DUNGENESS OFF-CHANNEL RESERVOIR FREQUENTLY ASKED QUESTIONS

Reservoir Safety

1. Are seismic faults present at the site?

The potential for a seismic fault crossing the Reservoir site was preliminarily reviewed by seismic/faulting experts from the U.S. Geologic Survey (USGS) and PanGEO, a consultant hired by Clallam County to prepare an independent review of the project prior to the current design phase. Although the presence of a fault was postulated in a USGS report in 2007 (Nelson et. al. 2007), no explanation was provided. The PanGEO report was prepared in 2020 with the assistance and participation of scientists from the USGS. They concluded that there "is no identifiable evidence of faulting in the project area".

The Reservoir project's geotechnical engineer, Shannon & Wilson, will be completing a more detailed seismic reconnaissance of the project area and the Reservoir will be designed to address the potential seismic risk at the site. The Washington Department of Ecology's Dam Safety Office (Dam Safety Office) will require very rigorous seismic analyses of the Reservoir to demonstrate that the Reservoir is designed to withstand the maximum probable seismic event at the site.

2. What is liquefaction, and what is the risk of liquefaction at the Reservoir site?

Liquefaction is the process when a solid material behaves as a liquid. Liquefaction occurs in loose sands/gravels that become saturated and instable during seismic events. Liquefaction of soils can cause structures to fail during seismic events. The subsurface explorations performed to date by the project's geotechnical engineer have not identified any subsurface materials that are at risk of liquefaction. Additional explorations and analyses will be completed to confirm that assessment.

3. How is the Reservoir being designed to meet the highest safety standards?

Reservoir safety has been and will continue to be a primary consideration in the design, construction, and future operation of the Reservoir. State regulations require that the Reservoir be designed to meet very stringent safety requirements. Construction of the Reservoir will require a Dam Construction Permit issued by Ecology's Dam Safety Office. The Dam Safety Office was consulted during the preliminary design process to ensure that geotechnical explorations (bore holes, test pits, groundwater monitoring) and engineering analyses would meet their requirements. Additional meetings will be held during the detailed

design phase to discuss the design of the Reservoir and hydraulic features, review design analyses, and ensure that dam safety requirements are met.

4. How much of the water will be stored in the Reservoir above the existing ground surface versus below the existing ground surface?

The Dungeness Off-Channel Reservoir, as currently designed, would have a full water surface area of 41.6 acres, with a total storage capacity of 1,591 acre-feet. For context, 1 acre-foot is 325,872 gallons, or roughly equivalent to a football field 1 foot in depth. In comparison to nearby lakes, Lake Sutherland is about 8 times larger in surface area, Anderson Lake in Jefferson County has a larger surface area (70 acres) but smaller volume (1,228 acre-feet).

As shown in the preliminary design documents, the proposed full water surface of the Dungeness Off-Channel Reservoir would be approximately 12 feet above the existing ground surface at the south end of the Reservoir and approximately 27 feet above the existing ground surface at the north end of the Reservoir. When the Reservoir is full, approximately 37% (592 acre-feet) of the volume of water stored in the Reservoir would be below the existing ground surface at the north end of the Reservoir and approximately 63% (999 acre-feet) of the volume would be above the existing ground surface. These numbers are based on the preliminary design and will be revised as the design proceeds.

5. Why is the Reservoir designed as an above ground storage facility, and how were the size and shape selected?

The height, elevations, and configuration of the Reservoir shown in the preliminary design documents were selected based on consideration of key design constraints, which include the following:

- **Gravity Filling and Releases:** One of the key benefits of this site is that a reservoir created at this site can be designed to operate by gravity (without pumping). An existing Highland Irrigation District (HID) ditch, referred to as the HID H1 Lateral, flows across the site from south to north. The HID H1 Lateral will be converted to pipelines that will fill the Reservoir by gravity and convey water released by the Reservoir to the downstream irrigation system by gravity, as occurs presently. To accomplish this, the top of the Reservoir will need to be lower than the elevation of the HID Main Canal, which is located on the hillside southeast of the Reservoir. The bottom of the Reservoir will need to be higher than the elevation of the HID H1 Lateral at the north property boundary at the site, where water will be released by gravity to flow to the downstream irrigation system for use. If pumping were required to fill or release water from the Reservoir, the cost of the energy required to pump the water would represent a large long-term operating cost that would make the project much more expensive to operate. Pumping would also add a level of complication to the operation and maintenance of the Reservoir. In addition, design of the Reservoir to allow for water to be released by gravity will make it easier for Reservoir operators to draw down the Reservoir in the event of an emergency.

