



# WATER-RIGHT DOCKET

## Wind Cave National Park

Docket No: 3

### HEADQUARTERS WELL

#### Preliminary Docket Information

00-00-0000: water right/source docket information

#### WATER RIGHT RECORD

Park: WICA

Docket Number:  
Federal #3

IDENTIFICATION NO: WICA, W, 0 6, 0 5, 0 5, A, F, 0, 3,

DITCH/WATER SYSTEM: Headquarters

SOURCE OF SUPPLY: Well

LOCATION: NE $\frac{1}{4}$ SE $\frac{1}{4}$  Sec. 6, T5S, R5E, Black Hills Median

#### WATER RIGHT:

Appropriator: United States of America, National Park Service

Application/Permit Number: 419-2

Certificate Record Number:

Date of Priority: December 29, 1955

Quantity of Water: 0.44 c.f.s.

Purpose: Domestic, recreation, irrigation, fire protection

Irrigated Land Description:

SUMMARY OF STATUS: This is a Federal water right consisting of a well, pump, pipe, reservoir and distribution system.

Well completed April 21, 1956.



IN REPLY REFER TO

United States Department of the Interior

NATIONAL PARK SERVICE  
DENVER SERVICE CENTER  
12795 W. ALAMEDA PARKWAY  
P.O. BOX 25287  
DENVER, COLORADO 80225-0287

JUN 1 1998



L2415 (DSC-EN)  
WICA-149-07

Eric Gronlund  
Joe Foss Building  
Building 523 East Capital  
Pierre, South Dakota 57501

Dear Mr. Gronlund:

Reference: Wind Cave National Park, Pkg. 149, PT: 07

Subject: Drilling Backup Well

The National Park Service is preparing to drill a back-up water well for Wind Cave National Park. The new back-up well will be an additional point of diversion from the same source of water as the existing well. The existing well, covered under water right number 419-2, provides water service for the entire park facility. Operation of the two wells will not exceed the water discharge appropriated under the original water right permit. The existing well number is 06-06-06 DDA. The location is in the NE 1/4, SE 1/4, SE 1/4, Section 6, T. 6 S., R. 6 E. and is in the Deadwood Formation (Pahasapa Limestone) aquifer. The depth of the well is 787 to 795 feet.

A USGS open file report, "Water-Supply Sites for Wind Cave National Park, Custer county, South Dakota," was completed in 1974. It recommends a site 500 feet west of the existing water-supply facilities as having potential for development as a supplementary ground water supply. The proposed new well will be drilled at a location 600 feet west of the existing well. For the locations of the existing well and the proposed well, see the enclosed map.

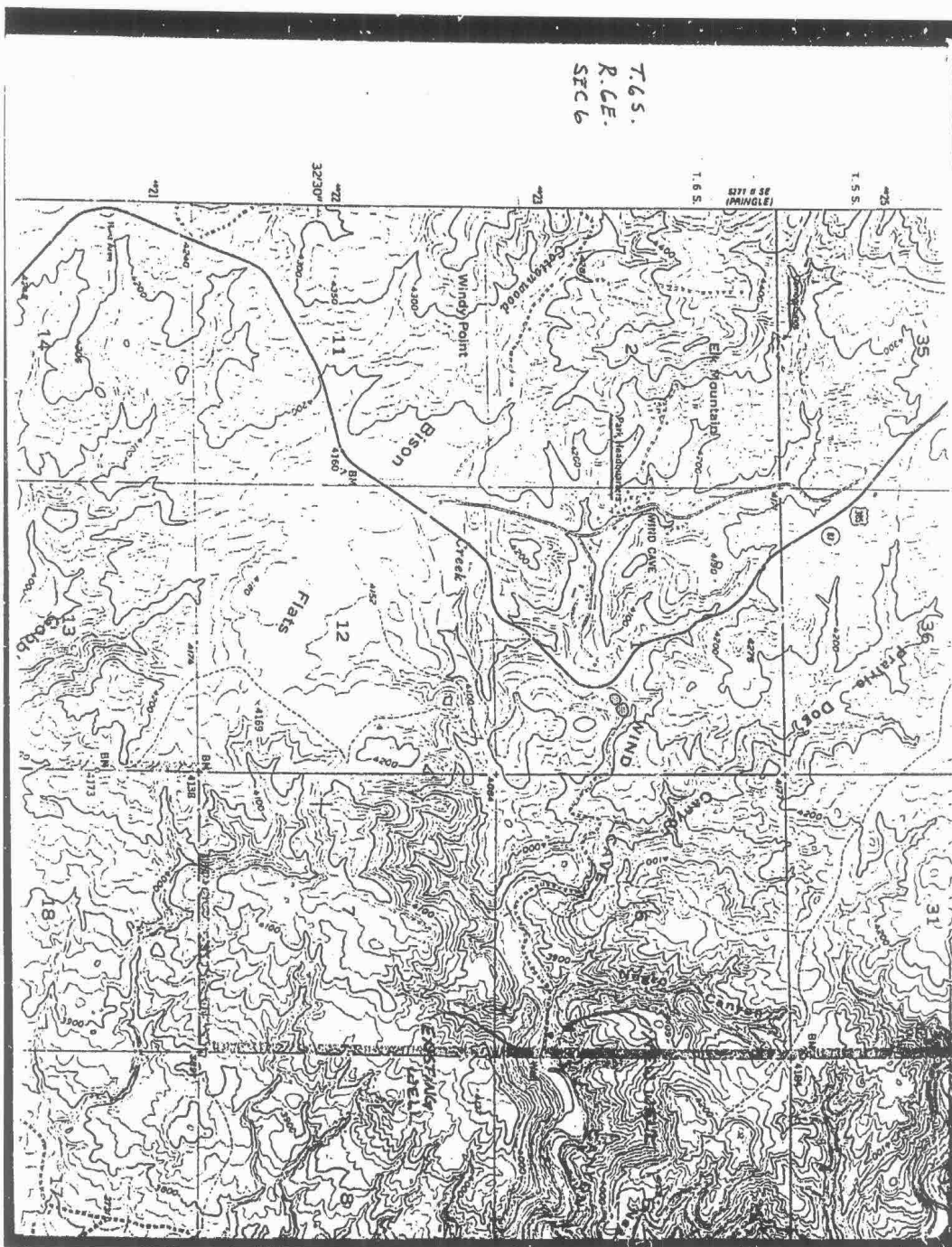
The construction of the new well will follow the South Dakota Codified Law 74:02:04, Well Construction Standards. The new well will be drilled to a depth of 750 to 800 feet into the same aquifer. If differing geologic conditions are encountered at the new site, you will be contacted to insure all statutes are met.

As per state statute 46-5-13.1, please review the proposed additional point of diversion for Wind Cave National Park to clarify that existing diversions are not affected. If there are any questions, please feel free to contact Bob Morrick at (303) 969-2487 or Sena Morrell at (303) 969-2413. Thank you for your time on this matter.

Sincerely,

*Sena Morrell*  
for Sena Morrell

Enclosure



DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES  
WATER RIGHTS PROGRAM

June 24, 1978

RE: Request for an additional point of diversion for Water Right No. 419-2, Wind Cave National Park

The National Park Service has submitted an application requesting authorization for an additional point of diversion for Water Right No. 419-2. SDCL 46-5-13.1 provides that a point of diversion may be changed or additional points of diversion may be approved without application or publication of a notice of hearing if the additional point of diversion is from the same source of water, no additional water is appropriated and the chief engineer makes a finding that the change does not increase the potential for interference with existing diversions.

Water Right No. 419-2 appropriates 0.15 cubic feet of water per second (cfs) from one well (approximately 790 feet deep) located in the SE1/4 SE1/4 Section 6, T6S, R6E. Water is used to provide water service to the entire park facility. The additional diversion point is to be used as a back-up well to the existing well authorized by Water Right No. 419-2.

The National Park Service requests an additional diversion point located approximately 500 feet west of the existing well. The proposed well is to be constructed into the Deadwood Formation and will be located in the SE1/4 SE1/4 Section 6, T6S, R6E. The request states that the additional well will be constructed to a depth of 750 to 800 feet into the same formation and the operation of the two wells will not exceed the 0.15 cfs appropriated under Water Right No. 419-2.

As part of the review of this request for an additional diversion point, a review of well construction reports on file with the Water Rights Program and existing water rights was conducted. There are no existing water rights utilizing the Deadwood Formation in the area. The nearest well completion reports on file are found approximately 2 1/2 miles to the northwest toward Pringle and 3 miles southeast of the proposed additional diversion point.

This additional diversion point is to be used as a back-up water supply. No additional appropriation of water is authorized. The additional well must be constructed in accordance with SD Well Construction Standards. Standard 74:02:04:28 is the applicable construction standard. The additional well must be grouted from the top of the formation to the land surface in order to comply with the standards.

*Eric Gronlund*

Eric Gronlund  
Natural Resources Engineer  
Water Rights Program

The Chief Engineer makes a finding that the additional diversion point does not increase the potential for interference with existing diversions. In making the finding, "does not increase the potential for interference" is interpreted to mean potential for adverse interference. An additional point of diversion for Water Right No. 419-2 may be constructed without requiring application or publication of a notice of hearing pursuant to SDCL 46-2A-4. A new water right permit is necessary for any diversions greater than 0.15 cfs at Wind Cave National Park

*John Hatch*

John Hatch, Chief Engineer 6-26-78  
Water Rights Program



419-2  
DEPARTMENT of ENVIRONMENT  
and NATURAL RESOURCES

JOE FOSS BUILDING  
523 EAST CAPITOL  
PIERRE, SOUTH DAKOTA 57501-3181  
www.state.sd.us/denr

June 29, 1998

Senn Morrell  
National Park Service  
P.O. Box 25287  
Denver, CO 80225-0287

Dear Ms. Morrell:

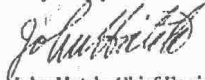
I am writing in regard to the National Park Service request for an additional diversion point (Deadwood Formation well) under Water Right No. 419-2. Water Right No. 419-2 appropriates 0.15 cubic feet of water per second from the Deadwood Formation for use at Wind Cave National Park.

The Park Service has requested an additional well to act as a back-up well to the existing well. The new well is to be located in the SE1/4 SE1/4 Section 6, T6S, R6E and is to be constructed into the Deadwood Formation. No additional water will be appropriated.

Upon review of the request and pursuant to SDCL 46-5-13.1, National Park Service is authorized to develop the addition diversion point (well) without application or publication of a notice of hearing pursuant to SDCL 46-2A-4. A new water right permit is necessary for any diversion greater than 0.15 cfs at Wind Cave National Park.

The additional well must be constructed in accordance with SD Well Construction Standards. Standard 74:02:04:28 is the applicable construction standard. The additional well must be grouted from the top of the formation to the land surface in order to comply with the standards. If you have any questions on well construction, please contact Jim Goodman at (605) 773-3352.

Very truly yours,

  
John Hatch, Chief Engineer  
Water Rights Program  
(605) 773-3352

419-2

Jeffrey C. Hughes

Dan McGlothlin

Owen Williams

JCH

DM

OW

February 22, 1996

L54(2380)  
WICA/Water Rights

Mr. John Hatch  
Chief Engineer, Water Rights Program  
Department of Environment  
and Natural Resources  
Joe Foss Building  
523 East Capitol  
Pierre, South Dakota 57501-3181

Dear Mr. Hatch:

Please find enclosed two Water Use Reports for 1995 for Wind Cave National Park water rights that are on file with the State of South Dakota. We have also sent a copy of these reports to the U.S. Geological Survey as you requested in your January 22, 1996, correspondence to South Dakota water users. These reports address water uses for water rights numbers 419-2 (Park Headquarters Well) and 33-2 (Wind Cave Pipeline). A Water Use Report for water right number 508-2 (Norbeck Reservoir) is not enclosed as the dam associated with this water right has breached, and the reservoir is no longer functional. The National Park Service will contact your office soon to determine the best course of action concerning this water right.

As you may recall, the National Park Service maintains that it has four vested riparian rights in Wind Cave National Park. We are in the process of quantifying water uses for these water rights and will provide you this information when our analysis is complete. Please let us know whether we should also send this information to the U.S. Geological Survey.

2

If you have any questions concerning these water use documents, please contact Jeff Hughes of my staff at (970) 225-3527.

Sincerely,

Owen R. Williams  
Chief, Water Rights Branch

Enclosures

bcc: (all w/Enclosure)  
WICA - Superintendent  
GPSO - Klukas  
Great Plains Cluster - Superintendent  
MWFA - Director  
2380 - Kimball, Jackson, Flora, Walker, McGlothlin

## WATER USE FOR 1995

PERMIT NO. 419-2

NAME FIRST Wind Cave National Park

ADDRESS 1 % Superintendent

ADDRESS 2 P.O. Box 190

CITY Hot Springs, SD 57747

**SOURCE OF WATER (PLEASE CHECK):**

GROUND WATER X NUMBER AND DEPTH OF WELLS 1 well, 759 feet deep

SURFACE WATER \_\_\_\_\_ NAME OF STREAM OR LAKE \_\_\_\_\_

**TYPE OF WATER USE (PLEASE CHECK):**

INDUSTRIAL \_\_\_\_\_ COMMERCIAL \_\_\_\_\_ INSTITUTIONAL \_\_\_\_\_  
GEOTHERMAL \_\_\_\_\_ POWER \_\_\_\_\_ MINING \_\_\_\_\_  
MUNICIPAL WATER SUPPLY \_\_\_\_\_

None of above uses. Park uses water for domestic uses (water for employees and visitors) and for other park operations.

ESTIMATED TOTAL 1995 WATER USE 4,328,500 GALLONS

\*\*\*\*\*

NAME OF CONTACT PERSON Jimmy Taylor (Superintendent)  
TELEPHONE NO. (605) 745-4600

ADDRESS CORRECTION none

Form 17. - Transmittal of Water License



No. 419-2

## Department of Natural Resource Development

WATER RIGHTS COMMISSION  
Office Building Number 2, Pierre, South Dakota 57501  
Phone 605/224-3151

June 25, 1975

Mr. Lester F. McClanaham, Superintendent  
Wind Cave National Park  
Hot Springs, South Dakota 57747

Dear Mr. McClanaham:

Enclosed herewith are, Water License No. 419-2, Certificate  
of Construction, and Receipt No. 4 3045, in the amount of \$ 12.00  
for the fee which you have paid.

Water License No. 419-2 is the final water right document  
completing your process of obtaining a water right.

As long as you use the water beneficially, as stated in the Water  
License, the State Water Laws provide that you have a continuing right  
to use the water.

Respectfully,

WATER RIGHTS COMMISSION

By:

A handwritten signature in cursive script that reads "Vern W. Butler". The signature is written in dark ink and is positioned above the printed name of the signatory.

Vern W. Butler, Acting  
Chief Engineer

## RECEIPT

WATER RIGHTS COMMISSION

State of South Dakota

No 4 3045

PIERRE, June 25, 1975

RECEIVED OF Wind Cave National Park

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. _____ } 419-2                                |  | 12.00 |
| Fee for inspecting Beneficial Use, and issuing Water License No. _____ } 419-2                                      |  |       |
| 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                                                                                                               |  | 12.00 |

WATER RIGHTS COMMISSION

By *Donald Driscoll*  
Chief Engineer, Executive Officer  
DONALD DRISCOLL bw

Form 15.

Permit No. 419-2

Water Diversion No. 2 Fall River Water District

**CERTIFICATE OF CONSTRUCTION**

This is to Certify, That Wind Cave National Park

\_\_\_\_\_ the holder \_\_\_\_\_ of  
Permit No. 419-2, issued upon Application No. 419-2, bearing date of priority of December 29,  
\_\_\_\_\_ authorizing the diversion of .44 cu. ft. per second of the waters of \_\_\_\_\_  
ground water & spring County of Custer, State of South Dakota at \_\_\_\_\_  
wells; 1000' N of the SE corner, Section 6, T6S, R6E, and springs;  
in the NE<sup>4</sup>, Section 32, T5N, R5E  
\_\_\_\_\_, for park operation

\_\_\_\_\_, has \_\_\_\_\_ 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. .15 cu. ft. per second of water.

Date June 24, 1975

By: WATER RIGHTS COMMISSION

*Vern W. Butler*  
Vern W. Butler, Acting  
Chief Engineer

Form 16.

## STATE OF SOUTH DAKOTA

## WATER LICENSE NO. 419-2

(1) WHEREAS, On the 29th day of December A. D. 19 55  
Wind Cave National Park  
made Water Right Application No. 419-2 for a permit to use .44 cubic feet per second of the waters  
of ground water and springs  
County of Custer, State of South Dakota, for park operation  
purposes; and  
(2) WHEREAS, On the 12th day of June A. D. 19 56  
Permit No. 419-2 with a date of priority of December 29, 1955  
was issued to said applicant for the diversion of said water, and provided for the completion of construction of the water  
supply system therein described on or before the 12th day of June A. D. 19 57 and for the  
application to beneficial use of said water on or before the 12th day of June A. D. 19 57

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 .15 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,

water is used for operations in Wind Cave National Park.

(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 Wind Cave National Park

\_\_\_\_\_ of Hot Springs

the holder \_\_\_\_\_ and owner \_\_\_\_\_ of said permit No. 419-2 a water right, dating from December 29, 1955

\_\_\_\_\_ to use of .15 cubic feet per second of the waters of ground water and springs

in the County of Custer and State of South Dakota, or so much thereof as may be necessary for the purposes hereinbelow mentioned, to be diverted at wells; 1000'N of the SE corner, Section 6, T6S, R6E, and springs; in the NE<sup>4</sup>, Section 32, T5N, R5E

\_\_\_\_\_ ed  
and conduct ~~XXXXXX~~ through the Park water distribution system

\_\_\_\_\_ for the purpose of park operation

Subject to any limitations listed in Water Right Permit No. 419-2 and subject to the laws of the State of South Dakota.

WITNESS, My hand and seal of our office at Pierre, South Dakota  
this 24th day of June A. D.  
Nineteen Hundred and seventy-five

WATER RESOURCES COMMISSION

By: Vern W. Butler  
Chief Engineer, Executive Officer  
Vern W. Butler, Acting

COMMISSION

M. E. Bierwagen, Milesville  
E. M. Brady, Mitchell  
Carl Cronin, Gettysburg  
Lauren A. Davis, Belle Fourche  
John Morrison, Wakonda  
Paul Russell, Edgemont  
John Sutton, Onida

SOUTH DAKOTA

*State Water Resources Commission*

STATE OFFICE BUILDING

PIERRE, SOUTH DAKOTA

March 17, 1960

419-2

J. W. GRIMES  
Chief Engineer  
and  
Executive Officer

Earl M. Semingsen-Superintendent  
Wind Cave National Park  
Hot Springs, SouthDakota

Dear Mr. Semingsen:

A check of our records reveals that the allotted time for Application of Water to Beneficial Use under your Permit Number 419-2 was June 12, 1957

If your project is completed and ready for the final inspection, it is requested that you fill in forms 16 and 17, which were sent to you along with your permit, so that the inspection can be made and the final papers issued.

Sincerely,

*Burton F. Jones*

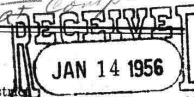
Burton F. Jones  
Water Rights Specialist

BFJ:ls

Perhaps you would like to have Mr. Mott make the inspection. If this is the case, we would be glad to authorize him to do so upon receipt of your written request stating this.

| X                                   | ROUTE TO     | DATE | DATE |
|-------------------------------------|--------------|------|------|
| <input checked="" type="checkbox"/> | Sup.         |      |      |
| <input type="checkbox"/>            | Chief Ranger |      |      |
| <input type="checkbox"/>            | Supr. Ranger |      |      |
| <input type="checkbox"/>            | Park Ranger  |      |      |
| <input type="checkbox"/>            | Naturalist   |      |      |
| <input type="checkbox"/>            | Chief Mtno.  |      |      |
| <input type="checkbox"/>            | Clerk-Steno. |      |      |
| <input checked="" type="checkbox"/> | Clerk-Typing |      |      |
| <input type="checkbox"/>            | Clerk-Typist |      |      |
| <input type="checkbox"/>            | Return By    |      |      |
| <input type="checkbox"/>            | For Reply    |      |      |
| <input type="checkbox"/>            | For Info     |      |      |
| <input type="checkbox"/>            | Files        |      |      |
| <input checked="" type="checkbox"/> | W.A.A.       |      |      |

Form 2—Application for Permit to Appropriate Water—Original

No. 419-2Water Division No. 2 Fall River  
(Blanks to be Filled by the Engineer for the W. R. C.)STATE WATER RESOURCES COM.  
PIERRE, SOUTH DAKOTA

## APPLICATION FOR PERMIT

## To Appropriate Water within the State of South Dakota

(NOTE—Draw a line through items not applicable.)

1. Name of applicant Wind Cave National Park, Earl M. Samingsen, Superintendent  
 Postoffice address Hot Springs, County Guster, State South Dakota
- I. If a corporation U. S. Government
- (a) Name of same National Park Service, Department of the Interior  
 (b) Date and place of incorporation Park established by Act of Congress Jan. 9, 1908  
 (c) Amount of capital stock Does not apply  
 (d) Amount paid in Does not apply  
 (e) Names and addresses of directors Conrad L. Wirth, Director, WFO, Washington, D.C.  
Howard W. Baker, Regional Director, Region Two, Omaha, Nebraska  
Earl M. Samingsen, Superintendent, Wind Cave National Park

(NOTE—A certified copy of articles of incorporation must accompany the application.)

