SNOHOMISH COUNTY PUD
PUBLIC UTILITY DISTRICT NO. 1

Your Northwest renewables utility

November 19, 2014

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: 2014 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: 2014 Survey* pursuant to the approved Resident Trout Monitoring Plan for the Youngs Creek Hydroelectric Project (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; both agencies stated they had no comments on the draft report, and neither requested a meeting to discuss the draft report.

This report represents the third year of monitoring after the commencement of Project operation. The results from 2014 indicate that the minimum instream flow releases are considered adequate to protect the fishery resource and that additional monitoring is not warranted. As such, the District will continue using the established instream flows as identified in License Article 411 and cease resident trout monitoring as allowed in the Trout Monitoring Plan.

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

Sincerely,

Craig W. Collar, P.E.
Assistant General Manager of Generation
CWCollar@snopud.com
(425) 783-1825

Enclosed: Resident Trout Monitoring Plan Annual Report 2014

Cc: Keith Binkley, District

Youngs Creek Hydroelectric Project
(FERC No. 10359)

Resident Trout Monitoring Plan
Annual Report

2014 Survey

Prepared by:

SNOHOMISH COUNTY PUD
PUBLIC UTILITY DISTRICT NO. 1

Everett, WA

November 2014

Final – This document has been prepared for the District. It has been peer-reviewed by the District for accuracy and formatting based on information known at the time of its preparation and with that understanding is considered complete by the District. The document may be cited as:

Public Utility District No. 1 of Snohomish County (District). 2014. Trout Monitoring Plan Annual Report 2014 Survey, FERC Project No. 10359. November 2014.

Table of Contents

Appendices

List of Tables

List of Figures

1. OVERVIEW

Public Utility District No. 1 of Snohomish County (the District) has completed the third 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 20, 2014 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. In order to meet minimum flow requirements, the Project often does not operate during the summer months however, during 2014, hydrologic conditions allowed for the Project to operate multiple times for periods of short duration. 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 – 2014 DATA

Table 1. Youngs Creek Resident Trout Monitoring Data – 2014.

Date: August 20, 2014	Start Time: 13:45	Finish Time: 17:00	Personnel: Larry Lowe, Sue Frese	
Weather: Sunny	Air Temp.: 21 ºC	Water Temp.: 16.5 ºC	Discharge: 7 cfs	Visibility: 8 feet

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		2	1	1					4	4
2	2	14	5	5		2			28	26
3	2	17	6	5	2				32	30
4		8	4	4	1				17	17
5	1	9		1					11	10
6	2	12	3	4	3	1			25	23
7	5	16	4	11	1	2	1		40	35
8		13	5	7	7	6	2		40	40
9		10	4	3	4				21	21
10	6	15	8	5	17	8	2	1	62	56
Totals	18	116	40	46	35	19	5	1	280	262

Pool #	Length (feet)	Width (feet)	Mean Depth	Max Depth	Control Depth	Photo #	Area (m^2)	(Total fish/m^2)
1	26	22	1.1	1.6	0.9	1	53.1	0.08
2	46	24	1.6	3.0	0.9	2	102.6	0.27
3	32	14	1.1	2.0	0.8	3	41.6	0.77
4	29	17	1.8	2.7	1.0	4	45.8	0.37
5	17	19	2.0	2.3	0.8	5	30.0	0.37
6	28	20	1.5	2.6	0.7	6	52.0	0.48
7	59	23	2.9	3.5	0.9	7	126.1	0.32
8	70	21	1.6	3.9	0.8	8	136.6	0.29
9	33	20	2.6	3.8	1.1	9	61.3	0.34
10	88	23	1.9	4.1	0.9	10	188.0	0.33

3. PROJECT MONITORING – THIRD 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 third year of operation (2014) was 26.2 fish/pool; substantially higher than the three year period of operation mean of 14.7 fish/pool. 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.

The District contends the results of the 2014 survey clearly indicate that the minimum instream flow releases are considered adequate to protect the fishery resource and that additional monitoring is not warranted.

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 latter 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 was relatively stable over the baseline period (Figure 1). Since the Project has been in operation, the index remained stable and consistent with the baseline during the first two years and increased substantially during the third year (Figure 2).

Table 2. Snorkel data summary (1989-2014).

Pre-Operational Data

Date	Flow (cfs)	Temp Start (ºC)		Temp End (ºC)	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 - 2011)	6.8	11.1	9.1	± 2.02	4.08	0.071	0.153	0.112	± 0.041	0.002	0.071	0.112	0.153	7.1	9.1	11.1
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																	
Early and Late Combined Baseline Period:								(1991 - 2011)	6.2	11.1	8.8	± 1.69	2.86	0.071	0.201	0.146	± 0.051	0.003	0.094	0.146	0.197	7.1	8.8	10.5

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.

