

WATER PERMIT NO. 2010-1

Name of Applicant: **Philip S Jerde**

Address: **13901 Zeona Rd, Reva SD 57651**

Phone: **605 866-4888**

Amount of Water Claimed: **81.7 AF**

Total Acres: **NA**

Source of Water Supply: **runoff**

Water to be used for: **fish & wildlife propagation, recreation, livestock**

County: **Perkins**

Type of Waste Disposal System:

Location: **23 miles southwest of Bison**

PRIORITY

Date Received: **11-18-21**

Application/License Fee: **\$ 700**

Corrected Application Received:

Period of Annual Use: **Jan 1 – Dec 31**

Remarks:

Diversion Point: **SE 1/4 SE 1/4 Sec 33-T17N-R10E**

Water Impounded: **SE 1/4, SE 1/4 SW 1/4 Sec 33-T17N-R10E & NW 1/4 NW 1/4 Sec 3-T16N-R10E**

Depth of Well: **NA**

Well Driller:

Remarks:

Type of Map: **aerial**

Prepared by:

Reviewed and the Number Assigned on: **11-18-21**

By: **Karen Schlaak**

Notice of Hearing - date to intervene: _____

**SOUTH DAKOTA
WATER PERMIT NO. 2010-1**

Date of first receipt of application November 18, 2021.

The Chief Engineer, on behalf of the Water Management Board, issues Water Permit No. 2010-1 to Philip S Jerde, 13901 Zeona Rd, Reva SD 57651 authorizing the construction of the dam and the placing of water to beneficial use subject to the following limitations, conditions and qualifications:

1. Water Permit No. 2010-1 authorizes impoundment 81.7 acre-feet of water from runoff by constructing a dam located in the SE 1/4 SE 1/4 Section 33-T17N-R10E with water impounded in the SE 1/4, SE 1/4 SW 1/4 Section 33-T17N-R10E and the NW 1/4 NW 1/4 Section 3-T16N-R10E. This permit authorizes impoundment of sufficient water to maintain water to the primary outlet elevation. The site of the dam is approximately 23 miles southwest of Bison SD.
2. The water appropriated shall be used for the purpose of fish and wildlife propagation, recreation, and livestock water use 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 from which applicant may claim right is November 18, 2021.
5. The date of approval of Permit No. 2010-1 is March 21, 2022.
6. One-fifth of the construction is to be completed on or before September 21, 2024.
7. All construction is to be completed on or before March 21, 2027.
8. Water is to be put to beneficial use on or before March 21, 2031.
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. Water Permit No. 2010-1 authorizes a dam with a storage capacity of 81.7 acre feet of water and sufficient water annually to maintain the water level to the outlet elevation.
2. Low flows as needed for downstream domestic use, including livestock water and prior water rights must be by-passed.

WATER MANAGEMENT BOARD

By: Eric Gronlund
Eric Gronlund, Chief Engineer
Water Rights Program
Department of Agriculture and Natural Resources

MAR 30 2022
date



NOV 18 2021

WATER RIGHTS
PROGRAM

PAID

NOV 18 2021

Ck# 1623

Mail to: DENR - Water Rights 523 E Capitol Ave Pierre, SD 57501-3182 ph. (605) 773-3352	No. <u>2010-1</u> (office use only) Hydrologic Unit <u>10130305</u>
	Basin <u>Moreau River</u>
	Newspaper <u>Bison Courier</u>
	<u>Black Hills Pioneer</u>

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

Check use(s) of water:

☐ Municipal	☐ Water Distribution System	☒ Recreational	☐ Institutional
☐ Rural Water System	☐ Commercial	☒ Fish & Wildlife	☐ Geothermal
☐ Domestic (over 18 gpm)	☐ Industrial	☒ Other <u>Livestock</u>	

Type of Application:
(check one)

☒ 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.)

1. Name to Appear on Water Permit Phillip Jerde PHILIP S. JERDE
 Mailing Address 13901 ZEONA ROAD REVA SD 57651
 (Address) (City) (State) (Zip Code)
 Phone 605-866-4888 Mobile _____ Email PELLEY CREEK RANCH @ SD PLAINS . COM

2. Amount of water claimed _____ *CFS or _____ **GPM and 81.7 ***AF or _____ 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 Surface Runoff

4. Location of point of diversion 33 17N-10E (SE 1/4 SE 1/4) County Perkins
 (example - 9-wells in SW 1/4 NE 1/4 section 12-T104N-R53W)

If not a public water supply (e.g. municipal), will water be used outside of the area described above? ☐ Yes ☒ NoIf "Yes," where will water be used? Water Impounded: S 1/2 SE 1/4, SE 1/4 SW 1/4 Sec 33-T17N-10E and NW 1/4 NW 1/4 Sec 3-T16N (example - NW 1/4 section 12-T104N-R53W)5. County or counties where water will be used Perkins R10E6. Annual period during which water is to be used YEAR ROUND Jan 1 - Dec 31

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)

See attached design.

I, PHILIP S. JERDE OWNER-OPERATOR-RANCHER-, 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.

Philip S. Jerde

Supplemental Information

(type or print)

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

a) If new wells, how many ____ 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) ____ Depth to Top of Water Bearing Material ____ Depth to Water from Surface ____

d) Distance to nearest domestic well on applicant's property ____ 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:



b) Freeboard 3 ft

c) Crest Width 12 ft

Crest Length 770 ft

d) Height 19 ft

e) Primary Outlet Capacity 47.5 CFS

If pipe, diameter 24"

f) Secondary Spillway Capacity 832 CFS

Spillway Width 130 ft (Natural)

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

Upstream 3

Downstream 3

h) Surface Area of Impoundment 21.9 Acres

i) Storage 81.7 Acre Feet

j) Drainage Area Above Dam 2,436.2 Acres

17N 10E
Section: 20

17N 10E
Section: 21

17N 10E
Section: 22

17N 10E
Section: 29

17N 10E
Section: 28

17N 10E
Section: 27

17N 10E
Section: 32

17N 10E
Section: 33

17N 10E
Section: 34

16N 10E
Section: 05

16N 10E
Section: 04

16N 10E
Section: 03

16N 10E
Section: 02

16N 10E
Section: 08

16N 10E
Section: 09

16N 10E
Section: 10

16N 10E
Section: 11

RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Agriculture and Natural Resources

Date November 18, 2021

RECEIVED OF Philip S. Jerde 13901 Zeona Road Reva SD 57651

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

Fee for Application for Permit No. <u>2010-1</u> to Appropriate Water, to construct and to put water to beneficial use	\$ <u>750.00</u>
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. <u>2010-1</u>	\$ <u>200.00</u>
Fee for Filing Transfer Form _____	\$ _____
Fee for _____	\$ _____
Fee for Issuing New Well Driller's License No. _____	\$ _____
Fee for Renewal of Well Driller's License No. _____	\$ _____
Fee for Issuing Well Pump Installer's License No. _____	\$ _____
Fee for Renewal of Well Pump Installer's License No. _____	\$ _____
(Any Other Work Provided by Law)	
TOTAL	\$ <u>950.00</u>

By Eric Bronlund
Chief Engineer

vm

Jerde
2010-1

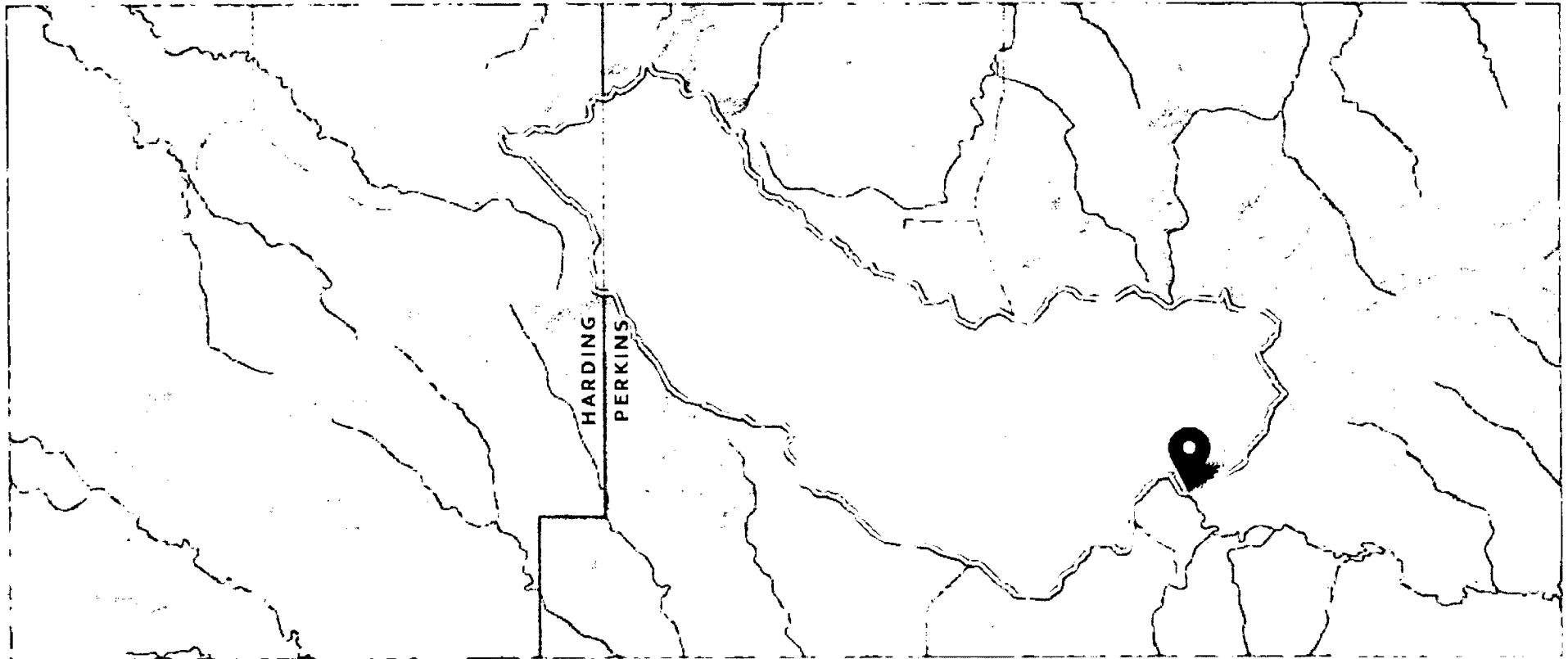
StreamStats Report

Region ID: SD

Workspace ID: SD20220103210148224000

Clicked Point (Latitude, Longitude): 45.38759, -102.89102

Time: 2022-01-03 15:02:11 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BASINPERIM	Perimeter of the drainage basin as defined in SIR 2004-5262	15.14	miles
BSLDEM10M	Mean basin slope computed from 10 m DEM	7	percent
COMPRAT	A measure of basin shape related to basin perimeter and drainage area	2.06	dimensionless
CONTDA	Area that contributes flow to a point on a stream	4.31	square miles
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	34.02	feet per mi
DRNAREA	Area that drains to a point on a stream	4.31	square miles
ELEV	Mean Basin Elevation	3006	feet
ELEVMAX	Maximum basin elevation	3173	feet
LAKESNWI	Percent lakes and ponds as determined from the National Wetlands Inventory (2001)	0.859	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	0.69	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	0.0964	percent
LFPLENGTH	Length of longest flow path	5.8	miles
LIME	Percentage of area of limestone geology	0	percent
MINBELEV	Minimum basin elevation	2871	feet
NONCONTDA	Area covered by noncontributing drainage area	0	square miles
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	2872	feet
PII_SD	Maximum 24-hour precipitation that occurs on average once in 2 years minus 1.5 inches	0	inches
RELIEF	Maximum - minimum elevation	301	feet
RELRELF	Basin relief divided by basin perimeter	19.9	feet per mi
SD_AS	Percent Artesian Spring from Sando and others (2008)	0	percent

Parameter Code	Parameter Description	Value	Unit
SD_AS LZ	Percent Loss Zone/Artesian Spring from Sando and others (2008)	0	percent
SD_BH EXT	Percent Black Hills Exterior from Sando and others (2008)	0	percent
SD_CC	Percent Crystalline Core from Sando and others (2008)	0	percent
SD_LST HW	Percent Limestone Headwaters from Sando and others (2008)	0	percent
SD_LST LZ	Percent Limestone Loss Zone from Sando and others (2008)	0	percent
SD_SND HLS	Percent Sand Hills setting from Sando and others (2008)	0	percent
SLOPERAT	Slope ratio computed as longest flow path (10-85) slope divided by basin slope	4.88	dimensionless
STORNWI	Percentage of storage (combined water bodies and wetlands) from the National Wetlands Inventory	1.091	percent
WETLND NWI	Percent wetlands as determined from the National Wetlands Inventory (2001)	0.231	percent

Peak-Flow Statistics Parameters [Subregion C]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
CON TDA	Contributing Drainage Area	4.31	square miles	0.06	904

Peak-Flow Statistics Flow Report [Subregion C]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	SE	ASEp	Equiv. Yrs.
50-percent AEP flood	57.4	ft ³ /s	13.3	247	108	108	1.8
20-percent AEP flood	169	ft ³ /s	61.2	466	67	67	4.8
10-percent AEP flood	291	ft ³ /s	120	708	58	58	8.3

Statistic	Value	Unit	Pll	Plu	SE	ASEp	Equiv. Yrs.
4-percent AEP flood	478	ft ³ /s	209	1090	53	53	12
2-percent AEP flood	658	ft ³ /s	290	1490	53	53	14.9
1-percent AEP flood	866	ft ³ /s	371	2020	55	55	16.5
0.2-percent AEP flood	1500	ft ³ /s	559	4030	65	65	16.6

Peak-Flow Statistics Citations

Sando, Steven K., 1998, A Method for Estimating Magnitude and Frequency of Floods in South Dakota: U.S. Geological Survey Water-Resources Investigations Report 98-4055, 48 p. (<http://pubs.water.usgs.gov/wri98-4055/>)

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Application Version: 4.6.2

StreamStats Services Version: 1.2.22

NSS Services Version: 2.1.2

StreamStats Report

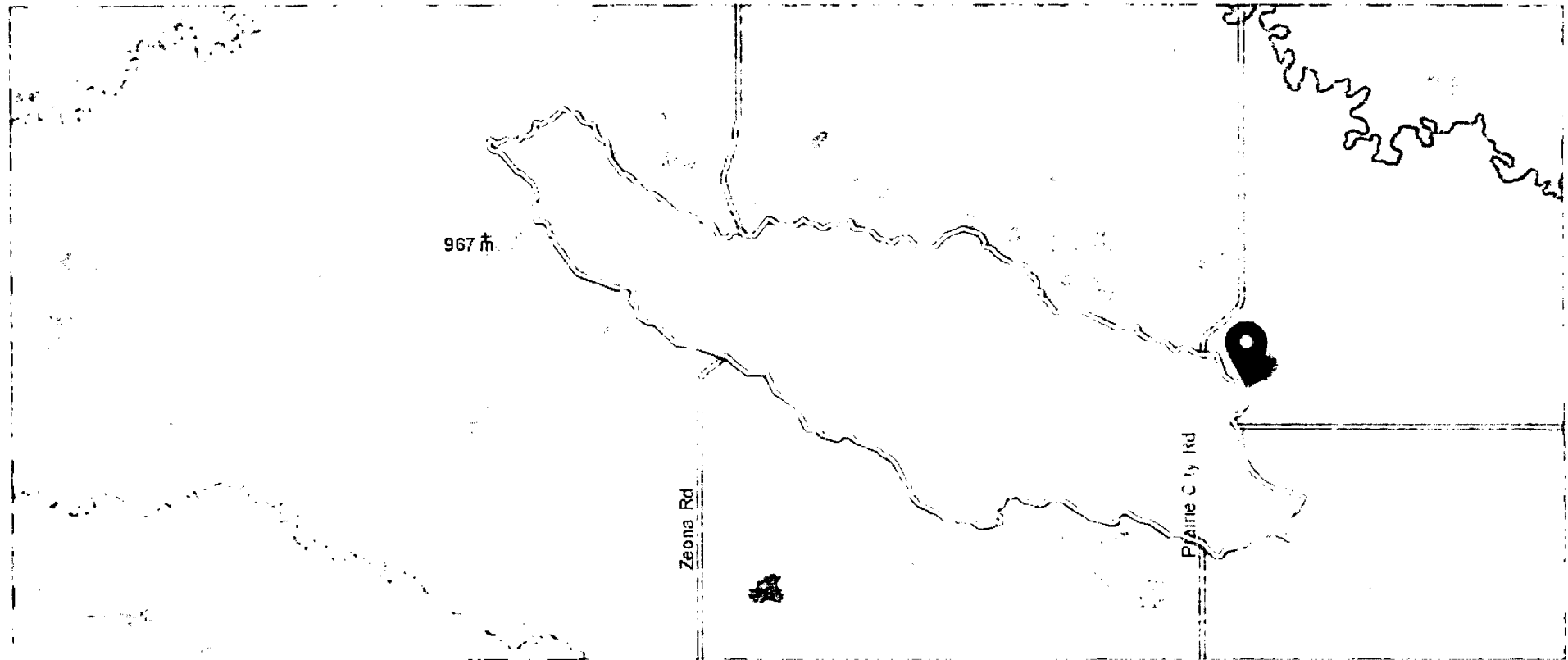
WR 90-1

Region ID: SD

Workspace ID: SD20220110151720920000

Clicked Point (Latitude, Longitude): 45.37806, -102.80648

Time: 2022-01-10 09:17:48 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BASINPERIM	Perimeter of the drainage basin as defined in SIR 2004-5262	29.57	miles
BSLDEM10M	Mean basin slope computed from 10 m DEM	5.6	percent
COMPRAT	A measure of basin shape related to basin perimeter and drainage area	2.24	dimensionless
CONTDA	Area that contributes flow to a point on a stream	13.82	square miles
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	21.23	feet per mi
DRNAREA	Area that drains to a point on a stream	13.82	square miles
ELEV	Mean Basin Elevation	2916	feet
ELEVMAX	Maximum basin elevation	3173	feet
LAKESNWI	Percent lakes and ponds as determined from the National Wetlands Inventory (2001)	0.42	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	0.72	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	0.0985	percent
LFPLENGTH	Length of longest flow path	13.9	miles
LIME	Percentage of area of limestone geology	0	percent
MINBELEV	Minimum basin elevation	2747	feet
NONCONTDA	Area covered by noncontributing drainage area	0	square miles
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	2747	feet
PII_SD	Maximum 24-hour precipitation that occurs on average once in 2 years minus 1.5 inches	0	inches
RELIEF	Maximum - minimum elevation	425	feet
RELRELF	Basin relief divided by basin perimeter	14.38	feet per mi
SD_AS	Percent Artesian Spring from Sando and others (2008)	0	percent

Parameter Code	Parameter Description	Value	Unit
SD_AS LZ	Percent Loss Zone/Artesian Spring from Sando and others (2008)	0	percent
SD_BHEXT	Percent Black Hills Exterior from Sando and others (2008)	0	percent
SD_CC	Percent Crystalline Core from Sando and others (2008)	0	percent
SD_LSTHW	Percent Limestone Headwaters from Sando and others (2008)	0	percent
SD_LSTLZ	Percent Limestone Loss Zone from Sando and others (2008)	0	percent
SD_SNDHLS	Percent Sand Hills setting from Sando and others (2008)	0	percent
SLOPERAT	Slope ratio computed as longest flow path (10-85) slope divided by basin slope	3.77	dimensionless
STORNWI	Percentage of storage (combined water bodies and wetlands) from the National Wetlands Inventory	0.58	percent
WETLNDNWI	Percent wetlands as determined from the National Wetlands Inventory (2001)	0.16	percent

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Application Version: 4.6.2

StreamStats Services Version: 1.2.22

NSS Services Version: 2.1.2

Permit Application 2010-1, Philip Jerde taken out of WR 90-1 Area

NRCS Annual Yield

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ac	Bullock-Trembles-Slickspots complex, channeled	D	193	2.20%
AdC	Amor-Cabba loams, 6 to 9 percent slopes	C	179	2.00%
AdD	Amor-Cabba loams, 9 to 15 percent slopes	C	1,443.10	16.30%
BcA	Belfield-Grail clay loams, 0 to 2 percent slopes	C	69.1	0.80%
BeC	Belfield-Morton complex, 2 to 9 percent slopes	C	60.4	0.70%
CaE	Cabba-Lantry complex, 15 to 40 percent slopes	D	741.9	8.40%
CbD	Cabba-Trembles complex, 2 to 30 percent slopes	D	18.4	0.20%
CcD	Cabba and Wayden stony soils, 2 to 25 percent slopes	D	1.4	0.00%
CdE	Cohagen-Vebar complex, 15 to 40 percent slopes	D	5.3	0.10%
FaA	Farnuf loam, 0 to 2 percent slopes	B	17	0.20%
FaB	Farnuf loam, 2 to 6 percent slopes	B	163.5	1.80%
Fd	Fluvaquents, saline	B/D	19.9	0.20%
LaB	Lawther silty clay, 3 to 6 percent slopes	C	16.5	0.20%
McB	Morton loam, 2 to 6 percent slopes	C	38.8	0.40%
MdC	Morton-Lantry loams, 2 to 9 percent slopes	C	879.7	9.90%
MdD	Morton-Lantry loams, 6 to 15 percent slopes	C	401.2	4.50%
MeD	Morton-Rhoades loams, 6 to 15 percent slopes	C	0.4	0.00%
RbB	Reeder-Amor loams, 2 to 6 percent slopes	C	233.6	2.60%
RcC	Reeder-Lantry loams, 2 to 9 percent slopes	C	918.4	10.40%
RdB	Reeder-Rhoades loams, 2 to 6 percent slopes	C	754.1	8.50%
ReB	Regent-Daglun complex, 3 to 6 percent slopes	D	133.9	1.50%
RfB	Regent-Savage silty clay loams, 3 to 6 percent slopes	C	456.6	5.20%
RmC	Rhoades-Daglun-Rhoades, severely eroded complex, 0 to 9 percent slopes	D	662.9	7.50%
SaA	Savage silty clay loam, 0 to 2 percent slopes	C	65	0.70%
SbA	Savage-Daglun complex, 0 to 2 percent slopes	C	259.2	2.90%
Sd	Shambo loam, channeled	B	69.1	0.80%
Ta	Trembles fine sandy loam	A	517.2	5.80%
VaC	Vebar-Cohagen fine sandy loams, 6 to 9 percent slopes	B	174.8	2.00%
VaD	Vebar-Flasher-Tally complex, 9 to 15 percent slopes	B	175.4	2.00%
VbB	Vebar-Parshall fine sandy loams, 3 to 6 percent slopes	B	23.1	0.30%
W	Water		21.9	0.20%
WcA	Watrous loam, shallow, 0 to 3 percent slopes	D	22.1	0.20%

Permit Application 2010-1, Philip Jerde

NRCS Annual Yield

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CaD	Cabba-Lantry-Amor loams, 9 to 25 percent slopes	C	16.7	0.60%
CbD	Cabba-Reeder loams, 9 to 25 percent slopes	D	3	0.10%
CeE	Cabbart-Rock outcrop complex, 15 to 50 percent slopes	D	3.1	0.10%
CoE	Cohagen fine sandy loam, 15 to 50 percent slopes	D	0.3	0.00%
FaB	Farnuf loam, 2 to 6 percent slopes	B	17.5	0.60%
RaB	Reeder loam, 3 to 6 percent slopes	C	1.1	0.00%
RcC	Reeder-Cabba loams, 6 to 9 percent slopes	C	28.8	1.00%
RnB	Rhoades-Daglum complex, 0 to 6 percent slopes	D	14	0.50%
SgA	Savage silty clay loam	C	1.5	0.10%
ToC	Tanna-Rhoades complex, 2 to 9 percent slopes	D	24.8	0.90%
AdC	Amor-Cabba loams, 6 to 9 percent slopes	C	16.9	0.60%
AdD	Amor-Cabba loams, 9 to 15 percent slopes	C	394.2	14.10%
BcA	Belfield-Grail clay loams, 0 to 2 percent slopes	C	40.9	1.50%
BeC	Belfield-Morton complex, 2 to 9 percent slopes	C	47.2	1.70%
CaE	Cabba-Lantry complex, 15 to 40 percent slopes	D	314.7	11.30%
CcD	Cabba and Wayden stony soils, 2 to 25 percent slopes	D	1.4	0.10%
CdE	Cohagen-Vebar complex, 15 to 40 percent slopes	D	5.3	0.20%
Fd	Fluvaquents, saline	B/D	19.9	0.70%
McB	Morton loam, 2 to 6 percent slopes	C	38.8	1.40%
MdC	Morton-Lantry loams, 2 to 9 percent slopes	C	623.3	22.30%
MdD	Morton-Lantry loams, 6 to 15 percent slopes	C	376.4	13.50%
MeD	Morton-Rhoades loams, 6 to 15 percent slopes	C	0.4	0.00%
RbB	Reeder-Amor loams, 2 to 6 percent slopes	C	15.3	0.50%
RcC	Reeder-Lantry loams, 2 to 9 percent slopes	C	202	7.20%
RdB	Reeder-Rhoades loams, 2 to 6 percent slopes	C	84.8	3.00%
ReB	Regent-Daglum complex, 3 to 6 percent slopes	D	18.8	0.70%
RfB	Regent-Savage silty clay loams, 3 to 6 percent slopes	C	156.1	5.60%
RmC	Rhoades-Daglum-Rhoades, severely eroded complex, 0 to 9 perc	D	107.1	3.80%
Sd	Shambo loam, channeled	B	69.1	2.50%
VaC	Vebar-Cohagen fine sandy loams, 6 to 9 percent slopes	B	30.1	1.10%
VaD	Vebar-Flasher-Tally complex, 9 to 15 percent slopes	B	88.7	3.20%
W	Water		12.4	0.40%

WcA Watrous loam, shallow, 0 to 3 percent slopes

D	22.1	0.80%
Acres:	2796.7	100%
mi ² :	4.37	
		SUM

Description: Pasture or range - good condition
Isogram Region: 1.5
CN: Region C -74

		acre - in	acre-ft	annual yield	
acre-in/acre (80%):	0.076	212.55	17.71	80%	✓
acre-in/acre (50%):	0.23	643.24	53.60	50%	✓
acre-in/acre (20%):	0.72	2013.62	167.80	20%	
acre-in/acre (10%):	1.3	3635.71	302.98	10%	✓

Lat
Long
acre -ft
acre

102°53'52.066"W 45°23'12.386"N

0.083333333
640

acre-in
mi²

Top of Dam Elevation: 2897
Primary Spillway Elevation: 2892.3
Secondary Spillway Elevation: 2894

Freeboard
4.7
3

✱

WR 90-1

NRCS Annual Yield

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ac	Bullock-Trembles-Slickspots complex, channeled	D	193	2.20%
AdC	Amor-Cabba loams, 6 to 9 percent slopes	C	179	2.00%
AdD	Amor-Cabba loams, 9 to 15 percent slopes	C	1,443.10	16.30%
BcA	Belfield-Grail clay loams, 0 to 2 percent slopes	C	69.1	0.80%
BeC	Belfield-Morton complex, 2 to 9 percent slopes	C	60.4	0.70%
CaE	Cabba-Lantry complex, 15 to 40 percent slopes	D	741.9	8.40%
CbD	Cabba-Trembles complex, 2 to 30 percent slopes	D	18.4	0.20%
CcD	Cabba and Wayden stony soils, 2 to 25 percent slopes	D	1.4	0.00%
CdE	Cohagen-Vebar complex, 15 to 40 percent slopes	D	5.3	0.10%
FaA	Farnuf loam, 0 to 2 percent slopes	B	17	0.20%
FaB	Farnuf loam, 2 to 6 percent slopes	B	163.5	1.80%
Fd	Fluvaquents, saline	B/D	19.9	0.20%
LaB	Lawther silty clay, 3 to 6 percent slopes	C	16.5	0.20%
McB	Morton loam, 2 to 6 percent slopes	C	38.8	0.40%
MdC	Morton-Lantry loams, 2 to 9 percent slopes	C	879.7	9.90%
MdD	Morton-Lantry loams, 6 to 15 percent slopes	C	401.2	4.50%
MeD	Morton-Rhoades loams, 6 to 15 percent slopes	C	0.4	0.00%
RbB	Reeder-Amor loams, 2 to 6 percent slopes	C	233.6	2.60%
RcC	Reeder-Lantry loams, 2 to 9 percent slopes	C	918.4	10.40%
RdB	Reeder-Rhoades loams, 2 to 6 percent slopes	C	754.1	8.50%
ReB	Regent-Daglum complex, 3 to 6 percent slopes	D	133.9	1.50%
RfB	Regent-Savage silty clay loams, 3 to 6 percent slopes	C	456.6	5.20%
RmC	Rhoades-Daglum-Rhoades, severely eroded complex, 0 to 9 percent slopes	D	662.9	7.50%
SaA	Savage silty clay loam, 0 to 2 percent slopes	C	65	0.70%
SbA	Savage-Daglum complex, 0 to 2 percent slopes	C	259.2	2.90%
Sd	Shambo loam, channeled	B	69.1	0.80%
Ta	Trembles fine sandy loam	A	517.2	5.80%
VaC	Vebar-Cohagen fine sandy loams, 6 to 9 percent slopes	B	174.8	2.00%
VaD	Vebar-Flasher-Tally complex, 9 to 15 percent slopes	B	175.4	2.00%
VbB	Vebar-Parshall fine sandy loams, 3 to 6 percent slopes	B	23.1	0.30%
W	Water		21.9	0.20%
WcA	Watrous loam, shallow, 0 to 3 percent slopes	D	22.1	0.20%

Acres:	8735.9	99%	SUM
mi ² :	13.65		

Description: Pasture or range - good condition
 Isogram Region: 1.5
 CN: Region C -74

		acre - in	acre-ft	annual yield
acre-in/acre (80%):	0.076	663.93	55.33	80%
acre-in/acre (50%):	0.23	2009.26	167.44	50%
acre-in/acre (20%):	0.72	6289.85	524.15	20%
acre-in/acre (10%):	1.3	11356.67	946.39	10%

Lat
 Long
 acre -ft
 acre

102°48'23.628"W 45°22'41.139"N

0.083333333
 640

acre-in
 mi²

Top of Dam Elevation:
 Primary Spillway Elevation:
 Secondary Spillway Elevation:

Freeboard

0
 0

EROSIONALLY EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
(Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)

Aux. Spillway Discharge = 112. cfs; Bottom Width = 130. 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	127.	627.	1.20	0.091	1.32	0.48	0.014

AUXILIARY SPILLWAY DURATION FLOW = 28.8 HOURS
ATTACK, OE/B = 1.0 ACFT/FT

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

EXIT CHANNEL FLOW SUBCRITICAL: MAX VELOCITY= 1.3 FT/SEC
EXIT SLOPE = 0.012 FT/FT
FLOW DEPTH = 0.6 FT

***** WARNING - SOLUTION EXCEEDED MAX. INPUT ELEVATION (2895.00) BY 1.21 FT.

>>>> NHCP378 RUN - MINIMUM DEPTH, DESIGN FLOW TO TOP OF DAM; 1.00 FT REQUIRED FOR THIS PASS. NEW TOP OF DAM ELEVATION = 2897.21.

