

Water Right Number 1633-2

1. Considered MAY 25, 19 78

2. Name of Applicant HAARON SCHOOL DISTRICT #27-1

3. Post Office Address PHILIP, S.D.

4. Amount of water claimed 2.00

5. Source of water supply 3750' DEEP WELL (MADISON FORMATION)

6. Water to be used for GEOTHERMAL HEAT FOR SCHOOL

Acres to be irrigated —

7. Water to be diverted and used in HAARON County
about IN CITY LIMITS miles of

8. Proof of Publication

Received 5-25-78

Net received —

9. Application

Approved —

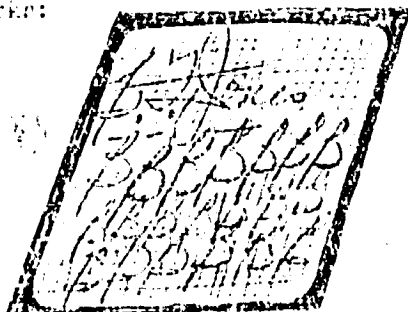
Subject to —

Not approved —

Action deferred —

*Requirements for
reconsideration*

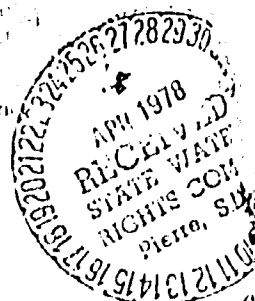
10. Remarks:



No. 1633-2Map No. 1397-2 Water Division No. 2 BAD RIVER

(Blank) to be filled by the Engineer for the D. W. C.

District



APPLICATION FOR PERMIT

To Appropriate Water within the State of South Dakota

(NOTE - Draw a line through items not applicable)

1. Name of Applicant HAAKON SCHOOL DISTRICT #27-1 859-2680Postoffice address Philip State South Dakota 57567

If a corporation show date and place of incorporation _____

2. Method of accomplishing work (contract, employment of others, or by direct labor) Contract

3. Name of diversion work _____

4. Amount of water claimed (cubic feet per second) approximately 2 cubic feet per second5. Source of water supply deep well into Madison Formation6. Location of point of diversion well - City of Philip NE 1/4 NE 1/4 S 1/4S 1/4 T 1 N R 2 E Block 3 High School AdditionCounty Haakon7. Annual period or periods during which water is to be used September 1 - May 308. Use to be made of water (irrigation industrial municipal, commercial, recreation, etc.) Geothermal heat for school9. For irrigation use, Total number of acres to be irrigated —

List below each forty acre subdivision, or lot, or fraction thereof and show number of acres to be irrigated in each.

Land Description	No. Acres Irr.	Land Description	No. Acres Irr.

Attach sheet if more space is needed

10. Time required to complete construction of water supply system 5 years. Additional time required to complete application of water to the proposed beneficial use 4 years.11. Choice of newspaper for Notice of Intent to Appropriate Water publication Pioneer Review, Philip, SD

12. Principal Features of the Proposed Water Supply System.

A. Works proposed to divert water from its natural source

Deep well

B. Works proposed to transport water to place of use.

Pipeline from well to school

C. Works proposed to apply water to beneficial use.

Deep well and pipelineEstimated Total Cost \$190,000Attachments: Attach Form 2A if diversion from a well or dugout or if storage of water is proposed. Attach map.
(See instructions concerning preparation.)

STATE OF SOUTH DAKOTA)

) ss.

County of Haakon)I, Darrel Brooks the applicant, certify that I have read the foregoing application and have examined the attached map and that the matters therein stated are true and that I intend, and am able to complete the necessary construction.Subscribed and sworn to before me this 27 day of April, 1978Signed Darrel Brooks
President of Board of Education

Notary Public (or other qualified officer)

My commission expires August 6, 1980

WATER RIGHT APPLICATION APPROVAL

The Water Rights Commission hereby approves Water Right Application No. 1633-2

HAakon School Dist. 27-1
(Applicant)

PHILIP
(Post Office Address)

SOUTH DAKOTA 57567 With the following modifications.

The well approved under this Permit shall be valved and the flow reduced to the minimum amount required for the uses served. The well shall also be equipped with a pressure recorder, and a record kept of any pressure fluctuations. Such records shall be available to the Commission upon request. If this well is abandoned or the Permit cancelled, the well must be plugged in accordance with specifications of the Water Rights Commission.

When definite plans are completed for secondary uses of this water, specific applications must be submitted to the Water Rights Commission for permits to cover such uses.

Secondary uses for total utilization of this water must be made within a five year period of construction of the well. (APPROVED 1-20-80)

Date of first receipt of application APRIL 26 19 78

Date of return to applicant for correction, amendments or changes required _____ 19 _____

Date of receipt of corrected application _____ 19 _____

Approved JULY 26 19 78 Recorded in Book 20 Page 45

WATER RIGHT PERMIT NO. 1633-2

The Water Rights Commission hereby grants and issues this Water Right Permit No. 1633-2 authorizing the construction of the water use system and the putting of water to beneficial use as stated in the Application and as modified in the Water Right Application approval, subject, however, to the following limitations and conditions.

1. The date from which applicant may claim right is APRIL 26 19 78
2. The equivalent of at least one-fifth of the work above specified is to be completed on or before JANUARY 26 19 81
3. The whole of said work is to be completed on or before JULY 26 19 83
4. The limit of time from proof of beneficial use of water appropriated in accordance herewith is JULY 26 19 87
5. The water appropriated shall be used for the purpose of GEOTHERMAL HEAT FOR SCHOOL
6. The prior right of all persons who, by compliance with the laws of the State of South Dakota, have acquired a right to the use of water must not be injuriously affected by this appropriation.
7. The amount of the appropriation herein granted shall not exceed 2.00 cubic feet per second; neither shall it exceed the capacity of the above described water supply system, nor shall it exceed the amount of water needed for USED FOR GEOTHERMAL HEATING actually and beneficially applied JULY 26 19 87 said water to be used during the following described annual period: SEPT. 1st - MAY 30th

Witness my hand this 31st day of JULY 19 78

WATER RIGHTS COMMISSION

By:

John Hatch
Chief Engineer, Executive Officer

Certificate of Construction issued _____ 19 _____

Water License issued _____ 19 _____

4409
23456789

12. Principal Features of the Proposed Water Supply System (continued.)

D. Well Information or Estimates

- (1) Drill Hole, Diameter Est. 9 3/4" & 6 1/4", Depth Est. 3750'+, 250'+
- (2) Casing, Type Steel (wood, concrete, steel, etc), Diameter 8", Thickness _____
- (3) Perforated Screen, Plan to use open hole in Pahasapa (Madison) Limestone
Type _____, Diameter _____, Length _____
- (4) Gravel Pack, Thickness _____, Length of gravel pack _____

E. Dugout Information or Estimates

- (1) Surface dimensions _____, Depth _____

F. Fill out for Either a Well or a Dugout.

- (1) Water Bearing Materials. (Please attach a copy to test well log if available.)

Character of Water bearing materials anticipate that water will be obtained from the Pahasapa (Madison) Limestone

Depth to top of water bearing material Est. 3750'+

Depth to bottom of water bearing material Est. 4000'+

Thickness of water bearing material Est. 250'+

Depth to water (ground surface to water level) +320 feet - existing well at Philip has head pressure of 140 PSI

- (2) Distance to nearest existing household or livestock watering wells.

On same owner's property None rds. On property owned by others None rds.

G. Water Storage Dams.

If the proposed water use system contains one or more water storage dams, please show in the space below, the height, maximum water depth, surface area and storage capacity of each storage dam. The location of each water storage dam should be shown on the water right map.

OTHER

It is anticipated that the 8" casing will be set and grouted from the ground surface to slightly into the Pahasapa (Madison) Limestone. It is anticipated that open hole completion of the well will be used, but during design, the need for well screen will be evaluated, and, if necessary, a well screen will be included in the final plans and specifications.

Donald D. Brooks, Pres
Signature of Applicant
Heaven Lake Dist #271
Philip, J. D.

Form C - Notice of Intent to Appropriate Water
GROUND WATER

No. 1633-2

Publish first publication, on or before May 12, 1978

NOTICE OF HEARING ON
APPLICATION TO APPROPRIATE WATER

Pierre, South Dakota 57501

May 3, 1978

Notice is hereby given that the Haakon School District # 27-1 whose post office address is Phillp, South Dakota, has made an application in accordance with the provisions of SDCL 46-1-1 thru 46-1-8; 46-2-9 thru 46-2-11, 46-2-13; 46-5-1 thru 46-5-8, 46-5-10 thru 46-5-22, 46-5-41, 46-6-3, 46-6-5, 46-6-6.1, 46-6-10, 46-6-14 and Commission Rules ARSD 52:01:01:01 thru 52:01:01:13, for a permit to appropriate for beneficial use 2.00 cubic feet of water per second or time from groundwater (one well) through ~~the~~ a deep well into Madison Form-, the point of diversion of which is to be located in the NE 1/4 NE 1/4 SE 1/4 section

of Section 14, Twp. 1N Range 20E. Said water to be used for the purpose of providing ~~irrigation to portions of the following described land:~~

geothermal heat for school

This Application No. 1633-2 will be considered by the Water Rights Commission at

Pierre SD upon the 25th day of May, 1978 at 10 A.M. The Commission is authorized to make a determination on this application at the hearing. All interested persons may appear and be heard. Any person who may be affected by a Commission decision who desires to present evidence or cross-examine witnesses according to SDCL 1-26 may notify the Commission in writing prior to the hearing or orally at the hearing

NOTE: The final proof of publication must be received before the hearing date for the Commission to take action.

WATER RIGHTS COMMISSION

Betty Westlund
Water Rights Specialist

cc: Haakon School District # 27-1
Phillp SD 57567

STATE OF SOUTH DAKOTA.)
) ss.
County Hauken)

Water was taken from the Pioneer-Review

City _____ of Philip _____

May 11, 1978

May 18, 1973

Carl F. Kellie

(Signature)

Publisher
(Title)

May 25, 1978
(Date Signed)

Pierre, South Dakota 57501
May 3, 1978

Notice is hereby given that the Haakon School District #27-1 whose post office address is Philip, South Dakota, has made an application in accordance with the provisions of SDCL 46-1-1 thru 46-1-8; 46-2-1 thru 46-2-11, 46-2-13; 46-5-1 thru 46-5-8, 46-5-10 thru 46-5-22, 46-5-41, 46-6-3, 46-6-5, 46-6-9.1, 46-6-10, 46-6-14 and Commission Rules ARSD 52:01:01:01 thru 52:01:01:13, for a permit to appropriate for beneficial use 2.30 cubic feet of water per second of time from groundwater (one well) through a deep well into Madison Formation, the point of diversion of which is to be located in the NE¼ NE¼ SE¼ of Section 14, Twp. 1N Range 20E. Said water to be used for the purpose of providing geothermal heat for school.

This application No. 1633-2 will be considered by the Water Rights Commission at Pierre S.D. upon the 25th day of May, 1976 at 10:00 A.M. The commission is authorized to make a determination on this application at the hearing. All interested persons may appear and be heard. Any person who may be affected by a Commission decision who desires to present evidence or cross-examine witnesses according to SDCL 1-26 may notify the Commission in writing prior to the hearing or orally at the hearing.

**WATER RIGHTS
COMMISSION**
Betty Westlund
Water Rights Specialist
(Publish May 11, & 18, 1978)

541.

Received
5-25-78

(1633-2)

Department of Natural Resource Development

WATER RIGHTS COMMISSION

Joe Foss Building, Pierre, South Dakota 57501
Phone 605/224-3151

July 19, 1978

TO: Persons concerned with Water Right Application No. 1633-2, Haakon County School District No. 27-1

FROM: John Hatch, Chief Engineer, Water Rights Commission

SUBJECT: Notice of Reconsideration Hearing on Application No. 1633-2

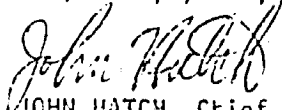
The Water Rights Commission will reconsider Water Right Application No. 1633-2 at 4:00 p.m., July 25, 1978 at the Roosevelt Room, Ramada Inn, Junction of Highway 38E and I-29, Sioux Falls SD.

This reconsideration hearing will be conducted in accordance with the provisions of SDCL 46-1-1 thru 46-1-8; 46-2-9 thru 46-2-11, 46-2-13; 46-5-1 thru 46-5-8, 46-5-10 thru 46-5-22, 46-5-41, 46-6-3, 46-6-5, 46-6-6.1, 46-6-10, 46-6-14 and Commission Rules ARSD 52:01:01:01 thru 52:01:01:13.

Application No. 1633-2 was deferred by the Water Rights Commission on May 25, 1978, pending Staff investigation.

After reconsideration of Application No. 1633-2 the Commission can approve, defer, or deny all or part of the Application.

Very truly yours,


JOHN HATCH, Chief Engineer
Water Rights Commission

NOTICE SENT TO:

Charles A. Maxen, Supt.
Haakon Co. School District #27-1
Phillip SD 57567

R. O. Berg
115 St. Joe Street
Rapid City SD 57701

1633-2
July 24, 1978

TO: WATER RIGHTS COMMISSION
FROM: BAD RIVER RURAL WATER SYSTEM
SUBJECT: WATER RIGHT APPLICATION NO. 1633-2

This letter is to inform the South Dakota Water Rights Commission of our intent to utilize water from the Haakon County School District well, if permit No. 1633-2 is granted.

Our group has held two organizational meetings and has selected a Steering Committee. We have met with the School Board and have received assurance that water would be made available to our System if the geothermal project develops.

Initial contact with the Environmental Protection Agency and the Public Health Service indicated that minimal treatment (chlorination) would make the water potable.

We are currently in the process of conducting a detailed water needs survey to determine the extent of interest. Contact will be made in the near future with engineering firms to conduct a preliminary engineering and feasibility study.

The Steering Committee on behalf of the Bad River Rural Water System wholeheartedly encourages your support and approval of Water Right Application No. 1633-2 to improve the standard of living for many Haakon County residents.

Doug Hauk, Vice-Chairman

Doug Hauk

Mel Smith
Mel Smith, Chairman

Keith Kuchenbecker
Keith Kuchenbecker, Sec.-Treas.

July 20, 1978

TO: SOUTH DAKOTA STATE WATER RIGHTS COMMISSION
FROM: OLD TRAIL RURAL WATER USERS ASSN.
PHILIP, SD

Gentlemen:

I am writing this letter on behalf of the "Old Trail Rural Water Users Association." We came into existence approximately two and one half years ago when most of the stock dams and domestic wells in our area were sadly depleted. Most of us were on the verge of desperation; indeed, some were hauling all the water for their homes and livestock. Of course, since that time things have changed, and although the need for a better more dependable water supply is not so immediate the long term outlook is bleak. Most of the older, larger stock dams that could be relied upon through a year or two of subnormal rainfall are silting in, their capacity greatly diminished. Surface wells in this area are marginal at best. Thus, we have kept the association alive in the hopes that before the next drought some sort of supply and delivery system could be developed. To date, most of the options have been far too costly.

Recently we became aware of the geothermal heating experiment proposed at the school system in Philip. According to Superintendent Charles Maxon, there would be some volume of water available to rural or other users after the heat has been extracted. Although the location of the water would not be optimum, nevertheless a substantial cost in building our system would be overcome.

Originally we planned to serve about twenty-five users, but in bringing the water from Philip to our delivery system probably an additional fifteen or twenty potential users would exist. This would lower the cost per user even further. For these reasons we are quite anxious to see the geothermal heat project continue and hope that the Water Resources Commission will look favorably on the application for this water permit.

Cordially,

KENNETH MCILRAVY

Kenneth McIlravy
HAROLD MC DANIEL *Harold McDaniel*
OFFICERS
OLD TRAIL RURAL WATER USERS ASSN.
PHILIP, SD

OFFICE OF SUPERINTENDENT
ELEMENTARY PRINCIPAL
HIGH SCHOOL PRINCIPAL

Phone 859-2679
859-2001
859-2680

Dear Mr. Hatch:

In order to remove the Radium 226, we will have to treat the water with Barium Chloride. According to the E.P.A., it should then be in a state that it can be discharged. The initial cost of the Ba Cl treatment plant will be approximately \$90,000 and the maintenance cost per year should run about \$3,000. This has delayed us from using the hot water during the current heating cycle. We anticipate that, avoiding any other adversities, we will be using the Madison water to heat during the 1980-81 heating cycle.

All of this has presented us with the additional problem of finding a secondary use for the water after heat extraction. We have been able to line up a heating district in the downtown Philip area. There is a group of 7 or 8 businesses that plan to hook on and heat direct with the water. They will come before the Water Management Board with a request for this. Our discharge will be at a point where it will be picked up for some irrigation and there will be livestock watering. We have not found a total consumption use for the water. I am sure that we will not be able to do this by 1984.

We would request from the Water Management Board:

- (1) Extend the time period from 1984 to 1990, or
- (2) In light of the energy shortage, declare geothermal

Haakon School District No. 27-1

PHILIP, SOUTH DAKOTA 57567

OFFICE OF SUPERINTENDENT
ELEMENTARY PRINCIPAL
HIGH SCHOOL PRINCIPAL

Phone ES9-2179
ES9-2301
859-1680

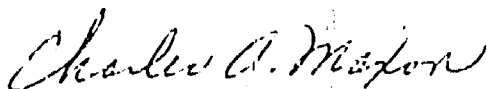
John Patch
December 18, 1979
Page 2

space heating a beneficial use and not require total consumption of the water after heat extraction.

Since the permit was for 200 cu.ft/sec or 897 gallons per minute, and our use will not exceed 300 gallons per minute, we feel that this would justify an extension of the time period. In light of the energy shortage and our saving 36,000 gallons of fuel oil, over 100,000 KWH of electricity, plus the propane to heat two small buildings, there is justification for declaring geothermal the beneficial use of Madison water. Also, the heating district will save additional thousands of gallons of fuel oil and propane.

Any and all consideration given to us by the Water Management Board will be appreciated. If you feel it necessary, I will be available to explain our situation to the Board when they meet in January.

Sincerely,



CHARLES A. MAXON, SUPT.
HAAKON SCHOOL DISTRICT 27-1

CAM:ph

J. Kitch



ENGINEERS • ARCHITECTS • LAND SURVEYORS • PLANNERS
BRADY CONSULTANTS, INC.

Respond to Spearfish Office

July 16, 1979

Acct. No. 79-53

Mr. Richard Howard
Deputy Secretary
Department of Water and Natural Resources
Joe Foss Building
Pierre, South Dakota 57501



RECEIVED

JUL 17 1979

DEPT. OF WATER &
NATURAL RESOURCES

Re: Water Treatment
Philip, South Dakota

Dear Mr. Howard:

The attached map shows the proposed treatment facilities. A description of the system is as follows:

1. The school well will flow at 250 G.P.M.
2. The water will be used for heating in the school and several buildings.
3. The water will then be pumped, if necessary, to the plant location.
4. 226 Ra will be removed by adding a 10% aqueous solution by weight of barium chloride to the water in a static mixer.
5. Two settling ponds will allow the flock to settle out, 36 hr. detention time.
6. About 82% of the T.D.S. will be removed in a reverse osmosis unit.
7. The discharge from the R.O. plant, 50 G.P.M., will run down the dry draw east of the water tanks. This water will have approximately 4500 ppm T.D.S. and < 2 pCi/l 226 Ra.



POST OFFICE BOX A
SPEARFISH, S.D. 57703

550 COLORADO BLVD.
PHONE 605 / 642 - 2656

POST OFFICE BOX 1329
GILLETTE, WYO. 82716

1601 DOUGLAS HIGHWAY
PHONE 307 / 682 - 8446

Mr. Richard Howard
July 16, 1979
Page 2

8. The processed water, 200 G.P.M. $\pm$, will be pumped into the existing potable water tanks. This processed water will have 200 ppm T.D.S. and < 2 pCi/l ^{226}Ra .

When the City does not need the water, the barium chloride treated water will be discharged down the afore mentioned dry draw. This water will have 1100 ppm T.D.S. and < 2 pCi/l ^{226}Ra . It is anticipated this discharge will average 150 G.P.M. daily in the winter. This would be reduced if the City sells water to the rural water district. During the summer months when the school well will be closed down, the City will rely on Lake Waggoner for their water supply.

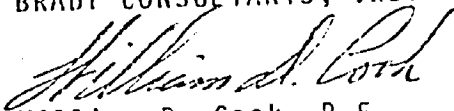
We request that the City be allowed to discharge into the dry draw under the conditions mentioned above.

The system outlined will satisfy the ^{226}Ra problem and provide a secondary use for the water.

If you have any questions, contact Dan Bjerke or myself.

