

## APPENDIX G

### RIVER GRAVEL QUANTITY STUDY CONSULTATION MEETINGS AND DOCUMENTS



**RIVER GRAVEL QUANTITY STUDY  
LIST OF AGENCY CONSULTATION MEETINGS**

<b>Date</b>	<b>Agenda</b>	<b>Attendees *</b>
11/10/83	Confer on river gravel quantity, and consultant proposal evaluation and selection	NMFS, USFWS & WDG
12/16/83	Discussion of study scope of work and biological requirements for salmon and steelhead	NMFS, WDG & WDF

**RIVER GRAVEL QUANTITY STUDY  
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\* WDF--Washington Department of Fisheries; WDG--Washington Department of Game (now Wildlife); TT--Tulalip Tribes; NMFS--National Marine Fisheries Services; and USFWS--U.S. Fish and Wildlife Service.



PUBLIC UTILITY DISTRICT No. 1



2320 California St., Everett, Washington 98201

258-8211

Mailing Address: P. O. Box 1107, Everett, Washington 98206

January 9, 1984  
PUD 14002

Mr. Jon Linvog  
National Marine Fisheries Service  
7600 Sandpointe Way  
Seattle, Washington 98115

Mr. David Somers  
Fisheries Biologist  
Tulalip Tribes  
6700 Totem Beach Road  
Marysville, Washington 98270

Mr. Gary Engman  
Wildlife Project Leader  
Washington Department of Game  
509 Fairview Avenue, North  
Seattle, Washington 98109

Mr. Robert Gerke  
Washington Department of Fisheries  
3939 Cleveland Avenue  
Tumwater, Washington 98504

Mr. Martin Kenney  
U. S. Fish and Wildlife Service  
2625 Parkmont Lane, S.W. Bldg. B-3  
Olympia, Washington 98502

Gentlemen:

Sultan River Project  
Anadromous Fish Mitigation Study  
Gravel Quantity

Prior to consummating a contract with the firm selected to do the Gravel Quantity Study, GeoEngineers, you requested a meeting with the consultant. The notes that I took of that meeting held on December 16, 1983 are recorded on the enclosed copy.

The contract was signed on January 5, 1984 and notice to proceed was issued concurrently. The consultant is planning to begin immediately, or rather as soon as favorable weather conditions permit helicopter reconnaissance.

I will keep you advised on field work opportunities based on GeoEngineers' schedule as it evolves.

Very truly yours,

R. G. Metzgar  
Sultan Project Coordinator

Enclosure

cc: GeoEngineers - J. Miller  
R. F. Vine

bcc: G. Mixdorf  
Williams, Novack and Hansen

Meeting Minutes - Anadromous Fish Mitigation  
Sultan River Gravel Quantity Study

DATE: December 16, 1983 (0930-1045)

PLACE: Geo Engineers, Inc., 2020 124th Avenue N. E., Bellevue WA

ATTENDEES: List Attached

1. Purpose

The District has fish mitigation study obligations. Some of the Joint Agencies have reviewed proposals on the gravel study. The District and contractor have completed negotiations on the potential scope of services. Prior to signing and proceeding the agencies had requested an opportunity to meet with the contractor for study scoping discussion. Metzgar distributed copies of the scope of services (copy attached).

2. Role of the Contractor

Miller explained his perception of the contractor's role in the study and the specific tasks. GeoE will be doing field work and sampling; Hydra will do technical analysis of sediment transport; and Wert will provide fisheries information and expertise.

Miller stated that the study won't be straightforward in that the Sultan River is a sediment deficient system. (Meaning, as explained later, that from a sediment bedload transport mathematical formulas and models design perspective, the river system doesn't transport enough material to yield accurate numbers.) Thus, no off-the-shelf equations or models are directly applicable. A scheme will have to be devised which approximates the system. They will be looking for things that will be adverse to spawning habitat.

What was the difference between the scope of services in the initial proposal and the revised one?

Metzgar replied primarily financial.

Which technique has been or will be selected?

Miller replied that selection will depend upon an evolving process with field work. It will probably be a combination. Tubbs added that while he and Tom Dunne have worked on other areas in the Snohomish Basin, they are not familiar with the Sultan River. They need a field survey. It will depend upon what's going on: What's the most appropriate technique?

## 2. Role of the Contractor (Continued)

Miller stated three basic parameters for designing their scope of study and subsequent field work and site selections:

- 1) channel armoring and scouring downstream from the powerhouse;
- 2) burial of gravel recruitment sources; and
- 3) change of gradation in the gravel spawning mix.

Seasonal timing of transport and availability of gravel were also mentioned.

What about the literature search for remedial measures?

Miller replied this will be based upon knowledge of what's been done in the past. Metzgar amplified that the specific task was deleted from the scope of study as a cost item. It is, however, still within the overall study plan. It was premature to provide funding for it. Also, study results may point out obvious or specific things.

Miller added that what's been done in the past could be the model, if needed. Several factors need looking at: high discharge; specific spill; tributary delta build-up; lack of turnover; damming of tributaries; and flood control.

Project flood control was discussed briefly, including speculation on project effects on sediment and water quality. Linovog stated that they'd prefer the flood control proposal be left open until study results were available. Ideally, the results should be available before stating their position.

Bruyn inquired about advance notice and coordination on study activities and availability of consultants for information exchange. Interest was also expressed in review of study site selection and advance notice on field reconnaissance and field work.

Metzgar replied that it must be clear who the consultant is working for (the PUD) and receiving direction from only one entity. Also, participation by the Joint Agencies should avoid interfering with the work and schedule. The Joint Agencies will be notified through the PUD of the Contractor's tentative schedule for their participation, if they wish to do so with the conditions stated.

## 3. Diversion Dam

Discussion about potential sampling sites led to coverage of the role of the diversion dam. Miller indicated that the emphasis of the study would be on spawning areas. This dam is a system modifier and the implications need to be calculated, but the focus is effects on the gravel transport system and implications to fish.

4. Agency Review of Report

Linvog inquired about reviewing the report. Metzgar replied that a review period was scheduled for the draft report prior to submitting it to the FERC.

5. Steelhead Spawning Sites

Wert asked about the previous field surveys (file reports) conducted on steelhead spawning. He wants to obtain that information for this study. Engman responded that he would search for the material indicating problems with retrieving it due to the recent WDG office move and the storage system.

6. Work Schedule

Koloski pointed out that there will be some lag time between the proposal and start of work. Metzgar checked with PUD Contracts Management and the contract requires Commission approval. The earliest that can/will occur is January 3rd. Contract signing and notice to proceed can occur after that.

Attachments (2)

RGM:cw  
1-4-84



## ATTACHMENT A

### SCOPE OF 1983-84 SERVICES

1. Detailed review of existing data base, including stream reach mapping, aerial photography, spawning surveys, textural analyses of spawning gravel, suspended sediment records, gaging records, and stream profiles. Pertinent data, literature and reports are to be provided by the PUD.
2. Helicopter reconnaissance of the Sultan River between the river mouth and Culmback Dam, with 35 mm photography of major gravel recruitment areas.
3. One-day reconnaissance trip to study area, including placement of scale markers on the ground for future reference in aerial photography.
4. Contracting for overlapping vertical aerial photography of the Sultan River from its mouth to Culmback Dam. Negatives to be at a scale of approximately 1" = 500'. Two sets of color contact prints and one set of 1' = 200' enlargements to be produced.
5. For each selected habitat study area (five spawning habitat sites are presently anticipated for detailed field study):
  - a. Establishing bench mark reference monuments at one or more locations on each valley wall.
  - b. Measuring cross section profiles(s) between the bench marks.
  - c. Preparing a detailed map of streambed characteristics.
  - d. Sampling of streambed sediment.
  - e. Laboratory textural analysis of collected samples.
6. Developing spawning habitat maps showing areas presently utilized by pink salmon, coho salmon, chinook salmon and steelhead.
7. Conducting field reconnaissance and bed sampling of major tributary streams to provide a basis for estimating the sediment load of the tributaries as well as the gradation of gravel materials carried to the Sultan River. Laboratory gradation tests to be made on selected samples.
8. Estimating the gradation and annual volume of bed load materials potentially mobile in the Sultan River during project operation for the reservoir rule curves proposed by the PUD and the Corps of Engineers. This estimate will be used to forecast changes in spawning gravel habitat which may result due to project operation.
9. Submittal of a final report describing the results of the 1983-84 studies.

NAME	REPRESENTING	PHONE
Don R. Linney	National Marine Fisheries Service (Seattle)	527-6120
? Gary Engman	Game	775-1311 or 774-8812
Len Bouya	Fisheries	oly 753-0250
Roy Metzger	Sno PUD	258-8560
Don Tibbs	HYDRA	722-0210 → 523-0500
Jim Miller	Geo Engineers	281-7900
Jon Koloski		
Mike Wert	Biol. Consultant	824-0169

SNOHOMISH COUNTY



PUBLIC UTILITY DISTRICT No. 1

2320 California St., Everett, Washington 98201

258-8211

Mailing Address: P. O. Box 1107, Everett, Washington 98206

March 20, 1984

PUD-14671

Mr. Ken Bruya  
Department of Fisheries  
111 General Administration Building  
AX-11  
Olympia, Washington 98504

Sultan River Project  
Anadromous Fish Mitigation  
River Gravel Quantity Study

Dear Mr. Bruya:

Our contractor is ready to commence field work based on the results of background tasks. These are discussed in enclosed meeting minutes.

The major item to note is the selection of proposed sampling/monitoring sites. Field work is scheduled for Site No. 1 on March 26th (weather and river flow conditions permitting). Unfavorable conditions could cause rescheduling. If interested in participating, please contact Roy Metzgar.

