Renewable World Energies

February 26, 2018

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

RE: Flambeau Hydroelectric Projects
FERC Project Number 2640 FERC Project Number 2421
FERC Project Number 2395 FERC Project Number 2473
Flambeau Hydro LLC
Final Report 2017 Water Quality Monitoring Data

Dear Ms. Bose:

On behalf of Flambeau Hydro LLC, "Flambeau" (Licensee), Renewable World Energies, LLC (RWE) is submitting a copy of the Final Report 2017 Water Quality Monitoring Data for each of the (4) Flambeau Hydroelectric Projects (Flambeau Upper, Flambeau Lower, Flambeau Pixley, and Flambeau Crowley). The report is a requirement of Flambeau's Federal license pursuant to articles 406 and 408 and the approved Water Quality Monitoring Plans for each. 2017 was the fourteenth year monitoring was conducted since the license was issued, but is the 6th year of submittal by RWE on the behalf of the Licensee.
Monitoring was conducted on April 13, July 20, and August 16, 2017. No issues were encountered during the 2017 monitoring season. All data has been given to the DNR to be entered into the SWIMS Data Base. The draft reports were sent to the agencies by attachment to an email dated November 16, 2017 for review and comment. No comments have been received as of the date of this letter. The next scheduled monitoring event will be conducted in 2018.

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If you have any questions concerning this submittal, please contact Brian Kreuscher at the Renewable World Energies, LLC offices @ 855-994-9376 Ext 230. He can also be reached by e-mail at bkreuscher@rwehydro.com.

Sincerely,
Renewable World Energies, LLC
Agent for Licensee

Mr. Jason Kreuscher
Vice President, Operations

Attachments: Flambeau Upper Final Rpt 2017 W Q Mon Data
Flambeau Lower Final Rpt 2017 W Q Mon Data
Flambeau Pixley Final Rpt 2017 W Q Mon Data
Flambeau Crowley Final Rpt 2017 W Q Mon Data
Correspondence

Cc: Ms. Cheryl Laatsch, WDNR
Mr. Nick Utrup, USFWS
RWE, Corporate

Final Report

2017 Water Quality Monitoring Data

For the

Flambeau (Upper) Hydroelectric Project

FERC Project #2640

Flambeau Hydro, LLC

North Fork of the Flambeau River, Price County, Wisconsin

Respectfully Submitted by:

Angie Stine

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903

Phone: 906-822-7889

Summary Flambeau (Upper) Hydroelectric Project – FERC #2640

2017 marked the fourteenth year of water quality sampling under FERC approved "Water Quality Monitoring Plan Per License Article 406 for the Flambeau (Upper) Hydroelectric Project – FERC Project # 2640 – Flambeau Hydro, LLC. Monitoring was conducted on April 13, July 20, and August 16, 2017. This document contains all of the associated records for the 2017 monitoring along with summary figures and tables in four appendices: (1) Appendix A (Figures 1-4), (2) Appendix B (Tables 1-3), (3) Appendix C (sampling logs by date), and (4) Appendix D (laboratory reports and chains of custody).

A map of the Flambeau (Upper) Hydroelectric Project is shown in Figure 1 indicating the water quality sampling location.

Monitoring results for 2017 are shown in Table 1. No unusual Temperature (Figure 2) or Dissolved Oxygen (Figure 3) readings were observed. The Secchi depths are shown in Figure 4.

In general, the weather (temperature and rainfall) during 2017 monitoring season appeared slightly warmer in May, June, and July, & August, with lower than normal precipitation in October, March, and September, and normal to high precipitation in the months of April, May, July, July, and August (Table 2).

Ice-Out occurred between Agenda and Nine Mile Landing on the North Fork of the Flambeau River sometime during the week beginning April 3, 2017. The Ice-Out sampling event occurred on April 13, 2017. River flow, based on the Flambeau (Upper) Hydroelectric Project records was approximately 605 cubic feet per second. Sampling occurred between 8:04 a.m. and 8:20 a.m. Samples were taken without incident. No unusual D.O. or Temperature readings were observed. Samples for laboratory analysis were delivered to White Water Associates, Inc. laboratory in Amasa, MI on April 13, 2017. White Water Associates, Inc. issued a laboratory report on April 27, 2017. No unusual levels of Chlorophyll *a*, True Color, or Total Phosphorus were noted in the laboratory reports.

River flow, based on Flambeau (Upper) Hydroelectric Project records, was approximately 797 cubic feet per second during the July 20, 2017 sampling event. Sampling occurred between 7:45 a.m. and 7:55 a.m. Samples were taken without incident. No unusual Temperature or D.O. readings were observed. Samples for laboratory analysis were delivered to White Water Associates, Inc. laboratory in Amasa, MI on July 20, 2017. White Water Associates, Inc. issued a laboratory report on September 21, 2017. No unusual levels of Chlorophyll *a*, True Color, or Total Phosphorus were noted in the laboratory reports.

River flow, based on Flambeau (Upper) Hydroelectric Project records, was approximately 503 cubic feet per second during the August 16, 2017 sampling event. Sampling occurred between 7:45 a.m. and 8:56 a.m. Samples were taken without incident. No unusual D.O. or Temperature readings were observed. Samples for laboratory analysis were delivered to White Water Associates, Inc. laboratory in Amasa, MI on August 16, 2017. White Water Associates, Inc. issued a laboratory report on September 14, 2017. No unusual levels of Chlorophyll *a*, True Color, or Total Phosphorus were noted in the laboratory reports.

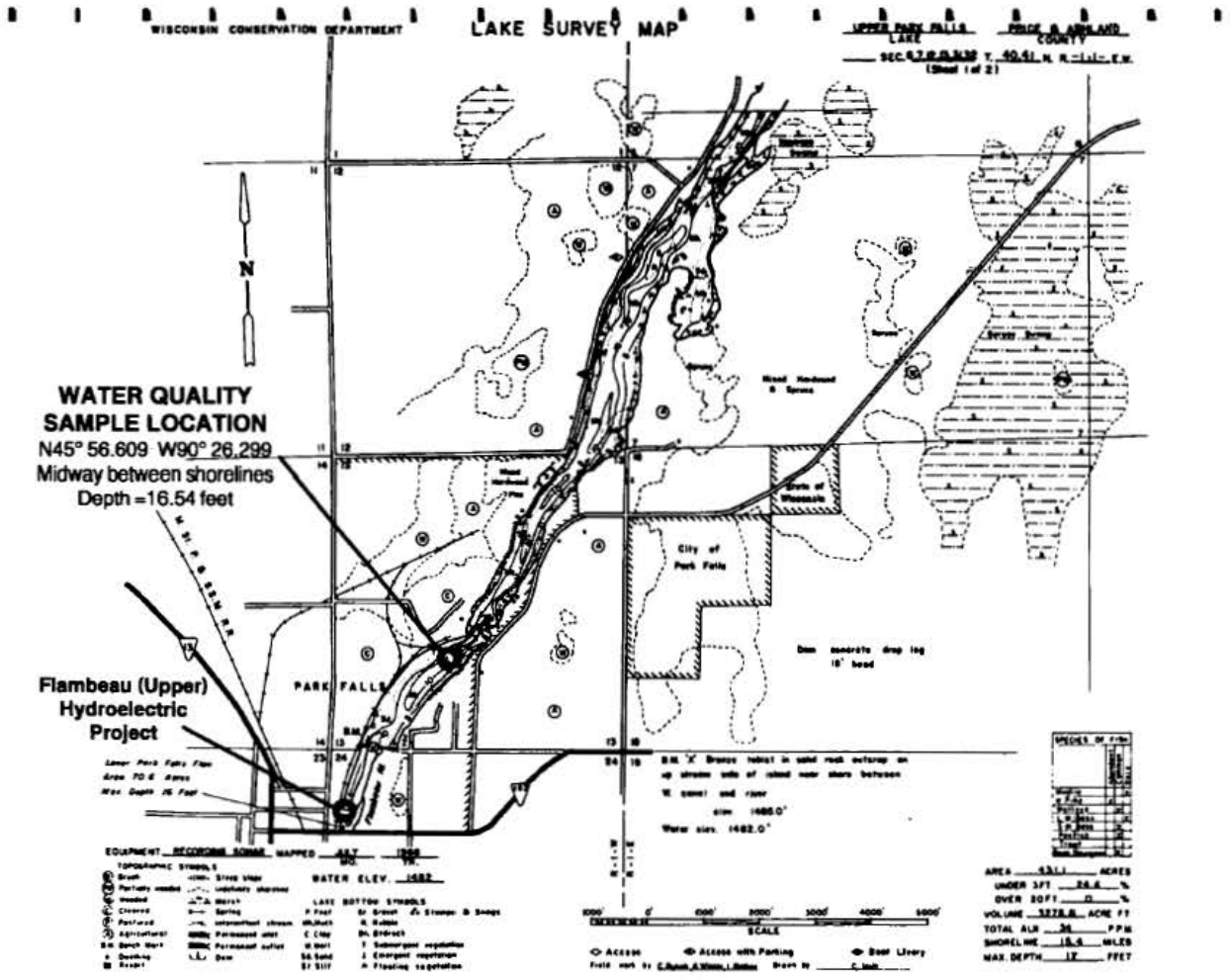
A summary of a comparison between the 2011 thru 2017 (Table 3) sampling results are as follows:

1. Water Clarity – Secchi increased Ice Out & July and decreased in August
2. Chlorophyll a – Increased Ice Out, decreased July and August
3. Color – Decreased July and stayed the same for Ice Out and August
4. Total Phosphorus – Decreased Ice Out and August and increased July
5. Overall, D.O. – Decreased Ice Out and July and increased in August
6. Water Temperatures – Increased Ice Out and July and decreased August

The next scheduled Water Quality Monitoring at the Flambeau (Upper) Hydroelectric Project is set to take place in 2018 beginning with the Ice-Out sampling event.

Appendix A – Flambeau (Upper) Hydroelectric Project Figures

Figure 1. Flambeau (Upper) Hydroelectric Project Map



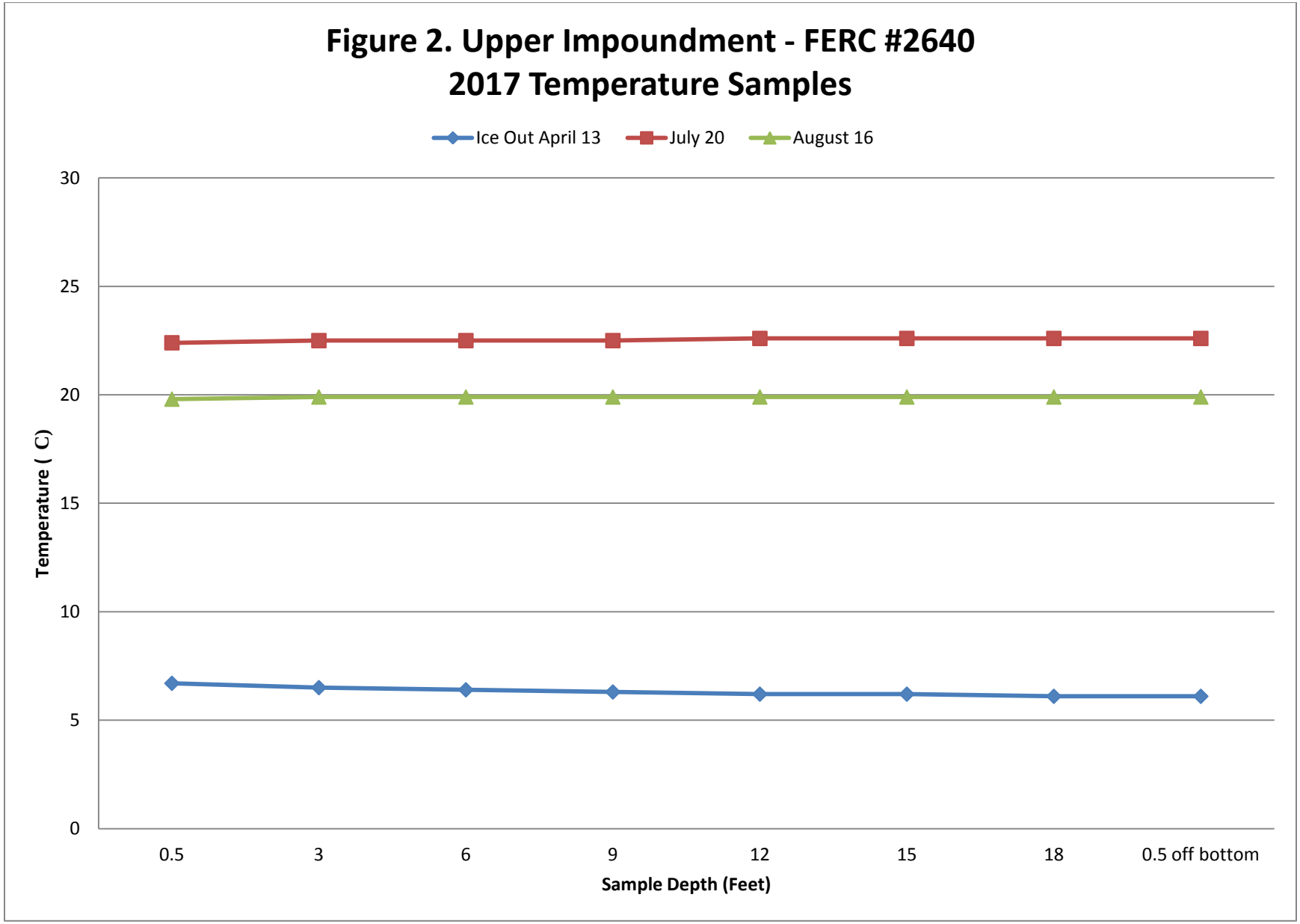


Figure 2. Upper Impoundment - FERC #2640
2017 Temperature Samples
Ice Out April 13
July 20
August 16
30
25
20
15
10
5
0
Temperature (C)
0.5
3
6
9
12
15
18
0.5 off bottom
Sample Depth (Feet)

Figure 3. Upper Impoundment - FERC #2640
2017 Dissolved Oxygen Samples

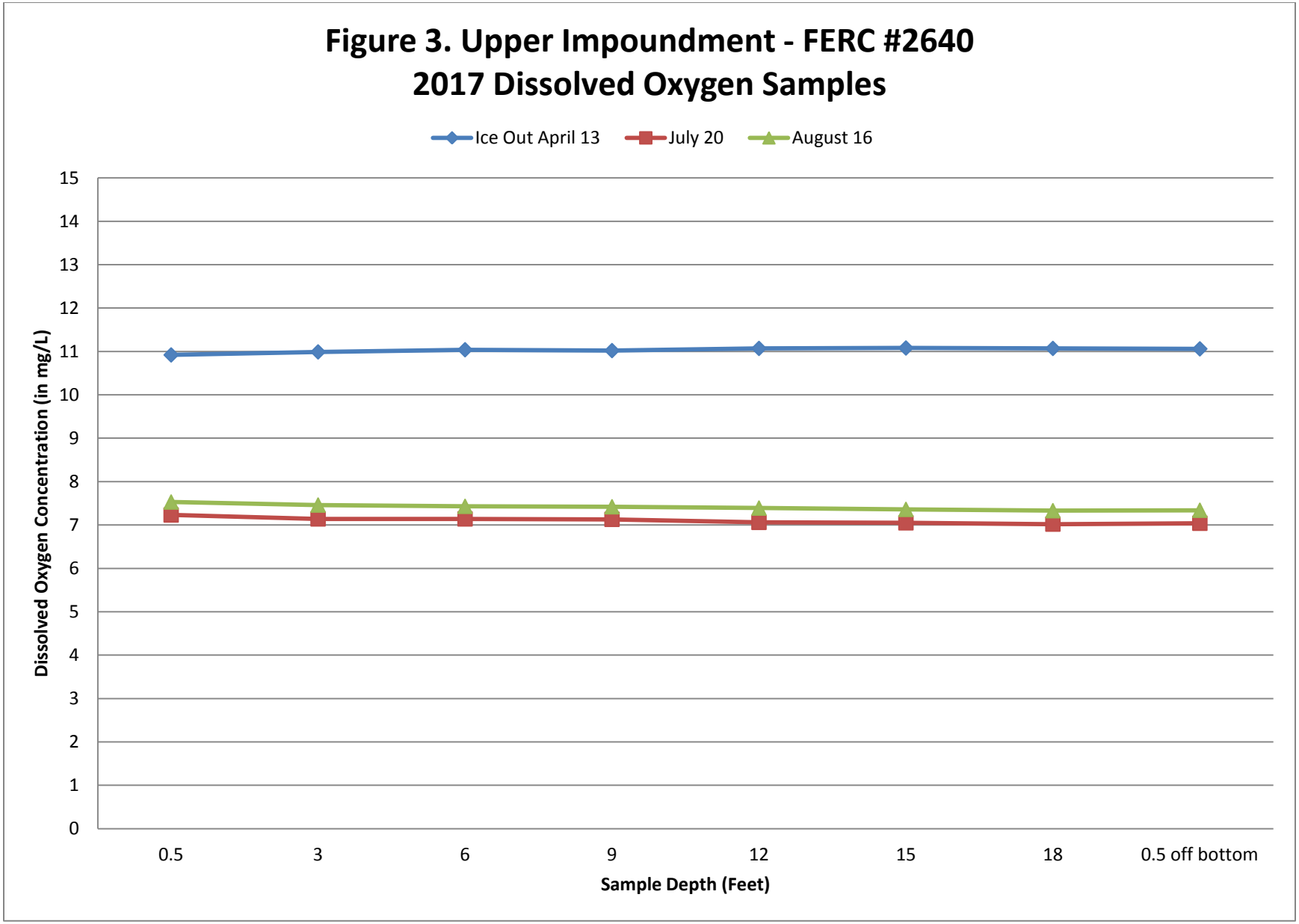
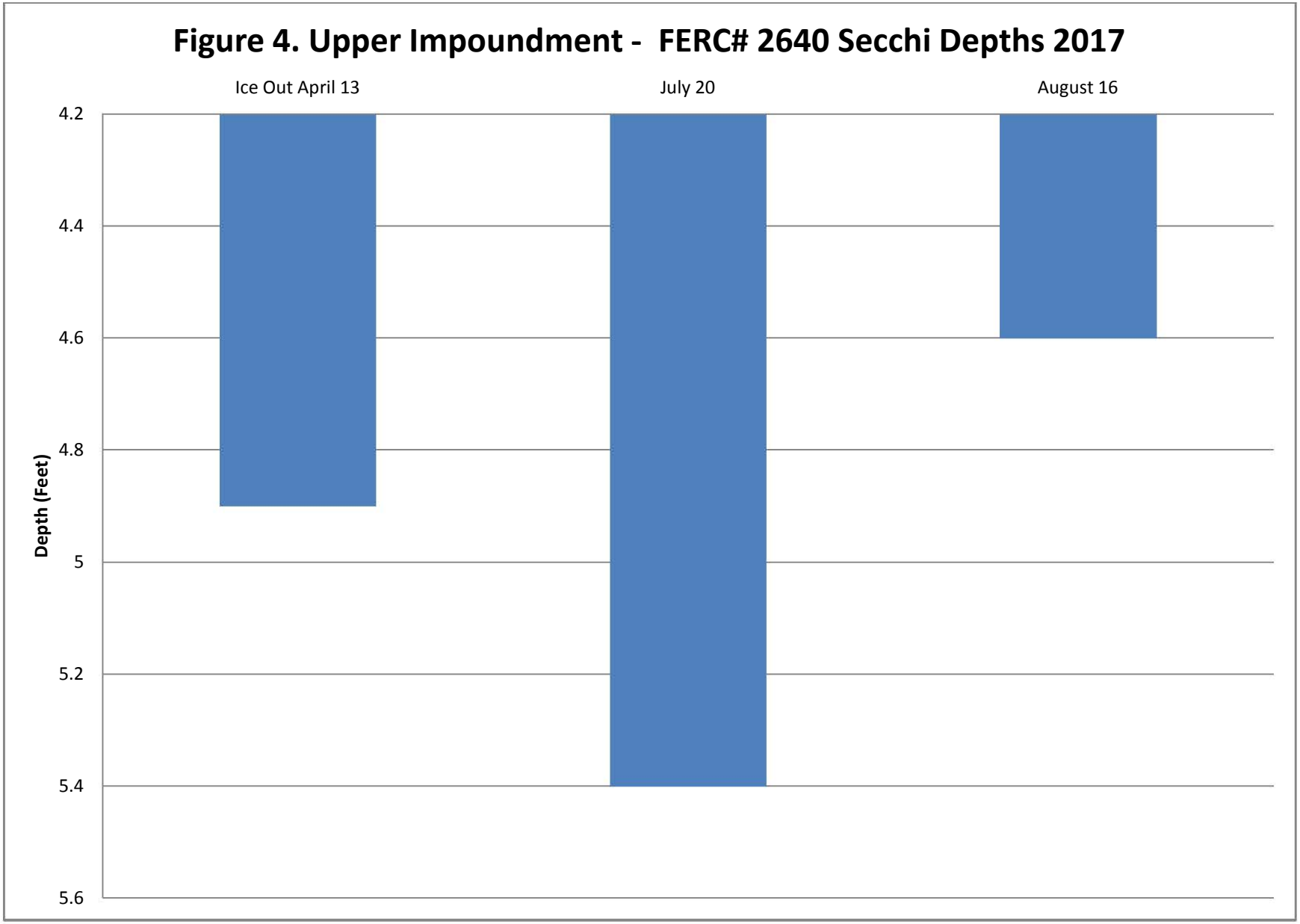


Figure 4. Upper Impoundment - FERC# 2640 Secchi Depths 2017



Appendix B – Flambeau (Upper) Hydroelectric Project Tables

Table 1. Flambeau (Upper) Hydroelectric Project – FERC Project # 2640: 2017 Water Quality Sampling Data

	Ice Out April 13, 2017			July 20, 2017			August 16, 2017		
Project Flow (c.f.s)	605			797					
Dissolved Oxygen	**Time**	**D.O. (mg/L)**	**Water Temp. (°C)**	**Time**	**D.O. (mg/L)**	**Water Temp. (°C)**	**Time**	**D.O. (mg/L)**	**Water Temp. (°C)**
0.5 feet below surface	8:07:45	10.92	6.7	7:46:55	7.23	22.4	7:46:58	7.53	19.8
3 feet below surface	8:08:28	10.99	6.5	7:47:40	7.14	22.5	7:47:33	7.46	19.9
6 feet below surface	8:09:00	11.04	6.4	7:48:10	7.14	22.5	7:47:58	7.43	19.9
9 feet below surface	8:09:38	11.02	6.3	7:48:46	7.13	22.5	7:48:30	7.42	19.9
12 feet below surface	8:14:05	11.07	6.2	7:49:22	7.06	22.6	7:48:52	7.39	19.9
15 feet below surface	8:14:40	11.08	6.2	7:49:56	7.05	22.6	7:49:42	7.36	19.9
18 feet below surface	8:15:07	1.07	6.1	7:50:54	7.02	22.6	7:50:16	7.33	19.9
0.5 meter above bottom	8:15:29	11.06	6.1	7:51:21	7.04	22.6	7:50:52	7.34	19.9
Secchi Disk	**Time**	**Depth (ft)**		**Time**	**Depth (ft)**		**Time**	**Depth (ft)**	
Feet below surface	8:20	4.9		7:55	5.4		7:56	4.6	
Chlorophyll *a*	**Time**	**µg/L**		**Time**	**µg/L**		**Time**	**µg/L**	
3 feet below surface	8:22	4.0		7:45	3.1		7:48	4.9	
Color (True)	**Time**	**C.P.U. Units**	**LOD**	**Time**	**C.P.U. Units**	**LOD**	**Time**	**C.P.U. Units**	**LOD**
3 feet below surface	8:20	30	5*	7:45	35	5*	7:48	35	5*
Total Phosphorus	**Time**	**mg/L**	**LOD**	**Time**	**mg/L**	**LOD**	**Time**	**mg/L**	**LOD**
3 feet below surface	8:20	0.018	0.008*	7:45	0.023	0.008*	7:48	0.018	0.008*
3 feet above bottom	8:17	0.029	0.008*	7:50	0.017	0.008*	7:46	0.015	0.008*
* Considered Method Detection Limit N/A = Not Applicable ND = No Detection									

Table 2. 2016/17 Water Year Monthly Temperature and Precipitation for Park Falls, Wisconsin

Month	Highest Temp.	Lowest Temp.	Average Temp.	Departure From Normal	Heating Degree Days	Normal Degree Days	Total Precip.	Total Snowfall	Normal Precip.	% of Normal Precipitation
October - 16	74	30	47.6	4.4	531	678	1.55	Trace	2.85	75
November - 16	70	10	40.2	11.4	735	1088	2.60	8.1	2.09	78
December - 16	39	-21	15.9	1.1	1512	1556	2.07	21.3	1.21	79
January – 17	45	-22	16.0	5.8	1511	1699	1.16	15.5	0.96	78
February – 17	52	-11	22.5	7.4	1185	1399	1.80	14.1	0.81	73
March – 17	59	-29	26.3	0.4	1193	1210	1.05	5.3	1.49	67
April – 17	70	23	42.2	2.6	678	762	3.02	1.9	2.43	68
May – 17	75	32	50.3	-1.1	446	426	4.11	0.8	3.23	68
June – 17	88	18	60.9	0.8	131	179	5.21	0.00	4.23	71
July – 17	86	48	65.3	-0.5	53	63	4.11	0.00	3.85	77
August – 17	82	46	61.5	-2.8	117	86	7.23	0.00	3.70	79
September - 17	83	37	58.6	3.0	212	298	3.55	0.00	4.11	81

