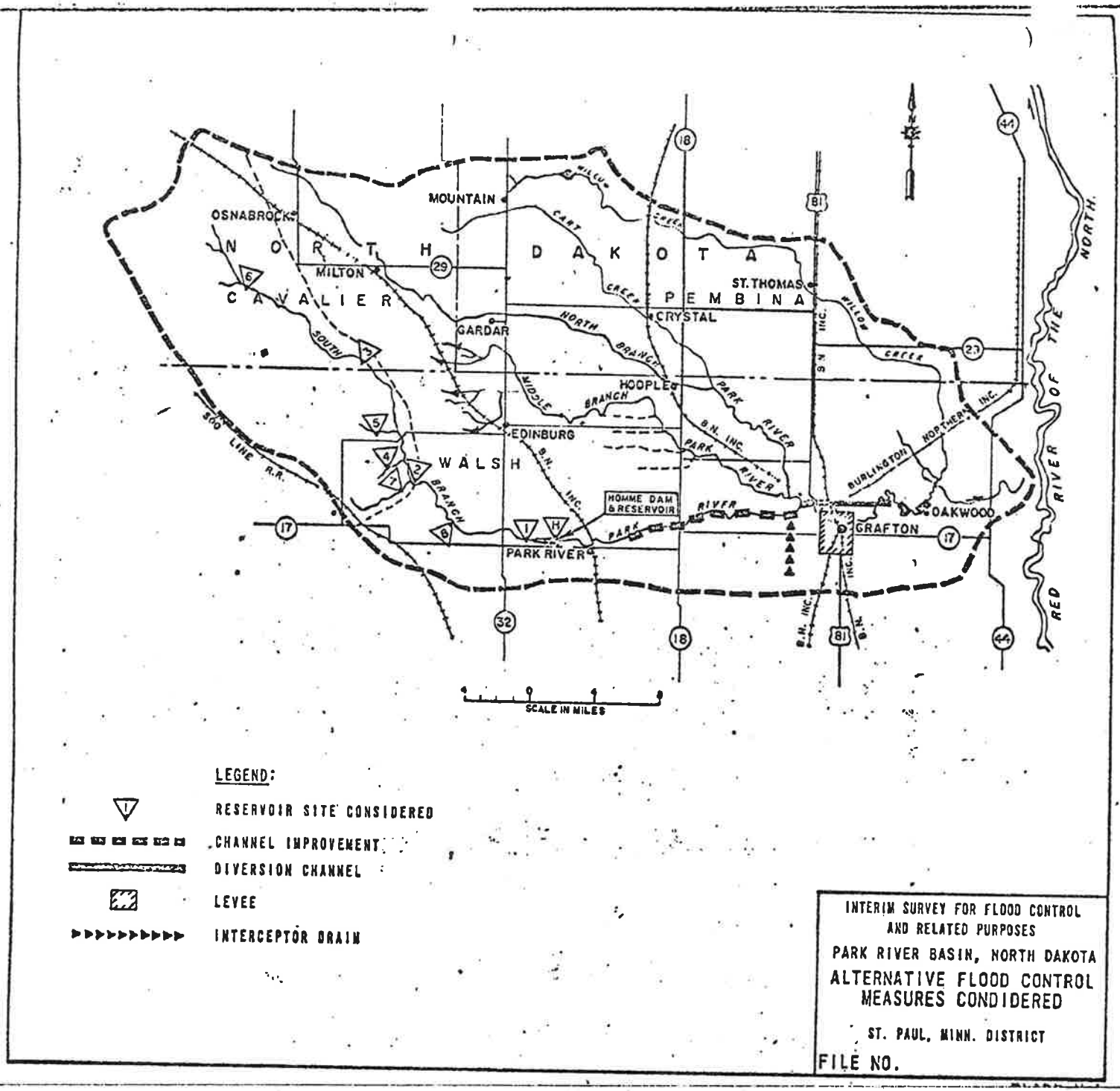
69. Because of the small, well-defined floodplain in Park River, floodplain regulations for Park River should consist of land-use controls to preclude development in the low-lying areas. Due to the large floodplain in the rural areas of the basin, floodplain regulations for these areas should consist primarily of building codes that would require that new buildings be constructed to minimize flood damages. This could be achieved by flood proofing new or existing structures, raising the main level of new buildings to above the 1-percent flood elevation, or constructing farmstead levees to protect either new or existing structures. Prevention of flood damages to agricultural crop production was found not economically feasible. Therefore, effective land management measures should be incorporated in upland farming practices wherever necessary to optimize water retention capabilities. Farmers in the floodplain areas should also incorporate appropriate land management and cropping measures to minimize their crop losses due to flood damages. Although it is recognized that these land management measures will not eliminate the crop losses due to flooding in the basin, these measures may tend to reduce such losses.