Very truly yours,

R. F. Vine  
Sultan Project  
Construction Manager

RFV/sys

Enclosures

cc: J. Miller, Geo Engineers, Inc.  
R. G. Metzgar

Note: Identical letters sent to:

Department of Game - Engman  
Tulalip Tribes - Somers  
National Marine Fisheries Service - Linvog  
U. S. Department of the Interior - Kenney

## Sultan River Project

### Anadromous Fish Mitigation Studies

#### Meeting Minutes - River Gravel Quantity Study

DATE: March 14, 1984 (0840-0920)

PLACE: GeoEngineers' office, Bellevue

ATTENDEES: Miller (GEI); Dunne and Tubbs (Hydra); Wert; and Metzgar (PUD)

#### Purpose

This was a progress report meeting and to present proposed work based upon results thus far.

#### Joint Agency Coordination

Miller inquired how this would be done. Metzgar responded that the PUD would inform them. The consultant was to proceed with work on their schedule. If Joint Agency personnel wish to participate or have inquiries it will come through the PUD. The same goes for field work or field trips.

#### Transmittals

GEI (Miller) returned the color aerial photography loaned from the PUD. Copies of aerial photos from Task 4 were transmitted to the PUD. Miller also handed out a budget summary on items (tasks) 2, 4, 5, and 6. The aerial photography cost less than the budget estimate, as did helicopter service.

#### Work Scope

Miller reported that the number of proposed sampling sites has been reduced from a possible 5 to 3 for gravel monitoring. This revision is based upon study results to date (aerial reconnaissance, photography and field trips). The sites chosen are based upon a combination of hydraulics and fish use (lower 2); gravel sources; and transport and accessibility. These sites are:

- 1) second major gravel bar above river mouth; right bank chinook spawning area; first bar upstream from freeze core sampling site (snag) #2.
- 2) upstream from Chaplain Creek gage and above the powerhouse; left bank chinook spawning area.
- 3) above the diversion dam in vicinity of right bank tributary; can use Start-up river gage records; sources of gravel check; check gravel transport; compare with downstream.

Meeting Minutes  
Page 2  
March 14, 1984

### Aerial Photography

Photo mosaics of the river from Culmbach Dam to confluence were mounted on the wall. These photos (1" = 200" color enlargements) present excellent detail and provide a good baseline record. The photos were taken on February 7th. A series of baseline maps will be prepared from them and an overlay system developed for subsequent comparison and analysis.

### Gravel Sluicing

Miller proposed a three-day operation at the diversion dam. The event requires suitable flow conditions, namely when the flow could be reduced to minimum instream flow afterwards so that transects could be run in the area of gravel detention behind the dam. I reported on project status and how that might relate to testing, particularly reservoir elevation. Also, what the likely scenarios might be. I advised that the City had agreed to do it with notice, but that after April 1st the District would be operating the project and could provide water to L. Chaplain via the powerhouse. Hence, if the sluicing were done later (after 4/1) then the City might not be involved.

Metzgar provided a copy of notes on 20 years of City operating records and water quality data since project operation began. Specifically, the record of operating the flood gate was needed to determine historical baseline and scheme for the study event. Turbidity values (ranges) by month were provided also.

### River Gravel Mining

Metzgar reported on the chance discovery of information about Town of Sultan gravel bar scalping opposite the park near the mouth of the river. DNR issues permits for the mining and has records of material removed. Discussion indicated that this information should be obtained. Metzgar will contact the DNR and advise Du ne of results.

### Habitat Mapping

Color copy machine copies have been made of the lower river photos. Wert will use these in the field to take notes as a basis for developing maps (overlays). Metzgar reported on river condition. He will advise Wert when flows and turbidity are right for field work and ground truthing of spawning areas.

### Schedule Revision

A Change Order is needed since the schedule calls for field work to be completed by March 15th. (Telcon Miller/Metzgar 3/15 agreed to revise schedule to April 30th for field work completion.)

### Field Work

In 3/15 telecon Miller notified Metzgar that field work at Site #1 is scheduled for March 26th.

G-11

RGM:cw

SNOKOMISH COUNTY



PUBLIC UTILITY DISTRICT No. 1

2320 California St., Everett, Washington 98201

258-8211

Mailing Address: P. O. Box 1107, Everett, Washington 98206

November 14, 1984  
PUD 15985

Mr. James W. Bartelme  
District Ranger  
U.S. Forest Service  
Mt. Baker-Snoqualmie Nat'l Forest  
Skykomish Ranger District  
Skykomish, WA 98288

Dear Mr. Bartelme:

Jackson Project - Anadromous Fish Mitigation  
River Gravel Study

The PUD has a FERC license order obligation to determine the potential operational effects of the project on the anadromous fishery in the Sultan River. One such concern of the fishery agencies is the changes that could occur to spawning area gravels. Accordingly, a study outline was prepared (copy attached). Subsequently, a consultant was selected and the work conducted. The results are now available. Two copies of the draft report are enclosed for the information of the Forest Service.


We are corresponding with you about this because of the potential implications of your land management plans and decisions which could affect river gravel and, thus, ultimately the dependent anadromous fishery in the lower 9.5 miles of the Sultan River. The pending Spada Timber Sales is one specific action that is pertinent due to the importance of the Blue Mountain area's contribution to the river gravel budget. It also could be relevant due to the "Mapleton District" precedent in Oregon.

The PUD does not have a position at this time with respect to the Forest Service's pending timber sales and the potential ramifications (if any) to our anadromous fish mitigation interests in the lower Sultan River. Nevertheless, this is to reaffirm our potential interest and concern regarding the timber sales as we discussed with you during our meeting on October 25th in your office at Skykomish.

November 14, 1984


The draft report has been sent to the fishery agencies for their review. Their response could determine our subsequent views on the river gravel issue and related activities such as basin timber harvest and project operations. Any views that you may wish to share in response at this time would be welcomed.

Very Truly Yours,

  
R. K. Schneider  
Power Manager

- - Enclosure (2 copies- River Gravel Study)

cc: Jack Hulsey, DNR  
Don Farwell, DNR

 bcc: G. Mixdorf  
T. Dickson  
R. Metzgar

SNODHOMISH COUNTY



PUBLIC UTILITY DISTRICT No. 1

2320 California St., Everett, Washington 98201 258-8211  
Mailing Address: P. O. Box 1107, Everett, Washington 98206

November 14, 1984  
PUD 15987

Colonel Roger F. Yankoup  
District Engineer  
Seattle District  
Army Corps of Engineers  
P. O. Box C-3755  
Seattle, WA 98124

Dear Colonel Yankoup:

RE: Jackson (Sultan) Project - FERC #2157  
Flood Control - Environmental Effects

This letter transmits the PUD consultant study report discussed in our November 12th letter to you on flood control. The enclosed report on Sultan River gravel quantity was prepared by Geo Engineers, Inc. The purpose of the study is to determine whether project operation would cause significant depletion of spawning gravels in the Sultan River.

The study directly addresses the issue of the potential environmental effects of the two proposed flood control operation options. Concerning reservoir operation, the enclosed draft report states that, "Infrequent high discharges from Culmback Dam are needed to flush sediment supplied in the Blue Mountain area into the lower portion of the basin. Because the frequency and magnitude of flood flows will be greater for the reservoir operation mode proposed by Snohomish County PUD No. 1, as compared to that proposed by the Corps of Engineers, the former operational mode should be adopted." (Note: The mode referred to here is the Corps' initial proposal, not the present proposal.) Further, potential accumulation of "fine" sediment in river channel gravels is also identified as a possible problem. Periodic high instream flows may be needed for gravel cleaning and thus maintain gravel quality suitable for fish spawning egg incubation, and intragravel survival of young fish.

In the event that unfavorable gravel conditions occur, undoubtedly the fishery agencies will require mitigative action. We believe that we previously have made our position clear regarding liability/responsibility for any mitigation costs caused by project operational modes other than those of the Licensee. The Licensee will not agree to any flood control operation inconsistent with the Settlement Agreement or objectionable to the fishery agencies nor pay for any additional mitigation obligation.



Colonel Roger F. Yankoup  
Army Corps of Engineers

-2-

November 14, 1984

The PUD sends you the enclosed report for Corps review and comment. We have requested comment from the other agencies by December 17th, although we anticipate possible discussion about it during the December 11th meeting on flood control. The study results should aid everyone in concluding consideration of project flood control operations.

Yours very truly,

JS/

J. D. Maner  
Executive Director  
Utility Operations

Enclosure

cc: D. Hogan, Corps (without enclosure)  
S. Foster, Corps (with enclosure)

RGM:mb

bcc: G. Mixdorf  
T. Dickson  
R. Metzgar  
L. King

SNOHOMISH COUNTY



PUBLIC UTILITY DISTRICT No. 1

2320 California St., Everett, Washington 98201 258-8211  
Mailing Address: P. O. Box 1107, Everett, Washington 98206

November 19, 1984  
PUD 15984

Mr. Gary Engman  
Washington State Department of Game  
16018 Mill Creek Blvd.  
Bothell, WA 98012

Mr. Jon Linvog  
National Marine Fisheries Service  
7600 Sand Point Way N.E.  
Bin C 15700  
Seattle, WA 98115

Mr. David Somers  
Tulalip Tribes, Inc.  
6700 Totem Beach Road  
Marysville, WA 98270

Mr. Lynn Childers  
U.S. Fish & Wildlife  
2625 Parkmont Lane S.W.  
Olympia, WA 98502

Mr. Robert Gerke  
Department of Fisheries  
3939 Cleveland Avenue  
Tumwater, WA 98504

Jackson (Sultan) Project  
Anadromous Fish Mitigation  
River Gravel Quantity Study

The District's consultant for the river gravel study, GeoEngineers, Inc., has completed a report on the results of their work on the Sultan River. The draft report is transmitted herewith for your agency's review. Two copies are enclosed for that purpose.

