

WATER PERMIT NO. 1974-1

Name of Applicant: **Brodie Limpert**

Address: **14105 Limpert Rd, Buffalo SD 57720**

Phone: **605 641-5155**

Amount of Water Claimed: **172 AF**

Total Acres: **NA**

Source of Water Supply: **runoff – Wolf Creek**

Water to be used for: **fwp, rec, livestock**

County: **Harding**

Type of Waste Disposal System:

Location: **14 miles southeast of Buffalo**

PRIORITY Date Received: **11-27-17**

Application/License Fee: **\$ 950**

Corrected Application Received: **2-8-17**

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

Remarks:

Diversion Point: **approximate center of the S 1/2**

Sec 17-T16N-R7E

Land to be Irrigated: **NA**

Depth of Well: **NA**

Well Driller:

Remarks:

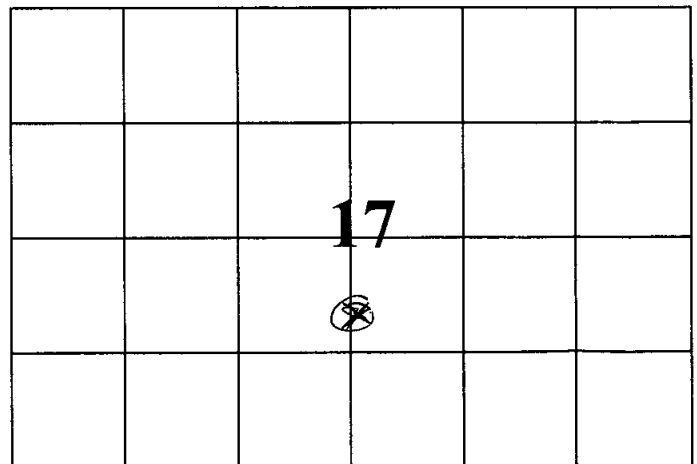
Type of Map: **aerial**

Prepared by:

Reviewed and the Number Assigned on: **2-9-18**

By: **Karen Schlaak**

Notice of Hearing - date to intervene: _____



FORM 2: Application for uses other than irrigation
(type or print)RECEIVED
NOV 27 2017
WATER RIGHTS
PROGRAM

Mail to: DENR - Water Rights 523 E Capitol Ave Pierre, SD 57501-3182 ph. (605) 773-3352	No. <u>1974-1</u>	(office use only) Hydrologic Unit <u>10130305</u>
	Basin <u>Moreau River</u>	
	Newspaper <u>Nation Center News, Buffalo</u>	
	<u>Black Hills Pioneer, Spearfish</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.)

- Name to Appear on Water Permit Broder Limpert
Mailing Address 14105 Limpert Rd Buffalo SD 57720
(Address) (City) (State) (Zip Code)
Phone (605) 641-5155 Mobile _____ Email slimbutter@hotmail.com
- Amount of water claimed _____ *CFS or _____ **GPM and 172 ***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)
- Source of water supply Runoff - Wolf Creek
- Location of point of diversion S 1/2 Section 17, T 16 N, R 7 E County Harding
(example - 3 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 ☒ No
If "Yes," where will water be used? Water Impounded: NE 1/4 SW 1/4, NW 1/4 SE 1/4, W 1/2 NW 1/4, SW 1/4 NE 1/4
(example - NW 1/4 section 12-T104N-R53W) Sec 17 - T16N-R7E
- County or counties where water will be used Harding
- Annual period during which water is to be used Year round Jan 1 - Dec 31
- 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)
Construct an earthen dam on Wolf Creek in Harding county. Spillway will be a 24 foot wide cable concrete lined channel, transitioning into a 40 foot wide permanent high velocity lined geotextile channel. Design plans, calculations, and specification are attached.

I, Broder Limpert, 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.

SOUTH DAKOTA
WATER PERMIT NO. 1974-1

Date of first receipt of application November 27, 2017.

Date of return to applicant for corrections, amendments or changes November 27, 2017.

Date of receipt of corrected application February 8, 2018.

The Chief Engineer, on behalf of the Water Management Board, issues Water Permit No. 1974-1 to Brodie Limpert, 14105 Limpert Rd, Buffalo SD 57720 and SD School and Public Lands, State Capitol, Suite 212, 500 E Capitol Ave, Pierre SD 57501 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. 1974-1 authorizes impoundment of 172 acre-feet of water from runoff into Wolf Creek by constructing a dam located in the approximate center of the S 1/2 Section 17 with water impounded in the NE 1/4 SW 1/4, NW 1/4 SE 1/4, W 1/2 NW 1/4 and SW 1/4 NE 1/4 Section 17; all in T16N-R7E which is approximately 14 miles southeast of Buffalo SD.
2. The water appropriated shall be used for the purpose of fish and wildlife propagation, recreation and livestock water and may not exceed the amount of water needed for beneficial use.
3. The water is to be used during the following described annual period: January 1 – December 31.
4. The date of approval of Permit No. 1974-1 is May 14, 2018.
5. The date from which applicant may claim right is February 8, 2018.
6. One-fifth of the construction is to be completed on or before November 14, 2020.
7. All construction is to be completed on or before May 14, 2023.
8. Water is to be put to beneficial use on or before May 14, 2027.
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. 1974-1 authorizes an impoundment with a storage capacity of 172 acre feet of water.
2. Low flows as needed for downstream domestic use, including livestock water and prior water rights must be by-passed.

WATER MANAGEMENT BOARD

By: 

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

MAY 17 2018

date



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:

Roy Boschee
NRCS
414 E. Stumer Rd, ste 700
Rapid City, SD, 57701
(605) 858-6694

b) Freeboard 2.5 at full spillway flow

c) Crest Width 14

Crest Length 923

d) Height 22 Feet

e) Primary Outlet Capacity 2659 CFS

If pipe, diameter ____

f) Secondary Spillway Capacity ____

Spillway Width 24

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

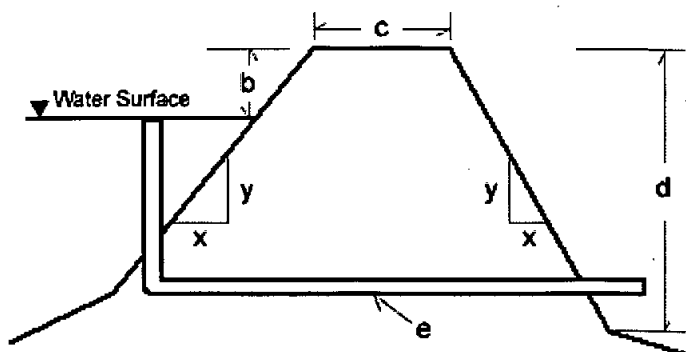
Upstream 3:1

Downstream 3:1

h) Surface Area of Impoundment 30.8

i) Storage 172.0 Acre Feet

j) Drainage Area Above Dam 5,924.0 Acres



Sec 7
T016N
R07E

Sec 8
T016N
R07E

Sec 9
T016N
R07E

Sec 18
T016N
R07E

Sec 17
T016N
R07E

Sec 16
T016N
R07E

Sec 19
T016N
R07E

Sec 20
T016N
R07E

Sec 21
T016N
R07E



PIS REVIEW

WATER PERMIT APPLICATION No. 1974-1

4/10/18

AT

TOP OF DAM ELEV. 2922 }
 SPILLWAY ELEV. 2916 } Ht = 22 FT CATEGORY 3
 1/2 TOE ELEV. 2900 }

NORMAL STORAGE CAPACITY = 172 AF

MAX. STORAGE CAPACITY = 410.3 AF

EFF. HT. X NORMAL CAPACITY = $16 \times 172 = 2752 < 3000 \therefore$ 25 YR MIN. SPILLWAY DESIGN

FROM USGS WRI 98-4055 "TECH. FOR EST. PEAK FLOW IN SD"

REGION: C BA = 5924 ac. = 9.3 mi²

$$Q_{25} = 207 CA^{0.573}$$

$$= 207(9.3)^{0.573}$$

$$= 743 \text{ cfs}$$

$$Q_{100} = 379 CA^{0.566}$$

$$= 379(9.3)^{0.566}$$

$$= 1,339 \text{ cfs}$$

SPILLWAY CAPACITY - THE NRCS ROUTES A Q50 PEAK OF 1,064 cfs THRU THE SPILLWAY GETTING A DISCHARGE OF 921 cfs AND USING 3.5 ft OF HEAD, LEAVING 2.5 FT OF FREEBOARD AVAILABLE

$$\text{MANNING EQ} = Q = VA = 9.23 \times 288 = 2658 \text{ cfs}$$

$$\text{OR } Q = A \left(\frac{1.486}{n} \right) R^{2/3} S^{1/2} = 288 \left(\frac{1.486}{.04} \right) (3.92)^{2/3} (.01)^{1/2} = 2661 \text{ cfs}$$

NRCS ANNUAL YIELD (CN=72 BA=5924 ISO = 1/2) SECTIONS 74:02:08:09

$$80\% \text{ chance} = 0.058$$

$$\left(\frac{0.058 \times 5924}{12} \right) = 29 \text{ AF}$$

$$50\% \text{ chance} = 0.18$$

$$\left(\frac{0.18 \times 5924}{12} \right) = 89 \text{ AF}$$

$$10\% \text{ chance} = 1.1$$

$$\left(\frac{1.1 \times 5924}{12} \right) = 543$$

1. TOPO MAP

7. SPILLWAY DETAILS OK

2. DAM AWS PROFILE OK

8. SPECS

OK

3. DAM MAX. X SEC. OK

9. EPP

(NOT NEEDED FOR CAT 3 DAM)

OK

4. AREA CAPACITY OK

5. OUTLET DETAILS OK

6. SPILLWAY RADIUS OK

RECEIVED

NOV 27 2017

WATER RIGHTS
PROGRAM

Brody Limpret Pond

S1/2 17 – T 16N – R7E

Harding County



Design Summary:

The pond is located in the South One-half of Section 17, Township 16 North, Range 7 East, Harding County and is located on Wolf Creek. The dam is approximately 2 miles north of the North Fork Moreau River. No structures are located in this area.

The drainage to the location of the embankment is 5924 acres (9.26 sq. mi) of native range with a runoff curve number of 72. The average watershed slope is 5.2 percent.

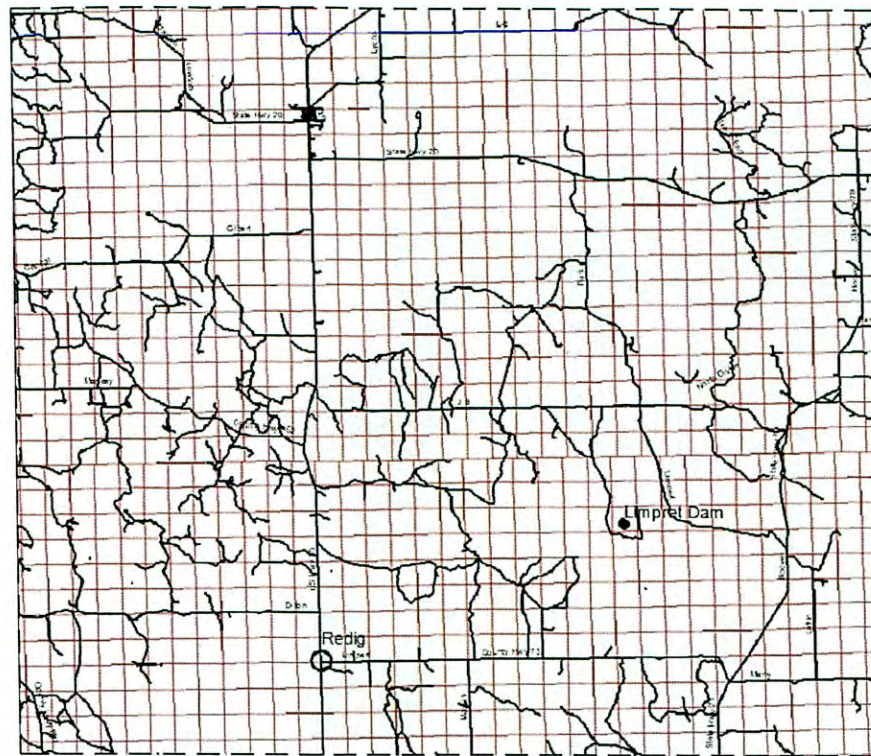
The pond will have a maximum depth of 16 feet and overall surface at the spillway elevation is 30.8 acres with 172 acre feet of storage and the top of dam surface area will be 51 acres with 410. acre feet of storage.

The planned spillway was designed base on the 50 – year, 24 – hour storm event producing a watershed discharge of 1064 cfs. The spillway will consist of a 24 foot wide cable concrete lined chute transitioning into a 40 foot wide turf reinforcement lined channel. Maximum discharge for the design storm is calculated at 921 cfs.

The embankment has a top width of 14 feet and has a 16 foot wide wave berm. The calculated freeboard of the pond under full flow conditions of the spillway will be 2.5 feet.

Soil borings were completed along the centerline of the dam and in the borrow area. Samples were sent to the NRCS Soils Laboratory in Lincoln, Nebraska.

NRCS personnel will be onsite during the construction of the core trench and the spillway.



S1/2, Sec 17, T 16N, R7E
Harding 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-7S.
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.
6. Engineer will be notified and be onsite during the construction of the core trench, cable concrete, and the erosion control mat.

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 V

SD CONSTRUCTION AND MATERIAL SPECIFICATIONS

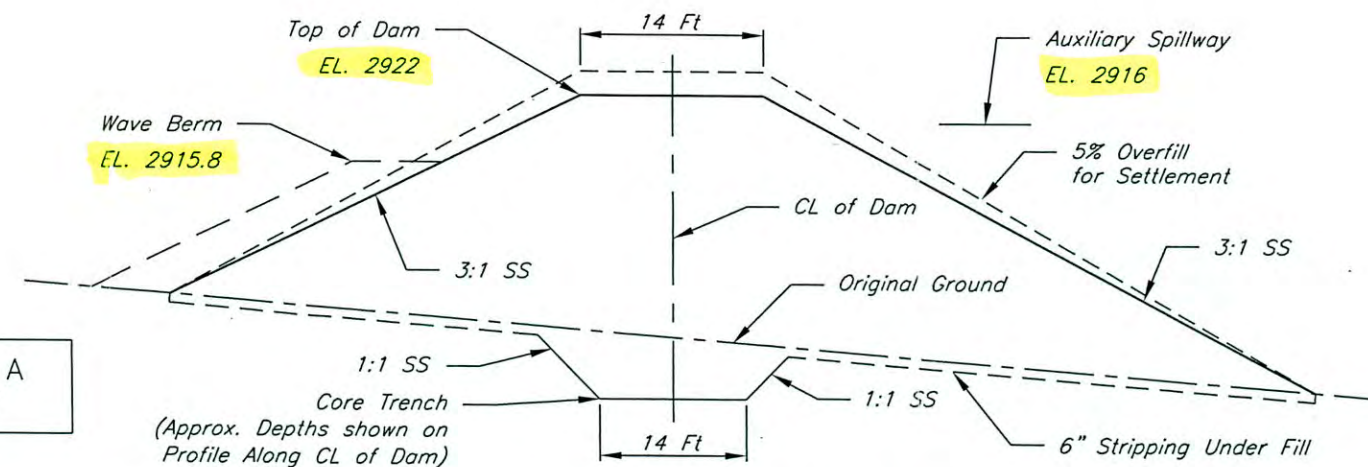
SD-4 Stripping
SD-5 Excavation
SD-7S Earthfill - Class S
SD-10 Salvaging And Spreading Topsoil
SD-28 Seeding

SD-_____
SD-_____
SD-_____
SD-_____
SD-_____
SD-_____

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.	29564	
Earthfill Class S - Core Trench	Cu. Yd.	835	
Earthfill Class S - Stripping	Cu. Yd.	1245	
Total Earthfill	Cu. Yd.	31644	
Topsoil Auxiliary Spillway	Cu. Yd.	436	
Seeding (Earthfill and Auxiliary Spillway)	Acre	1.0	



TYPICAL CROSS SECTION OF DAM

INDEX OF DRAWINGS

1. Cover Sheet
2. Plan View and Design Data
3. Profile of Dam and Spillway and Cross-Section of Spillway
4. Spillway Detail
5. _____
6. _____
7. _____
8. _____
9. _____

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 REB 11/09/2017
Drawn REB 11/09/2017
Checked P.F. 11/14/17
Approved [Signature] 11/14/17

NAME: BRODY LIMPRET
378 POND
COVER SHEET

S1/2, Sec 17, T 16N, R7E

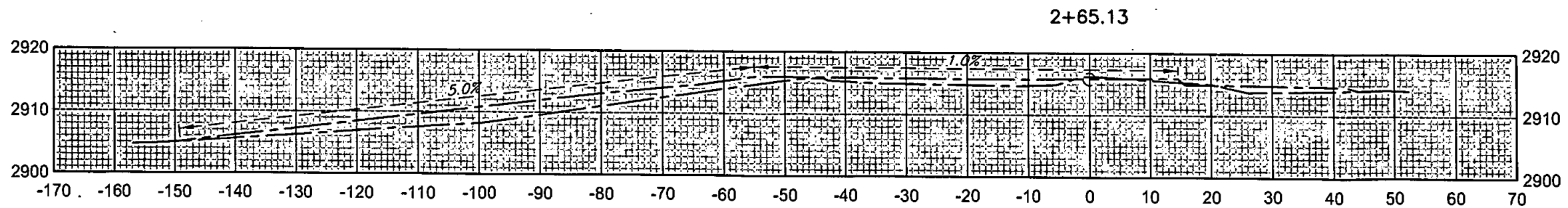
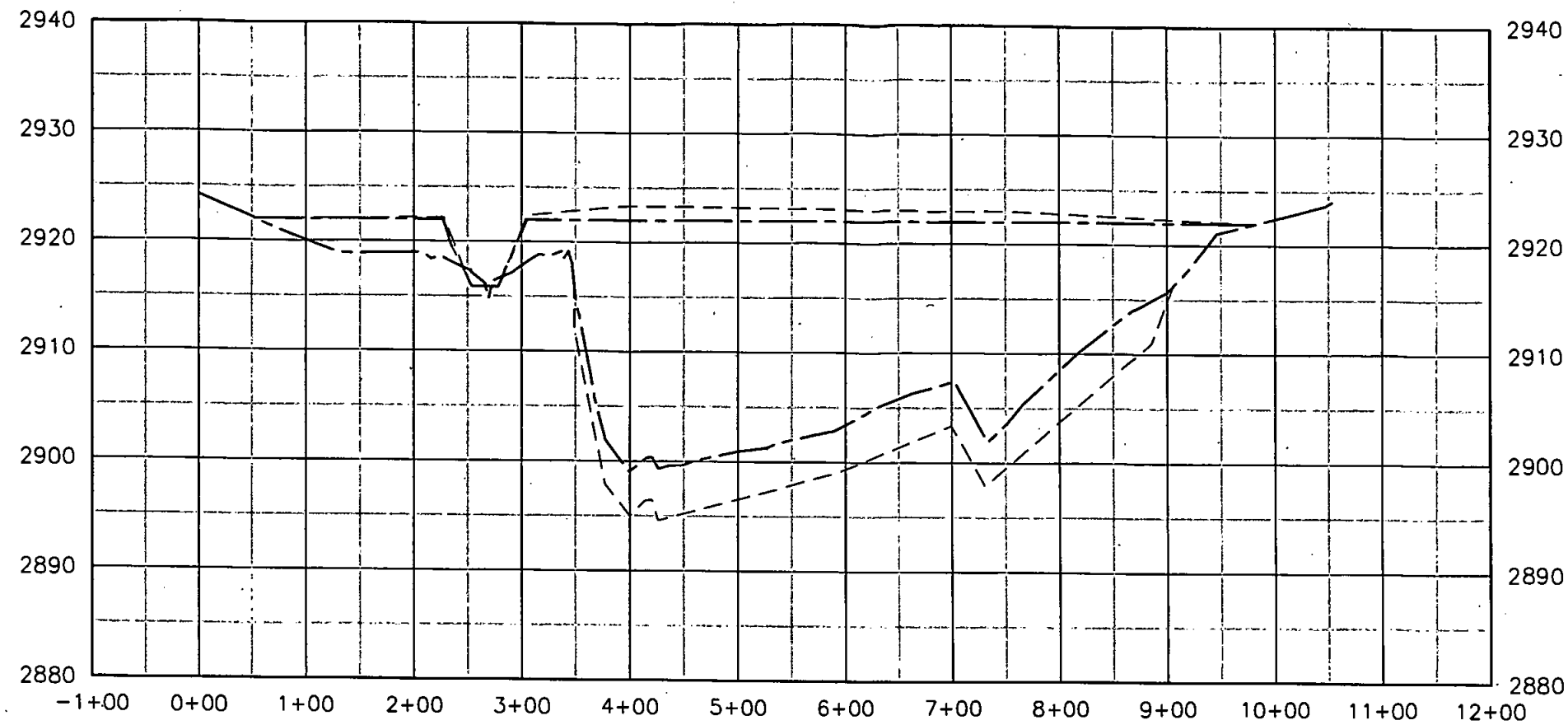
Harding County, South Dakota

United States
Department of
Agriculture
USDA
Natural Resources
Conservation Service

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Drawing No.
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Sheet 1 of 1



CENTERLINE PROFILE OF SPILLWAY

PROFILE OF DAM AND SPILLWAY AND
CROSS-SECTION OF SPILLWAY

United States
Department of
Agriculture
Natural Resources
Conservation Service

File No.
BLimpretFinal.dwg

Drawing No.

11/14/17 8:13 AM
Sheet 3 of

NAME: BRODY LIMPRET
378 POND
PROFILES AND CROSS-SECTIONS OF DAM AND SPILLWAY

S1/2, Sec 17, T 16N, R7E

Harding County, South Dakota

Designed REB 11/09/2017
Drawn REB 11/09/2017
Checked PIF 11/14/17
Approved [Signature] 11/14/17

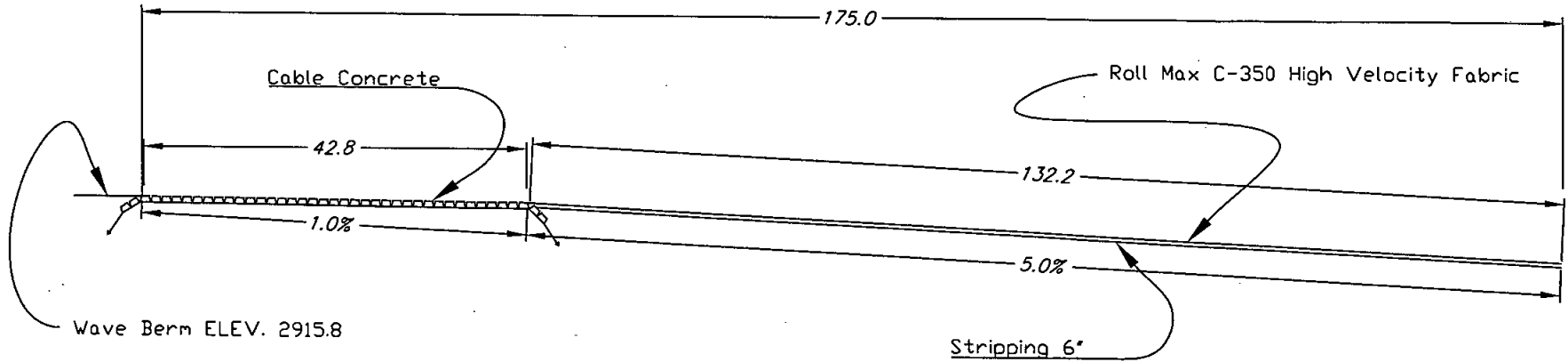
Limporet
Spillway Detail

TABLE OF QUANTITIES			
Item	Unit	Quantity	As-Built Quantity
Excavation	cubic yard		
Cable Concrete	SQFT	3,072	
Anchors	EA.		
Roll Max c-350 High Velocity Fabric	SQFT	4,800	
Staples	EA.		
Stripping	Cubic yard	146	

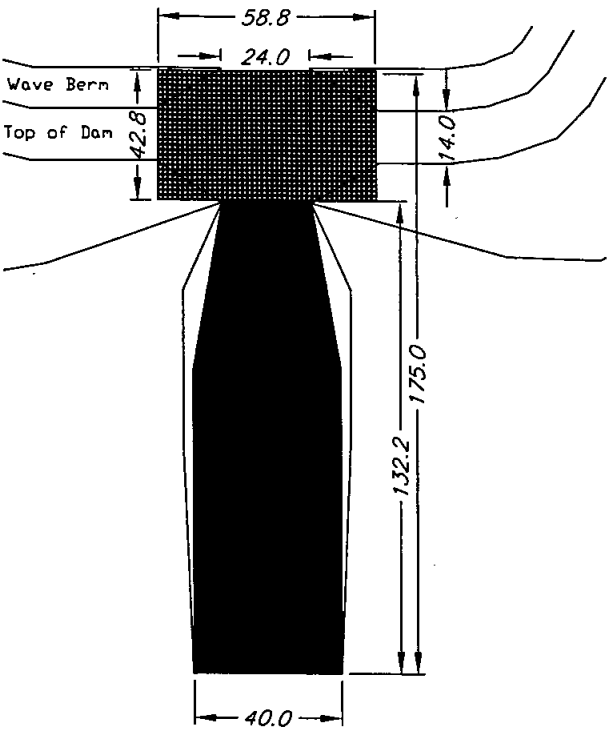
See Manufacturers Recommendations for Anchor & Staple
placement and Quantity.