Source: NOAA/Duluth, MN

Table 3. Flambeau (Upper) Project Sampling Comparison Table 2011 Thru Current Year										
Year	**Month**	**Secchi Depth**	**Chlorophyll *a***	**Color (True)**	**Total Phosphorus**	**Total Phosphorus**	**Low D.O.**	**High D.O.**	**Low Water Temp.**	**High Water Temp.**
		Feet	**µg/L**	**C.P.U. Units**	**Below Surface mg/L**	**Above Bottom mg/L**	**mg/L**	**mg/L**	**° C**	**° C**
2011	April	3.50	0.51	100.00	0.025	0.028	12.63	12.91	5.90	6.40
2012	April	3.50	1.00	100.00	0.027	*	12.01	11.71	8.50	8.90
2013	May	*	*	*	*	*	*	*	*	*
2014	June	3.20	1.90	130.00	0.024	*	7.09	7.37	17.60	17.80
2015	April	3.60	2.90	130.00	0.026	*	9.80	10.04	9.20	9.60
2016	March	3.50	ND	30.00	0.020	0.010	11.88	12.13	2.50	2.60
2017	April	4.90	4	30.00	0.018	0.029	10.92	11.08	6.10	6.70
Minimum	March/April/June	3.20	0.51	30.00	0.018	0.010	7.09	7..37	2.50	2.60
Maximum	March/April/June	4.90	4.00	130.00	0.027	0.029	12.63	12.91	17.60	17.80
Average	March/April/June	3.70	2.06	86.67	0.023	0.022	10.72	10.87	8.30	8.67
2011	July	3.80	5.80	70.00	0.038	*	7.37	7.70	24.40	25.20
2012	July	3.50	5.90	70.00	0.036	*	6.56	6.91	24.30	24.80
2013	July	3.10	1.60	150.00	0.026	*	6.35	6.41	24.00	24.20
2014	July	3.50	3.20	100.00	0.035	*	7.19	7.35	21.00	21.30
2015	July	3.90	3.50	80.00	0.017	*	6.91	7.10	20.30	20.70
2016	July	3.70	6.30	40.00	0.022	0.019	7.29	7.49	22.50	22.70
2017	July	5.40	3.10	35.00	0.023	0.019	7.02	7.23	24.40	25.20
Minimum	July	3.10	1.60	35.00	0.017	0.017	6.35	6.41	20.30	20.70
Maximum	July	5.40	6.30	150.00	0.038	0.019	7.37	7.70	24.40	25.20
Average	July	3.84	4.20	77.86	0.028	0.018	6.96	7.17	22.70	23.07
2011	August	2.90	11.00	120.00	0.033	*	8.13	8.43	22.20	22.90
2012	August	2.70	12.00	70.00	0.037	*	7.61	8.08	22.70	22.90
2013	August	3.30	6.00	130.00	0.066	*	7.45	7.69	19.50	19.70
2014	August	3.10	5.60	100.00	0.024	*	6.88	7.12	21.00	21.60
2015	August	3.50	16.00	70.00	0.029	*	7.40	7.79	20.70	21.70
2016	August	4.70	8.50	35.00	0.022	0.022	6.52	7.31	23.70	23.80
2017	August	4.60	4.90	35.00	0.018	0.015	7.33	7.53	19.80	19.90
Minimum	August	2.70	4.90	35.00	0.022	0.015	6.52	7.12	19.50	19.70
Maximum	August	4.70	16.00	130.00	0.066	0.022	8.13	8.43	23.70	23.80
Average	August	3.54	9.14	80.00	0.033	0.019	7.33	7.71	21.37	22.79

***no sample taken**

Appendix C – Flambeau (Upper) Impoundment Project Sampling Logs

IMPOUNDMENT SAMPLING LOG

Water Quality Study Location Plumbeam Upper

Hydroelectric Project – FERC # 2690

Date: 4-13-17

Pre-Sampling Data:

HWL 1484.57 TWL 1467.60 CFS 605

Sample Location: N45° 56.109' W98° 16.299'

Performed by:
A. Stine T. Plummer

Time: 8:04 Barometer: 30.4

Air Temp: 41 °F Wind Speed: N1mpH

Sky Conditions: 90% clouds

Precipitation within Last 24 Hours: 0.2

D.O. Meter Calibration:

Instrument Model Used: HQ40D

Were the batteries changed? ☐ Yes ☐ No

If yes, when were they changed: _____

Battery Status: _____% Charge

Calibration Method: Factory

Sampling Depth Profile: Measured depth to bottom of impoundment: 18 Feet

Secchi Depth (± 0.1)		
Time 8:20	4.9	Feet

Comments:

Chlorophyll *a* (3 feet below surface horizontal sampler)		
Lab Sample I.D. #:		
Time 8:22	Quantity (ml)	Filtered
	1000	In Lab
Preservative	$MgCO_3$	

True Color (3 feet below surface horizontal sampler)
Lab Sample I.D. # :
Time: 8:20

Total Phosphorus (3 feet below surface horizontal sampler)	
Lab Sample I.D. # :	
Time 8:20	Preservative
	H_2SO_4

Total Phosphorus (3 feet above bottom horizontal sampler)	
Lab Sample I.D. # :	
Time 8:17	Preservative
	H_2SO_4

D.O. and Temperature Profile			
Depth (Feet)	Time	D.O. (mg/L)	Temperature °C
0.5 below surface	8:07:44	10.92	6.7
3	8:08:28	10.99	6.5
6	8:09	11.04	6.4
9	8:09:38	11.02	6.3
12	8:14:05	11.04	6.2
15	8:14:46	11.08	6.2
18	8:15:07	11:07	6.1
21			
24			
0.5 above bottom	8:15:29	11.05	6.1

*If D.O. is below 5.0 mg/L notify agency and measure D.O. at 1.0 foot intervals if <5.0 mg/L.

WHITE WATER ASSOCIATES, INC.

IMPOUNDMENT SAMPLING LOG

Water Quality Study Location Upper Flambeau

Hydroelectric Project – FERC # 2640

Date: 7-20-17

Pre-Sampling Data:

HWL 1486.67 TWL 1467.60 CFS 797

Sample Location: N 45° 56.809' W90° 26.299'

Performed by: Steve Haag

Time: 7:45 Barometer: 29.9

Air Temp: 60 °F Wind Speed: SE 1 mph

Sky Conditions: 50% clouds

Precipitation within Last 24 Hours: no

D.O. Meter Calibration:

Instrument Model Used: HQ40D

Were the batteries changed? ☐ Yes ☒ No

If yes, when were they changed: ______

Battery Status: 70 % Charge

Calibration Method: Factory

Sampling Depth Profile: Measured depth to bottom of impoundment: 16 Feet

Secchi Depth (± 0.1)	
Time 7:55	5.4 Feet

Comments:

Chlorophyll *a* (3 feet below surface horizontal sampler)		
Lab Sample I.D. #:		
Time 7:45	Quantity (ml)	Filtered
	1000	In Lab
Preservative	$MgCO_3$	

True Color (3 feet below surface horizontal sampler)
Lab Sample I.D. # :
Time: 7:45

Total Phosphorus (3 feet below surface horizontal sampler)	
Lab Sample I.D. # :	
Time 7:45	Preservative
	H_2SO_4

Total Phosphorus (3 feet above bottom horizontal sampler)	
Lab Sample I.D. # :	
Time 7:50	Preservative
	H_2SO_4

D.O. and Temperature Profile			
Depth (Feet)	Time	D.O. (mg/L)	Temperature °C
0.5 below surface	7:46:35	7.23	22.4
3	7:47:40	7.14	22.5
6	7:48:10	7.14	22.5
9	7:48:46	7.13	22.5
12	7:49:22	7.06	22.6
15	7:49:51	7.05	22.6
~~18~~ 16	7:50:41	7.02	22.6
21			
24			
0.5 above bottom	7:51:21	7.04	22.6

*If D.O. is below 5.0 mg/L notify agency and measure D.O. at 1.0 foot intervals if <5.0 mg/L.

WHITE WATER ASSOCIATES, INC.

IMPOUNDMENT SAMPLING LOG

Water Quality Study Location Flambeau Upper

Hydroelectric Project – FERC # 2640

Date: 8-16-17

Pre-Sampling Data:

HWL 1486.69 TWL 1467.60 CFS 503

Sample Location: N45 36.609 W90° 26.299'

Performed by: Shane Haag

Time: 7:45 Barometer: 30.0

Air Temp: 56 °F Wind Speed: ene 4mph

Sky Conditions: 100% clouds

Precipitation within Last 24 Hours: NO

D.O. Meter Calibration:

Instrument Model Used: HQ40D

Were the batteries changed? ☐ Yes ☒ No

If yes, when were they changed: _____

Battery Status: 70 % Charge

Calibration Method: Factory

Sampling Depth Profile: Measured depth to bottom of impoundment: 16 Feet

Secchi Depth (± 0.1)		
Time 7:56	4' 7"	Feet

4.6

Comments:

Chlorophyll *a* (3 feet below surface horizontal sampler)		
Lab Sample I.D. #:		
Time 7:48	Quantity (ml)	Filtered
	1000	In Lab
Preservative	$MgCO_3$	

True Color (3 feet below surface horizontal sampler)
Lab Sample I.D. # :
Time: 7:48

Total Phosphorus (3 feet below surface horizontal sampler)	
Lab Sample I.D. # :	
Time 7:48	Preservative
	H_2SO_4

Total Phosphorus (3 feet above bottom horizontal sampler)	
Lab Sample I.D. # :	
Time 7:46	Preservative
	H_2SO_4

D.O. and Temperature Profile			
Depth (Feet)	Time	D.O. (mg/L)	Temperature °C
0.5 below surface	7:46:38	7.53	19.8
3	7:47:33	7.46	19.9
6	7:47:58	7.43	19.9
9	7:48:30	7.42	19.9
12	7:48:52	7.39	19.9
15	7:49:42	7.36	19.9
~~18~~ 16	7:50:16	7.33	19.9
21			
24			
0.5 above bottom	7:50:52	7.34	19.9

*If D.O. is below 5.0 mg/L notify agency and measure D.O. at 1.0 foot intervals if <5.0 mg/L.

WHITE WATER ASSOCIATES, INC.

Appendix D – Flambeau (Upper) Hydroelectric Project Lab Reports and Chains of Custody

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page

Client: RWE **WWA Job #:** 68749

Project: Monitoring

Date Received: 4/14/2017 **Date Reported:** 4/27/2017

Sample Number	Client Sample ID	Date Sampled	Sample Matrix
68749-001	Upper Flambeau	04/13/17	Water
68749-002	Upper Flambeau	04/13/17	Water
68749-003	Lower Flambeau	04/13/17	Water
68749-004	Lower Flambeau	04/13/17	Water
68749-005	Pixley	04/13/17	Water
68749-006	Pixley	04/13/17	Water
68749-007	Crowley	04/13/17	Water
68749-008	Crowley	04/13/17	Water

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page..continued

Client: RWE **WWA Job #:** 68749

Comments (if any):

Key to Laboratory Flags:

*: RPD exceeds limits.
B: The analyte was found in the associated blank as well as in the sample.
J: The quantitation is an estimated value because the result is less than the sample quantitation limit but greater than the detection limit.
M: A matrix effect was present.
Q: Batch QC data associated with the analysis does not meet the stated objectives
H: Indicates analytical holding time exceedance.
U: The analyte was analyzed for, but not detected.
P: A manual peak selection or manual integration was performed to correct an erroneous software selection.

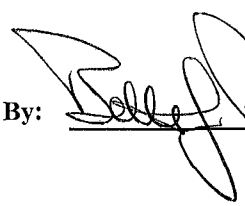
ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)
For coliform, Negative = No coliform bacteria detected, Positive = Coliform bacteria detected

Sample Types:
S = Solids, DW = Drinking water, D = Dissolved, T = Total, TC = TCLP extract, SP = SPLP extract

All samples were received intact and properly preserved unless otherwise noted. The results reported relate only to the samples tested. This report shall not be reproduced, except in full, without the written approval of this laboratory. The Chain of Custody is attached.

This report satisfies the requirements of your project but has not been prepared to comply with NELAP reporting requirements.

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and White Water Associates Standard Operating Procedures. Exceptions, if any, are discussed in the accompanying sample narrative. Release of this Final Report is authorized by White Water Associates management, as is verified by the following signature.

Approved By: 

WI DNR Lab Certification Number: 999971280
MI DEQ Certification Number: 9306
DoD-ELAP Accreditation Number: 65802
ISO/IEC 17025:2005 Accredited

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.

429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 68749

Project: Monitoring

Date Received: 4/14/2017 **Date Reported:** 4/27/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date	Method	MDL	MQL
68749-001 / Upper Flambeau / Surface / Water							
General Chemistry Parameters							
chlorophyll a	4.0		mg/m3	4/20/2017	10200H	NA	NA
Color	30		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.018	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-002 / Upper Flambeau / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.029	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-003 / Lower Flambeau / Surface / Water							
General Chemistry Parameters							
chlorophyll a	2.3		mg/m3	4/20/2017	10200H	NA	NA
Color	30		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.027	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-004 / Lower Flambeau / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.020	J	mg/L	4/19/2017	365.4	0.008	0.050

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 68749

Project: Monitoring

Date Received: 4/14/2017 **Date Reported:** 4/27/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date	Method	MDL	MQL
68749-005 / Pixley / Surface / Water							
General Chemistry Parameters							
chlorophyll a	3.9		mg/m3	4/20/2017	10200H	NA	NA
Color	35		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.028	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-006 / Pixley / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.025	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-007 / Crowley / Surface / Water							
General Chemistry Parameters							
chlorophyll a	3.4		mg/m3	4/20/2017	10200H	NA	NA
Color	30		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.025	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-008 / Crowley / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.028	J	mg/L	4/19/2017	365.4	0.008	0.050

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

Job # (WWA office use): 6849

CHAIN-OF-CUSTODY RECORD

JGut 4/19/17 Version 160504

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903

Phone: (906) 822-7889, Fax -7977
Web: white-water-associates.com

CLIENT NAME / BILL TO: RWE

EMAIL ADDRESS:

ADDRESS:

TELEPHONE:

CITY | STATE | ZIP:

CONTRACT / PO / PROJECT NAME / WSSN#: Monitoring

SAMPLER NAME (print first/last name): Angie Stine

COUNTY OF LOCATION:

PAGE 1 OF 1 — Indicate if more than one page of COC records used

SAMPLER'S SIGNATURE:

Check off preservatives for each bottle upon arrival and indicate total number of bottles. WWA database contains bottle preservation details.

ANALYSIS TYPE REQUESTED (Attach list if neeeded)

Instructions to White Water
Send my report by:
____ email
____ mail

Unless otherwise noted, drinking water report copies are sent to MDEQ and Health Dept.

REMARKS (Note any special instructions provided by client or conditions of receipt noted by WWA lab staff. Also note any residual chlorine.)

SAMPLE ID AND LOCATION (Containers for each sample may be combined on one line.)	DATE	TIME	SAMPLE MATRIX: Drinking water	Aqueous	Sed.	Soil	Other:	CONTAINERS / PRESERVATIVES: None	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Na Thio	Total Number of Containers	Chl a (mg/CO3)	Total Phos	Color
1 Upper Flambeau Surface	4-13-17	8:20						X	X						3	X	X	X
2 Upper Flambeau Bottom	4-13-17	8:17					②HNO3								1		X	
3 Lower Flambeau Surface	4-13-17	9:25						X							3	X	X	X
4 Lower Flambeau Bottom	4-13-17	9:23					②HNO3								1		X	
5 Pixley Surface	4-13-17	11:05						X							3	X	X	X
6 Pixley Bottom	4-13-17	11:00					②HNO3								1		X	
7 Crowley Surface	4-13-17	13:42						X							3	X	X	X
8 Crowley Bottom	4-13-17	13:40					②HNO3								1		X	
							①											

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
			②JGut 4/19/17		
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
	4-13-17	5:30 p.m.	①	4-4-17	1058

Comments/Sample temp. on receipt: 2.7

Packing: Ice ✓ Cooler ✓

WHITE - RETURN W/ REPORT CANARY - W/ SAMPLES PINK - CUSTOMER

UPS☐ FedEx☐ USPS☐ Client☐ Other WWA

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page

Client: RWE **WWA Job #:** 70828

Project: Monitoring

Date Received: 7/21/2017 **Date Reported:** 9/21/2017

Sample Number	Client Sample ID	Date Sampled	Sample Matrix
70828-001	Upper Flambeau	07/20/17	Water
70828-002	Upper Flambeau	07/20/17	Water
70828-003	Lower Flambeau	07/20/17	Water
70828-004	Lower Flambeau	07/20/17	Water
70828-005	Pixley	07/20/17	Water
70828-006	Pixley	07/20/17	Water
70828-007	Crowley	07/20/17	Water
70828-008	Crowley	07/20/17	Water

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page..continued

Client: RWE **WWA Job #:** 70828

Comments (if any):

Key to Laboratory Flags:

*: RPD exceeds limits.
B: The analyte was found in the associated blank as well as in the sample.
J: The quantitation is an estimated value because the result is less than the sample quantitation limit but greater than the detection limit.
M: A matrix effect was present.
Q: Batch QC data associated with the analysis does not meet the stated objectives
H: Indicates analytical holding time exceedance.
U: The analyte was analyzed for, but not detected.
P: A manual peak selection or manual integration was performed to correct an erroneous software selection.

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)
For coliform, Negative = No coliform bacteria detected, Positive = Coliform bacteria detected

Sample Types:
S = Solids, DW = Drinking water, D = Dissolved, T = Total, TC = TCLP extract, SP = SPLP extract

All samples were received intact and properly preserved unless otherwise noted. The results reported relate only to the samples tested. This report shall not be reproduced, except in full, without the written approval of this laboratory. The Chain of Custody is attached.

This report satisfies the requirements of your project but has not been prepared to comply with NELAP reporting requirements.

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and White Water Associates Standard Operating Procedures. Exceptions, if any, are discussed in the accompanying sample narrative. Release of this Final Report is authorized by White Water Associates management, as is verified by the following signature.

Approved By: Robert J. Reams

WI DNR Lab Certification Number: 999971280
MI DEQ Certification Number: 9306
DoD-ELAP Accreditation Number: 65802
ISO/IEC 17025:2005 Accredited

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 70828

Project: Monitoring

Date Received: 7/21/2017 **Date Reported:** 9/21/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
70828-001 / Upper Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	3.1		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	35		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.023	J	mg/L	8/1/2017 10:31	365.4	0.008	0.050	NK
70828-002 / Upper Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.017	J	mg/L	8/1/2017 10:32	365.4	0.008	0.050	NK
70828-003 / Lower Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	3.5		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	30		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.028	J	mg/L	8/1/2017 10:33	365.4	0.008	0.050	NK
70828-004 / Lower Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.029	J	mg/L	8/1/2017 10:33	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 70828

Project: Monitoring

Date Received: 7/21/2017 **Date Reported:** 9/21/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
70828-005 / Pixley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	6.3		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	35		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.036	J	mg/L	8/1/2017 10:35	365.4	0.008	0.050	NK
70828-006 / Pixley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.11		mg/L	8/1/2017 10:36	365.4	0.008	0.050	NK
70828-007 / Crowley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	8.3		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	35		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.033	J	mg/L	8/1/2017 10:36	365.4	0.008	0.050	NK
70828-008 / Crowley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.033	J	mg/L	8/1/2017 10:37	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

Job # (WWA office use): 70828

CHAIN-OF-CUSTODY RECORD

Version 160504

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903
Phone: (906) 822-7889, Fax -7977
Web: white-water-associates.com

CLIENT NAME / BILL TO: RWE

EMAIL ADDRESS:

ADDRESS:

TELEPHONE:

CITY | STATE | ZIP:

CONTRACT / PO / PROJECT NAME / WSSN#: Monitoring

SAMPLER NAME (print first/last name): Angi Stone

COUNTY OF LOCATION:

PAGE 1 OF 1 — Indicate if more than one page of COC records used

SAMPLER'S SIGNATURE:

Check off preservatives for each bottle upon arrival and indicate total number of bottles. WWA database contains bottle preservation details.

ANALYSIS TYPE REQUESTED (Attach list if neeeded)

Instructions to White Water
Send my report by:
____ email
____ mail

Unless otherwise noted, drinking water report copies are sent to MDEQ and Health Dept.

REMARKS (Note any special instructions provided by client or conditions of receipt noted by WWA lab staff. Also note any residual chlorine.)

	SAMPLE ID AND LOCATION (Containers for each sample may be combined on one line.)	DATE	TIME	SAMPLE MATRIX: Drinking water	Aqueous	Sed.	Soil	Other:	CONTAINERS / PRESERVATIVES: None	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Na Thio	Total Number of Containers	Chla Cmg/m3	T Phos	Color
1	Upper Flambeau Surface	7-20-17	7:45		X				X	X						3	X	X	X
2	Upper Flambeau Bottom	"	7:50													1		X	
3	Lower Flambeau Surface	"	9:14						X							3	X	X	X
4	Lower Flambeau Bottom	"	9:19													1		X	
5	Pixley Surface	"	10:57						X							3	X	X	X
6	Pixley Bottom	"	11:00													1		X	
7	Crowley Surface	"	13:40						X							3	X	X	X
8	Crowley Bottom	"	13:43													1		X	

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
[signature]	7-20-17	5:03 pm			
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
			[signature] ①	7-21-17	1045

Comments/Sample temp. on receipt: 3.5

Packing: Ice ✓ Cooler ✓

WHITE - RETURN W/ REPORT CANARY - W/ SAMPLES PINK - CUSTOMER

UPS☐ FedEx☐ USPS☐ Client☐ Other WWA

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page

Client: RWE **WWA Job #:** 71379

Project: Monitoring

Date Received: 8/17/2017 **Date Reported:** 9/14/2017

Sample Number	Client Sample ID	Date Sampled	Sample Matrix
71379-001	Upper Flambeau	08/16/17	Water
71379-002	Upper Flambeau	08/16/17	Water
71379-003	Lower Flambeau	08/16/17	Water
71379-004	Lower Flambeau	08/16/17	Water
71379-005	Pixley	08/16/17	Water
71379-006	Pixley	08/16/17	Water
71379-007	Crowley	08/16/17	Water
71379-008	Crowley	08/16/17	Water

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page..continued

Client: RWE **WWA Job #:** 71379

Comments (if any):

Key to Laboratory Flags:

*: RPD exceeds limits.
B: The analyte was found in the associated blank as well as in the sample.
J: The quantitation is an estimated value because the result is less than the sample quantitation limit but greater than the detection limit.
M: A matrix effect was present.
Q: Batch QC data associated with the analysis does not meet the stated objectives
H: Indicates analytical holding time exceedance.
U: The analyte was analyzed for, but not detected.
P: A manual peak selection or manual integration was performed to correct an erroneous software selection.

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)
For coliform, Negative = No coliform bacteria detected, Positive = Coliform bacteria detected

Sample Types:
S = Solids, DW = Drinking water, D = Dissolved, T = Total, TC = TCLP extract, SP = SPLP extract

All samples were received intact and properly preserved unless otherwise noted. The results reported relate only to the samples tested. This report shall not be reproduced, except in full, without the written approval of this laboratory. The Chain of Custody is attached.

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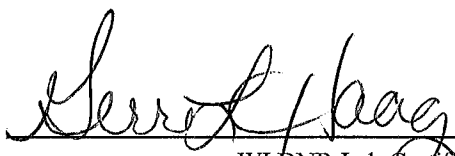
Approved By: 

WI DNR Lab Certification Number: 999971280
MI DEQ Certification Number: 9306
DoD-ELAP Accreditation Number: 65802
ISO/IEC 17025:2005 Accredited

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.

429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 71379

Project: Monitoring

Date Received: 8/17/2017 **Date Reported:** 9/14/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
71379-001 / Upper Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	4.9		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	35		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.018	J	mg/L	8/18/2017 11:41	365.4	0.008	0.050	NK
71379-002 / Upper Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.015	J	mg/L	8/18/2017 11:43	365.4	0.008	0.050	NK
71379-003 / Lower Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	5.6		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	40		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.032	J	mg/L	8/18/2017 11:43	365.4	0.008	0.050	NK
71379-004 / Lower Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.033	J	mg/L	8/18/2017 11:44	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 71379

Project: Monitoring

Date Received: 8/17/2017 **Date Reported:** 9/14/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
71379-005 / Pixley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	12		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	40		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.032	J	mg/L	8/18/2017 11:44	365.4	0.008	0.050	NK
71379-006 / Pixley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.027	J	mg/L	8/18/2017 11:46	365.4	0.008	0.050	NK
71379-007 / Crowley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	13		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	30		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.032	J	mg/L	8/18/2017 11:47	365.4	0.008	0.050	NK
71379-008 / Crowley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.030	J	mg/L	8/18/2017 11:47	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

V Gw 8/18/17 Version 160504

Job # (WWA office use): 71379

CHAIN-OF-CUSTODY RECORD

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903

Phone: (906) 822-7889, Fax -7977
Web: white-water-associates.com

CLIENT NAME / BILL TO: RWE.		EMAIL ADDRESS	
ADDRESS		TELEPHONE	
CITY	STATE / ZIP	CONTRACT / PO / PROJECT NAME / WSSN#: Monitoring	
SAMPLER NAME (print first/last name): Angie Shaw		COUNTY OF LOCATION	PAGE 1 OF 1 (Indicate if more than one page of COC records used)
SAMPLER'S SIGNATURE		Check off preservatives for each bottle upon arrival and indicate total number of bottles. WWA database contains bottle preservation details.	

ANALYSIS TYPE REQUESTED (Attach list if neeeded)

Instructions to White Water
Send my report by:
____ email
____ mail

Unless otherwise noted, drinking water report copies are sent to MDEQ and Health Dept.

REMARKS (Note any special instructions provided by client or conditions of receipt noted by WWA lab staff. Also note any residual chlorine.)

	SAMPLE ID AND LOCATION (Containers for each sample may be combined on one line.)	DATE	TIME	SAMPLE MATRIX: Drinking water	Aqueous	Sed.	Soil	Other:	CONTAINERS / PRESERVATIVES: None	H2SO4	HNO3	HCl Hg2Cl2	NaOH	ZnAc/NaOH	Na Thio	Total Number of Containers	Chl a	T Phos	Color
1	Upper Flambeau Surface	8-16-17	7:48		X				X	X		X				3	X	X	X
2	" Bottom	"	7:46		"				no	"						1		X	
3	Lower Flambeau Surface	8-16-17	9:20		"				X	"		X				3	X	X	X
4	" Bottom	"	9:18		"				no	"						1		X	
5	Pixley Surface	8-16-17	10:53		"				X	"		X				3	X	X	X
6	Pixley Bottom	"	10:51		"				no	"						1		X	
7	Crowley Surface	8-16-17	13:18		"					"		X				3	X	X	X
8	Crowley Bottom	"	13:16		"				no	"						1		X	

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date: 8-17-17	Time: 16:47	Received by:	Date: 8-17-17	Time: 830

Comments/Sample temp. on receipt:

Packing: Ice ✓
Cooler ✓

WHITE - RETURN W/ REPORT CANARY - W/ SAMPLES PINK - CUSTOMER

UPS☐ FedEx☐ USPS☐ Client☐ Other WWA

Final Report

2017 Water Quality Monitoring Data

for the

Flambeau (Lower) Hydroelectric Project

FERC Project #2421

Flambeau Hydro, LLC

North Fork of the Flambeau River, Price County, Wisconsin

Respectfully Submitted by:

Angie Stine

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903

Phone: 906-822-7889

Summary Flambeau (Lower) Hydroelectric Project – FERC #2421

2017 marked the fourteenth year of water quality sampling under FERC approved "Water Quality Monitoring Plan Per License Article 406 for the Flambeau (Lower) Hydroelectric Project – FERC Project # 2421 – Flambeau Hydro, LLC. Monitoring was conducted on April 13, July 20, and August 16, 2017. This document contains all of the associated records for the 2017 monitoring along with summary figures and tables in four appendices: (1) Appendix A (Figures 1-4), (2) Appendix B (Tables 1-3), (3) Appendix C (sampling logs by date), and (4) Appendix D (laboratory reports and chains of custody).

A map of the Flambeau (Lower) Hydroelectric Project is shown in Figure 1 indicating the water quality sampling location.

Monitoring results for 2017 are shown in Table 1. No unusual Temperature (Figure 2) or Dissolved Oxygen (Figure 3) readings were observed. The Secchi depths are shown in Figure 4.

