Aesthetics and recreation issues at the Enloe Hydroelectric Project

Expert Witness Report

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Washington State Department of Ecology and Public Utility District No. 1 of Okanogan County WA.

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Introduction

The Enloe Hydroelectric Project is located near River Mile 8.8 on the Similkameen River near the town of Oroville, Washington. An existing dam (54 feet tall by approximately 300 feet wide) was built in 1920 and backs up about 1.5 miles of river, creating a 77 acre reservoir. From 1922 to 1958 (36 years) the dam was used to divert up to 1,000 cfs to a 3.2 MW powerhouse on the southwest side of the river (river right). Since 1958 (the last 55 years), the entire flow of the Similkameen River has passed over the dam, creating a 54 foot “Dam Falls.” There is a roughly 20 foot natural falls (“Similkameen Falls”) about 350 feet downstream.

The Public Utility District No. 1 of Okanogan County (District) has proposed a new hydroelectric project (Project) at the site that would divert up to 1,600 cfs to a new 9 MW powerhouse on the northeast side (river left), while raising the dam five feet with new crest gates. The proposed Project will reduce flows over the Dam Falls and through a bypass reach that includes Similkameen Falls. During a roughly 8.5 month dry period in a typical year, there will be no flow over the dam and only 10 cfs (mid-September through March) or 30 cfs (mid-July through mid-September) will be released from a pipe below the dam into the bypass reach and over Similkameen Falls. By comparison, in the lowest flow month (September) under existing conditions the median flow over the two falls is 506 cfs (USGS gage 12442500, Similkameen River near Nighthawk, 1929-2008 as reported in FLA).


Several non-governmental agencies (hereafter referred to as the Appellants, including the Center for Environmental Law and Policy, American Whitewater, the Columbia River Bioregional Education Project, the North Cascades Conservation Council, and Sierra Club) have appealed the 401 Certification for the proposed Project. They assert that by adopting the District’s minimum flow proposal, the Certification is inconsistent with the federal Clean Water Act and Washington State water pollution control laws, specifically failing to adequately assess alternative flow options for recreation and aesthetics.

Confluence Research and Consulting (CRC) was asked to review the Project, the recreation and aesthetic values in the area, and related information collected and developed by the District or Ecology during FERC relicensing and the 401 Certification process. CRC was asked to assess whether the District or Ecology developed sufficient information to justify the proposed Project’s aesthetic flow regime under Washington’s water certification guidelines, to suggest other information or studies that could have helped with aesthetic or recreation flow decision-making, and determine if the District’s minimum flow proposal would provide “reasonable assurance” that recreation and aesthetic values were protected. This report documents that review, which will support expert witness testimony in the hearing.
Methods

Information in this report was developed from several sources and analyses, as described below. For clarity, we have also provided summary maps and photos of the proposed Project and identified other recreation or aesthetic features discussed in the report.

Study area

Figure 1 shows the regional setting; Figure 2 provides a closer view of the Project area to identify Project or recreation features. Figures 3, 4, and 5 are photos of the falls and surrounding area which help show the scale of recreation and aesthetic features.

Figure 1. Regional setting: Oroville, Enloe Dam, Similkameen Falls, and the Similkameen River Trail.
Figure 2. Overview of proposed project and the two falls.

Figure 3. Overhead view of Dam Falls (left) and Similkameen Falls from river right side at about 660 cfs.
Figure 4. Oblique view of Dam Falls and Similkameen Falls from river left side at about 700 cfs.

Figure 5. Front view of Dam Falls and Similkameen Falls at about 700 cfs.
Review of existing information

CRC reviewed documents pertaining to recreation or aesthetic flow issues. These were prepared by the District, its consultants, Ecology, and other agencies/stakeholders during the FERC and 401 Certification processes from 2005 through 2012. Types of documents are listed below.

- Ecology guidance on setting flows in Washington State.
- Study plans, reports, and memos.
- District draft and final license applications.
- Correspondence or meeting notes from the District, its consultants, Ecology, WDFW, and other agencies/stakeholders involved in the FERC or 401 Certification processes.
- Comment letters from agencies/stakeholders and District or Ecology responses to comments.
- Photos of the Dam Falls and Similkameen Falls at several flows.

CRC also reviewed more general literature about flows, recreation, and aesthetics, including licensing documents for other dams where aesthetics of waterfalls were an issue. They also interviewed a few individuals who participated in relicensing or 401 Certification meetings, or who had other experience or knowledge about Okanogan Valley or statewide recreation opportunities. Specific documents or individual interviews are cited when they are relied upon for findings in this report.

Fieldwork

Both researchers visited the Enloe Project site on October 18 and 19, 2012, accompanied by Tom O'Keefe (American Rivers) and Rich Bowers (Hydro Reform Coalition). The October 18 visit focused on the road-accessible river left side, and included meeting with Joseph Enzensperger, who collected photographs and video of the two falls through a range of flows during the summer and fall of 2012. The USGS reported a provisional mean daily flow of 675 cfs for October 18 for the upstream gage near Nighthawk, but flows during the afternoon visit (after accounting for travel time from the gage and hourly flow levels) were about 700 cfs. A field estimate of the flow in the distinct river left channel (the modified channel that was cut for the 1903-1920 era powerhouse) was 30 to 45 cfs.

The October 19 visit focused on the Similkameen River Trail and the river right side views of the falls, but included a second site visit to the river left side later in the day. Bo Shelby also paddled a kayak in the bypass channel between the two falls. The USGS reported a provisional mean daily flow of 577 cfs for October 19 for the upstream gage near Nighthawk, but flows during the morning and mid-day visit (after accounting for travel time from the gage and hourly flow levels) were about 600 cfs. A field estimate of the flow in the distinct river right channel was 35 to 50 cfs.

Hydrology information

CRC reviewed USGS flow records and statistics for the Nighthawk gage for the entire period of record (October 1, 1928 to December 31, 2012). This gage generally reflects the natural flow regime over the Dam Falls, in the bypass reach, and over Similkameen Falls. Although basin inputs (groundwater or tributaries) between the gage and bypass reach may add more flow during higher flow periods, contributions during low flow parts of the year at issue in this hearing are generally less than 4% (District, FLA Appx. E.6.3, p. 11). Gage information was used to estimate the months of the year in different flow ranges under the natural “existing condition” (no project) and for the proposed Project.
Photo Comparisons

CRC assembled several photos of the two falls at different flow levels from photos in the FERC record; provided by the District, Ecology, or WDFW during discovery; taken during CRC’s fieldwork; or taken by Joseph Enzensperger on specific dates under our general direction. For ease of comparison, photos were sometimes cropped to match the perspective or scale of other photos in a series. In all cases, we used flows for the USGS Nighthawk gage to describe the flow portrayed in photos.

CRC also simulated additional photos of lower flows, using information from the modeled cross section in the Bunn Memo (Bunn, 2008), other photos at other flows, flows over similar waterfalls at other sites (e.g., Spokane Falls), and flows estimated in side channels during fieldwork at this site. The mechanics of these simulated photos involved replacing a portion of visible whitewater in the falls in particular parts of the channel with concrete or rock textures. These simulated photos illustrate lower flows or release options, a strategy similar to photo simulations of the proposed tailrace, buildings, and dewatered dam used by the District in relicensing documents (District, FLA E8, 2008; District, May 29 letter with supplemental visual resource information, 2009).
Decision Setting

The State of Washington has several statutes related to instream flows to protect recreation and aesthetic values. Without commenting on the historical or legal issues, we have identified relevant excerpts from hearings or trials about protecting recreation or aesthetic flows, and excerpts from agency guidance about assessing impacts from hydroelectric development during FERC licensing or 401 Certification processes (Ecology and WDFW, 2003; Ecology 2005). These describe our understanding of the context (or “decision setting”) for this report.