LOCATION MAP

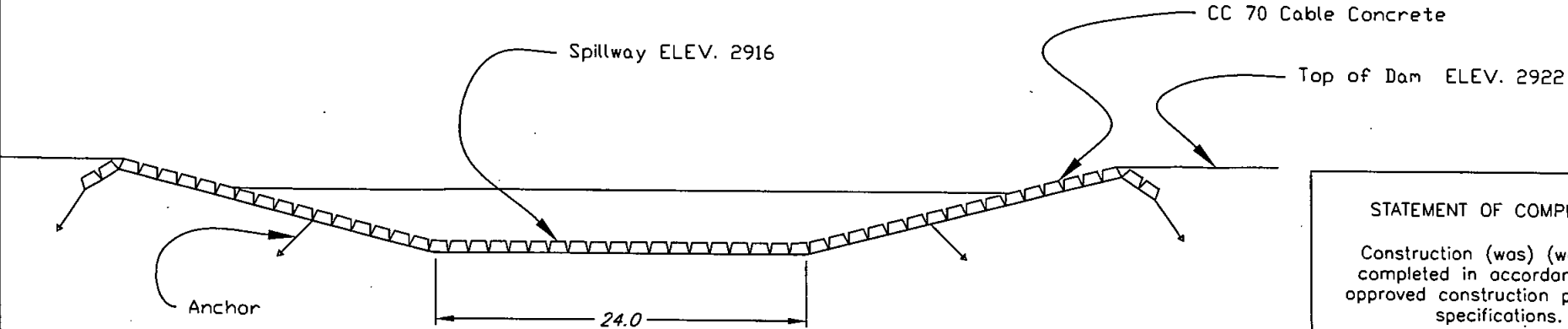
Harding County
Sec. 17 T16N R7E



Spillway Profile



Spillway Plan View



Spillway Cross Section

STATEMENT OF COMPLIANCE

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

JAA _____ Date _____

SD CONSTRUCTION AND MATERIAL SPECIFICATIONS

SD-2 CLEARING AND GRUBBING

SD-4 STRIPPING

SD-5 EXCAVATION

SD-10 SALVAGING AND SPREADING TOPSOIL

SD-12B CONCRETE FOR MINOR STRUCTURE

SD-28 SEEDING

SD-96 SILT FENCE

For a full text version of the specifications see http://www.sd.usda.gov/technical/SD_Engineering.html

NOTE: No excavator may begin any excavation without first notifying the ONE-CALL Notification center at 1-800-781-7474

United States
Department of
Agriculture
USDA
Natural Resources
Conservation Service

File No.
General_Template.dwg
Drawing No.
11/13/17 3:48 PM
Sheet 1 of 1

Spillway Detail

Limporet Project, 1/2, S 17, T16N, R7E
Harding County, South Dakota
Date 11/13/17
Designed P/JF
Drawn P/JF
Checked P/JF
Approved: [Signature] 11/14/17

NRCS JOB CLASS

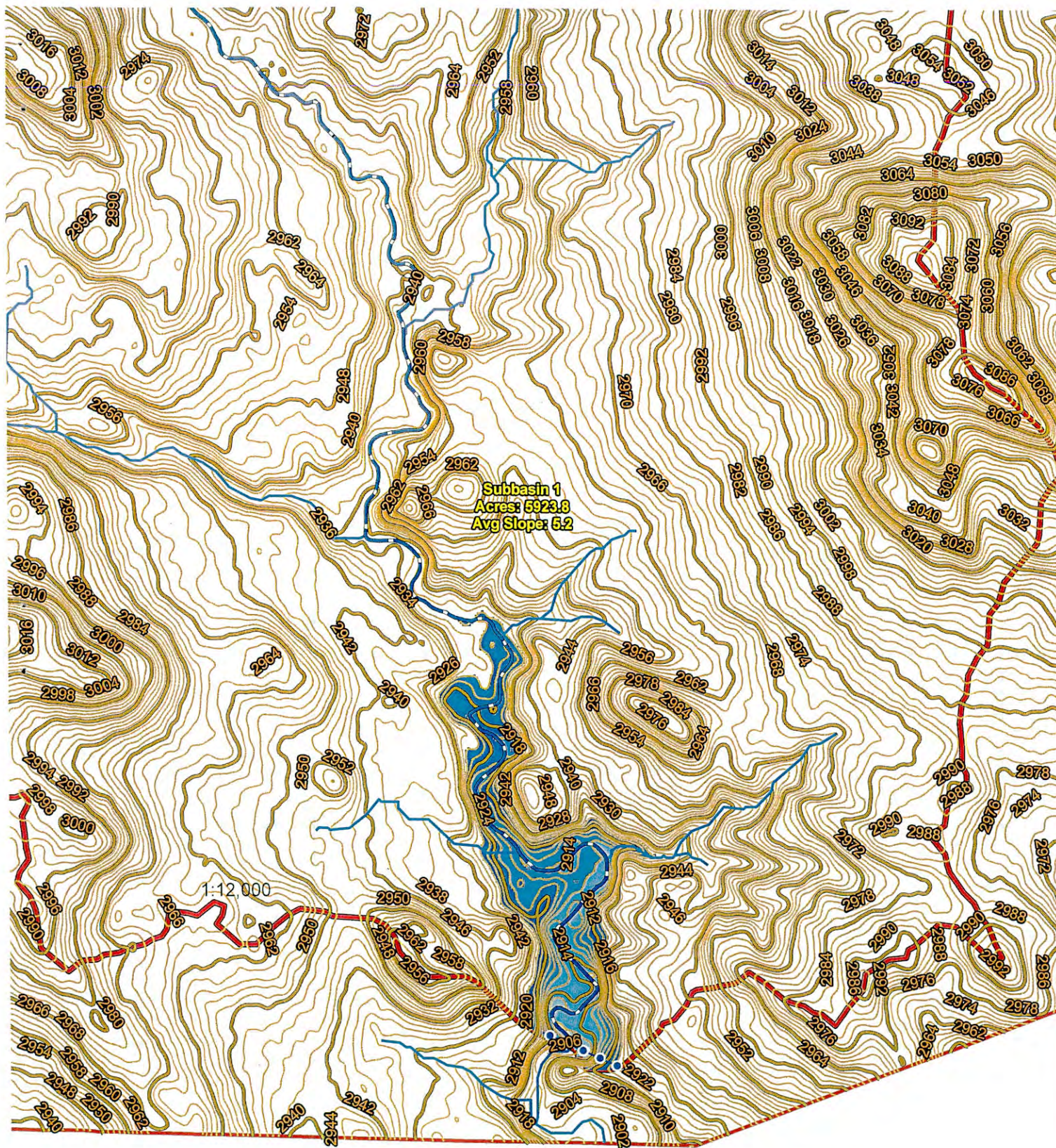
11/13/17

Hydraulics

Storage.txt

Limpert Storage
Project:
Basin Description:

Contour Elevation	Contour Area (sq. ft)	Depth (ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Avg. End (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative Volume Conic (cu. ft)	
2,900.000	5,035.49		N/A	N/A	0.00	N/A	0.00
2,901.000	16,701.15		1.000	10868.32	10868.32	10302.39	10302.39 0.24
2,902.000	28,895.47		1.000	22798.31	33666.63	22521.50	32823.89 0.75
2,903.000	43,491.06		1.000	36193.26	69859.89	35945.47	68769.36 1.58
2,904.000	69,303.81		1.000	56397.43	126257.33	55898.55	124667.91 2.86
2,905.000	139,059.17		1.000	104181.49	230438.82	102177.63	226845.53 5.21
2,906.000	179,951.13		1.000	159505.15	389943.97	159066.53	385912.07 8.86
2,907.000	237,862.22		1.000	208906.68	598850.64	208234.54	594146.60 13.64
2,908.000	342,306.89		1.000	290084.56	888935.20	288504.77	882651.37 20.26
2,909.000	409,736.82		1.000	376021.85	1264957.05	375517.01	1258168.38 28.88
2,910.000	560,747.21		1.000	485242.02	1750199.07	483271.88	1741440.26 39.98
2,911.000	722,341.16		1.000	641544.19	2391743.25	639841.46	2381281.72 54.67
2,912.000	821,139.16		1.000	771740.16	3163483.41	771212.61	3152494.33 72.37
2,913.000	933,728.92		1.000	877434.04	4040917.45	876831.45	4029325.78 92.50
2,914.000	1,066,415.27		1.000	1000072.10	5040989.55	999337.77	5028663.55 115.44
2,915.000	1,224,469.88		1.000	1145442.57	6186432.12	1144532.77	6173196.32 141.72
2,916.000	1,341,371.99		1.000	1282920.93	7469353.05	1282476.85	7455673.18 171.16
2,917.000	1,453,218.97		1.000	1397295.48	8866648.53	1396922.30	8852595.47 203.23
2,918.000	1,564,347.34		1.000	1508783.16	10375431.69	1508442.00	10361037.47 237.86
2,919.000	1,719,661.51		1.000	1642004.42	12017436.11	1641391.96	12002429.43 275.54
2,920.000	1,868,820.68		1.000	1794241.09	13811677.21	1793724.21	13796153.64 316.72
2,921.000	2,033,362.70		1.000	1951091.69	15762768.90	1950513.25	15746666.89 361.49
2,922.000	2,220,690.52		1.000	2127026.61	17889795.51	2126338.86	17873005.75 410.31



SCALE 1:12000

ELEV_FEET	POOL_ACRES	POOL_SQFT	ACRE_FOOT	Shape_Area
2924	38.8	1688851	275.9	157900.000001
2922	32.8	1430000	204.6	133525.000001
2920	27.3	1187805	144.4	110975
2918	21.1	920913	96.1	86425
2916	15.9	694719	59.5	65100
2914	11	478967	32.4	45225
2912	6.4	277691	15.4	26300
2910	3.6	155010	5.6	14700
2908	1	45650	1.1	4650

	Limpsett_Final2
Site Identification	S1
Watershed Runoff Curve Number	72.
Total Watershed Drainage Area (Sq.Miles)	9.26
Watershed Time of Concentration (Hours)	5.32
SDH Rainfall Total (Inches)	N/A
SDH Rainfall Duration (Hours)	N/A
FBH or Storm Rainfall Total (Inches)	3.70
FBH or Storm Rainfall Duration (Hours)	24.0
SDH Inflow Peak (CFS)	N/A
FBH or Storm Inflow Peak (CFS)	1063.9
Initial Reservoir Elevation (Feet)	2916.00
Maximum WS SDH (Feet)	N/A
Maximum WS FBH or Storm (Feet)	2919.48
Storage at Max. WS FBH or Storm (Acre-Ft)	295.3
Top Dam (Feet)	2921.48
Storage, Top Dam (Acre-Ft)	385.0
Emb. Yardage (CY)	N/A
PSH Drawdown (Days)	2.34
378 Drawdown (Days)	2.34
PS Crest (Feet)	2916.00
PS Number of Conduits	N/A
PS Conduit Diameter (Inches)	N/A
PS Conduit Height (Feet)	N/A
PS Conduit Width (Feet)	N/A
PS Conduit Area (Sq. Feet)	N/A
Storage, PS Crest (Acre-Ft)	171.7
PS Discharge at AS Crest (CFS)	921.1
PS Discharge for SDH (CFS)	N/A
PS Discharge FBH or Storm (CFS)	920.9
AS Crest (Feet)	2919.48
Storage, AS Crest (Acre-Ft)	295.2
AS Width (Feet)	200.
AS Exit Slope (%)	0.72
AS Ret. Curve Index	0.03
AS Veg. Cover Factor	0.75
AS Maintenance Code	3
AS Max. Head SDH (Feet)	N/A
AS Peak Discharge SDH/Storm (CFS)	N/A
AS Exit Velocity SDH or Storm (Ft/S)	N/A
AS Stress SDH or Storm (Lb./Sq.Ft.)	N/A
Hp FBH or Storm (Feet)	N/A
AS Peak Discharge FBH/Storm (CFS)	N/A
AS Integ. Dist. FBH or Storm (Feet)	N/A
Oe/B FBH or Storm (Acre-Ft/Ft)	N/A
Uncontrolled Drainage Area (Sq.Miles)	9.26
Number of Errors	0
Number of Warnings	1

 SITES XEQ 11/13/2017 WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
 VER 2005.1.8 (USER MANUAL - DATED DECEMBER 2005)
 TIME 14:26:23

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

SITES 01/01/2005 Limpritt Pond 9.25625 H5
 SAVMOV 0 101
 SAVMOV 101 1 1
 * New Pond
 * Cable Concrete lined spillway
 STRUCTURE
 2916 171.16
 2917 94.67 203.23
 2918 322.59 237.86
 2919 681.9 275.54
 2920 1182.82 316.72
 2921 1837.94 361.49
 2922 2659.59 410.3
 ENDTABLE
 WSDATA 5A1 AC 72 5924 37410 5.2
 PDIRECT 3.7 3.70
 POOLDATA ELEV 2916 2916 2915 2899
 ASDATA 41 127 127 3 .0072 2
 ASINSURF 41 .03 4.4 1 D
 ASINLET 41 0.0 0.0 127 0.0
 ENDTABLE
 ASEXSURF 41 .03
 .75 0
 3
 2 0
 .02
 ENDTABLE
 ASEXIT 41 N 208
 BTMWIDTH FEET 200
 GRAPHICS I
 GO,DESIGN HL TYPE2 24 TYPE2378 24
 SAVMOV 2 101 1
 ENDJOB

 1SITES XEQ 11/13/2017 ----- COMMENT PAGE -----
 VER 2005.1.8 Limpritt Pond WSID =

New Pond

Cable Concrete lined spillway

***** 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 11/13/2017 Limpritt Pond WSID=
VER 2005.1.8 SUBW= A
TIME 14:26:23 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	
3.70	0.00	0.00	3.70	
WSDATA - CN	DA-SM	TC/L	-/H	QRF
72.00	9.26	37410.00	5.20	0.00
SITEDATA- PERM POOL	CREST PS	FP SED	VALLEY FL	378?
2916.00	2916.00	2915.00	2899.00	YES
BASEFLOW	INITIAL EL	EXTRA VOL	SITE TYPE	
0.00	0.00	0.00	DESIGN	
PSDATA - NO. COND	COND L	DIA/W	-/H	
0.00	0.00	0.00	0.00	
PS N	KE	WEIR L	TW EL	
0.000	0.00	0.00	0.00	
2ND STG	ORF H	ORF L	START AUX.	
0.00	0.00	0.00	0.00	
ASCRESTS - AUX.1	AUX.2	AUX.3	AUX.4	AUX.5
0.00	0.00	0.00	0.00	0.00
AUX.Data - REF.NO.	RETARD. C1	TIE STATION	INLET LENGTH	
41	0.00	127.00	127	
AUX.Data - INLET N	SIDE SLOPE	EXIT N	EXIT SLOPE	ACTUAL AUX?
0.030	3.00	0.030	0.007	NO
BTM WIDTH - BW1	BW2	BW3	BW4	BW5
ft 200.00	0.00	0.00	0.00	0.00

AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.

1SITES -----

XEQ 11/13/2017 Limpritt Pond WSID=
VER 2005.1.8 SUBW= A
TIME 14:26:23 SITE = S 1 PASS= 1 PART= 2

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

PERM POOL 2916.00 FT 171.2 ACFT 0.00 AC 0.0 CFS
CREST PS 2916.00 FT 171.2 ACFT 0.00 AC 0.0 CFS
SED ACCUM 2916.00 FT 171.2 ACFT 0.00 AC 0.0 CFS
START ELEV 2916.00 FT 171.2 ACFT 0.00 AC 0.0 CFS
NRCS-PSH D= 24.00 HR P= 3.70 IN Q= 1.25 IN DA= 9.26 SM
TC= 5.32 HR CN= 72.00 VOL= 618.9 ACFT
PEAK = 1063.9 CFS, AT 15.7 HRS.

ROUTED RESULT - HYD TYPE EMAX VOL-MAX AMAX QMAX
NRCS-PSH 2919.48 FT 295.2 ACFT 0.00 AC 921.1 CFS
PS STORAGE 124.0 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.
DRAWDOWN (DDT) TEST 2916.00 FT 171.2 ACFT 0.00 CFS
CONTROL IS 0.000 DETENTION STORAGE
DRAWDOWN TIME = 2.34 DAYS, TO 0.0 CFS (LIMIT = 10.00 DAYS)

RATING TABLE DEVELOPED; SITE = S 1:
WITH PS GIVEN AND AUX. COMPUTED BY PROGRAM
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	2916.00	0.00	0.00	0.00	171.16	0.00
2	2917.00	94.67	94.67	0.00	203.23	0.00
3	2918.00	322.59	322.59	0.00	237.86	0.00
4	2919.00	681.90	681.90	0.00	275.54	0.00
5	2920.00	1182.82	1182.82	0.00	316.72	0.00
6	2921.00	1837.94	1837.94	0.00	361.49	0.00
7	2922.00	2659.59	2659.59	0.00	410.30	0.00

1SITES

XEQ 11/13/2017 Limpritt Pond WSID=
VER 2005.1.8 SUBW= A
TIME 14:26:23 SITE = S 1 PASS= 1 PART= 3

AUX. CREST 2919.48 FT 295.2 ACFT 0.00 AC 921.1 CFS
PS STORAGE 124.0 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.
START ELEV 2916.00 FT 171.2 ACFT 0.00 AC 0.0 CFS

EFFECTIVE HEIGHT(H)= 20.5 FEET, PRODUCT= 6045. (H * STORAGE AT CREST AUX.).

INPUT DESIGN CLASS = A1 = LT 3000. PRODUCT.

***** WARNING - NHCP-378 CRITERIA DOES NOT APPLY WHEN THE EFFECTIVE HEIGHT
IS OVER 35 FEET OR THE PRODUCT IS 3000 OR GREATER.

NRCS-EBH D= 24.00 HR P= 3.70 IN Q= 1.25 IN DA= 9.26 SM
TC= 5.32 HR CN= 72.00 VOL= 618.9 ACFT

PEAK = 1063.9 CFS, AT 15.7 HRS.

RATING TABLE DEVELOPED, SITE = S 1:
WITH PS GIVEN AND AUX. COMPUTED BY PROGRAM
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	2916.00	0.00	0.00	0.00	171.16	0.00
2	2916.29	27.43	27.43	0.00	180.45	0.00
3	2916.58	54.87	54.87	0.00	189.75	0.00
4	2916.87	82.30	82.30	0.00	199.04	0.00
5	2917.16	130.95	130.95	0.00	208.74	0.00
6	2917.45	197.00	197.00	0.00	218.78	0.00
7	2917.74	263.05	263.05	0.00	228.81	0.00
8	2918.03	332.85	332.85	0.00	238.94	0.00
9	2918.32	436.98	436.98	0.00	249.86	0.00
10	2918.61	541.11	541.11	0.00	260.78	0.00
11	2918.90	645.23	645.23	0.00	271.69	0.00
12	2919.19	775.94	775.94	0.00	283.27	0.00
13	2919.48	921.11	921.11	0.00	295.21	0.00
14	2919.60	998.20	984.34	13.87	300.40	0.00
15	2919.73	1075.46	1047.44	28.02	305.59	0.00
16	2919.96	1239.77	1161.17	78.59	314.94	0.00
17	2920.23	1529.49	1336.36	193.13	327.21	0.00
18	2920.74	2199.12	1666.80	532.32	349.79	0.00
19	2921.37	3247.69	2141.45	1106.24	379.52	0.00
20	2922.00	4511.43	2659.59	1851.84	410.30	0.00

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	0.	127.	0.0	0.030	**	**	**	CREST
2	127.	335.	0.7	0.030	0.75	3	2.0	EXIT !

@ The program interprets retardance curve index entries of less than 1 as
Manning's n values.

* Upper case indicates a reach of constructed spillway channel.

** The program does not use vegetal cover factor, maintenance code, and
rooting depth for inlet and crest reaches in computations.

! Reach 2 used in computing exit channel velocities.

DRAWDOWN USING FREEBOARD STORM FOLLOWS, STARTING AT ELEVATION 2919.48 FT.

DRAWDOWN (DDT) TEST 2916.00 FT 171.2 ACFT 0.00 CFS
CONTROL IS 0.000 DETENTION STORAGE

DRAWDOWN TIME = 2.34 DAYS, TO 0.0 CFS (LIMIT = 10.00 DAYS)

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.-HP FT	VOL-AUX. ACFT
NRCS-FBH	200.0	2919.48	295.2	0.0	0.00	0.0

^^^^ NOTE -- ACTUAL Hp OF 0.00 RAISED TO MEET MIN. 378 CRITERIA.

PEAK - CFS DISCHARGE =	Q-PS	Q-AUX.	Q-TOT.
	920.9	0.0	920.9

	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
AUXILIARY SPILLWAY ---	0.00	0.00	0.000	0.000

***** MESSAGE - MAX. DISCHARGE OF 0. CFS IS BELOW CREST AUXILIARY
SPILLWAY. NO STABILITY STRESS COMPUTED.

AUXILIARY SPILLWAY DURATION FLOW =	0.0 HOURS
ATTACK, OE/B =	0.0 ACFT/FT

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

>>>> NHCP378 RUN - MINIMUM DEPTH, CREST AUX. TO TOP OF DAM IS 2.00 FT.
NEW TOP OF DAM ELEVATION = 2921.48.

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.HP FT	VOL-AUX. ACFT
MINIMUM AUX.	200.0	2921.48	384.8	0.0	2.00	89.6

PEAK - CFS DISCHARGES =	Q-PS	Q-AUX.	Q-TOT.
	2230.3	1234.1	3464.4

	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
AUXILIARY SPILLWAY ---	1.05	5.78	0.013	0.018

Inflow Hyd 1 PSH-Peak = 921.11 CFS at 16.33 hrs., Location Point

Inflow Hyd 1 FBH-Peak = 920.94 CFS at 16.33 hrs., Location Point
HYDOUT 1

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

Limpritt Pond

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 ID	SUBWS ID	SUBWS DA (SQ MI)	CURVE NO.	TC (HRS)	TOTAL DA (SQ MI)	TYPE DESIGN	STRUC CLASS	<<<
	S 1	A	9.26	72.	5.32	9.26	378NR	A1	
PASS NO.	DIA./ WIDTH (IN/FT)	AUX.CREST ELEV (FT)	BTM. WIDTH (FT)	MAX. HP (FT)	MAX. ELEV (FT)	EMB. VOL. (CY)	INTEGR.* DIST. (FT)	EXIT* VEL. (FT/SEC)	TYPE HYD
1	0.0	2919.5	200.0	2.0	2921.5	0.	0.	0.0	MIN. AUX.

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

SITES.....SUMMARY TABLE 1 COMPLETED.

NRCS SITES VERSION 2005.1.8 ,01/01/2005
FILES

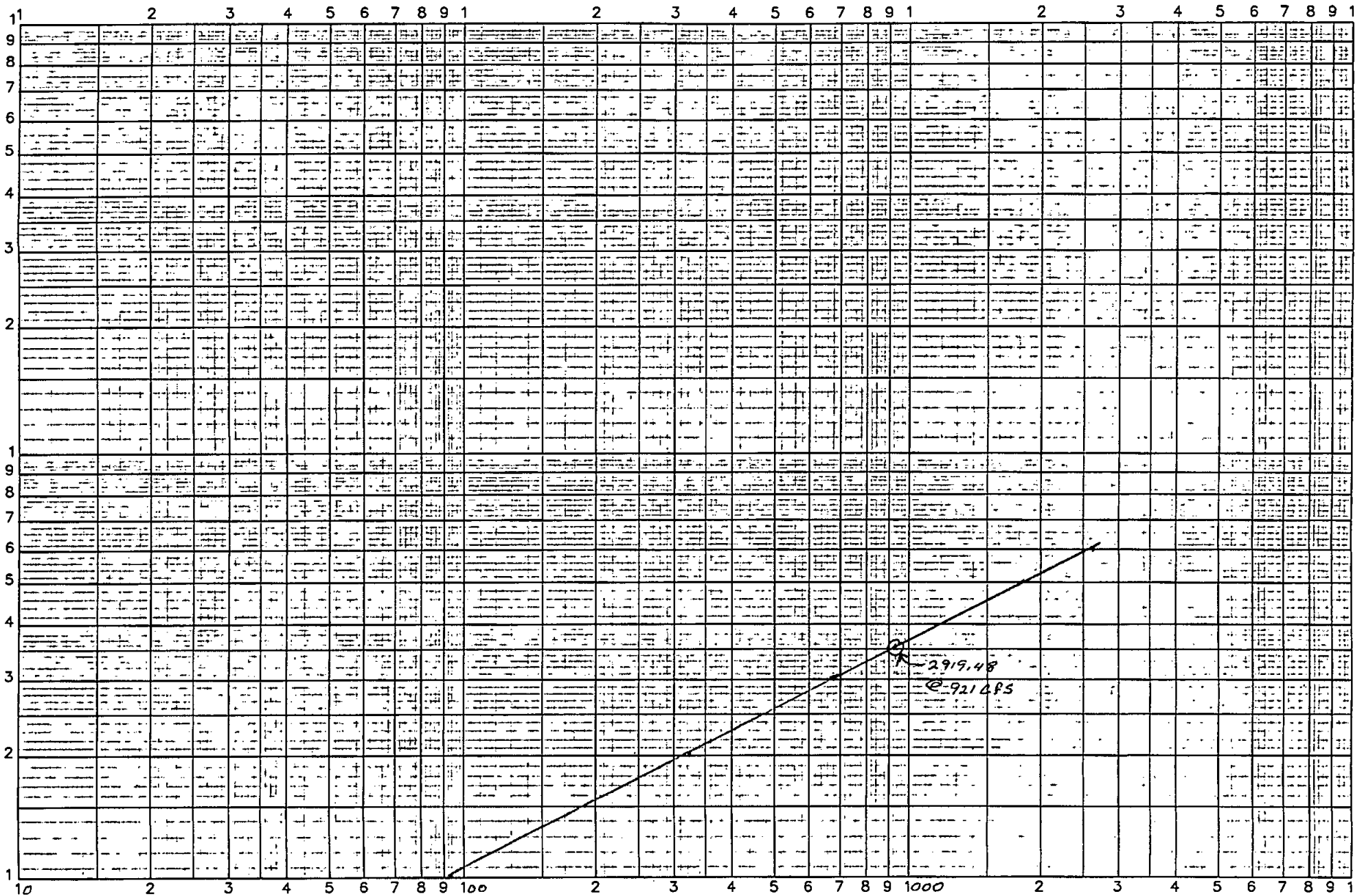
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OUTPUT = C:\Sitesdata\Limpritt\Limpritt_Final2.OUT
DATED 11/13/2017 14:26:23

ASSPRFL TBL = C:\Sitesdata\Limpritt\Limpritt DATED 11/13/2017 14:26:23

GRAPHICS FILES GENERATED

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OPTION "P" = C:\Sitesdata\Limpritt\Limprett_Final2.DHY DATED 11/13/2017 14:26:23
OPTION "E" = C:\Sitesdata\Limpritt\Limprett_Final2.DEM DATED 11/13/2017 14:26:23

SPILLWAY DISCHARGE PER FOOT OF DEPTH



Cable Concrete Specifications

**Natural Resources Conservation Service
United States Department of Agriculture**

Trapezoidal Channel Section

Participant: Limpert
Location: Spillway
County: HARDING MSE 2 County, SD

Designer: REB
Date: 11/06/2017

Checker: _____
Date: _____

Hydraulics Formula, Version 2.2.1

1' depth

Slope: .01 ft/ft
'n' value: 0.04

Hydraulic Radius: 0.87
Area: 28.00 sq ft
Velocity: 3.38 ft/sec
Capacity: 94.67 cfs

Sideslope: 4:1
Bottom Width: 24 ft
Depth of Flow: 1 ft.
Width @ surface 32 ft

**Natural Resources Conservation Service
United States Department of Agriculture**

Trapezoidal Channel Section

Participant: Limpert
Location: Spillway
County: HARDING MSE 2 County, SD

Designer: REB
Date: 11/06/2017

Checker: _____
Date: _____

Hydraulics Formula, Version 2.2.1

2' depth

Slope: .01 ft/ft
'n' value: 0.04

Hydraulic Radius: 1.58
Area: 64.00 sq ft
Velocity: 5.04 ft/sec
Capacity: 322.59 cfs

Sideslope: 4:1
Bottom Width: 24 ft
Depth of Flow: 2 ft.
Width @ surface 40 ft

**Natural Resources Conservation Service
United States Department of Agriculture**

Trapezoidal Channel Section

Participant: Limpret
Location: Spillway
County: HARDING MSE 2 County, SD

Designer: REB
Date: 11/06/2017

Checker: _____
Date: _____

Hydraulics Formula, Version 2.2.1

3' depth

Slope: .01 ft/ft
'n' value: 0.04

Hydraulic Radius: 2.22
Area: 108.00 sq ft
Velocity: 6.31 ft/sec
Capacity: 681.90 cfs