70. It is concluded that water supply for Grafton should be utilized from the Park River under the present system, but that either off-channel storage at Grafton or a pipeline to the Red River of the North should be constructed to supplement the present supply. In the future as water supply needs increase, or if a drought period is experienced, either of these alternatives should be utilized in the winter months to provide Grafton with water and eliminate the need for water releases from Homme Dam which cause ice buildup problems in the river channel along the South Branch Park River.

71. Additional major water-based recreation opportunities, mainly lakes, although needed and desired, are not feasible to provide in the basin. However, the natural wooded corridors along the rivers should be protected from further clearing and, wherever feasible, appropriate recreation opportunities should be provided along the existing river corridors.

72. The combination levee and flood bypass channel at Grafton as proposed would eliminate the major flood problems in the basin. These measures are considered the best overall major plan recognizing economic development, social well-being, and environmental quality as equal planning objectives. The additional measures which are proposed would aid in solving the remaining water and related problems in the basin.

73. Our cooperative planning efforts with the Grafton city officials and residents have revealed strong support for the combination levee and flood bypass channel at Grafton and a willingness to furnish the local assurances. Further planning meetings will be held with all other interests in the basin during May 1973. The draft of the report and the draft of the environmental statement will be furnished to Federal and State agencies for review and comment, and a public meeting will be held in June 1973. The District's final reports are scheduled to be submitted to our Division office in July 1973.


NORTH DAKOTA
CAVALIER
PEMBINA
WALSH
MOUNTAIN
OSNABROCK
MILTON
GARDAR
CRYSTAL
ST. THOMAS
HOOPLE
EDINBURG
PARK RIVER
GRAFTON
OAKWOOD
HOMME DAM & RESERVOIR
SOO LINE R.R.
BURLINGTON NORTHERN INC.
S.N. INC.
RED RIVER OF THE NORTH
SCALE IN MILES
LEGEND:
RESERVOIR SITE CONSIDERED
CHANNEL IMPROVEMENT
DIVERSION CHANNEL
LEVEE
INTERCEPTOR DRAIN
INTERIM SURVEY FOR FLOOD CONTROL AND RELATED PURPOSES
PARK RIVER BASIN, NORTH DAKOTA
ALTERNATIVE FLOOD CONTROL MEASURES CONDIDERED
ST. PAUL, MINN. DISTRICT
FILE NO.

CIVIL WORKS PROGRAMS IN NORTH DAKOTA

STATUS REPORT

DEPARTMENT OF THE ARMY
St. Paul District, Corps of Engineers
St. Paul, Minnesota 55101
5 May 1973

STATUS REPORT
CIVIL WORKS PROGRAMS IN NORTH DAKOTA
ST. PAUL DISTRICT
9 May 1973

I CONSTRUCTION GENERAL

1. Souris River

   a. Minot channel
      (1) Roosevelt Park cutoff - complete
      (2) Second stage clearing - 98 percent complete
      (3) Third stage channel improvement - award this FY

   b. Burlington Reservoir
      (1) Project formulation DM - being completed this FY
      (2) IJC study of reservoir effects in Canada delayed pending agreement on approval of project location, size, and operating plan.
      (3) Environmental concerns - Bureau of Sport Fisheries and Wildlife threatens to bring Department of Interior into objections to reservoir because of effects on refuges.

2. Sheyenne River

   a. Ashtabula Reservoir - full 1265.5 Q=16 cfs
      (1) Recreation improvements planned this summer at Old Highway 26 and Eggerts Landing with a user charge where facilities are available.
      (2) Future recreation improvements dependent upon new policy effective 1 July 1974. See ltr. to Gov. Link 4 Apr 1973.

   b. Kindred Reservoir
      Review study underway. This fiscal year work limited primarily to study of groundwater effects attributable to the reservoir pool funded cooperatively largely by the Corps and the Water Commission. We are currently reviewing an advance draft of the results as prepared by the U.S. Geological Survey. With next fiscal year funds we propose to contract for an environmental inventory, prepare an environmental impact statement, and consider the value of the pool on dilution of irrigation return flows.