In general, the weather (temperature and rainfall) during 2017 monitoring season appeared slightly warmer in May, June, and July, & August, with lower than normal precipitation in October, March, and September, and normal to high precipitation in the months of April, May, July, July, and August (Table 2).

Ice-Out occurred between Agenda and Nine Mile Landing on the North Fork of the Flambeau River sometime during the week beginning April 3rd, 2017. The Ice-Out sampling event occurred on April 13, 2017. River flow, based on the Flambeau (Lower) Hydroelectric Project records was approximately 621 cubic feet per second. Sampling occurred between 9:02 a.m. and 9:32 a.m. Samples were taken without incident. No unusual D.O. or Temperature readings were observed. Samples for laboratory analysis were delivered to White Water Associates, Inc. laboratory in Amasa, MI on April 13, 2017. White Water Associates, Inc. issued a laboratory report on April 27, 2017. No unusual levels of Chlorophyll *a*, True Color, or Total Phosphorus were noted in the laboratory reports.

River flow, based on Flambeau (Lower) Hydroelectric Project records, was approximately 793 cubic feet per second during the July 20, 2017 sampling event. Sampling occurred between 9:18 a.m. and 9:26 a.m. Samples were taken without incident. No unusual D.O. or Temperature readings were observed. Samples for laboratory analysis were delivered to White Water Associates, Inc. laboratory in Amasa, MI on July 20, 2017. White Water Associates, Inc. issued a laboratory report on September 21, 2017. No unusual levels of Chlorophyll *a*, True Color, or Total Phosphorus were noted in the laboratory reports.

River flow, based on Flambeau (Lower) Hydroelectric Project records, was approximately 514 cubic feet per second during the August 16, 2017 sampling event. Sampling occurred between 9:15 a.m. and 9:27 a.m. Samples were taken without incident. No unusual D.O. or Temperature readings were observed. Samples for laboratory analysis were delivered to White Water Associates, Inc. laboratory in Amasa, MI on August 16, 2017. White Water Associates, Inc. issued a laboratory report on September 14, 2017. No unusual levels of Chlorophyll *a*, True Color, or Total Phosphorus were noted in the laboratory reports.

A summary of a comparison between the 2011 thru 2017 (Table 3) sampling results are as follows:

1. Water Clarity – Secchi increased Ice Out and July and decreased in August
2. Chlorophyll a – Increased Ice Out, Decreased July and August
3. Color – Increased Ice Out, Decreased July and August
4. Total Phosphorus – Decreased Ice Out
5. Overall, D.O. – Decreased Ice Out, Increased in August
6. Water Temperatures – Increased Ice Out, Decreased August

The next scheduled Water Quality Monitoring at the Flambeau (Lower) Hydroelectric Project is set to take place in 2018 beginning with the Ice-Out sampling event.

Appendix A – Flambeau (Lower) Hydroelectric Project Figures

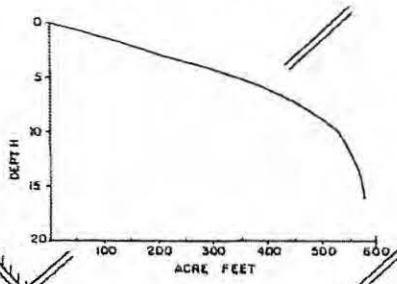
Figure 1. Flambeau (Lower) Hydroelectric Project Map (next page)

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

LOWER PARK FALLS FLOW LAKE — PRICE COUNTY

SEC. 24,25 T. 40 N. R. 1 E.W.



UPPER PARK FALLS FLOW

FLAMBEAU R.

CITY OF PARK FALLS

M ST. P & S.S.M.

Mixed Hardwood

Brush

Flambeau (Lower) Hydroelectric Project

FLAMBEAU RIVER

BM

Power dam concrete drop log 19' head

Mixed Hardwood

WATER QUALITY SAMPLE LOCATION

N45° 54.828' W90° 26.822'

50 Feet From E. Shoreline

Depth = 18.5 Feet

P.S.C. B.M. 'X' Bronze tablet set in top of concrete at right of right tainter gate

Elevation 1474.06

Normal water 1467.00

EQUIPMENT RECORDING SONAR MAPPED AUG. MO. 1966 YR.

WATER ELEV. 1467.00

TOPOGRAPHIC SYMBOLS

- Brush
- Partially wooded
- Wooded
- Cleared
- Pastured
- Agricultural
- BM Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- M. Muck
- C. Clay
- M. Marl
- Sd. Sand
- Si. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- T. Submergent vegetation
- E. Emergent vegetation
- Floating vegetation
- Stumps
- B. Boulder
- S. Snags

500' 0 500 1000 1500 2000 2500

SCALE

Access — Access with Parking — Boat Livery

Field work by L.Sather C.Busch G.Winter Drawn by C. Holt

SPECIES OF FISH

	Abundant	Common	Rare
Muskie			
N. Pike		X	
Walleye		X	
L.M. Bass			
S.M. Bass			
Panfish		X	
Trout			
Rock Sturgeon			X

AREA 70.6 ACRES

UNDER 3FT. 2.9 %

OVER 20FT. 0 %

VOLUME 570.9 ACRE FT.

TOTAL ALK. 36 P.P.M.

SHORELINE 4.2 MILES

MAX. DEPTH 16 FEET

Figure 2. Lower Impoundment - FERC #2421
2017 Temperature Samples

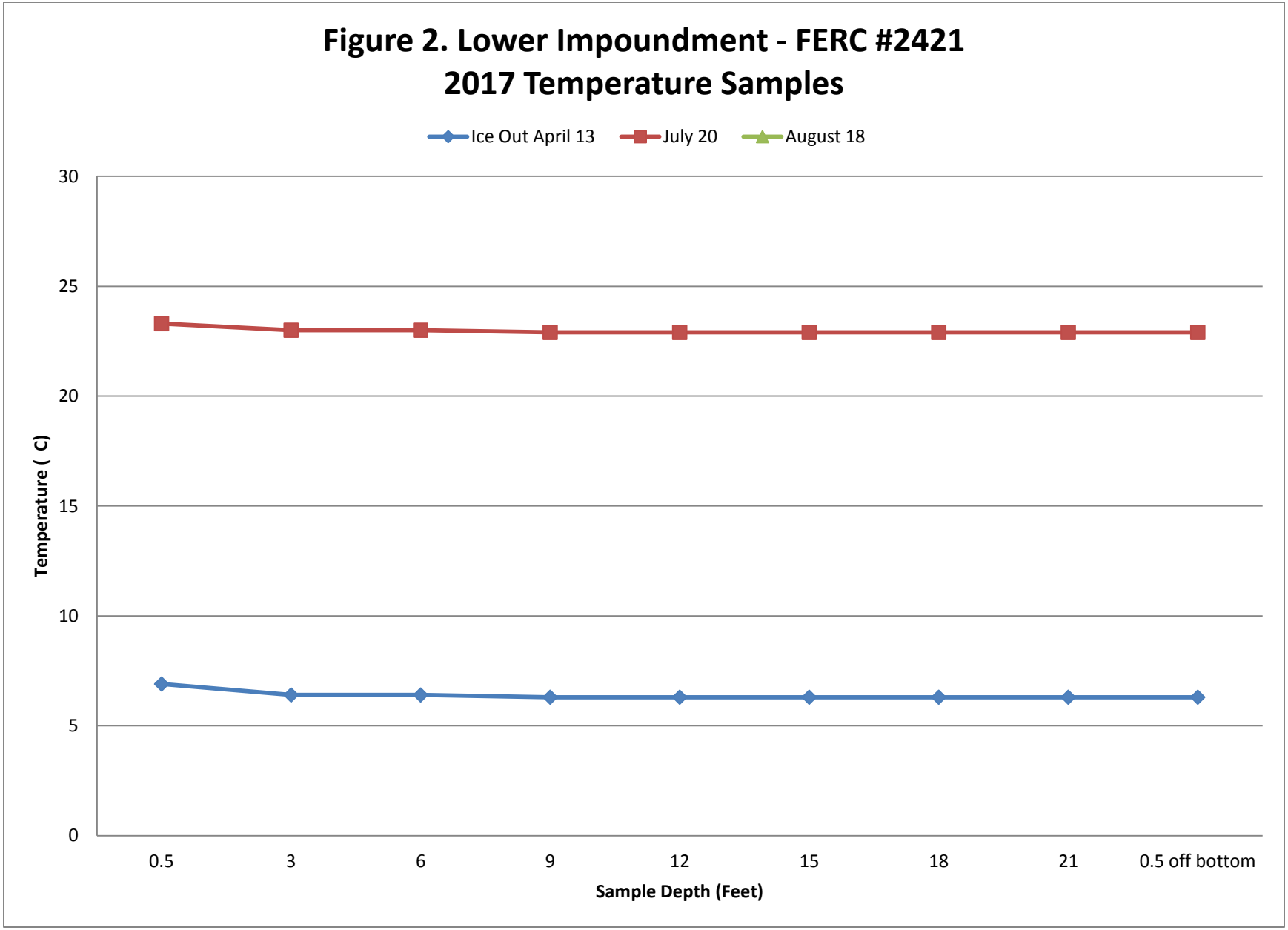
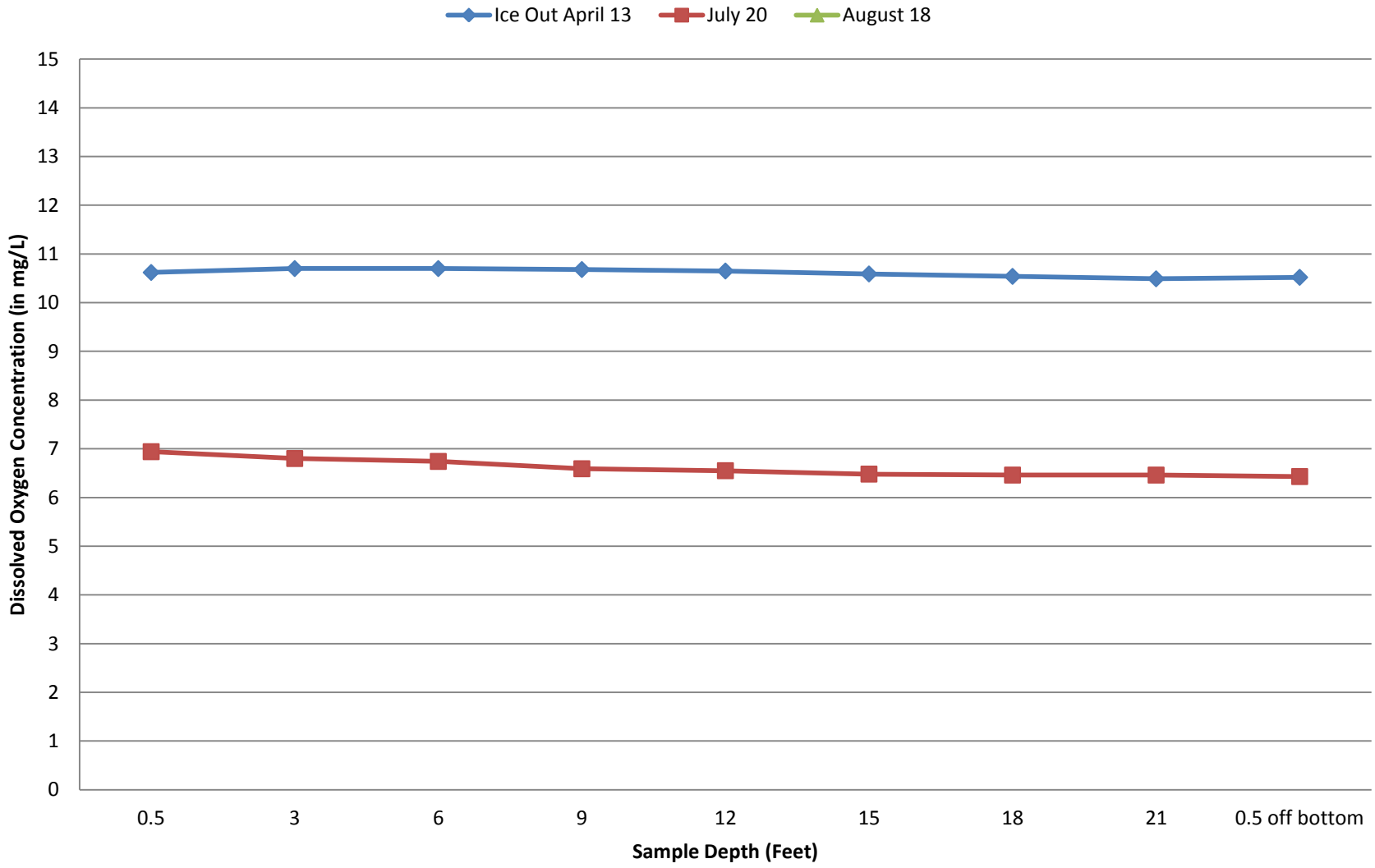


Figure 3. Lower Impoundment - FERC #2421
2017 Dissolved Oxygen Samples



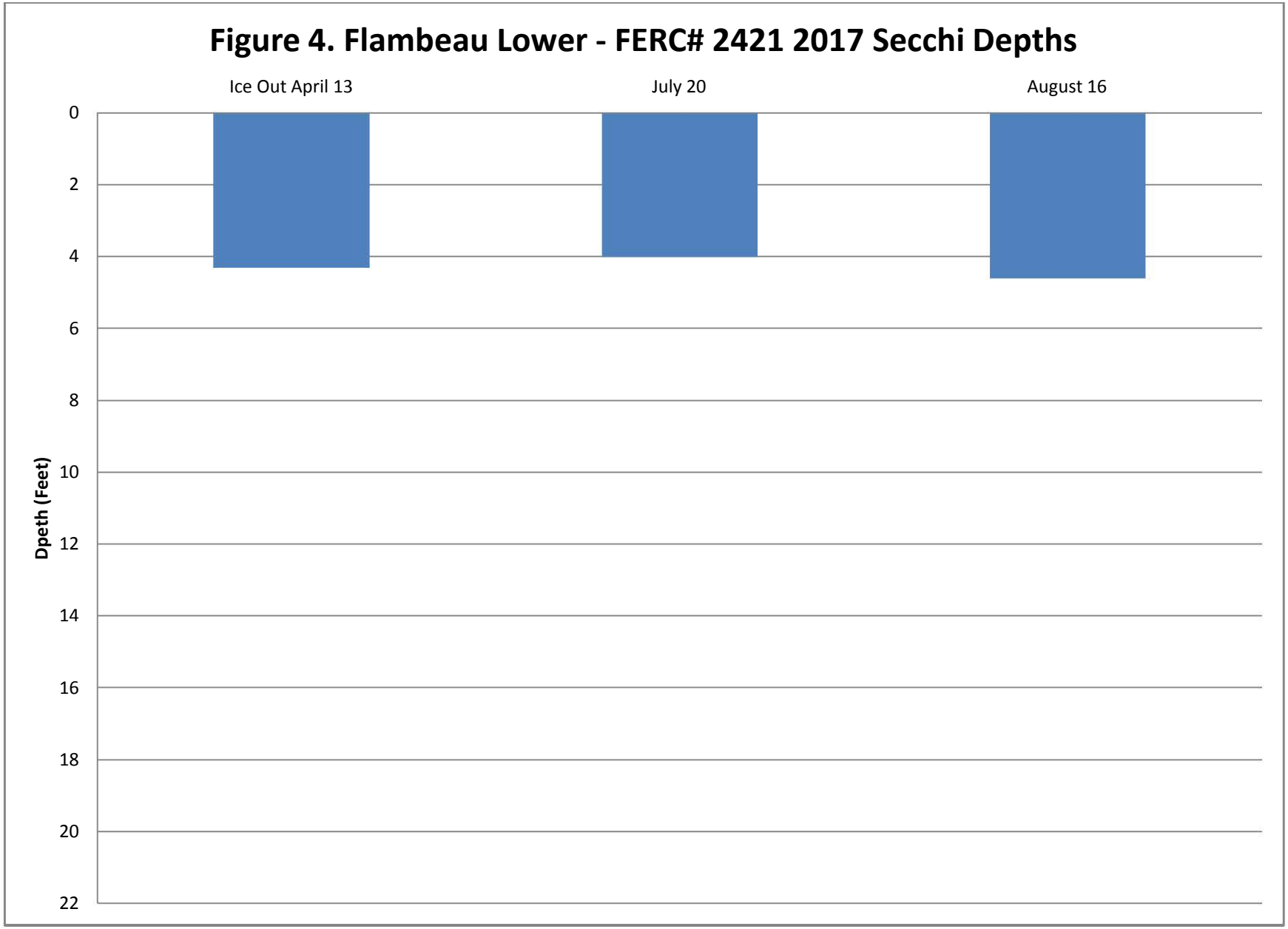


Figure 4. Flambeau Lower - FERC# 2421 2017 Secchi Depths
Ice Out April 13
July 20
August 16
Dpeth (Feet)
0
2
4
6
8
10
12
14
16
18
20
22

Appendix B – Flambeau (Lower) Hydroelectric Project Tables

Table 1. Flambeau (Lower) Hydroelectric Project – FERC Project # 2421: 2017 Water Quality Sampling Data

	Ice Out April 13, 2017			July 20, 2017			August 16, 2017		
Project Flow (c.f.s)	621			793			514		
Dissolved Oxygen	**Time**	**D.O. (mg/L)**	**Water Temp. (°C)**	**Time**	**D.O. (mg/L)**	**Water Temp. (°C)**	**Time**	**D.O. (mg/L)**	**Water Temp. (°C)**
0.5 feet below surface	9:21:40	10.62	6.9	9:16:18	6.94	23.3	9:18:36	7.23	20.8
3 feet below surface	9:22:18	10.70	6.4	9:16:50	6.80	23.0	9:19:34	6.99	20.9
6 feet below surface	9:22:54	10.70	6.4	9:17:18	6.74	23.0	9:20:08	6.97	20.9
9 feet below surface	9:23:25	10.68	6.3	9:17:50	6.59	22.9	9:20:39	6.95	20.9
12 feet below surface	9:23:58	10.65	6.3	9:18:22	6.55	22.9	9:21:08	6.93	21.0
15 feet below surface	9:24:33	10.59	6.3	9:19:26	6.48	22.9	9:21:46	6.84	21.0
18 feet below surface	9:25:06	10.54	6.3	9:19:56	6.46	22.9	9:22:56	6.77	21.0
21 feet below surface	9:26:00	10.49	6.3	9:21:24	6.46	22.9	N/A	N/A	N/A
0.5 meter above bottom	9:26:44	10.52	6.3	9:22:24	6.43	22.9	9:23:01	6.79	21.0
Secchi Disk	**Time**	**Depth (ft)**		**Time**	**Depth (ft)**		**Time**	**Depth (ft)**	
Feet below surface	9:32	4.3		9.:26	4.0		9:27	4.6	
Chlorophyll *a*	**Time**	**µg/L**		**Time**	**µg/L**		**Time**	**µg/L**	
3 feet below surface	9:25	2.3		9:16	3.5		9:20	5.6	
Color (True)	**Time**	**C.P.U. Units**	**LOD**	**Time**	**C.P.U. Units**	**LOD**	**Time**	**C.P.U. Units**	**LOD**
3 feet below surface	9:25	30	5*	9:16	30	5*	9:20	40	5*
Total Phosphorus	**Time**	**mg/L**	**LOD**	**Time**	**mg/L**	**LOD**	**Time**	**mg/L**	**LOD**
3 feet below surface	9:25	0.027	0.008*	9:16	0.028	0.008*	9:20	0.032	0.008*
3 feet above bottom	9:23	0.020	0.008*	9:19	0.029	0.008*	9:18	0.033	0.008*
* Considered Method Detection Limit N/A = Not Applicable ND = No Detection									

Table 2. 2016/17 Water Year Monthly Temperature and Precipitation for Park Falls, Wisconsin

Month	Highest Temp.	Lowest Temp.	Average Temp.	Departure From Normal	Heating Degree Days	Normal Degree Days	Total Precip.	Total Snowfall	Normal Precip.	% of Normal Precipitation
October - 16	74	30	47.6	4.4	531	678	1.55	Trace	2.85	75
November - 16	70	10	40.2	11.4	735	1088	2.60	8.1	2.09	78
December - 16	39	-21	15.9	1.1	1512	1556	2.07	21.3	1.21	79
January – 17	45	-22	16.0	5.8	1511	1699	1.16	15.5	0.96	78
February – 17	52	-11	22.5	7.4	1185	1399	1.80	14.1	0.81	73
March – 17	59	-29	26.3	0.4	1193	1210	1.05	5.3	1.49	67
April – 17	70	23	42.2	2.6	678	762	3.02	1.9	2.43	68
May – 17	75	32	50.3	-1.1	446	426	4.11	0.8	3.23	68
June – 17	88	18	60.9	0.8	131	179	5.21	0.00	4.23	71
July – 17	86	48	65.3	-0.5	53	63	4.11	0.00	3.85	77
August – 17	82	46	61.5	-2.8	117	86	7.23	0.00	3.70	79
September - 17	83	37	58.6	3.0	212	298	3.55	0.00	4.11	81

Source: NOAA/Duluth, MN

Table 3. Flambeau (Lower) Project Sampling Comparison Table: 2011 Thru Current Year										
Year	**Month**	**Secchi Depth**	**Chlorophyll *a***	**Color (True)**	**Total Phosphorus**	**Total Phosphorus**	**Low D.O.**	**High D.O.**	**Low Water Temp.**	**High Water Temp.**
		Feet	**µg/L**	**C.P.U. Units**	**Below Surface mg/L**	**Above Bottom mg/L**	**mg/L**	**mg/L**	**° C**	**° C**
2011	April	2.70	0.77	80.00	0.028	0.031	11.64	12.48	5.90	8.00
2012	April	2.60	2.10	120.00	0.038	0.055	10.94	11.35	8.80	9.00
2013	May	*	*	*	*	*	*	*	*	*
2014	June	3.80	1.10	130.00	0.025	0.027	7.30	7.60	18.80	19.60
2015	April	3.30	3.00	130.00	0.038	0.080	9.14	9.66	9.40	9.60
2016	March	2.90	ND	35.00	0.030	0.030	11.54	11.70	3.20	3.20
2017	April	4.30	2.30	30.00	0.027	0.020	10.49	10.70	6.30	6.90
Minimum	March/April/June	2.60	0.77	30.00	0.025	0.020	7.30	7.60	3.20	3.20
Maximum	March/April/June	4.30	3.00	130.00	0.038	0.080	11.64	12.48	18.80	19.60
Average	March/April/June	3.27	1.85	87.50	0.031	0.041	10.18	10.58	8.73	9.38
2011	July	3.70	5.60	80.00	0.042	0.041	6.62	6.91	24.90	25.30
2012	July	4.70	4.00	80.00	0.038	0.041	5.52	6.15	25.30	25.90
2013	July	3.50	3.20	150.00	0.041	0.041	5.91	6.04	25.00	25.00
2014	July	3.30	3.00	100.00	0.037	0.038	6.30	7.20	20.70	21.20
2015	July	3.50	4.00	80.00	0.026	0.027	6.59	6.88	20.90	21.30
2016	July	3.70	6.70	45.00	0.021	0.026	6.80	6.93	22.80	22.80
2017	July	4.00	3.50	30.00	0.028	0.029	6.43	6.94	22.90	23.30
Minimum	July	3.30	3.00	30.00	0.028	0.029	5.52	6.04	20.70	21.20
Maximum	July	4.70	6.70	150.00	0.042	0.041	6.80	7.20	25.30	25.90
Average	July	3.77	4.29	80.71	0.033	0.035	6.31	6.72	23.21	23.54
2011	August	3.25	13.00	120.00	0.048	0.047	7.74	7.14	23.20	24.30
2012	August	2.75	14.00	80.00	0.051	0.050	5.93	6.75	23.50	23.70
2013	August	3.20	5.30	130.00	0.071	0.110	7.06	7.24	19.90	20.00
2014	August	3.00	5.50	100.00	0.029	0.033	6.35	6.91	21.60	21.90
2015	August	4.00	14.00	70.00	0.031	*	6.96	7.21	22.10	22.20
2016	August	4.90	7.20	30.00	0.026	0.096	5.98	6.42	24.10	24.10
2017	August	4.60	5.60	40.00	0.032	0.033	6.77	7.23	21.00	20.90
Minimum	August	2.75	5.30	30.00	0.026	0.033	5.93	6.42	19.90	20.00
Maximum	August	4.90	14.00	130.00	0.071	0.110	7.74	7.24	24.10	24.30
Average	August	3.67	9.23	81.43	0.041	0.062	6.68	6.99	22.20	22.44

* No sample taken

Appendix C – Flambeau (Lower) Impoundment Project Sampling Logs

IMPOUNDMENT SAMPLING LOG

Water Quality Study Location Flambeau Canoe

Hydroelectric Project – FERC # 2421

Date: 4-13-17

Pre-Sampling Data:

HWL 1467.25 TWL 1448.6 CFS 621

Sample Location: N45° 54.828' W90° 26.822'

Performed by: A. Stone T Plummer

Time: 9:02 Barometer: 30.4

Air Temp: 44 °F Wind Speed: ESE 5mph

Sky Conditions: 95%

Precipitation within Last 24 Hours: 0.2"

D.O. Meter Calibration:

Instrument Model Used: HQ40D

Were the batteries changed? ☐ Yes ☒ No

If yes, when were they changed: _____

Battery Status: _____% Charge

Calibration Method: Factory

Sampling Depth Profile: Measured depth to bottom of impoundment: 20 Feet

Secchi Depth (± 0.1)		
Time 9:32	4.3	Feet

Comments:

Chlorophyll *a* (3 feet below surface horizontal sampler)		
Lab Sample I.D. #:		
Time 9:25	Quantity (ml)	Filtered
	1000	In Lab
Preservative	$MgCO_3$	

True Color (3 feet below surface horizontal sampler)
Lab Sample I.D. # :
Time: 9:25

Total Phosphorus (3 feet below surface horizontal sampler)	
Lab Sample I.D. # :	
Time 9:25	Preservative
	H_2SO_4

Total Phosphorus (3 feet above bottom horizontal sampler)	
Lab Sample I.D. # :	
Time 9:23	Preservative
	H_2SO_4

D.O. and Temperature Profile			
Depth (Feet)	Time	D.O. (mg/L)	Temperature °C
0.5 below surface	9:21:40	10.62	6.9
3	9:22:18	10.70	6.4
6	9:22:54	10.70	6.4
9	9:23:25	10.68	6.3
12	9:23:58	10.65	6.3
15	9:24:33	10.59	6.3
18	9:25:06	10.54	6.3
20	9:26:60	10.49	6.3
24			
0.5 above bottom	9:26:44	10.52	6.3

*If D.O. is below 5.0 mg/L notify agency and measure D.O. at 1.0 foot intervals if <5.0 mg/L.

WHITE WATER ASSOCIATES, INC.

