STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
Mailing Address: 600 Capitol Way N – Olympia, Washington 98501-1091 – (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building – 1111 Washington Street SE – Olympia, WA

June 22, 2004

Dear Interested Parties:

The Washington Department of Fish and Wildlife (WDFW) has published a Draft Environmental Impact Statement (DEIS) titled, **Lower Skagit River Steelhead Acclimation and Rearing Facility.** WDFW is considering two possible locations for the proposed steelhead acclimation and rearing facility. One site is on land owned by WDFW in the Birdsview area near Grandy Creek, and one is on land owned by Puget Sound Energy near the town of Concrete, about six miles upstream from the lower site**.** This DEIS presents the environmental impacts and mitigation if the acclimation and rearing facility were constructed on one of two alternative sites, as well as if no action were taken. The issue to be resolved is primarily related to the choice of site**.**

Public Hearing: On Wednesday, July 14, 2004, from 6-8 p.m. in Hearing Room B of the Skagit County Administration Building, 700 South 2nd St. in Mount Vernon, the WDFW will hold a public hearing to gather public input on the proposal to build a facility that will be used seasonally to acclimate up to 334,000 winter-run hatchery steelhead on the lower Skagit.

Following requirements of the State Environmental Policy Act, interested citizens can provide comments on this proposed project by attending the public hearing, or by sending comments on the DEIS via mail or e-mail.

Notice of Availability: The DEIS is available for review and download beginning June 22, 2004 on WDFWs website at http://wdfw.wa.gov/hab/sepa/sepa.htm. Printed copies are available for review at the Mount Vernon, Burlington, Sedro Woolley and Concrete libraries. CDs and a limited supply of bound copies are available by calling WDFW at (360) 902-2534. Written requests for a copy of the DEIS should be addressed to WDFW, Attention: SEPA Center, 600 Capitol Way N., Olympia, WA. 98501-1091, or via e-mail at habitatSEPA@dfw.wa.gov.

MAJOR CONCLUSIONS

Grandy Creek Site

- The Grandy Creek site would undergo a change from a disturbed site overrun by invasive plants to an active juvenile fish acclimation and rearing and adult collection facility.
- Some topographic and drainage pattern changes would be inevitable and unavoidable with project development.
- Invasive species would be replaced by native species in many areas of the site, particularly within the riparian zone between the proposed development area and Grandy Creek.

- Due to instream placement of weir and ladder structures during trapping operations (December 1 – March 15), upstream and downstream fish migrants would be temporarily delayed (no more than 24 hours). Following the trapping period, the weir would be removed to allow passage in Grandy Creek, and the fish ladder would be equipped with a bar grate to prevent entrance by upstream migrants.
- Some existing, unauthorized public access would be removed by fencing the central portion of the site; public access would be facilitated along the route between Cape Horn Road and the Skagit River.

<u>Baker River Site</u>

- The Baker River site would be cleared and excavated to accommodate two raceways, associated pipelines and a clarifier pond.
- Some topographic and drainage pattern changes would be inevitable and unavoidable with project development and excavation.
- Instream work to modify the existing intake structure, or to construct a new NOAA Fisheries compliant structure would be necessary. However, because the intake is situated upstream of the barrier dam, which is inaccessible to fish with the exception of stray juveniles that make their way downstream from Baker Lake through PSE turbines, negligible losses to instream habitat would occur.

AREAS OF CONTROVERSY AND UNCERTAINTY

<u>Grandy Creek Site</u>

- Drawdown of Grandy Creek may occur with proposed well pumping and water return. The magnitude of a potential drawdown is unknown.

<u>Baker River Site</u>

- The presence of the sockeye-strain of Infectious Hematopoetic Necrosis Virus (IHNV) in surface water and its potential effect on rearing steelhead.

<u>Both Sites</u>

- Both sites would improve acclimation of more juveniles to the lower Skagit River and the collection of adults at the site may increase ecological interactions in the immediate vicinity of the project site. As the project would attempt to shift a majority of the hatchery adult returns to the lower Skagit River, there may be less hatchery/wild interaction in the upper river.

WDFW believes this draft environmental impact statement will assist decision makers to identify the key environmental issues, and options associated with this action. Based on comments received from agencies and interested parties during public review of this draft document, WDFW will prepare and distribute a final environmental impact statement.

Sincerely,

Teresa A. Eturaspe

Teresa A. Eturaspe
SEPA/NEPA Coordinator
Agency Designated Official
Regulatory Services Division
Habitat Program

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

LOWER SKAGIT RIVER STEELHEAD ACCLIMATION AND REARING FACILITY

Prepared for Review and Comments
by Citizens and Government Agencies
in compliance with

The State Environmental Policy Act of 1971
Chapter 43.21C, Revised Code of Washington

and

SEPA RULES, Effective April 4, 1984
Chapter 197-11, Washington Administrative Code (as revised)

Washington State Department of Fish and Wildlife

Date of Issuance: June 22, 2004

FACT SHEET

Proposed Action

The applicant, the Washington Department of Fish and Wildlife (WDFW), is proposing to construct a juvenile **acclimation** and rearing facility at a location on the lower Skagit River, defined as at or below the confluence of the Baker River (river mile [RM] 56.5). Two alternative sites have been evaluated in this Draft Environmental Impact Statement (DEIS): 1) on the southerly 13.6 acres of the 32.7 acre Grandy Creek site, located at the confluence of Grandy Creek and the Skagit River (RM 45.6) near Birdsview, Washington; and 2) at the existing Puget Sound Energy (PSE) compound on the Baker River. The Grandy Creek site is owned by the WDFW, and the Baker River site is owned by PSE with several easements owned by Burlington Northern Railroad that traverse the property.

The proposal would include an acclimation and rearing facility for Skagit River hatchery origin winter steelhead juveniles produced at the Marblemount Hatchery and Barnaby Slough. At the Grandy Creek site, an adult steelhead trapping system would also be constructed to capture returning adults for use as hatchery **broodstock**. Because the PSE site has an existing adult trapping facility, no new trapping structures would be required at the site; however, modifications to the existing trapping facility may occur under a separate action as part of PSE's Federal Energy Regulatory Commission (FERC) relicensing project.

Development of the facility at the Grandy Creek site would require construction of internal roadways and parking facilities; two acclimation/rearing ponds; an adult collection **weir**, a fish ladder and holding ponds, an adult return pipe, a Grandy Creek surface water intake and fish screen, water supply and discharge/release pipelines, new wells (with pile barb streambank protection) and associated piping, water supply mixing and aeration building, a storage building, and a residence pad with utility hookups for staff use during the seasonal acclimation and rearing process. A visitor parking area with an information kiosk and restroom would also be developed. The Grandy Creek facility would be developed in one phase. Water and sewer for the Grandy Creek site would include on-site well and septic.

Development of the facility at the Baker River site would require the construction of a screened Baker River intake pipeline, and an outfall/volitional release pipeline, two acclimation raceways, an effluent clarifier pond, and an internal perimeter roadway.

This DEIS does not identify either of the alternatives as a "preferred alternative."

Location(s)

The Grandy Creek site is located near Birdsview within Section 15, Township 35 North, Range 7 East, W.M., Skagit County, Washington, approximately six miles west of the town of Concrete. The Baker River site is located approximately 0.5 miles east of the town of Concrete within Section 11, Township 35 North, Range 8 East, W.M.

Project Sponsor

Washington Department of Fish and Wildlife
600 Capitol Way North
Olympia, Washington 98501-1091

SEPA Lead Agency

Washington Department of Fish and Wildlife
600 Capitol Way North
Olympia, Washington 98501-1091

SEPA Responsible Official

Teresa Eturaspe
SEPA/NEPA Coordinator
Habitat Program
Regulatory Services Section
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Draft EIS Comments

Comments on this Draft EIS (DEIS) should be addressed to the SEPA Responsible Official noted above. Comments may be mailed or emailed to this official. Comments must be accompanied by the commenter's name and address. For emails, the subject line should include "Lower Skagit DEIS Comment".

Date Of Issuance

June 22, 2004

Comments Due

Comments are due by 5:00 p.m. July 22, 2004, which is the end of the public comment period.
WDFW SEPA Center
600 Capitol Way North
Olympia, WA 98501-1091

Public Hearing

6:00-8:00 p.m. July 14, 2004
A public hearing on the DEIS will be held at the Skagit County Administration Building, Hearing Room B, 700 South 2nd Street, Mount Vernon, Washington. Oral and written comments will be taken at that time. Oral comments will be limited to 3 minutes per person. A Final EIS that responds to comments received on the DEIS will be issued as soon as possible after the end of the public review period.

EIS Information

Background material and supporting documents may be reviewed at the offices of Washington State Department of Fish and Wildlife, or the Skagit County Planning and Permit Center.

Copies of DEIS and Technical Appendices

- The DEIS is available for review and download from the Department's website at http://wdfw.wa.gov/hab/sepa/sepa.htm.
- Copies of the DEIS have been sent to the list of individuals, agencies and organizations on the Distribution List presented in Appendix B.
- Copies on CD and a limited number of hard copies are available (hardcopies on a first-come, first-served basis) to persons requesting such as a response to the DEIS's Notice of Availability. When the hardcopy supply is exhausted, only CDs will be available.

EIS Contributors

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Stormwater Plus
P.O. Box 1055
Mount Vernon, WA 98273

Washington Department of Fish and Wildlife
600 Capitol Way North
Olympia, Washington 98501-1091

Required Licenses And Permits May Include:

Skagit County:

- Special Use Permit for fish hatchery-related activities
- Shoreline Substantial Development Permit for work in and within 200 feet of the streams
- Critical Areas Variance for buffer encroachments
- Clearing permit
- Roadway Construction permits for internal roadways
- Water and On-site Sewage Disposal permits
- Building permit

Northwest Air Pollution Authority/Department of Natural Resources

- Slash disposal permit

Washington State Department of Ecology

- National Pollutant Discharge Elimination System (NPDES) Permit
- Water Quality Certification
- Water Right

Washington State Department of Fish and Wildlife

- Hydraulic Project Approval

Washington State Department of Natural Resources

- Class IV (Conversion) Forest Practices

U.S. Army Corps of Engineers

- Section 404 Permit

Town of Concrete

- Clearing Permit
- Building Permit
- Shoreline Substantial Development Permit for work within 200 feet of the streams

Table of Contents

*Terms defined in glossary are **bold** in text

List of Tables

List of Figures

Appendices

LIST OF ACRONYMNS

A
ADA – Americans with Disabilities Act

B
BMP(s) – best management practice(s)

C
CAO – critical areas ordinance
CFD – cubic feet per day
CFR – Code of Federal Regulations
cfs – cubic feet per second
CWA – Clean Water Act
cy – cubic yards

D
dB – decibels
dBA – A-weighted decibels
DEIS – draft environmental impact statement
DO – dissolved oxygen
DS – Determination of Significance
DPS – Distinct Population Segment

E
EDNA – environmental designation for noise abatement
EIS – environmental impact statement
EMT – Emergency Medical Technician
EPA – United States Environmental Protection Agency
ESA – Endangered Species Act
ESU – Evolutionarily Significant Unit

F
FEMA – Federal Emergency Management Act
FERC – Federal Energy Regulatory Commission
FDA – Food and Drug Administration

G
GAP – Gap Analysis Program
GCM – Genetic Conservation Model
GMA – Growth Management Act
GPM – gallons per minute

H
HCA – habitat conservation area
HPA – hydraulic project approval
HSRG – Hatchery Scientific Review Group

I
IHNV – Infectious Hematopoietic Necrosis Virus

K
kW - kilowatts

L
lbs – pounds

M
M&E – Monitoring and Evaluation
MCC – motor control center
MCL – maximum contaminant level
MG – million gallons
mgd – million gallons per day
mm – millimeter

N
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
NPDES – National Pollutant Discharge Elimination System
NRCS – Natural Resource Conservation Service
NRHP – National Register of Historical Places
NWAPA – Northwest Air Pollution Authority
NWI – National Wetlands Inventory

O
OAHP – Office of Archaeologic and Historic Preservation
OHWM – ordinary high water mark

P
PM_{10} – particulate matter smaller than 10 micrometers in mass-mean diameter
PCA – protected critical area
PHS – Priority Habitats and Species
ppm – parts per million
PSE – Puget Sound Energy

R
RCW – Revised Code of Washington
RM – river mile
RRv – Rural Reserve

S
SaSI – Salmon and Steelhead Stock Inventory
SCC – Skagit County Code
SCNWCB – Skagit County Noxious Weed Control Board
SEPA – State Environmental Policy Act
SM – State Monitor Species
SMA – Shoreline Management Act
SMM– Stormwater Management Manual
SMP – Shoreline Management Program
SCS – Soil Conservation Service

T
TDS – total dissolved solids
TMDL – total maximum daily load
TN – total nitrogen
TNC – The Nature Conservancy
TP – total phosphorus
TSS – total suspended solids

U
USCOE – United States Army Corps of Engineers
USFS – United States Forest Service
USFWS – United States Fish and Wildlife Service
USGS – United States Geological Survey

W
WAC – Washington Administrative Code
WDF – Washington State Department of Fisheries
WDW – Washington State Department of Wildlife
WDFW – Washington State Department of Fish and Wildlife
WDNR – Washington State Department of Natural Resources
WDOE – Washington State Department of Ecology
WDOH – Washington State Department of Health
WNHP – Washington State Natural Heritage Program
WSDOT – Washington State Department of Transportation
WWTIT – Western Washington Treaty Indian Tribes

1.0 INTRODUCTION AND SUMMARY

1.1 GOALS OF THE APPLICANT

The applicant, WDFW is proposing a winter steelhead **acclimation** and rearing facility to be located within the lower Skagit River, defined as at or downstream of the confluence of the Skagit with the Baker River (RM 56.5). This proposal would not result in increased hatchery steelhead production in the Skagit River system, nor would it attempt to evaluate or justify the need for the existing WDFW Skagit River winter steelhead hatchery program. The main objective of the applicant is to propose a change in the release protocol for a portion of hatchery smolts in order to:

> Provide increased returns of harvestable adult hatchery steelhead to the lower Skagit River basin through the use of acclimation at a lower Skagit River location, and to do so in a manner that would provide increased protection of naturally spawning wild steelhead in the Skagit River system.

WDFW is proposing to develop a facility to provide juvenile acclimation and rearing for hatchery steelhead that are currently **direct-released** into various locations throughout the lower Skagit River. The proposed facility would use the **volitional** (of their own accord) release strategy for hatchery smolts. Volitional release of actively migrating smolts, as opposed to direct-release, may reduce the potential for smolts to **residualize** in the Skagit River system.

A primary goal of the proposed facility is to provide additional recreational and tribal hatchery steelhead fishing opportunities in the lower Skagit River through the release of fish that are acclimated and, as adults, return to the lower river, without increasing the number of steelhead **smolts** released annually into the system. The addition of an acclimation and rearing facility in the lower Skagit River (Grandy Creek or Baker River; Figure 1-1) is expected by fisheries managers to improve **homing** to the lower Skagit, and minimizing the amount of straying to other areas of the system.

An additional goal of the program is to reduce interaction between hatchery-produced winter steelhead and wild winter steelhead, particularly in the upper Skagit, through juvenile acclimation (and adult returns) in the lower reaches of the river. Minimal overlap of spawning periods for hatchery steelhead and wild steelhead is already largely achieved by selectively breeding early returning hatchery adults, hence advancing the run-timing of the hatchery **stock**. Adult hatchery steelhead that are not harvested and that return to the adult collection facility would be retained for hatchery **broodstock**, thereby removing them from the system.

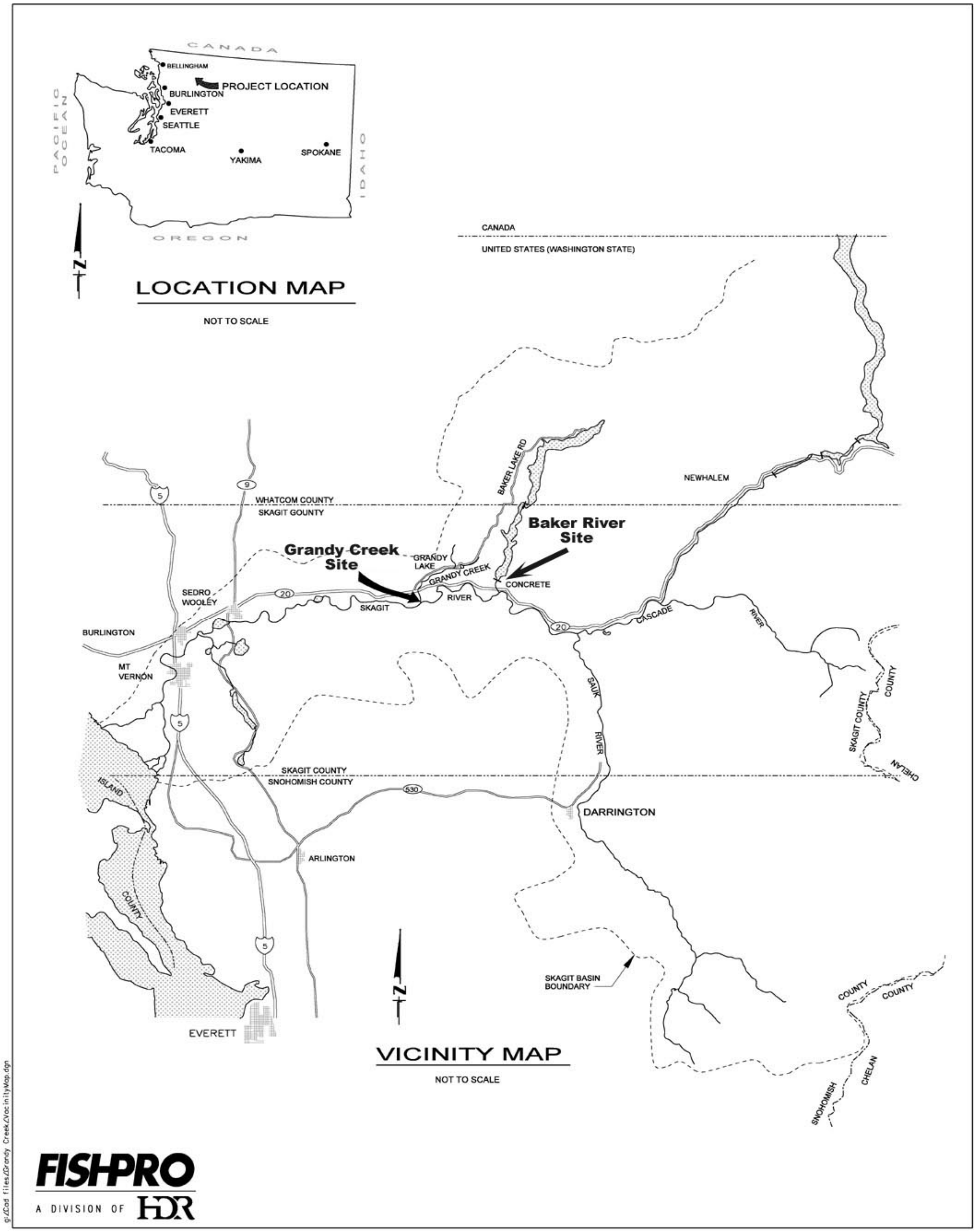

Figure 1-1. Lower Skagit River Steelhead Acclimation and Rearing Facility Alternative Locations and Vicinity Map.

1.2 SITES INVESTIGATED FOR FACILITY LOCATION

Potential locations for the proposed action were examined in the alternatives selection process under SEPA. The proposed alternative locations for siting of the Lower Skagit River Steelhead Acclimation and Rearing Facility include the Grandy Creek site and the Baker River site. Alternatives preliminarily evaluated but not considered to meet the goals and objectives of the applicant included maintaining the existing hatchery program, changing the hatchery program in a manner to better meet the goals and objectives of the applicant, and examining sites not owned or controlled by the applicant for implementation of the proposed action.

Specific objectives outlined by the applicant that underscored the project goals (see Section 1.1) include:

- Improve acclimation of hatchery fish to the lower Skagit River to encourage improved homing of adults to release location
- Improve hatchery fish harvest opportunity in the lower Skagit River
- Increase the number of hatchery adult return and collection sites

Many alternatives were examined to determine whether they could reasonably approximate the applicant's goals and objectives for the project. The various alternatives suggested by WDFW staff, agencies, affected tribes, and the public that were examined include the following:

- Eliminate hatchery steelhead **production** or release in the lower Skagit River; conduct hatchery operations and release in the upper river only
- Improve habitat to produce more wild steelhead and maintain the hatchery program as is
- Build a facility that would support multiple **species** instead of a single species
- Make the Marblemount Hatchery and Grandy Creek the primary rearing and release facilities, close Barnaby Slough and rehabilitate Barnaby Slough into a natural site
- Remove the hatchery system from the Skagit River basin
- Address fish passage issues at the Marblemount Hatchery instead of building a new facility in the lower Skagit River
- Create natural spawning areas and spawning channels for wild steelhead propagation at Grandy Creek, along with enhancing off-channel habitat
- Remove hatchery production from the Skagit River and impose more regulations on anglers (i.e., releasing all wild fish, no fishing from boats, using boats for transportation only, etc.) to minimize stress on wild fish
- Use existing hatchery facilities in the Skagit River basin, not necessarily owned or operated by WDFW, to meet the hatchery program needs
- No Action. Status quo; release 1/4 of Skagit winter steelhead from the Marblemount Hatchery, 1/4 from Barnaby Slough, 1/2 direct-release from haul truck in the lower river (including releases at Grandy Creek, Faber’s Ferry, Baker River, and other areas in the lower Skagit). All releases would be non-volitional, with adults trapped, spawned, and reared at the Marblemount Hatchery (see Section 2.1).

Appendix A provides more details about the alternatives selection process. With the exception of the No Action alternative as required under SEPA, the various options listed above were not subjected to further consideration. All other non-site-related alternatives listed above were determined not to pass the test of reasonably meeting the goals and objectives of the applicant. One exception to this was the alternative that included the possibility of using existing facilities, including tribal, public, and private, within the Skagit River basin to meet WDFW's hatchery program needs. This possibility was eliminated as an alternative after a review of available facilities showed that existing facilities could not meet the hatchery program needs because existing facilities could not produce adequate numbers of smolts to reasonably increase harvestable winter steelhead in the lower Skagit River.

In an effort to meet the SEPA requirements for reviewing viable alternative sites, WDFW examined known sites located in the lower Skagit River (at or below the confluence of the Baker River with the Skagit River) that met the objectives for steelhead acclimation and rearing facility siting. In addition to meeting these goals and objectives outlined for the project, physical constraints of a fish rearing facility were identified for aid in analysis of potential sites. The physical requirements analyzed during the facility siting process included:

- Water temperature between 42˚F to 65˚F
- Low water turbidity
- Available water flow at a minimum of 6,735 gallons per minute (gpm; 15 cubic feet per second [cfs])
- Topographically conducive to acclimation/rearing facility siting
- Adequate access and transportation network
- Public services and utilities available
- Out-of-floodplain structure siting possible
- Site at least 6 acres

The following sites were identified that could have reasonably met the project goals and objectives.

- <u>Grandy Creek Site</u>
  The Grandy Creek site, owned by WDFW, is located approximately six miles west of the town of Concrete on the north side of the Skagit River. Grandy Creek flows approximately north to south and is situated west of the main facility footprint, as proposed.
- <u>Baker River at the PSE Facility</u>
  This Baker River site is located approximately seven miles east of the Grandy Creek site on the north side of the Skagit River, and the east side of the Baker River. The Baker River flows from north to south emanating from Baker Lake, and is situated west of the main facility footprint, as proposed.
- <u>Cumberland Creek</u>
  The Cumberland Creek site is located approximately five miles west of the Grandy Creek site along the south side of the Skagit River. Cumberland Creek flows from south to north with the confluence area located on the south side of the Skagit River across from the city of Hamilton, Washington.
- <u>O'Toole Creek</u>
  O’Toole Creek is located approximately two miles west of the Grandy Creek site on the south side of the Skagit River. O’Toole Creek flows from south to north with the confluence area located on the south side of the Skagit River.
- <u>Baker River Old Channel/Gravel Pit Site</u>
  This site is located on the south side of the Skagit River at its confluence with the Baker River.
- <u>A site near the Baker Lake Sockeye spawning beach area</u>

Of these sites, only the Grandy Creek site and the Baker River site at the PSE facility met both the physical requirements of an acclimation and rearing facility as well as the goals and objectives of the applicant. The Baker River site at the PSE facility was determined to have low groundwater availability, a facility placed in this location would function solely on surface water from the Baker River. This site was considered as an alternative due to the extensive infrastructure already in place.

The Cumberland Creek and O'Toole Creek sites were determined to be streams of steep gradients that may result in excessive turbidity, large debris and bedload movement in the winter and spring, and low flows during fall months. Low flows during fall months and turbid flows during high water would necessitate a groundwater source to provide clean water and a backup water source. Ralston Hydrologic Services, Inc. (2003) determined that the Cumberland Creek and O'Toole Creek sites could not provide the groundwater quantities required to augment a small surface water source for an acclimation and rearing facility.

The Little Baker River old channel/gravel pit site was determined to be wholly located within the Baker River/Skagit River floodplain, a factor that did not meet the physical siting requirements for facility placement. The Baker Lake sockeye spawning beach area did not meet the objective of increasing hatchery adult returns because the loss of smolts traveling down the Baker River due to residualism and other factors would cancel the beneficial effects of improved rearing facilities.

1.3 SEPA DETERMINATION

This Draft Environmental Impact Statement (DEIS) for the proposed Lower Skagit River Steelhead Acclimation and Rearing Facility has been prepared for public review and comment. The applicant, WDFW, issued a Determination of Significance (6/17/02) through the State Environmental Policy Act (SEPA) threshold determination process. WDFW then proceeded with the preparation of an environmental impact statement by an independent consultant while retaining lead agency status.

The scope of the DEIS includes discussion of likely significant adverse impacts to the environment. For each alternative, this DEIS analyzes direct, indirect, and cumulative impacts under each environmental element. The following environmental elements were selected for discussion from those outlined in WAC 197-11-444 after completion of "Scoping" per WAC 197-11-408:

- Earth
- Air
- Water
- Plants and Animals
- Environmental Health
- Land and Shoreline Use
- Transportation
- Public Services and Utilities.

This DEIS considers "No Action" as an alternative to the proposal, along with two facility location alternatives, all of which were determined to be "reasonable" by WDFW. Alternatives are further discussed in Section 2.2 of this DEIS.

1.4 KEY FEATURES OF PROPOSED ACTION ALTERNATIVES

1.4.1 GRANDY CREEK ALTERNATIVE

Under this alternative, acclimation is proposed to occur on the Grandy Creek site (Figure 1-2). Activities on the southerly 13.6 acres of the 32.7-acre Grandy Creek site have historically been fish hatchery-related. Activities proposed for the site include:

- Site clearing to accommodate construction
- Construction of juvenile acclimation and adult collection facilities
- Construction of a weir, fish ladder, and water piping system to and from Grandy Creek
- Installation of new groundwater wells with pile barb bank protection
- Internal site roadway construction to access the ponds, wells, and weir
- Installation of a public parking area, information kiosk, and restroom
- Construction of an equipment storage and office building

- Installation of an RV pad, roof, and septic system for site personnel use
- Invasive plant removal, site cleanup, and revegetation to mitigate for short-term loss within the Grandy Creek riparian buffer.

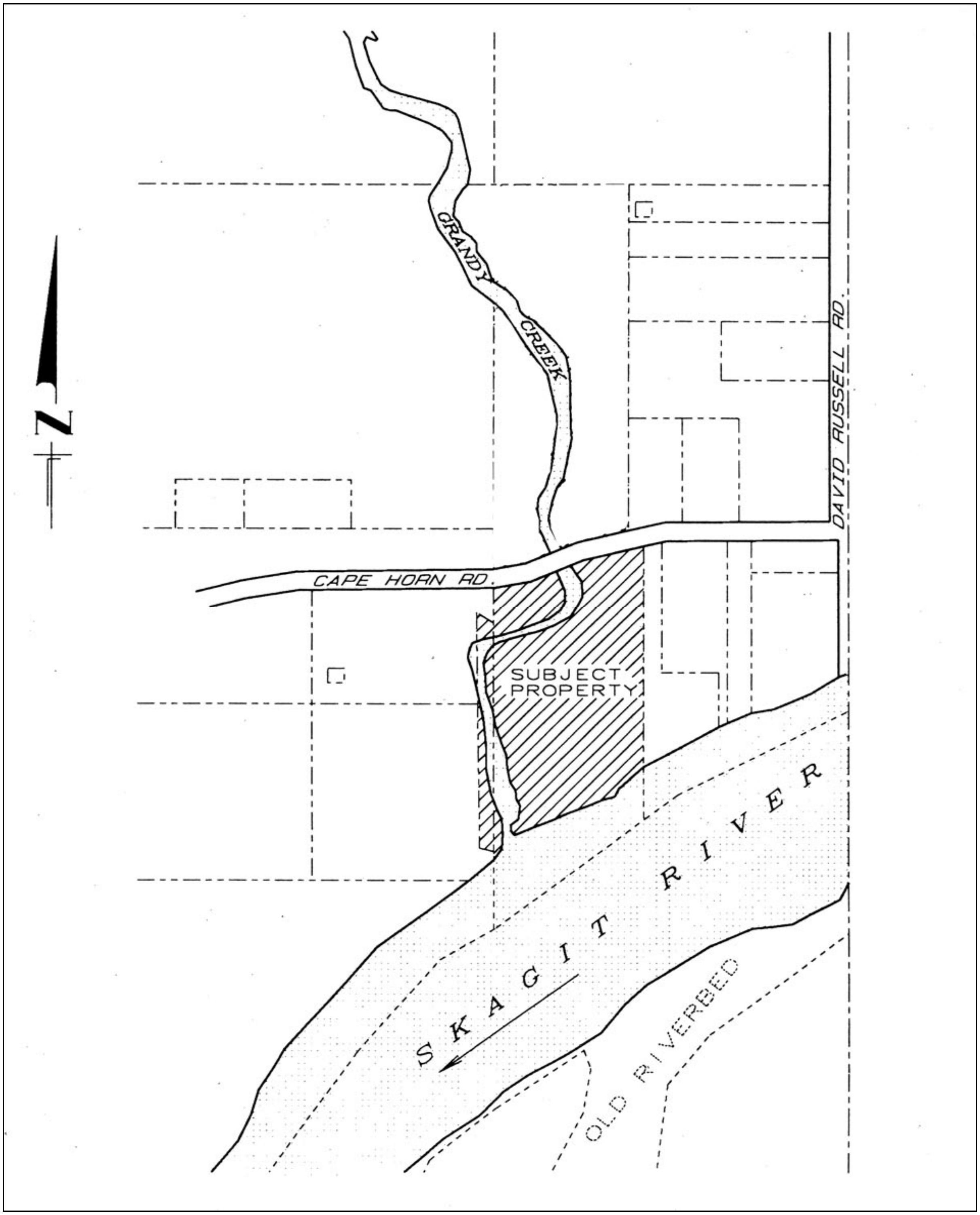

Figure 1-2. Grandy Creek Location Site Map.

1.4.2 BAKER RIVER ALTERNATIVE

The Baker River alternative site is located on the east bank of the Baker at the existing PSE facility near the lower Baker River dam (Figure 1-3). Although this DEIS identifies the Baker River alternative on PSE property, development of this alternative would require close cooperation between WDFW and PSE. At this time, however, PSE has made no commitment to WDFW, or vice versa, in regards to implementation of this project. If WDFW chooses the Baker River alternative for implementation, it would occur after close consultation and cooperation with PSE. No representations have been made to PSE on the financial requirements of such a partnership.

Implementation of this alternative would require:

- Construction of acclimation/rearing raceways at the PSE office/storage complex;
- Installation of water supply pipeline and a volitional **smolt** release system (through discharge pipeline);
- Construction of a raceway cleaning effluent treatment system (clarifier pond);
- Surface water conveyance. There are two options for surface water supply. Under the first option, surface water would be drawn from PSE's existing intake structure. This structure would be upgraded and replaced with an improved, NOAA Fisheries compliant intake through PSE's FERC Relicensing project. However, if upgrades to the intake are not implemented in time to meet WDFW's schedule, a screened intake may be constructed by WDFW to accommodate this alternative, with cooperation from PSE. Under each intake option, a water conveyance line would be installed to provide water from the intake to the raceways; and
- Adult collection (already in place). Migrating adults would be collected at the existing Baker River Trap located at the PSE-owned barrier dam. Although the existing PSE trapping and holding facilities would accommodate hatchery broodstock numbers, upgrades to the facilities are planned by PSE (to be completed by 2008 pending relicensing settlement agreements). Upgrades include improved holding and sorting facilities in association with FERC relicensing for the Baker River dams. These upgrades, however, are not necessary to accommodate this alternative as existing trapping facilities are sufficient to trap and hold required broodstock.

1.4.3 NO ACTION ALTERNATIVE

The No Action alternative would preclude development of a steelhead acclimation and rearing facility in the lower Skagit River. Adult collection would continue at the Baker River Trap as part of the existing trapping operations at the PSE barrier dam, but the majority of adults would continue to migrate significant distances upstream of the Baker River to collection facilities at Marblemount Hatchery and Barnaby Slough. The No Action alternative would not lead to impacts other than those already occurring at the sites. The existing Skagit River steelhead hatchery program would continue as outlined in Section 2.1.

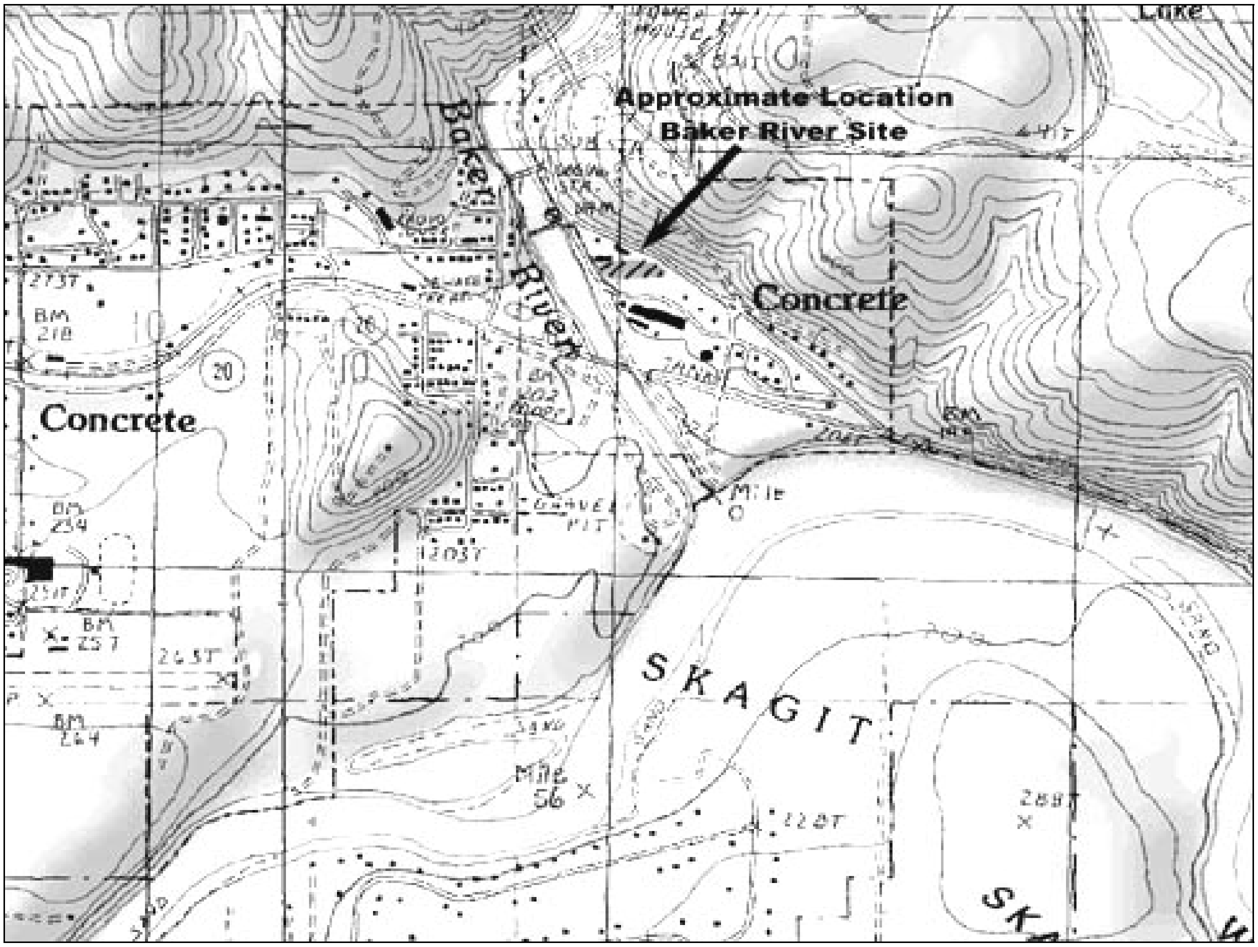

Figure 1-3. Baker River Location Site Map.

1.5 ADDITIONAL DISCUSSION UNDER SEPA

WAC 197-11-440(4) states that the summary of an EIS shall briefly state major conclusions, significant areas of controversy and uncertainty, and issues to be resolved, including environmental choices to be made among alternative courses of action and effectiveness of mitigating measures.

1.5.1 MAJOR CONCLUSIONS

Grandy Creek Site

The Grandy Creek site would undergo a change from a disturbed site overrun by invasive plants to an active juvenile fish acclimation and rearing and adult collection facility.

- Some topographic and drainage pattern changes would be inevitable and unavoidable with project development.
- Invasive species would be replaced by native species in many areas of the site, particularly within the riparian zone between the proposed development area and Grandy Creek.
- Due to instream placement of weir and ladder structures during trapping operations (December 1 – March 15), upstream and downstream fish migrants would be temporarily delayed (no more than 24 hours). A minor amount of instream habitat would also be lost due to placement of these structures.

Following the trapping period, the weir would be removed to allow passage in Grandy Creek, and the fish ladder would be equipped with a bar grate to prevent entrance by upstream migrants.
- Some existing, unauthorized public access would be removed by fencing the central portion of the site; public access would be facilitated along the route between Cape Horn Road and the Skagit River.

Baker River Site

The Baker River site would be cleared and excavated to accommodate two raceways, associated pipelines and a clarifier pond. The site has historically undergone disturbance and is currently dominated by immature alders with a blackberry shrub understory that provides low-value wildlife habitat.
- Some topographic and drainage pattern changes would be inevitable and unavoidable with project development and excavation.
- Instream work to modify the existing intake structure, or to construct a new NOAA Fisheries compliant structure would be necessary. However, because the intake is situated upstream of the barrier dam, which is inaccessible to fish with the exception of stray juveniles that make their way downstream from Baker Lake through PSE turbines, negligible losses to instream habitat would occur.

1.5.2 AREAS OF CONTROVERSY AND UNCERTAINTY

Grandy Creek Site

Hydrogeologic analysis of the shallow aquifer located beneath the lower Grandy Creek site was conducted on behalf of WDFW. The analysis determined that, with well pumping at rates necessary to maintain a fish-rearing use, some drawdown of Grandy Creek would occur. It is unknown to what extent drawdown of the shallow aquifer or Grandy Creek would occur and at what rate recharge would occur. However, water uses for the facility would be non-consumptive and water would be returned to Grandy Creek at the base of the proposed fish ladder.

Grandy Creek flows would increase directly downstream of the base of the fish ladder as a result of discharge (return) flows from the facility. Return flows would exceed quantities removed from Grandy Creek by up to 3,143 gpm (7 cfs), which represents the maximum amount of groundwater required by the facility.

An on-going area of uncertainty exists in regards to the impact that hatchery steelhead have on wild **salmonid** populations in the Skagit River system. Although addressed, intra and interspecific ecological interactions, including predation, competition, and potential genetic implications of hybridization between wild and hatchery steelhead are existing conditions in this system as up to 110,000 smolts are direct-released annually into Grandy Creek. This project would not increase the current status quo release goal of hatchery produced smolts throughout the Skagit system (534,000), but would shift release locations and eliminate direct-releases into the lower Skagit. Improved acclimation of more juveniles to the lower Skagit River, and the addition of an adult collection facility at Grandy Creek may increase ecological interactions in the immediate vicinity of the project site. As the project would attempt to shift a majority of the hatchery adult returns to the lower Skagit River, there may be less hatchery/wild interactions in the upper river.

Baker River Site

The uncertainty related to existing ecological interactions between hatchery steelhead and wild salmonids would also apply at the Baker River site. Currently, up to 100,000 smolts are released annually into the Baker River as part of the Skagit hatchery winter steelhead program. However, if the Baker River site were chosen the increase in the number of smolts released (to 334,000) may contribute to an increase in ecological interactions in the immediate vicinity of the site.

The main area of uncertainty at the Baker River site is the presence of the sockeye-strain of Infectious Hematopoetic Necrosis Virus (IHNV) in surface water and its potential effect on rearing steelhead. This virus is present within the system and has had deleterious effects on the sockeye rearing program, especially in the upper Baker system. Steelhead yearlings and smolts are less susceptible to the sockeye-strain of IHNV than age 0+ fish or other species, and hatchery winter steelhead have been successfully acclimated at the Baker River Trap for several years without occurrences of IHNV or other diseases (J. Varney, WDFW, pers comm., 3/5/04). However, under conditions of excessive stress the potential for infection does exist and this potential is greater in the Baker River system than at Grandy Creek.

Because surface water required for raceway operation would be returned directly downstream of the existing barrier dam, no impacts to flow and instream habitat are anticipated under this alternative. No false-attraction to the outfall structure is anticipated because the water would be returned near the fish ladder in an area of existing high velocity.

1.5.3 ISSUES AND ENVIRONMENTAL CHOICES

This DEIS presents the environmental impacts and mitigation if the acclimation and rearing facility were constructed on one of two alternative sites, as well as if no action were taken. The issue to be resolved is primarily related to choice of site. Regarding that choice, WAC 197-11-448 states that an EIS need not be an agency's only decision making document. The choice will be made based on this EIS and other relevant considerations and documents. For instance, some other considerations include Hatchery Scientific Review Group (HSRG) recommendations, budgetary considerations, legislative decisions, and in the case of the Baker River site, whether a partnering relationship may be arranged.

1.5.4 BENEFITS AND DISADVANTAGES OF FUTURE IMPLEMENTATION

WAC 197-11-440(5)(c)(vii) requires discussion of the benefits and disadvantages of reserving for some future time the implementation of the proposal, as compared with immediate implementation.

Both WDFW and the HSRG have determined that there is an immediate need for a steelhead acclimation facility in the lower Skagit River for both increased recreational and tribal fishing opportunities and reduced interaction between hatchery-produced winter steelhead and wild winter steelhead (HSRG 2003), particularly in the upper Skagit River.

In addition, an immediate need has been identified for increased collection of hatchery broodstock (through increased homing to collection sites via acclimation) to meet hatchery program needs within the basin, foregoing the need for interbasin transfers. The practice of interbasin transfers has recently been discontinued as it is out of compliance with current fish health transfer policies. Implementation of the Lower Skagit River Steelhead Acclimation and Rearing Facility proposal at a future time would not meet these immediate needs. With possible future implementation of the proposal, the hatchery program would continue as described in Section 2.1 and hatchery program goals described in Section 2.1.1 would likely continue to not be met.

1.5.5 SUMMARY OF IMPACTS, MITIGATING MEASURES, AND UNAVOIDABLE ADVERSE IMPACTS

Table 1-1. Summary of impacts, mitigating measures, and unavoidable adverse impacts.

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
GEOLOGY, SOILS, TOPOGRAPHY, AND EROSION			
	IMPACTS • Topsoil would be removed during construction and stockpiled for use elsewhere on the site. • Changes in topography would occur with the proposal. Approximately 8,300 cubic yards of earth would be moved for construction of ponds, roads, and building placement. • Excavated areas would be reseeded or otherwise stabilized after construction. • Gravel, sand and topsoil would have to be imported for roads, building foundations, landscaping and drainage improvements. • Excavated material from the pond area would be placed in on-site spoils storage areas. • Facilities would largely be located outside of the **100-year floodplain** for both the Skagit River and Grandy Creek, and steep slopes have been avoided in site design. • Areas that may be susceptible to damage from seismic shaking at the Grandy Creek site generally include steep slopes within the 100-year floodplain. • Sandy soils underlying the floor of the Skagit River valley may be susceptible to liquefaction by seismic shaking during large earthquake events. MITIGATING MEASURES • Impacts causing erosion are predominantly construction related and can be prevented by good construction practices. • Precautions should be taken during extremely wet periods to avoid earth work which can contribute to soil compaction and erosion. • Erosion potential would be reduced by directing surface water runoff to site stormwater facilities.	IMPACTS • Changes in topography would occur with the proposal. Approximately 4,900 cubic yards of earth would be moved for construction of raceways, the clarifier pond, and perimeter access road. • Gravel would be imported from an approved upland location for the proposed raceways, clarified pond, and perimeter access road. • Excavated materials would be hauled to an approved upland location. • Temporary erosion control measures would be required during site development. MITIGATING MEASURES • Erosion control measures detailed for the Grandy Creek alternative would also apply the Baker River site alternative, including sediment fencing along the Baker River, hydroseeding, or other revegetation. • Implementation of this alternative would require development of a temporary erosion and sediment control plan and a stormwater pollution prevention plan.	• The No Action alternative assumes that the sites would remain in their existing condition, with no changes to geology, soils, or topography as a result of facility construction. • Erosion would continue in the isolated areas where it occurs along the Skagit River on the Grandy Creek southerly site boundary. • Invasive vegetation would remain on-site in both locations.

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
	• Erosion control plans and maintenance guidelines for sediment removal facilities would be submitted with Skagit County clearing, filling and grading permits. The drainage plan, prepared in accordance with Skagit County guidelines and the Department of Ecology's 2001 Stormwater Management Manual (SMM), includes a stormwater pollution prevention plan. • Building design and construction must adhere to Uniform Building Code earthquake requirements. UNAVOIDABLE ADVERSE IMPACTS • Soil disruption and topographic alterations are unavoidable. Loss of soils to covering with impervious surfacing is unavoidable with project development.	• Because raceways and the clarifier pond are considered pervious, it is likely that no permanent stormwater facilities would be required for facility development. If required for the clarifier access road, stormwater treatment would be required to meet Skagit County guidelines and 2001 SMM requirements and to be reviewed by Skagit County/Town of Concrete in conjunction with final site design. UNAVOIDABLE ADVERSE IMPACTS • Soil disruption and topographic alterations would unavoidable with implementation of the Baker River alternative; however, the existing soils of the site are largely composed of fill material and have been subject to previous disturbance.	

<table>
<tr><th></th><th>GRANDY CREEK ALTERNATIVE</th><th>BAKER RIVER ALTERNATIVE</th><th>NO ACTION ALTERNATIVE</th></tr>
<tr><td colspan="3">AIR QUALITY</td><td></td></tr>
<tr><td></td><td colspan="2">IMPACTS (Same for both alternative sites)
• Temporary, localized increases in atmospheric concentrations of carbon monoxide, nitrogen dioxide, volatile organic compounds, and particulate matter, the typical pollutants in engine exhaust, would result from construction vehicle use, diesel generators, and other construction equipment. The scale of construction activities would be considered minor and emission would be unlikely to exceed the boundaries of the construction site.
• Outdoor burning may be conducted during the site clearing process. If burning includes more than one pile or exceeds four feet in diameter, burn permits would be obtained from WDNR (this does not apply to the Baker River alternative).
• During project construction, suspended particulate emissions (dust) would occur, particularly during excavating and grading. Particulates would also result from emissions from gasoline and diesel-fired engines. Dust could also be created from construction-related truck traffic entering the site. The impacted area would be minor and PM-10 (greater than 10 microns) generation would be unlikely to exceed air quality standards.
• No dust suppression measures are proposed.
•
MITIGATING MEASURES
• The effects of construction activities on air quality would be temporary and would not lead to permanent degradation of air quality in the site vicinity.
• Grading that causes dust during dry periods would be mitigated by watering exposed soils and minimizing the duration and extent of exposure.
• Site ingress and egress areas are proposed to be graveled construction entrances (mostly existing at Baker River).
•
UNAVOIDABLE ADVERSE IMPACTS.
• Some dust generation is unavoidable with site preparation and truck traffic.
• Pollutants associated with vehicle emissions are unavoidable impacts.</td><td>• With the No Action alternative, no air quality impacts would occur over possible existing impacts with on-going, unapproved recreational use of the site.
• Construction-related dust generation and a temporary increase in pollutants associated with vehicle emission would not occur.</td></tr>
</table>

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
SURFACE WATER			
	IMPACTS • A maximum of 10 cfs (4,490 gpm) of Grandy Creek source surface water would be required for facility operations. 4 cfs (1,796 gpm) would be required during months of operation of the adult collection facility (December through mid-March) to mix with groundwater for attraction flow to the fish ladder. Following adult collection, up to 10 cfs (4,490 gpm) of Grandy Creek source surface water would be required for the juvenile acclimation and rearing ponds. • All water drawn from surface and groundwater sources, combined, would be discharged to Grandy Creek. • There would be a short period in the month of October when the juvenile acclimation/rearing ponds are being filled that a lag would occur between withdrawal rate and discharge rate; water would be held in the acclimation pond system and discharge would occur at a rate lower than the withdrawal rate. • Grandy Creek would, overall, experience a gain in flow as a result of the groundwater withdrawn for use in the ponds being discharged to the creek. • New site wells are proposed to be pumped at a maximum rate of 7 cfs (3,143 gpm) and may result in a localized lowering of Grandy Creek surface water levels. Pumping tests conducted by SE/E in 1990 showed that withdrawals of 6.7 cfs (3,007 gpm) reduce Grandy Creek water levels by approximately 4.8 inches. However, groundwater would be returned to Grandy Creek upstream at the base of the fish ladder, and SE/E analysis was a worst-case scenario. Pumping tests were done in August (a low flow period) and the pumped water was discharged to the Skagit River, not upstream into Grandy Creek. • A peak flow of 20 gpm (0.04 cfs) will be drawn, when necessary, from a new deep aquifer well (to maintain a 100 gallon domestic water reservoir). • Evaporative loss of water drawn for use in the acclimation and adult holding ponds would occur, but would be limited because the site operational period would be within the fall, winter, and spring months.	IMPACTS • Surface water from the Baker River would be the only source of facility water. • The Baker River surface water supply would be pumped at a rate of 5,388 gpm (12 cfs). • Construction activities, including site preparation and excavation, would expose soils to erosion and potentially increase sediment loading in runoff. Post-construction, as well as operational phase, surface water quality could be affected if measures are not taken to prevent sediments from entering surface water. • If the Baker River location is chosen for facility siting, the applicant would be required to develop erosion and sediment control plans in conjunction with final drainage and site plans for approval by both Skagit County and WDOE. • Facility effluent would be required to meet the upland fin-fish hatching and rearing general NPDES permit limits. • No flood-related impacts are anticipated with the Baker River alternative site because most facilities are located outside of the 100-year floodplain of the Baker and Skagit rivers. Pipelines would be buried and would not impact flood storage, and the intake would be designed to withstand high water levels. MITIGATING MEASURES • Construction phase mitigation would be the same as mitigation proposed for the Grandy Creek alternative.	• This alternative would avoid surface water quantity and quality impacts described for the steelhead acclimation and rearing facility proposal.

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
	• Preliminary stormwater facilities designed for Grandy Creek include biofiltration swales for stormwater treatment and conveyance, along with dispersal trenches to aid in natural infiltration. Dispersal trenches would be required at the terminus of the biofiltration swales to aid in natural infiltration. All runoff would be dispersed onto vegetated areas and allowed to infiltrate naturally into the ground. • Runoff water quality from the Grandy Creek proposal would be managed through implementation of a Stormwater Pollution Prevention Plan (SWPPP) to reduce the contribution of pollutants into offsite waterways during construction. • Source controls would be implemented to reduce pollution from permanent facilities on the site. • Effluent discharged to Grandy Creek would contain different water chemistry and physical features than the water originally diverted. Hatchery discharges are managed by WDOE through the upland fin-fish hatching and rearing general NPDES permit, which would be required for the Grandy Creek facility. • No flood-related impacts are anticipated with the Lower Skagit River Steelhead Acclimation and Rearing Facility proposal because in-water and near water structures would be designed for high flows, and most of the improvements are above the 100-year flood elevation. MITIGATING MEASURES • Dry season road construction would minimize surface erosion. • Temporary erosion control measures would control construction phase erosion and sedimentation impacts. Seeding is proposed for stabilizing exposed soils. Erosion and sediment control systems would be implemented as construction progresses, and as seasonal conditions dictate. • The potential reduction in Grandy Creek water levels, or draw down, would be exceeded by the return flow to Grandy Creek (via groundwater discharge). Discharge water would flow into Grandy Creek through the fish ladder, less than 30 feet downstream of the surface water withdrawal location.	• Although proposed structures would be largely pervious, stormwater mitigation may be required with final site design if the Baker River alternative is chosen. A surface water quantity and quality monitoring program would be investigated if the Baker River alternative is chosen. UNAVOIDABLE ADVERSE IMPACTS • Withdrawal of surface water from the Baker River is a primary component of the proposal and would be unavoidable with implementation of this alternative.	

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
	• Stormwater mitigation built into the proposal in the form of treatment would include temporary erosion and sedimentation control (TESC), implementation of a SWPPP for construction phase stormwater quality and management and permanent facilities for biofiltration and infiltration. The above-ground diesel tank would be placed upon a concrete pad and double walled with leak detection to prevent contamination in the event of a spill. • Permanent stormwater facilities would require a final design process that adheres to the SMM and a rigorous maintenance program. • Surface Water Monitoring Water quality regulations for surface and ground waters, as well as discharge monitoring requirements stipulated by Skagit County and the Washington State Department of Ecology must be adhered to in all instances. Baselines for on-site water quality should be established prior to commencement of construction. UNAVOIDABLE ADVERSE IMPACTS • Withdrawal of surface water from Grandy Creek is a primary component of the proposal. • Alteration of existing surface water drainage patterns would be unavoidable.		
GROUNDWATER			
	IMPACTS • Because most of the Grandy Creek site would remain pervious, site drainage would, after treatment where required, provide recharge to the site groundwater system. • The facility proposal includes installation of five production wells along the southerly site boundary with the combined capability of yielding up to 7 cfs (3,143 gpm) of ground water from the shallow aquifer. A peak flow of 20 gpm (0.04 cfs) will be drawn, when necessary, from a deep aquifer well to be located onsite. • The effect of pumping groundwater from the shallow aquifer at the proposed rate was analyzed by SE/E in 1990 and EMCON Northwest in 1992. A pumping test within the deep aquifer was also conducted by SE/E in 1990. The effect of pumping from the shallow groundwater on Grandy Creek included a water level lowering 0.4 feet (4.8 inches) when the lowest site well was pumped at about 6.7 cfs (3,006 gpm). Pumping	IMPACTS • Groundwater is not proposed for use in augmenting surface water supplies at the Baker River site. MITIGATING MEASURES • None are identified. UNAVOIDABLE ADVERSE IMPACTS • None are identified.	• With the No Action alternative, groundwater would not be pumped from the shallow aquifer. No water level drawdown of Grandy Creek, associated with pumping the shallow aquifer, would occur. • Possible groundwater quality impacts that could be associated with site development would be avoided.

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
	tests did not cause any measurable impact to the Skagit River. Tests were conducted during low flows in August and the pumped water was discharged to the Skagit River, not back to Grandy Creek. • A pile barb well protection system, consisting of rows of wooden piles driven perpendicular to the Skagit River, would not impact the shallow aquifer. • EMCON Northwest (1992) modeled aquifer yield at a maximum of 12.9 cfs (5,800 gpm) during Skagit River and Grandy Creek low flow periods and concluded that sustained pumping of the shallow aquifer would result in increased flow (head loss) from Grandy Creek to the shallow aquifer. However, groundwater would be returned at the base of the fish ladder and EMCON analysis presented a worst-case scenario. The flow would continue at an unknown rate, and may result in unknown impacts to Grandy Creek. • Facility groundwater use for the proposal would not exceed 7 cfs (3,143 gpm). This pumping rate is below the maximum aquifer yield determined by EMCON Northwest, but is a rate that would result in head loss in lower Grandy Creek if the water were not returned to the creek 30 feet upstream of diversion. 20 gpm (0.04 cfs) will be drawn from an existing deep aquifer well that currently services local residences. • Domestic wells of adjacent homeowners are in the deep aquifer upgradient of the site and are unlikely to be impacted by the proposed well installation. • No significant impact to ground water quality in the area is expected as a result of the proposal. • Increased recharge from the Skagit River and Grandy Creek (caused by pumping) is not likely to affect water quality of the shallow aquifer since they are considered to be the main recharge sources for the aquifer. MITIGATING MEASURES • Water level monitoring in the shallow aquifer and the interconnected surface water bodies would be necessary with installation and operation of new site wells. • New well installation would include groundwater quality sampling as		

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
	required by WDOE and as necessary by WDFW prior to use in the proposed acclimation pond system. • The septic systems and drain fields would be constructed per appropriate standards to avoid potential impacts to the ground water systems. UNAVOIDABLE ADVERSE IMPACTS • No unavoidable adverse impacts to the Grandy Creek site groundwater system are anticipated based on the relatively low pumping rate proposed and the results of the EMCON Northwest 1992 modeling results.		
PLANTS AND WETLANDS			
	IMPACTS • Clearing and grading activities would impact on-site plant communities. • The permanent loss of 3.5 acres of on-site vegetation could result in increased runoff to Grandy Creek; however, only 1.7 acres would be replaced with impervious surfaces as ponds are considered pervious. • The facility would not impact wetlands or associated buffers. • The loss of a minor amount of riparian vegetation would occur as a result of installation of the structures along the banks of Grandy Creek, including the fish weir and associated west bank access road, fish ladder and surface water intake. MITIGATING MEASURES • Impacts to plant communities would be mitigated by utilizing BMPs for sediment and erosion control to reduce runoff from the construction area. • Hydroseeding impacted areas with native grass species, rather than exotics, would help to compensate for removal of existing vegetation. • Landscaping with native shrubs and trees throughout the property would also help mitigate for community losses. • An intensive invasive species removal is planned to target Japanese knotweed, Himalayan blackberry, and English ivy. In areas that would be temporarily disturbed due to construction activities, these species would be removed through intensive mowing and the application of approved herbicides.	IMPACTS • Impacts to degraded habitat, dominated by immature alders with an understory consisting primarily of blackberry, would occur as a result of raceway construction, clarifier pond construction and associated drain line installation. Approximately 40 trees, primarily immature alders, would be removed to implement the project. Impacts to the highly degraded riparian zone would occur during the installation of water supply and outfall/volitional release pipelines. MITIGATING MEASURES • Impacts to bank plant communities would be mitigated by utilizing BMPs for sediment and erosion control to reduce runoff from the construction area. • Hydroseeding impacted areas with native grass species, rather than exotics, would help to compensate for removal of existing vegetation. Native trees would be planted, where appropriate, to replace those trees removed due to construction activities.	• No impacts to plant communities would occur as a result of the No Action alternative. • The removal of invasive species within the critical area corridor, including Himalayan blackberry and Japanese knotweed, would not occur at the Grandy Creek site.

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
	• Vegetation buffers would be maintained around the facility. A variety of upland trees appropriate to the habitat and similar in function to those trees removed during construction would be planted throughout the site. • No known perch trees would be removed from the site. • The proposed pile barb well protection system would avoid removal of large trees and would attempt to avoid impacts to root systems, where possible. Installation of the protection system may also protect mature trees (large grand firs and big leaf maples) in the Skagit riparian corridor. Upon installation, piles would be covered with soils and the area planted with native vegetation. • Disturbances to riparian areas would be mitigated in conjunction with the Critical Areas and Fish and Wildlife Habitat Conservation Areas mitigation plan, in compliance with Skagit County Codes. UNAVOIDABLE ADVERSE IMPACTS • Construction activities at the Grandy Creek site would eliminate vegetation in some areas of the property, most of which is invasive and non-native. • A small portion of the riparian zone, considered a critical area by Skagit County, would be impacted. However, much of this area is currently dominated by invasive species, including Japanese knotweed and Himalayan blackberry.	UNAVOIDABLE ADVERSE IMPACTS • No significant unavoidable adverse impacts are anticipated to plant communities.	

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
TERRESTRIAL SPECIES			
	IMPACTS • Clearing and grading would reduce the available habitat on-site for terrestrial wildlife species. • Construction noise and disturbance during pile driving for the well protection system, and during the dismantling of existing Birdsview Hatchery structures may temporarily displace some species that are sensitive to noise during instream work. • Increased human activity and operational noise may displace some species from the site. • Perimeter fencing may displace some mammals on-site and may alter the migrational corridor for larger mammals. • Bird **predation** netting would be required. Losses to fish eating species may occur. Based on current hatchery operations the loss is typically minimal. MITIGATING MEASURES • To avoid potential impacts to overwintering bald eagles, the majority of construction and demolition of Birdsview Hatchery structures would occur during summer months. Although WDFW no longer imposes construction timing restrictions with respect to eagle activities, pile driving associated with the groundwater well protection system would likely occur in late August and September to avoid both eagle nesting and overwintering periods. • Removal of existing Birdsview Hatchery structures would open some habitat for wildlife in the floodplain that is currently unavailable. • Vegetation buffers would be left or developed around the facility to mitigate for the effect of noise and visual impacts on wildlife. • All property not developed would be left as it currently exists although some areas would be enhanced through revegetation with native species; mitigation would occur in conjunction with mitigation for impacts to Critical Areas and Fish and Wildlife Habitat Conservation Areas. UNAVOIDABLE ADVERSE IMPACTS • Although some wildlife species would be permanently displaced from the site due to habitat loss and human activity, no significant unavoidable adverse impacts are anticipated.	IMPACTS • Clearing and grading would reduce available habitat on-site for terrestrial species. However, because the Baker River raceways would be located on a disturbed site that has a moderate amount of human activity and currently serves as low-quality habitat for most wildlife species, adverse impacts to wildlife are not expected. • Displacement of small mammals, primarily rodents and **insectivores** is likely to occur during installation of the pipelines and construction of the raceways and clarifier pond. • Construction noise and disturbance may temporarily displace some species that are sensitive to noise. MITIGATING MEASURES • To avoid potential impacts to overwintering bald eagles, although construction timing restrictions are not required by WDFW, the majority of construction would occur during summer months. • Bird predation netting would be passive and designed to minimize impacts to avian species. UNAVOIDABLE ADVERSE IMPACTS • No significant unavoidable adverse impacts to terrestrial wildlife species are anticipated as a result of the Baker River alternative.	• No impacts to terrestrial species would occur as a result of the No Action alternative. • No removal of invasive species would occur to allow for improved habitat in some areas.

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
AQUATIC SPECIES			
	IMPACTS • During construction, fish within the Grandy Creek system may be temporarily displaced due to the placement of an instream cofferdam. • During operation of the fish barrier/ladder structure (December 1 through March 15) delays to upstream and downstream migrations (not to exceed 24 hours), as well as stressing of fish (through sorting and handling operations prior to return to the creek system) would occur. • Because this alternative would not increase the target number of hatchery winter steelhead smolts currently planted into the Skagit River system, overall ecological impacts (competition, predation, etc) related to the release of these smolts would likely remain near existing levels. However, impacts in the immediate vicinity of Grandy Creek may increase. Increased adult returns compared to existing direct-releases are anticipated to occur. Impacts in the Grandy Creek area would increase with a successful program. • Indirect predation in the immediate vicinity of smolt release may increase, causing additional impact to non-target species; however, due to the decreased number of smolts released from Marblemount and Barnaby Slough, predation in the upper Skagit River, if it occurs, would likely decrease. • The potential for co-mingling of hatchery steelhead spawners with early-arriving wild steelhead is an existing condition. However, if acclimation results in increased adult returns to the Grandy Creek site, as anticipated, the potential for intraspecific interactions in the immediate vicinity of Grandy Creek could increase; however, the potential for hatchery/wild interactions upstream of Grandy Creek would likely decrease due to the decrease of hatchery releases at Marblemount and Barnaby Slough. • The potential increased harvest effort in the immediate vicinity of Grandy Creek due to increased adult returns may increase harassment to non-target fish or wild steelhead, if present. • The pile barb well protection system would prevent, to some extent, erosion and lateral migration along the banks of the Skagit River. However, barbs may also act to trap large woody debris and create scour pools, which may be considered a gain in aquatic habitat opportunity.	IMPACTS • Negligible impacts to fish species are anticipated during construction since in-water work would be limited to work at the intake, which is upstream of the Baker River barrier dam. This area is inaccessible to fish with the exception of stray juveniles that make their way downstream from Baker Lake through PSE turbines. • Operational impacts are not expected to be significant due to existing collection and trapping operations at the Baker River Trap (PSE operated). • Increased juvenile stocking in the Baker River may result in increased predation on chum and pink salmon that utilize the system. Increased juvenile releases may also result in increased competition for resources, although the smolts would rapidly migrate to salt water and are not anticipated to remain in the Baker system for extended periods of time. • Indirect predation on juveniles in the immediate vicinity of smolt releases may increase, causing additional impact to non-target species. • Because wild winter adult steelhead that enter the Baker River are likely strays, an increase in hatchery/wild fish interactions is not anticipated, but may occur. However, a decrease in adult hatchery/wild interactions would be anticipated upstream of the Baker River site due to decreased releases at Marblemount and Barnaby Slough.	• If no action were taken, hatchery smolts would continue to be released at sites within the lower Skagit River without the benefit of acclimation. An acclimation and adult broodstock collection system on the lower Skagit River would not be constructed as recommended by the HSRG.

