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1414 West Hamilton Avenue
P.O. Box 8
Eau Claire, WI 54702-0008

December 11, 2012

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

Subject: 2012 Water Quality Monitoring Report For Big Falls Flowage (P-2390-01) and Thornapple Flowage (P-2475)

Dear Secretary:

Enclosed are the results of the water quality monitoring that Northern States Power Company – Wisconsin (NSPW) conducted during the 2012 field season on Big Falls and Thornapple flowages. The samples were obtained after ice-out, in late July, and late August per the Federal Energy Regulatory Commission's license requirement to monitor long-term changes in water quality. The results are summarized for the past eight years and while there appears to be some variability in the parameters analyzed, for the most part, the results have been relatively consistent. The data collected in 2012 is consistent with data from the previous years' sampling.

Licensee and WDNR agreed that the water quality monitoring results for Turtle Flambeau Flowage no longer need to be included in the annual written report. Water quality monitoring on Turtle Flambeau is conducted annually by local citizens and the results are published on the WDNR's website. Licensee will ensure that the monitoring results are available for review by the WDNR prior to submitting our annual report for Big Falls and Thornapple.

The WDNR and USFWS were provided 30 days to submit comments on the report but none were received. Should you have any questions regarding this report, feel free to contact Matthew Miller of this office at (715) 737-1353 or by electronic mail at matthew.j.miller@xcelenergy.com.

Sincerely,

William Zawacki
Director, Hydro Plants

Enclosure: Water Quality Monitoring Report

c: Mr. Jeff Scheirer – WDNR (cover letter only – via e-mail)
Ms. Cheryl Laatsch – WDNR (cover letter only – via email)
Mr. Nick Utrup – USFWS (cover letter only – via e-mail)
Project Files

2012 Water Quality Monitoring Report for Big Falls Flowage (P-2390-01) and Thornapple Flowage (P-2475)

Northern States Power Company – WI
An Xcel Energy Company

October 31, 2012

APPENDIX A

2012 Water Quality Fieldwork Data Sheets & Lab Analysis For Big Falls and Thornapple Flowages

Water Quality Sampling - Big Falls Flowage

Date: 4-24-12
Temperature: 58°
Weather Conditions: MOSTLY SUNNY, LIGHT WINDS
Depth of Bottom Sample: 11.5 M
Secchi Disk Reading: 4 FEET

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface	11.9	10.90
2	11.7	10.94
4	11.2	10.91
6	11.2	10.91
8	11.1	10.88
10	11.1	10.87
12	11.1	10.85
14	11.0	10.83
16	11.0	10.81
18	11.0	10.81
20	11.0	10.77
22	11.0	10.73
24	11.0	10.72
26	11.0	10.72
28	11.0	10.72
30	11.0	10.72
32	11.0	10.71
34	LO BATTERY	
36	LO BATTERY	
38	BOTTOM	BOTTOM
40		
42		
44		
46		

Remarks: WARM SPRING + RECORD WARM MARCH
RIVER FLOWS ≈ 1300 CFS
SAMPLING TAKEN @
DID NOT OBTAIN DO- TEMP PROFILE AFTER 32 FEET DUE TO LOW BATTERY

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- OBSERVED 1 MATURE EAGLE ON NEST
- NO NAVIGATION HAZARDS

1518 Chestnut Avenue N
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Phone: (612)630-4506
Fax: (612) 630-4367
Contact:Christine Keefe
Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Report To: Hydro Regulatory-WI
Environmental Services-WI
Attention: Matt Miller
Leroy Wilder

Work Request # WIHY0412
Date of Report 5/10/2012

Sample Description: Big Falls Flowage Surface
Location: BIG FALLS FLOWAGE
Customer Sample I.D.:
Chain of Custody # : 217488

LabWorks I.D. EH20759
Laboratory I.D.: 1263.07
Collection Date: 4/24/2012
Date Submitted: 4/26/2012

Constituent	Result	Units	Limit of Detection (LOD)	Limit of Quantitation (LOQ)	Analytical Method	Analyst	Analysis Start Date
Phosphorus	0.03	mg/L P	0.01	0.01	EPA 365.3	HRG	5/4/2012
Chlorophyll-a	6.9	ug/L	0.041	0.041	SM 19th 10200 H		4/26/2012

Comments related to sample number EH20759:

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Contact:Christine Keefe

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Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Report To: Hydro Regulatory-WI
Environmental Services-WI

Attention: Matt Miller
Leroy Wilder

Work Request # WIHY0412

Date of Report 5/10/2012

Sample Description: Big Falls Flowage Bottom

Location: BIG FALLS FLOWAGE

Customer Sample I.D.:

Chain of Custody # : 217488

LabWorks I.D. EH20760
Laboratory I.D.: 1263.08

Collection Date: 4/24/2012
Date Submitted: 4/26/2012

Constituent	Result	Units	Limit of Detection (LOD)	Limit of Quantitation (LOQ)	Analytical Method	Analyst	Analysis Start Date
Phosphorus	0.04	mg/L P	0.01	0.01	EPA 365.3	HRG	5/4/2012

Comments related to sample number EH20760:

Water Quality Sampling - Thornapple Flowage

Date: 4-24-12
Temperature: 67
Weather Conditions: SUNNY, LT WINDS NW
Depth of Bottom Sample: 20 FEET
Secchi Disk Reading: 4 FEET

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface	15.4	10.99
2	13.2	11.22
4	12.8	11.25
6	12.4	11.27
8	12.1	11.24
10	11.9	11.10
12	11.9	11.06
14	11.7	11.04
16	11.6	10.97
18	11.6	10.95
20	11.6	10.92
22	BOTTOM	BOTTOM
24		
26		
28		
30		
32		
34		
36		
38		
40		
42		
44		
46		

Remarks: - RIVER FLOW @ 1600 CFS
- SAMPLE TAKEN @ 4TH BUOY FROM WEST
- OBSERVED 1 MATURE EAGLE ON NEST + 1 LOON IN VICINITY OF NEST
- NO NAVIGATION HAZARDS

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Contact:Christine Keefe

Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Report To: Hydro Regulatory-WI
Environmental Services-WI

Attention: Matt Miller
Leroy Wilder

Work Request # WIHY0412

Date of Report 5/10/2012

Sample Description: Thornaplle Flowage Surface

Location: THORNAPPLE FLOWAGE

Customer Sample I.D.:

Chain of Custody # : 217488

LabWorks I.D. EH20761
Laboratory I.D.: 1263.09

Collection Date: 4/24/2012
Date Submitted: 4/26/2012

Constituent	Result	Units	Limit of Detection (LOD)	Limit of Quantitation (LOQ)	Analytical Method	Analyst	Analysis Start Date
Phosphorus	0.03	mg/L P	0.01	0.01	EPA 365.3	HRG	5/4/2012
Chlorophyll-a	2.3	ug/L	0.041	0.041	SM 19th 10200 H		4/26/2012

Comments related to sample number EH20761:

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Contact:Christine Keefe
Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Report To: Hydro Regulatory-WI
Environmental Services-WI
Attention: Matt Miller
Leroy Wilder

Work Request # WIHY0412
Date of Report 5/10/2012

Sample Description: Thornaplle Flowage Bottom
Location: THORNAPPLE FLOWAGE
Customer Sample I.D.:
Chain of Custody # : 217488

LabWorks I.D. EH20762
Laboratory I.D.: 1263.10
Collection Date: 4/24/2012
Date Submitted: 4/26/2012

Constituent	Result	Units	Limit of Detection (LOD)	Limit of Quantitation (LOQ)	Analytical Method	Analyst	Analysis Start Date
Phosphorus	0.03	mg/L P	0.01	0.01	EPA 365.3	HRG	5/4/2012

Comments related to sample number EH20762:

Water Quality Sampling - Big Falls Flowage

Date: 7-23-12
Temperature: 82
Weather Conditions: MOSTLY SUNNY, NW WIND @ 10
Depth of Bottom Sample: 11.5 M
Secchi Disk Reading: 4 FT

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface	27.2	7.68
2	27.1	7.68
4	27.1	7.70
6	26.9	7.73
8	26.6	7.50
10	26.3	7.32
12	26.2	7.33
14	26.0	6.95
16	25.8	6.89
18	25.5	6.55
20	25.2	6.28
22	25.1	6.02
24	25.0	5.98
26	24.9	5.77
28	24.7	5.51
30	24.6	5.26
32	24.4	4.91
34	24.3	4.28
36	Bottom	Bottom
38		
40		
42		
44		
46		

Remarks: NEAR RECORD HOT SUMMER
FLOW @ 750 CFS
SPOTTED 1 MATURE EAGLE SOARING NEAR NEST SITE
NO NAVIGATION HAZARDS

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Contact:Christine Keefe

Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Report To: Hydro Regulatory-WI
Enviromental Services-WI

Attention: Matt Miller
Leroy Wilder

Work Request # WIHY0712

Date of Report 8/9/2012

Sample Description: Surface

Location: BIG FALLS FLOWAGE

Customer Sample I.D.:

Chain of Custody # : 222967

LabWorks I.D. EH27031
Laboratory I.D.: 1281.23

Collection Date: 7/23/2012
Date Submitted: 7/25/2012

Constituent	Result	Units	Limit of Detection (LOD)	Limit of Quantitation (LOQ)	Analytical Method	Analyst	Analysis Start Date
Phosphorus	0.07	mg/L P	0.01	0.01	EPA 365.3	HRG	8/1/2012
Chlorophyll-a	6.1	ug/L	0.041	0.041	SM 19th 10200 H	NLS	7/31/2012

Comments related to sample number EH27031:

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Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Sample Description: Bottom
Location: BIG FALLS FLOWAGE
Customer Sample I.D.:
Chain of Custody # : : 222967

LabWorks I.D. EH27032
Laboratory I.D.: 1281.24

Collection Date: 7/23/2012
Date Submitted: 7/25/2012

Constituent	Result	Units	Limit of Detection (LOD)	Limit of Quantitation (LOQ)	Analytical Method	Analyst	Analysis Start Date
Phosphorus	0.10	mg/L P	0.01	0.01	EPA 365.3	HRG	8/1/2012

Comments related to sample number EH27032:

Water Quality Sampling - Thornapple Flowage

Date: 7-23-12
Temperature: 85°
Weather Conditions: M. SUNNY, WINDS W 5-10
Depth of Bottom Sample: 6.25M
Secchi Disk Reading: 3.5

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface	30.6	8.45
2	28.3	7.66
4	27.4	7.03
6	26.8	6.30
8	26.5	6.04
10	26.3	5.70
12	25.6	4.99
14	25.2	4.88
16	24.6	4.08
18	24.2	3.08
20	Bottom	Bottom
22		
24		
26		
28		
30		
32		
34		
36		
38		
40		
42		
44		
46		

Remarks: RECORD WARM SUMMER
FLOWS ≈ 750 CFS
NO NAVIGATION HAZARDS

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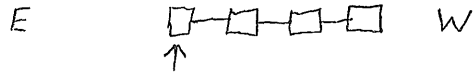

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Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Report To: Hydro Regulatory-WI
Environmental Services-WI
Attention: Matt Miller
Leroy Wilder

Work Request # WIHY0712
Date of Report 8/9/2012

Sample Description: Surface
Location: THORNAPPLE FLOWAGE
Customer Sample I.D.:
Chain of Custody # : 222967

LabWorks I.D. EH27033
Laboratory I.D.: 1281.25
Collection Date: 7/23/2012
Date Submitted: 7/25/2012

Constituent	Result	Units	Limit of Detection (LOD)	Limit of Quantitation (LOQ)	Analytical Method	Analyst	Analysis Start Date
Phosphorus	0.04	mg/L P	0.01	0.01	EPA 365.3	HRG	8/1/2012
Chlorophyll-a	11	ug/L	0.041	0.041	SM 19th 10200 H	NLS	7/31/2012

Comments related to sample number EH27033:

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Minneapolis Testing Laboratory Report

Lab Certification MN ID: 027-053-197
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Sample Description: Bottom
Location: THORNAPPLE FLOWAGE
Customer Sample I.D.:
Chain of Custody # : 222967

LabWorks I.D. EH27034
Laboratory I.D.: 1281.26

Collection Date: 7/23/2012
Date Submitted: 7/25/2012

Constituent	Result	Units	Limit of Detection (LOD)	Limit of Quantitation (LOQ)	Analytical Method	Analyst	Analysis Start Date
Phosphorus	0.05	mg/L P	0.01	0.01	EPA 365.3	HRG	8/1/2012

Comments related to sample number EH27034:

Water Quality Sampling - Big Falls Flowage

Date: 8-28-12
Temperature: 65°
Weather Conditions: SUNNY, LIGHT WINDS
Depth of Bottom Sample: 11.5 M.
Secchi Disk Reading: 5.5 FT

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)	
Surface	24.4	8.15	
2	24.3	8.14	
4	24.3	8.10	
6	24.3	8.04	
8	24.3	8.16	
10	24.2	7.82	
12	23.7	7.38	
14	23.5	7.15	
16	23.4	6.85	
18	23.4	6.75	
20	23.4	6.64	
22	23.3	6.44	
24	23.2	6.23	
26	23.0	5.84	
28	22.7	5.38	
30	22.6	5.25	
32	22.2	4.62	
34	20.8	3.88	Bottom
36			
38			
40			
42			
44			
46			

