

Considered: _____

WATER PERMIT NO. 752A-1

MAP No. same

Name of Applicant South Dakota Dept. of Game, Fish and Parks

Post Office Address Anderson Building 445 E. Capitol Pierre S.D.

Amount of Water Claimed 2.68 cfs add'l Total Acres _____

Source of Water Supply Groundwater ²⁸¹ 220 foot well (Spearfish Formation) existing

Water to be used for FWP County Lawrence

About _____ miles W of Spearfish

PROOF OF PUBLICATION: Received 1st 2-5-85 Not Received _____

APPLICATION: Approved 3-6-85 Subject to _____

F.F. & C.L. Adopted _____ Not Approved _____ Deferred _____

PRIORITY _____ Date Received Jan. 3, 1985 Fee N.A. Remarks _____

1-3-85

Corrected Application Received _____ Period of Annual Use Jan 1 To Oct 31

WATER QUALITY APPROVAL RECEIVED N.A. APPROVED/CONDITIONAL (Circle one)

W-1 Description same as Application YES _____ NO _____ REMARKS _____

Diversion Point NE⁴NE⁴ section 20 T7N-R1E

Land to be Irrigated _____

		20			
	20		21		

Well Log: Driller No log available Licensed YES _____ NO _____

Depth of Well 220 Feet REMARKS Well completed in 1967 for permit No. 752-1 (McNenny Fish Hatchery) Well log in file approx 1 mile east

Type of Map Drawn PREPARED BY U.S. Fish & Wildlife Ser. Reviewed and the Number assigned on 1-4-85 By Kevin C. Yarnon

Mail to: Water Rights Div.
DWNR, Foss Bldg.
Pierre, SD 57501
(605) 773-3352

No. 752A-1 Hydrologic Unit 10120203
Map No. Same Basin Belle Fourche
Newspaper Queen City Mail Box 152 Spearfish Wed.

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

Check use of water: Industrial ☐ Commercial ☐ Municipal ☐ Other Common Distribution System ☐
Rural Water System ☐ Suburban Housing ☐ Geothermal Heat ☐ Institutional ☐ Recreational ☐
Domestic ☐ (above 18gpm) Other ☒ - Fish culture

Type of Application: Check one or more of the following

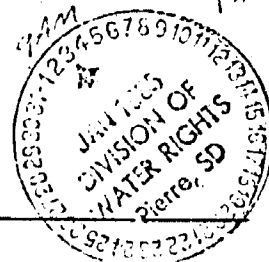
New ☐ Vested Right ☐ Future Use ☐ Change Use ☐

☒ Amend Permit No. 752-1 with old priority date retained

Change diversion point(s) ☐ Add diversion point(s) ☐ Other ☐

☐ Application to: Change diversion point(s) ☐ Add diversion point(s) ☐ on Permit No. _____

☐ Construction to use water reserved by Future Use Permit No. _____



1. Name of Applicant S.D. Department of Game, Fish and Parks Phone No. 773-3384

Post Office Address Anderson Building, 445 E. Capitol Ave, Pierre State SD 57501
(Street, RR or Box) Zip Code

2. Amount of water claimed (c.f.s.) 2.68 cfs additional

3. Source of water supply Artesian well

4. Location of point of diversion NE 1/4 NE 1/4 Sec. 20 T.7N; R.1E -- correction from current permit
which shows diversion at NW 1/4 NW 1/4 Sec. 21 T.7N., R.1E.

County Lawrence

5. Counties where water will be used Lawrence

6. Annual period during which water is to be used 01-01 - 12-31

7. Give a brief description of proposed project. When available include any preliminary engineering report or other reports or information that will help explain the project. (Attach sheet if more space is needed)

Amend currently held water permit #752-1 to reflect the actual amount of water the well is producing. No change in actual water use is requested. Form 2A currently on file is accurate and no changes need to be made.

Attachments: Attach Form 2A if diversion from a well or dugout or if storage of water, proposed. Attach map (see instruction)

STATE OF SOUTH DAKOTA)
County of Hughes)^{ss}

I, South Dakota Department of Game, Fish and Parks the applicant, certify that I have read the foregoing application, have examined the attached map and that the matters therein stated are true and that I intend, and am able to complete the necessary construction.

Signed Robert M. Koehn Resource Staff Specialist

Subscribed and sworn to before me this 2nd day of January 1985

Charles E. Koehn

Notary Public (or other qualified officer)



INTER-DEPARTMENT CORRESPONDENCE

State of South Dakota



From Dept. of _____ Ron Koth _____ To Dept. of _____ Kevin Larson _____
Subject McNenny State Fish Hatchery water _____ Date 12/31/84 _____
rights

After reviewing all the literature I could find regarding water right #752-1, I have determined that the additional amount of water needed is 2.68 cfs. This addition to the current right of 1.79 cfs will reflect the actual amount, according to hatchery records, that the well under #752-1 is producing. Evidently, some change in artesian head has occurred since the original right was granted. Please call if you have questions.

RK/ld



REPORT ON APPLICATION NO. 752A-1
SOUTH DAKOTA DEPT. OF GAME, FISH AND PARKS
January 14, 1985

This application requests an additional 2.68 cfs from an existing well 281 feet deep at the McNerny Fish Hatchery. The well location is in the NE $\frac{1}{4}$ NE $\frac{1}{4}$ Section 20, T71, R1E BHM. The water is being used in the operation of the fish hatchery.

Aquifer - Spearfish Formation

Geology and Aquifer Characteristics

The Spearfish Formation consists of red shales, siltstone, sandstones and gypsum (Rahn, 1979). The Spearfish Formation is generally not considered an aquifer, however, in the outcrop area surrounding the Black Hills and especially near live streams (Crow Creek in this instance) high capacity wells have been completed into the Spearfish Formation. The presence of water has dissolved the gypsum and coupled with fractures create favorable conditions for high capacity wells. This particular area around the hatchery has a history of wells producing large flows from the Spearfish, Minnekahta and Minnelusa Formations (Well Files, 1985). Most authorities have attributed the high pressure and large flows from the Spearfish to be caused by upward leakage from the Minnelusa and Madison (Cox, 1962). The probable existence of a fault (Cox, 1962) in this area further complicates the hydrologic setting, but does reinforce the idea of upward leakage in this area.

The aquifer is under artesian conditions. Pressure changes have an obvious affect upon the flow rates of the individual wells (Cox, 1962). Water levels are available for each of the hatchery wells (Brauford, 1981).

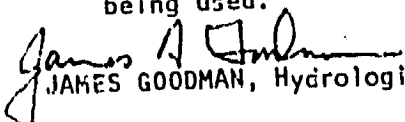
Review of Existing Water Permits

No.	Name	Amount	Use	Depth	Formation	Status
749-1	US Fish & Wildlife Ser.	2.23	Hatchery	220'	Spearfish	V/R
750-1	US Fish & Wildlife Ser.	2.68	Hatchery	springs	Spearfish	V/R
751-1	US Fish & Wildlife Ser.	1.79	Hatchery	281'	Spearfish	Licensed

There is also a U.S. Withdrawal Filing No. 595-1 which apparently duplicates the Water Permit No. 749-1. There are other water permits (8) in this area which derive water from the Minnelusa Formation or from springs.

Conclusions

1. There is water available from the Spearfish Formation. The wells are in existence and the flow has been measured at approximately 3000 gpm (Hern personal communication, 1985).
2. Flow rates for these wells apparently change significantly (volume) with relatively small changes in pressure.
3. Water is being produced from the Spearfish Formation, however, this may be from leakage from the underlying Minnelusa and Madison Formations.
4. Water level records indicate water levels have been increasing over the last few years.
5. These wells can be controlled and should be shut-down during period when not being used.


JAMES GOODMAN, Hydrologist

Application No. 752A-1

Bibliography

Bradford, W.L., 1981, Water Levels in Bedrock Aquifers in S.D., USGS Open File RPT 81-627, Huron SD 57350.

Cox, E.J., 1962, Artesian Water Minnelusa and Pahasapa Formations, Spearfish Belle Fourche Area, SDGS, Special Rpt 19, Vermillion SD.

Hern, P., 1985, Personal Communication McNenny Hatchery Wells, USGS, Rapid City SD.

Rahn, P.H., 1979, Ground Water Resources of Western SD, for U.S. Army Corps of Engineers, SDSM & T Project No. 2533, Rapid City SD.

Well Files, 1985, Water Rights Well Files, DWNR, Water Rights, Joe Foss Bldg, Pierre SD.

RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 752A-1, Department of Game, Fish
& Parks

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Division, Department of Water and Natural Resources concerning Water Permit Application No. 752A-1, Department of Game, Fish and Parks, Anderson Building, Pierre SD.

The Chief Engineer is recommending APPROVAL of Application No. 752A-1 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use and 4) in the public interest with the following qualifications:

1. The well approved under this Permit shall be valved and the flow reduced to the amount needed or to a minimum when not being used. The well shall also be equipped with a pressure gauge and a record kept of any pressure fluctuations. Such records shall be available to the Board, upon request. If this well is abandoned or the Permit cancelled, the well must be plugged in accordance with specifications of the Water Management Board.

2. The well approved under this Permit will be located near domestic wells and other wells which may obtain water from the same aquifer. The well owner, under this Permit shall control his withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.

See the attached report for additional information.



JOHN HATCH, Chief Engineer
January 16, 1985

ROUTING AND TRANSMITTAL SLIP

Date

1/15/85

TO: (Name, office symbol, room number, building, Agency/Post)

Initials

Date

1. Jim Goodman

SD DWR

2.

3.

4.

5.

Action

File

Note and Return

Approval

For Clearance

Per Conversation

As Requested

For Correction

Prepare Reply

Circulate

For Your Information

See Me

Comment

Investigate

Signature

Coordination

Justify

REMARKS



Dan Hern
Subdistrict Office

DO NOT use this form as a RECORD of approvals, concurrences, disapprovals, clearances, and similar actions

FROM: (Name, org. symbol, Agency/Post)

Room No.—Bldg.

U.S. Geological Survey

Rm. 317, Federal Bldg.

Phone No.

100 4th St. SW

Huron, South Dakota 57350

OPTIONAL FORM 41 (Rev. 7-76)

Prescribed by GSA
FPMR (41 CFR) 101-11.205



TO: *Law*

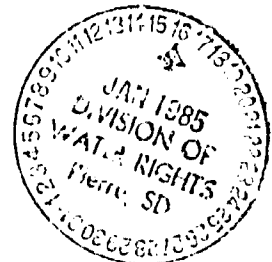
IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

Spearfish Fisheries Center
Rt. 1 Box 205
Spearfish, SD 57783

7/23/76

Mr. James H. Eade
Hydraulic Engineer
Federal Bldg.
515 9th. St.
Rapid City, SD 57701



Dear Sir,

Enclosed are copies of the well drilling records for the two artesian wells at the McNenny NFH. The combined water use from these wells is averaging 3,800,000 gal. per day. In addition to the wells, there are several small springs in use with a daily average of 1,000,000 gallons per day.

The hatchery has a Air-o-flo-aerobic digestion sewage treatment plant mdl. SO-250 with a design flow of 2,500 GPD. This is used for domestic water treatment only.

The above information pertains to the McNenny NFH.

There is a rearing station in Spearfish that uses 3,200,000 GPD. This water is supplied from Spearfish Creek. The domestic sewage is tied into the city of Spearfish sewage system.

In answer to question 6 we have at present 12 employees at the McNenny NFH. In addition to this we have and average of 50 tourists a day that visit the station and have use of the washrooms.

Sincerely,

William S. Ohnemus
William S. Ohnemus
Asst. Hatchery Manager



UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

RECORD OF WELL

7-1-21 CBB
US FISH-WILDLIFE
MENNY NEN, SPEARFISH

X			
		21	

1. Location: State South Dakota County Lawrence
Nearest P. O. Spearfish Direction from P. O. NW
Distance from P. O. 7 miles; NE 1/4 sec. 21 T. 7N R. 1E
If in city, give street and number Black Hills Meridian

Locate well on plat of section.

Bureau of Sport Fisheries & Wildlife
2. Owner: McMurry, Neil Address Rt. 1, Box 205, Spearfish, South Dakota
Driller: Layne-Minnacota Company Address 3140-48 Snelling Ave., Mpls. 6, Minn.
3. Situation: Is well on upland, in valley, or on hillside? hillside
4. Elevation of top of well: 3379 ft. above the level of sea level (Survey notes page 52, Book 2)
5. Type of well: drilled (Above or below) kind of drilling rig used rotary (Sea, depot, lake, or stream)
6. Depth of well: 220 ft.; year in which well was finished October 31, 1949 (Solid tool, jetting, rotary, etc.)

Does well enter rock? yes; if so, at what depth? 40 ft.; kind of rock Spearfish formation
7. Diameter: At top 8 inches; at bottom 8 inches. (red, sandy shale)
8. Principal water bed: Sandstone - Spearfish red shale (supplied by the underlying Minnacota sandstone)
Depth to principal water bed 190 ft.; thickness of bed 430 ft. +
If other water supplies were found, give depth to each See well log and Special Report No. 19, Nov. 1962 by S. D. Geologic Survey

9. Casings: Kind Steel; size 12"; length 50.5 ft.; between depths of 0.5 and 50 ft.
Kind Steel; size 8"; length 145.5 ft.; between depths of 1.5 and 145 ft.
Kind Steel; size 6"; length 15 ft.; between depths of 15 and 160 ft.
(depth 15 ground surface)

Packers (if any): Depth at which packers were used --; kind --
Screen or Strainer: Was well finished with screen? no; kind of screen --; length of screen -- ft.; diameter -- inches; size of openings --

10. Head: Does well at present overflow without pumping? yes; did it overflow when new? yes
if flowing, give pressure 26.6 lb. per sq. inch; or height water will rise in a pipe -- ft. above surface;
original pressure or head 30 psi; if not flowing, give water level in well -- ft. below surface.

11. Pump: Is the well pumped? no; kind of pump --; size or capacity of pump --; kind of power --

12. Yield: Natural flow at present (if any) 1100 gallons per minute; original flow 1600 gallons per minute;
well has been pumped at -- gallons per minute continuously for -- hours;
quantity of water ordinarily obtained from well 1,440,000 gallons per day. (1000 gpm)

13. Use: For what purpose is the water used? Fish cultural and domestic

Quality of the water: Hard; is there an analysis? --
(Hard or soft, fresh or salty, etc.)

15. Cost of well, not including pump: --; Temperature of water 52 ° F.

Name of person filling blank Carl U. Stephen, Hydraulic Engineer
Date October 1966 Address 1006 West Lake Street, Minneapolis, Minnesota

On the back of this sheet give the record of the beds through which the well passes and any other facts not given above.

7-1-26 BB

U. S. GOVERNMENT PRINTING OFFICE 8-5611

1113320104003501

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

No. A7-1-210661 ^{b4c}

SCHEDULED

WELL LOG

Other Nos.

obs. well

State South Dakota County Lawrence Subarea

Owner W.S. Fish & Wildlife, McNeary Culture Station, Spearfish

Location 220' TD

Drilled by Layne-Minnesota Drlg Address

Date 10/49 Casing diam. 1.65' of 8" ^{rest open} Land-surf. alt. 2329'

Source of data R. Davis (USGS) & Harvey Wilkoughby & Driller's log ^{Type A/P}

(Enter type of well, perforations, yield, and drawdown at end of log)

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Clay, red, & gravel	4	4
	clay, blue, & sand	3	7
	Sandstone, red & white	9	16
	clay, red, and rock	24	40
	Rock, hard, gray & red	15	55
	clay, red, and stone	13	68
	clay, red, and red & white stone	5	73
	clay, red, hard, and stone	13	86
	Rock, hard	5	91
	clay, red, and rock	16	107
	clay, red	13	120
	Sandstone, hard	6	126
	clay, red	13	139
	clay, and rock	6	145
	sandstone, ^{flowed} _{250 gpm between 145 and 149; hard 149-155}	22	167
	Shale, hard, red	4	171
	Sandstone and red shale, ^{flowed} _{300 gpm 171-183}	19	190
	Sandstone, red, ^{flowed} _{1600 gpm}	30	220

RECORD BY DATE

(yields cumulative)

SHEET 30 OF 30

SCHEDULED

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

RECORD OF WELL

CHEMICAL ANALYSIS
ON FILE 5/14/68

			X

Locate well on plat of section.

1. Location: State South Dakota County Lawrence
Nearest P. O. Spearfish Direction from SW
Distance from P. O. 7 miles; NE 1/4 Sec. 20, T. 7 N., R. 1 E.
Black Hills Meridian
If in city, give street and number _____

2. Owner: Bureau of Sport Fisheries & Wildlife Address R #1, Box 205, Spearfish, South Dakota
Driller: Layna-Minnesota Company Address 3147 California St. NE, Mpls., Minn.