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
	• Facility water would be returned to Grandy Creek immediately downstream (about 30 feet) from the intake structure. Given that recharge is likely much slower than pumping, the net effect on Grandy Creek is likely to be a slight increase in stream flow (except within the 30 foot diversion reach from the intake to discharge) when maximum groundwater is utilized. MITIGATING MEASURES • During construction, upstream and downstream passage would be maintained within Grandy Creek. • Instream work would take place within the in-water work window established for the Skagit River from the mouth to the Sauk River, June 15 – August 31, to minimize impacts to salmonid species that utilize Grandy Creek. • Removal of existing relic Birdsview Hatchery structures from the 100-year floodplain and replacing the structures with native vegetation may help to reduce runoff into the creek. • 100% of adult early-run hatchery steelhead returning to Grandy Creek would be trapped, reducing the potential interaction between hatchery and wild fish. However, prior to February 1, adults collected in excess of broodstock needs may be returned to the lower Skagit River to supplement recreational harvest opportunities. UNAVOIDABLE ADVERSE IMPACTS • Hatchery/wild interactions and straying would still be expected and may result in interbreeding with the earliest returning wild steelhead. However, this is an existing condition in the lower Skagit River and a facility at Grandy Creek, through acclimation to the lower river, may decrease interactions in the upper Skagit due to decreased smolt releases and subsequent adult returns to Marblemount and Barnaby Slough. • A direct loss of minor amounts of instream habitat (juvenile rearing and adult spawning habitat) would occur due to the placement of structures including the barrier weir, surface water intake structure, and fish ladder. • Passage within Grandy Creek would be temporarily delayed during trapping operations (December 1 – March 15). • A minor amount of habitat would be affected within the reach of the creek between the intake and discharge locations. Water would be returned about 30 feet downstream from where it is withdrawn.	• The potential increased harvest opportunities in the Baker River due to increased adult returns to the Trap may increase harassment to non-target fish and wild steelhead, if present. • The increased number of smolts released into the Baker River could impact the availability of habitat/food resources in the Baker River; although the distance to the confluence with the Skagit is less than 0.5 mile. • 12 cfs (5,388 gpm) of water withdrawn for operations would be returned near the existing fish ladder and therefore withdrawals are not anticipated to decrease instream habitat. MITIGATING MEASURES • Potential instream work would take place within the in-water work window established for the Skagit River from the mouth to the Sauk River, June 15 – August 31, to minimize impacts to salmonid species that utilize the Baker River. • Use of existing instream structures, including the Baker River Trap and collection facility, would limit the need for additional structures in the river, reducing impact to the aquatic environment. UNAVOIDABLE ADVERSE IMPACTS • Although hatchery winter steelhead have been successfully acclimated at the Baker River Trap (for shorter periods of time than proposed) for years without incident, the potential for exposure to IHNV would increase compared to existing conditions. If juveniles are tested and found to be infected, they may be destroyed instead of released.	

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
ENVIRONMENTAL HEALTH			
	IMPACTS • Short term noise impacts would occur from operation of construction equipment, including noise associated with dismantling of Birdsview Hatchery structures and vibratory pile driving for the proposed well protection system. Construction noise is exempt from Washington State Noise Standards contained in WAC 173-60. • Post-construction noise levels at residential receiving properties cannot exceed 57 dBA (A-weighted decibels) during the day and 47 dBA between the hours of 10:00 p.m. and 7:00 a.m. A backup generator system would be installed in the storage and equipment building to provide power to the facility in the event of a main power failure. The generator would be fitted with a residential-rated exhaust silencer that would meet a noise restriction level of 100 decibels at 100 feet from the generator unit when in operation. Operational noise from the air compressor unit would be minimized by placing the compressor within the office/storage building. The compressor would activate periodically throughout the day (maximum cycles estimated at 6-8 per day) but the unit is small and would be well muffled inside the building. • The increase in sound levels corresponding to slight increase in the vicinity traffic volume (see Section 3.2.3) would not be considered a noise impact according to WSDOT and FHWA criteria. MITIGATING MEASURES • To reduce temporary construction noise associated with the project, contractors would be required to comply with all applicable regulations. • Backup generators proposed for the Grandy Creek site would be housed within a storage/generator building. The resulting sound levels would not exceed noise limits. • Noise from other on-site equipment would not be produced at a level that would be heard off-site. • No additional noise mitigating measures are required.	IMPACTS • Construction-related noise under this alternative would be similar to that of the Grandy Creek alternative, although no pile driving or concrete cutting would occur. Operational noises would be similar to those of Grandy Creek. The stand-by generator, if needed, would be fitted with exhaust silencers and located within a building for noise attenuation. The air compressor, if required for screen cleaning, would be housed within a building designed to minimize noise. MITIGATING MEASURES • Mitigation necessary for identified noise impacts would be the same as for the Grandy Creek alternative. UNAVOIDABLE ADVERSE IMPACTS • Increases in noise would be unavoidable with project development. • Noise levels at the Baker River alternative site boundaries would be in compliance with all state and local noise regulations.	• With the No Action alternative, noise associated with development of the Lower Skagit River Steelhead Acclimation and Rearing Facility would not occur. • Some traffic-related noise associated with seasonal WDFW fish hauling trucks, along with traffic associated with unauthorized recreational use of the sites would likely continue at existing levels.

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
	UNAVOIDABLE ADVERSE IMPACTS • Increases in noise would be unavoidable with project development. Noise levels at the Grandy Creek site boundaries would be in compliance with all state and local noise regulations.		
LAND USE			
	IMPACTS • The Grandy Creek site is the location of a relic hatchery facility that operated for approximately fifty years. The proposal, therefore, would not be a change in land use over the historic use of the site. The proposal would result in a change in land use within portions of the shoreline buffer of the Skagit River and Grandy Creek. • Permits required for the Grandy Creek facility proposal would include a special use permit, shoreline substantial development permit, critical areas variance, hydraulic project approval, upland fin-fish hatching and rearing general NPDES permit, JARPA, and WDOE water quality certification. A Skagit County building permit would also be required. • Development of the Grandy Creek site is consistent with the hearing examiner special uses allowed under the RRv (rural reserve) zoning for the site. The plan for the acclimation facility would be consistent with setbacks and buffers, except in locations where variances would be necessary. • The visual character of the Grandy Creek site would not change significantly from the existing condition. • There are no previously identified historic, cultural, or archaeological resources on the Grandy Creek site that meet the requirements for historic or cultural preservation. • The Grandy Creek facility would provide improved foot access to the Skagit River for recreational use, which would include fishing. • A primary goal of the proposal is for increased angling opportunity in the lower Skagit River.	IMPACTS • The Baker River alternative site would not result in a change in land use for the alternative site. The site is included within PSE's lower Baker River complex, which includes fish collection facility. The addition of two raceways would not change either the use or the character of the site. • Land use regulations described for the Grandy Creek alternative, for which permits and approvals for a steelhead acclimation and rearing facility would be required would also apply to the Baker River alternative site. In addition, the Town of Concrete Comprehensive Plan and Zoning Ordinance and shoreline management plan would also apply. • The visual character of the Baker River site would not change from the existing condition if implementation of the facility proposal occurs on that site. • The lower Baker River hydroelectric plant is listed on the National Historic Register. No impacts to listed facilities would occur if the steelhead acclimation and rearing facility proposal is implemented on the Baker River alternative site. • The proposal is expected to provide increased fishing opportunity in the lower Skagit River.	• As with the proposal, the No Action alternative would not result in a change or an incompatibility in land use. • Aesthetic, historic and cultural, and recreation impacts associated with this alternative would not occur.

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
	MITIGATING MEASURES • Project development would occur only after necessary permits have been obtained from agencies with jurisdiction. • The Grandy Creek proposal would not result in a change in land use and is an allowed use within the zone with Skagit County Hearing Examiner approval and would, therefore, not require mitigation for land use activities. • A vegetated buffer would, for the most part, be maintained around the Grandy Creek site. • Construction and operations crews should be trained to recognize indications of archaeological sites. UNAVOIDABLE ADVERSE IMPACTS • No unavoidable adverse impacts to land use or historic and cultural preservation would occur with the proposal. • A slight, unavoidable change in the aesthetic quality of the site would occur, but would not be incompatible with the site vicinity and would not be considered significant.	MITIGATING MEASURES • If the Baker River alternative site is chosen, facility project development would occur only after necessary permits have been obtained from agencies with jurisdiction. • The Baker River alternative would not result in a change in land use and is an allowed, compatible use within the zone with Town of Concrete conditional use permit approval and would, therefore, not require mitigation for land use activities. • Construction and operations crews should be trained to recognize indications of archaeological sites. UNAVOIDABLE ADVERSE IMPACTS • No unavoidable adverse impacts to land use or historic and cultural preservation would occur with the proposal.	
TRANSPORTATION			
	IMPACTS • Short-term increases in traffic on area roadways would occur associated with construction activities. • A relatively low number of daily truck and employee trips would be generated. Haul trucks would carry materials and tank transfer trucks would carry smolts for acclimation to the Grandy Creek facility and adults collected at Grandy Creek to the Marblemount Hatchery. • Vehicle traffic is estimated to total 20-30 trips (inbound and outbound) during typical acclimation season operations (December – June 1), and 10-20 total trips during the off-season. • Employee trips are estimated at an additional 2 trips per day (inbound and outbound) throughout the year. All loading would occur within the pond and storage areas.	IMPACTS • Implementation of the Baker River site alternative would generate the same number of trips for equipment and fish transport as the Grandy Creek alternative, both existing and future. • The proposal would not result in a significant increase in trips on town, county, and state roadways. Therefore, no impacts have been identified to the roadway system surrounding the project site.	• With the No Action alternative, there would be no hatchery-related traffic associated with Grandy Creek site other than that which occurs under the existing hatchery program. • The No Action alternative would have no effect on the Skagit County roadway system.

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
	• Future project traffic generation would remain unchanged, as the Grandy Creek facility is proposed to be developed in one phase and no changes to the hatchery program are anticipated. • The anticipated traffic generation for the Grandy Creek site would not impact the existing Skagit County roadway system. • The primary access to the Grandy Creek site would occur from Cape Horn Road, which is designed to meet Skagit County commercial access standards. • The parking area would include two handicapped-parking spaces and 12 additional spaces for visitor and recreational parking. • Public foot traffic would be allowed on-site in designated areas between the parking area and the Skagit River. • A secondary access would be provided from an existing access road extending from Cape Horn Road, located in the northwesterly portion of the site. Usage of this road would be minimal, estimated at 12 trips (inbound and outbound) per year. MITIGATING MEASURES • Because the proposal would have no effect on Skagit County roadway systems, mitigation would only be necessary for design and construction of the connections to the system. Site access must be designed to Skagit County standards. • Additional suggested mitigation would include implementing appropriate on-site truck cleaning facilities during site clearing and construction activities to minimize the tracking of mud and dust onto public access roads, and to assure roadway cleaning as necessary. UNAVOIDABLE ADVERSE IMPACTS • None are identified.	• No modifications for PSE's existing internal roadway system would be required with implementation of the Baker River site alternative. • An existing gravel access road and parking area would be utilized with minimal required improvements. MITIGATING MEASURES • Because the proposal would have no effect on the surrounding roadway system, no mitigation would be necessary. UNAVOIDABLE ADVERSE IMPACTS • None are identified.	

	GRANDY CREEK ALTERNATIVE	BAKER RIVER ALTERNATIVE	NO ACTION ALTERNATIVE
PUBLIC UTILITIES AND SERVICES			
	IMPACTS • Construction-related impacts on public services and utilities would be similar to operational impacts for the proposal. Individual providers would determine utility connections when utilities are ordered for the Grandy Creek site. • The impact on the sheriff's office would be low. • It is unlikely that the proposal would increase the number of calls for fire services. • Emergency situations related to heavy equipment use during the site development and construction phase can occur that could require emergency medical service. Both construction and operational phases of the facility, however, would be unlikely to increase the need for emergency medical service in the Birdsview area. • Site equipment would be serviced with underground electrical transmission lines. The existing power grid can provide adequate service for the power consumption estimated for the Grandy Creek site. MITIGATING MEASURES • Site access control should be provided. • Security service provision during WDFW non-working hours is a component of the proposal. • Emergency medical stations and training should be implemented as part of the site's emergency response plan. • No mitigation for electrical service would be necessary. UNAVOIDABLE ADVERSE IMPACTS • No significant unavoidable adverse impacts on public services and utilities are expected as a result of the proposal.	IMPACTS • The impact on the Town of Concrete Police Department , the Skagit County Sheriff's office, or the Washington State Highway Patrol would be negligible. • Traffic increases as a result of the proposal would not increase the number of calls for fire services. • Both construction and operational phases of the facility would be unlikely to increase the need for emergency medical service in the Town of Concrete. • No impacts to electrical service would occur as a result of implementation of the Baker River alternative. MITIGATING MEASURES • No mitigation for police, fire, or emergency medical services would be necessary as a result of implementation of the Baker River alternative. • No mitigation for electrical service would be necessary. UNAVOIDABLE ADVERSE IMPACTS • No significant unavoidable adverse impacts on public services and utilities are expected as a result of implementation of the Baker River alternative.	• As with the proposal, the need for police, fire, or emergency medical services would not be necessary with the No Action alternative. • No changes to existing electrical service would be necessary.

2.0 PROPOSED ACTION ALTERNATIVES

The applicant, WDFW, is proposing a winter steelhead acclimation and rearing facility at one of two sites, Grandy Creek or the Baker River, both located in the lower Skagit River. The HSRG recently recommended the construction of an acclimation facility with adult collection capabilities at a location in the lower Skagit River basin. The HSRG formed as a result of Congress's Puget Sound and Coastal Washington Hatchery Reform Project (2000) and is comprised of an independent, scientific panel to review hatchery programs in 10 regions throughout Puget Sound and the coast, and to produce recommendations for reform. The following is an internet link to the HSRG's recommendations for the Skagit River Basin: http://www.longlivethekings.org/pdf/HSRG_Recommendations_Mar_03.pdf.

This DEIS does not identify either of the alternatives as a "preferred alternative." WDFW is proposing a change to its overall hatchery program by providing hatchery-produced winter steelhead juvenile acclimation and adult collection facilities on the lower Skagit River. This program change would allow smolt acclimation to the rearing location for a portion of fish that are currently trucked from the WDFW Marblemount Hatchery and Barnaby Slough and direct-released into several areas of the lower Skagit River, including both Grandy Creek and the Baker River (although when space is available at the Baker River Trap, smolts are acclimated prior to release). The change to the current program would encourage winter steelhead adults that are acclimated to the proposed facility to return to the **acclimation site** to be collected for broodstock instead of attempting to return to Marblemount and Barnaby or other points of release that do not have adult collection facilities. Under the proposed program 334,000 smolts would be transferred to a new facility (at either Grandy Creek or the Baker River) for acclimation, while 200,000 would remain at Marblemount or Barnaby Slough for the entire rearing period up to release.

The existing WDFW winter steelhead hatchery program incorporates facilities primarily located on tributaries to the Skagit River. The Skagit River watershed is the largest in the Puget Sound basin and drains over 1.7 million acres of the North Cascades (Weisberg and Riedel 1991). The headwaters of the Skagit River occur in British Columbia, Canada. The portion of the Skagit River watershed that occurs within Washington State encompasses most of Skagit County and the northeastern and eastern parts of Snohomish and Whatcom counties (Weisberg and Riedel 1991). The Cascade River basin includes 35 lakes and 57 glaciers (Weisberg and Riedel 1991).

The steelhead hatchery program is centered on the Marblemount Hatchery, located near Marblemount, Washington on the Cascade River, which, along with the Baker River and the Sauk-Suiattle Rivers, comprise the three major tributaries to the Skagit River. The hatchery is located approximately one mile from the confluence of the Cascade River with the Skagit River (RM 78.1). The Cascade River is approximately 28 miles long and drains an area of 185 square miles (Ames and Bucknell 1981). Clark Creek, a tributary to the Cascade River abuts the hatchery site, and Jordan Creek is in the immediate vicinity.

A portion of the steelhead produced at the Marblemount Hatchery are acclimated at existing facilities within the WDFW hatchery program on the Skagit River, and a portion of the steelhead are trucked from the Marblemount Hatchery and Barnaby Slough and direct-released (with no acclimation) into the Skagit River or its tributaries, including Grandy Creek and the Baker River. Acclimation facilities associated with the Marblemount Hatchery include the Baker River Trap, and formerly, Davis Slough.

- Barnaby Slough is located on the Skagit River at RM 70.2. A portion of the site is owned by Seattle City Light, and leased to WDFW, and the remainder is owned by WDFW. The site is adjacent to a wildlife and bald eagle protection area owned by the Nature Conservancy; public access is not allowed in the area.

- The Baker River Trap is located at the lower Baker River dam, located at Baker River RM 0.5. The Baker River Trap is a component of a group of fish rearing and collection facilities owned by Puget Sound Energy (PSE) and operated as mitigation for the two PSE-owned dams on the Baker River (HSRG 2003). The confluence of the Baker River with the Skagit River is at RM 56.5 on the Skagit River. The Baker River is approximately 32 miles in length, drains 298 square miles (Ames and Bucknell 1981), includes 39 lakes in the basin, of which two are reservoirs behind dams, and 63 glaciers (Weisberg and Riedel 1991).
- Davis Slough is located at Skagit River RM 40 approximately 10 miles west of the Dalles Bridge at Concrete on the South Skagit Highway.

The locations on the Skagit River where winter steelhead smolts are released after being trucked from the Marblemount and Barnaby include the WDFW property at Grandy Creek and the WDFW fishing access at Faber's Ferry, located at Skagit River RM 62.5. In 2003, Skagit River hatchery steelhead were also released into the Sauk River, although this is not an annual stocking location. WDFW Skagit River basin hatchery steelhead facility and release locations are shown on Figure 2-1.

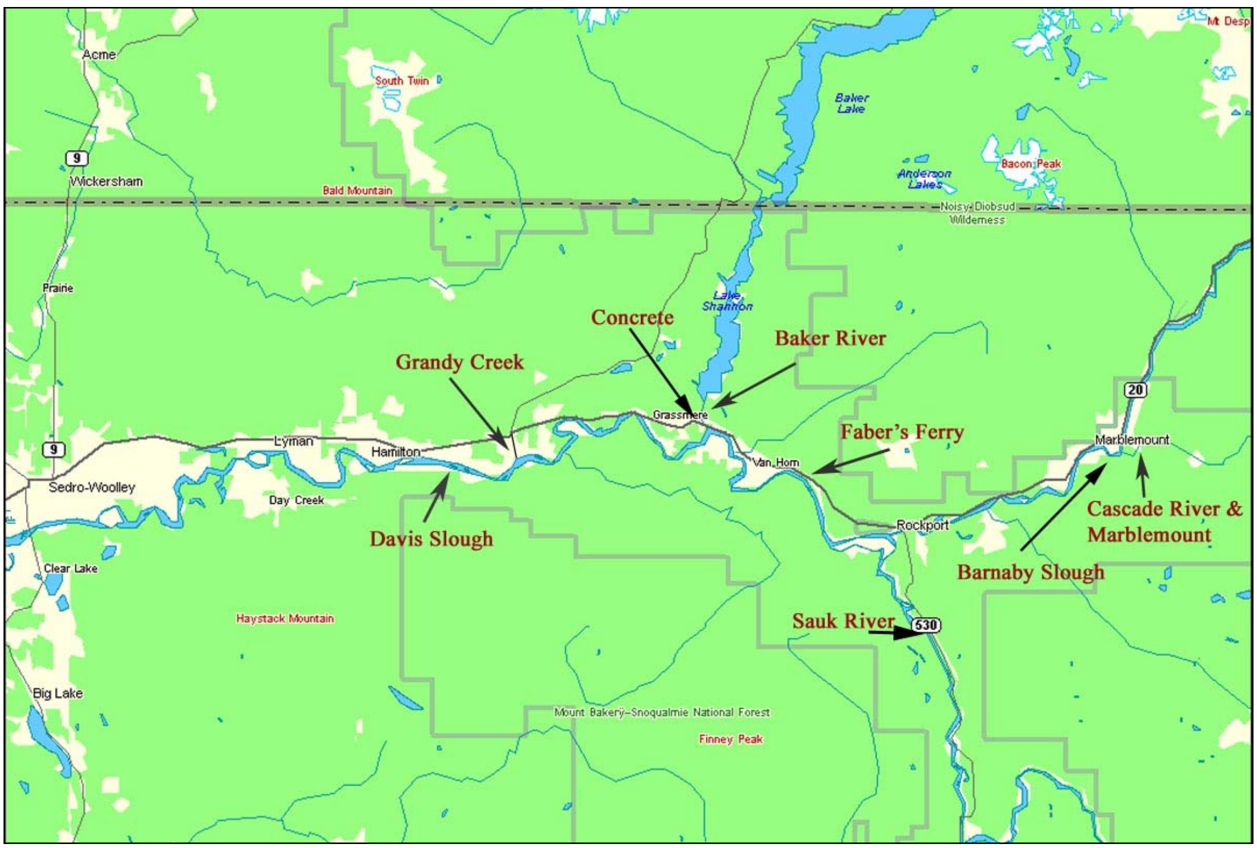

Figure 2-1. Current WDFW Skagit River Hatchery Winter Steelhead Smolt Rearing and Release Locations.

2.1 HISTORY AND STATUS OF THE SKAGIT RIVER STEELHEAD PROGRAM

HATCHERY PROGRAM BACKGROUND

The WDFW has released hatchery-produced early-timed winter steelhead into the Skagit River since the 1940s. Prior to the development of the Skagit River hatchery program, the Skagit River system was stocked with fish from hatchery facilities outside of the Skagit River basin to provide angling opportunities on the Skagit River. Increased angler demand and decreasing abundance of natural steelhead resulted in the development of the Skagit River winter steelhead hatchery program.

The winter steelhead hatchery program within the Skagit River basin began in the mid-1960s with early-run Chambers Creek steelhead transferred from the South Tacoma Hatchery to Barnaby Slough. At Barnaby Slough, fish were reared in earthen ponds and then planted into various tributaries of the Skagit River. Adult hatchery winter steelhead that returned to Barnaby Slough after initial planting were spawned on-site, and the eggs were incubated on site and shipped as eyed eggs to the South Tacoma Hatchery. Fingerlings were transferred to Barnaby Slough in August and September of each year. The Marblemount Hatchery facility, constructed in 1946 for **Chinook** and **coho** production in the Skagit River basin, was integrated into the winter steelhead program in 1995 when the Washington Department of Wildlife and the Washington Department of Fisheries merged. At that time, eggs were transferred from Barnaby Slough to Marblemount Hatchery for incubation to the eyed egg stage then shipped to the South Tacoma Hatchery. Beginning in 1997, South Tacoma Hatchery was no longer used for any part of the Skagit River steelhead program. In the present Skagit steelhead program, fingerlings are transferred from Marblemount Hatchery to Barnaby Slough in December of each year. Adult steelhead now return to the Barnaby Slough and Marblemount Hatchery facilities.

HATCHERY FACILITIES

The primary components of the WDFW steelhead hatchery program within the Skagit River watershed are the Marblemount Hatchery and Barnaby Slough facilities. These facilities were designed to collect adult winter steelhead that return to the Skagit River system for broodstock. Spawning, incubation, and early rearing is completed at the Marblemount Hatchery, and final rearing prior to release is completed at both Marblemount Hatchery and Barnaby Slough. Additional components of the Marblemount facility include:

- Rearing fish to the **fingerling** stage and transferring them to the Baker River Trap and Davis Slough (discontinued in 2003) for an acclimation period prior to release into the Skagit River system. Adult steelhead that return to the Baker River Trap are collected, and returned to the Marblemount Hatchery for spawning. There are no collection facilities at Davis Slough.
- Rearing fish to the smolt stage and hauling them to Faber’s Ferry (RM 62.5) and Grandy Creek (RM 45.6) for direct-release into the lower Skagit River.

<u>Marblemount Hatchery</u>

The Marblemount Hatchery is an important component of WDFW's Skagit River hatchery program, rearing spring, summer and fall Chinook, coho, and winter-run steelhead. The Marblemount Hatchery site buildings include three residences, one hatchery building that includes an incubation room with 66 vertical incubators and 16 indoor starter tanks, and a storage building (HSRG 2003). Fish rearing and holding facilities include 21 raceways, four large asphalt rearing ponds, one large earthen rearing pond, and one large asphalt adult trapping and holding pond (HSRG 2003). Water sources for the hatchery include two pump intakes from the Cascade River, one gravity intake from Jordan Creek, and five wells.

Clark Creek flows through the adult pond and is used to attract and hold all fish released from the hatchery (WDFW 2003b).

Barnaby Slough

Barnaby Slough is located near the town of Rockport on RM 70.2 of the Skagit River and is used exclusively for acclimation and adult collection of winter-run steelhead. Site buildings include one residence and a small egg incubation building that is not currently being used (HSRG 2003). Fish rearing and holding facilities include one large rearing pond with a gravity water supply, two adult traps, and two small raceways (HSRG 2003). The water source for the facility is Barnaby Slough surface water that is augmented by five groundwater wells.

Baker River Trap

The Baker River Trap is a component of the PSE-owned fish facilities that includes a barrier dam, trapping facilities, and spawning beaches. The WDFW winter steelhead hatchery program, in conjunction with the PSE fish program, uses the barrier dam and fish trap and at times uses the holding ponds for acclimation. At RM 0.5 on the Baker River, the barrier dam blocks adult fish from continuing upstream and guides them into a trapping facility. The concrete barrier dam is 150 feet long with a 50 feet wide apron and foundation slab and crosses the river diagonally. In cross-section, the dam is an A-frame structure that provides a fish passageway behind the Lower Baker Dam spill zone, which directs fish over the entrance weirs to the adult fish trap facility (PSE 2002). The adult trapping facility is a concrete and steel structure incorporating a small entrance vestibule, two holding ponds, a **brail** pond, and a hopper pond. The ponds constitute, essentially, a fish ladder. Each pond is regulated by a weir gate and has movable fish crowders that are used to encourage upstream movement of the fish during the sorting, trapping, and hauling operations (PSE 2002). The brail pond is 12 feet square and has a vertical crowder, or brail, that is used to guide fish into the 10 foot by 12 foot stainless steel hopper pond, which is then lifted by crane and loaded into a waiting fish tank truck (PSE 2002).

Davis Slough

Davis Slough is located at approximately RM 40 on the Skagit River. The Davis Slough facility consists of a pond with a dike at the lower end. Until 2003, approximately 30,000 pre-smolts were acclimated yearly at Davis Slough for about three weeks. Adult hatchery steelhead were not collected at Davis Slough. In an effort to remove from the program any acclimation facilities that did not include adult trapping facilities, Davis Slough is no longer used as a hatchery juvenile steelhead release facility. For the 2003 release season, the number of smolts allotted to Davis Slough were direct released into the Sauk River (S. Stout, WDFW, pers comm., 7/16/03).

Grandy Creek and Faber’s Ferry

Winter steelhead hatched and reared at the Marblemount Hatchery, along with a portion of the fish reared at Barnaby Slough, are trucked and direct-released at these locations into the Skagit River system. Smolts released at these locations are currently collected as adults returning to the Marblemount Hatchery.

HATCHERY STOCK TIMING

The Skagit River hatchery winter steelhead are the targeted **population** for recreational and tribal fisheries on the Skagit River. This hatchery steelhead stock has been selected over decades of development to return to the Skagit River primarily in December and January, and begin spawning by mid January. The return timing of the hatchery steelhead stock occurs one month before the initial return of the native wild winter steelhead stock. Wild winter steelhead begin to arrive in low numbers in January, but peak returns do not occur until March and April with peak spawning in April and May. This separation in run timing and spawning time substantially minimizes, but does not completely eliminate, interaction between hatchery and wild steelhead.

2.1.1 HATCHERY PROGRAM PRODUCTION GOALS

The goal for Skagit River hatchery winter steelhead program is to release hatchery-produced smolts in the lower Skagit River, defined as the portion of the river at and below its confluence with the Baker River, to encourage adult steelhead returns that serve to provide and focus the sport fishery in the lower reaches of the river, reducing pressure on wild stocks upstream. This shift would also focus the fishery downstream of the primary bald eagle winter nesting and feeding areas, located between McLeod Slough (RM 66.0) and Rocky Creek (RM 73.6) (USFS 1983). Prior to 1992, 248,000 hatchery steelhead smolts were produced at the Marblemount and Barnaby Slough hatchery facilities and released into the Skagit River. In 1992, the Washington Department of Wildlife (WDW) produced the *Option Paper on Hatchery Steelhead Stocking Guidelines to Limit Genetic Impacts to Wild Steelhead Stocks* (WDW 1992a). As a result of this analysis, WDW increased the hatchery steelhead stocking level in the Skagit River to the current target level of 534,000 smolts based on predicted harvest demands due to expected population growth in the Puget Sound area. This stocking level included release of 334,000 smolts from the Marblemount Hatchery and associated facilities (including direct release areas), and 200,000 from Barnaby Slough and associated direct-release locations. This stocking level is not consistently being realized; smolt releases are discussed in Section 2.1.2 of this DEIS.

Hatchery winter steelhead harvest goals are 10,000 fish for the Skagit River system, of which half is for tribal harvest and half is for sport harvest. Due to inadequate returns, the tribal goal for hatchery winter steelhead of harvesting 5,000 adults is not currently being achieved (WDFW 2003a), and sport harvest is also low.

The annual winter steelhead broodstock collection goal in the Skagit River system is 400 adults. This goal of having a self-sustaining hatchery run of 400 adults equates to approximately a 0.075% return of total smolt releases into the Skagit River watershed (534,000 smolts) (WDFW 2003b). Adult hatchery winter steelhead have not, however, returned to the Skagit River in numbers that meet both harvest goals and broodstock goals. Broodstock collection is discussed in Section 2.1.2 of this DEIS.

2.1.2 HATCHERY PROGRAM OPERATION

The WDFW's winter steelhead hatchery program includes collection of adult fish for spawning to produce offspring to return to the river, incubation of eggs, rearing of juveniles, acclimation at Barnaby and Marblemount, direct-release of juveniles at various locations along the Skagit River, and harvest monitoring to determine numbers of hatchery and wild fish that return to the system as adults.

2.1.2.1 ADULT BROODSTOCK COLLECTION AND SPAWNING

Collection

Hatchery adult winter steelhead are primarily collected at Marblemount Hatchery and Barnaby Slough for potential use as broodstock. Some hatchery fish are also collected at the Baker River Trap. Fish collected at Barnaby Slough and the Baker River Trap are transported to Marblemount Hatchery for spawning. The numbers of adult steelhead collected at Marblemount Hatchery and Barnaby Slough are provided in Table 2-1. The table starts in 1995 because that is the first year of returning adults after implementation of increased smolt releases in 1992 (see Section 2.1.1).

Table 2-1. Numbers of female and male hatchery adult winter steelhead collected at Marblemount Hatchery and Barnaby Slough.

	Marblemount Hatchery[1]		Barnaby Slough[2]		
Year	Females	Males	Females	Males	Total[4]
1995	17	32	227	265	541
1996	22	38	173	108	341
1997	29	27	162	153	371
1998	179	270	49	49	547
1999	277	241	39	39	596
2000	31	30	15	11	87
2001	143	160	39	39	381
2002	676[3]		78[3]		754
2003	32[3]		81[3]		113

[1] SOURCE: WDFW 2003a
[2] SOURCE: WDFW 2003b
[3] Separate sex data for these years is not available.
[4] The number returning to the Baker River is not available.

Spawning

Once collected and transported to Marblemount Hatchery, broodstock are selected randomly from the total adult steelhead return. Eggs are held in five fish pools and fertilization occurs in batches of 5 males to 5 females. The number of eggs produced by collected broodstock are provided in Table 2-2. For the 2003 season, the total egg collection goal for hatchery winter steelhead in the Skagit system was 750,000 (C. Mains, WDFW, unpublished brood data, July 23, 2003).

Table 2-2. Numbers of eggs produced by collected broodstock.

Year	Marblemount Hatchery	Barnaby Slough	Total
1995	114,657	689,800	804,457
1996	133,857	532,980	666,837
1997	96,880	770,500	867,380
1998	1,295,100	245,000	1,540,100
1999	1,056,290	194,000	1,250,290
2000	131,130	49,950	181,080
2001	648,900	182,200	831,100
2002	556,000	93,000	649,000
2003	159,100	81,300	240,400

SOURCE: WDFW 2003a, WDFW 2003b

In the past, when broodstock numbers were low and egg collection goals were not met, additional eggs were needed to maintain the program. During these times, eggs from other hatcheries, including WDFW's Tokul Creek and Bogachiel hatcheries, were transferred to the Marblemount Hatchery for use in the Skagit River program (HSRG 2003). However, a decision to discontinue this basin-to-basin transfer practice was recently made in 2003 (C. Kraemer, pers comm., 12/12/03). If the proposal presented in this DEIS results in greater broodstock returns, as anticipated by fisheries managers, the broodstock collection goal could be met without supplementation.

2.1.2.3 JUVENILE PRODUCTION AND RELEASE

Offspring of collected broodstock are reared for approximately one year and then released as smolts.

Incubation

Fertilized eggs are incubated in vertical incubators until the **eyed** stage is reached. Once eggs reach the eyed stage, non-viable are culled, and eyed eggs are returned to the vertical incubators for hatching. Egg loss varies from 4.5% to 8.5% (S. Stout, WDFW, pers comm., 7/16/03). The **hatched fry** are then transferred to rearing facilities.

Rearing

Fish are started in troughs in the hatchery building and held indoors as long as possible. When fish are about 400-800 fish per pound (fpp), the fingerling stage, they are moved to outdoor rearing ponds and asphalt channels. Fry to fingerling survival rate is 91%, and fingerling to smolt survival is 96%.

Release

The current smolt release goal for the Skagit River watershed is 534,000 smolts. Of the total 534,000 smolts, 334,000 are Marblemount Hatchery-reared smolts to be released from the Marblemount Hatchery and other direct-release areas, and 200,000 are Barnaby Slough-reared smolts to be released from Barnaby Slough and various downstream areas. The target number of smolts released from Marblemount Hatchery is 136,000 smolts. The remaining 198,000 are acclimated and/or released from sites on the Skagit River below the Rockport bridge (RM 70.2) at the same time and size as those released on-station. The additional release sites include:

- Sauk River (implemented as a release site in 2003; will not continue)
- Baker River Trap (acclimated when space allows, and released)
- Grandy Creek and Faber’s Ferry (direct-release only)
- Davis Slough (former release site; will not continue)

Steelhead are reared and released according to the guidelines of WDFW (Tipping 2001a, b). Hatchery smolts are **adipose-clipped** and released during the month of May at about 5.5 to 6 fpp (approximately 7.7 inches in length at 6 fpp), with a **condition factor** of 0.9 to 0.99 (S. Stout, WDFW, pers comm., 12/22/03). Of the 200,000 smolts reared and acclimated at Barnaby Slough, a portion are released from the Slough, and a portion are trucked and released into Grandy Creek and Faber’s Ferry. At times, smolts from the Marblemount Hatchery are also released at the Hamilton/Lyman boat launch, the Birdsview boat launch (S. Stout, WDFW, pers comm., 5/8/03), and portions of the mainstem Skagit River (C. Mains, WDFW, pers comm., unpublished data, 6/10/03). Target release numbers are provided in Table 2-3.

Table 2-3. Annual target release numbers of hatchery winter steelhead into the Skagit River basin. Released juveniles are reared at the Marblemount Hatchery (334,000 reared) and Barnaby Slough (200,000 reared).

Release Site	**Number of Smolts Released**[2]
Marblemount Hatchery	136,000[2]
Barnaby Slough	136,000[2]
Baker River acclimation site	60,000
Davis Slough acclimation site	30,000 (discontinued in 2003) [3]
Faber's Ferry and Grandy Creek	172,000[4]
TOTAL	**534,000**

[1] Sources: WDFW Marblemount Hatchery HGMP 2003; WDFW Barnaby Slough HGMP 2003; S. Stout, WDFW, pers comm., 4/2/03

[2] The annual number of smolts released is a generalized summary; the location and number of smolts released varies annually based on available production. In some years, smolts have been transferred to other basins (will no longer occur).

[3] Smolts normally released at Davis Slough were released as a one-time event to the Sauk River

[4] Total number of smolts direct-released into Grandy Creek and Faber's Ferry has averaged approximately 172,000 (108,000 from Marblemount acclimated stock, and 64,000 from Barnaby Slough acclimated stock).

Actual smolt release numbers do not always meet the release goals of the Skagit River winter steelhead hatchery program. The inability of the hatchery program to meet production goals is attributed to several factors including the lack of adequate adult returns to the system (HSRG 2003), as well as to juvenile losses due to flooding and pathology at the rearing facilities, and out of basin transfers (as previously mentioned, a decision to discontinue this transfer policy has recently been made). The actual release numbers from Marblemount Hatchery and Barnaby Slough are included in Table 2-4. As shown in Table 2-4, in only one year, 1998, has the production goal of 534,000 smolts been met or exceeded.

Table 2-4. Actual smolt release numbers for WDFW hatchery steelhead into the Skagit River system.

Year	Smolts Released from Marblemount Hatchery-Reared Stock[1]	Smolts Released from Barnaby Slough-Reared Stock [2]	Total Smolts Released[4]
1995	84,663	224,900	309,563
1996	92,214	223,996	316,210
1997	175,027	90,000	265,027
1998	412,181	200,000	612,181
1999	238,623	184,000	422,623
2000	285,300	185,000	470,300
2001	266,680	195,000	461,680
2002	230,000	200,000[3]	430,000
2003	288,500[3]	200,000[3]	488,500

[1] Source: WDFW Marblemount Hatchery HGMP, includes smolts released at Baker River, Faber's Ferry, Grandy Creek, and Davis Slough.

[2] Source: WDFW Barnaby Slough HGMP; includes smolts released at Baker River, Faber's Ferry, Grandy Creek, and Davis Slough.

[3] Source: S. Stout, WDFW, pers comm., 7/16/03.

[4] Actual release numbers to the Skagit River basin are often lower than survival estimates (to smolt) would predict. Lower release numbers may result from on-site pathologies, flooding events at the rearing facility, and the off-basin transfer of individuals into drainages outside of the Skagit basin.

2.1.3 HATCHERY SCIENTIFIC REVIEW GROUP RECOMMENDATIONS

In its review of the Skagit River Hatchery Winter Steelhead Program the HSRG (2003) suggested that construction of an acclimation and adult recapture facility in the lower Skagit River, specifically at Grandy Creek, would benefit the Skagit River program and could help reduce potentially adverse interactions between hatchery and wild fish. According to HSRG recommendations, releasing acclimated smolts into the lower Skagit River may help to shift the focus of steelhead harvest downstream of the current primary harvest areas, reducing pressure on wild steelhead in the upper reaches of the river.

In addition, acclimating juveniles in the lower Skagit River may decrease potential interactions between hatchery and wild steelhead in the upper river as hatchery adults that were reared as juveniles in the lower river would home to the lower river and be collected at an adult trap near the acclimation facility. With the exception of the Baker River Trap, there are no existing adult collection facilities on the lower Skagit River.

2.2 ALTERNATIVES

"SEPA Rules" (WAC 197-11) have been published by the WDOE to govern and guide preparation of environmental impact statements in the State of Washington. WAC 197-11-440(5) describes the range of alternatives that an impact statement must discuss. Every impact statement must address the "no action" alternative. "No action" implies a proposal is either not pursued or not approved.

Other alternatives requiring comparison with the proposal and "no action," are those which are "reasonable", (those which "...could feasibly attain or approximate a proposal's objective, but at a lower environmental cost or decreased level of environmental degradation" (WAC 197-11-440(5)(b)). The word "reasonable" is intended to limit the number and range of alternatives in an EIS. WAC 197-11-440(5)(d) states that when a proposal is a public project, the lead agency must evaluate the no action alternative plus other reasonable alternatives for achieving the proposal's objectives on sites that may not be owned or controlled by the applicant. Alternative sites were examined to meet this requirement and are discussed in Section 1.2 of this DEIS.

The Grandy Creek alternative would include construction of an acclimation pond system and adult collection facility, along with transportation and storage facilities, on WDFW's Grandy Creek site near Birdsview, Washington. The Baker River alternative would include the construction of two acclimation raceways, a waste clarifier pond, and associated pipelines at the PSE-owned Baker River site. The applicant's specific objectives are outlined in Section 1.1 of this DEIS. Sites other than the two alternative locations did not achieve the applicant's objectives as outlined in Section 1.2. Other than the two alternatives, therefore, this DEIS considers only the No Action Alternative.

2.2.1 GRANDY CREEK ALTERNATIVE

This alternative would include construction of a juvenile acclimation and adult trapping facility on the southerly 13.6 acres of the 32.7-acre Grandy Creek site, located at the confluence of Grandy Creek and the Skagit River (RM 45.6) near Birdsview, Washington. The Grandy Creek site is owned by WDFW. The Grandy Creek site is the location of the relic Birdsview fish hatchery that was owned and operated by the U.S. Fish and Wildlife Service (USFWS) between 1905 and the late 1950s.

2.2.1.1 PROPOSAL PURPOSE

An acclimation and rearing facility at Grandy Creek has been proposed as an alternative by WDFW to help fulfill the overall purpose of the Skagit River winter steelhead hatchery program, which is **to**

provide harvestable hatchery fish while protecting naturally spawning steelhead as much as possible. Funds for a facility at Grandy Creek were appropriated during the 52nd Legislature 1991 Special Session under Engrossed Substitution House Bill 1427.

The intent of the proposal is to construct a facility capable of acclimating up to 334,000 smolts (of the 534,000 total smolts produced in the Skagit River program) to Grandy Creek water so that, as adults, they will return to the lower Skagit River for sport and Tribal fisheries. Those that escape these fisheries would return to Grandy Creek to be trapped and transferred to Marblemount Hatchery for spawning. Of the remaining 200,000 juvenile steelhead, half would be transferred to Barnaby Slough for acclimation and release, and half would remain at Marblemount Hatchery for final rearing and release. At times, the Baker River acclimation pond may still be used as a release site if juvenile acclimation is possible considering PSE activities at the Trap. Because the HSRG recommended the discontinuation of direct releases without adult capture, the Baker River site would only be used if acclimation and adult re-capture continued to be available. **The Grandy Creek proposal does not propose an increase in the total target number of smolts released into the Skagit system over existing production goals (534,000)**. However, acclimation may result in increased hatchery returns to the lower Skagit, resulting in the collection of the required broodstock to meet full program goals. If this occurs, the actual number of smolts released (Table 2-4) may be closer to production goals shown in Table 2-5.

Table 2-5. Proposed Skagit River Hatchery winter steelhead releases under the Grandy Creek alternative.

	Proposed Program	
Release Site	**Release Date**	**Number of Smolts Released**
Marblemount Hatchery	May 1 – June 1[1,2]	100,000
Barnaby Slough	May 1 – June 1[1,2]	100,000
Grandy Creek acclimation site	May 1 – June 1[1]	334,000
TOTAL		**534,000**

[1]The proposed release dates reflect research that shows volitional release throughout the month of May may decrease levels of residualism (Flesher and Whitesel 1999)

[2] Acclimated smolt releases may still occur at the Baker River trap. These fish would be transferred from Marblemount or Barnaby Slough.

2.2.1.2 SITE LOCATION AND CONDITION

The Grandy Creek alternative site is located within Section 15, Township 35 North, Range 7 East, W.M., Skagit County, Washington. The site is located in the west-central portion of unincorporated Skagit County adjacent to the Skagit River near the intersections of Cape Horn Road and State Route (SR) 20. The site is approximately six miles west of the town of Concrete, near Birdsview. Additional WDFW-owned property located north of Cape Horn Road is not included in this proposal. Under this alternative, facility development would occur on the 13.6 acres located south of Cape Horn Road.

Grandy Creek runs through the westerly portion of the site and Cape Horn Road abuts the northerly portion of the site. The site is generally flat with distinct topographic breaks located along the creek and the Skagit River. The southerly portion of the site is traversed by old roadways and is dominated by invasive plant species that occur in areas of previous human activity. More than half of the site is within the Skagit River floodplain. The site is currently used for unmonitored public access to the river for recreation and recreational angling. Evidence of motorcycle and four-wheel vehicle activity exists near the Skagit River and Grandy Creek confluence. Several test wells exist along the southerly site boundary adjacent to the Skagit River.

2.2.1.3 PROPOSED FACILITIES

The Grandy Creek proposal would incorporate both an acclimation facility for Skagit River winter steelhead hatchery system juveniles produced at the Marblemount Hatchery and an adult trapping system on Grandy Creek to capture returning adults for use as hatchery broodstock. Proposed facilities are shown in Figure 2-2, Grandy Creek Site Plan.

Development of the facility would require construction of internal roadways and parking facilities; acclimation/rearing ponds; adult collection weir, ladder and holding ponds, wild adult upstream return pipe, Grandy Creek surface water intake and fish screen, water supply and discharge pipelines, new wells and associated piping, a well-protection barb system, water supply mixing and aeration building, a storage building, and a residence pad with utility hookups for staff use during the seasonal acclimation process. A visitor parking area with an information kiosk and restroom would also be developed.

The existing foot trail to the Skagit River would be maintained and integrated into a maintenance roadway that would be used to access the area where new wells would be drilled (about 15 feet landward of the Skagit River bank).

<u>Acclimation/Rearing Ponds and Associated Facilities</u>

Ponds

Two new acclimation/rearing ponds would be constructed on the Grandy Creek site. The ponds would be approximately 180 feet long by 90 feet wide and 6 feet deep. The ponds would be constructed side by side with an access driveway between them. Pond sides would either be sloped or vertical and would be determined in final site design. Vehicle access to the ponds would be constructed on the west side of the ponds.

Ponds would be lined with clay or **geomembrane** material to prevent water leakage. Pond substrate suitable for rearing would be placed in the pond bottom on top of the clay or geomembrane material.

Predation netting would be installed to prevent bird and other predator access to the ponds from above. The netting would be installed on a steel support framework with weights to maintain tension in the net when acclimation/rearing ponds are in use. The perimeter of the ponds would be fenced as described in Section 2.2.1.9.

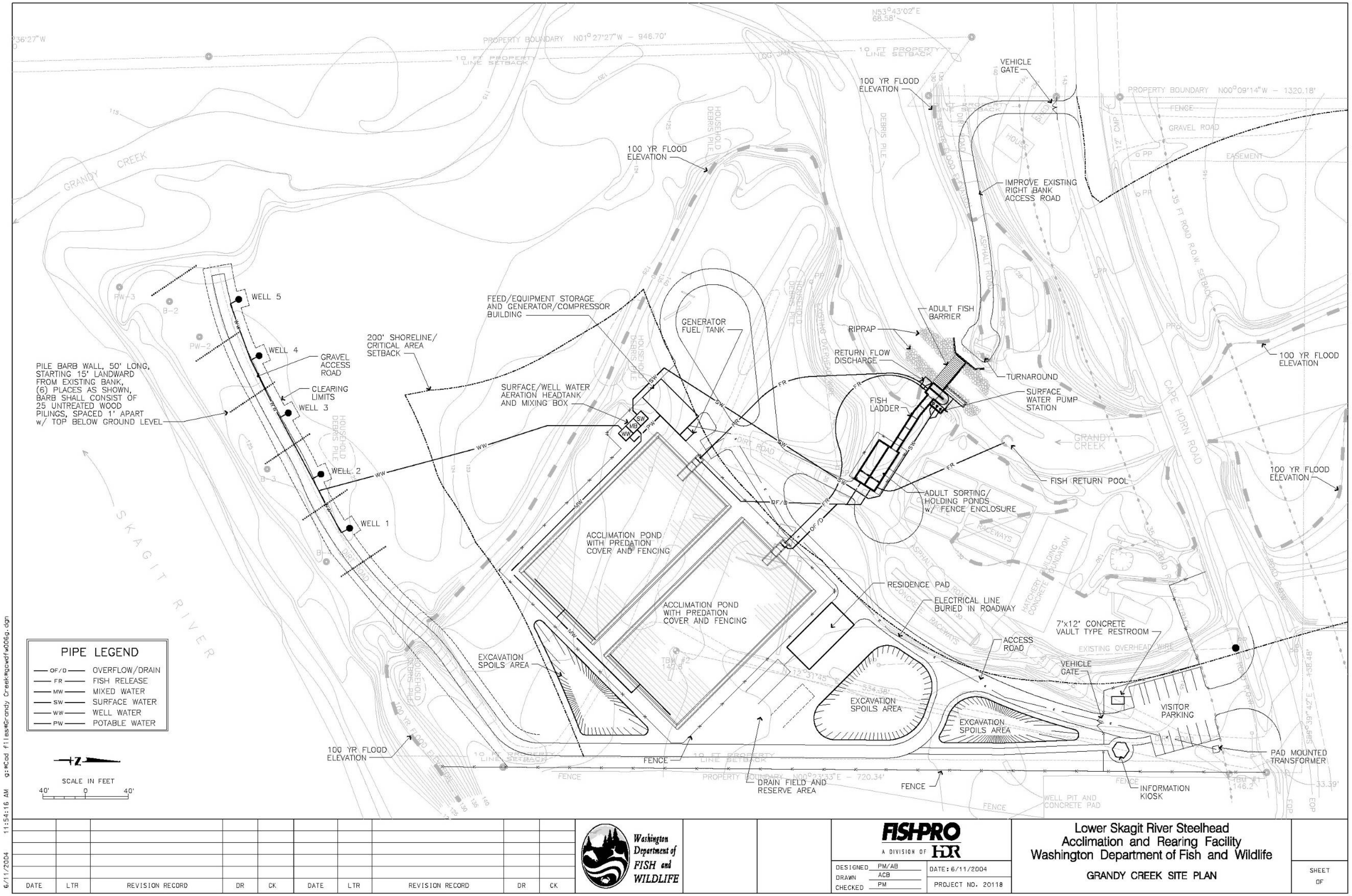

Figure 2-2. Grandy Creek Site Plan.

Adult Collection and Holding Facilities

The adult collection and holding facilities would consist of the following components:
- Fish barrier (weir) across Grandy Creek
- Fish ladder from the fish barrier to the sorting/holding ponds
- Adult sorting and holding ponds
- Hopper and lift system for broodstock loading or adult fish pump
- Adult wild fish upstream return pipe to Grandy Creek and associated pool

Fish Barrier (Weir)

A fish barrier would be installed across Grandy Creek. The purpose of a fish barrier is to guide upstream migrating adult steelhead from Grandy Creek to the entrance of a fish ladder. The fish barrier would be collapsible or removable so that it would not impede fish movement when a barrier is not needed. The barrier may consist of a picket barrier (weir) atop a rubber air bladder located atop a permanent concrete sill. The sill would be notched with a removable panel to periodically allow downstream transport of sediments past the barrier. The air bladder may be filled and deflated to raise or lower the barrier. An air compressor and air storage tank would be located within the office storage building, and air lines would run to the weir.

Fish Ladder

During trapping operations, fish would be guided by the weir to the entrance of the fish ladder. The entrance to the fish ladder would be located on the downstream side of the new intake structure. The fish ladder would be a pool-and-weir type ladder with each pool approximately 8 feet long and the fish ladder approximately 6 feet wide. The average water depth in the ladder would be 5 feet. Water would flow down the fish ladder to attract the fish to the ladder. Water sources for the ladder are discussed in Section 2.2.1.5. A finger weir, located at the entrance to the north adult holding pond, would route the returning adults to the north pond and prevent them from traveling back down the ladder.

Acclimation/rearing pond water would be discharged into a scour pool at the base of the proposed fish ladder throughout the rearing period (October through June 1). To prevent fish from entering the ladder following broodstock trapping operations, a bar grate equipped with one-inch spacing would be placed at the base of the fish ladder.

Holding and Sorting Ponds

Two adult holding and sorting ponds would be provided. The ponds would be located at the upstream end of the new fish ladder. Each pond would be approximately 33 feet long by 10 feet wide with an average water depth of 5 feet. Migrating adult steelhead and **resident** trout collected in the north pond would be sorted, and hatchery steelhead intended for transport to the Marblemount Hatchery would be transferred to the south pond. Wild steelhead and resident species, including juveniles that enter the adult sorting pond would be returned to Grandy Creek through a 12-inch diameter PVC fish return pipe that discharges into a pool approximately 75 feet upstream from the intake structure. A boulder or anchored root wad would be placed in-stream to maintain this scour pool at a minimum depth of 18 inches. This depth will be maintained by winter flows during fish ladder operations. The handling of fish other than hatchery-origin winter steelhead is discussed in Section 2.2.1.10 of this DEIS. The holding and sorting ponds would be fenced to prevent predation and vandalism as described in Section 2.2.1.9.

Hopper and Lift System

The adult holding and sorting ponds would be fitted with mechanical crowders. Fish would be crowded from the west to the east end of the ponds for sorting in the north pond and for loading the hatchery-bound adult steelhead into a fish transfer hopper. The hopper would be designed to hold water and fish. A release door would be located on the bottom of the transport hopper. The hopper, containing adult hatchery steelhead and holding water, would be lifted from the sorting area, placed on top of a transport truck or trailer, and released through a water-to-water transfer. A loading area and jib crane would be provided adjacent to the access road. Water from the surface water supply would be used to fill the transport tank via a fill pipe located adjacent to the adult ponds. A portable adult fish pump may possibly be used instead of a hopper and lift system.

Water Collection and Conveyance

Surface Water Intake and Pump Station

A new surface water intake and pump station would be constructed on Grandy Creek to provide up to 4,490 gpm (10 cfs) of surface water for operation of the facility. The new intake would be located immediately upstream from the new adult collection system and fish barrier. The fish barrier sill and barrier structure would create a backwater pool for the new intake structure. Both the barrier and sill would be equipped with panels (sill would only contain one panel) that could be periodically removed to pass sediment or overflow during high flow events.

The proposed intake structure would consist of a concrete box approximately 23 feet long by 3 feet wide (parallel to Grandy Creek) with an overall structure depth of approximately 12 feet. The intake structure would be fitted with wedgewire fish screens designed to meet NOAA Fisheries/WDFW design criteria of 0.4 feet per second approach velocity to the screen, with a safety factor added. With a maximum design flow of 5,388 gpm (12 cfs; screen designed to accommodate 20% over required flow for the facility), a total screen area of 45 square feet would be provided. A screen cleaning system consisting of an air backwash system would be provided to keep the screens clean. In addition, full baffling behind the screens would be provided to ensure an even distribution of flow through the screens.

Water would be drawn into the intake structure and pumped to the holding ponds via a pump station located on the landward side of the intake structure. Three vertical turbine multi-stage pumps would be installed and operated sequentially to meet the variable water demand requirements. The pump motors and controls would be located at the top of the pump and intake structure with the pump barrels extending into a pump chamber.

A sediment exclusion system would be integrated in the intake structure and adult fish barrier structure. A concrete channel would be installed in front of the intake structure and would extend below the fish barrier sill. A gate would be installed at the downstream end of the channel to allow periodic movement of accumulated sediment during high streamflows to preclude build up in front of the intake structure.

Bank protection (riprap) would be installed on the upstream and downstream banks of the new intake structure. The bank protection would consist of riprap extending 40 feet upstream and downstream from the new structures and keyed into the existing Grandy Creek banks and channel floor. The riprap would extend to a top elevation of approximately 2 feet above the 100-year flood elevation, be 3 feet in average thickness, and extend 5 feet from the toe of the bank out into the creek floor.

Well Water

Well water would be provided from new wells proposed to be drilled near the existing access trail that runs parallel to the Skagit River. The new wells would be drilled near existing test wells located along the southerly site boundary. Wells would provide a combined pumping volume of 3,143 gpm (7 cfs) for facility operations. A peak flow of 20 gpm (0.04 cfs) will be drawn, when necessary, from a deep aquifer well (to maintain a 100 gallon domestic water reservoir) to be located on site.

Aeration Tower and Mixing Boxes

Groundwater would be routed to a new aeration tower and mixing box located on the west corner of the acclimation/rearing ponds. The aeration tower and mixing box structure would be a three-chamber box with one chamber for aerated groundwater supply, one chamber for surface water supply, and a third for creating a mixed water supply. Following groundwater aeration, the well water and surface water could be mixed or routed directly to the acclimation/rearing and/or the adult sorting/holding ponds.

Surface and Well-Water Pipelines

Supply pipelines would extend from the group of on-site wells and from the surface water intake, individually, to the aeration tower and mixing box structure located adjacent to the acclimation/rearing ponds. The groundwater pipeline would discharge through a well water designated aeration tower and then into a chamber for distribution to either the ponds or the mixing box.

Drain lines

Drainage and overflow from the acclimation/rearing ponds would be routed to diffusers located in the adult holding and sorting ponds. The water passing through the drain lines would provide a portion of the attraction flow for operation of the fish ladder. This water routing system would provide for water re-use when both the acclimation/rearing ponds and adult holding and sorting ponds are in simultaneous operation, typically between December and March 15.

Fish release lines from the acclimation/rearing ponds would extend from each pond to the base of the fish ladder. The flow from the ladder would maintain a natural scour pool into which juveniles would enter Grandy Creek.

Accessory Structure

A feed and equipment storage building would be provided on the Grandy Creek project site. The building would be approximately 50 feet by 25 feet in size and would be located adjacent to the acclimation/rearing ponds. The building would be divided into several rooms that would house controls for primary power, a generator for backup power, office space, domestic water treatment, employee restroom, and storage for feed and supplies.

Electrical Control Room

An electrical room would house primary power controls, including the motor control center (MCC), alarms systems, main panel breakers, and communication equipment. The MCC would have power feeds to individual equipment including pumps, motors, site lighting, etc. Power would be extended to the equipment storage building from the existing commercial power grid located along Cape Horn Road. It is anticipated that the existing 480-volt, 3-phase power supply located within 0.5 miles of the site would be used for facility electrical needs.

A transformer mounted on an 8-foot square, 6-inch thick concrete pad would be located adjacent to the facility visitor parking area (Figure 2-2). The main power feed would extend from the transformer under the surface of the new facility access road to the feed and equipment storage building. All site power distribution would be located underground and would be routed within on-site roads to the extent possible.

Generator Room

A generator room would be provided to house the standby diesel generator. The generator would be sized to operate the surface water intake pumps, well pumps, and miscellaneous site power demands, and installed with an automatic transfer switch to transfer from the main power grid to the standby generator automatically in the event of a power outage. A minimum generator size of approximately 250 kW would be required to meet the site needs.

An above-ground 1,500 gallon diesel storage tank would be located on the northwest end of the equipment storage building to provide fuel for the generator. The fuel tank would be placed upon a concrete pad and double walled with leak detection.

A rollup garage door would be provided to allow access to the generator for maintenance and operation. The generator room would be insulated for noise reduction. The generator would be fitted with a residential-rated exhaust silencer that would meet a noise restriction level of 100 decibels at 100 feet from the generator unit when in operation. The noise abatement system would be tested to ensure the generator system meets the noise control requirements (see Section 3.2.1 of this DEIS).

Feed and Equipment Storage

Fish feed would be delivered to the site, unloaded, and stored in the building. Trucks would enter the site and proceed to the building on the site access road. Feed would be transferred directly from the truck to the building and the trucks could exit the site using the access road loop.

Office Space

A small office for the on-site administration and management of the facility would be included in the equipment/storage building.

Employee Facilities

A recreational vehicle (RV) pad would be installed on the north side of the acclimation/rearing ponds (Figure 2-2). The RV pad would be 15 feet wide by 40 feet long and constructed of concrete. The new gravel driveway and parking area would be located on the east side of the RV pad. A roof would be constructed over the RV pad to protect an RV that would be placed on the pad during the steelhead acclimation and adult collection season.

Potable water (20 gpm, 0.04 cfs) would be supplied from the deep aquifer via a proposed domestic well. A septic tank and drainfield would be constructed for the RV. When in operation, the domestic sewer line from the RV would be connected to the septic drainfield. The drainfield would be located in an open field on the east side of the RV pad. The drainfield system would be designed in accordance with Skagit County Health Department standards.

2.2.1.4 SITE PREPARATION

Clearing And Grading

The Grandy Creek site would be cleared to allow construction of the new facility components including the surface water intake, fish ladder, adult holding ponds, acclimation/rearing ponds, and associated infrastructure. The ruins of the Birdsview Hatchery remain on the site, portions of which occur within the Grandy Creek 100-year floodplain. Existing hatchery structures, including raceways and a concrete slab and wall, would be removed. Some household debris dumped on the site by unknown parties would be removed to a landfill.

Clearing activities would consist of removal of all vegetation and debris within the clearing limits included in Table 2-6.

Soils would be removed as necessary to provide a firm base for site construction activities. Excavated soil would be placed within excavation spoils areas shown on Figure 2-2.

Excavation and Backfill

Excavation necessary for construction of proposed site structures would be completed following removal of vegetation, debris, and surficial soils. Topsoil would be removed from cleared areas and stockpiled for use in final landscaping prior to seeding or planting. In some areas, surficial soils beneath topsoil would be removed to reach firm, load-bearing soils, and placement of gravel would be required. Gravel would be procured from an existing, permitted source. Excavated surficial soils would be used for non-structural backfill or placed in on-site fill areas (excavation spoils areas) located as shown on Figure 2-2. This fill would be placed and compacted in lifts, topped with stockpiled topsoil, and reseeded. Quantities of material proposed to be excavated for on-site facilities are included in Table 2-6.

The well access road would be staked in the field to avoid removing large trees in the area. Existing understory vegetation would be cleared to provide a maximum cleared width of approximately 14 feet to accommodate well access.

All woody debris and cleared vegetation would be removed and disposed of at an approved location, gathered into brush piles, or burned on site in accordance with WDFW and Skagit County standards.

Table 2-6. Clearing and excavation locations and quantities for the Grandy Creek alternative.

Clearing/Excavation Location	**Area cleared (square feet)**	**Area cleared (acres)**	**Excavation Quantity (cubic yards)**
Roadways, Parking, Trail			
West Bank Access Road to weir	4,500	0.10	126
Gravel Primary Access Road	30,000	0.69	740
Gravel Access Road/Trail to Wells, Utility Pad	30,400	0.64	1126
Visitor Parking/Restroom	4,900	0.11	181
Ponds			
Acclimation/Rearing Ponds	33,000	0.76	3700
Adult Sorting and Holding Ponds	1,500	0.03	296
Buildings			
Feed and Equipment Storage Building (including small office)	1,300	0.03	56
Residence Pad and Parking Area	1,800	0.04	67
Water and Fish Conveyance			
Adult Collection Barrier	1,700	0.04	296
Surface Water Intake and Mixing Boxes	800	0.01	111
Fish Ladder	1,000	0.03	267
Utility			68
Well Heads (5 total)	2,500	0.06	
Septic Drain Field and Reserve Area	4,800	0.11	93
Ponds Excavation Spoils Areas	14,800	0.34	530
Miscellaneous Site Clearing[1]	21,500	0.49	679
TOTAL	**154,500 ft^2**	**~3.5 acres**	**8336 cy**

[1] Includes pipeline corridors, brush, shrub, and weeds, adjacent to component sites

2.2.1.5 WATER SOURCES

Groundwater

New wells would be drilled and installed to replace the existing test wells that are located on the right bank of the Skagit River close to the shoreline. Combined, the new wells would provide 3,143 gpm (7 cfs) for facility operations. The new wells would be located away from the Skagit River bank (landward of the existing trail) and would be accessed from a new gravel roadway. Wells would be protected by individual pile bard walls, discussed below. Each cleared well area would be approximately 15 feet square. Each of the new wells would be connected to a primary groundwater supply line that would extend from the group of on-site wells to the aeration tower (see Section 2.2.1.3 and Section 3.1.3).

Potable water (20 gpm, 0.04 cfs) would be supplied from the deep aquifer via a proposed domestic well. The domestic water would be routed through a small pipe that would be routed through a filter system located within the storage and equipment building. The filtered water would be used for potable water within the storage building and for the residence trailer when in place.

Groundwater Well Protection

Over the course of facility operations (approximately 30 years), the Skagit River would likely continue its lateral migration, incising its right bank in the vicinity of proposed well field. To ensure that the wells are not damaged by incisive forces of the Skagit River, WDFW has proposed installation of wood piling protection barbs (Figure 2-2). The wood piling protection barbs would reduce Skagit River flow velocity adjacent to the barbs, and would trap sediments and large woody debris, stabilizing the river bank adjacent to the groundwater wells.

A series of six 50 foot long sections is proposed to be placed perpendicular to the Skagit River, with initial piles being driven approximately 15 feet landward of the existing river bank. Piles would be driven to ground elevation, covered with soil, and planted with native species. Each of the six separate barbs would consist of approximately 25 untreated wood pilings, driven approximately one foot apart to form a row perpendicular to river flow. The total number of piles proposed to be driven would not exceed 150. Pile driving activities would likely occur over a period of three weeks.

Surface Water

A new surface water intake and pump station would be constructed on the left (east) bank of Grandy Creek to provide up to 4,490 (10 cfs) of surface water for operation of the facility. An intake box with pumping equipment (see Section 2.2.1.3) would be placed along the creek bank. Installation of the intake system would require approximately 47 cubic yards of bank riprap. Surface water would be piped as described in Section 2.2.1.3.

Surface water and groundwater would be used in a variety of combinations throughout the juvenile acclimation and adult collection phases of Grandy Creek facility operation to meet the needs of both adult and juvenile winter steelhead. Requirements from each source for each month of facility operation are detailed in Sections 3.1.3 and 3.1.4 of this DEIS.

After flowing through the pond system (see Section 2.2.1.3), the mixed surface and groundwater would be discharged from the acclimation/rearing ponds to one of two possible locations:

- To a diffuser system located at the adult ponds. When the adult holding and sorting ponds are in operation and the adult collection system is also functioning, the acclimation pond discharge would be routed to the upstream end of the adult ponds and enter through a screen that would diffuse the water, preventing fish from entering the supply pipe and not inducing a jump instinct. This water would flow through the adult ponds and then the fish ladder and would serve as attraction flow when the fish barrier and ladder are in operation.

- Through discharge pipelines at the adult ponds and the fish ladder, located immediately downstream from the surface water intake. When releasing smolts, the fish would be allowed to move out of the ponds of their own accord into the fish release pipe discharging into the base of the fish ladder and then entering a scour pool, and into Grandy Creek. To prevent fish from entering the ladder following trapping operations, a bar grate equipped with one-inch spacing would be placed at the base of the ladder.

