STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
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July 28, 2011

Ms. Colleen K. Boyle
29722, 224th Avenue SSE
Black Diamond, WA 98010

Mr. Ken C. Dooley
22407 SE 297th Street
Black Diamond, WA 98010

Project: Lake Sawyer Outlet Structure
File Number: KI09-1177

Subject: June 28, 2011 At-Public-Request Inspection

Dear Ms. Boyle and Mr. Dooley:

The purpose of the letter is to present to you, as owners, the results of an inspection of the Lake Sawyer Outlet Structure. The inspection was not a regularly scheduled inspection, but completed after a request was received regarding flooding concerns from Alan Nix, Director of Parks and Natural Resources at the City of Black Diamond. I have copied him on this letter along with Alan Gangl, President of the Sawyer Lake Community Club, who made a request to receive a copy. This report provides background information and a description of the project, results of the June 28, 2011 inspection, and any remedial actions required based on the inspection findings. An Operation and Maintenance Plan and an Owner's Annual Inspection Form are also included.

In the Conclusion section of this letter, you will see that our overall assessment of the structure following our June 28th inspection is that Lake Sawyer Outlet Structure is adequately maintained and functioning properly and that the downstream hazard remains classified as Low, Hazard Class 3.

The inspectors were John R. Blacklaw, P.E. and David Cummings, P.E. of Ecology's Dam Safety Office. Ms. Dusta Dooley was present for the inspection. Mr. Dooley and Ms. Boyle were not present, although they had been apprised of the time for the inspection by certified letter.

In accordance with RCW 43.21A.064 (2), the Department of Ecology, Dam Safety Office (DSO) has the responsibility and authority to inspect the construction of all dams and other works related to the use of water, and to require necessary changes in construction or maintenance to

reasonably assure safety to life and property. This report has been prepared in accordance with this statute.

PROJECT INFORMATION

Sawyer Lake Outlet Structure is located on Covington Creek in the city of Black Diamond, Washington, within Section 4, T21N, R6E in King County (Figure 1). The dam is located at: Latitude 47.335703N., Longitude -122. 045458 E.

The purpose of the Sawyer Lake Outlet Structure is to provide a hardened spillway to limit erosion and head cutting in Covington Creek, for elevation control for Sawyer Lake, and to support fish passage. This results in a recreational benefit, primarily for lake side residents and facilities. The project is owned by the two residential owners of land parcels on each side of Covington Creek at the dam.

The owners are:

Left Side of Dam:
Ms. Colleen K. Boyle
29722, 224th Avenue SSE
Black Diamond, WA 98010

Right Side of Dam:
Mr. Ken C. Dooley
22407 SE 297th Street
Black Diamond, WA 98010
(360) 886-0125
kdchows@hughes.net

The project was constructed in 1952. The dam is a 4-foot high concrete structure, with a central fish passage section. The dam crest is 60 feet wide on the right side, 30 feet wide on the left, for a total width of about 94 feet. Both sides of the dam have raised concrete sections extending into the raised earthen abutments. The upstream slope is vertical. The downstream slope is an ogee shape. There is a concrete apron at the dam toe that extends about 10 feet downstream. The apron is about 6 feet below the dam crest elevation. Downstream of the apron is large rock.

About 100 feet downstream of the dam is 224th Street, a two lane street crossing Covington Creek. There are 3 approximately 5 foot diameter corrugated metal pipe (CMP) culverts. The culvert inverts are set at approximately the elevation of the dam apron (about 6 feet below the dam crest). The street is about 3 to 4 feet higher than the dam crest. 224th Street and the three culverts underneath would attenuate (limit) the peak flow rate from the dam during very large precipitation events or a potential dam breach failure.

The dam can impound about 1116 acre-feet when filled to the spillway crest height of 4 feet.

FIELD INSPECTION

On June 28th, there was a depth of flow over the dam crest of about 2 to 3 inches. Using the attached Flow versus Head chart, this amounts to about 40 cubic feet per second (cfs). Silt has built up on the upstream side of the dam and is evident about 1 to 2 feet below the water surface. There was no visible damage to the apron, although it was submerged by about 2 to 3 feet below the downstream water surface and was not easily observable. The rock beyond the apron

appeared to be stable. There is a large stump on the right toe near the abutment. It appeared to be stable. No scour holes were observed.

The owner stated that she had looked at the dam toe area during low flow periods and had noticed any problems.