IMPOUNDMENT SAMPLING LOG

Water Quality Study Location Lower Flambeau

Hydroelectric Project – FERC # 2421

Date: 7-2017

Pre-Sampling Data:

HWL 1467.20 TWL 1448.6 CFS 793

Sample Location: N 45° 54.828' W90° 26.821'

Performed by: Shane Haag

Time: 9:18 Barometer: 29.9

Air Temp: 67 °F Wind Speed: SW 4mph

Sky Conditions: 75% Clouds

Precipitation within Last 24 Hours: NO

D.O. Meter Calibration:

Instrument Model Used: HQ40D

Were the batteries changed? ☐ Yes ☒ No

If yes, when were they changed: _____

Battery Status: 70 % Charge

Calibration Method: Factory

Sampling Depth Profile: Measured depth to bottom of impoundment: 19 Feet

Secchi Depth (± 0.1)		
Time 9:24	4	Feet

Comments:

Chlorophyll *a* (3 feet below surface horizontal sampler)		
Lab Sample I.D. #:		
Time 9:16	Quantity (ml)	Filtered
	1000	In Lab
Preservative	$MgCO_3$	

True Color (3 feet below surface horizontal sampler)
Lab Sample I.D. # :
Time: 9:16

Total Phosphorus (3 feet below surface horizontal sampler)	
Lab Sample I.D. # :	
Time 9:16	Preservative
	H_2SO_4

Total Phosphorus (3 feet above bottom horizontal sampler)	
Lab Sample I.D. # :	
Time 9:19	Preservative
	H_2SO_4

D.O. and Temperature Profile			
Depth (Feet)	Time	D.O. (mg/L)	Temperature °C
0.5 below surface	9:16:18	6.94	23.3
3	9:16:50	6.80	23.0
6	9:17:18	6.74	23.0
9	9:17:50	6.59	22.9
12	9:18:22	6.55	22.9
15	9:19:26	6.48	22.9
18	9:19:26	6.46	22.9
~~21~~ 19.	9:21:24	6.46	22.9
24			
0.5 above bottom	9:22:24	6.43	22.9

*If D.O. is below 5.0 mg/L notify agency and measure D.O. at 1.0 foot intervals if <5.0 mg/L.

WHITE WATER ASSOCIATES, INC.

IMPOUNDMENT SAMPLING LOG

Water Quality Study Location Lower Flambeau

Hydroelectric Project – FERC # 2421

Date: 8-16-17

Pre-Sampling Data:

HWL 1467.25 TWL 1467.60 CFS 514

Sample Location: N45° 54.866' W90° 26.842'

Performed by: Steve Haag

Time: 9.15 Barometer: 30

Air Temp: 57 °F Wind Speed: ENE 4 mph

Sky Conditions: 100% Clouds

Precipitation within Last 24 Hours: None

D.O. Meter Calibration:

Instrument Model Used: HQ40D

Were the batteries changed? ☐ Yes ☒ No

If yes, when were they changed: _____

Battery Status: 70 % Charge

Calibration Method: Factory

Sampling Depth Profile: Measured depth to bottom of impoundment: 17 Feet

Secchi Depth (± 0.1)		
Time 9.27	4'7" Feet	
	4.6'	

Comments:

Chlorophyll *a* (3 feet below surface horizontal sampler)		
Lab Sample I.D. #:		
Time 9:20	Quantity (ml)	Filtered
	1000	In Lab
Preservative	$MgCO_3$	

True Color (3 feet below surface horizontal sampler)
Lab Sample I.D. # :
Time: 9.20

Total Phosphorus (3 feet below surface horizontal sampler)	
Lab Sample I.D. # :	
Time 9.20	Preservative
	H_2SO_4

Total Phosphorus (3 feet above bottom horizontal sampler)	
Lab Sample I.D. # :	
Time 9:18	Preservative
	H_2SO_4

D.O. and Temperature Profile			
Depth (Feet)	Time	D.O. (mg/L)	Temperature °C
0.5 below surface	9:18:31	7.23	20.8
3	9:19:34	6.99	20.9
6	9:20:08	6.97	20.9
9	9:20:39	6.95	20.9
12	9:21:08	6.93	21.0
15	9:21:41	6.84	21.0
18 17	9:22:56	6.77	21.0
21			
24			
0.5 above bottom	9:23:01	6.79	21.0

*If D.O. is below 5.0 mg/L notify agency and measure D.O. at 1.0 foot intervals if <5.0 mg/L.

WHITE WATER ASSOCIATES, INC.

Appendix D – Flambeau (Lower) Hydroelectric Project Lab Reports and Chains of Custody

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page

Client: RWE **WWA Job #:** 68749

Project: Monitoring

Date Received: 4/14/2017 **Date Reported:** 4/27/2017

Sample Number	Client Sample ID	Date Sampled	Sample Matrix
68749-001	Upper Flambeau	04/13/17	Water
68749-002	Upper Flambeau	04/13/17	Water
68749-003	Lower Flambeau	04/13/17	Water
68749-004	Lower Flambeau	04/13/17	Water
68749-005	Pixley	04/13/17	Water
68749-006	Pixley	04/13/17	Water
68749-007	Crowley	04/13/17	Water
68749-008	Crowley	04/13/17	Water

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page..continued

Client: RWE **WWA Job #:** 68749

Comments (if any):

Key to Laboratory Flags:

*: RPD exceeds limits.
B: The analyte was found in the associated blank as well as in the sample.
J: The quantitation is an estimated value because the result is less than the sample quantitation limit but greater than the detection limit.
M: A matrix effect was present.
Q: Batch QC data associated with the analysis does not meet the stated objectives
H: Indicates analytical holding time exceedance.
U: The analyte was analyzed for, but not detected.
P: A manual peak selection or manual integration was performed to correct an erroneous software selection.

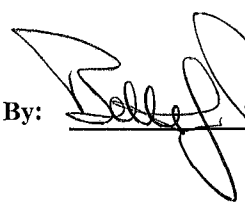
ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)
For coliform, Negative = No coliform bacteria detected, Positive = Coliform bacteria detected

Sample Types:
S = Solids, DW = Drinking water, D = Dissolved, T = Total, TC = TCLP extract, SP = SPLP extract

All samples were received intact and properly preserved unless otherwise noted. The results reported relate only to the samples tested. This report shall not be reproduced, except in full, without the written approval of this laboratory. The Chain of Custody is attached.

This report satisfies the requirements of your project but has not been prepared to comply with NELAP reporting requirements.

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and White Water Associates Standard Operating Procedures. Exceptions, if any, are discussed in the accompanying sample narrative. Release of this Final Report is authorized by White Water Associates management, as is verified by the following signature.

Approved By: 

WI DNR Lab Certification Number: 999971280
MI DEQ Certification Number: 9306
DoD-ELAP Accreditation Number: 65802
ISO/IEC 17025:2005 Accredited

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.

429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 68749

Project: Monitoring

Date Received: 4/14/2017 **Date Reported:** 4/27/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date	Method	MDL	MQL
68749-001 / Upper Flambeau / Surface / Water							
General Chemistry Parameters							
chlorophyll a	4.0		mg/m3	4/20/2017	10200H	NA	NA
Color	30		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.018	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-002 / Upper Flambeau / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.029	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-003 / Lower Flambeau / Surface / Water							
General Chemistry Parameters							
chlorophyll a	2.3		mg/m3	4/20/2017	10200H	NA	NA
Color	30		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.027	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-004 / Lower Flambeau / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.020	J	mg/L	4/19/2017	365.4	0.008	0.050

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 68749

Project: Monitoring

Date Received: 4/14/2017 **Date Reported:** 4/27/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date	Method	MDL	MQL
68749-005 / Pixley / Surface / Water							
General Chemistry Parameters							
chlorophyll a	3.9		mg/m3	4/20/2017	10200H	NA	NA
Color	35		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.028	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-006 / Pixley / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.025	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-007 / Crowley / Surface / Water							
General Chemistry Parameters							
chlorophyll a	3.4		mg/m3	4/20/2017	10200H	NA	NA
Color	30		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.025	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-008 / Crowley / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.028	J	mg/L	4/19/2017	365.4	0.008	0.050

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

Job # (WWA office use): 6849

CHAIN-OF-CUSTODY RECORD

JGut 4/19/17 Version 160504

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903

Phone: (906) 822-7889, Fax -7977
Web: white-water-associates.com

CLIENT NAME / BILL TO: RWE

EMAIL ADDRESS:

ADDRESS:

TELEPHONE:

CITY | STATE | ZIP:

CONTRACT / PO / PROJECT NAME / WSSN#: Monitoring

SAMPLER NAME (print first/last name): Angie Stine

COUNTY OF LOCATION:

PAGE 1 OF 1 — Indicate if more than one page of COC records used

SAMPLER'S SIGNATURE:

Check off preservatives for each bottle upon arrival and indicate total number of bottles. WWA database contains bottle preservation details.

ANALYSIS TYPE REQUESTED (Attach list if neeeded)

Instructions to White Water
Send my report by:
____ email
____ mail

Unless otherwise noted, drinking water report copies are sent to MDEQ and Health Dept.

REMARKS (Note any special instructions provided by client or conditions of receipt noted by WWA lab staff. Also note any residual chlorine.)

SAMPLE ID AND LOCATION (Containers for each sample may be combined on one line.)	DATE	TIME	SAMPLE MATRIX: Drinking water	Aqueous	Sed.	Soil	Other:	CONTAINERS / PRESERVATIVES: None	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Na Thio	Total Number of Containers	Chl a (mg/CO3)	Total Phos	Color
1 Upper Flambeau Surface	4-13-17	8:20						X	X						3	X	X	X
2 Upper Flambeau Bottom	4-13-17	8:17					②HNO3								1		X	
3 Lower Flambeau Surface	4-13-17	9:25						X							3	X	X	X
4 Lower Flambeau Bottom	4-13-17	9:23					②HNO3								1		X	
5 Pixley Surface	4-13-17	11:05						X							3	X	X	X
6 Pixley Bottom	4-13-17	11:00					②HNO3								1		X	
7 Crowley Surface	4-13-17	13:42						X							3	X	X	X
8 Crowley Bottom	4-13-17	13:40					②HNO3								1		X	
							①											

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
			②JGut 4/19/17		
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
	4-13-17	5:30 p.m.	①	4-4-17	1058

Comments/Sample temp. on receipt: 2.7

Packing: Ice ✓ Cooler ✓

WHITE - RETURN W/ REPORT CANARY - W/ SAMPLES PINK - CUSTOMER

UPS☐ FedEx☐ USPS☐ Client☐ Other WWA

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page

Client: RWE **WWA Job #:** 70828

Project: Monitoring

Date Received: 7/21/2017 **Date Reported:** 9/21/2017

Sample Number	Client Sample ID	Date Sampled	Sample Matrix
70828-001	Upper Flambeau	07/20/17	Water
70828-002	Upper Flambeau	07/20/17	Water
70828-003	Lower Flambeau	07/20/17	Water
70828-004	Lower Flambeau	07/20/17	Water
70828-005	Pixley	07/20/17	Water
70828-006	Pixley	07/20/17	Water
70828-007	Crowley	07/20/17	Water
70828-008	Crowley	07/20/17	Water

WHITE WATER ASSOCIATES, INC.
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Cover Page..continued

Client: RWE **WWA Job #:** 70828

Comments (if any):

Key to Laboratory Flags:

*: RPD exceeds limits.
B: The analyte was found in the associated blank as well as in the sample.
J: The quantitation is an estimated value because the result is less than the sample quantitation limit but greater than the detection limit.
M: A matrix effect was present.
Q: Batch QC data associated with the analysis does not meet the stated objectives
H: Indicates analytical holding time exceedance.
U: The analyte was analyzed for, but not detected.
P: A manual peak selection or manual integration was performed to correct an erroneous software selection.

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)
For coliform, Negative = No coliform bacteria detected, Positive = Coliform bacteria detected

Sample Types:
S = Solids, DW = Drinking water, D = Dissolved, T = Total, TC = TCLP extract, SP = SPLP extract

All samples were received intact and properly preserved unless otherwise noted. The results reported relate only to the samples tested. This report shall not be reproduced, except in full, without the written approval of this laboratory. The Chain of Custody is attached.

This report satisfies the requirements of your project but has not been prepared to comply with NELAP reporting requirements.

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and White Water Associates Standard Operating Procedures. Exceptions, if any, are discussed in the accompanying sample narrative. Release of this Final Report is authorized by White Water Associates management, as is verified by the following signature.

Approved By: Robert J. Reams

WI DNR Lab Certification Number: 999971280
MI DEQ Certification Number: 9306
DoD-ELAP Accreditation Number: 65802
ISO/IEC 17025:2005 Accredited

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 70828

Project: Monitoring

Date Received: 7/21/2017 **Date Reported:** 9/21/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
70828-001 / Upper Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	3.1		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	35		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.023	J	mg/L	8/1/2017 10:31	365.4	0.008	0.050	NK
70828-002 / Upper Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.017	J	mg/L	8/1/2017 10:32	365.4	0.008	0.050	NK
70828-003 / Lower Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	3.5		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	30		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.028	J	mg/L	8/1/2017 10:33	365.4	0.008	0.050	NK
70828-004 / Lower Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.029	J	mg/L	8/1/2017 10:33	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 70828

Project: Monitoring

Date Received: 7/21/2017 **Date Reported:** 9/21/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
70828-005 / Pixley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	6.3		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	35		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.036	J	mg/L	8/1/2017 10:35	365.4	0.008	0.050	NK
70828-006 / Pixley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.11		mg/L	8/1/2017 10:36	365.4	0.008	0.050	NK
70828-007 / Crowley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	8.3		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	35		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.033	J	mg/L	8/1/2017 10:36	365.4	0.008	0.050	NK
70828-008 / Crowley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.033	J	mg/L	8/1/2017 10:37	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

Job # (WWA office use): 70828

CHAIN-OF-CUSTODY RECORD

Version 160504

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903
Phone: (906) 822-7889, Fax -7977
Web: white-water-associates.com

CLIENT NAME / BILL TO: RWE

EMAIL ADDRESS:

ADDRESS:

TELEPHONE:

CITY | STATE | ZIP:

CONTRACT / PO / PROJECT NAME / WSSN#: Monitoring

SAMPLER NAME (print first/last name): Angi Stone

COUNTY OF LOCATION:

PAGE 1 OF 1 — Indicate if more than one page of COC records used

SAMPLER'S SIGNATURE:

Check off preservatives for each bottle upon arrival and indicate total number of bottles. WWA database contains bottle preservation details.

ANALYSIS TYPE REQUESTED (Attach list if neeeded)

Instructions to White Water
Send my report by:
____ email
____ mail

Unless otherwise noted, drinking water report copies are sent to MDEQ and Health Dept.

REMARKS (Note any special instructions provided by client or conditions of receipt noted by WWA lab staff. Also note any residual chlorine.)

	SAMPLE ID AND LOCATION (Containers for each sample may be combined on one line.)	DATE	TIME	SAMPLE MATRIX: Drinking water	Aqueous	Sed.	Soil	Other:	CONTAINERS / PRESERVATIVES: None	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Na Thio	Total Number of Containers	Chla Cmg/m3	T Phos	Color
1	Upper Flambeau Surface	7-20-17	7:45		X				X	X						3	X	X	X
2	Upper Flambeau Bottom	"	7:50													1		X	
3	Lower Flambeau Surface	"	9:14						X							3	X	X	X
4	Lower Flambeau Bottom	"	9:19													1		X	
5	Pixley Surface	"	10:57						X							3	X	X	X
6	Pixley Bottom	"	11:00													1		X	
7	Crowley Surface	"	13:40						X							3	X	X	X
8	Crowley Bottom	"	13:43													1		X	

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
[signature]	7-20-17	5:03 pm			
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
			[signature] ①	7-21-17	1045

Comments/Sample temp. on receipt: 3.5

Packing: Ice ✓ Cooler ✓

WHITE - RETURN W/ REPORT CANARY - W/ SAMPLES PINK - CUSTOMER

UPS☐ FedEx☐ USPS☐ Client☐ Other WWA

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page

Client: RWE **WWA Job #:** 71379

Project: Monitoring

Date Received: 8/17/2017 **Date Reported:** 9/14/2017

Sample Number	Client Sample ID	Date Sampled	Sample Matrix
71379-001	Upper Flambeau	08/16/17	Water
71379-002	Upper Flambeau	08/16/17	Water
71379-003	Lower Flambeau	08/16/17	Water
71379-004	Lower Flambeau	08/16/17	Water
71379-005	Pixley	08/16/17	Water
71379-006	Pixley	08/16/17	Water
71379-007	Crowley	08/16/17	Water
71379-008	Crowley	08/16/17	Water

WHITE WATER ASSOCIATES, INC.
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Cover Page..continued

Client: RWE **WWA Job #:** 71379

Comments (if any):

Key to Laboratory Flags:

*: RPD exceeds limits.
B: The analyte was found in the associated blank as well as in the sample.
J: The quantitation is an estimated value because the result is less than the sample quantitation limit but greater than the detection limit.
M: A matrix effect was present.
Q: Batch QC data associated with the analysis does not meet the stated objectives
H: Indicates analytical holding time exceedance.
U: The analyte was analyzed for, but not detected.
P: A manual peak selection or manual integration was performed to correct an erroneous software selection.

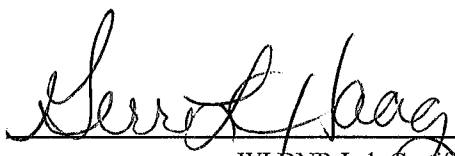
ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)
For coliform, Negative = No coliform bacteria detected, Positive = Coliform bacteria detected

Sample Types:
S = Solids, DW = Drinking water, D = Dissolved, T = Total, TC = TCLP extract, SP = SPLP extract

All samples were received intact and properly preserved unless otherwise noted. The results reported relate only to the samples tested. This report shall not be reproduced, except in full, without the written approval of this laboratory. The Chain of Custody is attached.

This report satisfies the requirements of your project but has not been prepared to comply with NELAP reporting requirements.

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and White Water Associates Standard Operating Procedures. Exceptions, if any, are discussed in the accompanying sample narrative. Release of this Final Report is authorized by White Water Associates management, as is verified by the following signature.

Approved By: 

WI DNR Lab Certification Number: 999971280
MI DEQ Certification Number: 9306
DoD-ELAP Accreditation Number: 65802
ISO/IEC 17025:2005 Accredited

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.

429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 71379

Project: Monitoring

Date Received: 8/17/2017 **Date Reported:** 9/14/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
71379-001 / Upper Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	4.9		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	35		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.018	J	mg/L	8/18/2017 11:41	365.4	0.008	0.050	NK
71379-002 / Upper Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.015	J	mg/L	8/18/2017 11:43	365.4	0.008	0.050	NK
71379-003 / Lower Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	5.6		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	40		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.032	J	mg/L	8/18/2017 11:43	365.4	0.008	0.050	NK
71379-004 / Lower Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.033	J	mg/L	8/18/2017 11:44	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 71379

Project: Monitoring

Date Received: 8/17/2017 **Date Reported:** 9/14/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
71379-005 / Pixley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	12		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	40		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.032	J	mg/L	8/18/2017 11:44	365.4	0.008	0.050	NK
71379-006 / Pixley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.027	J	mg/L	8/18/2017 11:46	365.4	0.008	0.050	NK
71379-007 / Crowley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	13		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	30		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.032	J	mg/L	8/18/2017 11:47	365.4	0.008	0.050	NK
71379-008 / Crowley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.030	J	mg/L	8/18/2017 11:47	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

V Gw 8/18/17 Version 160504

Job # (WWA office use): 71379

CHAIN-OF-CUSTODY RECORD

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903

Phone: (906) 822-7889, Fax -7977
Web: white-water-associates.com

CLIENT NAME / BILL TO: RWE.		EMAIL ADDRESS	
ADDRESS		TELEPHONE	
CITY	STATE / ZIP	CONTRACT / PO / PROJECT NAME / WSSN#: Monitoring	
SAMPLER NAME (print first/last name): Angie Shaw		COUNTY OF LOCATION	PAGE 1 OF 1 (Indicate if more than one page of COC records used)
SAMPLER'S SIGNATURE		Check off preservatives for each bottle upon arrival and indicate total number of bottles. WWA database contains bottle preservation details.	

ANALYSIS TYPE REQUESTED (Attach list if neeeded)

Instructions to White Water
Send my report by:
____ email
____ mail

Unless otherwise noted, drinking water report copies are sent to MDEQ and Health Dept.

REMARKS (Note any special instructions provided by client or conditions of receipt noted by WWA lab staff. Also note any residual chlorine.)

	SAMPLE ID AND LOCATION (Containers for each sample may be combined on one line.)	DATE	TIME	SAMPLE MATRIX: Drinking water	Aqueous	Sed.	Soil	Other:	CONTAINERS / PRESERVATIVES: None	H2SO4	HNO3	HCl Hg2Cl2	NaOH	ZnAc/NaOH	Na Thio	Total Number of Containers	Chl a	T Phos	Color
1	Upper Flambeau Surface	8-16-17	7:48		X				X	X		X				3	X	X	X
2	" Bottom	"	7:46		"				no	"						1		X	
3	Lower Flambeau Surface	8-16-17	9:20		"				X	"		X				3	X	X	X
4	" Bottom	"	9:18		"				no	"						1		X	
5	Pixley Surface	8-16-17	10:53		"				X	"		X				3	X	X	X
6	Pixley Bottom	"	10:51		"				no	"						1		X	
7	Crowley Surface	8-16-17	13:18		"					"		X				3	X	X	X
8	Crowley Bottom	"	13:16		"				no	"						1		X	

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date: 8-17-17	Time: 16:47	Received by:	Date: 8-17-17	Time: 830

Comments/Sample temp. on receipt:

Packing: Ice ✓
Cooler ✓

WHITE - RETURN W/ REPORT CANARY - W/ SAMPLES PINK - CUSTOMER

UPS☐ FedEx☐ USPS☐ Client☐ Other WWA

Final Report

2017 Water Quality Monitoring Data

for the

Flambeau (Pixley) Hydroelectric Project

FERC Project #2395

Flambeau Hydro, LLC

North Fork of the Flambeau River, Price County, Wisconsin

Respectfully Submitted by:

Angie Stine

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903

Phone: 906-822-7889

Summary Flambeau (Pixley) Hydroelectric Project – FERC #2395

2017 marked the fourteenth year of water quality sampling under FERC approved "Water Quality Monitoring Plan Per License Article 406 for the Flambeau (Pixley) Hydroelectric Project – FERC Project # 2395 – Flambeau Hydro, LLC. Monitoring was conducted on April 13, July 20, and August 16, 2017. This document contains all of the associated records for the 2017 monitoring along with summary figures and tables in four appendices: (1) Appendix A (Figures 1-4), (2) Appendix B (Tables 1-3), (3) Appendix C (sampling logs by date), and (4) Appendix D (laboratory reports and chains of custody).

A map of the Flambeau (Pixley) Hydroelectric Project is shown in Figure 1 indicating the water quality sampling location.

Monitoring results for 2017 are shown in Table 1. No unusual Temperature (Figure 2) or Dissolved Oxygen (Figure 3) readings were observed. The Secchi depths are shown in Figure 4.

In general, the weather (temperature and rainfall) during 2017 monitoring season appeared slightly warmer in May, June, and July, & August, with lower than normal precipitation in October, March, and September, and normal to high precipitation in the months of April, May, July, July, and August (Table 2).

Ice-Out occurred between Agenda and Nine Mile Landing on the North Fork of the Flambeau River sometime during the week beginning April 3, 2017. The Ice-Out sampling event occurred on April 13, 2017. River flow, based on the Flambeau (Pixley) Hydroelectric Project records was approximately 854 cubic feet per second. Sampling occurred between 10:55 a.m. and 11:08 a.m. Samples were taken without incident. No unusual D.O. or Temperature readings were observed. Samples for laboratory analysis were delivered to White Water Associates, Inc. laboratory in Amasa, MI on April 13, 2017. White Water Associates, Inc. issued a laboratory report on April 27, 2017. No unusual levels of Chlorophyll *a*, True Color, or Total Phosphorus were noted in the laboratory reports.

River flow, based on Flambeau (Pixley) Hydroelectric Project records, was approximately 850 cubic feet per second during the July 20, 2017 sampling event. Sampling occurred between 10:55 a.m. and 11:07 a.m. Samples were taken without incident. No unusual D.O. or Temperature readings were observed. Samples for laboratory analysis were delivered to White Water Associates, Inc. laboratory in Amasa, MI on July 20, 2017. White Water Associates, Inc. issued a laboratory report on September 21, 2017. No unusual levels of Chlorophyll *a*, True Color, or Total Phosphorus were noted in the laboratory reports.

River flow, based on Flambeau (Pixley) Hydroelectric Project records, was approximately 447 cubic feet per second during the August 16, 2017 sampling event. Sampling occurred between 10:50 a.m. and 11:00 a.m. Samples were taken without incident. No unusual D.O. or Temperature readings were observed. Samples for laboratory analysis were delivered to White Water Associates, Inc. laboratory in Amasa, MI on August 16, 2017. White Water Associates, Inc. issued a laboratory report on September 14, 2017. No unusual levels of Chlorophyll *a*, True Color, or Total Phosphorus were noted in the laboratory reports.

A summary of a comparison between the 2011 thru 2017 (Table 3) sampling results are as follows:

1. Water Clarity – Secchi increased Ice Out, July and August
2. Chlorophyll a – Increased Ice Out, Decreased July and August
3. Color – Decreased July
4. Total Phosphorus – Decreased Ice Out, Increased July and Decreased August
5. Overall, D.O. – Decreased Ice Out, Increased July and Decreased August
6. Water Temperatures – Increased Ice Out and July, Decreased August

The next scheduled Water Quality Monitoring at the Pixley Hydroelectric Project is set to take place in 2018 beginning with the Ice-Out sampling event.