- II. Method of accomplishing the work and financial resources of the applicant:
- (a) Method of accomplishing work (Whether by contract, employment of others, or by direct labor)  
By contract awarded to Sioux Drilling Co., Rapid City, South Dakota
- (b) Cash on hand, \$ -- (c) Treasury stock, \$ --  
 (d) Bonds to be issued, \$ -- (e) Other resources, \$ --  
(f) Contract let for \$22,960.00
2. Name of diversion work \_\_\_\_\_
3. Amount of water claimed 0.44 cubic feet per second 200 gal/min.
4. Source of water supply Deep well
5. Location of point of diversion on Wind Cave Canyon, Wind Cave National Park Sect. 6, T2S, R6E  
(See map attached for detailed location drawings) on \_\_\_\_\_ bank Guster County.
6. Annual period or periods during which water is to be used Year around depending on existing spring supply
7. To be used for:
- I. Irrigation or domestic use gravity overhead sprinkling or combination system? Domestic and public primary combination system.
- (a) Number of acres to be irrigated approx. 6 acres lands at park headquarters  
See map headquarters area
- (b) Legal subdivisions to be irrigated \_\_\_\_\_  
 (NOTE—A list of lands to be irrigated, giving each subdivision and fraction with acreage thereof, should be written here, or may be appended as a part of this application. Same must also be shown on accompanying map.)
- (c) Statement as to domestic use (giving location, etc.) For public visitor use and domestic use for Park employee staff.
- II. Stockwatering, mining, milling, power, fish culture, fire protection and public recreation:
- Fire protection, wildlife watering, public visitor use and
- (a) Nature of use \_\_\_\_\_  
 Name any of the above uses claimed domestic use.  
None
- (b) Amount of power to be generated \_\_\_\_\_ horse power.  
None  
 Amount claimed for engine cooling \_\_\_\_\_
- (c) Location of plant \_\_\_\_\_  
None
- (d) Method of developing power Power line to service well pump to be constructed by Birch Hills Power and Light Co.  
sewer disposal system, Wind Cave Canyon
- (e) Point where water will be returned to stream at Utility Area

M. N. 441-2

## 8. Estimated cost of work:

(a) Head Gates, \$----- (b) Pumping plant, \$44,000.00  
 (c) Fluming, \$----- (d) Canal-earth, \$----- Rock, \$-----  
 (e) Other structures Drilling Well 25,000. Pipeline Construction \$115,000. Total, \$-----

## 9. Description of diversion works:

## I. Nature of works: (Reservoir, dam, ditch, flume, pumping plant, etc.)

Water well with pumping plant

## II. Dimensions of works:

(a) Dam: Height, ----- feet; length at bottom ----- feet; length at top ----- feet; thickness at bottom ----- feet; thickness at top ----- feet; slope at front water face -----; slope at back face -----  
 material used in construction -----  
 (b) Reservoir: Capacity when filled 60,000 gal. reservoir existing ----- acre feet. Surface area at highwater mark ----- acres. Plans for additional 100,000 gal. reservoir to be constructed.

| DEPTH AT<br>OUTLET-Feet | SURFACE AREA AT EACH<br>DEPTH AT OUTLET--ACRES | FEET<br>DEPTH AT OUTLET--ACRES | ACRE-Feet<br>CAPACITY |
|-------------------------|------------------------------------------------|--------------------------------|-----------------------|
|                         |                                                |                                |                       |
|                         |                                                |                                |                       |
|                         |                                                |                                |                       |
|                         |                                                |                                |                       |
|                         |                                                |                                |                       |
|                         |                                                |                                |                       |
|                         |                                                |                                |                       |
|                         |                                                |                                |                       |
|                         |                                                |                                |                       |
|                         |                                                |                                |                       |

(c) \* Head gate: Width, ----- feet; height ----- feet;  
 Material -----  
 (d) Canal: Total length ----- miles.

| LOCATION BELOW<br>HEADGATE | DEPTH      | BOTTOM<br>WIDTH | WIDTH AT<br>WATER-LINE | GRADE<br>PER MILE |
|----------------------------|------------|-----------------|------------------------|-------------------|
| At ----- Mile              | ----- feet | ----- feet      | ----- feet             | ----- feet        |
| At ----- Mile              | ----- feet | ----- feet      | ----- feet             | ----- feet        |
| At ----- Mile              | ----- feet | ----- feet      | ----- feet             | ----- feet        |
| At ----- Mile              | ----- feet | ----- feet      | ----- feet             | ----- feet        |
| At ----- Mile              | ----- feet | ----- feet      | ----- feet             | ----- feet        |
| At ----- Mile              | ----- feet | ----- feet      | ----- feet             | ----- feet        |
| At ----- Mile              | ----- feet | ----- feet      | ----- feet             | ----- feet        |

(Give dimensions where reductions in size are made.)

10. Time required for completion of work 6 months ----- years.  
 11. Time required for complete application of water to the proposed beneficial use XXXXX years.  
 12. Choice of newspaper for publication of notice of intention to appropriate Custer County Chronicle

STATE OF SOUTH DAKOTA

County of Custer } ss.Earl M. Semington, Superintendent, Wind Cave Nat'l Park

I, -----, being first duly sworn on my oath depose and say: That my relation to the above described undertaking is that of owner, that I have read the above foregoing statement, examined the map accompanying the same, and that I know of my own personal knowledge that the matters therein stated and shown are true.

Signed Earl M. Semington

Subscribed and sworn to before me this ----- day of ----- 19-----

Notary Public (or other qualified officer.)

\*Each diversion must have a headgate or measuring device.

## Form 2A — Wells (Supplement to Form 2)

## 9. (Continued)

## III. Well Specifications

## (a) Hole and casing

Size of drill hole or excavation ..... 10" diameter, Depth ..... up to 800 ft.

Type of casing ..... Steel pipe, black (I.O.)  
(wood, concrete, steel, etc.)

Size of casing ..... 8", Thickness of casing ..... not less than 277 inches

Length of casing ..... 800 ft. If collection gallery, length, size and depth of  
gallery ..... none

## (b) Screens

Type of perforated screen ..... none

Size of perforated screen ..... none  
(diameter) (length)

Thickness of gravel pack ..... unknown, length of gravel pack ..... unknown

## (c) Water Bearing Materials

Distance to water ..... unknown as yet Character of water bearing materials ..... unknown

Thickness of water bearing material ..... unknown

## (d) Pump and Motor

Type of pump ..... submergable - planned for installation  
(centrifugal, propeller, mixed flow, etc.)

Name of pump ..... not purchased yet, size

Kind of motor ..... ---  
(gasoline, electric, diesel, etc.)

Horsepower App. 25-30 H.P. est. Name of Motor ..... ---

## (e) Complete well

Capacity ..... at drawdown of ..... Estimated cost \$22,960. (less  
depth required to be drilled)(f) Owner of land upon which well is located National Park Service, Wind Cave  
NameNational Park, Hot Springs, South Dakota  
Address

## (g) Distance to nearest existing wells

On same owner's property ..... none rods. On property owned by others ..... 10 miles VA Cente  
Hot SprinEarl M. Semingsen  
Superintendent

Remarks by State Water Resources Commission:

STATE OF SOUTH DAKOTA }  
County of Hughes } ss.Pierre, South Dakota, January 14, 1956This is to certify that the foregoing application was received by the Commission at 9:00 o'clock  
a.m. upon the 29th day of December, 1955.

State Water Resources Commission

By:

J. W. Grimes, Chief Engineer, Executive Officer

Number of permit 419-2Date of first receipt of application December 29, 1955Date of return to applicant for correction, amendments or changes required as follows: Jan. 3, 1956Date of receipt of corrected application January 14, 1956Date from which applicant may claim right December 29, 1955Approved May 7, 1956, Recorded in Book 3 Page 131

This is to certify that we have examined the foregoing application for a permit to appropriate water of the State of South Dakota, and we hereby grant the same as stated herein, subject, however, to the following limitations and conditions:

1st. The equivalent of at least one-fifth of the work above specified is to be completed on or before December 12, 19562nd. The whole of said work is to be completed on or before June 12, 19573rd. The limit of time for proof of beneficial use of water appropriated in accordance herewith is June 12, 19574th. The water appropriated shall be used for the purpose of irrigation, domestic use, fire protection, wildlife watering, and business use.

5th. 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.

6th. The amount of the appropriation herein granted shall not exceed 0.44 cubic feet per second; neither shall it exceed the capacity of the above described system of diversion works, nor the least amount of water that experience may hereafter indicate as necessary for the production of crops in the exercise of the best husbandry; and further, said appropriation must be limited to not more than one-seventieth (1/70) of one cubic foot of water per second of time for each acre of land to which water is actually and beneficially applied for irrigation on or before June 12, 1957; said water to be used during the following described annual period:during the entire yearWitness my hand this 12th day of June, 1956

State Water Resources Commission

By:

J. W. Grimes, Chief Engineer, Executive Officer

Certificate of Construction issued \_\_\_\_\_, 19\_\_\_\_

Water License issued \_\_\_\_\_, 19\_\_\_\_

|                                                                              |          |
|------------------------------------------------------------------------------|----------|
| No.-----                                                                     | District |
| Division No.-----                                                            |          |
| <b>PERMIT</b>                                                                |          |
| to appropriate water from -----                                              |          |
| County, South Dakota -----                                                   |          |
| Name of applicant -----                                                      |          |
| Name of diversion works -----                                                |          |
| Date of first receipt at Office of State<br>Water Resources Commission ----- |          |
| Returned to applicant for Correction -----                                   | 19.----- |
| Corrected application received -----                                         | 19.----- |
| Date of Water Right -----                                                    | 19.----- |
| Recorded in Book ----- Page -----                                            | 19.----- |
| One-fifth of work to be completed -----                                      | 19.----- |
| Whole work to be completed -----                                             | 19.----- |
| Final proof of use of water -----                                            | 19.----- |
| Approved -----                                                               | 19.----- |
| State Water Resources Commission                                             |          |
| By: Chief Engineer                                                           |          |

Standard Form No. 1144- Revised  
Form prescribed by  
Comptroller General, U. S.  
January 2, 1951  
Gen. Reg. No. 106-Rev., Supp. No. 1

## PUBLIC VOUCHER FOR ADVERTISING

Vou. No. \_\_\_\_\_  
(Payee must not use these lines)

Bu. Vou. No. \_\_\_\_\_

U. S. Department of the Interior, National Park Service  
(Department or establishment, bureau or office)  
Voucher prepared at Washington, D. C. Custer, S. Dak., Jan. 19, 1956  
(Give date and place)

THE UNITED STATES, Dr., To CUSTER COUNTY CHRONICLE  
(Name of publication)  
Mr. Carl H. Sundstrom, Publisher  
(Publisher or proprietor or his representative)

Address Custer, S. Dak.

PAID BY

(For use of paying office)

To publication of attached advertisement in the above-named publication, as authorized by the attached Advertising Order, on

Water Rights  
Notice of Intention  
to the  
State Engineer  
of the  
State of South Dakota  
December 27, 1955  
Supplemental Groundwater  
Supply Project

Wind Cave National Park  
The United States of America,  
National Park Service, by Earl M.  
Semingsen, Superintendent of  
Wind Cave National Park, Hot  
Springs, South Dakota, hereby  
notifies the State Engineer of  
South Dakota, of its intentions to  
appropriate by drilling, construction,  
withdrawal, diversion, storage  
and beneficial use, the afore-  
said unappropriated waters of  
South Dakota under Section 61-  
0123, Chapter 430 and Section 61-  
0404, Chapter 431 of the 1955 re-  
vised Laws of South Dakota:

1. The name of Project is Supplemental Groundwater Supply for Wind Cave.
  2. The amount of water claimed is 200,000 gallons per day.
  3. The source of water is an artesian basin in the Paha mesa limestone formation under Beaver Creek drainage, tributary to the Cheyenne River.
  4. The point of diversion, or withdrawal, will be at a well in SE $\frac{1}{4}$  SE $\frac{1}{4}$  or NE $\frac{1}{4}$  SE $\frac{1}{4}$  Sec. 6, T 6 S, R 5 E, of Black Hills Meridian, in Custer County.
  5. The water will be used during all 12 months of each year.
  6. The water will be used for domestic, recreational, irrigation and fire protection in Wind Cave National Park.
  7. The estimated cost of the Project is \$200,000.
  8. The well is to have a minimum diameter of 10 inches, depth between 600 and 750 feet, and 8 inch steel casing with minimum thickness of 0.277 inch.
  9. The water will be pumped approximately 1.5 miles through 4 inch steel pipe to existing Park water system which serves the Park under Federal Water Withdrawal No. 33-2.
  10. Regulatory storage will be provided in existing and additional reservoir units with capacities varying from 50,000 gallons to 500,000 gallons.
  11. The well is to be tested for maximum potential yield of 200 gallons per minute.
  12. Plans will be filled within one year, the details being dependent on results of proposed well drilling and pump tests for which contract was awarded before December 6, 1955.
  13. The initial unit, to divert and deliver part of the water to the existing and distribution system, will be started before June 30, 1956, and completed by June 30, 1957. The total project will be completed on schedule to serve increasing water demands, probably about June 30, 1956.
- Earl M. Semingsen  
Superintendent  
Wind Cave National Park  
437J19

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May, 1960

Water Division No. 2 Fall River Water District**Notice of Application of Water to Beneficial Use**

(This blank must be filled out by holder of permit and forwarded to the State Water Resources Commission at least sixty days before the time set for application of water.)

(P. O.) Hot Springs, South Dakota(Date) ?

TO THE STATE WATER RESOURCES COMMISSION OF SOUTH DAKOTA, PIERRE:

DEAR SIR: Notice is hereby given that on the ? day of ?  
 19?, at Wind Cave National Park County of Custer State of South Dakota,  
 before Mott? proof will be submitted of the application to beneficial use  
 (Examining Engineer or Officer)

of ? cubic feet per second of the waters of ground water

In accordance with the terms and conditions of Permit No. 419-2  
 heretofore issued by the Water Resources Commission of South Dakota.

1. The name and postoffice address of the person or corporation holding said permit are U. S. Government,  
Department of the Interior, National Park Service, Wind Cave National Park, Hot  
Springs, South Dakota
2. The use to which said water has been applied is Fire protection, wildlife watering,  
public visitor use and domestic use and for irrigation.
3. The amount applied to beneficial use is ? 51.3 gpm or 1114 c.f.s.
4. The place where said water is used is (if for irrigation, give full and accurate description of the lands ir-  
 rigated) Irrigation of approximately six (6) acres lawns at Wind Cave National Park  
Headquarters, for public visitor use and use by park employee staff.  
and for domestic use by public visitors and by Park  
Employees
5. The name of the canal or ditch or other works by which said water is conducted to such place of use is  
Deep well in Wind Cave Canyon, Wind Cave National Park, Sec. 6, T. 58, R6E, and  
pump and pipeline system.
6. The right to take the water from such works is based upon permit No. 419-2
7. The source of supply from which such water is diverted is ground water
8. The date of priority which said user is prepared to establish is December 29, 1955  
January 29, 1956  
Appropriation of Water

Permit No. 419-2

Water Div. No. 2 Fall River Water Dist.

**Notice of Application  
of Water**

Received

Date of Proof

Place

Notice sent to

Permit No. 419-2

Water Division No. 2 Fall River Water District

## NOTICE OF COMPLETION OF WORKS

This blank must be filled out by the holder of permit and forwarded to the Executive Officer at least 60 days before the time set for completion of works

(P. O.) Hot Springs, South Dakota

Date ?

TO THE STATE WATER RESOURCES COMMISSION  
OF SOUTH DAKOTA, PIERRE

DEAR SIR: Notice is hereby given of the completion of the works for the diversion of Ground water from deep well 044 cu. ft. per second of the waters of the state from deep well through the pumps, pipe lines and reservoirs comprising Wind Cave National Park Headquarters water system for irrigation, fire protection, wildlife watering, public and domestic purposes and constructed in accordance with the terms and conditions of a certain permit heretofore issued by the Water Resources Commission of the State of South Dakota.

1. The name of the person or corporation holding said permit is U. S. Government, Department of the Interior, National Park Service, Wind Cave National Park

2. The postoffice address of such person or the place of business of such corporation is Hot Springs County of Custer State of South Dakota

3. The number of such permit is 419-2 and the date of completion of such work was April 21, 1956

4. Said water to be used for irrigation, fire protection, wildlife watering and domestic purposes.

5. Said works of diversion will be fully completed on the date set for such completion, and the amount of water which said works are capable of conducting to the place of intended use, in accordance with the plans accompanying the application for such permit, is 251.3 (g.p.m.) 0.15 cubic feet per second.

6. The amount of land for which said water is available is six acres, particularly described as follows: Lawns at Wind Cave National Park Headquarters for public visitor use and use by park employee staff located in SE 1/4 Sec 6 T6S R6E B.H.M.

I hereby certify that the facts set forth in the above notice are true.

(Signature of Owners)

|                                          |  |
|------------------------------------------|--|
| NO. 419-2                                |  |
| Water Div. No. 2 Fall River Water Dist.  |  |
| <b>Notice of Completion<br/>of Works</b> |  |
| Contract                                 |  |
| Date of Prod                             |  |
| By Law                                   |  |
| Notice sent to                           |  |

HNB-

McK:SMC

33-104-43-2287

November 23, 1936

Honorable Rexford G. Tugwell,  
Administrator of Resettlement Administration,  
Washington, D. C.

Dear Mr. Administrator:

I have the honor to report the final examination of the abstract of title, deed and related papers pertaining to the acquisition of a tract of land, lying and being in the County of Gustar, State of South Dakota, containing 240 acres, more or less. This tract has been acquired under the provisions of existing legislation in connection with a project for which the land is being acquired by the Resettlement Administration from Floyd A. Miller, a single man, by a warranty deed, dated October 7, 1936, and recorded October 9, 1936, in the land records of the aforesaid County and State in Book 16 of Deeds, page 496, the total consideration being \$1200.00.

The land is more particularly described in the enclosed executed warranty deed.

The abstract of title, consisting of five entries, was prepared by G. H. Smith, Abstractor, and his final certificate, dated October 12, 1936, is in satisfactory form.

From an examination of the abstract of title, deed and related papers, I am of the opinion that a valid title to said land is now vested in the United States of America.

The abstract of title, deed, purchase money receipt and related papers are enclosed herewith.

Respectfully,

(Sgd) Homer Cummings

Attorney General.

Enc. 59657

Contract No. I-lp-8281

WARRANTY DEED

FLOYD A. MILLER, a single man, grantor of Custer County, State of South Dakota, for amain consideration of One Thousand Two Hundred Dollars (\$1,200.00), Grants, Conveys and Warrants to UNITED STATES OF AMERICA, Washington, D. C., or its Assigns, the following described real estate in the County of Custer in the State of South Dakota: The East Half of the Northeast Quarter (E½NE¼) and the Southeast Quarter (SE¼) of Section Twenty-four (24) in Township Five (5) South of Range Six (6) East of the Black Hills Meridian.

Dated this 7 day of Oct., 1936.

(Sgd) Floyd A. Miller

State of South Dakota, :  
                                  ss  
County of Custer.

On this 7 day of October in the year 1936, before me the undersigned, a Notary Public within and for said County and State, personally appeared Floyd A. Miller, a single man, known to me to be the person who is described in and who executed the within and foregoing instrument, and acknowledged to me that he executed the same.

(SEAL)

(Sgd) Bernard W. Keating  
Notary Public  
Custer County, South Dakota

My commission expires May 24, 1938.

STATE OF SOUTH CAROLINA  
COURT OF CHIEF JUSTICE

This instrument of writing  
filed for record on the 23rd day of  
Oct. A. D. 1936 at 11:45  
o'clock A. M. and duly recorded  
in Book 16  
of  
Deeds on page 136  
of  
Cora Sutherland  
Registers of Deeds.

Fee 60¢ pd. Deputy

RECORDED

CORRECTION

INDEXED

NOTICE: This instrument of writing, for which a fee of \$1.00 was paid, was filed for record on the 23rd day of October, A. D. 1936, at 11:45 o'clock A. M. and duly recorded in Book 16 of Deeds on page 136 of Cora Sutherland Registers of Deeds. The Court of Chief Justice, South Carolina, has reviewed the same and has found that the same are correct and conform to the provisions of the Act of the General Assembly of South Carolina, passed at the Session of 1935, Chapter 144, Section 1, which provides that any instrument of writing, when duly recorded, shall be deemed to be a true and correct copy of the original. Witness my hand and the seal of the Court of Chief Justice, South Carolina, at Columbia, South Carolina, this 23rd day of October, A. D. 1936.

Attest: \_\_\_\_\_

\_\_\_\_\_  
Deputy

State of South Carolina,  
County of \_\_\_\_\_

On this \_\_\_\_\_ day of \_\_\_\_\_, 1936, I, \_\_\_\_\_, of the County of \_\_\_\_\_, State of South Carolina, do hereby certify that the foregoing instrument of writing, which was duly recorded in Book 16 of Deeds on page 136 of Cora Sutherland Registers of Deeds, is a true and correct copy of the original. Witness my hand and the seal of the Court of Chief Justice, South Carolina, at Columbia, South Carolina, this \_\_\_\_\_ day of \_\_\_\_\_, A. D. 1936.

\_\_\_\_\_  
Deputy  
Cora Sutherland  
Registers of Deeds

By \_\_\_\_\_, Clerk of the Court of Chief Justice, South Carolina.

From Continuation of Abstract of Title, dated Oct. 12, 1936,  
To the following described Real Estate.

Description: The East Half of the Northeast Quarter and the Southeast Quarter of Section 24 in Township 5 South of Range 6 East of the Black Hills Meridian in Custer County, South Dakota.

Item No. 4

|                 |                                   |
|-----------------|-----------------------------------|
| From            | Inst. - Affidavit                 |
| Floyd A. Miller | Dated - - - -                     |
| To              | Filed - October 9, 1936, 11:45 AM |
| The Public      | Book - 14, Miscellaneous Records  |
|                 | Page - 272                        |

Floyd A. Miller states on oath that he is owner of record of these certain tracts of land lying and being in Custer County, South Dakota, described as follows:

E½NE¼ & SE¼ of Sec. 24, Twp. 5 S., Range 6 E., B. H. M.

That A. W. Miller did locate a Water Right on Apr. 12, 1911, to construct a dam across a dry draw on the NE¼SE¼ of Sec. 24, and to construct ditches and flumes for the purpose of directing flood waters from said dam for irrigation purposes; that Location Notice of said location was recorded Apr. 19, 1911 at 10:30 A. M. in Book 10 of Placer and Water Right Locations, page 233, records of Custer Co., S. D.

That A. W. Miller did locate a certain water right on July 9, 1910, appropriating certain waters from a spring located in the SE¼ of Sec. 24, which said water right location was recorded July 11, 1910 at 2 P. M. in Book 10, P. & W. R. Locations, Page 205.

That no dams, ditches or flumes were ever constructed under and by virtue of any of the above mentioned locations and that no waters were ever appropriated or taken from any Springs or Draws on any of the above described lands.