3. Pembina River

   a. Pembina local protection

a. Pembina local protection (cont)
   (1) Local coop: cash cont. est at $355,000
   " lands " 84,000
   (2) Plan to advertise and award this fiscal year.
   (3) Local interests assure us they can meet cooperation but have had some problems obtaining right-of-way.

b. Pembilier Reservoir
   (1) Recent meeting with Canadian members of IJC task force indicates progress. Benefits may be less than our original estimates but Manitoba seems interested
   (2) With the prospects of a 5-3/4 percent interest rate in the United States and using a 7½ percent interest rate for Canada, economic feasibility is less than 1.0. However, we could still recommend Federal participation if cooperation by Canada were assured.

4. Rush River, Lower Branch

   a. Work involves channel improvements and related work.
      (1) Contract award $721,000 - 4/25/72
      (2) Initiated work May 72
      (3) Scheduled completion November 73
      (4) Progress 35 percent complete

II GENERAL INVESTIGATIONS

1. Park River

   a. Grafton (see report)

2. Red River Basin, General
   a. Antelope Creek
   b. Red Lake River, Minn. (interim)
   c. Final report

3. Urban studies
   a. Fargo - Moorhead
   b. Grand Forks - East Grand Forks
   c. These studies cover major metropolitan areas and cover coordinated planning for all water resource problems particularly water supply, water quality, land-use as it relates to water, flood control.
   d. The Fargo - Moorhead urban study was proposed for Level- B Cooperative study by Federal - State agencies.
   e. Our Duluth - Superior study is of this scope.

4. Souris - Red-Rainy River Basins Commission

III OPERATION AND MAINTENANCE

Reservoir data	Normal Pool	3/31	4/30	5/7	Q
Lake Traverse					
Reservation Control	976.0	976.5	977.9	976.4	
White Rock	972.0	971.4	972.2	971.9	0
Orwell	1070.0	1049.0	1049.6	1048.7	276
Ashtabula	1266.0	1265.2	1265.6	1265.5	13
Red Lakes	1174.0	1174.2	1174.3	1174.3	220
Homme	1080.0	1080.0	1080.1	1080.0	4

APPENDIX "B"

RESOLUTION 73-5-340

Approval of Plans and Specifications
for Barnes County Water Management District
Sewer and Water Improvement District #1

BE IT RESOLVED by the North Dakota State Water Commission that the plans and specifications for improvements in Barnes County Water Management District Sewer and Water Improvement District #1, Barnes County, North Dakota, heretofore prepared by Moore Engineering, Engineer for the District, be and the same hereby are approved, ratified and confirmed as to the plans and specifications in accordance with which said improvements shall be constructed and the Secretary of the Water Management District shall file the same in his office open to public inspection.

NOW, THEREFORE, BE IT RESOLVED by the North Dakota State Water Commission in meeting duly assembled this 9th day of May, 1973, in Grand Forks, North Dakota, that the above stated specifications and plans are hereby approved.

FOR THE NORTH DAKOTA STATE WATER COMMISSION:

SEAL

/S/ Arthur A. Link
Arthur A. Link
Governor-Chairman

ATTEST:

/S/ Vernon Fahy
Vernon Fahy
Secretary

APPENDIX "C"

RESOLUTION 73-5-341

Approval of Plans and Specifications
for Rush River Water Management District
Sewer Improvement District #1

BE IT RESOLVED by the North Dakota State Water Commission that the plans and specifications for improvements in the Rush River Water Management District Sewer Improvement District #1, Cass County, North Dakota, heretofore prepared by Moore Engineering, Engineer for the District, be and the same hereby are approved, ratified and confirmed as to the plans and specifications in accordance with which said improvements shall be constructed and the Secretary of the Water Management District shall file the same in his office open to public inspection.

NOW, THEREFORE, BE IT RESOLVED by the North Dakota State Water Commission in meeting duly assembled this 9th day of May, 1973, in Grand Forks, North Dakota, that the above stated specifications and plans are hereby approved.

