

Final Supplemental Environmental Assessment

Howard Hanson Dam
Right Abutment Investigation, Reservoir Refill,
Reservoir Drawdown, and Interim Repair

Green River, King County, Washington

April 2010



**US Army Corps
of Engineers®**
Seattle District

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Responsible Agency: The responsible agency for this work is the U.S. Army Corps of Engineers, Seattle District (Corps).

Summary: During a rain storm in January 2009, water was stored at Howard Hanson Dam to elevation 1189 ft to prevent flooding downstream. This was a record flood storage height for the dam. During this time, two small depressions formed on the upstream face of the right abutment of the dam. Turbid water was observed from one of the drains in the right abutment drainage tunnel. These facts create concern that a flow path through the right abutment could potentially be developing that could ultimately lead to dam failure. Dam failure is not considered an imminent threat at this time. In spring 2009, the annual reservoir refill and drawdown strategy was modified to ensure that these actions could be conducted in a safe manner and to evaluate the integrity of the right abutment. In summer 2009, an interim repair of the right abutment was constructed to decrease seepage and make improvements to the drainage tunnel. This consisted of replacing one vertical drain and installing thirteen new horizontal drains within the drainage tunnel and constructing a grout curtain along approximately 475 ft of the right abutment. Beginning in 2010, and continuing for up to a period of five years, the Corps proposes to modify the typical reservoir refill and drawdown strategy used since 2007 defined by the Additional Water Storage Project. The 2010-2014 proposed plan will deviate slightly from the 2009 plan which was also modified from the typical protocol. The 2010-2014 reservoir refill plan includes water storage to 1167 ft with potential for additional water storage for a one week period up to a maximum elevation of 1177 ft. The 2010-2014 reservoir drawdown plan is presumed to be a normal drawdown. However, the actual drawdown plan will be determined in real time based on monitoring data. The interim repair initiated in 2009 is proposed to be extended in 2010. This includes extending the existing grout curtain to the northeast by approximately 650 ft to a depth of 15 ft into bedrock, deepening a 350 ft segment of the 2009 grout curtain so that it extends into bedrock, installing a 60-70 foot long sheet pile wall at the south end of the 2009 grout curtain footprint, and replacing existing drainage wells. The interim repair work is currently planned for 2010, but may be delayed depending on funding and/or authority considerations. Because this series of actions is similar to those conducted in 2009, this document is considered a Supplement to the June 2009 Final Environmental Assessment that evaluated the 2009 actions.

This Supplemental Environmental Assessment is intended to meet the Corps' requirements under the National Environmental Policy Act, consistent with Corps implementing regulations (ER 200-2-2).

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This document is available online under the project name “Howard Hanson Dam Right Abutment Investigation, Reservoir Refill, Reservoir Drawdown, and Interim Repair” at: http://www.nws.usace.army.mil/ers/doc_table.cfm. The June 2009 Final EA can also be found on the website under Howard Hanson Dam Right Abutment.

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1. INTRODUCTION

1.1. Background

The U.S. Army Corps of Engineers (Corps) operates and maintains Howard Hanson Dam (HHD) which is located on the Green River 35 miles southeast of Seattle and 25 miles east of Tacoma, Washington. HHD is operated during flood events to manage flood risk in the lower Green River valley including the cities of Kent, Auburn, Renton, and Tukwila.

During a storm event on 9 January 2009, HHD reached a record high pool elevation of 1188.8 feet¹. This is approximately six feet higher than the previous high pool record that occurred in February 1996. During and immediately after the record high flood pool, sediment was observed in the water from one of the drainage tunnel wells in the right abutment of the dam, and a depression formed on the upstream face of the right abutment of the dam at approximately elevation 1191 ft. A second smaller depression was discovered at approximately elevation 1174 ft on 2 February 2009.