3. Situation: Is well on upland, in valley, or on hillside? upland
4. Elevation of top of well: 3386.5 ft. above the level of sea level (survey notes page 52, look 2)
(Above or below) (Sea, depot, lake, or stream)
5. Type of well: drilled kind of drilling rig used rotary
(Dug, driven, bored, or drilled) (Solid tool, jetting, rotary, etc.)
6. Depth of well: 201.5 ft.; year in which well was finished 6/6/1966

Does well enter rock? yes; if so, at what depth? 47.5 ft.; kind of rock Spearfish "Redblood"

7. Diameter: At top 10 inches; at bottom 10 inches.
8. Principal water bed: Sandstone - Spearfish Red Shale (actual source in leakage from the Lower Permian sandstone formation) (Gravel, sand, clay, or rock. If rock, state kind)
Depth to principal water bed 63 ft.; thickness of bed 430 ft. ±

If other water supplies were found, give depth to each _____ (see well log on reverse side)
(surface casing)

9. Casings: Kind Steel; size 10"; length 56.5 ft.; between depths of -0.5 and 56.0 ft.
Kind Steel; size 14"; length 122.67 ft.; between depths of -0.5 and 122.27 ft.
Kind Steel; size 10"; length 145.67 ft.; between depths of -2.5 and 143.17 ft.
Packers (if any): Depth at which packers were used 153 to 173; kind hole packer
Screen or Strainer: Was well finished with screen? no; kind of screen _____

length of screen _____ ft.; diameter _____ inches, size of openings _____

10. Head: Does well at present overflow without pumping? yes; did it overflow when new? yes
if flowing, give pressure _____ lb. per sq. inch; or height water will rise in a pipe _____ ft. above surface;
original pressure or head 20 psi; if not flowing, give water level in well _____ ft. below surface.

11. Pump: Is the well pumped? no; kind of pump _____
size or capacity of pump _____; kind _____ power _____

12. Yield: Natural flow at present (if any) 1220 gallons per minute; original flow _____ gallons per minute;
well has been pumped at _____ gallons per minute continuously for _____ hours;
quantity of water ordinarily obtained from well _____ gallons per day.

13. Use: For what purpose is the water used? fish cultural and domestic for hatchery
Quality of the water: hard; is there an analysis? _____
(Hard or soft, fresh or salty, etc.)

15. Cost of well, not including pump: \$31,471.90 Temperature of water 50 ° F.

Name of person filling blank Carl W. Stoppan, Hydraulic Engineer

Date October 1966 Address 1006 West Lake St., Minneapolis, Minnesota

In the back of this sheet give the record of the beds through which the well passes and any other facts not given above.

LOG OF WELL

KIND OF ROCK OR OTHER MATERIAL (Give color and tell whether hard or soft)	DEPTH, IN FEET		THICKNESS, IN FEET	REMARKS (Especially information as to water found)
	From—	To—		
Red clay	0'	12'	12	
Clay, streaks of gray & black rock	12'	24'	12	
Red clay and ground up chips of gray, black & white rock	25'	30'	5	
Streaks of clay & ground up rock	30'	32'	2	
Black & streaks of red clay	32'	59'	27	
Rock - hard	59'	63'	4	
Gray, white rock & red clay in streaks	63'	75'	12	
White rock & streaks of red clay	75'	100'	25	
Red clay & very little rock	100'	120'	20	
Rock & streaks of red clay	120'	130'	10	
White clay and 25% rock	130'	140'	10	
Red clay-streaks of white rock	140'	143'	3	
Red clay-small streaks of hard rock	143'	170'	22	
Very hard clay & some very hard shale or brown sandstone	170'	178'	8	(very hard to determine)
Flow, shale & rock	178'	180'	2	
Flow, shale-streaks of flow rock white	180'	220'	40	
Flowing, shale in gravel form. all shale was in gravel form 15 to 1000 gpm	220'	229'	10	
1) Water encountered at 230' calculated production 0-600 gpm 3/21/66. Estimated flow increased to 2000-2500 gpm prior to sealing of surface casing leakage. Spring flow flowing into Board Road (found 11' below surface) dropped from 400 to 200 gpm. No noticeable effect on other two springs. Some effect on well #1 artesian.				
2) Final well test - artesian flow - from driller's completed well, field report:				
Date	Hours	Yield (gpm)		
5/21	2:00 pm to 6:00 pm	727		
6/2	9:03 am to 11:20 am	789-727		
6/4	5:53 pm to 7:00 pm	1695		
6/5	11:45 am to 12:45 pm	1695		
6/6	8:00 am to 2:30 pm	1695	Specific capacity = 1695 gpm/ft. drawdown	
			3/21/66 Flow memo by Adolphson 1600 gpm, head 28 psi, 1 sat	
			5/10/74 Grindard memo head 28 psi,	
Contract No. 14-16-0003-12, 119				
lign. (and) streaks of shale & gravel	230	269	39	
limestone, white to pink	269	277	8	
hard, silty red shale	277	281.5	4.5	

Instruction to Newspaper - Publish first publication of the following Notice on or before January 23, 1985 with 2nd publication 1 week later. The applicant is responsible for payment.

NOTICE OF HEARING on Application No. 752A-1 to Appropriate Water
and/or to Amend Water Permit or Water Rights No. 752-1

Notice is hereby given that S. D. Dept. of Game, Fish & Parks whose mailing address is Anderson Building, Pierre, South Dakota has made an application for a permit

to appropriate an additional 2.68 cubic feet per second from an existing well 281 feet deep at the McNenny Fish Hatchery. The location of the well is the NE $\frac{1}{4}$ NE $\frac{1}{4}$, Section 20, T7N-R1E. The water is used in operation of the Hatchery.

Pursuant to SDCL 46-2A-2 the Chief Engineer of the Water Rights Division recommends APPROVAL of Application No. 752A-1 because 1) unappropriated water is available, 2) will be no unlawful impairment of existing rights, 3) is beneficial use of water and 4) is in the public interest.

This application will be considered by the Water Management Board at 523 E. Capitol, Joe Foss Building, Room 216, Pierre, South Dakota, March 6 19 85 at 10:00 am.

The recommendation of the Chief Engineer is not final or binding upon the Board and the Board is authorized to make a determination on this application after it reaches a conclusion based upon facts presented at the public hearing. Any interested person who may be affected by a Board decision and who intends to participate in the hearing before the Board and present evidence or cross-examine witnesses according to SDCL 1-26, must file a written petition with BOTH the Applicant and the Chief Engineer by February 22, 1985. The petition may be informal, but it must include a statement describing the petitioners interest in the application, the reason for the petitioner's opposition to or support of the application, and the signature and mailing address of the petitioner or his legal counsel if legal counsel is obtained. The applicant need not file a petition.

This application is made pursuant to the provisions of SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-15; 46-2-3.1, 46-2-9, 46-2-11, 46-2-13, 46-2-17, 46-5-1 thru 46-5-16, 46-5-24, 46-5-25, 46-5-30.2, 46-5-31; 46-2A-1 thru 46-2A-10, 46-2A-12; (ground) 46-6-3, 46-6-3.1, 46-6-6.1, 46-6-10, 46-6-13, 46-6-14; (future use) ~~46-5-32 thru 46-5-40; (transfer lands)~~ ~~46-5-30.4, 46-5-33 thru 46-5-35; (10,000 AFA) 46-5-20.1, 46-5-8.1; and Board Rules ARSD 74:02:01:01 thru 74:02:01:15; (future use) 74:02:01:24 thru 74:02:01:25; (10,000 AFA) 74:02:01:15:02 thru 74:02:01:15:05.~~

This hearing is an adversary proceeding. The applicant or any person, after filing a petition, has the right to be present or to be represented by a lawyer. These and other due process rights will be forfeited if they are not exercised. Decisions of the Board may be appealed to the Circuit Court and the State Supreme Court as provided by law.

Any person wishing a copy of the Chief Engineer's recommendation, further information on this application or to assure access to the hearing by the handicapped can contact the Water Rights Division, DWNR, Joe Foss Bldg, Pierre SD (605 773-3352) for assistance prior to the hearing date. The time of the hearing will be automatically extended for at least twenty days upon written request of the applicant or any person who has filed a petition to oppose or support the application. The request for extension must be filed with the Chief Engineer by February 22, 1985.

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
) ss.
County Lawrence)

I, Bill Kunerth hereby

certify that the annexed printed copy of Notice of Intent to Appropriate

Water was taken from the Queen City Well

A newspaper which during the whole time of publication of said notice
herein after stated, has been and is printed and published in the _____

_____ city _____ of _____ Spearfish _____

County of Lawrence and State of South Dakota;
that the said notice was published in said newspaper on the following
two dates:

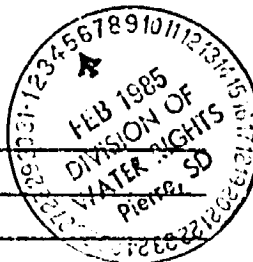
January 23, 1935 & January 30, 1935

Bill Kunerth
(Signature)

Co-publisher
(Title)

January 30, 1935
(Date Signed)

Cost of Printing: 40.16



NOTICE OF HEARING on Application
No. 752A-1 to Appropriate Water and to
Amend Water Permit or Water Rights
No. 752-1

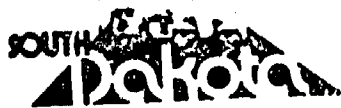
Notice is hereby given that S.D. Dept.
of Game, Fish & Parks whose mailing
address is Anderson Building, Pierre,
South Dakota has made an application
for a permit to appropriate an addi-
tional 2.68 cubic feet per second from an
existing well 281 feet deep at the
McNenny Fish Hatchery. The location
of the well is the NE $\frac{1}{4}$ NE $\frac{1}{4}$, Section 20,
T7N-R1E. The water is used in opera-
tion of the Hatchery.

Pursuant to SDCL 46-2A-2 the Chief
Engineer of the Water Rights Division
recommends APPROVAL of the Ap-
plication No. 752A-1 because 1) unap-
propriated water is available, 2) will be
no lawful impairment of existing rights,
3) is beneficial use of water and 4) is
in the public interest.

This application will be considered by
the Water Management Board at 523 E.
Capitol, Joe Foss Building, Room 216,
Pierre, South Dakota, March 6, 1936 at
10:00 am.

The recommendation of the Chief
Engineer is not final or binding upon
the Board and the Board is authorized
to make a determination on this ap-
plication after it reaches a conclusion
based upon facts presented at the
public hearing. Any interested person
who may be affected by a Board deci-
sion and who intends to participate in
the hearing before the Board and pre-
sent evidence or cross-examination
witnesses according to SDCL 1-28, must
file a written petition with BOTH the
Applicant and the Chief Engineer by

Produce, food, 572.10; Pacific R.
& Produce, food, 289.97; Pacific R.
Company, supplies, 84.36; Pacific R.
Company, supplies, 62.61; The Paper
Baking Co., food, 48.24; The Paper
Baking Co., food, 28.80; Metz
Baking Co., food, 73.44;
Metz Baking Co., food, 73.44;
Lystra, services, 23.34; Lystra, ser-
vice, 23.33; Manor House, Inc., food,
41.67; Lystra, service, 23.33;
June's Service, Inc., repair
Harker's, food, 230.40; Harker's, food,
Guille Dairly, Inc., food, 586.70;
Guille Dairly, Inc., food, 1536.91;
Guille Dairly, Inc., food, 1408.78;
ward Lonn & Co., supplies, 63.73;
ward Lonn & Co., supplies, 31.63; Ed-
Continental-Kell Inc., food, 81.14; Ed-
Booth Fisheries Corp., food, 5.00;
SCHOOL LUNCH
rice, equipment, 265.42; Total \$404.00.
mple, 105.10; Triangle School Ser-
vice, 87.31; Triangle School Service,



**Department of
Water & Natural Resources**

Water Rights Division
605 773-3352

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

APR 22 1985

S.D. Department of Game, Fish and Parks
Anderson Building
Pierre SD 57501

Dear Mr. Koth:

Enclosed is your Water Permit No. 752A-1 as approved by the Water Management Board authorizing the water diversion system and apply the water to beneficial use, not exceeding the limits as specified in the Water Permit.

We will schedule an inspection so that the Water License may be issued to you, thus completing your acquisition of a Water Right.

Very truly yours,

JOHN HATCH, Chief Engineer
Water Rights Division

JH:ks

enclosure

WATER PERMIT

The Water Management Board hereby approves Water Permit Application No. 752A-1
S.D. Dept. Game, Fish & Parks 445 E. Capital Pierre
(Applicant) (Post Office Address)
South Dakota 57501 With the following qualifications.
(State) (Zip Code)

The well approved under this Permit shall be valved and the flow reduced to the amount needed or to a minimum when not being used. The well shall also be equipped with a pressure guage and a record kept of any pressure fluctuations. Such records shall be available to the Board, upon request. If this well is abandoned or the Permit cancelled, the well must be plugged in accordance with specifications of the Water Management Board.

The well approved under this Permit will be located near domestic wells and other wells which may obtain water from the same aquifer. The well owner, under this Permit shall control his withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.

Date of first receipt of application January 3, 1985.

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

Date of receipt of corrected application —, 19—. Approved March 6, 1985.

The Water Management Board hereby approves this Water Permit No. 752A-1 authorizing the construction of the water use system and the placing of water to beneficial use as stated in the Application and as qualified in the Water Permit approval, subject, however, to the following limitations and conditions:

1. The date from which applicant may claim right is January 3, 1985.
2. The equivalent of at least one-fifth of the specified work is to be completed on or before —, 19—.
3. The whole of said work is ~~to be~~ completed ~~on or before~~ —, 19—.
4. The limit of time from proof of beneficial use of water appropriated in accordance herewith is —, 19—.
5. The water appropriated shall be used for the purpose of Fish hatchery water supply.
6. The prior right of all persons who, by compliance with the laws of the State of South Dakota, have acquired a right to the use of water must not be unlawfully impaired by this appropriation.
7. The amount of the appropriation herein granted shall not exceed 2.68 cubic feet per second; neither shall it exceed the capacity of the above described water supply system nor shall it exceed the amount of water needed for beneficial uses served and to which water is actually and beneficially applied for fish hatchery operation on or before —, 19—; said water to be used during the following described annual period: January 1 to December 31.

WATER MANAGEMENT BOARD

By: John H. Hahn
Chief Engineer

Division of Water Rights
 Dept. of Water and Natural Resources

APR 22 1985

, 19—

**SOUTH DAKOTA DEPARTMENT OF WATER & NATURAL RESOURCES
WATER QUALITY DATA**

Agency Code _____
 Sampler CORDES Project _____
 Received in Lab by _____ Date & Time 3-12-84 0800

Station Identification Nebraska State Hwy. 10 Nebraska R _____ Sec. 0
 Site Location near field, SD
 SICRET Number _____
 Name of Water WELL WATER - MINERALS
 Nearest Town Springfield

Date 3/15/85
 Time 9:30 AM
 Type of Sample Grab
 Sample Depth Surface

FIELD ANALYSES		Duplicate	
Water Temperature	11 °F	10 °C	50 °F
Air Temperature	21 °F	20 °C	50 °F
Conductivity / °C	94	Micromho	
Flow	61		2500 gpm
Secchi Disk	78	meters	
Alkalinity to pH 4.5	431	mgCaCO ₃ /l	
Dissolved Oxygen	300	mg/l	9.40 mg/l
pH	400	su	

VISUAL OBSERVATIONS
 Precip -- (n) m h
 Wind -- c m s
 Odor -- y (n)
 Septic -- y (n)
 Dead fish -- y n
 Film -- y n
 Turbidity -- y (n)
 Width --
 Water depth --
 Ice Cover -- 150
 Color -- 1000

Preservative Used

LAB ANALYSES	LAB METHOD		Bottle		Bottle		Bottle		Unit
	"A"	"B"	A	B	C	D	E	F	
✓ Fecal Coliform (MF)	31616	31615	655/25		612				/100 ml
✓ Conductivity / °C	95								Micromho
BOD	312								mg/l
✓ Lab pH	403		650/500	7.60					su
Alkalinity (P)	415								mg/l
✓ Alkalinity (T)	410		2.12						mg/l
✓ HCO ₃	440		3.57						mg/l
Total Solids	500								mg/l
✓ Total Diss. Solids	70300		434						mg/l
✓ Suspended Solids	530		1						mg/l
✓ Total Hardness as CaCO ₃	900		330						mg/l
Ca	916	915							mg/l
Mg	927	925							mg/l
Na	929	930							mg/l
K	937	935							mg/l
Cl	940								mg/l
✓ SO ₄	945	946	150.0						mg/l
✓ Ammonia as N	610	608		0.03					mg/l
NO ₂ as N	613								mg/l
NO ₃ as N	620	618							mg/l
NO ₃ - NO ₂ as N	630	631		0.4					mg/l
TKN as N	625	623							mg/l
Total PO ₄ as P	70505	70506							mg/l
Ortho PO ₄ as P	70507	671							mg/l

METALS - Preservative Used

As	1002	ug/l
Cd	1027	ug/l
Cr	1034	ug/l
Cu	1042	ug/l
Pb	1051	ug/l
Mn	1067	ug/l
Ag	1077	ug/l
Zn	1092	ug/l
Hg	71900	ug/l
Cn	720	mg/l
Fe Total	1045	mg/l
Mn	1056	mg/l

Field Comments:

DO Range 9.40-9.80
 AP: Range +4mm - +6mm
 A - ss @ 2 hour intervals / grab
 A Recovery - 1 grab during recovery cleaning

LAB COMMENTS:

1220 Raw water TSS

RECEIVED

APR 15 1985

Reported out by Lab _____

Sampler's estimated date and time of arrival in Lab _____

WHR-513-3/84

SOUTH DAKOTA DEPARTMENT OF
 WATER AND NATURAL RESOURCES
 OFFICE OF WATER QUALITY

851220

752A-1



Will Sayler
Assistant Hatchery Manager
McNenny State Fish Hatchery

SD Game, Fish & Parks
RR1 Box 205
Spearfish, SD 57783

6920
Ofc. (605) 642-6260
Res. (605) 642-3999

REPORT ON INSPECTION OF WATER RIGHT/PERMIT NOS. 749-1, 752A-1 and 752-1

Other permit(s) associated with the project: 750-1.