FOR THE NORTH DAKOTA STATE WATER COMMISSION:

/S/ Arthur A. Link
Arthur A. Link
Governor-Chairman

ATTEST:

/S/ Vernon Fahy
Vernon Fahy
Secretary

RESOLUTION 73-5-342

APPENDIX "D"

Authorizing the Establishment of
Divide County Water Management District

WHEREAS, Divide County, North Dakota, acting by and through its Board of County Commissioners, on the 18th day of April, 1973, filed with the North Dakota State Water Commission, its petition requesting the establishment of a water management district embracing the territory within Divide County; and

WHEREAS, the report of the Chief Engineer of this Commission and the facts adduced at a public hearing held in the Divide County Courthouse on the 8th day of May, 1973, disclosed that the investigation, regulation and conservation of water-bearing aquifers within Divide County can best be accomplished by a water management district in cooperation with state and federal agencies.

NOW, THEREFORE, BE IT RESOLVED that the North Dakota State Water Commission, in meeting duly assembled this 9th day of May, 1973, in Grand Forks, North Dakota, does hereby authorize and direct the Chairman and Secretary of this Commission to execute an Order establishing a water management district embracing the territory within Divide County and designated as the Divide County Water Management District.

FOR THE NORTH DAKOTA STATE WATER COMMISSION:

SEAL

/S/ Arthur A. Link
Arthur A. Link
Governor-Chairman

ATTEST:

/S/ Vernon Fahy
Vernon Fahy
Secretary

ORDER

ESTABLISHING DIVIDE COUNTY WATER
MANAGEMENT DISTRICT

SWC Project No. 1585

WHEREAS, Divide County, acting by and through its Board of County Commissioners, did on the 18th day of April, 1973, file with the North Dakota State Water Commission its petition requesting the establishment of a water management district embodying within its boundaries all of the territory within the county; and

WHEREAS, the petition of Divide County was accompanied by a certified copy of a resolution of the Board of County Commissioners, adopted on the 17th day of April, 1973, authorizing and directing for and on behalf of Divide County, the filing of such petition; and

WHEREAS, the report of the Chief Engineer of the State Water Commission and evidence submitted at a public hearing held in the city of Crosby on the 8th day of May, 1973, after legal notice thereof, disclosed that a water management district would provide a responsible legal entity to serve the people of the county through whom they can deal with all state and federal agencies in all aspects of the county's water resources; and

WHEREAS, the Commission at its regular meeting held at Grand Forks, North Dakota on the 9th day of May, 1973, approved the petition of Divide County and directed its Chairman and Secretary to execute the Order of the Commission establishing a water management district to be designated and known as the Divide County Water Management District.

The Divide County Water Management District, embracing within its boundaries the territory within the limits of Divide County, is hereby established.

Dated at Grand Forks, North Dakota, this 9th day of May, 1973.

NORTH DAKOTA STATE WATER COMMISSION

By Arthur A. Link
Arthur A. Link, Governor and Ex-Officio Chairman of the North Dakota State Water Commission

ATTEST:

Vernon Fahy

Vernon Fahy, Secretary

STATE OF NORTH DAKOTA)
) SS
COUNTY OF BURLEIGH)

On this 14th day of May, 1973, before me a Notary Public in and for Burleigh County and the State of North Dakota, personally appeared Honorable Arthur A. Link, known to me to be the Governor of North Dakota and Ex-Officio Chairman of the North Dakota State Water Commission, and Vernon Fahy, known to me to be the Chief Engineer and Ex-Officio Secretary of the said Commission and acknowledged to me that the Commission had executed the within and foregoing Order establishing the Divide County Water Management District.

