

WATER PERMIT NO. 6253-3

Name of Applicant: Otter Tail Power Company

Address: PO Box 496, Fergus Falls MN 56538-0496

Phone: 218 739-8475

Amount of Water Claimed: 1,000 AF

Total Acres: NA

Source of Water Supply: Big Stone Lake

Water to be used for: industrial use

County: Grant

Type of Waste Disposal System:

Location: Big Stone Power Plant

PRIORITY

Date Received: 2-1-2001

Fee: \$400

Corrected Application Received: 2-14-2001

Period of Annual Use: January 1 – December 31

Remarks: Increase the storage volume authorized by Water Right No. 1983-3 and to include the use of an ethanol production plant.

Diversion Point: E ½ NW ¼ Sec 8-T121N-R46W

Land to be Irrigated: NA

Depth of Well: NA

Well Driller: : NA

Remarks:

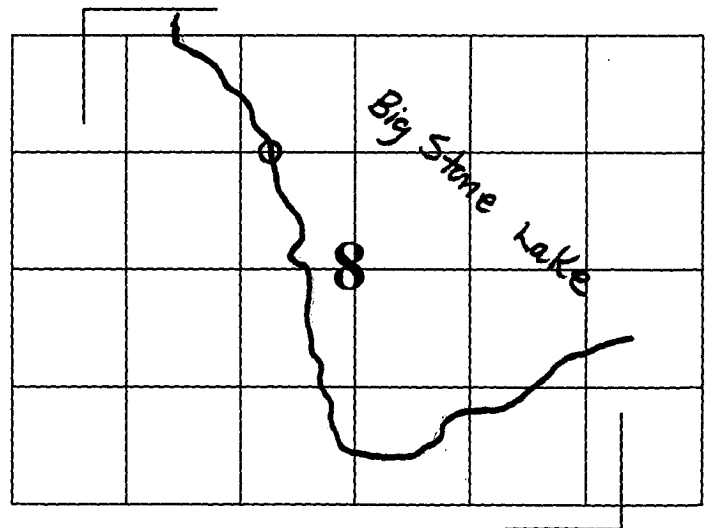
Type of Map: plat

Prepared by:

Reviewed and the Number Assigned on: 2-14-2001

By: **Karen Schlaak**

Notice of Hearing - date to intervene: _____



**SOUTH DAKOTA
WATER PERMIT NO. 6253-3**

Date of first receipt of application February 1, 2001.

Date of return to applicant for corrections, amendments or changes February 2, 2001.

Date of receipt of corrected application February 14, 2001.

The Water Management Board approved Water Permit Application No. 6253-3 on May 2, 2001 for Otter Tail Power Company, PO Box 496, Fergus Falls MN 56538-0496 authorizing the water use system and the placing of water to beneficial use subject to the following limitations, conditions and qualifications:

1. Water Permit No. 6253-3 authorizes the storage of an additional 1,000 acre feet of water by increasing the storage capacity authorized by Water Right No. 1983-3. Water Right No. 1983-3 appropriates up to 110 cubic feet of water per second from Big Stone Lake under specific diversion criteria and authorizes storage of 7,000 acre-feet of water for cooling and evaporation ponds at the Big Stone Plant. The diversion point is located in the E ½ NW ¼ Section 8-T121N-R46W. The water is for industrial use for electric power generation at the Big Stone Plant. This permit authorizes an increase of 1,000 acre feet of water in order to reflect the actual storage capacity of 8,000 acre feet in the five ponds. The ponds are located in portions of Sections 11, 12, 13 & 14; T121N-R47W and Section 7 and 18; T121N-R46W. No increase in the diversion rate is authorized by this permit. This permit authorizes the additional industrial use of serving an ethanol production plant.
2. The water appropriated shall be used for the purpose of supplying water for industrial use and may not exceed the amount of water needed for beneficial use.
3. The water is to be used during the following described annual period: January 1 – December 31.
4. The date from which applicant may claim right is February 1, 2001.
5. One-fifth of the construction is to be completed on or before November 2, 2003.
6. All construction is to be completed on or before May 2, 2006.
7. Water is to be put to beneficial use on or before May 2, 2010.
8. Water rights obtained in compliance with the laws of the State of South Dakota may not be unlawfully impaired by this appropriation.

QUALIFICATION

Water Right No 1983-3 and Water Permit No. 6253-3, combined authorize the impoundment of 8,000 acre feet of water for the Big Stone Power Plant and supplying water to an ethanol production plant subject to the following diversion criteria:

(continued)

Qualifications/Diversion Rates

Time Period	Lake Elevation (Feet)	Diversion Rate
May-September	>967	110 cfs
May-September	≤967	No Diversion Without Permission of SD & MN Boundary Water Commission
October-April	<965	No Diversion Without Permission of SD Water Management Board
October-April	≥965 and ≤966	Restricted to 10 cfs or Daily Acre-feet Equivalent
October-April	>966 and <967	35 cfs or Daily Acre-feet Equivalent not Exceeding 460 Acre-feet any Consecutive 7 Day Period
October-April	≥967	110 cfs

Note: Acre-feet/day = cfs x 1.9834 10 cfs = 19.8 Acre-feet/day 35 cfs = 69.4 Acre-feet/day

WATER MANAGEMENT BOARD

By: Garland Erbele
Garland Erbele, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

JUN 06 2001

date



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

Mail to: Water Rights Program Joe Foss Building 523 E. Capitol Pierre, SD 57501-3181 (605) 773-3352	No. <u>6253-3</u> (office use only) Hydrologic Unit <u>07020001</u>
	Basin <u>Minnesota - Whetstone</u>
	Newspaper <u>Grant Co. Review</u> <u>Milbank</u>



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

Check use(s) of water:

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

Type of Application: ☐ New ☐ Vested Right (Use predates Mar 2, 1955) ☐ Future Use Reservation
(check one) ☐ Place to Beneficial Use Water Reserved by Future Use Permit No. _____
☒ Amendment/Correction to Permit No. 1788-3 1983-3

Description of amendment/correction: (i.e. change diversion point(s), add diversion point(s), change use, etc.) _____

Change use. _____

Change storage volume. _____

- Name of Applicant Otter Tail Power Company Phone 218-739-8475
(check one) ☒ Owner/Operator ☐ Tenant/lessee
Mailing Address Environmental Services, P.O. Box 496, Fergus Falls State MN 56538-0496
(Street, RR, or Box and City) 1,000 AF additional (Zip Code)
- Amount of water claimed _____ *CFS or _____ **GPM (total) 8,000 ***AF
(*Cubic Feet per Second) (**Gallons per Minute) (***)Acre Feet - storage capacity of dam/dugout or annual use if applicable)
- Source of water supply Big Stone Lake
- Location of point of diversion (example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W) 1320 feet South of the North
section line of Section 8, Twp. 121N, Range 46W and 1440 feet East of the West section
line of said Section 8. (E 1/2 NW 1/4) County Grant
- County or counties where water will be used Grant
- Annual period during which water is to be used All year. 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)

See attachment.

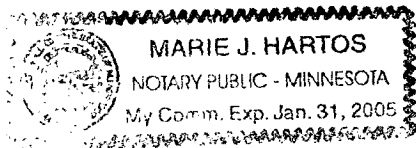
MINNESOTA
STATE OF ~~SOUTH DAKOTA~~ SS
County of Otter Tail
Terry Graumann

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

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

Applicant's signature [Signature]

Subscribed and sworn to before me this 25th day of January 20 01



[Signature]
Notary Public signature

**Application for Permit to Appropriate Water Within the State of South Dakota
Otter Tail Power Company
Big Stone Plant**

Description of Project

The changes proposed to the existing Permit Number 1768-3 are as follows:

1. The use of appropriated water in the permit is for Industrial Use specifically for electric power generating plant. This use will continue and we want to add the use of an ethanol production plant.
2. The water appropriations permit lists 7,000 acre-feet as the off-stream storage of water for cooling pond and reserve water supply purposes. The permit should be changed to 8,000 acre-feet. A description of the water storage ponds are as follows:

Description	Height	Water Depth	Approximate Surface Area (Acres)	Approximate Storage (Acre- ft.)
Cooling Pond	1122.5	16' Average	340	5,440
Makeup Pond	1125.5	12' Average	10	120
Holding Pond	1105	10' Average	96.5	965
Evaporation Pond	1105	10' Average	143.6	1436
Bottom Ash Pond	1087	10' Average	2.1	21
Total				7982

215 South Cascade Street
PO Box 496
Fergus Falls, Minnesota 56538-0496
218 739-8200
www.otpc.com (web site)

January 25, 2001



Mr. Ron Duvall
Natural Resources Engineer
Water Rights Program
523 East Capitol
Pierre, SD 57501-3181

Dear Mr. Duvall:

Subject: Amendment to Water Appropriations Permit No. 1768-3
Otter Tail Power Company, Big Stone Plant



Enclosed is the Application for Permit to Appropriate Water Within the State of South Dakota to change the permit for Otter Tail Power Company, Big Stone Plant and the application fee of \$50.00. Two changes are requested to the permit, one to correct the water storage volume and the other to add an additional use for the water to accommodate an ethanol plant to be constructed on the site.

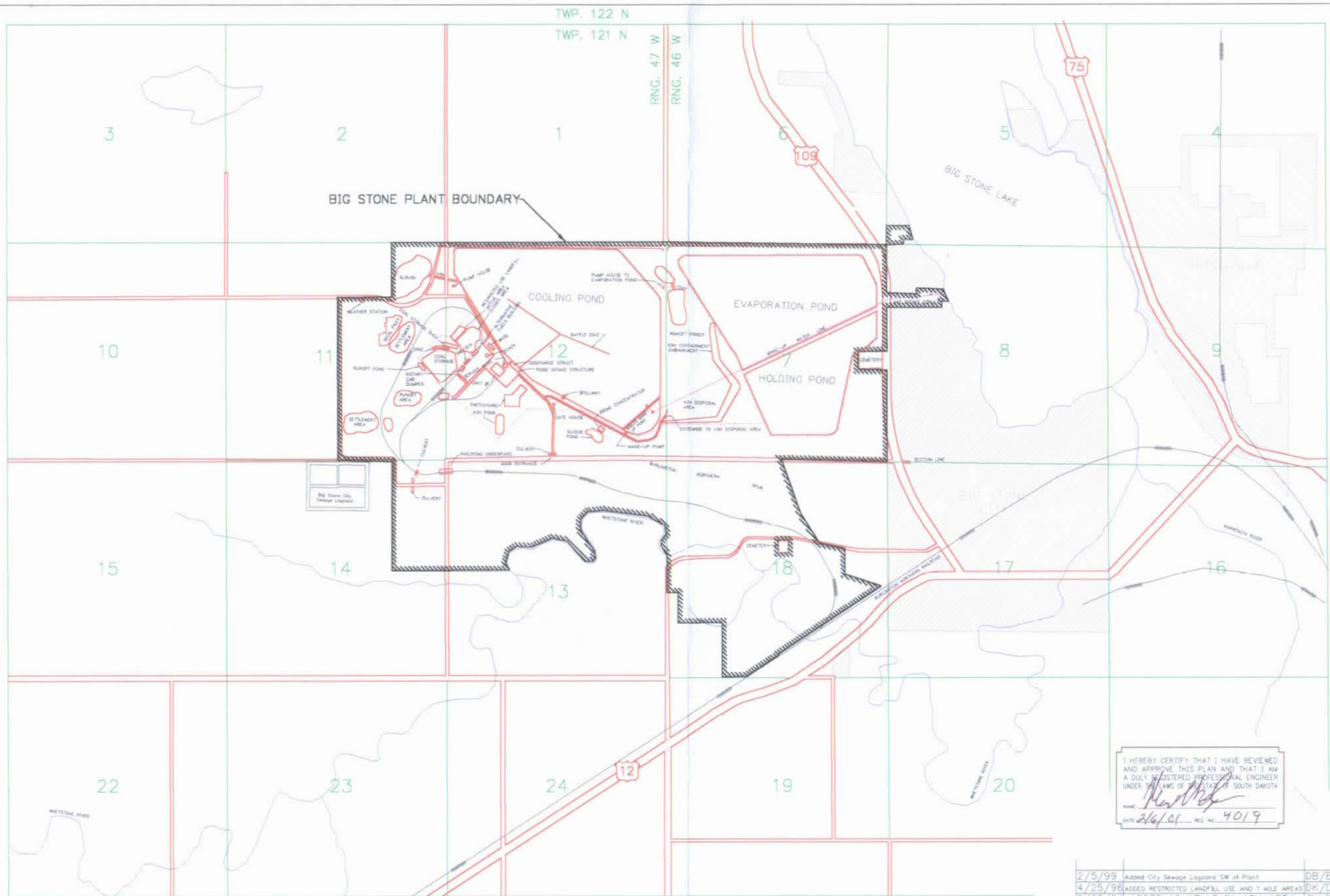
If you have questions, call me at 218-739-8475.

Sincerely,

A handwritten signature in cursive script that reads "Darlene Eckert".

Darlene Eckert
Environmental Compliance Specialist

Enclosures (2)



NOTE:
1. WELL LOCATIONS ARE APPROXIMATE

LEGEND:
= FENCE
= WELLS
= WELL POINT FOR GROUND WATER LEVEL
= ROADS

I HEREBY CERTIFY THAT I HAVE REVIEWED AND APPROVE THIS PLAN AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF SOUTH DAKOTA

NAME: *[Signature]*
DATE: 2/6/01 REG. NO.: 4019



2/5/99	Added City Sewage Lagoons SW of Plant	DB/BR
4/25/96	ADDED RESTRICTED LANDFILL USE AND 1 MILE AREAS	DK/DW
6/28/94	ADDED 12 WELLS IN ASH AREA	DK/DW
DATE	REVISION	BY
BIG STONE PLANT PROPERTY & SURROUNDING AREA		
SCALE: 1"=1500'	DATE: 6-4-93	DWG NO:
D. KANTRUD		L-RW-S-536-17

6253-3

RECEIPT

Water Rights Program

South Dakota Department of Environment and Natural Resources

N2 416746

Pierre, ~~February~~ 1, 2001

RECEIVED OF OtterTail Power Co., 215 S Cascade St, Fergus Falls, MN 56537
the following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. _____ to Appropriate Water, to construct
and to put water to beneficial use _____

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. 6253-3

50 00

Fee for Filing Transfer Form _____

Fee for Filing Extension Request _____

Fee for _____

(Any Other Work Provided by Law)

Total

50 00

By

Darland Erbe

Chief Engineer

gm

RECEIPT

Water Rights Program

South Dakota Department of Environment and Natural Resources

Nº 416771

Pierre, February 14, 2001

RECEIVED OF Otter Tail, Power Company, 215 S Cascade St, Fergus Falls, MN 56537
the following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. 6253-3 to Appropriate Water, to construct
and to put water to beneficial use _____

400 00

Fee for Application for Permit No. _____ to Appropriate Water, for Future
Use _____

Fee to retain Future Use Permit No. _____ after period of seven years.

Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water

License No. _____

Fee for Filing Transfer Form _____

Fee for Filing Extension Request _____

Fee for _____

(Any Other Work Provided by Law)

Total

400 00

By

Darland Ebele

Chief Engineer

gm



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

February 2, 2001

Otter Tail Power Company
Darlene Eckert, Env. Compliance Specialist
PO Box 496
Fergus Falls MN 56538-0496

Dear Ms. Eckert:

Thank you for submitting the *Application for a Permit to Appropriate Water* for Otter Tail Power Company. In order to complete the application the following is required.

Enclosed is the map submitted with the application. The map must be signed by one of the following: Registered Land Surveyor, Registered Professional Engineer or by any other government employee who normally prepares maps as a part of his assigned duties.

We received the \$50.00 submitted with the application. The application filing fee will be \$400.00 and licensing fee will be \$50.00 (\$450.00 total). The application filing fee is based on the request for 1,000 acre-feet of additional storage. Please submit the additional \$400.00.

If you have any questions, please contact me.

Sincerely,

Karen Schlaak
Water Rights Program
605 773-3352

enclosure

215 South Cascade Street
PO Box 496
Fergus Falls, Minnesota 56538-0496
218 739-8200
www.otpc.com (web site)

February 7, 2001



Ms. Karen Schlaak
Natural Resources Engineer
Water Rights Program
523 East Capitol
Pierre, SD 57501-3181

Dear Ms. Schlaak:

Subject: Amendment to Water Appropriations Permit No. 1768-3
Otter Tail Power Company, Big Stone Plant

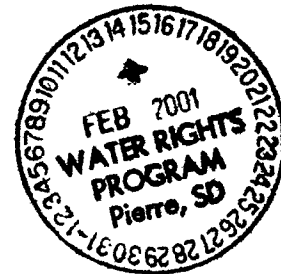
Enclosed is a check for \$400.00 for the additional storage capacity application and a drawing of the Big Stone Plant property signed by a Registered Professional Engineer. These items will complete the requirements for your review. If you need any additional information, call me at 218-739-8475.

Sincerely,

A handwritten signature in cursive script that reads "Darlene Eckert".

Darlene Eckert
Environmental Compliance Specialist

Enclosures (2)





**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 6253-3, Otter Tail Power Company**

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. 6253-3, Otter Tail Power Company, c/o Terry Graumann, Environmental Services, P.O. Box 496, Fergus Falls, MN 56538-0496.

The Chief Engineer is recommending APPROVAL of Application No. 6253-3 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use and 4) it is in the public interest with the following qualification:

Water Right No 1983-3 and Water Permit No. 6253-3, combined authorize the impoundment of 8,000 acre feet of water for the Big Stone Power Plant and supplying water to an ethanol production plant subject to the following diversion criteria:

Qualifications/Diversion Rates

Time Period	Lake Elevation (Feet)	Diversion Rate
May-September	>967	110 cfs
May-September	<967	No Diversion Without Permission of SD & MN Boundary Water Commission
October-April	<965	No Diversion Without Permission of SD Water Management Board
October-April	>965 and <966	Restricted to 10 cfs or Daily Acre-feet Equivalent
October-April	>966 and <967	35 cfs or Daily Acre-feet Equivalent not Exceeding 460 Acre-feet any Consecutive 7 Day Period
October-April	>967	110 cfs

Note: Acre-feet/day = cfs x 1.9834 10 cfs = 19.8 Acre-feet/day 35 cfs = 69.4 Acre-feet/day

See report on application for additional information.

Garland Erbele, Chief Engineer
March 29, 2001

REPORT ON WATER PERMIT APPLICATION 6253-3
Otter Tail Power Company
PO Box 496, Fergus Falls, 56538-0496
March 29, 2001

Water Permit Application No. 6253-3, Otter Tail Power Company, proposes to appropriate an additional 1000 acre-feet of water to correct the on-site storage capacity from the 7000 acre-feet authorized by Water Right No. 1983-3 to the developed storage capacity of 8000 acre-feet. The water will continue to be for Industrial Use at the power production plant with an additional use for a proposed ethanol production plant at the site. Withdrawals of water from Big Stone Lake would continue to take place from January 1 to December 31 annually as currently authorized. The water will be diverted from the lake at a point in the E½ NW¼ of Section 8 T121N R46W, Grant County, South Dakota to storage ponds on Big Stone Plant property (Attachment 1).

History and Review of Project

The only South Dakota Water License/Permit for withdrawal of water from Big Stone Lake is Water License No. 1983-3 originally issued to Northwestern Public Service Co., Montana-Dakota Utilities Co., and Ottertail Power Co., Fergus Falls, Minnesota for Industrial Use at the Big Stone Power Plant.

Big Stone Power Plant was originally issued Water Permit No.1768-3, priority date 09/14/1970, for withdrawal and storage of water from Big Stone Lake. Water Permit No.1768-3 authorized 7000 acre-feet of on-site water storage annually for Industrial Use and withdrawals of water from Big Stone Lake were subject to the following qualifications:

**Note: All elevations in this report are
referenced to project datum which is 2.3
feet higher than the 1929 feet mean sea
level datum.**

- Diversion of water from the lake, not to exceed 100 cubic feet per second, may be made when the water surface elevation is at or above elevation 967 feet.
- Diversion of water from the lake at a continuous rate of 10 cubic feet per second, or its daily acre feet equivalent, when lake surface levels are between elevations 967 and 965 during the annual period October to April, inclusive.
- Pursuant to statute, SDCL 46-29-12, water may not be diverted from the lake when lake levels are at or below elevation 967 during the annual period May to September, inclusive, without permission of the South Dakota-Minnesota Boundary Waters Commission.

The first and third qualification above are in conflict as both reference elevation 967 feet as the start point, i.e., at or above 967 and at or below 967. The State of South Dakota statute should

take preference and the first qualification should only refer to above 967 feet elevation. Application No. 1768-3 was noticed as a diversion of 7000 acre feet annually at a maximum diversion rate of 100 cubic feet per second.

Big Stone Power Plant began withdrawal of water from Big Stone Lake in 1972. Since then the on-site water storage capacity has been increased from approximately 6775 to 7982 acre-feet.

In 1973 Big Stone Power applied for Water Right No. 1983-3. During the South Dakota Water Rights Commission (predecessor to the Water Management Board) hearing on application No. 1983-3, Mr. Grimes, State Chief Engineer presented to the Commission that *".... the power companies also have a Minnesota permit to use water from Big Stone Lake which provides that whenever the elevation of the lake is above 966 during the October through April period, water may be withdrawn from the lake not to exceed 460 acre feet in any 7 day period. This, he said, comes to 35 cubic feet per second. Under the present South Dakota permit, they are limited to 10 cubic feet per second. The supplemental permit before the Commission at this time is to obtain the privilege of pumping from the lake at the rate of an additional 25 cubic feet per second making a total between the two permits of 35 cubic feet per second or its daily or weekly equivalent whenever the elevation is above 966"*. The Commission approved application No. 1983-3 with the wording *".... said water to be used at any time during October through April when the water level of Big Stone Lake is above elevation 966 feet project datum but less than elevation 967 project datum, the volume of water to be pumped in any period of seven (7) consecutive days not to exceed 460 acre feet"*. Application No. 1983-3 was noticed as 25 cfs or its daily or weekly equivalent not to exceed 460 acre feet per every seven day period.

