Guidance for Developing Dam Emergency Action Plans

Program Guidance

Publication 92-22

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Dam Safety Office

Water Resources Program

Washington State Department of Ecology

Olympia, Washington

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This document is available on the Department of Ecology's website at:
https://apps.ecology.wa.gov/publications/summarypages/9222.html

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Related Information

- Templates for Dam Emergency Action Plans are available on Ecology's website at:
  - Emergency Action Plan form[1]
  - Simplified Emergency Action Plan form[2]
- Information for Dam Owners website[3]
- Developing Dam Emergency Action Plans website[4]

Contact Information

Water Resources Program

Dam Safety Office
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Olympia, WA 98504-7600
Phone: 360-407-6872
Website[5]: Washington State Department of Ecology

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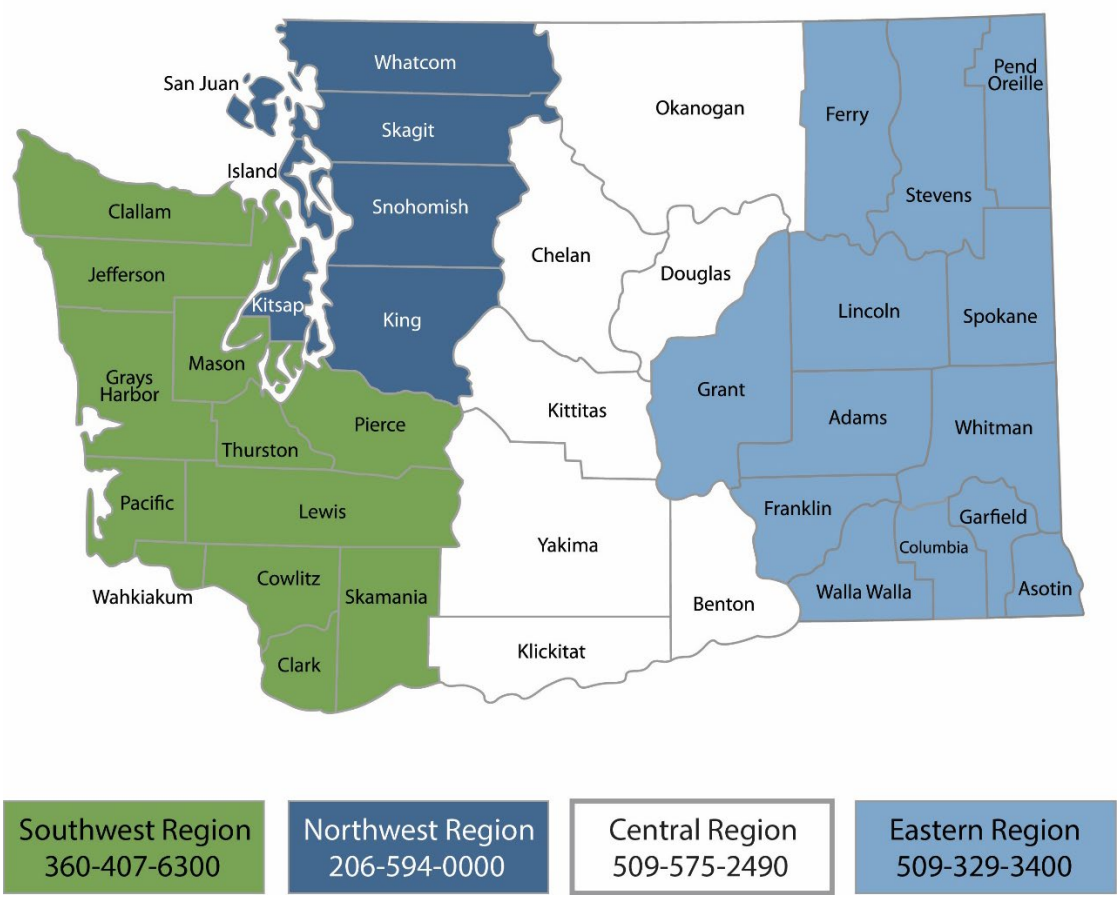
[1] https://apps.ecology.wa.gov/publications/SummaryPages/ECY070383.html
[2] https://apps.ecology.wa.gov/publications/UIPages/SummaryPages/ECY07037.html
[3] https://ecology.wa.gov/water-shorelines/water-supply/dams/info-for-dam-owners
[4] https://ecology.wa.gov/water-shorelines/water-supply/dams/info-for-dam-owners/emergency-action-plan
[5] www.ecology.wa.gov/contact

Department of Ecology's Regional Offices

Map of Counties Served



Region	Counties served	Mailing Address	Phone
Southwest	Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, Wahkiakum	PO Box 47775 Olympia, WA 98504	360-407-6300
Northwest	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom	PO Box 330316 Shoreline, WA 98133	206-594-0000
Central	Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima	1250 W Alder St Union Gap, WA 98903	509-575-2490
Eastern	Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman	4601 N Monroe Spokane, WA 99205	509-329-3400
Headquarters	Across Washington	PO Box 46700 Olympia, WA 98504	360-407-6000

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Washington State Department of Ecology
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Olympia, WA

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DEPARTMENT OF
ECOLOGY
State of Washington

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Introduction

What is an EAP?

An Emergency Action Plan (EAP) is a formal but simple plan that identifies potential emergency conditions that could occur at a dam, and prescribes procedures to follow to minimize loss of life and the potential for property damage. Ideally, the design, construction, operation, maintenance, and inspection of dams are all intended to minimize the risk of dam failures. Despite the adequacy of these programs, unique situations sometimes develop that may result in dam failure. Thus, it is prudent for dam owners to develop and maintain an EAP, so that emergency measures can be initiated that could prevent or minimize the consequences to life and property.

The primary function of an EAP is to provide a means of notifying downstream residents of failure or impending failure of a dam, so that the area can be evacuated in a timely manner. To accomplish this, the EAP must provide procedures to evaluate those conditions at the dam that could lead to failure, and clearly identify the circumstances under which the EAP is to be implemented. A secondary function of the plan is to identify strategies that can be taken following discovery of an emergency situation to prevent failure, or alternatively to delay failure until after downstream residents have been alerted.

The Department of Ecology, Dam Safety Office (DSO) has developed an Emergency Action Plan (EAP) template and guidelines to help dam owners or their representatives create a plan that will be used in case of an unusual event or emergency. The format for the EAP template was developed from the National Dam Safety Program and existing DSO guidelines, and a sample EAP is contained in these guidelines beginning on page 15.

This document and form for the EAP are also available on the Department of Ecology, Water Resources home page, at the following link: Publications & Forms[6]. We will provide the guidelines in alternate formats upon request.

Also available is the Simplified Emergency Action Plan form[7]. This form is suitable for smaller dams with a limited number of residences at risk. Contact this office to determine if this form is appropriate for your dam.

Authority to Require Emergency Action Plans

WAC 173-175-520 requires owners of dams that could pose a threat to life to develop and maintain an EAP acceptable to the department. The EAP must describe procedures for responding to unusual or emergency situations and procedures for detecting, evaluating, communicating, and initiating notification or warning of individuals who may be at risk in downstream and upstream areas. It is the duty and responsibility of the owner to implement

[6] https://ecology.wa.gov/footer-pages/online-tools-publications/publications-forms
[7] https://apps.ecology.wa.gov/publications/UIPages/SummaryPages/ECY07037.html

the EAP when conditions warrant, and to follow the method and schedule contained within the EAP.

Roles and Responsibilities

The Dam owner will provide the following:

- **Contact information** for the owner and operator of the dam.
- **Information about the dam**, including the dam's condition, type, height, crest width, and any other pertinent information. If structural data is not available for your project, please contact the DSO for assistance.
- **Inundation map**, a simplified procedure for developing a dam failure inundation map is available in the Dam Safety Guidelines - Technical Note 1[8], publication number 92-55E. To request a printed copy of this publication call (360) 407-6872 or e-mail at: WRpubs@ecy.wa.gov.
- **Contact information** for emergency personnel.
- **Coordination plans** relating to local emergency management agencies.
- Verify the names and phone numbers of residents and facilities in the flood path where possible, or develop other means of notification in consultation with local emergency management officials.
- **The location and availability of emergency supplies, equipment and contractors.**

The DSO will provide the following:

- The dam's Downstream Hazard Classification and state ID Number.
- Review of your Emergency Action Plan.
- Simplified inundation maps for dam owners who do not have the resources to hire an engineer.
- Technical assistance, contact the DSO at (564) 233-8152 or damsafety@ecy.wa.gov.

General tips, before you start:

Please review the Guidelines and the Sample Emergency Action Plan before gathering the information requested in each section. The sample illustrates how you may tailor the template to fit your project. For example, you may need to add additional contact and resource sheets, or eliminate sections (Hazard Chart or Glossary of Terms) that were included for reference but are not necessary in the final EAP.

[8] https://apps.ecology.wa.gov/publications/SummaryPages/9255e.html

Overview of Emergency Action Plans

The guidelines follow the layout of a typical Five Step EAP. Each section provides an overview of the purpose and contents of the corresponding section and steps of the plan. Certain important sections of an EAP are located in the Appendixes, such as the inundation and location maps, forms, and the contact and material lists.

The Five Step EAP Process

The Five-Step EAP process is the core of your Emergency Action Plan. The five steps are as follows:

- Step A: Event Detection
- Step B: Emergency Level Determination
- Step C: Notification and Communication
- Step D: Expected Actions
- Step E: Termination

In the Five-Step Process, each Emergency Level (Level 1, Level 2, and Level 3) contains all five steps. These steps, depending on the emergency level, may contain different contact lists and procedures. Careful preparation and review of all five steps will provide guidance during an unusual event or emergency.

Layout of Plan

An EAP, as a minimum, should contain the following chapters:

- Table of Contents
- Section I, Purpose
- Section II, Basic EAP Data
- Section III, The Five Step Emergency Action Plan Flowchart
- Section IV, Roles and Responsibilities
- Section V, Emergency Level Determination and Emergency Situations List
- Section VI, Five-Step EAP Process
- Section VII, Maintenance
- Appendices A and B

The content of each chapter is described in the following paragraphs:

Section I, Purpose

Includes a statement outlining the scope and limitations of your Emergency Action Plan. This will serve as an introduction and describe the procedures and responsibilities in case of an unusual or emergency situation.

Section II, Basic EAP Data

This section includes the contact information for the owner/operator, description of the potentially impacted area, any information specific to the dam and directions to the dam. If there are any access issues to the site -- such as locked gates (include contact information for the key holder) or a seasonally rough road -- please advise on the best route.

- A brief description of properties and facilities located downstream.
- Any additional information about the flood path.
- Stream or river drainage system.
- Structural information specific to the dam.
- Owner contact numbers and directions to the dam.
- Any other information that may be useful.

You may find this information in your property documents, county assessor's records, area maps and at the DSO.

Section III, the Five Step Emergency Action Plan Flowchart

The purpose of this flow chart is to illustrate the steps to take during an unusual event or emergency. Include this flowchart in your EAP.

- Copy the flowchart from the sample EAP or from the Emergency Action Plan template.

Section IV, Roles and Responsibilities

Outlines who is responsible for what during an unusual event or emergency. Includes the contact information for responsible individuals and agencies.

Before filling out this section, identify and verify all jurisdictions, agencies and individuals who will be involved in implementing the Emergency Action Plan. Careful research and coordinated planning with all involved parties will lay the foundation for a thorough and useful emergency action plan. Fill out the Roles and Responsibilities sheet (located in the EAP template); you may modify it to suit your project, but include all the requested information.

- Confirm the level of assistance your local emergency responders can supply. Determine who is in charge of notifications, evacuations, roadblocks, and emergency supplies.

- Remember when establishing contact and duty lists, it is important that no one person becomes overwhelmed during an emergency. Arrange for alternate or back up personal to handle the prearranged duties.

Developing an Emergency Contacts List: Contact the agencies below to identify who will do what during an emergency. These are the same numbers and contacts that will be used in the Emergency Services and Contacts List. Check and update this information whenever the EAP is revised.

Police and Fire Department – 911: Most often, this will be the first number called during an emergency or unusual event. Use your local non-emergency phone number to verify available services. In some jurisdictions, the local sheriff may be the primary contact in case of an emergency.

The Emergency Management Division (EMD): will aid with preparedness, and serves as the primary contact responsible for coordination of all emergency actions. The EMD will also work with local law enforcement to initiate warnings, order the evacuation of people at risk in the flood path and will terminate the emergency. The EMD can participate in the annual review and update of the EAP.

Washington Military Department, Emergency Management Division: web site address: https://mil.wa.gov/emergency-management-division#Contact.

Phone contact:

Main Switchboard (24 hour) (800) 562-6108 or (253) 512-7000

Public Information Officers (800) 688-8955

Search and Rescue, (888) 849-2727

Emergency Operations Center (Activations Only), (800) 854-5406, or (253) 912-4900

EMD Address:

Washington Military Department Emergency Management Division Building 20, MS TA-20

Camp Murray, WA 98430-5112

Depending on the location, size of the dam and type of incident it may be necessary to coordinate with the National Incident Management System (NIMS) during an unusual or emergency situation. The Unified Command is a public management system in which the United Command members, individuals from the different responsible agencies (Police, Fire, DSO, etc.); make collective decisions on the response and management activities of the incident (evacuation, road closure, sheltering, etc.).

National Incident Management System, Federal Emergency Management Agency

Telephone: (202) 646-2500

500 C Street S.W.

Washington, D.C. 20472

http://www.fema.gov

Dam Owner's Engineer: Include contact information if an engineer is available. An engineer can advise on the emergency level and assist with remedial actions to take if time permits.

Washington Department of Ecology - Dam Safety Office: The DSO is available to assist in determining the emergency level and what remedial actions to take. The DSO can also advise on when to conclude the EAP. Include the contact information listed below:

Dam Safety Emergency Number at: (360) 971-6347 (24 hr.) or (360) 407-6208 (office)

Contact this office for current phone number for the DSO Lead Engineer.

Emergency Services & Other Contacts list: Use the information gathered for the Emergency Services Contact List to develop the Emergency Level 1–3 notification lists. There is redundancy built into the EAP. The same contact information will appear in the "Emergency Services & Other Contacts" page, the Level 1-3 notification lists, and in the appendix. That way less time is needed to locate critical contact information.

- Copy the contact list and place before the Contact Checklist in Emergency Levels 1-3.

Section V, Emergency Level Determination & Emergency Situations List

This section is an overview of the Emergency Levels 1 through 3, and descriptions of potential dam failure situations. Appendix B-1 contains full descriptions of the Emergency Action Plan template. The dam owner is responsible for reviewing each emergency level and potential situation before an event. Timely evaluation of an event and correctly determining the appropriate emergency level is vital to protecting lives and property.

- Include the *Determining the Emergency Level* page from the EAP template; remember to add the county location of your dam.
- Include both pages of the *Guidance for Determining the Emergency Level* from the EAP template in your plan.
- In the *Guidance* chart determine and fill in the number of inches below the dam crest in the Flooding Event column for initiating Levels 2 and 3. Contact your engineer or the DSO for assistance.