In your review of the report, particularly the oversize figures (9, 10, 11, 12, etc.), we suggest special care in handling. Due to their large size, additional cost was incurred to provide quality reproductions. Other mitigation study consultants are finding these drawings very valuable in their work. We believe you will, too. However, because of the expense, we do not plan to re-issue copies of them with distribution of the final report to those who already have received the oversize figures. Thus, we make this suggestion for special care and handling of those drawings.

Jackson (Sultan) Project  
Anadromous Fish Mitigation  
River Gravel Quantity Study

-2-

November 19, 1984  
PUD 15984

For scheduling purposes, we suggest that December 17th is the target date for receipt by the PUD of Joint Agencies' review comments. If this date is infeasible, please notify Roy Metzgar.

Yours very truly, .

*[Signature]*  
Signed By: J. D. Maner

J. D. Maner  
Executive Director

Enclosures (2 Copies):  
River Gravel Quantity Study

cc: Steve Foster, Corps Engineers

*[Handwritten initials]* bcc: Jim Miller, GeoEngineers (w/4 Copies)  
T. Dickson, W-N-H (w/1 Copy)  
G. Mixdorf, Legal Dept. (w/1 Copy)  
R. Metzgar (w/1 Copy)



UNITED STATES  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE

ENVIRONMENTAL & TECHNICAL SERVICES DIVISION  
847 NE 19th AVENUE, SUITE 350  
PORTLAND, OREGON 97232-2279  
(503) 230-5400

January 24, 1985

F/NWR5

J. D. Maner, Executive Director  
Utility Operations  
Snohomish County PUD No. 1  
P.O. Box 1107  
Everett, Washington 98206

Dear Mr. Maner:

Henry M. Jackson Hydroelectric Project - November, 1984  
River Gravel Quantity Study (Bedload Transport), Sultan River

National Marine Fisheries Service (NMFS) reviewed the referenced study and has the following comments for your consideration.

In general, NMFS believes that the gravel study provides some excellent baseline data for documenting potential changes in Sultan River spawning habitat due to the construction and operation of the Jackson Hydroelectric Project. We appreciate the time and effort put forth by both Snohomish PUD and the study consultant in order to obtain this information. The following comments deal with some specific aspects of the study.

Page 2, number 2. The required minimum flow releases are not accurately represented. Minimum releases at the diversion dam range from 95 cfs to 175 cfs, and from 165 cfs to 200 cfs at the powerhouse at various times of the year. Details of the minimum flow regime are presented in our "Uncontested Offer of Settlement."

Page 4, FLOOD CONTROL CONSIDERATIONS. As you are likely aware, the discussion of the difference in flood control operational modes proposed by the PUD and Corps of Engineers is no longer accurate. The latest Corps proposal (dated January 9, 1985) is more consistent with the PUD and fishery agency desires. Significantly, it is also consistent with recommendation number 4 on page 48, which states that the PUD proposed operational mode should be adopted so that sediments could be more effectively flushed downstream. NMFS will soon provide comments on the Corps proposal in separate correspondence.

Page 47, paragraph 3. It's stated that periodic spills of 2,500 cfs from Culmback Dam may be required to remove surficial fines. However, the conclusion that spills during May and June would be least damaging to salmonid embryos and alevins is not entirely true since spills during this period could pose significant problems for steelhead spawning and incubation. NMFS is interested in further identifying alternative times of the year for a spill program which would pose less risk of damage to the steelhead resource, and at the same time minimizing potential impacts to all species. This needs further discussion among all parties.



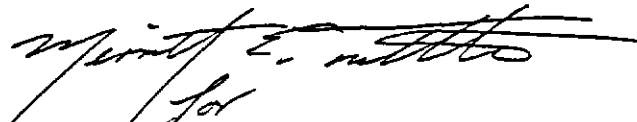
Page 48, number 3. Again, the discussion of flushing flows during May and June ignores potential impacts on steelhead. In addition, the duration of a recommended spill is not indicated.

Page 48, number 4. As acknowledged in this section, monitoring of areas downstream of river mile 2.9 is a key aspect for determining future impacts due to bed accretion and channel migration. In this same regard, monitoring would also be required to determine other possible impacts such as accumulation of fines and when to implement measures to reduce this accumulation. This whole issue of monitoring needs more clarification. For example, when will it be determined if significant accumulation of fines do occur and when controlled spills are needed? Will this determination be made only during field sampling scheduled for the years 1987 and 1994? What if significant impacts occur between 1987 and 1994? Similarly, if scheduled spills do occur in May or June, monitoring of steelhead spawning should be done to determine if redds are established at high flows so that subsequent dewatering at lower flows can hopefully be prevented or minimized. Also, transport of bedload material through the diversion dam should be monitored to determine if bedload is indeed moving through as predicted.

NMFS suggests that some of the practical considerations which are part of this study, particularly monitoring of sediment accumulation and timing of flushing flows, etc., warrants further constructive discussion with the PUD and study consultant. Hopefully, a reasonable approach to determining project impacts as they may occur can be accomplished to the benefit of all parties.

Thank you for giving us the opportunity to review and comment on the gravel study. If you have any questions, please contact Mr. Jon Linvog of my Seattle staff at (206) 526 6120.

Sincerely,



Dale R. Evans  
Division Chief

cc: WDF (Bruya)  
WDG (Engman)  
USFWS (Ging)  
Tulalip Tribes (Somers)  
GeoEngineers (Miller)



DEPARTMENT OF THE ARMY  
SEATTLE DISTRICT, CORPS OF ENGINEERS  
P.O. BOX C-3733  
SEATTLE, WASHINGTON 98124

FEB 20 1985

Planning Branch

Mr. J. D. Maner  
Executive Director, Utility Operations  
Snohomish County Public Utility District No. 1  
Post Office Box 1107  
Everett, Washington 98206

Dear Mr. Maner:

This is in answer to your letter of November 14, 1984 requesting our comments on your consultant's report of river gravel quantity study. Our delayed response to your request was discussed with your staff at the December 11 meeting and recently by phone.

As you were informed by our January 9, 1985 letter to you, the Corps' proposal for flood control operations of the Jackson (Sultan) Project is now consistent with your proposal and the settlement agreement. Accordingly, the mode of operation cited as the Corps' proposal in the report is no longer applicable.

Since we have modified our proposal to be consistent with your proposal, we have only one comment on your consultant's findings. Recommendation #3 of the consultant's report calls for a discharge from hydropower operations of 2,500 cfs. It is our understanding that the powerhouse hydraulic capacity is 1,300 cfs. If 1,300 cfs is correct and 2,500 cfs must be supplied to flush gravel, it would appear that a low level outlet from the reservoir would have to be used to accomplish a release of 2,500 cfs unless you can depend on discharges over the spillway to provide this flow. If the low level outlet must be used to meet the requirements for gravel flushing, we would request that it be done during the flood season October 1 to April 15 to increase available flood storage.

We appreciate the opportunity to comment on your report.

Sincerely,

A handwritten signature in cursive script, reading "George W. Ploudre", is written over a horizontal line.

GEORGE W. PLOUDRE, P.E.  
Asst. Chief, Engineering Division



WASHINGTON

DEPT. OF GAME

~~Region Four Office, 16018 Mill Creek Blvd., Mill Creek 98012 - Tele: 775-1311~~

April 2, 1985

J. D. Manor, Executive Director  
Snohomish County Public Utility District No. 1  
P. O. Box 1107  
Everett, Washington 98206

Henry M. Jackson Hydroelectric Project, FERC 2157, River Gravel Quantity  
Study (Bedload Transport), Sultan River

Dear Mr. Manor:

We have reviewed your bedload transport study. At the outset, we want to commend the Snohomish County PUD and study consultants for the effort to accomplish this significant study. We believe this evaluation will be an important benchmark for hydroelectric project operational impact evaluation. We have the following comments for your consideration.

Page 2, item 2. Minimum flow requirements as specified in the Uncontested Offer of Settlement are not accurately portrayed. Seasonal minimums at the diversion dam range between 95 and 175 cfs and below the powerhouse between 165 and 200 cfs. For clarity, perhaps the full minimum flow schedule should be presented.

Page 22. With respect to the gravel marking experiment and benefits to future studies, what studies are being referred to? How long will the paint remain visible on marked gravels? To secure the benefits of this effort, will observations between now and 1987 or 1994 be necessary? If yes, who will conduct this work?

Page 43. The authors emphasize their computations are approximate and we appreciate their candor. A major uncertainty was frequency and duration of project operational flows. When may this element of uncertainty be clarified? Will it be possible to remedy this source of imprecision before the 1987 or 1994 reevaluations? This may be an important consideration with regard to fully understanding conditions observed between now and then.

Page 48, item 2. It may be appropriate to distinguish between the latest, January 9, 1985 Corps of Engineers position on flood control and their considerably different earlier plans.

Page 48, item 3. Here and on page 47, direct discharges from Culmback Dam of 2500 cfs or more are suggested to mitigate any deterioration of spawning gravel texture, i.e., build-up of fines. The selected time frame of May or June, unfortunately, may not minimize negative impacts to incubating eggs or alevins as intended. This timing could, in fact, maximize damage to steelhead since this would be the period of greatest intergravel egg and alevin density and the time of highest vulnerability to scour damage. We are very interested in exploring possible alternatives or modifications to this proposal. Additionally, the means by which the effectiveness of this flushing scheme will be determined are not specified nor are the frequencies or duration of necessary spills. If spring spills are required, evaluations of impacts to steelhead spawning and incubation success will be necessary.

