SNOHOMISH COUNTY PUD
PUBLIC UTILITY DISTRICT NO. 1

Your Northwest renewables utility

November 25, 2013

VIA ELECTRONIC FILING

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

Re: Youngs Creek Hydroelectric Project, FERC No. 10359
Resident Trout Monitoring Plan Annual Report: 2013 Survey
License Article 408

Dear Secretary Bose:

Public Utility District No. 1 of Snohomish County (the "District") files its *Resident Trout Monitoring Plan Annual Report: 2013 Survey* pursuant to the approved Resident Trout Monitoring Plan for the Youngs Creek Hydroelectric Project (FERC No. 10359, "Project") and License Article 408. The District provided a consultation copy of the draft report to the Washington Department of Fish and Wildlife and the U.S. Fish and Wildlife Service; neither agency had comments on the contents of the draft report nor requested a meeting to discuss the draft report.

If you have any questions about the enclosed report, please contact Keith Binkley at (425) 783-1769.

Sincerely,

Kim D. Moore, P.E.
Assistant General Manager of Generation, Water, and Corporate Services

Enclosed: Resident Trout Monitoring Plan Annual Report 2013

cc: Keith Binkley, District

Youngs Creek Hydroelectric Project
(FERC No. 10359)

Resident Trout Monitoring Plan
Annual Report

2013 Survey

Prepared by:

Everett, WA

November 2013

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1. OVERVIEW

Public Utility District No. 1 of Snohomish County (the District) has completed the second year of post-Project baseline resident trout monitoring for the Youngs Creek Hydroelectric Project (FERC No. 10359) (Project).[1] This brief report and attached appendices summarize the August 23, 2013 sampling effort and the associated statistical inference tests [Tests 1-5] outlined in the Resident Trout Monitoring Plan (Monitoring Plan) (Beak Consultants Inc. 1993).[2] Habitat conditions during the survey are photo documented in Appendix A; a map of population monitoring site is included as Figure A-1. Despite a wet June, low flow conditions were observed during the summer/early fall 2013. As a result and in order to meet minimum flow requirements, the Project did not operate between June 25 and August 29 when the year-two survey was completed. These dry, natural conditions resulted in complete dewatering of portions of the monitoring site during summer. Documentation of consultation with the Washington Department of Fish and Wildlife and the U.S. Fish and Wildlife Service regarding this report is included in Appendix B.

As a summary, the Monitoring Plan is designed to:

(1) Assess changes in resident trout population using annual counts of the number of fish in 10 pools as an index of trout abundance
(2) Ensure Project-related changes in streamflow do not prevent the trout population from rebounding following a decline
(3) Use Least-Squared Regression 'Trend Analysis' to assess changes in trout abundance over time

Monitoring the trout population will assess change in the population index, regardless of the cause of the changes. The surveys will monitor two types of population changes:

(1) Statistically significant trends (3 or more years of surveys)
(2) Sudden catastrophic declines

[1] Start of Project operation occurred on November 16, 2011.
[2] The Trout Monitoring Plan was approved by the FERC in its Order Approving Resident Trout Monitoring Plan issued June 8, 1995 [19950614-0065].

2. SURVEY RESULTS – 2013 DATA

Table 1. Youngs Creek Resident Trout Monitoring Data – 2013.

Date:	Start Time:	Finish Time:	Personnel:	
8/23/2013	8:15	10:30	LL/SF	
Weather:	Air Temp.:	Water Temp.:	Discharge:	Visibility:
Overcast	65 F	15.2 C	~2 cfs	6'

Number of rainbow trout observed by size class in mm

Pool #	< 60 mm	61 - 90	91 - 120	121 - 150	151 - 180	181 - 210	211 - 240	> 240	TOTAL	Total > 60 mm
1									DRY	
2									DRY	
3									DRY	
4									0	0
5	2	1	2						5	3
6	3	1							4	1
7		8	5	4	4	3			24	24
8		2	2	4	1	1			10	10
9		2	5	2	1	3			13	13
10		9	4	6	9	6	2	2	38	38
Totals	5	23	18	16	15	13	2	2	94	89