NAME OF INSPECTION CONTACT Will Saylor

RELATIONSHIP TO PERMIT HOLDER, IF APPLICABLE: Assistant Hatchery Manager

NAME & ADDRESS OF PERMIT HOLDER: SD Dept. of Game, Fish & Parks

RR1, Box 205

Spearfish, SD 57783

DATE OF INSPECTION: September 17, 1997

DIVERSION POINT LEGAL LOCATION: 752-1 & 752A-1: 1285 feet south and 250 feet west of the
north east corner of Sec. 20, T7N-R1E,
(SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 20, T7N-R1E)

749-1: 700 feet south and 200 feet east of the north
west corner of Sec.21, T7N-R1E, (NW $\frac{1}{4}$ SW $\frac{1}{4}$
NW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 21, T7N-R1E)

WELL INFORMATION (752 and 752A-1):

- 1) Well Drilling Firm: Layne-Minnesota Company
- 2) No. of Wells one
- 3) Depth(s) 281 feet
- 4) Well log is available USGS Well Record

Casing:

- 1) Diameter 10 inches
- 2) Length 145.67 feet
- 3) Type steel

Screen:

- 1) Type none- open hole completion
- 2) Length 135.3 feet open hole interval
- 3) Static water level +65 feet (flowing well)

Capacity: 780 gpm

WELL INFORMATION (749-1):

- 1) Well Drilling Firm: Layne-Minnesota Company
- 2) No. of Wells one
- 3) Depth(s) 220 feet
- 4) Well log is available USGS Well Record

Casing:

- 1) Diameter 8 inches
- 2) Length 146.5 feet
- 3) Type steel

Screen:

- 1) Type none- open hole completion
- 2) Length 73.5 feet open hole interval
- 3) Static water level +65 feet (flowing well)

Capacity: 1000 gpm

DISTRIBUTION LINES OR CANALS:

- 1) Type transite 2) Size 10 inches 3) Length 850 feet

SYSTEM TYPE:

Both wells flow through buried 10-inch diameter transite pipe to a aeration tower at the west edge of the hatchery building, through the hatchery to the raceways. The system requires both wells full flow to operate, (cannot shut down one well without shutting down the hatchery).

PERMIT QUALIFICATIONS AND REGULATIONS:

- 1) Special qualifications to permit being abided by yes.
- 2) All structures, wells and lands on map yes

Water Right/Permit Nos. 752-1 and 752A-1
Belle Fourche River - Water District

Report Of Examination Of Works And/Or Application of Water To Beneficial Use

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

I have this day, September 17, 1997, made a thorough examination of the water use system constructed by SD Dept. of Game, Fish and Parks of Pierre, SD holder of Water Right/Permit Nos. 752-1 and 752A-1, bearing the priority of April 26, 1965 and January 3, 1985 (respectively) authorizing the diversion of 1.79 and 2.68 cu. ft. per second (respectively) of the waters of groundwater for fish culture purposes, in Lawrence County.

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

A. Works used to divert the water:

Water is diverted from a flowing well cased with 10-inch diameter steel casing, located in the SE¼ SE¼ NE¼ NE¼ Sec. 20, T7N-R1E, the well flows 780 gallons per minute

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

Water is transported to use through 850 feet of 10-inch diameter buried transite pipe.

C. Works used to apply water to beneficial use:

Water is applied to beneficial use in the McNenny Fish Hatchery Building and in the concrete raceways of the hatchery.

The system is in the following condition good. The points of diversion are located 1285 feet south and 250 feet west of the north east corner of Sec. 20, T7N-R1E. The works are capable of diverting and conveying to the place of use 1.73 cu. ft. per second of water which is to be used for fish culture. The license should be issued for 1.73 cfs.

Applicable permit qualifications have been complied with: yes

Exceptions to compliance are: n/a



Ken Buhler
Natural Resources Engineer
DENR, Water Rights Program

2/11/98

Date



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

APR 23 1998

752A-1

South Dakota Department of Game, Fish & Parks
Tim Olson
523 East Capitol
Pierre, SD 57501

Dear Mr. Olson:

Enclosed is Water License No. 751A-1. This is the final water right document completing your process of obtaining a Water Right.

For your information SDCL 46-6-27 requires that if the owner of an existing well, such as the well authorized by Water Right No. 751A-1, constructs a replacement well and does not plan to use the old well, the old well is considered abandoned and must be plugged. Also, any well that is being used or is not considered abandoned must be valved and controlled, if flowing, or sealed and capped so that no leaking occurs either underground or at the surface.

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. If you have any questions, please contact our office.

Very truly yours,

JOHN HATCH, Chief Engineer
Water Rights Program
(605) 773-3352

ks
enclosure

c: Will Saylor, Assistant Hatchery Manager, McNenny State Fish Hatchery, SD Game, Fish & Parks, RR 1, box 205, Spearfish, SD 57783.

NOTE: The applicable portions of Water Right No. 752-1 are incorporated into No. 752A-1.

STATE OF SOUTH DAKOTA

WATER LICENSE NO. 752A-1

(1) SD Department of Game, Fish and Parks, 523 E Capitol, Pierre SD 57501 made Application No. 752A-1, January 3, 1985 for a water permit to increase the appropriation from the well authorized by 752-1 and to correct the location of one existing well, Lawrence County, South Dakota for use at a fish hatchery. Permit No. 752A-1, with a priority date of January 3, 1985 was approved March 6, 1985 and issued to the applicant for diversion of water with construction of the described water supply system completed and the application to beneficial use of said water completed.

Water Right No. 752-1 with an April 26, 1965 priority date authorized 1.79 cfs from one well. The additional appropriation authorized by No. 752A-1 was not developed. The applicable portions of Water Right No. 752-1 are incorporated into No. 752A-1.

(2) It is certified that the applicant has complied with the provisions of South Dakota State Law relating to completion of the construction of the water supply system and is entitled to divert 1.73 cubic feet of water per second for beneficial use. The location of the diversion point is 1,285 feet south and 250 feet west of the northeast corner of Section 20-T7N-R1E (NE 1/4 NE 1/4).

(3) The applicant has complied with the provisions of South Dakota State Law relating to the application of water to beneficial use at the McNenny State fish hatchery.

(4) Pursuant to South Dakota Water Law 46-5-30.1 the South Dakota Department of Game, Fish and Parks, 523 E Capitol, Pierre SD 57501 the holder and/or owner of Incorporated Water Permit No. 752A-1 is issued a license to appropriate water, the right to use 1.73 cubic feet of water per second from groundwater (one well) with a priority date of April 26, 1965 from the location specified in (2) of this license for use at a fish hatchery. This license is subject to any limitations or qualifications listed in Incorporated Water Permit No. 752A-1 and subject to South Dakota State Law.



JOHN HATCH, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

APR 23 1998

date





DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

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

June 21, 1999

Tim Olson, Water Permits Coordinator
SD Department of Game, Fish & Parks
Foss Building
523 East Capitol
Pierre SD 57501-3182

Dear Mr. Olson:

Enclosed is a copy of reissued Water Right No. 752A-1 which appropriates water from one Spearfish/Minnekahta well (approximately 281 feet deep) located in the NE $\frac{1}{4}$ NE $\frac{1}{4}$ Section 20, T7N, R1E for use at McNenny Fish Hatchery. The water right is being reissued for 3.23 cubic feet of water per second to reflect the actual flow capability of well No. 2 after maintenance.

SD Department of Game, Fish and Parks has also made a request for an additional diversion point under Water Right No. 752A-1. The additional diversion point is to be used in conjunction with the existing well authorized by Water Right No. 752A-1. No additional water will be appropriated from the Spearfish/Minnekahta Aquifer.

Upon review of the request and pursuant to SDCL 46-5-13.1, the SD Department of Game, Fish and Parks is authorized to develop the additional diversion point (Spearfish/Minnekahta well) without application or publication of a notice of hearing pursuant to SDCL 46-2A-4. A copy of the report prepared on the request for an additional diversion point is attached. A new water right permit is necessary for any diversion greater than 3.23 cfs from the two wells. Additionally, the well must be constructed into the Spearfish/Minnekahta Aquifer. Any appropriation of water from a new well constructed into either the Minnelusa or Madison Formation will require a new water right permit.

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. The well will need to be valved and the flow reduced to the amount needed or to a minimum when not being used. If you have any questions on well construction, please contact Ken Buhler at (605) 773-3352.

Very truly yours,

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

enclosure

STATE OF SOUTH DAKOTA

REISSUED WATER LICENSE NO. 752A-1

(1) The South Dakota Department of Game, Fish & Parks, 523 E Capitol, Pierre, SD 57501 was issued Water License No. 752A-1, April 23, 1998 for a water right to divert 1.73 cubic feet of water per second from ground water (one well), Lawrence County County, South Dakota for use at a fish hatchery. Water License No. 752A-1, with a priority date of April 26, 1965 was issued to the department for diversion of water with construction of the described water supply system completed and the application to beneficial use of water completed.

Water License No. 752A-1, was originally issued April 23, 1998, and incorporated the applicable portions of Water Right No. 752-1. The license was issued for 1.73 cubic feet of water per second (cfs) from one well based on a calculated flow rate from the well. Corrected information has since been received from the Department of Game, Fish & Parks which shows the actual rate of flow from the well is 3.23 cfs after maintenance was performed. The water license dated April 23, 1998, is being reissued to correct the authorized diversion rate and assign the proper priority dates.

(2) It is certified that the department has complied with the provisions of South Dakota State Law relating to completion of the construction of the water supply system and is entitled to divert 3.23 cubic feet of water per second for beneficial use. The diversion point (a 281 feet deep well) is located 1,285'S and 250'W of the NE corner of Section 20, T7N, R1E (NE ¼ NE ¼).

(3) The department has complied with the provisions of South Dakota State Law relating to the application of water to beneficial at the McNenny State fish hatchery.

(4) Pursuant to South Dakota Water Law 46-5-30.1 the South Dakota Department of Game, Fish and Parks, 523 E Capitol, Pierre, SD 57501 the holder and/or owner of Incorporated Water Right No. 752A-1 is issued a license to appropriate water, the right to use 3.23 cubic feet of water per second from ground water (one Spearfish/Minnekahta well) with priority dates of April 26, 1965 (1.79 cfs) and January 3, 1985 (1.44 cfs) from the location specified in (2) of this license for use at a fish hatchery. This license is subject to any limitations or qualifications listed in Incorporated Water Right No. 752A-1 and subject to South Dakota State Law.



JOHN HATCH, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

JUN 21 1999

date



DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
WATER RIGHTS PROGRAM

June 3, 1999

RE: Request for an additional point of diversion for Water Right No. 752A-1, South Dakota
Department of Game, Fish and Parks

The South Dakota Department of Game, Fish and Parks has submitted a request for authorization to construct an additional point of diversion for Water Right No. 752A-1. 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. 752A-1 appropriates water from one Spearfish/Minnekahta well (approximately 281 feet deep) located in the NE¼ NE¼ Section 20, T7N, R1E for use at McNenny Fish Hatchery. This well is referred to as well No. 2. The proposed additional diversion point is to be used in conjunction with the existing well authorized by Water Right No. 752A-1.

Currently, Water Right No. 752A-1 is being reissued to reflect the actual flow capability from the well after maintenance. The following table shows the quantity of water appropriated by Reissued Water Right No. 752A-1 which incorporated No. 752A-1.

Water Permit/Right	Priority Date	Quantity
WR No. 752-1	April 26, 1965	1.79 cfs
WP No. 752A-1	January 3, 1985	2.68 cfs
WR License No. 752A-1 (incorporated WR No. 752-1 & WP No. 752A-1)	April 26, 1965 (1.79 cfs) January 3, 1985 (1.44 cfs)	3.23 cfs *

❖ Water Right No. 752-1 and Water Permit No. 752A-1 prior to incorporation appropriated a combined total of 4.47 cfs from Well No. 2. The incorporated water right license was originally issued in error for 1.78 cfs and is subsequently being reissued for 3.23 cfs to reflect the actual flow capability of Well No. 2 after maintenance (see file documentation in Water Right No. 752A-1 file).

The G,F&P is requesting an additional diversion point to address intermittent sediment problems from the existing well No. 2 which have hampered hatchery operations. G,F&P enlisted the services of Alliance Architects and Engineer to conduct an evaluation and prepare recommendations on the hatchery's water supply. A copy of this report is on file with the Water Rights Program. The study explored six alternatives.

Preferred alternative No. 4 proposes construction of an additional Spearfish/Minnekahta well. G,F&P may then use both wells to supply the 3.23 cfs authorized by licensed Water Right 752A-1. Having each well contribute 45 to 55 percent of the required quantity of water will reduce the flow rate in Well No. 2. This will decrease the upward water velocity within the well. The upward velocity is believed to be causing sloughing within the open bore portion of the well. This sloughing and the current upward velocity of flow within the well can result in sediment being transported to the land surface where it interferes with hatchery operations. Maintaining a lower upward velocity within the wells should reduce the potential for the sediment problem. See the attached Alternative No. 4 from the Alliance study.

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. It should be noted that these records do not include any existing wells that may be located in Wyoming approximately 2 miles west of this location.

GF&P also holds Water Right No. 749-1 from another well (well No. 1) for use through the hatchery raceways and Water Right No. 750-1 appropriates water from springs. Other than the two water rights held by G,F&P, there is one existing water right using the Minnekahta Formation within the same township/range. Water Right No. 1244-1 is located approximately two miles southwest of the G,F&P well. This water right is held by Haiar Enterprises for 1.56 cfs to irrigate 127 acres. There are a number of existing water rights in close proximity to Well No. 2 which are constructed into the Minnelusa Formation. Three domestic well completion reports were also found in the sections that surround Section 20, T7N, R1E that are constructed into the Spearfish Formation. They are:

Location (all in T7N, R1E)	Well Depth	Year Drilled	Well Owner
NW ¼ NW ¼ Sect. 28	230 feet	1995	Bob Baltezore
NE ¼ NW ¼ Sect. 21	280 feet	1979	Detlef Schnitzler *
SW ¼ NW ¼ Sect. 18	300 feet	1960	Cecil Nicholas

* There is a notice in the Lawrence County file held by the Water Right Program that the land where this well is located is owned by Randall & Patricia Christensen.

The status of these domestic wells is unknown. Additionally, there are other domestic wells within the search area constructed into different water formations.

No additional appropriation of water is requested and the proposed well is to be constructed in close proximity to the existing well No. 2. Therefore, interference should not be adverse to neighboring Spearfish/Minnekahta wells in the area. The existing well has flowed and has been put to beneficial use at the fish hatchery without controversy for many years.