Page 43, items 3 and 4. We concur that future monitoring efforts are prudent and desirable. We are uncertain, however, how well currently scheduled efforts may fulfill this need. We understand that Phases 2 and 3 of this study will occur in 1987 and 1994 and that the final textural evaluation will also be conducted in 1987. It is unclear how this schedule would allow timely identification and mitigation of problems as they emerge rather than after they have possibly reached major proportion.

Commentary on page 47 indicates that spawning surveys will be needed along with planned gravel field sampling to allow refinements of spawning habitat analyses. How will data for steelhead spawner use be collected? Department of Game, at least at present, has no plans (or funds) for unilateral continuation of spawner surveys in Sultan River.

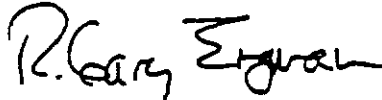
Appendix A-4. Numbers reflected in Table A-4 are for steelhead redds, not adults, as the labeling and title indicate. Numbers of adults would be much greater.



Once again, we appreciate the effort this report represents and the new understanding of gravel movement in Sultan River that it provides. Using this report as a basis, we look forward to constructive discussions with the PUD and study consultants leading to timely and realistic monitoring and mitigation of any future impacts.

Very truly yours,

THE DEPARTMENT OF GAME



R. Gary Engman  
Habitat Management Division

cc: WDF - Bruya  
NMFS - Linvog  
USFWS - Ging  
Tulalip Tribes - Somers  
Division - Fenton  
Region - Muller, Phillips, Kraemer



# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

Ecological Services  
2625 Parkmont Lane S.W., Bldg B-3  
Olympia, Washington 98502

May 14, 1985

Mr. J.D. Manor, Executive director  
Snohomish County PUD NO. 1  
P.O. Box 1107  
Everett, Washington 98206

Re: River Gravel Quantity Study (Bedload Transport) Henry M.  
Jackson Hydroelectric Project; FERC No. 2157

Dear Mr. Manor:

We have reviewed the subject document and offer the following comments for your consideration.

We are very pleased with the quality of your report, prepared by GeoEngineers, Inc., and believe it contains considerable information for eventually determining the impacts to bedload transport caused by the operation of the Henry M. Jackson Hydroelectric Project.

According to the report, Phases 2 and 3 will be conducted in October 1987 and October 1994, respectively. It is unclear what procedures will be followed if problems are identified before the conclusion of the study in 1994. The salmon and steelhead resource of the Sultan river is far too valuable to leave this issue "up in the air". A discussion of potential corrective measures needs to be presented.

Page 22. Gravel Marking Experiment. It does not appear that there is any pre-established schedule or procedure for monitoring the movement of marked bedload material, but rather, a reliance on observations collected by "interested parties". We recommend that some level of standardized effort be taken each year to document the downstream movement of marked material. This information is needed to corroborate some of the theoretically based estimates.

Page 35. In connection with the summary presenting the frequency of occurrence for each of the high discharge categories (2000-5000 cfs, 5000-10000 cfs, 10000-35400 cfs), it would be helpful if the month and year of each occurrence was also included for the period of the analysis. It is important to know how these higher flows are distributed over time.


Page 47. Supporting documentation is needed for the statement that "Spills during springtime (May and June) would be least damaging to salmonid embryos and alevins." We believe significant numbers of steelhead are still within the gravel during this time and could be lost through gravel scouring. The details (timing, magnitude, duration) and need for "gravel cleaning" spills need be carefully coordinated with the appropriate resource agencies.

While we acknowledge the quality of the information provided in the report regarding the estimate that spills of 2500 cfs may be needed to disrupt the armor layer and remove the accumulated fines, it should be made clear that higher flows may be required. We do not want the 2500 cfs figure to be zeroed in on and "set in concrete".

Page 48. Spawning Gravel Texture. We have no problem with the 2500 cfs figure being used as a starting point estimate, as long as there is a commitment from the Snohomish County PUD to provide the appropriate flow if this preliminary estimate proves to be too low. There also needs to be some discussion on the frequency and duration of these "periodic discharges", how this is to be determined, and by whom.

Thank you for the opportunity to review and comment on this report. If you have questions regarding the above comments and recommendations, please call Mr. Gwill Ging at (206) 753-9440.

Sincerely,

  
for Charles A. Dunn  
Field Supervisor

cc: WDF, Bruya  
WDG, Engman  
NMFS, Linvog  
Tulalip Tribes, Somers  
BIA, Roy

SNOHOMISH COUNTY



PUBLIC UTILITY DISTRICT No. 1

2320 California St., Everett, Washington 98201

258-8211

Mailing Address: P. O. Box 1107, Everett, Washington 98206

October 31, 1985  
PUD-16610

Mr. Dave Somers  
Tulalip Tribes, Inc.  
6700 Totem Beach Road  
Marysville, WA 98270

Mr. Ken Bruya  
Washington Dept. of Fisheries  
3939 Cleveland Ave.  
Tumwater, WA 98504

Gentlemen:

Jackson Project - FERC #2157  
River Gravel Quantity (Bedload Transport) Study

This letter is for clarification and update purposes. Recently, we reactivated consultant work on the referenced anadromous fish mitigation study in order to prepare a response to the review comments received thus far from the Joint Agencies on the study report. Our records show that we have not received comments from the Tulalip Tribes and the Washington Department of Fisheries on the report prepared by Geo Engineers (River Gravel Quantity Study - Bedload Transport) and sent to you for review. If our record is erroneous, please advise us.

Since we have comments from the other Joint Agency members, our consultant is using them as the basis on which to proceed. However, if you should have other comments in addition to those already submitted to the District by the other three members, we would appreciate receiving them from you as soon as possible. For work scheduling and coordination/consultation purposes, we will assume that you have no further review comment(s) on the study report unless we hear from you by November 15, 1985.

Yours very truly,

Original Signed By  
L. C. GRIMES  
L. Chet Grimes  
Chief, Generating Resources

cc: Miller - Geo Engineers  
Linvog - NMFS  
Engman - WDG  
Ging - USFWS

RGM:jk

bcc: R. Metzgar  
L. King  
R. Schneider  
G. Mixdorf

SNOHOMISH COUNTY



PUBLIC UTILITY DISTRICT No. 1

2320 California St., Everett, Washington 98201

258-8211

Mailing Address: P. O. Box 1107, Everett, Washington 98206

December 6, 1985  
PUD-16639

Mr. Gary Engman  
Washington State Department of Game  
16018 Mill Creek Blvd.  
Bothell, WA 98012

Mr. Jon Linvog  
National Marine Fisheries Service  
7600 Sand Point Way N.E.  
Bin C 15700  
Seattle, WA 98115

Mr. David Somers  
Tulalip Tribes, Inc.  
6700 Totem Beach Road  
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Mr. Gwill Ging  
U.S. Fish & Wildlife  
2625 Parkmont Lane S.W.  
Olympia, WA 98502

Mr. Robert Gerke  
Department of Fisheries  
3939 Cleveland Ave.  
Tumwater, WA 98504

Gentlemen:

Jackson (Sultan River) Project - FERC #2157  
Anadromous Fish Mitigation Studies  
River Gravel Quantity and Textural Composition

In accordance with pertinent Project License Articles and Orders issued by the Federal Energy Regulatory Commission, Settlement Agreement conditions, and the Anadromous Fish Study Plans (Proposed), the District has completed three studies on gravel in the Sultan River. Reports were submitted to the Joint Agencies for review and comment. Two were done by Michael Wert (1982 and 1984) on sediment quality analysis (textural composition). The third was conducted by GeoEngineers (1984) on quantity (bedload transport). The technical interrelationships of the studies became obvious as work progressed by Geo Engineers. Therefore, the District has combined them for purposes of response and mitigation planning.

The purpose of this letter is to transmit the District's draft response to comments received from the Joint Agencies on the gravel study reports prepared by Wert (1984) and GeoEngineers (1984). Our response includes a proposed gravel mitigation plan which is presented herein to serve as a basis for discussion at the pending meeting on the subject. The meeting is scheduled for 1:30 p.m. on December 17, 1985, at NMFS, Sand Point, Seattle. The attached responses (when finalized after that meeting) are intended to serve as the District's formal response to your comments and will be incorporated into the final reports which will be forwarded to the FERC.

The District's response to the Joint Agencies' comments can be grouped generally into six categories as follows:

- 1) study objective/purpose;
- 2) editorial revisions;
- 3) timing of flushing flows;
- 4) frequency and duration of flushing flows;
- 5) monitoring; and
- 6) mitigation.

Each category is discussed briefly in this letter by presenting a summary of the major points. Further discussion and specific information or details are presented in the response to comments attached.

1) Study Objective/Purpose

This category concerns the adequacy of the study results in satisfactorily fulfilling the fundamental objective/purpose intended. Basically, Wert's studies and the GeoEngineers study were to provide baseline information in order to evaluate the subsequent condition of river gravel in later years. The comments received to date, with one exception (WDF's), state that the results of all three studies do provide acceptable information and achieve the intended objectives.

The WDF raises technical issues about the technique and timing of freeze core sampling and consequent interpretation of the results regarding textural composition. Also, the validity is questioned of the results in terms of theoretical qualifications and comparative interpretation with other similar, referenced studies.