Section VI, Five-Step EAP Process

In the Five-Step EAP Process, each emergency level (level 1, level 2, and level 3) contains all five steps. These steps, depending on the emergency level, will contain different contact

lists and procedures. This is the core of your Emergency Action Plan. Careful preparation and review of all five steps will provide guidance during an unusual event or emergency.

Each emergency level is a "stand alone" section supported by information located in the appendices. Review the emergency level and the situation descriptions located in Appendix B-1of the EAP template. Becoming familiar with different potential events will lead to a rapid and accurate determination of the appropriate emergency level.

Complete the five steps for each of the three emergency levels as outlined in the Emergency Action Plan Overview. The Five Step Overview page is located at the beginning of the template.

STEP A: Event Detection

All Emergency Levels

- Complete the STEP A–EVENT DETECTION page from the EAP template. Add any additional information on conditions that could cause an unusual or emergency event.

STEP B: Emergency Level Determination

Emergency Level 1

- Complete the STEP B–EMERGENCY LEVEL DETEMINATION page from the EAP template.

Emergency Levels 2 & 3

- Complete the STEP B–EMERGENCY LEVEL DETEMINATION page from the EAP template.
- Determine and fill in the number of inches below the dam crest under the Flooding Event column in the Guidance chart. Contact your engineer or the DSO for assistance.

STEP C: Notification and Communications

Emergency Level 1

- Complete the EMERGENCY LEVEL 1 NOTIFICATION page from the EAP template. (You may modify the notification list to suit the needs of your project.)
- Fill in the County name under the Notification and Communication section.

- Use the guidance located in the Roles and Responsibility section to develop the contact lists.

Copy and place extra copies of the CONTACT CHECKLIST at the back of your EAP.

Emergency Level 2

- Complete the 911 SCRIPT.
- Complete the EMERGENCY LEVEL 2 NOTIFICATION page. You may modify the notification list to suit the needs of your project. Use the guidance located in the Roles and Responsibility section to develop the contact lists.
- Include the CONTACT CHECKLIST–EMERGENCY LEVEL 2 form.
- Complete the SUMMARY OF PEOPLE AND STRUCTURES AT GREATEST RISK. List in order of proximity to the dam.
- Complete the SUMMARY OF ROADS AT RISK. List in order of proximity to the dam.

Emergency Level 3

- Complete the 911 PHONE SCRIPT and the EMERGENCY MANAGER PHONE SCRIPT.
- Complete the EMERGENCY LEVEL 3 NOTIFICATION page. You may also modify the Notification list to suit the needs of your project. Use the guidance located in the Roles and Responsibility section to develop the contact lists.
- Include the CONTACT CHECKLIST–EMERGENCY LEVEL 3 form.
- Complete the SUMMARY OF PEOPLE AND STRUCTURES AT GREATEST RISK. List in order of proximity to the dam.
- Complete the SUMMARY OF ROADS AT RISK. List in order of proximity to the dam.

STEP D: Expected Actions

Emergency Level 1

- Include the STEP D - EXPECTED ACTIONS section in your EAP. Modify as needed to suit your dam.
- Copy the UNUSUAL OR EMERGENCY EVENT LOG form. Place extra copies at the back of your EAP.

Emergency Level 2

- Include the STEP D - EXPECTED ACTIONS section in your EAP. Modify as needed to suit your dam. This section outlines remedial actions to follow to mitigate a potential emergency situation.
- Complete the RESOURCES AVAILABLE LIST, adding additional pages as needed.
- Copy the UNUSUAL OR EMERGENCY EVENT LOG and place extra copies of this form at the back of your EAP.

Emergency Level 3

- Include the STEP D - EXPECTED ACTIONS section in your EAP. Modify as needed to suit your dam. This section outlines evacuation and safety procedures.
- Complete the RESOURCES AVAILABLE LIST, adding additional pages as needed.
- Copy the UNUSUAL OR EMERGENCY EVENT LOG and place extra copies of this form at the back of your EAP.

STEP E: Ending Response and Reporting, Termination Responsibilities

Emergency Level 1

- Include the STEP E - ENDING RESPONSE AND REPORTING section in your EAP. This section is in the EAP template.
- Copy the DAM EMERGENCY EVENT REPORT found in Appendix B of the EAP template.

Emergency Levels 2 and 3

- Include the STEP E - ENDING RESPONSE AND REPORTING section in your EAP. This section is in the EAP template. This section outlines termination procedures and responsibilities.
- Copy the DAM EMERGENCY EVENT REPORT found in Appendix B of the EAP template and place extra copies at the back of your EAP.

Section VII, Maintenance- Exercises and Review, Revision & EAP Locations

Dam emergencies and failures are not common events. Therefore, training and exercises are necessary to maintain emergency response readiness, timeliness, and effectiveness. To do this the EAP requires periodic maintenance to remain current and as effective as possible.

- It is required under WAC 173-175-520, that dam owners periodically test the functioning of their Emergency Action Plans.

Emergency Action Plans should be considered "Living Documents." This means that:

- They are never final.
- They should be reviewed and updated at least once a year.
- The local emergency manager should take part in the annual review.
- All updates should be promptly distributed to all plan holders.

EAP Exercises (Training) - Periodic training and exercises are necessary to ensure that people involved are thoroughly familiar with all elements of the plan, as well as their related duties and responsibilities. An appropriate number of people should receive training to ensure adequate coverage at all times. EAP exercises can include orientation, phone drills, tabletop exercises, and functional exercises.

The level of detail associated with testing and how often plans are tested depends on the size of the facility, the number of people at risk, and what is located in the flood path.

For significant hazard dams with a lower hazard rating, testing could consist of reviewing the EAP and verifying that the telephone numbers on the notification chart and the resource list are current.

In the case of larger, more complex projects, the training of personnel and response procedures may be much more involved. Technically qualified personnel should receive training in problem detection and evaluation, and appropriate remedial (emergency and non- emergency) measures. This training is essential to enable them to properly evaluate developing situations, and determine appropriate responses.

Testing at large dams may include:

- Verify that key personal understand the procedures and required actions to be followed during an emergency.
- Prepare scenarios (Table Top Exercises) for various emergencies and conditions.
- Review special procedures that are required for nighttime, weekends and holidays.
- Stage a drill that simulates emergency conditions, preferably up to, but not including an actual evacuation.
- Identify primary and auxiliary communications systems, both internal (between persons at the dam), and external (between dam personnel and outside organizations).
- Test remote sensing equipment at unmanned dams.

Coordination with emergency responders and other stakeholders is necessary for the successful execution of a plan in an actual emergency. Use the guidelines in the Roles and Responsibilities page to determine which organization, (local, state (DSO) or federal), is appropriate to assess the effectiveness of a plan.

At a minimum, owners of high hazard dams should conduct an annual orientation. The orientation can be a simple meeting where those individuals and entities with a stake in the EAP come together to review the roles and responsibilities described in the EAP. Orientations are especially useful for bringing new staff and leadership within any of the various organizations up to speed on the components of the EAP.

Owners of high hazard dams should maintain a comprehensive exercise program that includes all the components listed above plus tabletop and functional exercises. As tabletop and functional exercises are typically complex, they should be conducted about every five years, or when a significant change has taken place to the dam or surrounding area.

Reviewing and updating the EAP - The dam owner is responsible for updating the EAP documents. The EAP should be reviewed and updated annually, including:

- Calling all contacts on the notification charts in the EAP to verify that names and phone numbers are current.
- Contacting the Local Emergency Management Agency to verify where the EAP is kept and if responsibilities as described in the EAP are understood.
- Calling the locally available resources to verify that the phone numbers, addresses, and services are current.
- Reviewing information on the people and structures at risk and incorporate changes in development within the flood inundation area.

Any deficiencies found during training and exercises should be noted, and the plan revised accordingly.

When revisions occur, the dam owner should provide the revised pages and a revised Revision Summary Page to all the EAP document holders. Record where copies of the EAP are located and who is responsible for the maintenance of the EAPs.

The plan holders are responsible for updating their copies of the EAP whenever they receive revisions. Discard out-of-date pages to avoid confusion with the revisions.

Emergency Action Plan Location and Revision Lists - These two lists are located at the end of the Five Step Plan and before the Appendices. It is important to keep a record of where the plans are located and who will be responsible for updating the plans when revisions are made.

- Copy and include in your EAP the Emergency Action Plan Location sheet and the Revision sheet. These forms are in the EAP Template. Place extra copies of this form at the back of your EAP.
- Owners keep the “master” Emergency Action Plan, and record where copies of the EAP’s are located.

Section VIII, Appendices – Maps and Supporting Data

Appendix A

Appendix A-1 - Location and Vicinity Maps. Include a simple but clear map showing the location of the dam site. It is fine to "cut and paste" either electronically or from an available map of the area. See sample page 52.

Appendix A-2 - Inundation Map. The Dam Safety Guidelines - Technical Note 1, (publication number 92-55E) provides a simplified procedure for developing a dam failure inundation map. To request a copy of this publication call (360) 407-6872 or e-mail at: WRPubs@ecy.wa.gov or on our website at: https://apps.ecology.wa.gov/publications/SummaryPages/9255e.html. If you do not have the resources available to develop an inundation map, please contact this office. See sample page 53.

Appendix A-3 - Resources Available. This section provides information on equipment and materials that are locally available for use in responding to an emergency condition at the dam. Use the form located in the EAP template; see sample page 54.

List the following, and include contact information:

- Materials that may be needed for emergency repair, and their location, source, and intended use. Materials should be located as close as possible to the dam site.
- Equipment to be used, its location, how to obtain it, and who will operate it.
- How to contact the operator or contractor.
- Any other people who may be needed (e.g., laborers, engineers), and how they are to be contacted.
- Any other special instructions.

NOTE: For each applicable item, include specific contacts and how to reach them during business and non-business hours.

Place the Summary of People/Structures and Roadways at Risk tables before the Step D - Expected Actions section in Emergency Level 2 & 3. Blank tables are found in Appendix A-4 and A-5 of the EAP Template.

Appendix A-4 Summary of People/Structures at Greatest Risk, use the inundation map to determine the residences and other structures that may be impacted by floodwaters. List the residences and other structures with contact information in order of proximity to the dam and estimate as best as possible how long it would take for floodwaters to reach them.

You can find resident contact information at your local county assessor's office or in your local telephone directory. Depending on size of the impacted area and number of downstream residences, you may need to work with the appropriate Emergency Services to develop

procedures to contact people. Use the form located in the EAP template. See the sample on page 55.

Appendix A-5 Roadways at Risk, use the inundation map to determine the roads impacted by floodwaters. List the roads in order of proximity to the dam and estimate as best as possible how long it will take for floodwaters to reach them. It is important not to use roadways for access or evacuations that would be at risk of flooding. Use the form located in the EAP template. See the example on page 56.

Appendix A-6 Plan and Profile View of Dam, include a copy of the plan view and profile of your dam. Use your original designs or plans, if you cannot locate the plans, contact the DSO, we may have copies on file. If none exists, you will need to survey your dam. Cut and paste the plans into your EAP in either an 8 ½" by 11", 11" by 17" or larger format if appropriate for the scope of your dam. See the example on page 57.

Appendix A-7 Reservoir Elevation Area & Capacity Data, include this information for your dam. If you do not have this information available, you will need to hire an engineer or contact the DSO for assistance. See the sample on page 59.

Appendix B

Appendix B-1 Emergency Level Examples, include this section in your Emergency Action Plan. See page 61.

Appendix B-2 Contact Checklist, B-3 Unusual or Emergency Event Log, & B-4 Dam Emergency Event Report: fill out the name of the dam, ID number and contact information. Place where indicated and keep extra copies on hand. See example on pages 63.

Appendix B-5 Dam Hazard Classification Chart, provided for reference, if you have any further questions regarding how this chart was developed, please contact this office. See example on page 66.

Appendix B-6 Glossary of Terms with water equivalents table, provided for reference.

Appendix B-7 Signature Page (Concurrences) the Emergency Action Plan will need to be reviewed and approved by the Dam Safety office, the local emergency manager and other stakeholders. Once this has occurred, place this sheet at the end of the EAP.

If you have any comments, suggestions or questions please contact this office at (564) 233-8152 or damsafety@ecy.wa.gov.

Dam Safety Regulatory Authority, WAC 173-175-520

WAC 173-175-520 Emergency action plans.

(1) In those cases where a failure of the dam could pose a threat to life (downstream hazard classes 1A, 1B, 1C, and 2), the owner shall develop and maintain an emergency action plan (EAP) acceptable to the department.

(a) The EAP shall describe procedures for responding to unusual or emergency situations and procedures for detecting, evaluating, communicating, and initiating notification or warning of individuals who may be at risk in downstream and upstream areas. Information on the development of an EAP is contained within the department's Dam Safety Guidelines.

(b) It shall be the duty and responsibility of the owner to implement the EAP when conditions warrant and to follow the method and schedule contained within the EAP.

(c) Owners are required to coordinate the development of the EAP with representatives from the local emergency services staff, state department of community development, emergency management division, and appropriate local authorities.

(d) Copies of the completed EAP must be provided to the state emergency management division, local emergency services office, and to the department.

(2) Any proposed changes to the EAP which could have an affect on public or project safety must be submitted to the department for review and acceptance before implementation.

(3) Owners are required to exercise components of the EAP as needed to confirm the viability of the plan.

(4) The department will coordinate and solicit review comments from the local emergency services office and the state emergency management division on the acceptability of proposed EAP's. Those comments will constitute the primary basis for accepting or requesting modifications to a proposed EAP.

(5) The EAP must be updated within one hundred eighty days after a periodic inspection has been completed by the department.

[Statutory Authority: RCW 43.21A.064, 43.21A.080, 86.16.061, 90.03.350 and [90.03].470.

04-16-122 (Order 03-08), § 173-175-520, filed 8/4/04, effective 9/4/04. Statutory Authority: RCW 43.21A.064, [43.21A.] 080 and 86.16.061. 92-12-055 (Order 91-17), § 173-175-520, filed 6/1/92, effective 7/2/92.]