An April 13, 1999, memo from the Rick Cordes, Hatchery Manager, indicates that increasing amounts of flow from Well No. 2 causes a reduction of the flow of the springs authorized by Water Right No. 750-1. Decrease of flow from the springs may occur as a result of allowing the wells to flow at the maximum authorized rate. This appears to be a management issue for hatchery personnel who will need to weigh the hatchery needs and control the wells in a manner to maximize hatchery needs from the springs and wells.

The well depth of 600 feet cited in Form 2A of the G,F&P request may be considerably deeper than what is necessary. G,F&P's request for a 600 feet deep well is based on the report prepared by The Alliance which states the top of the Minnekahta will be in the 400 to 600 foot range. It is unlikely that this deep of a well is necessary for a Minnekahta well. In fact, this depth would be near the top of the Minnelusa Formation. Any appropriation of water from a new well constructed into either the Minnelusa or Madison Formation will require a new water right permit.

Conclusions

1. The additional diversion point is to be used in conjunction with the existing well in an attempt to resolve a reoccurring sediment problem in Well No. 2.

2. No additional appropriation of water is requested.
3. The additional well will be constructed in the general vicinity of the existing well.
4. The additional well must be constructed in accordance with SD Well Construction Standard 74:02:04:28.
5. The well will need to be valved and the flow reduced to the amount needed or to a minimum when not being used.

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. 752A-1 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 combined diversions greater than 3.23 cfs from both wells or if the new well is constructed into a formation other than the Spearfish/Minnekahta Aquifer.

John Hatch

6-21-99

John Hatch, Chief Engineer
Water Rights Program

4. A Combination of a New Well and Using Existing Well Number 2. With this scenario both Well Number 2 and a new well located in the general vicinity of Well Number 2 would be used to supply the required amount of water to the facility. Well Number 2 would have the flow reduced to about 900 gpm with the assumption that the new well would supply the remaining amount of water. Potentially the new well would reduce the flow in Well Number 2 to the desired flow rate by providing a secondary relief for the formation. If the flow was not sufficiently reduced in Well Number 2, then either the use of a valve or a smaller diameter pipe would throttle it to the desired flow rate. Using both wells, each supplying about 45 to 55 percent of the required quantity of water, the upward water velocity in either well would be reduced to 1.9 fps. Based on the history of Well Number 2, this velocity should be below the threshold velocity that created sediment in the existing well. However, sloughing could still occur, but the likelihood of that occurring is reduced. Construction of the new well would consist of installing about 70 feet of surface casing and then drilling a pilot hole to a depth of about 600 feet, which may be approximately the top of the Minnekahta formation. The depth of 600 feet allows for a margin of safety in estimating the top of the Minnekahta formation. In all likelihood the top of the Minnekahta would be in the 400 to 600 foot range. If the amount of water encountered during the drilling process plus a reduced amount from Well Number 2 was sufficient to meet the needs of the hatchery, the well would then be completed at that depth. With this scenario it would be preferable to case to the top of the Minnekahta and seal off the Spearfish formation so the only open borehole would be in the Minnekahta formation. However, it may be necessary to complete the well in the Spearfish formation to obtain the required amount of water, even though the risk of producing sediment is somewhat greater. Any further development in the Spearfish formation could effect the flow from the springs, but as long as the combined flow from the new well and Well Number 2 did not increase, the effect on the facility should be minimal. The pressure from a well completed in the Spearfish or the Minnekahta formations would likely be the same as the pressure in the existing well. If the quantity of water required is not available in the Spearfish or Minnekahta formations, the well would be deepened and completed in the Madison formation to a depth of about 1500 feet. If a new well was completed in the Madison formation, the pressure may be higher than the pressure in the existing well.

Water Rights Program - DENR
Conversation File Documentation

NAME OF PERSON OR FILE: Water Right No. 752A-1, SD Dept. of Game, Fish & Parks

ADDRESS: COUNTY: Lawrence

DATE: May 25, 1999 TELEPHONE:

RE: Justification for Reissuance of Water Right No. 752A-1

COMMENTS:

Water License No. 752A-1, which incorporates applicable portions of Water Right No. 752-1, was issued April 23, 1998, based on a licensing investigation by Ken Buhler. This licensed water right was issued for 1.73 cfs from one well located in the NE ¼ NE ¼ Section 20, T7N, R1E. The water is used at the McNenny fish hatchery.

Water Right No. 752-1 prior to incorporation authorized 1.79 cfs from one well (well No.2). In 1985, SD GF&P applied and received Water Permit No. 752A-1 to appropriate an additional 2.68 cfs from this well. The combined appropriation from this well was 4.47 cfs. A second well (well No. 1) exists for the use at the hatchery which is authorized separately under Water Right No. 749-1 for 2.23 cfs.

Ken Buhler, Water Rights Program staff engineer, conducted a licensing investigation of the water system on September 17, 1997. Will Saylor, a GF&P employee accompanied Mr. Buhler at the time of the investigation. From the information he provided we were unable to separate the quantity of flow from each of the two wells. For the purpose of licensing, Mr. Buhler arrived at the 1.73 cfs quantity to license Water Right No. 752A-1 by subtracting the quantity authorized by Water Right No. 749-1 from the total flow at the hatchery. By arithmetic calculation he arrived at 1.73 cfs.

Since that time, the McNenny fishery staff has provided us additional information on the production from each of the hatchery's water sources.

License No.	Source	License Quantity	Production prior to 6/25/98	Current Production
749-1	Well No. 1	2.23 cfs	1.34 cfs	1.34 cfs
750-1	Springs	2.68 cfs	2.45 cfs	1.78 cfs
752A-1	Well No. 2	1.73 cfs	2.23 cfs	3.23 cfs *

* - after maintenance was performed by Bice Drilling

Water Right No. 752A-1 should be reissued to be for a quantity of 3.23 cfs to reflect the actual flow capability of well No. 2 after maintenance.

File in Permit or other file as necessary. Use to document conversations and what the other party was told; why action or decision was made.

NAME: Eric Stambler



DEPARTMENT OF GAME, FISH AND PARKS

Foss Building
523 East Capitol
Pierre, South Dakota 57501-3182

May 19, 1999

Mr. John Hatch, Chief Engineer
Water Rights Program
SD Department of Environment and Natural Resources
Foss Building, 523 East Capitol Ave.
Pierre, SD 57501

RE: New well at McNenny State Fish Hatchery, Lawrence County

Dear Mr. Hatch:

Please consider this correspondence our formal request to drill an additional well into the Spearfish and/or Minnekahta Formation at our McNenny State Fish Hatchery facility in Lawrence County. Pursuant to SDCL 46-5-13 it is our intent to develop an additional diversion from the Spearfish/Minnekahta formation(s) without appropriating additional water from this source. As recently discussed with your staff, we also request that the quantity of water listed on the Water License No. 752A-1 be re-evaluated to reflect actual production from the well.

During 1997 and 1998, fish culture activities, fish stocking and maintenance at the hatchery were significantly hampered by excessive sediment delivered by the well authorized under Water Right No. 752A-1 (often referred to as well No. 2). Due to these problems we enlisted the assistance of the Alliance of Architects and Engineers from Rapid City to help us evaluate the well and to provide recommendations in developing a solution to these problems. A copy of their final report is on file in your office and provides additional background information regarding this issue. We intend to pursue alternative No. 4 as outlined in the report. Enclosed with this request is a memo from Rick Cordes, the hatchery manager, explaining in further detail why a new source of water is necessary to continue management of the hatchery in an efficient manner.

In summary, the selected alternative is to drill an additional well located in the general vicinity of well No. 2 (see enclosed map). Our preference is to complete this new well near the top of the Minnekahta formation in order to avoid potential sediment production from the Spearfish formation. However, if water production from the Minnekahta is insufficient, it may be necessary to complete the well in the Spearfish formation. With this additional well we will be able to reduce water production from well No. 2, thereby reducing flow velocities below the

threshold that is thought to cause the sediment problems experienced recently. Our intent is to not exceed the total diversion rate currently authorized under Water Right No. 752A-1.

If you or your staff need additional information to evaluate this request please contact me at 773-6208. Thank you for your assistance.

Sincerely,

A handwritten signature in cursive script, appearing to read "Tim Olson".

Tim Olson
Water Permits Coordinator

encs.

cc: Rick Cordes, Hatchery Manager

Supplemental Information

(type or print in ink)

SD GAME, FISH AND PARKS
MCNENNY FISH HATCHERY
Additional Well near Well #2
5/19/99

1. Well Information - Proposed Construction

- a) Drill Hole Diameter 12.25" Depth 600'
- b) Casing Type steel Diameter 9 5/8" Thickness ?
- c) Screen Type none Diameter NA Thickness NA
- d) Gravel Pack none Length of Gravel Pack NA
- e) Depth to Top of Water Bearing Material will be provided by driller
- f) Depth to Water (ground surface to water level) will be provided by driller
- g) Distance to nearest existing domestic well:

On applicants property Hatchery well #1 On property owned by others 0.5 mile NE on Kuchera property

2. Wastewater Disposal System Information

- a) Type of System (i.e. septic tank, drain field) 0.75 mile S on Chris Miller property
- b) System Capacity (gallons) _____ Year Constructed _____
- c) Connected to the City of _____ Sanitary System _____

3. Dugout Information

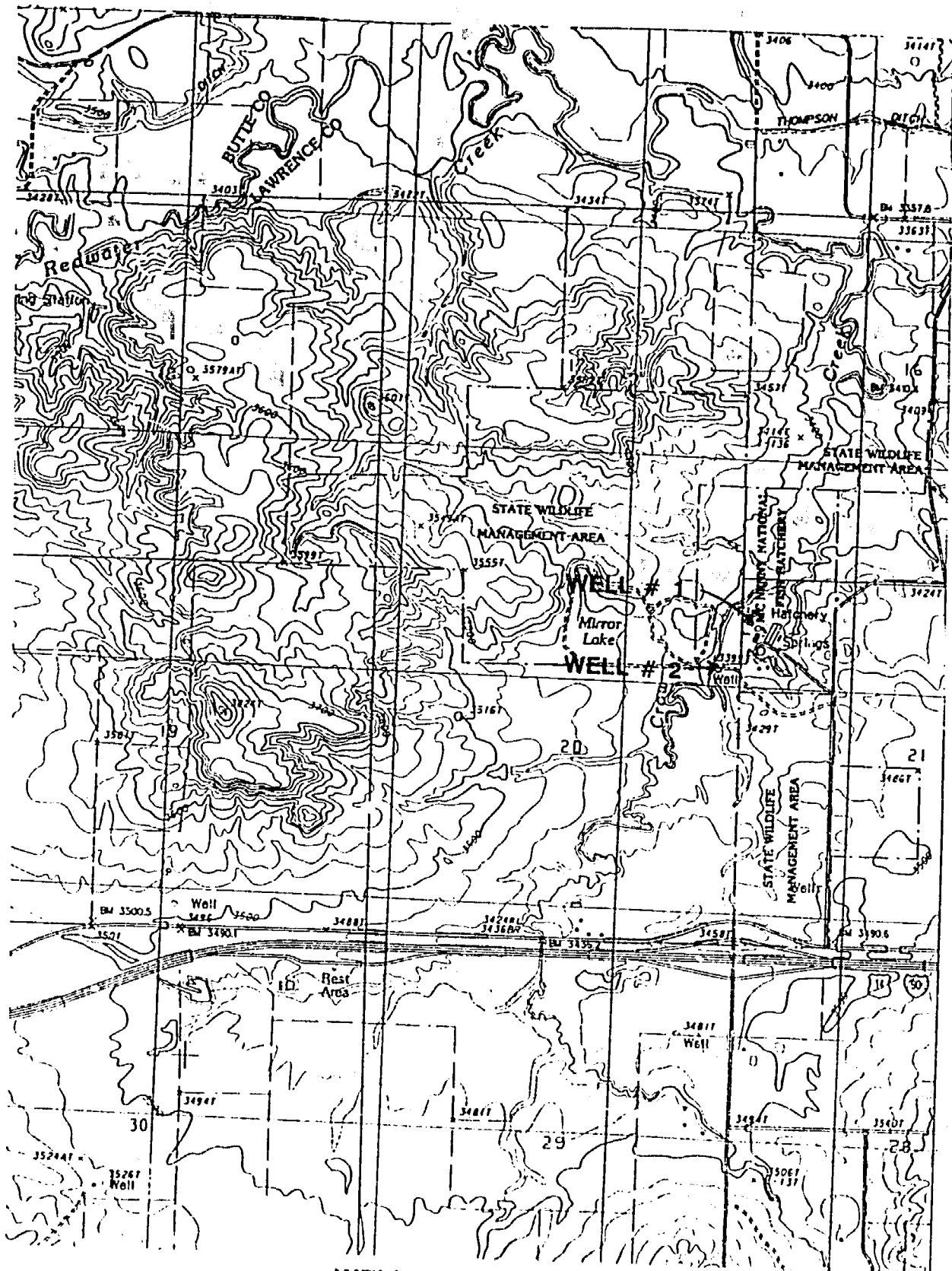
- a) Surface Dimensions _____ Depth _____
- b) Depth to water (ground surface to water level) _____

4. Water Storage Dams

If the proposed water use system contains one or more storage dams, please furnish the information requested below for each dam. The locations of the dams need to be shown on the map submitted with the application.

- a) If a private engineering firm or government agency was involved in the design of this dam, please give their name and address:

- b) Freeboard _____
- c) Crest Width _____
Crest Length _____
- d) Height _____
- e) Primary Outlet Capacity _____
If pipe, diameter _____
- f) Secondary Spillway Capacity _____
Spillway Width _____
- g) X & Y Slope _____
Upstream _____
Downstream _____
- h) Surface Area of Impoundment _____
- i) Storage _____ Acre Feet
- j) Drainage Area Above Dam _____ Acres



WELL LOCATIONS
McNENNY STATE FISH HATCHERY



MAY 03 1999

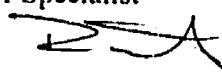
DEPARTMENT OF GAME, FISH AND PARKS

McNenny Trout Hatchery

RR 1 Box 205

Spearfish, South Dakota 57783-8905

Memorandum:

TO: Dennis Unkenholz, Fisheries Staff Specialist
FROM: Rick Cordes, Hatchery Manager 
RE: New Well Justification
DATE: April 30, 1999
CC:

I hope the following justification meets the needs for a statement for the application for an amendment to the existing Water Rights Licenses for McNenny State Fish Hatchery. Please edit as you see fit. If you have questions please contact me.

The occurrence of sediment production from well 752A-1 during the months of May – August, 1997 and March – August 1998 significantly impacted fish culture, fish stocking, and maintenance activities at McNenny State Fish Hatchery. Large volumes of suspended and settled sediment interfered with feeding activities, observation of fish, and fish health in the raceway units. Water containing these sediments is unusable for fish production. The fine red shale sediment adhered to gill filaments, interfering with oxygen transfer from the water to the fish. Eventually this would result in suffocation and mortality. As remedial action, the McNenny staff transferred fish production to D.C. Booth Historical Fish Hatchery in Spearfish and the adjustment in stocking schedules for waters in the Black Hills and the Missouri River reservoirs. Both actions resulted in the deviation from the management plans for chinook salmon for Lake Oahe and rainbow trout for Pactola and Deerfield reservoirs in the Black Hills in 1997 and 1998. The deposition of sediments in the raceways and the wastewater settling ponds also results in the labor-intensive removal of the sediment. Suspended sediments from 752A-1 discharged into the unnamed tributary of Crow Creek exceeded the Surface Water Discharge Permit for McNenny (No.: SD-0000191) during the sediment events in 1997 and 1998.

The above mentioned impacts require that a solution to the sediment problem be developed. Of the options reviewed to remedy the sediment production from well 752A-1, the preferred option is to develop a new well. The well would be developed in the Spearfish formation or the Minnekahta formation and in the same vicinity as 752A-1. High water velocity in the open borehole of 752A-1 is contributing to the sediment sloughing during the rise in the ground water level during the spring. The intent of

developing the well in the Spearfish or Minnekahta formation is to reduce the flow and velocity from 752A-1; therefore decreasing the sediment production from the unstable Spearfish formation in which 752A-1 was completed. The new well would supplement the reduced flow from 752A-1 and not increase the current total water appropriations from the existing permitted sources.

Memorandum:

TO: Dennis Unkenholz, Fisheries Staff Specialist
FROM: Rick Cordes, Hatchery Manager
RE: McNenny Water Rights
DATE: April 13, 1999
CC: Tim Olson, Steve Gurney

I would agree with Steve Gurney's and Ken Buhler's assessment regarding the need to amend the existing Water License for well #2 (752A-1), but there would be the need for a new Water License for the well if the intent is not to replace 752A-1, but supplement. But before we begin the process of requesting a hearing before the Water Management Board I think we need to review the license for 752A-1 that was issued April 23, 1998.