The District's response to the WDF concern is presented in greater detail in the attached response. The District conducted the textural composition studies in accord with the proposed study plan. Plan development was coordinated closely with the Joint Agencies. Also, as stated on page 8 of Wert's 1984 report, "Following the recommendation of Adams and Beschta (1980) and because the intention of the gravel texture analyses was to index Sultan River quality as a fisheries resources, the stream bed was sampled during the winter when eggs of anadromous fish are in the gravel."

2) Editorial Revisions

This category deals with misstatements about minimum instream flows and updating the status of flood control. There is no disagreement with the Joint Agencies' comments and appropriate revisions will be made in the text.

### 3) Timing of Flushing Flows

Several issues (biological, hydrological and operational) must be dealt with in determining when to release a special flow from Culmbach Dam for transporting and cleaning gravel in the Sultan River (if needed). Based on biological considerations (the life cycle timing of salmonid eggs, embryos, alevins, fry, juveniles and critical level of fines in the gravel), the springtime (May and/or June) was mentioned in the GeoEngineers report (p. 47) as the most favorable period for a mitigative release to cleanse and transport gravel. Further details supporting this statement are presented in the attached response.

From the hydrological viewpoint, May/June makes sense because historically, river flows sufficient to transport and clean gravel, have occurred due to rainfall/snowmelt events. Operationally, according to Exhibit H, Figure H-3, the project is in the upper portion of the proportional filling period for the reservoir. Therefore, sufficient volumes of water would normally be available and unintended spill could occur due to unanticipated flow increases. The likelihood is greatest in the spring of complete reservoir filling after a large release (controlled or uncontrolled) for gravel mitigation. A high flow release later into summer would constitute an "unnatural" event: the high flow and colder water temperatures would 'shock' the system, and the probability of refilling the reservoir would be substantially less. This is a brief explanation of the reasoning about flow release timing and does not mean that consideration of any other time is unacceptable to the District. We anticipate substantial constructive discussion about this matter with the Joint Agencies to determine when a special mitigative flow release would be made, if ever needed, from Culmbach Dam.

### 4) Frequency and Duration of Flushing Flows

Once criteria for mitigative action are mutually agreed upon, the basis for action will be through periodic monitoring, which is discussed in the attached responses to comments. Monitoring frequency should be resolved, once diagnostic characteristics for gravel quality are identified with confidence. The District proposes a conservative monitoring schedule based upon the frequency of high flow events (defined later) and coordinated with the previously agreed to study years of 1987 and 1994. Essentially, gravel monitoring would occur two years after a high flow event, subject to revision based upon experience and accumulated information. In 1985, two high flow events occurred. Therefore, we would not expect any need for either monitoring or a flushing flow until 1987 at the earliest. At this time the frequency "might" be two years, subject to modification based on monitoring results.

Determining the duration of a flushing flow release to produce intended results will be based on experience. Methods for determining the effectiveness and related duration are discussed further in the attached

responses. Initially, the District proposes that the peak of the flow be held for 12 hours, subject to revision after analysis of the initial release.

A key element remains to be determined, however. What are the criteria (e.g. % of accumulated fines, mean  $d_g$ , etc.) against which monitoring results will be evaluated? We believe that the criteria is a scientific or technical issue. Its determination, however, may require professional judgment.

#### 5) Monitoring

Surveillance of gravel conditions will provide essential information needed to determine if mitigative action is needed. The techniques and basis for the proposed schedule have been discussed already, and are discussed further in the mitigation plan and attached responses to Joint Agencies' comments. As noted above, due to the high flows already this year, 1987 is now proposed to be the next monitoring year, subject to no high flow event occurring in 1986.

#### 6) Mitigation

?  
The District is as interested as the Joint Agencies are in accurately and confidently determining the basis for and need of any mitigative action with gravel in the Sultan River. (Again, what is the criteria/value?) At this time, a special flow release at Culmback Dam via the valves at the base of the is envisaged as the most likely method. The amount of flow needed (theoretically) is 2,500 cfs at the diversion dam and 4,500 cfs at the powerhouse, subject to verification for effectiveness. This release would be for flushing accumulated fine sediment. However, it would also transport gravel downstream. Since the source area for Sultan River gravel recruitment is below Culmback Dam. Apparently there may be no need for special activity or mitigation regarding gravel quantity due to project operation, other than operating the sluice gate at the diversion dam, which will be done.

#### Gravel Mitigation Plan

In summary, the following four items comprise the proposed continuing mitigative plan concerning Sultan River gravel quantity and quality.

1. Continue freeze core gravel sampling - assuming that 1985 is the most recent high flow event year, in 1987 sample at three sites; one upstream and two downstream from the powerhouse. If no flushing flow (2,500 cfs or higher at the diversion dam) occurs in 1987, sample again in 1988. Continue the sequence in order to obtain a two, three, four and five year after high flow event sample. That is, if 1985 is the last high flow event year for several years, then the 1987 sampling is the two years after sample; the 1988 sample would be the three years after; the 1989 would be the four years after; and 1990 would be the five years after sample. The purpose of this sampling scheme and schedule is to establish a trend baseline of fine sediment accumulation



versus time. In 1994, regardless of the flow record and sampling schedule, a full scale sample (10 samples each at all five baseline sites) would be done. The sampling schedule is triggered by the high flow event; two years after it, sampling would be initiated from 1987 until 1994. If, however, a high flow event occurs in 1986, then 1988 becomes the two years after sample year, 1989 three years after, etc. Sampling after 1994, if needed, will be determined by the results obtained to that time. The amount of sampling proposed assumes that it is needed. Results in two, three, or four years may/may not indicate that more (or less) frequent sampling and at different scheduling would be as or more effective. The sampling schedule is intended to illustrate the District's commitment to developing an effective monitoring effort, not to specific years.

2. Install scour chains - this is another monitoring method. Three sites would be used (one upstream and two downstream from the powerhouse). Sites to be selected later in consultation with the Joint Agencies. The chains would be checked after "high flushing" flows.
3. Operate diversion dam sluice gate - when "high" flows occur, the gate will be raised to permit gravel movement downstream.
4. Flow release - if results of monitoring/sampling show accumulation of fine sediment beyond acceptable maximum levels (to be mutually agreed upon), a controlled release will be made at Culmback Dam via the valves for a 12-hour period. The timing, duration and frequency are 'tentative' or 'conditional', meaning that they are subject to revision based on the results of the monitoring/sampling work.

#### Final Steps - (Meeting Notice)

A final report is to be submitted to the Federal Energy Regulatory Commission in accord with the Settlement Agreement. Prior to completing the reports and determining appropriate remedial actions, we agree with your comments about the need for further constructive discussion with the District and its study consultants. Therefore, for that purpose, we have scheduled a meeting for 1:30 p.m. on December 17th in the conference room, NMFS, offices at Sand Point (Seattle). The consultants (Wert, Miller and Dr. Dunne) will be in attendance at this meeting along with appropriate District personnel. A proposed meeting agenda is attached.

In closing, it is our expectation that results of the December 17th meeting will provide the basis for concluding the present studies, identifying a mutually agreeable mitigative plan, and submitting a final report to the FERC. We are mindful, however, that with flood control operation unresolved and with a project operational study pending, it may be sometime before all mitigation matters are finally completed. Thank you for your cooperative assistance to the District.

Yours very truly,

Original Signed By  
R. K. SCHNEIDER  
Robert K. Schneider  
Power Manager

Attachments (2)

RGM:jk

cc: M. Wert  
J. Miller, GeoEngineers

bcc: R. Metzgar  
G. Mixdorf  
R. Schneider  
C. Grimes  
L. King  
J. D. Maner



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
ENVIRONMENTAL & TECHNICAL SERVICES DIVISION  
847 NE 12th Avenue, Suite 350  
Portland, Oregon 97232-3279  
(503) 230-5400

January 24, 1985

R/MRS

J. D. Maner, Executive Director  
Utility Operations  
Snohomish County PUD No. 1  
P.O. Box 1107  
Everett, Washington 98206

Dear Mr. Maner:

Henry M. Jackson Hydroelectric Project - November, 1984.  
River Gravel Quantity Study (Bedload Transport), Sultan River

National Marine Fisheries Service (NMFS) reviewed the referenced study and has the following comments for your consideration.

In general, NMFS believes that the gravel study provides some excellent baseline data for documenting potential changes in Sultan River spawning habitat due to the construction and operation of the Jackson Hydroelectric Project. We appreciate the time and effort put forth by both Snohomish PUD and the study consultant in order to obtain this information. The following comments deal with some specific aspects of the study.

Page 2, number 2. The required minimum flow releases are not accurately represented. Minimum releases at the diversion dam range from 95 cfs to 175 cfs, and from 165 cfs to 200 cfs at the powerhouse at various times of the year. Details of the minimum flow regime are presented in our "Uncontested Offer of Settlement."

Page 4, FLOOD CONTROL CONSIDERATIONS. As you are likely aware, the discussion of the difference in flood control operational modes proposed by the PUD and Corps of Engineers is no longer accurate. The latest Corps proposal (dated January 9, 1985) is more consistent with the PUD and fishery agency desires. Significantly, it is also consistent with recommendation number 4 on page 48, which states that the PUD proposed operational mode should be adopted so that sediments could be more effectively flushed downstream. NMFS will soon provide comments on the Corps proposal in separate correspondence.

Page 47, paragraph 3. It's stated that periodic spills of 2,500 cfs from Culmbach Dam may be required to remove surficial fines. However, the conclusion that spills during May and June would be least damaging to salmonid embryos and alevins is not entirely true since spills during this period could pose significant problems for steelhead spawning and incubation. NMFS is interested in further identifying alternative times of the year for a spill program which would pose less risk of damage to the steelhead resource, and at the same time minimizing potential impacts to all species. This needs further discussion among all parties.