Appendix A – Flambeau (Pixley) Hydroelectric Project Figures

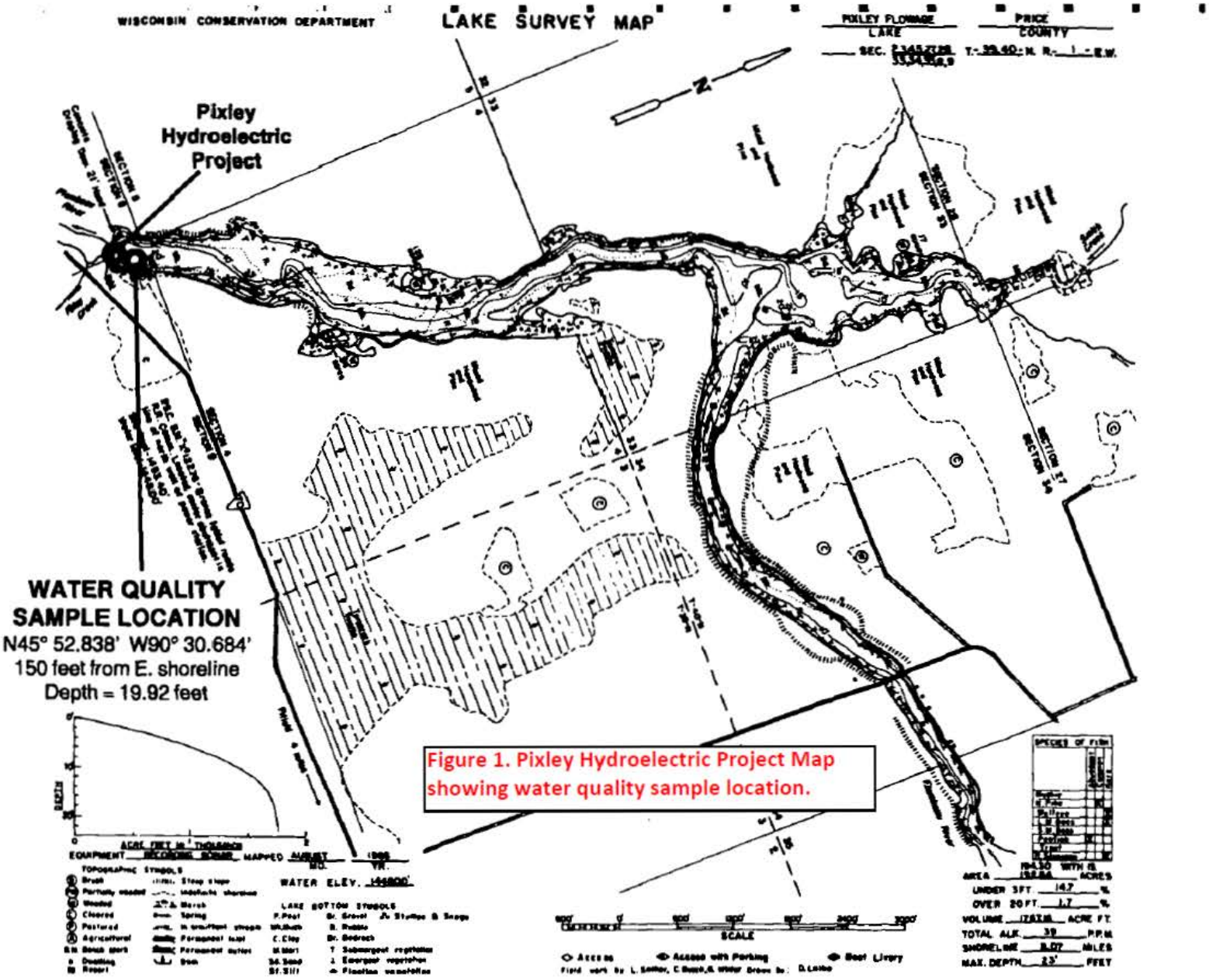


Figure 1. Pixley Hydroelectric Project Map showing water quality sample location.

Figure 2. Pixley - FERC #2395
2017 Temperature Samples

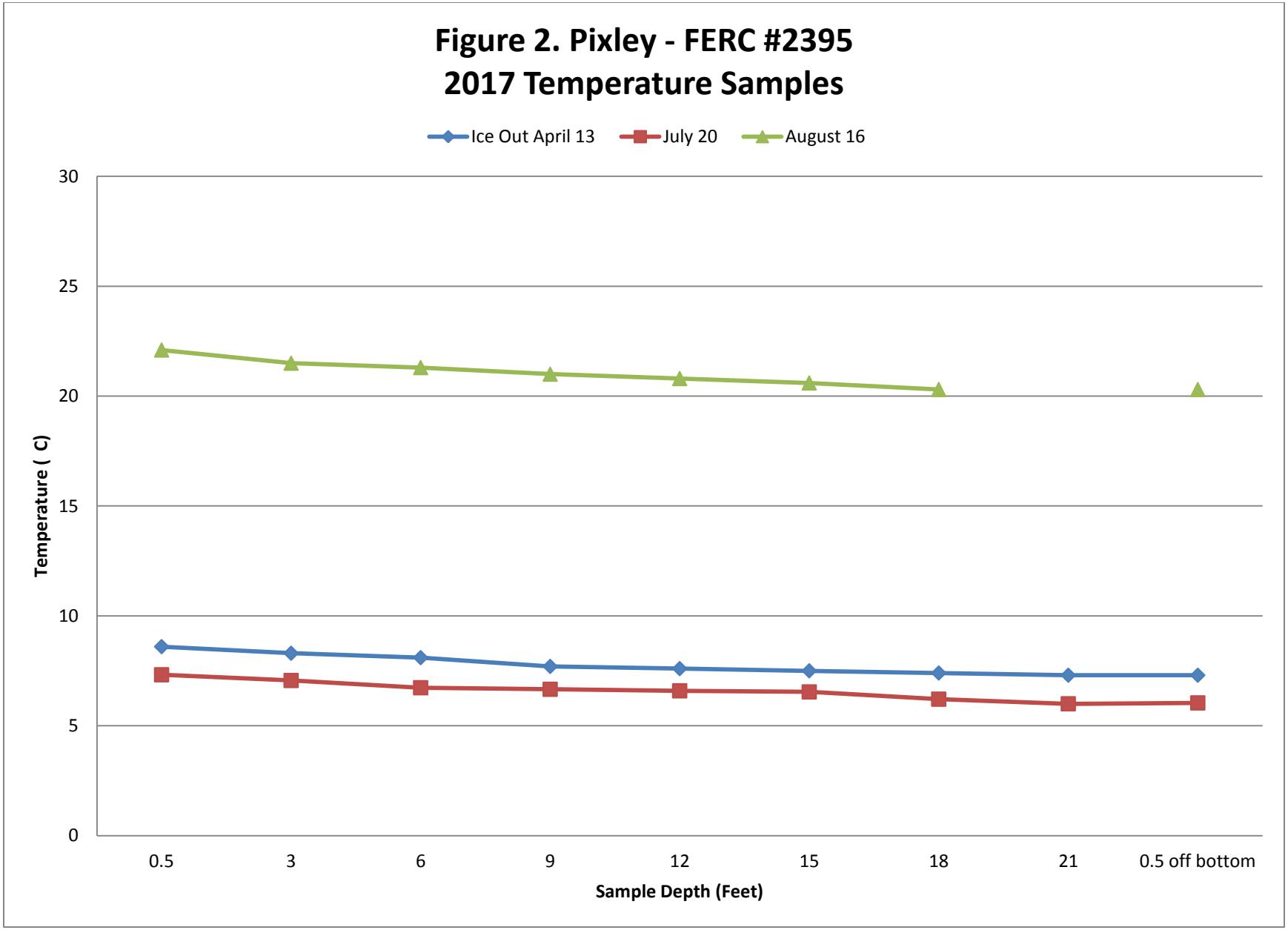
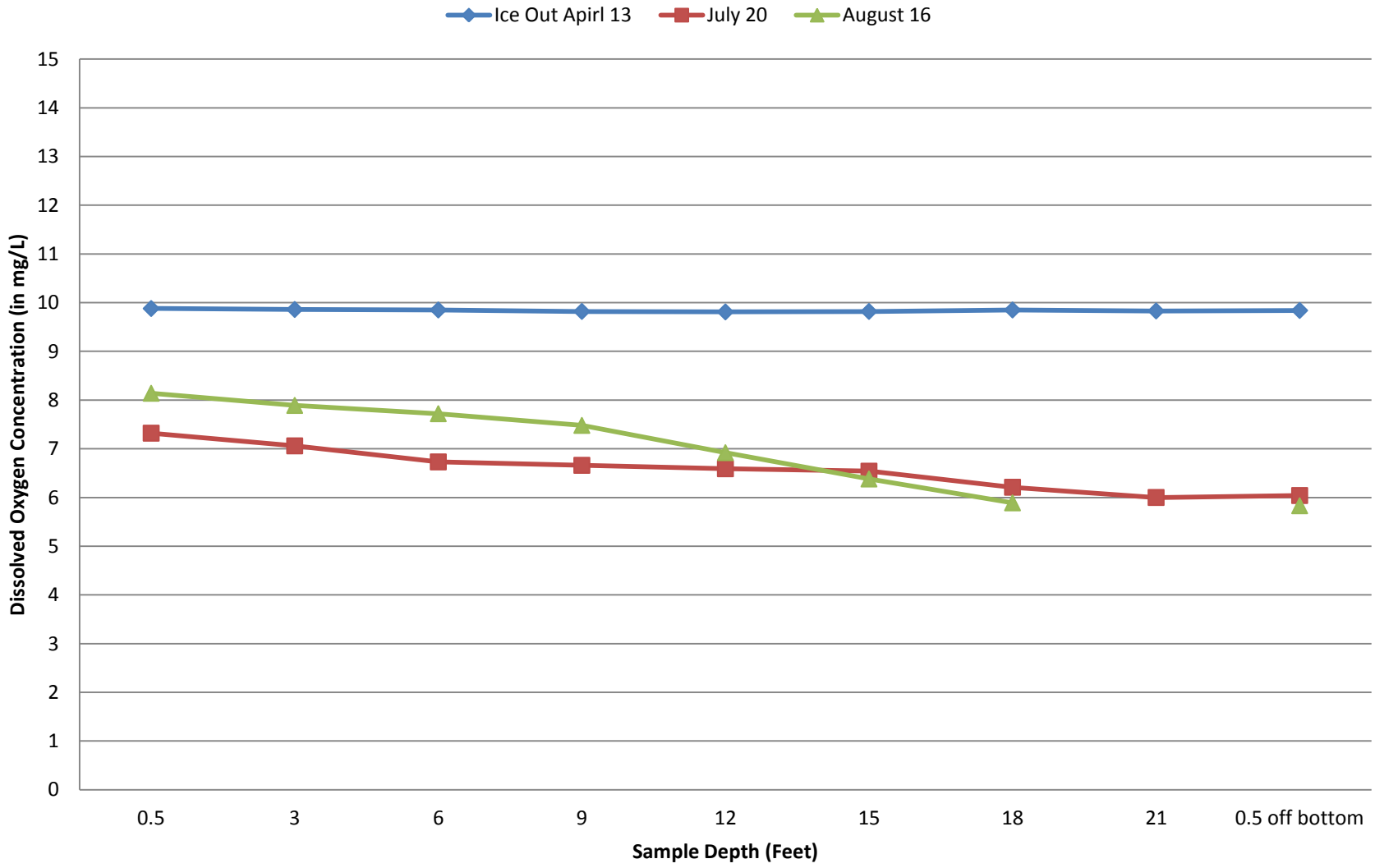


Figure 3. Pixley- FERC #2395
2017 Dissolved Oxygen Samples



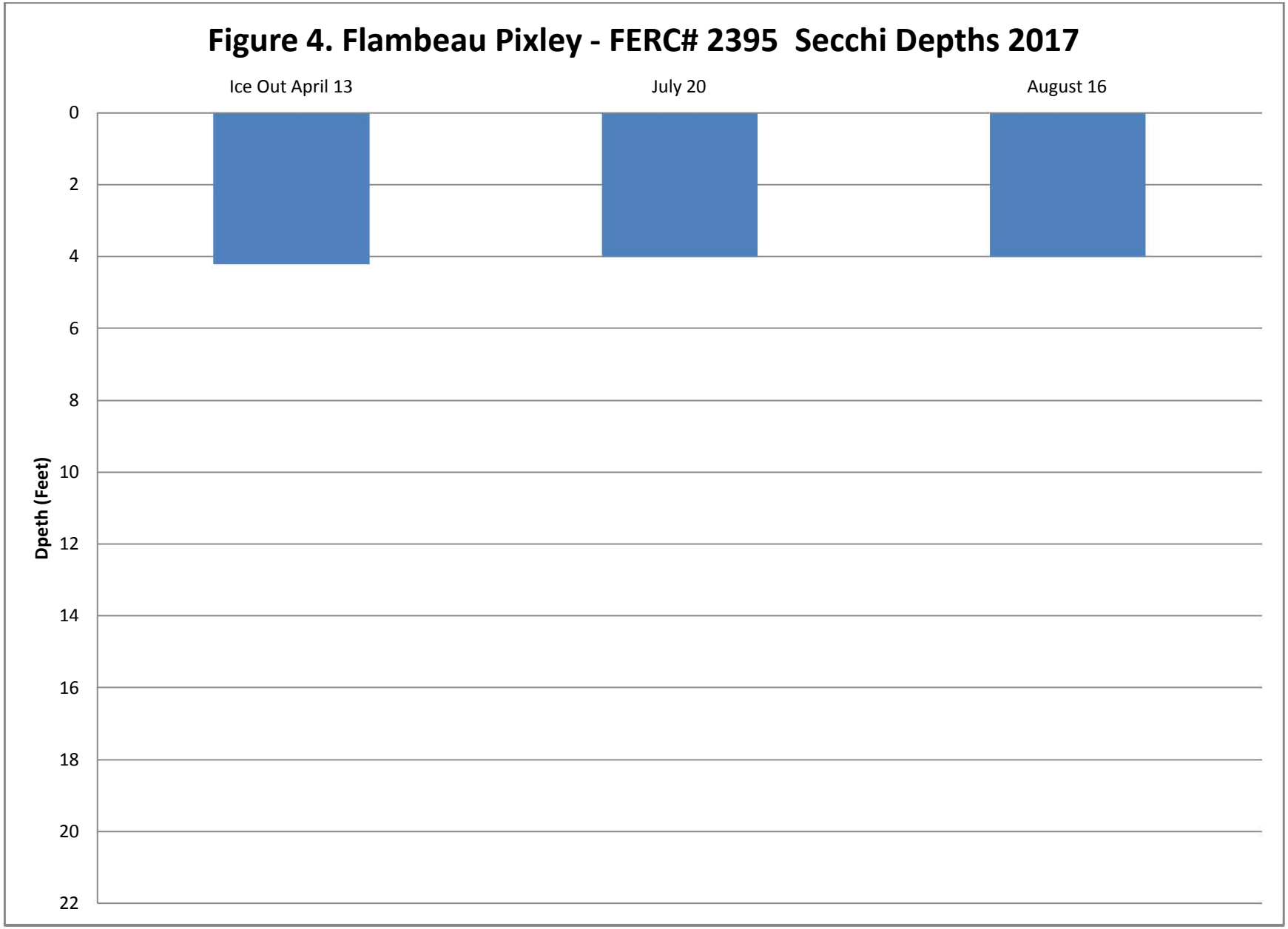


Figure 4. Flambeau Pixley - FERC# 2395 Secchi Depths 2017
Ice Out April 13
July 20
August 16
Dpeth (Feet)
0
2
4
6
8
10
12
14
16
18
20
22

Appendix B – Flambeau (Pixley) Hydroelectric Project Tables

Table 1. Pixley Hydroelectric Project – FERC Project # 2395: 2017 Water Quality Sampling Data

	Ice Out April 13, 2017			**July 20, 2017**			**August 16, 2017**		
Project Flow (c.f.s)	854			850			447		
Dissolved Oxygen	**Time**	**D.O. (mg/L)**	**Water Temp. (°C)**	**Time**	**D.O. (mg/L)**	**Water Temp. (°C)**	**Time**	**D.O. (mg/L)**	**Water Temp. (°C)**
0.5 feet below surface	10:56:52	9.88	8.6	10:57:18	7.32	25.1	10:50:07	8.14	22.1
3 feet below surface	10:57:18	9.86	8.3	10:57:54	7.06	24.4	10:50:57	7.89	21.5
6 feet below surface	10:57:56	9.85	8.1	10:59:09	6.73	24.0	10:51:30	7.72	21.3
9 feet below surface	10:58:33	9.82	7.7	10:59:09	6.66	23.8	10:52:02	7.48	21.0
12 feet below surface	10:59:04	9.81	7.6	11:00:15	6.59	23.8	10:52:49	6.92	20.8
15 feet below surface	10:59:25	9.82	7.5	11:01:08	6.54	23.7	10:53:34	6.38	20.6
18 feet below surface	11:00:02	9.85	7.4	11:02:15	6.21	23.6	10:54:24	5.89	20.3
19 feet below surface	11:01:39	9.83	7.3	11:03:14	6.00	23.5	N/A	N/A	N/A
20 feet below surface	11:02:39	9.84	7.3	11:04:18	6.04	23.5	10:55:27	5.83	20.3
0.5 meter above bottom	10:56:52	9.88	8.6	10:57:18	7.32	25.1	10:50:07	8.14	22.1
Secchi Disk	**Time**	**Depth (ft)**		**Time**	**Depth (ft)**		**Time**	**Depth (ft)**	
Feet below surface	11:06	4.2		11:07	4.0		11:00	4.0	
Chlorophyll *a*	**Time**	**µg/L**		**Time**	**µg/L**		**Time**	**µg/L**	
3 feet below surface	11:08	3.9		10:57	6.3		10:53	12	
Color (True)	**Time**	**C.P.U. Units**	**LOD**	**Time**	**C.P.U. Units**	**LOD**	**Time**	**C.P.U. Units**	**LOD**
3 feet below surface	11:05	35	5*	10:57	35	5*	10:53	40	5*
Total Phosphorus	**Time**	**mg/L**	**LOD**	**Time**	**mg/L**	**LOD**	**Time**	**mg/L**	**LOD**
3 feet below surface	11:05	0.028	0.01*	10:57	0.036	0.008*	10:53	0.032	0.008*
3 feet above bottom	11:00	0.025	0.01*	11:00	0.110	0.008*	10:51	0.027	0.008*
*Considered Method Detection Limit N/A = Not Applicable									

Table 2. 2016/17 Water Year Monthly Temperature and Precipitation for Park Falls, Wisconsin

Month	Highest Temp.	Lowest Temp.	Average Temp.	Departure From Normal	Heating Degree Days	Normal Degree Days	Total Precip.	Total Snowfall	Normal Precip.	% of Normal Precipitation
October - 16	74	30	47.6	4.4	531	678	1.55	Trace	2.85	75
November - 16	70	10	40.2	11.4	735	1088	2.60	8.1	2.09	78
December - 16	39	-21	15.9	1.1	1512	1556	2.07	21.3	1.21	79
January – 17	45	-22	16.0	5.8	1511	1699	1.16	15.5	0.96	78
February – 17	52	-11	22.5	7.4	1185	1399	1.80	14.1	0.81	73
March – 17	59	-29	26.3	0.4	1193	1210	1.05	5.3	1.49	67
April – 17	70	23	42.2	2.6	678	762	3.02	1.9	2.43	68
May – 17	75	32	50.3	-1.1	446	426	4.11	0.8	3.23	68
June – 17	88	18	60.9	0.8	131	179	5.21	0.00	4.23	71
July – 17	86	48	65.3	-0.5	53	63	4.11	0.00	3.85	77
August – 17	82	46	61.5	-2.8	117	86	7.23	0.00	3.70	79
September - 17	83	37	58.6	3.0	212	298	3.55	0.00	4.11	81

Source: NOAA/Duluth, MN

Table 3. Flambeau Pixley Project Sampling Comparison Table: 2011 Thru Current Year										
Year	**Month**	**Secchi Depth**	**Chlorophyll *a***	**Color (True)**	**Total Phosphorus**	**Total Phosphorus**	**Low D.O.**	**High D.O.**	**Low Water Temp.**	**High Water Temp.**
		Feet	**µg/L**	**C.P.U. Units**	**Below Surface mg/L**	**Above Bottom mg/L**	**mg/L**	**mg/L**	**° C**	**° C**
2011	April	3.20	2.10	80.00	0.033	0.031	11.64	12.05	6.60	11.70
2012	April	3.10	1.70	140.00	0.039	*	10.94	11.26	9.30	10.00
2013	May	*	*	*	*	*	*	*	*	*
2014	June	3.00	1.40	130.00	0.030	0.031	6.70	6.94	19.00	22.30
2015	April	3.60	1.30	130.00	0.037	0.030	9.55	9.84	8.70	10.90
2016	March	3.60	0.40	35.00	0.030	0.030	11.19	11.69	3.00	3.30
2017	April	4.20	3.90	35.00	0.028	0.025	9.81	9.88	7.30	8.60
Minimum	March/April/June	3.00	0.40	35.00	0.028	0.025	6.70	6.94	3.00	3.30
Maximum	March/April/June	4.20	3.90	140.00	0.039	0.031	11.64	12.05	19.00	22.30
Average	March/April/June	3.30	1.38	103.00	0.034	0.031	10.00	10.36	9.32	11.64
2011	July	3.00	16.00	70.00	0.057	0.041	6.62	8.25	25.40	25.80
2012	July	3.10	8.80	100.00	0.057	0.041	5.52	6.40	25.70	27.20
2013	July	2.10	6.20	150.00	0.044	0.043	5.24	5.85	25.10	25.30
2014	July	3.00	5.40	130.00	0.047	0.050	6.02	7.28	21.20	21.90
2015	July	3.20	4.20	80.00	0.032	0.031	5.40	6.43	21.60	21.80
2016	July	3.70	8.10	45.00	0.033	0.180	6.11	6.65	23.20	26.30
2017	July	4.00	6.30	35.00	0.036	0.110	6.00	7.32	23.50	25.10
Minimum	July	2.10	4.20	35.00	0.032	0.031	5.24	5.85	21.20	21.80
Maximum	July	4.00	16.00	150.00	0.057	0.180	6.62	8.25	25.70	27.20
Average	July	3.16	7.86	87.14	0.044	0.071	5.84	6.88	23.67	24.77
2011	August	3.10	14.00	140.00	0.052	0.047	7.74	7.44	25.50	26.00
2012	August	2.50	26.00	100.00	0.048	0.050	5.93	9.32	23.80	24.60
2013	August	3.33	6.30	150.00	0.110	0.071	6.41	6.84	20.10	20.60
2014	August	3.70	6.20	100.00	0.037	0.035	6.18	6.56	22.30	22.60
2015	August	2.80	20.00	60.00	0.037	0.031	6.42	7.92	22.40	23.50
2016	August	3.20	15.00	45.00	0.036	0.048	3.93	7.82	23.50	25.30
2017	August	4.00	12.00	40.00	0.032	0.027	5.83	8.14	20.30	22.10
Minimum	August	2.50	6.20	40.00	0.032	0.027	3.93	6.56	20.10	20.60
Maximum	August	4.00	26.00	150.00	0.110	0.071	7.74	9.32	25.50	26.00
Average	August	3.23	14.21	90.71	0.050	0.044	6.06	7.72	22.56	23.53

*no sample taken

Appendix C – Flambeau (Pixley) Impoundment Project Sampling Logs

IMPOUNDMENT SAMPLING LOG

Water Quality Study Location Pixley

Hydroelectric Project – FERC # 2395

Date: 4-13-17

Pre-Sampling Data:

HWL 1448.6 TWL 1427.7 CFS 854.

Sample Location: N45° 52.888' W120° 30.684'

Performed by: A. Stein T. Plummer

Time: 10:55 Barometer: 30.4

Air Temp: 47 °F Wind Speed: ESE 5mpH

Sky Conditions: 95 clouds

Precipitation within Last 24 Hours: 0.2"

D.O. Meter Calibration:

Instrument Model Used: HQ40D

Were the batteries changed? ☐ Yes ☒ No

If yes, when were they changed: _____

Battery Status: 75 % Charge

Calibration Method: Factory

Sampling Depth Profile: Measured depth to bottom of impoundment: 20 Feet

Secchi Depth (± 0.1)		
Time 11:04	4.2	Feet

Comments:

Chlorophyll *a* (3 feet below surface horizontal sampler)		
Lab Sample I.D. #:		
Time 11:06	Quantity (ml)	Filtered
	1000	In Lab
Preservative	$MgCO_3$	

True Color (3 feet below surface horizontal sampler)	
Lab Sample I.D. # :	
Time:	11:05

Total Phosphorus (3 feet below surface horizontal sampler)	
Lab Sample I.D. # :	
Time 11:05	Preservative
	H_2SO_4

Total Phosphorus (3 feet above bottom horizontal sampler)	
Lab Sample I.D. # :	
Time 11:00	Preservative
	H_2SO_4

D.O. and Temperature Profile			
Depth (Feet)	Time	D.O. (mg/L)	Temperature ° C
0.5 below surface	10:56:54	9.88	8.6
3	10:57:18	9.86	8.3
6	10:57:56	9.85	8.1
9	10:58:33	9.82	7.7
12	10:59:04	9.81	7.6
15	10:59:25	9.82	7.5
18	11:00:02	9.85	7.4
20	11:01:39	9.83	7.3
24			
0.5 above bottom	11:02:39	9.84	7.3

*If D.O. is below 5.0 mg/L notify agency and measure D.O. at 1.0 foot intervals if <5.0 mg/L.

WHITE WATER ASSOCIATES, INC.

IMPOUNDMENT SAMPLING LOG

Water Quality Study Location Pixley

Hydroelectric Project – FERC # 2395

Date: 7.20.17

Pre-Sampling Data:

HWL 1448.14 TWL 1427.6 CFS 850

Sample Location: N 45° 52.838' W90° 30.684

Performed by:

Shane Keary

Time: 10:55 Barometer: 30

Air Temp: 72 °F Wind Speed: W 5 mph

Sky Conditions: Clear

Precipitation within Last 24 Hours: NO

D.O. Meter Calibration:

Instrument Model Used: HQ40D

Were the batteries changed? ☐ Yes ☒ No

If yes, when were they changed: _____

Battery Status: 70 % Charge

Calibration Method: Factory

Sampling Depth Profile: Measured depth to bottom of impoundment: 19 Feet

Secchi Depth (± 0.1)		
Time 11:07	4	Feet

Comments:

Chlorophyll *a* (3 feet below surface horizontal sampler)		
Lab Sample I.D. #:		
Time 10:57	Quantity (ml)	Filtered
	1000	In Lab
Preservative	$MgCO_3$	

True Color (3 feet below surface horizontal sampler)
Lab Sample I.D. #.:
Time: 10:57

Total Phosphorus (3 feet below surface horizontal sampler)	
Lab Sample I.D. # :	
Time 10:57	Preservative
	H_2SO_4

Total Phosphorus (3 feet above bottom horizontal sampler)	
Lab Sample I.D. # :	
Time 11:00	Preservative
	H_2SO_4

D.O. and Temperature Profile			
Depth (Feet)	Time	D.O. (mg/L)	Temperature °C
0.5 below surface	10:57:18	7.32	25.1
3	10:57:54	7.06	24.4
6	10:59:04	6.73	24.0
9	10:59:09	6.66	23.8
12	11:00:15	6.59	23.8
15	11:01:08	6.54	23.7
18	11:02:15	6.21	23.6
~~21~~ 19	11:03:14	6.00	23.5
24			
0.5 above bottom	11:04:18	6.04	23.5

*If D.O. is below 5.0 mg/L notify agency and measure D.O. at 1.0 foot intervals if <5.0 mg/L.

WHITE WATER ASSOCIATES, INC.