ROUTED RESULTS	BTM WIDTH FT	Top of Dam MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.HP FT	VOL-AUX. ACFT
MINIMUM AUX.	130.0	2897.21	522.2	61.4	3.22	172.5

PEAK - CFS DISCHARGES = Q-PS 50.1 Q-AUX. 166.8 Q-TOT. 216.9

	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
AUXILIARY SPILLWAY ---	0.37	3.44	0.109	0.775

***** WARNING - SOLUTION EXCEEDED MAX. INPUT ELEVATION (2895.00) BY 2.21 FT.

PLOT NRCS-FBH 1 IN = 200. CFS

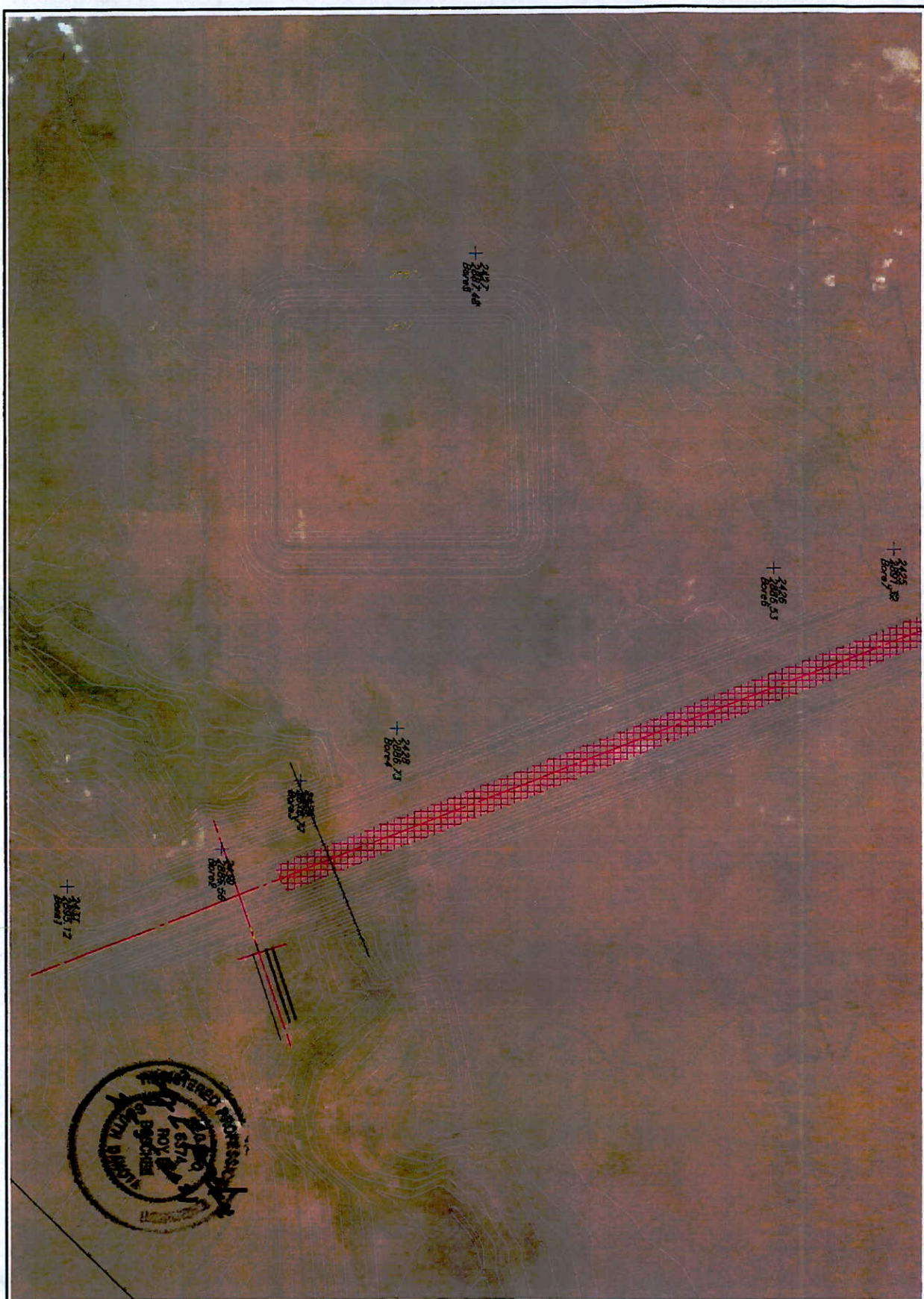
Time	Qin	Qout	Elev	Vol	Area	ExtVel	I	I	I	I
Time	Qin	Qout	Elev	Vol	Area	ExtVel	I	I	I	I
							0.	200.	400.	600.

END NRCS-FBH PLOT

Inflow Hyd 1 PSH-Peak = 41.46 CFS at 24.23 hrs., Location Point

Inflow Hyd 1 FBH-Peak = 159.47 CFS at 19.27 hrs., Location Point
HYDOUT 1

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



1/26/22 9:28 AM
Sheet of .

②

Soil Investigation Report – Jerke Pond - Perkins County

On Tuesday, June 22nd, 2021, Roy Boschee, Seth Haigh, Lander Legge, and I performed a soil investigation for Phil Jerke's's embankment pond. There is an existing pond upstream from the new site that failed. Six 2.5 inch holes were bored – two in the pool area and 4 in the planned new core trench.

The pool area had sufficient material (CL and ML-CL) to excavate for the fill to a depth of 7.5 feet. However, during excavation care should be taken to avoid the saline and potentially sodic soil that is present on the north central pool area. In test hole 1 (TP 1), considerable salts were encountered at a depth of about 3 inches and I am unsure if this area is sodium affected as well. Soil tests were not conducted for sodicity. The material in this area should not be used for fill unless there is not enough fill for the embankment and should just be used for buildup on the back slope of the embankment. The other test hole (TP 2) in the pool area did not have salts in the upper 7.5 feet but could be present below this depth. The soil in this area as CL and CL-ML. I would recommend a technician or engineer be on site to make sure the salty soil material be stockpiled away from the pool area and not be used in the embankment unless absolutely necessary.

Test hole 1 (TC 1) in the core trench had suitable material (CL-ML) to a depth of 43 inches. Care should be taken not to use the soft bedrock material in the core trench. Test hole 2 (TC2) had dark CL material to a depth of approximately 3 feet and brown CL material with redox concentrations to a depth of 6 feet which was the extent of the boring due to wetness at that depth. Test hole 3 (TC 3) was light CL material to a depth of 2.5 feet with CL material below that to a depth of 5.5 feet. Below that to a depth of 7.5 feet was CL-ML. Test hole 4 (TC 4) was about halfway up the hillslope on the north end of the planned core trench. Soil material to a depth of approximately 4 feet was light CL. Interbedded sandstone and siltstone was encountered around 4 feet and should not be used in the embankment. Bedrock should be encountered at shallower depths if the core trench is extended further up slope.

If you have any questions, please let me know.

Submitted by,

Kent Cooley
Area Resource Soil Scientist

5-1

HYDRAULIC DATA		
Drainage Area	2436.2	Acres
Annual Runoff Yield (50% Chance)	81.21	Ac. Ft
Time of Concentration	3.3	Hours
Runoff Curve Number	74	
Principal Spillway, 5Year - 24 Hour Rainfall	2.5	Inches
Auxiliary Spillway, 50Year - 24 Hour Rainfall	4.0	Inches
Peak Runoff 5 Year - 24 Hour Rainfall	285	CFS
Principal Spillway Discharge	47.5	CFS
Peak Runoff 50 Year - 24 Hour Rainfall	832	CFS
Auxiliary Spillway Discharge	116.5	CFS
Auxiliary Spillway Flow Depth	2.210	Feet

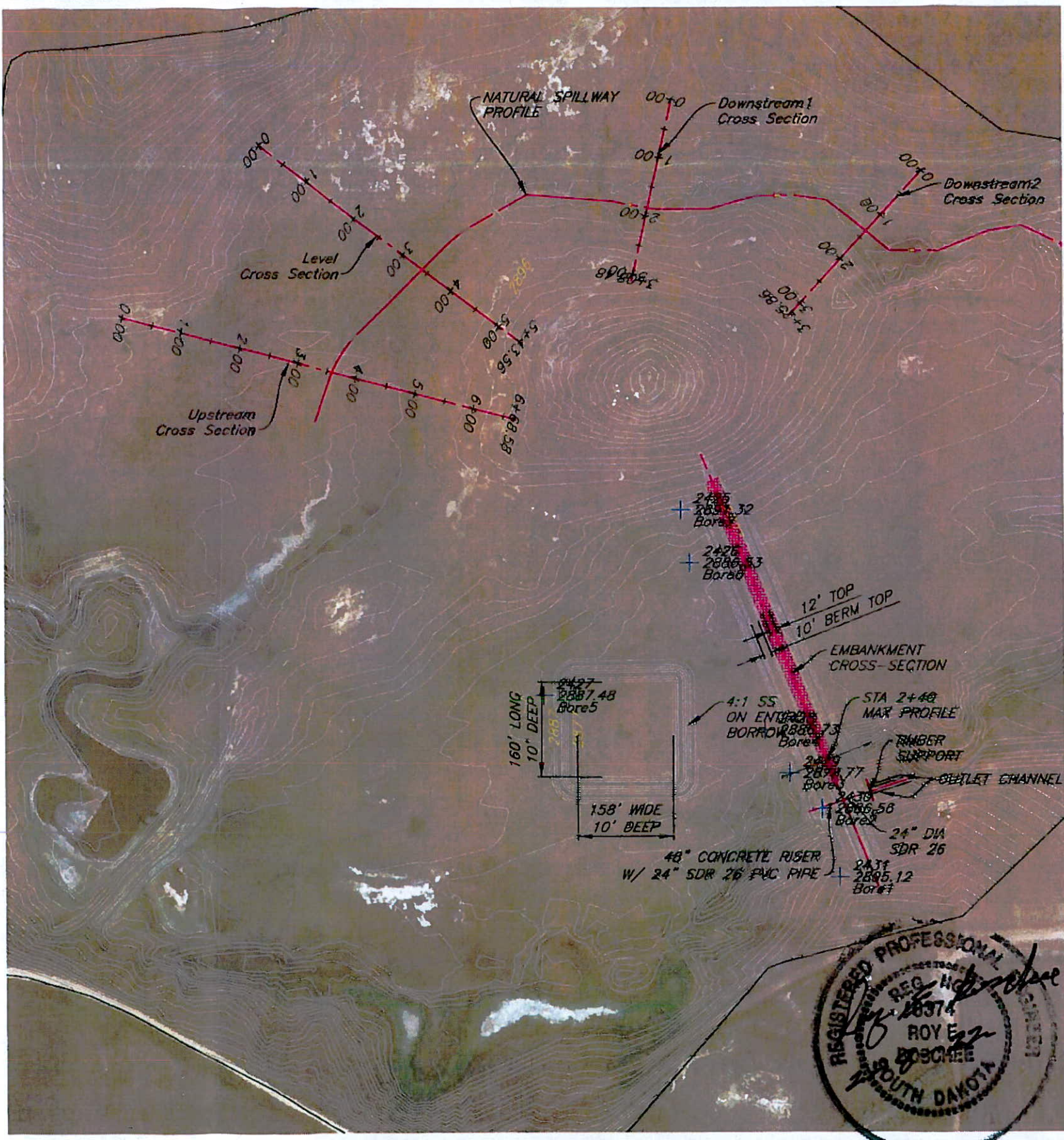


STRUCTURE DATA		
Length of Top of Dam	770	Feet
Water Depth to Crest of Principal Spillway	6	Feet
Height of Downstream Toe to Top of Dam	19	Feet
Effective Height	16	Feet
Product of Storage X Effective Height	1225.5	

POOL DATA			
	ELEV.	AREA	STORAGE
Crest of Principal Spillway	2892.3	21.9 Ac.	81.7 Ac.-Ft
Crest of Auxiliary Spillway	2894	33 Ac.	135.6 Ac.-Ft
Top of Dam	2897	44.6 Ac.	211.1 Ac.-Ft

SEDIMENT YIELD					
Erodibility Area	Gross Rate (A.F./Ac./Yr.)	Drainage Area (Acres)	Delivery Rate (%)	Design Period (Years)	Required Sediment Volume (Ac.-Ft.)
Q	.0016	2436	12	25	11.693

ID	ELEVATION	NORTHING	EASTING	BENCHMARK DESCRIPTION
base	2900.12	16496124.7480	2181805.7660	NEXT TO FENCE CORNER MARKED WITH FLAGS WITH ORANGE REBAR CAP
BM1	2892.54	16496298.0370	2181791.4780	ON TOP OF WELL HEAD AT POWER EAST OF DAM LOCATION
BM2	2901.88	16496117.5230	2181640.7040	IN FENCE LINE WEST OF GATE ON TOP OF 1/2 INCH REBAR



PLAN VIEW



Date
Designed L. Legge 09/14/21
Drawn L. Legge 09/14/21
Checked R.E.B. 09/21/21
Approved Roy E. Boschee 2/8/22

JERDE DAM
POND

PLAN VIEW AND DESIGN DATA

Perkins County, South Dakota

United States
Department of
Agriculture

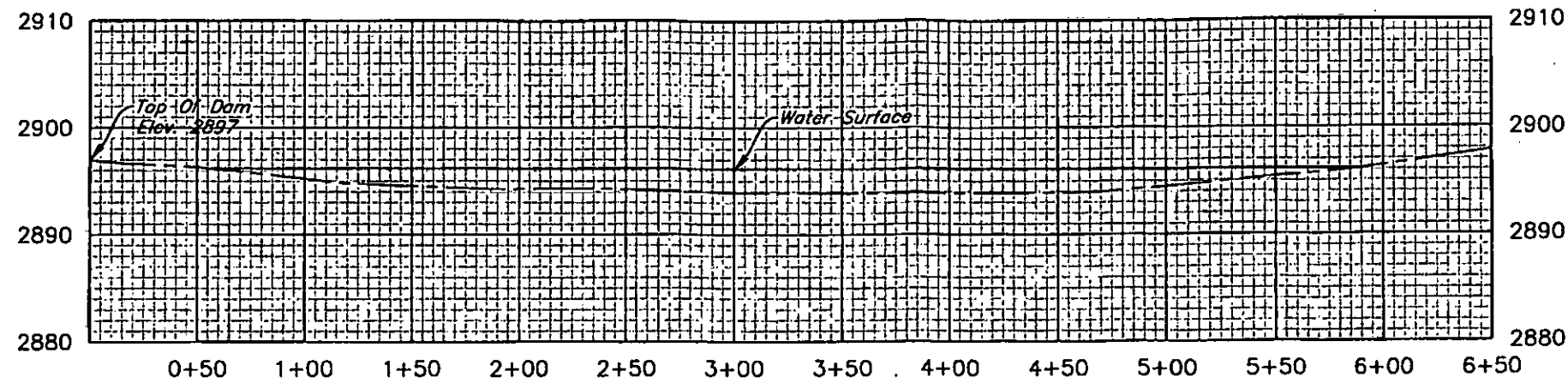
Natural Resources
Conservation Service

File No.
Jerde.dwg

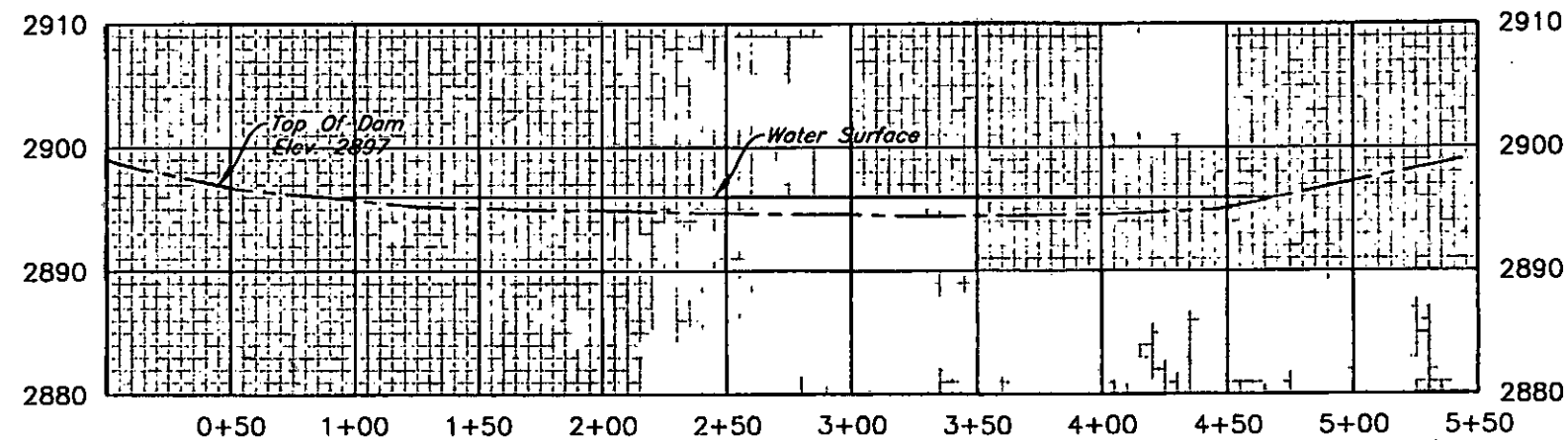
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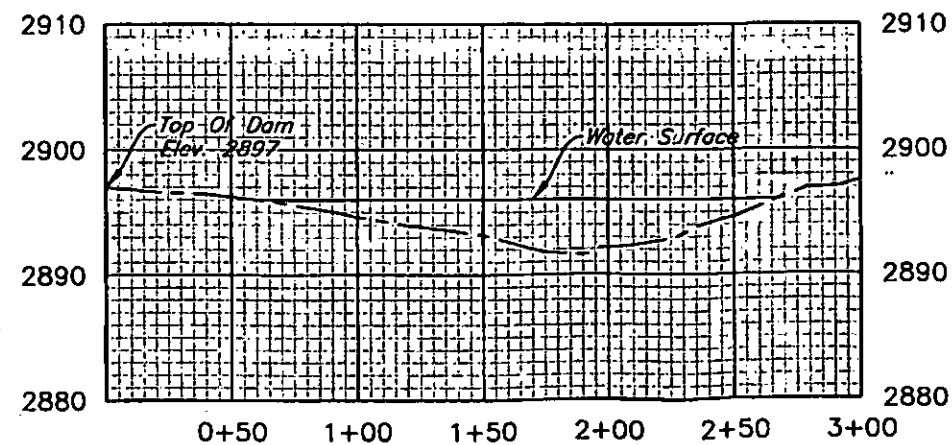
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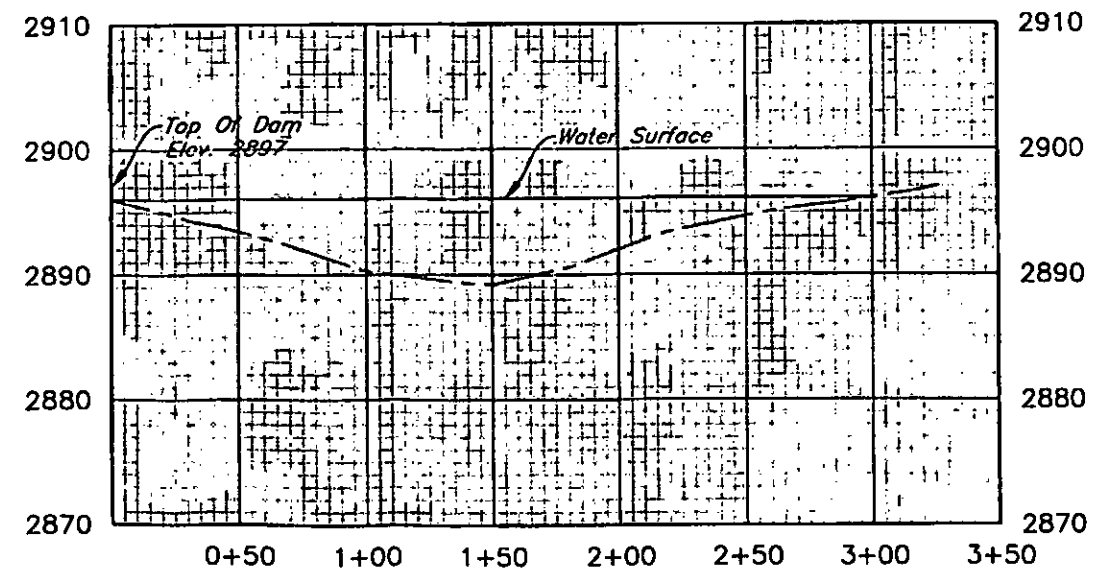
Upstream Cross Section



Level Cross Section



Downstream1 Cross Section



Downstream2 Cross Section



JERDE DAM
POND

Aux. Spillway Cross Sections

Perkins County, South Dakota

United States
Department of
Agriculture
USDA
Natural Resources
Conservation Service

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Jerde.dwg

Drawing No.

2/8/22 9:58 AM
Sheet of

Designed L. Legge 09/14/21
Drawn L. Legge 09/14/21
Checked RFB 2/8/22
Approved L. E. Bochee 2/8/22

33-16N.17N-10E

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Product of Storage X Effective Height	1225.5	

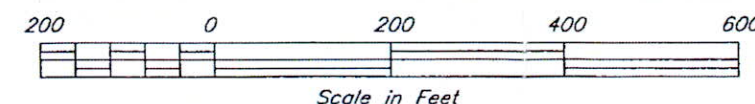
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PLAN VIEW



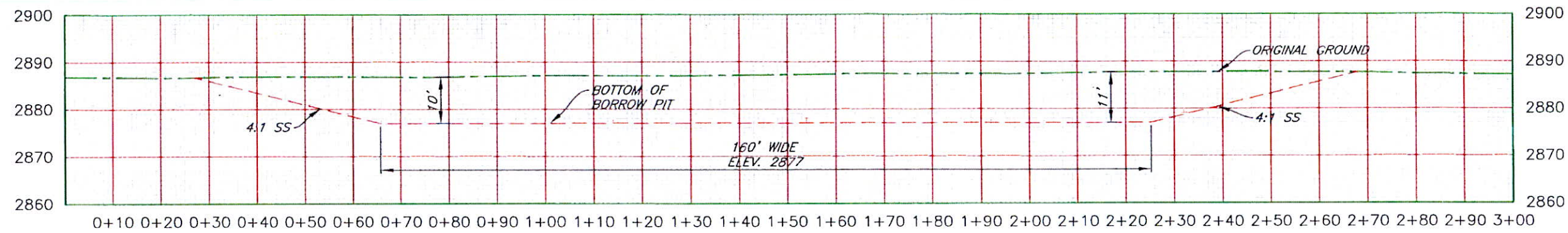
Date
Designed L. Legge 09/14/21
Drawn L. Legge 09/14/21
Checked KEB 9/14/21
Approved Roy E. Boschke 9/14/21

JERDE DAM
POND
PLAN VIEW AND DESIGN DATA

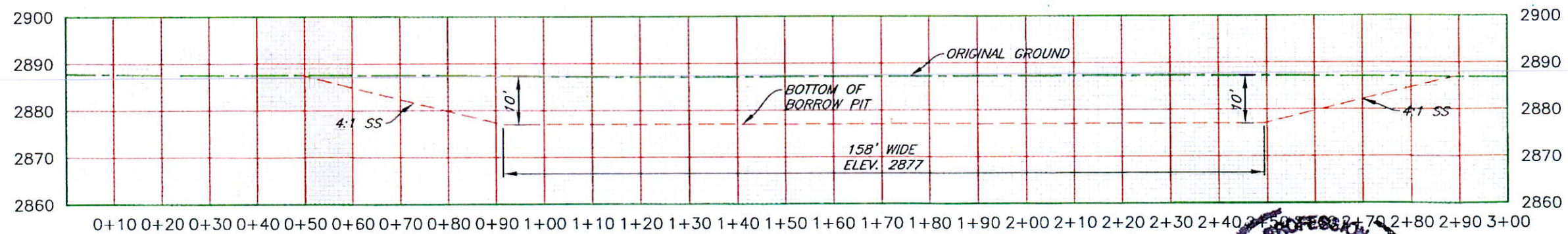
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9/20/21 10:23 AM
Sheet of



BORROW PIT N-S PROFILE

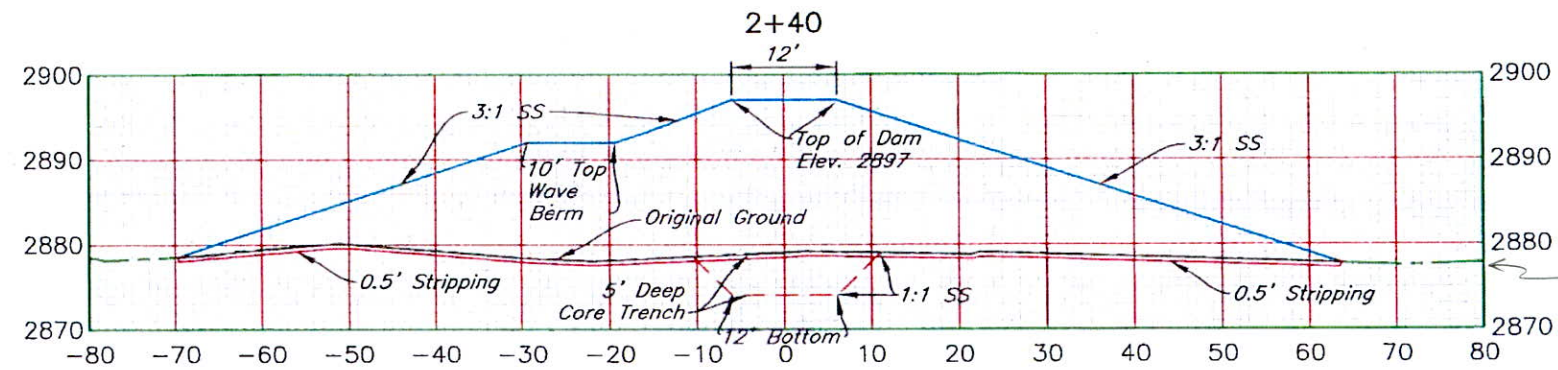


BORROW PIT E-W PROFILE

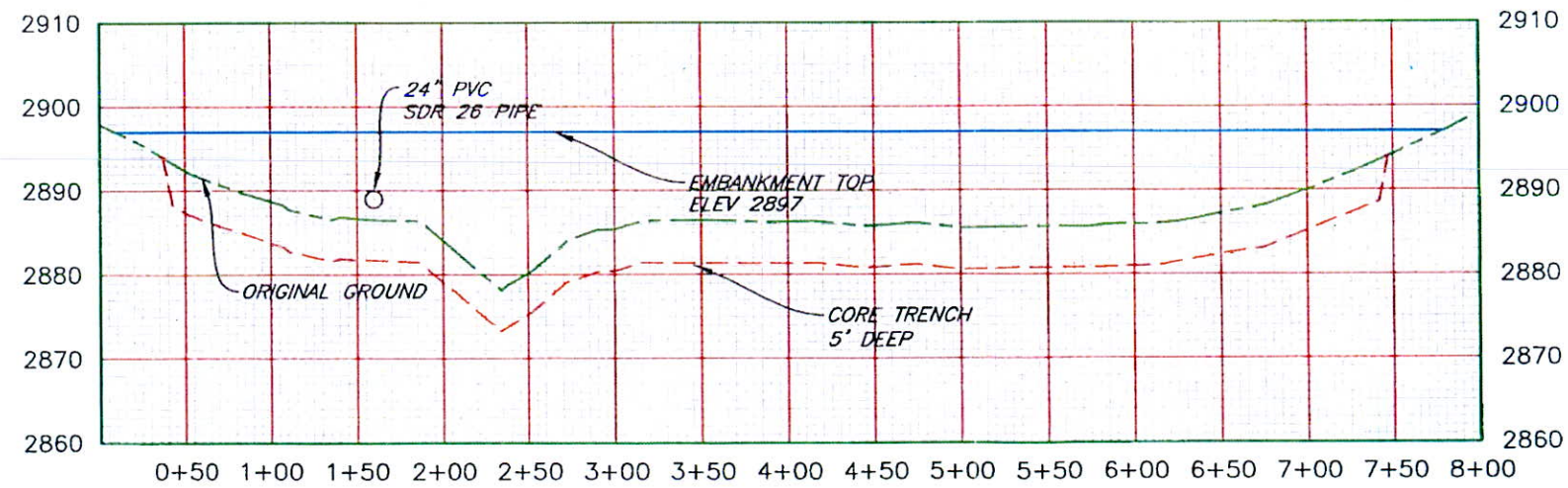


BORROW PIT PROFILE 1 & 2

United States Department of Agriculture USDA Natural Resources Conservation Service	Date Designed L. Legge 09/14/21 Drawn L. Legge 09/14/21 Checked R.E.B. 9/14/21 Approved Roy E. Boscnee 9/14/21
	JERDE DAM POND BORROW PIT PROFILES
	33- 16N.17N- 10E Perkins County, South Dakota
	File No. Jerde.dwg Drawing No. 9/20/21 10:23 AM Sheet of



MAX. CROSS SECTION OF DAM



EMBANKMENT PROFILE



Designed L. Legge	Date 09/14/21
Drawn L. Legge	Date 09/14/21
Checked R.E.B.	Date 9/14/21
Approved Roy E. Boschke	Date 9/14/21

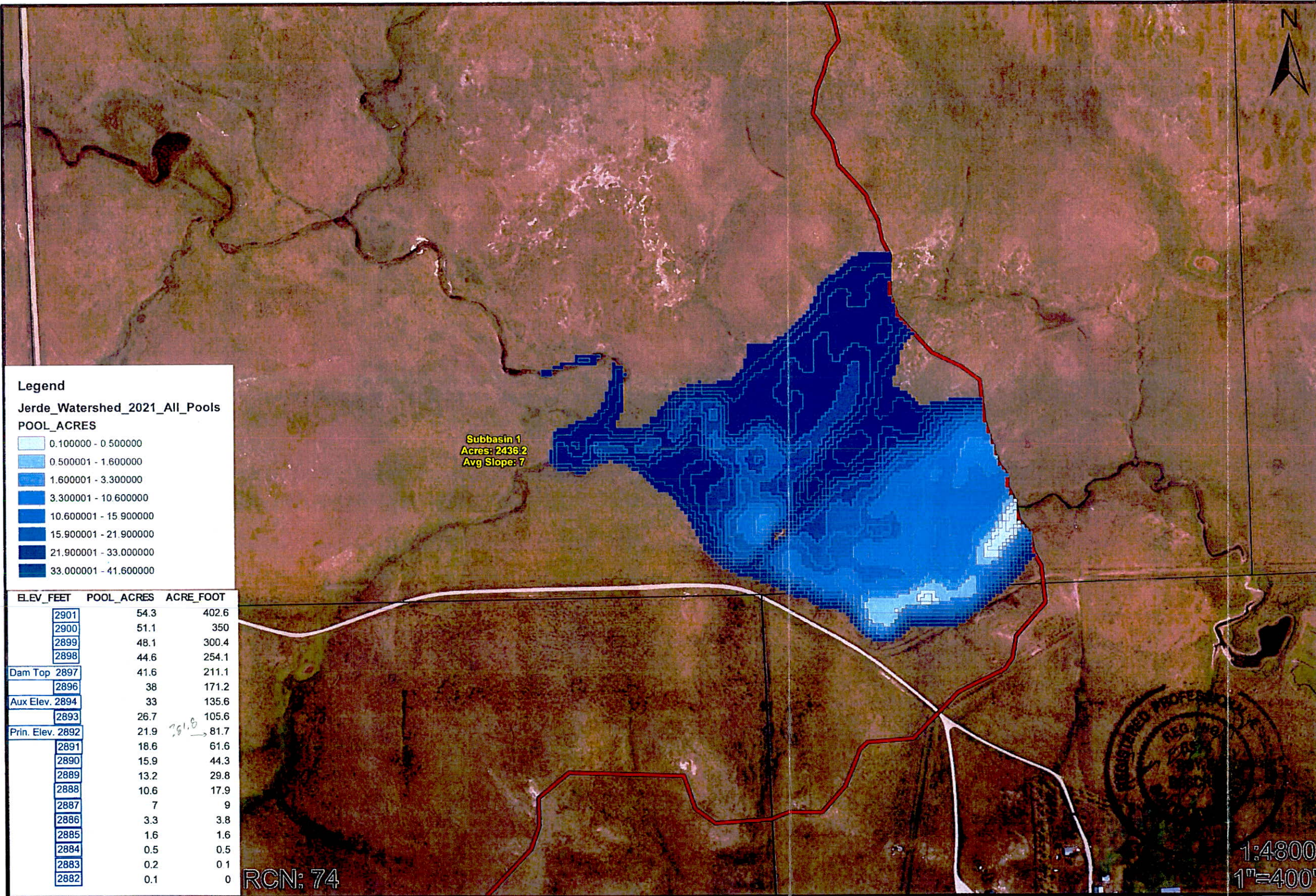
JERDE DAM
POND
MAX CROSS SECTION AND EMBANKMENT PROFILE
Perkins County, South Dakota
33-16N.17W-10E

United States
Department of
Agriculture
USDA
Natural Resources
Conservation Service

File No.
Jerde.dwg
Drawing No.
9/20/21 10:23 AM
Sheet of

Sheet
5-4

area - capacity
curves



Legend

Jerde_Watershed_2021_All_Pools

POOL_ACRES

0.100000 - 0.500000
0.500001 - 1.600000
1.600001 - 3.300000
3.300001 - 10.600000
10.600001 - 15.900000
15.900001 - 21.900000
21.900001 - 33.000000
33.000001 - 41.600000

ELEV. FEET	POOL_ACRES	ACRE FOOT
2901	54.3	402.6
2900	51.1	350
2899	48.1	300.4
2898	44.6	254.1
Dam Top 2897	41.6	211.1
2896	38	171.2
Aux Elev. 2894	33	135.6
2893	26.7	105.6
Prin. Elev. 2892	21.9	81.7
2891	18.6	61.6
2890	15.9	44.3
2889	13.2	29.8
2888	10.6	17.9
2887	7	9
2886	3.3	3.8
2885	1.6	1.6
2884	0.5	0.5
2883	0.2	0.1
2882	0.1	0