- Ecology can “impose flow conditions in order to protect beneficial uses of a river as identified in state water quality standards” in a 401 Certification (PUD No. 1 of Jefferson County v. Department of Ecology, 511 U.S. 700, 1994).
- Ecology can require minimum bypass flows in a 401 Certification to ensure “the waters will not be degraded so as to interfere with or injure existing beneficial uses.” (PUD No. 1 of Pend Oreille County v. Department of Ecology, 146 Wn. 2d 778, 821, 2002).
- “Aesthetic enjoyment, which is a characteristic use, includes enjoyment of beauty” (Snoqualmie Indian Tribe v. Ecology, PCHB No.03-156 (Final Findings of Fact, Conclusions of Law and Order, April 7, 2004)).
- Ecology can set instream flows for any or all of the listed resources and values, and recognizes that some may “overlap” or “are often clearly related....for example, recreational boating flows for fishing, pleasure, and whitewater are consistent with navigational values. Scenic values likewise support both aesthetic and recreational values” (Ecology and WDFW, 2003, p. 10).
- Instream flow statutes require instream flow “protection” RCW 90.22.010 or “preservation” (RCW 90.54.030(3)(a)) without specifically defining either term, but Ecology cites common dictionary definitions of “keeping from harm or injury” for both and requires “sufficient flows” for the “protection or preservation of fish, wildlife, scenic, recreation, navigation, water quality, and other environmental values...over the long term” (Ecology and WDFW, 2003, p. 10).
- Ecology has developed a “narrative standard” rather numerical standard for recreation and aesthetics in hydropower water quality certifications (Ecology, 2005, p.26). “Narrative criteria are implemented on a case-by-case basis to protect water quality and beneficial uses.”
- A two-page section in the 401 Water Quality Certification for Existing Hydropower Dams Guidance Manual focuses on recreation and aesthetic issues (Ecology, 2005, pp. 53-54). The section includes:
  - “Recreation and aesthetics (sight, smell, touch, and taste) are beneficial uses specifically protected in Washington’s water quality standards.”
  - Recognition of a “curvilinear relationship between instream flow and recreational benefits” (referred to as a “suitability curve”).
  - Examples of recreation activities that may be affected by flow or reservoir levels, including “motor boating, fishing, swimming, wading, rafting, canoeing, kayaking, inner-tubing, and aesthetic enjoyment.”
  - Recognition that evaluations (“preferences”) may be needed to assess how flows affect aesthetics. “Water features are often valued for their aesthetic properties. Beyond the mere presence or absence of water features, however, it also is possible to determine preferences for specific attributes of water features themselves (e.g., flow quantity, water clarity).”
A list of “possible causes of impairment” that includes 1) “direct dam effects such as river hydraulics, water depth, velocity, wetted perimeter, and turbulence;” and 2) indirect effects to “in-channel features such as sinuosity, sediment movement, channel movement, gravel bars, and beaches. Because of flow changes, there also may be changes to riparian vegetation, which, in turn, may affect the recreation experience.”

Example aesthetic impairments include “placing river flows through turbines,” and “other structural, operational, and indirect effects of dams on the senses. Growth and decay of aquatic plants; fish kills, boats, litter, and human or pet waste...and other problems contributable (sic) to dams or dam operations can affect taste, touch, smell, and sight.”

Recognition that evaluative information from recreation users is important. “A user-based survey provides an excellent means to get qualitative responses from the user community regarding river conditions. It also offers the opportunity to query users about other aspects of the recreational opportunity in addition to instream flow.”

Recognition of specific elements in a “comprehensive recreational flow study” as described in “Instream flows for recreation: A handbook on concepts and research methods” (Whittaker et al., 1993):
- Describe the resource.
- Determine which resource attributes are important to each subcategory of recreation use.
- Describe the hydrology—proposed, existing, and pre-project.
- Describe the relationship between flows and physical conditions in the project setting.
- Evaluate flow needs for specific opportunities (e.g., boating type, skill level).
- Integrate flow needs for various opportunities.
- Develop strategies to protect/provide flows.

Recognition that flows for recreation and aesthetics may need to be integrated with “flow needs for other values using an interdisciplinary approach. Some accommodation among uses will likely be necessary because it is unlikely that any flow can simultaneously optimize the needs of all uses.”

The importance of involving the public when allowing “potentially visually controversial facilities.”

Taken together, these guidelines require attention to recreation and aesthetic impacts of the proposed Project and suggest ways to collect and organize information. For the rest of the report, we assess these issues and whether the information assembled by the District or Ecology provides “reasonable assurance” that the proposed aesthetic flow regime adequately protects the area’s recreation and aesthetic beneficial uses.
Findings

This section of the report summarizes findings from our assessment of District and Ecology information and analyses. The findings are organized in three sections: the resource, information and analysis issues, and summary conclusions.

The Resource

Following from Whittaker et al. (1993, pp. 9-11) and the Ecology recreation and aesthetic guidelines for water quality standards (Ecology, 2005, p. 54), a comprehensive study should explicitly describe an area’s recreation and aesthetic resource values as a prelude to assessing potential impacts or developing protection, mitigation, or enhancement (PM&E) measures.

**Dam Falls and Similkameen Falls are aesthetic features**

The **Dam Falls** is a waterfall created by the Similkameen River flowing over Enloe Dam’s concave spillway and the natural bedrock on both sides of the channel. It produces a visually impressive “block falls” (Plumb, 1998), considerable sound, and mist (at higher flows). At 54 feet tall and about 280 feet wide at its crest, this is a large waterfall on a river with typical spring flows over 6,000 cfs (May-June median flows) and dry season flows over 500 cfs (median monthly flow in September, the driest month). The dam is 93 years old and the river has flowed over it continuously since 1958 (55 years), when the existing powerhouse was decommissioned.

The District and Ecology acknowledge the Dam Falls’ aesthetic benefits when discussing flows that will be provided during the 3.5 month high flow period (District 401 consultation meeting notes, Oct. 25, 2010; Ecology 401 Certification, 2012, p.9; Caldwell Biological Rationale for 10-30 cfs flows, Aug. 2012; Gangemi direct, p.20). They also concede the 10 / 30 cfs flow regime “dewaters” the dam during the no spill period (Demuth testimony, p. 6) and that this “would contribute little to the visible or audible values at the site” (Entrix, 2010, p. 23). Proposed PM&Es also include constructing a trail on river left specifically to view the falls, including interpretive displays with photos of water going over the falls so summer dry-season visitors can see what the falls would look like (Demuth testimony, p.7).

Is the Dam Falls part of the pre-Project condition that deserves protection? A parallel situation is providing flows to protect the non-resident fish populations that have developed in the plunge pool below the dam. Ecology is requiring flows to protect these fish resources, some of which might not exist without the dam or upstream reservoir (District analysis of bypass reach flows, Apr 2010). It is our opinion that the Dam Falls would have similar “standing” as an aesthetic resource.