IMPOUNDMENT SAMPLING LOG

Water Quality Study Location Pixley

Hydroelectric Project – FERC # 2395

Date: 8-16-17

Pre-Sampling Data:

HWL 1448.44 TWL 1427.60 CFS 447

Sample Location: N45° 52.838' W90° 36.684'

Performed by:
Stan Haag

Time: 10:30 Barometer: 30

Air Temp: 68 °F Wind Speed: SE 7mph

Sky Conditions: 50% clouds

Precipitation within Last 24 Hours: no

D.O. Meter Calibration:

Instrument Model Used: HQ40D

Were the batteries changed? ☐ Yes ☒ No

If yes, when were they changed: ____

Battery Status: 70 % Charge

Calibration Method: Factory

Sampling Depth Profile: Measured depth to bottom of impoundment: 18.2 Feet

Secchi Depth (± 0.1)		
Time 11:00	4.0	Feet

Comments:

Chlorophyll *a* (3 feet below surface horizontal sampler)		
Lab Sample I.D. #:		
Time 10:53	Quantity (ml)	Filtered
	1000	In Lab
Preservative	$MgCO_3$	

True Color (3 feet below surface horizontal sampler)
Lab Sample I.D. #:
Time: 10:53

Total Phosphorus (3 feet below surface horizontal sampler)	
Lab Sample I.D. #:	
Time 10:53	Preservative
	H_2SO_4

Total Phosphorus (3 feet above bottom horizontal sampler)	
Lab Sample I.D. #:	
Time 10:51	Preservative
	H_2SO_4

D.O. and Temperature Profile

Depth (Feet)	Time	D.O. (mg/L)	Temperature °C
0.5 below surface	10:50:07	8.14	22.1
3	10:50:57	7.89	21.5
6	10:51:30	7.72	21.3
9	10:52:02	7.48	21.0
12	10:52:49	6.92	20.8
15	10:53:34	6.38	20.6
18	10:54:24	5.89	20.3
21			
24			
0.5 above bottom	10:55:27	5.83	20.3

*If D.O. is below 5.0 mg/L notify agency and measure D.O. at 1.0 foot intervals if <5.0 mg/L.

WHITE WATER ASSOCIATES, INC.

Appendix D – Flambeau (Pixley) Hydroelectric Project Lab Reports and Chains of Custody

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page

Client: RWE **WWA Job #:** 68749

Project: Monitoring

Date Received: 4/14/2017 **Date Reported:** 4/27/2017

Sample Number	Client Sample ID	Date Sampled	Sample Matrix
68749-001	Upper Flambeau	04/13/17	Water
68749-002	Upper Flambeau	04/13/17	Water
68749-003	Lower Flambeau	04/13/17	Water
68749-004	Lower Flambeau	04/13/17	Water
68749-005	Pixley	04/13/17	Water
68749-006	Pixley	04/13/17	Water
68749-007	Crowley	04/13/17	Water
68749-008	Crowley	04/13/17	Water

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page..continued

Client: RWE **WWA Job #:** 68749

Comments (if any):

Key to Laboratory Flags:

*: RPD exceeds limits.
B: The analyte was found in the associated blank as well as in the sample.
J: The quantitation is an estimated value because the result is less than the sample quantitation limit but greater than the detection limit.
M: A matrix effect was present.
Q: Batch QC data associated with the analysis does not meet the stated objectives
H: Indicates analytical holding time exceedance.
U: The analyte was analyzed for, but not detected.
P: A manual peak selection or manual integration was performed to correct an erroneous software selection.

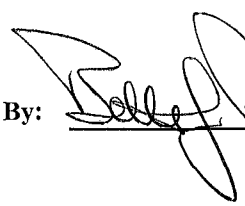
ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)
For coliform, Negative = No coliform bacteria detected, Positive = Coliform bacteria detected

Sample Types:
S = Solids, DW = Drinking water, D = Dissolved, T = Total, TC = TCLP extract, SP = SPLP extract

All samples were received intact and properly preserved unless otherwise noted. The results reported relate only to the samples tested. This report shall not be reproduced, except in full, without the written approval of this laboratory. The Chain of Custody is attached.

This report satisfies the requirements of your project but has not been prepared to comply with NELAP reporting requirements.

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and White Water Associates Standard Operating Procedures. Exceptions, if any, are discussed in the accompanying sample narrative. Release of this Final Report is authorized by White Water Associates management, as is verified by the following signature.

Approved By: 

WI DNR Lab Certification Number: 999971280
MI DEQ Certification Number: 9306
DoD-ELAP Accreditation Number: 65802
ISO/IEC 17025:2005 Accredited

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.

429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 68749

Project: Monitoring

Date Received: 4/14/2017 **Date Reported:** 4/27/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date	Method	MDL	MQL
68749-001 / Upper Flambeau / Surface / Water							
General Chemistry Parameters							
chlorophyll a	4.0		mg/m3	4/20/2017	10200H	NA	NA
Color	30		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.018	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-002 / Upper Flambeau / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.029	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-003 / Lower Flambeau / Surface / Water							
General Chemistry Parameters							
chlorophyll a	2.3		mg/m3	4/20/2017	10200H	NA	NA
Color	30		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.027	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-004 / Lower Flambeau / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.020	J	mg/L	4/19/2017	365.4	0.008	0.050

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 68749

Project: Monitoring

Date Received: 4/14/2017 **Date Reported:** 4/27/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date	Method	MDL	MQL
68749-005 / Pixley / Surface / Water							
General Chemistry Parameters							
chlorophyll a	3.9		mg/m3	4/20/2017	10200H	NA	NA
Color	35		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.028	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-006 / Pixley / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.025	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-007 / Crowley / Surface / Water							
General Chemistry Parameters							
chlorophyll a	3.4		mg/m3	4/20/2017	10200H	NA	NA
Color	30		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.025	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-008 / Crowley / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.028	J	mg/L	4/19/2017	365.4	0.008	0.050

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

Job # (WWA office use): 6849

CHAIN-OF-CUSTODY RECORD

JGut 4/19/17 Version 160504

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903

Phone: (906) 822-7889, Fax -7977
Web: white-water-associates.com

CLIENT NAME / BILL TO: RWE

EMAIL ADDRESS:

ADDRESS:

TELEPHONE:

CITY | STATE | ZIP:

CONTRACT / PO / PROJECT NAME / WSSN#: Monitoring

SAMPLER NAME (print first/last name): Angie Stine

COUNTY OF LOCATION:

PAGE 1 OF 1 — Indicate if more than one page of COC records used

SAMPLER'S SIGNATURE:

Check off preservatives for each bottle upon arrival and indicate total number of bottles. WWA database contains bottle preservation details.

ANALYSIS TYPE REQUESTED (Attach list if neeeded)

Instructions to White Water
Send my report by:
____ email
____ mail

Unless otherwise noted, drinking water report copies are sent to MDEQ and Health Dept.

REMARKS (Note any special instructions provided by client or conditions of receipt noted by WWA lab staff. Also note any residual chlorine.)

SAMPLE ID AND LOCATION (Containers for each sample may be combined on one line.)	DATE	TIME	SAMPLE MATRIX: Drinking water	Aqueous	Sed.	Soil	Other:	CONTAINERS / PRESERVATIVES: None	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Na Thio	Total Number of Containers	Chl a (mg/CO3)	Total Phos	Color
1 Upper Flambeau Surface	4-13-17	8:20						X	X						3	X	X	X
2 Upper Flambeau Bottom	4-13-17	8:17					②HNO3								1		X	
3 Lower Flambeau Surface	4-13-17	9:25						X							3	X	X	X
4 Lower Flambeau Bottom	4-13-17	9:23					②HNO3								1		X	
5 Pixley Surface	4-13-17	11:05						X							3	X	X	X
6 Pixley Bottom	4-13-17	11:00					②HNO3								1		X	
7 Crowley Surface	4-13-17	13:42						X							3	X	X	X
8 Crowley Bottom	4-13-17	13:40					②HNO3								1		X	
							①											

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
			②JGut 4/19/17		
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
	4-13-17	5:30 p.m.	①	4-4-17	1058

Comments/Sample temp. on receipt: 2.7

Packing: Ice ✓ Cooler ✓

WHITE - RETURN W/ REPORT CANARY - W/ SAMPLES PINK - CUSTOMER

UPS☐ FedEx☐ USPS☐ Client☐ Other WWA

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page

Client: RWE **WWA Job #:** 70828

Project: Monitoring

Date Received: 7/21/2017 **Date Reported:** 9/21/2017

Sample Number	Client Sample ID	Date Sampled	Sample Matrix
70828-001	Upper Flambeau	07/20/17	Water
70828-002	Upper Flambeau	07/20/17	Water
70828-003	Lower Flambeau	07/20/17	Water
70828-004	Lower Flambeau	07/20/17	Water
70828-005	Pixley	07/20/17	Water
70828-006	Pixley	07/20/17	Water
70828-007	Crowley	07/20/17	Water
70828-008	Crowley	07/20/17	Water

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page..continued

Client: RWE **WWA Job #:** 70828

Comments (if any):

Key to Laboratory Flags:

*: RPD exceeds limits.
B: The analyte was found in the associated blank as well as in the sample.
J: The quantitation is an estimated value because the result is less than the sample quantitation limit but greater than the detection limit.
M: A matrix effect was present.
Q: Batch QC data associated with the analysis does not meet the stated objectives
H: Indicates analytical holding time exceedance.
U: The analyte was analyzed for, but not detected.
P: A manual peak selection or manual integration was performed to correct an erroneous software selection.

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)
For coliform, Negative = No coliform bacteria detected, Positive = Coliform bacteria detected

Sample Types:
S = Solids, DW = Drinking water, D = Dissolved, T = Total, TC = TCLP extract, SP = SPLP extract

All samples were received intact and properly preserved unless otherwise noted. The results reported relate only to the samples tested. This report shall not be reproduced, except in full, without the written approval of this laboratory. The Chain of Custody is attached.

This report satisfies the requirements of your project but has not been prepared to comply with NELAP reporting requirements.

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and White Water Associates Standard Operating Procedures. Exceptions, if any, are discussed in the accompanying sample narrative. Release of this Final Report is authorized by White Water Associates management, as is verified by the following signature.

Approved By: Robert J. Reams

WI DNR Lab Certification Number: 999971280
MI DEQ Certification Number: 9306
DoD-ELAP Accreditation Number: 65802
ISO/IEC 17025:2005 Accredited

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 70828

Project: Monitoring

Date Received: 7/21/2017 **Date Reported:** 9/21/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
70828-001 / Upper Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	3.1		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	35		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.023	J	mg/L	8/1/2017 10:31	365.4	0.008	0.050	NK
70828-002 / Upper Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.017	J	mg/L	8/1/2017 10:32	365.4	0.008	0.050	NK
70828-003 / Lower Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	3.5		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	30		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.028	J	mg/L	8/1/2017 10:33	365.4	0.008	0.050	NK
70828-004 / Lower Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.029	J	mg/L	8/1/2017 10:33	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 70828

Project: Monitoring

Date Received: 7/21/2017 **Date Reported:** 9/21/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
70828-005 / Pixley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	6.3		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	35		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.036	J	mg/L	8/1/2017 10:35	365.4	0.008	0.050	NK
70828-006 / Pixley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.11		mg/L	8/1/2017 10:36	365.4	0.008	0.050	NK
70828-007 / Crowley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	8.3		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	35		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.033	J	mg/L	8/1/2017 10:36	365.4	0.008	0.050	NK
70828-008 / Crowley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.033	J	mg/L	8/1/2017 10:37	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

Job # (WWA office use): 70828

CHAIN-OF-CUSTODY RECORD

Version 160504

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903
Phone: (906) 822-7889, Fax -7977
Web: white-water-associates.com

CLIENT NAME / BILL TO: RWE

EMAIL ADDRESS:

ADDRESS:

TELEPHONE:

CITY | STATE | ZIP:

CONTRACT / PO / PROJECT NAME / WSSN#: Monitoring

SAMPLER NAME (print first/last name): Angi Stone

COUNTY OF LOCATION:

PAGE 1 OF 1 — Indicate if more than one page of COC records used

SAMPLER'S SIGNATURE:

Check off preservatives for each bottle upon arrival and indicate total number of bottles. WWA database contains bottle preservation details.

ANALYSIS TYPE REQUESTED (Attach list if neeeded)

Instructions to White Water
Send my report by:
____ email
____ mail

Unless otherwise noted, drinking water report copies are sent to MDEQ and Health Dept.

REMARKS (Note any special instructions provided by client or conditions of receipt noted by WWA lab staff. Also note any residual chlorine.)

	SAMPLE ID AND LOCATION (Containers for each sample may be combined on one line.)	DATE	TIME	SAMPLE MATRIX: Drinking water	Aqueous	Sed.	Soil	Other:	CONTAINERS / PRESERVATIVES: None	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Na Thio	Total Number of Containers	Chla Cmg/m3	T Phos	Color
1	Upper Flambeau Surface	7-20-17	7:45		X				X	X						3	X	X	X
2	Upper Flambeau Bottom	"	7:50													1		X	
3	Lower Flambeau Surface	"	9:14						X							3	X	X	X
4	Lower Flambeau Bottom	"	9:19													1		X	
5	Pixley Surface	"	10:57						X							3	X	X	X
6	Pixley Bottom	"	11:00													1		X	
7	Crowley Surface	"	13:40						X							3	X	X	X
8	Crowley Bottom	"	13:43													1		X	

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
[signature]	7-20-17	5:03 pm			
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
			[signature] ①	7-21-17	1045

Comments/Sample temp. on receipt: 3.5

Packing: Ice ✓ Cooler ✓

WHITE - RETURN W/ REPORT CANARY - W/ SAMPLES PINK - CUSTOMER

UPS☐ FedEx☐ USPS☐ Client☐ Other WWA

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page

Client: RWE **WWA Job #:** 71379

Project: Monitoring

Date Received: 8/17/2017 **Date Reported:** 9/14/2017

Sample Number	Client Sample ID	Date Sampled	Sample Matrix
71379-001	Upper Flambeau	08/16/17	Water
71379-002	Upper Flambeau	08/16/17	Water
71379-003	Lower Flambeau	08/16/17	Water
71379-004	Lower Flambeau	08/16/17	Water
71379-005	Pixley	08/16/17	Water
71379-006	Pixley	08/16/17	Water
71379-007	Crowley	08/16/17	Water
71379-008	Crowley	08/16/17	Water

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page..continued

Client: RWE **WWA Job #:** 71379

Comments (if any):

Key to Laboratory Flags:

*: RPD exceeds limits.
B: The analyte was found in the associated blank as well as in the sample.
J: The quantitation is an estimated value because the result is less than the sample quantitation limit but greater than the detection limit.
M: A matrix effect was present.
Q: Batch QC data associated with the analysis does not meet the stated objectives
H: Indicates analytical holding time exceedance.
U: The analyte was analyzed for, but not detected.
P: A manual peak selection or manual integration was performed to correct an erroneous software selection.

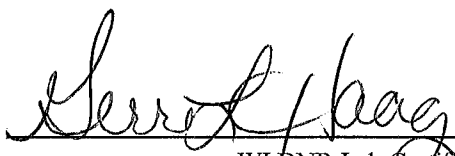
ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)
For coliform, Negative = No coliform bacteria detected, Positive = Coliform bacteria detected

Sample Types:
S = Solids, DW = Drinking water, D = Dissolved, T = Total, TC = TCLP extract, SP = SPLP extract

All samples were received intact and properly preserved unless otherwise noted. The results reported relate only to the samples tested. This report shall not be reproduced, except in full, without the written approval of this laboratory. The Chain of Custody is attached.

This report satisfies the requirements of your project but has not been prepared to comply with NELAP reporting requirements.

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and White Water Associates Standard Operating Procedures. Exceptions, if any, are discussed in the accompanying sample narrative. Release of this Final Report is authorized by White Water Associates management, as is verified by the following signature.

Approved By: 

WI DNR Lab Certification Number: 999971280
MI DEQ Certification Number: 9306
DoD-ELAP Accreditation Number: 65802
ISO/IEC 17025:2005 Accredited

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.

429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 71379

Project: Monitoring

Date Received: 8/17/2017 **Date Reported:** 9/14/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
71379-001 / Upper Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	4.9		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	35		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.018	J	mg/L	8/18/2017 11:41	365.4	0.008	0.050	NK
71379-002 / Upper Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.015	J	mg/L	8/18/2017 11:43	365.4	0.008	0.050	NK
71379-003 / Lower Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	5.6		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	40		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.032	J	mg/L	8/18/2017 11:43	365.4	0.008	0.050	NK
71379-004 / Lower Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.033	J	mg/L	8/18/2017 11:44	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 71379

Project: Monitoring

Date Received: 8/17/2017 **Date Reported:** 9/14/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
71379-005 / Pixley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	12		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	40		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.032	J	mg/L	8/18/2017 11:44	365.4	0.008	0.050	NK
71379-006 / Pixley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.027	J	mg/L	8/18/2017 11:46	365.4	0.008	0.050	NK
71379-007 / Crowley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	13		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	30		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.032	J	mg/L	8/18/2017 11:47	365.4	0.008	0.050	NK
71379-008 / Crowley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.030	J	mg/L	8/18/2017 11:47	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

V Gw 8/18/17 Version 160504

Job # (WWA office use): 71379

CHAIN-OF-CUSTODY RECORD

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903

Phone: (906) 822-7889, Fax -7977
Web: white-water-associates.com

CLIENT NAME / BILL TO: RWE.		EMAIL ADDRESS	
ADDRESS		TELEPHONE	
CITY	STATE / ZIP	CONTRACT / PO / PROJECT NAME / WSSN#: Monitoring	
SAMPLER NAME (print first/last name): Angie Shaw		COUNTY OF LOCATION	PAGE 1 OF 1 (Indicate if more than one page of COC records used)
SAMPLER'S SIGNATURE		Check off preservatives for each bottle upon arrival and indicate total number of bottles. WWA database contains bottle preservation details.	

ANALYSIS TYPE REQUESTED (Attach list if neeeded)

Instructions to White Water
Send my report by:
____ email
____ mail

Unless otherwise noted, drinking water report copies are sent to MDEQ and Health Dept.

REMARKS (Note any special instructions provided by client or conditions of receipt noted by WWA lab staff. Also note any residual chlorine.)

	SAMPLE ID AND LOCATION (Containers for each sample may be combined on one line.)	DATE	TIME	SAMPLE MATRIX: Drinking water	Aqueous	Sed.	Soil	Other:	CONTAINERS / PRESERVATIVES: None	H2SO4	HNO3	HCl Hg2Cl2	NaOH	ZnAc/NaOH	Na Thio	Total Number of Containers	Chl a	T Phos	Color
1	Upper Flambeau Surface	8-16-17	7:48		X				X	X		X				3	X	X	X
2	" Bottom	"	7:46		"				no	"						1		X	
3	Lower Flambeau Surface	8-16-17	9:20		"				X	"		X				3	X	X	X
4	" Bottom	"	9:18		"				no	"						1		X	
5	Pixley Surface	8-16-17	10:53		"				X	"		X				3	X	X	X
6	Pixley Bottom	"	10:51		"				no	"						1		X	
7	Crowley Surface	8-16-17	13:18		"					"		X				3	X	X	X
8	Crowley Bottom	"	13:16		"				no	"						1		X	

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date: 8-17-17	Time: 16:47	Received by:	Date: 8-17-17	Time: 830

Comments/Sample temp. on receipt:

Packing: Ice ✓
Cooler ✓

WHITE - RETURN W/ REPORT CANARY - W/ SAMPLES PINK - CUSTOMER

UPS☐ FedEx☐ USPS☐ Client☐ Other WWA

Final Report

2017 Water Quality Monitoring Data

for the

Crowley Hydroelectric Project

FERC Project #2473

Flambeau Hydro, LLC

North Fork of the Flambeau River, Price County, Wisconsin

Respectfully Submitted by:

Angie Stine

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903

Phone: 906-822-7889

Summary Flambeau (Crowley) Hydroelectric Project – FERC #2473

2017 marked the fourteenth year of water quality sampling under FERC approved "Water Quality Monitoring Plan Per License Article 406 for the Crowley Hydroelectric Project – FERC Project # 2473 – Flambeau Hydro, LLC. Monitoring was conducted on April 13, July 20, and August 16, 2017. This document contains all of the associated records for the 2017 monitoring along with summary figures and tables in four appendices: (1) Appendix A (Figures 1-4), (2) Appendix B (Tables 1-3), (3) Appendix C (sampling logs by date), and (4) Appendix D (laboratory reports and chains of custody).

A map of the Flambeau (Crowley) Hydroelectric Project is shown in Figure 1 indicating the water quality sampling location.

Monitoring results for 2017 are shown in Table 1. No unusual Temperature (Figure 2) or Dissolved Oxygen (Figure 3) readings were observed. The Secchi depths are shown in Figure 4.

In general, the weather (temperature and rainfall) during 2017 monitoring season appeared slightly warmer in May, June, and July, & August, with lower than normal precipitation in October, March, and September, and normal to high precipitation in the months of April, May, July, July, and August (Table 2).

Ice-Out occurred between Agenda and Nine Mile Landing on the North Fork of the Flambeau River sometime during the week beginning April 3, 2017. The Ice-Out sampling event occurred on April 13, 2017. River flow, based on the Crowley Hydroelectric Project records was approximately 1082 cubic feet per second. Sampling occurred between 13:07 and 13:48. Samples were taken without incident. No unusual D.O. or Temperature readings were observed. Samples for laboratory analysis were delivered to White Water Associates, Inc. laboratory in Amasa, MI on April 13, 2017. White Water Associates, Inc. issued a laboratory report on April 27, 2017. No unusual levels of Chlorophyll *a*, True Color, or Total Phosphorus were noted in the laboratory reports.

River flow, based on Crowley Hydroelectric Project records, was approximately 1228 cubic feet per second during the July 20, 2017 sampling event. Sampling occurred between 1340 and 1352. Samples were taken without incident. No unusual D.O. or Temperature readings were observed. Samples for laboratory analysis were delivered to White Water Associates, Inc. laboratory in Amasa, MI on July 20, 2017. White Water Associates, Inc. issued a laboratory report on September 21, 2017. No unusual levels of Chlorophyll *a*, True Color, or Total Phosphorus were noted in the laboratory reports.

River flow, based on Crowley Hydroelectric Project records, was approximately 729 cubic feet per second during the August 16, 2017 sampling event. Sampling occurred between 1315 and 1321. Samples were taken without incident. No unusual D.O. or Temperature readings were observed. Samples for laboratory analysis were delivered to White Water Associates, Inc. laboratory in Amasa, MI on August 16, 2017. White Water Associates, Inc. issued a laboratory report on September 14, 2017. No unusual levels of Chlorophyll *a*, True Color, or Total Phosphorus were noted in the laboratory reports.

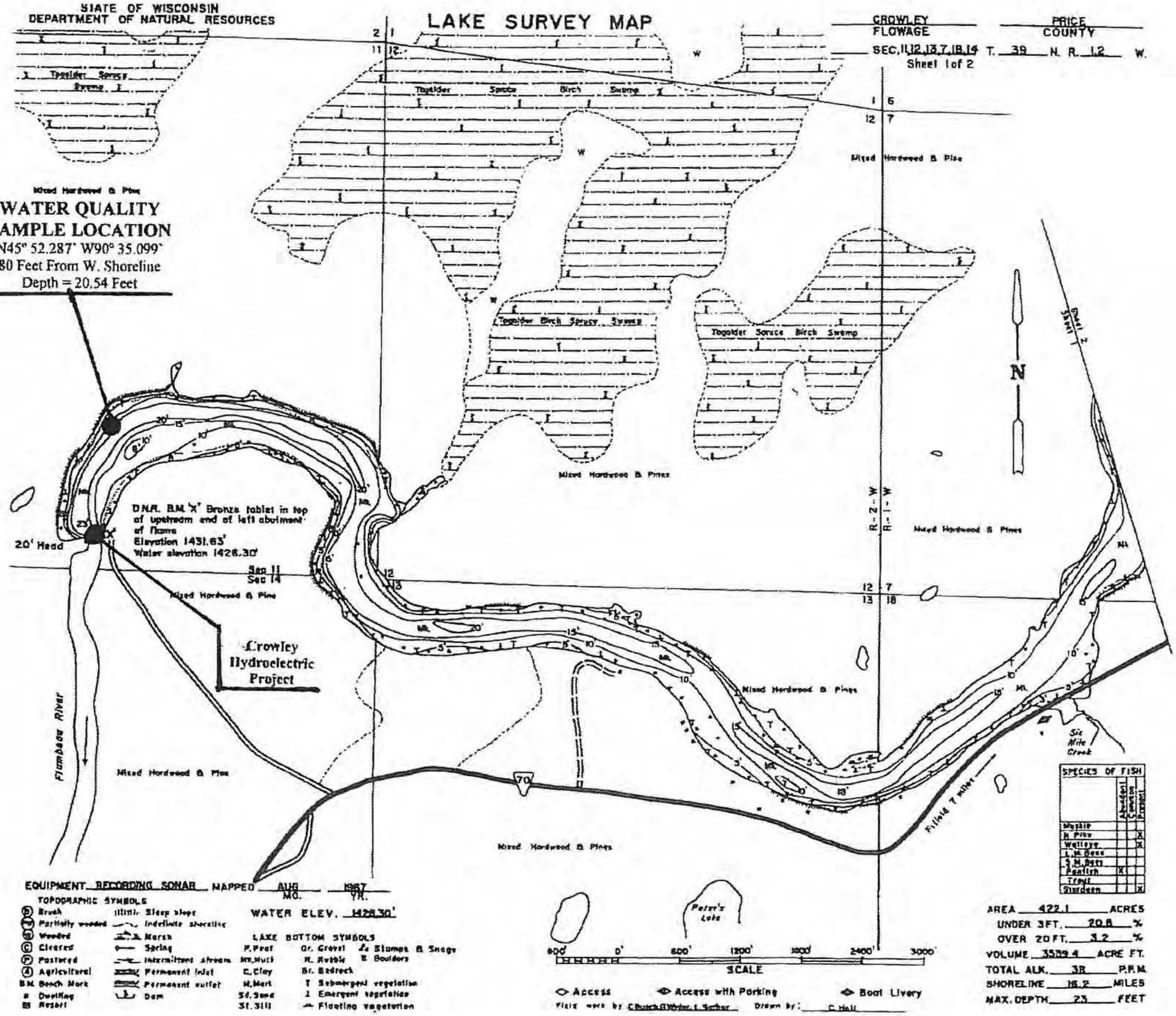
A summary of a comparison between the 2011 thru 2017 (Table 3) sampling results are as follows:

1. Water Clarity – Secchi Increased Ice Out and July
2. Chlorophyll a –Increased Ice Out and July, & Decreased August
3. Color – Decreased Ice Out, July & August
4. Total Phosphorus – Decreased Ice Out & July, and Increased August
5. Overall, D.O. –Decreased Ice Out, July & August
6. Water Temperatures – Increased Ice Out and July, Decreased August

The next scheduled Water Quality Monitoring at the Crowley Hydroelectric Project is set to take place in 2018 beginning with the Ice-Out sampling event.

