

WATER PERMIT NO. 5809-3

Phone: 853-3159

Name of Applicant: Mid-Dakota Rural Water System, Inc.

Post Office Address: PO Box 318, Miller SD 57362

Amount of Water Claimed: 30 gpm add'l Total Acres: NA

Source of Water Supply: Missouri River

Water to be used for: rural water system use County: Hughes

About 1 miles north of Oahe Dam

PRIORITY Date Received: 3-14-94 Fee: \$50.00 Remarks: change the

location of the diversion pt authorized by No. 5751-3 and for an add'l 30 gallon and
adds four more water users

Corrected Application Received: 3-14-94 Period of Annual Use: Jan 1 - Dec 31

WATER QUALITY APPROVAL RECEIVED: NA APPROVED/CONDITIONAL (Circle one)

WI-1 Description same as Application YES ☐ NO ☐ REMARKS: _____

Diversion Point: SE 1/4 SE 1/4 Sec 26-T112N-R80W

Land to be Irrigated: _____

			26		
				2	

Well Log: Driller: _____ Licensed YES ☐ NO ☐

Depth of Well: _____ REMARKS: _____

Type of Map: topo PREPARED BY: Douglas W. Mund, P.E. Reviewed and the Number

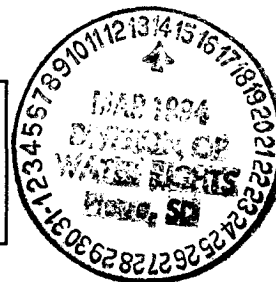
Assigned on: 3-14-94 By: Karen Schlaak

FORM 2: Application for uses other than irrigation

(type or print)

Mail to:
Water Rights Division
Joe Foss Building
523 E Capitol
Pierre SD 57501-3181
605 773-3352

No. 5809-3 Hydrologic Unit 10130105
Basin Missouri River
Newspaper (See attached sheet)
(office use only)



Application For Permit To Appropriate Water Within The State Of South Dakota

Check use of water:

☐ Municipal ☐ Suburban Housing ☐ Recreational ☐ Institutional
☒ Rural Water System ☐ Commercial ☐ Fish & Wildlife ☐ Geothermal Heat
☐ Domestic ☐ Industrial ☒ Other WETLANDS ENHANCEMENT
(over 18 gpm)

Type of Application: ☒ New ☐ Vested Right (Use predates Mar 2, 1955) ☐ Future Use Reservation
(check one) ☐ Place to Beneficial Use Water Reserved by Future Use Permit No. _____
☒ Amendment/Correction to Permit No. 5751-3

Description of amendment/correction: (i.e. change diversion point(s), add diversion point(s), change use, etc.)
CHANGE DIVERSION POINT AND ADD 30 GPM TO AMOUNT CLAIMED FOR NON-RECYCLABLE WATER
TREATMENT PLANT USAGE.

- Name of Applicant MID-DAKOTA RURAL WATER SYSTEM, INC. Phone (605) 853-3159
(check one) ☒ Owner ☐ Tenant/lessee
Mailing Address P.O. BOX 318 MILLER State SD 57362
(Street, RR, or Box) (309gpmadd'l) (City) (Zip Code)
- Amount of water claimed 16.55 *CFS or 7,430 **GPM 9,999 ***AF
(*Cubic Feet per Second) (**Gallons per Minute) (***)Acre Feet -- storage capacity of dam/dugout or annual use if applicable)
- Source of water supply MISSOURI RIVER
- Location of point of diversion (example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W) DIVERSION POINT (INTAKE
SCREEN) WILL BE LOCATED 1,270' NORTH AND 1,019' WEST OF THE SOUTHEAST CORNER OF
SEC. 26, T112N, R80W (SE 1/4 SE 1/4) County HUGHES
- County or counties where water will be used POTTER, FAULK, SULLY, HUGHES, HYDE, HAND, SPINK, BEADLE,
BUFFALO, JERAULD, SANBORN, KINGSBURY AND AURORA
- Annual period during which water is to be used ALL YEAR (JANUARY 1 - DECEMBER 31)
- Give a description of the project. When available include any preliminary engineering report or other reports or information that will help explain the project. (Attach sheet if more space is needed)
SAME AS INITIAL APPLICATION WITH THE INCLUSION OF THE FOLLOWING COMMUNITIES NOW
CONTRACTED FOR SERVICE: ORIENT, IROQUOIS AND YALE. OAH PLAINS SYSTEMS CORPORATION
HAS ALSO CONTRACTED TO RECIEVE WATER FROM THE MID-DAKOTA RURAL WATER SYSTEM.

Attachments: Attach Form 2A if diversion is from a well or dugout, or if storage of water is proposed. Attach map and any other technical information. (see instructions)

STATE OF SOUTH DAKOTA)

County of HAND)^{SS}

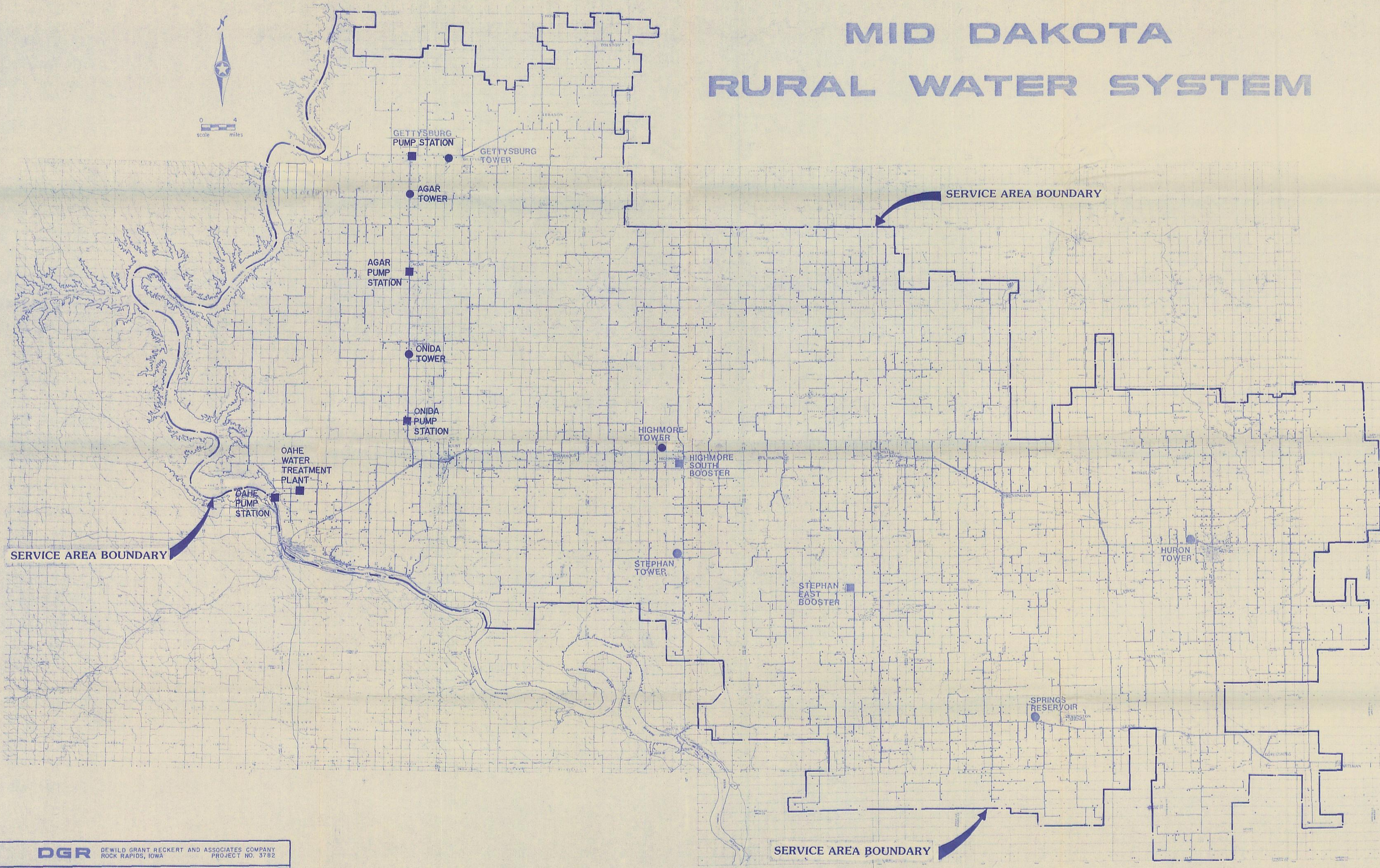
I, MURT PFEIFLE, the applicant, certify that I have read this application, have examined the attached map and that the matters stated are true and that I intend, and am able to complete the necessary construction.

Signed _____

Subscribed and sworn to before me this 10 day of MARCH 19 94

Notary Public

MID DAKOTA RURAL WATER SYSTEM



DGR DEWILD GRANT RECKERT AND ASSOCIATES COMPANY
ROCK RAPIDS, IOWA PROJECT NO. 3782

DRAFT SERVICE AREA BOUNDARY ADDED MARCH 16, 1990 BY BARTLETT & WEST ENG. INC.
MAINLINE FACILITIES REVISED FROM OAHE PS TO HIGHMORE TOWER (INCLUDING NORTH MAIN) 1/5/93
BY BARTLETT & WEST

**SOUTH DAKOTA
WATER PERMIT NO. 5809-3**

Date of first receipt of application March 14, 1994.

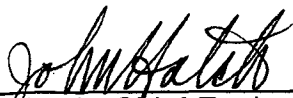
The Chief Engineer, on behalf of the Water Management Board, issues Water Permit No. 5809-3 to Mid-Dakota Rural Water System, Inc., PO Box 318, Miller SD 57362 authorizing the construction of the water use system and the placing of water to beneficial use subject to the following limitations, conditions and qualifications:

1. Water Permit No. 5809-3 changes the location of the diversion point, appropriates an additional 0.06 cubic feet of water per second (cfs) (30 gallons per minute) and adds additional users. Water Permit No. 5751-3 appropriates 16.49 cfs (9,999 acre-feet annually) from the Missouri River. Mid-Dakota RWS proposes to change the location of the diversion point to the SE 1/4 SE 1/4 Section 26-T112N-R80W. This permit authorizes an additional 0.06 cfs for use at the water treatment plant. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora Counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale and the Oahe Plains Systems Corporation. This permit does not authorize an increase in the 9,999 acre-feet annual volume of water authorized by Permit No. 5751-3.
2. The water appropriated shall be used for the purpose of supplying water to the rural water system and may not exceed the amount of water needed for beneficial use for rural water system purposes.
3. The water is to be used during the following described annual period: January 1 - December 31.
4. The date of approval of Permit No. 5809-3 is June 6, 1994.
5. The date from which applicant may claim right is March 14, 1994 (30 gallons per minute).
6. One-fifth of the construction is to be completed on or before December 6, 1996.
7. All construction is to be completed on or before June 6, 1999.
8. Water is to be put to beneficial use on or before June 6, 2003.
9. Water rights obtained in compliance with the laws of the State of South Dakota may not be unlawfully impaired by this appropriation.

QUALIFICATION

The Mid-Dakota Rural Water System, Inc. shall report to the Chief Engineer, annually, the amount of water withdrawn from the Missouri River.

WATER MANAGEMENT BOARD

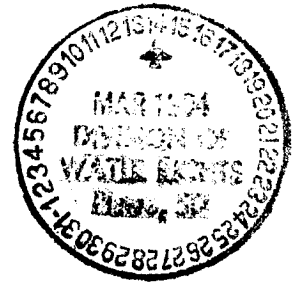
By: 
John Hatch, Chief Engineer
Water Rights Division
Department of Environment and Natural Resources

AUG 19 1994

date



Bartlett & West
Engineers, Inc.



March 10, 1994

Department of Environment & Natural Resources
Water Rights Division
Joe Foss Building
523 East Capital
Pierre, SD 57501-3131

Attn: Mr. Eric Gronlund

MID-DAKOTA RURAL WATER SYSTEM
WATER RIGHT PERMIT NO. 5751-3 AMENDMENT

Attached are two copies of the Water Permit Amendment Application and the filing fee for the Mid-Dakota Rural Water System (Mid-Dakota) per our March 7, 1994 telephone conversation.

Due to the inability of the U.S. Army Corps of Engineers (COE) to guarantee a reliable water source (due to the probability of extended periods of complete water supply interruption caused by repair and maintenance requirements at the powerhouse), Mid-Dakota has decided to construct a separate Oahe Intake and Pump Station facility on COE property approximately 9,500' northwest of the previous diversion point. The amendment is for 7,430 GPM; 6250 GPM (9 MGD) for rural water, 1,150 GPM for the federal wetland enhancement component of the project and an additional 30 GPM for non-recyclable water treatment plant usage.

It is anticipated that the first phase facilities of the Mid-Dakota System will be bid on June 30, 1994 with construction beginning this fall. First phase facilities include the Oahe Intake and Pump Station, Oahe Water Treatment Plant, Highmore Tower and approximately 4.6 miles of raw water and 43 miles of treated water transmission pipelines.

(701) 258-1110
2718 Gateway Ave., Suite 201
P.O. Box 1077
Bismarck, ND 58502

1

OTHER OFFICE
Topeka, KS

A Final Engineering Report for the Mid-Dakota Rural Water System has been prepared since submission of the original water right permit application. Five copies of the report have been transmitted to Mr. Jim Feeney of the DENR. If an additional copy is desired or if you require additional information or have questions concerning this amendment application, please contact me.

As discussed, please coordinate with Mid-Dakota concerning payment of the necessary newspaper publication fees.

BARTLETT & WEST ENGINEERS, INC.

A handwritten signature in black ink, appearing to read 'D. Mund', with a large loop at the end.

Douglas W. Mund, P.E.

CC: Mid-Dakota - Mr. Kurt Pfeifle w/attach.

File: Mid-Dakota Task 18 - Water Right Permit

MDGENCORRESP/WATER2.LTR/PKK



United States Department of the Interior



BUREAU OF RECLAMATION

Missouri-Souris Projects Office

P.O. Box 1017

Bismarck, North Dakota 58502

IN REPLY REFER TO:

MS-173

MAR 18 1994



Interested Parties:

The Bureau of Reclamation has completed the Final Environmental Assessment (FEA) Addendum/Finding of No Significant Impact (FONSI) which has been approved for the proposed Mid-Dakota Rural Water System located in 10 counties in north central South Dakota. The EA process addressed the environmental impacts of providing treated Missouri River water to more than 2,600 rural water users and 23 cities and towns serving over 29,000 rural and municipal residents and 600,000 head of livestock. Water would be pumped from a new intake on Lake Oahe 2 miles above Oahe Dam and treated at a water treatment plant several miles to the east. Water would be distributed through a system of pumps, storage tanks, and a network of 2,720 miles of buried pipelines. The project also includes a Wetland Enhancement component involving the provision of supplemental water to several wetlands and the development and implementation of water conservation programs throughout the service area to ensure that best practicable technology and management techniques are used to reduce the use, loss and waste of water; improve efficiency in the use of water; and examine potential to recycle or reuse water.

The Draft Environmental Assessment (DEA) was distributed for public review on December 3, 1993. Comments received from the public and other interested parties are included in the FEA Addendum/FONSI as well as necessary changes made to the DEA. Interested parties should refer to both the DEA and the FEA Addendum/FONSI for information or clarification. The DEA, together with the FEA Addendum/FONSI, constitute compliance with the National Environmental Policy Act (NEPA). Site specific NEPA compliance for Wetland Enhancement will be completed as that component is further developed.

The Final EA Addendum/FONSI is available upon request. Anyone desiring a copy or having questions about the documents should contact: Mr. Dennis Breitzman, Area Planning Officer, Bureau of Reclamation, Dakotas Area Office, P.O. Box 1017, Bismarck, North Dakota 58502, Telephone (701) 250-4592.

Sincerely,

Mike Whittington
Area Manager



Public Notice



**US Army Corps
of Engineers**
Omaha District

Reply to:
Pierre Regulatory Office
Federal Building, Room 317
Pierre, South Dakota 57501

Application No.: 199330082
Date: May 5, 1994
Expiration Date: June 4, 1994

CEMRO-OP-R
Mid-Dakota Rural Water System
Intake Structure
Missouri River, Mile 1073.75

30-DAY NOTICE

JOINT NOTICE OF PERMIT PENDING

US ARMY CORPS OF ENGINEERS AND SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

The application of Mid-Dakota Rural Water System, Incorporated, PO Box 318, Miller, South Dakota 57362, for approval of plans and issuance of a permit under authority of the Secretary of the Army is being considered by the District Engineer, US Army Engineer District, Omaha, Nebraska.

The applicant requests authorization to construct a regional water intake facility (Mid-Dakota Rural Water System Oahe Intake and Pump Station). The project is located in the Missouri River (Lake Oahe) in the southeast quarter (1/4) of Section 26, Township 112 North, Range 80 West, Hughes County, South Dakota.

The proposed project will consist of the on-shore construction of a concrete intake caisson (thirty (30) feet outside diameter and twenty-four (24) feet inside diameter by one hundred seven (107) feet in depth) and construction of a horizontal steel intake pipeline (thirty-six (36) inches in diameter by approximately eight hundred fifty (850) feet in length. The applicant anticipates that material from within the interior of the caisson will be broken up by drilling closely spaced holes (to the full caisson depth) then removed with a crane clamshell bucket. The horizontal intake pipeline will be microtunneled (installed at elevation 1535 feet msl (mean sea level) - five (5) feet below the minimum reservoir pool level) from within the caisson to emergence with the lakebed (eight hundred (800) to eight hundred twenty-five (825) feet from the center of the caisson). Underwater installation of the exposed portion of the intake pipeline and intake screen will be performed by divers utilizing a barge. The exposed intake line and screen will be supported above the lakebed on steel H-piles or reinforced concrete support. A siltation sump (fifty (50) feet square) with two to one (2:1) side slopes will be excavated beneath the intake screen to provide a minimum separation distance between the bottom of the intake screen and lakebed of four (4) to six (6) feet. An estimated one thousand (1000) cubic yards of lakebed material will be excavated from the siltation sump area with a barge mounted crane and deposited immediately downstream of the sump excavation. Approximately one thousand ninety-five (1095) cubic yards of rock riprap (two (2) to three (3) feet in thickness) will be installed over filter fabric from toe elevation 1610 feet msl to a variable top elevation of up to 1624 feet msl to prevent erosion along the west and south sides of the caisson.

A separate eight (8) inch diameter steel pipeline (air backwash line) may be installed (by future dredging above the thirty-six (36) inch diameter intake pipeline) for the purpose of periodically dislodging accumulated matter from the intake screen. An additional one (1) inch diameter chemical feed pipeline may also be installed (by future dredging) to control clogging of the intake screen caused by zebra mussels should they become a problem.

The intake pump station (forty (40) square feet in size) will be constructed on top of the caisson to pump the lake water to a raw water regulating tank site from which water will flow via gravity to a water treatment plant. The proposed project would remove an estimated four thousand five hundred (4500) acre feet of water from the lake annually.

The purpose of the project is to provide an ample supply of clean, safe drinking water to approximately thirty thousand (30,000) South Dakota residents for domestic and livestock use. The project will also provide raw and treated water for wetland enhancement.

The project will be completed in several phases. This first phase of construction (intake structure) is scheduled to begin in the summer of 1994 with completion of the entire project anticipated by the year 2000. In its entirety, the project will include a ten (10) county, seven thousand (7000) square mile area in central South Dakota east of the Missouri River. The future construction of an estimated two thousand seven hundred twenty (2720) miles of pipelines consisting of mains, secondary and distribution lines will be considered for authorization under the Department of the Army permit program on a construction phase basis.

The South Dakota Department of Environment and Natural Resources, Division of Environmental Regulation, 523 East Capitol Avenue, Pierre, South Dakota 57501-3181, will review the proposed project for state certification in accordance with the provisions of Section 401 of the Clean Water Act. The certification, if issued, will express the State's opinion that the operations undertaken by the applicant will not result in a violation of applicable water quality standards. The South Dakota Department of Environment and Natural Resources hereby incorporates this public notice as its own public notice and procedures by reference (ARSD 74:03:02).

Omaha District will comply with the National Historic Preservation Act of 1966 and 36 CFR § 800. We have checked the National Register of Historic Places and "its current supplements," and no property listed in the Register or proposed for listing is located in the permit area. This is the extent of our knowledge about historic properties in the permit area at this time. However, we will evaluate input by the State Historic Preservation Officer and the public in response to this public notice, and we may conduct or require a reconnaissance survey of the permit area or check for unknown historic properties, if warranted.

In compliance with the Endangered Species Act, our review indicates that the proposed activity will not affect species designated as threatened or endangered pursuant to the Endangered Species Act or their critical habitat.

The decision whether to issue a permit will be based on an evaluation of the probable impacts including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the proposals must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the activity will be considered including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, flood plain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food production, and, in general the needs and welfare of the people. In addition, the evaluation of the impacts of the project on public interest will include application of the guidelines promulgated by the Administrator, Environmental Protection Agency, under authority of Section 404(b) of the Clean Water Act (40 CFR § 230).

The Corps of Engineers is soliciting comments from the public; Federal, state, and local agencies and officials; Indian Tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

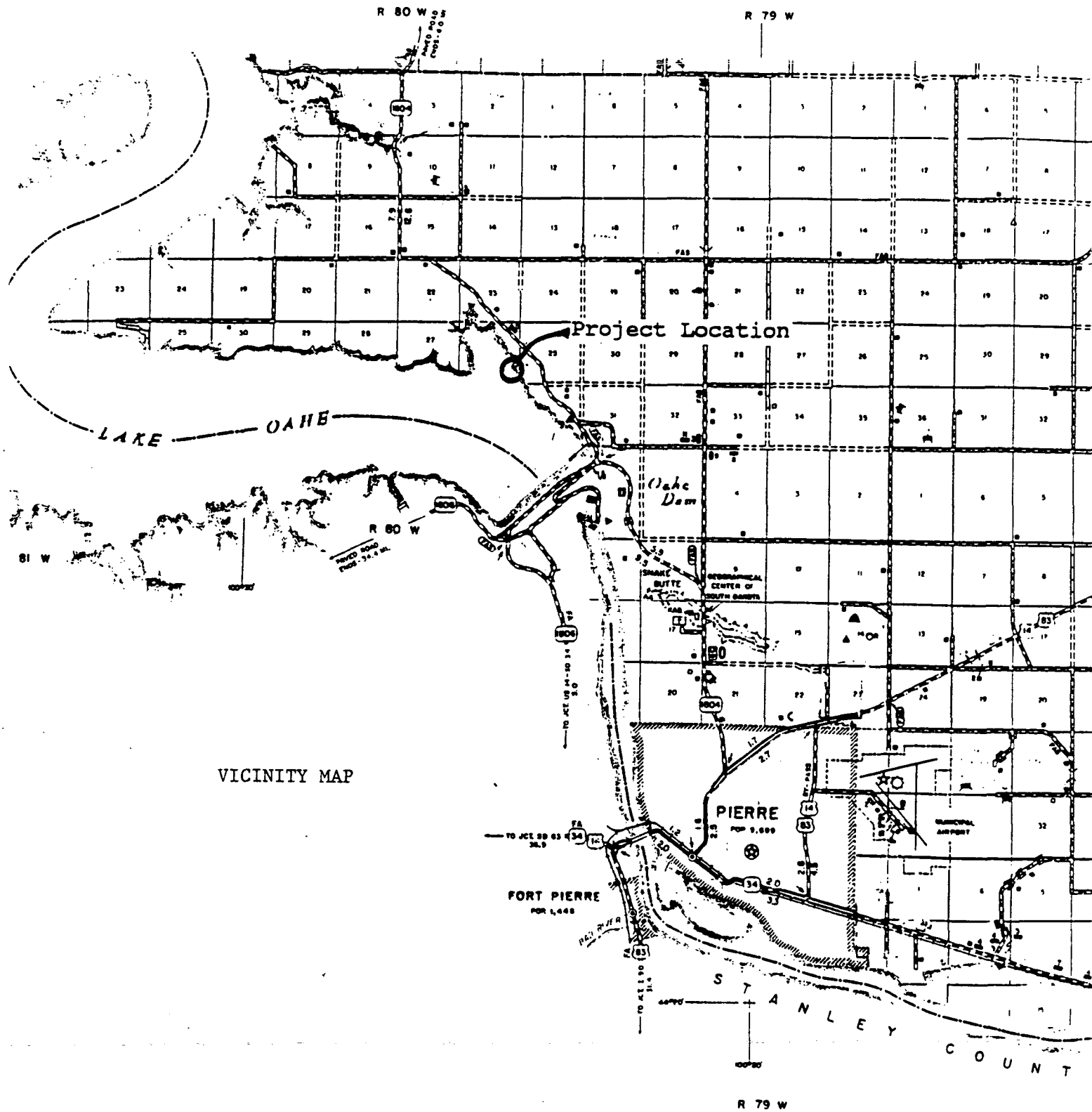
Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider this application. Requests for public hearings shall state, with particularity, the reason for holding a public hearing. The requests must be submitted to the US Army Corps of Engineers, Pierre Regulatory Office, Federal Building, Room 317, Pierre, South Dakota 57501.

Any interested party (particularly officials of any town, city, county, state, Federal agency, or local association whose interests may be affected by the proposed work) is invited to submit to this office, written facts, arguments, or objections on or before June 4, 1994. Any agency or individual having an objection to the proposed work should specifically identify it as an objection with clear and specific reasons. Comments, both favorable and unfavorable, will be accepted, made a part of the record and will receive full consideration in subsequent actions on this permit application. All replies to the public notice should be addressed to the address listed in the previous paragraph. Mr. Thomas A. Lowin, telephone number (605) 224-8531, may be contacted for additional information.

Comments received after the close of the business day on the expiration date of this public notice will not be considered.

This project, if authorized, will be under the provisions of Section 10 of the Rivers and Harbors Act of March 3, 1899 (30 Stat. 1151; 33 USC 403), and under the provisions of Section 404 of the Clean Water Act.

Drawings showing the location and extent of the work are attached to this notice.



PURPOSE: SUPPLY RAW WATER TO RURAL WATER SYSTEM TREATMENT PLANT

DATUM: USGS ELEVATIONS

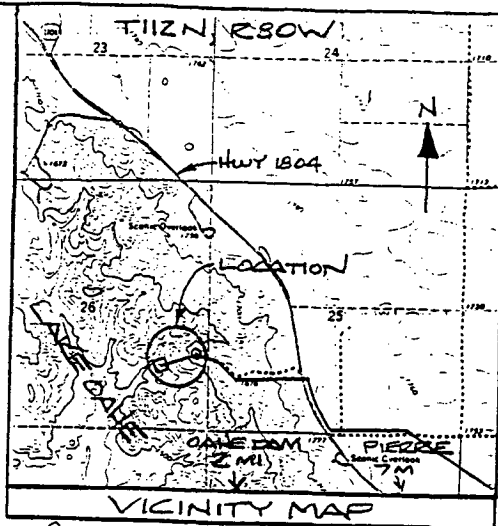
ADJACENT PROPERTY OWNERS: PROPOSED SITE LOCATED ON COE PROPERTY. ALL ADJACENT LAND OWNED BY C.O.E.

MID-DAKOTA RURAL WATER SYSTEM
BOX 315 MILLER, SD 57362

PROPOSED RAW WATER INTAKE

IN: MISSOURI RIVER, LAKE CAW
AT: 2 MI N. (UPSTREAM) OF OAHÉ DAM, EAST BANK
COUNTY: HUGHES STATE: SD

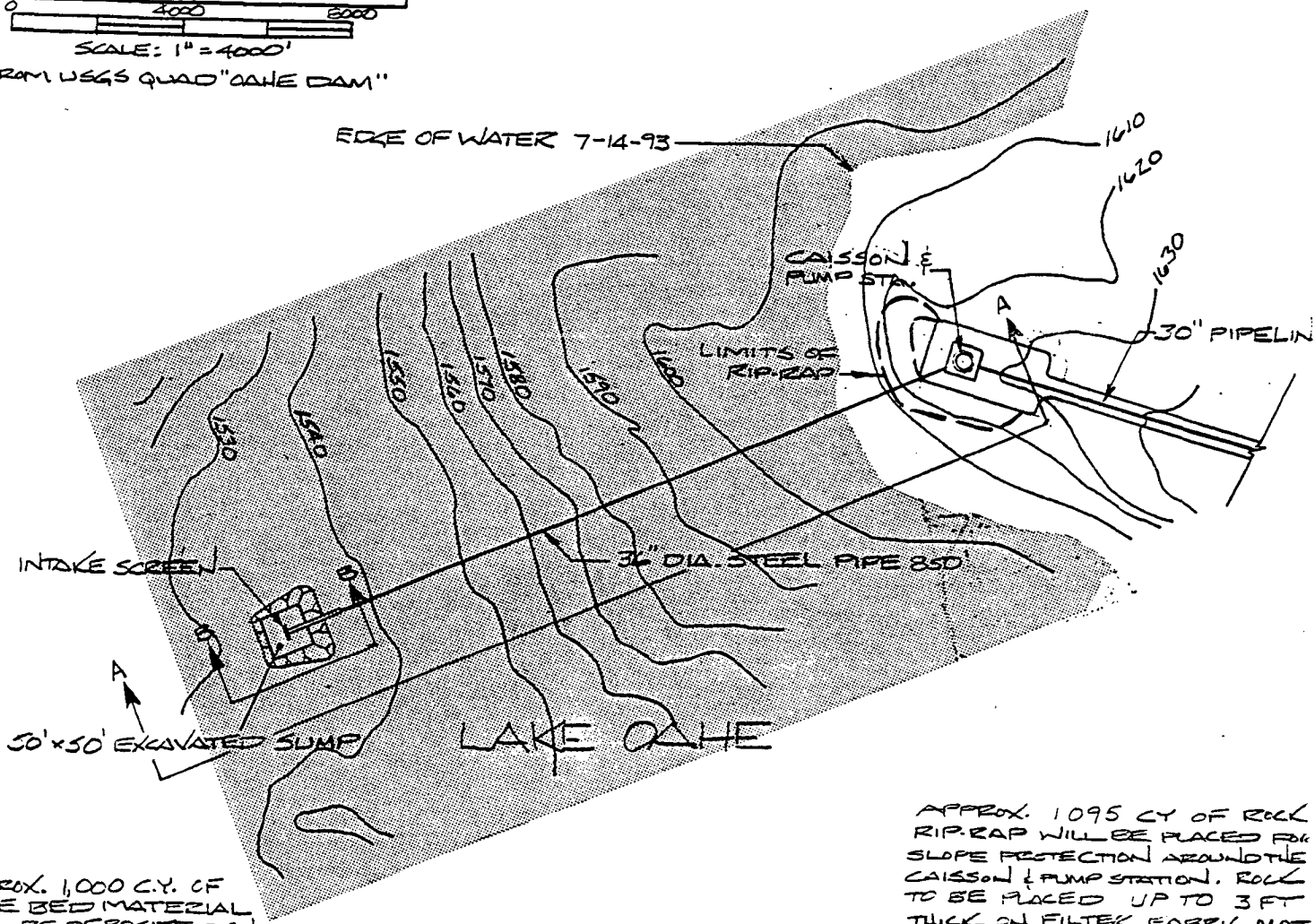
SHEET 1 OF 3



SITE LOCATION
SE 1/4 SEC. 26, T112N, R80W
LAT. 44°28'45" / LONG. 100°24'50"



EDGE OF WATER 7-14-93



APPROX. 1,000 C.Y. OF LAKE BED MATERIAL WILL BE DEPOSITED ON THE DOWNSTREAM SIDE OF THE SUMP EXCAVATION USING A CRANE WITH A CLAMSHELL BUCKET

APPROX. 1095 CY OF ROCK RIP-RAP WILL BE PLACED FOR SLOPE PROTECTION AROUND THE CAISSON & PUMP STATION. ROCK TO BE PLACED UP TO 3 FT THICK ON FILTER FABRIC MAT

APPLICATION BY: MID-DAKOTA RURAL WATER SYSTEM

PURPOSE: SUPPLY RAW WATER TO RURAL WATER SYSTEM TREATMENT PLANT

DATUM: USGS ELEVATIONS

ADJACENT PROPERTY OWNERS: PROPOSED SITE LOCATED ON COE PROPERTY. ALL ADJACENT LAND OWNED BY C.O.E.

PLAN VIEW
0 200 400
1" = 200'

MID-DAKOTA RURAL WATER SYSTEM
BOX 318 MILLER, SD 57362

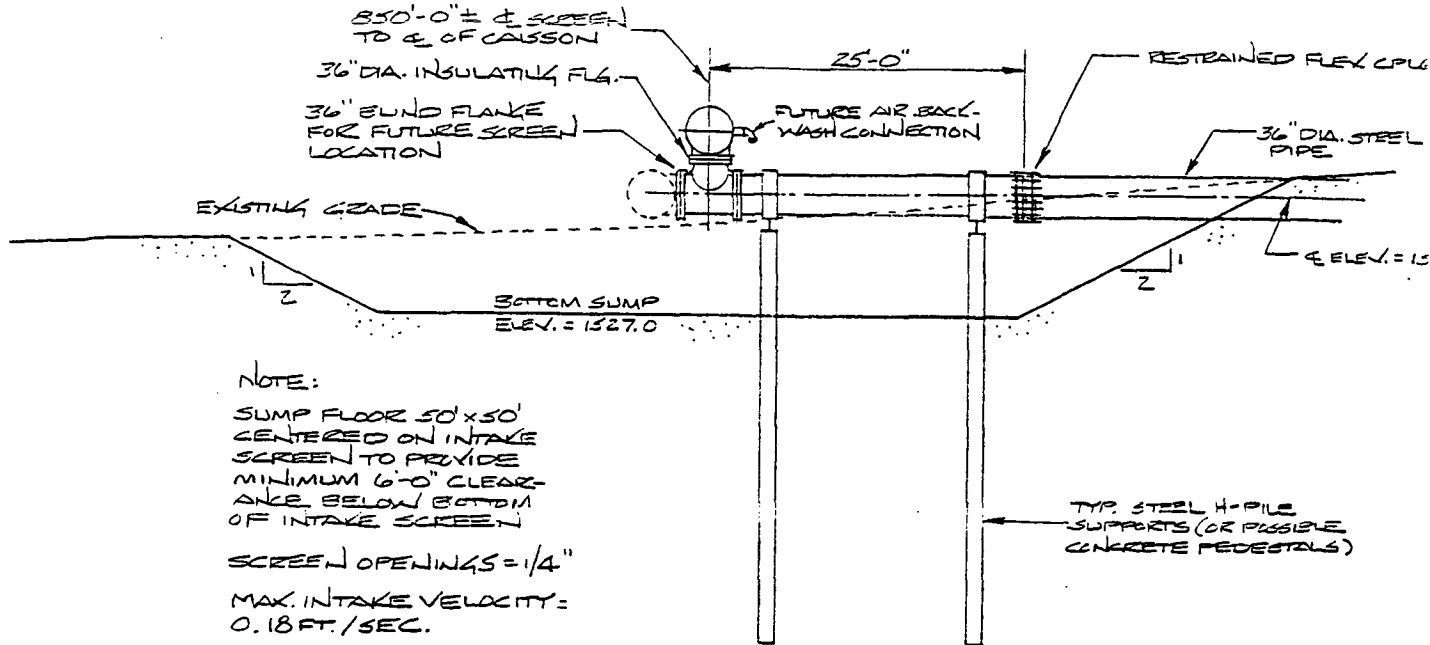
PROPOSED RAW WATER INTAKE

IN: MISSOURI RIVER, LAKE OAHÉ

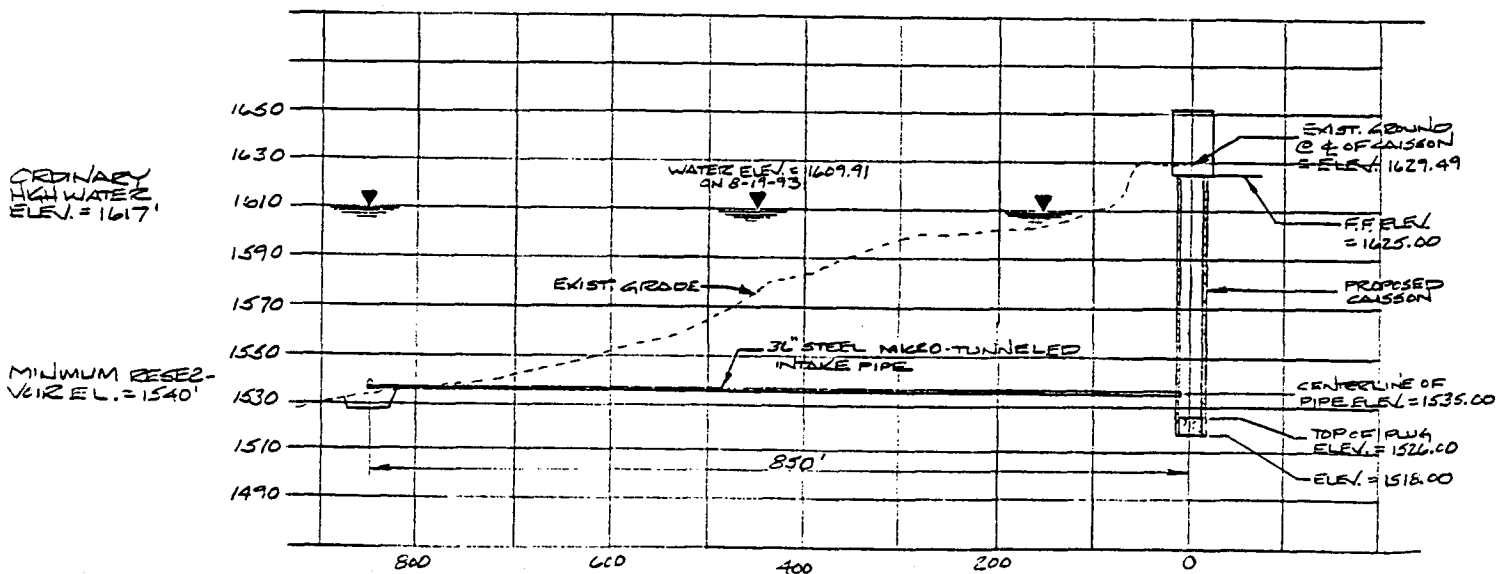
AT: 2 MI N. (UPSTREAM) OF OAHÉ DAM, EAST BANK

COUNTY: HUGHES STATE: SD

SHEET 2 OF 3 1-27-94



SECTION B-B
SCALE: 1" = 15'



SECTION A-A
HORIZ. 1" = 200' / VERT. 1" = 50'

APPLICATION BY: MID-DAKOTA
RURAL WATER SYSTEM

PURPOSE: SUPPLY RAW WATER TO RURAL WATER SYSTEM TREATMENT PLANT

DATUM: USGS ELEVATIONS

ADJACENT PROPERTY OWNERS:

PROPOSED SITE LOCATED ON C.O.E. PROPERTY. ALL ADJACENT LAND OWNED BY C.O.E.

SECTION VIEWS

MID-DAKOTA RURAL WATER SYSTEM

P.O. BOX 318

MILLER, SD 57362

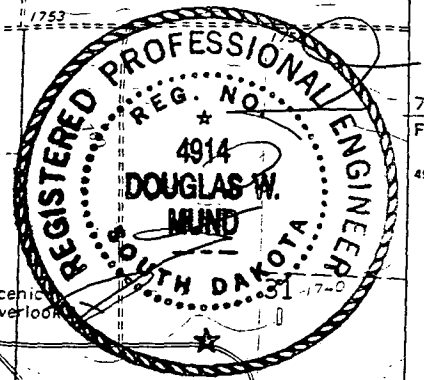
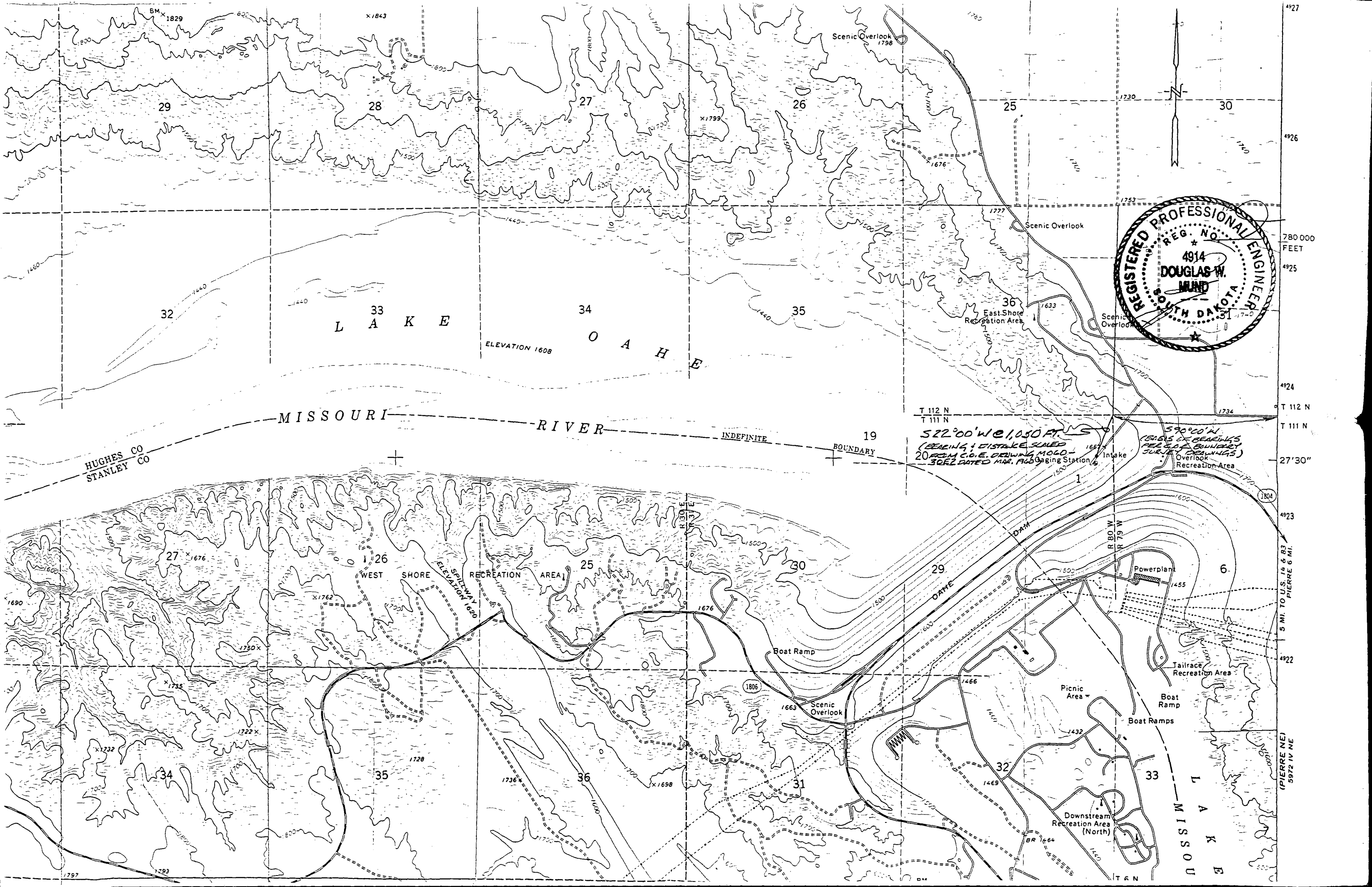
PROPOSED RAW WATER INTAKE

IN: MISSOURI RIVER, LAKE CAT

AT: 3 MI. N. (UPSTREAM) OF OAK DAM, EAST BANK

COUNTY: HUGHES STATE: SC

SHEET 3 OF 3 1-27-94



T 112 N
T 111 N
S 22° 00' W 1,050 FT. S
(BEARING & DISTANCE SCALED
FROM C.O.E. DRAWING MOGO-
3022 DATED MAR. 1962)
Intake
590° 00' W
(BASIS OF BEARINGS
PER C.O.E. DRAWING
SURVEY DRAWINGS)
Overlook
Recreation Area
1804
R 80 W
R 79 W
1804
5 MI. TO U.S. 14 & 83
PIERRE 6 MI.
(PIERRE NE)
5972 IV NE

RECEIPT

414088

Division of Water Rights

South Dakota Department of Environment and Natural Resources

Pierre, March 14, 1994

RECEIVED OF Douglas Mund, 800 Custer Dr., Mandan ND 58554

the following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. <u>5809-3</u> to Appropriate Water, to construct and to put water to beneficial use _____	50	00
Fee for Application for Permit No. _____ to Appropriate Water, for Future Use _____		
Fee to retain Future Use Permit No. _____ after period of seven years.		
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. _____		
Fee for Filing Transfer Form _____		
Fee for Filing Extension Request _____		
Fee for _____		

(Any Other Work Provided by Law)	Total	50 00

By

John Hatch
Chief Engineer

JOHN HATCH

ks

**Report on Water Permit Application No. 5809-3
Mid-Dakota Rural Water System. Inc.
March 29, 1994**

Background

Water Permit Application No. 5809-3 requests to amend Water Permit No. 5751-3, to change the location of the diversion point, to appropriate an additional 0.06 cubic feet of water per second (cfs), and to add additional users. Water permit No. 5751-3 is authorized to appropriate 16.49 cfs (9,999 acre-feet of water annually) from the Missouri River. Mid-Dakota Rural Water System, Inc. requests a change in the location of the diversion point from Lot 3 (E1/2 NE1/4) Section 1, T111N-R80W to the SE1/4 SE1/4 Section 26, T112N-R80W. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury, and Aurora Counties. The application requests to add the communities of Orient, Iroquois, Yale, and the Oahe Plains Systems Corporation. This application does not request an increase in the 9,999 acre-feet annual volume of water authorized by Water Permit No. 5751-3.

Discussion

Water Permit No. 5751-3 authorizes diversion from the Missouri River to provide, following treatment, a dependable high quality source of drinking water to over 30,000 people, and over 640,000 heads of livestock, in an area of over 7,000 square miles. Water Permit Application No. 5809-3 requests an additional 0.06 cfs (30 gallons per minute) with no increase in the 9,999 acre-feet annual volume of water authorized by Water Permit No. 5751-3.

Conclusions

Water Permit Application No. 5809-3 should be approved with the following qualification:

The Mid-Dakota Rural Water System, Inc. should annually report to the Chief Engineer the amount of water withdrawn from the Missouri River.



M. Rassool Ahadi
Natural Resources Engineer III

Approved By:



Delvin D. Brosz, P.E.
Natural Resources Engineer IV

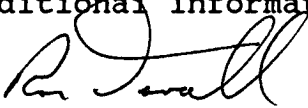
RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 5809-3, Mid-Dakota Rural Water System, Inc.

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Division, Department of Environment and Natural Resources concerning Water Permit Application No. 5809-3, Mid-Dakota Rural Water System, Inc., c/o Kurt Pfeifle, PO Box 318, Miller, SD 57362.

The Chief Engineer is recommending APPROVAL of Application No. 5809-3 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use and 4) in the public interest with the following qualification:

The Mid-Dakota Rural Water System, Inc. shall report to the Chief Engineer, annually, the amount of water withdrawn from the Missouri River.

See report on application for additional information.


for JOHN HATCH, Chief Engineer
May 2, 1994



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

NOTE: TO BE SURE OF PUBLICATION ON
THE CORRECT DATES, CONTACT
THE NEWSPAPERS RIGHT AWAY.

May 10, 1994

Kurt Pfeifle
Mid-Dakota Rural Water System, Inc.
PO Box 318
Miller, SD 57362

Dear Mr. Pfeifle:

Water Permit Application No. 5809-3 for rural water system use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice of hearing has been sent to the Publishers of the Potter Co. News printed at Gettysburg, SD (Ph # 765-2464), Faulk Co. Record printed at Faulkton, SD (Ph # 598-6525), The Onida Watchman printed at Onida, SD (Ph # 258-2724), Capital Journal printed at Pierre, SD (Ph # 224-7301), Highmore Herald printed at Highmore, SD (Ph # 852-2927), Miller Press printed at Miller, SD (Ph # 853-3575), Redfield Press printed at Redfield, SD (Ph # 472-0822), The Plainsman printed at Huron, SD (Ph # 352-6401), Brule Co. News printed at Kimball, SD (Ph # 778-6253), True Dakotan printed at Wessington Springs, SD (Ph # 539-1281), Woonsocket News printed at Woonsocket, SD (Ph # 796-4221), De Smet News printed at De Smet, SD (Ph # 854-3331) and South Dakota Mail printed at Plankinton, SD (Ph # 942-7770). For your information, a copy of the notice, the recommendation of the Chief Engineer and a report on the application are enclosed. Please review the notice prior to publication and notify this office, if you have any corrections or questions.

Be sure to contact the above newspapers to authorize publication of your Notice of Hearing and to arrange for payment. Early contact with the papers can eliminate delays. The publishers have been instructed to publish your notice once each week for two consecutive weeks with the last publication to occur twenty days before the board meeting. The newspapers have been instructed to send us the Proof of Publication. We must receive Proof of Publication before action can be taken on the application.

Sincerely,

Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

NOTE: If you plan to contest any part of the Chief Engineer's recommendation, you must file a petition pursuant to the procedures outlined in the attached notice of hearing. The Water Management Board will then consider your concerns during a hearing on the application.



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

May 10, 1994

Potter Co. News
Box 190
Gettysburg, SD 57442-0190

ATTENTION: Legal Department

Enclosed is a Notice of Hearing on Application No. 5809-3 to be published twice. Please publish the first notice on May 19, 1994, with the second publication 7 days later.

The APPLICANT MUST VERIFY TO YOU THAT THE NOTICE IS TO BE PUBLISHED, before you make the first publication. Please BILL the APPLICANT for the cost of publication. The APPLICANT is Mid-Dakota Rural Water System, Inc., PO Box 318, Miller, SD 57362 (Ph # 853-3159).

A copy of BOTH publications must be SENT to the WATER RIGHTS DIVISION. IMMEDIATELY return the FIRST publication with the FIRST Transmittal form on the bottom of this page. The first copy is needed to check the publication for errors so any corrections can be made in the second publication. Publication errors can invalidate the public notice and cause the applicant costly delays.

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Sincerely,

Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

-----CUT HERE-----
FIRST TRANSMITTAL NOTICE

TO: Eric Gronlund
Water Rights Division
Joe Foss Building
Pierre SD 57501-3181

No. _____

Date _____

We are in receipt of your letter of _____ enclosing Notice of
Hearing to Appropriate Water by Application No. _____ which was first
published in our issue of _____. ENCLOSED IS A COPY OF THIS
FIRST PUBLICATION.

Name

Newspaper



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

May 10, 1994

Faulk Co. Record
Box 68
Faulkton, SD 57438-0068

ATTENTION: Legal Department

Enclosed is a Notice of Hearing on Application No. 5809-3 to be published twice. Please publish the first notice on May 18, 1994, with the second publication 7 days later.

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Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

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FIRST TRANSMITTAL NOTICE

TO: Eric Gronlund
Water Rights Division
Joe Foss Building
Pierre SD 57501-3181

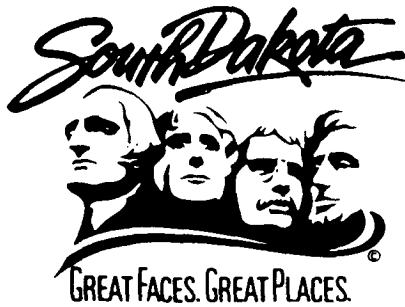
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Date _____

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**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

May 10, 1994

The Onida Watchman
Box 205
Onida, SD 57564-0205

ATTENTION: Legal Department

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Sincerely,

Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

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TO: Eric Gronlund
Water Rights Division
Joe Foss Building
Pierre SD 57501-3181

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Newspaper _____



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

May 10, 1994

Capital Journal
PO Box 878
Pierre, SD 57501-0878

ATTENTION: Legal Department

Enclosed is a Notice of Hearing on Application No. 5809-3 to be published twice. Please publish the first notice on May 16, 1994, with the second publication 7 days later.

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Sincerely,

Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

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FIRST TRANSMITTAL NOTICE TO: Eric Gronlund
Water Rights Division
Joe Foss Building
Pierre SD 57501-3181

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DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

May 10, 1994

Highmore Herald
Box 435
Highmore, SD 57345-0435

ATTENTION: Legal Department

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Natural Resources Engineer
605 773-3352

enclosures

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Water Rights Division
Joe Foss Building
Pierre SD 57501-3181

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**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

May 10, 1994

Miller Press
Box 196
Miller, SD 57362-0196

ATTENTION: Legal Department

Enclosed is a Notice of Hearing on Application No. 5809-3 to be published twice. Please publish the first notice on May 16, 1994, with the second publication 7 days later.

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Sincerely,

Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

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TO: Eric Gronlund
Water Rights Division
Joe Foss Building
Pierre SD 57501-3181

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**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

May 10, 1994

Redfield Press
Box 440
Redfield, SD 57469-0440

ATTENTION: Legal Department

Enclosed is a Notice of Hearing on Application No. 5809-3 to be published twice. Please publish the first notice on May 18, 1994, with the second publication 7 days later.

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Sincerely,

Eric Gronlund
Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

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FIRST TRANSMITTAL NOTICE

TO: Eric Gronlund
Water Rights Division
Joe Foss Building
Pierre SD 57501-3181

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Date _____

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Newspaper



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

May 10, 1994

The Plainsman
Box 1278
Huron, SD 57350-1278

ATTENTION: Legal Department

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**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

May 10, 1994

Brule Co. News
Box 46
Kimball, SD 57355-0046

ATTENTION: Legal Department

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Natural Resources Engineer
605 773-3352

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FIRST TRANSMITTAL NOTICE

TO: Eric Gronlund
Water Rights Division
Joe Foss Building
Pierre SD 57501-3181

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**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

May 10, 1994

True Dakotan
Box T
Wessington Springs, SD 57382

ATTENTION: Legal Department

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DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

May 10, 1994

Woonsocket News
Box 218
Woonsocket, SD 57385-0218

ATTENTION: Legal Department

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Natural Resources Engineer
605 773-3352

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Joe Foss Building
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**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

May 10, 1994

De Smet News
Box 69
De Smet, SD 57231-0069

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Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

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Joe Foss Building
Pierre SD 57501-3181

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**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

May 10, 1994

South Dakota Mail
Box 367
Plankinton, SD 57368-0367

ATTENTION: Legal Department

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Natural Resources Engineer
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Joe Foss Building
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Name

Newspaper

16, 17, 18,

Instruction to Newspaper - Publish first Notice on May¹⁹, 1994, with the second publication 7 days later. The applicant is responsible for payment.

NOTICE OF APPLICATION NO. 5809-3 to Appropriate Water
and to Amend Water Permit No. 5751-3

Notice is given that Mid-Dakota Rural Water System, Inc., PO Box 318, Miller, SD 57362 has filed an application for a water permit to change the location of the diversion point, appropriate an additional 0.06 cubic feet of water per second (cfs) [30 gallons per minute] and to add additional users. Water Permit No. 5751-3 appropriates 16.49 cfs (9,999 acre-feet annually) from the Missouri River. Mid-Dakota RWS proposes to change the location of the diversion point to the SE 1/4 SE 1/4 Section 26-T112N-R80W. This application requests an additional 0.06 cfs for use at the water treatment plant. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale and the Oahe Plains Systems Corporation. This application does not authorize an increase in the 9,999 acre-feet annual volume of water authorized by Permit No. 5751-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5809-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the chief engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and chief engineer. The applicant must file a petition if contesting the chief engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 6, 1994.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Division address to request copies of information pertaining to this application. Russell L. Stone, Acting Secretary, Department of Environment and Natural Resources.