Subbasin 1
Acres: 2436.2
Avg Slope: 7

RCN: 74



1:4800
1"=400'





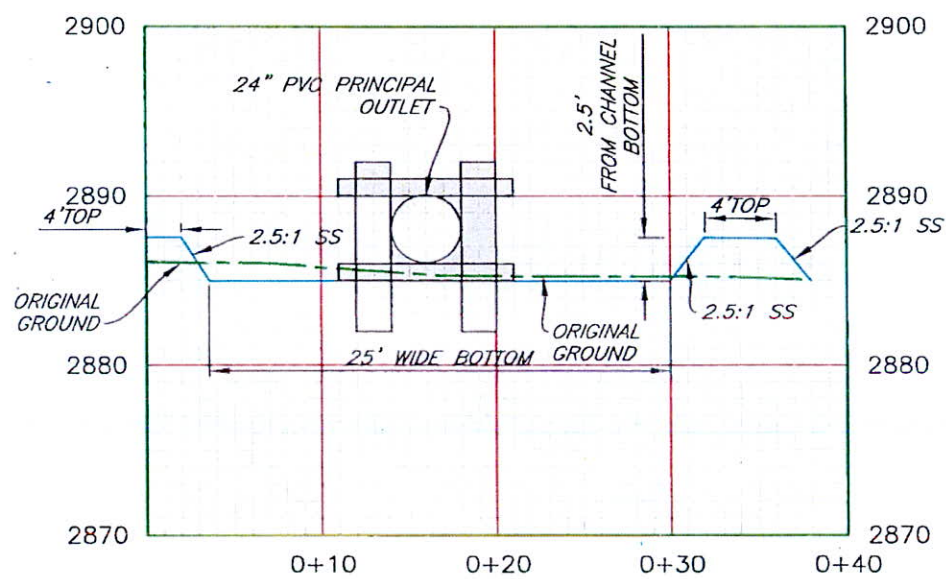
Natural Resources Conservation Service
United States Department of Agriculture

Phil Jerde

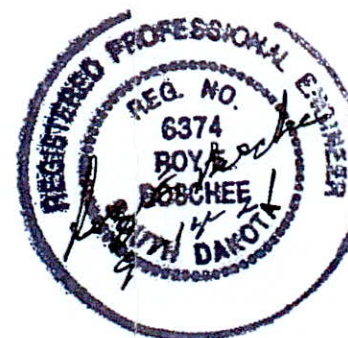
SE 1/2 33-17N-10E
PERKINS COUNTY,
SOUTH DAKOTA

Designed	L. Legge	Date	6/29/21
Drawn	L. Legge	Date	6/29/21
Checked	RFB	Date	9/14/21
Approved	Ag. E. Boudreau	Date	9/14/21

5



Principal Outlet Channel and Berm PROFILE



PRINCIPAL SPILLWAY OUTLET CHANNEL

Designed	L. Legge	Date	09/14/21
Drawn	L. Legge		09/14/21
Checked	R.E.B.		9/14/21
Approved	Roy E. Boschee		9/14/21

JERDE DAM
POND
BORROW PIT PROFILES

Perkins County, South Dakota

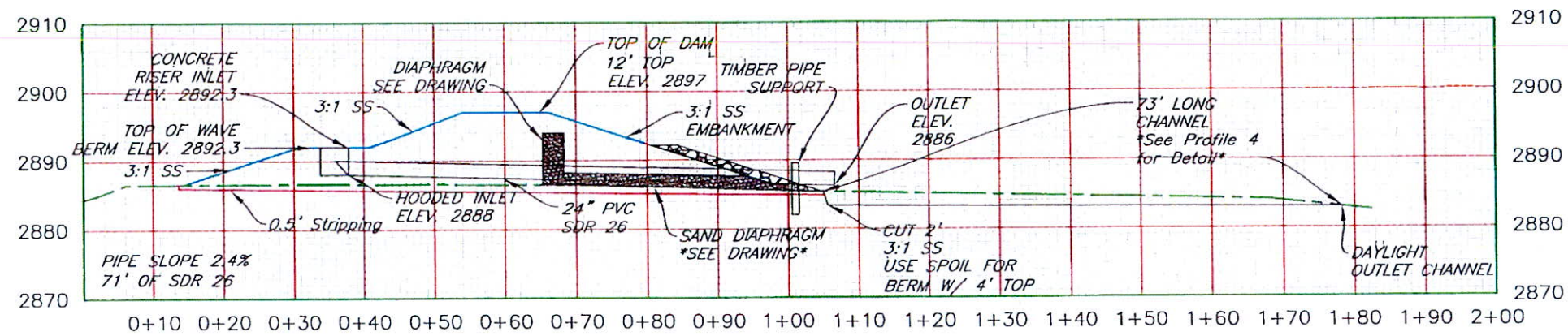


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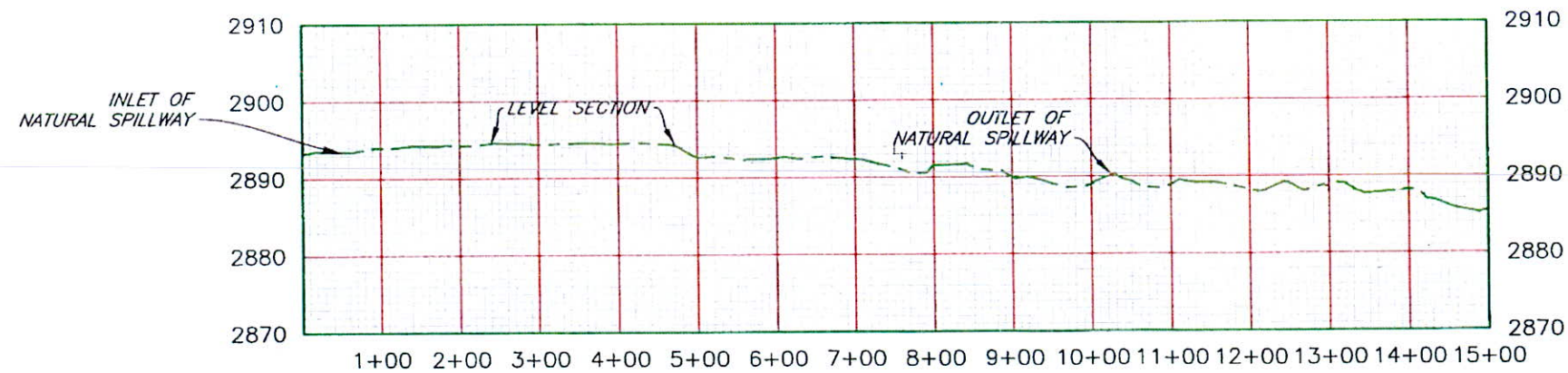
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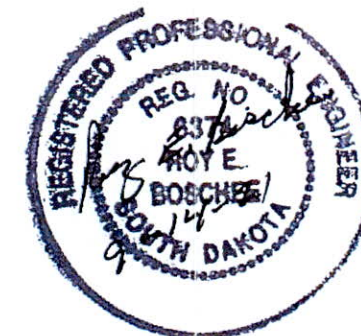
33- 16N.17N- 10E



PRINCIPAL AND OUTLET CHANNEL PROFILE



Aux Spillway PROFILE



United States Department of Agriculture USDA Natural Resources Conservation Service	JERDE DAM POND PRINCIPAL SPILLWAY AND AUX. SPILLWAY PROFILE Perkins County, South Dakota		Date Designed L. Legge 09/14/21 Drawn L. Legge 09/14/21 Checked LEB 9/14/21 Approved R. E. Boschee 9/14/21
	33- 16N.17N- 10E		
	File No. Jerde.dwg		
	Drawing No. 9/20/21 10:23 AM Sheet of		

Plan & Specification Review

Date:

Application #:

2010-1

initials

Name of Applicant:

Philip Jirde

1) ARSD Chapter 74:02:08:01 (n) – from plans prepare by an engineer

Top of Dam Elevation 2897.0 Maximum Storage Capacity - :01(15) 211.1 (ac-ft)

auxiliary 2nd Spillway Elevation 2894.0 Intermediate Storage Capacity - :01(14) 135.6

P. Spillway Elevation 2892.3 Normal Storage Capacity 81.7

Downstream embankment toe elevation 2897 - 19 = 2878 *← from dam x-sec sheet*

Height - :01(12) 19

Effective height - :01(8) 2894 - 2878 = 16

2) ARSD Chapter 74:02:08:01(3-5) & 74:02:08:05

Dam hazard category 3

3) ARSD Chapter 74:02:08:06

Dam size small *ht = 19 ft storage : 211.1 ac-ft*

4) ARSD 74:02:08:07 - Minimum design flood requirement

Minimum design flood required 16 ft (135.6 ac-ft) = 2169.6 *< 3000 ∴ 25-yr freq*

USGS WRI 98-4055 - Techniques for Estimating Peak-Flow Magnitude and Frequency Relations for South Dakota Streams; Review of design flows and comments:

- 1) Region C
- 2) 25 yr freq $Q = 207 CA^{0.573}$ $CA = 4.37$
- 3) yes $= 207(4.37)^{0.573}$
 $= 481.92$

Design peak flow in plans _____

Comments:

Plan & Specification Review

Date:

Application #:
Name of Applicant:

initials

5) ARSD 74:02:08:09 (n) – Plan Requirements

(1) Top map Yes
on sheet 5-1

(2) Dam axis profile Yes
on sheet 2

(3) Dam max X-section Yes
on sheet 3

(4) Area-capacity curves Yes
- table form on sheet 5-4

(5) Outlet details Yes
on sheet 5

(6) Spillway Rating Yes

(7) Spillway details Yes
on sheet 5 & 7

(8) Specs No

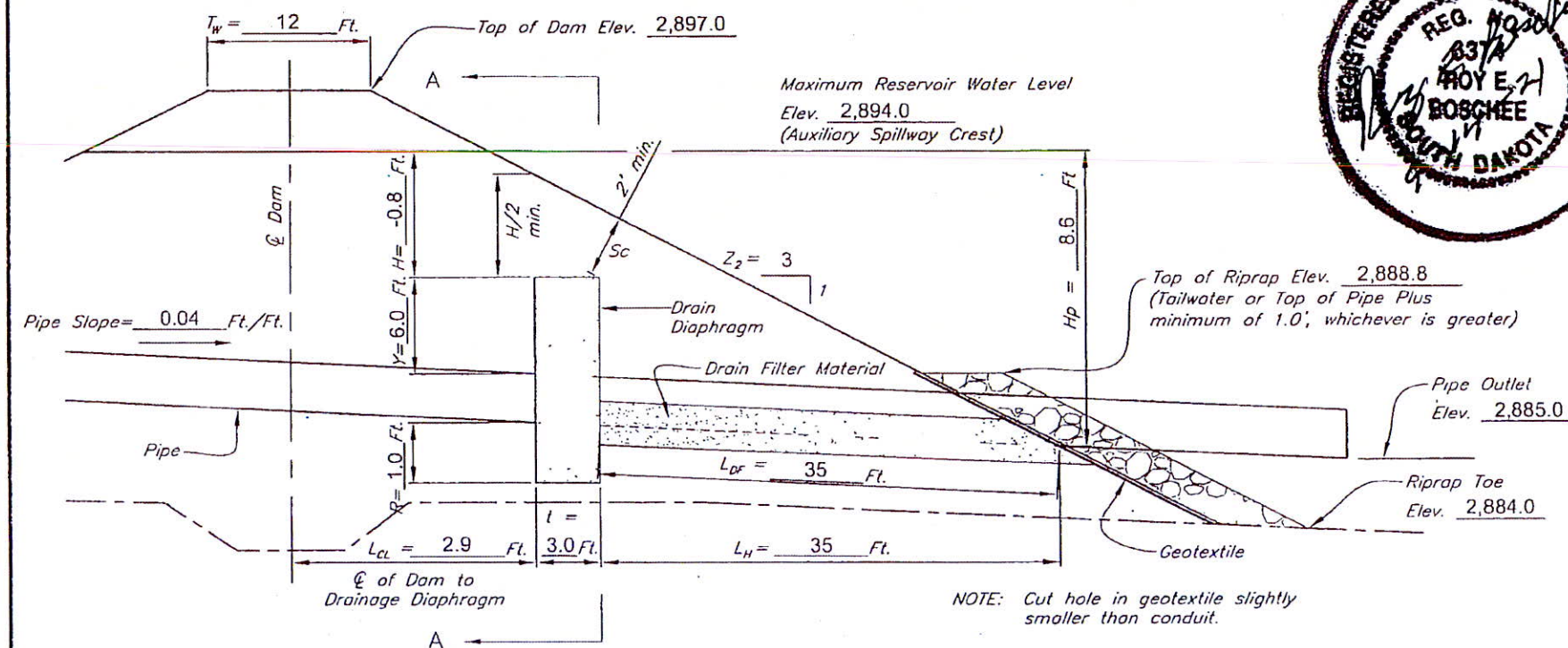
(9) If category 1 EPP/EAP N/A Cat 3

Additional comment/notes:

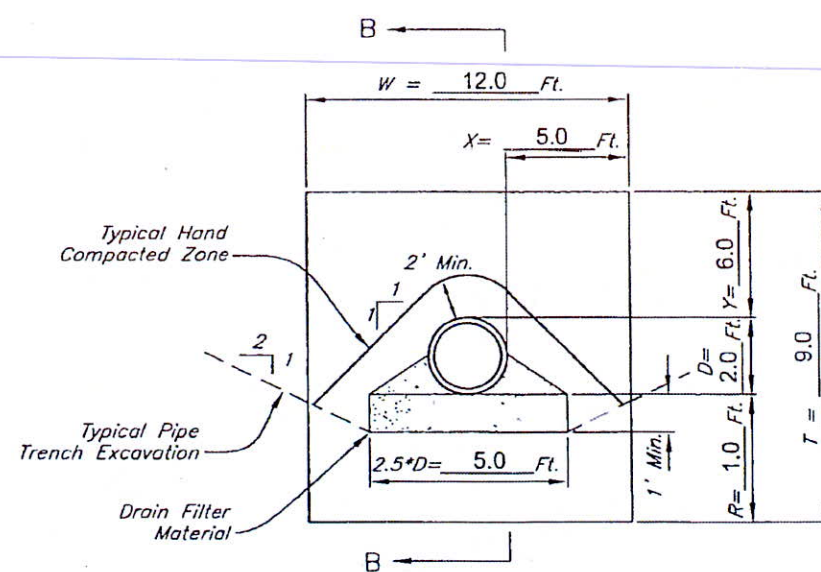
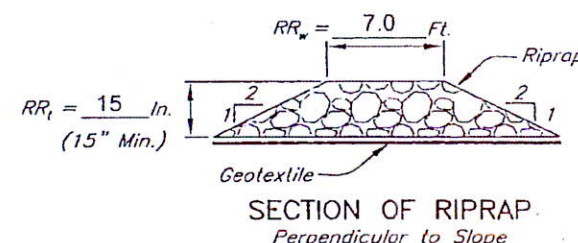
6) NRCS Annual Yield - From SD Engineering Field Manual for Conservation Practices

- see spreadsheet

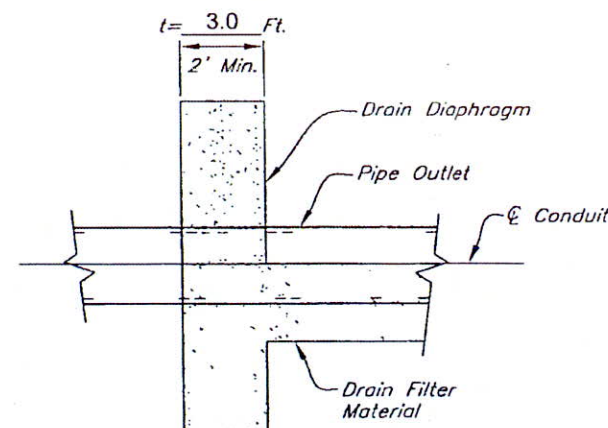
Qualifies for the National Inventory of Dams____
(see the National Inventory of Dams – State Government section for qualifications)



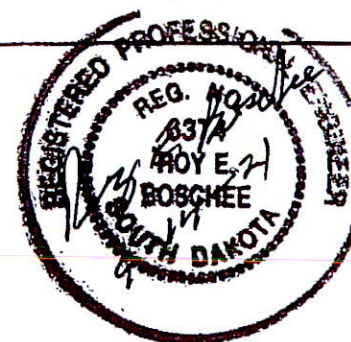
PROFILE ALONG $\mathcal{C}$ OF CONDUIT
NO SCALE



SECTION A-A
NO SCALE



SECTION B-B
NO SCALE



SUMMARY OF SAND DRAIN FILL DIMENSIONS		
$W =$	12.0 Feet	(Total Width of Drain Diaphragm)
$T =$	9.0 Feet	(Total Height of Drain Diaphragm)
$t =$	3.0 Feet	(Thickness of Single Filter)
$L_{df} =$	35 Feet	(Length of Sand Along Pipe)

SUMMARY OF GEOTEXTILE DIMENSIONS		
$G_w =$	12.0 Feet	(Total Width of Geotextile)
$G_L =$	15.2 Feet	(Total Length of Geotextile)

SUMMARY OF ROCK RIPRAP DIMENSIONS		
$RR_t =$	15 Inches	(Total Thickness of Rock Riprap)
$RR_w =$	7.0 Feet	(Total Width of Rock Riprap)

ESTIMATED TABLE OF QUANTITIES		
ITEM	UNIT	QUANTITY
Sand Drain Filter Material	Cu. Yds.	21.0
Geotextile	Sq. Yds.	20.3
Rock Riprap	Cu. Yds.	6.7

DRAIN FILTER GRADATION

SIEVE SIZE	PERCENT PASSING
3/8	100
#4	95-100
#8	80-100
#16	50-85
#30	25-60
#50	5-30
#100	0-10

ASTM C-33
Fine Concrete Aggregate

RIPRAP GRADATION

PERCENT SMALLER	WEIGHT RANGE (LBS.)	SIZE RANGE (IN.)
100	50 lb.	10"
50-85	30 lb.	7"
15-50	10 lb.	5"
0-15	3 lb.	3"

CONSTRUCTION NOTES

- The Drainage Diaphragm and envelope will be installed by placing Drain Filter Material in maximum 15 inch thick uncompacted lifts. Each lift will be saturated uniformly with approximately 1.2 gallons of water per cubic foot of loose Drain filter Material prior to compaction. Each lift will then be compacted by a minimum of two passes of a hand-directed vibratory compactor over the entire lift surface. No compaction of the drain envelope above the pipe invert will be required.
- The maximum height of drop of the rock riprap onto the Geotextile in the pipe outlet area shall be 3 feet. Rock riprap shall be placed without damaging the underlying geotextile.

MATERIAL NOTE

- The geotextile shall conform to the Class I requirements in Table 2 for Nonwoven Geotextiles in Material Specification SD-592.

DRAINAGE DIAPHRAGM DETAILS
JOB PLAN 3.8 REV. 02/2020

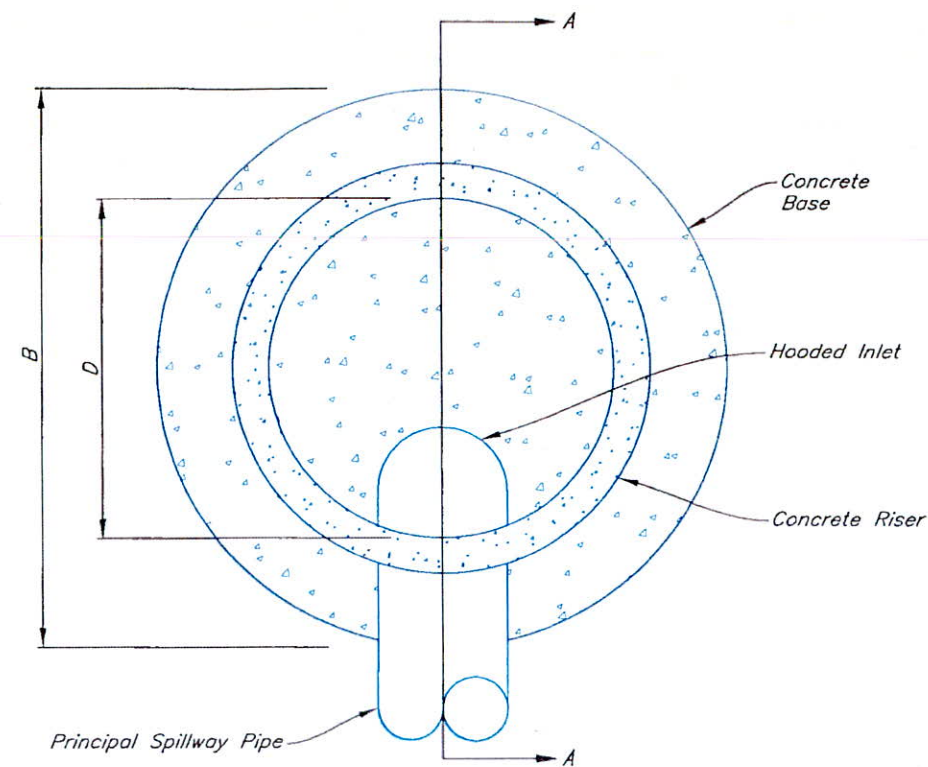
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NAME: Jerde									
378 - POND									
Drainage Diaphragm Detail									
Sect. 3/4/20, T. 161N, R. 10E, Perkins County, South Dakota									
Sheet 1 of 1									



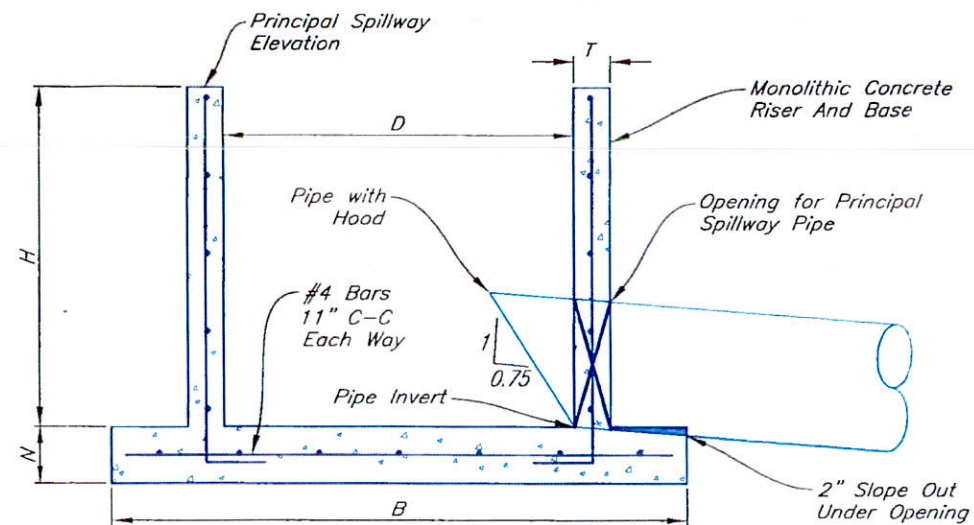
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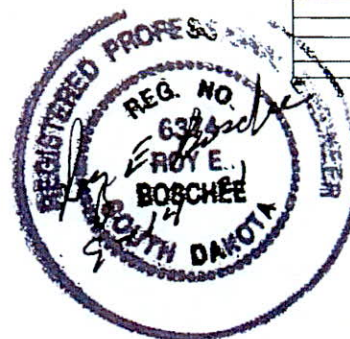
PLAN VIEW PRECAST RISER AND BASE



SECTION VIEW A-A

CONSTRUCTION NOTES

1. The riser and base is precast reinforced concrete and is manufactured according to ASTM C478 Standard Specification For Precast Reinforced Concrete Manhole Sections.
2. Provide a watertight joint between the precast concrete riser and the principal spillway pipe barrel.
3. Contact NRCS prior to installation for other options for the construction of the riser if a precast monolithic riser and base is not used.



(D) RISER DIAMETER	(H) RISER HEIGHT	(T) WALL THICKNESS	(B) BASE DIAMETER	(N) BASE THICKNESS	ESTIMATED WEIGHT	DIA. PIPE BARREL
30"	4'	3.5"	51"	6"	2,600 LBS	10" to 18"
30"	4.5'	3.5"	51"	6"	2,790 LBS	10" to 18"
30"	5'	3.5"	51"	6"	2,980 LBS	10" to 18"
36"	4'	4"	64"	6"	3,270 LBS	10" to 24"
36"	4.5'	4"	64"	6"	4,030 LBS	10" to 24"
36"	5'	4"	64"	6"	4,290 LBS	10" to 24"
36"	5.5'	4"	64"	6"	4,550 LBS	10" to 24"
36"	6'	4"	64"	6"	4,815 LBS	10" to 24"
48"	4'	5"	79"	8"	6,870 LBS	10" to 30"
48"	4.5'	5"	79"	8"	7,300 LBS	10" to 36"
48"	5'	5"	79"	8"	7,740 LBS	10" to 36"
48"	5.5'	5"	79"	8"	8,170 LBS	10" to 36"
48"	6'	5"	79"	8"	8,600 LBS	10" to 36"

PRECAST CONCRETE RISER AND BASE
WITH HOODED INLET
REV. 1/2012

Date
Designed L. Legge 09/14/21
Drawn L. Legge 09/14/21
Checked RES 9/14/21
Approved by E. Boschée 9/14/21

JERDE DAM
POND
PRECAST CONCRETE RISER AND BASE WITH HOODED INLET
Perkins County, South Dakota
33- 16N.17N- 10E

United States
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Agriculture
USDA
Natural Resources
Conservation Service

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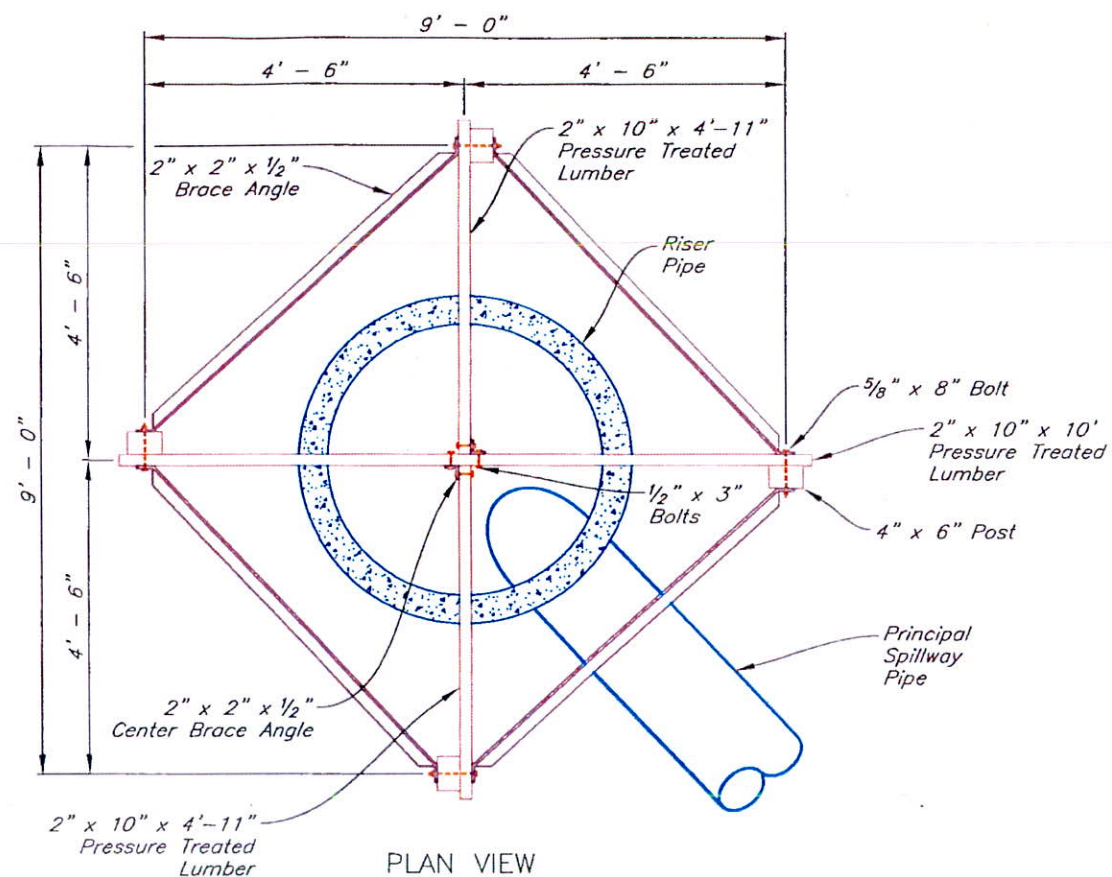
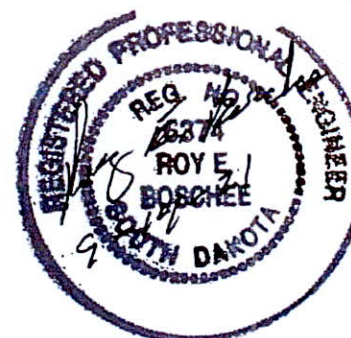
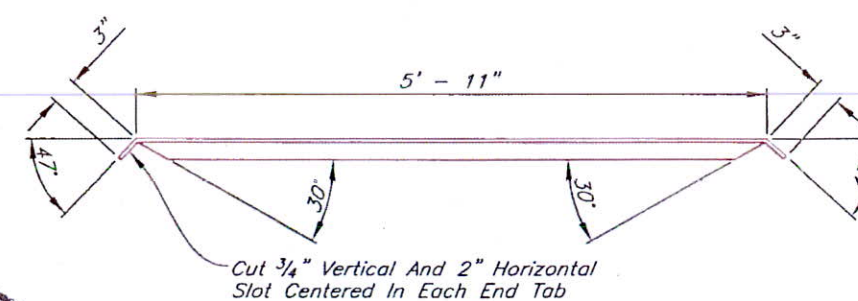
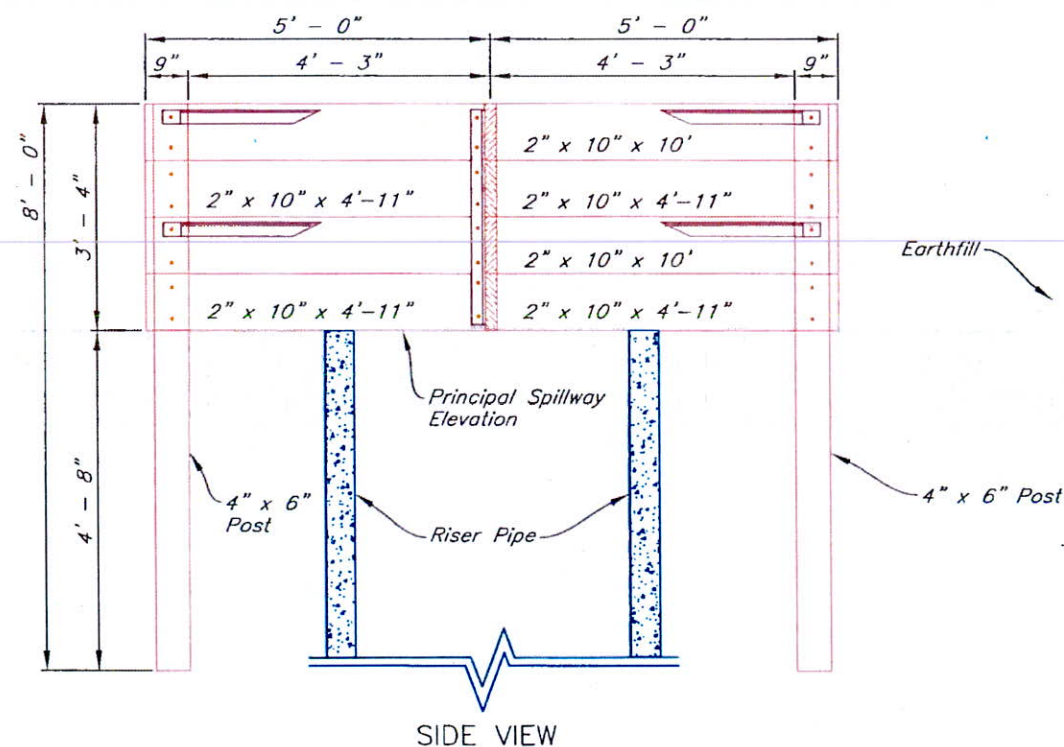


TABLE OF QUANTITIES			
ITEM	LENGTH OR SIZE	UNIT	QUANTITY
4" X 6" Pressure Treated Post	8 Ft	Each	4
2" X 10" Pressure Treated Lumber	10 Ft	Each	4
2" X 10" Pressure Treated Lumber	4' - 11"	Each	8
2" X 2" X 1/4" Steel Angle	6' - 5"	Each	8
2" X 2" X 1/4" Steel Angle	3' - 2"	Each	2
Steel Bolt (with nut and 2 washers)	5/8" X 8"	Sets	32
Steel Bolt (with nut and 2 washers)	1/2" X 3"	Sets	32

CONSTRUCTION NOTES

1. Bolt 4" x 6" posts and 2" x 10" lumber together using two 5/8" x 8" bolts. Do not place bolts closer than 1 1/2" from edge of board.
2. For center brace angles drill eight, 9/16" holes, 5/8" from outer edge of each leg of each angle and centered 5 1/4" apart along the leg.
3. Attach brace angles to top bolt on top of 2" x 10" board and to top bolt on next to bottom board.
4. All nuts, bolts, and washers shall be galvanized.