Appendix A – Crowley Hydroelectric Project Figures

Figure 1. Crowley Hydroelectric Project Maps (next page)


STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES
LAKE SURVEY MAP
CROWLEY FLOWAGE
PRICE COUNTY
SEC. 11,12,13,7,18,14 T. 39 N. R. 1,2 W.
Sheet 1 of 2
Tagalder Spruce Swamp
Tagalder Spruce Birch Swamp
Mixed Hardwood & Pine
Tagalder Birch Spruce Swamp
Tagalder Spruce Birch Swamp
Mixed Hardwood & Pines
WATER QUALITY
SAMPLE LOCATION
N45° 52.287' W90° 35.099'
80 Feet From W. Shoreline
Depth = 20.54 Feet
D.N.R. B.M. 'X' Bronze tablet in top of upstream end of left abutment of flume
Elevation 1431.63'
Water elevation 1428.30'
20' Head
Sec 11
Sec 14
Crowley
Hydroelectric
Project
Flambeau River
R-2-W
R-1-W
Six Mile Creek
Fifield 7 miles
70
Peter's Lake
N
Sheet 2
SPECIES OF FISH
Abundant
Common
Present
Muskie
N. Pike
Walleye
L.M. Bass
S.M. Bass
Panfish
Trout
Sturgeon
EQUIPMENT RECORDING SONAR MAPPED AUG 1967
MO. YR.
WATER ELEV. 1428.30'
TOPOGRAPHIC SYMBOLS
Brush
Partially wooded
Wooded
Cleared
Pastured
Agricultural
B.M. Bench Mark
Dwelling
Resort
Steep slope
Indefinite shoreline
Marsh
Spring
Intermittent stream
Permanent inlet
Permanent outlet
Dam
LAKE BOTTOM SYMBOLS
P. Peat
Mk. Muck
C. Clay
M. Marl
Sd. Sand
St. Silt
Gr. Gravel
R. Rubble
Br. Bedrock
Stumps & Snags
B Boulders
Submergent vegetation
Emergent vegetation
Floating vegetation
SCALE
600' 0' 600' 1200' 1800' 2400' 3000'
Access
Access with Parking
Boat Livery
Field work by
Drawn by: C. Hall
AREA 422.1 ACRES
UNDER 3 FT. 20.8 %
OVER 20 FT. 3.2 %
VOLUME 3539.4 ACRE FT.
TOTAL ALK. 38 P.P.M.
SHORELINE 16.2 MILES
MAX. DEPTH 23 FEET

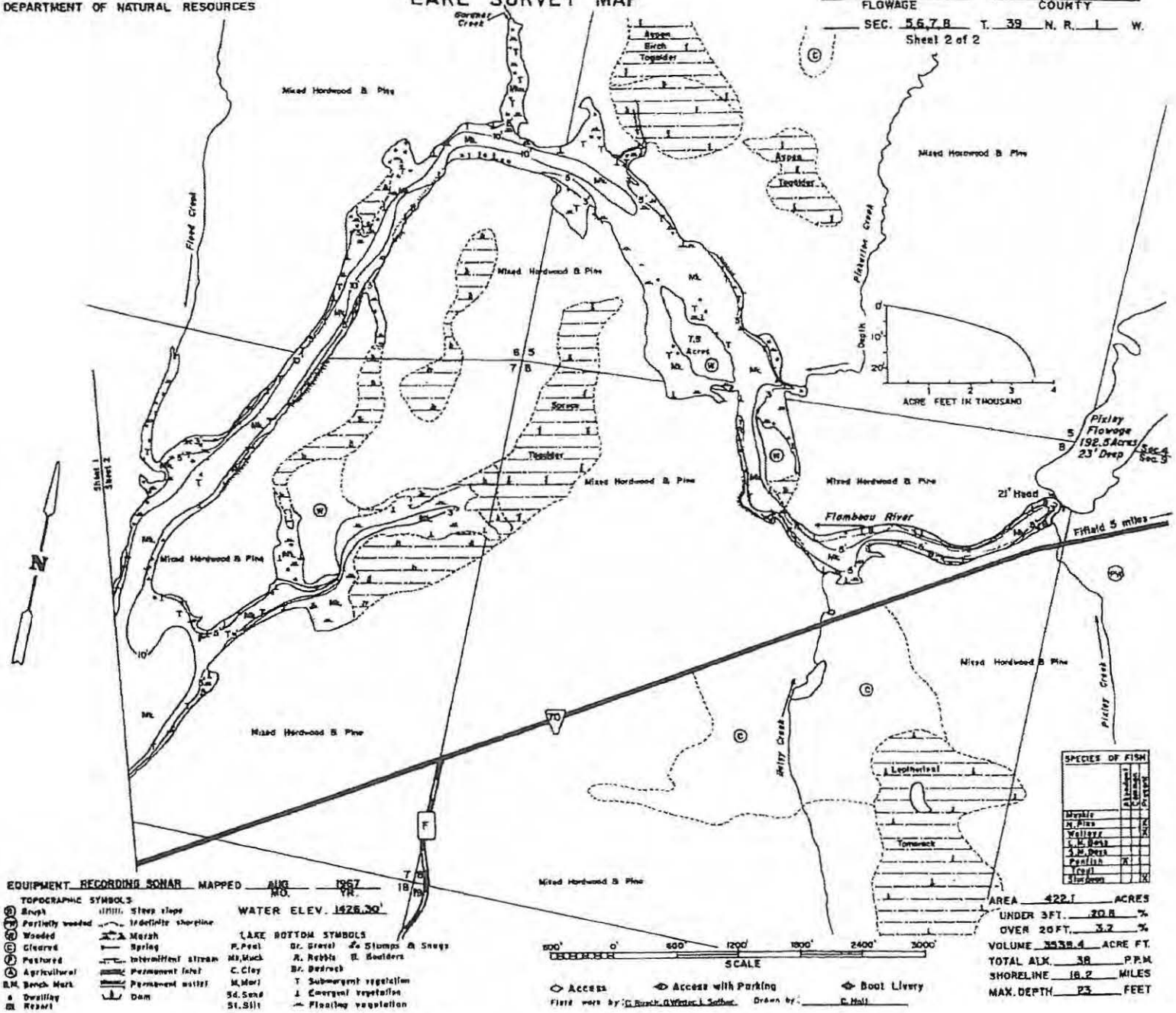
STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

LAKE SURVEY MAP

CROWLEY FLOWAGE — PRICE COUNTY

SEC. 5,6,7,8 T. 39 N. R. 1 W.

Sheet 2 of 2



EQUIPMENT RECORDING SONAR MAPPED AUG 1967
MO. YR.

WATER ELEV. 1426.30'

TOPOGRAPHIC SYMBOLS

- Brush
- Partially wooded
- Wooded
- Cleared
- Pastured
- Agricultural
- B.M. Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- T Submergent vegetation
- Emergent vegetation
- Floating vegetation
- Stumps & Snags
- B. Boulders

SCALE

1800' 0' 600' 1200' 1800' 2400' 3000'

◇ Access ◈ Access with Parking ◈ Boat Livery

Field work by: C. Roach, G. Wheeler & Sather Drawn by: C. Holt

SPECIES OF FISH

	Abundant	Common	Present
Muskie			
N. Pike			
Walleye			X
L.M. Bass			
S.M. Bass			
Panfish	X		
Crappie			
Sturgeon			X

AREA 422.1 ACRES
UNDER 3FT. 20.8 %
OVER 20FT. 3.2 %
VOLUME 3538.4 ACRE FT.
TOTAL ALK. 38 P.P.M.
SHORELINE 18.2 MILES
MAX. DEPTH 23 FEET

Figure 2. Crowley - FERC #2473
2017 Temperature Samples

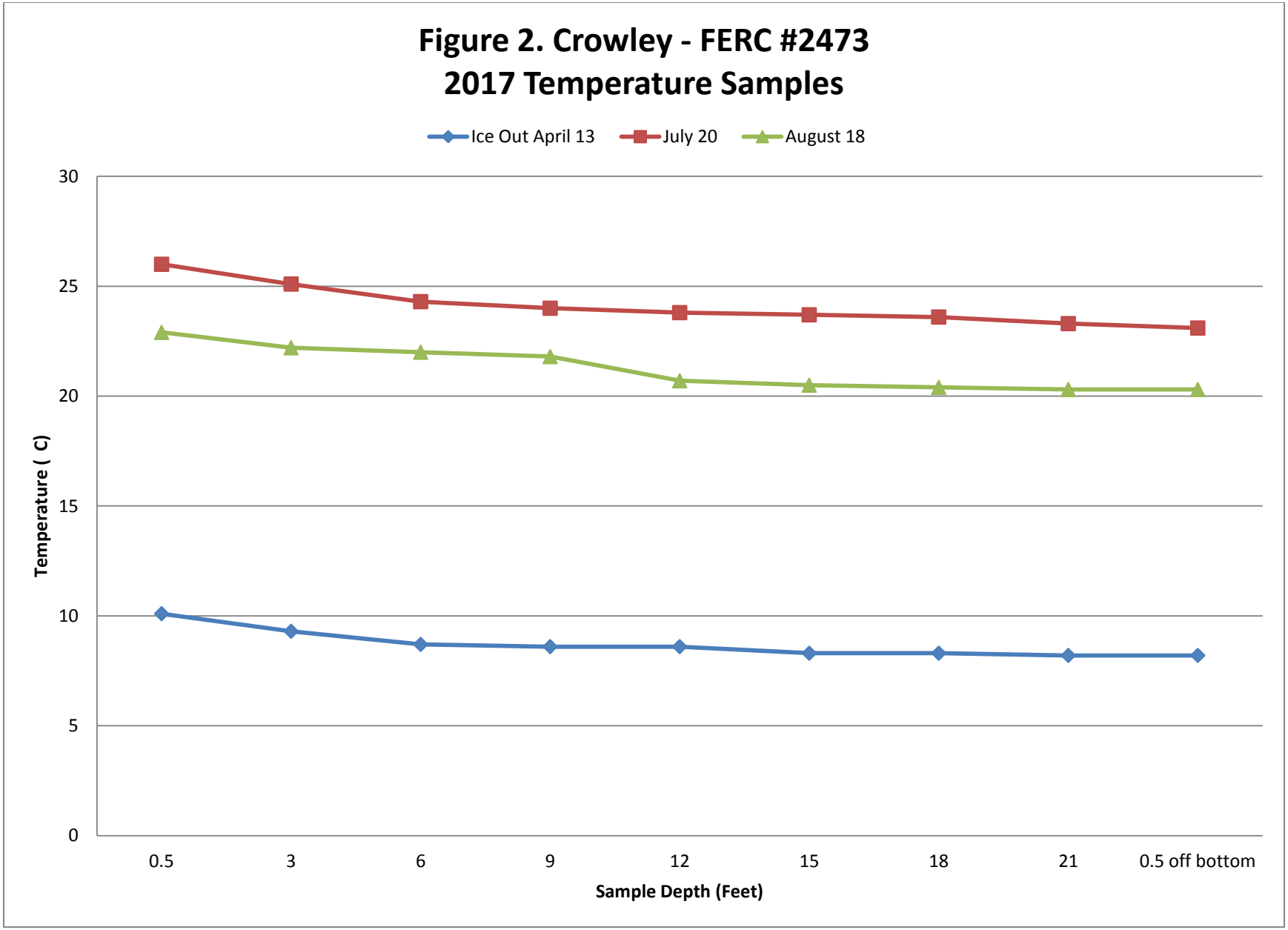
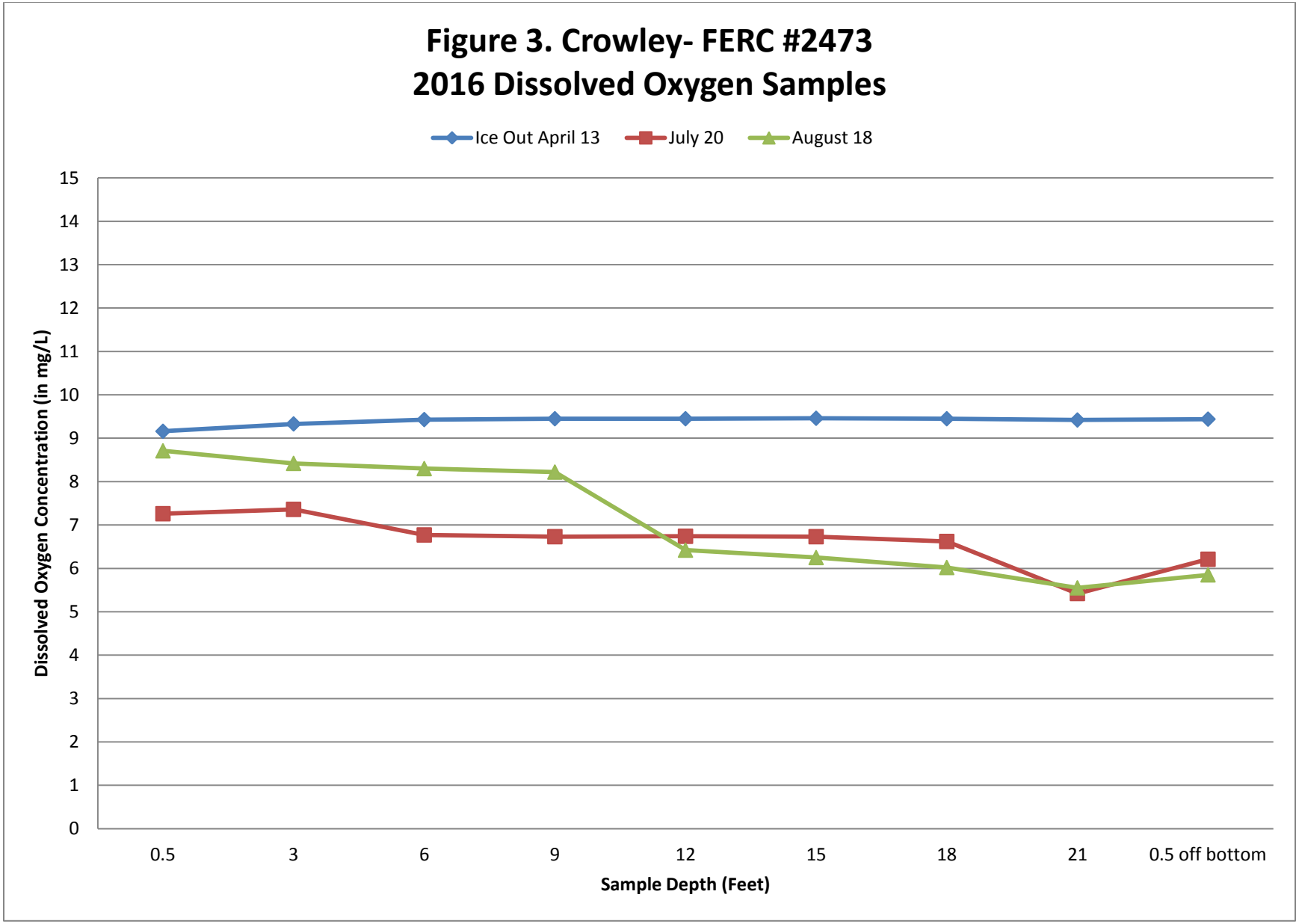


Figure 3. Crowley- FERC #2473
2016 Dissolved Oxygen Samples



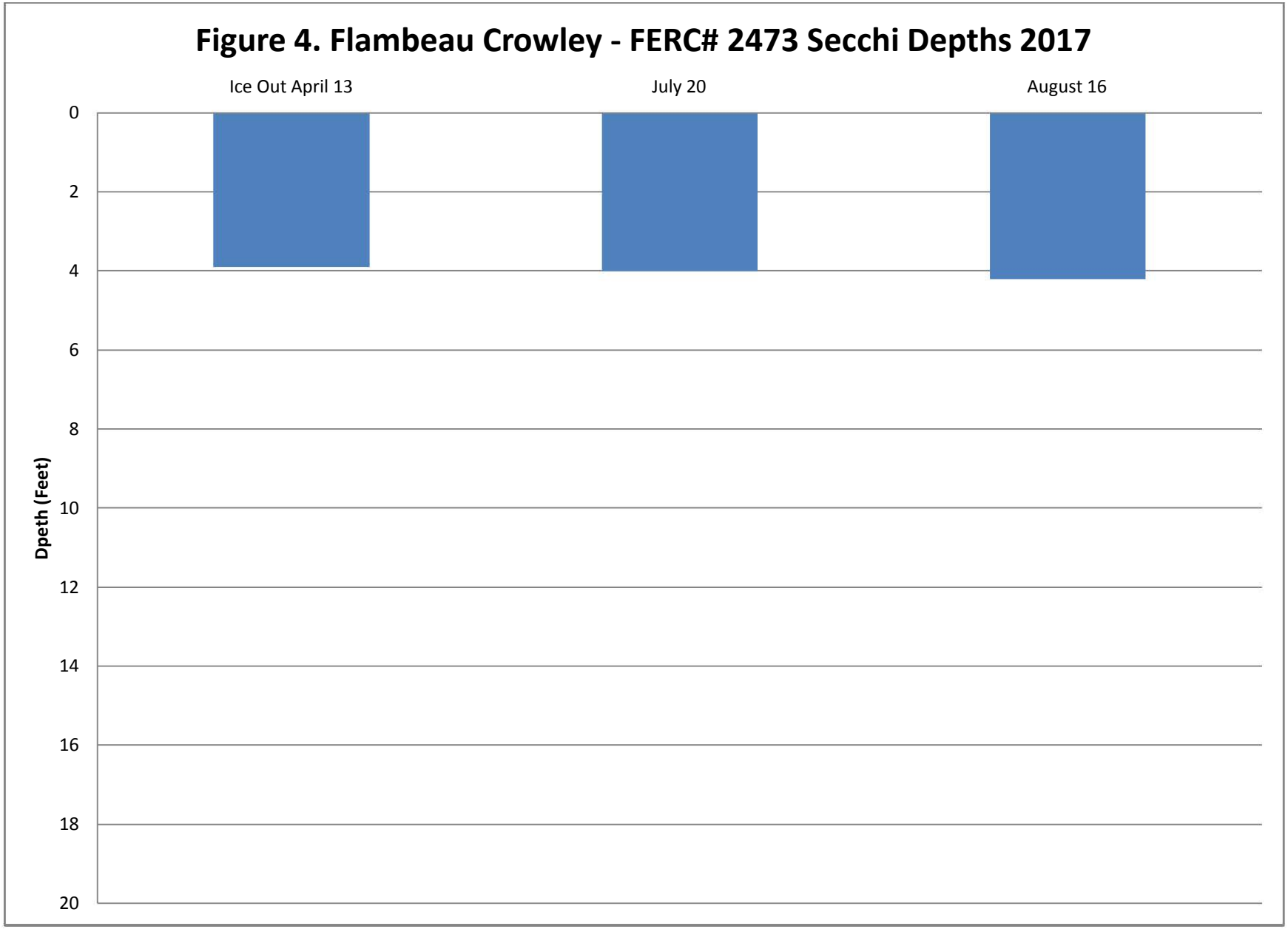


Figure 4. Flambeau Crowley - FERC# 2473 Secchi Depths 2017
Ice Out April 13
July 20
August 16
Dpeth (Feet)
0
2
4
6
8
10
12
14
16
18
20

Appendix B – Crowley Hydroelectric Project Tables

Table 1. Crowley Hydroelectric Project – FERC Project # 2473: 2017 Water Quality Sampling Data

	Ice Out April 13, 2017			July 20, 2017			August 16, 2017		
Project Flow (c.f.s)	1082			1228			729		
Dissolved Oxygen	**Time**	**D.O. (mg/L)**	**Water Temp. (°C)**	**Time**	**D.O. (mg/L)**	**Water Temp. (°C)**	**Time**	**D.O. (mg/L)**	**Water Temp. (°C)**
0.5 feet below surface	13:36:04	9.16	10.1	13:41:22	7.26	26.0	13:16:13	8.71	22.9
3 feet below surface	13:36:38	9.33	9.3	13:41:53	7.36	25.1	13:16:49	8.42	22.2
6 feet below surface	13:37:18	9.43	8.7	13:42:30	6.77	24.3	13:17:36	8.30	22.0
9 feet below surface	13:37:48	9.45	8.6	13:43:03	6.73	24.0	13:18:13	8.22	21.8
12 feet below surface	13:38:11	9.45	8.6	13:43:38	6.74	23.8	13:19:15	6.42	20.7
15 feet below surface	13:38:38	9.46	8.3	13:44:12	6.73	23.7	13:19:50	6.25	20.5
18 feet below surface	13:39:02	9.45	8.3	13:44:45	6.62	23.6	13:20:37	6.02	20.4
21 feet below surface	13:40:00	9.42	8.2	13:45:51	5.42	23.3	13:21:19	5.55	20.3
0.5 meter above bottom	13:41:00	9.44	8.2	13:47:25	6.21	23.1	13:22:22	5.85	20.3
Secchi Disk	**Time**	**Depth (ft)**		**Time**	**Depth (ft)**		**Time**	**Depth (ft)**	
Feet below surface	13:48	3.9		13:52	4		13:21	4.2	
Chlorophyll a	**Time**	**µg/L**		**Time**	**µg/L**		**Time**	**µg/L**	
3 feet below surface	13:45	3.4		13:40	8.3		13:18	13	
Color (True)	**Time**	**C.P.U. Units**	**LOD**	**Time**	**C.P.U. Units**	**LOD**	**Time**	**C.P.U. Units**	**LOD**
3 feet below surface	13:42	30	5*	13:40	35	5*	13:18	30	5*
Total Phosphorus	**Time**	**mg/L**	**LOD**	**Time**	**mg/L**	**LOD**	**Time**	**mg/L**	**LOD**
3 feet below surface	13:42	0.025	0.008*	13:40	0.033	0.008*	13:18	0.032	0.008*
3 feet above bottom	13:40	0.028	0.008*	13:43	0.033	0.008*	13:16	0.030	0.008*
*Considered Method Detection Limit									

Table 2. 2016/17 Water Year Monthly Temperature and Precipitation for Park Falls, Wisconsin

Month	Highest Temp.	Lowest Temp.	Average Temp.	Departure From Normal	Heating Degree Days	Normal Degree Days	Total Precip.	Total Snowfall	Normal Precip.	% of Normal Precipitation
October - 16	74	30	47.6	4.4	531	678	1.55	Trace	2.85	75
November - 16	70	10	40.2	11.4	735	1088	2.60	8.1	2.09	78
December - 16	39	-21	15.9	1.1	1512	1556	2.07	21.3	1.21	79
January – 17	45	-22	16.0	5.8	1511	1699	1.16	15.5	0.96	78
February – 17	52	-11	22.5	7.4	1185	1399	1.80	14.1	0.81	73
March – 17	59	-29	26.3	0.4	1193	1210	1.05	5.3	1.49	67
April – 17	70	23	42.2	2.6	678	762	3.02	1.9	2.43	68
May – 17	75	32	50.3	-1.1	446	426	4.11	0.8	3.23	68
June – 17	88	18	60.9	0.8	131	179	5.21	0.00	4.23	71
July – 17	86	48	65.3	-0.5	53	63	4.11	0.00	3.85	77
August – 17	82	46	61.5	-2.8	117	86	7.23	0.00	3.70	79
September - 17	83	37	58.6	3.0	212	298	3.55	0.00	4.11	81

Source: NOAA/Duluth, MN

Table 3. Flambeau Crowley Project Sampling Comparison Table: 2011 Thru Current Year										
Year	**Month**	**Secchi Depth**	**Chlorophyll *a***	**Color (True)**	**Total Phosphorus**	**Total Phosphorus**	**Low D.O.**	**High D.O.**	**Low Water Temp.**	**High Water Temp.**
		Feet	**µg/L**	**C.P.U. Units**	**Below Surface mg/L**	**Above Bottom mg/L**	**mg/L**	**mg/L**	**° C**	**° C**
2011	April	3.00	3.90	100.00	0.039	0.044	11.73	12.01	6.50	10.40
2012	April	3.30	1.70	120.00	0.041	*	9.30	10.37	8.80	11.80
2013	May	*	*	*	*	*	*	*	*	*
2014	June	3.50	1.70	150.00	0.031	0.029	6.61	6.97	19.00	21.90
2015	April	3.50	5.10	13.00	0.047	0.036	9.52	9.78	9.00	11.70
2016	March	3.60	0.41	40.00	0.030	0.030	11.35	11.61	2.90	3.70
2017	April	3.90	3.40	30.00	0.025	0.028	9.16	9.46	8.20	10.10
Minimum	March/April/June	3.00	0.41	13.00	0.025	0.028	6.61	6.97	2.90	3.70
Maximum	March/April/June	3.90	5.10	150.00	0.047	0.044	11.73	12.01	19.00	21.90
Average	March/April/June	3.47	2.70	75.50	0.036	0.033	9.61	10.03	9.07	11.60
2011	July	2.90	21.00	80.00	0.061	0.075	3.52	8.90	24.40	26.20
2012	July	3.20	17.00	120.00	0.061	0.087	1.67	7.38	25.30	28.00
2013	July	3.00	5.50	150.00	0.046	0.045	3.83	5.65	24.60	25.20
2014	July	3.25	5.30	130.00	0.046	0.044	5.78	6.38	21.70	22.20
2015	July	4.00	4.60	80.00	0.032	0.034	6.09	6.47	22.80	22.50
2016	July	3.40	6.50	55.00	0.036	0.030	5.60	6.10	22.70	26.50
2017	July	4.00	8.30	35.00	0.033	0.033	5.42	7.36	23.10	26.00
Minimum	July	2.90	4.60	35.00	0.032	0.030	1.67	5.65	21.70	22.20
Maximum	July	4.00	21.00	150.00	0.061	0.087	6.09	8.90	25.30	28.00
Average	July	3.39	9.74	92.86	0.045	0.050	4.56	6.89	23.51	25.23
2011	August	3.30	14.00	140.00	0.051	0.051	7.96	7.96	22.40	25.40
2012	August	3.00	17.00	80.00	0.043	0.042	5.22	9.27	23.70	25.30
2013	August	3.10	4.80	130.00	0.099	0.063	5.65	6.24	20.60	21.80
2014	August	1.30	6.90	100.00	0.047	0.051	5.11	5.65	22.80	24.30
2015	August	3.00	17.00	60.00	0.039	0.030	6.48	7.32	22.70	23.10
2016	August	4.20	15.00	40.00	0.030	0.030	3.57	8.07	23.30	25.70
2017	August	4.20	13.00	30.00	0.032	0.030	5.55	8.71	20.30	22.90
Minimum	August	1.30	4.80	30.00	0.030	0.030	3.57	5.65	20.30	21.80
Maximum	August	4.20	17.00	140.00	0.099	0.063	7.96	9.27	23.70	25.70
Average	August	3.16	12.53	82.86	0.049	0.042	5.65	7.60	22.26	24.07

*no sample taken

Appendix C – Crowley Impoundment Project Sampling Logs

IMPOUNDMENT SAMPLING LOG

Water Quality Study Location Crossley

Hydroelectric Project – FERC # 2473-0

Date: 4-13-17

Pre-Sampling Data:

HWL 427.31 TWL 1406.5 CFS 1082.00

Sample Location: N45° 52.287' W90° 35.199'

Performed by: Austin T Plummer

Time: 13:07 Barometer: 30.4

Air Temp: 52 °F Wind Speed: ESE 8 mph

Sky Conditions: 70% cloudy

Precipitation within Last 24 Hours: 0.2"

D.O. Meter Calibration:

Instrument Model Used: HQ40D

Were the batteries changed? ☐ Yes ☒ No

If yes, when were they changed: _____

Battery Status: 75 % Charge

Calibration Method: Factory

Sampling Depth Profile: Measured depth to bottom of impoundment: 20 Feet

Secchi Depth (± 0.1)		
Time 13:48	3.9	Feet

Comments:

Chlorophyll *a* (3 feet below surface horizontal sampler)		
Lab Sample I.D. #:		
Time	Quantity (ml)	Filtered
13:45	1000	In Lab
Preservative	$MgCO_3$	

True Color (3 feet below surface horizontal sampler)
Lab Sample I.D. # :
Time: 13:42

Total Phosphorus (3 feet below surface horizontal sampler)	
Lab Sample I.D. # :	
Time 13:42	Preservative
	H_2SO_4

Total Phosphorus (3 feet above bottom horizontal sampler)	
Lab Sample I.D. # :	
Time 13:40	Preservative
	H_2SO_4

D.O. and Temperature Profile			
Depth (Feet)	Time	D.O. (mg/L)	Temperature ° C
0.5 below surface	13:36:04	9.16	10.1
3	13:36:38	9.33	9.3
6	13:37:18	9.43	8.7
9	13:37:48	9.45	8.6
12	13:38:11	9.45	8.6
15	13:38:38	9.46	8.3
18	13:39:07	9.45	8.3
20	13:40:00	9.42	8.2
24			
0.5 above bottom	13:41	9.44	8.2

*If D.O. is below 5.0 mg/L notify agency and measure D.O. at 1.0 foot intervals if <5.0 mg/L.