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
 County of Potter) ss

I, Jack L. Stoner

certify that the attached printed Notice was

taken from the _____

Potter County News

printed and published in Gettysburg

County of Potter and State of

South Dakota. The notice was published in the newspaper on the following two dates:

May 19
and May 26, 1994

Cost of Printing: 56.92

Jack L. Stoner
 (Signature)

Publisher
 (Title)

June 6, 1994
 (Date Signed)

NOTICE OF APPLICATION NO. 5809-3 to Appropriate Water and to Amend Water Permit No. 5751-3

Notice is given that Mid-Dakota Rural Water System, Inc., PO Box 318, Miller S.D. 57362 has filed an application for a water permit to

change the location of the diversion point, appropriate an additional 0.1 cubic feet of water per second (cfs) (30 gallons per minute) and to accommodate additional users. Water Permit No. 5751-3 appropriates 16.49 cfs (9,999 acre-feet annually) from the Missouri River. Mid-Dakota RW

proposes to change the location of the diversion point to the SE 1/4 SE 1/4 Section 26-T112N-R80W. This application requests an additional 0.06 cfs for use at the water treatment plant. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale and the Oahe Plains Systems Corporation. This application does not authorize an increase in the 9,999 acre-feet annual volume of water authorized by Permit No. 5751-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5809-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the chief engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and chief engineer. The applicant must file a petition if contesting the chief engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E. Capitol, Pierre S.D. 57501 (605-773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 6, 1994.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the applica-

tion, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Division address to request copies of information pertaining to this application.

Russell L. Stone,
 Acting Secretary,
 Department of Environment
 and Natural Resources.

(Published in the Potter County News, May 19, and May 26, 1994.)





Affidavit of Publication

State of South Dakota

§

County of Faulk

James B. Moritz of said county, being first duly sworn, on oath says that he is the publisher of the **Faulk County Record**, a weekly newspaper printed and published in Faulkton in said County of Faulk and has a full and personal knowledge of all the facts therein stated; that said newspaper is a legal newspaper and has a bona-fide circulation of a least two hundred copies weekly, and has been published within said County for fifty-two successive weeks next prior to the publication of the notice herein mentioned, and was and is printed wholly or in part in an office maintained at said place of publication; that the

Mid-Dakota Rural Water System, Inc. Notice of Application No. 5809-3 to Appropriate Water and to Amend Water Permit No. 5751-3

a printed copy of which, taken from the paper in which same was published, is attached to this sheet, and is made a part of this Affidavit, was published in said newspaper at least once in each week for

Two (2)

successive weeks, on the day of each week on which said newspaper was regularly published, to-wit:

Wednesday, May 18, 1994
Wednesday, May 25, 1994

that the full amount of the fees for the publication of the annexed notice is

\$ 42.26

James B. Moritz

Subscribed and sworn to before me this

15th day of June, 1994

[Signature]

Notary Public
Faulk County, South Dakota

My Commission Expires
Sept. 16, 2000

No. 150, May 18 & 25, 1994

Notice

Notice of Application No. 5809-3 to Appropriate Water and to Amend Water Permit No. 5751-3

Notice is given that Mid-Dakota Rural Water System, Inc., PO Box 318, Miller, SD 57362 has filed an application for a water permit to change the location of the diversion point, appropriate an additional 0.06 cubic feet of water per second (cfs) [30 gallons per minute] and to add additional users. Water Permit No. 5751-3 appropriates 16.49 cfs (9,999 acre-feet annually) from the Missouri River. Mid-Dakota RWS proposes to change the location of the diversion point to the SE 1/4 SE 1/4 Section 26-T112N-R80W. This application requests an additional 0.06 cfs for use at the water treatment plant. The rural water system will serve users in Potter, Faulk, Sully, Hugh-

es, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale and the Oahe Plains Systems Corporation. This application does not authorize an increase in the 9,999 acre-feet annual volume of water authorized by Permit No. 5751-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5809-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the chief engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to

the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and chief engineer. The applicant must file a petition if contesting the chief engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 6, 1994.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Division address to request copies of information pertaining to this application. Russell L. Stone, Acting Secretary, Department of Environment and Natural Resources.

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
 County of Sully) ss

I, Parker Knox

certify that the attached printed Notice was

taken from the Onida

Watchman

printed and published in Onida

County of Sully and State of

South Dakota. The notice was published in the newspaper on the following two dates:

May 19, 1994

May 26, 1994

Cost of Printing: \$42.68

Parker Knox
 (Signature)

publisher
 (Title)

May 30, 1994
 (Date Signed)

NOTICE OF APPLICATION NO. 5809-3 TO APPROPRIATE WATER and to Amend Water Permit No. 5751-3

Notice is given that Mid-Dakota Rural Water System, Inc., PO Box 318, Miller, SD 57362 has filed an application for a water permit to change the location of the diversion point, appropriate an additional 0.06 cubic feet of water per second (cfs) (30 gallons per minute) and to add additional users. Water Permit No. 5751-3 appropriates 16.49 cfs (9,999 acre-feet annually) from the Missouri River. Mid-Dakota RWS proposes to change the location of the diversion point to the SE 1/4 SE 1/4 Section 26-T112N-R80W. This application requests an additional 0.06 cfs for use at the water treatment plant. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale and the Oahe Plains Systems Corporation. This application does not authorize an increase in the 9,999 acre-feet annual volume of water authorized by Permit No. 5751-3.

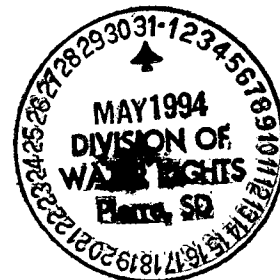
Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5809-3 because 1) unappropriated water is available, (2) existing rights will not be unlawfully impaired, (3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the chief engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and chief engineer. The applicant must file a petition if contesting the chief engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E. Capitol, Pierre SD 57501 (605-773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 6, 1994.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Division address to request copies of information pertaining to this application. Russell L. Stone, Acting Secretary, Department of Environment and Natural Resources.

-19-20

correction made
 5/31/94 ESH



PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
County of Hughes) ss

I, Peggy Warner

certify that the attached printed Notice was

taken from the Capital Journal

printed and published in Pierre

County of Hughes and State of

South Dakota. The notice was published in the newspaper on the following two dates:

May 16, 1994

May 23, 1994

Cost of Printing: 46.41

Peggy Warner
(Signature)

Legal Representative
(Title)

May 24, 1994
(Date Signed)

No. 7641 Duly 5/16, 5/23
NOTICE OF APPLICATION
NO. 5809-3 to Appropriate
Water and to Amend Water
Permit No. 5751-3

Notice is given that Mid-Dakota Rural Water System, Inc., PO Box 318, Miller, SD 57362 has filed an application for a water permit to change the location of the diversion point, appropriate an additional 0.06 cubic feet of water per second (cfs) (30 gallons per minute) and to add additional users. Water Permit No. 5751-3 appropriates 16.49 cfs (9,999 acre-feet annually) from the Missouri River. Mid-Dakota RWS proposes to change the location of the diversion point to the SE 1/4 SE 1/4 Section 26-T112N-R80W. This application requests an additional 0.06 cfs for use at the water treatment plant. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale and the Oahe Plains Systems Corporation. This application does not authorize an increase in the 9,999 acre-feet annual volume of water authorized by Permit No. 5751-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5809-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the chief engineer will act on the appli-

cation, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and chief engineer. The applicant must file a petition if contesting the chief engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E. Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 6, 1994.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Division address to request copies of information pertaining to this application. Russell L. Stone, Acting Secretary, Department of Environment and Natural Resources.



Affidavit of Publication

STATE OF SOUTH DAKOTA)

COUNTY OF HYDE)

SS.



MARY ANN MORFORD

of said county and state, being duly sworn, on her oath says: THE HIGHMORE HERALD is a weekly newspaper of general circulation, printed and published in HIGHMORE in said county and state by Mary Ann Morford and has been such a newspaper during the times hereinafter mentioned; that the said HIGHMORE HERALD is a legal newspaper and has been in existence for more than one year immediately preceding the first publication herein mentioned, and has more than two hundred bona fide subscribers; that I the undersigned, am publisher of said newspaper, in charge of the advertising department thereof, and have personal knowledge of all the facts stated in this affidavit and that the advertisement entitled

Notice of Application

a printed copy of which is hereto attached, was printed and published in said newspaper for 2 successive issues, the first publication being made on May 19 1994, and the last publication on May 26 1994; that \$ 42.82 being the full amount of the fee for publication of the annexed notice, insures solely to the benefit of the publisher of said newspaper; that no arrangement or understanding for a division thereof has been made with any person, and that no part thereof has been agreed to be paid to any other person whomsoever.

Mary Ann Morford
Mary Ann Morford, Publisher

Subscribed and sworn to before me this 6th

day of June, 1994

Nick Mason
Notary Public, Hyde County, South Dakota

My Commission Expires 8-26-99

NOTICE OF APPLICATION NO. 5809-3

to Appropriate Water and to Amend Water Permit No. 5751-3

Notice is hereby given that Mid-Dakota Rural Water System, Inc., PO Box 318, Miller, SD 57362 has filed an application for a water permit to change the location of the diversion point, appropriate an additional 0.06 cubic feet of water per second (cfs) [30 gallons per minute] and to add additional users. Water Permit No. 5751-3 appropriates 16.49 cfs (9,999 acre-feet annually) from the Missouri River. Mid-Dakota RWS proposes to change the location of the diversion point to the SE ¼ SE ¼ Section 26-T112N-R80W. This application requests an additional 0.06 cfs for use at the water treatment plant. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kinsbury and Aurora counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale and the Oahe Plains Systems Corporation. This application does not authorize an increase in the 9,999 acre-feet annual volume of water authorized by Permit No. 5751-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5809-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the chief engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and chief engineer. The applicant must file a petition if contesting the chief engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E Capitol, Pierre, SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 6, 1994.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Division address to request copies of information pertaining to this application. Russell L. Stone, Acting Secretary, Department of Environment and Natural Resources.

FPNO 36

LPNO 37

Length of line 12 pic
Size of type 8 pt
Number of lines 75
Line rate 297817

AFFIDAVIT OF PUBLICATION

STATE OF SOUTH DAKOTA)

)SS

County of Hand)

Gary L. McFarlane of said county being first duly sworn, on oath says that he is the publisher of The Miller Press, a weekly newspaper printed and published in Miller, said County of Hand and has full and personal knowledge of all the facts herein stated; that said newspaper is a legal newspaper and has a bona-fide circulation of at least two hundred copies weekly, and has been published within said County for fifty-two successive weeks next prior to the publication of the notice herein mentioned, and was and is printed wholly or in part in an office maintained at said place of publication; that the application 5809-3 to

appropriate water

a printed copy of which, taken from the paper in which the same was published, is attached to this sheet, and is made a part of this Affidavit, was published in said newspaper at least once in each week two successive weeks, on the day of each week on which said newspaper was regularly published, to wit:

<u>May 16</u>	19 <u>94</u> ;	19 <u>22.34</u>
<u>May 23</u>	19 <u>94</u> ;	19 <u>17.91</u>
_____	19 _____;	19 _____
_____	19 _____;	19 _____
_____	19 _____;	19 _____

that the full amount of the fees for the publication of the annexed notice is \$ 40.21

Gary L. McFarlane

Subscribed and sworn to before me this 23rd

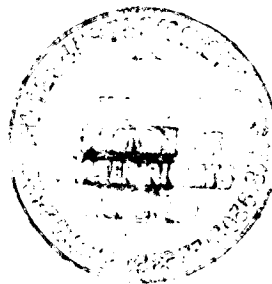
day of May

19 94
[Signature]

Notary Public

MY COMMISSION EXPIRES MAY 6, 2001

County of Hand, South Dakota



Notice of Application No. 5809-3 to Appropriate Water and to Amend ^{14.21} Water Permit No. 5751-3

Notice is given that Mid-Dakota Rural Water System, Inc., P.O. Box 318, Miller, SD 57362 has filed an application for a water permit to change the location of the diversion point, appropriate an additional 0.06 cubic feet of water per second (cfs) [30 gallons per minute] and to add additional users. Water Permit No. 5751-3 appropriates 16.49 cfs (9,999 acre-feet annually) from the Missouri River. Mid-Dakota RWS proposes to change the location of the diversion point to the SE 1/4 SE 1/4 Section 26-T112N-R80W. This application requests an additional 0.06 cfs for use at the water treatment plant. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale, and the Oahe Plains Systems Corporation. This application does not authorize an increase in the 9,999 acre-feet annual volume of water authorized by Permit No. 5751-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5809-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 462A-23, the chief engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the

chief engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and chief engineer. The applicant must file a petition if contesting the chief engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E. Capitol, Pierre, SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 6, 1994.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Division address to request copies of information pertaining to this application. Russell L. Stone, Acting Secretary, Department of Environment and Natural Resources.

FPNO 38

LPNO 39

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
 County of Spink) ss

OK

I, Margaret Mundtrock
 certify that the attached printed Notice was
 taken from the Redfield Press

printed and published in Sp Redfield
 County of Spink and State of

South Dakota. The notice was published in
 the newspaper on the following two dates:

May 18, 1994
May 25, 1994

Cost of Printing: \$35.93

Margaret Mundtrock
 (Signature)

Bookkeeper
 (Title)

June 10, 1994
 (Date Signed)



Notice to appropriate water

No. 59

NOTICE OF APPLICATION NO. 5809-3 TO APPROPRIATE WATER AND TO AMEND WATER PERMIT NO. 5751-3

Notice is given that Mid-Dakota Rural Water System, Inc., PO Box 318, Miller, SD 57362 has filed an application for a water permit to change the location of the diversion point, appropriate an additional 0.06 cubic feet of water per second (cfs) [30 gallons per minute] and to add additional users. Water Permit No. 5751-3 appropriates 16.49 cfs (9,999 acre-feet annually) from the Missouri River. Mid-Dakota RWS proposes to change the location of the diversion point to the SE 1/4 SE 1/4 Section 26-T112N-R80W. This application requests an additional 0.06 cfs for use at the water treatment plant. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora Counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale and the Oahe Plains Systems Corporation. This application does not authorize an increase in the 9,999 acre-feet annual volume of water authorized by Permit No. 5751-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5809-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the chief engineer will act on the

application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and chief engineer. The applicant must file a petition if contesting the chief engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E Capitol, Pierre, SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 6, 1994.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Division address to request copies of information pertaining to this application.

Russell L. Stone
 Acting Secretary
 Department of Environment
 and Natural Resources

(May 18, 25)

**NOTICE OF APPLICATION
No. 5809-3 to Appropriate Water
and to Amend****Water Permit No. 5751-3**

Notice is given that Mid-Dakota Rural Water System, Inc., PO Box 318, Miller, SD 57362 has filed an application for a water permit to change the location of the diversion point, appropriate an additional 0.06 cubic feet of water per second (cfs) [30 gallons per minute] and to add additional users. Water Permit No. 5751-3 appropriates 16.49 cfs (9,999 acre-feet annually) from the Missouri River. Mid-Dakota RWS proposes to change the location of the diversion point to the SE 1/4 SE 1/4 Section 26-T112N-R80W. This application requests an additional 0.06 cfs for use at the water treatment plant. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale and the Oahe Plains Systems Corporation. This application does not authorize an increase in the 9,999 acre-foot annual volume of water authorized by Permit No. 5751-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5809-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the chief engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and chief engineer. The applicant must file a petition if contesting the chief engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E. Capitol, Pierre, SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 6, 1994.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Division address to request copies of information pertaining to this application. Russell L. Stone, Acting Secretary, Department of Environment and Natural Resources.

No. 236 (adv.)

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
County of Beadle) ss

I, Mary Walz

certify that the attached printed Notice was

taken from the Plainsman

printed and published in Huron

County of Beadle and State of

South Dakota. The notice was published in
the newspaper on the following two dates:

May 16, 1994

May 23, 1994

Cost of Printing: \$96.40

Mary B. Walz
(Signature)

Business Manager
(Title)

May 23, 1994
(Date Signed)



10-10-442-96-40

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
 County of Bruce) ss



I, PAT HAYS

certify that the attached printed Notice was

taken from the Bruce County News

printed and published in Kimball

County of Bruce and State of

South Dakota. The notice was published in
 the newspaper on the following two dates:

May 19, 1994

May 26, 1994

Cost of Printing: 41.95

[Signature]
 (Signature)

Co-Publisher/Bookkeeper
 (Title)

May 26, 1994
 (Date Signed)



NOTICE OF APPLICATION NO. 5809-3 TO APPROPRIATE WATER AND TO AMEND WATER PERMIT NO. 5751-3

Notice is given that Mid-Dakota Rural Water System, Inc., PO Box 318, Miller, SD 57362 has filed an application for a water permit to change the location of the diversion point, appropriate an additional 0.06 cubic feet of water per second (cfs) (30 gallons per minute) and to add additional users. Water Permit No. 5751-3 appropriates 16.49 cfs (9,999 acre-feet annually) from the Missouri River. Mid-Dakota RWS proposes to change the location of the diversion point to the SE 1/4 SE 1/4 Section 26-T112N-R80W. This application requests an additional 0.06 cfs for use at the water treatment plant. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale and the Oahe Plains Systems Corporation. This application does not authorize an increase in the 9,999 acre-feet annual volume of water authorized by Permit No. 5751-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5809-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the chief engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and chief engineer. The applicant must file a petition if contesting the chief engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E. Capitol, Pierre SD 57501 (605) 773-3352" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 6, 1994.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Division address to request copies of information pertaining to this application.

Russell L. Stone,
 Acting Secretary, Department of
 Environment and Natural Resources
 (May 19, May 26)

Affidavit of Publication

STATE OF SOUTH DAKOTA, COUNTY OF JERAULD, SS.

Karen Wenzel being first duly sworn, deposes and says: that he is a resident of the County of Jerauld and State of South Dakota; and The Wessington Springs True Dakotan is a weekly newspaper of general circulation, printed and published in Wessington Springs, in said county by J. Craig and Dennis P. Wenzel; and is now and has been such newspaper continuously, during all the times hereafter mentioned; that the affiant is, and was during all the times hereafter mentioned, the business manager of said newspaper, in charge of the advertising department thereof; and has personal knowledge of all the facts stated in this affidavit;

and that the notice and advertisement headed *Notice of Application* No. 5809-3

a printed copy of which is hereunto attached and made a part hereof, was printed and published in said newspaper in *2* successive issues. That the first publication of said notice in said newspaper aforesaid was on Wednesday, the *17* day of *May* 19 *94*; and that the succeeding publications were:

on Wednesday, the *24* day of *May* 19 *94*
on Wednesday, the day of 19
on Wednesday, the day of 19
on Wednesday, the day of 19
on Wednesday, the day of 19
on Wednesday, the day of 19
on Wednesday, the day of 19
on Wednesday, the day of 19
that the fee charged for the printing and publishing of said notice and advertisement in said news-

paper as aforesaid, was *53* dollars and *87* cents, and for this affidavit; twenty-five (25) cents, and that said fee for printing and publishing said notice and advertisement in said newspaper has been fully paid; that the full amount of fees charged for the publishing of the said attached and annexed notice and advertisement inures to the benefit of the publisher of the said True Dakotan; and no agreement or understanding for the division thereof has been made with any person whomsoever; that the said newspaper is a legal newspaper as provided by law *Karen Wenzel*

Subscribed and sworn to before me, this *6* day of *June* 19 *94*.

Penny Wenzel Notary Public in and for
Jerauld County, South Dakota

AFFIDAVIT EX-REL. PUBLICATION

STATE OF SOUTH DAKOTA, COUNTY OF JERAULD, SS.

..... being first duly sworn
the authorized attorneys of the

..... in the action mentioned and described in the annexed notice; that the affiant directed the publication of the annexed notice; that no agreement or understanding for any division of the fees therefor has been made with any person whomsoever; and that no part thereof has been refunded or rebated by the party publishing said notice.

Subscribed and sworn to before me this day of 19

Notary Public, Jerauld County, South Dakota

to Appropriate Water and to Amend Water Permit No. 5751-3

Notice is given that Mid-Dakota Rural Water System, Inc., PO Box 318, Miller, SD 57362 has filed an application for a water permit to change the location of the diversion point, appropriate an additional 0.06 cubic feet of water per second (cfs) [30 gallons per minute] and to add additional users. Water Permit No. 5751-3 appropriates 16.49 cfs (9,999 acre-feet annually) from the Missouri River. Mid-Dakota RWS proposes to change the location of the diversion point to the SE 1/4 SE 1/4 Section 26-T112N-R80W. This application requests an additional 0.06 cfs for use at the water treatment plant. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale and the Oahe Plains Systems Corporation. This application does not authorize an increase in the 9,999 acre-foot annual volume of water authorized by Permit No. 5751-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5809-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the chief engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and chief engineer. The applicant must file a petition if contesting the chief engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E Capitol, Pierre, SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 6, 1994.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Division address to request copies of information pertaining to this application. Russell L. Stone, Acting Secretary, Department of Environment and Natural Resources. c-30,31



PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
 County of Sanborn) ss



I, Gerald W. Klaas

certify that the attached printed Notice was
 taken from the Woonsocket News

printed and published in Woonsocket

County of Sanborn and State of

South Dakota. The notice was published in
 the newspaper on the following two dates:

May 19, 1994

May 26, 1994

Cost of Printing: \$ 47.52

Gerald W. Klaas
 (Signature)

Publisher
 (Title)

5/26/94
 (Date Signed)

NOTICE OF APPLICATION NO. 5809-3 to Appropriate Water and to Amend Water Permit No. 5751-3

Notice is given that Mid-Dakota Rural Water System, Inc., PO Box 318, Miller, SD 57362 has filed an application for a water permit to change the location of the diversion point, appropriate an additional 0.06 cubic feet of water per second (cfs) (30 gallons per minute) and to add additional users. Water permit No. 5751-3 appropriates 16.49 cfs (9,999 acre-feet annually) from the Missouri River. Mid-Dakota RWS proposes to change the location of the diversion point to the SE 1/4 SE 1/4 Section 26-T112N-R80W. This application requests an additional 0.06 cfs for use at the water treatment

plant. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale and the Oahe Plains Systems Corporation. This application does not authorize an increase in the 9,999 acre-feet annual volume of water authorized by Permit No. 5751-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5809-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the chief engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

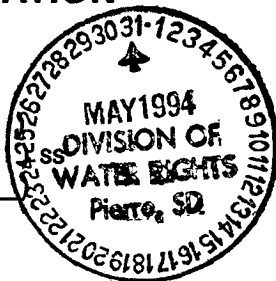
Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and chief engineer. The applicant must file a petition if contesting the chief engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E. Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 6, 1994.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Division address to request copies of information pertaining to this application. Russell L. Stone, Acting Secretary, Department of Environment and Natural Resources.

W35-2t

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA

County of KingsburyI, Dale Blegen

certify that the attached printed Notice was

taken from the De Smet Newsprinted and published in De SmetCounty of Kingsbury and State ofSouth Dakota. The notice was published in
the newspaper on the following two dates:May 18, 1994May 25, 1994Cost of Printing: 43.09

(Signature)

(Title)

(Date Signed)

NOTICE OF APPLICATION NO. 5809-3 to Appropriate Water and to Amend Water Permit No. 5751-3

Notice is given that Mid-Dakota Rural Water System, Inc., PO Box 318, Miller, SD 57362 has filed an application for a water permit to change the location of the diversion point, appropriate an additional 0.06 cubic feet of water per second (cfs) (30 gallons per minute) and to add additional users. Water Permit No. 5751-3 appropriates 16.49 cfs (9,999 acre-feet annually) from the Missouri River. Mid-Dakota RWS proposes to change the location of the diversion point to the SE 1/4 SE 1/4 Section 26-T112N-R80W. This application requests an additional 0.06 cfs for use at the water treatment plant. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale and the Oahe Plains Systems Corporation. This application does not authorize an increase in the 9,999 acre-feet annual volume of water authorized by Permit No. 5751-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5809-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the chief engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and chief engineer. The applicant must file a petition if contesting the chief engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 6, 1994.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Division address to request copies of information pertaining to this application. Russell L. Stone, Acting Secretary, Department of Environment and Natural Resources.

5-18-2wc-5-25

**NOTICE OF APPLICATION
NO. 5809-3 to Appropriate
Water and to Amend Water
Permit No. 5751-3**

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
County of Aurora) ss

I, Edward Van Bender

certify that the attached printed Notice was

taken from the South Dakota Mail

printed and published in Blankinton

County of Aurora and State of

South Dakota. The notice was published in
the newspaper on the following two dates:

May 19, 1994

May 26, 1994

Cost of Printing: \$49.73

Edward Van Bender
(Signature)

Blankinton
(Title)

5-26-94
(Date Signed)

Notice is given that Mid-Dakota Rural Water System, Inc., PO Box 318, Miller, SD 57362 has filed an application for a water permit to change the location of the diversion point, appropriate an additional 0.06 cubic feet of water per second [cfs] [30 gallons per minute] and to add additional users. Water Permit No. 5751-3 appropriates 16.49 cfs [9,999 acre-feet annually] from the Missouri River. Mid-Dakota RWS proposes the change the location of the diversion point to the SE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 26-T112N-R80W. This application requests an additional 0.06 cfs for use at the water treatment plant. The rural water system will serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora counties. The additional communities and users to be served by the system are Orient, Iroquois, Yale and the Oahe Plains Systems Corporation. This application does not authorize an increase in the 9,999 acre-feet annual volume of water authorized by Permit No. 5751-3.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5809-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. In accordance with SDCL 46-2A-23, the chief engineer will act on the application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider the application. Notice of the hearing will be given to the applicant and any person filing a petition.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and chief engineer. The applicant must file a petition if contesting the chief engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E. Capitol, Pierre, SD 57501 [605-773-3352]" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by June 6, 1994.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Division address to request copies of information pertaining to this application.

Russell L. Stone,
Acting Secretary,
Department of Environment
and Natural Resources

2-1c.-MAY 26





**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

AUG 19 1994

Kurt Pfeifle
Mid-Dakota Rural Water System, Inc.
PO Box 318
Miller, SD 57362

Dear Mr. Pfeifle:

Enclosed is Water Permit No. 5809-3 authorizing construction of your water diversion system and beneficial use of the water, not exceeding the limits as specified in the Water Permit.

Also enclosed is Form 10, Notice of Completion of Works and Application of Water to Beneficial Use, which you are to complete and submit to the Chief Engineer when you have completed the system and/or have put the water to beneficial use. An inspection can then be scheduled so that the Water License may be issued, thus completing your acquisition of a Water Right.

Very truly yours,

JOHN HATCH, Chief Engineer
Water Rights Division
605 773-3352

enclosures

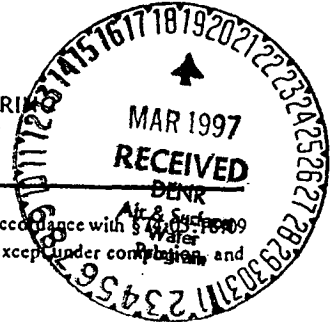
PLEASE NOTE: Certain changes can be made in your permit within the five year construction period, usually without affecting the priority date provided an application to amend your permit is made within the five year period - i.e. changes in location or number of diversion points (wells) or location of land to be irrigated. Well locations for wells into the same aquifer can be moved up to 660 feet without application.

Applications to amend a permit after the five year construction period will be assigned a new priority date. Applications to change water sources, to add lands or increase original diversion rates, if approved will usually receive the date of the new application as a priority date regardless of the five year construction period.



DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

NOTICE OF INTENT
TO RECEIVE COVERAGE UNDER THE
GENERAL PERMIT FOR TEMPORARY DEWATERING
AND A TEMPORARY WATER USE PERMIT



This form is provided by the Secretary of the South Dakota Department of Environment and Natural Resources in accordance with the Administrative Rules of South Dakota. No South Dakota Surface Water Discharge Permit will be issued except under conditions and submittal of this form to the following addresses:

original to: South Dakota Department of Environment
and Natural Resources
Point Source Control Program
Joe Foss Building
523 East Capitol Avenue
Pierre, South Dakota 57501-3181
Telephone: (605) 773-3351 FAX: (605) 773-4068

copy to: U.S. Environmental Protection Agency
Region VIII
NPDES Branch (8WM-C)
999 18th Street, Suite 500
Denver, CO 80202-2466
Telephone: (303) 293-1260

PLEASE PRINT OR TYPE

1. Name of Facility: Main Transmission Pipeline & Highmore Tower
2. Mailing Address of Owner:
Name Mid-Dakota Rural Water System, Inc.
Street P.O. Box 318
City Miller
State South Dakota County Hand Zip Code 57362-0318
3. Mailing address of facility (if different from owner):
Name Same
Street _____
City _____
State _____ County _____ Zip Code _____
4. Telephone Number:
Owner: (605) 853-3159 Facility: () Fax: (605) 853-3245
5. Standard Industrial Classification (SIC) Code of facility: 4941-03
6. Is this facility located in Indian country? ☐ Yes ☒ No
7. Please list all the activities which require the applicant to obtain a discharge permit.
Hydrostatic Testing, Disinfection, Flushing
8. Estimate the following:
Date water withdrawal will commence: 05/12/97 Date for commencement of discharge: 05/13/97
Termination date of withdrawal: 10/23/97 Termination date of discharge: 10/24/97
Total volume of withdrawal: 40 Million Gallons Total volume of discharge: 40 Million Gallons
Average flow rate of withdrawal: 2,835 gpm Average flow rate of discharge: 5,500 gpm
9. Source of water which is to be discharged: Lake Oahe
10. Name of Receiving Waters: Medicine Knoll

FOR SDDENR USE ONLY

Permit Number: _____	Date Received: _____
Date Permitted: _____	PCS: _____

11. Brief description of water treatment processes employed, if any: Disinfection, Rapid Mix and Flocculation Rapid Rate Gravity Filtration,

12. Describe the discharge and the type of wastewater from each outfall. Include all overflows, bypasses, or discharges from holding ponds, trenches, excavations, vessels, pipelines, etc.:

Outfall 001 Pipeline blowoff, potable water and dechlorinated water

Outfall 002 Pipeline blowoff, potable water and dechlorinated water

Outfall 003 _____

Attach additional sheets if necessary.

NOTE: Please place points of discharge on a topographic map, or other map if a topographic map is unavailable. This map should extend to one (1) square mile beyond the property boundaries of the facility and each of its discharge facilities, and those wells, springs, and other surface water bodies, drinking water wells, and surface water intake structures listed in public records, or otherwise known to the applicant in the map area.

13. Is there any reason to believe that the discharge may contain any pollutant other than those limited in the permit (i.e. TSS and TPH)? ☒ Yes ☐ No

If yes, list any pollutants that may be present: Total Suspended Solids (TSS); See Item 18.

NOTE: Attach any analytical data which indicate levels of pollutants present in water to be discharged.

If requesting coverage for Hydrostatic Testing related discharges, complete questions 14-17.

14. Type of vessel being tested: potable water pipeline and storage tank

15. Material from which vessel is constructed: mortar lined ductile iron and steel

16. Check appropriate box: ☐ Vessel has been previously used ☒ Vessel is virgin material

17. Description of fluid material normally contained/transported through the vessel:
water

18. List other information which you feel should be brought to the attention of the SDDENR regarding coverage under this general permit.
From Item 13, small amounts of suspended solids (dust or dirt) which may have entered pipeline during construction.

Attach additional sheets if necessary.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including revocation of the permit and the possibility of fine and imprisonment for knowing violations.

NOTE: Notice of Intent must be signed by the authorized chief elective or executive officer of the applicant, or by the applicant, if an individual.

Name (print) Kurt M. Pfeifle

Title General Manager

Date 18-March-1997

Signature [Signature]

Subscribed and sworn to before me this 18th day of

[Signature]
Notary Public

My commission expires



Department of Environment and Natural Resources
Air and Surface Water Program
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181
Telephone: (605) 773-3351

STATE OF SOUTH DAKOTA
BEFORE THE SECRETARY OF
THE DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

IN THE MATTER OF THE)
APPLICATION OF _____)
)
)
)
STATE OF _____)
) SS
COUNTY OF _____)

CERTIFICATION OF
APPLICANT

I, _____, the applicant in the above matter after being duly sworn upon oath hereby certify the following information in regard to this application:

South Dakota Codified Laws Section 1-40-27 provides:

"The secretary [of environment and natural resources] may reject an application for any permit filed pursuant to Titles 34A or 45, upon making a specific finding that:

(1) The applicant is unsuited or unqualified to perform the obligations of a permit holder based upon a finding that the applicant, any officer, director, partner, or resident manager of the facility for which application has been made:

- (a) Has intentionally misrepresented a material fact in applying for a permit;*
- (b) Has been convicted of a felony or other crime of moral turpitude;*
- (c) Has habitually and intentionally violated environmental laws of any state or the United States which have caused significant and material environmental damage;*
- (d) Has had any permit revoked under the environmental laws of any state or the United States;*
- (e) Has otherwise demonstrated through clear and convincing evidence of previous actions that the applicant lacks the necessary good character and competency to reliably carry out the obligations imposed by law upon the permit holder; or*

(2) The application substantially duplicates an application by the same applicant denied by the board within the past five years which denial has not been reversed by a court of competent jurisdiction. Nothing in this subdivision may be construed to prohibit an applicant from submitting a new application for a permit previously denied if the new application represents a good faith attempt by the applicant to correct the deficiencies that served as the basis for the board's denial in the original application.

All applications filed pursuant to Titles 34A and 45 shall include a certification, sworn to under oath and signed by the applicant, that he is not disqualified by reason of this section from obtaining a permit. In the absence of evidence to the contrary, that certification shall constitute a prima facie showing of the suitability and qualification of the applicant. If at any point in the application review, recommendation, or hearing process, the secretary finds the applicant has made any material misrepresentation of fact in regard to this certification, consideration of the application may be suspended and the application may be rejected as provided for under this section.

Applications rejected pursuant to this section constitute final agency action upon that application and may be appealed to circuit court as provided for under chapter 1-26."

Pursuant to SDCL 1-40-27, I certify that I have read the forgoing provision of state law, and that I am not disqualified by reason of that provision from obtaining the permit for which application has been made.

Dated this 18th day of March, 1997

Kent Pfeiffer, General Manager
Applicant Mid-Dakota Rural Water Sys., Inc.

Subscribed and sworn before me this 18th day of March, 1997

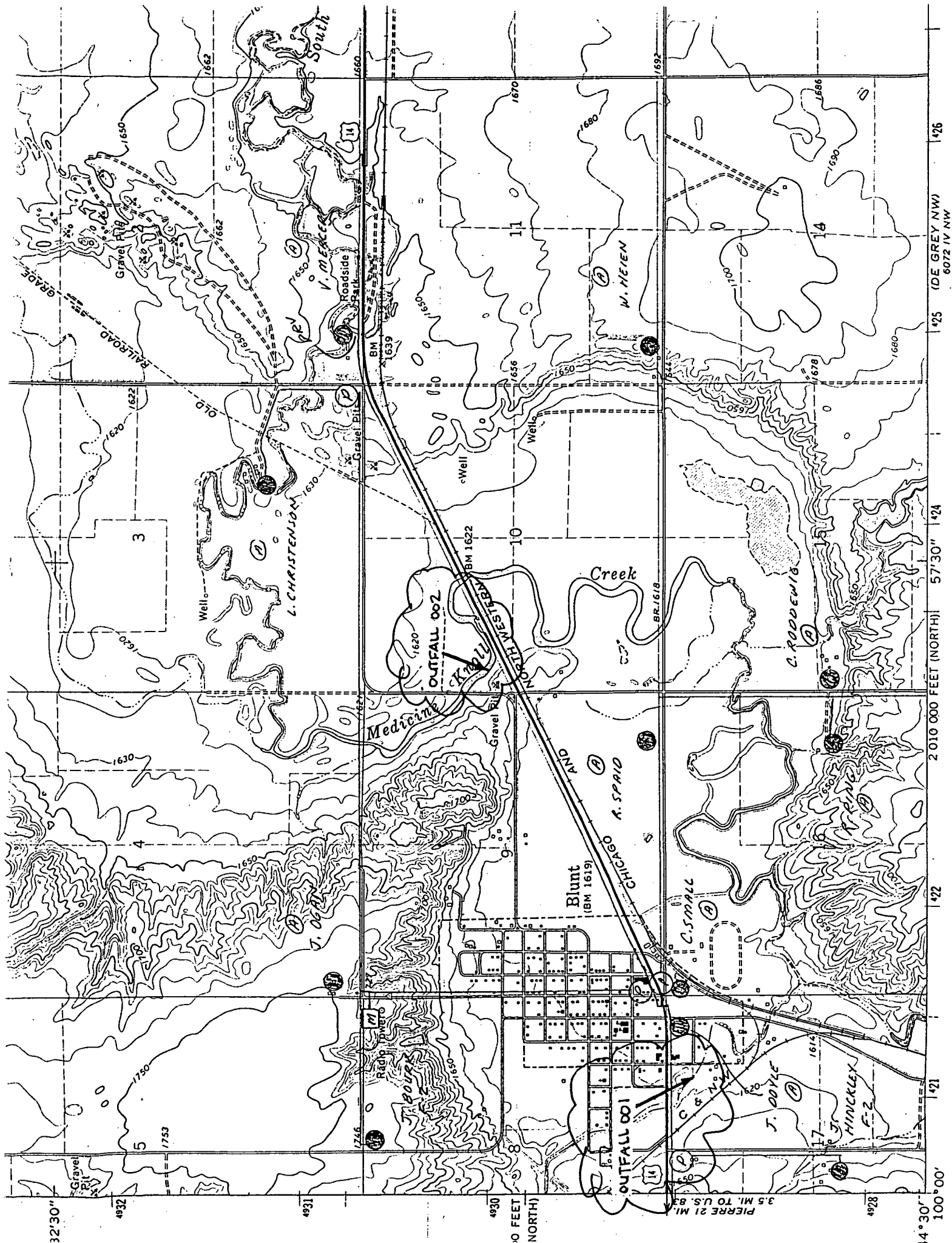
Susan Hargens
Notary Public

My commission expires:

(SEAL)



PLEASE ATTACH SHEET DISCLOSING ALL FACTS PERTAINING TO
SDCL 1-40-27 (1) (a) THROUGH (c).
ALL VIOLATIONS MUST BE DISCLOSED, BUT WILL NOT
AUTOMATICALLY RESULT IN THE REJECTION OF AN APPLICATION.



Permit No. 5751-3 & 5809-3

Missouri River - Water District

Report of Examination of Works and/or Application of Water to Beneficial Use

TO: Chief Engineer, Water Rights Program, DENR, Foss Bldg., Pierre, SD 57501

I have this day, **June 18, 2002**, made a thorough examination of the water use system constructed by **Mid-Dakota Rural Water System, Inc.** of **P.O. Box 318, Miller, SD 57362** holder of Permit Nos. **5751-3 and 5809-3**, bearing the priority of **February 11, 1993 and March 14, 1994** authorizing the diversion of **16.49 and 0.06** cu. ft. per second of the waters of **Missouri River** for **rural water system and wetland enhancement** purposes, in **Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury, and Aurora** Counties.

Inspection contact & relationship to permit holder, if applicable: **Ron Ramsey, Mid Dakota Rural Water System, Inc employee.**

A. Works used to divert the water:

Pump: At the Missouri River

- 1) Make 4 - Verti-Line
- 2) Model 805-04452-3
- 3) Size _____
- 4) Capacity 3,125 GPM each or 4.5 mil. gpd each

Motor:

- 1) Make 4 - U.S. Electric
- 2) Model No. 692718
- 3) Horsepower rating 300 each hp

Pump: At the water treatment plant

- 1) Make 4 - Verti-Line
- 2) Model 805-04454-3
- 3) Size _____
- 4) Capacity 2,600 each GPM

Motor:

- 1) Make 4 - U.S. Electric
- 2) Model No. 692719
- 3) Horsepower rating 400 each hp

Storage: 500,000 gallon clear tank

B. Works used to transport water to place of use:

- 1) Type steel 2) Size 30 inches 3) from Missouri River to the water treatment plant
1) Type steel 2) Size 30 inches 3) mainline distribution pipe

C. Works used to apply water to beneficial use:

Rural water distribution system.

D. Compliance with Permit Requirements:

- 1) Permit qualifications being abided by yes
2) Exceptions to compliance are: none

The system is in good condition with the point(s) of diversion located as follows: intake located 1019' W and 1270' N and pump house located 310' W and 1700' N of the SE corner in the NE¼ SE¼ Section 26-T112N-R80W. The works are capable of diverting and conveying to the place of use x.xx cu. ft. per second of water and/or storing 500,000 gal. or 1.53 acre-feet of water which is to be used for rural water system and wetland enhancement. Water has been put to beneficial use to the maximum extent as follows: to serve users in Potter, Faulk, Sully, Hughes, Hyde, Hand, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury and Aurora Counties.

The license should be issued for ----- cfs.

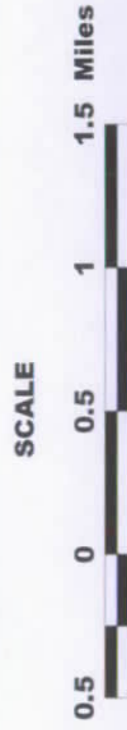
All structures, wells and lands on map yes

Comments or other permit(s) associated with the project: **This document is the result of an inspection that found the entire amount of water to be put to beneficial use has not yet been realized. The date for putting water to beneficial use for Permit No. 5809-3 is June 6, 2003. An application for extension of time has been suggested and sent to Mid-Dakota Rural Water System, Inc. If an extension is applied for the permits can be incorporated and licensed when the water is put to beneficial use.**

Lynn Beck
Natural Resources Engineer Specialist
DENR, Water Rights Program

Date report completed: July 15, 2002

Water Right Nos. 5751-3 and 5809-3 Mid-Dakota Rural Water System, Inc.



Lynn Beck
 Lynn Beck
 Natural Resources Engineer Specialist
 DENR, Water Rights Program
 July 12, 2002



SUPPLEMENTAL REPORT FOR
MID-DAKOTA RURAL WATER SYSTEM

MARCH, 1990

By Bruce F. McCollom
Bruce F. McCollom, P.E.
SD Reg. No. 2578
Project Manager



Prepared by: Bartlett & West Engineers, Inc.
2718 Gateway Ave., Suite 201
P.O. Box 1077
Bismarck, ND 58502
(701) 258-1110

TABLE OF CONTENTS

SECTION	TITLE	PAGE NO.
1.0	INTRODUCTION	1
2.0	ENGINEERING DESIGN AND SIZING CRITERIA	3
2.1	PROJECTED WATER USE	3
2.1.1	Municipal Water User	3
2.1.1.1	Class A Towns	3
2.1.1.2	Class C Towns	5
2.1.1.3	Towns Without Water Systems	5
2.1.2	Individual Water Users (Except in Towns)	6
2.1.2.1	Rural Household (Including High Consumption)	6
2.1.2.2	Seasonal	6
2.1.2.3	Livestock	6
2.1.3	Other Special Users	6
2.1.4	Water Use Breakdown	6
2.2	DESIGN CRITERIA	7
2.2.1	Special Users - Class A	7
2.2.2	Class C - Special Users	8
2.2.3	Individual Hookups	8
2.2.4	Growth	9
2.2.5	Fire Protection	10
2.2.5.1	Rural Distribution System - Individual Users	10
2.2.5.2	Municipalities - Class A and C	10
2.2.6	Design Capacity	11
2.2.7	Storage Criteria	11
2.2.8	System Design Modification	11
2.2.9	Oahe Water Source	14
2.2.10	Rural Distribution System Sizing - Pressure	15
2.2.11	Surge Protection	16
3.0	CAPITAL COST ESTIMATE	17
3.1	GENERAL	17
3.2	GETTYSBURG INTAKE AND PUMP STATION	17
3.3	OAHE PUMP STATION	17
3.4	WATER TREATMENT PLANTS	17
3.5	PUMPING STATIONS	19
3.6	WATER STORAGE TANKS	19
3.7	CONTROL SYSTEM	19
3.8	OPERATION & MAINTENANCE CENTER AND EQUIPMENT	20
3.9	TOWN SYSTEMS IMPROVEMENTS	20
3.10	MAIN TRANSMISSION PIPELINES	20
3.11	RURAL WATER DISTRIBUTION SYSTEM	20
3.12	ADDITIONAL WATER USERS	24
3.13	OTHER COSTS	24

Table of Contents (Continued)

SECTION	TITLE	PAGE NO.
4.0	OPERATION & MAINTENANCE COST ESTIMATE	27
4.1	GENERAL	27
4.2	SALARIES AND WAGES	27
4.3	UTILITIES	28
4.4	REPAIRS AND MAINTENANCE	32
4.5	CHEMICALS	32
4.6	COMPARISON WITH OTHER RURAL WATER SYSTEMS	32
5.0	REVENUE ESTIMATE	33
5.1	RATE SCHEDULES	33
5.1.1	Water Users Ability and Willingness to Pay	33
5.2	CALCULATION OF ANNUAL REVENUE	33
5.2.1	General	33
5.2.2	Rural Household	33
5.2.3	Municipal and Special	36
5.2.4	Revenue Breakdown and Comparison	37
6.0	PROJECT FINANCIAL PLAN	39
6.1	ANNUAL OPERATING BUDGET	39
6.2	PROJECT FINANCIAL PLAN	39

TABLES

TABLE NUMBER	TITLE	PAGE NO.
2.1	ESTIMATED ANNUAL WATER USE	4
2.1.4.1	BREAKDOWN OF ANNUAL WATER USE MGY AND %	7
2.2.4.1	HISTORY OF NUMBER OF METERS ON WEB	9
2.2.6.1	DESIGN CAPACITY	12
2.2.8.1	STORAGE TANK SIZES (THOUSAND GALLONS)	13
2.2.8.2	PUMP STATION SIZES	14
2.2.10.1	COMPARISON OF PEAK INSTANTANEOUS FLOW CRITERIA	15
3.1	ESTIMATED CAPITAL COSTS SUMMARY	18
3.5.1	PACKAGE PUMP STATION COSTS	19
3.6.1	WATER STORAGE TANK COSTS	19
3.10.1	MAIN TRANSMISSION PIPELINE COST ESTIMATE BREAKDOWN	21
3.10.2	WEB MAIN TRANSMISSION PIPELINE CONTRACT COST SUMMARY	22
3.11.1	DISTRIBUTION SYSTEM PVC PIPELINE COST ESTIMATE	23
3.11.2	WEB SECONDARY TRANSMISSION AND DISTRIBUTION PIPELINE CONTRACT COST SUMMARY	25
3.11.3	DISTRIBUTION SYSTEM COST ESTIMATE BREAKDOWN	26
4.1.1	ESTIMATED ANNUAL OPERATION AND MAINTENANCE COSTS	27
4.3.1	POWER RATES	29
4.3.2	PUMPING ENERGY REQUIREMENTS	30
4.3.3	PUMPING LOAD FACTORS	30
4.3.4	PUMPING COST CALCULATIONS	31
4.6.1	OPERATIONS & MAINTENANCE COSTS - SOUTH DAKOTA RURAL WATER SYSTEMS	32
5.1.1	RATE SCHEDULE USED FOR REVENUE ESTIMATE	34
5.2.1.1	ESTIMATED ANNUAL REVENUE	35
5.2.2.1	AVERAGE MONTHLY REVENUE PER RURAL HOUSEHOLD - SOUTH DAKOTA RURAL WATER SYSTEMS	36
5.2.4.1	BREAKDOWN OF ANNUAL REVENUE ESTIMATE \$ AND %	37
6.1.1	ANNUAL OPERATING BUDGET ESTIMATE	39
6.2.1	PROJECT FINANCIAL PLAN	40

FIGURES

FIGURE NUMBER	TITLE	PAGE NO.
2.2.9.1	OAHE WATER SOURCE CONCEPTUAL DESIGN	41
2.2.9.2	OAHE WATER SOURCE LOCATION	42

APPENDICES

APPENDIX NUMBER	TITLE	PAGE NO.
1.	RURAL HOUSEHOLD MONTHLY WATER BILL COMPARISON	43 - 46

MID-DAKOTA RURAL WATER SYSTEM FEASIBILITY REPORT SUPPLEMENT

1.0 INTRODUCTION

The purpose of this report is to supplement the Mid-Dakota Rural Water System Feasibility Study and Report dated November 1988, revised January 1989, and March 15, 1989, prepared by DeWild, Grant, Rekert and Associates Co. (hereinafter referred to as the DGR Report). This supplemental report addresses discussion items based on the United States Department of Interior Bureau of Reclamation's (USBR) review of the DGR Report.

The proposed Mid-Dakota Rural Water System (Mid-Dakota) service area lies just to the south of the WEB Rural Water Development Project (WEB) and therefore Mid-Dakota is expected to be similar to WEB in many ways. The Mid-Dakota Board of Directors prefers to use WEB as a model for the development of their system. This does not mean that it will be the same in all regards. It does mean that the Board prefers to use substantially similar rules and regulations and rate schedules. Therefore in this Mid-Dakota supplemental report the 1980 Summary Report and the 1983 Design Report for WEB are referenced frequently.

Additional memberships which paid good intention fees after August 1988 were included in this report. A generalized service area boundary was added to the System Map which had been prepared by DGR.

Additional information on probable water use contracts by certain municipalities was obtained by the Mid-Dakota staff. That information is used in this report along with other information in developing revised sizing criteria for the main transmission pipeline and water supply facilities. Other design and sizing criteria affecting the design of the water source, main transmission pipeline, storage tanks, and pumping stations were revised so that they are substantially the same as WEB's with one significant exception. The Oahe Intake Design was revised to be based on the use of existing Corps of Engineer and USBR facilities at the dam.

The capital cost estimate was revised based on the resized facilities and other revisions as determined appropriate. In developing the capital cost estimate, extensive use was made of cost data from WEB and the Southwest Pipeline Project (SWPP) in North Dakota.

The operation and maintenance cost estimate was revised to account for reduced water use, and the availability of Pick-Sloan power for pumping requirements and operational uses incidental thereto. Certain other changes in the operation and maintenance and cost estimate were made as determined appropriate based on comparison with operating rural water systems.

A revised revenue estimate was made based on the revised water use estimate and water rates similar to those charged on WEB and other operating rural water systems in South Dakota.

A project financial plan was developed based on the revised cost and revenue estimates. The financial plan includes federal funding similar to that provided for WEB.

2.0 ENGINEERING DESIGN AND SIZING CRITERIA

2.1 PROJECTED WATER USE

The water data, given in the DGR Report, were re-evaluated and additional information obtained in some cases. Table 2.1 shows the revised Estimated Annual Water Use for Mid-Dakota. It is based on memberships having paid good intention fees through January 1990. This estimate is for the purpose of O&M cost estimating and revenue estimating. Design capacity is discussed in Section 2.2.

2.1.1 Municipal Water Use

Additional water use information was obtained by Mid-Dakota staff from some of the city officials.

2.1.1.1 Class A Towns

In the five largest Class A towns Gettysburg, Highmore, Huron, Miller and Wessington Springs, water use data indicated water consumptions exceeding 100 gallons per capita per day (GPCD) and was considered reliable enough to use for the purposes of this report.

Huron is by far the largest single water user to be served by Mid-Dakota, therefore, the greatest effort went in to the estimation of its water use. Mid-Dakota staff contacted Huron City Officials who indicated that the City would like to contract for 2 million gallons per day (MGD) capacity. In 1988 the City used 736.7 million gallons (MG) or an average of 2.02 MGD of water. The City Officials indicated that Mid-Dakota water would be used as the primary supply. The existing supply and treatment facilities would be used to meet peak summer demands in excess of contract capacity. On this basis it is estimated that Huron will obtain 83% of its total annual water requirement from Mid-Dakota. The 83% figure was developed based on data developed for the City of Dickinson, ND in connection with the SWPP. In that study 11 years worth of daily water use data were analyzed to the amount of total annual water use above the average daily use for the same year. It is believed that the daily water use pattern in Huron would be similar to that in Dickinson.

There are eleven other Class A towns which are as follows: Agar, Blunt, Harrold, Hoven, Lane, Onida, Ree Heights, St. Lawrence, Tolstoy, Virgil and Wessington. The total population of these towns is 2,880. The projected water use for these towns is estimated on a basis of 100 GPCD. The 100 GPCD figure is consistent with that experienced for towns in the 100 to 1,000 population range served by other rural water systems in South (SD) and North Dakota (ND).

TABLE 2.1
ESTIMATED ANNUAL WATER USE

	MGY (1)
Rural Household (reference WEB Design Report p 7-9)	
$((60.93 \times 1.1) - 50) \div 1.1 \times 1000 = 15,475$	
$30,962 - 15,475 = 15,487$ use 15,500 gal./mo.	
$15.5 \text{ thou. gal./mo./mtr.} \times 12 \text{ mo./yr.} \times$	
$(1874 + 25 + 119) \text{ mtrs.} \div 1000 \text{ thou./mill.} =$	375.3
Municipal Household (reference WEB Design Report p 7-11)	
$4.14 \text{ thous. gal./mo./mtr.} \times 12 \text{ mo./yr.} \times$	
$136 \text{ mtrs.} \div 1000 \text{ thou./mill.} =$	6.8
Metered Livestock	
$25 \text{ thou. gal./yr./mtr.} \times (494 + 13 + 105) \text{ mtrs.}$	
$\div 1000 \text{ thou./mill.} =$	15.3
Seasonal (reference WEB Design Report p 7-8)	
$3.6 \text{ thou. gal./yr./mtr.} \times$	
$(69 + 6) \text{ mtrs.} \div 1000 \text{ thou./mill.} =$	0.3
Class C Town	
3 Towns	
$487 \text{ people} \times 0.1 \text{ thou. gal./person/day} \times$	
$365 \text{ days/yr.} \div 1000 \text{ thou./mill.} =$	17.8
15 Special Users Class C Town Rate	
$741 \text{ people} \times 0.1 \text{ thou. gal./person/day} \times$	
$365 \text{ days/yr.} \div 1000 \text{ thou./mill.} =$	27.0
Class A Town	
11 Towns	
$2880 \text{ people} \times 0.1 \text{ thous. gal./person/day} \times$	
$365 \text{ days/yr.} \times 98\% \div 1000 \text{ thou./mill.} =$	103.0
Gettysburg	
$365 \text{ days/yr.} \times 300 \text{ thou. gal./day} \times$	
$67\% \div 1000 \text{ thou./mill.} =$	73.4
Highmore	
$365 \text{ days/yr.} \times 135 \text{ thous. gal./day} \times$	
$98\% \div 1000 \text{ thou./mill.} =$	48.3
Huron	
$365 \text{ days/yr.} \times 2000 \text{ thous. gal./day} \times$	
$83\% \div 1000 \text{ thou./mill.} =$	605.9
Miller	
$365 \text{ days/yr.} \times 268 \text{ thous. gal./day} \times$	
$98\% \div 1000 \text{ thou./mill.} =$	95.9
Wessington Springs	
$365 \text{ days/yr.} \times 125 \text{ thous. gal./day} \times$	
$98\% \div 1000 \text{ thou./mill.} =$	44.7
3 Special Users Class A Town Rate	
$12 \text{ mo./yr} \times (522 + 1,774 + 3,942) \text{ thous. gal./mo.}$	
$\div 1000 \text{ thou./mill.} =$	74.9
TOTAL (2)	1,488.6

NOTES: (1) MGY is Million Gallons per Year
(2) Based on users having paid good intention fees
thru January 1990

A Class A town is defined as a town which has an existing public water supply system with a water source and storage for peak equalization and other purposes (possibly fire protection). Class A towns will receive service from Mid-Dakota through a master meter which has a flow rate restriction device capable of being set at a number of gallons per minute provided for in the water purchase contract. These towns are expected to continue to maintain their existing water system facilities including their supplies. The estimated percentage of their total annual needs which each of these towns is expected to obtain from Mid-Dakota is given in Table 2.1. The capacity which each town is expected to contract for is taken into account in arriving at those percentages. Those expected contract capacities are discussed further and given in Section 2.2. An exact determination of the percentage of the water which can be supplied at any given contract capacity requires the availability of daily water use amounts for the design year. That data was not available for this Study. Therefore, percentages for Mid-Dakota were extrapolated based on data for other towns in SD and ND.