Subscribed and sworn to May 23, 1936, before Bernard W. Keating, N. P., Custer Co., S. D. (Seal)

C O P Y

TLH:DM

HWB

July 11, 1936

33-104-43-2287

Honorable Rexford G. Tugwell,  
Administrator of Resettlement Administration,  
Washington, D. C.

Sir:

I have the honor to report the examination of the abstract of title to that certain tract or parcel of land consisting of 240 acres, more or less, lying and being in the County of Custer, State of South Dakota, which it is proposed to acquire under the provisions of existing legislation in connection with a project for which land is being acquired by the Resettlement Administration, from Floyd A. Miller for a total consideration of \$1200.00.

The land is more particularly described on the caption page of the enclosed abstract of title.

The abstract consists of 3 items and was prepared by G. H. Smith, Abstractor, and his certificate dated May 12, 1936, is in satisfactory form.

As disclosed by the abstract, the title to said land is found to be vested in Floyd A. Miller, subject to:

1. All taxes due and exigible.
2. The rights of the United States and third persons, if any, under the reservations contained in the patent shown at entry No. 2 of the abstract.
3. Easements, if any used by third persons in connection with vested and accrued water rights.

When the abstract, properly certified, is returned to this Department showing the elimination of objection No. 1, the recordation of the enclosed affidavit of the proponent pertaining to items 1 and 3 of the abstract,

the recordation of a duly executed and stamped warranty deed from Floyd A. Miller and wife, if married, conveying said land to the United States of America, payment of all taxes and assessments, the examination of the records continued to a date subsequent to the recordation of said deed and that nothing has occurred to affect the title since the date of the present certificate, and proper officials of the Federal Agency for which the land is being acquired shall inform the Attorney General, in writing, that the rights of third parties, if any, under objections 2 and 3 will not interfere with the contemplated use of the land and are acceptable to that Agency, the Attorney General will approve the title, subject to said approved rights.

The abstract and related papers are enclosed

Respectfully,  
For the Attorney General,

Harry W. Blair,  
Assistant Attorney General.

Enc. 30081

From Abstract of Title, dated May 12, 1936,  
To the following described Real Estate.

Description: The East Half of the Northeast Quarter and the South-east Quarter of Section 24 in Township 5 South of Range 6 East of the Black Hills Meridian in Custer County, South Dakota.

Item No. 2

|                                                                                                                                                        |                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>From</p> <p>The United States of America<br/>By the President: Franklin D.<br/>Roosevelt (Seal U. S. G. L. O.)</p> <p>To</p> <p>Floyd A. Miller</p> | <p>Inst. - Patent (Pierre 025424<br/>Pat. #1082639)</p> <p>Dated - April 14, 1936</p> <p>Filed - May 12, 1936 at 11:30 A.M.</p> <p>Book - 7 of Patents</p> <p>Page - 157</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Grants the E½NE¼ & SE¼ Sec. 24, Twp. 5 S., Rge. 6 E., and Lots 1, 2, 3 & 4 & E½NW¼ & SW¼NE¼ & NE¼SW¼ & NW¼SE¼ Sec. 19 & SE¼NW¼ Sec. 20, Twp. 5 S., Rge. 7 E., B. H. M., South Dakota, containing 622 acres according to the Official Plat of the survey.

Claim established and consummated pursuant to Act of Congress of May 20, 1862, "To secure homesteads to actual settlers on the public domain," and the acts supplemental thereto.

Subject to any vested and accrued water rights and to rights to ditches and reservoirs used in connection therewith. Reserves a right of way for ditches or canals constructed by the authority of the United States. Reserves to the United States all coal and other minerals in said lands, together with the right to prospect for, mine and remove same pursuant to the provisions and limitations of the Act of Dec. 29, 1916 (39 Stat., 862).

From Abstract of Title, dated May 12, 1936,  
To the following described Real Estate.

Description: The East Half of the Northeast Quarter and the Southeast Quarter of Section 24 in Township 5 South of Range 6 East of the Black Hills Meridian in Custer County, South Dakota.

Item No. 1

|                                                                                                  |                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>From</p> <p>A. W. Miller, Locator</p> <p>(Not Ack. 1 Witness)</p> <p>To</p> <p>The Public</p> | <p>Inst. - Dry Draw Water Right Location Notice</p> <p>Dated - April 12, 1911</p> <p>Filed - Apr. 19, 1911 at 10:30 A.M.</p> <p>Book - 10, Placer &amp; Water Right Locations</p> <p>Page - 233</p> |
|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Recites that A. W. Miller of Buffalo Gap, South Dakota, a citizen of the U. S. above the age of 21 yrs., being in possession of the SE $\frac{1}{4}$ SW $\frac{1}{4}$  & SW $\frac{1}{4}$ SE $\frac{1}{4}$  Sec. 19, Twp. 5 S., Rge. 7 E., B. H. M., Custer Co., S. D., availing himself of the right granted under the provisions of Chapter 31, 1907 Session Laws of So. Dak., has located and claims the right to construct a dam across a Dry Draw on the:

NE $\frac{1}{4}$ SE $\frac{1}{4}$  Sec. 24, Twp. 5 S., Range 6 E., B. H. M. and has located and claims the right to construct ditches & flumes for the purpose of directing flood waters from said dam for irrigation of the land first above described and claims the right of way across any land for the purpose of so conveying said waters.

Locator claims for the above purpose  $\frac{1}{2}$  cubic ft. of water per second during the whole of each year, prior to all subsequent appropriations. The location of the point of diversion of the reservoir is as follows: From the point of diversion the SE Corner of Sec. 24 T. 5 S., R. 6 E., B. H. M. bears S. 11°05' E. 1702 ft. The pipe line will run in a southerly direction to and on said land for a distance of 1765 ft.

Said location was made Mar. 9, 1911.

From Abstract of Title, dated May 12, 1936,  
To the following described Real Estate.

Description: The East Half of the Northeast Quarter and the Southeast Quarter of Section 24 in Township 5 South of Range 6 East of the Black Hills Meridian in Custer County, South Dakota.

Item No. 3

|                                                                               |                                                                                                                                                          |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| From<br><br>A. W. Miller, Locator and<br>Claimant<br><br>to<br><br>The Public | Inst. - Water Right Location<br><br>Date - July 9, 1910<br><br>Filed - July 11, 1910 at 2 P. M.<br><br>Book - 10, P. & W. R. Locations<br><br>Page - 205 |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|

Recites that claimant, a citizen of the U. S., resident of the State of South Dakota, has appropriated the water flowing from a spring situated approximately upon the SE $\frac{1}{4}$  of Sec. 24 - - - and probably about the center of the east half of said subdivision, and appropriates and claims by reason of prior appropriation and use to the extent of ten Miner's inches of water for domestic use, same to be conveyed in pipes in a southeasterly direction to the premises of claimant now owned and occupied by him; said spring being situated upon public unappropriated lands of the U. S.; that the undersigned has appropriated and claims the right of way over said public lands for the pipe line for the conveyance of said waters. That notice has been posted at the point of diversion of said waters in presence of Barnard Korthaus.

Item No. 3 a. - 1935 Per. taxes, Floyd Miller, \$6.78 and interest, unpaid

We hereby certify that the 1935 Per. tax of Floyd Miller shown above has been paid.  
Dated Oct. 12, 1936.

G. H. Smith Bonded Abstractor  
C. L. Dice Mgr.

## MIND CAVE NATIONAL PARK

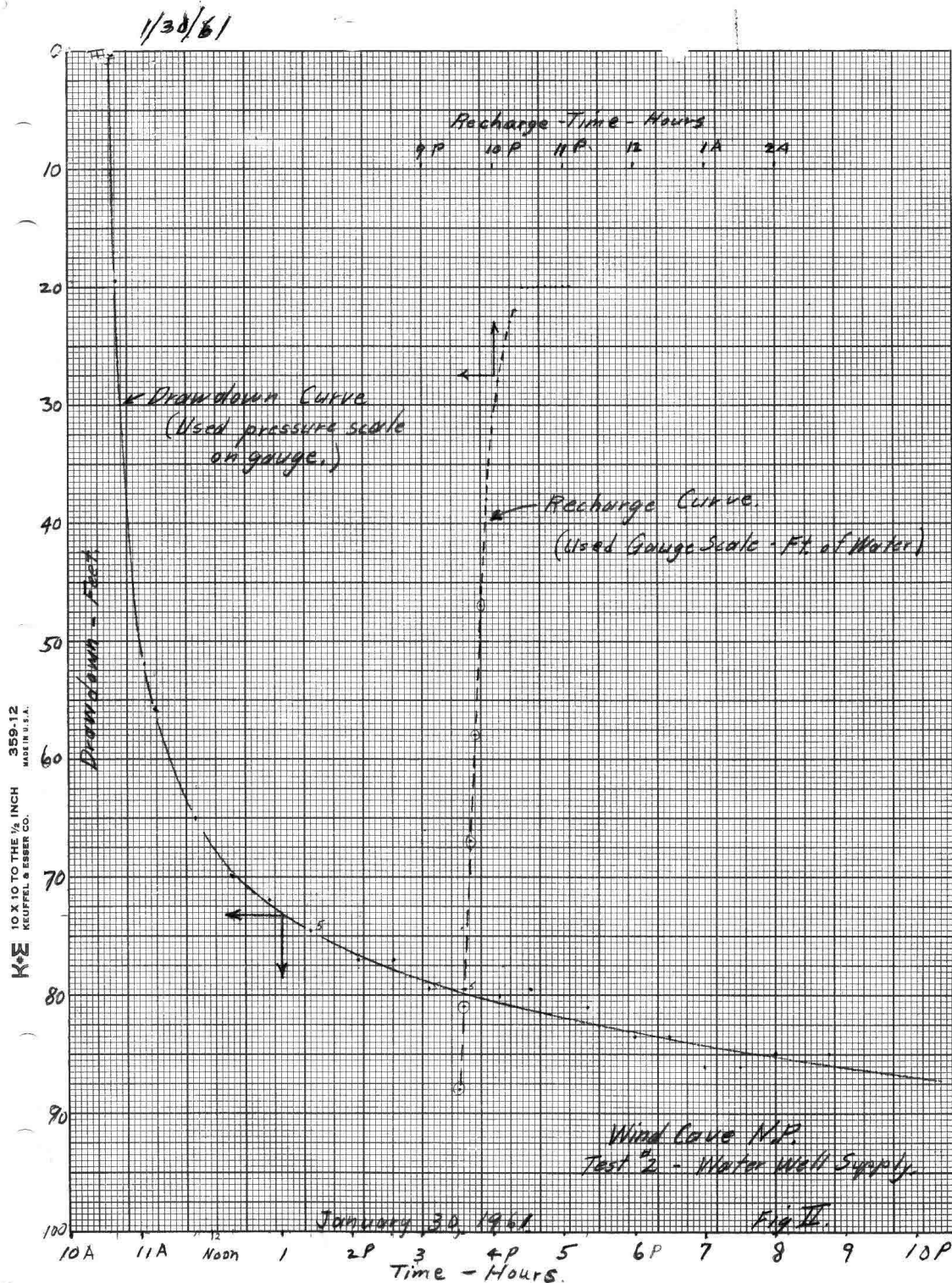
TEST #2 - FIELD TEST DATA - WELL, EAST BOUNDARY - SEE FIG. II (attached)

January 30, 1961

| AIR Gauge Reading                                                                           | Stop-watch Minutes | Water Meter Reading | $\Delta$      | GPM           | Static Head (feet) | Draw-down (feet) | $\Delta$ Static Head (feet) | Average Drawdown Per Min. per ft. |
|---------------------------------------------------------------------------------------------|--------------------|---------------------|---------------|---------------|--------------------|------------------|-----------------------------|-----------------------------------|
| Hour                                                                                        |                    |                     |               |               |                    |                  |                             |                                   |
| 10:35 A                                                                                     |                    | 0.0                 |               |               | 370                |                  |                             |                                   |
| 152                                                                                         |                    |                     |               |               | 351                | 19               |                             | 3.80                              |
| 10:40                                                                                       |                    |                     |               |               | 318                | 52               | 33                          | 1.65                              |
| 138                                                                                         | 2.80               |                     |               | 35.5          | 314                | 56               | 4                           | .40                               |
| 11:05                                                                                       |                    |                     |               |               | 305                | 65               |                             |                                   |
| 136                                                                                         |                    |                     |               |               | 300                | 70               | 9                           | .30                               |
| 11:45                                                                                       |                    |                     |               |               | 298                | 72               | 5                           | .143                              |
| 132                                                                                         |                    |                     |               |               | 295.5              | 74.5             | 2                           | .066                              |
| 12:20 P                                                                                     |                    |                     |               |               | 293                | 77               | 2.5                         | .86                               |
| 129                                                                                         |                    |                     |               |               | 290.5              | 79.5             | 2.5                         | .05                               |
| 12:50                                                                                       |                    |                     |               |               | 290.5              | 79.5             | 0                           | 0                                 |
| 128                                                                                         |                    |                     |               |               | 290                | 80               | .5                          | 0                                 |
| 127                                                                                         |                    |                     |               |               | 290.5              | 79.5             | 1.5                         | .0167                             |
| 2:05                                                                                        |                    |                     |               |               | 289                | 81               | 1.5                         | .0179                             |
| 2:35                                                                                        |                    |                     |               |               | 286.5              | 83.5             | 2.5                         | .032                              |
| 3:05                                                                                        |                    |                     |               | 35.5          | 286.5              | 83.5             | 0                           | .0675                             |
| 3:35                                                                                        |                    |                     |               |               | 284                | 86               | 2.5                         | 0                                 |
| 126                                                                                         |                    |                     |               |               | 284                | 86               |                             | .0835                             |
| 125.5                                                                                       |                    |                     |               |               | 285                | 85               | 1                           | -                                 |
| 126                                                                                         |                    |                     |               |               | 285                | 85               | 0                           | -                                 |
| 4:33                                                                                        |                    |                     |               |               | 282                | 88               | 3                           | .066                              |
| 4:05                                                                                        |                    |                     |               |               |                    |                  |                             |                                   |
| 5:20                                                                                        | 2.815              | 12700 - 14500       |               |               |                    |                  |                             |                                   |
| 124.5                                                                                       |                    |                     |               |               |                    |                  |                             |                                   |
| 124                                                                                         |                    |                     |               |               |                    |                  |                             |                                   |
| 6:30                                                                                        |                    |                     |               |               |                    |                  |                             |                                   |
| 123                                                                                         |                    |                     |               |               |                    |                  |                             |                                   |
| 7:00                                                                                        |                    |                     |               |               |                    |                  |                             |                                   |
| 123                                                                                         |                    |                     |               |               |                    |                  |                             |                                   |
| 7:30                                                                                        |                    |                     |               |               |                    |                  |                             |                                   |
| 123.5                                                                                       |                    |                     |               |               |                    |                  |                             |                                   |
| 8:45                                                                                        |                    |                     |               |               |                    |                  |                             |                                   |
| 123.5                                                                                       |                    |                     |               |               |                    |                  |                             |                                   |
| 122                                                                                         |                    |                     |               |               |                    |                  |                             |                                   |
| 9:30                                                                                        |                    |                     |               |               |                    |                  |                             |                                   |
| NOTE: This test was made after rehabilitating the airline and valve. (See FIG. II attached) |                    |                     |               |               |                    |                  |                             |                                   |
| Hour                                                                                        | FEET OF WATER      | FEET OF WATER       | FEET OF WATER | FEET OF WATER | FEET OF WATER      | FEET OF WATER    | FEET OF WATER               | FEET OF WATER                     |
| 9:32 P                                                                                      | 279                | 88                  | 10:35         | 342           | 20                 | 10:40            | 342                         | 20                                |
| 9:35                                                                                        | 285                | 81                  | 10:40         | 342           | 20                 | 10:45            | 342                         | 20                                |
| 9:40                                                                                        | 299                | 67                  | 10:45         | 342           | 20                 | 10:50            | 342                         | 20                                |
| 9:45                                                                                        | 308                | 58                  | 10:50         | 342           | 20                 | 10:55            | 342                         | 20                                |
| 9:50                                                                                        | 319                | 47                  | 10:55         | 342           | 20                 | 11:00            | 342                         | 20                                |
| 9:55                                                                                        | 328                | 38                  |               |               |                    |                  |                             |                                   |
| 10:00                                                                                       | 335                | 31                  |               |               |                    |                  |                             |                                   |
| 10:05                                                                                       | 338                | 28                  |               |               |                    |                  |                             |                                   |
| 10:10                                                                                       | 341                | 25                  |               |               |                    |                  |                             |                                   |
| 10:15                                                                                       | 343                | 23                  |               |               |                    |                  |                             |                                   |
| 10:20                                                                                       | 344                | 22                  |               |               |                    |                  |                             |                                   |
| 10:25                                                                                       | 342                | 20                  |               |               |                    |                  |                             |                                   |
| 10:30                                                                                       | 342                | 20                  |               |               |                    |                  |                             |                                   |

NOTE: These last tabulations of hour, feet of water, and drawdown are recovery readings.

NOTE: These last tabulations of hour, feet of water, and drawdown are recovery readings.



## WIND CAVE NATIONAL PARK

FIELD TEST DATA - WELL, EAST BOUNDARY - SEE FIG. I (attached)

Page 1

January 24, 1961

| Hour                                                                                                                                  | Gauge Reading | Stop-watch Minutes                                                      | Water Meter Readings | Δ   | GPM   | Static Head (feet) | Draw-down (feet) | Δ Static Head (feet) | Average Drawdown per min. per ft. |
|---------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------|----------------------|-----|-------|--------------------|------------------|----------------------|-----------------------------------|
| 10:36 A                                                                                                                               | 98            | 2.790                                                                   | 200 - 300            | 100 | 35.90 | 226                |                  |                      |                                   |
| 11:18                                                                                                                                 | 78            | 2.810                                                                   | 1500 - 1600          | 100 | 35.60 | 180                | 46               | 46                   | 1.095                             |
| 11:38                                                                                                                                 | 75            | 2.815                                                                   | 2200 - 2300          | 100 | 35.55 | 173                | 53               | 7                    | .35                               |
| 12:07 P                                                                                                                               | 73            | 2.83                                                                    | 3000 - 3100          | 100 | 35.30 | 168.5              | 57.5             | 4.5                  | .155                              |
| 1:00                                                                                                                                  | 71            | 2.82                                                                    | 5000 - 5100          | 100 | 35.4  | 164                | 62               | 4.5                  | .085                              |
| 1:32                                                                                                                                  | 70            | 2.823                                                                   | 6200 - 6300          | 100 | 35.4  | 161.5              | 64.5             | 2.5                  | .078                              |
| 1:40                                                                                                                                  |               | Opened Discharge Valve full capacity.                                   |                      |     |       |                    |                  |                      |                                   |
| 2:00                                                                                                                                  | 69            | 2.815                                                                   | 7000 - 7100          | 100 | 35.55 | 160                | 66               | 1.5                  | .0535                             |
| 2:33                                                                                                                                  | 66            | 2.821                                                                   | 8470 - 8570          | 100 | 35.4  | 152                | 74               | 8                    | .242                              |
| 3:07                                                                                                                                  | 62            | 2.814                                                                   | 9570 - 9670          | 100 | 35.5  | 143                | 83               | 9                    | .265                              |
| 3:55                                                                                                                                  | 56            | 2.812                                                                   | 11300 - 11400        | 100 | 35.5  | 129                | 97               | 14                   | .292                              |
| 4:27                                                                                                                                  | 53            | 2.812                                                                   | 12400 - 12500        | 100 | 35.5  | 122                | 104              | 7                    | .219                              |
| NOTE: Pump shut off around 3:10 PM to drain air tank down to outlet, replaced plug. Shut down approx. 3 min. and W. S. raised 5 feet. |               |                                                                         |                      |     |       |                    |                  |                      |                                   |
| Took 10 minutes to pump W. S. down to elevation when pump was shut off.                                                               |               |                                                                         |                      |     |       |                    |                  |                      |                                   |
| 5:30 P                                                                                                                                | 46            | 2.818                                                                   | 14630 - 14730        | 100 | 35.55 | 106                | 120              | 16                   | .254                              |
| 6:05                                                                                                                                  | 43            | 2.814                                                                   | 16000 - 16100        | 100 | 35.50 | 99.5               | 126.5            | 6.5                  | .186                              |
| 6:36                                                                                                                                  | 41            | 2.818                                                                   | 16920 - 17020        | 100 | 35.50 | 94.5               | 131.5            | 5                    | .161                              |
| 7:23                                                                                                                                  | 38            | 2.817                                                                   | 18620 - 18720        | 100 | 35.50 | 88                 | 138              | 6.5                  | .138                              |
| 8:00                                                                                                                                  | 35            | 2.816                                                                   | 19900 - 20000        | 100 | 35.50 | 81                 | 145              | 7                    | .189                              |
| 8:40                                                                                                                                  | 34            | 3.098                                                                   | 21230 - 21340        | 110 | 35.50 | 79                 | 147              | 2                    | .050                              |
| 9:27                                                                                                                                  | 32            | 2.820                                                                   | 22900 - 23000        | 100 | 35.50 | 74                 | 152              | 5                    | .106                              |
| 10:00                                                                                                                                 | 29            | 2.817                                                                   | 24120 - 24220        | 100 | 35.50 | 67                 | 159              | 7                    | .212                              |
| 10:31                                                                                                                                 | 27            | 2.818                                                                   | 25200 - 25300        | 100 | 35.50 | 63                 | 163              | 4                    | .129                              |
| 11:00                                                                                                                                 | 26            | 2.822                                                                   | 26210 - 26310        | 100 | 35.4  | 60                 | 166              | 3                    | .1035                             |
| 11:30                                                                                                                                 | 26            | 2.818                                                                   | 27310 - 27410        | 100 | 35.5  | 60                 | 166              | 0                    | .000                              |
| 11:44                                                                                                                                 | 26.5          | Stopped pump to change gauge in air tank.                               |                      |     |       |                    |                  |                      |                                   |
| 11:59                                                                                                                                 | 36            | Started pump                                                            |                      |     |       |                    |                  |                      |                                   |
| January 25, 1961                                                                                                                      |               |                                                                         |                      |     |       |                    |                  |                      |                                   |
| 12:20 A                                                                                                                               | 34.8          | 2.810                                                                   | 28650 - 28750        | 100 | 35.6  | 80                 | 146              | 3                    | .143                              |
| 1:10 A                                                                                                                                | 35.5          | 2.810                                                                   | 30450 - 30550        | 100 | 35.6  | 77                 | 149              | 3                    | .060                              |
| 1:45                                                                                                                                  | 31            | 3.09                                                                    | 31700 - 31800        | 110 | 35.6  | 72                 | 154              | 5                    | .143                              |
| 2:15                                                                                                                                  | 30            | 2.816                                                                   | 32800 - 32900        | 100 | 35.5  | 69.5               | 156.5            | 2.5                  | .083                              |
| 2:45                                                                                                                                  | 29            | 2.820                                                                   | 34000 - 34100        | 100 | 35.5  | 67                 | 158              | 1.5                  | .05                               |
| 3:45                                                                                                                                  | 26.5          | 3.100                                                                   | 36000 - 36110        | 110 | 35.4  | 61                 | 165              | 6                    | .100                              |
| 4:00 A                                                                                                                                | 98            | Increased air line pressure to 98 pounds.                               |                      |     |       |                    |                  |                      |                                   |
| 4:08 A                                                                                                                                |               | Closed air line at 98 pounds - and 226' static head to start new range. |                      |     |       | 226                |                  |                      |                                   |
| 4:35                                                                                                                                  | 95            | 2.820                                                                   | 37800 - 37900        | 100 | 35.5  | 219                | -                | 7                    | .259                              |