- **Footprint:** The Reservoir layout is constrained on the east by the River Road right-of-way, on the north by private residential properties, on the south by a Bonneville Power Administration easement with overhead transmission lines, and on the west by a steep bluff that drops off to the Dungeness River. There is also a shoreline buffer zone on the west where activities are restricted by Clallam County Code. The Reservoir has been configured to maintain an adequate buffer or space between the Reservoir and these constraints.
- **Storage Capacity:** The Reservoir footprint, depth, and elevations have been selected with the goal of creating a Reservoir that can store up to 1,591 acre-feet of water for irrigation. This volume of water storage would provide a sustainable supply of water for irrigators during the late summer and could increase flows in the Dungeness River by up to 25 cubic feet per second (cfs)—nearly half of the entire river flow measured by Ecology near the mouth of the Dungeness River at East Anderson Road in extreme water-short years such as 2015—at a critical time for fish.
- **Materials and Construction:** The Reservoir will be constructed by excavating on-site material and placing some of those materials to create an embankment around the Reservoir. The volume and type of materials excavated will be key to meeting design objectives. The ability to access and use sufficient silt and clay from within the glacial till layer that is buried below the top layer of sand, gravel, and cobbles has been a key consideration in determining Reservoir elevations and configuration.

The preliminary design evaluation looked at multiple reservoir configurations in an effort to select a reservoir configuration that would meet safety requirements while being constructable, efficient, and cost-effective as possible. The Reservoir design will continue to be refined to determine if adjustments can be made to reduce the height of the Reservoir while still achieving other design and safety goals and meeting key design constraints.

6. In the event that a large storm or a large earthquake causes a breach of the embankment, what would be the effect on the Reservoir? Would the subsequent impact on the neighboring vicinity be any different than if the Reservoir were not present?

As indicated in Ecology's Dam Safety Guidelines, reservoirs or earthen embankments that impound water have historically failed in one of the two following ways:

- **Overtopping Failure:** An overtopping failure occurs when a storm event results in inflow that exceeds the storage capacity of the Reservoir and water flows uncontrolled over the top of the embankment. This then causes the embankment to erode, and water is released from the Reservoir as erosion of embankment material increases and causes a breach in the embankment.
- **Piping Failure:** A piping failure occurs when water stored behind the embankment finds an area of loose or permeable soil to travel through or under the embankment. If a seepage path is established, water begins to pass through or under the embankment uncontrolled, material is eroded, and the embankment begins to fail. This can also occur if

material shifts during a seismic event, opening up a preferential path for water to seep through the embankment.

The Dam Safety Office requires that the Reservoir be designed to address these modes of potential failure. The Reservoir has been designed to ensure that excess water spills through the emergency spillway back to the Dungeness River to prevent the possibility of an overtopping failure. The spillway will have a capacity exceeding the flow expected in a 1 in 1,000,000-year storm event. The embankments for the Reservoir will be designed to be stable during a very large earthquake. The seismic analysis will use a 1 in 2,500-year event (a probability of occurrence of 0.04% [1/25 of 1%] in any year). That equates to a Cascadia Subduction Zone Earthquake (Magnitude 9.0) and Lake Creek Boundary Creek Fault, Sadie Creek Fault, and other shallow crustal earthquakes (up to Magnitude 7.0). The Reservoir is also being designed so that seepage through the embankment is monitored and controlled in a way that will prevent a piping failure.

To further address safety during operations, an O&M Manual for the Reservoir will be prepared and implemented. The O&M Manual will set regular inspection, monitoring, and maintenance activities, which will ensure that any seepage or other problems (such as unexpected settlement, animals burrowing in the embankment material, larger bushes or trees growing on the embankment, erosion of embankment material, or any impact of public use on the embankment) are spotted early and addressed to prevent failure of the Reservoir. The Dam Safety Office reviews inspection and maintenance reports and also performs periodic inspections to review the condition of the Reservoir.

The Dam Safety Office will also require an Emergency Action Plan be prepared and implemented. The Emergency Action Plan will include analysis of the failure mechanisms listed above and modeling of the flow through a breach in the embankment and its potential impact on downstream properties. That analysis is underway but is not yet complete. The Emergency Action Plan will also lay out very specific processes to guide the Reservoir operator through emergency situations and will include lists of people to contact, steps to take to ensure public safety, and steps to take to prevent a Reservoir failure, if one appears to be imminent.

In the very unlikely event of a storm or earthquake that equals or exceeds the design requirements, there would likely be widespread damage in the Sequim area separate from any impact caused by the Reservoir.

Reservoir Design

7. How high will the embankment be? What material will be used to build the embankment and how will it be compacted?

The Reservoir embankment, as currently designed in the Preliminary Design report, varies in height from approximately 15 feet, at the south end of the Reservoir, to approximately 30 feet above the existing ground elevation, at the north end of the Reservoir. The Reservoir will fill to a maximum water surface that is 3 feet below the top of the embankment. The full water surface will be approximately 12 feet above the existing ground surface at the south end of the Reservoir and approximately 27 feet above the existing ground surface at the north end of the Reservoir.