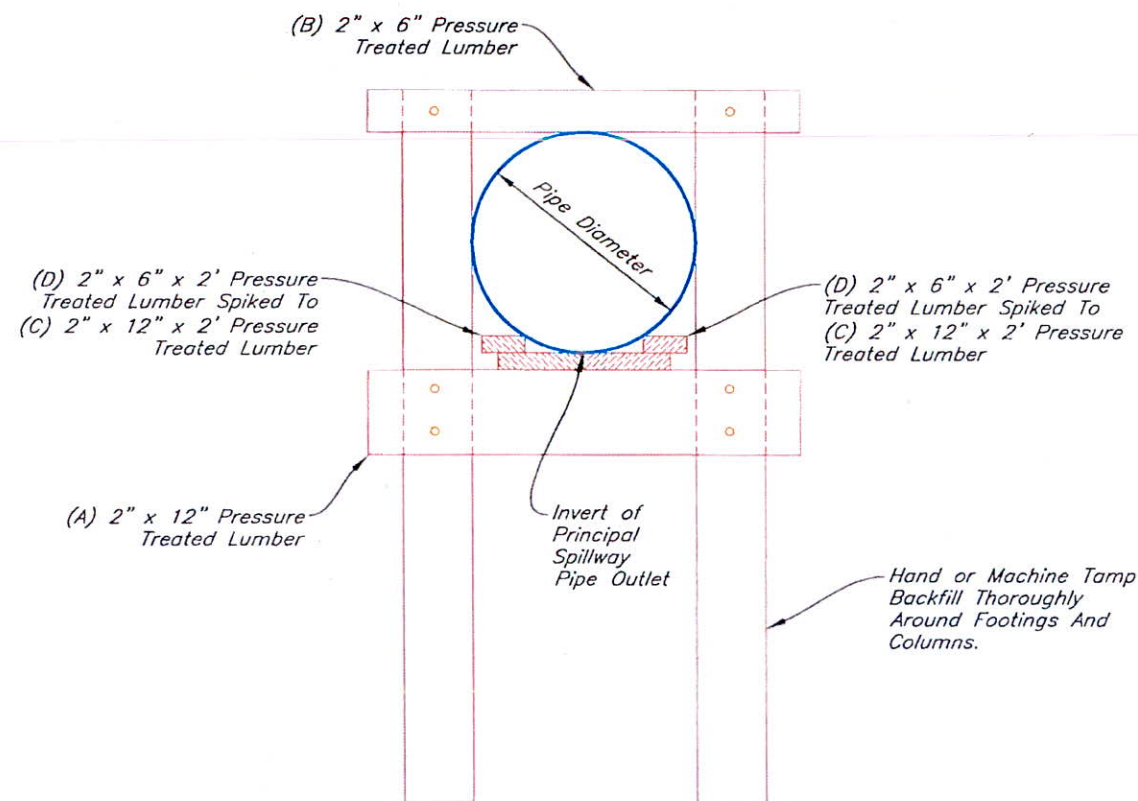
TRASH RACK AND BAFFLE FOR RISER DIA. 36" TO 60"
JOB PLAN NO. 6.4 REV. 1/2012

Designed L. Legge 09/14/21
Drawn L. Legge 09/14/21
Checked R.E.S. 9/14/21
Approved by E. Boschee 9/14/21

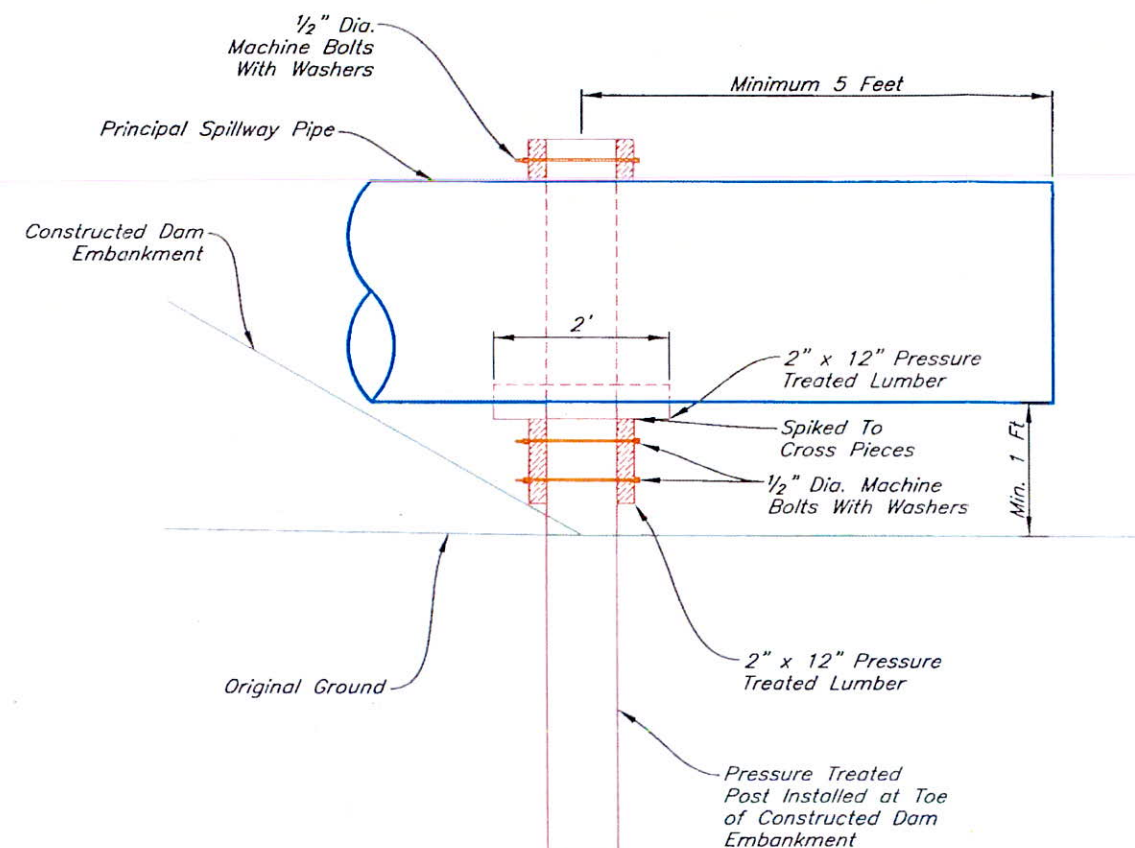
JERDE DAM
POND
TRASH RACK AND BAFFLE FOR RISER DIA. 36" TO 60"
Perkins County, South Dakota
33-16N.17N-10E

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Natural Resources
Conservation Service

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CROSS-SECTION VIEW



PROFILE VIEW

LENGTHS REQUIRED FOR DIFFERENT PIPE DIAMETERS

ITEM	MATERIAL SIZES BASED ON PIPE DIAMETER				UNIT	QUANTITY
	12" TO 18"	21" TO 24"	30" TO 36"	42" TO 48"		
8" Dia. Pressure Treated Post	8 Ft	--	--	--	Each	2
10" Dia. Pressure Treated Post	--	10 Ft	10 Ft	12 Ft	Each	2
(A) 2" X 12" Pressure Treated Lumber	4 Ft	4 Ft	5 Ft	6 Ft	Each	2
(B) 2" X 6" Pressure Treated Lumber	4 Ft	4 Ft	5 Ft	6 Ft	Each	2
(C) 2" X 12" Pressure Treated Lumber	2 Ft	2 Ft	2 Ft	2 Ft	Each	2
(D) 2" X 6" Pressure Treated Lumber	2 Ft	2 Ft	2 Ft	2 Ft	Each	2
1/2" Dia. Machine Bolts With Nuts	12 In.	14 In.	14 In.	14 In.	Each	6
1/2" Dia. Washers					Each	12
Spike Nails					Each	20

CONSTRUCTION NOTES

1. All nuts, bolts, and washers shall be galvanized.
2. If PVC pipe is used, protect the portions of pipe that will be permanently exposed to ultraviolet light from sunlight by priming the pipe with PVC solvent and painting with two coats high quality exterior latex paint.
3. Hand or machine tamp backfill thoroughly around footings and columns.



TIMBER PIPE SUPPORT
JOB PLAN NO. 4.0 REV. 1/2012

Date 09/14/21
Designed L. Legge
Drawn L. Legge
Checked RES
Approved Aug. E. Boschke 9/14/21

JERDE DAM
POND
TIMBER PIPE SUPPORT

Perkins County, South Dakota

33- 16N.17N- 10E

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U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

CONSTRUCTION PLANS AND SPECIFICATIONS

Belvidere Dam EWP

for

Phil Jerde

Pond

Section: 33

County: Perkins

Township: 16N & 17N

Range: 10E

Prepared By:

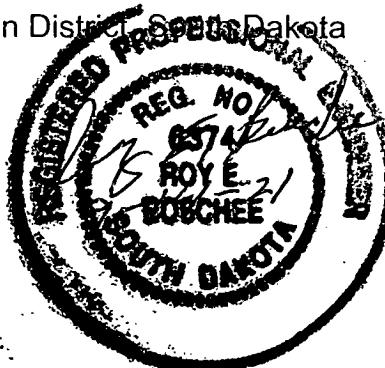
Rapid City

Field Support Office

Designed By: LL

Perkin's County

Conservation District, South Dakota



CONSTRUCTION SPECIFICATION

SD-4 STRIPPING

1. Scope

The work shall consist of removing topsoil and other undesirable materials from borrow areas and foundations of structures and earth fill areas.

2. General

Required stripping excavation depth will be the depth needed to expose subsoil reasonably free of roots and other perishable organic materials. Excavated earth material suitable for fill shall be placed in earth fill areas as appropriate. Stripped material suitable for topsoil shall be stockpiled and placed over disturbed areas as shown on the drawings or as approved by the Natural Resources Conservation Service (NRCS) inspector. All waste material shall be disposed of as shown on the drawings or as approved by the NRCS inspector.

3. Foundation Stripping

Remove loose soil and extend stripping to a reasonably smooth surface in consolidated subsoil. Except as shown on the drawings, foundation slopes shall be excavated to one horizontal to one vertical, or flatter.

4. Borrow Area Stripping

Borrow areas shall be stripped to expose material suitable for earth fill.

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.

Fill adjacent to structures shall be compacted to a density equivalent to that of the surrounding fill by means of hand tamping or manually directed power tampers or plate vibrators. Within 2 feet of any structure, equipment loads must not exceed 400 pounds.

Compaction of fill adjacent to concrete structures shall not be started for at least the following number of days after placement of the concrete.

Concrete Structure	Days After Concrete Placement
Vertical or near-vertical walls with earth load on one side only	14
Walls backfilled on both sides simultaneously	7
Conduits and spillway risers, cast-in-place (with inside forms in place)	7
Conduits and spillway risers, cast-in-place (forms removed)	14
Conduits, pre-cast, cradled	2
Conduits, pre-cast, bedded	1
Anti-seep collars and cantilever pipe supports (backfill both sides simultaneously)	3

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 conducive 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.

Rock riprap shall be placed in a manner to prevent damage to structures. Hand placing is required as necessary to prevent damage to new and existing structures.

5. Hand-placed Rock Riprap

The rock riprap shall be placed on the surface and to the depth specified. It shall be securely bedded with the larger rocks firmly in contact one to another without bridging. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rocks. Flat slab rock shall be laid on its vertical edge except where it is laid like paving stone and the thickness of the rock equals the specified depth of the riprap course.

6. Filters, Bedding, or Geotextiles

When the drawings specify filters, bedding, or geotextile beneath the rock riprap, the designated material shall be placed on the prepared subgrade surface as specified. Compaction of filter or bedding aggregate is not required, but the surface of such material shall be furnished reasonably smooth and free of mounds, dips, or windrows.

Where drawings require geotextiles beneath riprap, the geotextile shall be laid on the prepared subgrade surfaces with no folds or ripples. The geotextile fabric should be in direct contact with the subgrade surface and secured to prevent displacement. Except as otherwise specified, the fabric should be placed parallel to stream alignments and perpendicular to lake shorelines.

Except as otherwise specified, the geotextile splices shall overlap at least 18 inches, or shall be sewn following the geotextile manufacturer's recommendations. Anchoring pins shall be placed as recommended by the geotextile manufacturer except as otherwise specified.

CONSTRUCTION SPECIFICATION

SD-9 DRAIN FILL AND FILTER

1. **Scope**

The work shall consist of furnishing, placing, and compacting drain fill and filter sands and/or gravels.

2. **Materials**

Aggregates shall be sand, gravel, crushed stone, or mixtures thereof, 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 may be limestone and not more than 15 percent may be flat elongated particles.

The aggregates shall meet the following gradations as otherwise specified on the plans:

Masonry Sand (SDDOT, Masonry Mortar Sand)

Filter Aggregate Size (Sieve Size, mm)	Percent Passing by Weight
#4 (4.75 mm)	100
#8 (2.36 mm)	95 to 100
#16	70 to 100
#30	40 to 75
#50	10 to 40
#100	2 to 25
#200	0 to 10

Fine Drain Fill (ASTM C-33, Fine Aggregate)

Filter Aggregate Size (Sieve Size, mm)	Percent Passing by Weight
3/8" (9.5 mm)	100
#4 (4.75 mm)	95 to 100
#8 (2.36 mm)	80 to 100
#16	50 to 85
#30	25 to 60
#50	5 to 30
#100	0 to 10

Coarse Drain Fill (SDDOT, Select Granular Backfill)

Filter Aggregate Size (Sieve Size, mm)	Percent Passing by Weight
1 1/2" (37.5 mm)	100
1" (25 mm)	95-100
1/2" (12.5 mm)	25-800
#4 (4.75 mm)	0 to 20
#8 (2.36 mm)	0 to 5

3. Subgrade Preparation

Surfaces on which drain fill will be placed shall be as undisturbed as possible (do not scarify), and must be free of standing water during placement of drain aggregates. Care shall be taken to prevent collapse of drain walls.

4. Placement

Drain fill shall not be placed until the subgrade has been made available for inspection by the Natural Resources Conservation Service (NRCS) inspector. Drain fill shall not be placed around pipes until the pipe installation has been made available for inspection by the NRCS inspector.

Material must be placed in uniform, approximately twelve inch thick uncompacted layers. Extreme care shall be taken to assure uniformity of the drain fill and to prevent segregation or contamination of the drain fill with foreign mater. When collector pipes are included in drains, the fill materials shall be placed in a manner to avoid displacing the pipe.

When drainfill is constructed concurrently with adjacent zones of earthfill, the upper surface of drainfill shall be maintained at a minimum elevation of 1 foot above the upper surface of adjacent earthfill to prevent contamination of the drain fill.

5. Compaction

Drainfill shall be compacted using the following requirements where compaction of the Drain Filter material is specified:

Each lift will be saturated with approximately 1.2 gallons of water per cubic foot of loose Drain Filter Material prior to compaction. Each lift will then be compacted by a minimum of two passes of a hand-directed vibratory compactor over the entire lift 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 SPECIFICATIONS

SD-12A CONCRETE (CLASS 3,500)

1. Scope

The work shall consist of furnishing, forming, placing, finishing, and curing Portland cement concrete.

2. Materials

Portland cement shall conform to the requirements of ASTM C150, Type II or IIA, and shall be low alkali unless otherwise specified.

Cement that is partially hydrated or otherwise damaged shall not be used.

Fly ash shall conform to the requirements of ASTM C618, Class C, or F except loss ignition shall not exceed 3 percent.

Blast-furnace slag used as a partial substitute for Portland cement shall conform to ASTM C989 for ground granulated blast-furnace slag.

Aggregates shall conform to the requirements of ASTM C33. Coarse aggregates shall be size 467 (1/2 inch to #4 sieve) unless otherwise specified.

Aggregates known to have a slight potential reactivity with alkalis in cement may be used if low alkali cement is used.

Aggregates shall be handled in a manner to prevent contamination and segregation.

Water shall be clean, free of harmful chemicals, and suitable for drinking.

Water-reducing and/or Retarding admixtures shall conform to the requirements of ASTM C494.

Air-entraining admixtures shall conform to the requirements of ASTM C260. If air-entraining cement is used, any additional air-entraining admixture shall be of the same type as that used in the cement.

Plasticizing admixtures shall conform to ASTM C1017.

Preformed expansion joint filler (when specified) shall conform to ASTM D1752 or shall be as shown on the drawings.

Curing compound sprayed on concrete surfaces to retard water loss during curing, shall be white pigmented or have fugitive dye and meet ASTM C309, Type 2, or Type 1 with a fugitive dye as specified on the drawings or dictated by temperature.

3. Concrete Mix Design

~~The contractor is responsible for design and proportioning concrete mixes. Job mixes shall be prepared to meet quality, consistency, and strength of concrete specified. The contractor shall provide the Natural Resources Conservation Service (NRCS) inspector all documentation necessary to support each job mix and any admixtures to be used in the work. At least 15 calendar days prior to placement of concrete, a statement of materials and mix proportions (including admixtures) to be used along with full documentation of strength test results for the proposed mix shall be furnished to the NRCS inspector.~~

Calcium chloride, Sodium chloride (salt) or other corrosive accelerators shall not be used.

Fly ash may be used as a partial substitution for Portland cement in an amount not greater than 25 percent (by weight) of cement in the concrete mix.

Ground granulated blast-furnace slag may be used as a partial substitution for Portland cement in amounts between 25 and 70 percent (by weight) of cement in the concrete mix.

Approval of the concrete mix will be based on the following criteria:

Concrete shall have a minimum compressive strength of 3,500 pounds per square inch at 28 days.

The mix must contain at least six bags of cement per cubic yard of concrete.

Concrete shall contain not more than six gallons of water per bag of cement including free water in the aggregate.

Concrete air-entrainment must be between four and seven percent by volume.

Consistency of concrete must allow it to be worked into place without segregation. Unless otherwise specified, slump must be between two and five inches.

4. Inspection and Testing

The following tests will be performed by the methods indicated.

Type of Test	ASTM Test
Sampling	C172
Slump Test	C143
Air Content	C231 or C173
Compressive Test Specimens	C31 or C42
Compressive Strength Testing	C39 or C42

For each ASTM C31 strength test, 3 test specimens shall be made. The test result shall be the average of the strengths of the three specimens, except if one specimen in the test shows evidence of improper sampling, molding, or testing, it shall be discarded and the strengths of the remaining two specimens averaged. If more than one specimen shows such defects, the entire test shall be discarded.

The NRCS inspector shall have free access to the plant and equipment furnishing concrete. Proper facilities shall be provided for inspection of materials, equipment, and processes and to obtain samples of ingredients and concrete. All tests and inspections will be conducted in a way that does not unnecessarily interfere with concrete manufacture and delivery.

5. Handling and Measuring Materials

Materials shall be stored and handled in a manner that will prevent degradation, segregation, contamination, or intermixing of materials before proportioning.

Scales for weighing aggregates and cement shall be a springless type, clean and operating within one percent accuracy.

All materials entering the concrete shall be measured accurately by weight except liquids may be measured by volume.

6. Mixers and Mixing

Mixers must be capable of thoroughly mixing concrete ingredients into a uniform mass within the specified mixing time and discharging the mix without segregation. Each mixer or agitator shall bear a manufacturer's rating plate indicating the rated capacity and recommended speeds of rotation and shall be operated within these recommendations. Truck mixers and agitators must be equipped with revolution counters.

Concrete shall be uniform and thoroughly mixed when delivered to the structure.

Mixing water in excess of the job mix amount may not be added to the concrete without written approval of the NRCS inspector.

When concrete is mixed in a drum truck mixer, the total volume of all ingredients to be mixed shall not exceed 63 percent of the gross volume of the drum. The concrete ingredients shall be mixed between 70 and 100 revolutions of the drum or blades at the speed designated by the manufacturer as mixing speed. Mixing in excess of 100 revolutions shall be at the speed designated by the manufacturer as agitating speed. Unless otherwise specified, the filled drum shall not be rotated more than 300 revolutions before discharge of the concrete.

When ready-mix concrete is used, a delivery ticket must be provided showing time of loading, revolution counter reading at time of loading, and material quantities used for each load of concrete.

7. Forms

Forms shall be wood, plywood, metal, fiberglass, or other approved material and shall be mortar tight. The forms and associated false work shall be substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions and contours. Form surfaces shall be smooth and free from holes, dents, sags, or other irregularities. Forms shall be coated with a nonstaining form release agent before being set into place. Forms shall not be embedded in the concrete. Except as shown on the drawings, all permanently exposed concrete edges shall be chamfered three-quarter inch.

Metal ties or anchorages that will be embedded in the concrete shall be equipped with cones, she-bolts, or other devices that permit their removal to a depth of at least one inch without injury to the concrete. Ties designed to break off below the surface of the concrete shall not be used without cones. If approved fiberglass or plastic ties are used, the tie ends shall be cut flush with the finished concrete and ground smooth. All form bolts, metal ties, and similar forming restraints shall be removed to a depth of one inch below the surface of the concrete and their cavities repaired unless otherwise specifically permitted.

8. Preparation of Forms and Subgrade

Before placement of concrete, the forms, embedments, and subgrade shall be free of chips, sawdust, debris, water, ice, snow, extraneous oil, or other harmful substances or coatings. Any form release agent on reinforcing steel or other surfaces required to be bonded to the concrete, shall be removed.

Rock surfaces shall be cleaned by high pressure water, sandblasting, or wire brush scrubbing as necessary, and shall be wetted immediately prior to concrete placement. Earth surfaces shall be firm and damp. Concrete must not be placed on mud, dried earth, noncompacted fill, or frozen subgrade. Ice, snow, and frost shall be removed, and the temperature of all surfaces, including reinforcing steel and other metal to be in contact with the new concrete shall be between 40°F and 90°F.

Items to be embedded in the concrete shall be positioned accurately and anchored firmly.

Weep holes in walls or slabs shall be formed with nonferrous material.

9. Conveying

Concrete shall be delivered to the site and discharged completely into the forms within one and one-half hours, after introduction of cement to the mix. In hot or very dry weather, or under conditions contributing to quick stiffening of the concrete, the time between introduction of the cement to the mix and discharge shall not exceed 45 minutes. An appropriate time extension may be allowed when the setting time of the concrete is increased by an approved admixture.

Concrete must be conveyed from the mixer to the forms as rapidly as practicable by methods that prevent segregation of aggregates or loss of mortar. Concrete must not be dropped more than five feet vertically, except where suitable equipment is used to prevent segregation.

10. Placing

The NRCS inspector shall be notified of the time when concrete will be placed and given adequate time to inspect and approve reinforcing steel, forms, subgrade, vibrating equipment, and preparation for placement, finishing, and curing. Concrete shall not be placed until the equipment, subgrade, forms, steel reinforcement, and other embedments have been inspected and approved.

For walls and columns, subsequent higher placements of concrete shall not be placed until concrete below has gained sufficient strength to support dead and superimposed loads without distress.

All equipment and materials required for concrete finishing and curing must be available at the construction site prior to concrete placement.

Concrete shall be deposited as closely as possible to its final position in the forms. The concrete shall be worked into the corners and angles of the forms and around all reinforcement and embedded items to prevent segregation of aggregates or laitance. Deposition of concrete shall be regulated so that the concrete can be consolidated with a minimum of lateral movement. Concrete placed against a sloping surface shall start at the lowest elevation and work upwards to the highest elevation.

11. Layers

Slab concrete shall be placed to design thickness in one continuous layer unless otherwise specified. Formed concrete shall be placed in horizontal layers not more than 20 inches deep.

Successive layers of fresh concrete between construction joints shall be placed at a rate fast enough that the preceding layer is still plastic and can be easily mixed with the fresh concrete, preventing seams (cold joints) or planes of weakness. Where a successive layer cannot be placed in a timely manner, a standard type construction joint shall be constructed between layers, and unfinished ends of partial layers shall be formed by a vertical bulkhead.

12. Consolidating

Each layer of concrete must be completely consolidated by spading, hand tamping, and/or mechanical vibration. Vibration shall compact the concrete and bring it into intimate contact with the forms, reinforcing steel, and other embedded items while removing voids and pockets of trapped air. Applied vibration shall extend into previously placed layers of fresh concrete at all points to insure effective bond between layers.

The vibration process must not cause segregation of the mortar and aggregate or cause water or cement to flush to the surface. Vibrators may not be used to transport concrete in the forms or conveying equipment and shall not be applied directly to the reinforcing steel, forms, or hardened concrete.

13. Construction Joints

Construction joints shall be made at locations shown on the drawings except as approved by the NRCS inspector.

Where a feather edge would be produced at a construction joint (as in the top surface of a sloping wall), an insert form shall be used so that the resulting edge thickness on either side of the joint is not less than six inches.

Nonvertical construction joints in structural elements, such as walls and columns, shall be consolidated and screeded to grade unless otherwise specified. Unless otherwise specified, construction joints shall be covered and wet cured for seven days or until concrete placement is resumed.

Steel tying, form construction, and concrete placement next to in-place concrete shall not be started until the hardened concrete has cured at least 12 hours. Before new concrete is deposited on or against hardened concrete, the forms shall be retightened.

The surface of construction joints shall be cleaned of all unsatisfactory concrete, laitance, coatings, stains, or debris by washing and scrubbing with a wire brush or wire broom, or by other means approved by the NRCS inspector. The surfaces shall be kept moist for at least one hour before the new concrete is placed.

14. Expansion and Contraction Joints

Expansion and contraction joints shall be made only at locations shown on the drawings. Exposed concrete edges at expansion and contraction joints shall be carefully tooled or chamfered and the joints shall be free of mortar and concrete.

Preformed expansion joint filler shall be held firmly in the correct position as the concrete is placed and shall be left exposed for its full length with clean and true edges.

15. Water stops

Water stops shall be held firmly in the correct position as the concrete is placed.

16. Removal of Forms

Forms, supports, and protective coverings shall be removed as soon as practical after the concrete has been in place for the times shown in the following table. Removal shall be done so that the concrete surface is not damaged and sudden or excessive stresses are not induced.

Forms shall not be removed before expiration of the following minimum time intervals after concrete placement, exclusive of days when the minimum temperature of the air adjacent to the concrete is below 50°F. The times apply only to normal types of concrete.

<u>Forms</u>	<u>Minimum Time Before Form Removal</u>
Sides of slabs or beams	12 hours
Undersides of slabs or beams designed for significant lateral applied loads	
<10 feet clear span	4 days
10 to 20 feet clear span	7 days
>20 feet clear span	14 days
Undersides of slabs or beams designed only for dead weight upon form removal	
<10 feet clear span	8 days
10 to 20 feet clear span	14 days
>20 feet clear span	28 days
Sides of walls or columns with no significant horizontal loads applied	
<10 feet height above forms	12 hours
10 to 20 feet height above forms	24 hours
>20 feet height above forms	72 hours

17. Finishing Formed Surfaces

Immediately after form removal:

All fins and irregular projections shall be removed from exposed surfaces.

The holes produced by the removal of form ties, cone-bolts, and she-bolts shall be cleaned, wetted, and filled with dry-pack mortar. The mortar shall consist of 1 part Portland cement, 3 parts sand that will pass a #16 sieve, and just enough water to produce a consistency that the filling is at the point of becoming rubbery when the material is solidly packed.

18. Finishing Unformed Surfaces

Unformed surfaces (excluding slip-formed surfaces) exposed in the final work, shall be accurately struck off to grade and then float finished except as otherwise specified. Excessive floating or troweling of surfaces while the concrete is soft is not permitted. Adding dry cement or water to the surface of the screeded concrete to expedite finishing is not allowed.

Exposed concrete edges and joints shall be chamfered or finished with molding tools.

19. Curing

Concrete shall be prevented from drying for at least seven days after placement. Exposed surfaces shall be kept continuously moist for the entire period or until curing compound is applied. Concrete needing repairs must be kept wet and free of curing compound until the repairs are made.

Moisture shall be maintained by sprinkling, flooding, or fog spraying, or by covering with plastic or continuously moistened canvas, cloth, straw, earth, or sand. In place wood forms shall be kept continuously wet.

The application of water or covering shall not erode, mar, or otherwise damage the concrete. Black colored covering must not be used in hot weather.

Curing compound shall be thoroughly mixed before applying and shall be agitated during application. Curing compound shall be applied at a uniform rate of not less than 1 gallon per 175 square feet of surface. The applied compound must form a uniform, continuous, adherent film that does not check, crack, or peel. Surfaces that are damaged during the curing period shall be recoated in the same manner as the original application.

Curing compound must not be applied to surfaces requiring bond with concrete remaining to be placed, or with construction joints, reinforcing steel, or other embedded items.

20. Concrete Repair or Replacement

The contractor shall repair or replace concrete that does not meet requirements of this specification.

Prior to starting repair work, the Natural Resources Conservation Service (NRCS) inspector's approval of the repair plan shall be obtained.

When proprietary patching material is proposed in the plan, the manufacturer's data sheets and written recommendations shall be included in the plan. Proprietary patching material shall be appropriate for the type of repair, used within the manufacturer's recommended limits, and applied according to the manufacturer's recommendations.

21. Cold Weather Concrete Placement

Concrete shall not be placed when the daily minimum air temperature is less than 40°F unless facilities are provided to prevent freezing the concrete during the first 24 hours after placement.

Calcium chloride, Sodium chloride (salt), and other corrosive accelerators shall not be used.

22. Hot Weather Concrete Placement

The temperature of concrete must be maintained below 90°F during mixing, conveying, and placing. During hot, sunny, dry, low humidity, and/or windy conditions, exposed fresh concrete surfaces that tend to set too rapidly shall be continuously moistened using fog sprays or other means to maintain adequate moisture during the time between placement and finishing. Water shall not be sprinkled or added directly to the surface of the concrete before finishing.

After initial set, the concrete shall be kept continuously wet until completion of the curing period or application of curing compound. In hot weather, curing compound used shall have white pigment.

CONSTRUCTION SPECIFICATION

SD-13 STEEL REINFORCEMENT

1. Scope

The work shall consist of furnishing and placing steel reinforcement for reinforced concrete or pneumatically applied mortar.

2. Materials

Steel reinforcement shall be free of flaky rust, oil, grease, paint, mill scale, or other deleterious matter.

Steel bar reinforcement (except as otherwise specified) shall be grade 40, 50, or 60 deformed bars conforming to one of the following specifications.

- a. Deformed and Plain Billet-steel Bars for Concrete Reinforcement ASTM A615
- b. Rail-steel Deformed and Plain Bars for Concrete Reinforcement ASTM A616 with S1 Supplement Requirements
- c. Axle-steel Deformed and Plain Bars for Concrete Reinforcement ASTM A617

Dowels shall be plain round bars conforming to the above specifications.

Fabricated deformed steel bar mats for concrete reinforcement shall meet ASTM A184.

Plain steel welded wire fabric for concrete reinforcement shall meet ASTM A185.

Deformed steel welded wire fabric for concrete reinforcement shall meet ASTM A497.

Epoxy-coated steel bars for concrete reinforcement shall meet ASTM A775.

3. Cutting and Bending

Reinforcing bars may be shop or field cut and/or bent. All bends must be made without heating or otherwise weakening the bar. Shop bends must meet American Concrete Institute Standard 315. Bars with kinks, cracks, or improper bends will be rejected.

4. Splicing Bar Reinforcement

Except as otherwise specified, splices of reinforcing bars shall provide an overlap of at least 30 times the smaller bar diameter, but not less than 12 inches.

5. Splicing Welded Wire Fabric

Welded wire fabric shall be overlapped one full mesh (rectangle) plus two inches not counting cut portions.

6. Placing

Reinforcing shall be accurately placed and secured in position to prevent its displacement during concrete placement. Tack welding of bars is not permitted. Dimensions shown on the plans indicating concrete cover are the clear distances from the concrete surface to the reinforcing steel.

