



Upper Peninsula Power Company

700 North Adams Street
P.O. Box 19001
Green Bay, WI 54307-9001
www.uppco.com

December 11, 2012

FERC Project No. 10855

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

Dear Secretary Bose:

Re: Dead River Hydroelectric Project – 2012 Water Chemistry Monitoring Report

Pursuant to the Order Modifying and Approving Water Quality Monitoring under Article 408, issued on April 17, 2003 and modified on March 3, 2005, Upper Peninsula Power Company (UPPCO) is pleased to submit the results of water chemistry monitoring conducted at the three storage basins in the Dead River Hydroelectric Project.

In 2012, water chemistry samples were collected on a quarterly basis from the basin outlets of the following reservoirs:

- Silver Lake Storage Basin (NW $\frac{1}{4}$ of the NW $\frac{1}{4}$, Section 17, T48N, R28W),
- Dead River Storage Basin (NW $\frac{1}{4}$ of the NW $\frac{1}{4}$, Section 16, T48N, R26W) and
- McClure Storage Basin (SW $\frac{1}{4}$ of the NE $\frac{1}{4}$, Section 7, T48N, R25W)

Water chemistry monitoring data is enclosed in Attachment A. For your convenience, included with the 2012 results is a summary of the previous water chemistry results from 2007 and 2008 at the above sampling locations. Water chemistry samples were first collected from the McClure and Dead River Storage Basins in 2007 (5 years after license issuance). Due to the rebuilding of the Silver Lake Reservoir, water chemistry samples were first collected from this reservoir outlet in 2008.

A comparison of the 2007/2008 monitoring data to the 2012 monitoring data does not reveal any significant differences in the concentrations of the parameters monitored. At the Silver Lake Storage Basin, there is a slight decrease in specific conductivity, total hardness, nickel and copper concentration between 2008 and 2012, while all other monitored parameters have comparable concentrations between the sampling events. At the Dead River Storage Basin and McClure Storage Basin sampling locations, the concentrations of the monitored parameters are

Ms. Kimberly Bose, Secretary

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Page 2 of 2

similar between the 2007 and 2012 sampling events. None of the parameters monitored are above the State of Michigan Rule 57 water quality values.

A summary of the 2012 monitoring data was provided to the Michigan Department of Natural Resources (MDNR), Michigan Department of Environmental Quality (MDEQ), and U.S. Fish & Wildlife (FWS) for review and comment on November 2, 2012. UPPCO did not receive comments on the monitoring data from the resource agencies. Documentation of agency consultation is included in Attachment B. As described in the Water Quality Monitoring Plan, water chemistry samples will be collected every 5 years for the term of the license. The next water chemistry sampling event is scheduled to occur in 2017.

Should you have any questions or concerns about this report, please do not hesitate to call Mr. Mark Metcalf at (920) 433-1833.

Sincerely,



Terry P. Jensky

Vice President - Generation Assets

Wisconsin Public Service Corporation

Enc: 2012 Water Chemistry Monitoring Data and Agency Correspondence

cc: Mr. Gil Snyder, WPSC - D2	Mr. Robert Meyers, UPPCO - UISC
Mr. Shawn Puzen, IBS - D2	Mr. Bill Taft - MDEQ
Ms. Joan Johaneck, WPSC - D2	Mr. Mitch Koetje - MDEQ
Mr. Dave Giesler, IBS - D2	Mr. Burr Fisher - FWS
Mr. John Myers, IBS - D2	Mr. Kyle Kruger - MDNR
Mr. Keith Moyle, UPPCO - UISC	Mr. John Zygaj, FERC - CRO
Mr. Virgil Schlorke, UPPCO - UISC	

ATTACHMENT A

Dead River Hydroelectric Project

FERC Project No. 10855

2012 Water Chemistry Monitoring Results

Silver Lake Storage Basin - 2012 Water Chemistry Results

Parameter	Method	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>
		<u>3/14/2012</u>	<u>5/08/2012</u>	<u>8/15/2012</u>	<u>10/08/2012</u>
Alkalinity	EPA 310.2	16.7 mg/l (j)	16.2 mg/l (j)	13.1 mg/l (j)	17.9 mg/l (j)
pH	S.M. 4500H B	6.48 s.u. @ 2.0 °C	7.19 s.u. @ 11.5 °C	6.55 s.u. @ 21.1 °C	6.99 s.u. @ 10.0 °C
Specific Conductivity	S.M. 2510 B	39.2 uS/cm	33.9 uS/cm	40.7 uS/cm	40.5 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	38.0 mg/l	38.0 mg/l	90.0 mg/l	58.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l	<0.20 mg/l	<0.088 mg/l	<0.088 mg/l
Total Suspended Solids	S.M. 2540D	0.60 mg/l (j)	2.0 mg/l (j)	1.8 mg/l (j)	1.2 mg/l (j)
Total Arsenic	EPA 200.8	0.82 ug/l	0.57 ug/l	0.96 ug/l (j)	0.74 ug/l (j)
Total Cadmium	EPA 200.8	<0.028 ug/l	<0.028 ug/l	<0.13 ug/l	<0.13 ug/l
Total Copper	EPA 200.8	0.84 ug/l	0.70 ug/l	0.61 ug/l (j)	0.60 ug/l (j)
Total Lead	EPA 200.8	0.14 ug/l	0.10 ug/l	0.065 ug/l (j)	<0.061 ug/l
Total Nickel	EPA 200.8	0.68 ug/l	0.42 ug/l (j)	0.59 ug/l (j)	0.58 ug/l (j)
Total Silver	EPA 200.8	<0.25 ug/l	<0.25 ug/l	<0.059 ug/l	<0.059 ug/l
Total Organic Carbon	S.M. 5310C	11.5 mg/l	8.3 mg/l	12.1 mg/l	11.1 mg/l
Hardness (calculated)	S.M. 2340B	19.5 mg/l	15.2 mg/l	18.6 mg/l	17.0 mg/l
Chlorophyll a	S.M. 10200 H	0.18 ug/l	3.1 ug/l *	7.0 ug/l	3.2 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	2' 2" (on bottom of stream)	2' (on bottom of stream)	2' (on bottom of stream)	2' (on bottom of stream)

(j) - detected between method detection limit and reporting limit

* Chlorophyll a sample collected on 5/22/12

Silver Lake Storage Basin - 2008 Water Chemistry Results

Parameter	Method	Sample Date: 3/20/2008	Sample Date: 6/27/2008	Sample Date: 7/24/2008	Sample Date: 11/04/2008
Alkalinity	S.M. 2320 B	10.0 mg/l	13.2 mg/l	10.0 mg/l	25.9 mg/l
pH	S.M. 4500H B	6.89 s.u. @ 5.7 °C	7.16 s.u. @ 25.2C	7.42 s.u. @ 26.2 °C	7.61 s.u. @ 6.9 °C
Specific Conductivity	S.M. 2510 B	60.3 uS/cm	79.4 uS/cm	67.8 uS/cm	61.1 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	56.0 mg/l	Not analyzed	66.0 mg/l	84.0 mg/l
Total Phosphorous	EPA 365.4	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	S.M. 2540D	< 0.62 mg/l	3.3 mg/l	4.5 mg/l	1.5 mg/l
Total Arsenic	EPA 200.8	0.55 ug/l	<1.2 ug/l	0.80 ug/l	0.77 ug/l
Total Cadmium	EPA 200.8	0.046 ug/l (j)	<1.3 ug/l	0.064 ug/l (j)	< 0.10 ug/l
Total Copper	EPA 200.8	1.5 ug/l	<0.49 ug/l	3.3 ug/l	2.0 ug/l
Total Lead	EPA 200.8	0.086 ug/l (j)	<1.4 ug/l	0.29 ug/l	< 0.10 ug/l
Total Nickel	EPA 200.8	2.2 ug/l	<0.15 ug/l	4.8 ug/l	3.7 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.34 ug/l	<0.10 ug/l	<0.50 ug/l
Total Organic Carbon	S.M. 5310C	13.6 mg/l	9.8 mg/l	10.8 mg/l	12.8 mg/l
Hardness (calculated)	S.M. 2340 B	25.9 mg/l	20.9 mg/l	30.3 mg/l	43.5 mg/l
Chlorophyll a	S.M. 10200 H	0.58 ug/l	5.4 ug/l	0.93 ug/l	0.57 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)

(j) - detected between method detection limit and reporting limit

Dead River (Hoist) Storage Basin - 2012 Water Chemistry Results

Parameter	Method	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>
		<u>3/14/2012</u>	<u>5/08/2012</u>	<u>8/14/2012</u>	<u>10/09/2012</u>
Alkalinity	EPA 310.2	36.6 mg/l	28.6 mg/l	27.5 mg/l	33.0 mg/l
pH	S.M. 4500H B	6.86 s.u. @ 3.1 °C	7.16 s.u. @ 11.1 °C	6.89 s.u. @ 21.3 °C	7.43 s.u. @ 10.6 °C
Specific Conductivity	S.M. 2510 B	77.6 uS/cm	52.3 uS/cm	69.6 uS/cm	74.7 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	58.0 mg/l	54.0 mg/l	88.0 mg/l	74.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l	<0.20 mg/l	<0.088 mg/l	<0.088 mg/l
Total Suspended Solids	S.M. 2540D	0.80 mg/l (j)	1.1 mg/l (j)	1.6 mg/l (j)	1.8 mg/l (j)
Total Arsenic	EPA 200.8	0.54 ug/l	0.47 ug/l (j)	0.95 ug/l (j)	0.98 ug/l (j)
Total Cadmium	EPA 200.8	<0.028 ug/l	<0.028 ug/l	<0.13 ug/l	<0.13 ug/l
Total Copper	EPA 200.8	0.74 ug/l	0.87 ug/l	0.96 ug/l (j)	0.83 ug/l (j)
Total Lead	EPA 200.8	0.058 ug/l (j)	0.066 ug/l (j)	0.22 ug/l (j)	0.19 ug/l (j)
Total Nickel	EPA 200.8	0.29 ug/l (j)	0.19 ug/l (j)	0.38 ug/l (j)	0.40 ug/l (j)
Total Silver	EPA 200.8	<0.25 ug/l	<0.25 ug/l	0.081 ug/l(j)	0.089 ug/l(j)
Total Organic Carbon	S.M. 5310C	7.8 mg/l	6.7 mg/l	6.6 mg/l	7.4 mg/l
Hardness (calculated)	S.M. 2340B	38.5 mg/l	24.6 mg/l	30.9 mg/l	35.8 mg/l
Chlorophyll a	S.M. 10200 H	0.18 ug/l	1.6 ug/l *	2.4 ug/l	0.76 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	1' 4" (on bottom of stream)	2' (on bottom of stream)	2' 2" (on bottom of stream)	2' 2" (on bottom of stream)