2.1.1.2 Class C Towns

Class C towns are similar to Class A towns except that they do not have their own storage for peak equalization. Therefore, they are considered to be served on a demand basis and receive 100 percent of their water from Mid-Dakota. This is necessary since there is no way to control their wells. The average water use projected for these towns is based on 100 gallons/capita/day. The three Class C towns are Alpena, Broadland and Forestburg which have a total population of 487.

2.1.1.3 Towns Without Water Systems

Four of the towns, Artesian, Lebanon, Osceola and Polo, do not have public water supply systems at this time. Therefore, those towns are considered to be served by each individual household becoming a Mid-Dakota member. In the case of Lebanon, DGR's data sheet indicated that there were 40 individual household systems. In the other three towns the estimated number of connections in each town was determined by dividing the population of each town by three. The estimated average monthly consumption for these individual municipal household hookups is estimated at 4,140 gallons/month/hookup, which is equivalent to about 45 GPCD.

2.1.2 Individual Water Users (Except in Towns)

2.1.2.1 Rural Household (Including High Consumption)

Water use for rural household and high consumption rural household users is estimated to be 15,500 gallons/month/meter. The most difficult factor in arriving at this number is estimating the amount of livestock watering which will be done from Mid-Dakota. The livestock data given in Table 7 of the DGR Report are inconclusive in this regard because experience has shown that numbers of livestock shown on signup forms do not translate to number of livestock which take water from a rural water system. Parts of the WEB System have been in operation long enough to give some guidance. Data from the Randall Community Water District (RCWD) located to the south, are considered useful. Data on average monthly water use per meter for these systems is shown in Table 5.2.2.1.

2.1.2.2 Seasonal

The water use for seasonal users is estimated to be 3,600 gallons/year/meter.

2.1.2.3 Livestock

The water use for metered livestock users is estimated to be 25,000 gallons/year/meter.

2.1.3. Other Special Users

Mid-Dakota staff provided water user data sheets for 52 applications for which the proper classification was not readily apparent to them. Those users were classified either into the individual water user categories given in Subsection 2.1.2 or special users requiring water purchase agreements at either Class A or Class C town rate. This resulted in 38 users going into the individual water user categories. Three water users (Triple H Feed Lot, Onida Feeders, Thompson Trailer Court) were classified special Class A. Fifteen water users (Sheehan Feedlot, Sunshine Bible Academy, Highmore Farm Service, Farmland Industries, Nauman Flying Service, Fischer Spraying, State GF&P Lake Louis, Magness Livestock Market, Harts Trailer Court, Dell Acres Housing, Fred Pudwells Housing, Stan Ensiz Housing, West Whitlock Bait Shop & Trailer Park, J&S Farms Housing, Bobs Resort) were classified special Class C. The number of water users total 56 which is more than the number of applications because 2 applications were split into more than one user. Information on the water use projected for these other special users is given in Table 2.1.

2.1.4 Water Use Breakdown

Table 2.1.4.1 gives a water use breakdown by class of water user.

TABLE 2.1.4.1

BREAKDOWN OF ANNUAL WATER USE MGY AND %

CLASS OF USERS	MGY	%
Individual	397.7	27
Special		
Huron	605.9	40
36 Others	485.0	33
Subtotal	1,090.9	73
TOTAL	1,488.6	100

2.2 DESIGN CRITERIA2.2.1 Special Users - Class A

Design capacities for the five largest towns were determined based on additional data which the Mid-Dakota staff had collected. As discussed in Section 2.1.1.1, in the case of Huron, the design capacity of 2 MGD was specifically arrived at by contact of Mid-Dakota staff with city officials. Design capacities for these five towns are given in Table 2.2.6.1. Design capacity for the other 11 Class A towns was determined based on a peak factor of 2.0.

The design peaking factors for the 15 Class A towns other than Huron on Mid-Dakota are generally higher than those with the Class A towns served by WEB. This is the one significant difference in design criteria. The reason for this is because there has been some dissatisfaction expressed by WEB town systems which contracted for peak factors in the neighborhood of 1.0. There was a tendency among the towns which contracted after the construction had started to sign up for larger peak factors. There have also been instances of towns requesting to increase their contract capacities after construction. An example of the former is the City of Redfield which contracted in 1987 for a peak factor of 1.67. Redfield probably would have contracted for a higher peak factor had capacity been available. In order to provide total supply for most towns, a peak factor of about 2.5 would be required. While this would be desirable, and was done on a number of other rural water systems in South Dakota, it is extremely costly to do on systems like WEB and Mid-Dakota because of the great distance involved in transporting water. By definition, the peak factor of 2.5 means a utilization of only 40% of capacity, on the average. In this report the WEB philosophy of setting a postage stamp rate for a minimum monthly

bill based on the gallons per minute (GPM) capacity contracted for is retained. The rate, as is discussed in Section 5.1, is proposed to be the same as that used on WEB. However, in Mid-Dakota it is proposed that the authorizing cost estimate be based on a larger peaking factor for the Class A towns, except Huron and Gettysburg, in order that they may have the opportunity to contract for larger flow rates. At the time they contract with Mid-Dakota, the towns will have to weigh the desirability of the increased peaking factors against the increased costs for seldom used capacity.

2.2.2 Class C - Special Users

The design criteria for Class C special users on Mid-Dakota is the same as WEB. That is, a peak factor of 2.5 or a design capacity of 250 GPCD.

2.2.3. Individual Hookups

The equivalencies for service units for individual hookups on Mid-Dakota are proposed to be the same as those used on WEB and are as follows:

Rural Household, 1.0 service unit (1,080 GPD)
Municipal Household, 0.6 service unit (648 GPD)
Seasonal Cabin, 0.4 service unit (432 GPD)
Metered Livestock, 0.7 service unit (756 GPD)

Special:

Class A towns, developments, trailer courts, large livestock users and other special users served on a constant flow basis are included in the design at the constant flow they contract for.

Class C towns, developments, trailer courts and other special users served on a demand basis are included in the design at a number of service units equal to the population divided by four. This is equivalent to providing a peak consumption of 270 gallons per capita per day (GPCD).

High Consumption Users, number of service units subscribed for (range two through four). (2-2160 GPD, 3-3240 GPD, 4-4320 GPD)

It is felt that the incorporation of the rural household high consumption classification will provide a better means of establishing the design capacity required for livestock usage in the final sign-up and final design phase of the Mid-Dakota Project. That concept is documented in the WEB Rules and Regulations and 1983 Design Report and will not be repeated here. However, for the purpose of determination of design capacity in this report, it was necessary to estimate the total number of service units resulting from the rural household hookups which paid good intention fees. This was done by determining the average number of service units per rural household connection (regular plus high capacity) shown in the WEB 1983 Design Report. That number is 1.335 service units per rural household hookup.

In the WEB 1983 Design Report, a service unit was assigned a transmission flow capacity of 0.75 gallons/minute (GPM) or 1,080 gallons/day (GPD). In 1987 a revised design criteria for transmission flow was approved in order to "stretch" the system. That criteria recognizes that it is unlikely that all users in any given service area will peak on the same day. The equation for transmission flow is: $Q = 0.75N$ raised to the 0.96 power. In which Q is the transmission flow in GPM and N is the number of service units in the Service area. For the purposes of this report Q was taken to be 0.67 GPM/service unit, which is what the equation would yield for $N = 17$.

2.2.4 Growth

The population of rural portions of the Mid-Dakota service area (except the area near Huron and Pierre) has not been increasing in recent years. Therefore, design for major growth is not justified.

Rural water systems do exhibit a tendency for additional water users to sign up during the construction phase. Table 2.2.4.1 shows the total number of individual signups on the WEB Project at three different points in time along with the corresponding estimated sign up percentages.

TABLE 2.2.4.1

HISTORY OF NUMBER OF METERS ON WEB

TIME IN LIFE OF PROJECT	NUMBER METERS	ESTIMATED SIGN UP %
1980 SUMMARY REPORT (Good Intention Fees)	3322	72
1983 DESIGN REPORT (Hook-Up Fees)	2992	66
AS OF DECEMBER 31, 1989	4467	N/A

In January 1990, the Mid-Dakota staff provided information on rural signup percentage by township. For the entire service area the sign up percentage was estimated to be 58%. By January 1990, that percentage is estimated to have increased to 61%. A generalized service area boundary has been added to the System Map which had been prepared by DGR. The boundary includes the townships specified by the Mid-Dakota staff. The map shows that the service area boundary on which the signup percentage is based takes in considerable area outside of the distribution system pipelines. Thus the true sign up percentage in the area served by pipelines is higher.

It is considered prudent to provide for growth above the number of paid good intention fees in the design criteria and cost estimate. Seventeen percent above the calculated total design capacity is provided to allow for moderate growth. Of this, 7% is for growth which it is believed can be accommodated within the cost estimate given in this report. Roughly half of this, 7% growth allowance has already been subscribed for in the time period between January 1989 and January 1990. It is requested that some variations in the service area boundary be allowed in the future.

2.2.5 Fire Protection

2.2.5.1 Rural Distribution System - Individual Users

FmHA instructions, Section 1942.18 (c)(3)(i), state: "The system must have sufficient capacity to provide for reasonable fire protection and growth." However, fire protection has not been specifically provided on previous South Dakota rural water systems. In order to provide significant fire protection in accordance with the Insurance Services Office (ISO) Fire Suppression Rating Schedule a minimum flow of at least 500 gallons per minute (GPM) would be required. It is obviously not feasible to design a pipeline distribution system with about one mile of pipe per rural household for these quantities of flow. However, some assistance can be provided to fire departments by allowing them to fill tank trucks from cleanouts and flush hydrants. Another policy that has been used on some rural water systems is to install extra flush hydrants (on six inch and larger lines) at locations requested by the fire departments.

The fire departments are required to pay for these hydrants and to execute an agreement covering their use. Pumper trucks are not allowed to be connected to the hydrants.

2.2.5.2 Municipalities - Class A and C

The standard water purchase contracts for Class A and C towns which were used on WEB specifically state that "Association does not warrant or guarantee in any manner sufficient quantities of water to meet City's fire fighting needs." That contract form was approved by the USBR and is similar, in regard to fire protection, to what has been used on a number of South Dakota rural water systems.

To the extent that a city which has a contract with Mid-Dakota for additional supply and maintains existing sources, it could be said that fire protection is improved. However, a potential lessening of fire protection may come from a necessity of using peak equalization storage more with the Mid-Dakota supply than with existing (generally higher capacity sources). To provide fire protection in accordance with the ISO rating schedule requires that Class A towns have sufficient storage dedicated to fire protection.

2.2.6 Design Capacity

In this report, the design criteria provides for delivery of the design day water use in a 24 hour period. The transmission flow criteria applies to the sizing of the transmission pipelines, intakes, water treatment plants, and pump stations. The design capacity is summarized in Table 2.2.6.1. It is based on memberships having paid good intention fees through January 1989 with the added allowance for growth as discussed in Section 2.2.4.

2.2.7 Storage Criteria

The storage criteria recommended for Mid-Dakota are essentially the same as for WEB. The peak equalization storage (for demand users only) is one-fourth the design day. Emergency, or reserve, storage is equal to one-half the design day for each service area. In the case of the Gettysburg portion of the system, an additional one-half day storage would be located at the Gettysburg Ground Storage Reservoir. In the case of the Oahe portion of the system, the additional one-half day storage would be located at the Water Treatment Plant site. It would be desirable to locate the additional half-day storage in each instances at the towers (Gettysburg and Highmore) however, this would add an additional \$2.5 Million to the cost. In the case of the WEB system the additional one-half day storage was able to be located at the main storage reservoir (which provides gravity flow to much of the system) at a reasonable cost. In the case of Mid-Dakota this is not possible because the Gettysburg and Highmore towers are elevated storage which is considerably more expensive than ground level storage. Operational storage is included to provide for differences in tank water levels necessary to provide control functions associated with starting and stopping pumps.

2.2.8 System Design Modification

The selected alternative Preliminary System Design given in the DGR Report was modified to conform with the above design criteria. This involves the resizing of the intakes, water treatment plants, main transmission pipelines, pump stations, and storage tanks. The distribution system designed by DGR was not modified.

Copies of DGR's Hydraulic Calculations for the main transmission pipelines were obtained by Mid-Dakota. In general main transmission pipelines were reduced in size to provide essentially the same hydraulic grade line elevations at the reduced flow rates determined in accordance with the design criteria given herein.

TABLE 2.2.6.1

DESIGN CAPACITY

INDIVIDUAL	GPM
Rural Household $(1874 + 25) \times 1.335 \times 0.67 =$	1,699
Rural Household (unoccupied) $149 \times 0.67 =$	100
Municipal Household (4 towns with individual hook ups) $136 \times 0.6 \times 0.67 =$	55
Metered Livestock $(494 + 13) \times 0.7 \times 0.67 =$	238
Seasonal $69 \times 0.4 \times 0.67 =$	18

Subtotal Rural	2,110
 SPECIAL	
Class A	
Gettysburg	208
Highmore	188
Huron	1,389
Miller	372
Wessington Springs	174
11 Other towns population $2880 \times 0.13889 =$	400
3 Other special users	175

Subtotal Special Class A	2,906
 Class C	
3 Towns population $487 \times 0.17361 =$	85
15 Other special users equivalent population $741 \times 0.17361 =$	129

Subtotal Special Class C	214

Subtotal Users w/paid good intention fees (1)	5,230
 GROWTH	890
 TOTAL	6,120
	=====

NOTES: (1) Through January 1989

The portion of the pipeline from the Oahe water source to the Highmore tower is an exception. In the DGR Design this pipe was 30-inches in diameter. At the reduced flow rate a pipeline composed of half 30-inch and half 24-inch would give the same total friction loss. However, an economic analysis comparing the above design to an all 24-inch design was made. It was estimated that the all 24-inch design results in an increase in power costs of about \$14,000 annually and a decrease in construction costs of about \$1.45 Million. It can be seen that, at any reasonable discount rate and life expectancy, the 24-inch line is more economical. Therefore, the 24-inch line is recommended in this report.

Quantity breakdowns for the main transmission pipelines are given in Table 3.10.1.

Required storage volumes for peak equalization and emergency storage along with the AWWA Standard nominal size are given in Table 2.2.8.1.

TABLE 2.2.8.1

STORAGE TANK SIZES (THOUSAND GALLONS)

TANK	REQUIRED		AWWA (1) STANDARD SIZE
	PEAK EQUALIZATION	RESERVE	
HIGHMORE TOWER	332	1,110	1,500
HURON TOWER	123	1,689	1,500 (3)
STEPHAN TOWER	229	423	750
SAND SPRINGS RESERVOIR	97	486	500
GETTYSBURG RESERVOIR	(2)	698	750
GETTYSBURG TOWER	175	698	1,000
OAHE TREATMENT PLANT	<u>NONE</u>	<u>3,708</u>	<u>4,000</u>
TOTALS	956	8,812	10,000

NOTES: (1) Operating storage (ie. control volumes) not calculated in this report but considered to be included.

(2) Included in Tower calculation.

(3) City of Huron has 5,000.

The sizes of the pump stations are given in Table 2.2.8.2.

TABLE 2.2.8.2

PUMP STATION SIZES						
STATION	FLOW GPM	-----HEAD FEET-----			HP (1)	KW (2)
		STATIC	FRICTION	TOTAL		
Oahe	5150	250 (3)	24	274	429	348
Oahe WTP	5150	307	295	602	943	765
Gettysburg Intake	970	340 (3)	47	387	114	92
Gettysburg WTP	970	175	71	246	73	59
Highmore South	1096	100	250	350	117	95
Stephan East	586	-100	500	400	71	58
Gettysburg	970	213	71	284	84	68

NOTES: (1) Based on Pump Efficiency 83%
 (2) Based on Motor Efficiency 92%
 (3) With Lake Oahe at Low Elevation 1540 and Includes 30' for Loss thru Water Treatment Plant

2.2.9 Oahe Water Source

A conceptual design for connection of the Oahe Pumping Station to existing facilities at Oahe Dam was made. The Mid-Dakota primary connection point for normal operation would be the north most suction line of the USBR Oahe Unit main pumping plant. The backup connection, for use in the event Penstock No. 8 must be out of service, would be the Corps of Engineers drain line for Penstock No. 7. Figure 2.2.9.1 illustrates this conceptual design.

From the Mid-Dakota Oahe pumping plant, the discharge line would proceed northeasterly approximately 17,900 feet to the water treatment plant site. A second major pumping station would be located at the water treatment plant. A proposed water treatment plant location is shown on Figure 2.2.9.2 along with a preliminary raw water pipeline route from the Oahe pumping plant.

2.2.10 Rural Distribution System Sizing - Pressure

For the purpose of this report the rural distribution system designed by DGR was used. DGR discusses its design on pages 13 through 15 of their report. They use a somewhat different approach to design for peak instantaneous flow than was used on WEB. The approach used on WEB is described in detail in Section 4.2.2.4 of the 1983 Design Report. It is proposed that the WEB approach be used for final design of Mid-Dakota.

Direct comparison of the two peak instantaneous flow criteria would require analysis of a particular set of water user data. It would differ, for each group of water users, since in the DGR approach the flow to each water user is different depending on the amount of livestock. By taking an average amount of livestock per user in the DGR approach and an average number of service units per user in the WEB approach it is possible to compare peak instantaneous flows. Since DGR gives values (page 14) for only two points of the domestic flow equation, only those points can be compared. The results are shown in Table 2.2.10.1 which shows that the DGR approach gives larger flows. Thus the use of the DGR designed distribution should provide for some growth in number of users and be conservative for cost estimating purposes.

TABLE 2.2.10.1

COMPARISON OF PEAK INSTANANEOUS FLOW CRITERIA

FORMULA-METHOD	PEAK INSTANTANEOUS FLOW GPM	
	1 WATER USER	50 WATER USERS
DGR Report (1)	12.6	107
WEB 1983 Design Report (2)	11.6	91.8

NOTES:

- (1) With 1.14 GPM/User for Livestock (20 hour delivery)
- (2) With 1.335 Service Units/User

The minimum pressure of 20 psi which DGR uses (page 14) is consistant with the WEB criteria. Pressures this low are generally only found in the smaller (2-1/2 inch and less) distribution pipelines. In general considerably more pressure is available at municipalities in DGR's design. Most municipalities are located along main transmission pipelines. For example, along the North main the minimum pressure DGR's calculations show is 72 psi. Delivery pressures to municipalities will be determined during final design and will be included in Attachments to the Water Supply Contracts. At that time the most economical way of filling elevated tanks will be determined.

It is not specifically stated for which alternate water source location the rural distribution system was designed by DGR. It is noted that on page C-1, DGR states that "Distribution pipelines to the rural customers of the project are similar for all alternatives considered." While this is generally true, there would be certain areas where there would be a significant difference. The area along Highway 83 between Highways 14 and 212 is an example.

2.2.11 Surge Protection

No surge analysis has been made. It is felt this is not necessary for a cost estimate for project authorization purposes. In the final design a surge analysis will be made and surge protection systems provided.

In the resized North main transmission line the design velocity ranges from 2.4 to 3.4 feet per second (fps). At the Oahe pumps the discharge is at 3.4 fps. The pump station cost information from WEB and SWPP which is used in estimating major Mid-Dakota pump station costs (Section 3.5) includes surge protection systems consisting of surge tanks.

In the resized Gettysburg PVC main transmission line the design velocity is 3.2 fps. In the resized Stephan East main transmission line the design velocity is 2.1 fps in the 14" DIP and ranges from 2.0 to 4.2 fps in the PVC pipeline. The pump station cost information from WEB which is used in estimating the Gettysburg and package pump station costs (Section 3.5) includes surge protection systems consisting of pump control valves.

3.0 CAPITAL COST ESTIMATE

3.1 GENERAL

A summary capital cost estimate is given in Table 3.1. The estimate is considered current as of October 1989. Cost information from the WEB Project and the Southwest Pipeline Project (SWPP) in North Dakota was used extensively in preparing the cost estimate.

3.2 GETTYSBURG INTAKE AND PUMP STATION

The \$650 Thousand cost estimate for the Gettysburg Intake and Pump Station made by DGR is also used in this report. That cost estimate is for an inclined tube type intake, as discussed in the DGR Report. The cost of this type of intake is highly site specific and Bartlett & West (BW) has no information available on which to base an estimate.

3.3 OAHE PUMP STATION

The cost of the Oahe Pumping Station, including connection to the existing facilities, is based primarily upon comparison to the cost of the SWPP intake pump station. Adjustment was made to consider the smaller capacity and horsepower and less complex connection to existing facilities. The SWPP intake pump station shares the use of the Basin Electric Antelope Valley Station and Coal Gasification Plant intake structure. It uses two sets of pumps in series to achieve the total head of 683 feet at the capacity of 10,590 GPM. The first stage pumps had to be installed in an existing Basin Electric building and extend down into the existing wet well. The estimated cost for the Mid-Dakota Oahe main pumping plant is \$600 Thousand.

3.4 WATER TREATMENT PLANTS

The cost estimate for the 970 GPM (or 1.4 MGD) water treatment plant for the Gettysburg area is based on a cost curve for "package" water treatment plant. Indexed values for the two 1-1/2 MGD water treatment plants on the Randall Community Water District (Missouri River water from Lake Francis case) were also used as a comparison. The cost estimate for the Gettysburg area water treatment plant is \$1,350 Thousand. It includes the pumping station located in the same building and a nominal amount of clearwell storage.

The cost estimate for the 5,150 GPM (or 7.4 MGD) Oahe area water treatment plant is based primarily on the WEB water treatment plant which has a 7 MGD capacity. Adjustments were made to account for the following factors: size of pumps, size of clearwell, inflation, construction in a single stage rather than two. The cost of a 4 million gallon clearwell is also included. The cost estimate for the Oahe area water treatment plant is \$9.6 Million.

TABLE 3.1

ESTIMATED CAPITAL COSTS SUMMARY (1)

FACILITY	COSTS \$THOUSANDS
Water Sources with Pumping Stations	1,250
Water Treatment Plants with Clearwell Storage and Pumping Stations	10,950
Booster Pumping Stations	350
Water Storage Tanks	4,350
Main Pipelines	28,500
Distribution System	30,800
Control System	700
O&M Center and Equipment	700
Town System Improvements	300
Growth (Additional Users Distribution System)	2,100
Construction Subtotal	<u>80,000</u>
OTHER COSTS	
Land and Rights 0.25%	200
Legal, Administrative, and Inspection (Mid-Dakota) 6%	4,800
Engineering and Inspection 10%	8,000
USBR Administration 3%	2,400
Archeology 0.25%	200
Mitigation 1%	800
Contingencies 15%	12,000
TOTAL PROJECT COST	<u>108,400</u>

NOTES: (1) October 1989

3.5 PUMPING STATIONS

Cost estimates for four of the major pump stations were included in with facilities discussed above. The cost estimates for the other three pump stations are based on WEB costs for package pump stations with adjustment for horsepower. Cost for these three pump stations are shown in Table 3.5.1.

TABLE 3.5.1

PACKAGE PUMP STATION COSTS

	\$ THOUSAND
Highmore South Booster	130
Stephan East Booster	100
Gettysburg Booster	<u>120</u>
TOTAL	350

3.6 WATER STORAGE TANKS

Cost estimates for water storage tanks are based on cost for similar sizes and types of tanks recently bid on the WEB project and the SWPP project. The cost estimates are shown in Table 3.6.1.

TABLE 3.6.1

WATER STORAGE TANK COSTS

	\$ THOUSAND
Highmore Tower	1,200
Huron Tower	1,200
Stephan Tower	600
Sand Springs Reservoir	250
Gettysburg Reservoir	300
Gettysburg Tower	<u>800</u>
TOTAL	4,350

3.7 CONTROL SYSTEM

The control system cost estimate of \$700 Thousand is based on the WEB project control system contract award cost adjusted for the much smaller number of remote terminal units on Mid-Dakota (16 versus 53 on WEB).

3.8 OPERATION & MAINTENANCE CENTER AND EQUIPMENT

A budget estimate of \$500 Thousand to construct an Operation & Maintenance Center is included. It is believed that a satisfactory facility can be constructed for that amount. It would be a somewhat less extensive facility than the one designed for WEB and bid at \$749 Thousand in January, 1987. A budget estimate for maintenance equipment items of \$200 Thousand has also been included. That amount is similar to the amount budgeted in the 1983 WEB Design Report.

3.9 TOWN SYSTEMS IMPROVEMENTS

A budget item of \$300 Thousand is provided for Town System Improvements. The estimate is based on the costs experienced on the WEB project adjusted for the number of towns involved.

3.10 MAIN TRANSMISSION PIPELINES

Table 3.10.1 gives the breakdown of the resized 205 mile main transmission pipeline cost estimate. Unit prices and pipe quantities are shown in the breakdown. They were developed from cost data on the WEB project and the SWPP project with appropriate adjustments. The percentage to be applied to cover the cost of pipeline appurtenances was determined from an analysis of the WEB project. Table 3.10.2 is a tabulation of cost data from the 14 WEB main transmission pipeline contracts.

3.11 RURAL WATER DISTRIBUTION SYSTEM

Unit prices for PVC pipelines for the 2,515 mile rural distribution system are given in Table 3.11.1. These unit prices were developed on the basis of PVC material cost averaging about .48 cents/lb. as shown in the Table. The cost of PVC pipe has varied considerably over the years both up and down. It does not necessarily follow other market construction cost trends. Therefore, it is requested that this portion of the cost index for the Mid-Dakota project be done on a separate calculation based on the variation in PVC pipe costs. For the purposes of this estimate, the .48 cent/lb. is based on the most recent, (September 19, 1989) bids on the WEB project (Contract 6-2CD). The DGR quantity tabulation shows that there is a total of 19.6 million lbs. of PVC pipe estimated to be required for the Mid-Dakota distribution system. Therefore, a one cent change in material cost translates to a \$196 Thousand change in the distribution system cost estimate. The estimated installation costs determined by DGR were compared with those experienced on the WEB project and were found to be reasonable and thus were also used in this report.

A quantity breakdown for the rural water distribution system was obtained from DGR and is reproduced here along with the extensions in Table 3.11.1. This breakdown was prepared in September 1988 based on the memberships having paid good intention fees up to that time (2500 "rural connections").

TABLE 3.10.1

MAIN TRANSMISSION PIPELINE COST ESTIMATE BREAKDOWN

Item	Quantity LF	Unit Price \$/LF	Extension
North Main			
24" DIP Cl. 50	238,500	37.50	8,943,750
20" DIP Cl. 50	153,700	30.00	4,611,000
18" DIP Cl. 50	70,500	28.00	1,974,000
16" DIP Cl. 50	<u>146,800</u>	24.50	<u>3,596,600</u>
Subtotal	609,500		19,125,350
Stephan East Main			
14" DIP Cl. 50	26,500	22.00	583,000
12" PVC C900 Cl. 150	15,900	12.35	196,365
12" PVC C900 Cl. 100	127,200	9.26	1,177,872
12" PVC Cl. 200	76,800	9.43	724,224
10" PVC Cl. 200	122,000	6.99	852,780
8" PVC C900 Cl. 200	<u>18,500</u>	7.62	<u>140,970</u>
Subtotal	386,900		3,675,211
Gettysburg Main			
12" PVC Cl. 250	15,900	11.41	181,419
12" PVC Cl. 200	15,900	9.43	149,937
12" PVC Cl. 160	<u>53,000</u>	7.92	<u>419,760</u>
Subtotal	84,800		<u>751,116</u>
Subtotal Pipeline	1,081,200		23,551,677
Appurtenances @ 21% of Pipeline			4,945,852
TOTAL			=====
ROUND TO			28,497,529
			28,500,000

TABLE 3.10.2

WEB MAIN TRANSMISSION PIPELINE CONTRACT COST SUMMARY

MAINLINE CONTRACT	PIPE SIZE	L.F. PIPE	UNIT COST	\$ PIPE	CONTRACT \$ TOTAL	\$ APPURTENANCE	\$ APPURTENANCE
1-2	24-inch	16653	35.70	594512.10	617992.20	23400.10	3.95
1-4	24-inch	16720	37.53	627410.00	605220.01	57002.01	9.21
1-4A	24-inch	76792	35.00	2607720.00	3041604.37	353004.37	13.17
2-1A	30-inch 24-inch	44576 39700 ----- 84276	44.05 33.58 ----- 39.12	1963572.80 1333203.40 ----- 3296776.20	----- ----- ----- 3946002.19	----- ----- ----- 649225.99	----- ----- ----- 19.69
2-1B	24-inch	77390	35.01	2709170.00	3307484.32	590313.52	22.08
3-1A	10-inch 20-inch	47770 5192 ----- 52962	26.60 30.60 ----- 26.99	1270602.00 150075.20 ----- 1429557.20	----- ----- ----- 1647253.00	----- ----- ----- 217695.00	----- ----- ----- 15.23
3-1B	20-inch	79090	27.90	2206000.47	2020473.03	613664.56	27.01
4-1A	20-inch	64144	20.00	1796032.00	2057581.80	261549.80	14.56
4-1B	18-inch 20-inch	54841 36995 ----- 91836	27.50 30.00 ----- 20.51	1500127.50 1109850.00 ----- 2617977.50	----- ----- ----- 3291614.52	----- ----- ----- 673637.02	----- ----- ----- 25.73
4-1C	16-inch 10-inch	71074 4668 ----- 75742	23.20 29.00 ----- 23.56	1648916.80 135172.00 ----- 1784200.00	----- ----- ----- 2059493.80	----- ----- ----- 275205.00	----- ----- ----- 15.42
4-1D	14-inch	61137	21.06	1287239.54	1439000.17	151768.63	11.79
4-1E	14-inch	74203	20.60	1530229.00	1825676.53	295446.73	19.31
1-4D	CATHODIC PROTECTION				317670.00	317670.00	
3-1PRS	PRESSURE REDUCING STATIONS				277425.00	277425.00	
TOTALS		771025	29.27	22567730.41	27334499.74	4766769.33	21.12

TABLE 3.11.1

DISTRIBUTION SYSTEM PVC PIPELINE

COST ESTIMATE

SIZE INCHES	PRESSURE CLASS	LBS. PER FOOT	(1) PIPE MTL. \$/LB.	PIPE MTL. \$/LF	(2) INSTAL. \$/LF	TOTAL \$/LF	(2) UNITS LF	EXTENSION \$
2	160	0.440	0.48	0.211	0.84	1.05	908,300	953,715
2	200	0.530	0.48	0.254	0.84	1.09	657,200	716,348
2	250	0.639	0.48	0.307	0.85	1.16	1,254,450	1,455,162
2	315	0.783	0.48	0.376	0.85	1.23	5,078,750	6,246,863
2-1/2	160	0.633	0.48	0.304	0.88	1.18	206,700	243,906
2-1/2	200	0.768	0.48	0.369	0.89	1.26	181,200	228,312
2-1/2	250	0.924	0.48	0.444	0.90	1.34	302,100	404,814
2-1/2	315	1.15	0.47	0.541	0.91	1.45	736,050	1,067,272
3	160	0.932	0.48	0.447	0.93	1.38	288,850	398,613
3	200	1.14	0.47	0.536	0.94	1.48	164,300	243,164
3	250	1.39	0.47	0.653	0.96	1.61	266,000	428,260
3	315	1.70	0.47	0.799	0.97	1.77	742,350	1,313,960
4	160	1.53	0.47	0.719	1.03	1.75	143,100	250,425
4	200	1.88	0.47	0.884	1.05	1.93	63,600	122,748
4	250	2.29	0.47	1.08	1.08	2.16	275,600	595,296
4	C900-200(3)	3.20	0.49	1.56	1.12	2.68	769,500	2,062,260
5	160	2.34	0.47	1.10	1.14	2.24	116,600	261,184
5	200	2.87	0.47	1.35	1.18	2.53	10,600	26,818
5	250	3.50	0.47	1.65	1.22	2.87	123,900	355,593
5	315	4.29	0.47	2.02	1.26	3.28	389,550	1,277,724
6	160	3.32	0.47	1.56	1.26	2.82	106,000	298,920
6	200	4.07	0.47	1.91	1.31	3.22	16,900	54,418
6	250	4.97	0.47	2.34	1.36	3.70	32,800	121,360
6	C900-200(3)	6.74	0.49	3.30	1.45	4.75	84,800	402,800
8	160	5.63	0.47	2.65	1.53	4.18	63,600	265,848
8	200	6.88	0.47	3.23	1.61	4.84	31,800	153,912
8	250	8.42	0.47	3.96	1.70	5.66	37,100	209,986
8	C900-200(3)	11.77	0.49	5.77	1.85	7.62	11,600	88,392
10	160	8.73	0.47	4.10	1.85	5.95	58,300	346,885
10	200	10.69	0.47	5.02	1.97	6.99	53,000	370,470
10	250	13.37	0.47	6.28	2.12	8.40	84,800	712,320
12	200	15.04	0.47	7.07	2.36	9.43	21,200	199,916

TOTALS

13,280,600 21,877,664

NOTES: (1) Based on WEB Contract 6-2CD
 (2) Same as DGR Report
 (3) DGR used Cl. 50 DIP

To determine the cost of distribution system appurtenances, an analysis of the 17 WEB secondary transmission and distribution pipeline contracts was made. That analysis is given in Table 3.11.2.

The cost of the other components of the Mid-Dakota Rural Water Distribution System is shown in Table 3.11.3. In order to reconcile the number of "rural connections" included in Table 3.11.1 (2500) with the number of "individual water users" included in Table 2.2.6.1 (2760) two line items were added to Table 3.11.3 as follows:

1. One third mile of 2" PVC for each of 124 rural users.
2. Five hundred fifty feet of 2-4" PVC for each of 136 municipal household users in the 4 towns with individual users. (The estimated length and unit price for in town pipeline were determined from WEB data.)

The DGR distribution system quantities do not include service line. The quantity of service pipeline for Mid-Dakota was estimated to be the same amount per meter as the average required on WEB (i.e. 402 LF/meter). Meter items and Control Vaults (at tanks) were estimated separately.

3.12 ADDITIONAL WATER USERS

An allowance of \$2,100 Thousand for growth is included in the cost estimate. This allowance is not expected to provide for as large an increase in the number of meters as occurred on the WEB system as shown in Table 2.2.4.1. The allowance is based on the estimated cost of distribution system pipeline extension, service line, appurtenances, and meter items to serve enough additional individual users to take up seven of the seventeen percent capacity provided for growth (see Section 2.2.4). The cost estimates for the other facilities already include the capacity for growth.

3.13 OTHER COSTS

Other costs have been estimated based on the percentage of construction cost suggested by the USBR in their November 14, 1989 memorandum. BW concurs with those except that one percent was switched from Mid-Dakota provided inspection to Engineer provided inspection. The percentages are shown in Table 3.1.

It is felt that the 15% contingency is appropriate for an authorization cost estimate because of the level of detail in the design.

WEB SECONDARY

SECONDARY CONTRACT	L.F. TOTAL PIPE 2" - 12"	L.F. TOTAL PIPE 1-1/2"	\$ APPURTENANCES	% APPURTENANCES
1-5A	1477382	235435	356551.48	10.56
1-5B	1329874	168913	365877.15	16.58
2-2A	1311710	154966	313445.12	13.78
2-2B	1621175	91201	332040.90	9.06
3-2A	1284788	67990	387673.10	15.80
3-2B	1636596	110343	480122.54	14.67
4-2AB	652129	55303	320104.62	29.58
4-2C	575800	33041	237792.39	23.27
4-2D	385072	26537	207973.60	26.65
4-2E	1241031	166032	967439.39	31.63
4-2F	1493645	113912	746444.15	24.10
5-2A-1	509369	42194	274855.95	15.23
5-2A-2	1310865	149640	632762.48	17.28
5-2A-3&4	597616	56402	278411.28	21.72
6-2A	813765	36165	262359.50	16.68
6-2B	942525	45665	346954.70	22.05
6-2CD	1692290	149580	706027.25	21.69
TOTALS	18875632	1703319	7216835.60	18.30

TABLE 3.11.3

DISTRIBUTION SYSTEM COST ESTIMATE BREAKDOWN

Item - Quantity, Unit Price	\$
Distribution Pipeline - 2"-12" PVC (Table 3.11.1)	21,877,664
Distribution Pipeline (124 additional rural users) - 2" PVC 218,240 LF @ \$1.16/LF =	253,158
In Town Pipeline (136 municipal household users) - 2-4" PVC 74,800 LF @ \$5.00/LF =	374,000
Service Pipeline - 1-1/2" PVC 1,109,520 LF @ \$1.18/LF =	1,309,234
Appurtenances @ 18% of Pipeline	4,286,530
Meter Box Assemblies - 2,760 @ \$550/EA =	1,518,000
Service Connections - 2,253 @ \$300/EA =	675,900
Special Meters	
Type 7 Huron	30,000
Type 5 10 @ \$17,000/EA =	170,000
Type 4 8 @ \$14,000/EA =	112,000
Type 1-3 18 @ \$1,500/EA =	27,000
Connection to Town Systems - 19 @ \$2,000/EA =	38,000
Control Vaults - 6 @ \$9,000 =	54,000
TOTAL	30,725,486
ROUND TO	30,800,000

4.0 OPERATION & MAINTENANCE COST ESTIMATE

4.1 GENERAL

The Operation & Maintenance (O&M) Cost Estimate given in the DGR report was revised to be consistent with the projected water use given in Section 2.1. Pumping costs were calculated based upon the re-sized pump stations and main transmission pipelines. Certain other revisions in the O&M Cost Estimate were made as deemed appropriate. O&M cost information from the RCWD and WEB systems was analyzed and provided some guidance. O&M cost information from WEB was of less value since WEB is not yet fully in operation. However, it was used to some extent. The cost categories were re-formatted to follow those given in FmHA Instruction 1942-A Guide 7. The Total Annual Estimated Operation & Maintenance Costs are given in Table 4.1.1 (in October 1989 \$). It is based on memberships having paid good intention fees through January 1990.

TABLE 4.1.1

ESTIMATED ANNUAL OPERATION AND MAINTENANCE COSTS

Salaries and Wages	373,000
Taxes	37,000
Accounting, Auditing & Legal Fees	20,000
Utilities	279,000
Gasoline, Oil & Fuel	45,000
Insurance	70,000
Repairs & Maintenance	160,000
Supplies	20,000
Chemicals	98,000
Office Supplies & Printing	12,000
Miscellaneous	129,000

TOTAL	1,243,000

4.2 SALARIES AND WAGES

Salaries and wages is the largest item of the O&M Estimate. The amount estimated is based on a Manager, 2 Office Clerks, and 10 Operators. The item also includes a portion of fringe benefits. Other fringe benefits are included under the items for taxes and insurance.

4.3 UTILITIES

Current power rate schedules were obtained from the electric cooperatives and those rates were utilized for non-summer months. For the six summer months (April thru October) the estimate is based upon the use of Pick-Sloan Missouri River Basin Program Power wheeled by the same rural electric cooperatives. The wheeling charges estimated by the cooperatives were added to the WAPA rates. Table 4.3.1 shows the power rates used.

Power requirement calculations are based upon a wire to water efficiency of 76%. It is estimated that 60% of the energy demand will occur during the summer season. This estimate was developed from energy consumption data on the RCWD modified to account for the estimated higher percentage of water use by municipalities versus rural that is expected on Mid-Dakota as compared with Randall.

For the Oahe and Gettysburg Intake and Water Treatment Plant Pump Stations, the same procedure as used by DGR was used to calculate energy requirements. That was an assumption that the average operating conditions at the pumping stations would be 50% of the maximum design pipeline friction loss. This corresponds to about 69% of the maximum design flow rate. The elevation in Lake Oahe was taken as 1585 for pumping cost calculations. It was assumed that the demand charge for the summer months would be based on a maximum kw demand and in the non-summer months the average demand was used.

For the package pump stations it is assumed that all pumping is at maximum flow and working head. The demand charge is based on maximum KW in all months.

Table 4.3.2 shows the calculation of pumping energy requirements. The load factors calculated for this analysis are shown in Table 4.3.3. Pumping cost calculations are given in Table 4.3.4. The average power cost per kilowatt hour (KWH) is 4.26 cents KWH for summer months and 6.21 cents KWH for winter months.

TABLE 4.3.1.

POWER RATES

SOURCE	DEMAND	ENERGY
	\$ PER KW (7)	CENTS PER KWH
Oahe Electric Cooperative (2)	7.50	First 150 x DEM @ 5.2, Excess 4.2
REE Electric Cooperative (3)	11.20	3.4
CAM WAL Electric Cooperative (4)	9.00	First 4000 @ 4.5, Excess 3.5
WAPA (1)	1.85	First 441 x DEM @ 0.506, Excess 0.844
Cooperative's Wheeling	None	2.7 (5)
East River's Wheeling	10.20 (6)	None

- NOTES:
- (1) Based on Power Rate Adjustment November 1988 "Proposed"
 - (2) Will serve the two Oahe pump stations (In effect 6/13/89)
 - (3) Will serve the Highmore south and Stephan East pump stations (Effective 1/16/87)
 - (4) Will serve the three Gettysburg pump stations (Effective 3/15/87)
 - (5) Provided by Mr. Vernon Jutila, General Manager Oahe Electric Cooperative, at meeting 6/21/89.
 - (6) Provided by Mr. Jeffrey Nelson, General Manager East River Electric Cooperative, at meeting 6/21/89.
 - (7) All demand charges are per billing period except East Rivers which is per season.

TABLE 4.3.2
PUMPING ENERGY REQUIREMENTS

STATION	OPERATING CONDITIONS					ENERGY KWH
	GPM	HEAD (1)	KW	MGY	HOURS	
Oahe	3543	202 (2)	177	1483	6976	1,234,735
Oahe WTP	3543	455	398	1483	6976	2,776,410
Gettysburg Intake	667	304 (2)	50	158	3939	196,951
Gettysburg WTP	667	211	35	158	3939	137,865
Highmore South	1096	350	95	297	4517	429,086
Stephan East	586	400	58	142	4070	236,072
Gettysburg	970	284	68	158	2708	184,170
TOTAL						5,195,289

NOTES: (1) Friction loss at half maximum
(2) Lake Elevation 1585, 15' loss at water treatment plants (WTP)

The costs of space heating, water treatment process electric, small electric services (at control vaults, etc.), and telephone service are also included in the utilities category.

TABLE 4.3.3
PUMPING LOAD FACTORS

STATION	SUMMER (1)			WINTER		
	KW DEMAND	KWH	LF %	KW DEMAND	KWH	LF %
Oahe	291 (2)	740,841	58	177	493,894	64
Oahe WTP	765	1,665,846	50	398	1,110,564	64
Gettysburg Intake	82 (2)	118,171	33	50	78,780	36
Gettysburg WTP	59	82,719	32	35	55,146	36
Highmore South	95	257,452	62	95	171,634	41
Stephan East	58	141,643	56	58	94,429	37
Gettysburg	68	110,502	37	68	73,668	25
TOTALS		3,117,174			2,078,115	

NOTES: (1) April 15 - October 15 or 183 days
(2) Lake at Elevation 1585

TABLE 4.3.4

PUMPING COST CALCULATIONS

STATION	DEMAND	SUMMER ENERGY (1)	COST \$
Oahe	291x(1.85x6+10.20)	740,841x0.03291	30,576
Oahe WTP	765x(1.85x6+10.20)	1,665,846x0.03291	71,109
Gettysburg Intake	82x(1.85x6+10.20)	118,171x0.03291	5,635
Gettysburg WTP	59x(1.85x6+10.20)	82,719x0.03291	3,979
Highmore South	95x(1.85x6+10.20)	257,452x0.03291	10,495
Stephan East	58x(1.85x6+10.20)	141,643x0.03291	5,896
Gettysburg	68x(1.85x6+10.20)	110,502x0.03291	<u>5,084</u>
TOTAL			132,774

STATION	DEMAND	WINTER ENERGY	COST \$
Oahe	177x7.50x6	26,550x0.052+467,344x0.042	28,974
Oahe WTP	398x7.50x6	59,700x0.052+1,050,864x0.042	65,151
Gettysburg Intake	50x9.00x6	4,000x0.045+74,780x0.035	5,497
Gettysburg WTP	35x9.00x6	4,000x0.045+51,146x0.035	3,860
Highmore South	95x11.20x6	171,634x0.034	12,220
Stephan East	58x11.20x6	94,429x0.034	7,108
Gettysburg	68x9.00x6	4,000x0.045+69,668x0.035	<u>6,290</u>
TOTAL			129,100

TOTAL ANNUAL PUMPING COSTS

\$261,874

NOTES: (1) Based on 25% of KWH at the greater than 60%
load factor rate.

4.4 REPAIRS AND MAINTENANCE

This items includes labor and equipment for major system repairs done by outside companies, maintenance contracts on certain equipment and maintenance equipment repair & maintenance. It is based on a comparison with operating rural water systems taking into account size differences.

4.5 CHEMICALS

The cost of chemicals is based on \$0.060 per 1,000 gal. of water treated (10% more than water sales). This compares with \$0.032 on the Randall System in 1989 and \$0.048 on the WEB System in February, 1990. Randall and WEB treat basically the same water, however WEB feeds several additional chemicals. Also WEB has changed the form of several of the chemicals they feed. This should result in some cost savings to WEB.

4.6 COMPARISON WITH OTHER RURAL WATER SYSTEMS

The other O&M Cost catagories not discussed above were estimated by extrapolation from data from other systems. The adoption of the FmHA format makes this extrapolation easier to do since most rural water systems generally follow that format in their reporting. Table 4.6.1 shows the operation and maintenance costs, in unit cost terms of, several South Dakota Rural Water Systems for comparison.

TABLE 4.6.1

OPERATIONS & MAINTENANCE COSTS SOUTH DAKOTA RURAL WATER SYSTEMS

SYSTEM	YEAR- ACT/EST	NUMBER METERS	MGY WATER SALES	W/O CHEMICALS & UTILITIES \$/METER/YEAR	CENTS/ K/GAL SOLD(2) CHEM. & UTIL.
WEB, SD	89(4) Actual(3)	3167	527	119	51
Randall, SD	89(5) Actual	1783	624	176	34
	89(5) Adj.(1)	1783	624	215	34
Mid-Dakota	This Estimate	3027	1489	286	25
Mid-Dakota	DGR Estimate	2523	1755	400	36

NOTES: (1) Increased to provide a higher level of preventive maintenance.
 (2) K/GAL is 1,000 gallons.
 (3) Partial system operation.
 (4) FY 89 (Oct. 88 - Sept. 89)
 (5) Calendar Year

5.0 REVENUE ESTIMATE

5.1 RATE SCHEDULES

5.1.1 Water Users Ability and Willingness to Pay

It is felt that the Mid-Dakota water users ability and willingness to pay is similar to the WEB water users. Therefore no detailed studies of median income and bonded debt per capita have been made. Information on typical rates charged by other South Dakota rural water systems was obtained by Mid-Dakota staff. Appendix 1 compares rural household monthly water rates for a number of operating South Dakota Rural Water Systems with the proposed Mid-Dakota rate. Further comparisons of estimated Mid-Dakota revenue with that of other systems is made in Section 5.2.

The rate schedule on which this revenue estimate is based is shown in Table 5.1.1. It is based on the WEB rate schedule with 10% added (and rounded off) for all classes of users except for Class A and Class C towns. The minimum bill rate for Class A towns on Mid-Dakota is kept the same as WEB. This is recommended to make it more feasible for the Class A towns to contract for a larger capacity and peaking factor than they did on WEB. The reasons for this were discussed in the Design Criteria Section. The minimum bill rate for Class C towns on Mid-Dakota is increased 25% to make it result in average water costs sufficiently higher than Class A towns to reflect the provision of a 2.5 peak factor and storage. The water rate per 1,000 gallons of water used for Class A and Class C towns was kept the same as WEB's in recognition of the average water costs per 1,000 gallons (Section 5.2.3) which are believed to be appropriate.

5.2 CALCULATION OF ANNUAL REVENUE

5.2.1 General

The total annual revenue calculation is shown in Table 5.2.1.1. It is based on memberships having paid good intention fees through January 1990.

5.2.2 Rural Household

Rural household revenue was calculated on the basis of an average monthly water bill of \$50 per month.

TABLE 5.1.1

RATE SCHEDULE USED FOR REVENUE ESTIMATE

Classification	Minimum Bill for Time Period	Plus for Water Used
A Rural Household	\$ 27.50 Monthly	(1)
B Municipal Household	\$ 14.00 Monthly	(1)
C Seasonal Household	\$165.00 Annually	(1)
D Metered Livestock	\$165.00 Annually	(1)
F Special		
Constant flow rate	\$ 18.33 per gpm	
(Class A Town)	Monthly	\$0.75 per 1,000 gal.
Demand rate	\$ 3.91 per pers.	
(Class C Town)	Monthly	\$0.76 per 1,000 gal.
G High Consumption Std. Meter		
2 Service Units	\$ 34.50 Monthly	(2) (5,000-35.45)
3 Service Units	\$ 41.50 Monthly	(2) (8,000-42.40)
4 Service Units	\$ 48.50 Monthly	(2) (12,000-49.40)

NOTES: (1) Minimum bill includes 2,000 gallons for the time period. Next 4,000 gallons \$2.65 per 1,000 gallons. Next 4,000 gallons \$2.05 per 1,000 gallons. Next 5,000 gallons \$1.55 per 1,000 gallons. Over 15,000 gallons \$1.00 per 1,000 gallons.

(2) Total bill calculated as follows: first 4,000 gallons \$32.80; next 2,000 gallons \$2.65 per 1,000 gallons; next 4,000 gallons \$2.05 per 1,000 gallons; next 5,000 gallons \$1.55 per 1,000 gallons; over 15,000 gallons \$1.00 per 1,000 gallons; but not less than the minimum for the number of service units subscribed for.

TABLE 5.2.1.1

ESTIMATED ANNUAL REVENUE (1) (2)

	\$
Rural Household $(1874 + 25 + 119) \times 50 \times 12 =$	1,210,800
Rural Household (unoccupied) $(149 + 27) \times 27.50 \times 12 =$	58,080
Municipal Household $136 \times 20 \times 12 =$	32,640
Metered Livestock $(494 + 13 + 105) \times 200 =$	122,400
Seasonal $(69 + 6) \times 170 =$	12,750
3 Class C Towns + 15 Other Special Users $(487 + 741) \times ((3.91 \times 12) + (0.1 \times 365 \times 0.76)) =$	91,682
11 Class A Towns (except 5 listed below) $2880 \times ((12 \times 18.33 \times 0.13889) +$ $(0.1 \times 365 \times 0.75 \times 0.98)) =$	165,248
Gettysburg $(12 \times 18.33 \times 208) + (365 \times 300 \times 0.67 \times 0.75) =$	100,775
Highmore $(12 \times 18.33 \times 188) + (365 \times 135 \times 0.98 \times 0.75) =$	77,570
Huron $(12 \times 18.33 \times 1389) + (365 \times 2000 \times 0.83 \times 0.75) =$	759,949
Miller $(12 \times 18.33 \times 372) + (365 \times 268 \times 0.98 \times 0.75) =$	153,723
Wessington Springs $(12 \times 18.33 \times 174) + (365 \times 125 \times 0.98 \times 0.75) =$	71,807
3 Special Users Class A Town Rate $(12 \times 18.33 \times (30 + 45 + 100)) +$ $(12 \times (522 + 1,774 + 3,942) \times 0.75 =$	94,635
TOTAL	2,952,059

NOTES: (1) Based on memberships having paid good intention fees through January 1990.
(2) October 1989 \$

The WEB 1983 Design Report used \$50 per month as the basis for the revenue estimate. One might ask why, since the rates used in this report are 10% higher than the WEB rates, is the revenue estimate not based on \$55 per month? The data available does not indicate that the \$55 figure is justified at this time. Table 5.2.2.1 shows average monthly revenue per rural household for the operational part of WEB and the RCWD. The RCWD and WEB systems are believed to be typical of what can be expected on Mid-Dakota. The RCWD adopted a significant rate increase effective November 1, 1989. It is believed that the averages on the WEB system will increase as the system ages.

TABLE 5.2.2.1

AVERAGE MONTHLY REVENUE PER RURAL HOUSEHOLD
SOUTH DAKOTA RURAL WATER SYSTEMS

SYSTEM	YEAR	NUMBER RURAL HOUSEHOLDS	AVERAGE WATER SOLD K.GAL./MO.	\$/HOUSE/MO.
WEB Average	AUG. 89 (1)	2431	10.6	38.98
WEB Regular	AUG. 89 (1)	1795	7.5	34.97
WEB High Consumption	AUG. 89 (1)	636	19.5	50.30
Randall	89	1315	22.5	48.99
Mid-Dakota This Estimate		2018	15.5	50.00

NOTES: (1) One month

Appendix 1 shows a tendency for the "Low Rate per 1,000 gallons" on most of the systems to be somewhat higher than on WEB and the RCWD. One might expect the higher rates to produce higher revenue. However, it is believed that what actually happens is the average water consumption is low and thus there is not a significant difference in the average revenue per household. It is believed that such rate schedules discourage the use of rural water system water for livestock.

5.2.3 Municipal and Special

The average cost per 1,000 gallons for the 19 Class A Special Users is \$1.36. The average changes to \$1.50 without Huron. For Huron itself the average is \$1.25. When comparing the estimated average for Huron, it should be remembered that they will have considerably more cost associated with maintaining their existing surface water source and treatment facilities than will the towns with groundwater sources. By comparison the average for 1989 on

the RCWD was \$1.12 (RCWD has only the Class A type special users). The RCWD bulk users include the towns of Armour, Wagner, Platte and Geddes (1980 population of 3911 total) which pay a minimum monthly bill plus a flat rate per 1,000 gallons. The average also includes five other smaller bulk users which are Indian Communities and Corps of Engineers recreation facilities. These users pay only the flat rate charge (their share of capital costs was paid up front) and thus lower the averages. For 1989 on WEB \$1.42 was the average cost per 1,000 gallons for Class A and C users together. This WEB figure includes water purchased by contractors at a flat rate of \$0.75 per 1,000 gallons (and no minimum bill).

5.2.4 Revenue Breakdown and Comparison

A breakdown and comparison of revenue between special and individual users is given in Table 5.2.4.1. The "special" category is mainly municipal but includes a few rural users. Likewise the "individual" category is mainly rural but includes the municipal users in the 4 towns without public water supply systems. The special category is further divided to show Huron separately. Table 5.2.4.1 also breaks revenue down between minimum bills and water sales. This breakdown allows some relevant comparisons to be made.

TABLE 5.2.4.1

BREAKDOWN OF ANNUAL REVENUE ESTIMATE \$ AND %

CLASS OF USERS	MINIMUM BILL		WATER SALES		TOTAL\$
	\$	%	\$	%	
Individual	860,223	55	576,447	41	1,436,670
Special					
Huron	305,524	20	454,425	33	759,949
36 Others	391,298	25	364,142	26	755,440
Subtotal	696,822	45	818,567	59	1,515,389
TOTAL	1,557,045	100	1,395,014	100	2,952,059

One comparison that can be made is that the total minimum bill revenue estimate of \$1,557,045 is approximately equal to the principal and interest payment of \$1,553,690 as shown in Table 6.1.1. Likewise the estimated water sales revenue is approximately equal to the O&M cost plus reserve payment. Thus, it is felt that the proposed rate schedule is in balance in this regard.

A second comparison involves the sharing of financial responsibility between rural and municipal users. This is further subdivided between capital and O&M costs.

