Operation and Maintenance Plan
Dam Safety

Instructions

The Dam Safety Office (DSO) designed this template to aid dam owners in creating an Operations and Maintenance (O&M) Plan. For some simple earthen dams, completing this plan, or something equivalent, will satisfy the O&M Manual requirement under WAC 173-175-500. For other dams - like large concrete dams - a more comprehensive, detailed manual, which incorporates this plan, may be required by DSO. DSO will make this determination on a case-by-case basis after reviewing the completed dam template.

The template is a fillable-form and provides a wide variety of possible O&M elements. Most dams will not have every element listed here; and some dams may have elements that are not specifically listed in this template. Therefore, the owner should write N/A if an element doesn't apply and add elements in the blank spaces if needed.

More information and guidance on developing O&M documents can be found at https://fortress.wa.gov/ecy/publications/SummaryPages/92021.html, "Guidelines for Developing Dam Operation and Maintenance Manuals."

Although maintenance and repair work does not typically require a dam safety permit, some engineered solutions require DSO pre-approval. In addition, some of the assessment and repair work identified in this plan may require the services of a professional engineer (P.E.) and the use of specialized equipment. This could include concrete repairs and major component replacements. The owner should consult with the DSO if unsure which assessments and repairs require DSO approval and P.E. consultation. Maintenance activities should be logged on the owner's annual inspection report to DSO.

Worker safety should be paramount when implementing the plan. For instance, some working spaces require confined space entry training and protocols. Also, underwater work should be done by certified and skilled divers.

Finally, it is the owner's responsibility to comply with all other applicable federal, state, and local requirements including environmental review and permitting, if necessary.

Send copy of completed form to Ecology

Copies of completed O&M Plans should be sent to the Dam Safety Office.

Send by email to: damsafety@ECY.WA.GOV

Or by mail to: Department of Ecology
Water Resources Program
Attn: Dam Safety Compliance Technician
PO Box 47600 Olympia, WA 98504-7600

Project Data

Dam Name: Kayak Lake Dam	
Reservoir Name: North Fork Cherry Creek	
Owner Name: Mountain View Park Community Club	
Date: October 4, 2022	County: Snohomish
Dam Type: ☒ Earthen ☐ Concrete	Dam Number: SN07-0199

Responsible Individuals: The board of directors is responsible for overseeing the team of community members that will participate in the operation, maintenance, inspection and monitoring of the Dam. Four members listed (*) are full time residents at Lake Kayak, additional community residents also participate in the above activities.

Position	Name	Phone	Email Address
President	Andy Quast *	206-719-4747	Andrew.Quast@gmail.com
Vice President	Kacie Ciske *	406-431-1754	KacieCiske@gmail.com
Treasurer	Molly Graham	206-779-3750	mollyg1@comcast.net or MVPCCTreasurer@gmail.com
Secretary	Audrey Spence*	206-371-9192	88Audrey@gmail.com
Director	Patricia Mouton	206-755-7226	Patmouton1995@gmail.com
Director	Tom Morgan *	206-617-0395	Thomasemorgan44@gmail.com

List of Hydraulic Elements for Controlling Inflow to or Outflow from Reservoir:

Check which elements exist and fill in the description, location, and dimensions of each. Add additional elements as needed.

Exists	Element	Description, Location, and Dimensions
☒	Runoff inflow to reservoir from upstream watershed	Lake is fed by 2 creeks at northern end (NEast and NWest) of lake in addition to several underground springs
☒	Open channel – spillway and weir	Earthen channel spillway, no gates or valves. The overflow spillway is a concrete weir 13.5 feet wide and 2.5 feet deep with a center notch 8.0 feet wide and 0.8 feet deep. The weir is located at the end of a long channel that extends SE from the main body of the lake. Specifically, the weir is located in natural ground 200 feet SE from the left abutment for the spillway embankment.
☒	Culvert Drainage	2 culverts, 48 and 36 inches in diameter under roadway south of weir. No gates or valves.
☒	Low outlet pipe –	The low outlet reservoir drain is a CMP pipe, 12 inches in diameter, located at the base, near the center of the main dam. Flow control for the outlet pipe is provided by a slide gate located at the upstream of the pipe (lake side).
☐	Portable Pumps or temporary siphon/pipes	No temporary emergency pump/siphon apparatus on site and temporary pipes/pumps would be brought in on an emergency basis.