Post-Operational Data

Date	Flow (cfs)	Temp Start (ºC)	Temp End (ºC)	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 - 2014)	8.9	26.2	14.7	± 9.93	98.62	0.140	0.341	0.230	± 0.102	0.010	0.128	0.230	0.332	4.8	14.7	24.7
23-Aug-13	2	15.2	15.2	10	8.9	0.209																		
20-Aug-14	7	16.5	16.5	10	26.2	0.341																		

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

	Early 1990s Baseline				Late 2000s Baseline				Slope[1/]	Project Operations							
Pool #	1991	1992	1993	1994	2008	2009	2010	2011	(m)	2012	2013	2014	2015	2016	3-yr Slope[1/]	4-yr Slope[1/]	5-yr Slope[1/]
1	3	4	7	1	3	0	0	2	-0.1	3	0	4	7	3	0.5	1.6	0.7
2	14	7	7	5	5	0	0	4	-0.4	21	0	26	7	3	2.5	-1.6	-2.9
3	11	10	7	6	9	0	25	0	0.0	4	0	30	7	3	13.0	3.9	0.5
4	2	2	4	5	2	1	4	2	0.0	2	0	17	7	3	7.5	3.2	0.9
5	2	4	2	1	5	5	2	2	0.1	4	3	10	7	3	3.0	1.6	0.2
6	23	25	20	13	4	4	4	0	-1.0	6	1	23	7	3	8.5	2.5	0.0
7	2	3	7	6	13	3	4	6	0.1	12	24	35	7	3	11.5	-0.4	-3.5
8	31	26	24	16	27	14	9	13	-0.6	11	10	40	7	3	14.5	1.8	-1.9
9	4	12	10	8	7	4	13	9	0.0	10	13	21	7	3	5.5	-0.1	-2.0
10	0	1	3	1	36	50	44	30	2.2	18	38	56	7	3	19.0	-1.5	-6.1
(I) =	9.2	9.4	9.1	6.2	11.1	8.1	10.5	6.8	0.02	9.1	8.9	26.2	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	14.7	12.8	10.8			
$\sum m_i$ =			-0.05	-0.93	0.14	0.05	0.07	0.02	0.02						8.55	1.10	-1.41
S_m =	Standard deviation of the pool regression slopes								0.85						5.92	1.91	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									

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

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_{2014}/Ap_{2013}) < 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.

Test 1:	Example Tests 1 & 2 using 1994/2009 data as potential declines			1.03			
	0.70	0.92					
	FALSE	FALSE					
Test 2:				0.98	2.91	0.48	0.23
Test 3:	Exp. Test 3 using Baseline data		0.218			6.456	2.571 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	-14.190	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