All water quantities discharged to Grandy Creek would at least equal, and during most months of facility operation, exceed water quantities withdrawn from Grandy Creek. The mixture of groundwater and surface water that would be discharged to Grandy Creek would represent up to a 3,143 gpm (7 cfs) increase in flow in Grandy Creek below the fish ladder during the winter months, and would gradually decrease to a 0 cfs flow increase in the creek by the month of June.

2.2.1.6 WASTEWATER FACILITIES

Facility Operational Wastewater

Acclimation Pond Wastewater

No wastewater treatment is proposed for the pond discharge water. The operation of a fish rearing pond is such that solid materials settle out within the pond itself. When the rearing and acclimation period is complete and fish have been released, pond water would be drawn down gradually, and then allowed to dry up over the summer months. No solid materials would be routinely removed from the ponds; however, accumulated waste may be removed from the ponds as necessary. Most solid materials would remain on the pond bottoms to add to the natural substrate. Similar ponds operated by WDFW meet Washington State discharge requirements of the National Pollutant Discharge Elimination System (NPDES) without additional treatment and it is believed that the Grandy Creek facility would meet the requirements as well. Specifically, this is the method used at WDFW's Tokul Creek, Skookumchuck, Dayton, and Cottonwood facilities' acclimation/rearing ponds and has proven effective at capturing solids. NPDES requirements are discussed in Section 3.1.3 of this DEIS.

Truck Loading Pad Overflow Water

A 20 foot by 15 foot concrete pad would be provided on the east side of the adult holding and sorting pond. The pad would be sloped to a center drain where excess and spilled water from adult fish transfer to trucks would be collected and routed to drainage collection infiltration ditches.

On-Site Sewer

On-site sewage disposal facilities would be designed and constructed for peak wastewater flows associated with a seasonal RV-size residence and an employee restroom facility. Facilities would be designed, constructed, and maintained in compliance with the Skagit County On-site Sewage Code.

A concrete vault style restroom facility would be provided near the visitor's parking area. The restroom vault would be pumped by a certified septic hauler on a schedule determined by WDFW and the septage would be disposed of in an approved facility.

2.2.1.7 DRAINAGE FACILITIES

There is minimal surface drainage on and off the Grandy Creek site, other than the Grandy Creek stream corridor. Stormwater management for the facility would include biofiltration swales and dispersal trenches to aid in natural infiltration of stormwater. Biofiltration swales would provide treatment for the 6-month, 24-hour storm runoff, and to convey without erosion the100-year, 24-hour storm runoff.

A Stormwater Pollution Prevention Plan (SWPPP) has been prepared and would be implemented to reduce the contribution of pollutants into off-site waterways during construction. In addition to installation of permanent stormwater management facilities, source controls such as ensuring that all exposed soil areas on the site are vegetated, that hazardous materials are stored properly and isolated from any stormwater systems, and application of any herbicides or pesticides occurs only during dry periods would also be implemented for the site to reduce the possibility of pollution.

Stormwater management associated with the development of the Grandy Creek facility is discussed in Section 3.1.3 of this DEIS.

2.2.1.8 HAULING, ACCESS, AND PARKING

Both the existing Skagit County transportation network and the Grandy Creek internal roadway system would carry operational materials and fish to and from the other Skagit River steelhead hatchery facilities of Marblemount and Barnaby Slough.

Hauling

Operational materials, including dip nets, feed buckets, tools, netting supplies, repair equipment, and hand tools would be transported to the site by trucks for storage in an on-site storage building. Steelhead smolts would be transferred to the Grandy Creek site for acclimation on a seasonal basis. Steelhead adults would be transported off-site by truck, also on a seasonal basis. All loading would occur within the pond and storage areas.

Haul trucks would carry an average of 20 tons (40,000 pounds) of feed. Transport trucks would have the capacity to haul up to 5,000 gallons of water for the transfer of smolts and 1,000 gallons of water for adult steelhead transfer. Maximum gross truck weights would be between 35 and 53 tons. Total truck traffic is estimated at 20-30 trips (inbound and outbound) during typical acclimation season operations, and 10-20 trips during the off-season. Employee trips are estimated at an additional 2 trips per day (inbound and outbound) throughout the year.

Site Access

The primary access to the Grandy Creek site would occur from Cape Horn Road, which is designed to meet Skagit County commercial access standards. The road approach would be asphalt paved. Commercial vehicles currently utilize Cape Horn Road for access to local housing and utility lines.

A secondary access would be provided to the west abutment of the adult collection barrier from an existing access road extending from Cape Horn Road, located in the northwesterly portion of the site. The secondary access road is overgrown and would require clearing and reconstruction. The access road entrance is located approximately 150 feet west of the Grandy Creek bridge on Cape Horn Road. A new vehicle gate would be installed at the access road west of Grandy Creek, which would provide access for WDFW employees only. The entrance would be designed in accordance with Skagit County roadway standards. Usage on this road would be minimal, estimated at 12 trips (inbound and outbound) per year.

Internal Roadway System

The primary site road would extend from the visitor's parking area to the storage and equipment building. This road would be 15 feet wide and provide access to the major site facilities including the adult holding and sorting ponds, the feed and equipment storage building, the acclimation/rearing ponds, the RV pad, and the aeration tower and mixing box structure. The roadway would be gravel surfaced.

A new gravel well access road would extend from the visitor parking area to allow service access to the new wells. The existing public access trail that extends from Cape Horn Road to the Skagit River would be incorporated into the well access road to maintain pedestrian access to the Skagit River. The roadway would be approximately 14 feet wide and gravel surfaced.

Site roadways would be designed in accordance with Skagit County driveway design standards.

Parking

Parking for employees, trucks, and operations vehicles would be provided in the operational area of the site. Asphalt paved spaces would be provided near the site entrance for visitor and recreational parking. The lot would include two handicapped-parking spaces and 12 additional spaces.

Signage

An approximately 4 foot square wooden sign would be located at the primary access to the Grandy Creek facility off of Cape Horn Road. The sign would be located on the site outside of the Cape Horn Road right-of-way. Other signs, as necessary would be installed on-site to direct traffic and restrict access.

2.2.1.9 PUBLIC ACCESS AND SITE SECURITY

Public Access And Recreation Facilities

The Grandy Creek facility would be provided with visitor parking located adjacent to Cape Horn Road. Visitors would be able to park in the lot and follow a walking tour to the facility, as well as access the Skagit River and the mouth of Grandy Creek.

The Grandy Creek facility has not been designed as an educational/public information destination. However, visitors would be encouraged to view facility activities and a limited amount of educational signage would be provided to present information on facility operations and steelhead management in the Skagit River. An information kiosk would be located near the visitor parking area (Figure 2-2). Information on the development and purpose of the Grandy Creek facility would be presented at this kiosk location, along with other watershed management information. Informational signs would be placed along the hatchery facilities identifying each facility component and purpose.

The existing trail to the Skagit River would be integrated into the well access roadway to allow continued access to the mouth of Grandy Creek and the Skagit River (Figure 2-2). An ADA-accessible restroom facility would be provided adjacent the visitor’s parking area.

Site Security

Fencing

Site ingress and egress by visitors and employees would be controlled largely through fencing.

Fencing would be installed on the north and east sides of the facility, around the visitor parking area, and around acclimation/rearing ponds and adult holding and sorting ponds. All fencing would be chain link style. The fence along the easterly site boundary would connect with the fence around the visitor parking area, and gates would allow operations staff and service vehicles to access the wells or the main facility. The fence proposed for the northerly property boundary would extend a short distance along the property line between the visitor parking area and the Grandy Creek bridge at Cape Horn Road. This fence would be installed on the Cape Horn Road right-of-way line. The acclimation/rearing ponds and the aeration tower mixing box structure would be fenced as one unit, and the adult holding and sorting ponds would be fenced as one unit. The fencing around the acclimation/rearing ponds would be buried 12" deep to prevent intrusion by otters and other mammals.

Pedestrian access to the Skagit River would be available at all times through an opening in the fence. Bollards (short, thick vertical posts) would be used at the opening to prevent motor vehicle access to the trail.

The access road to the right (west) bank of Grandy Creek would be gated to restrict access to WDFW personnel only. The wells would be housed within above-ground steel casings and capped for protection.

Lighting

Site lighting would aid in security, but would be limited to minimize impact to adjacent landowners and wildlife. Area lighting would be controlled from the equipment and storage building. Area lights would be placed at the storage/office building, acclimation/rearing ponds, the adult collection barrier, the adult holding and sorting ponds, the residence pad, and the public parking area near the County Road. The area lighting would be manually operated except for photocell-controlled lights located at the storage building and public parking. The residence pad would also be equipped with a driveway parking area light that could be controlled manually from the residence trailer.

Site Personnel

A seasonal residence would be provided on-site to allow for a facility operator to be present at all times during juvenile rearing and adult collection phases. The presence of a full time operator would deter vandalism and allow for immediate response during emergencies, such as power failure.

2.2.1.10 SITE OPERATION

<u>Acclimation Facilities and Associated Infrastructure</u>

Fish Transfer

Under the Grandy Creek alternative, juvenile steelhead would be transferred from Marblemount Hatchery where they were hatched and reared to the fingerling stage. All juvenile steelhead would be adipose-clipped (to differentiate them from wild fish) prior to transfer to the Grandy Creek facility. Transfer from the Marblemount Hatchery would occur from October 1 through December 1. Juveniles would be placed in the two earthen acclimation/rearing ponds and reared at a low density for optimal fish quality.

Water Use

Surface water from Grandy Creek would be combined with well water beginning in January or February and continuing until all of the fish have been released. Use of Grandy Creek water would allow for adequate **imprinting** of the juveniles to Grandy Creek so that, as adults, they would return to Grandy Creek to be collected.

Fish Feeding

The juvenile steelhead would be fed according to WDFW hatchery protocols. Typically, fish are fed Moore-Clark Nutra Fry until they reach the size of approximately 100 fpp. The fish are then fed Rangen's Steelhead dry pellet. Fish are started at approximately 4.3% body weight per day and finish up as smolts being fed about 1.2% body weight per day with an expected conversion rate of 80%.

Fish Health

All tools and ponds would be disinfected between uses. Extensive periods of drying (provides ultraviolet disinfection) during summer months, and removal of accumulated waste would be the methods used to disinfect both the acclimation/rearing ponds and the adult holding ponds. All fish mortalities would be removed from the ponds daily. Fish would be checked every 3 weeks by a WDFW fish pathologist. Fish health treatments would be made as prescribed by the Fish Health Specialist and according to the Co-Managers Fish Health Manual (WDFW HGMP for Marblemount 2003). Representative samples of fish would be checked by the WDFW Fish Health Specialist prior to release.

Fish Release

When fish reach the smolt stage, the screens at the outlet end of the ponds would be removed and fish would be released from the acclimation/rearing ponds volitionally. Release would occur from May 1 through June 1. Smolts would travel from the acclimation/rearing ponds to Grandy Creek through a release pipe that would discharge at the base of the fish ladder before entering Grandy Creek. Water depth within the ponds would be gradually lowered over the duration of the release period.

<u>Adult Trapping, Holding, and Transfer</u>

Trapping and Sorting

After two to three years of Grandy Creek acclimation pond operation, mature hatchery adult steelhead would begin to return to Grandy Creek. The fish barrier (weir) and ladder system would be used to capture the returning adults for use as hatchery broodstock. All fish would be sampled for adipose clips and only marked fish would be used for broodstock.

Handling of Non-Target Fish (fish other than hatchery winter steelhead)

Fish other than hatchery steelhead that are trapped would be sorted once per day during the trapping season and would be placed in a fish return pipe. The return pipe would allow these fish to return to Grandy Creek, approximately 75 feet upstream of the fish barrier, to continue their upstream migration. Hatchery steelhead would be routed to the south holding pond where they would await transfer to the Marblemount Hatchery for spawning.

At the time of hatchery steelhead adult collection, some **anadromous** fish species may be migrating from Grandy Creek to the Skagit River. Outmigrating juvenile fish would be able to pass through the fish barrier pickets. Pickets would be periodically lowered to allow larger emigrating adults, such as wild steelhead **kelts**, to pass through the fish barrier

Fish Health

All tools used in the adult steelhead collection and handling process would be disinfected between each use. Standard protocols as defined in the Co-Managers Fish Health Manual would be followed. Adults collected at Grandy Creek that die prior to transfer to Marblemount would be removed from the holding ponds and frozen (a large chest freezer would be on-site) for storage until disposal offsite.

Adult Hatchery Steelhead Transfer

Two haul trips per week are planned to transfer hatchery adult steelhead from the Grandy Creek facility to the Marblemount Hatchery.

Excess Fish

Through February 1 hatchery-origin steelhead collected in excess of broodstock needs would be recycled back to the lower Skagit River for increased sport and Tribal fishing opportunity. After February 1, hatchery steelhead would no longer be returned to the Skagit River in order to avoid interactions between mature hatchery fish and wild fish that may be holding in the lower Skagit. The practice of recycling excess broodstock is employed at the Baker River Trap where excess hatchery steelhead are returned to the mainstem Skagit River near the Baker River confluence. Excess adult hatchery fish not needed for broodstock may be given to local tribes and food banks.

2.2.2 BAKER RIVER ALTERNATIVE

2.2.2.1 LOCATION AND ON-GOING ACTIVITIES

The Baker River alternative site is located within Section 11, Township 35 North, Range 8 East, W.M., Skagit County, Washington. The site (see Figure 2-3) is across Baker River from the town of Concrete and is located adjacent to the existing PSE Lower Baker River hydroelectric dam office compound, which is situated on the east bank of RM 0.5 of the Baker River near the existing Baker River adult collection trap.

2.2.2.2 BAKER RIVER TRAP

The Baker River Trap fish facilities are described in Section 2.1 of this DEIS. The Baker River Trap, which functions to collect all upstream migrating fish before they encounter the lower Baker River dam, would be used for hatchery adult steelhead collection as part of the Baker River alternative. As previously mentioned, upgrades to the trap have already been proposed by PSE under the re-licensing of the PSE Baker River Hydroelectric dams (upper and lower dams). However, proposed upgrades to the Trap would not be necessary for its continued use as part of WDFW's winter steelhead hatchery program. Proposed upgrades to the Baker River Trap include:

- Installation of a hydraulic lift adjacent to the existing sorting structure that would extend into the parking area where up to four new raceways would be installed. These raceways would hold sorted fish in up to four sorting areas.
- Installation of a mechanical crowder to facilitate collection and transport of collected fish into trucks.
- Installation of pumps to provide water to the sorting raceways.
- Baker River water intake upgrade to meet NOAA Fisheries screening criteria for juveniles.

Stress relief ponds may also be added for emigrating juvenile sockeye, which are part of PSE's fisheries program. These ponds would provide a one or two day resting area for smolts after being trucked down from above the dams and prior to release into Baker River.

2.2.2.3 PROPOSED FACILITIES

Construction of raceways would occur in a historically disturbed area near an existing railroad easement within the existing PSE office complex (Figure 2-3). Under the Baker River alternative, the migrating adults would be collected at the Baker River Trap located at the existing barrier dam. Broodstock steelhead would be sorted and held in post-sorting holding **raceways** (these are existing, but are also proposed for modification under the Baker River dam FERC relicensing). Transport trucks would carry the collected adults from the Baker River Trap to Marblemount Hatchery where the adults would be held and spawned. Captured wild fish would be returned to the mainstem Skagit River, or transferred above the dam in accordance with PSE/WDFW fish transfer policies.

Juvenile fish would then be transported from Marblemount to the proposed acclimation raceways for rearing and volitional release into the Baker River. Table 2-7 presents the proposed release scenario under the Baker River alternative.

Table 2-7. Proposed Skagit River Hatchery winter steelhead releases under the Baker River alternative.

	Proposed Program	
Release Site	**Release Date**	**Number of Smolts Released**
Marblemount Hatchery	May 1 – June 1[1]	100,000
Barnaby Slough	May 1 – June 1[1]	100,000
Baker River acclimation site	May 1 – June 1[1]	334,000
TOTAL		**534,000**

[1]The proposed release dates reflect research that shows volitional release throughout the month of May may decrease levels of residualism (Flesher and Whitesel 1999)

Development of the Baker River site for use by WDFW as an acclimation facility would require construction of two acclimation raceways, a smolt release system, water conveyance pipeline, standby generator, a waste effluent pond with drainline (tying into release pipeline) and perimeter access road, as shown in Figure 2-4. Storage and office space would likely be located inside an existing PSE warehouse.

Acclimation/Rearing Raceways

Two new raceways would be developed on the Baker River site. The raceways would be located just north of the PSE warehouse and remnant concrete plant. The raceways would be located side-by-side from east to west as shown on Figure 2-4. In order to erect the raceways, about four feet of fill would have to be cleared and removed and one foot of gravel added to provide a flat and compacted subgrade. The waste clarifier would be located on the west end of the raceways. The raceways would be above-ground and constructed of concrete.

Predation netting would be installed over the raceways. The netting would be supported on a steel support framework and tensioned with weights.

Baker River Intake and Water Conveyance Pipeline

Two options are available for the water supply intake to the rearing raceways:

(1) Option 1 - Permanent intake pump station constructed in conjunction with the PSE improvements to the existing fish trap, holding, and transportation facility.
(2) Option 2 - Permanent intake pump station constructed separately (by WDFW) with individual fish screens.

For Option 1, the intake pump station would be located upstream from the existing barrier dam on the left bank. The pump station would be constructed adjacent to the existing gravity intake and trashrack. A new fish screen would be constructed from the barrier dam at an angle upstream to tie into the existing Baker River left bank. The fish screen structure would screen all flow entering the existing gravity intake as well as the new pump station flow serving the expanded PSE trapping facilities and the new WDFW acclimation/rearing raceways. A new concrete sill and wall would be constructed to support the new fish screen panels. The screens would be fully baffled and fitted with a mechanical screen cleaning system. The pump station would be located downstream from the new fish screens and mounted on the upstream face of the barrier dam. The discharge piping would be routed to the existing parking/access area, then buried under the existing access road to the new raceway location.

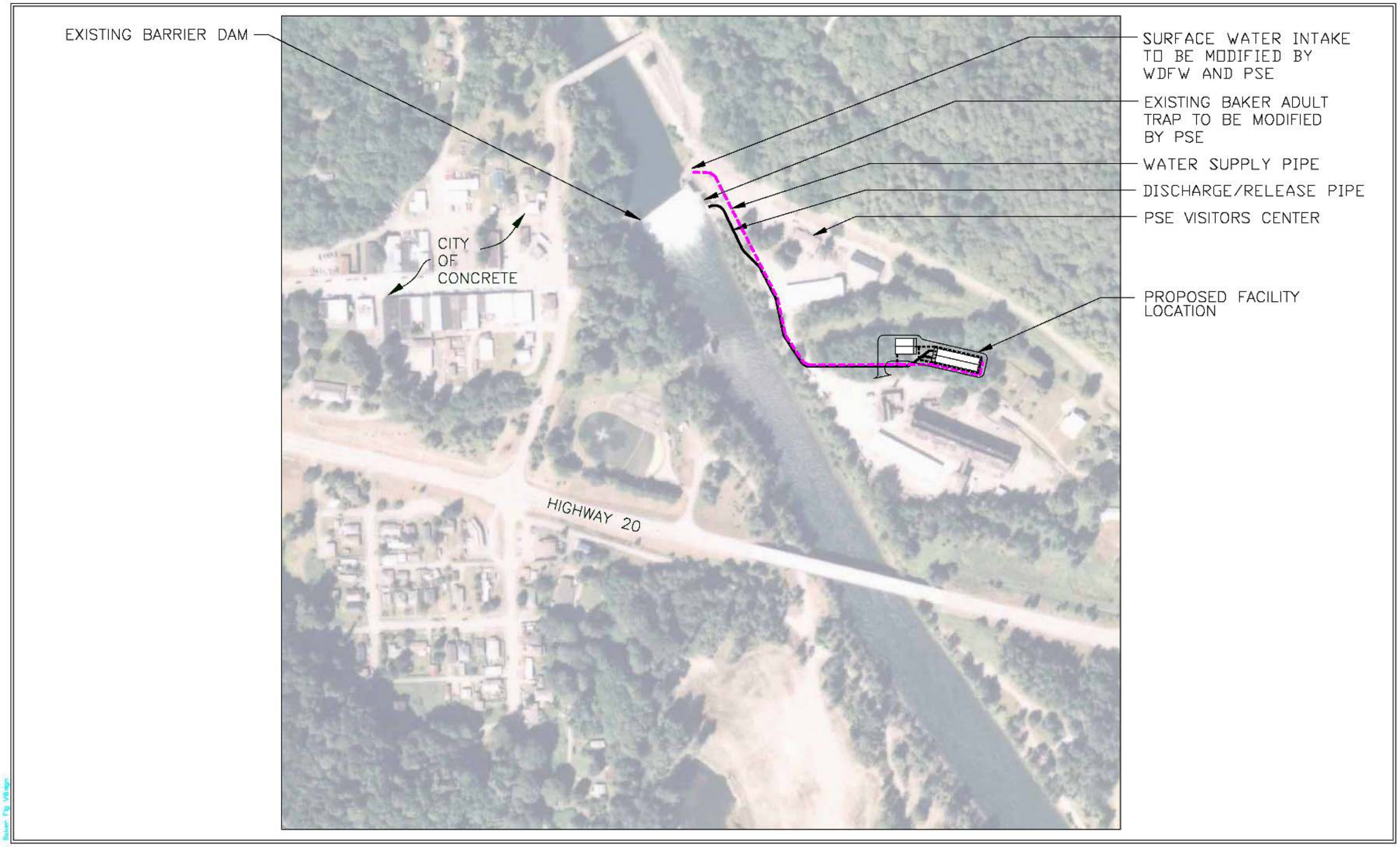

Figure 2-3. Aerial Photograph of Baker River Site with Facility Location Identified.

For Option 2, it was assumed that the new pump station would be constructed prior to any improvements to the PSE fish trapping facilities. With this option, the new pump station would be installed on the upstream face of the existing barrier dam. A submerged tee fish screen would be installed on the pump station suction lines. The submerged screens would be cleaned with either a water backwash or an air burst system. The piping would be routed in approximately the same location as proposed for Option 1.

Fish Release System

Fish release from the acclimation/rearing raceways would occur through an outfall pipe (combined with drain line) to the Baker River. The outfall pipe from each raceway would be routed west then north to a discharge location at the south end of the existing PSE trapping facility. The pipe would be placed above water so that the free fall of water would prevent fish from entering the pipe. The outfall pipe would be oriented to ensure that the maximum impact velocity is less than or equal to 30 feet per seconds (fps) as required by the NOAA Fisheries fish passage technical guidelines.

The first portion of the pipeline would be buried under the existing access road until it reaches the bank of the Baker River, where it would daylight and be located above-ground on concrete footings. The pipe would be exposed at the outfall allowing a free discharge from the outfall structure to the river. The pipe would be located at approximately 1 foot above the maximum normal water surface elevation. At the minimum normal water surface elevation, the vertical drop from the pipe would be 11 feet. This placement would ensure that the maximum NOAA Fisheries criteria of 30 fps impact velocity is not exceeded. The outfall would discharge into the tailwater pool that is maintained by flow over the barrier dam. The pool depth is maintained at a minimum of 6 feet during low tailwater conditions and is suitable for juvenile release.

The raceways would be fitted with fish screens to contain the smolts until volitional release. At that time, the screens would be removed and actively migrating smolts would be allowed to move out of the raceways.

Waste Effluent Pond And Drain

The raceways would be cleaned using a vacuum cleaning system and collected waste would be directed to a clarifier for settling. The clarifier proposed for this project is based on WDFW’s standard clarifier design that allows for a minimum settling time of thirty minutes. Upon settling of solids, the cleaning water would then be decanted and piped to a drain line, which then would discharge into the Baker River. The clarifier would be allowed to dry during the periods between use of the facility (June through September), and, once dry, solids would be removed and loaded into a truck for disposal at an approved site.

On-Site Storage

PSE owns and maintains an existing warehouse building located near the raceway area. New on-site storage building construction would not be possible with the limited site space; WDFW would work with PSE to obtain storage and office facilities during juvenile acclimation and adult collection phases.

Standby Generator

If a pump station is provided to supply water to the proposed adult holding raceways at the PSE facility, a standby generator would be provided as part of the adult collection system modifications. If this proposal were built before PSE’s improvements, a new standby power generator is anticipated to be required for the Baker River site alternative. The generator size and fuel requirements would be the same as the generator described for the Grandy Creek alternative (Section 2.2.1.3).

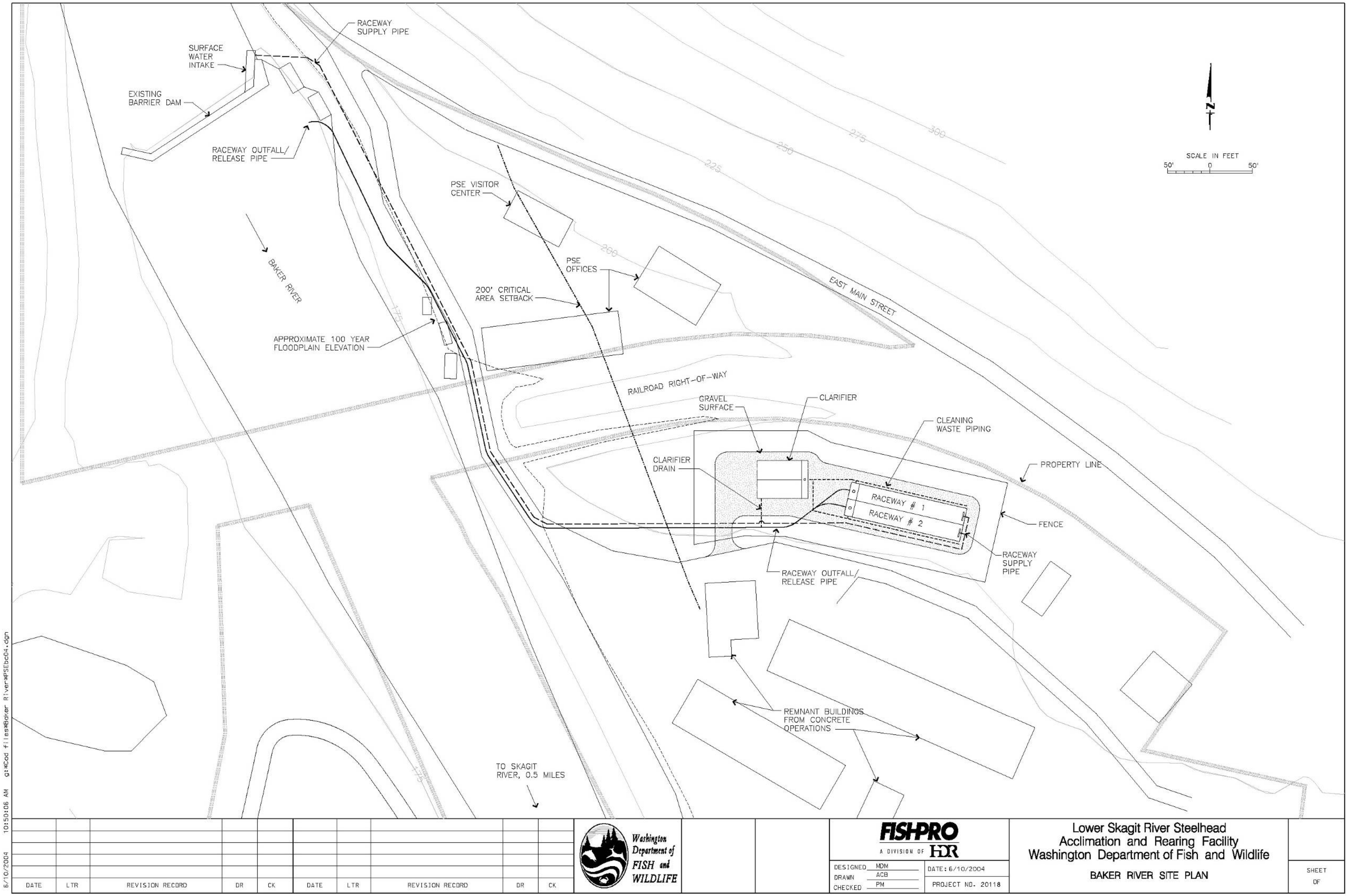

Figure 2-4. Baker River Site Plan.

Fencing

Site ingress and egress by visitors and employees would be controlled largely through fencing.

Fencing would be installed around the perimeter of the raceways and clarifier pond. All fencing would be chain link style and buried 12” deep to prevent intrusion by otters and other mammals.

2.2.2.4 SITE PREPARATION

Site Clearing and Excavation

Clearing and grading for construction of facility components would be necessary. Clearing and excavation locations and quantities are shown in Table 2-8. Clearing would include removal of approximately four feet of fill, all vegetation, and debris within the clearing limits. Unsuitable soil would be identified and removed to reach firm, bearing soils. Excavation and backfill activities would be required to install the water conveyance pipeline and the fish release outfall/effluent drain pipeline.

Table 2-8. Clearing and excavation locations and quantities for the Baker River alternative.

Clearing/Excavation Location	Area cleared (square feet)	Area cleared (acres)	Excavation Quantity (cubic yards)
Raceway Complex			
Perimeter access road	22,000	0.51	3,259
Acclimation/rearing raceways	5,600	0.13	830
Water and Fish Conveyance			
Surface water intake	1,000	0.02	533
Outfall and drain line	4,000	0.09	267
Clarifier			
Clarifier pond	2,400	0.06	356
TOTAL	**35,000 ft^2**	**0.81 acres**	**4,889 cy**

2.2.2.5 WATER SOURCES

Surface water from the Baker River would be the only water source for the facility. Groundwater is typically not found in quantities greater than can supply an average household within the geologic environment in which the lower Baker River occurs (Fig. 3-1). Approximately 12 cfs (5,388 gpm) of surface water would be supplied from a new pump station located on the upstream side of the existing barrier dam, on the east bank of the Baker River. The pump station would be constructed as part of the PSE-planned modifications to the Baker River fish trapping, sorting, and holding facility. If PSE modifications do not occur in time to meet the needs of this alternative, WDFW (or WDFW and PSE jointly) would construct the conveyance line and pump station.

Facility discharge water would be returned to the Baker River just downstream of the existing barrier dam, resulting in a negligible diversion reach. All water (12 cfs) would be returned as facility use would be non-consumptive.

2.2.2.6 WASTEWATER FACILITIES

A pond cleaning waste stream clarifier for the raceways would be WDFW’s standard clarifier design that allows for a minimum settling time of thirty minutes. Upon settling of solids, the cleaning water would then be decanted and piped to a drain line, which would then discharge into the Baker River.

2.2.2.7 STORMWATER DRAINAGE FACILITIES

Site stormwater runoff from the perimeter access road (around the raceway complex) would be directed to vegetated swales for filtration prior to discharge into an infiltration system.

2.2.2.8 HAULING, ACCESS AND PARKING

Minor modifications to PSE's existing internal roadway system may be required with implementation of the Baker River site alternative, although this is not anticipated. The perimeter access road is sized to allow transport trucks to access the clarifier and raceways, release fish into the acclimation raceways, and exit the site without having to turn around. Site parking is available in the immediate vicinity of the raceway location.

2.2.2.9 PUBLIC ACCESS AND SITE SECURITY

<u>Public Access</u>
Public access to the existing trapping operation and would be controlled and maintained by PSE. Additional display information describing the acclimation facility purpose and features could be provided to PSE for their visitor’s center. The acclimation raceways are located in a secure area and visitor access would be limited to guided tours provided by operations staff.

<u>Site Security</u>
Perimeter fencing would be required around the raceway complex. Access to the raceways and clarifier would be through a locked gate. The fencing system near the Trap may be enhanced, if necessary, to ensure adequate protection of adult fish when the trapping facility is in operation.

2.2.2.10 SITE OPERATION

Site operations would be similar to those described for the Grandy Creek alternative, presented in Section 2.2.1.10. Changes in operation procedures compared to the Grandy Creek alternative are presented below.

<u>Acclimation Facilities and Associated Infrastructure</u>
As with the alternative at Grandy Creek, transfer of juveniles from the Marblemount Hatchery would occur from October 1 through December 1. Juveniles would be placed in the two raceways and reared until the end of the volitional release period on June 1. Acclimation and rearing operations would occur concurrently with PSE’s adult trapping facility operation. The two facilities are physically removed from each other, so operational requirements would remain separated except for combined use of the surface water intake.

<u>Adult Trapping, Holding, and Transfer</u>
The proposed collection of steelhead broodstock would be included as part of the existing trapping operation at the Baker River Trap. As previously discussed, upgrades to the trapping and holding facilities would be implemented by PSE in association with FERC relicensing. However, these upgrades are not necessary to accommodate the Baker River alternative as existing facilities are sufficient to trap and hold hatchery broodstock. Marked adults would be collected at the Baker River Trap and held (for less than 24 hours) until they are transferred to the facilities at Marblemount Hatchery for spawning.

2.2.3 NO ACTION ALTERNATIVE

As described in Sections 2.1 and 2.2 of this DEIS, the proposal would result in a change to the existing Skagit River winter steelhead hatchery program by acclimating fish at a site located in the lower Skagit River. Production numbers would remain at status quo. As part of the existing hatchery program, steelhead smolts are trucked from Marblemount Hatchery and Barnaby Slough and direct-released into Grandy Creek and the Baker River, as well as other lower Skagit River tributaries. Currently, juvenile hatchery winter steelhead that are released into lower Skagit River return as adults to the Marblemount Hatchery or to Barnaby Slough. The proposal, therefore, is for the construction of a steelhead acclimation facility to acclimate hatchery steelhead smolts to a location in the lower Skagit River so that as adults, fish will return to collection facilities in the lower Skagit River. Acclimation and improved homing of adult steelhead returning to the lower river could provide additional angling opportunities there. A shift in the bulk of the fishery to the lower river could reduce pressure on wild stocks as well as reduce interactions between hatchery and wild steelhead in the upper Skagit. Additionally, having an acclimation and adult collection facility in the lower Skagit may help the winter steelhead program reach annual broodstock collection goals through increased returns to the area as compared to current juvenile direct-releases with no adult collection (see Section 2.1.1).

The No Action alternative would preclude development of a winter steelhead acclimation and rearing facility on the lower Skagit River (defined for this proposal as, at or below the confluence with the Baker River). The current hatchery winter steelhead program, as outlined in Section 2.1 of this DEIS, would continue in its existing form. The No Action alternative would not provide for enhanced recreational and Tribal harvest opportunity on hatchery steelhead in the lower Skagit River, and harvest and broodstock collection goals (see Section 2.1.1) may continue to not be realized.

Under this alternative, impacts identified in this DEIS would be avoided, but direct smolt releases (without acclimation) into various locations throughout the lower Skagit River would continue. Finally, under the No Action alternative, the recommendations of the HSRG (to discontinue smolt releases into waterbodies that lack adult collection facilities; and to construct such facilities in the lower Skagit River) would not be fulfilled.

3.0 ELEMENTS OF THE ENVIRONMENT

3.1 ELEMENTS OF THE NATURAL ENVIRONMENT

3.1.1 GEOLOGY, SOILS, TOPOGRAPHY, AND EROSION

3.1.1.1 GRANDY CREEK ALTERNATIVE

EXISTING CONDITIONS

United States Geologic Survey (USGS) geologic mapping and cross-sectional data, WDNR regional information, and on-site data, were used to infer potential impacts to geologic and groundwater resources on the alternative acclimation facility sites, located on Grandy Creek and the Baker River, and their immediate vicinities. Site data sources for the Grandy Creek site includes data logs from three wells and four test holes. Well logs from similar drilling projects on surrounding properties, obtained from WDOE well logs, were used to describe regional geology and the geology of surrounding areas.

Site Characteristics and Topography
The Grandy Creek site is located within the Hamilton quadrangle of Skagit County where Grandy Creek meets the Skagit River. Grandy Creek flows through the north-central and western portions of the site.

The Grandy Creek site is characterized by three relatively level surfaces, the top of which forms the surface of the Grandy Creek alluvial fan and slopes southerly to the valley floor. Site topography varies from an elevational high of 145 feet along the easterly portion of the site, to 120 to 130 feet in the middle of the site, to 115 feet at the point where Grandy Creek flows into the Skagit River. The easterly portion of the site forms an alluvial terrace that slopes steeply to a somewhat smaller terrace in the center of the site, likely an abandoned stream channel. The central terrace slopes steeply several feet to Grandy Creek. The terraced portions of the site include slopes of less than 10% to 15%, but the slopes between the terrace along the northeasterly portion of the site are as steep as 40%.

Surface and Subsurface Geology
Modification of the surface in the Skagit River valley occurred during the past two million years from glacial and nonglacial forces. The Grandy Creek site is largely composed of non-glacial Holocene Skagit River alluvial deposits [10,000 years before present (B.P.) to present (Dragovich et al. 1999)] that are known to extend from the surface to 100 feet below the surface on the Grandy Creek site and more than 250 feet below sea level elsewhere in the Skagit basin. These alluvial deposits overlay glacial deposits. Glacial deposits underlying the Skagit River alluvium were formed during the Everson Interstade of the Fraser glaciation [18,000 to 13,500 years B.P. (Easterbrook 1973)]. During this period a lobe of ice (Puget lobe) that had advanced through the Puget lowlands receded and left in its wake extensive glaciomarine deposits, composed of poorly sorted rock fragments and finer material (Dragovich and Grisamer 1998). The rock fragments of glaciomarine drift are usually poorly compacted in a matrix of varying amounts of sand, silt, and clay and are typically nonstratified internally. Glaciomarine outwash consists of angular sand, sandy gravel, gravelly sand, and sandy, cobbly gravel (Dragovich et al. 1999). Glaciomarine drift and outwash of the Everson Interstade typically overlies Vashon till, Vashon advance outwash, and older deposits (GeoEngineers 1983).

The Skagit River alluvial deposits consist of clay, silt, fine sand with minor sand and cobbly gravel, and local volcaniclastic materials derived from Cascade volcanoes, particularly Glacier Peak, and finer **fluvial** facies associated with deltaic estuarine settings (Dragovich et al. 1999). Both active and abandoned Skagit River channels and floodplains are bordered by older alluvium and 30 to 50-foot high terraces such as the Grandy Creek site. Although the active Skagit River channel is constrained between terraces, larger flood events are not, resulting in silty flood deposits on alluvial terraces (Dragovich et al. 1999).

As such, the near-surface soils at the Grandy Creek site generally consist of overbank and channel deposits from both the Skagit River and Grandy Creek. The upper alluvial terrace appears to be underlain by overbank deposits consisting of interbedded sand, silty sand and silt. The floodplain is underlain by several feet of sand and sand with silt that were deposited during catastrophic flood events; this material overlies alluvial gravel with sand and cobbles.

Surficial Soils
Natural processes have modified and exposed the Skagit River alluvium and overbank deposits that mantle the Grandy Creek site to form existing surficial soils. The Soil Survey of Skagit County Area, Washington (Klungland and McArthur1989) identifies three soil map units on the Grandy Creek site. Most of the site soils are Giles silt loam, with Larush silt loam along the west margin, and Wiseman channery sandy loam (0-8% slopes) at the northerly site boundary. These soils are described in Table 3-1.

Table 3-1. NRCS (SCS) soil types for the Grandy Creek Alternative Site

Giles silt loam 0 to 3 percent slopes Soil No. 59 Hydrologic group B	Very deep, well drained soil on terraces. Formed in glacial outwash and volcanic ash. Permeability is moderate. Available water capacity is high. Runoff is slow and the hazard of water erosion is slight.
Larush silt loam 0 to 3 percent slopes Soil No. 88 Hydrologic group B	Very deep, well drained soil on floodplains and terraces along major streams. Formed in alluvium. Permeability is moderate. Available water capacity is high. Runoff is slow and hazard of water erosion is slight.
Wiseman channery sandy loam 0 to 8 percent slopes Soil No. 159 Hydrologic group A	Very deep somewhat excessively drained soil on alluvial fans. Formed in alluvium derived from phyllite. Permeability is high. Available water capacity is low. Runoff is slow and the hazard of water erosion is slight.

Erosion
Grandy Creek is a braided stream channel that ranges from approximately 30 to 100 feet wide. Migration of the active channel has resulted in areas of active or recent erosion along the western margin of its floodplain. Active erosion occurs regularly along the bank of the Skagit River, which forms the southern margin of the site. Localized erosion landward of Grandy Creek and the Skagit River on the site and surrounding area is limited to small slope areas where soils have been exposed due to removal of native vegetation. Little on-site or off-site runoff occurs on the Grandy Creek site other than within the Grandy Creek stream corridor (see Section 3.1.4) that would result in erosion.

Geologic Hazards and Seismicity
Both deep and shallow earthquakes occur in the northwest because the Juan de Fuca plate and the continental plate contact beneath the Pacific Ocean and because of localized crustal movement in fault zones. Earthquakes that result in larger damage areas tend to be low on the Richter scale and occur at shallow depths beneath the North Cascade Mountain range. Earthquakes that result in smaller damage

areas tend to register high on the Richter scale and occur close to the contact zone between the Juan de Fuca plate and the continental plate (Noson et al. 1988).

Compression and mountain building of the Mid-Cretaceous produced thrusts and thrust faults throughout Skagit County. This compression of the earth's crust created several thrust faults that tend to push younger rocks beneath older, lower rock plates (GeoEngineers 1983). The Shuksan thrust fault winds its way through western Skagit County from Gee Point, located south of the Grandy Creek site to Chuckanut Mountain, located in northwest Skagit County. Shuksan thrust plates occur both north and south of the Grandy Creek site and both the Shuksan thrust plate and thrust fault overlie younger rocks of the Church Mountain thrust plate. Faulting could continue to occur, creating seismic disturbances in the Grandy Creek area and elsewhere in Skagit County.

Geologic hazard mapping of Skagit County (1997) places the lower Grandy Creek area within both the county's maximum lahar zone and the Mount Baker blast hazard zone. The Grandy Creek site is located near the Grandy Creek alluvial fan area, but is not considered a geologically hazardous area for landslides or erosion hazards. In addition, seismic hazard maps do not include the Grandy Creek site as a potential seismic source zone and, based on a review of seismic conditions, faults, and liquefaction potential; it does not appear that the Grandy Creek site would meet Skagit County critical areas criteria for a seismic hazard area.

The Uniform Building Code places the region containing the Grandy Creek site in Seismic Zone 3. This designation establishes a higher level of risk from seismic activity because the Puget Sound Basin area is seismically active and earthquakes occur frequently.

IMPACTS

Impacts to soils and topography would occur with development of the Grandy Creek site. Soil impacts would include grading for roadways, clearing portions of the site and excavation for acclimation/rearing ponds. The Grandy Creek site plan (Figure 2-2) identifies areas to be developed and areas that would not be disturbed. Out of the 13.6 site acres located south of Cape Horn Road, there would be approximately 3.5 developed acres and 10.1 undeveloped acres. Excavation and construction would occur on terraces; steep slopes would be avoided and would remain vegetated. As described in Section 2.2.4, topsoil would be removed and stockpiled for use elsewhere on the site.

Changes in topography would occur with the proposal. Excavation for placement of acclimation/rearing ponds would be necessary. Approximately 8,300 cubic yards of earth would be moved for construction of ponds, roads, and building placement, exposing soils to potential erosion. These areas would be reseeded or otherwise stabilized after construction. Gravel, sand and topsoil would have to be imported for roads, building foundations, landscaping and drainage improvements. For the most part, it is expected that cuts and fills for this construction would balance. Excavated material from the pond area would be placed in the spoils areas shown on Figure 2-2, compacted and seeded. This would avoid extensive trucking of excavated material off-site. The extent to which soils are eroded depends on soil type and the magnitude of storm events during periods of soil exposure. Earth movement and excavation have potential to create situations where erosion can occur. Soil compaction and creation of impervious surfaces contribute to increased runoff that would increase erosion if not controlled. Stored topsoil could erode unless seeded, covered, or otherwise stabilized.

The facilities proposed for the Grandy Creek site would largely be located outside of the 100-year floodplain for both the Skagit River and Grandy Creek, and steep slopes have been avoided in site design.

After clearing organic overburden, site soils are suitable for the type of construction proposed.

Areas that may be susceptible to damage from seismic shaking at the Grandy Creek site generally include steep slopes and those areas of the site within the 100-year floodplain. Damage within the floodplain may include earthflow deposition and liquefaction from seismic shaking. Impacts from strong seismic shaking may include liquefaction of saturated soils and differential settlement of foundations or other structures. Soil liquefaction or differential settlement may occur where saturated soil exists near the ground surface.

Saturated unconsolidated sediments on slopes greater than 15 percent within the Skagit River basin may constitute a moderate to high seismic hazard because the sediments can be expected to liquefy and flow or spread downslope because of ground shaking during a high-magnitude earthquake. Landslides triggered by seismic activity may also occur in unconsolidated sediments or bedrock in areas of the basin.

Sandy soils underlying the floor of the Skagit River valley may be susceptible to liquefaction by seismic shaking during large earthquake events. The site-specific potential for liquefaction depends on the grain size distribution of individual layers and the soil moisture content at the time of the earthquake.

MITIGATING MEASURES

Impacts causing erosion are predominantly construction related and can be prevented by good construction practices. This includes following erosion control plans that may include placement and maintenance of sediment fencing around all critical **riparian** areas, creation of temporary sedimentation traps with straw bales or fencing along drainage courses, use of hydroseed on exposed soils, mulching, and immediate revegetation. Precautions should be taken during extremely wet periods to avoid earth work which can contribute to soil compaction and erosion. Erosion potential would be reduced by directing surface water runoff to site stormwater facilities.

Grading activities would be conducted so that long-term soil exposure to erosion is avoided. Development of steep slopes and highly erodable soils would not occur. Erosion control plans and maintenance guidelines for sediment removal facilities would be submitted with Skagit County clearing, filling and grading permits. Topsoils would be excavated and stockpiled and surficial soils graded and compacted to provide satisfactory support for roadways and for the structure foundations. Stockpiled topsoil would be used elsewhere on site. The site excavation spoils area would be immediately compacted and seeded to avoid erosion and provide dust control. Roadway surfaces and parking areas would be stabilized with gravel or would be paved as described in Section 2.2 of this DEIS.

The drainage plan, prepared in accordance with Skagit County guidelines and the Department of Ecology's 2001 SMM, would include measures for temporary erosion and sediment control, along with a stormwater pollution prevention plan.

Building design and construction must adhere to Uniform Building Code earthquake requirements.

UNAVOIDABLE ADVERSE IMPACTS

Soil disruption and topographic alterations are unavoidable. Loss of soils to covering with impervious surfacing is unavoidable with project development.

3.1.1.2 BAKER RIVER ALTERNATIVE

EXISTING CONDITIONS

Site Characteristics and Topography

The Baker River alternative site is located within the Lake Shannon quadrangle of Skagit County approximately one-half mile north of the confluence of the Baker River with the Skagit River on privately-owned property. The Baker River flows along the southwesterly site boundary.

The Baker River alternative site contains several feet of fill material in the area of the proposed raceway complex. The raceway site is just north of a parking and staging area for PSE's vehicles and equipment near a former concrete plant for which the town of Concrete was named. The proposed raceway area occurs at approximately elevation 205.0 feet +/- and slopes quickly to the west to the proposed outfall location (Figure 2-4).

Surface and Subsurface Geology

The Baker River basin has undergone the same glacial and post-glacial geological transformations as the Grandy Creek and Skagit River basins. With the retreat of the Vashon Glacier about 15,000 years B.P, the Baker River was left in a deeply glaciated valley. Subsequent volcanic events over the next 10,000 years left the Baker River valley filled with lava and ash, changing the course and depth of the river channel many times. Subsequent to the lava flows and mudflows, **alluvium** and **colluvium** have filled in the Baker River basin drainages to significant depths (PSE 2002).

As with the Skagit River basin, glacial tills are typically found on the sides of the valley and are thought to underlie terrace deposits and alluvium underlies stream channels and valley floors. In the lower Baker River basin, terraces of glacial till occur at elevations between 900 and 1,100 feet, where they overlay pre-Vashon age lake bed deposits, which are up to many hundreds of feet in thickness (PSE 2002).

Surficial Soils

The Soil Survey of the Skagit County Area, Washington (Klungland and McArthur1989) identifies one soil map unit within the area proposed for use. This soil unit is Giles silt loam, which is described in Table 3-1 of this DEIS. The raceway areas have been historically disturbed and likely filled with compacted, non-native fill and gravel.

Erosion

The Baker River is constrained by a steep bank. No erosion occurs at the location of the raceway complex site and little erosion occurs along the bank of the Baker River. No stormwater runoff or surface water sources other than the Baker River occur in the area that would contribute to site or bank erosion.

Geologic Hazards and Seismicity

Geologic hazards detailed for the Grandy Creek alternative also apply to the Baker River alternative site. The site is within the Skagit County maximum lahar area, the Mount Baker blast hazard zone, and experiences the same potential earthquake hazards as the Grandy Creek alternative site.

IMPACTS

Impacts to soils and topography detailed for the Grandy Creek alternative site would also apply to the Baker River alternative site. Excavated spoils would be disposed of at an approved upland location. Temporary erosion control measures would be required during site development.

MITIGATING MEASURES

Erosion control measures detailed for the Grandy Creek alternative would also apply to the Baker River site alternative, including sediment fencing along the Baker River, hydroseeding, or other revegetation. Permanent stormwater facilities may be required with development of the perimeter access road. If required, stormwater treatment facilities would meet Skagit County guidelines and WDOE 2001 SMM requirements. Plans would be reviewed by Skagit County in conjunction with final site design.

UNAVOIDABLE ADVERSE IMPACTS

Soil disruption and topographic alterations would be unavoidable with implementation of the Baker River alternative.

3.1.1.3 NO ACTION ALTERNATIVE

The No Action alternative assumes that each site would remain in its existing condition, with no changes to geology, soils, or topography. At the Grandy Creek site, erosion would continue in the isolated areas where it occurs along the Skagit River on the Grandy Creek southerly site boundary.

3.1.2 AIR QUALITY

3.1.2.1 GRANDY CREEK AND BAKER RIVER ALTERNATIVES

EXISTING CONDITIONS

Climate

The seasonal climate in the general area of the lower Skagit River is governed primarily by weather fronts off the Pacific Ocean that affect the entire Puget Sound region. Published data show that measurable precipitation occurs an average of 157 days per year in the Puget Sound area, and the lowlands of western Skagit County receives approximately 35 inches of measured precipitation (Klungland and McArthur 1989), while the Concrete area at 195 feet elevation receives 67 inches of precipitation annually (Weisberg and Riedel 1991). This precipitation typically occurs between the months of September and April. The prevailing wind in Skagit County is from the southwest and average wind speed is highest in winter at 9 miles per hour (Klungland and McArthur 1989).

Air Quality

Air quality compliance in Skagit County is enforced by the Northwest Air Pollution Authority (NWAPA). NWAPA has adopted ambient air quality standards that meet Washington State air quality standards (WAC 173-460). These Washington State standards generally correspond to US Environmental Protection Agency (EPA) standards. National Ambient Air Quality Standards (NAAQS) exist for lead (Pb), ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide ($S0_2$), and particulate matter less than 10 microns in diameter (PM-10). The closest monitoring station to the Concrete area is located in Mount Vernon, Washington.

The air quality in Skagit County is good and has never exceeded a national air quality degradation standard. NWAPA has found that the highest levels of monitored pollutants are from wood smoke and diesel engines, which emit significant amounts of nitrogen oxides, particulate matter, and hydrocarbons that contribute to acid rain, ground-level ozone, and reduced visibility.

IMPACTS

Temporary, localized increases in atmospheric concentrations of carbon monoxide, nitrogen dioxide, volatile organic compounds, and particulate matter, the typical pollutants in engine exhaust, would result from construction vehicle use, diesel generators, and other construction equipment. The scale of construction activities would be considered minor and emission would be unlikely to exceed the boundaries of the construction site.

Outdoor burning may be conducted during the site clearing process. If burning includes more than one pile or exceeds four feet in diameter, burn permits would be obtained from WDNR.

During project construction, suspended particulate emissions (dust) would occur, particularly during excavating and grading. Particulates would also result from emissions from gasoline and diesel-fired engines. Dust could also be created from construction-related truck traffic entering the site. The impacted area would be minor and PM-10 generation would be unlikely to exceed air quality standards. No dust suppression measures are proposed.

MITIGATING MEASURES

The effects of construction activities on air quality would be temporary and would not lead to permanent degradation of air quality in the site vicinity. The following mitigation measures would be implemented to minimize impacts to air quality during the construction period:

- Watering exposed soils and minimizing the duration and extent of exposure to minimize dust production.
- Minimization off-site trips and cleaning vehicles before they enter public streets could reduce the potential for tracking dirt and dust off-site.
- Site ingress and egress areas are proposed to be graveled construction entrances.

UNAVOIDABLE ADVERSE IMPACTS

Some dust generation is unavoidable with site preparation and truck traffic. Pollutants associated with vehicle emissions are unavoidable impacts.

3.1.2.2 NO ACTION ALTERNATIVE

With the No Action alternative, no air quality impacts would occur in exceedance of possible existing impacts associated with on-going use of the sites. Construction-related dust generation and a temporary increase in pollutants associated with vehicle emission would not occur.

3.1.3 SURFACE WATER

INTRODUCTION

This section addresses potential impacts to hydrology and water quality associated with the Lower Skagit River Steelhead Acclimation and Rearing Facility proposal alternatives. Topics include impacts to surface water quality and quantity, and flooding.

3.1.3.1 GRANDY CREEK ALTERNATIVE

EXISTING CONDITIONS

Surface Water Sources

The Grandy Creek alternative site is located within the Grandy Creek watershed, adjacent to the Skagit River. The Grandy Creek drainage area includes approximately 19.7 square miles of land containing the proposed acclimation facility site and to the northeast, between Birdsview and Concrete, Washington. The watershed varies in elevation from about 115 feet on the southerly portion of the site to over 1,200 feet along the eastern watershed boundary. The Grandy Creek subbasin includes at least seven tributaries, two lakes, and numerous smaller drainages, and is in hydrologic contact with the Skagit River watershed. The surface water right for the flow necessary to operate this facility has been applied for.

<u>Grandy Creek Characteristics</u>

Grandy Creek converges along the north bank of the Skagit River at Skagit River Mile (RM) 45.6 (Ames and Bucknell 1981). The Grandy Creek watershed (including Grandy Lake, tributaries upstream of the lake, and small fish bearing tributaries to Grandy Creek) drains approximately 19.7 square miles of relatively steep hillside area northeast of the Grandy Creek site. The Grandy Creek subbasin includes at least four tributaries and two lakes (Ames and Bucknell 1981).

Grandy Creek below the SR 20 bridge is relatively shallow with primarily a cobble and gravel bottom. The streambed is wide and the steam is braided.

<u>Skagit River Characteristics</u>

Skagit River headwaters are in the Manning Provincial Park in British Columbia and flows southwesterly for 25 miles, turns southeast for seven miles to the U.S. border, then flows south for 20 miles in Washington where it breaks through the crest of the North Cascade Mountains (Weisberg and Riedel 1991). The total drainage area is approximately 3,100 square miles, 400 of which are in Canada. The major tributaries of the Skagit River are the Cascade, Sauk, Suiattle, and Baker rivers.

The Skagit River varies from the steep-gradient, fast-flowing river with a rocky bed to a low gradient meandering river with a silty bed. The confluence of Grandy Creek with the Skagit River is within the lower gradient portion of the river. Oxbows of the meandering Skagit River have become sloughs, of which Barnaby Slough, a component of WDFW's steelhead hatchery program, is one (see Section 2.1.1).

Water Quality and Quantity

<u>Grandy Creek</u>

No long term or stationed gage data exists for Grandy Creek. Grandy Creek discharge rates were calculated from the stage elevation and channel dimensions by R.W. Beck in 1990. Discharges at that time ranged from low daily averages of 25.5 cfs in October to high daily averages of 231.7 cfs during November storm events. R.W. Beck (1990) determined that an average discharge of 78 cfs for the winter months between October and March was more representative of Grandy Creek flows at that time. Analysis of flows recorded from November 2002 through March 2003 reflected a 76 cfs winter daily average with a low of 6 cfs in early November and a high of 240 cfs in March. September through early November, 2002 was a period of unusually low rainfall. Some additional development has occurred in the Grandy Creek basin since R.W. Beck’s report. These data, separated by 12 years, show that annual discharges from Grandy Creek have not changed significantly despite the development.

Water quality sampling results for Grandy Creek, a component of Water Resource Inventory Area (WRIA) 4 show temperature exceedences for Grandy Creek south of the SR20 bridge. Grandy Creek is listed as a 303(d) problem area for instream temperature (WDOE 2003). In addition, Grandy Creek is listed on WDOE's Surface Water Source Limited (SWSL) list. The SWSL list identifies low-flow streams in Washington State that, because of potential limitations in available supply, may be of concern for fish habitat (WDOE 2003).

<u>Skagit River</u>
Skagit River discharge has been monitored at the Dalles bridge, southwest of the town of Concrete by the USGS since 1924 (USGS 2003). This USGS gaging station, located at RM 54.1 has collected discharge data regularly since 1924, but includes some isolated peak discharge data from the 1800s. The USGS recorded data show an average annual discharge for the 2,737 square mile Skagit River drainage area above the town of Concrete of 15,086 cfs.

The Skagit River is classified as a WDOE Class AA water body from RM 25.6 upstream to the headwaters by standards set-forth in WAC 173-201A-130. Class AA designation refers to a surface water quality rating of "extraordinary", which exceeds the requirements for all or substantially all uses. Water quality data were collected at the USGS gaging station in Concrete from December 1970 to September 1971, and October 1977 to June 1980.

Values for fecal coliform in the USGS data for the Skagit River periodically violated surface water standards as defined by in WAC 173-201A-130. Non-point, agricultural-related sources of contamination have historically been credited with elevating levels of fecal coliform in the Skagit River. Data do not suggest, however, that significant deterioration of water quality occurs.

Drainage (Runoff/Absorption)
Little off-site runoff enters the Grandy Creek site and on-site drainage occurs primarily within the Grandy Creek corridor.

Flooding
The Federal Emergency Management Agency (FEMA) flood insurance study of the Skagit River (1985) shows that a portion of the Grandy Creek site is located within the 100-year regulatory floodplain for both the Skagit River and Grandy Creek. The 1989 FEMA FIRM map depicts the Grandy Creek site 100-year flood elevation at 130 feet (Figures 2-2 and 3-1).

The estimated October 2003 flood elevation at the Grandy Creek bridge was 128.5 feet (+/-). In addition, peak flow data are available for the Skagit River USGS gage near the town of Concrete. Skagit River peak flows, along with the gage stage during flood events are included in Table 3–2.

Table 3-2. Large floods on the Skagit River as measured at USGS gage 12194000 near Concrete, WA.

Year	Date	Gage Height	Peak Discharge
1815	—	69.3	500,000[1]
1856	—	57.3	350,000[1]
1897	November 19	51.1	275,000
1909	November 30	49.1	260,000
1917	December 30	45.7	220,000
1921	December 13	47.6	240,000
1932	February 27	39.99	147,000[2]
1949	November 27	40.80	154,000[2]
1951	February 10	38.99	139,000[2]
1980	December 26	40.19	148,700[2]
1990	November 10	40.20	149,000[2]
1995	November 29	41.57	160,000[2]
2003[3]	October 21	42.21	166,000[2]

[1] Discharge reconstructed from geologic evidence
[2] After dam construction
[3] Provisional data
SOURCE: USGS 2003.

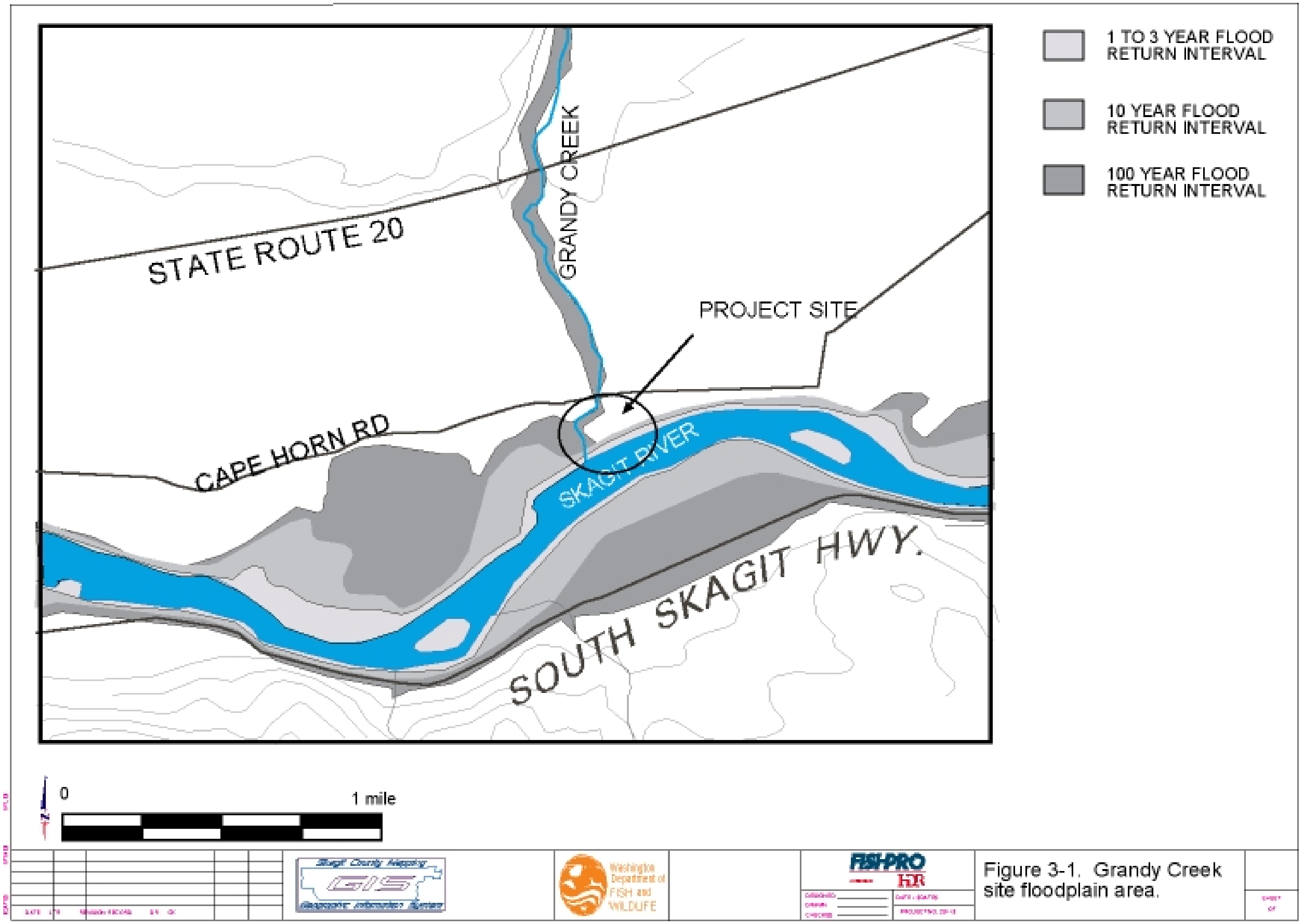

Figure 3-1. Grandy Creek Site Floodplain Area.

IMPACTS

Water Quantity Impacts

Section 2.2.1.5 of this DEIS describes surface water and groundwater sources and demands for operation of the proposed facility. Proposed water withdrawals from Grandy Creek and on-site wells for juvenile acclimation/rearing ponds and adult collection facilities, along with expected discharge quantities from the facility to Grandy Creek are included in Table 3–3.

Table 3-3. Maximum surface water and groundwater requirement (in cfs) relative to steelhead life history stage at the Grandy Creek alternative site and total discharge to Grandy Creek[1]

	Fish Ladder Attraction[2,6]	Juveniles		Total Water Requirements		Total Water Discharged to Grandy Creek
Month	Surface Water	Ground-water	Surface Water	Ground-water	Surface Water	Surface Water + Groundwater
October[3]		6		6		6
November		7		7		7
December	4	6	2	6	6	12
January	4	6	2	6	6	12
February	4	6	2	6	6	12
March 1-15[4]	3	5	4	5	7	12
March 15-31		5	5	5	5	10
April		3	8	3	8	11
May 1 – June 1[5]		2	10	2	10	12

[1] Assumes a total groundwater right of 7.0 cfs and a total surface water right of 10 cfs
[2] Assumes 12 cfs needed for attraction flow from the fish ladder. Adult pond water would be supplied from part of the acclimation pond water. If acclimation hasn't started by Dec 1, water would bypass acclimation/rearing ponds and go directly into adult ponds.
[3] Juveniles would be brought on station from October - December
[4] Adult collection would occur from December 1 – March 15 (end of trapping may cease earlier – determined on yearly basis)
[5] All juveniles would be released as of June 1, flow rate would diminish as fish are volitionally released
[6] During high flow periods at Grandy Creek, the flow through the entrance of the fish ladder would be increased up to the amounts shown in this column to provide better attraction flow to returning adults.

The juvenile acclimation/rearing ponds would be filled in October from groundwater wells and would be augmented in December with Grandy Creek source water. Adult pond water and fish ladder flows would be supplied from the acclimation pond discharge water. If juvenile acclimation has not been initiated by the beginning of December each year, mixed surface and groundwater would bypass the juvenile acclimation/rearing ponds and go directly into the adult holding and sorting ponds. Water from the acclimation/rearing ponds would, along with Grandy Creek water, be required at a rate of 12 cfs during months of operation of the adult collection facility (December through mid-March) for attraction of returning adult to the fish ladder. All water drawn from surface and groundwater sources, combined, would be discharged to Grandy Creek at the base of the fish ladder (Figure 2-2). Because water use would be non-consumptive, withdrawals are not anticipated to affect flows within Grandy Creek.

There would be a short period, approximately two days, in the month of October, during acclimation pond filling, when a lag would occur between groundwater withdrawal rate and discharge to Grandy Creek. At all other times, Grandy Creek would, overall, experience a gain in flow as a result of the groundwater withdrawn for use in the ponds being discharged to the creek. The gain that would be realized in Grandy Creek is shown in Table 3–4. Shut down of pumping would occur gradually (ramped), so as not to strand juveniles that may be rearing in the creek. Ramping would be conducted according to WDFW guidelines (Hunter 1992).