Metal hangers, spacers, and ties shall be placed in a manner that they are not exposed in the finished concrete surface. The legs of metal chairs or side form spacers that may be exposed on any surface of slabs, walls, beams, or other concrete surfaces shall have a protective coating or finish that will not corrode at the concrete surface. The coating or finish can be hot dip galvanizing, epoxy coating, plastic coating, or stainless steel. Precast concrete chairs shall be clean and moist at the time of concrete placement.

High density or structural plastic rebar accessories designed to ensure maximum concrete bond may be substituted for metal or concrete accessories in spacer applications. Exposure of plastic rebar accessories at the finished concrete surface shall be kept to a minimum. Plastic rebar accessories, when used, shall be staggered along adjacent parallel bars and shall be placed at intervals no closer than 12 inches. Plastic rebar accessories shall not be used in concrete sections 6 inches or less in thickness.

On structures exceeding four cubic yard of concrete, concrete shall not be placed until the reinforcement has been inspected and approved by the Natural Resources Conservation Service (NRCS) inspector. For any size pour, inspection of reinforcement embedded in concrete may be performed by the NRCS inspector using radar or other inspection instruments.

CONSTRUCTION SPECIFICATION

SD-14 WOOD AND STEEL STRUCTURES

1. Scope

The work shall consist of furnishing and constructing wood and/or steel structures.

2. Materials

Plywood. Plywood and Oriented Strand Board (OSB) 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.

Structural poles, posts, and lumber. All wood material shall be sound, new 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 poles, posts, and all nominal lumber sizes 2X10 or larger shall be pressure treated by one of the following preservatives:

Creosote

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.

Hardware. Bolts, rods, nuts, washers, and other hardware shall be an appropriate grade of steel and shall be galvanized except as shown otherwise on the drawings.

Structural Steel. Except as shown on the drawings, steel shall be malleable, weldable, carbon steel.

Galvanizing of Steel. Except as otherwise specified, items shown on the drawings to be galvanized, shall be galvanized according to ASTM A123, except 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.

Zinc Painting of Steel - For items specified to be painted with zinc paint, the surfaces shall be cleaned and painted as follows.

Cleaning - Surfaces to be painted must be clean and dry. Remove oil and grease using a solvent. Clean surfaces to be painted using sand blasting, power disk sanding, or wire brushing.

Paint - Apply 2 coats of zinc-rich cold galvanized compound using brush, or aerosol application (example: Rust-Oleum Professional Galvanizing Compound) or zinc dust - zinc oxide primer ASTM D79, D520, or D4146.

3. Installation

Structures shall be installed accurately to the dimensions shown on the drawings.

Nails and spikes shall be driven in wood 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.

Steel welds shall be heavy duty with obvious strength equal to the strength of the structural steel.

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

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

Spring prior to 5/15 – Cool-season species.

Summer 5/15 to 8/1 – Cover crop.

Late Summer 8/1 to 9/1 – Cool-season species.

Fall 9/1 to 11/1 – 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. 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 P₂O₅ 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.).

6. PERMANENT SEEDING

Seed requirements and seeding rates are listed below. Refer to South Dakota NRCS Range Technical Note 4 for more information on recommended varieties and "critical area" seeding rates. Documentation must be provided showing the seed meets current South Dakota laws and regulations. The seed must be planted within 9 months of its latest germination test.

	Grass	Seeding Rate (PLS lbs./Acre)	
		Drilled	Broadcast
☐	Smooth Brome grass ¹	12	16
☐	Western Wheatgrass	5	7
☒	Intermediate Wheatgrass	5	7
☐	Slender Wheatgrass	4	5
☐	Western Wheatgrass (Saline)	15	20
☐	Creeping Foxtail (Wet)	6	7
☐	Other, See Attached Seeding Sheet		

¹ Smooth brome grass is not recommended where the adjacent vegetation is predominantly native, as smooth brome grass is highly invasive.

7. COVER CROPS

If permanent seeding is not completed during the spring or late summer periods, a cover crop meeting the following rates and dates will be planted immediately after construction. The cover crop will be clipped to 8 to 10 inches in height or chemically killed during the boot stage to prevent seed formation. Remove or spread excess residues that would interfere with drilling the perennial species.

Cover crops may be used in all MLRAs at the following rates and seeding dates:

Crop	Seeding Rate	Spring Dates	Fall Dates
Barley	90 – 100 lbs./acre	Apr. 15 – June 1	Aug. 15 – Sept. 1
Oats	60 – 70 lbs./acre	Apr. 15 – June 1	Aug. 15 – Nov. 1
Grain sorghum	25 – 30 lbs./acre	May 15 – Aug. 15	
Millet	45 – 55 lbs./acre	May 15 – Aug. 15	
Sudangrass	25 – 30 lbs./acre	May 15 – Aug. 5	

8. **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.

PLASTIC PIPE (SD-55)

MATERIAL SPECIFICATION

1. Scope

This specification covers the quality of Poly Vinyl Chloride (PVC), Polyethylene (PE), High Density Polyethylene (HDPE), and Acrylonitrile-Butadiene-Styrene (ABS) plastic pipe, fittings, and joint materials.

2. Material

The pipe and fittings shall be free of visible cracks, holes, foreign inclusions, or other defects, and shall have dimensions measured as prescribed in ASTM D2122. Joints and fittings shall be as described in the pipe AWWA or ASTM specification and shall be compatible with and have pressure ratings at least equal to the specified pipe. Rubber gaskets for pipe joints shall conform to ASTM F477 Elastomeric Seals (Gaskets for Joining Plastic Pipe). Except as otherwise specified, pipe must conform to the following specifications.

Poly vinyl chloride (PVC) Pipe

Plastic pipe - Schedule 40, 80, or 120	ASTM D1785 or D2466
Pressure rated pipe - SDR Series	AWWA C900 or ASTM D2241
Plastic drain, waste, and vent pipe and fittings	ASTM D2665
Composite sewer pipe	ASTM D2680
Type PSM PVC sewer pipe and fittings	ASTM F3034
Large-diameter gravity sewer pipe and fittings	ASTM F679
Smooth-wall Underdrain Systems for Highway, Airport, and Similar Drainage	ASTM F758
Type PS-46 gravity flow sewer pipe and fittings	ASTM F789
Profile gravity sewer pipe and fittings based on controlled inside diameter	ASTM F794
Corrugated sewer pipe with a smooth interior and fittings	ASTM F949
Pressure pipe, 4-inch through 12-inch for water distribution	AWWA C900
Water transmission pipe, nominal diameters 14-inch through 36-inch	AWWA C905

Polyethylene (PE) pipe

Schedule 40	ASTM D2104
SDR-PR based on controlled inside diameter	ASTM D2239
Schedules 40 and 80 based on outside diameter	ASTM D2447
SDR-PR based on controlled outside diameter	ASTM D3035

High density polyethylene (HDPE) pipe

Plastic pipe and fittings	ASTM D3350
SDR-PR based on controlled outside diameter	ASTM F714
Plastic moldings and extrusion compounds	ASTM D1248
Heat joining polyolefin pipe and fittings	ASTM D2657

Acrylonitrile-butadiene-styrene (ABS) pipe

Plastic pipe, schedules 40 and 80	ASTM D1527
Plastic pipe, SDR-PR	ASTM D2282
Schedule 40 plastic drain, waste, and vent pipe	ASTM D2661
Composite sewer pipe	ASTM D2680
Sewer pipe and fittings	ASTM 2751

3. Perforations

Except as otherwise specified, perforations of perforated pipe shall meet the following requirements:

- a. Perforations may be circular or slots, but must be free of materials that reduce effective openings.
- b. Circular perforations shall be 3/16 to 5/16 inch diameter holes arranged in rows parallel to the axis of the pipe. Center-to-center perforation spacing along rows shall not exceed 2.5 inches. Perforations may appear at the ends of short and random lengths. Rows shall be arranged in equal groups at equal distance from pipe bottom vertical centerline. Lowermost rows shall be separated by 60 to 125 degrees. Uppermost rows shall be separated by an arc of 166 degrees or less. Other rows shall be uniformly spaced.

- c. Slot perforations shall be located within two rows, with one row in each of the lower quadrants of the pipe. Slots shall be no wider than 1/8 inch and spaced no more than 1.5 inches apart.
- d. Row numbers and minimum openings must be as follows.

Nominal pipe size, inch	Perforations		Minimum opening/foot, square inches
	Minimum number of rows circular	slot	
3 to 4	2	2	0.22
6 to 10	4	2	0.44
12 or larger	6	2	0.66

4. Potable use pipeline

Pipelines specified for use to carry potable water shall meet requirements of the National Sanitation Foundation (NSF).

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 selvaged 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	70 min.	70 min.	70 min.
Apparent opening size (AOS)	150-hr. exposure 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	≥ 50	≥ 50	≥ 50	≥ 50
Puncture, lb.	ASTM D4833	80 min.	60 min.	40 min.	40 min.
Ultraviolet light, % residual tensile strength	ASTM D4355	70 min.	70 min.	70 min.	70 min.
Apparent Opening Size (AOS)	150-hr. exposure 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.

PROCESSING INPUT DATA.

 SITES XEQ 09/02/2021 WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
 VER 2005.1.9 (USER MANUAL - DATED DECEMBER 2005)
 TIME 09:51:53

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

SITES 01/01/2005 Jerde_Dam 3.80625 H5
 SAVMOV 0 101
 SAVMOV 101 1
 STRUCTURE

2877 0.1
 2878 0.2
 2879 0.5
 2880 1.6
 2881 3.3
 2882 7.0
 2883 10.6
 2884 13.2
 2885 15.9
 2886 18.6
 2887 21.9
 2888 26.7
 2889 33.0
 2890 38.0
 2891 41.6
 2892 44.6
 2893 48.1
 2894 51.1
 2895 54.3

ENDTABLE
 WSDATA 5A1 AC 74 2436 26617 7.0
 PDIRECT 2.50 4.00
 POOLDATA ELEV 2892.3 2892.3 2892.3 2886 2886 SC
 PSINLET .7 12.56
 PSDATA 1 120 24 .01 2887
 ASDATA 41 127 125 3 .012 2
 ASINSURF 41 7.6
 ASINLET 41 0.0 0.0 25 0.0 3
 125 1

ENDTABLE
 ASEXSURF 41 5.6
 .5 0
 2
 3 0
 .001

ENDTABLE
 ASEXIT 41 N 500
 BTMWIDTH FEET 130
 GRAPHICS I
 GO, DESIGN HLPO TYPE2 24 TYPE2378 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 09/02/2021 Jerde Dam WSID
VER 2005.1.9 SUBW= A
TIME 09:51:53 SITE = S 1 PASS= 1 PART= 1

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

STORM DISTRIBUTION-PSH 24 HOUR TYPE II RAINFALL DISTRIBUTION

STORM DISTRIBUTION AUX. -24 HOUR TYPE II RAINFALL DISTRIBUTION

PRECIP. - P-PS,1-DAY	P-PS,10-DAY	P-SD	P-FB	
2.50	0.00	0.00	4.00	
WSDATA - CN	DA-SM	TC/L	-/H	QRF
74.00	3.81	26617.00	7.00	0.00
SITEDATA- PERM POOL	CREST PS	FP SED	VALLEY FL	378?
2892.30	2892.30	2892.30	2886.00	YES
BASEFLOW	INITIAL EL	EXTRA VOL	SITE TYPE	
0.00	0.00	0.00	DESIGN	
PSDATA - NO. COND	COND L	DIA/W	-/H	
1.00	120.00	24.00	0.00	
PS N	KE	WEIR L	TW EL	
0.010	0.70	12.56	2887.00	

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
0.00	0.00	0.00	0.00	0.00
AUX.Data - REF.NO.	RETARD. Ci	TIE STATION	INLET LENGTH	
41	0.00	127.00	125	
AUX.Data - INLET Ci	SIDE SLOPE	EXIT Ci	EXIT SLOPE	ACTUAL AUX?
7.600	3.00	5.600	0.012	NO
BTM WIDTH - BW1	BW2	BW3	BW4	BW5
ft 130.00	0.00	0.00	0.00	0.00

AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.

1SITES -----
 XEQ 09/02/2021 Jerde_Dam WSID=
 VER 2005.1.9 SUBW= A
 TIME 09:51:53 SITE = S 1 PASS= 1 PART= 2

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

HYD	PO	3.81							
0	0	0.2090						S 1	2
		0.00	0.00	0.02	0.08	0.24	PO D	3	
		0.56	1.07	1.86	2.94	4.32	PO D	4	
		6.76	9.98	13.38	17.67	22.04	PO D	5	
		26.40	31.06	35.34	39.17	39.53	PO D	6	
		39.72	39.89	40.04	40.17	40.29	PO D	7	
		40.40	40.49	40.58	40.67	40.74	PO D	8	
		40.81	40.87	40.92	40.97	41.02	PO D	9	
		41.06	41.11	41.14	41.18	41.21	PO D	10	
		41.24	41.26	41.29	41.31	41.33	PO D	11	
		41.35	41.37	41.38	41.39	41.40	PO D	12	
		41.41	41.42	41.43	41.43	41.44	PO D	13	
		41.44	41.45	41.45	41.45	41.45	PO D	14	
		41.46	41.46	41.46	41.46	41.45	PO D	15	
		41.45	41.45	41.44	41.43	41.41	PO D	16	
		41.40	41.38	41.35	41.33	41.30	PO D	17	
		41.27	41.24	41.21	41.17	41.13	PO D	18	
		41.10	41.06	41.02	40.98	40.94	PO D	19	
		40.90	40.86	40.82	40.78	40.74	PO D	20	
		40.70	40.66	40.62	40.58	40.53	PO D	21	
		40.49	40.45	40.41	40.36	40.32	PO D	22	
		40.28	40.24	40.20	40.15	40.11	PO D	23	
		40.07	40.02	39.98	39.93	39.88	PO D	24	
		39.84	39.79	39.75	39.70	39.65	PO D	25	
		39.61	39.56	39.51	39.47	39.42	PO D	26	
		39.38	39.23	38.47	37.73	37.01	PO D	27	
		36.29	35.60	34.91	34.24	33.58	PO D	28	
		32.93	32.30	31.67	31.06	30.47	PO D	29	
		29.88	29.30	28.74	28.19	27.64	PO D	30	
		27.11	26.59	26.08	25.57	25.15	PO D	31	
		24.73	24.32	23.92	23.52	23.13	PO D	32	
		22.75	22.37	22.00	21.64	21.28	PO D	33	
		20.93	20.58	20.24	19.91	19.58	PO D	34	
		19.25	18.93	18.62	18.31	18.01	PO D	35	
		17.71	17.42	17.13	16.84	16.57	PO D	36	
		16.29	16.02	15.76	15.50	15.24	PO D	37	
		14.99	14.74	14.49	14.25	14.02	PO D	38	
		13.81	13.63	13.45	13.28	13.10	PO D	39	
		12.93	12.77	12.60	12.43	12.27	PO D	40	
		12.11	11.95	11.80	11.64	11.49	PO D	41	
		11.34	11.19	11.05	10.90	10.76	PO D	42	
		10.62	10.48	10.35	10.21	10.08	PO D	43	
		9.95	9.82	9.69	9.56	9.44	PO D	44	
		9.31	9.19	9.07	8.95	8.84	PO D	45	
		8.72	8.61	8.50	8.38	8.28	PO D	46	
		8.17	8.06	7.96	7.85	7.75	PO D	47	

7.65	7.55	7.45	7.35	7.26	PO D 48
7.16	7.07	6.98	6.89	6.80	PO D 49
6.71	6.62	6.53	6.45	6.36	PO D 50
6.28	6.20	6.12	6.04	5.96	PO D 51
5.88	5.80	5.73	5.65	5.58	PO D 52
5.51	5.44	5.36	5.29	5.23	PO D 53
5.16	5.09	5.02	4.96	4.90	PO D 54
4.87	4.83	4.80	4.76	4.73	PO D 55
4.69	4.66	4.62	4.59	4.56	PO D 56
4.52	4.49	4.46	4.43	4.39	PO D 57
4.36	4.33	4.30	4.27	4.24	PO D 58
4.21	4.17	4.14	4.11	4.08	PO D 59
4.05	4.02	4.00	3.97	3.94	PO D 60
3.91	3.88	3.85	3.82	3.80	PO D 61
3.77	3.74	3.71	3.69	3.66	PO D 62
3.63	3.61	3.58	3.55	3.53	PO D 63
3.50	3.48	3.45	3.43	3.40	PO D 64
3.38	3.35	3.33	3.30	3.28	PO D 65
3.25	3.23	3.21	3.18	3.16	PO D 66
3.14	3.11	3.09	3.07	3.05	PO D 67
3.02	3.00	2.98	2.96	2.94	PO D 68
2.92	2.89	2.87	2.85	2.83	PO D 69
2.81	2.79	2.77	2.75	2.73	PO D 70
2.71	2.69	2.67	2.65	2.63	PO D 71
2.61	2.59	2.57	2.56	2.54	PO D 72
2.52	2.50	2.48	2.46	2.45	PO D 73
2.43	2.41	2.39	2.38	2.36	PO D 74
2.34	2.32	2.31	2.29	2.27	PO D 75
2.26	2.24	2.22	2.21	2.19	PO D 76
2.18	2.16	2.14	2.13	2.11	PO D 77
2.10	2.08	2.07	2.05	2.04	PO D 78
2.02	2.01	1.99	1.98	1.96	PO D 79
1.95	1.94	1.92	1.91	1.89	PO D 80
1.88	1.87	1.85	1.84	1.83	PO D 81
1.81	1.80	1.79	1.77	1.76	PO D 82
1.75	1.73	1.72	1.71	1.70	PO D 83
1.68	1.67	1.66	1.65	1.64	PO D 84
1.62	1.61	1.60	1.59	1.58	PO D 85
1.57	1.55	1.54	1.53	1.52	PO D 86
1.51	1.50	1.49	1.48	1.47	PO D 87
1.45	1.44	1.43	1.42	1.41	PO D 88
1.40	1.39	1.38	1.37	1.36	PO D 89
1.35	1.34	1.33	1.32	1.31	PO D 90
1.30	1.29	1.28	1.28	1.27	PO D 91
1.26	1.25	1.24	1.23	1.22	PO D 92
1.21	1.20	1.19	1.19	1.18	PO D 93
1.17	1.16	1.15	1.14	1.13	PO D 94
1.13	1.12	1.11	1.10	1.09	PO D 95
1.09	1.08	1.07	1.06	1.05	PO D 96
1.05	1.04	1.03	1.02	1.02	PO D 97
1.01	1.00	0.99	0.99	0.98	PO D 98
0.97	0.97	0.96	0.95	0.94	PO D 99
0.94	0.93	0.92	0.92	0.91	PO D100
0.90	0.90	0.89	0.88	0.88	PO D101
0.87	0.87	0.86	0.85	0.85	PO D102
0.84	0.83	0.83	0.82	0.82	PO D103
0.81	0.80	0.80	0.79	0.79	PO D104

0.78	0.78	0.77	0.76	0.76	PO D105
0.75	0.75	0.74	0.74	0.73	PO D106
0.73	0.72	0.72	0.71	0.70	PO D107
0.70	0.69	0.69	0.68	0.68	PO D108
0.67	0.67	0.66	0.66	0.66	PO D109
0.65	0.65	0.64	0.64	0.63	PO D110
0.63	0.62	0.62	0.61	0.61	PO D111
0.60	0.60	0.60	0.59	0.59	PO D112
0.58	0.58	0.57	0.57	0.57	PO D113
0.56	0.56	0.55	0.55	0.55	PO D114
0.54	0.54	0.53	0.53	0.53	PO D115
0.52	0.52	0.51	0.51	0.51	PO D116
0.50	0.50	0.00	0.00	0.00	PO D117

ENDTABLE

P 1, T 1118

1SITES

XEQ 09/02/2021
VER 2005.1.9
TIME 09:51:53

Jerde_Dam

WSID=
SUBW= A
PART= 3

SITE = S 1 PASS= 1

PERM POOL	2892.30 FT	268.0 ACFT	45.65 AC	0.0 CFS
CREST PS	2892.30 FT	268.0 ACFT	45.65 AC	0.0 CFS
SED ACCUM	2892.30 FT	268.0 ACFT	45.65 AC	0.0 CFS
START ELEV	2892.30 FT	268.0 ACFT	45.65 AC	0.0 CFS
NRCS-PSH	D= 24.00 HR	P= 2.50 IN	Q= 0.61 IN	DA= 3.81 SM
	TC= 3.30 HR	CN= 74.00	VOL= 123.5 ACFT	

PEAK = 283.2 CFS, AT 2.7 HRS.

ROUTED RESULT - HYD TYPE	EMAX	VOL-MAX	AMAX	QMAX
NRCS-PSH	2893.99 FT	349.8 ACFT	51.06 AC	41.5 CFS

PS STORAGE 81.8 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

DRAWDOWN (DDT) TEST 2892.30 FT 268.0 ACFT 0.00 CFS
CONTROL IS 0.000 DETENTION STORAGE

TIME LIMIT REACHED = 10.00 DAYS. FLOW WAS 0.05 CFS, ELEV = 2892.30

PLOT OF PRINCIPAL SPILLWAY HYDROGRAPH, 1 INCH= 50. CFS

Time	Qin	Qout	Elev	Vol	Area	ExtVel	I	50.	100.	150.
Time	Qin	Qout	Elev	Vol	Area	ExtVel	I	I	I	I
Time	Qin	Qout	Elev	Vol	Area	ExtVel	I	I	I	I
							0.	50.	100.	150.

END NRCS-PSH PLOT

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

AUX. RATING USED WSPVRT METHOD.

RATING TABLE NUMBER 1

	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	2892.30	0.00	0.00	0.00	267.99	45.65
2	2892.55	4.92	4.92	0.00	279.59	46.53
3	2892.80	13.91	13.91	0.00	291.41	47.41
4	2893.06	25.55	25.55	0.00	303.46	48.27
FULL CONDUIT FLOW, ELEV = 2893.31 FT						
5	2893.31	39.34	39.34	0.00	315.70	49.02
6	2893.52	40.04	40.04	0.00	326.15	49.66
7	2893.73	40.69	40.69	0.00	336.72	50.29
8	2893.94	41.32	41.32	0.00	347.44	50.93
9	2894.15	41.95	41.95	0.00	358.28	51.59
10	2894.37	42.56	42.56	0.00	369.28	52.27
11	2894.58	43.17	43.17	0.00	380.41	52.95
12	2894.79	43.77	43.77	0.00	391.69	53.62
13	2895.00	44.36	44.36	0.00	403.11	54.30

1SITES

XEQ 09/02/2021 Jerde_Dam WSID=
VER 2005.1.9 SUBW= A
TIME 09:51:53 SITE = S 1 PASS= 1 PART= 4

AUX. CREST 2893.99 FT 349.8 ACFT 51.06 AC 41.5 CFS

PS STORAGE 81.8 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

START ELEV 2892.30 FT 268.1 ACFT 45.66 AC 0.0 CFS

EFFECTIVE HEIGHT(H)= 8.0 FEET, PRODUCT= 2794. (H * STORAGE AT CREST AUX.).

INPUT DESIGN CLASS = A1 = LT 3000. PRODUCT.

NRCS-FBH D= 24.00 HR P= 4.00 IN Q= 1.60 IN DA= 3.81 SM
TC= 3.30 HR CN= 74.00 VOL= 324.0 ACFT

PEAK = 832.3 CFS, AT 4.2 HRS.

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

RATING TABLE NUMBER 2

	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	2892.30	0.00	0.00	0.00	267.99	45.65
2	2892.55	4.92	4.92	0.00	279.59	46.53
3	2892.80	13.91	13.91	0.00	291.41	47.41
4	2893.06	25.55	25.55	0.00	303.46	48.27

FULL CONDUIT FLOW, ELEV = 2893.31 FT .

5	2893.31	39.34	39.34	0.00	315.70	49.02
6	2893.39	39.65	39.65	0.00	319.89	49.28
7	2893.48	39.91	39.91	0.00	324.09	49.53
8	2893.56	40.18	40.18	0.00	328.31	49.79
9	2893.65	40.43	40.43	0.00	332.55	50.04
10	2893.73	40.69	40.69	0.00	336.81	50.30
11	2893.82	40.95	40.95	0.00	341.09	50.55
12	2893.90	41.20	41.20	0.00	345.40	50.81
13	2893.99	41.46	41.46	0.00	349.73	51.06
14	2894.04	43.20	41.61	1.59	352.35	51.22
15	2894.09	44.95	41.76	3.20	354.95	51.38
16	2894.18	48.09	42.02	6.07	359.65	51.68
17	2894.29	51.93	42.35	9.58	365.42	52.03
18	2894.49	58.90	42.93	15.97	376.02	52.68
19	2894.75	67.54	43.65	23.89	389.46	53.49
20	2895.00	82.90	44.36	38.54	403.10	54.30

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	2.	102.	-1.0	7.6	**	**	**	INLET
2	102.	127.	0.0	7.6	**	**	**	CREST
3	127.	627.	1.2	5.6	0.50	2	3.000	EXIT !

* 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.

HYD	FO	3.81						1
	0	0.2090						2
		0.05	0.05	0.05	0.05	0.05	FO D	3
		0.06	0.07	0.09	0.14	0.22	FO D	4
		0.42	0.88	1.74	3.14	5.53	FO D	5
		10.85	18.78	29.82	39.61	40.42	FO D	6
		41.23	47.91	56.60	64.67	75.51	FO D	7
		87.16	97.30	106.28	114.11	120.96	FO D	8
		126.98	132.25	136.85	140.83	144.27	FO D	9
		147.23	149.76	151.90	153.70	155.19	FO D	10
		156.40	157.38	158.14	158.71	159.11	FO D	11
		159.36	159.47	159.46	159.33	159.10	FO D	12
		158.77	158.35	157.85	157.27	156.62	FO D	13
		155.91	155.14	154.31	153.43	152.50	FO D	14
		151.54	150.56	149.55	148.54	147.51	FO D	15
		146.47	145.43	144.38	143.33	142.28	FO D	16
		141.22	140.14	139.04	137.88	136.66	FO D	17
		135.36	133.97	132.49	130.91	129.24	FO D	18
		127.48	125.66	123.77	121.84	119.88	FO D	19
		117.89	115.89	113.90	111.90	109.91	FO D	20

107.94	105.98	104.04	102.13	100.23	FO D 21
98.36	96.52	94.71	92.92	91.16	FO D 22
89.43	87.74	86.06	84.42	82.81	FO D 23
81.22	79.66	78.14	76.64	75.17	FO D 24
73.72	72.31	70.92	69.55	68.21	FO D 25
67.17	66.43	65.70	64.97	64.26	FO D 26
63.55	62.84	62.15	61.46	60.79	FO D 27
60.11	59.45	58.79	58.13	57.47	FO D 28
56.82	56.18	55.54	54.92	54.30	FO D 29
53.68	53.08	52.48	51.88	51.29	FO D 30
50.71	50.13	49.55	48.99	48.43	FO D 31
47.87	47.32	46.78	46.24	45.71	FO D 32
45.19	44.67	44.15	43.64	43.14	FO D 33
42.64	42.16	41.67	41.43	41.39	FO D 34
41.35	41.31	41.27	41.22	41.18	FO D 35
41.14	41.10	41.06	41.01	40.97	FO D 36
40.93	40.89	40.85	40.80	40.76	FO D 37
40.72	40.68	40.64	40.59	40.55	FO D 38
40.51	40.47	40.42	40.38	40.34	FO D 39
40.30	40.25	40.21	40.17	40.13	FO D 40
40.08	40.04	40.00	39.95	39.91	FO D 41
39.87	39.83	39.78	39.74	39.70	FO D 42
39.65	39.60	39.55	39.50	39.45	FO D 43
39.40	39.35	38.72	37.97	37.24	FO D 44
36.52	35.82	35.13	34.45	33.79	FO D 45
33.14	32.50	31.87	31.26	30.66	FO D 46
30.07	29.49	28.92	28.36	27.82	FO D 47
27.28	26.76	26.24	25.74	25.28	FO D 48
24.86	24.45	24.05	23.65	23.26	FO D 49
22.87	22.49	22.12	21.76	21.40	FO D 50
21.04	20.69	20.35	20.01	19.68	FO D 51
19.36	19.04	18.72	18.41	18.11	FO D 52
17.81	17.51	17.22	16.94	16.66	FO D 53
16.38	16.11	15.84	15.58	15.32	FO D 54
15.07	14.82	14.57	14.33	14.09	FO D 55
13.87	13.69	13.51	13.33	13.16	FO D 56
12.99	12.82	12.65	12.49	12.32	FO D 57
12.16	12.00	11.85	11.69	11.54	FO D 58
11.39	11.24	11.09	10.95	10.81	FO D 59
10.67	10.53	10.39	10.25	10.12	FO D 60
9.99	9.86	9.73	9.60	9.48	FO D 61
9.35	9.23	9.11	8.99	8.87	FO D 62
8.76	8.64	8.53	8.42	8.31	FO D 63
8.20	8.10	7.99	7.89	7.78	FO D 64
7.68	7.58	7.48	7.38	7.29	FO D 65
7.19	7.10	7.01	6.91	6.82	FO D 66
6.74	6.65	6.56	6.48	6.39	FO D 67
6.31	6.23	6.14	6.06	5.98	FO D 68
5.91	5.83	5.75	5.68	5.60	FO D 69
5.53	5.46	5.39	5.32	5.25	FO D 70
5.18	5.11	5.05	4.98	4.92	FO D 71
4.88	4.84	4.81	4.77	4.74	FO D 72
4.70	4.67	4.64	4.60	4.57	FO D 73
4.54	4.50	4.47	4.44	4.40	FO D 74
4.37	4.34	4.31	4.28	4.25	FO D 75
4.22	4.18	4.15	4.12	4.09	FO D 76
4.06	4.03	4.00	3.98	3.95	FO D 77

3.92	3.89	3.86	3.83	3.80	FO D 78
3.78	3.75	3.72	3.69	3.67	FO D 79
3.64	3.61	3.59	3.56	3.54	FO D 80
3.51	3.48	3.46	3.43	3.41	FO D 81
3.38	3.36	3.33	3.31	3.29	FO D 82
3.26	3.24	3.21	3.19	3.17	FO D 83
3.15	3.12	3.10	3.08	3.05	FO D 84
3.03	3.01	2.99	2.97	2.94	FO D 85
2.92	2.90	2.88	2.86	2.84	FO D 86
2.82	2.80	2.78	2.76	2.74	FO D 87
2.72	2.70	2.68	2.66	2.64	FO D 88
2.62	2.60	2.58	2.56	2.54	FO D 89
2.52	2.51	2.49	2.47	2.45	FO D 90
2.43	2.42	2.40	2.38	2.36	FO D 91
2.35	2.33	2.31	2.30	2.28	FO D 92
2.26	2.25	2.23	2.21	2.20	FO D 93
2.18	2.17	2.15	2.13	2.12	FO D 94
2.10	2.09	2.07	2.06	2.04	FO D 95
2.03	2.01	2.00	1.98	1.97	FO D 96
1.95	1.94	1.93	1.91	1.90	FO D 97
1.88	1.87	1.86	1.84	1.83	FO D 98
1.82	1.80	1.79	1.78	1.76	FO D 99
1.75	1.74	1.73	1.71	1.70	FO D100
1.69	1.68	1.66	1.65	1.64	FO D101
1.63	1.62	1.60	1.59	1.58	FO D102
1.57	1.56	1.55	1.53	1.52	FO D103
1.51	1.50	1.49	1.48	1.47	FO D104
1.46	1.45	1.44	1.43	1.42	FO D105
1.41	1.40	1.39	1.38	1.37	FO D106
1.36	1.35	1.34	1.33	1.32	FO D107
1.31	1.30	1.29	1.28	1.27	FO D108
1.26	1.25	1.24	1.23	1.22	FO D109
1.21	1.21	1.20	1.19	1.18	FO D110
1.17	1.16	1.15	1.15	1.14	FO D111
1.13	1.12	1.11	1.10	1.10	FO D112
1.09	1.08	1.07	1.06	1.06	FO D113
1.05	1.04	1.03	1.03	1.02	FO D114
1.01	1.00	1.00	0.99	0.98	FO D115
0.97	0.97	0.96	0.95	0.95	FO D116
0.94	0.93	0.93	0.92	0.91	FO D117
0.91	0.90	0.89	0.89	0.88	FO D118
0.87	0.87	0.86	0.85	0.85	FO D119
0.84	0.84	0.83	0.82	0.82	FO D120
0.81	0.81	0.80	0.79	0.79	FO D121
0.78	0.78	0.77	0.77	0.76	FO D122
0.75	0.75	0.74	0.74	0.73	FO D123
0.73	0.72	0.72	0.71	0.71	FO D124
0.70	0.70	0.69	0.69	0.68	FO D125
0.68	0.67	0.67	0.66	0.66	FO D126
0.65	0.65	0.64	0.64	0.63	FO D127
0.63	0.62	0.62	0.61	0.61	FO D128
0.61	0.60	0.60	0.59	0.59	FO D129
0.58	0.58	0.58	0.57	0.57	FO D130
0.56	0.56	0.55	0.55	0.55	FO D131
0.54	0.54	0.53	0.53	0.53	FO D132
0.52	0.52	0.52	0.51	0.51	FO D133
0.50	0.50	0.50	0.00	0.00	FO D134

ENDTABLE

P 1,T 2135

1SITES -----
 XEQ 09/02/2021 Jerde_Dam WSID=
 VER 2005.1.9 SUBW= A
 TIME 09:51:53 SITE = S 1 PASS= 1 PART= 5

DRAWDOWN USING FREEBOARD STORM FOLLOWS, STARTING AT ELEVATION 2893.99 FT.