Table 2.2.6.1 shows that of the capacity provided in the system 40% is for individual users, 27% is for Huron and 33% is for the other 36 special users. The estimated capital costs shown in Table 3.1 can be approximately apportioned by allocating all costs except the categories "Distribution System", "Additional Users", and "Town System Improvements" on the basis of capacity. "Distribution System" and "Additional Users" costs are allocated to individual users and "Town System Improvements" costs are all allocated to special users. This distribution is not exact because some of the smaller special users are located on the distribution system and the costs for all special user meters are included in the distribution system. Offsetting that is the fact that individual users should be allocated a higher percentage of the storage costs since they require peak equalization storage and the special users do not. When costs are apportioned on this basis the results are Individual Users 64%, Huron 16%, and 36 Other Special Users 20%. These percentages compare with 55, 20 and 25 respectively for minimum bill revenue (From Table 5.2.4.1.). Given the approximations involved, this is considered a close correlation. It should also be noted that Huron's share of capital cost would go up if it was adjusted for the fact that it is on the far end of the system. Thus it is felt that the proposed rate schedule is in balance in this regard.

The sharing of O&M costs between individual and special users is not quite directly proportioned to the volume of water treated and pumped because greater administrative and distribution system maintenance costs are generated by the individual users. However, as a general comparison Table 2.1.4.1 shows that water use breaks down as Individual Users 27%, Huron 40%, and 36 Other Special Users 33%. These percentages compare with 41, 33 and 26 respectively for water sales revenue (From Table 5.2.4.1.). It is believed that when costs are allocated more accurately to reflect the above discussion the proposed rate schedule will be shown to be in balance. Section 7.8 of the 1983 WEB Design Report shows a methodology that can be applied to accomplish that, at a similar point in the Mid-Dakota project development.

6.0 PROJECT FINANCIAL PLAN

6.1 ANNUAL OPERATING BUDGET

A summary of the Annual Operating Budget estimate is given in Table 6.1.1 (in October 1989 \$). The Annual Operating Budget is in the format required under FmHA Rules & Regulations. Under that format there is no "coverage" requirement or safety factor between income and expenses except the 10% (of principal and interest payment) reserve payment. This is to be set aside each year until such time as the amount in the reserve account equals one year's principal and interest payment.

TABLE 6.1.1

ANNUAL OPERATING BUDGET ESTIMATE

REVENUE (1)	\$2,952,059
OPERATION AND MAINTENANCE COST (1)	<u>1,243,000</u>
AMOUNT AVAILABLE FOR FINANCING	1,709,059
PRINCIPAL & INTEREST PAYMENT (2)	\$1,553,690
RESERVE 10%	<u>155,369</u>
TOTAL FINANCING COST	\$1,709,059

NOTES: (1) Based on operation of complete system.
(2) Based on a loan of 26,659,901 repaid over 40 years at 5% interest (ie. CRF = 0.05827816117). Payments on principal and interest start after project complete.

The annual operating budget is based upon operation of the complete system.

Principal and interest payment is based on the loan being re-paid over 40 years at 5% interest. It is assumed that payment on principal and interest will not start until after the project is complete.

6.2 PROJECT FINANCIAL PLAN

Table 6.2.1 gives a summary of the Project Financial Plan. The dollar figures given are in October 1989 dollars. The estimated total project cost does not include interest during construction on the Federal loan, initial Operating & Maintenance costs, or initial reserve. It is assumed that interest during construction will not be a cash expense to the project. This assumption is consistent with the WEB Project. Under FmHA Rules & Regulations initial O&M costs and initial reserve may be capitalized as a

total project cost but are not eligible for Federal Grant. On the Mid-Dakota Project these costs will be funded by hook-up fees collected from the water users and are not shown in Table 6.2.1.

TABLE 6.2.1

PROJECT FINANCIAL PLAN

	\$ Thousands
ESTIMATED TOTAL PROJECT COST (1)	108,400
FEDERAL LOAN	26,660

REQUIRED AMOUNT OF FEDERAL AND STATE GRANT	81,740

FEDERAL AND STATE GRANT AS A PERCENTAGE OF
PROJECT COST $81,740 - 108,400 = 75.4\%$

- NOTES: (1) In October 1989 \$, does not include: interest during construction on federal loan (2), initial O&M costs (3), or initial reserve (3).
- (2) Interest during construction is not a cash expense to the project.
- (3) Initial operation and maintenance and reserve will be funded by hook-up fees collected from the water users.

In order for the Mid-Dakota project to be a reality, it is considered to be essential that the State of South Dakota and the U.S. Congress fund it on the basis of the grant necessary to reduce user costs to a reasonable level.

FIGURE 2.2.9.1.

OAHE WATER SOURCE

CONCEPTUAL DESIGN

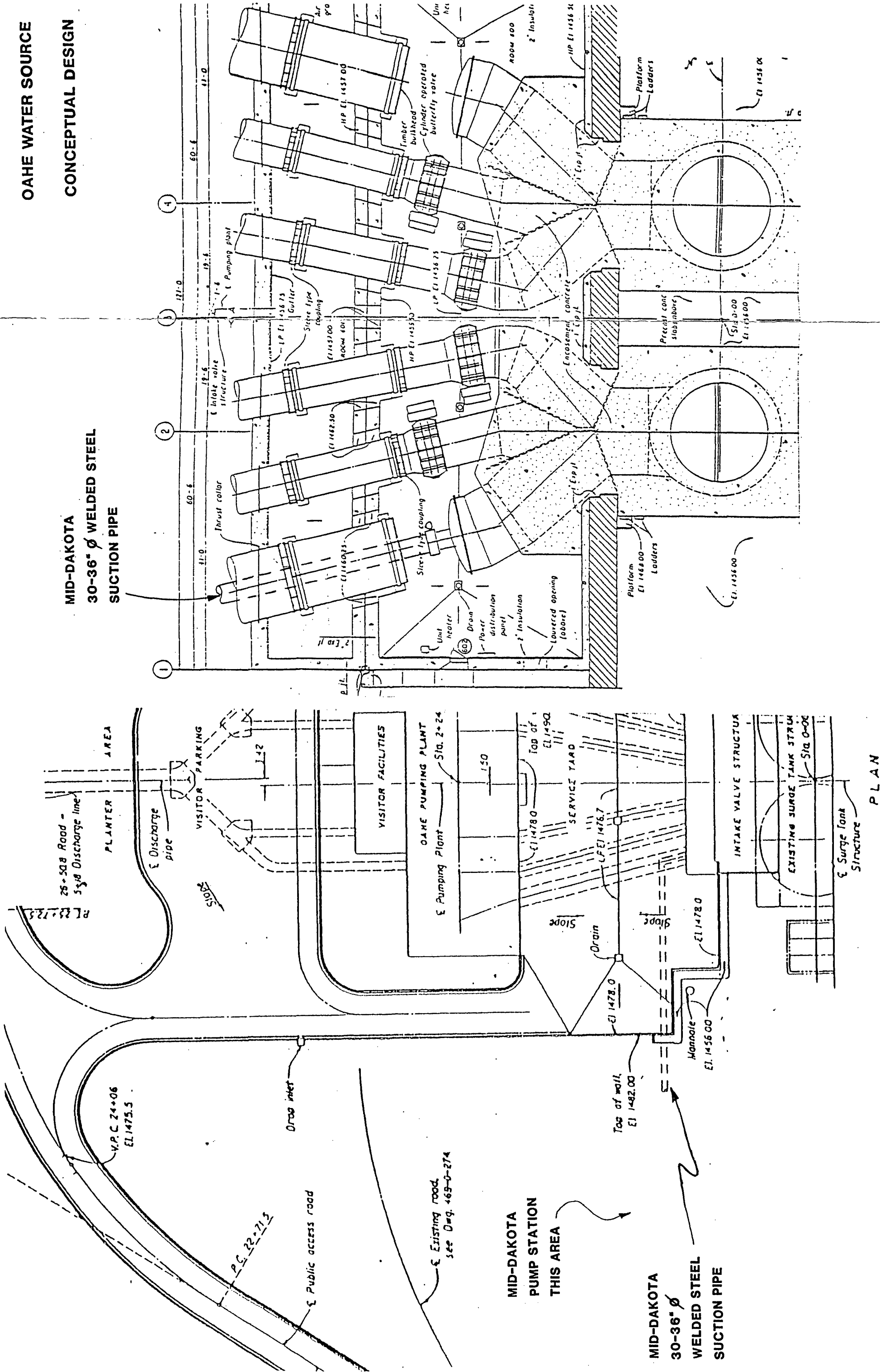


FIGURE 2.2.9.2.



MID-DAKOTA OAHES PUMPING PLANT

42

APPENDIX 1

RURAL HOUSEHOLD MONTHLY WATER BILL COMPARISON (SPRING 1989)

South Dakota System

Gallons Used	Proposed Mid-Dakota
- 0 -	\$ 27.50
1,000	27.50
2,000	27.50
3,000	30.15
4,000	32.80
5,000	35.45
6,000	38.10
7,000	40.15
8,000	42.20
9,000	44.25
10,000	46.30
15,000	54.05
20,000	59.05
25,000	64.05
30,000	69.05
35,000	74.05
40,000	79.05
45,000	84.05
50,000	89.05
60,000	99.05
70,000	109.05
80,000	119.05
90,000	129.05
Low Rate	
Per	
1,000	\$ 1.00

Note: All water usage below the heavy line in each column is at the low rate per 1,000 gallons.

RURAL HOUSEHOLD MONTHLY WATER BILL COMPARISON (SPRING 1989)

South Dakota System

Gallons Used	Minnehaha Com. Water Corp.	Sioux Rural Water System	Lincoln Co. Rural Water	S. Lincoln Rural Water	TM Rural Water Distr.
- 0 -	\$ 22.50	\$ 25.00	\$ 9.95	\$ 30.00	\$ 25.00
1,000	22.50	27.50	9.95	30.00	25.00
2,000	22.50	30.00	12.97	30.00	29.00
3,000	27.00	32.50	15.88	34.00	33.00
4,000	30.50	35.00	18.80	38.00	37.00
5,000	33.75	37.50	21.71	42.00	41.00
6,000	36.00	40.00	24.10	44.50	44.00
7,000	38.25	42.50	26.48	47.00	47.00
8,000	40.00	45.00	28.28	49.50	50.00
9,000	41.75	47.50	31.25	52.00	53.00
10,000	43.25	50.00	33.64	54.50	56.00
15,000	50.75	59.00	42.91	60.75	63.50
20,000	58.25	68.00	51.33	67.00	71.00
25,000	64.50	76.65	56.33	73.25	78.50
30,000	70.75	83.90	61.33	79.50	86.00
35,000	77.00	91.15	66.33	85.75	89.75
40,000	83.25	98.40	71.33	92.00	93.50
45,000	89.50	104.15	76.33	98.25	97.25
50,000	95.75	109.90	81.33	104.50	101.00
60,000	108.25	121.40	91.33	117.00	108.50
70,000	120.75	132.90	101.33	129.50	116.00
80,000	133.25	144.40	111.33	142.00	123.50
90,000	145.75	155.90	121.33	154.50	131.00

Low Rate					
Per					
1,000	\$ 1.25	\$ 1.15	\$ 1.00	\$ 1.25	\$ 0.75

Note: All water usage below the heavy line in each column is at the low rate per 1,000 gallons.

RURAL HOUSEHOLD MONTHLY WATER BILL COMPARISON (SPRING 1989)

South Dakota System

Gallons Used	BDM				
	Tripp Co. Rural Water	WEB Rural Water	Randall(1) Comm. Water District	Rural Water System	Big Sioux Water System
- 0 -	\$ 20.00	\$ 25.00	\$ 15.00	\$ 35.00	\$ 15.00
1,000	20.00	25.00	20.00	35.00	18.00
2,000	20.00	25.00	25.00	40.00	21.00
3,000	23.00	27.40	30.00	44.00	24.00
4,000	26.00	29.80	35.00	48.00	27.00
5,000	29.00	32.20	39.00	52.00	30.00
6,000	32.00	34.60	42.00	56.00	32.80
7,000	34.00	36.45	44.00	60.00	35.60
8,000	36.00	38.30	45.00	63.00	38.40
9,000	38.00	40.15	46.00	66.00	41.20
10,000	40.00	42.00	47.00	69.00	44.00
11,000	41.00	43.40	48.00	72.00	46.80
12,000	42.00	44.80	49.00	75.00	49.60
13,000	43.00	46.20	50.00	78.00	52.40
14,000	44.00	47.60	51.00	81.00	55.20
15,000	45.00	49.00	52.00	84.00	58.00
20,000	48.75	53.50	57.00	91.50	72.00
25,000	52.50	58.00	62.00	99.00	86.00
30,000	56.25	62.50	67.00	106.50	100.00
35,000	60.00	67.00	72.00	114.00	114.00
40,000	63.75	71.50	77.00	121.50	128.00
45,000	67.50	76.00	82.00	129.00	135.50
50,000	71.25	80.50	87.00	136.50	143.00
60,000	78.75	89.50	97.00	151.50	158.00
70,000	86.25	98.50	107.00	166.50	173.00
80,000	93.75	107.50	117.00	181.50	188.00
90,000	101.25	116.50	127.00	196.50	203.00

Low Rate					
Per					
1,000	\$ 0.75	\$ 0.90	\$ 1.00	\$ 1.50	\$ 1.50

Note: All water usage below the heavy line in each column is at the low rate per 1,000 gallons.

(1) Effective November 1, 1989

RURAL HOUSEHOLD MONTHLY WATER BILL COMPARISON (SPRING 1989)

South Dakota System

Gallons Used	Brookings- Deuel	B-Y Water District	Clark Rural Water System	Clay Rural Water System	Davison Rural Water	Hanson Rural Water System
- 0 -	\$ 18.00	\$ 25.00	\$ 30.00	\$ 22.00	\$ 23.00	\$ 25.00
1,000	20.25	25.00	30.00	25.50	23.00	28.30
2,000	22.50	30.00	30.00	29.00	26.00	31.60
3,000	24.75	35.00	34.50	32.50	29.00	34.90
4,000	27.00	39.00	39.00	36.00	32.00	38.20
5,000	29.25	43.00	43.50	39.50	35.00	41.50
6,000	31.50	46.00	47.00	43.00	38.00	44.80
7,000	33.75	49.00	50.50	46.50	40.00	47.00
8,000	36.00	51.50	54.00	50.00	42.00	49.20
9,000	38.25	54.00	57.50	53.50	44.00	51.40
10,000	40.50	56.50	61.00	57.00	46.00	53.60
11,000	42.75	59.00	63.50	59.50	47.30	54.70
12,000	45.00	61.50	66.00	62.00	48.60	55.80
13,000	47.25	63.25	68.50	64.50	49.90	56.90
14,000	49.50	65.00	71.00	67.00	51.20	58.00
15,000	51.75	66.75	73.50	69.50	52.50	59.10
20,000	63.00	75.50	86.00	82.00	59.00	64.60
25,000	70.50	84.25	93.50	94.50	65.50	70.10
30,000	78.00	93.00	101.00	100.75	72.00	75.60
35,000	85.50	101.75	107.25	107.00	78.50	81.10
40,000	93.00	110.50	113.50	113.25	85.00	86.60
45,000	100.50	119.25	119.75	119.50	91.50	92.10
50,000	108.00	128.00	126.00	125.75	98.00	97.60
60,000	123.00	145.50	138.50	138.25	111.00	108.60
70,000	138.00	163.00	151.00	150.75	124.00	119.60
80,000	153.00	180.50	163.50	163.25	137.00	130.60
90,000	168.00	198.00	176.00	175.75	150.00	141.60

Low Rate						
Per						
1,000	\$ 1.50	\$ 1.75	\$ 1.25	\$ 1.25	\$ 1.30	\$ 1.10

Note: All water usage below the heavy line in each column is at the low rate per 1,000 gallons.



Bartlett & West
Engineers, Inc.

October 31, 1991

Ms. Julie Apgar, Manager
Mid-Dakota Rural Water System, Inc.
P.O. Box 69
Miller, SD 57362

TASK NO. 4 - STUDY GETTYSBURG WATER SOURCE

This letter is transmitted in accordance with the AGREEMENT FOR PROFESSIONAL SERVICES, dated January 10, 1989 and amended February 21, 1989 and July 16, 1991, regarding Task No. 4, a study to determine the most feasible water source for the Gettysburg Service Area. This letter summarizes our findings as they were presented to the Board of Directors on October 17, 1991.

The alternatives considered were either providing capacity in the Oahe pump station and water treatment plant along with a transmission pipeline along Highway 83 from Highway 14 to Highway 212 (single source alternative) or providing a separate intake, pump station and water treatment plant near Highway 212 and a transmission pipeline to the junction of Highways 212 and 83 (dual source alternative).

Initially, an estimate was made of the pipeline quantities included in the DGR distribution pipeline cost estimate (as shown in their November 1988 Report, Table C-1) which is for the pipeline along Highway 83 between Highways 212 and 14. Later, when we received DGR's pipe size drawing for the Gettysburg Service Area, we compared it with our first estimate and found close agreement. The cost estimate for the distribution pipeline along Highway 83 is given in Attachment 1. We feel that \$1,458 thousand of the distribution pipeline cost should be deleted from the "Cost of Oahe Source" column in DGR's Table C-1 (see Attachment 2). However, the cost of using that source still exceeds the construction cost of a separate sub-system by \$2,773 thousand based on DGR's costs. DGR's estimates for operating costs (as shown in their November 1988 Report, Table C-5) show that the operating cost of the Oahe source alone is \$19,660 per year less than the operating cost with Gettysburg separate (see Attachment 3).

While the information from DGR (including the additional map) was helpful, we noted things we would do differently. Therefore, we prepared independent preliminary designs and cost estimates for the facilities and portions of the system which are different under the two water source alternatives. Location drawings of the single and dual source alternatives including intake facilities, water treatment plants, main transmission pipelines, pump stations and tower locations are included as Figures 1 and 2 respectively. Design criteria and calculation methods consistent with our March 1990 Supplemental Report were used in preparing our alternative estimates. One change from the design capacities given on Table 2.2.6.1 of the 1990 Report was made. Officials of the City of Gettysburg indicated that they wish to contract for 300 gpm of capacity rather than 208 gpm (this also increased the capacity for growth).

The estimated construction costs for the Gettysburg source alternatives are included as Table 1 with the pipeline quantity and cost tabulations for the single and dual source alternatives included as Tables 2 and 3 respectively. A comparison of the Table 1 total cost estimates shows the single source alternative has a \$40 thousand higher cost (about one twenty fifth of one percent of the estimated cost of the of the system).

An annual pumping cost comparison was prepared for two source alternatives. Single source pump stations consist of the Oahe Intake Pump Station, the Oahe Water Treatment Plant (WTP) and three package pump stations which are located south of Onida, south of Agar, and west of Gettysburg. Dual source pump stations consist of the Oahe Intake Pump Station, the Oahe WTP, the Gettysburg Intake Pump Station and the Gettysburg WTP. Pump station sizes for single and dual source alternatives are shown in Tables 4 and 5. Tables 6 and 7 show the calculations of the pumping energy requirements. The load factors are shown on Tables 8 and 9. Pumping cost calculations are given on Tables 10 and 11. The calculation of Tables 8 through 11 was made on the same basis as given in Section 4.3 of our 1990 Supplemental Report. The single source annual pumping cost when compared to that of the dual source alternative is \$38,145 higher.

There are additional labor costs associated with treating the same amount of water through two water treatment plants. The single source alternative has five pump stations whereas the dual source alternative has only four pump stations to operate. However, the dual source alternative has an added inclined tube type intake into Lake Oahe. Considering all these factors, it is estimated that for the single source alternative one and one-half fewer employees would be needed at an estimated annual cost savings of \$44,850 (including fringe benefits). Thus when annual pumping and labor costs are combined, there is an estimated savings of \$6,705 (about one-half of one percent of the estimated annual O&M cost of the system) for the single source alternative.

There are several things to consider in addition to costs when evaluating the two alternatives. Because of standard AWWA Storage tank sizing, the single source alternative provides for an additional 100 thousand gallons of storage. The two additional tanks in the single source alternative place the storage closer to the users and reduce unusually high static pressures in some parts of distribution system.

Another consideration is the uncertainty of the estimated cost of the Gettysburg Intake. The \$2,230 thousand estimated cost of the Gettysburg Intake and WTP is based on an inclined tube type intake with submersible pumps. About 15% of that cost is for the intake structure. Topographic maps made before Lake Oahe existed, were obtained from the U.S. Army Corps of Engineers. They show several good potential sites for this type of intake in the SE 1/4 of Sec. 20 and the SW 1/4 of Sec. 21, T118N, R78W. However, it is not uncommon for erosion and wave action to cause changes in topography. Also, the banks of Lake Oahe are known for the potential instability due to "slump blocks". Extensive geotechnical investigations and underwater surveys would be needed to further evaluate the potential intake sites. Therefore, the construction cost estimate for the Gettysburg intake must be considered to have a greater degree of uncertainty than the rest of the cost estimates.

Another consideration is intake type preference. The Oahe Intake will utilize the existing Oahe Reservoir Powerplant intake. In order to provide a functionally equivalent facility on the dual source alternative, an intake similar to that used on the WEB system, which is a vertical caisson with line shaft vertical turbine pumps would be required. This type of design is superior to the inclined tube type in terms of reliability and maintainability but is significantly more expensive to construct. Since construction costs of a vertical caisson intake are highly site specific, the cost of constructing an intake of this type, instead of an inclined tube type, is hard to estimate without geotechnical and underwater topography studies. However, additional costs of up to two million dollars would not be unexpected.

The calculated initial cost advantage for the dual source alternative is considered insignificant, in view of the accuracy of the cost estimates. The advantage on all other factors is in favor of the single source alternative. Therefore, the recommendation of BW is to construct the Mid-Dakota Rural Water System using a single source intake and water treatment plant and not using a separate sub-system source for the Gettysburg Service Area.

BARTLETT & WEST ENGINEERS, INC.

Bruce F. McCollom

Bruce F. McCollom, P.E.
Project Manager

cc: Mr. Robert Hatfield w/attach.

File: Corresp. wo/attach.
Task 4 w/attach.

ATTACHMENT 1

GETTYSBURG SERVICE AREA DISTRIBUTION PIPELINE ALONG HIGHWAY 83 (DGR FEASIBILITY STUDY)

<u>PIPELINE</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>EXTENSION</u>
10" Cl. 250	53,000	\$ 10.81	\$ 572,930
10" Cl. 200	37,100	9.10	337,610
10" Cl. 160	21,200	7.68	162,816
5" Cl. 315	10,600	4.07	43,142
5" Cl. 250	22,200	3.56	79,032
3" Cl. 315	15,900	2.07	32,913
2-1/2" Cl. 315	10,600	1.65	17,490
2" Cl. 315	15,900	1.38	<u>21,942</u>
Total Pipeline			\$1,267,875
Miscellaneous Items 15%			<u>190,181</u>
Total Distribution System			\$1,458,056

TABLE C-1
ESTIMATED CONSTRUCTION COSTS FOR
GETTYSBURG SUBSYSTEM SOURCE ALTERNATIVES

<u>Facility</u>	<u>Capacity</u>	<u>Cost of Separate Subsystem, thousands</u>	<u>Cost of Oahe Source, thousands</u>	<u>Cost of Sharpe Source, thousands</u>
Intake				
Water Treatment Plant	1,460 gpm	\$ 650	\$ 200	\$ 200
WTP Pumping Station	1,460 gpm	1,490	970	970
Gettysburg Booster	1,460 gpm	260	250	250
Blunt Booster	1,460 gpm	170	N/A ²	N/A
Agar Booster	1,460 gpm	N/A	170	170
Gettysburg Tower	870 gpm	N/A	130	130
Gettysburg Reservoir	500 kgal	600	600	600
Blunt Reservoir	1,000 kgal	500	N/A	N/A
Agar Reservoir	500 kgal	N/A	300	300
Main Pipeline	500 kgal	N/A	300	300
Distribution Pipeline		1,049	6,030	7,777
		<u>6,284</u>	<u>6,284</u>	<u>6,284</u>
Total Construction Cost, Gettysburg Area		\$11,003	\$15,234	\$16,981

¹Costs for Oahe and Sharpe sources are incremental costs over respective base systems which include service to Huron.

²N/A = Not applicable to this alternative.

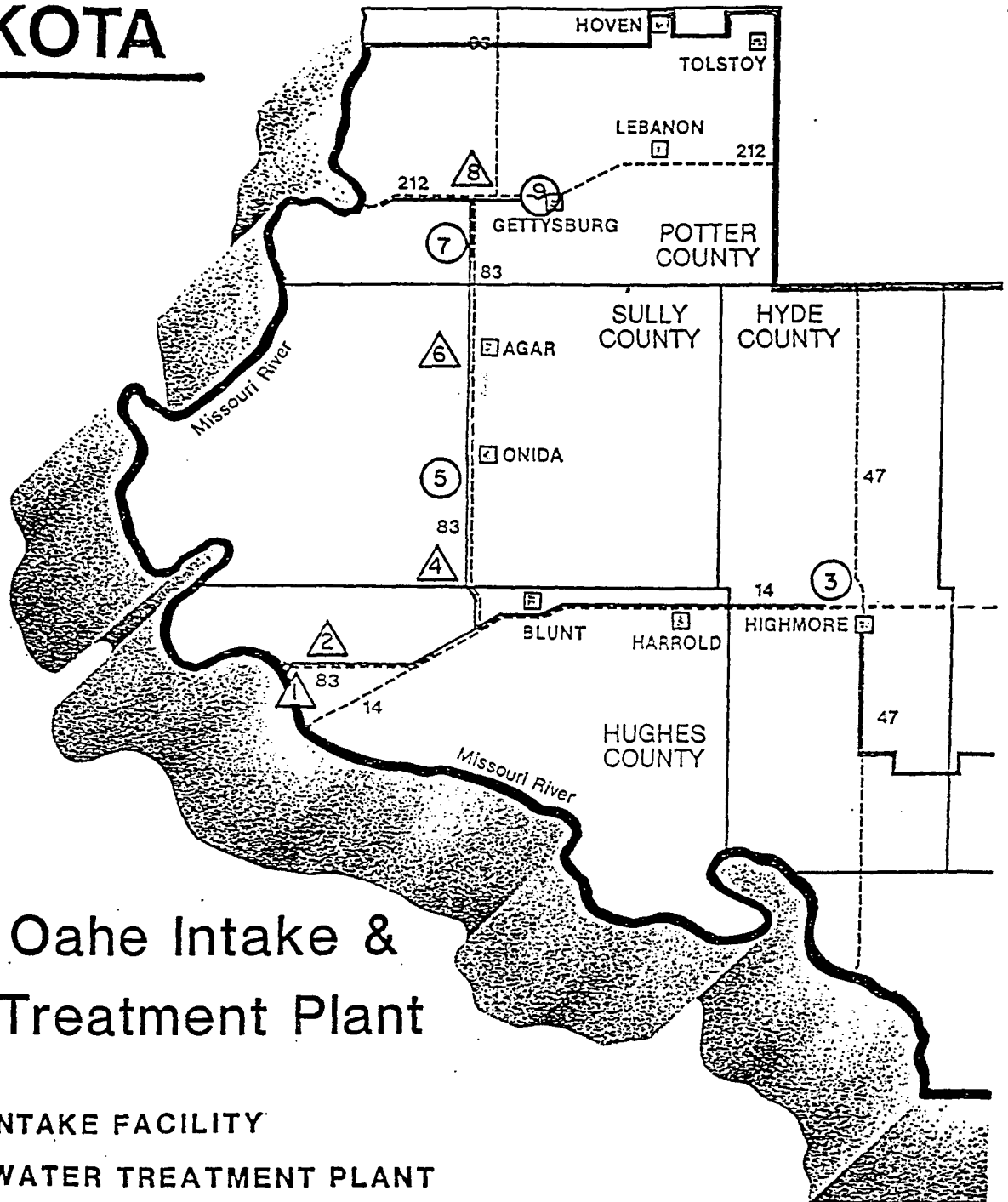
TABLE C-5

ESTIMATED OPERATING COSTS FOR ALTERNATIVE SOURCE PLANS

Item	Oahe			Big Bend			W/O Huron, W/Gettysburg Separate	Split 3 Source
	Alone	W/Gettysburg Separate	W/O Huron, W/Gettysburg Separate	Alone	W/Gettysburg Separate	W/O Huron, W/Gettysburg Separate		
Fixed Annual Costs								
Manager, 1 @ \$30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000
Office clerks, 2 @ \$14,000	28,000	28,000	28,000	28,000	28,000	28,000	28,000	28,000
Distribution Operators, 5 @ \$23,000	115,000	115,000	115,000	115,000	115,000	115,000	115,000	115,000
Fringe benefits on labor @40%	69,200	69,200	69,200	69,200	69,200	69,200	69,200	69,200
Administrative Office and Billing	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Water Treatment Plant Repair and Replacement	123,725	132,825	96,075	123,725	132,825	96,075	142,625	142,625
Pumping Station Repair and Replacement	28,000	31,150	24,150	41,650	30,150	27,300	30,150	30,150
Pipeline Repair and Replacement	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
Miscellaneous, Insurance and Directors	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Subtotal, fixed annual costs	\$ 553,925	\$ 566,175	\$ 522,425	\$ 567,575	\$ 573,175	\$ 525,575	\$ 502,975	
Variable Production Costs								
Pumping Energy	\$ 463,335	\$ 430,545	\$ 310,357	\$ 508,105	\$ 524,784	\$ 346,435	\$ 479,780	
Water Treatment Chemicals	195,000	195,000	110,000	195,000	195,000	110,000	195,000	
Water Treatment Labor	126,500	149,500	121,900	126,500	149,500	121,900	179,400	
Water Treatment Labor Fringe	50,600	59,800	40,760	50,600	59,800	40,760	71,760	
Miscellaneous	234,000	234,000	132,000	234,000	234,000	132,000	234,000	
Subtotal, Variable Costs	\$ 1,069,435	\$ 1,076,845	\$ 723,017	\$ 1,194,205	\$ 1,163,084	\$ 759,095	\$ 1,159,948	
Total Annual Costs	\$ 1,623,360	\$ 1,643,020	\$ 1,245,442	\$ 1,761,780	\$ 1,736,259	\$ 1,284,670	\$ 1,742,923	
Total Annual Production, Kgal	1,950,000	1,950,000	1,100,000	1,950,000	1,950,000	1,100,000	1,950,000	
Total Annual Sales, Kgal	1,755,000	1,755,000	990,000	1,755,000	1,755,000	990,000	1,755,000	
Total Unit Cost per Kgal Sold	\$ 0.92	\$ 0.94	\$ 1.26	\$ 1.00	\$ 0.99	\$ 1.30	\$ 0.99	

FIGURE 1

MID-DAKOTA

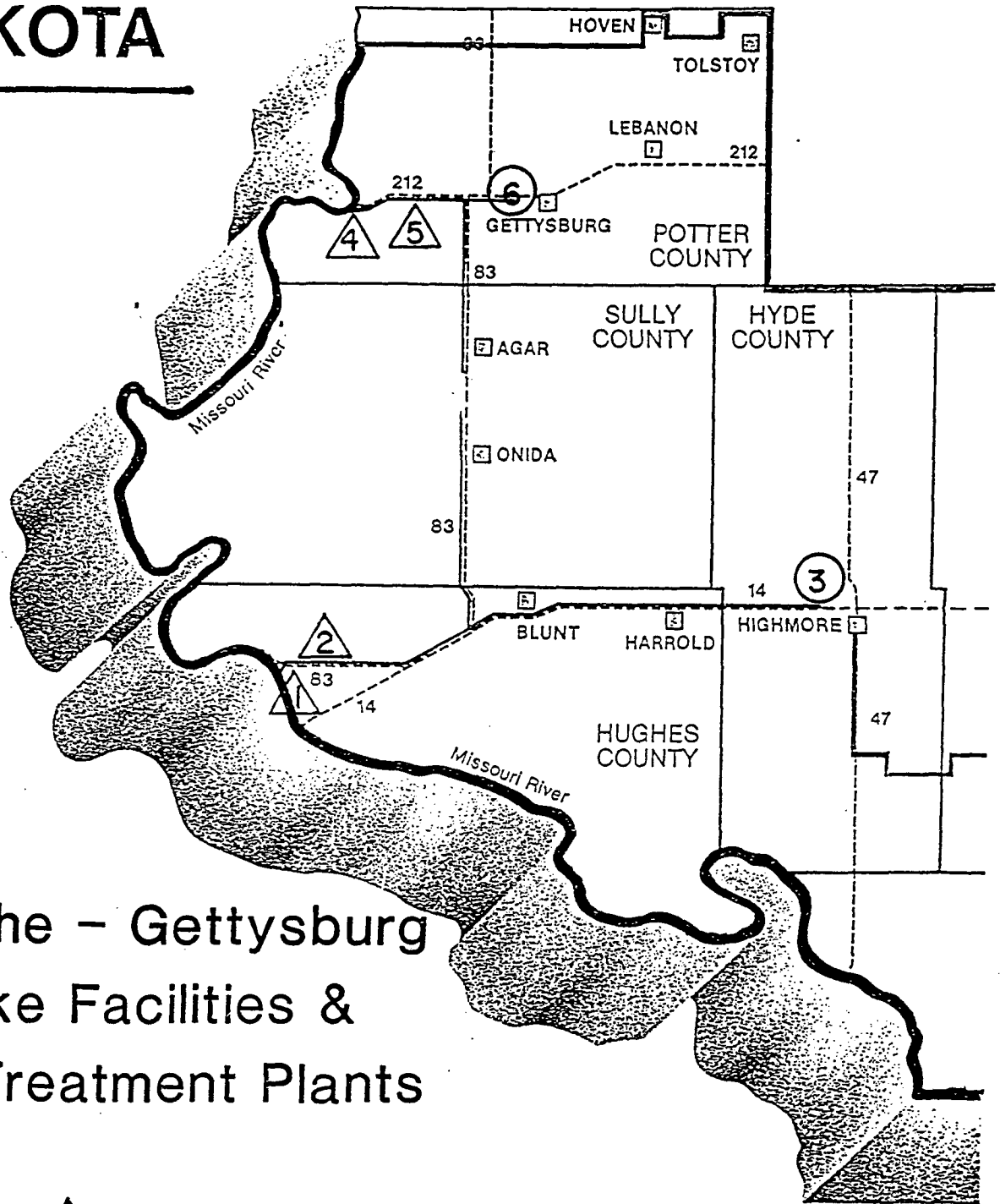


Single Oahe Intake & Water Treatment Plant

- ① OAHE INTAKE FACILITY
- ② OAHE WATER TREATMENT PLANT
- ③ HIGHMORE TOWER
- ④ ONIDA PUMP STATION
- ⑤ ONIDA TOWER
- ⑥ AGAR PUMP STATION
- ⑦ AGAR TOWER
- ⑧ GETTYSBURG PUMP STATION
- ⑨ GETTYSBURG TOWER

FIGURE 2

MID-DAKOTA



Dual Oahe - Gettysburg Intake Facilities & Water Treatment Plants

- ① OAHE INTAKE FACILITY
- ② OAHE WATER TREATMENT PLANT
- ③ HIGHMORE TOWER
- ④ GETTYSBURG INTAKE FACILITY
- ⑤ GETTYSBURG WATER TREATMENT PLANT
- ⑥ GETTYSBURG TOWER

TABLE 1
ESTIMATED CONSTRUCTION COSTS FOR
GETTYSBURG SOURCE ALTERNATIVES (3)

<u>FACILITY</u>	<u>CAPACITY</u>	<u>COST OF DUAL SOURCE SYSTEM THOUSANDS</u>	<u>COST OF SINGLE SOURCE SYSTEM THOUSANDS (1)</u>
Intake w/Pump Station	900 gpm	(4)	52
Water Treatment Plant w/Pump Station & Clearwell Storage	900 gpm	2,230	839
Onida Tower	150 kgal	N/A (2)	225
Agar Tower	200 kgal	N/A (2)	280
Gettysburg Tower	1,000 kgal (dual) 750 kgal (single)	800	600
Highmore Tower	1,500 kgal	1,200	1,200
Onida Booster Pump Station 1053 gpm @ 255'	100 hp	N/A (2)	120
Agar Booster Pump Station 894 gpm @ 238'	75 hp	N/A (2)	100
Gettysburg Booster Pump Station 737 gpm @ 236'	75 hp	N/A (2)	100
Telemetry Controls		84	133
Pipelines		9,695	10,420
Appurtenances @ 18.5% of Pipelines		1,794	1,928
Pressure Reducing Valves		<u>39</u>	<u>20</u>
SUB-TOTAL CONSTRUCTION COST		15,842	16,017
Engineering & Inspection Cost		<u>2,381</u> =====	<u>2,246</u> =====
TOTAL COST FOR COMPARISON		\$18,223	\$18,263

Footnotes:

1. Costs for Oahe source is incremental costs over base systems.
2. N/A = Not applicable to this alternative.
3. All costs are October 1989 \$.
4. Included with Water Treatment Plant.

TABLE 2

SINGLE SOURCE PIPELINE

MAINLINE TO HIGHMORE TOWER

PIPE SIZE -----	QUANTITY -----	UNIT PRICE -----	EXTENSION -----
24" DI CL. 50	225101	37.50	\$8,441,287.50

MAINLINE TO ONIDA PUMP STATION

PIPE SIZE -----	QUANTITY -----	UNIT PRICE -----	EXTENSION -----
12" CL. 200	28053	9.43	\$ 264,539.79

ONIDA PUMP STATION TO ONIDA TOWER

PIPE SIZE -----	QUANTITY -----	UNIT PRICE -----	EXTENSION -----
12" CL. 160	7426	7.92	\$ 58,813.92
12" CL. 200	10550	9.43	\$ 99,486.50
12" C900 CL 200	10475	14.41	\$ 150,944.75
12" CL 250	10700	11.41	\$ 122,087.00
SUBTOTAL			\$ 431,332.17

ONIDA TOWER TO AGAR PUMP STATION

PIPE SIZE -----	QUANTITY -----	UNIT PRICE -----	EXTENSION -----
12" CL. 160	44827	7.92	\$ 355,029.84
12" CL. 200	4000	9.43	\$ 37,720.00
12" CL. 250	1750	11.41	\$ 19,967.50
SUBTOTAL			\$ 412,717.34

AGAR PUMP STATION TO AGAR TOWER

PIPE SIZE -----	QUANTITY -----	UNIT PRICE -----	EXTENSION -----
12" CL. 160	7476	7.92	\$ 59,209.92
12" CL. 200	19675	9.43	\$ 185,535.25
12" CL. 250	17850	11.41	\$ 203,668.50
SUBTOTAL			\$ 448,413.67

SINGLE SOURCE PIPELINE (Continued)

AGAR TOWER TO GETTYSBURG PUMP STATION

PIPE SIZE -----	QUANTITY -----	UNIT PRICE -----	EXTENSION -----
12" CL. 160	24677	7.92	\$ 195,441.84
4" CL. 160	35200	1.75	\$ 61,600.00
4" CL. 200	11175	1.93	\$ 21,567.75
SUBTOTAL			\$ 278,609.59

GETTYSBURG PUMP STATION TO GETTYSBURG TOWER

PIPE SIZE -----	QUANTITY -----	UNIT PRICE -----	EXTENSION -----
10" CL. 160	11750	5.95	\$ 69,912.50
10" CL. 200	5300	6.99	\$ 37,047.00
10" CL. 250	4250	8.40	\$ 35,700.00
SUBTOTAL			\$ 142,659.50

SINGLE SOURCE PIPELINE TOTAL	\$10,419,559.56
	=====

Footnotes:

1. All costs are October 1989 \$.
2. 24" diameter pipeline is ductile iron (DI) all other pipeline is polyvinyl chloride (PVC) of the pressure class shown.
3. Quantities are lineal feet and unit prices are \$ per lineal foot.

TABLE 3

DUAL SOURCE PIPELINE

MAINLINE TO HIGHMORE TOWER

PIPE SIZE -----	QUANTITY -----	UNIT PRICE -----	EXTENSION -----
24" DI	225100	37.50	\$ 8,441,250.00

MAINLINE TO ONIDA

PIPE SIZE -----	QUANTITY -----	UNIT PRICE -----	EXTENSION -----
8" CL. 160'	2150	4.18	\$ 8,987.00
8" CL. 200	24250	4.84	\$ 117,370.00
8" CL. 250	49227	5.66	\$ 278,624.82
2 1/2" CL. 200	15725	1.26	\$ 19,813.50
SUBTOTAL			\$ 424,795.32

GETTYSBURG RAW WATER LINE

PIPE SIZE -----	QUANTITY -----	UNIT PRICE -----	EXTENSION -----
10" CL. 160	27175	5.95	\$ 161,691.25
10" CL. 200	500	6.99	\$ 3,495.00
10" C-900 CL. 200	800	10.52	\$ 8,416.00
10" CL. 250	950	8.40	\$ 7,980.00
SUBTOTAL			\$ 181,582.25

GETTYSBURG WATER TREATMENT PLANT TO TOWER AND TO AGAR

PIPE SIZE -----	QUANTITY -----	UNIT PRICE -----	EXTENSION -----
12" CL. 160	13050	7.92	\$ 103,356.00
12" CL. 200	5250	9.43	\$ 49,507.50
12" CL. 250	9325	11.41	\$ 106,398.25
10" C-900 CL. 200	9651	10.52	\$ 101,528.52
10" CL. 250	6275	8.40	\$ 52,710.00
6" CL. 200	32251	3.22	\$ 103,848.22
6" CL. 250	10577	3.70	\$ 39,134.90
4" CL. 160	21651	1.75	\$ 37,889.25
3" CL. 160	10575	1.38	\$ 14,593.50
3" CL. 250	24126	1.61	\$ 38,842.86
SUBTOTAL			\$ 647,809.00

DUAL SOURCE PIPELINE TOTAL	\$ 9,695,436.57
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=====

Footnotes:

1. All costs are October 1989 \$.
2. 24" diameter pipeline is ductile iron (DI) all other pipeline is polyvinyl chloride (PVC) of the pressure class shown.
3. Quantities are lineal feet and unit prices are \$ per lineal foot.

TABLE 4
SINGLE SOURCE PUMP STATION SIZES

STATION	FLOW GPM	TOTAL HEAD FEET	HP (1)	KW (2)
Oahe	6220	285 (3)	539	437
Oahe WTP	6220	641	1213	984
Onida	1053	255	82	67
Agar	894	238	65	53
Gettysburg	737	236	53	43

TABLE 5
DUAL SOURCE PUMP STATION SIZES

STATION	FLOW GPM	TOTAL HEAD FEET	HP (1)	KW (2)
Oahe	5320	279 (3)	452	367
Oahe WTP	5320	606	981	795
Gettysburg Intake	901	527 (3)	144	117
Gettysburg WTP	901	471	129	105

Footnotes:

1. Based on Pump Efficiency 83%
2. Based on Motor Efficiency 92%
3. With Lake Oahe at Low Elevation 1540 and Includes 30' for Loss through Water Treatment Plant

TABLE 6
SINGLE SOURCE PUMPING ENERGY REQUIREMENTS

STATION	OPERATING CONDITIONS					ENERGY KWH
	GPM	HEAD (1)	KW	MGY	HOURS	
Oahe	4279	212 (2)	225	1637	6376	1,434,600
Oahe WTP	4279	469	497	1637	6376	3,168,872
Onida	1053	255	67	156	2469	165,423
Agar	894	238	53	133	2479	131,387
Gettysburg	737	236	43	109	2465	105,995

TABLE 7
DUAL SOURCE PUMPING ENERGY REQUIREMENTS

STATION	OPERATING CONDITIONS					ENERGY KWH
	GPM	HEAD (1)	KW	MGY	HOURS	
Oahe	3660	209 (2)	190	1504	6849	1,301,310
Oahe WTP	3660	452	410	1504	6849	2,808,090
Gettysburg Intake	620	404	62	134	3602	223,324
Gettysburg WTP	620	401	62	134	3602	223,324

Footnotes:

1. Friction Loss at half maximum.
2. Lake Elevation 1585, 15' loss at water treatment plants (WTP).

TABLE 8
SINGLE SOURCE PUMPING LOAD FACTORS

STATION	SUMMER (1)			WINTER		
	KW DEMAND	KWH	LF %	KW DEMAND	KWH	LF %
Oahe	368 (2)	860,760	53	225	573,840	58
Oahe WTP	984	1,901,323	44	497	1,267,549	58
Onida	67	99,254	34	67	66,169	23
Agar	53	78,832	34	53	52,555	23
Gettysburg	43	63,597	34	43	42,398	23

TABLE 9
DUAL SOURCE PUMPING LOAD FACTORS

STATION	SUMMER (1)			WINTER		
	KW DEMAND	KWH	LF %	KW DEMAND	KWH	LF %
Oahe	307 (2)	780,786	58	190	520,524	62
Oahe WTP	795	1,684,854	48	410	1,123,236	63
Gettysburg	107 (2)	133,994	29	62	89,330	33
Gettysburg WTP	105	133,994	29	62	89,330	33

Footnotes:

1. April 15 - October 15 or 183 days.
2. Lake at Elevation 1585.

TABLE 10
SINGLE SOURCE PUMPING COST CALCULATIONS
SUMMER

STATION	DEMAND	ENERGY (1)	COST \$
Oahe	368 x (1.85 x 6 + 10.20)	860,760 x .03291	36,166
Oahe WTP	984 x (1.85 x 6 + 10.20)	1,901,323 x .03291	83,532
Onida	67 x (1.85 x 6 + 10.20)	99,254 x .03291	4,694
Agar	53 x (1.85 x 6 + 10.20)	78,832 x .03291	3,723
Gettysburg	43 x (1.85 x 6 + 10.20)	63,597 x .03291	<u>3,009</u>
TOTAL			131,124

WINTER

STATION	DEMAND	ENERGY	COST \$
Oahe	225x7.5x6	150x225x6x.052+371,340x.042	36,251
Oahe WTP	497x7.5x6	150x497x6x.052+820,249x.042	80,075
Onida	67x7.5x6	150x67x6x.052+5,869x.042	6,397
Agar	53x7.5x6	150x53x6x.052+4,855x.042	5,069
Gettysburg	43x9.0x6	4000x6x.045+18,398x.035	<u>4,046</u>
TOTAL			131,838
TOTAL ANNUAL PUMPING COSTS			\$262,962

Footnotes:

1. Based on 25% of KWH at the greater than 60% load factor rate.

TABLE 11
DUAL SOURCE PUMPING COST CALCULATIONS
SUMMER

STATION	DEMAND	ENERGY (1)	COST \$
Oahe	$307 \times (1.85 \times 6 + 10.20)$	$780,786 \times .03291$	32,235
Oahe WTP	$795 \times (1.85 \times 6 + 10.20)$	$1,684,854 \times .03291$	72,382
Gettysburg	$107 \times (1.85 \times 6 + 10.20)$	$133,994 \times .03291$	6,689
Gettysburg WTP	$105 \times (1.85 \times 6 + 10.20)$	$133,994 \times .03291$	<u>6,646</u>
TOTAL			117,952

WINTER

STATION	DEMAND	ENERGY	COST \$
Oahe	$190 \times 7.5 \times 6$	$150 \times 190 \times 6 \times .052 + 349,524 \times .042$	24,119
Oahe WTP	$410 \times 7.5 \times 6$	$150 \times 410 \times 6 \times .052 + 754,236 \times .042$	69,316
Gettysburg	$62 \times 9.0 \times 6$	$4000 \times 6 \times .045 + 65,330 \times .035$	6,715
Gettysburg WTP	$62 \times 9.0 \times 6$	$4000 \times 6 \times .045 + 65,330 \times .035$	<u>6,715</u>
TOTAL			106,865
TOTAL ANNUAL PUMPING COSTS			\$224,817

Footnotes:

1. Based on 25% of KWH at the greater than 60% load factor rate.



Bartlett & West
Engineers, Inc.

July 16, 1992

Mr. J.S. Mashl, Project Engineer
U.S. Army Corps of Engineers
Lake Oahe Office
P.O. Box 997
Pierre, SD 57501-0997

MID-DAKOTA RURAL WATER SYSTEM
WATER SUPPLY FROM OAHÉ POWERHOUSE/SURGE TANK BASE

This letter is to confirm our telephone conversation of today and to thank you for all of the assistance you have provided to the Mid-Dakota Rural Water Project. Particularly, thank you for meeting with Mr. Hatfield of my firm, Mr. Stiles of the U.S. Bureau of Reclamation and myself on February 26, 1992 and also for conducting the tour for the Board of Directors on April 29, 1992.

The Mid-Dakota Rural Water Project is moving along nicely. The authorizing legislation, HR 429, has passed both the House and Senate and is now in Conference Committee. I have attached a copy of the page of the Bill which authorizes connection to your facilities (Attachment 1). The Congressional Delegation has indicated that they expect passage of the Bill soon. Also, the South Dakota Legislature appropriated and the State Board of Water & Natural Resources recently released to Mid-Dakota, \$1.5 Million to continue work on the Project. Work authorized includes preparation of construction plans & specifications for the Oahe Pumping Plant, the Raw Water Transmission Line, Water Treatment Plant, and other facilities.

At this time, on behalf of the Mid-Dakota Rural Water System, I would like to request your further assistance in two areas. We need to initiate a program of water testing for turbidity and other parameters. In order to do this, samples need to be obtained from a point representative of the water we will be obtaining once the System is in operation. The S.D. Dept. of Water & Nature Resources will be obtaining these samples. Mr. Bill Stewart (telephone (605) 773-4216) is the person responsible. We are requesting your assistance in allowing Mr. Stewart's person access to the No. 5 and/or No. 6 penstocks at an appropriate sampling point. It is planned to obtain about 36 samples over the year commencing next week. Samples will be taken no less than bi-weekly with more

(701) 258-1110
2718 Gateway Ave., Suite 201
P.O. Box 1077
Bismarck, ND 58502

1

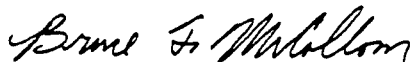
OTHER OFFICE
Topeka, KS

frequent samples during periods of high turbidity. Your assistance in alerting Mr. Stewart to periods of high turbidity in the Lake area around the Intake would be greatly appreciated. You will be provided with copies of all test results.

We are also requesting your assistance for the Final Design and plan preparation process for the Oahe Pump Station. As you know from our previous discussions, it appears that the most feasible place to connect to your facility might be at the surge tank unused recirculation pipeline just downstream of the manual gate valve as shown on the attached drawings (Attachment 2). We discussed connecting to the surge tanks for the No. 5 and No. 6 penstocks to provide redundancy. Only one penstock would be used at a time with conversion being made by means of manually operated valves. Tees would be placed in the existing pipelines and manifolded together into a single pipeline (probably 30") which would proceed northerly between penstocks No. 5 and No. 6 and exit your facility through the north wall approximately 9 feet below exterior grade. As we discussed the Project is open to discussion of whether it would be best for your or us to be responsible for the preparation of Contract Documents and Construction Administration for the portion of the work inside the surge tank base. The other party obviously would need to have review and approval authority.

Thank you again (and your staff Mr. John Bartel and others) for your assistance. I will be in contact with you again by telephone or in person for further discussion of this matter.

BARTLETT & WEST ENGINEERS, INC.



Bruce F. McCollom, P.E.
Project Manager

cc: Ms. Julie Apgar, Manager - Mid-Dakota
Mr. Bob Hatfield - BW Topeka
Mr. Bud Stiles - USBR
Mr. Bill Stewart - SDDENR

File: Mid-Dakota Task 5 WTP & Oahe PS

(5) public education programs; and
 (6) coordinated operation among each rural water system and the preexisting water supply facilities in its service area.
 Such programs shall contain provisions for periodic review and revision, in cooperation with the Secretary.

SEC. 1406. MITIGATION OF FISH AND WILDLIFE LOSSES.

Mitigation for fish and wildlife losses incurred as a result of the construction and operation of the water system shall be on an acre-for-acre basis, based on ecological equivalency, concurrent with project construction.

SEC. 1407. USE OF PICK-SLOAN POWER.

(a) IN GENERAL.—From power designated for future irrigation and drainage pumping for the Pick-Sloan Missouri River Basin Program, Western shall make available the capacity and energy required to meet the pumping and incidental operational requirements of the water system during the summer electrical season.

(b) CONDITIONS.—The capacity and energy described in subsection (a) shall be made available on the following conditions:

- (1) The water system shall be operated on a not-for-profit basis.
- (2) The water system shall contract to purchase its entire electric service requirements, including the capacity and energy made available under subsection (a), from a cooperative power supplier which purchases power from a cooperative power supplier which itself purchases power from Western.
- (3) The rate schedule applicable to the capacity and energy made available under subsection (a) shall be Western's Pick-Sloan Eastern Division Firm Power Rate Schedule in effect when the power is delivered by Western.
- (4) It shall be agreed by contract among—

- (A) Western;
- (B) the power supplier with which the water system contracts under paragraph (2);
- (C) that entity's power supplier; and
- (D) Mid-Dakota Rural Water System, Inc.;

that for the capacity and energy made available under subsection (a), the benefit of the rate schedule described in paragraph (3) shall be passed through to the water system, but the water system's power supplier shall not be precluded from including in its charges to the water system for such electric service its other usual and customary charges.

(5) Mid-Dakota Rural Water System, Inc., shall pay its power supplier for electric service, other than for capacity and energy supplied pursuant to subsection (a), in accordance with the power supplier's applicable rate schedule.

SEC. 1408. RULE OF CONSTRUCTION.

This title shall not be construed to limit authorization for water projects in the State of South Dakota under existing law or future enactments.

SEC. 1409. WATER RIGHTS.

Nothing in this title shall be construed to—

- (1) invalidate or preempt State water law or an interstate compact governing water;
- (2) alter the rights of any State to any appropriated share of the waters of any body of surface or groundwater, whether determined by past or future interstate compacts or by past or future legislative or final judicial allocations;
- (3) preempt or modify any State or Federal law or interstate compact dealing with water quality or disposal; or
- (4) confer upon any non-Federal entity the ability to exercise any Federal right to the waters of any stream or to any groundwater resources.

SEC. 1410. USE OF GOVERNMENT FACILITIES.

The use of and connection of water system facilities to Government facilities at the Oahe powerhouse and pumping plant and their use for the purpose of supplying water to the water system may be permitted to the extent that such use does not detrimentally affect the use of those Government facilities for the other purposes for which they are authorized.

SEC. 1411. AUTHORIZATION OF APPROPRIATIONS.

(a) WATER SYSTEM.—There is authorized to be appropriated to the Secretary \$100,000,000 for the planning and construction of the water system under section 1403, plus such sums as are necessary to defray increases in development costs re-

lected in appropriate
 remain available un-
 (b) WETLAND COM-
 tary—

- (1) \$2,756,000
- (2) such sums
- (3) \$7,000,000

SEC. 1501. PERMIT ISSU-

(a) No agency or
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 or feature of any pr
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- (1) increase
- (2) adversely
- (3) adversely

(b) Nothing in th
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SEC. 1502. JUDICIAL RE-

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SEC. 1503. COSTS.