Respectfully submitted,

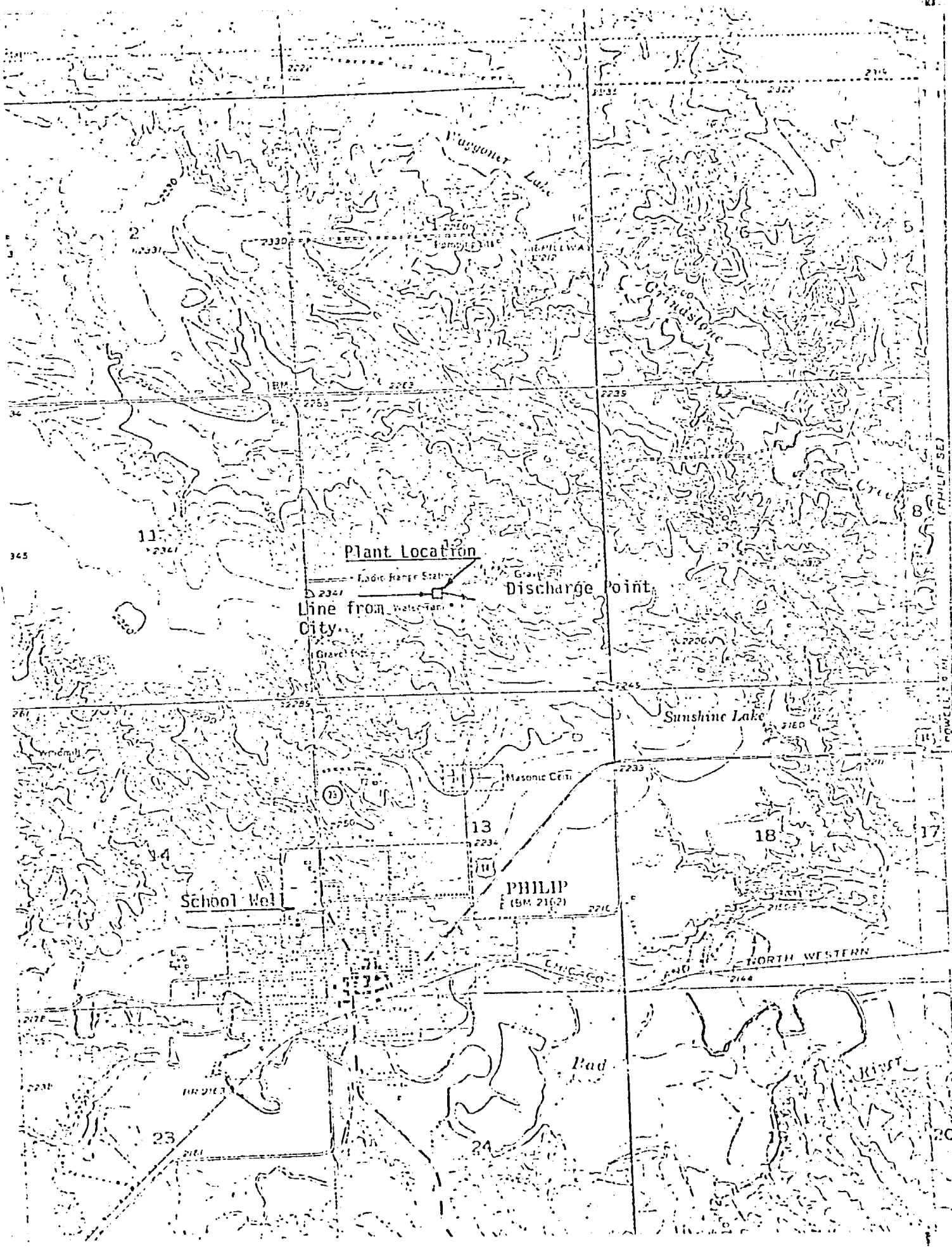
BRADY CONSULTANTS, Inc.



William D. Cook, P.E.
President

WDC/me
Enclosures

cc: Richard O. Berg



Plant Location

Line from City
Discharge Point
Gravel Pit

School Well

PHILIP
(BM 2162)

Masonic Cn

Sunshine Lake

Wagner Lake

Gravel Pit

Bad

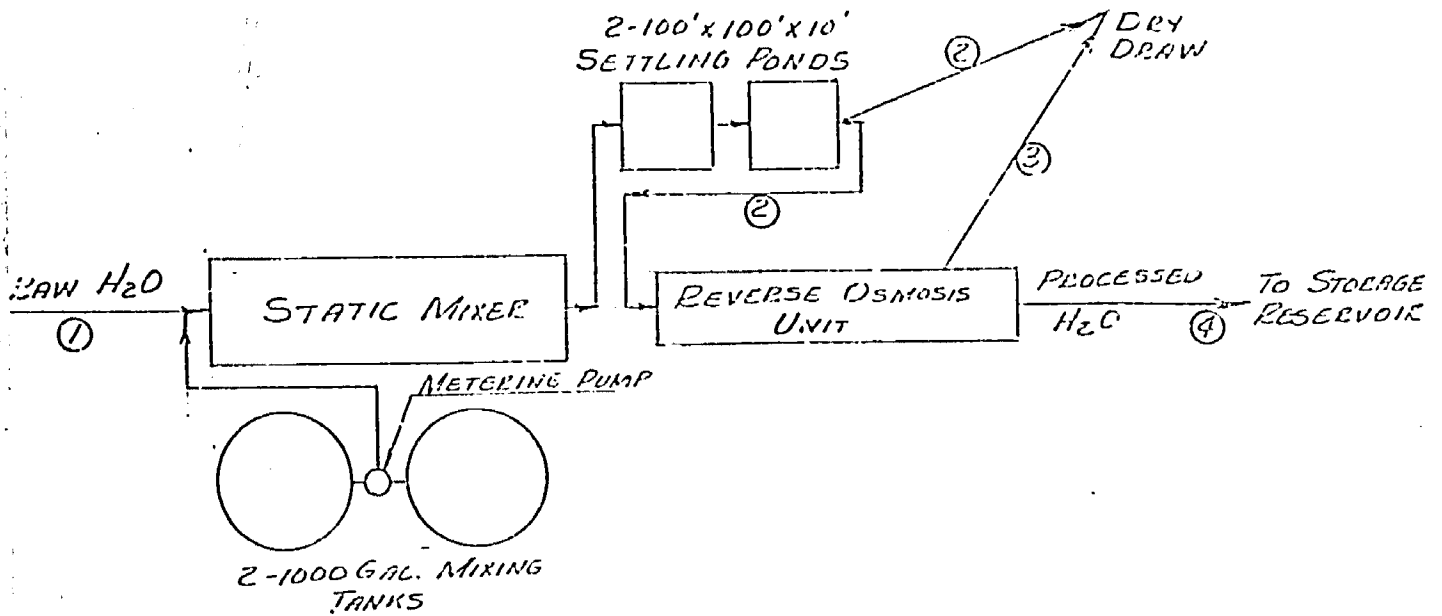
River

NORTH WESTERN

CHICAGO

PHILIP SE
POWELL 100 ft

PROPOSED TREATMENT FACILITY
Philip, South Dakota



WATER QUALITY

- | | |
|--|---|
| <p>1. 250 G.P.M.
80° F±
1100 ppm T.D.S.
155 pCi/l</p> | <p>3. 50 G.P.M.
65° F±
400 ppm T.D.S.
< 2 pCi/l</p> |
| <p>2. 250 G.P.M.
70° F±
1100 ppm T.D.S.
< 2 pCi/l</p> | <p>4. 200 G.P.M.
60° F±
200 ppm T.D.S.
< 2 pCi/l</p> |

ERDA PROPOSAL COVER SHEET

VOLUME 1

Research Proposal Submitted to the Energy
Research and Development Administration
Geothermal Energy Division
San Francisco Operations Office

SUPPLEMENTARY DATA
TECHNICAL

1677

Program Research and Development Announcement
For Direct Utilization of
Geothermal Energy Resources
POB EG - 77-N-03-1553

Proposal No. 1553-77-27-1

HAARON SCHOOL DISTRICT #27-1

Name of Organization

ACADEMIC

Organizational Classification

310 N. SCHOOL, PHILIP, HAARON COUNTY, SOUTH DAKOTA 57557

Address of Organization

DIRECT UTILIZATION OF GEOTHERMAL ENERGY FOR THE PHILIP SCHOOLS

Title of Proposed Project

Funds Requested _____ Proposed Duration 150 days _____ Requested Starting
Date May 10, 1978

Name of Principal Investigator CHARLES A. MAXON
Position and Title SUPERINTENDENT, HAARON SCHOOL DISTRICT #27-1

Address 310 N. SCHOOL, PHILIP, SD 57557

Telephone 605-353-2579 Business Phone: 605-859-2437 Home Phone _____

ENDORSEMENT

Principal Investigator Department Head Authorized Representative

Name Charles A. Maxon Charles A. Maxon Charles A. Maxon

Title Superintendent Superintendent Superintendent

Date November 23, 1977 November 23, 1977 November 23, 1977

Application Type EDUCATIONAL

Proposal Submission Date November 23, 1977 Proposal Expiration Date May 10, 1978

CONSENT STATEMENT

Consent is hereby given for outside government individuals to have access to
our proposal.

DIRECT UTILIZATION OF GEOTHERMAL
ENERGY FOR THE PHILIP SCHOOLS

ABSTRACT

A study performed by Hengel, Berg and Associates for the Haakon School District #27-1, Philip, SD, indicated that it would be feasible to heat the school buildings at Philip with geothermal energy from the Madison Formation. The study was completed in June, 1977.

Studies completed by the South Dakota School of Mines and Technology principle investigator,,D. J.P. Gries, "Geothermal Applications on the Madison Aquifer System in South Dakota" September 1977 indicate that geothermal energy in the Haakon County South Dakota area could be used to heat the entire community.

The school district does not have the available resources to implement the project. With financial help from ERDA, along with the resources of the school district, this project can be carried to completion.

The completed project would verify the estimate of cost of implementation, verify the water quality and prove the dependability of using geothermal heat from the Madison Formation.

The scope of the project will be to drill a well into the Madison Formation, convert the present steam and electrical heating systems to hot water systems, by using water to water shell and tube heat exchangers. Known data indicates that the well temperature will be 156° F. which is hot enough to heat the buildings in this manner.

This project will establish instrumentation to monitor the quality and quantity of flow, and provide test data and information to others who are interested in using geothermal energy. The information collected on this direct application will provide the last link between the theoretical and the practical. This project will verify theories advanced by previous studies, provide a solid application of geothermal energy which should encourage further

development.

The project implementation will provide low cost heat to the school buildings, conserve fossil fuels, and provide useful information for other prospective users of geothermal energy.

This project should assist others, who are interested in utilizing the geothermal energy, in obtaining the necessary financing from lending institutions to complete their projects.

The water has several possible uses after flowing through the school heating system. Among these are potential heating uses in a residential application, commercial applications, notably the possible summer use of the heat to dry grain. There are also recreational and domestic water uses.

Letters of intent and expressions of interest are attached to
Volume I.

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SUMMARY DATA (Volume 1A)

1. The proposer of this project is the Haakon School District #27-1, Haakon County, Philip, South Dakota 57567.

Total Capability Team

2. The "Total Capability Team" will include the following:
Charles A. Maxon, Superintendent of Schools, Haakon School District #27-1, will coordinate the work of the sub-contractors and supervise the project to its completion. His office will negotiate the contracts and sub-contracts. It will also handle the fiscal and required reporting.

The architectural and engineering firm of Hengel, Berg and Associates, Rapid City, South Dakota will perform the following tasks:

1. Preliminary design
2. Final design
3. Construction documents
4. Construction observation
5. Technical Assistance during Monitoring and Reporting Phase

A graduate student from the South Dakota School of Mines and Technology, Rapid City, South Dakota under the supervision of Dr. D.D. Carda will perform the following tasks at the Mining and Engineering Experiment Station on the SDSM & T campus and or at the project site in Philip, South Dakota.

1. Chemical analysis
2. Corrosion analysis
3. Water quality analysis
4. Collect data, make field test
5. Report findings to principal investigator

Status of Proposed Project

3. In June of 1977 the firm of Hengel, Berg and Associates, Rapid City, South Dakota completed a feasibility study for the direct utilization of geothermal energy to heat the school buildings at Philip. This study was done at the request of the Board of Education.

The study showed that it would be economically feasible to proceed with the project. Of several alternatives offered, the most viable proposal presented would be to drill a well on the school site. The board has agreed that this alternative (among five presented) was the best route in which to proceed.

Implementation of the project could not be accomplished as the school district does not have the financial resources to undertake an endeavor of this magnitude. With financial help from ERDA, the school district will be able to implement direct utilization of geothermal energy from the Madison Formation to heat the school buildings at Philip.

The initial phase of the project will be to drill a well, convert the existing steam heating system to hot water heat, field test and monitor the project.

4. Project Site

The project site will be at Philip, Haakon County, South Dakota. The actual well site will be on school district property which is immediately adjacent to the school buildings which are to be heated.

5. Geothermal Resources

At the present time, the City of Philip has a well located 2½ miles northeast of the City. The depth of the well is 4,010 feet with the source of the flow being the Madison Formation. The temperature of the water is 154 degrees fahrenheit and it free flows at 1,040 gallons per minute with a pressure of 145 pounds per square inch. The City of Midland, which is located 28 miles east of Philip, also has a well in the Madison Formation with a temperature of 160 degrees fahrenheit.

There is every reason to believe that a new well located at the school site in Philip will have the same potential as those mentioned above.

422

The capacity of the well (drilled to the same depth and similar diameter) will be more than is needed to heat the school. Therefore, plans have been set in motion to use the heat for other purposes as outlined in Volume IB-2(c) of this proposal.

6. Status of Geothermal Rights

The South Dakota State Water Commission will grant water rights to the school district for extraction of water from the Madison Formation.

7. Status of Ownership

The school district owns the land on which the well is to be drilled. Since it is immediately adjacent to the school buildings, no easements will be required. All of the buildings to be heated are owned by the school district.

8. Status of Financial Arrangement

The Board of Education of Haakon School District #27-1 voted unanimously to commit \$75,000 cash and up to \$25,000 in-kind payment to this project. They have also gone on record to turn the well over to the City of Philip, a public utility company, or a development corporation for other uses in the community. The school district will have to retain its vested interest in the well and arrangement with the ultimate owner will be made to insure that an adequate supply of geothermal energy is furnished to the school.

9. Funding Summary

The estimated total cost of the project is \$ 483,762 The school district will invest \$75,000 cash and up to \$25,000 in-kind payment. The cost-share from ERDA that we are requesting under this PON is \$ 383,762

TECHNICAL PROPOSAL (VOLUME 1B)

1

SUMMARY

The proposed project will use the available geothermal energy from the Madison Formation to heat the Haakon School District 27-1 buildings located at Philip, South Dakota. The geothermal energy will be used in a heat transfer system. The proposed project will require a well, piping, heat exchangers and terminal heating units. Geothermal energy will replace petroleum and electrical energy presently used to heat the buildings. There will be a net savings of petroleum and electrical energy. After the required heat is removed the well water will be piped to Lake Sunshine Reservoir and Recreation Area where it will be held for secondary users.

2(a)

PROGRAM OBJECTIVES

The objectives of the program are:

1. Provide low cost energy to heat the school facilities.
2. Conservation of fossil fuel.
3. Conservation of electrical energy.
4. Provide an energy source for other users in future development stages.
5. Provide information to other potential users of geothermal heat.

The Haddon School District 27-J retained Hengel, Berg & Associates to do a feasibility study to convert the Philip School Buildings to geothermal heat. This decision to make the feasibility study was influenced by two items.

1. The high cost of fuel and the prospect of fuel cost going higher.
2. The availability of natural hot water from the Madison Limestone Aquifer which underlays this area.

The study was initiated with the idea of using the water from the well owned by the City of Philip. This well is located at a recreation dam named Lake Waggoner which is located 2-1/2 miles from the City.

The City owned well is a free flowing well of approximately 1040 gallons per minute with a water temperature of 154° F.

The City of Philip has used this well as a source of water for the City. The water first has to be cooled in the Lake and is then pumped to town.

The City of Philip was receptive to the idea of letting the School use the water to heat their facility, however, the cost estimate made in the feasibility study indicates that the cost of the water line from the well to School would be equal to the cost of drilling a new well. Because of age of the existing well, it appears advisable to drill a new well near the School.

The Philip School consists of a complex of three buildings constructed at different times. Two of these buildings are heated with fuel oil fired steam boilers. The third building is heated with electricity.

The study of the system indicates that a conversion of the existing steam system can be made by:

1. Modifying the existing coils in the fan coil units.
2. Modify the fin tube radiation units.

3. Provide a water to water shell and tube heat in at the boiler room areas, which will be connected to the existing piping.
4. Provide a new system for the building heated electrically.

2(c)

PRESENT AND PROSPECTIVE USERS

Phase I of this project is direct utilization of geothermal energy to heat the school buildings at Philip. The South Dakota Housing Authority has plans to build elderly housing units in Philip with the intent of heating with geothermal heat. The City of Philip has an interest in heating public buildings, heating its swimming pool, and possibly using the water as a supplement to its present water supply.

There is a great deal of interest from the business community to convert their present heating systems to hot water heat. Some businesses currently heat their establishment with hot water from the Inyan Kara Formation. Their cost savings are known to others and thus it will not be a matter of selling an idea that is not a close reality.

There is interest at the national level to use a town the size of Philip (population 1000) as a model for complete business and residential heating. In a discussion with F. C. Paddison, John Hopkins University, it was pointed out that the geothermal potential is available at Philip to do this. Philip is a viable, progressive, growing community which, if monetary resources become available, can undertake and accomplish a project of this magnitude.

After the heat has been extracted, the water would be available for use by the City as an increase to its present water supply. There is also the possibility of establishing a rural water system for the ranchers in the immediate area. Western South Dakota is semi-arid and this water could be used for human and livestock consumption as well as irrigation in times of drought. Full utility from heat extraction to water consumption, with minimal waste, can be accomplished.

Another potential use of the heat would be for grain drying. Western South Dakota produces a vast quantity of wheat which could be dried at Philip during the months from June to September when other users would not have a demand for the heat. Thus, best useage would be year round.

Appendix D has letters of intent and support for this project.

2(d)

ENERGY DEMAND

The present school facilities has a total space heating requirement of 3365 MBH and a domestic water heating requirement of 200 MBH. This energy demand could be satisfied with 425 gallons per minute of water extracted from the Madison Formation. The water temperature leaving the well and entering the heat exchanger would be 150° F./66°C. The temperature of the water leaving the heat exchanger would be 130° F./54°C.

This quantity of water at 150°F./66°C. can be supplied from the Madison Formation as evidenced in the study by Dr. J. P. Gries, "Geothermal Applications on the Madison Aquifer System in South Dakota," September 1977. Also as evidenced by the Philip well that produces water at 154° F. and the Midland well that produces water at 160° F. The Philip well is approximately 17 years old and water temperature and pressure has remained constant since the well was drilled.

2(e)

LIFE-CYCLE ENERGY COSTS

A review of energy consumption for the past five years provides the following information:

1. In order to heat the two buildings that have steam heating systems, 36,200 gallons of fuel oil is consumed per year.
2. In order to heat the one building that is heated with electricity, 125,000 kilowatt hours of electrical energy is consumed per year.

The estimated quantity of energy that would be consumed during the design and construction of the geothermal heat conversion would be as follows:

1. Travel to Philip from Rapid City by design and research consultants - 700 gallons of gasoline.
2. Travel to Philip from major supply areas by skilled trades people - 300 gallons of gasoline.
3. Energy consumed by drilling equipment, excavating equipment and compaction equipment - 1000 gallons of diesel fuel and gasoline.

The estimated quantity of electrical energy that will be consumed per year to pump the hot water through the system is 28,000 kilowatt hours.

The completed conversion to geothermal heat would provide a net savings of energy the first year as follows:

1. Petroleum energy - 34,000 gallons
2. Electrical energy-107,000 KWH

During the years following the conversion to geothermal heat there will be a net savings per year as follows:

1. Petroleum energy - 35,200 gallons
2. Electrical energy-107,000 KWH

For the 30 year estimated life of the system there will be a total energy savings of 1,084,000 gallons of petroleum energy and 3,210,000 KWH of electrical energy.

2(f)

BENEFITS TO USER GROUP

The near term and long term economic benefits to Haakon School District 27-1 will provide a net decrease in energy costs. Using a 5 percent inflation rate, the annual savings in energy costs will average \$25,000 per year for the first ten years and average \$28,000 per year for the next twenty years.

2(g)

DESCRIPTION OF SYSTEM

The proposed system includes a new well drilled to the Madison Formation. The well will be sized to provide a free flowing well that will provide a minimum of 425 gallons per minute. The water will be piped to the buildings using the well pressure. (See Figure 1). The raw well water would be chlorinated to reduce the corrosive action of the water.

The well water will flow through a water-to-water shell and tube heat exchanger where the heat from the well water will be transferred to the closed system building heating water. (See Figures 2, 3, and 4)

After passing through the heat exchanger the water will be piped to Lake Sunshine Reservoir and Recreation Area where it will be held for secondary users. (See Figure 6)

Appropriate monitoring and recording devices as further described in the Acceptance and Test Plan will be provided for data collection.

The existing steam heating system in two of the buildings will be modified so that the closed system hot water can be pumped to the modified fin tube radiation units and the modified fan coil units. New fan coil units would be provided in the one building that is presently heated with electricity.

A similar heat exchanger will be used to heat domestic hot water.