Sideslope: 4:1
Bottom Width: 24 ft
Depth of Flow: 3 ft.
Width @ surface 48 ft

**Natural Resources Conservation Service
United States Department of Agriculture**

Trapezoidal Channel Section

Participant: Limpret
Location: Spillway
County: HARDING MSE 2 County, SD

Designer: REB
Date: 11/06/2017

Checker: _____
Date: _____

Hydraulics Formula, Version 2.2.1

4' depth

Slope: .01 ft/ft
'n' value: 0.04

Hydraulic Radius: 2.81
Area: 160.00 sq ft
Velocity: 7.39 ft/sec
Capacity: 1182.92 cfs

Sideslope: 4:1
Bottom Width: 24 ft
Depth of Flow: 4 ft.
Width @ surface 56 ft

Natural Resources Conservation Service
United States Department of Agriculture

Trapezoidal Channel Section

Participant: Limpert
Location: Spillway
County: HARDING MSE 2 County, SD
Designer: REB
Date: 11/13/2017

Checker: _____
Date: _____

Hydraulics Formula, Version 2.2.1

5' depth

Slope: .01 ft/ft
'n' value: 0.04

Hydraulic Radius: 3.37
Area: 220.00 sq ft
Velocity: 8.35 ft/sec
Capacity: 1837.94 cfs

Sideslope: 4:1
Bottom Width: 24 ft
Depth of Flow: 5 ft.
Width @ surface 64 ft

**Natural Resources Conservation Service
United States Department of Agriculture**

Trapezoidal Channel Section

Participant: Limpet
Location: Spillway
County: HARDING MSE 2 County, SD
Designer: REB
Date: 11/13/2017

Checker: _____
Date: _____

Hydraulics Formula, Version 2.2.1

~~8~~ depth
6

Slope: .01 ft/ft
'n' value: 0.04

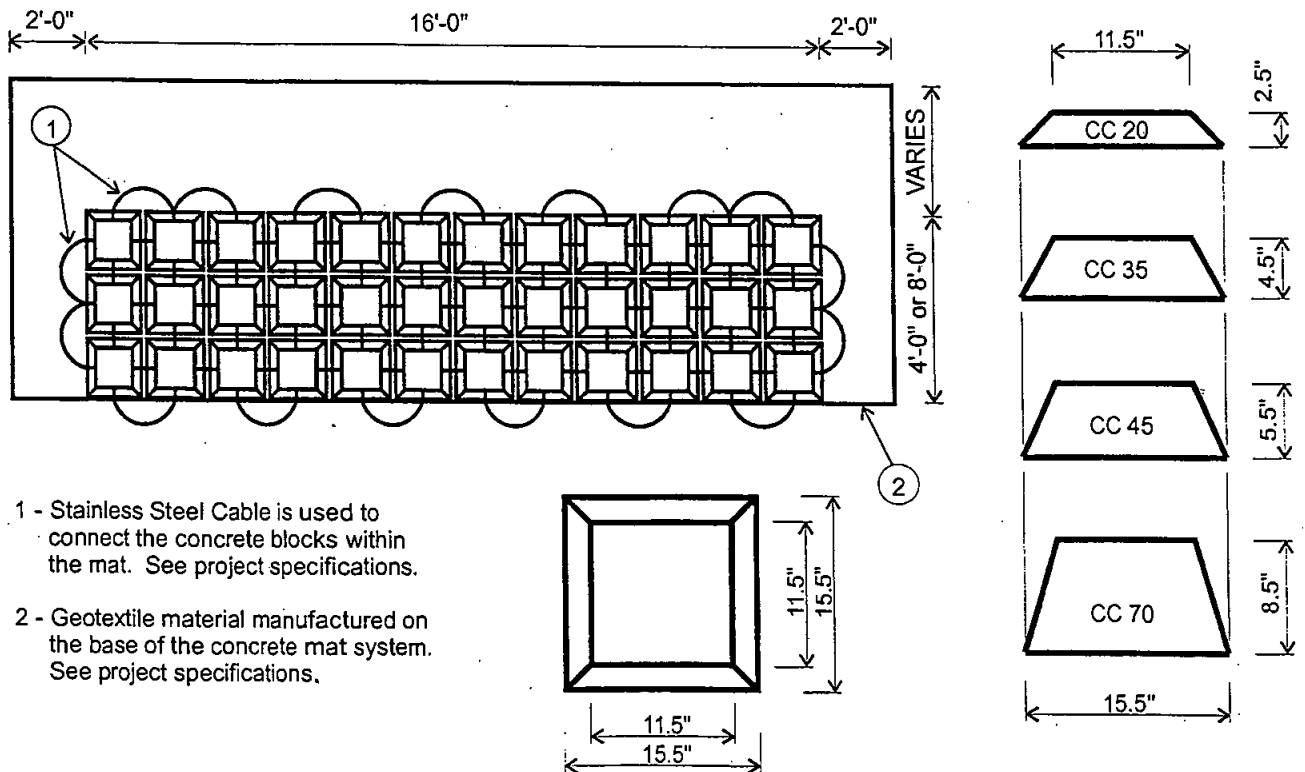
Hydraulic Radius: 3.92
Area: 288.00 sq ft
Velocity: 9.23 ft/sec
Capacity: 2659.59 cfs

Sideslope: 4:1
Bottom Width: 24 ft
Depth of Flow: 6 ft.
Width @ surface 72 ft

CABLE CONCRETE BLOCK SPECIFICATIONS ORIGINAL BLOCK - CLOSED CELL

		CC 20 23 lbs. / s.f.		CC 35 41 lbs. / s.f.		CC 45 50 lbs. / s.f.		CC 70 77 lbs. / s.f.	
MAT	AREA	64 s.f.	128 s.f.	64 s.f.	128 s.f.	64 s.f.	128 s.f.	64 s.f.	128 s.f.
	WEIGHT	1455 lbs.	2910 lbs.	2620 lbs.	5240 lbs.	3200 lbs.	6400 lbs.	4950 lbs.	9900 lbs.
	BLOCKS / MAT	36	72	36	72	36	72	36	72
BLOCKS	SPACING @ BASE	0.5 in.		0.5 in.		0.5 in.		0.5 in.	
	SPACING @ TOP	4.5 in.		4.5 in.		4.5 in.		4.5 in.	
	WEIGHT	40 lbs.		73 lbs.		89 lbs.		137 lbs.	
	HEIGHT	2.5"		4.5"		5.5"		8.5"	
CABLE	LENGTH	LENGTH	WIDTH	LENGTH	WIDTH	LENGTH	WIDTH	LENGTH	WIDTH
	DIAMETER	1/8 in.	1/8 in.	5/32 in.	5/32 in.	5/32 in.	5/32 in.	3/16 in.	5/32 in.
	CONSTRUCTION	1 x 19	1 x 19	1 x 19	1 x 19	1 x 19	1 x 19	1 x 19	1 x 19
	BREAKING STRENGTH	2100 lbs.	2100 lbs.	3300 lbs.	3300 lbs.	3300 lbs.	3300 lbs.	4700 lbs.	3300 lbs.
OPEN AREA		8.2%							

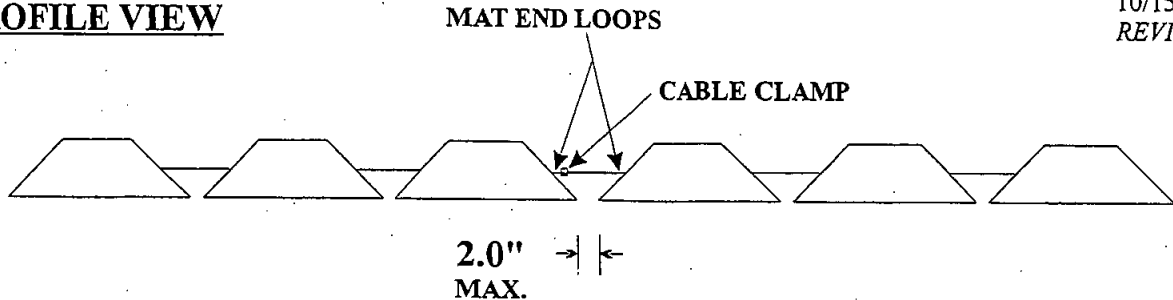
CABLE CONCRETE MAT DESIGN ORIGINAL BLOCK - CLOSED CELL



CABLE CONCRETE CLAMPING DETAILS USING CABLE CLAMPS

IECS/DJT
10/15/97
REVISED

PROFILE VIEW

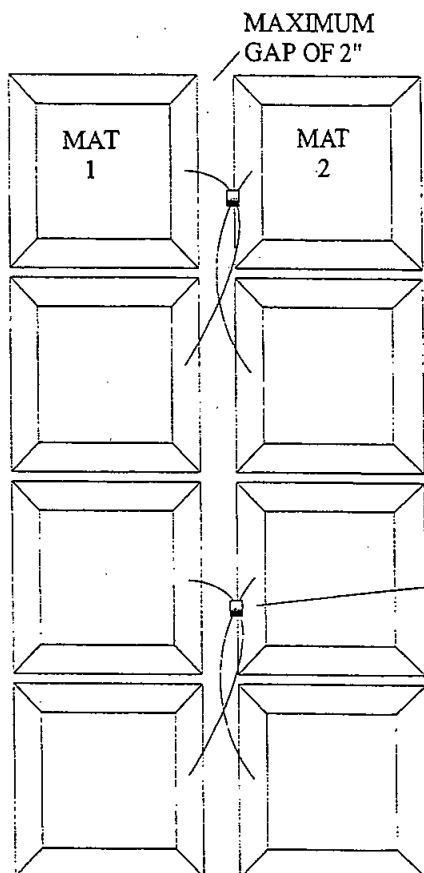


WHEN PLACING THE MATS, THE GAP BETWEEN THE MATS SHOULD NOT BE ANY LARGER THAN A 2" MAXIMUM. IF THE MATS ARE PLACED WITH A LARGER SPACE THAN 2", IT IS RECOMMENDED TO GROUT THE SEAM BETWEEN THE MATS.

NOTES:

- THE CLAMPS SHALL MADE OF MATERIALS PER PROJECT SPECIFICATIONS
- USE A HAND-HELD BATTERY OPERATED DRILL TO SCREW THE NUTS ON THE U-BOLT. TIGHTEN NUTS DOWN TO THE COVER SADDLE. INSPECT TO ASSURE NUTS ARE TIGHTEN. IF NEED BE, HAND TIGHTEN LAST TURNS UNTIL NO MORE TURNING CAN BE ACCOMPLISHED.

PLAN VIEW

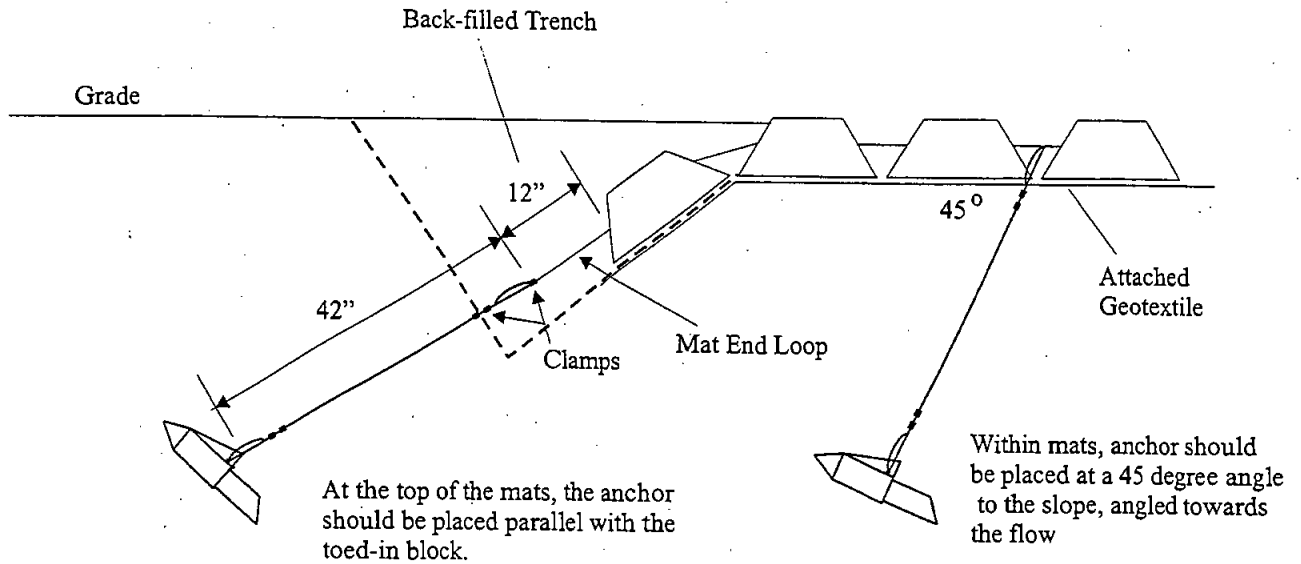


NOTE HOW THE CABLE OF OPPOSITE MAT IS PULLED TO AND CLAMPED AS CLOSE TO THE NEAREST MAT TO ELIMINATE SLACK BETWEEN THE TWO MATS

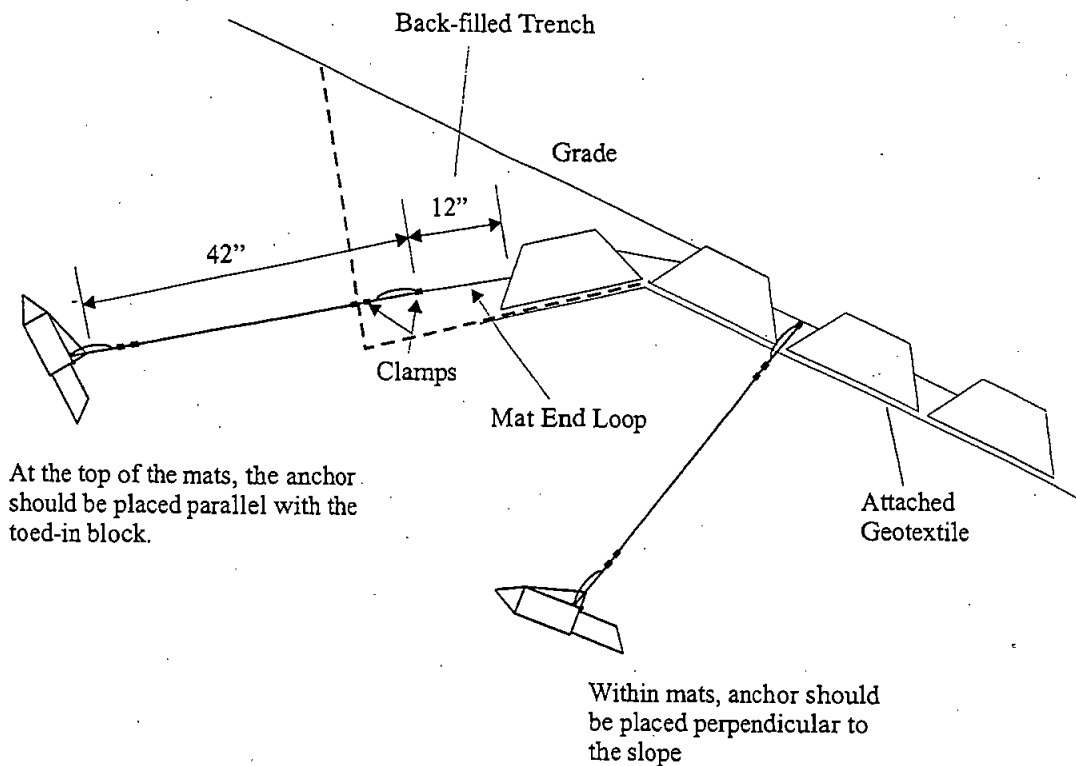
Anchor Placement Detail Cable Concrete

DJT/IECS
9/21/98
P. 1

Level Grade Application



Slope Application



Cable Concrete Specifications

Original Block – Closed Cell

A. DESCRIPTION

Cable Concrete is an articulated concrete block revetment system, developed by International Erosion Control Systems, LLC to control various types of erosion due to water, wind, or vehicular traffic. This system shall be made up of individual concrete blocks strung together in either 4' x 16' or 8' x 16' mattresses (if needed, irregular mat sizes may be designed), which are placed side by side and clamped together to provide one homogeneous erosion protection system. The concrete blocks are held together by integrally woven stainless steel cables, which are poured within the block. A geotextile fabric, specified by the governing engineer, shall be attached to the base of each concrete mat. The size of the concrete blocks shall be 15.5" square at the base and 11.5" square at the top face (a truncated pyramid shape). The only variations between the four different mat systems are the block heights.

Table 1

		<u>C.C. 20</u>	<u>C.C. 35</u>	<u>C.C. 45</u>	<u>C.C. 70</u>
General:	Weight(lbs/sf)	23	41	50	77
	Block Height	2.5"	4.5"	5.5"	8.5"
Cable:	Longitudinal:	1/8"	5/32"	5/32"	3/16"
	Transverse:	1/8"	5/32"	5/32"	5/32"

B. CONCRETE

The minimum required concrete strength should be 4000 PSI @ 28 days. The mix used shall be a DOT (in the state where the project exists) approved mix design. Air entrainment of 4% to 7% shall also be added. The aggregates shall meet DOT standards, with quality requirements for fine and coarse aggregates. All ASTM standards will be met in the production of the concrete.

C. CABLES

The cables shall be made of stainless steel aircraft cable of type 302, 304, or 316, depending on the specific use and conditions of the project. The cable shall be of type 1 X 19 construction.

D. GEOTEXTILE

The geotextile used is to be specified by the governing project engineer. The standard geotextile material used on non-specific projects is Geotex™ 801, made by Synthetics Industries, and/or 8-oz. equivalent needle punched nonwoven fabric.

The geotextile shall be attached to the base of the concrete block mats. An overlap of 2 ft to 3 ft shall be incorporated on three sides of the mat. The overlap shall provide an area for the adjoining mats to be placed upon and prevent undermining of the erosion control system.

It should be noted that when different geotextile weights are used and/or when additional overlap area is added to the mats, additional costs would adjust the price per unit.

E. CLAMPS

Sufficient galvanized or stainless steel wire rope clamps shall be used to secure loops of adjoining Cable Concrete mats. The type of clamp needed shall be determined by the field conditions of the project and by the governing engineer.

The number of loop connections is based on project specifics, and may be shown in the shop drawings or in typical detail sheets (or see the Guide for the Design and Placement of Cable Concrete Mats). Clamping in field must follow project layout details to be acceptable. Details available showing the proper method of clamping.

F. ANCHORING

Cable Concrete mats are designed to take velocities in certain slope and bedding situations. This information is founded on engineered flume testing. The data shows maximum limits of the mat system, based on unanchored mats.

Anchoring Cable Concrete mats offers additional safety to the erosion protection system. But, if a situation arises where velocities exceed maximum limits of a mat system, or if slopes of 1.5 to 1 or greater are encountered, then anchoring becomes an item to be specified by the governing project engineer. See detail sheets of rule-of-thumb procedures when considering anchoring.

International Erosion Control Systems has developed an anchoring system called the Royal Anchor-lock. The anchor is made of nylon fibers reinforced with glass fibers and with steel reinforcement encased to enhance installation durability in hard driving soils. The anchor is placed at perimeters of individual mats and the anchor is attached to the loops of the mat after placement. There shall be no slack in the driven anchor cable when it is attached to the loops of the mat.

Anchoring must follow project layout details to be acceptable.

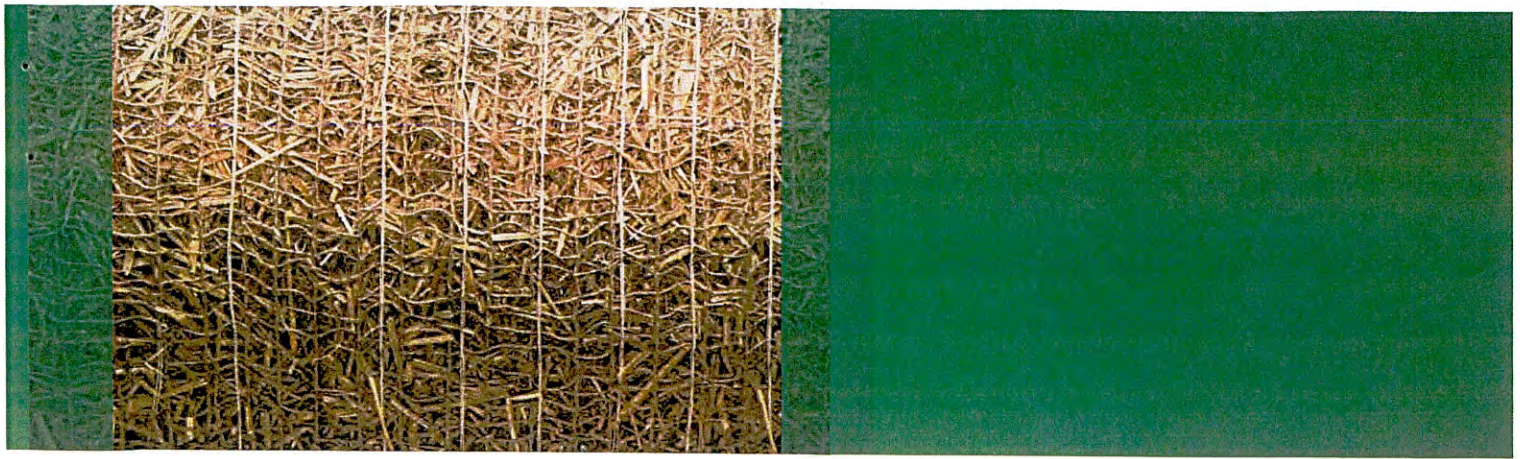
G. INSTALLATION

The supplier shall have a technician experienced in the installation of the Cable Concrete System available at the start of an installation where the engineer or contractor have not had experience with the product to assist in any special techniques needed to assure a proper installation.

The mats shall be laid from the downstream end of project to the upstream end, so the geotextile joints are shingled to direct flow over the joint and to prevent undermining. Intimate contact with the subsurface is critical to the systems performance in the field. The gaps between each mat shall not be greater than 2"; or else the gap must be closed using a grout mixture. The outside edges of the mat system shall be entrenched and buried at least one block into the ground. Compacted granular fill, or grout may be used to fill the entrenched edges.

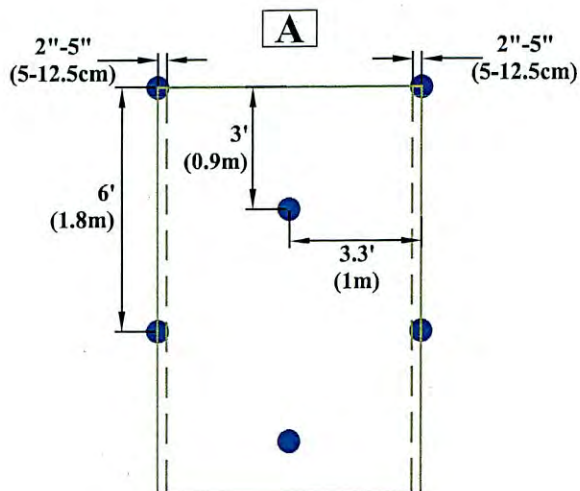
It is recommended that after the installation of the mat system, that the mat system be covered with black dirt and seeded with vegetation (grasses). The mat system will allow moisture to traverse back and forth from subgrade to vegetation. The mat system will lend support and an even grade for maintenance vehicles (mowers) to traverse over it. Any surface application should not be placed prior to the inspection of the systems clamping and anchoring.

