WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

Water Quality Certifications for Existing Hydropower Dams

Guidance Manual

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Guidance Manual

Prepared by an inter-program work group chaired by the

Washington State Department of Ecology
Watershed Management Section
Water Quality Program

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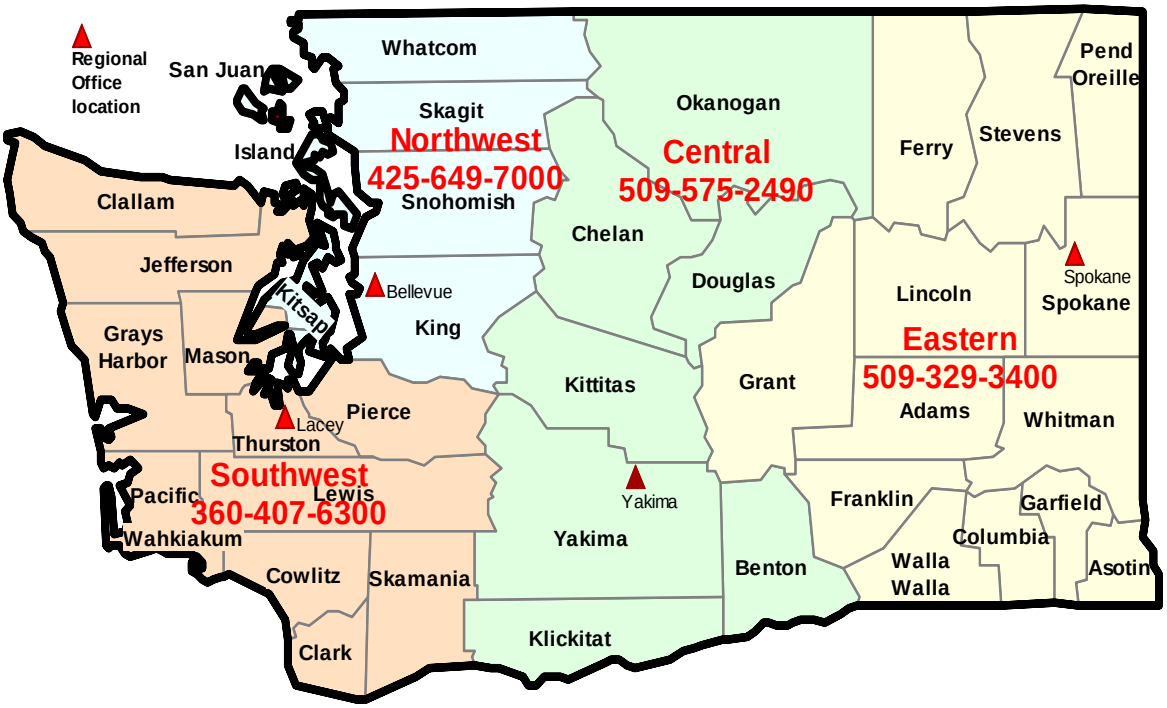

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The Purpose of This Manual

We compiled this guidance manual to help license applicants, tribes, and the public understand and participate in the Department of Ecology's (Ecology) water quality review process for re-licensing hydropower projects. It outlines Ecology's expectations for writing, issuing, and overseeing Water Quality Certifications for existing hydropower projects requiring Federal Energy Regulation Commission (FERC) licenses.

As guidance, this manual neither limits nor restricts agency action or interpretations of law or policy. It should not be used or relied upon for that purpose.

The guidance is designed to be used on line. There are a number of web address and links to additional information. Ecology may update the document if major revisions become necessary.

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Describes Ecology's role, authorities, and responsibilities in the FERC re-licensing process.

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Chapter 3

Provides technical details on the information needed to develop Water Quality Certifications for FERC projects. The chapter is divided into two sections:

> Section I gives an overview of Ecology's expectations of the applicant for the type, quality, and timing of water quality information needed.
>
> Section II offers information about many water quality parameters, associated water quality standards, monitoring considerations, and some possible solutions to correct water quality problems at hydropower projects.

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Chapter 1
Introduction

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1. The FERC Re-Licensing Process

The Federal Energy Regulatory Commission (FERC) decides whether to re-license hydropower projects. FERC's license process is designed to gather information that FERC uses to decide what conditions to include in the license.

Licenses issued by FERC allow dams to operate for 30 to 50 years. FERC also issues amendments to existing licenses for major modifications such as construction, raising reservoir levels, and adding power generation capacity.

License applicants must use the FERC re-licensing process to propose to FERC ways to address land management concerns. Those concerns include:

- Natural resources protection,
- Recreational enhancement,
- Cultural and historical resources protection, and
- Fish and wildlife protection and enhancement.

This application process is time-intensive and may include:

- Negotiation among all parties,
- Direct requests to FERC, or
- Demands from FERC for additional information.

2. Ecology's Relationship to the FERC Re-Licensing Process

Before FERC can re-license a hydropower project or issue an amendment to an existing license, Ecology must first certify (or waive authority through inaction) that the project will meet water quality requirements (Water Quality Certification). Ecology also determines whether the project will be consistent with the state's federally-approved Coastal Zone Management (CZM) Program.

FERC licenses must include any condition that the state requires in its Water Quality Certification or CZM Consistency statement.

Ecology's Water Quality Certification decisions and CZM Consistency Determinations can take place mostly outside the FERC re-licensing process. In practice, however, Ecology benefits from participating with applicants and with state, tribal, federal and local resource agencies in the negotiations during the FERC re-licensing

process. Participation in these negotiations, though time intensive, produces license conditions that are better understood, coordinated, and accepted by all parties. This is because water quality is intimately tied to other resource issues.

Water Quality Certification conditions must be consistent with negotiated agreements. Ecology can, however, require additional or modified conditions to comply with state water quality standards or other applicable requirements of state law.

If Ecology is not a party to the negotiation process, those engaged in the negotiations must understand how their agreements will affect Water Quality Certification conditions. Participants should communicate any concerns to Ecology.

Ecology and the Washington Department of Fish and Wildlife will work together, after this guidance manual is finished, to resolve procedural conflicts between negotiated agreements and Water Quality Certifications.

Ecology's interaction with the applicants for Water Quality Certifications should provide:

- Early communication about expectations - at least one year prior to Notice of Applicant's Intent to File with FERC for a new license.
- Mutual understanding about each party's staff resource limitations.
- Clarity of purpose, timing, and quality of data collection and studies.

The FERC re-licensing schedule for all Washington State hydropower projects can be found on Ecology's 401 Water Quality Certification hydropower web sites.

3. Ecology's Authorities and Legal Obligations.

These major laws define Ecology's responsibilities in re-licensing hydroelectric projects:

Federal Clean Water Act (CWA)
Total Maximum Daily Loads
State Water Pollution Control Act
State Water Quality Standards
The Washington Coastal Zone Management Program
Washington Water Code 90.03 RCW
State Environmental Policy Act (SEPA) 43.21C RCW

Additional references to other related laws, such as the Oil and Hazardous Substance Spill Prevention and Response law, are in Chapter 3, Section 2 of this manual.

- The overviews of each law are linked to a website contain the entire law.

Federal Clean Water Act (CWA)

Ecology's Water Quality Certification decisions are issued under the authority of the federal Clean Water Act. The federal Clean Water Act's major objective is "to restore and maintain the chemical, physical, and biological integrity of the nation's waters."

A Water Quality Certification is required when:

- A federal permit or license is required for the activity, and
- The activity involves discharges into navigable waterways. The term 'navigable' is broadly defined.

Section 401 of the Clean Water Act requires applicants for a federal permit or license for activities that involve discharge to the nation's waters to obtain a Water Quality Certification from the state where the discharge originates.

The CWA addresses water quality problems at hydropower projects, including:

- Discharges of water through a power plant,
- Fish passage systems,
- Sediments discharges or other materials entering the waterway during construction,
- Changes to water flow, and
- Reservoir levels.

States may use their Water Quality Certification authority to approve or deny an applicant's request. States can issue a Water Quality Certification only when the proposed activity will meet applicable state water quality standards and other appropriate requirements of state law. Approvals of such Water Quality Certification requests are nearly always conditional. States may also waive their authority to require a certification, although in doing so, they also lose their authority to affect the operation and construction of the project.

Conditions found in Water Quality Certifications are written to ensure that water quality criteria continue to be met throughout the life of the FERC license.

Total Maximum Daily Loads (TMDLs)

The Clean Water Act describes a process to measure pollution sources to arrive at a total maximum daily load; the states usually carry out this process. Each polluter is assigned a share of the clean-up burden. Since performing a TMDL is essentially an information gathering and planning exercise, TMDLs are further described at the end of Chapter 2.

State Water Pollution Control Act

Ecology's Water Quality Certifications are issued as Administrative Orders under Washington State's Water Pollution Control Act, 90.48 RCW.

The goal of the act is to "maintain the highest possible standards to insure the purity of all waters of the state consistent with public health and public enjoyment; the propagation and protection of wild life, birds, game, fish and other aquatic life; and the industrial development of the state. And to that end requires the use of all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the state of Washington."

This act gives Ecology powers, duties, and functions to administer water pollution control activities within the state. It defines Ecology's water quality protection and enforcement authorities, including the development of water quality standards rules.

State Water Quality Standards

The State Water Pollution Control Act directs Ecology to establish water quality standards.

The state is required to periodically update our water quality standards and give them to the Environmental Protection Agency (EPA) for approval. The most recent update was codified in July 2003 but has not as yet been approved by EPA (as of April 2005). Until these standards are approved, Water Quality Certifications and other water quality permitting programs rely on the previous 1997 water quality standards, but will attempt to incorporate both sets of water quality standards in Water Quality Certification conditions.

Washington State's Water Quality Standards, Chapter 173-201A WAC, consist of:

- Existing and designated uses that must be protected and supported in a particular water body,
- The numeric and narrative criteria that support such uses, and
- An antidegradation policy necessary to maintain existing uses.

The criteria for most water quality parameters associated with hydropower projects are described in Chapter 3, Section 2 of this guidance.

A new section was added to the 2003 rule identifying and providing more detail on tools that can be used for applying criteria and uses. The four tools that might pertain to existing hydropower facilities include:

1. Site-specific criteria revise the criteria for a pollutant. Site-specific criteria must demonstrate that the local biota is less sensitive to a pollutant than the biota used to establish the national or state criteria. The EPA has general guidance for developing site-specific water quality standards (CH 3.7) that was published in the federal register. This guidance details three methods for developing site-specific criteria. Site-specific criteria must be adopted into state water quality standards. From the time they are adopted, they will remain in effect indefinitely.

2. Ecology is creating a Use Attainability Guidance to assist Ecology and the public to meet the requirements of this tool. The Use Attainability Guidance provides guidance to persons or groups interested in evaluating the uses of water bodies that are to be protected under Washington's surface water quality standards regulation. An evaluation of uses is termed a "use attainability analysis" (UAA). A UAA is a structured scientific assessment of the factors affecting the attainment of uses designated for protection in the water quality standards. It may include an assessment of physical, chemical, biologic, and economic factors as described in the federal regulations at 40 CFR 131 10(g).

3. Variances are described in section 420 of the water quality standards.

4. Water quality offsets are described in the 2003 standards. To date (2005), no one has attempted to qualify for a water quality offset.

Ecology has a decision tree for selecting water quality standards exception tools.

We also added particular language regarding dams to the 2003 standards. It clarifies that a compliance schedule can be used to issue water quality certifications for re-licensing existing dams. Within the compliance timeframe, applicants need to endeavor to meet standards. If standards cannot be met, applicants may pursue a site-specific standard or use-attainability analysis (UAA). This language is found under WAC 173A-201A-510 as Appendix 5 of this manual.

The Washington Coastal Zone Management (CZM) Program

Congress passed the federal Coastal Zone Management Act (CZMA) in 1972 to encourage the appropriate development and protection of the nation's coastal and shoreline resources. The CZM Act gives states the primary role in managing these areas. To assume this role, the state prepares a CZM Program document that describes the state's coastal resources and how these resources are managed.

Hydropower activities and developments affecting coastal resources are evaluated through a process called "federal consistency" with the CZM Program. This process provides the public, local governments, tribes, and state agencies with an opportunity to influence federal actions likely to affect Washington's coastal resources or uses.

A Water Quality Certification is a part of a determination that a project is consistent with the CZM Program and water quality laws.

Other activities affecting any land use, water use, or natural resource of the coastal zone must also comply with these laws:

- The State Environmental Policy Act (SEPA),
- Clean Air Act, and the
- Shoreline Management Act.

Washington's CZM Program defines the state's coastal zone to include the 15 counties with marine shorelines: Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Mason, Pacific, Pierce, San Juan, Skagit, Snohomish, Thurston, Wahkiakum, and Whatcom counties. The CZM Program also applies to activities outside these counties that may impact Washington's coastal resources.

Washington Water Code 90.03 RCW

Anyone who wishes to divert or store surface waters must get a water right permit from the state. This applies to the hydroelectric projects that divert water through their intake structures or turbines.

The Washington Water Code permit system is based on the doctrine of prior appropriation — or "first in time, first in right." FERC projects may not impair the senior rights held by others.

Ecology sets flow levels through rule making to protect in-stream water resources (173.500 WAC). Stream flow regulations are like water rights that are owned by the state. If the hydropower project's water right is senior to the instream flow right, then the senior hydropower right takes precedent. However, flow may still be regulated under other authorities like the CWA Water Quality Certifications and CZM Act.

Water rights information in Washington State can be found at:
http://www.ecy.wa.gov/programs/wr/rights/water-right-home.html

State Environmental Policy Act (SEPA) 43.21C RCW

The State Environmental Policy Act requires all state and local governments within the state to analyze environmental effects of each proposed project. Appropriate decision-making considerations include environmental benefits and values along

with economic and technical considerations. In many respects, SEPA is analogous to the National Environmental Policy Act (NEPA).

Any hydropower project that needs only a Water Quality Certification to obtain a license does not need SEPA review. However, if hydropower project activities call for any other type of permit requiring compliance with SEPA, such as a shoreline permit, then SEPA must be completed before Ecology makes a Water Quality Certification decision.

When any proposed action would require a permit that is subject to SEPA (e.g., a water right or shoreline permit), then all permits required for that proposal--even those that alone would be exempt—become subject to SEPA.

State Environmental Policy Act rules allow documents prepared as part of a NEPA effort to satisfy the requirements of SEPA (WAC 197-11-610). This may eliminate the need for Ecology or the appropriate lead agency to prepare additional documents or duplicate the efforts of the NEPA preparers, assuming the NEPA documents satisfactorily meet SEPA needs. More information regarding adoption of NEPA or other documents is available in the SEPA Handbook.

Chapter 2
The Water Quality Certification Application Process What to Expect from Ecology

1. Three FERC Licensing Processes
2. Ecology's Process Overview
3. Ecology's Organization
4. Initial Consultation
5. Information Gathering Phase
6. Coastal Zone Management (CZM) Activities
7. Submitting the Water Quality Certification application and supporting documents
8. What to expect in a Water Quality Certification
9. After receiving a Water Quality Certification or a CZM Program Consistency Statement

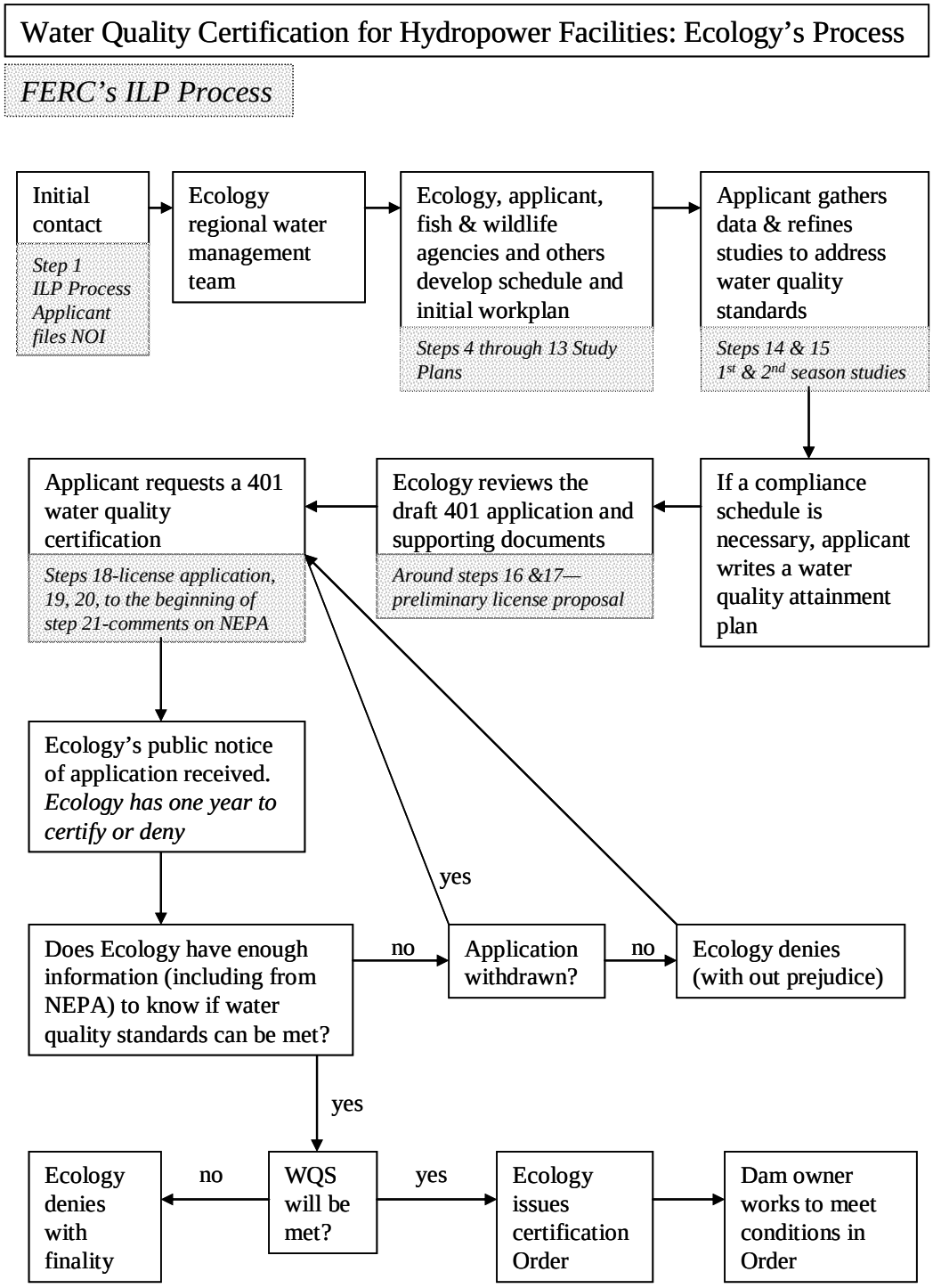
1. Three FERC Licensing Processes

- Traditional,
- Alternative, or
- Integrated.