In 1982 Water Right No. 1983-3, priority date 06/13/1973 incorporating applicable portions of Water Permit No. 1768-3, was licensed to Big Stone Power Plant authorizing water withdrawals from Big Stone Lake with diversions between 10 and 110 cfs. There is a discrepancy in this license in regard to the maximum diversion rate. One portion of this license states the holder is entitled to divert 110 cfs while an asterisked note states *".... diversions between 10 and 100 cfs are authorized"*. Since this license was issued before January 1, 1983, it is subject to South Dakota Statute 46-5-4.1. Validation of prior licenses, which states *"Any license issued prior to January 1, 1983, by the chief engineer or the water management board is hereby cured, legalized and validated as fully as if the license had been issued in full compliance with all existing provisions of this title"*.

Due to the drought conditions in the fall of 1976, Big Stone Power Plant requested an emergency allocation of 1000 acre-feet of water from Big Stone Lake. This request was granted by the South Dakota Water Rights Commission and 492 acre-feet were withdrawn in October 1976 and the remainder in February 1977. Big Stone Power Plant also requested and was granted an allocation of 2500 acre-feet to be withdrawn before May 1, 1977. Water supply conditions improved that spring and this withdrawal was not required.

In the fall of 1988, an emergency allocation of 500 acre-feet was requested by Big Stone Power Plant due to drought conditions. An emergency allocation of 3700 acre-feet was also requested in the spring of 1989. These requests were granted by the South Dakota Water Management Board and only the fall allocation was withdrawn from Big Stone Lake.

During the processing of the 1976, 1977, 1988, and 1989 emergency allocation requests, written and verbal communications were exchanged between South Dakota Department of Environment and Natural Resources' (DENR) Water Rights and Big Stone Power Plant personnel trying to clarify water surface elevations, rates of withdrawals, and periods of withdrawals. The following conditions were verbally and unofficially recognized in October 1988:

- 7000 acre-feet of storage per year
- During the period October 1 to April 30
 - 10 cfs @ elevation 965 feet
 - 35 (25+10) cfs @ elevation 966 feet
 - 100 cfs @ elevation 967 feet
- Diversion below 967 feet during period May 1 to September 30 requires permission from South Dakota-Minnesota Boundary Waters Commission

Review of Water Source

Big Stone Lake is a boundary water body between South Dakota and Minnesota located in the North East corner of South Dakota, Grant and Roberts Counties. Water surface elevations of this natural lake are controlled by two structures; a silt barrier, crest elevation 967 feet, at the outlet of the lake and a gated control dam on the Minnesota River downstream of the outlet (Attachment 1). Both South Dakota and Minnesota statutes pertaining to water elevations in Big Stone Lake state that the most desirable and beneficial level for the waters of the lake from May 1 to October 1 each year is elevation 967 feet. Agencies from both states are required to maintain and operate the Big Stone Lake control dam in conformance with these statutes.

Big Stone Power Plant originally had permits for diversion of water from Big Stone Lake from both South Dakota and Minnesota. The lowest water surface elevation at which diversions from the lake were authorized was set at 965 and 966 feet for the South Dakota and Minnesota permits respectively. In 1991 the manager of the Big Stone Power Plant requested the Minnesota Department of Natural Resources terminate the Minnesota permit. The Minnesota permit was terminated in November 1991 by the Department of Natural Resources, Division of Waters, Permit Unit Supervisor.

Big Stone Lake is primarily recharged by surface runoff. The confluence of the Whetstone River and the Minnesota River is between the silt barrier and the gated control dam (Attachment 1). The silt barrier blocks most of Whetstone River water from flowing upstream into Big Stone Lake during high water periods. Big Stone Lake will flow over the silt barrier during periods of high water to the gated control dam on the Minnesota River. In 1988 the crest elevation of the silt barrier was increased to 967 feet and the procedure for release of water into the Minnesota River was changed. Before 1988, during periods of high water, discharges from the lake were released quickly to bring the water surface elevation down to 967 feet. Since 1988 excess water is released slowly into the Minnesota River until water surface elevation 967 feet is reached, usually just before the fall freeze up. More water should be available during the summer months using this procedure than predicted in 1970 when the original Big Stone Power Plant permit was

issued. The control gates are operated such that 968 feet is the maximum water surface elevation held behind the dam. Minnesota has established the ordinary high water elevation for Big Stone Lake at 967.4 feet. The explanation in the South Dakota Water Right Application Approval for No. 1768-3 as to when unappropriated water is available in Big Stone Lake refers to the lake's ordinary high water mark as 967 feet elevation and ordinary low water mark as 965 feet elevation.

Minnesota Department of Natural Resources historical data show the following Big Stone Lake water surface elevation statistics:

<u>1972-2000</u>	
Mean-967.30 feet	Maximum-975.50 feet in 1997
Median-967.34 feet	Minimum-964.67 feet in 1976
10 Percentile-966.23 feet	75 Percentile-967.85 feet
25 Percentile-966.70 feet	90 Percentile-968.30 feet
50 Percentile-967.34 feet	

The data predict a 50 percent probability that the Big Stone Lake water surface elevation will be 967.34 feet or greater during any given year. There is a 75 percent probability the lake's water surface elevation will be 966.70 feet or greater during any given year. (Attachment 3)

From the time of the procedural change for managing Big Stone Lake's surface water elevations in 1988 through 2000, the data show the following elevation statistics:

<u>1988-2000</u>	
Mean-967.63 feet (+0.30)	Maximum-975.50 feet in 1997
Median-967.65 feet (+0.31)	Minimum-965.05 feet in 1988
10 Percentile-966.65 feet (+0.42)	75 Percentile-968.05 feet (+0.20)
25 Percentile-967.30 feet (+0.60)	90 Percentile-968.38 feet (+0.08)
50 Percentile-967.65 feet (+0.31)	

The 1988-2000 data show a 50 percent probability the water surface elevation will be 967.65 feet or greater and a 75 percent probability the water surface elevation will be 967.30 feet or greater during any given year (Attachment 4). The above figures in parentheses show a general increase in the Big Stone Lake water surface elevations after the procedural change for release of water into the Minnesota River, especially at or above the 967 feet elevation. For the 1972-2000 period the probability that the water surface elevation will be 967 feet or greater is 66 percent (Attachment 3). For the 1988-2000 period the probability for a water surface elevation of 967 feet or greater is 86 percent, a 20 percent increase (Attachment 4).

Statistical analyses of historical data indicate there is reasonable expectation the water surface elevations of Big Stone Lake will be within required parameters for the power plant to withdraw and store 8000 acre-feet of water annually.

Conclusions

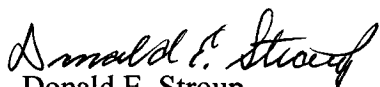
1. Water Permit Application No. 6253-3, Otter Tail Power Company, proposes to correct the on-site water storage volume from the 7000 acre-feet authorized by Water Right No. 1983-3 to the present on-site storage capacity of 8000 acre-feet for Industrial Use at the power plant and a proposed ethanol production plant.
2. On-site water storage capacity has been increased from approximately 6775 to 7982 acre-feet since issuing the original Water Permit No.1768-3.
3. Since 1988 higher water surface elevations have been maintained in Big Stone Lake making more water available than predicted when the original permit was issued in 1970.
4. Statistical analyses of historical data indicate there is non-appropriated water available in Big Stone Lake for the Big Stone Power Plant to withdraw and store 8000 acre-feet of water annually.
5. Additional on-site water storage increases the probability the power plant can operate during dry periods without emergency allocations of water.
6. Big Stone Power Plant holds the only South Dakota license/permit for withdrawal of water from Big Stone Lake. This allocation will not infringe on any other South Dakota water rights.
7. Water to be used by the proposed ethanol production plant should only be taken from the proposed 8000 acre-feet on-site storage.
8. The original qualifications from Water Right No.1768-3 are in conflict as both reference elevation 967 feet as the start point, i.e., at or above 967 and at or below 967. The State of South Dakota statute should take preference and the qualification pertaining to the May-September period at the diversion rate of 110 cfs should only refer to above the 967 feet elevation.
9. Water Right No. 1768-3 set a lower water surface elevation of 965 feet for the October to April period, but did not explicitly state diversions of water from Big Stone Lake would not take place when the water surface elevation was below 965. Requests from the power plant for emergency allocations of water from the lake were processed with no diversions of water when the lake's surface elevation was below 965 feet. Diversions from Big Stone Lake during the October to April period should not be allowed when the water surface level is below 965 feet without authorization of the South Dakota Water Management Board.
10. Water Right No. 1983-3 issued before 1983, entitled the holder to divert 110 cfs under conditions specified in Water Permit No 1768-3 and No. 1983-3, with diversions between 10 and 100 cfs authorized. Although there is a conflict between the maximum diversion rate in this license, the 110 cfs diversion rate is considered "*.... cured, legalized and validated as fully as if the license had been issued in full compliance with all existing provisions of this title*" by South Dakota Statute 46-5-4.1.

11. If approved, this application should include the water surface elevation and diversion rate qualifications from the following table:

Qualifications/Diversion Rates

Time Period	Lake Elevation (Feet)	Diversion Rate
May-September	>967	110 cfs
May-September	<967	No Diversion Without Permission of SD & MN Boundary Water Commission
October-April	<965	No Diversion Without Permission of SD Water Management Board
October-April	>965 and <966	Restricted to 10 cfs or Daily Acre-feet Equivalent
October-April	>966 and <967	35 cfs or Daily Acre-feet Equivalent not Exceeding 460 Acre-feet any Consecutive 7 Day Period
October-April	>967	110 cfs

Note: Acre-feet/day = cfs x 1.9834 10 cfs = 19.8 Acre-feet/day 35 cfs = 69.4 Acre-feet/day



Donald E. Stroup
Natural Resources Project Engineer
DENR Water Rights Program

Reviewed by:



Mark D. Rath
Natural Resource Engineering Specialist
DENR Water Rights Program

References:

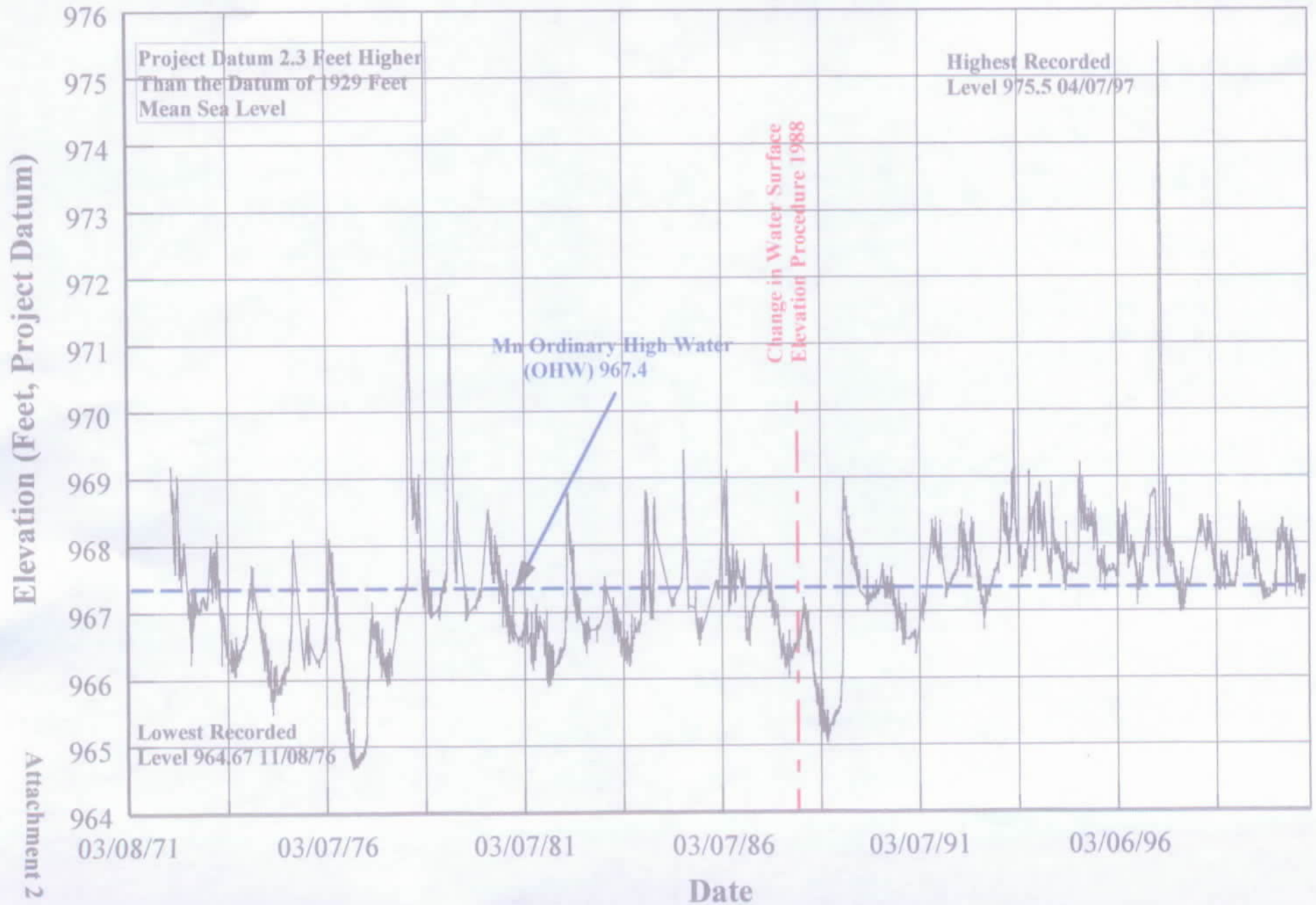
South Dakota Department of Environment and Natural Resources, Water Rights Program
Records

South Dakota Water Rights Commission Hearing Minutes

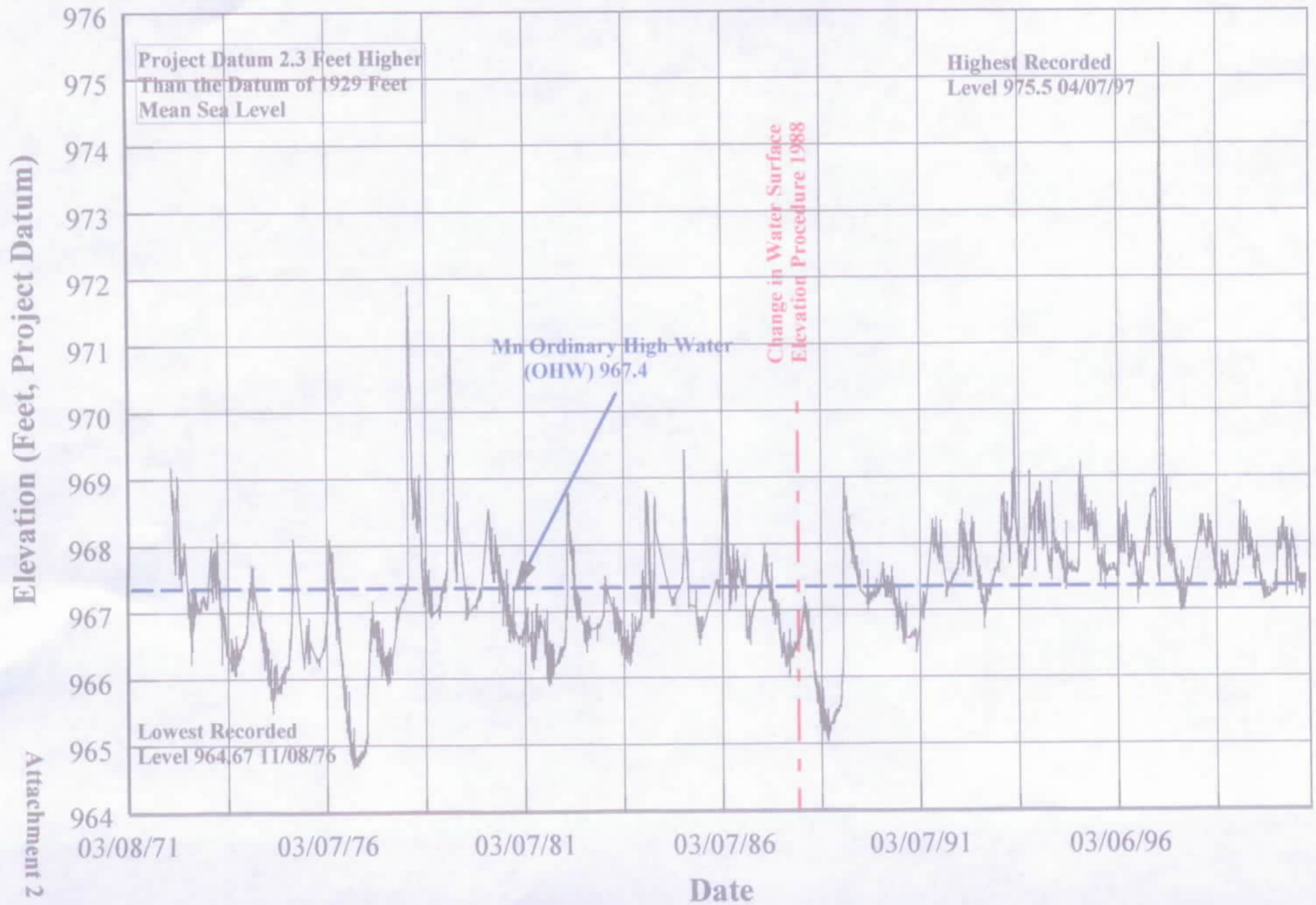
Minnesota Department of Natural Resources, Big Stone Lake Historical Data

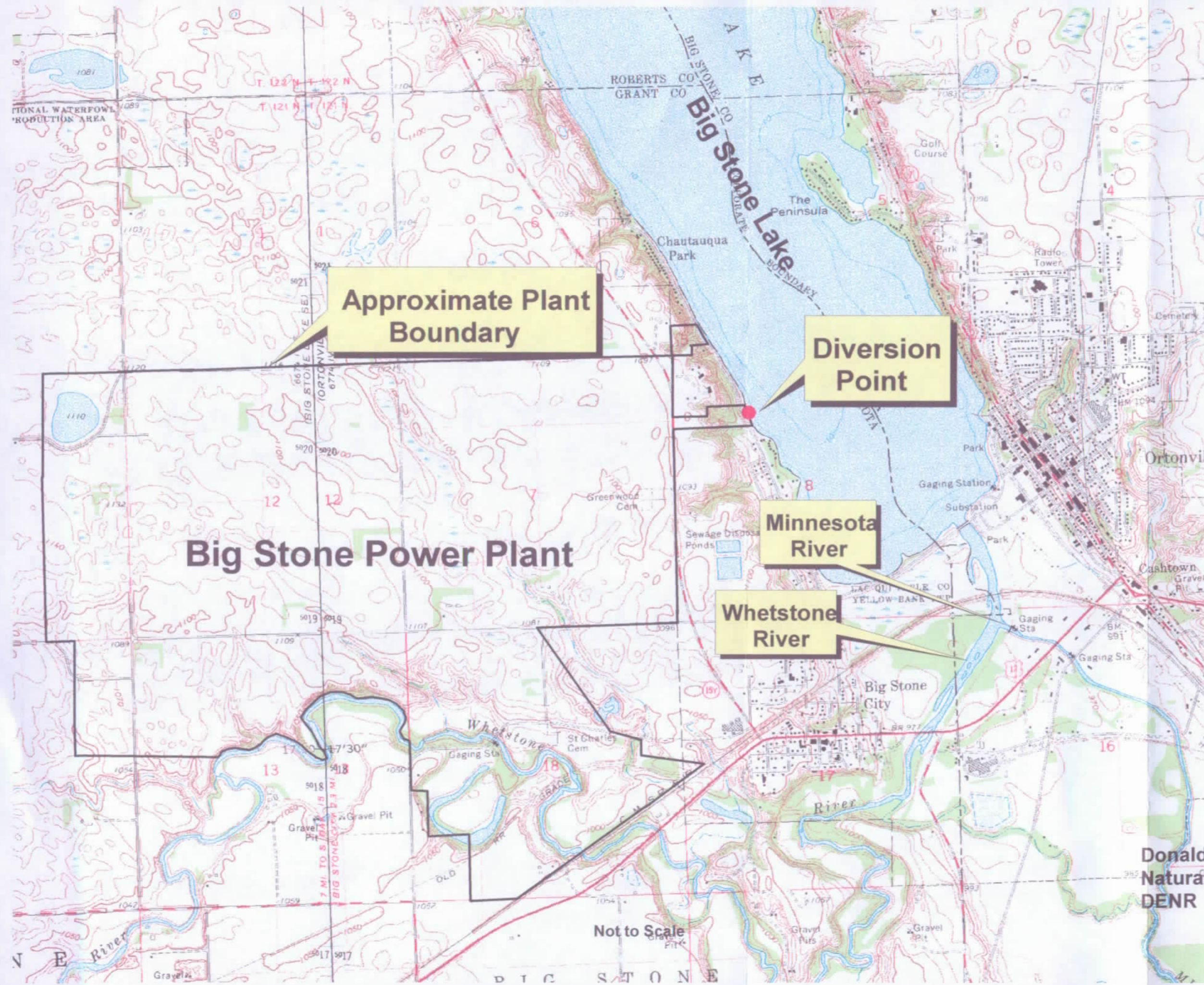
Descriptive Statistics and Graphs, PSI-Plot Software

Big Stone Lake Water Surface Elevation 1972-2000



Big Stone Lake Water Surface Elevation 1972-2000





Donald E. Stroup
Natural Resources Project Engineer
DENR



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

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

March 29, 2001

Terry Graumann, Manager
Otter Tail Power Company
Environmental Services
PO Box 496
Fergus Falls, MN 56538-0496

Dear Mr. Graumann:

Water Permit Application No. 6253-3 for industrial use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice of hearing has been sent to the Publisher of the Grant Co. Review printed at Milbank, SD (Ph # 605-432-4516). For your information, a copy of the notice, the recommendation of the Chief Engineer and a 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 to authorize publication of your Notice of Hearing and to arrange for payment. Early contact with the paper can eliminate delays. The publisher has been instructed to publish your notice once each week for two consecutive weeks with the last publication to occur twenty days before the board meeting. The newspaper has 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.