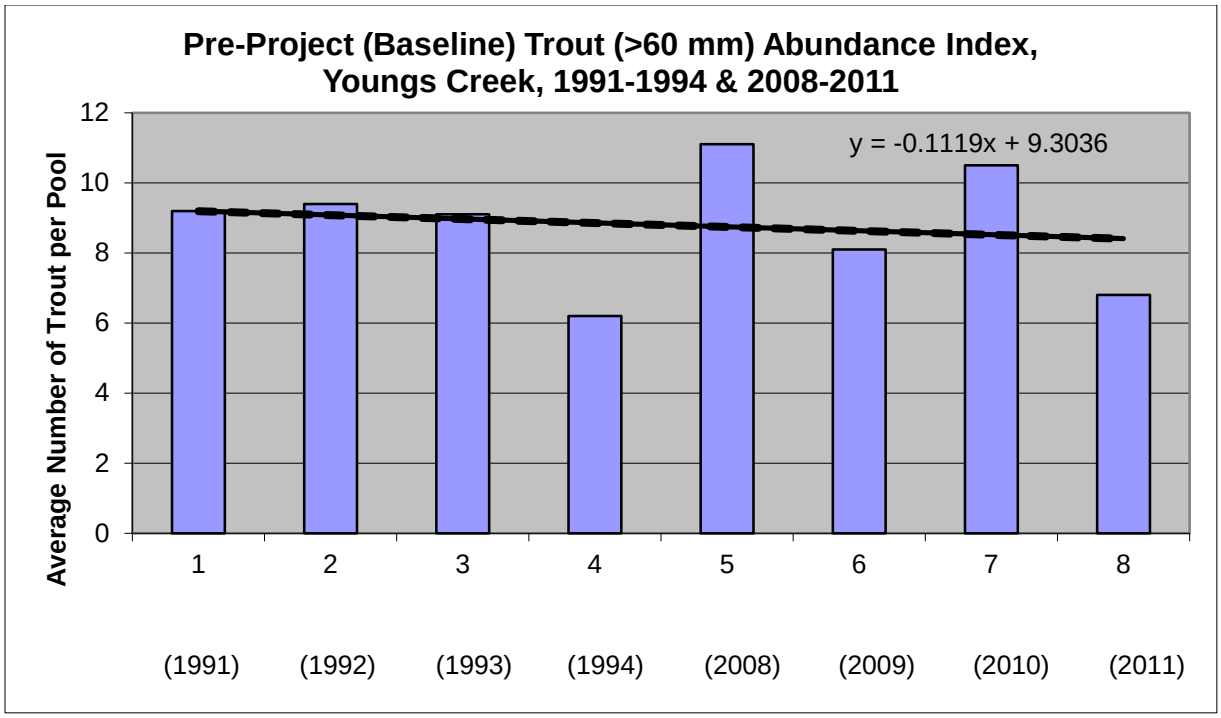

Figure 1. Youngs Creek Trout (>60mm) Abundance Index and least square regression trend line, based on 8 years of baseline data spanning 1991-2011.

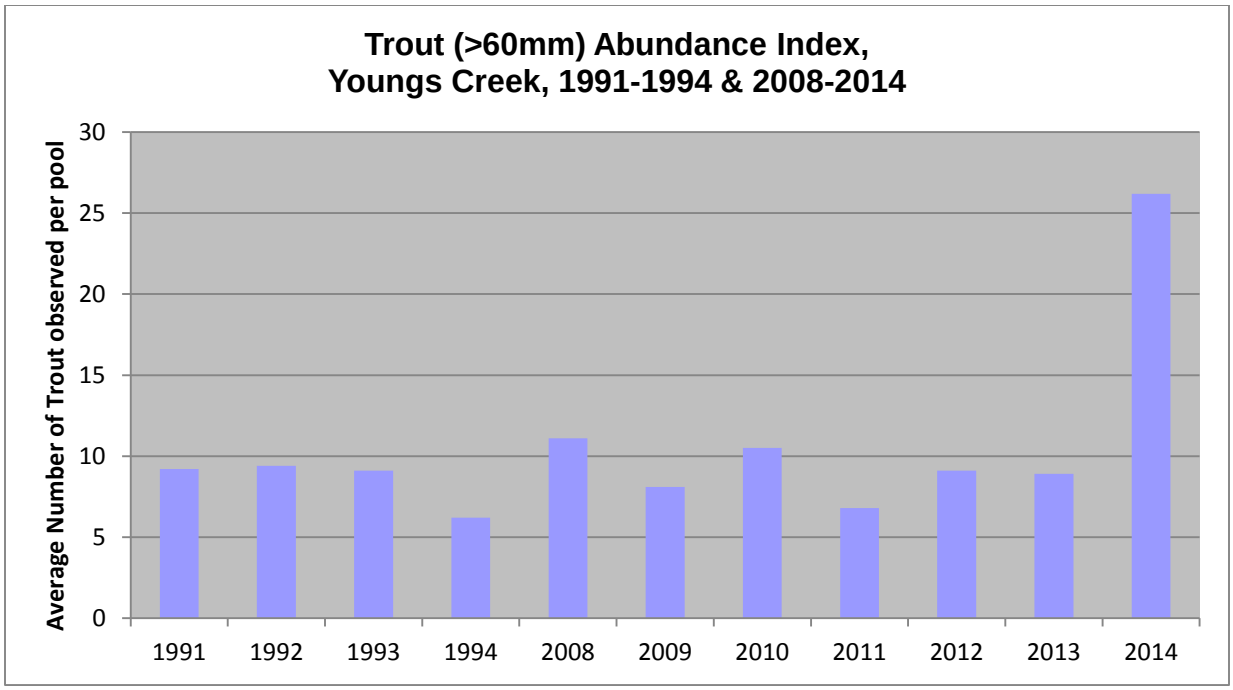

Figure 2. Average number of trout observed per pool, Youngs Creek, 1991-1994 and 2008-2014.

4. FUTURE REPORTING

This report represents the third year of monitoring after the commencement of Project operation. The results from 2014 indicate that the minimum instream flow releases are considered adequate to protect the fishery resource and that additional monitoring is not warranted.