**Similkameen Falls** is formed by the Similkameen River flowing over a horseshoe-shaped brink about 20 feet tall. At flows under about 1,500 cfs the falls is clearly “segmented,” (Plumb, 1998) with three distinct streams broken up by bedrock outcroppings. At unusually low flows some of these may become dry, and at higher flows the three channels merge and resemble a block falls. It is our opinion that Similkameen Falls is an aesthetic resource.

**Project effects on both falls.** During the roughly 8.5 drier months of the year, the proposed project would provide no flow over the Dam Falls, and only 10 or 30 cfs over Similkameen Falls. This eliminates the Dam Falls, and reduces Similkameen Falls to a relative trickle, 6% or less of median dry season flows.
(median monthly flows are higher than 500 cfs in Aug., Sep, and Oct). This clearly impairs aesthetic attributes of both falls, including the width of wetted channel; the depth/thickness of the plumes; the power, sound, and mist of the falls; and the presence of three segments in Similkameen Falls.

During the 3.5 months of higher water, flows would be reduced by up to 1,600 cfs. This eliminates the highest peak flows, and through the entire period would reduce the power in the river, the amount of mist, or the depth/thickness of the falls in comparison to the natural flow regime.

The plunge pool between the Dam Falls and Similkameen Falls is a third aesthetic feature in the bypass reach. It is unlikely to change as much as the two falls as a result of the Project, but if flows are too low, Ecology has acknowledged the wetted pool width could shrink in size by half (Entrix, 2010), which may create “ancillary aesthetic effects such as increased algae blooms with low flows (Ecology 401 consultation notes for July 1, 2009 meeting).

**Dam Falls and Similkameen Falls enhance recreation opportunities**

Literature shows that people enjoy flowing water in rivers (Shelby, Brown, and Taylor, 1992), and are often strongly attracted to whitewater cataracts and waterfalls in streams (Hudson, 2000). Waterfall viewing is a flow-dependent activity (Whittaker and Shelby, 2002), where the quality of experiences may be particularly reliant on the presence of higher flows (Hudson, 2002). Many other recreation opportunities are enhanced by aesthetics of landscape features such as waterfalls (Whittaker and Shelby, 2002). While activities such as fishing, hiking, or picnicking in a river corridor are often possible at low flows, it is clear that they can be enriched by nearby sights, sounds, and feel (mist) of falling water.

The Dam Falls and Similkameen Falls are dominant landscape features in the Similkameen River corridor between Nighthawk and Oroville, and are obvious attractions for visitors to the area (e.g., both falls are featured in the county brochure for the Similkameen River Trail). The District recognizes this when noting the public “will have the opportunity to enjoy flows much greater than the prescribed minimum instream flows during....periods of spring runoff” (Gangemi testimony, p. 18), and by proposing an interpretive trail as a PM&E measure specifically to view the falls with more water (or during dewatered times, to view interpretive displays showing photos of the falls with more water) (Demuth testimony, p. 7). This indicates the falls are a focal point and enhance recreation opportunities.

**Recreation values are higher and use is greater than District/Ecology characterizations**

At the same time they acknowledge the falls as attractions, the District downplays their importance to recreation users by suggesting that “Similkameen Falls is not the primary aesthetic attraction on the SRT,” “seasonal decreases in flows at the distant Similkameen Falls will not detract from visitors’ experiences or reduce visitor use” (Gangemi testimony, p 24); the site does not “represent a high value recreation resource,” and the “attraction of the area has more to do with the historical significance of human occupation and use rather than the falls” (Danison testimony, p. 13). Although no study has assessed the contribution of the two falls to overall recreation experiences, dewatering the Dam Falls and severely reducing flows in Similkameen Falls would clearly diminish the attractiveness of the area. We saw and talked to several visitors during our two-day field visit in Oct. 2012, and nearly all mentioned the falls or were observed taking photographs of them.
In a similar vein, the District downplays the level of existing and potential future use of the falls. Data from other waterfall viewing areas such as Idaho’s Shoshone Falls (Jones, 2011) and Yosemite Valley (Whittaker et al., 2012) shows higher flows often attract greater use and waterfall guidebooks commonly encourage visitors to view falls at higher flow periods (Plumb, 1998; Hudson, 2002). We expect similar effects would apply here. Based solely on our two-day site visit in late October 2012, we saw more use to the site than the 2006 recreation survey documented on most days during the peak recreation season, as well as considerable signs of use (e.g., user-created trails, user-created driftwood shelters, fishing litter, beverage containers, graffiti).

On the river left side, use is limited by the poor condition of existing access roads, lack of signs, and limited publicity about the site. A major finding from the recreation survey was visitor support for improved river access (District Recreation Needs Assessment, 2009). The project proposes improved roads and additional recreation development that includes a camping and picnic area, an interpretive trail to a falls viewing area, and connecting trails between them all. These will probably induce greater use than would be predicted from estimated population and demographic changes in the county and state (as predicted in the District Recreation Needs Assessment (2009)).

On river right, the opening of the SRT in 2011 has created considerably more use than in 2006 when the Danison recreation survey was conducted. We observed more use (5 vehicles parked at the Taber Trailhead at noon) over a four hour period on a cloudy cool weekday in late October than the 2006 study documented on most days in the peak season. Planned extension of the SRT allowing longer-distance hiking to Nighthawk and through-hiking on the Pacific Northwest Trail (PNT) would further increase this use (the PNT is a 1,200 mile Congressionally-designated National Scenic Trail (2009) connecting the Continental Divide in Glacier National Park to the Olympic Peninsula coast).

Finally, the potential for increased use from tourism is generally understated in District reports or testimony (Danison testimony). In contrast, the recreation survey documents that 65% of visitors to the area were from outside the county. This is a surprisingly high proportion for a resource the District claims is “remote” (Gangemi p. 14) or “represents a local recreational resource” (District Recreation Needs Assessment, 2009, p. 59). In contrast, a 21 mile rail-trail in York County PA (with close access to the Baltimore and DC area populations) attracts only 39% out-of-county users (York County Trails, 2007) and the Ferry County WA rail-trail survey reports only 9% out-of-county users (Ferry County Rail-Trail, 2013). The Project area already attracts a majority of use from non-locals, and the SRT is likely to accentuate that in the future (particularly given the proposed 40 year license of the Project).

**Recreation investment and development will induce greater use**

The North Okanogan Valley has 18 lodging and 10 camping areas (Okanogan Country, 2013), and regional tourism development is likely to continue growing over the length of the Dam’s license (40 years). In recent years the county has seen more growth in retail trade, accommodation, food services, and construction associated with real estate development than traditional agricultural, mining, and manufacturing sectors (Headwaters Economics, 2012). Okanogan County is actively developing recreation resources, including trails and nature viewing activities. The county has recently completed a Draft Recreation Plan (Okanogan County, 2012) that describes substantial investment in several area trails, including enhancing the existing SRT and extending it to Blackhawk as part of the PNT.

Across the border in Canada, the Okanagan Valley and the city of Osoyoos have been nurturing a reputation as the “Palm Springs of Canada” for the dry, warm climate and tourism (e.g., 26 hotels, 19
B&Bs, and 9 RV campgrounds in 2008) and retirement amenities (CanWest Media Works, 2013). As these resident and tourism populations grow, there may be increasing “spillover” visitation across the border that will add use from adjacent US Okanogan communities (Okanogan Country, 2012).