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

March 29, 2001

Grant Co. Review
Box 390
Milbank, SD 57252-0390

ATTENTION: Legal Public Notice

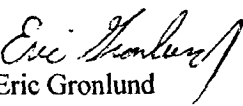
Enclosed is a Notice of Hearing on Application No. 6253-3 to Appropriate Water to be published twice. Please publish the first notice on April 4, 2001 with the second publication 7 days later.

The applicant must verify to you that the notice is to be published, before you make the first publication **Please BILL the APPLICANT for the cost of publication.** The APPLICANT is Terry Graumann, Manager, Otter Tail Power Company, Environmental Services, PO Box 496, Fergus Falls, MN 56538-0496 (Ph # 218-739-8475).

Please send the Water Rights Program the first publication immediately. The publication is checked for accuracy so any corrections can be made in the second publication. You may use the form below or fax a copy of the first publication. Any fax should be sent to the attention of Karen Schlaak at (605) 773-4068. Publication errors can invalidate the public notice.

After the second publication, **please send us an affidavit or use the enclosed Proof of Publication form.** The applicant pays the cost of publication, but the Water Rights Program records require an affidavit or Proof of Publication. Delays in receiving the affidavit can be costly to the applicant.

Sincerely,


Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

-----CUT HERE-----

No. 6253-3

TO: Eric Gronlund
Water Rights Program
Joe Foss Building
Pierre SD 57501-3181

Date _____

We are in receipt of your letter of March 29, 2001 enclosing Notice of Hearing to Appropriate Water by Application No. 6253-3 which was first published in our issue of _____. ENCLOSED IS A COPY OF THIS FIRST PUBLICATION.

Name

Newspaper

Instruction to Newspaper - Publish first Notice on April 4, 2001 with the second publication 7 days later. The applicant is responsible for payment.

NOTICE OF APPLICATION NO. 6253-3 to Store Additional Water and
to Amend Water Right No. 1983-3

Notice is given that Otter Tail Power Company, Environmental Services, PO Box 496, Fergus Falls MN 56538-0496 has filed an application for a water permit to authorize the storage of an additional 1,000 acre feet of water by increasing the storage capacity authorized by Water Right No. 1983-3. Water Right No. 1983-3 appropriates up to 110 cubic feet of water per second from Big Stone Lake under specific diversion criteria and authorizes storage of 7,000 acre-feet of water for cooling and evaporation ponds at the Big Stone Plant. The diversion point is located in the E ½ NW ¼ Section 8-T121N-R46W. The water is for industrial use for electric power generation at the Big Stone Plant. This application proposes an increase of 1,000 acre feet of water in order to reflect the actual storage capacity of 8,000 acre feet in the five ponds. The ponds are located in portions of Sections 11, 12, 13 & 14; T121N-R47W and Section 7 and 18; T121N-R46W. No increase in the diversion rate is authorized by this application. This notice also serves to notify of the additional industrial use of serving an ethanol production plant.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 6253-3 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.

Any person interested in opposing or supporting this application must file a written petition with BOTH the applicant and Chief Engineer. The applicant must also file a petition if opposed to 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 April 23, 2001. 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.

The Water Management Board will consider this application at The Matthew Training Center, Foss Building, 523 E. Capitol Ave., Pierre, SD at 10:00 A.M. May 2, 2001. The Chief Engineer's recommendation is not final or binding upon the Board. The Board is authorized to 1) approve, 2) approve with qualifications, 3) defer, or 4) deny this application based on the facts presented at the public hearing. The May 2, 2001 hearing date will be automatically delayed for at least 20 days upon written request to the Chief Engineer from the applicant or any interested person opposing the application. The request for an automatic delay must be filed by April 23, 2001.

Any hearing will be an adversary proceeding. Any person filing a petition and/or the applicant have the right to be represented by a lawyer and may present evidence or cross-examine witnesses according to SDCL 1-26. These and other due process rights will be forfeited if not exercised. Decisions of the Board may be appealed to the Circuit Court and State Supreme Court as provided by law. Contact Eric Gronlund by April 23, 2001, at the above Water Rights Program address to request copies of information pertaining to this application, to assure access to the hearing by the handicapped or to obtain an interpreter for the hearing impaired.

This application is made pursuant to SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-16; 46-2-3.1, 46-2-9, 46-2-11, 46-2-13, 46-2-17; 46-2A-1 thru 46-2A-10, 46-2A-12, 46-2A-14, 46-2A-15, 46-2A-20, 46-2A-21; 46-5-1 thru 46-5-11, 46-5-13 thru 46-5-15, 46-5-24, 46-5-25, 46-5-30.2, 46-5-30.4, 46-5-31; 46-6-3, 46-6-3.1, 46-6-6.1, 46-6-10, 46-6-13, 46-6-14, 46-6-26; and Board Rules ARSD 74:02:01:01 thru 74:02:01:15. Steven M. Pirner, Secretary, Department of Environment and Natural Resources.



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

March 30, 2001

Dave Leuthe, Regional Hydrologist
Minnesota DNR
PO Box 756
New Ulm MN 56073-0756

Jim Japs
Minnesota DNR
P.O. Box 111, 1400 East Lyon
Marshall, MN 56258

Gentleman:

I am sending you a copy of our staff report, recommendation and public notice on a water right permit application filed by Otter Tail Power Company in northeastern South Dakota. The application is to authorize an additional volume of water to reflect the actual storage capacity in their five ponds at the Big Stone Plant. The application also includes the additional industrial use of serving a proposed ethanol plant.

If you are not the appropriate person, please forward this information to the appropriate Minnesota DNR staff.

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

Sincerely,

Eric Gronlund
Water Rights Program
(605) 773-3352

enclosure

Printer's Affidavit of Publication

STATE OF SOUTH DAKOTA,
COUNTY OF GRANT

} ss.

Helli Seehager

of said County and State, being first duly sworn, on oath says that the Grant County Review is a legal weekly newspaper of general circulation, printed and published in Milbank, in said County of Grant and State of South Dakota, by Phyllis Justice, and has been such newspaper during the times hereinafter mentioned; that said newspaper is a legal newspaper; and that it has a bona fide circulation of more than two hundred copies weekly, and has been published within said County of Grant in the English language and has been admitted to the United States mail under second class mailing privilege, for at least one year next prior to the publication of the Notice herein mentioned, and has been printed wholly in an office maintained at the said place of publication, that I, the undersigned, Advertising Manager of said newspaper, in charge of the advertising department thereof, have personal knowledge of all the facts stated in this affidavit; that the advertisement headed Notice of

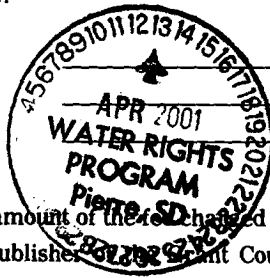
Application No. 6253-3 To Store Additional
Water and to Amend Water Right No. 1983-3

a printed copy of which, taken from the paper in which the same was published, is attached to this sheet and is made a part of this Affidavit, was published in said newspaper at least once each week for two successive weeks, on the day of each week on which the said newspaper was regularly published, to-wit:

April 4 2001

April 11 2001

19



19

19

19

That \$ 68.51, being the full amount of the fee charged for the publication of said Notice, inures to the benefit of the publisher of said Grant County Review; that no agreement or understanding for the division thereof has been made with any person, and that no part has been agreed to be paid to any person whomsoever.

Helli Seehager



Subscribed and sworn to before me this 14th day of April 19 2001

Debra L. Hemmer

Notary Public, Grant County, South Dakota

DEBRA HEMMER
Notary Public, GRANT COUNTY, S. DAK.
My Commission Expires OCT 27, 2003

NOTICE OF APPLICATION
NO. 6253-3
TO STORE ADDITIONAL
WATER AND TO AMEND
WATER RIGHT NO. 1983-3

Notice is given that Otter Tail Power Company, Environmental Services, PO Box 496, Fergus Falls, MN 56538-0496 has filed an application for a water permit to authorize the storage of an additional 1,000 acre feet of water from Big Stone Lake by increasing the storage capacity authorized by Water Right No. 1983-3. Water Right No. 1983-3 appropriates up to 110 cubic feet of water per second from Big Stone Lake under specific diversion criteria and authorizes storage of 7,000 acre-feet of water for cooling and evaporation ponds at the Big Stone Plant. The diversion point is located in the E1/2 NW 1/4 Section 8-T121N-R46W. The water is for industrial use for electric power generation at the Big Stone Plant. This application proposes an increase of 1,000 acre feet of water in order to reflect the actual storage capacity of 8,000 acre feet in the five ponds. The ponds are located in portions of Sections 11, 12, 13 & 14; T121N-R47W and Section 7 and 18; T121N-R46W. No increase in the diversion rate is authorized by this application. This notice also serves to notify of the additional industrial use of serving an ethanol production plant.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 6253-3 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.

Any person interested in opposing or supporting this application must file a written petition with BOTH the applicant and Chief Engineer. The applicant must also file a petition if opposed to 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

Publication Fee \$ 68.51

Notarial Fee \$

Total \$ 68.51

given above. A petition filed by either an interested person or the applicant must be filed by April 23, 2001. 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.

The Water Management Board will consider this application at The Matthew Training Center, Foss Building, 523 E. Capitol Ave., Pierre, SD at 10:00 AM May 2, 2001. The Chief Engineer's recommendation is not final or binding upon the Board. The Board is authorized to 1) approve, 2) approve with qualifications, 3) defer, or 4) deny this application based on the facts presented at the public hearing. The May 2, 2001 hearing date will be automatically delayed for at least 20 days upon written request to the Chief Engineer from the applicant or any interested person opposing the application. The request for an automatic delay must be filed by April 23, 2001.

Any hearing will be an adversary proceeding. Any person filing a petition and/or the applicant have the right to be represented by a lawyer and may present evidence or cross-examine witnesses according to SDCL 1-26. These and other due process rights will be forfeited if not exercised. Decisions of the Board may be appealed to the Circuit Court and State Supreme Court as provided by law. Contact Eric Gronlund by April 23, 2001, at the above Water Rights Program address to request copies of information pertaining to this application, to assure access to the hearing by the handicapped or to obtain an interpreter for the hearing impaired.

This application is made pursuant to SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-16; 46-2-3.1, 46-2-9, 46-2-11, 46-2-13, 46-2-17; 46-2A-1 thru 46-2A-10, 46-2A-12, 46-2A-14, 46-2A-15, 46-2A-20, 46-2A-21; 46-5-1 thru 46-5-11, 46-5-13 thru 46-5-15, 46-5-24, 46-5-25, 46-5-30.2, 46-5-30.4, 46-5-31; 46-6-3, 46-6-3.1, 46-6-3, 46-6-3.1, 46-6-6.1, 46-6-10, 46-6-13, 46-6-14, 46-6-26; and Board Rules ARSD 74:02:01:01 thru 74:02:01:15. Steven M. Pirner, Secretary, Department of Environment and Natural Resources.

April 4

April 11



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

JUN 06 2001

Terry Graumann
Otter Tail Power Company
Environmental Services
PO Box 496
Fergus Falls, MN 56538-0496

Dear Mr. Graumann:

Enclosed is Water Permit No. 6253-3 authorizing construction of your 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,

Garland Erbele, Chief Engineer
Water Rights Program
(605) 773-3352

enclosures

215 South Cascade Street
PO Box 496
Fergus Falls, Minnesota 56538-0496
218 739-8200
www.otpc.com (web site)

May 29, 2002



Mr. Garland Erbele
Water Rights Program
Department of Environment and Natural Resources
523 East Capitol
Pierre, SD 57501-3182

RECEIVED

MAY 31 2002

WATER RIGHTS
PROGRAM

Dear Mr. Erbele:

Subject: Water Permit Number 6253-3
Otter Tail Power Company
Big Stone Plant

Enclosed is the Notice Of Completion of Works and Application of Water to Beneficial Use form for Otter Tail Power Company, Big Stone Plant. The form is notification that Otter Tail Power Company has completed construction on the water lines serving the ethanol plant and has pressurized one of the lines for use and is waiting to pressurize the other line until the ethanol plant is ready. No significant water flows have been established, however, construction of the lines is complete.

Please call me at 219-739-8475 if you have questions.

Sincerely,

A handwritten signature in cursive script that reads "Darlene Eckert".

Darlene Eckert
Senior Compliance Specialist

Enclosure

**NOTICE OF COMPLETION OF WORKS AND
APPLICATION OF WATER TO BENEFICIAL USE**

Date 5/29/2002

TO: Water Rights Program, DENR
523 E. Capitol
Pierre, SD 57501-3181

FROM: Terry Graumann, Manager, Environmental Services
(name)

P.O. Box 496

(address)

Fergus Falls, MN 56538-0496

(city, state, zip)

218-739-8407

(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. 6253-3 states that the water use system is to be constructed by

May 2, 2006

(date)

, and water is to be put to beneficial use by May 2, 2010

(date)

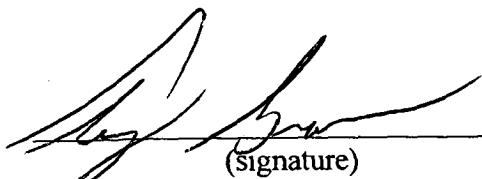
The water use system was completed on 5/23/2002

(date)

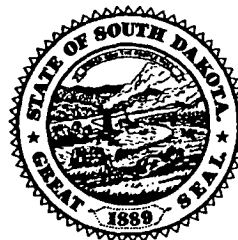
Applying the water to beneficial use was completed on 5/23/2002

(date)

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


(Signature)

Terry Graumann
Manager, Environmental Services



1983-3 & 6253-3

Water Rights Program - DENR
Conversation File Documentation

NAME OF PERSON OR FILE: Otter Tail Power Company

ADDRESS: COUNTY: Grant

DATE: November 6, 2006 TELEPHONE: 218-739-8407

RE: Discussion whether P & S for pond lining needed to be submitted for approval

Terry Graumann with Otter Tail called Thursday, November 2nd regarding the planned lining of existing ponds operated as part of the Big Stone I powerplant. Otter Tail is doing some making some changes in their water handling at the facility. As part of this effort some of the ponds will be lined. Mr. Graumann wanted to know if plans and specification needed to be submitted for DENR's approval as part of dam safety regulations. I asked if the work would entail making any structural changes to the berms that form the existing ponds. Mr. Graumann stated that no changes would be made, however during placement of the liner the inside riprap would be removed and then replaced once the liner was installed.

I conferred with Tim Schaal, DENR dam safety official, prior to calling Mr. Graumann. Tim and I concurred that approval of plans and specification is not required for lining the ponds. I contacted Mr. Graumann on November 6th to inform him of our decision. I did ask that a copy of the plans be filed with the Water Rights Program for our records.

NAME: Eric Schaal



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
denr.sd.gov

June 7, 2012

Mark Thoma
Manager, Environmental Services
Otter Tail Power Company
PO Box 496
Fergus Falls, MN 56538-0496

Dear Mr. Thoma:

We have reviewed the Barr Engineering plans and specifications for the Otter Tail Power Company Big Stone Plant 2012 Brine Pond Expansion located in the SE ¼ of Section 12-T121N-47W, in Grant County. The expansion will raise the top of dam elevation and maximum operating level 3.5 feet. The plans and specifications for the Brine Pond expansion are approved.

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

The Otter Tail Power Company Big Stone Plant Brine Concentrator Pond Dam will be classified as a small size Category 3, Low Hazard dam with a dam height of 16 ft. with a maximum storage capacity of 187 acre-feet with the reservoir at the top of dam elevation of 1123.0 fmsl.

Our review and approval pertains only to the Safety of Dams Rules. Our Waste Management Program must also approve the plans and specifications and a waste permit amendment.

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

Sincerely,

Timothy G. Schaal, P.E.
Natural Resources Engineer IV
for Garland Erbele, Chief Engineer
Water Rights Program
(605) 773-3352

c: Scott Creten, Barr Engineering Co.
SD DENR Waste Management Program

***Otter Tail Power Company
Big Stone Plant***

Interim Brine Management Plan

Big Stone City, SD

***Prepared for
Otter Tail Power Company***

May 2012



4700 West 77th Street
Minneapolis, MN 55435-4803
Phone: (952) 832-2600
Fax: (952) 832-2601

Executive Summary

This report outlines Otter Tail Power Company's proposed Interim Brine Management Plan for Big Stone Power Plant, Big Stone City, SD. The plan was prepared in response to the expectation that the existing brine storage ponds will reach maximum operating capacity sometime near the end of 2012.

New air quality control equipment will be installed and used as the primary disposal method of the brine in the future. However, the air quality control equipment is not scheduled to be on-line until mid to late 2015. Therefore, Otter Tail Power Company has retained Barr Engineering Company to prepare this Interim Brine Management Plan to identify a means for managing brine storage and/or disposal through the end of 2015. The phrase "interim time period" that is used throughout this report refers to the period of time between when the ponds are at capacity and the date when the new air quality control equipment comes on-line.

The plan includes an integrated approach to managing brine over the interim time period. The proposed plan includes:

- Adding supplemental brine storage capacity through the construction of a dike raise at brine pond no. 2.
- Applying brine to the ash fill disposal area on a trial basis, in accordance with permit requirements.
- Monthly monitoring of brine pond levels.
- Permit design for a new pond, with construction planned if a new pond is found to be necessary to properly manage the brine discharge.

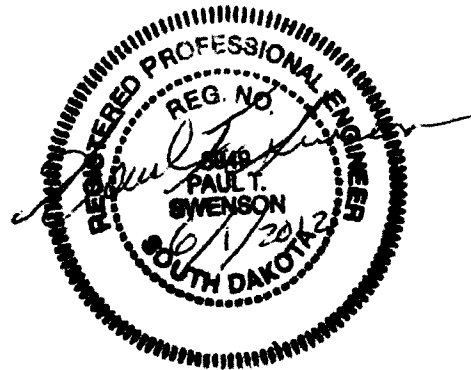
Because the proposed plan includes modifications to the regulated brine storage ponds, applications will be submitted to the South Dakota Department of Environment and Natural Resources to modify the solid waste permit and to raise the dam associated with the pond. This plan has been prepared to accompany the permit modification applications.

Big Stone Plant – Interim Brine Management Plan

May 2012

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1.0 Introduction

Otter Tail Power Company (OTPCO) owns and operates the Big Stone Power Plant located near Big Stone City, SD. Two lined ponds are used to store brine water that is produced as a by-product of the treatment of plant feed water. Model projections indicate the brine storage ponds will reach permitted operating capacity by between October and December 2012. Actual weather conditions and potential operational changes may result in deviation to the modeled filling schedule.

New air quality control equipment that will be used to dispose of the brine in the future is not scheduled to be on-line until mid to late 2015. Therefore, OTPCO needs to identify a means to manage brine after the ponds are filled to capacity and before the new air quality control equipment is in place. The phrase “interim time period” that is used throughout this report refers to this time period.

This report outlines OTPCO’s intended interim brine management plan and explains the logic of how the plan was formulated. Because the plan calls for structural modifications to the existing brine pond no. 2, OTPCO will submit applications to the South Dakota Department of Environment and Natural Resources (SDDENR) to modify the existing Solid Waste and Safety of Dams permits that regulate the ponds. This report has been prepared to support the permit applications.

2.0 Background-Existing Brine Management

2.1 Existing Brine Management

Currently, all brine produced is stored in two lined ponds located near the brine concentrator building. Brine pond no. 1 is a lined pond constructed in 1998 and is located to the south of the brine concentrator building. Brine pond no. 2 is a lined pond constructed in 2007 and is located to the west of brine pond no. 1. Both ponds are regulated under the facility's existing Solid Waste Permit issued by the SDDENR. Pond no. 2 is also regulated by a Safety of Dams permit, due to the perimeter dike height above existing ground and storage capacity. The construction plans included in Appendix A provide an existing site plan that shows the brine pond layout.

Brine generated from the water treatment process currently is discharged directly to pond no. 1 through an aboveground pipe that runs from the brine concentrator building to the pond. The pipe discharges near the northwest corner of the pond inside the lined area. Brine solids settle out of the waste stream near the discharge point and form a beach within the pond. The solids are removed from the pond approximately once per year.

Approximately 1 or 2 times per year, as pond no. 1 fills, brine is pumped from pond no. 1 through an aboveground pipe to pond no. 2 for final disposal. Both ponds are open to the environment and are not covered.

Brine pond no. 2 was designed to provide approximately 5 years of capacity at its current maximum operating level of El. 1116.0 feet MSL. The pond was designed assuming a design filling rate of 15 gpm (24 hours per day, 365 days per year). As described earlier, the ponds are nearing maximum permitted storage capacity. Model projections indicate the ponds will reach maximum operating capacity within the October to December 2012 timeframe. However, this timeframe is only an estimate, as the pond levels depend upon actual brine inflow, precipitation, and evaporation that occurs over time. These variables can only be estimated with limited accuracy and confidence.

The actual long-term average filling rate of pond no. 2 was calculated to be 14.77 gpm. This was computed by assuming the pond was put in service on October 1, 2007 (empty) and computing the storage volume on October 24, 2011 based on a pond level reading of El. 1113.75 feet MSL, and using the design stage-storage curve for the pond. The stage-storage relationship is shown in Table 1. Table 1 also includes the stage-storage relationship for the proposed dike raise construction, as further explained in Section 4.0.