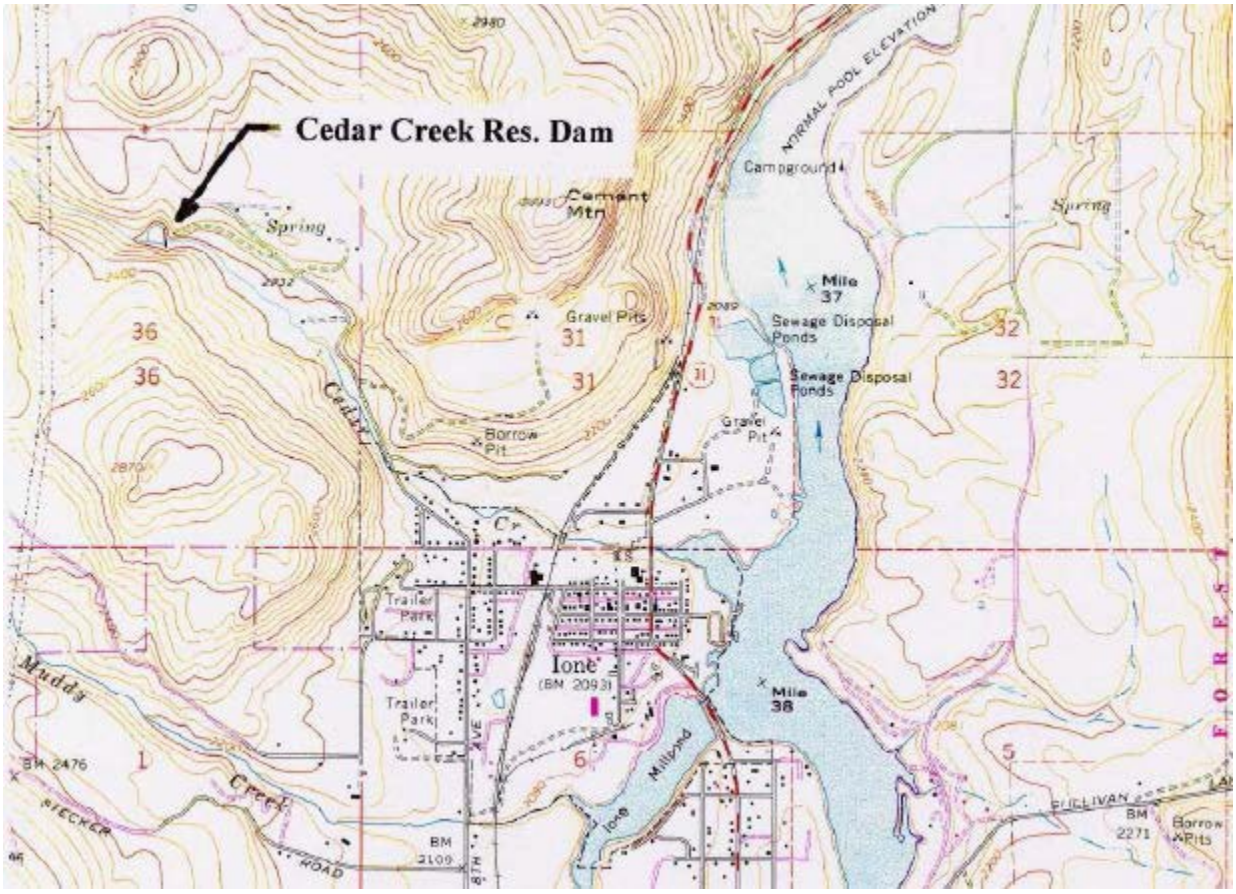
Sample Emergency Action Plan

EMERGENCY ACTION PLAN

Project Name: Cedar Creek Reservoir Dam

DSO File Number: PO62-1123

Location: Ione, Pend Oreille Co. Cedar Creek



Prepared by: Sample Engineering Staff

OWNER: City of Ione ISSUE DATE: July 4, 2005

REVISED DATE: July 4, 2011

The dam used for the examples: Cedar Creek Dam was built in 1950 to supply drinking water to the Town of Ione. After the town switched to well water in the 1980s the unused dam did little more than block approximately 10 miles of fish habitat. In an agreement between the Town of Ione and the Department of Ecology the dam was removed in 2005. Certain "facts" pertaining to the dam are exaggerated (or completely fictional) to help illustrate the sample Emergency Action Plan.

Table of Contents for the Sample EAP

Purpose

The purpose of this EAP is to reduce the risk of injury or loss of life and to minimize property damage during an unusual event or emergency. The EAP defines responsibilities and provides procedures designed to:

- Identify conditions that may endanger the dam.
- Begin remedial actions to prevent or minimize the downstream impacts of a dam failure.
- Notify local emergency personnel and effectively communicate conditions.
- Warn downstream residents of impending or actual failure of the dam.
- Conclude the response to the unusual or emergency event.

Basic EAP Data

Potentially Impacted Area:

Please describe the property downstream of the dam: (agricultural, residential, industrial, critical wildlife habitat, etc.) agricultural, residential, Railway and High School.

Additional information on impacted areas if available: Pend Oreille Valley Railroad and Pend Oreille

Elementary School both are adjacent to where Cedar Creek intersects with Grinnell Street and the railroad cut in the Town of Ione .

Located on: Cedar Creek Creek/River

Downstream Flood Path: Cedar Creek, Creek/River to Pend Oreille River ,

Description of the Dam:

Official Dam Name: Cedar Creek Reservoir Dam .

State I.D. Number: PO62-1123 .

Dam Owner and/or Operator: Town of Ione .

Mailing Address: 12345 City Hall, Ione, WA 00000 .

Owner and/or Operator Contact Numbers: (509) 123-0000 or (509) 123-0001Cell .

E-M ail Address: myemailaddress@YYY.net .

Section 36 Township 38N Range 42 E W.M. County: Pend Oreille .

Type of Dam:(earthfill, concrete, rockfill, or:) Concrete .

Dam Height: 19 feet Crest Length: 86 feet Crest Width:24 inches .

Downstream Hazard Classification: High 1-C

Number of Homes in the Dam break floodplain: 3 .

Complete the contact list for persons downstream affected by flood waters in Step C.

Directions to the Dam:

North on state highway No.31 to the town of Ione, West on Houghton Street then North on N 8th Road (Cedar Creek Road) approximately ¾ of a mile to access road to Cedar Creek Dam .

Cedar Creek Dam

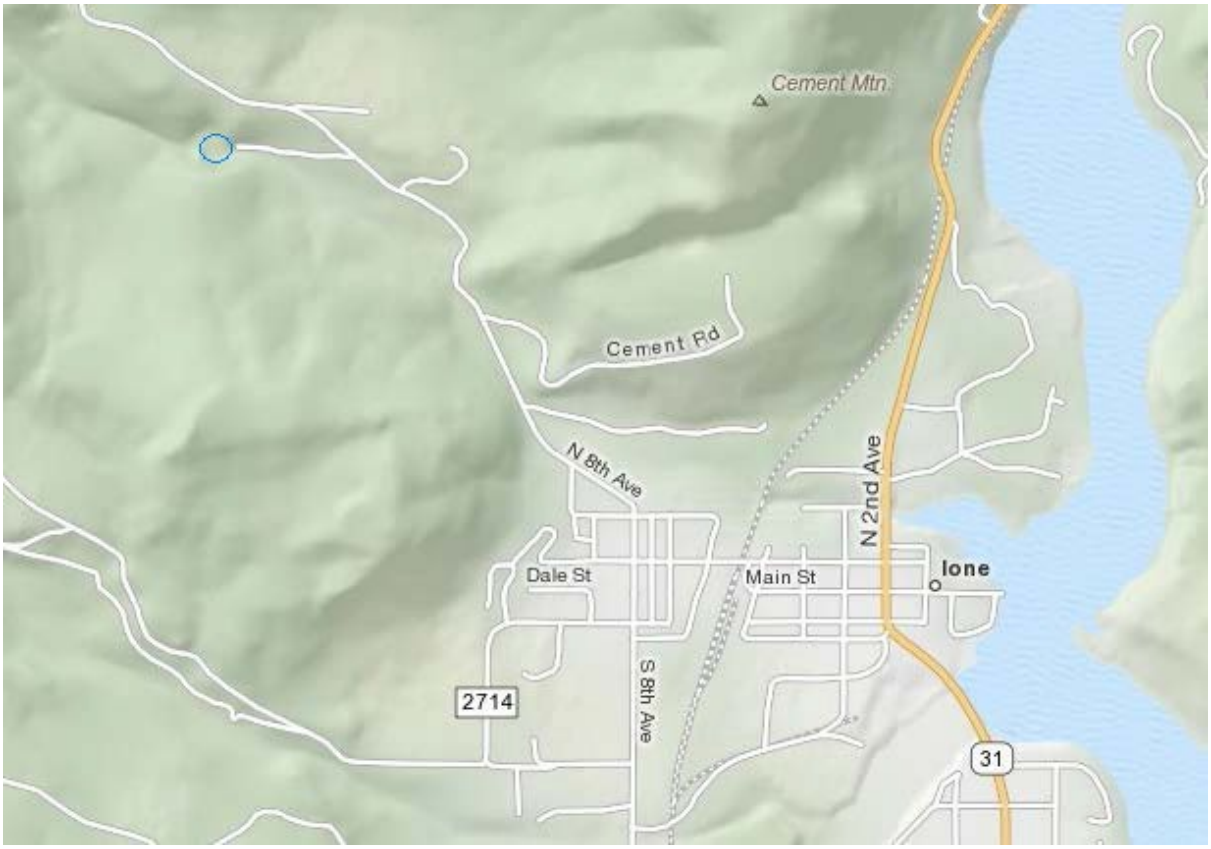
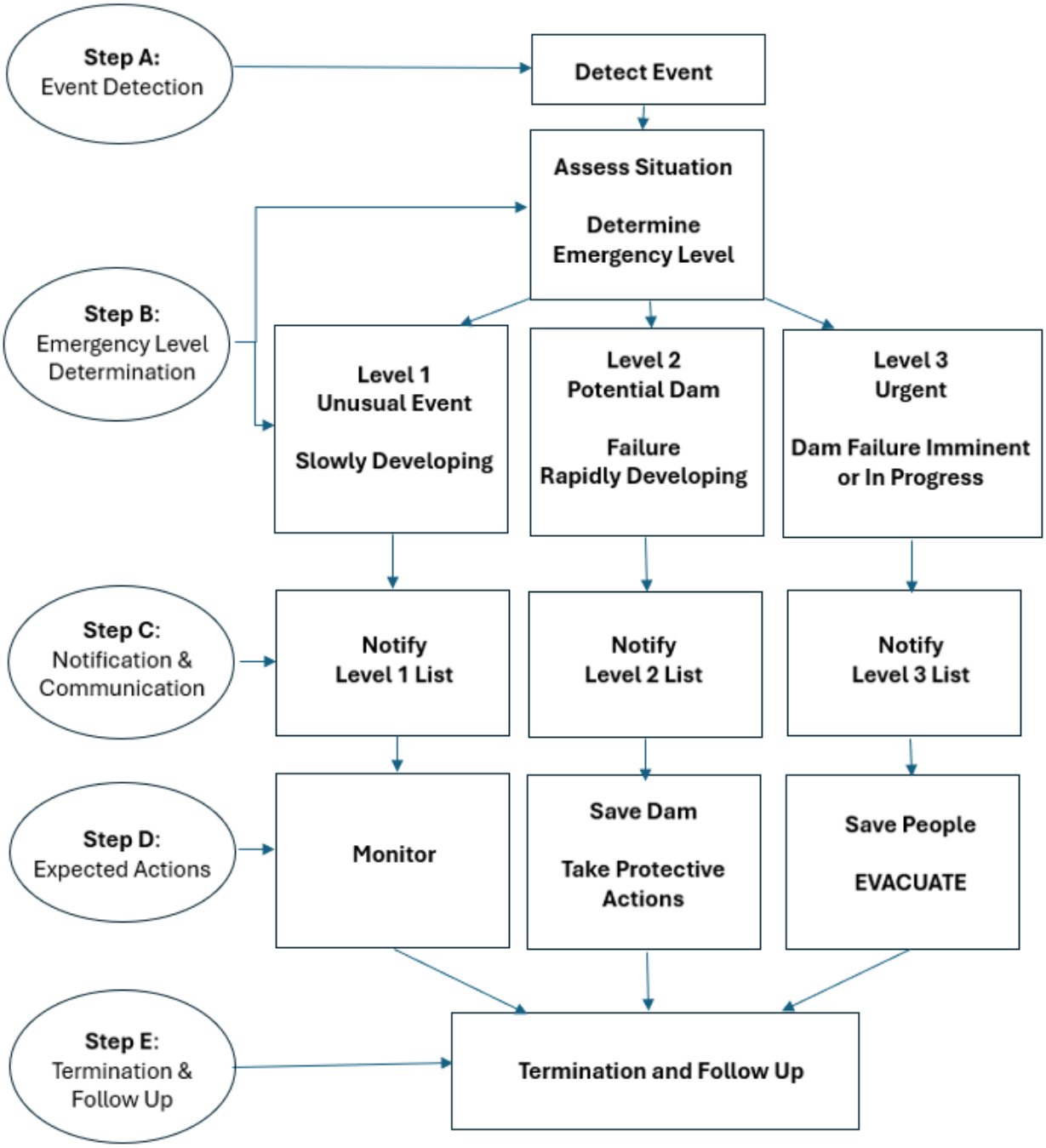


Figure 1. Location Map

Sample Emergency Action Plan

The Five Step Emergency Action Plan:

Figure 2. Emergency Action Plan Overview



Roles and Responsibilities

Dam Owner or Operator: Town of Ione: Primary office phone (509)123-0000, or secondary phone (509)123-0001

For example only.

As soon as an emergency event is observed or reported:

- **Determine the emergency level** (see Emergency Levels table, page 23.)
    - Level 1: unusual event, slowly developing
    - Level 2: potential dam failure, rapidly developing
    - Level 3: dam failure appears to be imminent or is in progress

For Level 2 or 3 Emergencies

Call 911

- Immediately notify the appropriate personnel for the emergency level in the order shown in Emergency Services & Other Contacts list, next page.
- This information is needed to make timely and accurate decisions regarding warnings and evacuations.
- Continue to provide updates of the situation to the Pend Oreille Emergency Management at:

Pend Oreille County - Office of Emergency Management at: Office Phone: (509) 447-3731
24hr Phone: (509) 447-3151

E-mail: Pend Oreille Emergency Preparedness

Dam Owner's Engineer - Dam Consultants Inc, Office Phone: (206) 222-0000, or (206) 222-0001.

For example only.

- Advises, if time permits, the dam owner as to what the emergency level determination is.
- Advises, if time permits, the dam owner as to what remedial action to take when a Level 2 event has occurred.

Washington Department of Ecology - Dam Safety Office:

Dam Safety Emergency number at: (360)407-6208 (office) or (360)971-6347 (24 hr.) and/or Lead Geotechnical Engineer at: (360) 407-#### (office) or (360) ###-#### (Cell).

- Provides assistance, if time permits, in determining the emergency level.
- Provides advice, if time permits, of remedial actions to be taken.
- Provides advice on when to terminate the EAP.