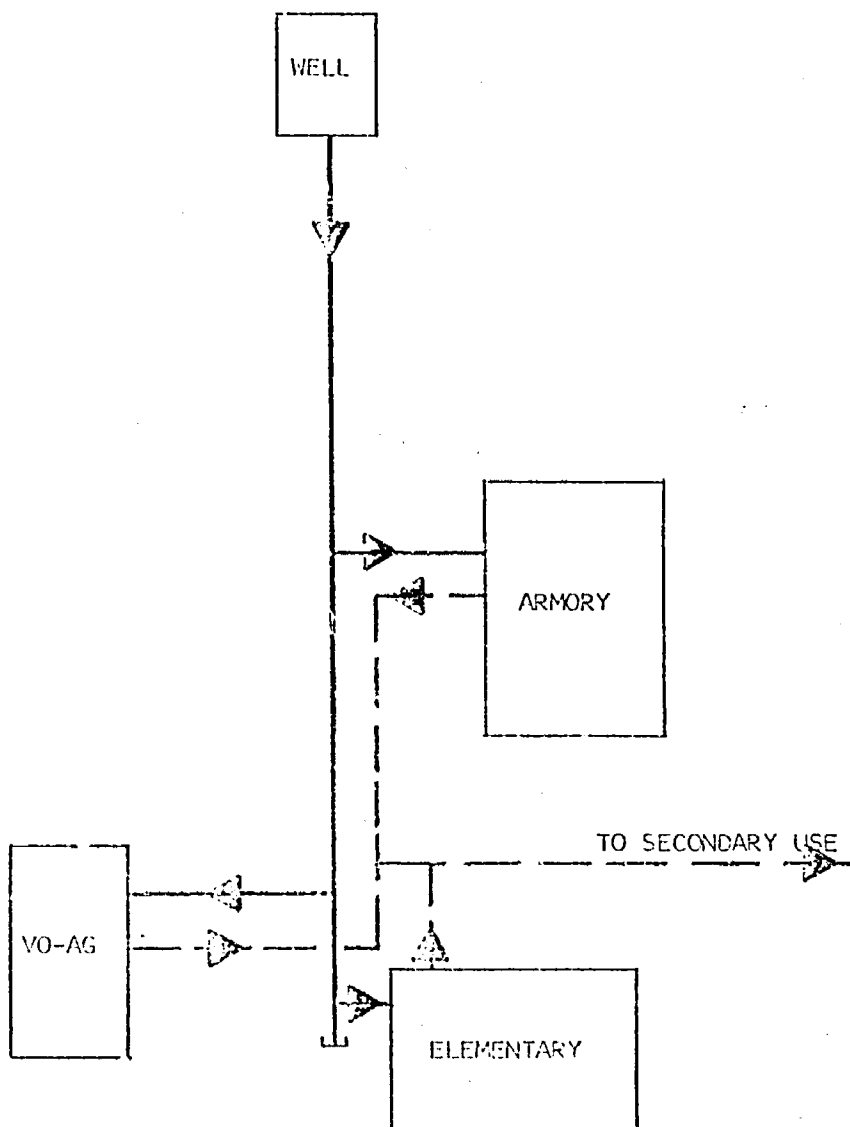
The existing steam boiler system, will be modified with the addition of a steam-to-water shell and tube heat exchanger for a stand-by or back-up system. (See Figure 3)

None of the equipment proposed to be used normally has a long-lead time for procurement.

2(h)

FINAL DESIGN

Final design specifications have not been completed.



	ARMORY	ELEMENTARY	VO-ED
HEATING LOAD - MBH	2,416	1,446	424
GPM @ EWT = 150 ⁰ , LWT = 130 ⁰	252	150	45
BLDG. FLOOR AREA - S.F.	20,088	15,356	6,252
BLDG. VOLUME - C.F.	327,690	154,223	83,124

FIG 1

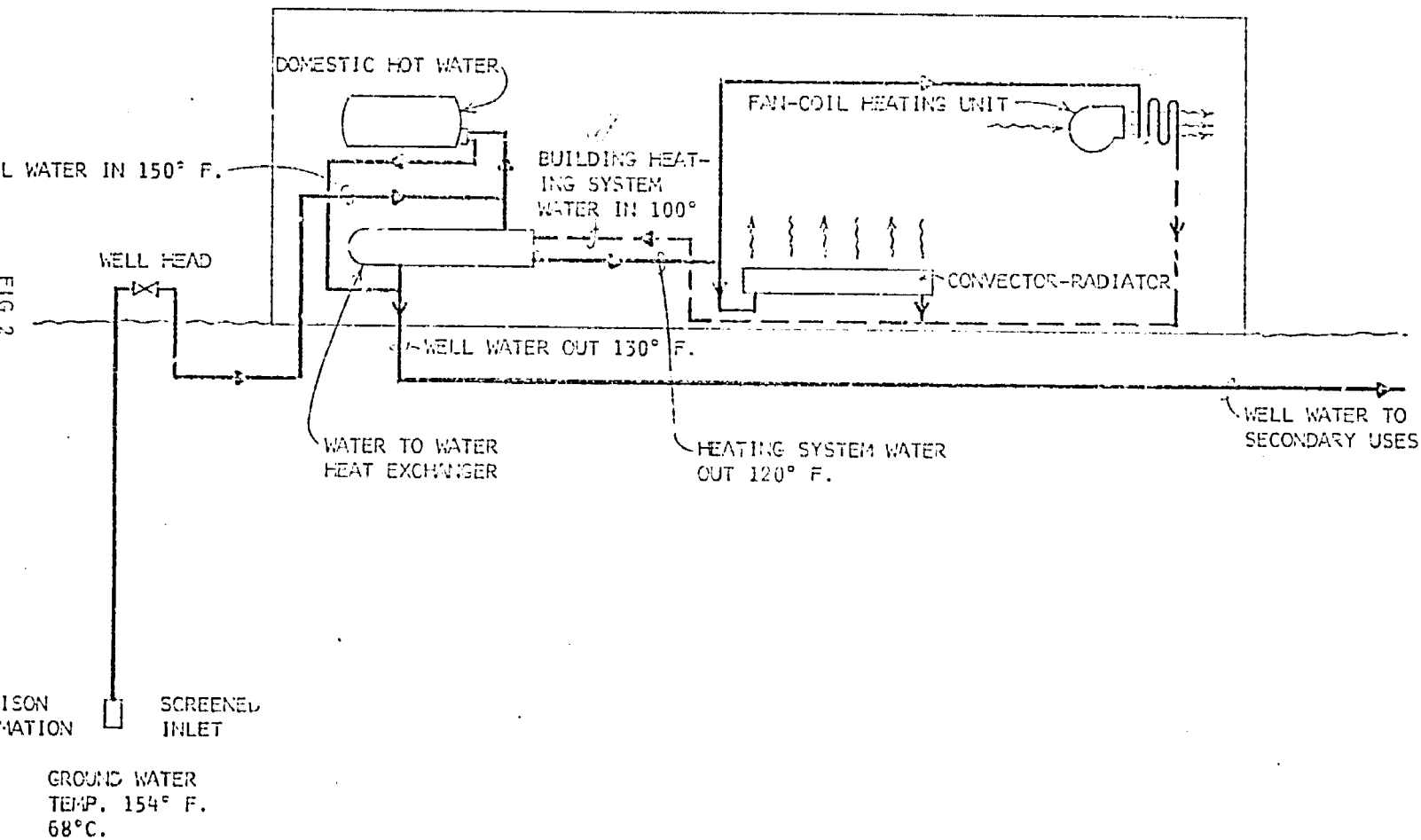
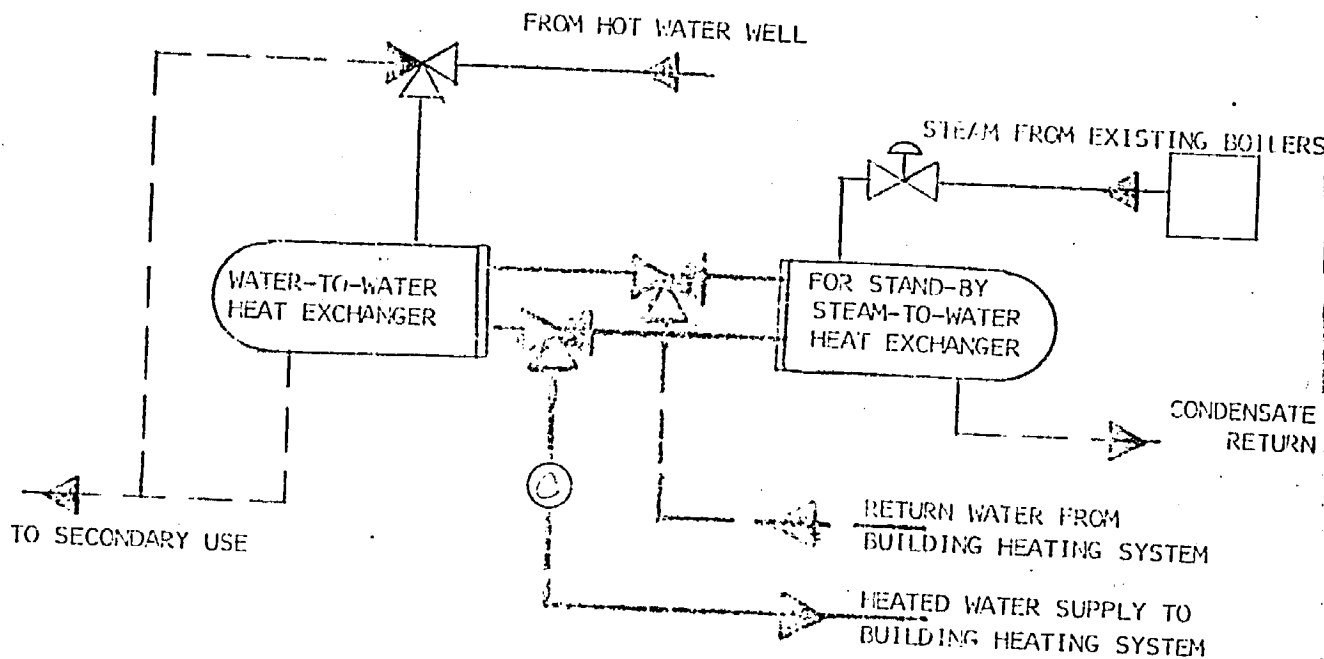


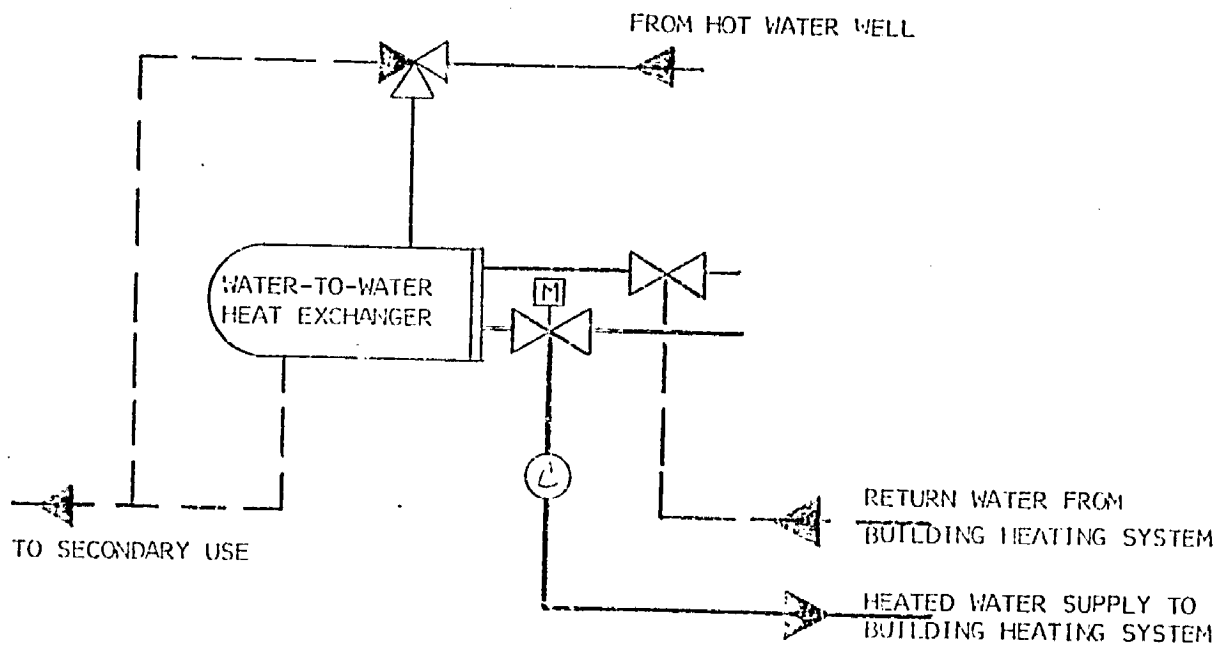
FIG. 2

ION
ATION

EDUCATION
 NO. 1
 DATE MICROFILMED
 CAMERA OPERATOR



WATER UTILIZATION DIAGRAM
TYPICAL FOR AUDITORIUM & ELEMENTARY



WATER UTILIZATION DIAGRAM
VOCATIONAL EDUCATION BUILDING

FIG 4

2(i)

SCHEDULE

The design/construction/installation schedule was developed to show the orderly sequence of tasks required to complete the project. The zero date is the day when notice to proceed is received.

See Figure 5 and 5A for schedule.

2(j)

SITE AND FACILITIES

Drawings of site, access routes and piping are shown on Figure 6, 6A, & 6B.

2(k)

OPERATION AND MAINTENANCE DEVELOPMENT PLAN

The construction specifications will require that the contractor provide an operating and maintenance manual. The manual is to include the equipment, manufacturer's specifications, parts list and recommended maintenance action by the Owner.

The Contractor will also be required to provide instructions to the owners custodial staff in the operation and maintenance of the system components.

2(l)

ACCEPTANCE TEST PLAN

To verify that the system meets the performance requirements as proposed, the following testing will be accomplished:

Construction Phase: Make water analysis as soon as well is completed to confirm expected data. Make H_2S analysis to determine amount of chlorination necessary. Verify that it is not fluctuating from day to day.

Monitoring Phase: Check chemical composition of water entering system and leaving system. Monitor sulfide gas content entering and exiting the system. Monitor residual chloring of water entering and exiting. Monitor dissolved oxygen of water entering and exiting. These samples will be obtained on day one of operations and then at 30 day intervals for the duration of the test.

The flow of water will be monitored to satisfy EPA and South Dakota Water Rights Commission. The temperature, pressure and flow should be included in ERDA reports. These would be continuously monitored on a strip chart recorder with multi pen capability. In using a continuous strip it would also be possible to install conductivity, pH, and dissolved oxygen probes to be recorded at the same time temperature, pressure and flow are being recorded.

WEEKS

0 4 8 12 16 20 24 28 32 36 40 44 48 52

ACTIVITY - DESCRIPTION

Preliminary Design

PDR
X

Preliminary Design Review

—

Enviromental Impact
Statement

X

Final Design &
Construction PlansFDR
X

Final Design Review

—

Advertise for Bids

—

Bid Opening

X

Review Bids - Award
of Construction Contracts

—X

Drill Well

—X

Chemical Evaluation

—X

Conversion of Existing
Heating System

—X

Instrumentation

—

X - Milestone

PDR - Preliminary Design Report

+ - Quarterly Report

FDR - Final Design Report

WEEKS

42 46⁺ 50 54 58⁺ 62 66 70⁺ 74 78 82⁺ 86 90 94 98⁺ 102 104

Monitor and Report

Final Report

—X

X MILESTONE

+ QUARTERLY REPORT

FIG. 16A

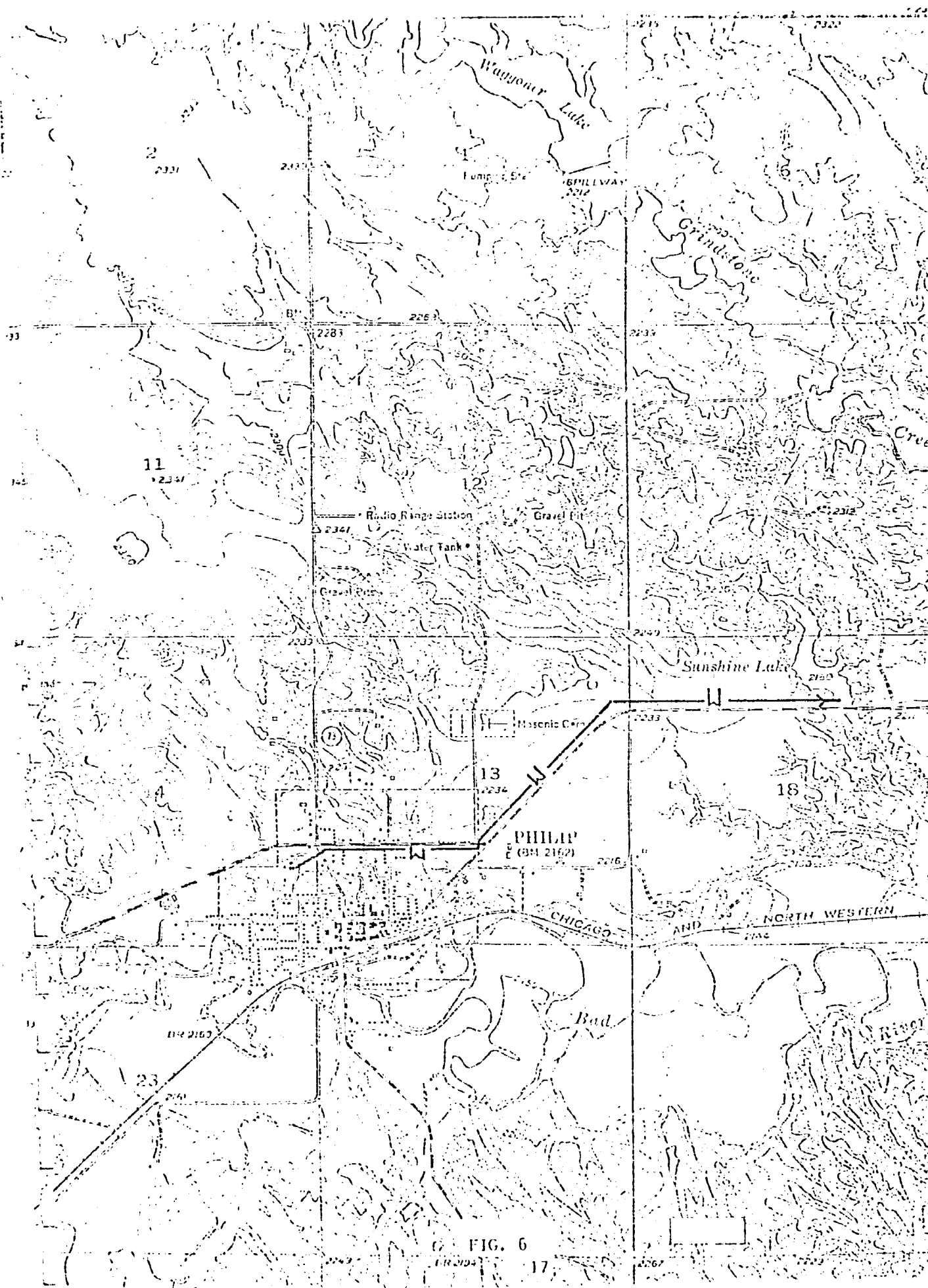
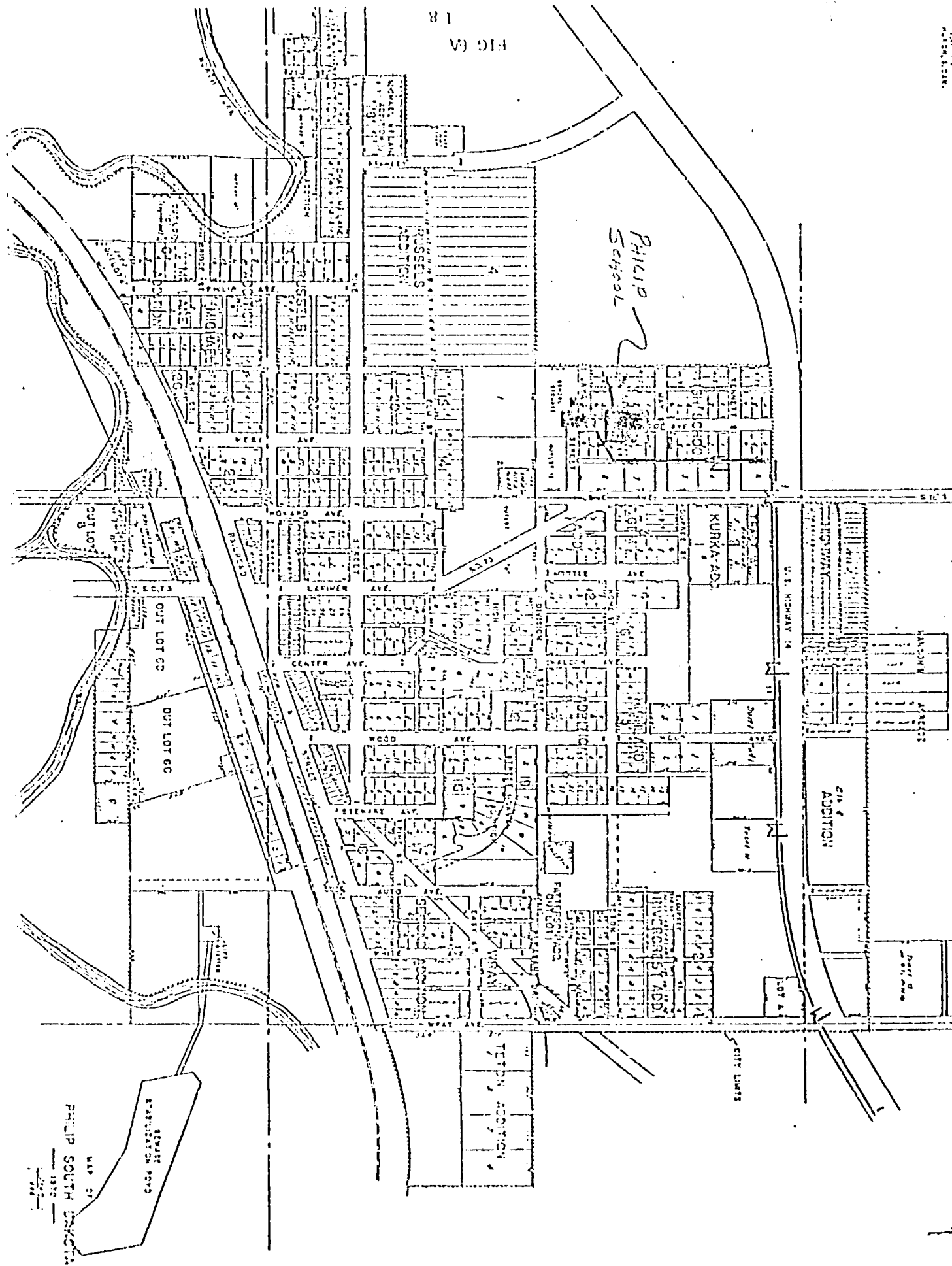