Table 1 Brine Pond No. 2 Stage-Storage Table

Contour Elevation (ft)	Contour Area (ft ²)	Incremental Volume (ft ³)	Cumulative Volume (ft ³)	Cumulative Volume (Gallons)	
1100.0	240,180	0	0	0	
1101.0	248,753	244,466	244,466	1,828,733	
1102.0	257,812	253,283	497,749	3,723,421	
1103.0	266,984	262,398	760,147	5,686,295	
1104.0	276,351	271,667	1,031,815	7,718,513	
1105.0	286,143	281,247	1,313,062	9,822,387	
1106.0	296,050	291,097	1,604,158	11,999,936	
1107.0	305,980	301,015	1,905,174	14,251,692	
1108.0	316,023	311,002	2,216,176	16,578,149	
1109.0	326,295	321,159	2,537,335	18,980,585	
1110.0	336,759	331,527	2,868,862	21,460,580	
1111.0	347,149	341,954	3,210,816	24,018,573	
1112.0	357,559	352,354	3,563,170	26,654,364	
1113.0	368,051	362,805	3,925,975	29,368,335	
1114.0	378,722	373,386	4,299,362	32,161,463	
1115.0	389,715	384,219	4,683,580	35,035,614	
1116.0	400,726	395,221	5,078,801	37,992,072	Existing capacity at current max. operating level
1117.0	411,758	406,242	5,485,043	41,030,974	
1118.0	422,879	417,319	5,902,362	44,152,737	
1119.0	434,438	428,659	6,331,021	47,359,329	
1119.5	440,312	218,688	6,549,709	48,995,229	Proposed capacity at new max. operating level
1120.0	444,588	220,825	6,770,534	50,647,115	
1121.0	453,186	448,887	7,219,421	54,005,023	
1122.0	461,849	457,517	7,676,938	57,427,488	
1123.0	470,575	466,212	8,143,150	60,914,996	Total capacity at new crest elevation

2.2 Alternatives for Interim Brine Management

In November 2011, Barr conducted an evaluation of possible alternatives for future brine management. The alternatives that were considered for brine disposal or reduction included the following:

- Disposal at a publicly-owned treatment works (POTW)
- Disposal in commercial injection well
- Disposal in a well that would be constructed and permitted by OTPCO

- Disposal through further concentration and crystallization

Additionally, the evaluation included:

- Evaluating the effectiveness of pond covers to separate rainfall from brine water and reduce the total briny water that would require treatment
- Siting a new pond to provide capacity for all brine generated over a four year period, or the fraction of brine that could not be managed with other methods
- Evaluating operating conditions at the existing brine ponds and a proposal for managing the ponds in the event that brine water levels cannot be maintained below the design operating levels. This option included raising the perimeter dike of brine pond no. 2 to gain additional storage capacity.

Based on many factors, OTPCO decided to pursue further investigation of the potential for raising the perimeter dike of brine pond no. 2 to gain additional storage capacity. In addition, OTPCO plans to begin applying brine to the ash fill disposal area, in accordance with the terms and conditions of their Solid Waste permit.

Once the potential alternative was selected, the next step was to determine how much additional storage capacity would be needed in brine pond no. 2, while considering the benefit provided from assumed ash wetting outflows. This combination of storage and ash wetting would need to provide for total management of brine generation over the interim period (as described in Section 1.0 above).

3.0 Interim Brine Management Plan Development

3.1 Introduction

A water balance model was created in an effort to understand the relationship between expected brine pond inflows (brine generation and precipitation), outflows (evaporation and ash wetting pump flows), and required supplemental pond storage requirements in the interim.

The model was created using a spreadsheet and is based on monthly time increments so that seasonal impacts of variable precipitation and evaporation rates could be estimated. Results of the model are included in Appendix C.

Several scenarios were evaluated. The various scenarios were modeled using differing assumptions and combinations for brine generation, precipitation, evaporation, and ash wetting pump flows. The model inputs, outputs, and assumptions are explained in more detail in Appendix C.

Potential ash wetting flows are not yet known. OTPCO intends to perform ash wetting on a trial basis. The amount of ash wetting will depend on ash fill disposal area surface conditions and weather conditions at the time of proposed wetting. Refer to Section 4.3 for further discussion of proposed ash wetting methods.

For the water balance model, estimates were made of potential ash wetting rates, based on several simplifying assumptions. It is not yet known if these estimates will match actual ash wetting rates that may occur. Therefore, the assumption that no ash wetting will occur is the most conservative assumption when estimating time to reach maximum capacity of the existing brine ponds.

3.2 Findings

The major findings of the water balance model evaluation include:

1. Within the assumed realistic limits of potential ash wetting (see Section 4.3), it was found that ash wetting alone would not likely provide sufficient management of brine during the interim time period. In other words, additional storage capacity is likely a requirement for satisfactory brine management during the interim time period.
2. Within the physical constraints of the proposed dike raise (see Section 4.2) and the assumed realistic limits of potential ash wetting (see Section 4.3), it was found that some form of additional storage capacity may be required during the interim time period above and beyond

the perimeter dike raise of pond no. 2. In other words, a new pond may need to be constructed in the interim time period, in addition to the proposed perimeter dike raise of pond no. 2. However, this cannot be confirmed until future pond filling rates (taking into consideration potential lower brine generation rates and proposed ash wetting flows) are known.

3. Fifteen gallons per minute (gpm) was the assumed brine generation rate in past analyses. Calibration of the water balance model with known conditions led to questions whether the assumed flow rate may be too high. Recent measurements of brine generation flow rates indicate that a design flow rate of 10 gpm may be more appropriate. OTPCO intends to monitor this flow rate going forward to verify design conditions.
4. A perimeter dike raise of brine pond no. 2 (as discussed in Section 4.2) will likely add 16 to 18 months or more to the operating capacity of pond no. 2, depending on actual pond inflows and outflows that will occur in the future.

3.3 Conclusions and Recommendations

The following conclusions and recommendations are provided based on the findings of the water balance model and the perimeter dike raise design. These recommendations form the basis of the Interim Brine Management Plan:

1. Additional brine storage capacity should be provided as soon as possible, due to the expectation that the existing brine ponds will reach maximum operating levels by the October to December 2012 timeframe. OTPCO intends to perform ash wetting in accordance with existing permit conditions. The ash wetting will aid in extending the time to reach operating capacity, but will not likely provide enough benefit on its own during the interim time period, without the addition of supplemental brine storage capacity.
2. Supplemental storage capacity can be accomplished with a raise of the perimeter dike of brine pond no. 2 and/or the construction of a new pond. Due to the short time frame expected until the ponds reach capacity, a raise to the perimeter dike of brine pond no. 2 is recommended to provide the needed supplemental storage capacity in the interim.
3. If the dike raise design presented in Section 4.2 is implemented, the time to reach capacity is expected to increase by approximately 16 to 18 months or more, depending on actual pond

inflows and outflows that will occur in the future. This recommendation provides the advantage of putting additional storage capacity on-line in the shortest period of time.

4. Because the dike raise of brine pond no. 2 is expected to provide 16 to 18 months or more of extended capacity, sufficient time is available to design, permit, and construct a new pond, if one is required. The need to construct a new pond should be evaluated by OTPCO on an ongoing basis, by measuring the levels of the ponds on a monthly basis to determine the current filling rate and to update the expected time to reach capacity.
5. A new pond should be constructed during the construction season prior to the date that the existing ponds are projected to be at permit capacity, unless OTPCO decides to dispose of brine using an alternative method, such as disposal at a POTW. This recommendation assumes that all design and permitting for a new pond is completed in advance of this date.
6. The permit design for a new pond should be prepared as soon as possible, preferably before the end of 2012. This will help to ensure that, if a new pond is needed in 2013 or beyond, all design and permitting will be complete prior to the need to construct a new pond.

If the recommendations in this report are implemented, it is expected that OTPCO will be able to adequately manage brine storage and/or disposal between the present time and the time when new air quality control equipment comes on-line (assumed to be mid to late 2015).

4.0 Selected Interim Brine Management Alternative

4.1 General

The Interim Brine Management Plan selected consists of an integrated approach consisting of: a dike raise of brine pond no. 2; applying brine to the ash fill disposal area on a trial basis; monthly monitoring of brine pond levels; permit design for a new pond, with possible construction of a new pond if found to be needed. The following sections describe each component of the proposed plan.

4.2 Dike Raise Design—Brine Pond No. 2

Construction of a perimeter dike raise to brine pond no. 2 is proposed. The new elevation of top of dike is proposed to be 3.5 ft. higher than the existing dike crest. This results in a new proposed operating level that is 3.5 ft. higher than the current maximum level. Table 2 compares key design elements of the dike raise to existing conditions. As described previously, the dike raise is expected to extend the operating capacity of the brine ponds by 16 to 18 months or more, depending on actual pond inflows and outflows that will occur in the future.

4.2.1 Pond Design

The existing brine pond no. 2 is constructed as a composite-lined facility to hold discharge from the brine concentrator unit. The composite liner consists of 2 feet of compacted clay overlain by a 60-mil high-density polyethylene (HPDE) geomembrane liner. The geomembrane liner is not covered.

The dike raise will be constructed with the same composite liner system. Refer to Appendix A for a detailed design of the proposed typical dike raise cross section.

The pond is designed for the parameters listed in Table 2.

Table 2 Pond Design Parameters

Design Parameter	Existing Maximum Value	Proposed Maximum Value
Maximum Operating Elevation	1116.0 ft. MSL	1119.5 ft. MSL
Top of Dike (Crest) Elevation	1119.5 ft. MSL	1123.0 ft. MSL
Storage capacity at maximum operating elevation	116.6 acre-ft	150.4 acre-ft
Storage capacity at Crest elevation	150.4 acre-ft	186.9 acre-ft
Maximum Operating depth	16 feet	19.5 feet
Exterior embankment height	13 feet	16 feet
Interior embankment height	19.5 feet	23 feet
Water surface area at maximum operating elevation	9.2 acres	10.1 acres

The two existing monitoring wells located along the top of the southern perimeter dike will need to be abandoned, due to the geometry of the dike raise and resulting loss of accessibility. To compensate for this loss, two new monitoring wells are proposed, to be installed in close proximity to the existing wells. Well abandonment and new well installation will be performed by a South Dakota licensed well driller and will be in accordance with all applicable SDDENR rules. The dike raise design plans and specifications are provided in Appendix A and B respectively.

4.2.2 Embankment Design

The existing embankment is constructed of earthen materials compacted to 95% of standard Proctor density with 4H:1V interior and exterior slopes. An emergency spillway is not included in the design since the pond is designed to prevent discharge of brine to the environment. Because there is virtually no tributary stormwater runoff area other than the pond itself, the existing and proposed freeboard design of 3.5 feet above the maximum operating level includes capacity to store the probable maximum precipitation (PMP) of 33-inches plus a wave run-up of 9-inches. The stage-area and storage volume table is provided in Table 1.

The dike raise embankment is proposed to be constructed of similar earthen materials as the existing embankment, also compacted to 95% of standard Proctor density. The interior and exterior slopes are proposed to be 3H:1V. A slope stability analysis was performed for the new dike design and found to be adequate. Results of the slope stability analysis are included in Appendix D.

The dike raise will be constructed by removing unsuitable materials and materials to be salvaged and excavating to the embankment and liner subgrades. Materials will be placed and compacted to construct the embankment, liner and other pond components. A construction quality assurance/quality control plan will be developed to guide testing of embankment and liner materials.

4.2.3 Dam Hazard Potential Determination

The potential flood plain area downstream of the dam is undeveloped with minimal structures. There is no expected loss of life potential from the proposed dam; therefore, the dam is rated as a Category 3 Hazard Potential. The dam hazard potential rating is unchanged as compared to existing conditions.

4.2.4 Dam Size Classification

The dam is classified as a “Small” size dam because the maximum storage capacity is 186.9 acre-feet and the maximum embankment height is 16 feet. The size classification is unchanged as compared to existing conditions.

4.3 Ash Wetting

OTPCO plans to apply brine to the open cell of the ash fill disposal area, in accordance with the terms and conditions of their Solid Waste permit. The ash wetting will be done on a trial basis and will be continuously monitored. Ash wetting will only occur under conditions that are suitable for the proposed methods being used.

The trial ash wetting will include the use of six Landshark evaporator units spaced along the top edge of the ash fill disposal area and aimed toward the open cell area. Two pumps will be used to convey the brine to the evaporator units through two aboveground pipes. When conditions are favorable, the units will be turned on and operated until conditions become unfavorable. Unfavorable conditions may include, but are not limited to: unfavorable wind speed or direction; high relative humidity; low temperatures; impending/forecasted precipitation; unacceptable surface runoff of brine; etc. The operation will be under continuous observation by OTPCO personnel so that the terms and conditions of the solid waste permit are met.

The Landshark evaporator units are designed to evaporate a portion of the flow that is blown into the air by the fan/spray unit. The remainder of the flow that does not evaporate will land on the surface of the ash fill disposal area.

As described previously, the volume of ash wetting that can be achieved by these methods is not known, and difficult to predict. For the water balance model, estimates were made of potential ash wetting rates that may occur, based on several simplifying assumptions. It is not yet known if these estimates will match actual ash wetting rates that may occur. Therefore, the assumption that no ash wetting will occur is the most conservative assumption when estimating time to reach maximum capacity of the existing brine ponds.

The Interim Brine Management Plan presented in this report assumes that little to no ash wetting will occur in the interim time period. Any ash wetting that does occur will aid in extending the time to reach brine pond capacity beyond what has been assumed in this report.

4.4 New Pond Design

As discussed in Section 3.3, monitoring of remaining capacity of the modified existing ponds will begin after the brine pond no. 2 dike raise construction is complete. OTPCO intends to complete permit design for a new pond prior to the end of 2012. The new pond operating storage volume will be designed based on a time estimate between the earliest estimated new pond in-service date and the date air quality control equipment will come on-line. Applicable permits will be applied for and once received, the design will be “put on the shelf”. OTPCO will continue to monitor projected time to reach capacity on a monthly basis.

A new pond should be built during the construction season that precedes the date that the existing ponds are projected to be at permit capacity, unless OTPCO decides to dispose of brine using an alternative method, such as disposal at a POTW. When this decision point occurs, OTPCO will evaluate the situation and compare the estimated date to reach permit capacity to the estimated date when the new air quality control equipment will come on-line. Depending on the results of the evaluation, OTPCO will either make the decision to construct a new pond or provide for an alternate disposal method of brine. SDDENR will be notified of any planned construction or change in brine management methods.

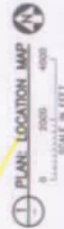
Appendix A

2012 Brine Pond Expansion Drawings

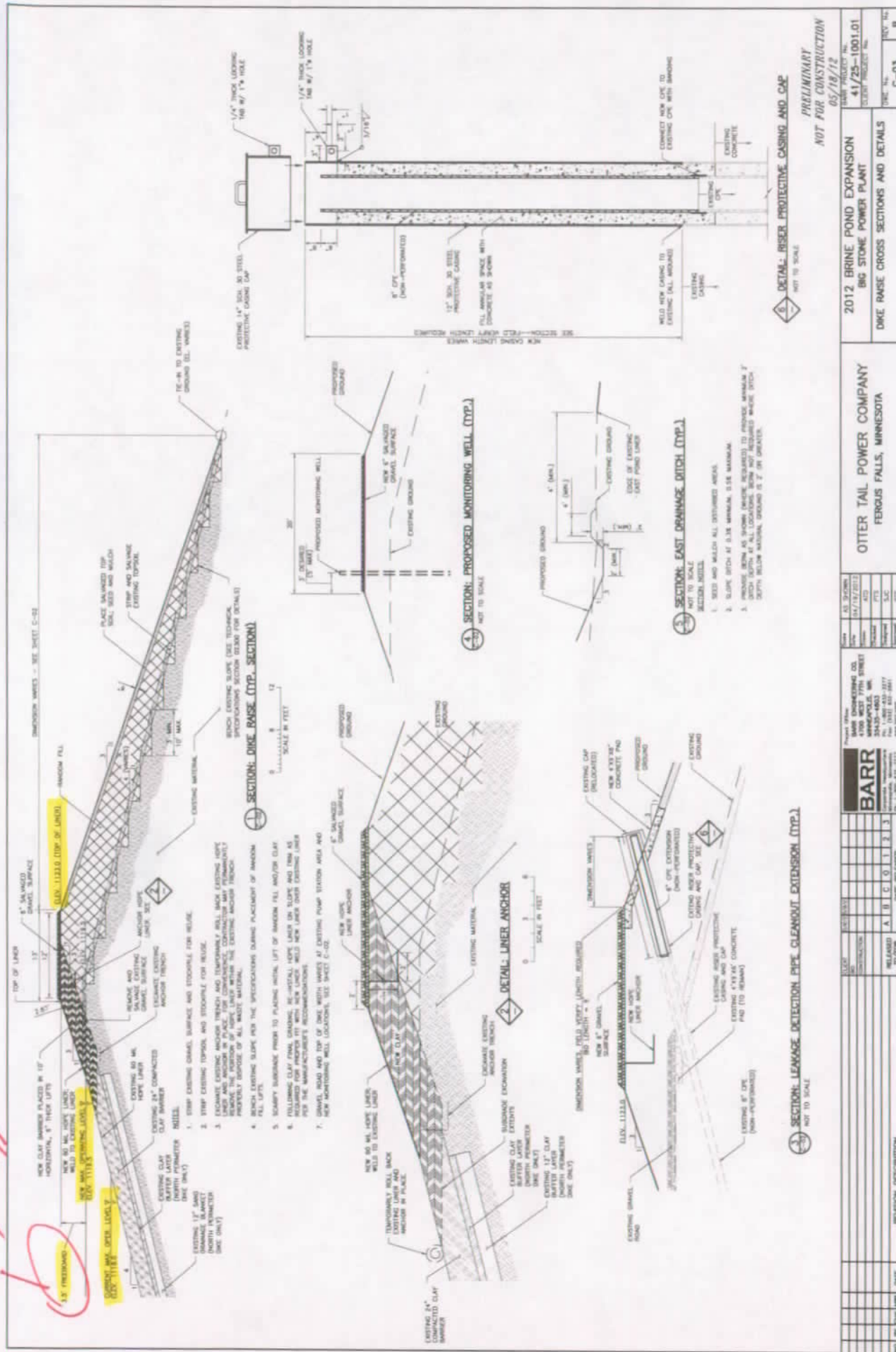


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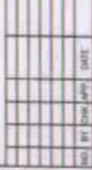
C-01.	Location, Vicinity Map and Sheet Index
C-01.	Site Plan Existing Conditions
C-02.	Grading Plan
C-03.	Dike Route Cross-Sections and Details
C-04.	Erosion Control and Borrow Area Site Plan and Details
C-05.	QA/QC Plan
C-06.	Existing Inlet Pipe Modifications
C-07.	New HDPE Liner Connection Details at Existing Transfer Pump Structure
C-07.	Existing Pump Station and Vase Vault Modifications
C-01.	

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3.7' from board
29" PMP + 18" 05/12/12

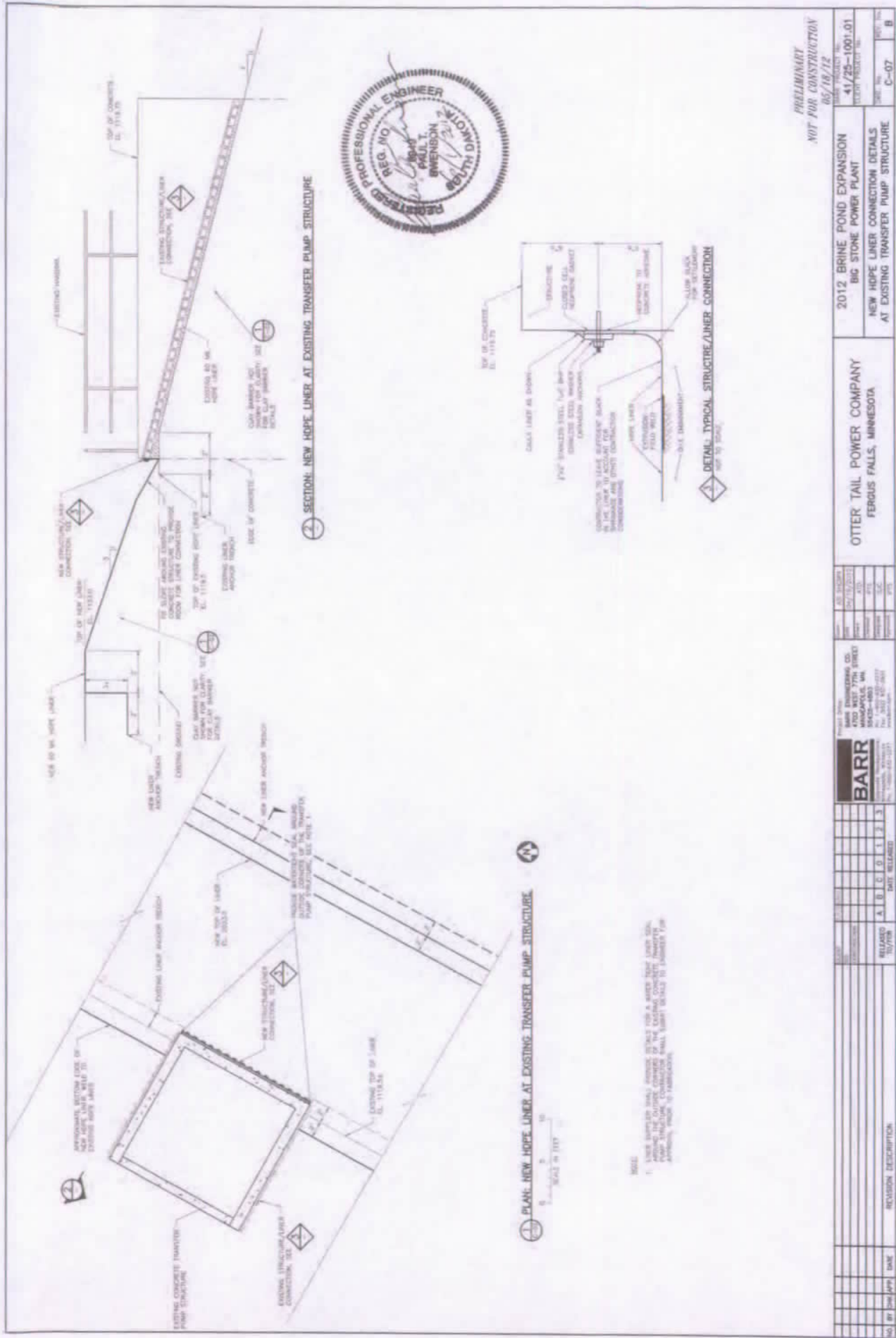


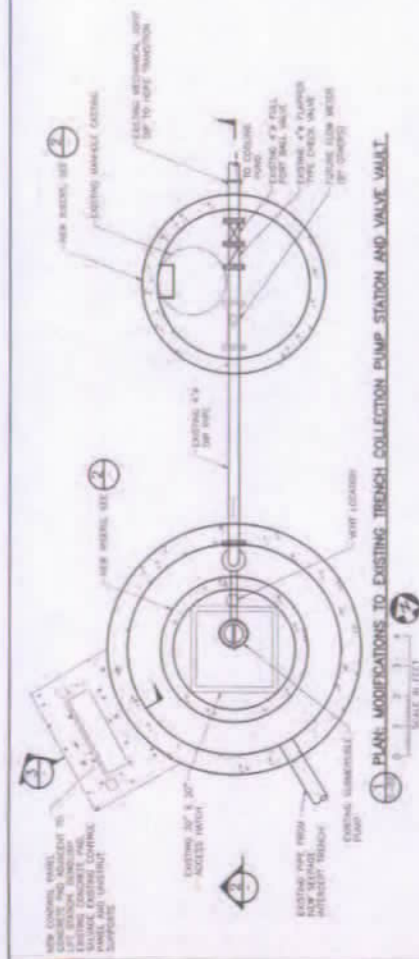
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OTTER TAIL POWER COMPANY FERGUS FALLS, MINNESOTA		SHEET NO. C-03	
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NEW CLAY BARREN AREA