Applicants are expected to use the integrated process after July 23, 2005. However, applicants can petition FERC to use one of the other two.

Charts and descriptions of the three licensing processes can be found at the FERC hydropower website. The charts are also found in Appendix 4 of this document.

Flow Chart


Water Quality Certification for Hydropower Facilities: Ecology's Process
FERC's ILP Process
Initial contact
Step 1 ILP Process Applicant files NOI
Ecology regional water management team
Ecology, applicant, fish & wildlife agencies and others develop schedule and initial workplan
Steps 4 through 13 Study Plans
Applicant gathers data & refines studies to address water quality standards
Steps 14 & 15 1st & 2nd season studies
If a compliance schedule is necessary, applicant writes a water quality attainment plan
Ecology reviews the draft 401 application and supporting documents
Around steps 16 &17— preliminary license proposal
Applicant requests a 401 water quality certification
Steps 18-license application, 19, 20, to the beginning of step 21-comments on NEPA
Ecology's public notice of application received. Ecology has one year to certify or deny
Does Ecology have enough information (including from NEPA) to know if water quality standards can be met?
no
Application withdrawn?
yes
no
Ecology denies (with out prejudice)
yes
WQS will be met?
no
Ecology denies with finality
yes
Ecology issues certification Order
Dam owner works to meet conditions in Order

2. Ecology's Process Overview

Regardless of which FERC licensing process the applicant chooses, Ecology uses a defined pathway for assessing the applicant's abilities to meet water quality standards. This pathway ensures that Ecology receives sufficient, timely, and quality information. Ecology uses this information to make informed and defensible determinations of the applicant's ability to meet water quality standards.

At least one year before the FERC process begins, applicants should meet with Ecology to discuss our expectations and to begin planning. At preliminary meetings, the parties begin to identify environmental concerns and studies. Many water quality studies require multiple years of monitoring or measurements during a wide range of hydrologic and climatic conditions.

The applicant, Ecology, and other parties, should create a realistic timeline to get water quality information and process the Water Quality Certification. This timeline should allow both the Water Quality Certification and the FERC process to proceed simultaneously. FERC's regulations require that the applicant submit its Water Quality Certification application to Ecology no later than 60 days after the FERC issues its Ready for Environmental Analysis notice.

Ecology makes Water Quality Certification decisions on the following bases:

- The environmental issues associated with structural modifications and operations at the project; and
- The timing and quality of information needed by Ecology to make informed decisions.

Ecology's water quality program usually issues the Water Quality Certifications for FERC hydropower projects. Ecology consults within the agency and with other state agencies to ensure compliance with the water quality standards.

3. Ecology's Organization

Ecology has several different water programs.

- The Water Quality Program usually takes the lead for Water Quality Certifications for existing hydropower projects. It establishes water quality standards.
- The Water Resources Program establishes site-specific water quality criteria of flow.
- The Shorelands and Environmental Assistance Program (SEA) takes the lead for Coastal Zone Management decisions as well as for shorelands and wetlands issues.
- The Environmental Assessment Program assists other programs with data gathering, technical assessments, engineering review, and modeling.

Regional directors can help applicants identify the appropriate staff contact who will be working on their certification.

Prior to formal re-licensing activities, Ecology's regional water management teams evaluate their schedule of dams coming up for re-licensing. They develop a work plan for managing Ecology's involvement with each project, based on existing program resources.

Regional water program managers choose staff to work on each project. This re-licensing team includes the principal decision maker who signs the Water Quality Certification, the contact person, and program specialists. Based on available staff resources, Ecology estimates its ability to manage the workload. These estimates include staffing for post-licensing follow-up.

Allocating resources takes into account the following factors:

- Whether Ecology will participate in the licensing process negotiations.
- Types and complexities of water issues expected.
- Usefulness and quality of existing data.
- Known environmental issues and associated legal, policy, and technical decisions.
- The relationship of negotiated agreements to Water Quality Certification conditions.

4. Initial Consultation

During the beginning of re-licensing, the applicant seeks understanding of the public's expectations for the project. This is known as 'Initial Consultation' in the FERC process. The initial consultation phase gives Ecology an opportunity to articulate its expectations, roles, and responsibilities to the applicant.

Prior to starting this formal process, applicants should work with Ecology to:

- Understand Ecology's role in their licensing process.
- Understand and begin planning the information gathering process for the Water Quality Certification decision.
- Coordinate between the Water Quality Certification and the FERC re-licensing processes.

Nothing prohibits applicants from beginning consultation earlier than required by FERC. In practice, Ecology encourages applicants to make their initial contact prior to filing a Notice Of Intent (NOI). Once an applicant files its NOI, then the applicant must adhere to FERC consultation requirements.

A re-licensing proceeding officially begins when the applicant sends FERC its NOI with either a Pre-Application Document (PAD) or an Initial Information Package (IIP). When Ecology receives a copy, the Water Quality Program's Hydropower

Water Quality Certification Coordinator notifies the appropriate Ecology regional director that the licensing proceeding is underway or about to begin.

Due to resource limitations, Ecology and applicants should work together to establish efficient meeting locations and times. They should also discuss steps that allow Ecology staff to participate more actively.

Permits issued by Ecology usually have a funding mechanism to pay for state time and resources. The applicant pays the fees. But Water Quality Certifications for hydropower projects in Washington State do not have a fee mechanism. If Ecology lacks staff resources to participate in the Water Quality Certification process for the FERC license, the applicant can explore funding Ecology staff through interagency agreements (Chapter 39.34 RCW) or cost reimbursement agreements for personal services contracts (Chapter 39.29 RCW).

The applicant should develop a draft work plan, in consultation with Ecology, for Water Quality Certification issues. This work plan should incorporate:

- Ecology's timing needs for information and studies.
- Type and quality of information expected—reports.
- Scope of studies.
- Opportunities for reassessing the data gathering strategy.

5. Information Gathering Phase

This is the part of the process where the applicant gathers information to submit to Ecology, along with its request for a Water Quality Certification.

This phase usually takes the most time. The timing should correspond to the formal consultation schedule in the FERC licensing process.

Information gathering tasks are detailed more thoroughly in Chapter 3, Section 2, but at a minimum, the applicant needs to complete these tasks prior to requesting Water Quality Certification:

- Create a detailed schedule for gathering data.
- Create initial study objectives for each water quality parameter.
- Create initial study objectives for all existing and designated uses.
- Create quality assurance plans for each study.
- Study the project's structures, operations, and activities' impacts on water quality.
- Develop a water quality attainment plan and a compliance schedule for those water quality parameters that do not meet water quality standards.

- Make commitments to assess new information to improve water quality.
- Send to Ecology for review all the materials (Water Quality studies, analyses, reports, etc.,) that will be used to back up any assertions that water quality standards will be met.

Information given to Ecology becomes available to public disclosure, limited to the Public Disclosure Act exemptions (RCW 42.17.310)

Ecology staff and the applicant should make a special effort early in the re-licensing process to coordinate in terms of available information. Ecology will try to come to the scoping meeting during the Integrated Licensing Process, or meet with applicants during the beginning of the Alternative or Traditional Licensing Process.

6. Coastal Zone Management (CZM) Activities

The applicant should send a request to the Shorelines and Environmental Assistance Program for a CZM Consistency Determination.

This request best occurs after requesting a Water Quality Certification. Ecology will not make a CZM Consistency Determination decision without a Water Quality Certification.

With a request for a CZM Consistency Determination, the applicant must provide specific information:

- A detailed description of the proposed activity and its associated facilities.
- Assessment of the probable effects.
- Maps, diagrams, and data when appropriate.
- A brief appraisal of the probable effects of the proposal.
- A short set of findings indicating that the project, its associated facilities, and their effects, are all consistent with the CZM Program's enforceable policies.

The request must also contain:

- An application for a Water Quality Certification (or an approved Water Quality Certification);
- A Shoreline Permit, if needed.
- A variance, or exemption, if needed.
- Evidence of compliance with the Washington State Environmental Policy Act (SEPA),if needed.
- Evidence of compliance with the other applicable enforceable policies of the CZM Program, if needed.

If Ecology fails to act within six months of receiving a complete request for a CZM Consistency Determination, including all necessary data and information, then Ecology's agreement is presumed.

Under the provisions of the CZM Act, the applicant can appeal Ecology's CZM Consistency decision to the Secretary of the U.S. Department of Commerce. If the Secretary of Commerce overrides Ecology's decision, FERC can approve the license or permit, anyway. FERC is not required to approve license applications that Ecology has agreed to.

For more information regarding Washington's Coastal Zone Management Program, refer to *Managing Washington's Coastline - Washington State's Coastal Zone Management Program.*

7. Submitting the Water Quality Certification application and supporting documents

Submittal

The applicant should attach the following information to its Water Quality Certification request:

- A completed Existing Hydropower Water Quality Certification Application Form.
- Water quality attainment plans and compliance schedules for those water quality parameters not meeting numeric and narrative criteria.
- Water quality management plans for those water quality parameters that potentially would not meet standards in the future (such as oil containment plans and best management plans for construction).
- Water quality assessments for all water quality parameters.
- Supporting documentation including: biological and engineering studies, modeling, quality assurance, compliance schedules, funding commitments, and economic analyses showing how the dam will comply with water quality standards.
- The applicable reference information in FERC filings.

An applicant using the Integrated Licensing Process must file a Water Quality Certification within 60 days after FERC has issued its Ready for Environmental Analysis document.

Ecology encourages the applicant to let us review and comment on studies and other information, at least 18 months before the Water Quality Application is due.

The applicant should use a completed Existing Hydropower Water Quality Certification Application Form. Send this form and all supporting documents to:

Water Quality Certification Hydropower Coordinator
Water Quality Program
Department of Ecology
P.O. Box 47600
Olympia, WA 98504

Ecology should formally acknowledge the receipt of the Water Quality Certification request with a certified letter to the applicant that clearly identifies the one-year action deadline.

Upon receipt of a request for Water Quality Certification, the state has one year to make a decision whether to accept of deny the application. If the information supporting this decision is insufficient or if relevant investigations are incomplete, then Ecology may deny the application without prejudice. The applicant may then resubmit the application with additional information.

If the one-year deadline is approaching and the applicant has yet to submit sufficient information to support its request, or if Ecology's analysis of the project impacts is incomplete, Ecology will notify the applicant. At this point, the applicant may decide to withdraw the request and reapply. This gives the applicant another year to provide supporting water quality information to Ecology. If the applicant decides not to withdraw, Ecology is put into a position of denying the project.

Ecology typically reviews the federal National Environmental Policy Act (NEPA) prior to issuing a Water Quality Certification decision. Making a Water Quality Certification decision following receipt of NEPA documents improves the quality of the certification and strengthens its defensibility. We rely on the NEPA evaluations of water quality, aquatic resources, and alternatives, for certification decisions and Coastal Zone Management decisions. NEPA documents frequently include valuable and objective scientific analyses pertaining to water quality standards, especially information on hydropower project effects on uses designated by the water quality standards.

A timing problem occurs when Ecology's one-year timeline expires before FERC completes its NEPA analysis. Ecology may ask the applicant to withdraw and reapply, or may deny the application without prejudice, so that the NEPA document can be adopted and consulted as Ecology makes Water Quality Certification decisions. For some applicants this can result in withdrawing and reapplying more than once, depending on the issues and the timing of the NEPA analysis.

Ecology does not plan to waive its Water Quality Certification authority through the failure to meet the one-year deadline to issue a decision. Ecology plans to never waive our authority if we have substantial environmental concerns.

How Ecology Works With Other States

The state will strive to meet downstream state and tribal water quality standards. The applicant will include interested jurisdictions in the licensing process through the FERC service list. Ecology will notify other water quality standards jurisdictions whose waters will be affected. We will provide opportunities for government-to-government meetings to discuss Water Quality Certification conditions and work toward achieving all water quality standards.

The federal Environmental Protection Agency (EPA) is responsible for:

- Certifying projects where water quality standards have been established for a tribe, but the tribe does not have authority for certifying under section 401, and where the project or its effects are within tribal jurisdiction.
- Reviewing Water Quality Certifications for potential impacts to tribes, other states and British Columbia, and providing a hearing to resolve conflicts.

The state of Washington will also seek to work with other states to ensure that waters entering Washington from FERC projects outside our jurisdiction meet Washington State water quality standards.

Public Participation

Public participation is required. Up-front public participation can create more defensible Water Quality Certifications decisions. The largest part of this public participation should occur in the years prior to the applicant's formal request to Ecology for a Water Quality Certification.

Ecology provides a Public Notice of our receipt of each hydropower Water Quality Certification application. See Chapter 173-225 WAC. We take written comments for a period of 20 days, but will consider extending the formal comment period. Ecology will encourage public participation by:

- Notifying interested parties of the application through the contacts found in the FERC service list as well as any others deemed appropriate,
- Asking the applicant to publish a legal notice in a local newspaper, if appropriate.
- Mailing a copy of the application to any tribe who asks.

After receiving an application, Ecology develops draft Water Quality Certification conditions. This involves discussions with the applicant and the public. During this time, Ecology strives for consistency between federal and state requirements and timelines.

After Ecology drafts the Water Quality Certification conditions, we provide an opportunity for interested parties to review and comment on the draft by:

- Mailing a notice that the draft water quality certification conditions are available for public comment. We will send this notice to those on FERC's list of interested parties.

- Placing the draft water quality certification conditions on Ecology's 401 Certification for Hydropower WEB-site.

- Accepting comments to the draft within 30 days of the web-site posting. This period may be extended at the discretion of the regional water quality manager.

8. What to expect in a Water Quality Certification

Cover Letter

The cover letter of the Water Quality Certification is addressed to the project proponent, identifies the project name with its FERC identification number, and provides Ecology's administrative order number. It also includes the appropriate Ecology contact name (generally the project manager) and telephone number. This letter may also reference the Coastal Zone Management determination requirements, if appropriate.

The Water Quality Certification responsible official at Ecology signs the letter. The responsible official and signatory for Water Quality Certifications for FERC projects is almost always a section manager in the region in which the project is located.

Administrative Order

Each Ecology Water Quality Certification is issued as an administrative order under Chapter 90.48 RCW. This makes the conditions of the Water Quality Certification enforceable under state law. The conditions of the order are incorporated into the FERC license according to the federal Clean Water Act.

The order identifies the:

- Project proponent
- Docket number
- FERC project number
- Project name
- Project's location
- Appropriate legal authorities under which the order is issued
- Penalties associated with noncompliance
- The procedure for appealing the order

The order usually includes a short description of the project, including:

- Location (river and/or lake)

- Description of structures associated with the project (e.g., dam, penstock, powerhouse)
- Size of dam and reservoir
- Megawatts.

All Water Quality Certifications contain specific requirements for water quality parameters. These fall into two categories:

1. Fixing known water quality problems that cause the facility to exceed water quality standards. These may be structural improvements to the dam, habitat improvements, or operational adjustments to meet water quality standards.

   Ecology usually identifies and discusses improvements with interested parties well before the applicant formally requests a Water Quality Certification.

2. Preventative measures to ensure water quality standards will not be violated in the future. Certain operations and construction activities are known to pose risks to water quality. Ecology requires pollution prevention plans in all Water Quality Certifications. They include spill prevention plans and best management plans for construction.

The language in the Water Quality Certification must contain firm dates when each improvement activity must take place. A decision tree, time graph, or matrix can be helpful.