Turf Reinforcement Specifications

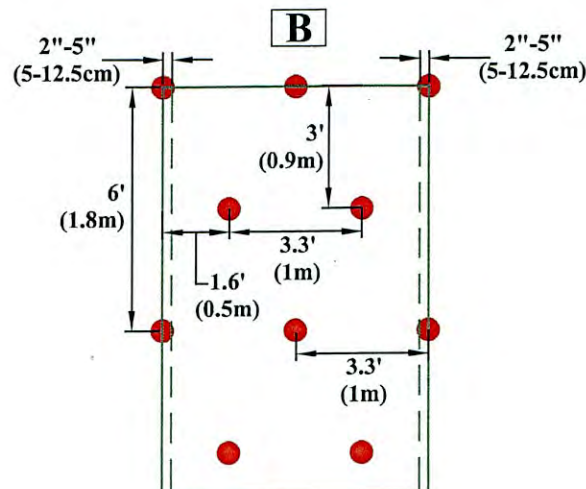


	TEMPORARY			PERMANENT		
	BIONET			ERONET		VMAX
						
	S150BN	SC150BN	C125BN	P300	SC250	C350
Longevity	12 mo.	18 mo.	24 mo.	Permanent	Permanent	Permanent
Applications	Moderate Flow Channels 3:1-2:1 Slopes	Medium Flow Channels 2:1-1:1 Slopes	High-Flow Channels 1:1 and Greater Slopes	High-Flow Channels 1:1 Slopes	High-Flow Channels 1:1 and Greater Slopes	High-Flow Channels 1:1 and Greater Slopes
Design Permissible Shear Stress lbs/ft ² (Pa)	Unvegetated 1.85 (88)	Unvegetated 2.10 (100)	Unvegetated 2.35 (112)	Unvegetated 3.0 (144) Vegetated 8.0 (383)	Unvegetated 3.0 (144) Vegetated 10.0 (480)	Unvegetated 3.2 (153) Vegetated 12.0 (576)
Design Permissible Velocity ft/s (m/s)	Unvegetated 6.00 (1.83)	Unvegetated 8.00 (2.44)	Unvegetated 10.00 (3.05)	Unvegetated 9.00 (2.7) Vegetated 16.0 (4.9)	Unvegetated 9.5 (2.9) Vegetated 15.0 (4.6)	Unvegetated 10.5 (3.2) Vegetated 20.0 (6.0)
Top Net	Leno woven, 100% biodegradable jute fiber 9.30 lbs/1000 ft ² (4.53 kg/100 m ²) approx wt	Leno woven, 100% biodegradable jute fiber 9.30 lbs/1000 ft ² (4.53 kg/100 m ²) approx wt	Leno woven, 100% biodegradable jute fiber 9.30 lbs/1000 ft ² (4.53 kg/100 m ²) approx wt	Heavyweight UV-stabilized polypropylene 5.0 lbs/1000 ft ² (2.44 kg/100 m ²) approx wt	Heavyweight polypropylene 5.0 lbs/1000 ft ² (2.44 kg/100 m ²) approx wt	Extra heavyweight polypropylene 8.0 lbs/1000 ft ² (3.91 kg/100 m ²) approx wt
Center Net	N/A	N/A	N/A	N/A	Ultra heavyweight polypropylene - corrugated 24.0 lbs/1000 ft ² (11.7 kg/100 m ²)	Ultra heavyweight polypropylene - corrugated 24.0 lbs/1000 ft ² (11.7 kg/100 m ²)
Fiber Matrix	Straw fiber 0.50 lbs/yd ² (0.27 kg/m ²)	Straw/coconut matrix 70% Straw 0.35 lbs/yd ² (0.19 kg/m ²) 30% Coconut 0.15 lbs/yd ² (0.08 kg/m ²)	Coconut fiber 0.50 lbs/yd ² (0.27 kg/m ²)	UV-stabilized polypropylene fiber 0.70 lbs/yd ² (0.38 kg/m ²)	70% Straw 0.35 lbs/yd ² (0.19 kg/m ²) 30% Coconut 0.15 lbs/yd ² (0.08 kg/m ²)	Coconut fiber 0.50 lbs/yd ² (0.27 kg/m ²)
Bottom Net	Woven, 100% biodegradable jute fiber 7.70 lbs/1000 ft ² (3.76 kg/100 m ²) approx wt	Woven, 100% biodegradable jute fiber 7.70 lbs/1000 ft ² (3.76 kg/100 m ²) approx wt	Woven, 100% biodegradable jute fiber 7.70 lbs/1000 ft ² (3.76 kg/100 m ²) approx wt	Heavyweight UV-stabilized polypropylene 3.0 lbs/1000 ft ² (1.47 kg/100 m ²) approx wt	Heavyweight UV-stabilized polypropylene 5.0 lbs/1000 ft ² (2.44 kg/100 m ²) approx wt	Extra heavyweight polypropylene 8.0 lbs/1000 ft ² (3.91 kg/100 m ²) approx wt
Thread	Biodegradable	Biodegradable	Biodegradable	UV-stabilized polypropylene	UV-stabilized polypropylene	UV-stabilized polypropylene fiber

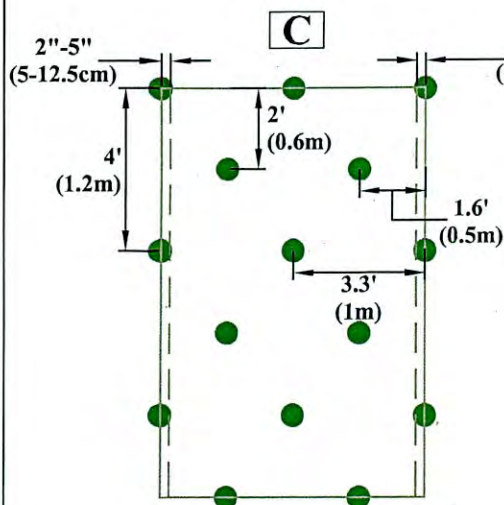
STAPLE PATTERN GUIDE



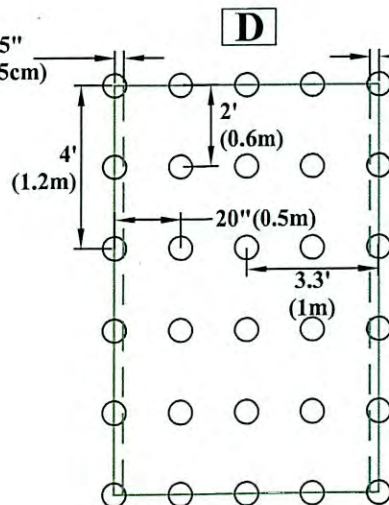
0.7 Staples per SQ.YD.



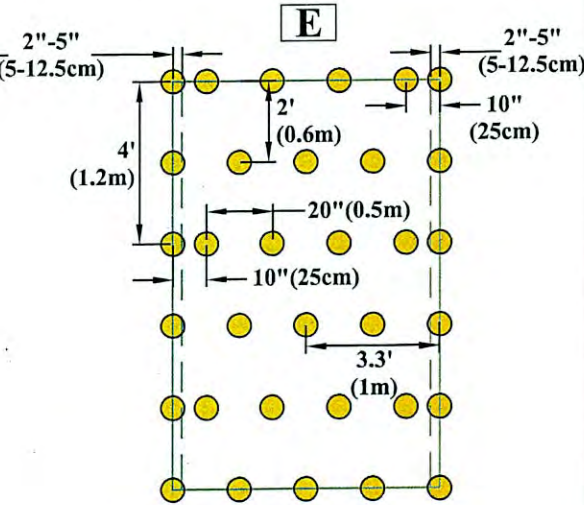
1.15 Staples per SQ.YD.



1.7 Staples per SQ.YD.



3.4 Staples per SQ.YD.



3.75 Staples per SQ.YD.

- 4:1 Slopes (A)
- 3:1 Slopes (B)
- 2:1 Slopes (C)
- 1:1 & Steeper Slopes (D)
- Medium/High Flow Channel (D)
- High Flow Channel And Shoreline (E)

NOTES:

* Use ECMS[®] for more accurate staple pattern selection.

Tensar

**NORTH
AMERICAN
GREEN[®]**

5401 St. Wendel - Cynthia Rd.
Poseyville, IN 47633

PH: 800-722-2040
www.naagreen.com

Disclaimer:

The information presented herein is general design information only. For specific applications, consult an independent professional for further design guidance.

Drawn on: 3-16-11

Drawing Not To Scale

Figure 1. Minimum Anchor Pattern

Maximum Design Conditions			Anchor Pattern
Shear Stress	Velocity	Wave Height	
$\leq 6 \text{ lbs/ft}^2$	$\leq 14 \text{ ft/s}$	6 in.	F
$> 6-8 \text{ lbs/ft}^2$	$> 14-18 \text{ ft/s}$	12 in.	G
$> 8 \text{ lbs/ft}^2$	$> 18 \text{ ft/s}$	18 in.	H

Figure 2. Minimum Anchor Type

Soil Type	Anchor Type
Clay-Clay Loam	10 in Wire Staple
Silt Loam - Loam	10 in Wire Staple
Sandy Loam	12 in Wire Staple
Sand / Muck $\leq 6 \text{ in}$	12 in Rebar Staple
Sand / Muck 6-12 in	18 in Rebar Staple
Sand / Muck 12-18 in	24 in Earth Anchor + 12 in Rebar Staple
Sand / Muck $> 18 \text{ in}$	36 in Earth Anchor + 18 in Rebar Staple

Figure 3. Anchor Patterns for use with Wire/Rebar Staples

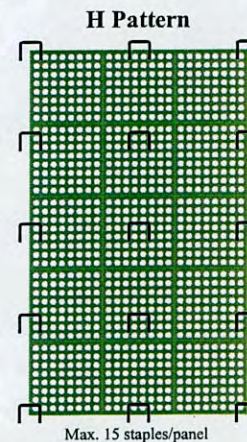
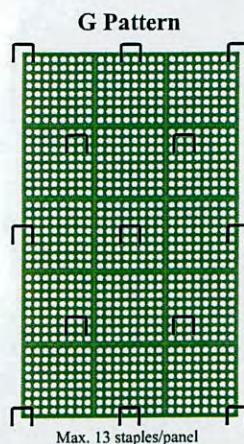
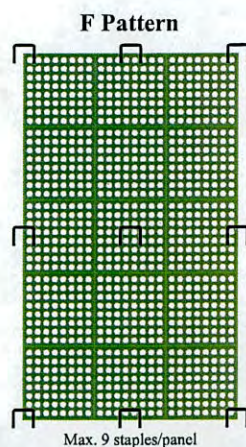
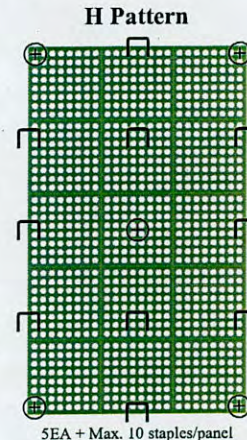
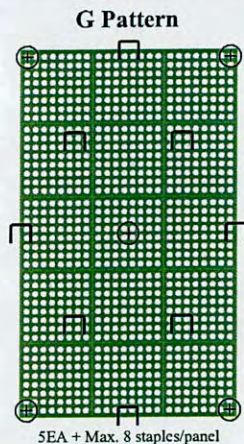
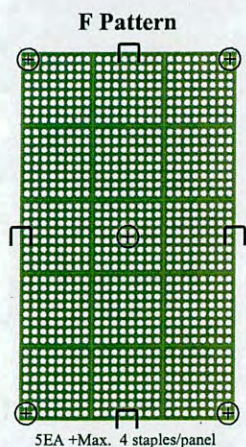


Figure 4. Anchor Patterns for use with Combination of Earth Anchors and Staples



ShoreMax™

ANCHORING GUIDE

1. When installing ShoreMax mat, the anchor pattern (figure 3 or 4) should be selected based on the expected maximum design conditions (shear stress, velocity, or wave impact) (figure 1).
2. Anchor selection should be based on the soil type and pull-out strength required (figure 2). In soft, highly erodible soils percussion earth anchors may be necessary. Earth anchors can be installed in conjunction with rebar staples (figure 4).
3. When using percussion earth anchors, position anchors in each corner and the center of the panel. Place staples in the appropriate pattern through remainder of mat. Staples can be shared between two adjacent panels.

***Note:**

Number of staples used per panel can be reduced by 30-40% when sharing staples between panels.

□ - Wire/Rebar Staple

⊕ - Percussion Earth Anchor

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Poseyville, IN 47633

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Disclaimer:

The information presented herein is general design information only. For specific applications, consult an independent professional for further design guidance.

Drawn on: 3-15-11

Drawing Not To Scale

**Natural Resources Conservation Service
United States Department of Agriculture**

Trapezoidal Channel Section

Participant: Limprit
Location: Fabric Lined Channel
County: HARDING MSE 2 County, SD
Designer: REB
Date: 11/13/2017

Checker: _____
Date: _____

Hydraulics Formula, Version 2.2.1

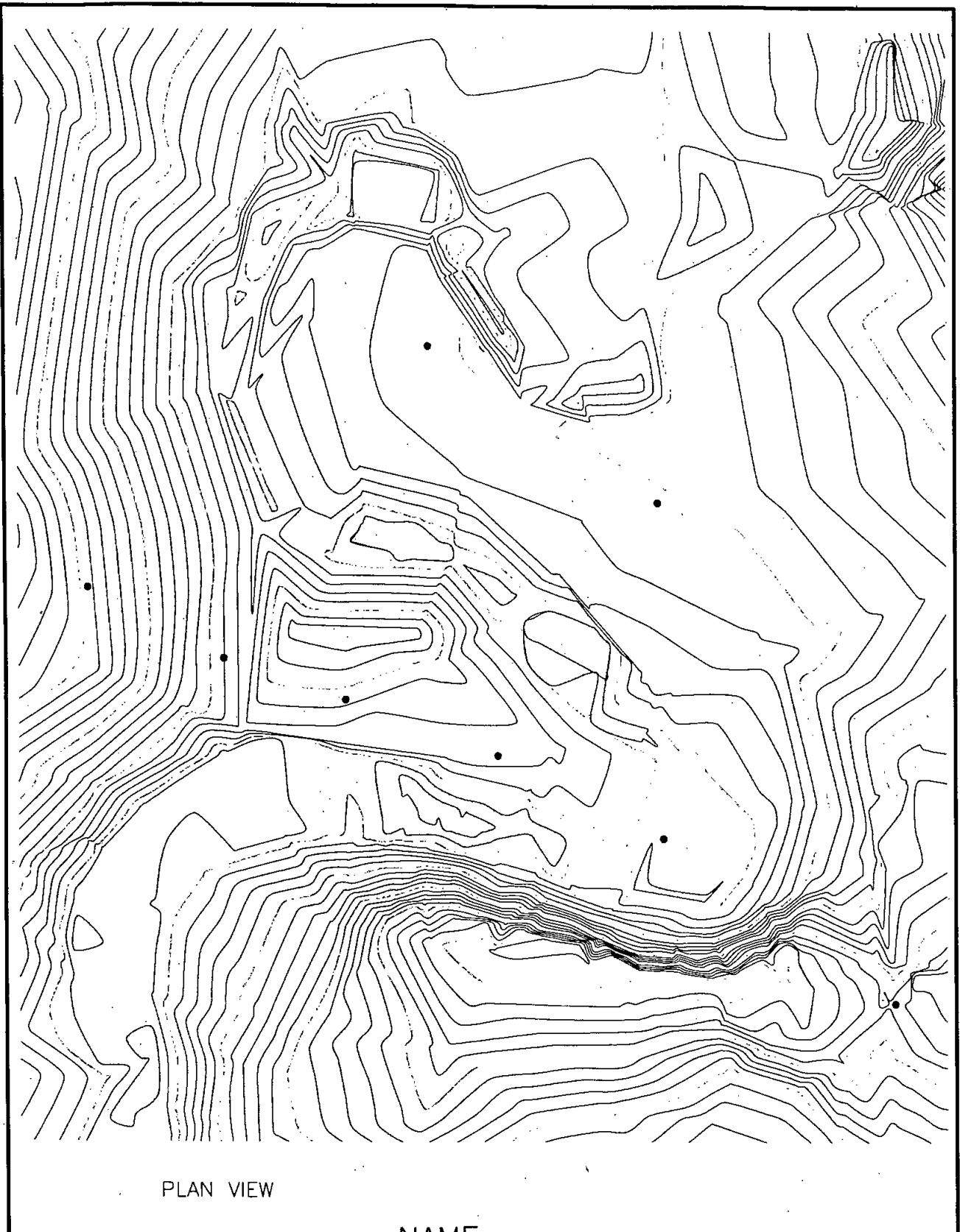
Fabric Lined Channel

Slope: .05 ft/ft
'n' value: 0.04

Hydraulic Radius: 1.55
Area: 84.96 sq ft
Velocity: 11.12 ft/sec
Capacity: 944.84 cfs

Sideslope: 4:1
Bottom Width: 40 ft
Depth of Flow: 1.8 ft.
Width @ surface 54 ft

Soils Investigations



United States
Department of
Agriculture

Natural Resources
Conservation Service

NAME:

378 POND

PLAN VIEW

Sec _____, T _____, R _____
County, South Dakota

Designed: _____ Date _____
Drawn _____
Checked _____
Approved _____

File No. BLimpret.dwg
Drawing No. _____
10/24/2017
Sheet 1 of 1



Natural
Resources
Conservation
Service

Subject: ENG – Soil Mechanics – South Dakota (CO-01)
Limpert Pond, Harding County

Date: OCT 24 2017

National Design,
Construction,
and Soil
Mechanics
Center

To: Jay B. Cobb
State Conservation Engineer
NRCS, Huron, South Dakota

File Code: 210-22
Job No.: 17-88C

Lincoln Soil
Mechanics
Laboratory
512 S. 7th St.
Lincoln, NE
68508-2919

Phone:
402-437-5337

BACKGROUND

The soil mechanics tests requested for the samples submitted from the subject site have been completed and the test results are summarized on the attached reporting form NRCS-ENG-354. Two disturbed large bag samples were submitted to the NDSCSMC-Lincoln soil mechanics laboratory for testing. The samples are representative of potential borrow material. Tests performed on each of the samples included standard index, dispersion, as-received moisture content, Standard Proctor density compaction, fine specific gravity, flexible wall permeability testing, and triaxial shear tests. This report summarizes the results of the testing performed.

INTERPRETATION AND DISCUSSION OF DATA

Index Tests

Based upon the standard index tests performed on the samples, these soils classify as similar materials according to the Unified Soil Classification System (USCS). The soils both classify as relatively fine grained medium plastic sandy lean clay, CL soil. The samples had elevated sand content (between 35 to 39 percent retained on the #200 sieve) with good clay content. The samples had medium plastic fines with Plasticity Index (PI) of 27. The complete index properties of the samples are included on the attached NRCS-ENG-354 form and are summarized in the following table included here for quick reference.

Sample Number		Percent passing			LL	PI	USCS Class	W _{REC} (%)
Lab	Field	0.002 mm	#200 sieve	#4 sieve				
17-687	102.1	28	65	100	44	27	CL	14.7
17-688	102.2	28	61	100	44	27	CL	22.6

Dispersion Tests

Crumb dispersion indication tests were performed on each sample according to ASTM D6572. Two separate crumb test specimens were obtained for each sample and tested. The crumb readings were taken after one hour and then averaged for the final recorded result. The crumb tests yielded readings of 3 for both CL samples. Double hydrometer dispersion tests were then performed according to ASTM D4221. The double hydrometer dispersion tests yielded results of 11 and 20 percent dispersive clay for the two CL soils.

These crumb and double hydrometer dispersion tests indicate different levels of dispersion. Dispersion can vary in intensity within short distances in the field. Therefore, when

dispersion is detected in the lab, it is an indication that dispersive soils are present in the area. Typically, the crumb and double hydrometer dispersion tests are both performed in the lab to increase the opportunity for detecting the potential problem. However, because each test is performed on a small discrete portion of the sample, it is possible for one test to detect dispersion and another to miss it or for the two tests to indicate different degrees of severity of the dispersion.

A pinhole dispersion test was performed on each of the borrow samples in accordance with ASTM D4647. The pinhole dispersion test is currently the most accurate test method to determine if a sample material is dispersive or not. The pinhole tests performed on the selected samples yielded results of ND3, slightly dispersive, for both of the samples. Based upon the dispersion tests performed on these samples, these sandy lean clay soils are slightly dispersive. The dispersion test results are included in the attachments on form NRCS-ENG-354 and are also summarized in the table included below.

A soluble salts test, to measure the percent of total soluble salts present in a soil, was also performed on a small portion of the sample material. The results of this test indicate that these samples did not have a measurable percent of soluble salts present (total soluble salts was <0.5%). The salts test results are also included on form NRCS-ENG-354 as well as the table below.

Sample Numbers		Dispersion Tests			Percent Salts	Percent clay (% < 0.002 mm)
Lab	Field	Crumb	Double Hydro.	Pinhole		
17-687	102.1	3	11	ND3	<0.5	28
17-688	102.2	3	20	ND3	<0.5	28

Compaction Test

A Standard Proctor density compaction test was performed on the samples according to ASTM D698, using Method A. A fine specific gravity (Gs) test was also performed according to ASTM D854. The Gs test was performed to assist in calculating the zero air voids curve for the compaction plots and calculating the saturated water content of the soil. Plotted test results are on the Compaction and Penetration Resistance form included in the attachments. These test results are also included on form NRCS-ENG-354 and are summarized in the table below.

Sample Numbers		Depth ft	Test Method	Gs	Max. γ_d lb/ft ³	W _{OPT} %	W _C %	W _C Relative to W _{Opt}
Lab	Field							
17-687	102.1	0.5 – 5.5	A	2.66	104.5	18.5	14.7	-3.8
17-688	102.2	5.5 – 11	A	2.67	105.0	18.5	22.6	+4.1

Permeability Tests

Flexible wall permeability testing was performed on the samples in accordance with ASTM-D5084 after test specimens were back-pressure saturated to provide a saturated hydraulic conductivity, k recorded in cm/sec. The tests were performed to evaluate the permeability rate of the untreated soil at a select density and molding water content. The testing was conducted until a relatively constant permeability rate was obtained.

A test specimen was prepared with each of the clay soils compacted to 95 percent of Standard Proctor maximum dry density. The water content at the time of compaction was at optimum water content plus 1.5 percent (about 80 percent of saturation) for both samples. These sandy lean clay soils, when tested at this density and molding water content combination, have relatively low permeability. The results for the permeability tests performed on the samples are included on form NRCS-ENG-354 and summarized in the following table.

Sample Number		Compaction % of Max γ_d	Test w_c (%) Ref. To W_{Opt}	Saturation %	Additive*		k cm/sec
Lab	Field				Type	Rate	
17-687	102.1	95	+1.5	79.4	None	--	2.6×10^{-7}
17-688	102.2	95	+1.5	79.7	None	--	3.5×10^{-7}

* Samples not tested with additives at this time.

Triaxial Shear Tests

Consolidated Undrained with pore pressure measured (CU') and Unconsolidated Undrained (UU) triaxial shear tests were both performed on the disturbed samples submitted that are representative of soil to be used for the construction of the proposed compacted earthen embankment. The CU' and UU shear tests were performed with the test specimens compacted to 95 percent of Standard Proctor maximum dry density.

The CU' test specimens were molded at water contents near 90 percent of theoretical saturation to aid in saturating the sample prior to the performance of the test. The UU test specimens were molded at about optimum water content plus 1.5 to 2.0 percent, and the tests performed on the moist soil. These CL soil had moderate shear strengths. The results of the CU' and UU triaxial shear tests for the compacted borrow samples are included in the attachments on form NRCS-ENG-354 and are also summarized in the table below.

Sample Number		Depth ft	Density	Test Type	ϕ deg.	c lb/ft ²	ϕ' deg.	c' lb/ft ²
Lab	Field							
17-687	102.1	0.5-5.5	95% STD	CU'	15.9	200	29.2	115
			95% STD	UU	4.7	1458		
17-688	102.2	5.5-11	95% STD	CU'	14.3	272	27.8	147
			95% STD	UU	3.0	1123		

DESIGN AND CONSTRUCTION CONSIDERATIONS

Degree of Compaction and Placement Water Content

These sandy lean clay borrow soils should be compacted to at least 95 percent of Standard Proctor maximum dry density to provide the necessary strength for the compacted earthen embankment. Compaction primarily results from the expulsion of air from soils by the manipulation of the soil with compaction equipment. It is difficult to compact soils to a dry density and molding water content combination where the degree of saturation is greater than about 90 percent. In other words, it is difficult to expel the last 10 percent of air from a soil in the compaction process. The maximum molding water content for the soil can be estimated with the following equation.

$$w_{Max} (\%) = 0.90 \left[\frac{\gamma_{water}}{\% \gamma_d} - \frac{1}{G_s} \right] \times 100$$

Where: w_{Max} = Maximum molding water content (%)
 γ_{water} = 62.4 lb/ft³ (density of water)
 γ_d = 105.0 lb/ft³, maximum dry density of the soil
 G_s = 2.67, specific gravity of the soil

These CL soils have similar maximum dry density at the same optimum water content. A single density and molding water content combination can be used for a compacted embankment constructed from these materials. Sample 17-688 would control the design, due to the slightly higher maximum dry density.

It is recommended to compact these clay soils at a water content that is wet of optimum water content, near the molding water content of the permeability and triaxial shear test specimens, in order to provide both strength and flexibility. Assuming that the earthen embankment berm is compacted to 95 percent of Standard Proctor maximum dry density, the soils to be used for the proposed embankment will have a maximum molding water content of about 22.6 percent. Therefore a recommended molding water content range to compact the CL soils in field similar to the samples tested would be from 20.0 to 22.5 percent, optimum water content plus 1.5 to 4.0 percent.

Seepage Protection Filter and Drains

A seepage protection filter diaphragm consisting of a fine aggregate should be included around any conduits that are placed through the embankment in order to intercept any potential cracks that may occur. Cracking is a particular concern with the possibility of potential dispersive soils that may be present on site.

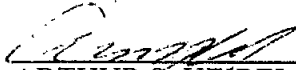
A seepage protection filter around any conduit through the embankment should be sized and located as described in Chapter 45, Filter Diaphragms, of Part 628 of the National Engineering Handbook (NEH). It is important to locate the filter as far downstream of the conduit as possible, but not less than the minimum required cover over the filter zone. The bandwidths for the fine aggregate filter and any potential drain fill aggregates should be sized according to calculations made using Chapter 26, of Part 633 in the NEH.

A representative fine aggregate design bandwidth was calculated using Chapter 26 with field sample 102.1, the slightly finer grained sample, as a base soil. This fine aggregate filter material design bandwidth is included in the attachments. The plot of the fine aggregate bandwidth with a representative filter material is also included in the attachments. ASTM C33 fine aggregate is one commercially available aggregate that will fit within the calculated design bandwidth for the filter material. If any additional assistance is needed for selecting a filter material please contact the NDCSMC-Lincoln.

Further testing and analysis for this project was not requested. If you have any questions about the test results or require any further testing or analysis for this project, please contact the NDCSMC-Lincoln at 402-437-5337.