FIG. 6

17

FIG 6A
18

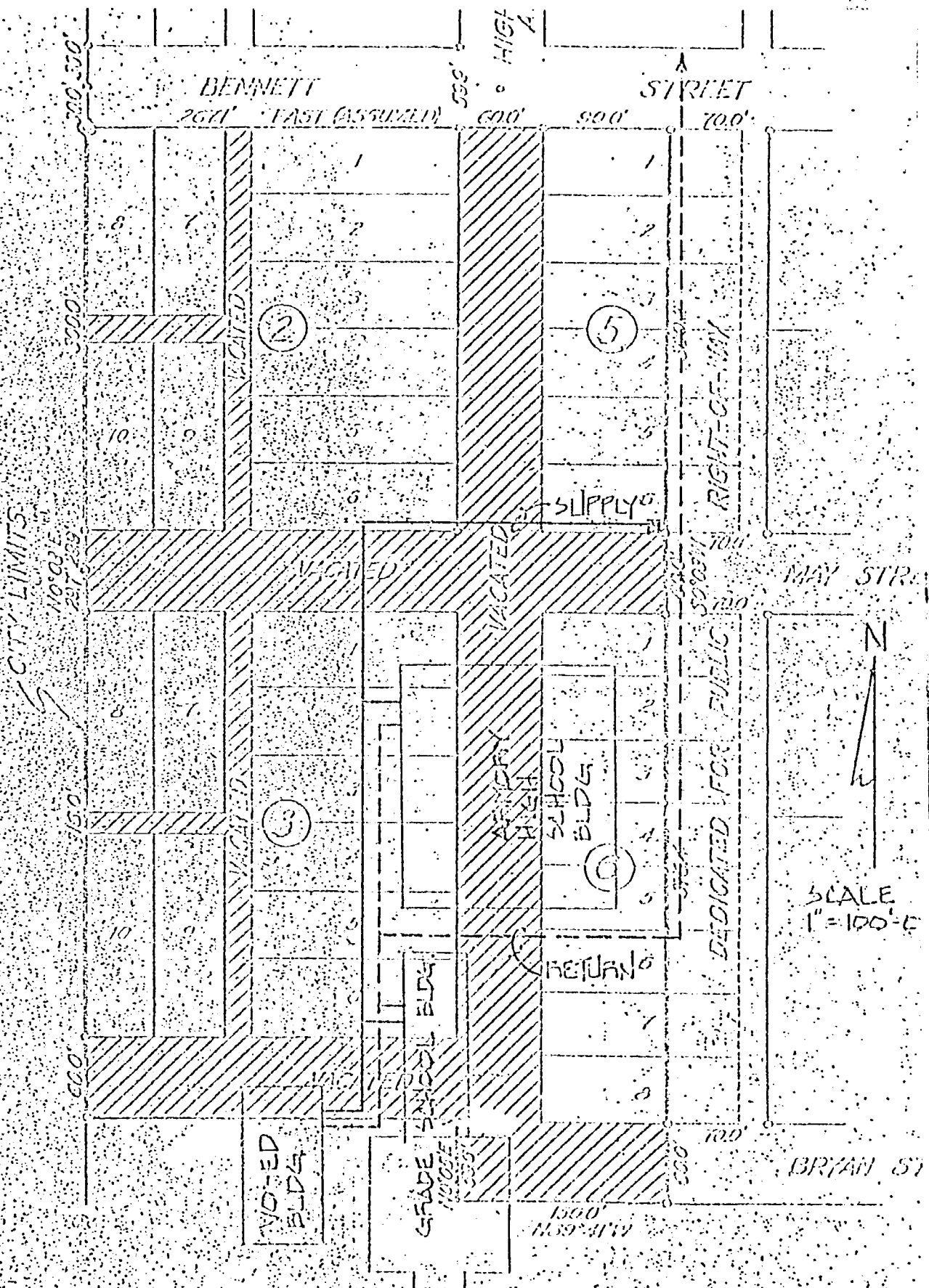


PHILIP SOUTH DAKOTA

MAP OF

REPLAT 1970

1970



This may be required since the water is essentially an industrial effluent and EPA often requires these monitors.

The recording polarograph would be utilized to measure the actual rates of corrosion experienced in the system.

2(m)

RELEVANT STUDIES

The following relevant studies and information are available for this project:

"Geothermal Applications on the Madison (PA,HA,SAPA) Aquifer System in South Dakota," South Dakota School of Mines and Technology, Principal Investigator, Dr. J. P. Gries. Prepared for Energy Research and Development Administration, Division of Geothermal Energy.

Feasibility Study of Conversion of Haakon County School Buildings' Heating System to utilize geothermal heat, prepared by Hengel, Berg & Associates for Haakon County School 27-1.

Town of Philip, Haakon County, South Dakota, well data.

Town of Midland, Haakon County, South Dakota, well data.

Environmental problems: Current Disposal of surplus water at Waggoner Lake shows no serious detrimental problems. Extensive chemical analysis performed under feasibility studies done by Gries. (Geothermal Applications of the Madison (Pahasapa) Aquifer System in South Dakota EY-76-S-07-1625.

3

MANAGEMENT PLAN

3(a)

TECHNICAL APPROACH

The well will be designed to provide the required volume of water from the Madison Formation from which heat can be extracted to heat the three buildings. From information available, the degree of success anticipated is 100 percent.

The water quality of the well will be tested for chemical composition and corrosiveness. Previous tests of wells in the Madison Formation indicate that there is a 100 percent probability that a new well will provide water very much similar to the existing wells.

Using standard heat loss, heat transfer principles and procedures, the size of the required heat exchangers will be determined. These same principles and procedures will be used to determine the required modifications to the existing heating system to convert it from steam to hot water.

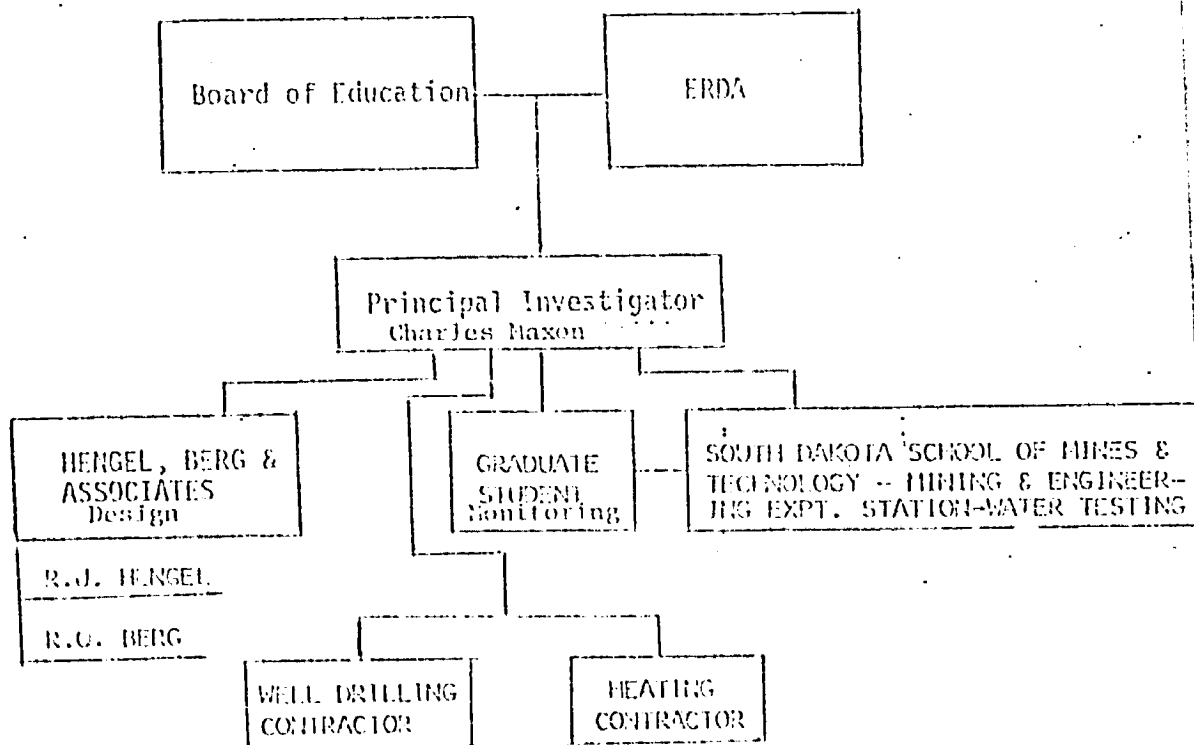
Instrumentation to monitor the operation of the total system will be developed using standard gages, and equipment.

3(b)

ORGANIZATIONAL ELEMENTS AND KEY PROJECT PERSONNEL

Upon acceptance of this proposal, the Board of Education, Haakon School District #27-1, Philip, SD will negotiate an agreement with ERDA that will lead to the completion of this project.

The organizational elements are proposed as follows:



Personal Data Information for

CHARLES A. MAXON
Box 117
Philip, South Dakota 57567

BIRTH:

September 14, 1938
Lemmon, South Dakota
Age 39

CERTIFICATION - STATE OF SOUTH DAKOTA

Superintendent
High School Principal
Teacher: Mathematics, Biology, Physical Science, Social Science

EDUCATION:

1974	Ed.S	University of South Dakota Vermillion, South Dakota	Major: Educational Administration
1967	M.A.	University of South Dakota Vermillion, South Dakota	Major: Secondary Administration
1961		University of South Dakota Vermillion, South Dakota	Major: Biology Minor: Mathematics

RELATED EDUCATIONAL EXPERIENCES:

1974	National Academy for School Executives (NASE-AASA) - San Diego	"Alternative Education Programs"
1973	National Academy for School Executives (NASE-AASA) - New Orleans	"Evaluation of School Administrators"
1972	National Academy for School Executives (NASE-AASA) - Tulsa	"Career Education - The Rural Context"
Summer 1965	National Science Institute South Dakota State University	BSCS Biology
Summer 1964	National Science Institute Washington State University	Mathematics
Summer 1963	National Science Institute Washington State University	Mathematics

PROFESSIONAL EXPERIENCE:

1976-	Supt., Haakon School District #27-1	Philip, South Dakota
1973-76	Todd Co. High School Principal	Hission, South Dakota
1967-73	Superintendent of Schools	West River Ind. School Dist Faith, South Dakota
1962-64	Mathematics-Science Teacher	Moorcroft High School Moorcroft, Wyoming
1961-62	Mathematics Teacher	Hay Springs High School Hay Springs, Nebraska

RELATED PROFESSIONAL EXPERIENCE:

Northwest Area Schools Multi-District Executive Board Member, Vice-Chairman for two years.

Member of North Central Association visitation team for Sturgis High School.

Member of Executive Committee of School Administrators of South Dakota.

Member of SASD Constitution Review Committee.

Consultant for the South Dakota State Professional Practices Commission on the Evaluation of School Administrators.

HENGEL, BERG & ASSOCIATES

ARCHITECTS - ENGINEERS

The partnership of Hengel, Berg & Associates, architects - Engineers, was formed in January of 1972 by Raymond J. Hengel and Richard O. Berg as the successor to Hengel Associates, a firm which evolved from a practice of architecture and engineering established in 1969. The firm has been responsible for the design of more than \$12 million dollars of architectural and engineering projects including commercial, educational, institutional, religious, governmental, industrial, residential and scientific buildings.

Hengel, Berg & Associates offers a full range of comprehensive professional services in the fields of architecture and civil, structural and environmental engineering. The firm's basic aim is to provide sound and creative design in an owner-oriented atmosphere, where the owner's budget and space requirements are the primary criteria in all of our designs. We recognize and consider the total cost of ownership for the life of the building, i.e., construction, operating (energy) and maintenance costs, during the planning stages of each project.

Our firm has the staff and expertise to provide all design services, for architectural, structural, heating, ventilation, air conditioning, plumbing, accoustical and landscaping. The electrical design is completed by a consulting electrical engineer, Robert Ballmes of Rapid City.

our staff capability for the total design provides better control and coordination of the design and construction of the different components of the project. The mechanical engineer is involved early in the design so that space for heating and ventilating ducts, plumbing, etc. is included in an economical structure. The structural engineer is also involved early in the design with the selection of the most economical structural system for the project that fulfills the owner's requirements.

The principals of our firm take an active part in the design, preparation of working drawings, specification writing, and construction observations. They are always available to the client and invite the client's active involvement in all critical aspects of the design of their project.

Our firm has had extensive experience in providing design services to eleven different school districts. For five of these school districts, we provided architectural and engineering services for more than one project.

Our firm designed the solar heating and air conditioning system for the Spearfish, South Dakota, High School that was partially financed with an ERDA grant.

HENGEL, BERG AND ASSOCIATES

RAYMOND J. HENGEL
ARCHITECT - PARTNER

EDUCATION: Bachelor of Science in Architectural Engineering
and Architecture 1952 Kansas State University

MEMBERSHIPS: American Institute of Architects
American Society of Heating, Refrigeration and
Air Conditioning Engineers
Black Hills Architects

LICENSES: Registered Architect - South Dakota 1960
Professional Engineer - South Dakota 1958

EXPERIENCE: Raymond J. Hengel started the firm in 1960 after 19
years of study and experience in the field of archi-
tecture and engineering. Mr. Hengel has studied in
the specialized fields of educational facilities,
building demolition, fallout shelters, advanced
architectural production techniques, design of solar
energy systems and energy conservation. He has served
on civic and professional committees and commissions
in the field of air pollution, written reports which
have resulted in the elimination of pollution, and
aided in writing and obtaining pollution control
legislation.

Mr. Hengel was the principal designer of the Spearfish
High School air conditioning and solar heating system.

HENGEL, BERG AND ASSOCIATES

RICHARD O. BERG - ENGINEER-PARTNER

EDUCATION: Bachelor of Science in Civil Engineering, South Dakota
School of Mines & Technology - 1958

PREVIOUS

PROFESSIONAL South Dakota Department of Highways, 14 years
EXPERIENCE:

REGISTRATION: Registered Professional Engineer
State of South Dakota State of Montana
State of Nebraska State of Wyoming
Registered Land Surveyor
State of South Dakota

AFFILIATIONS: Member - American Society of Civil Engineers
Past President of both State Section and Black Hills Branch
National Member - National Society of Professional Engineers
Member - Consulting Engineers Council of U.S. and South Dakota

EXPERIENCE:

Richard Berg joined the formation of the partnership in 1972 after 14 years of engineering experience with the South Dakota Department of Highways. While with the Department of Highways, Mr. Berg has had unique experience of being the owner's representative during the design and construction of 12 buildings. He programmed and supervised the maintenance of more than 40 buildings and sites owned by the Department of Highways, thereby gaining valuable first-hand knowledge of the owner's needs during design and construction and his problems of operation and maintenance.

VITA - DAN D. CARDA

Personal Background

Born: Tyndall, South Dakota, 9/16/43

Marital Status: Single

Home Address: Route 8, Box 405, Rapid City, SD 57701

Education

B.S., Chemistry, SDSM&T, 1968

M.S., Chemistry, SDSM&T, 1971 (Radioactivity in water)

Ph.D., Geology, SDSM&T, 1975 (Radium content of Madison waters)

Military Service

U.S. Army, 1968-70

Professional Organizations

American Chemical Society

Alpha Chi Sigma

Sigma Xi

Spectrochemical Society

Work Experience

Research Associate, Engineering and Mining Experiment Station, SDSM&T, 1975--

Major Projects

1. Coal Reserves in Harding County, South Dakota
2. Trace Elements in Waste Water Effluents from Coal Gasification
3. Geothermal Applications on the Madison Aquifer System in South Dakota

In addition to the above major projects, duties at the Experiment Station also have included instruction of analytical chemistry courses for both undergraduate and graduate students from the chemistry and geology departments.. These include general wet chemistry procedures as well as spectrophotometric methods, emission spectroscopy, X-ray spectrometry, X-ray diffraction and atomic absorption methods.

The position of Research Associate also involves overseeing the routine service analyses which the Experiment Station provides as a service to the campus, government agencies and general public. These services include mineral assays, trace element determinations, coal analyses, silica dust analyses, and a myriad of assorted analyses ranging from suspected fuel contaminations to toxic elements in blood and urine.

The Experiment Station handles in excess of 1300 individual samples per year which represent in excess of 5000 total determinations. Five to six students are employed to assist in the laboratory operations and full under the direct supervision of the Research Associate.

Publications

Radioactivity in artesian wells, Proceedings of the SD Academy of Sciences, p. 150-153, v. 51, 1972.

A study of the radium content of the ground waters in western South Dakota with emphasis on the Madison (Pahasapa) Limestone, PhD dissertation, SDSM&T, 1975.

3(c)

WORK SCHEDULE

The work schedule is shown in graphical form in Figure 5 and 5A.

3(d)

PROJECT MILESTONES

Project milestones will provide intermediate deadlines. These milestones will provide a measurement of the progress of the project toward completion and a way to coordinate the effort of the entire team. The milestones are as follows:

1. Completion of preliminary design and preliminary design report
2. Completion of final design and final design report
3. Bid opening
4. Award of construction subcontract
5. Completion of well and confirmation that the water is identical to existing wells
6. Completion of conversion of existing system
7. Report of water quality monitoring at the end of one year
8. Final report that should demonstrate reliability of the system

3(e)

ASSIGNMENTS OF RESPONSIBILITY

The principle investigator, Charles Maxon, will provide the general planning and coordination to move the project to completion. He will coordinate the activities of the subcontractors to insure that the scheduled deadlines are met. He will also complete and submit all required reports with the help of the subcontractors.

The design of the geothermal system and back up system will be subcontracted to Hengel, Berg & Associates. They will be responsible for the design, construction plans and specifications, construction observation and technical assistance on the field testing and monitoring.

The chemical analysis and corrosion testing of the well water will be done by a South Dakota School of Mines and Technology graduate student under the supervision of Dr. D.D. Carda, Research Associate of the SDSM & T Mining and Engineering Experiment Station.

The well will be provided by a subcontractor selected in accordance with the bid laws of the State of South Dakota.

The conversion of the existing building heating systems will be provided by a subcontractor selected in accordance with the bid laws of the State of South Dakota.

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
REPORTING REQUIREMENTS CHECKLIST

FORM ERDA 537
(2/1/77)

(See Instructions on Reverse)

1. IDENTIFICATION EG-77-N-03-1553		2. OBLIGATION INSTRUMENT:	
3. REPORTING REQUIREMENTS			
A. PROJECT MANAGEMENT a. ☒ Management Plan b. ☐ Milestone Plan and Management Report c. ☐ Cost Plan d. ☐ Manpower Plan e. ☒ Contract Management Summary Report f. ☐ Major Milestone Status Plot g. ☒ Technical Status Report h. ☒ Cost Management Report, Short form i. ☐ Manpower Management Report j. ☐ Funds Reconciliation Report	Frequency X M M M	A. PROJECT MANAGEMENT (CONT.) k. ☒ Conference Record l. ☐ Hot Line Report m. ☐ PMS (Earned Value) B. TECHNICAL INFORMATION REPORTING a. ☒ Energy RD&D Work - In Progress (SSIE) b. ☒ Technical Progress Report c. ☐ Topical Report d. ☒ Final Technical Report C. OTHER e. ☐ Travel Plan f. ☒ Preliminary Design Report g. ☒ Final Design Report h. ☒ Environmental Report per ERDA EMIQ-0001	Frequency A O Q F A A within 60 days of contract award
FREQUENCY CODES:			
A - As Required C - Contract Change F - Final (End of Contract) M - Monthly O - One Time (Soon After Contract Award) S - Semi-Annually X - Mandatory for Delivery with Proposals/Bid Y - Yearly or Upon Contract Renewal			
4. SPECIAL INSTRUCTIONS: *To be submitted by contractor as appropriate to the project and project schedule. 1. Ref. items A.e, A.g., and A.h. These should be sent together as your monthly progress report to ERDA. 2. Ref. Item B.b. A more complete description of the content and format of this report will be provided on request to ERDA/SAN. Contractor to supply a reproducible master plus copies as stipulated on Reports Distribution List. 3. Ref. Item B.d. In addition, ERDA requests a Draft Final Report be submitted for review and comment 30 days prior to the conclusion of the contract. 4. Monthly reports are due at ERDA by the 20th calendar day of the month following the reporting period. 5. Ref. Item A.k. This form shall show cost and fee separately. 6. Ref. C.b. (see attachment) 7. Ref. C.c. (see attachment) Note: All of the above reports shall be discussed in detail during negotiations.			
5. ATTACHED HERewith: ☒ Report Distribution List ☐ ☐ ☐			
6. PREPARED BY (Signature and date): Charles R. Mayon 11/22/77		7. REVIEWED BY (Signature and date):	

STATEMENT OF WORK

4.

Haakon School District 27-1, as Proposed Contractor, will provide project management and coordination. Hengel, Berg and Associates as proposed Subcontractor will be responsible for bid specifications, construction observation, and technical assistance thru construction and monitoring phases, under the supervision of Dr. D.D. Carda, A graduate student from South Dakota School of Mines and Technology will be responsible for monitoring the Chemistry, corrosive elements, and water quality.

5.

GEOLOGIC BACKGROUND

The Madison limestone is a cavernous group of three formations: The Mission Canyon, the Charles, and the Lodgepole. It is spread across most of western South Dakota, eastern Wyoming, eastern Montana, and western North Dakota as shown in Figure 7. It is part of the Williston Basin. Wells into the Madison limestone have always been capable of producing large amounts of relatively good quality water, with yields ranging from several hundred gallons per minute to several thousand gallons per minute (McVicar et. al., 1956; Konikow, 1976). Evidence of the stability of these wells can be shown by the Philip municipal well in Haakon County which has been flowing continuously since its completion in 1962 with little evidence of decline in flow. Another well in Butte County, the former Harmon-Olson oil test now converted to a free-flowing water well, also shows no signs of declining flow.

