WATER PERMIT NO. 6703-3

Name of Applicant: **Todd Worrell**

Address: **13320 Buckland Hall Rd, St. Louis MO** Phone: **314 453-0339**

Amount of Water Claimed: **150 acre-feet** Total Acres: **NA**

Source of Water Supply: ~~**groundwater**~~ groundwater ~~runoff~~

Water to be used for: **recreational and fish & wildlife propagation** County: **Aurora**

Type of Waste Disposal System:

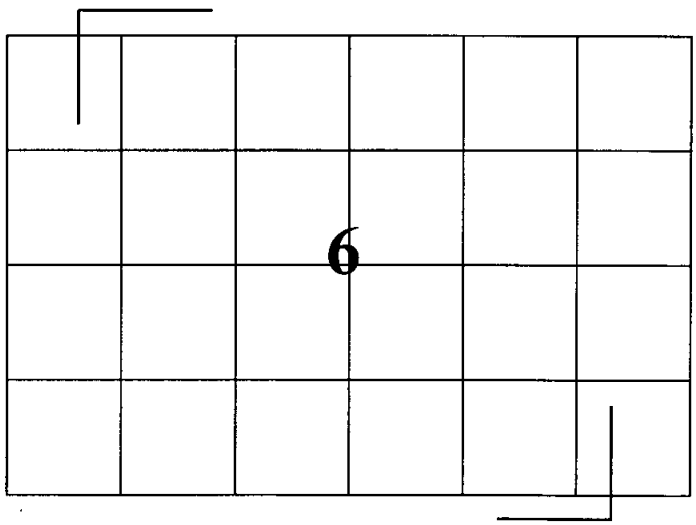
Location: **9 miles northeast of Plankinton**

PRIORITY Date Received: **2-13-06** Application/License Fee: **$**

Corrected Application Received: Period of Annual Use: **January 1 – December 31**

Remarks:

Diversion Point: **NE ¼ SW ¼ Sec 6-T104N-R63W**



Land to be Irrigated: **NA**

Depth of Well:

Well Driller:

Remarks:

Type of Map:

Prepared by:

Reviewed and the Number Assigned on: **3-8-06** By: **Karen Schlaak**

Notice of Hearing - date to intervene: _____

SD EForm - 1585LD V5

FORM 2: Application for uses other than irrigation

(type or print)

Mail to:	(office use only) No. 6703-3 Hydrologic Unit 10160011
DENR - Water Rights 523 E Capitol Ave Pierre, SD 57501-3182 ph. (605) 773-3352	Basin James River Newspaper South Dakota Mail, Plankington Daily Republic, Mitchell

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

Check use(s) of water:

- [ ] Municipal
- [ ] Rural Water System
- [ ] Domestic (over 18 gpm)
- [ ] Water Distribution System
- [ ] Commercial
- [ ] Industrial
- [x] Recreational
- [x] Fish & Wildlife
- [ ] Other
- [ ] Institutional
- [ ] Geothermal

Type of Application: (check one)

- [x] **New**
- [ ] **Vested Right** (Use predates Mar 2, 1955)
- [ ] **Future Use Reservation**
- [ ] **Place to Beneficial Use Water Reserved by Future Use Permit No.** _____
- [ ] **Amendment/Correction to Permit No.** _____

Description of amendment/correction: (i.e. change diversion point(s), add diversion point(s), change use, etc.)
Rehabilitation of existing embankment dam and construct new earth spillway.

1. Name to Appear on Water Permit Todd Worrell

   Mailing Address 810 Simmons Av. (Address) St. Louis (City) MO (State) 63122 (Zip Code)

   Phone _____ Mobile 314-616-6158 Email toddr3838@att.net

2. Amount of water claimed 0.17 *CFS or _____ **GPM and 148.4 ***AF or ~~148.4~~ Gallons
   Flow rate and volume are both required. (*Cubic Feet per Second) (**Gallons per Minute) (***Acre Feet - storage capacity of dam/dugout or annual use)

3. Source of water supply un-named drainage into Firesteel Creek dam SE¼ NW¼, well SE¼ NW¼

4. Location of point of diversion NW 1/4 Sec 6, T104N R63W Impoundment: SE¼ NW¼, Lot 5, Lot 4 County Aurora
   (example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W)

   If not a public water supply (e.g. municipal), will water be used outside of the area described above? [ ] Yes [x] No

   If "Yes," where will water be used? N/A
   (example - NW1/4 section 12-T104N-R53W)

5. County or counties where water will be used Aurora

6. Annual period during which water is to be used all 12 months

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

   Please see the attached project summary.
   well water also used for dog Kennel

I, Todd Worrell, [signature] _____, the applicant, certify under
Name of Person Title (if applicable)
penalty of perjury that I have read this application, examined the attached map, and that the matters stated are true. I further certify, if acting on behalf of an entity or individual other than myself, that I am authorized to submit this application.

2015-10

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

SOUTH DAKOTA
WATER PERMIT NO. 6703-3

Date of first receipt of application February 13, 2006.
Date of return to applicant for corrections, amendments or changes March 10, 2006.
Date of receipt of corrected application June 13, 2016.

The Chief Engineer, on behalf of the Water Management Board, issues Water Permit No. 6703-3 to Todd Worrell, 810 Simmons Ave, St. Louis MO 63122 authorizing the construction of the water use system and the placing of water to beneficial use subject to the following limitations, conditions and qualifications:

1. Water Permit No. 6703-3 authorizes impoundment of 150 acre-feet of water from an un-named drainage to Firesteel Creek by reconstructing a dam located in the SE 1/4 NW 1/4 Section 6 and appropriating 0.17 cubic feet of water per second from one well to be completed into the Niobrara aquifer (180 feet deep) located in the SE 1/4 NW 1/4 Section 6; all in T104N-R63W. The dam will impound water in the SE 1/4 NW 1/4, Lots 4 and 5 Section 6; all in T104N-R63W. The well will be used to maintain a water level in the dam as well as be a source of water for dog kennels. The permit authorizes impoundment of sufficient water to maintain the water level in the dam to the outlet elevation of 1287.0 feet mean sea level. The project will have the ability to divert water from the dam to three wetland areas formed by berms and ditch plugs with an approximate surface area of 14 acres located in portions of Lots 1, 2, 3 and the S 1/2 NE 1/4 Section 6; SW 1/4 NW 1/4 Section 5; all in T104N-R63W.

2. The water appropriated shall be used for the purpose of fish and wildlife propagation and recreational purposes and may not exceed the amount of water needed for beneficial use.

3. The water is to be used during the following described annual period: January 1 – December 31.

4. The date of approval of Permit No. 6703-3 is September 26, 2016.

5. The date from which applicant may claim right is June 13, 2016.

6. One-fifth of the construction is to be completed on or before March 26, 2019.

7. All construction is to be completed on or before September 26, 2021.

8. Water is to be put to beneficial use on or before September 26, 2025.

9. Water rights obtained in compliance with the laws of the State of South Dakota may not be unlawfully impaired by this appropriation.

QUALIFICATIONS

1. 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.

2. The well authorized by Permit No. 6703-3 shall be constructed by a licensed well driller and construction of the well and installation of the pump shall comply with Water Management Board Well Construction Rules, Chapter 74:02:04 with the well casing pressure grouted (bottom to top) pursuant to Section 74:02:04:28.

(continued)

3. Water Permit No. 6703-3 authorizes an impoundment with a storage capacity of 150 acre feet of water and sufficient water annually to maintain the water level to an outlet elevation of 1,287.0 feet mean sea level.

4. No pumping from the well into the dam is authorized when the water level in the lake is at or above the primary outlet elevation of 1,287.0 feet mean sea level.

5. The Permit Holder shall report to the Chief Engineer annually the amount of water withdrawn each year from the Niobrara aquifer.

6. Approval of Water Permit No. 6703-3 cancels Water Permit No. 4285-3 and withdraws Application No. 4285A-3.

WATER MANAGEMENT BOARD

By: Jeanne Goodman

Jeanne Goodman, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

OCT 0 4 2016
date

Form 2A
(Complete applicable portions only)

Supplemental Information

(type or print)

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1. Well Information (check one or both as applicable) ☒ Drilling new well(s) ☐ Using existing well(s)

a) If new wells, how many 1 Have test holes been drilled ☐ Yes ☒ No Drilled by _____
(if yes, please provide copies of logs)

b) If existing wells, how many ___ Provide copy of log(s), if available. Drilled by _____

For either Existing or Proposed Wells:

c) Well Depth (required) 180 Depth to Top of Water Bearing Material _____ Depth to Water from Surface _____

d) Distance to nearest domestic well on applicant's property 1/2 mile Property owned by others _____

2. Wastewater Disposal System Information

a) Type of System (i.e. septic tank, drain field) _____

b) System Capacity (gallons) _____ Year Constructed _____

c) Connected to the City of _____ Sanitary System

3. Dugout Information

a) Surface Dimensions _____ Depth _____

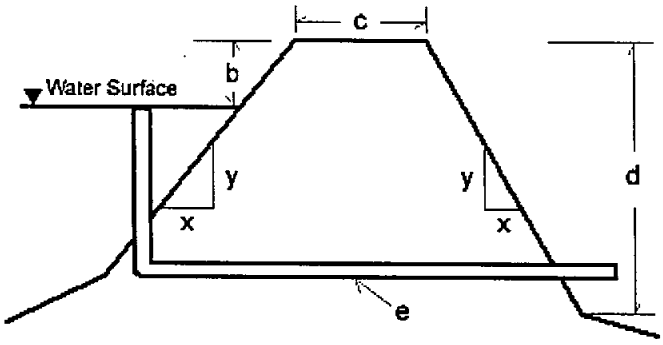
b) Depth to water (ground surface to water level) _____

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:

Dana Edwards
USDA-NRCS
1717 N. Lincoln Av.
Pierre, SD 57501



b) Freeboard 4 feet

c) Crest Width 12 feet

Crest Length 770 feet

d) Height 14

e) Primary Outlet Capacity 8.2 cfs

If pipe, diameter 10 inch

f) Secondary Spillway Capacity 281 cfs

Spillway Width 100 feet

g) X & Y Slope (e.g. 3 to 1 is a typical slope)

Upstream 3:1

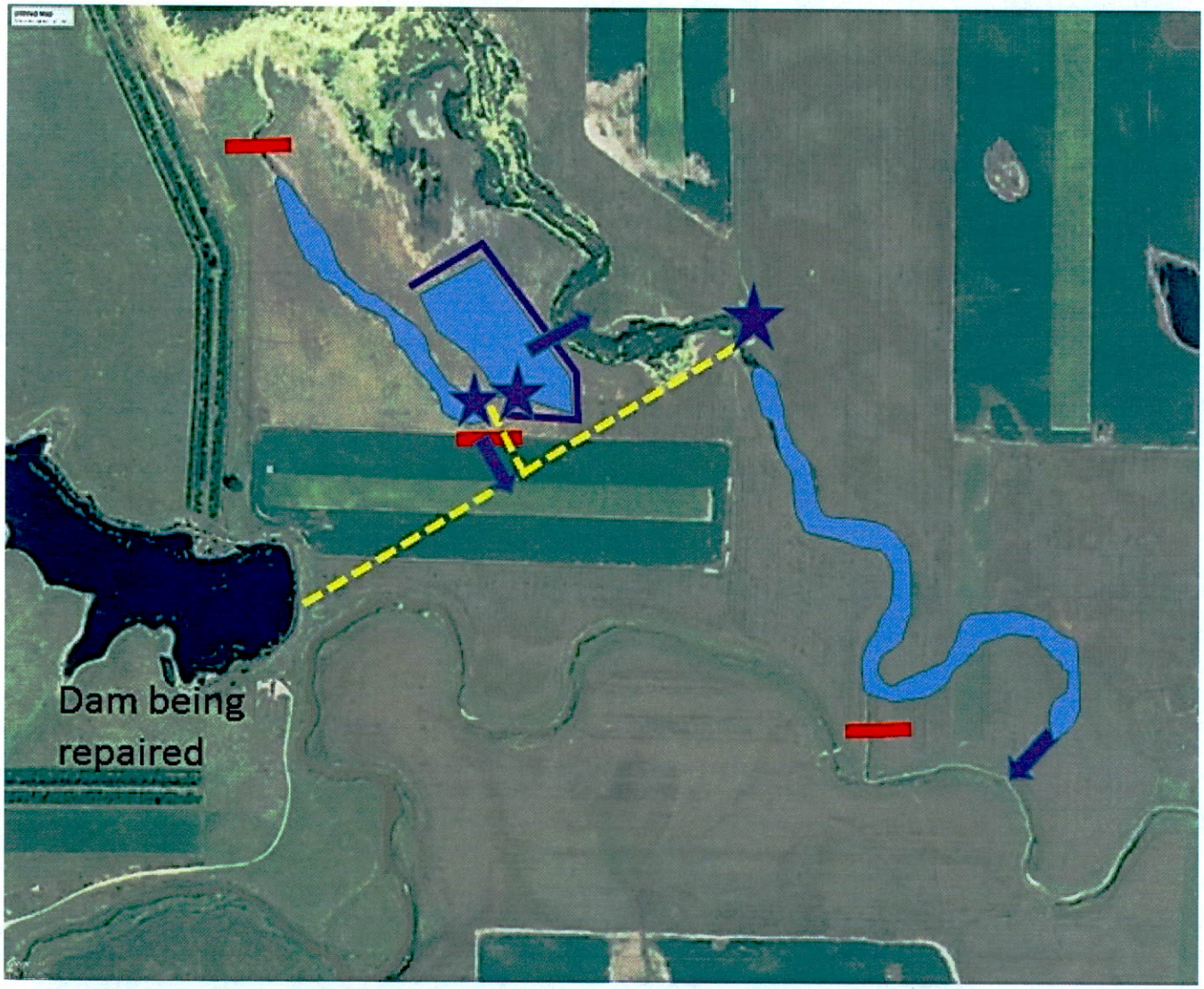
Downstream 2:1

h) Surface Area of Impoundment 30 Acres

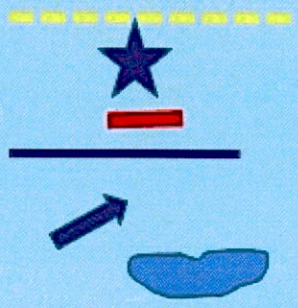
i) Storage 148.4 Acre Feet

j) Drainage Area Above Dam 1,741.0 Acres

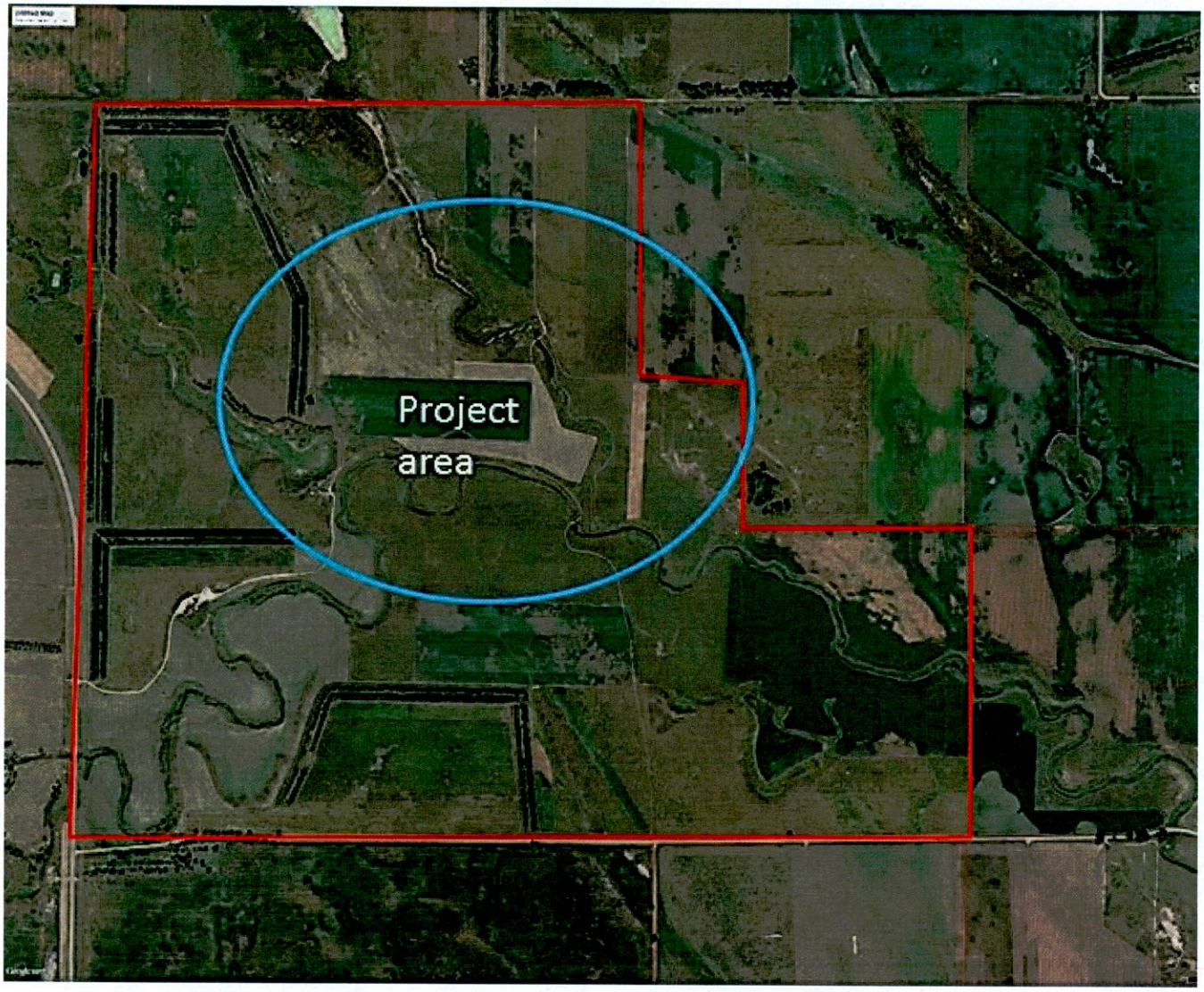
Todd Worrell, preliminary concept plan



Key:
Water pipeline
Discharge valves
Potential wetland berms/ditch plugs
Proposed wetland dike
Water control structure
Anticipated pond size

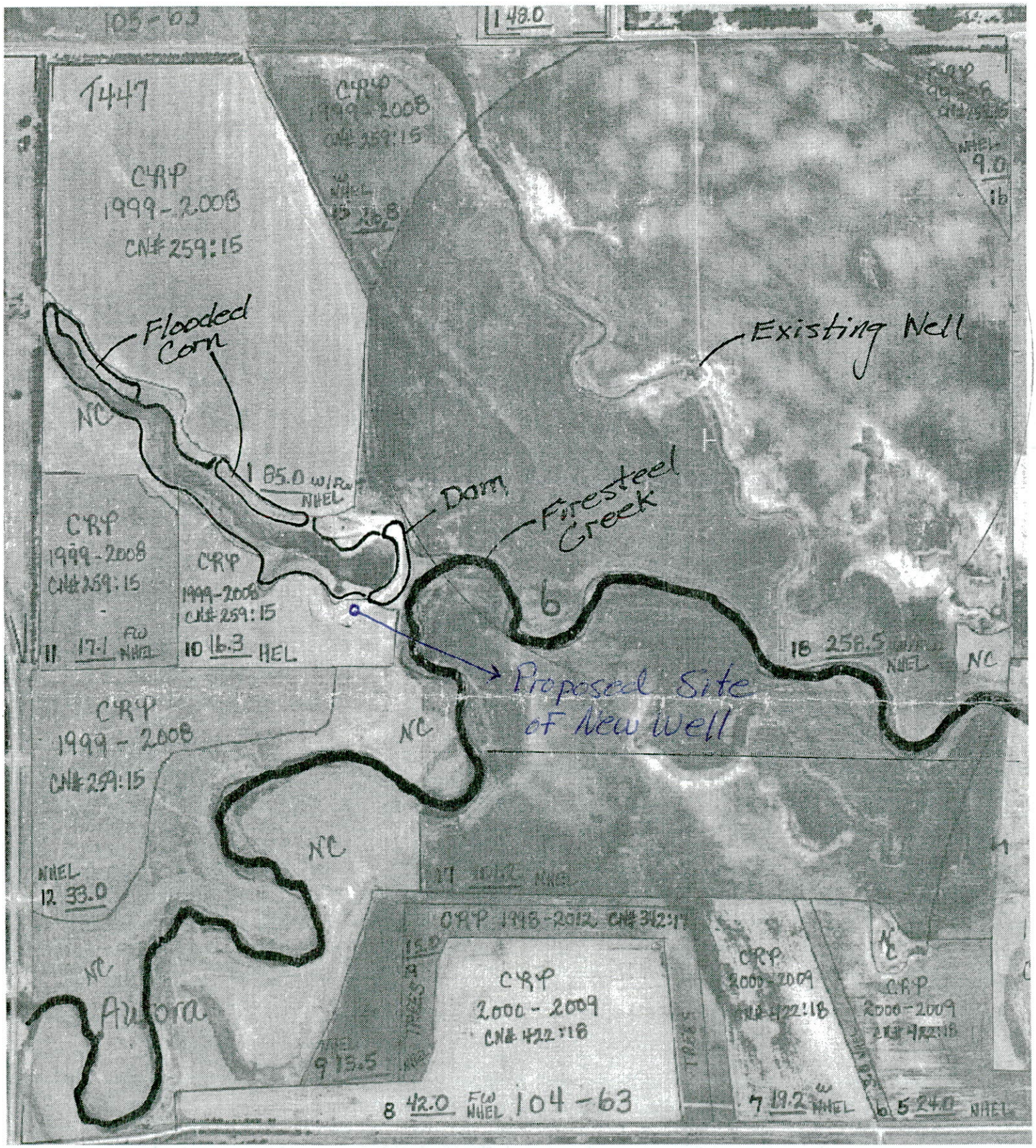


Todd Worrell, property boundary

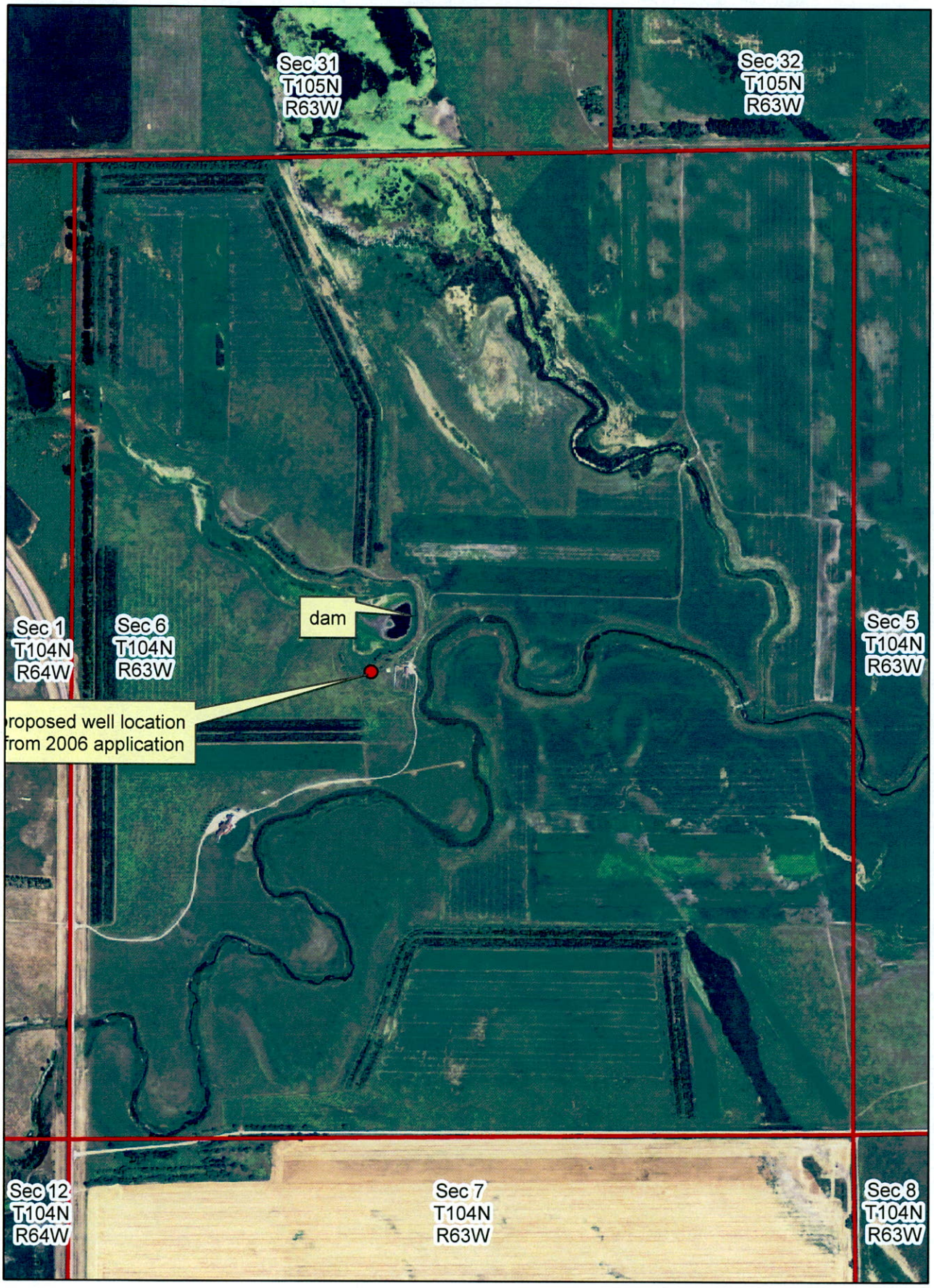


T. 104 N. R. 63 W. Section 6 all, Section 5
SW1/4, part of SW1/4NW1/4, Aurora County

MAP NOT TO SCALE
THIS IS NOT AN OFFICIAL WETLAND MAP



WORRELL APPLICATION

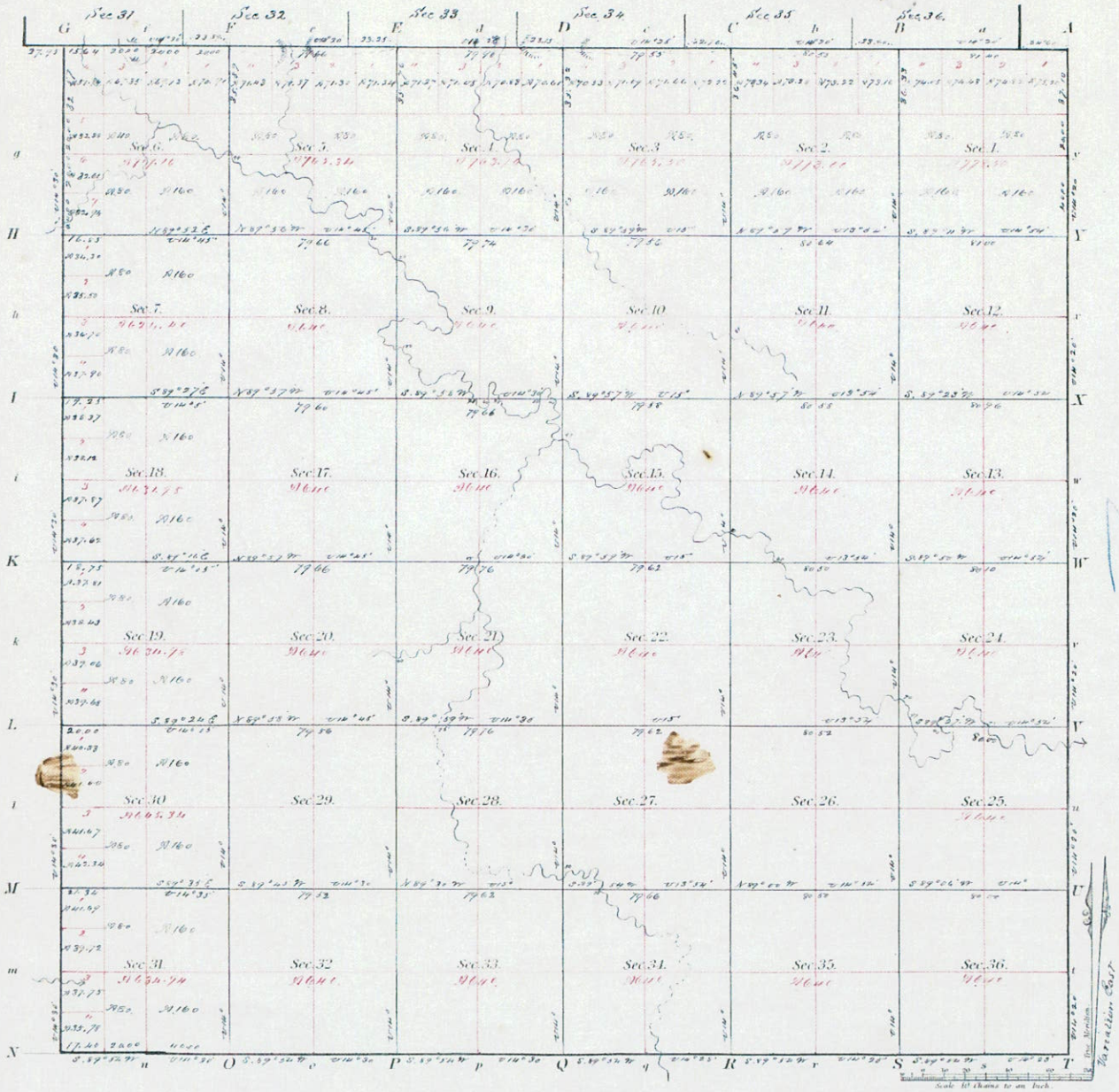


N

1,000 500 0 1,000 Feet

Filed with: Surveyor Gen's letter of 2 Jan 1874

TOWNSHIP No. 104 North RANGE No. 63 West of the 5th Principal MERIDIAN — SOUTH DAKOTA