Prepared by:

Concurred by:



ARTHUR S. HEIBEL
Engineer, Soil Mechanics Laboratory



STEPHEN D. REINSCH, P.E.
Co-Director, NDCSMC, Soil Mechanics

Attachments:

Form NRCS-ENG-354, Soil Mechanics Laboratory Test Data, 1 sheet

Compaction and Penetration Resistance, 2 sheets

Triaxial Shear Test Data, 4 tests, 10 sheets

Fine Aggregate Filter Design Bandwidth, 2 sheets

cc: (electronic distribution)

Ted Huscher, Geologist, NRCS, Lincoln, NE

Roy Boschec, Agricultural Engineer, NRCS, Rapid City, SD

U.S. Department of Agriculture
Natural Resources Conservation Service

Soil Mechanics Laboratory Data

Sheet 1 of 1

6/30/17		SOUTH DAKOTA (CO-01)	Sample Type	Depth ft.	Mechanical Analysis Grain Size Distribution Expressed as Percent Finer by Dry Weight																			Atterberg Limits		Unified Classification	Crumb	Dispersion %	Moisture-Density Relationships a Standard a Modified			Undisturbed Sample Data		G _s	Special Tests																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Lab. Sample No.	Field Number				Location and Description	Fines					Sand					Gravel													Curve No.	Max γ _d p.c.f.	w _o %	γ _d p.c.f.	w _N %		As Received Moisture	Soluble Salts %	Coefficient of Permeability, k cm/sec																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
						0.002 mm	0.005 mm	0.02 mm	0.05 mm	#200 0.074 mm	#140 0.105 mm	#60 0.250 mm	#40 0.42 mm	#20 0.84 mm	#10 2.0 mm	#4 4.76 mm	3/8" 9.525 mm	1/2" 12.7 mm	3/4" 19.05 mm	1" 25.4 mm	1 1/2" 38.1 mm	2" 50.8 mm																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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Limpert Pond, SD

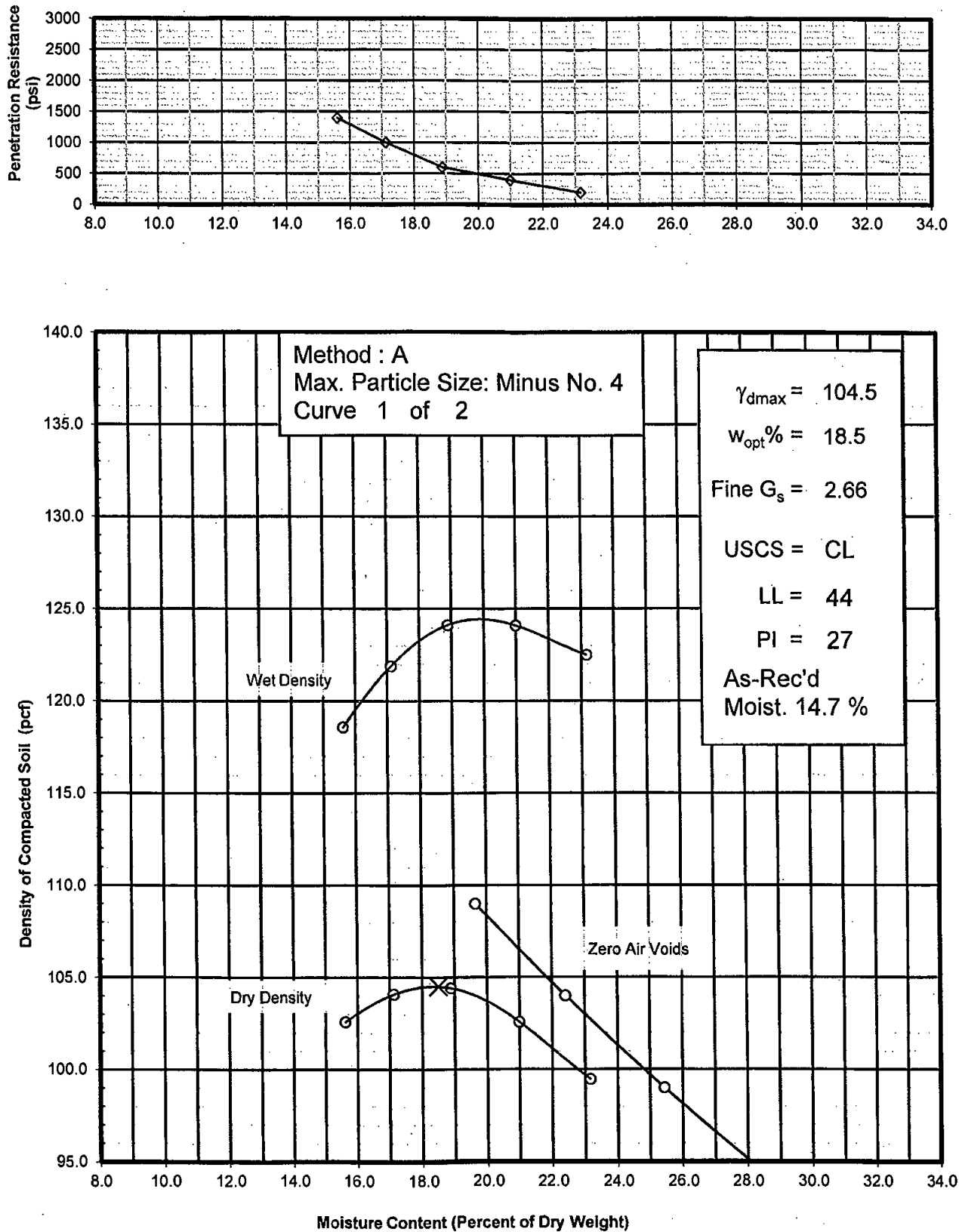
W.O. No. 88

Borrow Area

Dam CO-01

Field No. 102.1

Lab No. 17-687



LIMPERT POND, SD

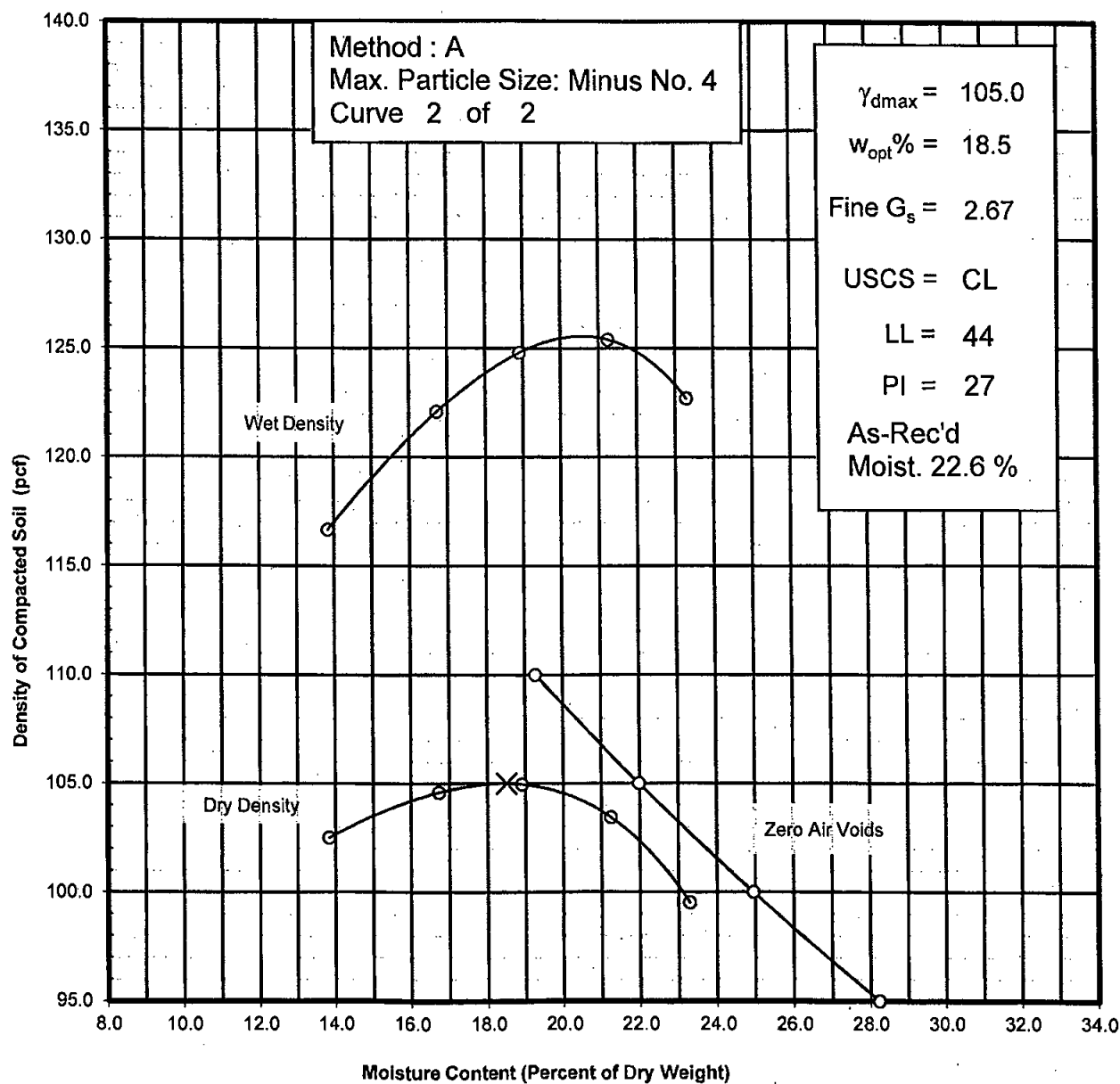
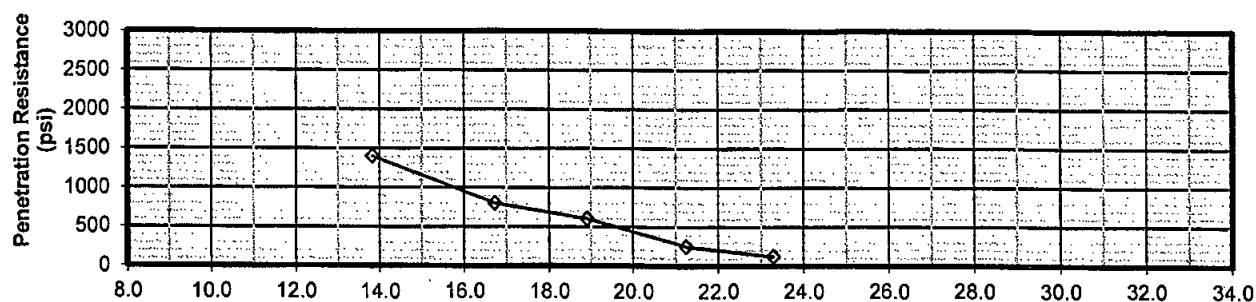
W.O. No. 88

Borrow Area

Dam CO-01

Field No. 102.2

Lab No. 17-688



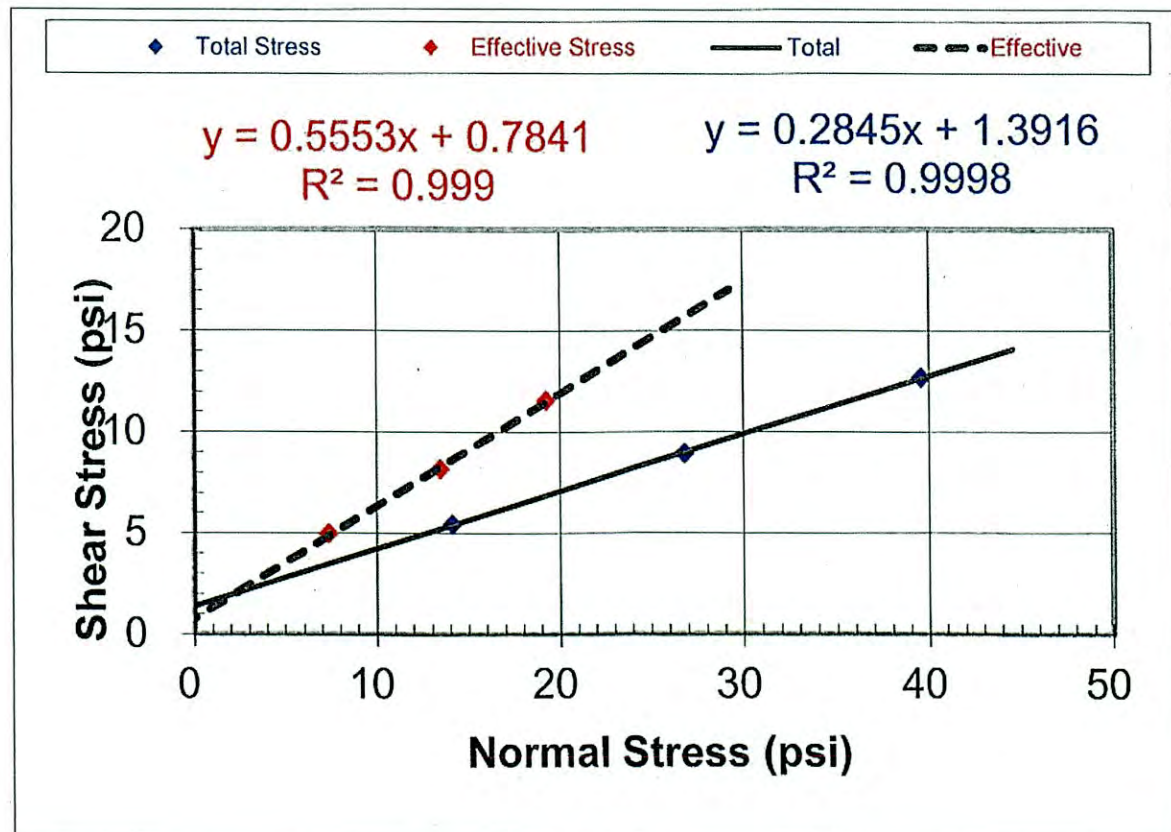
Mohr Circle Program

SITE NAME: **Limpert Pond**
STATE: **South Dakota**
SAMPLE NO: **17-687**

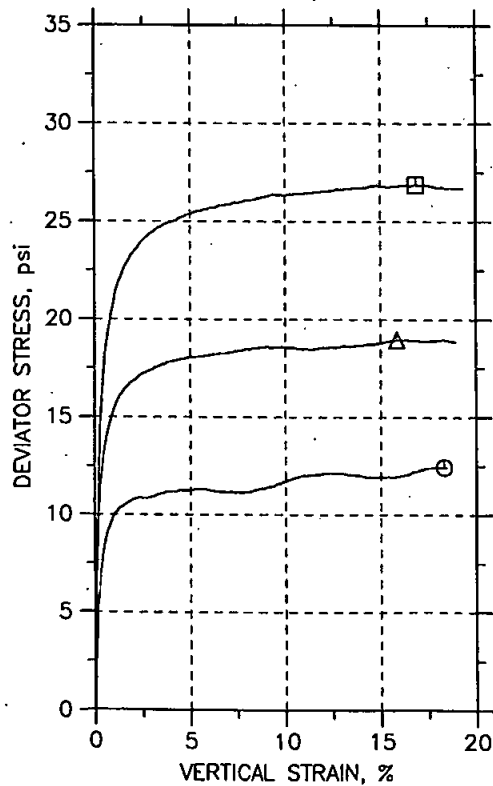
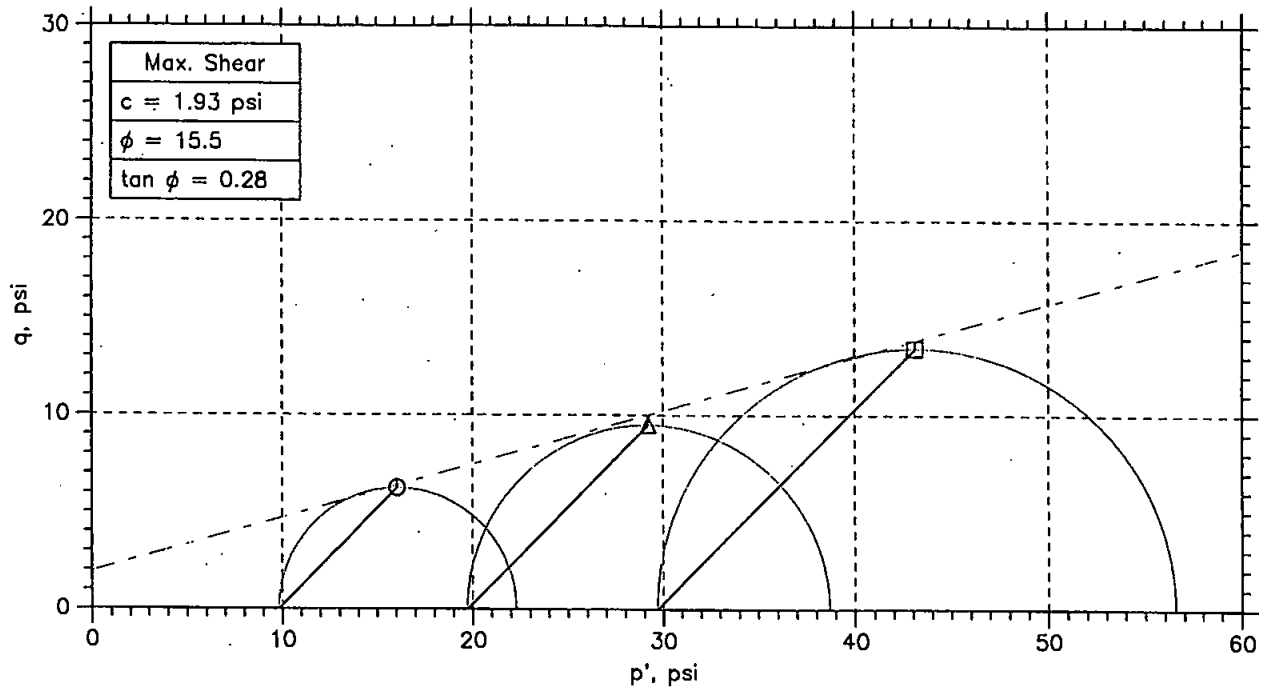
Failure Criterion: ☐ Maximum Dev. Stress ☒ Maximum Stress Ratio ☐ Max. Pore Pressure ☐ <= 10% Strain ☐ Selected Points	Total Strength Parameters:		Zero Cohesion:
	PHI: 15.9 degrees	15.9 degrees	Slope y=
	C: 200 psf	1.39 psi	
	Effective Strength Parameters:		
	PHI': 29.0 degrees	29.0 degrees	Slope y=
	C': 113 psf	0.78 psi	
Stress path analysis from p-q plot:			
	PHI': 29.2 degrees		
	C': 115 psf		

(All inputted values in the chart are in psi)

CELL PRESSURE	DEVIATOR STRESS AT FAILURE	PORE PRESSURE AT FAILURE	PERCENT STRAIN (Optional Entry)
10	11.3	5.5	5.4
20	18.6	11.3	8.9
30	26.4	17.6	9.3



CONSOLIDATED UNDRAINED TRIAXIAL TEST



Symbol	○	△	□	
Sample No.	17-687	17-687	17-687	
Test No.	1	2	3	
Depth	0.5-5.5'	0.5-5.5'	0.5-5.5'	
Initial	Diameter, in	1.4	1.4	1.4
	Height, in	3.001	3.001	3.002
	Water Content, %	23.1	23.1	23.3
	Dry Density, pcf	99.38	99.38	99.24
	Saturation, %	92.2	92.2	92.5
	Void Ratio	0.665	0.665	0.667
Before Shear	Water Content, %	25.8	24.1	22.8
	Dry Density, pcf	98.21	101.	103.2
	Saturation*, %	100.0	100.0	100.0
	Void Ratio	0.685	0.639	0.603
	Back Press., psi	100.2	100.3	100.3
	Ver. Eff. Cons. Stress, psi	9.823	19.73	29.69
	Shear Strength, psi	6.222	9.479	13.43
	Strain at Failure, %	18.3	15.9	16.9
	Strain Rate, %/min	0.06	0.06	0.06
	B-Value	0.00	0.00	0.00
	Measured Specific Gravity	2.65	2.65	2.65
	Liquid Limit	---	---	---
	Plastic Limit	---	---	---



Project: LIMPert POND

Location: SD

Project No.: 17-687

Boring No.: 102.1

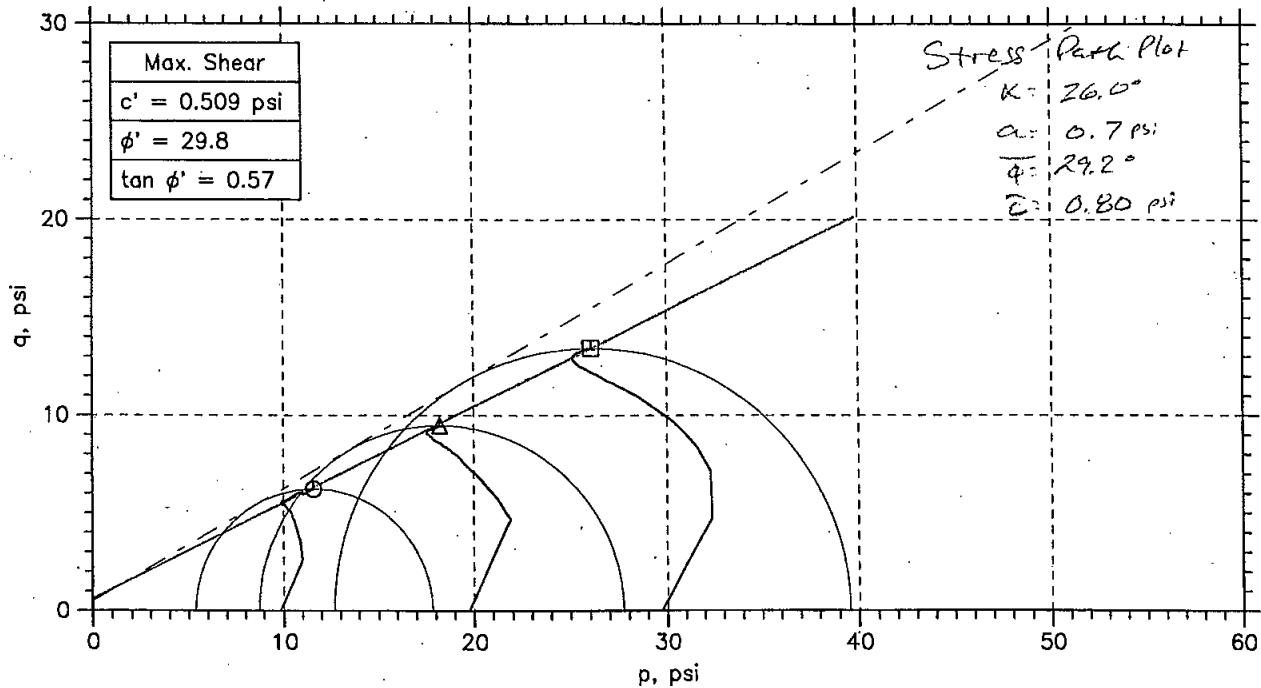
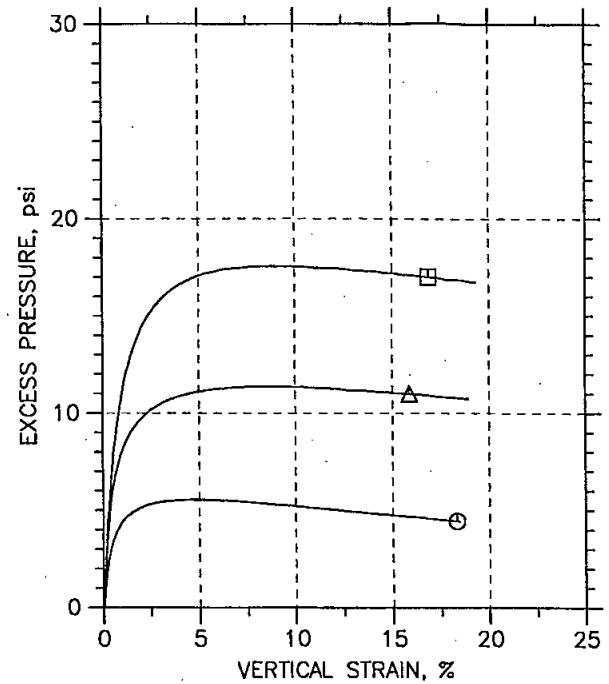
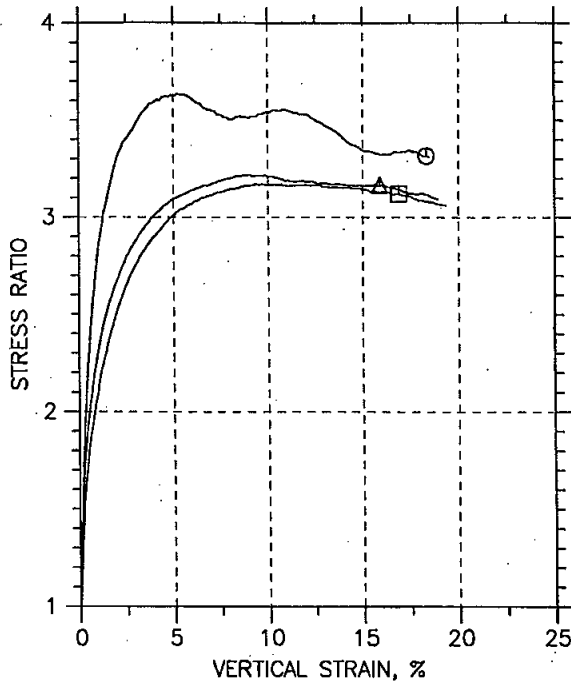
Sample Type: REMOLD

Description: BORROW AREA; EAST CENTER OF MEANDER CORE

Remarks:

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CONSOLIDATED UNDRAINED TRIAXIAL TEST



	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
○	17-687	1	0.5-5.5'	SKK	8/10/17	SKK		17-687-10eng.dat
△	17-687	2	0.5-5.5'	SKK	8/10/17	SKK		17-687-20eng.dat
□	17-687	3	0.5-5.5'	SKK	8/10/17	SKK		17-687-30eng.dat



Project: LIMPET POND

Location: SD

Project No.: 17-687

Boring No.: 102.1

Sample Type: REMOLD

Description: BORROW AREA; EAST CENTER OF MEANDER CORE

Remarks:

Mohr Circle Program

SITE NAME: Limpert Pond
STATE: South Dakota
SAMPLE NO: 17-688

Total Strength Parameters:

Zero Cohesion:

PHI:	14.3 degrees
C:	272 psf

14.3 degrees
1.89 psi

Slope y=

Failure Criterion:

- ☐ Maximum Dev. Stress
☒ Maximum Stress Ratio
☒ Max. Pore Pressure
☐ <= 10% Strain
☐ Selected Points

Effective Strength Parameters:

PHI':	27.1 degrees
C':	169 psf

27.1 degrees
1.18 psi

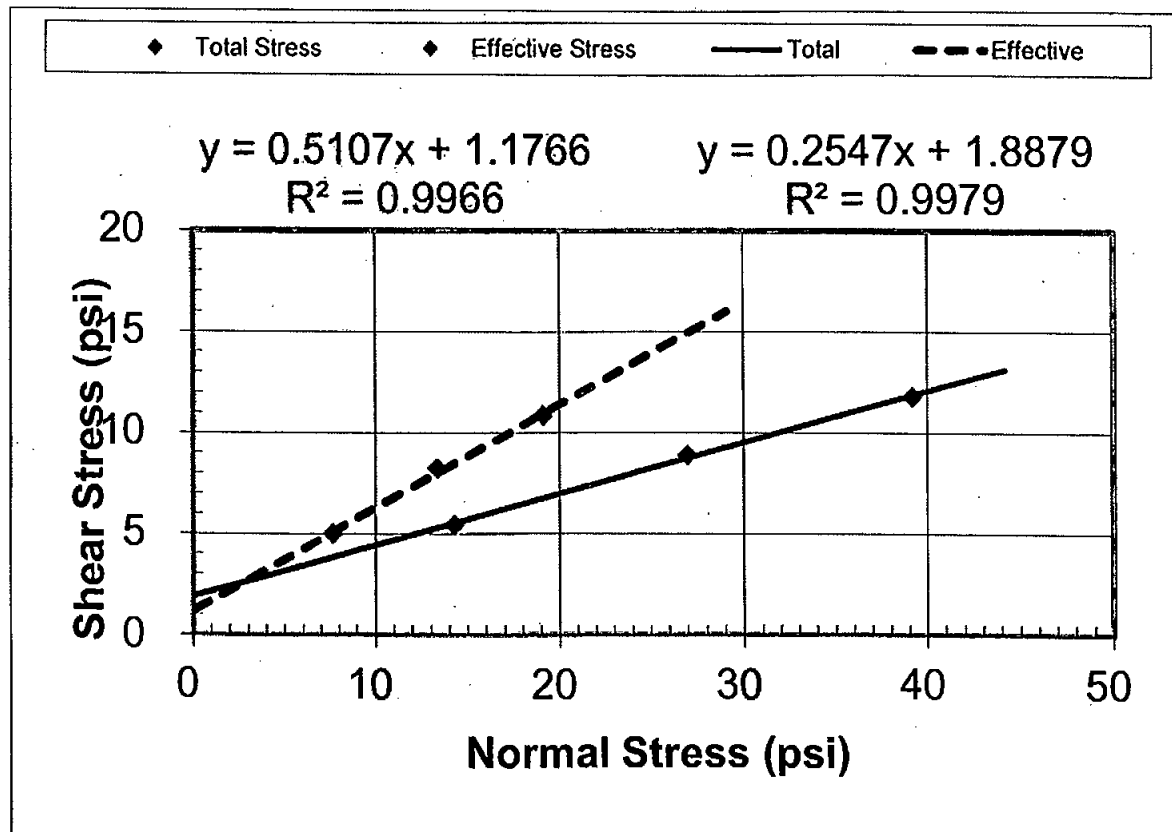
Slope y=

Stress path analysis from p-q plot:

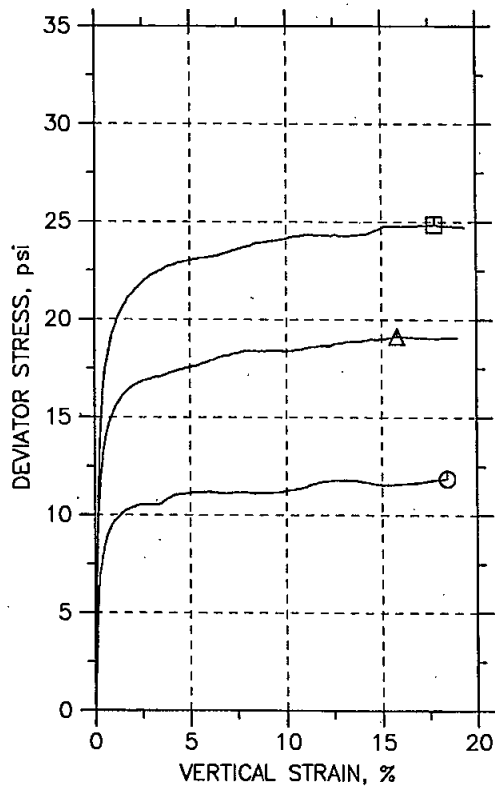
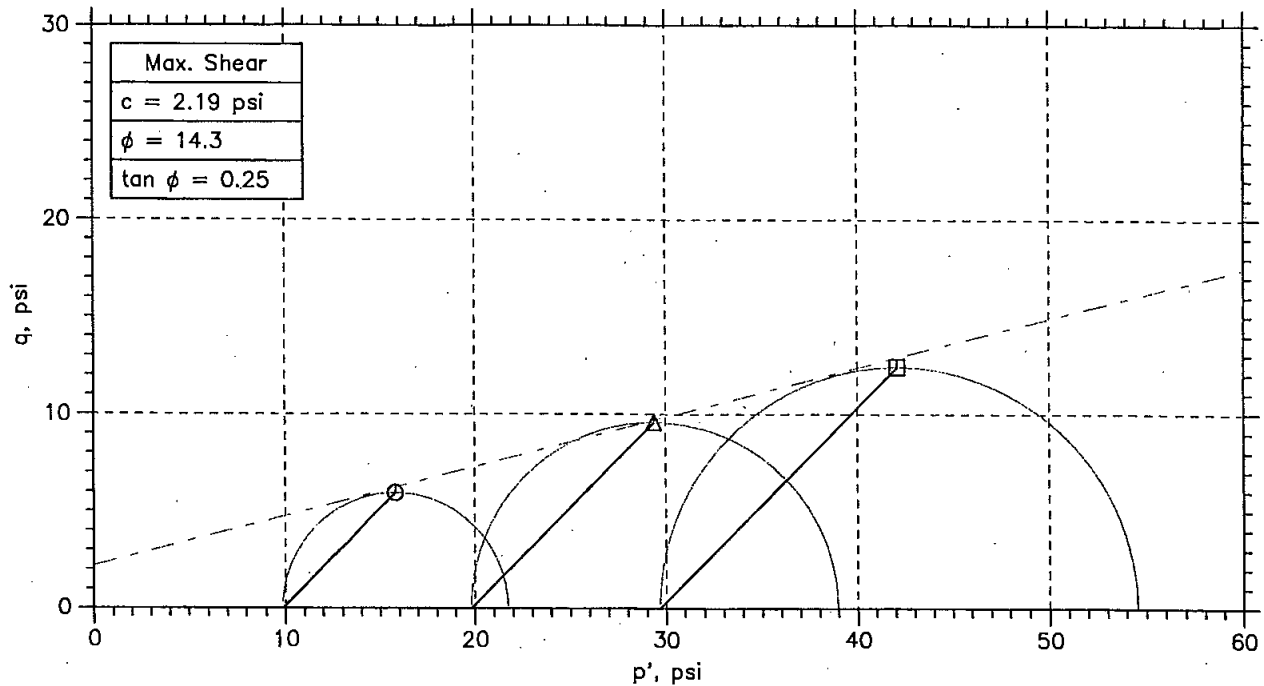
PHI': 27.8 degrees
C': 147 psf

(All inputted values in the chart are in psi)

CELL PRESSURE	DEVIATOR STRESS AT FAILURE	PORE PRESSURE AT FAILURE	PERCENT STRAIN (Optional Entry)
10	11.2	5.4	6.0
20	18.4	11.7	7.9
30	24.3	17.6	10.4



CONSOLIDATED UNDRAINED TRIAXIAL TEST



Symbol	○	△	□	
Sample No.	17-688	17-688	17-688	
Test No.	1	2	3	
Depth	5.5-11'	5.5-11'	5.5-11'	
Initial	Diameter, in	1.4	1.4	1.4
	Height, in	3	3.001	3
	Water Content, %	22.6	22.5	22.5
	Dry Density, pcf	99.82	99.88	99.84
	Saturation, %	90.0	89.7	89.9
Before Shear	Void Ratio	0.67	0.669	0.67
	Water Content, %	25.0	23.0	21.8
	Dry Density, pcf	99.97	103.3	105.3
	Saturation*, %	100.0	100.0	100.0
	Void Ratio	0.667	0.613	0.583
	Back Press., psi	100.1	100.2	100.3
	Ver. Eff. Cons. Stress, psi	9.864	19.81	29.68
	Shear Strength, psi	5.933	9.57	12.43
	Strain at Failure, %	18.4	15.8	17.8
	Strain Rate, %/min	0.06	0.06	0.06
	B-Value	0.00	0.00	0.00
	Measured Specific Gravity	2.67	2.67	2.67
	Liquid Limit	---	---	---
	Plastic Limit	---	---	---



Project: LIMPET POND

Location: SD

Project No.: 17-688

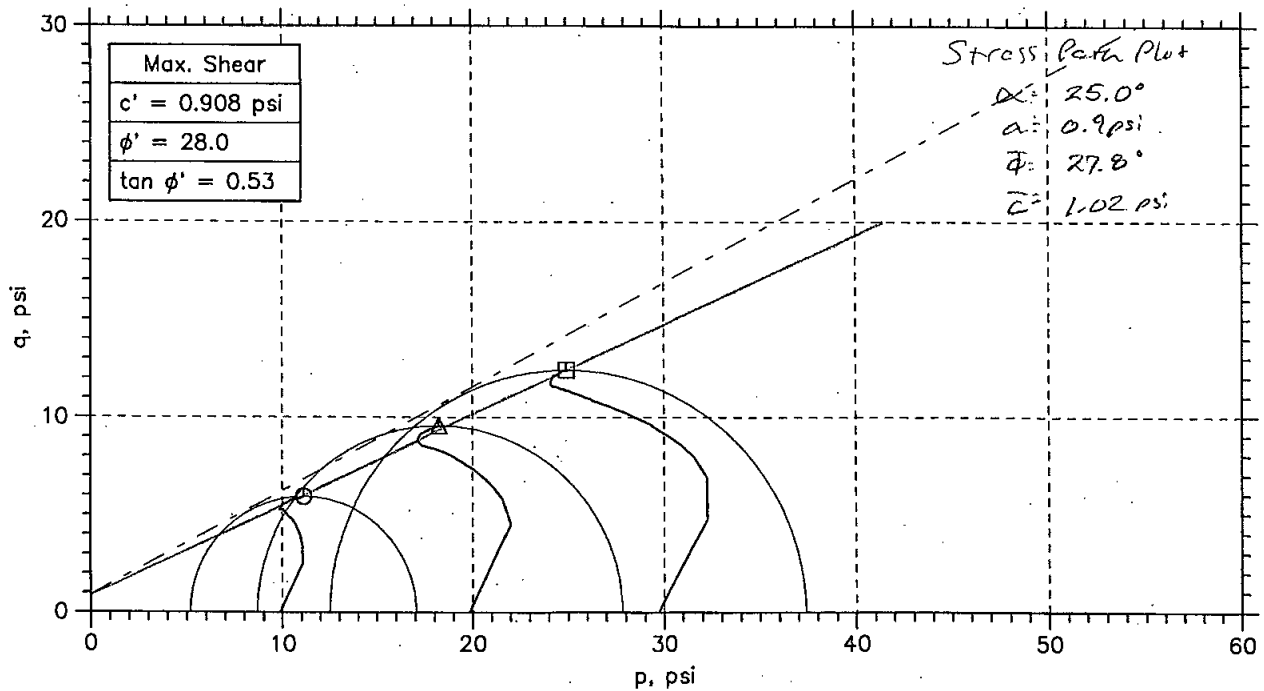
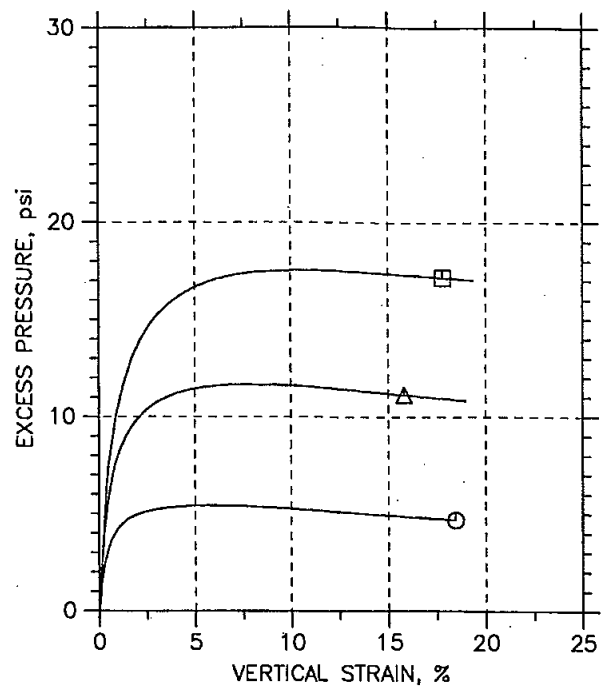
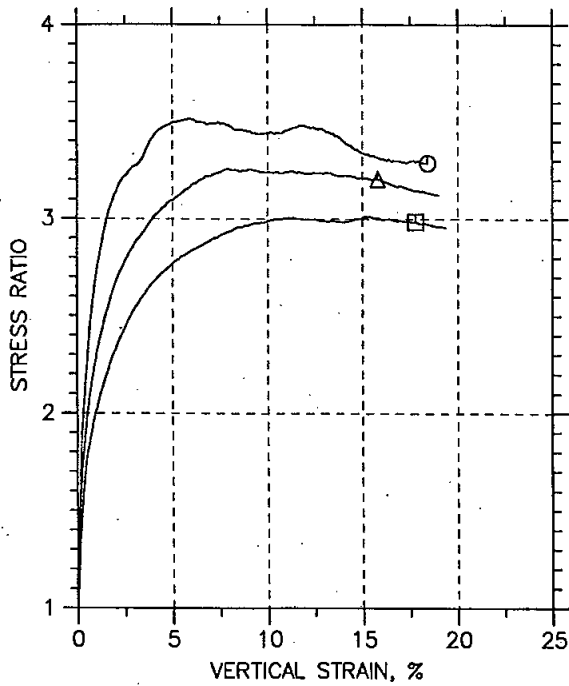
Boring No.: 102.2

Sample Type: REMOLD

Description: BORROW AREA; EAST CENTER OF MEANDER CORE

Remarks:

CONSOLIDATED UNDRAINED TRIAXIAL TEST



	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
○	17-688	1	5.5-11'	SKK	8/15/17	SKK		17-688-10eng.dat
△	17-688	2	5.5-11'	SKK	8/15/17	SKK		17-688-20eng.dat
□	17-688	3	5.5-11'	SKK	8/15/17	SKK		17-688-30eng.dat



Project: LIMPET POND

Location: SD

Project No.: 17-688

Boring No.: 102.2

Sample Type: REMOLD

Description: BORROW AREA; EAST CENTER OF MEANDER CORE

Remarks:

Mohr Circle Program

SITE NAME: Limpert Pond
STATE: South Dakota
SAMPLE NO: 17-687 UU

Total Strength Parameters:

Zero Cohesion:

PHI:	4.7 degrees
C:	1458 psf

4.7 degrees
10.12 psi

Slope y=

Failure Criterion:

- ☐ Maximum Dev. Stress
☐ Maximum Stress Ratio
☐ Max. Pore Pressure
☒ <= 10% Strain
☐ Selected Points

Effective Strength Parameters:

PHI':	4.7 degrees
C':	1458 psf

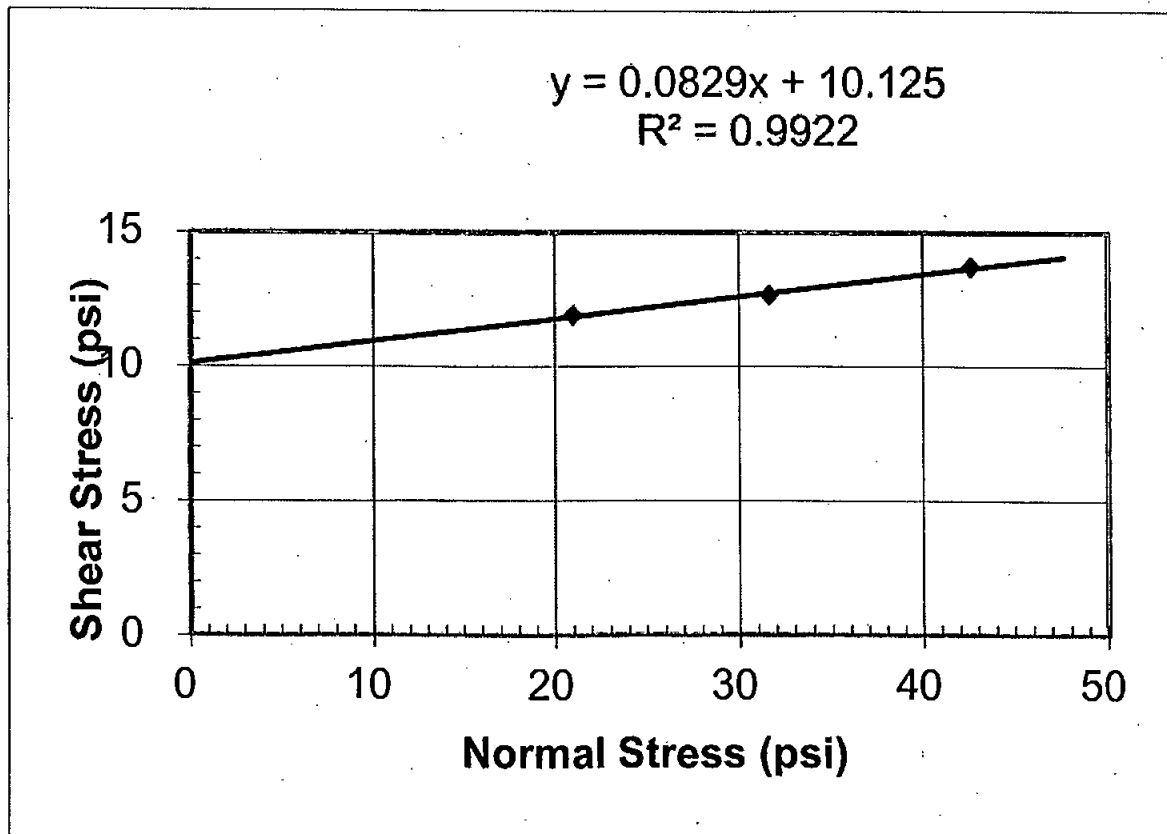
4.7 degrees
10.12 psi

Slope y=

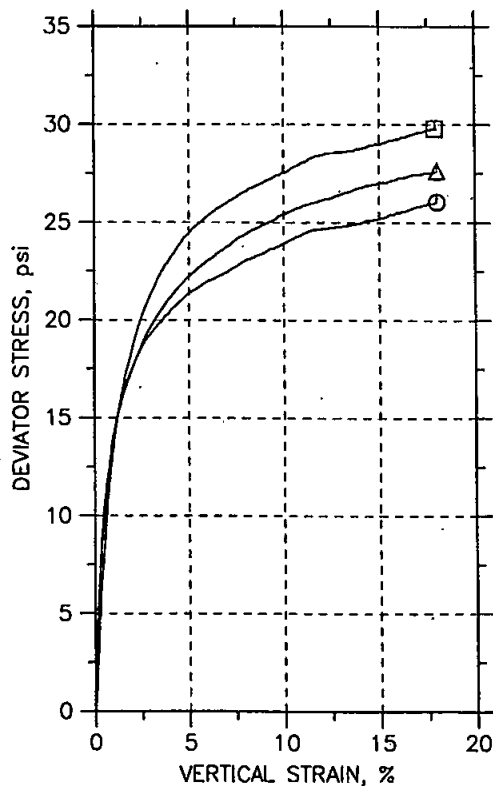
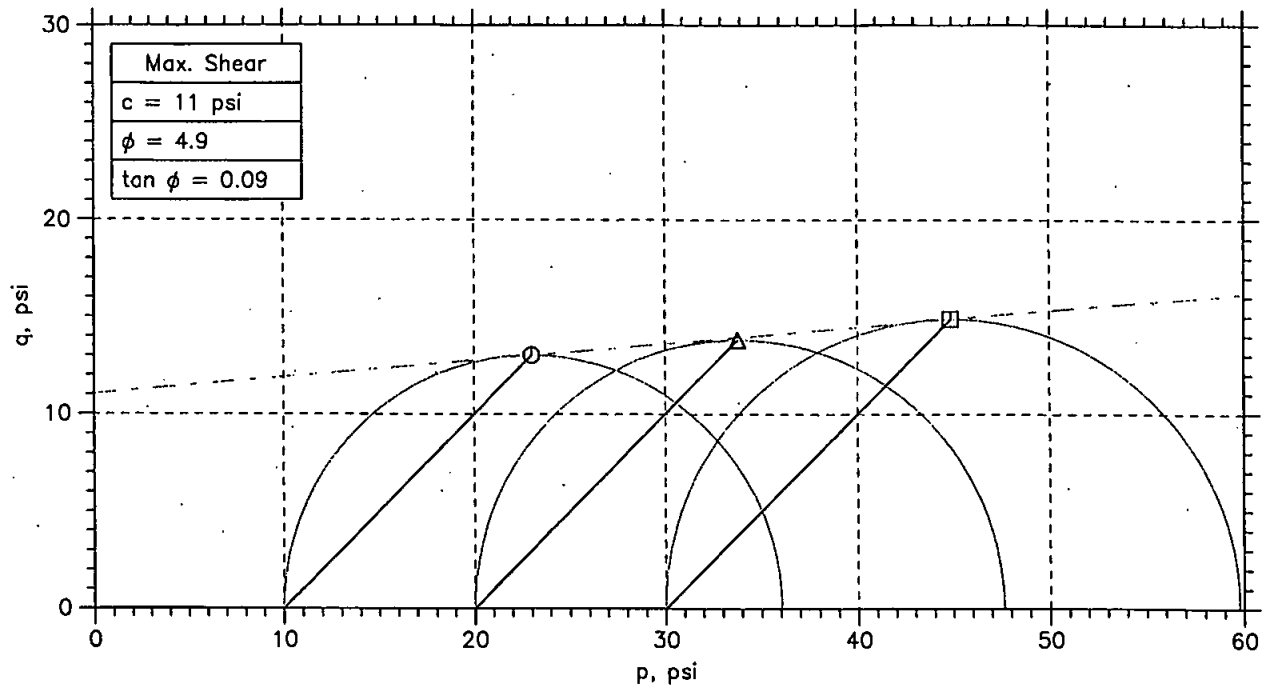
Alpha': degrees
a': psi

(All inputed values in the chart are in psi)

CELL PRESSURE	DEVIATOR STRESS AT FAILURE	PORE PRESSURE AT FAILURE	PERCENT STRAIN (Optional Entry)
10	23.9	0.001	10.0
20	25.4	0.001	10.0
30	27.5	0.001	10.0



UNCONSOLIDATED UNDRAINED TRIAXIAL TEST



Symbol	○	△	□	
Sample No.	14-687	14-687	14-687	
Test No.	1	2	3	
Depth	0.5-5.5'	0.5-5.5'	0.5-5.5'	
Tested by	SKK	SKK	SKK	
Test Date	8/10/17	8/10/17	8/10/17	
Checked by	SKK	SKK	SKK	
Check Date				
Diameter, in	1.4	1.4	1.4	
Height, in	3.001	3	3	
Water Content, %	20.1	20.3	20.2	
Dry Density, pcf	99.33	99.17	99.27	
Saturation, %	80.0	80.4	80.2	
Void Ratio	0.666	0.668	0.666	
Confining Stress, psi	10	20	30	
Undrained Strength, psi	13.02	13.81	14.89	
Max. Dev. Stress, psi	26.04	27.63	29.78	
Strain at Failure, %	18	18	17.9	
Strain Rate, %/min	1	1	1	
Measured Specific Gravity	2.65	2.65	2.65	
Liquid Limit	---	---	---	
Plastic Limit	---	---	---	
Plasticity Index	---	---	---	



Project: LIMPET POND

Location: SD

Project No.: 17-687

Boring No.: 102.1

Sample Type: REMOLD

Description: BORROW AREA; EAST CENTER OF MEANDER CORE

Remarks:

Phase calculations based on start and end of test.

Mohr Circle Program

SITE NAME: **Limpert Pond**

STATE: **South Dakota**

SAMPLE NO: **17-688 UU**

Total Strength Parameters:

Zero Cohesion:

PHI: 3.0 degrees

3.0 degrees

Slope y=

C: 1123 psf

7.80 psi

Failure Criterion:

☐ Maximum Dev. Stress

☐ Maximum Stress Ratio

☐ Max. Pore Pressure

☒ <= 10% Strain

☐ Selected Points

Effective Strength Parameters:

PHI': 3.0 degrees

3.0 degrees

Slope y=

C': 1123 psf

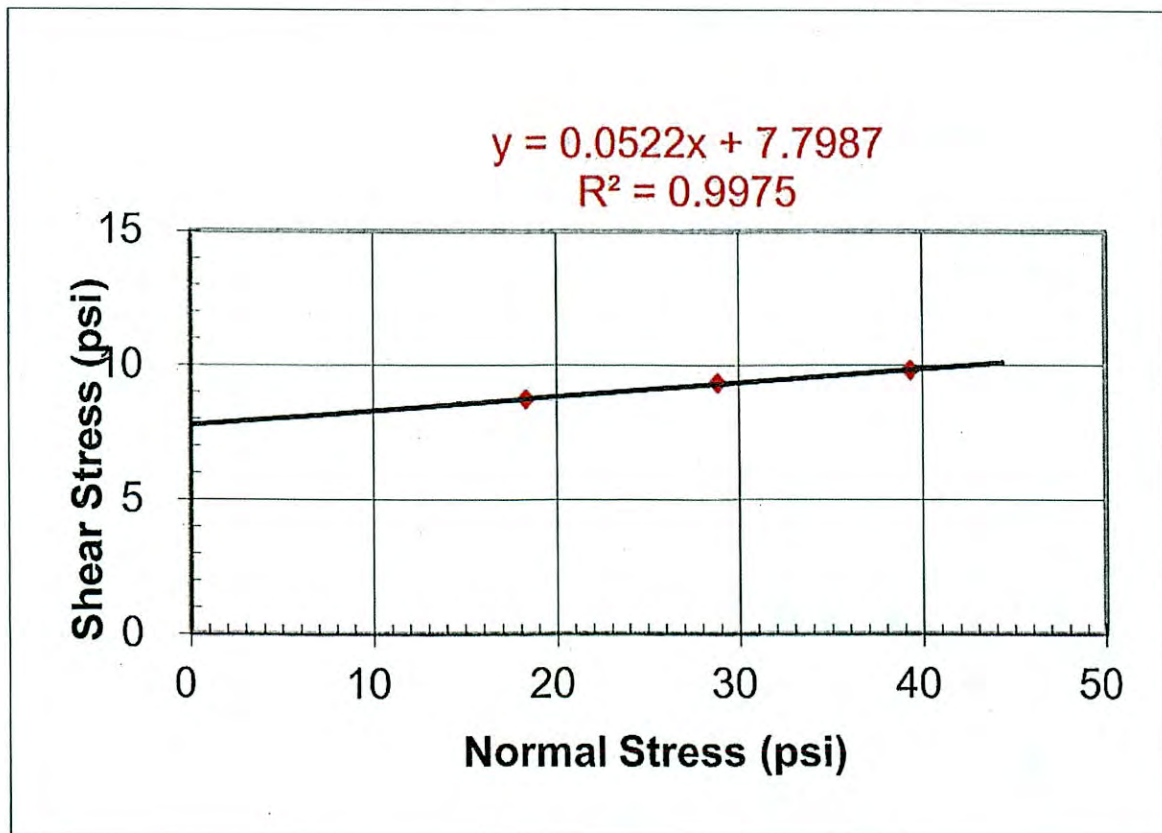
7.80 psi

Alpha': degrees

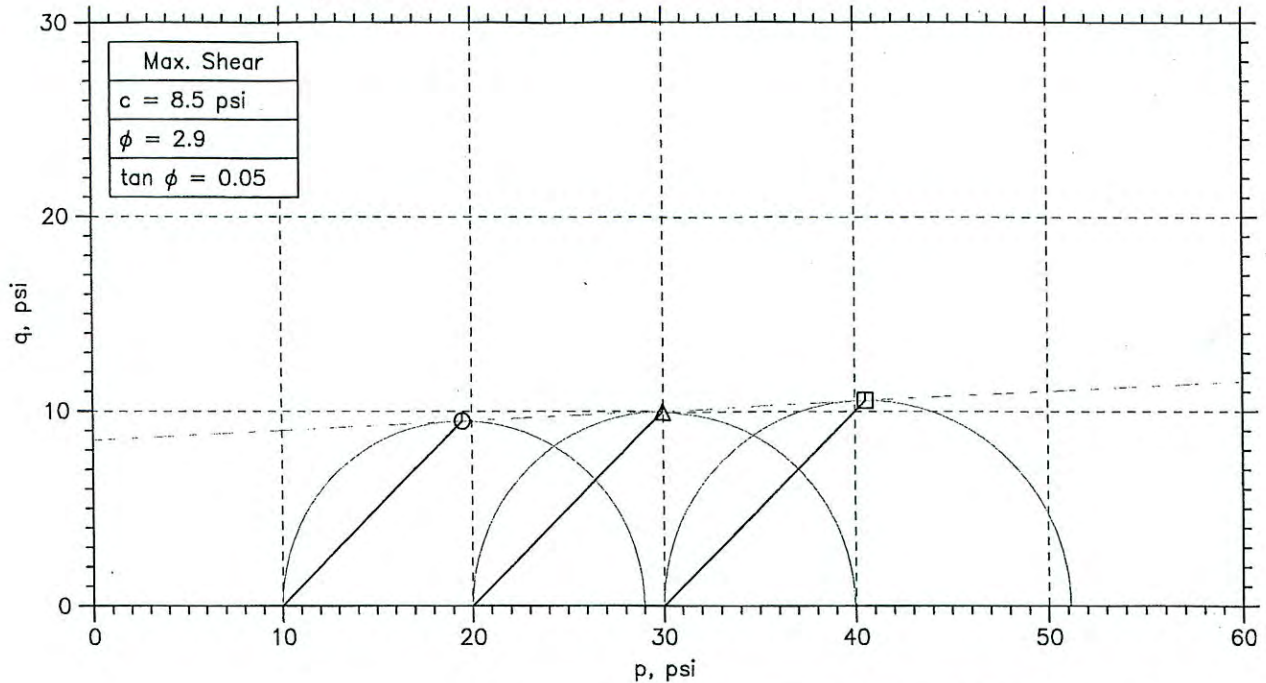
a': psi

(All inputed values in the chart are in psi)