A large portion of the recharge to the Madison limestone comes from the outcrops in the Black Hills area as shown by investigation conducted by Rahn and Gries (1972). Some of the water may be coming from as far away as the Bighorns in Wyoming (Swenson, 1968). The most recent investigation by Konikow (1976) give potentiometric surfaces shown in Figure 8. Due to the relative sparseness of communities in western South Dakota, it appears that if a well were placed in each community the Madison reservoir would not be affected to any degree at all.

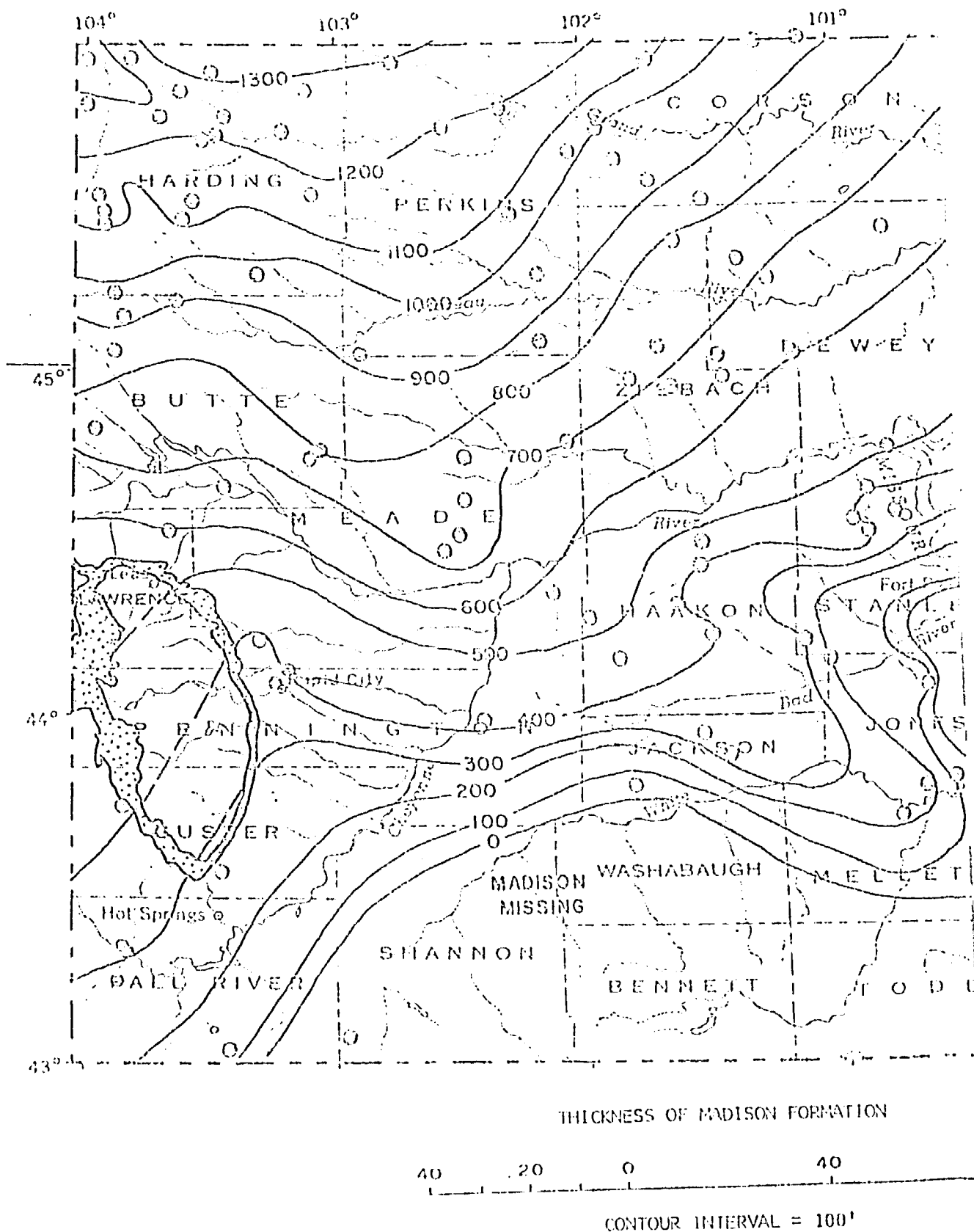
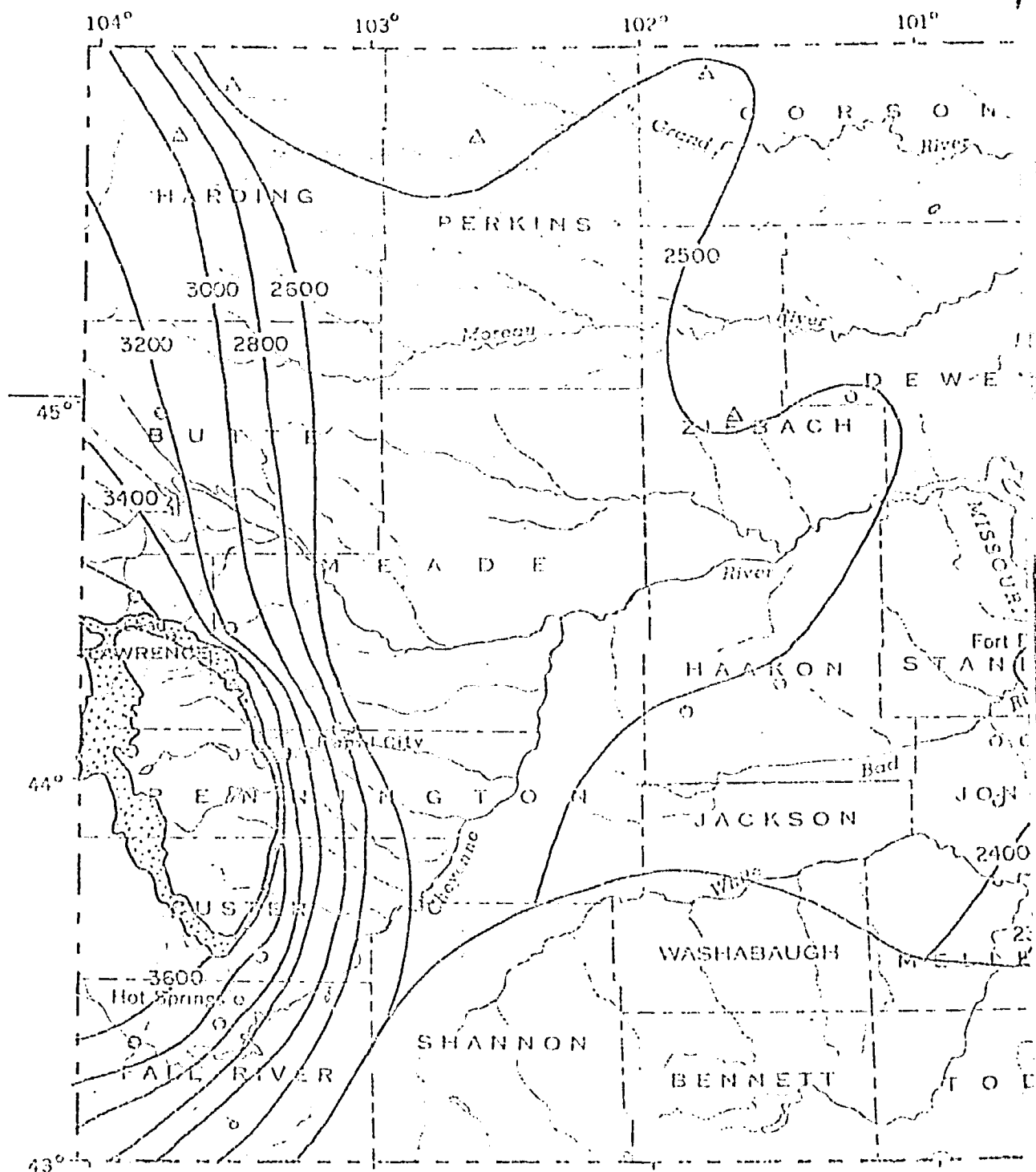


FIG. 7



POTENTIOMETRIC SURFACE
MADISON ARTESIAN SYSTEM

40 20 0 40

CONTOUR INTERVAL
100 FT BELOW 2800
200 FT ABOVE 2800

FIG. 8

The water temperature of the Madison Formation across Western South Dakota is shown in Figure 9.

The depth to top of the Madison Formation is shown in Figure 10.

The chemical composition of the water is basically a calcium sulfate type. The water is palatable to both humans and livestock and has been used for both purposes for many years in various areas of the state.

The geophysical evidence supports the availability of a geothermal resource that will satisfy the user's need.

McVicar, B. M., Heather, J. L. and Alger, R. R., 1956,
New Logging Techniques for Evaluation of Carbonate Reservoirs;
First International Williston Basin Symposium, p. 142.

Swenson, F. A., 1968a, New Theory of Recharge to the Artesian Basin
of the Dakotas; Geol. Soc. Am. Bull., V. 79, p. 163-182.

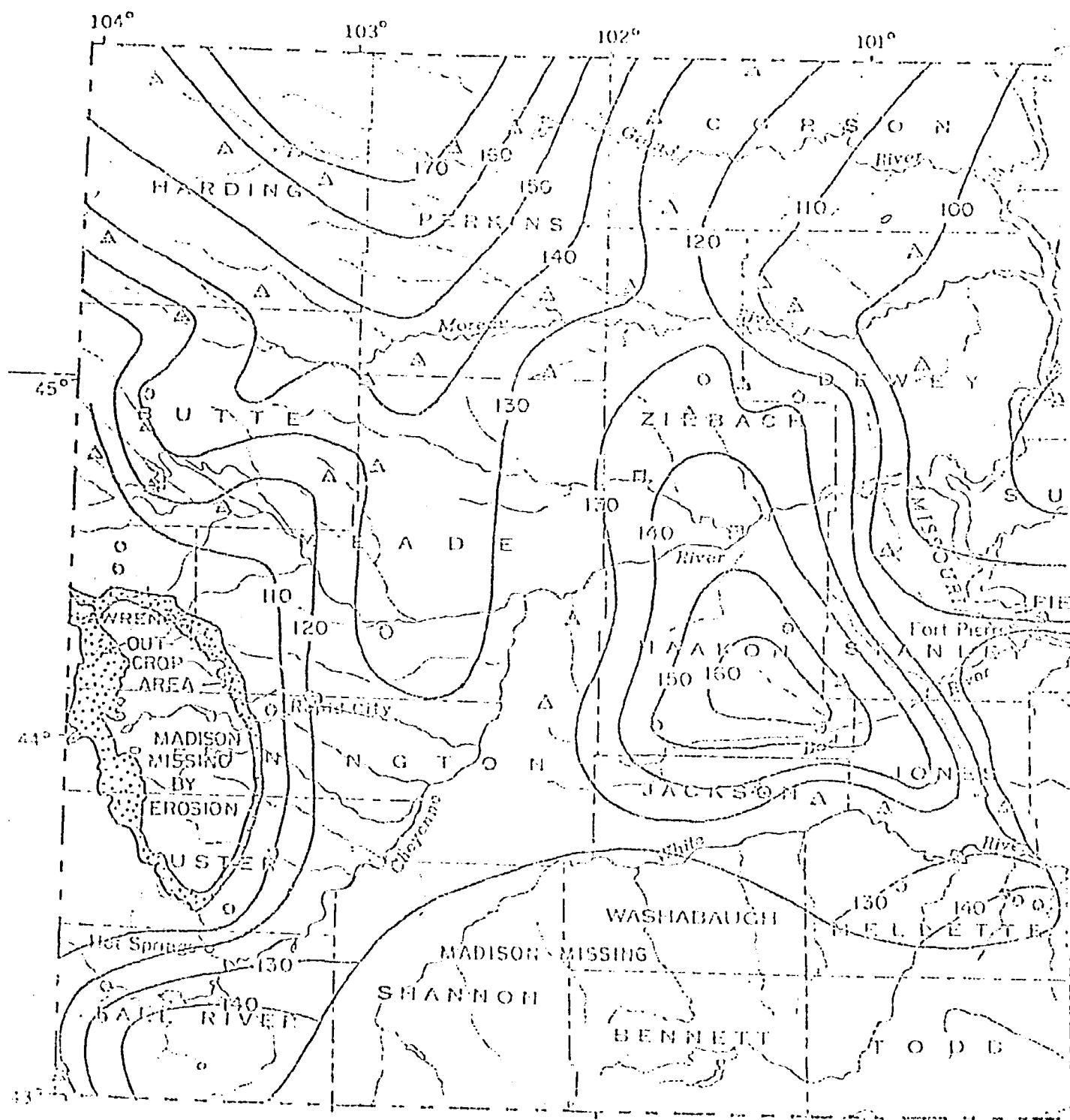
Konikow, L. F., 1976, Preliminary Digital Model of Ground Water Flow
in the Madison Group, Powder River Basin and Adjacent Areas,
Wyoming, South Dakota, North Dakota, and Nebraska; USGS Water
Resources Investigations 63-75, p. 44.

6. SITE/FACILITIES/EQUIPMENT DATA

The well would be located on property owned by the School District. All of the facilities for the project are available including the necessary testing facilities at the Mining and Engineering Experiment Station at the South Dakota School of Mines and Technology.

Monitoring of the water as it enters and leaves the system will be essential to the project. The well temperature pressure and flow will be continuously monitored on a strip chart recorder with multi pen capability. In using this device it will also be possible to install probes to measure conductivity, pH, and dissolved oxygen.

The equipment needed to monitor the project that needs to be purchased will be a recording pH meter, dissolved O₂ meter, recording polarograph, 6 pen recorder, recording temperature gauge, recording flow monitor and a recording pressure monitor.



ISOTHERMAL MAP MADISON FORMATION

40 20 0 20 40 60 80

CONTOUR INTERVAL 10°F

FIG. 9

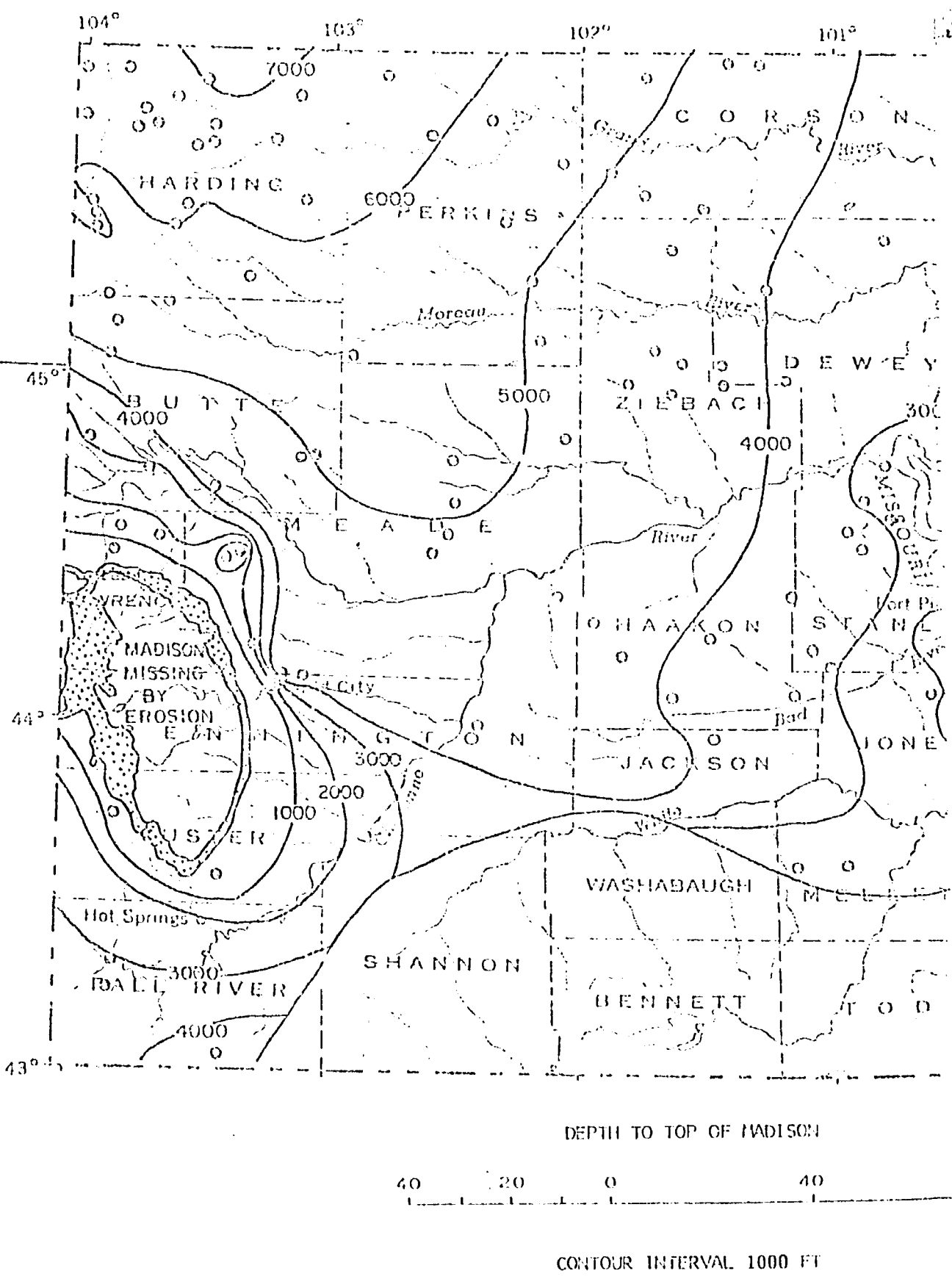


FIG. 10
 36

7.

CONTINUED USE OF FACILITIES

The present school facilities, or new buildings in the future, will be used as long as there is a school population in Philip. This "new" source of energy will insure the steady growth of the community. Once the availability of hot water heat has been established and the cost savings reinforced, potential users will become real users.

CITY FINANCE OFFICE
CITY OF PHILIP

Philip, South Dakota 57567

November 22, 1977

Philip High School
Philip, South Dakota 57567

Gentlemen:

We would be very interested in receiving the water that you might obtain after digging into the Madison formation; once you have heated your facilities.

Our needs would be for heating our 20 bed hospital, 22 bed rest home, the clinic and the Hanton County Courthouse. Also we could heat our City office, City Fire department, City ambulance building and approximately 30 businesses and 450 residences. It could also be used to heat the present swimming pool, making it possible to enclose with a dome to utilize the recreation facility the year round.

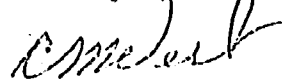
Once the heat factor has been utilized; the city could use the water for drinking and general uses. It could be piped to our water plant so that it could be distributed for general purposes.

It could very well be the supplemental water supply which we may need; due to the possibility of our present water system diminishing in the next five (5) years.

We submit this letter of support with the sincere hope that you will be successful in your endeavor to obtain a grant for the geo-thermal heat project.

Sincerely,

The City Council



C. E. East, Mayor

38

South Dakota

HOUSING DEVELOPMENT AUTHORITY

~~CONFIDENTIAL~~

Robert T. Hiatt
Executive Director

105 South Euclid
P.O. Box 1052
Pierre, South Dakota 57501
Phone: (605) 224-3181

November 16, 1977

Mr. Charles A. Maxon
Haakin School District 27-1
Philip, South Dakota 57567

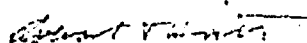
Dear Mr. Maxon:

The South Dakota Housing Development Authority is actively pursuing the development of housing for the elderly in Philip, South Dakota under the HUD Section 8 program. As has been previously discussed, we would be extremely interested in the use of geothermal energy as the primary heat source for this 12 to 16 unit project. We currently have a developer working to locate a suitable site for this development.

We would appreciate your keeping us informed of your progress so that we may gear our plans accordingly.

I can assure you, you have the enthusiastic support of our agency in this venture; if we can be of assistance in any respect, please do not hesitate to contact us.

Sincerely,



Robert T. Hiatt
Executive Director

RTH:jlh

UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION
Room 208, Federal Building
Huron, South Dakota 57350

November 18, 1977

Mr. Charles Maxon
Superintendent of Schools
Philip, South Dakota 57567

RE: Rural Water Systems

Dear Mr. Maxon:

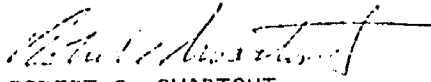
We have heard with interest your plan to attempt a project wherein the city school system and perhaps other public buildings will be heated by extracting heat from water free-flowing from a nearby well. It is our understanding the well was drilled into the Madison Formation and yields a substantial amount of water without need for pumping. Since this well is located near a golf course we financed north of Philip, we have observed it free flowing into a nearby lake and we assume the water eventually winds up in the Bad River. We would be very interested in a chemical analysis of this water.

We have funded several ranch type rural water systems in an area between Wall and Rapid City and we are aware that there are several other groups of ranchers interested in a similar project when and if they are able to develop a water supply. Two of the above mentioned projects are based on water obtained from deep wells drilled by the Air Force to serve missile sites. Upon abandonment of these sites, the Air Force, through the General Services Administration, was agreeable to turning the wells over for the private use of our borrower corporation. Another fairly substantial project is based on a deep well drilled for oil exploration purposes. The owner, again, was agreeable to turning the well over to our water corporation since the well was capable of a sizable yield of fairly good quality water.

We have attempted to contact our County Supervisor, Ted Risty, who has a sub-office in Philip. We have asked that he call on you at his next opportunity. He will be able to tell us of any potential applications

and provide you with local knowledge of ranch and farm water supplies. Needless to say, the project you have in mind, if the water quality is satisfactory, could become the basis for one or more additional rural water distribution systems.