WHITE WATER ASSOCIATES, INC.

IMPOUNDMENT SAMPLING LOG

Water Quality Study Location Crowley

Hydroelectric Project – FERC # 2473

Date: 7-20-17

Pre-Sampling Data:

HWL 1429.15 TWL 1416.8 CFS 228

Sample Location: N45° 52.287' W90° 35.099'

Performed by: Shane Hoag

Time: 13:40 Barometer: 30

Air Temp: 82 °F Wind Speed: W 5 mph

Sky Conditions: Clear

Precipitation within Last 24 Hours: No

D.O. Meter Calibration:

Instrument Model Used: HQ40D

Were the batteries changed? ☐ Yes ☒ No

If yes, when were they changed: _____

Battery Status: 78 % Charge

Calibration Method: Factory

Sampling Depth Profile: Measured depth to bottom of impoundment: 21 Feet

Secchi Depth (± 0.1)		
Time 13:52	4	Feet

Comments:

Chlorophyll *a* (3 feet below surface horizontal sampler)		
Lab Sample I.D. #:		
Time 13:40	Quantity (ml)	Filtered
	1000	In Lab
Preservative	$MgCO_3$	

True Color (3 feet below surface horizontal sampler)
Lab Sample I.D. # :
Time: 13:40

Total Phosphorus (3 feet below surface horizontal sampler)	
Lab Sample I.D. # :	
Time 13:40	Preservative
	H_2SO_4

Total Phosphorus (3 feet above bottom horizontal sampler)	
Lab Sample I.D. # :	
Time 13:43	Preservative
	H_2SO_4

D.O. and Temperature Profile			
Depth (Feet)	Time	D.O. (mg/L)	Temperature °C
0.5 below surface	13:41:22	7.26	26.0
3	13:41:53	7.36	25.1
6	13:42:30	6.77	24.3
9	13:43:03	6.73	24.0
12	13:43:38	6.74	23.8
15	13:44:12	6.73	23.7
18	13:44:45	6.63	23.6
Bottom 21	13:45:51	5.42	23.3
24			
0.5 above bottom	13:47:25	6.21	23.1

*If D.O. is below 5.0 mg/L notify agency and measure D.O. at 1.0 foot intervals if <5.0 mg/L.

I. Eagle

WHITE WATER ASSOCIATES, INC.

IMPOUNDMENT SAMPLING LOG

Water Quality Study Location Crowley

Hydroelectric Project – FERC # 2473 0

Date: 8-16-17

Pre-Sampling Data:

HWL 427.28 TWL 406.40 CFS 729

Sample Location: N45° 52.287' W90° 35.099'

Performed by:
Steve Hagy

Time: 13:15 Barometer: 30

Air Temp: 72 °F Wind Speed: SE 7mpH

Sky Conditions: 100 Clouds

Precipitation within Last 24 Hours: none

D.O. Meter Calibration:

Instrument Model Used: HQ40D

Were the batteries changed? ☐ Yes ☐/No

If yes, when were they changed: _____

Battery Status: 70 % Charge

Calibration Method: Factory

Sampling Depth Profile: Measured depth to bottom of impoundment: 21 Feet

Secchi Depth (± 0.1)	
Time 13:21	4' 2" Feet

Comments:

Chlorophyll *a* (3 feet below surface horizontal sampler)		
Lab Sample I.D. #:		
Time 13:18	Quantity (ml)	Filtered
	1000	In Lab
Preservative	$MgCO_3$	

True Color (3 feet below surface horizontal sampler)
Lab Sample I.D. # :
Time: 13:18

Total Phosphorus (3 feet below surface horizontal sampler)	
Lab Sample I.D. # :	
Time 13:18	Preservative
	H_2SO_4

Total Phosphorus (3 feet above bottom horizontal sampler)	
Lab Sample I.D. # :	
Time 13:16	Preservative
	H_2SO_4

D.O. and Temperature Profile			
Depth (Feet)	Time	D.O. (mg/L)	Temperature °C
0.5 below surface	13:16:08	8.71	22.9
3	13:16:49	8.42	22.2
6	13:17:31	8.30	22.0
9	13:18:13	8.22	21.8
12	13:19:15	6.42	20.7
15	13:19:52	6.25	20.5
18	13:20:37	6.02	20.4
21	13:21:19	5.55	20.3
24			
0.5 above bottom	13:22:22	5.85	20.3

*If D.O. is below 5.0 mg/L notify agency and measure D.O. at 1.0 foot intervals if <5.0 mg/L.

WHITE WATER ASSOCIATES, INC.

Appendix D – Crowley Hydroelectric Project Lab Reports and Chains of Custody

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page

Client: RWE **WWA Job #:** 68749

Project: Monitoring

Date Received: 4/14/2017 **Date Reported:** 4/27/2017

Sample Number	Client Sample ID	Date Sampled	Sample Matrix
68749-001	Upper Flambeau	04/13/17	Water
68749-002	Upper Flambeau	04/13/17	Water
68749-003	Lower Flambeau	04/13/17	Water
68749-004	Lower Flambeau	04/13/17	Water
68749-005	Pixley	04/13/17	Water
68749-006	Pixley	04/13/17	Water
68749-007	Crowley	04/13/17	Water
68749-008	Crowley	04/13/17	Water

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page..continued

Client: RWE **WWA Job #:** 68749

Comments (if any):

Key to Laboratory Flags:

*: RPD exceeds limits.
B: The analyte was found in the associated blank as well as in the sample.
J: The quantitation is an estimated value because the result is less than the sample quantitation limit but greater than the detection limit.
M: A matrix effect was present.
Q: Batch QC data associated with the analysis does not meet the stated objectives
H: Indicates analytical holding time exceedance.
U: The analyte was analyzed for, but not detected.
P: A manual peak selection or manual integration was performed to correct an erroneous software selection.

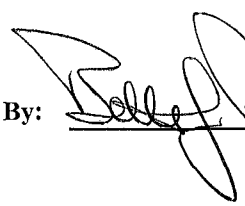
ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)
For coliform, Negative = No coliform bacteria detected, Positive = Coliform bacteria detected

Sample Types:
S = Solids, DW = Drinking water, D = Dissolved, T = Total, TC = TCLP extract, SP = SPLP extract

All samples were received intact and properly preserved unless otherwise noted. The results reported relate only to the samples tested. This report shall not be reproduced, except in full, without the written approval of this laboratory. The Chain of Custody is attached.

This report satisfies the requirements of your project but has not been prepared to comply with NELAP reporting requirements.

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and White Water Associates Standard Operating Procedures. Exceptions, if any, are discussed in the accompanying sample narrative. Release of this Final Report is authorized by White Water Associates management, as is verified by the following signature.

Approved By: 

WI DNR Lab Certification Number: 999971280
MI DEQ Certification Number: 9306
DoD-ELAP Accreditation Number: 65802
ISO/IEC 17025:2005 Accredited

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.

429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 68749

Project: Monitoring

Date Received: 4/14/2017 **Date Reported:** 4/27/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date	Method	MDL	MQL
68749-001 / Upper Flambeau / Surface / Water							
General Chemistry Parameters							
chlorophyll a	4.0		mg/m3	4/20/2017	10200H	NA	NA
Color	30		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.018	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-002 / Upper Flambeau / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.029	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-003 / Lower Flambeau / Surface / Water							
General Chemistry Parameters							
chlorophyll a	2.3		mg/m3	4/20/2017	10200H	NA	NA
Color	30		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.027	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-004 / Lower Flambeau / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.020	J	mg/L	4/19/2017	365.4	0.008	0.050

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 68749

Project: Monitoring

Date Received: 4/14/2017 **Date Reported:** 4/27/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date	Method	MDL	MQL
68749-005 / Pixley / Surface / Water							
General Chemistry Parameters							
chlorophyll a	3.9		mg/m3	4/20/2017	10200H	NA	NA
Color	35		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.028	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-006 / Pixley / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.025	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-007 / Crowley / Surface / Water							
General Chemistry Parameters							
chlorophyll a	3.4		mg/m3	4/20/2017	10200H	NA	NA
Color	30		CU	4/14/2017	2120B	5	5
Total Phosphorus LL (t)	0.025	J	mg/L	4/19/2017	365.4	0.008	0.050
68749-008 / Crowley / Bottom / Water							
General Chemistry Parameters							
Total Phosphorus LL (t)	0.028	J	mg/L	4/19/2017	365.4	0.008	0.050

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

Job # (WWA office use): 6849

CHAIN-OF-CUSTODY RECORD

JGut 4/19/17 Version 160504

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903

Phone: (906) 822-7889, Fax -7977
Web: white-water-associates.com

CLIENT NAME / BILL TO: RWE

EMAIL ADDRESS:

ADDRESS:

TELEPHONE:

CITY | STATE | ZIP:

CONTRACT / PO / PROJECT NAME / WSSN#: Monitoring

SAMPLER NAME (print first/last name): Angie Stine

COUNTY OF LOCATION:

PAGE 1 OF 1 — Indicate if more than one page of COC records used

SAMPLER'S SIGNATURE:

Check off preservatives for each bottle upon arrival and indicate total number of bottles. WWA database contains bottle preservation details.

ANALYSIS TYPE REQUESTED (Attach list if neeeded)

Instructions to White Water
Send my report by:
____ email
____ mail

Unless otherwise noted, drinking water report copies are sent to MDEQ and Health Dept.

REMARKS (Note any special instructions provided by client or conditions of receipt noted by WWA lab staff. Also note any residual chlorine.)

SAMPLE ID AND LOCATION (Containers for each sample may be combined on one line.)	DATE	TIME	SAMPLE MATRIX: Drinking water	Aqueous	Sed.	Soil	Other:	CONTAINERS / PRESERVATIVES: None	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Na Thio	Total Number of Containers	Chl a (mg/CO3)	Total Phos	Color
1 Upper Flambeau Surface	4-13-17	8:20						X	X						3	X	X	X
2 Upper Flambeau Bottom	4-13-17	8:17					②HNO3								1		X	
3 Lower Flambeau Surface	4-13-17	9:25						X							3	X	X	X
4 Lower Flambeau Bottom	4-13-17	9:23					②HNO3								1		X	
5 Pixley Surface	4-13-17	11:05						X							3	X	X	X
6 Pixley Bottom	4-13-17	11:00					②HNO3								1		X	
7 Crowley Surface	4-13-17	13:42						X							3	X	X	X
8 Crowley Bottom	4-13-17	13:40					②HNO3								1		X	
							①											

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
			②JGut 4/19/17		
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
	4-13-17	5:30 p.m.	①	4-4-17	1058

Comments/Sample temp. on receipt: 2.7

Packing: Ice ✓ Cooler ✓

WHITE - RETURN W/ REPORT CANARY - W/ SAMPLES PINK - CUSTOMER

UPS☐ FedEx☐ USPS☐ Client☐ Other WWA

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page

Client: RWE **WWA Job #:** 70828

Project: Monitoring

Date Received: 7/21/2017 **Date Reported:** 9/21/2017

Sample Number	Client Sample ID	Date Sampled	Sample Matrix
70828-001	Upper Flambeau	07/20/17	Water
70828-002	Upper Flambeau	07/20/17	Water
70828-003	Lower Flambeau	07/20/17	Water
70828-004	Lower Flambeau	07/20/17	Water
70828-005	Pixley	07/20/17	Water
70828-006	Pixley	07/20/17	Water
70828-007	Crowley	07/20/17	Water
70828-008	Crowley	07/20/17	Water

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page..continued

Client: RWE **WWA Job #:** 70828

Comments (if any):

Key to Laboratory Flags:

*: RPD exceeds limits.
B: The analyte was found in the associated blank as well as in the sample.
J: The quantitation is an estimated value because the result is less than the sample quantitation limit but greater than the detection limit.
M: A matrix effect was present.
Q: Batch QC data associated with the analysis does not meet the stated objectives
H: Indicates analytical holding time exceedance.
U: The analyte was analyzed for, but not detected.
P: A manual peak selection or manual integration was performed to correct an erroneous software selection.

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)
For coliform, Negative = No coliform bacteria detected, Positive = Coliform bacteria detected

Sample Types:
S = Solids, DW = Drinking water, D = Dissolved, T = Total, TC = TCLP extract, SP = SPLP extract

All samples were received intact and properly preserved unless otherwise noted. The results reported relate only to the samples tested. This report shall not be reproduced, except in full, without the written approval of this laboratory. The Chain of Custody is attached.

This report satisfies the requirements of your project but has not been prepared to comply with NELAP reporting requirements.

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and White Water Associates Standard Operating Procedures. Exceptions, if any, are discussed in the accompanying sample narrative. Release of this Final Report is authorized by White Water Associates management, as is verified by the following signature.

Approved By: Robert J. Reams

WI DNR Lab Certification Number: 999971280
MI DEQ Certification Number: 9306
DoD-ELAP Accreditation Number: 65802
ISO/IEC 17025:2005 Accredited

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 70828

Project: Monitoring

Date Received: 7/21/2017 **Date Reported:** 9/21/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
70828-001 / Upper Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	3.1		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	35		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.023	J	mg/L	8/1/2017 10:31	365.4	0.008	0.050	NK
70828-002 / Upper Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.017	J	mg/L	8/1/2017 10:32	365.4	0.008	0.050	NK
70828-003 / Lower Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	3.5		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	30		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.028	J	mg/L	8/1/2017 10:33	365.4	0.008	0.050	NK
70828-004 / Lower Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.029	J	mg/L	8/1/2017 10:33	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 70828

Project: Monitoring

Date Received: 7/21/2017 **Date Reported:** 9/21/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
70828-005 / Pixley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	6.3		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	35		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.036	J	mg/L	8/1/2017 10:35	365.4	0.008	0.050	NK
70828-006 / Pixley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.11		mg/L	8/1/2017 10:36	365.4	0.008	0.050	NK
70828-007 / Crowley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	8.3		mg/m3	8/10/2017 14:30	10200H	NA	NA	WS
Color	35		CU	7/21/2017 14:00	2120B	5	5	AH
Total Phosphorus LL (t)	0.033	J	mg/L	8/1/2017 10:36	365.4	0.008	0.050	NK
70828-008 / Crowley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.033	J	mg/L	8/1/2017 10:37	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

Job # (WWA office use): 70828

CHAIN-OF-CUSTODY RECORD

Version 160504

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903
Phone: (906) 822-7889, Fax -7977
Web: white-water-associates.com

CLIENT NAME / BILL TO: RWE

EMAIL ADDRESS:

ADDRESS:

TELEPHONE:

CITY | STATE | ZIP:

CONTRACT / PO / PROJECT NAME / WSSN#: Monitoring

SAMPLER NAME (print first/last name): Angi Stone

COUNTY OF LOCATION:

PAGE 1 OF 1 — Indicate if more than one page of COC records used

SAMPLER'S SIGNATURE:

Check off preservatives for each bottle upon arrival and indicate total number of bottles. WWA database contains bottle preservation details.

ANALYSIS TYPE REQUESTED (Attach list if neeeded)

Instructions to White Water
Send my report by:
____ email
____ mail

Unless otherwise noted, drinking water report copies are sent to MDEQ and Health Dept.

REMARKS (Note any special instructions provided by client or conditions of receipt noted by WWA lab staff. Also note any residual chlorine.)

	SAMPLE ID AND LOCATION (Containers for each sample may be combined on one line.)	DATE	TIME	SAMPLE MATRIX: Drinking water	Aqueous	Sed.	Soil	Other:	CONTAINERS / PRESERVATIVES: None	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Na Thio	Total Number of Containers	Chla Cmg/m3	T Phos	Color
1	Upper Flambeau Surface	7-20-17	7:45		X				X	X						3	X	X	X
2	Upper Flambeau Bottom	"	7:50													1		X	
3	Lower Flambeau Surface	"	9:14						X							3	X	X	X
4	Lower Flambeau Bottom	"	9:19													1		X	
5	Pixley Surface	"	10:57						X							3	X	X	X
6	Pixley Bottom	"	11:00													1		X	
7	Crowley Surface	"	13:40						X							3	X	X	X
8	Crowley Bottom	"	13:43													1		X	

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
[signature]	7-20-17	5:03 pm			
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
			[signature] ①	7-21-17	1045

Comments/Sample temp. on receipt: 3.5

Packing: Ice ✓ Cooler ✓

WHITE - RETURN W/ REPORT CANARY - W/ SAMPLES PINK - CUSTOMER

UPS☐ FedEx☐ USPS☐ Client☐ Other WWA

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page

Client: RWE **WWA Job #:** 71379

Project: Monitoring

Date Received: 8/17/2017 **Date Reported:** 9/14/2017

Sample Number	Client Sample ID	Date Sampled	Sample Matrix
71379-001	Upper Flambeau	08/16/17	Water
71379-002	Upper Flambeau	08/16/17	Water
71379-003	Lower Flambeau	08/16/17	Water
71379-004	Lower Flambeau	08/16/17	Water
71379-005	Pixley	08/16/17	Water
71379-006	Pixley	08/16/17	Water
71379-007	Crowley	08/16/17	Water
71379-008	Crowley	08/16/17	Water

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Cover Page..continued

Client: RWE **WWA Job #:** 71379

Comments (if any):

Key to Laboratory Flags:

*: RPD exceeds limits.
B: The analyte was found in the associated blank as well as in the sample.
J: The quantitation is an estimated value because the result is less than the sample quantitation limit but greater than the detection limit.
M: A matrix effect was present.
Q: Batch QC data associated with the analysis does not meet the stated objectives
H: Indicates analytical holding time exceedance.
U: The analyte was analyzed for, but not detected.
P: A manual peak selection or manual integration was performed to correct an erroneous software selection.

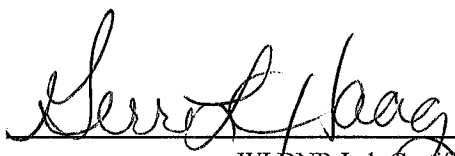
ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)
For coliform, Negative = No coliform bacteria detected, Positive = Coliform bacteria detected

Sample Types:
S = Solids, DW = Drinking water, D = Dissolved, T = Total, TC = TCLP extract, SP = SPLP extract

All samples were received intact and properly preserved unless otherwise noted. The results reported relate only to the samples tested. This report shall not be reproduced, except in full, without the written approval of this laboratory. The Chain of Custody is attached.

This report satisfies the requirements of your project but has not been prepared to comply with NELAP reporting requirements.

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and White Water Associates Standard Operating Procedures. Exceptions, if any, are discussed in the accompanying sample narrative. Release of this Final Report is authorized by White Water Associates management, as is verified by the following signature.

Approved By: 

WI DNR Lab Certification Number: 999971280
MI DEQ Certification Number: 9306
DoD-ELAP Accreditation Number: 65802
ISO/IEC 17025:2005 Accredited

ANALYTICAL REPORT

WHITE WATER ASSOCIATES, INC.

429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 71379

Project: Monitoring

Date Received: 8/17/2017 **Date Reported:** 9/14/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
71379-001 / Upper Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	4.9		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	35		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.018	J	mg/L	8/18/2017 11:41	365.4	0.008	0.050	NK
71379-002 / Upper Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.015	J	mg/L	8/18/2017 11:43	365.4	0.008	0.050	NK
71379-003 / Lower Flambeau / Surface / Water								
General Chemistry Parameters								
chlorophyll a	5.6		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	40		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.032	J	mg/L	8/18/2017 11:43	365.4	0.008	0.050	NK
71379-004 / Lower Flambeau / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.033	J	mg/L	8/18/2017 11:44	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

WHITE WATER ASSOCIATES, INC.
429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: RWE **WWA Job #:** 71379

Project: Monitoring

Date Received: 8/17/2017 **Date Reported:** 9/14/2017

Sample Results

Sample No. / ID / Description / Matrix	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
71379-005 / Pixley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	12		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	40		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.032	J	mg/L	8/18/2017 11:44	365.4	0.008	0.050	NK
71379-006 / Pixley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.027	J	mg/L	8/18/2017 11:46	365.4	0.008	0.050	NK
71379-007 / Crowley / Surface / Water								
General Chemistry Parameters								
chlorophyll a	13		mg/m3	9/7/2017 10:00	10200H	NA	NA	WS
Color	30		CU	8/17/2017 11:40	2120B	5	5	AH
Total Phosphorus LL (t)	0.032	J	mg/L	8/18/2017 11:47	365.4	0.008	0.050	NK
71379-008 / Crowley / Bottom / Water								
General Chemistry Parameters								
Total Phosphorus LL (t)	0.030	J	mg/L	8/18/2017 11:47	365.4	0.008	0.050	NK

ND = Not Detected, MDL = Method Detection Limit, MQL = Method Quantitation Limit,
ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)

V Gw 8/18/17 Version 160504

Job # (WWA office use): 71379

CHAIN-OF-CUSTODY RECORD

WHITE WATER ASSOCIATES, INC.

429 River Lane, P.O. Box 27
Amasa, Michigan 49903

Phone: (906) 822-7889, Fax -7977
Web: white-water-associates.com

CLIENT NAME / BILL TO: RWE.		EMAIL ADDRESS	
ADDRESS		TELEPHONE	
CITY	STATE / ZIP	CONTRACT / PO / PROJECT NAME / WSSN#: Monitoring	
SAMPLER NAME (print first/last name): Angie Shaw		COUNTY OF LOCATION	PAGE 1 OF 1 (Indicate if more than one page of COC records used)
SAMPLER'S SIGNATURE		Check off preservatives for each bottle upon arrival and indicate total number of bottles. WWA database contains bottle preservation details.	

ANALYSIS TYPE REQUESTED (Attach list if neeeded)

Instructions to White Water
Send my report by:
____ email
____ mail

Unless otherwise noted, drinking water report copies are sent to MDEQ and Health Dept.

REMARKS (Note any special instructions provided by client or conditions of receipt noted by WWA lab staff. Also note any residual chlorine.)

	SAMPLE ID AND LOCATION (Containers for each sample may be combined on one line.)	DATE	TIME	SAMPLE MATRIX: Drinking water	Aqueous	Sed.	Soil	Other:	CONTAINERS / PRESERVATIVES: None	H2SO4	HNO3	HCl Hg2Cl2	NaOH	ZnAc/NaOH	Na Thio	Total Number of Containers	Chl a	T Phos	Color
1	Upper Flambeau Surface	8-16-17	7:48		X				X	X		X				3	X	X	X
2	" Bottom	"	7:46		"				no	"						1		X	
3	Lower Flambeau Surface	8-16-17	9:20		"				X	"		X				3	X	X	X
4	" Bottom	"	9:18		"				no	"						1		X	
5	Pixley Surface	8-16-17	10:53		"				X	"		X				3	X	X	X
6	Pixley Bottom	"	10:51		"				no	"						1		X	
7	Crowley Surface	8-16-17	13:18		"					"		X				3	X	X	X
8	Crowley Bottom	"	13:16		"				no	"						1		X	

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date: 8-17-17	Time: 16:47	Received by:	Date: 8-17-17	Time: 830

Comments/Sample temp. on receipt:

Packing: Ice ✓
Cooler ✓

WHITE - RETURN W/ REPORT CANARY - W/ SAMPLES PINK - CUSTOMER

UPS☐ FedEx☐ USPS☐ Client☐ Other WWA

Brian Kreuscher

From: Brian Kreuscher
Sent: Thursday, November 16, 2017 3:55 PM
To: Cheryl Laatsch; Nick Utrup
Subject: Flambeau Upper (P-2640) Flambeau Lower (P-2421) Pixley (P-2395) Crowley (P-2473) Water Quality Draft Reports
Attachments: Draft Report 2017 Flambeau Upper Final WQ-Complete.pdf; Draft Report 2017 Pixley FInal WQ-Complete.pdf; Draft Report 2017 Crowley Final WQ-Complete.pdf; Draft Report 2017 Flambeau Lower Final WQ-Complete.pdf

All,
Attached is the Draft Water Quality Reports. Please review and provide any comments you may have to me within 30 days for FERC submittal.

Thanks
Brian Kreuscher
Renewable World Energies
Regulatory & Compliance
855-944-9376 x230

Brian Kreuscher

From: Brian Kreuscher
Sent: Friday, November 17, 2017 3:59 PM
To: Cheryl Laatsch; Nick Utrup; Sue Reinecke; Paul Strong; Dale Higgins
Subject: 2017 Draft Water Quality Report
Attachments: Draft Report 2017 Danbury Final WQ-Complete.pdf; Draft Report 2017 Flambeau Lower Final WQ-Complete.pdf; Draft Report 2017 Flambeau Upper Final WQ-Complete.pdf; Draft Report 2017 Pixley FInal WQ-Complete.pdf; Draft Report 2017 Winter Final WQ-Complete.pdf; Draft Report 2017 Clam River Final WQ-Complete.pdf; Draft Report 2017 Crowley Final WQ-Complete.pdf

All,
In previous emails I said we need comments within 30 days for the FERC submittal. Correction, we are to allow 60 days for you to comment on the Water Quality Reports before the FERC submittal is required on these projects:

Winter (P-2064)

Clam River (P-9185)
Danbury (P-9184)
Flambeau Upper (P-2640)
Flambeau Lower (P-2421)
Pixley (P-2395)
Crowley (P-2473)

Sorry for the confusion, I have re-attached all reports noted for ease.

Thanks
Brian Kreuscher
Renewable World Energies
Regulatory & Compliance
855-944-9376 x230