The concrete structure was evaluated by David Cummings, P.E., Structural Specialist with the Dam Safety Office. His observations are noted: The structure appears to be stable and has not changed much since it was last inspected 18 years ago. Moss has obscured the surface in places. Even so, it appears that the concrete dam members had no cracks of significant width, or out-of-plane offsets or misalignments. There was no apparent deviation of flow at the dam crest, as would be noticeable if there were cracks of significant size. All concrete members appeared to have smooth, well-formed surfaces, with what appeared to be the original cast-in-place alignments.

Please note that the above statements about the concrete members were made without any consideration of member sizes, concrete strength, or viewing from a close enough distance to make condition statements beyond an "approximate" accuracy.

HAZARD SETTING

In light of the inundation path findings noted below, the Lake Sawyer Outlet Structure hazard remains classified as Low, Hazard Class 3.

The dam hazard classification is based on an evaluation of potential impacts downstream from a hypothetical dam breach to an inundation pathway area downstream of the dam. Evaluated impacts include the potential for loss of life, and economic and environmental impacts.

There are three hazard categories – High, Significant, and Low. The High Hazard category has three additional separations – High 1A, High 1B, and High 1C. There is a matrix of risk parameters used to make these distinctions. Please see Table 2 of the Dam Safety Guidelines, Part IV: *Dam Design and Construction at: http://www.ecy.wa.gov/programs/wr/dams/dss.html.*

The downstream hazard area is principally wooded streambed. The general area is semi-rural mostly developed into large lot residential homes of several acres each. There are two main roadway crossings between the dam and where Covington Creek enters the Green River about 15 miles downstream. See the attached Inundation Map.

The inspection included reviewing the flow pathway of a potential dam breach flood from the dam until Covington Creek enters the Green River. The first road crossing was at 224th Street less than 100 feet downstream of the dam. There were 3 large approximately 5 feet diameter corrugated metal pipe (CMP) culverts that pass the Covington Creek flow at that point. The culverts were flowing about ¼ full at the time of the inspection. The roadway is approximately 3 to 4 feet above the dam elevation and would constrict the potential dam breach flow rate, if the dam were to fail.

It is estimated that peak stormwater flow during large design-basis storm events and/or a potential dam breach failure would be attenuated by the 224th Street roadway and culverts and that there would be no significant impacts downstream caused by the dam's presence. Therefore, a failure of the dam would not likely result in a loss of life.

The second roadway crossing is several miles downstream of the dam on the Kent Black Diamond Road near 328th Street. This crossing is a two lane bridge with apparent limited stormwater flow capacity. It is estimated that the bridge capacity is no greater than the culvert capacity on 224th Street. There are two homes on the right side of Covington Creek just downstream of the bridge crossing that were flooded (according to City of Black Diamond staff) in the past two years. It is likely that the flooding was the result of a combination of high water flows from local surface water and from Covington Creek. This location has a much larger watershed that the dam due to tributary streams below the dam. The limited capacity of the bridge could also cause backwater conditions that might affect local flooding in the area.

There is a fish hatchery (Soos Creek Hatchery) just upstream of the confluence of Covington Creek and the Green River. In discussions with Mike Wilson, Fish Hatchery Specialist, at the hatchery, there is routine flooding at this facility. He said that most of the flooding is from impacts of backwater from the Green River due to flood water control at the Howard Hanson Dam. He does not believe that Covington Creek alone has caused his facility to flood.

Prior to the inspection, the hazard classification was considered Low, Hazard Class 3.

Information obtained on the Inundation Path Downstream from the dam is listed below:

Equivalent Number of Downstream Residences:	None
Number of Road Crossings:	Two
Number of Bridge Crossings:	One
Infrastructure Description:	Semi-rural developed in large lots
Reservoir Contaminants Description:	Lake water
Environmental Resources Description:	Salmon and trout habitat
Other Impacts:	None

CONCLUSIONS

Our overall assessment of the structure following our June 28th inspection is that Lake Sawyer Outlet Structure is adequately maintained and functioning properly and that the downstream hazard remains classified as Low, Hazard Class 3. The necessary Operation and Maintenance Plan and Owner's Annual Inspection Form need to be instituted by the owners. There are no other required remedial actions for the owners.

Thank you for your assistance during the inspection. If you have questions, please contact me at the Dam Safety Office. I can be reached at (360) 407-6883, or at John.Blacklaw@ecy.wa.gov.