(j) - detected between method detection limit and reporting limit

* Chlorophyll a sample collected on 5/22/12

Dead River (Hoist) Storage Basin - 2007 Water Chemistry Results

Parameter	Method	Sample Date:	Sample Date:	Sample Date:	Sample Date:
		<u>3/8/2007</u>	<u>6/12/2007</u>	<u>9/04/2007</u>	<u>11/02/2007</u>
Alkalinity	S.M. 2320 B	37.8 ppm as CaCO ₃	14.2 ppm as CaCO ₃	27.0 ppm as CaCO ₃	28.0 ppm as CaCO ₃
pH	S.M. 4500H B	6.45 s.u. @ 4.4 °C	7.02 s.u.	7.11 s.u.	7.18 s.u.
Specific Conductivity	S.M. 2510 B	90.8 uS/cm	49.8 uS/cm	67.5 uS/cm	71.6 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l
Total Dissolved Solids	EPA 160.1	64 mg/l	44 mg/l	68 mg/l	52 mg/l
Total Phosphorous	EPA 365.4	<0.13 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	EPA 160.2	0.71 mg/l (j)	<0.61 mg/l	1.4 mg/l (j)	2.0 mg/l
Total Arsenic	EPA 200.8	0.42 ug/l	0.40 ug/l	0.59 ug/l	0.26 ug/l
Total Cadmium	EPA 200.8	<0.017 ug/l	<0.017 ug/l	<0.017 ug/l	<0.017 ug/l
Total Copper	EPA 200.8	0.88 ug/l	1.5 ug/l	1.1 ug/l	0.38 ug/l
Total Lead	EPA 200.8	0.12 ug/l	<0.030 ug/l	<0.030 ug/l	<0.030 ug/l
Total Nickel	EPA 200.8	0.52 ug/l	0.60 ug/l	0.43 ug/l	0.14 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l
Total Organic Carbon	EPA 415.2	6.7 mg/l	7.4 mg/l	8.1 mg/l	6.4 mg/l
Hardness (calculated)	S.M. 2340 B	41.8 mg/l	20.0 mg/l	29.0 mg/l	12.0 mg/l
Chlorophyll a	S.M. 10200 H	0.38 ug/l	1.2 ug/l	2.3 ug/l	2.3 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	2.5 ft (on bottom of stream)	7.0 ft *	5.0 ft *	7.0 ft (taken immediately in discharge from powerhouse)

* Secchi Disk readings on 6/12 and 9/04 were taken at the respective dam intake structures.

(a) - detected between method detection limit and reporting limit

McClure Storage Basin - 2012 Water Chemistry Results

Parameter	Method	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>
		<u>3/14/2012</u>	<u>5/08/2012</u>	<u>8/14/2012</u>	<u>10/09/2012</u>
Alkalinity	EPA 310.2	35.5 mg/l	23.5 mg/l	25.5 mg/l	33.7 mg/l
pH	S.M. 4500H B	6.75 s.u. @ 2.8 °C	7.40 s.u. @ 10.7 °C	7.30 s.u. @ 21.8 °C	7.28 s.u. @ 10.7 °C
Specific Conductivity	S.M. 2510 B	79.2 uS/cm	86.9 uS/cm	73.2 uS/cm	78.9 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	72.0 mg/l	58.0 mg/l	66.0 mg/l	52.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l	<0.20 mg/l	<0.088 mg/l	<0.088 mg/l
Total Suspended Solids	S.M. 2540D	0.60 mg/l (j)	0.71 mg/l (j)	2.0 mg/l	1.2 mg/l (j)
Total Arsenic	EPA 200.8	0.60 ug/l	0.40 ug/l (j)	0.78 ug/l (j)	0.75 ug/l (j)
Total Cadmium	EPA 200.8	<0.028 ug/l	0.028 ug/l (j)	<0.13 ug/l	<0.13 ug/l
Total Copper	EPA 200.8	0.81 ug/l	0.92 ug/l	1.5 ug/l	0.75 ug/l (j)
Total Lead	EPA 200.8	0.070 ug/l (j)	0.081 ug/l (j)	0.22 ug/l (j)	<0.061 ug/l (j)
Total Nickel	EPA 200.8	0.37 ug/l (j)	0.23 ug/l (j)	0.71 ug/l (j)	0.39 ug/l (j)
Total Silver	EPA 200.8	<0.25 ug/l	<0.25 ug/l	<0.059 ug/l	<0.059 ug/l
Total Organic Carbon	S.M. 5310C	7.3 mg/l	6.4 mg/l	6.8 mg/l	6.6 mg/l
Hardness (calculated)	S.M. 2340B	39.6 mg/l	26.1 mg/l	32.3 mg/l	35.9 mg/l
Chlorophyll a	S.M. 10200 H	0.23 ug/l	3.4 ug/l *	3.4 ug/l	0.76 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	3.0 ft (on bottom of stream)	3.0 ft (on bottom of stream)	3.0 ft (on bottom of stream)	3.0 ft (on bottom of stream)

(j) - detected between method detection limit and reporting limit

* Chlorophyll a sample collected on 5/22/12

McClure Storage Basin - 2007 Water Chemistry Results

Parameter	Method	Sample Date: 3/8/2007	Sample Date: 6/12/2007	Sample Date: 09/04/2007	Sample Date: 11/02/2007
Alkalinity	S.M. 2320 B	38.4 ppm as CaCO ₃	20.2 ppm as CaCO ₃	28.8 ppm as CaCO ₃	30.0 ppm as CaCO ₄
pH	S.M. 4500H B	6.51 s.u. @ 2.9 °C	7.18 s.u.	7.17 s.u.	7.20 s.u.
Specific Conductivity	S.M. 2510 B	93.6 uS/cm	52.9 uS/cm	70.3 uS/cm	73.6 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	0.59 mg/l (j)
Total Dissolved Solids	EPA 160.1	64 mg/l	44 mg/l	54 mg/l	50 mg/l
Total Phosphorous	EPA 365.4	<0.13 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	EPA 160.2	0.75 mg/l (j)	1.0 mg/l (j)	1.6 mg/l (j)	1.0 mg/l (j)
Total Arsenic	EPA 200.8	0.43 ug/l	0.34 ug/l	0.55 ug/l	0.59 ug/l
Total Cadmium	EPA 200.8	0.069 ug/l	0.17 ug/l	<0.017 ug/l	0.022 ug/l (j)
Total Copper	EPA 200.8	1.1 ug/l	1.6 ug/l	2.0 ug/l	1.4 ug/l
Total Lead	EPA 200.8	0.18 ug/l	0.13 ug/l	0.16 ug/l	0.12 ug/l
Total Nickel	EPA 200.8	0.56 ug/l	0.59 ug/l	0.53 ug/l	0.50 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l
Total Organic Carbon	EPA 415.2	6.4 mg/l	5.0 mg/l	5.2 mg/l	6.6 mg/l
Hardness (calculated)	S.M. 2340 B	39.8 mg/l	22.0 mg/l	29.0 mg/l	34.0 mg/l
Chlorophyll a	S.M. 10200 H	0.17 ug/l	1.1 ug/l	2.2 ug/l	2.3 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	3.0 ft (on bottom of stream)	7.5 ft *	4.5 ft *	5.0 ft (on bottom of stream)

* Secchi Disk readings on 6/12 and 9/04 were taken at the respective dam intake structures.

(j) - detected between method detection limit and reporting limit

ATTACHMENT B

Dead River Hydroelectric Project

FERC Project No. 10855

Documentation of Agency Consultation

Metcalfe, Mark W

From: Metcalfe, Mark W
Sent: Thursday, April 05, 2012 8:53 AM
To: Taft, Bill ; Kruger, Kyle
Cc: Koetje, Mitch ; Puzen, Shawn C; Meyers, Robert J; Schlorke, Virgil E
Subject: Dead River Water Chemistry Report
Attachments: 20120405 DR Q1 water chemistry report.pdf

Good morning Mr. Taft and Mr. Kruger,

Attached for your review is a water chemistry report for samples collected in the first quarter of 2012 as part of the water quality monitoring plan for the Dead River Hydroelectric Project. If you have any questions, please feel free to contact me.

Thanks,
Mark

Mark Metcalf

Environmental Consultant - Air & Water | Integrys Business Support, LLC

920-433-1833 (Green Bay)

920-617-6046 (De Pere)

920-606-8432 *cell*

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Providing support for Integrys Energy Group, Integrys Energy Services, Michigan Gas Utilities, Minnesota Energy Resources, North Shore Gas, Peoples Gas, Upper Peninsula Power Company and Wisconsin Public Service.

Metcalfe, Mark W

From: Metcalf, Mark W
Sent: Thursday, April 05, 2012 9:23 AM
To: Cavalieri, Vincent
Cc: Puzen, Shawn C; Meyers, Robert J; Schlorke, Virgil E
Subject: FW: Dead River Water Chemistry Report
Attachments: 20120405 DR Q1 water chemistry report.pdf

Good morning Vince,

Attached please find a water chemistry monitoring report for the first quarter of 2012 for the Dead River hydroelectric Project. Feel free to contact me if you have any questions.

Thanks,
Mark

Mark Metcalf

Environmental Consultant - Air & Water | Integrys Business Support, LLC

920-433-1833 (Green Bay)

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From: Metcalf, Mark W
Sent: Thursday, April 05, 2012 8:53 AM
To: Taft, Bill ; Kruger, Kyle
Cc: Koetje, Mitch ; Puzen, Shawn C; Meyers, Robert J; Schlorke, Virgil E
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Mark

Mark Metcalf

Environmental Consultant - Air & Water | Integrys Business Support, LLC

Metcalf, Mark W

From: Vincent_Cavalieri@fws.gov
Sent: Thursday, April 05, 2012 10:14 AM
To: Puzen, Shawn C
Cc: 'jamie_bettaso@fws.gov'; Nuthals, James D; Metcalf, Mark W
Subject: Re: FW: Dead River Water Chemistry Report
Attachments: pic26058.gif; 20120405 DR Q1 water chemistry report.pdf

Hello everyone,

I still need to notify the broader group but Jaime will be taking over for me as part of the team. Please direct future projects and correspondence to Jaime. Its been great working with you all and good luck moving forward!

Vince Cavalieri
Fish and Wildlife Biologist
(Great Lakes piping plover coordinator)
U.S.Fish and Wildlife Service
East Lansing Field Office
2651 Coolidge Road
East Lansing, MI 48823
(517) 351-5467
vincent_cavalieri@fws.gov
▼ "Puzen, Shawn C" <SCPuzen@integrysgroup.com>

"Puzen, Shawn C"
<SCPuzen@integrysgroup.com>

04/05/2012 11:02 AM

To"vincent_cavalieri@fws.gov"
<vincent_cavalieri@fws.gov>,
"jamie_bettaso@fws.gov"
<jamie_bettaso@fws.gov>

cc"Metcalf, Mark W"
<MWMetcalf@integrysgroup.com>, "Nuthals,
James D" <JDNuthals@integrysgroup.com>

SubjectFW: Dead River Water Chemistry Report

Jamie-

Can you please let me know if you are to receive this information from now on for projects other than Bond Falls?