The sediment movement combined with depression formation is an indication of potential piping. Piping is the movement of soil particles by percolating water leading to the development of a channel, and has been identified as a credible failure mode for the right abutment of the dam. Dam failure is not considered an imminent threat at this time. However, in response to these events, the Corps modified the annual reservoir refill and drawdown strategy in 2009, installed several drainage wells, and constructed a grout curtain along approximately 475 ft of the right abutment of the dam. The Corps completed an Environmental Assessment (EA) and signed a Finding of No Significant Impact (FONSI) in June 2009 for the 2009 activities. The Corps plans a similar set of activities for the 2010 to 2014 period. These activities are further detailed below. Because the 2010 to 2014 activities are similar to those conducted in 2009, this document is considered a Supplement to the June 2009 Final EA that evaluated the 2009 actions. Background information including detail on HHD operations and existing authorities can be found in the June 2009 Final EA titled “Howard Hanson Dam Right Abutment Investigation, Reservoir Refill, Reservoir Drawdown, and Interim Repair. This document can be found at: http://www.nws.usace.army.mil/ers/doc_table.cfm under Howard Hanson Dam Right Abutment.

1.2. Purpose and need

The purpose of the modified reservoir refill and drawdown strategy in 2010-2014 is to 1) ensure a safe reservoir refill and drawdown, 2) evaluate the integrity of the right abutment, including the effectiveness of the 2009 interim repair activities, and 3) control seepage through the right abutment of the dam. The actions will provide data to determine acceptable flood, conservation, and municipal and industrial (M&I) water storage elevations so that HHD can be effectively operated to meet its authorized purposes. Based on the historical operation of the reservoir (i.e., assuming no pool restrictions for flood control operations), the annual probability of a flood pool

¹ All elevations in this document are referenced to mean sea level.

reaching elevation 1167 ft is 7%. Similarly, the annual probability of a flood pool reaching elevation 1177 ft is about 4%. Capturing additional storage during a spring refill therefore provides an important information collection opportunity to help manage and operate HHD during potential flood conditions. Furthermore, the data from the project will be used to determine the need for and design information for a permanent repair to the right abutment. The need for a modified reservoir refill and drawdown strategy, as described here, is expected to continue for five years or until the Corps is confident that both the authorized conservation and flood control pools can be safely and securely stored behind the right abutment and dam.

1.3. Project authority

The authorization for the dam, initially named the Eagle Gorge Dam, came from the Rivers and Harbors Act of 1950 (Public Law 516, 81st Congress, 2nd Session, 17 May 1950). It was constructed by the Corps and completed in 1962. The original authorized and implemented project purposes were flood risk reduction and summer low flow augmentation. The work described here is part of the operation and maintenance of the dam.

2. ALTERNATIVES

The recommended plan identified in the June 2009 Final EA included three categories of actions, 1) reservoir refill, 2) reservoir drawdown, and 3) interim repair. See the June 2009 EA for additional description. The reservoir refill and drawdown are closely related to one another. The interim repair is independent of the refill and drawdown actions. Each of the three categories of actions, their range of alternatives, and effects of the alternatives were addressed and described in the June 2009 Final EA. The selected alternatives identified in the Final EA were for 2009 and were implemented in that year. Since the concerns with the dam have not yet been fully resolved, a modified reservoir refill and drawdown plan is necessary over a period expected to extend a number of years, until the dam concerns are permanently addressed. The discussion below evaluates reservoir refill and drawdown alternatives for the 2010-2014 time period. In the case of the interim repair alternative, the 2009 Final EA described a defined project over a defined geographic area. The interim repair addressed in this document is a continuation of the work described in 2009.

2.1. Reservoir refill

Five refill alternatives were detailed in the June 2009 Final EA. They included:

1. No action – refill to 1167 ft
2. No spring refill
3. Refill to 1190 ft to investigate dam with periodic refill stops
4. Refill to 1167 ft with periodic refill stops
5. Refill to 1167 ft, periodic refill stops, with potential short peak above 1167 ft

Alternative 5 was selected as the preferred reservoir refill alternative in 2009. After evaluation of the refill data from 2009, the Corps determined that the periodic refill stops are not necessary to ensure that the right abutment monitoring wells equilibrate with the reservoir. The gradual

rise in the reservoir that occurs during the normal refill protocol is sufficient to allow the monitoring wells to equilibrate. Therefore, the refill plan implemented in 2009 is proposed to be modified to exclude the refill stop periods during the 2010-2014 time period. This new alternative is therefore summarized as alternative 6:

6. Refill to 1167 ft with potential for water storage above 1167 ft for seven days

No refill stop periods, as defined by Alternative 5, would occur. Data collected during the reservoir refill would be thoroughly evaluated when the reservoir reaches 1147 ft, 1157 ft, and 1167 ft. Each of these evaluations would conclude with a decision to either continue or halt the refill. Dye tests using food grade dyes may also be conducted at these approximate elevations.