The SRT has already seen substantial investment, and the District has been a major contributor. The donated girder bridge had an estimated value of over $1,000,000 and cost about $10,000 in transaction costs, while the District apparently provided over $50,000 in in-kind value to resurface the bridge for trail use (Danison testimony, p. 12). This is admirable and indicates the District values the public benefits of these resources, but this is at odds with District claims that recreation use in the area is unimportant and unlikely to increase (FLA, Exhibit E.7, p. E.7-25, 2008). Initial total estimated costs for the 12.5 mile completed trail (not including the bridge’s value) are $1,200,000 (Okanogan County and BLM, 2011). In the County’s current Draft Outdoor Recreation Plan (2012), estimates for new projects associated with the SRT (or its extension) include $800,000 for acquisition and improvements, and $107,000 for a restroom at the existing Oroville Trailhead (Okanogan County and BLM, 2011). It seems unlikely that local communities would undertake such investments for unimportant resources or anticipated static use levels.

Finally, designations like the PNT and Greater Columbia Water Trail are likely to increase publicity for, attention to, and use of the area, as the District acknowledges in its Recreation Needs Assessment. This document, which includes revisions of the original recreation trends analyses in the DLA and FLA, concludes “the development of these trails would increase recreation visitation in the area, bringing in hikers, boaters, and possibly bikers. The director of Pacific Northwest Trails estimated that 1,000 hikers per year will use the trail once it becomes a National Scenic Trail and expects 300-400 hikers on the Oroville to Nighthawk segment during the first year it is developed” (District Recreation Needs Assessment, 2009, p. 44). If this prediction is accurate, it will nearly double annual recreation use in the area estimated in the 2006 study and FLA. This supports use of the District’s “high growth” scenario.

This information runs counter to Gangemi’s opinion (p. 6-7) about the limited appeal of the PNT and that “in the absence of [extension of the trail to Nighthawk], it is unlikely that visitation will increase substantially on the existing section of the trail in the near future.” First, it seems likely that the trail will be extended sometime during the term of the Enloe license (40 years). Second, we think the District is underestimating the power of long distance trail designations to induce occasional use of even fragmented trail segments. Gangemi predicts small numbers of “through hikers” on the PNT until the trail develops a reputation, but we think far greater numbers will seek shorter day or overnight trail opportunities on a designated long distance route (similar to how the Pacific Crest Trail and Appalachian Trail attract many more users than just “through hikers”).
Information and analysis issues

The District claims it has conducted sufficient analyses to address the flow-aesthetics issue, citing the “Bunn Memo” (Bunn, 2008) and aesthetic evaluations focused on buildings and facilities that included a simulation of “the view of the falls from near the pool below the falls” (Boettger testimony, p.30), discussed further below. Other information from the District or Ecology included a recreation user survey, random photos of the falls, estimates of costs of aesthetic flows due to foregone power generation, and water temperature analyses of 10 and 30 cfs flows. Specific information and analysis issues are described below.

Flow-aesthetics studies should produce a flow evaluation curve

Ecology’s guidelines for addressing aesthetic flow needs (Ecology, 2005) point to a curvilinear relationship between aesthetic quality and flow, and cite the need for such curves as discussed in Whittaker et al., (1993) and Whittaker and Shelby (2002). Gangemi elaborates and accurately describes the concept: “aesthetic flow research indicates a sharp increase in approval ratings of aesthetics in the low flow range but minimal change in ratings as flows transition from low to medium to high” (Gangemi testimony, p. 21-22).

We obviously agree, and have advocated that researchers, agencies, and stakeholders develop “flow evaluation curves,” sometimes called “suitability curves” (Whittaker et al., 1993; Whittaker et al., 2005). While it is preferable to develop curves from quantitative evaluations, we have also developed and used curves based on expert judgments. Curves make evaluations explicit and transparent, and become a focal point for stakeholder discussions about agreement/disagreement, suitable PM&Es, or tradeoffs between aesthetics and power generation or other resources.

Despite the District’s assertion that it has conducted flow-aesthetics analyses, neither the District nor Ecology has produced a single flow evaluation curve. The only time a curve is mentioned is when their expert tells us it is important, or the Ecology manual encourages their development.

Direct evaluations of actual or simulated conditions are most accurate

The most obvious way to develop a curve is to have experts, stakeholders, and/or users evaluate flows directly (Whittaker et al., 1993; Whittaker et al., 2005). Gangemi suggests this will not work for Enloe given 1) little ability to control flows for an onsite study, 2) the difficulty (“challenging if not impossible”) of representing lower flows with simulations, 3) limited user or stakeholder knowledge and sensitivity to flows; and 4) low recreation visitation (Gangemi testimony, pp. 4, 15-16). He also disparages the idea of having focus groups evaluate flows because he presumes they can only do so onsite (and the project cannot manipulate flows for onsite evaluations).

Gangemi confuses who should evaluate flows (focus groups are one choice) with what would be evaluated (onsite flows, actual photos, and simulated photos are three common choices). In any case, neither the District nor Ecology had anyone besides their “experts” evaluate any flows, and those experts’ judgments were flawed (as will be discussed below). Better evaluations typically involve more than one evaluator, reasonable visual representations of the appropriate range of flows, and flow evaluation curves to make evaluations explicit (these topics are further discussed below).
Evaluations from Upper Spokane Falls Study are a good example

It is surprising Gangemi didn’t see the applicability of a study he observed. The recent work at Upper Spokane Falls (CH2M Hill, 2010) provides an excellent example of methods for conducting flow-aesthetics studies (with some modifications necessary to fit the Enloe situation). We agree that Upper Spokane Falls is a higher profile resource with considerably more visitation than Enloe, but how many people benefit from improved flows is a secondary issue discussed later in this report.

The Spokane study evaluated a range of flows onsite and from photos (along with channel modifications to improve aesthetics). The falls at the bottom of the South Channel is about 20 feet tall and 105 feet wide in a bedrock channel similar to Similkameen Falls, and the study evaluated a range of flows including “leakage” (about 30 cfs) and 400 cfs in the South Channel. Figure 6 shows flow evaluation curves for South Channel, North Channel, and the entire falls taken together, based on photos taken as flows changed through the previous few months. The study suggests a reasonable range of flows to assess at Enloe (given a similar-sized channel and falls). It also shows that the 30 cfs leakage flow produced unacceptable aesthetic quality in a channel 105 feet wide, casting substantial doubt that the District’s proposed 30 cfs flow would be acceptable in a wider (145 to 200 foot) channel like Similkameen Falls.

![Figure 6](image)

**Figure 6.** Flow evaluations in Upper Spokane Falls from photos; example photos show 400 cfs (top) and 30 cfs (bottom) in the roughly 105 foot wide South Channel.
Photo evaluations of existing flows are possible for Dam Falls and Similkameen Falls

Gangemi asserts that Spokane-style evaluation techniques are not applicable at Enloe because the inoperative existing dam cannot control flows to produce photos that represent the relevant range (Gangemi testimony, pp. 4, 15-16). But the Similkameen has experienced natural flow variations over several years that offer opportunities to collect a range of photos. The District and Ecology conducted several studies of fisheries during low flow periods in 2006, and there have been other low flow periods since aesthetics became an issue in 2008 that offered opportunities to photograph a relevant range of flows. The District and Ecology did not systematically photograph these flows, or assemble other photos in their possession.