Thanks,

Shawn C. Puzen

Environmental Consultant | Environmental Services | Integrys Business Support, LLC

920-433-1094

920-639-2480 cell

920-433-1176 fax
SCPuzen@integrysgroup.com
www.integrysgroup.com

Providing support for Integrys Energy Group, Integrys Energy Services, Integrys Transportation Fuels, Michigan Gas Utilities, Minnesota Energy Resources, North Shore Gas, Peoples Gas, Upper Peninsula Power Company, Wisconsin Public Service, and Wisconsin River Power.

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Mark Metcalf
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Providing support for Integrys Energy Group, Integrys Energy Services, Michigan Gas Utilities, Minnesota Energy Resources, North Shore Gas, Peoples Gas, Upper Peninsula Power Company and Wisconsin Public Service.

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Cc: Koetje, Mitch ; Puzen, Shawn C; Meyers, Robert J; Schlorke, Virgil E
Subject: Dead River Water Chemistry Report

Good morning Mr. Taft and Mr. Kruger,

Attached for your review is a water chemistry report for samples collected in the first quarter of 2012 as part of the water quality monitoring plan for the Dead River Hydroelectric Project. If you have any questions, please feel free to contact me.

Thanks,
Mark

Mark Metcalf

Environmental Consultant - Air & Water | Integrys Business Support, LLC

920-433-1833 (Green Bay)

920-617-6046 (De Pere)

920-606-8432 *cell*

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mwmetcalf@integrysgroup.com

www.integrysgroup.com

Providing support for Integrys Energy Group, Integrys Energy Services, Michigan Gas Utilities, Minnesota Energy Resources, North Shore Gas, Peoples Gas, Upper Peninsula Power Company and Wisconsin Public Service.

(See attached file: 20120405 DR Q1 water chemistry report.pdf)



Upper Peninsula Power Company

700 North Adams Street
P.O. Box 19001
Green Bay, WI 54307-9001
www.uppco.com

April 5, 2012

FERC Project No. 10855

Mr. Bill Taft
Water Resources Division
Michigan Department of Environmental Quality
P. O. Box 30273
Lansing, MI 48909

Mr. Kyle Kruger
Michigan Dept. of Natural Resources
Mio Field Office
191 South Mt. Tom Rd
Mio, MI 48647

Dear Mr. Taft and Mr. Kruger:

Per the Order Modifying and Approving Water Quality Monitoring Plan Under Article 408, dated April 17, 2003, and the Order Approving Modification to Approved Water Quality Monitoring Plan Under Article 408, dated March 3, 2005, Upper Peninsula Power Company (UPPCO) is pleased to submit water chemistry monitoring results for the first quarter of 2012.

Water chemistry samples were collected from the outlets of the Silver Lake Dam, Hoist Powerhouse and McClure Dam Powerhouse as described in the water quality monitoring plan. Water chemistry samples will be collected in the 2nd, 3rd, and 4th quarters of 2012 at these sites. For your convenience, included with the first quarter results is a summary of the previous water chemistry results from the sampling locations. Should you have any questions about the monitoring data, please do not hesitate to call me at (920) 433-1833.

Sincerely,

A handwritten signature in black ink that reads "Mark Metcalf". The signature is written in a cursive, flowing style.

Mark W. Metcalf
Environmental Consultant - Air & Water
Integrays Business Support, LLC
Telephone: (920) 433-1833

Attach: Water Chemistry Results

cc: Mr. Mitch Koetje – MDNR
Mr. Robert Meyers, UPPCO
Mr. Virgil Schlorke - UPPCO
Mr. Shawn Puzen, Integrays Business Support

Silver Lake Storage Basin - 2012 Water Chemistry Results

Parameter	<u>Method</u>	<u>Sample Date:</u> <u>3/14/2012</u>
Alkalinity	EPA 310.2	16.7 mg/l (j)
pH	S.M. 4500H B	6.48 s.u. @ 2.0 °C
Specific Conductivity	S.M. 2510 B	39.2 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	38.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l
Total Suspended Solids	S.M. 2540D	0.60 mg/l (j)
Total Arsenic	EPA 200.8	0.82 ug/l
Total Cadmium	EPA 200.8	<0.028 ug/l
Total Copper	EPA 200.8	0.84 ug/l
Total Lead	EPA 200.8	0.14 ug/l
Total Nickel	EPA 200.8	0.68 ug/l
Total Silver	EPA 200.8	<0.25 ug/l
Total Organic Carbon	S.M. 5310C	11.5 mg/l
Hardness (calculated)	S.M. 2340B	19.5 mg/l
Chlorophyll a	S.M. 10200 H	0.18 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	2' 2" (on bottom of stream)

(j) - detected between method detection limit and reporting limit

Silver Lake Storage Basin - 2008 Water Chemistry Results

Parameter	Method	Sample Date: 3/20/2008	Sample Date: 6/27/2008	Sample Date: 7/24/2008	Sample Date: 11/04/2008
Alkalinity	S.M. 2320 B	10.0 mg/l	13.2 mg/l	10.0 mg/l	25.9 mg/l
pH	S.M. 4500H B	6.89 s.u. @ 5.7 °C	7.16 s.u. @ 25.2C	7.42 s.u. @ 26.2 °C	7.61 s.u. @ 6.9 °C
Specific Conductivity	S.M. 2510 B	60.3 uS/cm	79.4 uS/cm	67.8 uS/cm	61.1 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	56.0 mg/l	Not analyzed	66.0 mg/l	84.0 mg/l
Total Phosphorous	EPA 365.4	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	S.M. 2540D	< 0.62 mg/l	3.3 mg/l	4.5 mg/l	1.5 mg/l
Total Arsenic	EPA 200.8	0.55 ug/l	<1.2 ug/l	0.80 ug/l	0.77 ug/l
Total Cadmium	EPA 200.8	0.046 ug/l (j)	<1.3 ug/l	0.064 ug/l (j)	< 0.10 ug/l
Total Copper	EPA 200.8	1.5 ug/l	<0.49 ug/l	3.3 ug/l	2.0 ug/l
Total Lead	EPA 200.8	0.086 ug/l (j)	<1.4 ug/l	0.29 ug/l	< 0.10 ug/l
Total Nickel	EPA 200.8	2.2 ug/l	<0.15 ug/l	4.8 ug/l	3.7 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.34 ug/l	<0.10 ug/l	<0.50 ug/l
Total Organic Carbon	S.M. 5310C	13.6 mg/l	9.8 mg/l	10.8 mg/l	12.8 mg/l
Hardness (calculated)	S.M. 2340 B	25.9 mg/l	20.9 mg/l	30.3 mg/l	43.5 mg/l
Chlorophyll a	S.M. 10200 H	0.58 ug/l	5.4 ug/l	0.93 ug/l	0.57 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)

(j) - detected between method detection limit and reporting limit

Dead River (Hoist) Storage Basin - 2012 Water Chemistry Results

Parameter	Method	Sample Date: <u>3/14/2012</u>
Alkalinity	EPA 310.2	36.6 mg/l
pH	S.M. 4500H B	6.86 s.u. @ 3.1 °C
Specific Conductivity	S.M. 2510 B	77.6 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	58.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l (j)
Total Suspended Solids	S.M. 2540D	0.80 mg/l
Total Arsenic	EPA 200.8	0.54 ug/l
Total Cadmium	EPA 200.8	<0.028 ug/l
Total Copper	EPA 200.8	0.74 ug/l
Total Lead	EPA 200.8	0.058 ug/l (j)
Total Nickel	EPA 200.8	0.29 ug/l (j)
Total Silver	EPA 200.8	<0.25 ug/l
Total Organic Carbon	S.M. 5310C	7.8 mg/l
Hardness (calculated)	S.M. 2340B	38.5 mg/l
Chlorophyll a	S.M. 10200 H	0.18 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	1' 4" (on bottom of stream)

(j) - detected between method detection limit and reporting limit

Dead River (Hoist) Storage Basin - 2007 Water Chemistry Results

Parameter	Method	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>
		<u>3/8/2007</u>	<u>6/12/2007</u>	<u>9/04/2007</u>	<u>11/02/2007</u>
Alkalinity	S.M. 2320 B	37.8 ppm as CaCO ₃	14.2 ppm as CaCO ₃	27.0 ppm as CaCO ₃	28.0 ppm as CaCO ₃
pH	S.M. 4500H B	6.45 s.u. @ 4.4 °C	7.02 s.u.	7.11 s.u.	7.18 s.u.
Specific Conductivity	S.M. 2510 B	90.8 uS/cm	49.8 uS/cm	67.5 uS/cm	71.6 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l
Total Dissolved Solids	EPA 160.1	64 mg/l	44 mg/l	68 mg/l	52 mg/l
Total Phosphorous	EPA 365.4	<0.13 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	EPA 160.2	0.71 mg/l (j)	<0.61 mg/l	1.4 mg/l (j)	2.0 mg/l
Total Arsenic	EPA 200.8	0.42 ug/l	0.40 ug/l	0.59 ug/l	0.26 ug/l
Total Cadmium	EPA 200.8	<0.017 ug/l	<0.017 ug/l	<0.017 ug/l	<0.017 ug/l
Total Copper	EPA 200.8	0.88 ug/l	1.5 ug/l	1.1 ug/l	0.38 ug/l
Total Lead	EPA 200.8	0.12 ug/l	<0.030 ug/l	<0.030 ug/l	<0.030 ug/l
Total Nickel	EPA 200.8	0.52 ug/l	0.60 ug/l	0.43 ug/l	0.14 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l
Total Organic Carbon	EPA 415.2	6.7 mg/l	7.4 mg/l	8.1 mg/l	6.4 mg/l
Hardness (calculated)	S.M. 2340 B	41.8 mg/l	20.0 mg/l	29.0 mg/l	12.0 mg/l
Chlorophyll a	S.M. 10200 H	0.38 ug/l	1.2 ug/l	2.3 ug/l	2.3 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	2.5 ft (on bottom of stream)	7.0 ft *	5.0 ft *	7.0 ft (taken immediately in discharge from powerhouse)

* Secchi Disk readings on 6/12 and 9/04 were taken at the respective dam intake structures.