Sincerely,

John R. Blacklaw, P.E.
Dam Safety Engineer
Dam Safety Office
Water Resources Program

Cc: Aaron Nix, Director, Parks and Natural Resources, City of Black Diamond
Alan Gangl, President, Sawyer Lake Community Club
Jacque Klug, Ecology, NWRO

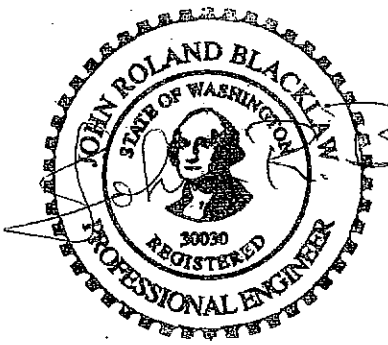
Mailing Addresses:

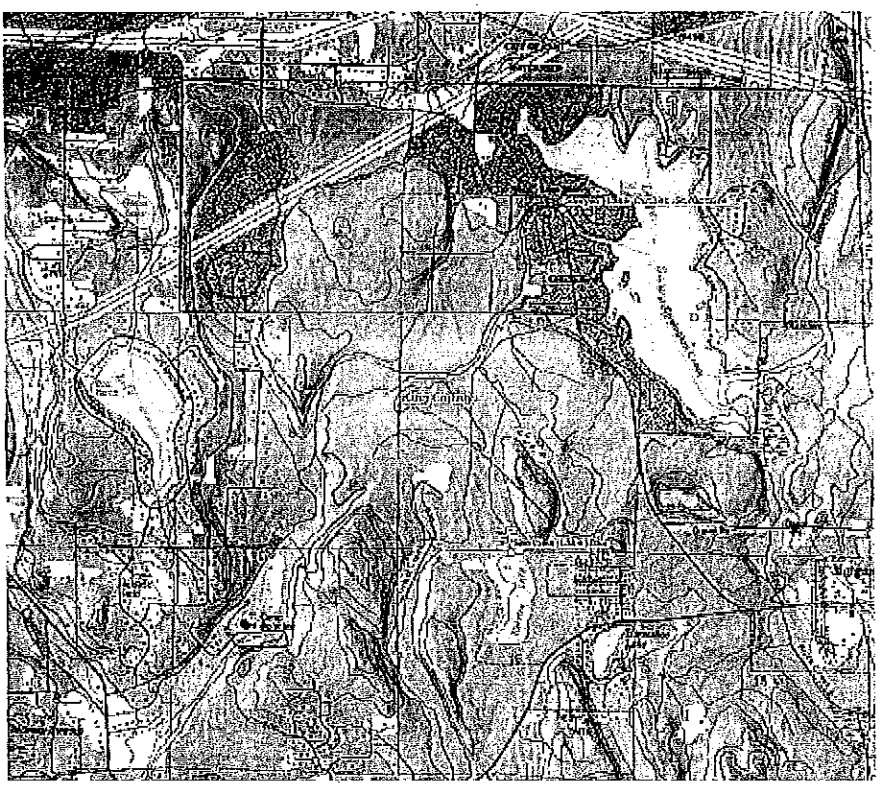
Aaron Nix, Director
Parks and Natural Resources
City of Black Diamond
24301 Roberts Drive (PO Box 599)
Black Diamond, WA 98010

Alan Gangl, President
Sawyer Lake Community Club
PO Box 191
Black Diamond, WA 98010

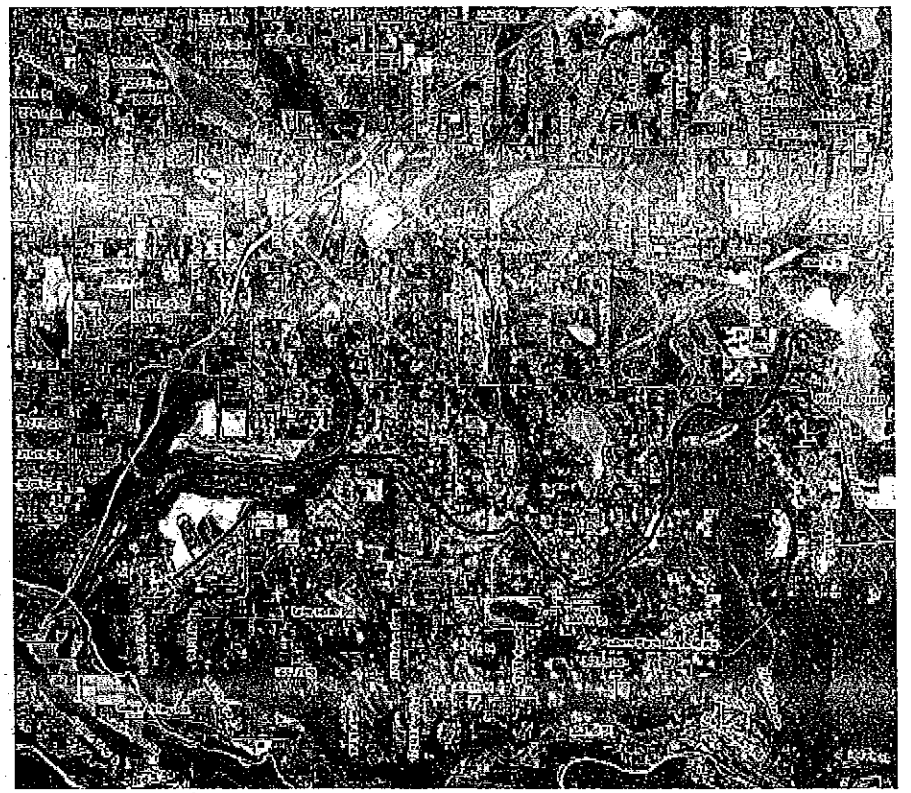
The dam safety inspection of the Lake Sawyer Outlet Structure and technical material presented in this letter were prepared under the supervision and direction of the undersigned professional engineer, in accordance with RCW 43.21A.064 (2).