The embankment will be constructed of soil sourced from the excavation of the Reservoir or imported from outside sources to meet the design needs. The embankment will include zones of different materials designed to control seepage through the embankment and ensure that the embankment is stable under the full range of seismic and Reservoir operating conditions. The zones will vary from very fine, low-permeability material that will prevent seepage through the embankment, to sand that will create a buffer or filter layer between finer and coarser materials, to coarse materials that will provide a path for controlled drainage and will protect the exterior of the embankment from erosion.

8. How much water will the Reservoir store at maximum capacity and how often will the Reservoir be at maximum capacity?

The Reservoir has been designed to store up to 1,591 acre-feet of water. The Reservoir water level will be low or near empty at the end of each irrigation season (in September). Seasonal maintenance will be performed when the Reservoir is low. The Reservoir will then be filled when water is available from the Dungeness River through the winter, spring, and early summer. This will typically result in the Reservoir being full or near full sometime in June or July. During wet years, when more water is available, the Reservoir may fill earlier in the spring. During dry years, when less water is available, the Reservoir may never completely fill. The Reservoir will be drawn down as water is released for irrigation during the late summer (August and September). Then the cycle of Reservoir filling and releases will repeat.

9. Would use of a pump system allow water to be stored at a lower elevation?

If the Reservoir were to rely on pumping to release water from the Reservoir to the downstream irrigation system, the Reservoir could be constructed at a lower elevation. However, several Reservoir concepts have been studied in the Dungeness River over the past 30 years that would have relied on pumping to deliver water to storage or to release water from storage for irrigation. None of these ideas progressed to implementation, primarily because of the cost and complexity associated with pumping. Pumping at a flow rate of 25 cfs would require a large supply of power, which would result in much higher annual operating

costs. The long-term operating costs would increase with the cost of power. In addition, the cost of pumping facilities would increase the overall cost of implementing the project. Pumps designed to deliver 25 cfs would be large, expensive pumps. Pumping systems are also more complicated and expensive to operate and maintain than gravity systems. For safety reasons, it is typically better to release water by gravity from a reservoir. Lowering the Reservoir during an emergency will be much easier if water can be released by gravity, without pumping.

10. Would the Reservoir be designed to accommodate future storms that could occur with climate change?

The Reservoir is being designed to accommodate a rainstorm, estimated using meteorological and hydrologic data and modeling, with a probability of occurrence of once every 1,000,000 years. That equals a storm that would deliver approximately 14 inches of rain in a 24-hour period, which greatly exceeds the largest recorded storm of record at Sequim, which had 3 inches of rain in a 24-hour period. (On average the Sequim area receives 16 inches of precipitation per year.) The 1 in 1,000,000-year storm represents meteorological estimates of the "Probable Maximum Precipitation" that can occur at the Reservoir site.

The Reservoir is being designed with two features that will allow the Reservoir to accommodate the design storm and even larger storms, should they occur. The first is a freeboard of 3 feet, which means the normal water level in the Reservoir will be kept 3 feet below the top of the embankments as a factor of safety to prevent overtopping. The second is the spillway and pipe from the Reservoir, which will convey excess water directly to the Dungeness River. The spillway and pipe are being designed with more than enough capacity to convey a design flow of 50 cfs, which is the inflow from the Highland Irrigation District pipeline entering the reservoir plus 14 inches of rain falling on the Reservoir.

With climate change, predictions are that precipitation will increase during winter, and storms will become more intense. Information from the University of Washington's Climate Impacts Group was reviewed, and their predictions are for a 22% increase in rain intensity for a 24-hour storm by the 2080s. A 22% increase in 24-hour precipitation can be accommodated by the Reservoir.

Climate change will impact residents living alongside the Dungeness River. The Climate Impacts Group predict a 55% increase in 100-year flood volumes in the 2080s. The current 100-year flood in the Dungeness River is about 10,000 cfs and would increase to about 15,000 cfs under the Climate Impacts Group predictions. The maximum the Reservoir would discharge to the Dungeness River is about 50 cfs during a 1 in 1,000,000-year storm event. The Reservoir would not contribute to flooding along the Dungeness River.

11. Are there other design features that will facilitate safe and efficient operation of the Reservoir?

Design features that will contribute to the safe and efficient operation of the Reservoir include the following:

- Automated control of gates and valves that will control the flow of water to the Reservoir for filling and release water from the Reservoir for irrigation.
- Inclusion of an emergency spillway to meet Dam Safety requirements that will return excess water to the Dungeness River while maintaining adequate freeboard in the Reservoir. The emergency spillway will only convey flow from the Reservoir if a storm event occurs when the Reservoir is full.
- Updated diversion and conveyance infrastructure that will allow the Reservoir operator to fill the Reservoir when water is available and release water when it is needed for irrigation.
- Design of the Reservoir with materials that will control seepage through the embankment and provide stability for the range of seismic and operating conditions that could possibly occur during the life of the Reservoir.
- Geotechnical monitoring will be performed during operations which could include constructing wells to monitor groundwater and seepage conditions and installation of multiple survey monuments on embankments to monitor settlement.