The state maintains its authority to enforce conditions in the administrative order throughout the licensing period, although Ecology generally relies on FERC's authority and oversight to enforce conditions. Should the state ever consider enforcement, Ecology would first pursue compatibility with federal license conditions.

The Water Quality Certification decision may be appealed. The appeal must be filed with the Pollution Control Hearings Board, P.O. Box 40903, Olympia, Washington 98504-0903, within thirty (30) days of the applicant's receipt of the order. At the same time, the appeal must also be sent to the appropriate regional office of the Department of Ecology. The appeal alone will not stay the effectiveness of the certification. Stay requests must be submitted in accordance with RCW 43.21B.320. These procedures are consistent with Chapter 43.21B RCW.

Water quality monitoring and reporting conditions

Water quality monitoring is used to track:

- Compliance with the conditions of the Water Quality Certification.
- Progress toward meeting water quality standards.

- On-going environmental conditions so appropriate steps can be taken if problems occur.

Monitoring requirements in a certification identify the parameters to be monitored, including specific attributes such as location and frequency. They may also refer to a monitoring plan describing sampling methods, locations, etc. The Water Quality Certification conditions also describe the content and frequency of the data reports that the applicant must submit to Ecology.

General conditions

Water Quality Certifications contain specific water quality improvement goals for the hydropower project. However, certain general conditions will be necessary.

- The Water Quality Certification prohibits violation of water quality standards.
- Access shall be granted for inspections.
- Conditions are subject to changes based on new relevant state or federal laws that reflect better understanding of how to protect beneficial uses.
- Conditions are subject to changes based on new information as may be necessary to meet water quality standards, TMDLs, and other applicable requirements of state law.

Actual examples of Water Quality Certification conditions are found on Ecology's Existing 401 Water Quality Certifications for Dams website.

9. After receiving a Water Quality Certification *or* CZM Program *Consistency Statement*

After the Water Quality Certification has been issued, it is subject to appeal by the applicant or another party.

If an applicant objects to a Water Quality Certification, resolution is at the state Pollution Control Hearings Board (PCHB) (and subsequently to higher state courts), not FERC. If the applicant disagrees with Ecology's CZM consistency determination, relief may be sought from the Secretary of the Unites States Department of Commerce.

Once FERC does issue the license, Ecology staff will (as resources allow) play a continuing role in managing the project. Staff will review post-licensing studies, participate in reviewing progress of compliance schedules, review compliance with the conditions contained in the Water Quality Certification and, if the conditions are not met, take appropriate action. Enforcement actions available to Ecology are clearly outlined in Washington State's water pollution law, RCW 90.48. Ecology will rely on FERC to enforce water quality conditions in the license. If FERC fails to do so, or if the water quality conditions have not yet been incorporated into the new license, Ecology will take enforcement action under state authority if deemed necessary.

After the applicants receive a Water Quality Certification, they will need to provide Ecology specific information required by Water Quality Certification conditions. These will include:

- Notification of specific activities.
- Ongoing monitoring.
- Targeted monitoring for areas of water quality concern where water quality compliance schedules are in effect.
- Study plans and reports for water quality parameters not meeting standards.
- Implementation activity evaluations.
- Continued planning to adjust monitoring to obtain needed water quality information.
- Continued evaluations and adjustments to implementation activities.

Chapter 3, Section 1
Information Requirements for Water Quality Certification Decisions

Although every dam is unique and every water quality parameter is unique, every activity to gather and assess information must satisfy five key requirements:

1. Water quality assessments (that answer the appropriate questions)
2. Existing and designated use study
3. Correct information collecting methods and models
4. Acceptable data quality assurance methods
5. Schedules (so deadlines can be met)
6. Total maximum daily load calculations

Utilities may use this section to work with Ecology to plan and perform the necessary and appropriate information gathering activities.

Assessing water quality through collection and analysis of environmental data follows a set of fundamental principles that apply equally to the Water Quality Certification process for FERC hydropower licensing as to any other environmental study.

Ecology can decide to certify a hydropower facility only if there is "reasonable assurance" that a project can meet the state's water quality standards. If the applicant works with Ecology to define adequate study objectives, data quality, study designs, and analyses, Ecology will be more likely to have the necessary information at the right time needed to make defensible decisions.

1. Water Quality Assessments

Will water quality standards be met? To answer this question, a sequence of assessments is needed.

During the **initial assessment, the applicant** reviews all existing data for all relevant water quality concerns. The applicant should answer several questions for each type of pollution:

- What is the quality of the data, analyses, and other information?
- What do we not know about compliance with the standards?
- What is the uncertainty of what we know?
- What studies are needed to eliminate information gaps and reduce uncertainty?

The applicant performs **follow-up assessments** to determine the ability to meet water quality standards. They are a series of studies, monitoring efforts, and analyses, probably conducted over several years for all potential water quality issues. The applicant identifies the water quality issues through discussion with the lead Ecology staff assigned to the project. Section two of this chapter gives an indication of the types of water quality issues that may arise. Most facilities will need to look at temperature; flow for habitat and recreation, pH, dissolved oxygen, turbidity, and

gas supersaturation and support for existing and designated uses. Other parameters and standards to be examined will be specific to each facility. As studies are completed and information evaluated, parameters and existing and designated uses will begin to sort themselves into those that meet water quality standards and those that either presently do not or may not in the future.

Impact assessments, for the parameters that are not meeting standards, quantify the effect on water quality of structural influences, operations, and other activities associated with the project being licensed.

Measures to identify how to fix water quality problems evaluate the potential success of various alternatives to protect and improve water quality and fix water quality problems. The measures should include the following specific steps:

- Identify potential solutions
- Evaluate costs
- Assess environmental effects
- Prioritize based on cost-effectiveness
- Develop an implementation schedule (also termed a compliance schedule)

Water quality improvements assessment evaluates the long-term success of actions to protect and improve water quality. These assessments establish performance measures to assess success over the life of the license. They also identify appropriate actions if the targets and compliance schedules are not met. The assessment should address the following:

- How successful are the compliance actions in achieving standards?
- Are compliance actions meeting specific targets set for management of the actions?
- How can the compliance actions improve to assure compliance with standards?
- What is the quality of the data, analyses, and other information?

2. Existing and Designated Use Study

Ecology must have enough information to determine that the proposal will protect and support existing and designated beneficial uses of the water body. The application should provide Ecology with a study that identifies:

- Existing and designated beneficial uses
- Historic impacts of the project on them
- Anticipated future impacts of the proposal on them

The principal uses that are most often affected are fish and recreation. Recreation includes fishing, boating, swimming, and aesthetics. The applicant should examine not only uses that do not currently exist, but also uses that would be available without the project impacts.

3. Correct Information Collecting Methods and Models

There are a number of tools available to gather information on compliance with water quality standards. They can be roughly categorized as:

- Monitoring
- Statistical analysis
- Modeling

4. Acceptable Quality Assurance Measures

Federal law requires both EPA and FERC to ensure data quality. EPA uses *Quality System for Environmental Data and Technology* while FERC has its own "*Information Quality Guidelines*." Ecology Executive Policy 1-21 states that "A Quality Assurance Project Plan is prepared for each environmental study/activity that acquires or uses environmental measurement data."

According to Ecology's "*Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*," data quality assurance includes:

- An organizational Quality Assurance Policy and Quality Management Plan
- Staff training in the principles and practices of Data Quality Assurance
- Preparation and use of Quality Assurance Project Plans
- Preparation and use of Standard Operating Procedures
- Use of appropriate Quality Control Procedures
- Review, verification, and validation of data
- Assessment to determine whether the data support the project objectives
- Quality improvement through audits of systems and performance
- Use of environmental laboratories accredited by Ecology

Applicants should demonstrate that either their organization or their consultant is performing these data quality assurance elements.

5. Schedules

Anticipate studies that will be needed. Plan to provide the correct information well before the information will be used for Water Quality Certification decisions.

The applicant should develop a study plan for each phase of assessment. Each water quality parameter likely has a critical period, based on river flows and

temperatures, watershed conditions, and dam operations. Therefore, identify a critical monitoring season for each water quality parameter. Prior to monitoring, set aside a reasonable amount of time for development and review of the quality assurance plan. The time allotted should take into account several rounds of review, which may include meetings and third party review. Let contracts for monitoring far enough ahead to allow for this work, rather than immediately before the monitoring season. Discuss these concerns at scoping and study plan meetings when possible in coordination with the FERC licensing process.

Plan review and release of study reports to allow time for the follow-up work that has been identified through the study. Also, allow time to account for unexpected results or the emergence of new issues. On an annual cycle, identify monitoring needs and funding for the next round of studies.

Over the life of the expected new license, a schedule should account for water quality monitoring, and studies. This is necessary to continue to assess conditions, especially as efforts are made to correct water quality problems.

6. Total Daily Maximum Load (TMDL) or Water Cleanup Plan

If total daily maximum load (TMDL) allocation of pollutants to a hydropower facility can provide information that helps make these water quality certification decisions, Ecology will use them. Total maximum daily loads are not separate enforceable requirements, but are used as a tool to make regulatory decisions. Ecology does not require a TMDL to be finished in order make water quality certification decisions.

Ecology undertakes TMDLs on a watershed basis, using a five-step, five-year process. We assess water quality conditions through TMDLs, focus staff effort, and support water protection activities on a geographic basis. The state of Washington has been divided into 23 water quality management areas (WQMAs). Each of these areas is on a rotating five-year cycle for TMDLs:

Year 1	Scoping
Year 2 & 3	Data collection and analysis
Year 4	Technical report
Year 5	Implementation

A TMDL may be useful to the applicants. It allocates the portion of the pollution that is the responsibility of applicants where there is more than one source. If a TMDL study has not been undertaken and if an applicant needs to speed up a TMDL in order to meet the licensing deadlines, there are two options:

- Work with the appropriate Ecology water quality section manager to reprioritize their TMDL schedule in order to accomplish a TMDL before the water quality certification application is due.
- Fund a TMDL study in order to meet the timeline of the FERC license.

We do not expect the applicants to determine impacts from activities beyond their control. However, we will expect applicants to determine their contribution to the pollution.

Chapter 3, Section 2 – Water Quality Standards

Purpose of this section

Overview of water quality standards as they apply to hydropower dams

Numeric Standards

1. Total Dissolved Gas
2. Temperature
3. Turbidity
4. pH
5. Dissolved Oxygen (DO)
6. Nutrients/Trophic Status
7. Fecal Coliform
8. Oil and Grease
9. Toxics

Narrative Criteria (specified site by site to protect beneficial uses)

10. Aquatic Plants and Animals
11. Fish Habitat -- Flow
12. Recreation and Aesthetics
13. Wildlife Habitat

Broad Relationships to Water Quality Standards

14. Wetlands
15. Shorelands
16. Project-Related Indirect and Cumulative Impacts

Purpose

This section of the guidance acquaints applicants and other stakeholders with how hydropower dams may affect each water quality parameter, monitoring considerations, and potential improvement actions.

The 16 criteria in this section are the pollutants most likely to be of concern for hydropower facilities in terms of dam impacts to water quality. This list is supposed to be useful, but is not inclusive. Not all parameters, considerations, or possible impacts will apply to each project.

Overview of Water Quality Standards as They Apply to Hydropower Dams

Washington State's water quality standards provide protection in several different ways:

- Numeric standards are regulatory thresholds for water quality parameters specifically listed in water quality standards. An example of a numeric

standard is the 110 percent total dissolved gas criteria. The common numeric criteria associated with hydropower facilities are grouped together in the first half of this section.

- Narrative criteria rely on the analysis of impacts to uses such as fishing, aquatic organisms, boating, swimming, and aesthetics. Narrative criteria are implemented on a case-by-case basis to protect water quality and beneficial uses from the effects of water pollution. Narrative criteria are used where numeric standards are not sufficient to protect a sensitive beneficial use.

- Use protection is the bottom line of the standards. Even if numeric criteria are attained, if studies show the uses in the water body are being harmed by the activities to be permitted, the narrative criteria may be invoked to further restrict the activities.

  Uses designated in the water quality standards must be protected unless a formal process called a use attainability analysis (UAA) is conducted on the water body in question to show the uses do not exist or are not attainable.

- The anti-degradation policy in the water quality standards protects beneficial uses by providing a three-tiered system of protection:
  - Tier I, protection and maintenance of existing and designated uses. *The Tier I criterion will apply to existing dams.*
  - Tier II, protection of waters of higher quality than the standards. *Tier II generally will not apply to relicensing except for expansion projects that alter the characteristics of the water body. Tier II criteria would apply to new dams.*
  - Tier III, protection of outstanding resource waters. *These are pristine waters where no pollution is allowed. A public process is used to assign waters to Tier III. No water bodies in Washington presently exist in this category as of 2005.*

- Natural conditions are defined as "surface water quality that was present before any human caused pollution." Pollution is broadly defined to include most kinds of activities that harm beneficial uses. If natural conditions in a water body exceed the criteria found in the water quality standards, natural conditions are used as the water quality criteria for that water body. For some water quality criteria, the water quality standards allow and additional small change from natural conditions for human effects.

- Reservoirs with a mean detention time of greater than 15 days are treated as lakes under the water quality standards. The water quality standards for lakes are often based on maintaining natural conditions, but the fact is the dam and the "lake" behind it are not natural. This means that Ecology cannot treat dam effects to water quality as natural.

For example, while we may consider the temperature or dissolved oxygen measurements of water draining from a natural lake as meeting water quality standards, we may not for a reservoir.

To address this situation, the Water Quality Certification can employ a formal compliance schedule that focuses on meeting the water quality criteria downstream of the dam and achieving the highest attainable water quality condition within the reservoir. This goal is most consistent with the water quality standards and state and federal water pollution control laws. This is because:

- Achieving the highest attainable quality in a reservoir is essentially the same as maintaining a natural lake in its highest natural state of quality.
- Federal water quality regulations focus on identifying and protecting the highest attainable uses for the water body.

However, since the reservoir is not natural, the discharge from the reservoir will not be considered a natural condition even when it has attained the highest water quality condition.

Descriptions for each water quality parameter follow, and include:

- Background
- Water quality standard
- Possible causes of impairment
- Monitoring considerations
- Protection and improvement actions

1. Total Dissolved Gas (TDG)

Total Dissolved Gas is the amount of air (composed of several gasses—78% nitrogen, 20% oxygen, 1% argon and 0.3% carbon dioxide) held in saturation in the water. Criteria in the standards are in terms of percent of saturation pressure relative to ambient barometric pressure. TDG can also be expressed in units of pressure. Many dams experience TDG as a major water quality issue.

Background

Fish and other gill breathers are harmed by water supersaturated with dissolved nitrogen. Fish in this water may not display signs of difficulty if the higher water pressures at depth offset high TDG pressure passing through the gills into the blood stream. However, if the fish inhabit supersaturated water for extended periods or rise in the water column to a lower water pressure at shallower depths, nitrogen comes out of solution within the fish, forming bubbles in their body tissues. This gives rise to gas bubble disease, which is lethal at high levels, or gives rise to chronic impairment at lower levels. Air bubbles also form on the outside, and for

invertebrate insects causes death by lifting them off the bottom and exposing them to predation and changed water conditions.

Several phenomena cause increases in TDG levels. Water plunging into a deep pool with entrained air bubbles, such as below a dam spillway or natural waterfall, can rapidly increase TDG levels. Bubbles introduced into the high-pressure zones around a hydropower turbine can have a similar effect.

The response of organisms to elevated TDG levels depends on species and life stage. Adult salmon are relatively resistant to high TDG, perhaps due to their mobility and physiological factors. Shallow dwelling, territorial fish (such as some species of sucker) appear more sensitive to TDG.

Water Quality standard

Total dissolved gas measurements shall not exceed 110 percent at any point of measurement. Water quality standards for TDG do not apply during natural flood conditions. This is a calculated flow defined as the highest flood that occurs for seven consecutive days in a ten-year period, the 7Q-10. Ecology has directions for how to determine 7Q-10 for high flows.

The Columbia and Snake rivers, have an exception to the 110 percent TDG standard to allow for passage of juvenile fish downstream over the dams rather than through the turbines. On these rivers, the standard is not to exceed 125 percent TDG as a one-hour average; not to exceed 120 percent TDG in the tailrace; and not to exceed 115 percent TDG in the forebay of the next dam downstream as measured as an average of the 12 highest consecutive hourly readings in any one day (24-hour period). This exception is based on a risk analysis study conducted by the National Oceanic and Atmospheric Administration (NOAA) fisheries. The study weighed the benefits of spilling water to assist juvenile salmon avoid turbine mortalities against the mortalities of fish exposed to harmful levels of dissolved gas. In order to receive this exemption, a gas abatement plan developed by the applicant must be approved by Ecology.

Possible Causes of Impairment

- Spill over the dam pushes air deep into a plunge pool where, under pressure, the air is forced into solution.
- Air injected into the turbines during power up or power down (ramping) to avoid/reduce cavitation at the turbine blades. These usually small amounts of supersaturated gas can remain for long periods of times if found in slow moving water below the dam.
- Air injected to spin the turbines with no water and no power generation. The wicket gates are closed, but water leaks into the turbine area where air is being injected. Under the headwater above the dam, this air is pressurized, and leaking wicket gate water is gassed and collects in the draft tubes.
- Air entry from ventilation during powering up or powering down turbines.