Response by Public Utility District No. 1 of Snohomish County  
to the National Marine Fisheries Service Comments of 1/24/85

1. Comments noted.
2. The District regrets the error in stating the minimum instream flows. Appropriate revisions will be made in the final report.
3. The District agrees with the NMFS comments about project flood control operation. Revisions will be made to reflect the present situation regarding flood control.
4. The District agrees with NMFS comments about the need for further discussion concerning the scheduling of flows for gravel mitigation purposes. If a natural high flow event has not occurred within a specified period of time (yet to be determined), then a controlled release of water would be made at Culmbach Dam to provide a flow of 2,500 cfs at the diversion dam. Already in late 1985, two uncontrolled spills with high river flow have been recorded. On October 25, the flow averaged 5,214 cfs and on November 2, the average flow was 7,345 cfs for 24 hours. (See District response no. 1 to FWS comments of 9/7/84.) Obviously, these flows provided the necessary transport and cleansing of the river gravels. Therefore, immediate sampling for monitoring purposes, as well as a supplemental flushing flow release, is unnecessary for at least the 1986 spawning season. At this time, the District would next conduct gravel sampling in 1987. The frequency of gravel monitoring sampling and the timing, frequency and duration of a flushing flow will be discussed below.

This proposal was based on the status of chinook and coho: growth such that they have moved into deeper water and away from shoreline areas, thus less stranding potential. Pink and chum fry have departed. Winter steelhead fry haven't emerged yet; they are in the alevin stage, so steelhead fry wouldn't be affected by stranding. Summer steelhead eggs are in the gravel. Late spawning winter steelhead are spawning. While the District acknowledges your assessment about the potential effect on the steelhead resource, nevertheless the duration of steelhead spawning (March through June) precludes any window of opportunity during that time.

If another traditional high flow period is selected for flushing, more salmonid species are at risk. For example, eggs of four species could be disrupted in the months of November through February. In September-October, recently deposited chinook and pink eggs could be disrupted. With these considerations, there is no window when adverse effects could be avoided as occurs naturally. Therefore, a least effect period would seem to be the most reasonable, which is May/June. Furthermore, if "artificial" high flushing flows might be needed to mitigate the effects of the project, the most likely time to do so would be to replicate a high spring runoff flow. The timing approximates "natural" conditions and provides greater probability of refilling the reservoir with spring snowmelt and rainfall.

5. Concern about the timing of flushing flows was addressed in #4 above. As to the duration of the flushing flow, the armor layer (top surface) of the river channel gravel should be breached with 2,500 cfs flow at the diversion dam and 4,500 cfs in the lower Sultan River (minimum instream flow plus tributary inflows and full power, 1,300 cfs. from the powerhouse). Theoretically, upon armor breaching gravel movement should



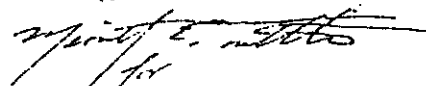
Page 48, number 1. Again, the discussion of flushing flows during May and June ignores potential impacts on steelhead. In addition, the duration of a recommended spill is not indicated.

Page 48, number 4. As acknowledged in this section, monitoring of areas downstream of river mile 2.9 is a key aspect for determining future impacts due to bed accretion and channel migration. In this same regard, monitoring would also be required to determine other possible impacts such as accumulation of fines and when to implement measures to reduce this accumulation. This whole issue of monitoring needs more clarification. For example, when will it be determined if significant accumulation of fines do occur and when controlled spills are needed? Will this determination be made only during field sampling scheduled for the years 1987 and 1994? What if significant impacts occur between 1987 and 1994? Similarly, if scheduled spills do occur in May or June, monitoring of steelhead spawning should be done to determine if redds are established at high flows so that subsequent devastating at lower flows can hopefully be prevented or minimized. Also, transport of bedload material through the diversion dam should be monitored to determine if bedload is indeed moving through as predicted.

NMFS suggests that some of the practical considerations which are part of this study, particularly monitoring of sediment accumulation and timing of flushing flows, etc., warrants further constructive discussion with the PUD and study consultant. Hopefully, a reasonable approach to determining project impacts as they may occur can be accomplished to the benefit of all parties.

Thank you for giving us the opportunity to review and comment on the gravel study. If you have any questions, please contact Mr. Jon Linvog of my Seattle staff at (206) 526 6120.

Sincerely,

  
Dale R. Evans  
Division Chief

cc: WDF (Bruya)  
MDG (Engman)  
USEWS (Ging)  
Tulalip Tribes (Somers)  
GeoEngineers (Miller)

National Marine Fisheries Service

-2-

Comments of 1/24/85

occur almost immediately. Allowing for effective removal of fine sediment, a minimum of 12 hours of supplemental flow release is recommended, excluding ramping rate considerations. Methods to determine effectiveness are discussed in the next response.

6. Gravel monitoring will rely upon two sensing methods.

First, freeze core sampling will be conducted on three sites (one upstream and two downstream from the powerhouse) established by the baseline studies. Five samples would be collected at each site. The need and frequency of sampling will be based on the developing base of information and relative time elapsed since the last "flushing" flow. For example, since a high flow considerably above 2,500 cfs at the diversion dam and over 4,500 cfs below the powerhouse occurred in November, 1985, the next sampling would be in 1987, provided that a similar event doesn't occur in 1986. But if it does, then the District would request rescheduling the 1987 study for 1988 instead.

Assuming that 1985 is the most recent high flow event year and no flushing occurs in either 1986 or 1987, sample again in 1988. Continue the sequence in order to obtain a two, three, four and five year after high flow event sample. That is, if 1985 is the last high flow event year for several years, then the 1987 sampling is the two years after sample; the 1988 sample would be the three years after; the 1989 would be the four years after; and 1990 would be the five years after sample. The purpose of this sampling scheme and schedule is to establish a trend baseline of fine sediment accumulation versus time, and the need and frequency of flushing. The sampling schedule is triggered by the high flow event; two years after it, sampling would be initiated from 1987 until 1994. If, however, a high flow event occurs in 1986, then 1988 becomes the two years after sample year, 1989 three years after, etc. Sampling after 1994, if needed, will be determined by the results obtained to that time.

The District and Joint Agencies agreed to conduct a sampling study in 1994. Irregardless of the flow record and sampling sequence that may/may not be in progress at the time, full scale sampling (10 samples each at all five baseline study sites) would be done in 1994.

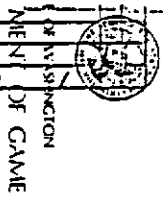
Second, scour chain is also proposed to be used as a monitoring method. The chain anchor is buried below the expected depth of high flow channel scouring. Then a length of chain is buried in the gravel vertically from the embedded anchor to the surface. After a high flow event, the chain is checked for displacement from vertical to horizontal, indicating the depth of scouring. These chains would be checked after high stream flows (flows approaching and/or exceeding the theoretical bedload movement flows). Scour chains would be sited on three monitoring sites such as Kien's Bar and other heavy spawning sites used in study work. One site upstream and two sites downstream would be chosen in discussions with the Joint Agencies.

The U.S. Fish and Wildlife Service recommended extending the studies for 15 years to 1999. (See FWS comments of 9/7/94 and response no. 1.) Fifteen years may/may not be needed to establish reliable indicators of the relationships among instream flow regime and build-up of "fines" in the river gravel. The District believes that it is premature to commit to long-term monitoring until the results of proposed monitoring and operational experience are obtained. Rather the terms and conditions of pertinent sections of the Settlement Agreement and FERC License Articles and Orders assure proper attention to the issue until concluded.

7. Monitoring of potential steelhead spawning and subsequent potential redd dewatering due to high flushing flows should be unnecessary due to the limited duration of the event. Initially, 12 hours will be tested for effectiveness. Including the ramping period of a few additional hours, the higher flow period should be concluded before redd building could be completed.
8. The diversion dam sluice gate will be operated to enhance gravel movement downstream. Determining effective movement is relatively simple. Removal of temporarily impounded gravel is promoted by the design of the sluice gate. Opening the gate initiates water currents which scour the river channel upstream from the dam. Pre-sluicing and post-sluicing observations readily provide an effective assessment of the results. Sluicing operation does not require the "high" flow of 2,500 cfs at the diversion dam recommended for bedload transport. However, when such a release is made, sluice gate operation will be scheduled also to coincide with that release.

Note, when the impoundment area behind the diversion dam is filled with gravel, subsequent material moving downstream is carried over the dam. The impoundment has thus become a filled river channel.

9. Comment noted. The District plans to continue discussions with the Joint Agencies. Many of the considerations and issues are presented in the District's response to other comments.



Regional Four Office, 16010 Mill Creek Blvd., Mill Creek 98012 - Tele: 775-1311

April 2, 1985

J. D. Manor, Executive Director  
Snohomish County Public Utility District No. 1  
P. O. Box 1107  
Everett, Washington 98206

Henry H. Jackson Hydroelectric Project, FERC 2157, River Gravel Quantity  
Study (Bedload Transport), Sultan River

Dear Mr. Manor:

We have reviewed your bedload transport study. At the outset, we want to commend the Snohomish County PUD and study consultants for the effort to accomplish this significant study. We believe this evaluation will be an important benchmark for hydroelectric project operational impact evaluation. We have the following comments for your consideration.

Page 2, Item 2. Minimum flow requirements as specified in the Uncontested Offer of Settlement are not accurately portrayed. Seasonal minimums at the diversion dam range between 95 and 175 cfs and below the powerhouse between 165 and 200 cfs. For clarity, perhaps the full minimum flow schedule should be presented.