(a) - detected between method detection limit and reporting limit

McClure Storage Basin - 2012 Water Chemistry Results

Parameter	<u>Method</u>	<u>Sample Date:</u> <u>3/14/2012</u>
Alkalinity	EPA 310.2	35.5 mg/l
pH	S.M. 4500H B	6.75 s.u. @ 2.8 °C
Specific Conductivity	S.M. 2510 B	79.2 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	72.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l
Total Suspended Solids	S.M. 2540D	0.60 mg/l (j)
Total Arsenic	EPA 200.8	0.60 ug/l
Total Cadmium	EPA 200.8	<0.028 ug/l
Total Copper	EPA 200.8	0.81 ug/l
Total Lead	EPA 200.8	0.070 ug/l (j)
Total Nickel	EPA 200.8	0.37 ug/l (j)
Total Silver	EPA 200.8	<0.25 ug/l
Total Organic Carbon	S.M. 5310C	7.3 mg/l
Hardness (calculated)	S.M. 2340B	39.6 mg/l
Chlorophyll a	S.M. 10200 H	0.23 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	3.0 ft (on bottom of stream)

(j) - detected between method detection limit and reporting limit

McClure Storage Basin - 2007 Water Chemistry Results

Parameter	Method	<u>Sample Date:</u> 3/8/2007	<u>Sample Date:</u> 6/12/2007	<u>Sample Date:</u> 09/04/2007	<u>Sample Date:</u> 11/02/2007
Alkalinity	S.M. 2320 B	38.4 ppm as CaCO ₃	20.2 ppm as CaCO ₃	28.8 ppm as CaCO ₃	30.0 ppm as CaCO ₄
pH	S.M. 4500H B	6.51 s.u. @ 2.9 °C	7.18 s.u.	7.17 s.u.	7.20 s.u.
Specific Conductivity	S.M. 2510 B	93.6 uS/cm	52.9 uS/cm	70.3 uS/cm	73.6 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	0.59 mg/l (j)
Total Dissolved Solids	EPA 160.1	64 mg/l	44 mg/l	54 mg/l	50 mg/l
Total Phosphorous	EPA 365.4	<0.13 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	EPA 160.2	0.75 mg/l (j)	1.0 mg/l (j)	1.6 mg/l (j)	1.0 mg/l (j)
Total Arsenic	EPA 200.8	0.43 ug/l	0.34 ug/l	0.55 ug/l	0.59 ug/l
Total Cadmium	EPA 200.8	0.069 ug/l	0.17 ug/l	<0.017 ug/l	0.022 ug/l (j)
Total Copper	EPA 200.8	1.1 ug/l	1.6 ug/l	2.0 ug/l	1.4 ug/l
Total Lead	EPA 200.8	0.18 ug/l	0.13 ug/l	0.16 ug/l	0.12 ug/l
Total Nickel	EPA 200.8	0.56 ug/l	0.59 ug/l	0.53 ug/l	0.50 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l
Total Organic Carbon	EPA 415.2	6.4 mg/l	5.0 mg/l	5.2 mg/l	6.6 mg/l
Hardness (calculated)	S.M. 2340 B	39.8 mg/l	22.0 mg/l	29.0 mg/l	34.0 mg/l
Chlorophyll a	S.M. 10200 H	0.17 ug/l	1.1 ug/l	2.2 ug/l	2.3 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	3.0 ft (on bottom of stream)	7.5 ft *	4.5 ft *	5.0 ft (on bottom of stream)

* Secchi Disk readings on 6/12 and 9/04 were taken at the respective dam intake structures.

(j) - detected between method detection limit and reporting limit

Metcalfe, Mark W

From: Metcalf, Mark W
Sent: Friday, June 01, 2012 11:16 AM
To: 'Taft, Bill '; 'Kruger, Kyle'
Cc: 'Koetje, Mitch '; Puzen, Shawn C; Meyers, Robert J; Schlorke, Virgil E; Bettaso, Jamie
Subject: Dead River Water Chemistry Report - 2012 Q2
Attachments: 20120601 DR Q2 water chemistry report.pdf

Good morning Mr. Taft and Mr. Kruger,

Attached for your review is a water chemistry report for samples collected in the second quarter of 2012 as part of the water quality monitoring plan for the Dead River Hydroelectric Project. If you have any questions, please feel free to contact me.

Thanks,
Mark

Mark Metcalf

Environmental Consultant - Air & Water | Integrys Business Support, LLC

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Upper Peninsula Power Company

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June 1, 2012

FERC Project No. 10855

Mr. Bill Taft
Water Resources Division
Michigan Department of Environmental Quality
P. O. Box 30273
Lansing, MI 48909

Mr. Kyle Kruger
Michigan Dept. of Natural Resources
Mio Field Office
191 South Mt. Tom Rd
Mio, MI 48647

Dear Mr. Taft and Mr. Kruger:

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Water chemistry samples were collected from the outlets of the Silver Lake Dam, Hoist Powerhouse and McClure Dam Powerhouse as described in the water quality monitoring plan. Water chemistry samples will be collected in the 3rd, and 4th quarters of 2012 at these sites. For your convenience, included with the 2012 results is a summary of the previous water chemistry results from the sampling locations. Should you have any questions about the monitoring data, please do not hesitate to call me at (920) 433-1833.

Sincerely,

A handwritten signature in black ink that reads "Mark Metcalf". The signature is written in a cursive, flowing style.

Mark W. Metcalf
Environmental Consultant - Air & Water
Integrays Business Support, LLC
Telephone: (920) 433-1833

Attach: Water Chemistry Results

cc: Mr. Mitch Koetje – MDNR
Mr. Jamie Betasso - USFWS
Mr. Robert Meyers, UPPCO
Mr. Virgil Schlorke - UPPCO
Mr. Shawn Puzen, Integrays Business Support

Silver Lake Storage Basin - 2012 Water Chemistry Results

Parameter	Method	<u>Sample Date:</u>	<u>Sample Date:</u>
		<u>3/14/2012</u>	<u>5/08/2012</u>
Alkalinity	EPA 310.2	16.7 mg/l (j)	16.2 mg/l (j)
pH	S.M. 4500H B	6.48 s.u. @ 2.0 °C	7.19 s.u. @ 11.5 °C
Specific Conductivity	S.M. 2510 B	39.2 uS/cm	33.9 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	38.0 mg/l	38.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l	<0.20 mg/l
Total Suspended Solids	S.M. 2540D	0.60 mg/l (j)	2.0 mg/l (j)
Total Arsenic	EPA 200.8	0.82 ug/l	0.57 ug/l
Total Cadmium	EPA 200.8	<0.028 ug/l	<0.028 ug/l
Total Copper	EPA 200.8	0.84 ug/l	0.70 ug/l
Total Lead	EPA 200.8	0.14 ug/l	0.10 ug/l
Total Nickel	EPA 200.8	0.68 ug/l	0.42 ug/l (j)
Total Silver	EPA 200.8	<0.25 ug/l	<0.25 ug/l
Total Organic Carbon	S.M. 5310C	11.5 mg/l	8.3 mg/l
Hardness (calculated)	S.M. 2340B	19.5 mg/l	15.2 mg/l
Chlorophyll a	S.M. 10200 H	0.18 ug/l	3.1 ug/l *
Secchi Disk Transparency	EPA 440-4-91-002	2' 2" (on bottom of stream)	2' (on bottom of stream)

(j) - detected between method detection limit and reporting limit

* Chlorophyll a sample collected on 5/22/12

Silver Lake Storage Basin - 2008 Water Chemistry Results

Parameter	Method	Sample Date: 3/20/2008	Sample Date: 6/27/2008	Sample Date: 7/24/2008	Sample Date: 11/04/2008
Alkalinity	S.M. 2320 B	10.0 mg/l	13.2 mg/l	10.0 mg/l	25.9 mg/l
pH	S.M. 4500H B	6.89 s.u. @ 5.7 °C	7.16 s.u. @ 25.2C	7.42 s.u. @ 26.2 °C	7.61 s.u. @ 6.9 °C
Specific Conductivity	S.M. 2510 B	60.3 uS/cm	79.4 uS/cm	67.8 uS/cm	61.1 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	56.0 mg/l	Not analyzed	66.0 mg/l	84.0 mg/l
Total Phosphorous	EPA 365.4	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	S.M. 2540D	< 0.62 mg/l	3.3 mg/l	4.5 mg/l	1.5 mg/l
Total Arsenic	EPA 200.8	0.55 ug/l	<1.2 ug/l	0.80 ug/l	0.77 ug/l
Total Cadmium	EPA 200.8	0.046 ug/l (j)	<1.3 ug/l	0.064 ug/l (j)	< 0.10 ug/l
Total Copper	EPA 200.8	1.5 ug/l	<0.49 ug/l	3.3 ug/l	2.0 ug/l
Total Lead	EPA 200.8	0.086 ug/l (j)	<1.4 ug/l	0.29 ug/l	< 0.10 ug/l
Total Nickel	EPA 200.8	2.2 ug/l	<0.15 ug/l	4.8 ug/l	3.7 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.34 ug/l	<0.10 ug/l	<0.50 ug/l
Total Organic Carbon	S.M. 5310C	13.6 mg/l	9.8 mg/l	10.8 mg/l	12.8 mg/l
Hardness (calculated)	S.M. 2340 B	25.9 mg/l	20.9 mg/l	30.3 mg/l	43.5 mg/l
Chlorophyll a	S.M. 10200 H	0.58 ug/l	5.4 ug/l	0.93 ug/l	0.57 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)

(j) - detected between method detection limit and reporting limit

Dead River (Hoist) Storage Basin - 2012 Water Chemistry Results

Parameter	Method	Sample Date:	Sample Date:
		<u>3/14/2012</u>	<u>5/08/2012</u>
Alkalinity	EPA 310.2	36.6 mg/l	28.6 mg/l
pH	S.M. 4500H B	7.16 s.u. @ 11.1 °C	6.86 s.u. @ 3.1 °C
Specific Conductivity	S.M. 2510 B	77.6 uS/cm	52.3 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	58.0 mg/l	54.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l	<0.20 mg/l
Total Suspended Solids	S.M. 2540D	0.80 mg/l (j)	1.1 mg/l (j)
Total Arsenic	EPA 200.8	0.54 ug/l	0.47 ug/l (j)
Total Cadmium	EPA 200.8	<0.028 ug/l	<0.028 ug/l
Total Copper	EPA 200.8	0.74 ug/l	0.87 ug/l
Total Lead	EPA 200.8	0.058 ug/l (j)	0.066 ug/l (j)
Total Nickel	EPA 200.8	0.29 ug/l (j)	0.19 ug/l (j)
Total Silver	EPA 200.8	<0.25 ug/l	<0.25 ug/l
Total Organic Carbon	S.M. 5310C	7.8 mg/l	6.7 mg/l
Hardness (calculated)	S.M. 2340B	38.5 mg/l	24.6 mg/l
Chlorophyll a	S.M. 10200 H	0.18 ug/l	1.6 ug/l *
Secchi Disk Transparency	EPA 440-4-91-002	1' 4" (on bottom of stream)	2' (on bottom of stream)

(j) - detected between method detection limit and reporting limit

* Chlorophyll a sample collected on 5/22/12

Dead River (Hoist) Storage Basin - 2007 Water Chemistry Results

Parameter	Method	Sample Date: 3/8/2007	Sample Date: 6/12/2007	Sample Date: 9/04/2007	Sample Date: 11/02/2007
Alkalinity	S.M. 2320 B	37.8 ppm as CaCO ₃	14.2 ppm as CaCO ₃	27.0 ppm as CaCO ₃	28.0 ppm as CaCO ₃
pH	S.M. 4500H B	6.45 s.u. @ 4.4 °C	7.02 s.u.	7.11 s.u.	7.18 s.u.
Specific Conductivity	S.M. 2510 B	90.8 uS/cm	49.8 uS/cm	67.5 uS/cm	71.6 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l
Total Dissolved Solids	EPA 160.1	64 mg/l	44 mg/l	68 mg/l	52 mg/l
Total Phosphorous	EPA 365.4	<0.13 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	EPA 160.2	0.71 mg/l (j)	<0.61 mg/l	1.4 mg/l (j)	2.0 mg/l
Total Arsenic	EPA 200.8	0.42 ug/l	0.40 ug/l	0.59 ug/l	0.26 ug/l
Total Cadmium	EPA 200.8	<0.017 ug/l	<0.017 ug/l	<0.017 ug/l	<0.017 ug/l
Total Copper	EPA 200.8	0.88 ug/l	1.5 ug/l	1.1 ug/l	0.38 ug/l
Total Lead	EPA 200.8	0.12 ug/l	<0.030 ug/l	<0.030 ug/l	<0.030 ug/l
Total Nickel	EPA 200.8	0.52 ug/l	0.60 ug/l	0.43 ug/l	0.14 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l
Total Organic Carbon	EPA 415.2	6.7 mg/l	7.4 mg/l	8.1 mg/l	6.4 mg/l
Hardness (calculated)	S.M. 2340 B	41.8 mg/l	20.0 mg/l	29.0 mg/l	12.0 mg/l
Chlorophyll a	S.M. 10200 H	0.38 ug/l	1.2 ug/l	2.3 ug/l	2.3 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	2.5 ft (on bottom of stream)	7.0 ft *	5.0 ft *	7.0 ft (taken immediately in discharge from powerhouse)

* Secchi Disk readings on 6/12 and 9/04 were taken at the respective dam intake structures.