Meanders of

Posts	Courses	Ch^ns Lk^s	Posts	Courses	Ch^ns Lk^s	Posts	Courses	Ch^ns Lk^s

Paid Report 25519

Area noted in Exact 15002
Dec 9-1877

Total number of Acres 23,734.91

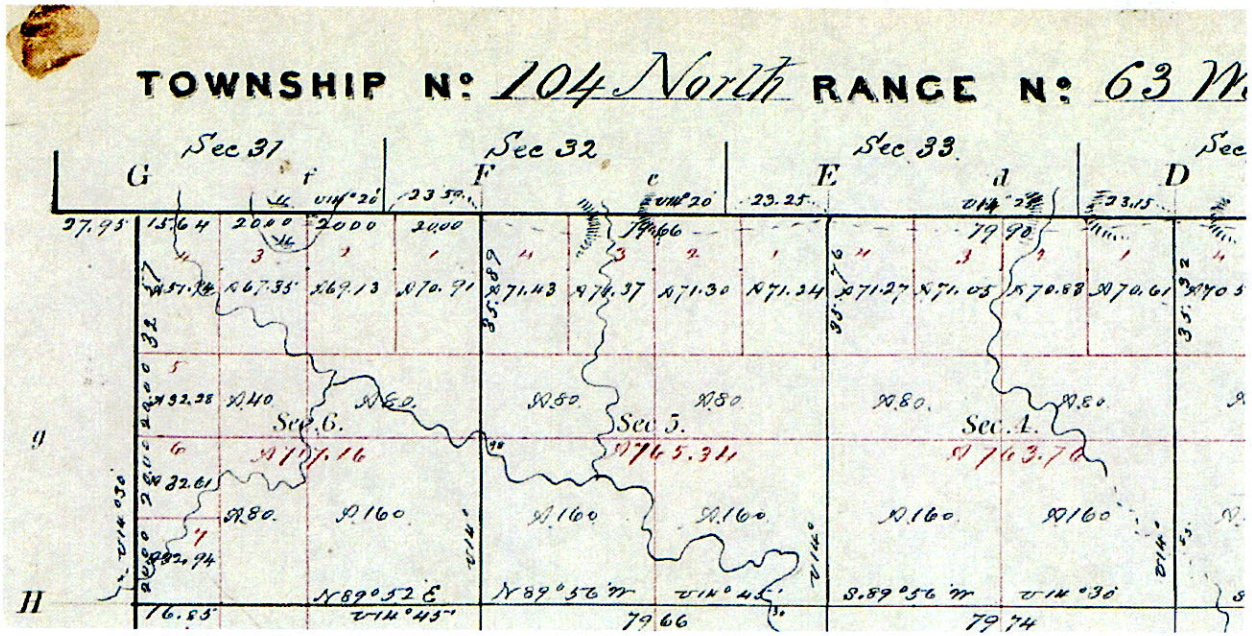
	Surveys Designated	By Whom Surveyed	Date of Contract	Amount of Surveys			When Surveyed
S E ⅓	Township lines	George N. Pepper	May 28th 1869	16	00	00	October 1869
	Subdivisions	Newton Edmunds	May 29th 1872	62	31	21	Sept 18th to 20th inclusive 1873
North	Township lines	M. K. Brookings	Aug 4th 1868	5	76	68	August 1868

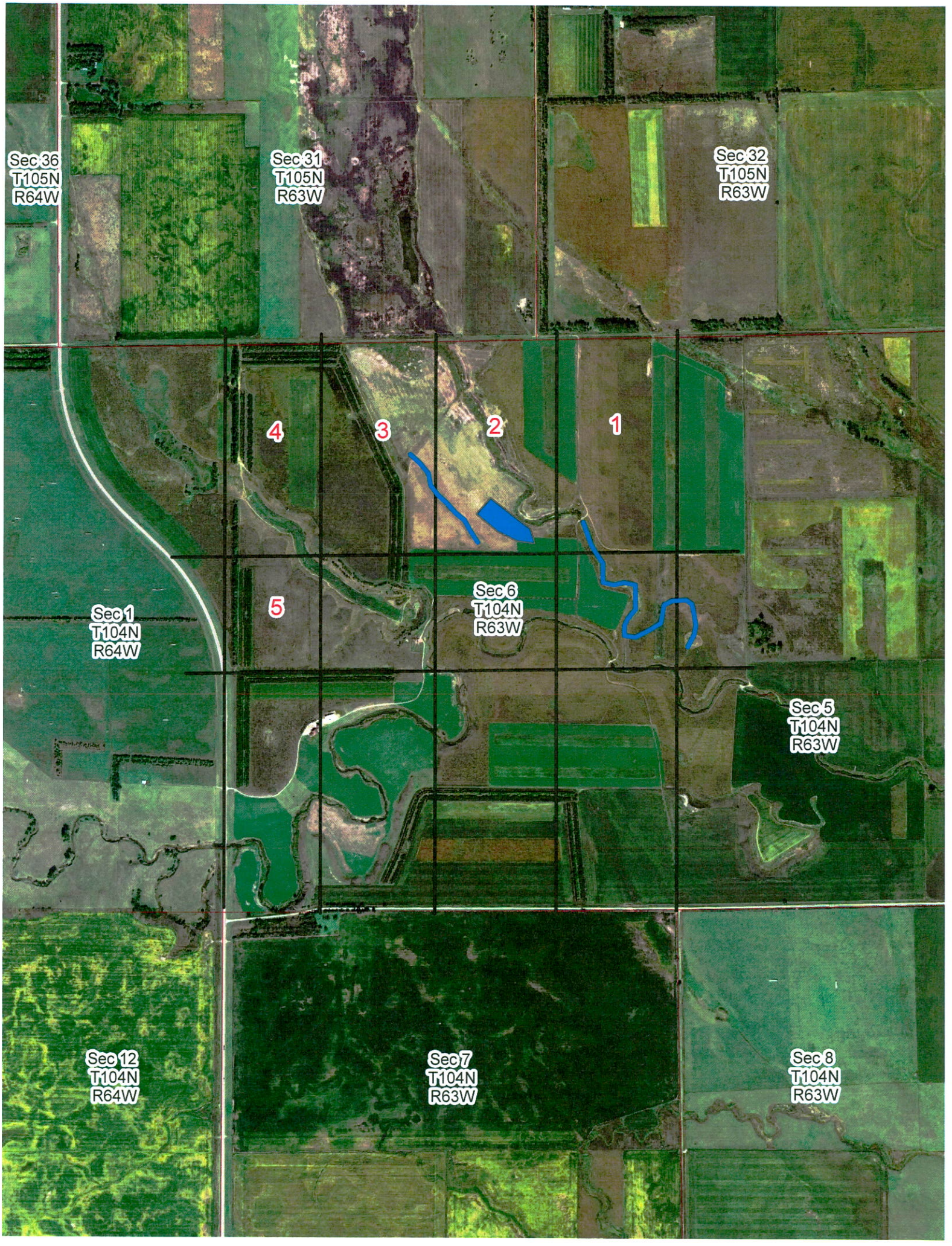
The above Map of Township No. 104 North of Range No. 63 West of the 5th Principal Meridian Dakota Territory is strictly conformable to the field notes of the survey thereof on file in this Office, which have been examined and approved.

Surveyor Generals Office,
Yankton D. T. December 31st 1873

W. H. Dewey
Sur. Gen.

Duplicate plat filed in U.S. Land Office at Springfield S.D. January 27th 1874 as per Register receipt


TOWNSHIP No: 104 North RANGE No: 63 W.
Sec 31
Sec 32
Sec 33
G
F
E
D
Sec. 6.
Sec. 5.
Sec. 4.
N 89° 52 E
N 89° 56 m
S. 89° 56 m
79.66
79.74


Sec 36
T105N
R64W
Sec 31
T105N
R63W
Sec 32
T105N
R63W
4
3
2
1
5
Sec 6
T104N
R63W
Sec 1
T104N
R64W
Sec 5
T104N
R63W
Sec 12
T104N
R64W
Sec 7
T104N
R63W
Sec 8
T104N
R63W

RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date 6/24, 20 16

RECEIVED OF Firesteel Creek Hunting Lodge 810 Simmons Ave Kirkwood MO 63122

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

Fee for Application for Permit No. _____ to Appropriate Water, to construct and to put water to beneficial use	75	00
Fee for Application for Permit No. _____ to Appropriate Water for Future use		
Fee to retain Future Use Permit No. _____ after period of seven years.		
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. _____		
Fee for Filing Transfer Form _____		
Fee for _____		
Fee for Issuing New Well Driller's License No. _____ for C.Y. _____		
Fee for Renewal of Well Driller's License No _____ for C.Y. _____		
Fee for Issuing Well Pump Installer's License No. _____ for C.Y. _____		
Fee for Renewal of Well Pump Installer's License No. _____ for C.Y. _____		
(Any Other Work Provided by Law) TOTAL	75	00

No. 07868

By Jean Goodman
Chief Engineer

RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date February 13, 20 06

RECEIVED OF Firesteel Creek Hunting Lodge, 24466 US Hwy 281 Plankington SD 57368

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

Fee for Application for Permit No. _____ to Appropriate Water, to construct and to put water to beneficial use	150	00
Fee for Application for Permit No. _____ to Appropriate Water for Future use		
Fee to retain Future Use Permit No. _____ after period of seven years.		
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. _____	50	00
Fee for Filing Transfer Form _____		
Fee for _____		
Fee for Issuing New Well Driller's License No. _____ for C.Y. _____		
Fee for Renewal of Well Driller's License No _____ for C.Y. _____		
Fee for Issuing Well Pump Installer's License No. _____ for C.Y. _____		
Fee for Renewal of Well Pump Installer's License No. _____ for C.Y. _____		
(Any Other Work Provided by Law) TOTAL	200.00	

No. 32297

By Darland Eilers

Chief Engineer

P & S Review 7/18/16 T65

Water Permit Application No 6703-3
Todd Worrell

Top of Dam Elev. - 1291
2nd Spillway Elev. - 1288.2
P. Spillway Elev - 1287
D/S Emb. Toe Elev - 1277

Ht = 14 ft.

Cat. 3 - Low Hazard Dam

Normal Storage Capacity - 148.4 Ac-ft
Int Storage Capacity - 188.8
Max Storage Capacity - 302.3

Int Cap. x Eff Ht. = 188.8 x 15.7 = 2964 < 3000 ∴ 25 year Minimum Spillway Design

From USGS WRI 98-4055 "Tech for Est Flood Peaks ... in SD"
Region II DA = 1741 Ac = 2.72 mi² P_{II} = 1.0

$Q_{25} = 218\ CA^{.513}\ P_{II}^{4.80}$

$= 218(2.72)^{.513}(1)^{4.80}$

$= 218(1.67)(1.0)$

$= 365$ cfs

$Q_{100} = 362\ CA^{.521}\ P_{II}^{4.47}$

$= 362(2.72)^{.521}(1.0)^{4.47}$

$= 362(1.68)(1)$

$= 610$ cfs

Secondary Spillway Capacity

$Q = CLH^{3/2}$ C = 2.6, L = 100, H = 2.8

$= 2.6(100)(2.8)^{1.5}$

$= 1218$ cfs

NRCS Annual Yield

DA = 1741 Ac CN = 65 ISO = 2 1/2

80% chance = 0.09
0.09 x 1741/12 = 13 Ac-ft

50% chance = 0.27
.27 x 1741/12 = 39 Ac-ft

10% chance = 1.5
1.5 x 1741/12 = 218 Ac-ft

Section 74:02:08:09

1. Topo Map - OK
2. Dam Axis Profile - OK
3. Dam Max X-Sec - OK
4. Area - Capacity - OK
5. Outlet Details - OK
6. Spillway Rating - OK
7. Spillway Details - OK
8. Specs - NRCS - OK
9. EAP - NH Cat. 3 - OK

Gronlund, Eric

From: Gronlund, Eric
Sent: Thursday, June 16, 2016 4:24 PM
To: 'toddr3838@att.net'
Cc: Schaal, Tim
Subject: water permit application for dam
Attachments: Worrellmap.pdf

Todd

DENR has received your revied application for the impoundment of water in the dam and a well to assist in maintaining the water level. We have contacted Dana Edwards with the NRCS to get a copy of the final plans and specifications. A couple of things besides submittal of the plans and specification need to submitted or clarified prior to processing to the application.

1. You submitted $250 for the application/licensing fee back in 2006. The actual fee is $325 based on the fee structure back then (in 2009 the fee structure was increase three fold). Please submit an additional $75 made payable to the Water Rights Program at 523 E. Capitol Avenue, Pierre SD 57501.
2. The revised application does not reference the well. I assume that the well is still part of the project? Is it correct to use the well information for a 160 – 170 foot deep well located in the SE ¼ NW ¼ Section 6 submitted with the original application? Is the location still the same on the map submitted in 2006 (see attachment). If the well location is different, please mark the new proposed location.
3. The project description for the original application discussed raising the water level to flood standing corn and then later lower the water level. When Tim Schaal and I were out there you talked about a Duck Unlimited component to your project where you planned berm some small areas to the northeast of the dam and pump water from the dam to create shallow habitat for waterfowl. Please mark the location where these bermed areas are planned, the number of them contemplated, a general description of the surface area and approximate maximum depth. Also what do you anticipate the pump rate from the dam to these small habitat ponds to be?
4. Do you anticipate continuous pumping of the well to help maintain the water level in the dam? If not, can you estimate the percentage of the time the well would be pumped?

Thanks

Eric Gronlund
Water Rights Program, DENR
605 773-3352
Eric.gronlund@state.sd.us

Application No. 6703-3

Water Rights Program - DENR
Conversation File Documentation

NAME OF PERSON OR FILE: Application No. 6703-3, Worrell

ADDRESS: 810 Simmons Avenue, St Louis MO 63122 COUNTY: Aurora County

DATE: June 17, 2016 TELEPHONE: 314 616-6158

RE: response to my June 16, 2016 email

Mr. Worrell called to respond to my email dated June 16, 2016.

1. He will submit an additional $75.
2. The well remains part of the project. It is anticipated to by between 180 – 200 feet.
3. The well location is approximate where the attachment to the email showed.
4. In addition to the well being used to maintain the lake, it will also supply the dog kennels.
5. He indicated the waterfowl habitat will now be the small bermed ponds. There are two of them planned. Steve Donovan with Duck Unlimited is supposed to send me information on them. He indicated that the design will be such that water from the dam will gravity flow to fill them up as needed.
6. He stated that at dry time the well may run continuously in order to help fill the impoundment behind the dam.
7. I said we left a message for Dana Edward with NRCS and are awaiting a call back. We want him to forward DENR a copy of the final plans and specifications.

NAME: Eric Gronlund

Gronlund, Eric

From: Todd Worrell <toddr3838@att.net>
Sent: Monday, June 20, 2016 7:27 PM
To: Gronlund, Eric
Subject: FW: draft restoration plans

Eric, Attached are two maps showing the project area that DU is going to develop, if you need more info let me know.
Todd

From: Todd Worrell [mailto:toddr3838@att.net]
Sent: Monday, June 20, 2016 6:21 PM
To: Worrell Todd
Subject: Fwd: draft restoration plans

Sent from my iPhone

Begin forwarded message:

> **From:** Steve Donovan <sdonovan@ducks.org>
> **Date:** June 20, 2016 at 3:48:57 PM CDT
> **To:** "toddr3838@att.net" <toddr3838@att.net>
> **Subject: draft restoration plans**
>
> Todd,
>
> Here you go. Let me know if this is not sufficient.
>
> Thank you
>
> Steve Donovan
> Manager of Conservation Programs
> Ducks Unlimited, Inc.
> 2301 Research Park Way, Suite 247
> Brookings, SD 57006
> (605) 633-0270
> sdonovan@ducks.org

RECEIVED
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WATER RIGHTS
PROGRAM

NRCS

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

TODD WORRELL

POND REHABILITATION PROJECT

NW ¼ Section 6, T. 104 N, R. 63 W
AURORA County, South Dakota

Prepared By:

Natural Resources Conservation Service
Pierre Field Support Office
605-224-2476 Ext. 5

REGISTERED PROFESSIONAL ENGINEER & LAND SURVEYOR
REG. NO. 4729
DANA B. EDWARDS
SOUTH DAKOTA
6/9/2016

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION & MAINTENANCE GUIDELINES

FOR

TODD WORRELL

POND REHABILITATION PROJECT

OPERATION AND MAINTENANCE PLAN
POND
CODE 378

Landowner/Operator Todd Worrell

Job Location NW 1/4 Sec 6 T104N R63W GPS _____

Prepared by Dana Edwards Date 6/8/16

Operation and Maintenance Items

A properly operated and maintained pond is an asset to your farm. This structure was designed and installed to provide storage to runoff water for beneficial use. The estimated life span of this installation is at least 10-20 years. The life of this installation can be assured and usually increased by developing and carrying out an effective operation and maintenance program. Here are some recommendations for effective operation and maintenance:

- ☐ Inspect the pond after the first significant rainfall and again after each rain until the pond is filled to the inlet elevation.
- ☐ Avoid using vegetated spillways as a travel lane for vehicles and/or farm machinery.
- ☐ Excessive erosion, settlement, and/or cracks in earthen sections must be investigated (to determine the cause) and repaired.
- ☐ Periodically inspect spillways and control gates, valves, and weirs for proper functioning and their ability to maintain the water level to design elevations. Remove debris or flow blockages.
- ☐ Inspect metal surfaces for rust and other damage. Especially inspect sections in contact with earthfill and/or other materials. Repair or replace damaged sections and apply a protective covering.
- ☐ Inspect concrete for accelerated weathering, spalling, settlement, misalignment, or cracks. Repair defects.
- ☐ Inspect rock riprap for accelerated weathering and displacement. Repair to original grades if necessary.
- ☐ Check for unusual seepage on the backside of the dam. Check for water flowing underneath the pipe at the outlet, water flowing in the inlet but not out the outlet, and for water flowing out the outlet but not in the inlet. Make sure all structure drains are functional and soil is not being transported through the drainage system. Screens and/or rodent guards must be maintained and in place.
- ☐ Repair any rodent, burrowing animal, vandalism, vehicle, or livestock damage.
- ☐ Maintain vigorous growth of vegetative coverings. This includes reseeding, fertilization, and application of herbicides when necessary. Periodic mowing or short-term grazing may also be needed.
- ☐ If fences are installed, they must be maintained to prevent unauthorized entry.

Other _____

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

DESIGN DOCUMENTATION

FOR

TODD WORRELL

POND REHABILITATION PROJECT

REGISTERED PROFESSIONAL ENGINEER & LAND SURVEYOR
REG. NO. 4729
DANA B. EDWARDS
SOUTH DAKOTA
6/9/2016

Project Summary

This project consists of rehabilitation of an existing earth embankment dam and constructing a new earth spillway that meets NRCS standards. The existing dam had wave erosion on the dam face narrowing up the top of dam. The existing earth spillway was very narrow and had a head cut on the downstream side of the dam. An existing 10 inch PVC principal spillway is present, the condition of the pipe is unknown but the owner indicated it was functioning and did not have a reason to replace it. An existing 10" PVC draw down pipe with a riser inlet is also present, the condition of the pipe is unknown but it is also functioning. Do to the fact that these two PVC pipes are functioning and the owner wishes to retain them, no further evaluation of the pipes took place as part of this design. The new 100 foot wide auxiliary spillway design was sized utilizing peak runoff from a 50 year – 24 hour storm event and will have a maximum flow depth of 1.8 feet deep. Flow from the existing 10 inch PVC principal spillway was not considered when flood routing the auxiliary spillway but this pipe invert elevation will set the full pool elevation. The excavated material from the spillway was used to reface the upstream dam embankment and reestablish a 12 foot top for the dam. The owner has retained rock that will be placed on the dam in-slope to protect it from future wave erosion.

Construction Schedule:

Construction activities were started when the owner requested a final set of plans. It is anticipated that construction will be completed by mid-summer.

Operations and Maintenance:

See the attached O&M document.

Authority:

The project was designed and engineering job approval by Dana Edwards PE,LS, Civil Engineer, Pierre Field Support Office, Pierre, South Dakota at the direction of the project owner.

Operator Informantion:

Owner:

Todd Worrell, 810 Simmons Av. St. Louis Mo. 63122 Phone: 314-616-6158.

Project Site:

NW ¼ Section 6, T104N R63W

Dana Edwards June 9, 2016

Dana Edwards PE,LS
Civil Engineer

Date

REGISTERED PROFESSIONAL ENGINEER & LAND SURVEYOR
REG. NO. 4729
DANA B. EDWARDS
SOUTH DAKOTA
6/9/2016

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*****************************************************************************
SITES XEQ 05/16/2016   WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
     VER 2005.1.8                (USER MANUAL - DATED DECEMBER 2005)
     TIME 13:47:31

************************** 80-80 LIST OF INPUT Data **************************

SITES      01/01/2005                                          2.7203125 H4
SAVMOV     0     101
SAVMOV     101   1
STRUCTURE                1287      148.4AcFt   30.0 Acres                1
                         1275      1.01
                         1276      2.15
                         1277      4.05
                         1278      5.65
                         1279      7.60
                         1280      9.36
                         1281      11.32
                         1282      13.64
                         1283      15.41
                         1284      17.18
                         1285.5    23.44
                         1286      25.08
                         1288      35.60
                         1289      42.2
ENDTABLE
WSDATA     5A1     AC 65          1741 Drainage Area  17300     1.72
RAINTABLE mse2         24         MSE2
                         0.000000  0.000170  0.000359  0.000565  0.000790
                         0.001030  0.001290  0.001570  0.001870  0.002180
                         0.002510  0.002860  0.003230  0.003620  0.004020
                         0.004440  0.004880  0.005340  0.005810  0.006310
                         0.006820  0.007350  0.007890  0.008460  0.009040
                         0.009640  0.010260  0.010900  0.011550  0.012230
                         0.012920  0.013630  0.014350  0.015100  0.015860
                         0.016640  0.017440  0.018250  0.019090  0.019940
                         0.020810  0.021700  0.022600  0.023530  0.024470
                         0.025430  0.026410  0.027400  0.028420  0.029450
                         0.030500  0.031560  0.032650  0.033750  0.034870
                         0.036010  0.037170  0.038350  0.039540  0.040750
                         0.041980  0.043220  0.044490  0.045770  0.047070
                         0.048390  0.049730  0.051080  0.052450  0.053840
                         0.055250  0.056680  0.058120  0.059580  0.061060
                         0.062560  0.064080  0.065610  0.067160  0.068730
                         0.070320  0.071930  0.073550  0.075190  0.076850
                         0.078530  0.080220  0.081940  0.083670  0.085420
                         0.087180  0.090120  0.093100  0.096120  0.099190
                         0.102290  0.105450  0.108640  0.111880  0.115160
                         0.118490  0.121850  0.125270  0.128720  0.132220
                         0.135760  0.141150  0.147320  0.154280  0.162030
                         0.170560  0.179880  0.189980  0.200870  0.212540
                         0.225000  0.243980  0.269120  0.304660  0.356220
                         0.456270  0.643780  0.695340  0.730880  0.756020
                         0.775000  0.787460  0.799130  0.810020  0.820120
                         0.829440  0.837970  0.845720  0.852680  0.858850
                         0.864240  0.867780  0.871280  0.874730  0.878150
                         0.881510  0.884840  0.888120  0.891360  0.894550
```

```
                    0.897710  0.900810  0.903880  0.906900  0.909880
                    0.912820  0.914580  0.916330  0.918060  0.919780
                    0.921470  0.923150  0.924810  0.926450  0.928070
                    0.929680  0.931270  0.932840  0.934390  0.935920
                    0.937440  0.938940  0.940420  0.941880  0.943320
                    0.944750  0.946160  0.947550  0.948920  0.950270
                    0.951610  0.952930  0.954230  0.955510  0.956780
                    0.958020  0.959250  0.960460  0.961650  0.962830
                    0.963990  0.965130  0.966250  0.967350  0.968440
                    0.969500  0.970550  0.971580  0.972600  0.973590
                    0.974570  0.975530  0.976470  0.977400  0.978300
                    0.979190  0.980060  0.980910  0.981750  0.982560
                    0.983360  0.984140  0.984900  0.985650  0.986370
                    0.987080  0.987770  0.988450  0.989100  0.989740
                    0.990360  0.990960  0.991540  0.992110  0.992650
                    0.993180  0.993690  0.994190  0.994660  0.995120
                    0.995560  0.995980  0.996380  0.996770  0.997140
                    0.997490  0.997820  0.998130  0.998430  0.998710
                    0.998970  0.999210  0.999435  0.999641  0.999830
                    1.000000
ENDTABLE
PDIRECT                                           4.80
POOLDATA  ELEV                1288.2              1272.5    1272.5    NH
ASDATA    41 300    100                   3                 .01       2
ASCREST   ELEV      1288.2
ASINSURF  41                  4.4-50yr                                D
ASINLET   41        0.0       0.0       80        0.0                 3
                    180       10
ENDTABLE
ASEXSURF  41                  .035
                              .65       0
                              2
                              2         0
                              .0075
ENDTABLE
ASEXIT    41        N                                         100
BTMWIDTH  FEET      100
GRAPHICS  I
GO,DESIGN HL        mse2      24        mse2 378  24
SAVMOV    2    101  1
ENDJOB

*******************************************************************************

***** MESSAGE - ALTERNATE STRUCTURE ID (S   1) BEING USED
                SINCE USER DID NOT INPUT AN ID.

***** MESSAGE - ALTERNATE SUBWATERSHED ID ( A) BEING USED SINCE
                 USER DID NOT INPUT AN ID.

***** MESSAGE - DRAINAGE AREA FROM WSDATA CONTROL BEING CONVERTED FROM
                  ACRES TO SQUARE MILES FOR COMPUTATION PURPOSES.


1SITES ---------------------------------------------------------------------
 XEQ 05/16/2016                                                  WSID=
 VER 2005.1.8                                                      SUBW=  A
```

TIME 13:47:31 SITE = S 1 PASS= 1 PART= 1

********** BASIC Data **********

CLIMATE AREA - NOT DEFINED DESIGN CLASS A1 = LT 3000.

STORM DISTRIBUTION-PSH MSE2
PRINCIPAL SPILLWAY DURATION = 24.00 HOURS

STORM DISTRIBUTION AUX. -MSE2

PRECIP. -	Q-PS,1-DAY	Q-PS,10-DAY	P-SD	P-FB	
	0.00	0.00	0.00	4.80	
WSDATA -	CN	DA-SM	TC/L	-/H	QRF
	65.00	2.72	17300.00	1.72	0.00
SITEDATA-	PERM POOL	CREST PS	FP SED	VALLEY FL	378?
	0.00	1288.20	0.00	1272.50	YES
	BASEFLOW	INITIAL EL	EXTRA VOL	SITE TYPE	
	0.00	0.00	0.00	DESIGN	
PSDATA -	NO. COND	COND L	DIA/W	-/H	
	0.00	0.00	0.00	0.00	
	PS N	KE	WEIR L	TW EL	
	0.000	0.00	0.00	0.00	
	2ND STG	ORF H	ORF L	START AUX.	
	0.00	0.00	0.00	0.00	
ASCRESTS -	AUX.1	AUX.2	AUX.3	AUX.4	AUX.5
	1288.20	0.00	0.00	0.00	0.00
AUX.Data -	REF.NO.	RETARD. Ci	TIE STATION	INLET LENGTH	
	41	0.00	300.00	100	
AUX.Data -	INLET Ci	SIDE SLOPE	EXIT N	EXIT SLOPE	ACTUAL AUX?
	4.400	3.00	0.035	0.010	NO
BTM WIDTH -	BW1	BW2	BW3	BW4	BW5
ft	100.00	0.00	0.00	0.00	0.00

AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.

1SITES ----------

XEQ 05/16/2016 WSID=
VER 2005.1.8 SUBW= A
TIME 13:47:31 SITE = S 1 PASS= 1 PART= 2

MESSAGE ---- Climatic Index changed from 0.0 to 1.0 for this run.

CREST PS	1288.20 FT	188.8 ACFT	36.92 AC	0.0 CFS
SED ACCUM	1288.20 FT	188.8 ACFT	36.92 AC	0.0 CFS

START ELEV 1288.20 FT 188.8 ACFT 36.92 AC 0.0 CFS

1SITES ----------

XEQ 05/16/2016 WSID=
VER 2005.1.8 SUBW= A
TIME 13:47:31 SITE = S 1 PASS= 1 PART= 3

AUX. CREST 1288.20 FT 188.8 ACFT 36.92 AC 0.0 CFS

PS STORAGE 0.0 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

START ELEV 1288.20 FT 188.8 ACFT 36.92 AC 0.0 CFS

EFFECTIVE HEIGHT(H)= 15.7 FEET, PRODUCT= 2964. (H * STORAGE AT CREST AUX.).

INPUT DESIGN CLASS = A1 = LT 3000. PRODUCT.

NRCS-FBH D= 24.00 HR P= 4.80 IN Q= 1.52 IN DA= 2.72 SM
TC= 6.02 HR CN= 65.00 VOL= 220.8 ACFT

PEAK = 407.2 CFS, AT 16.1 HRS.

****

RATING TABLE DEVELOPED, SITE = S 1:
BY PROGRAM FOR PS AND AUX. SPILLWAYS
AUX. RATING USED WSPVRT METHOD.

***** MESSAGE - THE PS RATING CONTAINS NO OR INSIGNIFICANT FLOW VALUES.

RATING TABLE NUMBER 2

	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	1288.20	0.00	0.00	0.00	188.80	36.92
2	1288.20	0.00	0.00	0.00	188.80	36.92
3	1288.20	0.00	0.00	0.00	188.80	36.92
4	1288.20	0.00	0.00	0.00	188.80	36.92
5	1288.20	0.00	0.00	0.00	188.80	36.92
6	1288.20	0.00	0.00	0.00	188.80	36.92
7	1288.20	0.00	0.00	0.00	188.80	36.92
8	1288.20	0.00	0.00	0.00	188.80	36.92
9	1288.20	0.00	0.00	0.00	188.80	36.92
10	1288.20	0.00	0.00	0.00	188.80	36.92
11	1288.20	0.00	0.00	0.00	188.80	36.92
12	1288.20	0.00	0.00	0.00	188.80	36.92
13	1288.20	0.00	0.00	0.00	188.80	36.92
14	1288.24	1.35	0.00	1.35	190.28	37.18
15	1288.28	2.69	0.00	2.69	191.77	37.45
16	1288.35	5.10	0.00	5.10	194.49	37.92
17	1288.44	8.06	0.00	8.06	197.85	38.50
18	1288.60	13.44	0.00	13.44	204.10	39.56
19	1288.80	23.14	0.00	23.14	212.14	40.88
20	1289.00	64.12	0.00	64.12	220.45	42.20

****

SUMMARY OF AUXILIARY SPILLWAY SURFACE CONDITIONS USED IN COMPUTATIONS BY REACH

REACH	FROM STA (ft)	TO STA (ft)	SLOPE (%)	RETARDANCE CURVE INDEX@	VEGETAL COVER FACTOR	MAINT. CODE	ROOTING DEPTH (ft)	REACH LOCATION *
1	200.	220.	-10.0	4.4	**	**	**	INLET
2	220.	300.	0.0	4.4	**	**	**	CREST
3	300.	400.	1.0	0.035	0.65	2	2.0	EXIT !

@ The program interprets retardance curve index entries of less than 1 as Manning's n values.
* Upper case indicates a reach of constructed spillway channel.
** The program does not use vegetal cover factor, maintenance code, and rooting depth for inlet and crest reaches in computations.
! Reach 3 used in computing exit channel velocities.
****

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.-HP FT	VOL-AUX. ACFT
NRCS-FBH	100.0	1289.97	264.5	48.6	1.77	75.7

^^^^^ NOTE -- ACTUAL Hp OF 1.77 RAISED TO MEET MIN. 378 CRITERIA.

PEAK - CFS DISCHARGE =	Q-PS	Q-AUX.	Q-TOT.
	0.0	281.3	281.3

AUXILIARY SPILLWAY ---	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
	0.62	4.44	0.021	0.029

****

EROSIONALLY EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
(Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)
Aux. Spillway Discharge = 281. cfs; Bottom Width = 100. ft

REACH NO.	FROM STA	TO STA	SLOPE %	MANNING'S n	VELOCITY ft/s	TOTAL STRESS lb/ft^2	EFFECTIVE STRESS lb/ft^2
3	300.	400.	1.00	0.035	3.53	0.49	0.096

****

AUXILIARY SPILLWAY DURATION FLOW = 69.9 HOURS
ATTACK, OE/B = 2.2 ACFT/FT

***** MESSAGE - NHCP378 CRITERIA USED BUT AUXILIARY SPILLWAY RATING NOT BASED ON ASFILE RATINGS.

EXIT CHANNEL FLOW SUBCRITICAL: MAX VELOCITY= 3.5 FT/SEC
EXIT SLOPE = 0.010 FT/FT
FLOW DEPTH = 0.8 FT

***** WARNING - SOLUTION EXCEEDED MAX. INPUT ELEVATION (1289.00) BY 0.97 FT.