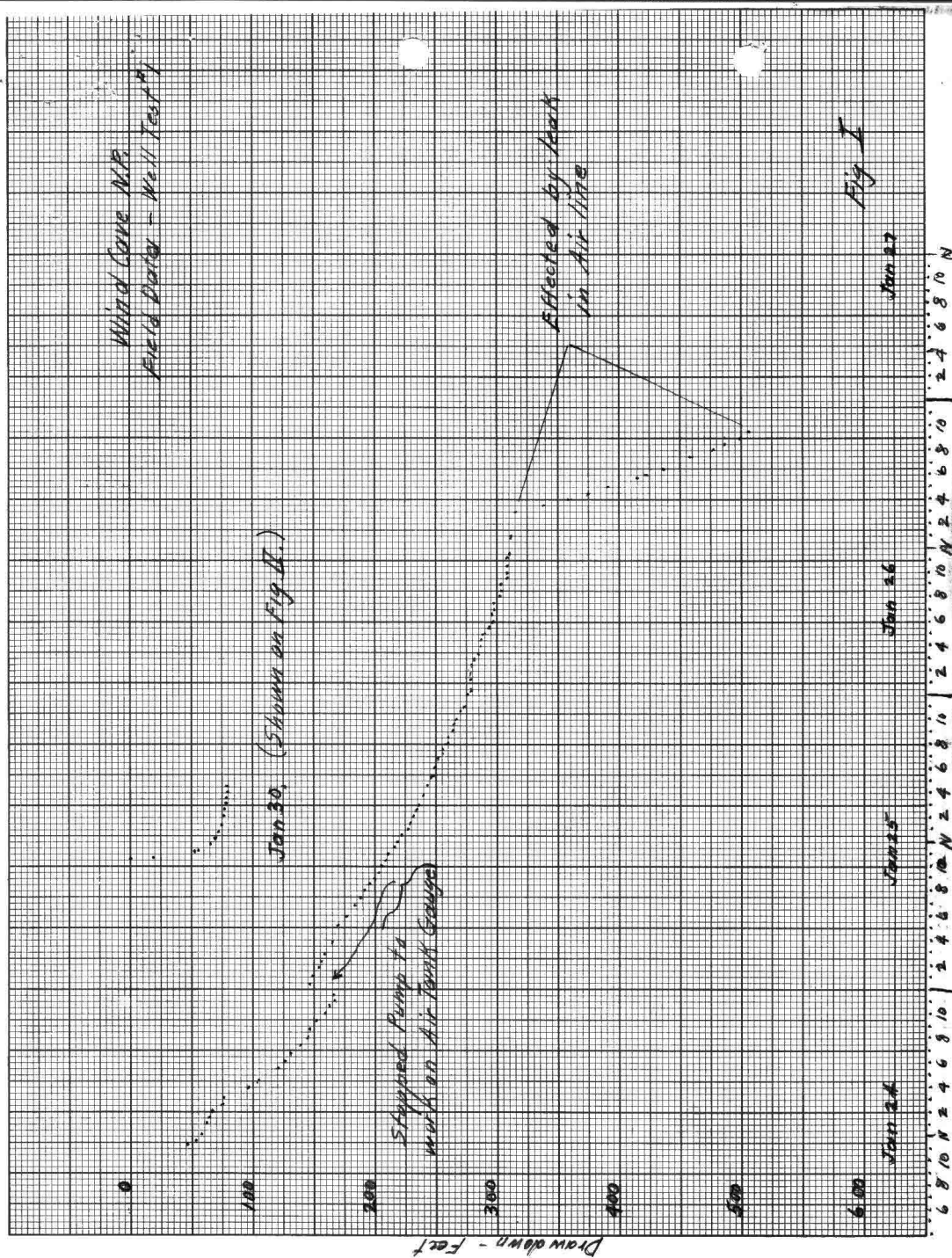
January 25, 1961 cont'd

| Hour             | Air<br>Gauge<br>Reading | Stop-watch<br>Minutes | Water Meter Readings | Δ   | GPM  | Static<br>Head<br>(feet) | Draw-<br>down<br>(feet) | Δ Static<br>Head<br>(feet) | Average Δ<br>Drawdown per<br>Min. per ft. |
|------------------|-------------------------|-----------------------|----------------------|-----|------|--------------------------|-------------------------|----------------------------|-------------------------------------------|
| 5:10 A           | 93                      | 2.820                 | 39000 - 39100        | 100 | 35.5 | 215                      | 169                     | 4.0                        | .114                                      |
| 5:50             | 90                      | 2.820                 | 40400 - 40500        | 100 | 35.5 | 208                      | 176                     | 7.0                        | .175                                      |
| 6:45             | 87                      | 2.820                 | 42200 - 42300        | 100 | 35.5 | 201                      | 183                     | 7.0                        | .127                                      |
| 7:25             | 85                      | 2.822                 | 43800 - 43900        | 100 | 35.5 | 196                      | 188                     | 5.0                        | .125                                      |
| 8:00             | 83                      | 2.813                 | 45000 - 45100        | 100 | 35.5 | 193                      | 191                     | 3.0                        | .086                                      |
| 8:30             | 82                      | 2.823                 | 46000 - 46100        | 100 | 35.4 | 189                      | 195                     | 4.0                        | .133                                      |
| 9:00             | 80                      | 2.820                 | 47100 - 47200        | 100 | 35.5 | 184                      | 200                     | 5.0                        | .166                                      |
| 9:30             | 78                      | 2.820                 | 48300 - 48400        | 100 | 35.5 | 180                      | 204                     | 4.0                        | .133                                      |
| 10:00            | 77                      | 2.820                 | 49400 - 49500        | 100 | 35.5 | 178                      | 206                     | 2.0                        | .067                                      |
| 10:30            | 76                      | 2.820                 | 50100 - 50200        | 100 | 35.5 | 175                      | 209                     | 3.0                        | .100                                      |
| 11:00            | 75                      | 2.820                 | 51400 - 51500        | 100 | 35.5 | 173                      | 211                     | 2.0                        | .067                                      |
| 11:30            | 73                      | 2.820                 | 52500 - 52600        | 100 | 35.5 | 168                      | 216                     | 5.0                        | .167                                      |
| 12:00 A          | 72                      | 2.820                 | 53700 - 53800        | 100 | 35.5 | 166                      | 218                     | 2.0                        | .067                                      |
| 12:30 P          | 70                      | 2.820                 | 54700 - 54800        | 100 | 35.5 | 161.5                    | 222.5                   | 4.5                        | .150                                      |
| 1:00             | 68                      | 2.820                 | 55700 - 55800        | 100 | 35.5 | 157                      | 227                     | 4.5                        | .150                                      |
| 1:30             | 67                      | 2.822                 | 56700 - 56800        | 100 | 35.5 | 154.5                    | 229.5                   | 2.5                        | .083                                      |
| 2:00             | 66                      | 2.822                 | 57800 - 57900        | 100 | 35.5 | 152                      | 232                     | 2.5                        | .083                                      |
| 2:30             | 65                      | 2.820                 | 59100 - 59200        | 100 | 35.5 | 150                      | 234                     | 2.0                        | .067                                      |
| 3:00             | 64                      | 2.820                 | 60100 - 60200        | 100 | 35.5 | 148                      | 236                     | 2.0                        | .067                                      |
| 3:48             | 63                      | 2.820                 | 61590 - 61790        | 100 | 35.5 | 145                      | 239                     | 3.0                        | .063                                      |
| 4:32             | 61                      | 2.820                 | 63180 - 63280        | 100 | 35.5 | 141                      | 243                     | 4.0                        | .091                                      |
| 5:18             | 60                      | 2.820                 | 64800 - 64900        | 100 | 35.5 | 138                      | 246                     | 3.0                        | .065                                      |
| 6:03             | 58                      | 2.820                 | 66300 - 66400        | 100 | 35.5 | 135                      | 249                     | 3.0                        | .067                                      |
| 6:33             | 57                      | 2.90                  | 67400 - 67500        | 100 | 34.5 | 132                      | 252                     | 3.0                        | .100                                      |
| 7:15             | 55.5                    | 2.86                  | 68660 - 68760        | 100 | 35.0 | 128                      | 256                     | 4.0                        | .095                                      |
| 7:30             | 55                      | 2.82                  | 69430 - 69530        | 100 | 35.4 | 127                      | 257                     | 1.00                       | .067                                      |
| 8:00             | 54                      | 2.82                  | 70550 - 70650        | 100 | 35.4 | 125                      | 259                     | 2.0                        | .067                                      |
| 8:32             | 53                      | 3.18                  | 71630 - 71740        | 110 | 35.6 | 124                      | 260                     | 1.0                        | .031                                      |
| 9:00             | 52                      | 3.18                  | 72700 - 72800        | 100 | 35.6 | 121                      | 263                     | 3.0                        | .107                                      |
| 9:32             | 51.5                    | 2.90                  | 73770 - 73870        | 100 | 34.5 | 119                      | 265                     | 2.0                        | .063                                      |
| 10:00            | 50.5                    | 2.89                  | 74500 - 74600        | 100 | 34.6 | 117                      | 267                     | 2.0                        | .071                                      |
| 10:35            | 49                      | 3.76                  | 75720 - 75850        | 130 | 34.6 | 114                      | 270                     | 3.00                       | .086                                      |
| 11:00            | 48                      | 2.90                  | 76600 - 76700        | 100 | 34.5 | 111                      | 273                     | 3.0                        | .120                                      |
| January 26, 1961 |                         |                       |                      |     |      |                          |                         |                            |                                           |
| 12:05 A          | 47                      | 2.90                  | 79000 - 79100        | 100 | 34.5 | 108                      | 276                     | 3.0                        | .046                                      |
| 12:46            | 46                      | 2.90                  | 80210 - 80310        | 100 | 34.5 | 106                      | 278                     | 2.0                        | .049                                      |
| 1:18             | 46                      | 2.89                  | 81400 - 81500        | 100 | 34.6 | 106                      | 278                     | 0                          | -                                         |
| 1:40             | 46                      | 2.90                  | 82500 - 82600        | 100 | 34.5 | 106                      | 278                     | -                          | -                                         |
| 2:21             | 45                      | 2.89                  | 83600 - 83700        | 100 | 34.6 | 104                      | 280                     | 2.0                        | .049                                      |

January 26, 1961 cont'd

| Hour    | Air Gauge Reading                          | Stop-Watch Minutes                                                                     | Water Meter Readings | Δ   | GPM  | Static Head (feet) | Draw-down (feet) | Δ Static Head (feet) | Average Δ Drawdown Per min. per ft. |  |
|---------|--------------------------------------------|----------------------------------------------------------------------------------------|----------------------|-----|------|--------------------|------------------|----------------------|-------------------------------------|--|
| 2:53 A  | 44                                         | 2.89                                                                                   | 84700 - 84800        | 100 | 34.6 | 101.5              | 282.5            | 2.5                  | .078                                |  |
| 3:28    | 43                                         | 2.90                                                                                   | 85900 - 86000        | 100 | 34.5 | 99                 | 285              | 2.5                  | .069                                |  |
| 3:57    | 42                                         | 2.90                                                                                   | 86900 - 87000        | 100 | 34.5 | 97                 | 287              | 2.0                  | .069                                |  |
| 4:28    | 42                                         | 2.89                                                                                   | 88000 - 88100        | 100 | 34.6 | 97                 | 287              | 0                    | -                                   |  |
| 4:57    | 41                                         | 2.89                                                                                   | 89000 - 89100        | 100 | 34.6 | 94.5               | 289.5            | 2.5                  | .086                                |  |
| 5:31    | 39                                         | 2.89                                                                                   | 90200 - 90300        | 100 | 34.6 | 90                 | 294              | 4.5                  | .132                                |  |
| 6:00    | 38                                         | 2.89                                                                                   | 91200 - 91300        | 100 | 34.6 | 87.5               | 296.5            | 2.5                  | .086                                |  |
| 6:31    | 38                                         | 2.89                                                                                   | 92300 - 92400        | 100 | 34.6 | 87.5               | 296.5            | 0                    | -                                   |  |
| 7:00    | 37                                         | 2.89                                                                                   | 93300 - 93400        | 100 | 34.6 | 85.5               | 298.5            | 2.0                  | .069                                |  |
| 7:32    | 37                                         | 2.89                                                                                   | 94400 - 94500        | 100 | 34.6 | 85.5               | 298.5            | 0                    | -                                   |  |
| 8:00    | 35                                         | 2.89                                                                                   | 95400 - 95500        | 100 | 34.6 | 81                 | 303.0            | 4.5                  | .161                                |  |
| 8:30    | 35                                         | 2.872                                                                                  | 96300 - 96400        | 100 | 34.8 | 81                 | 303.0            | 0                    | -                                   |  |
| 9:00    | 35                                         | 2.88                                                                                   | 97400 - 97500        | 100 | 34.7 | 81                 | 303.0            | 0                    | -                                   |  |
| 9:30    | 33                                         | 2.874                                                                                  | 98300 - 98400        | 100 | 34.8 | 76                 | 308              | 5.0                  | .167                                |  |
| 10:00   | 33                                         | 2.88                                                                                   | 99500 - 99600        | 100 | 34.7 | 76                 | 308              | 0                    | -                                   |  |
| 10:30   | 33                                         | 2.878                                                                                  | 100600 - 100700      | 100 | 34.8 | 76                 | 308              | 0                    | -                                   |  |
| 11:15   | 32.5                                       | 3.45                                                                                   | 102100 - 102200      | 120 | 34.8 | 75                 | 309              | 1.0                  | .022                                |  |
| 11:30   | 32                                         | 2.875                                                                                  | 102600 - 102700      | 100 | 34.8 | 74                 | 310              | 1.0                  | .067                                |  |
| 1:00 P  | 31                                         | 2.885                                                                                  | 105800 - 105900      | 100 | 34.7 | 72                 | 312              | 2.0                  | .022                                |  |
| 2:20    | Increased air line pressure to 150 pounds. |                                                                                        |                      |     |      |                    |                  |                      |                                     |  |
| 3:00 P  | 135                                        | 2.90                                                                                   | 110000 - 110100      | 100 | 34.5 | 312                | 315              | 3.0                  | -                                   |  |
| 3:30    | 125                                        | 2.90                                                                                   | 111000 - 111100      | 100 | 34.5 | 289                | 338              | 23.0                 | .770                                |  |
| 4:00    | 116                                        | 2.90                                                                                   | 112000 - 112100      | 100 | 34.5 | 268                | 359              | 21.0                 | .700                                |  |
| 4:30    | 109                                        | 2.90                                                                                   | 113100 - 113200      | 100 | 34.5 | 252                | 375              | 16.0                 | .553                                |  |
| 5:00    | 102                                        | 2.90                                                                                   | 114200 - 114300      | 100 | 34.5 | 236                | 391              | 16.0                 | .553                                |  |
| 5:45    | 92                                         | 2.89                                                                                   | 115300 - 115400      | 100 | 34.6 | 212                | 415              | 24.0                 | .533                                |  |
| 6:00    | 88                                         | 2.89                                                                                   | 116300 - 116400      | 100 | 34.6 | 203                | 424              | 9.0                  | -                                   |  |
| 6:30    | 82                                         | 2.89                                                                                   | 117250 - 117350      | 100 | 34.6 | 190                | 437              | 13.0                 | -                                   |  |
| 7:30 P  | 73                                         | 2.89                                                                                   | 119300 - 119400      | 100 |      | 168                | 459              | 22.0                 | -                                   |  |
| 8:00    | 67                                         | 2.88                                                                                   | 120300 - 120400      | 100 |      | 154.5              | 477              | 13.5                 | -                                   |  |
| 8:30    | 63                                         | 2.88                                                                                   | 121400 - 121500      | 100 |      | 145                | 487              | 9.5                  | -                                   |  |
| 9:00    | 57                                         | 2.88                                                                                   | 122300 - 122400      | 100 |      | 131.5              | 500              | 13.5                 | -                                   |  |
| 9:30    | 54                                         | 2.89                                                                                   | 123500 - 123600      | 100 |      | 124.5              | 507              | 7.0                  | -                                   |  |
| 10:00   |                                            |                                                                                        |                      |     |      |                    |                  |                      |                                     |  |
| 10:55 P | 52                                         | Opened airline, reduced pressure to zero, ready to stop pump and check recharge rates. |                      |     |      |                    |                  |                      |                                     |  |
|         |                                            |                                                                                        |                      |     |      | 120                |                  |                      |                                     |  |

K-E 10 X 10 TO THE 1/2 INCH  
KEUFFEL & ESSER CO. 359-12  
MADE IN U.S.A.



FORM 2-19-59

REGION TWO OFFICE

WELL PUMP DATA CHART

PARK OR MONUMENT

Date March 5, 1959

Sheet 1 of 1

Wind Cave National Park

| NAME OF SUPPLY, and LOCATION by<br>NO. ACRE DIVISION of Sec., Twp. & Rge. | MAKE                                                                  | SERIAL<br>NUMBER | TYPE - PISTON<br>TURBINE, ETC.       | P U M P U N I T          |        | HEAD - FEET     |             | DIA.-INCHES |                               | P U M P                                                                 |    | P O W E R<br>Operating<br>HP |
|---------------------------------------------------------------------------|-----------------------------------------------------------------------|------------------|--------------------------------------|--------------------------|--------|-----------------|-------------|-------------|-------------------------------|-------------------------------------------------------------------------|----|------------------------------|
|                                                                           |                                                                       |                  |                                      | CAPACITY - GPM<br>DESIGN | ACTUAL | DESIGN          | ACTUAL      | INTAKE      | OUTLET                        | KIND<br>ELEC.-GAS                                                       | HP |                              |
| NE 1/4 of SE 1/4 of Sec. 6, T5S, R5E                                      | Model 8DA<br>Hydrite<br>Peerless<br>Pump                              | 120850           | Gear Turbo                           | 47                       | 51.3   | 800             | 14ft<br>776 | 4"          | 4"                            | Elec.<br>GE Model<br>5K4286K02PM                                        | 20 | 1760                         |
|                                                                           | Peerless<br>Pump<br>High Pressure<br>Model 1 1/2<br>TWH-7<br>3500 RPM | 121099           | Centrifugal<br>3 stage Booster @ 515 | 50 gpm<br>515            | 51.3   | Booster<br>300' |             | 4"          | 1 1/2"<br>expands<br>to<br>4" | Marathon<br>Elec.<br>Model #<br>TM-2864TD<br>15W<br>3 phase<br>240 volt | 25 | 3500                         |

Form 10-174  
(Rev. 1/56)UNITED STATES DEPARTMENT OF THE INTERIOR  
NATIONAL PARK SERVICE

REPORT 7 SPL

## COMPLETION REPORT OF CONSTRUCTION PROJECT

|                                                                          |                                        |                                                           |                                       |
|--------------------------------------------------------------------------|----------------------------------------|-----------------------------------------------------------|---------------------------------------|
| REGION<br><b>Two</b>                                                     | AREA<br><b>Wind Cave National Park</b> | COUNTY<br><b>Custer</b>                                   | STATE<br><b>South Dakota</b>          |
| PROJECT OR JOB TITLE<br><b>Water Supply System for Headquarters Area</b> |                                        |                                                           | PCP NO.<br><b>U-11-1 &amp; 11-2</b>   |
| LOCATION IN AREA<br><b>Headquarters Area</b>                             |                                        | MASTER PLAN NO.<br><b>---</b>                             | BUILDING NO.<br><b>---</b>            |
| WORKING DRAWING NO. AND TITLE<br><b>NP-WC-3106-C</b>                     |                                        |                                                           |                                       |
| APPROPRIATION TITLE AND SYMBOL<br><b>141035 Buildings and Utilities</b>  |                                        |                                                           | ACCOUNT NO.<br><b>WICA-1111 332.3</b> |
| CONTRACT NO.<br><b>14-10-232-172</b>                                     |                                        | DATE WORK STARTED<br><b>9-1-56</b>                        | DATE WORK COMPLETED<br><b>4-26-57</b> |
| NAME OF CONTRACTOR<br><b>Anchor Construction Company</b>                 |                                        | ADDRESS<br><b>614 Standard Oil Bldg., Omaha, Nebraska</b> |                                       |

## COST ANALYSIS

| CONSTRUCTION ITEMS            | QTY. | UNIT COST<br>IN PLACE | TOTAL COST<br>IN PLACE            |
|-------------------------------|------|-----------------------|-----------------------------------|
| <b>Contract</b>               |      |                       |                                   |
| 1st est.                      |      | 10,878.97             | 10,878.97                         |
| 2nd est.                      |      | 24,219.98             | 35,098.95                         |
| 3rd est.                      |      | 20,774.20             | 55,873.15                         |
| 4th est.                      |      | 15,894.28             | 71,767.43                         |
| 5th est.                      |      | 15,931.14             | 87,698.57                         |
| 6th est.                      |      | 5,439.20              | 93,137.77                         |
| 7th est.                      |      | 1,645.00              | 94,782.77                         |
| <b>Other Direct Expenses</b>  |      |                       |                                   |
| Telephone & Telegraph         |      |                       | 66.47                             |
| Buckingham Transportation     |      |                       | 2.10                              |
| <b>Supplies and Materials</b> |      |                       | 79.47                             |
| <b>Facilitating Charges</b>   |      |                       | <del>718.00</del><br>718.00       |
| <b>TOTAL</b>                  |      |                       | <del>95,648.81</del><br>95,648.81 |

COST AGREES WITH FFO RECORDS  
C. D. VAN KIRK, SUPERVISORY ACCT.  
REGION TWO OFFICE FFO  
DATE FEB 18 1958

## SUMMARY OF EXPENDITURES other than contractual:

|                   |                                                                             |                        |
|-------------------|-----------------------------------------------------------------------------|------------------------|
| PERSONAL SERVICES | EQUIPMENT                                                                   | MATERIALS AND SUPPLIES |
|                   |                                                                             | 79.47 ind. of contrac  |
| OTHER             | Facilitating Services: <del>\$718.00</del> ; Other Direct Expenses: \$68.57 |                        |
|                   | 718.00                                                                      |                        |

| ORIGINAL CONTRACT AMOUNT       | CHANGE ORDERS |                                 |          |  |
|--------------------------------|---------------|---------------------------------|----------|--|
|                                | FIRST         | SECOND                          | THIRD    |  |
| <del>90,618.60</del> 90,618.60 | 487.00        | 2,092.50                        | 495.00   |  |
| FINAL CONTRACT AMOUNT          | FOURTH        | INCREASE                        | DECREASE |  |
| <del>94,782.77</del> 94,782.77 | 709.00        | Increase in quantities - 380.67 |          |  |

THIS PROJECT OR JOB HAS BEEN COMPLETED IN ACCORDANCE WITH  
APPROVED DRAWINGS, SPECIFICATIONS, AUTHORIZED CHANGES

|                                                                          |                                  |
|--------------------------------------------------------------------------|----------------------------------|
| SUBMITTED BY (Name and title)<br><b>E. J. Axline, Project Supervisor</b> | DATE<br><b>November 22, 1957</b> |
| APPROVED BY (Name and title)<br><b>Earl M. Semingsen, Superintendent</b> | DATE<br><b>November 22, 1957</b> |

(ATTACH NARRATIVE STATEMENT, PHOTOGRAPHS, AND "AS BUILT" DRAWINGS TO THIS FORM)

Narrative Statement

**INTRODUCTION**

On April 21, 1956 a 790 foot water well, FCP U-13, was completed near the east boundary of Wind Cave National Park. The work was accomplished by the Sioux Drilling Company of Rapid City, South Dakota, under Contract No. 14-10-232-131, for a total sum of \$22,960.00.