(a) - detected between method detection limit and reporting limit

McClure Storage Basin - 2012 Water Chemistry Results

Parameter	Method	<u>Sample Date:</u>	<u>Sample Date:</u>
		<u>3/14/2012</u>	<u>5/08/2012</u>
Alkalinity	EPA 310.2	35.5 mg/l	23.5 mg/l
pH	S.M. 4500H B	6.75 s.u. @ 2.8 °C	7.40 s.u. @ 10.7 °C
Specific Conductivity	S.M. 2510 B	79.2 uS/cm	86.9 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	72.0 mg/l	58.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l	<0.20 mg/l
Total Suspended Solids	S.M. 2540D	0.60 mg/l (j)	0.71 mg/l (j)
Total Arsenic	EPA 200.8	0.60 ug/l	0.40 ug/l (j)
Total Cadmium	EPA 200.8	<0.028 ug/l	0.028 ug/l (j)
Total Copper	EPA 200.8	0.81 ug/l	0.92 ug/l
Total Lead	EPA 200.8	0.070 ug/l (j)	0.081 ug/l (j)
Total Nickel	EPA 200.8	0.37 ug/l (j)	0.23 ug/l (j)
Total Silver	EPA 200.8	<0.25 ug/l	<0.25 ug/l
Total Organic Carbon	S.M. 5310C	7.3 mg/l	6.4 mg/l
Hardness (calculated)	S.M. 2340B	39.6 mg/l	26.1 mg/l
Chlorophyll a	S.M. 10200 H	0.23 ug/l	3.4 ug/l *
Secchi Disk Transparency	EPA 440-4-91-002	3.0 ft (on bottom of stream)	3.0 ft (on bottom of stream)

(j) - detected between method detection limit and reporting limit

* Chlorophyll a sample collected on 5/22/12

McClure Storage Basin - 2007 Water Chemistry Results

Parameter	Method	Sample Date: 3/8/2007	Sample Date: 6/12/2007	Sample Date: 09/04/2007	Sample Date: 11/02/2007
Alkalinity	S.M. 2320 B	38.4 ppm as CaCO ₃	20.2 ppm as CaCO ₃	28.8 ppm as CaCO ₃	30.0 ppm as CaCO ₄
pH	S.M. 4500H B	6.51 s.u. @ 2.9 °C	7.18 s.u.	7.17 s.u.	7.20 s.u.
Specific Conductivity	S.M. 2510 B	93.6 uS/cm	52.9 uS/cm	70.3 uS/cm	73.6 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	0.59 mg/l (j)
Total Dissolved Solids	EPA 160.1	64 mg/l	44 mg/l	54 mg/l	50 mg/l
Total Phosphorous	EPA 365.4	<0.13 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	EPA 160.2	0.75 mg/l (j)	1.0 mg/l (j)	1.6 mg/l (j)	1.0 mg/l (j)
Total Arsenic	EPA 200.8	0.43 ug/l	0.34 ug/l	0.55 ug/l	0.59 ug/l
Total Cadmium	EPA 200.8	0.069 ug/l	0.17 ug/l	<0.017 ug/l	0.022 ug/l (j)
Total Copper	EPA 200.8	1.1 ug/l	1.6 ug/l	2.0 ug/l	1.4 ug/l
Total Lead	EPA 200.8	0.18 ug/l	0.13 ug/l	0.16 ug/l	0.12 ug/l
Total Nickel	EPA 200.8	0.56 ug/l	0.59 ug/l	0.53 ug/l	0.50 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l
Total Organic Carbon	EPA 415.2	6.4 mg/l	5.0 mg/l	5.2 mg/l	6.6 mg/l
Hardness (calculated)	S.M. 2340 B	39.8 mg/l	22.0 mg/l	29.0 mg/l	34.0 mg/l
Chlorophyll a	S.M. 10200 H	0.17 ug/l	1.1 ug/l	2.2 ug/l	2.3 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	3.0 ft (on bottom of stream)	7.5 ft *	4.5 ft *	5.0 ft (on bottom of stream)

* Secchi Disk readings on 6/12 and 9/04 were taken at the respective dam intake structures.

(j) - detected between method detection limit and reporting limit

Metcalfe, Mark W

From: James_Bettaso@fws.gov
Sent: Wednesday, June 06, 2012 5:19 PM
To: Metcalfe, Mark W
Cc: Puzen, Shawn C; Burr_Fisher@fws.gov
Subject: Re: FW: Dead River Water Chemistry Report - 2012 Q2
Attachments: pic06172.gif; 20120601 DR Q2 water chemistry report.pdf

Hello Mark Metcalfe,

This is Jamie Bettaso with the East Lansing Field Office checking in with you to let you know that Burr Fisher in this office will once again resume as the lead for FERC related projects. Burr has been involved in the past and will likely be a far better resource than I have been thus far, so I wish you all well with the management of the great rivers of this state.

Sincerely yours,
Jamie

Jamie B. Bettaso
Fish and Wildlife Biologist
U. S. Fish and Wildlife Service
East Lansing Field Office (ES)
2951 Coolidge Road, Suite 101
E. Lansing, MI 48823
Phone: (517)-351-5293
FAX: (517)-351-1443
email: james_bettaso@fws.gov

▼ "Metcalfe, Mark W" <MWMetcalfe@integrysgroup.com>

"Metcalfe, Mark W"
<MWMetcalfe@integrysgroup.com>

06/05/2012 09:56 AM

To "Bettaso, Jamie" <james_bettaso@fws.gov>

cc "Puzen, Shawn C"
<SCPuzen@integrysgroup.com>

SubjectFW: Dead River Water Chemistry Report - 2012
Q2

Good morning Jamie,

Attached for your review is the second quarter of 2012 water chemistry report for the Dead River Hydroelectric Project. If you have any questions, please feel free to contact me.

Thanks,
Mark

Mark Metcalfe

Environmental Consultant - Air & Water | Integrys Business Support, LLC

920-433-1833 (Green Bay)

920-617-6046 (De Pere)

920-606-8432 *cell*

920-433-4916 *fax*

mwmetcalf@integrysgroup.com

www.integrysgroup.com

Providing support for Integrys Energy Group, Integrys Energy Services, Integrys Transportation Fuels, Michigan Gas Utilities, Minnesota Energy Resources, North Shore Gas, Peoples Gas, Upper Peninsula Power Company and Wisconsin Public Service.

From: Metcalf, Mark W

Sent: Friday, June 01, 2012 11:16 AM

To: 'Taft, Bill '; 'Kruger, Kyle'

Cc: 'Koetje, Mitch '; Puzen, Shawn C; Meyers, Robert J; Schlorke, Virgil E; Bettaso, Jamie

Subject: Dead River Water Chemistry Report - 2012 Q2

Good morning Mr. Taft and Mr. Kruger,

Attached for your review is a water chemistry report for samples collected in the second quarter of 2012 as part of the water quality monitoring plan for the Dead River Hydroelectric Project. If you have any questions, please feel free to contact me.

Thanks,

Mark

Mark Metcalf

Environmental Consultant - Air & Water | Integrys Business Support, LLC

920-433-1833 (Green Bay)

920-617-6046 (De Pere)

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(See attached file: 20120601 DR Q2 water chemistry report.pdf)

Metcalfe, Mark W

From: Metcalf, Mark W
Sent: Friday, September 14, 2012 12:59 PM
To: Taft, Bill ; Burr Fisher ; Kruger, Kyle; Koetje, Mitch
Cc: Meyers, Robert J; Schlorke, Virgil E; Puzen, Shawn C
Subject: Dead River water chemistry report - 2012 Q3
Attachments: 20120914 DR Q3 water chemistry report.pdf

Good afternoon,

Attached for your review is a water chemistry report for samples collected in the third quarter of 2012 as part of the water quality monitoring plan for the Dead River Hydroelectric Project. If you have any questions, please feel free to contact me.

Thanks,
Mark

Mark Metcalf

Environmental Consultant - Air & Water | Integrys Business Support, LLC

920-433-1833 (Green Bay)

920-617-6046 (De Pere)

920-606-8432 *cell*

920-433-4916 *fax*

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Upper Peninsula Power Company

700 North Adams Street
P.O. Box 19001
Green Bay, WI 54307-9001
www.uppco.com

September 14, 2012

FERC Project No. 10855

Mr. Bill Taft
Water Resources Division
Michigan Department of Environmental Quality
P. O. Box 30273
Lansing, MI 48909

Mr. Kyle Kruger
Michigan Dept. of Natural Resources
Mio Field Office
191 South Mt. Tom Rd
Mio, MI 48647

Dear Mr. Taft and Mr. Kruger:

Per the Order Modifying and Approving Water Quality Monitoring Plan Under Article 408, dated April 17, 2003, and the Order Approving Modification to Approved Water Quality Monitoring Plan Under Article 408, dated March 3, 2005, Upper Peninsula Power Company (UPPCO) is pleased to submit water chemistry monitoring results for the third quarter of 2012.

Water chemistry samples were collected from the outlets of the Silver Lake Dam, Hoist Powerhouse and McClure Dam Powerhouse on August 14th and 15th, 2012. Water chemistry samples will be collected in the 4th quarter of 2012 at these sites. For your convenience, included with the 2012 results is a summary of the previous water chemistry results from the sampling locations. Should you have any questions about the monitoring data, please do not hesitate to call me at (920) 433-1833.

Sincerely,

A handwritten signature in black ink that reads "Mark Metcalf". The signature is written in a cursive, flowing style.