- Other operations creating plunging spills such as continuous fish bypass spills and opening trash sluiceways.

Monitoring considerations

- Violent hydraulics below a dam create safety hazards.
- Turbine water entrainment of water into high volume bubbles of surface spill.
- Spill and turbine waters often travel great distances downstream with little mixing.
- Gradual mixing and dilution with turbine waters downstream.
- Gradual to rapid degassing downstream depending on river hydraulics and bathymetry.
- Rapid effervescence (degassing) in the aerated zone below the dam. Below this zone, degassing depends on the water depth and velocity and wind speed.
- Under most conditions a dam's spill reaches a new equilibrium independent of upstream conditions as it spills and plunges.
- Typically, water passes through the hydro turbines unchanged from upstream conditions.

Refer to the *USGS Monitoring Protocol* for initial data gathering to characterize conditions, transect data gathering if a problem is found, and permanent monitors for long-term data collection.

Protection and Improvement Actions

Refer to the U.S. Army Corps of Engineers' work on the Columbia and Snake rivers for examples of methods to reduce gas super-saturation through operational and structural improvements.

- *Dissolved Gas Abatement: Technical Report* US Corps of Engineers, Portland District 1996

- *Dissolved Gas Abatement Studies, Phase II, Volumes I and II*. US Corps of Engineers, Portland District

2. Temperature

Water temperature is usually measured in degrees Celsius, using either a liquid thermometer or an electronic thermistor. We discuss both narrative criteria and numeric standards here. Temperature is a major issue for storage reservoirs as well as for many run-of-river dams.

Background

Water temperatures significantly affect the health, distribution, and abundance of fish, amphibians, aquatic insects, other benthic organisms, and aquatic plants. Bull

trout, salmon, and steelhead are examples of native species adapted to cool temperature regimes. Many native frogs and salamanders also require temperatures similar to those needed by salmon and trout. Bull trout require temperatures several degrees lower than optimum for salmon and trout. Many benthic macroinvertebrates, an important source of food for fish and an indicator of overall stream health, also require cool water to thrive. High water temperatures can help trigger algal blooms, excessive growth of aquatic macrophytes, and fish diseases. Sudden changes in water temperature, as well as unnaturally cool waters also harms aquatic organisms. (See also Aquatic Plants, Trophic Status, and Flow.)

Water Quality Standard

Ecology designed Washington's *numeric* criteria for temperature to protect the most sensitive beneficial uses of a particular river or stream. We use several native salmonid species as the most temperature-sensitive representatives. When a water body's temperature is warmer than the numbers provided in the standards and the condition is due to natural conditions, then cumulative human actions may not cause the temperature of that water body to increase by more than 0.3C.

The *1997 Water Quality Standards* provide criteria for temperature in fresh water where dams occur: 16° Celsius for Class AA waters and 18° Celsius for Class A waters. The Columbia River has a special condition of 20° Celsius. These are for instantaneous measurements. A small additional increase is allowed. The amount of the small additional increase varies depending on whether natural conditions are above or below the criterion.

The *2003 Water Quality Standards* for temperature have an instantaneous maximum high as a narrative criterion, one-day maximum high, and several seven-day average maximum temperatures based on fish species. A small additional increase varies depending on whether natural conditions are above or below the criterion.

2003 Criteria: Table 200 (1)(c)
Aquatic Life Temperature Criteria in Fresh Water*

Category	Highest 7-Day Average Daily Maximum
Char	12°C (53.6°F)
Salmon and Trout Spawning, **Core** Rearing, and Migration	16°C (60.8°F)
Salmon and Trout Spawning, **Noncore** Rearing, and Migration	17.5°C (63.5°F)
Salmon and Trout Rearing and Migration **Only**	17.5°C (63.5°F)
Non-Anadromous Interior Redband Trout	18°C (64.4°F)
Indigenous Warm Water Species	20°C (68°F)

* Certain waters will require protection for more sensitive life stages

Several rivers (e.g., the lower Columbia and the Pend Oreille among others) have specific standards for temperature, often a one-day maximum of 20°C. See the 2003 water quality standards, WAC 173-201A-600 and the use designation tables in WAC 173-201A-602 to determine the temperature standard for these particular rivers.

Although the numeric standards set the maximum one and seven-day average temperatures allowed in the state's waters, the *narrative* criteria also require that populations of native aquatic species be protected from the instantaneous high temperatures, sudden temperature swings, unnaturally cool waters that sometimes result from dam operations, and any other numerically undefined temperature that harms beneficial uses.

Possible Causes of Impairment

Dams can influence reservoir and river temperatures in one or more of the following ways.

- By decreasing flow in the diversion reach, leading to increased warming during the hotter months. The water in the diversion reach is shallower and there is less of it than there would be without the diversion.

- Withdrawing cooler subsurface water from a thermally stratified reservoir immediately upstream of the dam and routing this water through the penstocks and turbines back into the river downstream of the dam. Even if there is only moderate surface warming, subsurface withdrawal can too quickly cool the river downstream.

- Spilling warmer surface water.

- Changing flow release quantities to respond to power demands. This can cool or heat up downstream waters, sometimes almost instantaneously, especially when the reservoir behind the dam is stratified. Rapid fluctuations in river levels can strand fish in pockets of water, which can heat up to lethal levels on hot days.

- Impounding the river behind the dam. Some reservoirs generally heat up more during the summer than a free-flowing river because of slower moving water and more surface area exposed to solar and air temperature influence.

- Diverting small volumes of river water into fish ladders to aid in upstream movement of fish. Because of the small volumes, these diverted streams of water tend to heat rapidly, especially if uncovered and exposed to the sun.

- Blocking ground water inputs to the river, because the impounded water keeps the river at higher elevations than pre-dam (especially during the summer low-water season.) Local groundwater inflows to rivers can create cold-water refuge areas for fish and other aquatic organisms.

- Eliminating spring flood flows. In some rivers, cold, high spring runoff saturates the banks of the river, recharging the local aquifer. Relatively cool ground water then seeps out during warmer, lower flow months and provides cold-water refugia for aquatic organisms.

Monitoring Considerations

Three methods are used to understand how a dam affects temperature: an empirical method, statistical analysis, and modeling. Each project will need to evaluate the availability of data to decide what to use.

Protection and Improvement Actions

Improvement actions will vary depending on the nature of the dam and how it operates.

Ecology will have to consider the combined effects of reservoir management of dissolved oxygen and temperature and benefits and tradeoffs between managing for one or the other.

3. Turbidity

Turbidity is a measure of water clarity, which measures the effect of suspended particles to block the passage of light through water. Therefore, it is also an indirect measure of suspended solids. Turbidity is expressed in nephelometric turbidity units (NTU) and measured with a calibrated turbidimeter. Turbidity is a major numeric water quality concern for dam construction and dam removal.

Background

Elevated turbidity can cause clogging of gills; organism avoidance behavior; reduced ability to find food; reduced photosynthesis and primary production; and smothering of benthic organisms, spawning areas, and habitat with settled solids. Turbidity is also related to aesthetic values since water clarity is highly valued by human users. Turbidity can be an indicator of other environmental problems, such as riparian habitat loss to stream bank erosion or channel cutting from watershed hydrology change. Because many toxic compounds tend to adsorb to organic and clay particles, turbidity can be associated with the uptake, transport, and deposition of toxic materials.

Water Quality Standard

Water quality numeric criteria for turbidity are described in WAC 173-201A-200 (1)(e).

2003 Criteria: Table 200 (1)(e)
Aquatic Life Turbidity Criteria in Fresh Water

Category	NTUs
Char	Turbidity shall not exceed: • 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Salmon and Trout Spawning, **Core** Rearing, and Migration	Same as above.
Salmon and Trout Spawning, **Noncore** Rearing, and Migration	Same as above.
Salmon and Trout Rearing and Migration **Only**	Turbidity shall not exceed: • 10 NTU over background when the background is 50 NTU or less; or • A 20 percent increase in turbidity when the background turbidity is more than 50 NTU.
Non-Anadromous Interior Redband Trout	Turbidity shall not exceed: • 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Indigenous Warm Water Species	Turbidity shall not exceed: • 10 NTU over background when the background is 50 NTU or less; or • A 20 percent increase in turbidity when the background turbidity is more than 50 NTU.

Possible Causes of Impairment

Turbidity problems can be divided into several categories:

- Construction activities.
- Erosion of downstream channels due to excessive, unnatural flows from dam releases.
- Erosion of the reservoir shoreline caused by fluctuations in the level of the reservoir.
- Erosion of areas exposed during drawdown, including sheet erosion of denuded banks and down cutting of tributaries into deposited sediment.
- Mass wasting due to wetting and drying of the soils on the reservoir shore.
- Effects of watershed development stimulated by the dam and reservoir.
- Sediment settling in the reservoir can make discharge water in the river below unnaturally clear with corresponding losses of fish productivity.

Monitoring Considerations

Turbidity monitoring presents some unique challenges because of the need for data on background conditions. The water quality standards allow some flexibility for how turbidity is compared to reference conditions. Data sets for statistical

comparison are needed that are large enough to provide some statistical power. In this way, the patterns of turbidity and the frequency that the five NTU threshold is exceeded can be evaluated.

A minimum baseline level of turbidity to promote juvenile salmon survival may also be considered. The baseline may be found to be different than the numeric criteria.

Turbidity has traditionally been measured by grab samples and laboratory analysis. However, turbidity sensors are now available for data logging meters, allowing the collection of data over long time series in multiple locations. This is particularly helpful in evaluating storm events and other intermittent releases, and developing large data sets for statistical evaluation. Care must be taken to choose representative background and assessment locations.

Protection and Improvement Actions

The approach to identifying corrective action varies, depending on the nature of the activity that could cause a violation of standards.

Advanced planning can avoid some, but not all, emergencies like drawdown for emergency repairs, extreme floods, and other unexpected activities addressing health and safety. Advanced planning can also eliminate turbidity problems caused from construction, periodic maintenance, unexpected maintenance, unusual weather, and unusual energy prices.

Applicants performing routine activities (e.g., maintenance, drawdown for runoff storage, ramping for power production) need to complete compliance and best management turbidity prevention plans.

4. pH

The pH is a measure of the water's acidity or alkalinity. "Standard units" range from 0 to 14, where 7 is neutral, lower values are acidic, and higher values alkaline or basic.

Background

See also "Dissolved Oxygen," "Toxics," and "Aquatic Plants." Aquatic life requires ranges of pH that do not vary widely from the neutral pH of 7.

A critical characteristic in the response of an aquatic system to pH changes is buffering capacity. Well-buffered systems have high concentrations of dissolved minerals and are resistant to pH changes. Poorly buffered systems, such as rivers in pristine watersheds with granitic bedrock, are highly sensitive to pH changes.

Changes in pH can affect dissolved metals. Low pH levels may release dissolved metals from sediments into the water column. Conversely, high pH levels may cause dissolved metals to precipitate onto suspended solids or into sediments. Therefore extreme shifts in pH can produce increased toxicity in the water column or sediments due to changes in metals concentrations.

Water Quality Standard

Numeric criteria for pH are presented in WAC 173-201A-200 (1)(g):

2003 Criteria: Table 200 (1) (g)
Aquatic Life pH Criteria in Fresh Water

Use Category	pH Units
Char	pH shall be within the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.2 units.
Salmon and Trout Spawning, **Core** Rearing, and Migration	Same as above.
Salmon and Trout Spawning, **Noncore** Rearing, and Migration	pH shall be within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units.
Salmon and Trout Rearing and Migration **Only**	Same as above.
Non-Anadromous Interior Redband Trout	Same as above.
Indigenous Warm Water Species	Same as above.

Possible Causes of Impairment

- Reduced flow in reservoirs and the creation of shallow flooded areas allows plants to maintain a foothold at the edges of the reservoir as well as allowing the growth of phytoplankton. Increased photosynthesis can drive pH in these areas above 8.5-9.0 due to the absorption of CO_2 in the form of carbonic acid.
- Nutrients (usually phosphorus) from lakeshore development can contribute to increased productivity.
- Chemical discharges, most commonly wet concrete. Other chemicals used at the project might increase or decrease pH, either through use or by a spill. Possibilities include alkaline cleaners or acid washing.
- Decay of organic material, such as in wetlands or in the anoxic bottom layers of a lake.
- Steady, reduced flow in the bypass reach can contribute to excessive plant growth.

Monitoring Considerations

- Critical period for pH from nutrient-enhanced productivity will be spring and summer.
- Include monitoring for pH in any trophic assessment. The highest pH from productivity will probably occur mid-afternoon, associated with high DO levels.
- Include modeling of pH in any quantitative evaluation of the compliance with *Lake Criteria* (since they refer to natural conditions). This can be very challenging. The usual approach to pH is through DO and trophic status.

- Monitored downstream effects on pH from concrete pours or grout work. If high or low pH chemicals are being used near waters, some monitoring may be necessary during that operation.
- Assess buffering capacity for a project where poor buffering capacity is suspected.

Protection and Improvement Actions

- Design aquatic plant management programs to decrease biomass of non-native aquatic plants growing in the reservoir during the summer.
- Reduce primary productivity through nutrient management.
- Prevent spillage of concrete or other high and low pH chemicals through best management practices.

5. Dissolved Oxygen (DO)

The level of oxygen dissolved in water is usually expressed as milligrams of oxygen per liter of water (mg/L), a unit that is interchangeable with "parts per million" (ppm). DO as a percent of saturation relative to ambient barometric concentration is also of interest.

Background

DO is of critical importance to gill-breathers, who are able to remove DO from the water to meet metabolic needs. Organisms vary in their sensitivity to low DO levels between species and at different life stages.

DO levels are determined by interaction of water temperature, re-oxygenation, decay of organic materials, chemical oxidation, respiration, and the rate at which new plant biomass is formed by photosynthesis, otherwise known as primary productivity. DO saturation concentrations drop as water temperatures increase because colder water can hold more DO. Currents, rapids, and physical barriers that may cause aeration also influence DO. DO levels are in dynamic equilibrium with the atmosphere, so wind, turbulence, and water depth can affect re-oxygenation rates. DO saturation concentrations are also lower at higher elevations due to the lower partial pressures in the atmosphere.

The amount of oxygen used by decay and oxidation is termed "biochemical oxygen demand," or BOD. BOD loading can originate from external sources, either from human activities (e.g., sewage, manure, or industrial wastes) or from natural sources e.g., leaf fall). One source of BOD is the death and decay of algae or rooted plants.

Water Quality Standard

Water quality numeric criteria for dissolved oxygen can be found in WAC 173-201A-200 (1)(d):

2003 Criteria: Table 200 (1)(d)
Aquatic Life Dissolved Oxygen Criteria in Fresh Water

Category	Lowest 1-Day Minimum
Char	9.5 mg/L
Salmon and Trout Spawning, **Core** Rearing, and Migration	9.5 mg/L
Salmon and Trout Spawning, **Noncore** Rearing, and Migration	8.0 mg/L
Salmon and Trout Rearing and Migration **Only**	6.5 mg/L
Non-Anadromous Interior Redband Trout	8.0 mg/L
Indigenous Warm Water Species	6.5 mg/L

(i) When a waterbody's DO is lower than the criteria in Table 200 (1)(d) (or within 0.2 mg/L of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the DO of that water body to decrease more than 0.2 mg/L.

(ii) For lakes, human actions considered cumulatively may not decrease the dissolved oxygen concentration more than 0.2 mg/L below natural conditions.

(iii) Concentrations of DO are not to fall below the criteria in the table at a probability frequency of more than once every ten years on average.

Possible Causes of Impairment

- A dam project can increase BOD if there are associated wastewater sources, such as a sewage treatment plant for workers or for an associated recreation facility.
- The project can also exacerbate problems from other BOD sources because of reduced aeration in the reservoir or low flows below the dam.
- Increased macrophyte and algae growth can lead to increased daily swings in DO with very high levels during daylight and sags after dark.
- Thermal stratification in reservoirs, when warmer water stays near the surface and cooler, denser water sinks to the bottom. This can lock up a deeper layer of colder water where DO commonly reaches very low levels.
- Deep releases from a stratified reservoir are likely to show very low oxygen levels, causing fish kills and foul odors.
- All of these problems can combine: high algal biomass can use up the oxygen in the lower levels of a reservoir. Ammonia inputs can both exert BOD by oxidizing and can serve as a nutrient source for algae.

- Where deposits of organic material are found within the reservoir or streambed, an assessment of DO should be targeted, especially for areas of potential spawning activity.

Monitoring Considerations

The critical period for DO is usually late summer and early fall because of high temperatures and low flows. Depending on local conditions, the critical period can begin in the late spring and extend late into fall. Cooler temperatures and higher flows in the winter and early spring usually prevent low DO impacts.

DO is also strongly affected by primary productivity, i.e., the photosynthesis of aquatic algae and plants. Photosynthesis can produce a net increase in DO during the day, while at night respiration drives DO down. A diurnal cycle of DO (and pH) is common and requires a need for continuous monitoring to capture this pattern and minimum levels in the early morning.