**Add drawing to Appendix A showing where all hydraulic elements are located.

I. Project Operations

Rules and Procedures for Reservoir Operation:

How is the reservoir level controlled? No manual controls other than keeping spillway clear

How do reservoir operations change during floods? Spillway checked if increased inflow noted (rains/storm/ice melt)

Is the reservoir level manually changed throughout the year? No

When is the reservoir drawn down? None performed since built

When is the reservoir filled? Only naturally filled (rain, streams, icemelt, springs)

Record Keeping

List of records to be kept. Check all that apply:

☒ Maintenance records

☐ Monitoring records

☐ Gate operations

☐ Observations

☐ Pool levels

☐ Drawdowns

☒ Inspections

☒ Photos

Location of records – Electronic/hardcopy Documents stored with board files/records, reports submitted electronically to DSO

Facility Security:

How do you prevent intentional damage to your facility by outside parties? Private community, large signage at community entrance, outlet pipe control wheel is secured at private home, access to Dam/Spillway via private driveway at end of country road.

Describe any security monitoring equipment? none

Owner Annual Inspections:

Per WAC 173-175-510, owners are required to do an overall inspection of their dam annually and to submit a copy of the report to the Washington State Dam Safety Office.

Time of year annual inspection will be performed: Fall

An owner may use their own format, or they can use one of Ecology's Dam Owner Annual Inspection Form templates located online.

Earthen dams: https://fortress.wa.gov/ecy/publications/SummaryPages/ECY070572.html

**Add a blank inspection form to Appendix B which the owner will use to document the inspections.

Other Owner Inspections:

Describe any other routine or special circumstances inspections outside of the annual inspection. This might include post-earthquake or post-storm event inspections to conduct damage assessments:

Special circumstances of heavy rains, high water levels, significant ice melt, earthquake or post-storm as relevant to lake/spillway levels.

II. Instrumentation and Monitoring

List of Instrumentation: **(NONE INSTALLED - This section will be updated when staff gauge is installed.)**

Check which instrumentation exist and fill in the table. Add additional instrumentation as needed.

Exists	Instrumentation	Location of Instrumentation	Frequency of Monitoring	Method of Record-keeping
☐	Staff gauges to measure reservoir levels			

**Add drawing to Appendix C showing where all instrumentation is located.

IV. Maintenance

List of Items Requiring Periodic Maintenance with Frequency and Description:

Earthen Dams and Embankments

Fill in the frequency. Add elements as needed.

Element	Frequency (i.e. weekly, monthly, annually, after large storm events, after seismic events)	Maintenance Activity Description (Modify descriptions as necessary)
Vegetation control	Annually or more as needed	Remove weeds and mow native grasses as needed to allow visual surveillance of the embankment surface and abutments. Remove and/or control woody vegetation.

Element	Frequency (i.e. weekly, monthly, annually, after large storm events, after seismic events)	Maintenance Activity Description (Modify descriptions as necessary)
Control of burrowing animals	Annually or as needed	Control burrowing animal population to alleviate the problem long term. Repair animal burrows by compacting fill into the excavated areas. If burrowing is extensive, seek the advice of a professional engineer, as fill must be replaced to original grades and densities.
Maintain crest design elevation	Monitor annually	Fill any ruts or minor depressions with similar fill material to designed grade. Repair erosion. If extensive, seek the advice of a professional engineer and contact the Ecology Dam Safety Office.
Erosion control on upstream and downstream slopes	Monitor annually	Repair erosion. Reseed with native grasses or install appropriate erosion control measures such as gravel fill, etc. Fill large areas with compacted fill. If erosion is extensive, seek the advice of a professional engineer and contact the Ecology Dam Safety Office.
Outlet Pipe	Monitor annually	Keep free of obstructions and open to allow free drainage. Control vegetation at outlet pipe so area can be located and accessed for observation and inspection. Monitor seepage.

Open Water Conveyance Systems (i.e. Channels, Ditches, Weir Spillways)

Fill in the frequency. Write N/A if not applicable to this dam. Add elements as needed.