We have started this process (Figures 7 through 14) to show how it could be done. We began by collecting existing photos found on the internet, photos the District or Ecology produced during discovery (they withheld photos from Cultural Resource Work Group field trips, and photos from a low flow visit during preparation for this hearing). We also worked with a local resident in Oroville (Joseph Enzensberger) to take photos at a range of flows through summer and fall 2012.

![Figure 7](image1.png)

**Figure 7.** Dam Falls with unknown low (leakage) flow from 1950s (from Similkameen River Trail Facebook Page).

![Figure 8](image2.png)

**Figure 8.** 236 cfs on Sep 12, 2006 (from District fish studies).
**Figure 9.** About 365 cfs on Oct. 14, 2012. From Joseph Enzensperger.

**Figure 10.** About 500 cfs on Sep 8, 2012. From Joseph Enzensperger.

**Figure 11.** About 365 cfs on Oct 14, 2012. From Joseph Enzensperger.

**Figure 12.** About 423 cfs on Sep 18, 2012. From Joseph Enzensperger.

**Figure 13.** About 600 cfs on Oct 19, 2012. From Tom O’Keefe.

**Figure 14.** About 1,360 cfs on Nov. 15, 2012. From Joseph Enzensperger.
Photo simulations are possible for other important flows

Gangemi correctly points out that photos in the natural range may not be sufficient to assess aesthetics of lower flows (the proposed 10 / 30 cfs flows are far below the lowest flows on record of 120 to 150 cfs, which generally occur during winter freezes). But Gangemi is too pessimistic about simulations of these flows (which he labels “photo montages”).

Using information from the lowest flow photos we have found, plus other information about wetted channel widths at different flows, we have developed simulations of both falls to illustrate lower flows or different release options (Figures 15-18). They include:

- A dewatered Dam Falls and Similkameen Falls as initially proposed by the District in the DLA (2007) as described by Boettger testimony (p.25).
- A dewatered Dam Falls with the new crest gates as proposed in the 401 Certification, with 30 cfs in Similkameen Falls.
- 30 cfs in Similkameen Falls as produced by a “thin stream” down the face of the dam as discussed in consultation meetings between Ecology and the District (District 401 consultation meeting notes, Oct 11, 2010).
- 120 cfs flow in Similkameen Falls and over one-third of the Dam Falls. This approximates the lowest natural flow recorded, provided as a release over part of the Dam Falls as discussed in summary of Bypass Flow Technical Memorandum (Entrix, 2010, p. 20).

These simulations were based on careful scrutiny of existing photos at known flows, expert judgments about how water would be distributed through the rocks of the falls, modeling information from the Bunn memo, and limited onsite measurements during our October 2012 site visit or those reported from District or Ecology fieldwork. They are provided as reasonable illustrations of the technique, not the ultimate depictions one might employ if charged with conducting a study (the accuracy of these simulations could be improved with onsite measurements at low flows and basic modeling of water surface elevations). We would collaborate with stakeholders while developing simulations, explaining why simulations depict different flows as they do, and developing consensus about the simulations that are ultimately used.

It is more challenging to simulate flows that are farther from those in existing photos, or that represent smaller contrasts. However, we are confident simulations can distinguish flows “about 30 cfs” from those “about 120 cfs,” which can be compared to existing photos and limited measurements at about 265 cfs (and higher). This is sufficient to develop a reasonable flow evaluation curve, which is the goal. The result may not be perfect, but it is better than complaining that the task is so difficult, construction should proceed with no information about aesthetics of the 10/30 cfs flows the Project proposes to deliver (Gangemi testimony, p. 16).
Figure 15. Simulated photo of Dam Falls and Similkameen Falls with 0 cfs flow (proposed in DLA).

Figure 16. Simulated photo of 0 cfs over Dam Falls and 30 cfs over Similkameen Falls.

Figure 17. Simulated photo of 30 cfs in “thin stream” over Dam Falls and 30 cfs over Similkameen Falls.

Figure 18. Simulated photo of 120 cfs over one-third of Dam Falls and over Similkameen Falls.
Empirical ratings can be used to produce flow evaluation curves

With an array of photos through the appropriate range, one can systematically evaluate those flows. Quantitative evaluations on an acceptability scale provide a commonly-used format that has been well-tested (Whittaker et al., 1993; Whittaker and Shelby, 2002). The evaluators could be experts, a focus group or panel of stakeholders, recreation users, or even the general public. In all cases, evaluations become transparent and are put on an empirical basis. Analyses and graphics can help assess similarities or differences among evaluators.

We have provided our own evaluations of the photos and simulations we assembled for the Dam Falls and Similkameen Falls (Figure 19). We used the same evaluation scale as in the Upper Spokane Falls study, which included a 7-point acceptability scale (with a “marginal” mid-point), along with three higher evaluations (“good,” “excellent,” and “outstanding”) to acknowledge that the aesthetics of very high flows are outside the range at issue.

Results show that flows of 30 cfs are rated unacceptable for both falls, because they cover only a small proportion of the bottom of the channel, provide little depth or power, and are unlikely to produce much sound or mist. For the Dam Falls, evaluations improve substantially through 240 cfs, where a 2006 photo shows good coverage across the entire dam and some power in the falls. Above this point, coverage and power in the Dam Falls does not improve as dramatically through 700 cfs (the highest flow we have personally seen on site). The curve shows that flows over the Dam Falls become marginally acceptable about 175 cfs, and are moderately acceptable (6 on the scale) by 250 cfs.

At Similkameen Falls, flows are concentrated in deeper channels and it takes more water to spread out across the full width of the channel. As the literature would predict, however, ratings improve substantially as the three channels fill and water falls over more of the horseshoe-shaped brink. The curve shows that flows over Similkameen Falls become marginally acceptable about 350 cfs, and are moderately acceptable (6 on the scale) about 450 cfs.

Readers need not agree with our evaluations or the curves they produce, just as one may not agree with the District’s expert (Bunn), Ecology’s expert (Caldwell), or the expert-based VRM evaluations of facilities. But our evaluations are transparent and are offered as only one of several that should be collected, unlike evaluations from Ecology and the District which are difficult to assess and essentially presented as a fait accompli. Showing evaluations for specific flows (and the full curve connecting them) invites stakeholders to make their own ratings and discuss similarities or differences.
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Figure 19. Whittaker and Shelby’s expert judgment flow evaluation curves for the Dam Falls and Similkameen Falls based on photos and simulations.

Collaboration can be used to improve evaluations

A goal in an aesthetic study is to represent evaluations of all relevant groups. In a low controversy situation, a single expert’s opinion may be sufficient, but in more contentious settings it makes sense to involve concerned stakeholders and possibly recreation users or the general public. This allows empirical analysis to explain similarities and differences.

In the Upper Spokane Falls study (CH2M Hill, 2010), which evolved from a settlement of 401 certification litigation, 22 stakeholders formed the evaluation panel. There was representation from the utility, state and federal agencies, several non-governmental organizations (including CELP, a party to this litigation), and consultants for various “sides” concerned about the issue (including ourselves and John Gangemi). In quantitative evaluations and focus groups, there was considerable agreement about the aesthetic evaluations for different flows. Focus group discussions were particularly powerful in creating transparency (opinions were on display and ratings had to be explained).