Protection and Improvement Actions

- Reduce macrophyte biomass for any low DO levels caused by overly abundant macrophyte growth.
- Decrease temperature in the reservoir.
- Reduce nutrient loading to the reservoir.
- Reduce BOD sources to reservoir. Herbicide application is not a source reduction; however, removing aquatic plants can reduce biomass.
- Hypolimnetic aeration such as using bubblers or oxidant chemicals.
- Selective withdrawal for hydropower.

Ecology will have to consider the combined effects of reservoir management of dissolved oxygen and temperature, and benefits and tradeoffs between managing for one or the other.

6. Nutrients/Trophic Status

Background

Nutrient enrichment can harm water quality and the environment. The extent of the impact is determined by which nutrient is “limiting” and other environmental factors that control the growth of plants and algae, such as temperature, light, and habitat conditions. Nutrient depletion may also be an issue in some situations.

Trophic status in a lake is the amount of nutrients in the system.

Water Quality Standard

Nutrients and trophic status are related to DO, aesthetics, pH (see other sections), and lake nutrient criteria (WAC 173-201A-230).

Trophic status is generally measured by three parameters:

1. Total phosphorus (TP)
2. Chlorophyll *a* concentration (related to productivity levels as well as color)
3. Water clarity (Secchi depth)

Other criteria include oxygen deficit, indicator species, and carbon uptake.

Lakes generally are placed into three categories:

1. Oligotrophic: very low nutrient levels (<10 ug/L TP), low productivity (<4 ug/L chlorophyll *a*), and very high clarity (>4 meters Secchi depth).
2. Mesotrophic: moderate nutrient levels, good productivity, moderate clarity.
3. Eutrophic: high nutrient levels (>30 ug/L TP), very productive (>6 ug/L chlorophyll *a*), low clarity (<2 meters Secchi depth).

The lake nutrient criteria provide guidelines for setting TP criteria for trophic status protection. Action levels are described by ecoregion that can be used to trigger the establishment of criteria. For the Coast Range, Puget Lowlands, and Northern Rockies ecoregions, the action value is 20 ug/L TP, which corresponds to the upper boundary for "lower mesotrophic" conditions. In the Cascades ecoregion, the action value is 10 ug/L TP, corresponding to the upper boundary for oligotrophic conditions. In the Columbia Basin ecoregion, the action value is 35 mg/L TP, which is the upper boundary of "upper mesotrophic" conditions.

Possible Causes of Impairment

Trophic level is closely tied to the effects on DO and pH from the rate at which plant biomass is formed, so refer to those sections for more information. Primarily the geology of the watershed, the morphology of the reservoir, and the meteorology of the region determine the "natural" trophic status.

Factors caused by human activities in a reservoir include:

- Nutrient loading into the reservoir
- Nutrient recycling from sediments
- Lake height, volume, and residence time
- Changes in watershed hydrology
- Increased erosion
- Increased fertilizer use from development
- Increased wastewater discharge
- Changes in the sediment balance in the reservoir and watershed
- Changes in reservoir hydraulics
- Water release depth

Monitoring Considerations

Monitoring of trophic status will consist primarily of measuring total phosphorous (TP), chlorophyll *a*, and Secchi depth.

- TP measurements are usually a "volume-weighted average" over the season.
- Chlorophyll *a* is also a volume-weighted average, but only from the photic zone.
- Secondary measurements can be taken to assess trophic status such as:
    - Identification of phytoplankton assemblages at several different times
    - Carbon 14 uptake studies
    - Light-dark bottle experiments can look at oxygen production and respiration
    - Surface light levels and attenuation with depth
    - Modeling the full suite of nutrients
- Monitoring is required over the entire growing season, and ideally over the entire year.
- Nutrients transported within sediments during high winter flows can be released from the sediments in summer.
- Measuring inputs from streams is relatively straight forward, although monitoring storm events is more difficult.
- Ground water, surface erosion, and aerial deposition contribute nutrients.
- For free-flowing waters, complex site-specific studies may be necessary.

Protection and Improvement Actions

Nutrient source control is the first step to balance the relative responsibility for creating the reservoir and attracting new sources of nutrient against sources already present or entering from outside the project boundaries. Various management tools are available to manipulate the lake to control the trophic status. A few of these are:

- Chemical sealing of sediments to reduce nutrient cycling
- Chemical clarification of the water column (e.g., with alum)
- Reduction of algal biomass with pesticides (e.g., copper sulfate)

These types of interventions introduce new potential impacts that must be carefully evaluated.

7. Fecal Coliform

Fecal coliform is a bacteria used as an indicator of the presence of bird and mammal (including human) feces.

Water Quality Standard

Numeric criteria for bacteria can be found in WAC 173-201A-200 (2)(b):

2004 Criteria: Table 200 (2)(b)
Water Contact Recreation Bacteria Criteria in Fresh Water

Category	Bacteria Indicator
Extraordinary Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 50 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies /100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies /100 mL.
Secondary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 200 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 400 colonies /100 mL.

Possible Causes of Impairment

- Septic system failures caused by raising groundwater levels (from rises in reservoir levels).
- If increased, camping facilities provided by the applicant (as a relicensing condition) do not provide adequate facilities. Increased use of water's edge by pet owners may occur and associated pet wastes can add to fecal counts.

Monitoring Considerations

If sources of fecal coliform are potentially caused by dam operations or utility activities, a survey of septic tanks and drain fields in the vicinity of the reservoir should be conducted to determine horizontal and vertical separation distance and compare to local health district's criteria. The study should be designed to separate out any other potential human and natural sources, for instance upriver municipal sewage treatment facilities.

Protection and Improvement Actions

Septic systems leakage:

- Keep lake levels low
- Move drain fields away from high water mark
- Follow local county and city requirements

Bacterial pollution from increased recreation:

- Increased availability of septic dumping stations for boats (in large reservoirs) and recreational vehicles.
- Pooper scooper policies for campers.
- Pet restricted areas.
- Public education.
- Sufficient restroom facilities.

Utilities can take responsibility only for those actions that reduce pollution or its affects that are directly under their control. The prime responsibility for controlling human feces contamination often lies with the city or county.

8. Oil and Grease

Background

Dam facilities contain numerous sources of oil and grease. Oils continuously escape into the river via various avenues. Routine oil losses to the water have exceeded several hundred gallons per year at a facility. Equipment failures and other unplanned incidents can result in large and small periodic spills, up to several thousand gallons. Most oil and grease products concentrate somewhere in the system — on the shore or on the bottom. Some of the byproducts bioaccumulate in fish. When fresh grease, oil, hydraulic fluids, and used collected oils are stored on site, the potential exists for spills into the river.

Water Quality Standard and Applicable Laws

Several sections of the Clean Water Act and Washington State laws and regulations apply and can be referenced in Water Quality Certification conditions.

- *RCW 90.48 Pollution Control Act*

  This enabling law for the water quality standards found in the rule, WAC 173-201A, gives Ecology the authority to insure the purity of all waters of the state consistent with public health, public enjoyment, protection of wildlife and aquatic life, and the industrial development of the state; and to that end require the use of all known available and reasonable methods by industries and others to prevent and control the pollution. It provides for assessment and compensation to the state from oil spills (90.48.366-368);

- *WAC 173-201A Water Quality Standards*

  Pollution from oil or petroleum products is generally considered as harming beneficial uses and is therefore a narrative criterion;

- *Clean Water Act Section 401*

  Under Section 401 (d) of the CWA, other applicable state laws can be written into Water Quality Certifications. Ecology has regularly required compliance with other laws in Water Quality Certifications;

- *RCW 90.56 Oil*

  The applicable sections of 90.56 are: duty to report spill and liability for cleanup costs. Development of five-year oil spill prevention plans and cleanup plans and natural resource damage assessments for spills that have already occurred are required;

- *RCW 90.76 Underground Storage Tanks (UST)*

  These facilities are required to obtain a permit and comply with several installation and operational requirements and reporting of releases. The rules implementing this law are in WAC 173-360-(Underground Storage Tank Regulations). Cleanup of releases from UST facilities is generally handled under the Model Toxics Control Act; and

- *RCW 70.105D Model Toxics Control Act (MTCA)*

  This law applies to all facilities where there has been a release or threatened release of a hazardous substance that may pose a threat to human health or the environment. The rules implementing this law are in WAC 173-340 (MTCA Cleanup Regulation) and WAC 173-204 (Sediment Management Standards).

Possible Causes of Impairment

- Escape of grease and heavy oil used for lubrication and hydraulics. (These are generally comprised of longer, bigger aliphatic and aromatic molecules than most fuels, and have about 100 times less solubility in water than gasoline.)
- Servomotors leak oils to the bottom of the turbine pit.
- Wicket gates lubricants can leak directly into the water.
- Turbine guide bearing oil. This is usually stored in large tanks on site. Gravity brings most of the lubricant into a sump where it is pumped back into the lubrication system. Leakage occurs and oil from other sources collects to be pumped to large sumps prior to being discharged to the river.
- Lubrication of spill gate mechanisms, turbine gate mechanisms, etc.
- Most transformers have been purged of PCB oil and now contain “mineral” oils. Low levels of PCBs may still be found in purged transformers, due to incomplete purging or desorption from transformer materials.
- The mineral oil used in transformers typically is less refined than the store-bought variety and contains low levels of contaminants, such as metals and organic contaminants that accumulate during use.

- Oil leakage from the vehicle onto facility pavement is likely to result in contaminated storm water, if untreated. The washing of equipment can also result in an oily discharge, if untreated.
- Vehicle and boat use in the watershed is likely to increase due to recreation and development encouraged by the reservoir behind the dam. Increased vehicle use may result in increased oil levels in storm water. Studies have shown recreational boats to be a major source of oil discharges — from spills, leakage, and engine pass-through.

Monitoring Considerations

- Keep detailed and accurate records of all oil uses, transfers, and disposal (including sorbent materials).
- Setting a numeric discharge limit may be insufficient protection for dams that leak at seals or discharge oily waters. This is due to the tremendous amount of dilution that occurs through normal river flows.
- Many types of lubricants and hydraulic fluids are used, and toxicities of each product to aquatic life are largely unknown.
- The types of petroleum products used do not dissolve much in the water, and instead have a tendency to concentrate at the surface or sorb onto particulate matter or sediments.
- Where accumulation in the sediment is suspected, undertake bioassays to determine if the accumulated product has adverse impacts on benthic (sediment dwelling) organisms.
- Determination of the source of the sediment contamination may be difficult to determine with 100 percent assurance due to the myriad of other potential sources of petroleum to the surface water.
- Follow the sighting of a sheen with careful sampling of the surface water layer.
- Target specific activities for monitoring, such as cleaning operations, oil changes, stormwater event sampling, or monitoring during periods of high recreational use.

Protection and Improvement Actions

FERC applicants should be expected to use the best technology, and all known and reasonable methods to make sure that oil, grease, and hydraulic fluids do not enter the river.

Dam operators are required to file Spill Prevention, Control, and Countermeasure (SPCC) plans with the Environmental Protection Agency (EPA) to meet the requirements of 40 Code of Federal Regulations, Part 112. These plans describe oil storage at the project, as well as detailing spill prevention and cleanup measures for potential leaks from the turbines, transformers, generators, storage tanks, delivery trucks, and any other potential sources of oils at the dam.

Dam owners have successfully reduced oil and grease discharges by using more environmentally friendly lubrication products, increasing maintenance and cleaning of turbine and wicket gate parts, replacing seals earlier than normally scheduled, replacing seals with non-grease type seals, aggressive sump cleaning regimen, spill response plans, stormwater and washwater retention ponds, and boater education and inspections at boat launches.

9. Toxics

Water Quality Standard

The *numeric* water quality standards provide numeric limits for many metals and organic and inorganic compounds found in the water column or pore water in the sediment. *Narrative* water quality criteria for toxics are measured in three ways at specific sites: first in fish tissue, second in bioassays of benthic invertebrates, and third by literature reviews for chemicals with no state criteria.

Toxic substances shall not be introduced above natural background levels that have the potential, either singularly or cumulatively, to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent upon those waters, or adversely affect public health. Ecology has a list of substances, primarily pesticides and metals, for which acute and chronic levels have been established. (WAC 173-201A-040).

Possible Causes of Impairment

Toxics related to dam projects can be categorized as:

- Sources from the project itself
- Sources that increase due to the projects influence
- Increases due to the project operation's impacts on transport of sediments

Dams are industrial sites, so many of the sources of toxics associated with industrial activities are likely to be found. Examples of sources to consider are:

- Solvents for equipment maintenance and repair
- Metals from equipment wear and maintenance
- Paint from maintenance
- Legacy toxics, such as PCBs, in transformers
- Pesticides used for grounds maintenance

Indirect sources could include increased residential, commercial, and industrial development, and associated increases in vehicle use, landscape care, cleaning, maintenance, and toxic source materials. All have a typical suite of toxics associated with the activity, including metals, solvents, paints, pesticides, and other materials.

Dam reservoirs accumulate contaminated sediments as the water slows and the suspended toxic materials from upstream sources settle to the bottom of the reservoir. A related problem could be the release of such substances, if a dam is removed.

Other possible issues include the use of toxic materials as fill during construction projects, the release of toxics in anoxic sediments in the lake bottom, past disposal of toxic materials such as transformer oils containing PCBs, and wind dispersal of toxics from exposed sediments during drawdown.

Monitoring Considerations

The first step is to inventory the possible source of toxics and identify pathways. This can help focus monitoring. Sampling methods are specified in the water quality standards.

Protection and Improvement Actions

- Develop and follow a Pollution Prevention Plan that addresses toxics.
- Disallow use or disposal of toxic materials as fill during construction of the dam.
- Develop a cleanup strategy for contaminated sites.

10. Aquatic Plants and Animals

See also DO, pH, and Nutrients/Trophic Status

Background

The excessive growth of non-native aquatic plant and animal species, and even native aquatic plants in reservoirs can increase pH, raise water temperatures, and increase or decrease dissolved oxygen and total dissolved gas, and otherwise influence the designated uses. Both aquatic and emergent vegetation and invasive animal species can interfere with recreation, degrade aquatic and near shore habitat, cause flooding, interfere with irrigation and power generation, create fish passage problems, trap excessive quantities of sediments and attached nutrients, and be aesthetically displeasing.

Water Quality Standard

Overly abundant plant or animal growth can interfere with many beneficial uses as well as contribute to violations of several numeric standards including pH, dissolved oxygen, and temperature.

Dams create additional habitat for aquatic macrophytes and invasive aquatic animal species by increasing shallow, slack water areas along the shoreline of the river or reservoir. Sediments are deposited in these areas because of the slow current

velocities. These areas also tend to be warmer than the free-flowing river. Still water, warmer temperatures, and the nutrients attached to sediments all provide better conditions for the growth of invasive species than would be found in free-flowing rivers.

Boaters drawn to the reservoir and the facilities developed under a FERC license can introduce invasive non-native species and spread them throughout the reservoir.

Monitoring Considerations

The following information should be collected:

- A baseline map of the extent and species composition of aquatic plant beds should be prepared during the peak of the growing season. Ecology has a web page discussing methods for plant surveys and how to identify aquatic plants.
- A periodic monitoring plan developed and carried out to detect new non-native plant and animal introductions with special attention to potentially destructive species such as zebra mussels and hydrilla.
- If pH and DO do not meet state water quality standards and plant growth is suspected as a contributing factor, water column profiles of parameters upstream, downstream, and in the plant beds should be collected to understand the effects of macrophytes on pH and DO. (See sections on pH and DO.)
- Nitrogen and phosphorous should be monitored upstream and downstream of large plant beds and within them, to provide information on the impact of the plants on nutrients in the reservoir.

Protection and Improvement actions

Work with group of interested agencies, tribes, and citizens (including the dam operators) to cooperatively design and implement an Integrated Aquatic Species Management Plan. The plan should cover:

- Containment methods for invasive plants and animals growing in the reservoir.
- A strategy for quickly detecting new invasive species and rapidly responding to eradicate, control, or contain the new infestation, where feasible.
- A plan to prevent or reduce the risk of new aquatic invasive species introductions from recreational watercraft.
- A schedule to address any plant and animal problems.
- Provisions for adaptive management as new technologies are developed and/or conditions change.

Ecology's *Citizen's Manual for Developing Integrated Aquatic Vegetation Management Plan*. It details manual, mechanical, biological, chemical, and other plant control options. Also, see Ecology's Web site for the most up-to-date information about aquatic plant control methods.

Refer to the Washington State Aquatic Invasive Species Management Plan when addressing these issues.

Judge the severity of the plant and animal problem against the impacts of the controls because any control method will have environmental effects of its own:

- Increased turbidity may result from diver dredging or rotovating.
- Water level drawdowns may freeze out the roots of native plants as well as those of invasive exotics.
- Herbicides have various side effects.

11. Fish Habitat including Flow

Water quantity directly affects many other water quality parameters that affect fish. Flow for fish has been the single biggest Water Quality Certification issue related to hydropower in Washington State.

Many local groups develop flow recommendations under Washington's Watershed Planning Act. Dam operators should coordinate with these efforts. Contact information is on Ecology's Watershed Planning Web site. (http://www.ecy.wa.gov/programs/wq/watershed/index.html)

Fish habitat related to water quality includes large woody debris, gravel, and channel formation and destruction processes. Ecology will rely on the Integrated Streambank Protection Guidelines to evaluate these factors.