Remarks:

- VERY LOW RIVER FLOWS ≈ 600 CFS
- NO NAVIGATION HAZARDS
- NO BALD EAGLE ACTIVITY

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Xcel Energy

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Contact: Christine Keefe
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Minneapolis Testing Laboratory Report

Report To: Hydro Regulatory-WI
Enviromental Services-WI

Attention: Matt Miller
Leroy Wilder

Work Request # WIHY0812
Date of Report 10/3/2012

Sample Description: Surface
Location: BIG FALLS FLOWAGE
Customer Sample I.D.:
Chain of Custody #.: 222988

LabWorks I.D. EH30347
Laboratory I.D.: 1289.04
Collection Date: 8/28/2012
Date Submitted: 8/30/2012

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Chlorophyll-a	3.3	ug/L	NLS	0.041	SM 19th 10200 H	9/11/2012
Total Phosphorus	0.02	mg/L P	HRG	0.01	EPA 365.3	9/5/2012

Comments related to sample number EH30347:

Xcel Energy

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Contact: Christine Keefe
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Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Sample Description: Bottom
Location: BIG FALLS FLOWAGE
Customer Sample I.D.:
Chain of Custody #.: 222988

LabWorks I.D. EH30348
Laboratory I.D.: 1289.05
Collection Date: 8/28/2012
Date Submitted: 8/30/2012

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Total Phosphorus	0.04	mg/L P	HRG	0.01	EPA 365.3	9/5/2012

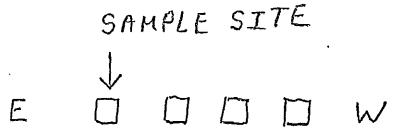
Comments related to sample number EH30348:

Water Quality Sampling - Thornapple Flowage

Date: 8-28-12
Temperature: 75
Weather Conditions: OVERCAST, CALM WINDS
Depth of Bottom Sample: 19FT 6M
Secchi Disk Reading: 5.5 FT

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface	23.6	8.37
2	23.3	7.98
4	23.7	7.83
6	23.1	7.72
8	23.1	7.84
10	23.1	7.68
12	23.0	7.16
14	22.8	6.57
16	22.6	6.22
18	22	3.31
20	BOTTOM	BOTTOM
22		
24		
26		
28		
30		
32		
34		
36		
38		
40		
42		
44		
46		



Remarks: - LOW RIVER FLOWS
- NO NAVIGATION HAZARDS

Xcel Energy

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Minneapolis Testing Laboratory Report

Report To: Hydro Regulatory-WI
Environmental Services-WI

Attention: Matt Miller
Leroy Wilder

Work Request # WIHY0812
Date of Report 10/3/2012

Sample Description: Surface
Location: THORNAPPLE FLOWAGE
Customer Sample I.D.:
Chain of Custody #.: 222988

LabWorks I.D. EH30349
Laboratory I.D.: 1289.06
Collection Date: 8/28/2012
Date Submitted: 8/30/2012

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Chlorophyll-a	8.6	ug/L	NLS	0.041	SM 19th 10200 H	9/11/2012
Total Phosphorus	0.03	mg/L P	HRG	0.01	EPA 365.3	9/5/2012

Comments related to sample number EH30349:

Xcel Energy

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Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Sample Description: Bottom
Location: THORNAPPLE FLOWAGE
Customer Sample I.D.:
Chain of Custody #.: 222988

LabWorks I.D. EH30350
Laboratory I.D.: 1289.07
Collection Date: 8/28/2012
Date Submitted: 8/30/2012

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Total Phosphorus	0.03	mg/L P	HRG	0.01	EPA 365.3	9/5/2012

Comments related to sample number EH30350:

APPENDIX B

Summary Of Total Phosphorous And Chlorophyll A Data For Big Falls And Thornapple Flowages 2005 - 2012

Summary of Water Quality Data for Big Falls and Thornapple Flowages (2005-2012)

	Big Falls Flowage			Thornapple Flowage		
Date	Surface Total Phosphorus (mg/L P)	Surface Chlorophyll-A (ug/L)	Bottom Total Phosphorus (mg/L P)	Surface Total Phosphorus (mg/L P)	Surface Chlorophyll-A (ug/L)	Bottom Total Phosphorus (mg/L P)
4/19/2005	0.050	0.50	0.057	0.055	0.70	0.051
7/25/2005	0.031	0.60	0.044	0.031	1.50	0.045
8/31/2005	0.020	1.50	0.092	0.029	2.75	0.030
4/26/2006	0.023	0.94	0.035	0.026	2.35	0.024
7/24/2006	0.029	0.50	0.099	0.035	4.03	0.041
8/23/2006	0.048	1.50	0.035	0.050	2.11	0.040
4/30/2007	0.028	1.95	0.067	0.039	4.50	0.033
7/31/2007	0.029	4.81	0.043	0.037	3.35	0.032
8/29/2007	0.052	4.45	0.027	0.049	2.93	0.033
4/30/2008	0.024	0.579	0.031	0.030	0.961	0.029
7/23/2008	0.032	2.80	0.043	0.041	11.0	0.051
8/26/2008	0.030	3.70	0.047	0.032	13.0	0.034
4/28/2009	0.030	5.5	0.033	0.040	11.0	0.033
7/28/2009	0.033	6.9	0.099	0.021	4.8	0.053
8/24/2009	0.021	5.0	0.032	0.023	3.6	0.075
4/28/2010	0.025	4.2	0.048	0.029	7.2	0.016
7/27/2010	0.07	1.8	0.05	0.07	0.76	0.07
8/31/2010	0.05	3.8	0.06	0.01	0.69	0.06
4/29/2011	NA*	NA*	NA*	0.03	2.70	0.03
7/26/2011	0.04	7.3	0.06	0.05	5.40	0.04
8/24/2011	0.04	3.8	0.04	0.04	2.50	0.05
4/24/2012	**0.03**	**6.9**	**0.04**	**0.03**	**2.30**	**0.03**
7/23/2012	**0.07**	**6.1**	**0.10**	**0.04**	**11.00**	**0.05**
8/28/2012	**0.02**	**3.3**	**0.04**	**0.03**	**8.60**	**0.03**
Average (Ice-out sample)	0.02	2.29	0.03	0.03	3.52	0.03
Average (July sample)	0.04	3.42	0.06	0.04	4.65	0.04
Average (August sample)	0.03	3.01	0.04	0.03	4.02	0.04

* No sampling conducted as reservoir was drawndown for repairs to left embankment

APPENDIX C

Summary Of Dissolved Oxygen And Temperature Data For Big Falls Flowage 2005 - 2012

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2005.