Gangemi dismisses the focus group approach without seeming to recognize the collaborative value of this process. Convening stakeholders with potentially opposing views, evaluating photos and simulations together, and learning about similarities and differences is what’s important. Neither the District nor Ecology ultimately pursued this direct approach, even though they considered the idea in July 2009 (Ecology consultation meeting notes for July 1, 2009).
Other examples of waterfalls over dams with aesthetic flows

Aesthetic flows for a dam are not unprecedented; other minimum-flow bypass reaches produce waterfalls over dams. For example, 200 cfs is required during daylight hours over Lower Spokane Falls, where part of the falls is formed by the diversion dam (Figure 20). At Post Falls on the Spokane River in Idaho, 46 cfs is required on weekends during the summer over a combination of dams and natural falls. For the Upper Collinsville Project on Connecticut’s Farmington River, a suitability study (GZA GeoEnvironmental, Inc., 2011) recommends minimum flows over the scenic low head dam that maintain a 6 inch “veil flow” in spring and a 2 inch veil flow during the drier parts of the year (reducing turbine design flow by 500 cfs).

![Figure 20. Monroe Street Dam/Lower Spokane Falls at low (left) and high flows (right).](image)

Traditional desktop recommendations

An instream flow specialist for WDFW (Beecher) calculated instream flow recommendations for the bypass reach based on traditional desktop methods (Tennant, 1976; Hatfield and Bruce, 2000). Primarily focused on fish habitat concerns, the Tennant Method provides “rule of thumb” estimates of flow needs as a percentage of a river’s mean annual flow (e.g., 30% is good habitat, 60% is excellent to outstanding” etc.). Tennant has claimed that the 30% and 60% estimates are also relevant for general recreation uses, a simple idea that has some usefulness (Whittaker et al., 1993; Shelby and Jackson, 1991).

For the Similkameen with a mean annual flow of 2,238 cfs (at Blackhawk gage), Beecher identifies “severe degradation” and “poor or minimum” habitat would occur below 228 cfs, and flows between 457 and 1,826 cfs provide “fair,” “good,” “excellent,” “outstanding,” or “optimum” conditions in different seasons (Beecher, 2009). The Tennant 30% and 60% rules for recreation come to 671 and 1,370 cfs respectively. Beecher also cites flows from Ptolemy (20% of MAF or 457 cfs) and Hatfield and Bruce (475 cfs to 800 cfs for different life stages of rainbow trout). Beecher recommends 465 cfs minimum, plus some diversity of flows through the year.

Desktop “rule of thumb” estimates are easy to calculate and help suggest a range of flows to consider, but more specific information usually improves recommendations. That said, these flows are
considerably higher than the District’s 10 / 30 cfs proposal, and they fit with physical characteristics of the bypass channel (where it probably takes 450 to 700 cfs to fill the bottom of the channel). This also fits with Ecology’s “toe-width method,” which uses a single cross section to estimate the flow that covers the full bottom of the channel (the width of the channel from the toe of one bank to toe of the other) (Ecology and WDFW, 2003). This can’t be confirmed because Ecology did not conduct a cross section (they tried, but didn’t have the right equipment on the days they visited) (Interrogatory response from Ecology, Dec 5, 2012).

In any case, it appears that Beecher was persuaded to focus on narrower fish issues and ignore aesthetics (cite emails that document). In general, flows higher than the 10/30 cfs proposal apparently cost too much in foregone power generation revenues given the District’s pre-determined PM&E package (Boetgger testimony, p. 33-34).

The District claims two “aesthetic analyses” address flow issues

1. **Bunn Memo (2008)**
   Calling this an aesthetics study is probably a misnomer. It is actually a memo with two pages of text, three modeling/engineering references, a one-page modeled cross section, and four pages of hydrographs. It appears that no fieldwork was conducted for this analysis, and there is no evidence that the memo reached Ecology (they were asking for cross section information in July 2009; Ecology 401 consultation notes July 1, 2009).

2. **Aesthetic Resources Study (2008)**
   This more elaborate study (28 pages in FLA appendix) focused on landscape-level assessments of how proposed project facilities (e.g., fences, buildings, dam, tailrace, transmission lines) will look. This is important, but not relevant to aesthetics of flows over the Dam Falls or Similkameen Falls.

**Bunn Memo analysis of Dam Falls aesthetic flows is theoretical, has no aesthetic criterion**

The District accepted some responsibility for providing aesthetic flows over Dam Falls, asking Bunn to calculate a minimum flow to accomplish this. Using office-generated engineering calculations based on weir formulae (and no field measurements), Bunn estimated the flow it would take to cover the dam at a depth of 2.4 inches and provide “nappe separation” (aeration to make the water turn white; see Figure 21). There is no rationale for the implicit aesthetic criteria used here. Why is 2.4 inches over the dam a suitable depth? Why is minimal nappe separation “aesthetic?”

In spite of this opacity, it is interesting that Bunn’s criteria (a uniform depth of 2.4 inches and aeration) result in his version of “the amount that it takes to cover the bottom of the channel” (in this case, the dam face). By his calculations, 80 cfs will accomplish this, but even that flow was apparently too high,
and dropped from further consideration by the District. In addition, there is no evidence that Ecology saw or heeded information in the Bunn Memo.

**Bunn Memo analysis of Similkameen Falls aesthetic flows is not based on field measurements**

The Bunn Memo presents a channel cross section and then models water surface elevations for 20, 40, 80, 120, and 300 cfs flows. In citing this as an important analysis, Gangemi assumes the cross section came from an onsite measurement. However, Bunn recalls building cross section data from a satellite-based contour map, and could not specify the location of the cross section (aside from “perpendicular to the current” (personal communication, 2013). Given the horse-shoe shape of the brink of Similkameen Falls, the tangent that represents the cross section is obviously important. This makes all subsequent analysis highly theoretical and potentially inaccurate. For example, the Bunn Memo shows all three deeper channels have water at 80 cfs and 120 cfs, but photos from 236 cfs in Sep 2006 show no water in the river right channel.

**Bunn Memo for Similkameen Falls uses a questionable aesthetic criterion**

The Bunn memo says even the lowest flows produce visible whitewater, implying (with no citation or rationale) this is some sort of aesthetic standard. Gangemi agrees by asserting that “flows with contrasting visible differences such as turbulent water (i.e., whitewater) would be present for viewing even at very low flows – at flows lower than 30 cfs flow (sic) that is currently proposed….based on these results….aesthetic flows were not an issue in the bypassed reach” (Gangemi testimony, p. 10). This “white water” criterion is not based on any literature we know of, it does not fit with the “cover the bottom of the channel” rationale in the literature (Whittaker & Shelby, 2002), and is not supported by “totally unacceptable” evaluations of 30 cfs leakage flows at Spokane Falls. One can produce visible water that is white from a faucet discharging 2.2 gallons per minute, which is only 5/1,000s of a cfs.

**Bunn’s Similkameen Falls modeling shows 30 cfs wets very little of the channel**

Even given the flaws in this desktop technique (see above), the Bunn memo indicated that lower flows fill very little of the channel. Figure 22 shows the modeled cross section (looking downstream) near the brink of the falls with Bunn’s estimates of how 20, 40, 80, 120, and 300 cfs fill the channel (blue lines). Figure 23 shows the water surface width of filled channel for each flow. The green line has been added to show the water surface width when all the mid-channel rocks are covered (147 feet wide, with the falls about 19 feet above the lower pool), and the blue line has been added to show the width at roughly the ordinary high water channel (about 196 feet wide, with the falls about 21 feet above the lower pool).