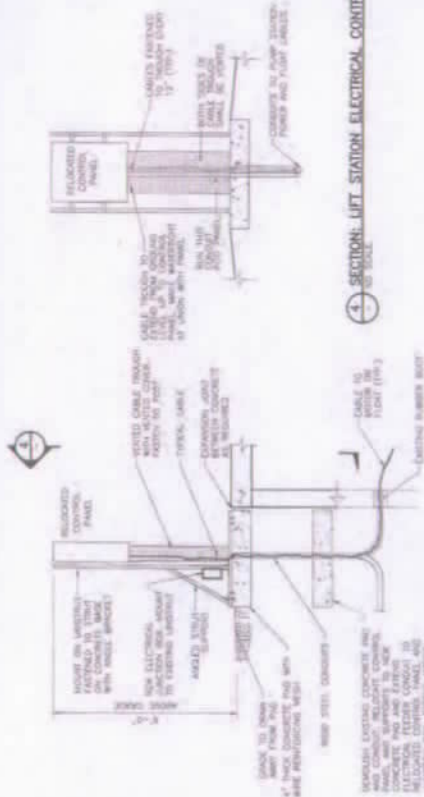
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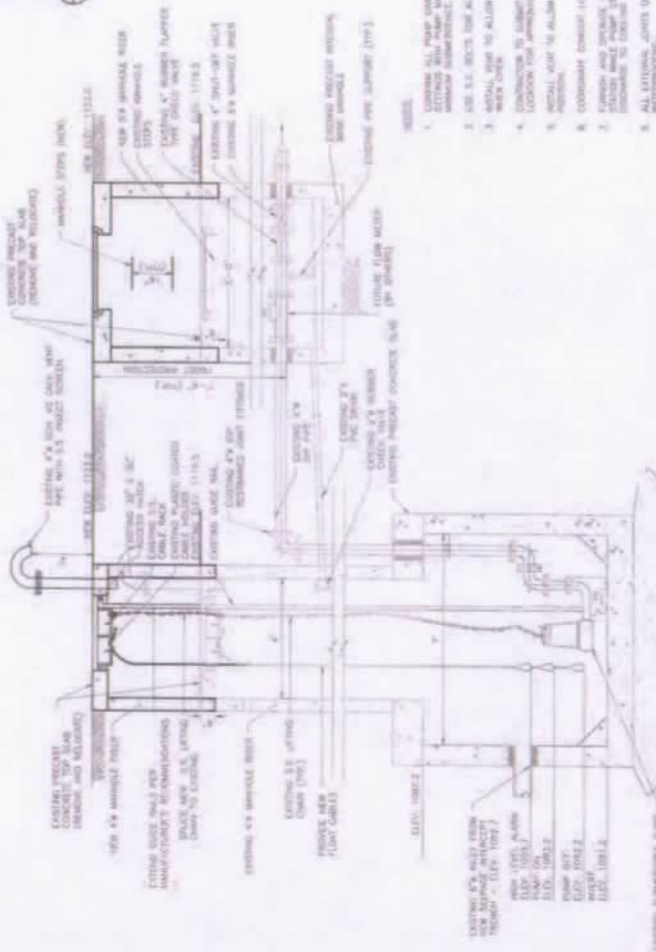


① PLAN: MODIFICATIONS TO EXISTING TRENCH COLLECTION PUMP STATION AND VALVE VAULT

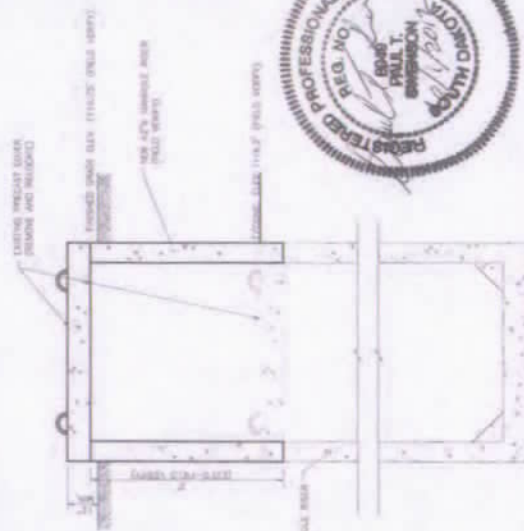
④ SECTION: LIFT STATION ELECTRICAL CONTROL PANEL



③ SECTION: LIFT STATION ELECTRICAL PANEL AND CABLE/RACEWAY INSTALLATION



② SECTION: MODIFICATIONS TO EXISTING TRENCH COLLECTION PUMP STATION SYSTEM



⑤ DETAIL: CONCRETE RISER EXTENSION

- NOTES:
1. EXISTING ALL PUMP UNITS AND ALL PUMP/TRANSFER STATIONS WILL REMAIN UNCHANGED IN THEIR EXISTING LOCATIONS.
 2. ALL S.E. RISES FOR ALL TANKS ARE TO BE IN PLACE.
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 4. EXISTING TO NEW PUMP/TRANSFER STATIONS ARE TO BE IN PLACE.
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PRELIMINARY
NOT FOR CONSTRUCTION
05/16/12

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MAY 02 2007

Barr Engineering Co

April 30, 2007

DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

Terry Graumann
Manager, Environmental Services
Otter Tail Power Company
PO Box 496
Fergus Falls, MN 56538-0496

Dear Mr. Graumann:

We have reviewed the Barr Engineering plans and specifications for the Otter Tail Power Company Big Stone Plant Brine Concentrator Pond Dam located in the SE ¼ of Sec. 12-T121N-47W, in Grant County. The plans and specifications for the construction of the Brine Concentrator Expansion Pond are approved.

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

The Otter Tail Power Company Big Stone Plant Brine Concentrator Pond Dam will be classified as a small size Category 3, Low Hazard dam with a dam height of 13 ft. with a maximum storage capacity of 158 acre-feet with the reservoir at the top of dam elevation of 1119.5 fmsl

Our review and approval pertains only to the Safety of Dams Rules. Please be aware that our Department's Waste Management Program is currently working on a solid waste permit amendment that relates to the Brine Concentrator Pond. It is my understanding that Otter Tail Power Company must also receive a solid waste permit amendment and plans and specifications approval from the Waste Management Program prior to constructing the pond.

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

Sincerely,

Timothy G. Schaal, P.E.
Natural Resources Engineering Specialist
for Garland Erbele, Chief Engineer
Water Rights Program
(605) 773-3352

COPY

c: Paul Swenson, Barr Engineering Co.
SD DENR, Waste Management Program

6678-3



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

July 19, 2007

Tom Hrdlicka
Big Stone Power Plant
PO Box 218
Big Stone City, SD 57216-0218

Dear Mr. Hrdlicka:

The Department of Environment and Natural Resources is in receipt of three copies of the plans and specifications for the 2007 Brine Pond Expansion at the Big Stone Power Plant. Also included with the contract documents are Addendums No. 1, 2, and 3 and Change Orders No. 1 and 2. We have reviewed and hereby approve the plans, specifications, Addendums No. 1, 2, and 3, and Change Order No. 1 for the above described project.

Please note that our office has not approved Change Order No. 2 because the change order does not include any of the necessary signatures to execute the change order. Please provide a fully executed copy of Change Order No. 2 to our office so that we may grant approval for it also.

Our review of the plans, specifications, addendums, and change orders was primarily to determine compliance with the minimum design requirements for the proposed solid waste holding pond. Our review did not cover such items as quality of material or products, structural soundness, and electrical or mechanical design features. Approval of the plans, specifications, addendums, and change order does not in any way release the owner from the responsibility that the solid waste facility is constructed and maintained properly.

Sincerely,

Jim Wendte, P.E.
Waste Management Program
(605) 773-3153

Enclosure

cc: Michael Hoefs, Barr Engineering Company, 4700 West 77th St., Minneapolis, MN 55435
Darlene Eckert, Otter Tail Power Company, PO Box 496, Fergus Falls, MN 56538
Tim Schaal, SD DENR, Water Rights Program



6253-3
DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
denr.sd.gov

June 26, 2012

T.J. Newkirk
Senior Compliance Specialist
Otter Tail Power Company
P.O. Box 496
Fergus Falls, MN 56538-0496

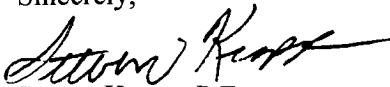
Dear Mr. Newkirk:

On June 6, 2012, our office received the *Big Stone Plant Interim Brine Management Plan (Plan)* from Otter Tail Power Company. The Plan details a short-term, temporary solution for handling supernatant generated at the Big Stone power plant. The Plan seeks to raise the dike around the larger brine concentrator pond by three and one-half feet and recommends construction of an additional brine concentrator pond. The Plan contains technical specifications for the project including the compacted clay liner, HDPE liner, piping, fencing and turf establishment. The Plan also identifies that monitoring well BC-5 and BC-6 will need to be abandoned and replaced.

Our office has reviewed the Plan, specifications and drawings for the dike raising project and our office approves the plans and specifications to raise the dike around the large brine concentrator contingent on two conditions. First, you will need to submit a construction quality assurance (CQA) plan for the construction of the compacted clay liner. The CQA plan should state which ASTM test(s) will be used to perform the moisture and density testing. The CQA plan should state how many passing moisture and density tests will be performed per lift per acre of clay liner constructed. Typically our office sees four passing moisture and density tests per lift per acre for compacted clay liner construction. Second, you will need to ensure that monitoring wells BC-5 and BC-6 are properly abandoned in accordance with South Dakota Well Construction Standards found in ARSD 74:02:04. Both of these wells will need to be replaced since they are a part of the approved ground water monitoring system. Please coordinate with our office regarding the location of the two replacement wells.

According to permit condition 2.06, you will need to notify this office in writing of any revisions to the approved plans and specifications for this project. If you have any questions, please contact our office at (605) 773-3153.

Sincerely,


Steven Kropp, P.E.
Waste Management Program

cc: Keith Kelly, Fuel Supervisor, Big Stone Power Plant, Big Stone City, SD
Jeff Endrizzi, Plant Manager, Big Stone Power Plant, Big Stone City, SD
Scott Creten, Barr Engineering Co.
Tim Schaal, SD DENR – Water Rights Program



6253-3
DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

PMB 2020
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denr.sd.gov

September 6, 2012

T.J. Newkirk
Senior Compliance Specialist
Otter Tail Power Company
P.O. Box 496
Fergus Falls, MN 56538-0496

Dear Mr. Newkirk:

On June 6, 2012, our office received the *Big Stone Plant Interim Brine Management Plan (Plan)* from Otter Tail Power Company. The Plan detailed a short-term, temporary solution for handling supernatant generated at the Big Stone power plant. The Plan sought to raise the dike around the larger brine concentrator pond by three and one-half feet and identified that monitoring well BC-5 and BC-6 will need to be abandoned and replaced. The Plan contained technical specifications for the project.

Our office reviewed the Plan, specifications and drawings for the dike raising project. On June 26 our office approved the plans and specifications to raise the dike around the large brine concentrator. The approval was contingent upon Otter Tail Power Company submitting a construction quality assurance (CQA) plan for the construction of the compacted clay liner for the dike raising project and ensuring that monitoring wells BC-5 and BC-6 are properly abandoned in accordance with South Dakota Well Construction Standards and replacement wells would be installed.

On September 4, our office received from you the CQA plan for the brine pond construction project as well as the technical memorandum for the abandonment of monitoring wells BC-5 and BC-6 and the installation of replacement wells BC-5R and BC-6R. This office has reviewed the CQA plan and the technical memorandum and has determined that the documents meet the requirements outlined in our office's June 26 letter.

As a reminder, permit condition 2.06 states that you will need to notify this office in writing of any revisions to the approved plans and specifications for this project. If you have any questions, please contact our office at (605) 773-3153.

Sincerely,

Steven Kropp, P.E.
Waste Management Program

cc: Tim Schaal, SD DENR – Water Rights Program



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

February 26, 2013

denr.sd.gov

Mark Thoma
Manager--Environmental Services
Otter Tail Power Company
215 South Cascade Street
PO Box 496
Fergus Falls, MN 56538-0496

Dear Mr. Thoma:

We have reviewed the Barr Engineering plans and specifications for the Otter Tail Power Company Big Stone Power Plant Brine Pond No. 3 located in the SE ¼ of Section 12-T121N-47W, in Grant County. The plans and specifications for the Brine Pond No. 3 are approved.

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

The Otter Tail Power Company Big Stone Power Plant Brine Pond No. 3 will be classified as a small size Category 3, Low Hazard dam with a dam height of 23 ft. with a maximum storage capacity of 86.1 acre-feet with the pond at the top of dam elevation of 1123.0 fmsl. The storage capacities at the Target Maximum Operating level (1119.5) and Upper Limit Operating level (1120.5), as described on General Note "A" on drawing C-06, will be 66.82 acre-feet and 72.16 acre-feet.

Our review and approval pertains only to the Safety of Dams Rules. Our Waste Management Program must also approve the plans and specifications and a waste permit amendment.

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

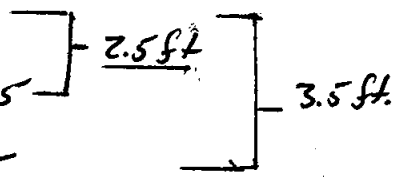
Sincerely,

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

c: Scott Creten, Barr Engineering Co.
SD DENR Waste Management Program

Otter Tail Power Company
 Big Stone Power Plant
 Brine Pond No. 3

Top of Dam Elevation - 1123
 Upper Limit Max. Operating Level - 1120.5
 Target Max. Operating Level - 1119.5
 D/S Emb Toe Elev. - 1100



The diagram shows a vertical bracket on the right side. The top of the bracket is aligned with the 'Upper Limit Max. Operating Level - 1120.5' line. The bottom of the bracket is aligned with the 'Target Max. Operating Level - 1119.5' line. A horizontal line segment labeled '2.5 ft' connects the top of the bracket to the 'Upper Limit Max. Operating Level' text. Another horizontal line segment labeled '3.5 ft' connects the bottom of the bracket to the 'Target Max. Operating Level' text.

Section 74:02:08:07.04 - Design Requirements for dams
 Constructed Without Spillways

30" PMP Required = 2 1/2 ft ∴ OK

* See General Note "A" on Drawing C-06

2 1/2 feet Between Top of Dam & Upper Limit Max Operating Level
 &

3 1/2 feet Between Top of Dam & Target Maximum Level

Schaal, Tim

From: Scott J. Creten <SCreten@barr.com>
Sent: Friday, February 15, 2013 1:08 PM
To: Schaal, Tim
Cc: kolson@otpc.com; tnewkirk@otpc.com; mthoma@otpc.com; Paul T. Swenson; Mike R. Hoefs
Subject: Big Stone Plant-Brine Pond #3 project-dam safety review submittal
Attachments: Big Stone Brine Pond No 3 Drawings.pdf; Relevant Technical Specifications.pdf; CQAQC Plan_v0.2.pdf

Hello Tim,

On behalf of Otter Tail Power Company, please find attached preliminary drawings, relevant technical specifications, and CQA plan for the above referenced project for your review and approval. The documents are being submitted in accordance with the requirements found in ARSD 74:02:08.

Please let me know if you require any additional information to help with your review.

Please address your final response to:

Mark Thoma
Manager – Environmental Services
Otter Tail Power Company
215 South Cascade Street
PO Box 496
Fergus Falls, MN 56538-0496

Please provide a copy to me as well.

Thank you,

Scott J. Creten, PE

Senior Civil Engineer
Barr Engineering Co.
4700 West 77th Street
Minneapolis, MN 55435

office: 952.842.3605
toll-free: 800.632.2277
cell: 906.399.4145

SCreten@barr.com
www.barr.com

resourceful. naturally.



OTTER TAIL POWER COMPANY, NORTHWESTERN ENERGY, MONTANA-DAKOTA UTILITIES

BIG STONE BRINE POND NO. 3

BIG STONE PLANT

BIG STONE CITY, SOUTH DAKOTA

RECEIVED
FEB 15 2013
WATER RIGHTS
PROGRAM



1 PLAN: LOCATION MAP
0 1000 2000
SCALE IN FEET



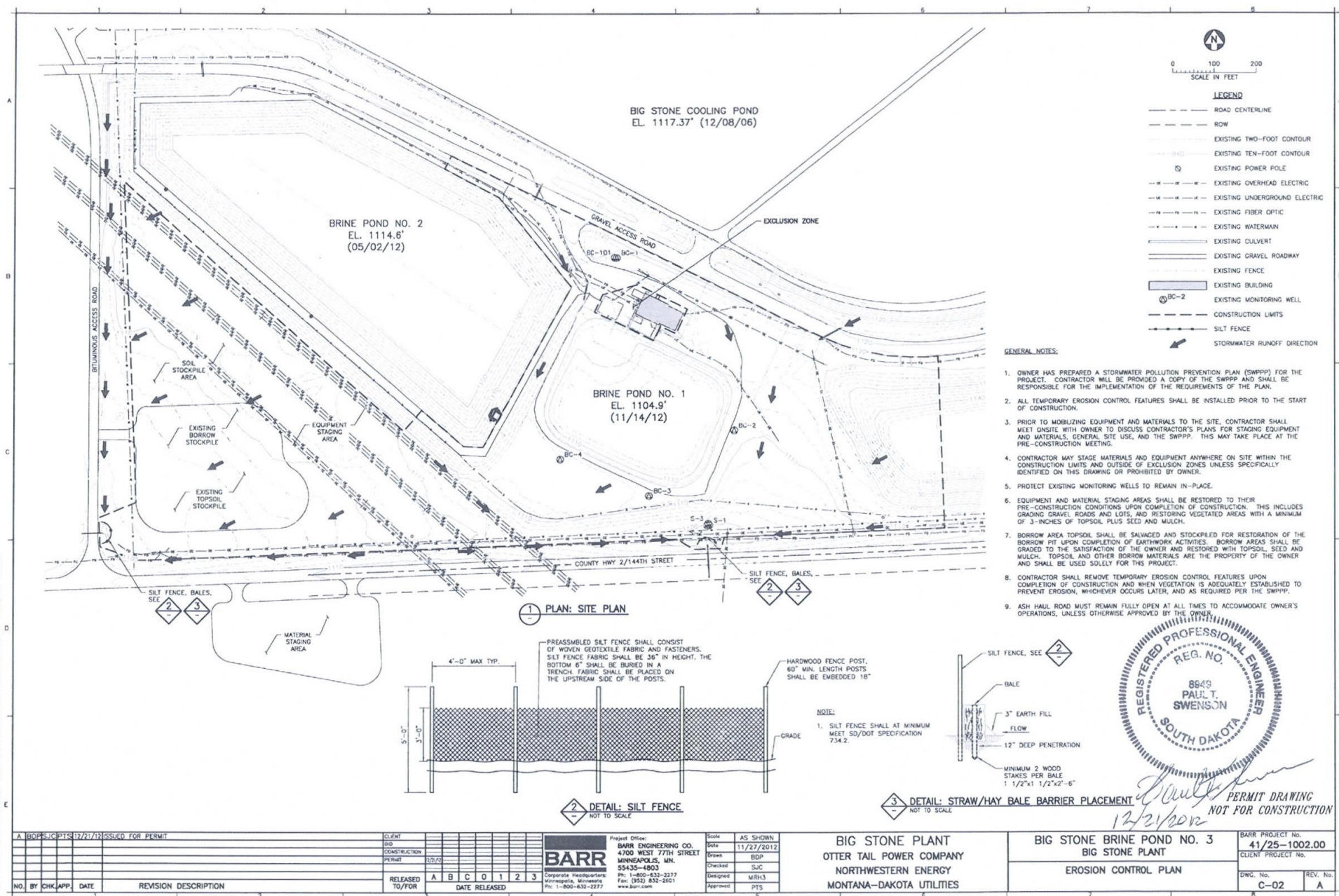
SHEET INDEX

SHEET NO.	TITLE
G-01	LOCATION, VICINITY MAP AND SHEET INDEX
C-01	SITE PLAN EXISTING CONDITIONS
C-02	EROSION CONTROL PLAN
C-03	DECOMMISSIONING AND DEMOLITION
C-04	PROPOSED SITE PLAN
C-06	TYPICAL SECTIONS AND DETAILS
C-07	MISCELLANEOUS SECTIONS AND DETAILS
C-08	QA/QC PLAN



PERMIT DRAWING
NOT FOR CONSTRUCTION

A. BOP-3-01-PTS 02/17/2012 ISSUED FOR PERMIT				CLIENT				Project Office:				Scale				BIG STONE PLANT				BIG STONE BRINE POND NO. 3				BARR PROJECT No.			
B. BOP-3-01-PTS 01/22/2012 ISSUED FOR CLIENT REVIEW				CONSTRUCTION				BARR ENGINEERING CO.				Date				OTTER TAIL POWER COMPANY				BIG STONE PLANT				41/25-1002.00			
C. BOP-3-01-PTS 02/15/2012 ISSUED FOR PERMIT REVIEW				PERMIT				4700 WEST 77TH STREET				Drawn				NORTHWESTERN ENERGY				LOCATION, VICINITY MAP				CLIENT PROJECT No.			
								MINNEAPOLIS, MN				Checked				MONTANA-DAKOTA UTILITIES				AND SHEET INDEX							
								50435-4803				Designed												DWG. No.			
								Ph: 1-800-632-2277				Approved												G-01			
								Fax: (612) 832-2501																REV. No.			
								www.barr.com																C			



ASH LANDFILL 1/4 MILE



12/21/2012

- | | <u>LEGEND</u> |
|---|-------------------------------|
| ---- | COUNTY ROAD CENTERLINE |
| ---- | ROW |
| ===== | EXISTING TWO-FOOT CONTOUR |
| ===== | EXISTING TEN-FOOT CONTOUR |
| ⊙ | EXISTING POWER POLE |
| — — — — — | EXISTING OVERHEAD ELECTRIC |
| — — — — — | EXISTING UNDERGROUND ELECTRIC |
| — — — — — | EXISTING FIBER OPTIC |
| — — — — — | EXISTING WATERMAIN |
| ===== | EXISTING CULVERT |
| ===== | EXISTING GRAVEL ROADWAY |
| — — — — — | EXISTING FENCE |
| ⊙ BC-2 | EXISTING MONITORING WELL |
| | EXISTING BUILDING |

- # GENERAL NOTES
1. OWNER WILL RELOCATE EXISTING BRINE DISCHARGE PIPE SYSTEM PRIOR TO START OF BRINE POND NO. 1 DEMOLITION.
 2. EXISTING DRAINAGE PIPES FROM BRINE CONCENTRATOR BUILDING TO BRINE POND NO. 1 WILL BE SHUT DOWN BY OWNER PRIOR TO POND NO. 1 DEMOLITION. OWNER SHALL REMOVE EXISTING DRAIN PIPES TO EDGE OF EXISTING CONCRETE SLAB. INSTALL STAFF PIPES ON END PIPES. DEWD MATERIALS SHALL BE DISPOSED OF AT ASH LANDFILL.
 3. OWNER WILL SHUT DOWN AND REMOVE EXISTING POND DRAIN DOWN POWER SUPPLY SYSTEM PRIOR TO POND NO. 1 DEMOLITION.
 4. OWNER WILL DISCONNECT POWER FROM EXISTING UNDERGROUND COLLECTION PUMP STATION PRIOR TO START OF BRINE POND NO. 1 DEMOLITION. UPON COMPLETION OF BRINE POND NO. 1, CONTRACTOR SHALL REMOVE GROUND UNDERDRAIN COLLECTION PUMP STATION, PIPES, AND ELECTRIC SERVICE LINES.
 5. OWNER WILL REMOVE EXISTING VENTURINE DISCHARGE PIPES FROM BRINE POND NO. 1 PRIOR TO POND NO. 1 DEMOLITION.
 6. OWNER WILL REMOVE AND RELOCATE EXISTING OVERHEAD ELECTRIC PRIOR TO START OF POND NO. 3 CONSTRUCTION.
 7. REMOVE EXISTING CHAIN LINK FENCE AND POSTS. MATERIALS SHALL BECOME CONTRACTOR'S PROPERTY AND REMOVED FROM SITE.
 8. UTILITY LOCATIONS ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO START OF CONSTRUCTION.