The purpose of the one week additional storage above 1167 ft is to generate data on the performance of the right abutment after each element of the interim repair is completed. This is important for determining how to manage floods during the following year. Therefore, after each constructed feature, the Corps would try and maximize the reservoir elevation the following year or in subsequent years until 1177 ft is achieved. A lesser reservoir elevation does provide important monitoring data. So even if 1177 ft is unachievable during a given year, the Corps would still pursue additional storage to a lesser elevation after each period of construction.

In general, the one week storage above 1167 ft would be timed to coincide with a storm event so that the reservoir can be raised quickly. It is also possible that the Corps would pursue a lesser storage episode resulting in a limited 2-3 ft increase in reservoir elevation independent of any storm event. The total duration the reservoir would be higher than 1167 ft is approximately seven days. This includes both the storage and drawdown back to 1167 ft. This one week increase above 1167 ft may be repeated in any given year if hydrologic conditions are favorable and the resource agencies/Tacoma Water don't have an immediate need to withdraw water from the reservoir. This also assumes that the first episode only achieved a modest increase in reservoir elevation (2-3 ft). The purpose of limiting the height and duration of this action is to minimize stress on vegetation around the reservoir.

The potential one week water storage above elevation 1167 ft is limited by hydrologic conditions, monitoring data needs, and effects on natural resources upstream and downstream of the dam. In any given year, the probability of hydrologic conditions favorable for a reservoir elevation of 1177 ft is about 2%. Given this low probability, there are a range of scenarios that might occur from 2010-2014. These include but are not limited to achieving 1177 ft three out of the five years, achieving 1177 ft once and lesser reservoir elevations in the intervening years, and achieving lesser elevations in three out of the five years. The Corps would undertake refill above 1167 feet, up to 1177 feet, no more than three times during the five-year project period. As stated above, the probability of achieving 1177 ft even once in five years is unlikely. The Corps does not anticipate water storage above 1167 ft in every year from 2010-2014. The most likely scenario is several additional feet of water storage above 1167 ft during two out of the five years. This is the preferred reservoir refill alternative for 2010 to 2014 because it maximizes data collected about the right abutment and minimizes potential adverse effects.

2.2. Reservoir drawdown

Five drawdown alternatives were detailed in the June 2009 Final EA. They included:

1. No action - normal drawdown
2. Three day drawdown to elevation 1147 ft
3. Ten day drawdown to elevation 1147 ft
4. Three week drawdown to elevation 1147 ft
5. Drawdown to elevation compatible with M&I water needs

Alternative 5 was selected as the preferred reservoir drawdown alternative in the June 2009 Final EA and FONSI. This decision was made as the reservoir reached its maximum elevation in June 2009. The decision was based on real time monitoring data from the right abutment of the dam. This was equivalent to a drawdown to reservoir elevation 1155 ft. The 2010-2014 reservoir drawdown alternative would be selected in a manner similar to the way the 2009 decision was made. Each year, monitoring data from the right abutment of the dam will be continually evaluated. The Corps will select a drawdown alternative based on this real time monitoring data. As a result of the 2009 interim repair, the seepage problems through the right abutment are expected to be reduced. Consequently, the 'presumed' 2010-2014 drawdown alternative is the no action - normal drawdown without any reservoir restrictions. However, as stated above the actual drawdown alternative in any given year would be selected during the course of the reservoir refill and drawdown. If monitoring data creates dam safety concerns related to the integrity of the right abutment in any year, an expedited drawdown would be initiated. This could occur at any time or reservoir elevation during the refill. The most likely expedited drawdown alternative, if one is deemed necessary, is expected to be similar to Alternative 5, selected as the preferred alternative in the EA and implemented in 2009. As stated above, this was a 2-3 week drawdown from elevation 1167 ft to approximately 1155 ft. The preferred alternative is also predicated on the recognition that an emergency drawdown – evacuating the reservoir in less than the three days reflected in EA Alternative 2, may be necessary at any reservoir elevation as dictated by dam safety concerns. The need for such an emergency drawdown is considered highly unlikely for the duration of this SEA.