Bunn’s results show that 30 cfs would produce a stream above the falls only about 12 feet wide, while 120 cfs would be about 39 feet wide, and 300 cfs would be about 99 feet wide. These data show substantial improvements in “filling the bottom of the channel” with each of the flow increments, suggesting that aesthetics are increasing substantially based on this criterion from the literature. We think modeling higher flows would show smaller gains in channel coverage from 450 to 650 cfs (illustrated by the dotted purple line). This analysis would benefit from including a typical low flow of 500 cfs, which is a more useful reference point than 300 cfs (the 95% exceedence level) for the issues under consideration here.
Figure 9. Bunn cross section for 20, 40, 80, 120, and 300 cfs with channel widths at key water surface elevations.

Figure 10. Graphing wetted channel widths vs. flow from Bunn Memo results.
Monetary costs of providing flows are not aesthetic criteria

The Bunn Memo calculates the costs of providing 20, 40, and 80 cfs for 12 hours per day from July through October (Bunn, 2008). This shows the District is interested in the monetary costs of aesthetic flows, but does not show how the information is to be used. While the assumptions in those calculations are different from the District’s current proposal, calculations show that 80 cfs would cost about $53,500 annually. This is apparently too high, given the 30 cfs and shorter mid-July to mid-September time period in the District’s pre-determined PM&E package (Boetgger testimony, p.33-34).

Monetary costs are important, but they are not the appropriate criteria for evaluating aesthetics of flows. The initial goal of a flow-aesthetic study is to determine how aesthetics change through the flow range. After specifying acceptable aesthetics, a second level analysis focuses on the tradeoffs of providing flows for different resources including aesthetics, recreation, fish, or power generation.

Aesthetic flows need not be available 24-7 to benefit visitors, so there may be creative ways to provide aesthetic flows that minimize lost power, or avoid temperature impacts to fish. The District/Ecology show some interest by considering options for engineering smaller releases (District Nov. 10, 2010) and providing aesthetic flows for shorter periods (e.g., holidays and weekends) (Pratt, May 11 email to Pat Irle, 2009), but these are eventually dropped without explanation of effects on aesthetics. It is challenging to develop such alternatives without knowing the flow-aesthetics relationship.

Landscape level evaluations of facilities are not relevant for aesthetics of flows

The District conducted a landscape aesthetics analysis using the BLM VRM system (District FLA Aesthetics appendix, E8, 2008). This is an expert-based system that rates natural and human-built features at the landscape scale (foreground is 3 to 5 miles) and then assesses the degree of contrast. “Key Observation Points” (KOPs) are used in a desktop analysis that determines which facilities are visible from those places. This is useful for assessing proposed facilities (buildings, fences, transmission lines, etc.), but it did not address aesthetics of flows over Dam Falls or Similkameen Falls. Several issues are listed below for completeness.

- Several simulations show considerable (but unspecified) flows over Dam Falls and Similkameen Falls, even though those flows would not be present 8.5 months of the year.
- The landscape evaluations were conducted by a single expert, and involved no input from stakeholders, users, or the public.
- There are no KOPs on the river right side, where the new SRT and the planned SRT extension provide Falls viewpoints important to visitors.
- Of all the simulations, only two show potential altered flows, and these are only for the dam. There are no simulations of 10 or 30 cfs in Similkameen Falls.
- The VRM system’s focus on landscape-level evaluations with a foreground scale of 3 to 5 miles is too far away for assessing flow differences in Dam Falls and Similkameen Falls.
- Some of the photo simulations were unrealistic or used questionable base photos. Examples include:
  - No depiction of the proposed flow valve and 70-foot arcing water jet that would provide 10/30 cfs flows.
o Inaccurate location of the tailrace in the simulation for KOP 7 (District, May 29 supplemental information on Visual Resources, p. 8), compared to the top view schematic of the proposed Project.
o Waterfalls at the end of the tail race which probably will not be present (because head would be lost).
o Water going over a log jam in the tailrace.
o Dam crest gates missing (except some shown in one simulation).
o Snow or ice in base photos (when most recreation use will occur in warmer seasons).
o No “water stains” or algae blooms on the dewatered dam face from potential crest gate leakage (the District estimates 2 cfs).

These flaws give reason to question the landscape evaluations, and recognize they are no substitute for direct evaluations of a range of flows over the Falls. Agencies and NGOs drew similar conclusions in their comments (BLM, 2008; NPS Feb and Oct, 2008; Hydro Reform Coalition, 2012).

2006 Recreation survey issues

The District conducted the Danison recreation user survey in the summer in 2006 (Danison testimony). Findings were adequately summarized in a report that was included in an appendix of the FLA. Findings appear useful to profile existing use and describe some additional recreation management issues. But the study had some weaknesses and didn’t directly address flow-recreation issues, summarized below for completeness.

• Low existing use in 2006 on the river left side is not surprising given poor access to the site. The roads to the dam parking area are rutted, can be wet in spring and early summer, and are poorly signed.
• The study showed little use along the abandoned railroad grade on river right because the bridge across the river was not public and the SRT did not exist (it opened in 2011).
• The survey ignored potential winter and spring use. Current access is poor in winter, but the SRT provides winter recreation opportunities.
• The survey did not include “viewing the falls” in the list of recreation activities in the area or directly ask about their importance as attractions, providing no basis for Gangemi’s or Danison’s assertions that the falls are unimportant to current users.
• The survey had no evaluative questions about...
o Aesthetic evaluations of specific flows (from photos or simulations) for the two falls.
o Changes in development levels from new project buildings, inlet, tailrace, transmission lines, or fences that may frame the landscape in which flow-aesthetics evaluations might be made.
• There were no questions about favored seasons, days of the week, or times of day, which might help determine when aesthetic flows should be provided (if given a water budget).

In spite of these flaws, the survey documented that 65% of visitors are tourists (people who live outside the county). It also showed considerable diversity in recreation activities, and documented substantial support for additional access to the river.
Flow aesthetic issues were raised in sufficient time to address the issue

The District’s Cultural Resources Work Group raised the issue of flow-related impacts on aesthetics in spring 2007 (Demuth direct testimony, p. 9). Several stakeholders and agencies registered stronger concerns and requested specific studies about the issue after reviewing the DLA in November 2007 (NPS, Feb. 2008; DNR, 2008; BLM 2008). A year and half later (July 1, 2009 401 consultation meeting notes) indicate that direct evaluations of flows in photos or simulations were contemplated by District and Ecology, Demuth’s testimony indicates that landscape aesthetics concerns led to additional PM&Es (e.g., the interpretive trail to a falls viewing area with interpretive displays showing photos of the falls with water in them). This suggests that the District and Ecology had sufficient time to conduct better evaluations or collaborate with stakeholders about aesthetics issues.