Sample Emergency Action Plan

Table 1. Emergency Services & Other Contacts

Agency/Organization	Principal Contact & Email Address	Address	Office telephone number	Alternate telephone numbers
Emergency Responders	**911**		**911**	
Pend Oreille County Office of Emergency Management	Pend Oreille Emergency Preparedness	231 S. Garden Ave P.O. Box 5035 Newport, WA 99156	(509) 447-3731	(509) 447-3151 24 hour
Dam Engineer *(for example)*	Name: Sr. D. Engineer Dam Consultants Inc.	123W. West St. Nothere, WA 98000	(206) 222-0000	(206) 222-0001
State of Washington Department of Ecology	Dam Safety Emergency Number	PO Box 47600 Olympia, WA 98504	(360) 407-6208	(360) 971-6347 24 hr.
State of Washington Department of Ecology	Lead Geotechnical Engineer	PO Box 47600 Olympia, WA 98504	(360) 407-####	(360) ###-#### Cell
U.S. Forest Service	Ranger District Colville National Forest	765 South Main St. Colville, WA 99114	(509) 684-7000	
US Weather Service *(for example)*			(800) 000-0000	
Pend Oreille High School *(for example)*	Principal Peters	123 West Oak Pend Oreille WA 12345	(509) 123-4567	(509) 123-4568 Cell.
Pend Oreille Valley Railroad *(for example)*	Sir Toppenhat	123 Railroad Way Sodar, IL 1B3 D5F	(509) 123-4569 Local	(123) 999-1111 24 hour
WA State Emergency Management Division	Duty Officer	Building 20, MS TA-20 Camp Murray, WA 98430-5112	Main Switchboard (800) 562-6108 or (253) 512-7000	

(Attach additional sheets as necessary)

Event Detection:

Unusual or emergency events can be detected by:

- Observations made at or near the dam. Reports can be made by hikers, law enforcement, staff on site, or from a variety of sources. It is important to evaluate all reports that are received.
- Earthquakes felt or reported at or near the dam.
- Other conditions that can cause an unusual or emergency event at the dam, for example, forecasts of a severe weather event, a flash flood, high fire danger, upstream dam failure or releases.

Determining the Emergency Level

After an unusual or emergency event is detected or reported, *the dam owner or representative is responsible for classifying the event into one of the following three emergency levels*. Use the Guidance Chart on the next page and examples of emergency situations in Appendix B-1.

It is important to become familiar with the different emergency levels and situations before an event occurs.

Emergency Level 1 - Unusual event, slowly developing

This event is not normal but has not yet threatened the operation or structural integrity of the dam. This event could affect the structural integrity of the dam if left unchecked.

Emergency Level 2 - Potential dam failure, rapidly developing

This event may eventually lead to dam failure and potential flooding downstream, but there is not an immediate threat of dam failure. This emergency level also applies when uncontrolled flow through the dam's spillway has or is likely to result in flooding of downstream areas, but is not yet affecting buildings or roads, or posing a significant risk to healthy, safety, or welfare.

Emergency Level 3 - Urgent; dam failure appears imminent or is in progress

This is an urgent event, where a dam failure is occurring or is clearly about to occur and cannot be prevented. Flash flooding will occur downstream of the dam. The amount of flooding and resulting damage will be dependent upon several factors, such as the water level in the reservoir and the time of year. If the breach occurs during the dry season when the water level in the reservoir level is low, the escaped water will flood a significantly smaller area than if the breach occurs at the time the dam's reservoir is full. If a breach occurs when the dam's reservoir is full, the entire area shown on the inundation map will be flooded.

This event level is also applicable when flow through the dam's spillway is flooding buildings or roads. The dam owner will **contact 911** and the responsible **Emergency Services** to evacuate people at risk and close roads in the flood path if necessary.

Table 2. Guidance for Determining the Emergency Level*

Event	Situation	Emergency Level
Spillways	Principal spillway severely blocked with debris or structurally damaged	1
	Principal spillway leaking with muddy flows	1
	Principal spillway blocked with debris and pool is rapidly rising	2
Flooding	National Weather Service issues a flood warning for the area	1
	The reservoir elevation reaches the predetermined notification trigger elevation of **6*** inches below dam crest	2
	The reservoir elevation reaches the predetermined notification trigger elevation of **0*** inches below dam crest	3
	Spillway flow is flooding roads and people downstream	3
Seepage	New seepage areas in or near the dam	1
	Boils observed downstream of dam	1
	Boils observed downstream of dam with cloudy discharge	2
	New seepage areas with cloudy discharge or increasing flow rate	2
	Cloudy flow and one or more of the following (with constant reservoir level): accelerating rate of flow, expanding flow at exit point, or buildup of soils.	3
Sinkholes	Observation of new sinkhole in reservoir area or on embankment	2
	Rapidly enlarging sinkhole	3
Embankment Cracking	New cracks in the embankment greater than ½ inch wide and greater than two feet deep, without seepage	1
	Cracks in the embankment with seepage emerging	2
Embankment Moving	Visual movement/slippage of the embankment slope	1
	Sudden or rapidly proceeding slides of the embankment slopes	2
Instruments	Instrumentation readings beyond predetermined values	1
Earthquake	Measurable earthquake felt or reported within 50 miles of the dam	1
	Earthquake resulting in visible damage to the dam or appurtenances	2
	Earthquake resulting in uncontrolled release of water from the dam	3
Security Threat	Verified bomb threat that, if carried out, could result in damage to the dam	2
	Detonated bomb that has resulted in damage to the dam or appurtenances	3
Sabotage/Vandalism	Damage to the dam or appurtenances with no impacts to the functioning of the dam	1
	Modification to the dam or appurtenances that could adversely impact the functioning of the dam	1
	Damage to the dam or appurtenances that has resulted in seepage flow	2
	Damage to the dam or appurtenances that has resulted in uncontrolled water release	3

*Trigger level is for example only

Emergency level 1: Non-emergency, unusual event, slowly developing.

Emergency level 2: Potential dam failure situation, rapidly developing.

Emergency level 3: Urgent; dam failure appears to be imminent or is in progress.

***For further examples and guidance in determining emergency levels, see Appendix B-1.**

Emergency Level 1. (Unusual event, slowly developing)

STEP A - EVENT DETECTION

Unusual or emergency events can be indicated by:

- Observations made at or near the dam.
- Earthquakes felt or reported at or near the dam.
- Identify other conditions that can cause an unusual or emergency event at the dam. For example, forecasts of a severe weather event, a flash flood, upstream dam failure or releases, or unstable slope.

Go to Step B – Emergency level Determination.

STEP B - EMERGENCY LEVEL DETERMINATION

After an unusual or emergency event is detected or reported, the dam owner is responsible for classifying the event into one of the three emergency levels. Confirm the emergency level by using the chart below. Further guidance is in Appendix B-1

Table 3. Emergency Level 1 Events

Category	Typical Emergency Level 1 Events*
Spillways	• Principal spillway severely blocked with debris or structurally damaged; or • Principal spillway leaking with muddy flows
Flooding	• National Weather Service issues a flood warning for the area
Seepage	• New seepage areas in or near the dam; or • Boils observed downstream of the dam
Embankment Cracking	• New cracks in the embankment greater than 1/2 inch wide and greater than two feet deep, without seepage
Embankment Movement	• Visual movement/slippage of the embankment slope
Instruments	• Instrument readings beyond predetermined “normal” values
Earthquake	• Measurable earthquake felt or reported within 50 miles of the dam
Sabotage/ Vandalism	• Damage to the dam or appurtenances with no impacts to dam functions; or • Change to the dam or appurtenances that could adversely impact the functioning of the dam

* Each of these situations is not normal but has not threatened the operation or structural integrity of the dam but could affect the operation or structural integrity of the dam if left unchecked.

Sample Emergency Action Plan

Go to Step C: Notification and Communication

STEP C – NOTIFICATION AND COMMUNICATIONS

- **Contact the Department of Ecology, Dam Safety Supervisor, and the Dam Owner's Engineer.** Describe the situation and request technical assistance on the next steps you should take.
- **Monitor the dam**, especially during storm events to detect any further development of a potential or imminent dam failure.
- **Contact the Pend Oreille County Emergency Manager** if you believe the conditions may worsen and require emergency action.

Emergency Level 1 Notifications

You must use the Contact Checklist (next page) to record all contacts made.

Dam Owner or representative

Name: On-duty staff

Organization: Town of Ione

Office: (509) 123-0000

Home: ( )

Cell: (509) 123-0001

Washington State Dept. of Ecology, Dam Safety Office

Dam Safety Emergency Number:

Office: (360) 407-6208

24 Hour: (360) 971-6347

Lead Geotechnical Engineer:

Office: (360) 407-####

Cell: (###) ###-####

Engineering Firm (if applicable)

Name: Senior Dam Engineer

Organization: Dam Consultants Inc.

Office: (206) 222-0000

Home: ( )

Cell: (206) 222-9991

Email:

Other Contact Numbers (as needed)

Name: Colville Ranger District

Organization: US Forest Service

Office: (509) 684-7000

Home: ( )

Cell: ( )

Email:

Name:

Organization:

Office: ( )

Cell: ( )

Email:

Name:

Organization:

Office: ( )

Home: ( )

Cell: ( )

Email:

Go to step D: Expected Actions

Sample Emergency Action Plan

Contact Checklist – Emergency Level 1

(Dam owner/operator to complete during event)

Date _____

Dam Name: Cedar Creek Reservoir Dam, Dam ID Number: PO62-1123

Pend Oreille County, Washington

Contact Ecology's Dam Safety Office and your engineering firm immediately after you are alerted to an unusual or emergency situation if you need assistance in determining the emergency level (see Appendix B-1 for additional guidance).

The person making the contacts should initial and record the time of the call and who they notified for each contact made.

Washington State Dept. of Ecology, Dam Safety Office

Dam Safety Emergency Number:

Office: (360) 407-6208

24 Hour: (360) 971-6347

Lead Geotechnical Engineer:

Office: (360) 407-####

Cell: (###) ###-####

Engineering Firm (if applicable)

Name: Senior Dam Engineer

Organization: Dam Consultants Inc.

Office: (206) 222-0000

Home: ( )

Cell: (206) 222-9991

Email: _____

Person Contacted	Time of Contact (Record and Initial)					

(Attach additional sheets as necessary)

STEP D - EXPECTED ACTIONS

Once you have determined the emergency level and made the necessary contacts, follow the steps below:

Emergency Level 1

You *must* record all information, observations, and actions taken on the **Event Log Form** on the next page.

Note the times when the conditions change and, if possible, document the situation with photographs and/or video.

- **Assess and monitor conditions**: Inspect the full length of the upstream slope, crest, downstream slope, and downstream toe of the dam. Check the reservoir area, abutments, and downstream channel of the dam for signs of changing conditions.
- **Contact Ecology's Dam Safety Office and your dam engineer** to further investigate conditions and recommend corrective actions. Call Ecology's Dam Safety Office immediately if you see increased seepage, erosion, cracking, or settlement. (Refer to the emergency level table on page 24 for guidance in determining the appropriate event level for new conditions.)
- **Complete the recommended actions and continue to monitor conditions** until risk has ended.

Go to step E: Termination

STEP E – TERMINATION AND FOLLOW UP, Ending Response and Reporting

Whenever you have activated the EAP, you must take actions to conclude the EAP once the event is over and you have followed all the needed procedures (steps A through D).

Termination responsibilities

- It is the responsibility of the person who made the original calls to inform each person contacted earlier that the event has concluded. Use the Contact Checklist created during the event to ensure that you have notified everyone.
- The dam owner uses the information gathered during the event (Event Log, Contact Checklist) to complete a **Dam Emergency Event Report** at the conclusion of an emergency.
- It is the dam owner's responsibility to distribute copies of the completed report to Ecology's Dam Safety Office, and to the local Emergency Manager.

Unusual or Emergency Event Log

(Dam owner/operator completes during event)

Date _____

Dam Name: Cedar Creek Reservoir Dam, Dam ID Number: PO62-1123

Pend Oreille County, Washington

When and how was the event detected? _____

_____

Weather conditions: _____

General description of the event: _____

_____

_____

Emergency level determination: _____ Made by: _____

ACTIONS AND EVENT PROGRESSION

Date	Time	Action/event progression	Taken/witnessed by

(Attach additional sheets as necessary)

Report prepared by:_____ Date: _____

Emergency Level 2 (Potential dam failure, rapidly developing)

STEP A - EVENT DETECTION

Unusual or emergency events may be indicated by:

- Observations at or near the dam by the public, landowner, or employee of the company.
- Strong earthquakes felt or reported at or near the dam.
- Forewarning of conditions that may cause an unusual event or emergency event at the dam. For example, a forecast of a severe weather event, flash flood, or landslide (for example only).

Go to Step B: Emergency Level Determination

STEP B - EMERGENCY LEVEL DETERMINATION

After an unusual or emergency event is detected or reported, the dam owner is responsible for classifying the event into one of the three emergency levels. Confirm the emergency level by using the chart below. Further guidance is in Appendix B-1.

Table 4. Emergency Level 2 Events

Event	Emergency Level 2 Events
Flooding	• The reservoir elevation reaches the predetermined notification trigger elevation of 6 inches below dam crest
Seepage	• Boils observed downstream of dam with cloudy discharge
Sinkholes	• New seepage areas with cloudy discharge or increasing flow rate • Observation of new sinkhole in reservoir area or on embankment
Embankment Cracking	• Cracks in the embankment with seepage emerging
Embankment Movement	• Sudden or rapidly proceeding slides of the embankment slopes
Earthquake	• Earthquake resulting in visible damage to the dam or appurtenances
Security Threat	• Verified bomb threat that, if carried out, could result in damage to the dam
Sabotage/Vandalism	• Damage to the dam or appurtenances that has resulted in seepage flow

These situations may eventually lead to dam failure and flash flooding downstream, but there is not an immediate threat of dam failure. This emergency level also applies when flow through the spillway may result in flooding of downstream areas where people near the channel could be endangered.

Go to Step C: Notification and Communication

STEP C – NOTIFICATION AND COMMUNICATIONS

Notification

- **Contact the 911 dispatcher and inform him/her that the EAP has been activated.**

***911 Script:** the following message may be used to help describe the situation to the **911** dispatcher and the Pend Oreille County Emergency Manager:

"This is (Identify yourself name, position, etc.). We have an emergency condition at Cedar Creek Dam located 3 miles North of Town of Ione .

We have activated the Emergency Action Plan for this dam and are currently under Emergency Level 2. We are implementing predetermined actions to respond to a rapidly developing situation that could result in dam failure.

Reference the Inundation Map in your copy of the Emergency Action Plan if an evacuation is necessary.

We will advise you as soon as the situation is resolved or if the situation gets worse.

You can call me at (509)123-0000 .

If you cannot reach me, please call (509)123-0001 .

**Sample dialogue*

- **Contact the Local Emergency Manager** to inform him/her that the EAP has been activated and, if current conditions get worse, the emergency level may increase, and evacuation may be necessary.
- **Contact the Department of Ecology, Dam Safety Supervisor and the Dam Owner's Engineer** (if applicable). Describe the situation and request technical assistance on the next steps to take.

Communication

Emergency Level 2

- **Report any changes** in the condition of the dam to the **Local Emergency Manager**. If the dam condition worsens and failure becomes imminent, your Local Emergency Manager must be notified immediately of the change in the emergency level to evacuate the people at risk downstream.
- **Monitor the dam** to detect any further development of a potential or imminent dam failure.
- **The local Emergency Manager prepares to contact people and facilities at risk. Evacuation list** (page 34).
- **Be aware of roads and highways in the path of floodwaters**. See **Inundation map, Appendix A-2** and **Roadways at risk – page 34**, for locations and approximate time that floodwaters will reach the roadways.

Emergency Level 2 Notifications - Level 2 contact list

Potential Dam Failure --- Rapidly Developing

You must use the Contact Checklist (next page) to record all contacts made.