Pool #	Length (feet)	Width (feet)	Mean Depth	Max Depth	Control Depth	Photo #	Area (m^2)	(fish/m^2)
1	DRY					1		
2	DRY					2		
3	DRY					3		
4	12	5	0.4	0.8	0.3	4	6	0.000
5	18	14	0.7	1	0.6	5	23	0.128
6	15	9	0.4	0.7	0	6	13	0.080
7	48	17	0.8	1.4	0.3	7	76	0.317
8	62	16	0.7	1.9	0.4	8	92	0.109
9	23	12	1	1.7	0.4	9	26	0.507
10	79	16	0.8	1.8	0.5	10	117	0.324
								0.209

3. PROJECT MONITORING – SECOND YEAR OF OPERATION

A catastrophic decline during the first year of operation (2012) has been defined for the Youngs Creek Monitoring Plan as a 75 percent decline in the mean pre-Project population index from all surveys [Test 1]. The pre-Project data ranged between 6 and 11 fish per pool and averaged 8.8 fish per pool. Thus, one would need to record a population index following the first year of operation of less than 2.2 fish per pool to be categorized as a catastrophic event. The trout abundance index during the first year of operation was 9.1 fish/pool; slightly higher than the pre-operational mean. The increase in fish abundance was not regarded as a catastrophic event under Test 1 of the Monitoring Plan.

Catastrophic declines of 75 percent or more in subsequent years of operation [Years 2-5] are compared to mean population data from the period of operation rather than the pre-Project baseline period [Test 2]. The trout abundance index during the second year of operation (2013) was 8.9 fish/pool; slightly higher than the period of operation mean. The increase in fish abundance is not regarded as a catastrophic event under Test 2 of the Monitoring Plan.

Since a catastrophic event did not occur in year 1, adjustments in the minimum in-stream flow regime, in accordance with the current MOA, will only be implemented if:

(1) there are two successive catastrophic population declines during five post-operational years, or
(2) the population index undergoes a steady, statistically significant decline over a period of five post-operational years.

Monitoring could end following three years of post-operational surveys if the minimum in-stream flow releases are considered adequate to protect the fishery resource by means of the following Test 3:

(1) the trout population index does not exhibit a statistically significant decline in three years of Project operation.

Monitoring could continue past five years of post-operational surveys as a factor of either: (a) determining if a near-term catastrophic decline has an opportunity to rebound [Test 5]; or (b) a longer-term statistically significant decline occurs [Test 4], resulting in resetting the minimum instream flow regime.

The slope of the fish abundance data per individual pool (l) is variable (Table 3). Some pools show increasing trends while others show decreasing trends. During 2010 and 2011 of the baseline period and during 2012 and 2013 of the post-operational period, the streamflow in the lower alluvial portion of the monitoring reach, specifically pools 1 through 4, has gone subsurface for a two- to four-week period during late summer / early fall. Although lower in recent years, the trout abundance estimates during the baseline period do not show a statistically significant trend in the annual survey data from 1991 to 2011. This result implies the Youngs Creek trout population index has been relatively stable over the baseline period (Figure 1). The index has remained stable during the first and second years of operation.

Table 2. Snorkel data summary (1989-2013).

