



North Dakota State Water Commission

900 EAST BOULEVARD AVENUE, DEPT 770 • BISMARCK, NORTH DAKOTA 58505-0850
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December 30, 2010

North Dakota Department of Health
Division of Water Quality
918, East Divide Avenue
Bismarck, ND – 58501-1947

RE: Devils Lake Outlet

Enclosed are the monthly discharge reports for the Devils Lake Outlet for the month of November 2010 and the summaries of the sample results and flow data. The outlet discharged continuously until November 13th.

Attached to the summaries are the tables showing average daily outlet discharge, water quality results of the samples collected from outlet, the upstream and the downstream location, the average daily stream flow data and the conductivity data obtained from the USGS gaging station at the upstream and the downstream location. Water quality samples were taken weekly during the outlet operation period. After the outlet discharge ceased, ice conditions on the river did not allow all the samples requested to be taken.

If you have any questions, please contact me at 701-328-4958.

Sincerely,

Bruce Engelhardt P.E.
Director, Water Development Division
BE:SPG:416-10

OUTLET OPERATOR NAME/ADDRESS

NAME: ND State Water Commission
 ADDRESS: 900 E Boulevard Avenue,
 Bismarck ND 58505

MONTHLY DISCHARGE REPORT

LOCATION: AT OUTLET

FACILITY: Devils Lake Outlet Project

LOCATION: Benson Co, ND

MONITORING PERIOD	
START DATE	END DATE
11/1/10	11/30/10

Devils Lake Outlet discharged 5,718 ac-ft over 13 Days

PARAMETER	MINIMUM	MAXIMUM	AVERAGE	UNITS	SAMPLING FREQUENCY	TYPE
pH	7.96	8.74	8.58	SU	4 x Week	GRAB
SPECIFIC CONDUCTANCE	-	-	-	umho/cm	Continuous	Recorder
SULFATE	543	579	564.67	mg/L	4 x Week	GRAB
7 DAY AVERAGE OF SULFATE	561.5	567	564.71	mg/L	4 x Week	GRAB
OUTLET DISCHARGE	4	261	222	cfs	Continuous	Recorder
SIGNATURE	<i>Bruce Engelhardt</i>					
NAME AND TITLE	BRUCE ENGELHARDT, DIRECTOR, WATER DEVELOPMENT DIVISION			12/30/10	701-328-4958	TELEPHONE NUMBER
COMMENT AND EXPLANATION OF ANY VIOLATIONS						
Summary of individual sample results and flow data for outlet, upstream & downstream monitoring locations attached.						

Water Quality Results of the samples collected at the outlet Devils Lake Outlet									
Date	Time	Sampler	Average Daily EC from Outlet Telemetry (µS/cm)	Lab pH	Lab Sulfate (mg/L)	7 Day Rolling Average of Sulfate for the operating period (mg/L)	Total Suspended Solids (mg/L)	No. of days included in the 7 day Rolling average	
11/1/2010	16:00	NDSWC	-	8.66	566	565.5	-	7	
11/2/2010	14:00	NDSWC	-	8.69	566	565.5	32	7	
11/3/2010	11:00	NDSWC	-	8.69	571	567	-	7	
11/4/2010	8:00	NDSWC	-	7.96	543	561.5	-	7	
11/5/2010	-	-	-	-	-	-	-	-	
11/6/2010	-	-	-	-	-	-	-	-	
11/7/2010	-	-	-	-	-	-	-	-	
11/8/2010	16:20	NDSWC	-	8.74	579	564.75	8	7	
11/9/2010	8:00	NDSWC	-	8.74	563	564	-	7	
11/10/2010	-	-	-	-	-	-	-	-	
11/11/2010	-	-	-	-	-	-	-	-	
11/12/2010	-	-	-	-	-	-	-	-	
11/13/2010	-	-	-	-	-	-	-	-	
11/14/2010	-	-	-	-	-	-	-	-	
11/15/2010	-	-	-	-	-	-	-	-	
11/16/2010	-	-	-	-	-	-	-	-	
11/17/2010	-	-	-	-	-	-	-	-	
11/18/2010	-	-	-	-	-	-	-	-	
11/19/2010	-	-	-	-	-	-	-	-	
11/20/2010	-	-	-	-	-	-	-	-	
11/21/2010	-	-	-	-	-	-	-	-	
11/22/2010	-	-	-	-	-	-	-	-	
11/23/2010	-	-	-	-	-	-	-	-	
11/24/2010	-	-	-	-	-	-	-	-	
11/25/2010	-	-	-	-	-	-	-	-	
11/26/2010	-	-	-	-	-	-	-	-	
11/27/2010	-	-	-	-	-	-	-	-	
11/28/2010	-	-	-	-	-	-	-	-	
11/29/2010	-	-	-	-	-	-	-	-	
11/30/2010	-	-	-	-	-	-	-	-	
Minimum				7.96	543.00	561.50			
Maximum				8.74	579.00	567.00			
Average				8.58	564.67	564.71			