1. **Dam owner or representative**

   Name: _____

   Office: _____

   Home: _____

   Cell: _____

2. **Call 911**. Prepare to start evacuation procedures, contact numbers page 34.

   And/or **Local/County Emergency Manager**

   Name: _____

   Phone: _____

3. **Washington Dept. of Ecology, Dam Safety Office**

   Emergency Number: (360) 407-6208 (office) or (360) 971-6347 (24-hour)

   Lead Geotechnical Engineer: _____ or _____(cell)

4. **Engineering Firm** (if applicable)

   Name/Organization: _____

   Office: _____ Home: _____

   Cell: _____

5. **U.S. Weather Service**: On duty staff

   24-hour: _____

6. **U.S. Forest Service** (if dam is on or effects USFS land)

   Ranger/District: _____

   Name/Number: _____

7. (organization): _____

   Name/Number: _____

Contact Checklist – Emergency Level 2

(Dam owner/operator to complete during event)

Date _____

Dam Name: Cedar Creek Reservoir Dam, Dam ID Number: PO62-1123

Pend Oreille County, Washington

Contact Ecology's Dam Safety Office and your engineering firm immediately after you are alerted to an unusual or emergency situation if you need assistance in determining the emergency level (see Appendix B-1 for additional guidance).

The person making the contacts should initial and record the time of the call and who they notified for each contact made.

Local Emergency Manager

Name: Pend Oreille Co, 24-hour Duty Officer

Office: (509) 447-3151

24-Hour: (509) 447-3731

Or call **911**

Washington Dept. of Ecology, Dam Safety Office

Emergency Number:

Office: (360) 407-6208

24 Hour: (360) 971-6347

Lead Geotechnical Engineer:

Office: (360) 407-####

Cell: (###) ###-####

Engineering Firm (if applicable)

Name: Senior Dam Engineer

Organization: Dam Consultants Inc.

Office: (206) 222-0000

Home: ( )

Cell: (206) 222-9991

Email: _____

Person Contacted	**Time of Contact** (Record and Initial)						

(Attach additional sheets as necessary)

Summary of People and Structures at Greatest Risk (list in order of proximity to the dam)

Residence/Business/ Structure Name	Number of residents (if known)	Address	Phone Number	Approximate depth & time flood may arrive
Jones Residence	6	442 Cedar Creek Rd Pend Oreille WA 12345	(509)111-1114 (___) ___- _____	Depth: 1 foot 3 inches Time: 11 minutes
Joe and Jane Smith	2	888 Cedar Creek Rd Pend Oreille WA 12345	(509)111-1111 (___) ___- _____	Depth: 6 inches Time: 15 minutes
Grandma Jones	1	444 Cedar Creek Rd Pend Oreille WA 12345	(509)111-1112 (509)111-1113	Depth: 3 feet 9 inches Time: 25 minutes
Pend Oreille High School Principal Peters	65 when school is in session 2, 8-5 weekdays during recess	123 West Oak Pend Oreille WA 12345	(509)123-4567 (509)123-4568 Cell.	Depth: 3 feet Time: 35 min. approx.

Summary of Roads at Risk (list in order of proximity to the dam)

Roads or Highways at risk	Location, intersections etc. (directions)	Approximate depth & time flood may arrive
Cedar Creek Road	Cedar Creek Road and County Road No. 2854	Depth: 2 feet Time: 15 min. approx.
Pend Oreille Valley Railroad & Grinnell Street	Railroad Ave and Grinnell Street ¼ mile north of city shop	Depth: 4 feet Time: 30 min. approx.
State Highway 31	Adjacent to Pend Oreille River by log terminal	Depth: 3 feet Time: 35 min. approx..

(Attach additional sheets as needed, see appendix A-5 for extra contact lists)

Go to Step D: Expected Actions

STEP D - EXPECTED ACTIONS

Once you have determined the emergency level and made needed contacts, follow the steps below:

Emergency Level 2 - (Potential dam failure, rapidly developing)

Record all information, observations, and actions taken on the Event Log Form (Appendix B-3) as it happens or at a minimum daily. Note the time of changing conditions. Document the situation with photographs and video, if possible.

Stay safe! Until conditions at the dam have been evaluated, take precautions for your safety!

- If time permits, the dam owner or a representative will inspect the dam. If you observe piping, increased seepage, erosion, cracking, or settlement, immediately report this to the Local Emergency Manager and State Dam Safety Engineer. Refer to the emergency level table for guidance in determining the appropriate event level for the new condition and recommended actions.
    A. Inspect the full length of the upstream slope, crest, downstream toe, and downstream slope of the dam.
    B. Check the reservoir area, abutments, and downstream channel for signs of changing conditions.
- The dam owner will contact the State Dam Safety Engineer and Dam Owner's Engineer and request technical staff to investigate the situation and recommend corrective actions.
- Take emergency remedial actions, if appropriate.

Immediate implementation of these remedial actions may delay, moderate, or prevent the failure of the dam. Several of the listed adverse or unusual conditions may be apparent at the dam at the same time, requiring implementation of several modes of remedial actions.

    A. Close monitoring of the dam must be maintained to confirm the success of any remedial action taken at the dam.
    B. If possible, remedial action should be developed through consultation with the Department of Ecology, Dam Safety Supervisor.

- Refer to the Resources Available list (Appendix A-3) for sources of equipment and materials

Embankment overtopping

- Place sandbags along the low areas of the top of the dam to reduce the likelihood of overtopping and safely direct more water through the spillway.
- Cover the weak areas of the top of the dam and downstream slope with riprap, sandbags, plastic sheets, or other materials to provide erosion-resistant protection.

Seepage and sinkholes

- Open outlet(s) to lower the reservoir level as rapidly as possible to a level that stops or decreases the seepage to a non-erosive velocity. If the outlet is damaged, blocked, or of limited capacity, pumping or siphoning may be required. Continue lowering the water level until the seepage stops.
- If the entrance to the seepage origin point is visible in the reservoir (possible whirlpool) and accessible, attempt to reduce the flow by plugging the entrance with readily available materials, such as hay bales, bentonite, soil, rock, or plastic sheeting.

    A. Cover the seepage exit area(s) with several feet of sand/gravel to hold fine-grained embankment or foundation materials in place. Alternatively, construct sandbag or other types of ring dikes around seepage exit areas to retain a pool of water, providing backpressure and reducing the erosive nature of the seepage.

    B. Prevent vehicles and equipment from driving between the seepage exit points and the embankment to avoid potential loss from the collapse of an underground void.

Embankment movement

- Open outlet(s) and lower the reservoir to a safe level at a rate commensurate with the urgency and severity of the condition of the slide or slump. If the outlet is damaged, blocked or of limited capacity, pumping or siphoning may be required.
- Repair settlement of the crest by placing sandbags or fill materials in the damaged area to restore freeboard.
- Stabilize slides on the downstream slope by creating a soil or rock buttress against the toe area of the slide.

Earthquake

- Immediately conduct a general overall visual inspection of the dam.
- Perform field survey to determine if there has been any settlement and movement of the dam embankment, spillway, and low-level outlet works.
- Drain reservoir if required. If the low-level outlet is damaged, consider pumping or siphoning.

Go to Step E: Termination

Sample Emergency Action Plan

Unusual or Emergency Event Log

(Dam owner/operator completes during event)

Date _____

Dam Name: Cedar Creek Reservoir Dam, Dam ID Number: PO62-1123

Pend Oreille County, Washington

When and how was the event detected? _____

_____

Weather conditions: _____

General description of the event: _____

_____

_____

Emergency level determination: _____ Made by: _____

ACTIONS AND EVENT PROGRESSION

Date	Time	Action/event progression	Taken/witnessed by

(Attach additional sheets as necessary)

Report prepared by:_____ Date: _____

STEP E – TERMINATION AND FOLLOW UP, Ending Response and Reporting

Whenever the EAP has been activated and an emergency declared, the Local Emergency Manager and the dam owner must take actions to conclude the EAP once the event is over and all necessary procedures (steps A through D) have been followed.

Termination responsibilities

Your Local Emergency Manager is responsible for terminating the EAP operations for a Level 2 emergency, and relaying this decision to the dam owner.

- Prior to termination of an Emergency Level 2 or 3 events, the Washington State Dam Safety Supervisor must assure the dam is inspected to determine if any hazardous conditions exist.
- If it is determined that hazardous conditions no longer exist, the Washington State Dam Safety Supervisor will advise the Local Emergency Manager to terminate EAP operations.
- The person who made the original calls must inform each person contacted that the emergency is now concluded. Use the Contact Checklist created during the event to verify everyone has been contacted.
- The dam owner will use the information that was gathered during the event (Event Log and Contact Checklist) to complete a Dam Emergency Event Report at the conclusion of an emergency.
- The dam owner must distribute copies of the completed report to Ecology's Dam Safety Office and to the local Emergency Manager.

Emergency Level 3 (Urgent; dam failure appears imminent or is in progress)

STEP A - EVENT DETECTION

Unusual or emergency events may be indicated by:

- Observations at or near the dam by the public, landowner or employee of the company.
- Severe earthquakes felt or reported in the vicinity of the dam.
- Forewarning of conditions that may cause an unusual event or emergency event at the dam. For example, a severe weather event, flash flood forecast, or landslide (for example only).

Go to Step B: Emergency level Determination

STEP B - EMERGENCY LEVEL DETERMINATION

Once detected or reported, the dam owner is responsible for classifying the event into one of the three emergency levels. Confirm the emergency level 3 with the table below. Further guidance is in Appendix B-1.

Table 5. Emergency Level 3 – Urgent Situations

Event	Emergency 3 Situations
Flooding	• The reservoir elevation reaches the predetermined notification trigger elevation of 0 inches below the dam crest • Spillway flow is flooding roads and buildings downstream • Flood flows are overtopping the dam
Seepage	• Cloudy flow and one or more of the following (with constant reservoir level): accelerating rate of flow, expanding flow at exit point, or buildup of soils.
Sinkholes	• Rapidly enlarging sinkhole in reservoir area or embankment
Earthquake	• Earthquake resulting in uncontrolled release of water from the dam
Security Threat	• Detonated bomb that has resulted in damage to the dam or appurtenances
Sabotage/ Vandalism	• Damage to the dam or appurtenances that has resulted in uncontrolled water release

- Extreme weather events that exceed dam design can cause significant flow through the emergency spillway or overtopping of the embankment.
- Not all emergency conditions are listed above, and the dam owner is urged to use safety as a priority in determining whether a specific condition should be defined as an emergency. See the “Examples of Emergency Situations” section in Appendix B-1 for a more complete discussion of potential emergency conditions.

Go to Step C: Notification and Communications

STEP C – NOTIFICATION and COMMUNICATIONS

Notification: (Urgent; dam failure appears imminent or is in progress)

- **Utilize the Level 3 Contact list** – page 42 to **record contacts made, time of contact**.
- **Contact the 911 dispatcher** inform him/her that the EAP has been activated (*911 script below).

***911 Script:** the following message may be used to help describe the situation to the **911** dispatcher and the Pend Oreille County Emergency Manager:

"This is (Identify yourself name, position, etc.). We have an emergency condition at Cedar Creek Dam located 3 miles North of Town of Ione.

We have activated the Emergency Action Plan for this dam and are currently under Emergency Level 3. We are implementing predetermined actions to respond to a rapidly developing situation that could result in dam failure. Reference the Inundation Map in your copy of the Emergency Action Plan if an evacuation is necessary.

We will advise you as soon as the situation is resolved or if the situation gets worse.

You can call me at (509) 123-0000.

If you cannot reach me, please call (509)123-0001.

- **Notify the Local Emergency Manager** to inform him/her that the EAP has been activated, and the potentially flooded area must be evacuated and potential inundated roads closed.
- **Inundation map (Appendix A-2 and Roadways at risk** – page 53), for locations and approximate times floodwaters will reach the roadways.
- **Local Emergency Manager begins contacting people and facilities at risk. Evacuation list** (page 43). Emergency personal may use the following scripted message to communicate the emergency status to the public:

"Attention: This is an emergency message from the Pend Oreille County Emergency Manager. Listen carefully. Your life may depend on immediate action. ***Cedar Creek Dam*** *is failing. Repeat,* ***Cedar Creek Dam*** *is failing.*

If you are in or near this area, proceed immediately to high ground away from the valley. Do not travel on ***Cedar Creek Road, Grinnell Street or State Highway 31*** *or return to your home to recover your possessions. You cannot outrun or drive away from the flood wave. Move immediately to high ground away from the valley."*

[Repeat message.]

- **Contact Ecology's Dam Safety Supervisor and the Dam Owner's Engineer** (if applicable). Describe the situation and request technical assistance on the next steps to take.

Sample Emergency Action Plan

Emergency Level 3 Notifications

Urgent Event --- Dam failure is imminent or in progress!

You must use the Contact Checklist (next page) to record all contacts made.

1. **Dam owner or representative**

   Name: _____

   Office: _____

   Home: _____

   Cell: _____

2. **Call 911**. This starts the evacuation process, contact numbers page 43.

   And/or **Local/County Emergency Manager**

   Name: _____

   Phone: _____

3. **Washington Dept. of Ecology, Dam Safety Office**

   Emergency Number: (360) 407-6208 (office) or (360) 971-6347 (24-hour)

   Lead Geotechnical Engineer: _____ or _____(cell)

4. **Engineering Firm** (if applicable)

   Name/Organization: _____

   Office: _____ Home: _____

   Cell: _____

5. **U.S. Weather Service**: On duty staff

   24-hour: _____

6. **U.S. forest Service** (if dam is on or effects USFS land)

   Ranger/District: _____

   Name/Number: _____

7. (organization): _____

   Name/Number: _____

Contact Checklist – Emergency Level 3

(Dam owner/operator to complete during event)

Date _____

Dam Name: Cedar Creek Reservoir Dam, Dam ID Number: PO62-1123

Pend Oreille County, Washington

Contact Ecology's Dam Safety Office and your engineering firm immediately after you are alerted to an unusual or emergency situation if you need assistance in determining the emergency level (see Appendix B-1 for additional guidance).

The person making the contacts should initial and record the time of the call and who they notified for each contact made.

Local Emergency Manager

Name: Pend Oreille Co,

24-hour Duty Officer

Office: (509) 447-3151

24-Hour: (509) 447-3731

Or call **911**

Washington Dept. of Ecology, Dam Safety Office

Emergency Number:

Office: (360) 407-6208

24 Hour: (360) 971-6347

Lead Geotechnical Engineer:

Office: (360) 407-####

Cell: (###) ###-####

Person Contacted	**Time of Contact** (Record and Initial)						

(Attach additional sheets as necessary)

Table 6. Sample Summary of People and Structures at Greatest Risk
(list in order of proximity to the dam)

Residence/Business/ Structure Name	Number of residents (if known)	Address	Phone Number	Approximate depth & time flood may arrive
Jones Residence	6	442 Cedar Creek Rd Pend Oreille WA 12345	(509)111-1114 (___) ___-_____	Depth: 1 foot 3 inches Time: 11 minutes
Joe and Jane Smith	2	888 Cedar Creek Rd Pend Oreille WA 12345	(509)111-1111 (___) ___-_____	Depth: 6 inches Time: 15 minutes
Grandma Jones	1	444 Cedar Creek Rd Pend Oreille WA 12345	(509)111-1112 (509)111-1113	Depth: 3 feet 9 inches Time: 25 minutes
Pend Oreille High School Principal Peters	65 when school is in session 2, 8-5 weekdays during recess	123 West Oak Pend Oreille WA 12345	(509)123-4567 (509)123-4568 Cell.	Depth: 3 feet Time: 35 min. approx.