I have read through the cover letter from John Hatch, Chief Engineer, Water Rights Program and the Water License #752A-1 and am concerned that the information in the license is inaccurate. I could not locate the correspondence dated January 3, 1985 with regard to the request to increase the appropriation from well 752-1 (well #2) or the approval dated March 6, 1985 in section 1 of the license. The second paragraph states that the additional appropriation was not developed. I cannot validate this claim, because I do not know what was requested in 1985 as an increase in appropriation or what determines if the appropriation was not developed.

What confuses the issue further is the fact that the license is for 1.73 cfs or 448 gpm from well #2. The well produces from 1000 gpm to 1600 gpm, average 1300 gpm or 2.9 cfs which from my knowledge has always been the use from the well since it was completed in 1966. This is addressed in the correspondence dated July 13, 1983 from the US Fish and Wildlife Service. The letter indicates that there were discrepancies and that the intent was to correct them. Apparently these never happen, but may have been addressed in the January 3, 1985 request by the Department to increase the appropriation.

I have enclosed the above mentioned correspondences and licenses for the two wells and the springs for your review. I would ask that Tim Olson look at this information and try to clarify what events actually occurred in 1985 and why 752A-1 states that the additional

appropriations were not developed. These issues need to be addressed and corrected if we are to proceed with hearings before the Water management Board for a new well. Also the following table will provide some insight into what is water apportioned by license compared to what is actual produced by each source.

License #	Source	Amount	Production Prior to 6/25/98	*Current Production
749-1	Well #1, NW ¼ NW ¼ Section 21-T7N-R1E	2.23 cfs 1,000 gpm	1.34 cfs 600 gpm	1.34 cfs 600 gpm
750-1	Springs, NW ¼ NW ¼ Section 21-T7N-R1E	2.68 cfs 1,200 gpm	2.45 cfs 1,100 gpm	1.78 cfs 800 gpm
752A-1	Well #2, NE ¼ NE ¼ Section 20 -T7N-R1E	1.73 cfs 775 gpm	2.23 cfs 1,000 gpm	3.23 cfs 1,450 gpm
TOTAL		6.64 cfs 2,975 gpm	6.02 cfs 2,700 gpm	6.35 cfs 2,850 gpm

The change in water production occurred on June 25, 1998 when Bice Drilling setup their rig and ran a drill bit down to 276 feet in well #2. The water production in pond #3 went from 490 gpm to 200 gpm and an increase in well #2. Our last estimate on water production from well #2, 1,450 gpm was on 2/17/99 using the 2-foot weir measurements at the end of the raceways.

Water development is an issue in Lawrence County as is the continued growth and development that contribute to the increase demands on ground water sources. Locally it may not be of significant concern with many landowners in western Lawrence County because we are in a wet cycle and they have seen a corresponding increase in elevation or production in their Minnelusa and Madison wells. That was the general consensus from our informal meeting with landowners last fall.

75-2A-1

Date:

SOUTH DAKOTA WELL AND TEST HOLE PLUGGING REPORT

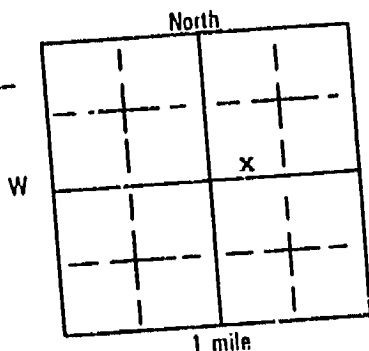
10-85

Location NE 1/4 NE 1/4 Sec. 20 Twp. 7 Rg. 1

County

Lawrence

Please mark well location with an "X"



Well Owner:

Name State of South Dakota

Address Dept. of Game & Fish

523 E. Capitol
Pierre, SD 57501

Plugging completion Date 12-9-99

CHECK APPROPRIATE BOX

EXISTING WELL ☐

TEST HOLE ☒

Well depth 307'

Casing material Steel

Casing size(s) 38'-16", 42'-8", 169'-5 1/2"

Casing condition New

Hole depth 307

Hole size 7 7/8

Describe plugging procedure: Place 5 1/2" casing to 169' with attached formation packer, pump 145 sx of Type G cement. Well still flowing, packer had apparently washed out, seal well casings and pump 60 sacks of cement between 5 1/2 casing and 8 5/8 casing. Flow stopped, still no flow after 24 hours. Fill 5 1/2 casing to surface, pump cement between 8 5/8 and 16''

Describe grout or plugging material:

First cement job was Type G cement grout

Second and topeff was of Type I/II cement

Type of non-slip plug:

This well or test hole was plugged under license # 604

And this report is true and accurate.

Drilling firm Weston Engineering, Inc.

Signature of Licensed Representative [Signature]

Signature of Well Owner [Signature]

Date 12-9-99

752A-1

**MCNENNEY FISH HATCHERY
WELL NO. 3
PROJECT REPORT**

INTRODUCTION

The purpose of this report is to present the results of a test well drilling project completed for the South Dakota Game, Fish and Parks Department McNenney Fish Hatchery, located near the Wyoming/South Dakota state line. This report is based on drilling observations, aquifer test data, and records available from the South Dakota Department of Natural Resources.

This report describes the well construction and hydrogeologic information developed over the course of the test well drilling program, as well as the results of aquifer testing and water quality analyses. Attachment A provides the lithologic descriptions of the test well. Attachments B and C contain the aquifer testing data and water quality laboratory reports.

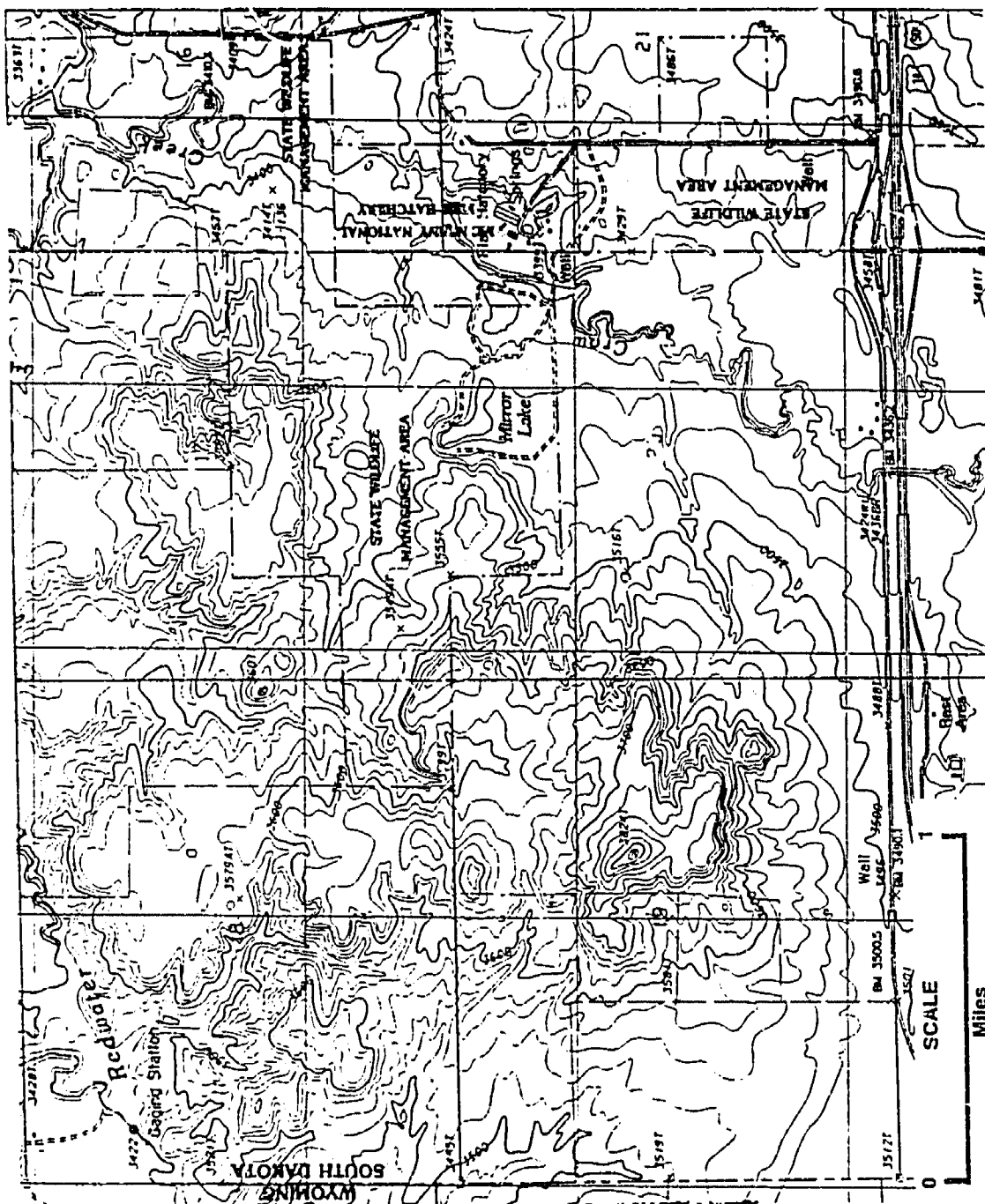
STUDY LOCATION

The McNenney Fish Hatchery is located in the NE 1/4, NE 1/4 of Section 20, Township 7 North, Range 1 East in Lawrence County, South Dakota. The site is approximately one mile north of Interstate 90 (see Figure 1).

SITE HISTORY

Two wells currently serve the McNenney Fish Hatchery (see Figure 1). The first well, Well No. 1, was drilled to a total depth of 220 feet in 1949. Well records obtained from the South Dakota Department of Natural Resources indicate that the well has an open hole completion from a depth of 145 to 220 feet. The well is open to and produces water from the Spearfish Formation. Well No. 2 was drilled in 1966 to a depth of 281 feet. Although well records obtained from the South Dakota Department of Natural Resources are incomplete, the records indicate the well has casing installed to a depth of 146 feet. The completion below 146 feet is probably open hole. The well appears to be open to and produce water from the Spearfish Formation and the upper part of the Minnekahta Limestone.

Hatchery personnel have noted that during spring run off the turbidity of the water discharged from both of the wells increases significantly. The elevated turbidities are problematic because the fish raised at the hatchery do not thrive in the turbid water. In an attempt to alleviate the turbidity problem, the South Dakota Game, Fish and Parks Department retained Weston Engineering, Inc. (WESTON) to drill a test well and evaluate the feasibility of utilizing well screens and sand pack to alleviate the turbidity problem.



T L N

**MC NENNEY FISH HATCHERY
WATER SUPPLY PROJECT**

LOCATION MAP
FIGURE 1



TEST WELL DRILLING

The Test Well No. 3 drilling program was initiated by drilling the test well at the site selected by WESTON and Rick Cordus, the Hatchery Manager, to determine the lithology and thickness of the formations in the subsurface and to obtain an indication of the productivity of the Spearfish and Minnelusa Aquifers at the site. WESTON mobilized on the site on November 19, 1999. Because it was anticipated that the well would flow large quantities of water from a shallow depth, a 20-inch diameter borehole was drilled to a depth of 37.5 feet and 37.5 feet of 16-inch diameter steel surface casing was installed and cemented in place to control flow. Excellent returns of cement were observed at the ground surface. A 41.60 foot long string of 8 5/8-inch steel casing was installed in the well and welded to the 16-inch surface casing to facilitate installation of a gate valve to control flow from the well and allow for drilling the well with air. After the cement seal was allowed to cure, the test well borehole was advanced, using a 7 7/8-inch diameter bit, to a total depth of 307 feet. Lithologic samples were collected every 10 feet and examined to determine the lithology of the geologic formations being penetrated and to identify the contacts of the formations. The Spearfish Formation, which is exposed at the ground surface at the hatchery, is 267 feet thick at the test well site. The Minnekahta Limestone was encountered in the test well from 267 to 295 feet and the Opeche Shale was penetrated from 295 feet to 307 feet.

The first indication of water production in the well occurred as the well was drilled from 45 to 125 feet. At 125 feet the well produced approximately 150 gpm and the static water level was 15 feet. As drilling progressed to a depth of 175 feet the well began to flow approximately 3 gpm. From 175 to 250 feet the production increased from the well, with the well flowing approximately 1,000 gpm from 250 feet. The flow increased further when the drill string was removed from the borehole to 1,200 gpm.

A gate valve attached to the top of the surface casing was used to control flow; however, when the gate valve was closed to shut in the test well after drilling was completed, water began to discharge at the ground surface approximately eight feet from the wellhead. The gate valve was reopened and after consulting with Ken Beuhler of DENR on December 6, 1999, it was decided to abandon the test well because of a failure of the cement surface seal. A 168.9 foot long string of 5 1/2-inch casing was installed to facilitate the successful cementing of the well. The test hole was plugged and abandoned on December 9, 1999. Visual inspections of the well casing and ground surface around the well site indicated the cement seal was successful.

WELL CONSTRUCTION

Because large quantities of water were observed flowing from the test well, it was decided to continue the project by drilling a production well. After plugging and abandoning the test well, the drilling rig was moved approximately 35 feet northwest and drilling of Well No. 3 began. A 26-inch tri-cone bit was used to drill to a depth of 20 feet and 20 feet of 24-inch diameter steel conductor casing was placed in the borehole. The conductor casing was then cemented in place

and the cement seal was allowed to cure. The high discharge rates and water pressures observed in Test Well No. 3 and the existing wells at the hatchery were important in determining the design of Well No. 3. After drilling to a depth of approximately 140 feet, 143 feet of 16-inch diameter steel surface casing was cemented in place to prevent washout, as was experienced with the test well. A 14 3/4-inch diameter borehole was drilled from 140 to 320 feet through the Spearfish Formation and into the Opeche Formation. Steel casing, with a 10 3/4-inch outside diameter, and 10-inch pipe size stainless steel screen was placed in the well from 173 to 296 feet. Screened intervals were placed across productive intervals, as determined from lithologic cuttings and observations of drilling characteristics. Figure 2 depicts the well construction details.

After installing the casing and screen assembly a mixture of 6x9 and 8x12 Colorado Silica sand pack was installed in the annular space between the borehole and the casing and screen assembly. A 1 1/4-inch tremie pipe was installed in the well to a depth of 260 feet and gravel pack was washed into the annular space with fresh water. The tremie pipe was gradually withdrawn from the well as the level of the sand pack rose in the well. Sand pack was installed from 320 to 160 feet. A cement seal of Type I/II Portland cement was installed in the well from the top of the sand pack to the ground surface using the 1 1/4-inch tremie pipe. Excellent returns of cement were observed at the ground surface.

After allowing the cement seal to cure for 18 hours the well was developed using air lifting techniques. Total development time was 8 hours.

WELL TESTING PROGRAM

Step-Testing

Following well drilling, construction, and development, a step-test of Well No. 3 was conducted on February 15, 2000. The step-test was performed in order to evaluate the efficiency of the well and to determine a long-term production rate for the constant-discharge test. Artesian flow of water from the well made pumping equipment unnecessary for the aquifer tests. A 4.5 inch, 30-pound pressure gauge was installed in the discharge piping to monitor changes in hydraulic head in the well during the step-test. Flows for the stepped-flow rates were controlled using a gate valve on the discharge piping and the flow rates were monitored using a 6-inch diameter orifice plate mounted on an 8-inch O.D. discharge pipe.

The flow rates for the step-test were 150, 300, 600, and 800 gallons per minute (gpm) and each flow rate was maintained for 30 minutes. Following step-testing, the well was allowed to recover to pre-testing hydraulic head conditions.