Pre-Operational Data

Date	Flow (cfs)	Temp Start (°C)		Temp End (°C)	Pools (#)	Fish > 60 mm (#/pool)	Pool Density (fish/m²)		Fish per pool Statistics Min.	Max.	Mean		S.D.	Var.	Fish Density (Fish per m²) Min.	Max.	Mean		S.D.	Var.	Fish Density (Fish per m²) One Standard Deviation			Fish per pool Statistics One Standard Deviation		
Aug-89	4.8	12.0			2	9.0	0.299																			
13-Aug-90	1.1	17.8			2	9.0	0.293	(1989 - 1990)	9.0	9.0	9.0	±	0.00	0.00	0.293	0.299	0.296	±	0.004	0.000	0.292	0.296	0.300	9.0	9.0	9.0
8-Aug-91	3.1	16.5			10	9.2	0.195																			
11-Aug-92	8.0	15.0		16.0	10	9.4	0.198																			
18-Aug-93	12.4	-			10	9.1	0.201	(1991 - 1994)	6.2	9.4	8.5	±	1.52	2.32	0.121	0.201	0.179	±	0.039	0.001	0.140	0.179	0.217	7.0	8.5	10.0
11-Aug-94	8.9	16.5			10	6.2	0.121																			
14-Aug-08	2.0	14.3	*	16.8	10	11.1	0.142																			
18-Aug-09	0.6[1]	14.4	#	17.5	10	8.1	0.071	(2008 - 2012)	6.8	11.1	9.1	±	1.75	3.06	0.071	0.153	0.118	±	0.038	0.001	0.080	0.118	0.156	7.4	9.1	10.9
14-Aug-10	2.4	14.0	^	15.0	10	10.5	0.153																			
22-Aug-11	2.5	15.6	§	15.6	10	6.8	0.083																			
23-Aug-12	3.5	15.2		15.2	10	9.1	0.140																			
Early and Late Combined Baseline Period:								(1991 - 2012)	6.2	11.1	8.8	±	1.59	2.51	0.071	0.201	0.145	±	0.048	0.003	0.097	0.145	0.193	7.2	8.8	10.4

1) Subsurface flow apparent

*) 2008 water temperature at 0930 hrs; temp rose to 16.8C by 1430 hrs.

#) 2009 water temperature at 0940 hrs; temp rose to 17.8C by 1430 hrs; Air temp 17.5C to 26.7C over the same time period

^) 2010 water temperature at 0945 hrs; temp rose to 15.0C by 1330 hrs; Air temp 18.3C to 21.1C over the same time period

§) 2011 water temperature at 1130 hrs; steady at 15.6C until 1340 hrs; Air Temp 21.1C.

§) 2011 water temperature at 1130 hrs; steady at 15.6C until 1340 hrs; Air Temp 21.1C.

Post-Operational Data

Date	Flow (cfs)	Temp Start (°C)	Temp End (°C)	Pools (#)	Fish > 60 mm (#/pool)	Pool Density (fish/m²)		Fish per pool Statistics Min.	Max.	Mean		S.D.	Var.	Fish Density (Fish per m²) Min.	Max.	Mean		S.D.	Var.	Fish Density (Fish per m²) One Standard Deviation			Fish per pool Statistics One Standard Deviation		
23-Aug-12	3.5	15.2		10	9.1	0.140	(2012 - 2016)	8.9	9.1	9.0	±	0.14	0.02	0.140	0.209	0.175	±	0.049	0.002	0.126	0.175	0.223	8.9	9.0	9.1
23-Aug-13	2	15.2	15.2	10	8.9	0.209																				

Table 3. Youngs Creek Resident Trout Monitoring Plan statistical trend analysis.

	Early 1990s Baseline				Late 2000s Baseline				Slope[1/]
Pool #	1991	1992	1993	1994	2008	2009	2010	2011	(m)
1	3	4	7	1	3	0	0	2	-0.1
2	14	7	7	5	5	0	0	4	-0.4
3	11	10	7	6	9	0	25	0	0.0
4	2	2	4	5	2	1	4	2	0.0
5	2	4	2	1	5	5	2	2	0.1
6	23	25	20	13	4	4	4	0	-1.0
7	2	3	7	6	13	3	4	6	0.1
8	31	26	24	16	27	14	9	13	-0.6
9	4	12	10	8	7	4	13	9	0.0
10	0	1	3	1	36	50	44	30	2.2