Daily Outlet Discharge

Date	Average Daily Outlet Discharge (cfs)	Total Daily Volume (cu-ft)	
11/1/2010	235.67	20,361,888	
11/2/2010	260.02	22,465,728	
11/3/2010	252.34	21,802,176	
11/4/2010	248.94	21,508,416	
11/5/2010	248.01	21,428,064	
11/6/2010	253.68	21,917,952	
11/7/2010	258.2	22,308,480	
11/8/2010	260.6	22,515,840	
11/9/2010	248.98	21,511,872	
11/10/2010	247.39	21,374,496	
11/11/2010	236.1	20,399,040	
11/12/2010	129.35	11,175,840	
11/13/2010	3.67	317,088	
11/14/2010	0	0	
11/15/2010	0	0	
11/16/2010	0	0	
11/17/2010	0	0	
11/18/2010	0	0	
11/19/2010	0	0	
11/20/2010	0	0	
11/21/2010	0	0	
11/22/2010	0	0	
11/23/2010	0	0	
11/24/2010	0	0	
11/25/2010	0	0	
11/26/2010	0	0	
11/27/2010	0	0	
11/28/2010	0	0	
11/29/2010	0	0	
11/30/2010	0	0	
Total		249,086,880	cu-ft
Total		1863.17	Mgal
Total		5718.25	Ac-ft
Average Flow	221.77		cfs
Minimum	3.67	317,088	
Maximum	260.60	22,515,840	
Average	221.77	19,160,529	

OUTLET OPERATOR NAME/ADDRESS

NAME: ND State Water Commission
 ADDRESS: 900 E Boulevard Avenue
 Bismarck ND 58505

MONTHLY DISCHARGE REPORT

LOCATION: UPSTREAM OF THE OUTLET (FLORA)

FACILITY: Devils Lake Outlet Project
 LOCATION: Benson Co, ND

MONITORING PERIOD	
START DATE	END DATE
11/1/10	11/30/10

PARAMETER	MINIMUM	MAXIMUM	AVERAGE	UNITS	SAMPLING FREQUENCY	TYPE
pH	8.12	8.33	8.28	SU	4 x Week	GRAB
SPECIFIC CONDUCTANCE	1400	1440	1418.33	umho/cm	Continuous	Recorder
SULFATE	331	337	334.67	mg/L	4 x Week	GRAB
7 DAY AVERAGE OF SULFATE	314.75	334.75	328.83	mg/L	4 x Week	GRAB
FLOW, INSTREAM	43	116	89.08	cfs	Continuous	Recorder
SIGNATURE	<i>Bruce Engelhardt</i>			12/30/10	701-328-4958	
NAME AND TITLE	BRUCE ENGELHARDT, DIRECTOR, WATER DEVELOPMENT DIVISION			DATE	TELEPHONE NUMBER	
COMMENT AND EXPLANATION OF ANY VIOLATIONS						
Summary of individual sample results and flow data for outlet, upstream & downstream monitoring locations attached.						
Instream samples and measurements for this summary pertain only to time periods when outlet is actually operated.						