Date: 4/19/2005
Secchi Disk (ft.): 5.5
Depth of Bottom Sample: 11 m
Weather Conditions: partly cloudy, S wind, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	15.4	10.1
2.0	15.2	10.2
4.0	14.9	10.2
6.0	14.8	10.2
8.0	14.8	10.2
10.0	14.8	10.2
12.0	14.8	10.2
14.0	14.8	10.2
16.0	14.8	10.2
18.0	14.7	10.1
20.0	14.6	10.1
22.0	14.7	9.8
24.0	14.8	9.9
26.0	14.7	10.0
28.0	14.7	10.0
30.0	14.7	10.0
32.0	14.6	10.0
34.0	14.6	10.0
36.0	14.6	10.0
38.0	14.5	9.9
40.0	14.3	9.6

Date: 7/25/2005
Secchi Disk (ft.): 4
Depth of Bottom Sample: 12.5 m
Weather Conditions: cloudy, S wind, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	26.5	6.3
2.0	26.4	6.2
4.0	26.2	6.0
6.0	26.1	5.9
8.0	26.1	5.9
10.0	26.0	5.7
12.0	25.9	5.9
14.0	25.7	5.6
16.0	25.5	5.3
18.0	25.4	5.0
20.0	25.2	5.2
22.0	25.1	5.0
24.0	25.1	5.0
26.0	25.1	5.1
28.0	25.1	5.2
30.0	25.0	5.5
32.0	24.9	5.3
34.0	24.9	5.1
36.0	24.8	4.2
38.0	22.4	0.2

Date: 8/31/2005
Secchi Disk (ft.): 7
Depth of Bottom Sample: 37 ft.
Weather Conditions: Mostly sunny, 65 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	21.6	8.2
2.0	21.5	8.2
4.0	21.3	8.3
6.0	21.2	8.1
8.0	21.1	8.0
10.0	21.1	8.0
12.0	21.0	8.0
14.0	21.0	8.0
16.0	21.0	8.0
18.0	20.9	8.0
20.0	20.9	7.9
22.0	20.9	7.7
24.0	20.8	7.5
26.0	20.8	7.4
28.0	20.6	6.9
30.0	20.5	6.7
32.0	20.5	6.6
34.0	20.5	6.5
36.0	20.5	6.4
38.0	20.5	2.3

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2006.

Date: 4/26/2006
Secchi Disk (ft.): 4
Depth of Bottom Sample: 13 m
Weather Conditions: sunny, west wind @ 10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	12.4	9.9
2.0	12.1	10.0
4.0	12.0	10.0
6.0	12.0	10.0
8.0	11.9	10.0
10.0	11.3	10.0
12.0	11.2	10.2
14.0	11.2	10.2
16.0	11.2	10.2
18.0	11.1	10.1
20.0	11.1	10.0
22.0	11.1	9.8
24.0	11.1	9.8
26.0	11.0	9.9
28.0	11.0	9.9
30.0	11.0	9.9
32.0	11.0	9.9
34.0	11.0	9.9
36.0	11.0	9.9
38.0	11.0	9.9
40.0	Bottom	Bottom

Date: 7/24/2006
Secchi Disk (ft.): 6
Depth of Bottom Sample: 15 m
Weather Conditions: Partly cloudy, south wind at 10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.9	7.6
2.0	25.4	7.5
4.0	25.2	7.3
6.0	25.1	7.2
8.0	25.0	6.9
10.0	24.9	6.8
12.0	24.8	6.4
14.0	24.7	6.1
16.0	24.5	5.8
18.0	24.5	5.6
20.0	24.2	6.1
22.0	24.0	6.4
24.0	24.0	6.4
26.0	23.9	6.3
28.0	23.8	6.3
30.0	23.8	6.2
32.0	23.8	5.9
34.0	23.7	5.5
36.0	21.8	0.6
38.0	Bottom	Bottom
40.0		

Date: 8/23/2006
Secchi Disk (ft.): 5
Depth of Bottom Sample: 38 ft.
Weather Conditions: Cloudy, south wind @ 5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	23.3	8.3
2.0	23.3	8.3
4.0	23.1	8.2
6.0	23.1	8.1
8.0	23.1	8.1
10.0	23.1	8.1
12.0	23.1	8.0
14.0	23.0	7.9
16.0	22.9	7.5
18.0	22.8	7.1
20.0	22.7	7.0
22.0	22.7	7.0
24.0	22.5	6.8
26.0	22.3	6.3
28.0	22.2	6.0
30.0	22.1	5.8
32.0	22.1	5.8
34.0	22.0	5.6
36.0	22.0	5.3
38.0	22.0	5.1
40.0	Bottom	Bottom

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Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2007.

Date: 4/30/2007
Secchi Disk (ft.): 4
Depth of Bottom Sample: 12 m
Weather Conditions: Partly cloudy, light wind

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	15.8	9.40
2.0	15.8	9.59
4.0	15.7	9.74
6.0	15.5	9.82
8.0	15.4	9.76
10.0	15.4	9.74
12.0	15.4	9.66
14.0	15.3	9.54
16.0	15.2	9.47
18.0	15.2	9.39
20.0	15.2	9.35
22.0	15.2	9.33
24.0	15.2	9.28
26.0	15.2	9.23
28.0	15.2	9.08
30.0	15.2	9.05
32.0	14.8	8.99
34.0	13.9	8.85
36.0	12.9	8.75
38.0	Bottom	Bottom
40.0		

Date: 7/31/2007
Secchi Disk (ft.): 7
Depth of Bottom Sample: 12 m
Weather Conditions: Mostly sunny, south wind at 5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	28.1	7.43
2.0	27.8	7.46
4.0	27.4	7.41
6.0	27.3	7.30
8.0	27.2	7.28
10.0	27.1	6.82
12.0	27.0	6.68
14.0	26.9	6.47
16.0	26.8	6.26
18.0	26.8	6.08
20.0	26.6	5.45
22.0	26.4	5.18
24.0	26.3	5.15
26.0	26.0	4.85
28.0	25.8	4.78
30.0	25.5	4.27
32.0	25.4	4.00
34.0	24.0	0.43
36.0	Bottom	Bottom
38.0		
40.0		

Date: 8/29/2007
Secchi Disk (ft.): 6
Depth of Bottom Sample: 12 m
Weather Conditions: Mostly sunny N wind @ 10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface		
2.0		
4.0		
6.0	DO/Temperature profile was not taken due to equipment problems	
8.0		
10.0		
12.0		
14.0		
16.0		
18.0		
20.0		
22.0		
24.0		
26.0		
28.0		
30.0		
32.0		
34.0		
36.0		
38.0		
40.0		

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Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2008.