Element	Frequency (i.e. weekly, monthly, annually, after large storm events, after seismic events)	Maintenance Activity Description (Modify descriptions as necessary)
Earthen spillway channel	Monitor periodically, Annual inspection	Keep free of obstructions and vegetation to maintain channel hydraulics. Repair erosion damage by removing loose material and replacing it with compacted fill. Gravel and properly sized riprap should be added to the damaged area as appropriate to prevent future erosion. Replace or repair riprap to prevent movement or removal by flow events.
Weir structure	Cleared throughout year, Monitor regularly, Annual inspection	Keep weir structure free of obstructions. Remove debris that could interfere with flow capacity.
Culvert drainage	Cleared throughout the year	Keep free of obstructions

EMERGENCY Procedure for lake level Draw Down:

Element	Frequency (i.e. weekly, monthly, annually, after large storm events, after seismic events)	Activity Description
Reservoir Area (Lake)	AS NEEDED, for EMERGENCY draw down of lake level	Contact local company AUS, to activate 'temporary/emergency siphon agreement' with Associate Underwater Services, Inc, located at 6706 NE 175th St, unit D, Kenmore, WA 98028. Phone 425-587-0329 (Office). Request dispatch for installation of temporary siphon piping, and all materials needed. AUS to transport of materials (piping, connections, valves, priming pump/gas, trained operators) to Lake Kayak and perform setup/installation of temporary piping, siphon and initiate operation of temporary siphon piping apparatus once set up. Equipment may remain onsite for as long as needed as rental. Agreement signed with AUS in 2020. See materials and siphon specifications from AUS in table below:

SIPHON PERFORMANCE CALCULATOR

Kayak Lake WA

PIPE CHARACTERISTICS

Type:	HDPE
Size (in):	8
Inside Diameter (in):	7.500
C Factor:	145

SUCTION		DISCHARGE	
Length (ft):	75	Length (ft):	200
90°	0	90°	1
45°	1	45°	1
Reducer		Reducer	0
Check Valve	0	Check Valve	0
Gate Valve	1	Gate Valve	1
Eq. Length (ft):	109	Eq. Length (ft):	257

Total Equivalent Length (ft): 366

SITE CONDITIONS

Water Level MSL (ft):	904.2
Discharge MSL (ft):	895.0
Elevation Change (ft):	9.2
Apex MSL (ft):	907.5
Suction Submergence (ft):	5
Suction Lift (ft):	3.3

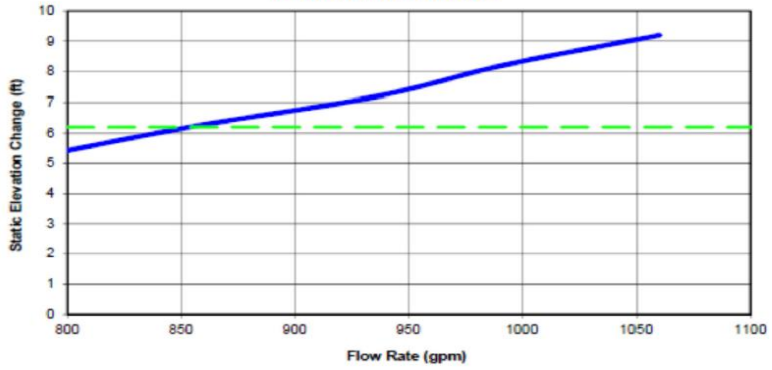
PHYSICAL PROPERTIES

Water Temperature (°F):	60
Vapor Pressure (ft):	0.590
Atmospheric Pressure (ft):	32.7
Max Available Vacuum (ft):	32.1
Max Allowable Vacuum (ft):	25.0

CALCULATED PERFORMANCE

VELOCITY	7.7	ft/s
FLOW RATE	1,060	gpm
MINIMUM SUBMERGENCE	37	in
MAX ELEVATION CHANGE	9	ft
MAX SUCTION LIFT	0.0	ft

PERFORMANCE CURVE



*Green line indicates elevation at which required minimum submergence is compromised

*Red line indicates elevation at which max lift exceeded / vacuum breakers required