Mark W. Metcalf
Environmental Consultant - Air & Water
Integrays Business Support, LLC
Telephone: (920) 433-1833

Attach: Water Chemistry Results

cc: Mr. Mitch Koetje – MDNR
Mr. Burr Fisher - USFWS
Mr. Robert Meyers, UPPCO
Mr. Virgil Schlorke - UPPCO
Mr. Shawn Puzen, Integrays Business Support

Dead River Hydroelectric Project

Water Chemistry Monitoring Data

Silver Lake Storage Basin - 2012 Water Chemistry Results

Parameter	Method	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>
		<u>3/14/2012</u>	<u>5/08/2012</u>	<u>8/15/2012</u>
Alkalinity	EPA 310.2	16.7 mg/l (j)	16.2 mg/l (j)	13.1 mg/l (j)
pH	S.M. 4500H B	6.48 s.u. @ 2.0 °C	7.19 s.u. @ 11.5 °C	6.55 s.u. @ 21.1 °C
Specific Conductivity	S.M. 2510 B	39.2 uS/cm	33.9 uS/cm	40.7 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	38.0 mg/l	38.0 mg/l	90.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l	<0.20 mg/l	<0.088 mg/l
Total Suspended Solids	S.M. 2540D	0.60 mg/l (j)	2.0 mg/l (j)	1.8 mg/l (j)
Total Arsenic	EPA 200.8	0.82 ug/l	0.57 ug/l	0.96 ug/l (j)
Total Cadmium	EPA 200.8	<0.028 ug/l	<0.028 ug/l	<0.13 ug/l
Total Copper	EPA 200.8	0.84 ug/l	0.70 ug/l	0.61 ug/l (j)
Total Lead	EPA 200.8	0.14 ug/l	0.10 ug/l	0.065 ug/l (j)
Total Nickel	EPA 200.8	0.68 ug/l	0.42 ug/l (j)	0.59 ug/l (j)
Total Silver	EPA 200.8	<0.25 ug/l	<0.25 ug/l	<0.059 ug/l
Total Organic Carbon	S.M. 5310C	11.5 mg/l	8.3 mg/l	12.1 mg/l
Hardness (calculated)	S.M. 2340B	19.5 mg/l	15.2 mg/l	18.6 mg/l
Chlorophyll a	S.M. 10200 H	0.18 ug/l	3.1 ug/l *	7.0 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	2' 2" (on bottom of stream)	2' (on bottom of stream)	2' (on bottom of stream)

(j) - detected between method detection limit and reporting limit

* Chlorophyll a sample collected on 5/22/12

Silver Lake Storage Basin - 2008 Water Chemistry Results

Parameter	Method	Sample Date: 3/20/2008	Sample Date: 6/27/2008	Sample Date: 7/24/2008	Sample Date: 11/04/2008
Alkalinity	S.M. 2320 B	10.0 mg/l	13.2 mg/l	10.0 mg/l	25.9 mg/l
pH	S.M. 4500H B	6.89 s.u. @ 5.7 °C	7.16 s.u. @ 25.2C	7.42 s.u. @ 26.2 °C	7.61 s.u. @ 6.9 °C
Specific Conductivity	S.M. 2510 B	60.3 uS/cm	79.4 uS/cm	67.8 uS/cm	61.1 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	56.0 mg/l	Not analyzed	66.0 mg/l	84.0 mg/l
Total Phosphorous	EPA 365.4	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	S.M. 2540D	< 0.62 mg/l	3.3 mg/l	4.5 mg/l	1.5 mg/l
Total Arsenic	EPA 200.8	0.55 ug/l	<1.2 ug/l	0.80 ug/l	0.77 ug/l
Total Cadmium	EPA 200.8	0.046 ug/l (j)	<1.3 ug/l	0.064 ug/l (j)	< 0.10 ug/l
Total Copper	EPA 200.8	1.5 ug/l	<0.49 ug/l	3.3 ug/l	2.0 ug/l
Total Lead	EPA 200.8	0.086 ug/l (j)	<1.4 ug/l	0.29 ug/l	< 0.10 ug/l
Total Nickel	EPA 200.8	2.2 ug/l	<0.15 ug/l	4.8 ug/l	3.7 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.34 ug/l	<0.10 ug/l	<0.50 ug/l
Total Organic Carbon	S.M. 5310C	13.6 mg/l	9.8 mg/l	10.8 mg/l	12.8 mg/l
Hardness (calculated)	S.M. 2340 B	25.9 mg/l	20.9 mg/l	30.3 mg/l	43.5 mg/l
Chlorophyll a	S.M. 10200 H	0.58 ug/l	5.4 ug/l	0.93 ug/l	0.57 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)

(j) - detected between method detection limit and reporting limit

Dead River (Hoist) Storage Basin - 2012 Water Chemistry Results

Parameter	Method	Sample Date:	Sample Date:	Sample Date:
		<u>3/14/2012</u>	<u>5/08/2012</u>	<u>8/14/2012</u>
Alkalinity	EPA 310.2	36.6 mg/l	28.6 mg/l	27.5 mg/l
pH	S.M. 4500H B	6.86 s.u. @ 3.1 °C	7.16 s.u. @ 11.1 °C	6.89 s.u. @ 21.3 °C
Specific Conductivity	S.M. 2510 B	77.6 uS/cm	52.3 uS/cm	69.6 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	58.0 mg/l	54.0 mg/l	88.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l	<0.20 mg/l	<0.088 mg/l
Total Suspended Solids	S.M. 2540D	0.80 mg/l (j)	1.1 mg/l (j)	1.6 mg/l (j)
Total Arsenic	EPA 200.8	0.54 ug/l	0.47 ug/l (j)	0.95 ug/l (j)
Total Cadmium	EPA 200.8	<0.028 ug/l	<0.028 ug/l	<0.13 ug/l
Total Copper	EPA 200.8	0.74 ug/l	0.87 ug/l	0.96 ug/l (j)
Total Lead	EPA 200.8	0.058 ug/l (j)	0.066 ug/l (j)	0.22 ug/l (j)
Total Nickel	EPA 200.8	0.29 ug/l (j)	0.19 ug/l (j)	0.38 ug/l (j)
Total Silver	EPA 200.8	<0.25 ug/l	<0.25 ug/l	0.081 ug/l(j)
Total Organic Carbon	S.M. 5310C	7.8 mg/l	6.7 mg/l	6.6 mg/l
Hardness (calculated)	S.M. 2340B	38.5 mg/l	24.6 mg/l	30.9 mg/l
Chlorophyll a	S.M. 10200 H	0.18 ug/l	1.6 ug/l *	2.4 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	1' 4" (on bottom of stream)	2' (on bottom of stream)	2' 2" (on bottom of stream)

(j) - detected between method detection limit and reporting limit

* Chlorophyll a sample collected on 5/22/12

Dead River (Hoist) Storage Basin - 2007 Water Chemistry Results

Parameter	Method	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>
		<u>3/8/2007</u>	<u>6/12/2007</u>	<u>9/04/2007</u>	<u>11/02/2007</u>
Alkalinity	S.M. 2320 B	37.8 ppm as CaCO ₃	14.2 ppm as CaCO ₃	27.0 ppm as CaCO ₃	28.0 ppm as CaCO ₃
pH	S.M. 4500H B	6.45 s.u. @ 4.4 °C	7.02 s.u.	7.11 s.u.	7.18 s.u.
Specific Conductivity	S.M. 2510 B	90.8 uS/cm	49.8 uS/cm	67.5 uS/cm	71.6 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l
Total Dissolved Solids	EPA 160.1	64 mg/l	44 mg/l	68 mg/l	52 mg/l
Total Phosphorous	EPA 365.4	<0.13 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	EPA 160.2	0.71 mg/l (j)	<0.61 mg/l	1.4 mg/l (j)	2.0 mg/l
Total Arsenic	EPA 200.8	0.42 ug/l	0.40 ug/l	0.59 ug/l	0.26 ug/l
Total Cadmium	EPA 200.8	<0.017 ug/l	<0.017 ug/l	<0.017 ug/l	<0.017 ug/l
Total Copper	EPA 200.8	0.88 ug/l	1.5 ug/l	1.1 ug/l	0.38 ug/l
Total Lead	EPA 200.8	0.12 ug/l	<0.030 ug/l	<0.030 ug/l	<0.030 ug/l
Total Nickel	EPA 200.8	0.52 ug/l	0.60 ug/l	0.43 ug/l	0.14 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l
Total Organic Carbon	EPA 415.2	6.7 mg/l	7.4 mg/l	8.1 mg/l	6.4 mg/l
Hardness (calculated)	S.M. 2340 B	41.8 mg/l	20.0 mg/l	29.0 mg/l	12.0 mg/l
Chlorophyll a	S.M. 10200 H	0.38 ug/l	1.2 ug/l	2.3 ug/l	2.3 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	2.5 ft (on bottom of stream)	7.0 ft *	5.0 ft *	7.0 ft (taken immediately in discharge from powerhouse)

* Secchi Disk readings on 6/12 and 9/04 were taken at the respective dam intake structures.

(a) - detected between method detection limit and reporting limit

McClure Storage Basin - 2012 Water Chemistry Results

Parameter	Method	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>
		<u>3/14/2012</u>	<u>5/08/2012</u>	<u>8/14/2012</u>
Alkalinity	EPA 310.2	35.5 mg/l	23.5 mg/l	25.5 mg/l
pH	S.M. 4500H B	6.75 s.u. @ 2.8 °C	7.40 s.u. @ 10.7 °C	7.30 s.u. @ 21.8 °C
Specific Conductivity	S.M. 2510 B	79.2 uS/cm	86.9 uS/cm	73.2 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	72.0 mg/l	58.0 mg/l	66.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l	<0.20 mg/l	<0.088 mg/l
Total Suspended Solids	S.M. 2540D	0.60 mg/l (j)	0.71 mg/l (j)	2.0 mg/l
Total Arsenic	EPA 200.8	0.60 ug/l	0.40 ug/l (j)	0.78 ug/l (j)
Total Cadmium	EPA 200.8	<0.028 ug/l	0.028 ug/l (j)	<0.13 ug/l
Total Copper	EPA 200.8	0.81 ug/l	0.92 ug/l	1.5 ug/l
Total Lead	EPA 200.8	0.070 ug/l (j)	0.081 ug/l (j)	0.22 ug/l (j)
Total Nickel	EPA 200.8	0.37 ug/l (j)	0.23 ug/l (j)	0.71 ug/l (j)
Total Silver	EPA 200.8	<0.25 ug/l	<0.25 ug/l	<0.059 ug/l
Total Organic Carbon	S.M. 5310C	7.3 mg/l	6.4 mg/l	6.8 mg/l
Hardness (calculated)	S.M. 2340B	39.6 mg/l	26.1 mg/l	32.3 mg/l
Chlorophyll a	S.M. 10200 H	0.23 ug/l	3.4 ug/l *	3.4 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	3.0 ft (on bottom of stream)	3.0 ft (on bottom of stream)	3.0 ft (on bottom of stream)