Water Quality Standard

Adequate flows are necessary to protect fish and other aquatic organisms. Water flows also greatly influence numeric water quality parameters like temperatures, gas super-saturation, dissolved oxygen, and turbidity.

Possible Causes of Impairment

Water flows create, take away, or influence many different aspects of fish habitat. The important flows affecting habitat may typically be one or more of the following dam operations:

- No flows or low flows in the river channel from diverting water from the river channel into turbines located downstream from the dam or outside the river basin altogether.
- Periodic no or low flows to high flows in the river channel from managing water for power generation, recreation, or flood control.

- Scouring flows from large releases and floods.
- Quickly varying flows from peaking — routing flows through the turbines mostly during periods of daily or weekly high electricity demand.
- Varying flows due to power generator demands, flood control, maintenance, or other operations.
- Flow blockages and impediments affecting upstream or downstream migration of fish.
- Reservoir fluctuations.

How water is held back or passed though or over the dam affects water quality parameters such as total dissolved gas below the dam and temperature in the reservoir and in the river below.

Basic monitoring considerations

Flows affect fish survival in many ways. Ecology requires studies for Water Quality Certifications to answer the questions of how flow is related to fish survival for various fish species:

- *Fish species* - What species are or were present?
- *Fish distribution* - Which species would use which stream reaches?
- *Fish habitat needs for spawning* - What streamflow provides adequate depth, velocity, substrate, and cover for each species' spawning needs for long-term health?
- *Fish habitat needs for rearing* - What stream flow provides adequate depth, velocity, substrate, and cover for each species' rearing needs for long-term health?
- *Side channel habitat* - At what flow are the side channels connected for rearing and spawning? At what times of year are the side channels connected or not connected?
- *Water temperature* - Will the water temperatures be too high for juvenile and adult survival and migration during summer and fall and spawning during fall? Do they meet the state water quality standards?
- *Dissolved gases* - Is nitrogen super-saturation a problem? Does it meet the state standard?
- *Adult fish passage upstream* - Are flows of adequate depth for adult migration of each fish species? Is a pulse of water needed to stimulate upstream passage?
- *Juvenile smolt migration downstream* - Are flows of adequate velocity for juvenile migration? Is a pulse of water needed to stimulate downstream passage?
- *Incubation* - Will there be adequate depth, velocity, and temperature for incubation?

- *Predation* - Is more depth needed to prevent bird predation? Is more velocity needed to prevent fish predation of key species? Are non-native species causing an increase in predation on native species?
- *Food supply* - Will the wetted width of the stream allow terrestrial insects to provide food for fish, and will the water velocities be maintained to allow for drift of aquatic insects?
- *Hydrology* - What flow pattern have the fish evolved with? Will any flow changes cause a change in the usual location of fish redds that will cause increased scouring of redds during high flows? Will the rate at which flow is ramped up and down cause juveniles to be stranded in potholes on gravel bars or in side channels? Will lowered flows prevent proper flushing of fines from gravel and prevent successful spawning and incubation? Will lower flows in winter allow the formation of anchor ice and the freezing of eggs and juveniles?

To address fish habitat, Ecology usually requests use of an instream flow method, which estimates the amount of habitat available at different flows that might occur with and without the proposed project. In most cases, this request is met by using the Physical Habitat Simulation (PHABSIM), part of the Instream Flow Incremental Methodology (IFIM), following quality control and model limitations consistent with the state's Instream Flow Study Guidelines. These processes require consultation with Ecology, fish agencies, and affected tribes.

Different types of studies measure different things. One "size" does not fit all. Methodologies are available to quantify the necessary instream flows for such specific values as fish, wildlife, and recreational use. Many tools are available for assessing instream flows. To begin the process of choosing a method, consider the following factors:

- Level of detail needed
- Time and money constraints
- Target species (e.g., game, non-game, threatened, and endangered)
- Assessment of instream values and priorities (fish, wildlife, recreation, etc.)
- Availability of historical flow records

Details about these methodologies are to be found on Ecology's Web site for instream flows.

Protection and improvement actions

Resolution of habitat flow problems for existing dams usually involves some balancing between fish needs, recreation, navigation, and water quality issues. While dams often create recreational opportunities, they can also create barriers to recreation. Correcting water quality problems, caused by flow or lack of flow, is most often an operational fix. Operational improvements usually center around three areas:

- Increasing flow
- Stabilizing flow
- Improving hydraulics

Localized flows, such as those used to attract adult spawning salmon to fish ladders or channel improvements to increase habitat, can require structural adjustments to the dam or the river channel.

12. Recreation and Aesthetics

Water-related recreational uses are a significant hydropower water quality issue. Shelby (1992) found a curvilinear relationship between instream flow and recreational benefits; that is, the quality of the recreation typically increases with increases in instream flow up to a point, and then decreases with further increases in flow. The graphical depiction of this relationship is referred to as a suitability curve.

Background

- Instream flows and reservoir levels for recreation

  Recreation occurs in a number of different ways: motor boating, fishing, swimming, wading, rafting, canoeing, kayaking, inner-tubing, and aesthetic enjoyment. Many of these activities are closely related to streamflow.

- Instream flows and reservoir levels for aesthetics

  Water features are often valued for their aesthetic properties. Beyond the mere presence or absence of water features, however, it also is possible to determine preferences for specific attributes of water features themselves (e.g., flow quantity, water clarity).

Water Quality standard

Recreation and aesthetics (sight, smell, touch, and taste) are beneficial uses specifically protected in Washington's water quality standards.

Possible Causes of Impairment

Recreation

- Direct dam effects can include: river hydraulics; water depth, velocity, wetted perimeter, and turbulence; and reservoir levels.
- Indirect effects on recreation include changes to reservoir levels and in-channel features such as sinuosity, sediment movement, channel movement, gravel bars, and beaches. Because of flow changes, there also may be changes to riparian vegetation, which, in turn, may affect the recreation experience.

Aesthetics

Aesthetic impairment can include results of placing river flows through turbines and can include other structural, operational, and indirect effects of dams on the senses. Growth and decay of aquatic plants; fish kills, boats, litter, and human or pet waste; reservoir levels; and other problems contributable to dams or dam operations can affect taste, touch, smell, and sight.

Monitoring considerations

A user-based survey provides an excellent means to get qualitative responses from the user community regarding river conditions. It also offers the opportunity to query users about other aspects of the recreational opportunity in addition to instream flow. A user-survey approach could be combined with other assessment methods as well.

Recreation

A comprehensive recreational flow study can accomplish the following objectives:

- Describe the resource.
- Determine which resource attributes are important to each subcategory of recreation use.
- Describe the hydrology—proposed, existing, and pre-project.
- Describe the relationship between flows and physical conditions in the project setting.
- Evaluate flow needs for specific opportunities (e.g., boating type, skill level).
- Integrate flow needs for various opportunities.
- Develop strategies to protect/provide flows.

See Instream Flows for Recreation: A Handbook on Concepts and Research Methods, 1993.

Protection and Improvement Actions

- Integrate flows for recreation and aesthetics with the flow needs for fish and other values using an interdisciplinary approach. Some accommodation among uses will likely be necessary because it is unlikely that any flow can simultaneously optimize the needs of all uses.
- Use education, cleanup, and enforcement to address irresponsible waste disposal.
- Provide education and ordinances to limit boating speeds and hours.
- Involve the public when siting net pens and other potentially visually controversial facilities.

13. Wildlife Habitat

Wildlife relies on the water of reservoirs and rivers. Ecology relies on the Washington Fish and Wildlife Agency to identify critical wildlife concerns directly related to water quality.

Water Quality

standard

Beneficial uses include wildlife habitat. "Wildlife habitat" is defined in the state standards (WAC 173-201A-020) as "waters of the state used by, or that directly or indirectly provide food to support to, fish, other aquatic life, and wildlife for any life history stage or activity."

Possible Causes of Impairment

Dams replace rivers with reservoir systems, as well as changing reservoir pool and downriver fluctuations:

- Operations can greatly affect the habitat of the reservoir. Depending on the season, in reservoirs with long holding times, drawdown can create zones barren of most vegetation and inhospitable to most wildlife.
- Operations may affect side channel or seasonal flood stage areas used during different seasons.
- The riparian habitat, as well as the wildlife using the habitat, is affected by project operations. One of the most significant affects of dam operations to habitat is water fluctuations resulting in shoreline flooding below the dam for short periods of hours or days.
- Riprap reduces aquatic and terrestrial habitat. Recovery of riparian habitat is difficult.

Monitoring Considerations

Ecology relies on the Washington State Department of Fish and Wildlife (WDFW) to work with the project applicant to identify federal and state endangered and threatened species and species of concern. They also address all other wildlife species by categories (game animals, waterbirds, shorebirds, reptiles, insects, plants, etc.) potentially found in the vicinity, and then identify impacts the project could have on any of the species.

Protection and Improvement Actions

Enhancement measures for wildlife and their habitats should come from protection, mitigation, and enhancement measures negotiated by WDFW as part of the FERC licensing process. However, Ecology is ultimately responsible for wildlife improvements contained in the Water Quality Certification. Ecology also relies on information provided by *local jurisdictions* about shoreline issues in the area.

14. Wetlands

Wetlands are important for maintaining water quality. They:

- Remove sediment, phosphorus, nitrogen, and toxics
- Provide habitat for cover, rearing, and food chain support
- Retain waters reducing impacts from runoff
- Provide water during low flow periods
- Cool water
- Abate erosion

Water Quality Standard and Applicable Laws

The antidegradation policy in the water quality standards requires the protection of wetlands by ensuring all human activities that may lower water quality are:

- Necessary
- In the overriding public interest
- Do not harm any existing or designated uses

All known, available, and reasonable methods of prevention, control, and treatment must be applied.

The Shoreline Management Act (SMA) regulates setbacks and buffers for those wetlands within 200 feet of jurisdictional shorelines and wetlands "associated" with these shorelines. Shoreline Management Act (Chapter 90.58 RCW)

Possible Causes of Impairment

- Dam operations and construction can exceed the wetland's ability to assimilate sediments, nutrients, and toxins.
- The introduction of nutrients or organic material to a wetland can lead to a high biochemical oxygen demand (BOD), which in turn can lead to reduced dissolved oxygen. Increases in nutrients can favor one group of organisms (such as algae) to the detriment of other types such as submerged aquatic vegetation. This potentially causes adverse health effects, objectionable tastes and odors, detrimental impacts to aquatic organisms and wildlife, and other problems.
- Changes in water height and flow can significantly affect a wetland's ability to provide water quality and water quantity support to the beneficial use of water supply.
- Severe water fluctuations limit denitrification and phosphorus retention. Changes in pH to more acidic conditions can reduce the wetland's ability to process nitrogen and phosphorus.

- Increases in water volume and/or velocity increase loading and decrease sedimentation rates in the wetland, thereby decreasing the effectiveness of the wetland's ability to remove and retain nutrients and sediments.
- Increased velocities can also cause decreased water storage time in the wetland, which will reduce the opportunity for the wetland to serve as a groundwater recharge source.
- Drawdown of wetland water levels often concentrates and mobilizes nutrients locked up in the exposed substrate.
- Changes in water velocity and volume may result in reduction of wetland quality and diversity of wetland types.
- Changes to a wetland's outlet also can significantly affect the water within the wetland. Wetlands with no outlets or constricted outlets have an increased probability of adsorption, biological processing, and retention of nutrients. Alterations to the outfall that increase the flow out of the wetland will reduce the ability of the wetland to perform these functions.
- Removal, change, or death of vegetation, because of dam operations or construction activities, alters the wetland's ability to remove or store water, nutrients, and other materials.

Monitoring Considerations

Historic records such as surveyor notes and aerial photographs, combined with the National Wetlands Inventory, can be used to identify historic and current wetlands' conditions. This inventory should include all areas within the historic flood migration zone of the channel that is affected by the operation of a facility. Classification and delineation of wetlands should be done in accordance with the *Washington State Wetlands Identification and Delineation Manual*, *March 1997*.
http://www.ecy.wa.gov/biblio/9694.html

Protection and Improvement Actions

A plan might be developed to improve and restore those wetlands that no longer exist or have been converted because of dam operations. In addition, they are identified through evaluation of the historic record to have existed, and support designated uses listed in the water quality standards. If no such designated uses are listed in the standards, restoration plans may address wetlands lost after November 28, 1975.

An existing violation of a particular water quality standard should be considered when identifying the wetlands or wetland functions in need of restoration. The possibility of creating mitigation banks could be explored as a method for dam operators to achieve restoration and defer associated costs while restoring the natural function of the wetlands along the impacted reach.

15. Shorelands

Development activities under the control of the applicant are expected to meet Shoreline Management Act requirements and be compatible with local shoreline regulations.

Water Quality Standard and Applicable Laws

Shoreline development can directly and indirectly affect both numeric criteria and water quality standards.

The goal of the Shoreline Management Act (Chapter 90.58 RCW) is to prevent adverse impacts to shorelines by controlling piecemeal development of those shorelines. Shorelines are those areas adjacent to lakes and streams exceeding certain sizes and flows, respectively, that extend 200 feet landward from the water and include associated wetlands. Local governments are required to develop plans governing shoreline development in their jurisdiction.

Possible Causes of Impairment

Dam construction and operation increase the potential for adverse effects to water quality by making shoreline areas more attractive for development. Increasing the amount of shoreline available, controlling water levels, and providing easy access to shorelines accomplish this. For example, manipulating flow through dams may alter the ordinary high water (OHW) mark of water bodies. The OHW mark serves as the basis for determining appropriate setbacks of structures and buffer zones. The raising of the OHW mark can result in once compliant structures becoming nonconforming uses, backing up septic systems and otherwise affecting water quality. Lowering of an OHW mark can result in structures or activities being allowed to occur closer to a water body than neighboring uses, creating a perception of inequity and promoting further encroachment upon the water body and habitats.

Intensive development of shorelines presents a potential to compromise water quality by:

- Creating incompatible uses
- Encouraging the construction of building in-water structures
- Removing vegetation that controls contaminated surface water runoff
- Promoting soil erosion as a result of vegetation removal, grading, and filling

Monitoring

Work with local shoreline jurisdictions to make sure the local program is consistent with the actions of the dam operation. Dam operators should work closely with local jurisdictions in conducting comprehensive updates of Shoreline Master Plans.

Protection and Improvement Actions

Applicants and operators should participate in the applicable local government Shoreline Master Program update process in order to ensure that their issues and concerns are addressed and to promote a partnership with the jurisdictions in developing an effective and adequate public education and compliance program. Local land-use controls in shoreline areas should reflect any long-term plans dam operators have for flow variation. FERC also recognizes, through its shoreline planning process, that it is in the best interest of dam operators to clearly understand and recognize surrounding land-use and ownership patterns, which can be accomplished by participating in the local shoreline inventory process.

Guidance for Shoreline Management Planning at Hydropower Projects, Office of Energy Projects, FERC, April 2001

Introduction to Washington's Shoreline Management Act, Ecology publication 99-113, December 1999

16. Project Related Indirect and Cumulative Impacts

Background

Activities that should be addressed are those that affect water quality and are within the scope of the applicant's control.

Project Related Indirect Impacts

When hydropower projects produce inexpensive power, consistently available water, a predictable water elevation, and improved public access, then certain types of activities increase more rapidly than they would otherwise. Examples include oil and gas releases from increased septic seepage and nutrient loads from land-use practices made possible due to reservoir management. These activities can lead to water quality problems. Some of these have been discussed earlier in this document. Additionally, the creation of reservoirs and changes in river hydraulics can cause upstream pollution sources to exert greater impacts and be the ultimate yet indirect cause of standards violations. Indirect impacts are addressed on a project-specific basis.

Cumulative Impacts

Cumulative impacts are best described as: how the licensing action would interact with impacts associated with other FERC-licensed projects or with actions outside of the FERC's proceeding. FERC and the applicant are required to address cumulative impacts within the NEPA document. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time. Such impacts may be addressed in the Water Quality Certification insofar as they result from the project.

Water Quality Standard

Other state authorities may be cited in the Water Quality Certification in order to ensure that water quality will be maintained during future activities. These include:

- Shorelands Management Act Ch. 90.58 RCW Coastal Zone Management
- Watershed Planning Act Ch. 90.82 RCW - Watershed planning
- Federal Power Act, Section 10(a)(1)
- Washington State Senate Bill 5028

Possible Indirect Causes of Impairment

- Recreation within control of the project.
- Creation of habitat conducive to invasive species; also, effects of physical and chemical control of these species can cause harm.
- Shoreline recreational development and public access development associated with license conditions and within control of the applicant, such as docks and marinas, jetties, rip-rap, boat launch ramps, camp grounds, and roads. This includes recreational reservoir levels in the FERC license.
- Roads building for construction of project facilities.
- Construction activities at the dam.
- Construction activities within the project boundaries resulting from mitigation for recreation, fish, and navigation.
- Construction activities outside project boundaries that affect water quality resulting from off-site mitigation for recreation or fish and wildlife.