2.3. Interim repair

Six interim repair alternatives were detailed in the June 2009 Final EA. They included:

1. No action
2. Micropile wall
3. Construct secant wall
4. Geosynthetic clay liner or shotcrete upstream face of dam
5. Dewatering wells in the existing drainage tunnel
6. Grout curtain

A combination of alternatives 5 and 6 was selected as the preferred alternatives in summer 2009. The bulk of work was completed by November 2009. Between November and March, the grout curtain was extended to the northeast by 25 ft and extended deeper in certain sections. The 2009 interim repair resulted in a grout curtain along 475 ft of the right abutment. The drainage tunnel work consisted of replacing one existing dewatering well and installation of several new

dewatering wells. The preferred 2010 plan would complete the activities initiated under the 2009 preferred alternative by extending the grout curtain across the entire length and depth of the right abutment. It would also replace the remaining older dewatering wells. The 2010 preferred plan includes 1) extending the 2009 grout curtain to the northeast by 650 ft, 2) deepening 375 ft of the 2009 grout curtain, 3) constructing a concrete drill pad to support the 2010 grout extension, 4) installing a sheet pile wall at the south end of the 2009 grout curtain, and 5) replacing ten existing dewatering wells in the drainage tunnel. Figures 1 and 2 in Appendix A illustrate the proposed interim repair plan. These measures are designed to further control seepage and piping in the right abutment of the dam.

The grout curtain extension to the northeast (station 4+75 to station 11+25) would extend from ground surface (elevation 1206 ft) to a depth of fifteen feet into bedrock with an average depth of 230 feet of grouted hole. The grout curtain consists of two rows of grout about eight feet apart. All grout holes would be oriented vertically. A total of 219 mandatory grout holes would be drilled per row with an additional 142 higher order grout holes per row to reach closure in areas of higher grout takes. These totals are estimates. The deepening of the 2009 grout curtain (station 1+00 to 4+75) would include drilling from the ground surface (elevation 1206 ft) to a depth of fifteen feet into bedrock with an average hole depth of 230 feet. Since this area was previously grouted, grouting would only be required from the bottom of the 2009 grout curtain to fifteen feet into bedrock. This segment would require 129 mandatory holes per row with an anticipated 84 additional holes per row to reach closure in areas of higher grout takes. All grout mixes would be high mobility, stable, balanced grouts. This is similar to the grout curtain design and spacing constructed in 2009.

To support the grout curtain, a work or drill pad is required. This consists of extending the 2009 constructed drill pad to the northeast by 650 ft to support the footprint of the grout curtain extension. This requires excavating a road into the right abutment of the dam at elevation 1206 ft. The new road would connect to an existing road to the northeast (Appendix A, Figure 2). Work includes cutting into the uphill slope and filling out/steepening the downstream slope. The width of the drill pad would be approximately 20-30 ft. The length of the pad extension would be 650 ft coinciding with the length of the northern segment of work. It would be surfaced with concrete similar to the 2009 drill pad. The 2009 pad would remain in place to support the 2010 work. At the conclusion of the project, both the 2009 and 2010 constructed concrete drill pads would likely be removed. A slightly narrower gravel road is anticipated to remain in its place.

The sheet pile wall proposed for the south end of the 2009 grout curtain would extend 60-70 ft in length and from elevation 1230 ft down to bedrock at elevation 1140 ft. The purpose of the sheet pile wall is to connect the 2009 grout curtain to the drain of the engineered section of the dam. This should further reduce concerns for water seepage around the south side of the grout curtain.