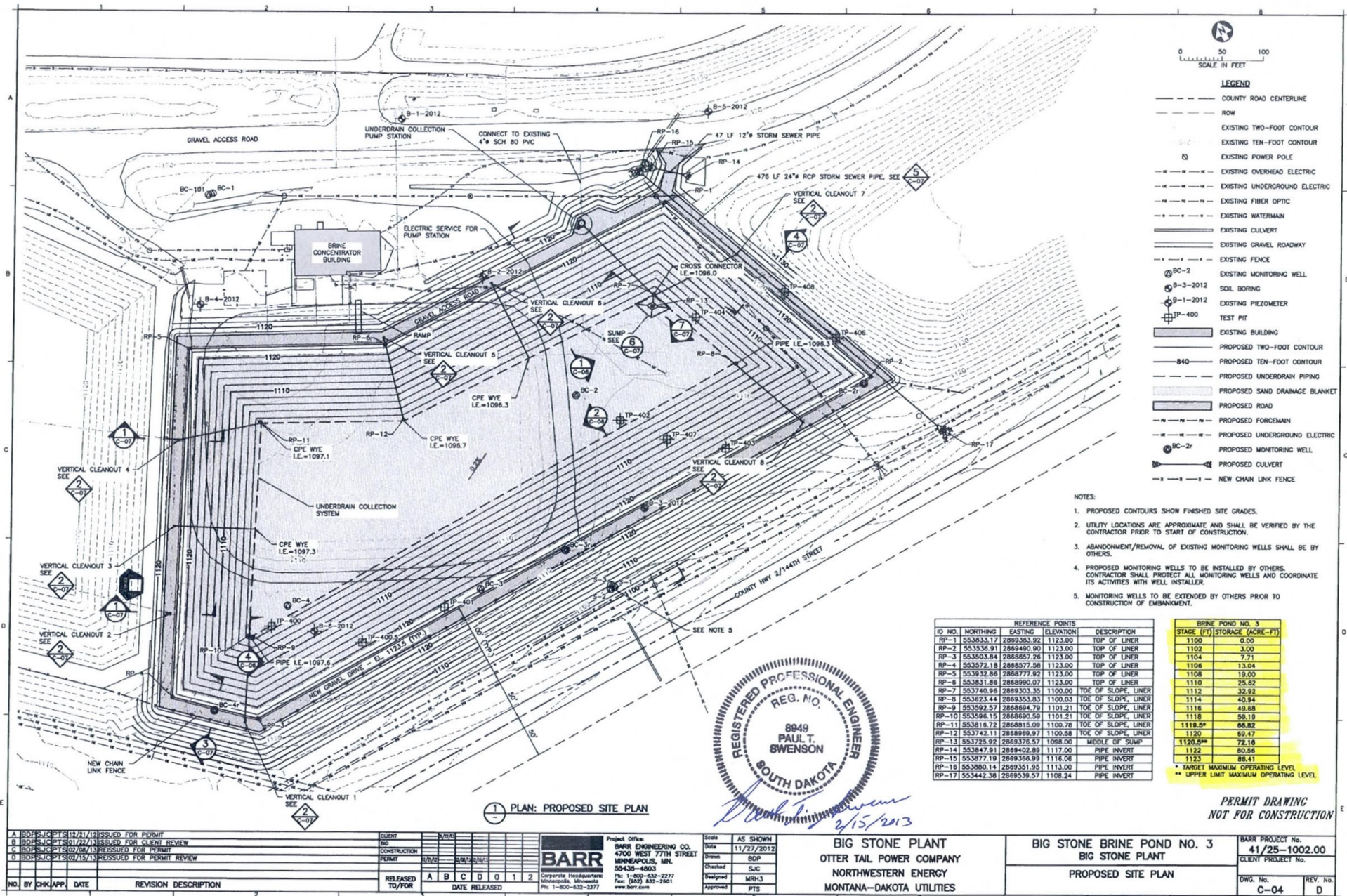
POND NO. 1 REMOVAL NOTES (BY CONTRACTOR)

- A. PUMP BRINE WATER FROM BRINE POND NO. 1 INTO BRINE POND NO. 2 PRIOR TO SLUDGE REMOVAL.
- B. REMOVE SLUDGE FROM BRINE POND NO. 1. HAUL SLUDGE TO ASH LANDFILL FOR DISPOSAL USING LEAK-PROOF CONTAINERS/EQUIPMENT. ANY SPILLED SLUDGE, WATER, AND IMPACTED SOILS SHALL BE CLEANED UP AND DISPOSED OF AT ASH LANDFILL. APPROX. 7,200 CY. OF SLUDGE TO BE REMOVED.
- C. REMOVE EXISTING GEOMEMBRANE LINER MATERIAL AND HAUL TO ASH LANDFILL FOR DISPOSAL.
- D. REMOVE UNSUITABLE SOILS FROM UNDER POND NO. 1 GEOMEMBRANE AND HAUL TO ASH LANDFILL.
- E. REMOVE EXISTING UNDERDRAIN COLLECTION SYSTEM MATERIALS AND DISPOSE OF AT ASH LANDFILL.

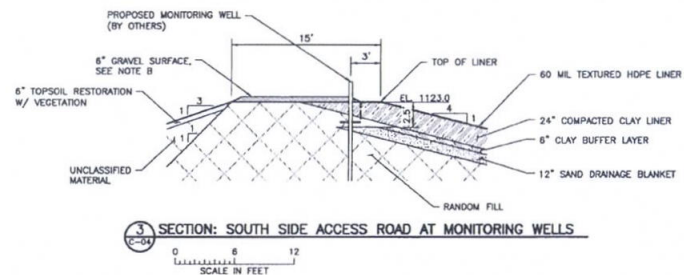
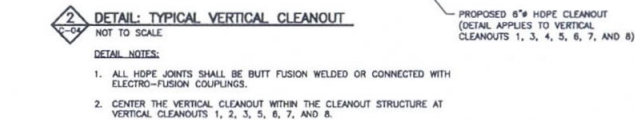
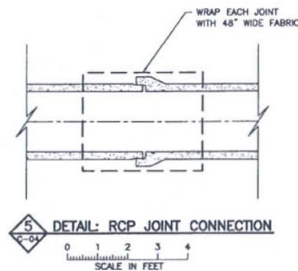
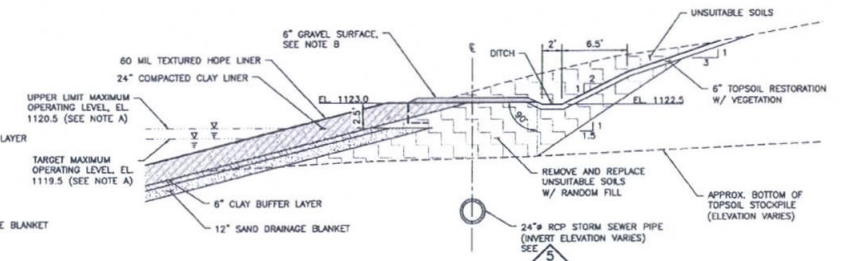
PERMIT DRAWING
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A BODIS CEPTS 07/21/12 ISSUED FOR PERMIT					CLIENT BID CONSTRUCTION PERMIT					BARR Corporate Headquarters Minneapolis, Minnesota Ph: 1-800-832-2277 Fax: (952) 832-2601 www.barr.com					Project Office: BARR ENGINEERING CO. 4700 WEST 77TH STREET MINNEAPOLIS, MN. 55435-6803 Ph: 1-800-832-2277 Fax: (952) 832-2601 www.barr.com					Scale AS SHOWN Date 11/27/2012 Draw BOP Checked SJC Designed MRLH Approved PTS					BIG STONE PLANT OTTER TAIL POWER COMPANY NORTHWESTERN ENERGY MONTANA-DAKOTA UTILITIES					BIG STONE BRINE POND NO. 3 BIG STONE PLANT DECOMMISSIONING AND DEMOLITION					BARR PROJECT No. 41/25-1002.00 CLIENT PROJECT No.				
					RELEASED TO/FOR					A B C O I 2 3 DATE RELEASED															DWG. No. C-03 REV. No. A														
NO. BY CHK APP DATE					REVISION DESCRIPTION																																		

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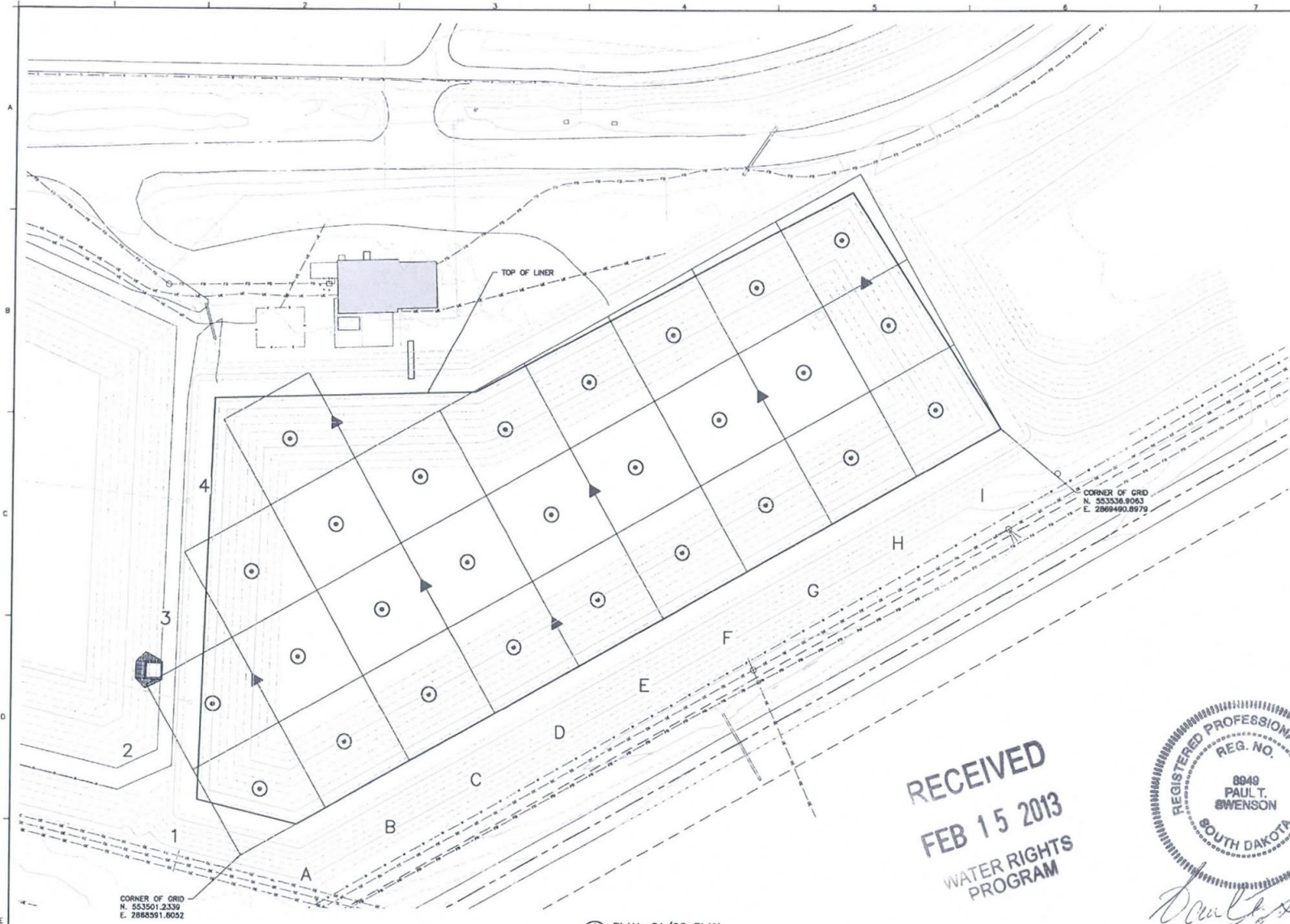
A. THE OPERATING LEVEL OF THE POND WILL NORMALLY BE MAINTAINED AT THE TARGET MAXIMUM OPERATING LEVEL. IF OPERATIONAL OR WEATHER CONDITIONS REQUIRE THE POND LEVEL TO BE MAINTAINED ABOVE THE TARGET MAXIMUM OPERATING LEVEL, THE OPERATING LEVEL OF THE POND WILL BE MAINTAINED NO HIGHER THAN THE UPPER LIMIT MAXIMUM OPERATING LEVEL. IF THE POND OPERATING LEVEL BETWEEN THE TARGET MAXIMUM OPERATING LEVEL AND THE UPPER LIMIT MAXIMUM, THE OPERATING LEVEL OF THE POND WILL BE RETURNED TO THE TARGET MAXIMUM OPERATING LEVEL AS SOON AS POSSIBLE.

B. SLOPE GRAVEL ACCESS ROAD TO DRAIN AWAY FROM POND.



A BDRS-CDPTS/01/27/12 ISSUED FOR PERMIT B BDRS-CDPTS/01/27/12 ISSUED FOR CLIENT REVIEW C BDRS-CDPTS/02/08/13 REISSUED FOR PERMIT D BDRS-CDPTS/02/08/13 REISSUED FOR PERMIT REVIEW		CLIENT BDO CONSTRUCTION PERMIT	2/2/12 2/8/12 2/8/12/2/2/13	 Project Office: BARR ENGINEERING CO. 4700 WEST 77TH STREET MINNEAPOLIS, MN 55435-4803 Ph: 1-800-632-2277 Fax: (212) 632-2201 www.barr.com	Scale AS SHOWN Date 11/27/2012 Drawn BDC Checked SJC Designed MHH/3 Approved PTS	BIG STONE PLANT OTTER TAIL POWER COMPANY NORTHWESTERN ENERGY MONTANA-DAKOTA UTILITIES	BIG STONE BRINE POND NO. 3 BIG STONE PLANT MISCELLANEOUS SECTIONS AND DETAILS	BARR PROJECT No. 41/25-1002.00 CLIENT PROJECT No.	DWG. No. C-07	REV. No. D
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- 0 50 100
SCALE IN FEET
- LEGEND**
- ROAD CENTERLINE
 - ROW
 - FINAL TWO-FOOT CONTOUR
 - FINAL TEN-FOOT CONTOUR
 - ⊙ EXISTING POWER POLE
 - EXISTING OVERHEAD ELECTRIC
 - EXISTING UNDERGROUND ELECTRIC
 - EXISTING FIBER OPTIC
 - EXISTING WATERMAIN
 - EXISTING CULVERT
 - EXISTING GRAVEL ROADWAY
 - EXISTING FENCE
 - EXISTING BUILDING
 - TOP OF LINER

- CLAY LINER TEST LOCATIONS**
- IN-PLACE MOISTURE DENSITY TESTS
- ⊙ LIFTS 1, 2, 3, AND 4
- UNDISTURBED PERMEABILITY TEST SAMPLE LOCATIONS
- ▲ SAMPLE LOCATIONS

- NOTES:**
1. IN-PLACE DENSITY AND MOISTURE CONTENT TESTS ARE TO BE CONDUCTED WITHIN THE GRID BOUNDARIES. ACTUAL TEST LOCATIONS WITHIN THE GRID BOUNDARY TO BE DETERMINED IN FIELD BY OWNER OR SOIL TESTING TECHNICIAN.
 2. COLLECT UNDISTURBED PERMEABILITY TEST SAMPLES AFTER COMPLETION OF FOURTH LIFT. SAMPLE SHALL INCLUDE THE FULL 2-FOOT LINER THICKNESS. A MINIMUM OF FOUR UNDISTURBED PERMEABILITY TEST SAMPLES SHALL BE COLLECTED FROM THE POND SLOPES. A MINIMUM OF THREE UNDISTURBED PERMEABILITY TEST SAMPLES SHALL BE COLLECTED FROM THE POND BOTTOM.
 3. THE THICKNESS OF THE CLAY LINER WILL BE MEASURED BY SURVEYING THE TOP OF THE SUBGRADE AND THE TOP OF THE COMPACTED CLAY.
 4. MATERIAL TESTING AND CLAY LINER VERIFICATION SURVEY WILL BE CONDUCTED BY OWNER.

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Paul T. Swenson
 12/21/2012

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A BUDGET/CDPTS/12/21/12/SSJGD FOR PERMIT				CLIENT				Project Office:				Scale				BIG STONE PLANT				BIG STONE BRINE POND NO. 3				BARR PROJECT No.			
				CONSTRUCTION				BARR ENGINEERING CO.				Date				OTTER TAIL POWER COMPANY				BIG STONE PLANT				41/25-1002.00			
				PERMIT				4700 WEST 77TH STREET				Drawn				NORTHWESTERN ENERGY				QA/QC PLAN				CLIENT PROJECT No.			
								MINNEAPOLIS, MN.				Checked				MONTANA-DAKOTA UTILITIES								DWG. No.			
								55435-4803				Designed												C-08			
								Ph: 1-800-832-2277				Approved												REV. No.			
								Fax: (952) 832-2601																A			
								www.barr.com																			



SECTION 02300

EARTHWORK

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PROGRAM

PART 1: GENERAL

1.01 DESCRIPTION OF WORK

- A. All Work included in this Section shall be performed in accordance with the following paragraphs as well as the general requirements set forth in Division 1 of these Specifications and the other Contract Documents.
- B. Work covered under this Section includes providing all materials, equipment, and labor to perform earthwork activities including, but not limited to:
 - 1. Excavation, hauling, and disposal of unsuitable materials below the geomembrane of existing Pond No 1 as deemed necessary by Owners.
 - 2. Excavating, hauling, placing, and compacting of random fill materials excavated from within the Pond No. 3 excavation area, obtained from the Random Fill and Clay Liner borrow area, obtained from the random Fill Stockpile, or materials obtained from off-site sources.
 - 3. Excavating, hauling, placing, and compacting of clay liner materials obtained from the Random Fill and Clay Liner borrow area, or obtained from off-site sources.
 - 4. Excavating, hauling, placing, and compacting of unclassified excavation materials obtained from the existing topsoil stockpile on the east side of Pond No. 3.
 - 5. Excavation and backfill for storm sewer pipes.
 - 6. Excavation and backfill for the underdrain collection system and pump station.
 - 7. Preparation of Pond No. 3 subgrade.
 - 8. Placement of the sand drainage blanket.
 - 9. Placement of the clay liner and buffer layer.
 - 10. Constructing temporary and permanent surface water controls including berms and ditches.
 - 11. Placement of gravel surfacing on new pond roads and around brine concentrator building.
 - 12. Miscellaneous site grading.

1.02 BASIS FOR COMPENSATION

- A. Compensation for all Work covered under this Section of these Specifications will be as set forth in Section 1025, Measurement and Payment.

1.03 REFERENCES

- A. South Dakota Department of Transportation Operations Support Standard Specifications for Construction, 2004 Edition, hereafter referred to as SDDOT Standard Specifications.
- B. Construction Quality Assurance and Quality Control Plan for Brine Pond No. 3 Construction prepared for Otter Tail Power Company by Barr Engineering Co. (December 2012)
- C. American Society for Testing and Materials, Current Edition, hereafter referred to as ASTM.

1.04 SUBMITTALS

- A. Submit for information a list of sources of materials specified to be supplied by the Contractor in this Section.
- A. Submit for documentation test results for samples as described in Section 01400 of each material to be delivered to Site. Testing shall be conducted according to appropriate ASTM or SDDOT standards to confirm required material properties or classifications specified in Subpart 2.01 of this Section. Documentation shall be submitted within two weeks after award of bid, but not later than five (5) working days prior to the time planned for incorporation of the materials into the Work.
- B. Refer to Section 01400 for submittal procedures of Contractor provided clay liner materials.