The purpose of the well is to supplement the present water supply at Wind Cave National Park. The Park now obtains all water for the Headquarters Area from a spring located some distance away. For a number of years the supply has not been adequate due to drought and the continual increase in demand. This project makes the additional water supply of the well available when the spring supply is low and the public use is high.

This contract provides for an electrically driven deep-well pump to lift the water in the well from the 650 foot level to an electrically driven booster pump. From the booster pump the water flows through about 8100 feet of 4 inch pipe and about 2800 feet of 6 inch pipe to a connection with the water system in place, thence on into the reservoirs. In addition to the above the contract also provided for a branch line to the utility area, five new fire hydrants, an electric pump control circuit from the well to the reservoir, and related items such as check valves, air release valves, etc.

A new agreement was made with the Black Hills Power and Light Company whereby they would install a new overhead power system from the Park carpenter shop to the pumphouse at the well to furnish electricity for the pumps. It was also agreed that the National Park Service would be permitted to install a two wire pump control circuit from the pumphouse to the reservoirs on the power company's poles.

For location of new water supply system, please see contract drawing No. NP-MC-3106C.

For location of Black Hills Power and Light power line in the Park, see drawing attached to the above agreement.

#### SURVEYS AND PLANS

In the fall of 1955 the Superintendent of Wind Cave National Park started negotiations for a survey of the necessary pipe line from the well to the Headquarters Area. It was found that the Park Engineer was too busy with his regular duties to make the survey, also that there were no engineers available from the Western Division of Design and Construction in San Francisco. With these sources eliminated, the alternate was to contact various professional engineers in this state with the proposal that they contract the necessary survey.

Invitations to Bid were mailed to four engineering companies in this area, only two of which offered a bid. Walker and Gantz of Custer, South Dakota submitted the low bid of \$1,250.00. The contract was awarded to this firm on October 22, 1955. Mr. Gardner Gantz and survey crew completed required survey on November 29, 1955. A recheck of this survey prior to construction showed a few minor errors with some minor changes in alignment required to save trees and generally benefit the Park.

The plans and specifications for this project were prepared in the Western Division of Design and Construction, based on the survey made by Mr. Gardner Gantz.

#### CONTRACTUAL PROCEDURE

The plans and specifications for this project were mailed from the Western Division of Design and Construction to the interested Park Service offices on July 17, 1956 for distribution to the contractors on their mailing lists. Invitations to Bid were immediately mailed to each prospective bidder.

The bids were opened in the office of the Regional Director, Region Two, Omaha, Nebraska at 3:00 P.M., C.S.T., on August 7, 1956.

Four bids were received. Anchor Construction Company was low with a total bid of \$92,063.00. However, due to shortage of funds, certain items were deleted and the Contract No. 10-14-232-172 was awarded to the Anchor Construction Company, 614 Standard Oil Building, Omaha, Nebraska for \$90,618.60 on August 20, 1956.

Notice to Proceed was acknowledged by the Contractor on August 31, 1956, making September 1, 1956 as the first day of the contract period and December 29, 1956 as the last day of this period, according to the specifications.

On December 21, 1956 the Contractor asked for an extension of time on this contract amounting to 30 calendar days due to delay in receiving the booster pump and the check valve to be installed in the pumphouse. He has submitted evidence to prove that the delay is due to others over whom he has no control. This evidence was rejected by Regional Counsel on the grounds that delay in receipt of materials was not sufficient cause. However, under Change Orders Nos. 1 through 4 an extension of time was granted in an amount that no liquidated damages were assessed.

The entire project was accepted in accordance with the contract and specifications on June 26, 1957, and Estimate No. 7-- Final Payment was prepared.

#### CONSTRUCTION

Please refer to Drawing No. NP-WC 3501-C, Plan As Built.

On September 13, 1956 none of the Contractor's personnel or equipment had arrived on the project site, however there had been considerable correspondence concerning materials. The Contracting Officer warned the Contractor that September 15, 1956 was the official starting date for construction and inquired as to his intentions. The Contractor advised that a carload of water pipe had been shipped from Birmingham, Alabama and that the construction superintendent, with a crew, would arrive on the job soon.

On September 18, 1956 a carload of 6 inch cast iron, cement-lined, mechanical joint pipe arrived at Hot Springs, South Dakota. This same day, four of the Contractor's men arrived with a boom-truck, Northwest backhoe and a compressor. They immediately proceeded to haul the pipe to the project.

On September 24, 1956 the Contractor started ditch excavation and laying the 6 inch pipe at Sta. 82 + 24. He continued digging and laying pipe to Sta. 109 + 92 on our revised alignment. Some rock was encountered, requiring blasting, but with the use of mats there was very little throw. The rock in the pipe ditch also required the Contractor to obtain select material for pipe bedding. The Superintendent of Wind Cave National Park arranged for this material from the South Dakota State Park at no expense to the Con-

tractor, however he had it hauled about 8.5 miles to the job site.

While testing this section of pipe line considerable trouble was experienced with the mechanical joints sweating during the test. We found about 30 joints sweating in 2000 feet which was considered too many even though the loss of water was less than permitted in the specifications. With the assistance of the Contractor it was found that the outside bituminous coating was too thick and rough to permit a watertight seal between the gaskets and the pipe. The Contractor agreed to scrape off all extra coating before the joints were made up. This reduced the number of sweating joints to a very few.

Up to November 2, 1956 all pipe had been tested before covering, but at this time a storm foretold of colder weather ahead so it was agreed that in the future the pipe would be tested to 120 psi with air then backfilled in the usual manner and to be tested with water after reaching the pumphouse. The Contractor understood that the line would not be accepted until tested. This would prevent frozen pipe and save filling the pipeline with water several times. All 6 inch pipe was tested when laid.

Due to the rocky material a great deal of select material was required for pipe bedding. The available source within the Park was very small so the Contractor paid for hauling some 350 cubic yards from a pit in State Park about 8.5 miles from the project.

The ditch excavation up and down the steep slopes was accomplished by holding the backhoe with a cable to a tractor. This method was satisfactory and no accident occurred.

On December 11, 1956 virtually all of the pipe had been installed up to the pumphouse and the construction of the pipeline complete except for the drains, air release valves and Type B manholes. The pipeline was to be tested from the pumphouse to the 4" gate valve later, after the installation of the pumps.

The Contractor immediately started work on the base for the deep well pump which arrived December 3, 1957. The footing for the pumphouse was poured shortly after. On December 6, the Contractor opened a crate containing the installation instructions for this pump and determined that the pump guarantee was void unless the pump column was placed in a well that was completely cased, which ours was not. He tried to get more information from the pump company, but could not until December 18, when he notified the Project Supervisor that the pump company had verified the statement on the instructions. WDC

was immediately notified and asked for recommendations.

On December 27, 1956 the Black Hills Power and Light Company completed their line to the well so that the Contractor could have started installation of the pump circuit at this time, but his men had been laid off for Christmas and this work would not have required the whole crew. The copperweld wire for the pump circuit was not obtained from the freight depot until January 2, 1957 and work was started at once on the pump control circuit.

On January 3 the Contractor informed the Project Supervisor that he must know at once as to what action would be taken on casing the Wind Cave well so that he could install the deep well pump. WDC and Region Two were called and both gave approval of casing the well. However, there was some question as to the straightness of the well, so the Contractor voluntarily probed the well, first with a pipe containing 4 fins of iron 7-5/8" OD x 3". This probe lodged in the well. Then he tried a 26' pipe with fins 7" OD which went to the bottom. This gave us hopes that 7" OD casing would go in the well. Also, this was the minimum size deemed advisable to allow sufficient water to flow between the casing and the pump column. Change Order No. 2 was written to the Contractor, directing him to install 310' of 7" OD, perforated casing on the bottom of the well where it had not been cased. On January 19, a well driller from Newcastle, Wyoming brought in a small rig. They bailed out about 10' of mud. The mud was very fine and loose, red in color. There was also a strong odor when the bailer was opened. It seemed to be a sulphurous odor.

The next Monday, January 21 the casing was welded and lowered in the well. It went below 570', where the probe had lodged, by about 24' and stuck. It was raised back to the collar of the hole and left. WDC and Region Two were called again to advise them of the situation. WDC recommended that we recall the original well driller to correct the well, but Region Two determined that for legal reasons, this could not be done, and recommended a Directional Survey of the well with a new caliper survey. This would determine if the well could be reamed or if it would have to be redrilled in part or entirely.

Change Order No. 3 was written to the Contractor January 25, 1957 directing him to have the above surveys made of the well at the earliest possible date. The continuous Directional Survey with a Hole Caliper was made by Schlumberger Well Surveying Corp. of Newcastle, Wyoming on January 28, 1957. The results of this survey showed that the bore was as specified in the drilling specifications, but that it had deviated considerably from the vertical, and was not straight.

At this time it was decided that a conference concerning the procedure for correcting the well was required. A conference was arranged to be held in Omaha on February 6 and 7, with Mr. P. E. Smith from WDC, Mr. Robertson of Region Two, Counsels Cook and Mullady, Superintendent Semingsen of Wind Cave National Park and Mr. E. V. Axline, Project Supervisor from WDC. It was decided that a Change Order should be written to Anchor Construction Company to have the well reamed or redrilled from the bottom of the 10" casing. The Contractor made inquiries of various drillers who advised against this procedure and recommended drilling a new well. The estimate for the new well was about \$22,000. However, the drillers would not contract for this amount, but preferred to drill at an hourly rate.

Since Anchor Construction Company could do no work on their contract until a final decision was made as to what was to be done with the well, they took their men to another project and suspended all work here. During this period, Mr. Smith suggested that we consider a submersible pump, so the Anchor Construction Company was asked for an estimate for the installation of a submersible pump in lieu of the Peerless Hi-Lift pump that was specified. On February 26 this estimate was received and forwarded to WDC. They considered the estimate too high and recommended that we install the Peerless Hi-Lift pump even though it would not be guaranteed since the submersible pump would not be guaranteed either.

Thus Mr. Sanborn was notified to resume work on his contract March 11, 1957. The Peerless pump was installed with rubber spiders on upper 100' of water column only. This is where the well is straight and plumb.

The  $\frac{1}{4}$ " galvanized pipe for the drawdown gauge was installed separately with the low-water cut-off unit attached to it. The pump water column inlet is 656 feet below the pump base. The draw-down gauge inlet is 5 feet below the pump inlet and the low-water cut-off switch is 2 feet above the pump inlet. Then the booster pump was set on blocks and all piping connected as per plan. The concrete base for the booster pump was placed on the compacted fill of the pumphouse rather than placed in unit with the pumphouse floor as shown on the plans. This was done to get the pumping unit into operation sooner.

The pumphouse, a Butler Building was erected and fitted with the electrical control box, heater and lights. Two overhead lights were installed instead of one as shown on the plans. Also, a 110 volt duplex outlet box was installed to facilitate maintenance and repairs when needed. An additional ground wire with lightning arrester was

installed on the pumphouse for the pump control circuit. This was not specified, but complies with the electrical code. An additional 25 foot power pole was installed at the pumphouse to carry electrical power from the Blackhills Power and Light terminal pole, with transformers, to the pumphouse. It also carries the pump control circuit. This pole was necessary since a smaller mast on the building would not carry the weight of the wires.

The insulation of the steel building was quite a problem. The most satisfactory method found was to fit 1" x 2" wood furring strips into the steel frame of the building and stapling the insulation bats to them, then tightening the strips in place further with more 1" x 2" strips and nailing them. Gluing the insulation bottoms to the metal building was not recommended.

The pumping unit was put into operation and found satisfactory after some minor adjustments as long as it could be closely watched. It was found necessary to reduce the delay between starting of the well pump and the booster pump to one second. There is too much pressure built up by the well pump if the booster does not start for safety so a 2 inch safety valve was installed in the line. To give good control of the system it was determined that additional pressure gauges were needed on the low and high pressure sides of the booster pump and these were installed.

The deep well was started with the discharge through the 2 inch bypass. As expected, the water was very muddy. Then it would clear for awhile and become muddy again for awhile. On the first run the well was pumped dry at 656 feet in one and one-half hours. Later tests showed that the flow had increased some, but not sufficiently for the proposed use. The well was drawn down three times and the water cleared a great deal, but not entirely.

The booster pump was started and the pipeline filled and flushed. Then 25 pounds of HTH disinfectant was placed in the pipeline and well and pumped along the line until it showed at each drain and fire hydrant. The disinfectant was left in the line for twenty-four hours, then drained.

All of the switches, pipeline and pumps were tested and met the specifications. A test of the amount of water pumped was made at the upper fire hydrant on the line near the administration building. The flow measured through a 2 inch water meter and timed with a stop watch, showed 51.3 gallons per minute.

Since there was not sufficient flow in the well at 656 feet, the Contractor was directed to order and install 120 feet more of water column and shaft as provided in the specifications. This material arrived April 22, 1957 and was immediately installed.

The method of procedure was changed for this installation. The northwest dragline was used for lowering the additional pump column. This method was satisfactory except that the brakes on the cable drums had not been used for some time and they did not work smoothly. The pump was held about 4 feet above its base while the 1/4" G. I. pipe airline for the drawdown gauge was lowered with the low-water cut-off unit attached. The low-water cut-off and the lower end of the air line are approximately 4 feet above the well pump intake, 772 feet. The pump was lowered into place and all piping reconnected.

On April 25, 1957 the work was started on tests of the deep well pump with the intake at 776 feet. The pump was run for 8 hours continuously. The well drew down to a zero reading on the drawdown gauge, but continued to fill a 55 gallon drum in one minute and ten seconds by stop watch. The water was fairly clear, but showed a trace of oil. There seemed to be more vibration in the pump when the well was low.

On April 26, 1957 after a discussion with Val Sanborn, the Contractor's Superintendent, concerning Change Order No. 4 and Estimate No. 7, Final Payment, the project was accepted in accordance with the specifications.

#### CONCLUSION

1. It is my opinion that the project will function satisfactorily throughout, except for a few minor incidents that could not be foreseen during construction of the deep well pump.

2. The following difficulties should be anticipated with the deep well pump: (a) Since part of the well is not cased, rocks and other material from the walls of the bore may sluff off and lodge against the water column causing much trouble when the column is to be pulled for repairs; and (b) Since well is not straight, the water column and shaft was not installed in a straight line. This puts considerable strain on the shaft and bearings as it rotates at 1800 RPM. It can be anticipated that the shaft will unduly wear certain bearings or guides in the water column and will eventually fail, requiring considerable maintenance.

Submitted by: E. J. Gilman Project Supervisor

Dated 1/14/58

Approved by: Val Sanborn Superintendent

Dated Jan 17, 1958

# Culligan WATER CONDITIONING, INC.

521 Kansas City Street, Rapid City, South Dakota, Fillmore 2-0430

## REQUEST OF SIOUX DRILLING



## WATER ANALYSIS REPORT

To: Culligan Soft Water Service  
521 Kansas City St.  
Rapid City, S. D.

Analysis No. W-102,431

File No. 40-230

Sample of: Wind Cave National Park  
Park Dept.

Date Analyzed: April 30, 1936

Source of Water: Municipal Well, 787 Ft.

Date Typed: May 3, 1936

Taken: 4-24-36 Received: 4-25-36

Description of Sample:  
5 Color, Grey (mg) turbidity,  
Filters clear  
no odor

Type of Installation: Service Residential

|                            |      |      |                      |      |      |
|----------------------------|------|------|----------------------|------|------|
| pH                         | 7.6  |      | Calcium Hardness     | 6.2  | grs. |
| Iron (Fe)                  | neg. | ppm. | Magnesium Hardness   | 2.9  | grs. |
| Silica (SiO <sub>2</sub> ) | 11.3 | ppm. | Total Hardness       | 9.1  | grs. |
|                            |      | ppm. | Compensated Hardness | 10.0 | grs. |

## RECOMMENDATIONS:

Dealer's remarks: Filter- add chlorination.

Culligan is suggested for softening.

## Hypothetical Combination:

|                       |     |      |                 |
|-----------------------|-----|------|-----------------|
| Calcium bicarbonate   | 6.2 | grs. |                 |
| Magnesium bicarbonate | 2.9 | grs. |                 |
| Sodium bicarbonate    | 1.3 | grs. |                 |
| Sodium sulfate        | 0.8 | grs. | (Washers' salt) |
| Sodium chloride       | 0.8 | grs. | (Salt)          |

J. V. Nelson

Call and discuss your water problem

**SOUTH DAKOTA STATE DEPARTMENT OF HEALTH**  
 Division of Sanitary Engineering  
 Pierre, South Dakota

**MINERAL WATER ANALYSIS REPORT**

TOWN Wind Cave National Park - Hot Springs  
 OWNER OF SUPPLY Wind Cave National Park  
 COLLECTOR'S NAME \_\_\_\_\_  
 DATE COLLECTED 4-20-56  
 REPORT TO: Wind Cave National Park  
Hot Springs, South Dakota

DATE 6-22-56  
 LAB. NO. \_\_\_\_\_  
 MINERAL NO. 474  
 DATE RECEIVED \_\_\_\_\_

cc: M. O. Nelson, Dist. Engr.