John R. Blacklaw, P.E.
Dam Safety Engineer
Dam Safety Office

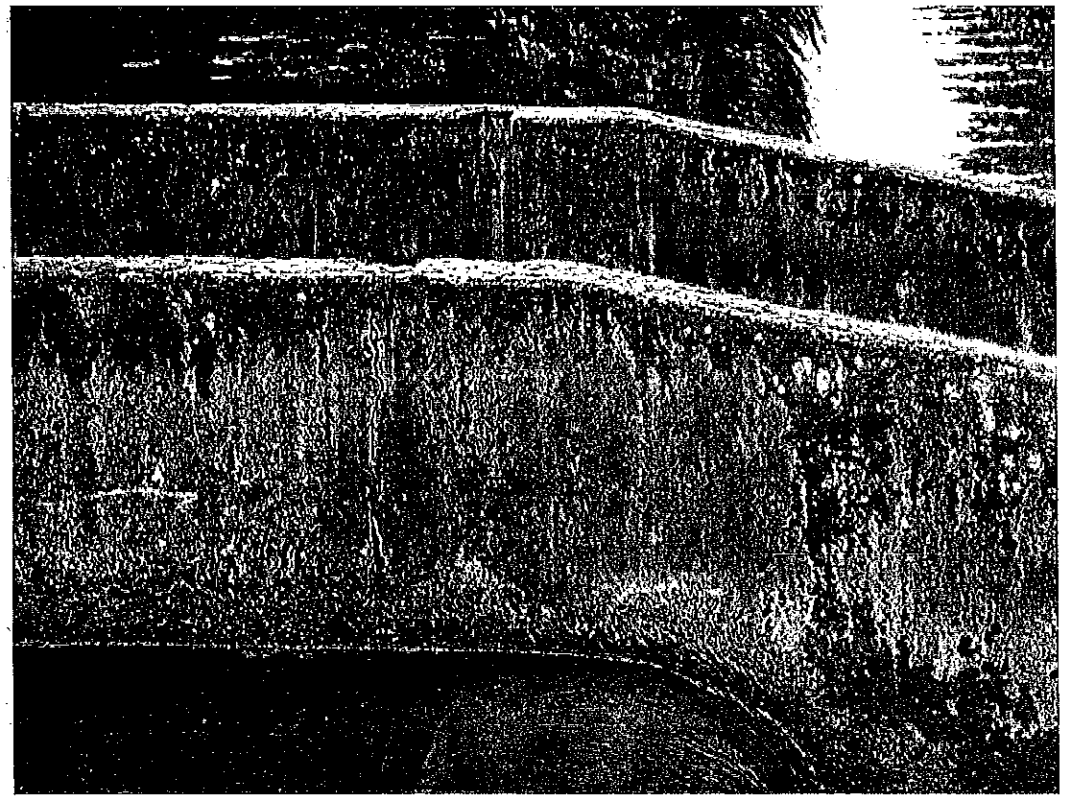




Lake Sawyer Outlet Structure Location Map

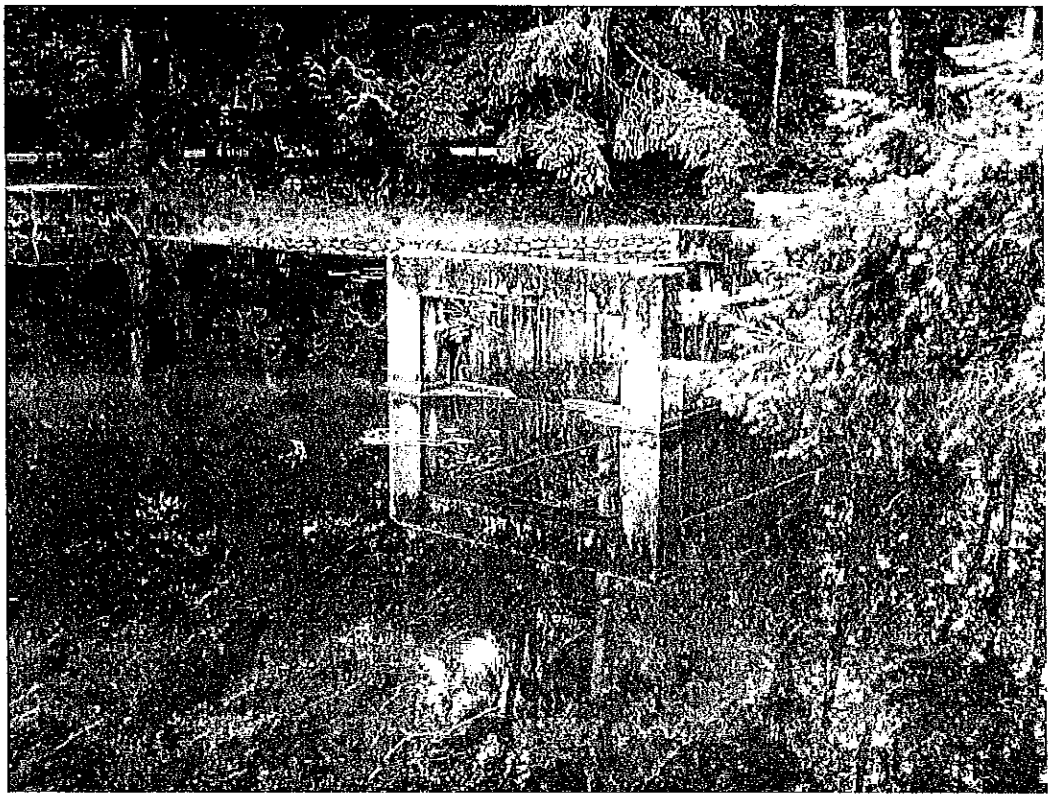


Lake Sawyer Outlet Structure Inundation Map

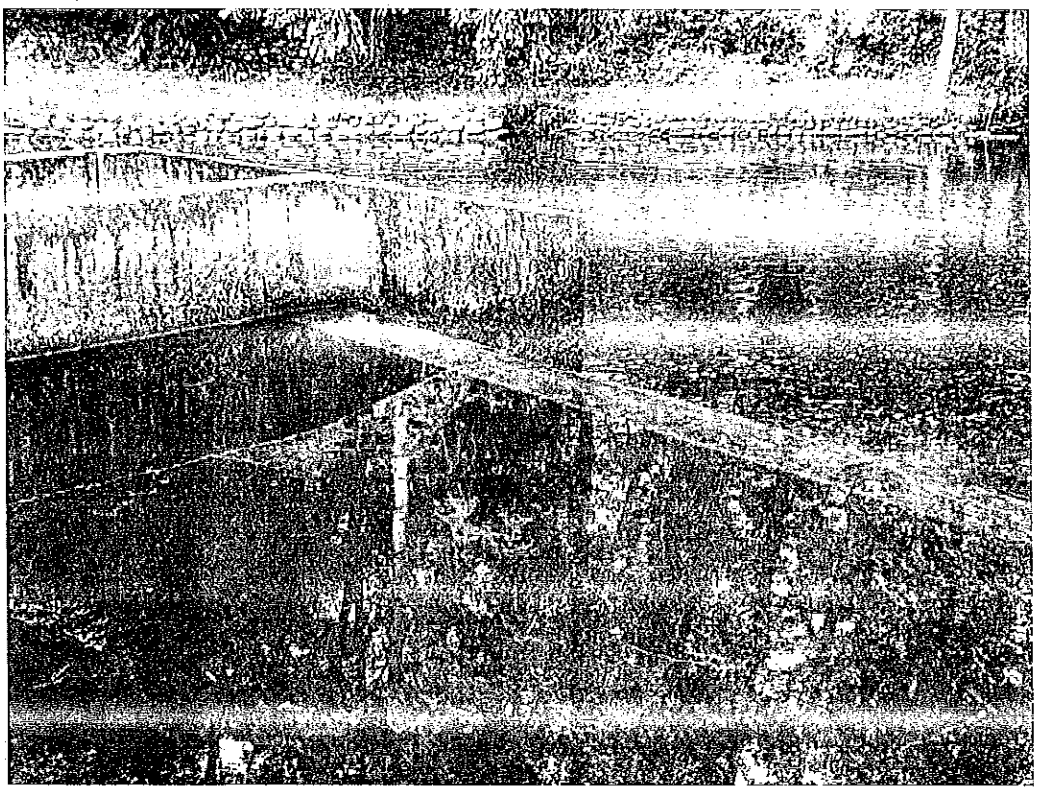


Fish Passage Training Wall Looking from Right Abutment

Fish Passage and Crest from Right Abutment



Fish Passage Entrance



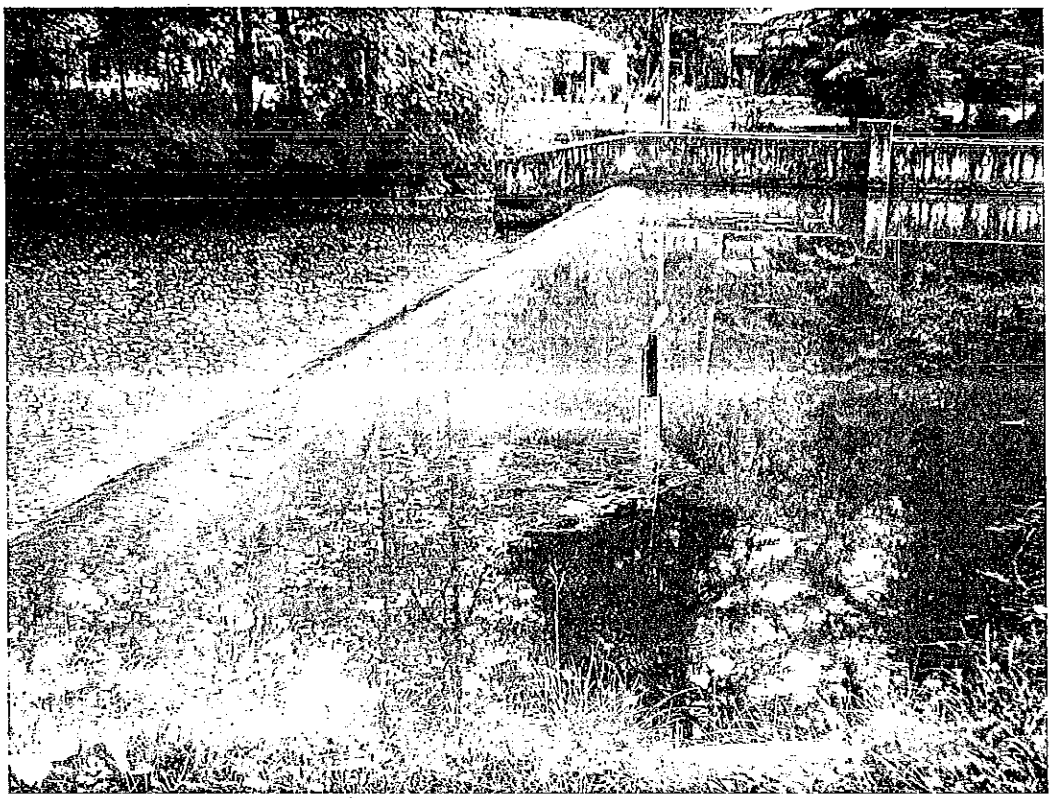
Right Side Dam Crest Looking Downstream

Stump Remnant at Left Downstream Toe

224th Street Culvert Looking from Right Abutment

Looking Upstream at Dam from 224th Street near Culverts

Looking Upstream at Dam from 224th Street Roadway Margin



Water Level Indicator Looking from Left Abutment

OPERATION AND MAINTENANCE PLAN

1. PROJECT DATA:

Dam Name: Lake Sawyer Outlet Structure
Reservoir Name: Lake Sawyer
Owner's Names:

Left Side of Dam:
Ms. Colleen K. Boyle
29722 224th Avenue SSE
Black Diamond, WA
98010

Right Side of Dam:
Mr. Ken C. Dooley
22407 SE 297th Street
Black Diamond, WA 98010
(360) 886-0125
kdchows@hughes.net

Creek/River: Covington Creek
Location: Section 4, T21N, R6E, Latitude 47.335703N., Longitude -122. 045458 E.
Dam Type: Concrete ogee with downstream apron
Dam Height: 4 ft. Crest Length: 94 ft. Crest Width: 3 ft.