```
>>>>> NHCP378 RUN - MINIMUM DEPTH, CREST AUX. TO TOP OF DAM IS  2.00 FT.
                   NEW TOP OF DAM ELEVATION =  1290.20.

ROUTED        BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX    AUX.HP   VOL-AUX.
RESULTS           FT        FT       ACFT      AC         FT       ACFT
MINIMUM AUX.     100.0   1290.20     270.3     50.1       2.00      81.5

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGES =       0.0     310.0     310.0

                         CRITICAL  CRITICAL   CRITICAL   25% OF Q
                           DEPTH   VELOCITY   SLOPE-Sc      Sc
          AUXILIARY         FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---     0.66      4.58      0.021     0.028


>>>>> NHCP378 RUN - MINIMUM DEPTH, DESIGN FLOW TO TOP OF DAM; 1.00 FT REQUIRED
                   FOR THIS PASS.  NEW TOP OF DAM ELEVATION =  1290.97.

ROUTED        BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX    AUX.HP   VOL-AUX.
RESULTS           FT        FT       ACFT      AC         FT       ACFT
MINIMUM AUX.     100.0   1290.97     302.3     55.2       2.77     113.5

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGES =       0.0     467.8     467.8

                         CRITICAL  CRITICAL   CRITICAL   25% OF Q
                           DEPTH   VELOCITY   SLOPE-Sc      Sc
          AUXILIARY         FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---     0.87      5.23      0.019     0.026

***** WARNING - SOLUTION EXCEEDED MAX. INPUT ELEVATION ( 1289.00) BY   1.97 FT.

 Inflow Hyd 1 FBH-Peak =       281.35 CFS  at   17.95 hrs.,  Location Point
HYDOUT   1