Figure 3 summarizes the results of the step-test, depicting the specific capacities (gpm of production divided by the feet of drawdown) for the test well. The changes in hydraulic head, measured on the pressure gauge, were converted to equivalent feet of water. Specific capacity data for step-tests in an ideal, 100 percent efficient well will plot as a straight line, with a slope of

MCNENNEY FISH HATCHERY TEST WELL
STEP-TEST DATA
FEBRUARY 15, 2000

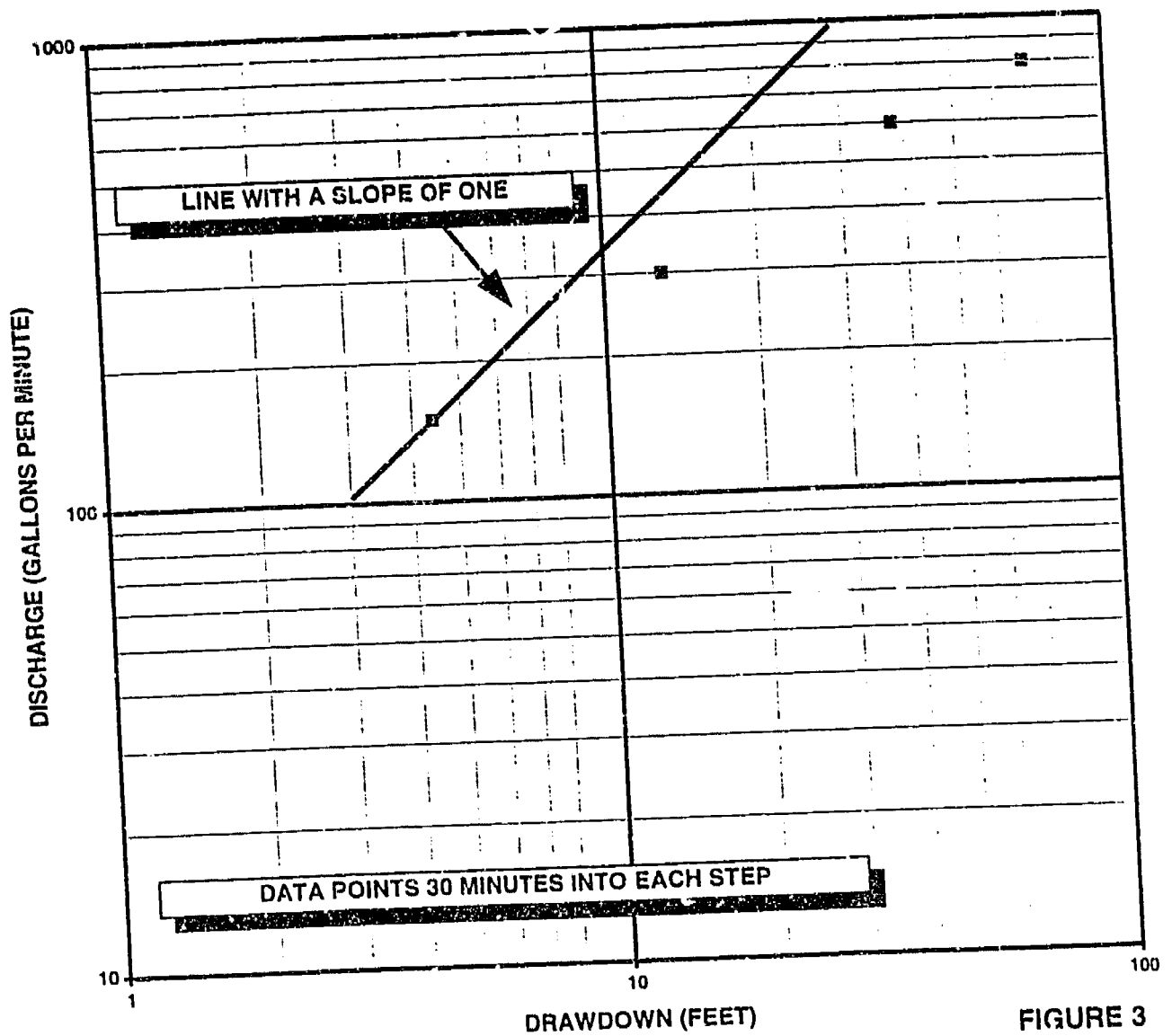


FIGURE 3

one, on a log-log plot. A line with a slope of one has been drawn on Figure 3 and the log-log plot of drawdown versus production for the McNenney Fish Hatchery Well No. 3 for the various stepped flow rates shows a deviation from linearity at higher flow rates. The deviation is an indication that the well is not as efficient at higher pumping rates. Reductions in hydraulic head caused by flow testing frequently result in decreases in the coefficient of storage, which results in greater drawdown per volume of water discharged (Freeze and Cherry, 1979). Additionally, declines in hydraulic head associated with flow testing can cause hydrostatic unloading, which results in partial collapse of fractures and/or caverns yielding water to the well which may cause a decline in well efficiency. Turbulent flow of water entering the well from voids can also cause diminished well efficiency. The specific capacity of the well, calculated from the step-test results, ranges from 11.6 to 34.2 gallons per minute per foot.

Constant-Discharge Testing

Based on the results of the step-test and the productivity of the two existing wells at the hatchery, a long-term flow rate of 750 gpm was projected for Well No. 3. The monitoring equipment used during the step-test was also used during the long-term test. The long-term test was carried out for a period of 53.5 hours to determine hydrogeologic characteristics that could be expected to influence drawdown during long-term water production.

The long-term flow test was initiated on February 25, 2000. After one minute of flow testing at 750 gpm the drawdown in the well was approximately 40 feet. Total drawdown after 3,210 minutes of flow testing was approximately 57 feet. Flow testing ceased on February 27, 2000 and recovery data was collected until February 28, 2000.

Figure 4 illustrates the results of the constant-discharge test using the semi-logarithmic method developed by Cooper and Jacob (1946). Analysis of the data depicted in Figure 4 indicates that the effective transmissivity of the aquifer yielding water to the well is 99,000 gallons per day per foot (gpd/ft). The effective transmissivity calculated from the drawdown data is only a first-order approximation because the assumptions used in the analysis are violated. The Cooper and Jacob method assumes that the aquifer materials are homogeneous and isotropic (has equal permeability in every direction) and that there are no sources or sinks in the aquifer other than discharge of the well. The first assumption is violated because the aquifer yielding water to the well has well developed solution cavities, which make the aquifer heterogeneous and anisotropic. The second assumption is violated because water is most likely being recharged to the aquifer during the flow test.

Observation Well Data. Well No. 2, located approximately 215 feet south of Well No. 3, was used as an observation well during the flow test. Hydraulic head readings were taken from a pressure gauge mounted on the Well No. 2 wellhead at periodic intervals during the flow test. Figure 5 provides the results of the observation well data from the constant-discharge flow test using the semi-logarithmic method developed by Cooper and Jacob (1946). Drawdown observed in Well No. 2 followed a linear trend on the semi-logarithmic plot for the first hour of flow testing.

MCNENNEY FISH HATCHERY TEST WELL
CONSTANT DISCHARGE TEST DATA
FEBRUARY 25 - 27, 2000

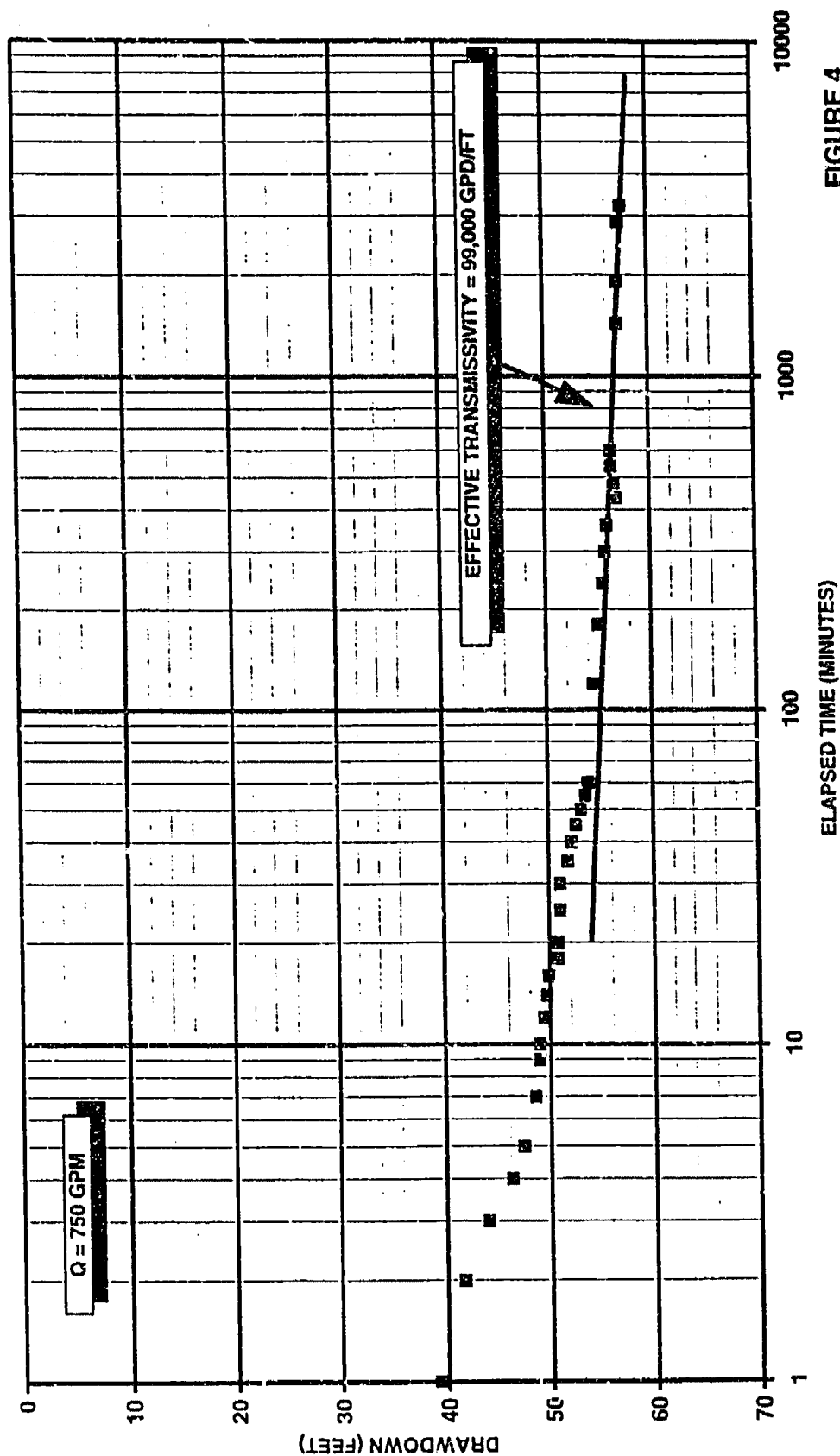


FIGURE 4

MCNENNEY FISH HATCHERY TEST WELL
 CONSTANT-DISCHARGE TEST
 OBSERVATION WELL DATA
 FEBRUARY 25 - 27, 2000

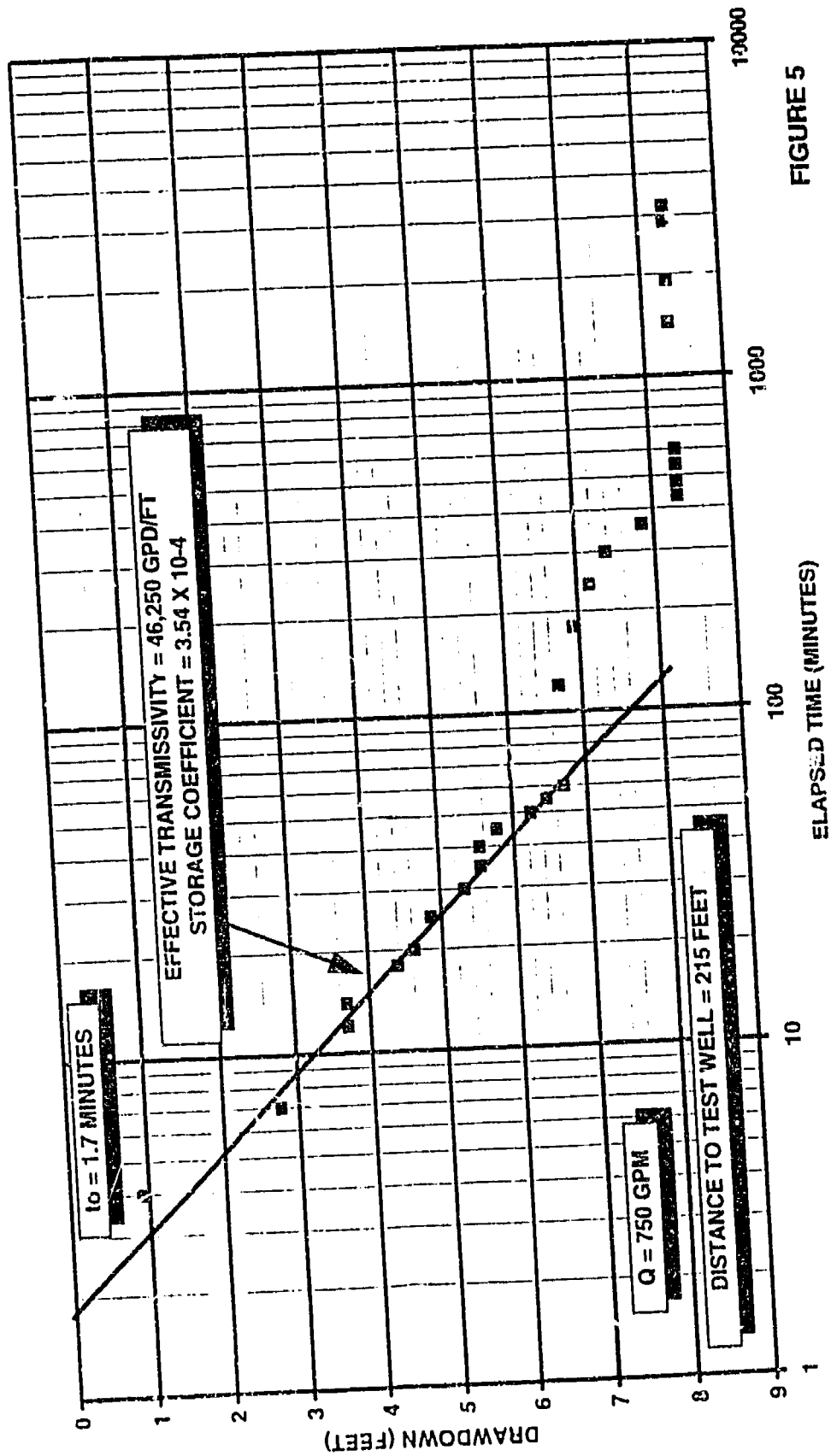


FIGURE 5

The effective transmissivity determined from the first hour of flow testing was approximately 46,250 gpd/ft. A storage coefficient of 3.5×10^{-4} was determined from data from the same time period. This storage coefficient indicates that the aquifer yielding water to the wells is confined.

Between 60 minutes and 120 minutes the trend in draw down changed significantly (see Figure 5). During flow testing of Well No. 3 water was being discharged from Well No. 2 to meet the needs of the hatchery. The change in the drawdown trend may be the result of a change in flow rates from Well No. 2. From 435 minutes to the end of the flow test there was no increase in drawdown observed in Well No. 2. This lack of drawdown is likely the result of the cone of depression associated with flow testing encountering a positive or recharge boundary.

Operation of Well No. 2 during the flow test of Well No. 3 violates the assumptions inherent in the Cooper and Jacob (1946) equations for observation wells. Because the observation well was flowing, effective transmissivities calculated from observation well data are underestimated and represent a minimum value. Actual transmissivities are likely to be significantly higher. Additionally, storage coefficients calculated from the observation well data are overestimated. The actual storage coefficient is smaller, which indicates the aquifer is well confined.

Recovery Data

Analysis of the recovery data collected from Well No. 3 following the termination of pumping yields a lower transmissivity compared to the constant-discharge test. The transmissivity calculated using the straight-line, semi-logarithmic method (Jacob, 1963) is 49,500 gpd/ft (see Figure 6), which is in close agreement with the transmissivity calculated from the observation well for the constant-discharge test. Extending the straight line fitted to the recovery data reveals that the zero residual drawdown occurs near a t/t' value of 16 (t = time since the pump was started, t' = time since the pump was stopped). Driscoll (1986) states that the intercept time will deviate from 1 if there is a variation in the storage coefficient, if there is recharge to the aquifer during testing, or if there is interference from other wells. It is likely that the deviation is caused by interference from Well No. 2 being in operation during the flow testing.

Figure 7 provides a summary of the recovery data for the observation well using the method developed by Jacob (1963). The effective transmissivity, as determined from the recovery data, is 50,770 gpd/ft. Extending the straight line fitted to the recovery data reveals that the zero residual drawdown occurs near a t/t' value of 12. As stated above, it is likely that the deviation is caused by interference from operation of Well No. 2 during the flow testing.

Figure 8 provides a plot of the recovery data using the calculated recovery method developed by Theis (1935). The storage coefficient derived from Figure 8 is 1.64×10^{-4} , which is in close agreement with the storage coefficient calculated from the flow test data. The transmissivity calculated from the Theis method, 52,105 gpd/ft, is also in close agreement with the value determined using the Jacob method.