Project Operations							
2012	2013	2014	2015	2016	3-yr Slope[1]	4-yr Slope[1]	5-yr Slope[1]
3	0	6	7	3	1.5	1.8	0.7
21	0	6	7	3	-7.5	-3.6	-2.9
4	0	6	7	3	1.0	1.5	0.5
2	0	6	7	3	2.0	2.1	0.9
4	3	6	7	3	1.0	1.2	0.2
6	1	6	7	3	0.0	0.8	0.0
12	24	6	7	3	-3.0	-3.3	-3.5
11	10	6	7	3	-2.5	-1.6	-1.9
10	13	6	7	3	-2.0	-1.6	-2.0
18	38	6	7	3	-6.0	-6.5	-6.1

1) = Slope (m) of the least squares regression line

(I) =	9.2	9.4	9.1	6.2	11.1	8.1	10.5	6.8	0.02	9.1	8.9	6.0	7.0	3.0			
B_p =	9.2	9.3	9.2	8.5	9.0	8.9	9.1	8.8									
A_p =										9.1	9.0	8.0	7.8	6.8			
$\sum m_i$ =			-0.05	-0.93	0.14	0.05	0.07	0.02	0.02						-1.55	-0.92	-1.41
S_m =	Standard deviation of the pool regression slopes								0.85						3.26	2.88	2.29
√# of pools =	4.47214	5.47723	6.32456	7.07107	8.36660	8.94427											
S_b =	Standard deviation using individual pool counts							10.3									
S_{bp} =	Standard deviation using annual pool counts							1.7									

Test 1: First Year Catastrophic Decline using Pre-Project Data

Where: (I) = average number of fish/pool for current year.

(B_p) = average number of fish/pool observed pre-project conditions = 8.8 fish/pool

Catastrophe: (I_{2012}/Bp_{2011}) < 0.25 = < 2.2 fish/pool

Test 2: Subsequent Year Project Operational Catastrophic Decline using Post-Project Data

Where: (I) = average number of fish/pool for any given year.

(Ap) = average number of fish/pool observed prior to the current survey.

Test 4: Negative Population Trends [Preceeding 5 Years]

Test compares the the annual average of the regression slopes of number of fish per pool

Negative decrease = regression slope less than zero (*P* = 0.10)

Use Students' t-test; same as for Test 3, only looking for significant decreases.

Determine critical t value using a table of t-distributions with DF = (# of pools)-1, and a 1-tailed *P* = 0.10.

If the absolute value of negative *t*-calculated is greater than *t*-critical, a significant difference exists and it can be concluded that a significant negative population trend has developed.

Catastrophe: $(I_{2013}/Ap_{2012}) < 0.25$; or for any combination of current year and prior post-project mean

Test 3: Positive Population Trends (Operational Years 3 and 4)

The test compares the average of the slopes of the regression line for each pool

Positive increase = regression slope greater than zero (*P* = 0.10).

Students' T-test is subsequently used to compare the slope averaged for 30 or 40 pools

depending upon the year tested (Year 3 or 4).

For each pool use linear regression analysis (Y = mX + b)

Where: Y = number of fish
X = Year

m = slope coefficient for each pool

S_m = Standard Deviation of the slopes

Use a single sample t-test for the mean slope versus a slope of zero.

$$t = \frac{[(\sum m_i) / \#\text{ of pools}] - 0}{S_m / \sqrt{\#\text{ of pools}}}$$

Determine critical t value using a table of t-distributions with DF = (# of pools)-1, and a 1-tailed *P* = 0.10.

If *t*-calculated is greater than *t*-critical, a significant difference exists and it can be concluded that a significant

Test 5: Comparison of 1-yr Catasrophe with Pre-Project Baseline Population

This test is used only after a 1st-Yr Catastrophic Decline defined in Test 1 has occurred.
Compares post-Project population numbers with pre-Project baseline.

If post-Project is not significantly less than pre-Project mean of 8.8 fish/pool, the population is considered to have rebounded from the earlier catastrophic decline.

Where:
(I) = average number of fish/pool for current year.
(B_p) = average number of fish/pool observed pre-project conditions = 8.8 fish/pool
(S_b) = standard deviation of pre-project population using individual pool counts = 10.3 fish/pool
S_b is the within pool mean-square error determined using a one-way ANOVA with DF = 60 [10 pools (7 years -1)].