Date: 4/30/2008
Secchi Disk (ft.): 4.5
Depth of Bottom Sample: 11 m
Weather Conditions: 50 F, sunny, south wind @ 10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	5.8	11.8
2.0	5.9	11.8
4.0	5.7	11.9
6.0	5.7	11.9
8.0	5.7	11.9
10.0	5.7	11.9
12.0	5.7	11.9
14.0	5.7	11.9
16.0	5.7	11.9
18.0	5.7	11.9
20.0	5.7	11.9
22.0	5.7	11.9
24.0	5.7	11.9
26.0	5.7	11.9
28.0	5.7	11.9
30.0	5.7	11.9
32.0	5.7	11.9
34.0	5.7	11.8
36.0	5.7	11.8
38.0	5.7	6.0
40.0	Bottom	Bottom

Date: 7/23/2008
Secchi Disk (ft.): 5.5
Depth of Bottom Sample: 10 m
Weather Conditions: 73 F, sunny, south wind @ 5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.7	7.60
2.0	24.4	7.58
4.0	24.2	7.58
6.0	24.1	7.50
8.0	24.0	7.36
10.0	23.9	7.31
12.0	23.8	7.27
14.0	23.7	7.27
16.0	23.7	7.19
18.0	23.7	7.09
20.0	23.5	6.95
22.0	23.5	6.84
24.0	23.5	6.75
26.0	23.3	6.06
28.0	23.3	6.05
30.0	23.2	5.61
32.0	23.1	5.34
34.0	23.1	4.82
36.0	Bottom	Bottom

Date: 8/26/2008
Secchi Disk (ft.): 5.5
Depth of Bottom Sample: 11 m
Weather Conditions: 71 F, sunny, southeast wind 5-10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.7	7.04
2.0	22.5	6.95
4.0	22.3	6.91
6.0	22.3	6.77
8.0	22.3	6.31
10.0	22.2	6.39
12.0	21.9	6.71
14.0	21.8	6.82
16.0	21.8	6.93
18.0	21.7	6.91
20.0	21.7	6.80
22.0	21.6	6.80
24.0	21.6	6.82
26.0	21.6	6.91
28.0	21.6	6.91
30.0	21.5	6.82
32.0	21.5	6.81
34.0	21.4	6.83
36.0	21.4	6.71
38.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2009.

Date: 4/28/2009
Secchi Disk (ft.): 5.0
Depth of Bottom Sample (ft) 38
Weather Conditions: mostly sunny, wind NE @ 10
Temperature (F): 51

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	9.4	10.65
2.0	9.4	10.65
4.0	9.4	10.64
6.0	9.3	10.64
8.0	9.3	10.64
10.0	9.3	10.63
12.0	9.3	10.62
14.0	9.2	10.62
16.0	9.2	10.61
18.0	9.2	10.61
20.0	9.2	10.60
22.0	9.2	10.60
24.0	9.2	10.59
26.0	9.2	10.58
28.0	9.2	10.57
30.0	9.2	10.57
32.0	9.2	10.56
34.0	9.2	10.56
36.0	9.2	10.54
38.0	9.2	10.14
40.0	Bottom	Bottom

Date: 7/28/2009
Secchi Disk (ft.): 6.5
Depth of Bottom Sample (ft) 36
Weather Conditions: partly sunny, wind W @ 15
Temperature (F): 66

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.7	7.86
2.0	22.8	7.82
4.0	22.7	7.81
6.0	22.7	7.79
8.0	22.7	7.79
10.0	22.7	7.75
12.0	22.5	7.55
14.0	22.4	7.03
16.0	22.3	6.59
18.0	22.1	6.22
20.0	22.0	6.07
22.0	21.7	5.95
24.0	21.6	5.91
26.0	21.6	5.69
28.0	21.4	5.41
30.0	21.3	5.20
32.0	21.2	4.58
34.0	20.3	2.52
36.0	Bottom	Bottom

Date: 8/24/2009
Secchi Disk (ft.): 6.5
Depth of Bottom Sample: 36
Weather Conditions: sunny, wind S @ 10
Temperature (F): 80

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	21.0	8.61
2.0	20.8	8.70
4.0	20.0	8.55
6.0	19.9	8.38
8.0	19.7	7.69
10.0	19.5	7.26
12.0	19.3	7.29
14.0	19.2	7.51
16.0	19.0	7.71
18.0	18.8	8.33
20.0	18.7	8.19
22.0	18.7	8.22
24.0	18.7	8.19
26.0	18.7	8.17
28.0	18.5	7.95
30.0	18.5	7.93
32.0	18.5	7.92
34.0	18.5	7.84
36.0	18.4	7.48
38.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2010.

Date: 4/28/2010
Secchi Disk (ft.): 5.0
Depth of Bottom Sample (ft) 36
Weather Conditions: mostly sunny, light winds
Temperature (F): 50

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	14.8	10.79
2.0	14.2	10.52
4.0	14.1	10.41
6.0	14.0	10.23
8.0	14.0	10.10
10.0	13.9	10.04
12.0	13.8	9.94
14.0	13.8	9.87
16.0	13.7	9.85
18.0	13.4	9.70
20.0	13.2	9.63
22.0	13.1	9.52
24.0	13.1	9.57
26.0	13.0	9.53
28.0	13.0	9.44
30.0	13.0	9.33
32.0	13.0	9.20
34.0	13.0	9.19
36.0	12.9	9.12
38.0	Bottom	Bottom

Date: 7/27/2010
Secchi Disk (ft.): 3.0
Depth of Bottom Sample (ft) 36
Weather Conditions: cloudy, S wind @ 7
Temperature (F): 75

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.7	6.44
2.0	24.7	6.29
4.0	24.6	6.35
6.0	24.6	6.26
8.0	24.6	6.49
10.0	24.6	6.34
12.0	24.6	6.27
14.0	24.6	6.34
16.0	24.6	6.26
18.0	24.4	6.21
20.0	24.4	6.22
22.0	24.4	6.20
24.0	24.2	6.21
26.0	24.1	6.17
28.0	23.9	6.13
30.0	23.8	6.06
32.0	23.6	6.02
34.0	23.5	5.95
36.0	23.4	5.7
38.0	Bottom	Bottom

Date: 8/31/2010
Secchi Disk (ft.): 3.0
Depth of Bottom Sample: 36
Weather Conditions: partly cloudy, S wind @ 10
Temperature (F): 79

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.2	6.70
2.0	24.2	6.68
4.0	24.2	6.68
6.0	24.2	6.67
8.0	24.2	6.66
10.0	24.2	6.66
12.0	24.2	6.66
14.0	24.2	6.66
16.0	24.1	6.63
18.0	24.0	6.60
20.0	24.0	6.59
22.0	24.0	6.60
24.0	24.0	6.60
26.0	24.0	6.58
28.0	24.0	6.60
30.0	24.0	6.59
32.0	23.9	6.59
34.0	23.9	6.55
36.0	23.8	6.34
38.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2011.