MCNENNEY FISH HATCHERY TEST WELL
 RECOVERY FROM CONSTANT-DISCHARGE TEST DATA
 FEBRUARY 27 - '28, 2000

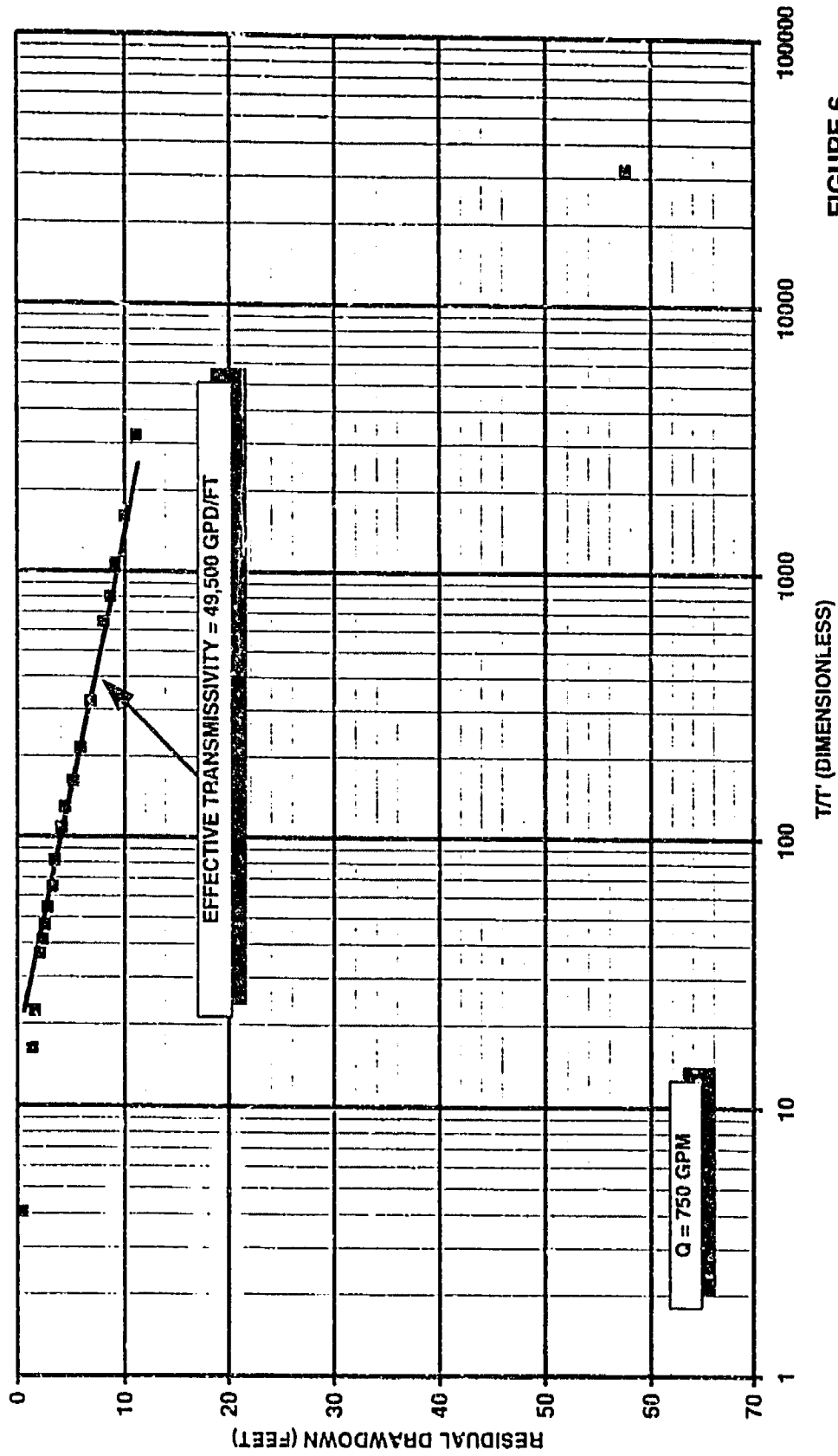


FIGURE 6

MCNENNEY FISH HATCHERY WELL NO. 3
 CONSTANT-DISCHARGE TEST RECOVERY
 OBSERVATION WELL
 FEBRUARY 27 - 28, 2000

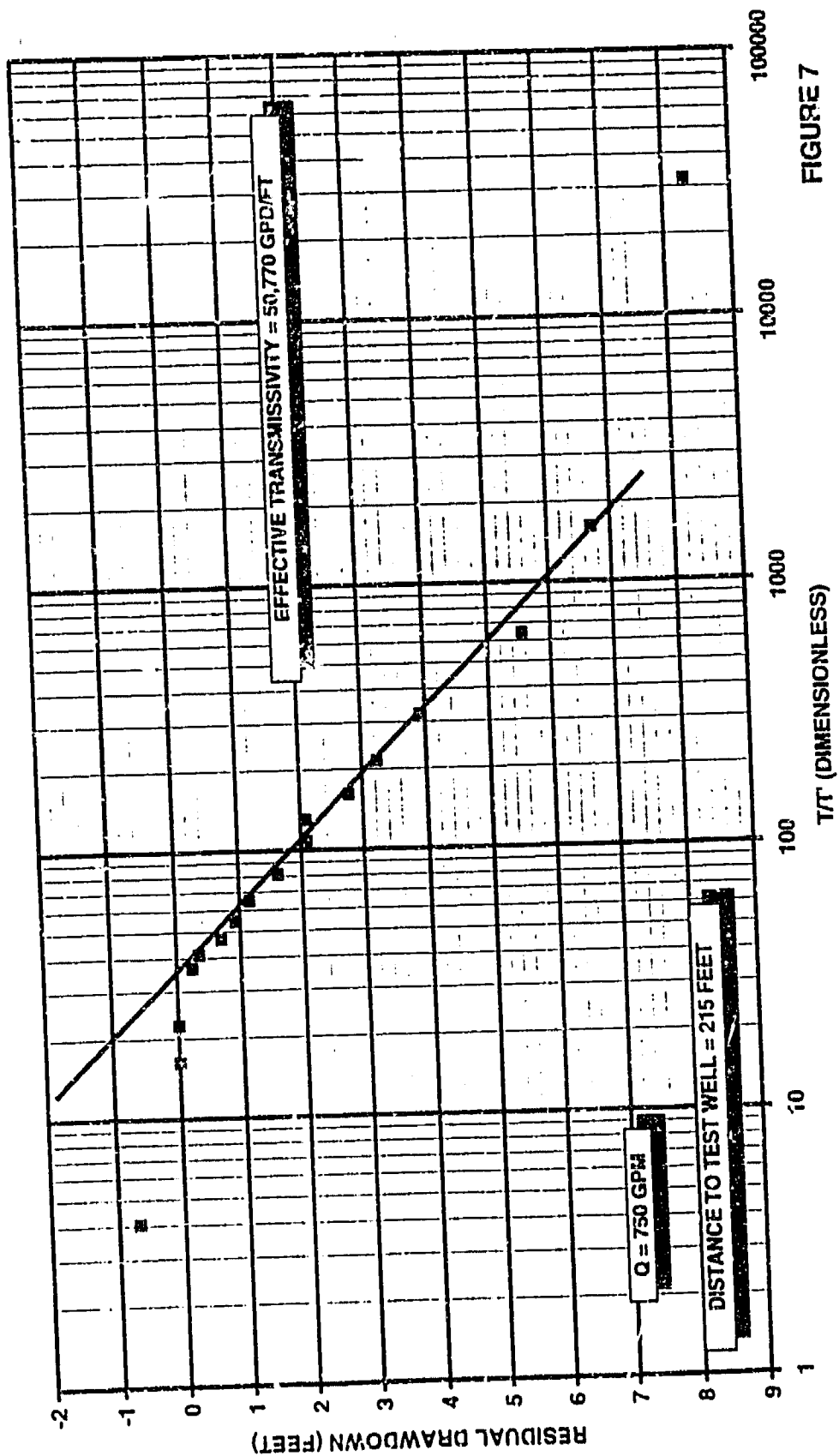


FIGURE 7

MCNENNEY FISH HATCHERY WELL NO. 3
 CONSTANT-DISCHARGE TEST RECOVERY
 OBSERVATION WELL
 FEBRUARY 27 - 28, 2000

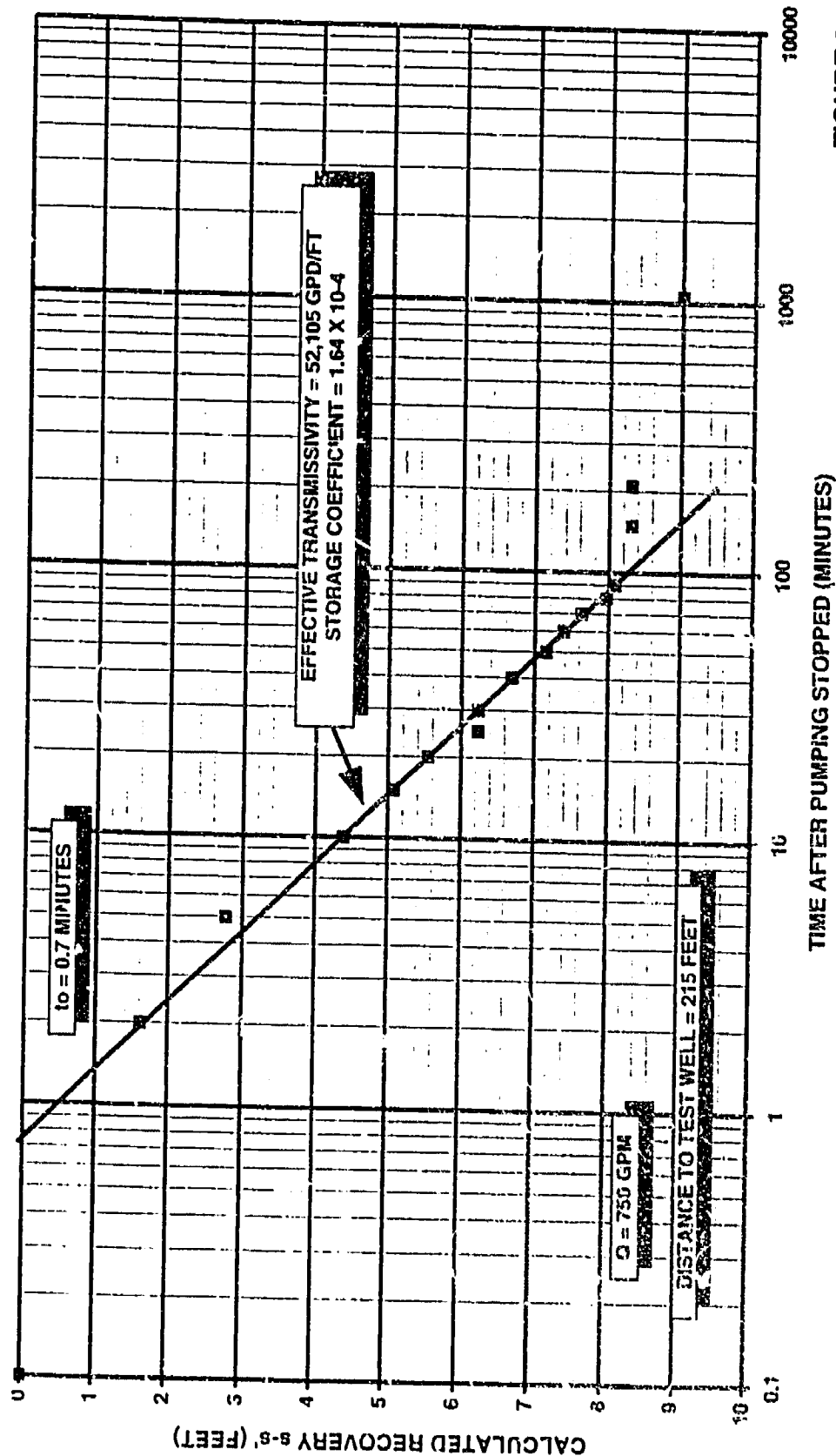


FIGURE 8

Summary of Flow Testing

The results of the Well No. 3 flow tests are summarized in Table 1. A step-test was performed to determine well performance characteristics and determine the flow rate for the constant-discharge test. Aquifer characteristics were determined using data obtained from Well No. 3 and one observation well during constant-discharge flow and recovery tests.

Table 1 shows that the aquifer characteristics calculated using the various methods are similar, with the exception of the transmissivity calculated from the drawdown plot of Well No. 3. Based on recovery (non-pumping) data, testing determined that the aquifer developed by this well is probably a confined system with an apparent effective transmissivity of 50,000 gpd/ft. Based on the observation well data, the storage coefficient for the aquifer developed by Well No. 3 is between 1.64×10^{-4} and 2.59×10^{-4} .

TABLE 1
SUMMARY OF FLOW TEST ANALYSES

TYPE OF TEST	WELL	RADIUS (Feet from Pumping Well)	METHOD OF ANALYSIS	TRANS- MISSIVITY (gpd/ft)	STORAGE COEFFICIENT (dimensionless)
Constant- discharge (drawdown)	Well No. 3	0.42 ft	Cooper & Jacob (1946)	99,000	ND
Constant- discharge (recovery)	Well No. 3	0.42 ft	Jacob (1963)	49,500	ND
Constant- discharge (drawdown)	Well No. 2	215 ft	Cooper & Jacob (1946)	46,250	3.54×10^{-4}
Constant- discharge (recovery)	Well No. 2	215 ft	Jacob (1963)	50,770	ND
Constant- discharge (recovery)	Well No. 2	215 ft	Theis (1935)	52,105	1.64×10^{-4}

ND - Not Determined

Long-Term Yield Projections

Safe yield is a groundwater resource evaluation concept originally employed to designate the withdrawal rate from an aquifer that will not deplete the supply. Consequently, one can redefine safe yield as the amount of groundwater one can withdraw "without getting into trouble" (Lohman, 1972). Trouble for the McNenney Fish Hatchery wells can be defined as causing the hydraulic head in the wells to decline to the point where pumps are required to be installed in the wells.

Because fractures and caverns yield groundwater to the McNenney Fish Hatchery wells, conducting a safe-yield analysis using standard analytical methods is assumed to be of little utility. This requires that the safe yield for Well No. 3 be based on local water production experience, potential for well interference, potential for interference with springs within the hatchery grounds, and well and aquifer characteristics. At the present time it is suggested that the safe-yield for Well No. 3 is 750 gpm; however, this prediction should be reviewed periodically in light of the potential for interference with other wells and springs. WESTON recommends that records of water production from all three of the hatchery wells, as well as shut-in and operational pressures, be maintained on a regular basis. Review of these records will allow determination of declines in the hydraulic head in the aquifer yielding water to the wells.

WATER QUALITY

Water quality samples were collected by hatchery personnel following completion of the well. The results of the analyses are summarized in Table 2. The quality of the water developed by Well No. 3 is excellent for drinking water purposes, with the exception of mercury. The concentration of mercury measured from the sample was 0.017 milligrams per liter (mg/L). The maximum contaminant level (MCL) for mercury is 0.002 mg/L. While this well will primarily be used for however, hatchery personnel will need to examine the results to determine the suitability of the water for fish rearing.

WELL TIE-IN TO EXISTING SYSTEM

Following testing of Well No. 3, the wellhead was completed and the well was tied into the existing water system. Figure 9 provides an as-built diagram of the well. Figure 10 provides details of the piping from the wellhead to the existing water line.