The right abutment drainage tunnel has ten existing dewatering wells, also called vertical drains, that would be abandoned and replaced (Appendix A, Figure 2). The existing wells were constructed in 1969 of 6-inch diameter perforated steel casing with no filter pack, and thus are an unfiltered exit for seepage water. Unfiltered seepage exits are common initiation points for a piping failure mode, which has been identified as a credible failure mode for HHD. The ten

existing drains extend from ground surface to approximately 20 feet below the invert of the tunnel. The existing drains would be abandoned by backfilling with a cement-bentonite grout via tremie pipe after any loose sediment within the drain is removed. The ten new drains would be centered over the tunnel at the same station as the drains they are replacing. The new drains would be constructed by drilling from ground surface creating a 14-inch diameter minimum borehole. The bottom of the drain screen would exit into the drainage tunnel through the tunnel ceiling. This riser pipe would extend approximately three feet above ground surface and would be covered with a cap.

The interim repair actions would be planned for calendar year 2010, but completion of some or all of the work may be delayed to future years depending on funding and/or authority considerations.

3. EXISTING CONDITIONS

The June 2009 Final EA titled “Howard Hanson Dam Right Abutment Investigation, Reservoir Refill, Reservoir Drawdown, and Interim Repair should be consulted for detail on existing conditions at HHD and the Green River. This document can be found at: http://www.nws.usace.army.mil/ers/doc_table.cfm under Howard Hanson Dam Right Abutment.

4. ENVIRONMENTAL EFFECTS

The effects described below are intended to supplement the analysis presented in the June 2009 Final EA titled “Howard Hanson Dam Right Abutment Investigation, Reservoir Refill, Reservoir Drawdown, and Interim Repair. This latter document should be consulted for detailed information and analysis of project effects. It can be found at http://www.nws.usace.army.mil/ers/doc_table.cfm under Howard Hanson Dam Right Abutment. Where necessary, due to environmental conditions or differences between the 2009 and 2010 plans, additional information and analysis is provided below.

The proposed reservoir refill plan is different from the 2009 refill plan in several ways. First, there are no refill stop periods proposed for 2010-2014. As stated previously, it was determined that the refill stop periods were not necessary to the plan. Second, there could potentially be two storage events above 1167 ft in a single year. Finally, due to the fact this is a five year plan, the probability for a one week storage event to elevation 1177 ft is greater under the proposed plan than it was under the plan for 2009 which only addressed a single year.

In 2009, an expedited drawdown was selected as the preferred alternative. In 2010-2014, the real time decision making process will be the same as that of 2009. However, for 2010-2014, it is expected that the alternative ultimately selected will be a normal drawdown without any reservoir restrictions. This is largely due to the expectation that the 2009 interim repairs will sufficiently decrease seepage through the right abutment to safely allow the maintenance of a reservoir greater than 1155 ft for several months. If a more expedited drawdown is required by

monitoring data, the reservoir is expected to be drafted as safely and benignly as possible. The most likely expedited drawdown strategy, if one is deemed necessary, is expected to be a strategy similar to the one implemented in 2009. This was a 2-3 week drawdown to elevation 1155 ft. This expedited drawdown alternative was evaluated in the June 2009 Final EA. The preferred alternative is also predicated on the recognition that an emergency drawdown – evacuating the reservoir in less than the three days reflected in the Final EA Alternative 2, may be necessary at any reservoir elevation as dictated by dam safety concerns. The need for such an emergency drawdown is considered highly unlikely for the duration of this SEA.

The 2010 grout curtain extension and sheet pile wall would occur on the upstream side of the right abutment of the dam. The drainage tunnel well replacement project would occur immediately downstream of the right abutment along the alignment of the drainage tunnel. The project footprint for the 2010 grout curtain work is slightly different from the 2009 work although there is substantial overlap including for construction access on the slope of the abutment (Appendix A, Figure 2). The drainage well replacement work would occur substantially within the footprint of work described in 2009. Effects of the 2010 interim repair work are substantially the same as that conducted in 2009 except for the shift of the work to the northeast.