2. INDIVIDUALS WHO ARE RESPONSIBLE FOR:

Operations: Owners (See above)
Maintenance: Owners (See above)
Inspections: Owners (See above)
Monitoring of Instrumentation (Water Level Gage): Owners (See above)

3. LIST OF ITEMS REQUIRING PERIODIC MAINTENANCE, AND PROCEDURES FOR PERFORMING MAINTENANCE.

Debris: Since there is no log boom or other device to limit debris from impinging on the structure, quarterly maintenance should identify any need for debris removal. The owners should then make arrangements for debris removal. The entry to the fish passage may be particularly susceptible to debris build up and should be observed specifically each quarter so debris is eliminated in order to keep fish passage functional.

Concrete: Concrete surfaces should be observed for significant cracking that appears unstable (may move and separate) or that has out-of-plane offsets (misalignments, separations) or leakage (flowing water). Be sure to observe the contact of the fish ladder with the ogee spillway sections on each side.

Apron: The downstream toe of the dam (apron and rock) is a potential dam failure area that needs to be evaluated during periods of low flow and low downstream water level so the area can be adequately inspected. Be careful for personal safety when inspecting this area. Be sure to look for large or significant concrete defects (see above) and for void areas at the end of the apron when flow may have eroded or displaced the large rock. At

the left abutment, there is a large stump that was cut off at the water line at some time in the past. This area should be observed for potential changes or deterioration of the apron and abutment in the area.

4. LIST OF INSTRUMENTATION, FREQUENCY OF MONITORING, AND METHOD OF RECORD KEEPING:

Water level measurements should be made quarterly (around January 1, April 1, July 1 and October 1) by the owners and recorded in a log book. The only instrumentation at the dam is the water level gage (indicator). This gage measures the upstream water level and is most easily observed from the left abutment area. Measurements can be correlated to stream flow rate for Covington Creek using the water level, dam width dimensions and standard weir flow rate calculation methods. These measurements may be useful by city or county officials, or others, to monitor stream flow for fish or flood protection purposes. Use the chart below to convert water level measurements to approximate stream flow rates.

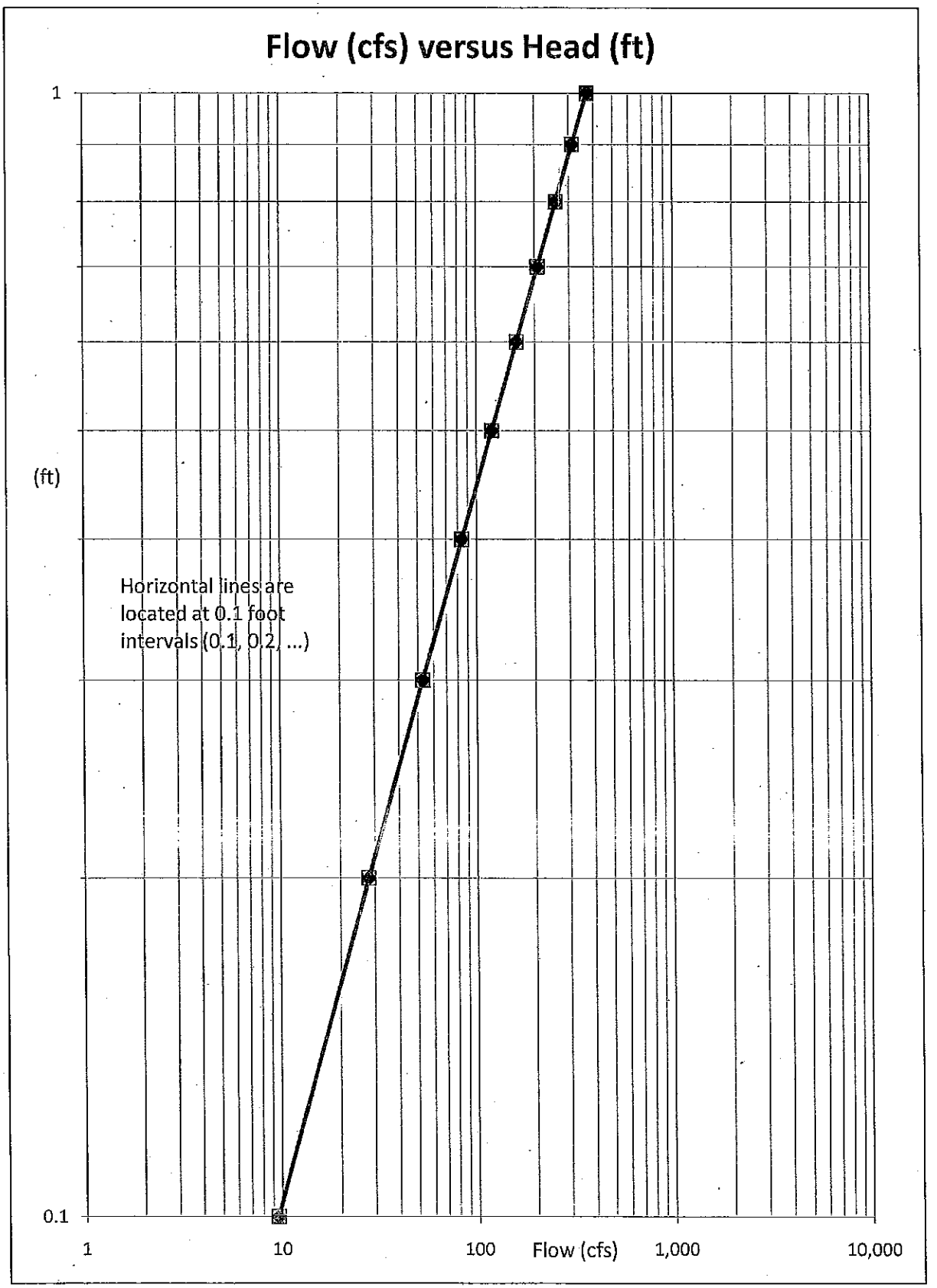
5. FREQUENCY OF ROUTINE INSPECTIONS:

Routine inspections should be done quarterly when the water level gage measurements are taken (around January 1, April 1, July 1 and October 1). Routine inspections should be made by the owners by walking around and observing the condition of the dam to see if anything is out of place or has changed since the last inspection. Photographs are helpful in evaluating changes with time. Notes should be taken and entered in the log book along with the photos and water level measurements.

6. ANNUAL INSPECTIONS BY OWNER:

The dam should be inspected annually (around October 1) using the attached Annual Inspection Form. Of particular interest would be the condition of the concrete members and of the downstream apron and rock at the dam toe.

Ideally, the annual inspection should be scheduled after a prolonged low flow period when the dam toe, apron and rock can be readily observed. Also, an additional inspection may be warranted if there is concern following an unusually large storm event. A major earthquake causing lengthy strong shaking in the area should also trigger an annual inspection.


Flow (cfs) versus Head (ft)
1
(ft)
0.1
Horizontal lines are located at 0.1 foot intervals (0.1, 0.2, ...)
1
10
100
Flow (cfs)
1,000
10,000

OWNER'S ANNUAL INSPECTION FORM

Project Data:		
Dam Name: Lake Sawyer Outlet Structure		
Owner's Names: **Left Side of Dam:** Ms. Colleen K. Boyle 29722 224th Avenue SSE Black Diamond, WA 98010	**Right Side of Dam:** Mr. Ken C. Dooley 22407 SE 297th Street Black Diamond, WA 98010	
Inspected by: _____	Inspection date: _____	Weather: _____
Reservoir Data:		
Reservoir Level at time of Inspection: _____ (Use the water level gage or estimate the water level flowing over the dam crest.) Reservoir Outflow at time of Inspection: _____ (Use the Flow versus Head chart to determine stream flow rate at the dam.)		

Condition of Dam: (Describe below deficiencies found and their approximate locations.)

Debris: _____

Concrete: _____

Apron: _____

Measurements: _____

Maintenance Deficiencies: (Note any maintenance issues found and provide a description of the recommended action required to make needed corrections.)
Additional Inspector Comments:
Notes on Attached Photos: (Attach and number photos taken during the inspection.)

Instructions: Send a copy of the completed Owner's Annual Inspection Form to the Dam Safety Office at the following address within 30 days of the inspection. Keep the original in the facility Logbook.

Dam Safety Office
Washington State Dept. of Ecology
PO Box 47600
Olympia, WA 98504-7600

Note: If a significant or serious problem is observed during the inspection, please call the Dam Safety Office at (360) 407-6208 during normal working hours or the 24-hour pager number at (360) 971-6347 for guidance and assistance.