**FIELD DATA**

SOURCE: Well Name Wind Cave Well No. \_\_\_\_\_  
 Depth \_\_\_\_\_ Construction date 4-20-56  
 Location of Well Wind Cave Canyon  
 Point of Collection Lower End  
 Well pumped 65 hrs. at 20 (gpm.)  
 Was sample free of turbidity when collected? no  
 Temperature °C \_\_\_\_\_ Alkalinity (ppm CaCO<sub>3</sub>) P \_\_\_\_\_ Total \_\_\_\_\_  
 pH \_\_\_\_\_ Iron (ppm Fe) \_\_\_\_\_  
 Remarks:

**LABORATORY ANALYSIS**  
 (Parts Per Million)

Specific Conductance at 25 °C 29.92  $\times 10^{-5}$  Turbidity \_\_\_\_\_  
 Insoluble Matter \_\_\_\_\_  $\text{Fe}_2\text{O}_3/\text{Al}_2\text{O}_3/\text{Mn}_2\text{O}_3/\text{SiO}_2$  4.4  
 Total Solids 229 Dissolved Solids \_\_\_\_\_ Total Iron (ppm) 0.1  
 Alkalinity P 0 Total 180 pH 7.8  
 Alkali as Na 20.95 Nitrate as N 0.5  
 Calcium as Ca 44.05 Fluoride as F 0.75  
 Magnesium as Mg 12.63 Chloride as Cl 12.0  
 Manganese as Mn 0.00 Sulfate as SO<sub>4</sub> 16.13  
 Bicarbonate as HCO<sub>3</sub> 219.6  
 Calculated Hardness as CaCO<sub>3</sub> 162.1 ppm 9.48 ppm  
 analyst O. D. Dunbar

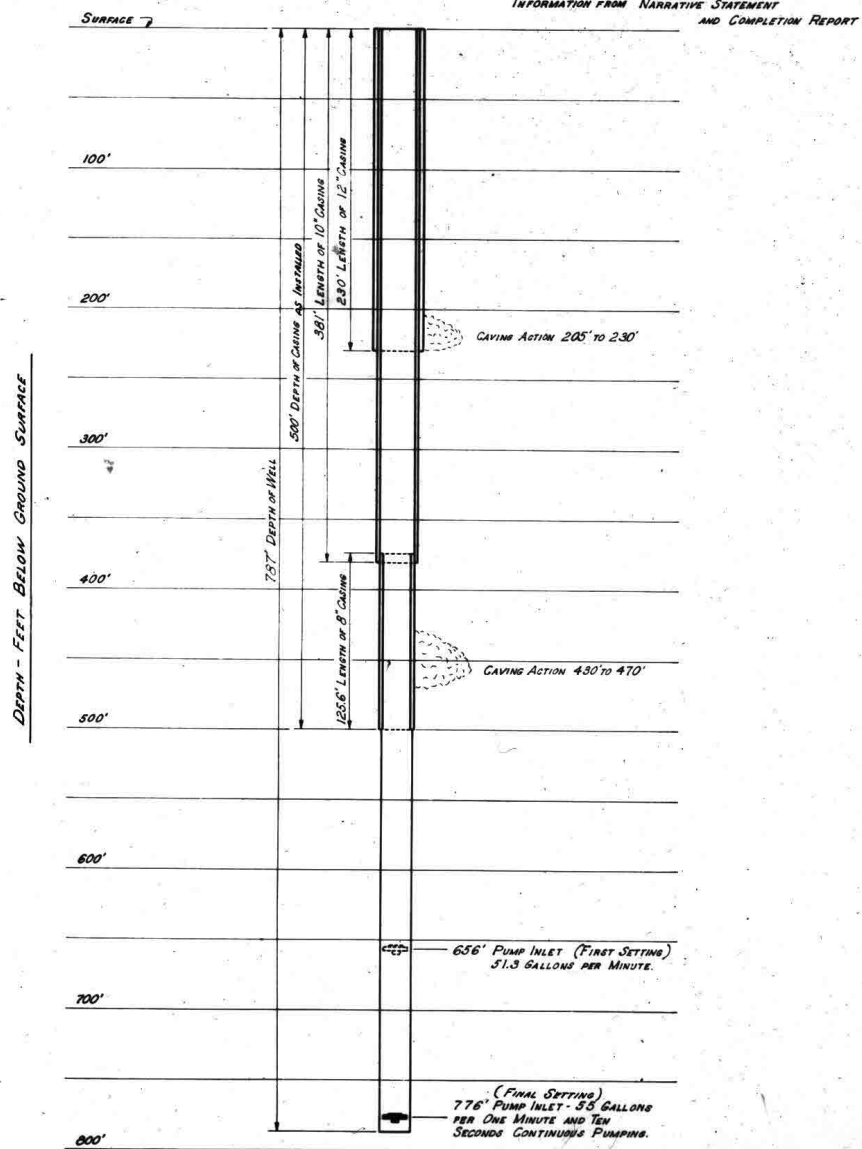
*Charles E. Carl*

Title \_\_\_\_\_

**WATER WELL  
WIND CAVE NATIONAL PARK  
SOUTH DAKOTA**

COMPLETED APRIL 1956

INFORMATION FROM NARRATIVE STATEMENT  
AND COMPLETION REPORT



**REGION TWO OFFICE**

DATE: NOV 1960

DRAWN BY: JEM

P. O. Box 300

Phone 2-1740

5.00 p.m.

## THE SIOUX DRILLING CO.

ROTARY &amp; CABLE TOOLS

WELL SERVICE

RAPID CITY, S. D.

Rapid City, S. D. Park Avenue

DRILLER'S LOG OF WIND CAVE WATER WELL.

Started Drilling Dec 16, 1955, Well Completed April 20, 1956.

Contract 14-10-232-131

|     |     |                                                          |
|-----|-----|----------------------------------------------------------|
| 0   | 5   | top soil                                                 |
| 5   | 20  | gravel (20' of 6" surface casing)                        |
| 20  | 70  | sandy lime (surface water at 51')                        |
| 70  | 90  | red shale                                                |
| 90  | 105 | gray shale                                               |
| 105 | 136 | sandy lime                                               |
| 136 | 139 | open cave                                                |
| 139 | 160 | sandy lime (very hard and sharp)                         |
| 160 | 165 | dark shale                                               |
| 165 | 230 | lime and chert                                           |
| 230 | 260 | sandy lime (232 ft. of 12" casing in place)              |
| 260 | 270 | shale and lime shells                                    |
| 270 | 310 | sandy lime                                               |
| 310 | 340 | sandy shale                                              |
| 340 | 350 | gray lime                                                |
| 350 | 380 | red shale and gyp shells (very cavy)                     |
| 380 | 410 | lime (380' of 10" casing, cemented with 135 bags cement) |
| 410 | 470 | red shale and gyp shells, (very cavy)                    |
| 470 | 510 | lime, hard Run 126' of 8" liner (from 376' to 500')      |
| 510 | 520 | lime (hard) water in top 20' of above formation          |
| 520 | 540 | lime, sandy                                              |
| 540 | 575 | lime, hard                                               |
| 575 | 579 | lime, sandy--- 20 g.p.m. at this point                   |
| 579 | 650 | lime, sandy                                              |
| 650 | 670 | lime and quartz                                          |
| 670 | 720 | lime, sandy                                              |
| 720 | 730 | lime, hard                                               |
| 730 | 750 | lime, sandy                                              |
| 750 | 760 | lime and red shale breaks                                |
| 760 | 770 | lime, sandy                                              |
| 770 | 787 | lime, hard and sharp                                     |
| 787 |     | TOTAL DEPTH                                              |

avg. 1.5



5 Copies of each

Wind Cave National Park Water Well

Drilled by Sioux Drilling Company, Rapid City, S. D. 1956

Located in Wind Cave Canyon, in  $38\frac{1}{2}$   $58\frac{1}{2}$  sec. 6, T. 6 N., R. 6 E.

Guster County, South Dakota

Sample set on file at S. D. School of Mines.

Samples studied by J. P. Gries, 1956.

Minnelusa formation (well starts roughly 180 feet below top of formation)

- 0 - 10 surface soil and gravel. Gravel consists of fragments of Minnelusa dolomite and sandstone, chert and quartz.
- 20 gravel, same but more pink to yellow dolomite
- 30 sandstone, poorly sorted, very calcareous, pink to orange-brown,  $2/3$ ; grading to limestone, sandy, same colors,  $1/3$ .
- 40 sandstone, orange to white, poorly sorted, very calcareous, 80%; limestone, as above, 20%.
- 50 sandstone, orange to white, poorly sorted, calcareous
- 70 sandstone, same
- 80 clay, gray to red-brown and hematite red, micaceous
- 90 shale, red-brown to hematite red, micaceous
- 95 shale, same, to silvery gray, micaceous
- 105 shale, dark gray to black
- 110 dolomite, finely crystalline, gray-brown, glassy
- 120 dolomite, same, and with much milky chert
- 130 dolomite, same, to dolomite, buff, finely crystalline, slightly earthy; some is sandy
- 135 dolomite, same
- 140 sample is mostly finely drilled up milky and brown chert with a trace of dolomite
- 160 sample same; trace of sand below 180
- 170 sandstone, fine to medium, yellow to white, calcareous
- 180 sandstone, same
- 190 sandstone, same; some new finely crystalline earthy yellow-brown dolomite
- 200 limestone and dolomite, pink to buff, still much chert
- 210 shale, black, looks petroliferous; caves badly
- 220 dolomite, finely crystalline, hard, gray to brown, mottled red; trace sandstone
- 230 dolomite, same; some sandy; may be some streaks of dolomitic sandstone. 12 3/4" set at 232'
- 240 dolomite, finely crystalline, granular, light brown with pinkish cast; faintly porous, trace milky chert and druse quartz
- 250 detrital material; earthy finely crystalline dolomite, shale, black, chert, chalcodony
- 2 60 dolomite, light cream, fine- to medium crystalline, some earthy, very porous, with spar calcite crystals
- 2 70 dolomite, same, and dolomite, finely crystalline, earthy, pale pink to pale green; green is almost a silty shale
- 280 sandstone, fine, dolomitic, off-white; chert, white to milky
- 290 dolomite, finely crystalline, glassy, some sandy, light gray, more calcite spar
- 300 dolomite, finely crystalline, pink, very sandy
- 310 dolomite, same, and dolomite, very finely crystalline, gray with embedded frosted quartz grains

## Wind Cave

- 2 -

- 310 - 320 sandstone, fine to coarse, off-white to faintly yellow, calcareous but  
drills to free grains
- 330 dolomite, very finely crystalline, hard, nearly white; some rhombic  
dolomite, some sandy dolomite
- 340 dolomite, finely crystalline, glassy to earthy; nearly white to lavender,  
to greenish shale; trace red shale?
- 350 dolomite, same; dolomite, silty, lavender; shale, silty lavender to  
maroon
- 360 dolomite, finely crystalline to medium crystalline, glassy, nearly white  
to faint pinkish-brown
- 370 dolomite, same, and shale, red-brown to maroon; siltstone, maroon
- 380 limestone, fine- to coarsely crystalline, white
- at 380 limestone, very finely crystalline, white to very light brown, trace  
milky chert. 10" set at 381'
- 390 limestone, same
- 400 limestone, same; and may be some silty shale and pink calcareous ss
- 410 sandstone, red to orange, with red and maroon flaky shale
- 420 sand, orange; sand, colorless; shale, maroon; coarse fragments detrital  
chert
- 430 shale, waxy, maroon to hematite red; trace green; some streaks sandstone  
as above
- 440 shale, same, with few coarse frosted quartz grains
- 450 shale, maroon to hematite red
- 460 shale, red to pale green; much new fine to medium white sandstone with  
coarse embedded frosted quartz grains
- 470 shale, same; more sand, some with white and light green interstitial  
clay
- 472 shale, same, and maybe some new dense to medium crystalline white limestone,  
Water and top Pahassa at 472'
- 480 same as '72, perhaps more limestone 8" at 486' (E-log pick)
- 490 limestone, fine- to medium crystalline (sample mostly maroon shale)
- 500 probably same, sample 98% shale
- 502 limestone, dolomitic, very finely crystalline, white (about 1/3 shale)
- 510 limestone, fine- to medium crystalline, soft, white
- 530 limestone, same, 2/3; dolomite, medium- to coarsely crystalline, glassy,  
colorless to white, porous, 1/3
- 540 limestone, fine- to medium crystalline, soft, white, still stained flesh  
pink from shale cavings
- 550 dolomite, finely crystalline, white to flesh pink, earthy
- 560 dolomite, same, and dolomite, medium- to coarsely crystalline, colorless  
to flesh pink, some intergranular porosity
- 570 dolomite, medium to coarsely crystalline, colorless to flesh pink, some  
intergranular porosity
- 572 dolomite, same
- 580 no sample
- 590 limestone, very finely crystalline, white, dense
- 600 dolomite, fine- to medium crystalline, earthy, light brown, vuggy por
- 610 dolomite, finely crystalline, white to coarsely crystalline, pink, pink  
is very porous
- 620 dolomite, medium crystalline, glassy, pink to gray-brown
- 630 dolomite, fine- to medium crystalline, white to pink and salmon, no  
porosity
- 640 dolomite, same, but much spar calcite

- 640 - 680 dolomite, same and some more coarsely crystalline to rhombic, flesh pink, very porous
- 680 dolomite, finely crystalline, gray to brown, slightly saccharoidal, some porosity, some hematite red mottlings in the gray
- 670 dolomite, finely crystalline, saccharoidal, light gray-brown some porosity, some hematite red mottlings in the gray
- 680 dolomite, fine- to medium crystalline, pale pink to salmon, glassy, some vuggy porosity
- 690 dolomite, fine- to coarsely crystalline and rhombic, pale pink to nearly white, some vuggy and intergranular porosity
- 700 dolomite, fine- to coarsely crystalline, white to pale pink, some rhombic, much intergranular vuggy porosity
- 720 dolomite, finely crystalline, glassy, nearly white to faintly pink, some coarsely crystalline, rhombic, porous
- 730 dolomite, fine to medium crystalline, some rhombic, light gray-brown to faintly pink.

Inglewood formation

- 730 - 740 dolomite, finely crystalline, light brown to pink, vuggy porosity
- 750 dolomite, finely crystalline, wealy, red-brown, argillaceous, some red to orange shale or clay
- 760 dolomite, fine- to medium crystalline, wealy to rhombic, red-brown to maroon and gray; trace porosity, trace maroon shale

Deadwood formation

- 760 - 770 sandstone, colorless to red-brown, quartzitic, poorly sorted; trace of igneous and metamorphic rock fragments
- 780 sandstone, colorless to gray, quartzitic, tight, few fragments igneous or metamorphic rock
- 785 sandstone, colorless to white, trace hematitic stain; fine to very coarse, quartzitic, more metamorphic quartz

PreCambrian schists

- 785 - 795 quartz-mica schist, gray to white

**COMPLETION REPORT  
for  
DRILLING OF WATER WELL  
at  
WIND CAVE NATIONAL PARK  
SOUTH DAKOTA**

**PCP U-13**

**CONTRACT NO. 14-10-232-131  
Dated: December 6, 1955**

Form 10-174  
(Rev. 1/56)UNITED STATES DEPARTMENT OF THE INTERIOR  
NATIONAL PARK SERVICE

REPORT 7 SPL

## COMPLETION REPORT OF CONSTRUCTION PROJECT

|                                                                                            |                                            |                                              |                              |
|--------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------|------------------------------|
| REGION<br><b>Two</b>                                                                       | AREA<br><b>Wind Cave National Park</b>     | COUNTY<br><b>Custer</b>                      | STATE<br><b>South Dakota</b> |
| PROJECT OR JOB TITLE<br><b>Drilling of Water Well at Wind Cave National Park</b>           |                                            |                                              | PCP NO.<br><b>U-13</b>       |
| LOCATION IN AREA<br><b>SE 1, Sec. 6, T 65, R 5 E</b>                                       |                                            | MASTER PLAN NO.                              | BUILDING NO.                 |
| WORKING DRAWING NO. AND TITLE<br><b>None</b>                                               |                                            |                                              |                              |
| APPROPRIATION TITLE AND SYMBOL<br><b>14X1035 (WICA) Construction National Park Service</b> |                                            |                                              | ACCOUNT NO.<br><b>332.2</b>  |
| CONTRACT NO.<br><b>14-10-232-131</b>                                                       | DATE WORK STARTED<br><b>Dec. 14, 1955</b>  | DATE WORK COMPLETED<br><b>April 21, 1956</b> |                              |
| NAME OF CONTRACTOR<br><b>Sioux Drilling Company</b>                                        | ADDRESS<br><b>Rapid City, South Dakota</b> |                                              |                              |

## COST ANALYSIS

| CONSTRUCTION ITEMS                                             | QTY. | UNIT COST<br>IN PLACE | TOTAL COST<br>IN PLACE |
|----------------------------------------------------------------|------|-----------------------|------------------------|
| Total payments to Contractor<br>including Change Orders 1,2,&3 |      |                       | \$22,951.07            |
| Equipment                                                      |      |                       | 4.41                   |
| Materials and Supplies                                         |      |                       | 2.06                   |
| Facilitating Services                                          |      |                       | 229.60                 |
| Other                                                          |      |                       | 727.92                 |
| TOTAL                                                          |      |                       | 23,915.06              |

## SUMMARY OF EXPENDITURES

|                   |                   |                                |
|-------------------|-------------------|--------------------------------|
| PERSONAL SERVICES | EQUIPMENT<br>4.41 | MATERIALS AND SUPPLIES<br>2.06 |
| OTHER<br>957.52   |                   |                                |

## CHANGE ORDERS

|                                         |                        |                         |                        |
|-----------------------------------------|------------------------|-------------------------|------------------------|
| ORIGINAL CONTRACT AMOUNT<br>\$22,960.00 | FIRST<br>No additional | SECOND<br>No additional | THIRD<br>No Additional |
| FINAL CONTRACT AMOUNT<br>\$22,951.07    | FOURTH                 | FIFTH                   | SIXTH                  |

THIS PROJECT OR JOB HAS BEEN COMPLETED IN ACCORDANCE WITH  
APPROVED DRAWINGS, SPECIFICATIONS, AUTHORIZED CHANGES

|                                                                           |                              |
|---------------------------------------------------------------------------|------------------------------|
| SUBMITTED BY (Name and title)<br><b>Melvin A Thuring, Park Engineer</b>   | DATE<br><b>June 11, 1956</b> |
| APPROVED BY (Name and title)<br><b>Paul M. Henningsen, Superintendent</b> | DATE<br><b>June 11, 1956</b> |

(ATTACH NARRATIVE STATEMENT, PHOTOGRAPHS, AND "AS BUILT" DRAWINGS TO THIS FORM)

Sioux Drilling Co. of Rapid City, South Dakota began drilling on December 16, 1955 by the cable tool method. An open cave was encountered from depth 136 to 139 and difficulty was experienced by the driller in starting from the bottom of this open cave. From depth 160 to 165 dark shale was encountered and at depth 205 the hole began to cave somewhat. On the next day the hole was down to 230 feet and was caving so badly drilling operations were suspended by the contractor until 12" casing could be installed. After installation of 12 inch casing the bore was continued to the top of the Pahasapa limestone at 361 feet depth where, upon advice from Dr. Gries, professor of geology at the South Dakota School of Mines, it was decided to cement the 10" casing in place. It was believed water may be under sufficient pressure, if encountered at this level, to become a flowing well. If such were the case it would be very difficult, if not impossible, to cement the 10" casing in place.

By placing 10" casing inside the 12" it was thought an effective grout seal could be made between the two without loss of circulation into the cave. Guides were welded on the last 230 feet of 10" casing to assure true centering of the casing. Plumbness and alignment was checked by lowering through the hole a forty one ft. section of 8" pipe with 9 1/2 inch O.D. couplings on each end and the middle. Cementing was done by the Halliburton Oil Well Cementing Co. of Newcastle, Wyoming by separate P.O.

Grout consisted of a slurry of cement and water mixed in the proportions of about 6 1/2 to 7 1/2 gallons of water per sack of cement. Cement used was Lacotah Type III High-Early Strength cement. A calculated amount of 30 barrels (1260 gal.) was needed. Forty barrels (1680 gal.) were used in an attempt to complete circulation of grout from the bottom toward the top. It was thought circulation was being lost into the cave from leakage around the bottom of the 12" casing. All during circulation a minimum pressure of less than 100 psi was used. Another 47 bags of cement were used in placing grout from the top between the 10" and 12" casing. In order to check effectiveness of the grout seal, Schlumberger Well Surveying Corporation from Newcastle, Wyoming was ordered to conduct a temperature survey. Information thus obtained indicated seal between the 10" and 12" casing complete to within 120 feet of the surface. On the next day 14 bags of cement were placed from the top to completely fill the space between the 10 and 12 inch casing. Another 16 bags were placed in the annular space outside the 12 inch casing near the surface. It was then decided an effective seal had been made and the cement was allowed to set for 48 hours. Drilling was then resumed.

Top of the water bearing strata was encountered at the 470 ft. depth and in a 10 minute interval water had risen to within 190 ft. of the surface. Drilling was continued through various limestone and shale formations to near the 500 ft. depth where a very hard limestone strata was encountered. At this point serious caving action of the shale developed between the 430 to 470 ft. levels, thus preventing further drilling until an 8" liner could be installed.

The liner consists of 125.6 ft. of 8" ID casing weighing not less than 24.70 lbs. of the following lengths in order of placement in the hole: 24.2', 21.2', 19.5', 21.3', 81.4', and 20.0'. The 24.2 ft. section of pipe is slotted, slots being in four sections, each consisting of 5, 4" slots, each 5 feet long, equally spaced around the circumference of the pipe. Total length of slots is 20 ft. An undetermined number of 1/2" holes were also cut into this section of casing at random. A cave catcher, fabricated from a 20 gallon oil drum by the driller was welded to the 21.2' section of pipe about 25ft. from the end of the string of pipe. (See attached sketch). Foundation for the 8" pipe was provided by fashioning a shoe from a thread protector by cutting off the bottom overlap, screwing the protector onto the 8" casing and spot welding it to the casing. The pipe rests on a shoulder formed in the hole by reducing the size of bore from 10" to 8". There is no other support for this 8" liner. Development by a plunger could not be accomplished because there was concern as to whether or not this liner would stay in place.

After placement of the 8" liner drilling was continued to the 579 foot depth, where, upon recommendations from Dr. Gries; E. Hansen, driller; and A. V. Smith, Jr., manager of the Sioux Drilling Company, it was concluded an ample water supply had been penetrated. A 3 hour bailer test conducted by the driller indicated production of 40 gpm with no change in static water level and the driller indicated the well would produce 200 gpm or more.

Development was accomplished by running the string of drill tools up and down in the hole and bailing. At the end of about 32 hours water in the bailer was clear. However, when the test pump was operated water from the pump discharge contained large quantities of red shale. The test pump (described later under final pump test) was set at depth 470. After 6 hours and 33 minutes of intermittent pumping, during which time varying concentrations of shale in the water were observed, it was obvious to all present the maximum quantity of water available was about 20 gallons per minute. Fifty gallons per minute was desired.

It was recommended by Dr. Gries, the driller, and manager to continue drilling an 8 inch bore through the Pahasapa limestone in hopes of penetrating additional water producing zones. Drilling was continued through the Pahasapa limestone, Englewood formation (approximate depth 730 to 760 ft.), Deadwood formation (760 to 785) and halted at the top of the Pre-Cambrian schists at about depth 787. The entire water bearing formation had been penetrated. Additional casing was not required.

The Schlumberger Well Surveying Corporation was then called upon to run such surveys to give as much knowledge of the bore and water producing potentials of the stratum penetrated as practical. Gamma Ray - Neutron Log and Micro Log equipment was defective and only the Gamma Ray - Neutron Log was useable. Since the Hole Caliper was made in conjunction with the Micro Log only 2 field graf prints of the survey were obtained.

The Gamma Ray - Neutron Log indicated two zones of relatively high porosity had been penetrated, one between depths 660 and 669, the other between 744 and 752. Static water level in the well had also risen

from about 195 to 172. It was decided to develop and test pump.

Development was accomplished by cleaning the full depth of the hole with a bailer and pumping at the rate of about 30 gallons per minute for a period of about three hours. At the end of this period water discharged from the pump was slightly cloudy but free from objectionable concentrations of shale.

Plumbness and alignment was measured by a 41.1 ft. plumb made of two pieces of 7" OD, 5/16" thick pipe connected with a 7 5/8" outside diameter coupling and having two 7 5/8" OD couplings on each end. This plumb was lowered through the entire length of 8" pipe. However, care was taken not to let the top of the plumb drop below the end of the 8" liner. The driller expressed concern about the safety of the 8" section should the edge of the plumb hook on the end of the 8" liner when raising the plumb. The open hole from depth 500 to 767 was not checked for plumbness or alignment.