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SEC. 1504. DISCLAIMER

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TITLE XVI—IR

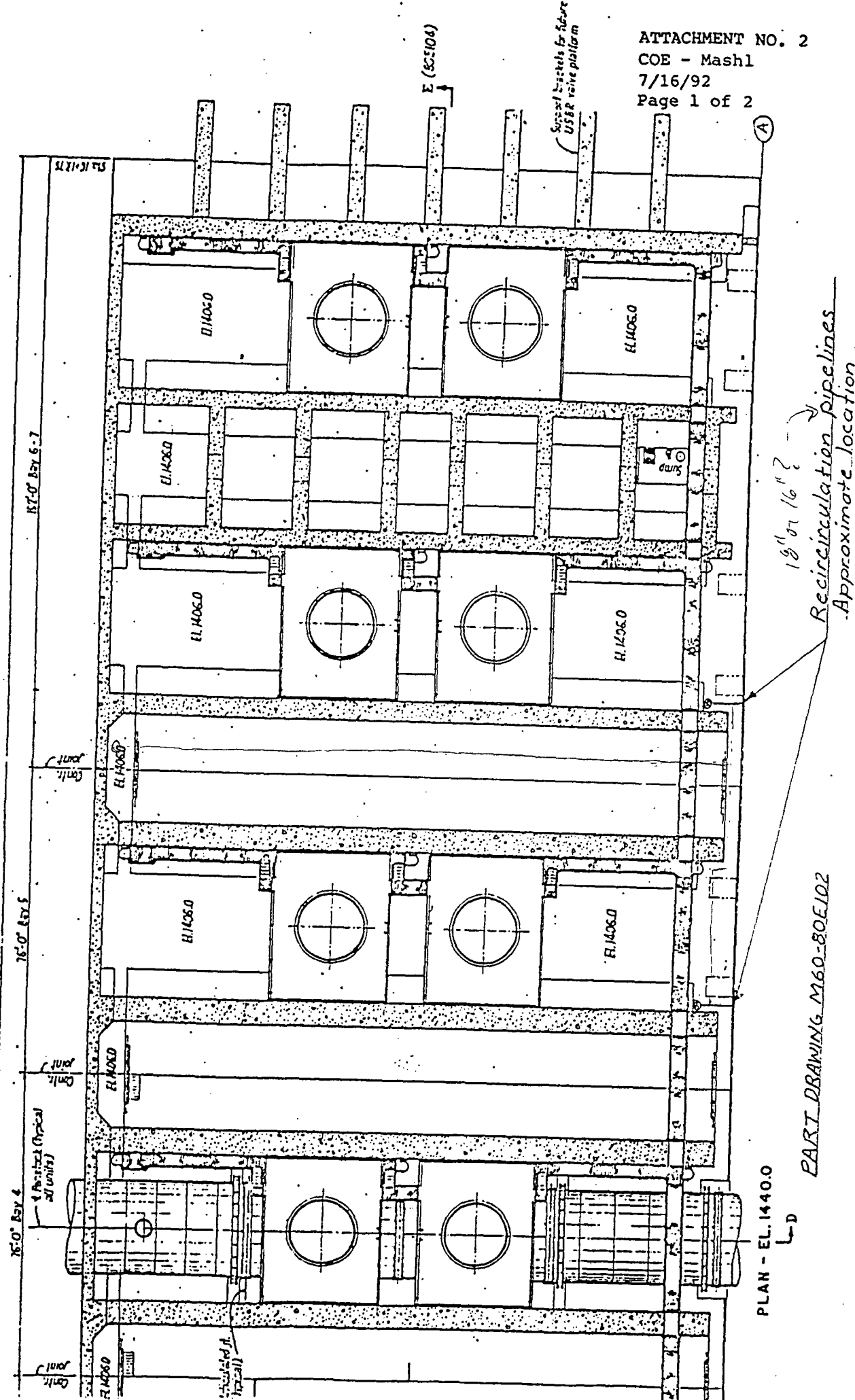
SEC. 1601. IRRIGATION

Section 5(e) of P
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TITLE X

SEC. 1701. AUTHORIZA

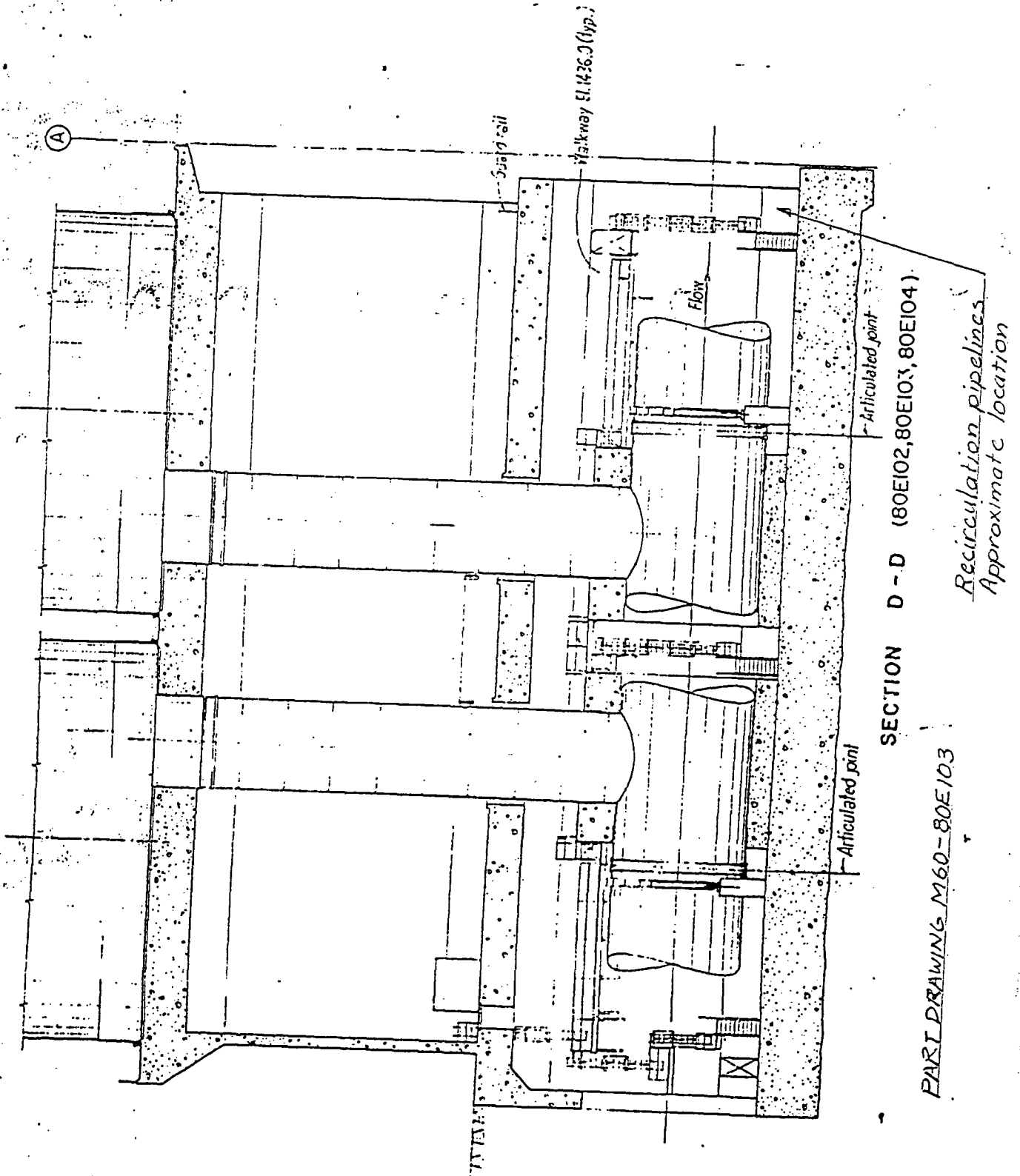
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PLAN - EL.14400

L-D

PART DRAWING M60-80E102



SECTION D-D (80E102, 80E103, 80E104)

PART DRAWING M60-80E103



THE WETLAND DEVELOPMENT
AND ENHANCEMENT COMPONENT
OF THE MID-DAKOTA
RURAL WATER SYSTEM

APRIL 1990



ATTACHMENT 2:

ESTIMATED DEVELOPMENT AND MAINTENANCE
COST FOR THREE WETLAND AREAS

ANDERSON WATERFOWL PRODUCTION AREA - 160 TOTAL ACRES		
TOTAL DEVELOPMENT COSTS		\$200,000
AVERAGE ANNUAL WATER PURCHASE COST		\$1,872 *
MARSHALL WATERFOWL PRODUCTION AREA - 65 TOTAL ACRES		
TOTAL DEVELOPMENT COST		\$250,000
AVERAGE ANNUAL WATER PURCHASE COST		\$5,982 *
KAHRE WATERFOWL PRODUCTION AREA - 140 TOTAL ACRES		
TOTAL DEVELOPMENT COST		\$215,000
AVERAGE ANNUAL WATER PURCHASE COST		\$13,028 *
TOTAL MANAGED LAND 365 ACRES		
TOTAL DEVELOPMENT COST		\$665,000
TOTAL ANNUAL WATER PURCHASE COST		\$20,882
*Average pumping cost based upon full water delivery 50 percent of the time.		

ART CREDITS:

- Center sculpture, "Three Goldeneyes" by John Sharp, Kent, Ohio. The 1988 Natural Wood Finish World Championship. Photo courtesy of the Ward Foundation, Salisbury, Maryland.
- Mallards, Canada Geese, and Ring-necked Pheasant photos by South Dakota Department of Tourism, Pierre, South Dakota.
- Great Blue Heron photo and interior art by Apple Advertising & Marketing, Sioux Falls, South Dakota.

MID
DAKOTA
RURAL WATER SYSTEM

SOUTH DAKOTA

THE WETLAND DEVELOPMENT AND ENHANCEMENT COMPONENT OF THE MID-DAKOTA RURAL WATER SYSTEM

INTRODUCTION

Waterfowl is an important national and international resource. Millions of Americans spend time watching, photographing and hunting migratory waterfowl. Unfortunately, waterfowl numbers have drastically declined in recent years threatening this national resource and its associated benefits.

Although there are a number of reasons for the declining population of waterfowl, most experts concur that population declines coincide with the decimation of wetlands over the last twenty years.

The critical population levels of many duck species were made evident in 1985 when the U.S. Fish and Wildlife Service's continental duck breeding survey recorded the lowest number of breeding ducks in the 31-year survey history. This was followed by the lowest fall flight forecast ever predicted. The current declining population levels, particularly among mallards, follow the alarming continuation of a long-term downward trend that has become more and more pronounced since 1980.

Several factors are probably responsible for the declining number of ducks: inadequate and poor quality nesting cover, high nest predation rates, environmental contaminants and disease. Probably the most dominant of all related factors is the degradation and reduction of wetland habitats. Although the extent to which these and other factors influence duck population levels is not known, the degradation and loss of wetlands is undoubtedly a major reason for the current low population levels. Even though the federal government has long recognized that waterfowl production is a very important wetland value and has developed policies to discourage wetland draining and filling, the loss of wetlands continues.

A major federal activity directed at wetland protection for waterfowl production centers around the acquisition of wetlands through

purchase and easement. Although some progress is being made to preserve wetlands, additional techniques to protect and increase wetlands and wetland wildlife are needed, as evidenced by the tremendous declines in some waterfowl species in recent years.

Despite extensive drainage, wetlands in the prairie pothole states of the northern Great Plains (Canada's prairie provinces, eastern North Dakota, eastern South Dakota, eastern Montana, Minnesota and into north-central Iowa) remain as the most productive waterfowl breeding and nesting habitat in North America. Prairie potholes are relatively shallow, ranging from ponds that are less than one acre in size to larger sloughs that may cover several thousand acres. Water permanency also varies from temporarily flooded wetlands that contain water for only a few weeks after spring snowmelt or following heavy rains, to semi-permanently flooded wetlands that generally contain water throughout the year.

The best waterfowl production occurs where there is a mixture of the various wetland permanence types associated with well-managed mixed grasslands and low, shrubby areas for nesting. The small, shallow, less permanent wetlands provide the first open water, food and secure areas for returning pairs of waterfowl early in the spring. The larger, more permanent wetlands are necessary for rearing the broods later in the year. Where any of the wetland components are missing, waterfowl production is reduced. Management actions by state and federal wildlife agencies are often directed at providing or increasing the component that is seen to be limiting waterfowl production in a particular area. Most often, in the Prairie Pothole Region, poor quality or limited acreage of nesting cover or inadequate brood rearing habitat are identified as the primary limiting factors.



Canada Goose

ATTACHMENT I:

ESTIMATED DEVELOPMENT AND MAINTENANCE COST FOR ENHANCEMENT OF THE HYDE WATERFOWL PRODUCTION AREA

TOTAL EXISTING LAND - 320 ACRES.
TOTAL DEVELOPMENT COST
AVERAGE ANNUAL PUMPING COST

306,000 see p 5
\$1,319,000
\$729*
972 see p 5

COST FOR DEVELOPMENT OF ADDITIONAL WETLAND ACRES SURROUNDING THE HYDE WATERFOWL PRODUCTION AREA

TOTAL MANAGED LAND - 1,600 acres
TOTAL DEVELOPMENT COST
AVERAGE ANNUAL PUMPING COST

\$485,000**
\$5,535*

NOTES:

Land acquisition costs were taken from, "Waterfowl Enhancement Opportunities Associated with a Federal Water Development Project in South Dakota," Prepared by James J. Ruwaldt, Jr., USFWS, April 1986 and increased by 15 percent. No increased construction costs are incurred by developing the new wetlands.

*Average pumping costs based upon full water delivery 50 percent of the time.

**Does not reflect the construction cost of \$1,319,000 identified as a development cost for the existing WPA.

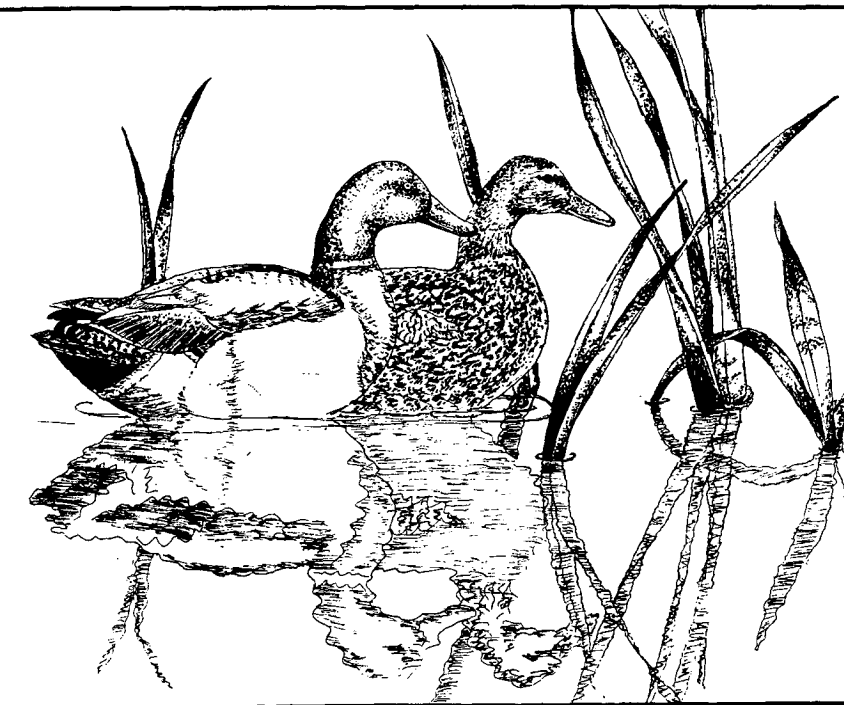
JOINT VENTURE CONCEPT

In conjunction with the Mid-Dakota Rural Water System, it is proposed that a \$7 million trust be established for South Dakota. This trust could be administered by the South Dakota Game, Fish & Parks Foundation or an ad hoc wetland trust committee established by Congress for participation in a Joint Ventures effort. We suggest the South Dakota Game, Fish & Parks Foundation administer the wetland trust. This Foundation is a private non-profit organization, registered in the State of South Dakota, designed to accept contributions, real or personal property, grants or bequests. It is currently functioning and has both credibility and legal status, being recognized by both the State and Federal Governments. Administration by the Foundation would provide an efficient, responsible and accountable method of receiving, handling and spending money. Criteria for administering the trust would need to be included in the authorizing legislation, which could also provide for such items as an advisory board, annual audits, etc.

The joint venture concept stems from the North American Waterfowl Management Plan's Joint Ventures which bring together both private and public support for the conservation of key waterfowl habitat regions. Concerned citizens, government agencies and conservation organizations cooperate collectively in an attempt to reverse the downward trend in the continent's waterfowl population.

The majority of the wetlands in the Mid-Dakota area are privately owned. As such, the key to the success of any enhancement project is the local landowner's willingness to participate. The attraction of utilizing the Joint Venture concept is that it can be tailored to suit the individual landowner-operator. Wetland areas can be managed and developed through cooperative agreements to protect existing wetlands, restore drained wetlands, develop new wetlands and protect nesting cover.

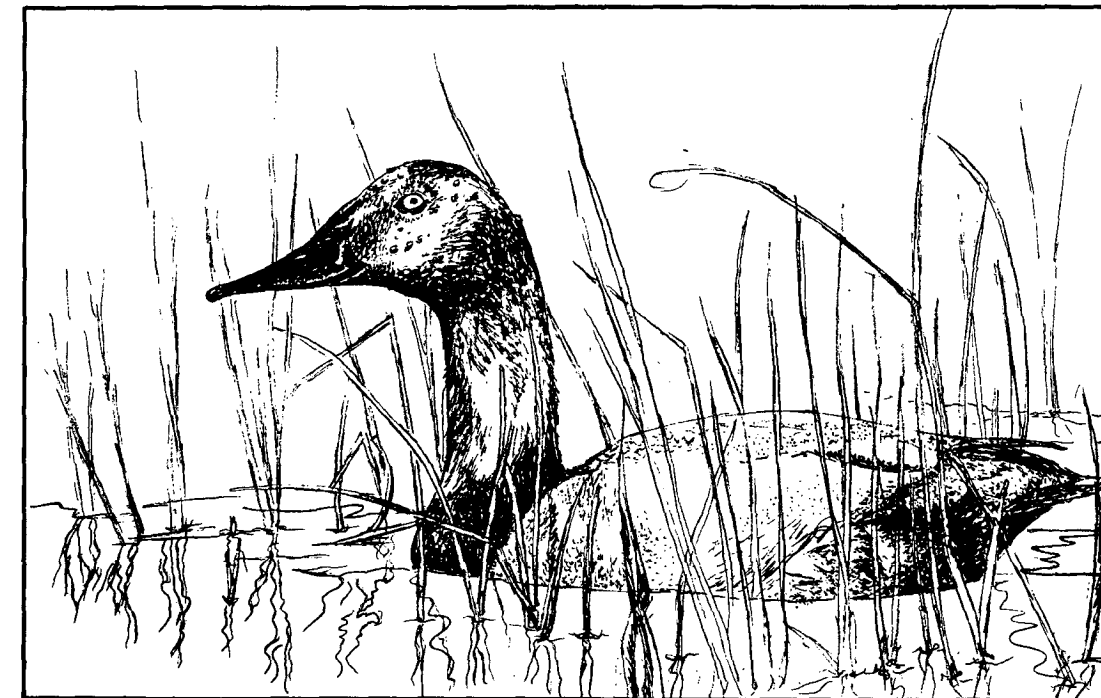
It is proposed that eligible wetland acres be acquired through long-term leases and that implementation of wetland restoration and habitat manipulation be accomplished through the use of existing federal, state and local programs.



Mallards

The quality of the wetland/waterfowl habitat varies significantly over the Prairie Pothole Region. In many parts of the Region, intensive agriculture has drained most of the wetlands. Those wetlands that remain are surrounded by cropland that is usually poor waterfowl nesting cover. In some areas, waterfowl production is limited by inadequate brood rearing habitat, even though abundant breeding pair and nesting habitat may be present. The development of more permanent wetlands for brood rearing in these areas through practices such as the construction of suitable ponds, development of island complexes, and provision of supplemental water can provide for dramatic increases in waterfowl production. Providing supplemental water can be particularly effective in areas where brood rearing wetlands are in short supply. This would be especially so during drought years when brood rearing habitat is particularly critical. In most cases, however, additional sources of water are not now readily available for such purposes.

In addition to producing 50 percent of America's waterfowl, wetlands in the Prairie Pothole Region also provide essential elements of survival to over 100 species of other birds. They also provide a number of important, but often unrecognized functions that are valuable to our society. Wetland basins as well as adjacent uplands provide homes for deer, pheasants, furbearers and many other animals. Wetlands help to purify polluted water, provide flood control and water storage, contribute to aquifer and ground water recharge, improve aesthetics, provide stream bank and shore protection, enhance food chain support, act as sediment traps, and provide both active and passive recreational opportunities.



Canvasback

WETLAND DEVELOPMENT AND ENHANCEMENT OPPORTUNITIES FOR WATERFOWL ASSOCIATED WITH THE MID-DAKOTA RURAL WATER SYSTEM

The Mid-Dakota Rural Water System project lies within the Prairie Pothole Region of South Dakota. This area lies east of the Missouri River and covers about 35,000 square miles or 45 percent of the state. Both the Central and Mississippi Flyways overlap in the Prairie Pothole Region (PPR) with large numbers of migratory birds using the corridor during the spring and fall migrations. South Dakota is considered a leader in waterfowl production in the lower 48 states. In 1989, South Dakota was ranked first in waterfowl production and in any given five year period South Dakota consistently ranks second. Besides being eminent to migratory birds, the area is also important to resident wildlife as well, and can be considered the heart of the South Dakota pheasant range. Endangered species are present in the area including bald eagles which winter along the Missouri River, the largest concentration of which occurs in the Karl Mundt National Wildlife Refuge, and at Pierre.

The wetland component associated with the Mid-Dakota project is unique as it proposes to utilize both the resources of the rural water system and environment to enhance, restore and create wetland acres. As proposed, the wetland component will consist of the following:

1. Enhancement of existing wetlands utilizing untreated Mid-Dakota rural water.
2. Enhancement of existing wetlands utilizing treated Mid-Dakota rural water.
3. Development of constructed wetlands.
4. Restoration of drained wetlands.
5. Development of a Joint Ventures program utilizing a trust fund established by the federal government.



Pintails

CONSTRUCTED WETLANDS

Constructed wetlands are man-made systems that are designed, built and operated to emulate natural wetlands. As used for wastewater treatment, constructed wetlands may include swamps - wet regions dominated by trees, shrubs and other woody vegetation, or bogs - low nutrient, acidic waters dominated by mosses. But most commonly constructed wetlands refers to marshes - shallow water regions dominated by emergent herbaceous vegetation such as cattails, bulrushes, rushes and reeds.

Four municipalities that will be utilizing Mid-Dakota rural water have been identified as having the potential to develop constructed wetlands for wastewater treatment. Wetland acres ranging from 4 to 327 for a total of 343 acres at a cost of \$1.3 million could be developed using existing EPA programs.

RESTORED WETLANDS

Opportunities may exist within the project area to restore drained wetlands. This concept may be pursued separately or in conjunction with the Joint Ventures program which is described later in this proposal. As envisioned, wetlands that have been drained would be purchased, placed under easement or acquired through long-term leases. The existing drain would be plugged, thereby allowing the wetland to fill with water from natural runoff.

Restoration of drained wetlands can be a very cost-effective method of establishing wetlands and will be pursued where willing landowners can be identified.



Ring-necked Pheasant

TREATED WATER

The addition of supplemental water to wetlands in dry years offers a more permanent brood-rearing habitat. Three WPA sites in Beadle County were selected by South Dakota State University's wildlife biologists for enhancement using treated project water. The three sites, currently owned by the U.S. Government and managed by the U.S. Fish & Wildlife Service, are as follows:

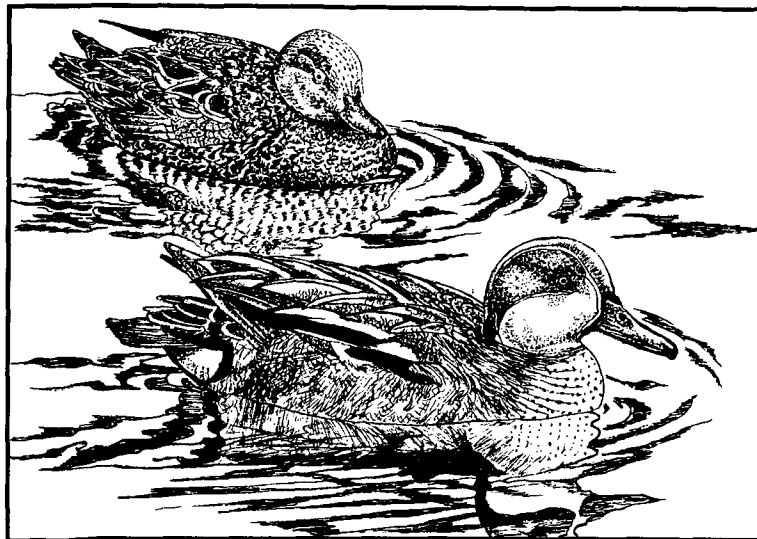
- 1) *Anderson Waterfowl Production Area*
- 2) *Marshall Waterfowl Production Area*
- 3) *Kahre Waterfowl Production Area*

The three Waterfowl Production Areas comprise 365 acres of wetland and surrounding upland area. Unless additional upland acres are needed for habitat, there is no need to acquire land since the federal government currently owns the sites. Approximately one-third of the lands will receive supplemental water to enhance the existing wetland areas.

Criteria used to select the individual wetlands included:

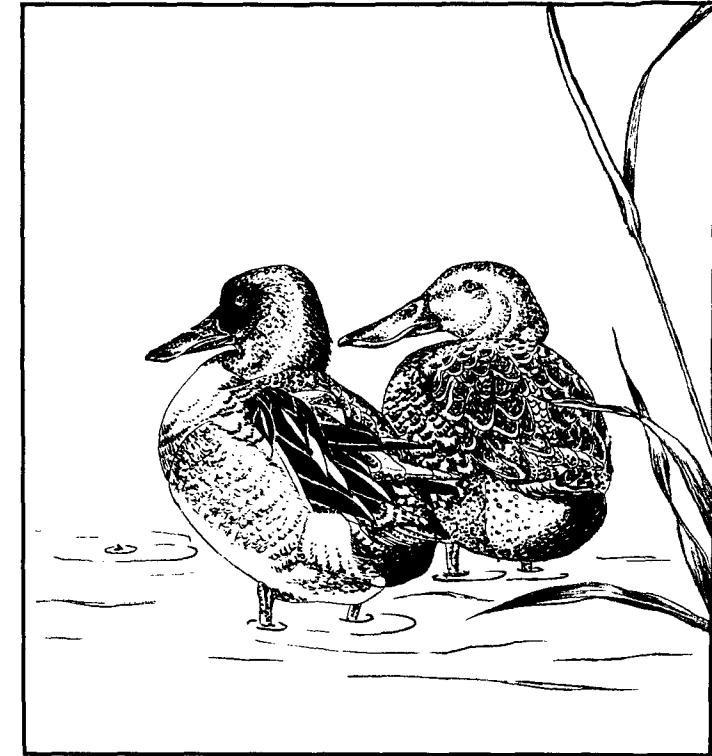
- 1) *Proximity to pipeline.*
- 2) *Water regime - seasonal or semi-permanent.*
- 3) *Proximity to other types of wetlands.*
- 4) *Soil type.*
- 5) *Size of basin.*

Costs associated with delivering treated water to restore or maintain an average depth of 18 inches in the three WPA sites consists of the delivery pipeline and the annual water purchase cost. The total estimated project development cost for all three sites is \$665,000 with an average annual pumping cost of \$20,882.



Teals

It is important to note that the wetland proposal was derived from the direct involvement of many wildlife organizations. After approval and implementation of the plan, the management will be conducted by the U.S. Fish and Wildlife Service or South Dakota Game, Fish & Parks as appropriate. All costs associated with the wetland component of Mid-Dakota, including O&M, shall be non-reimbursable. This is consistent with existing federal legislation. Title IX, Section 906 of the Water Resources Development Act of 1986 mandates that enhancement shall be a federal cost when such enhancement provides benefits to migratory waterfowl or threatened or endangered species or such activities are located on lands managed as a national wildlife refuge.



Northern Shovelers

UNTREATED WATER

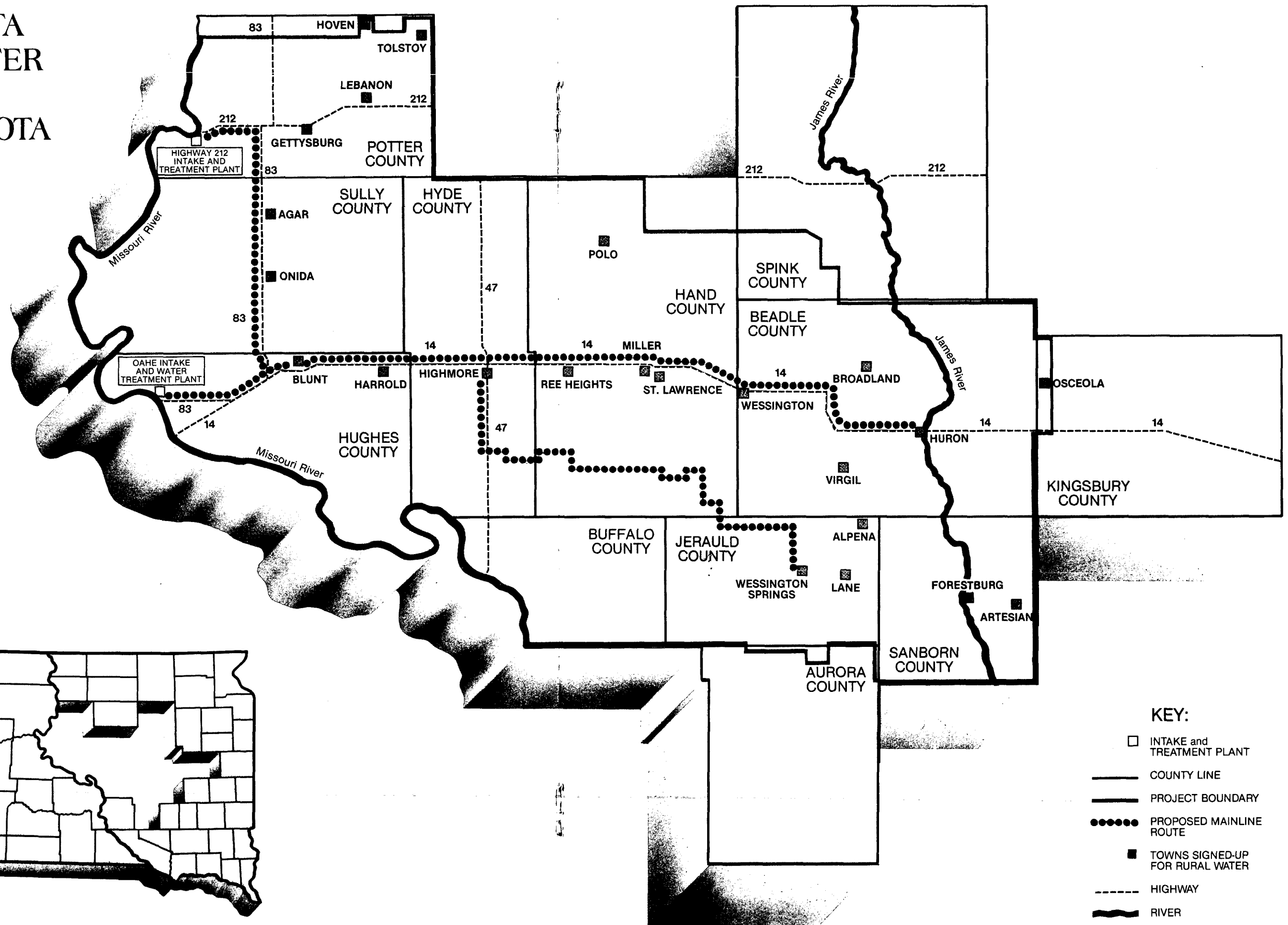
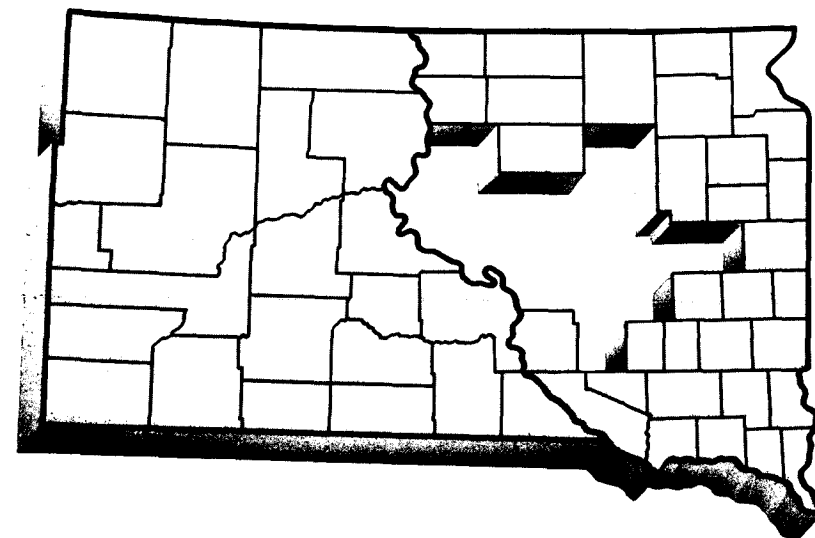
The addition of untreated Missouri River water is proposed as an enhancement technique for the 320-acre Hyde Waterfowl Production Area (WPA), a unit of the National Wildlife Refuge System. This 320-acre site is located in Hughes County approximately 1½ miles south of the proposed water treatment plant site. Through the addition of water to the wetland, the existing WPA will be improved and waterfowl production increased.

An opportunity may exist for development of additional wetland and upland acres around the existing Hyde WPA if willing landowners can be identified. This could be accomplished through the construction of a low head dike across a portion of the wetland basin to create a managed wetland of 320 acres. Project water could also be provided to a 90-acre wetland in the surrounding area. The surrounding upland area (1,200 acres) would be seeded to nesting cover. Management techniques such as island construction, nest basket development and management of existing grassland could be engaged depending on the site (total acres of enhancement and development-1,600).

The Hyde WPA is currently under federal ownership. The estimated construction cost for enhancement of the Hyde WPA is \$306,000 with average annual pumping costs of \$972.

It is proposed that lands necessary for the development of additional wetland and upland areas be acquired through a combination of purchases, easements and long-term leases from willing landowners at an estimated cost of \$485,000. Average annual pumping charges to deliver water to the expanded area, including the existing WPA, are estimated at \$5,535.

MID-DAKOTA RURAL WATER SYSTEM, SOUTH DAKOTA

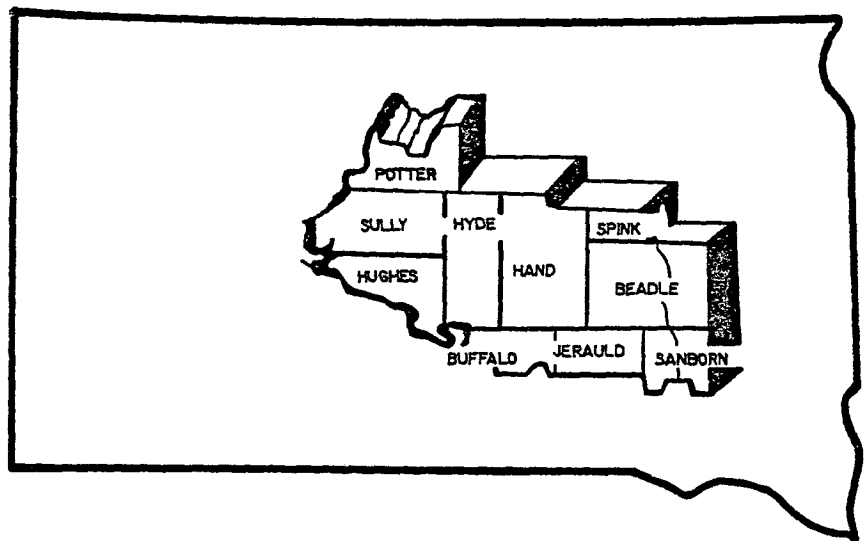


KEY:

- INTAKE and TREATMENT PLANT
- COUNTY LINE
- PROJECT BOUNDARY
- PROPOSED MAINLINE ROUTE
- TOWNS SIGNED-UP FOR RURAL WATER
- - - HIGHWAY
- ~~~~~ RIVER

**MID DAKOTA RURAL WATER SYSTEM
FEASIBILITY STUDY AND REPORT**

November 1988



DeWild Grant Reckert & Assoc. Co.

DGR Project No. 3782

MID DAKOTA RURAL WATER SYSTEM
FEASIBILITY STUDY AND REPORT

November 1988

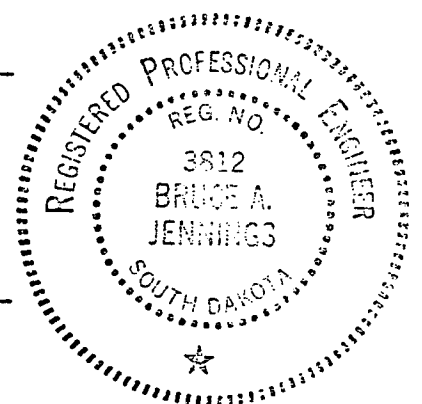
Revised January 1989

I hereby certify that this plan, specification or report was prepared by me or under my direct personal supervision and that I am a duly Registered Professional Engineer under the laws of the State of South Dakota.

By Bruce Jennings
Bruce Jennings, P.E.

Registration No. 3812

Date 1-9-89



DGR Job No. 3782

DEWILD GRANT RECKERT AND ASSOCIATES COMPANY
ARCHITECTURE - ENGINEERING - PLANNING
ROCK RAPIDS, IOWA
SIOUX FALLS, SOUTH DAKOTA

MID DAKOTA RURAL WATER SYSTEM
FEASIBILITY STUDY AND REPORT

November 1988

Revised January 1989

Revised March 15, 1989

I hereby certify that this plan, specification or report was prepared by me or under my direct personal supervision and that I am a duly Registered Professional Engineer under the laws of the State of South Dakota.

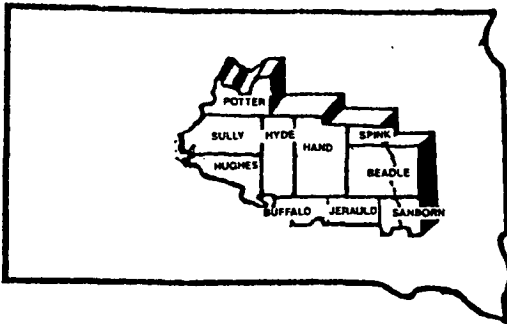
By Bruce Jennings
Bruce Jennings, P.E.

Registration No. 3812

Date 3-20-89

DGR Job No. 3782

DEWILD GRANT RECKERT AND ASSOCIATES COMPANY
ARCHITECTURE - ENGINEERING - PLANNING
ROCK RAPIDS, IOWA
SIOUX FALLS, SOUTH DAKOTA



MID-DAKOTA RURAL WATER SYSTEM

OFFICE

120 WEST SECOND STREET — P.O. BOX 69

MILLER, SOUTH DAKOTA 57362

TELEPHONE: (605)853-3159

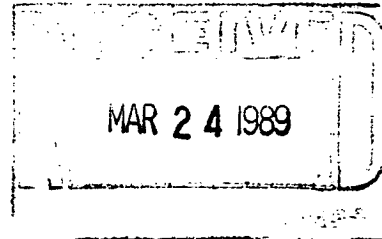
BOARD OF DIRECTORS

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EUGENE WARRINER, VICE-CHAIRMAN, BLUNT
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GERALD KUTZLER, HURON
DON OLSON, HURON
KERMIT WULFF, GANN VALLEY

JULIE L. APGAR, MANAGER



March 22, 1989

Mr. Ken Royse
Bartlett & West Engineers, Inc.
2718 Gateway Ave., Suite 201
P.O. Box 1077
Bismarck, North Dakota 58502

Dear Ken:

Please find enclosed the following:

- 1) Payment for Professional Services dated January 10, 1989.
- 2) Letter from John Madden to Julie Apgar regarding corrections to feasibility report.
- 3) Revisions to report
 - a) Title page
 - b) Table 9
 - c) P. 20
 - d) Table 10
 - e) Table C-5
- 4) Additional tabulations requested of DGR by Mid-Dakota
- 5) Information on the North American Waterfowl Habitat Improvement Program.
- 6) Electric Rate Information

Please review items 2-4 at your earliest convenience and let me know your opinion as to its accuracy. Also, contact me if you need any additional data.

Sincerely;

Julie Apgar
Manager

JA/dg



DeWild Grant Reckert and Associates Company
Consulting Engineers

315 First Avenue
Rock Rapids, Iowa 51246
(712) 472-2531

March 20, 1989

Mid Dakota Rural Water System
P.O. Box 69
Miller, SD 57362

Attn: Julie Apgar, Manager

RE: Mid Dakota Rural Water System
DGR File No. 3782

Dear Ms. Apgar:

In accordance with your letter of February 27, 1989 and your verbal authorization of March 13, 1989, we enclose additional information regarding the Mid Dakota Rural Water System Study.

We have revised the report tables which included an incorrect summation of annual operating costs. Those tables include Table 9, Table 10, and Table C-5. Because the operating cost correction most significantly affects the municipal bulk rate, we have revised Page 20 to indicate a projected municipal rate of \$1.25 per 1,000 gallons. This rate change is also reflected on the revised Table 10. In accordance with your request, we are providing corrected pages for the reports, along with a revised title page.

With respect to your request for additional data, we enclose tabulations of pumping station data for the various alternatives considered. Within the alternatives considered by the study, 11 pumping station locations were considered. For some of the alternatives, some of the pumping stations were not used. Also, flow rates at the individual stations varied with service area alternatives. The enclosed tables summarize the flows and heads which were used for the respective pumping stations for the alternatives considered.

Regarding power rate schedules, we used a flat 7.5¢ per kilowatt hour to calculate operating costs. We did assume that the average operating condition at the pumping stations would be 50% of the maximum design pipeline friction loss. This corresponds to slightly less than 70% of the maximum design flow rate. In that the projected annual pumpage is approximately 55% of the maximum system design capacity, we believe that this is an appropriate assumption for initial operating projections.

March 20, 1989
Mid Dakota Rural Water System
Page Two

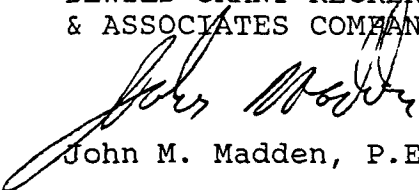
We also include tabulations of calculations for the main pipelines of the project alternative described by Table 8 of the report. The north main pipeline information refers to the main pipeline from the Oahe Dam to Huron along Highway 14. The Stephen East main tabulation refers to the main pipeline from Highmore south to the Stephen Tower and southeast to the Wessington Springs reservoir. Sizes and lengths for the main pipelines are included on the tabulations.

Finally, we enclose a tabulation of distribution system pipeline sizes and lengths for the project. These pipeline sizes reflect only a preliminary study level of refinement. We did not attempt to do detailed design of pressure regulation at this level of study. Therefore, we expect that actual distribution system pipelines will generally be of a lower pressure rating and slightly larger diameter than those tabulated here. We believe that the cost trade-offs involved in final design of distribution system pipelines from higher pressure classes to slightly larger sizes will be offsetting, and that the cost estimate given is appropriate.

The detailed information which we enclose is of the nature of design notes. It was our understanding that you did not require this information for general distribution and that the level of detail and clarity of presentation of the enclosed materials would be appropriate. Please contact us if we can provide additional information.

Sincerely,

DEWILD GRANT RECKERT
& ASSOCIATES COMPANY



John M. Madden, P.E.

JMM:kld

Enclosures

MID DAKOTA RURAL WATER SYSTEM
FEASIBILITY STUDY AND REPORT

TABLE OF CONTENTS

	<u>Page No.</u>
I. INTRODUCTION	1
II. PROJECT AREA	2
A. Geography	2
B. Population	3
C. Economy	4
III. EXISTING WATER SUPPLIES	5
A. Groundwater	6
B. Surface Water	9
C. Existing Systems	9
IV. WATER NEEDS	10
V. WATER SYSTEM DESIGN	10
A. Intake	10
B. Water Treatment	11
C. Pipelines	13
D. Pumping Stations and Storage	15
E. Gettysburg Service Area	15
F. Central Project Area	16
VI. WATER SYSTEM COSTS	17
VII. OPERATING COSTS	19
VIII. PROJECT FEASIBILITY	19
IX. RECOMMENDATIONS	20
APPENDIX A - EXISTING MUNICIPAL WATER SYSTEM SUMMARIES	
APPENDIX B - PIPELINE UNIT PRICE ESTIMATES	
APPENDIX C - WATER SOURCE LOCATION ALTERNATIVES	
DRAWINGS	
Project Area Map	1

LIST OF TABLES

<u>Table No.</u>		<u>Follows Page</u>
1	Population Data	3
2	Livestock Census Data	5
3	Municipal Water Analyses	6
4	Summarized Water Quality Information by Aquifer	6
5	James River at Huron Mean Total Dissolved Solids in mg/l	9
6	Lake Oahe Water Quality Characteristics and Drinking Water Standards	9
7	Water System Design Capacity	10
8	Estimated Project Costs	17
9	Estimated Operating Costs	19
10	Project Funding Summary	20

LIST OF FIGURES

<u>Figure No.</u>		<u>Follows Page</u>
1	Project Area	1
2	Approximate Boundaries of Principle Aquifers, Basal or Surficial Groups	6
3	Inclined Tube Intake Schematic	11
4	Vertical Caisson Intake Schematic	11
5	Water Treatment Plant Process Schematic	12
6	Major Project Features Location Map	17

MID DAKOTA RURAL WATER SYSTEM FEASIBILITY STUDY AND REPORT

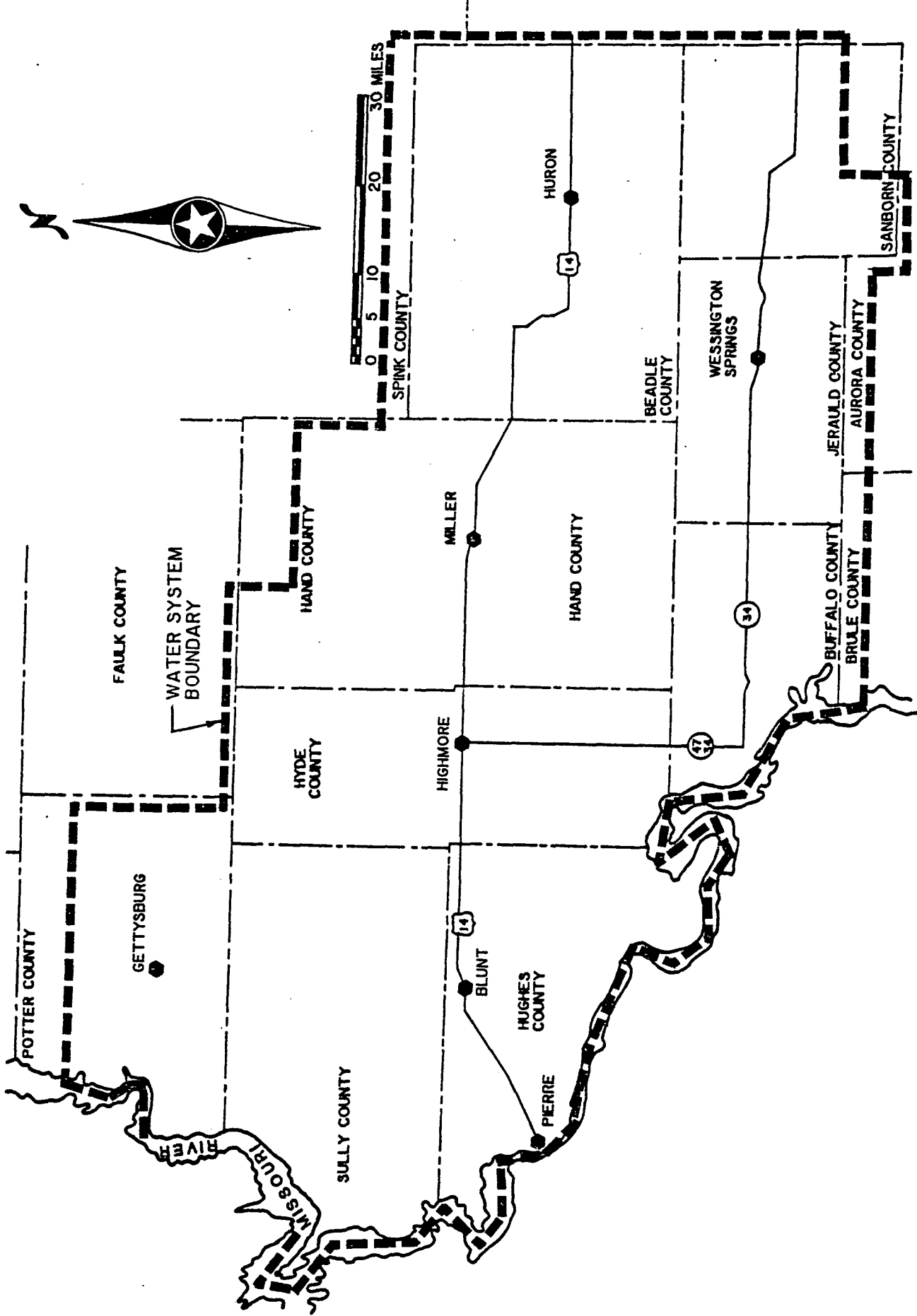
I. INTRODUCTION:

This Feasibility Study and Report provides information regarding the preliminary analysis of a potable water distribution system for a major area of east central South Dakota. The proposed project will provide an adequate supply of high quality domestic water for rural and town residents of the project area.

The western boundary of the project area is the Missouri River from west of Gettysburg to Ft. Thompson. The area is bounded on the east by the Beadle County line just east of the James River. The north and south boundaries of the water system are determined primarily by existing rural water development. On the north are the WEB Water Project and the Clark Rural Water System. On the south are the Davison Rural Water System and the Aurora Brule Rural Water System. The project area is shown on Figure 1.

This study is a continuation of reconnaissance study efforts sponsored in 1987 by the Mid Dakota Water Development District. As a result of the reconnaissance study, which identified an area of water needs and presented potential costs for water development, a canvass of the area was undertaken to determine interest in rural water system development. A non-profit corporation, the Mid Dakota Rural Water System, was organized to coordinate work on the project. Over 2,500 rural water users and 23 cities and communities expressed an interest in development of the Mid Dakota Rural Water System and paid a good intention fee to be included. The purpose of this feasibility study is to describe a rural water system which can meet the water needs of the signed up subscribers in the area and to provide a preliminary estimate of probable project costs.

This study was conducted using readily available base data from U.S. Geological Survey maps of 1:100,000 scale. Topographic data were obtained from U.S.G.S. 1:24,000 scale maps. Individual water user locations were determined from information provided by the prospective water users on sign-up forms. No field work was conducted in developing plans for water system facilities. Assumptions for planning of these facilities were based on the experience of previous rural water system construction in South Dakota.



PROJECT AREA



DeWid Grant Reckert & Associates Co.
 Denver, Colorado
 Rock Rapids, Iowa
 Sioux City, Iowa
 Sioux Falls, South Dakota

Date
 Drawn By
 Approved
 Revised

NOV 1968
 BH
 BJ

MID DAKOTA
 RURAL WATER SYSTEM

II. PROJECT AREA:

A. Geography:

The project area for the Mid Dakota Rural Water System is shown on Figure 1. The project area includes all of Sully, Hughes, Hyde, Buffalo, Jerauld and Beadle Counties. In addition, most of of Sanborn, Potter, and Hand Counties and small parts of Spink, Kingsbury and Aurora Counties are included.

The feasibility study project area is similar to that of the reconnaissance study conducted in 1987. Significant changes in the project area from the reconnaissance study are the reduction of the area of Spink County included due to a lack of sign-ups in that area, and the addition of Potter and northern Sully County due to significant interest in sign-ups in that area.

The project area at its maximum limits is over 125 miles east to west and over 80 miles north to south. The land area of the project exceeds 7,000 square miles, or nearly 10 percent of the land area of South Dakota.

Geographically, the western one-half of the study area is in the Coteau Du Missouri geologic area. The topography of the Coteau area is flat to gently rolling. Subsurface geology is primarily dense glacial till in excess of 100 feet thickness, underlain by the Pierre Shale and bedrock aquifers. Streams in the area are poorly developed with the exception of steep gullies adjacent to the Missouri River.

The eastern part of the project area is in the James River lowland. The river valley is extremely flat. Drainage is provided by the James River. Slowly rising and falling spring floods are common.

Notable in the region is the presence of numerous areas of poorly drained wetlands. These wetland areas range in size from a few to several hundred acres. The presence of the wetlands is maintained by relatively impermeable subsoil and flat topography with little surface runoff. However, the variability of rainfall in the project area results in dramatic year to year changes in the aerial extent of the wetlands. The lack of a stable water surface area adversely affects waterfowl production of the wetlands.

Average annual precipitation varies from 16 inches in the west to 18 inches in the east. Rainfall varies substantially from year to year, and years of less than

70% of normal rainfall occur about 4 years of every 10 years. Average annual temperature is 46° F. Temperature extremes range from less than -30° F. to over 105° F.

B. Population:

The Mid Dakota region was not significantly settled until the railroads expanded into the area in the late 1860's and the 1870's. Significant increases in population occurred during the 1880's with the increased migration of new settlers from the east. Drought conditions from 1886 to 1897 stalled population growth as settlers were first subjected to the impacts of precipitation variations in the region.

The early 1900's brought more rainfall and better times to the project area. However, the drought was not forgotten, and population growth was more modest through 1930. The historical high population for the area was recorded in 1930.

A return of drought conditions and the nationwide economic depression caused significant out-migration from the area during the decade of the 1930's. The census of 1940 recorded a population decrease of about 20% in the area. The population of Beadle County and the Huron area has been relatively stable since 1940. The remaining counties in the project area have shown slightly declining populations in each census. Estimates of population for 1986, made by the South Dakota Business Research Bureau, indicate a stabilization of population in most of the area between 1980 and 1986.

The overall area census population was 42,060 in 1980. Census data for 1980 and estimates for 1986 are given in Table 1. County population totals of Table 1 are representative of project area population trends. However, all of the population of the counties listed is not participating in the Mid Dakota project due to boundary differences between the project area and the counties listed. The total project service population is estimated to be approximately 29,000 people.

There are some indications that the population declines of the past several decades will level off at near the present population. Small towns in the project area have seen some increase in economic activity over the last two years.

Consolidation of farm and ranch units has contributed greatly to the declines in area population, both due to the actual rural population lost and due to the loss of

TABLE 1
POPULATION DATA

<u>Municipality</u>	<u>1980 Census Population</u>	<u>1986 Population Estimate</u>
Agar	139	130
Alpena	288	300
Artesian	227	220
Blunt	424	410
Broadland	49	50
Forestburg	150*	150*
Gettysburg	1,623	1,680
Harrold	196	200
Highmore	1,055	860
Hoven	615	630
Huron	13,000	12,240
Lane	83	80
Lebanon	129	140
Miller	1,931	1,700
Onida	851	760
Osceola	40*	40*
Polo	30*	30*
Ree Heights	88	70
St. Lawrence	223	220
Tolstoy	97	80
Virgil	37	30
Wessington	327	270
Wessington Springs	<u>1,203</u>	<u>1,050</u>
Total of Partici- pating Municipalities	22,805	21,340

*Non-incorporated community, population estimated.

Rural Populations by County

Beadle	4,934	4,880
Buffalo	1,795	1,600
Hand	2,683	2,690
Hughes	1,627	1,690
Hyde	1,014	1,040
Jerauld	1,355	1,370
Potter	1,210	1,170
Sanborn	1,966	1,840
Sully	1,000	1,010

Source: Business Research Bureau, University of South Dakota,
South Dakota County and Subcounty Population Estimates,
1987.

economic activity in small towns serving the rural population. The consolidation of farm and ranch enterprises has occurred because narrower profit margins in agriculture make a larger volume necessary to support a family; and because larger, more efficient machinery allows greater production with less labor. Because farm units are now, on average, of a more economically viable size, and because modern machinery approaches the maximum size limit for feasible operation, rural populations can be expected to become more stable in the future.

Along with stability in rural populations will come stability in small town populations. The economies of communities of the area are almost entirely dependent on service to agricultural enterprises and rural families. Business enterprises and employment include retail stores, elevators, livestock sales, professional services, schools and local governments. For most of these enterprises, a stable service area population is of primary importance for survival.

No significant population growth is projected for the project area for purposes of this study. Some population increase may occur in the Huron area, and in Hughes County near Pierre. However, it is expected that any growth in these areas will not be significant in comparison to total water system demands including livestock.

C. Economy:

Agriculture has been the predominant economic activity in the project area since settlement and remains so today. Agriculture production and emphasis varies through the project area. On the west, adjacent to the Missouri River, some irrigation development has taken place. Primary irrigated crops are corn and soybeans.

Cattle raising and small grain production are the principal agricultural enterprise through the center of the project area. Cattle, and to a lesser extent sheep and hogs, are most often part of an integrated farming operation which includes hay and grain production. Typical dryland small grains in the area are wheat, barley and oats.

The James River Valley in Beadle and Sanborn Counties on the east side of the project area is an area of more intensive farming. Primary crops in this area are small grains, corn and soybeans. Some irrigation has been developed with groundwater sources or diversions from the James River.

Manufacturing and service businesses are a small but growing part of the area economy. Many of the businesses are agriculture-related, including meat processing, equipment manufacturing and farm management.

Maintenance of the existing livestock industry is an important reason for development of Mid Dakota Rural Water. Livestock census data for 1974, 1978 and 1982 are presented on Table 2. The 1974 data are believed to represent normal to high stocking rates. The 1978 data represent depressed inventories due to the 1976 drought. The 1982 data show a return to more normal stock inventory.

Most farm or ranch units in the project area are diversified, with production in, and income from, a variety of agricultural enterprises. These enterprises include crop production and livestock production.

The reason for diversification of farm enterprises is to stabilize farm income over a range of market conditions, and to obtain maximum value from crops which are produced. For example, a given operator may integrate cattle raising and feeding within a grain raising operation in order to obtain maximum value from grain which is produced by feeding it to cattle. In this way, the operator maintains the flexibility to feed cattle or sell both grain and feeder cattle on the cash market, depending on market conditions.

Adequate water supply is critical to the viability of these farm operations. A lack of quality water may cause massive sell-off of livestock herds. These sell-offs depress prices over the short term and disrupt farm cash flows. Because of the significant debt load of many farm operations, a stable cash flow can be the most important factor in economic viability.

Much of the project area relies on stock dams or other small surface water impoundments for livestock water. These ponds, for the most part, rely upon runoff for water supply. Thus, in years of low or moderate rainfall, livestock water supplies may be critically short. This occurs even in years when rainfall is adequate for crop production, but does not result in runoff.

III. EXISTING WATER SUPPLIES:

Existing water supply information was obtained from records of the South Dakota Office of Drinking Water, cities and towns in the project area, and the South Dakota Geological Survey. For the most part, potable water supplies in the

TABLE 2
LIVESTOCK CENSUS DATA

<u>County</u>	<u>Cows & Calves</u>	<u>Hogs</u>	<u>Sheep</u>	<u>Cow Units</u>
<u>1974</u>				
Beadle	128,172	40,186	20,008	140,211
Buffalo	30,746	2,500	4,898	32,226
Hand	129,151	20,954	27,955	138,933
Hughes	32,887	2,553	4,784	34,354
Hyde	73,688	4,204	11,356	76,800
Jerauld	55,219	13,501	14,101	60,739
Potter	55,733	28,574	15,270	64,502
Sanborn	64,505	23,456	17,425	72,681
Sully	53,029	13,611	7,955	<u>57,342</u>
		1974 Total		677,788
<u>1978</u>				
Beadle	106,778	48,434	13,428	119,150
Buffalo	25,735	3,002	4,108	27,157
Hand	108,774	21,461	19,167	116,900
Hughes	23,984	4,415	5,119	25,890
Hyde	53,232	6,293	13,152	57,121
Jerauld	43,673	20,724	10,285	49,875
Potter	42,034	20,488	12,585	48,649
Sanborn	49,317	28,228	12,065	57,376
Sully	29,313	10,484	4,454	<u>32,301</u>
		1978 Total		534,418
<u>1982</u>				
Beadle	120,059	53,005	12,689	133,197
Buffalo	22,940	2,282	5,733	24,543
Hand	110,087	17,699	21,092	117,845
Hughes	30,641	4,810	3,451	32,293
Hyde	56,874	3,763	11,553	59,937
Jerauld	46,610	19,952	5,862	51,772
Potter	46,365	18,398	12,487	52,542
Sanborn	51,478	18,654	9,399	57,088
Sully	35,696	13,583	5,564	<u>39,525</u>
		1982 Total		568,742
Signed-up Totals	363,217	119,070	47,490	396,529

Note: Population data are converted to cow units for calculation of water demand. Cows and calves equal one unit per head, hog and sheep equal 0.2 units per head.

Source: U.S. Census of Agriculture.

area are drawn from groundwater sources. Huron is a notable exception, with a surface water intake on the James River. Also, Gettysburg has a Missouri River intake near Highway 212 for their water supply. Groundwater is also used extensively for livestock water supply, but small dams, wetlands, streams and ponds provide much of the existing livestock water.

A. Groundwater:

Groundwater availability and quality varies widely through the project area. Groundwater from the Dakota Sandstone bedrock aquifer is available at depths of 800 feet or more below the surface throughout the project area. The aquifer is artesian, and flowing wells are common. However, artesian pressure in the aquifer has declined more than 200 feet since wells were originally drilled in the early 1900's. In recent years, the decline in artesian pressure has been measured at 1 to 1.5 feet annually.

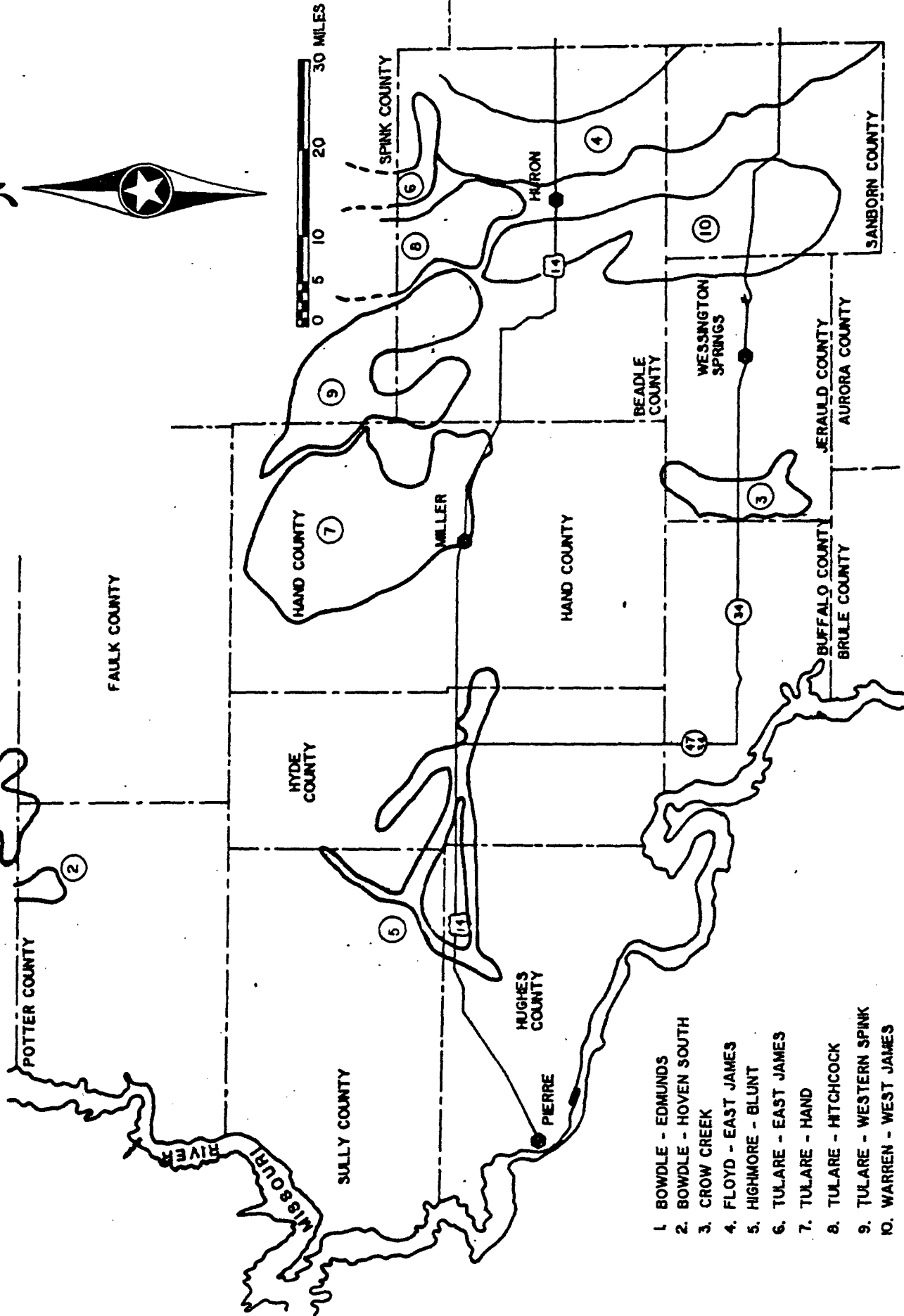
Representative water quality data for six Dakota Sandstone wells are included on Table 3 where depths are between 950 and 1,300 feet. Water from the Dakota Sandstone in the project area is high in total dissolved solids, sodium and sulfate. The eastern South Dakota water quality summary for the Dakota Sandstone, Table 4, shows water quality similar to that of the wells shown on Table 3 for the Dakota Sandstone. Individual Dakota Sandstone wells throughout the area can be expected to have similar water quality to that given in Tables 3 and 4.

Shallower surficial, basal or intermediate aquifers are important sources of potable water in the area. As shown on Table 4, these wells are typically less than 100 feet deep. Figure 2 shows the general boundaries of the more important aquifers in the area. None of the shallow aquifers can be expected to consistently produce water with total dissolved solids less than 500 mg/l, although isolated instances of better quality can be found. The quality parameters for shallow municipal wells listed on Table 3 are indicative of specific water quality for the well locations. The statistical data of Table 4 present general water quality information for the area.

Poor water quality is a significant problem throughout the project area. As can be seen from the specific water quality information on Table 3 and the statistical information on Table 4, certain minerals are most commonly in excess of drinking water standards in the project area. The following is a description of those constituents and the significant of each.



0 5 10 20 30 MILES



1. BOWDLE - EDMUNDS
2. BOWDLE - HOVEN SOUTH
3. CROW CREEK
4. FLOYD - EAST JAMES
5. HIGHMORE - BLUNT
6. TULARE - EAST JAMES
7. TULARE - HAND
8. TULARE - HITCHCOCK
9. TULARE - WESTERN SPINK
10. WARREN - WEST JAMES

**APPROXIMATE BOUNDARIES OF
PRINCIPLE AQUIFERS
BASAL OR SURFICAL GROUPS**

TABLE 3

MID DAKOTA RURAL WATER SYSTEM
MUNICIPAL WATER ANALYSES

Water system name	NO3-N	F	Cl	Fe	Mn	SO4	TDS	Hardness	Na	K Depth, ft.
Agar raw, well 2	1.1	2.7	594.0	0.4	0.1	280.0	1,881.0	33.1	740.0	11.9
Alpena	0.1	1.8	96.9	3.3	0.1	1,204.0	2,044.0	700.0	360.0	21.6
Blunt raw, well 1N	0.1	0.2	370.0	0.2	2.1	324.0	1,353.0	821.0	97.7	8.7
Blunt raw, well 2S	0.1	0.1	300.0	2.9	2.4	314.0	1,188.0	759.0	82.6	8.6
Broadland raw, well 1	0.1	2.3	111.0	1.8	0.1	1,246.0	2,077.0	1,119.0	183.0	22.9
Forestburg raw	0.1	1.7	77.1	1.6	0.2	1,188.0	1,996.0	532.0	432.0	20.1
Gettysburg raw	0.1	0.5	12.7	0.2	0.0	184.0	441.0	215.0	61.4	4.5
Gettysburg treated	0.1	1.3	14.2	0.1	0.0	184.0	355.0	129.0	64.2	4.3
Harrold raw, well 1 & 2	0.1	0.2	20.5	6.3	1.2	151.0	682.0	381.0	54.8	8.9
Harrold treated	0.1	0.2	20.8	4.5	1.2	149.0	679.0	382.0	53.7	9.0
Higmore raw, well 1	0.8	2.6	22.4	2.2	0.6	212.0	676.0	440.0	47.5	5.8
Higmore raw, well 2	0.1	0.2	21.4	1.3	0.8	200.0	679.0	423.0	38.8	5.8
Hoven east	4.8	0.5	46.7	0.2	1.8	348.0	1,071.0	646.0	55.3	8.5
Hoven north	0.9	15.7	82.9	0.4	1.4	186.0	744.0	1,429.0	53.7	8.0
Hoven south	0.9	0.5	52.1	0.1	1.5	203.0	715.0	435.0	36.7	6.9
Hoven west	1.9	0.4	42.4	0.2	1.5	219.0	771.0	462.0	43.1	7.6
Huron raw, James River	0.1		38.8	2.0	0.6	139.0	501.0	237.0	62.2	
Huron treated			57.3	0.1	0.0	164.0	402.0	113.0	70.6	
Lane raw, well 2	0.1	1.8	72.5	1.8	0.1	1,200.0	1,998.0	693.0	347.0	21.5
Miller raw well 1	0.1	1.9	91.6	2.0	0.0	1,177.0	2,028.0	791.0	333.0	18.0
Miller raw well 2	0.2	1.9	91.0	2.9	0.1	1,195.0	2,021.0	784.0	329.0	17.9
Miller raw well 3	0.1	2.1	100.0	8.8	0.2	1,102.0	1,942.0	346.0	500.0	15.2
Onida treated	0.4	3.2	89.1	4.2	0.1	1,236.0	2,143.0	1,299.0	90.0	17.5
Onida raw, sundance well	0.1	3.1	75.9	2.0	0.1	1,290.0	2,151.0	1,417.0	48.1	17.3
Ree Heights wells 1 & 2	1.0	0.3	34.9	0.3	0.2	194.0	825.0	381.0	146.0	10.9
St. Lawrence wells 1 & 2	1.4	0.4	80.4	4.5	0.4	478.0	1,328.0	285.0	354.0	13.2
Tolstoy raw, well 1	0.1	0.2	25.6	1.5	0.7	564.0	1,271.0	944.0	28.9	7.7
Virgil raw, well 1	2.3	1.8	151.0	1.2	0.1	1,168.0	2,103.0	884.0	287.0	17.2
Wess. Springs south raw	0.1	0.2	16.2	0.1	1.5	456.0	1,011.0	696.0	42.0	10.4
Wess. Springs treated	0.1	1.2	16.3	0.1	0.0	446.0	671.0	345.0	57.4	12.3
Wess. Springs west raw	0.1	0.2	14.8	0.2	2.4	423.0	1,004.0	652.0	63.8	13.0
Wessington treated	0.1	0.3	95.5	0.4	2.5	743.0	1,662.0	753.0	257.0	11.6
South Dakota Standard	10.0	4.0	250.0	0.3	0.05	250.0	500.0			

TABLE 4

SUMMARIZED WATER QUALITY INFORMATION BY AQUIFER

Aquifer	Well Depth, ft.	Concentration of Quality Parameter			
		Total Dissolved Solids, mg/l	Sulfate mg/l	Sodium mg/l	Hardness mg/l
Bowdle-Edmunds	40-62	538-1198	151-351	27-97	420-666
Bowdle-Hoven South	37-52	517-895	131-249	39-88	345-451
Crow Creek	64-86	224-1445	229-355	62-106	371-501
Floyd-East James	96-112	1569-1999	689-866	209-274	580-708
Highmore-Blunt	28-58	620-1500	185-469	79-240	349-859
Tulare-East James	79-89	1181-2102	399-588	165-221	504-648
Tulare-Hand	63-83	927-1581	380-600	156-221	542-754
Tulare-Hitchcock	66-76	966-1505	473-613	105-143	671-800
Tulare-Western Spink	86-98	731-1126	297-446	106-159	404-563
Warren-West James	74-87	1235-1610	493-640	235-302	407-548
Dakota	812-892	1892-2080	841-934	436-510	462-554
South Dakota Standard		500	250		

Note: Values given for quality parameters are statistically determined 95 percent confidence interval, and represent 2 standard deviations above and 2 standard deviations below the mean.

Source: U.S. Army Corps of Engineers, "Evaluation of Groundwater Resources, Eastern South Dakota and upper Big Sioux River, South Dakota and Iowa.

Total Dissolved Solids (TDS) is an indicator of the total mineral content of the water. TDS is therefore a general quality indicator, in that lower mineral content typically indicates a better quality potable water. When TDS is greater than 500 milligrams per liter (mg/l), it is important to review the chemical constituents of the total solids as each relates to the potability of the water.

Iron (Fe) in the ground water supply exists as free or unoxidized iron. Typical water treatment processes, especially disinfection with chlorine; and water distribution processes such as storage in reservoirs, result in oxidation of iron. The oxidized iron imparts a reddish color to the water and may deposit on piping systems or plumbing fixtures. In general, iron concentrations above the suggested maximum of 0.3 mg/l will result in red water or iron deposition which interferes with normal uses of potable water.

Manganese (Mn) is similar to iron in that manganese also becomes objectionable when oxidized. Manganese results in black coloration of water and black deposits on plumbing fixtures where concentrations exceed 0.05 mg/l.

Sulfate (SO_4) is an important water quality parameter because of the bitter taste which it imparts to the water and because of the laxative effect of sulfate salts. Taste is noticeable in water with sulfate concentrations above 300 to 400 mg/l, which includes over half of the municipal quality analyses of Table 3. Laxative effects are reported by many people at a sulfate concentration of 300 to 500 mg/l, and by most people unaccustomed to the water at concentrations over 1,000 mg/l. About 2/3 of the municipal water test results of Table 3 indicate sulfate in excess of the recommended standard of 250 mg/l.

Sodium (Na) is an essential part of the human diet, but is known to be generally consumed in excess by members of modern society. Excessive sodium intake has been shown to contribute to high blood pressure. A reduced sodium diet is often prescribed for patients with hypertension. Most of the population would benefit if dietary sodium intake were restricted to 2,000 mg per day or less. Based on daily intake of 2 liters of water, the water supply must be limited to 250 mg/l in order not to contribute more than 25% of total dietary sodium. About 1/3 of the tests of Table 3 show sodium in excess of 250 mg/l. For those on sodium restricted diets, allowance is typically made for sodium of 100 mg/l in the water.

Hardness of water is the generic description for the sum of polyvalent cations in the water, most commonly calcium and magnesium. Hardness is usually expressed in terms of the equivalent quantity of calcium carbonate (CaCO_3). Nationwide, water with a hardness greater than 75 mg/l is considered hard. However, in South Dakota, hardness is generally much higher. As such, hardness of less than 350 mg/l will generally be considered relatively soft in South Dakota. High hardness interferes with the efficacy of nearly all household and commercial water uses. Most notable of the problems is interference with the solubility of soap, resulting in excessive soap consumption for cleaning tasks and the formation of hard water scum. Hardness also contributes to scale build-up on fixtures and hot water appliances or equipment.

Fluoride (F) can be both beneficial and harmful in potable water supplies. South Dakota law requires public water supplies serving a population of over 500 to add fluoride if necessary to reach a level of 0.9 to 1.2 mg/l. This is done because fluoride contributes to a reduction in cavities, especially in children. However, at levels in excess of 2.5 to 4 mg/l, fluoride can cause mottling of tooth enamel and skeletal fluorosis.

Nitrate (NO_3) is an increasing water supply hazard throughout the nation, and especially for shallow wells in South Dakota. The most important adverse effect of nitrate is induction of methemoglobinemia, especially in infants. This disorder interferes with the ability of blood to carry oxygen through the body. Another possible effect of nitrate contamination is formation of carcinogenic nitrosamines. The maximum allowable nitrate concentration for public water supplies is 10.0 mg/l as nitrate.

Major sources of nitrate contamination in South Dakota are decaying organic matter and agricultural runoff. Nitrate contaminated water often enters rural individual water supplies or shallow aquifers through poorly protected wells. In many cases, shallow wells are located in low areas because that is where there is greatest availability of water during drought. However, during high runoff, the well may become flooded with contaminated water, in turn contaminating the aquifer.

Application of nitrogen fertilizers has become more common and more intensive as agricultural production has increased. This may result in higher nitrate concentration of water percolating into shallow aquifers, and more nitrate in runoff water in general.

B. Surface Water:

The James River flows north to south through the east side of the project area. The City of Huron uses the James for water supply. Flows at Huron are somewhat stabilized by releases from the Sand Lake Wildlife Refuge, but flows are regularly low enough in the summer months to cause restriction of withdrawals by irrigators along the river. Water quality deteriorates markedly during low flows.

The James River is not a reliable, quality water supply for the City of Huron. Table 5 describes the typical annual variation in total dissolved solids for the James at Huron. The constituents of total solids in the James are similar to area groundwaters. Operation of the water treatment plant at Huron is complicated by the raw water variation. In addition, noticeable changes of water taste and odor do occur. The City of Huron has developed wells to supplement the James supply, but well water quality (Table 3) is not good.

The Missouri River is the most prominent water resource of the project area. The Missouri is controlled in the area by the Oahe Dam north of Pierre and by the Big Bend dam at Ft. Thompson. These two dams create Lake Oahe and Lake Sharpe, respectively. The Missouri is a vast resource in comparison to the needs of this project, with average annual flow of about 18 million acre-feet. The Missouri flow compares to a total annual domestic and livestock water use in the Mid Dakota area of less than 10,000 acre-feet. Water quality of the Missouri River dams is also good, in comparison to local surface water and groundwater alternatives. Water quality data for the Missouri at Oahe Dam is given in Table 6.

The Missouri River dams are the only realistic water source in the project area for development of a large project like Mid Dakota Rural Water. Groundwater sources in the project area are not of adequate quality to meet drinking water standards, or are of insufficient quantity for the water system. Sufficient unappropriated water is not available from the James River.

C. Existing Systems:

Existing municipal water systems were reviewed as to adequacy of water systems. The municipal systems present a typical array of needs, but all have indicated an interest in Mid Dakota Rural Water because existing water sources are deficient. In most cases, the long term deficiency is water quality rather than

TABLE 5

JAMES RIVER AT HURON
MEAN TOTAL DISSOLVED SOLIDS IN MG/L

January	1,150	July	660
February	1,370	August	710
March	820	September	750
April	510	October	820
May	610	November	840
June	660	December	950

Source: U.S. Bureau of Reclamation, CENDAK Project
Draft Environmental Impact Statement, 1986.

TABLE 6

LAKE OAHE WATER QUALITY CHARACTERISTICS AND DRINKING WATER STANDARDS

Parameter	Lake Oahe		Maximum Level Under Surface Water Quality Standards	Maximum Contaminant Level for Drinking Water
	Typical Range ¹	Highest (Lowest) Observed Value ¹		
Temperature (degrees C.)				
Surface	0-23	25		
Epilimnion avg. ²	1-22		18	
Hypolimnion avg. ²	1-14			
Color (Pt-Co Units)	3-15	25, (3)		15
Turbidity (tu)	1-6	15, (0)		1 ⁴
Suspended Solids	2-8	16, (0)	30	
Total Algae (per ml)	10-100	9700, (1)		
Total Chlorophyll	0.002-0.015	0.058, (0)		
Fecal Strep (MF, per 100 ml)	<5	10, (<5)		
Fecal Coliform (MF, per 100 ml)	<3	10, (1)	200	1 ⁴
TOC	3-6	6, (3)		
COD	4-15	19, (3)		
Total P	0.01-0.03	0.04, (0)		
NH ₃ +NH ₄ -N	0.01-0.07	0.14, (0)	0.6	
NO ₃ -N	0.05-0.20	0.20, (0)	10	10 ⁴
D.O.	7-14	16, (6)	6 (min.)	
pH (std. units)	7.5-8.5	9.2, (7.2)	6.6-8.3	6.5-8.5 ³
Dissolved Solids	475-585		1,000	500 ³
Hardness (as CaCO ₃)	240-260			
Alkalinity (as CaCO ₃)	155-180		750	
Ca	42-62			
Mg	23-32			
Fe	0.07-0.30	0.45, (0.02)	0.2	0.3 ³
Mn	0.006-0.040	0.068, (0.004)		0.05 ³
Na	64-80			
K		4-6		
HCO ₃	190-215			
SO ₄	170-270			250 ³
Cl	10-15		100	250 ³
F	0.3-0.5	0.7, (0.1)		4.0 ⁴
Al	0.020-0.200	0.321, (0)		
As	0.002	0.003		0.05 ⁴
Ba	0.030-0.060	0.080, (0.020)		1.00 ⁴
Cd	0.001-0.006	0.007, (0)		0.010 ⁴
Cr	0-0.007	0.010, (0)		0.05 ⁴
Cu	0.003-0.009	0.018, (0)		1 ³
Pb	0.010-0.030	0.117, (0)		0.05 ⁴
Hg	0.0002-0.0007	0.0030, (0)		0.002 ⁴
Se	0-0.002	0.002, (0)		0.01 ⁴
Ag	0-0.002	0.002, (0)		0.05 ⁴
Zn	0.010-0.072	0.077, (0.004)		5 ³

¹ Expressed in milligrams per liter (mg/l), unless noted otherwise.

² Thermocline normally at about 100 ft. depth in 200 ft. of water near the dam.

³ Secondary Standard.

⁴ Primary Standard

Information Sources:

1. Water Resources Data for South Dakota, 1978-1980, U.S.G.S.
2. STORET, Retrieval date 12/7/81, U.S. C.O.E. 1976-1981 data.
3. S.D. DWR, WQM Station No. 71, 1975-1981 data.

quantity. Some communities have an existing shortage of quantity of water, but have delayed investment in new wells or other source facilities due to high costs or poor quality of potential supplies. The water quality information on Tables 3 and 4 illustrates the need for an improved water supply.

Appendix A includes individual summaries of existing water facilities for each municipality.

IV. WATER NEEDS:

Water requirements for the Mid Dakota system were calculated from information provided by the prospective water users, and from standard values of water consumption for the region. Data were provided by rural users in the form of water use information forms for each location.

Data relative to municipal water use were provided by the municipalities where water use records were available. Where detailed records were not available, water use was estimated on a per capita basis.

System water needs are listed in Table 7. Municipal water needs are planned to be delivered to the respective communities. For this study, it was assumed that all water for each municipal system would be provided by Mid Dakota. Rural, domestic and livestock water is planned to be delivered to the respective water users as indicated on the sign-up forms.

Livestock water is provided as required by the signed-up water users. These water users reported livestock inventories equal to about 70% of the total livestock in the project area, as described by census information. It is believed that, due to the continued use of existing livestock water supplies, the design for 70% livestock capacity is adequate to meet future demands on the system.

V. WATER SYSTEM DESIGN:

The major elements of the Mid Dakota Rural Water System are pipelines, water treatment, and pumping stations and reservoirs. The goal of water system design is to provide delivery of quality treated water, at the design capacity, to each water service location. With the selected Missouri River water source, one objective of the preliminary design procedure was to compare the economies of different diversion locations.

A. Intake:

For the feasibility study, consideration was given to water sources at three locations. The locations were

TABLE 7

WATER SYSTEM DESIGN CAPACITY

<u>Municipality</u>	<u>Average Day, gallons per day</u>	<u>Maximum Day, gallons per day</u>
Agar	24,000	49,000
Alpena	49,000	100,000
Artesian	40,000	82,000
Blunt	71,000	147,000
Broadland	7,000	15,000
Forestburg	25,000	52,000
Gettysburg	260,000	600,000
Harrold	31,000	64,000
Highmore	159,000	300,000
Hoven	105,000	215,000
Huron	2,100,000	3,600,000
Lane	15,000	30,000
Lebanon	22,000	45,000
Miller	300,000	620,000
Onida	133,000	290,000
Osceola	7,000	14,000
Polo	5,000	10,000
Ree Heights	13,000	27,000
St. Lawrence	35,000	71,000
Tolstoy	16,000	34,000
Virgil	9,000	19,000
Wessington	47,000	96,000
Wessington Springs	<u>200,000</u>	<u>300,000</u>
Subtotal, Municipal	3,673,000	6,780,000
<u>Rural, 2,500 Connections</u>		
Domestic	400,000	720,000
Livestock (400,000 cow units)	<u>750,000</u>	<u>3,420,000</u>
Subtotal, Rural	1,150,000	4,140,000
System Totals (gallons per day)	4,823,000	10,920,000
	5,400 acre feet annually	9,100 gpm for 20 hours/day

adjacent to Highway 212 west of Gettysburg, at Oahe Dam, and at Big Bend Dam. These locations were chosen for ease of access and for proximity to acceptable main pipeline routes along major highways. The three locations offer good comparison of potential diversion locations along the length of the Missouri adjacent to the project area. In addition, there is a potential for sharing existing Corps of Engineers or Bureau of Reclamation intake facilities at the dam sites.

Two types of intakes are normally considered for year-around use on the Missouri River reservoirs in South Dakota. These intakes are the inclined tube type and the vertical caisson type. For the inclined tube intake (Figure 3), steel pipelines, approximately 12 inches to 24 inches diameter depending upon the capacity required, are laid on the approximate grade of the submerged shoreline. Submersible turbine pumps are placed in the inclined tubes to lift water to a shoreline station, or to the water treatment plant. Pumps can be removed for maintenance when required, although the quantity of pump discharge pipeline involved can make winter maintenance a difficult task.

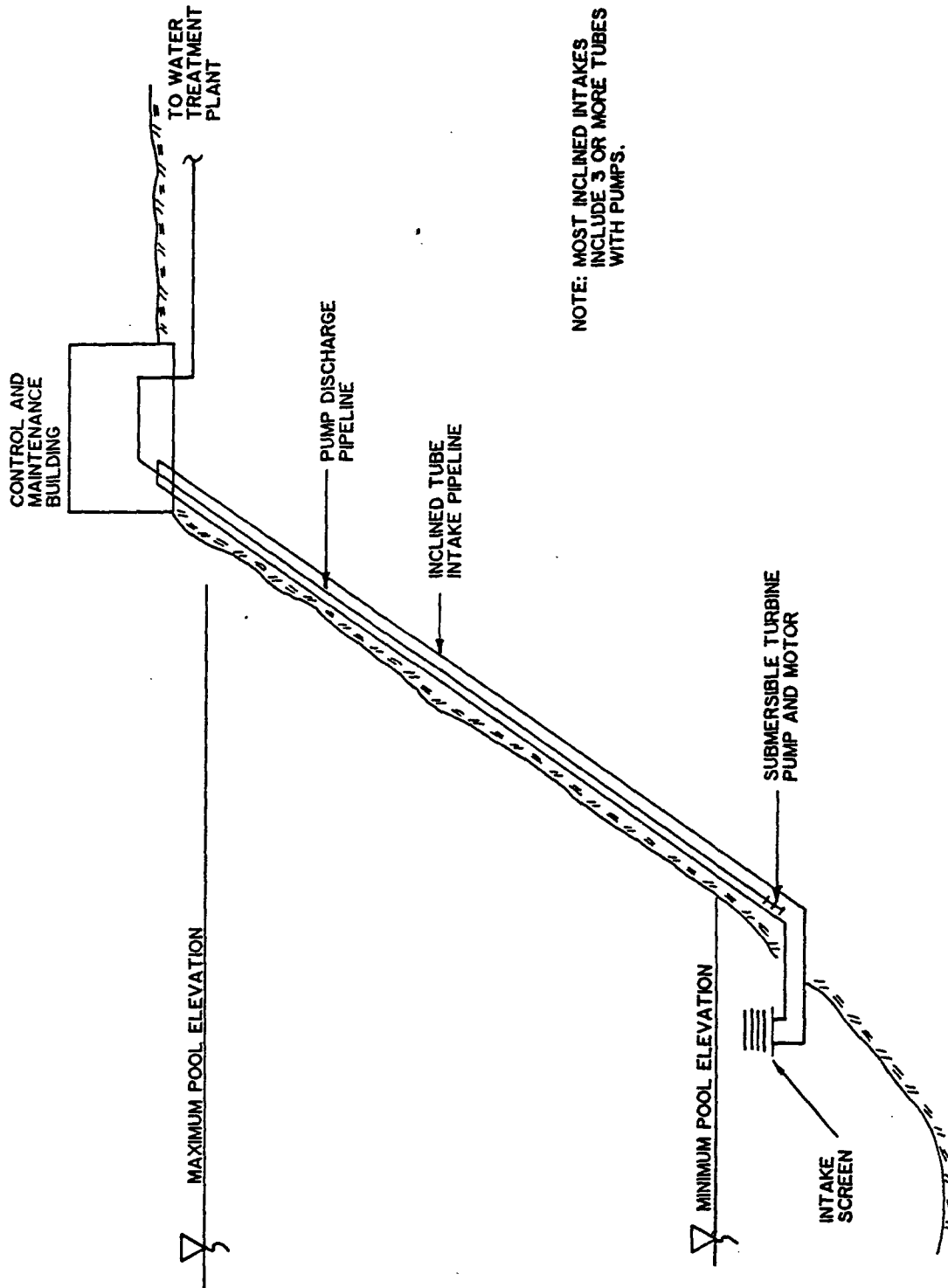
Vertical caisson intakes (Figure 4) are designed to use conventional vertical turbine pumps. These intakes are relatively more expensive, especially for smaller intakes, due to the depths of excavation required. For the vertical intake, a round caisson of a diameter adequate for the necessary pumps is constructed vertically on the shore above the high water mark, to below the design minimum water level. A horizontal intake tube is then bored from the caisson, below the reservoir water surface. Pump maintenance is more convenient because less discharge pipeline is required, and because standard rather than submersible motors are used.

B. Water Treatment:

Water treatment will be provided to produce a high finished water quality consistent with the standards of the Safe Drinking Water Act (SDWA). The SDWA primary standards, by law, establish the minimum acceptable quality criteria. SDWA secondary standards establish minimum criteria for aesthetically acceptable water.

Water quality records for the Missouri River at Lake Oahe are given in Table 6. Water quality at Gettysburg or Big Bend would be similar.

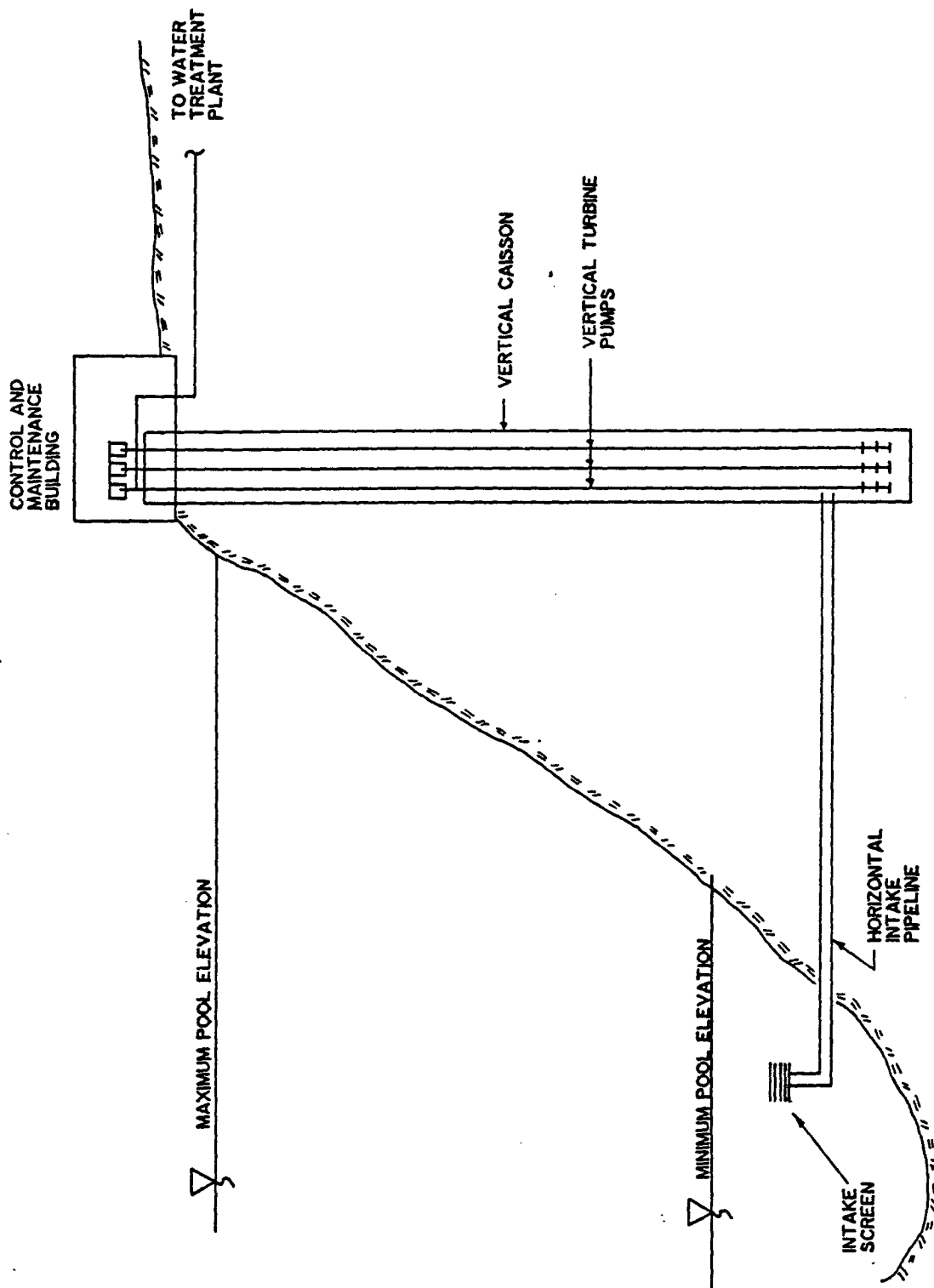
Drinking water quality standards are also listed in Table 6. From comparison of the measured raw water quality with the drinking water standards, it can be



NOTE: MOST INCLINED INTAKES
INCLUDE 3 OR MORE TUBES
WITH PUMPS.

TYPICAL INCLINED TUBE INTAKE SCHEMATIC

NOT TO SCALE



TYPICAL VERTICAL CAISSON INTAKE SCHEMATIC

NOT TO SCALE

seen that treatment is necessary only to remove suspended solids and biological organisms. Suspended solids in Lake Oahe and Lake Sharpe are primarily colloidal clay particles. Biological organisms include algae and bacteria.

The water treatment process will be directed toward removal of the suspended solids and organic matter through sand filtration. Several steps of treatment process are expected in order to accomplish this treatment objective. A typical process schematic is shown on Figure 5.

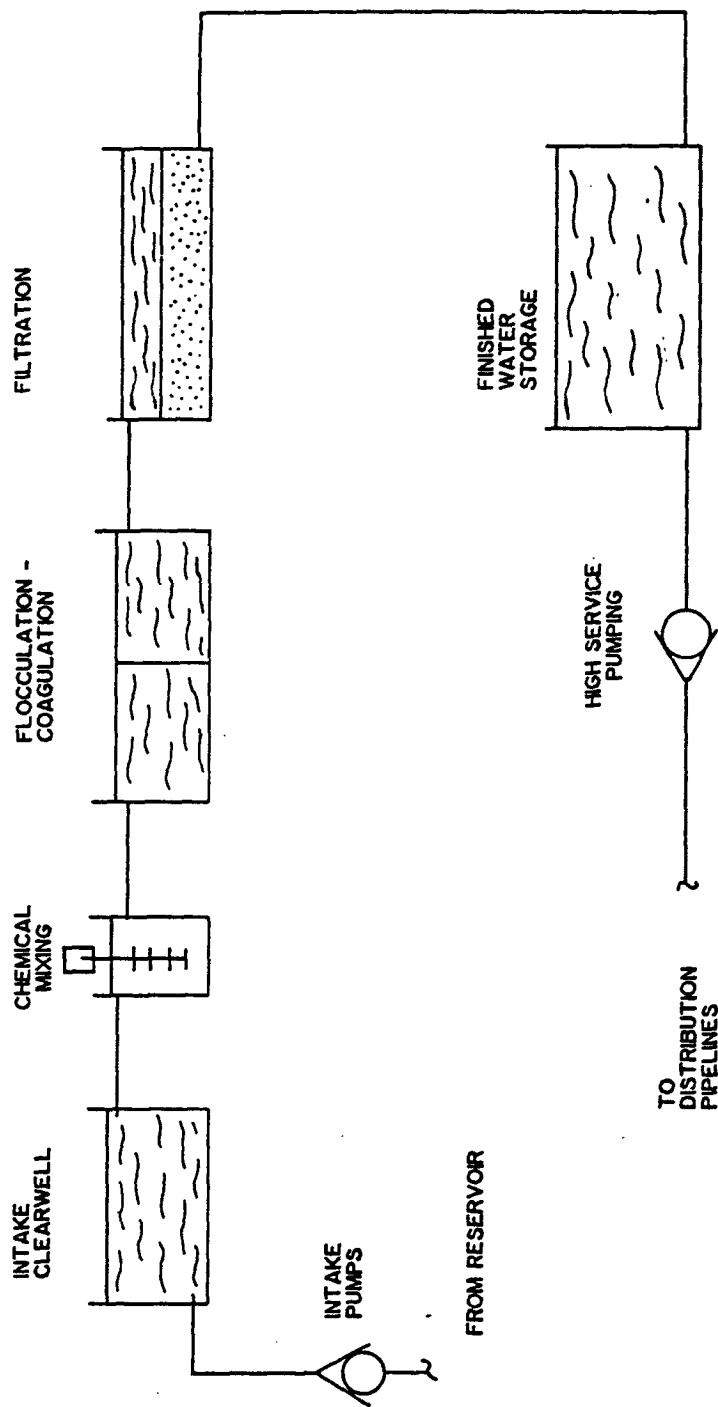
Water will be pumped from the intake structure to the treatment plant. The first step of the process is to coagulate the fine clay, organic or mineral particles present into larger particles or "floc" which can be filtered out. Initially, a coagulant such as lime is added to the water in a high speed or hydraulically turbulent mixer. Then, the water passes to a flocculation basin where low speed mixers stir the water to promote floc formation. A coagulant aid such as aluminum is often added.

The coagulated floc is partially removed from the water by settling. The traditional settling equipment is large sedimentation tanks through which the water passes at low velocity. Newer design equipment, such as tube settlers, may be used. If taste or odor control is needed, or if organics which may contribute to the formation of trihalomethanes in the finished water are present, activated carbon may be added following flocculation. If lime addition is sufficient to raise the pH of the water, carbon dioxide will be added to the water to lower the pH back to non-corrosive levels.

Filtration is the final step for removal of contaminants from the water. Sand or anthracite coal are the most common filtration media. Filtration is required to remove the fine floc which does not settle in the sedimentation process.

Following filtration, chlorine will be added to maintain disinfection of the water in the storage and distribution system. Fluoride will be added to help prevent tooth decay. Treated water will be stored in a ground level reservoir, and ultimately pumped to the pipeline system.

At about 250 mg/l (15 grains per gallon), the water from the Missouri is considered moderately hard by federal standards. However, compared to other water supplies in South Dakota, including groundwater



TYPICAL WATER TREATMENT PROCESS SCHEMATIC

NOT TO SCALE

supplies as described by Table 3, the water is relatively soft. The raw water hardness is suitable for most intended uses. Point of use treatment for hardness reduction can be economically applied for household water uses which require soap, including laundry and bathing. Due to the relatively small volume of water used for these purposes, as compared to the total water system capacity, softening processes for treatment were not considered.

Treated water quality will be substantially the same as raw water quality shown on Table 6, with the exception of the removal of color, turbidity, suspended solids and organics. The addition of lime as a coagulant may result in minor reductions of hardness, including removal of some calcium carbonate or magnesium carbonate. However, lime is not expected to be added to the extent necessary to accomplish significant softening.