4.1. Hydrology and water quality

As of 8 March 2010, the Natural Resources Conservation Service (NRCS) estimate snow water equivalent in the central to south Puget Sound snowpack to be 47-60% of average based on SNOTEL data (NRCSa 2010). The National Weather Service Climate Prediction Center three month forecast for the Pacific Northwest predicts above average temperatures and below average precipitation (National Weather Service 2010). As of March 1, the NRCS estimates mountain snowpack to be 32% of average in the Green River basin (NRCSb 2010). This is likely influenced by the current El Nino weather pattern. The 2010 snowpack for the Green River basin is therefore likely to be quite a bit below average. This is in direct contrast to 2009 when snowpack was well above average and persisted well in to May (NRCSb 2010). This will likely result in lower river flows during the 2010 refill and drawdown compared to what occurred in 2009. Figure 3 in Appendix A summarizes the 2009 reservoir refill and drawdown and compares that to median flow conditions. While river flows can be estimated for spring 2010 based on the snowpack and forecast at the time of this document, anticipated river flows and resultant effects in 2011-2014 can not be predicted with any certainty beyond an analysis of median conditions. The June 2009 Final EA should be consulted for these median conditions.

Since the refill stop periods have been eliminated from the 2009 plan, the reservoir refill should be unaffected by the proposed plan until elevation 1167 ft is reached at which time the Corps will attempt to store more water over a one week period. Weather conditions will determine if and how high the reservoir is raised above 1167 ft. Based on probability alone, it is unlikely that 1177 ft will be achieved during the five year period of the proposed plan. The most likely scenario is several additional feet of water storage above 1167 ft during two out of the five years. As stated above, the proposed plan could result in two episodes of water storage above 1167 ft in a single year. The second episode would only be pursued if the first episode accomplishes no

more than a moderate reservoir elevation increase (2-3 ft). This second attempt to raise the reservoir above 1167 ft will be subservient to the needs of downstream resources.

The effect of the one week storage above 1167 feet will be a likely increase in reservoir elevation of between two and 10 feet (to a reservoir elevation of 1169 to 1177 feet, respectively). Storage will occur for three to four days. The reservoir will then be drawn down over a similar timeframe. The practical effect of this will be to shift the hydrograph peak in time by three to four days. The timing of this event will likely be mid-May to late June if it occurs at all. Over the last eight years during the May-June timeframe, inflow peaks caused by storms or snowmelt cycles have been as high as 6,800 cfs, which occurred in 2008. Between 2000 and 2007, these events have ranged between no meaningful inflow peak and 2,800 cfs. When they occur, these spring inflow peaks typically last about a week or longer. Due to the typical weeklong duration, it is unlikely that the entire peak can be stored while still limiting the time above 1167 ft to one week. Therefore only a percentage of the peak can be stored. This means discharge will increase as water is stored depending on the magnitude of the inflow peak. The real time management objective is to store and discharge water in a manner resulting in minimal natural resource impacts upstream and downstream of the dam.

It is possible that food grade dye from the three proposed dye tests will enter the reservoir. Dye concentrations are expected to be sufficiently low so that water quality should not be affected. Dye was observed in the reservoir following dye tests in 2009. Dye was detected at the USGS stream gage approximately 0.5 miles downstream of HHD and at the Tacoma Headworks approximately 3.5 miles downstream of HHD during the 1147 ft and 1167 ft pool dye test for one dye at concentrations near the laboratory limit of detection (Corps 2009).

The grout work could potentially affect water quality if grout escaped to the reservoir or to the river downstream. Based on the 2009 grout curtain construction, best management practices (BMPs) should effectively contain any grout. BMPs successfully employed in 2009 include installation of silt fences, construction of the concrete drill pad with curbs to contain drill water and any spills, and diligent monitoring for grout breaking out on the downstream slope. If grout is detected on the downstream slope, it will be contained by constructing sedimentation ponds and small berms to contain the grout allowing it to solidify. BMPs, diligent monitoring, and a halt of the grout work if grout is observed breaking out onto the downstream slope should prevent grout from reaching surface waters. The Corps plans water quality monitoring in the reservoir and downstream river to confirm that grout is not entering surface waters. The 2009 monitoring detected no increases in pH in the reservoir or in the river downstream. This indicates that the grout work likely had no effect on water quality in 2009.