CELL PRESSURE	DEVIATOR STRESS AT FAILURE	PORE PRESSURE AT FAILURE	PERCENT STRAIN (Optional Entry)
10	17.5	0.001	10.0
20	18.7	0.001	10.0
30	19.7	0.001	10.0



UNCONSOLIDATED UNDRAINED TRIAXIAL TEST



Symbol	○	△	□	
Sample No.	17-688	17-688	17-688	
Test No.	1	2	3	
Depth	5.5-11'	5.5-11'	5.5-11'	
Tested by	SKK	SKK	SKK	
Test Date	8/11/17	8/11/17	8/11/17	
Checked by	SKK	SKK	SKK	
Check Date				
Diameter, in	1.4	1.4	1.4	
Height, in	2.999	2.999	3.001	
Water Content, %	20.6	20.8	20.8	
Dry Density, pcf	99.93	99.71	99.77	
Saturation, %	82.2	82.8	82.6	
Void Ratio	0.668	0.672	0.671	
Confining Stress, psi	10	20	30	
Undrained Strength, psi	9.492	9.972	10.56	
Max. Dev. Stress, psi	18.98	19.94	21.12	
Strain at Failure, %	17.9	17.6	17.9	
Strain Rate, %/min	1	1	1	
Measured Specific Gravity	2.67	2.67	2.67	
Liquid Limit	---	---	---	
Plastic Limit	---	---	---	
Plasticity Index	---	---	---	



Project: LIMPET POND

Location: SD

Project No.: 17-688

Boring No.: 102.2

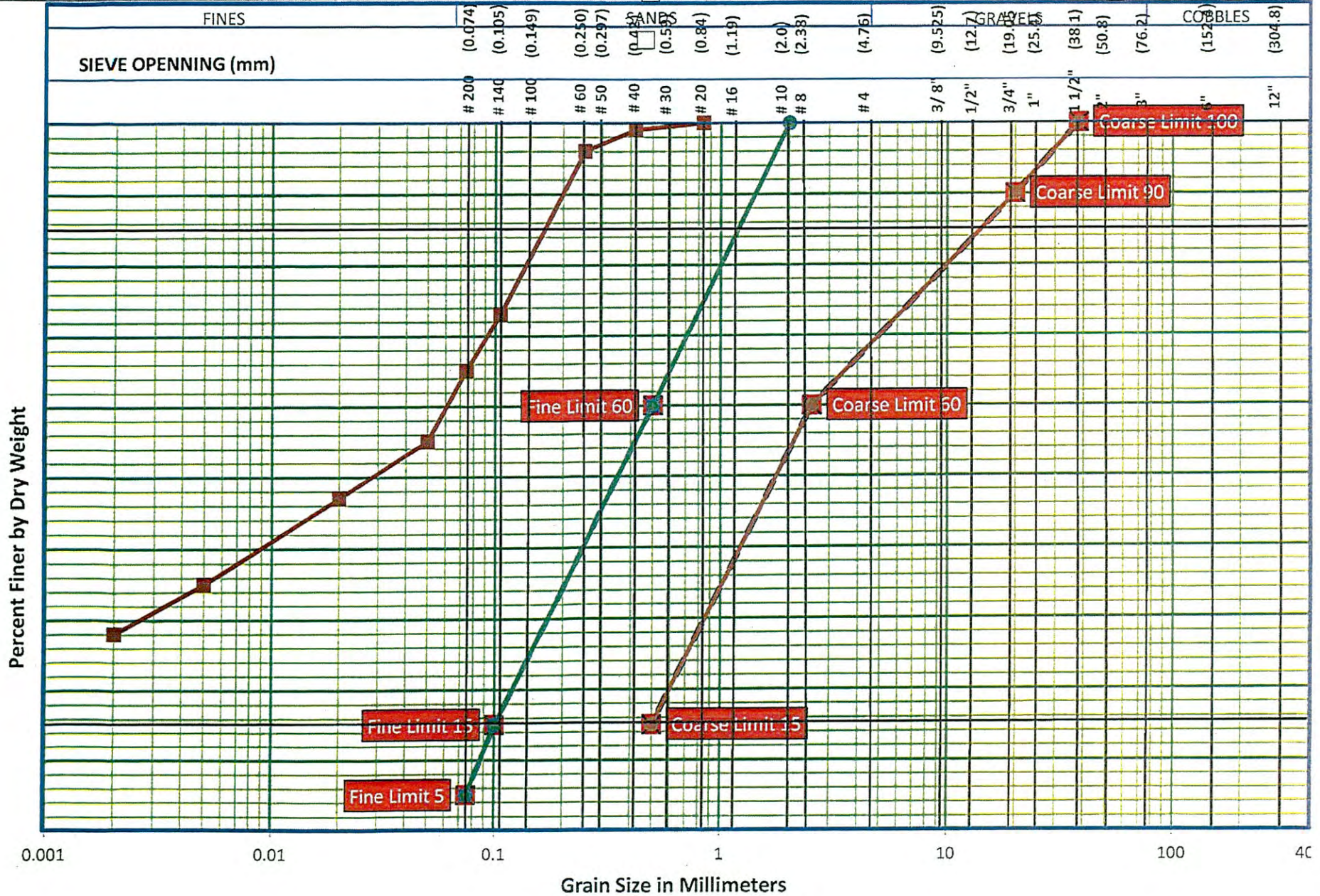
Sample Type: REMOLD

Description: BORROW AREA; EAST CENTER OF MEANDER CORE

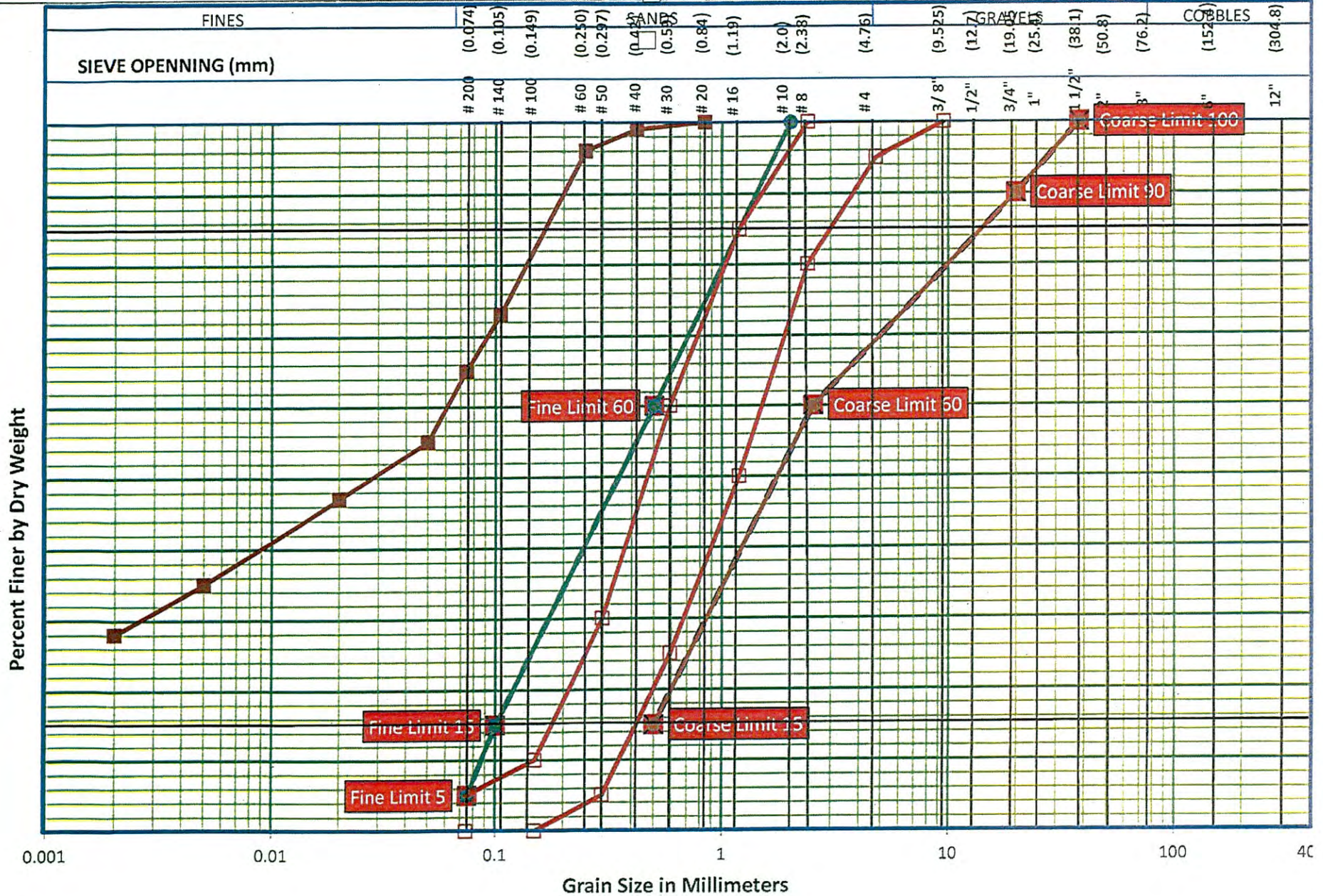
Remarks:

Phase calculations based on start and end of test.

Soil Gradations to Graph	City of	Standard Aggregations	Filter Band	Coarse Side
Base Soil	☒	Fine Aggregate - ASTM C-33	☐	☐
Base Soil with Coarse Limit	☐	Coarse Aggregate - ASTM C-33 (89)	☐	☐
Regraded Base Soil	☐	Coarse Aggregate - ASTM C-33 (56)	☐	☐
Filter Fine Limit	☒	Coarse Aggregate - ASTM C-33 (57)	☐	☐
Filter Coarse Limit	☒	Coarse Aggregate - ASTM C-33 (67)	☐	☐
Fine Limit 100 Extrapolated	☐	Coarse Aggregate - ASTM C-33 (7)	☐	☐
Manual Fine Limit	☒	Coarse Aggregate - ASTM C-33 (8)	☐	☐
Manual Coarse Limit	☒	Project Defined Aggregate	☐	☐



Soil Gradations to Graph	✓	Standard Aggregations	✓	
Base Soil	✓	Fine Aggregate - ASTM C-33	✓	
Base Soil with Coarse Limit	✓	Coarse Aggregate - ASTM C-33 (89)		
Regraded Base Soil	✓	Coarse Aggregate - ASTM C-33 (56)		
Filter Fine Limit	✓	Coarse Aggregate - ASTM C-33 (57)		
Filter Coarse Limit	✓	Coarse Aggregate - ASTM C-33 (67)		
Fine Limit 100 Extrapolated	✓	Coarse Aggregate - ASTM C-33 (7)		
Manual Fine Limit	✓	Coarse Aggregate - ASTM C-33 (8)		
Manual Coarse Limit	✓	Project Defined Aggregate		



Watershed or County: <u>Harding Co SD</u>		Site No. or Name: <u>Limpert Pond</u>		Date: <u>6/20/17</u>
Drilling Equipment: <u>Giddings "W" 3" Auger</u>		Logged by: <u>Ted Huscher</u>		Project: <u>WF-08</u> <u>PL-46</u> <u>PL-06</u> <u>RCD</u> <u>GP</u>
Hole No. <u>TH-1</u>	Location: <u>West / right high area of E</u>		Elevation: _____	Depth to Water: _____

Depth In Feet -		CLASSIFICATION				DESCRIPTION	Sample		Depth In Feet		
From	To	Material	Sand	Silt	Clay		USCS	No.	Type	From	To
0	7	sandy (w) silty clay - all	60-70	10	20	SC-SM	alluvial sand. Gray brown moist non plastic. Sands are very fine grained. Can clump a ball. friable				
7	8	poorly graded sand	90	3	7	SP	sand. Gray brown moist non plastic. Sands are very fine grained. friable				
8	13	clayey silty sand	85+	7+	7+	SC-SM layers	layers of clay sand. gray brown moist. non plastic. v. f. sand. Gravel alternating layers but mostly sand				
13	15	clayey sand	70	5	20	SC	alluvial sand. gray brown moist. low plasticity. Firm to friable. v. f. sand				
17	19	clayey sand	80	5	15	SC	residuum of clayey sandstone. gray brown. drills finer / more solid. moist. low to non plastic. firm. very fine grained sand.				
							No water in hole. hole filled				
							total depth 19'				

NE-ENG-11' 5/72
(File Code -ENG 16)

GEOLOGIC INVESTIGATIONS FIELD LOG SHEET

U.S.D.A. Soil Conservation Service

Sheet 1 of 1

Watershed or County: Harding Co SD		Site No. or Name: Lampert Pond		Date: 6/20/17	
Drilling Equipment: Giddings 0" 7 3" Auger		Logged by: Ted Huscher		Project: WF-08 PL-46 PL-06 RCD GP	
Hole No: 1H-2	Location: Area between creek meanders		Elevation:	Depth to Water: 10.8' 6 3/4"	

Hole caved to 11.6' depth

Depth In Feet		CLASSIFICATION				DESCRIPTION	Sample		Depth In Feet	
From	To	Material	Sand	Silt	Clay	USCS	No.	Type	From	To
0	5	Lean clay w/ sand	20-25	35-40	40	CL				
						w/S				
5	7	fat clay				CH				
7	12	lean clay w/ sand	25+35	40+		CL (high)				
						w/S				
12	16	clayey sand w/ dirt sand lenses	40+	25	35	SC				
						OP, SC				
16	20	clayey sand	78	2	<20	SC				

WATER IN HOLE TO END OF DRILLING

Watershed or County: <u>Harding Co SD</u>	Site No. or Name: <u>Limpert Pond</u>	Date: <u>6/20/17</u>
Drilling Equipment: <u>Caddis 4" 3" Auger</u>	Logged by: <u>Ted Huscher</u>	Project: <u>WF-08 PL-46 PL-06 RCD GP</u>
Hole No. <u>TH-3</u>	Location: <u>Roughly middle of proposed structure area</u>	Elevation: <u></u> Depth to Water: <u>5.5 6/21/17</u>

Depth In Feet		CLASSIFICATION				DESCRIPTION	Sample		Depth In Feet	
From	To	Material	Sand	Silt	Clay	USCS	No.	Type	From	To
0										
						VARIOUS CLAYS w/ SANDS +				
						SANDS WITH CLAY GRAY BROWN TO BROWN GRAY VERY FINE SAND				
0	1	SILTY SAND				SM				
						0-1 SM GRAY BROWN MOIST LOW				
						MODERATE PLASTICITY STIFF				
1	2	CLAYEY SAND				SC				
						1-2 SC GRAY BROWN MOIST				
						MODERATE PLASTICITY FIRM				
2	3	LEAN CLAY				CL w/ S				
		w/ SAND				(HIGH)				
						HIGH PLASTICITY STIFF				
3	4	CLAYEY SAND				SC				
						BROWN GRAY FIRM MOIST				
						MODERATE PLASTICITY				
4	5	LEAN CLAY				CL w/ S				
		w/ SAND				(HIGH)				
						BROWN GRAY MOIST TO WET				
						HIGH PLASTICITY				
5	6	SAME								
						SAME BUT w/ CLAY (SHALE?)				
						PEDS / HARD BUT MAKABLE PIECES				
6	9	LEAN CLAY				CL w/ S				
		w/ SAND				S				
						HIGH PLASTICITY FIRM TO SOFT				
						(HIGH)				
						STRUCTURE / LAYERS PRESENT				
						REDDY @ 7-8" + GRAY SAND				
						POCKETS THIN SAND WISPS / COATINGS IN LAMINAE				
9	12	LEAN CLAY				CL w/ S				
		w/ SAND								
						GRAY BROWN WET HIGH PLASTICITY				
						FIRM NOTICIBLY HIGHER CLAY CONTENT				
						DARK BROWN SAND LAMINAE				

Watershed or County: <u>Harding Co SD</u>		Site No. or Name: <u>Limoent Pond</u>		Date: <u>6/20/17</u>	
Drilling Equipment: <u>Grinding 3" Auger</u>		Logged by: <u>Ted Huscher</u>		Project: WF-08 <u>PL-46</u> <u>PL-06</u> <u>RGD</u> <u>GP</u>	
Hole No. <u>TH-3</u>	Location: <u>Roughly middle of proposed structure area</u>		Elevation:		Depth to Water: <u>5.5'</u> <u>6/21/17</u>

[illegible]

NE-ENG-11 5/72
(File Code -ENG 16)

GEOLOGIC INVESTIGATIONS FIELD LOG SHEET U.S.D.A. Soil Conservation Service

Sheet 1 of 1

Watershed or County: <u>Hardin Co. IA</u>	Site No. or Name: <u>Limpert Pond</u>	Date: <u>6/20/17</u>
Drilling Equipment: <u>Coldings W 3</u>	Logged by: <u>Ed Hurscher</u>	Project: WF-08 PL-46 PL-06 RCD GP
Hole No. <u>TH-4</u>	Location: <u>Break in relief, lower than valley nose</u>	Elevation: <u> </u> Depth to Water: <u>3.7</u> <u>6/21/17</u>

Depth In Feet		CLASSIFICATION				DESCRIPTION	Sample		Depth In Feet	
From	To	Material	Sand	Silt	Clay	USCS	No.	Type	From	To
0	4	sandy clay	~40	±	20	40	CL			
						W/S				
4	6	sandy clay to clayey sand	49	+	13	38	CL ^W /S			
						SC				
6	8	lean clay w/ sand				CL ^W				
						Sand				
						(high)				
8	9	clayey sand	75	+		SC				
9	10	sandy clay	49			CL ^W /S				
10	11	clayey sand	75	+		SC				
11	12	sandy clay	49			CL ^W /S				
12	14	silt/clay				SC				
14	16	lean clay w/ sand				CL ^W				
						J				
16	16+	clayey gravel				GC				
						W/S				

• WATER IN HOLE DURING DRILLING

Watershed or County: <u>Harrison Co. MS</u>	Site No. or Name: <u>Limpert Pond</u>	Date: <u>6/20/17</u>
Drilling Equipment: <u>Geopac w/ 3" Auger</u>	Logged by: <u>Ted Hatcher</u>	Project: <u>WF-08</u> <u>PL-46</u> <u>PL-06</u> <u>RCD</u> <u>GP</u>
Hole No. <u>145</u>	Location: <u>drainage along G</u>	Elevation: <u></u> Depth to Water: <u>2.6' @ 11/17</u>

Depth In Feet		CLASSIFICATION				DESCRIPTION	Sample		Depth In Feet	
From	To	Material	Sand	Silt	Clay	USCS	No.	Type	From	To
0	4	lean clay	10	40+	CL	alluvium, moist, high plasticity, stiff, tough				
		to fat clay			to CH	redox, iron speck, sparse coarse sand				
4	6	sandy lean clay w/ gravel			CL w/ S+G	alluvium, moist, moderate plasticity, soft, to sand and gravel lenses w/ high silt content				
6	10	lenses silt sand			SP-SM	gravel up to 3/8"				
						alluvium, gray, wet, low plasticity, fine sands, high in silt, soft, 2" clay lenses				
10	12	silt clay sand	88	12%	SP-SC	alluvium, gray, green, wet, low plasticity, fine, very fine to fine sands				
					SP-SM	very fine to fine sands				
12		tan to fat clay	10	45	45	CL-CH	residual shale? olive brown, moist, high plasticity, firm, sparse coarse sand			

Hole caved to 4.6' depth 9:15 AM

GEOLOGIC INVESTIGATIONS

FIELD LOG SHEET

Project: <u>B Limbent Pond</u>	County: <u>Harding Co SD</u>	Legal:	Date: <u>6/20/17</u>
Drilling Equipment: <u>Cordillero 3" Auger</u>	Logged by: <u>Ted Huscher</u>	Program: <u>EDIP</u>	
Hole No.: <u>TH-102</u>	Hole Location: <u>Area between meanders - east center</u>	Elevation:	Depth to Water: <u>7.1</u> <u>6/21/19</u>

Hole Came to 8.2' depth 8:28 am

Depth in Feet		CLASSIFICATION			DESCRIPTION	Sample		Depth in Feet	
From	To	Material	Sand Silt Clay	Uni. Class		No.	Type	From	To
0	5.5	lean to fat clay		CL-CH	Alluvium Brown arg. moist, high plasticity, hard & dense sand (very fine)	102.1	LB	0	5.5
5.5	11	sandy lean clay	20+ 40	CL w/s (high)	residue of sandy claystone, gray brown moist, with platy structure, firm drills hard, sands are very fine & coarse medium sand, hard yellow (shade?) silty, fine 8-11'	102.2	LB	5.5	11
11	12	clayey sand	50+	SC	residue of sandy shale, gray brown, wet moderate plasticity, soft				

narrow high ground
between theanders

Depth In Feet		CLASSIFICATION				DESCRIPTION	Sample		Depth In Feet		
From	To	Material	Sand	Silt	Clay		USCS	No.	Type	From	To
0	3	lean clay ^y sand	20	40	40	CL w/s	residuum of ^{sandy} claystone gray brown, due to moist moderate plasticity, hard				
3	12	lean clay				CL w/s	residuum of claystone yellow gray brown moist drills hard 46 white specks of gypsum or calcium carbonate, moderate plasticity increasing sand content (very fine sand) with depth approaching SC - 5 in. at 12' where drilling was very hard (pore the sands & the slab) less clay + more silt with depth				
							No water in test hole @ end of drilling				

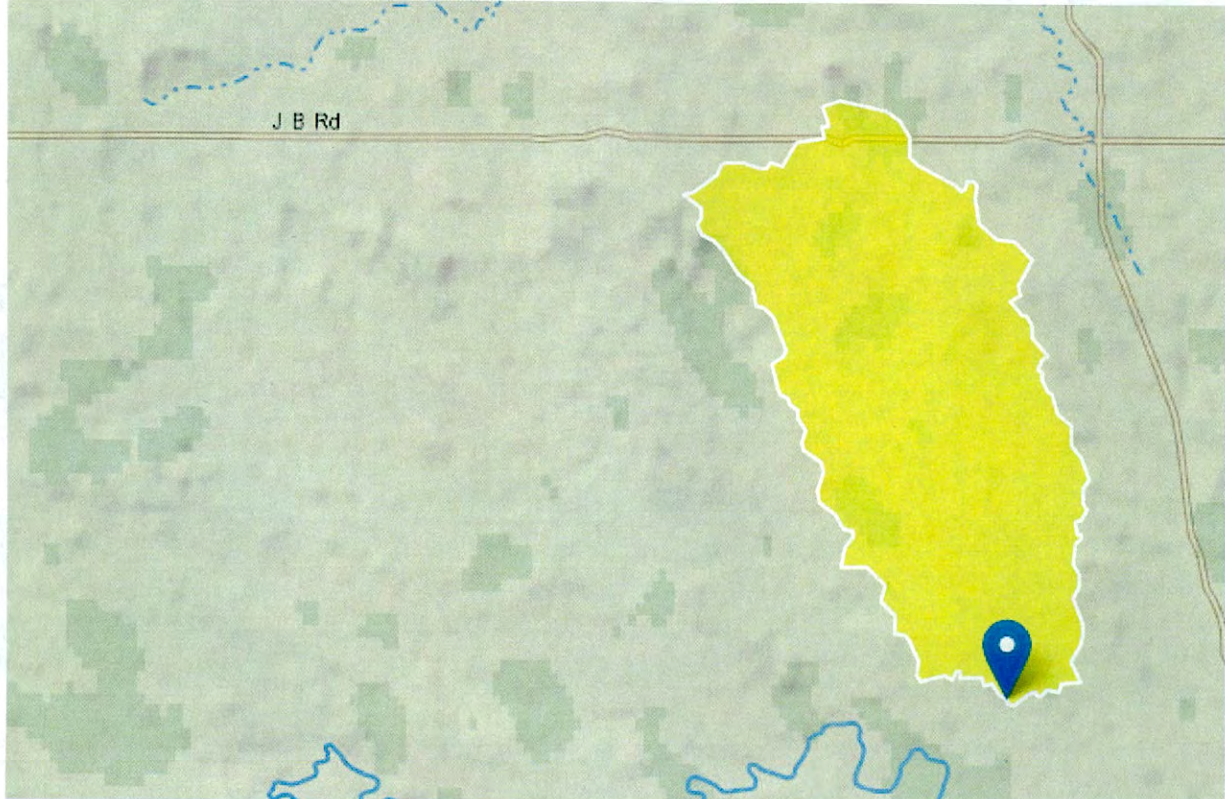
StreamStats Report

Region ID: SD

Workspace ID: SD20180409152234067000

Clicked Point (Latitude, Longitude): 45.34759, -103.29477

Time: 2018-04-09 10:22:50 -0500



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
CONTDA	Area that contributes flow to a point on a stream	9.3	square miles

Peak-Flow Statistics Parameters [Subregion C]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
CONTD	Contributing Drainage Area	9.3	square miles	0.06	904

Peak-Flow Statistics Flow Report [Subregion C]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	SE	SEp	Equiv. Yrs.
2 Year Peak Flood	88.9	ft ³ /s	20.7	383	108	108	1.8
5 Year Peak Flood	263	ft ³ /s	95.5	725	67	67	4.8
10 Year Peak Flood	455	ft ³ /s	187	1100	58	58	8.3
25 Year Peak Flood	743	ft ³ /s	326	1690	53	53	12
50 Year Peak Flood	1020	ft ³ /s	450	2310	53	53	14.9
100 Year Peak Flood	1340	ft ³ /s	576	3110	55	55	16.5
500 Year Peak Flood	2290	ft ³ /s	859	6130	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/>)

RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date November 27, 2017

RECEIVED OF Brodie Limpert 14129 Limpert Rd Buffalo 57720-7004

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

Fee for Application for Permit No. <u>1974-11</u> to Appropriate Water, to construct and to put water to beneficial use	750	00
Fee for Application for Permit No. _____ to Appropriate Water for Future use		
Fee to retain Future Use Permit No. _____ after period of seven years.		
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. <u>11974-11</u>	200	00
Fee for Filing Transfer Form _____		
Fee for _____		
Fee for Issuing New Well Driller's License No. _____ for C.Y. _____		
Fee for Renewal of Well Driller's License No. _____ for C.Y. _____		
Fee for Issuing Well Pump Installer's License No. _____ for C.Y. _____		
Fee for Renewal of Well Pump Installer's License No. _____ for C.Y. _____		
(Any Other Work Provided by Law)	TOTAL	950 00

No. 08380

By

Jeanne Goodman
Chief Engineer

2cm



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

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

denr.sd.gov

November 27, 2017

Brodie Limpert
14105 Limpert Rd
Buffalo SD 57720-7004

Dear Mr. Limpert:

Thank you for submitting the *Application for a Permit to Appropriate Water* for a dam to be located on Wolf Creek in Harding County. In order to complete the application, the following is required.