Of the parameters listed on Table 6, fluoride and chlorine will be added. Fluoride will be maintained at near the optimum level of 1.2 mg/l. Free chlorine residual will be maintained at 0.3 to 1.0 mg/l. Chlorine may be added at various locations within the system to maintain this free chlorine residual. The minimum residual chlorine for delivered water will be approximately 0.3 mg/l.

C. Pipelines:

Rural and municipal water use locations are shown on the large project area maps bound at the back of this report. Main pipelines are generally planned along primary highways to ease initial construction and future maintenance. In addition, main routes along the highways conveniently deliver water to the major municipalities in the area.

Main pipelines were sized to provide maximum day demands to municipalities and storage reservoirs over a 20 hour daily delivery period. Pipe sizes were selected to provide a maximum flow velocity of less than four feet per second. This velocity limitation results in pressure losses due to friction which are not excessive, and minimizes potential surge pressures during system operation. Smaller main pipeline sizes would require more pumping stations, greater energy input, and more sophisticated control systems.

Rural distribution pipelines were sized to deliver water to each signed up rural location. Pipeline routes were plotted primarily along section lines. In some cases, pipelines follow existing roads, as shown

by available mapping, rather than section lines. Field investigation of pipeline routes was not a part of this study, and some realignment will undoubtedly be necessary to avoid construction obstacles such as steep terrain or wetlands.

Distribution pipeline sizing was calculated based on estimated flow rates to each location. The flow rate estimate for instantaneous peak demand for household use was based on an empirical estimate developed by the Engineer. The design provides for instantaneous peak flow of 11.5 gallons per minute for pipelines with one connection. Design average flow per connection is reduced due to time diversity of demands as the number of connections increases. For example, the design domestic flow rate for a pipeline serving 50 connections is 50 gallons per minute.

In addition to the peak domestic flow rate, design flows were added to each pipeline segment for livestock water. The livestock flow rate is intended to deliver livestock water to the connection location as required by the stock numbers which the water user provided on the signup form. Livestock water delivery is based on delivery of the required volume over 20 hours daily. As such, during peak system demands and for large volumes of livestock water, some on-farm storage may be required. Water service to municipalities was also calculated on a 20 hour daily delivery time basis.

Implicit to pipeline design is the design pressure at which water will be delivered to the users. Each location will have a range of operating pressure, depending on system demands. During times of low flow, service pressure is determined by the difference in elevation between the reservoir water surface and the consumer location. This is the static pressure. For this project, the design goal was a minimum static pressure of 40 pounds per square inch (psi). Where reservoir elevations were significantly affected by relatively few users, some exceptions to this goal were made and are noted in the text.

As the water flows through the pipelines, energy, in the form of pressure, is lost to friction. Higher flow rates in a given pipe size cause more friction losses, and consequently lower pressures. Pipe sizes for this system were calculated to result in not less than 20 psi residual pressure to any location at the design maximum flow rate. Friction losses were calculated with the Hazen Williams head loss formula using C=150 for PVC pipes and C=140 for other materials.

Not withstanding the minimum design pressures for the water system, most connections will have higher pressures. Those connections at relatively lower elevations, and those near main pipelines, will have higher pressures. Pressure regulators will be provided to reduce delivery pressure to approximately 50 to 60 psi where main pipeline pressures are higher.

D. Pumping Stations and Storage:

Pumping stations are required to lift water to the project area and to provide energy for pressurization. Pumping station design flow rates are equal to pipeline design flow rates at the location. Pumping station pressures were calculated to provide lift and to overcome pipeline friction losses.

Storage reservoirs were sized within industry standard size steps to provide approximately one maximum day total system storage. Elevated or ground reservoirs were selected depending on hydraulic gradients required for pipeline hydraulics and the topography of the reservoir site.

E. Gettysburg Service Area:

Rural distribution areas were established for pipeline design. Each of these areas is a separate hydraulic zone with separate storage and pipeline facilities. The service areas were established based on topography and divisions of individual pipelines, as dictated by water user locations. In addition, the rural service areas were located to correspond to water storage locations at high elevations within the project area.

The Gettysburg tower service area is the northwest corner of the Mid Dakota system including Potter and northern Sully Counties. The service area elevation is high compared to the rest of the system. A water tower is proposed at Gettysburg to serve the area. Alternative water sources considered for the Gettysburg area were the Highway 212 intake, the Oahe Dam intake and the Lake Sharpe intake. Additional information regarding alternatives is presented in Appendix C.

Service to the Gettysburg area from the Oahe Dam intake requires pumping and main pipeline from the south. Main pipeline is sized at 14 inches diameter from Blunt to the Gettysburg reservoir at the intersection of Highways 212 and 83. The required flow rate for the area including Agar and north is 1,460 gallons per minute. A small pumping station will be required near Agar to fill the Gettysburg tower. Service to the

Gettysburg area from the Lake Sharpe source is similar, except that water is pumped to Blunt from the southeast rather than the west.

An alternative water source for the Gettysburg area is a separate intake and water treatment plant near the Highway 212 bridge on Oahe west of Gettysburg. This source alternative is approximately 25 miles closer to the major water use of the subsystem than the main pipeline at Blunt, and 42 miles closer than the Oahe Dam intake. The cost of the separate intake and water plant must be compared to the cost of the additional main pipeline and pumping station with the Oahe source alternative. The City of Gettysburg has an existing intake at this location. The existing system is not sufficient to meet present municipal demands, but further planning and design efforts may identify ways to use all or parts of the existing system for this project.

Use of the Gettysburg source for the entire project area was not considered. Because 30 miles of additional main pipeline would be needed with the Gettysburg source for the entire project, as compared to the relatively small economy of eliminating pipeline from Blunt to Gettysburg with an Oahe source, the Gettysburg treatment plant for the entire system does not appear to be a viable option.

F. Central Project Area:

The hydraulic parameters of the remainder of the water system are primarily defined by proposed water storage at Highmore, Stephan and Wessington. These three locations were selected for major water storage because of relatively high elevation compared to the surrounding area.

On the north side of the system, north of Highway 14 and exclusive of the Gettysburg service area, water users are at elevations up to about 1,950 MSL. A small area near Orient has ground elevations up to 2,000 MSL, but no users there are presently signed up. A water tower is proposed at Highmore to serve the area. Through the center of the system, ground elevations are up to 2,180 MSL six miles north of Stephan. A ground reservoir with a hydraulic gradient of 2,210 MSL is proposed at the high location.

A corridor of lower elevations along Highway 34 and east of Wessington Springs is treated as a separate service area. The reservoir for this area will be about 3 miles west of Wessington Springs at a ground

elevation of 1,970 MSL. A ground reservoir is proposed with a hydraulic gradient of 2,000 MSL at this location.

The final hydraulic segment of the water system is the James River Valley. The valley area is extremely flat with ground elevations generally ranging from 1,280 to 1,320 MSL. A few water users on the east side of the north end of the river valley area are at elevations up to 1,450 MSL. These locations will require a small booster pump of less than 5 horsepower. The James River area can be served from either the north or south mainline route, depending on the water source selected.

Three service area alternatives were considered for each of the Lake Oahe and Lake Sharpe water source. First was service to the entire Mid Dakota system. Second was service to the system excluding the Gettysburg service area. Finally, consideration was given to dividing the project area into three parts, with sources at all of Gettysburg, Oahe and Big Bend. More information regarding these alternatives is presented in Appendix C.

VI. WATER SYSTEM COSTS:

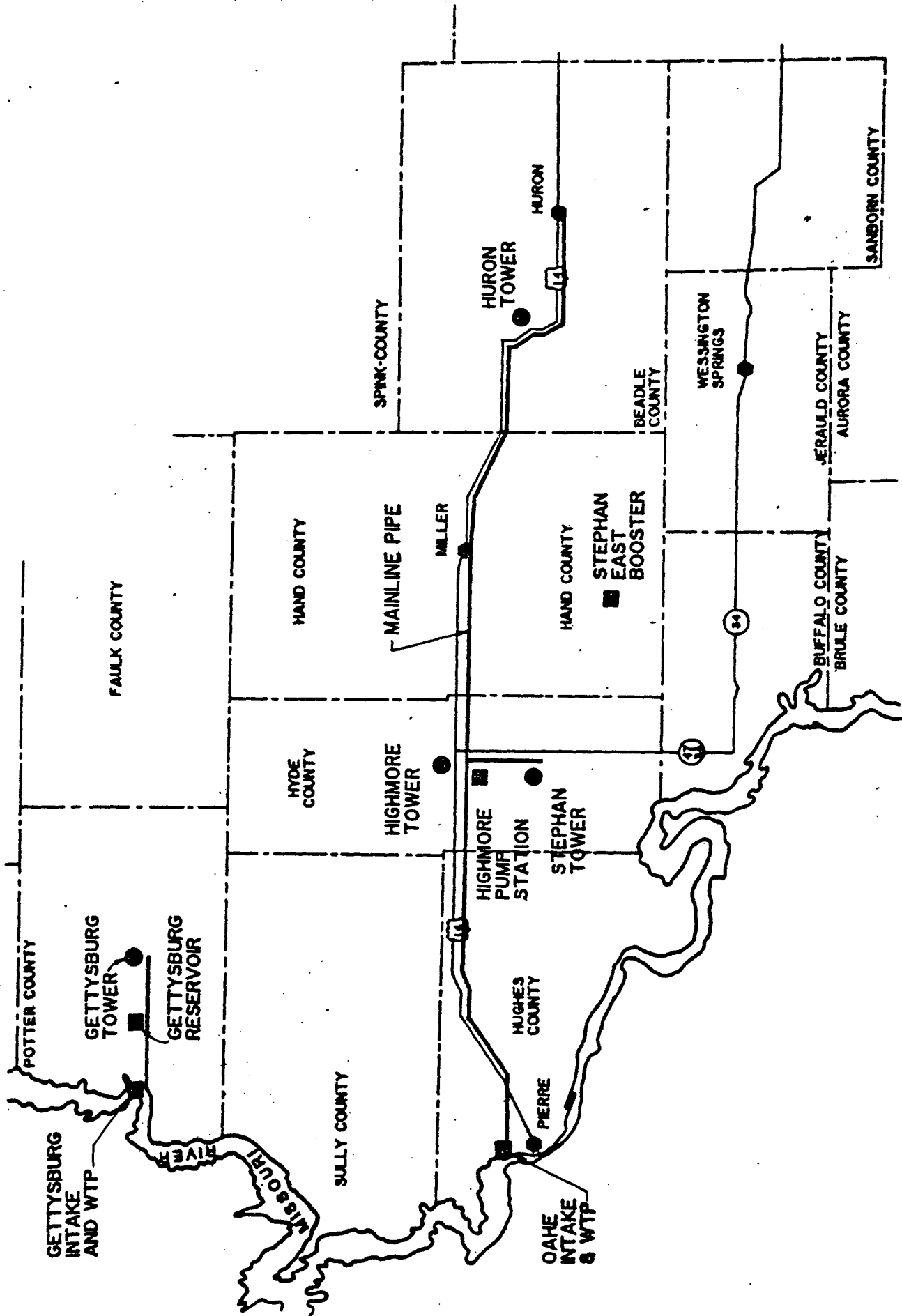
Project costs were estimated for construction of the Mid Dakota Rural Water System. Estimated costs are presented in Table 8 for the project. Facility sizes are also summarized. The project presented in Table 8 includes source and treatment at Gettysburg for the Gettysburg service area and at Oahe Dam for the remainder of the project as shown on Figure 6. This alternative was selected because, of the alternatives considered, it is not significantly more costly initially and it has lower energy requirements. In addition, there is a potential for use of existing Corps of Engineers or Bureau of Reclamation intake facilities at Oahe Dam, similar to plans proposed by the Mni Wiconi Rural Water Supply Project.

Estimated costs presented are based on feasibility study designs, as described herein, and the Engineer's experience with similar projects in South Dakota. The estimates were made without benefit of field investigations. Due to the many variables which will ultimately affect project costs, including costs of materials, labor and machinery, all of which are beyond the control of the Engineer, the Engineer can not and does not, guarantee the accuracy of cost estimates.

The most significant costs of the project are for pipelines. A description of the unit price estimate for pipelines is included in Appendix B. More detailed information on costs of other project features and alternatives is presented in Appendix C.

TABLE 8
ESTIMATED PROJECT COSTS

<u>Facility</u>	<u>Capacity</u>	<u>Cost, \$ Thousands</u>
Oahe Intake	7,660 gpm	\$ 1,900
Gettysburg Intake	1,460 gpm	650
Oahe Water Treatment	7,660 gpm	6,100
Gettysburg Water Treatment	1,460 gpm	1,490
Oahe WTP Pumping	7,660 gpm	1,050
Gettysburg WTP Pumping	1,460 gpm	260
Highmore South Booster	1,480 gpm	170
Stephan East Booster	800 gpm	130
Gettysburg Booster	1,460 gpm	170
Highmore Tower	4,000 kgal	3,000
Huron Tower	500 kgal	600
Stephan Tower	1,500 kgal	1,300
Springs Reservoir	500 kgal	300
Gettysburg Reservoir	1,000 kgal	500
Gettysburg Tower	500 kgal	600
Oahe Main Pipeline		30,768
Gettysburg Main Pipeline		1,049
Distribution Pipeline:		
Springs South		2,515
Sanborn		2,082
Buffalo East		1,313
Sharpe East		842
Gettysburg East		2,233
Gettysburg South		4,051
Oahe East		1,716
Blunt East		2,119
East Hughes		1,483
Highmore East		3,140
Hyde		2,062
St. Lawrence East		2,458
Hand		1,990
Beadle		<u>2,941</u>
TOTAL CONSTRUCTION		\$80,982
Other Costs:		
Property Rights	1%	\$ 810
Legal and Administrative	3%	2,429
Engineering and Inspection	9%	7,289
Contingencies	<u>10%</u>	<u>8,098</u>
OTHER OTHER COSTS	23%	<u>\$18,626</u>
TOTAL ESTIMATED PROJECT COST		\$99,608



MAJOR FACILITY LOCATIONS

Intake costs are estimated for construction of new intake facilities at the respective sites. Intakes less than 1,500 gpm capacity are planned as inclined tube type intakes with submersible pumps. Larger intakes are planned as vertical wet well type with turbine pumps. There is a possibility of sharing existing federal intake facilities at Oahe, or sharing City of Gettysburg facilities at Highway 212, but these alternatives were not included in the cost estimates.

Water treatment plants are budgeted as conventional surface water treatment systems. Costs include the treatment plant structures, associated contact and holding basins and filtration equipment. High service pumping equipment and reservoirs, which may be co-located with water treatment, are budgeted separately.

The major pumping station cost item is for pumping at the respective water treatment plants. Pipelines and storage reservoirs are designed for minimal pumping beyond the initial lift at the water plant. Smaller pumping stations are needed for repumping to some areas. Pumping station construction costs include sitework, building, piping, pumps and other equipment.

Reservoirs are either elevated tanks (water towers) or ground level reservoirs, as required by the design hydraulic gradient and land elevations at the reservoir location. Costs presented are based on coated steel tanks. For the larger ground level reservoirs, concrete tanks may be considered at the time of final design.

Main pipelines are those pipelines from the water treatment plants to the reservoirs, and to Huron. Estimated costs are based on ductile iron pipeline for sizes 14 inch and larger. Smaller pipe sizes are estimated as PVC. Alternative materials will be considered at the time of final design.

Distribution pipelines are those branch lines required to distribute water to the individual connections and to towns off the main pipeline. Branch pipeline costs are based on PVC pipe from 2 inches to 12 inches nominal diameter and ductile iron pipe for 14 inches diameter and larger.

Other project costs include engineering, legal, land and budget contingencies. Total other costs are estimated as 23% of estimated construction costs. Previous experience with similar projects would indicate that this budget allowing 10% of construction cost for contingency items is adequate.

Table 8 presents estimated project costs. Costs are for the selected project plan with sources at Gettysburg and Oahe.

VII. OPERATING COSTS:

The feasibility of the Mid Dakota water system is dependent on the ability of the water users to pay for operation and maintenance costs, and to finance construction costs. Estimated operation and maintenance costs are presented on Table 9 to allow comparison of these costs to the value of water to the water users.

Costs are presented for the categories of administration, distribution system and treatment and pumping. Administrative costs relate to the office operation of the water system, including billing of individual customers and to management and planning for the system. Insurance and training costs are also included in administrative costs.

Distribution system maintenance is related to the land area of the water system, the number of subscribers, and the number of pipeline miles. Water system personnel must locate and repair pipeline leaks, monitor and repair pumps or reservoirs and handle customer service calls. Labor, materials, mileage and outside contract labor, primarily for excavation, are included in this budget category.

Water treatment and pumping are the most significant variable costs for the water system. In general, labor requirements for treatment and pumping are related to the sizes of the facility. Chemical and energy costs are directly related to the volume of water produced.

The operating cost per unit of water produced is dependent to some extent on the total of water sold, due to economies of scale. Annual operating budgets were prepared based on water needs projections presented in Table 7. These values provide for approximately 160 gallons per capita per day for municipal residents and approximately 14,000 gallons per connection per month for rural connections including livestock. Municipal estimates are based primarily on information provided by existing water systems. The rural estimate is based on the experience of other South Dakota water systems.

VIII. PROJECT FEASIBILITY:

The Mid Dakota Rural Water System is nearly surrounded by operating rural water systems. These existing systems, and others in South Dakota, offer a comparative basis for assessing feasibility. Feasibility of a new water system is dependent upon the project sponsor's ability to find construction financing which includes debt of not more than the repayment capability of the water users.

Other rural water systems in South Dakota have average monthly incomes from water users of \$30 to \$55 per month. Most recently constructed water systems are budgeted with

TABLE 9

ESTIMATED OPERATING COSTS
WATER SOURCES AT OAHE AND GETTYSBURG

<u>Item</u>	<u>Estimated Cost</u>
Fixed Annual Costs:	
Manager, 1 @ \$30,000	\$ 30,000
Office Clerks, 2 @ \$14,000	28,000
Distribution Operators, 5 @ \$23,000	115,000
Fringe Benefits on Labor @ 40%	69,200
Administrative Office and Billing	50,000
Water Treatment Plant Repair and Replacement	132,825
Pumping Station Repair and Replacement	31,150
Pipeline Repair and Replacement	60,000
Miscellaneous, Insurance and Directors	50,000
Subtotal, Fixed Annual Costs	\$ 566,175
Variable Production Costs:	
Pumping Energy	\$ 438,545
Water Treatment Chemicals	195,000
Water Treatment Labor	149,500
Water Treatment Labor Fringe	59,800
Miscellaneous	234,000
Subtotal, Variable Production Costs	\$1,076,845
Total Annual Costs	\$1,643,020
Total Annual Sales, kgal	1,755,000
Total Unit Cost per kgal Sold	\$0.94

TABLE 9

ESTIMATED OPERATING COSTS
WATER SOURCES AT OAHE AND GETTYSBURG

<u>Item</u>	<u>Estimated Cost</u>
Fixed Annual Costs:	
Manager, 1 @ \$30,000	\$ 30,000
Office Clerks, 2 @ \$14,000	28,000
Distribution Operators, 5 @ \$23,000	115,000
Fringe Benefits on Labor @ 40%	69,200
Administrative Office and Billing	50,000
Water Treatment Plant Repair and Replacement	132,825
Pumping Station Repair and Replacement	31,150
Pipeline Repair and Replacement	60,000
Miscellaneous, Insurance and Directors	<u>50,000</u>
Subtotal, Fixed Annual Costs	\$ 566,175
Variable Production Costs:	
Pumping Energy	\$ 438,545
Water Treatment Chemicals	219,500
Water Treatment Labor	149,500
Water Treatment Labor Fringe	59,800
Miscellaneous	<u>263,400</u>
Subtotal, Variable Production Costs	\$ 692,200
Total Annual Costs	\$1,258,375
Total Annual Sales, kgal	1,755,000
Total Unit Cost per kgal Sold	\$0.72

average monthly water bills of approximately \$50 per month. These systems have shown that \$50 per month is a reasonable charge for water service. However, management personnel, water users and financing officials believe that average water bills in excess of \$60 per month are not realistic, and will not be supported by consumers.

Water charges to municipalities for bulk water delivery vary widely. The reasons for this variation in charges include variations in water system debt assigned to municipalities and variations in operating costs among water systems. Bulk water charges by other systems range from less than \$1.00 to over \$2.00 per thousand gallons.

Similar, but smaller, rural water systems in South Dakota have been financed primarily by FmHA, with assistance from State and local programs. These water systems have been provided with approximately 40% to 75% grant funding. FmHA regulations allow no more than 75% grant funding. The WEB project to the north of Mid Dakota was primarily federally funded, with grant funds of slightly over 80%. The Mid Dakota System will require funding similar to the WEB project in order to maintain water rates consistent with surrounding water systems.

The total project cost for the selected alternative for the Mid Dakota Rural Water System includes the separate source for the Gettysburg area and the Lake Oahe source for the remainder of the project. The total project cost for this arrangement is estimated to be about \$100 million. Major facilities for this project are shown on Figure 7.

Table 10 presents a project funding summary which generally describes the financing which will be required for the project. The table references an average water bill for rural connections of \$50 per month and a municipal bulk water rates of \$1.25 per 1,000 gallons. These water rates are consistent with existing rural water systems. The table shows the total debt which could be carried by the water users, with current FmHA market interest rates. Final selection of a funding plan, and development of a water rate schedule which results in revenues required for operation and debt service, will depend on actions of water system directors and availability of project funding.

IX. RECOMMENDATIONS:

The Mid Dakota Rural Water System offers a comprehensive plan for domestic water supply in the project area. The following are recommendations to continue system development:

average monthly water bills of approximately \$50 per month. These systems have shown that \$50 per month is a reasonable charge for water service. However, management personnel, water users and financing officials believe that average water bills in excess of \$60 per month are not realistic, and will not be supported by consumers.

Water charges to municipalities for bulk water delivery vary widely. The reasons for this variation in charges include variations in water system debt assigned to municipalities and variations in operating costs among water systems. Bulk water charges by other systems range from less than \$1.00 to over \$2.00 per thousand gallons.

Similar, but smaller, rural water systems in South Dakota have been financed primarily by FmHA, with assistance from State and local programs. These water systems have been provided with approximately 40% to 75% grant funding. FmHA regulations allow no more than 75% grant funding. The WEB project to the north of Mid Dakota was primarily federally funded, with grant funds of slightly over 80%. The Mid Dakota System will require funding similar to the WEB project in order to maintain water rates consistent with surrounding water systems.

The total project cost for the selected alternative for the Mid Dakota Rural Water System includes the separate source for the Gettysburg area and the Lake Oahe source for the remainder of the project. The total project cost for this arrangement is estimated to be about \$100 million. Major facilities for this project are shown on Figure 7.

Table 10 presents a project funding summary which generally describes the financing which will be required for the project. The table references an average water bill for rural connections of \$50 per month and a municipal bulk water rates of \$1.00 per 1,000 gallons. These water rates are consistent with existing rural water systems. The table shows the total debt which could be carried by the water users, with current FmHA market interest rates. Final selection of a funding plan, and development of a water rate schedule which results in revenues required for operation and debt service, will depend on actions of water system directors and availability of project funding.

IX. RECOMMENDATIONS:

The Mid Dakota Rural Water System offers a comprehensive plan for domestic water supply in the project area. The following are recommendations to continue system development:

TABLE 10
PROJECT FUNDING SUMMARY

Basic System Data:

Budgeted Rural Connections	2,500
Rural Water Sales, million gallons annually	414
Municipal Water Sales, million gallons annually	1,341

Project Cost Data:

Total Project Cost	\$100,000,000
Project Construction Loan	\$ 16,500,000

Annual Cost Data:

Annual Debt Service, 7.75%, 40 yrs., 10% reserve	\$1,481,441
Annual Operating Costs, Table 9	<u>1,643,020</u>
Total Annual Costs	\$3,124,460

Annual Revenue Required:

Municipal, 1,341,000 kgal @ \$1.25/kgal	\$1,676,250
Rural, 2,500 connections @ \$50.00/month	<u>1,500,000</u>
Total Annual Revenue	\$3,176,250

TABLE 10

PROJECT FUNDING SUMMARY

Basic System Data:

Budgeted Rural Connections	2,500
Rural Water Sales, million gallons annually	414
Municipal Water Sales, million gallons annually	1,341

Project Cost Data:

Total Project Cost	\$100,000,000
Project Construction Loan	\$ 17,500,000

Annual Cost Data:

Annual Debt Service, 7.75%, 40 yrs., 10% reserve	\$1,571,225
Annual Operating Costs, Table 9	<u>1,258,375</u>
Total Annual Costs	\$2,829,600

Annual Revenue Required:

Municipal, 1,341,000 kgal @ \$1.00/kgal	\$1,341,000
Rural, 2,500 connections @ \$50.00/month	<u>1,500,000</u>
Total Annual Revenue	\$2,841,000

1. Seek Federal authorization of the project as described herein. The authorization should provide for construction of a municipal, rural and industrial water supply system for the area at a cost of \$100 million, indexed to January 1, 1989.
2. Request the continued support of the Mid Dakota Water Development District, the South Dakota Department of Water and Natural Resources, the Governor of South Dakota, the congressional delegation and local governmental entities.
3. Initiate a review of environmental aspects of the project, and solicit the input of local and national environmental agencies and citizen's groups.
4. Identify multiple use opportunities within the project area, and evaluate changes in project costs and benefits.
5. Because participation of the City of Huron is particularly significant with respect to project planning, project sponsors should coordinate with City Officials to assist the City in making a decision on the project as early as possible.
6. Further define the project plan, with emphasis on coordination of source and treatment facilities with Gettysburg and the Bureau of Reclamation. Further consideration of alternate source locations may be appropriate if the project scope changes.

APPENDIX A

EXISTING MUNICIPAL WATER SYSTEM SUMMARIES

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Agar

Contact Person: Tom Squires, Water Superintendent

Population (1980): 139

Design Water Delivery:

Average Day	<u>24,000</u>	gallons per day
Maximum Day	<u>49,000</u>	gallons per day
	<u>40</u>	gallons per minute

Existing Source: New well, 1977, 1,900 ft. depth, 40 gpm
Old well, 1926, standby, 20 gpm

Existing Treatment: None

Existing Storage: Concrete Ground 14,000 gallons
Steel Elevated 150,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	1.1	<0.2	10
Fluoride	2.69	1.2	4.0
Chloride	594	15	250
Iron	0.38	<0.05	0.3
Manganese	0.07	<0.02	0.05
Sulfate	280	225	250
Total Dissolved Solids	1,881	500	500
Calcium	8.0	50	
Magnesium	3.2	30	
Hardness	33.1	250	
Sodium	740	75	
Potassium	11.9	5	

Comments: Distribution system old, condition unknown
Customers not metered

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Alpena

Contact Person: Gilbert Hotchkiss

Population (1980): 288

Design Water Delivery:

Average Day	<u>49,000</u>	gallons per day
Maximum Day	<u>100,000</u>	gallons per day
	<u>85</u>	gallons per minute

Existing Source: Well 1, 1961, 975 ft. depth, 750 gpm

Existing Treatment: None

Existing Storage: Steel elevated tank abandoned

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	0.1	<0.2	10
Fluoride	1.82	1.2	4.0
Chloride	96.9	15	250
Iron	3.28	<0.05	0.3
Manganese	0.13	<0.02	0.05
Sulfate	1,204	225	250
Total Dissolved Solids	2,044	500	500
Calcium	190	50	
Magnesium	54.8	30	
Hardness	700	250	
Sodium	360	75	
Potassium	21.6	5	

Comments: Existing distribution system in poor condition
Customers not metered

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Artesian

Contact Person: Bill Johnston

Population (1980): 227

Design Water Delivery:

Average Day	<u>40,000</u>	gallons per day
Maximum Day	<u>82,000</u>	gallons per day
	<u>70</u>	gallons per minute

Existing Source: Individual wells at each household

Existing Treatment: None

Existing Storage: None

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N		<0.2	10
Fluoride		1.2	4.0
Chloride		15	250
Iron		<0.05	0.3
Manganese		<0.02	0.05
Sulfate		225	250
Total Dissolved Solids		500	500
Calcium		50	
Magnesium		30	
Hardness		250	
Sodium		75	
Potassium		5	

Comments:

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Blunt

Contact Person: Jan Harkless

Population (1980): 424

Design Water Delivery:

Average Day	<u>71,000</u>	gallons per day
Maximum Day	<u>147,000</u>	gallons per day
	<u>125</u>	gallons per minute

Existing Source: Well 1 N, 1976, 72 ft. depth
Well 25, 1930, standby

Existing Treatment: Gas Chlorination
Aquadene for control of manganese oxidation

Existing Storage: Concrete Ground 60,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	0.1	<0.2	10
Fluoride	0.16	1.2	4.0
Chloride	370	15	250
Iron	0.19	<0.05	0.3
Manganese	2.14	<0.02	0.05
Sulfate	324	225	250
Total Dissolved Solids	1,353	500	500
Calcium	215	50	
Magnesium	69.0	30	
Hardness	821	250	
Sodium	97.7	75	
Potassium	8.7	5	

Comments: 4" and 6" water mains
Cast iron mains in poor condition
Customers not metered
144 customer connections

Sources: 1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.

2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Broadland

Contact Person: Steve Brock

Population (1980): 49

Design Water Delivery:

Average Day	<u>7,000</u>	gallons per day
Maximum Day	<u>15,000</u>	gallons per day
	<u>25</u>	gallons per minute

Existing Source: Well 1, 1977, 1,010 ft. depth, flowing

Existing Treatment: None

Existing Storage: None

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	<0.1	<0.2	10
Fluoride	2.32	1.2	4.0
Chloride	111	15	250
Iron	1.81	<0.05	0.3
Manganese	0.13	<0.02	0.05
Sulfate	1,246	225	250
Total Dissolved Solids	2,077	500	500
Calcium	323	50	
Magnesium	76.0	30	
Hardness	1,119	250	
Sodium	183	75	
Potassium	22.9	5	

Comments:

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Forestburg - Forestburg Well Co.

Contact Person: Ray Baysinger, John Torgerson

Population (1980): 150 est.

Design Water Delivery:

Average Day	<u>25,000</u>	gallons per day
Maximum Day	<u>52,000</u>	gallons per day
	<u>45</u>	gallons per minute

Existing Source: Well 1, 1965, 685 ft. depth, flowing, 30 gpm
Well 2, 1968, 655 ft. depth, flowing, 45 gpm,
inactive

Existing Treatment: None

Existing Storage: None

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	<0.1	<0.2	10
Fluoride	1.68	1.2	4.0
Chloride	77.1	15	250
Iron	1.59	<0.05	0.3
Manganese	0.15	<0.02	0.05
Sulfate	1,188	225	250
Total Dissolved Solids	1,996	500	500
Calcium	146	50	
Magnesium	40.7	30	
Hardness	532	250	
Sodium	432	75	
Potassium	20.1	5	

Comments: 2" and 4" existing distribution system
Well 2 has cracked casing

- Sources:
- Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 - Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Gettysburg

Contact Person: Mike Devine

Population (1980): 1,623

Design Water Delivery:

Average Day	<u>260,000</u>	gallons per day
Maximum Day	<u>600,000</u>	gallons per day
	<u>475</u>	gallons per minute

Existing Source: Missouri River intake, 300 gpm capacity

Existing Treatment: Partial softening surface water treatment

Existing Storage: Steel elevated 500,000 gallons
Concrete ground 17,000 gallons
Clearwell 17,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>		<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
	<u>Raw</u>	<u>Treated</u>		
Nitrate-N	<0.1	<0.1	<0.2	10
Fluoride	0.51	1.27	1.2	4.0
Chloride	12.7	14.2	15	250
Iron	0.16	0.05	<0.05	0.3
Manganese	0.04	0.02	<0.02	0.05
Sulfate	184	184	225	250
Total Dissolved Solids	441	355	.	500 500
Calcium	50.1	31.6	50	
Magnesium	21.9	12.2	30	
Hardness	215	129	250	
Sodium	61.4	64.2	75	
Potassium	4.5	4.3	5	

Comments: Most of the municipal distribution system is less than 10 years old
Watering restrictions were required in 1988 due to inadequate supply capacity. The City requested 600,000 gallons per day as a maximum day design value to meet estimated total demand.

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Harrold

Contact Person: Jan Harklass

Population (1980): 196

Design Water Delivery:

Average Day	<u>31,000</u>	gallons per day
Maximum Day	<u>64,000</u>	gallons per day
	<u>55</u>	gallons per minute

Existing Source: Well 1, 1975, 45 ft. depth
Well 2, 1975, 45 ft. depth

Existing Treatment: Chlorination

Existing Storage: Steel elevated 65,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	<0.1	<0.2	10
Fluoride	0.16	1.2	4.0
Chloride	20.8	15	250
Iron	4.48	<0.05	0.3
Manganese	1.22	<0.02	0.05
Sulfate	149	200	250
Total Dissolved Solids	679	500	500
Calcium	106	50	
Magnesium	28.6	30	
Hardness	382	250	
Sodium	53.7	70	
Potassium	9.0	5	

Comments: 93 metered customer connections.

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Highmore

Contact Person: Richard Hamlin

Population (1980): 1,055

Design Water Delivery:

Average Day	<u>159,000</u>	gallons per day
Maximum Day	<u>300,000</u>	gallons per day
	<u>275</u>	gallons per minute

Existing Source: North Well 1, 1976, 145 ft. depth, 750 gpm
South Well 2, 1960, 145 ft. depth, 300 gpm

Existing Treatment: Fluoridation

Existing Storage: Elevated steel 50,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	<0.1	<0.2	10
Fluoride	0.22	1.2	4.0
Chloride	21.4	15	250
Iron	1.32	<0.05	0.3
Manganese	0.75	<0.02	0.05
Sulfate	200	200	250
Total Dissolved Solids	679	500	500
Calcium	115	50	
Magnesium	33.1	30	
Hardness	423	250	
Sodium	38.8	70	
Potassium	5.8	5	

Comments: 480 metered municipal customers.
20 metered rural customers.

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Hoven

Contact Person: Juliam Okroi

Population (1980): 615

Design Water Delivery:

Average Day	<u>105,000</u>	gallons per day
Maximum Day	<u>215,000</u>	gallons per day
	<u>180</u>	gallons per minute

Existing Source: South Well, 1980, 54' depth, 150 gpm
North Well, 1972, 56' depth, 160 gpm
East Well, 1959, 54' depth, 80 gpm
West Well, 1952, 55' depth, 80 gpm

Existing Treatment: Fluoridation

Existing Storage: Elevated steel 65,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source*</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	0.9	<0.2	10
Fluoride	0.45	1.2	4.0
Chloride	52.1	15	250
Iron	0.10	<0.05	0.3
Manganese	1.48	<0.02	0.05
Sulfate	203	200	250
Total Dissolved Solids	715	500	500
Calcium	121	50	
Magnesium	32.2	30	
Hardness	435	250	
Sodium	36.7	70	
Potassium	6.9	5	

*South Well.

Comments:

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Huron

Contact Person: Herb Scheele

Population (1980): 13,000

Design Water Delivery:

Average Day	<u>2,100,000</u>	gallons per day
Maximum Day	<u>3,600,000</u>	gallons per day
	<u>3,000</u>	gallons per minute

Existing Source: James River intake
7 wells, 80 to 96 ft. depth, 250 to 600 gpm,
2,950 gpm total

Existing Treatment: Partial softening

Existing Storage: Ground storage 3 million gallons
Elevated steel 2 million gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>		<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
	<u>Raw</u>	<u>Treated</u>		
Nitrate-N	<0.1	<0.1	<0.2	10
Fluoride	----	----	1.2	4.0
Chloride	38.8	57.3	15	250
Iron	2.03	0.06	<0.05	0.3
Manganese	0.62	0.01	<0.02	0.05
Sulfate	139	164	200	250
Total Dissolved Solids	501	402	500	500
Calcium	51.7	26.9	50	
Magnesium	26.3	11.2	30	
Hardness	237	113	250	
Sodium	62.2	70.6	70	
Potassium	----	----	5	

Comments: Samples above from James River intake operation
4/27/87.

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Lane

Contact Person: Otto Bathke

Population (1980): 83

Design Water Delivery:

Average Day	<u>15,000</u>	gallons per day
Maximum Day	<u>30,000</u>	gallons per day
	<u>40</u>	gallons per minute

Existing Source: Well 1, 1938, 800 ft. depth, 50 gpm,
flowing well
Well 3, 1955, 830 ft. depth, 50 gpm,
flowing well
Well 2, 1920, 780 ft. depth., standby

Existing Treatment: Hand fed chlorination

Existing Storage: Hydropneumatic system
Concrete ground 44,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	<0.1	<0.2	10
Fluoride	1.78	1.2	4.0
Chloride	72.5	15	250
Iron	1.80	<0.05	0.3
Manganese	0.13	<0.02	0.05
Sulfate	1200	225	250
Total Dissolved Solids	1998	500	500
Calcium	192	50	
Magnesium	51.9	30	
Hardness	693	250	
Sodium	347	75	
Potassium	21.5	5	

Comments: Above local source sample from Well 2, 11/20/86.

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Lebanon

Contact Person: Morris Simon

Population (1980): 129

Design Water Delivery:

Average Day	<u>22,000</u>	gallons per day
Maximum Day	<u>45,000</u>	gallons per day
	<u>40</u>	gallons per minute

Existing Source: Individual wells

Existing Treatment: None

Existing Storage: None

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N		<0.2	10
Fluoride		1.2	4.0
Chloride		15	250
Iron		<0.05	0.3
Manganese		<0.02	0.05
Sulfate		225	250
Total Dissolved Solids		500	500
Calcium		50	
Magnesium		30	
Hardness		250	
Sodium		75	
Potassium		5	

Comments: Approximately 40 individual water systems.

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Miller

Contact Person: Don Holley

Population (1980): 1931

Design Water Delivery:

Average Day	<u>300,000</u>	gallons per day
Maximum Day	<u>620,000</u>	gallons per day
	<u>515</u>	gallons per minute

Existing Source: Well 1, 1965, 1100 ft. depth, 175 gpm
Well 2, 1961, 1245 ft. depth
Well 3, 1961, 1245 ft. depth
Well 4, 1976, 1100 ft. depth

Existing Treatment: Inline sand filters

Existing Storage: Elevated steel, 75,000 gallons
Elevated steel, 80,000 gallons
Ground steel, 300,000 gallons
Ground concrete, 80,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>		<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
	<u>Well 1</u>	<u>Well 3</u>		
Nitrate-N	0.1	<0.1	<0.2	10
Fluoride	1.90	2.07	1.2	4.0
Chloride	91.6	100	15	250
Iron	2.02	8.82	<0.05	0.3
Manganese	0.02	0.17	<0.02	0.05
Sulfate	1177	1102	225	250
Total Dissolved Solids	2028	1942	500	500
Calcium	220	91.5	50	
Magnesium	58.7	28.6	30	
Hardness	791	346	250	
Sodium	333	500	75	
Potassium	18.0	15.2	5	

Comments: No water meters at wells, customers individually metered.

Sources: 1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.

2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Onida

Contact Person: Jerry Culey

Population (1980): 851

Design Water Delivery:

Average Day	<u>133,000</u>	gallons per day
Maximum Day	<u>290,000</u>	gallons per day
	<u>230</u>	gallons per minute

Existing Source: Well 1, 1932, 1600 ft. depth, 60 gpm
Well 2, 1958, 1600 ft. depth, 60 gpm
Well 3 (Sundance), 1959, 2050 ft. depth,
400 gpm
Well 4, 1977, 1836 ft. depth, 60 gpm

Existing Treatment: Gas Chlorination

Existing Storage: Elevated steel, 50,000 gallons
Ground concrete, 100,000 gallons
Ground concrete, 26,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	0.4	<0.2	10
Fluoride	3.20	1.2	4.0
Chloride	89.1	15	250
Iron	4.19	<0.05	0.3
Manganese	0.08	<0.02	0.05
Sulfate	1236	225	250
Total Dissolved Solids	2143	500	500
Calcium	358	50	
Magnesium	98.5	30	
Hardness	1299	250	
Sodium	90.0	75	
Potassium	17.5	5	

Comments: Above present source analysis is for composite sample,
9/7/88.

- Sources:
- Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 - Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Osceola

Contact Person: Roy Webe

Population (1980): 40 est.

Design Water Delivery:

Average Day	<u>7,000</u>	gallons per day
Maximum Day	<u>14,000</u>	gallons per day
	<u>25</u>	gallons per minute

Existing Source: Individual wells

Existing Treatment: None

Existing Storage: None

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N		<0.2	10
Fluoride		1.2	4.0
Chloride		15	250
Iron		<0.05	0.3
Manganese		<0.02	0.05
Sulfate		225	250
Total Dissolved Solids		500	500
Calcium		50	
Magnesium		30	
Hardness		250	
Sodium		75	
Potassium		5	

Comments:

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Polo

Contact Person: Paul Schlecter

Population (1980): 30 est.

Design Water Delivery:

Average Day	<u>5,000</u>	gallons per day
Maximum Day	<u>10,000</u>	gallons per day
	<u>20</u>	gallons per minute

Existing Source: Individual wells

Existing Treatment: None

Existing Storage: None

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N		<0.2	10
Fluoride		1.2	4.0
Chloride		15	250
Iron		<0.05	0.3
Manganese		<0.02	0.05
Sulfate		225	250
Total Dissolved Solids		500	500
Calcium		50	
Magnesium		30	
Hardness		250	
Sodium		75	
Potassium		5	

Comments:

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Ree Heights

Contact Person: Delton Beck

Population (1980): 88

Design Water Delivery:

Average Day	<u>13,000</u>	gallons per day
Maximum Day	<u>27,000</u>	gallons per day
	<u>40</u>	gallons per minute

Existing Source: South well, 1960, 45 ft. depth, 20 gpm
West well, 1960, 45 ft. depth, 20 gpm

Existing Treatment: None

Existing Storage: Elevated steel, 20,000 gallons
Ground, 10,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	1.0	<0.2	10
Fluoride	0.28	1.2	4.0
Chloride	34.9	15	250
Iron	0.25	<0.05	0.3
Manganese	0.23	<0.02	0.05
Sulfate	194	225	250
Total Dissolved Solids	825	500	500
Calcium	104	50	
Magnesium	29.5	30	
Hardness	381	250	
Sodium	146	75	
Potassium	10.9	5	

Comments: 40 metered customer connections.

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: St. Lawrence

Contact Person: Charles Smith

Population (1980): 223

Design Water Delivery:

Average Day	<u>13,000</u>	gallons per day
Maximum Day	<u>27,000</u>	gallons per day
	<u>60</u>	gallons per minute

Existing Source: Well 1, 1945, 162 ft. depth
Well 2, 1961, 162 ft. depth

Existing Treatment: None

Existing Storage: Ground concrete, 130,000 gallons
Elevated steel, 50,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	1.4	<0.2	10
Fluoride	0.36	1.2	4.0
Chloride	80.4	15	250
Iron	4.51	<0.05	0.3
Manganese	0.38	<0.02	0.05
Sulfate	478	225	250
Total Dissolved Solids	1328	500	500
Calcium	80.0	50	
Magnesium	20.8	30	
Hardness	285	250	
Sodium	354	75	
Potassium	13.2	5	

Comments:

- Sources: 1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Tolstoy

Contact Person: Ed Dutt

Population (1980): 97

Design Water Delivery:

Average Day	<u>16,000</u>	gallons per day
Maximum Day	<u>34,000</u>	gallons per day
	<u>45</u>	gallons per minute

Existing Source: Well 1, 1966, 80 ft. depth, 180 gpm

Existing Treatment: None

Existing Storage: Elevated steel 50,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	<0.1	<0.2	10
Fluoride	0.21	1.2	4.0
Chloride	25.6	15	250
Iron	1.53	<0.05	0.3
Manganese	0.70	<0.02	0.05
Sulfate	564	225	250
Total Dissolved Solids	1271	500	500
Calcium	244	50	
Magnesium	81.4	30	
Hardness	944	250	
Sodium	28.9	75	
Potassium	7.7	5	

Comments: 4 and 6 inch PVC distribution system constructed in 1969.
35 metered customer connections.

Sources: 1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.

2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Virgil

Contact Person: Tom Westphal

Population (1980): 37

Design Water Delivery:

Average Day	<u>9,000</u>	gallons per day
Maximum Day	<u>19,000</u>	gallons per day
	<u>30</u>	gallons per minute

Existing Source: Well 1, 1952, 1130 ft. depth

Existing Treatment: None

Existing Storage: Ground concrete, 105,000 gallons
Elevated steel, 25,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	2.3	<0.2	10
Fluoride	1.83	1.2	4.0
Chloride	151	15	250
Iron	1.20	<0.05	0.3
Manganese	0.10	<0.02	0.05
Sulfate	1168	225	250
Total Dissolved Solids	2103	500	500
Calcium	240	50	
Magnesium	69.2	30	
Hardness	884	250	
Sodium	287	75	
Potassium	17.2	5	

Comments: Portions of existing distribution system in poor condition.

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Wessington

Contact Person: Doug Dubois

Population (1980): 327

Design Water Delivery:

Average Day	<u>47,000</u>	gallons per day
Maximum Day	<u>96,000</u>	gallons per day
	<u>80</u>	gallons per minute

Existing Source: Well 1, 1977, 54 ft. depth, 193 gpm
Well 2, 1900, 36 ft. depth, standby

Existing Treatment: Gas chlorination

Existing Storage: Elevated steel, 50,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
Nitrate-N	<0.1	<0.2	10
Fluoride	0.28	1.2	4.0
Chloride	95.5	15	250
Iron	0.41	<0.05	0.3
Manganese	2.49	<0.02	0.05
Sulfate	743	225	250
Total Dissolved Solids	1662	500	500
Calcium	202	50	
Magnesium	60.3	30	
Hardness	753	250	
Sodium	257	75	
Potassium	11.6	5	

Comments: 150 customer connections.

- Sources:
1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.
 2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

Mid Dakota Rural Water System
Municipal Water System Summary

Water System Name: Wessington Springs

Contact Person: Larry Neaton

Population (1980): 1203

Design Water Delivery:

Average Day	<u>200,000</u>	gallons per day
Maximum Day	<u>300,000</u>	gallons per day
	<u>310</u>	gallons per minute

Existing Source: West well, 1977, 48 ft. depth, 600 gpm
South spring, 1964, 100 gpm
East well, 1977, 65 ft. depth, 600 gpm
(summer use)
Gravel pit, 1964, standby

Existing Treatment: Gas chlorination, fluoridation, partial softening

Existing Storage: Ground concrete, 61,000 gallons
Ground steel, 300,000 gallons

Water Quality Summary:

<u>Parameter (mg/l)</u>	<u>Present Source</u>	<u>Mid Dakota Proposed</u>	<u>South Dakota Standard</u>
	<u>Raw</u>	<u>Treated</u>	
Nitrate-N	<0.1	<0.1	<0.2 10
Fluoride	0.20	1.16	1.2 4.0
Chloride	14.8	16.3	15 250
Iron	0.22	0.13	<0.05 0.3
Manganese	2.41	0.04	<0.02 0.05
Sulfate	423	446	225 250
Total Dissolved Solids	1004	671	500 500
Calcium	184	79.0	50
Magnesium	46.9	35.9	30
Hardness	652	345	250
Sodium	63.8	57.4	75
Potassium	13.0	12.3	5

Comments: Existing distribution system operates with 2 pressure zones.
Raw sample for present source is west well, 12/11/86.
Treated sample is composite, 12/11/86.

Sources: 1. Existing system data from field interviews and from South Dakota Department of Water and Natural Resources, Office of Drinking Water Public Water System Sanitary Survey Reports, 1986-1988.

2. Mid Dakota proposed water quality based on typical values from long-term records at Oahe Dam, and conventional water treatment.

APPENDIX B

PIPELINE UNIT PRICE ESTIMATES

COST ESTIMATES FOR RURAL WATER SYSTEM PIPELINES

Significant rural water system construction has occurred in the five-state region of North Dakota, South Dakota, Nebraska, Minnesota and Iowa in each of the past 10-15 years. Essentially, all of this construction has been competitively bid. Several large contractors have developed special expertise in the rural water field. There is considerable competition in the pipeline installation business, both in terms of materials and for actual installation.