(j) - detected between method detection limit and reporting limit

* Chlorophyll a sample collected on 5/22/12

McClure Storage Basin - 2007 Water Chemistry Results

Parameter	Method	Sample Date: <u>3/8/2007</u>	Sample Date: <u>6/12/2007</u>	Sample Date: <u>09/04/2007</u>	Sample Date: <u>11/02/2007</u>
Alkalinity	S.M. 2320 B	38.4 ppm as CaCO ₃	20.2 ppm as CaCO ₃	28.8 ppm as CaCO ₃	30.0 ppm as CaCO ₄
pH	S.M. 4500H B	6.51 s.u. @ 2.9 °C	7.18 s.u.	7.17 s.u.	7.20 s.u.
Specific Conductivity	S.M. 2510 B	93.6 uS/cm	52.9 uS/cm	70.3 uS/cm	73.6 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	0.59 mg/l (j)
Total Dissolved Solids	EPA 160.1	64 mg/l	44 mg/l	54 mg/l	50 mg/l
Total Phosphorous	EPA 365.4	<0.13 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	EPA 160.2	0.75 mg/l (j)	1.0 mg/l (j)	1.6 mg/l (j)	1.0 mg/l (j)
Total Arsenic	EPA 200.8	0.43 ug/l	0.34 ug/l	0.55 ug/l	0.59 ug/l
Total Cadmium	EPA 200.8	0.069 ug/l	0.17 ug/l	<0.017 ug/l	0.022 ug/l (j)
Total Copper	EPA 200.8	1.1 ug/l	1.6 ug/l	2.0 ug/l	1.4 ug/l
Total Lead	EPA 200.8	0.18 ug/l	0.13 ug/l	0.16 ug/l	0.12 ug/l
Total Nickel	EPA 200.8	0.56 ug/l	0.59 ug/l	0.53 ug/l	0.50 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l
Total Organic Carbon	EPA 415.2	6.4 mg/l	5.0 mg/l	5.2 mg/l	6.6 mg/l
Hardness (calculated)	S.M. 2340 B	39.8 mg/l	22.0 mg/l	29.0 mg/l	34.0 mg/l
Chlorophyll a	S.M. 10200 H	0.17 ug/l	1.1 ug/l	2.2 ug/l	2.3 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	3.0 ft (on bottom of stream)	7.5 ft *	4.5 ft *	5.0 ft (on bottom of stream)

* Secchi Disk readings on 6/12 and 9/04 were taken at the respective dam intake structures.

(j) - detected between method detection limit and reporting limit

Metcalf, Mark W

From: Taft, Bill (DEQ) [TAFTW@michigan.gov]
Sent: Monday, October 15, 2012 2:03 PM
To: Metcalf, Mark W
Cc: Kruger, Kyle (DNR); Koetje, Mitch (DEQ)
Subject: Water and sediment results from the 3rd quarter of 2012

We have reviewed your water and sediment monitoring results dated (September 4, 2012–water and October 4th 2012-sediment results)for the Dead River Hydroelectric Project. We have no comments at this time.

William H. Taft

Senior Aquatic Biologist
Surface Water Assessment Section
Water Resources Division
Michigan Department of Environmental Quality
517-335-4205
taftw@michigan.gov

Metcalfe, Mark W

From: Metcalf, Mark W
Sent: Friday, November 02, 2012 10:30 AM
To: 'Taft, Bill '; 'Burr Fisher '; 'Kruger, Kyle'; 'Koetje, Mitch '
Cc: Meyers, Robert J; Schlorke, Virgil E; Puzen, Shawn C
Subject: Dead River 2012 Water Chemistry Report
Attachments: 20121102 DR water chemistry rpt.pdf

Good morning,

Attached for your review is the 2012 water chemistry report for the Dead River Hydroelectric Project. If you have any questions, please feel free to contact me.

Thanks,
Mark

Mark Metcalf

Environmental Consultant - Air & Water | Integrys Business Support, LLC

920-433-1833 (Green Bay)

920-617-6046 (De Pere)

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Providing support for Integrys Energy Group, Integrys Energy Services, Integrys Transportation Fuels, Michigan Gas Utilities, Minnesota Energy Resources, North Shore Gas, Peoples Gas, Upper Peninsula Power Company and Wisconsin Public Service.



Upper Peninsula Power Company

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November 2, 2012

FERC Project No. 10855

Mr. Bill Taft
Water Resources Division
Michigan Department of Environmental
Quality
P. O. Box 30273
Lansing, MI 48909

Mr. Kyle Kruger
Michigan Dept. of Natural Resources
Mio Field Office
191 South Mt. Tom Rd
Mio, MI 48647

Dear Mr. Taft and Mr. Kruger:

Re: Dead River Hydroelectric Project – 2012 Water Chemistry Monitoring Report

Pursuant to the Order Modifying and Approving Water Quality Monitoring under Article 408, issued on April 17, 2003 and modified on March 3, 2005, Upper Peninsula Power Company (UPPCO) is pleased to submit the results of water chemistry monitoring conducted at the three storage basins in the Dead River Hydroelectric Project for your review and comment.

As described in the water quality monitoring plan, water chemistry samples were collected from the outlets of the Silver Lake Storage Basin (NW $\frac{1}{4}$ of the NW $\frac{1}{4}$, Section 17, T48N, R28W), Dead River Storage Basin (NW $\frac{1}{4}$ of the NW $\frac{1}{4}$, Section 16, T48N, R26W), and McClure Storage Basin (SW $\frac{1}{4}$ of the NE $\frac{1}{4}$, Section 7, T48N, R25W) during each calendar quarter of 2012. Enclosed for your review are the water chemistry results. For your convenience, included with the 2012 results is a summary of the previous water chemistry results from 2007 and 2008 at the sampling locations. Water chemistry samples were originally collected over a two year period due to the rebuilding of the Silver Lake Reservoir. The next round of water chemistry samples is scheduled to occur in 2017.

A comparison of the 2007/2008 monitoring data to the 2012 monitoring data does not reveal any significant differences in the concentrations of the parameters monitored. At the Silver Lake Storage Basin, there is a slight decrease in specific conductivity, total hardness, nickel, and copper concentration between 2008 and 2012, while all other monitored parameters have comparable concentrations between the sampling events. At the Dead River Storage Basin and McClure Storage Basin sampling locations, the concentrations of the monitored parameters are

November 2, 2012
Mr. Taft and Mr. Kruger
Page 2 of 2

similar between the 2007 and 2012 sampling events. None of the parameters monitored are above the State of Michigan Rule 57 water quality values.

Please review the enclosed information and make any comments you may have as soon as possible, but within 30 days of this letter. Should you have any questions or concerns, please do not hesitate to call me at (920) 433-1833.

Sincerely,

A handwritten signature in black ink that reads "Mark Metcalf". The signature is written in a cursive, flowing style.

Mark W. Metcalf
Environmental Consultant - Air & Water
Integrays Business Support, LLC
Telephone: (920) 433-1833

Attach: Water Chemistry Results

cc: Mr. Mitch Koetje - MDNR
Mr. Burr Fisher - USFWS
Mr. Robert Meyers - UPPCO
Mr. Virgil Schlorke - UPPCO
Mr. Shawn Puzen - Integrays Business Support

Silver Lake Storage Basin - 2012 Water Chemistry Results

Parameter	Method	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>
		<u>3/14/2012</u>	<u>5/08/2012</u>	<u>8/15/2012</u>	<u>10/08/2012</u>
Alkalinity	EPA 310.2	16.7 mg/l (j)	16.2 mg/l (j)	13.1 mg/l (j)	17.9 mg/l (j)
pH	S.M. 4500H B	6.48 s.u. @ 2.0 °C	7.19 s.u. @ 11.5 °C	6.55 s.u. @ 21.1 °C	6.99 s.u. @ 10.0 °C
Specific Conductivity	S.M. 2510 B	39.2 uS/cm	33.9 uS/cm	40.7 uS/cm	40.5 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	38.0 mg/l	38.0 mg/l	90.0 mg/l	58.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l	<0.20 mg/l	<0.088 mg/l	<0.088 mg/l
Total Suspended Solids	S.M. 2540D	0.60 mg/l (j)	2.0 mg/l (j)	1.8 mg/l (j)	1.2 mg/l (j)
Total Arsenic	EPA 200.8	0.82 ug/l	0.57 ug/l	0.96 ug/l (j)	0.74 ug/l (j)
Total Cadmium	EPA 200.8	<0.028 ug/l	<0.028 ug/l	<0.13 ug/l	<0.13 ug/l
Total Copper	EPA 200.8	0.84 ug/l	0.70 ug/l	0.61 ug/l (j)	0.60 ug/l (j)
Total Lead	EPA 200.8	0.14 ug/l	0.10 ug/l	0.065 ug/l (j)	<0.061 ug/l
Total Nickel	EPA 200.8	0.68 ug/l	0.42 ug/l (j)	0.59 ug/l (j)	0.58 ug/l (j)
Total Silver	EPA 200.8	<0.25 ug/l	<0.25 ug/l	<0.059 ug/l	<0.059 ug/l
Total Organic Carbon	S.M. 5310C	11.5 mg/l	8.3 mg/l	12.1 mg/l	11.1 mg/l
Hardness (calculated)	S.M. 2340B	19.5 mg/l	15.2 mg/l	18.6 mg/l	17.0 mg/l
Chlorophyll a	S.M. 10200 H	0.18 ug/l	3.1 ug/l *	7.0 ug/l	3.2 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	2' 2" (on bottom of stream)	2' (on bottom of stream)	2' (on bottom of stream)	2' (on bottom of stream)

(j) - detected between method detection limit and reporting limit

* Chlorophyll a sample collected on 5/22/12

Silver Lake Storage Basin - 2008 Water Chemistry Results

Parameter	Method	Sample Date: 3/20/2008	Sample Date: 6/27/2008	Sample Date: 7/24/2008	Sample Date: 11/04/2008
Alkalinity	S.M. 2320 B	10.0 mg/l	13.2 mg/l	10.0 mg/l	25.9 mg/l
pH	S.M. 4500H B	6.89 s.u. @ 5.7 °C	7.16 s.u. @ 25.2C	7.42 s.u. @ 26.2 °C	7.61 s.u. @ 6.9 °C
Specific Conductivity	S.M. 2510 B	60.3 uS/cm	79.4 uS/cm	67.8 uS/cm	61.1 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	56.0 mg/l	Not analyzed	66.0 mg/l	84.0 mg/l
Total Phosphorous	EPA 365.4	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	S.M. 2540D	< 0.62 mg/l	3.3 mg/l	4.5 mg/l	1.5 mg/l
Total Arsenic	EPA 200.8	0.55 ug/l	<1.2 ug/l	0.80 ug/l	0.77 ug/l
Total Cadmium	EPA 200.8	0.046 ug/l (j)	<1.3 ug/l	0.064 ug/l (j)	< 0.10 ug/l
Total Copper	EPA 200.8	1.5 ug/l	<0.49 ug/l	3.3 ug/l	2.0 ug/l
Total Lead	EPA 200.8	0.086 ug/l (j)	<1.4 ug/l	0.29 ug/l	< 0.10 ug/l
Total Nickel	EPA 200.8	2.2 ug/l	<0.15 ug/l	4.8 ug/l	3.7 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.34 ug/l	<0.10 ug/l	<0.50 ug/l
Total Organic Carbon	S.M. 5310C	13.6 mg/l	9.8 mg/l	10.8 mg/l	12.8 mg/l
Hardness (calculated)	S.M. 2340 B	25.9 mg/l	20.9 mg/l	30.3 mg/l	43.5 mg/l
Chlorophyll a	S.M. 10200 H	0.58 ug/l	5.4 ug/l	0.93 ug/l	0.57 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)	1.0 ft (on bottom of stream)