Table 7. Summary of Roads at Risk
(list in order of proximity to the dam)

Roads or Highways at risk	Location, intersections etc. (directions)	Approximate depth & time flood may arrive
Cedar Creek Road	Cedar Creek Road and County Road No. 2854	Depth: 2 feet Time: 15 min. approx.
Pend Oreille Valley Railroad & Grinnell Street	Railroad Ave and Grinnell Street ¼ mile north of city shop	Depth: 4 feet Time: 30 min. approx.
State Highway 31	Adjacent to Pend Oreille River by log terminal	Depth: 3 feet Time: 35 min. approx..

(Attach additional sheets as needed, see appendix A-5 for extra contact lists)

Go to Step D: Expected Actions

Sample Emergency Action Plan

STEP D- EXPECTED ACTIONS

Once the emergency level has been established and contacts have been made, follow the steps below:

Emergency Level 3 – Urgent: dam failure is imminent or in progress:

The Local Emergency Manager, 911 dispatcher, or other emergency personal are responsible for following their own emergency procedures. The Section 3, Roles and Responsibilities contact list will outline who is responsible for notification, evacuations and road closures.

The Dam Owner/Operator will:

- **Stay safe! Until conditions at the dam have been evaluated, take precautions for your safety!**
- Continue to use the Contact Checklist to record each person contacted and when.
- Record all information, observations, and each step taken on the Event Log Form as they happen or at least daily. Document the situation with photographs and video if possible.
- Keep in frequent contact with the Local Emergency Manager, providing with updates of the situation to assist in timely decisions concerning warnings and evacuations. If all means of communication are lost:
  (a) Try to find out why.
  (b) Try to get to another radio or telephone that works.
  (c) Get someone else to try to reestablish communications.
  (d) If these means fail, handle the immediate problems as well as you can, and periodically try to reestablish contact with the Local Emergency Manager and emergency services.
- Do whatever is necessary to bring people in immediate danger to safety if directed by the Local Emergency Manager (anyone on the dam, downstream from the dam, boating on the reservoir, or evacuees). See next page for Summary of People/Structures at Greatest Risk.
- Advise people monitoring the dam to follow safe procedures. Everyone should stay away from any of the failing structures or slopes and out of the potential breach inundation areas.
- Contact the Washington State Dam Safety Supervisor and Dam Owner's Engineer and request technical staff to investigate the situation and recommend corrective actions.
- Initiate emergency remedial actions, if appropriate. Refer to the Resources Available list (Appendix A-3) for sources of equipment and materials.
- Continue to inspect the full length of the upstream slope, crest, downstream toe, and downstream slope, to the extent it can be done safely. Check the reservoir area, abutments, and downstream channel for signs of changing conditions. If you observe piping, increased seepage, erosion, cracking, or settlement, immediately report changing conditions to the Local Emergency Manager and State Dam Safety Supervisor.

Go to Step E: Termination

Unusual or Emergency Event Log

(Dam owner/operator completes during event)

Date _____

Dam Name: Cedar Creek Reservoir Dam, Dam ID Number: PO62-1123

Pend Oreille County, Washington

When and how was the event detected? _____

_____

Weather conditions: _____

General description of the event: _____

_____

_____

Emergency level determination: _____ Made by: _____

ACTIONS AND EVENT PROGRESSION

Date	Time	Action/event progression	Taken/witnessed by

(Attach additional sheets as necessary)

Report prepared by:_____ Date: _____

STEP E – TERMINATION AND FOLLOW UP, Ending Response and Reporting

Whenever the EAP has been activated and an emergency declared, the EAP will need to be concluded once the event is over.

Termination responsibilities

Your Local Emergency Manager is responsible for terminating an emergency Level 3 Response and relaying this decision to the dam owner.

- Prior to termination of an Emergency Level 3 event, the Washington State Dam Safety Supervisor will assure the dam is inspected to determine if any hazardous conditions remain.
- If it is determined that there are no remaining hazardous conditions, the Washington State Dam Safety Supervisor will advise the Local Emergency Manager to terminate EAP operations.
- It is then the responsibility of the individual who made the original calls to inform each person contacted during the emergency that the event is now concluded. Use the **Contact Checklist (Appendix B-2)** created during the event to verify that everyone receives notice.
- The dam owner will use the information gathered during the event **(Event Log Appendix B-3 & Contact Checklist Appendix B-2)** to complete a **Dam Emergency Event Report (Appendix B-4)** at the conclusion of an emergency.
- The dam owner will distribute copies of the completed report to Ecology's Dam Safety Office and the local Emergency Manager.

MAINTENANCE (Training, Reviewing, and Updating the EAP)

Introduction

Emergency Action Plans should be considered "Living Documents". This means that:

- They will never be final.
- They should be reviewed and updated at least once a year.
- The local emergency manager should take part in the annual review.
- All updates should be promptly distributed to all Plan holders, (owners keep the "master" Emergency Action Plan, and record where copies of the EAP's are located).

Dam emergency events and failures are not common events. Therefore, training and exercises are necessary to maintain emergency response readiness, timeliness, and effectiveness. The EAP therefore requires periodic maintenance to remain current and as useful and effective as possible.

EAP Training:

Periodic training and exercises are necessary to ensure that people involved are thoroughly familiar with all elements of the plan, as well as their related duties and responsibilities. An appropriate number of people should receive training to ensure adequate coverage at all times.

EAP exercises can include:

- Orientations
- Phone drills
- Tabletop exercises
- Functional exercises

The level of detail associated with testing and how often plans are tested depends on the size of the facility, the population at risk, and what is located in the floodplain. For low-risk dams, testing could consist of reviewing the EAP and verifying that the telephone numbers on the notification chart and the resource list is current.

At a minimum, owners of high and significant hazard dams should conduct an annual orientation and phone drill. The orientation can be a simple meeting where those individuals and entities with a stake in the EAP come together to review the roles and responsibilities described in the EAP. Orientations are especially useful for bringing new staff and leadership within any of the various organizations up to speed on the components of the EAP.

Owners of high hazard dams should maintain a comprehensive exercise program that includes all the components listed above. Tabletop and Functional exercises are typically complex but should be conducted about every five years.

Key personnel from the Dam Safety Office and local emergency management agencies should be invited to participate in orientation and exercises provided by the dam owner.

Reviewing and Updating the EAP

The EAP should be reviewed and updated annually, including:

- Calling all contacts on the notification charts in the EAP to verify that names and phone numbers are current.
- Contacting the Local Emergency Management Agency to verify where the EAP is kept and if responsibilities as described in the EAP are understood.
- Calling the locally available resources to verify that the phone numbers, addresses, and services are current.
- Review information on the people and structures at risk and incorporate changes in development within the flood inundation area.
- **Any deficiencies found during training and exercises should be noted and the plan revised.**

The dam owner is responsible for updating the EAP documents to revise any changes of contact information, services, service providers, or people, structures, or roads at risk. When revisions occur, the dam owner should provide the revised pages and a revised Revision Summary Page to all the EAP document holders. Record where copies of the EAP are maintained in the Emergency Action Plan Locations table on the next page.

The plan holders are responsible for updating their copies of the EAP whenever they receive revisions. Discard out-of-date pages to avoid confusion with the revisions.

Table 8. Emergency Action Plan Locations

Copy Number	Organization Name and Address	Person(s) receiving copy
1	Owner or Representative: City of Ione Phone: (509)123-0000 or (509)123-0001Cell Address: 12345 City Hall Ione, WA 00000 e-mail www.------@----------	Staff
2	Pend Oreille County Emergency Manager Phone: (509)447-3731 Address 231 S. Garden Ave P.O. Box 5035 Newport, WA 99156 e-mail Pend Oreille Emergency Preparedness	Name Here
3	Dept of Ecology, Dam Safety Office (360)407-#### PO Box 47600 Olympia, WA 98504-7600 #### #### @ecy.wa.gov	Dam Safety Office Name of lead engineer
4	Pend Oreille High School Phone: (509)123-4567 or (509)123-4568 Cell Address: 123 West Oak Pend Oreille WA 12345	Principal Peters
5	Owner or Representative: __ Phone: Address: e-mail:	

(Attach additional sheets as necessary)

Table 9. Record of Revisions and Updates Made to this Emergency Action Plan

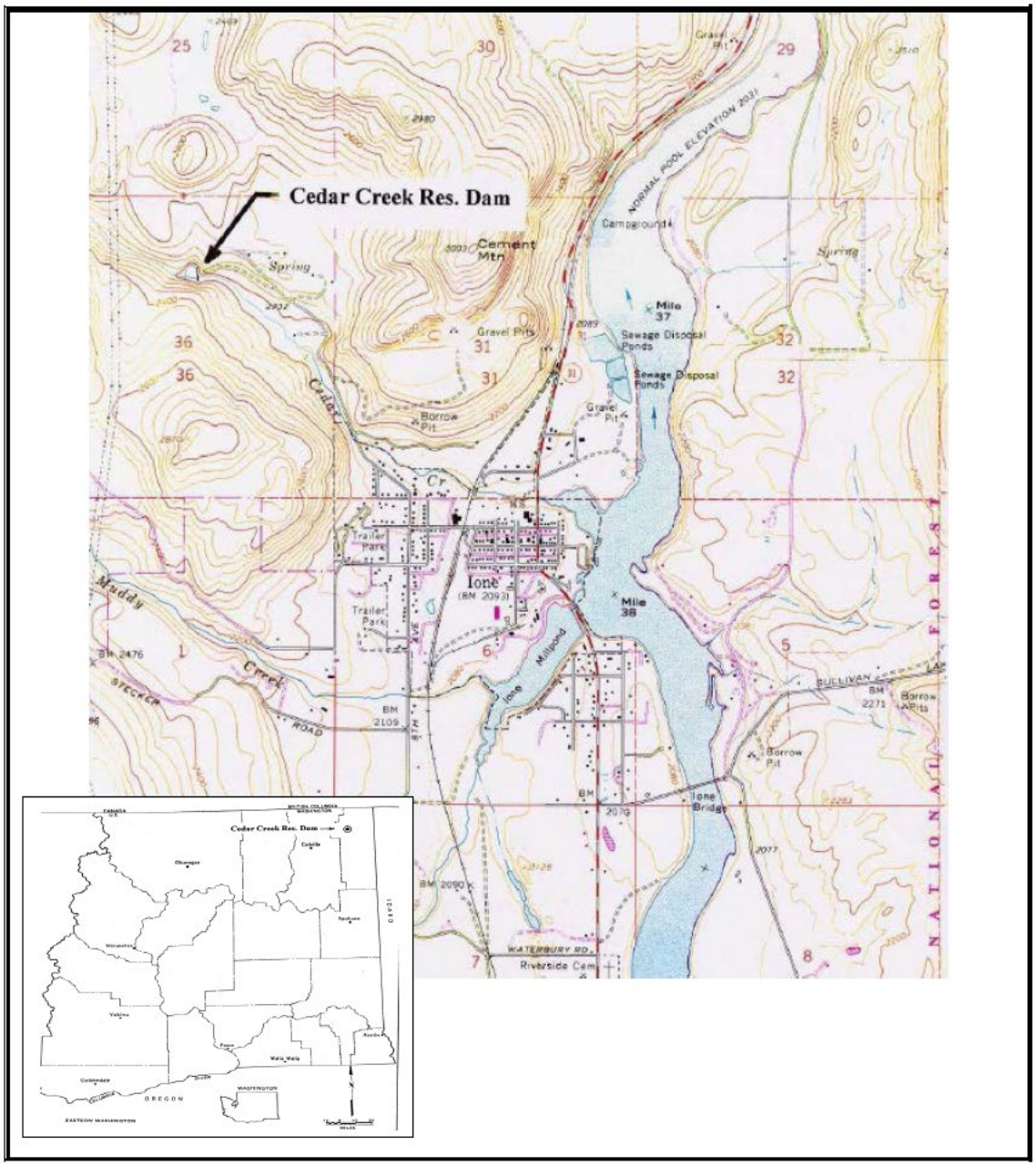
Revision Date	Revisions made	By whom and Phone number
1 7/04/2010	Contact phone number for Pend Oreille High School (new contact list)	Town of Ione, Maintenance Staff
2 7/04/2011	Resources Available list (new Resource list)	Town of Ione, Maintenance Staff
3		
4		
5		
6		
7		
8		
9		
10		

(Attach additional sheets as necessary)

Appendices: Maps, Supporting Data, Forms & Glossary

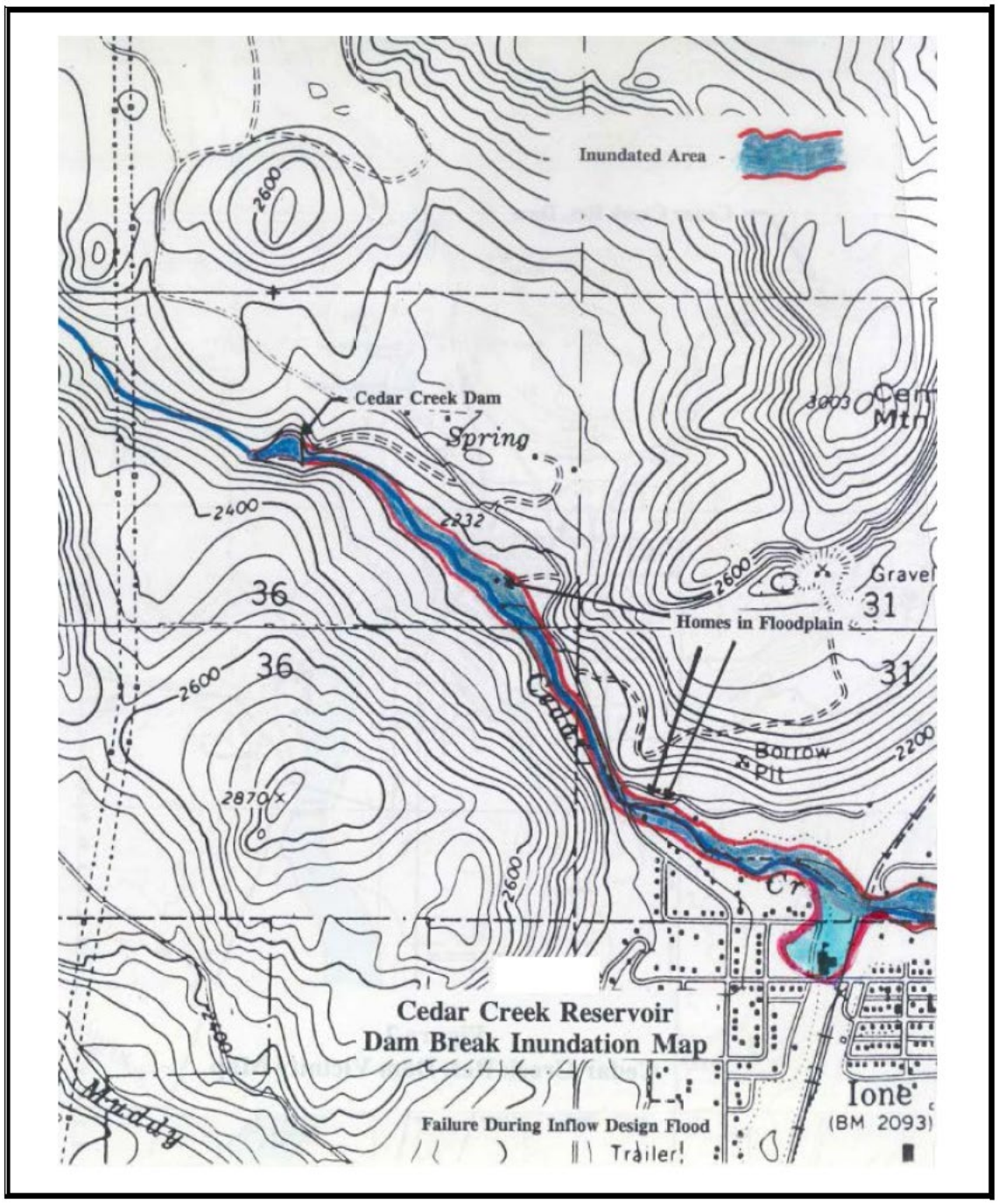
Appendix A

Appendix A-1 Location and Vicinity Maps



Sample Emergency Action Plan

Appendix A-2 Inundation Maps



Appendix A-3 Resources Available

Locally available equipment, labor, and materials:

(Revised: July 4, 2010)

Heavy equipment service and rental	**Sand and gravel supply**	**Ready-mix concrete supply**
Name: John Doe's Construction Address: 123 Ione Drive Ione, WA 12345 Phone: (509)000-0000 Cell	Name: John Doe Jr. Construction Address: 125 Ione Drive Ione WA 12345 Phone: (509)000-0001 Cell	Name: John Doe Jr. Construction Address: 125 Ione Drive Ione WA 12345 Phone: (509)000-0001 Cell
Sand Bags	**Diving Contractor**	**Pumps**
Name: Town of Ione Address: On site in back of office at Cedar Creek Dam Phone: (509)123-0001 Cell	Name: N/A Address: Phone: ( ) -	Name: Town of Ione Address: On site in storage shed at Cedar Creek Dam Phone: (509)123-0001 Cell
Other	**Other**	**Other**
Name: Address: Phone: ( ) -	Name: Address: Phone: ( ) -	Name: Address: Phone: ( ) -

Notes: _____

_____

_____

_____

_____

Sample Emergency Action Plan

Appendix A-4 Summary of People and Structures at Greatest Risk (list in order of proximity to the dam)

Table 10. Summary of People and Structures at Greatest Risk

Residence/Business/ Structure Name	Number of residents (if known)	Address	Phone Number	Approximate depth & time flood may arrive
Jones Residence	6	442 Cedar Creek Rd Pend Oreille WA 12345	(509)111-1114 (___) ___- _____	Depth: 1 foot 3 inches Time: 11 minutes
Joe and Jane Smith	2	888 Cedar Creek Rd Pend Oreille WA 12345	(509)111-1111 (___) ___- _____	Depth: 6 inches Time: 15 minutes
Grandma Jones	1	444 Cedar Creek Rd Pend Oreille WA 12345	(509)111-1112 (509)111-1113	Depth: 3 feet 9 inches Time: 25 minutes
Pend Oreille High School Principal Peters	65 when school is in session 2, 8-5 weekdays during recess	123 West Oak Pend Oreille WA 12345	(509)123-4567 (509)123-4568 Cell.	Depth: 3 feet Time: 35 min. approx.

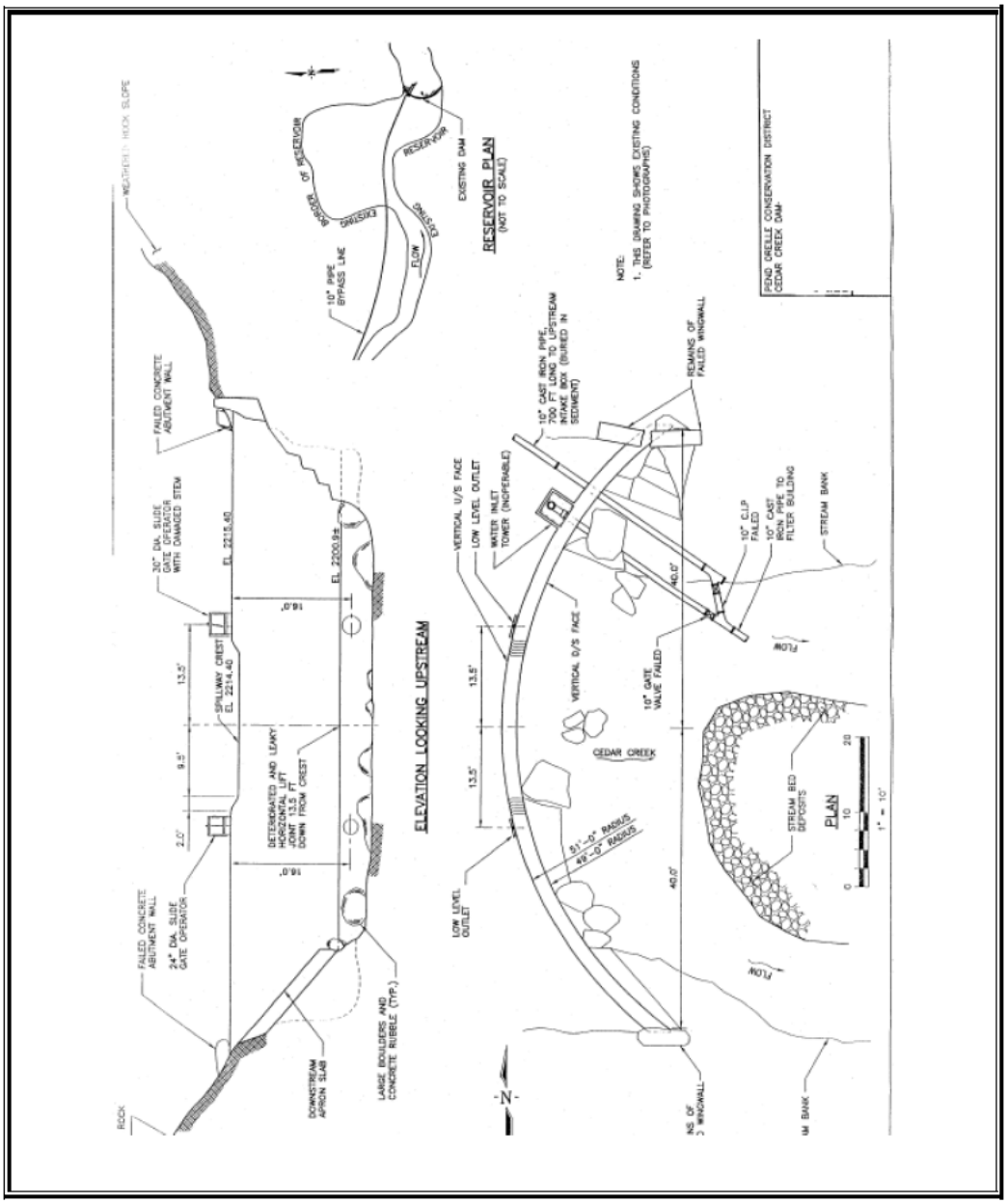
Sample Emergency Action Plan

Appendix A-5 Summary of Roads at Risk (list in order of proximity to the dam)

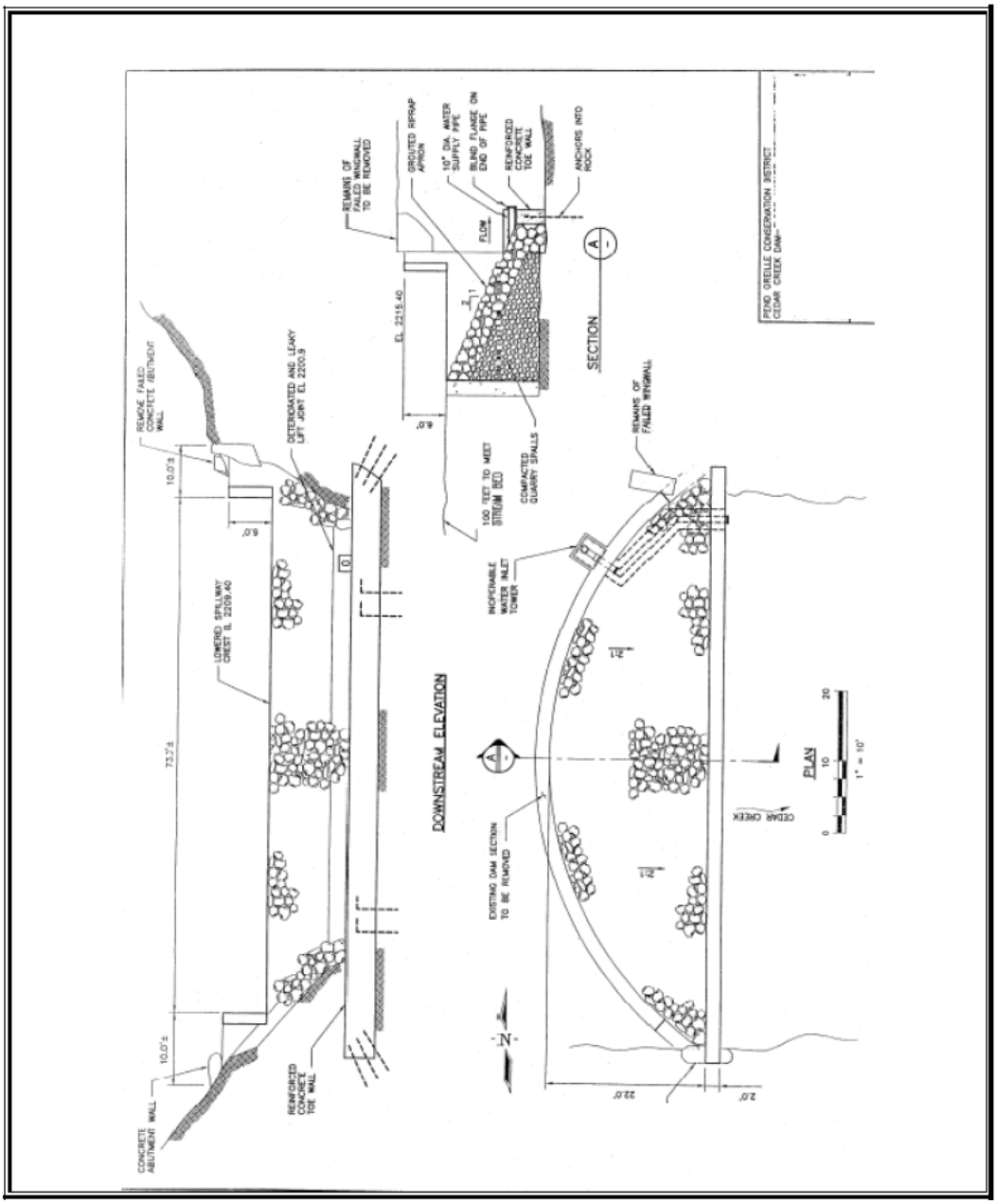
Table 11. Summary of Roads at Risk

Roads or Highways at risk	Location, intersections etc. (directions)	Approximate depth & time flood may arrive
Cedar Creek Road	Cedar Creek Road and County Road No. 2854	Depth: 2 feet Time: 15 min. approx.
Pend Oreille Valley Railroad & Grinnell Street	Railroad Ave and Grinnell Street ¼ mile north of city shop	Depth: 4 feet Time: 30 min. approx.
State Highway 31	Adjacent to Pend Oreille River by log terminal	Depth: 3 feet Time: 35 min. approx..

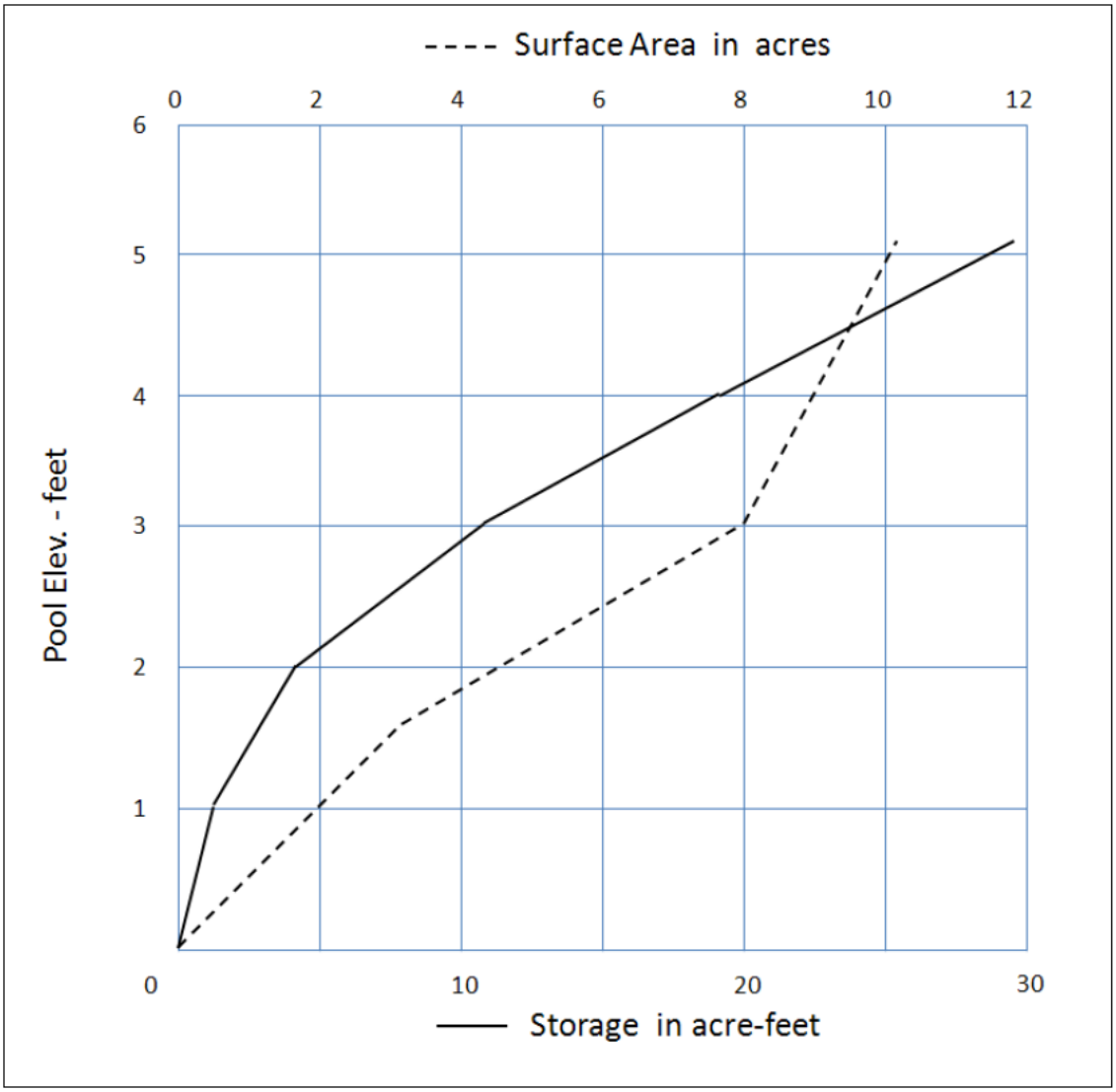
Appendix A-6 Plan and Profile Views of the Dam



Appendix A-6 Plan and Profile Views of the Dam



Appendix A-7 Reservoir Elevation, with Area and Capacity Data



Sample Emergency Action Plan

Appendix B

Appendix B-1 Examples of Emergency Situations

The following are examples of conditions that may occur at a dam that usually constitute an emergency. Emergency Level 1 events do not constitute an "emergency" unless they progress to the situations described below. Adverse or unusual conditions that can cause the failure of a dam are typically related to aging, or design and construction oversights. Extreme weather events that may exceed design conditions can cause significant flow through the emergency spillway or can overtop the embankment. Accidental or intentional damage to the dam may also result in an emergency situation. We have grouped the examples below to identify the more likely emergency level conditions. They are provided as guidance only. Not all emergency conditions are listed and the dam owner is urged to use conservative judgment in determining whether a condition at the dam constitutes an emergency.