Page 22. With respect to the gravel marking experiment and benefits to future studies, what studies are being referred to? How long will the paint remain visible on marked gravels? To secure the benefits of this effort, will observations between now and 1987 or 1994 be necessary? If yes, who will conduct this work?

Page 43. The authors emphasize their computations are approximate and we appreciate their candor. A major uncertainty was frequency and duration of project operational flows. When may this element of uncertainty be clarified? Will it be possible to remedy this source of imprecision before the 1987 or 1994 reevaluations? This may be an important consideration with regard to fully understanding conditions observed between now and then.

Response by Public Utility District No. 1 of Snohomish County  
to Washington Department of Game Comments of 4/2/85

1. Comments noted.
2. The District agrees with the WDG comment and appropriate revisions will be made.
3. The international orange-colored epoxy paint applied to some gravel for marking purposes should adhere to the gravel indefinitely. When other project consultants have been doing field work in the Sultan River, they were instructed to note marked gravel if/when seen. During sampling work, incidental observations will be made of river gravel conditions, including possible discovery of marked gravel. However, due to algal accumulations, it will be difficult to spot marked gravel except immediately after periods of bedload movement. Also, see District response no. 3 to FWS comments of 5/14/85.
4. The District agrees with the WDG comments. See response to FWS comments of 9/7/84 and MHS comments of 1/24/85. Placement of scour chains and subsequent monitoring and correlation with stream flows (or releases) should, during the next few years, either confirm or lead to revising flow, frequency, timing and duration interrelationships.
5. The District agrees with the WDG comment. Appropriate revisions will be made concerning flood control.
6. The District agrees with WDG concerns. The timing of a gravel "flushing" flow release, if and when needed, is based on historical flow records (timing, frequency and magnitude), the likelihood of water availability, and the life history of fish in the Sultan River. What the District proposes to do, regarding the flushing flow, is merely replicate a natural event that would occur normally if it weren't for the project (operation). Therefore, the District disagrees with the need for biological monitoring ("evaluations of impacts to steelhead spawning and incubation success will be necessary"). Instead, monitoring would be conducted of the flushing flow to determine the effectiveness of removing accumulated fine sediments from the gravel. See District responses nos. 6 and 7 to MHS comments of 1/24/85, and response nos. 2 to MHS comments of 9/17/84.
7. The District agrees with this WDG comment. Also, see District response nos. 6 and 7 to MHS comments of 1/24/85.
8. The District assumed (incorrectly) that the WDG would conduct spawner surveys in the future on the Sultan River. Spawning surveys are not an essential component for refining gravel transport analyses.
9. The District agrees with the WDG comment and regrets the error in label and title in Table A-4. Appropriate revisions will be made.

J. D. Manor  
April 2, 1985  
Page 2

Page 48, item 2. It may be appropriate to distinguish between the latest, January 9, 1985 Corps of Engineers position on flood control and their considerably different earlier plans.

Page 48, item 3. Here and on page 47, direct discharges from Culmbach Dam of 2500 cfs or more are suggested to mitigate any deterioration of spawning gravel texture, i.e., build-up of fines. The selected time frame of May or June, unfortunately, may not minimize negative impacts to incubating eggs or alevins as intended. This timing could, in fact, maximize damage to steelhead since this would be the period of greatest intergravel egg and alevin density and the time of highest vulnerability to scour damage. We are very interested in exploring possible alternatives or modifications to this proposal. Additionally, the means by which the effectiveness of this flushing scheme will be determined are not specified nor are the frequencies or duration of necessary spills. If spring spills are required, evaluations of impacts to steelhead spawning and incubation success will be necessary.

Page 43, items 3 and 4. We concur that future monitoring efforts are prudent and desirable. We are uncertain, however, how well currently scheduled efforts may fulfill this need. We understand that Phases 2 and 3 of this study will occur in 1987 and 1994 and that the final textural evaluation will also be conducted in 1987. It is unclear how this schedule would allow timely identification and mitigation of problems as they emerge rather than after they have possibly reached major proportion.

Commentary on page 47 indicates that spawning surveys will be needed along with planned gravel field sampling to allow refinements of spawning habitat analyses. How will data for steelhead spawner use be collected? Department of Game, at least at present, has no plans (or funds) for unilateral continuation of spawner surveys in Sultan River.

Appendix A-4. Numbers reflected in Table A-4 are for steelhead redds, not adults, as the labeling and title indicate. Numbers of adults would be much greater.

J. D. Manor  
April 2, 1985  
Page 3

Once again, we appreciate the effort this report represents and the new understanding of gravel movement in Sultan River that it provides. Using this report as a basis, we look forward to constructive discussions with the PUD and study consultants leading to timely and realistic monitoring and mitigation of any future impacts.

Very truly yours,

THE DEPARTMENT OF GAME

*R. Gary Engman*  
R. Gary Engman  
Habitat Management Division

cc: MDF - Bruya  
HMFS - Linvog  
USFWS - Ging  
Tulalip Tribes - Somers  
Division - Fenton  
Region - Muller, Phillips, Kraemer

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United States Department of the Interior  
FISH AND WILDLIFE SERVICE

Ecological Services  
2625 Parkmont Lane S.W., Bldg. B-2  
Olympia, Washington 98501

May 14, 1985

Mr. J.D. Manor, Executive Director  
Snohomish County PUD No. 1  
P.O. Box 1107  
Everett, Washington 98206

Re: River Gravel Quantity Study (Bedload Transport) Henry M.  
Jackson Hydroelectric Project; FERC No. 2157

Dear Mr. Manor:

We have reviewed the subject document and offer the following comments for your consideration.

We are very pleased with the quality of your report, prepared by Geotechnical, Inc., and believe it contains considerable information for eventually determining the impacts to bedload transport caused by the operation of the Henry M. Jackson Hydroelectric Project.

According to the report, Phases 2 and 3 will be conducted in October 1987 and October 1994, respectively. It is unclear what procedures will be followed if problems are identified before the conclusion of the study in 1994. The salmon and steelhead resource of the Sultan River is far too valuable to leave this issue "up in the air". A discussion of potential corrective measures needs to be presented.

Page 27. Gravel Marking Experiment. It does not appear that there is any pre-established schedule or procedure for monitoring the movement of marked bedload material, but rather, a reliance on observations collected by "interested parties". We recommend that some level of standardized effort be taken each year to document the downstream movement of marked material. This information is needed to corroborate some of the theoretically based estimates.

Page 35. In connection with the summary presenting the frequency of occurrence for each of the high discharge categories (2000-5000 cfs, 5000-10000 cfs, 10000-35400 cfs), it would be helpful if the month and year of each occurrence was also included for the period of the analysis. It is important to know how these higher flows are distributed over time.

Response by Public Utility District No. 1 of Snohomish County  
to U. S. Dept. of Interior, Fish and Wildlife Service comments of 5/14/85

1. Comment noted.
2. See District response to FWS comments of 9/7/84 and NMFS comments of 1/24/85.
3. See District response no. 3 to WDC comments of 4/2/85. Also, an annual or yearly effort would be wasted unless movement flows have occurred during the year. The rate of downstream transport of gravel is not a critical issue as long as replenishing gravels are recruited upstream and moved downstream from time-to-time. The value of the information to be gained by a standardized effort on marked gravel scheduled on a yearly basis does not justify the financial cost.
4. The high flow frequency information presented on page 35 is summarized from table 4-12, Sultan River Floods at Diversion Dam (1929-1968), Exhibit 5 (Revised), Snohomish County PUD, 1983, p. 4-43. The year, but not the month, is shown in that table. A copy of table 4-12 is included in this response. Historically, the Sultan River's highest high flow months occur November-February.
5. See District responses nos. 6 and 7 to NMFS comments of 1/24/85.
6. Concerning the accuracy of the 2,500 cfs flushing flow, please note the qualifying discussion on page 43. Also, please refer to District response to FWS comments of 9/7/84 and NMFS comments of 1/24/85. The District agrees that 2,500 cfs is not yet a "set" or firm flow value. The flow required could either be higher or lower, subject to field verification discussed in other responses.
7. See response no. 6. Also, please refer to District response nos. 4 and 5 to NMFS comments of 1/24/85.



Table 4-12

**SULTAN RIVER FLOODS AT DIVERSION DAM  
(1929 - 1968)**

	Without project		
	Numbers of days in column 1000- 5000 cfs	1000- 10,000 cfs	Over 10,000 cfs
1929	7		
1930	11		
1931	14		
1932	23	1	1
1933	21	6	
1934	36	10	
1935	14	7	1
1936	19		
1937	21	1	
1938	11	4	1
1939	11	3	
1940	13		
1941	10	1	
1942	14		
1943	14	2	
1944	4	1	1
1945	20	2	1
1946	11		
1947	23	6	
1948	23	2	
1949	14		
1950	22	4	1
1951	16	4	2
1952	11		
1953	20	4	1
1954	27	1	
1955	25	4	
1956	27	4	2
1957	24	3	
1958	10		
1959	23	4	2
1960	27	5	2
1961	27	3	1
1962	15	2	
1963	16	3	
1964	19	2	
1965	11	5	
1966	13		
1967	28	3	
1968	32	7	
<hr/>			
	843 days	108 days	16 days
	39 years	30 years	12 years
	every year	every 1.3 years	1 in 3.2 years
	100%	77%	31%

	With project		
	Numbers of days in column 1000- 5000 cfs	5000- 10,000 cfs	Over 10,000 cfs
1933	7	3	
1934	11	1	
1935	2		
1951	1	1	1
1953	3	1	1
1956			
1957	3		
1959	2		
1960	2	2	1
1961	1		
1962	2		
1967	1		
<hr/>			
	32 days	9 days	4 days
	11 years	6 years	4 years
	1 in 3 years	1 in 6 years	1 in 10 years
	20%	15%	8%

Page 47. Supporting documentation is needed for the statement that "Spills during springtime (May and June) would be least damaging to salmonid embryos and alevins." We believe significant numbers of steelhead are still within the gravel during this time and could be lost through gravel scouring. The details (timing, magnitude, duration) and need for "gravel cleaning" spills need be carefully coordinated with the appropriate resource agencies.