FLOW RATES CALCULATED BELOW GREEN / RED LINES ARE QUESTIONABLE AND SHOULD NOT BE USED FOR SIPHON DESIGN

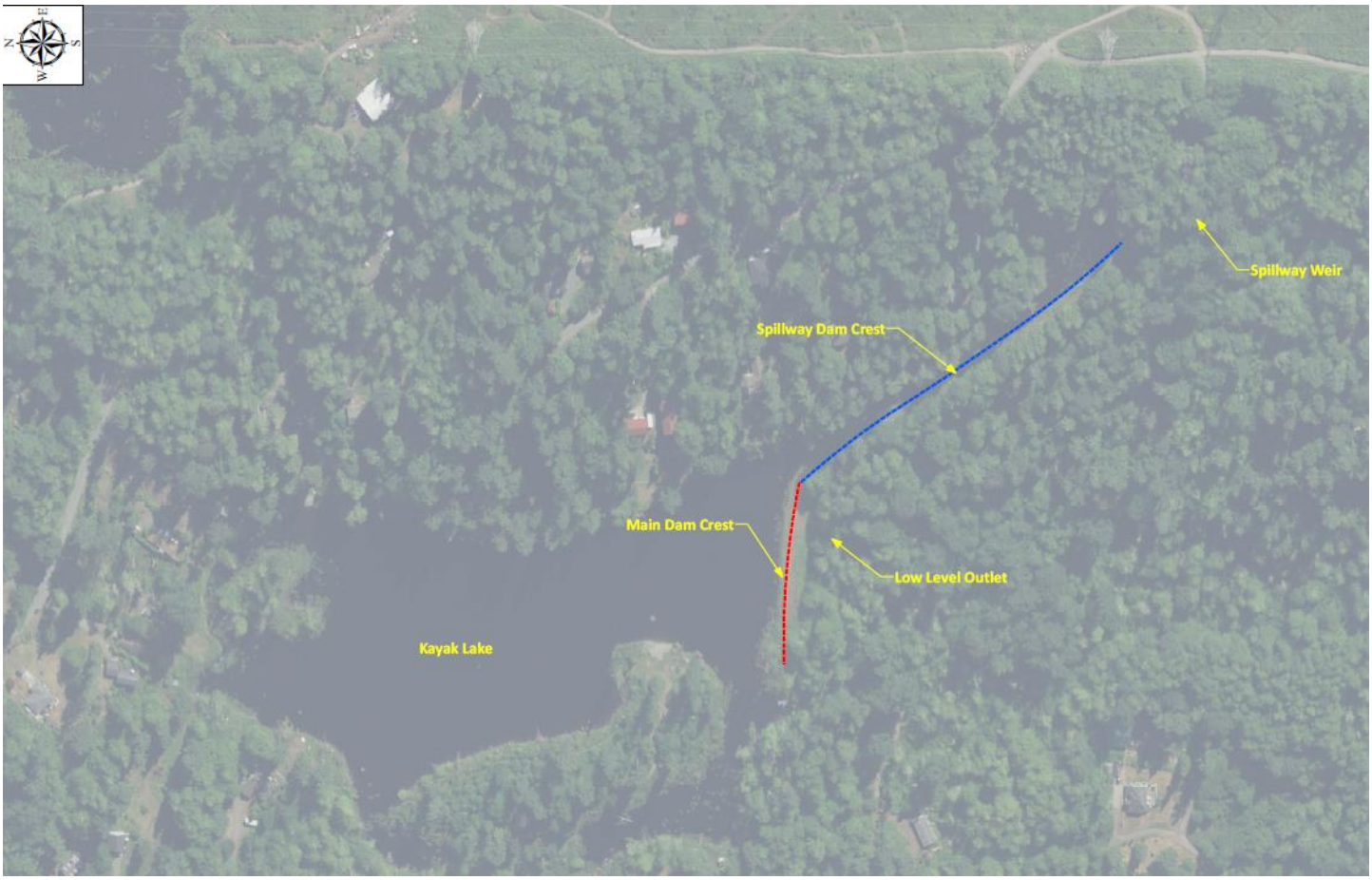
Associated Underwater Services, Inc. ● Office 425-487-0329 ● Fax 425-487-0364 ● www.ausdiving.com

Other Elements

Fill in the frequency. Write N/A if not applicable to dam. Add elements as needed.

Element	Frequency (i.e. weekly, monthly, annually, after large storm events, after seismic events)	Maintenance Activity Description
Reservoir Area (Lake)	Monitor regularly, annual inspection	Keep lake clear of debris and vegetation that could clog channel/spillway to weir area.

Appendix A
Drawing showing locations of hydraulic elements



No Appendix B (Template for the Annual Dam Owner Inspection report)

No Appendix C (no instrumentation installed at this time)