DRAWDOWN (DDT) TEST 2892.30 FT 268.0 ACFT 0.00 CFS
 CONTROL IS 0.000 DETENTION STORAGE

TIME LIMIT REACHED = 10.00 DAYS. FLOW WAS 0.05 CFS, ELEV = 2892.30

HYD	FO	3.81							
0	0.2090								
	0.05	0.05	0.05	0.05	0.05	0.05	FO D	3	
	0.06	0.07	0.09	0.14	0.22	FO D	4		
	0.42	0.88	1.74	3.14	5.53	FO D	5		
	10.85	18.78	29.82	39.61	40.42	FO D	6		
	41.23	47.91	56.60	64.67	75.51	FO D	7		
	87.16	97.36	106.28	114.11	120.96	FO D	8		
	126.98	132.25	136.85	140.83	144.27	FO D	9		
	147.23	149.76	151.90	153.70	155.19	FO D	10		
	156.40	157.38	158.14	158.71	159.11	FO D	11		
	159.36	159.47	159.46	159.33	159.10	FO D	12		
	158.77	158.35	157.85	157.27	156.62	FO D	13		
	155.91	155.14	154.31	153.43	152.50	FO D	14		
	151.54	150.56	149.55	148.54	147.51	FO D	15		
	146.47	145.43	144.38	143.33	142.28	FO D	16		
	141.22	140.14	139.04	137.88	136.66	FO D	17		
	135.36	133.97	132.49	130.91	129.24	FO D	18		
	127.48	125.66	123.77	121.84	119.88	FO D	19		
	117.89	115.89	113.90	111.90	109.91	FO D	20		
	107.94	105.98	104.04	102.13	100.23	FO D	21		
	98.36	96.52	94.71	92.92	91.16	FO D	22		
	89.43	87.74	86.06	84.42	82.81	FO D	23		
	81.22	79.66	78.14	76.64	75.17	FO D	24		
	73.72	72.31	70.92	69.55	68.21	FO D	25		
	67.17	66.43	65.70	64.97	64.26	FO D	26		
	63.55	62.84	62.15	61.46	60.79	FO D	27		
	60.11	59.45	58.79	58.13	57.47	FO D	28		
	56.82	56.18	55.54	54.92	54.30	FO D	29		
	53.68	53.08	52.48	51.88	51.29	FO D	30		
	50.71	50.13	49.55	48.99	48.43	FO D	31		
	47.87	47.32	46.78	46.24	45.71	FO D	32		
	45.19	44.67	44.15	43.64	43.14	FO D	33		
	42.64	42.16	41.67	41.43	41.39	FO D	34		
	41.35	41.31	41.27	41.22	41.18	FO D	35		
	41.14	41.10	41.06	41.01	40.97	FO D	36		
	40.93	40.89	40.85	40.80	40.76	FO D	37		
	40.72	40.68	40.64	40.59	40.55	FO D	38		
	40.51	40.47	40.42	40.38	40.34	FO D	39		
	40.30	40.25	40.21	40.17	40.13	FO D	40		
	40.08	40.04	40.00	39.95	39.91	FO D	41		

39.87	39.83	39.78	39.74	39.70	FO D 42
39.65	39.60	39.55	39.50	39.45	FO D 43
39.40	39.35	38.72	37.97	37.24	FO D 44
36.52	35.82	35.13	34.45	33.79	FO D 45
33.14	32.50	31.87	31.26	30.66	FO D 46
30.07	29.49	28.92	28.36	27.82	FO D 47
27.28	26.76	26.24	25.74	25.28	FO D 48
24.86	24.45	24.05	23.65	23.26	FO D 49
22.87	22.49	22.12	21.76	21.40	FO D 50
21.04	20.69	20.35	20.01	19.68	FO D 51
19.36	19.04	18.72	18.41	18.11	FO D 52
17.81	17.51	17.22	16.94	16.66	FO D 53
16.38	16.11	15.84	15.58	15.32	FO D 54
15.07	14.82	14.57	14.33	14.09	FO D 55
13.87	13.69	13.51	13.33	13.16	FO D 56
12.99	12.82	12.65	12.49	12.32	FO D 57
12.16	12.00	11.85	11.69	11.54	FO D 58
11.39	11.24	11.09	10.95	10.81	FO D 59
10.67	10.53	10.39	10.25	10.12	FO D 60
9.99	9.86	9.73	9.60	9.48	FO D 61
9.35	9.23	9.11	8.99	8.87	FO D 62
8.76	8.64	8.53	8.42	8.31	FO D 63
8.20	8.10	7.99	7.89	7.78	FO D 64
7.68	7.58	7.48	7.38	7.29	FO D 65
7.19	7.10	7.01	6.91	6.82	FO D 66
6.74	6.65	6.56	6.48	6.39	FO D 67
6.31	6.23	6.14	6.06	5.98	FO D 68
5.91	5.83	5.75	5.68	5.60	FO D 69
5.53	5.46	5.39	5.32	5.25	FO D 70
5.18	5.11	5.05	4.98	4.92	FO D 71
4.88	4.84	4.81	4.77	4.74	FO D 72
4.70	4.67	4.64	4.60	4.57	FO D 73
4.54	4.50	4.47	4.44	4.40	FO D 74
4.37	4.34	4.31	4.28	4.25	FO D 75
4.22	4.18	4.15	4.12	4.09	FO D 76
4.06	4.03	4.00	3.98	3.95	FO D 77
3.92	3.89	3.86	3.83	3.80	FO D 78
3.78	3.75	3.72	3.69	3.67	FO D 79
3.64	3.61	3.59	3.56	3.54	FO D 80
3.51	3.48	3.46	3.43	3.41	FO D 81
3.38	3.36	3.33	3.31	3.29	FO D 82
3.26	3.24	3.21	3.19	3.17	FO D 83
3.15	3.12	3.10	3.08	3.05	FO D 84
3.03	3.01	2.99	2.97	2.94	FO D 85
2.92	2.90	2.88	2.86	2.84	FO D 86
2.82	2.80	2.78	2.76	2.74	FO D 87
2.72	2.70	2.68	2.66	2.64	FO D 88
2.62	2.60	2.58	2.56	2.54	FO D 89
2.52	2.51	2.49	2.47	2.45	FO D 90
2.43	2.42	2.40	2.38	2.36	FO D 91
2.35	2.33	2.31	2.30	2.28	FO D 92
2.26	2.25	2.23	2.21	2.20	FO D 93
2.18	2.17	2.15	2.13	2.12	FO D 94
2.10	2.09	2.07	2.06	2.04	FO D 95
2.03	2.01	2.00	1.98	1.97	FO D 96
1.95	1.94	1.93	1.91	1.90	FO D 97
1.88	1.87	1.86	1.84	1.83	FO D 98

1.82	1.80	1.79	1.78	1.76	FO D 99
1.75	1.74	1.73	1.71	1.70	FO D100
1.69	1.68	1.66	1.65	1.64	FO D101
1.63	1.62	1.60	1.59	1.58	FO D102
1.57	1.56	1.55	1.53	1.52	FO D103
1.51	1.50	1.49	1.48	1.47	FO D104
1.46	1.45	1.44	1.43	1.42	FO D105
1.41	1.40	1.39	1.38	1.37	FO D106
1.36	1.35	1.34	1.33	1.32	FO D107
1.31	1.30	1.29	1.28	1.27	FO D108
1.26	1.25	1.24	1.23	1.22	FO D109
1.21	1.21	1.20	1.19	1.18	FO D110
1.17	1.16	1.15	1.15	1.14	FO D111
1.13	1.12	1.11	1.10	1.10	FO D112
1.09	1.08	1.07	1.06	1.06	FO D113
1.05	1.04	1.03	1.03	1.02	FO D114
1.01	1.00	1.00	0.99	0.98	FO D115
0.97	0.97	0.96	0.95	0.95	FO D116
0.94	0.93	0.93	0.92	0.91	FO D117
0.91	0.90	0.89	0.89	0.88	FO D118
0.87	0.87	0.86	0.85	0.85	FO D119
0.84	0.84	0.83	0.82	0.82	FO D120
0.81	0.81	0.80	0.79	0.79	FO D121
0.78	0.78	0.77	0.77	0.76	FO D122
0.75	0.75	0.74	0.74	0.73	FO D123
0.73	0.72	0.72	0.71	0.71	FO D124
0.70	0.70	0.69	0.69	0.68	FO D125
0.68	0.67	0.67	0.66	0.66	FO D126
0.65	0.65	0.64	0.64	0.63	FO D127
0.63	0.62	0.62	0.61	0.61	FO D128
0.61	0.60	0.60	0.59	0.59	FO D129
0.58	0.58	0.58	0.57	0.57	FO D130
0.56	0.56	0.55	0.55	0.55	FO D131
0.54	0.54	0.53	0.53	0.53	FO D132
0.52	0.52	0.52	0.51	0.51	FO D133
0.50	0.50	0.50	0.00	0.00	FO D134

ENDTABLE

P 1, T 2135

1SITES -----
 XEQ 09/02/2021 Jerde Dam WSID=
 VER 2005.1.9 SUBW= A
 TIME 09:51:53 SITE = S 1 PASS= 1 PART= 6

ROUTED	BTM WIDTH	MAX ELEV	VOL-MAX	AREA-MAX	AUX.-HP	VOL-AUX.
RESULTS	FT	FT	ACFT	AC	FT	ACFT
NRCS-FBH	130.0	2896.21	471.2	58.2	2.22	121.4

PEAK - CFS	Q-PS	Q-AUX.	Q-TOT.
DISCHARGE =	47.6	111.9	159.5

	CRITICAL DEPTH	CRITICAL VELOCITY	CRITICAL SLOPE-Sc	25% OF Q
	FT	FT/SEC	FT/FT	Sc
AUXILIARY				
SPILLWAY ---	0.28	3.01	0.181	1.519

EROSIONALLY EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
(Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)

Aux. Spillway Discharge = 112. cfs; Bottom Width = 130. 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	127.	627.	1.20	0.091	1.32	0.48	0.014

AUXILIARY SPILLWAY DURATION FLOW = 28.8 HOURS
ATTACK, OE/B = 1.0 ACFT/FT

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

EXIT CHANNEL FLOW SUBCRITICAL: MAX VELOCITY= 1.3 FT/SEC
EXIT SLOPE = 0.012 FT/FT
FLOW DEPTH = 0.6 FT

***** WARNING - SOLUTION EXCEEDED MAX. INPUT ELEVATION (2895.00) BY 1.21 FT.

>>>> NHCP378 RUN - MINIMUM DEPTH, DESIGN FLOW TO TOP OF DAM; 1.00 FT REQUIRED FOR THIS PASS. NEW TOP OF DAM ELEVATION = 2897.21.

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.HP FT	VOL-AUX. ACFT
MINIMUM AUX.	130.0	2897.21	522.2	61.4	3.22	172.5

PEAK - CFS DISCHARGES =	Q-PS	Q-AUX.	Q-TOT.
	50.1	166.8	216.9

	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
AUXILIARY SPILLWAY ---	0.37	3.44	0.109	0.775

***** WARNING - SOLUTION EXCEEDED MAX. INPUT ELEVATION (2895.00) BY 2.21 FT.

PLOT-NRCS-FBH						1 IN = 200. CFS				
Time	Qin	Qout	Elev	Vol	Area	ExtVel	I	I	I	I
Time	Qin	Qout	Elev	Vol	Area	ExtVel	I	I	I	I
							0.	200.	400.	600.
							0.	200.	400.	600.

END NRCS-FBH PLOT

Inflow Hyd 1 PSH-Peak = 41.46 CFS at 24.23 hrs., Location Point
Inflow Hyd 1 FBH-Peak = 159.47 CFS at 19.27 hrs., Location Point
HYDOUT 1

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

Jerde_Dam

0 SUBWATERSHED(S) ANALYZED.

1 STRUCTURE(S) ANALYZED.

2 HYDROGRAPHS ROUTED AT LOWEST SITE.

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

SITES.....COMPUTATIONS COMPLETE

>>>		SITE	SUBWS	SUBWS DA	CURVE	TC	TOTAL DA	TYPE	STRUC	<<<	
		ID	ID	(SQ MI)	NO.	(HRS)	(SQ MI)	DESIGN	CLASS		
		S 1	A	3.81	74.	3.30	3.81	3/8NR	A1		
PASS	DIA./	AUX.CREST	BTM.	MAX.	MAX.	EMB.	INTEGR.*	EXIT*	TYPE		
NO.	WIDTH	ELEV	WIDTH	HP	ELEV	VOL.	DIST.	VEL.	HYD		
	(IN/FT)	(FT)	(FT)	(FT)	(FT)	(CY)	(FT)	(FT/SEC)			
1	24.0	2894.0	130.0	3.2	2897.2	0.	0.	1.3	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 2005.1.9 ,01/01/2005
FILES

INPUT = C:\SITESdata\JerdeDam\Jerde_Watershed_SITES--48inch riser Edited24.D2C
OUTPUT = C:\SITESdata\JerdeDam\Jerde_Watershed_SITES--48inch riser Edited24.OUT
DATED 09/02/2021 09:51:53

FILE GEN. = C:\SITESdata\JerdeDam\Jerde_Watershed_SITES--48inch riser Edited24

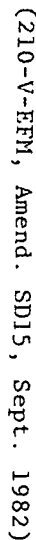
GRAPHICS FILES GENERATED

OPTION "L" = C:\SITESdata\JerdeDam\Jerde_Watershed_SITES--48inch riser Edited24.DRG DA1

OPTION "P" = C:\SITESdata\JerdeDam\Jerde_Watershed_SITES--48inch riser Edited24.DHY DA1

Site Identification
 Watershed Runoff Curve Number 74.
 Total Watershed Drainage Area (Sq. Miles) 3.81
 Watershed Time of Concentration (Hours) 3.30
 SDH Rainfall Total (Inches) N/A
 SDH Rainfall Duration (Hours) N/A
 FBH or Storm Rainfall Total (Inches) 4.00
 FBH or Storm Rainfall Duration (Hours) 24.0
 SDH Inflow Peak (CFS) N/A
 FBH or Storm Inflow Peak (CFS) 832.3
 Initial Reservoir Elevation (Feet) 2892.30
 Maximum WS SDH (Feet) N/A
 Maximum WS FBH or Storm (Feet) 2896.21
 Storage at Max. WS FBH or Storm (Acre-Ft) 468.3
 Top Dam (Feet) 2897.21
 Storage To Dam (Acre-Ft) 522.0
 Emb. Yardage (CY) N/A
 PSH Drawdown (Days) N/A
 378 Drawdown (Days) N/A
 PS Crest (Feet) 2892.30
 PS Number of Conduits 1
 PS Conduit Diameter (Inch) 24.0
 PS Conduit Height (Feet) N/A
 PS Conduit Width (Feet) N/A
 PS Conduit Area (Sq. Feet) 3.14
 Storage at PS Crest (Acre-Ft) 268.
 PS Discharge at AS Crest (CFS) 41.5
 PS Discharge for SDH (CFS) N/A
 PS Discharge FBH or Storm (CFS) 47.6
 AS Crest (Feet) 2893.99
 Storage at AS Crest (Acre-Ft) 349.8
 AS Width (Feet) 130.
 AS Exit Slope () 1.20
 AS Ret. Curve Index 5.60
 AS Veg. Cover Factor 0.50
 AS Maintenance Code 2
 AS Max. Head SDH (Feet) N/A
 AS Peak Discharge SDH/Storm (CFS) 111.9
 AS Exit Velocity SDH or Storm (Ft/S) 1.32
 AS Stress SDH or Storm (Lb./Sq.Ft) 0.014
 H. FBH or Storm (Feet) 2.22
 AS Peak Discharge FBH/Storm (CFS) 112.
 AS Integ. Dist. FBH or Storm (Feet) N/A
 Oa/B FBH or Storm (Acre-Ft/Ft) 1.0
 Uncontrolled Drainage Area (Sq. Miles) 3.81
 Number of Errors 0
 Number of Warnings 2

SOUTH DAKOTA



11-66 (SD)

FIGURE NO. 1

AD = 100.39'

11-72 (SD)

Area P

The soils are from fine-textured clays developed either from Pierre shale weathered in-place or from the shale residue. The Pierre, Promise, Opal, Kyle, Samsil, Millboro, and Dupree soils lie within this area. The topography is dominantly gently rolling to rolling. This area has a well-defined drainage pattern.

Average Annual Sheet and Rill Erosion Rates by Land Use

<u><25% Cultivated</u>	<u>25-50% Cultivated</u>	<u>50-75% Cultivated</u>	<u>> 75% Cultivated</u>
0.0034 AF/ac	0.0044 AF/ac	0.0054 AF/ac	0.0063 AF/ac

Average Annual Sheet and Rill Erosion Rates for Rangeland Hydrologic Conditions

<u>Poor Hydrologic Condition</u>	<u>Fair Condition</u>	<u>Good Condition</u>
0.0072 AF/ac	0.0057 AF/ac	0.0042 AF/ac to 0.0027 AF/ac

Area Q

This area includes a variety of soils. They are primarily sandy to silty textured. In addition, claypan soils and loose sandy soils are included. They are formed from the Hell Creek and Fox Hills formations of Upper-Cretaceous Age. Soil names in this area include the Reeder, Morton, Regent, Vebar, Rhoades, Cabba, and Flasher. The topography ranges from gently sloping to rolling with occasional badlands and buttes. There is a moderately well-established drainage pattern.

Average Annual Sheet and Rill Erosion Rates by Land Use

<u><25% Cultivated</u>	<u>25-50% Cultivated</u>	<u>50-75% Cultivated</u>	<u>> 75% Cultivated</u>
0.0019 AF/ac	0.0027 AF/ac	0.0034 AF/ac	0.0042 AF/ac

Average Annual Sheet and Rill Erosion Rates for Rangeland Hydrologic Conditions

<u>Poor Hydrologic Condition</u>	<u>Fair Condition</u>	<u>Good Condition</u>
0.0052 AF/ac	0.0037 AF/ac	0.0023 AF/ac to 0.0008 AF/ac



NOAA's National Weather Service Hydrometeorological Design Studies Center Precipitation Frequency Data Server (PFDS)



Search

NWS All NOAA Go

General Information

Project Name
Project Number
Project Date
Country

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: SD

Data description

Data type: Precipitation depth Units: English Time series type: Partial duration

Select location

1) Manually:

a) By location (decimal degrees, use "-" for S and W): Latitude: Longitude: Submit

b) By station (list of SD stations): Select station

c) By address Search

2) Use map (if ESRI interactive map is not loading, try adding the host: https://is.arcgis.com/ to the firewall, or contact us at hdsr.questions@noaa.gov):

Satellite

Labels

a) Select location

Move crosshair or double click

b) Click on station icon

Show stations on map

Location information:

Name: Reva, South Dakota, USA*

Latitude: 45.3855°

Longitude: -102.8838°

Elevation: 2855.3 ft **

* Source: ESRI Maps

** Source: USGS

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 8, Version 2

PF tabular

Print page

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)¹

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.252 (0.196-0.323)	0.306 (0.238-0.393)	0.402 (0.312-0.518)	0.488 (0.377-0.631)	0.617 (0.464-0.832)	0.723 (0.530-0.984)	0.837 (0.592-1.16)	0.959 (0.651-1.36)	1.13 (0.739-1.65)	1.27 (0.805-1.86)
10-min	0.369 (0.287-0.474)	0.448 (0.349-0.576)	0.589 (0.457-0.758)	0.715 (0.551-0.924)	0.903 (0.679-1.22)	1.06 (0.776-1.44)	1.23 (0.868-1.70)	1.41 (0.954-2.00)	1.66 (1.08-2.41)	1.86 (1.18-2.72)
15-min	0.450 (0.351-0.578)	0.547 (0.426-0.703)	0.718 (0.557-0.925)	0.872 (0.672-1.13)	1.10 (0.828-1.49)	1.29 (0.947-1.76)	1.50 (1.06-2.08)	1.71 (1.16-2.43)	2.02 (1.32-2.94)	2.27 (1.44-3.32)
30-min	0.637 (0.496-0.817)	0.770 (0.600-0.990)	1.01 (0.782-1.30)	1.22 (0.942-1.58)	1.54 (1.16-2.08)	1.81 (1.33-2.46)	2.09 (1.48-2.91)	2.40 (1.63-3.41)	2.84 (1.85-4.12)	3.18 (2.02-4.66)
60-min	0.789 (0.615-1.01)	0.957 (0.745-1.23)	1.25 (0.972-1.61)	1.52 (1.17-1.96)	1.91 (1.44-2.58)	2.24 (1.64-3.05)	2.59 (1.83-3.60)	2.96 (2.01-4.21)	3.49 (2.28-5.07)	3.91 (2.48-5.72)
2-hr	0.941 (0.741-1.20)	1.14 (0.900-1.45)	1.50 (1.18-1.91)	1.82 (1.42-2.32)	2.29 (1.74-3.05)	2.67 (1.98-3.59)	3.09 (2.21-4.23)	3.53 (2.42-4.94)	4.14 (2.74-5.94)	4.64 (2.98-6.70)
3-hr	1.01 (0.803-1.28)	1.23 (0.976-1.56)	1.61 (1.27-2.04)	1.95 (1.53-2.48)	2.45 (1.87-3.23)	2.85 (2.13-3.80)	3.28 (2.37-4.46)	3.74 (2.59-5.19)	4.37 (2.92-6.22)	4.88 (3.16-6.99)
6-hr	1.17 (0.938-1.46)	1.42 (1.13-1.77)	1.83 (1.46-2.30)	2.20 (1.74-2.76)	2.73 (2.10-3.55)	3.15 (2.37-4.14)	3.60 (2.62-4.82)	4.07 (2.85-5.57)	4.72 (3.18-6.61)	5.23 (3.44-7.39)
12-hr	1.40	1.66	2.11	2.49	3.04	3.48	3.93	4.40	5.05	5.55

	(1.13-1.73)	(1.34-2.05)	(1.70-2.61)	(2.00-3.10)	(2.37-3.90)	(2.65-4.50)	(2.90-5.19)	(3.12-5.94)	(3.45-6.96)	(3.70-7.74)
24-hr	1.66 (1.36-2.03)	1.95 (1.59-2.38)	2.43 (1.98-2.97)	2.83 (2.29-3.47)	3.40 (2.67-4.29)	3.84 (2.96-4.90)	4.30 (3.21-5.59)	4.76 (3.42-6.33)	5.40 (3.74-7.33)	5.88 (3.98-8.09)
2-day	1.94 (1.60-2.34)	2.25 (1.86-2.72)	2.77 (2.28-3.36)	3.21 (2.63-3.90)	3.81 (3.03-4.74)	4.28 (3.33-5.38)	4.74 (3.58-6.08)	5.22 (3.80-6.83)	5.66 (4.12-7.83)	6.34 (4.36-8.59)
3-day	2.11 (1.75-2.52)	2.45 (2.03-2.94)	3.01 (2.49-3.62)	3.48 (2.87-4.19)	4.12 (3.30-5.09)	4.62 (3.62-5.76)	5.12 (3.90-6.51)	5.63 (4.13-7.31)	6.30 (4.47-8.36)	6.81 (4.72-9.16)
4-day	2.25 (1.88-2.68)	2.61 (2.18-3.11)	3.20 (2.67-3.83)	3.70 (3.07-4.44)	4.39 (3.53-5.39)	4.92 (3.88-6.11)	5.46 (4.18-6.90)	6.00 (4.43-7.75)	6.73 (4.80-8.88)	7.26 (5.08-9.73)
7-day	2.62 (2.21-3.10)	3.03 (2.55-3.58)	3.71 (3.11-4.39)	4.28 (3.58-5.08)	5.07 (4.13-6.18)	5.70 (4.54-7.01)	6.33 (4.90-7.93)	6.98 (5.22-8.92)	7.85 (5.67-10.3)	8.52 (6.02-11.3)
10-day	2.96 (2.51-3.48)	3.41 (2.89-4.01)	4.16 (3.52-4.91)	4.80 (4.03-5.67)	5.68 (4.64-6.87)	6.37 (5.11-7.78)	7.07 (5.51-8.79)	7.78 (5.86-9.88)	8.74 (6.37-11.3)	9.48 (6.75-12.4)
20-day	3.95 (3.40-4.60)	4.55 (3.90-5.29)	5.52 (4.72-6.42)	6.30 (5.36-7.38)	7.38 (6.09-8.78)	8.19 (6.64-9.85)	9.00 (7.10-11.0)	9.81 (7.48-12.2)	10.9 (8.07-13.8)	11.7 (8.43-15.1)
30-day	4.81 (4.15-5.54)	5.52 (4.76-6.36)	6.65 (5.72-7.68)	7.55 (6.47-8.76)	8.76 (7.27-10.3)	9.66 (7.88-11.5)	10.5 (8.35-12.7)	11.4 (8.73-14.0)	12.4 (9.26-15.7)	13.2 (9.65-16.9)
45-day	5.88 (5.11-6.73)	6.73 (5.85-7.71)	8.07 (6.99-9.26)	9.12 (7.87-10.5)	10.5 (8.75-12.2)	11.5 (9.41-13.5)	12.4 (9.90-14.9)	13.3 (10.3-16.2)	14.3 (10.8-17.9)	15.1 (11.1-19.1)
60-day	6.80 (5.94-7.74)	7.77 (6.78-8.86)	9.27 (8.07-10.6)	10.4 (9.05-12.0)	11.9 (9.99-13.8)	13.0 (10.7-15.2)	14.0 (11.2-16.6)	14.9 (11.6-18.0)	15.9 (12.0-19.7)	16.6 (12.4-21.0)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS)

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in CSV format: [Precipitation frequency estimates](#)

Main Link Categories:
[Home](#) | [OWP](#)

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
Office of Water Prediction (OWP)
1325 East West Highway
Silver Spring, MD 20910
Page Author: [HDSC webmaster](#)
Page last modified: April 21, 2017

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To improve filter diaphragm performance, provide a drain outlet for the filter diaphragm at the downstream toe of the embankment. Protect the outlet from surface erosion and animal intrusion.

Ensure filter diaphragm functions both as a filter for adjacent base soils and as a drain for seepage that it intercepts. Use sand meeting ASTM C-33, for fine concrete aggregate, for the materials for the filter diaphragm, or meet the requirements of NEH Part 628, Chapter 45, Filter Diaphragms, Section 628.4503(d), Filter and Drain Gradation.

Table 4. Acceptable plastic pipe for use in earth embankments

Pipe Material	Testing Method Designation	SDR / Pressure Rating and/or Schedule	Applicable Pipe Diameters (inches)	Maximum Fill Height Above Pipe (feet)
PVC 1120/1220 Plastic Irrigation Pipe (PIP)	ASTM D2241	SDR 26 - 160 psi	8, 10, 12, 14, 15, 18, 21, 24, 27	10
		SDR 21 - 200 psi	(15)	18
PVC and ABS 1120/1220/2120 Iron Pipe Size (SDR-PR) (IPS)	ASTM D2241	SDR 26 - 160 psi	8, 10, 12, 14, 16, 18, 20, 24, 30, 36	10
		SDR 21 - 200 psi	8, 10, (12, 14, 16, 18, 20, 24, 30, 36)	18
		SDR 17 - 250 psi	(8, 10, 12, 14, 16, 18, 20, 24, 30, 36)	30
PVC Schedule 40 & 80	ASTM D1785	Schedule 40 - SDR varies with diameter	8, 10, 12, (14, 16, 18)	8
			(20 & 24)	6 *
		Schedule 80 - SDR varies with diameter	8	28
			10	26
			12 & (14)	24
			(16 & 18)	22
			(20 & 24)	20
PVC Plastic Pipe, Iron Pipe Size (IPS) O.D. dia. Controlled	AWWA C905	SDR 26 - 160 psi	14, 16, 18, 20, 24, 30, 36	10
		SDR 21 - 200 psi	14, 16, 18, 20, 24, 30, 36	18
PVC Plastic Pipe, Iron Pipe Size (IPS)	AWWA C900	SDR 25 - 100 psi	8, 10, & 12	4
		SDR 18 - 150 psi	8, 10, & 12	10
		SDR 14 - 200 psi	8, 10, & 12	16
Type PSM - PVC Pipe (Sewer Pipe)	ASTM D3034	SDR 26	8, 10, 12, 15	10 *
PE Schedule 40 Plastic Pipe	ASTM D2447	Schedule 40 - SDR varies with diameter	(8)	5 *
			(10)	4 *
Polyethylene Plastic Pipe (SDR-PR) O.D. dia. Controlled (IPS)	ASTM D3408, D3306, D3406, D2306, D2406, D2305, & D1404	SDR 26 - Pressure Rating varies with Material	8, 10, 12, 14, 16, 18, 20, 22, & 24	4 *
		SDR 21 - Pressure Rating varies with Material	8, 10, 12, 14, 16, 18, 20, 22, & 24	8
		SDR 17 - Pressure Rating varies with Material	8, 10, 12, 14, 16, 18, 20, 22, & 24	10
		SDR 15.5 - Pressure Rating varies with Material	8, 10, 12, 14, 16, 18, 20, 22, & 24	14

6

Natural Resources Conservation Service
United States Department of Agriculture

Trapezoidal Channel Section

Participant: Jerde
Location: Perkins
County: County, South Dakota
Designer: L. Legge
Date: 08/31/2021

Checker: _____
Date: _____

Hydraulics Formula, Version 2.2.1

Slope: 0.005 ft/ft
'n' value: .03

Hydraulic Radius: 1.41
Area: 32.00 sq ft
Velocity: 4.41 ft/sec
Capacity: 141.11 cfs

Sideslope: 3:1
Bottom Width: 10 ft
Depth of Flow: 2 ft.
Width @ surface 22 ft

$$Q = \frac{1.49}{n} A R_H^{2/3} S^{1/2}$$

$n = 0.03$
 $S = 0.005$
 $R_H = 1.41$
 $A = 32$

$$= \frac{1.49}{0.03} (32) 1.41^{0.667} 0.005^{0.5}$$
$$= 1589.33 (1.25742) (0.070711)$$
$$= 141.31 \text{ cfs}$$

from Roy Boschee email 2/3/2022

"...this sheet is for the outlet channel at the principle spillway."

- BMA

Gronlund, Eric

From: Kilts, Whitney (DENR)
Sent: Thursday, January 13, 2022 10:02 AM
To: Duvall, Ron; Gronlund, Eric
Subject: FW: [EXT] Proposed Jerde Dam in Perkins Co.

The below email may need to be a part of the file for application 2010-1, since part of it has information from the design engineer on the hazard class for the dam. Thanks.

From: Boschee, Roy - FPAC-NRCS, Rapid City, SD <roy.boschee@usda.gov>
Sent: Tuesday, December 7, 2021 12:39 PM
To: Kilts, Whitney (DENR) <Whitney.Kilts@state.sd.us>
Cc: Hansen, Blaise <Blaise.Hansen@state.sd.us>; Legge, Lander - NRCS, Rapid City, SD <lander.legge@usda.gov>; Haigh, Seth - NRCS, Rapid City, SD <seth.haigh@usda.gov>; Stuteville, Zack - FPAC-NRCS, RAPID CITY, SD <Zack.Stuteville@usda.gov>
Subject: RE: [EXT] Proposed Jerde Dam in Perkins Co.

Whitney and Blaise,

- NRCS has an internal Job Approval Authority (JAA) and is based on several factors such as Height, Storage, Spillway Capacity, Drainage Area etc. In the case of the Murdo and Belvidere projects these projects were in the highest Job Class and requires us to have an additional review by the Huron office and was an internal criteria we had to have. In the case of Phil Jerde's Dam this dam is of a Lower Job Classification for NRCS and does not require the additional review by the Huron office. The Murdo and Belvidere projects were atypical for NRCS whereas Jerde's dam is more of a typical project we would do. So no additional review is required on our end.
- We have reviewed the elevation information and have found the following: The location of the downstream structures are over 6 stream miles and 3 horizontal miles downstream from the structure: the elevation difference from the stream channel to the lowest unoccupied out building is 4 feet and the elevation difference for the house is 8 feet; upstream there are a few areas of flood plain that are near our over 100 foot wide; and upstream there appears to be functioning waterspreading system located in the N1/2 1-16N-10E. Based on this information I felt there was no need to run a breach analysis. However, we can provide one if you have a need for it.
- We checked the ownership information we have and Phil Jerde owns the land in the pool area and the surrounding land above the top elevation of the dam as well as immediately downstream.