The interim repair could potentially have some effect on downstream flows. Based on a preliminary analysis of stream flow at the radial gate of the dam and the USGS stream gage 0.5 miles downstream, it is estimated that the volume of water (cfs) affected is negligible and probably within the error of the measurement tools. Furthermore, if there were an effect, any flow reduction would automatically be compensated for through an adjustment in the regulation of the dam which is tied to the USGS stream gage downstream. This means that any incremental

flow lost as a result of the interim repair would be compensated for by an incremental increase in discharge from the dam.

4.2. Flora and fauna

The water storage above 1167 ft will be limited to no more than one week to minimize adverse effects to vegetation. The maximum anticipated reservoir elevation is 1177 ft. Under this scenario, some vegetation will be submerged by 10 ft. It is anticipated that minimal, if any, vegetation will be lost during this one week period. Hardwoods will likely survive this inundation without much difficulty. Conifers are more vulnerable and die if branches become inundated after just a few days (Iles 1993). The majority of vegetation between elevation 1167 ft and 1177 ft are hardwood species, primarily alder, although there are conifers within this zone. Conifer branches should largely be out of the inundation zone. In general, vegetation that lies within the upper part of this 10 foot elevation range will be flooded for a shorter duration or not at all depending on the amount of water stored. The Corps will develop and implement a monitoring plan to confirm that any water storage above 1167 ft does not adversely impact vegetation around the reservoir. Monitoring will likely include vegetation surveys at several different locations conducted before the reservoir is increased above 1167 ft and during the falling autumn if the reservoir exceeds 1167 ft that spring. This would result in a maximum of ten vegetation surveys. Any measured adverse effects of greater than minimal significance will be mitigated.

The proposed refill and drawdown plan may incrementally increase the potential for sloughing along the banks of the reservoir. The reservoir has exceeded 1176 ft three times since 1962, so while 1177 ft is not a common reservoir elevation it is not unique. Sloughing around the reservoir has been occurring since water was first stored in 1962 as a result of flood pools and the spring conservation pool. The reservoir is currently adjusting to the relatively new spring conservation pool of 1167 ft initiated in 2007.

The short duration storage above 1167 ft may result in fish within the reservoir migrating to the newly flooded habitat. It is possible that some fish might become stranded as the reservoir is quickly drafted from the peak reservoir elevation back to 1167 ft.

The effect on downstream fishery resources of the short duration storage above 1167 ft is expected to be negligible due to the real time management of the action. The reservoir and discharge will be managed to mimic as much as practicable the actual inflow hydrograph, only delayed by three or four days. If an inflow peak does not occur and a decision is made to continue to store water as soon as 1167 ft is reached, the water capture rates and discharge will be limited so as to have minimal effects to downstream fisheries. Water capture rates will be in the range typically observed during the spring refill. The discharge will result in an artificial flow peak downstream. Discharge will be adaptively managed to avoid downstream fish stranding or steelhead redd scour. All project ramping rates will be followed.

The short duration storage above 1167 ft may affect wildlife species around the reservoir. This could include temporarily displacing small and large mammals including elk and deer. It is

possible that some low nesting bird species could be flooded off their nests resulting in some loss of eggs. This would be limited to ground nesting birds such as ducks and geese, and birds nesting in understory vegetation. The Corps will monitor nesting bird activity to determine whether there are adverse effects. Section 6.10 discusses this monitoring in more detail. Approximately 109 acres would be flooded between 1167 ft and 1177 ft. The largest areas potentially flooded are the confluence of the reservoir with the mainstem Green River and the North Fork Green River (Appendix A, Figure 4).

The footprint of the grout curtain and sheet pile work is within the previously disturbed footprint of the original dam construction. It currently consists of primarily riprap, areas of grass, and a gravel road lower on the slope. The extreme north section of the project site contains several trees that surround a small drainage. This drainage will not be disturbed and no trees are expected to be removed as part of the project. Work to replace the vertical drains will occur on existing roads or already cleared land. No new clearing or tree removal is expected. The June 2009 Final EA contains more detail on existing roads in this area.