Monitoring Considerations

On-going, post-license monitoring may be needed to track compliance with specific activities and projects. If periodic post-licensing monitoring detects increased levels of pollutants, further monitoring may be needed to trace to pollutants to their source(s).

An analysis of project-related and cumulative impacts will need to be done by the project proponent to consider present and reasonably foreseeable future, project activities that may have an impact to water quality.

See also information about specific parameters: aquatic plants, turbidity, phosphorous, shorelands, fish habitat, and oil and grease.

Protection and Improvement Actions

Assessing and planning for future activities will prepare the applicant to address the full range of consequences of actions so that water quality standards can be met throughout the life of the license. Activities that should be addressed in plans incorporated into Water Quality Certifications are those that affect water quality and are within the scope of the applicant's control.

Appendix 1 –
Acronyms and Water Quality Terms

Acronyms

Water Quality Certification	Section 401 of the Clean Water Act requiring, among other things, federally licensed projects to meet state water quality standards
404	Section 404 Clean Water Act
7Q-10 Flow	One week period of extreme flows calculated to happen once in ten years
AIR	Additional information request
ALP	Alternative Licensing Process
BOD	Biological oxygen demand
CFR	Code of Federal Regulations
CWA	Clean Water Act
CZMP	Coastal Zone Management Program
DEA	Draft Environmental Assessment
DEIS	Draft Environmental Impact Statement
DNEPA	Draft National Environmental Policy Act
DO	Dissolved oxygen
EA	Environmental Assessment
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
IFIM	Instream Flow Incremental Process
IIP	Initial Information Packet
ILP	Integrated Licensing Process
NEPA	National Environmental Policy Act
NOI	Notice of Intent (to file for a FERC license)
NTU	Nephelometric turbidity units
PDNEPA	Preliminary Draft National Environmental Policy Act
PHABSIM	Physical Habitat Simulation, a flow model
pH	Measure of alkalinity or acidity

PM&E	Protection, mitigation, and enhancement measures
PAD	FERCs required Pre-Application Document
QAPP	Quality Assurance Planning Process
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
REA	Ready for Environmental Analysis (FERC's NEPA EIS)
SEPA	State Environmental Policy Act
SMP	Shoreline Master Program
SOD	Sediment oxygen demand
SPCC	Spill Prevention and Control Plans
TDG	Total dissolved gas
TLP	Traditional Licensing Process
TMDL	Total Maximum Daily Load
TP	Total phosphorous
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WQS	Water Quality Standards

Water Quality terms

Refer to the 2003 Water Quality Standards for a more complete definition

Compliance Schedules for Dams	Ten-year plans for dam owners who are currently violating water quality standards to develop a process and schedule for implementing all reasonable and feasible structural and operational changes they can to meet water quality standards. After this time, other water quality standards tools such as use attainability analyses, variances, and site-specific criteria become available. See WAC 173-201A-510
Designated Uses	Those uses specified in the Water Quality Standards (Chapter 173-201A WAC) for each water body or segment, regardless of whether or not the uses are currently attained. See WAC 173-201A-020.

Existing Uses	Means those uses actually attained in fresh or marine waters on or after November 28, 1975, whether or not they are designated uses. Waterbody surveys, historic records, and to a limited extent, anecdotal accounts should be relied on. Introduced species that are not native to Washington, and put-and-take fisheries comprised of non-self-replicating introduced native species, do not need to receive full support as an existing use. See WAC 173-201A-020.
Highest Attainable Uses for Dams	The most sensitive (requiring the most stringent water quality conditions) existing or designated uses that can be feasibly achieved (determined procedurally through WAC 173-201A-510 and 40 CFR 131.10).
Narrative Criteria	Are non-numeric water quality criteria that establish qualitative performance goals to protect beneficial uses from detrimental conditions (e.g., meet requirements of use, no toxic effects, no offensive odors, no blockage of migration).
Natural Conditions	Means surface water quality that was present before human-caused pollution. See WAC 173-201A-020.
Numeric Standards	Numeric water quality criteria assigned to protect designated uses in the water quality standards (Chapter 173-201A WAC) from the detrimental effects of specific water quality constituents.
Site-Specific Criteria	Uses science-based study designs to show that species at a site are more tolerant of a pollutant than are the species used in the national or state studies that formed the basis for the state criteria. Site specific criteria must be formally adopted into the water quality standards and approved by the USEPA under the federal Clean Water Act. See WAC 173-201A-430.
Use Attainability Analyses (UAA)	Structured scientific assessments of the factors affecting the attainment of the water bodies' designated uses, which may include physical, chemical, biologic, and economic factors. A UAA can be used to remove a designated use from the water quality standards (Chapter 173-201A WAC) that is neither existing nor attainable. See WAC 173-201A-440.

Appendix 2 – Ecology Contacts

Ecology Contacts

The headquarters Water Quality Hydropower Certification Coordinator or the regional directors can help you get in contact with the appropriate staff who will be working on your Water Quality Certification.

Headquarters
- Water Quality Hydropower Certification Coordinator.....360-407-6484

Northwest Regional Office
- Regional Manager 425-649-7010
- Water Quality Section Manager 425-649-7033
- Water Resources Section Manager..... 425-649-7270
- SEA Section Manager 425-649-7096

Southwest Regional Office
- Regional Manager 360-407-6307
- Water Quality Section Manager 360-407-6271
- Water Resources Section Manager..... 360-407-6058
- SEA Section Manager 360-407-0271

Eastern Regional Office
- Regional Manager 509-329-3516
- Water Quality Section Manager 509-329-3534
- Water Resources Section Manager..... 509-329-3464
- SEA Section Manager 509-329-3561

Central Regional Office
- Regional Manager 509-457-7120
- Water Quality Section Manager 509-457-7107
- Water Resources Section Manager..... 509-454-3989
- SEA Section Manager 509-574-3992

Appendix 3 – Application Form

Place cursor in first fill-in field and use F11 to tab through fields.

Water Quality Certification Application (401) for Existing Hydropower Dams Form

(For use in Washington State)

Send to: Water Quality Certification Hydropower Coordinator
Water Quality Program
Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98501

NOTE: For other permitting and regulatory questions, contact the Office of Regulatory Assistance at 1-800-917-0043, assistance@ora.wa.gov, or www.ora.wa.gov. Use the Joint Aquatic Resources Permit Application (JARPA) for any construction activities.

Please type or print in black ink. *ALSO be sure to complete the Signature Block on page two.*

1. Applicant:			
Mailing address:			
Work phone:	E-mail address:	Home phone:	FAX #:

If an agent is acting for the applicant during the permit process, complete #2.

2. Authorized agent:			
Mailing address:			
Work phone:	E-mail address:	Home phone:	FAX #:

3. Waterbody(s) of FERC project: Is this waterbody on the 303(d) list? Yes ☐ No ☐ Has, or could, the project contribute to exceedance of any water quality standard? Yes ☐ No ☐ If yes, what parameter(s)? Website for 303(d) list: http://www.ecy.wa.gov/programs/wq/links/impaired_wtrs.html	Tributary of:	WRIA #: http://www.ecy.wa.gov/services/gis/data/hydro/wria.gif

4. Attached materials:

Attach a complete list of all applicable studies, research, summaries, and information that is needed for Ecology to conclude that water quality standards will be met for the project.

Application is hereby made for a certification that water quality standards will be met. I will make available to Ecology, upon request, any information necessary for Ecology to make a 401 water quality certification decision. I am familiar with the existing information and believe that it is sufficient to show that water quality standards will be met for this project. To the best of my knowledge and belief, such information is true, complete, and accurate.

Signature of applicant	*Date*
Signature of authorized agent	*Date*

I hereby designate to act as my agent in matters related to this application for permit(s). I understand that if a federal permit is issued, I must sign the permit.

Signature of applicant	*Date*

This application **must** be signed by the applicant and the agent, if an authorized agent is designated.

If you need this publication in an alternate format, please contact us at 360-407-6404. If you are a person with a speech or hearing impairment, call 711 or 800-833-6388 for TTY.

AGENCY USE ONLY

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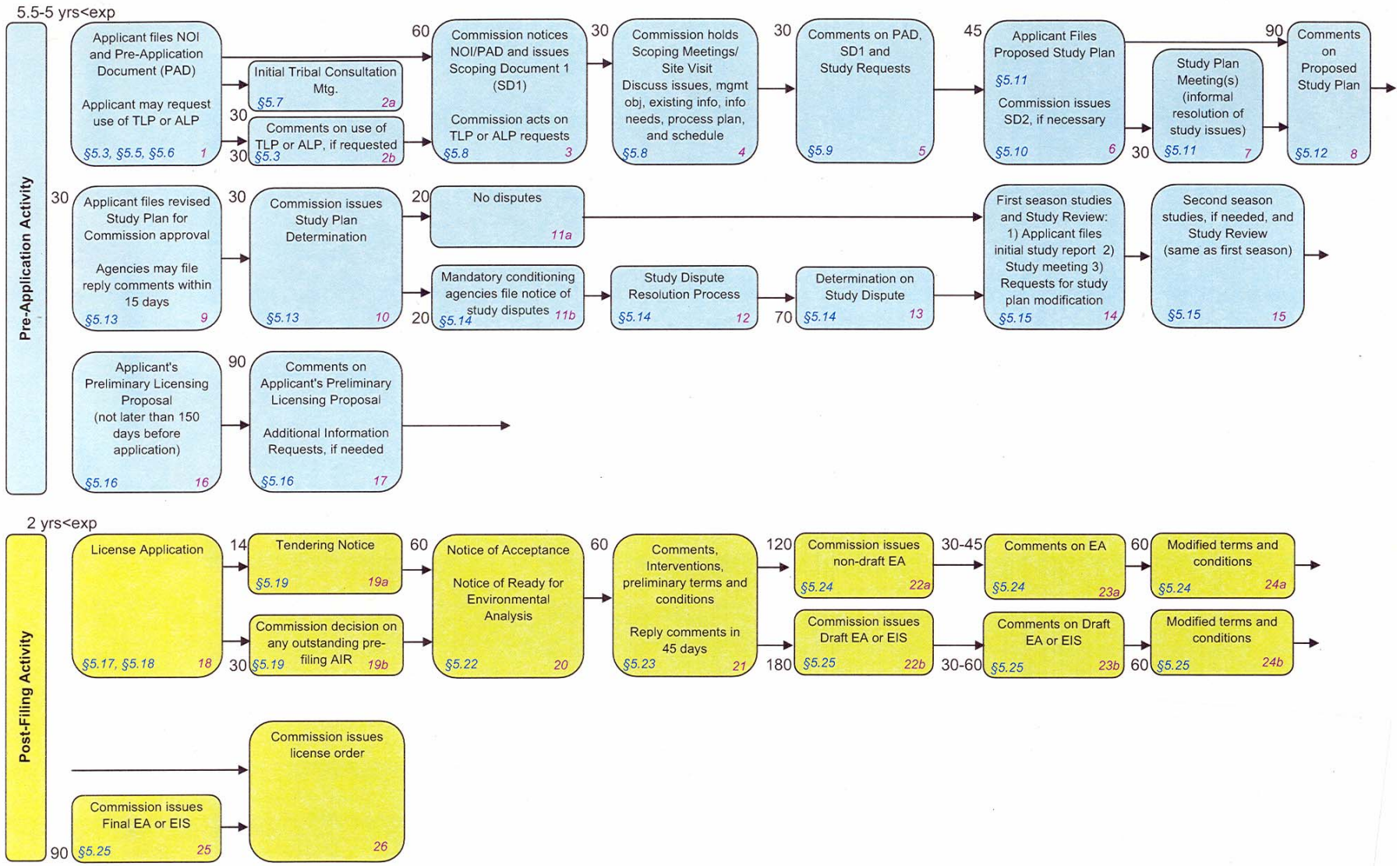
Appendix 4 –
FERC Process Charts

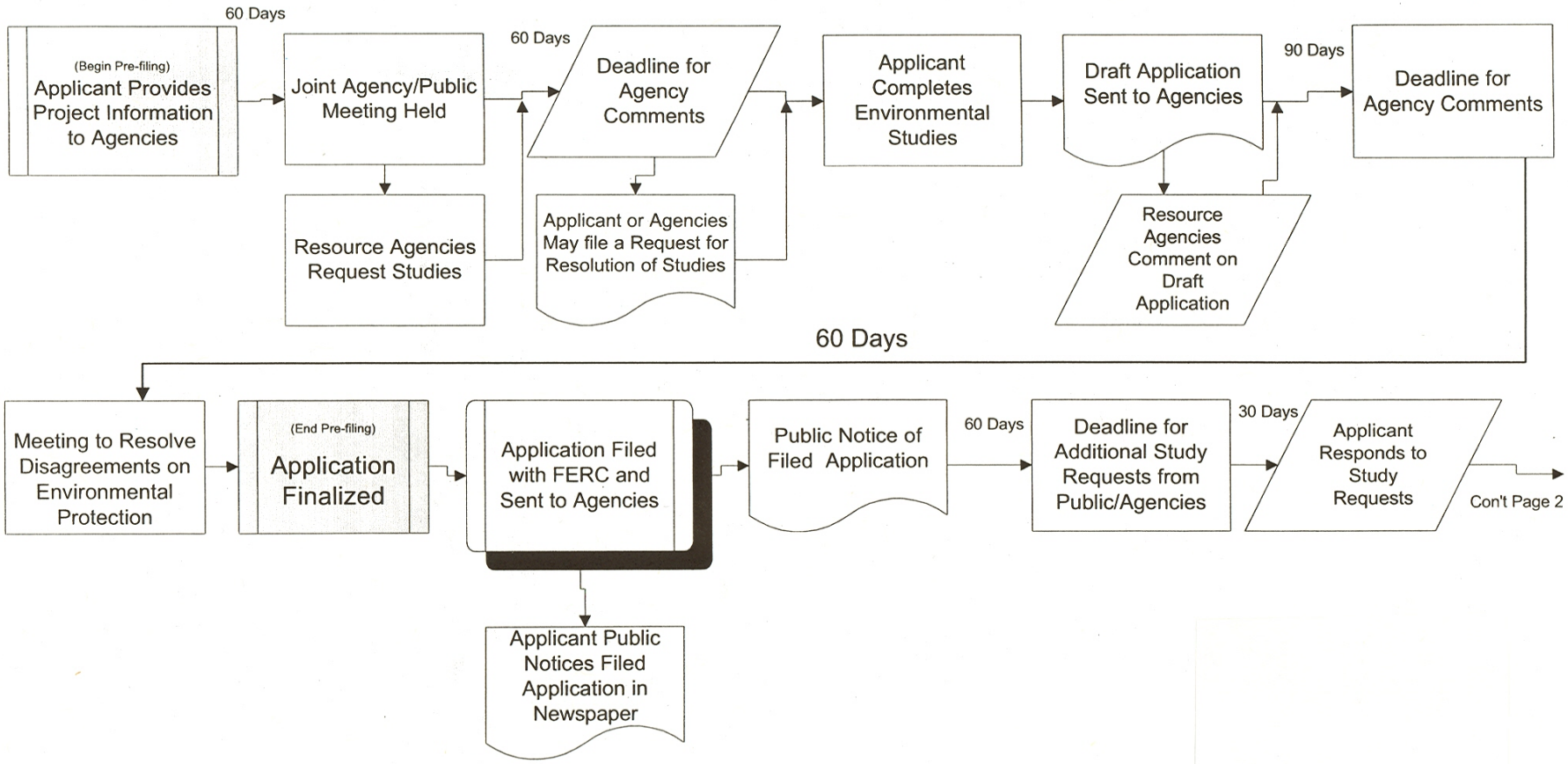
Glossary to Charts

AIR	Additional Information Request
ALP	Alternative Licensing Process
BLM	Bureau of Land Management
DEA	Draft Environmental Assessment
DEIS	Draft Environmental Impact Statement
DNEPA	Draft National Environmental Policy Act
EA	Environmental Assessment
EIS	Environmental Impact Statement
EOT	Extension of Time
NEPA	National Environmental Policy Act
NOI	Notice of Intent
PAD	Preliminary Application Document
PDNEPA	Preliminary Draft National Environmental Policy Act
REA	Ready for Environmental Analysis
SD	Scoping Document
TLP	Traditional Licensing Process