If you have any further questions or information please contact me.

Roy E. Boschee, PE
414 E. Stumer Road, Ste 700
Rapid City, SD 57701
605 – 858-6694
Roy.Boschee@sd.usda.gov

From: Kilts, Whitney (DENR) <Whitney.Kilts@state.sd.us>
Sent: Tuesday, November 30, 2021 9:48 AM
To: Boschee, Roy - FPAC-NRCS, Rapid City, SD <roy.boschee@usda.gov>
Cc: Hansen, Blaise <Blaise.Hansen@state.sd.us>
Subject: Proposed Jerde Dam in Perkins Co.

1/11/2022

P&S Review check of BH review

wkk

2010-1

Philip Jerde

Plans prepared by an engineer as defined by ARSD Chapter 74:02:08 _Yes-Roy Boschee SD LC# 6374_

Top of Dam Elevation __2897 ft__ Maximum Storage Capacity__211.1 ac-ft__

2nd Spillway Elevation __2894 ft__ Intermediate Storage Capacity_135.6 ac-ft__

P. Spillway Elevation __2892.3 ft__ Normal Storage Capacity_81.7 ac-ft__

need to verify normal storage is 81.7, there are a couple mentions of it being 81.8 ac-ft in P&S

Downstream embankment toe elevation_2878 (2897ft-19ft, the topo map did not have labeled elevation contours to allow for verification of downstream toe elevation) ____

Height __19ft (from plan sheet 2) ____

Effective height (per ARSD 74:02:08:01(8)) _2894-2878(embankment profile)= _16ft__

Minimum design flood requirement under ARSD 74:02:08:07

Dam hazard category __low?__ Dam size_ small__

Additional ARSD requirements/notes:

NRCS Hazard Class A- Dams in rural or agricultural areas where failure may damage farm buildings, agricultural land, or township and country roads.

Based on past reviews NRCS hazard class a generally corresponds to a low (category 3) hazard classification, however the damage to farm buildings could trigger a category 2 classification (significant). See email from engineer: indicated nearest house is 6 stream miles down stream and 8 ft above stream channel and lowest unoccupied building at the downstream farm site is 4 ft above the stream channel. Also, between dam and house there are several wide flood plain areas.

Assuming low, check for ARSD 74:02:08:07.01 exception, intermediate storage capacity times effective height < 3000, $135.6 * 16 = 2169.6$ which is less than 3000-so qualifies for exception

Minimum design flood required __ (if low) 25 year event__

Review of design flows and comments:

USGS WRI 98-4055 techniques for Estimating Peak-Flow Magnitude and Frequency Relations for South Dakota Streams

-done via USGS Streamstats see print out, estimates 50yr peak runoff at approximately 628 cfs

-Blaise's USGS Streamstats- output looks good estimates 50yr peak runoff at approximately 658 cfs

-NRCS design storm parameters: NRCS DA-ok , NRCS 50yr 24 hr rainfall-ok, Curve Number-ok (type c soils with grass cover)

Design peak flow in plans _50yr 24 hr (sheet 2)- peak runoff 832 cfs__

Comments: no issue with NRCS design storm, NRCS calculated secondary spillway flow at the 50yr-24hr event to be 116.5 cfs with a depth of 2.210 ft

Qualifies for the National Inventory of Dams

Yes

-will need to be added to inventory after construction

-recommend requesting as-builds as part of the approval letter

- test hole / boring info for borrow location
- " / " for profile
- thickness assume grass on up slope of rip rap
- zoning - look up in the sources Whitney gave me is the dam going to be homogeneous
- to top of dam
- Secondary spillway cross-section



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

February 17, 2022

Philip S. Jerde
13901 Zeona Road
Reva, South Dakota, 57651

Dear Mr. Jerde:

We have reviewed the plans and specifications for your dam project located in the SE ¼ SE ¼, Sec 33, T17N-R10E in Perkins County. The plans and specifications for the construction of the dam are approved for Water Permit Application No. 2010-1. Approval of the plans and specifications does not authorize construction of the dam. The construction of the dam may not begin until Water Permit No. 2010-1 is 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, the owner of the dam, from the responsibility for operating and maintaining the dam to ensure the safety of the dam.

The dam for Water Permit Application No. 2010-1 will be classified as a small size category 3, (low hazard dam) with an effective height of 16 feet and a normal storage capacity of 81.7 acre-feet. A category 3 dam is a low hazard dam whose failure may cause limited damage to agricultural lands or county or township roads or minimum economic loss. However, future downstream development could change this classification. Additionally, the Water Rights Program does not have a routine inspection program for privately owned low hazard dams, so you are encouraged to develop an inspection and maintenance routine to help ensure the long-term safety of the dam.

If a set of as-built plans are prepared for this dam, the Water Rights Program requests a copy of them for our records. If you have any questions, please feel free to contact the Water Rights Program at (605)773-3352.

Sincerely,

Eric Gronlund, PE
Water Rights Program

Schlaak, Karen

From: Schlaak, Karen
Sent: Thursday, February 17, 2022 4:18 PM
To: peggycreekranch@sdplains.com
Subject: Water Application No. 2010-1
Attachments: 2561.pdf

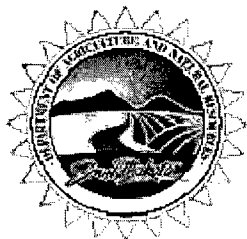
Attached is a copy of the report, chief engineer recommendation and information regarding the public notice for your water permit application. As stated in the letter, please contact the paper(s) as soon as possible to authorize publication and arrange for payment. This information is being mailed to you today.

Karen Schlaak

DANR - Water Rights Program

(605) 773-3352

Website: <https://danr.sd.gov>





**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT APPLICATION
NO. 2010-1, Philip S. Jerde**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Agriculture and Natural Resources concerning Water Permit Application NO. 2010-1, Philip S. Jerde, 13901 Zeona Rd, Reva, SD, 57651.

The Chief Engineer is recommending APPROVAL of Application No. 2010-1 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing domestic water uses and water rights, 3) the proposed use is a beneficial use, and 4) it is in the public interest as it pertains to matters of public interest within the regulatory authority of the Water Management Board with the following qualifications:

1. Water Permit No. 2010-1 authorizes a dam with the storage capacity of 81.7 acre-feet of water and sufficient water annually to maintain the water level to the outlet elevation.
2. Low flows as needed for downstream domestic use, including livestock water and prior water rights must be by-passed.

See report on application for additional information

Eric Gronlund, Chief Engineer

February 17, 2022

**REPORT TO THE CHIEF ENGINEER ON
WATER PERMIT APPLICATION NO. 2010-1**

**Philip S. Jerde
February 17, 2022**

Water Permit Application No. 2010-1 has been filed by Philip Jerde to impound 81.7 acre-feet of water from runoff by constructing a dam located in the SE ¼ SE ¼ Section 33 T17N-R10E with water impounded in the SE ¼, SE ¼ SW ¼ Section 33 T17N-R10E and the NW ¼ NW ¼ Section 3 T16N-R10E. The application requests impoundment of sufficient water to maintain the water level at the primary outlet elevation. The water is for recreation, livestock watering, and fish and wildlife propagation. The site of the dam is in Perkins County, approximately 23 miles southwest of Bison, SD,

This report will evaluate the availability of unappropriated water and the potential for unlawful impairment of existing rights to address permitting requirements as mandated under South Dakota Codified Law (SDCL) 46-2A-9. The plans and specifications of the proposed dam structure will be reviewed for dam safety compliance as specified under Administrative Rule of South Dakota (ARSD) Chapter 74:02:08.

Applicable Statutes and Administrative Rules:

South Dakota Codified Law (SDCL) 46-2A-9: Pursuant to SDCL 46-2A-9, a permit to appropriate water may only be issued if there is reasonable probability that unappropriated water is available for the applicant's proposed use, the proposed diversion can be developed without unlawful impairment of existing domestic water uses and water rights, the proposed use is a beneficial use, and the permit is in the public interest as it pertains to matters of public interest within the regulatory authority of the Water Management Board.

Administrative Rules of South Dakota (ARSD) Chapter 74:02:08: ARSD Chapter 74:02:08 contains the minimum design requirements for dams over a certain height and storage capacity. Construction may not begin on a new dam as defined by ARSD 74:02:08:01(7) until plan and specifications have been approved by the chief engineer and a water permit application, if needed, has been approved.

Review of Water Source and Existing Water Rights:

The applicant is proposing construction of a small storage dam to collect runoff from the upstream watershed. The Philip Jerde Dam will be in the SE ¼ SE ¼ Section 33; T17N-R10E. The source of water for this proposed project is from Peggy Creek with the proposed dam location approximately 20.6 stream miles upstream from the confluence with Rabbit Creek before eventually flowing to the Moreau River. There is one existing Water Right/Permit diverting water from Peggy Creek, approximately 8.7 stream miles downstream of the proposed dam location. It is Water Right No. 90-1 and is authorized a diversion rate of 5 cfs to irrigate 145 acres (Water Rights, 2022). There is also Location Notice No. 661-1 just upstream of the proposed dam location. It is authorized to collect an unspecified amount of water from a dry draw, not Peggy Creek, from

February through May. There is another Location Notice No. 27948, owned by James McBride, approximately 4.7 stream miles downstream of the proposed dam location. Areal photography indicates that this structure intercepts Peggy Creek. It is authorized to store 1.6 acre-feet of water for livestock watering.

Review of the Proposed Dam:

The proposed dam has been designed by the Natural Resources Conservation Services (NRCS) and the plans are stamped by a professional engineer registered with the State of South Dakota. It classifies as a small size, category 3, low hazard dam whose failure may cause minimal economic loss and limited damage to agricultural land or county/township roads.

The dam will have a total height of 19 feet and an effective height of 16 feet. It will have a normal storage capacity of 81.7 acre-feet (ac-ft) with the reservoir level at the primary spillway elevation, an intermediate storage capacity of 135.6 ac-ft with the reservoir level at the secondary spillway elevation, and a maximum storage capacity of 211.1 ac-ft with the reservoir level at the top of dam elevation.

The dam has a drainage area of 2,436.2 acres or 3.81 square miles (USGS, 2022). The dam will have a 24-inch diameter PVC conduit with 4.7 feet of freeboard at the primary spillway, and a 130-foot bottom width, natural earth, secondary spillway with 3.0 feet of available freeboard. A 25-year frequency event produces a peak runoff of approximately 482 cubic feet per second (cfs) and a 100-year frequency event produces a runoff of approximately 873 cfs (Sando, 1998). The proposed earth-cut secondary spillway will have a full capacity of approximately 167 cfs.

The annual surface yield determines the volume of runoff which can be expected for a twelve-month period, a given percent of the time. This analysis utilizes the NRCS method which includes site specific values based on soil cover, hydrologic soil groups, and contributing drainage area to produce anticipated yield volumes of surface water. For this drainage area with an 80 percent chance of occurrence, or 8 out of 10 years, the annual yield is calculated to be approximately 18 ac-ft. The annual yield with a 50 percent chance of occurrence, or 1 out of 2 years, is calculated to be approximately 54 ac-ft. The annual yield with a 10 percent chance of occurrence, or 1 out of 10 years, is calculated to be approximately 303 ac-ft (NRCS, 2022).

Discussion:

The applicant is proposing to construct a dam for recreation, livestock watering and fish and wildlife propagation. It will have a normal storage capacity of 81.7 ac-ft and will be located on Peggy Creek, a tributary to Rabbit Creek which eventually flows to the Moreau River. The annual yield of the watershed with a 50 percent chance of occurrence is approximately 54 ac-ft. Except during periods of extremely dry conditions, water availability is not an issue.

There is one existing Water Right/Permit diverting water from Peggy Creek, approximately 8.7 miles downstream of the proposed dam location. It is Water Right No. 90-1 and is authorized a diversion rate of 5 cfs to irrigate 145 acres. Also of note is that the watershed which contributes to the proposed application is also a portion of the overall watershed that contributes to Water Right

No. 90-1. The annual yield of the overall watershed with a 50 percent chance of occurrence is approximately 167 ac-ft. Removing the aforementioned annual yield of 54 ac-ft which is the contribution of the watershed to the application location results in approximately 113 ac-ft remaining to satisfy the water requirements authorized for Water Right No. 90-1. Therefore, the issuance of this permit is not expected unlawfully impair existing rights.

The proposed dam would be classified as a small size, category 3, low hazard dam. As per ARSD 74:02:08:07.01, the dam qualifies for the spillway design flood exception since the product of the intermediate storage capacity times the effective height is less than 3000. Therefore, the minimum spillway system design must be capable of passing a 25-year frequency event. This dam design was analyzed using the NRCS SITES program which is commonly used by NRCS as part of dam design. The program modeled dam performance during a 50 year, 24 hour design storm (which is a larger event than required for this structure under SD Safety of Dams Rules). When the 50 year, 24 hour design storm was routed (which accounts for both spillway capacity and detention storage in the dam between the primary and secondary spillways) through the proposed dam with a starting reservoir level at normal pool; the principal spillway operates at maximum capacity and the modeled secondary spillway discharge is 116.5 cfs with a flow depth of 2.210 ft. The reservoir elevation is modeled to reach 2896.1 ft during the 50 year, 24 hour design storm, which is 0.79 ft below the top of the dam. Therefore, the design meets SD Safety of Dams Rules spillway requirements since the proposed dam can handle a larger storm than required without overtopping.

Conclusions:

1. Water Permit Application No. 2010-1 proposes to impound 81.7 ac-ft of water from runoff by constructing a dam for recreation, livestock watering and fish and wildlife propagation purposes.
2. The plans and specifications have been reviewed for compliance with ARSD Chapter 74:02:08 Safety of Dams and will be approved; however, construction of the dam cannot begin without approval of Water Permit Application No. 2010-1.
3. The proposed permit can be issued because unappropriated water is available, and it will not unlawfully impair existing rights.
4. If this application is approved, it should include the following qualifications:

Low flows must be bypassed to protect downstream domestic use include livestock watering when needed.



Blaise M. Hansen
Natural Resources Engineer I

Reviewed by:



Mark D. Rath
Natural Resources Engineer III



Whitney Kilts
Natural Resources Engineer III

References:

1. Water Rights. 2022. Water Right/Permit Files. SD DANR-Water Rights Program, Joe Foss Building, Pierre, SD.
2. USGS. 2022. <https://streamstats.usgs.gov/ss/>. Accessed 12/25/2021.
3. Sando, Steven K., 1998, A Method for Estimating Magnitude and Frequency of Floods in South Dakota: U.S. Geological Survey Water-Resources Investigations Report 98-4055.
4. NCRS. 2022. National Engineering Handbook Hydrology - South Dakota Engineering Field Manual - Watershed Yield.

Water Rights Program - File Documentation

NAME: Philip Jerde

ADDRESS: Reva SD

DATE: 3-3-22

RE: Publication Notice

COMMENTS:

On February 17, 2022, I emailed publication notice to the Bison Courier to be published on March 3, 2022. Notice was published on that date. On March 4th, I realized the wrong publication notice had been used.

I resent the paper the correct notice to be published on March 10th with instructions to bill us the cost of publication.

The Black Hills Pioneer did not publish to notice on March 3 because they had not received authorization. The notice in the Black Hills Pioneer on March 10 was correct.



Karen Schlaak
Water Rights Program

March 23, 2022

PAYMENT REQUEST FORM

PAYEE: The Bison Courier
PO Box 429
Bison SD 57620

FROM: DANR Water Rights Program
523 E. Capitol Ave
Pierre, SD 57501-3181

DESCRIPTION OF SERVICE, PRODUCE OR TRANSFER

Affidavit of Publication for permit #2010-1

AMOUNT: \$45.36

FUNDING SOURCE:

GENERAL: X

FEDERAL:

OTHER:

COMMENTS:

AUTHORIZATION: *Eini Hunkler* 3/23/2022

I declare and affirm under the penalties of perjury that this claim is in all things, true and correct. I further agree to comply with the provisions of the Civil Rights Act of 1964 and regulations issued thereunder relating to nondiscrimination in federal assisted programs.

PO BOX 429 | BISON, SD 57620



Invoice

Date	Invoice #
3/10/2022	45738

WATER RIGHTS PROGRAM
523 E CAPITOL
PIERRE SD 57501

RECEIVED

MAR 21 2022

**WATER RIGHTS
PROGRAM**

Terms

Description	Amount
Notice of Application No. 2010-1 to Appropriate Water	45.36

Thank you for your business!

Subtotal	\$45.36
Sales Tax (6.5%)	\$0.00
Balance Due	\$45.36

A 2% monthly finance charge (24% annual) will be assessed on balances not paid by the due date. \$1.50 minimum.

A \$35 fee will be assessed for any returned payment.

PUBLISHER'S AFFIDAVIT OF PUBLICATION

STATE OF SOUTH DAKOTA

)SS

COUNTY OF PERKINS

RECEIVED

MAR 21 2022

WATER RIGHTS
PROGRAM

Arlis Seim, of said County and State, being duly sworn, on oath says: THE BISON COURIER is a weekly newspaper of general circulation, printed and published in Bison, in said County and State and has been such newspaper during the times hereinafter mentioned; that the said BISON COURIER is a legal newspaper and has been in existence for more than one year immediately preceding the first publication herein mentioned; and has more than 200 bonafide subscribers; that I, the undersigned, am Legal Advertising Manager, of said newspaper, and in charge of the advertising department thereof, and have personal knowledge of all facts stated in this affidavit; and that the advertisement headed

Revised

NOTICE OF APPLICATION NO. 2010-1 to Appropriate Water

a printed copy of which is hereto attached, was printed and published in said newspaper for 1 successive issues, the first publication being on the 10 day of March, 2022 and the last publication on the 10 day of March, 2022 that \$45.36 being the full amount of the fee for publication of the annexed notice insures solely to the benefit of the publishers of the said newspaper; that no arrangement or understanding for a division thereof has been made with any person and that no part thereof has been agreed to be paid to any other person whomsoever.

Arlis Seim

Subscribed and sworn to before me this 17 day of March, 2022.

Misty Simon
Notary Public, Perkins County

My commission expires:

June 20, 2023

**NOTICE OF
APPLICATION
NO. 2010-1 to
Appropriate Water**

Notice is given that Philip S Jerde, 13901 Zeona Rd, Reva SD 57651 has filed an application for a water permit to impound 81.7 acre-feet of water from runoff by constructing a dam located in the SE 1/4 SE 1/4 Section 33-T17N-R10E with water impounded in the SE 1/4, SE 1/4 SW 1/4 Section 33-T17N-R10E and the NW 1/4 NW 1/4 Section 3-T16N-R10E. This application requests impoundment of sufficient water to maintain water to the primary outlet elevation. The water is for fish and wildlife propagation, recreation, and livestock water purposes. The site of the dam is approximately 23 miles southwest of Bison SD.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 2010-1 with qualifications because 1) unappropriated water is available, 2) existing domestic water uses and water rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest as it pertains to matters within the regulatory authority of the Water Management Board. The Chief Engineer's recommendation with qualifications, the application, and staff report are available at <https://danr.sd.gov/public> or contact Ron Duvall for this information, or other information, at the Water Rights Program address provided below.

Any person interested in opposing this application or recommendation shall allege that the application, upon approval, will cause injury to the person that is unique from any injury suffered by the public in general. The injury must concern a matter either within the regulatory authority found in SDCL 46-2A-9 for approval or denial of the application, or other matter concerning the application within the regulatory authority of the board to act upon as defined by SDCL 46-2-9 and 46-2-11, or both. Any person meeting

the petitioner requirements and wishing to be a party of record in a contested case hearing shall file a written petition to oppose the application with BOTH the applicant and Chief Engineer. A petition opposing the application shall be filed on a form provided by the Chief Engineer. The petition form is available online at <https://danr.sd.gov/public> or by contacting the Chief Engineer. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501" or call (605) 773-3352. The applicant's mailing address is given above. If contesting the Chief Engineer's recommendation, the applicant shall also file a petition. A petition filed by either an interested person or the applicant must be filed by March 21, 2022.

The petition shall include a statement describing the unique injury upon approval of the application on the petitioner, the petitioner's reasons for opposing the application, and the name and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

Any interested person may file a comment on the application with the Chief Engineer. The comment shall be filed on a form provided by the Chief Engineer and is available online at <https://danr.sd.gov/public> or by calling (605) 773-3352 or writing the Chief Engineer at the address provided above. Filing a comment does not make the commenter a party of record or a participant in any hearing that may be held. Any comment must be filed by March 21, 2022.

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.

Published March 10, 2022 at a total approximate cost of \$45.36.]

**RECEIVED
MAR 21 2022
WATER RIGHTS
PROGRAM**

PUBLISHER'S AFFIDAVIT OF PUBLICATION

STATE OF SOUTH DAKOTA

)SS

COUNTY OF PERKINS

Jerde pay
this one

RECEIVED

MAR 21 2022

WATER RIGHTS
PROGRAM

Arlis Seim, of said County and State, being duly sworn, on oath says: THE BISON COURIER is a weekly newspaper of general circulation, printed and published in Bison, in said County and State and has been such newspaper during the times hereinafter mentioned; that the said BISON COURIER is a legal newspaper and has been in existence for more than one year immediately preceding the first publication herein mentioned; and has more than 200 bonafide subscribers; that I, the undersigned, am Legal Advertising Manager, of said newspaper, and in charge of the advertising department thereof, and have personal knowledge of all facts stated in this affidavit; and that the advertisement headed

NOTICE OF
APPLICATION
NO. 2010-1 to
Appropriate Water

Notice is given that Philip S Jerde, 13901 Zeona Rd, Reva SD 57651

a printed copy of which is hereto attached, was printed and published in said newspaper for 1 successive issues, the first publication being on the 3 day of March, 2022 and the last publication on the 3 day of March, 2022 that \$31.00 being the full amount of the fee for publication of the annexed notice insures solely to the benefit of the publishers of the said newspaper; that no arrangement or understanding for a division thereof has been made with any person and that no part thereof has been agreed to be paid to any other person whomsoever.

Arlis Seim

Subscribed and sworn to before me this 7 day of March, 2022.

W. J. Simon
Notary Public, Perkins County

My commission expires:

6/20/23

RECEIVED

MAR 21 2022

WATER RIGHTS
PROGRAM

**NOTICE OF
APPLICATION
NO. 2010-1 to
Appropriate Water**

Notice is given that Philip S Jerde, 13901 Zeona Rd, Reva SD 57651 has filed an application for a water permit to impound 81.7 acre-feet of water from runoff by constructing a dam located in the SE 1/4 SE 1/4 Section 33-T17N-R10E with water impounded in the SE 1/4, SE 1/4 SW 1/4 Section 33-T17N-R10E and the NW 1/4 NW 1/4 Section 3-T16N-R10E. This application requests impoundment of sufficient water to maintain water to the primary outlet elevation. The water is for fish and wildlife propagation, recreation, and livestock water purposes. The site of the dam is approximately 23 miles southwest of Bison SD.

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.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 2010-1 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 <https://danr.sd.gov/public> or contact Ron Duvall for this information, or other information, at the Water Rights Program address provided below.

[Published March 3, 2022 at a total approximate cost of \$31.00.]

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 March 14, 2022.

NOTICE OF APPLICATION NO. 2010-1 to Appropriate Water

- Notice is given that Philip S Jerde, 13901 Zeona Rd, Reva SD 57651 has filed an application for a water permit to impound 81.7 acre-feet of water from runoff by constructing a dam located in the SE 1/4 SE 1/4 Section 33-T17N-R10E with water impounded in the SE 1/4, SE 1/4 SW 1/4 Section 33-T17N-R10E and the NW 1/4 NW 1/4 Section 3-T16N-R10E. This application requests impoundment of sufficient water to maintain water to the primary outlet elevation. The water is for fish and wildlife propagation, recreation, and livestock water purposes. The site of the dam is approximately 23 miles southwest of Bison SD.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 2010-1 with qualifications because 1) unappropriated water is available, 2) existing domestic water uses and water rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest as it pertains to matters within the regulatory authority of the Water Management Board. The Chief Engineer's recommendation with qualifications, the application, and staff report are available at <https://danr.sd.gov/public> or contact Ron Duvall for this information, or other information, at the Water Rights Program address provided below.

Any person interested in opposing this application or recommendation shall allege that the application, upon approval, will cause injury to the person that is unique from any injury suffered by the public in general. The injury must concern a matter either within the regulatory authority found in SDCL 46-2A-9 for approval or denial of the application, or other matter concerning the application within the regulatory authority of the board to act upon as defined by SDCL 46-2-9 and 46-2-11, or both. Any person meeting the petitioner requirements and wishing to be a party of record in a contested case hearing shall file a written petition to oppose the application with BOTH the applicant and Chief Engineer. A petition opposing the application shall be filed on a form provided by the Chief Engineer. The petition form is available online at <https://danr.sd.gov/public> or by contacting the Chief Engineer. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501" or call (605) 773-3352. The applicant's mailing address is given above. If contesting the Chief Engineer's recommendation, the applicant shall also file a petition. A petition filed by either an interested person or the applicant must be filed by March 21, 2022.

The petition shall include a statement describing the unique injury upon approval of the application on the petitioner, the petitioner's reasons for opposing the application, and the name and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

Any interested person may file a comment on the application with the Chief Engineer. The comment shall be filed on a form provided by the Chief Engineer and is available online at <https://danr.sd.gov/public> or by calling (605) 773-3352 or writing the Chief Engineer at the address provided above. Filing a comment does not make the commenter a party of record or a participant in any hearing that may be held. Any comment must be filed by March 21, 2022.

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.

Published once at the total approximate cost of_

RECEIVED

MAR 14 2022

WATER RIGHTS
PROGRAM

*Gerde pays
this one*

Affidavit of Publication

STATE OF SOUTH DAKOTA:

COUNTY OF LAWRENCE:

Letitia Lister of said County and State being first duly sworn, on her oath says: That the BLACK HILLS PIONEER is a legal daily newspaper of general circulation, printed and published in the City of Spearfish, in said County and State by Letitia Lister, and has been such a newspaper during the times hereinafter mentioned; and that said newspaper has a bonafide circulation of at least 200 copies weekly, and has been published within said County in the English language for at least one year prior to the first publication of the notice herein mentioned, and is printed in whole or in part in an office maintained at the place of publication; and that I, Letitia Lister, the undersigned, am the Publisher of said newspaper and have personal knowledge of all the facts stated in this affidavit; and that the advertisement headed:

Notice Of Application
No. 2010-1

a printed copy of which is hereto attached, was printed and published in said newspaper for 1 successive and consecutive weeks, the first publication being made on the 10th day of March, 2022, and the last publication on the _____ day of _____, _____, that the full amount of fees charged for publishing same, to-wit: The sum of \$ 39.79, insures solely to the benefit of the publisher of the BLACK HILLS PIONEER, that no agreement or understanding for a division thereof has been made with any person and that no part thereof has been agreed to be paid to any other person whomsoever.


Subscribed and sworn to before me this 11th day of Mar., 2022



Notary Public, Lawrence County, South Dakota

My commission expires: 7-18-2025

**NOTICE OF
APPLICATION
NO. 2010-1 to
Appropriate Water**

Notice is given that Philip S Jerde, 13901 Zena Rd, Reva SD 57651 has filed an application for a water permit to impound 81.7 acre-feet of water from runoff by constructing a dam located in the SE 1/4 SE 1/4 Section 33-T17N-R10E with water impounded in the SE 1/4, SE 1/4 SW 1/4 Section 33-T17N-R10E and the NW 1/4 NW 1/4 Section 3-T16N-R10E. This application requests impoundment of sufficient water to maintain water to the primary outlet elevation. The water is for fish and wildlife propagation, recreation, and livestock water purposes. The site of the dam is approximately 23 miles southwest of Bison SD.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 2010-1 with qualifications because 1) unappropriated water is available, 2) existing domestic water uses and water rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest as it pertains to matters within the regulatory authority of the Water Management Board. The Chief Engineer's recommendation with qualifications, the application, and staff report are available at <https://danr.sd.gov/public> or contact Ron Duvall for this information, or other information, at the Water Rights Program address provided below.

Any person interested in opposing this application or recommendation shall allege that the application, upon approval, will cause injury to the person that is unique from any injury suffered by the public in general. The injury must concern a matter either within the regulatory authority found in SDCL 46-2A-9 for approval or denial of the application, or other matter concerning

the application within the regulatory authority of the board to act upon as defined by SDCL 46-2-9 and 46-2-11, or both. Any person meeting the petitioner requirements and wishing to be a party of record in a contested case hearing shall file a written petition to oppose the application with BOTH the applicant and Chief Engineer. A petition opposing the application shall be filed on a form provided by the Chief Engineer. The petition form is available online at <https://danr.sd.gov/public> or by contacting the Chief Engineer. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501" or call (605) 773-3352. The applicant's mailing address is given above. If contesting the Chief Engineer's recommendation, the applicant shall also file a petition. A petition filed by either an interested person or the applicant must be filed by March 21, 2022.

The petition shall include a statement describing the unique injury upon approval of the application on the petitioner, the petitioner's reasons for opposing the application, and the name and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

Any interested person may file a comment on the application with the Chief Engineer. The comment shall be filed on a form provided by the Chief Engineer and is available online at <https://danr.sd.gov/public> or by calling (605) 773-3352 or writing the Chief Engineer at the address provided above. Filing a comment does not make the commenter a party of record or a participant in any hearing that may be held. Any comment must be filed by March 21, 2022.

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.

Published once at the total approximate cost of \$41.24.

**#915
Mar 10**

Schlaak, Karen

From: Schlaak, Karen
Sent: Friday, March 4, 2022 9:35 AM
To: peggycreekranch@sdplains.com
Subject: FW: Water Application No. 2010-1
Attachments: 2010-1corrected.docx

The Black Hills Pioneer contacted us regarding publication of your notice. Since they did not receive verification from you, they did not publish the notice on March 3, 2022. I have resent the notice to them for publication on March 10, 2022. **It is important that you contact them 605 642-2761 ASAP to authorize publication and arrange for payment.**

The Bison Courier did publish the notice.

I have called and left a phone message.

Karen

From: Schlaak, Karen
Sent: Thursday, February 17, 2022 4:18 PM
To: peggycreekranch@sdplains.com
Subject: Water Application No. 2010-1

Attached is a copy of the report, chief engineer recommendation and information regarding the public notice for your water permit application. As stated in the letter, please contact the paper(s) as soon as possible to authorize publication and arrange for payment. This information is being mailed to you today.

Karen Schlaak

DANR - Water Rights Program
(605) 773-3352
Website: <https://danr.sd.gov>



Schlaak, Karen

From: Schlaak, Karen
Sent: Friday, March 4, 2022 8:58 AM
To: courier@sdplains.com
Subject: 2010-1, Philip S Jerde
Attachments: 2010-1corrected.docx; FORM8.FRM.doc

Attached is a notice to be published on March 10, 2022.

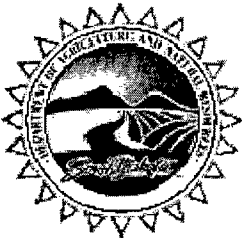
Bill the Water Rights Program for cost of publication.

Please send the affidavit or return the attached Proof of Publication form ASAP to the Water Rights Program, 523 E Capitol, Pierre SD 57501.

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

Karen Schlaak

DANR - Water Rights Program
(605) 773-3352
Website: <https://danr.sd.gov>



Schlaak, Karen

From: legals@bhpioneer.com
Sent: Thursday, March 3, 2022 9:15 AM
To: Schlaak, Karen
Subject: Re: [EXT] 2020-1, Philip S Jerde

I have pulled it! Thanks Karen.

On Mar 3, 2022, at 8:10 AM, Schlaak, Karen <Karen.Schlaak@state.sd.us> wrote:

Please pull it if you still can. It has an incorrect date within. Let me know

From: legals@bhpioneer.com <legals@bhpioneer.com>
Sent: Thursday, March 3, 2022 9:05 AM
To: Schlaak, Karen <Karen.Schlaak@state.sd.us>
Subject: Re: [EXT] 2020-1, Philip S Jerde

Good Morning Karen,

I haven't heard from this person to authorize payment and have tried calling him multiple times and I left a message. I will pull this legal as we are ready to print. Thanks.