Table 3–4. Gain in Grandy Creek surface flow (due to groundwater returns from facility discharge).

Month of Operation	Total Water Withdrawn From Grandy Creek (cfs)	Flow Gain Over Water Withdrawn from Grandy Creek (cfs)	Grandy Creek median flow (cfs)[1]
October	0	6	Not available
November	0	7	55
December	6	6	41
January	6	6	101
February	6	6	52
March 1-15	7	5	52
March 15-31	5	5	Not available
April	8	3	Not available
May 1 – June 1	10	2	Not available

[1] Daily mean flows, 2002-2003 from R. Berg, WDFW, unpublished data

Evaporative loss from the acclimation and adult holding ponds would occur, but would be limited because the site operational period would fall within the fall, winter, and spring months.

Water Quality Impacts

A facility at Grandy Creek could impact the creek's water quality in both the short term during construction and in the long term during facility operation.

<u>Drainage Water Quality</u>

Washington State and Skagit County require that new projects meet state and county stormwater management standards. These reference treatment standards are outlined in the Washington State Department of Ecology's Stormwater Management Manual (SMM). Washington State references the 2001 SMM and Skagit County references the 1992 SMM; stormwater analysis for the Grandy Creek facility proposal has been conducted according to requirements of the 2001 SMM.

The 2001 SMM requires either stormwater attenuation or stormwater infiltration of runoff from new or redeveloped facilities, with infiltration as the preferred option. Water quality treatment of runoff from pollution-generating surfaces on the site, as well as the implementation of source control practices is also required. New on-site stormwater conveyance systems are required to carry the contributing flow from the 100-year, 24-hour storm event. New projects are also required to incorporate Best Management Practices (BMPs) for stormwater management as outlined in the SMM, along with preparation and implementation of a TESC and a SWPPP.

For the Grandy Creek site, preliminary design of stormwater facilities includes biofiltration swales for stormwater treatment and conveyance, along with dispersal trenches to aid in natural infiltration. The approximately one acre that would include the juvenile acclimation/rearing ponds and the adult sorting/holding ponds were excluded from drainage calculations.

The Grandy Creek site includes four topographically distinct drainage subbasins in the areas proposed for site re-development. These subbasins include:

- <u>West Subbasin</u>: the area located west of Grandy Creek that includes an overgrown access roadway that is proposed to be improved.

- East - North Subbasin: the portion of the site that includes the proposed parking area, a portion of the primary roadway, and the adult pond access and staging area.
- East - South Subbasin: the developed area of the site that would include the storage building, the area around the juvenile acclimation/rearing ponds, and the primary access loop road.
- Well Access Subbasin: the well access road, the RV pad area, and the RV drainfield area.

Table 3–5 includes general subbasin characteristics.

Table 3–5. Lower Skagit River Steelhead Acclimation and Rearing Facility drainage subbasin attributes.

Subbasin	Total Acreage	Pervious Area (Acres)	Impervious Area (Acres)
1 - West	0.10	0.10	0.00
2 - East-North	0.52	0.34	0.18
3 - East-South	0.89	0.85	0.04
4 - Well Access	0.87	0.83	0.04

Stormwater treatment, conveyance, and infiltration were analyzed for each of the site subbasins. Facilities were designed for the Grandy Creek site based on calculated runoff rates for the site subbasins. Calculated runoff rates are included in Table 3–6. The gated west access road (the West subbasin) and the well access road (the Well Access subbasin) would seldom be used, would not be considered pollution-generating surfaces, and would not require stormwater treatment facilities. The east subbasins would require treatment facilities and all subbasins would require infiltration areas.

Table 3–6. Calculated runoff rates for Lower Skagit River Steelhead Acclimation and Rearing Facility subbasins.

Subbasin	6-MonthStorm (cfs)	100 Year Storm (cfs)
1 - West	0.02	0.08
2 - East-North (EN)	0.14	0.48
3 - East-South (ES)	0.16	0.73
4 - Well Access	0.13	0.66

Stormwater Treatment and Conveyance
A gravity conveyance system is proposed to collect runoff from the developed portions of the site and carry it to the appropriate treatment and/or dispersal facilities. Biofiltration swales within the east subbasins would provide treatment for parking lot and gravel driveway runoff, which are the only pollution-generating surfaces proposed on the site.

East Basin – North (EN) Swale
This swale would treat runoff from the paved parking lot, gravel roadway areas, and adjacent facilities north of the juvenile acclimation/rearing ponds (Figure 3–2). Runoff would be directed from the parking and roadway areas through pipes or swales to the biofiltration swale. The swale would be a 250 foot long roadside ditch.

East Basin – South (ES) Swale
This swale would treat runoff from the gravel roadway areas and adjacent facilities west of the juvenile acclimation/rearing ponds (Figure 3–2).   Runoff would be directed from the gravel roadways through pipes or swales to the biofiltration swale. The swale would be a 265 foot long ditch.

Stormwater Infiltration

Dispersal trenches would be required at the terminus of the biofiltration swales to aid in natural infiltration. Typical dispersal trenches can handle up to 0.50 cfs of runoff; two dispersal trenches would be required for each of the EN, ES, and Well Access subbasins. No trench is proposed for the west access road, as runoff would sheetflow directly off of the roadway into an existing vegetated area between the access road and Grandy Creek. The calculated vegetated areas required to infiltrate each basin's 100-year, 24-hour flow within 24 hours is included in Table 3-7.

Table 3–7. Calculated infiltration areas for Grandy Creek site subbasins.

Subbasin	100-Year Runoff (cfs)	Infiltration Rate (inches/hour)	Required Infiltration Area (acres)
1 - West	0.08	0.54	0.15
2 - East-North	0.48	0.54	0.88
3 - East-South	0.73	0.54	1.34
4 - Well Access	0.66	0.54	1.21

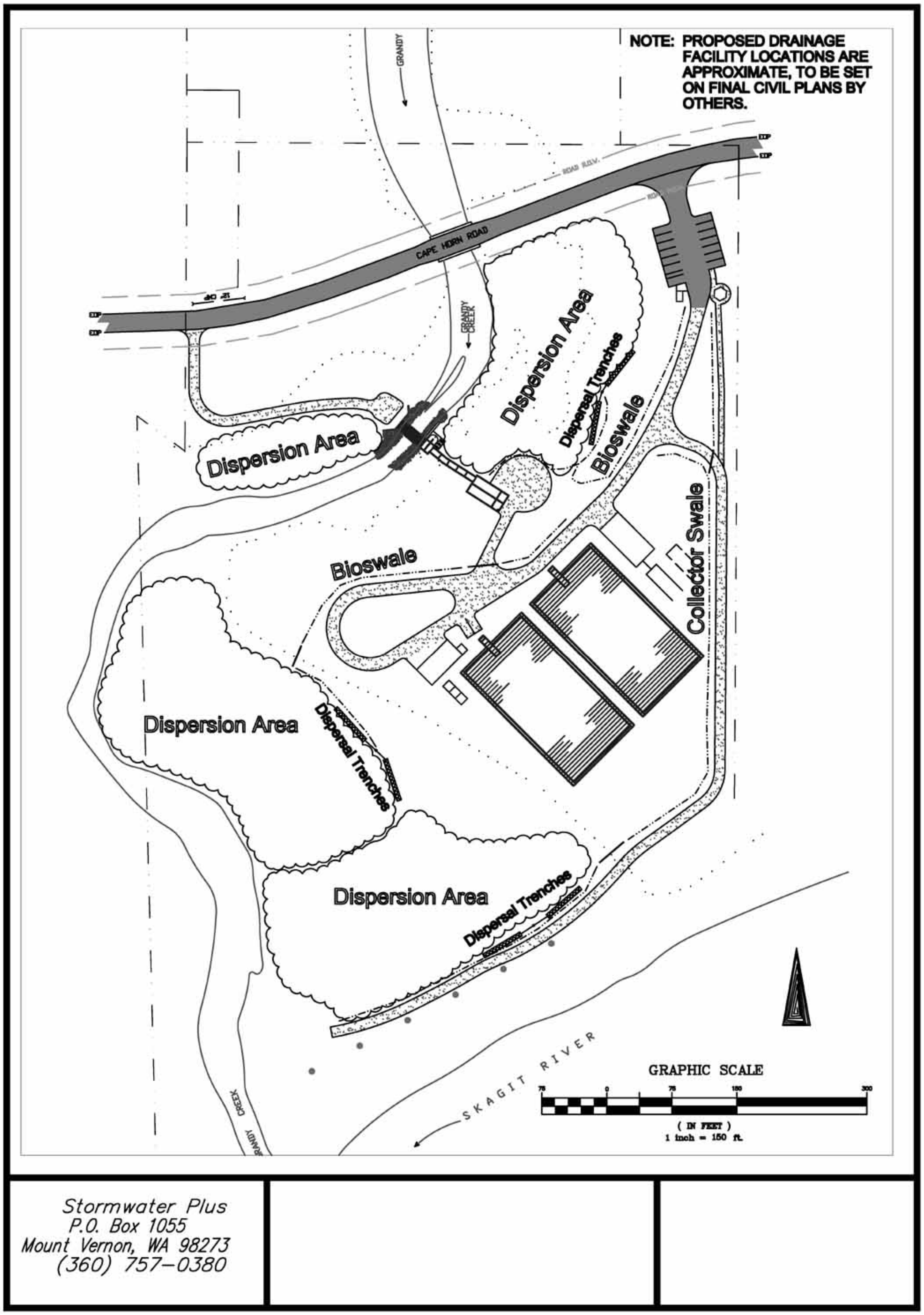

Figure 3-2. Grandy Creek Site Preliminary Drainage Improvement Plan

Construction Phase Stormwater Quality

Runoff water quality from the Grandy Creek proposal would be managed through implementation of a SWPPP to reduce the contribution of pollutants into offsite waterways during construction. During placement of the groundwater well protection system, BMPs, including silt fencing and straw bales, would be implemented to prevent runoff from entering the river.

Operational Water Quality

Source controls would be implemented to reduce pollution from permanent facilities on the site. Typical source controls include ensuring that all exposed soil areas on the site are vegetated, that hazardous materials are stored properly and isolated from any stormwater systems, and application of any herbicides or pesticides occurs only during dry periods. As described in Section 2.2 of this DEIS, acclimation pond water would be drawn from Grandy Creek and augmented by on-site well water. The water discharged from the acclimation/rearing ponds after use (effluent) would be routed back to Grandy Creek through the piping system described in Section 2.2.3.

Discharge Water Characteristics

Effluent discharged to Grandy Creek would contain different water chemistry and physical features than the water originally diverted. The rearing pond and raceway wastewater contains some organic solid wastes that consist of uneaten food and fecal material. The quantity of these wastes depends upon the volume of fish food being fed, the pounds of fish, and the amount of waste that settles out of the water prior to its discharge. In addition, the physical parameters of the effluent may change, causing increased temperatures, pH, and decreased dissolved oxygen. The potential for the presence of fish pathogens, and fish therapeutants in the effluent also exists.

The primary pollutants of concern in the effluent are the total suspended solids (TSS) and the settleable solids (SS). Other pollutants of concern that may be found in the discharge from these facilities include nutrients, dissolved oxygen (DO), temperature, ammonia, and pathogen control chemicals.

As described in Section 2.2.6, the Grandy Creek acclimation pond effluent would be routed to Grandy Creek without separate treatment. In-pond settling of solids would achieve NPDES discharge standards as demonstrated at a similar WDFW earthen acclimation pond facility, located on Tokul Creek. Data collected by WDOE at the Tokul Creek acclimation/rearing ponds (Table 3–8) show that effluent values are, in most cases, no different or are not significantly higher than influent values.

Table 3–8. Tokul Creek facility discharges (comparing measure of parameter in influent versus effluent).

Parameter	TSS (mg/L)	SS (ml/L)	DO (mg/L)	Temp. (deg C)	TKN (mg/L)	Ammonia/ Nitrate (mg/L)
Influent	<1	<0.1	10.4	15.1	0.13	0.36
Effluent	<1	<0.1	10.5	15.2	0.13	0.33

Note: BOD samples resulted in invalid data
Source: WDOE 1989

NPDES Discharge Conditions And Limitations

Hatchery effluent must meet strict water quality parameters before discharge into waters of the state. Hatchery discharges are managed by WDOE through the upland fin-fish hatching and rearing general NPDES permit, which would be required for the Grandy Creek facility. Implementation of the Grandy Creek site proposal would result in a net production of 57,600 pounds of fish that would represent the growth of the fish during the acclimation phase. This production number is greater than the 20,000 pound production threshold requiring an upland fin-fish hatching and rearing general NPDES permit.

Rearing pond water effluent limitations for discharge to surface water, under the fin fish NPDES requirements, are for settleable solids and total suspended solids. The allowed instantaneous and monthly discharge maximums for solids are presented in Table 3–9.

Table 3–9. NPDES rearing pond wastewater discharge limitations.

Flow-Through Rearing Pond Wastewater	Effluent Limitations	
Parameter	Average Monthly[a]	Instantaneous Maximum[b]
Settleable Solids	.01 net ml/L	—
Total Suspended Solids	5.0 net mg/L	15.0 net mg/L
Rearing Pond Drawdown Wastewater	Effluent Limitations	
Parameter	Instantaneous Maximum[b]	
Settleable Solids	1.0 ml/L	
Total Suspended Solids	100.0 mg/L	

[a]The average monthly effluent limitation is defined as the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

[b]Instantaneous Maximum the maximum allowable concentration of a pollutant determined from the analysis of any discrete or composite sample collected, independent of the flow rate and the duration of the sampling event.

Source: WDOE 2000.

Flood-Related Impacts

No flood-related impacts are anticipated with the Grandy Creek proposal. As described in Section 2.2 of this DEIS, site facilities have been, for the most part, located outside of both the Skagit River and Grandy Creek 100-year floodplains. The Grandy Creek site design includes a water intake facility/weir system located within the creek that would withstand flood flows. Surface water pump facilities included in the preliminary design have been placed above the 100-year flood elevation for Grandy Creek. Groundwater wells would be equipped with submersible pumps and electrical controls elevated above the floodplain.

The weir proposed to be installed within Grandy Creek would increase the level of Grandy Creek during high water events that occur during the adult collection period of December 1 to March 15. The water level increase would be small and the creek would be unlikely to experience the effects beyond a limited area upstream of the weir and within the Grandy Creek site boundaries. The proposed west bank access road would be below the 100 year flood elevation but would be unlikely to be damaged because the backwater effect of the Skagit River flood flows tend to slow Grandy Creek flows.

Proposed site wells and the well maintenance roadway would be located within the Skagit River floodplain. As discussed in Section 2.2.1.3 of this DEIS, WDFW has proposed a series of well protection barbs that would consist of driven piles to slow flow river flow velocities and to provide bank stabilization if or when the bank erodes to these structures. Installation of pile barbs would not affect the Skagit River floodplain or inhibit the existing overflow path on the Grandy Creek site. If the Skagit River continues to incise the right bank adjacent to existing wells and the proposed well installation location, the presence of the pile barbs may slightly alter flood flows over the Grandy Creek site, as well as the river thalweg in the vicinity of the pile barbs as a result of accumulated debris.

MITIGATING MEASURES

Construction Phase

Dry season road construction would minimize surface erosion. Stormwater mitigation built into the proposal in the form of treatment would include TESC, implementation of a SWPPP for construction phase stormwater quality, and management and permanent facilities for biofiltration and infiltration. Seeding is proposed for stabilizing exposed soils. Erosion and sediment control systems would be implemented as construction progresses, and as seasonal conditions dictate.

Operational Phase

<u>Water Quantity</u>
Discharge water would return to Grandy Creek approximately 30 feet downstream of the surface water withdrawal location resulting in a limited diversion reach. All water utilized within the facility (ground and surface water) would be returned to Grandy Creek.

<u>Water Quality</u>
Stormwater mitigation built into the proposal in the form of treatment would include a TESC, implementation of a SWPPP for construction phase stormwater quality and management and permanent facilities for biofiltration and infiltration. These plans will be developed as part of the application for further permits. The above-ground diesel tank for the standby generator would be double wall construction to prevent spills onto the ground.

Permanent stormwater facilities would require a final design process that adheres to the SMM and a rigorous maintenance program.

Temporary Erosion and Sedimentation Control (TESC) Measures
Temporary controls would be used to mitigate the potential erosion and sedimentation due to construction activities. The required final drainage plans must include a TESC plan containing the recommendations of the SWPPP and meeting the requirements of Skagit County and the WDFW.

Permanent Erosion Control Measures
Permanent controls, including catch basins, conveyance piping, biofiltration swales, and dispersal trenches would be required for the Grandy Creek proposal. All uncovered surfaces would be seeded and/or landscaped in accordance with Skagit County regulations. The proposed BMPs match the minimum requirements for construction of roadways, buildings, and paved surfaces.

The preliminary drainage report prepared by Stormwater Plus (2003) includes preliminary SWPPP and TESC plans.

Surface Water Monitoring
Water quality regulations for surface and ground waters, as well as discharge monitoring requirements stipulated by Skagit County and the Washington State Department of Ecology must be adhered to in all instances. Baselines for on-site water quality should be established prior to commencement of construction. Additional monitoring should include:

- Withdrawal and discharge quantities from and to Grandy Creek
- Pond effluent to ensure compliance with the NPDES requirements. This monitoring of settleable solids and total suspended solids would ensure that excessive amounts do not enter receiving water. NPDES testing requirements include monitoring flow, TSS, and SS. Flow influent must be monitored twice per month, SS influent and effluent must be measured each week, and TSS influent and effluent must be measured each month.

- Receiving water quality during construction and visual monitoring for turbidity, during in-water construction activities.
- Fish feed quantity control to minimize waste and TSS and SS in discharge water.

UNAVOIDABLE ADVERSE IMPACTS

Withdrawal of surface water from Grandy Creek is a primary component of the proposal and would be unavoidable with implementation of the Grandy Creek alternative. Surface water withdrawal from Grandy Creek would be balanced or exceeded by return flows to Grandy Creek immediately downstream of the withdrawal location. Alteration of existing surface water drainage patterns would be unavoidable.

3.1.3.2 BAKER RIVER ALTERNATIVE

EXISTING CONDITIONS

Baker River Characteristics

The Baker River watershed is located in a mountainous area west of the Cascade Mountains in Skagit and Whatcom counties. The river's headwaters lie in the northeastern section of the basin along the slopes of Mt. Challenger and Whatcom Peak (PSE 2003). The watershed covers 298 square miles, includes 63 glaciers, and 39 lakes, of which two are reservoirs (Weisberg and Riedel 1991).

The Baker River is the only dammed tributary of the Skagit River. The Baker River's confluence with the Skagit River is at Skagit River RM 56.5 (Ames and Bucknell 1981) at an elevation of 175 feet. Primary tributaries to the Baker River that are located within Skagit County include Thunder Creek and Bear Creek (Ames and Bucknell 1981). The Baker River alternative site for a steelhead acclimation and rearing facility is located one-half mile upstream from the Baker River's confluence with the Skagit River on the left bank.

The surface water right necessary to operate this facility is anticipated to be a change of diversion from a water right owned by PSE.

Surface Water Quantity and Quality

The mean annual streamflow in the Baker River at Concrete for water years 1928 to 1999 is 2,621 cfs (close to 12 million gpm), which is equivalent to an average annual runoff over the basin of roughly 120 inches (PSE 2002). Mean annual unregulated flow over the given period has ranged from a minimum of 1,709 cfs (about 78 inches of runoff) in 1944 to a maximum of 3,541 cfs (about 162 inches of runoff) in 1974 (PSE 2002).

The quality of waters of the Baker River drainage is excellent and typically meets the Class AA state water quality standards. However, turbidity downstream of the dam is a known condition at times. Winter surface water temperatures are suitable for fish rearing (Westley 1966). The river's natural pH level is occasionally below the normal neutral value of 7.0. The Baker River watershed is less developed than the Skagit River watershed, resulting in high water quality. Snowpack in higher elevations of the watershed results in high runoff that tends to remove pollutants from the system. In addition, the residence time for water flowing through the river impoundments (Baker Lake and Lake Shannon) may help limit downstream water quality changes (PSE 2002).

Water quality data has been collected by the USGS and WDOE at RM 0.5, near the Baker River site. In general the surface waters existing in the watershed are neutral in pH, nearly saturated with oxygen, and low in turbidity (PSE 2003).

Drainage
A drainage analysis would be completed to meet Skagit County and WDOE standards. Engineered drainage facilities would be similar to those analyzed and proposed for the Grandy Creek alternative. Limited new impervious area would be added, consisting of gravel access areas around the raceways and clarifier.

Flooding
The Baker River site is located outside of the Baker River floodplain.

IMPACTS

Water Quantity Impacts
The Baker River surface water supply would be pumped at a rate of 12 cfs (5,388 gpm) from a new pump station located on the upstream side of the existing barrier dam. The removal of up to 12 cfs during the fall and winter would not measurably affect Baker River water levels because water would be returned near the existing PSE barrier dam, with no measurable impact to instream flows.

Water Quality Impacts
As with the Grandy Creek alternative, facility development could result in both short term construction-related impacts and long-term operation-related impacts.

<u>Construction-Related Impacts</u>
Construction activities, including site preparation and excavation, would expose soils to erosion and potentially increase sediment loading in runoff. Post-construction, as well as operational phase surface water quality could be affected if measures are not taken to prevent sediments from entering surface water. In-water work at the existing intake structure would likely require a cofferdam and dewatering, which may produce sedimentation and increased turbidity to downstream waters.

Skagit County requires that new projects meet county and WDOE drainage water quality standards. If the Baker River site is chosen for facility siting, the applicant would be required to develop erosion and sediment control plans in conjunction with final drainage and site plans for approval by both Skagit County and WDOE.

<u>Operational Water Quality Impacts</u>
The water discharged from the acclimation/rearing ponds after use (effluent) would be routed back to the Baker River through the outfall piping system. As described for the Grandy Creek alternative, facility effluent would be required to meet the upland fin-fish hatching and rearing general NPDES permit limits. The fish would be reared in concrete raceways that would not provide the same settling function as the larger ponds proposed for the Grandy Creek alternative. At the Baker River site, raceways would be vacuum-cleaned and the cleaning wastes would be directed to a constructed clarifier pond to settle out solids. Each summer, or when it becomes necessary, the clarifier pond would be dried and the settled solids would be removed to an approved off-site location for disposal.

Flood-Related Impacts
No flood-related impacts are anticipated with the Baker River alternative site because most facilities are located outside of the 100-year floodplain of the Baker River. Only the intake and fish release pipe

outfall structure, by necessity, would be located near the river within the floodplain. These elements of the project would be designed to withstand floodwater velocities. The pumps and stand-by generator, if required, would be located above the 100-year flood elevation.

MITIGATING MEASURES

Construction Phase
Construction phase mitigation would be the same as mitigation proposed for the Grandy Creek alternative.

Operational Phase
If a backup generator is necessary, diesel fuel tanks would be contained in a manner similar to that proposed at the Grandy Creek site. Stormwater mitigation may be required with final site design if the Baker River alternative were chosen. If required, permanent stormwater facilities would be incorporated into final designs. A surface water quantity and quality monitoring program similar to that proposed for the Grandy Creek alternative would be developed and implemented if the Baker River alternative is chosen.

UNAVOIDABLE ADVERSE IMPACTS

Because surface water withdrawn from the Baker River would be returned immediately downstream of the existing barrier dam according to preliminary design, impacts due to surface water withdrawals would be negligible at this site.

3.1.3.3 NO ACTION ALTERNATIVE

This alternative would avoid surface water quantity and quality impacts described for the steelhead acclimation and rearing facility proposal.

3.1.4 GROUNDWATER

INTRODUCTION

Groundwater is water beneath the earth's surface, occurring in open spaces in soil, sand, gravel, and other sediments (Whitehead 1994). When water enters the ground, it is called shallow groundwater. When groundwater forms a pool against a barrier (aquitard) and remains for some time, it is then referred to as an aquifer. Aquitards can be slightly permeable and groundwater often flows through to deeper groundwater that has collected against impermeable aquitards, forming a confined aquifer.

The Puget-Willamette trough aquifer system underlies a basin that extends to the south from near the Canadian border in Washington to central Oregon (Sceva 1950). A major aquifer type that composes the Puget-Willamette trough regional aquifer system and underlies the Grandy Creek site is the unconsolidated-deposit aquifer. Unconsolidated-deposit aquifers consist predominantly of glacial deposits (sand and gravel), and provide fresh water for most public, domestic, commercial, industrial, and agricultural uses (Bauer and Mastin 1997). Permeability of the unconsolidated deposits is variable:

- Sand and gravel commonly yield from 0.04 to 4.4 cfs (20 to 2,000 gpm, respectively) to wells
- Coarser deposits along major streams and deposits of glacial outwash yield from 500 to 2,500 gpm to wells that penetrate from 50 to 150 feet of saturated deposits
- Fine-grained deposits commonly yield from 0 to 0.2 cfs (1 to 100 gpm, respectively) depending on

the percentage of clay.

A generalized map of groundwater availability in the Skagit River basin prepared by Drost and Lombard (1978) suggests that well yields from unconsolidated aquifer units in the Skagit River basin range from 0.06 to 0.56 cfs (26 to 250 gpm, respectively; Figure 3-3). This magnitude of well yield is generally sufficient for single-family domestic use and limited irrigation use.

3.1.4.1 GRANDY CREEK ACCLIMATION FACILITY

EXISTING CONDITIONS

Hydrogeologic Setting
The Grandy Creek site is located in Skagit County at the point where Grandy Creek meets the Skagit River. The highest elevation on the site is 145 feet, located in the north end of the site, near Cape Horn Road (See Figure 2-2). The lowest elevations occur along the valley floor and the Skagit River. The Grandy Creek site is north-south oriented.

The topographic slope of the Grandy Creek site is from northeast to southwest and topographic lows occur where Grandy Creek flows into the Skagit River. A significant portion of the Grandy Creek site, including the area where ground water extraction facilities exist, lies within the 100-year floodplain of the Skagit River and Grandy Creek. The remainder of the site lies upon a series of alluvial terraces.

Groundwater Data
Grandy Creek site well drilling was conducted by Sweet-Edwards/EMCON, Inc. (SE/E) in 1990. SE/E drilled two pumping wells, PW-1 and PW-2, in 1990 to evaluate soils, geologic units, and groundwater. Three successful borings, B-2, B-3, and B-4, were also drilled to install observation wells for groundwater analysis. In 1992, SE/E drilled a third pumping well, PW-3, in a more favorable site location to determine maximum well yield.

State recorded (WDOE) local wells, along with published state and USGS hydrogeologic information were reviewed. Groundwater resource analysis was completed using map unit descriptions and observations of water well and boring logs. Test borings and wells drilled on the Grandy Creek site are described in Table 3-10.

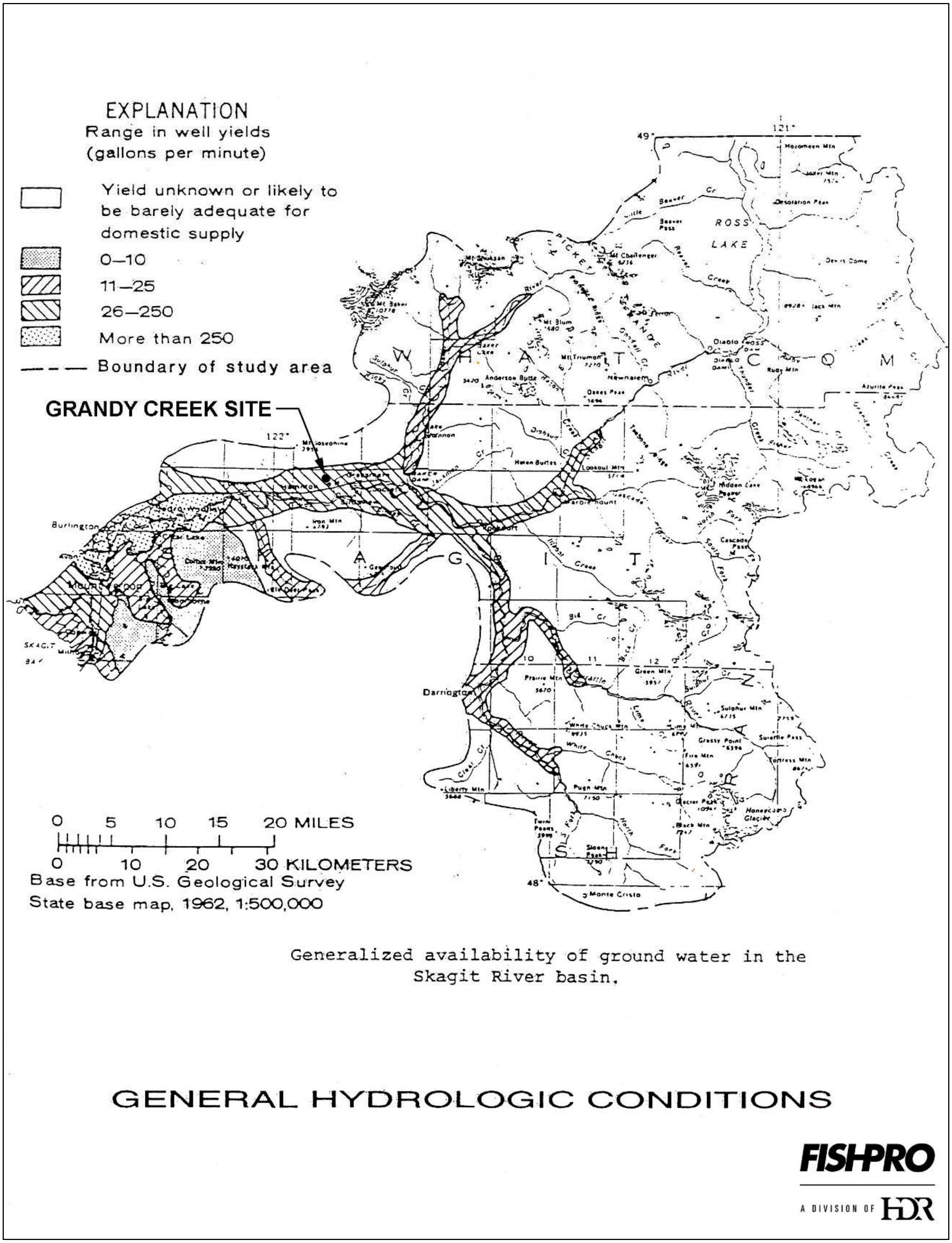

Figure 3-3. Grandy Creek Site General Hydrologic Conditions.

Table 3-10. Pumping wells and boring drilled in 1990 & 1992 on the Grandy Creek site.

Well	Well Depth (feet)	Water Level (feet below surface)
PW-1	99.0	14.0
PW-2	40.0	12.5
PW-3	51.0	13.0
B-2	62.0	12.0
B-3	38.0	12.5
B-4	56.5	13.75

Data Sources: SE/E 1990a, 1990b, EMCON Northwest 1992.

Existing, neighboring wells, logged by WDOE, adjacent to the Grandy Creek site are included in Table 3-11.

Table 3-11. Wells located near the Grandy Creek site.

Section 15 Location (T35N R7E)	*Owner*	Depth (feet)	Water Level (feet below top of well)	Remarks
SE1/4 NW1/4	Pressley	45.0	—	6" diameter, unscreened
NE1/4 SW1/4	Denny	216.5	25.5	6" casing, unscreened
NE1/4 SW1/4	Pritchard	51.0	35.0	6" casing, unscreened
NE1/4 SE1/4	Wilde	46.0	23.0	6" casing, unscreened
NE1/4 SE1/4	Stlhd Club	92.0	18.0	8" diameter, screened
NE1/4 SW1/4	Imas	97.0	4.0	6" diameter, unscreened, till at 50 feet
SW1/4 NE1/4	Mathew	118.0	23.4	6" diameter, unscreened, completed at 60 feet
NE/4 SW1/4	Pritchard	55.0	35.0	6" diameter, unscreened
SW1/4 NE1/4	Pressley	120.0	20.0	6" diameter, unscreened
SW1/4 NE1/4	Johnson	58.5	15.5	6" diameter, unscreened
SW1/4 NE1/4	Johnson	60.0	14.0	6" diameter, unscreened
SW1/4 NE1/4	Steward	110.5	10.5	6" casing, Screened -105’

SOURCE: WDOE 2003.

Grandy Creek Site Groundwater System

Shallow Aquifer

Skagit River alluvial deposits typically abut and underlie river valleys throughout Skagit County. The alluvial deposits consist of silty-clay, sand, and gravel, and possess high to very high geohydrologic potential (Dragovich et al. 1999). Based on site observations and data collection, it is apparent that the Grandy Creek site includes a defined shallow groundwater body that coincides with the presence of the Skagit River alluvium. This shallow groundwater body occurs in the westerly and southwesterly portions of the site (Figure 3-4) and may extend westerly beyond Grandy Creek. The top of the shallow aquifer was found by SE/E (1990a, 1990b, 1992) to be approximately 12 feet below the ground surface, and the bottom of the aquifer to be 40 to 55 feet below the ground surface (Figure 3-5). This shallow groundwater appears to be hydrologically connected to Grandy Creek and the Skagit River. Measurements taken by SE/E in 1990 showed that Grandy Creek feeds the shallow groundwater body during periods when the aquifer is lower than Grandy Creek. This condition is unlikely to have changed in the years since.

Deep Aquifer

Glaciomarine Drift of the Everson Interstade underlies the Skagit River alluvium through which the shallow groundwater body flows. This is of poor geohydrologic potential. Vashon advance outwash, consisting of sand and gravel, that underlies the glaciomarine drift is, however, extensive and water bearing.

The deep aquifer is largely overlain with non-water-bearing Everson glaciomarine drift to a depth of 40 feet and water-bearing Everson glaciomarine outwash between 40 and 95 feet (SE/E 1990b). Everson glaciomarine drift deposits typically mantle hillsides such as those within the Grandy Creek drainage basin and follow topography, likely dipping below the bed of the Skagit River. Everson glaciomarine drift is a very dense silt deposit of extremely low permeability located between water bearing alluvium above (shallow aquifer) and water-bearing Vashon outwash below (deep aquifer) in wells drilled along the southerly boundary of the Grandy Creek site. This dense silt deposit allows little, if any, seepage from the shallow to the deep aquifer.

Area Wells

There are numerous wells within 1 mile of the Grandy Creek site. Well logs for wells near the site (Table 3-11) indicate they are generally used for domestic water supply. Most wells are completed in a confined aquifer similar to and possibly equivalent with the deep aquifer described at the Grandy Creek site. Wells located some distance east (upstream) of the Grandy Creek site along the Skagit River, are completed in one or more shallow, unconfined sand and gravel aquifers, likely relatively recent river alluvium. The gravels containing the shallow aquifer described for the Grandy Creek site appear to thin eastward and are not believed to extend far upstream along the Skagit River (SE/E 1990b, EMCON Northwest, 1992).

Groundwater Quality

Several Grandy Creek site ground water quality samples were collected and analyzed by SE/E in 1990. The water quality of the shallow aquifer (well PW-2) showed that groundwater from the shallow aquifer met the standards for all tested primary and secondary drinking water constituents. Groundwater from the deep aquifer met all primary drinking water standards, but did not meet the secondary drinking water standard of 0.5 parts per million (ppm) for manganese.

Water Rights

When new wells are drilled on the Grandy Creek site, the existing wells would be abandoned. Water rights for the new wells have been applied for.

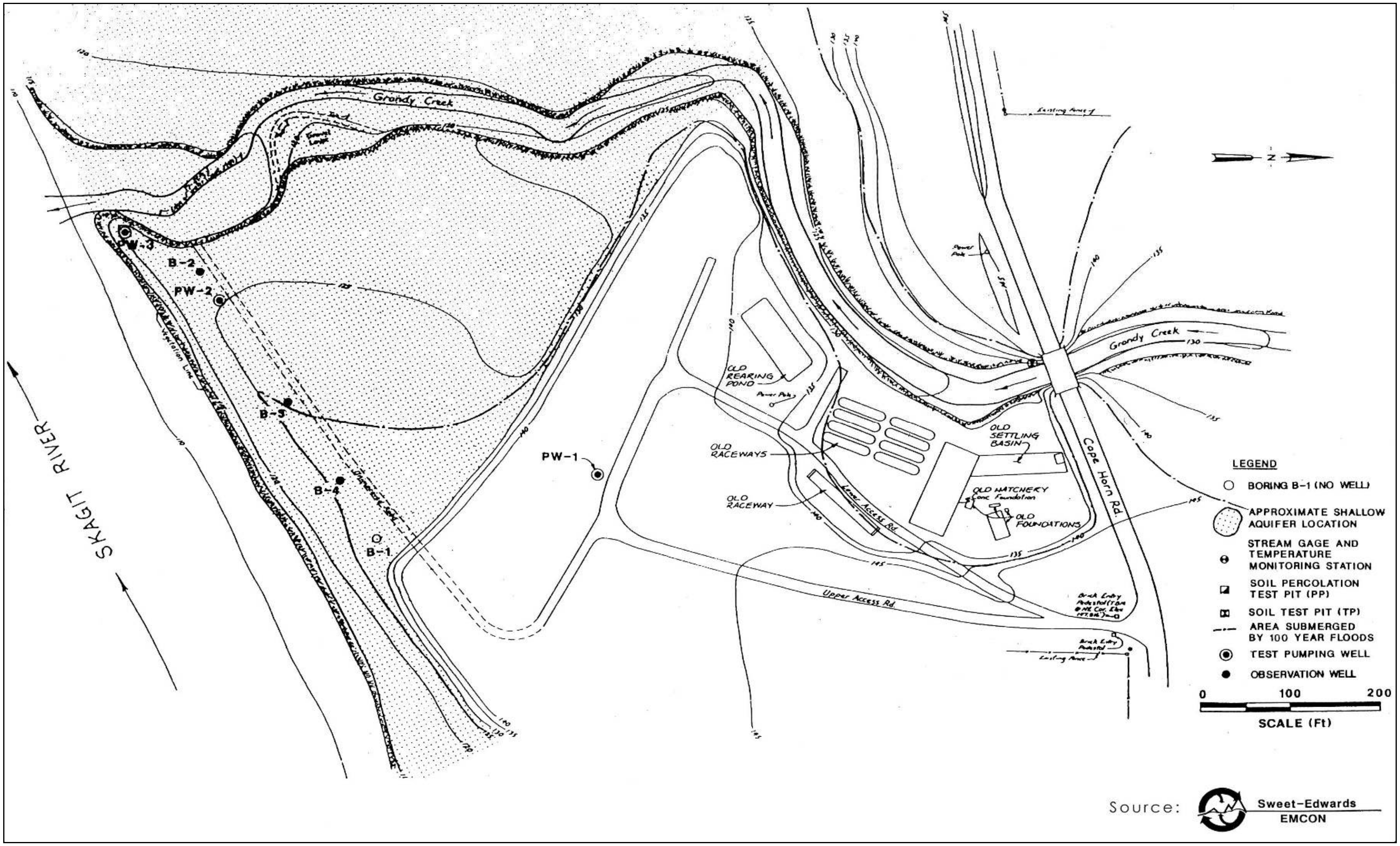

Figure 3-4. Grandy Creek Site Shallow Groundwater System.

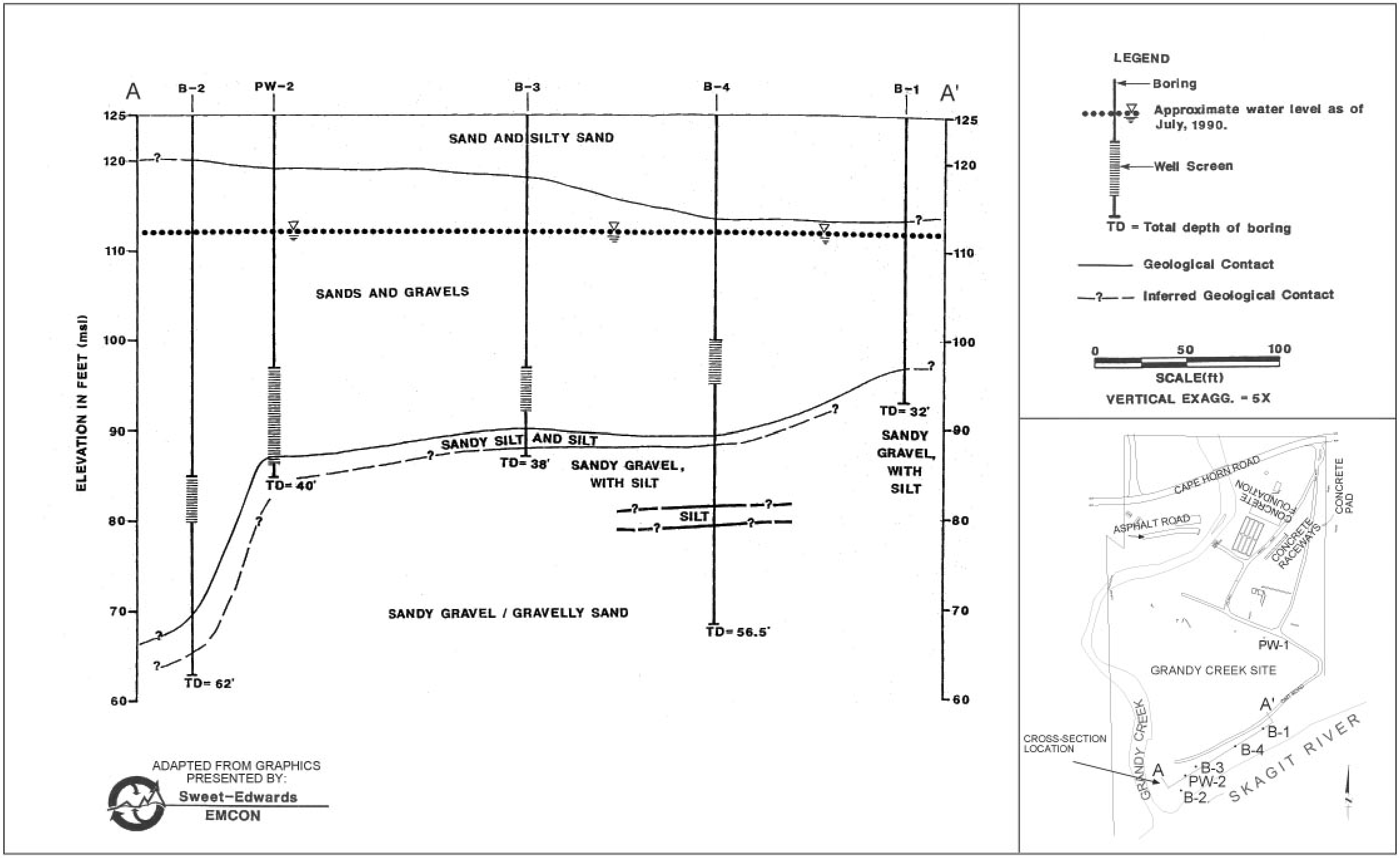

Figure 3-5. Geologic Cross-section of the Lower Grandy Creek Site.

IMPACTS

Groundwater Quantity Impacts

The Grandy Creek alternative site design includes little impervious surfacing. Because most of the site would remain pervious, site drainage would, after treatment where required, provide recharge to the site groundwater system.

Site Wells

The acclimation facility proposal includes installation of five production wells along the southerly site boundary to provide up to 7 cfs (3,143 gpm) of ground water from the shallow aquifer for facility operations. Potable water (20 gpm when necessary) would be supplied from the deep aquifer through a proposed domestic well.

The effects of pumping groundwater from the shallow aquifer at approximately the proposed rate were analyzed by SE/E in 1990 and EMCON Northwest in 1992.

Water level drawdown tests were conducted on PW-2 in 1990 and on PW-3 in 1992. Pumping test results showed that PW-3 production potential was higher than the potential for PW-2 because PW-3 is recharged by both Grandy Creek and the Skagit River. The effect of pumping from the shallow groundwater on Grandy Creek included a water level lowering 0.4 feet (4.8 inches) when PW-3 was pumped at about 6.7 cfs (3,000 gpm) in August (low flow season); water was discharged to the Skagit River, not returned to Grandy Creek. Pumping tests did not cause any measurable impact to the Skagit River.

EMCON Northwest (1992) modeled aquifer yield based on PW-2 and PW-3 pumping results. A maximum aquifer yield of 12.9 cfs (5,800 gpm) during Skagit River and Grandy Creek low flow periods was determined by the model. EMCON Northwest (1992) concluded that sustained pumping of the shallow aquifer would result in increased flow from Grandy Creek to the shallow aquifer. These effects for a sustained pumping at a maximum yield scenario would result in flow from Grandy Creek but occurring at an unknown rate, and would result in unknown impacts to Grandy Creek.

Sections 3.1.3 and 3.1.4 of this DEIS detail the surface water and groundwater use for the proposed facility. Facility groundwater use would not exceed 7.0 cfs (3,143 gpm). This pumping rate is below the maximum aquifer yield determined by EMCON Northwest, but is a rate that would result in head loss in lower Grandy Creek. As described in Section 3.1.3, however, the facility has been designed to minimize both surface water withdrawal from Grandy Creek and groundwater withdrawal to minimize impacts to this interconnected system. Groundwater would be pumped to maintain facility ponds to the maximum monthly rates included in Table 3–3. Based on the EMCON Northwest (1992) modeling results, this pumping rate is not anticipated to have a measurable effect on the ongoing aquifer yield and surface water impacts would be mitigated through facility design as described in Section 3.1.3. Additionally, groundwater would be returned to upstream Grandy Creek at the base of the fish ladder, as fish facility uses are non-consumptive.

Site Well Protection System

No impacts to the shallow aquifer are anticipated with proposed placement of well protection pile barbs. All piles (150 total) would consist of untreated wood and are not expected to affect shallow aquifer flows or constituents.

Area Wells

Domestic wells of adjacent homeowners are screened in the deep aquifer (see Table 3-11). Infrequent use of the deep aquifer for potable water needs on the Grandy Creek site is not likely to affect the available yield at adjacent properties. It is possible that one or more wells west (downstream) of the site intercept the same shallow aquifer found at the Grandy Creek site. If domestic wells of adjacent landowners are extracting water from the same shallow aquifer being pumped at the Grandy Creek site, it is possible that pumping of the aquifer would reduce the available yield of those wells. If adjacent wells penetrate the shallow aquifer, then the shallow aquifer is more extensive than was estimated by SE/E.

Wells would be housed in above ground steel casing and capped to prevent vandalism and to protect groundwater sources during major flooding events along the Skagit River. Additionally, the new wells would be located landward of the existing access road and protected with pile barbs. These measures would facilitate well protection during periods flooding and erosion.

Groundwater Quality Impacts

Percolation test pits (R.W. Beck 1990) were completed and analyzed for the Grandy Creek site to determine construction requirements for septic systems. These data show that ground water quality should not be influenced by construction of the septic system for the same reasons that ground water recharge is not likely to be affected. Discharge from the septic system is expected to be adequately treated by the time it passes through the silty sands and sandy silts of the site. No significant impact to ground water quality in the area is expected. Increased recharge from the Skagit River and Grandy Creek (caused by pumping) is not likely to affect water quality of the shallow aquifer since they are considered to be the main recharge sources for the aquifer (EMCON Northwest 1992).

MITIGATING MEASURES

Water Quantity

Long-term pumping of the shallow aquifer should occur at a rate that would ensure the long-term sustainability of the shallow aquifer and its associated surface water sources. Water level monitoring in the shallow aquifer and the interconnected surface water bodies would be necessary with installation and operation of new site wells. Monitoring should consist, at a minimum, of periodic measurements of:

- the water surface elevation in Grandy Creek
- water level elevations of on-site monitoring wells during pumping operations
- water level elevations of off-site wells if determined necessary
- measurement of aquifer recharge rate.

Monitoring should occur at intervals required by WDOE and Skagit County, with observations submitted to the appropriate agencies for review. Monitoring should also include discharge water flow measurements as water would be cycled through the proposed acclimation facility to Grandy Creek.

Water Quality

New well installation would include groundwater quality sampling as required by WDOE and as necessary by WDFW prior to use in the proposed acclimation pond system. Groundwater quality entering the mixing boxes would be monitored routinely during acclimation facility operation by WDFW staff. Facility discharge would be monitored according to state and local requirements. Routine monitoring would include analysis of temperature and dissolved oxygen.

The septic system and drain field would be constructed as outlined in Skagit County standards to avoid potential impacts to the groundwater system.

UNAVOIDABLE ADVERSE IMPACTS

No unavoidable adverse impacts to the Grandy Creek site groundwater system are anticipated based on the relatively low pumping rate proposed and the results of the EMCON Northwest 1992 modeling.

3.1.4.2 BAKER RIVER ALTERNATIVE

EXISTING CONDITIONS

As with the Skagit River basin, the Baker River basin consists primarily of unconsolidated alluvial and glacial deposits composed of sand and gravel. These deposits are found in significant thickness and aerial extent only along portions of the main Baker River valley and along the lower reaches of some of the major tributary valleys (PSE 2002).

A hydrogeologic investigation conducted by Ralston Hydrologic Service in 2003 noted that area wells are within the capacity range that is adequate for domestic use, but that the likelihood of encountering an aquifer that would yield quantities necessary for groundwater augmentation of the acclimation facility would be unlikely. Ralston Hydrologic Service noted that the general lithology of lower Baker River area wells is silt, fine sand, and gravel from the surface to approximately 2 to 20 feet below the ground surface, then sand and gravel to approximately 30 to 60 feet below the surface. This lithology generally corresponds to the lithology of PW-1 on the Grandy Creek site, which is adequate for domestic use, but would not meet the groundwater requirements for a hatchery-related use.

IMPACTS

Groundwater is not proposed for use in augmenting surface water supplies at the Baker River alternative acclimation facility site.

MITIGATING MEASURES

None are identified.

UNAVOIDABLE ADVERSE IMPACTS

None are identified.

3.1.4.3 NO ACTION ALTERNATIVE

With the No Action alternative, at the Grandy Creek site groundwater would not be pumped from the shallow aquifer, assuring no impact to the deep aquifer. No water level drawdown of Grandy Creek, associated with pumping the shallow aquifer, would occur.

Groundwater quality impacts that could be associated with site development at Grandy Creek would be avoided.

3.1.5 VEGETATION AND WETLANDS

SKAGIT BASIN OVERVIEW

The Skagit River watershed lies within the North Cascades mountain range, an area in which countless icy crags rise abruptly from the river valley of low elevation (Whitney 1983). The western slope of the Cascade Mountains has unique vegetation communities classified as the Pacific Northwest Coastal Forest Zone. A typical plant community in this Puget lowlands zone contains, among other species, grand fir (*Abies grandis*), red alder (*Alnus rubra*), black cottonwood (*Populus trichocarpa*), and willows (*Salix* spp.) along streams and rivers (Whitney 1989). Western red cedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) also comprise the climax species within this zone. Common shrubs and herbs in these areas include vine maple (*Acer circinatum*), salmonberry (*Rubus spectabilis*), sword fern (*Polystichum munitum*) (Whitney 1983; Johnson and O'Neil 2001), salal (*Gaultheria shallon*), huckleberry (*Vaccinium parvifolium*), twinflower (*Linnaea borealis*), and oceanspray (*Holodiscus discolor*) (Franklin and Dyrness 1988; USFS 1983).

In addition to native vegetation, noxious weeds are common in Skagit County. Skagit County maintains a list of noxious weed species, which is a subset of the State of Washington's noxious weed list. In Washington, as in most other states, noxious weeds pose a serious economic and environmental threat. The State uses four classifications for noxious weeds:

- Class A Noxious Weeds pose a serious environmental or economic threat, are not native to the state, and are of limited distribution or unrecorded *within the State*. Control and eradication is required statewide.
- Class B Designate Noxious Weeds are those whose populations within a region are such that all seed production can be prevented within a calendar year. Control is required in Skagit County.
- Class B Noxious Weeds pose a serious environmental or economic threat, are not native to the state, and are of limited distribution *within a limited region or area.* County weed boards decide which will be controlled.
- Class C Noxious Weeds include any other noxious weeds. County weed boards decide which to control.

A total of 115 noxious weeds, including 30 Class A, 41 Class B Designate, 17 Class B and 27 Class C weeds, are currently listed by the Skagit County Noxious Weed Control Board (SCNWCB 2003). These invasive, mostly non-native, plants choke out crops, destroy range and pasture lands, clog waterways, affect human and animal health and threaten native plant communities. They can accelerate soil erosion and surface water runoff. Introduced plants in the basin often form monotypic stands that displace native plant communities and reduce local plant diversity. The spread of noxious weeds reduces forage production for wildlife and replaces wildlife forage on range and pasture, thereby reducing habitat suitability (Bryson et al. 2001). Management of noxious weeds at specific project locations would reduce the production and dispersal of seed and thereby help to prevent the spread of noxious weeds to off-site areas. Planting of native vegetation where possible would help to re-establish a native plant community in areas previously dominated by noxious weeds or disturbed during construction.

3.1.5.1 GRANDY CREEK ALTERNATIVE

EXISTING CONDITIONS

Vegetation

The Grandy Creek site is bordered to the south by the Skagit River and to the west by Grandy Creek. The Skagit River, flowing from east to west, forms the southern property boundary and influences drainage and soil characteristics that then impact the vegetative structure of the site. Grandy Creek flows through the site from north to south and also influences these features. The confluence of the Skagit River and Grandy Creek is located at the southwest corner of the property.

Plant communities on the Grandy Creek site consist of predominantly upland deciduous forests and riparian forest habitats along the periphery, with remnant grasslands that are almost completely overrun with invasive weeds dominated by Himalayan blackberry (*Rubus discolor*). Representative plant communities on the subject property were mapped by WDFW and designated as vegetation polygons (Figure 3-6). A once-extensive grassland community, which has become invaded with blackberry and English ivy, is located in the ruins of the relic Birdsview Hatchery buildings. About 2 acres of deciduous forest are found on-site and are dominated by an overstory of alder with an understory primarily composed of salmonberry and red elderberry (*Sambucus racemosa*). The riparian forest community is dominated by deciduous species of trees including big-leaf maple and black cottonwood in the overstory with salmonberry, vine maple, stinging nettle (*Urtica dioica*), and red osier dogwood (*Cornus stolonifera*) in the understory. Dense patches of Japanese knotweed (*Polygonum cuspidatum*) are invading areas immediately adjacent to Grandy Creek in the riparian zone. Some patches of knotweed have established themselves atop gravel bars within Grandy Creek. Young stands of bitter cherry (*Prunus emarginata*) occur just north of the Skagit River riparian forest.

A detailed discussion of each vegetation unit is presented below.

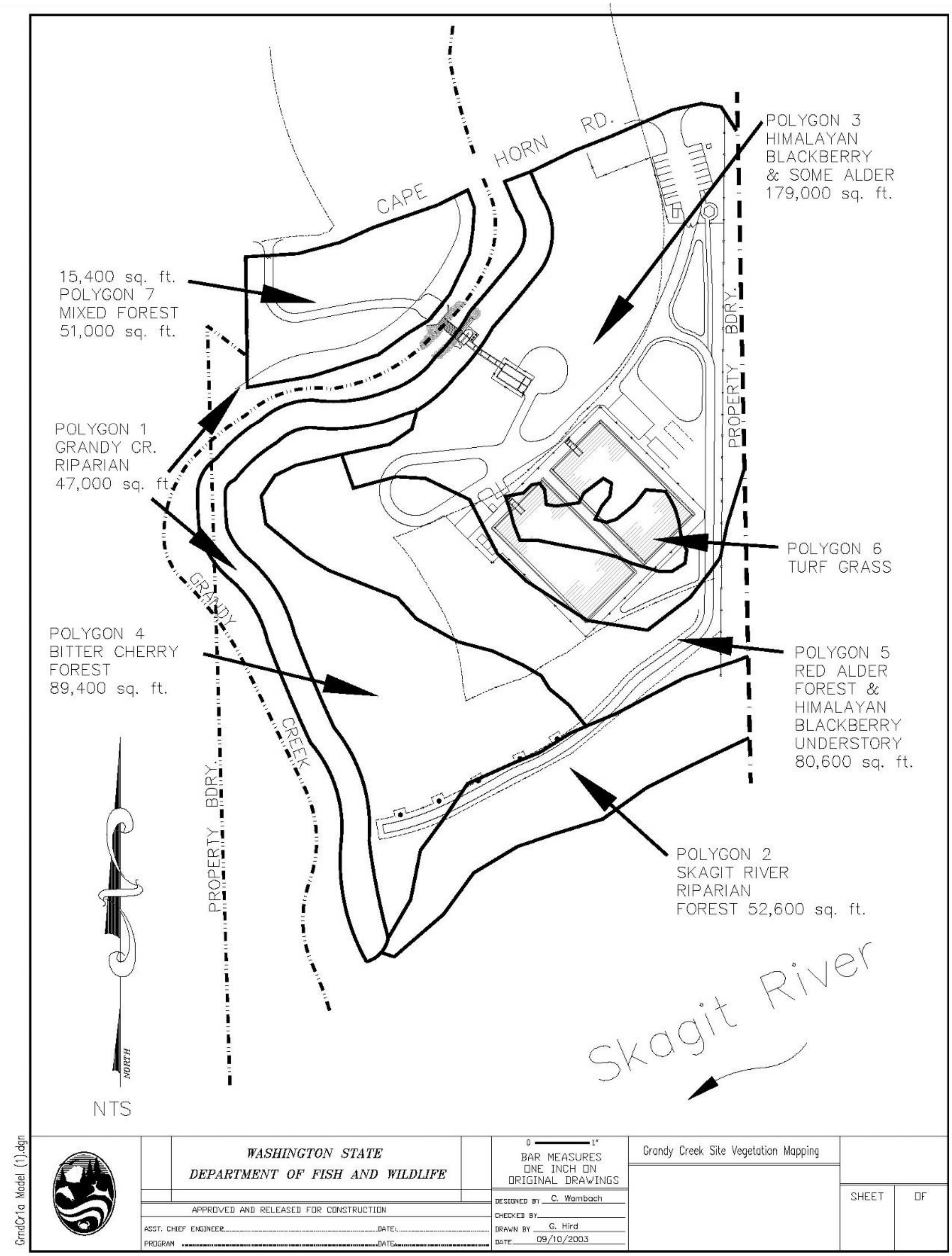

Figure 3-6. Vegetation Units at the Grandy Creek Alternative Site (as mapped by WDFW 2004)

Upland Vegetation Zones and Riparian Habitats

Upland plant communities on the Grandy Creek site consist predominantly of invasive weedy species. Deciduous and riparian forest habitats dominate the periphery of the site. The riparian forest is considered upland throughout most of the site because most of it does not meet the technical definition of a wetland.

Polygon 1. Grandy Creek Riparian

The stream channel of Grandy Creek has meandered across an area 300 feet wide with aggregation of upstream alluvial material and uprooting of vegetation. There is evidence that storm flows have scoured new channels, deposited sediment, and undermined banks so trees have fallen into the channel. It appears that logjams may have altered the hydrology, creating new channels. This broad swath of stream channel consists of unconsolidated sediment with fast growing plants, such as red alder, pacific willow, Japanese knotweed, and horsetail.

A large portion of the Grandy Creek and Skagit River riparian zone is unvegetated or sparsely vegetated unconsolidated gravels. Dominant plants that line the riparian zone are slowly becoming established in old stream channels. These plants include Japanese knotweed, bitter cherry, alder, and Himalayan blackberry. Within this riparian zone, Japanese knotweed has become well-established and relatively large, monotypic patches of this species are located in the Grandy Creek riparian corridor (delineated as a separate vegetational polygon). Himalayan blackberry is interspersed with the knotweed, although the thickets become more dense further from the creek. Other shrub and herb species at the Creek include Pacific ninebark (*Physocarpus capitatus*), snowberry (*Symphoricarpos albus*), red elderberry, nootka rose (*Rosa nutkana*), bracken fern (*Pteridium aquilinum*), and beaked hazelnut (*Corylus cornuta*). Although this polygon is largely unforested, the most abundant tree species located adjacent to the Creek is bitter cherry. Other tree species include sparse willow (*Salix* spp.), and some red alder, big-leaf maple (*Acer macrophyllum*), several black locust (*Robinia pseudoacacia*), and a few western red cedar (*Thuja plicata*).

Japanese knotweed is quickly invading distinct areas immediately adjacent to Grandy Creek in the riparian zone. Japanese knotweed occurs from the edge of the bank to about 10 to 20 feet east throughout almost the entire length of Grandy Creek in the vicinity of the alternative site. Patches of the species are also becoming established on gravel bars within the creek itself, such as those created every winter when the creek floods and changes course into new channels. These patches illustrate a likely method by which knotweed is spread downstream to other areas along the creek's bank. Portions of knotweed roots travel downstream in the current and take root in exposed substrate in riparian areas, specifically low gravel bars. Because this knotweed species grows as much as 16 feet tall in one season and can survive high streamflows, Japanese knotweed can alter many of the habitat-forming and food production characteristics of streamside forests, including insect production (juvenile salmon prey) and plants that feed native wildlife (NWIFC 2002). Perhaps more importantly, the plant creates dense monocultures that preclude the establishment of native woody shrubs and trees from growing within the riparian zone. Due to the plant's ability to dominate a stream channel and riparian zone rapidly once it becomes established, the plant has been designated as a Class B weed in the state of Washington and Skagit County.

Due to the relatively steep banks of Grandy Creek, the riparian zone is well-drained in most areas and does not support **hydrophytic** vegetation.

Polygon 2. Skagit River Riparian Forest

Riparian areas are distinguished by their cool, moist environments and by their multitude of conditions across a watershed (Johnson and O'Neil 2001). The riparian forest community is generally dominated by deciduous trees that border the banks of rivers, streams, or ponds (Franklin and Dyrness 1988; Johnson and O'Neil 2001; King County 1987). Tree species include red alder, black cottonwood, western red cedar, bigleaf maple, and pacific willow. The understory is composed of shrub species such as vine maple, salmonberry, red elderberry, snowberry, and red-osier dogwood, with herb species such as trailing blackberry and sedges (*Carex* spp.) (King County 1987). Adjacent to the Skagit River, large big-leaf maple dominates the canopy. Other trees include red alder, several large black cottonwood, bitter cherry and two grand fir (*Abies grandis*). One of the grand firs is very large and has a diameter at breast height (dbh) of approximately 72 inches. No significant invasive species occur in this area other than some orchard grass (*Dactylis glomerata*) and sparse Himalayan blackberry in areas disturbed at existing test well locations. The remaining understory consists of: vine maple, red-osier dogwood, snowberry, thimbleberry (*Rubus parviflorus*), red huckleberry (*Vaccinium parvifolium*), pacific ninebark, osoberry/Indian plum (*Oemleria cerasiformis*), scouring rush (*Equisetum hyemale*), and orchard grass.

Due to the presence of anadromous fish in both Grandy Creek and the Skagit River, Skagit County considers all areas within 200 feet of these water bodies as Critical Areas or Fish and Wildlife Habitat Conservation Areas (HCA), including the riparian zone.

Polygon 3. Himalayan Blackberry with Alder

This polygon is dominated by an understory of Himalayan blackberry with a mixed community of trees in the overstory including red alders and scattered Douglas fir (*Pseudotsuga menziesii*), western red cedar, black cottonwood and big-leaf maple. Some apple trees are located in the center of the property, associated with the ruins of the Birdsview Hatchery. Thimbleberry is common among the blackberry thickets. Some bitter cherry and black locust also occur in this area. Invasive English ivy is rapidly becoming established on trees and remnant hatchery structures.

Polygon 4. Bitter Cherry Forest Parallel to Southern Grandy Creek

This area is dominated by bitter cherry shrubs. Some red alder and big-leaf maple also occur in this area. Understory vegetation consists of osoberry, beaked hazelnut, snowberry, sword fern (*Polystichum munitum*), salmonberry, pacific ninebark, and thimbleberry.

Polygon 5. Red Alder Forested Areas with Himalayan Blackberry Understory

This area is forested primarily with red alder, although some mixed forest species also occur. The understory primarily consists of Himalayan blackberry, salmonberry, fern, and some thimbleberry. The alders provide habitat for bird species while blackberry and thimbleberry provide foraging and shelter habitats for birds, insectivores, rodents, and other species. Himalayan blackberry is an invasive weed that crowds out most native species, forming a monotypical stand of densely entangled thorn-bearing canes.

Polygon 6. Turf Grass with Himalayan Blackberry Encroaching

The turf grass area is characterized by a stable population of unmowed lawn grasses, consisting primarily of orchard grass and fescues (*Festuca* spp.), with an increasing component of invasive shrub species, primarily blackberry (Franklin and Dyrness 1988; King County 1987). A small patch of abandoned lawn grass is associated with the ruins of the Birdsview Hatchery. Some invasive species such as, Scot's broom (*Cytisus scoparius*), Canada thistle (*Cirsium arvense*), and Himalayan blackberry are present, but cover less than 50 percent of the ground surface (King County 1987). One distinct grassland community was observed on the site south of the Cape Horn Road. This community likely once surrounded the old Birdsview Hatchery complex. It is likely that this grass community is a successional stage reclaiming this man-made disturbance and it is rapidly being overrun with blackberry and English ivy. This grassland area is likely part of a remnant lawn, and contains European turf-grass species that are common in lawn and erosion control mixes. There are also several non-native species present including several ornamental fruit trees and shrubs, which are likely remnants of the relic Birdsview Hatchery gardens. Scot's broom and blackberry, both non-native invasive species, have invaded this area and will likely become the dominant species over time. English ivy is also prevalent in areas surrounding the ruins of the Birdsview Hatchery.

Polygon 7. Mixed Forest
This small patch of forest is partially connected to a larger forest complex that extends along the north bank of the Skagit River west of Grandy Creek and the subject property. Polygon 7 is forested with red alder, black cottonwood, big-leaf maple, western red cedar, and Douglas fir. Some western hemlock, Sitka spruce, and grand fir may occur in the forest complex outside of Polygon 7. Thimbleberry is common among blackberry thickets in the understory. Some bitter cherry and black locust also occur in this area.