Mechanical parts of the test pump operated satisfactorily at a 550 ft. setting. A diesel powered, 18 stage, oil lubricated, turbine type Peerless pump with 7" OD bowls was used for test pumping. Water discharge rates were measured with an orifice.

The initial pump test for maximum yield indicated a maximum of about 35 gallons per minute could be pumped from the well for a period of six hours or more. In lieu of establishing a desired yield (1/2 maximum yield) as indicated in the specifications, the 24 hour pump test was made at 30 gallons per minute.

Following the 24 hour pump test additional pump tests were planned to establish pumping level at various discharge rates, and such pump tests were begun. After approximately two hours pumping time the water (which had become clear during the previous tests) suddenly became dirty. Large concentrations of red shale were evident. Pump tests were discontinued until a conference could be arranged with the drilling contractor and cause and remedies could be determined.

It was decided the cause was from struts of shale in the limestone formation and that the largest concentrations of shale are probably coming from the vicinity of the 470 ft. level. Three possible solutions were suggested:

1. Reconstruct the well by sealing off the shale from the water bearing formation at about depth 470 by cementing in an 8 inch liner from the 470 depth to the surface.
2. Reconstruct the well by sealing off the shale from the water bearing formation at depth 470 by placing special packers at the top and bottom of the 8" liner.
3. Attempt to rinse out the unstable shale by pumping in surges.

Suggestions one and two would involve considerable extra work and expense. Results may or may not have been satisfactory, depending upon the accuracy and completeness with which the shale could be sealed off without affecting the water producing strata. It was decided to pump in surges.

Previous performance of the pump indicated possibility that water which came from the 470 level was having difficulty passing the bowl of the pump to get into the intake. The pump was raised 30 feet to an enlarged section of the hole as indicated by the hole caliper survey. Pump performance improved.

At the end of about 20 hours of surge type pumping, during which pump test data was recorded, the water alternately cleared and became cloudy. There was no indication that this shale condition could be cleared up within the near future by pumping. The drilling contractor indicated wells in this area may have that characteristic for one or two years or more.

A continuous  $6\frac{1}{2}$  hour final test was conducted beginning with maximum yield and checking pumping level recovery at decreasing discharge rates.

Following removal of test pumping equipment, the bore was cleaned of all accumulations of sediment. A screwed cap was installed on the casing, the site was cleaned up and the contractor allowed to remove his equipment. The well was completed April 21, 1955.

It is interesting to note that a surprisingly small amount of sediment had accumulated at the bottom of the bore during the test pumping operations despite evidence of large concentrations of shale present at times in the pump discharge. A light film of oil was observed at times on the surface of the water discharged during test pumping. It is thought this may be coming from the pump, although a petroliferous layer of shale was encountered at the 210 foot depth, which, it is believed, is positively sealed from the well by grout. A one gallon water sample has been sent into the South Dakota State Public Health Service for a complete analysis and if crude oil is present it will be determined by the test.

6

| Depth | Dir | Angle | DIRECTION    |                       | LATITUDE            |        | DEPARTURE |      | COORDINATES |       |      |   |   |
|-------|-----|-------|--------------|-----------------------|---------------------|--------|-----------|------|-------------|-------|------|---|---|
|       |     |       | True Bearing | Horizontal<br>Tieings | Vertical<br>Package | N      | S         | E    | W           | N     | S    | E | W |
| 430   | 22  | 23    | S            | 5E                    |                     | 290.00 |           |      |             |       |      |   |   |
| 430   | 22  | 15    | S            | 5E                    | 0.414               | 498.89 | .412      | .038 |             | .412  | .036 |   |   |
| 510   | 22  | 15    | S            | 5E                    | 0.393               | 500.98 | .391      | .034 |             | .803  | .070 |   |   |
| 510   | 22  | 15    | S            | 5E                    | 0.393               | 501.97 | .25       | .120 |             | .060  | .180 |   |   |
| 540   | 38  | 15    | S            | 20E                   | 0.262               | 531.97 | .227      | .033 |             | .239  | .038 |   |   |
| 540   | 38  | 15    | S            | 20E                   | 0.262               | 533.97 | .227      | .131 |             | .476  | .430 |   |   |
| 540   | 38  | 15    | S            | 20E                   | 0.262               | 545.97 | .227      | .033 |             | .743  | .57  |   |   |
| 540   | 38  | 15    | S            | 20E                   | 0.262               | 545.97 | .227      | .129 |             | 2.020 | .656 |   |   |
| 570   | 38  | 45    | S            | 20E                   | 0.305               | 565.96 | .277      | .038 |             | 2.227 | .735 |   |   |
| 570   | 38  | 45    | S            | 20E                   | 0.305               | 565.96 | .277      | .129 |             | 3.574 | .915 |   |   |
| 580   | 38  | 45    | S            | 20E                   | 0.319               | 585.94 | .316      | .148 |             | 2.890 | .062 |   |   |
| 580   | 38  | 45    | S            | 20E                   | 0.319               | 585.94 | .316      | .148 |             | 2.006 | .210 |   |   |
| 600   | 40  | 10    | S            | 20E                   | 0.349               | 595.94 |           |      |             | 4.326 | .350 |   |   |
| 600   | 40  | 10    | S            | 20E                   | 0.349               | 595.94 |           |      |             | 5.136 | .930 |   |   |
| 700   | 40  | 10    | S            | 20E                   | 1.985               | 598.87 | .70       | .98  |             | 9.772 | .020 |   |   |
| 700   | 40  | 10    | S            | 20E                   | 1.985               | 598.87 | .70       | .98  |             | 9.772 | .418 |   |   |
| 780   | 40  | 10    | S            | 20E                   | 1.304               | 787.77 | .90       | .167 |             |       |      |   |   |

Scale = 1" = 1'

|                               |                                                |
|-------------------------------|------------------------------------------------|
| Position of bottom of hole at | 10.64' - 30.00' - 20.11' East of base of road. |
|-------------------------------|------------------------------------------------|

Position of bottom of hole at \_\_\_\_\_

WICA



United States Department of the Interior  
NATIONAL PARK SERVICE

Wind Cave National Park  
Hot Springs, South Dakota 57747

Rocky Mountain  
Regional Office

AUG 4 '75

IN REPLY REFER TO:  
L54

July 30, 1975

|                   |  |
|-------------------|--|
| Director          |  |
| Deputy Director   |  |
| NPS Mgmt.         |  |
| Administration    |  |
| Professional Svcs |  |
| Coop. Activities  |  |
| Operations Eval.  |  |
| Public Affairs    |  |
| EEO               |  |
| <i>M. Keel</i>    |  |
| Action Taken      |  |

Memorandum

To: Regional Director, Rocky Mountain Region

From: Superintendent, Wind Cave

Subject: Completion of Works and Water License No. 419-2, Wind Cave

Enclosed is a copy of the Completion of Works and Water License No. 419-2 for Wind Cave showing corrected location.

We sent you copies of these documents July 1 then discovered an error in location.

*Lester F. McClanahan*  
Lester F. McClanahan

Enclosures





RECEIVED  
AUG 4 8 57 AM '75  
NATIONAL PARK SERVICE  
DENVER, COLORADO

Enclosure

Robert E. McQuinn

*[Handwritten signature]*

error in location.  
He sent me copies of these documents that I then discovered in  
No. 173-5 for which some growing collected together.  
Enclosed is a copy of the collection of notes and other license  
Subject: Collection of notes and other license No. 173-5, which some  
From: Superintendent, Ariz. State  
To: National Director, Rocky Mountain Region  
Memorandum

R24  
IN REPLY, PLEASE DO



July 30, 1975  
The Director, Rocky Mountain Region  
Ariz. State Department of  
NATIONAL PARK SERVICE

United States Department of the Interior



419-2

# Department of Natural Resource Development

## WATER RIGHTS COMMISSION

Office Building Number 2, Pierre, South Dakota 57501

Phone 605/224-3151

July 23, 1975

| ROUTE TO         | INIT | DATE |
|------------------|------|------|
| Sept.            |      |      |
| Adm. Officer     |      |      |
| Chief, W. R. M.  |      |      |
| Chief, R. I.     |      |      |
| Chief, Forest    |      |      |
| Wilderness Supv. |      |      |
| Secretary        |      |      |
| Clerk-typing     |      |      |
| JECA             |      |      |
| Park Tech.       |      |      |
| Research Biol.   |      |      |
| Action           |      |      |

Lester F. McClanahan, Supt.  
Wind Cave National Park  
Hot Springs, South Dakota 57747

Dear Mr. McClanahan:

We are returning your Completion of Works and Water License  
No. 419-2. We have made the corrections on our records  
in this office.

Sincerely,

*Burton F. Jones*  
BURTON F. JONES  
Water Rights Specialist

BFJ/bw  
Encl: As stated

*file with Com  
admit.*

Exce~~p~~pts of telephone conversation to South Dakota Water Resources Commission - Burton F. Jones ~~fx~~ by Bill Mekeel.

A note is put on the permit itself that the applicant has to allow water to go downstream for domestic use. It is not policed but people let the State know if this is not done and the State can give the applicant a call.

You don't have to have a water right for domestic use.

Livestock water under South Dakota statute is a domestic use.

A written letter will suffice as a protest in South Dakota. An appearance is not necessary.

Wind Cave National Park  
Hot Springs, South Dakota

January 31, 1961

THE REPORT ON ANALYSIS ON WATER SUPPLY OF WIND CAVE WELL

PERFORMANCE OF THE WELL

During operation of the well, apparent air occurred in the water distribution system causing a hammer in the water line as excessive air issued from the various outlets. There is a general opinion that the water supply from the water supply from the well had diminished to a point where the pump was pumping air into the system.

THE METHOD OF TEST PUMPING

The park personnel equipped the supply pump with an air tank through which the flow was passed as discharged under open flow. It was the intent of the air tank to trap what air might be produced by the supply pump thus indicating the water surface in the well as having reached the pump intake. The initial water surface in the well was undeterminable due to the inaccessibility to the water surface for use of electric cable.

TEST PUMP

Air was injected into the air line which extended to a depth of 761 feet below ground surface. Pressure was built up to 48 pounds pressure at which time the valve was closed to maintain registry on the gage of the relative pressures as the water surface lowered during pumping. When the pump was started, the discharge valve was throttled down to approximately half capacity which produced approximately 5 pounds pressure on the air tank. The pump was operated with this discharge for approximately three hours when the discharge valve was opened to full capacity and remained during the balance of the pump operations. Throughout the pumping time, the discharge remained constant at 35.5 gallons per minute. The apparent drawdown of the water surface progressed quite uniformly though quite persistent in a uniform rate of change and when the data was plotted (a copy attached hereto) appeared to reflect a reasonable relationship between the drawdown and time of operations. After a period of 56 hours of pumping, during which no accumulated air was observed in the air tank, the pump was shut down and the recovery of the water surface to static elevation failed to register any increase of pressure on the air line gage. Further investigation revealed that the air line had a minor leak which affected the accuracy of the gage in showing the relative drawdown of the water surface. The air line was rehabilitated eliminating

*See socket  
RF 2*

any air leaks and a new valve was installed to assure that the line would maintain the desired air pressure.

The extended time of pumping, without any indication of producing air into the water system, indicates an adequate supply of water to facilitate the normal periods of pumping as required to meet the demand on the supply.

The pump was started to run a short drawdown test, for the purpose of checking the air line and its functioning, and this operation was continued for about eleven hours. Data on this pump test also attached. Attached also is a graph showing the relationship between drawdown, in feet, and drawdown time, and a graph showing the rate of recovery. The air gage responded very reasonably through the drawdown test and during the recovery test until the water surface reached an elevation approximately 20 foot below static water level at which point the gage ceased to change and showed no further rise of the water surface.

By correlation of the shorter drawdown test and the recovery test, it appears that adequate water is available to permit normal operation with a possible maximum drawdown of 88 feet. This drawdown seems indicative that the well has a dependable supply although the exact water surface elevations were not determined.

It was expected that if pumping continued in excess of the normal operation cycles that the water surface would draw down to the intake when air would be admitted, then the initial water surface elevation could be correlated then with the elevation of the intake. However, the continued discharge of 35.5 gallons per minute did not lower the water surface to the intake, thus, we were unable to establish the elevation of the initial static water surface.

#### ANALYSIS OF POSSIBLE AIR ADMISSION TO THE WATER SYSTEM

Upon completion of the recovery test of the well, the pump was started and the discharge was placed into the distribution system through the booster pump. It was observed when watching the pressure on the low side of the booster pump that when the gage registered zero (and possibly a slight vacuum) the booster pump operated with considerable vibration and rumbling. As long as the pressure gage on the lower side of the booster pump registered 4 to 5 pounds pressure, the booster pump operated more smoothly and in normal fashion. The pump remained in operation while inspection was made at various points along the distribution system in an attempt to determine the existence and amount of air in the line. At no point was any appreciable amount of air observed sufficient to create, at any faucet, a hammering effect in the water line. The presence of some air (milky water)

was reported, but the water cleared after standing a short while.

CONCLUSION

It is believed that the chief difficulty of air in the line emanates from the operation of the booster pump. It is essential that proper control of the flow be maintained so that at least 4 or 5 pounds pressure will be carried on the lower side of the booster pump. A smaller valve in the discharge line from the booster pump would facilitate closer regulation of the discharge pressure and provide a more assured and uniform pressure on the lower side of the pump. It is believed that when the booster pump operates without a slight pressure on the lower side that the pump will beat the water under the low intake pressure causing a separation and ionization thus producing some air in the discharge line. The regulation of the pressure on the lower side of the booster pump will likely offer continued concern regarding accurate regulation, as the booster pump is over capacity for the size of the well pump.

*William A Mott P.E.*

William A. Mott  
Hydraulic Engineer

Attachments

Chief Naturalist

November 23, 1960

Geologist

Discussions of Water Supply Problems with Hydraulic Engineer William A. Mott, Region Two

The attached correspondence on the operation of the well at Wind Cave prompts me to report briefly on discussions with Hydraulic Engineer William A. Mott of Region Two during my Omaha stopover on November 14 and 15.

Mr. Mott thinks it would be practicable to do some experimenting with a submersible type pump. He has descriptive literature on a unit which might prove suitable. This opinion is shared by Superintendent Lombard as noted in the fourth paragraph of his memorandum of November 10 to the Regional Director, Region Two.

In conversation with Mr. Mott I stated that considerable cost would be involved in either straightening out the existing well in the crooked portion below the 500 foot level or in drilling a new well. I also like Mr. Lombard's suggestion that further extensive pump testing be done to determine the well's specific capacity (gallons produced per foot of drawdown) and its actual recovery rate.

At the time of completion of the drilling of the present well it seems possible that more effort might have been made to develop a sustained uniform yield. The various methods of developing maximum or optimum yield use the principle of surging or agitating the water in the aquifer. This is done to remove finer material near the casing and to prevent "bridging" of the sand particles. Methods vary but all cause an alternate flow of water from the aquifer to the well and vice versa. One "back washing" method employs intermittent starting and stopping of the pump. It is also common practice to "surge" wells using a surge plunger and to surge with compressed air.

Before undertaking "backwashing" or "surging", the textural composition of the aquifer formation should be known. This can be achieved by making a sieve analysis of the dried sand in which the screen is to be set. A size of screen is then selected which will exclude up to about one-third of the dry sand. If the sand is of virtually uniform grain size, the screen perforations must be a little smaller than average grain size. Perhaps an experienced ground water geologist

could make these determinations and act as consultant during the extensive pumping tests. Actually the "backwashing" or surging operations result in washing the "fines" from a zone in the aquifer surrounding the screen leaving coarser material into which the inflow from the aquifer occurs.

There are risks of caving, sealing off of supply of water or of collapsing of the well casing if the backwashing or surging are overdone.

My discussions with Mr. Mott also covered proposed water developments at Dinosaur and at Devils Tower. I would be glad to submit thoughts on those projects in case appropriate representatives of the Divisions of Operations Design and Construction think they would be helpful.

  
Robert H. Rose  
Geologist

Copy to: ~~Mr.~~ Van Dunn  
✓ Mr. Vint

W. K. G. 1/28  
C. 2.

x 154

Memorandum

NOV 16 1960

To: Superintendent, Wind Cave National Park  
From: Acting Regional Chief of Operations  
Subject: Water Supply, Wind Cave National Park

A review of your November 10 memorandum regarding the apparent shortage of water supply from the well located near the east boundary of the Park seems to indicate the possible pumping of air during relatively short periods of pumping as indicated by the functional operation of the chlorinator unit.

We believe the supply should be analyzed to determine whether or not the water surface drawdown is sufficient to admit air into the pump column, or whether the erratic action of the chlorinator unit is caused from some other source. To analyze the drawdown of the water surface, a 3/4" or 1" pipe should be inserted in the well along the water column to permit the use of an electric cable in determining the water surface behavior in the well. The line pipe (guide for electric cable) should extend down to the top of the pump. We are not sure whether the design of the pump head (ground surface level) will permit the admission of the line pipe without lifting the pump and possibly removing the motor unless sufficient clearance is available in the motor housing design to permit the installation of the line pipe with the pump motor in its present position.

It will be possible to use the present pump to effect the drawdown of the water surface, and it would be a relatively simple investigation to determine the behavior of the water surface under normal pumping operations. The line pipe is necessary to assure the proper use of the electric cable in following the changing water surface.

Please inspect the conditions of the well, determine the extent of work necessary to install the line pipe, and submit an estimate of costs for the installation of this line pipe. Should it be necessary to lift the pump from its present position it would be advisable to accomplish the work under contract. Otherwise, the line pipe might be installed by Park personnel and they could observe the water surface drawdown. This investigation should be accomplished during the winter months when the demand for water will be at a minimum.

(SGD.) JOHN F. AITON

Copy to: WBSO (2)  
Chief, WOBC (2)

John F. Aiton  
Acting Regional Chief of Operations

DRAFT 5/18/60

Memorandum

To: Supt., Wind Cave NP

From: Regional Chief of Operations

Subject: Proposed Notice of Completion of Construction and Beneficial Use of Water under Application 419-2, Part II, Supplemental

Water Use Supply, Docket 1, Wind Cave NP

*Returned to file 10/21/60*

Mr. Dunn in his memorandum of May 9, <sup>1960</sup> copy to your office, comments on some points relative to the filings for water rights to the supplemental supply from the well.

We are unable to find in our files any copy, or record, of Map 441-2. Please check your records, and if you have none, inquire of the State Water Commissioner for a copy of Map 441-2 and supply four copies for distribution to our various record docket.

The 200 gpm, shown in the application, is greatly in excess of 35 gpm, the amount ~~at~~ at which well was test pumped, as stated in the completion report. We feel the 200 gpm may have been based on the ~~driller's~~ driller's opinion that the well would produce 200 gpm or more. You should reconsider and determine the amount of water that will be required from the well to meet the maximum anticipated demand, and whether or not additional regulatory storage will satisfactorily facilitate the ultimate demand when needed for only short periods.

If full use of 51.3 gpm has already been made of the well supply during periods of peak demand and it will require the installation of a larger pump to meet the anticipated demand, the development should be considered as incomplete and we should file an Application

for Extension of Time.

The Notice of Completion of Works with the notations circled and initialed by Mr. Dunn might be filed with the State to indicate the status of the water supply development.

George F. Baggle  
Reg. Ch. of Operations

Copy to: \_\_\_\_\_

WAMott/etb



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
NATIONAL PARK SERVICE  
WASHINGTON 25, D. C.

May 9, 1960

IN REPLY REFER TO:

LS4-OBL

|                         |
|-------------------------|
| REG. DIRECTOR           |
| ASST. REG. DIRECTOR     |
| CHf. DIV. OF ADMIN.     |
| CHf. DIV. OF OPERATIONS |
| CHf. DIV. OF INTERP.    |
| CHf. REG. RES. PLANNING |
| CHf. RANGER ACTIVITIES  |
| FIELD SOLICITOR         |
|                         |
|                         |
|                         |
| ACTION TAKEN            |
| FILE                    |

Memorandum

To: Regional Director, Region Two

From: Chief, Water Resources Section

Subject: Proposed Notice of Completion of Construction and Beneficial Use of Water under Application 419-2, Part II, Supplemental Water Supply, Docket 1, Wind Cave

The following attachments are being returned in accordance with Mr. Harvey's memorandum of April 19.

1. Copy of Superintendent Lombard's March 24 memorandum.
2. Letter dated March 17, 1960, from Mr. Burton Jones, Water Rights Specialist, South Dakota Water Resources Commission.
3. Notice of Completion of Works.
4. Notice of Application of Water to Beneficial Use.

We do not appear to have received a reply to my memorandum of July 1, 1958, concerning this water claim. Among other things, we still need a copy of the Map 441-2. We assume that the Peerless Pump, Serial No. 121099, 50 gpm capacity, on the Superintendent's list of March 5, 1959, is the one involved in this supplemental supply. There is some question in my mind as to whether the application should not have been replaced with a Federal withdrawal, but the advantages have been largely lost by the lapse of time.

The major question is now why the application was for the withdrawal of 200 gpm, and only a 50 gpm pump was installed. At what maximum sustained rate can the well be pumped. Also, what rate of pumping will ultimately be needed to supply the peak season needs with a reasonable amount of storage on the line?

If, as I assume, the application for 200 gpm was not based on an engineering estimate, and is excessive, there is no objection to making proof on less. However, if the ultimate demand is to be more than the 51.3 gpm, or 0.114 sec.ft., the Notice of Application of Water to Beneficial Use should not be filed. Technically, after using the

application form, this Notice is also premature unless 51.3 gpm of water have actually been used for beneficial purposes at the date which has not been filled in on that Notice. If the attendance records, irrigation and population of buffalos and antelope indicate that this rate of use was made during certain hours of the peak tourist season, the Notice may be completed. Otherwise, an application for extension of time should be filed. //

If full use of 51.3 gpm has already been made, and further developments of water using facilities and increased attendance and water demand are anticipated, it is clear that the system should not be considered to be complete until a larger pump is installed. On the returned draft of the "Notice of Completion of Works, I have added, circled, and initialed a statement on the first and second line which seems proper in any case. I have made a similar addition at the close of the paragraph which would only be applicable if you wish to request an extension of time in which to install a larger pump."