Date: 4/29/2011
Secchi Disk (ft.):
Depth of Bottom Sample (ft):
Weather Conditions: mostly sunny, light winds
Temperature (F):

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface		

Not Sampled Due To Reservoir Drawdown

Bottom		Bottom

Date: 7/26/2011
Secchi Disk (ft.): 4.0
Depth of Bottom Sample (ft) 36
Weather Conditions: mostly sunny, light winds
Temperature (F): 76

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.8	6.58
2.0	25.8	6.56
4.0	25.6	6.66
6.0	25.2	6.56
8.0	25.2	6.59
10.0	25.2	6.58
12.0	25.2	6.53
14.0	25.1	6.52
16.0	24.9	6.38
18.0	24.5	6.32
20.0	24.5	6.32
22.0	24.3	6.29
24.0	24.3	6.33
26.0	24.2	6.27
28.0	24.1	6.31
30.0	24.1	6.25
32.0	24.1	6.20
34.0	24.1	6.18
36.0	24.1	6.11
38.0	Bottom	Bottom

Date: 8/24/2011
Secchi Disk (ft.): 3.0
Depth of Bottom Sample: 36
Weather Conditions: sunny, wind NW @ 10-15
Temperature (F): 72

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.3	7.51
2.0	22.3	7.52
4.0	22.3	7.53
6.0	22.2	7.54
8.0	22.1	7.60
10.0	22.0	7.59
12.0	21.9	7.46
14.0	21.8	7.45
16.0	21.7	7.52
18.0	21.6	7.49
20.0	21.6	7.55
22.0	21.6	7.52
24.0	21.5	7.55
26.0	21.5	7.53
28.0	21.5	7.56
30.0	21.5	7.58
32.0	21.5	7.57
34.0	21.5	7.56
36.0	21.5	7.52
38.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2012.

Date: 4/24/2012
Secchi Disk (ft.): 4.0
Depth of Bottom Sample (ft) 32
Weather Conditions: mostly sunny, light winds
Temperature (F): 58

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	11.9	10.90
2.0	11.7	10.94
4.0	11.2	10.91
6.0	11.2	10.91
8.0	11.1	10.88
10.0	11.1	10.87
12.0	11.1	10.85
14.0	11.0	10.83
16.0	11.0	10.81
18.0	11.0	10.81
20.0	11.0	10.77
22.0	11.0	10.73
24.0	11.0	10.72
26.0	11.0	10.72
28.0	11.0	10.72
30.0	11.0	10.72
32.0	11.0	10.71
34.0	*Low battery*	*Low battery*
36.0	*Low battery*	*Low battery*

Date: 7/23/2012
Secchi Disk (ft.): 4.0
Depth of Bottom Sample (ft) 34
Weather Conditions: mostly sunny, NW wind @ 1
Temperature (F): 82

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	27.2	7.68
2.0	27.1	7.68
4.0	27.1	7.70
6.0	26.9	7.73
8.0	26.6	7.50
10.0	26.3	7.32
12.0	26.2	7.33
14.0	26.0	6.95
16.0	25.8	6.89
18.0	25.5	6.55
20.0	25.2	6.28
22.0	25.1	6.02
24.0	25.0	5.98
26.0	24.9	5.77
28.0	24.7	5.51
30.0	24.6	5.26
32.0	24.4	4.91
34.0	24.3	4.28
36.0	Bottom	Bottom

Date: 8/28/2012
Secchi Disk (ft.): 5.5
Depth of Bottom Sample: 34
Weather Conditions: sunny, light winds
Temperature (F): 65

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.4	8.15
2.0	24.3	8.14
4.0	24.3	8.10
6.0	24.3	8.04
8.0	24.3	8.16
10.0	24.2	7.82
12.0	23.7	7.38
14.0	23.5	7.15
16.0	23.4	6.85
18.0	23.4	6.75
20.0	23.4	6.64
22.0	23.3	6.44
24.0	23.2	6.23
26.0	23.0	5.84
28.0	22.7	5.38
30.0	22.6	5.25
32.0	22.2	4.62
34.0	20.8	3.82
36.0	Bottom	Bottom

APPENDIX D

Summary Of Dissolved Oxygen And Temperature Data For Thornapple Flowage 2005 - 2012

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2005.

Date:	4/19/2005
Secchi Disk (ft.):	5
Depth of Bottom Sample:	6 m
Weather Conditions:	cloudy, S wind, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	10.2	10.7
2.0	10.2	10.7
4.0	10.1	10.8
6.0	10.1	10.8
8.0	10.1	10.8
10.0	10.0	10.8
12.0	9.9	10.8
14.0	9.8	10.8
16.0	9.8	10.8
18.0	9.8	10.8
20.0	9.8	10.8

Date:	7/25/2005
Secchi Disk (ft.):	4
Depth of Bottom Sample:	6 m
Weather Conditions:	cloudy, S wind, 82 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.4	7.4
2.0	25.0	7.0
4.0	24.7	6.7
6.0	24.5	6.4
8.0	24.4	6.0
10.0	23.8	5.2
12.0	23.5	5.3
14.0	23.3	4.8
16.0	23.2	4.6
18.0	22.3	0.8
20.0		

Date:	8/31/2005
Secchi Disk (ft.):	5.5
Depth of Bottom Sample:	6 m
Weather Conditions:	sunny, S wind, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.4	8.1
2.0	21.9	7.9
4.0	21.5	7.7
6.0	21.4	7.4
8.0	21.3	7.4
10.0	21.3	7.4
12.0	21.3	7.3
14.0	21.2	7.3
16.0	21.2	7.2
18.0	21.2	7.2
20.0	21.2	7.1

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2006.