Notary Public, Burleigh County,
State of North Dakota

My Commission Expires July 29, 1976

NORTH DAKOTA STATE WATER COMMISSION
FINANCIAL STATEMENT MAY 31, 1973
1971-73 APPROPRIATIONS

C5-1.2

	Available Funds APPROPRIATION	RECEIPTS	Disbursements TO DATE	MAY, '73	Account Balances UNEXPENDED	ENCUMB.	UNENCUMB.
GENERAL OPERATIONS ACCOUNT							
1001-Salaries Expense (1)	$ 934,621.00	$ -	$ 821,664.96	$40,127.13	$112,956.04	$ -	$112,956.04
2001-Fees & Services	162,625.00	-	141,589.23	8,675.51	21,035.77	-	21,035.77
2051-Data Processing	4,500.00	-	4,094.84	613.38	405.16	-	405.06
3001-Supplies & Materials	163,600.00	-	151,862.21	17,954.20	11,737.79	-	11,737.79
4001-Equipment	25,000.00	-	19,268.31	119.00	5,731.69	5,630.00	101.69
7701-Red Basin Comm.	60,000.00	-	60,000.00	-	-	-	-
TOTAL GENERAL OPERATIONS	$1,350,346.00	$ -	$1,198,479.55	$67,489.22	$151,866.54	$ 5,630.00	$151,303.54
7721-West River Diversion (2)	$ 132,400.00	$ -	$ 113,993.36	$ 8,779.30	$ 18,406.64	$ -	$ 18,406.64
CONTRACT FUND							
336-770-Contract "Cash" $1,000,000							
Contract Collections 900,000	$1,900,000						
Collection to Date		$ 779,060.16					
Transfer from 001 to 336		900,000.00					
			$1,643,827.44	$143,122.36	$256,172.56	$196,405.00	$ 59,767.56
TOTAL CONTRACT FUND	$1,900,000.00	$1,679,060.16	$1,643,827.44	$143,122.36	$256,172.56	$196,405.00	$ 59,767.56
GRAND TOTALS	$3,382,746.00	$1,679,060.16	$2,956,300.35	$219,390.88	$426,445.74	$202,035.00	$229,477.74

(1) Includes $88,550.00 Federal Grant
Includes $15,000.00 Emergency Comm. Authorization to Supervise $181,934 Public Works Project

(2) Includes $32,400.00 Federal Grant

*Unencumbered by the fact that some of the projects authorized will not be funded until during the 1973-75 biennium

NORTH DAKOTA STATE WATER COMMISSION

PAYROLL - April 1973*

NAME	POSITION	REMARKS	GROSS
HOISVEEN, MILO W.	STATE ENGINEER	INC.JULY'72	$ 1,875.00
BAESLER, GORDON	WATER RIGHTS TECHNICIAN	INC.JULY'72	850.00
BALLIET, ALLEN	RODMAN	INC.JULY'72	575.00
CHRISTENSEN, RAYMOND	CONSTRUCTION ENGINEER	INC.JULY'72	945.00
DALLY, ANTOINETTE	STENOGRAPHER	INC.JULY'72	430.00
EMERSON, MATT	ASSISTANT SECRETARY	INC.JULY'72	1,265.00
FAHY, VERN	ASSISTANT CHIEF ENGINEER	STA.SEPT.'72	1,625.00
FROELICH, LARRY	GEOLOGIST	INC.JULY'72	1,015.00
GALLAGHER, RICHARD	COMMISSIONER	STA.JULY'61	75.00
GEHRING, OSCAR	LAB TECHNICIAN	INC.JULY'72	655.00
GRAY, GORDON	COMMISSIONER	STA.JULY'70	60.00
GRUNSETH, ARLAND	INVESTIGATIONS ENGINEER	INC.JULY'72	1,145.00
HANSON, HAROLD	COMMISSIONER	RES.APRIL'73	30.00
HANSON, WILLIAM	DRAFTSMAN	INC.DEC.'72	600.00
HOETZER, STEVE	ASSISTANT DESIGN ENGINEER	INC.JULY'72	945.00
JOCHIM, CLIFFORD	ATTORNEY	INC.JULY'72	1,350.00
JUNGROTH, JAMES	COMMISSIONER	STA.SEPT.'67	120.00
KLAPPRODT, LEROY	ENGINEER TECHNICIAN	INC.JULY'72	620.00
KLING, THOMAS	SOILS TECHNICIAN	STA.SEPT.'71	265.00
KNUTSON, LEWIS	DRILLER	INC.JULY'72	795.00
KOCH, KAY	ACCOUNTANT	INC.JULY'72	315.00
KRAMER, ALVIN	COMMISSIONER	STA.APR.'70	45.00
LINDVIG, MILTON	GROUND-WATER ENGINEER	INC.JULY'72	1,265.00
LOCKEN, SHARON	CHIEF STENOGRAPHER	INC.JULY'72	650.00
MAYHEW, ROGER	CONSTRUCTION INSPECTOR	STA.APR.'73	137.50
MEES, LADARANA	FIELD ENGINEER	INC.JULY'72	880.00
MURI, GARVIN	CHEMIST	INC.JULY'72	940.00
NAPLIN, CHARLES	GEOLOGIST	INC.JULY'72	955.00
NEAL, DEAN	LAB TECHNICIAN	STA.SEPT.'71	184.00
NELSON, C. P.	DRAINAGE ENGINEER	INC.JULY'72	1,200.00
NOTEBOOM, DONALD	COMMISSIONER	STA.APR.'73	30.00
O'BRIEN, GEORGE	DRAFTSMAN	INC.DEC.'72	600.00
PUTZ, ROY	OFFICE ASSISTANT	INC.JULY'72	525.00
ROTH, TERRANCE	CONSTRUCTION INSPECTOR	STA.APR.'73	385.00
SACKMAN, EUGENE	SURVEYOR	INC.JULY'72	795.00
SCHAAN, WENDELL	ASSISTANT DRILLER	INC.APR.'73	530.00
SCHMID, ROGER	GROUND-WATER HYDROLOGIST	INC.JULY'72	1,125.00
SCHUETTE, GERALD	CONSTRUCTION INSPECTOR	STA.APR.'73	550.00
SCHULZ, DELTON	OFFICE ENGINEER	INC.JULY'72	1,470.00
SCOTT, LLOYD	CHIEF DRAFTSMAN	INC.DEC.'72	795.00
SENGER, ANTON	CONSTRUCTION INSPECTOR	INC.JULY'72	580.00
SENZEK, GORDON	EDA ENGINEER	STA.JAN.'73	1,050.00
SIEMS, MYRNA	STENOGRAPHER	INC.JULY'72	360.00
SPEAKS, GLENN	OPERATOR	RES.APR.'73	819.69
SPRENGER, THOMAS	PROJECTION ENGINEER	STA.APR.'73	750.00
SVIHLA, ROSALIE	STENOGRAPHER	INC.JULY'72	380.00
SWANSON, RONALD	DESIGN ENGINEER	INC.JULY'72	1,115.00
TILLOTSON, ANN	RESEARCH ASSISTANT	INC.JULY'72	500.00
ULRICH, ROGER	RODMAN	INC.JULY'72	540.00
WALTERSON, HOWARD	CONSTRUCTION SUPT.	INC.JULY'72	850.00
WELCH, CYNTHIA	STENOGRAPHER	STA.SEPT.'70	340.00
WERNER, ROBERT	DRAFTSMAN	INC.DEC.'72	575.00
SWC GROUP INS.			307.50
SWC RET-MATCHING			1,304.59
SOCIAL SECURITY			2,038.85
			$40,127.13