1SITES....JOB NO.  1 COMPLETE.
 ---------------------------------------------------------------------------


       0 SUBWATERSHED(S) ANALYZED.

       1 STRUCTURE(S) ANALYZED.

       1 HYDROGRAPHS ROUTED AT LOWEST SITE.

       0 TRIALS TO OBTAIN BOTTOM WIDTH FOR SPECIFIED STRESS OR VELOCITY.

 ***************************************************************************


 SITES.....COMPUTATIONS COMPLETE
```

>>>	SITE ID	SUBWS ID	SUBWS DA (SQ MI)	CURVE NO.	TC (HRS)	TOTAL DA (SQ MI)	TYPE DESIGN	STRUC CLASS	<<<
	S 1	A	2.72	65.	6.02	2.72	378NR	A1	

PASS NO.	DIA./ WIDTH (IN/FT)	AUX.CREST ELEV (FT)	BTM. WIDTH (FT)	MAX. HP (FT)	MAX. ELEV (FT)	EMB. VOL. (CY)	INTEGR.* DIST. (FT)	EXIT* VEL. (FT/SEC)	TYPE HYD
1	0.0	1288.2	100.0	2.8	1291.0	0.	0.	3.5	MIN. AUX.

* INTEGRITY DIST. AND EXIT VEL. ARE BASED ON THE ROUTED HYDROGRAPH AND WILL NOT RELATE TO THE MAX. ELEV. (TOP OF DAM), WHICH IS SET BY MINIMUM DESIGN CRITERIA.

SITES.....SUMMARY TABLE 1 COMPLETED.

NRCS SITES VERSION 2005.1.8 ,01/01/2005

FILES

INPUT = H:\Documents\Angela.Roman\SITES\Worrell\Worrell.2016.Nopipe\b.d2c
OUTPUT = H:\Documents\Angela.Roman\SITES\Worrell\Worrell.2016.Nopipe\b.OUT
DATED 05/16/2016 13:47:31

GRAPHICS FILES GENERATED

OPTION "L" = H:\Documents\Angela.Roman\SITES\Worrell\Worrell.2016.Nopipe\b.DRG DATED

OPTION "P" = H:\Documents\Angela.Roman\SITES\Worrell\Worrell.2016.Nopipe\b.DHY DATED

OPTION "E" = H:\Documents\Angela.Roman\SITES\Worrell\Worrell.2016.Nopipe\b.DEM DATED

NRCS

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

CONSTRUCTION SPECIFICATIONS

FOR

TODD WORRELL

POND REHABILITATION PROJECT

REGISTERED PROFESSIONAL ENGINEER & LAND SURVEYOR
REG. NO. 4729
DANA B. EDWARDS
SOUTH DAKOTA
6/9/2016

CONSTRUCTION SPECIFICATION

SD-5 EXCAVATION

1. Scope

The work shall consist of excavation required by the drawings and specifications and disposal of the excavated material.

2. Classification

Common Excavation is defined as the excavation of all materials that can be excavated, transported, and unloaded using heavy ripping equipment and heavy rubber tired loaders or scrapers with pusher tractors. This classification includes rocks smaller than one cubic yard.

Rock Excavation is defined as the excavation of all hard, compacted, or cemented materials that require blasting or the use of unusually large ripping and excavating equipment. This classification includes the removal of isolated rocks larger than one cubic yard.

Unclassified Excavation is defined as the excavation of all materials (including rock) encountered, regardless of the nature of the material or the excavation method needed.

3. Use of Excavated Materials

To the extent needed, all suitable materials from excavations shall be used in the construction of specified earth or rock fills. Suitability of materials for specific purposes will be determined by the Natural Resources Conservation Service (NRCS) inspector. The contractor shall not waste or otherwise dispose of suitable excavated materials.

4. Disposal of Waste Materials

All surplus and unsuitable excavated materials will be disposed of at the locations shown on the drawings or designated by the landowner or NRCS inspector. The disposal site shall be left in a neat condition suitable to be seeded without additional shaping and sloped to provide drainage.

5. Excavation Limits

Excavated surfaces too steep to be safe without support, shall be supported as necessary to safeguard the work and workers. The width of the excavation shall be increased if necessary to provide space for sheeting, bracing, shoring, and other supporting installations. The contractor shall furnish, place, and subsequently remove such supporting installations. Excavations outside the lines and limits shown on the drawings required to meet safety requirements shall be the responsibility of the contractor in constructing and maintaining a safe and stable excavation. Excavation side slopes may be flattened for safety reasons where approved by the NRCS inspector. Excavations shall be completed to specified lines and grades prior to placement of earth fill or construction of structures.

7. Borrow Excavation

When suitable materials from specified excavations are insufficient to construct specified fills, additional material shall be obtained from designated borrow areas. The extent and depth of borrow pits shall be as approved by the NRCS inspector. Borrow pits must be shaped to eliminate unsightly conditions and steep or unstable slopes. Borrow areas shall be excavated and finally dressed to blend with the existing topography and sloped to prevent ponding and to provide drainage. All borrow sites shall be left in a neat condition suitable to be seeded without additional shaping.

CONSTRUCTION SPECIFICATION

SD-7S EARTHFILL-CLASS S

1. Scope

The work shall consist of the construction of compacted earth fills where the amount of compaction is to be controlled by specifying a construction method.

2. Materials

All fill materials shall be obtained from required excavations and designated borrow areas. Selection, blending, placement, and compaction of fill will be subject to approval of the Natural Resources Conservation Service inspector.

Fill materials shall contain no frozen material, sod, roots or other perishable material, or rocks larger than eight inches in diameter. Fill shall not be placed on a frozen surface.

3. Foundation Preparation

All foundation (including abutment) surfaces shall be shaped one horizontal to one vertical or flatter except as otherwise specified.

After stripping (see stripping specification), the foundation shall be loosened thoroughly by scarifying or plowing to a minimum depth of four inches. The foundation shall then be compacted by the process specified for the fill.

4. Placement

All foundation excavation and preparation shall be completed and the foundation shall be free of standing water before placing fill. Except as required by the drawings, fill material shall be mixed and uniformly placed throughout the entire fill without lenses, streaks, pockets, or layers of material that differ significantly from surrounding material.

Placement and compaction methods must prevent damage to structures and allow the structure to assume backfill loads gradually and uniformly. Within 2 feet of any structure, fill layer thickness must not exceed 4 inches and equipment loads must not exceed 400 pounds.

Fill shall be placed in approximately horizontal layers. Except as described above, fill layer thickness shall not exceed nine inches for compaction by large machines or four inches for small hand directed power tampers.

If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified parallel to the axis of the fill, to a depth of not less than two inches, before the next layer is placed.

Except as otherwise specified, openings temporarily left in dam fills (for pipe installation, stream flow, etc.,) shall have side slopes three horizontal to one vertical or flatter. When filling the opening, the bonding surface of the fill in place shall be stripped of all material not meeting the requirements of this specification and shall be scarified, moistened, and recompacted as new earthfill is placed.

5. Control of Moisture Content

At the time of compaction, earth fill materials shall have a moisture content that when kneaded in the hand will form a firm ball that does not easily crumble when pressed between the hands. If the soil is too wet, it will yield free water when kneaded in the hand.

Fill materials must be wetted or dried and mixed as needed to achieve proper moisture prior to compaction.

6. Compaction (Class S)

Fill layers shall be compacted by one of the following methods.

a. By routing the hauling and spreading equipment such that all points of the fill are traversed by at least one tread track of the loaded equipment traveling parallel to the centerline of the fill.

b. By at least 2 passes of a tamping (sheepsfoot) roller weighing at least 100 pounds per square inch of bearing area.

CONSTRUCTION SPECIFICATION

SD-8 ROCK RIPRAP AND BEDDING

1. Scope

The work shall consist of furnishing and installing loose rock riprap and blankets, including filter layers, bedding, or geotextiles as shown on the drawings.

2. Materials

Rock Riprap - Individual rock fragments shall be dense, hard, durable, and free from cracks, seams, and other defects conductive to accelerated weathering. Except as otherwise specified, rock fragments shall be angular or sub-rounded. The least dimension of an individual rock fragment shall be not less than one-third the greatest dimension of the fragment. ASTM D4992 provides guidance on selecting rock from a source.

Rock that fails to meet the above requirements will be accepted only if similar rock from the same source has been demonstrated to be sound after three years of exposure to conditions similar to conditions where the riprap is to be placed.

The rock shall conform to the grading limits shown on the drawings. Sand, rock fines, and dirt shall be less than five percent of the total weight of the riprap.

Sand, Gravel Filter - Filter aggregates shall be sand, gravel, crushed stone, or mixtures thereof. Aggregates shall be composed of clean, hard, durable mineral particles free of organic matter, clay balls, soft particles, or other substances that would interfere with free-draining properties of the aggregates.

Not more than 5 percent of the material of the material may be limestone and not more than 15 percent may be flat, elongated particles.

Except as otherwise shown on the drawings, the aggregate shall meet the following gradation requirements after placement.

Filter Aggregate Size	Percent Finer by Weight
3"	100
1"	90 to 100
#4	50 to 85
#50	10 to 40
#200	0 to 5

Geotextile - Geotextiles shall conform to the National Engineering Handbook Material Specification 592-Geotextile. The geotextile fabric shall be protected from moisture, dust, dirt, debris, and ultraviolet light prior to installation.

3. Subgrade Preparation

Subgrade surfaces on which riprap, bedding, or geotextile will be placed shall be cut or filled to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved materials and shall conform to the requirements of the specified class of fill.

Riprap, bedding, or geotextile shall not be placed until the foundation preparation is completed and the surfaces have been inspected and approved by the Natural Resources Conservation Service inspector.

4. Equipment-placed Rock Riprap

Rock riprap shall be placed by equipment on the surface and to the depth specified. It shall be installed to the full course thickness in one operation and in a manner as to avoid serious displacement of the underlying material. The rock shall be delivered and placed in a manner that ensures the riprap in place is reasonably homogenous with the larger rocks uniformly distributed and firmly in contact one to another and with the smaller rocks and spalls filling the voids between the larger rocks. Some hand placing may be required to provide a neat and uniform surface.

CONSTRUCTION SPECIFICATION

SD-10 SALVAGING AND SPREADING TOPSOIL

1. Scope

The work shall consist of salvaging topsoil from borrow pits or other excavations and spreading it in the designated areas to the specified depths.

2. Quality of Topsoil

Topsoil shall consist of friable soil reasonably free of grass, roots, weeds, sticks, stones, or other foreign materials.

3. Excavation

Topsoil shall be removed after clearing, grubbing and removing vegetation and shall be incorporated in required earthfill areas as specified, or stockpiled. Objectionable materials shall be removed and buried, or disposed of, at locations approved by the Natural Resources Conservation Service inspector.

4. Spreading

Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Surfaces to be covered shall be lightly scarified just prior to the spreading operation.

All earth fills not to be submerged shall be covered with topsoil to a depth of 6 to 18 inches measured perpendicular to the surface of the fill and placed to the neat lines shown on the drawings.

After placement is completed, the topsoil surface shall be left in a condition that will permit seeding equipment to be operated without excessive smoothing.

CONSTRUCTION SPECIFICATION

SD-16 WOOD FABRICATION AND INSTALLATION

1. Scope

The work shall consist of furnishing and constructing wood structures and wood parts of composite structures.

2. Plywood Material

Plywood and Oriented Strand Board for use in above ground sheltered construction (buildings etc.,) shall meet Product Standard PS-1 and shall conform to the requirements shown on the drawings.

Plywood for use in exposed above ground construction shall be exterior grade, meet Product Standard PS-1 and shall conform to the requirements shown on the drawings.

Treated plywood for use above ground shall meet Product Standard PS-1 and be pressure treated with waterborne preservatives (Arsenicals) to a retention level of at least 0.4 pounds per cubic foot except as shown on the drawings.

Treated plywood that is to be in permanent contact with water or the earth must meet Product Standard PS-1 and be pressure treated with waterborne preservatives (Arsenicals) to a retention level of 0.6 pounds per cubic foot, except as shown on the drawings.

3. Structural Timber and Lumber Material

All wood material shall be sound wood free from decay and disease damage, shall be straight, not cracked, and shall meet the requirements shown on the drawings. Structural timber and lumber shall be structural grade or better.

Unless otherwise specified, all timber and all nominal lumber sizes 2X10 or larger shall be pressure treated by one of the following preservatives:

Cresote

Pentachlorophenol

Waterborne Preservatives (Arsenicals) treated to 0.4 pounds per cubic foot retention

Unless otherwise specified, all nominal lumber sizes 2X8 or smaller shall be pressure treated using waterborne preservatives (Arsenicals). Wood for use above ground shall be treated to a retention level of at least 0.4 pounds per cubic foot. Wood for use in permanent contact with water or earth shall be treated to a retention level of at least 0.6 pounds per cubic foot.

4. Metal Hardware

Bolts, nuts, washers, rods, angle iron, and other metal hardware shall be an appropriate grade of steel and shall be galvanized or have equal corrosion protection except as shown otherwise on the drawings. Bolts, screws, and other fasteners 0.5 inch or less in diameter may be coated with electro-deposited zinc or cadmium coating following ASTM B766 or B633.

5. Installation

All framing shall be true and exact. Timber and lumber shall be accurately cut and assembled to close fit. Nails and spikes shall be driven with just sufficient force to set the heads flush with the surface of the wood.

Bolt holes shall be drilled for snug fit. Holes for lag screws shall be bored with a bit not larger than the body of the screw at the base of the thread.

Washers shall be used in contact with all bolt heads and nuts that would otherwise be in contact with wood.

CONSTRUCTION SPECIFICATION

SD-95 GEOTEXTILE

1. Scope

The work shall consist of furnishing all material, equipment, and labor necessary for the installation of geotextiles.

2. Quality

Geotextiles shall conform to the requirements of Material Specification SD-592 and this specification.

3. Storage

Before installation, geotextile shall be protected from damage by weather, sunlight, and other causes.

4. Surface Preparation

The surface on which geotextile is to be placed shall be graded to the lines and grades shown on the drawings. Except as shown on the drawings, the surface shall be reasonably free of loose rock and clods, holes, depressions, projections, water, and muddy conditions.

5. Placement

Before geotextile is placed, the soil surface will be inspected for quality assurance. Geotextile shall be unrolled along the placement area and loosely laid without stretching so that it will conform to surface irregularities without tearing when upper materials are placed. The geotextile may be folded and/or overlapped as needed for proper placement. Geotextile sections shall be joined by sewing or overlapping.

Geotextile sections joined by sewing shall have seams producing minimum seam strength equal to 90 percent of minimum fabric strength. The sewn overlap shall be at least six inches, and the sewing shall consist of at least two parallel stitched rows at least one-half inch apart with rows at least two inches from fabric edges. The stitching must be a lock-type stitch. Installed geotextile must be secured to prevent movement during construction.

Geotextile sections joined by overlapping shall be overlapped a minimum of 18 inches and secured to the underlying soil surface using securing pins as provided and recommended by the geotextile manufacturer. Upstream or upslope geotextile sections shall overlap abutting downslope geotextile.

Geotextile tears shall be repaired by overlap (described above) of additional geotextile placed in contact with the torn geotextile.

GEOTEXTILE (SD-592)
MATERIAL SPECIFICATION

1. Scope

This specification covers the quality of geotextile.

2. General Requirements

Geotextiles shall be a minimum of 85 percent by weight polypropylenes, polyesters, polyamides, polyethylene, polyolefins, or polyvinylidenechlorides. They shall be formed into a stable network of filaments or yarns retaining dimensional stability relative to each other. The geotextile shall be defect free and conform to Table 1 or 2 requirements as applicable to the material specified. The geotextile shall be free of chemical treatments or coatings that reduce its porosity. Geotextiles shall have enhanced resistance to ultraviolet light.

Thread used for sewing shall be high strength polypropylene, polyester, or polyamide, and shall be at least as resistant to ultraviolet light as the geotextile.

3. Classification

Woven - Fabrics formed by interweaving monofilament yarn, creating distinct and measurable openings. The edges of woven fabric shall be selvedged or otherwise finished to prevent the outer yarn from unraveling.

Nonwoven - Fabrics formed by random placement of threads in a mat and bonded by needle punching.

4. Shipping and Storage

Geotextile shall be shipped in rolls wrapped with a cover. Each roll shall be labeled to clearly identify the brand, class, and production run following ASTM D4873.

Table 1. Requirements for Woven Geotextile

Property	Test Method	Class I	Class II&III	Class IV
Tensile strength, lb.[1/]	ASTM D4632	200 min.	120 min.	180 min.
Elongation at failure, %[1/]	ASTM D4632	<50	<50	<50
Puncture, lb.[1/]	ASTM D4833	90 min.	60 min.	60 min.
Ultraviolet light, % residual tensile strength	ASTM D4355 150-hr. exposure	70 min.	70 min.	70 min.
Apparent opening size (AOS)	ASTM D4751	As specified, but >.212mm (#70[2/])	As specified, but >.212 mm (#70)	As specified, but >.212mm (#70)
Percent open area (%)	CWO-02215-86[3/]	4.0 min.	4.0 min	1.0 min.
Permeability, permittivity Sec.$^{-1}$	ASTM D4491	0.10 min.	0.10 min.	0.10 min.

Table 2. Requirements for Needle-Punched Nonwoven Geotextile

Property	Test Method	Class I	Class II	Class III	Class IV
Tensile Strength, lb.[1/]	ASTM D4632	180 min.	120 min.	90 min.	115 min.
Elongation at failure, %[1/]	ASTM D4632	$\geq$ 50	$\geq$ 50	$\geq$ 50	$\geq$ 50
Puncture, lb.	ASTM D4833	80 min.	60 min.	40 min.	40 min.
Ultraviolet light, % residual tensile strength	ASTM D4355 150-hr. exposure	70 min.	70 min.	70 min.	70 min.
Apparent Opening Size (AOS)	ASTM D4751	As specified max. #40[2/]	As specified max. #40[2/]	As specified max. #40[2/]	As specified max. #40[2/]
Permeability permittivity sec^{-1}	ASTM D4491	0.70 min.	0.70 min.	0.70 min.	0.70 min.

1/ Minimum average roll value (weakest principal direction).
2/ US standard sieve size.
3/ CWO is a US Army Corps of Engineers reference.

CONSTRUCTION SPECIFICATION
SD-28 SEEDING

1. Scope

The work shall consist of furnishing all labor, equipment, and materials needed for seeding the areas shown on the drawings.

2. General

Permanent Seeding and related operations shall be performed in the following time periods:

Early Spring prior to 5/15 – Cool-season species only.
Late Spring 5/15 to 6/15 – Warm-season species only with a companion crop.
Late Summer 8/1 to 9/1 – Cool-season species with a cover crop.
Dormant 11/1 to Spring Thaw – Cool-season species with mulch.

Permanent seeding must be completed as soon as possible during the first allowable seeding time period after construction. If construction ends between 5/15 and 9/15, a cover crop shall be planted immediately after construction. The cover crop shall be clipped or chemically killed and perennial species shall be planted during the next available establishment period. Consider the previous two years of herbicide application. Any potential carryover problems should be addressed by delaying construction and seeding, establishing a cover crop, and/or changing the species to be planted.

3. Fertilizer

Fertilizer is _____ ☐ Required _____ ☑ Not Required

If fertilizer is used it shall be supplied and applied as follows: Apply fertilizer based on the recommendations from a soil test or apply 30 to 40 pounds of actual N and 40 to 60 pounds of P_2O_5 per acre. Well decomposed manure, at a rate of 10 to 15 tons of per acre, may be used in lieu of the commercial fertilizer and will also increase organic matter. Do not use manure on areas that will drain directly into a water body or stream. Zinc, at a rate of 5 to 10 pounds per acre, may be added to speed up growth on medium-textured soils. Thoroughly mix all fertilizer and/or manure into the upper 3 to 5 inches of the soil during final seedbed preparation.

4. Seedbed Preparation

The area to be seeded shall be made reasonably smooth and firm. Ditches shall be filled to conform to design lines and grades before seedbed preparation is begun. The seedbed will be worked to a depth of three to five inches. Drag or pack to break up large clods and firm the seedbed. Prior to seeding, required fertilizer shall be applied and mixed with the soil surface to a depth of 3 inches. The seedbed should be firm enough so that the boot heel of an average adult penetrates the soil to a depth of approximately ½ inch. The contractor shall suspend operations when the soil is too wet.

5. Sowing Seed

Except as otherwise specified, seeding shall be performed immediately after seedbed preparation. Seeding shall be drilled or broadcast and incorporated in a manner that will achieve uniform distribution of seed placed at appropriate soil depth. Optimum seeding depths are ¼ to ¾ inch.

When seeding waterways or similar water flow areas, machinery operations must be performed in a direction that is not parallel to water flow (use figure-eight or serpentine pattern, etc.).

Companion crops shall be seeded at the same time as the permanent seeding. The companion crop should be clipped and removed or mowed before it becomes competitive with the perennial species or sets seed.

9. **Mulching**

Mulching is _____ ☐ Required _____ ☑ Not Required

Mulching is encouraged but not required for all construction and seeding dates. Mulching is required for all waterways constructed between September 15, and the spring thaw and when seeding into a bare seedbed during the early spring period where the design velocity is greater than 2.5 fps. Except as otherwise specified, required mulching must be performed as soon as possible after seeding. Mulch shall be applied uniformly as follows. Straw will be applied uniformly at a rate of 3,000 pounds minimum to 4,000 pounds maximum per acre. The straw will be anchored using an anchoring tool (or a farm disk set straight with adequate weight) that has serrated straight disk blades spaced 6 to 10 inches apart that punches mulch into the ground with a depth of approximately 2 inches. All anchoring should be at right angles to the slope.

If late summer or dormant seeding dates are used, seed just prior to mulching.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

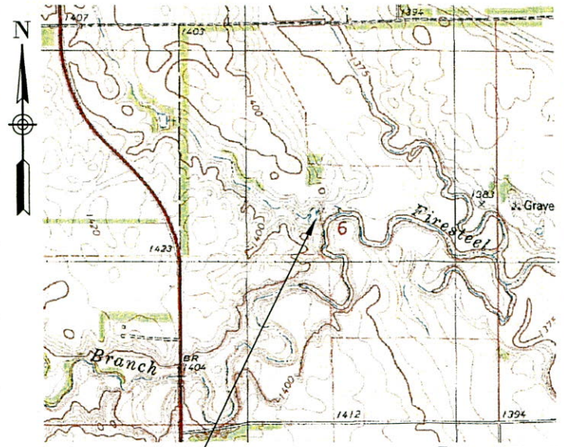
CONSTRUCTION PLANS

FOR

TODD WORRELL

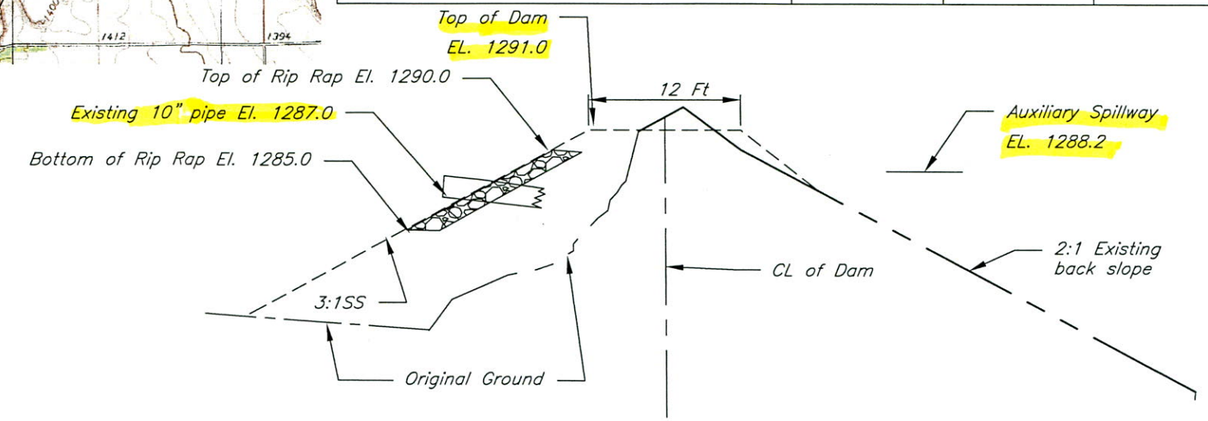
POND REHABILITATION PROJECT

REGISTERED PROFESSIONAL ENGINEER & LAND SURVEYOR
REG. NO. 4729
DANA B. EDWARDS
SOUTH DAKOTA
6/9/2016



Project Location
NW, Sec. 6, T 104, R63__
Aurora County, South Dakota

TABLE OF QUANTITIES			
ITEM	UNIT	QUANTITY	AS-BUILTS
Earthfill Class S – Embankment	Cu. Yd.	1,836	
Earthfill Class S – Stripping	Cu. Yd.	608	
Total Earthfill	Cu. Yd.	1,876	
Excavation– Auxiliary Spillway	Cu. Yd.	8,763	
Topsoil Auxiliary Spillway	Cu. Yd.	991	
Seeding (Earthfill and Auxiliary Spillway)	Acre	1.6	



TYPICAL CROSS SECTION OF DAM

SEDIMENT YIELD					
Erodibility Area	Gross Rate (A.F./Ac./Yr.)	Drainage Area (Acres)	Delivery Rate (%)	Design Period (Years)	Req. Sed. Volume (Ac.–Ft.)
H	.0019	1741	13	25	82.7

STRUCTURE DATA		
Length of Top of Dam	770	Feet
Water Depth to Crest of Auxiliary Spillway	15.7	Feet
Height of Downstream Toe to Top of Dam	14.0	Feet
Effective Height	15.7	Feet
Product of Storage X Effective Height	2964	

POOL DATA			
	ELEV.	AREA	STORAGE
Crest of Principal Spillway	1287.0	30.0 Ac.	148.4 Ac.–Ft
Crest of Auxiliary Spillway	1288.2	36.9 Ac.	188.8 Ac.–Ft
Top of Dam	1291.0	55.2 Ac.	302.3 Ac.–Ft

NO EXCAVATOR MAY BEGIN ANY EXCAVATION WITHOUT FIRST NOTIFYING THE ONE–CALL NOTIFICATION CENTER OF THE PROPOSED EXCAVATION AT 1–800–781–7474.

CONSTRUCTION NOTES

1. If cultural resources are discovered during construction, discontinue construction and notify the local Natural Resources Conservation Service office.
2. The landowner is responsible for complying with all federal, state, and local laws.
3. Clear and grub the entire area within the work limits.
4. Any shale, gravel, or sand that is exposed during borrow operations shall be immediately backfilled with 2 feet of clay material.
4. All fill material must not contain frozen material, sod, roots, or other perishable material, or rock larger than eight inches in diameter as described in SD Construction Specification SD–7S.
5. Six inches topsoil will be incorporated into the earthfill to meet the neat lines shown on the typical section.
6. All areas top–dressed with topsoil and disturbed during construction will be seeded according to SD Construction Specification SD–28.

HYDRAULIC DATA		
Drainage Area	1741	Acres
Annual Runoff Yield	39.2	Ac. Ft.
Time of Concentration	6.02	Hours
Runoff Curve Number	65	
Auxiliary Spillway, 50 Year – 24 Hour Rainfall	4.4	Inches
Peak Runoff 50 Year – 24 Hour Rainfall	407.2	CFS
Auxiliary Spillway Discharge	281.3	CFS
Auxiliary Spillway Flow Depth	1.8	Feet

SD CONSTRUCTION AND MATERIAL SPECIFICATIONS

SD–4 Stripping
SD–5 Excavation
SD–7S Earthfill – Class S
SD–10 Salvaging And Spreading Topsoil
SD–28 Seeding
For A Full Text Version See
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/sd/technical/engineering/?cid=nrcs141p2_036575

NRCS HAZARD CLASS A
NRCS JOB CLASS V

STATEMENT OF COMPLIANCE

Construction (was) (was not) completed in accordance with approved construction plans and specifications.

JAA Date

REGISTERED PROFESSIONAL ENGINEER & LAND SURVEYOR
REG. NO. 4729
DANA B. EDWARDS
SOUTH DAKOTA
6/9/2016

POND WITHOUT PRINCIPAL SPILLWAY PIPE
JOB PLAN 1.0NP REV. 4/2016

Date
Designed 6/9/16
Drawn 6/9/16
Checked 6/9/16
Approved 6/9/16

TODD WORRELL
378 POND
COVER SHEET
Aurora County, South Dakota
NW, Sec. 6, T 104, R63__

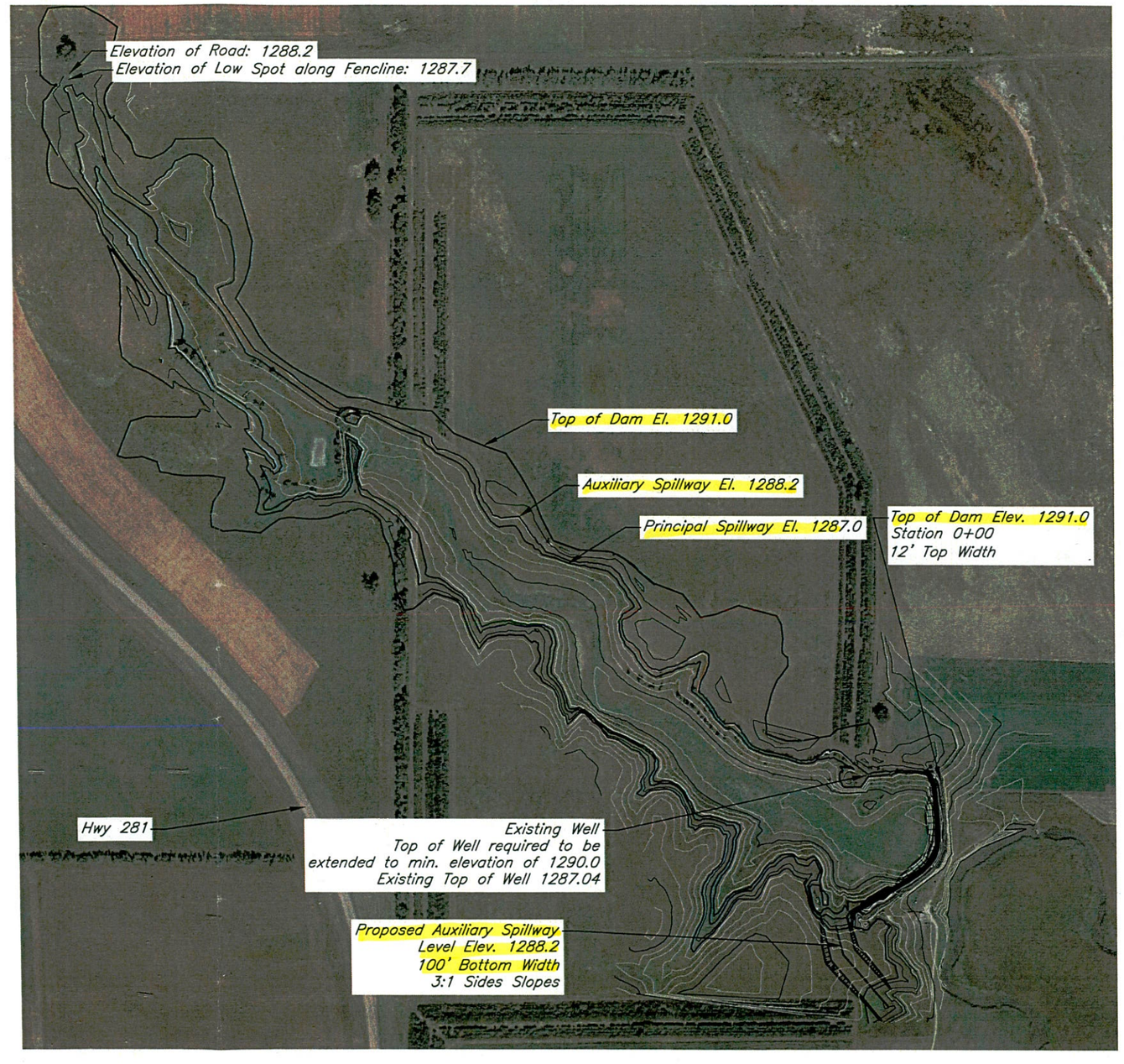
United States Department of Agriculture
Natural Resources Conservation Service

File No. WorrellCS.dwg
Drawing No. –
6/9/2016 3:57 PM
Sheet 1 of 4

DESIGN NOTES

1. Existing dam contains a Hickenbottom inlet riser with a 10" diameter PVC drawdown pipe under the dam which outlets in Firesteel Creek. Dam also has an additional 10" diameter PVC pipe installed through the embankment of the dam. Inlet elevation is 1287.0. This pipe also outlets into Firesteel Creek. Condition/material of existing pipes are unknown, owner has indicated they function properly.
2. Flood routing was completed without the flows of either of the existing pipes. The Hickenbottom inlet riser flow is controlled by landowner. The other 10" PVC inlet is located 1.2' below the proposed auxiliary spillway elevation. The owner accepts condition of existing pipes, this design does not address the pipe materials.