Date:	4/26/2006
Secchi Disk (ft.):	4
Depth of Bottom Sample:	6 m
Weather Conditions:	sunny, W wind @15 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	13.9	10.1
2.0	13.9	10.2
4.0	13.7	10.2
6.0	13.3	10.1
8.0	13.0	10.0
10.0	12.4	9.9
12.0	12.3	9.8
14.0	12.3	9.7
16.0	12.3	9.7
18.0	12.3	9.7
20.0	12.3	9.5
22.0	Bottom	Bottom

Date:	7/24/2006
Secchi Disk (ft.):	6
Depth of Bottom Sample:	5 m
Weather Conditions:	Mostly sunny, S wind@10mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.1	7.6
2.0	24.6	7.4
4.0	24.3	7.2
6.0	24.0	6.8
8.0	23.8	6.7
10.0	23.6	6.4
12.0	23.5	6.2
14.0	22.8	5.0
16.0	19.7	0.3
18.0	Bottom	Bottom

Date:	8/23/2006
Secchi Disk (ft.):	4
Depth of Bottom Sample:	6 m
Weather Conditions:	cloudy, S wind@5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.3	9.6
2.0	24.1	9.4
4.0	23.6	8.6
6.0	23.3	7.9
8.0	23.3	7.8
10.0	23.2	7.6
12.0	23.2	7.4
14.0	23.1	7.0
16.0	23.0	6.7
18.0	22.9	5.6
20.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2007.

Date:	4/30/2007
Secchi Disk (ft.):	5
Depth of Bottom Sample:	6 m
Weather Conditions:	cloudy, S wind @10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	15.3	11.26
2.0	14.7	11.27
4.0	14.4	11.33
6.0	14.3	11.32
8.0	14.3	11.28
10.0	14.1	11.28
12.0	14.0	11.20
14.0	13.9	11.13
16.0	13.8	10.90
18.0	13.1	10.43
20.0	Bottom	Bottom
22.0		

Date:	7/31/2007
Secchi Disk (ft.):	5
Depth of Bottom Sample:	6 m
Weather Conditions:	Mostly sunny, S wind @ 5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	27.1	8.50
2.0	26.7	8.31
4.0	25.9	7.54
6.0	25.8	7.35
8.0	25.8	7.27
10.0	25.7	7.22
12.0	25.7	7.04
14.0	25.5	6.81
16.0	25.5	6.79
18.0	25.1	6.27
20.0	24.7	5.78
22.0	Bottom	Bottom

Date:	8/29/2007
Secchi Disk (ft.):	5
Depth of Bottom Sample:	6 m
Weather Conditions:	Mostly sunny, S wind @ 5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface		
2.0	DO/Temperatures profiles were not taken due to equipment malfunction	
4.0		
6.0		
8.0		
10.0		
12.0		
14.0		
16.0		
18.0		
20.0		

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2008.

Date:	4/30/2008
Secchi Disk (ft.):	4
Depth of Bottom Sample:	NA
Weather Conditions:	55 F, sunny, south wind @ 10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface		
2.0		
4.0		
6.0	DO/temperature profile not taken due to problems with DO meter	
8.0		
10.0		
12.0		
14.0		
16.0		
18.0		
20.0		

Date:	7/23/2008
Secchi Disk (ft.):	5
Depth of Bottom Sample:	5.5 m
Weather Conditions:	78 F, partly cloudy, south wind @ 5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.1	7.56
2.0	24.7	7.43
4.0	24.2	7.27
6.0	23.5	6.95
8.0	23.1	6.70
10.0	23.1	6.70
12.0	22.9	6.46
14.0	22.4	5.48
16.0	21.8	4.36
18.0	21.6	4.12
20.0	Bottom	Bottom

Date:	8/26/2008
Secchi Disk (ft.):	5
Depth of Bottom Sample:	5 m
Weather Conditions:	76 F, sunny, southeast wind @ 5-10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.3	9.64
2.0	22.0	9.46
4.0	21.8	9.25
6.0	21.6	8.99
8.0	21.5	8.82
10.0	21.4	8.73
12.0	21.4	8.70
14.0	21.3	8.65
16.0	21.3	8.62
18.0	21.3	8.60
20.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2009.

Date:	4/28/2009
Secchi Disk (ft.):	5.5
Depth of Bottom Sample (ft):	20
Weather Conditions:	mostly sunny, wind NE @ 10
Temperature (F):	57

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	8.3	10.90
2.0	8.3	10.95
4.0	8.2	10.96
6.0	8.2	10.93
8.0	8.2	10.93
10.0	8.2	10.94
12.0	8.2	10.92
14.0	8.2	10.91
16.0	8.2	10.90
18.0	8.1	10.90
20.0	8.1	10.86
22.0	Bottom	Bottom

Date:	7/28/2009
Secchi Disk (ft.):	7
Depth of Bottom Sample (ft)	18
Weather Conditions:	cloudy, wind W @ 5
Temperature (F):	67

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.4	8.65
2.0	22.3	8.42
4.0	21.8	7.18
6.0	21.4	6.78
8.0	21.1	6.16
10.0	21.0	5.97
12.0	20.7	6.16
14.0	18.1	3.71
16.0	17.0	1.45
18.0	15.7	0.00
20.0	Bottom	Bottom

Date:	8/24/2009
Secchi Disk (ft.):	6.5
Depth of Bottom Sample (ft)	18
Weather Conditions:	sunny, wind S @ 10-15
Temperature (F):	77

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	21.1	9.95
2.0	20.9	9.79
4.0	20.6	9.41
6.0	20.1	8.76
8.0	19.7	8.68
10.0	19.6	8.86
12.0	19.5	8.27
14.0	19.2	6.89
16.0	19.1	6.65
18.0	18.6	5.23
20.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2010.

Date:	4/28/2010
Secchi Disk (ft.):	5.0
Depth of Bottom Sample (ft):	20
Weather Conditions:	p. cloudy, S winds 5-10
Temperature (F):	59

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	13.8	11.90
2.0	13.7	11.74
4.0	12.6	11.83
6.0	12.4	11.70
8.0	12.3	12.02
10.0	12.2	12.01
12.0	11.8	10.50
14.0	11.5	10.63
16.0	11.2	10.44
18.0	11.2	10.37
20.0	11.2	10.25

Date:	7/27/2010
Secchi Disk (ft.):	3
Depth of Bottom Sample (ft)	20
Weather Conditions:	p. cloudy, S wind @ 5
Temperature (F):	84

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.4	4.46
2.0	25.0	4.44
4.0	24.6	4.37
6.0	24.5	4.38
8.0	24.5	4.37
10.0	24.5	4.30
12.0	24.3	4.23
14.0	24.3	4.23
16.0	24.2	4.35
18.0	24.2	4.37
20.0	24.2	4.3
22.0	Bottom	Bottom

Date:	8/31/2010
Secchi Disk (ft.):	3
Depth of Bottom Sample (ft)	20
Weather Conditions:	cloudy, S wind @ 10
Temperature (F):	81

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	23.0	5.82
2.0	22.8	5.75
4.0	22.8	5.74
6.0	22.7	5.71
8.0	22.6	5.71
10.0	22.6	5.71
12.0	22.6	5.71
14.0	22.6	5.71
16.0	22.6	5.70
18.0	22.6	5.70
20.0	22.6	5.7
22.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2011.