Sincerely,



ROBERT C. SWARTOUT
Chief, Community Programs

cc County Supervisor, FmHA
Pierre, South Dakota

District Director, FmHA
Rapid City, South Dakota

ERDA PROPOSAL COVER SHEET

VOLUME II 16.5

Research Proposal Submitted to the Energy
Research and Development Administration
Geothermal Energy Division
San Francisco Operations Office

BUSINESS PROPOSAL
COST PROPOSAL

Program Research and Development Announcement
For Direct Utilization of
Geothermal Energy Resources
PON EG - 77-N-03-1553

Proposal No. 1553-77-27-1

HAARON SCHOOL DISTRICT #27-1

Name of Organization

ACADEMIC

Organizational Classification

310 N. SCHOOL, PHILIP, HAARON COUNTY, SOUTH DAKOTA 57567

Address of Organization

DIRECT UTILIZATION OF GEOTHERMAL ENERGY FOR THE PHILIP SCHOOLS

Title of Proposed Project

Funds Requested _____ Proposed Duration 150 days Requested Start Date May 10, 1978

Name of Principal Investigator CHARLES A. MAXON
Position and Title SUPERINTENDENT, HAARON SCHOOL DISTRICT #27-1

Address 310 N. SCHOOL, PHILIP, SD 57567

Telephone 605-859-2679 Business Phone: 605-859-2437 Home Phone

ENDORSEMENT

Principal Investigator

Department Head

Authorized Representative

Name

Title

Date November 23, 1977

November 23, 1977

November 23, 1977

Application Type EDUCATIONAL

Proposal Submission Date November 23, 1977 Proposal Expiration Date May 10, 1978

CONSENT STATEMENT

Consent is hereby given for outside government individuals to have access to
our proposal.

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	Page number
1. Commitment	1
2. Teaming Arrangement	1
3. Project Experience	2
4. Team Organization and Key Personnel	4
5. Key Personnel	5
6. Management Controls	5
7. Public Awareness	5
8. Geothermal Use Stimulation	6
9. Type of Contractual Arrangements Proposed	6
10. Other Pertinent Data	7
11. Personnel	8
12. Cost Proposal Vol. A/B	13
13. Cost Sharing Estimate	13
14. Funding	19
15. Projected Cash Flow	20
16. Cost Comparison	21

BUSINESS PROPOSAL (VOLUME II A)

1

COMMITMENT

On November 9, 1977 the Board of Education, Haakon School District #27-1, Philip, South Dakota, passed a Resolution committing \$75,000 cash and up to \$25,000 in-kind contribution to the project of installing a hot water heating system in the school buildings. Authority was also given to the Superintendent of Schools to be the Principal Investigator on this project. State law provides that the Board of Education has overall authority for maintenance and operation of the schools and buildings within its jurisdiction.

Dr. Carda from the South Dakota School of Mines and Technology has given his time and energy to help prepare this proposal. He and his associates have engaged in a great deal of research on geothermal energy. They have a desire to continue to research and help in the actual implementation of geothermal energy useage.

The firm of Hengel, Berg and Associates is a private architect and engineering firm offering Architectural and Engineering services. They were engaged for the completed feasibility study and have been retained to complete the design, construction observation and provide technical assistance during the monitoring and reporting phases.

2

TEAMING ARRANGEMENT

Superintendent Charles A. Maxon will be the project director. It will be his responsibility to negotiate a contract with ERDA for the direct implementation of geothermal heat useage. He will coordinate the work of the subcontractors.

Hengel, Berg and Associates will be responsible for preliminary and final design, construction documents, construction observation, and technical assistance during the monitoring phase.

A graduate student at the South Dakota School of Mines and Technology, under the supervision of Dr. D. D. Carda, will be responsible for doing chemical analysis of the water. The graduate student will make a study of the corrosiveness of the water at specified intervals after completion of the project. The graduate student will monitor water quality and quantity. The graduate student will be a contracted employee of the Haakon School District #27-1.

Haakon School District #27-1 is a state non-profit educational institution for grades K through 12.

Hengel, Berg and Associates is a small business partnership to conduct consulting and engineering services in the area of architectural and mechanical engineering projects.

The well drilling and heating systems conversion will be subcontracted to private, for profit businesses, based on competitive bids in accordance with South Dakota State Law.

3

PROJECT EXPERIENCE

While the project manager has no prior experience in the development of geothermal resources, he has had eleven years of administrative experience in the public schools which required the coordination of people and events. His academic preparation and practical experience provide him with the qualifications necessary for directing this project.

The partnership of Hengel, Berg and Associates, Architects-Engineers, was formed in January of 1972 by Raymond J. Hengel and Richard O. Berg as the successor to Hengel Associates, a firm which evolved from a practice of architecture and engineering established in 1960. The firm has been responsible for the design of more the \$12 million dollars of architectural and engineering projects including commercial, educational, institutional, religious, governmental, industrial, residential and scientific buildings.

Hengel, Berg and Associates offers a full range of comprehensive professional services in the fields of architecture and civil, structural and environmental engineering. The firm's basic aim is to provide sound and creative design in an owner-oriented atmosphere, where the owner's budget and space requirements are the primary criteria in all of our designs. We recognize and consider the total cost of ownership for the life of the building, i.e., construction, operating (energy) and maintenance costs, during the planning stages of each project.

Our firm has the staff and expertise to provide all design services, for architectural, structural, heating, ventilation, air conditioning, plumbing, accoustical, and landscaping. The electrical design is completed by a consulting electrical engineer, Robert Bailmes of Rapid City.

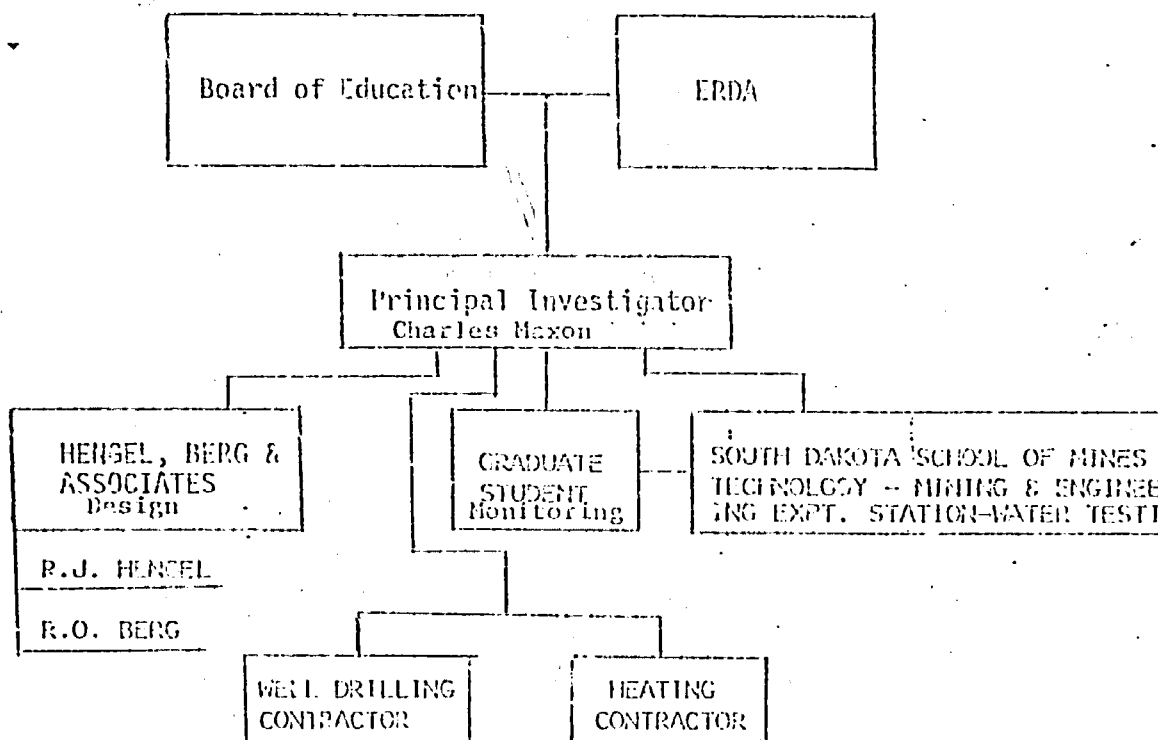
The principals of our firm take an active part in the design, preparation of working drawings, specification writing, and construction observations. They are always available to the client and invite the client's active involvement in all critical aspects of the design of their project.

Our firm has had extensive experience in providing design services to eleven different school districts. For five of these school districts, we provided architectural and engineering services for more than one project.

Our firm designed the solar heating and air conditioning system for the Spearfish High School, Spearfish, South Dakota that was partially financed with an ERDA grant.

TEAM ORGANIZATION AND KEY PERSONNEL

The organization elements and key personnel needed to carry out this project are as follows:



KEY PERSONNEL

Pages 8 to 12 give the vitas of the project personnel. They are Charles A. Maxon, project manager; Richard Berg and Raymond Hengel, Principals of Hengel, Berg and Associates, Architects- Engineers for the project; Dan Carda, water analysis consultant for the project.

MANAGEMENT CONTROLS

The Haakon School District #27-1 will assume the responsibility to control the budget and handle the payments for all contract expenditures. The cost accounting method used by the School District is the system recommended by the Department of Health, Education and Welfare (handbook 2) and required by the State of South Dakota.

Monthly progress meetings will be scheduled by the Project Manager to insure oderly and timely completion of the project.

All contracts and contract payments will be handled in accordance with the South Dakota State Laws governing public entities.

PUBLIC AWARENESS

On June 8, 1977, Ray Hengel and Dick Berg met with the Board of Education to present the findings of their feasibility study of conversion of the school buildings heating system to utilize geothermal heat. There were approximately 50 other community members in attendance who were made aware of their report and this project.

On November 16, 1977, the principal investigator, Charles Maxon, presented the geothermal heat proposal to the Philip Chamber of Commerce. The text of the presentation was well received and Chamber members discussed future applications of geothermal heat. The Chamber appointed a committee whose function is to bring to Philip consultants who will further discuss applications

of geothermal heat. This meeting will be publicized so that a total community awareness is possible.

All members of the team will cooperate with news reporters and free lance feature writers to obtain the maximum publicity and dissemination of the results of this application of geothermal energy.

8

GEOHERMAL USE STIMULATION

This project will make the surplus geothermal energy available for commercial, residential and/or industrial use. The school will use only a part of the heat potential from this well.

The South Dakota Housing Authority has plans to locate a 12 to 16 elderly housing unit in Philip. They wish to use energy from this well to heat the structure. Small businesses have contacted the school board as to how they may gain information on the utilization of geothermal energy to heat their business establishments.

Potential industrial uses of the geothermal resources during the summer will be for grain drying. During the winter the discharge can be used for hydroponics.

After the heat has been fully extracted, there are potential uses for human and livestock consumption as well as irrigation. For instance there is interest, as indicated by a letter in the appendix in Vol. I, to utilize the water for a rural water district.

9

TYPE OF CONTRACTUAL ARRANGEMENTS PROPOSED

The Board of Education of Haakon School District #27-1 will enter into a Contract with ERDA as provided by State and Federal statutes.

The subcontractors will enter into agreements with the Haakon School District #27-1 as provided by South Dakota State statutes.

Payment schedules will be set up in a standard manner as work progresses on the project.

10

OTHER PERTINENT DATA

Haakon School District No. 27-1 is a public educational facility and as such its financial statement is a matter of public record. This financial statement indicates that the School District can commit funds to the project and still have the necessary reserve to carry out their educational responsibilities.

The school district has not entered into a government contract since the National Guard Armory-School complex was built in 1961.

The right to extract water from the Madison Formation will have to be obtained from the South Dakota Water Rights Commission. Communication has already been established with this body to obtain water rights.

An environmental impact statement will be provided by the School District. The study will be made in cooperation with the Water Resources Commission and the South Dakota Environmental Protection Agency.

Personal Data Information for

CHARLES A. MAXON
Box 117
Philip, South Dakota 57567

BIRTH:

September 14, 1938
Lemmon, South Dakota
Age 59

CERTIFICATION - STATE OF SOUTH DAKOTA

Superintendent
High School Principal
Teacher: Mathematics, Biology, Physical Science, Social Science

EDUCATION:

1974	Ed.S	University of South Dakota Vermillion, South Dakota	Major: Educational Administration
1967	M.A.	University of South Dakota Vermillion, South Dakota	Major: Secondary Administration
1961		University of South Dakota Vermillion, South Dakota	Major: Biology Minor: Mathematics

RELATED EDUCATIONAL EXPERIENCES:

1974	National Academy for School Executives (NASE-AASA) - San Diego	"Alternative Education Programs"
1973	National Academy for School Executives (NASE-AASA) - New Orleans	"Evaluation of School Administrators"
1972	National Academy for School Executives (NASE-AASA) - Tulsa	"Career Education - The Rural Context"
Summer 1965	National Science Institute South Dakota State University	BSCS Biology
Summer 1964	National Science Institute Washington State University	Mathematics
Summer 1963	National Science Institute Washington State University	Mathematics

PROFESSIONAL EXPERIENCE:

1976-	Supt., Haakon School District #27-1	Philip, South Dakota
1973-76	Todd Co. High School Principal	Mission, South Dakota
1967-73	Superintendent of Schools	West River Ind. School Dist. Faith, South Dakota
1962-64	Mathematics-Science Teacher	Moorcroft High School Moorcroft, Wyoming
1961-62	Mathematics Teacher	Hay Springs High School Hay Springs, Nebraska

RELATED PROFESSIONAL EXPERIENCE:

Northwest Area Schools Multi-District Executive Board Member, Vice-Chairman for two years.

Member of North Central Association visitation team for Sturgis High School.

Member of Executive Committee of School Administrators of South Dakota.

Member of SASD Constitution Review Committee.

Consultant for the South Dakota State Professional Practices Commission on the Evaluation of School Administrators.

HENGEL, BERG AND ASSOCIATES

RAYMOND J. HENGEL
ARCHITECT - PARTNER

EDUCATION: Bachelor of Science in Architectural Engineering
and Architecture 1952 Kansas State University

MEMBERSHIPS: American Institute of Architects
American Society of Heating, Refrigeration and
Air Conditioning Engineers
Black Hills Architects

LICENSES: Registered Architect - South Dakota 1960
Professional Engineer - South Dakota 1958

EXPERIENCE: Raymond J. Hengel started the firm in 1960 after 19
years of study and experience in the field of archi-
tecture and engineering. Mr. Hengel has studied in
the specialized fields of educational facilities,
building demolition, fallout shelters, advanced
architectural production techniques, design of solar
energy systems and energy conservation. He has served
on civic and professional committees and commissions
in the field of air pollution, written reports which
have resulted in the elimination of pollution, and
aided in writing and obtaining pollution control
legislation.

Mr. Hengel was the principal designer of the Spearfish
High School air conditioning and solar heating system.

HENGEL, BERG AND ASSOCIATES

RICHARD O. BERG - ENGINEER-PARTNER

EDUCATION: Bachelor of Science in Civil Engineering, South Dakota
School of Mines & Technology - 1958

PREVIOUS

PROFESSIONAL South Dakota Department of Highways, 14 years
EXPERIENCE:

REGISTRATION: Registered Professional Engineer
State of South Dakota State of Montana
State of Nebraska State of Wyoming
Registered Land Surveyor
State of South Dakota

AFFILIATIONS: Member - American Society of Civil Engineers
Past President of both State Section and Black Hills Branch
National Member - National Society of Professional Engineers
Member - Consulting Engineers Council of U.S. and South Dakota

EXPERIENCE: Richard Berg joined the formation of the partnership in 1972 after 14 years of engineering experience with the South Dakota Department of Highways. While with the Department of Highways, Mr. Berg has had unique experience of being the owner's representative during the design and construction of 12 buildings. He programmed and supervised the maintenance of more than 40 buildings and sites owned by the Department of Highways, thereby gaining valuable first-hand knowledge of the owner's needs during design and construction and his problems of operation and maintenance.

VITA - DAN D. CARDA

Personal Background

Born. Tyndall, South Dakota, 9/16/43

Marital Status: Single

Home Address: Route 8, Box 405, Rapid City, SD 57701

Education

B.S., Chemistry, SDSM&T, 1968

M.S., Chemistry, SDSM&T, 1971 (Radioactivity in water)

Ph.D., Geology, SDSM&T, 1975 (Radium content of Madison waters)

Military Service

U.S. Army, 1968-70

Professional Organizations

American Chemical Society

Alpha Chi Sigma

Sigma Xi

Spectrochemical Society

Work Experience

Research Associate, Engineering and Mining Experiment Station, SDSM&T,
1975--

Major Projects

1. Coal Reserves in Harding County, South Dakota
2. Trace Elements in Waste Water Effluents from Coal Gasification
3. Geothermal Applications on the Madison Aquifer System in South Dakota

In addition to the above major projects, duties at the Experiment Station also have included instruction of analytical chemistry courses for both undergraduate and graduate students from the chemistry and geology departments. These include general wet chemistry procedures as well as spectrophotometric methods, emission spectroscopy, X-ray spectrometry, X-ray diffraction and atomic absorption methods.

The position of Research Associate also involves overseeing the routine service analyses which the Experiment Station provides as a service to the campus, government agencies and general public. These services include mineral assays, trace element determinations, coal analyses, silica dust analyses, and a myriad of assorted analyses ranging from suspected fuel contaminations to toxic elements in blood and urine.

The Experiment Station handles in excess of 1300 individual samples per year which represent in excess of 5000 total determinations. Five to six students are employed to assist in the laboratory operations and full under the direct supervision of the Research Associate.

Publications

Radioactivity in artesian wells, Proceedings of the SD Academy of Sciences, p. 150-153, v. 51, 1972.

A study of the radium content of the ground waters in western South Dakota with emphasis on the Madison (Pahasapa) limestone, Ph.D. dissertation, SDSM&T, 1975.

CONTRACT PRICING PROPOSAL (RESEARCH AND DEVELOPMENT)				Office of Management and Budget Approval No. 29-RO184	
This form is for use when (i) submission of cost or pricing data (see FPR 1-33.00-3) is required and (ii) substitution for the Optional Form 32 is authorized by the contracting officer.				PAGE NO 1	NO. OF PAGES 3
NAME OF OFFEROR Haakon School District #27-1			SUPPLIES AND/OR SERVICES TO BE FURNISHED Field Experiment Direct Utilization of Geothermal Energy Resources		
HOME OFFICE ADDRESS Philip, South Dakota 57567					
DIVISION(S) AND LOCATION(S) WHERE WORK IS TO BE PERFORMED			TOTAL AMOUNT OF PROPOSAL \$ 483,762	GOVT SOLICITATION NO. PON EG 77-N-03-1553	
DETAIL DESCRIPTION OF COST ELEMENTS					
1. DIRECT MATERIAL (Identify on Exhibit A)			EST COST (\$)	TOTAL EST COST	REFER- ENCE
a. PURCHASED PARTS					
b. SUBCONTRACTED ITEMS			381,800		
c. OTHER — (1) RAW MATERIAL					
(2) YOUR STANDARD COMMERCIAL ITEMS					
(3) INTERDIVISIONAL TRANSFERS (At other than cost)					
TOTAL DIRECT MATERIAL				\$381,800	
2. MATERIAL OVERHEAD (Rate % NS Rate =)					
3. DIRECT LABOR (Specify)		ESTIMATED HOURS	RATE/ HOUR	EST COST (\$)	
Charles Maxon		800	11.00	8800	
Phyliss Hajek (Business Manager)		285	5.00	1425	
TOTAL DIRECT LABOR					
				\$10,225	
4. LABOR OVERHEAD (Specify Department or Cost Center)		O/H RATE	BASE =	EST COST (\$)	
Fringe Benefits O/H					
15% of Wages & Salaries		15%	10,225	1534	
TOTAL LABOR OVERHEAD					
				\$1534	
5. SPECIAL TESTING (Including field work at Government installations)				EST COST (\$)	
STD. Water & Trace Elements Tests 28 @ \$76				2128	
TOTAL SPECIAL TESTING				\$2128	
6. SPECIAL EQUIPMENT (If direct charge) (Identify on Exhibit A)				EST COST (\$)	
				\$14,350	
7. TRAVEL (If direct charge) (Give details on attached Schedule)				EST COST (\$)	
a. TRANSPORTATION				1680	
b. PER DIEM OR SUBSISTENCE				326	
TOTAL TRAVEL				\$2006	
8. CONSULTANTS (Identify - name - rate)				EST COST (\$)	
Graduate Research Assistant 2 years @ 3600/year				7200	
Environmental Impact Statement				3000	
Hengel, Berg & Associates				48,780	
TOTAL CONSULTANTS				\$58,980	
9. OTHER DIRECT COSTS (Identify on Exhibit A)				EST COST (\$)	
				\$7320	
TOTAL DIRECT COST AND OVERHEAD				\$478,345	
10. GENERAL AND ADMINISTRATIVE EXPENSE (Rate % of estimated cost)				EST COST (\$)	
53 % of estimated cost				\$5419	
11. PROFIT					
TOTAL ESTIMATED COST					
12. FEE OR PROFIT					
TOTAL ESTIMATED COST AND FEE OR PROFIT				\$483,762	

This proposal is submitted for cost in connection with and in response to (DDC, the RFP, &c.)
 PON EG 77-N-03-1553 Direct Utilization of Geothermal Energy Resources --
 Field Experiments

and reflects our best estimates as of this date, in accordance with the Instructions to Offerors and the footnotes which follow.