3. Flow depth in the proposed auxiliary spillway is 1.8' for a 50yr–24hr storm event.
4. The low spot on the section line road near the tail water of the dam is 1288.2, the same elevation of the proposed auxiliary spillway. The low spot along the south fence line of the section line road is 1287.7, principal spillway elevation is 1287.0
5. The auxiliary spillway is level throughout the length of the spillway.
6. The face of the dam will be lined with rock rip rap and concrete, and underlined with a non woven 8 oz geotextile fabric. Rock will be placed from elevation 1' below top of dam to the bottom of the front toe to protect embankment at all water levels.

N



REGISTERED PROFESSIONAL ENGINEER & LAND SURVEYOR
REG. NO. 4729
DANA B. EDWARDS
SOUTH DAKOTA
6/9/2016

BENCHMARK POINTS TABLE					
NO.	ID	ELEVATION	NORTHING	EASTING	BENCHMARK DESCRIPTION
Base 2	2	1293.219	9400.06	11108.26	rebar with 1x2 stakes located between dam and dog kennels
CP3	CP3	1283.50	9427.24	11199.31	rebar located along west fence of dog kennels

PLAN VIEW

500 0 500 1000 1500
Scale in Feet

		Date
Designed	DBE	6/9/16
Drawn	A. Roman	6/2/16
Checked	DBE	6/9/16
Approved	DEdwards	6/9/16

TODD WORRELL
378 POND
PLAN VIEW AND DESIGN DATA
NW, Sec 6, T104, R63W
Aurora County, South Dakota

USDA United States Department of Agriculture
Natural Resources Conservation Service

File No. Worrell2016.dwg
Drawing No. ----
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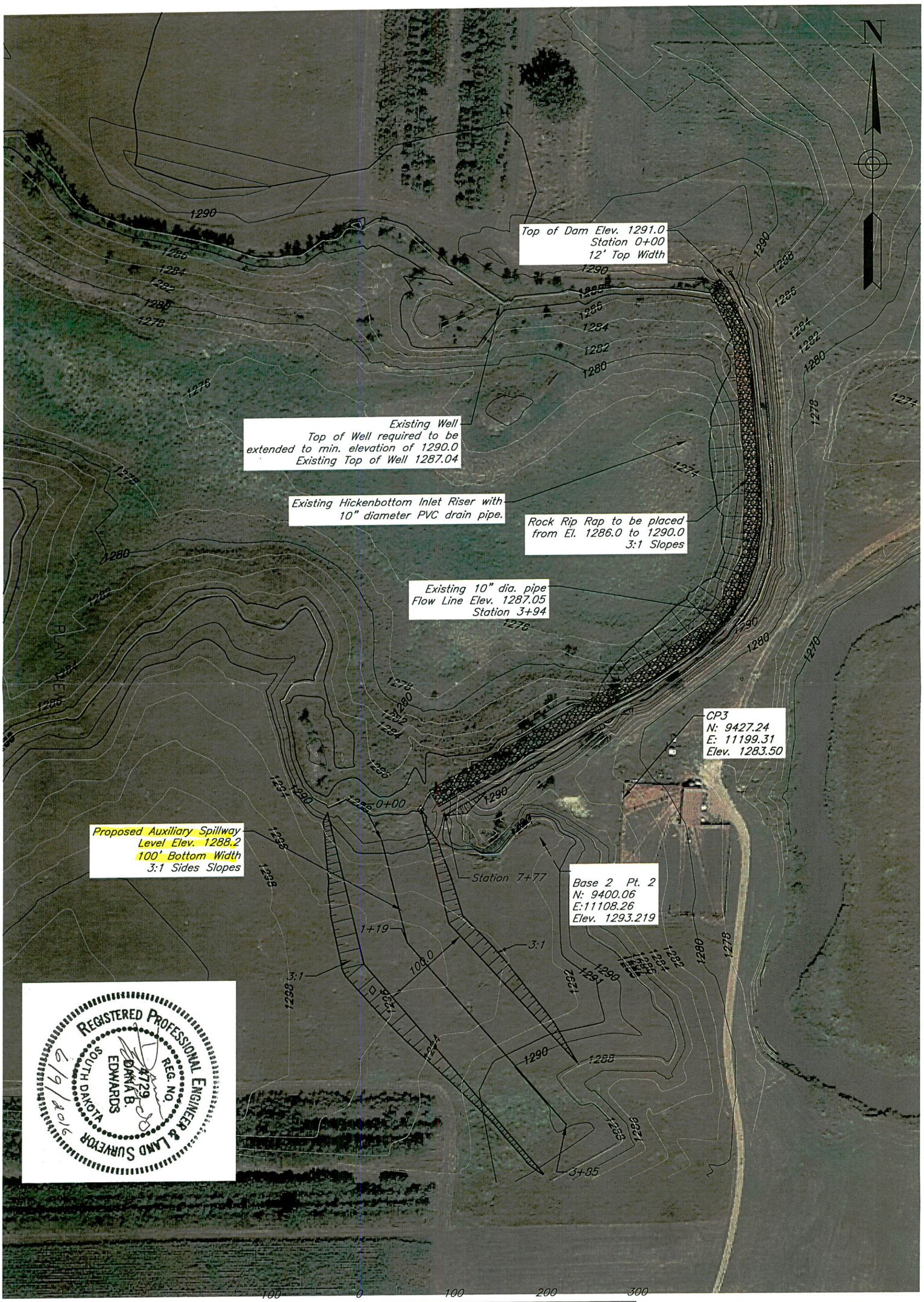
Sheet 2 of 4



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Sheet 3 of 4

File No. Worrell2016.dwg

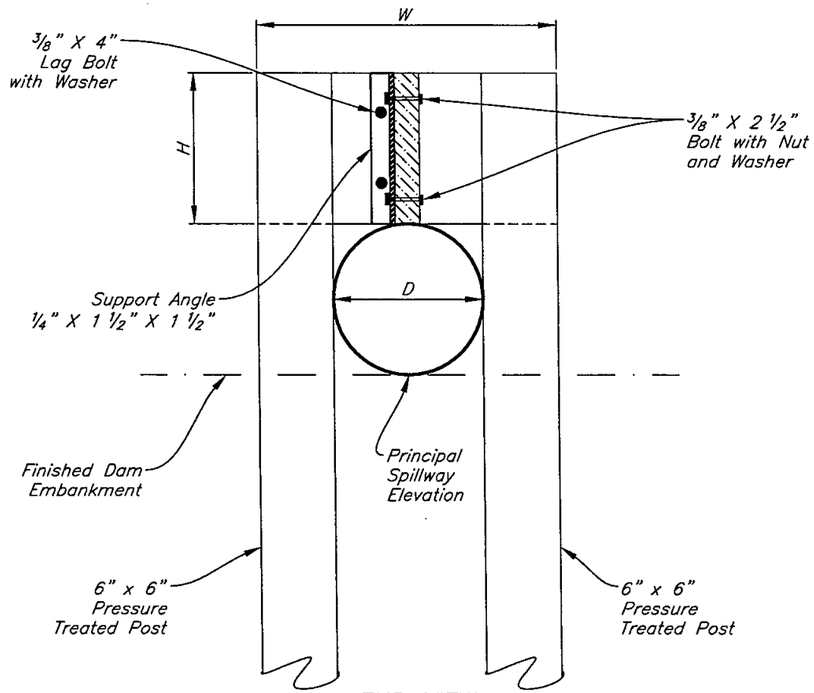
Drawing No. ----

USDA United States Department of Agriculture
Natural Resources Conservation Service

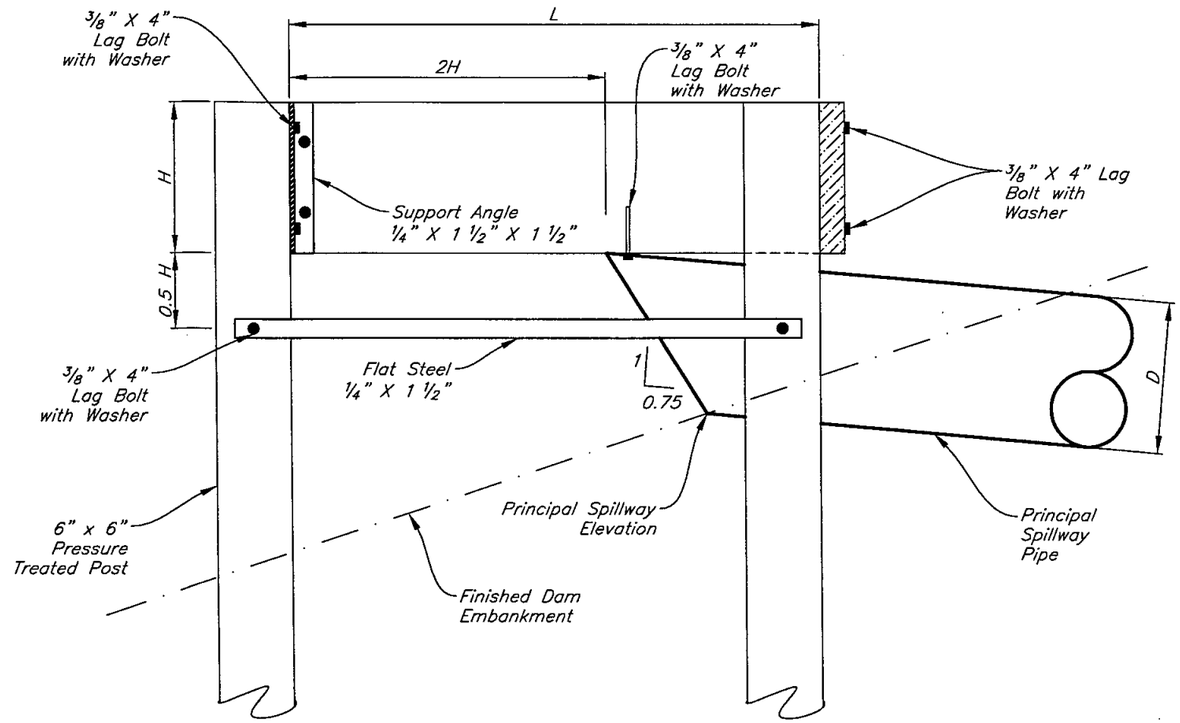
TODD WORRELL
378 POND
PLAN VIEW

NW, Sec 6, T104, R63W — Aurora County, South Dakota

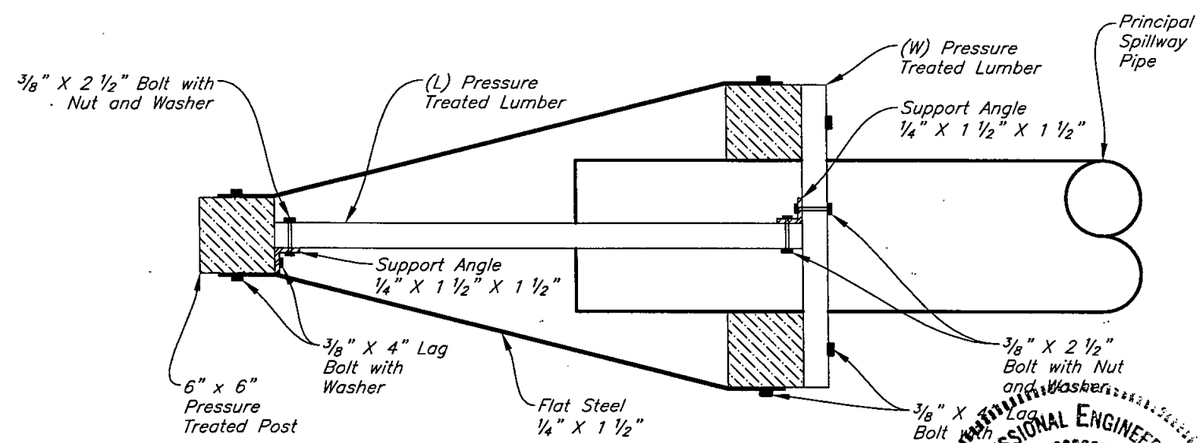
		Date
Designed	DBE	6/9/16
Drawn	A. Roman	6/2/16
Checked	DBE	6/9/16
Approved	D Edwards	6/9/16



END VIEW



SIDE VIEW



TOP VIEW

GUIDE TABLE – DIMENSIONS FOR DIFFERENT PIPE DIAMETERS						
Pipe Dia. (D)	(H)	No. of Posts 6" x 6" (6' Long)	Pressure Treated Lumber (L)	No. of L	Pressure Treated Lumber (W)	No. of W
10"	10"	3	2" x 10" x 2'-11"	1	2" x 10" x 1'-10"	1
12"	12"	3	2" x 12" x 3'-6"	1	2" x 12" x 2'-0"	1
15"	16"	3	2" x 8" x 4'-3"	2	2" x 8" x 2'-3"	2
18"	20"	3	2" x 10" x 5'-0"	2	2" x 12" x 2'-6"	2

GUIDE TABLE – DIMENSIONS FOR DIFFERENT PIPE DIAMETERS						
Pipe Dia. (D)	1 1/2" x 1 1/2" x 1/4" Steel Angle Length	No. Angle	1 1/2" x 1/4" Flat Steel Length	No. Flat	Number of Lag Bolts with Washer 3/8" x 4"	Number of Bolts with Nuts and Washers 3/8" x 2 1/2"
10"	0'-10"	2	3'-0"	2	11	6
12"	1'-0"	2	3'-6"	2	11	6
15"	1'-4"	2	4'-6"	2	17	12
18"	1'-8"	2	5'-4"	2	17	12

CONSTRUCTION NOTES

1. All nuts, bolts, and washers shall be galvanized.
2. Steel bar and angle shall be clean and dry. Paint with two coats of zinc-rich cold galvanized compound or zinc dust – zinc oxide primer.
3. Lag bolt through top of pipe shall be 3/8" x 4" with large washer on the pipe side.

REGISTERED PROFESSIONAL ENGINEER & LAND SURVEYOR
REG. NO. 4729
DANA B. EDWARDS
SOUTH DAKOTA
6/9/2016

THREE POST BAFFLE, HOODED INLET, AND TRASH RACK
JOB PLAN 5.4CI REV. 1/2012

		Date
Designed	----	----
Drawn	A. Roman	6/2/16
Checked	[illegible]	6/9/16
Approved	[illegible]	6/9/16

TODD WORRELL
378 POND
THREE POST BAFFLE, HOODED INLET AND TRASH RACK
NW, Sec 6, T104, R63W
Aurora County, South Dakota

United States Department of Agriculture
Natural Resources Conservation Service

File No. Worrell2016.dwg

Drawing No. ----

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Sheet 4 of 4

FORM 2: Application for uses other than irrigation
(type or print)

Mail to: Water Rights Program, Joe Foss Building, 523 E. Capitol, Pierre, SD 57501-3181, (605) 773-3352	(office use only) No. _____ Hydrologic Unit _____ Basin _____ Newspaper _____

RECEIVED
MAY - 6 2005
WATER RIGHTS PROGRAM

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

Check use(s) of water:

___ Municipal	___ Suburban Housing	X Recreational	___ Institutional
___ Rural Water System	___ Commercial	X Fish & Wildlife	___ Geothermal Heat
___ Domestic (over 18 gpm)	___ Industrial	___ Other ___	

Type of Application: ___ **New** ___ **Vested Right** (Use predates Mar 2, 1955) ___ **Future Use Reservation**
(check one) ___ **Place to Beneficial Use Water Reserved by Future Use Permit No.** ___
X **Amendment/Correction to Permit No.** 4285-3 & 4978-3

Description of amendment/correction: (i.e. change diversion point(s), add diversion point(s), change use, etc.) Primary use would be to fill & maintaine water level in Lake/Pond when necessary.

1. Name of Applicant TODD WORRELL Phone 314-453-0339
   (check one) X Owner ___ Tenant/lessee
   Mailing Address 13320 BUCKLAND HALL Rd, St. Louis State MO. 63131
   (Street, RR, or Box and City) (Zip Code)
2. Amount of water claimed ___ *CFS or 8-10,000 **GPM 10-12 ***AF
   (*Cubic Feet per Second) (**Gallons per Minute) (***Acre Feet - storage capacity of dam/dugout or annual use if applicable)
3. Source of water supply Exsisting well.
4. Location of point of diversion (example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W) 1 well in T447 6-104-63
   County Aurora
5. County or counties where water will be used Aurora
6. Annual period during which water is to be used Summer & Fall when needed.
7. Give a description of the project. When available include any preliminary engineering report or other reports or information that will help explain the project. (Attach sheet if more space is needed)

STATE OF SOUTH DAKOTA) SS
County of Aurora)

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

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

Applicant's signature [signature]

Subscribed and sworn to before me this 3rd day of May 2005

KATHRYN C. PALUMBO
Notary Public-Notary Seal
State of MISSOURI
St. Louis County
My Commission Expires: December 16, 2006

[signature] Notary Public signature
Kathryn C. Palumbo

4-2000

Description of Project

The purpose of this project is to provide a habitat for wildlife, mainly ducks and geese as well as support fishing. Currently this site is a stock dam that held water for an irrigation pivot. The existing dam needs repairs in order to be filled to the proper level. The irrigation pivot will be taken down but the existing well will become the water source to fill and maintain the lake or pond. During duck season, I would like to raise the water level in order to flood an area that would have standing corn and in spring lower the water level so the flooded area could dry out and be farmed. The area to be flooded would be about a foot deep when flooded. The run off from lowering the pond would run into the west branch of Firesteel Creek. (Please refer to the map for details).

NOTICE OF TRANSFER OF OWNERSHIP

To: Chief Engineer
Water Rights Program, DENR
523 E. Capitol
Pierre, SD 57501-3181

RECEIVED
MAY - 6 2005
WATER RIGHTS PROGRAM

No. _____

Date: 5/3/05

I\We request that Water Permit/Right No. 4285-3 & 4978-3

formerly owned by: Carl & Dave Estabrook

be transferred to: (name & address) TODD WORRELL, 24466 US Hwy 281
Plankinton, SD 57368 Telephone No. 605-942-7666

Title to the following described land(s)/property has been transferred as described above:

_____

I\We understand that the validity of Water Permit/Right No. 4285-3 & 4978-3 has not been determined by this transfer action. If I/We have any questions on validity, I/We understand that only the Water Management Board has the authority to determine if a water permit/right is valid (see note).

You are requested to file this "Notice of Transfer" in the appropriate file with the Water Rights Program, as evidence of the change of ownership.

A fee of Two Dollars and Fifty Cents ($2.50) is attached to cover the filing fees as required under SDCL 46-2-13.

STATE OF SOUTH DAKOTA)
)
County of AURORA)

I/We TODD WORRELL being first duly sworn on my oath depose and say that my relation to the above described undertaking is that of Owner, that I have read the above foregoing statement, and that I know of my own personal knowledge that the information herein stated is true.

Todd Worrell
(Signed)

Subscribed and sworn to before me this 3 day of May, 2005.

KATHRYN C. PALUMBO
Notary Public-Notary Seal
State of MISSOURI
St. Louis County
My Commission Expires: December 16, 2006

Kathryn C. Palumbo
(Notary Public)
Kathryn C. Palumbo

NOTE: Water permits may be cancelled for nonconstruction within the five year construction period. Once a water permit is developed and the water used, the permit becomes a right. A water right may be lost for three reasons:

1. Abandonment - no intent to use water and use is abandoned.
2. Forfeiture - no use of water for three year period without legal excuse.
3. For a third violation of a condition of a water permit/right.

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES
PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

June 10, 2005

Todd Worrell
13320 Buckland Hall Rd
St. Louis MO 63131

Dear Mr. Worrell:

The Water Rights Program is in receipt of your water permit application to use an existing well to provide habitat for wildlife by maintaining the water level of the dam authorized by Water Right No. 4285-3 in Aurora County, South Dakota. You also filed a notice of transfer of ownership. Additional information is necessary prior to processing the application and the transfer of ownership as set forth below.

It is my understanding that you now own the land once owned by Carl Estabrook in Section 6, T104N, R63W. There are two permits in existence on this property. Water Permit No. 4285-3 appropriates water from a dam for irrigation in Section 6 while Water Permit No. 4978-3 appropriates water a small stream running through the NE ¼ Section 6 to irrigate the same acres. Copies of the permits are attached. You indicated that you have or intend to abandon all irrigation and just want to maintain the dam and use the existing well to supplement the dam.

Since our May 2nd telephone conversation I have reviewed the Estabrook permits and deferred applications on file. The proposed use of this well by Mr. Estabrook to maintain the dam for irrigation was extremely controversial. In fact, the application elevated to the State Supreme Court in the 1980's. The end result was the application to use the well was denied and there is not an existing permit in place for any use from this well. A copy of the Court's decision is attached. It is probable that this controversy may resurface with your application.

I held your application since it was received because you planned to be in South Dakota the later part of May to first week in June and I thought we might meet to discuss the Estabrook water issues in person.

I am going to address three issues in this letter. They are 1) completing the submitted application; 2) the notice of transfer of ownership; and 3) the status and pending action on the deferred Estabrook applications.

What is necessary to complete application?

- This application is considered a new application and can not be viewed as an amendment to existing Water Permit Nos. 4285-3 and 4978-3.

- An application filing fee for appropriating less than 120 acre feet of water is $200. This $200 fee must be submitted.

- The map submitted with the application must be signed by a registered professional engineer, professional land surveyor or government employee who prepares maps as a normal part of their duties. Many ag producers use the county Natural Resource Conservation Service to assist them with this requirement. I am returning your map for you to obtain a proper signature.

- The application states a diversion rate of 8,000 to 10,000 gallons per minute. This appears to be an unrealistically high diversion rate. Did you mean 800 to 1,000 gallons per minute? A Water Rights staff person remembers the well being test pumped at approximately 1,050 gpm. Please let me know the proposed diversion rate from the well.

Transfer of ownership forms

You submitted one transfer of ownership form for both permits. A separate notice of transfer of ownership form is necessary for each water permit under new ownership. I have enclosed a partially completed transfer forms for you to review and sign for both Water Permit Nos. 4285-3 and 4978-3. In addition, a $2.50 transfer filing fee is required for each notice of transfer of ownership filed (total $5.00) **(See below section on Water Permit Nos. 4285-3 & 4978-3 on whether there is even a need to transfer the permits or if they are subject to cancellation for your proposed use).**

Existing Water Permits and Deferred Applications

Water Permit No. 4285-3 (copy enclosed) states the water shall be used for the purpose of irrigation. You indicated during our telephone conversation that the irrigation component of this permit is abandoned and you only desire to maintain the dam for recreational and fish & wildlife which is not a listed use. If the dam is to be used for stock watering of any type, Permit No. 4285-3 can simply be reissued for the dam for stock watering since there is a specific state law allowing for an abandoned permitted irrigation dam to be reissued for stock watering. However, there is not a mechanism in state water law to allow irrigation permit to be reissued for recreation and fish & wildlife purposes. If water is to be used solely for the recreation and fish & wildlife use it will require this to be included in your pending application and Water Permit No. 4285-3 will be subject to cancellation.

Water Permit No. 4978-3 (copy enclosed) authorizes use of a small stream for irrigation of the same lands as Permit No. 4285-3. What is the planned use of water from the small stream in the NE ¼ of Section 6? If water will not be diverted from the stream, the water permit is subject to cancellation due to abandonment and/or forfeiture. If this is the case the water permit need not be transferred but can be scheduled for cancellation.

Deferred Applications – There are three deferred applications for irrigation in Section 6, T104N, R63W that were filed by Carl Estabrook. There is not a mechanism in state water rights law to transfer a pending application to new landowner. Therefore the applications become subject to denial. It is my intention to schedule these deferred applications for denial at the Water Management Board's October 5 and 6, 2005 meeting. Denial of these applications does not preclude you from filing a new application at some time in the future. Specifically, the deferred applications in question are:

1. Deferred Application No. 4285A-3 proposed to increase the storage capacity of the existing dam in the NW ¼ Section 6 from 80 acre feet to 210 acre feet. The application also sought to include the diversion point authorized by Permit No. 4978-3 plus a small dam in Lot 1 of Section 1, T104N, R64W. The application was to irrigate the same acres authorized by Permit Nos. 4285-3 and 4978-3 plus an additional 300 acres. The application was deferred in 1987 until easement and right-of-way arrangements were obtained and proper repairs were made to the dam. If the existing dam stores more than 80 acre-feet, this is something that needs to be addressed in your present application. Back in 1987, the issue of the larger storage capacity was an issue because of the backing up of water onto neighboring land.

2. Deferred Application No. 4437-3 proposed diversion of water from Firesteel Creek to act as an additional diversion point to Application No. 4405-3 (the application for the well that was denied by the Supreme Court)

3. Deferred Application No. 4460-3 proposed using Firesteel Creek flood water to be pumped into the storage dam to irrigate portion of Sections 5 and 6, T104N, R63W.

Unfortunately, I have am unable to keep this letter short or simple. This was a very complicated and contentious issue back in the 1980's. Basically, I am trying to simplify this by getting all the extraneous deferred applications out of the way and having your application reflect what you actually plan to do. In order to do this I have included a summary sheet with items to make sure you address and questions to answer. Please complete and send back in the self address stamped envelop.

Please feel free to contact me if you have questions. It may be necessary for a water right person to conduct an on-site visit to view the condition of the dam. Until a complete application is filed for staff review, the Chief Engineer can not formulate a recommendation on the application. I caution you not to make any large capital investments in the well or dam until you have obtained a water permit.

Sincerely,

Eric Gronlund
Water Rights Program DENR
(605) 773-3352

enclosures

Gronlund, Eric

From: Gronlund, Eric
Sent: Wednesday, June 15, 2005 9:41 AM
To: Goodman, Jim
Subject: Estabrook issue -- Todd Worrell new owner

Mr. Worrell is the owner of the property involved in the Estabrook controversy. He applied to use the existing well (subject of Supreme Court decision) to maintain the dam. I sent him a letter telling him about the controversy and what was necessary to complete the application.

Mr. Worrell called. After talking to the well driller, he believes the best course of action is to abandon and plug existing well and drill a new well down by the dam. Driller was extremely leery of the electrical and said it would take just as much money to bring the existing up to snuff as it would to drill a new well. Told him this may still be controversial but he still wants to take a shot at it.

All the other permits & deferred application will go away.

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES
PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

January 19, 2006

Todd Worrell
13320 Buckland Hall Rd
St. Louis MO 63131

Dear Mr. Worrell:

Last spring we had telephone conversations regarding the water rights permitting for the land once held by Carl Estabrook in Aurora County. You now own this property.

Our conversations culminated in you filing an application to amend Water Permit No. 4285-3 and 4978-3. This then resulted in my sending you a letter on June 10, 2005 (copy enclosed) to explain what was necessary to complete the application. At that time I also included some discussion of transferring ownership of the water permits to your name and status of deferred Estabrook applications.

In response to my letter you called me stating it was now your intent to plug the existing well and drill a new well for the sole purpose of maintaining the dam. I then sent you application forms to apply for the new permit and a sheet explaining the steps necessary to move forward. I am again sending you application forms and this explanation sheet.

Mr. Worrell, I am writing to you to find out if you are still interested in pursuing a new well to maintain the water level in the dam. If so, an application will need to be filed for the new well. Also, Water Right No. 4285-3 should be transferred to your name if it will be used for livestock watering. The water right can then be reissued for just the dam and the irrigation component will be deleted from the water right. If the dam will only be used for fish and wildlife habitat purposes, the dam should be included on the application for a new water permit.

Please give me a call if you have any questions about completing a water right permit application. It is my goal to assist you so that the application accurately reflects the water use on your property.

Sincerely,

Eric Gronlund
Water Rights Program DENR
(605) 773-3352

enclosures

FORM 2: Application for uses other than irrigation
(type or print)

Mail to: Water Rights Program, Joe Foss Building, 523 E. Capitol, Pierre, SD 57501-3181, (605) 773-3352	(office use only) No. 6703-3 Hydrologic Unit 10160011
	Basin James River
	Newspaper

RECEIVED
FEB 13 2006
WATER RIGHTS PROGRAM

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

Check use(s) of water:

___ Municipal	___ Suburban Housing	X Recreational	___ Institutional
___ Rural Water System	___ Commercial	X Fish & Wildlife	___ Geothermal Heat
___ Domestic (over 18 gpm)	___ Industrial	___ Other ___	

Type of Application: (check one) X **New** ___ **Vested Right** (Use predates Mar 2, 1955) ___ **Future Use Reservation**
___ **Place to Beneficial Use Water Reserved by Future Use Permit No.** ___
X **Amendment/Correction to Permit No.** 4285-3 & 4978-3

Description of amendment/correction: (i.e. change diversion point(s), add diversion point(s), change use, etc.) Primary use would be to fill & maintaiane water level in Lake/Pond when necessary.

1. Name of Applicant TODD WORRELL Phone 314-453-0339
   (check one) X Owner ___ Tenant/lessee
   Mailing Address 13320 BUCKLAND HALL Rd, St. Louis State MO. 63131
   (Street, RR, or Box and City) (Zip Code)
2. Amount of water claimed ___ *CFS or ~~5-10,000~~ 75 **GPM ~~10-12~~ 150 ***AF
   (*Cubic Feet per Second) (**Gallons per Minute) (***Acre Feet - storage capacity of dam/dugout or annual use if applicable)
3. Source of water supply ~~Existing well~~. New Well
4. Location of point of diversion (example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W) 1 well in T447 6-104-63 Latitude: 43° 50' 21" N Longitude: 98° 26' 18" W County Aurora
5. County or counties where water will be used Aurora
6. Annual period during which water is to be used Summer & Fall when needed.
7. Give a description of the project. When available include any preliminary engineering report or other reports or information that will help explain the project. (Attach sheet if more space is needed)

STATE OF SOUTH DAKOTA) SS
County of Aurora)

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

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

Applicant's signature [signature]

Subscribed and sworn to before me this 3rd day of May 2005

KATHRYN C. PALUMBO
Notary Public-Notary Seal
State of MISSOURI
St. Louis County
My Commission Expires: December 16, 2006

[signature] Notary Public signature
Kathryn C. Palumbo

4-2000

Form 2A
(Complete applicable portions only)

Supplemental Information

(type or print in ink)

1. Well Information - Proposed Construction

a) Drill Hole Diameter 12" Depth 160 - 170'

b) Casing Type PVC Diameter 8" Thickness Sch. 80

c) Screen Type PVC 250 Pl Diameter Slot size 25 Thickness

d) Gravel Pack yes Length of Gravel Pack 30 FT

e) Depth to Top of Water Bearing Material

f) Depth to Water (ground surface to water level) 160' to 180'

g) Distance to nearest existing domestic well:

On applicants property 1/2 mile On property owned by others Over 1 mile

2. Wastewater Disposal System Information

a) Type of System (i.e. septic tank, drain field)

b) System Capacity (gallons) Year Constructed

c) Connected to the City of Sanitary System

3. Dugout Information

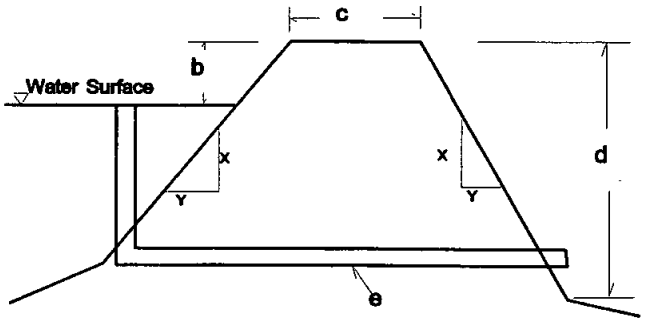
a) Surface Dimensions Depth

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 5 Feet

c) Crest Width 15'

Crest Length 450 FT

d) Height 25 FT

e) Primary Outlet Capacity See Drawing

If pipe, diameter 2' DIA

f) Secondary Spillway Capacity 2'

Spillway Width 2'

g) X & Y Slope

Upstream X = 1' Y = 2'

Downstream X = 1' Y = 10"

h) Surface Area of Impoundment 16.5 Ac.

i) Storage 150 Acre Feet

j) Drainage Area Above Dam 250 Acres

4-2000

Todd Worrell Application in Aurora County

Submit a total of $205 made payable to the Water Rights Program ($200 for application and $5 to transfer Permits No. 4285-3 & 4978-3. (This amount may change if the application is further amended or the permits are not transfer).

Complete and sign the two transfer of ownership forms and return. This assumes that the permits are not subject to abandonment and/or forfeiture.

Return the properly signed map.

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FEB 13 2006
WATER RIGHTS PROGRAM

What is the actual diversion rate from the well? _____

Is the existing dam use for stockwatering? No

Water is the storage capacity of the existing dam? 150 AC FT

Will the repair you mentioned in our telephone conversation enlarge the dam? No

If no, may I amend the submitted application to include the existing dam for recreation and fish & wildlife use?

yes

What is the intended use of water fro the small stream located in the NE ¼ Section 6 that is authorized for irrigation by Permit No. 4978-3?

_____

Do you have any concern with the deferred applications being denied?

_____

SIGNED [signature] 2/9/06
Todd Worrell Date

return to: Eric Gronlund, Water Rights Program, DENR, 523 E. Capitol Avenue, Pierre SD 57501

Todd Worrell Application in Aurora County

Submit application filing fee – see item No. 5 on instruction sheet to calculate fee.

If diversion from the well will not exceed 120 acre-feet of water annually and based on what you've told me I don't think they will - a total of $202.50 made payable to the Water Rights Program ($200 for application and $2.50 to transfer Permit No. 4285-3). Call me if you have questions on calculating the fee.

Complete and sign the transfer of ownership form for Permit No. 4285-3 and return.

You will need to determine the amount of water claimed in gallons per minute and the maximum acre feet of water annually that will be diverted. This information goes in Item No. 2 on the application. You well driller may be able to assist you in determining the diversion rate from the well.

Obtain a map that references a section corner showing the location of the proposed well. The map needs to be signed as set forth in Item No. 2 d) of the instruction sheet. I believe we talked that you may be able to obtain assistance from NRCS in meeting this requirement. There is a field office for Aurora County at 206 N Main Street in Plankinton.

RECEIVED
FEB 13 2006
WATER RIGHTS PROGRAM

Item No. 4 – provide the location of proposed well- See Map

Water is the storage capacity (in acre feet) of the existing dam?
150 Ac FT

Will the repair you mentioned in our telephone conversation enlarge the dam? No

You discussed installing a riser pipe spillway. Are you having this designed by an engineer? Plans and specification will be required for this type of alteration to the dam since it goes beyond the scope of being maintenance. We decided against a riser pipe spillway. See drawing for spillway.

Return application to: Eric Gronlund, Water Rights Program, DENR, 523 E. Capitol Avenue, Pierre SD 57501

NOTICE OF TRANSFER OF OWNERSHIP

To: Chief Engineer
Water Rights Program, DENR
523 E. Capitol
Pierre, SD 57501-3181

No. **4978-3**

Date: _____

RECEIVED
FEB 13 2006
WATER RIGHTS PROGRAM

I/We request that Water Permit No. **4978-3**

formerly owned by: **Carol Estabrook**

be transferred to: (name & address) **Todd Worrell, 24466 US Hwy 281, Plankinton SD 57368**

Telephone No. 605 942-7666

Title to the following described land(s)/property has been transferred as described above:

NE ¼, N ½ SE ¼ Section 6; W ½ NW ¼ & NW ¼ SW ¼ Section 5, all in T104N, R63W

I/We understand that the validity of Water Permit No. **4978-3** has not been determined by this transfer action. If I/We have any questions on validity, I/We understand that only the Water Management Board has the authority to determine if a water permit/right is valid (see note).

You are requested to file this "Notice of Transfer" in the appropriate file with the Water Rights Program, as evidence of the change of ownership.

A fee of Two Dollars and Fifty Cents ($2.50) is required to cover the filing fees as required under SDCL 46-2-13. This form must be signed by the new owner.

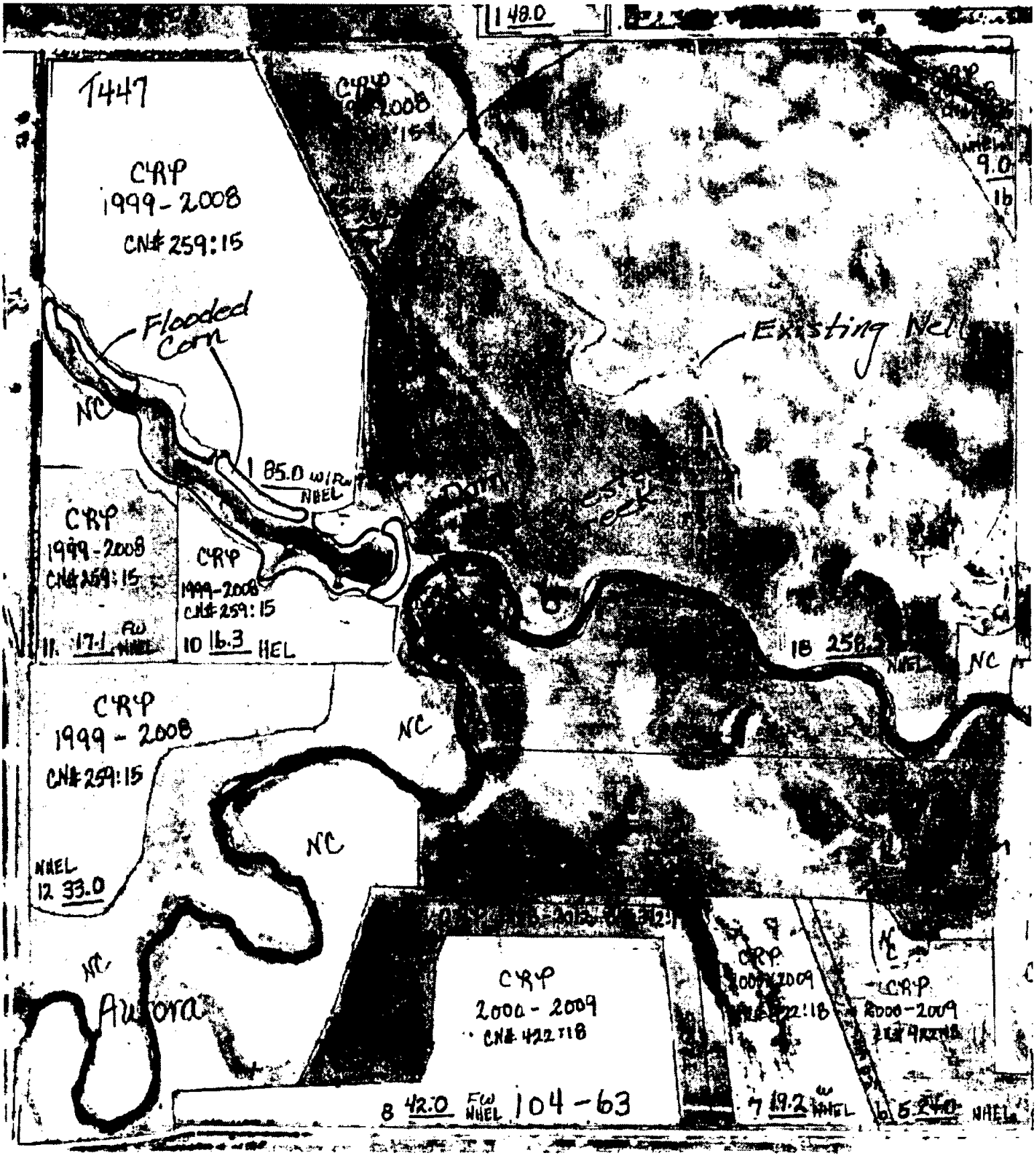
I/We Todd Worrell, the new owner, certify that the above information is true and correct.

Todd Worrell
(Signed by new owner)

NOTE: Water permits may be cancelled for nonconstruction after the five year construction period has expired. Once a water permit is developed and the water used, the permit becomes a right. A water right may be lost for three reasons:

1. Abandonment - no intent to use water and use is abandoned.
2. Forfeiture - no use of water for three year period without legal excuse.
3. For a third violation of a condition of a water permit/right.