Wetlands

According to the Skagit County NWI wetlands and hydric soils map (2002) no wetlands or hydric soils are known to occur in the immediate vicinity of the Grandy Creek site (Skagit County 2002). The alluvial soil composition and relatively abrupt banks that confine the creek likely prohibit the formation of hydric soils. A recent wetland characterization of the site, conducted by WDFW, indicated that there are no wetlands or associated buffers within the footprint of the Grandy Creek alternative site or within 200 feet of the proposed construction area (WDFW 2004).

Threatened, Endangered, Rare Species

The Washington Natural Heritage Program (WNHP) has developed a list of plant species considered to be threatened, endangered or sensitive within Skagit County (Table 3-12). Based on field surveys and a review of existing information, no plant species listed as endangered, threatened, or sensitive by state or federal agencies are known or likely to occur in the immediate project area. Additionally, information obtained from the WNHP indicates there are no endangered, threatened, or sensitive plant species present in the vicinity of the proposed project (WNHP 2003b).

Table 3-12. List of rare plants known to occur in Skagit County.

Common Name	Scientific Name	State Status	Federal Status
Bristly sedge	*Carex comosa*	S	None
Poor sedge	*Carex magellanica spp. Irrigua*	S	None
Teacher's sedge	*Carex praeceptorum*	Review	None
Long-styled sedge	*Carex stylosa*	S	None
Golden paintbrush	*Castilleja levisecta*	E	T
Pink fawn-lily	*Erythronium revoltum*	S	None
Canadian St. John's wort	*Hypericum majus*	S	None
Orange blossom	*Impatiens aurella*	Review	None
Water lobelia	*Lobelia dortmanna*	T	None
Alpine azalea	*Loiseleuria procumbens*	T	None
Curved woodrush	*Luzula arcuata*	S	None
Branching montia	*Montia diffusa*	S	None
Blunt-leaved pondweed	*Potamogeton obtusifolius*	S	None
Alaska alkaligrass	*Puccinellia nutkaensis*	S	None
Soft-leaved willow	*Salix sessilifolia*	S	None
Pygmy saxifrage	*Saxifraga rivularis*	S	None

Source: WNHP information system, 2003: http://www.wa.gov/dnr/htdocs/fr/nhp/refdesk/lists/plantsxco/Skagit.html
Legend: E = Endangered, T = Threatened, S = Sensitive

Noxious Weeds
Noxious weeds occur abundantly throughout the site. Field surveys revealed the presence of six noxious weed species, including three Class B weeds: herb Robert (*Geranium robertianum*); Japanese knotweed, and Scot's broom; and three Class C weeds: Canada thistle, English ivy, and reed canary grass (*Phalaris arundinacea*). Currently, Scot's broom, Japanese knotweed, and Canada thistle have been given priority status for their control. In addition to those designated noxious weeds, extensive communities of Himalayan blackberry are found in on-site.

IMPACTS

Construction

Impacts due to the construction of the Grandy Creek facility would be limited to approximately one-third of the property owned by WDFW (~13.6 acres), in the area south of Cape Horn Road. The majority of construction would involve disturbance to grassland communities, followed by disturbance to mixed forests. In addition, riparian forests, deciduous forests and a small amount of stream habitat would be impacted. Although planning designs have attempted to minimize impacts to critical areas, some structures would be located within 200 feet of the Skagit River and Grandy Creek. These structures would therefore encroach upon the Critical Areas zone and the Fish and Wildlife HCA, as designated by Skagit County (SCC 14.24.500). As previously stated in Chapter 2, construction of the acclimation facility and associated components would result in direct impact to the plant communities on-site. The main construction areas would be located in areas proposed for the adult holding ponds, acclimation pond complex, the residence and its septic drainfield, and two access roads. Clearing and grading of vegetation (approximately 3.5 acres), and construction of impervious surfaces would remove all vegetation in these areas. The anticipated amount of impervious surface area that would be added to the site due to construction activities is approximately 1.7 acres (acreage of acclimation and holding ponds is considered pervious). Vegetation surrounding Grandy Creek facility structures would likely be disturbed during construction activities. Although the specific amount of vegetation that would be disturbed is difficult to quantify, temporary disturbance of surrounding habitats would be minimized to the extent possible, and altered areas revegetated with appropriate native species upon completion of construction. Specific impacts to vegetation types and associated habitat are discussed below.

Upland Communities and Riparian Habitats. In total, about 3.5 acres would be cleared to construct the facility, including 0.5 acres to be cleared during construction staging and access. The following paragraphs discuss impacts due to individual facility components.

Approximately 1.1 acres of a mixed community of blackberry brush, grasslands, and immature alder forest would be cleared to construct the acclimation/rearing ponds and perimeter fencing, the feed/equipment storage building, and the mixing box (Figure 3-6). Grasslands are dominated by velvetgrass (*Holcus lanatus*), orchard grass, fescue (*Festuca* spp.), and pockets of reed canary grass. Bitter cherry, wild rose (*Rosa* spp.), clover (*Trifolium* spp.) and wild strawberry (*Fragaria* spp.) are also abundantly present in these areas. It is estimated that approximately 20 trees, primarily alders, alder saplings, bitter cherry, ornamental fruit trees and junipers (associated with the relict Birdsview Hatchery) would be removed during clearing and grading of the area. Temporary impacts to adjacent communities would occur due to the need for construction staging areas and the use of construction equipment.

The proposed surface water intake structure, fish ladder, and fish barrier (weir) would be constructed at approximately RM 0.2 of Grandy Creek, within the Fish and Wildlife HCA. Less than 0.05 acres of riparian habitat and Japanese knotweed communities would be disturbed due to placement of these structures. Six alders and one mature big-leaf maple would likely be removed for intake/ladder installation. Localized, loss of riparian habitat would occur within 100 to 150 feet of Grandy Creek for installation of the fish ladder/trap structure. Riprap would be placed 40 feet upstream and downstream from the proposed intake to stabilize the structure and protect it from flooding. Riprap would be placed stream-side of riparian vegetation to avoid impacts to the vegetation. Riprap placement may result in temporary sedimentation into the creek and in the long-term may limit the input of gravels and large woody debris. In addition, upland and riparian habitat would also be disturbed due to the construction of the adult holding ponds. Approximately 1,500 square feet (0.03 acres) of mixed deciduous and coniferous forests with an understory of dense blackberry and Japanese knotweed would be permanently removed. The pipeline corridors would traverse several different plant communities and would result in the temporary disturbance to approximately 0.15 acres of bitter cherry forest, blackberry shrub and alder forest communities. A large stand of invasive Japanese knotweed would also be removed during installation. Several alder trees may be removed for pipeline installation. In addition, the proposed upstream non-target fish release pipeline would traverse areas that are dominated by Japanese knotweed and blackberries. Disturbed areas would be revegetated with native species following installation.

Improvements and modifications to an existing dirt trail would occur to allow continued public access through the site and to the Skagit River as well as to allow for maintenance of the wells. Maintenance activities associated with the well access road, along with well drilling and piling placement (for the well protection system) would impact less than 0.8 acres of riparian forest communities, most of which is already disturbed by the current access trail. The well access road would be staked in the field prior to construction to avoid the removal of mature trees, and impacts would primarily occur to shrubby species including bitter cherry, huckleberry and salmonberry. The well-water conveyance pipeline would traverse several different plant communities, but primary impacts would occur to a mixed community represented primarily by bitter cherry and blackberry thickets in the understory with deciduous alders dominating portions of the canopy. Installation of the pipeline would temporarily disturb these communities. Upon completion of installation, disturbed areas would be revegetated with native species.

The proposed RV pad and associated septic drainfield would be located in an area dominated by a mixed community of dense blackberry thickets with interspersed lowland grasses in the understory and deciduous alders dominating the canopy. Several deciduous trees, primarily alders and bitter cherry, would be removed. Approximately 1,800 square feet (0.04 acres) would be permanently removed for construction of the residence. Impacts due to installation of the drainfield (4,800 square feet) are expected to be temporary as this area would likely regenerate with herbaceous vegetation.

Two existing access roads, one along the eastern property boundary and one leading to Grandy Creek on the west (right) bank, would be widened to allow for improved vehicular access. Improvements to the existing road on the eastern portion of the parcel would disturb approximately 0.1 acres of mixed communities dominated by lowland grass, bitter cherry, and blackberry shrubs. Improvements to the west bank road, including the addition of a vehicular access gate, would disturb approximately 0.1 acres of communities that appear to have been highly disturbed from past use of the old road, including dense thickets of stinging nettle, blackberry, creeping buttercup (*Ranunculus repens*), herb Robert and velvet grass. Several alders would be removed during these improvements. Where possible, areas would be revegetated with native species following improvements.

A new service road is proposed for access to the adult holding ponds and juvenile acclimation/rearing ponds. This gravel road would begin near the proposed parking area off Cape Horn Road and would continue south for 650 feet, looping near the proposed feed storage building. This road would impact 0.7 acres of habitat dominated by a mixed community of lowland grasses and dense blackberry canes, with deciduous alders dominating portions of the canopy. Approximately 10-12 trees, including alders and a few ornamental junipers and overgrown fruit trees would be removed. The proposed visitor parking area would impact approximately 4,500 square feet (0.1 acres) of alder forest, and would require the removal of approximately 4 trees. The vaulted restroom and information kiosk would also require the removal of 1-2 alders, with an estimated disturbance of 250 square feet of deciduous forest.

Resultant spoils from acclimation pond excavation would be placed in multiple areas, totaling approximately 14,800 square feet (0.3 acres) of disturbance. Many of these areas are dominated by invasive Himalayan blackberry shrubs, and, in some areas, are covered by English ivy. These invasive species would be removed to allow for restoration following the completion of construction as the spoils area would be covered with topsoil and revegetated with native species.

Removal of existing Birdsview Hatchery structures would result in temporary disturbance to areas immediately surrounding those structures, but would ultimately result in a net gain of approximately 0.5 acres of vegetation, portions of which lie within the 100-year floodplain. These areas would be revegetated with native species and noxious weed control measures would be implemented to prevent the invasion of weedy species into the reclaimed areas.

Wetlands. A recent wetland characterization performed by WDFW (2004), determined that there are no wetlands or associated wetland buffers within 200 feet of the Grandy Creek alternative footprint. The proposed intake/fish ladder structure would be located on a relatively steep bank that drains well and is currently overrun with Japanese knotweed.

Operational

Loss of Habitat

The permanent loss of deciduous forest, lowland grasses and blackberry shrub habitat would result in a loss of potential nest sites for birds, burrows for ground-dwelling mammals, roost sites for bats and birds, and foraging and cover sites for amphibians, reptiles, birds, and mammals. More details regarding the impact to wildlife species is discussed in Section 3.1.6 and in WDFW 2004.

Increased Stormwater Runoff

Increased impervious surfaces at the site could increase stormwater flow volumes and water level fluctuations within Grandy Creek's riparian zone. This could foster growth of invasive, non-native plants that thrive in disturbance regimes. However, due to prior disturbances related to the Birdsview Hatchery, invasive species have already become well-established on-site.

MITIGATING MEASURES

The following mitigation measures are summarized based on the WDFW (2004 - *Habitat Management Plan and Fish and Wildlife Habitat Conservation Area and Wetland Analysis: Grandy Creek Facility*). The overall approach to mitigation for potential natural habitat impacts is to first avoid impacts to these areas to the extent possible, through careful site design, planning, construction techniques, and strict adherence to BMPs. If avoidance is not possible, mitigation measures to minimize impacts on vegetation communities are proposed to compensate for alterations to the vegetation from the proposed activity.

To mitigate for habitat disturbed by construction activities, areas would be revegetated with native species, including hydroseeding with herbaceous vegetation. Native shrubs and trees would be planted throughout the site. Impacts to the Skagit River and Grandy Creek riparian corridors would be mitigated through extensive plantings of native coniferous trees and shrubs. In addition to intensive native plantings, mitigation would also include the removal and control of invasive and noxious weeds throughout the site, particularly blackberry and Japanese knotweed.

During final design of the groundwater well protection system, every effort would be made to avoid disturbance to mature coniferous and deciduous trees and their root systems. Although some limbing may occur on existing trees, proposed mitigation would compensate for lost density of vegetation.

Because the north bank of the Skagit is subjected to erosion, riparian trees in this area would likely benefit from the proposed well protection system.

To minimize soil disturbance during well drilling and piling installation, surrounding vegetation would be cleared to ground level and geotextile fabric would cover staging areas. Minimally sized construction equipment would be used to reduce compaction, and all equipment used for these activities would be inspected daily for fluid leaks.

Impacts from stormwater runoff during construction would be minimized using the most current BMPs from the WDOE's Stormwater Manual (2001).

UNAVOIDABLE ADVERSE IMPACTS

Clearing and grading activities would represent the most significant unavoidable impacts on the vegetation community from proposed activities.

Uplands
Clearing and grading activities for construction activities would result in the permanent removal of up to 25 percent of the upland plant communities on site. In addition, areas adjacent to proposed structures would likely be impacted temporarily during construction activities. Approximately 20 trees outside of the facility footprint would likely be removed during construction.

Wetlands
As previously stated, because no wetlands or associated buffers occur in or immediately adjacent to the proposed construction areas, significant unavoidable impacts to wetlands would not occur.

3.1.5.2 BAKER RIVER ALTERNATIVE

EXISTING CONDITIONS

Vegetation
The Baker River site is also located in the Northern Cascades Province of the Pacific Northwest and lies within the temperate western hemlock vegetation zone (Franklin and Dyrness 1988). Vegetation within the Baker River basin has been modified primarily by timber management, natural burns and, to a lesser extent, urbanization, hydroelectric development and recreation development.

Large areas surrounding the Baker River site are typically represented by the subclimax forest dominated primarily by Douglas fir. Dominant plant communities in the Baker River basin generally fall into two main categories: older unmanaged forest stands and younger forested timberlands. Within the older stands of forest (old growth), Douglas fir, western hemlock and western red cedar typically dominate, and subdominants include red alder, Sitka spruce (*Picea sitchensis*), big-leaf maple and black cottonwood. In some stands red alder may dominate after disturbance, while black cottonwood tends to dominate riparian areas. Understory plants within the unmanaged forests typically contain salal, low Oregon grape (*Berberis nervosa*), Pacific blackberry, sword fern, vine maple, salmonberry and red huckleberry.

Although much of the Baker River basin is typical of Cascade lowland deciduous and coniferous forests, the Baker River site is located in an area that has been disturbed by previous activities associated with the PSE compound. As proposed, the raceway footprint is located within an area that has been filled and now largely contains immature alders with a sparse understory dominated by Himalayan blackberry. In the most shaded areas, snowberry, English ivy, Indian plum and horsetail occur.

Threatened, Endangered, Rare Species
A list of endangered, threatened, and sensitive plant species that are known to be in the immediate vicinity of the site was requested from the WDNR's Natural Heritage DataBase (2003). DNR indicated that three species of plants listed as State Sensitive, the *Platanthera sparsiflora* (canyon bog-orchid), *Botrychium lanceolatum* (lance-leaved grape-fern) and *Lycopodium dendroideum* (treelike clubmoss), could potentially occur in the general vicinity of the site. However, because the majority of the proposed footprint for the Baker River site is located in an area that is highly disturbed, no **sensitive species** occur in the area. Additionally, none of these species were known to occur within the PSE hydroelectric facility's project boundary (PSE 2002).

Wetlands
There are no wetlands located within the Baker River alternative site footprint or in the immediate vicinity. Due to the presence of steep banks along the Baker River in the vicinity of the project, no riparian riverine wetlands occur adjacent to the river.

IMPACTS

Construction

Facility components (see Figure 2-4) would be located in an area that was previously filled but is now an immature alder forest typical of a subclimax community in the area. Up to 40 immature alders and two immature big-leaf maples would be removed. One mature alder, with a dbh exceeding 24 inches, would also be removed. Disturbance to these communities would not result in significant impacts because the area has been previously disturbed and does not have high value or function for wildlife species.

The buried water conveyance pipeline would initiate in an upland area near the Baker River Trap and would route water to the acclimation raceways via an existing gravel road. Installation of the water supply line would temporarily disturb vegetation along the steeply sloped bank of the Baker River. Existing vegetation in this area consists primarily of weedy species, including blackberry, aster composites, *Rosa* spp., horsetail and a small patch of junipers. No trees would be removed due to installation of the water supply line.

The outfall/drain line would initiate in an upland area near the raceway complex and would be buried under an existing gravel road until it daylights at the bank of the river. Upon day-lighting, the pipeline would be located above-ground on concrete footings. The installation of these footings may impact vegetation along the bank of the river, which largely contains blackberry and other weedy species. The riparian area from the waterline to approximately 30 feet up the bank is largely devoid of all vegetation and contains a significant amount of riprap material. No trees would be removed during installation of the outfall/drainline.

The Baker River Trap is located near this site and would be used to collect returning hatchery steelhead under this alternative. Modifications are currently proposed in conjunction with improvements to the collection facility for PSE's FERC relicensing and would occur regardless of this project, under separate environmental review and consultation. These upgrades would disturb minimal slope-side vegetation as the bank at this location is primarily riprapped and contains existing fish collection structures. Vegetation along this bank has been previously altered and is primarily composed of weedy invasive species including aster composites and blackberry shrubs. Orchard grass and *Poa* species also occur in this area.

Operation
Operation of a facility at the Baker River site would not result in additional impacts to vegetation.

MITIGATING MEASURES

To mitigate for potential losses of habitat associated with tree removal to construct facility components, native trees could be replanted in disturbed areas where possible. Planting of these trees could mitigate for losses to songbird habitat. Although surrounding vegetation is primarily invasive species of low quality and function, additional mitigation measures to protect adjacent vegetation would be implemented during construction activities. Mitigation measures, including the use of BMPs to control erosion and runoff to adjacent vegetation, would be similar to those previously described under *Mitigation Measures* for the Grandy Creek site.

UNAVOIDABLE ADVERSE IMPACTS

Because the majority of the facilities would be located in low-quality vegetative habitat that would be revegetated with native species following construction, there would be no unavoidable adverse impacts to vegetation resources if the Baker River site were chosen.

3.1.5.3 NO ACTION ALTERNATIVE

No changes to plant communities would occur as a result of the No Action alternative. Native species would not be removed or disturbed; neither would non-native species. Existing land uses would continue.

3.1.6 TERRESTRIAL ANIMALS

SKAGIT BASIN OVERVIEW

The variety of landforms, plant communities and habitat resources of the Skagit River basin, as with most of Puget Sound lowland forest communities, has led to the development of a diverse wildlife community (Whitney 1983). Riparian habitats, and the river itself, dominate the environment of the Skagit basin and attract a wide variety of water-oriented wildlife. Raptors, such as osprey (*Pandion haliaetus*) and bald eagles (*Haliaeetus leucocephalus*) are attracted to plentiful fish stocks as prey. Waterfowl including mallards (*Anas platyrhynchos*), wood ducks (*Aix sponsa*), gulls (*Larus* spp.), common loon (*Gavia immer*), western harlequins (*Histrionicus histrionicus pacifica*), hooded and common mergansers (*Mergus* spp.), and goldeneye (*Bucephala clangula*) are known to nest along the Skagit River (Whitney 1983; Udvardy 1986).

Other animal categories that are well represented in the Skagit Basin include big game, upland game birds, fur-bearers, small mammals and bats. Highly visible and notable examples of those likely to occur include elk (*Cervus elaphus*) and black-tailed deer (*Odocoileus hemionus*). Most western birds common to lowland forested areas are also present. Representatives from all these groups are potential inhabitants or visitors to the confluence of Grandy Creek and the Skagit River.

3.1.6.1 GRANDY CREEK ALTERNATIVE

Wildlife species found in the immediate vicinity of the Grandy Creek project area are those associated with the area's primary habitat types, including riparian areas; shrub and early **seral** habitats; shrub/deciduous forest types; and mixed deciduous/coniferous forests typical of the north Cascades lowland forests. Upland forests provide habitat to a variety of native wildlife species along the perimeter of the site. Bald eagles may perch in trees near the shoreline of the Skagit River, but are not known to utilize the Grandy Creek site for nesting or overwintering.

As previously discussed in Chapter 3.1.5, due to the presence of anadromous fish in Grandy Creek and the Skagit River, the on-site riparian area within 200 feet of the water bodies is considered a Fish and

Wildlife HCA by Skagit County. A mandatory HCA assessment and Habitat Management Plan was completed by WDFW (2004).

EXISTING CONDITIONS

Birds

Habitat at the Grandy Creek project site could support a wide variety of bird species, including several species listed as birds of "special concern" in Washington. The great blue heron (*Ardea herodias*), a state monitor species (SM), has been observed in Grandy Creek in the northern portion of the parcel (north of proposed facility site), likely foraging on juvenile salmonids or amphibian species. Although great blue herons use the parcel for foraging, no nesting platforms were observed on-site.

Raptors, including owls and hawks, use the property as part of their foraging area. Red-tailed hawks (*Buteo jamaicensis*) were observed during a field survey, although owls, due to their nocturnal nature, were not observed. Owls are unlikely to use the Grandy Creek site for nesting because snags, owls preferred nesting sites, are in limited supply on-site. There is a relative lack of nesting sites for all raptor species due to the lack of old growth trees or snags and due to the fact that rural residential development surrounds portions of the site. WDW (1991; WDFW 2002) also notes that osprey (SM) and bald eagles (state and federally Threatened) nest or roost in areas within a few miles of the Grandy Creek site. Bald eagles are discussed in detail in the *Threatened, Endangered and Rare Species* section, presented later in this chapter.

Four species of game birds likely to be present in the vicinity include ruffed grouse (*Bonasa umbellus*), ringneck pheasant (*Phasianus colchicus*), California quail (*Callipepla californica*), and the migratory band-tailed pigeons (*Columba fasciata*) (WDFW 2002). Passerines (perching birds) make up the majority of bird species identified at the Grandy Creek site during field investigations. Jays, finches, sparrows and grosbeaks are common passerines that have been observed on-site. These species nest in low trees and shrubs and feed on seeds and fruits of coniferous and deciduous trees throughout the site, as well as shrubs.

Four species of woodpeckers, including the pileated woodpecker (*Dryocopus pileatus*; state candidate for listing) may utilize the site. The downy woodpecker (*Picoides pubescens*), northern flicker (*Colaptes auratus*), and hairy woodpecker (*P. villosus)* have all been detected during various field surveys conducted since the early 1990s.

Mammals

Many species of mammals occur at the Grandy Creek site in habitats that are typical of the Skagit River basin. While the property itself is large and unoccupied, limits to the presence of certain species of wildlife are likely due to the close proximity of residential development and the presence of humans (Adams and Dove 1989). The close presence of humans and domestic pets, as well as the occurrence of recreational users on the site may contribute to increased negative affects to wildlife.

Several mammalian species were identified during field investigations at the Grandy Creek site, based on sightings or signs. These include moles, beavers (*Castor canadensis*), Douglas's squirrels (*Tamiasciurius douglasi*), deer mice (*Peromyscus maniculatus*), raccoons (*Procyon lotor*), mink (*Mustela vison*), river otters (*Lutra canadensis*), and deer. Other species, not specifically identified during site work, are likely to occur in this area based on known habitat preferences. Mammalian species present have been grouped into four categories for the purpose of this discussion. These categories include large mammals (some big game), furbearers, small mammals and bats.

Stable populations of large mammals/big game animals occur throughout the Skagit basin (USFS 1983). Black-tailed deer are a common sight on the river bottoms, with the highest concentration of animals occurring upriver from Concrete where undeveloped forests extend to the river in some areas (USFS 1983). Although no direct or indirect evidence of the presence of elk was observed during site visits, the Grandy Creek area falls within the Skagit/South Josephine Elk Winter Range, containing regular concentrations of Rocky Mountain elk (WDW 1991) and is indicated as a core habitat zone for elk (Johnson and Cassidy 1997). Black bear (*Ursus americanus*) are fairly common in some parts of the Skagit River basin and may traverse the property occasionally as the Grandy Creek site is well within the known range of black bears in the Cascades area of the State. Mountain lions (*Felis concolor*) may also be present in the area.

Forage habitat for furbearers is available on-site for species such as coyotes (*Canis latrans*), raccoons, weasels, mink, and otters. Small mammals that likely inhabit the site or utilize resources on-site for foraging include members of the rodent, insectivore and lagomorph (rabbits, hares and pikas) families. Most rodents are herbivorous, feeding on a variety of food types including grasses, seeds, berries and woody plant material. Due to the abundance of forage materials and burrow/nesting sites, members of the rodent family, including mountain beaver (*Aplodontia rufa*), voles, mice, squirrels, chipmunks and rats are likely to use the Grandy Creek site. Previous surveys indicated the presence of beaver on the southern portion of the site near the Skagit River (FishPro 1994), however, recent surveys did not detect the presence of the species.

Though not observed, it is likely that bats utilize the property. According to the Washington State GAP analysis (Johnson and Cassidy 1997), bats that may utilize habitat in the general vicinity of Grandy Creek include the big brown bat (*Eptesicus fuscus*), little brown myotis (*Myotis lucifugus*), long-eared myotis (*M. evotis*; federal **species of concern** [SOC]), silver-haired bat (*Lasionycteris noctivagans*) and potentially Townsend's big-eared bat (*Plecotus townsendii*; state candidate, federal SOC).

Reptiles and Amphibians

Distribution and habitat use patterns of reptiles and amphibians in the Pacific Northwest are generally less understood than those of other animal species. This stems from their use of obscure habitat and life history limitations (Hodge 1984). Riparian zone habitat is often suitable for reptiles and amphibians. Water saturated forest debris and deadfall that accumulates in depressions provide salamander habitat, and wetland areas often serve as reptile and amphibian habitat (Whitney 1983; Whitney 1989; Hodge 1984; Leonard et al. 1996; Johnson and O'Neil 2001). There are 30 species of reptiles and amphibians known to occur in the coastal forests of Washington (Hodge 1984). Reptiles found in Puget Sound lowlands such as the Skagit River basin include several species of lizards and snakes. Amphibians that may be found in the Skagit River basin include salamanders, newts, toads, tailed frogs, tree frogs, and true frogs.

Habitat exists on the property that is suitable for reptiles and amphibians, particularly in the riparian zone. Eighteen amphibian species are reported to inhabit coastal forest habitats that are similar to those found on the Grandy Creek site. The Pacific tree frog (*Hyla regilla*) was the only one of these species observed on the property during field investigations. However, extensive frog vocalization at dusk indicated the presence of many frogs in the riparian zone on-site. WDW (1991) indicated that individual occurrences of the tailed frog have been observed in areas near the site.

Three species of lizards and nine species of snakes are reported to inhabit Puget Sound lowland forests (Hodge 1984; Stebbins 1966; Whitney 1983; Brown et al. 1995). Although ample habitat exists on the Grandy Creek site, only one reptilian species, the common garter snake (*Thamnophis sirtalis*), was observed during field investigations.

Threatened, Endangered, Rare Species

Bald Eagle *(Haliaeetus leucocephalus)*

The bald eagle has been classified as either threatened or endangered in all states except Alaska since 1978. Although there are petitions to delist the species because populations have significantly rebounded, it is currently listed as threatened both federally and by the State of Washington. The bald eagle wintering range is concentrated primarily from southern Alaska and Canada southward. Movement patterns support the existence of a Pacific Bald Eagle Flyway, consisting of two corridors from the Strait of Georgia north along the coast to Prince Rupert, and along the Fraser River Valley from Vancouver to Chilko Lake (Watson and Pierce 1997). Over two-thirds of the bald eagle nesting population and one-half of the wintering population of the seven-state Pacific Recovery Area occur in Washington and Oregon (WDW 1990).

In Washington, bald eagles are most common along saltwater, and lakes and rivers west of the Cascades (Stalmaster 1987; Rodrick and Milner 1991). Bald eagle nests in the Pacific Northwest are usually located in uneven-aged stands with old-growth components (Anthony et al. 1982). A consistent characteristic of bald eagles is that they are usually located in the tallest tree within a stand (Stalmaster 1987). Tall trees ensure a structure that will support a large nest and provide an open flight path. Additionally, nest heights likely provide a buffer from human disturbance (Watson and Pierce 1998). Douglas-fir and Sitka spruce trees within 300 yards of open water are often used as nesting trees, as are black cottonwoods trees near rivers (Anthony et al. 1982; Stalmaster 1987). The majority of nest building activity takes place in January and February in Washington, with nest sites used for more than one year. Egg-laying typically occurs in March and early April. Eggs hatch in mid-April and early May. Eaglets fledge by mid-July and typically remain in the nest area for an additional month (Stalmaster 1987).

The wintering Skagit River bald eagle aggregation is one of the largest in the lower 48 states (WDW 1991). The eagles migrate to favored wintering grounds beginning in November through mid-March, with the highest use from mid-December through February, peaking in mid-January (USFS 1993; WDFW 2001). The highest concentration of eagles normally occurs between McLeod Slough (RM 66.0) and Rocky Creek (RM 73.6) (USFS 1983). During the fall and winter, the bald eagle is most evident along the middle floodplain of the river associated with stretches of undeveloped timberland. Both adults and juveniles are frequently seen perched in trees along the riverbank. A small number of these birds are permanent residents of the basin. More eagles visit the basin during peak periods of annual anadromous fish migration (Hunt et al. 1992). The principle food source for the overwintering eagles in the Skagit basin is chum salmon (*Oncorhynchus keta*). Chum spawn in the Skagit River from mid-November through December (WDFW and WWTIT 1994), but provide a food source through February. Coho salmon (*O. kisutch*) that spawn in tributaries, including Grandy Creek, may be an important food source after mid-January.

Recent eagle counts (2002-2003 season) for the stretch of the Skagit River between Sedro Woolley and Rockport, within which the Grandy Creek site is located, have yielded single day totals averaging 66 individuals between December through the end of February. The highest single day total during the winter of 2002-2003 occurred during the middle of January when 143 bald eagles were counted in this stretch of the Skagit. The highest single day total between Sedro Woolley and Newhalem (~RM 23 to 93) occurred during the last week of December when 375 eagles were counted (USFS 2003).

Two communal roost sites have been documented between Grandy Creek and Rockport: 1) Savage Ponds eagle roost is 0.7 mile upstream and across the river from the Grandy Creek site; and 2) the O'Toole Creek Roost is approximately 1.5 miles downstream. A review of the Washington State Priority Habitat and Species database and discussions with Julie Stofel, WDFW bald eagle biologist (5/28/03), revealed three bald eagle nests within the Rasar State Park breeding territory, in the vicinity of the project site.

Two nests occur on the north side of the Skagit River, 0.5 mile southwest of the project area, and one nest site occurs on the south side in the Mill Creek drainage (>0.5 mile from the project site). Nesting activities occur from January 1 through August 15. No bald eagles were identified during a WDFW site reconnaissance (WDFW 2004). However, several large black cottonwood, red alder, and grand fir trees adjacent to the Skagit River may provide onsite roosting opportunities for wintering eagles.

Marbled Murrelet *(Brachyramphus marmoratus marmoratus)*

The marbled murrelet is listed as threatened both federally and by the State of Washington (WDFW 2002). Marbled murrelets occur along the North Pacific coast from the Aleutian Islands and southern Alaska to Central California (USFWS 1997). Marbled murrelets feed on fish and invertebrates in the marine environment and nest in stands of mature and old growth forest within 50 miles of marine water. Puget Sound waters are heavily used by murrelets during the summer breeding season to obtain food (USFWS 1997). Preferred prey appears to be forage fish, especially Pacific herring (*Clupea harengus*) and sand lance (*Ammodytes hexapterus*). Critical habitat has been designated for the marbled murrelet and includes areas within a half-mile of mature or old growth trees that are, or could be, used as nesting sites. However, the Grandy Creek site is not located within a Critical Habitat Unit (WDFW 2004).

Marbled murrelets have been detected during the nesting season approximately 52 miles from saltwater in Washington; however, the majority (90%) of sightings occur within 40 miles of marine waters (Hamer et al. 1994). Suitable marbled murrelet nesting habitat consists of large coniferous trees (> 32 in. dbh) within 50 miles of marine water that provide limbs of at least 5-7 in. in diameter or other suitable nesting platforms (including deformities, broken limbs, mistletoe infection, and other formations providing platforms of suitable size to support adult murrelets). Abundance has been positively correlated with the presence of Douglas fir, western hemlock and western red cedar and negatively associated with the presence of silver fir (Hamer and Cummins 1991). Marbled murrelets are commonly absent from stands less than 60 acres (USFWS 2001), however, nests have been located in stands as small as approximately seven acres (Hamer and Nelson 1995). Nesting activities occur from March 1 through September 15.

Within one mile of the Grandy Creek site, the WDFW database has indicated one record of marbled murrelet activity. This record is located approximately one mile south of the site in the Pressentin Creek and Mill Creek drainages.

Although the marbled murrelet may occur in the vicinity of the Grandy Creek site (USFWS 2003), the forested stands in the immediate area of the alternative footprint are dominated by mixed mature deciduous stands comprised primarily of red alder, big leaf maple and black cottonwood. Conifers occur in much less abundance along the banks of the Skagit and none of these conifers exhibit platform characteristics that would be suitable for murrelet nesting. No marbled murrelets were identified during a WDFW site reconnaissance (WDFW 2004).

Northern Spotted Owl (*Strix occidentalis cuarina*)

The northern spotted owl is currently listed as endangered by the WDFW and threatened by the USFWS. The owl can be found throughout the west slope of the Cascades below elevations of 4,200 feet. Their preferred habitat consists of closed-canopy coniferous forest with multi-layer canopies dominated by mature and/or old growth trees that are sufficiently open enough to provide for movement through and below the canopy. Suitable habitat provides opportunities for spotted owls to nest, roost, or forage. In western Washington spotted owls nest most often in cavities of trees with a dbh greater than 20 inches. Nesting habitat also provides roosting and foraging habitat, although not all roosting and foraging habitat provides nesting habitat (WDFW et al. 1997). Critical habitat for the spotted owl has been designated and includes areas throughout its range that have a moderate to high canopy enclosure (60 to 80%); a multilayered, multi-species canopy with large (>30 inch dbh) overstory trees; a high incidence of large trees with various deformities; large snags; large accumulations of fallen trees or other woody debris on the ground; and sufficient open space below the canopy for owls to fly (USFWS 1992).

Spotted owls nest from March through September, and juveniles disperse during the fall and winter. Generally, during the winter, owls become more solitary and wander less from their home range (averages 1.8 mile radius) than during the breeding season. The main prey of spotted owls is small mammals, including the northern flying squirrel (WDFW et al. 1997).

WDFW Priority Habitat and Species (PHS) and USFWS data indicated that spotted owls may occur in the vicinity of the Grandy Creek site. The two closest recorded spotted owl activity centers are south of the Skagit River, over 2.5 and 3 miles from the site. It is unlikely that the owl utilizes the habitat at the Grandy Creek site since it is composed primarily of red alder, big leaf maple and black cottonwood, with scattered mature conifers. Aerial photo interpretation and field reconnaissance surveys performed by WDFW et al. (1997) revealed no suitable northern spotted owl habitat within 0.25 miles of this site. Additionally, no spotted owls have been sighted in the vicinity of the Grandy Creek site during field surveys or along the Skagit River between RM 46 and 78 (WDFW et al.1997; WDFW 2004).

Oregon Spotted Frog (*Rana pretiosa*)

Over the past 50 years, the Oregon spotted frog has experienced a dramatic reduction in range in western Washington (Leonard et al. 1996). The spotted frog is currently listed as a state endangered species and is a federal candidate for listing. The species is found from southeast Alaska through British Columbia to northeast California, and eastward through portions of Idaho, Nevada, Montana, Wyoming and Utah. Adult spotted frogs are found in or near perennial water bodies such as springs, ponds, lakes or slow moving streams. In these habitats it prefers non-woody wetland plant communities including sedges, rushes and grasses (Leonard et al. 1996). According to Licht (1986), it is rare to find a spotted frog more than one meter away from water. They tend to remain in the shallows, half submerged, or they float in deeper water, clinging to aquatic vegetation with their head visible.

Current WDFW PHS and USFWS data did not indicate that the species utilizes habitat within the immediate vicinity of the Grandy Creek site. The site is located within the historic range of the Oregon spotted frog. Prior to the 1940s, the species was found in portions of the Puget Sound Lowlands, but they now appear to be virtually eliminated from the area (Leonard et al. 1996). No shallow emergent or deep emergent wetland or pond habitat occurs in the immediate vicinity of the site and there have been no recent sightings of the Oregon spotted frog in the area (WDFW et al. 1997; WDFW 2004). The closest known population of spotted frogs occurs over 100 miles south of the Grandy Creek site (WDFW 2004). The relative high water velocities of the Skagit River and Grandy Creek do not provide suitable habitat and likely preclude use of the area by the spotted frog.

Species of Concern

Although not indicated to be present within a one-mile radius of the Grandy Creek site, the following federal SOC have been documented in Skagit County and may be located on or near the site (USFWS 2003): California wolverine (*Gulo gulo luteus*), cascades frog (*Rana cascadae*), long-eared myotis (*M. evotis*), long-legged myotis (*M. volans*), northern goshawk (*Accipiter gentiles*), olive-sided flycatcher (*Contopus cooperi*), Pacific fisher (*Martes pennanti pacifica*), Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*), peregrine falcon (*Falco peregrinus*), tailed frog (*Ascaphus truei*), and western toad (*Bufo boreas*).

None of these species were detected during numerous surveys of the project site, although surveys were conducted during the day, when several of the species (bats) would not likely be detected.

IMPACTS

Expected wildlife impacts include habitat damage or loss; temporary noise and human activity disturbance during construction; and long-term disturbance during program operation resulting from increased human presence, maintenance activities and light from facilities. Direct loss of habitat resulting from clearing, grading and filling in riparian or associated upland habitats would result in the most significant adverse impacts to wildlife. Stand structure and distribution of habitat types would not be grossly affected by the proposed action. Current densities of snags, downed logs and other habitat attributes would be affected in localized areas only.

Wildlife species would be impacted by both the construction of the Grandy Creek facility and post construction operations. The impacts of the two phases of the proposed project are different. Therefore, potential impacts during these two phases of the project are discussed separately, below.

Construction

Vegetation Clearing and Grading

Approximately 3.5 acres of upland vegetation would be cleared in preparation for construction. Most of this acreage would be permanently cleared for the facilities, whereas other areas would only be temporarily cleared during construction and then restored. Vegetation clearing and grading would result in a loss of potential nest sites for birds, burrows for ground-dwelling mammals, roost sites for bats and birds, and foraging and cover sites for amphibians, reptiles, birds, and mammals. Some animals such as amphibians and mice could face direct mortality during vegetation clearing, while other animals may relocate to adjacent habitats to the east, north and south. The loss of shrub and tree habitat during construction would take from five to 25 years to restore, resulting in a temporal loss of habitat. While some displaced species would return to this habitat, most would be permanently displaced. These areas are less likely to be used by wildlife as they would be in close proximity to buildings and human activity.

Noise and Human Activity

During construction, vehicular and human traffic would increase within the immediate vicinity of the proposed project site. Construction equipment and human activity would generate increased noise levels in areas surrounding the construction site. Noise levels associated with construction may affect wildlife use in the immediate vicinity. Studies have shown that certain wildlife species respond negatively to recreational activities, and automobile traffic (Larkin 1996). Noise from these activities can affect wildlife activity and communication patterns, including predator-prey relationships and reproductive success. Noise from heavy machinery and equipment also may affect wildlife physiology and behavior in a similar manner. Birds may not be able to hear each other singing, which may disrupt territorial behavior. However, some wildlife species (or individuals) appear to be acclimated to human noises. Species commonly observed near human habitation, such as American robin (*Turdus migratorius*), song sparrow (*Melospiza melodia*), and black-tailed deer, may not be as affected by human noise and activities as other species. Wildlife species, or individuals, not accustomed to human generated noise are likely to be less tolerant of increased noise and activity, and may avoid construction areas, or experience other behavioral or physiological responses. Impacts associated with construction activities would be short-term and many displaced wildlife species would likely return to the area following the completion of construction.

Vibratory pile driving (at the well site) and concrete fracturing (associated with the dismantling of the remnant Birdsview Hatchery structures and existing bridge abutments) would produce high, periodic noise levels that may disturb some species of wildlife within a ¼ mile or more of the site to levels that may result in changes to normal behavior. Temporary displacement of some individuals may occur. The highest noise level activities would primarily occur between June and September, when weather and soil conditions are most conducive to earthwork at the ponds, road and instream structures. These activities would temporarily displace local wildlife.

Reduced Aquatic Prey Densities

Reduced prey densities in aquatic habitats from potential sedimentation due to construction activities may also affect some animals found in upland habitats that forage on aquatic-related species. With lower prey densities, animals may expend more energy and time foraging over a larger area. This increased effort could result in the animals' shorter life span, lower reproductive success, increased competition for food resources, or disease. However, construction stormwater BMPs would be included in the proposed action and sedimentation due to construction is not anticipated to impact aquatic prey species.

Effects of Construction on Threatened, Endangered and Special Status Species

Bald Eagles. Bald eagles may be affected by construction in two ways: direct habitat modification and disturbance during construction activities. The removal of about 0.3 acres of alder and bitter cherry forest would have relatively minor, if any, impact on bald eagles since they are not known to utilize the site. The riparian forest, comprised primarily of tree species that are preferable to eagles including big-leaf maple, grand fir and western red cedar, would remain largely undisturbed by construction activities. It is anticipated that approximately seven trees, including six alders and one big-leaf maple, would be removed due to construction of the surface water intake structure. Additionally, due to upland construction of the facility components, approximately 40 alders, bitter cherry, ornamental junipers, and fruit trees would be removed. It is unlikely that these trees are utilized by eagles at any time.

As previously discussed, the nearest bald eagle nest is over 0.5 mile from the project site. Therefore, it is unlikely that nesting bald eagles would be impacted by construction activities at the project site (J. Grettenberger, USFWS, pers comm., 1/16/04). Construction activities are not expected to influence bald eagle use at winter communal roosts, since the closest communal winter roost identified in the PHS database is located approximately 0.7 mile from the Grandy Creek project site (WDFW et al. 1997; 2004). Trees targeted for removal do not likely serve as habitat for the species. Additionally, due to the improved status of eagles in the state, WDFW no longer imposes timing restrictions for construction activities in regards to their impact on nesting or wintering eagles (J. Stofel, WDFW, pers comm., 5/12/04).

In regards to impacts to winter foraging eagles, the USFWS, in their Biological Opinion for the Issuance of Special Use Permits Regulating Surface Water on the Skagit Wild and Scenic River System (USFWS 1996) concluded that the number of bald eagles wintering along the Skagit River appears to be primarily a function of salmon carcass availability and is not limited by human disturbance. Also, eagles appear to exhibit adaptability to disturbance activities within the context of experimental studies (Watson and Pierce 1998). Therefore, it is anticipated that overwintering bald eagle foraging activities would not be adversely affected during a single winter construction period. Construction during the winter would be limited to low-level noise producing activities, including internal facility construction. High-level noise producing activities, including demolition of existing Birdsview Hatchery structures and major earth work involving construction vehicles would likely take place during the late spring, summer or early fall, when dryer conditions persist on-site. Additionally, although construction timing restrictions are no longer imposed by WDFW, pile driving activities for the well protection system would likely occur during late August and September to minimize potential impacts to overwintering eagles and to work within windows approved by the USFWS. Piles would be driven via the vibratory method to ground level, which minimizes impacts due to noise. Piles would likely be driven in less than three weeks; they would be covered with soils and revegetated following installation.

Marbled Murrelets. The closest known murrelet activity site was identified approximately one mile south of the site. There is no suitable nesting habitat for marbled murrelets in the immediate vicinity of the site, and therefore construction of the Grandy Creek facility should have no effect on the species. However, although the Skagit River is not ideal foraging habitat for the marbled murrelet, individuals possibly could forage there. Noise from the project construction could disturb foraging activities of an individual marbled murrelet in the unlikely occurrence that an individual marbled murrelet were to wander near the project site during construction. Noise from pile driving the shoreline protection barbs into place could temporarily disturb the foraging activities of the marbled murrelet.

Northern Spotted Owls. No suitable northern spotted owl nesting trees occur on the Grandy Creek site. No old growth forests occur in the immediate vicinity of the site and the species is not known to occur at the site. No adverse impacts to the northern spotted owl are expected to occur as a result of potential facility construction and operation.

Oregon Spotted Frog. Construction activities should not impact the spotted frog since there is no suitable habitat for the species, including emergent shallow and deep-water wetlands and slow moving streams or ponds, in the immediate project area.

Other Sensitive Species. Because no federal SOC have been reported to occur within one mile of the site, and none were observed during field surveys, no impacts to the preferred habitat or individuals of these species would occur as a result of this project. The pileated woodpecker, occasionally known to forage on the site, may avoid nesting and foraging in adjacent habitats during construction. The pileated woodpecker, as well as the great blue heron, would likely return to habitats adjacent to the site after construction has been completed. Other special status species as described in the affected environment section, though less likely to be present on the site, may use adjacent habitats, but would likely avoid habitats adjacent to construction activities. Some of the species may return to habitats adjacent to the site after construction has been completed.

Operations

Impacts to upland and riparian plant communities may affect habitat for some wildlife species. However, wildlife would likely successfully relocate to nearby habitats. Some individuals may experience direct mortality, while others may produce fewer young due to stress. Such severe impacts are anticipated to be very limited in occurrence.

Habitat Loss or Fragmentation

Operation of a facility at the Grandy Creek site would require the use and therefore loss of habitat, mostly upland forest habitat that is dominated by invasive species in the understory. This would result in loss of upland habitat elements including cover, nest sites, foraging areas, and corridors for wildlife movement. The quality of these existing habitats and the range of species they support are variable and site-dependent, as described under **Existing Conditions** section. The effects of the loss of these habitats are dependent upon the quality of the habitat and the site's value as a corridor for wildlife movement between other habitats.

Maximum surface water withdrawals of approximately 10 cfs would be required from May through June 1^{st}. Because surface water use is non-consumptive and the water would be returned to the creek immediately downstream of the intake location, it is not anticipated that these withdrawals would affect the wetted perimeter of the reach. Therefore aquatic habitat for amphibians that utilize Grandy Creek for portions of their life-cycle are not likely to be impacted by water level drawdowns.

Corridor Disruption

The riparian habitats found at the Grandy Creek alternative site likely provide important travel and dispersal corridors, and cover, resting, and foraging habitats. These corridors would be disrupted; however, species would likely continue to use nearby corridors after they acclimate to the presence of facility structures. Adjacent habitats are currently fragmented by rural residential development and a low amount of human disturbance. The Grandy Creek facility would not likely significantly increase the level of human disturbance and therefore this impact would likely be minimal.

Increased Noise, Light and Human Activity

Operational activities due to a facility at the Grandy Creek site would contribute to increased noise levels. The primary source of additional noise would be due to vehicle use, the low level hum of pumps at the creek intake and the weekly 2-hour test of the muffled standby generator. Operational noise from the air compressor unit would be minimized by placing the compressor within the office/storage building. The compressor would activate periodically throughout the day (maximum cycles estimated at 6-8 per day) but the unit is small and would be well muffled inside the building. Disturbance from noise at the intake location is not anticipated. Operational noise may reduce the numbers of noise-sensitive animals that currently use the site; however, predicted noise levels are not anticipated to cause significant adverse impacts to wildlife in the area. The use of facility lighting is not anticipated to adversely affect species use as the predicted level of lighting is low and associated mainly with the facility residence. Other effects are similar to those stated for noise and human activities under the Construction Impacts section.

Bald Eagle. Increased human activity associated with the operation of a facility at the Grandy Creek site could potentially impact bald eagles. However, the effects of operational activities are not expected to impact nesting or winter communal roosting bald eagles because of the distance to nest and roost sites. There could be some disturbance to foraging eagles in the immediate vicinity of the site, but this portion of the Skagit River was identified as having only a low level of eagle foraging occurrence (WDFW et al. 1997). As a result of increased hatchery returns to this area of the Skagit, foraging opportunities may increase. Use by recreational steelhead fishers may increase; however, the disturbance caused by the current level of recreational use appears not to have significantly reduced the bald eagle recovery rate in the Northwest (WDFW et al. 1997).

Marbled Murrelet. Operational activity should not impact the marbled murrelet since the area is not known to support the species and there is no suitable nesting habitat in the immediate vicinity of the Grandy Creek site.

Spotted Owl. Operation of a facility at the Grandy Creek site should not impact the spotted owl as there is no suitable habitat in the immediate vicinity of the site.

Spotted Frog. Operation of a facility at the Grandy Creek site should not impact the spotted frog as there is no suitable habitat in the immediate vicinity of the site; therefore the frog is not likely to occur in the area.

MITIGATING MEASURES

As part of mitigation for impacts due to the construction of a facility at the Grandy Creek site, existing concrete infrastructure, including raceways and a wall that were part of the relic Birdsview Hatchery would be demolished and replaced with native vegetation. This activity would increase the amount of pervious surface area by 0.5 acres within the floodplain, resulting in less runoff to the creek. Additionally, removal of these structures would result in more available habitat for wildlife.

Since some of the proposed structures, including the intake/fish ladder structure and the adult holding ponds, would occur within Skagit County's designated 200-foot critical areas setback (from Grandy Creek), which includes the Fish and Wildlife HCA, mitigation for these disturbances is mandatory. In accordance with the mitigation requirements, a mitigation plan would be implemented based on WDFW's *Habitat Management Plan and Fish and Wildlife Habitat Conservation Area and Wetland Analysis: Grandy Creek Facility* (WDFW 2004). Mitigation would include maintenance of vegetation buffers around the facility to mitigate the effect of noise and visual impacts on wildlife. All property not developed would be left as natural open space and habitat features, including bird and bat boxes, would be installed throughout the site, including the critical areas buffer. Riparian zones would be replanted with native trees, shrubs and herbaceous vegetation to restore functionality to pre-disturbance levels. The use of natural vegetation buffers would serve to enhance the existing shoreline environment and the various landscapes that are visible from the river and its banks. These measures are designed to preserve the setting of the natural property and to enhance its value as habitat for birds, mammals, reptiles and amphibians.

The majority of external infrastructure for the Grandy Creek facility would be constructed during work windows specified by the WDFW, NOAA Fisheries, and USFWS to avoid critical periods (i.e., nesting and breeding/spawning, migration) for wildlife.

UNAVOIDABLE ADVERSE IMPACTS

Some birds may be permanently displaced from the site due to habitat removal and human disturbance. Increased human activity may increase disturbance to locally occurring bald eagle populations, however, increased disturbance to bald eagles is unlikely. Some mammalian species (e.g., elk and deer) may be permanently lost from the site due to habitat removal and human disturbance. However, removal of concrete structures from the Birdsview Hatchery would create new habitat for small mammals. Although 3.5 acres of habitat would be permanently lost, including a small amount of riparian and upland habitat, no significant unavoidable impacts to reptiles and amphibians are anticipated due to construction activities on-site. Some individuals would be displaced, but adjacent habitat is available for colonization.

3.1.6.2 BAKER RIVER ALTERNATIVE

EXISTING CONDITIONS

Baker River Basin

The Baker River site footprint is located in an area that is dominated by immature deciduous trees that may serve as habitat for nesting songbirds, or as perch trees for raptors. The understory likely serves as habitat for small mammals and ground nesting birds, and serves as a corridor for deer. Adjacent areas immediately south of the site are developed (PSE/Baker River hydroelectric project office compound/storage area) and are covered by impervious surfaces that do not serve as valuable wildlife habitat. However, surrounding areas to the north and east support a diverse community of mammals, birds, reptiles and amphibians. Prime habitats occur a few miles north of the Baker River site in forest and riparian communities surrounding Baker Lake and Lake Shannon, reservoirs created by the upper and lower Baker River dams. A discussion of Baker River basin fauna is presented in the following paragraphs.

Birds

At least 164 species of birds may inhabit the Baker River basin (PSE 2002). The species composition includes waterfowl, shorebirds and water birds, game birds, raptors, songbirds and other birds.

Shorebirds that may utilize the basin include loons, grebes, gulls, sandpipers, herons and other species. Common loons are regular visitors to the reservoirs and tend to use them for wintering and for foraging during their annual migrations. There are no records of common loons nesting along the shorelines of the two reservoirs. American dippers (*Cinclus mexicanus*) are very common in riparian areas, as are belted kingfishers (*Ceryle alcyon*).

Gamebirds in the basin include the ruffed grouse and band-tailed pigeon. Of these, the ruffed grouse, which can be found in mixed deciduous and coniferous forests, as well as along forest roads, is the most likely to occur in the vicinity of the potential project site.

Of the potential raptors that occur in the Baker River basin (PSE 2002), only the bald eagle and osprey (SM) commonly use the Baker River reservoirs. According to WDFW PHS data (2002), an osprey nest is known to occur on the southern shoreline of the Skagit River across from the mouth of the Baker River, approximately 1 mile south of the potential facility site. The peregrine falcon may be an uncommon visitor to the Baker River basin, as the area is within its range and suitable habitat is present (National Geographic Society 1999). Owl and hawk species may utilize the mature and old-growth forests that are present in the upper portion of the Baker River basin, including the northern spotted owl and northern goshawk. Forest stands may provide habitat for the barred owl, great horned owl and western screech owl. Open habitats are frequented by species such as the red-tailed hawk, American kestrel (*Falco sparverius*) and the short-eared owl (*Asio flammeus*).

Mammals

The Baker River basin supports approximately 60 mammal species (PSE 2002) including large mammals, furbearers, small mammals and bats.

The most common large mammal in the Baker River basin is the black-tailed deer. This species is more common in the southern half of the Baker River basin, where forage material is in greater abundance. Two black-tailed deer were observed within the facility footprint during a site visit. Another common large mammal is the elk, individuals of which likely represent the South Fork Nooksack River herd (likely a mix of Rocky Mountain and Roosevelt elk subspecies). Elk tend to winter in the lower elevation areas within the Baker River basin. Other large mammals observed by PSE biologists in the site vicinity include black bear, mountain lion, and harbor seals that are occasionally observed in the Baker River below the fish barrier dam (PSE 2002).

Furbearers including river otter, beaver, mink, coyote and bobcat are known to use the Baker River reservoirs and associated riparian and forested habitats in the areas north of the Baker River site. In 2004, river otters were a nuisance, resulting in the early release of juvenile steelhead acclimating at the Baker River Trap. Small mammals common to the reservoir area and surrounding forest communities include Townsend chipmunk, northern flying squirrel, Trowbridge shrew, deer mouse and snowshoe hare. Bats that may inhabit the general area include the little brown myotis, long-eared myotis, silver-haired bat and potentially Townsend's big-eared bat (PSE 2002). Habitat in the immediate vicinity of the Baker River site is not heavily utilized by many large mammals due primarily to a general lack of habitat and existing year-round disturbance from on-going activities at the PSE office compound.

Reptiles and Amphibians

The Baker River Basin contains habitat suitable for a variety of reptile and amphibian species. Typical forest dwelling species include the Pacific giant salamander, Ensatina, Pacific chorus frog and western terrestrial garter snake. Species likely to be found primarily in riparian areas include the tailed frog, northern red-legged frog, western toad and common garter snake. Newly clear-cut or open areas could contain species such as the northwestern fence lizard and northwestern garter snake. The bullfrog can be found in disturbed wetland and pond areas where they have been introduced. There is suitable habitat for the Oregon spotted frog and Cascades frog in the Baker River basin. However, within the vicinity of the Baker River site, water-dependent amphibian species do not likely occur in great abundance.

Threatened, Endangered, Rare Species

The Baker River site is located within the North Cascades Grizzly Bear Recovery Zone established by the USFWS (1993). Grizzly bears (*Ursus arctos*) may be occasional visitors to the basin at high elevations as evidenced by a track observed in 1989, however, no bears have been observed in recent studies (PSE 2002). Gray wolves (*Canis lupus*), lynx (*Lynx canadensis*) and wolverine may also be occasional visitors in the high elevation areas of the Baker River basin (PSE 2002). However, none of these species is known to occur in the immediate vicinity of the Baker River site.

Bald eagles have established two nest territories along the shores of Baker Lake, one near the mouth of the Baker River as it enters Baker Lake and the other near the mouth of Boulder Creek. Both of these sites are more than 3 miles from the Baker River site. A pair of eagles uses the Baker River nest nearly every year, while the Boulder Creek nest is active only periodically. Both were active in 2001 (PSE 2002). According to the WDFW database, the closest known eagle activity site is located approximately 1.7 miles from the Baker River site.

Marbled murrelets have been observed flying up the basin and suitable nesting habitat occurs in some areas of the basin, including the eastern shore of Baker Lake (PSE 2002). No suitable habitat for nesting murrelets occurs in the immediate vicinity of the Baker River site.

Suitable habitat for both the spotted owl and the Oregon spotted frog occurs in areas throughout the Baker River basin (USFWS 2003), although no known occurrences of either of these species was reported in the immediate vicinity of the project site (WDFW 2002).

IMPACTS

All construction would take place within upland areas. The water supply and outfall drain line would, by necessity, be located adjacent to the Baker River, resulting in impacts to the severely degraded riparian zone in the vicinity of the existing Baker River Trap. Impacts due to potential construction activities are described below.

Upland Construction

<u>Vegetation Clearing</u>

Vegetation clearing and subsequent fill to accommodate the raceways and waste clarifier pond would be required at the Baker River site. The immature stands of deciduous trees likely serve as nesting habitat for song birds, and groundcover is likely used by nesting birds and small mammals. Black-tailed deer are known to forage in the proposed raceway location. The effects of habitat loss are anticipated to be minimal because these sites are expected to support a low diversity of common urban species. Forage areas for deer are available in other accessible areas within PSE's compound. The value of these vegetated habitats as corridors for wildlife movement is marginal for terrestrial species considering the close proximity of the PSE compound. Therefore, loss of vegetation within the construction area would likely have minor effects on terrestrial species, and would not likely result in long-term adverse impacts to wildlife. To mitigate for lost nesting habitat, surrounding areas could be replanted with native trees. A mitigation strategy would be implemented that is satisfactory to both reviewing agencies and to the property owner, PSE.

Noise and Human Activity

Most mammals and birds that inhabit this site are accustomed to the noise of commercial traffic, and are therefore not likely to be negatively affected by construction noise and activities. Species that may potentially be affected by construction noise and activities in adjacent forest habitats include black-capped chickadee (*Parus atricapillus*), golden-crowned kinglet (*Regulus satrapa*), pileated woodpecker, red-tailed hawk, and other bird species inhabiting this area. Birds may be flushed from their nests, or may avoid nesting, foraging, or perching in areas located near the construction activities. Mammals and amphibians may also be affected in a similar manner.

Effects of Construction on Threatened, Endangered and Special Status Species

Construction at the Baker River site is not likely to impact bald eagles as no known activity sites occur within a mile of the raceway location, as proposed. No perch trees are located within the proposed raceway location. Increased noise levels during construction could reduce the amount of habitat available for special status bird species including the red-tailed hawk and the pileated woodpecker. The pileated woodpecker and red-tailed hawk, known to forage in the vicinity of the project site, may avoid nesting and foraging in adjacent habitats during construction. Other special status species as described in the **Existing Conditions** section, though less likely to be present on the site, may also avoid habitats adjacent to construction activities.

Operation

Operational activities at the Baker River site would be negligible as the site is currently developed and has a moderate level of human activity and a low level of use by most wildlife species. Wildlife species that currently use the area as a fringe habitat would likely continue to do so as the acclimation/rearing facility would only minimally increase disturbance in the area primarily from increased use by haul trucks during adult collection activities. Operational lighting would not likely increase existing impacts because security lighting for the PSE office facility is already in place.

Noise associated with occasional use of a stand-by generator and an air compression system (if one is used for intake screen cleaning) would be minimal because the units would be housed within buildings designed to minimize sound. The existing noise produced by the barrier dam operations would likely mask any noise produced by these units.

Corridor Disruption

Because the site is currently disturbed and moderate human activity occurs on a daily basis in association with Baker River dam operations, the site's function as a migratory corridor is minimal. Wildlife that currently use adjacent roads as travel corridors would likely continue to do so. Operation of an acclimation facility would not increase disturbance and therefore would not impact this function.

MITIGATING MEASURES

Mitigation measures similar to those presented for the Grandy Creek site would be implemented at the Baker River site. These measures include, primarily, revegetation of disturbed areas with native species and noxious weed control.

UNAVOIDABLE ADVERSE IMPACTS

There would be no unavoidable adverse impacts to terrestrial species as a result of construction and operation of an acclimation and rearing facility at the Baker River site.

3.1.6.3 NO ACTION ALTERNATIVE

If no action were taken, marginal wildlife habitat would not be disturbed by construction or operational activities at the Baker River site. Corridors would be maintained and species use would continue as under the current conditions.

3.1.7 AQUATIC ANIMALS

SKAGIT BASIN OVERVIEW

The Skagit River is one of the largest rivers in Washington State and the largest river in the Puget Sound region (DeShazo 1985; Williams et al. 1975). The system, encompassing over 3,100 square miles within the North Cascades mountain range in Snohomish, Skagit, and Whatcom counties, along with headwater regions in British Columbia , is one of the largest and last remaining strongholds of fish and wildlife habitat in the Puget Sound region (DeShazo 1985; Beamer et al. 2003). The mainstem of the Skagit River is 162 miles in length. Anadromous fish are blocked at RM 105 by Gorge Dam, about 30 miles downstream of the Canadian border (DeShazo 1985; Seattle City Light 1980).

The town of Concrete, 12 miles west of Rockport, is located at the confluence of the Baker River (RM 56.5), the lowest major tributary to the Skagit River. An impassable hydroelectric dam is located on the Baker River just upstream of Concrete. The mainstem Skagit in this section contains 12 miles of meandering river flowing from the town of Concrete to 1.5 miles below the community of Birdsview. Within this section, seven tributary streams occur, of which Grandy Creek (RM 45.6) is considered one of the most important for salmonid utilization (Williams et al. 1975). From Grandy Creek, the Skagit River then meanders downstream through extensive farmland, occasional industrial areas and past considerable rural residential developments. Between Concrete and Sedro Woolly, at RM 25, the river contains frequent pool/riffle areas (DeShazo 1985). At approximately RM 8 the Skagit breaks into a highly braided configuration with many sloughs and channels. Besides the three main tributaries (Baker, Sauk, and Cascade river), the Skagit system contains numerous smaller tributaries. In total, approximately 4,540 linear miles of stream length exists in the system of which 310 miles is suitable habitat for steelhead production (Phillips et al. 1980; DeShazo 1985; Williams et al. 1975).

Fish Species Present in the Skagit River

The Skagit River and associated tributaries comprise the largest drainage basin in Puget Sound. All five anadromous species of Pacific salmon including Chinook, coho, pink, chum and sockeye, plus summer and winter run steelhead, coastal cutthroat and sea run char are present in the system. Several resident species of recreational importance are also common to the Skagit system. These include rainbow trout, brook trout, Dolly Varden and whitefish, as well as many other species that inhabit the Skagit system. Table 3-13 presents fish species that currently occur within the Skagit River system.

Table 3-13. List of anadromous and resident fish species present in the Skagit River system.

Common Name	Scientific Name
Steelhead/rainbow trout	*Oncorhynchus mykiss*
Chinook	*Oncorhynchus tshawytscha*
Sockeye/kokanee	*Oncorhynchus nerka*
Cutthroat trout	*Oncorhynchus clarki*
Chum	*Oncorhynchus keta*
Pink	*Oncorhynchus gorbuscha*
Coho	*Oncorhynchus kisutch*
Dolly Varden	*Salvelinus malma*
Bull trout	*Salvelinus confluentus*
Brown trout[1]	*Salmo trutta*
Brook trout[1]	*Salvelinus fontinalus*
Golden trout[1]	*Oncorhynchus aquabonita*
Grayling[1]	*Thymallus arcticus*
Mountain whitefish	*Prosopium williamsoni*
Eulachon	*Thaleichthys pacificus*
Longfin smelt	*Spirinchus thaleichthys*
Yellow perch[1]	*Perca flavescens*
Prickly sculpin	*Cottus asper*
Aleutian (coast range) sculpin	*Cottus alueticus*
Brown bullhead[1]	*Ictalurus nebulosus*
White sturgeon[2]	*Acispenser transmontanus*
Pacific lamprey	*Lampetra tridentata*
River lamprey	*Lampetra ayresi*
Brook lamprey	*Lampetra richardsoni*
Redside shiner	*Richardsonius balteatus*
Northern squawfish	*Ptychocheilus oregarensis*
Peamouth	*Mylocheilus caurinus*
Longnose dace	*Rhinichthys cataractae*
Carp[1]	*Cyprinus carpio*
Largescale sucker	*Catostomus macrocheilus*
Threespine stickleback	*Gasterosteus aculeatus*
Pumpkinseed[1]	*Lepomis gibbosus*
Black crappie[1]	*Pomoxis nigromaculatus*
Largemouth bass[1]	*Micropterus salmoides*
American shad[1]	*Alosa sapidissima*
Atlantic salmon[3]	*Salmo salar*

Source: Wydoski and Whitney 1979; C. Kraemer, WDFW, pers comm., 12/12/03
[1] Not native to Skagit River basin; [2]Do not reproduce in Skagit; [3]Net pen escapee

Wild Steelhead

Steelhead trout are the anadromous form of rainbow trout (*O. mykiss*). There are many genetic or hereditarily distinct races of this species that are differentiated by habitat (Behnke 1979 and 1992; Phillips et al. 1980; Raleigh et al. 1984). In the Pacific Northwest, steelhead trout are commonly managed as two principle races, summer and winter. The two groups are primarily distinguished by the time adults return to freshwater, the extent of their sexual maturity at time of return and, to a limited degree, by appearance (Leider et al. 1986; Leider et al. 1990a; Raleigh et al. 1984; Tipping 1991). Steelhead within the Skagit River are part of the Puget Sound Steelhead **Evolutionarily Significant Unit** (ESU). This ESU occupies river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal in Washington. Recent population trends within the Puget Sound ESU are predominantly downward, even though upward trends in the two largest stocks, the Skagit and Snohomish river stocks, were observed in the mid 1990s (Busby et al. 1996).