While we acknowledge the quality of the information provided in the report regarding the estimate that spills of 2500 cfs may be needed to disrupt the armor layer and remove the accumulated fines, it should be made clear that higher flows may be required. We do not want the 2500 cfs figure to be zeroed in on and "set in concrete".

Page 48. Spawning Gravel Texture. We have no problem with the 2500 cfs figure being used as a starting point estimate, as long as there is a commitment from the Snohomish County PUD to provide the appropriate flow if this preliminary estimate proves to be too low. There also needs to be some discussion on the frequency and duration of these "periodic discharges", how this is to be determined, and by whom.

Thank you for the opportunity to review and comment on this report. If you have questions regarding the above comments and recommendations, please call Mr. Gwill Ging at (206) 753-9440.

Sincerely,

*Charles A. Dunn*  
for Charles A. Dunn  
Field Supervisor

cc: WDF, Bruys  
WDG, Engman  
NMFS, Linvog  
Tulalip Tribes, Somers  
BIA, Roy

**SNOHOMISH COUNTY**



**PUBLIC UTILITY DISTRICT No. 1**

2320 California St., Everett, Washington 98201

258-8211

Mailing Address: P. O. Box 1107, Everett, Washington 98206

July 6, 1988  
PUD-17893

Mr. Gary Engman  
Washington State Department of Wildlife  
16018 Mill Creek Blvd.  
Mill Creek, WA 98012

Mr. Jon Linvog  
National Marine Fisheries Service  
7600 Sand Point Way N.E.  
Bin C 15700  
Seattle, WA 98115

Mr. David Somers  
Tulalip Tribes, Inc.  
- 6700 Totem Beach Road  
Marysville, WA 98270

Mr. Gwilll Ging  
U. S. Fish & Wildlife Service  
2625 Parkmont Lane S.W.  
Olympia, WA 98502

Mr. Robert Gerke  
Washington Department of Fisheries  
3939 Cleveland Ave.  
Tumwater, WA 98504

Gentlemen:

Jackson Project - FERC #2157  
Sediment Analysis and River Gravel Quantity Studies  
Sultan River - Landslide Report

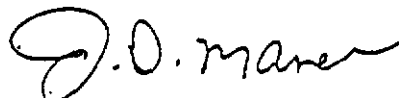
This is to advise you of a natural event which took place earlier this year. A large landslide occurred in the Sultan River canyon about one mile downstream from the City's Diversion Dam. Discovery was made by a private landowner, Mr. Mooney, who owns property along the Diversion Dam road. He reported it to one of our power plant operators after noting ponding of the river in a normally flowing section and surmising that a slide had occurred, which was subsequently confirmed. The date of occurrence is unknown, including the date of discovery and/or the date we were advised about it. Generally, our recollection is February/March for occurrence and discovery.

Subsequently, during the course of other work, we were able to obtain aerial photos of the landslide. A set of those photos is enclosed. A field trip has been made by District Project personnel to the site on the river opposite the landslide. The site was also viewed during the annual FERC operating inspection on May 19, 1988. Messrs. Engman and Linvog were in the inspecting party.

The Sultan River has re-established a channel on the left side of the slide (looking downstream). This channel is passable for migratory fish. Adult winter-run steelhead trout were observed in spawning activity at traditional spawning areas immediately downstream of the Diversion Dam after the slide's occurrence was known. However, we do not know if those adult fish were upstream before the slide took place.

Please call Roy Metzgar at 347-4319 if you have any questions.

Very truly yours,



J. D. Maner  
Director, Engineering and  
Power Supply

-Enclosure

RGM:jk

cc: O. Edson, FERC

bcc: C. Olivers, City of Everett

D. Hale/G. Mixdorf

R. Metzgar

N. Johnson (w/o enclosure)



1802 - 75th Street S.W. • Everett, WA • 98204 • (206) 347-4300  
Mailing Address: P.O. Box 1107 • Everett, WA • 98206-1107

August 15, 1995  
PUD 20246

Mr. Gary Engman  
Washington Dept. of Wildlife  
Region 4  
16018 Mill Creek Boulevard  
Mill Creek, WA 98012

Mr. David Somers  
Tulalip Tribes, Inc.  
6700 Totem Beach Road  
Marysville, WA 98270

Mr. Gwill Ging  
U.S. Fish & Wildlife Service  
3704 Griffen Lane SE, Suite 102  
Olympia, WA 98501

Mr. Jon Linvog  
National Marine Fisheries Service  
7600 Sand Point Way N.E.  
Bin C 15700  
Seattle, WA 98115

Dear Gentlemen:

RE. Jackson Hydroelectric Project - FERC No. 2157  
License Article 55 - Final Report on Aquatic Resources Studies  
Final Report on Sultan River Gravel Quality and Quantity Studies

This letter requests your review of the final report on Sultan River Gravel Quality and Quantity Study for inclusion in the final Article 55 report on aquatic resources. Article 55 in the Order Amending License and Providing for Hearing (17 FERC 61,056) in conjunction with Articles 54 and 56 and the Settlement Agreement (22 FERC 61,140) require the Licensees (Snohomish County Public Utility District and the City of Everett) to consult and cooperate with the Joint Agencies (Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service, National Marine Fisheries Service and Tulalip Tribes), in conducting a series of mitigation studies for the aquatic resources of the Sultan River. In accord with Article 55, the Snohomish County Public Utility District (District) has been conducting the required studies on behalf of the Licensees. Annual reports on the status of the studies have been filed with the FERC beginning on June 1, 1987. At the request of the District, the FERC issued a December 6, 1990 order granting a time extension to June 30, 1994 for submittal of the final report on the studies. However, due to present circumstances, the Licensees have conducted further study (concurrent with by the Joint Agencies) and requested extension of time for the final Article 55 report on aquatic resources to September 30, 1995.

The Joint Agencies have always had an interest in the long term impacts of project operation on the Sultan River's spawning gravels below the project's diversion dam. With the raising of Culmback Dam the concern was sediment transport competency and that peaking flows to break up armoring would be altered to the detriment of spawning habitat maintenance. Specifically, if spill from Culmback Dam was not of a magnitude and frequency to maintain gravel conditions, the Licensees would need to mitigate. Therefore, to address this concern, the Licensees agreed in the Settlement Agreement with the Joint Agencies to conduct several multi-year studies of the Sultan River to determine the project operational impacts on the quality and quantity of spawning gravels from the diversion dam to the mouth of the Sultan River. Over the last twelve years the District has

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completed the required studies according to the agreement schedule. Gravel quantity studies (supply) were conducted in 1984 following construction. Gravel quality studies were conducted pre-project construction (1982), immediately following construction (1984), and three years post project construction (1987). These studies addressed Sultan River conditions for project operations under operating rule curves established when the project was first allowed to generate power commercially in 1984.

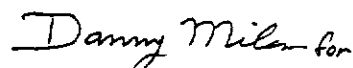
Under license Article 57, a second interim operating plan (58 FERC 62,224) was approved by the FERC in 1992. The operating plan was submitted by the District as the culmination of a long process of consultations with the Joint Agencies and Corps of Engineers. During the consultation process the Licensees offered a set of modified rule curves as being mutually advantageous to the interests of all parties. The District has been operating under the revised rule curves with the consent and knowledge of all parties since November 1, 1989. However, one result of operating under the revised rule curves has been a decrease in the magnitude and frequency of spill flows at Culmback Dam, as project hydrologic modeling forecast during the development of the operating plan. Furthermore, the Pacific Northwest has been experiencing an extended period of dry hydrologic conditions which have resulted in no spill flows at Culmback Dam for the past four years (since December, 1990).

As previously scheduled, the final report on aquatic resources under License Article 55 was to be submitted on June 30, 1994. Given the change in operating rule curves following the last gravel quality study conducted in 1987 and the current condition of four years of no spill flows on the Sultan River, the District initiated with Joint Agency concurrence an additional textural analysis of the gravels. The effort was within the intent of the license and Settlement Agreement to determine the long term effects of project operations on the quality of spawning habitat. Under the conditions of the second interim operating plan, the District conducted (with Joint Agencies concurrence) this sampling in early September 1994.

To include the final report encompassing all the Sultan River gravel studies over the past twelve years to the final aquatic resources mitigation report, the Licensees request your review of the final report on Sultan River gravel quality and quantity studies. Please provide your comments to the District on or before September 15, 1995.

If you have any questions, please contact the Jackson Project fish biologist, Murray Schuh, at (206) 347-4369.

Sincerely,



Bruce F. Meaker  
Jackson Project Manager

cc: Bell & Ingram (w/enclosure)  
A. Martin - FERC, Portland (w/enclosure)  
C. Olivers - City of Everett (w/enclosure)  
bcc: B. Meaker - O1 (w/o enclosure)  
M. Schuh - O1 (w/o enclosure)  
R. Metzgar - City of Everett (w/o enclosure)  
C. Thompson - E1 (w/o enclosure)