MAP NOT TO SCALE
THIS IS NOT AN OFFICIAL WETLAND MAP



DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES
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JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

March 10, 2006

Todd Worrell
13320 Buckland Hall Road
St. Louis MO 63131

Dear Mr. Worrell:

The South Dakota Water Rights Program received the re-filed water right permit application to drill a new well to maintain the dam located in the NW ¼ Section 6, T104N, R63W in Aurora County. The application states it is an amendment to existing permits. For purposes of clarification, Water Rights views this as a new application because it involves an appropriation from a well and the actual dam storage is greater than the 80 acre feet authorized by Water Permit No. 4285-3.

The map submitted with the application showing the location of the new well must be signed by a SD registered professional engineer, land surveyor or government employee who prepares maps as part of his duties. We often direct ag producers to their local Natural Resource Conservation Service to assist in meeting this requirement. A copy of the map is enclosed along with a self addressed stamped envelope.

Supporting documents submitted with the application state that repairs will not enlarge the dam. However, the description of project states an intention to raise the water level in order to flood an area for waterfowl habitat. Maintenance to a dam is allowable without submittal of plans and specification if the work does not structurally change the dam. However, if the primary outlet shown in the diagram you submitted will allow the water level to be controlled at a higher level than the existing outlet, plans and specification will need to be submitted. In addition, the outlet must be properly sized to handle storm events. Dam safety regulations require that plans and specifications be prepared by a professional engineer and submitted for alterations to existing dams. Questions on dam safety requirements may be directed to Tim Schaal at (605) 773-3352.

Lastly, you filed a transfer of ownership for Water Permit Nos. 4285-3 and 4978-3. However you only submitted a filing fee for one transfer ($2.50). Since Water Permit No. 4285-3 authorizes the dam, that is the permit that is being transferred. Water Permit No. 4978-3 authorized irrigation from a small stream. It is my understanding from our previous conversation that no irrigation will occur from the steam, therefore, No. 4978-3 can be cancelled and there is no reason to transfer the water permit. If I am incorrect, please let me know.

Again, I caution you about drilling the well or altering the dam prior to obtaining a permit. The Chief Engineer will not make a recommendation until the application is complete and staff has thoroughly reviewed water availability. As I've discussed with you previously, there was significant controversy regarding water use on the property when owned by Mr. Estabrook.

Please feel free to contact me if you have any questions.

Sincerely,

Eric Gronlund

Eric Gronlund
Water Rights Program, DENR
605 773-3352

enclosure

c: also sent to Mr. Worrell, c/o Firesteel Creek Hunting Lodge, 24466 US Highway 281, Plankinton SD 57368

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES
PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

May 21, 2008

Todd Worrell
13320 Buckland Hall Road
St. Louis MO 63131

Dear Mr. Worrell:

I am writing regarding water right permitting on land you own in Aurora County. This was land previously owned by Mr. Estabrook which had water rights for irrigation in place. As I recall you intended to abandon all irrigation but desired to drill a new well to maintain the existing dam for fish and wildlife.

In February 2006 you filed an application for the well. At that time additional information was necessary to complete the application. Primarily we requested a properly signed map showing the proposed location of the well and plans and specification for alterations to the existing dam. A copy of my March 10, 2006 letter is enclosed. Last I knew you had contacted the Natural Resource Conservation Service to assist you with meeting these requirements.

I am writing to find out if it is still your intention to complete a well to maintain the dam. If so, what is the status of getting plans and specification completed for the dam alterations. If you no longer intend to proceed with the well and dam alterations, the application can be withdrawn. We can then work to get the other permitting issues such as reissuing of the existing water right for just storage in the dam and cancellation of those water uses that have been abandoned.

I also note that you have a hunting operation with a lodge. From a water rights standpoint, if a private well supplies the lodge the use is a commercial use of water. South Dakota water rights law provides that all commercial uses of water from a well require a water permit to be obtained. The only use that does not require a water permit in South Dakota is domestic use which is for a private family residence and livestock water. Enclosed are application forms.

Please feel free to contact me if you have any questions.

Sincerely,

Eric Gronlund
Water Rights Program, DENR
605 773-3352
eric.gronlund@state.sd.us

enclosure

c: also sent to Mr. Worrell, c/o Firesteel Creek Hunting Lodge, 24466 US Highway 281, Plankinton SD 57368

Gronlund, Eric

From: Gronlund, Eric
Sent: Tuesday, March 17, 2015 10:41 AM
To: 'Todd Worrell'
Subject: RE: South Dakota water permitting issue

Todd

Okay – once you complete the application for the well and dam we will proceed with cancellation of the two existing permits and denial of the deferred applications to get them "off the books". To complete the application, see below in Item Nos. 1 and 2 in my initial email.

I do not see the existing irrigation permits/deferred applications benefiting what your trying to accomplish. By law, irrigation rights can only be transferred for domestic use or use within a water distribution system and your project is wildlife and recreation oriented. In situations where an irrigation dam is involved and the irrigation component is abandoned, there is the ability to add stock watering to the license. However since livestock is not involved, that option is not available.

Because of the history prior to you owning the property, there is potential for the application to be contested during the public notice phase. The perception of the well being used to maintain a lake and impairing neighboring domestic wells and whether the dam may back water against the road or on to someone else's land were issues back then and could resurface even though irrigation is no longer intended. Just want to make sure you are aware of that upfront.

Eric

From: Todd Worrell [mailto:toddr3838@att.net]
Sent: Saturday, March 14, 2015 7:56 PM
To: Gronlund, Eric
Subject: RE: South Dakota water permitting issue

Eric,

What I am purposing is a 20-22 acre lake for wild life and recreation which would require the current damn repaired and a spillway that could handle spring rain run-off into Firesteel Creek. My proposal has nothing to do with irrigation or any of the things Carl Estabrook did on the property before I owned it. The new drilling of a well would be for replacing evaporation of water and or raising and lowering the water level for duck hunting. As for the permits on record by the Estabrook's they can all be eliminated unless there is a permit that falls in line with what I am proposing that would benefit what I am trying to do.

Todd

FYI: The irrigation pivot was taken down about 10 years ago. None of the wells that were drilled by the Estabrook's are operational. If need be someone from your office needs to come out to the property and put this Estabrook issue to bed and move forward. You are worrying about something that no longer exsists.

rom: Gronlund, Eric [mailto:Eric.Gronlund@state.sd.us]
Sent: Friday, March 13, 2015 7:24 AM
To: 'toddr3838@att.net'
Subject: South Dakota water permitting issue

Mr. Worrell:

I am getting back to you regarding your application from 2006 to appropriate 75 gallons per minute from a well to help maintain and fill a dam/pond in Section 6, T104N, R63W in Aurora County, SD. The application also is to increase the storage capacity of the dam from the 80 acre feet of water authorized by the irrigation permit No. 4285-3 to 150 acre feet of water. The application has been on hold awaiting completion. At this point, I believe two items are necessary to complete the application.

1. Plans and specification for the dam are needed. You planned to work with the Natural Resource Conservation Service to have engineering plans prepared that would detail the repair/rehabilitation design of the dam including dimensions, spillway capacity, impounded area and risk assessment in the event of a failure.

2. An application filing fee of $200 dollars was submitted in 2006. That amount was insufficient by $100. However, in 2009 the state legislature increased filing fees and the fee for this application would now total $950. The balance of $750 will need to be submitted.

As stated in prior correspondence, permitting issues by the prior owner, Mr. Estabrook, for a well and the dam were extremely controversial. Issues ranged from the impact of a well on domestic users to the dam causing flooding on other property. It is possible that this controversy may resurface with your application. Until the application is thoroughly reviewed, I can not give you any idea of what the Chief Engineer's recommendation maybe on the application. We would certainly need to look at the prior court decision in this matter. Attached is the South Dakota Supreme Court's ruling in Fraser v. Water Rights Commission involving Application No. 4405-3. The conclusion in that case was the granting of the permit would be detrimental and not beneficial or in the public interest. I have not fully analyzed the similarities or difference between your proposed project and the previous Estabrook application. Also attached is the 1987 minutes from the Water Rights Commission involving a hearing on another Estabrook application.

Below is a summary of permits and deferred applications pending with relevance to this matter. I believe all these applications involve land you now own.

Permit No. 4285-3 – this permit was transferred to your name. The permit authorizes diversion from the storage dam for irrigation for irrigation of 323 acres in portions of Sections 5 and 6 as specified on the permit. The storage dam is designated as having a storage capacity of 80 acre feet of water. Irrigation has not taken place and the permit is likely subject cancellation due to forfeiture for nonuse. By law, irrigation rights can not be transferred to recreation and fish & wildlife use.

Permit No. 4978-3 appropriates 300 gpm from a small stream in the NE ¼ Section 6 to irrigate the same acres as listed on Permit No. 4285-3. Again DENR records indicate that this has not been used recently and therefore the permit likely subject to cancellation for abandonment and/or forfeiture for nonuse.

Deferred Application No. 3435-3 proposed use ground water fromn the center of the SE ¼ Section 6 to irrigate 220 acres in the SE 1/4, S ½ NE ¼, and E ½ SW ¼ Section 6. DENR believe the application should now be denied to get it "off the books" since there is no intent on your part to irrigate from a well in this location.

Deferred Application No. 4285A-3 proposed to increase the storage capacity of the existing dam and add a small dam for a total storage capacity of 210 acre-feet of water plus irrigate an additional 300 acres. This application was deferred in 1987 until easement and right-of-way arrangements were obtained and proper repairs made to the dam. It is likely this deferred application can be denied in order to get it "off the books" .

Deferred Application No. 4405-3 proposed appropriation of water from a well to irrigate 260 acres in portions of Sections 5 and 6. This was the application that went before the SD Supreme Court in Fraser v. Water Rights Commission. DENR believe it should be now be denied to get it "off the books" since there is no intent on your part to irrigate from a well.

Deferred Application No. 4437-3 proposed diversion of water from Firesteel Creek to act as an additional point to Application No. 4405-3. DENR believe the application should now be denied to get it "off the books" since there is no intent on your part to irrigate from Firesteel Creek.

Deferred Application No. 4460-3 sought to appropriate Firesteel Creek flood flows to irrigate 335 acres in portions of Sections 5 and 6 as set forth in application. DENR believe it should now be denied to get it "off the books" since there is no intent on your part divert from Firesteel Creek.

Please understand that combined the records for these permits/deferred applications are about 850 pages. I have not delved into every detail. What is relevant at this time is the application you filed in 2006 for the dam and a well. Also this is an opportunity to handle the deferred applications that there is not an intent to develop and the two permits that are not in use.

Please contact me if you have questions after reviewing this material.

Eric Gronlund
Water Rights Program, DENR
605 773-3352
Eric.gronlund@state.sd.us

Gronlund, Eric

From: Gronlund, Eric
Sent: Friday, April 15, 2016 3:57 PM
To: Goodman, Jeanne; Schaal, Tim
Cc: Duvall, Ron
Subject: Todd Worrell (Estabrook dam)

Dave Bartel with JRWDD called Friday morning to say that he told Todd Worrell the JRWDD is going to hold off on any funding for his dam until he gets permitting issues right with DENR. It was a courtesy call to let me know that Mr. Worrell will be calling.

Currently, Mr. Worrell holds the old Estabrook WR No. 4285-3 which is for 80 acre feet for irrigation.

Our contact with Mr. Worrell started back in about 2005. At that time he wanted to enlarge the dam to 150 acre feet in capacity and have a well to help maintain the water level. It is unclear whether the dam was already 150 acre feet in capacity or if he was adding height to the dam. He filed an application but we never deemed it complete with the primary issue being getting plans and specification for alteration to the existing dam. He was to work with NRCS. I do have email correspondence from 2012 where I sent pertinent information on the file to Brosz Engineering.

Mr. Worrell stated that nothing is going to change with the dam, he's just maintaining it. It has never breached and four years ago it was full to the brim. He then went on to say that based on the engineering estimates it was going to cost $250,000 to repair it but that included a 100 foot wide concrete spillway (that may have come from Brosz Engineering). He simply is not going to pay that much. His position is there is a dam in place and when water comes down the drainage it impounds water whether there is a water right or not so doesn't see this as a big deal. He told me he has had a contractor on site, re-cutting, grading and reworking the dam. His plan is to spend $50,000 to $75,000 on construction. He said they are ready to put fabric down and armor areas with rock. New he sees that JRWDD put a hold of one of his funding mechanisms. I asked if there were any plans drawn up and he said no.

I then went on to inform him there are dam safety regulation to insure that proper spillway sizing it in place to handle storm events. That process involves DENR's approval and as of right now we don't know the size of the dam and he's had a contracted conducting work. He went it is no larger than it was. I again said the water right is for 80 acre feet and we have an application pending that says the dam is going to be 150 acre feet and I have no idea how that amount was arrived at.

I then asked if it is still his intention to drill a well to supplement the dam. He said yes and that he has the permit for a well in place for that. I told him that he has an application pending but it has not been processed because we were waiting for P&S on the dam.

My last correspondence with him was in March of 2015. At that time I brought up that WR No. 4285-3 was for a dam for irrigation. By law, irrigation rights can not be transferred to any uses other than domestic and water distribution system use. His use is listed on the pending application as recreational and fish and wildlife. There is the provision under 46-5-31.1 that if irrigation is abandoned and livestock watering is occurring that stock watering can be added to the permit. He has no livestock. So unless he buys a cow or a horse, he's basically a new permit application for a dam that has been in place for years.

Mr. Worrell was clearly frustrated but remained polite. And he sees one of his funding sources may have dried up, at least temporarily. I thinks he knows that DENR is frustrated by the fact he conducted construction activities without P&S. It seemed odd that Mr. Worrell had no recollection of any prior discussion or correspondence that we had in 2005, 2006, 2008 and 2015).

He asked if we could just come down there to look at it and see what he's done so we can discuss options. I told him I'd brief the Chief Engineer on Monday and give him a call. If we were to come down it would likely be Tim Schaal and myself. I get the uneasy sense that he thinks by us seeing the dam in place and the work that has been done, we'll be okay with it.

Eric

Gronlund, Eric

From: Gronlund, Eric
Sent: Monday, May 02, 2016 1:05 PM
To: toddr3838@att.net
Cc: Schaal, Tim
Subject: Dam

Mr. Worrell:

Thank you for taking the time last Friday to show Tim Schaal and myself the dam on your property and discuss what is needed to proceed with water right permitting for the dam in order to comply with South Dakota water rights law.

The primary issue is that DENR will need plans and specifications for the dam. At the time we met there was discussion on whether you planned to have a primary outlet or just the earthen spillway. That is something you will need to decide after consulting with whoever completes the plans and specification. Among other things the plans and specification will define the storage capacity, the size of the outlet to handle storm events and the elevation of the spillway in reference to the culverts in the upstream road..

You indicated that construction of a well is still planned to assist in maintain the water level.

Also you indicated in cooperation with Ducks Unlimited, you intend to divert water to a few small shallow bermed areas for habitat. If that is planned, we will need information of the number, size, location and intended diversion/pump rate from the dam to these bermed areas. Your application can then be amended accordingly.

Options that you were going to check into regarding completion of plans and specifications included contacting either

- Natural Resource Conservation Service
- Ron Gillen
- Steve Donovan with Ducks Unlimited.

Once DENR has final plans and specification for the dam the application can be amended and we will proceed with processing the water permit application.

Eric Gronlund
Water Rights Program, DENR
605 773-3352
eric.gronlund@state.sd.us

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

September 7, 2016

Todd Worrell
810 Simmons Ave.
St. Louis, MO 63122

Dear Mr. Worrell:

We have reviewed the plans and specifications for your dam project located in the SE ¼ NW ¼ of Section 6-T104N-63W, in Aurora County. The plans and specifications for the reconstruction of the dam are approved.

Our review was to determine compliance with the requirements of the Water Management Board Safety of Dams Rules, Chapter 74:02:08. Approval of these plans and specifications does not release you, as owner of the dam, from the responsibility for operating and maintaining the dam in good repair to ensure the safety of the dam.

The Worrell Dam (NID ID No. SD02206) will be classified as a small size Category 3, Low Hazard dam with a dam height of 14 feet and a normal storage capacity of 148.4 acre-feet and a maximum storage capacity of 302.3 acre-feet.

If you have any questions, please feel free to contact us.

Sincerely,

Timothy G. Schaal, P.E.
Engineer IV
for Jeanne Goodman, Chief Engineer
Water Rights Program
(605) 773-3352

c: Dana Edwards, P.E., NRCS, Pierre

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES

JOE FOSS BUILDING
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PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT APPLICATION NO. 6703-3, Todd Worrell

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Environment and Natural Resources concerning Water Permit Application No. 6703-3, Todd Worrell, 810 Simmons Avenue, St. Louis MO 63122.

The Chief Engineer is recommending APPROVAL of Application No. 6703-3 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use and 4) it is in the public interest with the following qualifications:

1. 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.

2. The well authorized by Permit No. 6703-3 shall be constructed by a licensed well driller and construction of the well and installation of the pump shall comply with Water Management Board Well Construction Rules, Chapter 74:02:04 with the well casing pressure grouted (bottom to top) pursuant to Section 74:02:04:28.

3. Water Permit No. 6703-3 authorizes an impoundment with a storage capacity of 150 acre feet of water and sufficient water annually to maintain the water level to an outlet elevation of 1,287.0 feet mean sea level.

4. No pumping from the well into the dam is authorized when the water level in the lake is at or above the primary outlet elevation of 1,287.0 feet mean sea level.

5. The Permit Holder shall report to the Chief Engineer annually the amount of water withdrawn each year from the Niobrara aquifer.

6. Approval of Water Permit No. 6703-3 cancels Water Permit No. 4285-3 and withdraws Application No. 4285A-3.

See report on application for additional information.

Jeanne Goodman, Chief Engineer
September 7, 2016

NOTE: Water Permit No. 4285-3 that is intended to be cancelled under qualification No. 6 was transferred to your name in 2006. The permit is for the dam at a storage capacity of 80 acre feet of water for irrigation purposes. The application that is pending is for the same dam at a storage capacity of 150 acre feet of water for recreation and fish and wildlife purposes.

Adam Mathiowetz's staff report contains a history of controversy involving applications filed by Carl and Carol Estabrook. There are five applications on deferred status and one water permit. Once your Application No. 6703-3 is through the permitting process, it is the Water Rights Program's intent to bring the deferred applications before the Water Management Board for denial and notice the existing permit for cancellation. You will be provided notice scheduling these actions before the Board.

REPORT TO THE CHIEF ENGINEER
ON
WATER PERMIT APPLICATION NO. 6703-3
TODD WORRELL
SEPTEMBER 8, 2016

Water Permit Application No. 6703-3 proposes to impound 150 acre-feet (ac-ft) of water from an un-named drainage to Firesteel Creek by reconstructing a dam located in the SE ¼ NW ¼ Section 6 and diverting water from the Niobrara aquifer at a maximum diversion rate of 0.17 cubic feet of water per second (cfs) from one well (approximately 180 feet deep) to be located in the SE ¼ NW ¼ Section 6; all in T104N-R63W in Aurora County. The dam will impound water in the SE ¼ NW ¼, Lots 4 and 5 of Section 6; all in T104N-R63W. The well will be used to maintain a water level in the dam as well as be a source of water for dog kennels. The application requests impoundment of sufficient water to maintain the water level in the dam to the outlet elevation of 1,287.0 feet mean sea level. The project will have the ability to divert water from the dam to three wetland areas formed by berms and ditch plugs with an approximate surface area of 14 acres located in portions of Lots 1, 2, 3, and the S ½ NE ¼ Section 6; SW ¼ NW ¼ Section 5; all in T104N-R63W. The water is for fish and wildlife propagation and recreational purposes. This report will cover the groundwater component of this application, the 0.17 cfs diversion from the Niobrara aquifer.

AQUIFER: Niobrara aquifer (NBRR)

Aquifer Characteristics:
The Niobrara Formation, sometimes also called Niobrara Marl, underlies much of eastern (Hedges et. al, 1982) and western (Allen, Iles, and Petres, 1984) South Dakota. Figure 1 is a map showing the approximate extent of the Niobrara Formation in eastern South Dakota. Figure 1 shows the Niobrara Formation is not contiguous. The well proposed by this application is located such that it would be completed into the largest section of the Niobrara Formation. The Niobrara Formation underlies approximately 29,000 square miles (18,560,000 acres) of eastern South Dakota (Hedges et. al, 1982). The portion of the Niobrara Formation that is saturated is known as the Niobrara aquifer. The Niobrara aquifer is often called "chalk" or "chalkstone" by drillers (Hamilton, 1985).

The Niobrara Formation in Aurora and Jerauld Counties is comprised up to "190 feet of gray, firm to soft, thin-bedded chalk and calcareous claystone (marl) that is interbedded with very soft, dark-gray, calcareous shale" (Hamilton, 1985). However, not all of that thickness is aquifer. It is only the portion with the aquifer that contains fractures and solution cavities. The Niobrara aquifer underlies approximately 1,230 square miles (787,200 acres) of Aurora and Jerauld Counties (Hedges et. al, 1982). The Niobrara aquifer can be encountered from 77 to 770 feet below grade and has an average thickness of 80 feet in Aurora and Jerauld Counties (Hamilton, 1985). The aquifer is under confined conditions in this area (Water Rights, 2016a). The static water level is expected to be approximately 40 feet below grade at the proposed well site (Water Rights, 2016a). Figure 2 is a map showing the area around the proposed well site.

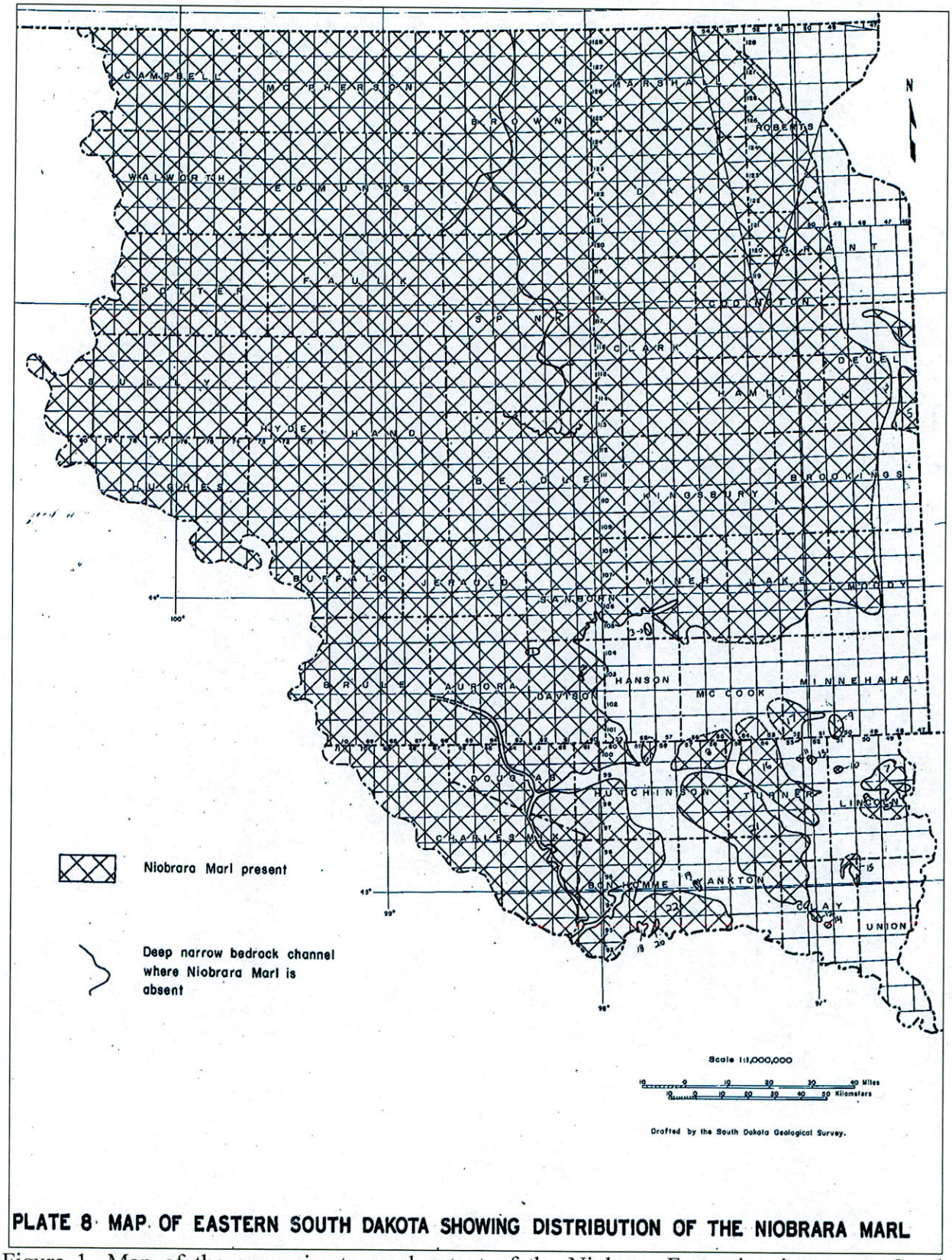

PLATE 8 MAP OF EASTERN SOUTH DAKOTA SHOWING DISTRIBUTION OF THE NIOBRARA MARL

Figure 1- Map of the approximate areal extent of the Niobrara Formation in eastern South Dakota (Hedges et. al, 1982)

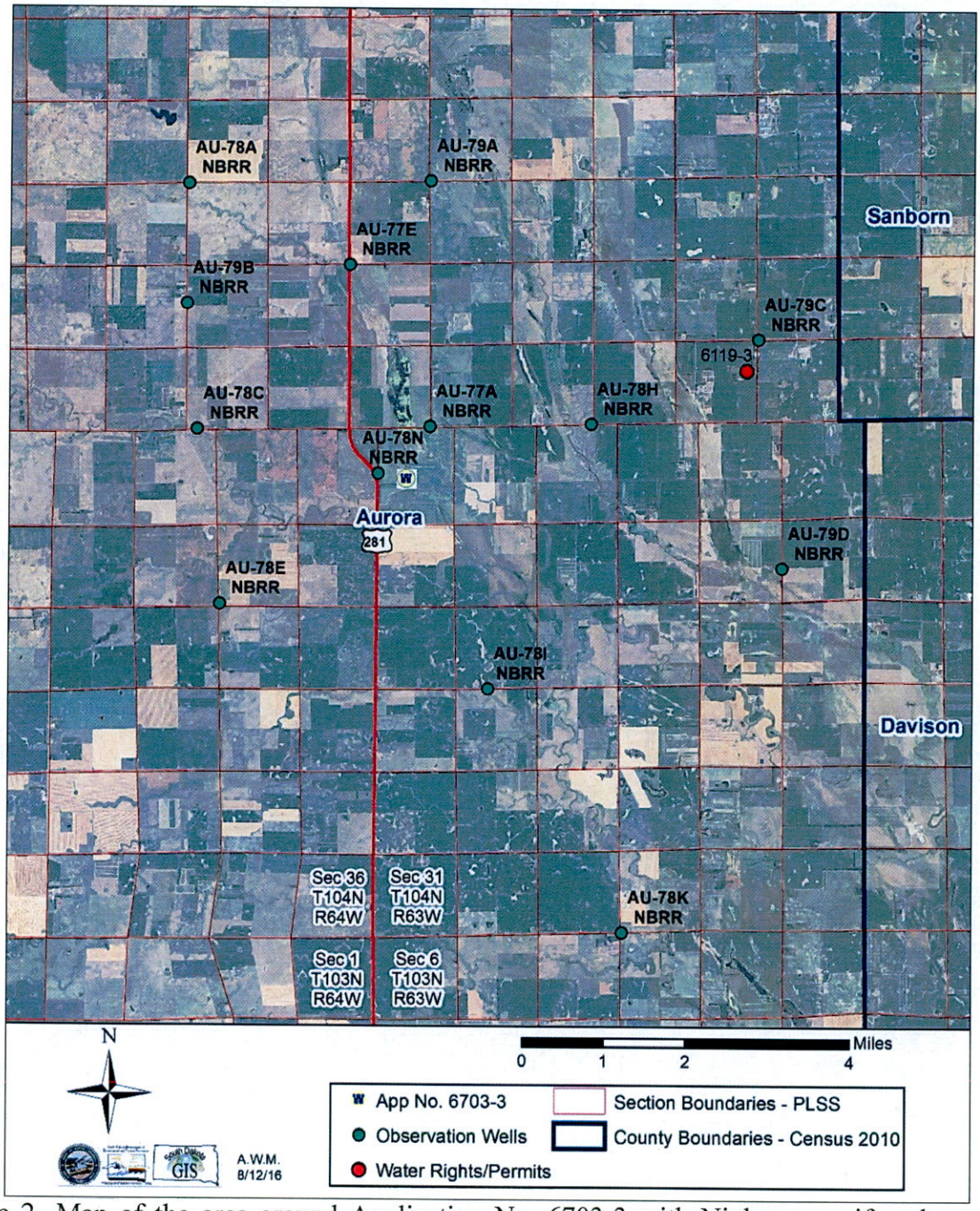

Figure 2- Map of the area around Application No. 6703-3 with Niobrara aquifer observation wells (Water Rights, 2016a) and water rights/permits (Water Rights 2016b)

South Dakota Codified Law (SDCL) 46-2A-9

Pursuant to SDCL 46-2A-9, a permit to appropriate water may be issued only if there is a reasonable probability that there is unappropriated water available for this applicant's proposed use, that the proposed diversion can be developed without unlawful impairment of existing rights and that the proposed use is a beneficial use and in the public interest. This report will address the availability of unappropriated water and effects on existing rights from the aquifer that are pertinent to this application.

WATER AVAILABILIITY:

This application proposes to appropriate water from the Niobrara aquifer. The probability of unappropriated water being available from the aquifer can be evaluated by considering SDCL 46-6-3.1, which requires "No application to appropriate groundwater may be approved if, according to the best information reasonably available, it is probable that the quantity of water withdrawn annually from a groundwater source will exceed the quantity of the average estimated annual recharge of water to the groundwater source." If the source of the water is older or lower than the Greenhorn Formation and a water distribution system has applied for a permit, the Board need not consider the recharge/withdrawal issue. In this case, the aquifer is not stratigraphically lower than the Greenhorn Formation and this application is not for a water distribution system. Therefore, the recharge versus withdrawal issue needs to be considered.

Recharge and Discharge

Recharge:

The Niobrara aquifer is recharged through infiltration of precipitation where the aquifer is at or near land surface, percolation from overlying aquifers that have higher potentiometric surfaces than the Niobrara aquifer, and the underlying Codell aquifer when the two aquifers are in direct contact and the Codell has a higher potentiometric surface. The Niobrara aquifer in Aurora and Jerauld Counties is likely recharged from subsurface inflow from the west. There may be some recharge coming from overlying sediments (Hamilton, 1985), especially where the aquifer is closer to land surface and overlain by more permeable materials. The aquifer may also be receiving recharge from the underlying Greenhorn Limestone and Dakota aquifer. Steece and Howells (1965) stated, "Casing of hundreds of deep wells have corroded and permitted water from the Greenhorn and Dakota to flow into the Niobrara and Codell."

The recharge rate to the Niobrara aquifer in Jerauld and Aurora Counties has not been estimated. However, Hamilton (1985) estimated groundwater outflow to the east and south from Jerauld and Aurora Counties. Hamilton (1985) used the slope of the potentiometric surface, average transmissivity of the aquifer, and the aquifer length perpendicular to the direction of the flow to make the estimate. The groundwater outflow was estimated to be 9,000 ac-ft/yr. (Hamilton, 1985). Provided there is no change in aquifer storage, the total groundwater outflow is balanced by an equal amount of recharge. Figure 3 is the hydrograph for observation well AU-79C. The hydrograph shows that over the period of record the water level in the aquifer has risen. This rise has been entirely in artesian head pressure. That means storage in the aquifer has increased, but the change is minor. This is supported by the other hydrographs shown in Figures 5 through 11.

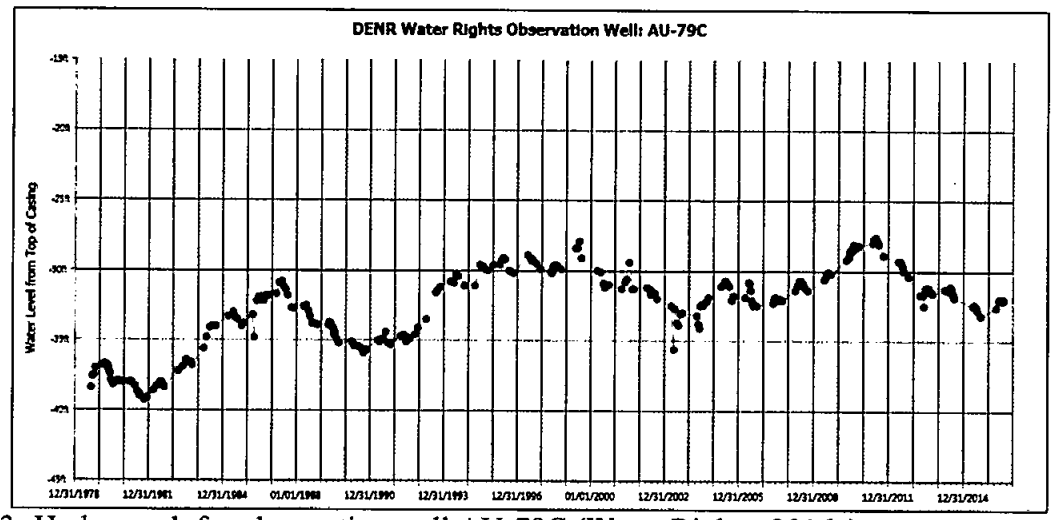

Figure 3- Hydrograph for observation well AU-79C (Water Rights, 2016a)

Discharge:
The Niobrara aquifer in Aurora and Jerauld Counties discharges through groundwater outflow to the east and south, leakage to adjacent aquifers and sediments that have a lower potentiometric surface, well withdrawals, and possibly to the Codell aquifer. In this area, the potentiometric surface of the Codell aquifer is lower than the potentiometric surface of the Niobrara aquifer (Water Rights, 2016a). There are 81 water rights/permits authorizing the withdrawal of water from the Niobrara aquifer in South Dakota with two in Aurora County and none in Jerauld County (Water Rights, 2016b). Table 1 lists those two water rights. Both water rights are used for standby purposes only, and very little to no water use is expected under either water right.

Permit No.	Name	County	Priority Date	Status	Use	CFS	Vol. (ac-ft/yr.)
4121A-3	City of White Lake	AU	09/02/1977	LC	MUN	0.13	0*
6119-3	Storla Sunset Home	AU	12/21/1998	LC	INS	0.067	0*
Au= Aurora County, LC= Water Right, MUN= Municipal, INS= Institutional, *= Standby Source (Water Rights, 2016b)							

Table 1- Water Rights/Permits authorizing withdrawal from the Niobrara aquifer in Aurora and Jerauld Counties (Water Rights, 2016b)

There are a number of domestic wells on file with the DENR-Water Rights Program that are completed into the Niobrara aquifer in Aurora and Jerauld Counties (Water Rights, 2016c). The domestic use from the Niobrara aquifer is insignificant compared to the estimated recharge.

This application proposes to maintain water in the dam and then flood approximately 14 acres with 1 foot of water every fall for wildlife (Water Rights, 2016d). The area of water stored behind the dam when it is full is approximately 30 acres. According to Spuhler and others (1971), there is approximately 36 inches of lake evaporation per year in this area. That is an evaporation of approximately 90 ac-ft/yr. Therefore, if there is no runoff or precipitation to fill the dam or the land to be flooded from the dam, the maximum annual diversion from the Niobrara aquifer under this application would be 90 ac-ft/yr. to fill the dam plus 14 ac-ft/yr. to flood the land for a total of 104 ac-ft/yr.

Hydrologic Budget:
Hamilton (1985) estimated there is approximately 9,000 ac-ft/yr. of groundwater outflow from the Niobrara aquifer in Aurora and Jerauld Counties. The hydrographs show there has been a minor increase in aquifer storage. Thus, there is approximately 9,000 ac-ft/yr. of recharge in excess of withdrawal to the Niobrara aquifer in Aurora and Jerauld Counties. There is little to no appropriative pumpage from the Niobrara aquifer in Aurora and Jerauld Counties. Domestic use from the Niobrara aquifer in Aurora and Jerauld Counties is minimal when compared to the estimated recharge. This application is expected to pump less than 104 ac-ft/yr. Therefore, there is a reasonable probability that unappropriated water is available for this proposed appropriation.

Observation Well Data
Administrative Rule of South Dakota Section 74:02:05:07 requires that the Water Management Board shall rely upon the record of observation well measurements in addition to other data to determine that the quantity of water withdrawn annually from the aquifer does not exceed the estimated average annual recharge of the aquifer.

The DENR-Water Rights Program monitors 60 observation wells completed into the Niobrara aquifer with 13 in Aurora County and none in Jerauld (Water Rights, 2016a). There are seven observation wells, all in Aurora County, within approximately three miles of the proposed well site (Water Rights, 2016a). The locations of the observation wells are shown in Figure 1, and the hydrographs are shown in Figures 5 through 11. The hydrographs show generally rising water levels over the period of record. These hydrographs are representative of the Niobrara aquifer in this area.

The hydrographs show the Niobrara aquifer responds to climatic conditions, rising during wetter periods and slowly declining during drier periods. Climatic effects on water level dominate the changes of water level in the aquifer. Thus, recharge to and natural discharge from the aquifer significantly exceeds pumping. Natural discharge from an aquifer can be captured for pumping. Recognizing that, the hydrographs for the observation wells document there is unappropriated water available for this proposed appropriation.

The drawdown shown early in the period of record (1977 through 1980) for AU-77A, AU-77E, AU-78C, AU-78H, and AU-78N is the result of pumping from a high capacity well (approximately 1,600 gallons per minute) that was originally authorized under Experimental Permit No. 3435-3 for Carl Estabrook. After 1980, the seasonal drawdown was possibly caused by a well that was pumped in excess of 150 gpm approximately one-half mile north of AU-77A. There was no authorization for a 150 gpm groundwater diversion. The early drawdown matches well with estimated drawdown using the Theis Equation with a diversion rate of 1,600 gpm. The late 1980's to early 1990's drawdown is greater than expected from a 150 gpm pump. The drawdown matches more closely to the drawdown expected from a 650 to 750 gpm pump. Documentation in the permit file for Water Permit No. 4285-3 indicates there may have been a pump larger than 150 gpm used to fill the dam authorized by Permit No. 4285-3. Figure 4 shows the location of the irrigation well and observation wells AU-77A, AU-77E, AU-78C, and AU-78H.

As a confined aquifer such as the Niobrara aquifer is pumped, the drawdown created can be significant some distance from the well. The pumping causes a decrease in artesian head pressure at the well and an accompanying decrease in pressure in the aquifer within the cone of depression from that well. Because the water being pumped is from artesian head pressure and not from dewatering the aquifer, the water levels recover to near pre-pumping levels relatively soon after pumping stops. This is shown in the hydrographs of the observation wells and is typical of confined aquifers in South Dakota where there is high-capacity appropriative pumping.

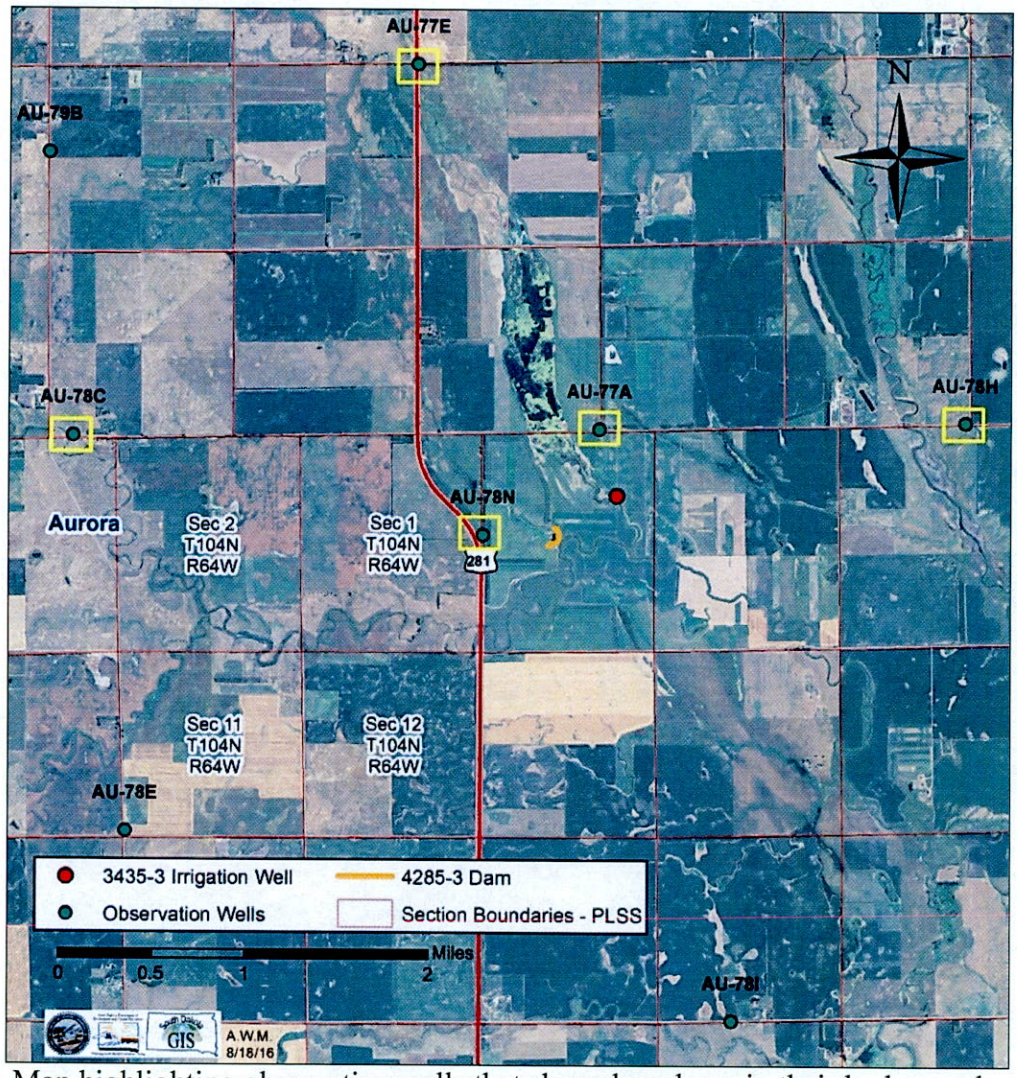

Figure 4- Map highlighting observation wells that show drawdown in their hydrographs

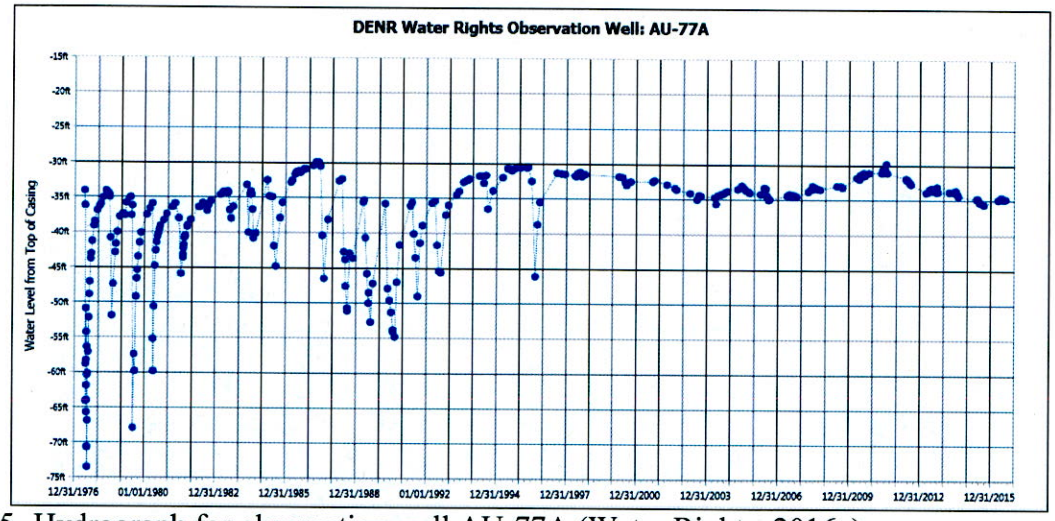

Figure 5- Hydrograph for observation well AU-77A (Water Rights, 2016a)

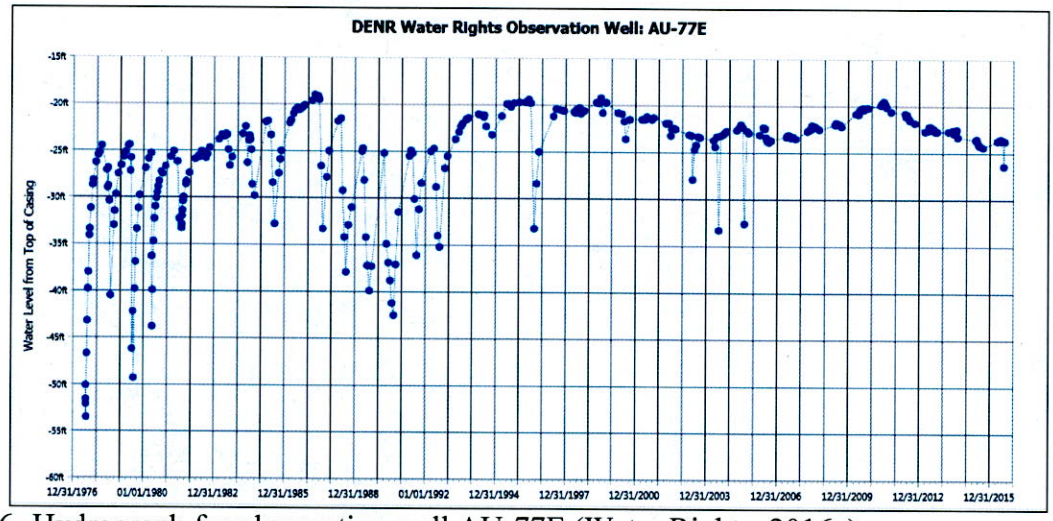

Figure 6- Hydrograph for observation well AU-77E (Water Rights, 2016a)

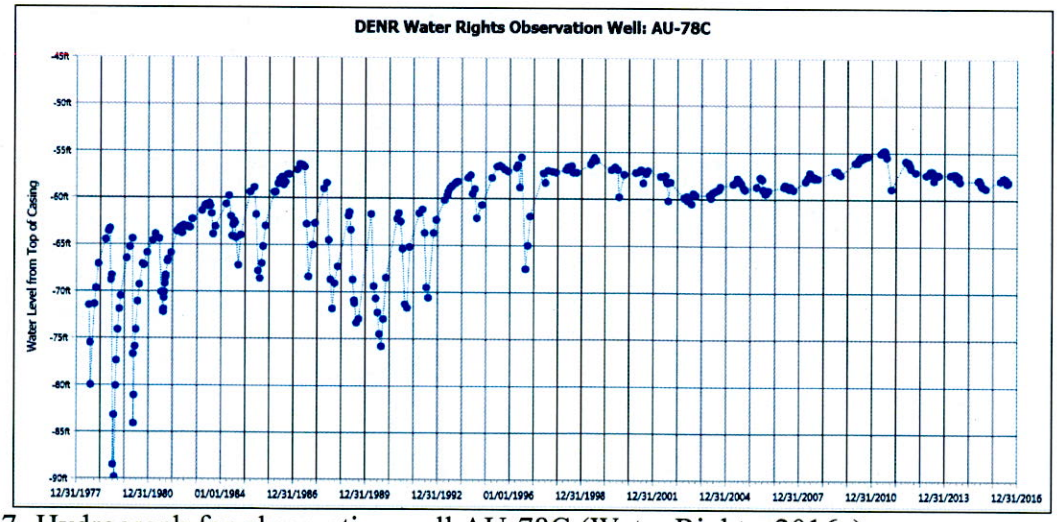

Figure 7- Hydrograph for observation well AU-78C (Water Rights, 2016a)

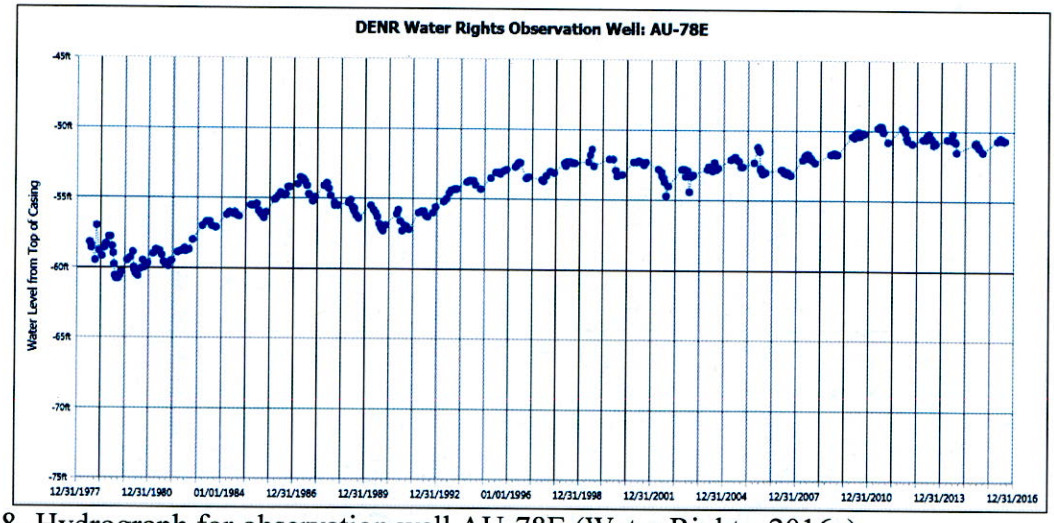

Figure 8- Hydrograph for observation well AU-78E (Water Rights, 2016a)

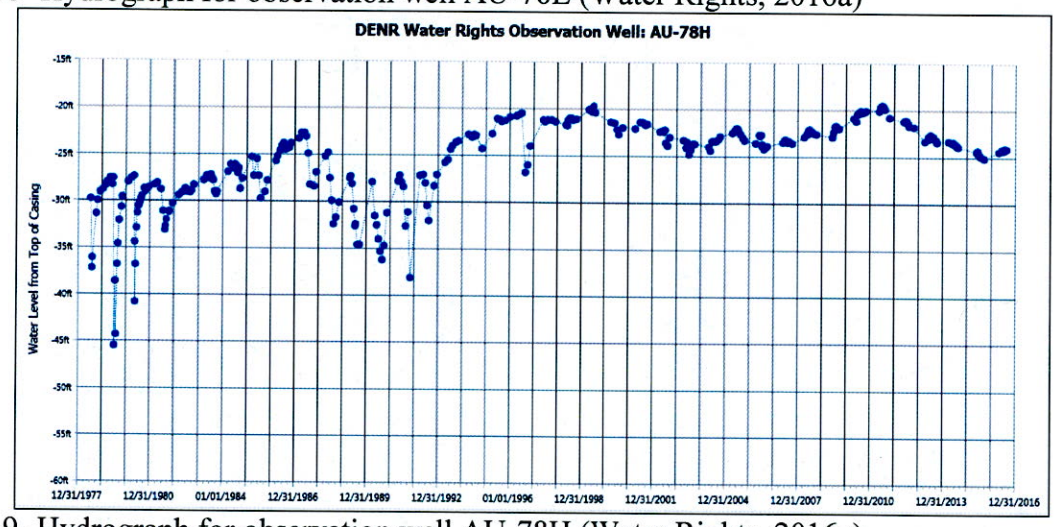

Figure 9- Hydrograph for observation well AU-78H (Water Rights, 2016a)

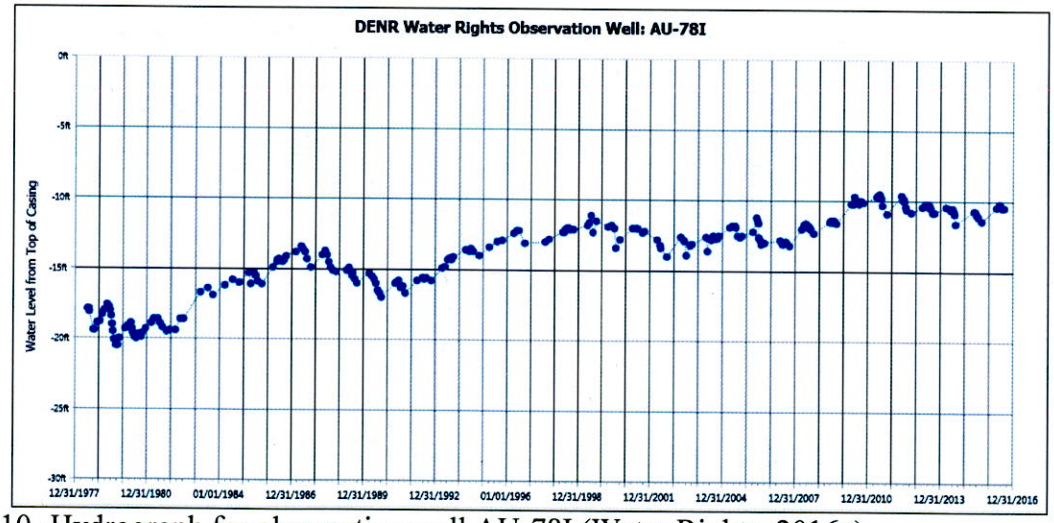

Figure 10- Hydrograph for observation well AU-78I (Water Rights, 2016a)

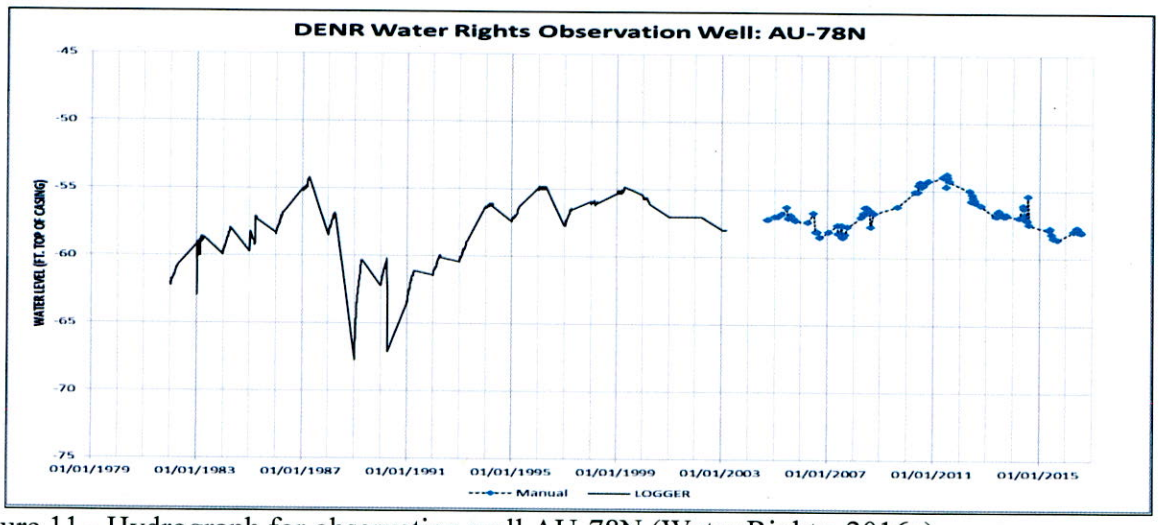

Figure 11 - Hydrograph for observation well AU-78N (Water Rights, 2016a)

The early data shown in the hydrograph for AU-78N is from a continuous data recorder. Since early 2004, all of the measurements taken at the well have been manual measurements.

EXISTING WATER RIGHTS:

As pumping from the Niobrara aquifer in this area increases, there is potential for interaction between the Niobrara, Codell, and Dakota aquifers. Increased pumping from the Niobrara aquifer could reduce leakage to the Codell aquifer. Thus, the Codell aquifer water levels could lower. Also, increased pumping from the Niobrara aquifer could induce more leakage from the Dakota aquifer into the Niobrara aquifer through poorly constructed/deteriorating Dakota aquifer wells. The increase in leakage could lower Dakota aquifer water levels. However, the amount of pumping proposed by this application is minimal compared to the amount of water in storage in each of the aquifers. Thus, the amount of pumping from the Niobrara aquifer is not expected to have any effects on the Codell and Dakota aquifers, and if there were effects they would be minor and localized to the pumping well.

The nearest water right/permit to the proposed well site authorizing the withdrawal of water from the Niobrara aquifer is Water Right No. 6119-3. The wells Water Right No. 6119-3 authorized are approximately 4.4 miles northeast of the well site proposed by this application. There are a number of domestic wells on file with the SD DENR-Water Rights Program that appear to be completed into the Niobrara aquifer within three miles of the proposed well site (Water Rights, 2016c).

There is a significant history of well complaints related to irrigation projects covering much of the same property in Section 6 T104N-R63W, and the dam this application proposes to use. Irrigation permit applications were first filed for Section 6 T104N-R63W in 1976. All of the permit applications for groundwater pumping were intensely opposed by neighbors primarily with concerns of adverse impacts to domestic wells. Eventually, Application No. 3435-3 was approved as an experimental permit which would allow irrigation for one year or until adverse impacts were detected on nearby domestic wells. The intent of the experimental permit was to determine cause and effect of irrigation pumping in this area, not aquifer characteristics. Impacts to domestic well supplies were reported within several days of the beginning of pumping. The

holder of Experimental Permit No. 3435-3, Carl Estabrook, paid for repair to several wells and drilled two new wells, before being completely shut off by The Water Rights Commission. Pumping was allowed under the experimental permit for approximately one month in 1977. Since that time, several applications attempting to authorize irrigation from ground water in Section 6 T104N-R63W were filed and all were intensely opposed. The Water Rights Commission (predecessor of the Water Management Board) approved Application No. 4405-3, which corrected and combined the well location and acres to be irrigated with the acres listed in Experimental Permit No. 3435-3. The South Dakota Supreme Court invalidated the decision of the Water Rights Commission on Application No. 4405-3 for, among other reasons, the potential impacts on domestic well supplies. During that time there were several violations committed by pumping from the irrigation well originally authorized by Experimental Permit No. 3435-3 while the applications were deferred or involved in legal proceedings. Since then, irrigation has been approved using local runoff for Water Permit Nos. 4285-3 and 4978-3 even though both applications were opposed. The diversion rate requested by this application (0.17 cfs) is much less than what was granted by Experimental Permit No. 3435-3 (2.23 cfs) or the pump that was installed for irrigation under Experimental Permit No. 3435-3 (3.57 cfs)

The aquifer is under confined conditions and that means drawdown created by pumping a well may be measurable some distance from the pumping well. Drawdown created by pumping this proposed diversion can be estimated using the Theis Equation. The values used for the Theis Equation are shown in Table 2. The drawdown calculated using the values in Table 2 at various distances from the proposed well are shown in Table 3. These drawdown values are estimates. The transmissivity is the average transmissivity of the Niobrara aquifer in Aurora and Jerauld Counties (Hamilton, 1985). The days since beginning pumping are the required length of time to pump 104 ac-ft/yr. at 0.17 cfs. That length of time assumes absolutely no runoff or precipitation filling the dam or the 14 acres to be flooded in the fall and is therefore a worst case scenario after the initial fill of the dam.

Q (cfs)	T (ft^2/d)[1]	Days since beginning pumping	Storativity
0.17	4,000	308	0.0001
[1]= (Hamilton, 1985)			

Table 2- Values used for the Theis Equation

Distance from well (miles)	0.5	1	1.5	2	3
Drawdown (ft)	2.42	2.02	1.78	1.61	1.38

Table 3- Estimated drawdown at various distances from the proposed well site after one year of continuous pumping at the proposed diversion rate (Utah, 2016)

The transmissivity and storativity shown in Table 2 are reasonable based on the late 1970's drawdown documented in the hydrographs. The drawdown shown in the hydrographs for the late 1980's and early 1990's is not representative of a purported pump rate of 150 gpm. Using the transmissivity and storativity values supported by known data from late 1970's water level measurements (see Table 2), drawdown estimates calculated using the Theis Equation are shown in Table 3.

Drawdown created by pumping this proposed diversion is expected to be less than listed in Table 3, because there will be runoff and precipitation also filling the dam. Therefore, the days pumping will be less than 308. Furthermore, there is generally between 60 and 100 feet of artesian head pressure above the top of the Niobrara aquifer within a few miles of the proposed well site (Water Rights, 2016a).

The Water Management Board has previously considered the effects of pumping on artesian head pressure and has promulgated rules to place water to maximum beneficial use. The Water Management Board has defined an "adversely impacted domestic well" in ARSD 74:02:04:20(7) as:

> "a well in which the pump intake was set at least 20 feet below the top of the aquifer at the time of construction or, if the aquifer is less than 20 feet thick, is as near to the bottom of the aquifer as is practical and the water level of the aquifer has declined to a level that the pump will no longer deliver sufficient water for the well owner's needs"

In the past, the Water Management Board has recognized to place water to maximum beneficial use, a certain amount of drawdown may occur. Since the aquifer is under confined conditions, drawdown due to pumping may extend some distance from the well sites. The Water Management Board considered the delivery of water by artesian head pressure versus maximum beneficial use of water issue for Water Right No. 2313-2 for Coca-Cola Bottling Company of the Black Hills. The Water Management Board adopted Findings of Facts and Conclusions of Law that noted reservation of artesian head pressure for delivery of water would be inconsistent with SDCL 46-1-4 which states, "general welfare requires that the water resources of the state be put to beneficial use to the fullest extent of which they are capable..." (Water Rights, 1995). Furthermore, the Water Management Board found if increased cost or decreased production as a result of impacts on artesian head pressure by legitimate users is to be considered an adverse impact it would also be in conflict with SDCL 46-1-4 (Water Rights, 1995). With that in mind, some existing well owners may need to lower theirs pumps to accommodate for deeper water levels depending on the specific characteristics of the Niobrara aquifer at the proposed well sites. However when considering the statute (SDCL 46-6-6.1), rule (ARSD 74:02:04:20(7)), and the artesian head pressure, well interference from this proposed diversion is not expected to cause an adverse impact. Therefore, there is a reasonable probability that any interference created by pumping this proposed diversion will not be adverse.

HISTORY OF CONTROVERSY IN THE AREA

As previously stated there is a history of opposition to irrigation from this area. While this application is not for irrigation, it is from the same location as the proposed irrigation projects and uses the same aquifer (Niobrara aquifer) as several of the irrigation applications proposed to use. The applications were filed by Carl Estabrook with one application filed by Carol Estabrook.

The issues started in July 1976 with Application No. 2863-3 for Carl Estabrook for a diversion rate of 1.9 cfs from the Dakota aquifer for the irrigation of 160 acres in NE ¼ Section 6 T104N-R63W. The application was intensely opposed. The application was deferred. The application

was later invalidated because water quality approval from the State Conservation Commission was never obtained. The application was later withdrawn.

Application No. 3435-3 for Carl Estabrook requesting 2.22 cfs from the Niobrara aquifer for the irrigation of 220 acres in SE ¼, E ½ SW ¼, and S ½ NE ¼ Section 6 T104N-R63W was filed in December 1976. There were issues with the diversion point location and the number and location of acres applied for and what was approved by the State Conservation Commission for soil/water compatibility. A one year experimental permit was approved for 1977. The lands actually irrigated under the experimental permit were the NE ¼, a portion of the NW ¼ Section 6 and a portion of the NW ¼ Section 5; all in T104N-R63W. These were the same lands as applied for irrigation under Application No. 2863-3. Mr. Estabrook was ordered to stop irrigation in July 1977 after several area domestic well owners reported problems. Mr. Estabrook fixed several wells and drilled two new wells to alleviate some of these problems. Application No. 3435-3 was deferred until the completion of aquifer testing by the U.S. Geological Survey. The application remains in deferred status.

Application No. 4003-3 was filed in March 1977 by Carl Estabrook for the diversion of 2.28 cfs from the Niobrara aquifer for the irrigation of 720 acres in SW ¼ Section 5 and W ½ 6; T104N-R63W and W ½ Section 32 and SW ¼ SW ¼ Section 31; T105N-R63W. A water sample from the dam in Section 6 T104N-R63W was approved but a sample from the well authorized under Application No. 3435-3 was not approved. Mr. Estabrook did not authorize advertisement of the application. The application was withdrawn.

Application No 4285-3 filed in April 1978 by Carl Estabrook for 3.71 cfs from a storage dam in SE ¼ NW ¼ Section 6 T104N-R63W, the dam Application No. 6703-3 proposes to use, for the irrigation of 260 acres located in W ½ NW ¼, NW ¼ SW ¼ Section 5 and NE ¼, N ½ SE ¼ Section 6; all in T104N-R63W. Conditional approval of soil/water compatibility was granted. The application was opposed because of concerns that Mr. Estabrook would pump from the irrigation well under Application No. 4405-3 to fill the dam if there wasn't enough runoff. The application was only approved for use of runoff water by the Water Rights Commission. In July 1979, a notice of violation was sent to Mr. Estabrook regarding pumping from the irrigation well, the well authorized under Application No. 3435-3, into the dam. The application is currently Water Permit No. 4285-3 held by Todd Worrell. Mr. Worrell does not irrigate. The dam authorized by this application is currently in disrepair. There has been no irrigation under this permit since 2003, and the permit is subject to cancellation.

Application No. 4405-3 was filed by Carl Estabrook in February 1978 for the diversion of 3.71 cfs from the Niobrara aquifer for the irrigation of land in W ½ Section 5 and NE ¼ Section 6; all in T104N-R63W. The application was not processed at that time because the Niobrara aquifer was removed from consideration for appropriation by the Water Rights Commission. In file documents Application No. 4405-3, in its original form, is occasionally referenced as "no number" application. The acreage to be irrigated was later corrected to NE ¼, N ½ SE ¼ Section 6 and W ½ NW ¼, NW ¼ SW ¼ Section 5; all in T104N-R63W. There were significant administrative issues concerning whether this application was a "new" application or "amended" application, and was a new water sample and thus new soil/water compatibility required. The Water Rights Commission approved the application in June 1979 amid heavy opposition. The

opponents to the permit appealed the Commission's decision. The Sixth Circuit Court reversed the Water Rights Commission's decision and remanded it with instruction to approach the application as a new application, thus requiring a new soil/water compatibility approval. The Water Rights Commission, now the Water Management Board, appealed to the State Supreme Court. The State Supreme Court affirmed the Sixth Circuit Court's decision in May 1980. During the legal proceedings a temporary restraining order and a bond of $25,000 dollars were set to prevent Mr. Estabrook from pumping under the permit. A letter of reprimand was placed in the administrative file regarding violations during the appeals process. After the Supreme Court's decision, Mr. Estabrook filed a request to return Application No. 4405-3 to its original state as filed in February 1978. This request was denied by the Water Management Board because of questionable water quality effects on the soil. Mr. Estabrook filed a Notice of Appeal on the Findings of Fact and Conclusions of Law regarding the Water Management Board's denial of returning Application No. 4405-3 to its original form. The Hon. Judge McKeever wrote a letter to the attorney's for Mr. Estabrook and the Water Management Board stating he agreed with the Board's decision. No further actions were taken. Application No. 4405-3 is currently deferred.

Application No. 4437-3 was filed by Carl Estabrook in June 1979 for an additional diversion point for Application No. 4405-3 from Firesteel Creek with no additional diversion rate or acreage. In September 1979, the State Conservation Commission conditionally approved the soil/water compatibility. Later in September 1979, the Water Management Board met and discussed Application No. 4437-3 at length. The Water Management Board deferred the application because Application No. 4405-3 was still under appeal and the two applications were tied together. The application is currently deferred.

Application No. 4460-3 was filed by Carl Estabrook in January 1980 for a diversion of 3.71 cfs from Firesteel Creek for the irrigation of the same lands as Application No. 4405-3. This application was essentially a re-submittal of Application No. 4437-3 without any connection to the well or diversion rate requested under Application No. 4405-3. The soil/water compatibility was given conditional approval. Application No. 4460-3 was deferred for review until September 1980 for several reasons. Some of the concerns were from the City of Mitchell regarding potential agricultural chemical contamination of Firesteel Creek and protection of the city's water rights for the creek, and assuring that water will be available for downstream domestic users. No further action has been taken. The application is currently deferred.

Application No. 4978-3 was filed by Carol Estabrook in October 1983 for additional diversion rate of 0.67 cfs from a tributary to Firesteel Creek for the irrigation of the lands authorized under Water Permit No. 4285-3. The soil/water compatibility was given conditional approval. The application was recommended for approval. The City of Mitchell intervened because they were concerned about the potential effects on Vested Right No. 426-3 and Future Use Permit No. 427-3 from Firesteel Creek which are held by the city. Local opposition to the application was concerned about having a stream channel that ran through the acres to be irrigated restored to a more functional state to prevent/reduce flooding on their property. The application was approved with conditions that require the City of Mitchell to be able to fill Lake Mitchell before any water can be pumped and if their future use is developed that the City of Mitchell's needs are satisfied before any diversion is made, low flows for downstream domestic use must be bypassed, a chemical storage tank moved away from the stream, and no diversions made until the creek

channel across the center pivot area is cleaned out, the stream bed returned to original grade, and culverts installed for any pivot crossings. The application is currently Water Permit No. 4978-3.

Application No. 4285A-3 was filed by Carl Estabrook in September 1986 for increasing the storage capacity of the dam authorized by Water Permit No. 4285-3 and adding a small dam in Section 1 T104N-R64W. The water source of runoff was to remain the same with pumpage from a tributary of Firesteel Creek. The capacity of the existing dam was to increase from 80 ac-ft to 210 ac-ft. The application proposed to irrigate the 260 acres authorized under Water Permit Nos. 4285-3 and 4978-3 and an additional 300 acres in Sections 5 and 6 T104N-R63W. The diversion rate was to not exceed 3.71 cfs as was previously authorized under Water Permit Nos. 4285-3 and 4978-3. The application was opposed by locals as well as township boards/supervisors, and the city of Mitchell. The application was deferred by the Water Management Board in May 1987 until easements or other right-of-way arrangements were obtained and repairs to the dam completed. The application is still deferred.

In summary, there were several attempts to irrigate land in Sections 5 and 6 T T104N-R63W using groundwater and surface water. All of the applications were opposed. Application No. 3435-3 was granted a one year experimental status but was quickly shutdown and then deferred after nearby domestic wells were impacted from pumping. Application No. 4405-3 was approved by the Water Rights Commission, but the decision was later reversed by the courts. All of the other groundwater permits were not approved. The surface water permits fared better. Water Permit Nos. 4285-3 and 4978-3 were approved. Application Nos. 4285A-3, 4437-3, and 4460-3 were deferred. Much of the opposition to the groundwater use was over concerns of impacts to domestic wells and the unsuitability of the groundwater sources for irrigation. Opposition to the surface water use were primarily concerns about potential impacts on existing appropriative and domestic users, and potential agricultural chemical contamination of the surface water source.

Water Permit Nos. 4285-3 and 4978-3 have not had irrigation under the permits since 2003 and would be subject to cancellation. Furthermore documentation in the file for this application indicates the applicant intends to remove the center pivot that was authorized under Application No. 3435-3. Application No. 4285A-3 will be dismissed as part of processing this application. That leaves two groundwater applications, Application Nos. 3435-3 and 4405-3, and two surface water applications, Application Nos. 4437-3 and 4460-3, still deferred.