Wild steelhead can be defined as any fish spawned and reared in the natural environment, regardless of its ancestry (Hulett and Leider 1992; 1989). Wild steelhead generally spend two or three years in freshwater before emigrating and spend, one, two or three years in the ocean before returning (WDFW and WWTIT 1994). It is estimated that approximately 10 percent of Skagit River steelhead are repeat spawners (WDFW and WWTIT 1994). Historically, it is estimated that total annual wild steelhead run size (both summer and winter) was as high as 20,000 fish (DeShazo 1985).

The Skagit River contains wild runs of both summer and winter steelhead. Historically, native summer stocks consisted of small runs of fish limited by their habitat in areas of the Skagit basin that are inaccessible to winter fish. Run-timing of summer steelhead stocks (May through October) is distinct from run-timing of winter steelhead stocks (November through May) in the Skagit River system. The Skagit River contains three summer steelhead stocks: Finney Creek, Sauk River and Cascade River; and three winter steelhead stocks: mainstem Skagit and tributaries, Sauk River and Cascade River.

Wild origin winter steelhead have been defined as those fish that spawn after March 15 through the early July (Woodin et al. 1984; C. Kraemer, WDFW, pers comm., 12/12/03). Spawning activity is limited until mid to early April, with peaks of activity in the second and third weeks of May (C. Kraemer, WDFW, pers comm., 12/22/03). The majority of wild steelhead smolts in the Skagit are two-year fish with a rare 1-year smolt and some three-year smolts. Peak emergence occurs in early August with emigration in late April through early June, making most smolts 21 months old (C. Kraemer, pers comm., 12/12/03). Most fry spend their freshwater phase in their natal stream. However, some begin migrating downstream to the mainstem Skagit earlier, where they spend the remainder of their freshwater residency (R.W. Beck 1987). Data collected from Skagit River wild winter-run steelhead spawners in the 1980s and 1990s indicates average fecundities of 5,200 eggs per female (WDW 1992b). Winter steelhead in the Skagit River system spawn in mainstems, particularly the mainstem Sauk River, and most tributaries throughout the anadromous zone from the headwaters downstream as far as Sedro Woolley. A **redd** observed just near RM 22 is one of the most downstream spawning locations in recent years (C. Kraemer, WDFW, pers comm., 5/13/03).

Hatchery Steelhead

The Washington Department of Game (WDG, later WDW, now WDFW) began stocking large numbers of early-timing winter steelhead smolts in the Skagit River in the 1960s (DeShazo 1985). Prior to 1992, the average number of hatchery steelhead smolts stocked in the Skagit River was 248,000. Demands for increased stocking due to predicted population growth in the Puget Sound area resulted in the 1992 *Option Paper on Hatchery Steelhead Stocking Guidelines to Limit Genetic Impacts to Wild Steelhead Stocks* (WDW 1992a). Based on the analyses presented in that paper and subsequent compliance with WDW's Genetic Conservation Model (GCM; Hulett and Leider 1993), WDG geneticists proposed a stocking option for hatchery steelhead in the Skagit that would theoretically provide for increased harvest while limiting the genetic impact on wild populations to a level considered acceptable.   This option resulted in a 115% increase in Skagit River stocking to the current level of 534,000 smolts.

As discussed in Section 2.1, the Skagit River winter steelhead hatchery stock was developed for early time of return, which is meant to accomplish two major goals: 1) provide an opportunity for high harvest rates on early returning hatchery fish prior to the arrival of wild fish, and 2) minimize opportunities for interbreeding between naturally spawning hatchery and wild fish (Busby et al. 1996). Most adult hatchery fish return to the Skagit in December and January (DeShazo 1985). These fish begin spawning by early January (WDW 1992a). Steelhead of hatchery origin that spawn in the wild are defined as those fish spawning before March 15, for management purposes on the Skagit (Woodin et al. 1984).   This cut-off point is based on scale analysis and known maturation timing of hatchery stock steelhead (Chambers Creek stock) and is the approximate mid-point of overlap between hatchery and wild spawning. Based on returns to hatchery racks, only 5% of hatchery fish have spawned after March 1, with as little as 1% in some years (testimony by C. Kraemer, WDFW, as cited in Washington Trout et al. v. WDFW 1998). According to Curt Kraemer, WDFW, this rate has been even further reduced in recent years (pers comm., 12/12/03) as recent trapping data from Marblemount Hatchery and Barnaby Slough has indicated that most hatchery steelhead are trapped and spawned around the second week of February. Traps are maintained until early March, but hatchery fish do not utilize the traps past mid February (S. Stout, WDFW, pers comm., 12/30/03).

The section of the mainstem Skagit most heavily spawned by hatchery origin adults occurs between the Cascade and the Sauk rivers, upstream of both the Grandy Creek and Baker River sites. The high counts in this section are most likely due to the return of spawners to the vicinity of Barnaby Slough. Recent hatchery **escapement** data (from returns to hatchery racks) for Skagit River winter steelhead is shown in Table 3-14.

Table 3-14. WDFW hatchery winter steelhead escapement to traps at Marblemount Hatchery and Barnaby Slough from 1994-2003.[1]

Facility	Season								
	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Barnaby Slough	0	954	289	0	0	27	0	78	81
Marblemount	154	67	58	449	364	69	339	676	32
Totals	154	1,021	347	449	364	96	339	754	113

[1]WDFW Hatchery Escapement and Broodstock Reports for all seasons
http://www.wa.gov/wdfw/hat/escape/escape.htm

In contrast to wild steelhead juveniles, which can remain in freshwater for up to three years, hatchery steelhead are reared for one year at which time they attain smolt characteristics and begin seaward migration immediately upon release (Bley and Moring 1988; Emmett et al., 1991; Pauley et al. 1986; Raleigh et al., 1984; Leider et al. 1986). Hatchery steelhead have been released as smolts at Marblemount Hatchery, the Barnaby Slough rearing facility, the Cascade River, the Sauk River (one time event in 2003), Grandy Creek, Faber's Ferry, Baker River and Davis Slough (HSRG 2003). At times, smolts are also direct released at the Hamilton/Lyman boat launch and the Birdsview boat launch (S. Stout, WDFW, pers comm., 5/8/03).

Hatchery and Wild Steelhead Population Data

Most winter steelhead (approximately 75 percent) that spawn in the Skagit basin use tributary streams (Phillips et al. 1980; Phillips et al. 1981; Woodin et al. 1984). Historically, wild winter steelhead have accounted for approximately 55 percent of Skagit steelhead adult returns and hatchery adult returns accounted for the remaining 45 percent (DeShazo 1985). However, recent data indicates that hatchery fish now comprise only 10 percent of the total returns to the Skagit River. Table 3-15 shows total run size for winter steelhead both of wild and hatchery origin from 1977 through 2003, as well as Tribal and sport harvest. Data presented in Table 3-15 has been updated based on revised information from WDFW.

Spawning escapements of wild winter steelhead are shown in Table 3-15. The minimum wild winter-run escapement goal for the Skagit is 6,000 fish (Trout Unlimited 2002; P. Castle, WDFW, pers comm., 5/28/03). This goal fluctuates annually based upon seasonal escapements (6,000 minimum goal, plus 16% of the run greater than 6,000 fish when run exceeds 6,000).

Table 3-15. Total run size for winter steelhead in the Skagit River system.[1]

Return	Sport Harvest			Tribal Harvest			Escapement			Total Run Size		
Year	Hatchery	Wild	Total	Hatchery	Wild	Total	Hatchery	Wild	Total	Hatchery	Wild	Total
1977/78	3,033	371	3,404	3,465	787	4,252	1,537	5,757	7,294	8,035	6,915	14,950
1978/79	4,638	240	4,878	3,986	901	4,887	961	2,982	3,943	9,585	4,123	13,708
1979/80	2,679	799	3,478	4,046	154	4,200	721	5,288	6,009	7,446	6,241	13,687
1980/81	1,231	1,105	2,336	2,364	623	2,987	1,127	4,308	5,435	4,722	6,036	10,758
1981/82	1,635	1,023	2,658	2,313	384	2,697	175	9,609	9,784	4,123	11,016	15,139
1982/83	632	666	1,298	1,700	281	1,981	33	7,732	7,765	2,365	8,679	11,044
1983/84	1,698	296	1,994	3,228	79	3,307	392	8,963	9,355	5,318	9,338	14,656
1984/85	4,793	1,435	6,228	4,690	283	4,973	3,702	8,603	12,305	13,185	10,321	23,506
1985/86	2,525	1,916	4,441	4,664	233	4,897	1,339	11,098	12,437	8,528	13,247	21,775
1986/87	1,677	1,895	3,572	3,530	536	4,066	964	8,305	9,269	6,171	10,736	16,907
1987/88	2,278	1,873	4,151	4,161	746	4,907	1,195	13,194	14,389	7,634	15,813	23,447
1988/89	1,230	1,892	3,122	2,964	676	3,640	779	11,854	12,633	4,973	14,422	19,395
1989/90	1,283	1,351	2,634	3,291	272	3,563	852	10,017	10,869	5,426	11,640	17,066
1990/91	141	637	778	1,681	465	2,146	339	5,818	6,157	2,161	6,920	9,081
1991/92	976	51	1,027	n/a	84	n/a	34[4]	7,514	7,548	1,010	7,649	8,659
1992/93	1,721	1,318	3,039	821	46	867	110[4]	6,900	7,010	2,652	8,264	10,916
1993/94	600	1,052	1,652	127	74	201	164[4]	6,412	6,576	891	7,538	8,429
1994/95	987	561	1,548	798	271	1,069	154[4]	7,656	7,810	1,939	8,488	10,427
1995/96	1,040	455	1,495	1,160	22	1,182	1,021[2]	n/a	n/a	3,221	n/a	n/a
1996/97	1,839	1,609	3,448	72	73	145	347[2]	n/a	n/a	2,258	n/a	n/a
1997/98	347	49	396	61	3	64	449[2]	7,448	7,897	857	7,500	8,357
1998/99	561	1,030	1,591	90	186	276	364[2]	7,870	8,234	1,015	9,086	10,101
1999/00	497	361	858	130	94	224	96[2]	3,780	3,876	723	4,235	4,958
2000/01	1,572	53	1,625	31[3]	186[3]	217[3]	339[2]	4,584	4,923	1,883	4,818	6,701
2001/02	2,860	131	2,991	97[3]	15[3]	112[3]	754[2]	5,394	6,148	3,684	5,563	9,247
2002/03	439+[1]	35[1]	468[1]	10[3]	25[3]	35[3]	113[2]	6,818[1]	6,931[1]	562[1]	6,878[1]	7,440[4]

[1]Source: W. Gill, WDFW, unpublished data, 6/6/03; 12/03; Data for winter steelhead from 1 November – 30 April
[2]Source: WDFW Hatchery Escapement and Broodstock Reports for individual seasons; numbers are estimates only
[3]Source: R. Bernard, Skagit System Cooperative, pers comm., unpublished data; 6/12/03; data are estimates only and include test fish and expansions
[4] Data from S. Hammer, WDFW, pers comm., unpublished data, estimates only; 7/10/03

Interactions between hatchery and wild steelhead spawners have been a cause for concern among conservationists and scientists alike. However, Hindar et al. (1991) found that gene frequencies of naturally produced juvenile fish in the Skagit River were typical of wild populations. Hindar et al.'s study suggested that **introgression** between hatchery and wild fish was not occurring at high levels at the time of the study. In a more recent genetic analysis of Skagit River juvenile steelhead, Phelps et al. (1997) also indicated that the level of introgression between hatchery and wild fish was minor and was not widespread in the system. More information on genetic interactions between hatchery and wild steelhead is presented later in this chapter.

Chinook

Skagit River Chinook are considered part of the Puget Sound ESU that was listed as a federally threatened species on March 24, 1999 (CFR Vol. 64, No. 56). The Skagit River supports what was historically the largest natural Chinook run in Puget Sound (City of Seattle 2001). The abundance of naturally spawning Chinook has declined only slightly in the Skagit Basin (Cramer et al. 1999). The current escapement goal for summer/fall Chinook is 14,900 spawners per year, while the goal for spring Chinook is 3,000 (timing designations have been dropped from the Skagit system, however, escapement goals are still based on seasonal stock designations). Skagit Chinook prefer to spawn in larger tributaries and spawn throughout the mainstem from the Gorge Dam (RM 105) down to Sedro Woolley (RM 23), in the mainstem Sauk and Suiattle rivers (WDFW and WWTIT 1994). Chinook also spawn in most of the larger tributary streams of the Skagit, Sauk, Cascade, Suiattle, and Whitechuck (C. Kraemer, WDFW, pers comm., 12/12/03). In recent years, it appears that there has been a shift of wild Skagit Chinook production increasingly into sections of the Skagit that are upstream of Rockport. Between 1974-1984 the percentage of the overall wild Chinook population that spawned upstream of Rockport was 62%; between 1985-1993 it was 73%; and between 1994-2001 it was 78% (Connor and Pflug 2003). The mainstem habitat is affected by flow fluctuations resulting from dam operations and glacial siltation.

Chinook within the lower Skagit begin to emerge as early as January and most fry have emerged from their redds by May (C. Kraemer, WDFW, pers comm., 12/12/03). Skagit Chinook generally migrate to saltwater during the summer and fall of their first year of life, although significant numbers overwinter in freshwater and emigrate during their second year as early as January through May. Chinook fry have been captured at Skagit smolt traps as early as mid-January and continue their migration through the summer with little movement after late August (C. Kraemer, WDFW, pers comm., 12/12/03). Beamer *et al*. (2001) described basic variations in Chinook salmon life history within the Skagit River. Emigrating Chinook salmon exhibit two generalized variations in timing, individual residency period, and habitat utilization. These variations are described as:

1. *Ocean Type* life history or 0+ age class are juvenile Chinook that emigrate within a few days to a few months after emerging as fry from their freshwater incubation areas. Residency of *Ocean Type* class within the Skagit River estuary and lower Skagit is between February and June.
2. *Stream Type* life history or 1+ age class may spend at least a full year rearing in freshwater prior to migrating to marine waters. Juvenile *Stream Type* class typically migrates directly to **neritic** marine waters without an extended residency time in the estuary or lower Skagit.

Chinook mature and return to the river predominately as three, four and five-year-olds, with the majority returning as four-year-olds (WDFW and WWTIT 1994). Although juvenile Chinook do not rear in the main stem Skagit River for an extended duration (Beamer et al. 2001), habitat preference studies for juvenile Chinook rearing within 27 reaches of the Skagit have shown that densities along modified banks were only 1/3 of those along natural banks and 1/6 of those in backwaters (Cramer et al. 1999). Loss of estuarine habitats, habitat degradation, competition with hatchery fish and harvest are key factors in the decline of Chinook on the Skagit River (NWIFC 2000).

The WDFW formerly identified six stocks of Chinook in the Skagit River system: three spring runs, two summer runs and a fall run. In the 2002 SaSI revision, run-timing designations were dropped from stock names because timings were inconsistently applied to Puget Sound stocks. Although these stocks are identified as unique based on spawning timings and geographical distributions, they share a similar genetic composition, although the frequency of **alleles** varies from stock to stock.

Hatchery Chinook

Based on the former designations, Skagit summer and fall stocks are not currently supplemented to a significant extent by hatchery production, and production programs for fisheries enhancement of these stocks has been discontinued (Puget Sound Indian Tribes and WDFW 2001). Skagit spring Chinook hatchery production include stocks originating in the upper Sauk, the Suiattle and upper Cascade rivers. Annual releases averaged 112,000 yearlings for the period of 1982-1991 (WDF et al. 1993), and since then about 250,000 **subyearlings** have also been released annually (Puget Sound Indian Tribes and WDFW 2001).

Chum

The Skagit River supports the largest run of wild chum salmon in the continental U.S. with average annual escapement of 69,000 spawners (City of Seattle 2001). Current escapement goals for this stock are 40,000 for odd years and 116,500 for even years. The latest escapement data for Skagit River chum is 225,326 (2003), which represents the largest run in recent decades (P. Castle, WDFW, pers comm., 5/28/03). Chum salmon are found throughout the Skagit River basin except for smaller tributaries and the upper reaches of the watershed. Chum spawn in the Skagit River and tributaries between RM 34 and RM 92 from mid-November through December. Preferred spawning habitats are larger tributaries, side channels, and mainstem areas with reduced flow velocities. Fry emerge in March and April, at which time they immediately begin to migrate to salt water. Most fry begin feeding in the estuary, although some freshwater rearing may occur. Fry abundance in inshore marine waters reaches a peak in May and declines through June as fry move offshore into open ocean areas. Adults generally return as three, four or five-year-olds, with four-year-olds predominant in most years (WDF et al. 1993). Chum salmon enter the Skagit from September to January, but the peak entry time is during October and early November, depending on the location and stock involved.

Currently, three stocks of fall chum occur within the Skagit River system including the Mainstem Skagit fall chum, the Sauk fall chum and the Lower Skagit Tributary fall chum.

Coho

The Skagit River contains the second largest wild run of coho in the Puget Sound watershed. Skagit River coho are part of the Puget Sound ESU, which was formerly designated as a candidate for listing by the federal government (CFR Vol. 60, No. 142, p. 38011). In April 2004, NOAA Fisheries revised this status and now considers this ESU to be a Species of Concern (69 FR 19976, April 15, 2004). Coho salmon spawn in tributaries throughout the Skagit River from just upstream of the river mouth to the headwaters. They are also known to spawn in lower densities in some of the side channels and sloughs along the mainstem Skagit. They appear to prefer to spawn in smaller tributaries that have cover, including Grandy Creek. Following emergence, fry redistribute to rearing habitats throughout the system and may rear dozens of miles from where they were spawned. They rear for approximately one year in the river and may redistribute farther during this time into off-channel habitats. Different rearing habitats are used in the summer and winter with instream movements between the two (C. Kraemer, WDFW, pers comm., 12/12/03). Preferred rearing habitats are slower-moving sections of streams, as well as ponds, lakes, side channels, sloughs, and swamps. Juveniles have also been observed to rear in riverine tidal habitats in the estuary.

Skagit River coho smolt and emigrate in the spring of their second year. Emigration appears to begin in March or April, with a peak in May to early June, and it ends by July. Most coho spend 1 ½ years in the ocean before returning to spawn in the fall of their third year. Adults enter the river from July through January, with a bulk of the run entering during September and October. Peak entry timing occurs from mid-September to late October. Spawning occurs from late October to early March, with coho in the lower tributaries spawning earliest. Redd counts from 1967 – 2002 vary greatly from a low of 14,000 in 1971/72 to a high of 112,000 in 1986. The current escapement goal for Skagit River coho is 60,000. In 2002, 41,548 fish were located (P. Castle, WDFW, pers comm./unpublished data, 5/28/03).

The Skagit River coho are broken down into two stocks, the mainstem Skagit stock and the Baker River stock. The stock origin, river entry timing, and spatial use differentiate these stocks. Based on short-term declines in the Skagit River stock, WDFW originally classified them as Depressed in 1992, but increases in run sizes have upgraded the rating to Healthy in 2002 (WDF et al. 1993; WDFW 2003a).

Uncertainties in the distinctness of the Baker River coho and a lack of data originally lead to an Unknown status for the stock, although the stock is currently considered Healthy (WDFW 2003a). Factors thought to limit these stocks include low summer flows, poor-ocean upwelling resulting in a reduction of available forage material, increased oceanic prey interactions (marine mammals and mackerel) and potential hatchery versus wild interactions with Fraser River sockeye.

Sockeye

The only known sustained population of sockeye salmon in the Skagit River drainage is found in the Baker River system upstream of upper Baker Dam. Spawning is now confined to artificial spawning beaches. Smolts must be barged downstream of the upper and lower dams or must pass through a passage chute at the dams to migrate to the ocean. Most sockeye return as four-year-olds, although three and five-year-olds also occur. Baker River sockeye enter a trap below the lower dam from mid-June through mid-August, peaking in mid-July. Spawning occurs from late September through December, peaking from late October to late November.

Based on the long-term negative trend in adult count traps at the Lower Baker Dam, this stock was classified as Critical in 1994 (WDFW and WWTIT 1994). However, the Baker sockeye salmon stock has shown a remarkable recovery since the early 1990s and now is rated as Healthy with fish numbers exceeding 4,000 trapped and transported at the Baker Trap for the past two seasons (WDFW 2003a; P. Castle, WDFW, pers comm., 5/28/03; C. Kraemer, WDFW, pers comm., 12/12/03). A continuing concern for this stock is the fact that most spawning takes place in an artificial spawning facility in Baker Lake.

Pink Salmon

One stock of pink salmon, the Skagit River pink stock, occurs in the Skagit River. The Skagit River stock represents the largest run of pink salmon in the continental U.S. with average annual escapement of 400,000 spawners (City of Seattle 2001). Mainstem spawning occurs from Newhalem (RM 93) downstream at least to Sedro Woolley (RM 23). Spawners also use the Sauk River as far as the forks and penetrate the Sauk for at least two miles. The heaviest spawning is in mainstem areas, from Marblemount (RM 78) to Newhalem, as tributary spawning depends on flow levels, with higher flows attracting more fish.

Pink salmon enter the Skagit as early as late July, although peak entrance is in late August and continues into early October. Mainstem spawning generally occurs in odd-numbered years and begins in early September and continues to late October, usually peaking in early October. Headwater spawning begins in late August. Fry emerge in February and March and immediately begin migrating downstream. Presence in inshore waters peaks in April and May, after which fry begin to move offshore and toward open ocean waters.

The Skagit pink stock is the largest in the state of Washington with a total escapement goal of 330,000 and total run size estimates from the 1960s to early 2000s ranging from 197,000 to 1,364,000 (WDFW and WWTIT 1994; WDFW 2003a). Due to substantial escapement levels, Skagit pinks were classified as Healthy in 1994 and remain so currently (WDFW and WWTIT 1994; WDFW 2003a).

Native Char: Bull Trout and Dolly Varden

The Skagit River supports the largest population of native char in the Puget Sound and likely contains the largest population of bull trout in the state (City of Seattle 2001). Until 1978, bull trout and Dolly Varden were considered the same species. In general, Dolly Varden are found in coastal areas and bull trout are found mostly in interior areas. However, while it was commonly thought that the Dolly Varden were primarily anadromous and bull trout were fluvial and adfluvial, that is not the case in the north Puget Sound. In sampling done in Skagit Bay, the char have been identified as both Dolly Varden and bull trout (WDFW et al. 1997). The geographic range of bull trout and Dolly Varden overlap in Puget Sound area of Washington and along the southern British Columbia coast (Cavender 1978; Haas 1988). Due to significant amounts of hybridization, overlaps in geographic habitat utilization and spawn timing, bull trout and Dolly Varden are considered one population within the Skagit River system (WDFW et al. 1997). For the purposes of this document, no effort will be made to distinguish between the two species.

Life histories for bull trout/Dolly Varden in the Skagit River basin are complex. Spawning occurs in the upriver areas as water temperatures decrease to about 8°C. In many cases, fluvial, anadromous and resident adults spawn in the same areas. After spawning, while resident adults remain in the area, fluvial adults move throughout the upper river area and remain in pools throughout the winter, spring and early summer. Anadromous adults, after spawning, begin the downriver migration from late fall through the winter and enter the estuary area in the spring. They remain in the estuary until early to mid-summer to again begin the upriver spawning run. Anadromous char migrate as smolts in the spring, return to the lower river in the fall, overwinter in the lower river, then move to the estuary and Puget Sound in late winter and early spring (WDFW 1998). Based on anecdotal accounts, field surveys and tagging surveys, WDFW (1998) has identified three stocks of bull trout/Dolly Varden within the Skagit River system: Baker Lake, upper Skagit River (above Gorge Dam), and lower Skagit River and tributaries.

Within the Skagit River basin, bull trout numbers have increased dramatically over the last 15 years, with more and older adult spawners present in the system (C. Kraemer, WDFW, pers comm., 12/12/03).

Cutthroat Trout

Skagit coastal cutthroat trout have been identified as a unique stock of cutthroat based on the geographic distribution of their spawning grounds. Coastal cutthroat are considered a federal species of concern (SOC). All life-history forms of cutthroat are found within the Skagit River system. The anadromous form is most commonly found in the mainstem and some tributary waters where passage to salt water is accessible. The adfluvial form is found in waters of Baker Lake and Lake Shannon, as well as Ross Lake and its tributaries. Run-timing of the anadromous form is from July through November, with spawning from January through May (C. Kraemer, WDFW, pers comm., 12/12/03). The status of Skagit coastal cutthroat trout is Unknown (Blakley et al. 2000).

Lampreys

The Pacific lamprey and the river lamprey are both considered federal SOC and the river lamprey is a state candidate for listing. Although information regarding the presence of lampreys in the Skagit River system is limited, recent field studies have identified river lampreys in Skagit Bay. USGS biologists, working in conjunction with NOAA Fisheries, located 36 river lampreys that were collected in Skagit Bay (Meeuwig et al. 2003).

Threatened, Endangered, Rare Species

As previously discussed, there are two federally threatened species known to occur in the Skagit River system: the Puget Sound ESU of Chinook salmon and the Coastal-Puget Sound Distinct Population Segment (DPS) of bull trout. Both species stocks are also candidates for listing in the state of Washington. The current listing status of these stocks is described below.

<u>Chinook.</u> As previously stated, Skagit River Chinook are considered part of the Puget Sound ESU that was listed as a federally threatened species on March 24, 1999 (CFR Vol. 64, No. 56). The ESU is a state candidate for listing. The ESU includes all naturally spawned populations of Chinook salmon from rivers

and streams flowing into Puget Sound including the Straits of Juan de Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington. Critical habitat for this ESU, designated in 2000, was withdrawn in 2002. WDFW and WWTIT (1994) classified 11 out of 29 stocks of this ESU as being sustained, in part, through artificial propagation. Marblemount Hatchery currently produces both spring and summer Chinook to aid in the restoration of Skagit River Chinook (NMFS 1999b).

Bull Trout. Skagit River bull trout are part of the Coastal-Puget Sound DPS that was listed as federally threatened in 1999 (Federal Register 64:58910). This DPS is threatened by habitat degradation, dams and diversions, and predation by non-native fish. Although critical habitat has been proposed for several bull trout populations in the Northwest (USFWS 2002), there is currently none proposed for the Coastal-Puget Sound DPS.

3.1.7.1 GRANDY CREEK ALTERNATIVE

EXISTING CONDITIONS

The Grandy Creek site is located at approximately RM 45.6 of the Skagit River (Williams et al. 1975). Grandy Creek is approximately 7.6 miles in length and originates from springs about one mile above the inlet to Grandy Lake (Williams et al. 1975). It flows through a moderately wide valley below Grandy Lake and generally contains a moderate gradient except near RM 3 where the stream drops sharply. The stream valley has a moderate to steep slope bordered by trees. Low-density agricultural lands exist below RM 1 and forestry lands above. The Grandy Creek tributaries are all precipitous-type streams flowing over rather steep terrain that has been mostly clear-cut.

In the vicinity of the Grandy Creek alternative site, the creek contains relatively few fines and small (1-3”), medium (3-5”) and large (5-8”) sized cobbles that are suitable for spawning salmonids. Water depth varies greatly with an average depth of about one foot. During a WDFW habitat survey, the maximum depth was approximately three feet (WDFW 2004). However, low flows conditions are common within the creek during the fall and likely limit use by most fall spawning salmonids. Moderate-velocity riffles and glides occur near the proposed intake location. Gravel bars occur in the lower 0.5 RM and large woody debris (LWD) is common due to lateral creek movement and resulting erosion/sloughing of the streambank. Heavy riparian vegetation occurs along both banks of the creek, providing ample shading habitat. The DOE placed Grandy Creek on the 303d list (under the Clean Water Act) for elevated temperatures and listed the creek as “restricted with low flows” (WDOE 2003).

Fish Species in Grandy Creek

Wild Fish
Grandy Creek was surveyed by electroshocking annually in the late 1970s as part of a Skagit River steelhead study (Philips et al. 1981; WDFW et al. 1997). During that period, only steelhead and coho were collected. During spawner surveys, steelhead, coho and cutthroat spawners have been observed in Grandy Creek (WDFW 1997 et al.; C. Kraemer, WDFW, pers comm., 5/13/03). Species that are known to spawn in Grandy Creek are discussed separately, below.

Steelhead. In 1977-78, juvenile steelhead numbers were estimated at 2.04/meter in a section of Grandy Creek 0.4 miles upstream of the Skagit River confluence. In 1979 and 1980, steelhead juveniles (age 0+) were estimated at 4.99/meter and 3.04/meter, respectively (Phillips et al. 1981). Besides this information, there is no historic wild steelhead ground survey data for Grandy Creek. However, according to Pete Castle (pers comm., 5/28/03), former WDFW Skagit River Salmon and Steelhead

Biologist, a small number of wild steelhead have been observed spawning all the way up to Grandy Lake. Although steelhead have been observed spawning in the Grandy Creek system, the majority simply dip into the tributary for short periods on their continued upstream migration. Most lower Skagit wild steelhead spawn upstream within the mainstem, between Grandy Creek and Newhalem (C. Kraemer, WDFW, pers comm., 5/13/03; P. Castle, WDFW, pers comm., 5/28/03).

Coho. In the 1970s, spawning coho were observed from the mouth of Grandy Creek all the way up to Grandy Lake, with a few spawners in feeder tributaries; however, the number of coho spawners in the creek has greatly decreased in recent seasons. In 1977-78, juvenile coho numbers were estimated at 0.54/meter (Phillips et al. 1980). In the 1980s, the Skagit System Cooperative performed coho surveys in Grandy Creek and introduced coho into Grandy Lake as part of a Skagit coho mark and recapture study. Current use of the Grandy Creek system by coho is minor due to limited suitable spawning and rearing habitat (P. Castle, WDFW, pers comm., 5/28/03; WDFW 2004), although as cited in WDFW (2004), coho spawners are believed to be common (there are some every year), but not abundant (low density compared to other streams in the area) in Grandy Creek. The lack of coho may be attributed to frequent flash flows that have contributed to scouring of the streambed, resulting in a larger bedload of gravel moving down the creek. This gravel has covered channel features desired by coho, likely contributing to a reduction in populations of this salmonid species in Grandy Creek.

Coastal Cutthroat. According to the streamnet database, coastal cutthroat spawners have been observed upstream from coho and steelhead spawning areas in Grandy Creek (WDFW 2003a, b). They likely spawn all the way up to Grandy Lake, although beaver dams near RM 5.4 may limit their use above that mile marker (Williams et al. 1975; P. Castle, WDFW, pers comm., 5/28/03). According to C. Kraemer, WDFW, adfluvial and resident lifeforms occur in Grandy Lake and in the creek above the lake (pers comm., 12/12/03).

Chinook. According to the “Catalog of Washington Streams and Salmon Utilization” (Williams et al. 1975) and Puget Sound Chinook Harvest Management Plan (Puget Sound Indian Tribes and WDFW 2001) Chinook are known to spawn in Grandy Creek, although the frequency of spawning is unknown. Due to the existing plane bed channel type, as opposed to pool riffle or forced pool riffle, it is not expected that Chinook spawners are abundant in Grandy Creek (WDFW 2004). However, limited utilization may occur in the lower 2 RM of the creek due to the presence of suitable spawning gravels. A low number of incidental spawners have been observed in the creek and 2-3 redds have been seen between the mouth and the Cape Horn Bridge overpass in past seasons (~RM 0.3) (P. Castle, WDFW, pers comm., 5/28/03). In years with higher than average fall flows, adult mainstem Chinook may indeed spawn in the system. Generally, juvenile Chinook use the first 0.5 miles of any given tributary during rearing; therefore they may rear in lower Grandy Creek (C. Kraemer, WDFW, pers comm., 5/13/03).

Char. During various surveys, including extensive electroshocking surveys of Grandy Creek during the 1970s and 1980s, bull trout/Dolly Varden were neither captured nor observed in Grandy Creek (WDFW et al. 1997). Additionally, there are no historical records of bull trout occurrence within Grandy Creek. However, foraging bull trout have been observed in several of the Skagit tributaries of similar elevations and it is expected that, at least occasionally, juvenile bull trout, and possibly even adults, may wander into the creek to forage (C. Kraemer, WDFW, pers comm., 12/12/03). Specifically, juvenile char in the 150-200 mm size range may enter Grandy Creek during the summer/early fall in search of food or for rearing (C. Kraemer, WDFW, pers comm., 5/13/03; P. Castle, WDFW, pers comm., 5/28/03). The majority of bull trout spawning and juvenile rearing in the Skagit basin occurs in clear water tributaries. Because of the low elevation of Grandy Creek, it is likely too warm to support spawning bull trout (C. Kraemer, WDFW, pers comm., 12/12/03).

Pinks and Chum. Although reported to utilize Grandy Creek at times (WDFW 2003b), there have been very few observations of chum or pink salmon in the Grandy Creek system (P. Castle, WDFW, pers comm., 5/28/03). Some individuals could occasionally enter the area, although the flow in Grandy Creek is generally too low for high utilization by these species.

Hatchery Fish

WDFW annually stocks between 30,000 and 110,000 hatchery winter steelhead smolts (reared at Marblemount Hatchery or Barnaby Slough) into various portions of Grandy Creek (C. Mains, WDFW, unpublished data, pers comm., 6/9/03), usually at the Highway 20 overpass (S. Stout, WDFW, pers comm., 5/8/03). Smolt releases into the Grandy Creek system from 1996 to the present are shown in Table 3-16.

Table 3-16. WDFW hatchery releases into the Grandy Creek system.

Year	Class	Hatchery Facility Origin	Release Site	Number of Smolts Released
1996	Smolt	Barnaby Slough Facility	Grandy Creek	58,884
1997	Smolt	Barnaby Slough Facility	Grandy Creek	64,575
1997	Smolt	Marblemount Hatchery	Grandy Creek	45,017
1999	Smolt	Barnaby Slough Facility	Grandy Creek	10,846
1999	Smolt	Marblemount Hatchery	Grandy Creek	20,247
2000	Smolt	Barnaby Slough Facility	Grandy Lake	13,364
2000	Smolt	Marblemount Hatchery	Grandy Creek	27,450
2001	Smolt	Marblemount Hatchery	Grandy Creek	31,400
2002	Smolt	Barnaby Slough Facility	Grandy Creek	52,499

Source: WDFW Plants report database as of 6/9/03 – preliminary and unverified (C. Mains, pers comm., 6/10/03)

Threatened, Endangered, Rare Species

As previously discussed, there are two federally threatened species known to occur in the Skagit River system: the Puget Sound ESU of Chinook salmon and the Coastal-Puget Sound DPS of bull trout. Although their use of Grandy Creek is infrequent, individuals may occasionally enter the creek during foraging or resting periods.

IMPACTS

To assist in the presentation of impacts to fish species due to the construction and operation of a facility at Grandy Creek, Table 3-17 illustrates species presence and timing information for salmonids that are found within the Skagit River and that may be impacted by released steelhead smolts. Species that have been known to spawn with frequency within Grandy Creek are cutthroat, steelhead and coho. Chinook may also utilize the lower portions of Grandy Creek for spawning, but with low frequency. Juvenile Chinook and bull trout may occasionally use the creek for rearing and foraging activities. Timing for fish species within Grandy Creek is similar to that for mainstem Skagit stocks.

Table 3-17. Timing of various life-stages of Skagit River salmonids and proposed construction windows.

Species / Event	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Construction												
Instream work						■	■	■				
Upland construction	■	■	■	■	■	■	■	■	■	■	■	■
Facility Operation												
Adult trapping[1]	■	■	■									■
Transfer of juveniles to Grandy Creek for acclimation[2]										■	■	■
Acclimation	■	■	■	■	■					■	■	■
Volitional smolt release					■							
Hatchery Winter Steelhead												
Adult immigration/spawning	■	■									■	■
Smolt emigration					■	■						
Skagit Mainstem/Tributaries Wild Winter Steelhead												
Adult immigration and holding	■	■	■	■	■						■	■
Adult spawning			■	■	■	■	■					
Fry emergence							■	■	■	■		
Rearing	■	■	■	■	■	■	■	■	■	■	■	■
Emigration				■	■	■						
<u>Skagit River Chinook</u>												
Lower Skagit Chinook												
Adult immigration, holding and spawning								■	■	■	■	
Emergence[3]	■	■	■	■	■							
Rearing	■	■	■	■	■	■	■	■	■	■	■	■
Juvenile emigration	■	■	■	■	■	■	■	■	■			
Chinook Stocks Upstream of Grandy/Skagit Confluence (Spawn upstream)[4]												
Adult immigration, holding and spawning			■	■	■	■	■	■	■	■		
Juvenile emergence/emigration	■	■	■	■	■	■	■	■	■			
Bull trout – Lower Skagit												
Adult immigration, holding and spawning					■	■	■	■	■			
Downstream kelts	■	■	■	■						■	■	■
Rearing	■	■	■	■	■	■	■	■	■	■	■	■
Juvenile emigration				■	■							

Species / Event	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Skagit Chum												
Adult immigration and holding												
Adult spawning												
Emergence/immediate emigration												
Juvenile estuary holding												
Skagit Coho												
Adult immigration and holding												
Adult spawning												
Emergence												
Juvenile rearing (subadults)												
Juvenile emigration												
Baker Sockeye												
Adult immigration and holding												
Adult spawning												
Juvenile emigration[5]												
Skagit Pink												
Adult immigration and holding												
Adult spawning												
Emergence/immediate emigration												
Juvenile estuary holding												
Cutthroat Trout												
Adult immigration and holding												
Adult spawning												
Juvenile emergence/emigration												

Source: WDFW and WWTIT 1994; C. Kraemer, WDFW, pers comm., 12/12/03

1 Although hatchery steelhead are usually captured and spawned by mid to late February, trapping would continue to mid March to assure all have been captured; if, after a few seasons of successful trapping, hatchery fish are not trapped during the first week of March, trapping operations could cease earlier.

[2] Transfer of juveniles from Marblemount/Barnaby to Grandy Creek may occur over a 2 month period from October through December

[3] Emergence is triggered by an increase in flow (P. Castle, WDFW, pers comm., 5/28/03)

[4]Some rearing in mainstem Skagit occurs below Grandy Creek

[5] Juveniles are collected barged down from Baker Lake March – July (G. Sprague, WDFW, pers comm., 5/1/03)

Construction

Upland Site Disturbance

Disturbance to upland areas would occur due to the construction of upland facility components. In addition to facility construction, disturbance to uplands would occur due to the proposed demolition of the relic concrete infrastructure of the Birdsview Hatchery.

Construction of a facility at Grandy Creek would have physical impacts that relate to site disturbances on previously undeveloped land. Portions of the facility would be constructed in areas that were previously altered by the Birdsview Hatchery. Construction activities would disturb the ground and add less than two acres of impervious surfaces to the site (acreage due to acclimation and holding ponds is considered pervious), which may lead to increased or rerouted runoff and sediment carried into the river. Increased runoff is expected to be short-lived and is not anticipated to exceed the creek's ability to carry sediment downstream or to change the creek's substrate. The anticipated amount of sedimentation would not alter the channel configuration or exceed the creek's ability to carry sediment. A creek's ability to carry sediment depends on two things: competence and capacity. Competence is the ability of a stream to move large particles and depends on velocity. Capacity is how much load a stream can carry and depends on discharge of stream. Grandy Creek is capable of carrying the estimated sedimentation from construction activities downstream through flow predicted during the proposed construction windows (this prediction is based on available flow data). If sedimentation exceeds the stream's ability to carry and disperse it downstream, it would settle out and may cause increased impacts until the next high flow event.

Most upland construction activity would occur away from the river channel and would be managed by the use of erosion control devices, removal of the least amount of vegetation possible, and revegetation of the site immediately following construction. Additional mitigation would include the removal of invasive species throughout the site, particularly the riparian zones of both Grandy Creek and the Skagit River. Once removed, these areas would be controlled for invasive species and revegetated with native plants. More information regarding vegetation removal can be found in Section 3.1.5. BMPs to reduce sedimentation from construction activities are incorporated into the proposed action. However, construction activities may still result in a temporary increase in sediment and runoff to Grandy Creek. According to Waters (1995), most such construction projects, done essentially at a point on a stream, would have temporary effects. If subsequent flows within these river systems are high enough to scour away light deposits, as is the case in Grandy Creek, fish will generally repopulate quickly (Waters 1995).

Site disturbances, including noise and increased human activity, may cause fish to temporarily disperse from the area during construction. Background activities may be detrimental to fish species in that they may spend more energy hiding if they are disturbed by noise or traffic. These affects are anticipated to be minimal and short-lived.

Channel Alterations due to Installation of Instream Structures

As discussed in Chapter 2, the following facility components would require construction within Grandy Creek or along its banks: intake and surface water conveyance line; fish return pipeline and pool; and the fish ladder/weir structure.

Construction and installation of in-water structures would take place over one approved (USCOE, WDFW, and USFWS) instream work window from June15 through August 31. Work during this window is proposed to minimize impacts to aquatic species, primarily listed salmonids. The proposed intake location would provide the sweeping velocity required by NOAA Fisheries and WDFW, and would serve to reduce clogging by debris and aquatic vegetation. The fish screen would be designed to meet current juvenile screening criteria of NOAA Fisheries (NMFS 1996) and would comply with Washington State Laws (RCW 77.16.220; RCW 77.55.040 (formerly RCW 75.20.040and RCW

77.55.070 formerly RCW 75.20.061) that require that all diversions from waters of the state be screened to protect fish (WDFW Fish Passage Technical Assistance website). The intake would be plated off when not in use.

Sedimentation

Instream construction activities, including intake/fish ladder installation, installation of buried pipelines (acclimation pond discharge drainline, volitional release lines, and adult fish return line), and associated cofferdamming activities may cause increases in turbidity and suspended sediments in Grandy Creek. Servizi and Martens (1992) have shown that turbidity usually does not cause direct mortality to fish unless extremely high levels occur. Suspended sediment is described as various sizes of soil particles carried in suspension in the water column. Although usually not lethal, increases in suspended sediment in surface waters may alter fish behavior. The extent to which suspended sediments may affect resident and migratory fish that may be present in affected streams depends on many factors including background turbidity, amount of increase in turbidity, and duration of increased turbidity (NMFS 2001).

Studies have shown that juvenile salmon avoid water when the turbidity levels are high (Servizi and Martens 1992; and Bisson and Bilby 1982; and Waters 1995). Migrating fish would avoid areas of high-suspended sediments, resulting in a disruption of their migration and a subsequent reduction of reproductive success (Waters 1995). Measures to minimize suspended sediments that may result due to construction activities include cofferdamming and removal of sediments from the cofferdam following construction. These measures are incorporated into the proposed action.

A second impact from erosion and sedimentation may occur when suspended sediments are deposited along the streambeds, impacting fish both directly and indirectly. Excessive sedimentation during periods when eggs are incubating in stream gravels can fill the space between the gravels and restrict the flow of oxygenated water to the developing eggs. Sediment can similarly reduce the production of macroinvertebrates, which are important prey items for many fish species. Suspended sediments may reduce primary productivity of aquatic macrophytes, and modify behavior of invertebrates, resulting in impacts on fish through the alteration and reduction of food sources (Waters 1995). Increased sedimentation can also degrade habitats used by fish. Sedimentation can reduce the quantity and quality of spawning habitat and can reduce the quality of pool and riffle habitats and lead to an overall decrease in habitat complexity. However, Waters (1995) states that impacts due to sedimentation caused by a point-source construction activity, such as the installation of a low-volume intake and ladder/weir structure, are short-term and aquatic organisms would likely recolonize the area quickly following activities.

Accidental Discharge of Pollutants

Use of construction equipment may result in the incidental, incremental, or accidental discharge of pollutants, such as fuel, oil, grease, and hydraulic fluid, and the unavoidable release of combustible exhaust. These pollutants may be discharged into adjacent aquatic habitats during regular construction operations or in the event of machinery failure. Implementation of BMPs would prevent or reduce the probability of accidental spills. The effects of the discharge depend on the volume, type of substance released, and the cleanup response. Employment of spill kit cleanup (to be available on site) immediately after an accidental spill would reduce the effect of the spill on the surrounding environment. Heavy substances (like grease) are likely to persist in aquatic systems unless they are removed. These substances have a high potential for toxicity to resident fish and aquatic organisms. Lighter petroleum products are toxic when their concentrations reach certain thresholds.

Large quantities of sediment or spills of pollutants are not expected during construction; therefore, impacts to Grandy Creek are expected to be negligible. Additionally, construction equipment instream or adjacent to the river would use hydraulic synthetic oil as recommended by NOAA Fisheries. Relocation of existing wells near the Skagit River would involve work within the required 200-feet critical areas setback of the river, however, silt fencing would be used during construction activities and impacts to the aquatic system are not anticipated. Potential sedimentation caused by instream activities would be limited, as previously discussed, as BMPs to prevent sedimentation are included in the proposed action.

Dewatering

Installation of the intake would require construction of a cofferdam and the use of a dewatering system. Grandy Creek water would be diverted to the opposite side of the creek during the instream construction. Therefore instream passage would still be available. Cofferdamming would eliminate instream habitat within the dewatered area for the entire duration of construction activities; however, the cofferdam would be placed in such a manner as to assure that no isolated pools are created once it is removed. About 50-70 feet of the creek bank would be removed for the placement of the intake, screens, fish ladder and surface water pipeline. Upon completion of the intake and ladder, the cofferdam would be removed. Due to instream construction timing (June 15 – August 31), dewatering is not anticipated to affect potential salmonid redds in Grandy Creek. However, if wild steelhead do utilize Grandy Creek for spawning in April and May, incubating eggs would be present in the gravel through early summer. Therefore, WDFW would perform spawner surveys in the spring preceding construction activities in the immediate vicinity of proposed instream construction to ensure that no redds and eggs are impacted (H. Beecher, pers comm., 12/12/03).

Riparian Vegetation Removal

The removal of vegetation in riparian areas adjacent to fish-bearing streams could result in potential adverse impacts to fish. Riparian vegetation provides overhanging cover for fish, water quality improvement, large woody debris, shade and water temperature regulation, and sources of nutrients such as terrestrial invertebrates or litter material (HSRG 2000). In addition, riparian soils hold water and contribute gravel for spawning and rearing habitat. These functions may be lost or reduced due to the elimination or reduction of riparian vegetation.

A total of approximately 3,500 square feet of primarily invasive riparian vegetation would be removed from the banks of Grandy Creek. Removal of approximately 1,800 square feet of riparian vegetation would occur in association with intake/fish ladder installation. Proposed weir abutments would impact 800 square feet of riparian vegetation on the east and west bank of Grandy Creek. Approximately 700 square feet of riparian vegetation would be removed in association with the upstream adult return pipe. Riprap would be placed stream-side of existing vegetation so as not to unnecessarily impact riparian vegetation or shading. In addition, as part of project mitigation, invasive riparian vegetation would be removed and replanted with native species.

Due to the limited amount of riparian removal, and the presence of ample shading habitat in the immediate vicinity of instream work areas, the effects on salmonids and other fish species that utilize the existing habitat would be minimal. Revegetation of disturbed areas with native species would improve the riparian habitat condition and associated instream shading habitat for aquatic species.

Flow Alterations

Alteration of the creek's hydrology due to placement of instream structures may occur, but would affect minimal amounts of habitat and is not anticipated to affect flow within the creek. Rerouted water flow during construction is not anticipated to affect ambient water temperatures. Long-term impacts may include behavioral modifications and changes in the distribution of individual fish due to changes in upstream and downstream hydrology, although this is not anticipated to occur to a significant degree.

Approximately 47 cy of riprap would be placed around the intake structure to provide flood protection and to stabilize the structure. This riprap may alter the hydrology of the creek in the area and cause localized modifications to habitat use. The USFWS determined that if a loss of juvenile rearing habitat is the only direct result of riprap placement and there is surplus rearing habitat available, then riprap placement would not affect the production of salmonids within a system (USFWS 1988). More details regarding flow alterations are discussed in Section 3.1.4 and in the **Facility Operation and Management** impacts section that follows.

<u>Loss of Habitat Opportunity</u>
Placement of structures within the channel may result in a loss of aquatic habitat opportunity as the channel would be fixed and not able to migrate laterally through the floodplain. However, at the proposed weir location the channel is already constrained by remnant County bridge abutments, and by the existing riprapped bank at the proposed intake location. The right bank across from the intake location is also constrained by an existing old road. Therefore, the stream at these locations is not subject to lateral migration and has stayed in one place for decades. Areas upstream of the County bridge abutments and near the mouth of the creek are subjected to lateral movement as evidenced by braiding.

The pile barb well protection system would prevent, to some extent, erosion and lateral migration along the banks of the Skagit River. However, barbs may also act to trap large woody debris and create scour pools, which may be considered a gain in aquatic habitat opportunity.

<u>Impacts to Fish Species Present in Grandy Creek</u>
During instream construction, fish that occur within the immediate area, including juvenile salmonids, may be displaced, and some mortality may occur; however, mortalities are unlikely. The placement of riprap within Grandy Creek would remove approximately 640 square feet of potential salmonid habitat. However, the amount of proposed riprap is not likely to impact rearing habitat for juvenile salmonids on a watershed scale as there is ample suitable habitat upstream or downstream from the proposed disturbance area. Species that may potentially be present during instream construction include juvenile coho, steelhead and cutthroat trout.

<u>Impacts to Listed Species</u>
Because bull trout/Dolly Varden have never been observed utilizing Grandy Creek for spawning, and rarely, if ever, for juvenile rearing or adult feeding (WDFW et al. 1997), there should be no impact to native char during instream construction operations. Adult Chinook rarely utilize Grandy Creek and therefore would not likely be impacted by instream construction. If adult Chinook do utilize Grandy Creek, construction during the instream work window would largely avoid impact to the species. If rearing juvenile Chinook are present within Grandy Creek during construction, they may be temporarily displaced. They would likely move from the area of construction and avoid the general area until construction is complete.

Facility Operation and Management
The Grandy Creek facility would be in operation from October 1 through June 1st as shown in Table 3-17.

<u>Broodstock Collection, Maintenance, and Transport</u>
As previously discussed, trapping data from Marblemount Hatchery and Barnaby Slough indicates that hatchery steelhead are typically trapped and spawned by mid February. However, in an effort to ensure that all hatchery fish are collected, broodstock would be collected from December 1 through March 15. Returning hatchery steelhead spawners would be collected at the facility. The weir's concrete sill (with the exception of the single removable panel to allow sediment passage) and air bladder would be permanent structures; the air bladder would lie flat upon the sill when trapping is not taking place. The removeable picket weir would be manually installed (bolted into place) via boom truck at the beginning of each trapping season and would be removed (unbolted) following collection activities to allow free flow over the concrete sill. The sill would be designed to maintain a maximum of a 0.8 foot drop when

the barrier is not in operation. This condition would occur during low flow conditions to maintain fish passage for resident fish species.

The trap would be connected to a ladder that would lead directly to the north adult holding pond. The two ponds would have the capacity to hold approximately 200 adult fish. One-hundred percent of the targeted hatchery steelhead that ascend the ladder would be collected at the facility. Migrating adult steelhead and resident trout collected in the north pond would be sorted, and hatchery steelhead intended for transport to the Marblemount Hatchery would be transferred to the south pond. Mechanical crowders would be used to assist in the collection of adults for transfer from the two ponds. Transfers would take place about two times per week. The approximate distance from Grandy Creek to the Marblemount Hatchery is 30 miles, which would require about an hour of hauling.

Wild steelhead, salmonids, and resident species that may enter the adult sorting pond would be held for less than 24 hours and returned to Grandy Creek through a 12-in. diameter PVC fish return pipe that discharges into a pool approximately 75 feet upstream from the intake structure. River rock would likely be used to scour and maintain this pool at a minimum depth of 18 inches.

Non-targeted fish migrants may be temporarily delayed during trapping operations; however, this delay would not be greater than 24 hours. Delayed species may include cutthroat, coho, wild steelhead and juvenile bull trout and Chinook. According to Steve Stout, Marblemount Hatchery manager, wild steelhead are rarely encountered at facility traps prior to the beginning of March (pers comm., 12/29/03). Adult Chinook and bull trout are not likely to be impacted by collection activities since the collection of steelhead broodstock would take place between December and mid-March, outside of the return time for Chinook and bull trout runs. Also, Grandy Creek is not known frequent spawning habitat for either species. The weir would be monitored by WDFW personnel for the presence of downstream migrants. If non-target species that enter the adult trap do not intend to ascend Grandy Creek for spawning or use (only dipping into the creek), downstream migration would be possible through periodic lowering of the weir panel sections. The weir's picket panels would be removed following collection (March 15). Once the weir panels are removed, the permanent concrete sill (equipped with a removable section) would no longer block fish migrations. If hatchery steelhead are not captured after the first week of March, trapping operations could potentially cease earlier than March 15. Such an adaptive management strategy would be determined on an annual basis by project managers.

Juvenile Rearing/Acclimation

Rearing conditions can strongly influence the physiological, morphological and behavioral characteristics of hatchery fish, which, in turn affect the magnitude and types of interactions between hatchery and wild fish. Pathogen free, silt free well water would be used for preliminary rearing in two large earthen ponds that would provide adequate space (densities) and flow. Grandy Creek surface water would be introduced during January or February to allow for adequate acclimation of juveniles. Predation netting would be used to protect rearing juveniles from avian predators.

Fish Health Management

Fish health monitoring protocols for the Marblemount Hatchery and Barnaby Slough follow the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW 2003c, d). The Grandy Creek facility would adhere to the requirements of the policy. The goals of the proposed program are similar to those at existing facilities and are intended to: 1) acclimate healthy and robust hatchery smolts whose survival would not be impaired by health constraints; and 2) conduct the fish health program such that it integrates concerns for both natural and hatchery populations to minimize infectious disease interactions between both populations.

Fish health monitoring objectives for the proposed Lower Skagit River Steelhead Acclimation and Rearing Facility may include the following practices:

- Monitoring adult mortalities.
- Conducting monthly monitoring of acclimating juveniles to assess presence of viral, bacterial, fungal and parasitic agents.
- Administration of vaccines when appropriate to protect fish health.
- Monitoring pre-release hatchery-reared smolts annually.
- Conducting examinations at all life stages when unusual loss or anomalies occur to determine cause of loss and recommend preventative and therapeutic treatment.

Good quality fish rearing practices, fish health monitoring, and treatment of disease outbreaks within the acclimation facility would help maintain acceptable fish health and reduce risk of pathogen amplification.

Methods and Magnitude of Release

The volitional release strategy would be used. Actively migrating smolts would be released directly from the acclimation/rearing ponds into Grandy Creek through a release pipe that discharges at the proposed adult collection ladder entrance (RM 0.2 of Grandy Creek). The volitional release strategy assumes that fish would exit the ponds over an extended period of time, from May 1st through June 1st, thus spreading their impact on natural biota over time. This release protocol is consistent with recent studies performed on hatchery steelhead in Washington and Oregon. These studies showed that steelhead released in May expressed a greater readiness to migrate as smolts compared to those released in April (Ashbrook and Fuss 1997; Flesher and Whitesel 1999). Additionally, according to the HSRG (2003), releasing smolts throughout the month of May may help to minimize possible interaction with listed juvenile Chinook salmon as this timing allows them to grow to a size that reduces the potential for predation.

Release of smolting fish at 5-7 fpp reduces in-river residency time, as these fish typically migrate immediately (Tipping 2001b). According to the HSRG (2004) "Rapidly migrating smolts will be less likely to residualize and imprint on inappropriate stream sites." All released fish would have been adipose-clipped as fingerlings at the Marblemount Hatchery. Table 3-18 presents the current smolt release program for Skagit River hatchery winter steelhead. The proposed release protocol for the program under the Grandy Creek alternative is also shown.

Table 3-18. Current and proposed Skagit River hatchery winter steelhead release protocol under the Grandy Creek alternative.[1]

Current Program			Proposed Program		
Release Site	**Release Date**	**# Smolts Released**[2]	**Release Site**	**Release Date**	**# Smolts Released**
Marblemount	May 1-May 15	136,000	Marblemount	May 1 - June 1[5]	100,000[3]
Barnaby Slough	May 1-May 15	136,000	Barnaby Slough	May 1 - June 1	100,000[3]
Baker River acclimation site	May 1-May 15	60,000	Grandy Creek	May 1 - June 1	334,000
Davis Slough acclimation site	May 1-May 15	30,000			
Faber's Ferry and Grandy Creek	May 1-May 15	172,000[4]			
Totals		**534,000**			**534,000**

[1] Sources: HSRG Recommendations 2003; S. Stout, WDFW, pers comm., 4/2/03.
[2] Number of smolts released varies annually. Numbers shown represent maximum releases under the current stocking guidelines.
[3] Number of smolts to be released from Marblemount and Barnaby is 200,000. The distribution of those releases from the two facilities would be determined on an annual basis. Acclimated releases from Baker River may continue under this alternative.
[4] Total number of smolts released into Grandy Creek and Faber's Ferry has been approximately 172,000; the distribution of those releases has varied annually.
[5] Smolts would be volitionally released from May 1 – June 1 (S. Stout, WDFW, pers com, 12/29/03).

As shown in Table 3-18, the current stocking goal is 534,000 steelhead smolts into the Skagit system. The Grandy Creek alternative would maintain the status quo. As presented previously in Table 3-16, Grandy Creek is annually stocked with between 30,000 to 110,000 hatchery steelhead juveniles throughout the length of the creek. In most years, smolts are released near the Highway 20 crossing, located approximately one mile upstream of the proposed release site at Grandy Creek. As shown in Table 3-18, the proposed program would increase the total number of smolts released into Grandy Creek to 334,000. Although this is an increase from historic releases into Grandy Creek, the release would be located only 0.2 miles from the mouth of the Skagit, smolts are likely to disperse quickly to the Skagit with little holding time in the creek. The impact on fish species that may inhabit the first 0.2 RM of Grandy Creek, particularly rearing and late-emigrating coho (if present), is expected to be low.

Benefits associated with the release of additional smolts into Grandy Creek include the reduction of smolt releases from areas upstream of Grandy Creek including Marblemount and Barnaby Slough and the probable elimination of releases at Faber's Ferry. Acclimated releases into the Baker River may continue under the Grandy Creek alternative. Reduced releases upstream of Grandy Creek may reduce the potential for intra/interspecific competition in that stretch of the Skagit River upstream of Grandy Creek. Additionally, because smolts would no longer be released upstream of RM 0.2 of the Grandy Creek system, impacts to resident fish or rearing juveniles in the upper reaches of the Grandy Creek system, potentially including coho and cutthroat, would no longer occur.

Water Gains and Losses

The Grandy Creek facility would operate from October through June 1st. As previously shown in Table 3-3, during operation, the facility would require a maximum of 10 cfs of surface water during the entire month of May. According to temporary flow gages that have been operated and monitored by WDFW, the average daily Grandy Creek flow during winter and spring months is 76 cfs, with flows exceeding 100 cfs from December through March (R. Berg, WDFW, pers comm., 1/14/03). During late spring, when the maximum flow is required, the flow may drop to 50-70 cfs (R. Berg, WDFW, pers comm., 6/18/03). However, acclimation pond water would be released through a drain pipe that would discharge at the base of the proposed fish ladder, which would be located immediately downstream (approximately 20-30 feet) of the intake structure. Therefore, withdrawn water would essentially be discharged to the same location from which it is withdrawn with withdrawal rates typically less than or equal to discharge rates, resulting in a negligible diversion reach.

As discussed in Section 3.1.3, groundwater withdrawals and discharges may cause minor fluctuations in water levels in Grandy Creek. However, the withdrawal rate for groundwater would be less than or equal the total discharge rate to Grandy Creek, and impacts to aquatic species would likely be negligible. Additionally, preliminary geotechnical investigations have determined that use of well water for facility operations would not adversely affect the Skagit River or adjacent wells within the area (SE/E 1990b).

Water Quality

As previously described, facility water would be discharged immediately downstream of the intake structure. Water discharged from the acclimation pond would be routed to and released from the proposed fish ladder without treatment other than solids settling within the acclimation pond.

During the final stages of acclimation, water level in the ponds would begin to be lowered. The damboards at the end of the ponds would be gradually removed so that the pond level does not drop drastically. Once the pond levels are down to approximately 70 to 50 percent of their original depth, the flow of water into the ponds would be reduced. This gradual drawdown would then continue until the water is about ¼ of the original depth. Once release and removal of fish has been completed, the water supply would be turned off and the pond would be allowed to dry up over the summer. This is the method used at WDFW's Tokul Creek Hatchery's rearing/acclimation pond and other ponds and is proven effective in capturing solids. These solids may or may not be removed from the pond each summer, depending on the level of accumulation. If solids are removed they would be disposed of at an approved facility.

Effluent discharge from the facility may disrupt the behavior and distribution of individual fish immediately adjacent to and downstream of the site. Through the EPA's NPDES permit process, each state sets limits to specific discharged parameters to ensure that receiving waters are not overloaded with potentially detrimental amounts of substances that may adversely affect the environment, including plants, animals and water chemistry. Estimated effluent production at the Grandy Creek facility for parameters including TSS, phosphorous, and ammonia were previously discussed in Section 3.1.3.1. Effluent discharges would be within the limitations of the general NPDES permit for aquaculture facilities that produce greater than 20,000 pounds in the state of Washington, and as such are not anticipated to adversely affect the aquatic environment. Additionally, according to NMFS (1999), although "the level of impact [of aquaculture effluent] or the exact effect on fish survival is unknown, it is assumed to be very small and is probably localized at outfall areas as effluent is rapidly diluted in the receiving streams and rivers." Therefore, the overall impact of effluent on water quality is not anticipated to affect the aquatic environment or aquatic species on a watershed scale.

Chemicals used to prevent or treat fish diseases would be handled, applied, and disposed of in accordance with state and federal regulations.

Water discharged from the facility could potentially be cooler than the receiving river water when well water is the primary source. Groundwater temperatures for the general area average approximately 50-52° F (SE/E 1990a, b), which is suitable for steelhead rearing. Discharge water would mix rapidly with the creek water downstream of the facility as "The temperature effects from point source discharges generally diminish downstream quickly as heat is added and removed from a waterbody through natural equilibrium processes" (EPA 2003). Diverted creek water may be exposed to solar thermal gain in the rearing ponds, but it would pass through the facility under constant flow. Although the facility may discharge warmer water into Grandy Creek, the temperature increase would be negligible and discharges would not violate maximum temperature criteria presented in the EPA's *Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards* (EPA 2003). Temperature changes would therefore be minor and are not expected to impact aquatic species. Additionally, although the facility would release water with acceptable dissolved oxygen levels, any potential reductions would be mitigated when facility water is discharged through the fish ladder.

<u>Fish Traps, Ladders and Weirs</u>
An adult trap/fish barrier would be constructed to capture returning hatchery adults for broodstock. The proposed fish barrier (weir) would direct all fish to the fish ladder, to be located on the east bank of the creek. As described in Chapter 2, the fish barrier would consist of a removable picket barrier operated with a rubber air bladder located atop a permanent concrete sill, downstream of the picket barrier. To raise the barrier, the air bladder would be filled. To lower the picket barrier, the air bladder would be deflated. When not in operation, the pickets would be removed and the bladder would be deflated to lie atop the weir sill and streambed and allow for passage over the structure. The concrete sill would have a 3 to 5 foot wide notch (panel) at the east end coinciding with the deepest part of the stream. This notch would be closed with pickets or lumber to prevent passage when trapping is desired and opened at other times to allow for sediment transport and fish passage.

Water flowing through the fish ladder would be a mix of well water, surface water, and, during acclimation operations, outfall discharge water from the acclimation/rearing ponds. The ladder would provide sufficient attraction flow and would allow movement of non-target adults upstream of the weir while it is in operation. Fish that enter the ladder would ascend steps and pools to enter the north holding pond where they would be sorted. Hatchery steelhead would be transferred to the southern-most holding pond, where they would await transfer to Marblemount Hatchery for spawning. Wild species including early winter steelhead, cutthroat, and coho entering Grandy Creek would be passed approximately 75 feet upstream of the weir via a return pipe. This activity may delay migration/spawning, but fish would not be held for more than 24 hours and the delay is not expected to adversely affect spawning activities. To provide downstream passage, barrier pickets would be periodically lowered to allow larger emigrating adults, such as kelts, to pass around the barrier.

Because the weir and ladder would be in operation during late winter/early spring (December 1 – March 15), emigration of juveniles, including coho and cutthroat, may be slightly delayed, however the one-inch spacing of the weir pickets would allow their movement up and downstream during steelhead trapping operations. If juvenile steelhead, bull trout or Chinook are present in Grandy Creek during weir operations, the one-inch weir panel spacing would be sufficient to safely pass those species upstream or downstream.

The selected location of the weir currently supports lower quality fish habitat due to the presence of concrete abutments associated with an old bridge. Concrete rubble occupies the left bank and left side of the creek channel. In total, the barrier/trap structure, intake and stabilizing riprap would permanently remove up to 3,200 square feet of potential salmonid spawning and rearing habitat. This localized loss of habitat is not anticipated to have significant effects on wild fish **population viability** as there is suitable habitat to support salmonid spawners downstream and upstream.

Because bed load generally moves in the winter during high flows, sediment (cobble, gravel, silt and sand) may collect up to the top of the weir during trapping operations. To avoid sedimentation or potential backwatering upstream of the fish barrier during the trapping season, both the barrier and sill would contain removable sections that could periodically be removed to pass sediment or overflow during high flow events. When trapping operations are complete, that sill section can be completely removed to allow passage of sediments. The section would likely be positioned along the left bank and would allow the flow to be concentrated on the left side of the river channel to increase channel velocities and move deposited gravel past the barrier and intake. The section may be fitted with a removable bar-grate to allow water to pass, which would maintain a sweeping velocity past the intake screen.

Ecological Interactions

Ecological interactions between Skagit River hatchery fish and wild salmonids currently occur within the system. There would be no increase in the target production number of smolts released into the Skagit due to the proposed action. However, under the Grandy Creek alternative, the full broodstock needs may be met, resulting in an increase in the actual number of smolts released compared to recent years (see Table 2-4). Under the proposed action, the number of smolts released from Marblemount and Barnaby Slough would decrease. Increased adult returns and smolt releases in the immediate vicinity of Grandy Creek may result in increased localized impacts, but impacts upstream of the creek, where the majority of wild steelhead spawn, would likely decrease, benefiting upstream spawners. The ecological interactions presented below are based on existing conditions and the proposed release scenarios.