Aesthetic

12. What will the view of the Reservoir look like when it's complete?

The parcel of land the Reservoir would be located on is 319 acres. The Reservoir and its embankments will cover about 88 acres. The Reservoir embankment will be visible from River Road and from areas adjacent to the Reservoir. However, the exterior of the slope will be seeded with grasses, and the area around the embankment will be replanted with trees. After a few years of operation, it is anticipated that the embankment will be mostly hidden behind trees and vegetation.

The Reservoir site is planned to be developed as a county park after the Reservoir is constructed. It is anticipated that access to the Reservoir itself will be limited for public safety reasons, but the area around the Reservoir will be accessible for recreation. The County Parks, Fair & Facilities Department will be planning and implementing those improvements through a separate public process.

Wildlife will continue to use the new county park. The Reservoir will be designed with features that discourage access by wildlife and waterfowl to prevent nutrients and bacteria from causing water quality problems in the water that will be released for irrigation. No other design features are being included to restrict wildlife access to the site.

Water Quality

13. What will the water quality be like in water released from the Reservoir? Will the water quality be adequate for use in organic farming? What are the measures to protect against water quality concerns resulting from chemicals and bacteria?

Preliminary analysis indicates that water released from the Reservoir will have good water quality. Simple measures – such as fencing and vegetation management – can be implemented to discourage excessive use of the Reservoir by waterfowl and reduce nutrient loading which affects water quality. The consultant team will be evaluating water quality in more detail as part of the ongoing design effort and will be looking specifically at coliform bacteria as a constituent of concern. The analysis will be completed with the goal of designing and constructing the Reservoir to maintain water quality that is acceptable for irrigation of both organic and nonorganic farms. Consideration will be given to the potential for including aeration facilities or other features needed to maintain water quality. Water quality will also be monitored as part of the long-term operation of the Reservoir.

14. Will the Reservoir attract mosquitos? What is the abatement plan?

Measures to minimize mosquitos will be evaluated along with water quality as part of the ongoing design effort.

Reservoir Operations

15. What are the O&M requirements for the Reservoir and who will make the management decisions regarding the Reservoir operations?

Operations & Maintenance (O&M) requirements for the Reservoir will be outlined in a detailed O&M Plan that will be developed prior to final design with review and consultation of project partners. The O&M Plan will be submitted for review by Ecology's Dam Safety Office prior to issuing a Dam Construction Permit. Requirements will include regular inspection of the Reservoir. Mechanical and electrical equipment, such as automated gates and sensors, will require frequent inspection and operation. The Reservoir embankment and other static features will also require regular, but less frequent, inspection. The design will allow for the Reservoir operator to make remote adjustments to gates, if needed, that will control the flow of water to the Reservoir for filling or release of water from the Reservoir for irrigation. More detailed inspections will be made following large storm events or seismic events. Detailed inspections and maintenance will also take place seasonally in the early fall after the Reservoir has been drawn down and before filling takes place. Safety inspections are reported to the Dam Safety Office, who review the inspection reports and perform their own periodic inspections.

The O&M Plan will designate roles and responsibilities for various O&M activities that will be defined by Clallam County and its project partners prior to finalizing the Plan. The O&M Plan will include tables summarizing the required O&M activities and will indicate the frequency and schedule for performing those activities. The O&M Plan will also include contact information for those that are responsible. O&M roles, responsibilities, and the responsible parties will be defined by Clallam County and its project partners in a memorandum of agreement that the County and Washington Water Trust are developing.

Cost

16. What is the anticipated cost to construct the project? What are the O&M costs?

The preliminary opinion of probable costs (prepared in February 2022) for the Reservoir and related facilities was as follows:

- **Total Construction Cost:** $39 million
- **Annual O&M Cost:** $40,000 to $50,000

The total construction cost includes the Reservoir; the inlet, outlet, bypass, and spillway pipelines and appurtenances; upgrade of the HID Main Canal upstream of the Reservoir by replacing the canal with a closed pipeline; inclusion of a settling basin; and modifications to the HID intake and screening facilities. The total construction cost also includes a contingency and an allowance for construction administration costs.

The estimated annual O&M Cost assumes salary and benefits for one-fourth full-time equivalent (regular O&M would not likely be a full-time job) with an allowance for administrative, transportation, supplies, maintenance, repairs, and contracted labor costs. The O&M costs are expected to vary from year to year depending on maintenance needs.

It should be noted that the cost of materials and labor has been extremely volatile the past 3 to 4 years due to inflation and supply chain issues. These costs were developed early in 2022 and will be updated and refined as the project moves forward to reflect current materials costs, labor costs, and adjustments to the design.

17. Is the Reservoir cost-effective compared to other similar projects?

Based on the consultant team's experience looking at other water storage opportunities in the Dungeness Watershed and throughout Washington, the construction cost per acre-foot of storage for the project is comparable to similar projects. For example, a 1,600-acre-foot reservoir was constructed for the Roza Irrigation District in eastern Washington in 2017 at a cost of $31 million.