CONCLUSIONS AND RECOMMENDATIONS

McNenney Well No. 3 is capable of yields of approximately 750 gpm under artesian conditions. WESTON recommends that hatchery personnel closely monitor production rates, quantities of

TAB: E 2

**MCNENNEY FISH HATCHERY WELL NO. 3
WATER SAMPLE ANALYTICAL RESULTS
AND COMPARISON WITH EPA DRINKING WATER STANDARDS**

PARAMETERS (mg/l except as noted)	EPA MAXIMUM CONTAMINANT LEVEL (MCL)	SAMPLE DATE 2/13/00
--------------------------------------	---	---------------------------

Primary EPA Parameters

Regulated Organic Chemicals	Various	NA
Microbiological	Various	NA
Antimony	0.008	<0.001
Arsenic	0.05	<0.005
Barium	1.00	<0.05
Beryllium	0.004	<0.0016
Cadmium	0.005	0.02
Chromium (Total)	0.10	<0.01
Cyanide	0.20	NA
Fluoride	4	0.28
Lead	0.05	<0.10
Mercury	0.002	0.017
Nickel	0.1	<0.04
Nitrate (as N)	10	0.26
Nitrite (as N)		<0.01
Selenium	0.05	0.01
Thallium	0.002	NA
Turbidity	5 NTU	NA
Uranium	0.02**	0.002
Radon 222, pCi/l	300**	NA
Gross alpha, pCi/l	15	<3.0
Gross beta, pCi/l	50	<4

Secondary EPA Parameters

Temperature (°F)	NS	NA
pH (no units)	6.5-8.5	7.4
Total Dissolved Solids	500	330
Suspended Solids	NS	<4
Alkalinity (CaCO ₃)	NS	150
Aluminum	NS	<1.0
Bicarbonate	NS	180
Boron	NS	<0.25
Calcium	NS	80
CO ₂	NS	15
Chloride	250	2.0
Copper	1	<0.01
Hardness	NS	NA
Hydrogen Sulfide	NS	<1
Iron	0.30	0.1
Magnesium	NS	22
Manganese	0.05	<0.03
Ammonia (Distilled)	NS	<0.05
Phosphorus	NS	NA
Potassium	NS	2
Silica	NS	<1
Sodium	250	12
Sulfate	250	130
Vanadium	NS	<1.0
Zinc	5	0.03

** = Proposed; Deferred = According to EPA, deferred status due to low health risk

NS = No Standard; NA = Not Analyzed; ND = Not Detected

Well Nos. 2 and 3 are in hydraulic communication, as is proven by the response of the wells during flow testing and observations of increased turbidity of water developed by Well No. 3 when Well No. 2 was shut in for piping modifications. The use of screens and sand pack in construction of Well No. 3 should provide stability in the formation around the well and prevent elevated turbidity from formation collapse in the immediate vicinity of the well. However, because Well No. 2 is not screened and sand packed, each time Well No. 2 is shut in and during spring runoff turbidity will continue to be a problem for both wells.

It is recommended that water derived from Well No. 3 be closely monitored for turbidity in the spring of 2001, during periods of past turbidity problems in the old wells. If the turbidity is as low or lower than past observances in Well Nos. 1 and 2, with only Well No. 3 in operation, then the use of screen and sandpack in well construction will be proven successful. If the turbidity is the same as that observed in the old wells then drilling Well No. 3 into the Madison Formation should be considered.

REFERENCES

Cooper, H.H. Jr., and C.E. Jacob, 1946, A generalized graphical method for evaluating formation constants and summarizing wellfield history: Transactions, American Geophysical Union, vol. 27, pp. 526-534.

Driscoll, F.G., 1986, Groundwater and Wells: Johnson Division, 1089 pp.

Freeze, R.A. and Cherry, J.A., 1979, Groundwater: Prentice-Hall, Inc., Englewood Cliffs, N.J., 589 pp.

Jacob, C.E., 1963, Recovery method for determining the coefficient of transmissibility: U.S. Geological Survey Water Supply Paper 15361.

Theis, C.V., 1935, The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage: Transactions of American Geophysical Union, 2, pp. 519-524.

ATTACHMENT A

LITHOLOGIC LOGS



LITHOLOGIC LOG
McNENNEY FISH HATCHERY
TEST WELL NO. 3

Depth (feet)	Principal Lithology	Description	Comments
0 - 50	Mudstone, Siltstone, and Shale	Moderate reddish brown, slightly silty, shale; shaley, moderately well cemented, calcareous siltstone; light olive gray, soft mudstone; and trace of clear, poorly cemented, well rounded, fine grained sandstone and grayish orange pink, finely crystalline limestone	Spearfish Formation
50 - 70	Shale	Moderate reddish brown, slightly silty shale and rare, thin chips of gypsum	
70 - 110	Siltstone and Gypsum	Moderate reddish brown and white, moderately well cemented, calcareous siltstone and white to clear gypsum	Abundant chips of cement
110 - 200	Mudstone	Moderate reddish brown, sticky mudstone with traces of gypsum; minor amounts of clear, moderately well cemented, well rounded, fine grained sandstone from 170 to 180 feet and grayish orangish green claystone from 180 to 200 feet	
200 - 265	Siltstone	Moderate reddish brown, poor to moderately well cemented, slightly clayey siltstone; abundant white gypsum from 250 to 260 feet	
265 - 297	Limestone	Pale blue and pale pink to pale yellowish brown, finely crystalline limestone	Minnokahta Limestone
297-320	Shale	Grayish red calcareous shale	Opeche Formation
TD of Well = 320 feet			

Note: Colors were determined using the GSA Rock Color Chart.

LITHOLOGIC LOG
McNENNEY FISH HATCHERY
WELL NO. 3

Depth (feet)	Principal Lithology	Description	Comments
0 - 50	Mudstone, Siltstone, and Shale	Moderate reddish brown, slightly silty, shale; shaley, moderately well cemented, calcareous siltstone; light olive gray, soft mudstone; and trace of clear, poorly cemented, well rounded, fine grained sandstone and grayish orange pink, finely crystalline limestone	Spearfish Formation
50 - 70	Shale	Moderate reddish brown, slightly silty shale and rare, thin chips of gypsum	
70 - 110	Siltstone and Gypsum	Moderate reddish brown and white, moderately well cemented, calcareous siltstone and white to clear gypsum	
110 - 200	Mudstone	Moderate reddish brown, sticky mudstone with traces of gypsum; minor amounts of clear, moderately well cemented, well rounded, fine grained sandstone from 170 to 180 feet and grayish orangish green claystone from 180 to 200 feet	
200 - 265	Siltstone	Moderate reddish brown, poor to moderately well cemented, slightly clayey siltstone; abundant white gypsum from 250 to 260 feet	
265 - 297	Limestone	Pale blue and pale pink to pale yellowish brown, finely crystalline limestone	Minnekahta Limestone
297-320	Shale	Grayish red calcareous shale	Opeche Formation
TD of Well = 320 feet			

Note: Colors were determined using the GSA Rock Color Chart.

ATTACHMENT B

FLOW TEST DATA



MCNENNEY FISH HATCHERY WELL NO. 3 PROJECT

Step-Test Data

Date: February 15, 2000
 Tested by: Weston Engineering, Inc., Upton, Wyoming
 Monitoring Equipment: 30 Psi pressure gauge. Flow rate controlled by gate valve and flow rates monitored by controlled by a gate valve and flow rates monitored 6-inch orifice plates on a 8-inch weir with a manometer.
 Discharge: 150, 300, 600, and 800 gpm.
 Comments: Shut-in pressure = 31.3 psi

Elapsed Time (min)	Pressure (psi)	Drawdown (ft)	Comments
1	30	3.203	Start Test Q= 150 gpm
2	30.1	2.772	
3	30	3.003	
4	30	3.003	
5	29.9	3.234	
6	29.9	3.234	
7	29.8	3.465	
8	29.8	3.465	
9	29.8	3.465	
10	29.8	3.465	
12	29.8	3.465	
14	29.8	3.465	
16	29.8	3.465	
18	29.8	3.465	
20	29.7	3.653	
25	29.5	4.158	
30	29.4	4.389	
31	26.1	12.012	
32	26	12.243	
33	25.9	12.474	
34	25.8	12.705	
35	26	12.243	
36	25.9	12.474	
37	25.9	12.474	
38	25.9	12.474	
39	25.9	12.474	
40	25.8	12.705	
42	25.8	12.705	
44	25.8	12.705	
46	25.8	12.705	
48	25.9	12.474	
50	25.8	12.705	Q= 300 gpm
55	25.8	12.705	
60	25.7	12.936	
61	15.2	37.191	
62	15.2	37.191	
63	15	37.653	
64	15	37.653	
65	15	37.653	

Elapsed Time (min)	Pressure (psf)	Drawdown (ft)	Comments
66	15	37.853	
67	15	37.853	
68	15	37.353	
69	15	37.353	
70	15	37.853	
72	14.9	37.864	
74	14.8	38.115	
76	14.7	38.348	
78	14.7	38.348	
80	14.7	38.348	
85	14.9	37.884	Q= 600 gpm
90	14.9	37.884	
91	3	65.373	
92	2	67.683	
93	2	67.683	
94	1.8	68.145	
100	1.5	68.838	
130	1.5	68.838	
140	1.2	69.531	
141	1.2	69.531	End Test

MCNENNEY FISH HATCHERY WELL NO. 3 PROJECT

Constant-Rate Test and Recovery Data Well No. 3

Date: February 25-27, 2000
Tested by: Weston Engineering, Inc., Upton, Wyoming

Monitoring Equipment: 30 Psi pressure gauge. Flow rates controlled by gate valve and flow rates monitored by controlled by a gate valve and flow rates monitored 3-inch orifice plate on a 6-inch weir with a manometer.

Discharge: 750 gpm.

Comments: Shut-in pressure = 31.3 psi

Elapsed Time (min)	Pressure (psi)	Drawdown (ft)	Comments
1	12	39.27	Start Test
2	11	41.58	Q = 750 gpm
3	10	43.89	Water is dark red
4	9	46.2	
5	8.5	47.335	Adjust flow up
7	8	48.51	
9	7.8	48.97	
10	7.8	48.972	Adjust flow up
12	7.6	49.434	Water is pink and clearing
14	7.5	49.665	
16	7.4	49.896	Adjust flow up
18	7	50.82	
20	7	50.32	
25	6.9	51.051	
30	6.9	51.051	
35	6.6	51.774	
40	6.4	52.206	
45	6.2	52.668	
50	6	53.13	
55	5.8	53.562	
60	5.7	53.823	
120	5.4	54.516	
180	5.2	54.975	
240	5	55.44	
300	4.9	55.671	
360	4.8	55.902	
435	4.4	56.826	
480	4.5	56.565	
540	4.6	56.364	
600	4.6	56.364	
1440	4.3	57.057	
2400	4.3	57.057	
3620	4.2	57.288	
4140	4.1	57.519	End Test
1	24.2	11.088	Begin Recovery
2	24.7	9.933	
3	25.1	9.009	
4	25.3	8.547	
5	25.6	7.854	
10	26.1	6.699	
15	26.5	5.775	
20	26.8	5.082	
25	27.1	4.389	

Elapsed Time (min)	Pressure (psi)	Drawdown (ft)	Comments
30	27.05	4.0425	
40	27.5	3.465	
50	27.6	3.234	
60	27.8	2.773	
70	27.9	2.541	
80	28	2.31	
90	28.1	2.079	
150	28.2	1.817	
210	28.4	1.386	
1050	28.8	0.462	End Recovery

MCNENNEY FISH HATCHERY WELL NO. 3 PROJECT

Constant-Rate Test and Recovery Data Observation Well (Well No. 2)

Date: February 25-27, 2000
 Tested by: Weston Engineering, Inc., Upton, Wyoming
 Monitoring Equipment: 30 Psi pressure gauge. Flow rates controlled by gate valve and flow rates monitored by controlled by a gate valve and flow rates monitored 6-inch orifice plates on a 8-inch weir with a manometer.
 Discharge: 750 gpm.
 Comments: Shut-in pressure = 21.4 psi

Elapsed Time (min)	Pressure (psi)	Drawdown (ft)	Comments
4	12	0.924	Q= 750 gpm
7	10	2.772	
12	8	3.696	
14	7.8	3.696	
18	7.6	4.389	
20	7.5	4.62	
25	7.4	4.851	
30	7	5.313	
35	7	5.544	
40	6.9	5.544	
45	6.9	5.775	Adjust flow up
50	6.6	6.237	
55	6.4	6.468	
60	6.2	6.699	
120	6	6.699	
130	5.8	6.83	
240	5.7	7.161	
300	5.4	7.392	
360	5.2	7.654	
435	5	8.316	
480	4.9	8.316	End Test
540	4.8	8.316	
600	4.4	8.316	
1440	4.5	8.316	
1920	4.0	8.316	
2880	4.6	8.316	
3210	4.3	8.316	
2	18.5	6.699	Begin Recovery
5	19	5.544	
10	19.7	3.927	
15	20	3.234	
20	20.2	2.772	
25	20.5	2.079	
30	20.5	2.079	
40	20.7	1.517	
50	20.9	1.155	
60	21	0.924	
70	21.1	0.693	End Recovery
80	21.25	0.3495	
90	21.3	0.231	
150	21.4	0	
210	21.4	0	
1050	21.7	-0.693	

ATTACHMENT C

WATER QUALITY DATA



REPORT OF CHEMICAL ANALYSIS

REPORT DATE: March 8, 2000

REPORT TO: MCNENNY STATE FISH HATCHERY
RR 1 BOX 205
SPEARFISH SD 57783

JOB NO: 97-24380

Date Sampled: 2/13/00, 2/14/00
Date Received: 2/14/00

INORGANIC ANALYSIS

Lab # 560
Sample Desc: NEW WELL
Sample Matrix: WATER

PARAMETER	RESULT(mg/l)	IDL
Alkalinity (CaCO ₃)	150	1.0
Dicarbonate (HCO ₃ ⁻)	180	NA
Boron (B)	<0.25	0.25
Chloride (Cl)	2	1.0
Fluoride (F)	1.28	0.10
Sulfate (SO ₄ ²⁻)	130	1.0
Nitrogen, Ammonia (NH ₃)		
Distilled	<0.05	0.05
Nitrogen, Nitrate (NO ₃ ⁻)	0.26	0.10
Nitrogen, Nitrite (NO ₂ ⁻)	<0.01	0.01
pH, Units	7.4	NA
Solids, Dissolved	330	20.0
Solids, Suspended	<4	4.0
Carbon Dioxide	15	0.1
Silica	<1	1.0

EPA METHOD	ANALYZED
310.1	2/14/00,JP
**Calc	2/14/00,JP
212.3	3/1/00,DK
325.3	2/21/00,JP,DK
341.2	2/18/00,DK,JP
375.4	2/16/00,KS
*4500-NH ₃ -B,C	2/22/00,JP,DK
353.3	2/15/00,DK
354.1	2/15/00,DK,JP
150.1	2/15/00,JP
160.1	2/22/00,JP
160.2	2/22/00,JP
SM4500-CO ₂	2/29/00,DK
SM4500-Si-O ₂	2/29/00,DK

*Standard Methods

**Calculation

MAXIM TECHNOLOGIES, INC.

Dan Krikac

Dan Krikac
Inorganic Laboratory Supervisor

Kate Shreves

Kate Shreves
Microbiologist

REPORT OF CHEMICAL ANALYSIS

REPORT DATE: March 8, 2000
 REPORT TO: MCNEENY STATE FISH HATCHERY
 RR 1 BOX 205
 SPEARFISH SD 57783

JOB NO: 97-2438C

Date Sampled: 2/13/00, 2/14/00
 Date Received: 2/14/00

TOTAL METALS ANALYSIS

Lab # 560
 Sample Desc NEW WELL
 Sample Matrix WATER

PARAMETER	RESULT(mg/l)	LDL	EPA METHOD	ANALYZED
Aluminum (Al)	<1.0	1.0	202.1	2/23/00, DK
Arsenic (As)	<0.005	0.005	206.2	2/18/00, DK
Barium (Ba)	<0.05	0.05	208.1	2/23/00, DK
Cadmium (Cd)	0.02	0.01	213.1	2/18/00, DK
Calcium (Ca)	80	1.0	215.1	2/28/00, DK
Chromium (Cr) Total	<0.10	0.10	218.1	2/18/00, DK
Copper (Cu)	<0.01	0.01	220.1	2/18/00, DK
Iron (Fe)	0.10	0.05	236.1	2/24/00, DK
Lead (Pb)	<0.10	0.10	239.1	2/18/00, DK
Magnesium (Mg)	22	1.0	242.1	2/28/00, DK
Manganese (Mn)	<0.03	0.03	343.1	2/28/00, DK
Mercury (Hg)	0.017	0.0002	245.1	2/22/00, DK
Mossium (K)	2.0	1.0	258.1	3/1/00, DK
Selenium (Se)	0.01	0.002	270.2	2/21/00, DK
Sodium (Na)	12	1.0	373.1	2/28/00, DK
Vanadium (V)	<1.0	1.0	286.1	2/24/00, DK
Zinc (Zn)	0.03	0.01	289.1	2/17/00, DK
Hydrogen Sulfide	<1	1.0	*4500-S ² -E	2/18/00, DK
Uranium (mg/l)	0.002	0.002	ASTM D2907 91	3/1/00, HRI
Uranium (pCi/l)	1	1	ASTM D2907-91	3/1/00, HRI

*Standard Methods

MAXIM TECHNOLOGIES, INC.

Don Krikac

Don Krikac
 Inorganic Laboratory Supervisor

Kate Shreve

Kate Shreve
 Microbiologist

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