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 2014 Survey

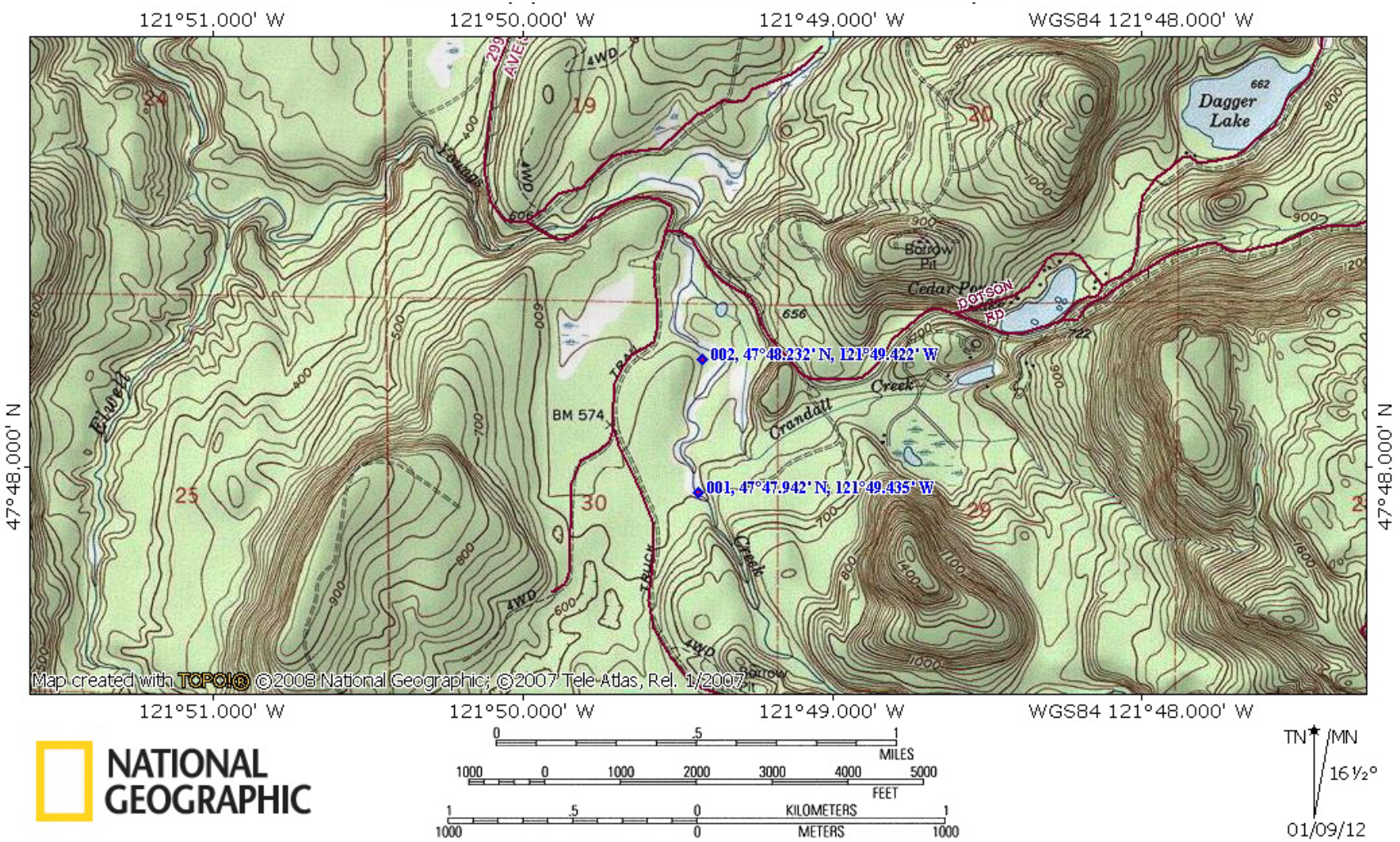

Figure A-1. Map of Monitoring Site Reach. Waypoint 001 indicates Powerhouse location at RM 2.4 and approximate downstream boundary of trout monitoring site.

Photo 1. Pool 1, summer 2014. (Note: due to camera failure, all photos were taken during September under similar flow conditions).

Photo 2. Pool 2, summer 2014.

Photo 3. Pool 3, summer 2014.

Photo 4. Pool 4, summer 2014.

Photo 5. Pool 5, summer 2014.

Photo 6. Pool 6, summer 2014.

Photo 7. Pool 7, summer 2014.

Photo 8. Pool 8, summer 2014.

Photo 9. Pool 9, summer 2014.

Photo 10. Pool 10, summer 2014.