Adjusted for inflation, the Roza project would cost $38 million in 2023, which is in line with the project costs described in FAQ 16. Construction costs have increased dramatically over the

past few years, which has resulted in an increase in the overall cost and the cost per acre-foot for the project.

This project will require large volumes of material to be excavated, stockpiled, processed, and placed to create the Reservoir within an area that is relatively flat. The earthwork and lining costs are the largest components of the overall cost. The storage project at this site was conceived from a study completed in 2014 (Pacific Groundwater Group and Anchor QEA 2014) that looked at several other water storage opportunities throughout the Dungeness River Watershed. Other potential storage projects had been identified and evaluated through prior studies, going back more than 20 years. None of the other storage projects that have been identified or studied compare favorably in size, function, or cost per acre-foot of storage to the current project.

In addition, the County has completed a benefit-cost analysis for the project to support funding applications. The benefit-cost analysis resulted in a benefit-cost ratio of 1.9, indicating that the value of project benefits is nearly double the anticipated project cost.

Schedule

18. What is the schedule for construction of the Reservoir?

If funding and permits for Reservoir construction can be secured, construction of the Reservoir will begin in 2024. It is anticipated that construction of the Reservoir will likely take approximately 2 years. The following summarizes the anticipated schedule, as currently envisioned by Clallam County:

- **Land Acquisition:** Through the first quarter of 2024
- **Design and Permitting**: Through the first quarter of 2024
- **Construction Bidding**: Second quarter of 2024
- **Construction**: Second quarter of 2024 through second quarter of 2026
- **First Reservoir Filling**: Fall 2026 through early summer 2027
- **First Releases for Irrigation**: 2027 irrigation season

This schedule will be adjusted as the design and permitting effort progresses and additional funding becomes available for construction of the project.

Permitting Requirements

19. What permits are required for the project?

A detailed summary of anticipated permitting requirements for the project was provided as Table 6-1 in the Preliminary Basis of Design Report for the project (available at:

https://www.clallamcountywa.gov/DocumentCenter/View/10257/Dungeness-Reservoir-Draft-Preliminary-Design-Report-PDF). The project will require permits that demonstrate compliance with the federal Clean Water Act, Endangered Species Act, and National Historic Preservation Act. These will require review and approvals from the U.S. Army Corps of Engineers, National Marine Fisheries Service, U.S. Fish and Wildlife Service, the Washington State Department of Ecology, and the Washington State Department of Archaeology and Historic Preservation. Hydraulic permit approval will be required for work below the ordinary high-water mark on the Dungeness River from the Washington Department of Fish and Wildlife. Clallam County will take the lead on confirming that the project is compliant with the Washington State Environmental Policy Act, Shoreline Management Act, Critical Areas Approval, Floodplain Consistency Approval, Dungeness Water Rule (WAC 173-518) and construction permits (Building and Clearing and Grading Permits).

General Terminology

20. How does the Dungeness Reservoir differ from a classic dam?

Many of the large water storage reservoirs that the general public is most familiar with were constructed by placing a dam across a river or other large waterway. We refer to these as in-channel reservoirs. The large reservoirs on the Columbia River, the Snake River, or the Colorado River would be examples of in-channel reservoirs. These reservoirs capture runoff from large upstream watersheds and are subject to the natural variability in flow that results from floods, droughts, and large storm events that occur in those watersheds. They are typically much larger in scope, volume, cost, and impact on the river, fish and wildlife, and surrounding area than the proposed Dungeness Off-Channel Reservoir Project.

The Dungeness Reservoir will be an off-channel reservoir, meaning that it will not be created by building a dam across a river or other natural watercourse. It will be created by excavating, stockpiling, processing, and placing earthen materials to create a place where water can be stored on the proposed Reservoir site. It will be more similar to stormwater detention ponds, irrigation ponds, or drinking water storage facilities where water is conveyed to the facility through a manufactured pipe or channel. These types of facilities are common and are found throughout cities and neighborhoods in Washington. For example, the City of Seattle stores large volumes of drinking water in reservoirs that are surrounded by earthen embankments on hilltops in the densely populated neighborhoods of Maple Leaf, Lake Forest Park, Bitter Lake, Beacon Hill, and at other locations throughout the city. The City of Port Angeles has a small drinking water reservoir at Peabody Heights. For the Dungeness Off-Channel Reservoir Project, water will be conveyed from the Dungeness River to the Reservoir through the HID ditch system. The project team is currently evaluating modifications to HID facilities that will allow diversion and safe delivery of specific amounts of water, when available, to the Reservoir, as well as provide automated controls to close the diversion when the Reservoir is

full. The Reservoir will not capture uncontrolled runoff from an upslope watershed and will not be subject to large inflows during peak storm events.