Single-sample Students' T-test is subsequently used to compare the mean pre-project population (Bp) of 8.8 fish/pool versus the average number of fish per pool for the current year (I).

Determine critical t value using a table of t-distributions with DF = (# of pools) *(n-1), and a 1-tailed *P* = 0.10.

If *t*-calculated is greater than *t*-critical, a significant difference exists and it can be concluded that the population has not rebounded to pre-project levels.

Example Tests 1 & 2 using 1994/2009 data as potential declines

Test 1:	0.70	0.92	1.03					
	FALSE	FALSE						
Test 2:				0.98	0.67	0.88	0.39	
Test 3:	Exp. Test 3 using Baseline data		0.218			-2.125	-1.428	Result; t-calculated
	Critical Value of the t-Distribution	=	1.296			1.311	1.304	Critical Value of the t-Distribution; t-critical

Test 4:								-2.754	Result; t-calculated
	Critical Value of the t-Distribution	=						1.299	Critical Value of the t-Distribution; t-critical
Test 5:	Example Test 5 using 2011 data		1.631	-0.082	2.283	1.468	4.730		Result; t-calculated
	Critical Value of the t-Distribution	=	1.292	1.291	1.290	1.289	1.288		Critical Value of the t-Distribution; t-critical

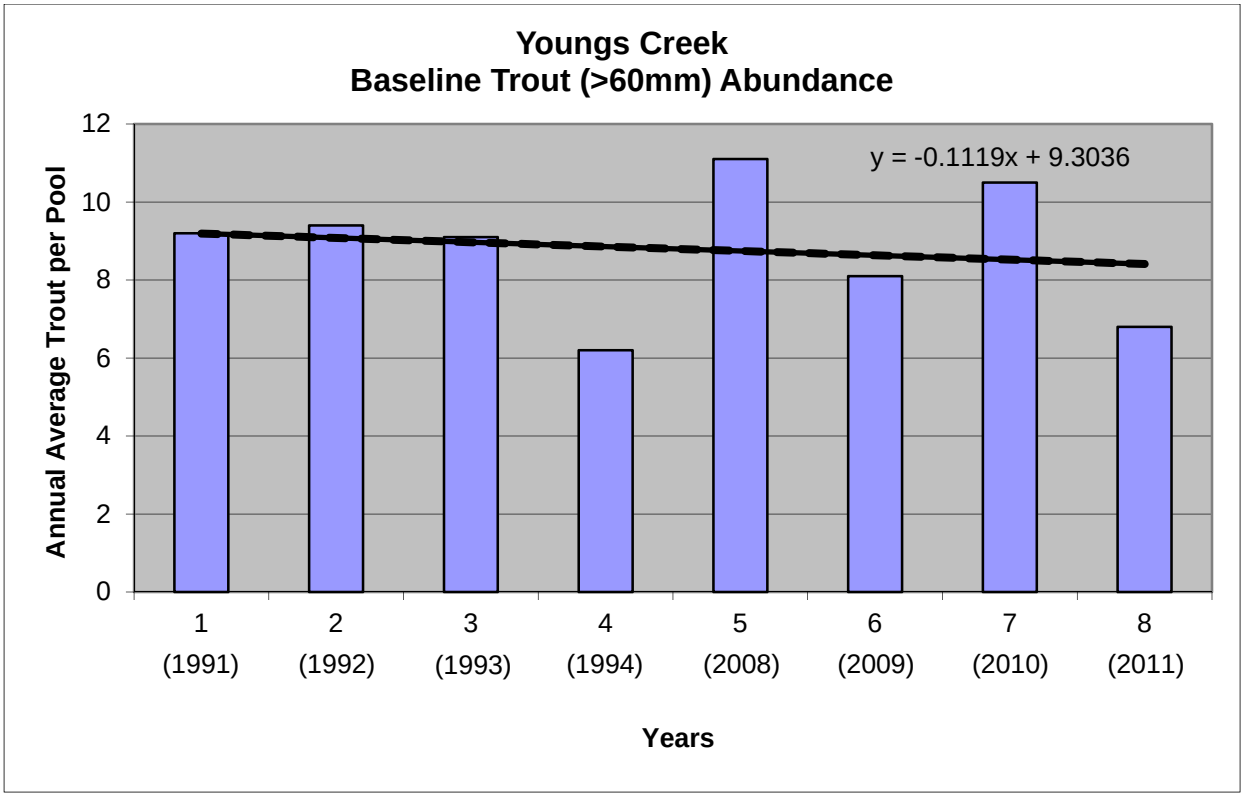

Figure 1. Youngs Creek average annual abundance index and least square regression trend line, based on 8 years of baseline data spanning 1991-2011.

4. FUTURE REPORTING

This report represents the second year after the commencement of Project operation. A similar survey and subsequent annual report will be prepared for year 3 as indicated in the Monitoring Plan.

Please contact Keith Binkley (Generation - Natural Resources Manager, fish biologist) at KMBinkley@snopud.com if you have any questions about the data collected to date and how they apply to the Resident Trout Monitoring Plan.