Intraspecific Interactions: Interactions Within the Same Species

Predation on Juvenile Fish. Predation on released steelhead juveniles may occur in the immediate area of the release site (fish ladder) as increased releases of hatchery fish may attract greater than normal numbers of bird or fish predators (Steward and Bjornn 1990). Releases would be volitional and would occur over a period of one month, resulting in some loss of hatchery fish. Introduction of releases of hatchery fish could buffer predation on wild fish if the abundance of local predator populations remains stable (Collis et al. 1995). However, no causal relationship between increases in the number of hatchery fish released and long-term changes to predator population abundance have been established (HSRG 2000).

Since the total goal release of juvenile steelhead would not change from existing conditions, overall predation by hatchery smolts on wild steelhead juveniles is not anticipated to increase from current levels. Some increase in predation of wild steelhead may occur in the vicinity of Grandy Creek if predators are attracted to hatchery releases. However, since the number of hatchery steelhead to be released into the Skagit upstream of Grandy Creek would be reduced, impacts to wild steelhead juveniles in that stretch of the river may decrease. Fish would be released as actively migrating smolts and are not anticipated to reside in Grandy Creek or the lower Skagit River for any duration. These smolts should migrate rapidly through to the lower river and enter the Skagit estuary for continued rearing until moving into Puget Sound. Additionally, young-of-the-year steelhead in the Skagit do not emerge from the gravel until mid-summer, after the hatchery smolts have emigrated.

Fish Health. The etiology of disease in wild steelhead in the Skagit system remains essentially unknown. However, there are known pathogens in the river system that can affect steelhead. One that has been documented in the Skagit is Infectious Hematopoietic Necrosis virus (IHNV) (Hayman 1992). Of the diseases caused by viruses, IHNV has resulted in the most substantial losses to trout, steelhead and salmon populations in fish hatcheries throughout the state of Washington (Kerwin et al. 1989; Warren 1991). IHNV is endemic to sockeye in the Skagit system, primarily the Baker Lake area (Hayman 1992), and is considered a sockeye strain of the virus (J. Thomas, WDFW, pers comm., 6/18/03). Current prevention practices have reduced the occurrence of this disease through advanced husbandry, including decreases in fish numbers to reduce crowding and stress factors that decrease the resistance of salmonids to disease. Additionally, advances in fish health care and adherence to federal and interagency fish health policies have considerably decreased the possibility of disease transmission from hatchery to wild fish (NOAA Fisheries 2003).

Although there has been no detection of IHNV in steelhead rearing at Marblemount or Barnaby Slough (S. Stout, WDFW Marblemount Hatchery manager, pers comm., 5/8/03), under stressful conditions (including **smoltification**), steelhead smolts may be susceptible to the virus.

Harvest Regimes. The majority of angling effort for hatchery winter steelhead has historically occurred between RM 46, just upstream of the Grandy Creek confluence, and RM 85 (WDFW et al. 1997). As a result of potential increased adult returns through use of an acclimation facility at Grandy Creek, the proposed program would attempt to shift the focus of the steelhead sport fishery to areas of the lower Skagit, below RM 46. This may help to reduce angling pressure on wild stocks that spawn in areas upstream of Grandy Creek. However, angling impacts to early-returning wild steelhead in the lower Skagit River would continue. These impacts are primarily caused by hooking stress and mortality during catch and release of wild steelhead.

Adult Capture. As previously discussed, the fish ladder/trap/barrier would capture adults that utilize the system during broodstock collection operations (December 1 through March 15). Early-run non-target wild steelhead, if they enter Grandy Creek during this period, would be passed upstream to continue spawning and migration activities. A downstream passage system, consisting of periodic lowering of the weir panels, would be incorporated into the fish barrier design so that non-target species may exit Grandy Creek and return to the mainstem Skagit. If present, wild steelhead would be subject to additional stress and minor migrational delays due to these activities. However, prior to March, wild steelhead are rarely observed in traps at Marblemount and Barnaby Slough. Additionally, it is unlikely that pre-spawning mortalities would occur because experienced WDFW hatchery personnel would be handling the adults and all transfers of fish would be of short duration and water to water. Trapping operations could cease prior to the March 15 date if hatchery fish are not captured for an extended period after mid to late February, but the decision to cease operations prior to March would be made by fisheries managers on a yearly basis.

Non-target steelhead should not experience false attraction at the weir as Grandy Creek is relatively narrow and proposed attraction flow (12 cfs) is more than sufficient to attract fish to the ladder entrance. Therefore it is not anticipated that fish will be delayed in their migrations as they should have little difficulty locating the ladder entrance.

Competition. Among the primary concerns of artificial production is the potential decline of wild populations in response to large-scale releases of hatchery juveniles as a result of competition (Flagg et al. 1995). Although the extent to which juvenile salmonids may compete for resources is unknown in the Skagit system, potential competition is minimized through the release of smolting juveniles that would rapidly emigrate to saltwater. Migration rates of up to 20 miles per day have been observed in hatchery steelhead within the Cowlitz River (WDFW 2003e; Harza 1998). In contrast, researchers in the Yakima River (McMichael et al. 2000) found that 26 to 39% of hatchery releases did not emigrate within one month following release. However, evidence for the Skagit suggests migrational rates similar to the Cowlitz River (WDFW et al. 1997; P. Castle, WDFW, pers comm., 5/28/03). In addition, the Species Interaction Work Group (SIWG 1984) concluded that migrant hatchery smolts are likely present for too short a period to compete with resident salmonids. Although there would be no increase in the total goal number of smolts released into the Skagit River compared to existing conditions, an increase in the number of smolts released in the immediate vicinity of Grandy Creek may result in increased competition in that area. However, because hatchery smolts generally migrate to saltwater immediately and the proposed facility would use the volitional release strategy to reduce residualism, competition effects should be minor and similar to existing conditions.

Another form of competition occurs when hatchery adults return to spawn. Returning hatchery fish may compete for spawning ground and mates, potentially causing density-dependent reductions in productivity of wild fish (Kostow and Phelps 2001), especially in the vicinity of Grandy Creek. However, studies have found that some hatchery salmonids are competitively inferior during spawning, with wild counterparts dominating spawning activities (Berejikian et al. 1999). Additionally, substantial temporal separation between the spawning of hatchery and wild steelhead also acts to reduce competition for mates and spawning grounds.

Co-mingling of Wild and Hatchery Steelhead

In recent years, WDFW surveyors in the lower Skagit have observed wild steelhead redds late in the second week of March (C. Kraemer, WDFW, pers comm., 12/26/03). As previously stated, most hatchery steelhead are collected and spawned at Marblemount Hatchery and Barnaby Slough by the second week of February, and although traps remain in place through early to mid March, no hatchery fish have been collected past February in recent years (S. Stout, WDFW, pers comm., 12/30/03). However, there still remains the potential that late hatchery spawners could come into contact with early returning wild steelhead in the vicinity of Grandy Creek. Such potential interactions, although low, could lead to interbreeding of the two stocks. The potential genetic consequences of such interbreeding are discussed below.

Potential interactions between hatchery and wild steelhead are existing conditions within the lower Skagit River system. Increased hatchery returns to Grandy Creek through improved homing and acclimation may increase interactions in the immediate vicinity of the creek. However, potential interbreeding interactions are minimized by the advanced spawn-timing of Skagit River hatchery steelhead. High harvest rates (80-90%) have also resulted in less overlap on the natural spawning grounds, resulting in less hatchery/wild interactions (Busby et al. 1996; HSRG Recommendations 2003). Additionally, if hatchery males do remain in the system to attempt to mate with early spawning wild females, it is likely that wild males would out-compete hatchery males, reducing the potential for interactions.

Genetic Interactions

Background and History. In many Pacific Northwest streams, hatchery fish have intermingled with wild fish for 50 to 100 years (Amend et al. 2002). When they interbreed, hatchery populations can directly affect the genetic character of natural populations through gene flow and gene transfer. Campton (1995) described three categories by which hatcheries and hatchery fish may impact natural populations: 1) the genetic effects of hatchery practices on hatchery fish; 2) the direct genetic effect of hatchery fish on wild populations due to potential interbreeding if hatchery fish spawn in the wild; and 3) the indirect genetic effects of hatchery fish on natural populations due to competition, predation, and other ecological factors.

Empirical observations suggest that when cultured fish come into contact with **indigenous** populations, the direct genetic consequences vary from complete introgression to no detectable effects on the genetic population structure (Hindar et al. 1991). Hindar et al. (1991) further stated that when there is a detectable effect in comparisons of genetically pure wild and **hybrid** fish, the performance of pure wild fish is always better. Recent data also suggests that the performance of hatchery origin fish in the natural environment falls short of that of wild fish (Reisenbichler and Rubin 1999; Einum and Fleming 2001; Fleming and Petersson 2001). Additionally, Williams et al. (2003) state that hatchery fish are more likely to be eaten by predators, more likely to get lost in migration, and are less successful in spawning.

One potential result of hatchery and wild interbreeding is the loss of locally-adapted gene complexes which may be detrimental to the genetic integrity of wild populations, and ultimately to natural production (Hindar et al. 1991; Reisenbichler and Rubin 1999; Utter 2002). Another result of interbreeding is the potential reduction in offspring fitness due to **domestication** of hatchery fish (reduced fecundity, fertility and viability; increased stray rates; weaker territorial behavior; lower return rates). Campton (1995) concluded that domestication selection could be a significant source of genetic change in salmonid hatchery populations; however, the extent to which these changes could impact natural populations is unknown.

Studies of transplanted hatchery steelhead of non-local origin in the Kalama River have indicated that the reproductive success of those hatchery fish is substantially lower (up to 72 percent) than that of their wild counterparts when spawning in the wild (Chilcote et al. 1986; Campton et al. 1991; Leider et al. 1990b; Sharpe et al. 2000). Other studies have recently reported similar conclusions regarding reproductive success of non-local origin hatchery stocks in Forks Creek in Washington (McLean et al. 2003) and in the Hood River (Blouin 2003, Ardren 2003), and the Clackamas River (Kostow et al. 2003) in Oregon. Hybridization between non-local origin hatchery fish and wild fish may therefore produce less fit offspring and threaten the long-term genetic integrity of wild-origin fish. However, recent studies assessing steelhead fitness in Hood River have indicated that hatchery steelhead of native origin may have reproductive success that is only slightly less than that of natural-origin wild steelhead (Ardren 2003 and Blouin 2003).

Although non-local origin hatchery steelhead have generally been shown to have reduced fitness, some researchers have found that interbreeding between hatchery and wild stocks has not eliminated the genetic distinctiveness of the wild stocks. Researchers in the Kalama River found that, despite generations of relatively high potential for interbreeding between hatchery and wild steelhead, the wild population has maintained a substantial degree of genetic distinction from its hatchery stock counterpart (Sharpe et al. 2000; Hulett 2000). Thurow et al. (2000) found similar results in the Columbia and Klamath River basins, although wild steelhead only comprised 22% of fish in those sites surveyed. In recent genetic studies of hatchery and wild steelhead in the Clackamas River, Kostow et al. (2003) found that “whatever interbreeding may have occurred between hatchery and wild fish, it has not diminished the genetic and biological distinctiveness of the wild winter steelhead and we do not believe it has had an effect on the productivity of the wild populations.” NOAA Fisheries confirmed Kostow’s findings, stating that hatchery and wild steelhead within the Clackamas River have maintained genetic separation (NOAA Fisheries 2003). Most researchers caution, however, that these results do not suggest that introgression has not occurred, only that the level of introgression has not, as of yet, lead to homogenization of hatchery and wild stocks in areas sampled. A review of the effects of interbreeding in salmonids noted that the complex life history of anadromous salmonids may decrease their susceptibility to impacts from introgression, but does not give them immunity to its effects (Utter 2000).

Existing Conditions in the Skagit River. Hindar et al. (1991), using protein assays (**allozyme electrophoresis**), found that gene frequencies of naturally produced Skagit River steelhead juveniles were typical of wild populations. These results suggested that introgression between hatchery and wild fish was occurring at low levels at the time of the study (or that the stocks did not differ substantially to begin with). Since Hindar et al.’s study, stocking levels have approximately doubled in the Skagit. However, genetic analysis (using allozyme electrophoresis) of Skagit River juvenile steelhead from 1994 through 1996 also indicated that the level of introgression was minor and was not widespread in the system over the past twenty years (Phelps et al. 1997). This conclusion must be cautioned, however, since the researchers used only seven different genetic markers in their study. Since 1997, no new studies are known to have been conducted to determine levels of introgression within the Skagit River. However, introgression is believed to be low as there is currently substantial temporal separation of hatchery and wild spawn timings, and spawning overlap is believed to be less than 1% (C. Kraemer, WDFW, pers comm., 12/12/03). Although funding is uncertain at this preliminary stage, new genetic studies could be included within an M&E plan for the proposed project.

The Grandy Creek facility would likely result in better imprinting of hatchery smolts to the creek (fish more likely to return to release site rather than spawning upstream or downstream throughout the Skagit basin, or potentially into other basins), potentially reducing the spatial overlap of hatchery and wild spawners throughout the Skagit system.

Reducing Existing Impacts, Particularly Upstream of Grandy Creek. Early-returning wild fish that come into contact with late-spawning hatchery fish may interact. Since WDFW currently releases steelhead smolts annually into portions of the lower Skagit River including Grandy Creek, Davis Slough, Faber's Ferry, and the Hamilton/Lyman launch (HSRG Recommendations 2003; C. Mains, WDFW, pers comm., unpublished release data, 6/10/03), co-mingling of stocks likely occurs as an existing condition. As previously discussed, marked differences in spawn timings have resulted in substantial temporal separation between the stocks, although wild steelhead that are not yet ready to spawn may still come into contact with hatchery fish, particularly in the vicinity of Grandy Creek. An anticipated benefit of rearing juveniles in and acclimating juveniles to Grandy Creek water is the reduction of hatchery steelhead spawning prior to reaching Grandy Creek, as well as the potential decrease of straying of returning adult hatchery fish upstream of Grandy Creek. This is an improvement over existing conditions, in which hatchery smolts are direct-released without acclimation. The section of the Skagit River that has historically been the most heavily spawned by hatchery-origin adults is the area upstream of Grandy Creek between the Cascade and Sauk rivers (due to the return of hatchery spawners to the vicinity of Barnaby Slough rearing facility) (Graybill et al. 1979; Stober et al. 1982); therefore, increased returns to Grandy Creek due to acclimation could potentially reduce the presence of hatchery fish upstream.

Straying. Although straying is a natural process that allows salmon to colonize new habitat, artificial propagation can result in higher rates of straying than would occur naturally (Waples 1995). Stray hatchery fish can potentially affect wild populations through interbreeding and competition (Lindsay et al. 2000; 2001), and hatchery strays could disrupt the development of locally-adapted subpopulations.

Although straying rates of about five percent are typical for Pacific salmon (Quinn 1997), Schroeder et al. (2001) found the percentage of steelhead hatchery strays in Oregon to be greater, at about 11%. However, researchers of steelhead in western Washington streams have found that hatchery fish tend to return close to the hatchery, consistent with olfactory imprinting on the hatchery's water supply (Mackey et al. 2001).

A limited amount of hatchery steelhead straying likely occurs in the Skagit River. One goal of the proposed Lower Skagit River facility is to reduce adult straying through the use of acclimation. Evidence for improved homing and reduction of straying due to acclimation is contradictory. Although some studies (Lindsay et al. 2001; Kenaston et al. 2001) suggest that acclimation does not improve homing or achieve a lower percentage of straying, NOAA Fisheries (NMFS 1999a) has identified acclimation as a potential method by which stray rates can be reduced. NOAA Fisheries (NMFS 1999a) states that "rearing and releasing salmon in water from their intended return location has the greatest potential to minimize straying," and "empirical evidence indicates that fish transported and released in a distant location are more susceptible to straying than those released where they were reared." These statements are supported by other studies that suggest that adult homing is influenced by rearing location (Labelle 1992; Pascual et al. 1995; Sholes and Hallock 1979; Slaney et al. 1993; McIsaac and Quinn 1988; Hayes and Carmichael 2002). Additionally, former WDFW salmon and steelhead biologist for the Skagit, Pete Castle (pers comm., 5/28/03), stated that acclimating juvenile steelhead at Grandy Creek may improve fidelity to the creek, which is an improvement over current direct release protocols.

Volitional release strategies may also help reduce straying. According to the HSRG (2003) "Rapidly migrating smolts will be less likely to residualize and imprint on inappropriate streams. Therefore, they will be less likely to stray during their homing migration, thus reducing the likelihood of introgression of hatchery fish on non-target populations."

The activity most likely to reduce the effects of straying would be increased harvest rates due to better homing and concentrations of hatchery fish in the lower Skagit. At the Grandy Creek site, surface water would be introduced from January to mid February through the end of facility operations (June 1). This strategy would provide the opportunity for smolts to imprint to Grandy Creek water for 3-4 months prior to volitional release. Assuming acclimation would increase adult returns to Grandy Creek and reduce straying, the majority of returning adults that are not harvested would return to the area of Grandy Creek (RM 45.6) and would not migrate farther upstream in the Skagit River. This scenario could therefore potentially reduce existing interactions with those wild winter-run stocks upstream of Grandy Creek (mainstem Skagit upstream of RM 45.6; Sauk River; and Cascade River stocks). This strategy is consistent with HSRG recommendations (2000) that call for a release point at a location that would provide hatchery fish an opportunity to imprint and return to a water source that minimizes the likelihood of interactions between hatchery and wild adults.

Additionally, recent (2004) HSRG recommendations for the Skagit system call for including "adult collection capability wherever steelhead are released, to capture as many adults from the returning segregated population as possible; discontinue releases where adults cannot be collected at return." The proposed Grandy Creek program would fulfill these recommendations as all returning hatchery adults would be collected at Grandy Creek and current direct releases to areas that do not have adult collection capabilities would be eliminated.

Interspecific Interactions: Interactions between different species

<u>Fish Health</u>. As presented in the **Intraspecific Interactions** section, methods to maintain disease-free steelhead, as presented previously, would minimize potential adverse impacts to wild fish health.

<u>Harvest Regimes.</u> Recreational fishing for winter-run hatchery steelhead occurs from mid-December through the beginning of March. This timing does not coincide with run timings for several salmonid species in the Skagit, including pink and the majority of Chinook salmon. Some overlap of steelhead harvest and wild coho and chum spawning occurs, but steelhead fisheries are currently confined within the Skagit River mainstem and anglers are required to release wild coho and listed species.

For listed bull trout there is a complete overlap with post-spawn adults and sub-adults for most, if not all of the steelhead season. Currently WDFW allows the retention of two bull trout (exceeding 20 inches) per day. Similarly, coastal cutthroat would be holding in the mainstem for most of the winter prior to spawning in the tributaries. Because this is an existing condition, the Grandy Creek project would not change hatchery steelhead impacts except when more steelhead are available to anglers, which may reduce the angler's preference for bull trout or cutthroat.

The target total hatchery steelhead releases to the lower Skagit River would not exceed current levels (534,000). However, establishing a juvenile acclimation and adult collection facility at Grandy Creek may result in increased adult returns to the lower Skagit River. Therefore, steelhead angling effort (expressed as angler trips) and subsequent impacts to other salmonids may increase compared to current levels, particularly in the lower river. Additionally, if increased hatchery steelhead returns to Grandy Creek cause a shift in angling efforts in the immediate vicinity of Grandy Creek, species in that area may experience increased levels of harassment, possibly resulting in mortality of some fish that are incidentally caught by steelhead fisherman.

<u>Adult Capture/Spawning Delays</u>. As previously discussed, the fish trap/barrier would capture adults that utilize the system during trapping operations (December 1 through March 15). Non-target species such as coho and cutthroat would be passed upstream to continue spawning and migration activities. Although fish would be subject to additional stress and minor migrational delays due to these activities, it is

unlikely that pre-spawning mortalities would occur as experienced hatchery personnel would be handling individuals for a very short period of time. Additionally, downstream migration during this period would be possible through periodic lowering of the weir panels.

Predation. Researchers in the Lewis River found that steelhead hatchery smolts did prey on Chinook fry and other salmonids, although at low levels (Hawkins and Tipping 1999; W. Dammers, WDFW, pers comm., 6/19/03). Such predation on juvenile Chinook is likely due to the great abundance of Chinook fry in the Lewis River (J. Tipping, WDFW, pers comm., 6/19/03). Researchers at the Cowlitz River have observed evidence of hatchery steelhead smolt predation on juvenile coho in the range of 60-80 mm in length (J. Serl, WDFW, pers comm., 6/19/03). However, it was estimated that only about one percent of those steelhead smolts passing through downstream trapping structures showed evidence of preying on coho. Additionally, Beauchamp (1995) found that hatchery-reared steelhead smolts in the Cedar River showed no evidence of preying on salmonid fry.

Hatchery steelhead would be volitionally released from the Grandy Creek facility from May 1 through June 1. As shown in Table 3-17, this release period overlaps with juvenile emigration and/or rearing timing of Skagit Chinook, chum, pink, coho, sockeye and bull trout. Among the anadromous salmonids of most concern in the lower Skagit River are emigrating fall, spring and summer Chinook. Newly emerged fall Chinook are particularly vulnerable to predation due to their small size upon emergence (Pearsons and Fritts 1999). However, because steelhead smolts would be released in May, they would enter the river well after the Chinook fry have emerged from the gravel since emergence can begin as early as late December and is completed by early spring (C. Kraemer, pers comm., 12/12/03). Pearsons and Fritts (1999) reported results of studies that evaluated steelhead predation on fingerling Chinook that demonstrated that yearling steelhead smolts preyed upon and consumed Chinook fingerlings up to 44% of their body length (some of these studies were conducted under controlled conditions). At 6 fpp, the average yearling steelhead smolt would be about 196 mm long and would therefore be capable of consuming juvenile Chinook up to 86 millimeters long (Gayeski 2003). From May through June, when hatchery steelhead smolts would be actively migrating to the ocean, average lengths of downstream migrating juvenile Chinook caught in migrant traps in the Skagit River basin range from 51.7 to 68.0 mm (Seiler et al. 2002). Therefore, it is possible that the majority of juvenile Chinook rearing and migrating in the Skagit during May and June may be susceptible to predation by steelhead smolts.

Although steelhead smolts may prey on juvenile fry, including Chinook, the current level of predation in the Skagit River is generally unknown, but is likely to be low (C. Kraemer, WDFW, pers comm., 5/13/03). Research conducted by WDFW on hatchery steelhead smolts near Skagit Bay in the 1980s failed to identify juvenile fish in the stomachs of smolts (P. Castle, WDFW, pers comm., 5/28/03). Based on limited sampling of hatchery steelhead smolts in the lower Skagit River, predation by hatchery steelhead appears to be limited to those species that are small and abundant in the system, particularly chum salmon and pink salmon in even years (C. Kramer, WDFW, unpublished study). Two of the three Skagit River chum stocks are listed as Healthy, while the third is listed as Unknown (WDFW 2003a). The Skagit River pink stock is considered Healthy (WDFW 2003a).

Although steelhead smolts are not believed to be significant predators, potential predation on those rearing juvenile salmonids downstream of the Grandy Creek release site cannot be discounted. An increase in the number of smolts released at Grandy Creek could increase the potential for predation in the immediate vicinity. However, since the goal number of smolt releases into the Skagit system would remain at current levels and estimates of predation are low, the overall potential for predation on lower mainstem juvenile salmonid populations is likely to remain near existing levels. Predation on rearing juvenile salmonids upstream of the Grandy Creek/Skagit River confluence (RM 45.6), including the area upstream of Rockport where 78% of wild Chinook have been reported to spawn (Connor and Pflug 2003), would likely decrease since fewer hatchery steelhead would be emigrating through that stretch of the

Skagit River. Additionally, since most hatchery fish would emigrate quickly, the short-term impact of potential predation should be relatively minor (McMichael et al. 1997; WDFW et al. 1997).

Researchers in Washington state have shown that predation on wild salmonids by residual hatchery steelhead is also low (Martin et al. 1993; Pearsons et al. 1993), but may occur. More discussion regarding residual hatchery steelhead is presented later in this chapter. Predation by adult steelhead may occur, however, the most prevalent food items found in adult steelhead were insects (Tricoptera) and, although Chinook eggs were also found, no juvenile fish were found in stomachs (VanderHaegen et al. 1998). Although an existing condition, if predation by adult hatchery steelhead occurs, it is likely minimal since the vast majority of hatchery steelhead are harvested or collected for broodstock.

Competition. In most cold-water communities, fish have a considerable degree of behavioral adaptability that allows them to minimize competition for resources. Ecological segregation is also possible due to the relatively small number of species found in these streams (Moyle and Cech 1988). According to the "Competitive Exclusion Principle" two species cannot occupy the same niche indefinitely (Hardin 1960). For example, this is the case of steelhead and bull trout smolts in the Skagit. Both emigrate at similar times, but char will orient more closely to the river bottom (WDFW et al. 1997).

If stream resources were limited, competition between juvenile hatchery steelhead and other salmonids, including young Chinook, coho, cutthroat and bull trout, could be expected to negatively affect those populations. For example, in closed-tank experiments, steelhead juveniles were aggressive toward same age juvenile Chinook and promoted behavioral changes in Chinook individuals, including relinquishing of Chinook habitats (Kelsey et al. 2002). In another study, Pearsons et al. (1994) reported that, although agonistic interactions were observed between hatchery steelhead and wild trout, these interactions did not appear to have significantly impacted the trout populations examined.

The potential for negative effects on the behavior of wild fish as a result of hatchery fish releases depends on the degree of spatial and temporal overlap in occurrence of hatchery and wild fish. Although the studies discussed above have demonstrated that steelhead may outcompete other salmonids through aggression, any such occurrence in the Skagit River system is an existing condition whose potential would not be increased through the proposed action. However, spatial use by hatchery smolts in the immediate vicinity of the Grandy Creek release point would increase during peak volitional releases and may cause behavioral modifications in those juveniles that may be present in the immediate area. The potential impact to juvenile salmonids would be mitigated to some degree because released smolts are likely to emigrate to the saltwater environment within two weeks of release and temporal affects of competition should be negligible (WDFW et al. 1997). The vast majority of smolts (some may residualize) would be utilizing the river primarily as a corridor to the sea and would not be establishing holding territories for feeding. Additionally, the reduction in the number of smolts released from Marblemount and Barnaby Slough may reduce competition in areas of the Skagit upstream of Grandy Creek (RM 45.6).

Impact of Residualism. It is possible that some hatchery smolts do not migrate to the ocean upon release, but remain in the Skagit River system for their entire lifetimes. This phenomenon is called residualism and may occur in some individuals released from the Grandy Creek facility. As observed by McMichael and Pearsons (2001) and others, hatchery-reared steelhead that do not emigrate as smolts shortly after release may harm wild fish communities through ecological interactions throughout their lifetimes. However, residualized hatchery steelhead smolts have been found in very low numbers in past investigations in the Skagit River (Johnston 1996), when hatchery juveniles were force released at the end of the release period.

Human-Fish Interactions
Most human-fish interactions fall under two categories: those related to natural resource management, and those related to fishing. Indirect effects may occur due to management initiatives, such as those to protect species listed under the ESA. Direct and more immediate effects may stem from fishing within the area.

Resource Management. It is assumed that future management actions within the Skagit River hatchery winter steelhead program would be consistent with those inherent in the current program. Coordination of all activities that directly and indirectly affect the program is essential to ensure efficiency and to promote sustainable viability of the program. Consistency among state, federal, tribal, and natural resource agency management decisions is critical. The facility itself would be manned at all times fish are on station and secured with fencing to prevent vandalism and to ensure the protection of rearing juveniles. The HSRG recommendations for the Skagit River suggest the establishment of a wild steelhead management zone, an area where hatchery fish are not released. The purpose of such a zone is to protect the genetic integrity of wild stocks. Currently, there are no wild steelhead management zones within the Skagit River, although plans to establish a steelhead management zone are being developed (P. Castle, WDFW, pers comm., 5/28/03; W. Gill, WDFW, pers comm., 12/03).

Harvest. A goal of the Grandy Creek facility is to provide hatchery steelhead for harvest to lower portions of the Skagit River to reduce some of the pressure placed on wild stocks higher up in the Skagit. An increase in returning adults to the Grandy Creek area may increase angling pressure/harassment (including hooking mortalities) of other species in the immediate vicinity of Grandy Creek.

MITIGATING MEASURES

During construction activities, the impacts of instream construction would be minimized by BMPs as well as the requirements of a Hydraulic Permit, and a Corps of Engineers 404 permit for construction within waters of the U.S. These practices and permits typically require the following: restriction of instream bank or bed work to low flow times of the year, minimal bank vegetation disturbance, prevention of silt from running into the stream during construction, prevention of wet cement coming into contact with flowing stream waters before seven days of curing have passed, and prevention of chemicals or oil from entering the system.

Instream work would occur from June 15 through August 31, the instream work window established for the area, or a period designated by WDFW biologists as being the least likely for spawning/incubating salmonids to be present in the system.

As part of mitigation for impacts due to the potential construction of a facility at Grandy Creek, existing concrete infrastructure from the old Birdsview Hatchery, including raceways, a building slab and a remnant wall would be demolished and replaced with native vegetation. This activity would reduce the existing impervious surface area by 0.5 acres, some of which is within the 100-year floodplain, resulting in less runoff to the creek as well as providing increased habitat for wildlife and vegetation.

Since some of the proposed structures, including the intake/fish ladder structure and the adult holding ponds, would occur within Grandy Creek or Skagit County's designated 200-foot critical areas setback (from Grandy Creek), which includes the Fish and Wildlife HCA, mitigation for these disturbances is mandatory. In accordance with the mitigation requirements, a mitigation plan (WDFW 2004) would be implemented. As part of that mitigation plan, large amounts of invasive weeds (primarily blackberry and knotweed) would be removed from riparian areas to mitigate for riprap placement, loss of shade habitat, and weir construction. Subsequent areas would be replanted in high densities with native vegetation, including long-lived coniferous trees to provide bank stabilization, shading, cover and large woody debris recruitment. In addition, native trees of suitable size may be used for in-water habitat mitigation.

In an effort to determine the extent of hatchery and wild fish interaction, particularly interbreeding, on-going monitoring for the Skagit River winter steelhead program, as well as funding-dependent M&E plans for the project could include:

- Continued monitoring of harvested numbers of hatchery and wild fish
- Continued monitoring to determine the distribution and abundance of adult spawners of hatchery and natural origin
- Development and implementation of new genetic studies, including the use of current technology, to estimate gene flow patterns and to determine current levels of introgression of hatchery and wild steelhead in the Skagit River system
- Continued evaluation and reporting of communicable diseases
- Comparison and documentation of morphological differences between hatchery and wild spawners

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable impacts to aquatic species in the Skagit River basin are expected to be minimal primarily due to the fact that the only aspects of the existing program that would be modified under the Grandy Creek alternative are modifications to release locations and the addition of acclimation at Grandy Creek. Total proposed released numbers would maintain the current status quo. However, the number of smolts released at the Grandy Creek site would increase and could result in localized changes in predation and competition as described above. The current program targets the early-returning winter steelhead for production, and results in relatively distinct separation between the hatchery adult and wild populations. However, some hatchery/wild interactions and straying can still be expected and may result in interbreeding with the earliest returning wild steelhead. This interbreeding may result in adverse affects as described under **Intraspecific Interactions**.

Improved broodstock collection facilities are expected to result in capturing more broodstock, allowing production goals to be met more frequently. If this occurs, the level of production of steelhead juveniles and adults would be expected to be higher than in recent years, and density-dependent effects, as described above, may increase.

Operational errors at the facility may also result in impacts. Accidental discharges of common hatchery therapeutants and chemicals could occur as a result of human error. The impact of any such occurrence would depend upon the volume and composition of the accidental discharge. Only Food and Drug Administration (FDA) approved hatchery use therapeutants would be used on-station and these must pass vigorous environmental testing by the FDA. Operational errors of this type are highly unlikely as therapeutants or chemicals would be properly handled and stored by hatchery personnel who are trained in the use of such substances.

The spread of disease by hatchery fish is not considered to be an issue in the Skagit system. At present, five existing fish culture operations are active in the system, with no evidence of pathogen transfer resulting in disease to wild populations (S. Stout, WDFW, pers comm., 5/8/03).

3.1.7.2 BAKER RIVER ALTERNATIVE

EXISTING CONDITIONS

The Baker River flows into the Skagit River at approximately RM 56.5 (Williams et al. 1975). Use of the Baker River alternative site would release hatchery steelhead into the Baker River at approximately RM 0.5 of the Baker River. Smolts would likely emigrate rapidly toward the Skagit River.

Fish Species within the Baker River
Both anadromous and resident fish species occur in the Baker River system. These groups are discussed separately in the following sections.

Anadromous Species
The confluence of the Baker River and the Skagit River occurs at RM 56.5 of the Skagit (Williams et al. 1975). From the Highway 20 bridge at Concrete to the Baker River fish barrier dam (Baker River Trap), all waters are closed for harvest (WDFW 2003a). Data from the PSE-owned adult trap, located downstream from the lower Baker Dam at RM 0.5 of the Baker River, indicate that sockeye, coho, summer and winter steelhead, Chinook, pink salmon, chum, native char (bull trout/Dolly Varden) and coastal cutthroat utilize the Baker River. Of those salmonids that utilize the Baker River, sockeye and coho comprise the overwhelming majority with substantial returns at the Baker River Trap (Montgomery Watson Harza 2003; PSE 2002). Although occasionally collected in the trap, Chinook, pink and chum salmon do not originate in the Baker River. These fish are thought to be strays from the Skagit and other river systems. Native char are also occasionally captured in the Baker River trap (PSE 2002).

Steelhead. Prior to the construction of the Baker River dams, over 1,000 returning adult steelhead were observed in the Baker River in the early 1920s, primarily during the month of May (Anonymous 1926; WDG 1979). Very few steelhead are believed to have ascended the river as far as Baker Lake (WDG 1977). Damming of the river greatly reduced the use of the system by steelhead, and currently, wild steelhead that enter the Baker River are considered strays. The WDFW currently manages the Baker River system for hatchery winter steelhead, and acclimated releases into the system may continue under the Grandy Creek alternative (from Marblemount and Barnaby stocks). WDFW hatchery releases into the Baker River from 1996 to 2001 are shown in Table 3-19.

Table 3-19. WDFW hatchery releases into the Baker River.

Year	Class	Hatchery Facility Origin	Release Site	Number Released
1999	Smolt	Barnaby Slough	Baker River	10,962
1999	Smolt	Marblemount Hatchery	Baker River	38,032
1999	Fingerling	Marblemount Hatchery	Baker River	3,600
2000	Smolt	Marblemount Hatchery	Baker River	60,000
2001	Smolt	Marblemount Hatchery	Baker River	93,000

Source: WDFW Plants report database as of 6/9/03 – preliminary and unverified (C. Mains, pers comm., 6/10/03)

Until recently, all steelhead entering the adult trap were transported and released into Baker Lake. That policy was modified in the 1980s so that only wild fish were transported above the dams. The transport policy was again modified in 1999 to exclude all summer-run fish (returning from June 1 to October 31), as well as hatchery stocks (both summer and winter adipose-clipped), which are released back into the Skagit River at the confluence of the Baker River or at Hamilton (PSE 2002; Walsh 1999; G. Sprague, WDFW, pers comm., 5/3/03). However, protocols have once again been modified and adipose-clipped summer steelhead that are collected at the adult trap during June and July are currently transferred up to

Baker Lake for nutrient enhancement. These fish are likely strays from the Whitehorse Hatchery summer stock (D. Bruland, PSE, pers comm., 6/18/03).

Chinook. Prior to construction of the Baker River dams, Chinook salmon utilized the Baker River moderately for spawning. Historical records of Baker River Chinook egg takes varied from 9,000 in the 1917-1918 season to over 100,000 eggs in the 1915-1916 season (Smith and Anderson 1921). An average of 219 Chinook salmon were captured annually at the Baker River Trap from 1926 to 2000 (PSE 2002). In the recent past, Chinook that entered the Baker River Trap were transported to Baker Lake. However, WDFW determined that they did not likely originate in the Baker system, but were strays from the Skagit River. Based on this determination, most Chinook are now returned to the Skagit River near the mouth of the Baker River. However, to address the ecological impacts of removing historical Chinook from the Baker River system, WDFW began introducing spring Chinook into the Baker watershed in 1999 (PSE 2002). Unmarked spring Chinook that are collected at the Trap from June 1 through August 15 are taken to Baker Lake (PSE 2003). After August 15, all unmarked Chinook are returned to the Skagit River. Chinook with coded-wire tags are returned to the Marblemount Hatchery (PSE 2003). Juveniles are transported in the spring downstream of the Baker River dams with an annual collection of approximately 1,470 individuals since 1989 (PSE 2002).

Chum. Migration of small numbers of adult chum salmon into the Baker River Trap, presumably of fish bound for upstream Skagit River areas and tributaries, occurs from late September through December, peaking in November. Trapped fish are returned to the Skagit River under present fisheries management policies (PSE 2003).

Coho. Annual escapement to the Baker River (based on trap counts, 1926-2000) has ranged from a minimum of 187 to a maximum of 26,549, with a mean of 6,061. Adult coho entering the Baker River are collected at the Trap, transported upstream, and released into Baker Lake and Lake Shannon to spawn in the many tributaries of Baker River system. Spawning occurs from October to January in riffle areas of the numerous tributaries to Lake Shannon and Baker Lake (PSE 2002). Although the population status of Baker River coho was unknown in 1992, recent-year adult escapement trends and absolute numbers of fish observed indicate that the stock is now classified as Healthy (WDF et al. 1993; WDFW 2003a).

Sockeye. Baker River sockeye are native to the basin and have been the primary focus of fisheries managers for decades. Annual sockeye salmon escapement to the Baker River from 1926 to 2000 ranged from a minimum of 99 to a maximum of 15,991, with a mean of 3,078 (PSE 2002). Sockeye adults migrate into the Baker River from June through August (peak of July), after spending 2 to 3 years in the ocean. Adults are collected at the Trap and transported to artificial spawning beaches located at the south end of Baker Lake. Fish in excess of beach capacity are stocked in an auxiliary beach or released directly into Lake Shannon or Baker Lake to seek suitable spawning habitat. Juveniles from both Lake Shannon and Baker Lake are trapped from March through July, transported downstream and released into the Skagit River at the mouth of the Baker River (G. Sprague, WDFW, pers comm., 5/3/03).

Although the Baker River sockeye stock was designated as “critical” in the 1990s because of highly variable smolt return rates (WDFW and WWTIT. 1994), adult sockeye returns to the Baker River have significantly rebounded, and, in 2002, their status was updated to Healthy (WDFW 2003a). In 1999, NMFS concluded that this stock should be removed from the candidate species list (PSE 1999).

Pinks. The Baker River system does not support a self-sustaining population of pink salmon, although adult fish are occasionally collected in the Baker River Trap. One such year was 1993, when pinks captured in the Baker Adult Trap were transported and released into Baker Lake due to excess Skagit River escapement. Adult pink salmon are captured in the Trap from August through November, with the peak occurring in October. Until 2001, agency management policy was to return all pink salmon collected in the Baker River trap to the Skagit River. Now, due to high escapement levels in the Skagit River, pink salmon collected at the Baker River Trap are transported to Baker Lake (PSE 2003).

Char. Native char occur in the Baker River system (Young 1999; PSE 2002). The majority are residents in the upper Baker Lake. Based on 1995-2000 trap data, the number of adult native char that entered the Baker River trap and were hauled upstream of the Upper Baker Dam averaged approximately 20 individuals per year (PSE 2002). Currently, native char, including bull trout, that enter the Baker River Trap are strays from the Skagit River stock and are transported and released back into the Skagit River (G. Sprague, WDFW, pers comm., 5/1/03). However, some native char may be transferred up to Baker Lake (PSE 2003).

Cutthroat. Sea-run (anadromous) coastal cutthroat trout migrate into the Baker River system sporadically throughout the year, but primarily in October and November. A limited amount of juveniles have been captured at the Upper Baker River juvenile outmigrant trap (PSE 2002). Typically, adult cutthroat that are trapped at the Trap are returned to the Skagit River and not barged up to the reservoirs (G. Sprague, WDFW, pers comm., 5/13/03), however, some cutthroat may be transferred to Baker Lake (PSE 2003).

Atlantic Salmon. Occasionally, Atlantic salmon are collected at the Baker River Trap. This species is cultured commercially in marine net pens in Puget Sound. Fish collected at the Baker River Trap are likely escapees from these net pens. Fishery managers in the State are concerned that the escaped Atlantic salmon may impact native fish stocks. Potential impacts by escaped Atlantic salmon include competition, predation, disease transfer, hybridization, and colonization. Because these fish are non-native and undesirable to the Skagit River system, they are sacrificed once collected.

Resident Fish Species
Numerous resident fish species are present in the Baker River system above the upper and lower dams. These include: mountain whitefish, brook trout, native char, rainbow trout, sculpin, suckers and pumpkinseeds. These species are generally isolated from the free-flowing portions of the Baker River in the immediate vicinity of the alternative site.

Threatened, Endangered, Rare Species

There are two federally threatened species known to occur in the Baker River system: the Puget Sound ESU of Chinook salmon and the Coastal-Puget Sound DPS of bull trout. Both species stocks are also candidates for listing in the State of Washington.

IMPACTS

To assist in the discussion of impacts related to the construction and operation of an acclimation facility at the Baker River site, Table 3-20 illustrates species presence and timing information for salmonids that are found within the Baker River.

Table 3-20. Migration timing of anadromous adults and juveniles to the Baker River.

Species / Event	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Construction												
Instream work												
Upland construction												
Baker River Alternative Acclimation Facility Operation												
Adult trapping												
Juvenile acclimation												
Summer Steelhead												
Adult immigration												
Juvenile emigration												
Winter Steelhead												
Adult immigration												
Juvenile emigration												
Chinook												
Adult immigration												
Juvenile emigration												
Bull trout/Dolly Varden												
Adult immigration												
Juvenile emigration												
Chum												
Adult immigration												
Juvenile emigration												
Coho												
Adult immigration												
Juvenile emigration												
Sockeye												
Adult immigration												
Juvenile emigration												
Pink												
Adult immigration												
Juvenile emigration												
Cutthroat Trout												
Adult immigration												
Juvenile emigration												

Source: Baker River Trap (PSE trap) records as cited in PSE 2002

Construction

Upland Site Disturbance
Because adult collection and trapping facilities exist at the Baker River site that could accommodate broodstock returns, a new broodstock collection system would not be necessary. As presented in Chapter 2, upgrades to the existing Trap and holding area will likely occur independent of this project, in conjunction with FERC relicensing of the Baker River dams.

Construction of the raceway complex, including the waste clarifier pond and perimeter access road, would occur on upland areas that are currently dominated a subclimax community of immature alders. Impacts to the aquatic environment due to the construction of these facilities would likely be limited to sedimentation. The use of BMPs combined with the significant distance of construction activities from the river channel (> 200 feet) would minimize the potential for sedimentation and increased turbidity.

A small amount of invasive vegetation located on the steeply sloped bank of the Baker River would be removed due to installation of the pipelines. This area is dominated by weedy herbaceous species. Trees are absent from the proposed pipeline corridors; therefore, pipeline installation would not impact any shading habitat. Impacts to herbaceous vegetation would be mitigated hydroseeding in disturbed areas. The existing riparian zone within the area is extremely degraded and could be improved through such revegetation measures. However, extensive planting in this area is not likely due to on-going PSE maintenance of the riparian corridor.

Site disturbances, including noise and increased human activity, may cause fish to temporarily disperse from the area during construction phase. However, because the site is located in an area that has been used for decades for Baker River dam activities (with existing moderate levels of human disturbance), disturbances due to construction activities are anticipated to be minimal and short-lived.

Channel Alterations
Instream construction would be limited to modifications to the intake structure, which may occur regardless of this project. Construction would occur during the approved instream work window, which would minimize impacts to downstream salmonid species. However, impacts to aquatic species would be negligible because the intake area is located behind the barrier dam, which is inaccessible to fish with the exception of stray juveniles that make their way downstream from Baker Lake through PSE turbines. Potential increases in sediment and turbidity would be mitigated by the use of a coffer dam and removal of sediment from the dry work area would occur prior to the completion of construction activities. No instream work would be required to install the release/effluent pipeline. No streambank stabilization would be necessary due to the existence of riprap near the trapping facility. The pipeline would be exposed at the outfall allowing a free discharge from the outfall structure to the river below the existing barrier dam.

Raceway Operation and Management
The facility at Baker River would be in operation from October 1 through June 1st as shown in Table 3-20.

Broodstock Collection, Maintenance, and Transport
Returning hatchery steelhead spawners would be trapped at the existing Baker River Trap. The Trap is connected to a fish holding/sorting facility. Hatchery steelhead would be transferred to an existing on-site adult holding pond that is currently used to hold fish that are collected at the PSE/Baker River Trap. Fish would be held for less than 24 hours. Under proposed modifications at the Baker River Trap that would occur with PSE's FERC relicensing activities, the adult holding pond would be equipped with a mechanical crowder to allow for collection of adults for transfer via haul truck to the Marblemount

Hatchery, located about 20 miles away. Although PSE's proposed modifications would improve holding and sorting conditions at the Trap, such modifications are not necessary to accommodate hatchery broodstock as existing facilities are sufficient to trap, hold and sort returning adults.

Juvenile Rearing

Juveniles would be reared in above ground acclimation raceways. Because groundwater is unavailable at the site, surface water would be the primary water source at the facility.

Fish Health Management

Fish health management techniques would be similar to those previously described for the Grandy Creek alternative. In 1994, the IHNV virus was diagnosed in individuals that were reared at the Baker River sockeye net pens, with subsequent high mortality. In 1996, fisheries agencies adopted an IHNV-viral disease management protocol, which dictates the early termination of sockeye fry if they are diagnosed past a threshold level of the disease.

Steelhead yearlings and smolts are less susceptible to the sockeye-strain of IHNV than age 0+ fish or other species and WDFW hatchery winter steelhead have been successfully acclimated at the Baker River Trap for several years without occurrences of IHNV or other diseases (J. Varney, WDFW, pers comm., 3/5/04). However, under conditions of excessive stress the potential for infection does exist and this potential is greater in the Baker River system than at the Grandy Creek site.

Methods and Magnitude of Release

Generally, approximately 60,000 hatchery steelhead smolts are released annually near the mouth of the Baker River (stocking in 2001 exceeded average levels, see Table 3-19). In recent years, the Baker River Trap holding area (referred to as the Baker River acclimation facility) was used to test the feasibility of acclimating steelhead smolts to the river (HSRG 2003). Under the alternative proposal, 334,000 smolts would be released into the Baker River from May 1 through June 1. This increased release could adversely affect juveniles that are barged down from the Baker River reservoirs (Lake Shannon and Baker Lake), including Chinook, coho and sockeye salmon.

Water Gains and Losses

The Baker River alternative facility would operate from October 1 through June 1. Maximum surface water requirements for the facility would be approximately 12 cfs for the months of December through June 1. As discussed in Chapter 2, two options are available for the water supply intake system:

- Option 1 - Permanent intake pump station constructed in conjunction with the PSE improvements to the existing fish trap, holding, and transportation facility.
- Option 2 - Permanent intake pump station constructed separately (by WDFW) with individual fish screens.

Under either water supply alternative, the conveyance line would be tapped upstream of the existing barrier dam on the left bank and buried under the existing access road to the raceways. Discharged water from the proposed raceways would be returned to the Baker River immediately downstream of PSE's barrier dam, resulting in a negligible diversion reach that is not anticipated to impact fish species.

Water Quality

Discharges would meet or exceed federal and state water quality standards and guidelines, and would satisfy all NPDES permit requirements for aquaculture facilities though they would constitute a new source of water quality impact. Important physical properties and chemical constituents in facility effluent would be routinely monitored to assure compliance with water quality standards. Chemicals used to prevent or treat fish diseases would be handled, applied, and disposed of in accordance with state and federal regulations.

Effluent during cleaning operations would be routed to a clarifier pond, where solids would settle and be collected and then disposed of in a local landfill or other permitted disposal site. Effluent discharge from the facility may disrupt the behavior and distribution of individual fish immediately adjacent to and downstream of the site, but the overall impact is not anticipated to affect populations on a watershed scale as discussed under the Grandy Creek alternative.

Water temperatures would not change with use as flows through the raceways would be sufficient to provide rapid turn-over (replacement) of the water volume.

Fish Traps, Ladders and Weirs

The Baker River alternative would utilize PSE's existing Baker River Trap structure for broodstock collection. No new structures would be required. Because all individuals of all species are trapped at the facility, the collection of hatchery steelhead spawners would not increase impacts to aquatic species.

Ecological Interactions

Intraspecific Interactions

Intraspecific interactions would be similar to those presented in the Grandy Creek site alternative. Because the Baker River site is located further upstream in the Skagit (approximately 11 RM upstream of Grandy Creek), returning hatchery spawners would have to travel further upstream through the Skagit, requiring more migratory time to reach their return destination waters in the Baker River. This increase in both the spatial and temporal presence of adult spawners could increase the potential for co-mingling and hybridization with early wild steelhead. Compared with existing conditions, there may be increased impact to intraspecific interactions within the lower mainstem Skagit due to anticipated increased numbers of hatchery adults homing into the lower River.

Compared to the Grandy Creek alternative the potential for adverse impacts to wild steelhead health may increase under this alternative. Because the sockeye strain of IHNV is prevalent in the Baker River, the potential impact on wild fish health and hatchery fish is real. However, operating protocols, including existing incubation practices (isolated incubation, routine disinfection) at the Marblemount Hatchery combined with proposed low-density rearing at the Baker River site, would mitigate for the potential spread of IHNV. Additionally, WDFW hatchery winter steelhead have been successfully acclimated at the Baker River Trap for several years without occurrences of IHNV or other diseases (J. Varney, WDFW, pers comm., 3/5/04)..

Interspecific Interactions

Interactions between released hatchery steelhead and other fish species would be similar to those described for the Grandy Creek site. Currently, approximately 60,000 steelhead are released into the Baker River acclimation facility, which consists of temporary holding troughs or net pens adjacent to the Trap. Increased potential for predation on juvenile Chinook and sockeye (barged down from the Baker River dams), and other salmonids within the Baker River may occur due to the increased numbers of hatchery steelhead smolts into the river. Additionally, if steelhead smolts are released into Baker River, they would be present in the lower Skagit for a longer period of time before reaching saltwater, thus increasing their chance of encountering emigrating juveniles.

Human-Fish Interactions

The Baker River is heavily fished during adult migrations. If this site were chosen for an acclimation facility, there may be an increase of anglers along the banks of the Baker River. This may result in additional harassment of species that are migrating upstream to the Baker River Trap.

MITIGATING MEASURES

Mitigation measures for the Baker River site alternative would consist of Hydroseeding of disturbed areas within the riparian zone and within the facility footprint, where practicable. The existing riparian zone is heavily disturbed and dominated by weedy species that do not function as shading structures. Therefore, replanting disturbed banks with native vegetation would be a significant improvement over existing conditions.

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts of use of the Baker River site would be similar to those presented for the Grandy Creek site. If the Baker River site alternative were chosen, it would result in an increase in the amount of steelhead released into the Baker system. This could impact the availability of habitat and food resources in the Baker River. However, because smolts would not likely hold in the Baker River, but would follow the downstream current to the Skagit River on their seaward migration, this impact is anticipated to be low. Once the hatchery smolts reach the mainstem Skagit, impacts are not anticipated to surpass those that currently occur due to hatchery releases throughout the Skagit.

The Baker River sockeye population is known to carry the sockeye strain of IHNV. Given the position of the Baker River alternative site in the basin, there is a more serious threat of disease spread into the proposed facility. Although hatchery winter steelhead have been successfully acclimated at the Baker River Trap for several years without occurrences of IHNV or other diseases (J. Varney, WDFW, pers comm., 3/5/04), under conditions of stress, the potential for IHNV to infect hatchery steelhead via surface water does exist. However, this potential is lessened by proposed low density rearing and the relative resistance to the disease by steelhead smolts.

Existing low flows at certain times of the year currently impact the system. However, because facility surface water would be returned to the river immediately downstream of the point of diversion, proposed withdrawals would not exacerbate the low flow condition. Flow regulation by PSE would be instrumental in maintaining minimum low flows to support those aquatic species that utilize the Baker River.

3.1.7.3 NO ACTION ALTERNATIVE

If no action were taken, existing co-mingling between hatchery and wild steelhead in the upper and lower Skagit would continue at current levels. The direct release of hatchery smolts would continue at sites throughout the lower Skagit River. Juvenile acclimation and the subsequent collection of returning adults in the lower Skagit River would not occur. Returning adults would continue to migrate into the upper Skagit to reach the Marblemount Hatchery or Barnaby Slough for collection.

3.2 ELEMENTS OF THE BUILT ENVIRONMENT

3.2.1 ENVIRONMENTAL HEALTH (NOISE)

3.2.1.1 GRANDY CREEK ALTERNATIVE

EXISTING CONDITIONS

Regulatory Background

Washington State Noise Limits

Skagit County has adopted the Washington State noise regulations (WAC 173-60). Permissible sound levels are based on the Environmental Designation for Noise Abatement (EDNA) of source and receiving properties. The EDNA is determined based on land use criteria, with residential use being Class A EDNA, commercial use Class B EDNA, and industrial use being Class C EDNA. An acclimation facility at Grandy Creek would be considered a commercial land use, and receiving properties in the immediate area are residential land uses. The primary limits for noise produced at Class B EDNA properties and received at Class A EDNA properties are included in Table 3-21.

Table 3-21. Washington State permitted sound levels for EDNA Class B noise sources and Class A receivers.

Time of Day	Noise Limit
Daytime (7 a.m. to 10 p.m.)	57 dBA
Nighttime (10 p.m. to 7 a.m.)	47 dBA

In any one-hour period, the basic noise limits can be exceeded by 5 dBA for a total of 15 minutes or by 10 dBA for a total of 5 minutes or by 15 dBA for a total of 1.5 minutes.

The noise limits would apply to all equipment operating at the Grandy Creek site during facility operation, and would include trucks operating on the site. The limits do not apply to trucks operating on public roads, which are regulated by noise emission criteria for individual vehicles. Temporary construction noise and emergency or warning beepers are exempt from the noise regulations.

U.S. Environmental Protection Agency (EPA) Region 10 Noise Criteria

The EPA established non-statutory guidelines for land-use compatibility. EPA guidelines are used to evaluate noise increases caused by a project over existing sound levels. Noise increases of 0-5 dB at residential receivers are considered a slight impact, 5-10 dB a significant impact, and over 10 dB a serious impact. These criteria are guidelines only, and have no statutory authority.

Federal Highway Administration (FHWA) and Washington State Department of Transportation (WSDOT) Criteria

Noise from project-related traffic on off-site public roads is exempt from State of Washington noise limits. The WSDOT Noise Abatement Policy and Procedures (1997) consider an increase of more than 10 dBA over existing sound levels a substantial increase and a traffic noise impact.

Grandy Creek Site Existing Noise Environment

As described in Section 2.2 of this DEIS, the Grandy Creek site is essentially unused and includes the remains of a fish hatchery that ceased operation in the 1950s. Unauthorized recreational use of the site occurs, largely for foot traffic access to the Skagit River. There are typically no significant noise sources on-site. Traffic on Cape Horn Road and the noise from flowing water in the Skagit River and Grandy Creek are the dominant noise sources in the immediate site vicinity. Traffic noise from SR20 may also be heard under certain conditions. Noise-sensitive receivers occur adjacent to the Grandy Creek site to the north and to the east.

IMPACTS

Construction Phase

Construction details and sequencing are described in Section 2.2 of this DEIS. Short term noise impacts would occur from operation of construction equipment. Noise levels from construction equipment are projected to be 70-90 dBA, as is typical of construction equipment, at 100 feet from the source. Noise levels at residences along Cape Horn Road near the Grandy Creek site may exceed 60 dBA for short periods during construction.

Vibrational pile driving in association with installation of the proposed groundwater well protection system (see Section 2.2.1.3), and dismantling of existing Birdsview Hatchery structures would likely produce the highest levels of noise. These noise sources, however, would not exceed levels associated with typical construction activities. Piles driving activities would occur over an approximate three week period. Noise during the construction period would be confined to daytime hours. Construction noise is exempt from Washington State Noise Standards contained in WAC 173-60.

Operation Phase

Post-construction noise would be regulated by Washington State noise standards (WAC 173-60). Noise levels at residential receiving properties cannot exceed 57 dBA during the day and 47 dBA between the hours of 10:00 p.m. and 7:00 a.m. Long-term noise sources would be those related to operation of the proposed steelhead acclimation and rearing facility during the months of site operation, including noise from pumps, mixers and, occasionally, generators, as well as WDFW and public site traffic.

As described in Section 2.2.3.4, a backup generator system would be installed in the storage and equipment building to provide power to the facility in the event of a main power failure. The generator would be fitted with a residential-rated exhaust silencer that would meet Skagit County residential noise standards. Field-testing of the noise abatement system would be conducted to ensure the generator system meets the noise control requirements. The air compressor unit would be located within the office/storage building, which would provide noise attenuation for the unit, minimizing noise impacts to a level that meets noise control requirements.

The increase in sound levels corresponding to slight increase in the vicinity traffic volume (see Section 3.2.3) would not be considered a noise impact according to WSDOT and FHWA criteria.

MITIGATING MEASURES

Construction-Related Mitigation

To reduce temporary construction noise associated with the project, contractors would be required to comply with all applicable regulations. The following measures should be employed to reduce construction noise:

- All equipment should have sound-control devices no less effective than those provided on the original equipment. No equipment would have an unmuffled exhaust.
- Equipment should be turned off when not in use and not left idling.
- Piles would be driven via the vibratory method, which significantly reduces noise production compared to traditional methods. Other sound attenuation methods, including the placement of

wooden blocks or other sound dampening material between the hammer and the piling may be implemented during the installation, if hammering is necessary during the final siting of the pilings.

Warning devices such as back-up alarms are exempt from noise regulations.

Operation-Related Mitigation

The backup generator proposed for the Grandy Creek site would be housed within a storage/generator building as shown on Figure 2-4. The proposed air compressor unit would also be housed within the storage building. The resulting sound levels would not exceed noise limits presented in Table 3-21.

Noise from other on-site equipment, such as diesel trucks, may produce a level of noise that would be heard off-site. This would be infrequent, limited to the daytime and during seasonal operations. No additional noise mitigating measures are required.

UNAVOIDABLE ADVERSE IMPACTS

Increases in noise would be unavoidable with project development. Noise levels at the Grandy Creek site boundaries would be in compliance with all state and local noise regulations.

3.2.1.2 BAKER RIVER ALTERNATIVE

EXISTING CONDITIONS

The Baker River alternative site noise environment includes noise from nearby PSE power generation facilities, noise from the Town of Concrete, traffic noise on SR20, noise from nearby residential uses, and noise from Baker River flow. The Baker River alternative site would be considered an industrial site and would be considered Class C EDNA. The noise limit at nearby residential receiving properties would be 60 dBA during the day and 50 dBA at night.

IMPACTS

Impacts related to the implementation of the winter steelhead acclimation and rearing facility on the Baker River site, both construction-related and operation-related would be the same as the Grandy Creek alternative.

MITIGATING MEASURES

Mitigation necessary for identified noise impacts would be the same as for the Grandy Creek alternative.

UNAVOIDABLE ADVERSE IMPACTS

Increases in noise would be unavoidable with project development. Noise levels at the Baker River alternative site boundaries would be in compliance with all state and local noise regulations.

3.2.1.3 NO ACTION ALTERNATIVE

With the No Action alternative, noise associated with development of the Lower Skagit River Steelhead Acclimation and Rearing Facility at either site would not occur. Some traffic-related noise associated with seasonal WDFW fish hauling trucks, along with traffic associated with unauthorized recreational use of the site would likely continue at existing levels.

3.2.2 LAND USE

3.2.2.1 GRANDY CREEK ALTERNATIVE

EXISTING CONDITIONS

The Grandy Creek site is located within Skagit County, west of the Town of Concrete near Birdsview. The 32.7-acre WDFW-owned site is bordered by the Skagit River, and is bisected by both Grandy Creek, in a north-south direction, and by Cape Horn Road, in an east-west direction (Figure 1-2).

The Grandy Creek site was the location of a fish hatchery, the Birdsview Hatchery, operated by the USFWS, from 1905 until it closed in the 1950s (Luttrell 1992). Since the time of closure of the hatchery, no activity has occurred on the site. The site includes an unofficial trail between Cape Horn Road and the Skagit River that is used by area recreational fishermen. The Grandy Creek site is largely overgrown with invasive vegetation that covers concrete building foundations and remnant fish rearing structures.

Existing Land Use

Land uses in the Grandy Creek site vicinity include of a mixture of low-density residential lots, low-intensity pasture land, and undeveloped forested areas. Surrounding parcels range in size from approximately two to forty acres, with average lot sizes at approximately ten acres. Residences are located on all but the Skagit River sides of the Grandy Creek site, with higher densities located along Cape Horn Road. The Birdsview Grange, located on Cape Horn Road, is approximately one-half mile from the site.

The Grandy Creek watershed includes timber production and residential uses. The Grandy Lake State Park is also located within the Grandy Creek drainage basin. Some commercial, primarily retail and service businesses occur along Cape Horn Road.

Land Use Designations

The Skagit County Comprehensive Plan (1997) identifies the Grandy Creek site as rural reserve (RRv). The Comprehensive Plan identifies rural reserve lands as, “all rural areas not designated as natural resource lands or rural intermediate that are not included within an urban growth area or rural village.” The purpose of the rural reserve designation is to allow low-density development and to preserve the open space character of those areas not designated as resource lands or as urban growth areas. Lands that include the rural reserve designation are transitional areas between resource lands and non-resource lands for those uses that require moderate acreage. The Grandy Creek site abuts additional RRv-designated lands to the west, and rural intermediate-designated areas to the west and north (Figure 3-7).

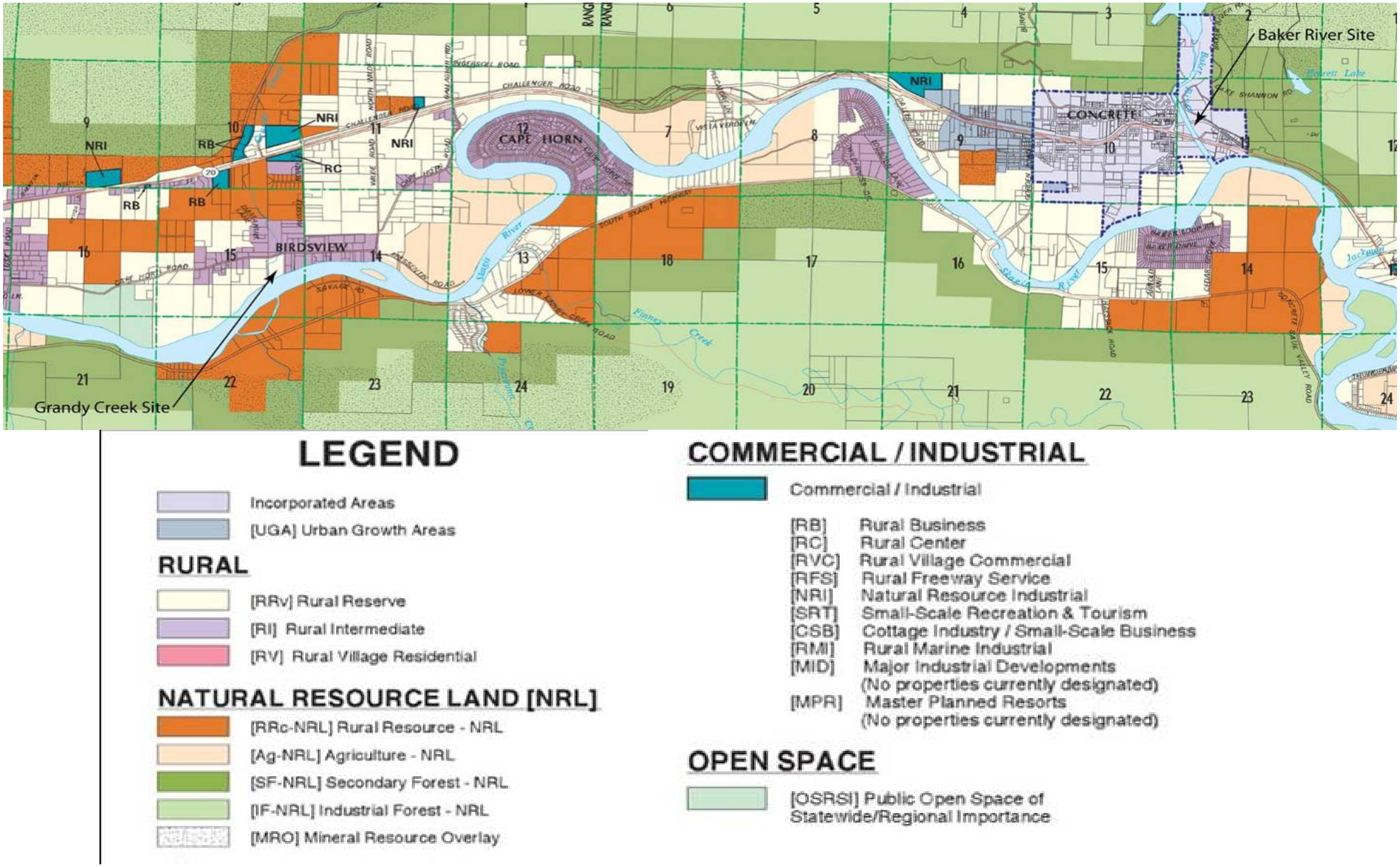

Figure 3-7. Grandy Creek and Baker River Sites, Vicinity Land Use and Zoning Designations.