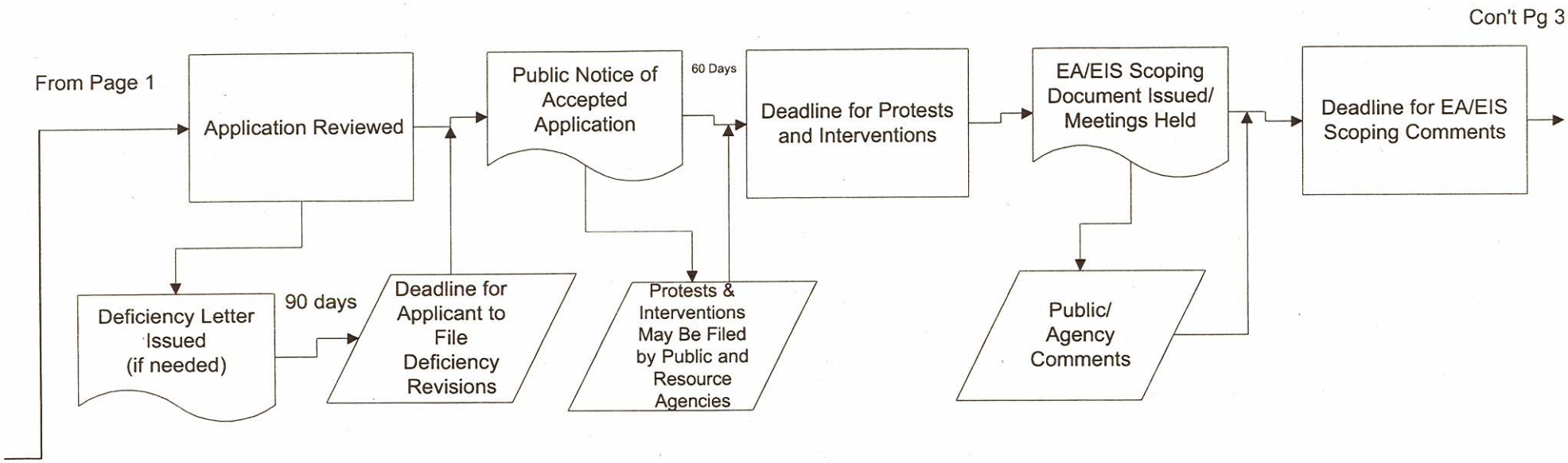
Integrated Licensing Process



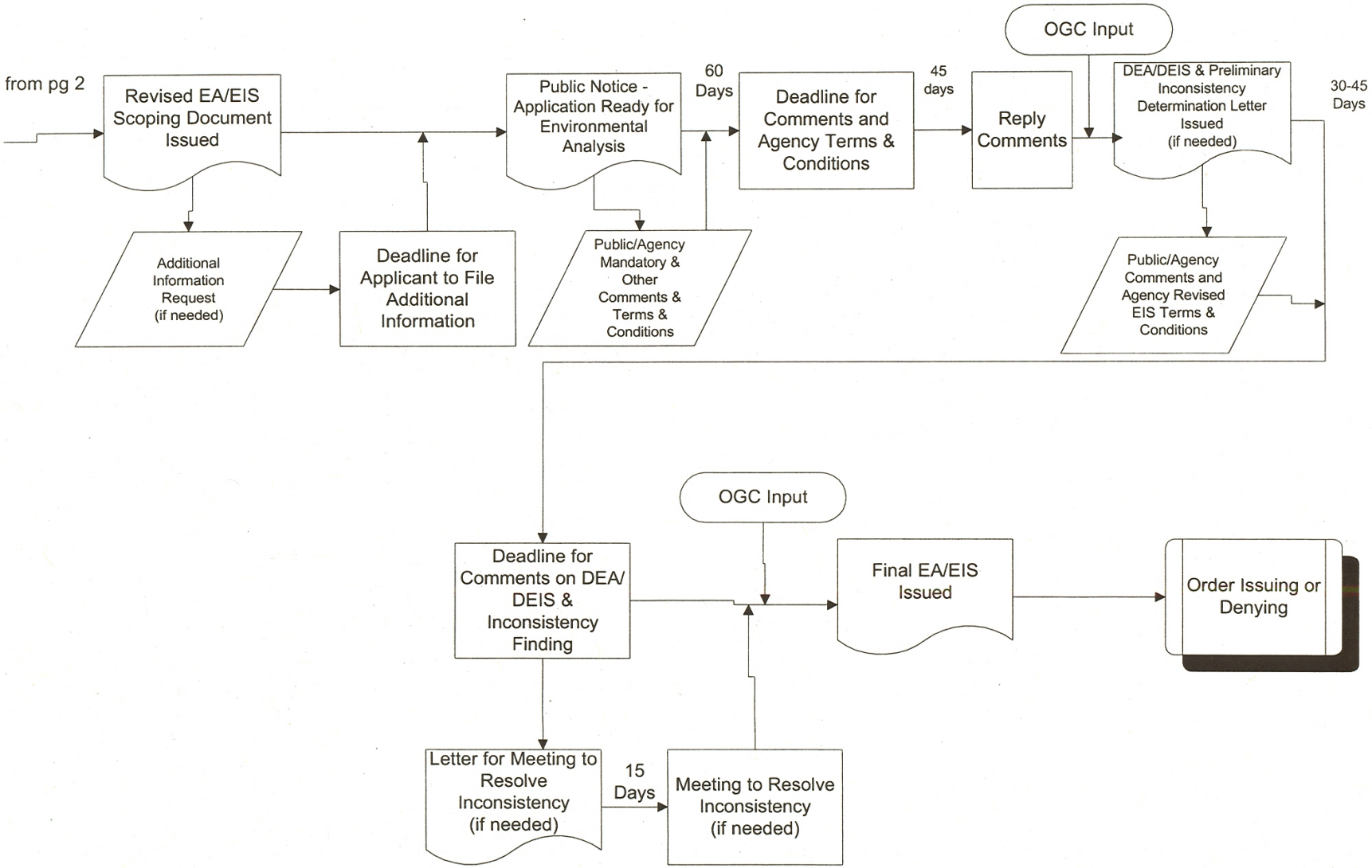
Traditional Licensing Process



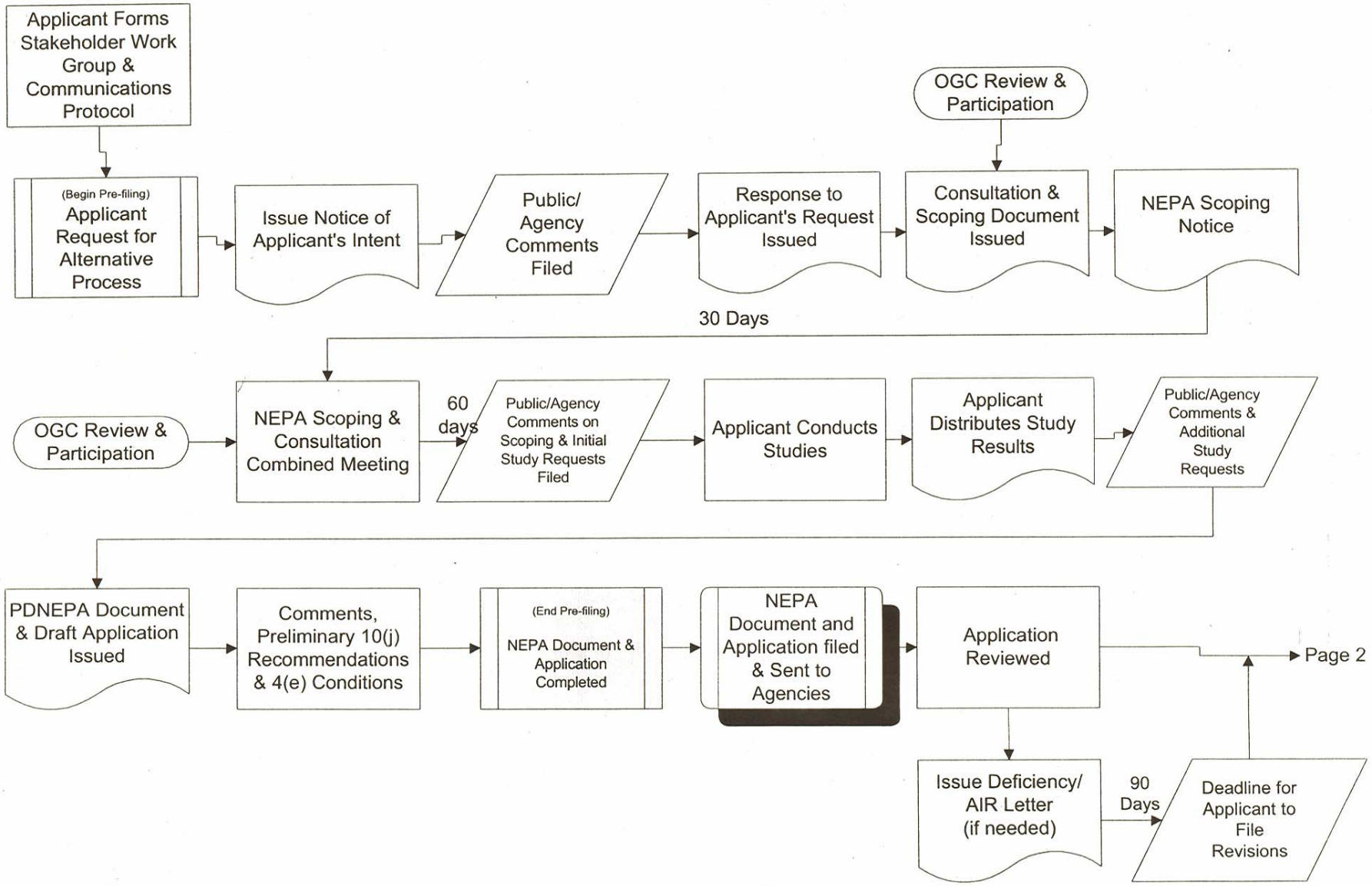
Traditional Licensing Process (continued)



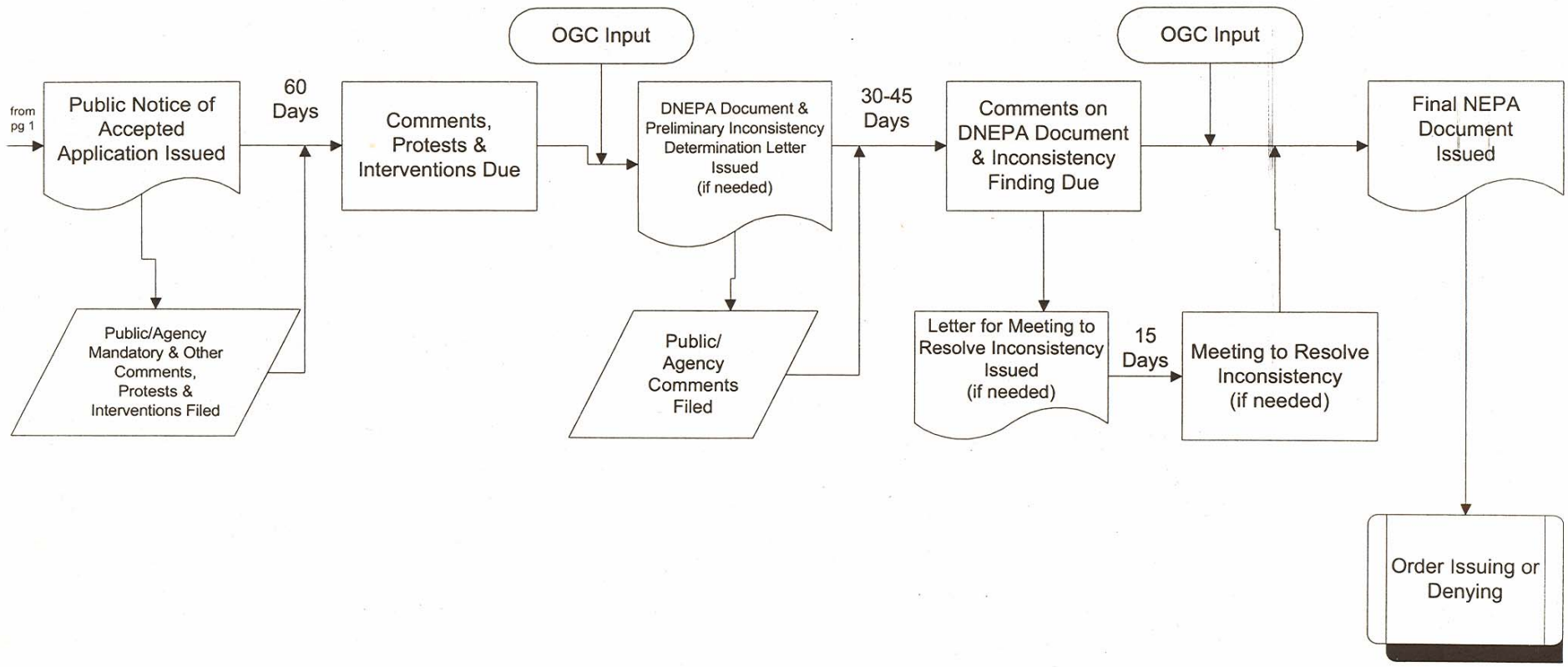
Traditional Licensing Process (continued)



Alternative Licensing Process



Alternative Licensing Process (continued)



Appendix 5 – **State Water Quality Standards** Compliance Schedules for Dams

Chapter WAC 173-201A-510(5) Compliance schedules for dams:

(a) All dams in the state of Washington must comply with the provisions of this chapter.

(b) For dams that cause or contribute to a violation of the water quality standards, the dam owner must develop a water quality attainment plan that provides a detailed strategy for achieving compliance. The plan must include:

(i) A compliance schedule that does not exceed ten years;

(ii) Identification of all reasonable and feasible improvements that could be used to meet standards, or if meeting the standards is not attainable, then to achieve the highest attainable level of improvement;

(iii) Any department-approved gas abatement plan as described in WAC 173-201A-200 (1)(f)(ii);

(iv) Analytical methods that will be used to evaluate all reasonable and feasible improvements;

(v) Water quality monitoring, which will be used by the department to track the progress in achieving compliance with the state water quality standards; and

(vi) Benchmarks and reporting sufficient for the department to track the applicant's progress toward implementing the plan within the designated time period.

(c) The plan must ensure compliance with all applicable water quality criteria, as well as any other requirements established by the department (such as through a total maximum daily load, or TMDL, analysis).

(d) If the department is acting on an application for a water quality certification, the approved water quality attainment plan may be used by the department in its determination that there is reasonable assurance that the dam will not cause or contribute to a violation of the water quality standards.

(e) When evaluating compliance with the plan, the department will allow the use of models and engineering estimates to approximate design success in meeting the standards.

(f) If reasonable progress toward implementing the plan is not occurring in accordance with the designated time frame, the department may declare the project in violation of the water quality standards and any associated water quality certification.

(g) If an applicable water quality standard is not met by the end of the time provided in the attainment plan, or after completion of all reasonable and feasible improvements, the owner must take the following steps:

(i) Evaluate any new reasonable and feasible technologies that have been developed (such as new operational or structural modifications) to achieve compliance with the standards, and develop a new compliance schedule to evaluate and incorporate the new technology;

(ii) After this evaluation, if no new reasonable and feasible improvements have been identified, then propose an alternative to achieve compliance with the standards, such as site specific criteria (WAC 173-201A-430), a use attainability analysis (WAC 173-201A-440), or a water quality offset (WAC 173-201A-450).

(h) New dams, and any modifications to existing facilities that do not comply with a gas abatement or other pollution control plan established to meet criteria for the water body, must comply with the water quality standards at the time of project completion.

(i) Structural changes made as a part of a department approved gas abatement plan to aid fish passage, described in WAC 173-201A-200 (1)(f)(ii), may result in system performance limitations in meeting water quality criteria for that parameter at other times of the year.

Appendix 6
Certification of Consistency

CERTIFICATION OF CONSISTENCY WITH

THE WASHINGTON STATE COASTAL ZONE MANAGEMENT PROGRAM FOR FEDERALLY LICENSED OR PERMITTED ACTIVITIES

Federal Application Number: _____

Applicant: _____

Project Description: _____
_____
_____
(attach site plans, location (county/city), and proximity to waterbody (name))

This action under CZMA§307(c)(3) is for a project that will take place within Washington's coastal zone or which will affect a land use, water use, or natural resource of the coastal zone. *(The coastal zone includes all parts of Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Mason, Pacific, Pierce, San Juan, Skagit, Snohomish, Thurston, Wahkiakum, and Whatcom counties.)*

The project complies with the following enforceable policies of the Coastal Zone Management Program:

1. Shoreline Management Act (SMA):

Is outside of SMA jurisdiction	( )
Applied for shoreline permit	( )#_____being reviewed by _____
Has a valid shoreline permit	( )#_____issued by_____on_____
Has received an SMA Exemption	( )#_____issued by_____on_____

2. State Water Quality Requirements:

Does not require water quality permits	( )
Applied for water quality certification	( )
Has received water quality certification	( )# _____issued on _____
Applied for stormwater permit	( )# _____issued on _____
Has received stormwater permit	( )# _____issued on _____

3. State Air Quality Requirements:

Does not require air quality permits	( )
Applied for Air Quality permit	( )#_____being reviewed by _____
Has an Air Quality permit	( )# _____issued by _____on_____

4. State Environmental Policy Act: SEPA Lead Agency is: _____

Project is exempt from SEPA	( )
SEPA checklist submitted	( ) date_____
SEPA decision issued/adopted	( )DNS ( ) MDNS ( ) EIS ( ) Other _____ date _____
NEPA decision adopted by lead agency to satisfy SEPA	( )SEPA # _____ date _____

Public Notice for this proposed project was provided through:
( ) notices mailed to interested parties using _____mailing list on _____(date).
( ) publication in _____ (newspaper) on _____(dates).
( ) other (include dates) _____

Therefore, I certify that this project complies with the enforceable policies of Washington's approved Coastal Zone Management Program and will be conducted in a manner consistent with that program.

Signature: _____ **Date:** _____