Public Involvement

21. How is the public being consulted, and how will the County notify the public of the status of the project?

Public engagement has been important to the development of this project. Since the project idea was first envisioned in the early 2010s, various project partners have made presentations at a range of public events and before organizations, including the Clallam County Fair, League of Women Voters, Jamestown S'Klallam Tribe, Clallam County Board of Commissioners, City of Sequim, multiple meetings of the Dungeness River Management Team, Soroptimist International chapter, and Sunrise Realtors.

As the project has further developed and initial progress had been made, including completion of preliminary (30% complete) design documents, it was important to bring these concepts to the general public. This intention culminated in an Open House on December 6, 2022, at the Dungeness River Center in Sequim, which was advertised in print, radio, and social media, as well as direct mail to residents within 1 mile downgradient of the Reservoir. At the Open House, attended by more than 200 people, members of the public heard from the Reservoir Design Team and project partners, provided written public comments, and engaged with regional experts on different project elements and benefits. Public comments have and will continue to be received online at: https://www.cognitoforms.com/ClallamCounty1/EmailUsAboutDungenessOffChannelReservoir, with project updates available at https://www.clallamcountywa.gov/188/Dungeness-Off-Channel-Reservoir. Existing project comments have informed the development of this document, with ideas and comments considered as we review the existing design. It is anticipated that project partners will continue to reach out to stakeholders in various venues to provide material project updates, address questions, and incorporate design suggestions.

Water Supply

22. How much water will the Reservoir supply and who will have access to the water?

The Reservoir will hold a maximum of nearly 1,591 acre-feet at its maximum capacity during the spring and early summer.

Three irrigation districts located downstream of the Reservoir will have access to water, including Highland Irrigation District, Sequim Prairie Tri-Irrigation Association, and Dungeness Irrigation District. Water will be supplied by gravity through irrigation pipelines and canals

upon release from the Reservoir, with total supply matching the existing demand of 15 to 25 cfs during the last 4 to 6 weeks of the irrigation season. Stored water will add reliability to the irrigation supply system east of the Dungeness River because water can be diverted to storage over a longer period of time when water is available, then released from the Reservoir when flows in the Dungeness River are low. The irrigation water released from the Reservoir during this time will relieve the river of those diversions in late season, resulting in substantial river flow left instream.

23. How will water rights be impacted?

The proposed use of water for the reservoir project is a beneficial use, according to the Washington Administrative Code (WAC 173-500-050). Water proposed for use for the Reservoir will be subject to the permitting process authorized by the Washington State Department of Ecology. Chapter 90.03 of the Revised Code of Washington (90.03 RCW), also known as the Washington State Water Code, allows appropriation of waters of the state to new uses, but will not allow diversion of water without a permit. Pursuant to RCW 90.03.290, Ecology will issue a water right permit if water is available for the proposed use and such use will not impair or harm other water users or the public interest.

24. How will the Reservoir help streamflows and fish?

The Dungeness River, like many rivers throughout the western United States, experiences low stream flows in later summer due to the natural hydrologic cycle and out of stream water uses which usually peak when river flow is lowest. The late summer low-flow conditions contribute to fish passage problems, reduced habitat, and increased river temperatures. Numerous salmon recovery and watershed plans cite low flow as a critical limiting factor for salmon recovery in the Dungeness.

The Puget Sound Salmon Recovery Plan states that, "Low water can isolate eggs and juveniles in pools whose temperatures increase while the dissolved oxygen content decreases, and also causes them to be more susceptible to predation. Low water makes it difficult or impossible for out-migrating juveniles and in-migrating spawners to reach their destinations." (Puget Sound salmon recovery plan, Corporate Authors(s) : Shared Strategy for Puget Sound (Organization), Shared Strategy Development Committee,; United States, National Marine Fisheries Service,; Published Date : 2007 URL : https://repository.library.noaa.gov/view/noaa/16005) Because of the harm to salmon that low flows cause, one of the salmon habitat recovery recommendations in the Dungeness Watershed Plan is to, "Retain flows in all WRIA 18 streams and rivers to protect instream values to the extent possible." (Elwha-Dungeness Planning Unit. May 2005. Elwha-Dungeness Watershed Plan, Water Resource Inventory Area 18 (WRIA 18) and Sequim Bay in West WRIA 17. Published by Clallam County. Volume 1: Chapters 1-3 and 15 appendices; Volume 2: Appendix 3-E. URL: https://www.clallamcountywa.gov/812/Elwha-Dungeness-Watershed-Plan)

Dungeness River restoration partners have made important efforts to restore late summer streamflows, including piping more than two-thirds of the irrigation delivery system (more than 75 miles of ditches and canals), effectively reducing the amount of streamflow diverted for irrigation by more than 31 cfs. Despite these gains in irrigation efficiency, summer low flows dropped below the 105 cfs target flow between 2014 and 2022, which is critical for salmon. Further, climate change will continue to have significant impacts on streamflow, with low flows anticipated to decrease by as much as 35% in the Dungeness by the 2080s (see the "Climate Change in the Dungeness River" reference guide, available at: https://www.floodplainsbydesign.org/wp-content/uploads/2018/09/FbD_Dungeness-climatechange_web.pdf). Improving streamflows in the Dungeness River via implementation of the Reservoir project is critical effort to build climate change resilience, reinforce habitat restoration gains, and address the risks to salmon survival that low flows amplify: fish passage, habitat access, and high stream temperatures.