Date:	4/29/2011
Secchi Disk (ft.):	3.5
Depth of Bottom Sample (ft):	22
Weather Conditions:	sunny, wind S @ 5-10
Temperature (F):	45

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	6.9	12.5
2.0	6.8	12.4
4.0	6.8	12.4
6.0	6.8	12.4
8.0	6.8	12.4
10.0	6.8	12.4
12.0	6.8	12.4
14.0	6.8	12.3
16.0	6.8	12.3
18.0	6.8	12.3
20.0	6.8	12.3
22.0	6.8	12.3
24.0	Bottom	Bottom

Date:	7/26/2011
Secchi Disk (ft.):	4.5
Depth of Bottom Sample (ft)	20
Weather Conditions:	sunny, light winds
Temperature (F):	80

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	26.4	6.56
2.0	26.3	6.54
4.0	25.9	6.54
6.0	25.6	6.47
8.0	25.7	6.46
10.0	25.5	6.45
12.0	25.4	6.41
14.0	24.6	6.14
16.0	24.2	5.76
18.0	24.2	5.68
20.0	23.7	5.00
22.0	Bottom	Bottom

Date:	8/24/2011
Secchi Disk (ft.):	3
Depth of Bottom Sample (ft)	20
Weather Conditions:	sunny, NW wind 15-20
Temperature (F):	78

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	23.7	6.52
2.0	23.7	6.50
4.0	23.0	6.36
6.0	22.7	6.26
8.0	22.7	6.23
10.0	22.6	6.16
12.0	22.5	6.08
14.0	22.3	5.94
16.0	22.1	5.73
18.0	22.0	5.60
20.0	22.0	5.60
22.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2012.

Date:	4/24/2012
Secchi Disk (ft.):	4.0
Depth of Bottom Sample (ft):	20
Weather Conditions:	sunny, light NW winds
Temperature (F):	67

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	15.4	10.99
2.0	13.2	11.22
4.0	12.8	11.25
6.0	12.4	11.27
8.0	12.1	11.24
10.0	11.9	11.10
12.0	11.9	11.06
14.0	11.7	11.04
16.0	11.6	10.97
18.0	11.6	10.95
20.0	11.6	10.92
22.0	Bottom	Bottom

Date:	7/23/2012
Secchi Disk (ft.):	3.5
Depth of Bottom Sample (ft)	18
Weather Conditions:	sunny, winds W @ 5-10
Temperature (F):	85

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	30.6	8.45
2.0	28.3	7.66
4.0	27.4	7.03
6.0	26.8	6.30
8.0	26.5	6.04
10.0	26.3	5.70
12.0	25.6	4.99
14.0	25.2	4.88
16.0	24.6	4.08
18.0	24.2	3.08
20.0	Bottom	Bottom

Date:	8/28/2012
Secchi Disk (ft.):	5.5
Depth of Bottom Sample (ft)	18
Weather Conditions:	overcast, calm
Temperature (F):	78

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	23.6	8.37
2.0	23.3	7.98
4.0	23.7	7.83
6.0	23.1	7.72
8.0	23.1	7.84
10.0	23.1	7.68
12.0	23.0	7.16
14.0	22.8	6.57
16.0	22.6	6.22
18.0	22.0	3.31
20.0	Bottom	Bottom

APPENDIX E

Agency Correspondence

Xcel Energy®
RESPONSIBLE BY NATURE™

1414 West Hamilton Avenue
P.O. Box 8
Eau Claire, WI 54702-0008

October 31, 2012

Mr. Jeff Scheirer
Wisconsin DNR
875 South 4th Avenue
Park Falls, WI 54552

Subject: 2012 Water Quality Monitoring Report For Big Falls Flowage (P-2390-01), Thornapple Flowage (P-2475) And Turtle-Flambeau Flowage (P-2390-02).

Dear Mr. Scheirer:

Enclosed are the results of the water quality sampling for Big Falls and Thornapple flowages that Northern States Power Company – Wisconsin (NSPW) conducted during the 2012 field season. The samples were taken after ice-out and in late July and August. The samples were acquired from the deepest point of the reservoirs immediately upstream from the boat restraining barriers. The results are summarized for the past eight years and while there appears to be some variability in the parameters analyzed, for the most part, the results have been relatively consistent.

In order to reduce unnecessary paperwork, we will no longer be submitting the water quality monitoring results for the Turtle Flambeau Reservoir. This was agreed upon via electronic mail between Xcel Energy and Ms. Cheryl Laatsch (WDNR) on October 24, 2012. Prior to submitting this report and for each subsequent report, Xcel Energy will verify that the monitoring results for the Turtle Flambeau Reservoir are available on the WDNR's website.

Please provide me with any comments that you might have by December 5, 2012. Should you have any questions concerning this report, you may contact me by telephone at (715) 737-1353 or by electronic mail at matthew.j.miller@xcelenergy.com.

Sincerely,

Matthew J. Miller
Hydro Licensing Specialist

Enclosure: 2012 Water Quality Monitoring Report

c: Nick Utrup – USFWS
Cheryl Laatsch – WDNR (via e-mail)
Project Files

Xcel Energy®
RESPONSIBLE BY NATURE™

1414 West Hamilton Avenue
P.O. Box 8
Eau Claire, WI 54702-0008

October 31, 2012

Mr. Nick Utrup
U.S. Fish & Wildlife Service
2661 Scott Tower Drive
New Franken, WI 54229

Subject: 2012 Water Quality Monitoring Report For Big Falls Flowage (P-2390-01), Thornapple Flowage (P-2475) And Turtle-Flambeau Flowage (P-2390-02).

Dear Mr. Utrup:

Enclosed are the results of the water quality sampling for Big Falls and Thornapple flowages that Northern States Power Company – Wisconsin (NSPW) conducted during the 2012 field season. The samples were taken after ice-out and in late July and August. The samples were acquired from the deepest point of the reservoirs immediately upstream from the boat restraining barriers. The results are summarized for the past eight years and while there appears to be some variability in the parameters analyzed, for the most part, the results have been relatively consistent.

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Sincerely,

Matthew J. Miller

Matthew J. Miller
Hydro Licensing Specialist

Enclosure: 2012 Water Quality Monitoring Report

c: Jeff Scheirer - WDNR
Cheryl Laatsch – WDNR (via e-mail)
Project Files

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