APPENDIX A

Photos of Habitat Conditions during August 2013 Survey

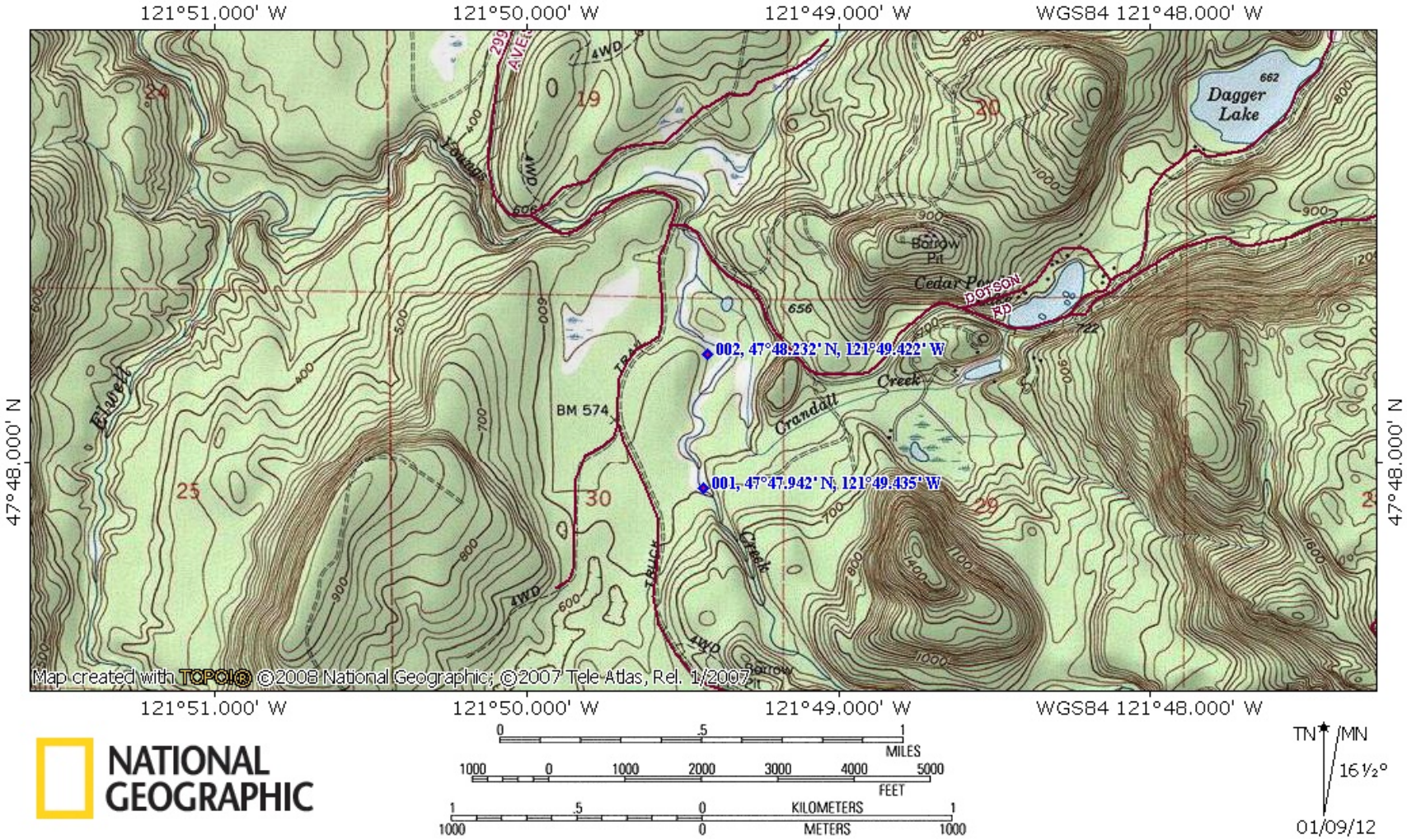

Figure A-1. Map of Monitoring Site Reach. Waypoint 001 indicates Powerhouse location at RM 2.4 and approximate downstream boundary of trout monitoring site.

Photo 1. Pool 1, August 2013.

Photo 2. Pool 2, August 2013.

Photo 3. Pool 3, August 2013.

Photo 4. Pool 4, August 2013.

Photo 5. Pool 5, August 2013.

Photo 6. Pool 6, August 2013.

Photo 7. Pool 7, August 2013.

Photo 8. Pool 8, August 2013.

Photo 9. Pool 9, August 2013.

Photo 10. Pool 10, August 2013.

APPENDIX B

Consultation Documentation

Presler, Dawn

From: Applegate, Brock A (DFW) <Brock.Applegate@dfw.wa.gov>
Sent: Friday, October 25, 2013 1:33 PM
To: Presler, Dawn; 'Tim_Romanski@fws.gov' (Tim_Romanski@fws.gov); LouEllyn Jones (louellyn_jones@fws.gov)
Cc: Binkley, Keith
Subject: FW: Youngs Creek Hydro (P-10359) - 2013 Trout Monitoring Annual Report
Attachments: Resident Trout Survey 2013.pdf

Hi Dawn, WDFW has reviewed the resident trout survey for Youngs Creek Hydroelectric project. We have no comments.

Sincerely, Brock

Brock Applegate
Major Projects Mitigation Biologist
Washington Department of Fish and Wildlife
16018 Mill Creek Boulevard
Mill Creek, WA 98012-1541