APPENDIX B

Consultation Documentation

From:	Applegate, Brock A (DFW)
To:	Presler, Dawn; "Tim_Romanski@fws.gov" (Tim_Romanski@fws.gov)
Cc:	Binkley, Keith; Allegro, Justin K (DFW)
Subject:	RE: Youngs Creek Hydro (FERC No. 10359) - Trout Monitoring Plan Year 3 Draft Report for your 30-day review/comment
Date:	Wednesday, November 12, 2014 5:17:53 PM

Hi Dawn, We have no comments other than we agree with the findings and conclusions. Thanks to SnoPUD for concluding the surveys to confirm the project's instream flows on the trout population.

Sincerely, Brock

Brock Applegate
Renewable Energy/Major Projects Mitigation Biologist
Washington Department of Fish and Wildlife
P.O. Box 1100
111 Sherman St. (physical address)
La Conner, WA 98257-9612

(360) 466-4345 x244 (office)
(360) 789-0578 (cell)
(360) 466-0515 (fax)

From: Presler, Dawn [mailto:DJPresler@SNOPUD.com]
Sent: Monday, October 13, 2014 3:58 PM
To: 'Tim_Romanski@fws.gov' (Tim_Romanski@fws.gov); Applegate, Brock A (DFW)
Cc: Binkley, Keith
Subject: Youngs Creek Hydro (FERC No. 10359) - Trout Monitoring Plan Year 3 Draft Report for your 30-day review/comment

Tim and Brock,
Attached is the Trout Monitoring Draft Report for the Youngs Creek Hydro Project. Please take the next 30 days to review and provide comments back to me **by November 12, 2014**. If you would like to meet in the next two weeks to discuss the results, please let me/Keith know asap so we can set up that meeting/conference call. Thanks!

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

From:	Romanski, Tim
To:	Presler, Dawn
Subject:	Re: Youngs Creek Hydro (FERC No. 10359) - Trout Monitoring Plan Year 3 Draft Report for your 30-day review/comment
Date:	Thursday, November 13, 2014 2:23:00 PM

Sorry, I don't have any comments.

Tim Romanski
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
Washington Fish and Wildlife Office
Branch Manager of Conservation and Hydropower Planning
510 Desmond Drive SE, Lacey, WA 98503
360.753.5823 (phone) 360.753.9518 (fax)

On Thu, Nov 13, 2014 at 8:50 AM, Presler, Dawn <DJPresler@snopud.com> wrote:

> Received your comments. Thanks!
>
> Dawn
>
> ---
>
> **From:** Applegate, Brock A (DFW) [mailto:Brock.Applegate@dfw.wa.gov]
> **Sent:** Wednesday, November 12, 2014 5:18 PM
> **To:** Presler, Dawn; 'Tim_Romanski@fws.gov' (Tim_Romanski@fws.gov)
> **Cc:** Binkley, Keith; Allegro, Justin K (DFW)
> **Subject:** RE: Youngs Creek Hydro (FERC No. 10359) - Trout Monitoring Plan Year 3 Draft Report for your 30-day review/comment
>
> Hi Dawn, We have no comments other than we agree with the findings and conclusions. Thanks to SnoPUD for concluding the surveys to confirm the project's instream flows on the trout population.
>
> Sincerely, Brock
>
> Brock Applegate
>
> Renewable Energy/Major Projects Mitigation Biologist
>
> Washington Department of Fish and Wildlife

P.O. Box 1100

111 Sherman St. (physical address)

La Conner, WA 98257-9612

(360) 466-4345 x244 (office)

(360) 789-0578 (cell)

(360) 466-0515 (fax)

From: Presler, Dawn [mailto:DJPresler@SNOPUD.com]
Sent: Monday, October 13, 2014 3:58 PM
To: 'Tim_Romanski@fws.gov' (Tim_Romanski@fws.gov); Applegate, Brock A (DFW)
Cc: Binkley, Keith
Subject: Youngs Creek Hydro (FERC No. 10359) - Trout Monitoring Plan Year 3 Draft Report for your 30-day review/comment

Tim and Brock,

Attached is the Trout Monitoring Draft Report for the Youngs Creek Hydro Project. Please take the next 30 days to review and provide comments back to me **by November 12, 2014**. If you would like to meet in the next two weeks to discuss the results, please let me/Keith know asap so we can set up that meeting/conference call. Thanks!

Dawn Presler

Sr. Environmental Coordinator

Generation Resources

(425) 783-1709

****

Public Utility District No. 1 of Snohomish County

PO Box 1107

Everett, WA 98206-1107