On Feb 17, 2022, at 3:07 PM, Schlaak, Karen <Karen.Schlaak@state.sd.us> wrote:

Attached is a notice to be published on March 3, 2022.

Philip S Jerde, 13901 Zeona Rd, Reva SD 57651 (605 866-4888) 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 to the Water Rights Program, 523 E Capitol, Pierre SD 57501.

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

Karen Schlaak
DANR - Water Rights Program
(605) 773-3352
Website: <https://danr.sd.gov>

Schlaak, Karen

From: Schlaak, Karen
Sent: Friday, March 4, 2022 9:21 AM
To: Legals (legals@bhpioneer.com)
Subject: FW: 2010-1, Philip S Jerde
Attachments: 2010-1corrected.docx; FORM8.FRM.doc

I have called (left message as you did) and emailed the Jerde's that they need to contact you to authorize publication.

Attached is a notice to be published on March 10, 2022.

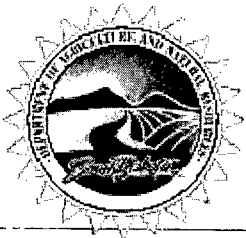
Philip S Jerde, 13901 Zeona Rd, Reva SD 57651 (605 866-4888) has been notified to contact you to authorize publication and arrange for payment.

Please send the affidavit or return the attached Proof of Publication form ASAP to the Water Rights Program, 523 E Capitol, Pierre SD 57501.

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

Karen Schlaak

DANR - Water Rights Program
(605) 773-3352
Website: <https://danr.sd.gov>



NOTICE OF APPLICATION NO. 2010-1 to Appropriate Water

Notice is given that Philip S Jerde, 13901 Zeona Rd, Reva SD 57651 has filed an application for a water permit to impound 81.7 acre-feet of water from runoff by constructing a dam located in the SE 1/4 SE 1/4 Section 33-T17N-R10E with water impounded in the SE 1/4, SE 1/4 SW 1/4 Section 33-T17N-R10E and the NW 1/4 NW 1/4 Section 3-T16N-R10E. This application requests impoundment of sufficient water to maintain water to the primary outlet elevation. The water is for fish and wildlife propagation, recreation, and livestock water purposes. The site of the dam is approximately 23 miles southwest of Bison SD.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 2010-1 with qualifications because 1) unappropriated water is available, 2) existing domestic water uses and water rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest as it pertains to matters within the regulatory authority of the Water Management Board. The Chief Engineer's recommendation with qualifications, the application, and staff report are available at <https://danr.sd.gov/public> or contact Ron Duvall for this information, or other information, at the Water Rights Program address provided below.

Any person interested in opposing this application or recommendation shall allege that the application, upon approval, will cause injury to the person that is unique from any injury suffered by the public in general. The injury must concern a matter either within the regulatory authority found in SDCL 46-2A-9 for approval or denial of the application, or other matter concerning the application within the regulatory authority of the board to act upon as defined by SDCL 46-2-9 and 46-2-11, or both. Any person meeting the petitioner requirements and wishing to be a party of record in a contested case hearing shall file a written petition to oppose the application with BOTH the applicant and Chief Engineer. A petition opposing the application shall be filed on a form provided by the Chief Engineer. The petition form is available online at <https://danr.sd.gov/public> or by contacting the Chief Engineer. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501" or call (605) 773-3352. The applicant's mailing address is given above. If contesting the Chief Engineer's recommendation, the applicant shall also file a petition. A petition filed by either an interested person or the applicant must be filed by March 21, 2022.

The petition shall include a statement describing the unique injury upon approval of the application on the petitioner, the petitioner's reasons for opposing the application, and the name and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

Any interested person may file a comment on the application with the Chief Engineer. The comment shall be filed on a form provided by the Chief Engineer and is available online at <https://danr.sd.gov/public> or by calling (605) 773-3352 or writing the Chief Engineer at the address provided above. Filing a comment does not make the commenter a party of record or a participant in any hearing that may be held. Any comment must be filed by March 21, 2022.

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.

Published once at the total approximate cost of__

Schlaak, Karen

From: Schlaak, Karen
Sent: Thursday, February 17, 2022 4:07 PM
To: Black Hills Pioneer Spearfish (legals@bhpioneer.com)
Subject: 2020-1, Philip S Jerde
Attachments: 2010-1public.short.docx; FORM8.FRM.doc

Attached is a notice to be published on March 3, 2022.

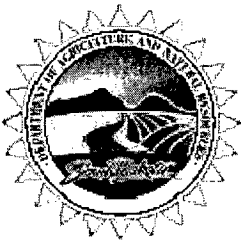
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Please send the affidavit or return the attached Proof of Publication form ASAP to the Water Rights Program, 523 E Capitol, Pierre SD 57501.

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

Karen Schlaak

DANR - Water Rights Program
(605) 773-3352
Website: <https://danr.sd.gov>



Schlaak, Karen

From: Schlaak, Karen
Sent: Thursday, February 17, 2022 4:06 PM
To: 'courier@sdplains.com'
Subject: 2020-1, Philip S Jerde
Attachments: 2010-1public.short.docx; FORM8.FRM.doc

Attached is a notice to be published on March 3, 2022.

Philip S Jerde, 13901 Zeona Rd, Reva SD 57651 (605 866-4888) 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 to the Water Rights Program, 523 E Capitol, Pierre SD 57501.

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

Karen Schlaak
DANR - Water Rights Program
(605) 773-3352
Website: <https://danr.sd.gov>





**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

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

February 18, 2022

Philip S Jerde
13901 Zeona Rd
Reva SD 57651

Dear Mr. Jerde:

Water Permit Application No. 2010-1 for fish & wildlife propagation, recreation and livestock water use have been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice has been sent to the Bison Courier printed at Bison SD (Ph # 605 244-7199) and the Black Hills Pioneer printed at Spearfish SD (Ph # 605 642-2761). You will need to contact the newspapers and authorize publication of this notice. For your information, a copy of the notice, the recommendation of the Chief Engineer and report on the application are enclosed. Please review the notice prior to publication and notify this office, if you have any corrections or questions.

Be sure to contact the above newspapers to authorize publication of your Notice and to arrange for payment. Early contact with the papers can eliminate delays. Upon receiving authorization from you, the publishers have been instructed to publish your notice. The newspapers have 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,

Karen Schlaak

Karen Schlaak
Water Rights Program
(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.

NOTICE OF APPLICATION NO. 2010-1 to Appropriate Water

Notice is given that Philip S Jerde, 13901 Zeona Rd, Reva SD 57651 has filed an application for a water permit to impound 81.7 acre-feet of water from runoff by constructing a dam located in the SE 1/4 SE 1/4 Section 33-T17N-R10E with water impounded in the SE 1/4, SE 1/4 SW 1/4 Section 33-T17N-R10E and the NW 1/4 NW 1/4 Section 3-T16N-R10E. This application requests impoundment of sufficient water to maintain water to the primary outlet elevation. The water is for fish and wildlife propagation, recreation, and livestock water purposes. The site of the dam is approximately 23 miles southwest of Bison SD.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 2010-1 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 <https://danr.sd.gov/public> or contact Ron Duvall 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 March 14, 2022.

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.

Published once at the total approximate cost of _

March 28, 2022

PAYMENT REQUEST FORM

PAYEE: Philip S Jerde
13901 Zeona Rd
Reva, SD 57651

FROM: DANR Water Rights Program
523 E. Capitol Ave
Pierre, SD 57501-3181

DESCRIPTION OF SERVICE, PRODUCE OR TRANSFER

Refund-Over Payment for Application/License Fee

AMOUNT: \$250.00

FUNDING SOURCE:

GENERAL: X

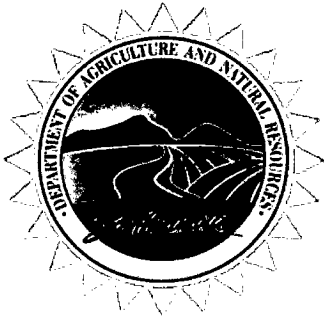
FEDERAL:

OTHER:

COMMENTS:

AUTHORIZATION: *Eui Munkun* 3/28/2022

I declare and affirm under the penalties of perjury that this claim is in all things, true and correct.
I further agree to comply with the provisions of the Civil Rights Act of 1964 and regulations issued thereunder relating to nondiscrimination in federal assisted programs.



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

MAR 30 2022

Philip S Jerde
13901 Zeona Rd
Reva SD 57651

Dear Mr. Jerde:

Enclosed is Water Permit No. 2010-1 authorizing construction of your water diversion system and beneficial use of the water, not exceeding the limits as specified in the Water Permit.

An application/license filing fee of \$950.00 was submitted with the application. The correct fee for this permit is \$700.00. \$250.00 will be refunded to you. The refund check should be received within the next couple of weeks.

A 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 information 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,


Eric Gronlund, Chief Engineer
Water Rights Program
605 773-3352

enclosures

2010-1
RECEIVED

SEP 29 2022

OFFICE OF
WATERNOTICE OF COMPLETION OF WORKS AND
APPLICATION OF WATER TO BENEFICIAL USEDate SEPTEMBER 23RD, 2022TO: Water Rights Program, DANR
523 E. Capitol
Pierre, SD 57501-3181FROM: PHILIP S. JERDE
(name)
13901 ZEONA ROAD
(address)
REVA, SD 57651 605.866.4888
(city, state, zip) (phone)

I have completed the construction of the water use system and I have put the water to beneficial use to the maximum extent it is going to be used.

Water Permit No. 2010-1 states that the water use system is to be constructed by MARCH 21, 2027, and water is to be put to beneficial use by MARCH 21, 2031.
(date) (date)

The water use system was completed on SEPT 20, 2022.
(date)

Applying the water to beneficial use was completed on SEPT 20, 2022.
(date)

You may schedule an investigation so that the water license may be issued.

Philip S. Jerde
(signature)
PHILIP S. JERDE





**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

September 30, 2022

2010-1

Philip S Jerde
13901 Zeona Rd
Reva SD 57651

Dear Mr. Jerde:

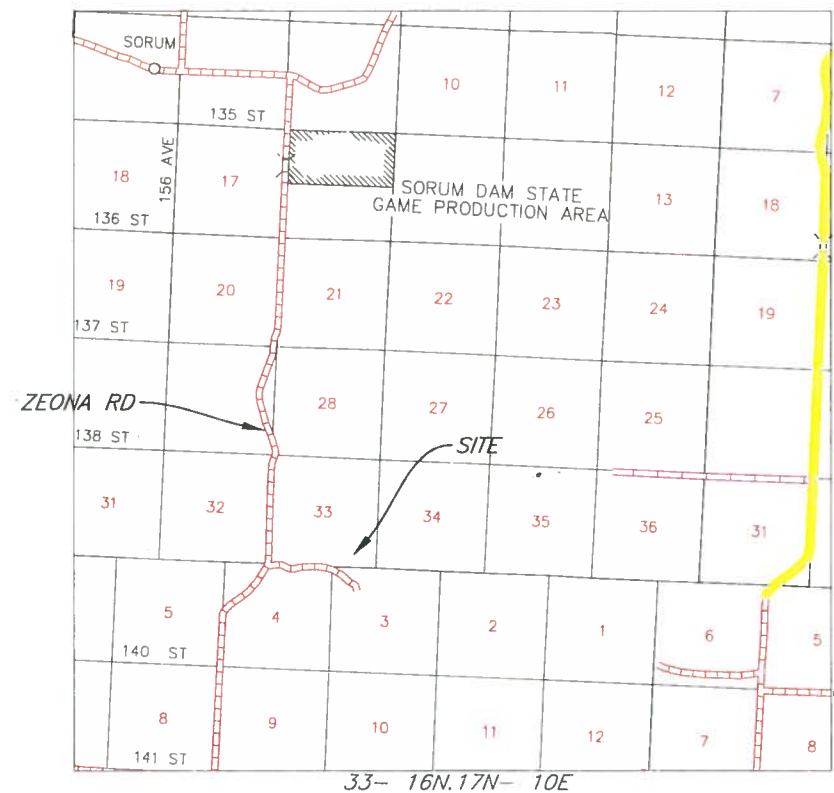
I am writing to acknowledge receipt of the "Notice of Completion of Works" form that you sent in to let us know that you are completed with project authorized under Water Permit No. 2010-1.

The system is now ready for inspection. Inspections are done on a county-by-county basis as staff time permits. You have done everything you need to do and the intervening time between the completion of your project and the staff inspection has no bearing on your water permit.

Someone from our office will contact you prior to the inspection to set up a time that is convenient for you. If you have any questions, please contact me.

Sincerely,

Genny McMath
Water Rights Program
(605) 773-3352
email: genny.mcmath@state.sd.us



Perkins County, South Dakota

LOCATION MAP

GENERAL 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.

CONSTRUCTION NOTES

1. Clear and grub the entire area within the work limits.
2. 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-75.
3. Any shale, gravel, or sand that is exposed during borrow operations shall be immediately backfilled with 2 feet of clay material.
4. Six inches topsoil will be incorporated into the earthfill to meet the neat lines shown on the typical section.
5. All areas top-dressed with topsoil and disturbed during construction will be seeded according to SD Construction Specification SD-28.

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

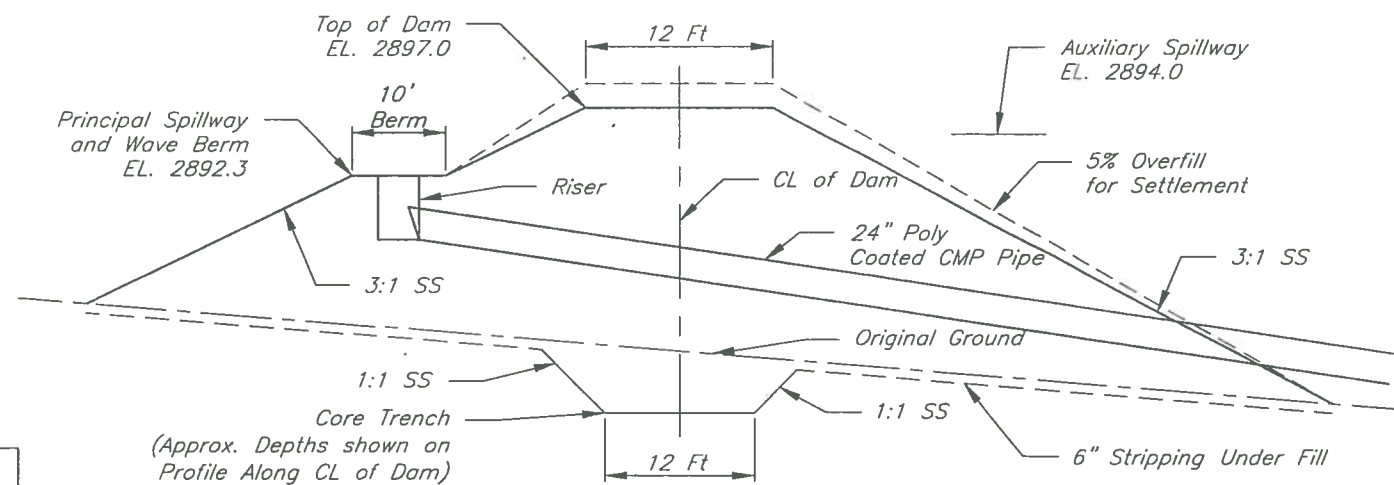
NRCS HAZARD CLASS A
NRCS JOB CLASS IV

SD CONSTRUCTION AND MATERIAL SPECIFICATIONS

SD-4 Stripping
SD-5 Excavation
SD-75 Earthfill - Class S
SD-8 Rock Riprap and Bedding
SD-9 Drain Fill and Filter
SD-10 Salvaging And Spreading Topsoil
SD-12A Concrete (Class 3500)
SD-13 Steel Reinforcement
SD-14 Wood and Steel Structures
SD-28 Seeding
SD-55 Plastic Pipe
SD-95 Geotextile
SD-592 Geotextile
For A Full Text Version See
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/sd/technical/engineering/?cid=nrcs141p2_036575

TABLE OF QUANTITIES

ITEM	UNIT	QUANTITY	AS-BUILT
Earthfill Class S - Embankment	Cu. Yd.	15066	15423
Earthfill Class S - Core Trench	Cu. Yd.	2210	
Earthfill Class S - Stripping	Cu. Yd.	1231	
Total Earthfill	Cu. Yd.	18507	20641
Principal Spillway Pipe			
24" Dia. Poly Coated CMP	Lin. Ft.	70	70
48" Dia. 4 Tall Riser and Base	Each	1	1
with Trash Rack and Baffle	Each	1	1
Drainage Diaphragm (Sand)	Each	1	1
Timber Pipe Support	Each	1	1



TYPICAL CROSS SECTION OF DAM

INDEX OF DRAWINGS

1. Cover Sheet
2. Plan View and Design Data
3. Principal Spillway and Aux Spillway Profiles
4. Max Cross Section and Embankment Profile
5. Borrow Pit Profiles
6. Principal Spillway Outlet Berm Channel
7. Precast Riser
8. Trash Rack
9. TPS

Asbuilts in red and
completed by Lander Legge
10/31/2023

STATEMENT OF COMPLIANCE

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

JAA

Date

POND WITH PRINCIPAL SPILLWAY PIPE
JOB PLAN 1.0P REV. 4/2016

Designed L. Legge 09/14/21
Drawn L. Legge 09/14/21
Checked
Approved

JERDE DAM
POND
COVER SHEET

United States
Department of
Agriculture
USDA
Natural Resources
Conservation Service

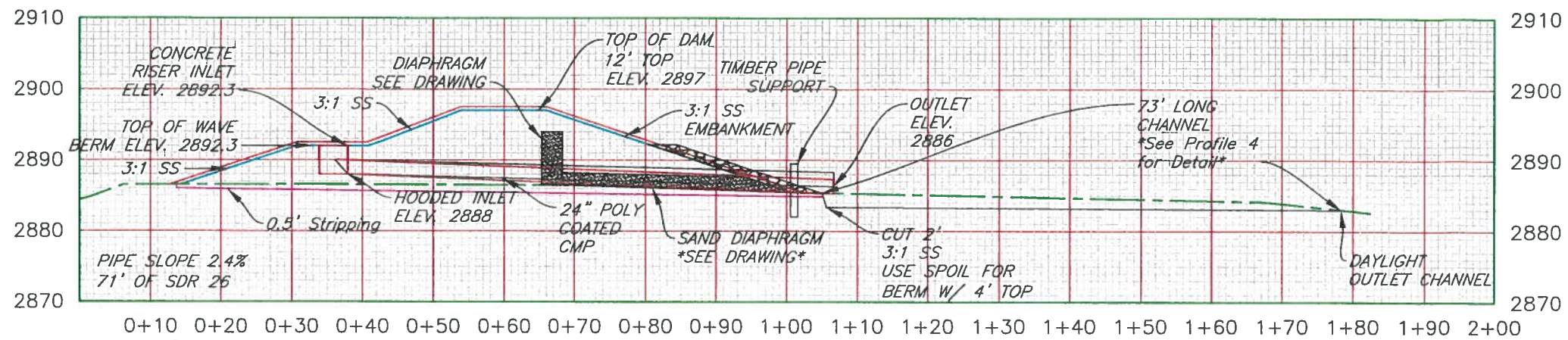
File No.
JerdeASBUILT.dwg

Drawing No.

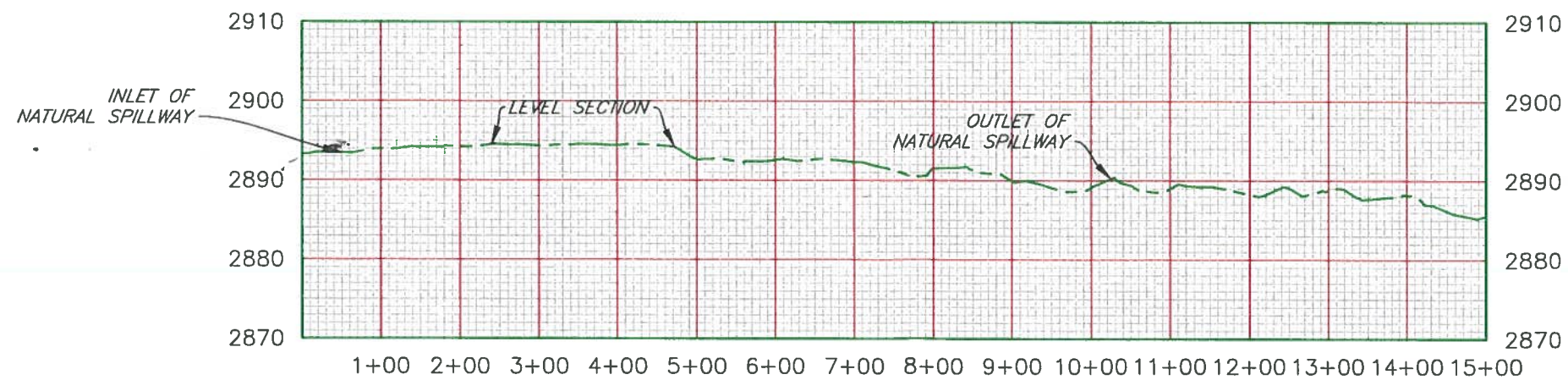
10/31/23 12:01
Sheet PM of

Perkins County, South Dakota

33- 16N.17N- 10E



PRINCIPAL AND OUTLET CHANNEL PROFILE



Aux Spillway PROFILE

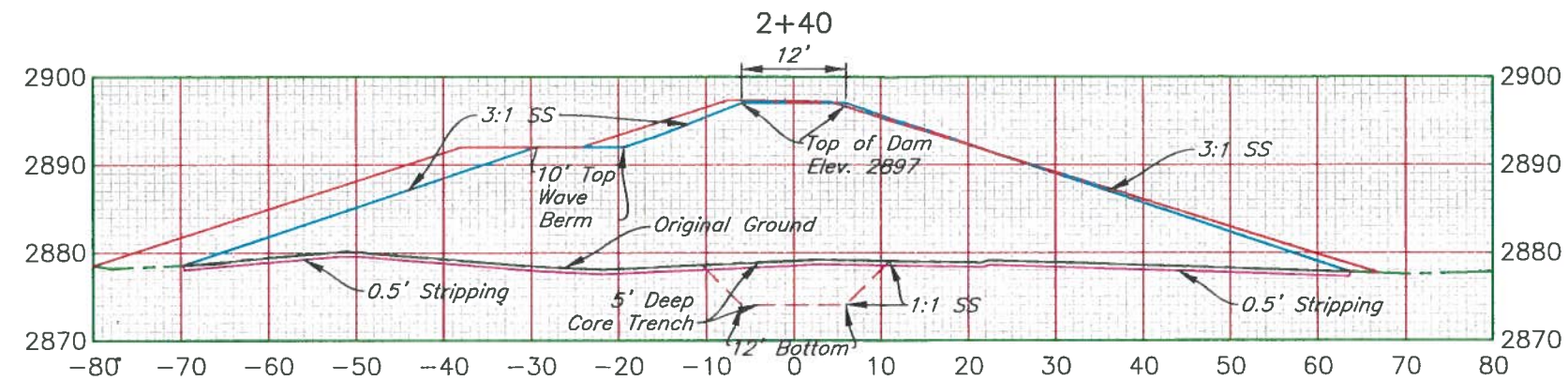
Asbuilts in Red

Designed	L. Legge	Date	09/14/21
Drawn	L. Legge		09/14/21
Checked			
Approved			

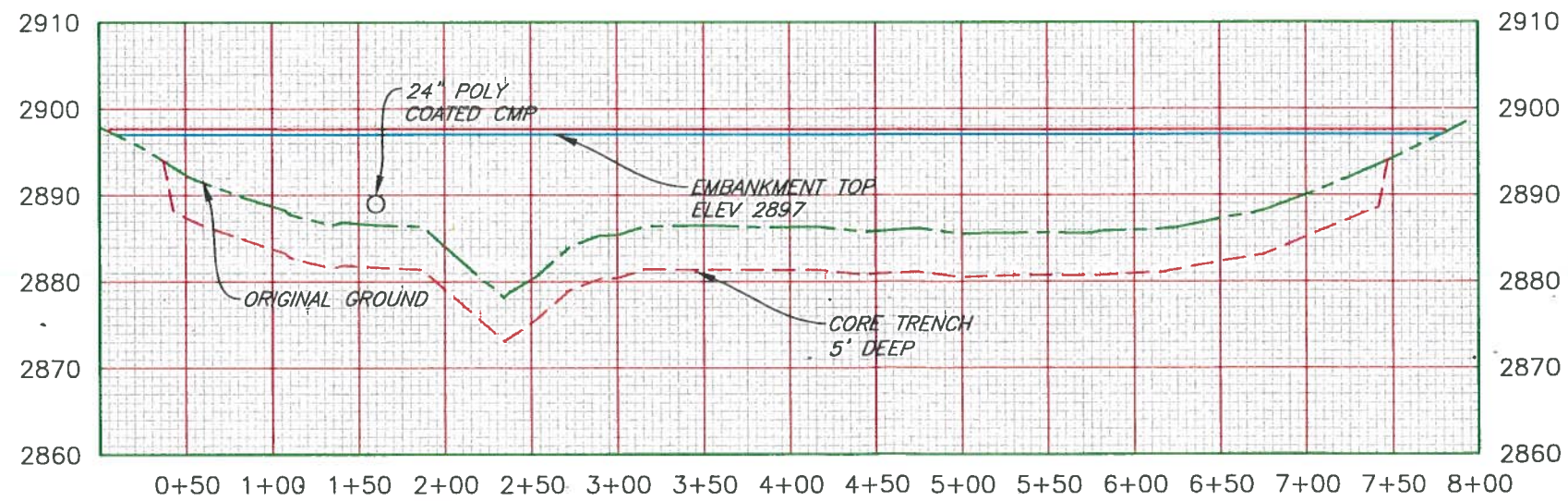
JERDE DAM
POND
PRINCIPAL SPILLWAY AND AUX. SPILLWAY PROFILE
Perkins County, South Dakota
33- 16N.17N- 10E



File No.	JerdeASBUILT.dwg
Drawing No.	
10/31/23 12:01	
Sheet PM of	



MAX. CROSS SECTION OF DAM



EMBANKMENT PROFILE

Asbuilts in Red

Asbuilts in Red

Designed L. Legge 09/14/21
 Drawn L. Legge 09/14/21
 Checked
 Approved

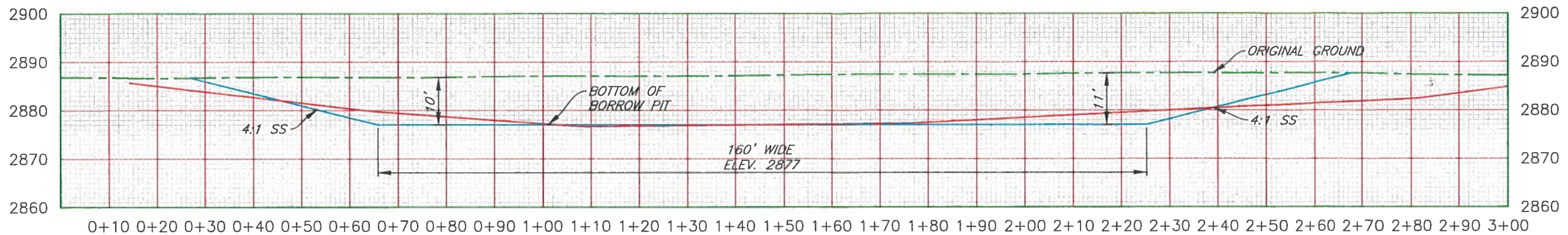
JERDE DAM
 POND
 MAX CROSS SECTION AND EMBANKMENT PROFILE
 33- 16N.17N- 10E
 Perkins County, South Dakota

United States
 Department of
 Agriculture
 USDA
 Natural Resources
 Conservation Service

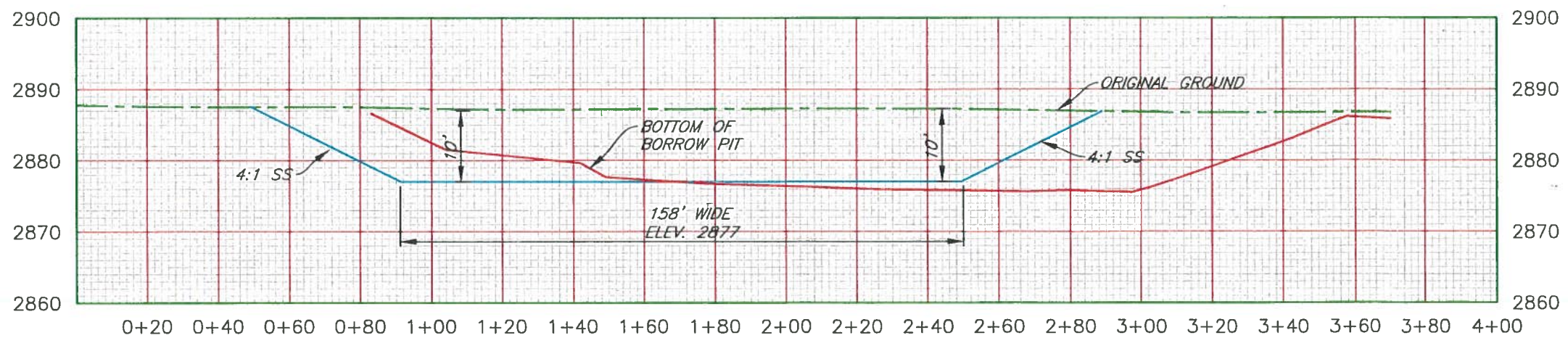
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Drawing No.

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BORROW PIT N-S PROFILE



BORROW PIT E-W PROFILE

Asbuilts in Red

Date 09/14/21
 Designed L. Legge
 Drawn L. Legge
 Checked
 Approved

JERDE DAM
 POND
 BORROW PIT PROFILES

Perkins County, South Dakota

33- 16N.17N- 10E

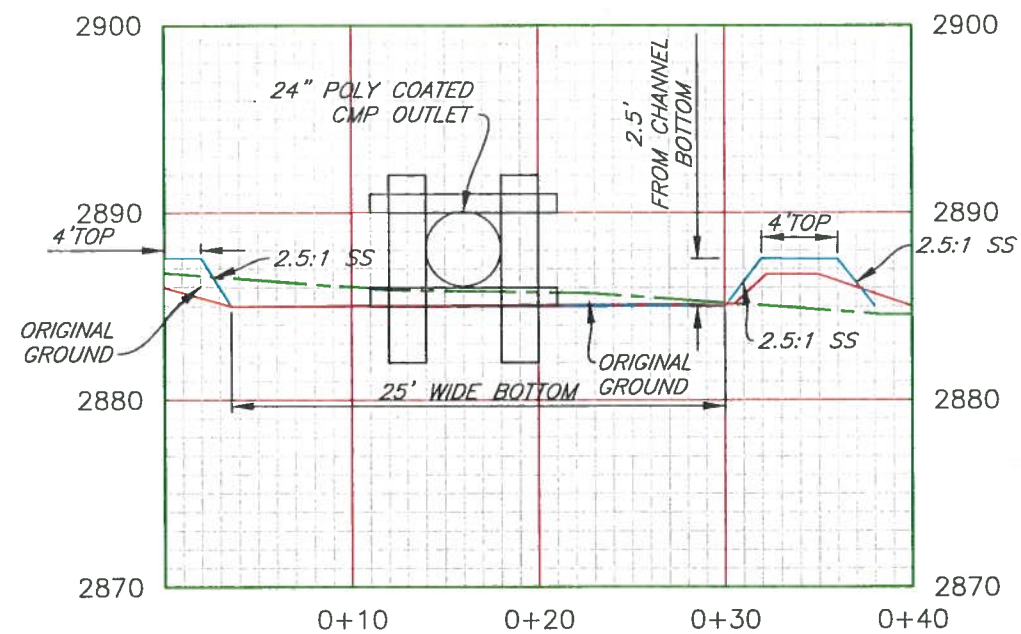
United States
 Department of
 Agriculture
 USDA
 Natural Resources
 Conservation Service

File No.
 JerdeASBUILT.dwg

Drawing No.

10/31/23 2:59 PM
 Sheet of

Asbuilts in Red
 BORROW PIT PROFILE 1 & 2



Principal Outlet Channel and Berm PROFILE

Designed	L. Legge	Date	09/14/21
Drawn	L. Legge		09/14/21
Checked			
Approved			

JERDE DAM
POND
BORROW PIT PROFILES

33- 16N.17N- 10E

Perkins County, South Dakota



File No.
JerdeASBUILT.dwg

Drawing No.

10/31/23 2:59 PM
Sheet of .

Asbuilts in Red
PRINCIPAL SPILLWAY OUTLET CHANNEL