**Water Quality Results of the samples collected from the upstream location near Flora
Sheneyne River Above Devils Lake Outlet Near Flora**

Date	Time	Sampler	USGS EC (µS/cm)	Lab pH	Lab Sulfate (mg/L)	7 Day Rolling Average of Sulfate for the operating period (mg/L)	Total Suspended Solids (mg/L)	No. of days included in the 7 day Rolling average
11/1/2010	16:15	NDSWC	1400	8.29	336	314.75	-	7
11/2/2010	14:15	NDSWC	1420	8.33	336	324.75	13	7
11/3/2010	11:15	NDSWC	1430	8.31	335	330.25	-	7
11/4/2010	8:15	NDSWC	1440	8.12	331	334.5	-	7
11/5/2010	-	-	-	-	-	-	-	-
11/6/2010	-	-	-	-	-	-	-	-
11/7/2010	-	-	-	-	-	-	-	-
11/8/2010	17:00	NDSWC	1410	8.32	337	334.75	-	7
11/9/2010	8:15	NDSWC	1410	8.33	333	334	-	7
11/10/2010	-	-	-	-	-	-	-	-
11/11/2010	-	-	-	-	-	-	-	-
11/12/2010	-	-	-	-	-	-	-	-
11/13/2010	-	-	-	-	-	-	-	-
11/14/2010	-	-	-	-	-	-	-	-
11/15/2010	-	-	-	-	-	-	-	-
11/16/2010	-	-	-	-	-	-	-	-
11/17/2010	8:30	NDSWC	1440	8.3	339	-	10	-
11/18/2010	-	-	-	-	-	-	-	-
11/19/2010	-	-	-	-	-	-	-	-
11/20/2010	-	-	-	-	-	-	-	-
11/21/2010	-	-	-	-	-	-	-	-
11/22/2010	-	-	-	-	-	-	-	-
11/23/2010	-	-	-	-	-	-	-	-
11/24/2010	-	-	-	-	-	-	-	-
11/25/2010	-	-	-	-	-	-	-	-
11/26/2010	-	-	-	-	-	-	-	-
11/27/2010	-	-	-	-	-	-	-	-
11/28/2010	-	-	-	-	-	-	-	-
11/29/2010	-	-	-	-	-	-	-	-
11/30/2010	-	-	-	-	-	-	-	-
Minimum			1400.00	8.12	331.00	314.75		
Maximum			1440.00	8.33	337.00	334.75		
Average			1418.33	8.28	334.67	328.83		

Average daily streamflow and conductivity data at the upstream location near Flora

USGS Gaging Station Data		
Sheyenne River Above Devils Lake Outlet Near Flora		
Date	Streamflow (cfs)	EC (μS/cm)
11/1/2010	43	1400
11/2/2010	53	1420
11/3/2010	80	1430
11/4/2010	99	1480
11/5/2010	109	1500
11/6/2010	108	1470
11/7/2010	103	1460
11/8/2010	116	1430
11/9/2010	106	1410
11/10/2010	98	1400
11/11/2010	95	1400
11/12/2010	83	1400
11/13/2010	65	1400
11/14/2010	61	1410
11/15/2010	57	1420
11/16/2010	54	1430
11/17/2010	52	1440
11/18/2010	Ice	1460
11/19/2010	Ice	1510
11/20/2010	Ice	1600
11/21/2010	Ice	1580
11/22/2010	Ice	1590
11/23/2010	Ice	1640
11/24/2010	Ice	1660
11/25/2010	Ice	1650
11/26/2010	Ice	1660
11/27/2010	Ice	1670
11/28/2010	Ice	1690
11/29/2010	Ice	1740
11/30/2010	Ice	1750
Minimum	43	1400
Maximum	116	1500
Average	89.08	1430.77

OUTLET OPERATOR NAME/ADDRESS

NAME: ND State Water Commission
 ADDRESS: 900 E Boulevard Avenue
 Bismarck ND 58505

MONTHLY DISCHARGE REPORT

LOCATION: DOWNSTREAM OF THE OUTLET (BREMEN)

FACILITY: Devils Lake Outlet Project

LOCATION: Benson Co, ND

MONITORING PERIOD	
START DATE	END DATE
11/1/10	11/30/10

PARAMETER	MINIMUM	MAXIMUM	AVERAGE	UNITS	SAMPLING FREQUENCY	TYPE
pH	8.5	8.54	8.52	SU	4 x Week	GRAB
SPECIFIC CONDUCTANCE	1710	1750	1730	umho/cm	Continuous	Recorder
SULFATE	491	507	500.5	mg/L	4 x Week	GRAB
7 DAY AVERAGE OF SULFATE	499.25	519	507.5	mg/L	4 x Week	GRAB
FLOW, INSTREAM	194	381	327.92	cfs	Continuous	Recorder
SIGNATURE	<i>Bruce Engelhardt</i>			12/30/10	701-328-4958	
NAME AND TITLE	BRUCE ENGELHARDT, DIRECTOR, WATER DEVELOPMENT DIVISION			DATE	TELEPHONE NUMBER	
COMMENT AND EXPLANATION OF ANY VIOLATIONS						
Summary of individual sample results and flow data for outlet, upstream & downstream monitoring locations attached.						
Instream samples and measurements for this summary pertain only to time periods when outlet is actually operated.						