(425) 775-1311 x310
(360) 789-0578 (cell)
(425) 338-1066 (fax)

From: Presler, Dawn [mailto:DJPresler@SNOPUD.com]
Sent: Friday, October 11, 2013 9:32 AM
To: 'Tim_Romanski@fws.gov' (Tim_Romanski@fws.gov); LouEllyn Jones (louellyn_jones@fws.gov); Applegate, Brock A (DFW)
Cc: Binkley, Keith
Subject: Youngs Creek Hydro (P-10359) - 2013 Trout Monitoring Annual Report

Dear Tim, LouEllyn, and Brock:
Attached is the Resident Trout Monitoring Plan 2013 Annual Report for the Youngs Creek Hydro Project for your 30-day review and comment. Please let Keith know by October 25 if you would like to have a meeting to discuss the results of the annual report. Otherwise, your comments are due back to me by November 11. If you have no comments on the attached report, a quick email stating so would be greatly appreciated.

Tim/LouEllyn - Due to the federal government shut-down that's currently going on, I can extend out the due dates based on your need to meet or need to have more time to review the report. Just let us know. However, the license does require us to submit the report to the FERC by November 30.

Thanks!

Dawn Presler
Sr. Environmental Coordinator
Generation Resources
(425) 783-1709
****
PUD No. 1 of Snohomish County
PO Box 1107
Everett, WA 98206-1107