1.05 OWNER-FURNISHED PRODUCTS

- A. Contractor may obtain materials from designated on-site source(s) for clay liner material. All operations necessary to excavate, sort, transport, stockpile and place the material will be the responsibility of the Contractor. **The designated on-site source for clay liner materials is shown in Figure 1.**
- B. Contractor may obtain random fill material from designated on-site source(s). All operations necessary to excavate, sort, transport, stockpile and place the material will be the responsibility of the Contractor. **The designated on-site sources for random fill materials are shown in Figure 1.** Random fill materials may also be obtained from the pond excavation provided the requirements of Subpart 2.01 B are met and materials are not designated as Unclassified or Unsuitable.
- C. Contractor may obtain topsoil from materials stripped from the Site and from designated on-site source(s). All operations necessary to excavate, sort, transport, stockpile and place the material will be the responsibility of the Contractor.
- D. Contractor may obtain a portion of the required quantity of gravel surfacing material from materials stripped from the Site. All operations necessary to excavate, sort, transport, stockpile and place the material will be the responsibility of the Contractor. Any material needed to perform the Work that is in excess of available materials procured from the Site shall be obtained by the Contractor.
- E. Contractor shall furnish all other materials specified in this Section. Contractor shall be responsible for setting up, maintaining, and closing stockpiles and borrow areas, loading and transporting materials, and controlling dust and erosion at stockpiles, borrow areas, and haul roads.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Upon delivery of imported materials to the Site, Contractor shall provide access for sampling or observation of loads by Owners prior to unloading.
- B. Store materials where designated on Drawings or as approved by Owners. Prevent segregation of graded materials and mixing of dissimilar materials during unloading, stockpiling, or removal from stockpile.



-  Proposed Borrow Areas
-  Area Off Limits
-  Haul Road (Existing)
-  Haul Road (To be Constructed)
-  Culvert Required



Figure 1

BORROW AREAS & HAUL ROADS
Big Stone Plant
Big Stone City, SD
Otter Tail Power

1.07 SEQUENCING AND SCHEDULING

- A. Owners will be collecting and evaluating grade, slope, and material thickness data, collecting material samples, and conducting field testing of materials throughout the duration of the Project. Do not proceed with subsequent operations until Owners have been notified and has been given opportunity to verify that Work meets the requirements of these Specifications.

1.08 JOB CONDITIONS

- A. It shall be Contractor's sole responsibility to review available tests and reports, conduct additional tests, and otherwise determine to its own satisfaction the location and nature of all surface and subsurface features and the soil and water conditions that may be encountered. Owners' information regarding on-site conditions may be reviewed at Owners' offices as scheduled with Owners.
- B. Contractor shall be solely responsible for determining the means and methods for meeting the compaction requirements unless otherwise specified herein, except that compaction by flooding, puddling, or other means that involve saturation or over-wetting the soil will not be permitted.
- C. Provide shoring, bracing, sheet piling, trench boxes, tie backs, and other measures required to perform all Work in accordance with Laws and Regulations. Specifically, all excavations shall conform to the requirements of OSHA set forth in 29 CFR 1926, Subpart P (Occupational Safety and Health Standards-Excavations).

PART 2: PRODUCTS

2.01 MATERIALS

- A. Random Fill (ON-SITE or IMPORTED):
 - 1. Random Fill is a mineral soil consisting of sound durable particles, excluding brine sludge/solids, crushed carbonate quarry rock, crushed concrete, and salvaged bituminous mixture, and free of all organic material, rubbish, demolition debris, and other foreign materials. Maximum particle size is 12 inches in the largest dimension.
 - 2. Random Fill material shall be from soils excavated from the designated on-site source(s), including from within the pond excavation, or imported by the Contractor, at the Contractor's preference.
 - 3. Random Fill materials may need to be dried prior to and/or during placement in order to achieve the required compaction of at least 95 percent standard Proctor maximum dry density.
- B. Unsuitable Materials: Materials containing brine sludge/solids, crushed carbonate quarry rock, boulders larger than 12" diameter, rubbish, demolition debris, and other foreign materials unsuitable for constructing the new pond embankments. Wet soils immediately below the existing Pond 1 geomembrane liner shall be considered unsuitable. Unsuitable materials shall be hauled to the ash landfill for disposal.
- C. Unclassified Materials: Organic soils obtained from the existing topsoil stockpile on the east side of the site and excess topsoil materials generated from stripping operations. These materials cannot be placed in the random fill zone of the new pond embankments, but can be placed on the outside slope of the

embankments as shown on the Drawings.

- D. Sand (IMPORTED): An inorganic mineral soil with a maximum of 12 % by weight passing the #200 sieve, a maximum of 30 % gravel, and a maximum of 3" rock diameter.
- E. Clay Buffer (ON-SITE or IMPORTED): Clay buffer is a mineral soil consisting of sound durable particles, excluding brine sludge/solids, crushed carbonate quarry rock, crushed concrete, and salvaged bituminous mixture, and free of all organic material, rubbish, demolition debris, and other foreign materials. Maximum particle size is 3 inches in the largest dimension.
- F. Clay Liner (DESIGNATED ON-SITE OR IMPORTED)
 - 1. Clay material shall be from soils excavated from the designated on-site source(s) or imported by the Contractor, at the Contractor's preference.
 - 2. Clay shall be an inorganic mineral soil with the following properties:
 - a. Unified classification designation (ASTM D 2487) of CL and/or CH.
 - b. A minimum of 50 percent by weight which passes the #200 sieve, a maximum of 5 percent gravel by weight, and a maximum of 1" rock diameter.
 - c. A maximum clod size of one-half the compacted lift thickness.
 - d. A Liquid Limit of 25 percent or greater.
 - e. A Plasticity Index of 12 or greater.
 - f. A maximum saturated hydraulic conductivity of 1×10^{-7} cm/s.
 - g. Free of debris, roots, organic material, frozen material, angular stones, and other deleterious material.
- G. Topsoil (ON-SITE or IMPORTED):
 - 1. Topsoil may be obtained from materials stripped from the Site, from designated on-site source(s), or imported by the Contractor, at the Contractor's preference. Topsoil shall be natural, friable, fertile sandy loam. The topsoil shall be free from subsoil, noxious weeds, stones, lime, concrete, ash, slag, or other deleterious matter and shall be well drained.
 - 2. Excess topsoil stripped from the site, not needed for final site restoration, may be used as unclassified fill in the construction of the new pond embankments.
- H. Gravel Surfacing (ON-SITE or IMPORTED): Gravel surfacing may be obtained from materials stripped from the Site and imported from off-site source(s). Gravel material shall be in conformance with SDDOT Standard Specification 882.2, Gravel Surfacing.

2.02 SOURCE QUALITY CONTROL

- A. Contractor must submit information to Owners for all off-site sources planned for use through the

procedures described elsewhere in these documents.

- B. Owners may take samples of the materials after they have been furnished to the Site for additional testing. Owners will pay for testing of samples that meet the Specifications. Contractor shall pay for testing of samples that do not meet Specifications.
- C. Contractor shall work closely with Owners and Owners' Representative during excavation activities to identify materials suitable for use as random fill and clay liner, and segregate materials deemed unclassified or unsuitable.

PART 3: EXECUTION

3.01 GENERAL

- A. Locate and protect overhead and underground utilities and monitoring wells.
- B. Construct excavations in accordance with applicable Laws and Regulations.
- C. Provide temporary controls such as diversions, ditches, berms, and dewatering equipment to prevent surface runoff from entering excavations and to remove ponded water from excavations. Maintain excavations in a dry and stable condition at all times.
- D. Notify Owners of any unsatisfactory soil materials encountered that require additional excavation (e.g. peat, debris, lake sediments, unstable fat clays, other soils subject to compressibility, etc.). Owners will provide direction for proceeding.
- D. Extend excavations a sufficient distance to allow placement and compaction of bedding, encasement, and other required backfill materials, prevent sloughing of materials into the excavation, and to permit observation of the Work by Owners. Excavate to sufficient depth to remove loose or disturbed soil. Avoid over-excavating sound native soil.
- E. Contractor may request three dimensional (3D) surface data from Owners for use in excavating and grading pond features to the planned elevations and grades.

3.02 MATERIAL SOURCE (BORROW AREAS)

- A. Material Source Development
 - 1. Contractor shall develop the designated material sources identified by Owners to the extent necessary to obtain the required quantities of random fill and clay liner materials.
 - 2. Materials excavated from the Random Fill and Clay Liner borrow area shall be segregated for their intended use. In general, the quality of the material appears to increase with depth.
 - 3. Over-excavation is allowed at the Random Fill and Clay Liner borrow area provided the excavation is filled-in and the site is restored to the grades shown in the Drawings.

3.03 EXCAVATION

A. Pond Excavation

1. Contractor shall excavate pond to subgrade elevations as required so lines and grades shown on the Drawings can be obtained.
2. Excavation materials shall be segregated and identified as random fill, unclassified material, or unsuitable material prior to transport and placement. Owners and/or Owners' Representative will be on-site during excavation work to help identify materials.
3. Prior to placement of sand drainage blanket, scarify, re-moisten (if required), and re-compact the subgrade a minimum of 6 inches to at least 95 percent standard Proctor maximum dry density (ASTM D 698).

B. Excavation for Structures and Pipes -- See Specification Section 02630

1. Excavation for structures and pipes will be as required so lines and grades shown on the Drawings can be obtained.
2. Adequate excavation will be performed so that proper depths of bedding and backfill materials can be placed.
3. Contractor shall provide shoring, bracing, sheet piling, trench boxes, tie backs, and other measures required to perform all Work in a safe manner and in accordance with applicable Laws and Regulations.
4. Installation of the Underdrain Collection Pump Station will require an excavation deeper than 20 feet. The provisions of CFR 1926 Subpart P shall be strictly followed when planning for and completing the excavation for this structure. When required that sloping, benching, or protective systems be designed by a registered professional engineer, Contractor shall be responsible for submitting the design to the Owner for review prior to beginning the excavation. The design submitted by the Contractor shall be prepared and certified by a South Dakota registered professional engineer.

C. Geomembrane Anchor Trenches

1. Anchor trenches for geomembrane materials shall be cut at the minimum depths and widths required for proper anchoring of the geomembrane.

D. Excavation Adjacent to Existing Features

1. Contractor shall carefully excavate adjacent to structures, piping, embankments, and other features so as not to damage or remove any part of the feature.
2. Necessary repairs to existing features damaged by Contractor will be at Contractor's expense.

3.03 BACKFILL, EMBANKMENT AND COMPACTION

A. General

1. Place embankment materials at the locations and to the dimensions, thicknesses, and tolerances shown on the Drawings, or identified elsewhere in these Specifications. Employ necessary means, methods and equipment required to meet compaction criteria specified herein.
2. Construct embankments, backfill excavations, and compact only with approved materials and those indicated on the Drawings and this specification.
3. When embankment is placed and compacted on hillsides, against existing embankments, or when embankment is built half width at a time, the slopes that are steeper than 4H:1V shall be continuously benched as the embankment is built in horizontal layers. Benching shall be of sufficient width to permit operations of placing and compacting equipment. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Excavated benching material shall be re-compacted along with the new embankment material.

B. Random Fill and Unclassified Material

1. Materials shall be placed to the dimensions and at the locations shown on the Drawings.
2. Place Random Fill and Unclassified Material in maximum 12 inch loose lifts. Lifts shall be constructed in a generally horizontal orientation. Compact each lift to at least 95 percent standard Proctor maximum dry density (ASTM D 698) before proceeding to the next lift. Compaction shall be accomplished using appropriate equipment for the type of material being placed in order to achieve the specified compaction requirements.

C. Sand Drainage Blanket

1. The sand drainage blanket shall not be placed until the subgrade is surveyed and documented.
2. Spreading shall occur by pushing the material from discrete dumping points, and pushing the newly dumped materials outward over that material already placed. The drainage material shall be "rolled" over the edge of the subgrade, rather than pushed or slid across the subgrade

D. Clay Buffer

1. Clay buffer materials shall be at 0 to 4 percentage points above optimum moisture content at time of placement and compaction.
2. The clay buffer shall not be placed until the sand drainage blanket is surveyed and documented.
3. Place clay buffer concurrently with first lift of clay liner. Clay buffer shall be placed in a maximum 6 inch loose lift using methods that prevent rutting in the underlying sand drainage blanket.

E. Clay Liner

1. Clay Liner shall be above optimum moisture content at time of placement and compaction, within the limits presented in paragraph 3 below.

2. Over-wetted clay shall not be used for construction of the clay liner. Clay shall be determined to be over-wetted if the field tested moisture content is higher than the specified amount, or if the required compaction cannot be achieved with a reasonable number of passes with compaction equipment.
3. Place clay, so that each compacted lift is not greater than 6 inches thick. **For designated on-site clay source material:** compact each lift to at least 98 percent standard Proctor maximum dry density (ASTM D 698) at a moisture content 2 to 6 percentage points above optimum. **For imported clay source material:** compact each lift to at least 95 percent standard Proctor maximum dry density (ASTM D 698) at a moisture content 0 to 6 percentage points above optimum.
4. The next lift of clay shall not be placed until the current lift is surveyed and documented.
5. Compaction shall be performed with sheepsfoot compactors. The surface of intermediate clay lifts shall be in a roughened condition at the time of placement of an overlying lift, such as from imprints from a sheepsfoot compactor.
6. The surface of each clay lift shall be kept moist until the next clay lift is placed. If the clay surface becomes dry, apply water and rework the surface with a sheepsfoot compactor, scarifier, or other suitable equipment to thoroughly remoisten the clay.
7. The final graded clay surface shall be rolled with a smooth-drum compactor to remove imprints from the sheepsfoot and to produce a smooth, uniform surface.
8. The finished clay liner surface shall be maintained in a moist condition until covered by geomembrane. Moisture content shall not be allowed to fall below optimum in the top 1 inch of the clay layer. Frequent water application may be required, especially during hot, dry, or windy weather. If cracks develop in the finished clay surface due to over-drying, contractor shall scarify, moisture condition and re-compact top layer of clay.
9. It is recommended that Contractor construct a clay liner "test pad" and conduct compaction and permeability tests as needed in order to ensure Contractor's means and methods produce sufficient results prior to commencing clay liner construction. Such tests shall be at the Contractor's expense and are separate from other quality assurance/quality control tests specified within the technical specifications.

F. Gravel Surfacing

1. Gravel Surfacing shall be placed on smooth, compacted subgrades to the thicknesses, elevations, grades, and cross slopes shown on the Drawings.
2. The final surface shall be uniformly graded and rolled with a smooth drum roller to produce a firm and level driving surface.

G. Pipe and Structures

1. Remove loose soil from bottom of excavation, or re-compact loose soil to a minimum of 95 percent standard Proctor maximum dry density before placing backfill materials.

2. After placing structures, backfill with material as shown on the Drawings. Place backfill in maximum 12-inch loose lifts and compact before placing subsequent lifts. Before compaction, moisten or aerate each lift as necessary to assist with compaction. Compact each lift to at least 95 percent standard Proctor maximum dry density. Do not place backfill material on surfaces that are frozen or muddy or that contain ice or frost. Scarify, remoisten, and re-compact surfaces that have been dried, weathered, or loosened between lifts.
3. All storm sewer pipes shall have a minimum of 6-inches of granular bedding underneath the pipe invert. Compact around the pipe per pipe manufacturer's recommendations. See specification section 02630 for granular bedding material requirements.
4. Place backfill materials evenly adjacent to structures to reach required elevations. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around structure to approximately the same elevation in each lift.

3.05 SUBGRADE PREPARATION FOR GEOMEMBRANES

- A. Smooth-roll the subgrade to remove imprints from the sheepsfoot compactor and other surface irregularities. The finished surface shall be smooth and free from lumps, ruts, depressions, protruding rocks, and rocks larger than 1 inch in surface dimension whether protruding or flush with the finished surface.
- B. Contractor shall maintain subgrade in a moist, smooth, and compacted condition and in good repair up to the time of geomembrane installation. Water application, compaction, and smooth rolling may be required to maintain subgrade.
- C. Contractor shall make any improvements to the surface condition requested by the geomembrane installer at no additional cost to Owners.

3.06 SITE GRADING

- A. Grade drainage swales and ditches to drain toward culverts or other drainage features as shown on the Drawings.
- B. Smooth-grade finished ground in areas shown in the Drawings and disturbed by Contractor's activities to uniform grades between points where elevations are shown, or between such points and existing ground.

3.07 TOLERANCES

- A. Construct the excavation and backfill Work within the dimensional tolerances given below. Elevation and thickness tolerances are acceptable deviations from the dimensions shown on the Drawings.
- B. Elevation Tolerances:
 1. Areas receiving clay liner:
 - a. Finished subgrade of sand drainage blanket: -0.2 foot, 0.0 foot
 - b. Finished surface of sand drainage blanket: -0.2 foot, 0.0 foot
 - c. Finished clay surface: 0.0 foot, +0.2 foot

C. Thickness Tolerances:

1. Clay liner: 0.0 foot, +0.4 foot
2. Sand Drainage Blanket, 0.00 foot, +0.2 foot
2. Topsoil: 0.0 foot , +0.2 foot
3. Gravel Surface: 0.0 foot, +0.2 foot.

3.09 FIELD QUALITY CONTROL

- A. Perform field quality control as specified elsewhere in these Specifications and in the project CQA/QC Plan.

END OF SECTION 02300

SECTION 02770
GEOMEMBRANE

PART 1: GENERAL

1.01 DESCRIPTION OF WORK

- A. All Work included in this Section shall be performed in accordance with the following paragraphs as well as the general requirements set forth in Division 1 of these Specifications and the other Contract Documents.
- B. Work covered under this Section includes providing all materials, equipment, and labor to excavate and fill for the construction of structures and to grade the Site including, but not limited to:
 - 1. Reviewing and accepting subgrade.
 - 2. Furnishing and installing smooth 60-mil high density polyethylene (HDPE) geomembrane.
 - 3. Installing Owner-Furnished smooth 60-mil high density polyethylene (HDPE) geomembrane.
 - 4. Performing on-site quality control testing for geomembrane installation.
 - 5. Supervising placement of geomembrane cover materials.

1.02 SUBMITTALS

- A. Submittals shall be made prior to or at the time of delivery of geomembrane materials to the Site.
- B. Resin: Submit for documentation the following information for resin used in the manufacture of geomembrane and extrudate rod:
 - 1. Resin type and cell classification (ASTM D 3350).
 - 2. Physical properties as specified herein.
 - 3. Production dates of the resin used for this Project
- C. Geomembrane: Submit for documentation the following information for geomembrane to be used for this Project.
 - 1. Test methods and results defining physical properties as specified herein, of the geomembrane to be used for this Project. Test results shall be representative of each roll of geomembrane furnished for this Project (e.g., a test sample taken between two consecutive rolls from a continuous run will be considered representative of both rolls). Test results shall be reported with corresponding roll identification numbers. Test results which may not be available prior to construction (e.g., environmental stress crack resistance) shall be presented as preliminary information prior to construction, with final test results submitted within 60 days of the start of geomembrane installation.

2. Statement of the geomembrane manufacturer's quality control procedures and frequency of sampling.
 3. Details of any factory seaming process proposed.
- D. Geomembrane Installation: Submit for review the following information regarding the geomembrane installation.
1. Identification of geomembrane installation subcontractor accompanied by a statement of qualifications. Owners' reserve the right to disapprove geomembrane installation subcontractor based on the information contained in this submittal or based on past experience with the proposed subcontractor.
 2. A proposed panel and seam layout diagram specifying the type and location of all field and factory seams. The layout diagram shall be to scale and used as a construction plan and shall include all necessary dimensions and details. The layout diagram shall be compatible with the panel and seam layout requirements specified in Subpart 3.03 of this Section.
 3. An installation schedule.
 4. A list of personnel performing field supervision, seaming supervision, and quality control, along with experience records and resumes.
 5. A list of equipment types proposed to be used in panel layout, membrane seaming, and destructive and nondestructive testing.
- E. Subgrade Certification: Prior to the installation of any geomembrane, Contractor shall submit for documentation geomembrane installer's certification in writing that the surface upon which the geomembrane is to be installed is acceptable (use the form at end of this Section or geomembrane installer's equivalent).

1.03 GEOMEMBRANE INSTALLERS

- A. Geomembrane installation shall be performed under the direct supervision of a single field supervisor who shall remain on Site throughout installation, including inspection of the surface upon which the geomembrane is to be installed, geomembrane handling and storage, panel layout and placement, seaming, seam testing, panel and seam repair, installation of appurtenances, anchorage, protective cover placement, and other geomembrane-related Work. The field supervisor shall have complete supervisory responsibility for the installation, testing, and repair.
- B. Field seaming of geomembrane panels shall be performed under the direction of a seaming supervisor who may or may not be the same person as the field supervisor.
- C. The geomembrane installer selection is subject to approval by Owners prior to mobilization for geomembrane installation. Owners have the right to reject any geomembrane installer, and request that Contractor select an alternate.

1.04 PRE-INSTALLATION CONFERENCE

- A. Contractor and geomembrane installer shall attend a meeting at the Site prior to installation of the geomembrane to discuss details of the proposed design and installation.

1.05 REFERENCES

- A. American Society for Testing and Materials, Current Edition, hereafter referred to as ASTM.

1.06 BASIS FOR COMPENSATION

- A. Compensation for all Work covered under this Section of these Specifications will be as set forth in Section 1025.

PART 2: PRODUCTS

2.01 MATERIALS

A. Resin

1. Geomembrane and extrudate rods used for this Project shall be manufactured of new, first quality resins, designed specifically for use in flexible membrane liner installations.
2. Resin used in manufacturing geomembrane used for this Project shall meet the following specifications:

Property	HDPE	Test Method
Specific Gravity	≥ 0.93	ASTM D 1505
Melt Flow Index	<1.1 g/10 min.	ASTM D 1238 Condition 190/2.16

3. Recycled polymer shall not be added to the resin. However, the resin may contain polymer reclaimed during the manufacturing process if reclaimed polymer content does not exceed 2 percent by weight.