TITLED NAME AND TITLE

Charles A. Maxon, Superintendent

SIGNATURE

Charles A. Maxon

NAME OF FIRM

Haakon School District #27-1

DATE OF SUBMISSION

November 22, 1977

EXHIBIT A--SUPPORTING SCHEDULE (Specify. If more space is needed, use reverse)

COST EL NO.	ITEM DESCRIPTION (See footnote 5)	EST COST (\$)
1b	Well w/casing	190,000
1b	Supply Piping	5,600
1b	Pipe from School to Lake Sunshine	67,500
1b	Heat Exchangers and Modifications Armory Building	44,500
1b	Heat Exchangers and Modifications Elementary Building	35,000
1b	Heat Exchangers and Fan Coil Units Vo-Ag Building	26,000
1b	Heat Exchangers for Back-up system	13,200
	SUB TOTAL	381,800
	TESTING AND RECORDING EQUIPMENT	
6	Recording Polarograph	9,500
6	Recording Pressure Monitor	350
6	Recording Flow Monitor	500
6	Recording Temperature Gauge	400
6	Recording pH meter	600
6	Recording Dissolved Oxygen	1,000
6	Recorder w/6 pens	2,000
7	a. TRANSPORTATION	
	Automobile mileage: Est. 5040 miles between Rapid City	
	and Philip @ 0.20/mile	1,008
	Commercial Airline: Est. 2 trips to Oakland, Calif.	600
	@ \$300/trip	
	Continued next page	

1. HAS ANY EXECUTIVE AGENCY OF THE UNITED STATES GOVERNMENT PERFORMED ANY REVIEW OF YOUR ACCOUNTS OR RECORDS IN CONNECTION WITH ANY OTHER GOVERNMENT PRIME CONTRACT OR SUBCONTRACT WITHIN THE PAST TWELVE MONTHS?

☐ YES ☒ NO (If yes, identify below)

NAME AND ADDRESS OF REVIEWING OFFICE AND INDIVIDUAL

TELEPHONE NUMBER, EXTENSION

2. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS PROPOSED CONTRACT?

☐ YES ☒ NO (If yes, identify on reverse or separate page)

3. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT?

☒ YES ☐ NO (If yes, identify): ☐ ADVANCE PAYMENTS ☒ PROGRESS PAYMENTS OR ☐ GUARANTEED LOANS

4. DO YOU NOW HOLD ANY CONTRACT (Or, do you have any independently financed (IFED) projects) FOR THE SAME OR SIMILAR WORK CALLED FOR BY THIS PROPOSED CONTRACT?

☐ YES ☒ NO (If yes, identify):

5. DOES THIS COST SUMMARY CONFORM WITH THE COST PRINCIPLES SET FORTH IN AGENCY REGULATIONS?

☒ YES ☐ NO (If no, explain on reverse or separate page)

See Federal Acquisition Regulation and Instructions

OPTIONAL FORM 66 (10-71)

This proposal is submitted for use in connection with and in response to *(Describe RFP, etc.)*

PON FG 77-N-03-1553 Direct Utilization of Geothermal Energy Resources -
Field Experiments

and reflects our best estimates as of this date, in accordance with the Instructions to Officers and the Footnotes which follow.

 TYPED NAME AND TITLE

Charles A. Maxon Superintendent

SIGNATURE

SIGNATURE
Charles A. Maxon

NAME OF FRIA

Hakon School District #27-1

DATE OF SUBMISSION

November 22, 1977

EXHIBIT A—SUPPORTING SCHEDULE (Specify. If more space is needed, use reverse)

[illegible]

1. HAS ANY EXECUTIVE AGENCY OF THE UNITED STATES GOVERNMENT PERFORMED ANY REVIEW OF YOUR ACCOUNTS OR RECORDS IN CONNECTION WITH ANY OTHER GOVERNMENT PRIME CONTRACT OR SUBCONTRACT WITHIN THE PAST TWELVE MONTHS?

☐ YES ☒ NO (If no, identify below.)

NAME AND ADDRESS OF RECEIVING OFFICE AND INDIVIDUAL

TELEPHONE NUMBER/EXTENSION

11. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS PROPOSED CONTRACT?

☐ YES ☒ NO (If yes, identify on name or separate page)

10 DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT?

☒ YES ☐ NO (If yes, identify): ☐ ADVANCE PAYMENTS ☐ PROGRESS PAYMENTS OR ☐ GUARANTEED LOANS

IV. DO YOU NOW HOLD ANY CONTRACT (Or, do you have any independently financed (TRFD) projects) FOR THE SAME OR SIMILAR WORK CALLED FOR BY THIS PROPOSED CONTRACT?

$\begin{bmatrix} 1 \\ 0 \end{bmatrix}$ vs $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$ is If yes, identify ρ .

10. DOES THIS COST SUMMARY CONFORM WITH THE COST PRINCIPLES SET FORTH IN AGENCY REGULATIONS?

☐ YES ☐ NO (If no, explain on reverse or separate page)

See Review for Instructions and Examples

OPTIONAL FORM 60 (10-71)

CONTRACT PRICING PROPOSAL (RESEARCH AND DEVELOPMENT)

Office of Management and Budget
Approval No. 29-RC184

This form is for use when (i) submission of cost or pricing data (see FPR 1-3.807-3) is required and (ii) substitution for the Optional Form 32 is authorized by the contracting officer.

PAGE NO.

1

NO. OF PAGES

2

NAME OF OFFEROR

Hengel, Berg and Associates

HOME OFFICE ADDRESS

115 St. Joseph Street
Rapid City, South Dakota 57701

NAME OF(S) AND LOCATION(S) WHERE WORK IS TO BE PERFORMED

Same

SUPPLIES AND/OR SERVICES TO BE FURNISHED

Design and construction observation
of Project and Technical Assistance
with Monitoring and Reporting

TOTAL AMOUNT OF PROPOSAL

\$48,780

GOVT SOLICITATION NO.

PON EG -77-N-03-1553

DETAIL DESCRIPTION OF COST ELEMENTS

1. DIRECT MATERIAL (Itemize on Exhibit A)	EST COST (\$)	TOTAL EST COST	REFERENCE
a. PURCHASED PARTS			
b. SUBCONTRACTED ITEMS			
c. OTHER - (1) RAW MATERIAL			
(2) YOUR STANDARD COMMERCIAL ITEMS			
(3) INTERDIVISIONAL TRANSFERS (At other than cost)			
TOTAL DIRECT MATERIAL			
2. MATERIAL OVERHEAD (Rate % of \$100 -) (Rate -)			
3. DIRECT LABOR (Specify)	ESTIMATED HOURS	RATE / HOUR	EST COST (\$)
Technical Assistance and Construction Observation			
R.J. Hengel	174	12.50	2175
R.O. Berg	260	12.50	3250
Engineer	176	6.75	1188
Clerical	94	4.50	423
	704		
TOTAL DIRECT LABOR			\$7036
4. LABOR OVERHEAD (Specify Department or Cost Center)	O.H. RATE	BASE	EST COST (\$)
Entire Company	20.2 %	7036	\$1421
TOTAL LABOR OVERHEAD			\$1421
5. SPECIAL TRAVEL (For field work at Government installation)			EST COST (\$)
Survey Crew - Est. 32 Hours @ \$33 per hour			\$1056
TOTAL SPECIAL TRAVEL			\$1056
6. SPECIAL EQUIPMENT (If direct charge) (Itemize on Exhibit A)			EST COST (\$)
7. TRAVEL (If direct charge) (Give details on attached Schedule)			EST COST (\$)
a. TRANSPORTATION			1680
b. PER DIEM OR SUBSISTENCE			2.6
TOTAL TRAVEL			\$2036
8. CONSULTANTS (Identify - purpose - rate)			EST COST (\$)
Francis-Meador-Gelhaus Inc. - Field design & Observation			14,000
Dr. D.D. Carda - Instrumentation			1000
Hengel, Berg & Associates - Design and Shop Drawings			13,975
conversion of system and line to lake			
TOTAL CONSULTANTS			\$28,975
9. OTHER DIRECT COSTS (Itemize on Exhibit A)			1,500
TOTAL DIRECT COST AND OVERHEAD			\$41,994
10. GENERAL AND ADMINISTRATIVE EXPENSE (Rate 68.3% of contract No. 3)			4,806
11. PROFIT			
TOTAL ESTIMATED COST			
12. PROFIT FOR Technical Assistance and Construction Observation 15%			\$1980
TOTAL ESTIMATED COST AND PROFIT			\$48,780

PON EG 77-N-03-1553 Direct Utilization of Geothermal Energy Resources -
Field Experiments

11760 NAME AND TITLE

Richard O. Berg - Partner

SIGNATURE

NAME C: P.24

Hengel, Berg & Associates

DATE OF SUBMISSION

November 22, 1977

EXHIBIT A--SUPPORTING SCHEDULE (Specify. If more space is needed, use reverse)

[illegible]

1. HAS ANY EXECUTIVE AGENCY OF THE UNITED STATES GOVERNMENT PERFORMED ANY REVIEW OF YOUR ACCOUNTS OR RECORDS IN CONNECTION WITH ANY OTHER GOVERNMENT PRIME CONTRACT OR SUBCONTRACT WITHIN THE PAST TWELVE MONTHS?

☐ YES ☒ NO (If yes, identify below.)

NAME AND ADDRESS OF REVIEWING OFFICE AND INDIVIDUAL

TELEPHONE NUMBER/EXTENSION

11. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS PROPOSED CONTRACT?

☐ YES ☐ NO (If yes, identify on reverse or on other page)

4. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTR. ST.

☒ YES ☐ NO (If no, itemize): ☐ ADVANCE PAYMENTS ☒ PROGRESS PAYMENTS OR ☐ GUARANTEED LOANS

17. DO YOU NOW HOLD ANY CONTRACT (Or, do you have any independently financed (IFED) projects) FOR THE SAME OR SIMILAR WORK CALLED FOR BY THIS PROPOSED CONTRACT?

[7] vs. [5] NO (If yes, identify):

Y. DOES THIS COST SUMMARY CONFORM WITH THE COST PRINCIPLES SET FORTH IN AGENCY REGULATION?

[3] vs [7] NO (If no, why? See on right or opposite page)

See Reverse for Instructions and Estimates

OPTIONAL FORM 60 (10-71)

COST SHARING ESTIMATE

ITEM	TOTAL COST	ERDA FUNDING	HAAKON SCHOOL DISTRICT #27-1 FUNDING
Direct Labor by Haakon School District #27-1	\$10,225		\$10,225
Fringe Benefits on Direct Labor by School District	\$ 1,534		\$ 1,534
General and Administrative Expense by School District	\$ 5,419		\$ 5,419
Well Site	\$ 5,000		\$ 5,000
Well w/casing	\$190,000	\$168,892	\$21,171
Supply Piping	\$ 5,600	\$ 5,600	
Pipe from School to Lake Sunshine	\$67,500	\$ 67,500	
Heat Exchangers and Modifications			
Armory Building	\$44,500	\$ 44,500	
Elementary Building	\$35,000	\$ 35,000	
Vo-Ag Building	\$26,000	\$ 26,000	
Heat Exchanger for Back-up system	\$13,200		\$13,200
Standard Water Tests	\$ 2,128	\$ 2,128	
Testing and Recording Equipment	\$14,350	\$ 14,350	
Graduate Research Assistant	\$ 7,200		\$ 7,200
Environmental Impact Statement	\$ 3,000		\$ 3,000
Professional Services - Design			
Construction observation and			
Technical Assistance	\$48,780	\$ 19,855	\$ 28,925
Feasibility Study completed June 1977	\$ 1,400		\$ 1,400
Expendable Supplies	\$ 20		\$ 20
Communications	\$ 200		\$ 200
Printing (reports)	\$ 700		\$ 700
Travel and Subsistence	\$ 2,006		\$ 2,006
	<u>\$481,762</u>	<u>\$383,762</u>	<u>\$100,000</u>
TOTAL			

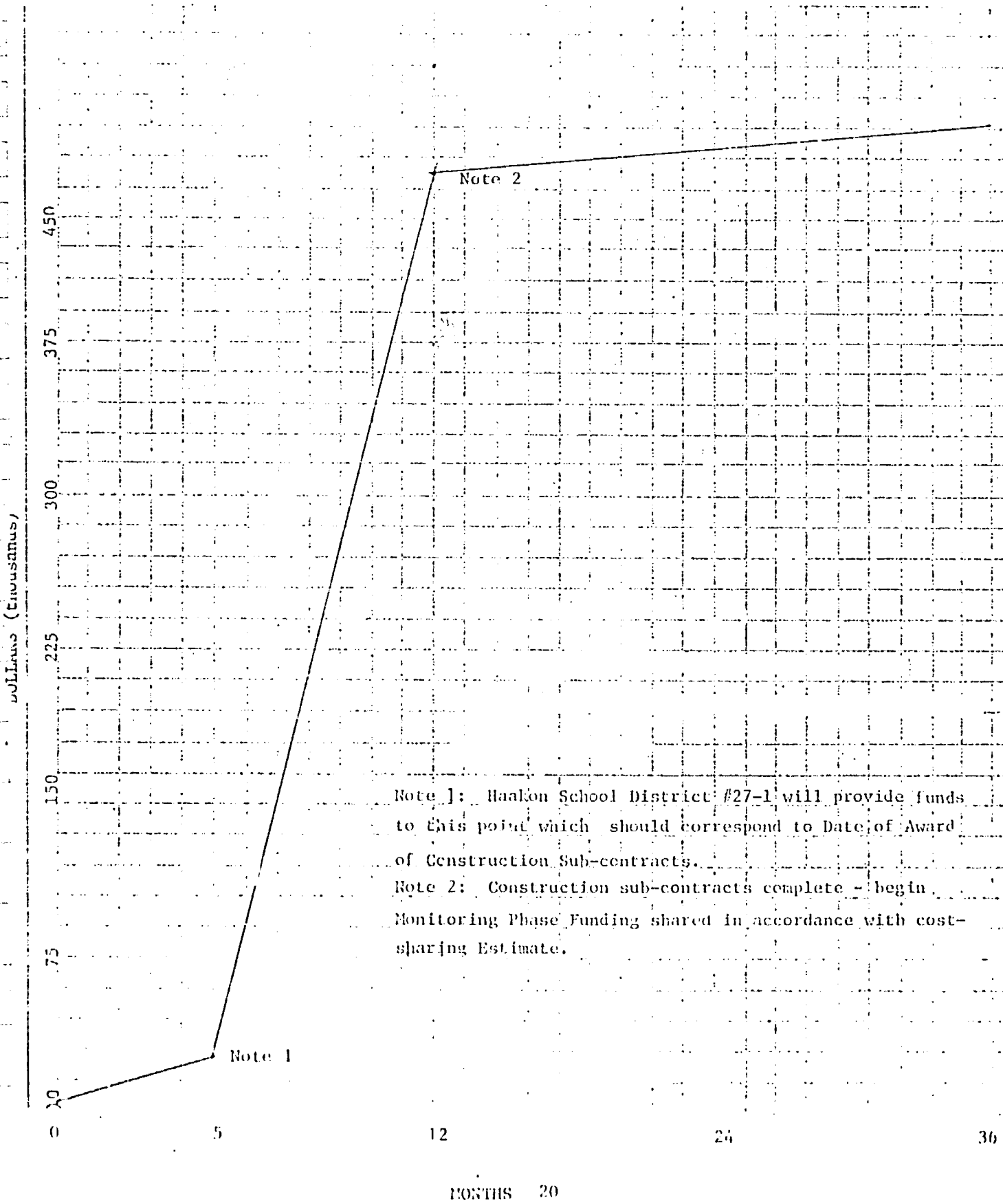
FUNDING

Haakon School District #27-1 has provided the funds for a feasibility study which was completed in June, 1977. They have the local funds available to move the project to the bid opening stage. After the award of the construction contracts, ERDA and Haakon School District #27-1 would participate in the construction cost as itemized on the COST SHARING ESTIMATE. The cost of monitoring and reporting would be shared by ERDA and Haakon School District #27-1 for the two years of monitoring and reporting which begins with the completion of the well.

Because the conversion of the existing system can not be completed until the summer months, it is anticipated that the monitoring and reporting phase would begin, approximately one year after the notice of award of ERDA grant.

The following PROJECTED CASH FLOW PLAN is shown on the anticipated time of expenditure of the amounts shown in the COST SHARING ESTIMATE.

PROJECTED CASH FLOW



Note 1: Haakon School District #27-1 will provide funds to this point which should correspond to Date of Award of Construction Sub-contracts.

Note 2: Construction sub-contracts complete - begin Monitoring Phase Funding shared in accordance with cost-sharing Estimate.

COST COMPARISON

This request is for a grant to convert an existing oil and electric heating system to a geothermal system. All costs except for the cost of the back-up heat system are associated with the proposed geothermal energy system. The COST SHARING ESTIMATE itemizes the costs of the various items involved with the conversion of the existing system.

APPENDIX C

REPRESENTATIONS AND CERTIFICATIONS

Contract No.	Supplemental Agreement No.	Synopsis No.	Reque. - For Proposal No.
--------------	-------------------------------	--------------	------------------------------

Instructions: Check or complete all appropriate boxes or blanks.

The proposer makes the following representations and certifications:

1. SMALL BUSINESS

He () is, (☒) is not, a small business concern. (For this purpose, a small business concern is a business concern, including its affiliates, which (a) is independently owned and operated, (b) is not dominant in the field of operation in which it is bidding on Government contracts, and (c) can further qualify under the criteria concerning number of employees average annual receipts, or other criteria as prescribed by the Small Business Administration.)

2. CONTINGENT FEE

(a) He () has, (☒) has not, employed or retained any company or person (other than a full-time bona fide employee working solely for the bidder) to solicit or secure this contract, and (b) he () has, (☒) has not, paid or agreed to pay any company or person (other than a full-time bona fide employee working solely for the bidder) any fee, commission, percentage or brokerage fee, contingent upon or resulting from the award of this contract; and agrees to furnish information relating to (a) and (b) above as requested by the Contracting Officer. (For interpretation of the representation, including the term "bona fide employee," see Code of Federal Regulations, Title 41, Subpart 1-1.5.)

3. TYPE OF ORGANIZATION

He operates as an () individual, () partnership, (☒) joint venture, () corporation, incorporated in State of _____.

4. EQUAL OPPORTUNITY

He () has, (X) has not, participated in a previous contract or subcontract subject to the Equal Opportunity Clause herein, the clause originally contained in Section 301 of Executive

Order No. 10925, or the clause contained in Section 201 of Executive Order No. 11114; he () has, (X) has not, filed all required compliance reports; and representations indicating submission or required compliance reports, signed by proposed subcontractors, will be obtained prior to subcontract awards.

5. AFFIRMATIVE ACTION COMPLIANCE PROGRAM

The offeror represents that (a) he ☒ has developed and has on file, () has not developed and does not have on file, at each establishment an affirmative action program as required by the rules and regulations of the Secretary of Labor (41 CFR 60-1 and 60-2), or (b) he ☒ has not previously had contracts subject to written affirmative action program requirements of the rules and regulations of the Secretary of Labor because (check as applicable):

_____ offeror does not have 50 or more employees

X offeror has not had a Government prime contract or subcontract of \$50,000 or more, or

X offeror is exempt under 41 CFR 60-1 (list exemption)
Public School.

6. EQUAL OPPORTUNITY COMPLIANCE

[Applicable to proposals exceeding \$1,000,000]

The offeror represents --

- a. That a full compliance review of the offeror's employment practices () has, (~~X~~) has not, been conducted by an agency of the Federal Government.
- b. If a full compliance review has been conducted by an agency of the Federal Government, the most recent compliance review was conducted on _____ by _____.
- (Date) (Federal Agency)

- c. The proposed first-tier subcontractors which will be awarded subcontracts of \$1,000,000 or more are _____.

Any offeror and his known first-tier subcontractors which will be awarded subcontracts of \$1,000,000 or more will be subject to full, preaward equal opportunity compliance reviews before the award of the contract for the purpose of determining whether the proposer and his subcontractors are able to comply with the provisions of the equal opportunity article.

7. CERTIFICATION OF NONSEGREGATED FACILITIES

By the submission of this proposal, the offeror, applicant, or subcontractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. He certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The offeror, applicant, or subcontractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. He further agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause; that he will retain such certifications in his files; and that he will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR
CERTIFICATION OF NONSEGREGATED FACILITIES

A Certification of Nonsegregated Facilities must be submitted prior to the award of a subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semi-annually, or annually).

8. PARENT COMPANY AND EMPLOYER IDENTIFICATION NUMBER

Each proposer shall furnish the following information by filling in the appropriate blocks.

- a. Is the proposer owned or controlled by a parent company as described below? () Yes (X) No. (For the purpose of this proposal, a parent company is defined as one which either owns or controls the activities and basic business policies of the proposer. To own another company means the parent company must own at least a majority (more than 50 percent) of the voting rights in that company. To control another company, such ownership is not required; if another company is able to formulate, determine or veto basic business policy decisions of the proposer, such other company is considered the parent company of the proposer. This control may be exercised through the use of dominant minority voting rights, use of proxy voting, contractual arrangements, or otherwise.)
- b. If the answer to a. above is "Yes", proposer shall insert in the space below the name and main office address of the parent company.

Name of Parent Company

Main Office Address (No., Street, City State, and Zip Code)

- c. Proposer shall insert in the applicable space below, if he has no parent company, his own Employer's Identification Number (E.I. No.) (Federal Social Security Number used on Employer's Quarterly Federal Tax Return, U. S. Treasury Department Form 941), or if he has a parent company, the E.I. No. of his parent company.