**Water Quality Results of the samples collected from the downstream location near Bremen
 Sheyenne River Below Devils Lake Outlet Near Bremen**

Date	Time	Sampler	USGS EC ($\mu\text{S}/\text{cm}$)	Lab pH	Lab Sulfate (mg/L)	7 Day Rolling Average of Sulfate for the operating period (mg/L)	Total Suspended Solids (mg/L)	No. of days included in the 7 day Rolling average
11/1/2010	16:50	NDSWC	1710	8.5	503	519	-	7
11/2/2010	14:45	NDSWC	1720	8.54	503	512.5	25	7
11/3/2010	11:50	NDSWC	1720	8.51	505	508.25	-	7
11/4/2010	8:45	NDSWC	1740	8.53	507	504.5	-	7
11/5/2010	-	-	-	-	-	-	-	-
11/6/2010	-	-	-	-	-	-	-	-
11/7/2010	-	-	-	-	-	-	-	-
11/8/2010	17:20	NDSWC	1750	8.53	491	501.5	-	7
11/9/2010	9:00	NDSWC	1740	8.52	494	499.25	-	7
11/10/2010	-	-	-	-	-	-	-	-
11/11/2010	-	-	-	-	-	-	-	-
11/12/2010	-	-	-	-	-	-	-	-
11/13/2010	-	-	-	-	-	-	-	-
11/14/2010	-	-	-	-	-	-	-	-
11/15/2010	-	-	-	-	-	-	-	-
11/16/2010	-	-	-	-	-	-	-	-
11/17/2010	8:00	NDSWC	-	8.29	356	-	19	-
11/18/2010	-	-	-	-	-	-	-	-
11/19/2010	-	-	-	-	-	-	-	-
11/20/2010	-	-	-	-	-	-	-	-
11/21/2010	-	-	-	-	-	-	-	-
11/22/2010	-	-	-	-	-	-	-	-
11/23/2010	-	-	-	-	-	-	-	-
11/24/2010	-	-	-	-	-	-	-	-
11/25/2010	-	-	-	-	-	-	-	-
11/26/2010	-	-	-	-	-	-	-	-
11/27/2010	-	-	-	-	-	-	-	-
11/28/2010	-	-	-	-	-	-	-	-
11/29/2010	-	-	-	-	-	-	-	-
11/30/2010	-	-	-	-	-	-	-	-
Minimum			1710.00	8.50	491.00	499.25		
Maximum			1750.00	8.54	507.00	519.00		
Average			1730.00	8.52	500.50	507.50		

Average daily streamflow and conductivity data at the downstream location near Bremen
USGS Gaging Station Data
Sheyenne River Below Devils Lake Outlet near Bremen

Date	Streamflow (cfs)	EC (µS/cm)
11/1/2010	218	1720
11/2/2010	263	1720
11/3/2010	297	1730
11/4/2010	340	1750
11/5/2010	367	1770
11/6/2010	378	1770
11/7/2010	373	1760
11/8/2010	377	1760
11/9/2010	381	1740
11/10/2010	373	1740
11/11/2010	356	1750
11/12/2010	346	1750
11/13/2010	194	1750
11/14/2010	98	1560
11/15/2010	81	
11/16/2010	76	
11/17/2010	73	
11/18/2010	Ssn	
11/19/2010	Ssn	
11/20/2010	Ssn	Ssn
11/21/2010	Ssn	Ssn
11/22/2010	Ssn	Ssn
11/23/2010	Ssn	Ssn
11/24/2010	Ssn	Ssn
11/25/2010	Ssn	Ssn
11/26/2010	Ssn	Ssn
11/27/2010	Ssn	Ssn
11/28/2010	Ssn	Ssn
11/29/2010	Ssn	Ssn
11/30/2010	Ssn	Ssn
Minimum	194	1720
Maximum	381	1770
Average	327.92	1746.92