The 2000 Skagit County Zoning Code [Skagit County Code (SCC) Title 14.16] implements the Comprehensive Plan goals and policies. The Grandy Creek site includes a zoning designation of Rural Reserve (RRv). The RRv zone allows fish hatchery-related activities as a special use requiring Hearing Examiner approval. New residential uses in the RRv zone are intended to be low density and, as such, are limited to a residential lot size of a minimum of 10 acres.

Aesthetics

The Birdsview area is a small settlement consisting primarily of low density residential uses. The views from Cape Horn Road include a mixture of open fields, frame houses, mobile homes, and forested areas. Views along Baker Lake Road, which follows the Grandy Creek drainage corridor to its headwaters include residential uses and forested areas, with steep drop-offs to Grandy Creek.

The Grandy Creek site is primarily forested with a mixture of coniferous and deciduous trees interspersed among the hatchery ruins. No residences occur on the Grandy Creek site. Maple and alder dominate the lower-lying floodplain and riparian areas, while grand fir and cedar predominate the upland, plateau areas. Overgrown domestic shrubs and trees, as well as invasive species occur in the central portion of the site surrounding the abandoned hatchery area. The elevational change on the Grandy Creek site, from the Grandy Creek and Skagit River confluence to the site entrance at Cape Horn Road, is from 115 to 145 feet above sea level, or 30 feet.

The river and creek provide aesthetic variety to the landscape because of the contrast between riparian vegetation and upland forests. The riparian zone provides abundant and unique habitat for wildlife, particularly for many species of birds. The existing forest tends to obscure the remnants of the abandoned hatchery from the casual observer. Existing foundations are overgrown with invasive blackberries, ivy and moss.

Historic and Cultural Preservation

In conjunction with this EIS process, WDFW has requested a records search from the Washington State Office of Archaeology and Historic Preservation (OAHP) in Olympia, Washington to assist in identification of potential impacts to historic and cultural resources. When requested to do so, OAHP reviews records that include ethnographic and historic literature and maps, archaeological base maps and site records, survey reports, and atlases of historic sites on file. The purpose of the record search was to ascertain the extent of previous archaeological surveys in the vicinity of the Grandy Creek site, other than those previously reported by Luttrell in 1992. The Upper Skagit Tribe was also notified of the proposal. An information request to OAHP in 1992 by Luttrell produced no cultural resources filed for the Grandy Creek site and no cultural resources in the project area potentially eligible for National Register.

The relic hatchery complex and a notched log structure were noted during Luttrell's survey on the Grandy Creek site. The log structure is located on the west bank of Grandy Creek, near its confluence with the Skagit River. The four corners of the structure were joined by axe-hewed notching with no metal fasteners. Luttrell (1992) concluded that, due to lack of physical integrity, the log structure and the relic fish hatchery did not appear to be significant cultural resources.

Recreation

Roadways were developed on the Grandy Creek site for fish hatchery-related uses in the early 1900s. The site is gated to discourage public access to site roadways, but an unauthorized recreational use trail occurs between Cape Horn Road and the Skagit River through the site. Recreational fishing occurs adjacent to the site on the Skagit River during all permitted seasons of the year.

Area Park and Recreation Facilities

The Skagit County Parks and Recreation Department operates Grandy Lake Park, located approximately five miles north of the Grandy Creek site, and the Cascade Trail, located between Sedro-Woolley and Concrete, which parallels SR20, less than one-half mile north of the site. The closest Skagit County sport recreation facility is a ballfield complex located at Burlington-Edison High School, operated cooperatively between the High School and the County. State park facilities near the Grandy Creek site include Rasar State Park and Rockport State Park.

- Grandy Lake Park
  Scott Paper Company of Everett, Washington donated the 22-acre site to be used solely for public recreational purposes on December 18, 1979. The park is open for camping from May through October.
- Cascade Trail
  The Cascade Trail is 22.5 miles in length and is located between Sedro Woolley and Concrete parallel to State Route 20. The trail's surface is crushed rock, with parking areas at each end of the trail. The trail is open year round for day use, and includes portable toilets at the trailheads and ten benches along the trail provided by the Boy Scouts of America. The trail was created as a result of the 1983 National Trails System Act that preempts rail corridor abandonment, keeping the corridors intact as trails or for other transportation uses in the future.
- Rasar State Park
  Rasar State Park is a 169-acre camping park with 4,000 feet of freshwater shoreline located along the north shore of the Skagit River in Skagit County, approximately 19 miles east of Burlington. The Rasar Family donated 128 acres for the park 1986. An additional 40 acres adjacent to the park were acquired in 1990 from WDNR. The park is open year-round for camping and day use. The park offers one kitchen shelter with electricity, water, a fireplace, braziers and ADA access and there are several pieces of playground equipment.
- Rockport State Park
  Rockport State Park is a 670-acre camping park in an old growth forest, located eight miles east of Concrete. In 1935, Sound Timber sold the land that now includes the park, with its timber intact, to the state of Washington for $1. Washington State Parks acquired the property from the WDNR in 1961 and opened the park. The park is located at the foot of Sauk Mountain, which includes an elevation of 5,400 feet and a steep but climbable trail to the top.

  The park has eight tent sites, 50 utility sites, one dump station, two restrooms and four showers. The park has 18 standard sites, 20 utility sites with electricity and water (two ADA), eight walk-in sites and three primitive hiker/biker sites, as well as two Adirondack (three-sided) sleeping shelters available to walk-in campers. Sites have no hook-ups. The park provides one kitchen shelter without electricity. The park is closed in the winter from October 28 through April 3. The park's primary recreational offerings include 5 miles of hiking trails, and fishing on the Skagit River.

Fishing

The Skagit River basin is the largest watershed in the Puget Sound basin, providing over 20 percent of the water flowing into Puget Sound (Weisberg and Riedel 1991). The Skagit River is the only large river system in Washington State that contains healthy populations of all five native salmon species (Chinook, coho, pink, sockeye, chum) and two species of anadromous trout (steelhead and cutthroat) (Weisberg and Riedel 1991). More than 25 native fish species also occur in the Skagit River system.

Sport Fishing

Both sport anglers and professional fishing guides access the river and fish from riverbanks and boats during permitted fishing seasons. WDFW maintains six rough boat launch and fishing access sites on the Skagit River between Rockport and Sedro-Woolley to provide fishing opportunity for anglers. The boat launches are located at Faber's Ferry South, Faber's Ferry North, Pressentin Creek, Hamilton, Gilligan Creek and Sedro-Woolley (PSE 2002).

Steelhead fishing is allowed on the Skagit River from the river mouth to SR 536 at Mount Vernon year-round, and from SR 536 to Bacon Creek in the upper Skagit River from June 1 through March 15. Until recently, the area between the Dalles Bridge at Concrete and the Cascade River was open for catch and release game fishing from March 16 and April 30 for protection of wild steelhead spawners. This season has been closed in recent years because of low wild steelhead run sizes

Tribal Commercial Fishing

Tribal commercial fishing for salmon and steelhead is allowed under treaty rights afforded local tribes. The Swinomish, Sauk-Suiattle, and the Upper Skagit Tribes were affirmed fishing rights in the Skagit system under the Point Elliott Treaty of 1855 (Hogan 1995). Tribes are entitled to 50% of the available steelhead stocks, both hatchery-produced and wild, in the river. The wild winter steelhead run in the Skagit River system is fished upon by the Swinomish Tribe in the lower mainstem and Skagit Bay and by the Upper Skagit Tribe and Sauk-Suiattle Tribe in the lower Skagit River (Weisberg and Riedel 1991).

As previously shown in Table 3-15, steelhead run size, including hatchery-produced fish is significantly lower than it was almost 20 years ago. Steelhead harvests are not allowed in any fishery between April and June to protect spawning steelhead.

IMPACTS

Introduction

A facility at the Grandy Creek site would result in the conversion of approximately 3.5 acres of 13.6 acres of the site lying south of Cape Horn Road from mixed forest and disturbed areas to an acclimation and rearing facility for the Skagit steelhead program. It would also provide an additional public access to the Skagit. Facility components and operations are discussed in Section 2.2 of this DEIS.

Construction and operation of the Grandy Creek facility could result in impacts to surface and groundwater, vegetation, and fish species, but such impacts would be compatible with the surrounding land uses. The Grandy Creek site is the location of a relic hatchery facility that operated for approximately fifty years. The proposal, therefore, would not deviate from historical use of the site. Some vegetated portions of the site, however, that were not included in previous hatchery-related uses, would be cleared for proposed acclimation facility use (see Section 3.1.5). Where possible, cleared areas would be revegetated. The proposal would result in a change in land use within portions of the shoreline buffer of the Skagit River and Grandy Creek. Proposed uses within the buffer are shown on Figure 2-2.

<u>Applicable Plans and Regulations</u>
Skagit County has regulatory authority over use of the Grandy Creek site for fish hatchery-related activities. Washington State agencies have regulatory authority over water withdrawal, both surface and ground, in-water work, and water discharge from the site. Federal approvals, including ESA consultation, would be required for in-water work proposed for Grandy Creek. The Skagit County Hearing Examiner would review the proposal's consistency with applicable policies as they relate to use of the site, use of the shoreline, and construction activities. Plans and regulations that relate to approvals required by the federal government, WDOE, WDFW, and Skagit County for the proposal are described below.

Wild & Scenic Rivers Act

The Skagit Wild and Scenic River System was designated in 1978 (by Public Law [PL] 95-625) to include 158.5 miles (38,939 acres) of the Skagit River and three of its tributaries (the Sauk, Suiattle and

Cascade Rivers). The system was designated primarily for its remarkable wildlife. The mainstem of the Skagit River, from Sedro-Woolley 58.5 miles upstream to Bacon Creek, was designated as a recreational river segment. The system is managed by the USFS according to the Final River Management Analysis and Plan: Skagit River (USFS 1983).

If the Grandy Creek site were chosen for the acclimation and rearing facility, USFS personnel may review the proposal to determine compatibility with Section 7 of the Wild & Scenic Rivers Act. This review would occur in conjunction with federal review if in-stream work is proposed for the Skagit River. No in-water work is proposed for the Skagit River; the USFS will decide whether to act in an advisory capacity during USCOE review of the Grandy Creek proposal.

Water Pollution Control Act

The Water Pollution Control Act, RCW Chapter 90.48, empowers the state to develop, maintain, and administer federal statutes and programs required by the federal Clean Water Act. The Clean Water Act of 1977 and its 1987 amendments provide the basis for all federal water quality policy and control actions in waters of the U.S. Surface waters are controlled under Sections 401, 402, and 404 of the Clean Water Act.

- Section 401 of the Clean Water Act ensures that all activities requiring a federal permit comply with the Clean Water Act. Section 401 is administered in Washington State by the WDOE through its water quality certification process (WAC 173-201). Most in-stream construction activities that would create short-term construction-related adverse impacts to water quality require water quality certification and temporary modification of water quality standards.
- Section 402 of the Clean Water Act is a 1987 amendment that regulates stormwater discharge. Section 402 instituted the NPDES permitting process that classifies stormwater runoff pollutants as point-source pollutants under the control of a specific discharger. Section 402 is administered by WDOE.
- Section 404 of the Clean Water Act is administered by the USCOE and regulates discharge of dredged or fill material in U.S. waters, including wetlands.

The state Water Quality Standards (WAC 173-201), implement mandates of the Clean Water Act through the authority of WDOE. The River and Harbor Act of 1899 was enacted to preserve the navigability of the nation's waterways. The Section 10 provisions of the River and Harbor Act prohibit unauthorized obstruction or alteration of any navigable water of the U.S. and limits all structures or work below the mean ordinary water mark of navigable fresh waters. Section 10 of the River and Harbor Act is administered by the USCOE through a permit process that includes consideration of navigation, flood control, fish and wildlife management, and environmental impacts in conjunction with Clean Water Act Section 404 permit processing.

Compliance with Clean Water Act mandates would require a biological assessment for instream work associated with the water intake on Grandy Creek. The assessment of the in-stream work would be coordinated directly with the USCOE.

State Environmental Policy Act

The State Environmental Policy Act (SEPA) (43.21C RCW) was passed to ensure that the environment is considered in state and local regulatory decision-making processes. SEPA is administered at the state level by WDOE through SEPA rules (WAC 197-11) adopted in 1990.

The SEPA process typically begins with a permit application to an agency. Potential adverse environmental impacts are evaluated by the lead agency and distributed to other agencies and affected tribes for comment. If potential environmental impacts are determined to be significant, an EIS is required. The primary purpose of an EIS is to provide decision-makers with adequate information about the likely impacts and proposed and suggested mitigation for permits to be issued. After issuance of an EIS, agencies may act on the permit application(s) or other approvals required for the proposal.

In the case of this EIS for the Lower Skagit River Acclimation and Rearing Facility, WDFW is the SEPA lead agency, as well as the applicant. WDFW decided to proceed directly to EIS preparation in anticipation of significant environmental impacts as a result of the proposal.

Elements of the environment included in WAC 197-11-444 scoped for this project are included in the Fact Sheet of this DEIS. For most of the elements of the environment listed in the Fact Sheet, at least one required permit or approval relies on information provided in the DEIS. Information included in each of these elements is used by one or more decision-makers for issuance or denial of requested permits.

Shoreline Management Act

The Shoreline Management Act (SMA) was designed to protect public resources such as water, fish and wildlife, and supporting habitat by regulating public and private development in shoreline areas. SMA defines shoreline designation; provides guidance to WDOE and local jurisdictions for developing procedures, rules, and plans for shoreline activities; establishes timelines for the development of local shoreline management plans; and identifies activities generally exempt from shoreline permits.

The Skagit County Shoreline Management Master Program (SMP) (SCC Title 14.26) would be applicable to the Grandy Creek facility because of the proposed intake, outfall, and adult collection locations on Grandy Creek (Figure 2-2), along with well location and maintenance along the Skagit River. The Skagit River and Grandy Creek, at the proposed acclimation facility location, include Rural shoreline designations. Rural shoreline designations occur in areas that are low in density and intensity of use, and are maintained to encourage recreation that is compatible with both shoreline and agricultural uses and to prevent shoreline development. At setback of 200 feet from the ordinary high water mark is required for Rural shoreline areas.

Transportation facilities are allowed in the shoreline area; shoreline regulations suggest utilization or expansion of existing transportation facilities or corridors, and require avoidance of shoreline resources. The required shoreline setback for non-arterial, secondary, and access roads within the Rural shoreline designation is 100 feet. An internal maintenance roadway is proposed for inclusion in the Grandy Creek facility plan that would allow access to and maintenance of existing wells adjacent to the Skagit River. The wells occur within 100 feet of the shoreline, requiring construction of the maintenance roadway within 100 feet. The violation of the 100 foot setback for roadways would require a shoreline variance. A shoreline substantial development permit would be required for any activity proposed within 200 feet of the shoreline, including well maintenance and possible new well installation along the Skagit River.

Washington Hydraulic Code

The Washington Hydraulic Code (RCW 75.20.100-140), administered by WDFW, was developed to preserve fish and wildlife habitat in and around state waters. Any work in or around state waters requires Hydraulic Project Approval (HPA) from WDFW if the work is considered a hydraulic project. Hydraulic projects are defined under RCW 75.20.100-140 as work that would use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state. HPA applications may be denied for work that may be irreparably harmful to fish

HPA approval would be required for the water intake, outfall, and adult collection facilities along Grandy Creek, all proposed to occur within the wetted perimeter of the creek.

Wild Salmonid Policy

The Washington Fish and Wildlife Commission adopted a wild salmonid policy (WSP) for WDFW on December 5, 1997. This policy contains fish management and habitat elements for both anadromous and resident salmonids. The overall goal of the policy is to conserve and manage wild salmonids and their ecosystems at a level that sustains fisheries and ecological processes (Phelps 1998). The habitat portion of the WSP outlines habitat conditions necessary for salmon production. The implementation strategies provide an emphasis for local problem solving with citizens, local governments and other state agencies through watershed planning while emphasizing rigorous enforcement of existing applicable laws.

The fish management portion of the WSP seeks to create conditions for increasing local adaptation and stock productivity in situations where it has been reduced. Differential harvest rates on cultured and wild fish and complimentary fish culture strategies are the primary mechanisms for achieving the policy goals. WDFW determined that the Grandy Creek proposal was compatible with their WSP prior to issuing the Determination of Nonsignificance and proceeding to preparation of this DEIS.

Skagit County Comprehensive Plan

The Skagit County Comprehensive Plan was updated and adopted by the Skagit County Commissioners in 1997 to meet mandates of the Washington State Growth Management Act (GMA). GMA was passed by the state legislature in 1990 and amended in 1991 and 1993. GMA was designed to limit population growth to urban areas, maintain fish and wildlife habitat, and retain recreational and resource lands through comprehensive planning and management. GMA mandated that cities and counties develop comprehensive plans to meet GMA goals. GMA Goal 6 encourages the retention of open space and development of recreational opportunities while conserving fish and wildlife habitat and increasing access to natural resource lands and water.

The Skagit County Comprehensive Plan (1997) must meet the goals of GMA’s mandatory plan elements and be consistent with county-wide planning policies. The purpose of the Comprehensive Plan, therefore, is to establish a framework of goals, policies, and action items for detailed growth planning and implementation, including planning for retention of open space and increasing recreational opportunities.

<u>Skagit County Zoning Ordinance</u>

The Skagit County Zoning Ordinance was adopted as Title 14.16 of the Skagit County Code. The zoning ordinance implements the goals and policies of the Comprehensive Plan by regulating physical development throughout the county through provision of allowable uses, density requirements, setbacks, lot clustering and reserve tracts, building setbacks, height regulations, allowable lot coverage, and development standards for each zone district. Zoning for the Grandy Creek site and vicinity is Rural Reserve (RRv). Grandy Creek site development as a fish hatchery-related use would require consistency with the hearing examiner special use requirements of the RRv zoning for the site.

<u>Skagit County Critical Areas Ordinance</u>

The Skagit County Critical Areas Ordinance (CAO) (Title 14.06) became effective in June, 1996. The Critical Areas Ordinance was also developed to meet directives of GMA, providing guidelines for protection and conservation of critical areas such as wetlands, geologically hazardous areas, fish and wildlife habitat conservation areas (HCA), frequently flooded areas, and aquifer recharge areas. The CAO applies to all areas of unincorporated Skagit County.

Critical areas within the area encompassed by the Grandy Creek proposal include the riparian zones of Grandy Creek and the Skagit River, as well as the waterbodies themselves. The site is also considered a geologically hazardous area in terms of the Mount Baker blast zone and the lahar hazard area. Site critical areas would have to be categorized according to the CAO, must be buffered based upon typing and categorization as outlined in the CAO, and must be described in the DEIS. Mitigation for any direct impact or buffer encroachment must also be described. Grandy Creek, as a type 1 Water, includes a Fish and Wildlife HCA CAO buffer of 200 feet. The proposed well maintenance access along the Skagit River would also encroach into the 200 foot HCA setback required for the Skagit River by the CAO Encroachment into these buffers, as contemplated in the Grandy Creek proposal, would require critical areas-specific mitigation. For the Grandy Creek proposal, the mitigation plan would account for HCA impacts.

Skagit County Flood Damage Prevention Ordinance

The Flood Damage Prevention Ordinance, SCC Title 15.20, regulates development in flood hazard areas. The ordinance emphasizes standards for uses within FEMA floodplains. The Grandy Creek site is within a FEMA floodplain and includes an historic Skagit River overflow area. Site activities, including the well maintenance access along the Skagit River and the fish barrier, surface water intake, fish ladder, and right bank access road along Grandy Creek would not require flood-related permits.

Skagit County Roadway Standards

Roadway requirements included in the Skagit County's transportation plan and the Skagit County Design Standards are included in the Grandy Creek site plan. On-site roadways do not require application of roadway requirements because they do not include permanent surfacing. The primary site entry and its intersection with Cape Horn Road would be constructed to commercial roadway standards.

Skagit County Drainage Ordinance

GMA mandated that counties and their cities adopt stormwater guidelines developed by WDOE. The intent of the guidelines is to provide jurisdictional control over stormwater discharge resulting from development activities with the direct result of uniform implementation of reasonable methods of erosion control, flood control, and water quality treatment. Skagit County adopted WDOE stormwater guidelines for both temporary and long-term stormwater management to protect adjacent landowners from flooding, erosion, and pollution related to county project approvals.

Site and roadway drainage and erosion controls, therefore, must be designed to SCC Title 14.36 standards. A proposed drainage plan must be prepared and the resultant impacts and associated mitigation must be discussed in the DEIS.

Skagit County Construction Standards and Sewage Code

Construction Standards, adopted by Skagit County under Title 15, include requirements for building construction as part of the Grandy Creek proposal. The sewage code was adopted by Skagit County under Title 12.05 of the Skagit County Code. Building and septic permits would be applied for after permits and approvals described in the DEIS are in place.

In summary, proposals such as the Lower Skagit River Steelhead Acclimation and Rearing Facility require permits from both state and local authorities. Permits and approvals are required for:

- Shoreline development and encroachment
- Water Quality Certification
- NPDES permit
- Hydraulic Project Approval
- SEPA review
- Critical areas review
- WDOE water well approval
- Skagit County building permit
- Skagit County septic approval

- Skagit County stormwater design approval
- Endangered species consultation
- Clean Water Act 404 permitting.

Issuance of many of these permits is dependent on SEPA approval. HPA approval is not issued until SEPA review is complete, and shoreline permits are generally not issued until all other necessary permits are in place. Fish hatchery activities allowed under special provisions of the Skagit County Zoning Code would require Hearing Examiner approval. Shoreline permits would require Skagit County approval and WDOE concurrence. The proposed on-site septic system would be designed in accordance with Skagit County design criteria, and on-site wells must meet Washington State standards for Group A public water systems (WAC 246-290).

Aesthetics

The visual character of the Grandy Creek site would not change significantly from the existing condition. The central portion of the site now covered by invasive species would be cleared, along with internal roadway and parking areas. A small portion of the riparian buffer along Grandy Creek would be removed for installation of the intake structure planned between the Creek and the acclimation/rearing ponds (Figure 3-6). Views of the site from Cape Horn road would be of a vegetated site with a more developed driveway than currently exists. The rooftop of the proposed storage/generator building may be visible from the roadway. The site as seen from the Skagit River would remain unchanged.

Historic and Cultural Preservation

There are no previously identified historic, cultural, or archaeological resources on the Grandy Creek site that meet the requirements for historic or cultural preservation. No impacts to historic, cultural, or archaeological resources are identified, therefore, for the Grandy Creek site proposal.

Recreation

The Grandy Creek facility would provide improved foot access to the Skagit River for recreational use. A primary goal of the Lower Skagit River Steelhead Acclimation and Rearing Facility proposal, as described in Sections 2.1 and 2.2, is increased angling opportunity in the lower Skagit River. With 334,000 steelhead smolts being acclimated to Grandy Creek, it is expected that a large number of those acclimated smolts would return to Grandy Creek to spawn, providing increased fishing opportunity in the lower river.

Increased winter steelhead fishing opportunity in the lower Skagit River may increase use of county and state park and recreation facilities that provide access to the Skagit River. The Grandy Creek site is not expected to be a recreation destination for hikers or as an educational tour destination and, as such, is not expected to contribute to increased use of area park and recreation facilities for activities other than river access for fishing.

MITIGATING MEASURES

Land Use

Project development would occur only after necessary permits have been obtained from agencies with jurisdiction. The Grandy Creek facility proposal would not result in a change in land use and is an allowed use within the zone with Skagit County Hearing Examiner approval and would, therefore, not require mitigation for land use activities.

Aesthetics

A vegetated buffer would, for the most part, be maintained around the Grandy Creek site and would be augmented over time. Buffer enhancement and replacement is proposed to mitigate for buffer loss associated with pipe corridors to and from Grandy Creek and the well maintenance roadway along the Skagit River. Native vegetation is also proposed to replace existing invasive species. No impacts to aesthetic resources or inconsistencies with the character of the Birdsview area are anticipated for the Grandy Creek proposal and no mitigation would be necessary.

Historic and Cultural Preservation

No historic, cultural, or archaeological resources that require preservation were identified on the Grandy Creek site. It is possible that archaeological resources could be exposed during acclimation pond excavation. In the event of such an exposure, the following measures should be implemented so that any possible archaeological find would be managed appropriately:

- Construction and operations crews should be trained to recognize indications of archaeological sites, along with proper protocol in the event of an archaeological resource exposure.
- The protocol in the event of exposure should include work stoppage and ground-disturbing activities within the vicinity of the discovery until a qualified archaeologist can evaluate the significance of the find.

Archaeological evaluation in the event of artifact exposure would be completed with the assistance of the OAHP, the Upper Skagit Tribe, and any other entities of concern.

Recreation

The proposed facility at Grandy Creek would increase fishing access to the Skagit River bank, improve angling success, and provide limited educational information about the Skagit River steelhead hatchery program. A visitor parking area, information area, and a public trail are included in the site design. Recreational use of the site is not expected to change over the existing condition.

UNAVOIDABLE ADVERSE IMPACTS

No unavoidable adverse impacts to land use or historic and cultural preservation would occur with the proposal. Implementation of the adult collection facility may permanently impact the area allowed for fishing within 400 feet downstream of the collection weir. A slight, unavoidable change in the aesthetic quality of the site would occur, but would not be incompatible with the site vicinity.

3.2.2.2 BAKER RIVER ALTERNATIVE

EXISTING CONDITIONS

Land Use

The Baker River alternative site is located on the east (left) bank of the Baker River on property owned by PSE south of its lower Baker Dam complex. The PSE complex is located within the area bounded by the Baker River, East Main Street, Everett Street and SR 20, and within the Town of Concrete. The PSE property includes six acres that extend from the dam southward to, and slightly beyond, SR 20 in Concrete. The property includes garage, storage and fueling facilities, as well as several abandoned cement silos remaining from a former site use, located to the south of the office complex

Residential and commercial uses are concentrated in the town of Concrete, located across the Baker River from the alternative site. Residential uses also occur north of SR20 near the alternative site. The area north of the PSE complex is forested and used primarily for commercial forest management.

Land Use Designation
The PSE fisheries facilities, visitor center, offices, and maintenance facilities are located in the Town of Concrete Industry zone. The storage yard that incorporates the alternative site is within the Town of Concrete Residential zone. The Residential zone is intended to encourage a high quality of life and high-density development (Town of Concrete, 1998). Permitted uses include single-family residential development, play areas and schools.

The intent of the Industry classification is to provide for the concentration of enterprises that involve retail service and manufacturing features. Allowed uses include auto-related businesses, wood production, varied commercial and industrial operations, eating and entertainment establishments, and storage.

Aesthetics
The PSE facilities that surround the Baker River alternative site include the most prominent constructed features in the area. Lower Baker Dam spans a narrow, steep-sided gorge located at the south end of Lake Shannon. The dam is an arch-type, gray concrete structure approximately 285 feet high and about 570 feet long (PSE 2002). Views of the dam are more extensive from Lake Shannon on the upstream side of the dam, and from elevated viewpoints (PSE 2002). The immediate vicinity of the alternative site includes a powerhouse structure with a sloped roof, a surge tank and an electrical substation. Abandoned concrete silos are also visible near the alternative site.

Historic and Cultural Preservation
Puget Sound Power & Light Company (Puget Power, now Puget Sound Energy) developed the Baker River’s potential for hydroelectric power when it built the Lower Baker Development in 1924-25 in response to increasing development of the Puget Sound region (PSE 2002). The Lower Baker River Hydroelectric Power Plant, including the dam, intake, main pressure tunnel, circular fore bay or surge chamber, branch tunnel, and penstocks, was listed in the National Register of Historic Places on July 7, 1990 (PSE 2002).

Recreation
In addition to the park and recreation facilities described for the Grandy Creek alternative, the Town of Concrete includes two parks and PSE has developed recreational facilities in conjunction with its lower Baker River hydroelectric plant. These recreational facilities include a visitor center and fish handling facility, along with informational exhibits. On nearby Lake Shannon, PSE facilities include a boat ramp, and a 3-acre undeveloped park site with undefined camping areas, a gravel boat launch, and portable toilets (PSE 2002).

The Town of Concrete parks are Old Concrete School Playfield that includes ball fields, a picnic area, and restrooms, and Roadside Park, located near the downtown area, which includes a small lawn and picnic area.

Steelhead fishing described for the Grandy Creek alternative, both in terms of steelhead catch and fishing rules also apply to the Baker River site vicinity.

IMPACTS

Land Use
The Baker River alternative site, if chosen as the location for WDFW's winter steelhead acclimation and rearing facility, would not result in a change in land use. The site is included within PSE's lower Baker

River complex, which includes fish collection facilities described in Section 2.1 of this DEIS. The addition of two rearing raceways would not change either the use or the character of the site.

Land use regulations described for the Grandy Creek alternative, for which permits and approvals for a steelhead acclimation and rearing facility would be required would also apply to the Baker River alternative site. In addition, the Town of Concrete Comprehensive Plan and Zoning Ordinance and shoreline management plan would also apply.

Town of Concrete Comprehensive Plan

The Town of Concrete adopted its Comprehensive Plan in May 1998, in compliance with the Washington Growth Management Act. The Plan's land use designations are used for long-term planning and are applied as zoning districts. The Baker River alternative site is designed at R-residential. The R-residential zones are intended to create a living environment of optimum standards for single-family dwellings and to encourage development of higher densities. Government facilities with the R-residential zone would require a zoning conditional use permit.

Town of Concrete Shoreline Management Program

The Town of Concrete adopted the Skagit County Shoreline Management program to implement state direction for management of shorelines within the boundaries of the Town. Requirements of the Skagit County Shoreline Management Program are described under the Grandy Creek alternative.

Aesthetics

The visual character of the Baker River site would not change from the existing condition if implementation of the winter steelhead acclimation and rearing facility proposal occurs on that site. The acclimation raceway location is now a parking and storage area surrounded by buildings; a change to above-ground raceways surrounded by buildings would not be an appreciable change from viewpoints around the site. A small portion of the riparian buffer along the Baker River would be removed for installation of the intake structure/return piping system planned between the river and the raceways (Figure 2-4). Views of the site from the Town of Concrete would be primarily of trees along the Baker River, a largely unchanged view from the existing condition.

Historic and Cultural Preservation

The lower Baker River hydroelectric plant is listed on the national historic register. The area designated for the steelhead acclimation raceways does not include known historic, cultural, or archaeological resources. No impacts to listed facilities would occur if the steelhead acclimation and rearing facility proposal is implemented on the Baker River alternative site.

Recreation

The proposal is expected to provide increased fishing opportunity in the lower Skagit River. Some fishing would also occur in the Baker River, but fishing is restricted below the existing PSE fish ladder, located at Lower Baker dam. Increased winter steelhead fishing opportunity in the lower Skagit River may increase use of area park and recreation facilities that provide access to the Skagit River.

The PSE site includes recreation facilities designed to provide information on fish handling facilities and power generation facilities on their site. The PSE site tends to be a recreational destination for educational purposes; acclimation facility implementation on the Baker River alternative site may contribute to the educational interest of the PSE site.

MITIGATING MEASURES

Land Use

If the Baker River alternative site is chosen for the winter steelhead acclimation and rearing facility project, development would occur only after necessary permits have been obtained from agencies with jurisdiction. The Baker River alternative would not result in a change in land use and, with a conditional use permit and approval, would be compatible with zoning of the Town of Concrete. Therefore, no mitigation would be required for land use activities.

Aesthetics

Aesthetic impacts would not occur as a result of implementation of the Baker River alternative and would require no aesthetic-related mitigation.

Historic and Cultural Preservation

No historic, cultural, or archaeological resources that require preservation were identified in the alternative location for the winter steelhead acclimation raceways. It is possible that archaeological resources could be exposed during pipeline preparation excavation. In the event of such an exposure, the following measures should be implemented so that any possible archaeological find would be managed appropriately:

- Construction and operations crews should be trained to recognize indications of archaeological sites, along with proper protocol in the event of an archaeological resource exposure.
- The protocol in the event of exposure should include work stoppage and ground-disturbing activities within the vicinity of the discovery should be halted until a qualified archaeologist can evaluate the significance of the find.

Archaeological evaluation in the event of artifact exposure would be completed with the assistance of the OAHP, the Upper Skagit Tribe, and any other entities of concern.

Recreation

Development of a winter steelhead acclimation and rearing facility that would result in adult steelhead returning to the Baker River would provide additional angling opportunity in the lower Skagit River and at the confluence of the Baker River with the Skagit River. No mitigation is required for this increased angling opportunity.

Use of the existing PSE recreational facilities may increase slightly over the existing condition, but would not require mitigation.

UNAVOIDABLE ADVERSE IMPACTS

No unavoidable adverse impacts to land use or historic and cultural preservation would occur with the proposal. Implementation of the adult collection facility may permanently impact the area allowed for fishing within 400 feet downstream of the collection weir. A slight, unavoidable change in the aesthetic quality of the site would occur, but would not be incompatible with the site vicinity.

3.2.2.3 NO ACTION ALTERNATIVE

As with the proposal, the No Action alternative would not result in a change or an incompatibility in land use. Permits required for the proposal would not be necessary. Aesthetic, historic and cultural, and recreation impacts associated with this alternative would not occur.

3.2.3 TRANSPORTATION

3.2.3.1 GRANDY CREEK ALTERNATIVE

EXISTING CONDITIONS

The primary roadway that would be used to access the Grandy Creek site is Cape Horn Road, which is accessed from state route (SR) 20. Westbound vehicles may also use Russell Road or Wilde Road as a connecting roadway between SR 20 and Cape Horn Road. The Grandy Creek site is accessed directly from Cape Horn Road.

- **Cape Horn Road** is a two-lane county road that is essentially east-west oriented with 6-foot gravel shoulders. The posted speed limit is 40 mph through the Birdsview area and is designated as a rural access road by Skagit County.
- **Russell Road** is a two-lane north-south oriented roadway that connects SR20 with Cape Horn Road. Russell Road has a posted speed limit of 35 mph, has a paved overall width of 21 feet, and has gravel shoulders. Russell Road is also designated as a rural access road by Skagit County.
- **Wilde Lane** is a two-lane north-south oriented roadway, located east of Russell Road, which connects SR20 with Cape Horn Road. Wilde Lane has a posted speed limit of 35 mph, has a paved overall width of 20 feet, and has gravel shoulders. Wilde Lane is also designated as a rural access road by Skagit County.
- **State Route 20** is a primarily two-lane unlimited access collector arterial that serves as the primary east-west route through Washington State north of Interstate-5. The speed limit is typically 55 mph adjacent to Birdsview area.

Skagit County roadway surfaces in the Birdsview area are BST chip-seal and are in good condition. SR-20 is asphalt-surfaced and also in good condition.

IMPACTS

Construction Phase Traffic Generation
Traffic associated with the construction phase at the Grandy Creek site would be of relatively short duration. Traffic would consist of haul vehicles for equipment and materials, contractor and employee vehicles, and WDFW supervisory personnel. Total numbers of daily trips would depend upon project phasing, but WDFW expects total vehicle numbers to be low as reflected by the size of the facility proposal. The low trip numbers and the short duration of the construction phase would not result in impacts to vicinity roadways, themselves, or roadway levels of service.

Project Traffic Generation
With development of the Grandy Creek site, a relatively low number of daily truck and employee trips would be generated. Operational materials and fish would be hauled to and from the other Skagit River steelhead hatchery facilities of Marblemount and Barnaby Slough. Haul trucks would carry materials and tank transfer trucks would carry smolts for acclimation to the proposed Grandy Creek facility and adults collected at Grandy Creek to the Marblemount Hatchery.

- Haul trucks would carry an average of 20 tons (40,000 pounds) of feed.
- Transport trucks would have the capacity to haul up to 5,000 gallons of water for the transfer of smolts and 1,000 gallons of water for adult steelhead transfer.

Total truck traffic is estimated at 20-30 trips (inbound and outbound) during typical acclimation season operations, and 10-20 trips during the off-season. Employee trips are estimated at an additional 2 trips per day (inbound and outbound) throughout the year. All loading would occur within the pond and storage areas.

Future project traffic generation would remain unchanged, as the Grandy Creek facility is proposed to be developed in one phase and no changes to the hatchery program as described in Section 2.2 are anticipated.

The anticipated traffic generation for the Grandy Creek site would not impact the existing Skagit County roadway system.

Site Access

The primary access to the Grandy Creek site would occur from Cape Horn Road, which is designed to meet Skagit County commercial access standards. Commercial vehicles currently utilize Cape Horn Road for access to local housing and utility lines. This primary access would include a visitor parking area and would be gated beyond the parking area. The parking area would include two handicapped-parking spaces and 12 additional spaces for visitor and recreational parking. Public foot traffic would be allowed on-site in designated areas between the parking area and the Skagit River.

A secondary access would be provided to the west abutment of the adult collection barrier from an existing access road extending from Cape Horn Road, located in the northwesterly portion of the site. The secondary access road is overgrown and would require clearing and reconstruction. The access road entrance is located approximately 150 feet west of the Grandy Creek bridge on Cape Horn Road. A new vehicle gate would be installed at the access road west of Grandy Creek, which would provide access for WDFW employees only. The entrance would be designed in accordance with Skagit County roadway standards. Usage on this road would be minimal, estimated at 12 trips (inbound and outbound) per year.

MITIGATION

Because the proposal would have no effect on Skagit County roadway systems, mitigation would only be necessary for design and construction of the connections to the system. Site access must be designed to Skagit County standards.

Additional suggested mitigation would include implementing appropriate on-site truck cleaning facilities during site clearing and construction activities to minimize the tracking of mud and dust onto public access roads, and to assure roadway cleaning as necessary.

UNAVOIDABLE ADVERSE IMPACTS

None are identified.

3.2.3.2 BAKER RIVER ALTERNATIVE

EXISTING CONDITIONS

SR 20 is the primary travel route through the Town of Concrete. Skagit County highways and local streets intersect SR 20 and provide access throughout the town and its vicinity. Access to the PSE-owned lower Baker River facilities is provided by local streets. These streets include Everett Street and East Main Street which intersect SR 20 at the east end of Concrete or Dillard Avenue from the downtown Concrete area.

PSE maintains access roads within the operations complex, along the east bank of the Baker River to the PSE powerhouse, and to several support facilities at the east abutment to the dam (PSE 2002).

IMPACTS

Project Traffic Generation

During construction, approximately 500 trips to haul excavated material from the site would be required. Similarly, approximately 100 trips to haul fill gravel to the site would be necessary. It is anticipated that excavated materials would be transported to a local licensed quarry or landfill. Generated trips are not anticipated to impact local traffic due to the limited amount of trips and the relative low traffic volumes on Highway 20.

Implementation of the Baker River site alternative would generate the same number of trips for equipment and fish transport as the Grandy Creek alternative, both existing and future.

The proposal would not result in a significant increase in trips on town, county, and state roadways and no impacts, therefore, have been identified to the roadway system surrounding the project site.

Site Access

No modifications for PSE's existing internal roadway system would be required with implementation of the Baker River site alternative. An existing gravel access road and parking area would be utilized with minimal required improvements.

MITIGATING MEASURES

Because the proposal would have not effect on the surrounding roadway system, no mitigation would be necessary.

As with the Grandy Creek alternative, additional suggested mitigation would include implementing appropriate on-site truck cleaning facilities during site clearing and construction activities to minimize the tracking of mud and dust onto public access roads, and to assure roadway cleaning as necessary.

UNAVOIDABLE ADVERSE IMPACTS

None are identified.

3.2.3.3 NO ACTION ALTERNATIVE

With the No Action alternative, there would be no hatchery-related traffic associated with either the Grandy Creek or Baker River sites. The No Action alternative would have no effect on the Skagit County roadway system.

3.2.4 PUBLIC SERVICES AND UTILITIES

This section addresses potential impacts on public services and utilities that may result from the Grandy Creek proposal. Public services include police, fire, and emergency medical services. Electrical is the only utility that may be impacted by the proposal.

3.2.4.1 GRANDY CREEK ALTERNATIVE

EXISTING CONDITIONS

Police Service

Approximately 58,000 people reside in unincorporated Skagit County. The Skagit County Sheriff's Office and the Washington State Patrol provides police protection services for this population within unincorporated Skagit County, as well as some incorporated cities without law enforcement within the county.

The Skagit County Sheriff's Office maintains an upriver detachment on SR20 near Sedro-Woolley. The detachment consists of 4 patrol deputies and one patrol sergeant. The upriver detachment is supported by the main Skagit County Sheriff's Office in Mount Vernon. The Skagit County Sheriff's Office usually divides the county into four patrol zones. Each zone is patrolled by one deputy per eight-hour shift. The Sheriff's upriver headquarters provide that a deputy is within the Birdsview and Concrete areas continuously, which would result in an approximate response time of five minutes to the Grandy Creek site. The primary Sheriff's Office headquarters in Mount Vernon are approximately 25 miles from the Grandy Creek site. In the unlikely event that response would be required from the Mount Vernon area, response time would vary depending on the location of the responding officer, but would likely be 25 minutes if lights and sirens are used, and 45 minutes without (W. Dowhaniuk, Skagit County Sheriff's Office, pers comm., 7/7/03).

The Washington State Patrol patrols and responds to activities on state routes and interstates within Skagit County, including SR20 in the Birdsview and Concrete areas. The State Patrol includes 16 troopers and two sergeants assigned to Skagit County. Approximately one-third of all staff is on duty at any given time, and minimum staffing would include two troopers. The State Patrol station for Skagit County is located near the I-5/Cook Road exit. The State Patrol is responsible for traffic violations and patrols SR20 near the Grandy Creek site in autonomous patrol zones. The State Patrol would not respond to calls related to the Grandy Creek site, as it is not located on a state route, but does respond to calls related to activities on SR20, located approximately three miles from the Grandy Creek site.

Fire Protection Service

Outside of the urban areas of Anacortes, Burlington, Mount Vernon, and Sedro Woolley, Skagit County has 33 fire protection districts. These rural fire departments are almost entirely volunteer staff. Skagit County's fire districts are part of a countywide mutual aid agreement that allow any fire district to help another in its jurisdiction. Some jurisdictions also have automatic response agreements that allow one jurisdiction to respond to particular types of service calls or calls within a specific geographical area. These agreements are generally used in areas that are difficult to reach, or areas that might have specific needs, such as ladder trucks. Skagit 911 provides communication services for 28 of the 33 fire protection districts.

The Grandy Creek site is located within Skagit County Fire District 10 (Birdsview Fire District). Fire District 10 encompasses the area between SR20 and Cape Horn Road, with the west boundary of the district as the SR20/Cape Horn Road intersection and Challenger Road as the east district boundary (M. Donnelly, Fire District 10, pers comm., 7/3/03).

Estimated response time (turnout time plus travel time) to the Grandy Creek site would be 7 minutes from the Birdsview fire station, located on Russell Road near its intersection with Cape Horn Road (M. Donnelly, Fire District 10, pers comm., 7/3/03). Mutual aid for Fire District 10 is provided by Fire District 8. The closest Fire District 8 station to Fire District 10 is located east of the Town of Lyman near the intersection of SR20 and Cabin Creek Road. Fire District 9 employs a full time fire chief. Response time from the Fire District 8 station would be approximately 15 minutes (M. Donnelly, Fire District 10, pers comm.7/3/03). Fire District 10 also includes a station in Grassmere, located on SR20 near its intersection with Grassmere Road; response time from the Grassmere station would be approximately 10 to 15 minutes (M. Donnelly, Fire District 10, pers comm., 7/3/03).

Fire District 10 is an all-volunteer district comprised of 23 volunteers. The Fire District 10 station located on Russell Road houses the following equipment:

- 1,000 gallon Tanker Truck
- 750 gallon Tanker Truck
- Portable pump
- 10,000 gallon water storage tank

Call responses by Fire District 10 primarily include motor vehicle accidents on SR20 and the Baker Lake Highway (80%), outdoor fires such as brush fires and grass fires or fires started from outdoor burning (10%), and structure fires (10%). Structure fires are primarily chimney-related and seldom include full structure involvement (M. Donnelly, Fire District 10, pers comm., 7/3/03).

Emergency Medical Service

Skagit County's Emergency Medical Services system is a network of emergency personnel directed toward the delivery of immediate care to victims of sudden and serious illness or injury (Skagit EMS Council 2002). Calls to 9-1-1 activate the emergency system elements, including fire departments, emergency medical technicians, paramedics, search-and-rescue units, emergency aircraft, and hospital emergency departments.

The emergency medical service system has come to be known as Medic One. Skagit County Medic One is a countywide system that cares for the emergency medical needs for the county and is managed by the Skagit Emergency Medical Services (EMS) Commission. Medic One services in the Birdsview and Concrete areas are provided by Aero-Skagit Ambulance Service (Rantschler 2003). The Med 7 Advanced Life Support (ALS) unit is based in Concrete. This unit covers all up river calls east of Lyman, often by themselves, but also in conjunction with Skagit County Sheriff's deputies, Washington State Patrol, and local fire departments. Fire District 10 is not considered a first responder and does not go on aid call or accidents unless specifically requested (Intercept Northwest 2001). The Med 10 ALS unit is also based in Concrete; this unit is an unmanned backup ALS unit for Med 7. Med 10 is staffed by people on pagers if there is a second call in Med 7's service area (Intercept Northwest 2001).

The Aero-Skagit ambulance response time to the Birdsview area is typically 20 minutes (M. Donnelly, Fire District 10, pers comm., 7/3/03).

Electrical Service

PSE provides electricity and a range of energy related services to homes and businesses throughout the Puget Sound area, including Skagit County.

Both single phase and three-phase power are available on Cape Horn Road. Overhead single phase power occurs on-site as part of the remains of the Birdsview Hatchery and is distributed along three power poles. The lines have not been in use since the 1950s.

IMPACTS

Construction-related impacts on public services and utilities would be similar to operational impacts for the proposal. Individual providers would determine utility connections when utilities are ordered for the Grandy Creek site.

Police Service
The impact on the sheriff's office would be low. Based on hatchery-related traffic activity (see Section 3.2.3), traffic increases as a result of the proposal would be negligible. Police service calls that currently occur in the Birdsview vicinity would be unlikely to increase; the sheriff's office expects minimal, if any, impacts on the local community with implementation of the proposal (W. Dowhaniuk, Skagit County Sheriff's Office, pers comm., 7/7/03).

Fire Service
It is unlikely that the proposal would increase the number of calls for fire services. Call-outs predicted by the fire department primarily include vehicular accidents and grass/brush fires. As described in Section 3.2.3, traffic associated with the Grandy Creek facility would increase negligibly. Hatchery-related traffic would be unlikely to create traffic congestion, vehicle accidents, or slower emergency response times.

Emergency Medical Services
Emergency situations related to heavy equipment use during the site development and construction phase can occur that could require emergency medical service. Both construction and operational phases of the proposed Grandy Creek facility, however, would be unlikely to increase the need for emergency medical service in the Birdsview area.

Electrical Service
Site equipment, as described in Section 2.2 of this DEIS, would be serviced with underground transmission lines. The existing power grid can provide adequate service for the power consumption estimated for the Grandy Creek site.

MITIGATING MEASURES

Police, Fire, Emergency Medical Services
The following mitigation may aid in reduction of police and fire service call-outs:
- Site access control should be provided (see Section 2.2.9).
- Security service provision during non-working hours (see Section 2.2.9).
- Emergency medical stations and training implemented as part of the site's emergency response plan.

Electrical Service
No mitigation for electrical service would be necessary.

UNAVOIDABLE ADVERSE IMPACTS

No significant unavoidable adverse impacts on public services and utilities are expected as a result of the proposal.

3.2.4.2 BAKER RIVER ALTERNATIVE

EXISTING CONDITIONS

Police Service
The Concrete Police Department has three full-time officers and offers 24-hour protection seven days per week. Response time to the Baker River site would be five minutes or less.

Fire Service
Concrete's Fire Department is manned by a volunteer crew, consisting of 25 members in four squads. The department includes four captains, two lieutenants, and one chief. The Concrete fire station houses the following equipment:

- 1,000 gallon Tanker Truck
- 750 gallon Tanker Truck
- 500 gallon Backup Truck
- Portable pump
- 10,000 gallon water storage tank

Emergency Medical Service
Aero-Skagit Ambulance Service provides emergency medical response to the Town of Concrete and other portions of Skagit County as described for the Grandy Creek alternative. The Aero-Skagit ambulance response time within the Town of Concrete is typically 5 minutes or less (citation).

Electrical Service
The Baker River alternative site is located on the grounds of the PSE Lower Baker River electrical generation facility. Electricity for the PSE grounds and operations is provided by the dam and generation operation. PSE would be able to meet the electrical needs of the proposal at the proposed location.

IMPACTS

Police Service
The impact on the Town of Concrete Police Department, the Skagit County Sheriff's office, or the Washington State Highway Patrol would be negligible. Traffic increases as a result of the proposal would not be noticeable. The site would be fenced and secured. Police service calls would be unlikely to increase over the existing condition.

Fire Service
It is unlikely that the proposal would increase the number of calls for fire services.

Emergency Medical Services
Emergency situations related to heavy equipment use during the site development and construction phase can occur that could require emergency medical service. Both construction and operational phases of the facility at the Baker River site, however, would be unlikely to increase the need for emergency medical service in the Town of Concrete.

Electrical Service
No impacts to electrical service would occur as a result of implementation of the Baker River alternative for winter steelhead acclimation and rearing facility siting.

MITIGATING MEASURES

Police, Fire, Emergency Medical Services
No mitigation for police, fire, or emergency medical services would be necessary as a result of implementation of the Baker River alternative.

Electrical Service
No mitigation for electrical service would be necessary.

UNAVOIDABLE ADVERSE IMPACTS

No significant unavoidable adverse impacts on public services and utilities are expected as a result of implementation of the Baker River alternative.

3.2.4.3 NO ACTION ALTERNATIVE

As with the proposal, the need for police, fire, or emergency medical services would not be necessary with the No Action alternative. No changes to existing electrical service would be necessary.

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GLOSSARY

Acclimation. Acclimation is a process that is used to allow fish to gradually adjust to, and chemically imprint on the water in which they are reared in the months prior to release. The fish will then return to that water source in their adult migration more reliably than if they were released at a site different from where they were reared.

Acclimation site. Sites at which young fish are held in artificial ponds to allow them to imprint to that water so that they return to that place to spawn.

Acclimation site. Sites at which young fish are held in artificial ponds to allow them to imprint to that they return to that place to spawn.

Adipose-clipped. Refers to a missing adipose fin (a small fin located behind the dorsal fin and in front of the caudal fin), which indicates the fish was produced in a hatchery

Alleles. All alternate forms of the same gene, including the "normal" form; analysis of alleles is used to compare the genetic differences among species.

Allozyme. Alternate allelic forms of a protein (typically differentiated by electrical charge resulting from amino acid substitutions due to allelic differences)

Alluvium. Sediment deposited by flowing water, as in a riverbed, flood plain, or delta.

Anadromous. A species reared in fresh water, lives in the ocean for part of the life cycle then returns to fresh water to spawn.

Brail. A small net for drawing fish from a trap

Broodstock. Fish that will be spawned to create hatchery stock.

Carrying capacity. The maximum number or biomass of fish that could potentially be supported by a given habitat, as determined by prevailing physical, chemical, and biological conditions.

Chinook (*Oncorhynchus tshawytscha*). Also called king, tule, or bright salmon.

Coho (*Oncorhynchus kisutch*). Also called silver salmon.

Colluvium. A loose deposit of rock debris accumulated through the action of gravity at the base of a cliff or slope.

Condition factor. Ratio of fish weight to length cubed.

Direct-released. Release of smolts directly into a waterbody without acclimation to that waterbody

Domestication. The process by which, over time, genetic traits are selected that benefit fish in a hatchery setting rather than the natural environment

Electrophoresis. Method using electric current to move molecules (often proteins) through a medium; used to determine genetic differences among individuals

Empirical. Based on observation or experience.

Escapement. Fish that are allowed to spawn naturally (as in, *escapement* from sport, tribal and commercial fishing).

Evolutionarily significant unit. A population or group of populations that is considered distinct (and hence a "species") for purposes of conservation under the ESA. To qualify as an ESU, a population must: (1) be reproductively isolated from other conspecific populations; and (2) represent an important component in the evolutionary legacy of the biological species.

Eyed-eggs. Life stage of a fertilized egg between the time the eyes become visible and hatching occurs.

Fingerling. Stage from the time of disappearance of the yolk sac up to nine months of age and generally two to four inches in total length; also called **parr**

Fluvial. Migrating between smaller streams and larger rivers.

Fry. Juvenile salmonid life stage following absorption of yolk sac.

Geomembrane. Woven or non-woven load-bearing fabric used for construction purposes

Hatched fry. Stage from hatching through fourteen days after the beginning of feeding

Homing. Navigational behavior that guides species during migrations.

Hybrid. Offspring of mating between two types of organisms (in the context of this DEIS: hatchery and wild parents)

Hydrophytic. Water-liking; specifically in this DEIS, a plant that is adapted to survive in saturated soils and anaerobic conditions

Imprinting. The process by which e.g. salmon fry remember their home stream to which they return to spawn as adults. In the hatchery setting, a juvenile fish rearing and release process applied in an artificial propagation program to promote recognition, and high fidelity, of returning adult fish to the waterbody of release.

Indigenous. Occurs naturally in an area or environment.

Insectivores. Mammals whose diet is comprised primarily of insects

Interspecific. Pertaining to interactions of individuals of different species

Intraspecific. Relating to or occurring between members of the same species

Introgression. The introduction of an allele (or a gene) from one group (species or population) to another. Introgression can lead to loss of, or changes in, population identity including loss of diversity among populations, characteristics of adaptation with populations, or of other evolved features of genetic organization (may occur through crossbreeding)

Kelts. Repeat spawners

Neritic. Relatively shallow water zone in oceans or seas that extends from the high-tide mark to the edge of the continental shelf

100-year floodplain. That portion of a river valley adjacent to the stream channel which is covered with water when the stream overflows its banks during a 100-year flood event. A 100-year flood event is one that has a 1 in 100 chance of happening in any given year.

Parr. Juvenile salmonids develop bar-shaped marks on their sides called parr marks between becoming fry and smolting.

Pathogen. A disease-causing agent.

Population. A group of individuals of a species living in a certain area.

Population viability. The overall condition and long-term probability of survival of the population.

Predation. The harm, destruction, or consumption of a prey organisms by an animal predator.

Production. Number of individuals produced from a natural environment or fish culture facilities.

Raceway. Holding area or rearing facility (generally concrete, long and narrow) for juvenile or adult salmonids in a hatchery.

Redd. A salmon nest.

Resident. Present year round (not migratory).

Residualize. A process in which salmon fail to migrate to the ocean and instead remain in their natal watershed throughout their lifetimes

Riparian zone. Any land and associated vegetation that adjoins, directly influences, or is influenced by a body of water. Associated with watercourses such as streams, rivers, springs, ponds, lakes, or tidewater.

Salmonid. Belonging to the family Salmonidae, i.e., salmon, trout, steelhead, whitefish.

Sensitive species. Those plants and animals identified by the Regional Forester (USFS) for which population viability is a concern as evidenced by significant current or predicted downward trend in populations or density and significant or predicted downward trend in habitat capability.

Seral. Of or relating to dry habitats.

Sluice. An artificial channel for conducting water, with a valve or gate to regulate the flow

Smolt. Juvenile salmon undergoing metamorphosis into a saltwater fish, usually during the downstream migration period

Smoltification. The physical and chemical process which salmonid parr undergo as they prepare to migrate downstream and enter salt water.

Species. A group of interbreeding individuals not interbreeding with another such group; similar, and related species are grouped into a genus.

Species of concern. Native species that are either low in number, limited in distribution, or have suffered significant population reductions due to habitat losses.

Steelhead. The sea going rainbow trout, reclassified in the same genus as Pacific salmon in 1989.

Stock. A distinct genetic unit of fish within a species

Subbasin. Subdivision of a larger drainage basin. The drainage or catchment area of a stream which along with other subbasins make up the drainage basin of a larger stream.

Substrate. The material comprising the bed of a stream.

Subyearling smolts. Juvenile salmonids that physiologically mature and migrate to the ocean when less than one year old; e.g., certain stocks of fall and summer Chinook.

Supplementation. The use of artificial propagation of a wild stock in the attempt to maintain or increase natural production while maintaining the long-term fitness of the target population, and while keeping the ecological and genetic impacts on non-target populations within specified biological limits.

Thalweg. The line defining the lowest points along the length of a river bed or valley.

Volitional. Of one’s own accord.

Weir. A fence or a barrier placed in a stream to catch, retain or count fish.

Wild fish. A fish that has not spent any part of its life history in an artificial environment and is the progeny of naturally-reproducing salmon regardless of their parentage.

Appendix A

Project Goals and Objectives Matrix for Alternatives Analysis

Project Goals and Objectives Matrix for Alternatives Analysis

	Alternative	Does Alternative Meet the Project Goals?	Does Alternative Reduce Hatchery/Wild Fish Interaction?	Does Alternative Better Acclimate Hatchery Fish to the Lower Skagit River?	Does Alternative Improve Adult Hatchery Fish Collection Opportunity in the Lower Skagit River?	Does Alternative Increase the Distribution of Hatchery Adult Return Areas?	Does Alternative Meet the Physical Requirements for Meeting the Project Goals?							
							Water Temperature 42˚F to 65˚F?	Low Water Turbidity?	Water Flow at 15 cfs Minimum?	Topographically Conducive to Acclimate Pond Siting?	Adequate Access and Transportation Network?	Public Services and Utilities Available?	Out-Of-Floodplain Structure Siting Possible?	Site At Least 6 Acres?
1	Grandy Creek acclimation pond and adult collection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2A	Baker River near PSE office below adult collection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**No**	Yes	Yes	Yes	**No**
2B	Baker River - two sites near the confluence of the Baker and Skagit rivers and are near the Little Baker River side channel project.													
	Site 1 - Upstream/upland site 3.7 acres cleared	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**No**	Yes
	Site 2 - Downstream site 1.2 acres cleared near confluence						Yes	Yes	Yes	Yes	Yes	Yes	**No**	**No**
3	Elimination of hatchery steelhead production or release in the lower Skagit River; conduct hatchery operations and release in the upper river only	**No**	Explanation: The Goals predicate distribution of hatchery steelhead in the lower Skagit River for increased harvest distribution.											
4	Explore the limiting factor (habitat) associated with wild steelhead and solve that problem instead of increasing hatchery program	**No**	Explanation: The Goals include increased returns of adult hatchery steelhead, not wild steelhead which cannot be harvested.											
5	Explore a facility that would address the needs of multiple species instead of targeting a single species	Yes	Will discuss in the EIS. Use for other species, if contemplated in the future will be addressed at that time with a supplemental EIS.											
6	Explore the possibility of making Marblemount and Grandy Creek the primary facilities and closing Barnaby Slough and rehabilitate into a natural site	Yes	Yes	Yes	Yes	**No**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	Removing hatchery system from Skagit River basin	**No**	Explanation: The goals predicate continued presence of hatchery steelhead in the Skagit River.											
8	Fix passage issues at Marblemount instead of building Grandy Creek facility	**No**	Explanation: The alternative does not address the first goal of increasing returns of adult hatchery steelhead.											
9	Create natural spawning areas and spawning channels for wild steelhead propagation at Grandy Creek, off-channel habitat	**No**	Explanation: The alternative does not address the first goal of increasing returns of adult hatchery steelhead.											
10	Remove hatchery production from Skagit River and impose more regulations on anglers, such as releasing all wild fish, no fishing from boats, using boats for transportation only, etc, to minimize stress on wild fish	**No**	Explanation: The goals predicate continued presence of hatchery steelhead in the Skagit River.											
11	No Action. Status quo; release 1/4 of Skagit winter steelhead from Marblemount, 1/4 from Barnaby, 1/2 from haul truck in lower river (not just Grandy site). All releases non-volitional, adults trapped, spawned, and reared at Marblemount.	**No**	Although this 'No Action' alternative must and will be considered, the alternative does not address the goals of the project.											
12	Alternative fish culture methods such as lower rearing densities, fluctuating flows, objects in the raceways (cover) natural foods and natural food presentation.	Yes	Not considered an alternative. Any or all of these features can be incorporated into rearing strategies for the facility.											

Project Goals and Objectives Matrix for Alternatives Analysis

	Alternative	Does Alternative Meet the Project Goals?	Does Alternative Reduce Hatchery/Wild Fish Interaction?	Does Alternative Better Acclimate Hatchery Fish to the Lower Skagit River?	Does Alternative Improve Adult Hatchery Fish Collection Opportunity in the Lower Skagit River?	Does Alternative Increase the Distribution of Hatchery Adult Return Areas?	Does Alternative Meet the Physical Requirements for Meeting the Project Goals?							
							Water Temperature 42˚F to 65˚F?	Low Water Turbidity?	Water Flow at 15 cfs Minimum?	Topographically Conducive to Acclimate Pond Siting?	Adequate Access and Transportation Network?	Public Services and Utilities Available?	Out-Of-Floodplain Structure Siting Possible?	Site At Least 6 Acres?
13	O'Toole Creek - tributary to the Skagit River on south bank of river, approximately 2 miles downstream of Grandy Creek	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**No** Surface water 3.6 cfs in Nov. '02 Well water Needed	Yes Maybe marginal due to steep gradient	Yes	3 phase power is unknown	Yes South side of Skagit Highway maybe out of floodplain	Yes Land available for sale in area. Land purchase from O'Toole to Cumberland by Land Trust Company then to USFS for inclusion in the Wild and Scenic River Program
14	Cumberland Creek - tributary to the Skagit River on the south bank approximately 5.5 miles downstream of Grandy Creek.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**No** Surface water 1.2 cfs in Nov. '02 Well water needed	Yes	Yes	3 phase power is unknown	Yes South side of Skagit Highway maybe out of floodplain. Limited acreage ~5 ac. North of Highway out of floodplain	Unknown
15	Baker Lake Sockeye Spawning Beach area	**No**	Explanation: Limited rearing facility area available. Smolts reared at this site will have to be trucked below the dams to maximize survival. Acclimation and imprinting to the Baker River will not be achieved. Smolts directly released from the facility will have to migrate through the dam, and some may residualize in the lake environment. High outmigration mortality and low smolt to adult survival is anticipated.											

Appendix B

DEIS Distribution List

DRAFT ENVIRONMENTAL IMPACT STATEMENT
DISTRIBUTION LIST

This list is made up of governmental agencies per WAC 197-11-455 and those others who responded to the Department of Fish and Wildlife's invitation to the public to request a DEIS.

FEDERAL

US Army Corps of Engineers, Seattle District
US Dept of Commerce, NOAA-Fisheries
US Environmental Protection Agency, Region 10
US Fish & Wildlife Service, Western WA
US Forest Service, Olympia & Mt Baker-Snoqualmie National Forest
US National Park Service
US Dept of Transportation

STATE AND COUNTY

Puget Sound Action Team
Skagit Conservation District
Skagit County Board of Commissioners
Skagit County Planning & Permit Center
WA Dept of Ecology Environmental Review (2 copies)
WA Dept of Health
WA Dept of Natural Resources SEPA Center
WA Dept of Transportation
WDFW Region 4 Office
WA Parks and Recreation Comm., Rasar SP

CITY GOVERNMENT

City of Burlington
Town of Concrete
Concrete Fire Dept
Concrete Schools
Town of Hamilton
City of Mount Vernon
City of Sedro Woolley

PUBLIC LIBRARIES

Burlington Public Library
Concrete Public Library
Mount Vernon Public Library
Sedro Woolley Public Library

TRIBES

Lummi Tribe
Nooksack Tribe
Northwest Indian Fisheries Commission
Skagit River Systems Cooperative
Suquamish Tribe
Swinomish Tribe
Upper Skagit Indian Tribe

PRIVATE ORGANIZATIONS

Clark-Skamania Flyfishers
Federation of Fly Fishers, Steelhead Committee
Fisher & Sons, Inc.
Fish-Pro
Friends of the Earth
Birdsview Grange
King County Outdoor Sports Council
Long Live the Kings
Northwest Ecosystem Alliance
Northwest Marine Trade Association
Pierce County Sports Council
Pilchuck Audubon Society
Puget Sound Energy Inc
Salmonid Foundation
Seattle Real Estate Dev Historic Dearborn House
Sierra Club, Cascade Chapter
Skagit Audubon Society
Skagit Fisheries Enhancement Group
Skagit Surveyors
Skagit Conservation District
Skagit Fisheries Enhancement Group
Skagit Watershed Council
Smith & Lowney, Rick Smith Attorney
Snohomish Sportsmen=s Club
South King Co. Chapter of Trout Unlimited
Steelhead Trout Club of Washington
Trout Unlimited, Stillaguamish Valley 356
Washington Environmental Council
Washington Fly Fishing Club
Washington Trout

Washington State Library (2 copies)

Whatcom Trout Unlimited
Wild Salmon Center
Wild Steelhead Coalition
Wildcat Steelhead Club

CITIZENS

Appy, Marcus
Bee, Gary
Bennett, Greg
Boynton, Hal
Brashears, Brenda, Brian, Joseph
Brown, Dennis
Buckles, Ay
Buehrens, Thomas
Calhoun, John Stuart
Church, Denny
Clever, Richard
Croft, Michele
De Bauge, Ted
De Yonge, Sonja
Debow, Rob
Diaz, Philip
Fescher, Baily
Freet, Bruce
Gades, Anthony M.
Gallagher, John
Granger, Robert F.
Haight, Lawrence
Haight, Lawrence, Jr.
Hebert, Al
Hopper, Alan S.
Huddleston, Robert
Johnson, Jeff
Kitzman, Camile

CITIZENS

Kratochvil, Kevin
Kukowski, Mike
Kuschner, Jane
Lapansky, Janice
Lavier, Chuck
McGowan, Jeff
McLachlan, Brian A.
Norton, Dee W.
Brien, Bruce
Poolman, Lyle
Pritchard, Fred
Raisler, Richard
Ripley, Todd A.
Roberts, Bryan G.
Russell, Steven
Serka, Mario Simonseta, Brian
Smith, Chuck
Smith, Ted
Stocking, Cal
Thompson, Art
Tingley, Ron
Tucker, Phil
Van De Grift, Bruce, Doug, James
Wellman, Brad C
Wright, Sam
Yamashita, David
Ylenni, Mike