25. How will this help agriculture?

Farming is integral to the economy and character of the Dungeness Valley which has a long history of dairy, beef cattle, row crops, and most recently lavender in an area that experiences 16 inches of rainfall each year due to the rain shadow of the Olympic Mountains. For more than a century, farmers have irrigated their land with Dungeness River water, relying on robust snowpack to maintain the water supply through late summer, but that supply is increasingly uncertain due to impacts from climate change, which will shift the precipitation from snowfall to more rainfall and earlier in the season. The proposed Reservoir will help adapt to these changing water supply conditions to provide improved agricultural water supply reliability during the late irrigation season keeping agricultural land in production while keeping water instream for endangered salmon and steelhead.

26. How will the Reservoir help aquifer recharge?

Aquifer recharge is a water management tool to infiltrate surface water into specific groundwater locations. Recharged water can be used to augment groundwater, offset other uses, or support surface water restoration. The infiltration, depending on the geology of the site, will cool the water and change the timing of the water reaching a surface waterbody. The Dungeness Water Exchange operates a Managed Aquifer Recharge program consisting of six aquifer recharge sites operated by the irrigation districts and companies and is conveyed through existing irrigation infrastructure. The Dungeness Water Exchange is a program required by WAC 173-518 and administered by Washington Water Trust, which supplies mitigation credits for new domestic water users in the Dungeness River and implements aquifer recharge projects to restore stream flows in the Dungeness River.

Water for aquifer recharge sites is supplied by water rights purchased from the Dungeness River irrigators. These water rights allow aquifer recharge sites to be used for both mitigation and restoration of streams. The Reservoir will provide a reliable source of water to allow for additional flexibility in timing at these and future Managed Aquifer Recharge sites. Managed

Aquifer Recharge will also be used in a complementary project by the City of Sequim to manage storm events, which currently result in significant overland flow volumes that can inundate roads and city infrastructure. The City's approach allows the use of stormwater to recharge the aquifer while reducing storm event damage to homes.

27. Will the Reservoir make our community more climate adaptable/resilient?

Yes, the Reservoir is designed to help our community be resilient in the face of climate change. Climate change is already impacting our community and the effects are forecasted to worsen over the next 50 years. The University of Washington's Climate Impacts Group projects that the Dungeness area will transition to a rain-dominant system (where now it is snow and mixed rain), have a snowpack reduced by almost half by the 2040s, have more frequent heavy rain events, and result in low flows being as much as 35% lower in the late season. Drought in the past 4 of 8 years provides a window into potential future conditions, including the plummeting of Dungeness River flows to 56 cfs in August 2015 (at the lower Ecology stream gage), far below the minimum target flow (105 cfs) and insufficient to support Endangered Species Act-listed salmon and steelhead. Projected stream flow and temperature changes mean that additional actions are needed to secure abundant, cool water for salmon, steelhead, and trout survival in the Dungeness River. Increasingly frequent low-flow conditions also lower water supply reliability for the local agricultural economy. The Reservoir will increase water supply resilience in the face of these changing conditions, particularly as our natural reservoir snowpack disappears.

Recreation

28. What park amenities will be available to the public?

Once the land is acquired, the Clallam County Parks, Fair & Facilities will spearhead the park formation process of the Dungeness River Park and will work with the Clallam County Parks and Recreation Advisory Board to develop a park plan for the recreation activities adjoining the Reservoir. There will be a public process for residents to provide input to the Parks and Recreation Advisory Board on what recreational activities the public would like in the lands adjacent to the Reservoir.

Taxes and Insurance

29. How will the Dungeness Reservoir impact my taxes? Property value?

Property value is dependent on a variety of factors. The aspect of the Reservoir project to impact property values is likely to be the presence of a new public park. Research has shown that proximity to parks and public open space increases property value (Crompton and

Nicholls, 2020). Additional information on how the County Assessor determines property value is included below.

In accordance with state law, assessors are mandated to evaluate property at 100 percent of its true and fair market value, based on the property's highest and best use. The fair market value or true value of a property is determined by the amount a willing and unobligated buyer is prepared to pay a willing and unobligated seller.

In the event of a significant change to a property or its surrounding areas, the effects on the value will eventually become apparent in the local sales. If the market experiences an increase or decrease in sales prices, the assessors' office will address these changes in due course, once sufficient documented information is available. This process can take years to come to fruition if changes in market occur.

Should there be a change to the appraised value of your property, the landowner will be notified via a change of value notice which will provide a comparison between the old and new appraised values of both land and improvements. By analyzing the two values, you can determine whether your appraised property value has increased or decreased.