It is common in a Traditional Licensing Process for the utility to develop and then support some ideas about impacts and the size of PM&E packages that would address them. The problem comes when stakeholders don’t learn about specific project proposals or recognize an important impact until the DLA comes out. By this time, a pre-determined PM&E package may have been worked out, and it is more challenging to bring in other measures (as related by Boettger (p-33-34). In the Enloe case, it seems that several agencies and NGOs did not discover how low the minimum flow would be until the DLA, and they immediately asked for more information about impacts on aesthetics. The District has consistently refused to conduct the obvious aesthetics study, presumably because they are unwilling to consider any flows higher than the proposed 10 / 30 cfs regime. They have instead defended the predetermined proposal.
Summary conclusions

1. Flows have a profound effect on the aesthetics of Dam Falls and Similkameen Falls.
2. The proposed 10/30 cfs flow requirement does not protect the aesthetics of Dam Falls or Similkameen Falls. Thirty cfs is a 94% reduction of the 500 cfs natural low flow typically found during dry months of the year, and doesn’t come close to filling the bottom of the channel. A flow evaluation curve based on photos of Similkameen Falls (produced in this report) shows that marginal aesthetic flows start at about 350 cfs and become totally acceptable by 450 cfs; for the Dam Falls, marginal aesthetic flows start about 150 cfs and become totally acceptable by 350 cfs.
3. The District studied some flow-related issues, including fisheries, water temperatures, and monetary costs. Although important for other issues, these analyses failed to address the effects of flows on Dam Falls and Similkameen Falls, and are therefore beside the point.
4. Agencies and stakeholders identified aesthetics of flows in the bypass reach as an issue, and specifically requested studies that evaluated relevant flows based on visual representations (such as photos). This was done at a reasonable time in the FERC and 401 Certification processes.
5. Ecology has required minimum flow conditions for aesthetics on other projects based on information from appropriate studies.
6. Although the District responded to some requests for information regarding aesthetics (e.g., by producing additional simulated photos of facilities), they refused to conduct a study that directly evaluated aesthetics of the appropriate range of flows based on reasonable visual representations.
7. An appropriate flow-aesthetics study for the Dam Falls and Similkameen Falls would include flow evaluations of a reasonable range of actual or simulated photos of different flows, output in the form of flow evaluation curves, and stakeholder involvement.
8. The District produced two documents regarding aesthetics, but one was an office/engineering formula-based memo and the other was focused on landscape-level assessments and facilities. Neither specifically evaluated aesthetics of the appropriate range of flows in Dam Falls or Similkameen Falls using reasonable visual representations.
9. As mitigations for dewatering Dam Falls and Similkameen Falls, the District has offered spill flows mostly outside of the peak recreation season, a trail and Falls viewpoint on river left, and interpretive signs with photos of water going over the falls (so summer dry-season recreation visitors can see what Dam Falls and Similkameen Falls should look like). These are poor substitutes for the aesthetic benefits provided by flows over the Dam Falls or Similkameen Falls.
10. Dam Falls, Similkameen Falls, and the surrounding area are important recreation and aesthetic resources. This conclusion is obvious at face value when visiting the site, but it is supported by investments in the area (such as the Similkameen River Trail) and the local and regional commitment to recreation and tourism. The continued development of the SRT on river right, plus any improvements to access or recreation facilities on river left, will increase the use and value of these resources.
11. It is important to “balance” uses of river flows, but only as a second-level assessment after we know how each resource is affected by flow. The District and Ecology pre-determined the adequacy of the 10/30 cfs flow regime without documenting the effects of flows on aesthetics of Dam Falls and Similkameen Falls, and then refused to seriously consider other aesthetic flows in the reasonable range.
12. In “balancing” uses, knowing how flows affect aesthetics of Dam Falls and Similkameen Falls allows realistic assessment of trade-offs. For example, if 350 cfs produces higher quality aesthetics, it is possible to consider appropriate seasons, days of the week, or times of day that would best utilize a “water budget.”

13. A new study focused on aesthetics could determine effects of flows on Dam Falls and Similkameen Falls, and how these falls fit into the broader context of recreation resources in the area.
Appendix A. Qualifications to testify

Names and occupations of researchers

Bo Shelby
Professor, Department of Forest Ecosystems and Society, College of Forestry, Oregon State University
President, Confluence Research and Consulting
3600 NW Thrush, Corvallis, Oregon 97330

Doug Whittaker
Senior researcher and planner, Confluence Research and Consulting
6324 Red Tree Circle, Anchorage, Alaska 99507

Summary of experience and qualifications

Confluence Research and Consulting conducts studies or planning projects related to natural resource use and management, often with a focus on recreation in river settings. The firm’s researchers, Bo Shelby and Doug Whittaker, have been involved in more than a hundred recreation studies or planning projects for federal, state, local, non-profit, or private organizations across the country. They have also been expert witnesses in judicial proceedings, and have conducted training programs on flows and recreation, recreation planning, and river management for multiple local, state, and federal agencies.

CRC has particular expertise with flows for recreation and aesthetics, navigability determinations, visitor impact management, and capacity in river recreation settings. In conducting projects, they have developed and applied “state-of-the-art” concepts and planning frameworks; developed or improved methodological approaches; and applied findings to help make better management decisions.

Skills include: study plans; field reconnaissance; surveys and associated databases; statistical analyses of social and resource data; clear graphics of critical findings; presentations that highlight implications of critical findings; report writing; meeting facilitation; and working within complex and contentious decision processes that involve multiple stakeholders and agencies.

Bo Shelby, PhD. has over 35 years of research experience studying natural resource use and management, and has published hundreds of reports and journal articles. He is nationally recognized as a leading recreation researcher, well known for his work on capacity, visitor impacts, recreation use conflicts, and instream flows for recreation. Dr. Shelby is a professor in the Department of Forest Ecosystems and the Natural Resources Program at Oregon State; he has a PhD. in sociology from the University of Colorado. He is based in Corvallis, Oregon. A complete CV is available separately.

Doug Whittaker, PhD. has over 25 years of experience working on natural resource issues as an outdoor recreation planner with the Bureau of Land Management and National Park Service or as a researcher/consultant. He has published dozens of reports and journal articles, and has made presentations at symposia and conferences across the country. His work is focused on instream flows for recreation, navigability, capacities in recreation settings, crowding, use conflicts, and attitudes toward urban wildlife. Dr. Whittaker has a PhD. in human dimensions of natural resources from Colorado State University. He is based in Anchorage, Alaska. A complete CV is available separately.
Summary of involvement in this project/hearing process

Whittaker and Shelby were first contacted in mid-May 2012 but were not engaged at that time. They received an introductory email about the project and some related information on August 16, 2012 from Rich Bowers, CELP member. A scope of work for the project was first initiated on August 23, 2012. They began reviewing documents and/or conducting interviews with people familiar with the site shortly afterward. Whittaker and Shelby visited the Similkameen River in the vicinity of Dam Falls and Similkameen Falls on Oct 18 and 19, 2012.
Appendix B. Exhibits

To be supplemented at the close of discovery.
References


BLM. Oct 31, 2008. Letter from DOI BLM to FERC with comments on District’s FLA.

Boettger direct testimony in this hearing.


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GZA GeoEnvironmental, Inc. 2011. Upper And Lower Collinsville Dams Hydroelectric Project Town Of Canton, Connecticut Pre-Feasibility Study for Re-Powering the Upper and Lower Collinsville Dams along the Farmington River.


Jones, A. 2011. Review of the economics of restoring hydropower at Enloe Dam on the Similkameen River. Analysis Of The Public Utility District No. 1 Of Okanogan County’s Final License Application For


Pratt, J. May 11, 2009. Email exchange between Jeremy Pratt and Pat Irle (and others) regarding revenue effects of potential aesthetic flow release.


USGS. 1928-2012. Flow information from gage Number 12442500 Similkameen River near Nighthawk, Wa.