B. Geomembrane

1. Geomembrane sheets used for this Project shall meet the following specifications:

Property	60-mil Smooth HDPE	Test Method
Nominal Sheet Thickness	60 mil $\pm 10\%$	ASTM D 5199
Specific Gravity	≥ 0.94	ASTM D 1505
Tensile Strength at yield	≥ 120 lbs./in.	ASTM D 6693
Tensile Strength at break	≥ 200 lbs./in.	ASTM D 6693
Elongation at yield	$\geq 10\%$	ASTM D 6693
Elongation at break	$\geq 500\%$	ASTM D 6693

Property	60-mil Smooth HDPE	Test Method
Tear Resistance (lbs)	≥35 lbs.	ASTM D 1004
Low Temperature Brittleness	<-90°F	ASTM D 746
Dimensional stability	<3%	ASTM D 1204, 1 hour at 100°C
Environmental Stress Crack	1500 hrs.	ASTM D 5397
Puncture Resistance	≥70 lbs	ASTM D 4833
Carbon black content	2-3%	ASTM D 4218
Carbon black dispersion	A-1,A-2,B-1	ASTM D 5596

2. The geomembrane shall contain at a maximum 3 percent by weight additives, fillers, or extenders.
 3. The geomembrane shall be free of holes, blisters, striations, undispersed raw material, and contamination by foreign matter.
 4. The geomembrane shall be supplied in rolls. Each roll shall be labeled with the mil-thickness, length, width, manufacturer, lot number, and a unique roll identification number. This identification number shall be used to identify roll location on the panel layout record drawing.
- C. Extrudate: Resin used in the extrudate rod shall be the same as that used to manufacture the geomembrane sheets. Extrudate rods are to be delivered in original containers with the manufacturer's labeling. Extrudate rods shall be free of dirt, grease, moisture, other contaminants, and shall be free of damage.
- D. Neoprene Foam: Closed cell, weatherproof, black neoprene foam with adhesive backing suitable for long-term sun and liquid exposure. Dimensions shall be as specified on the Drawings.
- E. Clamped Boots: Boots required to seal the geomembrane to the structures passing through it shall be made of the same materials as the geomembrane. The boots shall be fabricated so that all field assembly, welding, and seam testing can be accomplished using equipment and procedures regularly employed in the field for geomembrane installation. Smooth geomembrane shall be used in all geomembrane boots.
- F. Banding Straps: Type 302 stainless steel banding straps suitable for use on the pipe diameters shown on the Drawings. Banding strap dimensions shall be as specified on the Drawings. All surfaces of the banding straps shall be machined smooth to prevent tearing or puncturing of the geomembrane pipe boots.
- G. Caulk: Caulk shall be Sonneborn NPI or approved equal.

2.02 EQUIPMENT

- A. Extruding equipment shall be equipped with a temperature gauge at the barrel and nozzle.
- B. Fusion equipment shall be equipped with a temperature gauge capable of continuous monitoring.

- C. Provide continuous temperature monitoring equipment, in good working condition, with each welding unit. Welding equipment shall not be operated without functioning temperature monitoring equipment.
- D. A coupon cutter and a calibrated tensiometer shall be provided for in-field seaming prequalification testing and destructive sample testing.
- E. Store, transport, and operate all equipment to avoid damage to geomembrane.

PART 3: EXECUTION

3.01 SUBGRADE INSPECTION

- A. Geomembrane installer shall certify in writing that the surface upon which the geomembrane is to be installed is acceptable (use the form at end of this Section or geomembrane installer's equivalent).
- B. After subgrade has been accepted by geomembrane installer, it shall be geomembrane installer's responsibility to indicate to Contractor any change in subgrade conditions that may require repair Work. Damage to subgrade caused by Work involved in installing geomembrane shall be repaired at geomembrane installer's expense. Geomembrane cover placement over unsuitable surfaces will not be permitted.

3.02 HANDLING, TRANSPORTATION, AND STORAGE

- A. Geomembrane rolls shall be packaged and labeled prior to transporting to the Site. Geomembrane rolls delivered to the Site shall be wrapped in a relatively impermeable and opaque protective cover which may consist of a sacrificial wrap of geomembrane. The sacrificial wrap shall be removed and not used as part of the geomembrane installation.
- B. Geomembrane transportation shall be in a manner that reduces the possibility of material damage during shipment.
- C. On-site storage of the geomembrane rolls shall be in a safe manner, with rolls protected from grease, dirt, moisture, excessive heat, direct sunlight, vehicle traffic, and other possible sources of damage including theft and vandalism. Storage areas shall be at Contractor's discretion unless otherwise specified by Owners.
- D. Geomembrane and appurtenant materials delivered to the Site shall be checked for proper labeling and visually inspected for transport or manufacturing damage. Owners reserve the right to reject any unacceptable material at no cost to Owners.
- E. Only that quantity of geomembrane that is to be placed on a particular day shall be removed from the packaging. Geomembrane rolls shall be transported from the storage area to the construction area using wide lifting straps and properly sized forklifts, front end loaders, or other appropriate equipment. Under no circumstances shall any heavy equipment be allowed directly on the geomembrane. Prior to placement, the geomembrane shall be visually inspected for damage and manufacturing defects. Geomembrane material which, in the opinion of Owners, is damaged or otherwise unsuitable shall not be used for the Project. Minor damage may be repaired as specified in Subpart 3.08 of this Section. Damage to the geomembrane caused by geomembrane installer during

handling shall be repaired or replaced at Contractor's expense.

3.03 PANEL LAYOUT AND PLACEMENT

A. Panel and Seam Layout Diagram:

1. Prepare panel and seam layout diagram so that panel seams run parallel to the direction of maximum slope.
2. Slope panels shall extend past grade-break lines as indicated on the Drawings.
3. Slope panels shall not be constructed from more than two pieces of geomembrane (i.e., not more than one cross-seam shall be permitted on slope panels).
4. Cross seams in slope panels shall be oriented at 45 degrees.
5. Cross seams in adjacent panels shall be staggered.
6. Assign identification number to each seam for reference to test results and Record Drawings.

B. Panel Placement:

1. Panel size and placement shall be in general accordance with the panel layout diagram. Place geomembrane of the type (smooth or textured) and mil-thickness, and at the locations and to the dimensions as shown on the Drawings.
2. Panels shall be anchored with sand bags or other approved methods to prevent uplift and damage by wind.
3. The roll identification number and a unique panel number shall be marked on each panel as the panel is placed. The roll and panel numbers shall appear on the Record Drawings.
4. Place panels with appropriate slack incorporated into geomembrane to accommodate expansion and contraction without jeopardizing the integrity of the geomembrane.
5. Only soft-soled/rubber-soled boots or shoes shall be worn on the geomembrane.
6. Smoking is prohibited on or near the geomembrane.

C. All geomembrane panels shall be seamed on the same day that they are deployed.

D. Owners and Contractor will visually inspect in-place panels prior to seaming. Any damaged panels shall be repaired, and, if requested by Owners, replaced at no additional cost to Owners. Repairs shall be made in accordance with Subpart 3.08 of this Section. All damages and repairs shall be recorded on the Record Drawings.

3.04 SEAMING

- #### A. Seaming Methods:
- All seams shall be joined using a hot fusion (split wedge) or heat extrusion weld process in accordance with the manufacturer's recommendations. The hot fusion method shall be the primary seaming method. The use of extrusion welding shall be limited to repairs and areas or

seam configurations inaccessible to fusion welding equipment. The geomembrane installer shall maintain in working order at the Site at least one spare seaming apparatus for each type of welder used.

B. Factory and field seams shall meet the following minimum specifications:

Property	60-mil Smooth HDPE	Test Method
Shear Adhesion (lbs/in width)	≥120, FTB	ASTM D 4437 NSF Annex A
Peel Adhesion (lbs/in width)	≥70, FTB	ASTM D 4437 NSF Annex A
Peel Adhesion (fusion) (lbs/in width min.)	≥70, FTB	ASTM D 4437 NSF Annex A

Note: All seams must fail at film tear bond (FTB).

C. Seam Configuration and Preparation:

1. Overlap panels to be seamed at least 3 inches but not more than 6 inches. The loose end of the upper panel shall extend no more than 3 inches from the weld.
2. Cross seams on slopes shall be made at a 45 degree angle to the edge of the panel.
3. The contact area between panels shall be clean and free of moisture, dust, dirt, debris, and foreign material. A protective layer of filter fabric or scrap geomembrane shall be used directly beneath each seam overlap to achieve proper support and a clean work surface, if necessary.
4. Where extrusion welding is used, the contact surfaces between panels shall be ground to remove oxidation prior to welding. Grinding shall not result in grooving of the liner or reduction of the liner thickness by more than 10 percent. The grinding motion shall be made perpendicular to the seam. Grinding in a direction parallel to the seam will not be permitted.
5. Seams shall be aligned to minimize the number and size of wrinkles.

D. Test Seam Specimen Preparation:

1. At least two test seam samples shall be prepared with each piece of seaming equipment at the beginning of each seaming period (usually morning and afternoon), unless otherwise directed by Owners. Samples shall be prepared by the corresponding operator. Samples shall be at least 6 feet long (in the direction of the seam) by at least 1 foot wide, and may be prepared from scrap pieces of geomembrane.
2. Six 1-inch-wide specimens (coupons) from each test seam sample shall be prepared for on-site field testing for shear and peel strength. Coupons shall be prepared using a sheet cutter so that consistent, uniform 1-inch-wide coupons are obtained. Three 12-inch-long specimens shall be prepared for retention by Owners and geomembrane installer.
3. Each specimen shall be labeled with an equipment and operator identification number, date,

ambient air temperature, operating temperature, speed of seaming equipment, and field test results.

4. Seaming equipment shall not be used until satisfactory test seams have been prepared.

E. Climatic Conditions for Seaming:

1. Seaming shall be performed only when panel temperatures are between 40°F and 115°F, unless otherwise approved by Owners. If seaming is permitted to be performed at panel temperatures below 40°F, the panel contact surface shall be preheated and geomembrane installer shall certify in writing that the low-temperature seaming procedures will not cause any short- or long-term damage to the geomembrane.
2. Seaming during rainy weather or when dew is present on panels will not be permitted.
3. Contractor shall provide any special lighting required for seaming during low-light or dark hours. Geomembrane installer shall leave slack in geomembrane as necessary to account for thermal expansion or contraction of geomembrane. Stress on panels due to thermal expansion and contraction shall be minimized by performing field seaming operations during the coolest parts of the day or night, if necessary. Special scheduling or extended hours of operation require approval by Owners.

- F. All welding shall provide a tight, leak-proof, homogeneous bond between panels. All seams shall extend to ends of panels.

- G. Welding equipment shall be continuously monitored to control the temperature of extrudate and wedge.

3.05 SEAMING PREQUALIFICATION TESTING

- A. Seaming prequalification coupons (prepared per Paragraph 3.04D of this Section) shall be tested for shear and peel strength with the on-site tensiometer prior to starting production seaming. Three coupons shall be tested in shear and three in peel. All coupons shall exhibit the required strength at yield or break, and failure mechanism (FTB) as set forth in Paragraph 3.04B of this Section. If any of the coupons fail, another test seam shall be prepared and coupons cut and tested. If any of the second set of coupons fails, the reason for the failure shall be identified and corrected prior to preparing another test seam. No production seaming shall be performed with any seaming equipment or by any operator without a passed seaming prequalification test witnessed by Owners.

3.06 NONDESTRUCTIVE TESTING OF PRODUCTION SEAMS

- A. Visual Inspection: A visual inspection of all seams shall be performed. This inspection shall look for obvious flaws in seaming, patches, penetration sealing, material defects, or other problems. Deviations from acceptable workmanship standards shall be noted and corrected.
- B. Pressure Testing (Split-Wedge System): Where a split-wedge fusion seaming system is employed, the continuity of the seam shall be tested with air pressure in accordance with the following procedure. Geomembrane installer shall provide all equipment and personnel to conduct the testing specified herein. The flow channel must not be obstructed by foreign objects or geomembrane material throughout the length of seam being tested. The vacuum test described in Paragraph 3.06C of this Section must be employed for testing of all seams that do not have a contiguous flow channel.

1. A test device consisting of an inflation needle and pressure gauge mounted on a "T" fitting shall be used for air pressure testing. Insert the needle into the flow channel and seal the end of the channel around the needle. Connect a pump (such as a small bicycle pump) to the test device.
 2. Ascertain that the flow channel is contiguous by leaving the other end of the channel open and pumping air through the channel. If air does not pass through the channel the test length must be shortened until a contiguous length of flow channel is found.
 3. Seal and clamp both ends of the flow channel to assure an airtight seal. Inflate the flow channel to 25 to 30 psig. Allow one minute for the seam to stabilize.
 4. Reinflate to 25 to 30 psig and test for a period of five minutes.
 5. At the end of the test period, if the pressure has not dropped more than 2 psi, the test shall be considered a pass and the following procedure will be implemented:
 - a. Remove the test device and clamps.
 - b. Make any repairs, if necessary, to the area where the flow channel was clamped or inflated.
 - c. Record the test results, mark the seam as a pass, and proceed to the next seam.
 6. If the pressure drops below the 2 psi allowance, the test shall be considered a failure and the following procedure shall be implemented to identify the failure:
 - a. Check to determine if there is excessive seepage around the inflation needle.
 - b. Check both ends of the seam to ensure the flow channel is completely sealed off.
 - c. Walk the length of the seam; look and listen for air leaks.
 - d. If either of these procedures fails to identify the leak, trim the seam overlap and vacuum test the seam to locate the leak.
 - e. Once the leak is identified, make the necessary repairs and retest the seam.
- C. Vacuum Testing: Vacuum testing shall be used to test the continuity of extrusion welded and mechanical seams. Geomembrane installer shall provide all equipment and personnel to conduct the testing specified herein. The following procedure shall be followed:
1. Wet seam to be tested with a soapy solution mixed at a ratio of 1 ounce soap to 1 gallon water.
 2. Place clear-topped vacuum box over seam to be tested, evacuate box to a vacuum of 3 to 5 inches water column, and tug up to ensure a leak-tight seal has developed.
 3. Examine the seam for 5 to 10 seconds; watch for soap bubble formation.
 4. If bubbles are not evident, move to next test location.
 5. If bubbles are present, mark area clearly for repair.
 6. If the vacuum testing indicates leakage, the area shall be spot patched; or if major leaks are detected, the entire seam shall be reworked.

3.07 DESTRUCTIVE TESTING OF PRODUCTION SEAMS

- A. The purpose of destructive testing is to verify that the seaming process has produced seams of acceptable physical integrity. Geomembrane installer shall provide all equipment and personnel to conduct on-site destructive testing. One seam sample shall be taken at random for each 500 feet of seam. Sample locations shall be designated by Owners. Each sample shall be assigned a unique identification number and the location shall be shown on the panel layout drawing. All holes in the installed geomembrane resulting from obtaining samples shall be repaired immediately. All repairs shall be 100 percent vacuum tested for continuity.
- B. Each sample shall be approximately 18 inches long by 12 inches wide with the seam centered lengthwise. Samples shall be divided as follows:
 - 1. Six 1-inch-wide coupons for on-site testing by geomembrane installer for shear and peel strength.
 - 2. One 6-inch-wide coupon for archival storage.
- C. Geomembrane installer shall conduct shear strength and peel adhesion tests on each sample using an on-site tensiometer. The sample shall exhibit film tearing bond (FTB) in both shear and peel and meet the minimum strength requirements set forth in Section 3.04B of this Section. The samples shall be delivered to Owners who will retain them for one year after contract completion. Destructive seam testing shall be performed under the observation of Owners.
- D. In case of disputes regarding the test results, arrangements will be made to test samples at an independent testing laboratory. Geomembrane installer shall label the samples with the location and date that they were taken.
- E. The following procedure will be followed in the event of a destructive seam test failure:
 - 1. Determine the extent of the area in question by finding a boundary of two passed seam samples. Samples shall be taken at least 10 feet away on both sides of the failure location.
 - 2. If both of these new samples pass the destructive field test, then the seam between shall be reconstructed by extrusion welding.
 - 3. If one or both of these new samples fail, then the procedure shall continue until two passed seam samples bound the seam area in question.
 - 4. Reconstruct by extrusion welding the entire seam bounded by two passed seam samples.
 - 5. All unacceptable seams shall be bounded by two passed seam sample locations.
- F. All testing equipment required for these quality control tests shall be provided by geomembrane installer. Any seams failing the quality control tests shall be repaired at Contractor's expense until passing test results are obtained. At all times, care shall be exercised to avoid damaging the geomembrane.

3.08 GEOMEMBRANE PANEL AND SEAM REPAIR

- A. Pin holes and creases shall be repaired by either patching or extrusion welding. Blisters, large holes, and areas containing undispersed raw materials or foreign matter shall be repaired by patching:

1. Patches shall be round or oval in shape, made of the same geomembrane material as the panel being repaired, and extend at least 6 inches beyond the edge of the defective area.
 2. Patch seaming shall be performed in accordance with Subpart 3.04 of this Section.
- B. Wrinkles in the geomembrane shall be removed or repaired as directed by Owners.
1. Wrinkles shall be repaired by cutting the geomembrane at the top edge of the wrinkle and overlapping the cut panels.
 2. The cut panels shall be repaired in accordance with Subpart 3.04 of this Section.
- C. Any protuberances in the geomembrane caused by rocks, vegetation, or other foreign matter located on the subgrade below the geomembrane shall be repaired by cutting out the protuberance and patching the hole.
- D. All repairs shall be tested in accordance with Subpart 3.06 of this Section.
- E. All repair locations shall be identified on Record Drawings.

3.09 APPURTENANCES

- A. The geomembrane shall be installed around any pipes or other appurtenances protruding through or adjacent to the geomembrane as shown on the Drawings.

3.10 ANCHORAGE

- A. The geomembrane shall be anchored as shown on the Drawings.

3.11 RESTORATION

- A. Contractor shall restore all areas affected by geomembrane-related Work to pre-existing conditions and to the satisfaction of Owners.

3.12 GEOMEMBRANE ACCEPTANCE

- A. Contractor shall retain all ownership and responsibility for the geomembrane and related Work until written acceptance from Owners is received.
- B. Owners will provide written acceptance after the geomembrane installation and all related Work, including cover material placement, has been satisfactorily completed and a written certification letter and Record Drawings reflecting all geomembrane-related Work has been provided to Owners Representative and approved by Owners. The written certification letter and Record Drawings reflecting all geomembrane-related Work shall be submitted in accordance with the general requirements to Owners not more than ten (10) working days after completion of all field seaming.
- C. A 20-year material and 2-year workmanship warranty shall be provided by Contractor.

END OF SECTION 02770

CERTIFICATE OF ACCEPTANCE OF
GEOMEMBRANE SUBGRADE SURFACE BY GEOMEMBRANE INSTALLER

DESCRIPTION OF AREA TO BE CERTIFIED

<u>GEOMEMBRANE INSTALLER</u>	<u>PROJECT</u>
NAME: _____	LOCATION: _____
ADDRESS: _____	PROJECT: _____
_____	AREA ACCEPTED: _____
AUTHORIZED REPRESENTATIVE: _____	OWNERS: _____

The undersigned, _____, certifies that he is a representative of

(Name)

(Company)

duly authorized to execute this certificate, that he visually inspected the subgrade surface described above on ____ / ____ / ____ and found the surface to be acceptable for installation of the geomembrane.

(Date)

This certification is based on observations of the surface of the subgrade only. No subterrain

inspections or tests have been performed and _____ makes no representations or

(Company)

warranties regarding conditions which may exist below the surface of the subgrade.

DATE: _____

SIGNATURE: _____

NAME: _____

TITLE: _____

CERTIFICATE RECEIVED BY
CONTRACTOR:

CERTIFICATE RECEIVED BY
OWNERS:

DATE: _____

DATE: _____

COMPANY: _____

COMPANY: _____

SIGNATURE: _____

SIGNATURE: _____

NAME: _____

NAME: _____

TITLE: _____

TITLE: _____



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
denr.sd.gov

April 19, 2013

T.J. Newkirk
Senior Compliance Specialist
Otter Tail Power Company
PO Box 496
Fergus Falls, MN 56538-0496

Dear Mr. Newkirk:

The Department of Environment and Natural Resources (DENR) is in receipt of three copies of the plans and specifications for the 2013 Brine Pond #3 Construction Project at the Big Stone Power Plant. We have reviewed and hereby approve the plans and specifications for the above described project.

Our review of the plans and specifications was primarily to determine compliance with the minimum design requirements for the proposed solid waste holding pond. Our review did not cover such items as quality of material and products, structural soundness, and electrical or mechanical design features. Approval of the plans and specifications does not in any way release the owner from the responsibility that the solid waste facility is constructed and maintained properly.

Please contact our office if you have questions.

Sincerely,

Jim Wendte, P.E.
Waste Management Program
(605) 773-3153

Enclosure

cc: Paul Swenson, Barr Engineering Company, 4700 West 77th St., Minneapolis, MN 55435
Tim Schaal, SD DENR, Water Rights Program



6253-3
DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

August 23, 2013

T.J. Newkirk
Senior Compliance Specialist
Otter Tail Power Company
P.O. Box 496
Fergus Falls, MN 56538-0496

Dear Mr. Newkirk:

On August 19, 2013, our office received the *Construction Certification Report (Report) for Dike Raise of Brine Pond #2* from Otter Tail Power Company. The Report detailed the construction quality assurance testing conducted during construction to raise the dike around brine pond #2 by three and one-half feet. The Report contained the testing that was performed on the compacted clay liner, HDPE liner, and as-built drawings.

Our office has reviewed the Report and determined the project was completed in accordance with the approved plans and specifications. In addition, our office received documentation that monitoring wells BC-5 and BC-6 were properly abandoned and replaced with wells BC-5r and BC-6r. Therefore, effective this date, brine pond #2 may operate at a new target maximum operating level of 1119.5 fmsl and a new upper limit maximum operating level of 1120.5 fmsl.

If you have any questions, please contact our office at (605) 773-3153.

Sincerely,

Steven Kropp, P.E.
Waste Management Program

cc: Tim Schaal, SD DENR – Water Rights Program
Scott Creten, Barr Engineering Co., Minneapolis, MN