Employer Identification Number of Parent Company: _____

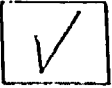
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9. DISCLOSURE STATEMENT - COST ACCOUNTING PRACTICES AND CERTIFICATION

Any contract in excess of \$100,000 resulting from this solicitation except (1) when the price negotiated is based on (a) established catalog or market prices of commercial items sold in substantial quantities to the general public, or (b) prices set by law or regulation, or (2) contracts which are otherwise exempt (see 4 CFR 331.50(b) and FPRI-3.1203(a)(2)) shall be subject to the requirements of the Cost Accounting Standards Board. Any offeror submitting a proposal, which, if accepted, will result in a contract subject to the requirements of the Cost Accounting Standards Board must, as a condition of contracting, submit a Disclosure Statement as required by regulations of the Board. The Disclosure Statement must be submitted as a part of the offeror's proposal under this solicitation (see (I) below) unless (1) the offeror, together with all divisions, subsidiaries, and affiliates under common control, did not exceed the monetary exemption for disclosure as established by the Cost Accounting Standards Board (see (II) below), (ii) the offeror exceeded the monetary exemption in the Federal Fiscal Year immediately preceding the year in which this proposal was submitted but, in accordance with the regulations of the Cost Accounting Standards Board, is not yet required to submit a Disclosure Statement (see (III) below); (iii) the offeror has already submitted a Disclosure Statement disclosing the practices used in connection with the pricing of this proposal (see (IV) below); or (iv) post award submission has been authorized by the Contracting Officer. See 4 CFR 351.70 for submission of a copy of the Disclosure Statement to the Cost Accounting Standards Board.

Caution: A practice disclosed in a Disclosure Statement shall not, by virtue of such disclosure, be deemed to be a proper, approved, or agreed to practice for pricing proposals or accumulating and reporting contract performance cost data.

Check the appropriate box below:



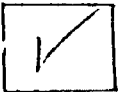
I. CERTIFICATE OF CONCURRENT SUBMISSION OF DISCLOSURE STATEMENT(S)

The offeror hereby certifies that he has submitted, as a part of his proposal under this solicitation, copies of the Disclosure Statement(s) as follows: (i) original and one copy to the cognizant Contracting Officer; and (ii) one copy to the cognizant contract auditor.

Date of Disclosure Statement(s):

Name(s) and Address(es) of Cognizant Contracting Officer(s) where filed:

The offeror further certifies that practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the Disclosure Statement(s).



II. CERTIFICATE OF MONETARY EXEMPTION

The offeror hereby certifies that he, together, with all divisions, subsidiaries, and affiliates under common control, did not receive net awards of negotiated national defense prime contracts subject to cost accounting standards totaling more than \$10,000,000 in either Federal Fiscal Year 1974 or 1975 or net awards of negotiated national defense prime contracts and subcontracts subject to cost accounting standards totaling more than \$10,000,000 in Federal Fiscal Year 1976 or in any subsequent Federal Fiscal Year preceding the year in which this proposal was submitted.

CAUTION: Offerors who submitted or who currently are obligated to submit a Disclosure Statement under the filing requirements previously established by the Cost Accounting Standards Board are not eligible to claim this exemption unless they have received notification of final acceptance of all deliverable items on all of their prime contracts and subcontracts containing the Cost Accounting Standards clause, (Section 1-3.1204-1).



III. CERTIFICATE OF INTERIM EXEMPTION

The offeror hereby certifies that (i) he first exceeded the monetary exemption for disclosure, as defined in (II) above, in the Federal Fiscal Year immediately preceding the year in which this proposal was submitted, and (ii) in accordance with

the regulations of the Cost Accounting Standards Board (4 CFR 351.40(f)), he is not yet required to submit a Disclosure Statement. The offeror further certifies that if an award resulting from this proposal has not been made by March 31 of the current Federal Fiscal Year, he will immediately submit a revised certificate to the Contracting Officer, in the form specified under (I), above, or (IV), below, as appropriate, to verify his submission of a completed Disclosure Statement.

Caution: Offerors may not claim this exemption if they are currently required to disclose because they exceeded monetary thresholds in Federal Fiscal Years prior to fiscal year 1976. Further, the exemption applies only in connection with proposals submitted prior to March 31 of the year immediately following the Federal Fiscal Year in which the monetary exemption was exceeded.

☐ IV. CERTIFICATE OF PREVIOUSLY SUBMITTED DISCLOSURE STATEMENT(S)

The offeror hereby certifies that the Disclosure Statement(s) were filed as follows:

Date of Disclosure Statement(s):.....

Name(s) and Address(es) of Cognizant Contracting Officer(s) where filed:.....
.....

The offeror further certifies that practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the Disclosure Statement(s).

10. COST ACCOUNTING STANDARDS - EXEMPTION FOR CONTRACTS OF \$500,000 OR LESS - CERTIFICATION

If this proposal is expected to result in the award of a contract of \$500,000 or less and the offeror is otherwise eligible for an exemption, he shall indicate by checking the box below that the exemption to the Cost Accounting Standards clause (FPR 1-3.1204 under the provisions of 4 CFR 331.20(b)(8) (see FPR 1-3.1203(h)) is claimed. Where the offeror fails to check the box, he shall be given the opportunity to make an election in writing to the Contracting Officer prior to award. Failure to check the box below or make such an election shall mean that the offeror cannot claim the exemption to the Cost Accounting Standards clause or that the offeror elects to comply with such clause.

(X) Certificate of Exemption for Contracts of \$500,000 or Less.

The offeror claims an exemption from the Cost Accounting Standards clause under the provisions of 4 CFR 331.30(b)(8) and certifies that he has received notification of final acceptance of all items or work on (i) any prime contract or subcontract in excess of \$500,000 which contains the Cost Accounting Standards clause, and (ii) any prime contract or subcontract of \$500,000 or less awarded after January 1, 1975, which contains the Cost Accounting Standards clause. The offeror further certifies he will immediately notify the Contracting Officer in writing in the event he is awarded any other contract or subcontract containing the Cost Accounting Standards Clause subsequent to the date of this certificate but prior to the date of any award resulting from this proposal.

11. ADDITIONAL COST ACCOUNTING STANDARDS APPLICABLE TO EXISTING CONTRACTS-CERTIFICATION

- (a) Cost accounting standards will be applicable and effective as promulgated by the Cost Accounting Standards Board to any award as provided in the Federal Procurement Regulations Subpart 1-3.12. If the offeror presently has contracts or subcontracts containing the Cost Accounting Standards clause, a new standard becomes applicable to such existing contracts prospectively when a new contract or subcontract containing such clause is awarded on or after the effective date of such new standard. Such new standard may require a change in the offeror's established cost accounting practices, whether or not disclosed. The offeror shall specify by an appropriate entry below, the effect on his cost accounting practice.
- (b) The offeror hereby certifies that an award under this solicitation (X) would, () would not, in accordance with paragraph (a)(3) of the Cost Accounting Standards clause require a change in his established cost accounting practices affecting existing contracts and subcontracts.

NOTE: If the offeror has checked "would" above, and is awarded the contemplated contract, he will also be required to comply with the clause entitled Administration of Cost Accounting Standards.

2. MINORITY BUSINESS ENTERPRISE

The offeror represents that he () is, (X) is not, a minority business enterprise. A minority business enterprise is defined as a "business, at least 50 percent of which is owned by minority group members or, in case of publicly owned businesses, at least 51 percent of the stock of which is owned by minority group members." For the purpose of this definition, minority group members are Negroes, Spanish-speaking American persons, American-Orientals, American-Eskimos, and American Aleuts.

13. INSURANCE ON GOVERNMENT PROPERTY (Applicable to Fixed Price Proposal(s))

The Offeror represents that the quoted price () does, () does not, include a charge or reserve for insurance (including self-insurance) covering damage to Government property (a) caused by any peril while the property is in transit off the Contractor's premises, or (b) caused by any of the excepted perils enumerated in the terms and conditions attached to this Request for Proposal.

14. CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (Applicable to Fixed Price Proposals)

a. By submission of this proposal, each offeror certifies, and in the case of a joint proposal each party thereto certifies as to its own organization, that in connection with this procurement:

- (1) The prices in the proposal have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other offeror or with any competitor;
- (2) Unless otherwise required by law, the prices which have been quoted in this proposal have not been knowingly disclosed by the offeror and will not knowingly be disclosed by the offeror prior to award directly or indirectly to any other offeror or to any competitor; and
- (3) No attempt has been made or will be made by the offeror to induce any other person or firm to submit or not to submit a proposal for the purpose of restricting competition.

b. Each person signing this proposal certifies that:

- (1) He is the person in the offeror's organization responsible within the organization for the decision as to the prices being offered herein and that he has not participated, and will not participate, in any action contrary to (a)(1) through (a)(3) above; or
- (2) (i) He is not the person in the offeror's organization responsible within that organization for the decision as to the prices being offered herein but that he has been authorized in writing to act as agent for the persons responsible for such decision in certifying that such persons have not participated, and will not participate, in any action contrary to (a)(1) through (a)(3) above, and as the agent does hereby so certify; and (ii) he has not participated, and will not participate, in any action contrary to (a)(1) through (a)(3) above.

c. This certification is not applicable to a foreign offeror submitting a proposal for a contract which requires performance or delivery outside the United States, its possessions, and Puerto Rico.

d. A proposal will not be considered for award where (a)(1), (a)(3), or (b) above has been deleted or modified. Where (a)(2) above has been deleted or modified, the proposal will not be considered for award unless the offeror furnishes with the proposal a signed statement which sets forth in detail the circumstances of the disclosure and the head of the agency, or his designee, determines that such disclosure was not made for the purpose of restricting competition.

15. BUY AMERICAN CERTIFICATE

The offeror hereby certifies that each end product, except the end products listed below is a domestic source end product (as defined in the clause entitled "Buy American Act"); and that components of unknown origin have been considered to have been mined, produced, or manufactured outside the United States.

Excluded End Products

Country of Origin

16. CLEAN AIR AND WATER CLAUSE

(Applicable if the bid or offer exceeds \$100,000, or the Contracting Officer has determined that orders under an indefinite quantity contract in any year will exceed \$100,000, or a facility to be used has been the subject of a conviction under the Clean Air Act (42 U.S.C. 1857c-8(c)(1)) or the Federal Water Pollution Control Act (33 U.S.C. 1319(c)) and is listed by EPA, or is not otherwise exempt.)

The bidder or offeror certifies as follows:

(a) Any facility to be utilized in the performance of this proposed contract has ☐, has not ☐, been listed on the Environmental Protection Agency List of violating facilities

(b) He will promptly notify the Contracting Officer, prior to award of the receipt of any communication from the Director, Office of Federal Activities, U.S. Environmental Protection Agency, indicating that any facility which he proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities.

(c) He will include substantially this certification, including this paragraph (c), in every nonexempt subcontract.

Haakon School District #27-1
(Offeror)

By Charles A. Maylon

Title Superintendent

Date November 22, 1977

Offerors must set forth full accurate and complete information as required by this solicitation (including attachments).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

1633-2 Hackberry School Aug 27-1

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q To Empty 331 100 psi
furnace 100 psi

Pressure 1100 psi

Leptotrypa 159' F

Walt. W. Brown, Esq., June 22,

Acetabularia medusa (L.) Lamour.

Don't forget

Journal of Management Education 36(7) 809-824
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Al. rubra

...and the fact that the *in vitro* and *in vivo* results are in good agreement.

Age Group	2006	2007	2008
18-29	~85	~88	~90
30-49	~75	~78	~80
50-69	~65	~68	~70
70+	~55	~58	~60

Figure 1. The effect of the concentration of the *Agrobacterium* suspension on the transformation efficiency of *Agrobacterium* strains. The concentration of the *Agrobacterium* suspension was 10⁶ cells/ml (A), 10⁷ cells/ml (B), 10⁸ cells/ml (C), and 10⁹ cells/ml (D). The concentration of the *Agrobacterium* suspension was 10⁶ cells/ml (A), 10⁷ cells/ml (B), 10⁸ cells/ml (C), and 10⁹ cells/ml (D). The concentration of the *Agrobacterium* suspension was 10⁶ cells/ml (A), 10⁷ cells/ml (B), 10⁸ cells/ml (C), and 10⁹ cells/ml (D). The concentration of the *Agrobacterium* suspension was 10⁶ cells/ml (A), 10⁷ cells/ml (B), 10⁸ cells/ml (C), and 10⁹ cells/ml (D).

1. *Chlorophyll a* (Chl *a*)

RECEIPT

WATER RIGHTS COMMISSION

State of South Dakota

No 4 8659

PIERRE, ~~January 13 1912~~, 1912

RECEIVED OF Haakon County Dist. #27-1, Philip, SD 57567

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

Fee for Application for Permit to appropriate Water No. (examination, processing, recording and filing)		
Fee for inspecting Construction, and issuing Cert. of Construction No.		
Fee for inspecting Beneficial Use, and issuing Water License No. 1633-2	50	00
Fee for issuing Location Certificate-Dry Draw, No		
Fee for filing		
Fee for certified copy of		
Fee for Print copy of map		
Fee for Certifying		
Fee for		
(any other work as provided by law)		
TOTAL	50	00

WATER RIGHTS COMMISSION

By J. H. Hatch
Chief Engineer, Executive Officer
JOHN HATCH, 

Permit No 1633-2Water Division 2 Bad River Water DistrictREPORT OF EXAMINATION OF WORKS
AND/OR APPLICATION OF WATER TO BENEFICIAL USE

TO: WATER RIGHTS, WATER MANAGEMENT BOARD / FOSS BLDG., PIERRE, SOUTH DAKOTA 57501

I have this day made a thorough examination of the water use system constructed by Hudson School
 Dist # 27-1 of Philip S. Dak 57567 holder
 of Permit No. 1633-2, bearing date of priority of April 26, 1975
 authorizing the diversion of 2.0 cu. ft. per second of the waters of One Madison Well
 for Geothermal Heating purposes, in H. Dak. County.

I have to report on the condition of the same as follows:

The Water Use System consists of,

A. Works used to divert the water:

Artesian flowing well - Flowing 330 gpm (max)

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

Pipeline from Well to School

C. Works used to apply water to beneficial use.

Water runs thru a heat exchanger and the heat from the water heats the school buildings. The water then is piped to about 8 farms in town. It is then treated and discharged into the Bad River.

The system is in the following condition. ExcellentThe point of diversion is located N. 83° 0' W. 60 ft from the SE Cor. of Lot C

Block 2 High school addition to the city of Philip. To NE 1/4 NE 1/4 SE 1/4
Sec. 14, T14N R20E

The works are capable of diverting and conveying to the place of use 1.73 (330 gpm)cu. ft. per second of water which is to be used for Geothermal Heating Purposes

Water has been put to beneficial use to the maximum extent as follows:

comprising a total of _____ acres of land

Well Data:

Depth - 4266Max Pressure 100 psiTemperature 150°FFlowing 330 gpm

Well has all of the necessary
 controls. An excellent installation

Pressure 173 cfsDate April 13, 1975

L. Roy J. McLaughlin
 (Signature)

STATE OF SOUTH DAKOTA

WATER LICENSE NO. 1633-2

(1) WHEREAS, On the 26th day of April A. D. 19 78
Haakon School District #27-1

made Water Right Application No. 1633-2 for a permit to use 2.0 cubic feet per second of the waters
 of groundwater (one Hadison well)

County of Haakon, State of South Dakota, for geothermal heating

purposes; and

(2) WHEREAS, On the 26th day of July A. D. 19 78

Permit No. 1633-2, with a date of priority of April 26, 1978

was issued to said applicant 5 for the diversion of said water, and provided for the completion of construction of the water
 supply system therein described on or before the 26th day of July A. D. 19 83 and for the
 application to beneficial use of said water on or before the 26th day of July A. D. 19 87

and:

(3) WHEREAS, It is hereby certified that the applicant has complied with the provisions of the laws of the State of South Dakota
 relating to completion of the construction of the water supply system and is entitled to divert 0.73 cubic feet
 per second of water for beneficial use and,

(4) WHEREAS, It is hereby certified that the applicant has complied with the provisions of the laws of the State of South Dakota
 relating to the application of water to beneficial use of the following extent,

to supply water for geothermal heating of school buildings without
the City of Philip

(5) NOW, THEREFORE By the virtue of the authority vested in us by the laws of the State of South Dakota, We hereby grant and confirm to Haakon School District #27-1

_____ of _____
the holder s as owner s of said permit No. 1633-2 a water right, dating from April 26, 1978
_____ to use of 73 cubic feet per second of the waters
of groundwater (one Madison well)

in the County of Haakon and State of South Dakota, or so much thereof as may be necessary for the
purposes hereinbelow mentioned, to be diverted at a point N83° 0' W 60 feet from the SE
corner of Lot 6, Block 2, High School addition to the City of Philip,
In NE¼NE¼SE¼ of Section 14, T1N, R20E

and conducted to and upon through the distribution system of the Haakon
School District

for the purpose of geothermal heating

Subject to any limitations listed in Water Right Permit No. 1633-2 and subject to the laws of the State of South Dakota.

WITNESS, My hand and seal of our office at Pierre, South Dakota
this 4th day of May A. D.
Nineteen Hundred and Eighty-Two

WATER MANAGEMENT BOARD

By:

John Hatch
Chief Engineer, Executive Officer **JOHN HATCH**

Permit No. 1633-2

Water Diversion No. 2 Bad River Water District
10140102

CERTIFICATE OF CONSTRUCTION

This is to Certify, That Haakon School District #27-1

_____ the holder _____ of
Permit No. 1633-2, issued upon Application No. 1633-2, bearing date of priority of _____
April 26, 1978 authorizing the diversion of 2.0 cu. ft. per second of the waters of _____
groundwater (one Hadison well) County of Haakon, State of South Dakota at _____
a point N83° 0'W 60 feet from the SE corner of Lot 6, Block 2, High
School addition to the City of Philip. In NE&NE&SE&, Section 14,
T11N, R20E for geothermal heating

_____ purposes have _____ complied with the provisions of the laws of the State of South Dakota relating to proof of
completion of the works of diversion set out and described in said Permit; that said works are found in satisfactory
condition for diverting and conveying to the place of intended use 6.73 cu. ft. per second of water.

Date May 4, 1982


JOHN HATCH, Chief Engineer
Water Rights Division

Water Rights Division
605 773-3352

1633-2

June 6, 1984

Haakon School Dist.
ATTN: Roland Smith
310 N School
Philip SD 57567

Mr. Smith:

Th's letter is in regard to your question concerning the individual who would like to be hooked up to the geothermal well used by the School District.

As this will be a non-consumptive use and will not increase the diversion from the well a new permit application will not be required. If you have any further questions, please contact this office.

Thank you,

KEVIN C LARSON
Water Resources Engineer

KCL:ks

SDSmet

1033-2



South Dakota

Farm

Philip School Dist
Madison well No 2

County Haakon

Company

City of Philip

Sec. 14 T. 1 N R. 20 E Driller

Northern Wyoming Drilling Co

1550 FSL
750 FEL

Authority

Samples Set 646

Date spudded

Dec.

1978

Completed

Feb. 1979

Elevation

2239 KB

Method

TM

T.D.

4265

Casing

10" @ 12.5 KB

7" @ 3723 KB

5" hole 240' Set at 3900

Quad

Philip

Static level

Flow

Date

1979

Flow

SIP

Logs

Birdwell 155

Density

Remarks

Flow (after sand?)

290 gpm

Sharn Lgr best

1078 - 1087

T. No

1260

T No 2411

1360

3 No 24

1476

T 2412

1742

T 2413

1812

X 1st

1850.53 or 1965.71

1st 24

2078

T 2414

2112

Sharn Lgr

2418

FR

2555

Mar

2685

Jsh

2694

Avg.

2835

T 2415

2980 or 2996

T. Madison

3800 - 3875

1633-2

ENGINEERING & MINING EXPERIMENT STATION
of the
SOUTH DAKOTA SCHOOL OF MINES & TECHNOLOGY

REPORT OF ANALYSIS

Rapid City, S. D., March 1979, 19

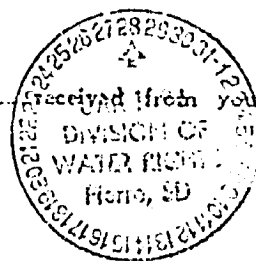
Mr. Philip High School

Philip, SD 57567

The sample of water has been analyzed and the results obtained are as follows:

Certificate No. 789888

Your sample No. #2



SUBSTANCE	mg/L	SUBSTANCE	mg/L
Total Dissolved Solids	1128	Calcium (Ca)	205
Volatile Dissolved Solids		Magnesium (Mg)	44
Total Suspended Solids	17	Sodium (Na)	15
Volatile Suspended Solids		Potassium (K)	8
		Iron (Fe)	0.03
Total Hardness	692	Manganese (Mn)	0.07
Carbonate Hardness	105		
Non-Carbonate Hardness	587		
		Chloride (Cl)	11
pH --- 7.5		Sulfate (SO ₄)	778
Alkalinity (Phenolph'n)	0	Silica (SiO ₂)	
Alkalinity (Met. Orange)	105	Nitrate (N)	.306
		Orthophosphate (PO ₄)	.032
Turbidity (J.U.) ---		Total Phosphate (PO ₄)	.058
Spec. Conductance ---			

REMARKS:

The Engineering and Mining Experiment Station assumes no responsibility as to the source of the above samples.

Analyst.

D. D. Carda, Research Associate

hb

267.1'

300.0

10 9

VACATED

60.0'

90.0'

4 *

5 2

PROP. COR.

WELL

N83°0'W

60.0'

300.2

RIGHT-OF-WAY

29.9

29.7

NO°03'E

8 7

VACATED

VACATED

1

2

3

4

5

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3

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2

3

4

5

6

7

8

316.0

376.4

SO°03'W

60.0

70.0

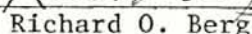
DEDICATED FOR PUBLIC

0°05'E

59.6

A circular professional seal for Richard O. Berg. The outer ring contains the text "REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR" and "SOUTH DAKOTA". The inner circle contains "REG. NO. 1477" and "RICHARD O. BERG". Above the seal, the text "BRYAN STREET" is visible.

HAAKON COUNTY, SOUTH DAKOTA



MAP # ~~1397~~ 2 APPL # 1633-2