*Pd. in May

NORTH DAKOTA STATE ER COMMISSION
FINANCIAL STATEME / JULY 31, 1973
1971-73 APPROPRIATIONS

C5-1.2

	Available Funds APPROPRIATION	RECEIPTS	Disbursements TO DATE	JULY '73	Account Balances UNEXPENDED
GENERAL OPERATIONS ACCOUNT					
1001-Salaries Expense (1)	$ 934,621.00	$ -	$ 907,919.53	$ 46,630.25	$ 26,701.47
2001-Fees & Services	162,625.00	-	159,010.57	6,512.02	3,614.43
2051-Data Processing	4,500.00	-	4,446.76	-	53.24
3001-Supplies & Materials	163,600.00	-	163,498.87	1,899.17	101.13
4001-Equipment	25,000.00	-	24,898.31	-	101.69
7701-Red Basin Comm.	60,000.00	-	60,000.00	-	-
TOTAL GENERAL OPERATIONS	$1,350,346.00	$ -	$1,319,774.04	$ 55,041.44	$ 30,571.96
7721-West River Diversion (2)	$ 132,400.00	$ -	$ 127,661.93	$ 4,264.80	$ 4,738.07
CONTRACT FUND					
336-770-Contract "Cash" $1,000,000					
Contract Collections 900,000	$1,900,000				
Collection to Date		$ 835,550.72			
Transfer from 001 to 336		1,000,000.00			
TOTAL CONTRACT FUND	$1,900,000.00	$1,835,550.72	$1,807,437.32	$ 87,406.15	$ 28,113.40 (3)
GRAND TOTALS	$3,382,746.00		$3,254,873.29	$146,712.39	$ 63,423.43

(1) Includes $88,550.00 Federal Grant
Includes $15,000.00 Emergency Comm. Authorization to Supervise $181,934 Public Works Project

(2) Includes $32,400.00 Federal Grant

(3) $28,113.40 net contract fund account balance based upon net collection and transfer of $1,835,550.72

ORIGINAL MINUTES DO NOT CONTAIN PAGES:

73, 74