(j) - detected between method detection limit and reporting limit

Dead River (Hoist) Storage Basin - 2012 Water Chemistry Results

Parameter	Method	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>
		<u>3/14/2012</u>	<u>5/08/2012</u>	<u>8/14/2012</u>	<u>10/09/2012</u>
Alkalinity	EPA 310.2	36.6 mg/l	28.6 mg/l	27.5 mg/l	33.0 mg/l
pH	S.M. 4500H B	6.86 s.u. @ 3.1 °C	7.16 s.u. @ 11.1 °C	6.89 s.u. @ 21.3 °C	7.43 s.u. @ 10.6 °C
Specific Conductivity	S.M. 2510 B	77.6 uS/cm	52.3 uS/cm	69.6 uS/cm	74.7 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	58.0 mg/l	54.0 mg/l	88.0 mg/l	74.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l	<0.20 mg/l	<0.088 mg/l	<0.088 mg/l
Total Suspended Solids	S.M. 2540D	0.80 mg/l (j)	1.1 mg/l (j)	1.6 mg/l (j)	1.8 mg/l (j)
Total Arsenic	EPA 200.8	0.54 ug/l	0.47 ug/l (j)	0.95 ug/l (j)	0.98 ug/l (j)
Total Cadmium	EPA 200.8	<0.028 ug/l	<0.028 ug/l	<0.13 ug/l	<0.13 ug/l
Total Copper	EPA 200.8	0.74 ug/l	0.87 ug/l	0.96 ug/l (j)	0.83 ug/l (j)
Total Lead	EPA 200.8	0.058 ug/l (j)	0.066 ug/l (j)	0.22 ug/l (j)	0.19 ug/l (j)
Total Nickel	EPA 200.8	0.29 ug/l (j)	0.19 ug/l (j)	0.38 ug/l (j)	0.40 ug/l (j)
Total Silver	EPA 200.8	<0.25 ug/l	<0.25 ug/l	0.081 ug/l(j)	0.089 ug/l(j)
Total Organic Carbon	S.M. 5310C	7.8 mg/l	6.7 mg/l	6.6 mg/l	7.4 mg/l
Hardness (calculated)	S.M. 2340B	38.5 mg/l	24.6 mg/l	30.9 mg/l	35.8 mg/l
Chlorophyll a	S.M. 10200 H	0.18 ug/l	1.6 ug/l *	2.4 ug/l	0.76 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	1' 4" (on bottom of stream)	2' (on bottom of stream)	2' 2" (on bottom of stream)	2' 2" (on bottom of stream)

(j) - detected between method detection limit and reporting limit

* Chlorophyll a sample collected on 5/22/12

Dead River (Hoist) Storage Basin - 2007 Water Chemistry Results

Parameter	Method	Sample Date:	Sample Date:	Sample Date:	Sample Date:
		<u>3/8/2007</u>	<u>6/12/2007</u>	<u>9/04/2007</u>	<u>11/02/2007</u>
Alkalinity	S.M. 2320 B	37.8 ppm as CaCO ₃	14.2 ppm as CaCO ₃	27.0 ppm as CaCO ₃	28.0 ppm as CaCO ₃
pH	S.M. 4500H B	6.45 s.u. @ 4.4 °C	7.02 s.u.	7.11 s.u.	7.18 s.u.
Specific Conductivity	S.M. 2510 B	90.8 uS/cm	49.8 uS/cm	67.5 uS/cm	71.6 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l
Total Dissolved Solids	EPA 160.1	64 mg/l	44 mg/l	68 mg/l	52 mg/l
Total Phosphorous	EPA 365.4	<0.13 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	EPA 160.2	0.71 mg/l (j)	<0.61 mg/l	1.4 mg/l (j)	2.0 mg/l
Total Arsenic	EPA 200.8	0.42 ug/l	0.40 ug/l	0.59 ug/l	0.26 ug/l
Total Cadmium	EPA 200.8	<0.017 ug/l	<0.017 ug/l	<0.017 ug/l	<0.017 ug/l
Total Copper	EPA 200.8	0.88 ug/l	1.5 ug/l	1.1 ug/l	0.38 ug/l
Total Lead	EPA 200.8	0.12 ug/l	<0.030 ug/l	<0.030 ug/l	<0.030 ug/l
Total Nickel	EPA 200.8	0.52 ug/l	0.60 ug/l	0.43 ug/l	0.14 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l
Total Organic Carbon	EPA 415.2	6.7 mg/l	7.4 mg/l	8.1 mg/l	6.4 mg/l
Hardness (calculated)	S.M. 2340 B	41.8 mg/l	20.0 mg/l	29.0 mg/l	12.0 mg/l
Chlorophyll a	S.M. 10200 H	0.38 ug/l	1.2 ug/l	2.3 ug/l	2.3 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	2.5 ft (on bottom of stream)	7.0 ft *	5.0 ft *	7.0 ft (taken immediately in discharge from powerhouse)

* Secchi Disk readings on 6/12 and 9/04 were taken at the respective dam intake structures.

(a) - detected between method detection limit and reporting limit

McClure Storage Basin - 2012 Water Chemistry Results

Parameter	Method	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>
		<u>3/14/2012</u>	<u>5/08/2012</u>	<u>8/14/2012</u>	<u>10/09/2012</u>
Alkalinity	EPA 310.2	35.5 mg/l	23.5 mg/l	25.5 mg/l	33.7 mg/l
pH	S.M. 4500H B	6.75 s.u. @ 2.8 °C	7.40 s.u. @ 10.7 °C	7.30 s.u. @ 21.8 °C	7.28 s.u. @ 10.7 °C
Specific Conductivity	S.M. 2510 B	79.2 uS/cm	86.9 uS/cm	73.2 uS/cm	78.9 uS/cm
Total Ammonia	EPA 350.1	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l
Total Dissolved Solids	S.M. 2540C	72.0 mg/l	58.0 mg/l	66.0 mg/l	52.0 mg/l
Total Phosphorous	EPA 365.4	<0.20 mg/l	<0.20 mg/l	<0.088 mg/l	<0.088 mg/l
Total Suspended Solids	S.M. 2540D	0.60 mg/l (j)	0.71 mg/l (j)	2.0 mg/l	1.2 mg/l (j)
Total Arsenic	EPA 200.8	0.60 ug/l	0.40 ug/l (j)	0.78 ug/l (j)	0.75 ug/l (j)
Total Cadmium	EPA 200.8	<0.028 ug/l	0.028 ug/l (j)	<0.13 ug/l	<0.13 ug/l
Total Copper	EPA 200.8	0.81 ug/l	0.92 ug/l	1.5 ug/l	0.75 ug/l (j)
Total Lead	EPA 200.8	0.070 ug/l (j)	0.081 ug/l (j)	0.22 ug/l (j)	<0.061 ug/l (j)
Total Nickel	EPA 200.8	0.37 ug/l (j)	0.23 ug/l (j)	0.71 ug/l (j)	0.39 ug/l (j)
Total Silver	EPA 200.8	<0.25 ug/l	<0.25 ug/l	<0.059 ug/l	<0.059 ug/l
Total Organic Carbon	S.M. 5310C	7.3 mg/l	6.4 mg/l	6.8 mg/l	6.6 mg/l
Hardness (calculated)	S.M. 2340B	39.6 mg/l	26.1 mg/l	32.3 mg/l	35.9 mg/l
Chlorophyll a	S.M. 10200 H	0.23 ug/l	3.4 ug/l *	3.4 ug/l	0.76 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	3.0 ft (on bottom of stream)	3.0 ft (on bottom of stream)	3.0 ft (on bottom of stream)	3.0 ft (on bottom of stream)

(j) - detected between method detection limit and reporting limit

* Chlorophyll a sample collected on 5/22/12

McClure Storage Basin - 2007 Water Chemistry Results

Parameter	Method	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>	<u>Sample Date:</u>
		<u>3/8/2007</u>	<u>6/12/2007</u>	<u>09/04/2007</u>	<u>11/02/2007</u>
Alkalinity	S.M. 2320 B	38.4 ppm as CaCO ₃	20.2 ppm as CaCO ₃	28.8 ppm as CaCO ₃	30.0 ppm as CaCO ₄
pH	S.M. 4500H B	6.51 s.u. @ 2.9 °C	7.18 s.u.	7.17 s.u.	7.20 s.u.
Specific Conductivity	S.M. 2510 B	93.6 uS/cm	52.9 uS/cm	70.3 uS/cm	73.6 uS/cm
Total Ammonia	EPA 350.1	<0.50 mg/l	<0.50 mg/l	<0.50 mg/l	0.59 mg/l (j)
Total Dissolved Solids	EPA 160.1	64 mg/l	44 mg/l	54 mg/l	50 mg/l
Total Phosphorous	EPA 365.4	<0.13 mg/l	<0.17 mg/l	<0.17 mg/l	<0.17 mg/l
Total Suspended Solids	EPA 160.2	0.75 mg/l (j)	1.0 mg/l (j)	1.6 mg/l (j)	1.0 mg/l (j)
Total Arsenic	EPA 200.8	0.43 ug/l	0.34 ug/l	0.55 ug/l	0.59 ug/l
Total Cadmium	EPA 200.8	0.069 ug/l	0.17 ug/l	<0.017 ug/l	0.022 ug/l (j)
Total Copper	EPA 200.8	1.1 ug/l	1.6 ug/l	2.0 ug/l	1.4 ug/l
Total Lead	EPA 200.8	0.18 ug/l	0.13 ug/l	0.16 ug/l	0.12 ug/l
Total Nickel	EPA 200.8	0.56 ug/l	0.59 ug/l	0.53 ug/l	0.50 ug/l
Total Silver	EPA 200.8	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l	<0.043 ug/l
Total Organic Carbon	EPA 415.2	6.4 mg/l	5.0 mg/l	5.2 mg/l	6.6 mg/l
Hardness (calculated)	S.M. 2340 B	39.8 mg/l	22.0 mg/l	29.0 mg/l	34.0 mg/l
Chlorophyll a	S.M. 10200 H	0.17 ug/l	1.1 ug/l	2.2 ug/l	2.3 ug/l
Secchi Disk Transparency	EPA 440-4-91-002	3.0 ft (on bottom of stream)	7.5 ft *	4.5 ft *	5.0 ft (on bottom of stream)

* Secchi Disk readings on 6/12 and 9/04 were taken at the respective dam intake structures.

(j) - detected between method detection limit and reporting limit

Document Content(s)

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