Emergency Spillway Flows

Emergency Level 2 - Potential dam failure; rapidly developing:

1. Significant erosion or head cutting of the spillway is occurring, but a breach of the spillway crest that would result in an uncontrolled release from the reservoir does not seem imminent.
2. Flow through the emergency spillway is likely to cause flooding that threatens harm to any person, home, or road downstream from the dam.

Emergency Level 3 - Urgent; dam failure is imminent or in progress:

1. Significant erosion or head cutting of the spillway is occurring at a rapid rate and a breach of the control section appears imminent.
2. Flow through the emergency spillway is causing flooding that threatens harm to any person, home, or road downstream from the dam.

Embankment Overtopping

Emergency Level 2 - Potential dam failure; rapidly developing:

1. The reservoir level has reached the top of the dam and is projected to continue to rise.
2. Flow is occurring over the embankment, but it is not eroding the embankment slope, and the reservoir is expected to continue to recede.

Emergency Level 3 - Urgent; dam failure is imminent or in progress:

1. Flow is occurring over the embankment and is causing erosion damage to the embankment slope.
2. The reservoir level has exceeded the top of the dam and is expected to continue to rise.

Seepage and Sinkholes

Emergency Level 2 - Potential dam failure; rapidly developing:

1. Cloudy seepage or soil deposits are observed at seepage exit points or from internal drain outlet pipes.

2. New or increased areas of wet or muddy soils are present on the downstream slope, abutment, and/or foundation of the dam, and there is an easily detectable and unusual increase in volume of downstream seepage.
3. Significant new or enlarging sinkhole(s) on or near the dam.
4. Reservoir level is falling without apparent cause.
5. The following known dam defects are or soon will be inundated by a rise in the reservoir:
    a. Sinkhole(s) located on the upstream slope, crest, abutment, and/or foundation of the dam; or
    b. Transverse cracks extending through the dam, abutments, or foundation.

Emergency Level 3 - Urgent; dam failure is imminent or in progress:

1. Rapid increase in cloudy seepage or soil deposits at seepage exit points, to the extent that failure appears imminent or is in progress.
2. Rapid increase in volume of downstream seepage, to the extent that failure appears imminent or is in progress.
3. Water flowing out of holes in the downstream slope, abutment, and/or foundation of the dam, to the extent that failure appears imminent or is in progress.
4. Whirlpools or other evidence exists indicating that the reservoir is draining rapidly through the dam or foundation.
5. Rapid enlargement of sinkhole(s) is forming on the dam or abutments, to the extent that failure appears imminent or is in progress.
6. Rapid increase in flow through crack(s) which is eroding materials, to the extent that failure appears imminent or is in progress.

Embankment Movement and Cracking

Emergency Level 2 - Potential dam failure; rapidly developing:

1. Settlement of the crest, slopes, abutments and/or foundation of the dam that may eventually result in breaching of the dam.
2. Significant increase in length, width, or offset of cracks in the crest, slopes, abutments, and/or foundation of the dam, which may eventually result in breaching of the dam.

Emergency Level 3 - Urgent; dam failure is imminent or in progress:

1. Sudden or rapid progression of slides, settlement, or cracking of the embankment crests, slopes, abutments, and/or foundation, where breaching of the dam appears imminent or is in progress.

Appendix B-2: Contact Checklist

Contact Checklist – Emergency Level ____

(Dam owner/operator to complete during event)

Date _____

Dam Name: _____, Dam ID Number: _____

_____County, Washington

Contact Ecology's Dam Safety Office and your engineering firm immediately after you are alerted to an unusual or emergency situation if you need assistance in determining the emergency level (see Appendix B-1 for additional guidance).

The person making the contacts should initial and record the time of the call and who they notified for each contact made.

Local Emergency Manager	**Washington Dept. of Ecology, Dam Safety Office**	**Engineering Firm** (if applicable)
Name: _____	Emergency Number:	Name: _____
Office: _____	Office: (360) 407-6208	Firm: _____
Home: _____	24 Hour: (360) 971-6347	Office: ( ) - _____
Cell: _____	Lead Geotechnical Engineer:	Home: ( ) _____
Or call **911**	Office: (360) 407-####	Cell: ( ) - _____
	Cell: (###) ###-####	Email: _____

Person Contacted	**Time of Contact** (Record and Initial)						

(Attach additional sheets as necessary)

Notes: _____

_____

_____

Appendix B-3: Unusual or Emergency Event Log

(To be completed during an emergency)

Date _____

Dam Name:_____, Dam ID Number: _____

_____County, Washington

When and how was the event detected? _____

_____

Weather conditions: _____

General description of the event: _____

_____

_____

Emergency level determination: _____ Made by: _____

ACTIONS AND EVENT PROGRESSION

Date	Time	Action/event progression	Taken/witnessed by

(Continue on additional sheets as necessary)

Report prepared by:_____ Date: _____

Sample Emergency Action Plan

Appendix B-4: Dam Emergency Event Report

(Dam owner must complete and submit to Ecology once emergency has concluded)

Dam name: _____ State DAM ID: _____

City: _____ County: _____ Stream/River: _____

Date of event: _____ Time: _____

Weather conditions: _____

General description of event: _____

_____

_____

Area(s) of dam affected: _____

Extent of dam damage: _____

Possible cause(s): _____

Effect on dam's operation: _____

Initial reservoir elevation: _____ Time: _____

Maximum reservoir elevation: _____ Time: _____

Final reservoir elevation: _____ Time: _____

Description of area flooded downstream/damages/injuries/loss of life: _____

_____

_____

_____

Other data and comments: _____

_____

Observer's name and telephone number: _____

Report prepared by: _____ Date: _____

Appendix B-5: Dam Hazard Classification Table

The downstream hazard classification for your dam will be determined by the Dam Safety Office and is provided to the dam owner. The table below is one of the tools that are used to assess the risk of a dam failure on downstream areas. Each hazard classification level is an estimation of the damage that would occur from a hypothetical dam failure occurring with the reservoir at normal storage elevation and maximum storage elevation.

Table 12. Dam Hazard Classification Criteria

Downstream Hazard Potential	Downstream Hazard Classification	Population at Risk	Economic Loss Generic Descriptions	Environmental Damages
Low	**3**	**0**	**Minimal** No inhabited structures. Limited agriculture development.	No deleterious materials in water
Significant	**2**	**1 to 6**	**Appreciable** 1 or 2 inhabited structures. Notable agriculture or work sites. Secondary highway and/or rail lines.	Limited water quality degradation from reservoir contents and only short-term consequences.
High	**1C**	**7 to 30**	**Major** 3 to 10 inhabited structures. Low density suburban area with some industry and work sites. Primary highways and rail lines.	Severe water quality degradation potential from reservoir contents and long-term effects on aquatic and human life.
High	**1B**	**31-300**	**Extreme** 11 to 100 inhabited structures. Medium density suburban or urban area with associated industry, property and transportation features.	Severe water quality degradation potential from reservoir contents and long-term effects on aquatic and human life.
High	**1A**	**More than 300**	**Extreme** More than 100 inhabited structures. Highly developed, densely populated suburban or urban area with associated industry, property, transportation and community lifeline features.	Severe water quality degradation potential from reservoir contents and long-term effects on aquatic and human life.

Appendix B-6: Glossary of Terms

Abutment	That part of the valley side against which the dam is constructed. The left and right abutments of dams are defined with the observer looking in the downstream direction from the dam.
Acre-foot	A unit of (volumetric) measure that would cover one acre with water (or other fluid) to a depth of one foot. One acre-foot is equal to 43,560 cubic feet or 325,850 gallons.
Appurtenant structures	Ancillary features of a dam such as outlets, spillways, power plants, tunnels, etc.
Boil	A disruption of the soil surface due to water discharging from below the surface. Eroded soil may be deposited in the form of a ring (miniature volcano) around the disruption.
Breach	An opening through a dam that allows the uncontrolled draining of a reservoir. A controlled breach is a constructed opening. An uncontrolled breach is an unintentional opening caused by discharge from the reservoir. A breach is generally associated with the partial or total failure of the dam.
Conduit	A closed channel (round pipe or rectangular box) that conveys water through, around, or under the dam.
Control section	A usually level segment in the profile of an open channel spillway above which water in the reservoir discharges through the spillway.
Dam	A man-made barrier, together with appurtenant structures, constructed above the natural surface of the ground for the purpose of impounding water.
Dam failure	The uncontrolled release of a dam's impounded water.
Dam Owner	Any person, private or non-profit company, special district, federal, state, or local government agency, or any other entity in direct routine control of a dam and reservoir, and/or directly involved in the physical operation and maintenance of a dam.
Drain, blanket	A layer of pervious material placed to facilitate drainage of the foundation and/or embankment.
Drain, chimney	A vertical or inclined layer of pervious material in an embankment to facilitate and control drainage of the embankment fills.

Drain, toe	A system of pipe and/or pervious material along the downstream toe of a dam used to collect seepage from the foundation and embankment and convey it to a free outlet.
Drainage area	The area that drains to a particular point on a river or stream. (Watershed)
Drawdown	The difference between a water level and a lower water level in a reservoir within a particular time.
Emergency	A condition that develops unexpectedly, endangers the structural integrity of the dam and/or downstream human life and property, and requires immediate action.
Emergency Action Plan	A written document prepared by the dam owner, describing a detailed plan of actions for response to emergency or unusual events, including alerting and warning emergency officials in the event of a potential or imminent dam failure or other emergency related to the safety of the dam and public.
Engineer	A Professional Engineer registered and licensed in the State of Washington. The engineer must be sufficiently qualified and experienced in the design, construction, and safety evaluation of the type of dam under consideration.
Filter	One or more layers of granular material graded (either naturally or by selection) so as to allow seepage through or within the layers while preventing the migration of material from adjacent zones.
Freeboard	The vertical dimension between the crest (or invert) of the emergency spillway and the crest of the dam.
Groin	That area along the intersection of the face of a dam and the abutment.
Hazard Classification	The placement of a dam into one of three categories (High, Significant & Low) based on the hazard potential derived from an evaluation of the probable adverse consequences due to failure or improper operation of the dam.
Height, Jurisdictional	The vertical dimension measured from the elevation of the lowest point of the natural surface of the ground, or from the invert of the outlet pipe if excavated below the natural surface of the ground, whichever is lower, where the low point occurs along the longitudinal centerline of the dam, up to the spillway crest of the emergency spillway.

Instrumentation	An arrangement of devices installed into or near dams that provide measurements to evaluate the structural behavior and other performance parameters of the dam and appurtenant structures.
Inundation Map	A map depicting the area downstream from a dam that would reasonably be expected to be flooded in the event of a failure of the dam.
Local Emergency Manager	Person(s) responsible for developing, organizing, and exercising a community's emergency operations plan. Typically, City Police or Fire Department, or County Sheriff's Department personnel act as the Local Emergency Manager.
Notification	Immediately inform appropriate individuals, organizations, or agencies about a potential emergency event so they can initiate appropriate actions.
Outlet	A conduit (usually regulated by gates or valves) used for controlled or regulated releases of impounded water from the reservoir.
Piping	The progressive destruction of an embankment or embankment foundation by internal erosion of the soil by seepage flows.
Reservoir	A body of water impounded by a dam.
Seepage	The natural movement of water through the embankment, foundation, or abutments of the dam.
Slide	The movement of a mass of earth down a slope on the embankment or abutment of the dam.
Spillway	An appurtenant structure that conducts overflows from a reservoir.
Spillway (principal)	The overflow structure designed to limit or control the operating level of a reservoir, and first to be activated in runoff conditions.
Spillway (emergency)	The appurtenant structure designed to pass the Inflow Design Flood in conjunction with the routing capacity of the reservoir and any principal or service spillway(s).
Spillway crest	The elevation of the floor of a spillway, grade control structure, or ogee crest above which spillway flow begins.
State Dam Safety Engineer	For purposes of this EAP, the Washington State Department of Ecology, Dam Safety Office engineer(s) responsible for safety

	inspections, plan review and determining the safe reservoir storage level of assigned dams.
Toe of dam	The junction of the upstream or downstream face of an embankment with the ground surface.
Top of dam (dam crest)	The elevation of the uppermost surface of an embankment which can safely impound water behind the dam.

Table 13. **Water Equivalents Table**

An acre-foot covers one acre of land one foot in depth.

1 cubic foot…….7.48 gallons…….6.25 lbs of water

1 acre foot……..43,560 cubic feet…….325,851 gallons

1 cubic foot per second (CFS)……..7.48 gallons per second

1 CFS…..448.8 GPM…..646,272 GPD…..1.98 acre-ft./day

1,000 GPM…….2.23 CFS…….4.42 acre-ft./day

1 million gallons per day……..694 GPM……..1.55 CFS

Appendix B-7 Signature Page, Concurrences

By my signature, I acknowledge that I, or my representative, have reviewed this plan and concur with the tasks and responsibilities assigned herein for my organization and myself.

1. _____
Signature Organization Date

Dam Owner: _____
Printed title and name

2. _____
Signature Organization Date

Washington State Dam Safety Office: _____
Printed title/organization and name

3. _____
Signature Organization Date

County Emergency Management Coordinator: _____
Printed title/organization and name

4. _____
Signature Organization Date

_____: _____
Printed title/organization and name

5. . _____
Signature Organization Date

_____: _____
Printed title/organization and name

6. . _____
Signature Organization Date

_____: _____
Printed title/organization and name