Most of the rural water system pipelines are polyvinylchloride (PVC) material. The price of PVC pipe is dependent upon the size and pressure rating of the pipe. Higher pressure pipe has a thicker wall, and therefore requires more material. Typically, PVC pipe is priced at a relatively uniform price per pound. The pipe is homogeneous PVC resin, extruded to the pipe shape by a continuous manufacturing process. By using a constant price per pound for estimating purposes, the assumption is that the pipe manufacturer has a given cost per pound for resin material, adds a uniform cost per pound for processing and has a uniform cost per pound for transportation to the job site. A review of pipe invoices for various prior projects in the area show that a uniform per pound estimate for material, at the job site, is reasonably accurate. Manufacturers confirm that a similar procedure for ductile iron pipe is appropriate.

Installation costs for pipeline were also estimated. Installation costs include labor, equipment, management, overhead and profit. Variations in installation cost over time occur primarily due to changes in labor, equipment and fuel costs. Variations between projects occur due to differences in installation requirements, such as pipe depth or backfill compaction, and differences in local conditions, such as rock or unstable soils.

For pipeline cost estimates for the Mid Dakota Rural Water System, PVC prices were estimated at \$0.65 per pound of pipe, delivered to the job site. This estimate was based on 1988 actual prices for pipe delivered in South Dakota. For ductile iron pipe, a material cost of \$0.28 per pound was used. This estimate was based on supplier information. Both PVC and ductile iron prices fluctuate with changing national and world markets.

Pipe installation costs were based on installation costs for similar projects bid recently in South Dakota and Minnesota. Pipeline depth for the comparable projects was similar to anticipated depth for Mid Dakota. Due to the large area covered by the Mid Dakota project, it is expected that construction conditions, on the average, will be similar to the average conditions of other projects.

Estimated material, installation and total cost unit prices for pipeline are given in Table A-1.

For all pipe sizes 1.5 through 12 inches, 15% was added over the costs of Table A-1, for miscellaneous valves, hydrants, highway crossings and service connections. For sizes 14 through 36 inches, 7.5% was added.

TABLE B-1

PIPELINE UNIT PRICE ESTIMATES

Pipe Material Prices:

Nominal Size	PVC					Ductile Iron Class 50
	Class 160	Class 200	Class 250	C900 CL 150	C900 CL 200	
1.5		0.23	0.27			
2	0.29	0.35	0.42			
2.5	0.42	0.51	0.62			
3	0.62	0.75	0.91			
4	1.01	1.23	1.53	1.63	2.03	3.33
5	1.53	1.95	2.34			
6	2.18	2.67	3.28	3.38	4.19	4.76
8	3.72	4.56	5.56	5.85	7.20	6.78
10	5.82	7.13	8.70	8.84	10.84	8.96
12	8.20	9.99	12.19	12.61	15.33	11.42
14	9.89			16.94		14.28
16	13.01			21.91		16.80
18	16.75			27.52		19.38
20	20.66			33.77		22.09
24	29.78			48.17		27.89
30				74.11		36.54

Installation Cost:

Nominal Size	PVC					Ductile Iron Class 50
	Class 160	Class 200	Class 250	C900 CL 150	C900 CL 200	
1.5		0.80	0.80			
2	0.84	0.84	0.85			
2.5	0.88	0.89	0.90			
3	0.93	0.94	0.96			
4	1.03	1.05	1.08	1.09	1.12	1.65
5	1.14	1.18	1.22			
6	1.26	1.31	1.36	1.37	1.45	2.08
8	1.53	1.61	1.70	1.73	1.85	2.63
10	1.85	1.97	2.12	2.13	2.31	3.22
12	2.20	2.36	2.56	2.60	2.85	3.87
14	2.48			3.12		4.61
16	2.89			3.71		5.27
18	3.36			4.35		5.94
20	3.85			5.04		6.65
24	4.93			6.62		8.13
30				9.37		10.35

TABLE B-1
PIPELINE UNIT PRICE ESTIMATES
(Continued)

Total Installed Cost:

<u>Nominal Size</u>	<u>PVC</u>			<u>C900</u>		<u>Ductile Iron Class 50</u>
	<u>Class 160</u>	<u>Class 200</u>	<u>Class 250</u>	<u>CL 150</u>	<u>CL 200</u>	
1.5		1.03	1.07			
2	1.13	1.19	1.27			
2.5	1.30	1.40	1.52			
3	1.55	1.69	1.87			
4	2.04	2.28	2.61	2.71	3.15	4.98
5	2.67	3.13	3.56			
6	3.45	3.98	4.64	4.75	5.64	6.84
8	5.26	6.17	7.26	7.58	9.05	9.41
10	7.68	9.10	10.81	10.97	13.15	12.18
12	10.40	12.35	14.75	15.21	18.18	15.30
14	12.36			20.07		18.89
16	15.90			25.62		22.07
18	20.11			31.87		25.32
20	24.51			38.81		28.74
24	34.72			54.79		36.02
30				83.48		46.89

APPENDIX C

WATER SOURCE LOCATION ALTERNATIVES

DRAWINGS

WATER SOURCE LOCATION ALTERNATIVES

I. ALTERNATIVES CONSIDERED:

The Mid Dakota Rural Water System is a large network of pipelines supported by water treatment, pumping and storage facilities. Due to the many inter-relationships among the various facilities, many alternatives may be considered which would meet the objective of providing water to the project participants.

For a feasibility study analysis, the objectives are to determine whether methods and materials are available to successfully build the project and to make an estimate of the probable costs of the construction.

For this study, analyses of alternatives centered on different locations for the Missouri River water source. Three source locations, including intake and water treatment at each, were considered. A location west of Gettysburg adjacent to Highway 212 was considered for water service to the northwestern part of the project. This location was selected because it is significantly closer to the city of Gettysburg and the water users in Potter and northern Sully County than the other source locations considered.

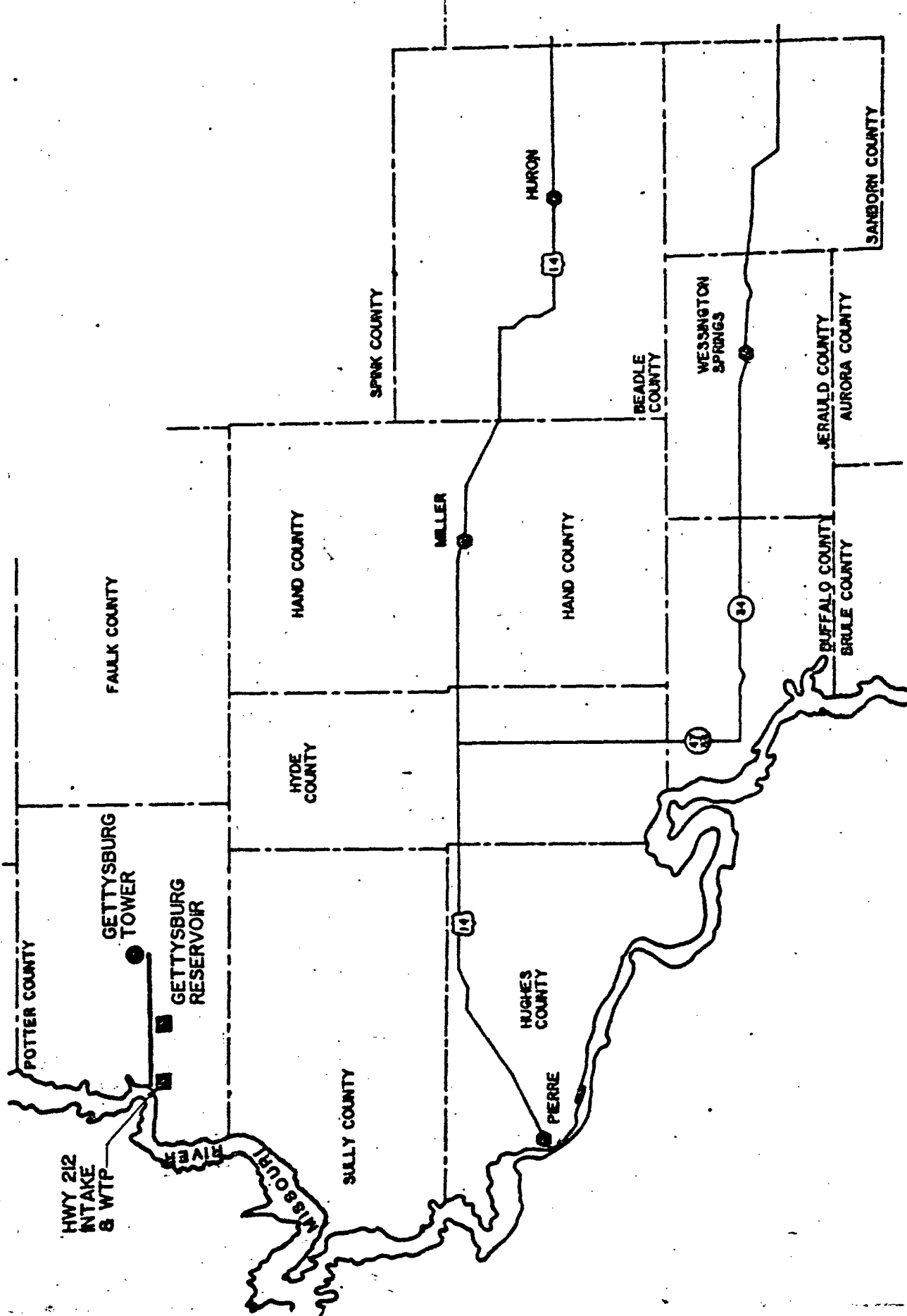
The second source location considered was at the Oahe Dam. The Oahe location is approximately centered north to south within the project area. It is also the most southerly location, nearest to major water users, at which water can be taken from the relatively higher Oahe reservoir. The higher elevation should be reflected in reduced pumping costs for the project.

The final source alternative was the Big Bend Dam. The Big Bend location was reviewed because it is the access to the Missouri which is nearest to Huron. Because Huron is the largest water user on the system, accounting for nearly one-third of maximum day demand, the closer source results in a shorter distance of large diameter pipeline.

Consideration of alternatives was limited to the three source locations and the main pipelines required for each. Distribution pipelines to the rural consumers of the project are similar for all alternatives considered.

II. GETTYSBURG SERVICE AREA:

The service area considered for the Gettysburg source is the northwest part of the project, including Potter and northern Sully counties as shown on Figure C-1. The service area elevation is high compared to most of the Mid Dakota project area. Ground elevations at typical service locations range



MAJOR FACILITY LOCATIONS GETTYSBURG AREA

C-1



DeWild Grant Reckert & Associates Co.
Denver, Colorado
Rock Rapids, Iowa
Sioux City, Iowa
Sioux Falls, South Dakota

Date
Drawn By
Approved
Revised

NOV 1988
BH
BJ

MID DAKOTA
RURAL WATER SYSTEM

from approximately 1,800 feet MSL south of Agar to 2,100 feet MSL northeast of Gettysburg. The area includes about 365 rural connections and the municipalities of Agar, Onida, Gettysburg, Lebanon and Tolstoy. Average day water demand is about 650,000 gallons per day, maximum day about 1,750,000 gallons.

A water tower is proposed at Gettysburg to serve the area. The water tower will directly supplement existing city storage and provide pressurization and storage for rural and smaller municipal connections. A capacity of 500,000 gallons is proposed.

The Gettysburg water source location was considered only for the northwest service area of the system. The source location is too far removed from the remainder of the project area to be more economical than alternatives at Oahe or Big Bend for the entire project.

A. Gettysburg Source Facilities:

For the Gettysburg intake and water treatment plant, located adjacent to Highway 212 on Lake Oahe, separate intake and water treatment facilities are proposed for this service area. The intake would be constructed at an accessible location, and offers the advantage of a water source 25 or 42 miles closer to the major water users of the area than Oahe or Big Bend, respectively.

The water treatment plant would be constructed near the intake location. Design capacity of the water plant is 1,460 gpm or 2.1 million gallons per day. High service pumping at the water plant would move water to a ground storage reservoir approximately nine miles east. A reservoir capacity of 1 million gallons is proposed. At the reservoir site, pumps will pump east to the water tower at Gettysburg. Pipeline from the intake location is 14 inches diameter. The maximum flow rate from the intake is 1,460 gallons per minute.

B. Oahe Water Source:

Lake Oahe source and treatment facilities could serve the Gettysburg area, in common with all or a part of the total Mid Dakota system. Use of the Oahe source requires oversizing of the Oahe water treatment plant, pumping stations and pipeline.

The incremental size to be added to the Oahe intake and treatment plant would be 1,460 gallons per minute. Discharge pipeline size from Oahe to Blunt would be correspondingly increased. For the alternative serving the total project area from Oahe, the pipeline size change would be from 30 inch diameter to 36 inch for the Gettysburg area.

A 500,000 gallon ground reservoir with pumping station would be located at Blunt. Pipeline north from Blunt to a second reservoir and pumping station near Agar would be 14 inch diameter. From Agar, 14 inch pipeline would be placed to the Gettysburg Tower.

C. Big Bend Water Source:

Use of the Big Bend source for the Gettysburg area was reviewed as part of the analysis for service to the total project from Big Bend. Oversizing of facilities between Big Bend and Blunt would be necessary.

Facilities from Blunt north would be similar to the Oahe alternative.

D. Estimated Costs of Alternatives:

Estimated costs for the three source alternatives for the Gettysburg area are presented in Table C-1. From the relative costs which are shown, it can be seen that the relatively closer source near Gettysburg is more economical than the other alternatives.

III. CENTRAL PROJECT AREA:

The hydraulic parameters of the remainder of the water system are primarily defined by proposed water storage at Highmore, Stephan and Wessington. These three locations were selected for major water storage because of relatively high elevation compared to the surrounding area.

On the north side of the system, north of Highway 14 and exclusive of the Gettysburg service area, water users are at elevations up to about 1,950 MSL. A small area near Orient has ground elevations up to 2,000 MSL, but no users there are presently signed up. A water tower is proposed at Highmore with a hydraulic gradient of 2,030 MSL to serve the area. About 10 water users will have static pressures between 30 and 40 psi with this tower elevation.

Through the center of the system, ground elevations are up to 2,180 MSL six miles north of Stephan. A ground reservoir with a hydraulic gradient of 2,210 MSL is proposed at the high location. Approximately 5 water users near the reservoir will have static pressure of 30 to 40 psi with this reservoir design. The Stephan service area extends east to the edge of the James River Valley.

For the design alternatives which include a water source at Big Bend Dam, a corridor of lower elevations along Highway 34 is treated as a separate service area. The reservoir for this area will be about 3 miles west of Wessington Springs at a ground elevation of 1,970 MSL. A ground reservoir is proposed with a hydraulic gradient of 2,000 MSL at this

location. For the Big Bend source alternatives, this reservoir will also provide water to Huron and the James River Valley.

The final hydraulic segment of the water system is the James River Valley. The valley area is extremely flat with ground elevations generally ranging from 1,280 to 1,320 MSL. A few water users on the east side of the north end of the river valley area are at elevations up to 1,450 MSL. These locations will require a small booster pump of less than 5 horsepower. The James River area can be served from either the north or south mainline route, depending on the water source selected.

A. Oahe Water Source:

The Oahe Dam intake and water treatment plant alternative was considered for service to the entire Mid Dakota project area, the total area excluding the Gettysburg service area, or the north half of the project area. These alternatives were selected to correspond to the geographic divisions of the project area relative to user elevations and proximity of major water users to source and treatment facilities. Locations of major facilities area shown on Figure C-2.

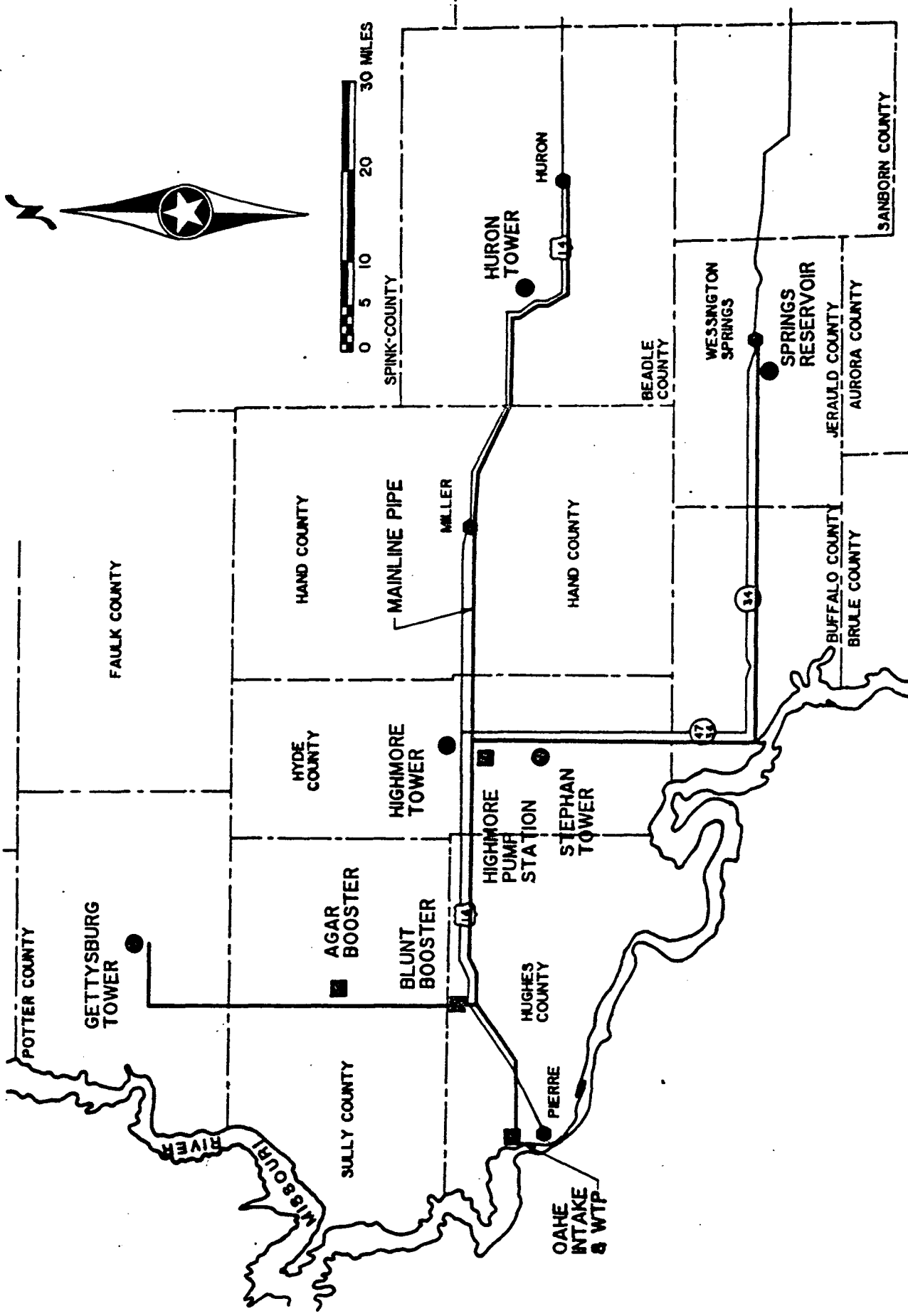
High service pumps at the water treatment plant will discharge to main pipeline following Highway 14 east of Blunt. The water tower at Highmore will be the initial major water storage for the system.

From Highmore, water will be piped east along Highway 14. A water tower sill be located near Huron to provide water storage for the City and rural water users in that area. No pumping is required between Highmore and Huron. For service only to the northern part of the system from Oahe, the Huron area will be served by the Big Bend source, and main pipeline from Oahe will extend only to Wessington.

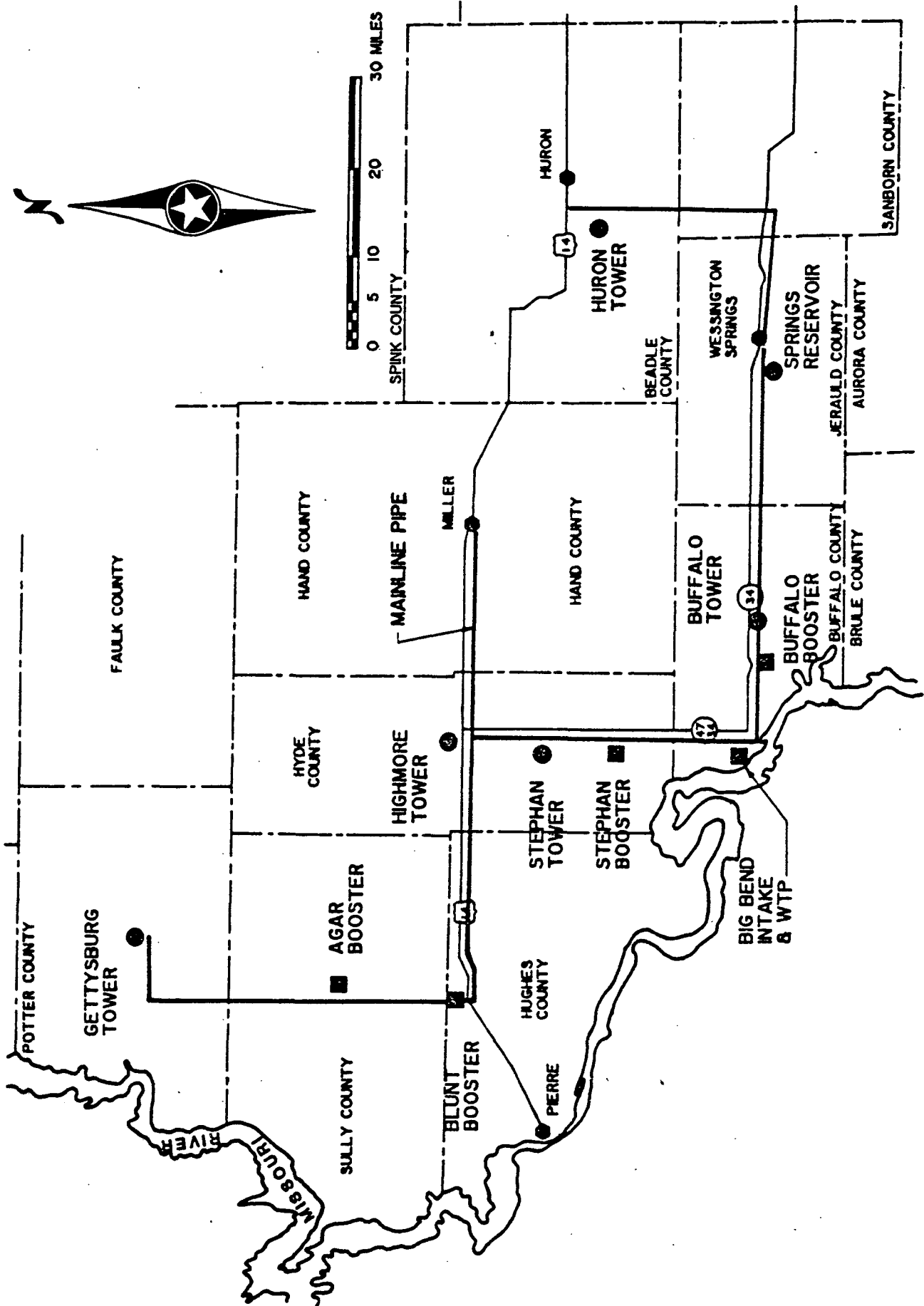
For service to the total project area, water will be pumped south from Highmore to the Stephan Tower. The Stephan Tower will serve the high area between Highways 14 and 34. A small booster pumping station is required to pump to Wessington Springs and adjacent areas during maximum flows.

B. Big Bend Water Source:

The Big Bend water source was considered for service to the entire Mid Dakota project area, the total area excluding the Gettysburg service area, or the south half of the project area including Huron. Locations of major facilities are shown on Figure C-3.



MAJOR FACILITY LOCATIONS
LAKE OAHE SOURCE



MAJOR FACILITY LOCATIONS LAKE SHARPE SOURCE

C-3



DeWild Grant Reckert & Associates Co.
Denver, Colorado
Rock Rapids, Iowa
Sioux City, Iowa
Sioux Falls, South Dakota

Date
Drawn By
Approved
Revised

NOV 1988
BH
BJ

MID DAKOTA
RURAL WATER SYSTEM

High service pumps at the water treatment plant will pump east along Highway 34 and north along Highway 47. To the east, the initial water storage will be at Wessington Springs. A booster pumping station will be required between the water plant and the reservoir. From Wessington Springs, no additional pumping is required to Huron.

North from Big Bend, a pumping station is required to reach the water tower at Stephan. From Stephan, water flows to the Highmore Tower and on to water users in the north half of the project. For the alternative with service from Big Bend only to the south half of the project, water from Big Bend terminates at the Stephan Tower.

IV. ALTERNATIVE COSTS:

Construction costs were estimated for the various source alternatives. Because the City of Huron is a major part of the project, costs were also estimated with and without service to Huron.

Costs for the Gettysburg service area are given on Table C-1. The table shows costs for the separate source west of Gettysburg, and for incremental costs to add to the Oahe or Big Bend sources for service to the Gettysburg area.

Table C-2 presents estimated construction costs for the Oahe source alternative. Costs are presented without service to the Gettysburg area, because Table C-1 shows a clear cost advantage for the separate Gettysburg source. Table C-3 provides similar information for the Big Bend source alternative.

Estimated cost data for sources at both Oahe and Big Bend are given on Table C-4. With this alternative, intake and treatment facilities would be located at all of the three source locations.

Table C-5 presents estimated operating costs for the various source alternatives. Operating costs were estimated to provide data relative to the long-term costs of the various alternatives. The single Oahe source provides the lowest long-term operating cost because of the economy of a single water treatment plant and the lower energy input due to a higher source elevations. However, differences among operating costs for the Oahe or Big Bend source are slight. The three source alternative has significantly higher operating costs due to the use of a significant amount of water from the lower elevation Big Bend source, and due to operating costs for three separate water plants.

TABLE C-1
ESTIMATED CONSTRUCTION COSTS FOR
GETTYSBURG SUBSYSTEM SOURCE ALTERNATIVES

<u>Facility</u>	<u>Capacity</u>	<u>Cost of Separate Subsystem, thousands</u>	<u>Cost of Oahe Source, thousands¹</u>	<u>Cost of Sharpe Source, thousands¹</u>
Intake	1,460 gpm	\$ 650	\$ 200	\$ 200
Water Treatment Plant	1,460 gpm	1,490	970	970
WTP Pumping Station	1,460 gpm	260	250	250
Gettysburg Booster	1,460 gpm	170	N/A ²	N/A
Blunt Booster	1,460 gpm	N/A	170	170
Agar Booster	870 gpm	N/A	130	130
Gettysburg Tower	500 kgal	600	600	600
Gettysburg Reservoir	1,000 kgal	500	N/A	N/A
Blunt Reservoir	500 kgal	N/A	300	300
Agar Reservoir	500 kgal	N/A	300	300
Main Pipeline		1,049	6,030	7,777
Distribution Pipeline		<u>6,284</u>	<u>6,284</u>	<u>6,284</u>
Total Construction Cost, Gettysburg Area		\$11,003	\$15,234	\$16,981

¹Costs for Oahe and Sharpe sources are incremental costs over respective base systems which include service to Huron.

²N/A = Not applicable to this alternative.

TABLE C-2

ESTIMATED COSTS FOR OAHE SOURCE SYSTEM
EXCLUDING GETTYSBURG AREA

<u>Facility</u>	<u>With Huron</u>		<u>Without Huron</u>	
	<u>Capacity</u>	<u>Cost, thousands</u>	<u>Capacity</u>	<u>Cost, thousands</u>
Intake	7,660 gpm	\$ 1,900	4,660 gpm	\$ 1,500
Water Treatment Plant	7,660 gpm	6,100	4,660 gpm	4,000
WTP Pumping Station	7,660 gpm	1,050	4,660 gpm	650
Highmore South Booster	1,480 gpm	170	1,480 gpm	170
Stephan East Booster	800 gpm	130	800 gpm	130
Highmore Tower	4,000 kgal	3,000	2,500 kgal	2,100
Huron Tower	500 kgal	600	500 kgal	600
Stephan Tower	1,500 kgal	1,300	1,500 kgal	1,300
Springs Reservoir	500 kgal	300	500 kgal	300
Main Pipeline		30,768		20,772
Distribution Pipeline:				
Springs South		2,515		2,515
141 East		2,082		2,082
Buffalo East		1,313		1,313
Sharpe East		842		842
Oahe East		1,716		1,716
Blunt East		2,119		2,119
35 East		1,483		1,483
Highmore East		3,140		3,140
59 East		2,062		2,062
St. Lawrence East		2,458		2,458
94 East		1,990		1,990
115 East		<u>2,941</u>		<u>2,941</u>
TOTAL CONSTRUCTION COST, EXCLUDING GETTYSBURG AREA		\$69,979		\$56,183

TABLE C-3

ESTIMATED COSTS FOR LAKE SHARPE SOURCE SYSTEM
EXCLUDING GETTYSBURG AREA

<u>Facility</u>	<u>With Huron</u>		<u>Without Huron</u>	
	<u>Capacity</u>	<u>Cost, thousands</u>	<u>Capacity</u>	<u>Cost, thousands</u>
Intake	7,660 gpm	\$ 1,900	4,660 gpm	\$ 1,500
Water Treatment Plant	7,660 gpm	6,100	4,660 gpm	4,000
WTP Pumping Station	7,660 gpm	1,050	4,660 gpm	650
Buffalo Booster	4,750 gpm	400	1,750 gpm	180
Stephan Booster	2,800 gpm	230	2,800 gpm	230
Blunt Booster	200 gpm	70	200 gpm	70
Buffalo Tower	1,000 kgal	1,000	500 kgal	600
Springs Reservoir	2,000 kgal	1,000	1,000 kgal	500
Huron Tower	500 kgal	600	500 kgal	600
Stephan Tower	2,000 kgal	1,700	2,000 kgal	1,700
Highwater Tower	1,000 kgal	1,000	1,000 kgal	1,000
Blunt Reservoir	250 kgal	150	250 kgal	150
Main Pipeline		27,404		20,269
Distribution Pipeline:				
Springs South		2,515		2,515
141 East		2,082		2,082
Buffalo East		1,313		1,313
Sharpe East		842		842
Oahe East		1,716		1,716
Blunt East		2,119		2,119
35 East		1,483		1,483
Highmore East		3,140		3,140
59 East		2,062		2,062
St. Lawrence East		2,458		2,458
94 East		1,990		1,990
115 East		<u>2,941</u>		<u>2,941</u>
TOTAL CONSTRUCTION COST, EXCLUDING GETTYSBURG AREA		\$67,265		\$56,110

TABLE C-4

ESTIMATED COSTS FOR THREE SOURCE SYSTEM
WITH SERVICE TO HURON

Facility	Gettysburg		Oahe		Big Bend	
	Capacity	Cost, \$Thousands	Capacity	Cost, \$Thousands	Capacity	Cost, \$Thousands
Intake	1,460 gpm	\$ 650	2,760 gpm	\$ 1,100	4,880 gpm	\$ 1,550
Treatment	1,460 gpm	1,490	2,760 gpm	2,560	4,880 gpm	4,100
WTP Pumping	1,460 gpm	260	2,760 gpm	400	4,880 gpm	680
Buffalo Booster					4,480 gpm	370
Stephan Booster					410 gpm	100
Blunt Booster			2,200 gpm	200		
Gettysburg Booster	1,460 gpm	170				
Buffalo Tower					1,000 kgal	1,000
Springs Reservoir					2,000 kgal	1,000
Huron Tower					500 kgal	600
Stephan Tower					500 kgal	600
Highmore Tower			2,000 kgal	1,700		
Blunt Reservoir			1,000 kgal	500		
Gettysburg Reservoir	1,000 kgal	500				
Gettysburg Tower	500 kgal	600				
Main Pipeline		1,049		9,044		18,122
Distribution Pipeline						
Springs South						2,515
141 East						2,082
Buffalo East						1,313
Sharpe East						842
Gettysburg East		2,233				
Gettysburg South		4,051				
Oahe East				1,716		
Blunt East				2,119		
35 East				1,483		
Highmore East				3,140		
59 East				2,062		
St. Lawrence East				2,458		
94 East				1,990		
115 East				1,990		2,941
TOTAL ESTIMATED CONSTRUCTION COST		\$ 11,003		\$ 32,462		\$ 37,815
COMBINED COST, INCLUDING GETTYSBURG AREA						\$ 81,280

TABLE C-5

ESTIMATED OPERATING COSTS FOR ALTERNATIVE SOURCE PLANS

Item	Oahe			Big Bend		
	-----			-----		
	Alone	W/Gettysburg Separate	W/O Huron, W/Gettysburg Separate	Alone	W/Gettysburg Separate	W/O Huron, W/Gettysburg Separate
Fixed Annual Costs						
Manager, 1 @ \$30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000
Office clerks, 2 @ \$14,000	28,000	28,000	28,000	28,000	28,000	28,000
Distribution Operators, 5 @ \$23,000	115,000	115,000	115,000	115,000	115,000	115,000
Fringe benefits on labor 34.0%	69,200	69,200	69,200	69,200	69,200	69,200
Administrative Office and Billing	50,000	50,000	50,000	50,000	50,000	50,000
Water Treatment Plant Repair and Replacement	123,725	132,825	96,075	123,725	132,825	96,075
Pumping Station Repair and Replacement	28,000	31,150	24,150	41,650	38,150	27,300
Pipeline Repair and Replacement	60,000	60,000	60,000	60,000	60,000	60,000
Miscellaneous, Insurance and Directors	50,000	50,000	50,000	50,000	50,000	50,000
Subtotal, fixed annual costs	\$ 553,925	\$ 566,175	\$ 522,425	\$ 567,575	\$ 573,175	\$ 525,575
Variable Production Costs						
Pumping Energy	\$ 463,335	\$ 438,545	\$ 310,357	\$ 588,105	\$ 524,784	\$ 346,435
Water Treatment Chemicals	195,000	195,000	110,000	195,000	195,000	110,000
Water Treatment Labor	126,500	149,500	121,900	126,500	149,500	121,900
Water Treatment Labor Fringe	50,600	59,800	48,760	50,600	59,800	48,760
Miscellaneous	234,000	234,000	132,000	234,000	234,000	132,000
Subtotal, Variable Costs	\$ 1,069,435	\$ 1,076,845	\$ 723,017	\$ 1,194,205	\$ 1,163,084	\$ 759,095
Total Annual Costs	\$ 1,623,360	\$ 1,643,020	\$ 1,245,442	\$ 1,761,780	\$ 1,736,259	\$ 1,284,670
Production and Sales Data						
Total Annual Production, Kgal	1,950,000	1,950,000	1,100,000	1,950,000	1,950,000	1,100,000
Total Annual Sales, Kgal	1,755,000	1,755,000	990,000	1,755,000	1,755,000	990,000
Total Unit Cost per Kgal Sold	\$ 0.92	\$ 0.94	\$ 1.26	\$ 1.00	\$ 0.99	\$ 1.30
						\$ 0.99

TABLE C-5

ESTIMATED OPERATING COSTS FOR ALTERNATIVE SOURCE PLANS

Item	Oahe		Big Bend		W/O Huron,		W/Gettysburg		W/Gettysburg		Split 3 Source
	Alone	W/Gettysburg Separate	Alone	W/Gettysburg Separate	W/O Huron, Separate	W/Gettysburg Separate	Alone	W/Gettysburg Separate	W/Gettysburg Separate	W/Gettysburg Separate	
Fixed Annual Costs											
Manager, 1 @ \$30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000
Office clerks, 2 @ \$14,000	28,000	28,000	28,000	28,000	28,000	28,000	28,000	28,000	28,000	28,000	28,000
Distribution Operators, 5 @ \$23,000	115,000	115,000	115,000	115,000	115,000	115,000	115,000	115,000	115,000	115,000	115,000
Fringe benefits on labor @40%	69,200	69,200	69,200	69,200	69,200	69,200	69,200	69,200	69,200	69,200	69,200
Administrative Office and Billing	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Water Treatment Plant Repair and Replacement	123,725	132,825	123,725	96,075	96,075	132,825	123,725	132,825	96,075	142,625	142,625
Pumping Station Repair and Replacement	28,000	31,150	41,650	24,150	24,150	38,150	41,650	38,150	27,300	38,150	38,150
Pipeline Repair and Replacement	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
Miscellaneous, Insurance and Directors	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Subtotal, fixed annual costs	\$ 553,925	\$ 566,175	\$ 567,575	\$ 522,425	\$ 522,425	\$ 573,175	\$ 567,575	\$ 573,175	\$ 525,575	\$ 582,975	
Variable Production Costs											
Pumping Energy	\$ 463,335	\$ 438,545	\$ 588,105	\$ 310,357	\$ 310,357	\$ 524,784	\$ 588,105	\$ 524,784	\$ 346,435	\$ 479,788	\$ 479,788
Water Treatment Chemicals	195,000	195,000	195,000	110,000	110,000	195,000	195,000	195,000	110,000	195,000	195,000
Water Treatment Labor	126,500	149,500	126,500	121,900	121,900	149,500	126,500	149,500	121,900	179,400	179,400
Water Treatment Labor Fringe	50,600	59,800	50,600	48,760	48,760	59,800	50,600	59,800	48,760	71,760	71,760
Miscellaneous	234,000	234,000	234,000	132,000	132,000	234,000	234,000	234,000	132,000	234,000	234,000
Subtotal, Variable Costs	\$ 606,100	\$ 638,300	\$ 606,100	\$ 412,660	\$ 412,660	\$ 638,300	\$ 606,100	\$ 638,300	\$ 412,660	\$ 680,160	
Total Annual Costs	\$1,160,025	\$1,204,475	\$1,173,675	\$ 935,085	\$ 935,085	\$1,211,475	\$1,173,675	\$1,211,475	\$ 938,235	\$1,263,135	
Total Annual Production, Kgal	1,950,000	1,950,000	1,950,000	1,100,000	1,100,000	1,950,000	1,950,000	1,950,000	1,100,000	1,950,000	
Total Annual Sales, Kgal	1,755,000	1,755,000	1,755,000	990,000	990,000	1,755,000	1,755,000	1,755,000	990,000	1,755,000	
Total Unit Cost per Kgal Sold	\$ 0.66	\$ 0.69	\$ 0.67	\$ 0.94	\$ 0.94	\$ 0.69	\$ 0.67	\$ 0.69	\$ 0.95	\$ 0.72	

Mid Dakota Rural Water
 Source alternative operating cost review

Pump Efficiency 0.830
 Motor efficiency 0.920
 Head loss factor 0.500
 Flow rate factor 0.688
 Elec cost \$/KWH 0.075
 Ann. load factor 0.550 20 hr.

Maximum Station Flows

Station	Flow	Total Head	Static Head	HPower	Total Operating KW	Operating Head	Operating HPower	Operating KW	Annual Mgal	Operating Ann \$
Lahe WTP	9110	700	450	1,940	1,573	575	1,096	888	2,195	389,265
Sharpe WTP	9110	600	450	1,663	1,349	525	1,000	811	2,195	355,416
Gettysburg WTP	1460	400	315	178	144	358	109	89	352	38,787
Highmore South	1480	350	100	158	128	225	70	56	357	24,746
Agar North	1450	550	200	243	197	375	114	92	349	40,407
Stephan East	800	400	-100	97	79	150	25	20	193	8,917
Buffalo	4850	350	200	516	419	275	279	226	1,168	99,114
Stephan North	4250	200	230	259	210	215	191	155	1,024	67,903
Blunt	1700	400	0	207	168	200	71	58	410	25,266
Agar	1450	550	200	243	197	375	114	92	349	40,407
Gettysburg	1460	400	315	178	144	358	109	89	352	38,787

Total Dahe Source

Station	Flow	Total Head	Static Head	HPower	Total KW	Operating Head	Operating HPower	Operating KW	Annual Mgal	Operating Ann \$
Dahe WTP	9110	700	450	1,940	1,573	575	1,096	888	2,195	389,265
Sharpe WTP		0	0	0	0	0	0	0	0	0
Gettysburg WTP		0	0	0	0	0	0	0	0	0
Higmore South	1480	350	100	158	128	225	70	56	357	24,746
Agar North	1450	550	200	243	197	375	114	92	349	40,407
Stephan East	800	400	-100	97	79	150	25	20	193	8,917
Buffalo		0	0	0	0	0	0	0	0	0
Stephan North		0	0	0	0	0	0	0	0	0
Blunt		0	0	0	0	0	0	0	0	0
Agar		0	0	0	0	0	0	0	0	0
Gettysburg		0	0	0	0	0	0	0	0	0
Totals				2,438	1,977		1,304	1,058	3,093	463,335

Dahe with Gettysburg Separate

Station	Flow	Total Head	Static Head	HPower	Total KW	Operating Head	Operating HPower	Operating KW	Annual Mgal	Operating Ann \$
Dahe WTP	7660	700	450	1,631	1,323	575	921	747	1,845	327,307
Sharpe WTP		0	0	0	0	0	0	0	0	0
Gettysburg WTP	1460	400	315	178	144	358	109	89	352	38,787
Highmore South	1480	350	100	158	128	225	70	56	357	24,746
Agar North		0	0	0	0	0	0	0	0	0
Stephan East	800	400	-100	97	79	150	25	20	193	8,917
Buffalo		0	0	0	0	0	0	0	0	0
Stephan North		0	0	0	0	0	0	0	0	0
Blunt		0	0	0	0	0	0	0	0	0
Agar		0	0	0	0	0	0	0	0	0
Gettysburg	1460	400	315	178	144	358	109	89	352	38,787
Totals				2,242	1,818		1,234	1,001	3,098	438,545

Oahe without Huron, Gettysburg Separate

Station	Flow	Total Head	Static Head	HPower	Total Operating KW	Operating Head	Operating HPower	Operating KW	Annual Mgal	Operating Ann \$
Oahe WTP	4660	700	450	992	805	575	560	454	1,123	199,119
Sharpe WTP		0	0	0	0	0	0	0	0	0
Gettysburg WTP	1460	400	315	178	144	358	109	89	352	38,787
Higmore South	1480	350	100	158	128	225	70	56	357	24,746
Agar North		0	0	0	0	0	0	0	0	0
Stephan East	800	400	-100	97	79	150	25	20	193	8,917
Buffalo		0	0	0	0	0	0	0	0	0
Stephan North		0	0	0	0	0	0	0	0	0
Blunt		0	0	0	0	0	0	0	0	0
Agar		0	0	0	0	0	0	0	0	0
Gettysburg	1460	400	315	178	144	358	109	89	352	38,787
Totals				1,603	1,300		874	708	2,375	310,357

All Sharpe

Station	Flow	Total Head	Static Head	HPower	Total Operating KW	Operating Head	Operating HPower	Operating KW	Annual Mgal	Operating Ann \$
The WTP		0	0	0	0	0	0	0	0	0
Sharpe WTP	9110	600	450	1,663	1,348	525	1,000	811	2,195	355,416
Gettysburg WTP		0	0	0	0	0	0	0	0	0
Highmore South		0	0	0	0	0	0	0	0	0
Shar North		0	0	0	0	0	0	0	0	0
Stephan East		0	0	0	0	0	0	0	0	0
Buffalo	4850	350	200	516	419	275	279	226	1,168	99,114
Stephan North	4250	200	230	259	210	215	191	155	1,024	67,903
Mount	1700	400	0	207	168	200	71	58	410	25,266
Agar	1450	550	200	243	197	375	114	92	349	40,407
Gettysburg		0	0	0	0	0	0	0	0	0
Totals				2,888	2,341		1,655	1,342	5,146	588,105

Sharpe with Gettysburg separate

Station	Flow	Total Head	Static Head	HPower	Total Operating KW	Operating Head	Operating HPower	Operating KW	Annual Mgal	Operating Ann \$
Dahe WTP		0	0	0	0	0	0	0	0	0
Sharpe WTP	7660	600	450	1,398	1,134	525	841	682	1,845	298,846
Gettysburg WTP	1460	400	315	178	144	358	109	89	352	38,787
Highmore South		0	0	0	0	0	0	0	0	0
Agar North		0	0	0	0	0	0	0	0	0
Stephan East		0	0	0	0	0	0	0	0	0
Buffalo	4850	350	200	516	419	275	279	226	1,168	99,114
Stephan North	2850	200	230	173	141	215	128	104	687	45,535
Blunt	250	400	0	30	25	200	10	8	60	3,716
Agar	0	0	0	0	0	0	0	0	0	0
Gettysburg	1460	400	315	178	144	358	109	89	352	38,787
Totals				2,474	2,006		1,477	1,198	4,464	524,784

Split 3 sources

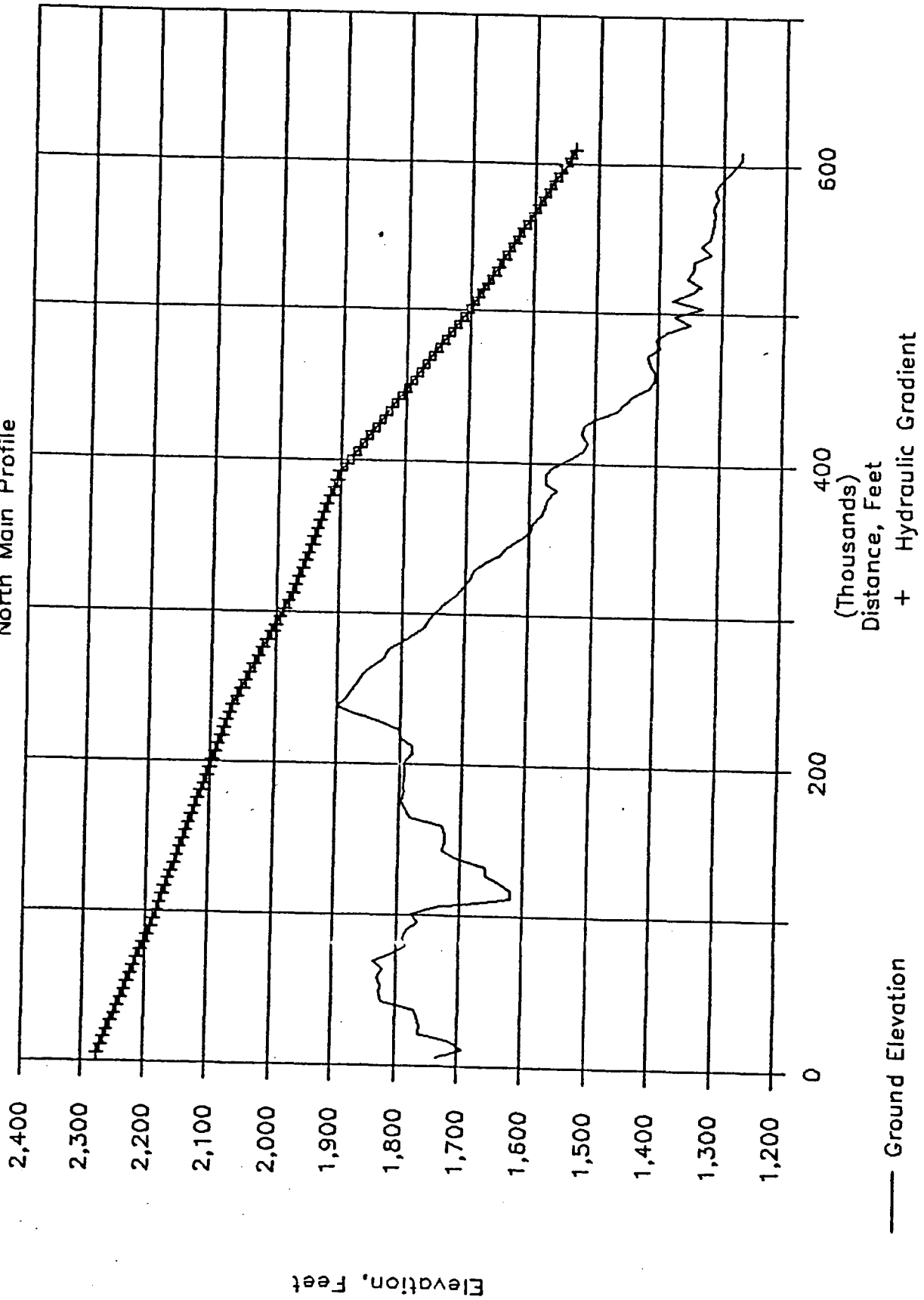
Station	Flow	Total Head	Static Head	HPower	Total KW	Operating Head	Operating HPower	Operating KW	Annual Mgal	Operating Ann \$
Nahe WTP	3600	700	450	767	622	575	433	351	867	153,826
Marpe WTP	4060	600	450	741	601	525	446	362	978	158,396
Gettysburg WTP	1460	400	315	178	144	358	109	89	352	38,787
Highmore South	420	350	100	45	36	225	20	16	101	7,022
Mar North		0	0	0	0	0	0	0	0	0
Stephan East		0	0	0	0	0	0	0	0	0
Buffalo	4060	350	200	432	351	275	234	189	978	82,969
Stephan North		0	0	0	0	0	0	0	0	0
unt		0	0	0	0	0	0	0	0	0
Agar	0	0	0	0	0	0	0	0	0	0
Gettysburg	1460	400	315	178	144	358	109	89	352	38,787
Totals				2,340	1,898		1,351	1,095	3,628	479,788

Sharpe without Huron, Gettysburg separate

Station	Flow	Total Head	Static Head	HPower	Total KW	Operating Head	Operating HPower	Operating KW	Annual Mgal	Operating Ann \$
Dahe WTP		0	0	0	0	0	0	0	0	0
Sharpe WTP	4660	600	450	851	690	525	512	415	1,123	181,804
Gettysburg WTP	1460	400	315	178	144	358	109	89	352	38,787
Highmore South		0	0	0	0	0	0	0	0	0
Agar North		0	0	0	0	0	0	0	0	0
Stephan East		0	0	0	0	0	0	0	0	0
Buffalo	1850	350	200	197	160	275	106	86	446	37,806
Stephan North	2850	200	230	173	141	215	128	104	687	45,535
Blunt	250	400	0	30	25	200	10	8	60	3,716
Agar	0	0	0	0	0	0	0	0	0	0
Gettysburg	1460	400	315	178	144	358	109	89	352	38,787
Totals				1,607	1,303		975	791	3,018	346,435

Mid Dakota Rural Water

North Main Profile



North Main Profile

Total Distance, miles 115.44

Node	Flow	Head	To	End Node	Total				
Distance	Pipe	Rate	Loss	Elev	HGL	Pressure	Distance	Segment	Cumulative
Feet	Type	GPM	Feet	Feet	Feet	PSI	Feet	Cost, \$	Cost, \$
5,300	30-DI	7,658	5.20	1,734	2,275	234.1	5,300	248,517	248,517
5,300	30-DI	7,658	5.20	1,694	2,270	249.2	10,600	248,517	497,034
5,300	30-DI	7,658	5.20	1,712	2,264	239.1	15,900	248,517	745,551
5,300	30-DI	7,658	5.20	1,763	2,259	214.8	21,200	248,517	994,068
5,300	30-DI	7,658	5.20	1,761	2,254	213.4	26,500	248,517	1,242,585
5,300	30-DI	7,658	5.20	1,766	2,249	209.0	31,800	248,517	1,491,102
5,300	30-DI	7,658	5.20	1,772	2,244	204.2	37,100	248,517	1,739,619
5,300	30-DI	7,658	5.20	1,823	2,238	179.8	42,400	248,517	1,988,136
5,300	30-DI	7,658	5.20	1,828	2,233	175.4	47,700	248,517	2,236,653
5,300	30-DI	7,658	5.20	1,826	2,228	174.0	53,000	248,517	2,485,170
5,300	30-DI	7,658	5.20	1,831	2,223	169.6	58,300	248,517	2,733,687
5,300	30-DI	7,658	5.20	1,821	2,218	171.7	63,600	248,517	2,982,204
5,300	30-DI	7,658	5.20	1,836	2,212	163.0	68,900	248,517	3,230,721
5,300	30-DI	7,658	5.20	1,807	2,207	173.3	74,200	248,517	3,479,238
5,300	30-DI	7,658	5.20	1,786	2,202	180.1	79,500	248,517	3,727,755
5,300	30-DI	7,658	5.20	1,791	2,197	175.7	84,800	248,517	3,976,272
5,300	30-DI	7,658	5.20	1,785	2,192	176.0	90,100	248,517	4,224,789
5,300	30-DI	7,077	4.49	1,767	2,187	181.9	95,400	248,517	4,473,306
5,300	30-DI	7,077	4.49	1,776	2,183	176.1	100,700	248,517	4,721,823
5,300	30-DI	7,077	4.49	1,732	2,178	193.2	106,000	248,517	4,970,340
5,300	30-DI	7,077	4.49	1,620	2,174	239.7	111,300	248,517	5,218,857
5,300	30-DI	7,077	4.49	1,620	2,169	237.8	116,600	248,517	5,467,374
5,300	30-DI	7,077	4.49	1,639	2,165	227.6	121,900	248,517	5,715,891
5,300	30-DI	7,077	4.49	1,660	2,160	216.5	127,200	248,517	5,964,408
5,300	30-DI	7,077	4.49	1,660	2,156	214.6	132,500	248,517	6,212,925
5,300	30-DI	7,077	4.49	1,706	2,151	192.7	137,800	248,517	6,461,442
5,300	30-DI	7,077	4.49	1,730	2,147	180.4	143,100	248,517	6,709,959
5,300	30-DI	7,077	4.49	1,727	2,142	179.8	148,400	248,517	6,958,476
5,300	30-DI	7,077	4.49	1,726	2,138	178.3	153,700	248,517	7,206,993
5,300	30-DI	7,077	4.49	1,731	2,133	174.1	159,000	248,517	7,455,510
5,300	30-DI	7,077	4.49	1,783	2,129	149.7	164,300	248,517	7,704,027
5,300	30-DI	7,077	4.49	1,789	2,124	145.2	169,600	248,517	7,952,544
5,300	30-DI	7,077	4.49	1,796	2,120	140.2	174,900	248,517	8,201,061
5,300	30-DI	7,077	4.49	1,793	2,115	139.5	180,200	248,517	8,449,578
5,300	30-DI	7,077	4.49	1,795	2,111	136.7	185,500	248,517	8,698,095
5,300	30-DI	6,977	4.37	1,793	2,106	135.7	190,800	248,517	8,946,612
5,300	30-DI	6,977	4.37	1,793	2,102	133.8	196,100	248,517	9,195,129
5,300	30-DI	6,977	4.37	1,793	2,098	131.9	201,400	248,517	9,443,646
5,300	30-DI	6,977	4.37	1,780	2,093	135.6	206,700	248,517	9,692,163
5,300	30-DI	6,977	4.37	1,780	2,089	133.7	212,000	248,517	9,940,680
5,300	30-DI	6,977	4.37	1,800	2,085	123.2	217,300	248,517	10,189,197
5,300	30-DI	6,977	4.37	1,801	2,080	120.9	222,600	248,517	10,437,714
5,300	30-DI	6,977	4.37	1,831	2,076	106.0	227,900	248,517	10,686,231
5,300	30-DI	6,977	4.37	1,870	2,071	87.2	233,200	248,517	10,934,748
5,300	30-DI	6,977	4.37	1,900	2,067	72.3	238,500	248,517	11,183,265

5,300 24-DI	4,939	6.62	1,826	2,060	75.5	243,800	190,906	11,374,171
5,300 24-DI	4,939	6.62	1,677	2,054	76.6	249,100	190,906	11,565,077
5,300 24-DI	4,939	6.62	1,869	2,047	77.2	254,400	190,906	11,755,983
5,300 24-DI	4,939	6.62	1,860	2,041	78.2	259,700	190,906	11,946,889
5,300 24-DI	4,939	6.62	1,845	2,034	81.8	265,000	190,906	12,137,795
5,300 24-DI	4,939	6.62	1,827	2,027	86.7	270,300	190,906	12,328,701
5,300 24-DI	4,939	6.62	1,819	2,021	87.3	275,600	190,906	12,519,607
5,300 24-DI	4,939	6.62	1,799	2,014	93.1	280,900	190,906	12,710,513
5,300 24-DI	4,939	6.62	1,779	2,007	98.9	286,200	190,906	12,901,419
5,300 24-DI	4,939	6.62	1,763	2,001	103.0	291,500	190,906	13,092,325
5,300 24-DI	4,939	6.62	1,756	1,994	103.1	296,800	190,906	13,283,231
5,300 24-DI	4,939	6.62	1,744	1,988	105.5	302,100	190,906	13,474,137
5,300 24-DI	4,939	6.62	1,731	1,981	108.2	307,400	190,906	13,665,043
5,300 24-DI	4,939	6.62	1,715	1,974	112.3	312,700	190,906	13,855,949
5,300 24-DI	4,170	4.84	1,704	1,970	114.9	318,000	190,906	14,046,855
5,300 24-DI	4,170	4.84	1,694	1,965	117.2	323,300	190,906	14,237,761
5,300 24-DI	4,170	4.84	1,688	1,960	117.7	328,600	190,906	14,428,667
5,300 24-DI	4,170	4.84	1,670	1,955	123.4	333,900	190,906	14,619,573
5,300 24-DI	4,170	4.84	1,647	1,950	131.2	339,200	190,906	14,810,479
5,300 24-DI	4,170	4.84	1,636	1,945	133.9	344,500	190,906	15,001,385
5,300 24-DI	4,170	4.84	1,613	1,940	141.7	349,800	190,906	15,192,291
5,300 24-DI	4,170	4.84	1,599	1,936	145.7	355,100	190,906	15,383,197
5,300 24-DI	4,170	4.84	1,594	1,931	145.8	360,400	190,906	15,574,103
5,300 24-DI	4,170	4.84	1,581	1,926	149.3	365,700	190,906	15,765,009
5,300 24-DI	4,170	4.84	1,574	1,921	150.2	371,000	190,906	15,955,915
5,300 24-DI	4,170	4.84	1,572	1,916	149.0	376,300	190,906	16,146,821
5,300 24-DI	4,170	4.84	1,558	1,911	153.0	381,600	190,906	16,337,727
5,300 24-DI	4,170	4.84	1,575	1,907	143.5	386,900	190,906	16,528,633
5,300 24-DI	4,170	4.84	1,576	1,902	141.0	392,200	190,906	16,719,539
5,300 20-DI	3,788	9.77	1,564	1,892	142.0	397,500	152,322	16,871,861
5,300 20-DI	3,788	9.77	1,539	1,882	148.6	402,800	152,322	17,024,183
5,300 20-DI	3,788	9.77	1,518	1,872	153.4	408,100	152,322	17,176,505
5,300 20-DI	3,788	9.77	1,510	1,863	152.6	413,400	152,322	17,328,827
5,300 20-DI	3,788	9.77	1,520	1,853	144.1	418,700	152,322	17,481,149
5,300 20-DI	3,788	9.77	1,517	1,843	141.2	424,000	152,322	17,633,471
5,300 20-DI	3,788	9.77	1,500	1,833	144.3	429,300	152,322	17,785,793
5,300 20-DI	3,788	9.77	1,465	1,824	155.2	434,600	152,322	17,938,115
5,300 20-DI	3,788	9.77	1,450	1,814	157.5	439,900	152,322	18,090,437
5,300 20-DI	3,788	9.77	1,440	1,804	157.6	445,200	152,322	18,242,759
5,300 20-DI	3,788	9.77	1,415	1,794	164.2	450,500	152,322	18,395,081
5,300 20-DI	3,788	9.77	1,405	1,784	164.3	455,800	152,322	18,547,403
5,300 20-DI	3,788	9.77	1,404	1,775	160.5	461,100	152,322	18,699,725
5,300 20-DI	3,788	9.77	1,412	1,765	152.8	466,400	152,322	18,852,047
5,300 20-DI	3,788	9.77	1,416	1,755	146.8	471,700	152,322	19,004,369
5,300 20-DI	3,788	9.77	1,397	1,745	150.8	477,000	152,322	19,156,691
5,300 20-DI	3,788	9.77	1,404	1,736	143.6	482,300	152,322	19,309,013
5,300 20-DI	3,788	9.77	1,384	1,726	148.0	487,600	152,322	19,461,335
5,300 20-DI	3,788	9.77	1,351	1,716	158.0	492,900	152,322	19,613,657
5,300 20-DI	3,788	9.77	1,375	1,706	143.4	498,200	152,322	19,765,979
5,300 20-DI	3,420	8.09	1,330	1,698	159.4	503,500	152,322	19,918,301
5,300 20-DI	3,420	8.09	1,380	1,690	134.3	508,800	152,322	20,070,623
5,300 20-DI	3,420	8.09	1,346	1,682	145.5	514,100	152,322	20,222,945
5,300 20-DI	3,420	8.09	1,332	1,674	148.0	519,400	152,322	20,375,267
5,300 20-DI	3,420	8.09	1,356	1,666	134.2	524,700	152,322	20,527,589
5,300 20-DI	3,420	8.09	1,347	1,658	134.5	530,000	152,322	20,679,911
5,300 20-DI	3,420	8.09	1,346	1,650	131.5	535,300	152,322	20,832,233

5,300 20-DI	3,420	8.09	1,320	1,642	139.2	540,600	152,322	20,984,555
5,300 20-DI	3,420	8.09	1,334	1,634	129.7	545,900	152,322	21,136,877
5,300 20-DI	3,420	8.09	1,322	1,625	131.4	551,200	152,322	21,289,199
5,300 20-DI	3,420	8.09	1,318	1,617	129.6	556,500	152,322	21,441,521
5,300 20-DI	3,420	8.09	1,315	1,609	127.4	561,800	152,322	21,593,843
5,300 20-DI	3,420	8.09	1,313	1,601	124.8	567,100	152,322	21,746,165
5,300 20-DI	3,420	8.09	1,316	1,593	120.0	572,400	152,322	21,898,487
5,300 20-DI	3,420	8.09	1,308	1,585	119.9	577,700	152,322	22,050,809
5,300 20-DI	3,420	8.09	1,313	1,577	114.3	583,000	152,322	22,203,131
5,300 20-DI	3,420	8.09	1,306	1,569	113.8	588,300	152,322	22,355,453
5,300 20-DI	3,420	8.09	1,293	1,561	115.9	593,600	152,322	22,507,775
5,300 20-DI	3,420	8.09	1,283	1,553	116.7	598,900	152,322	22,660,097
5,300 20-DI	3,420	8.09	1,270	1,545	118.9	604,200	152,322	22,812,419
5,300 20-DI	3,420	8.09	1,270	1,537	115.4	609,500	152,322	22,964,741

North Main Continued

609,500

743.48

22,964,741

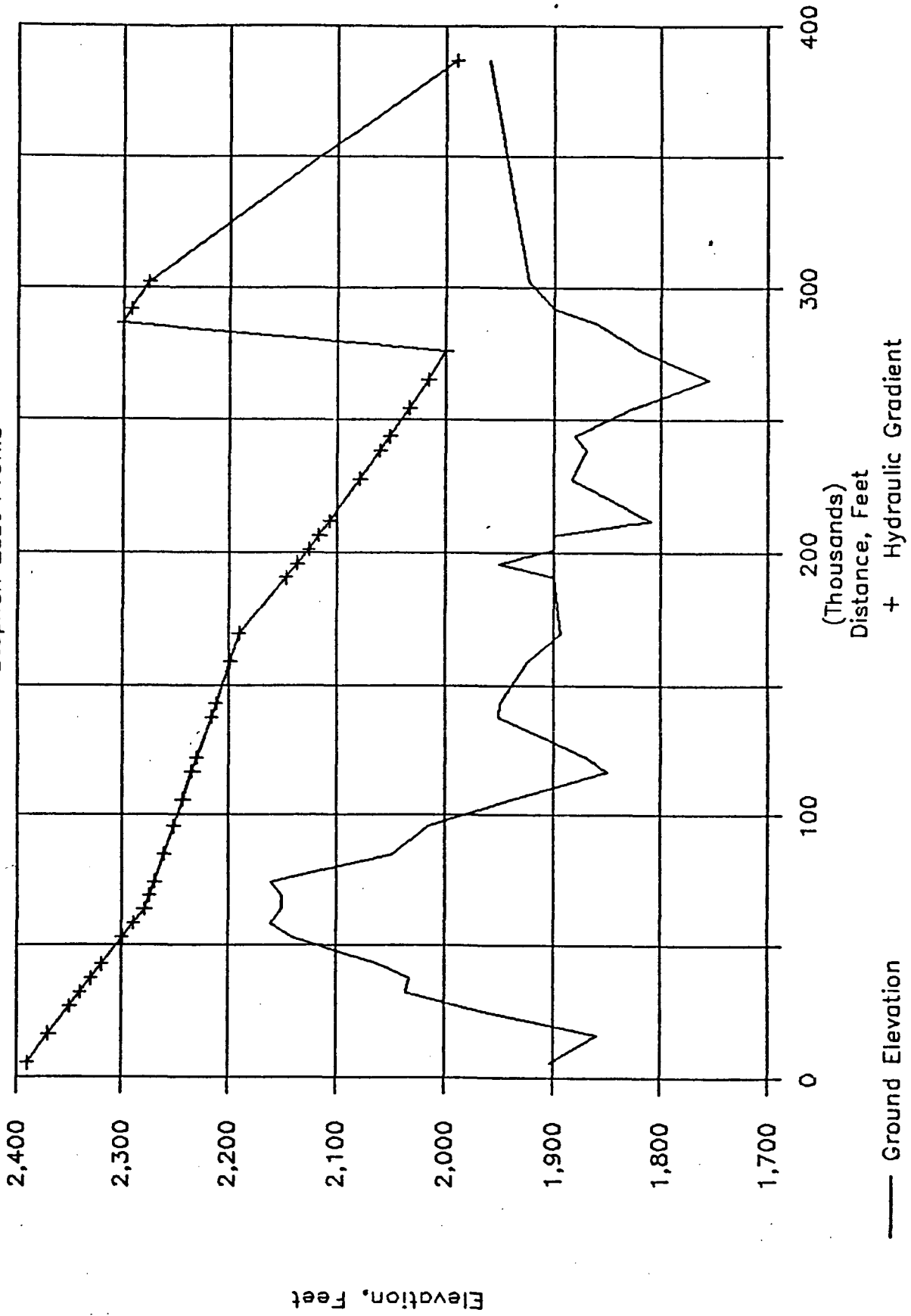
DGR and Associates
Water Resources Main Pipeline Calculations
Mid Dakota Rural Water System
Bruce Jennings October 1988

Stephan East Main

Total Distance, miles			73.28						
Node	Flow	Head	To	2,400	End Node	Total			
Distance	Pipe	Rate	Elev	HGL	Pressure	Distance	Segment	Cumulative	
Feet	Type	GPM	Feet	Feet	PSI	Feet	Cost, \$	Cost, \$	
5,300	14-DI	1,480	10.07	1,903	2,390	210.8	5,300	100,117	100,117
10,600	14-DI	1,480	20.14	1,859	2,370	221.1	15,900	200,234	300,351
10,600	14-DI	1,480	20.14	1,986	2,350	157.4	26,500	200,234	500,585
5,300	14-DI	1,480	10.07	2,037	2,340	131.0	31,800	100,117	600,702
5,300	14-DI	1,480	10.07	2,033	2,330	128.4	37,100	100,117	700,819
5,300	14-DI	1,480	10.07	2,061	2,319	111.9	42,400	100,117	800,936
10,600	14-DI	1,480	20.14	2,141	2,299	68.5	53,000	200,234	1,001,170
5,300	14-DI	1,480	10.07	2,161	2,289	55.5	58,300	100,117	1,101,287
5,300	14-DI	1,480	10.07	2,151	2,279	55.5	63,600	100,117	1,201,404
5,300	14-DI	1,002	4.89	2,151	2,274	53.4	68,900	100,117	1,301,521
5,300	14-DI	980	4.70	2,161	2,270	47.0	74,200	100,117	1,401,638
10,600	14-DI	951	8.89	2,049	2,261	91.6	84,800	200,234	1,601,872
10,600	14-DI	950	8.87	2,016	2,252	102.1	95,400	200,234	1,802,106
10,600	14-DI	949	8.85	1,940	2,243	131.1	106,000	200,234	2,002,340
10,600	14-DI	947	8.82	1,850	2,234	166.3	116,600	200,234	2,202,574
5,300	14-DI	947	4.41	1,868	2,230	156.6	121,900	100,117	2,302,691
15,900	14-DI	946	13.20	1,950	2,217	115.4	137,800	300,351	2,603,042
5,300	14-DI	941	4.36	1,949	2,212	113.9	143,100	100,117	2,703,159
15,900	14-DI	939	13.02	1,923	2,199	119.5	159,000	300,351	3,003,510
10,600	14-DI	926	8.46	1,893	2,191	128.9	169,600	200,234	3,203,744
21,200	12-200	923	43.36	1,900	2,147	107.1	190,800	261,820	3,465,564
5,300	12-200	922	10.82	1,950	2,137	80.7	196,100	65,455	3,531,019
5,300	12-200	901	10.37	1,900	2,126	97.9	201,400	65,455	3,596,474
5,300	12-200	877	9.86	1,900	2,116	93.6	206,700	65,455	3,661,929
5,300	12-200	876	9.84	1,809	2,106	128.8	212,000	65,455	3,727,384
15,900	12-200	839	27.26	1,883	2,079	84.9	227,900	196,365	3,923,749
10,600	12-200	839	18.17	1,869	2,061	83.1	238,500	130,910	4,054,659
5,300	12-200	833	8.97	1,881	2,052	74.0	243,800	65,455	4,120,114
10,600	12-200	829	17.77	1,826	2,034	90.2	254,400	130,910	4,251,024
10,600	12-200	827	17.69	1,755	2,017	113.2	265,000	130,910	4,381,934
10,600	12-200	800	16.64	1,818	2,000	78.8	275,600	130,910	4,512,844
10,600	12-250	797	15.79	1,861	2,300	190.0	286,200	161,226	4,674,070
5,300	12-250	794	7.84	1,900	2,292	169.8	291,500	80,613	4,754,683
10,600	12-200	791	16.30	1,923	2,276	152.8	302,100	130,910	4,885,593
84,800	10-200	772	285.88	1,960	1,990	13.0	386,900	771,680	5,657,273
386,900			725.87	5,657,273					

Mid Dakota Rural Water

Stephan East Profile



Mid Dakota Rural Water System
Distribution Pipelines

Item No.	Item	Units	Unit Price	Extension
1	2"-160	908,300	1.13	1,026,379
2	2"-200	657,200	1.19	782,068
3	2"-250	1,254,450	1.27	1,593,152
4	2"-315	5,078,750	1.38	7,008,675
5	2.5"-160	206,700	1.30	268,710
6	2.5"-200	181,200	1.40	253,680
7	2.5"-250	302,100	1.52	459,192
8	2.5"-315	736,050	1.65	1,214,483
9	3"-160	288,850	1.55	447,718
10	3"-200	164,300	1.69	277,667
11	3"-250	266,000	1.87	497,420
12	3"-315	742,350	2.07	1,536,665
13	4"-160	143,100	2.04	291,924
14	4"-200	63,600	2.28	145,008
15	4"-250	275,600	2.61	719,316
16	4"-DI	769,500	4.98	3,832,110
17	5"-160	116,600	2.67	311,322
18	5"-200	10,600	3.13	33,178
19	5"-250	123,900	3.56	441,084
20	5"-315	389,550	4.07	1,585,469
21	6"-160	106,000	3.45	365,700
22	6"-200	16,900	3.98	67,262
23	6"-250	32,800	4.64	152,192
24	6"-DI	84,800	6.84	580,032
25	8"-160	63,600	5.26	334,536
26	8"-200	31,800	6.17	196,206
27	8"-250	37,100	7.26	269,346
28	8"-DI	11,600	9.41	109,156
29	10"-160	58,300	7.68	447,744
30	10"-200	53,000	9.10	482,300
31	10"-250	84,800	10.81	916,688
32	12"-200	21,200	12.35	261,820
Total Pipeline				26,908,200
Miscellaneous items			15%	4,036,230
Total Pipeline				30,944,429



5809-3
**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

NOV 01 2006

5751-3
5809-3
5809A-3

Kurt Pfeifle
Mid Dakota Rural Water System Inc
PO Box 318
Miller SD 57362-0318

Dear Mr. Pfeifle:

Enclosed is Water License No. 5809A-3. This is the final document which completes the process of obtaining a water right. Also included is a copy of the map prepared by the staff engineer who conducted the field investigation.

As long as you use the water beneficially, as stated in the Water License, State Water Laws provide that you have a continuing right to use the water.

Sincerely,

Garland Erbele, Chief Engineer
Water Rights Program
(605) 773-3352

enclosures

Note: The applicable portions of Water Permit Nos. 5751-3 and 5809-3 were incorporated into Water License No. 5809A-3.

STATE OF SOUTH DAKOTA

WATER LICENSE NO. 5809A-3

(1) Mid-Dakota Rural Water System Inc., PO Box 318, Miller SD 57362 made Application No. 5809A-3, July 23, 2002 for a water permit to extend the length of time allowed for water to be put to beneficial use as authorized by Water Permit No. 5809-3 to June 6, 2008. Water Permit No. 5809-3 changed the location of the diversion point, increased the diversion rate and added users to Water Permit No. 5751-3. Nos. 5751-3 and 5809-3, combined authorize 16.55 cubic feet of water per second (9,999 acre feet of water annually) from the Missouri River, Hughes County, South Dakota for rural water system purposes.

The applicable portions of Water Permit Nos. 5751-3 (priority date of May 11, 1993) and 5809-3 (priority date of March 14, 1994) have been incorporated into this Water License No. 5809A-3.

(2) It is certified that the permit holder has complied with the provisions of South Dakota State Law relating to completion of the construction of the water supply system and is entitled to divert 16.55 cubic feet of water per second (cfs) for beneficial use. The location of the diversion point is 1,180 feet west and 1,550 feet north of the SE corner of Section 26, T112N, R80W (NE ¼ SE ¼)*.

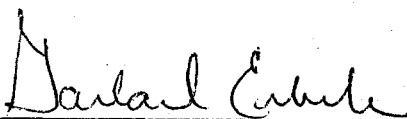
** The diversion point was to have been located in the SE ¼ SE ¼ Section 26. The actual location is in the NE ¼ SE ¼ Section 26. Pursuant to SDCL 46-5-13.1 and ARSD 74:02:01:14.01, the Chief Engineer made a finding that the change in location of the diversion point did not increase the potential for adverse effects to existing diversions.*

(3) The permit holder has complied with the provisions of South Dakota State Law relating to the application of water to beneficial use in supplying water to communities and rural hook-ups in Potter, Faulk, Sully, Hughes, Hyde, Spink, Beadle, Buffalo, Jerauld, Sanborn, Kingsbury, Aurora and Hand Counties in South Dakota.

(4) Pursuant to South Dakota Water Law 46-5-30.1 Mid-Dakota Rural Water System, Inc the holder and/or owner of Incorporated Water Right No. 5809A-3 is issued a license to appropriate water, the right to use 16.55 cubic feet of water per second from the Missouri River with priority dates of May 11, 1993 (16.49 cfs) and March 14, 1994 (0.06 cfs) from the location specified in (2) of this license. The water is used for rural water system purposes as outlined in (3) above.

This license is subject to South Dakota Water Law, any limitations or conditions listed in Incorporated Water Right No. 5809A-3 and subject to the following qualification:

- The Mid-Dakota Rural Water System, Inc shall report to the Chief Engineer annually the amount of water withdrawn from the Missouri River.



Garland Erbele, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

NOV 01 2008

date