- A map needs to be submitted that references a government section corner or quarter corner including section, township and range. For your use, I have enclosed a map with those designations. Please mark the proposed dam location with an "X".

If you have any questions, please contact me.

Sincerely,

A handwritten signature in cursive script that reads "Karen Schlaak".

Karen Schlaak
Water Rights Program
605 773-3352
karen.schlaak@state.sd.us

enclosure



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

RECEIVED
FEB 08 2018
WATER RIGHTS
PROGRAM

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

denr.sd.gov

January 25, 2018

Brodie Limpert
14150 Limpert Rd
Buffalo SD 57720-7004

Dear Mr. Brodie:

On November 27, 2017, you submitted an *Application for Permit to Appropriate Water Within the State of South Dakota* for a dam located in Harding County. You were notified what additional information was required to complete the application. A copy of that letter is enclosed. To date, we have not received the map.

For your use, I have enclosed another map. Please mark the proposed dam location with an "X". Return in the attached envelope.

Once the map is returned, we will continue to process your application. If you have any questions, please contact me.

Sincerely,

Karen Schlaak

Karen Schlaak
Water Rights Program
Phone: (605) 773-3352
karen.schlaak@state.sd.us

enclosures



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

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

denr.sd.gov

April 10, 2018

Brodie Limpert
14105 Limpert Rd
Buffalo, SD 57720

SD School and Public Lands
% Ryan Brunner, State Capitol, Suite 212
500 E Capitol Ave
Pierre, SD 57501

Dear Mr. Limpert and Mr. Brunner:

We have reviewed the plans and specifications for your dam project located in the approximate center of the S½ of Section 17, T16N-R7E, in Harding County. The plans and specifications for the construction of the dam are approved. Approval of the plans and specifications does not authorize construction of the dam. The construction of the dam may not begin until Water Permit Application No. 1974-1 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, as owner of the dam, from the responsibility for operating and maintaining the dam in good repair to ensure the safety of the dam.

The Limpert Dam #2 will be classified as a small size Category 3, Low Hazard dam with a dam height of 22.0 feet and a normal storage capacity of 172 acre-feet and a maximum storage capacity of 410.3 acre-feet.

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

Sincerely,

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

c: Roy Boschee, NRCS Rapid City



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

denr.sd.gov

April 16, 2018

Brodie Limpert
14105 Limpert Rd
Buffalo SD 57720

Dear Mr. Limpert:

I am writing in follow up to our phone conversation regarding the water permit application you filed to construct a dam capable of impounding 172 acre feet of water on Wolf Creek in Harding County. DENR's review of the application found a portion of the dam embankment is located on land held by School and Public Lands. I inquired whether you had entered into a written agreement with School and Public Lands regarding placement of the dam structure on both your properties.

DENR intends to place the water permit application on hold until provided documentation that School and Public Lands acknowledges the dam structure will be partially located on their property, that they are in agreement with the presence of the dam at this location and that you hold the water permit. Please provide DENR proper documentation of School and Public Lands agreement to this dam and we'll proceed with processing the application.

Through this process, DENR has become aware that the dam has been for the most part constructed. Please let me know if that is not the case. State law states "No person may begin or carry on any construction of works for storing or carrying water until a permit to appropriate the water has been issued". Therefore construction should not have begun prior to obtaining the water permit that you applied for and you have put yourself at risk in the event the water permit is not approved.

Mike Cornelison with School and Public lands has been included in this letter. Please let me know if you have any questions.

Sincerely,

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

Cc: Mike Cornelison, School and Public Lands

Gronlund, Eric

From: JS Limpert <slimbuttes@sdplains.com>
Sent: Thursday, April 26, 2018 9:44 AM
To: Gronlund, Eric
Subject: [EXT] Brodie Limpert water permit

Eric:

I Brodie Limpert request to amend my water rights application, and submit it as a joint ownership between myself and South Dakota School and Public Lands.

Any questions please don't hesitate to contact me.

Thanks,
Brodie Limpert
605-641-5155

Gronlund, Eric

From: Cornelison, Mike
Sent: Thursday, April 26, 2018 10:56 AM
To: Gronlund, Eric; Tieman, Aaron; Schaal, Tim
Cc: Brunner, Ryan; Williams, Rich; Mines-Bailey, Ann
Subject: RE: [EXT] Brodie Limpert water permit

Yes S&PL does concur with the amendment to Mr. Limpert's application and ultimately the water permit being held in joint ownership between Mr. Limpert and S&PL.

Thanks - Miken

From: Gronlund, Eric
Sent: Thursday, April 26, 2018 10:29 AM
To: Cornelison, Mike <Mike.Cornelison@state.sd.us>
Cc: Schaal, Tim <Tim.Schaal@state.sd.us>; Tieman, Aaron <Aaron.Tieman@state.sd.us>
Subject: FW: [EXT] Brodie Limpert water permit

Mike

DENR received the following email from Mr. Limpert to amend his application for the dam to be held in joint ownership between S&PL and himself. Does S&PL concur with the application and ultimately the water permit being held in joint ownership?

Thanks - Eric

From: JS Limpert [<mailto:slimbuttes@sdplains.com>]
Sent: Thursday, April 26, 2018 9:44 AM
To: Gronlund, Eric
Subject: [EXT] Brodie Limpert water permit

Eric:

I Brodie Limpert request to amend my water rights application, and submit it as a joint ownership between myself and South Dakota School and Public Lands.

Any questions please don't hesitate to contact me.

Thanks,
Brodie Limpert
605-641-5155



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
<http://denr.sd.gov>

**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 1974-1, Brodie Limpert & SD School and Public Lands**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Environment and Natural Resources concerning Water Permit Application No. 1974-1, Brodie Limpert, 14105 Limpert Road, Buffalo SD 57720 and South Dakota School and Public Lands, c/o Ryan Brunner, Commissioner, State Capitol, Suite 212, 500 E Capitol Avenue, Pierre SD 57501.

The Chief Engineer is recommending APPROVAL of Application No. 1974-1 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use and 4) it is in the public interest with the following qualifications:

1. Water Permit No. 1974-1 authorizes an impoundment with a storage capacity of 172 acre feet of water.
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.

Jeanne Goodman, Chief Engineer
April 27, 2018

REPORT ON WATER PERMIT APPLICATION NO. 1974-1

For Brodie Limpert & SD Office of School and Public Lands

April 10, 2018

Brodie Limpert & SD Office of School and Public Lands has filed an application for a water permit to impound 172 acre-feet of water from runoff into Wolf Creek by constructing a dam located in the approximate center of the S½ of Section 17 with water impounded in the NE¼ SW¼, NW¼ SE¼, W½ NW¼ and SW¼ NE¼ Section 17; all in T16N-R7E which is approximately 14 miles southeast of the town of Buffalo, in Harding County, South Dakota. The water will be used for fish and wildlife propagation, recreation and livestock watering purposes.

DISCUSSION

The dam will be classified as a small size, Category 3, Low Hazard dam. The dam has been designed by the Natural Resources Conservation Service (NRCS). The plans and specifications have been reviewed and will be approved; however, construction of the dam cannot begin until Water Permit Application No. 1974-1 is approved.

The dam will be 22 feet high with a normal storage capacity of 172 acre-feet with a reservoir level at the spillway elevation, and a maximum storage capacity of 410.3 acre-feet with a reservoir level at the top of dam elevation. A dam of this size and hazard classification is required to have a minimum spillway design capable of passing a 25-year frequency event.

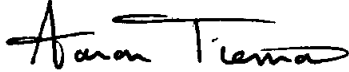
The dam has a drainage area of 5,924 acres or 9.3 square miles. The dam will have a 24 foot wide cable concrete lined channel, transitioning in to a 40 foot wide permanent high velocity lined geotextile channel. A 25-year frequency event produces a peak runoff of approximately 743 cfs and a 100-year frequency event produces a peak runoff of approximately 1,340 cfs. The spillway will have a total capacity of approximately 921 cfs.

The annual yield for this drainage area with an 80 percent chance of occurrence, or 8 out of 10 years, is expected to be 29 acre-feet. The annual yield with a 50 percent chance of occurrence, or 1 out of 2 years, is expected to be 89 acre-feet. The annual yield with a 10 percent chance of occurrence, or 1 out of 10 years, is expected to be 543 acre-feet.

The Limpert Dam will be located in the approximate center of the S½ of Section 17, T16N-R7E on Wolf Creek, about two miles upstream of the confluence of Wolf Creek and the North Fork of the Moreau River. There are no existing Water Rights/Permits filed on Wolf Creek between the proposed dam and the North Fork of the Moreau River.

CONCLUSIONS

1. Water Permit Application No. 1974-1 proposes to impound 172 acre-feet of water from runoff into Wolf Creek by constructing a dam located in the approximate center of the S½ of Section 17, T16N-R7E in Harding County, SD.
2. There is reasonable probability that unappropriated water is available and approval of this application should not have any adverse effect on existing Water Permits/Rights.
3. If approved, the low flow bypass requirement for downstream domestic use should be a qualification on Water Permit Application No. 1974-1.

A handwritten signature in black ink, appearing to read "Aaron Tieman". The signature is fluid and cursive, with a long horizontal stroke extending from the end.

Aaron Tieman

SD DENR-Water Rights Program

RECEIVED

MAY 16 2018

WATER RIGHTS
PROGRAM

NOTICE OF
APPLICATION NO.
1974-1 to Appropriate
Water

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. 1974-1

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 3rd day of May, 2018, and the last publication on the day of , , that the full amount of fees charged for publishing same, to-wit: The sum of \$27.26, 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.

[Signature]
Subscribed and sworn to before me this 7th day of May, 2018

[Signature]
Notary Public, Butte County, South Dakota
My commission expires: 3-21-2023

Notice is given that Brodie Limpert, 14105 Limpert Rd, Buffalo SD 57720 and SD School and Public Lands, c/o Ryan Brunner, State Capitol, Suite 212, 500 E Capitol Ave, Pierre SD 57501 have filed an application for a water permit to impound 172 acre-feet of water from runoff into Wolf Creek by constructing a dam located in the approximate center of the S 1/2 Section 17 with water impounded in the NE 1/4 SW 1/4, NW 1/4 SE 1/4, W 1/2 NW 1/4 and SW 1/4 NE 1/4 Section 17; all in T16N-R7E which is approximately 14 miles southeast of Buffalo SD. The water is for fish and wildlife propagation, recreation and livestock water purposes.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 1974-1 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 <http://denr.sd.gov/public> or contact Eric Gronlund for this information, or other information, at the Water Rights Program address provided below.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and Chief Engineer. The applicant must file a petition if contesting the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by May 14, 2018.

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

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

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

Published once at the
total approximate cost of
\$27.72.

#364
May 3

RECEIVED

MAY 16 2018

WATER RIGHTS
PROGRAMNOTICE OF
APPLICATION NO.
1974-1 to Appropriate
Water**Affidavit of Publication****STATE OF SOUTH DAKOTA:****COUNTY OF HARDING:**

Letitia Lister of said County and State being first duly sworn, on her oath says: That the NATION'S CENTER NEWS is a legal weekly newspaper of general circulation, printed and published in the City of Buffalo, 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. 1974-1

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 3rd day of May, 2018, and the last publication on the _____ day of _____, _____, that the full amount of fees charged for publishing same, to-wit: The sum of \$27.26, insures solely to the benefit of the publisher of the NATION'S CENTER NEWS, 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.

[Signature]
Subscribed and sworn to before me this 14th day of May, 2018

[Signature]
Notary Public, Butte County, South Dakota
My commission expires: 3-21-2023

Notice is given that Brodie Limpert, 14105 Limpert Rd, Buffalo SD 57720 and SD School and Public Lands, c/o Ryan Brunner, State Capitol, Suite 212, 500 E Capitol Ave, Pierre SD 57501 have filed an application for a water permit to impound 172 acre-feet of water from runoff into Wolf Creek by constructing a dam located in the approximate center of the S 1/2 Section 17 with water impounded in the NE 1/4 SW 1/4, NW 1/4 SE 1/4, W 1/2 NW 1/4 and SW 1/4 NE 1/4 Section 17; all in T16N-R7E which is approximately 14 miles southeast of Buffalo SD. The water is for fish and wildlife propagation, recreation and livestock water purposes.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 1974-1 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 <http://denr.sd.gov/public> or contact Eric Gronlund for this information, or other information, at the Water Rights Program address provided below.

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

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

Published once at the total approximate cost of \$27.72.

#599
May 3

Schlaak, Karen

From: Schlaak, Karen
Sent: Friday, April 27, 2018 9:07 AM
To: Cornelison, Mike
Subject: Water Permit Application No. 1974-1, Brodie Limpert
Attachments: 1974-1.pdf

Enclosed is the report, Chief Engineer recommendation and other information regarding Water Permit Application No. 1974-1, Brodie Limpert. This is being mailed out today.

Karen Schlaak

SD DENR, Water Rights Program
(605) 773-3352



Schlaak, Karen

From: Schlaak, Karen
Sent: Friday, April 27, 2018 9:16 AM
To: Legals (legals@bhpioneer.com)
Subject: 1974-1, Brodie Limpert
Attachments: 1974-1public.short.docx; FORM8.FRM.doc

Attached is a notice to be published on May 3, 2018 in both the Nation Center News and the Black Hills Pioneer.

Brodie Limpert, 14105 Limpert Rd, Buffalo SD 57720 (605 641-5155) and/or SD School & Public Lands, c/o Ryan Brunner, 500 E Capitol, Pierre SD (605 773-3303) have 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

SD DENR, Water Rights Program
(605) 773-3352





**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

denr.sd.gov

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

April 27, 2018

Brodie Limpert
14105 Limpert Rd
Buffalo SD 57720

SD School and Public Lands
c/o Ryan Brunner, State Capitol, Suite 212
500 E Capitol
Pierre SD 57501

Dear Mr. Limpert and Mr. Brunner:

Water Permit Application No. 1974-1 for fish & wildlife propagation, recreation and livestock use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice has been sent to the Nations Center News and the Black Hills Pioneer both printed at Spearfish SD (Ph # 605-642-2761). You will need to contact the newspaper and authorize publication of this notice in both newspapers. 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 newspaper(s) to authorize publication of your Notice and to arrange for payment. Early contact with the paper(s) can eliminate delays. Upon receiving authorization from you, the publisher has been instructed to publish your notice. The newspaper has also been instructed to send us the Proof of Publication. We must receive Proof of Publication before action can be taken on the application.

Sincerely,

Eric Gronlund
Natural Resources Engineer
(605) 773-3352

enclosures

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

NOTICE OF APPLICATION NO. 1974-1 to Appropriate Water

Notice is given that Brodie Limpert, 14105 Limpert Rd, Buffalo SD 57720 and SD School and Public Lands, c/o Ryan Brunner, State Capitol, Suite 212, 500 E Capitol Ave, Pierre SD 57501 have filed an application for a water permit to impound 172 acre-feet of water from runoff into Wolf Creek by constructing a dam located in the approximate center of the S 1/2 Section 17 with water impounded in the NE 1/4 SW 1/4, NW 1/4 SE 1/4, W 1/2 NW 1/4 and SW 1/4 NE 1/4 Section 17; all in T16N-R7E which is approximately 14 miles southeast of Buffalo SD. The water is for fish and wildlife propagation, recreation and livestock water purposes.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 1974-1 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 <http://denr.sd.gov/public> or contact Eric Gronlund for this information, or other information, at the Water Rights Program address provided below.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and Chief Engineer. The applicant must file a petition if contesting the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by May 14, 2018.

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

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

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



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
<http://denr.sd.gov>

MAY 17 2018

Brodie Limpert
14105 Limpert Rd
Buffalo SD 57720

Ryan Brunner, Commissioner of School & Public Lands
State Capitol Bldg, Suite 212
500 E Capitol Ave
Pierre SD 57501

Dear Mr. Limpert and Commissioner Brunner:

Enclosed is Water Permit No. 1974-1 authorizing construction of the water diversion system and beneficial use of the water, not exceeding the limits as specified in the Water Permit.

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

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

Sincerely,

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

enclosures

1974-1
RECEIVED

AUG 20 2018

WATER RIGHTS
PROGRAMNOTICE OF COMPLETION OF WORKS AND
APPLICATION OF WATER TO BENEFICIAL USEDate August 14, 2018TO: Water Rights Program, DENR
523 E. Capitol
Pierre, SD 57501-3181FROM: Brodie Limpert
(name)
14105 Limpert Rd
(address)
Butte, SD 57720 (605) 641-5155
(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.

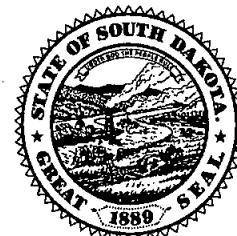
Water Permit No. 1974-1 states that the water use system is to be constructed by May 14, 2023, and water is to be put to beneficial use by May 14, 2027.
(date) (date)

The water use system was completed on July 1, 2018.
(date)

Applying the water to beneficial use was completed on August 1, 2018.
(date)

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

Brodie Limpert
(signature)





DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
<http://denr.sd.gov>

August 21, 2018

1974-1

Brodie Limpert
14105 Limpert Rd
Buffalo SD 57720

Dear Mr. Limpert:

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 the impoundment authorized under Water Permit No. 1974-1. The completion of works form indicates the system was completed on July 1, 2018 and water applied to beneficial use on August 1, 2018.

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,

A handwritten signature in black ink, appearing to read "Genny McMath".

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

c: Ryan Brunner, Commissioner, School & Public Lands (interoffice mail)

Report of Examination of Works and/or Application of Water to Beneficial Use For Permit No. 1974-1

I have this day, September 6, 2018 made a thorough examination of the water use system constructed by Brodie Limpert, 14105 Limpert Rd, Buffalo, SD 57720 and SD School and Public Lands, State Capitol Suite 212, 500 E. Capitol, Pierre, So. Dak. 57501 of Permit No. 1974-1, bearing the priority of 2/8/2018 authorizing the diversion and storage of 172 acre-feet of runoff water from Wolf Creek for fish, wildlife, recreation and livestock water purposes in Harding County.

Inspection contact & relationship to permit holder, if applicable:

Brodie Limpert, Co-Owner
605-641-5155

A. Dam Information:

- 1) Height to crest 26.8 feet from downstream toe
- 2) Height to primary spillway 16.8 feet from downstream toe
- 3) Height to secondary spillway N/A feet from downstream toe
- 4) Crest width 21 feet
- 5) Crest length 923 feet
- 6) Primary Spillway width 24 feet (24' bottom rock riprap lined)
- 7) Secondary Spillway width ---- feet
- 8) Approx. storage to primary spillway 172 ac-ft
- 9) Approx. storage to crest 410 ac-ft

Date constructed: July 2018

B. Works used to put water to beneficial use:

This is an earth fill embankment utilizing a 24 foot wide bottom trapezoidal spillway armored with rock riprap placed over engineering fabric. The water impounded in the reservoir is put to beneficial use in-place.

C. Compliance with Permit Requirements:

- 1) Permit qualifications being abided by: Yes

Low flows as needed for downstream domestic use including livestock and prior water rights must be by-passed. A permanent by-pass structure was not installed. Any by-pass of flows if needed will use temporary means.

Irrigation Questionnaires checked to determine if permit owner started irrigation by the end of construction period. N/A

List any extended period of nonuse: **none**

- 2) Exceptions to compliance are: none

D. Condition and Location:

1. The system is in good condition with the point of diversion located as follows:
2522' W and 1,673' N of the SE corner Section 17 T16N R7E (45.347608, -103.293869)

The works are capable of diverting to the place of use and storing 172.0 acre-feet of water which is to be used for **fish, wildlife, recreation and livestock use**. Water has been put to beneficial use to the maximum extent and the license should be issued for 172.0 acre-feet storage.

2. All structures, wells and lands on map Yes

E. Comments or other permit(s) associated with the project: none



Steven Quissell
Water Rights Inspector
DENR, Water Rights Program

Date report completed: 9/11/2018



Inlet to spillway, pool, and riprap along dam front face

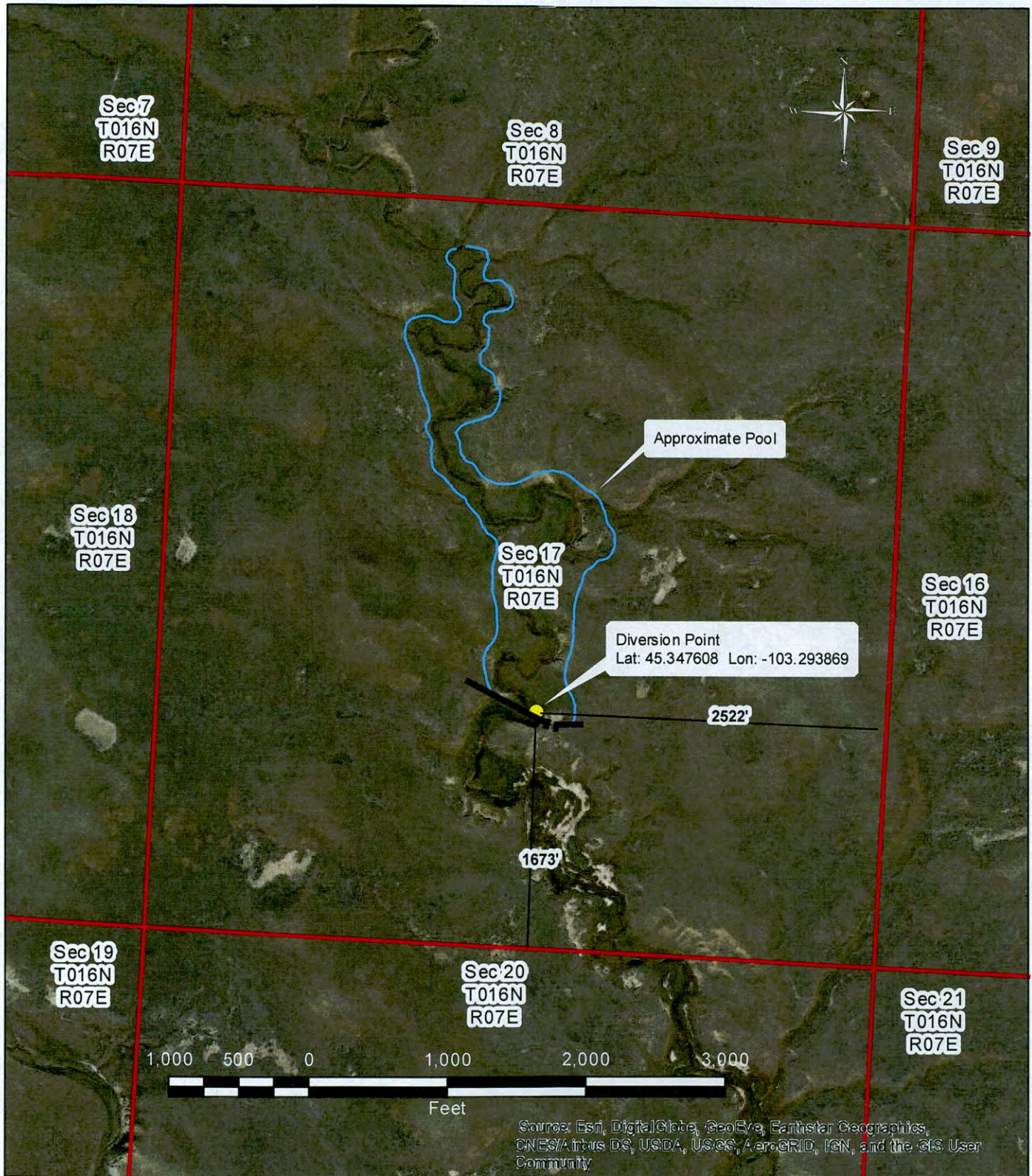


Outlet of spillway looking towards inlet and pool



Crest of dam viewed from east end.

Water Right # 1974-1
Brodie Limpert and School and Public Lands
9/6/2018



Steven Quissell

Steven Quissell
Water Rights Inspector
DENR Water Rights Program



STATE OF SOUTH DAKOTA
WATER LICENSE NO. 1974-1

(1) Brodie Limpert, 14105 Limpert Rd, Buffalo SD 57720 and SD School and Public Lands, State Capitol, Suite 212, 500 E Capitol, Pierre SD 57501 made Application No. 1974-1, November 27, 2017 for a water permit to impound 172 acre feet of water from runoff into Wolf Creek, Harding County, South Dakota for fish and wildlife propagation, recreation and livestock water purposes. Permit No. 1974-1, with a priority date of February 8, 2018 was approved May 14, 2018 and issued to the applicants for diversion of water with construction of the described storage dam to be completed on or before May 14, 2023 and for the application to beneficial use of water on or before May 14, 2027.

A "Notice of Completion of Works and Application of Water to Beneficial Use" was received on August 20, 2018. The "Notice" stated the water use system was completed on July 1, 2018 and the water placed to beneficial use on August 1, 2018.

(2) It is certified that the permit holders have complied with the provisions of South Dakota State Law relating to completion of the water supply system and are entitled to impound 172 acre feet of water for beneficial use. The location of storage dam (spillway) is:

- 2522'W and 1,673'N of the SE corner of Section 17, T16N, R7E (approximate center of the S ½)
Latitude 45.347608, Longitude -103.293869

Water is impounded in the NE ¼ SW ¼, NW ¼ SE ¼, W ½ NW ¼ and SW ¼ NE ¼ Section 17, T16N, R7E.

(3) The permit holders have complied with the provisions of South Dakota State Law relating to the application of water to beneficial use.

(4) Pursuant to South Dakota Water Law 46-5-30.1 Brodie Limpert, 14105 Limpert Rd, Buffalo SD 57720 and SD School and Public Lands, State Capitol, Suite 212, 500 E Capitol, Pierre SD 57501 the holders and/or owners of Water Right No. 1974-1 are issued a license to appropriate water, the right to impound 172 acre feet of water from runoff into Wolf Creek with a priority date of February 8, 2018 from the location specified in (2) of this license for fish & wildlife propagation, recreation and livestock water purposes.

This license is subject to South Dakota Water Law, any limitations or conditions listed in Water Right No. 1974-1 and subject to the following qualifications:

- Water Right No. 1974-1 authorizes an impoundment with a storage capacity of 172 acre feet of water.
- Low flows as needed for downstream domestic use, including livestock water and prior water rights must be bypassed.



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

SEP 24 2018

date





DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
<http://denr.sd.gov>

SEP 24 2018

1974-1

Brodie Limpert
14105 Limpert Rd
Buffalo SD 57720

Ryan Brunner, Commissioner
SD School & Public Lands
State Capitol, Suite 212
500 E Capitol Ave
Pierre SD 57501

Dear Mr. Limpert and Commissioner Brunner:

Enclosed is Water License No. 1974-1. This is the final water right document completing the process of obtaining a Water Right. Included with your license is a map prepared by the staff engineer who conducted the field investigation.

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

Sincerely,

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

enclosures