The issue is can this application be approved for withdrawal from the Niobrara aquifer when there are two applications for withdrawal from the Niobrara aquifer in the same section that have been deferred. All actions on Application No. 3435-3 were delayed until settlement of Application No. 4405-3 was completed. Application No. 4405-3 was in essence invalidated and after an attempt to return it to its original form, no actions have been taken. Simply put, Application No. 4405-3 while listed as deferred has essentially been withdrawn from consideration. Furthermore, the property Application No. 4405-3 proposed to irrigate is no longer owned by the applicant. Application No. 4405-3 was submitted to correct the lands to be irrigated and the well location from Application No. 3435-3. Therefore, if Application No. 4405-3 is essentially withdrawn and no longer valid so is Application No. 3435-3. Thus, Application No. 6703-3 could be approved for a withdrawal from the Niobrara aquifer in Section 6 T104N-R63W.

CONCLUSIONS:

1. Application No. 6703-3 proposes to divert water from the Niobrara aquifer at a maximum diversion rate of 0.17 cfs to maintain the water level in a dam as well as be a source of water for dog kennels. The proposed dam will impound 150 ac-ft of water from an un-named drainage to Firesteel Creek. Water can be diverted to three wetland areas formed by berms and ditch plugs with an approximate surface area of 14 acres.

2. There is a reasonable probability there is unappropriated water available from the Niobrara aquifer to supply this proposed appropriation.

3. There is a reasonable probability this proposed diversion can be pumped without adversely impacting existing appropriative or domestic users.

4. There has been significant opposition in the past to irrigation development in this area. The concerns were primarily over potential impacts to wells and the unsuitability of the groundwater sources for irrigation. This application does not include any irrigation and artesian head pressure is no longer protected as a means of water delivery.

5. Even though there are two deferred applications proposing withdrawal from the Niobrara aquifer in the same section as this application, it is reasonable to approve this application.

Adam Mathiowetz, PE
SD DENR-Water Rights Program

Approved by:

Ken Buhler
SD DENR-Water Rights Program

REFERENCES:

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Water Rights. 1995. Findings of Fact, Conclusions of Law, and Final Decision in the Matter of Water Permit Application No. 2313-2, Coca-Cola Bottling Company of the Black Hills. DENR-Water Rights Program file for Water Right No. 2313-2. Pierre, South Dakota.

REPORT ON DAM COMPONENT OF
WATER PERMIT APPLICATION No. 6703-3
Todd Worrell
July 29, 2016

Water Permit Application No. 6703-3 has been filed by Todd Worrell to impound 148.4 acre-feet of water from runoff by reconstructing a dam located in the SE ¼ NW ¼ of Section 6-T104N-R63W and appropriating 0.17 cfs of water from one well to be completed into the Niobrara aquifer (180 feet deep) located in the SE ¼ NW ¼ of Section 6-T104N-R63W. The well will be used to maintain the water level in the dam as well as be a source of water for dog kennels. The application also requests impoundment of sufficient water to maintain water at the outlet elevation of 1287.0 fmsl. The project will have the ability to divert water from the dam to three wetland areas formed by berms and ditch plugs with an approximate surface area of 14 acres located in portions of Lots 1, 2, and 3 and the S ½ NE ¼ Section 6; SW ¼ NW ¼ Section 5; all in T104N-R63W. The water will be used for fish and wildlife propagation and recreational purposes.

Discussion:

The dam will be classified as a small size, Category 3, Low Hazard dam. The dam repair project has been designed by the Natural Resources Conservation Service (NRCS). The plans and specifications have been reviewed and will be approved.

The dam will be 14 feet high with a normal storage capacity of 148.40 acre-feet with a reservoir level at the primary spillway elevation, and a maximum storage capacity of 302.3 acre-feet with a reservoir level at the top of dam elevation. A dam of this size and hazard classification is required to have a minimum spillway design capable of passing a 25-year frequency event.

The dam has a drainage area of 1741 acres or 2.72 square miles. The dam has a 10 inch diameter PVC pipe with 4.0 feet of available freeboard as the primary spillway and a 100 foot wide earthcut spillway with 2.8 feet of available freeboard as the secondary spillway. A 25-year frequency event produces a peak runoff of approximately 365 cfs and a 100-year frequency event produces a peak runoff of approximately 610 cfs. The earthcut spillway will have a capacity of approximately 1200 cfs.

The annual yield for this drainage area with an 80 percent chance of occurrence, or 8 out of 10 years, is expected to be 13 acre-feet. The annual yield with a 50 percent chance of occurrence, or 1 out of 2 years, is expected to be 39 acre-feet, and the annual yield with a 10 percent chance of occurrence, or 1 out of 10 years, is expected to be 218 acre-feet. The low runoff potential is why Mr. Worrell wants to use the proposed well to supplement the water level i the dam.

The Worrell Dam (formerly Estabrook Dam, NID ID No. SD02206) is located in the SE ¼ NW ¼ of Section 6-T104N-R63W on an unnamed tributary to the West Branch of Firesteel Creek immediately upstream of the confluence of the unnamed tributary and the West Branch of Firesteel Creek, and about 7.5 miles upstream of the confluence of the West Branch of Firesteel Creek and Firesteel Creek. There are no existing Water Rights/Permits filed on the unnamed tributary or the West Branch of Firesteel Creek between the dam and Firesteel Creek.

History

Water Right No. 4285-3 was issued on June 2, 1978 to Carl Estabrook for irrigation of 323 acres from the dam located in the SE ¼ NW ¼ of Section 6-T104N-R63W. At that time, the dam had a storage capacity of 80 acre-feet. Water Right No. 4285-3 was later transferred to Mr. Worrell in 2006. The dam was repaired and the storage capacity increased in 1980. Mr. Estabrook filed Water Permit Application 4285A-3 in 1986 and again in 1987 to increase the storage capacity by 130 acre-feet for a total storage capacity of 210 acre-feet. Water Permit Application No. 4285A-3 was deferred on May 6, 1987 until easements or other right of way arrangements were obtained and several repairs to the dam were made. According to the contour map on sheet 2 of the P&S provide by the NRCS, the normal reservoir level at the primary spillway elevation of 1287 would back up to within approximately 400 feet of the upstream township road, staying on Mr. Worrell's property. Permanent flood easements would not be necessary. The upstream road and secondary spillway will be at the same elevation of 1288.2. There may be some temporary flooding to the road and upstream property during runoff events that pass through the secondary spillway.

The irrigation portion of Water Right No. 4285-3 has been abandoned and is subject to cancellation. Since the new use of the stored water will be recreation and fish and wildlife use, state law does not allow the transfer of use from irrigation water.

Conclusions:

1. Water Permit Application No. 6703-3 should be approved since unappropriated water is available and approval should not have any adverse effect on existing Water Permits/Rights.

2. If approved, Water Right No. 4285-3 should be scheduled for cancellation and action taken to dismiss Water Permit Application No. 4285A-3.

Timothy G. Schaal, P.E.
Engineer IV

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES

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NOTE: TO BE SURE OF PUBLICATION ON THE CORRECT DATES, CONTACT THE NEWSPAPER(S) RIGHT AWAY.

September 8, 2016

Todd Worrell
810 Simmons Ave
St. Louis MO 63122

Dear Worrell:

Water Permit Application No. 6703-3 for fish & wildlife propagation and recreational use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice has been sent to the South Dakota Mail printed at Plankinton SD (Ph # 605-942-7770) and the Daily Republic printed at Mitchell SD (Ph # 605-996-5514). You will need to contact the newspaper(s) and authorize publication of this notice. For your information, a copy of the notice, the recommendation of the Chief Engineer and reports on the groundwater component and dam construction on the application are enclosed. Please review the notice prior to publication and notify this office, if you have any corrections or questions.

Be sure to contact the above newspaper(s) to authorize publication of your Notice and to arrange for payment. Early contact with the paper(s) can eliminate delays. Upon receiving authorization from you, the publisher has been instructed to publish your notice. The newspaper has also been instructed to send us the Proof of Publication. We must receive Proof of Publication before action can be taken on the application.

Sincerely,

Eric Gronlund
Natural Resources Engineer
(605) 773-3352

enclosures

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

Instruction to Newspaper - Publish the Notice on September 15, 2016. The applicant is responsible for payment.

NOTICE OF APPLICATION NO. 6703-3 to Appropriate Water

Notice is given that Todd Worrell, 810 Simmons Ave, St. Louis MO 63122 has filed an application for a water permit to impound 150 acre-feet of water from an un-named drainage to Firesteel Creek by reconstructing a dam located in the SE 1/4 NW 1/4 Section 6 and appropriating 0.17 cubic feet of water per second from one well to be completed into the Niobrara aquifer (180 feet deep) located in the SE 1/4 NW 1/4 Section 6; all in T104N-R63W. The dam will impound water in the SE 1/4 NW 1/4, Lots 4 and 5 Section 6; all in T104N-R63W. The well will be used to maintain a water level in the dam as well as be a source of water for dog kennels. The application requests impoundment of sufficient water to maintain the water level in the dam to the outlet elevation of 1287.0 feet mean sea level. The project will have the ability to divert water from the dam to three wetland areas formed by berms and ditch plugs with an approximate surface area of 14 acres located in portions of Lots 1, 2, 3 and the S 1/2 NE 1/4 Section 6; SW 1/4 NW 1/4 Section 5; all in T104N-R63W. The water is for fish and wildlife propagation and recreational purposes.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 6703-3 with qualifications because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. The Chief Engineer's recommendation with qualifications, the application, and staff report are available at http://denr.sd.gov/public or contact Eric Gronlund for this information, or other information, at the Water Rights Program address provided below.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and Chief Engineer. The applicant must file a petition if contesting the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501 (605-773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by September 26, 2016.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

If the applicant does not contest the recommendation of the Chief Engineer and no petition to oppose the application is received, the Chief Engineer shall act on the application pursuant to the recommendation with no hearing held before the Water Management Board. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled and the Water Management Board will consider this application. Notice of the hearing will be given to the applicant and any person filing a petition.

Steven M. Pirner, Secretary, Department of Environment and Natural Resources. Published once at the total approximate cost of_____.

Schlaak, Karen

From: Schlaak, Karen
Sent: Thursday, September 08, 2016 11:09 AM
To: sdmail@siouxvalley.net
Subject: 6703-3, Todd Worrell
Attachments: 6703-3publicnov2015.short1.docx; FORM8.FRM.doc

Attached is a notice to be published on September 15, 2016.

Todd Worrell, 810 Simmons Ave, St. Louis MO 63122 (314 616-6158) has been notified to contact you to authorize publication and arrange for payment.

Please send the affidavit or return the attached Proof of Publication form ASAP.

Let me know if you have questions. Please acknowledge receipt of this email.

Karen Schlaak
Water Rights Program
523 E Capitol Ave
Pierre SD 57501
Phone: 605 773-3352

Schlaak, Karen

From: Schlaak, Karen
Sent: Thursday, September 08, 2016 11:10 AM
To: 'phohbach@mitchellrepublic.com'
Subject: 6703-3, Todd Worrell
Attachments: 6703-3publicnov2015.short1.docx; FORM8.FRM.doc

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Karen Schlaak
Water Rights Program
523 E Capitol Ave
Pierre SD 57501
Phone: 605 773-3352

RECEIVED
SEP 19 2016
WATER RIGHTS PROGRAM

Form 8

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
) SS
County of Aurora)

I, Gayle A. Van Genderen

certify that the attached printed Notice was taken from the The South Dakota Mail

printed and published in Plankinton

County of Aurora and

state of South Dakota. The notice was published

in the newspaper on the following date:

Sept. 15, 2016

Cost of Printing

$40.56

(Signature)

Publisher

(Title)

9-15-16

(Date Signed)

NOTICE OF APPLICATION NO. 6703-3 to Appropriate Water

Notice is given that Todd Worrell, 810 Simmons Ave, St. Louis MO 63122 has filed an application for a water permit to impound 150 acre-feet of water from an un-named drainage to Firesteel Creek by reconstructing a dam located in the SE 1/4 NW 1/4 Section 6 and appropriating 0.17 cubic feet of water per second from one well to be completed into the Niobrara aquifer (180 feet deep) located in the SE 1/4 NW 1/4 Section 6; all in T104N-R63W. The dam will impound water in the SE 1/4 NW 1/4, Lots 4 and 5 Section 6; all in T104N-R63W. The well will be used to maintain a water level in the dam as well as be a source of water for dog kennels. The application requests impoundment of sufficient water to maintain the water level in the dam to the outlet elevation of 1287.0 feet mean sea level. The project will have the ability to divert water from the dam to three wetland areas formed by berms and ditch plugs with an approximate surface area of 14 acres located in portions of Lots 1, 2, 3 and the S 1/2 NE 1/4 Section 6; SW 1/4 NW 1/4 Section 5; all in T104N-R63W. The water is for fish and wildlife propagation and recreational purposes.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 6703-3 with qualifications because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. The Chief Engineer's recommendation with qualifications, the application, and staff report are available at http://denr.sd.gov/public or contact Eric Gronlund for this information, or other information, at the Water Rights Program address provided below.

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Steven M. Pirner,
Secretary,
Department of
Environment and
Natural Resources

(Published once at the total approximate cost of $40.56.)

RECEIVED
SEP 19 2016
WATER RIGHTS
PROGRAM

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Steven M. Pirner,
Secretary, Department of Environment and Natural Resources.

Published once at the total approximate cost of $83.02

AFFIDAVIT OF PUBLICATION

STATE OF SOUTH DAKOTA)
) SS
COUNTY OF DAVISON)

Penny Hohbach of said county, being, first duly sworn, on oath, says; that he/she is the publisher or an employee of the publisher of The Daily Republic, a daily newspaper, published in the City of Mitchell, in said County of Davison, and State of South Dakota; that he/she has full and personal knowledge of the facts herein stated; that said newspaper is a legal newspaper as defined in SDCL 17-2-2.1 through 17-2-2.4 inclusive; that said newspaper has been published within the said County of Davison and State of South Dakota, for at least one year next prior to the first publication of the attached public notice, and that the notice, order or advertisement, a printed copy of which, taken from the paper in which the same was published, and which is hereto attached and made a part of this affidavit, was published in said newspaper for 1 issues(s), to wit:

Thursday, September 15, 2016

That the full amount of the fee charged for the publication of the attached public notice insures to the sole benefit of the publisher or publishers; that no agreement or understanding for the division thereof has been made with any other person, and that no part thereof has been agreed to be paid to any person whomsoever, that the fees charged for the publication thereof are: $83.02

Signed: Penny Hohbach

Subscribed and sworn to before me this 16th day of September, 2016.

Melissa Seppala

MELISSA SEPPALA
Notary Public
SEAL
South Dakota

Notary Public
County of Davison

My Commission Expires: 4-15-20

Prepared by: The Daily Republic, P.O. Box 1288, Mitchell S.D. 57301 605-996-5515

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

OCT 0 4 2016

Todd Worrell
810 Simmons Ave
St. Louis MO 63122

Dear Mr. Worrell:

Enclosed is Water Permit No. 6703-3 authorizing construction of the water diversion system and beneficial use of the water, not exceeding the limits as specified in the Water Permit.

Form 10, *Notice of Completion of Works and Application of Water to Beneficial Use*, is enclosed. Please return this completed form after you have finished the system and have put the water to beneficial use. An investigation can then be scheduled so the water license may be issued, thus completing the acquisition of a water right.

An informational sheet *?Common Water Right Questions?* is also enclosed. This sheet is intended to answer some of the questions associated with obtaining and keeping a water right.

Sincerely,

Jeanne Goodman

Jeanne Goodman, Chief Engineer
Water Rights Program
(605) 773-3352

enclosures

Note: Approval of Water Permit No. 6703-3 cancels Water Permit No. 4285-3 and withdraws Application No. 4285A-3.

6703-3 SD EForm - 1621LD V1

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

X Location ~~NW~~ SE ¼ ___ ¼ Sec 6 Twp 104N Rg 63W

X County Aurora

Please mark well location with an "X"

North

W X E

1 Mile

Well Completion Date 10-15-2016

Distance to nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)? ___ ft. from NONE (identify source)

PROPOSED USE:
- [ ] Domestic/Stock
- [x] Irrigation
- [ ] Municipal
- [ ] Industrial
- [ ] Business
- [ ] Institutional
- [ ] Test holes
- [ ] Monitoring well

METHOD OF DRILLING: ROTARY MUD

CASING DATA: [ ] Steel [x] Plastic [ ] Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
250 LB/FT	8 IN	0 FT	140 FT	12 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
Neat Cement	7	15.5 Lb/gal	0 Ft	30 Ft
GROUT	10	9.5 Lb/gal	30 Ft	135 Ft

Describe grouting procedure: TREMIE PIPE

SCREEN: [x] Perforated pipe [ ] Manufactured

Diameter 8 Inches Length 40 Feet

Material PVC 250

Slot Size 25,000 Set From 140 Feet to 180 Feet

Other information

WAS A PACKER OR SEAL USED? [ ] Yes [x] No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?
- [x] Yes, How? CHLORINE
- [ ] No, Why Not?

Lab to which water quality sample sent for analysis

Well Owner: Todd Worrell

Business Name: FIRESTEEL CREEK HUNTING LODGE

Address: 810 SIMMONS AVE.

City, State, Zip: KIRKWOOD, MO. 63122

WELL LOG:

FORMATION	DEPTH FROM	DEPTH TO
TOP SOIL	0	2
SAND & GRAVEL	2	7
YELLOW CLAY	7	36
BLUE CLAY	36	138
CHALK	138	180

STATIC WATER LEVEL 80 FEET

If flowing: closed in pressure ___ PSI

GPM flow [redacted] through [redacted] Inch pipe

Controlled by [ ] Valve [ ] Reducers [ ] Other

Reduced flow rate ___ GPM

Can well be completely shut in?

WELL TEST DATA:
- [x] Pumped Describe: DEVELOPED WITH AIR
- [ ] Bailed
- [ ] Other

Pumping Level Below Land Surface

133 Ft. After 12 Hrs. pumped 50 GPM

___ Ft. After ___ Hrs. pumped ___ GPM

If pump installed, pump rate: 50 GPM

REMARKS

NIOBRARA RB

RECEIVED
JAN - 3 2017
WATER RIGHTS PROGRAM

This well was drilled under license # 296 and this report is true and accurate.

Drilling firm: CHASE DRILLING INC.

Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

X Todd Worrell

Date: 12/18/2016

Form 12

Report of Examination of Works and/or Application of Water to Beneficial Use For Permit No. 6703-3

I have this day, **August 15, 2025**, made a thorough examination of the water use system constructed by **Todd Worrell, Firesteel Creek Hunting Lodge, 810 Simmons Ave, Kirkwood, MO 63122** of Permit No. **6703-3**, bearing the priority of **June 13, 2016** authorizing the diversion of **0.17** cu. ft. per second and the storage of **150** acre-feet of the waters of the **Niobrara Aquifer** for **fish & wildlife propagation and recreational** purposes, in **Aurora** County.

A. Works used to divert the water:

Well Information:

1) Well Drilling Firm: **Chase Drilling (#296)**
2) No. of Wells **1**
3) Depth(s) **180** feet
4) Well log is available **Y**

Casing:

1) Diameter **8** inches
2) Length **140** feet
3) Type **Plastic**

Screen:

1) Type **PVC**
2) Length **40** feet
3) Static water level **80** feet

Pump:

1) Make **Submersible**
2) Model **Unknown**
3) Size **Unknown**
4) Capacity **50** GPM

Motor:

1) Make **Unknown**
2) Model No. **Unknown**
3) Horsepower rating **Unknown** hp

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

1) Type **Unknown** 2) Size **Unknown** inches 3) Length **Unknown** feet

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

1) Type **Unknown** 2) Size **Unknown** inches 3) Length **Unknown** feet

Comments: **xx**

D. Compliance with Permit Requirements:

1) Permit qualifications being abided by **Y**

2) Exceptions to compliance are: **None**

E. Condition and Location:

1. The system is in **excellent** condition with the point(s) of diversion located as follows: **WELL LOCATION From the SW corner Sec 6 T104N R63W, 2985 ft N & 2000 ft E, Lat 43.84069 Long -98.43726 (SE ¼ NW ¼)**

   PRIMARY OUTLET LOCATION From the SW corner, Sec 6 T104N R63W, 3325 ft N & 2090 ft E Lat 43.84181 Long -98.43653 (SE ¼ NW ¼).

2. The works are capable of storing **150** acre-feet of water which is to be used for **fish & wildlife propagation and recreational use**.

   the license should be issued for **0.11** cfs and **150** acre-feet of storage.

3. All structures, wells and lands on map **Y**

F. Comments or other permit(s) associated with the project:

Used FSA maps and ArcGIS to construct the project map.

The dam structure is in excellent condition with no evidence of any erosion issues and good grass cover.

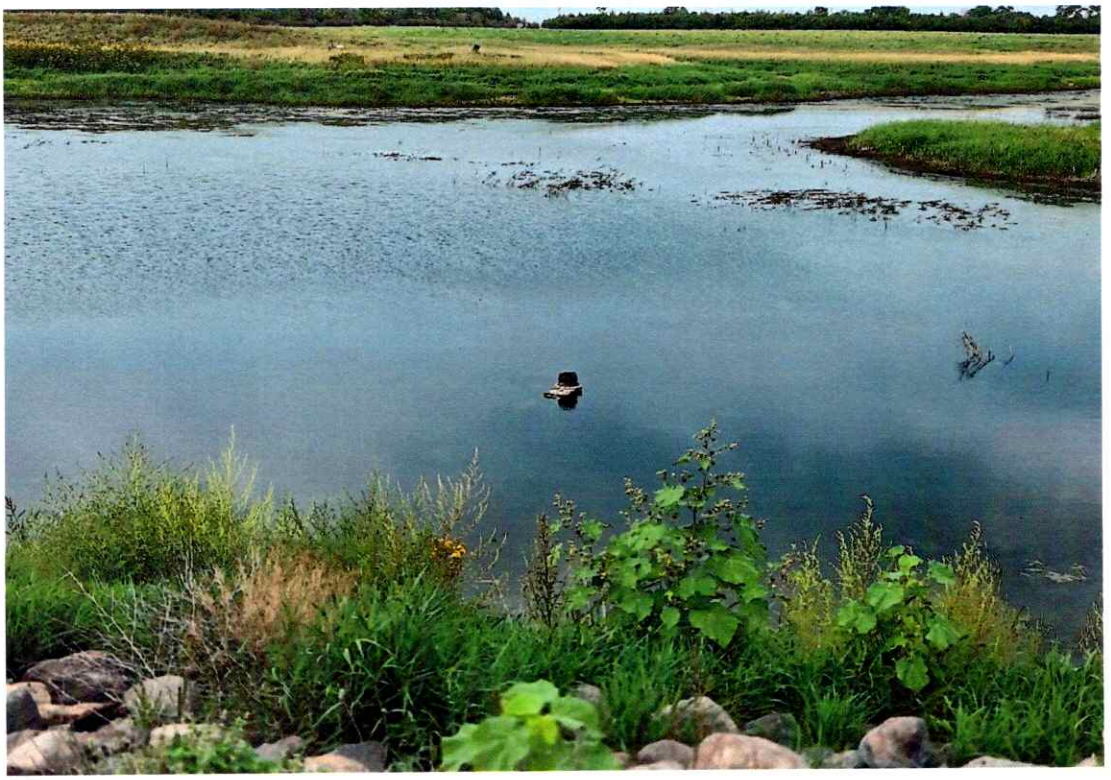
The structure appears to have been constructed in accordance with the given NRCS design specifications that can be found on Page 4 of the Permit Application materials.

Mr. Worrell's current mailing address is 550 John Pitman Dr., St. Louis, MO 63304 and his cell phone number is 314/616-6158. Just a note of interest, Mr. Worrell was a relief pitcher for the St. Louis Cardinals baseball team.

Darrell DeBoer
Water Rights Inspector
DENR, Water Rights Program

Date report completed: **August 19, 2025**

PIC 1. Looking south from north side of dam.



PIC 2. Looking west at the inlet from top of the dam. Note the riprap on the upper face of the dam.

PIC 3. Looking northeast towards the dam from the east edge of the secondary spillway.

PIC 4 Looking northwest from the east edge of the secondary spillway.

PIC 5. Looking at downslope of the dam. Note excellent grass cover and steep downslope.

PIC 6. Looking downstream from the dam.

WELL LOCATION
From the SW corner
Sec 6 T104N R63W
2985 ft N & 2000 ft E
Lat 43.84069 Long -98.43726

PRIMARY OUTLET LOCATION
From the SW corner
Sec 6 T104N R63W
3325 ft N & 2090 ft E
Lat 43.84181 Long -98.43653

0 495 990 1,980 2,970 3,960 Feet

Darrell DeBoer
Water Right Inspector
DANR-Water Rights Program

0 175 350 700 1,050 1,400 Feet

Darrell DeBoer
Water Right Inspector
DANR-Water Rights Program

STATE OF SOUTH DAKOTA
WATER LICENSE NO. 6703-3

(1) Todd Worrell, 550 Pitman Dr, St. Louis MO 63304, made Application No. 6703-3, February 13, 2006, for a water permit to divert 0.17 cubic feet of water per second (cfs) from groundwater, one well (Niobrara Aquifer) and impound up to 150 acre-feet (ac-ft) of water annually, from Firesteel Creek in a dam, Aurora County, South Dakota for recreational and fish & wildlife propagation purposes. Permit No. 6703-3, with a priority date of June 13, 2016, was approved September 26, 2016, and issued to the applicant for diversion of water with construction of the described water supply system to be completed on or before September 26, 2021, and for the application to beneficial use of water on or before September 26, 2025.

(2) It is certified that the permit holder has complied with the provisions of South Dakota State Law relating to completion of the construction of the water supply system and is entitled to divert 0.11 cfs from the well and impound 150 ac-ft of water in the dam, for beneficial use. The locations of the diversion points are:

- Dam: 3,325 ft N & 2,090 ft E of the SW corner Section 6, T104N, R63W (SE ¼ NW ¼) (Latitude 43.84181 & Longitude -98.43653)
- Well: 2,985 ft N & 2,000 ft E of the SW corner Section 6, T104N, R63W (SE ¼ NW ¼) (Latitude 43.84069 & Longitude -98.43726)

(3) The water is to be used during the following described annual period: January 1 – December 31.

Water from the well may be used to supplement water levels in the dam, as well as providing water to dog kennels also located on the property.

(4) The permit holder has complied with the provisions of South Dakota State Law relating to the application of water to beneficial use.

(5) Pursuant to South Dakota Water Law 46-5-30.1 Todd Worrell, the holder and/or owner of Water Right No. 6703-3 is issued a license to appropriate water, the right to impound 150 ac-ft of water from Firesteel Creek annually in a dam & divert 0.11 cubic feet of water per second from groundwater, one well (Niobrara Aquifer), with a priority date of June 13, 2016, from the locations specified in (2) of this license for recreational and fish & wildlife propagation purposes.

This license is subject to South Dakota Water Law, any limitations or conditions listed in Water Right No. 6703-3 and subject to the following qualifications:

1. 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.

2. The well authorized by Permit No. 6703-3 shall be constructed by a licensed well driller and construction of the well and installation of the pump shall comply with Water Management Board Well Construction Rules, Chapter 74:02:04 with the well casing pressure grouted (bottom to top) pursuant to Section 74:02:04:28. *(The well was drilled in 2016 by Chase Drilling Inc. A copy of the well completion report is on file with the Water Rights Program.)*

continued

3. Water Permit No. 6703-3 authorizes an impoundment with a storage capacity of 150 acre-feet of water and sufficient water annually to maintain the water level to an outlet elevation of 1,287.0 feet mean sea level.

4. No pumping from the well into the dam is authorized when the water level in the lake is at or above the primary outlet elevation of 1,287.0 feet mean sea level.

5. The Permit holder shall report to the Chief Engineer annually the amount of water withdrawn each year from the Niobrara Aquifer.

6. Approval of Water Permit No. 6703-3 cancels Water Permit No. 4285-3 and withdraws Application No. 4285A-3.

Mark Mayer, PE
Director of the Office of Water
Department of Agriculture and Natural Resources

8/22/25
date

DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES
JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

AUG 22 2025

6703-3

Todd Worrell
550 John Pitman Dr
St. Louis MO 63304

Dear Mr. Worrell:

Enclosed is Water License No. 6703-3. This is the final water right document completing your process of obtaining a Water Right. Included with your license is a map prepared by the staff engineer who conducted the field investigation.

For your information SDCL 46-6-27 requires that if in the future, the owner of an existing well, 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.

So long as you use the water beneficially, as stated in the Water License, State Water Laws provide that you have a continuing right to use the water. If you have any questions, please contact Amanda Dewell, Water Rights Permitting Administrator (605) 773-3352.

Sincerely,

Mark Mayer, PE
Director of the Office of Water

enclosures