In considering the possible need for a larger pump, the matter should be weighed with a consideration of the alternative provision of additional regulatory storage if the ultimate demand is only expected to exceed 51.3 gpm for short intervals.



A. van V. Dunn  
Chief, Water Resources Section

Copy to: Superintendent, Wind Cave  
Chief, WODC

L-34

APR 19 1960

W O D C  
APR 22 1960

|       |  |
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| ADM   |  |
| PERS  |  |
| P & P |  |
| ARCH  |  |
| ENV   |  |
| L.A.  |  |
| SPEC  |  |
| CONT  |  |
| SFTV  |  |

*Docket 1*

*Montgomery*  
*Wors*

ACTION TAKEN - DAY

**Memorandum**

**To: Director**

**From: Acting Regional Director, Region Two**

**Subject: Notice of Completion of Works and Notice of Application of Water to Beneficial Use, Permit 419-2, Headquarters Water System, Wind Cave National Park**

**Attached are the following:**

1. Copy of Superintendent Lombard's March 24 memorandum
2. Letter dated March 17, 1960 from Mr. Burton Jones, Water Rights Specialist, South Dakota Water Resources Commission.
3. Notice of Completion of Works.
4. Notice of Application of Water to Beneficial Use.

The capacity of the works was determined by measurement of the flow with a two-inch water meter and timed by a stop watch. The flow was determined to be 51.3 gpm (0.114 cfs). While the application for permit claimed 0.44 cfs of water, we believe the capacity of the works would be affected by the fluctuating static pressure from the reservoir and therefore should be shown as 0.15 cfs.

Mr. Mott can make the inspection of the water works development after you have reviewed and commented on the attached forms. We would appreciate having the attachments returned for our further use.

*Y*

(Sgd.) M. H. HARVEY

Acting Regional Director

**Attachments**

**In duplicate**

**Copy to: Supt., Wind Cave NP  
Chief, WODC (2)**

W.R. Klop  
E

March, 1960?

L-54

**Memorandum**

**To: Director**  
**From: Acting Regional Director, Region Two**  
**Subject: Notice of Completion of Works and Notice of Application of Water to Beneficial Use, Permit 419-2, Headquarters Water System, Wind Cave National Park**

**Attached are the following:**

1. Copy of Superintendent Lombard's March 24 memorandum
2. Letter dated March 17, 1960 from Mr. Burton Jones, Water Rights Specialist, South Dakota Water Resources Commission.
3. Notice of Completion of Works.
4. Notice of Application of Water to Beneficial Use.

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Mr. Nott can make the inspection of the water works development after you have reviewed and commented on the attached forms. We would appreciate having the attachments returned for our further use.

**Acting Regional Director**

✓ **Attachments**

**In duplicate**

**Copy to: Supt., Wind Cave NP  
Chief, WDC (2)**



UNITED STATES  
DEPARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE  
Wind Cave National Park  
Hot Springs, South Dakota

March 24, 1960

IN REPLY REFER TO:

154-L ✓

D2621

|                             |
|-----------------------------|
| REG. DIRECTOR               |
| ASST. REG. DIRECTOR         |
| CHF. DIV. OF ADMIN.         |
| CHF. DIV. OF OPERATIONS     |
| CHF. DIV. OF INTERP.        |
| CHF. REC. RES. PLANNING     |
| CHF. RANGER ACTIVITIES      |
| FIELD SOLICITOR             |
| <i>Giton</i>                |
| <i>X Mott</i>               |
| ACTION TAKEN <i>4-19-60</i> |
| <i>To Director</i>          |
| FILE                        |

Memorandum

To: Regional Director, Region Two

From: Superintendent, Wind Cave National Park

Subject: Water Rights Headquarters Water System, Wind Cave, Docket 1,  
Part II Supplemental Groundwater Supply

Enclosed is a copy of a letter dated March 17, 1960 from Burton F. Jones, Water Rights Specialist, South Dakota State Water Resources Commission, requesting submission of their Notice of Completion of Works and Notice of Application of Water to Beneficial Use.

There is no indication in the files here that either of these form notices have been prepared or submitted although the due date specified was June 12, 1957.

We would like to have some assistance in preparation of these notices, especially as they are long past due. We want to be sure they are filled in correctly and none of us here are able to come up with all the answers.

Mr. Jones suggests we might like to have Mr. Mott make the inspection. We also would like to have Mr. Mott make the examination if it is satisfactory to you.

Enclosed are photo copies of Notice of Completion of Works and Notice of Application of Water to Beneficial Use filled in where we could do so. Any assistance in filling in the unanswered questions will be appreciated. Note that we are uncertain as to date proof will be submitted, amount in cubic feet of water applied to beneficial use, whether or not Mr. Mott will be examining engineer, capacity of water works to show and date set for completion.

*Jess H. Lombard*  
Jess H. Lombard  
Superintendent

In duplicate

Attachments-Copies of Forms 16 and 17

(dup. copy sent to Waso 4/19/60 memo.)

|                                    |
|------------------------------------|
| C. C. MAILED TO:                   |
| <i>Waso</i>                        |
| BY <i>Mott</i> DATE <i>4/19/60</i> |



single sheet plan with pipe sizes, contour elevations, and tie to one of the corners on included section subdivision, would be better. I am unable to find HP-WC-3501-C, as constructed. Perhaps Drawing 441-2 and Sheet 1 of 3105-C with tie and elevations added on the key drawing, or the same treatment of one sheet of 3501-C would be sufficient.

Items 4 and 11. These may not all be available, but Mr. Mott should purchase photostat negatives of the certificate of inspection, item 11, from the State Engineer, and supply prints for the four dockets if no copies were supplied for this Service. They are a matter of state record. The permit to drill, item 4, is not so essential.

In reviewing these records I note several errors and irregularities.

- A. Our draft of the Notice of Intention to Appropriation (Part II-2) and the published notice (Part II-3) specified that the well would be in ~~SE<sub>1</sub> SW<sub>1</sub>~~ or NE<sub>1</sub> SE<sub>1</sub> Sec. 6, T 6 S, R 5 E, the underlining being mine at this time. The answer to Question 5 of Application (Part II-4) specifies Sec. 6, T 5 S, R 6 E. Drawing 3105-C indicates that the location should be in ~~SE<sub>1</sub> SW<sub>1</sub>~~ Sec. 6, T 6 S, R 6 E, EBM, as also given in the log, in Wind Cave Canyon, tributary to Beaver Creek in Wind Cave National Park, whence Park monument marker No. 11 on east line of said section bears S 42° 33' E. 49 ft. Not all of the corrected location may be needed in the record, but it should be supplied in a letter to the State Engineer, with copies for all four dockets, to try to obtain correction without further advertising of a change in point of diversion.
- B. Our copy of the South Dakota Water Laws is dated 1944 and issued to me by the State Engineer in 1948. Sec. 61.0137 of the 1919 statutes ~~was~~ still in effect and authorized the United States to make withdrawals instead of filing applications for the appropriation of water. We also have a copy of Chapter 430, Water Laws passed at the Thirty-fourth Session of the Legislature in 1955, in which the same nominal provision is made in Sec. 61.0123. We shall appreciate a review of the Park files to determine whether the introduction of the Application was due to instructions from the State Engineer in 1955, or a misunderstanding by the Superintendent. This irregularity is one reason for our desire to review any applications or withdrawals which Mr. Mott may prepare, before they are filed; and a reason for the two of us and any superintendent to keep each other posted on any new procedures of which any of us learn.

- G. In filling out the application, the name of the claimant in answer to question 1 should always be: "The United States of America" (for the designated park or monument if that is not evident in answer to some other question). The address should be this office, the regional office, or the area, depending on where the future correspondence is to be addressed. We have been giving the Director's Office, but have recently started giving the Superintendent's address to expedite posting or advertising of notices when only 30 days are allowed. The United States is not a corporation, hence we have never filled in such questions as 1-I-a to e. No changes are recommended in the particular case.
- D. Mr. Semingsen's signature on the application is not dated, but was probably transmitted with letter of same date. We should add the date on our copies, if possible.
- E. There should have been a statement on the application, probably on bottom margin, reading: "Nothing herein shall constitute a waiver of any other rights the United States may have to the same water". It is too late to add to the particular application, but the statement should appear on every application filed by the United States until the Solicitor gives other instructions.

**SIGNED**

A. van V. Dunn  
Chief, Water Resources Section

Attachment - Docket No. 1

Copy to: Superintendent, w/c Docket No. 1  
Chief, WODC, w/c Docket No. 1



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
NATIONAL PARK SERVICE  
Region Two  
Omaha 2, Nebraska

IN REPLY REFER TO:

D-5039

*D. M. Dunn*  
*D. B. Keen*  
*D. H. Hunt*  
*D. H. Hunt*

Address reply to:  
Regional Office, Region Two  
National Park Service 9 17

AUG 10 1956

Memorandum

To: The Director

From: Regional Engineer, Region Two

Subject: Permit for Drilling Water Well, Wind Cave National Park

Attached is a copy of the permit issued by the State of  
South Dakota, Water Resources Commission, for the drilling of a  
well in Wind Cave National Park.

*William E. Robertson*  
William E. Robertson  
Regional Engineer

Attachment

*WICA*

**AIR MAIL**

1956 JUN 27 AM 9:17

JUNE 21, 1956

Memorandum

To: Superintendent, Wind Cave National Park

From: Supervisory Engineer, Western Office, Division of Design and Construction

Subject: Working Drawing, Proposed Water Line, Wind Cave

As no preliminary drawing was made for this project, attached for your approval are two prints of Working Drawing No. W-42-31068, Proposed Water Line, Headquarters Area, which was signed by Mr. Robert G. Hall, Acting Chief, Western Office, Division of Design and Construction, on June 15, 1956. The approval procedure should be the same as if this were a preliminary drawing. By copy of this memorandum we are forwarding one print each to The Director and the Regional Director, Region Two, for their review. The estimated cost as shown is \$81,636 while the programmed amount for construction is \$38,900. The contract for the water line will be for the entire unit including pumps, pump house and controls.

A filter system at the pump house as previously discussed has been omitted. Discussions with public health personnel and representatives of commercial water filtering companies indicate sand filters or commercial filter would not give satisfactory service due to the relatively large volume of solids to be removed. A filtering medium would quickly become clogged and a maintenance problem would be involved. It is thought a calculated risk should be taken by assuming the well water will clear within a reasonable period of time by pumping through the bypass line provided. If the well water does not clear sufficiently, a reservoir should be provided to allow solids to settle out. Such a reservoir can be constructed at a later date.

Considerable thought has been given design of the pumping unit. Two pumps, a deep well position displacement type and a centrifugal for a booster, have been recommended as the most economical installation using standard pumps. Submersible pumps are not recommended for use where abrasive matter is present in the water and a deep well turbine is inadvisable since a turbine to satisfy conditions would have to rotate at 3600 r.p.m., a speed too fast for good service from the shafting due to its length. The type of pump selected, a Fearless Hi-Lift, or equal, will produce 50 g.p.m. at the 650 foot setting recommended

This will necessitate an entirely new pumping installation

WICA

by the firm that tested the well. If necessary, this pump will produce 47 g.p.m. at a 700 foot setting. Should it become necessary to reduce production to a rate less than 50 g.p.m., a portion of the water pumped will be bypassed back into the well through the 1-inch line provided.

The Public Health Service here has recommended not using a hypochlorinator if possible and indicated most deep well pumps do not usually require chlorination. Tests should be made for conformance with P.H.S. drinking water standard after installation of the pump. A hypochlorinator can be installed at a later date, if necessary.

(Sgd) P. E. Smith

P. E. Smith  
Supervisory Engineer

In duplicate

Copy to: The Director w/print - *7-11 Air, Miami*  
Reg., Dir., Region Two w/print

Letter File-  
WIND CAVE

WR copy

COPY

In reply refer to:  
L 54-L

UNITED STATES

DEPARTMENT OF THE INTERIOR  
National Park Service

Wind Cave National Park  
Hot Springs, South Dakota

December 27, 1955

Chief Engineer, J. W. Grimes  
Executive Officer  
State Water Resources Commission  
State Capitol Building  
Pierre, South Dakota

Dear Mr. Grimes:

Our previous correspondence with you concerning the government's desire to secure perfection of water rights for a proposed well within Wind Cave National Park is covered in our letter of November 1 and yours dated November 7.

Attached is the original signed and dated notice of Federal Intent to divert and use 200,000 gallons of artesian water.

For your information we are having the Notice of Intent published in the officially designated newspaper for Custer County, on three separate dates, in the Custer County Chronical, Custer, South Dakota. We have notified the Sioux Drilling Co. of Rapid City, South Dakota to start work for drilling the well.

Respectfully yours,

Earl M. Semingsen  
Superintendent

Attachment: (1)

*Letter File  
WIND CAVE*      *reply refer to: WR copy*  
L. S. L.

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
NATIONAL PARK SERVICE  
Wind Cave National Park  
Hot Springs, South Dakota

December 27, 1955

Carl Sundstrum  
Custer County Chronical  
Custer, South Dakota

Dear Carl:

Attached is Purchase Order # 99-350-F issued by our Washington Office for the purpose of having the attached legal notice advertised on three separate dates. Please acknowledge on the pink copy of the order and return to us.

Attached also is a Public Voucher for advertising to cover payment for this service when rendered. Please sign only the original copy of the voucher where marked with red "X" with title such as owner, manager etc. and return to us with your invoices in duplicate and copies dates etc. of publication as in previous orders of this kind.

Thanks kindly for your cooperation.

Sincerely yours,

Earl M. Semingsen  
Superintendent

Attachments: (1) Legal Notice  
(2) Purchase Order  
(3) Voucher

Office of  
Chief, Western Office  
Dept. of Design and Const.

DEC 21 1955, M.

Supv. Architect

X-2 Supv. Engineer 141429

Supv. Landscape Arch.

Safety Engineer

Memorandum

12-21-55

154-1

DEC 15 1955

To: Superintendent, Wind Cave

From: Assistant Director

Subject: Perfection of Water Rights for Proposed Well, Wind Cave

By Air Mail memorandum of December 7 from the Acting Regional Chief of Operations, we have been advised that the contract for the well has been awarded to the Sioux Drilling Company, and we are requested to secure the State Engineer's permission to start drilling.

Attached are the original and one copy of a Notice of Federal Intent to divert and use 200,000 gallons of artesian water. Copies are being sent directly to the Regional Office and Western Office of Design and Construction. Please date and sign both copies, send the original to the State Engineer, State Capitol, Pierre, South Dakota, and place the carbon copy in your assembly of Docket 1, for which we will supply new folders and dividers later. Please advise all offices of the date of your signature so that we may make the notation on our copies.

Also attached are skeleton purchase order and voucher to cover publication of a notice of the withdrawal which the State Engineer will send you after receipt of the Federal Notice of Intention. These are made out for payment from Water Right funds of this office, should be completed as to payee, and actual cost for publication as the State Engineer will prescribe, and all carbon copies should be returned to this office immediately thereafter for accounting purposes.

The Notice of Intent should be submitted to the State Engineer with a simple cover letter, with copies for Region Two, WODC, and this office, to indicate the date of mailing. You may wish to advise, however, that the Sioux Drilling Company can start work as soon as authorized.

We have used the Federal Notice of Intention for a withdrawal instead of an application for appropriation for several reasons, but a significant one is that we do not have sufficient details or the plan of the water system. The perfection of rights is also more simplified because little more is needed than a map of the system and certificate of construction.

The notice provides for the use of approximately all water which could be pumped at 200 gpm during about 16 hours per day. The plan, when prepared, may be modified to cover a smaller well yield but no more under the same priority. Accordingly, the plan should be deferred until the well yield is determined, and then completed for ultimate diversion and use of the maximum portion of the yield which can be justified, even though the maximum pump capacity and regulatory storage may not be provided for a decade or more. The plan, with tie from well to section corner, and both initial and ultimate capacities shown, should be completed and submitted to this office for review as soon as possible after the well is tested.

(SGD) THOMAS J. ALLEN  
Assistant Director

Attachments 2

Copy to: Regional Director, Region Two, with copy of attachment  
~~Western~~ Office of Design and Construction, with copy of attachment

Water Rights

Notice of Intention  
to the  
State Engineer  
of the  
State of South Dakota

Supplemental Groundwater Supply Project

December \_\_\_\_, 1955

Wind Cave National Park

The United States of America, National Park Service, by Earl M. Swingsen, Superintendent of Wind Cave National Park, Hot Springs, South Dakota, hereby notifies the State Engineer of South Dakota, of its intentions to appropriate by drilling, construction, withdrawal, diversion, storage and beneficial use, the aforesaid unappropriated waters of South Dakota under Section 61.0123, Chapter 430 and Section 61.0404, Chapter 431 of the 1955 revised Laws of South Dakota:

1. The name of Project is Supplemental Groundwater Supply for Wind Cave.
2. The amount of water claimed is 200,000 gallons per day.
3. The source of water is an artesian basin in the Pahasapa limestone formation under Beaver Creek drainage, tributary to the Cheyenne River.
4. The point of diversion, or withdrawal, will be at a well in  $SE\frac{1}{4} SE\frac{1}{4}$  or  $NE\frac{1}{4} SE\frac{1}{4}$  Sec. 6, T 6 S, R 5 E, of Black Hills Meridian, in Custer County.
5. The water will be used during all 12 months of each year.
6. The water will be used for domestic, recreational, irrigation and fire protection in Wind Cave National Park.
7. The estimated cost of the Project is \$200,000.
8. The well is to have a minimum diameter of 10 inches, depth between 600 and 750 feet, and 8 inch steel casing with minimum thickness of 0.277 inch.
9. The water will be pumped approximately 1.5 miles through 4 inch steel pipe to existing Park water system which serves the Park under Federal Water Withdrawal No. 33-2.

10. Regulatory storage will be provided in existing and additional reservoir units with capacities varying from 50,000 gallons to 500,000 gallons.
11. The well is to be tested for maximum potential yield of 200 gallons per minute.
12. Plans will be filed within one year, the details being dependent on results of proposed well drilling and pump tests for which contract was awarded before December 6, 1955.
13. The initial unit, to divert and deliver part of the water to the existing distribution system, will be started before June 30, 1956, and completed by June 30, 1957. The total project will be completed on schedule to serve increasing water demands, probably about June 30, 1965.

Earl E. Smingsen  
Superintendent  
Wind Cave National Park

WR City

In reply refer to:  
D 5039

November 21, 1955

Air Mail

**Memorandum**

**To: Director**  
**Attention: Mr. A. van V. Dunn, Chief**  
**Water Resources Section**

**From: Acting Chief, Western Office, Division of Design and Construction**

**Subject: Application for Water, Water Well Drilling Project,**  
**Wind Cave National Park**

Reference is made to Mr. Semingsen's memorandum to you, dated November 17, 1955, regarding the water well drilling project at Wind Cave National Park.

As requested, we are attaching a copy of the revised well drilling specifications for your information.

(S&C) LYLE E. BENNETT

**Lyle E. Bennett**  
**Acting Chief, Western Office**  
**Division of Design and Construction**

**In duplicate**

**Attachment**

**Copy to: Supt., Wind Cave NP**

WR Copy  
*[Signature]*

1000 Geary Street  
San Francisco, California  
National Park Service

NOV 21 1955 8:53

*Price*

**FBS Teletype**

November 21, 1955

Superintendent, Wind Cave National Park, Hot Springs, South Dakota

**D 5039.** Following wire sent this date to bidders listed in memorandum of November 15: "Re Water Well Drilling Bid Invitation, Wind Cave National Park, dated November 15, 1955. Addendum No. 1 to be made part of Bid/- When contract is drawn, provision will be made for partial monthly payments for each item of work completed, ten percent being retained as given in Article 7 of General Provisions (Construction Contracts) Form 23A". Send identical copy to any others.

Bennett  
Acting Chief, WDC

Confirmation Copy

Mailed Copy to: Range States Drilling Co., Hot Springs, South Dakota  
Chief, D&C  
Regional Director, Region Two  
Mr. A. van V. Dunn, Chief, Water Resources Section

*WICA*

UNITED STATES  
DEPARTMENT OF THE INTERIOR

D-5039  
L-54-L

NATIONAL PARK SERVICE  
Wind Cave National Park  
Hot Springs, South Dakota

November 14, 1955

Memorandum

To: Director  
Attention: Mr. A. Van V. Dunn, Chief  
Water Resources Section

From: Superintendent, Wind Cave National Park

Subject: Application for water, water well drilling project, Wind  
Cave National Park.

Please refer to Region Two memorandum dated October 19 and  
November 2, and your memorandum dated October 26 on this subject.

We are forwarding to you all application instructions, forms,  
etc. as received from Chief Engineer J. W. Grimes, Executive Officer,  
State Water Resources Commission, Pierre, South Dakota, for your  
execution and submission to that office for approval. Included also  
is a copy of Park Drawing No. NP - WC 2023-D indicating the location  
where the well will be drilled and the pipe line location showing  
approximately where it will tie into the existing water system. (See  
Drawing No. NP-WC 5311-E for existing water system.) The new pipe  
line will tie into the existing six inch water line about one hundred  
yards west of the Administration Building.

Under contract with a registered engineer, Gardiner Gantz,  
Custer, South Dakota, a pipe line survey has been made. However, his  
completed plans and profile have not been completed for submission to  
W.O.D.C. for drafting specifications on the pipe line project.

Western Office Design Construction has prepared the well  
drilling specifications and, after first advertisement, it was decided  
to redraft the specifications for readvertisement. By copy of this  
memorandum we are asking W.O.D.C. to forward a copy of the revised  
well specifications to you which contain information you will need to  
complete the application for the State Water Resources Commission.

You may also need a copy of the pipe line survey and when  
available we will send you a copy or ask W.O.D.C. to duplicate the  
drawing for submission to you.

If additional copies of the State application are needed by your office, Region Two office, or Western Office of Design and Construction, they may be obtained directly from Mr. Grimes' office.

Signed: Earl M. Semingsen

Earl M. Semingsen  
Superintendent

Attachments:  
Form 2 - (2)  
Form 3 - (1)  
Water Laws - (1)  
Drawing NP-WC 2023-D

In duplicate

Copy to: Director, Region Two  
W.O.D.C.

Docket Information

Number of Documents in Docket 96

Documents Dated from 5/12/1936 to 2/22/1996

Docket Compiled: 3/27/2012