Valuation notices are not tax bills. An increase in value does not necessarily mean that next year's property taxes will increase at a proportionate rate.

Additional Context

Reservoir Design and Key Safety Features:

Ecology's Dam Safety Office will issue a Dam Construction Permit when the design team has provided documentation that demonstrates that the Reservoir will meet current Dam Safety Guidelines. The documentation required includes detailed design drawings, technical specifications, engineering reports, a detailed Operations and Maintenance (O&M) Plan, and an Emergency Action Plan. Ecology's Dam Safety Guidelines and requirements ensure design, construction and operation of the Reservoir meet very stringent safety standards. Based on consultation with Dam Safety Office and review of their Dam Safety Guidelines, it is anticipated that the following requirements will apply to the design of the Dungeness Off-Channel Reservoir:

- An emergency spillway will be designed to have a minimum capacity that will accommodate a 1 in 1,000,000 probability (Design Step 8) storm event. The spillway may be used during the rare occasion when the Reservoir is full (typically in spring and early summer), and water continues to flow to the reservoir through the inlet pipeline or a significant storm event occurs, adding water to the full reservoir. The design storm for the spillway equates to approximately 14 inches of rain within 24 hours. In comparison, the highest 1-day rainfall total recorded in Sequim since 1931 is 3 inches (on November 3, 1955); on average, the Sequim area receives 16 inches of precipitation per year. With climate change, we acknowledge that precipitation will increase during winter, and

storms are predicted to become more intense. However, the Reservoir and spillway will have the capacity to accommodate storms even greater than the 14-inch rainfall storm.

- The embankments for the Reservoir will be designed to be stable during a very large earthquake. The seismic analysis will use a 2,500-year return period event (a probability of occurrence of 0.04% [1/25 of 1%] in any year). That equates to a Cascadia Subduction Zone Earthquake (Magnitude 9.0) and Lake Creek Boundary Creek Fault, Sadie Creek Fault, and other shallow crustal earthquakes (up to Magnitude 7.0).

A Final Design Report that provides all the engineering analyses will be prepared for review and approval by the Dam Safety Office. Analysis will be required to demonstrate that the Reservoir embankment can withstand the extremely unlikely storm and seismic events outlined in this document without causing harm to downstream properties and people. To meet these requirements, the preliminary Reservoir design has identified some key features that will ensure the Reservoir is safe, including the following:

- **Controlled Reservoir Inflows and Outflows:** The filling of and releases from the Reservoir will be controlled by gates. Shutoff gates will be included at two key locations: at the diversion from the Dungeness River and at a flow control structure that will control flow from the HID Canal to the Reservoir inlet pipeline. The gates that control flow to the Reservoir will be designed to automatically close when the Reservoir is full. Sensors in the Reservoir will continuously monitor Reservoir water levels and will send a signal for the control gates to close when the Reservoir is full. The capacity of the inlet pipeline will also be limited to 25 cfs. In addition, the Reservoir will be designed with an embankment around the entire perimeter of the Reservoir so that runoff from upslope areas cannot flow into the Reservoir. Unlike a Reservoir that is constructed on a river or stream channel, there will be no natural, uncontrolled inflow to this proposed off-channel Reservoir, except from precipitation directly over the Reservoir.
- **Spilling of Excess Water:** In the event that the Reservoir is completely full, and water enters the Reservoir due to precipitation over the Reservoir or an unexpected failure of a gate to close, excess water would be discharged via an emergency spillway directly to the Dungeness River. The spillway will be conservatively sized to ensure the design storm event (14 inches over 24 hours) plus up to an additional 25 cfs of inflow from the Highland Irrigation District pipeline can be discharged while maintaining adequate freeboard in the Reservoir to prevent the water stored in the Reservoir from overtopping the embankment, which is one of the key causes of Reservoir failures.
- **Reservoir Operations:** The Reservoir is designed and will typically operate so that it is only full for a couple of months during the late spring and early summer, when an extreme storm event is less likely to occur. The Reservoir will generally be drawn down at the end of the irrigation season, in September, and will fill when water is available in the Dungeness River, from October through the late spring or early summer.
- **Seepage Control:** The Reservoir will be constructed with a low-permeability layer to control seepage through the bottom of the Reservoir and the Reservoir embankment. Excessive seepage through an earthen embankment can be another cause of Reservoir

failure. Low-permeability material will be used to form the core of the embankment. The embankment will also be designed with toe drains and other features to control seepage. Seepage will be monitored through piezometers in the embankment and through visual inspections of water emanating from drains.

- **Seismic Stability:** The Reservoir design will be required to evaluate Maximum Credible Earthquake ground motions from different sources, including the following:
    - Cascadia Subduction Zone (Magnitude 9.0)
    - Lake Creek Boundary Creek Fault, Sadie Creek Fault, and other shallow crustal sources (up to Magnitude 7.0)

  The Reservoir will be designed to minimize displacement of the Reservoir embankment during these extreme and unlikely seismic events.