4.3. Threatened and endangered species

The June 2009 Final EA included analysis of effects to species after the 2009 refill was conducted, based on actual observed conditions. This resulted in an evaluation of the refill management and how closely assumptions were met. This analysis is supplemented where necessary below to account for 2010 weather and expected flow conditions. This is limited to the fisheries species that are most directly affected by river flow conditions. As mentioned above, the refill stop periods that were part of the 2009 refill plan have been eliminated from the 2010-2014 refill planning.

Puget Sound Chinook Salmon ESU

The timing of the one week storage above 1167 ft will likely be mid-May to late June. This is towards the end of the juvenile Chinook salmon (*Oncorhynchus tshawytscha*) outmigration period, so there are still likely to be substantial numbers of juvenile Chinook in the river during this action. In 2009, the short duration storage from 1167 ft to 1169 ft likely had no effect on juvenile Chinook salmon due to the relatively small amounts of water stored and the limited changes in river stage that resulted. Greater storage would result in greater river stage changes downstream. However, these stage changes are expected to be similar to what would occur naturally only delayed by several days as described above. If an expedited drawdown occurs, effects should be similar to those that occurred in 2009 and as described in the 2009 Final EA. This includes additional flow in the river for two to three weeks at the tail end of the juvenile outmigration in June and possibly into early July. The 2009 ESA analysis resulted in a determination of not likely to adversely affect based on these downstream effects. Since no Chinook salmon occur upstream of the dam, an 1177 ft reservoir elevation will have no effect on this species. The interim repair work is expected to have no effect on Chinook salmon because of the BMPs employed and the distance of the work from surface waters. The project is therefore “not likely to adversely affect” Chinook salmon or Chinook salmon critical habitat due to the downstream effects described above.

Puget Sound Steelhead DPS

Based on data collected from the screw trap installed at RM 33 of the Green River, the juvenile steelhead (*Oncorhynchus mykiss*) outmigration period is generally from mid-April to late May (WDFW 2008). Any effect from the proposed refill and drawdown plans would likely occur in early June after the juvenile outmigration period. Since juvenile steelhead remain in freshwater for multiple years, they will be present in the river throughout the refill and drawdown. Adult spawners and eggs will also be in the river during these activities. The proposed plan could potentially affect these life stages. However, the range of flows is expected to be within the range of natural variation, and will be adaptively managed to minimize redd dewatering, redd scour, and juvenile stranding. The project is not expected to adversely affect any redds or strand fish any more than might occur under natural conditions. If an expedited drawdown does occur, this will result in higher river flows for the two to three week period of the drawdown. This should provide more protection to any redds in the river and more aquatic habitat than would naturally be present this time of year. The interim repair work is expected to have no effect on steelhead because of the BMPs employed and its distance from surface waters. Due to the real time management of these actions as described above, the project is “not likely to adversely affect” steelhead. Steelhead critical habitat has not yet been designated.

Coastal-Puget Sound Bull Trout DPS

No spawning population of bull trout (*Salvelinus confluentus*) has been documented in the Green River, and they are only occasionally observed or caught. Their use of the Green River is probably limited to anadromous adult fish that occasionally enter the river from Puget Sound and rear for short periods in the lower river (Tacoma 2001). Due to the real time management of the refill activities, the limited numbers of bull trout in the system, and the fact river flows should be within the natural range of variation for that time of year, the project will result in “no effect” on bull trout or bull trout critical habitat.

Species	Status	Effect Determination	Critical Habitat Determination
Northern Spotted Owl	Threatened	no effect	no effect
Marbled Murrelet	Threatened	no effect	no effect
Grizzly Bear	Threatened	no effect	not designated
Gray Wolf	Endangered	no effect	not designated
Canada Lynx	Threatened	no effect	no effect
Puget Sound Chinook Salmon	Threatened	not likely to adversely affect	not likely to adversely affect
Puget Sound Steelhead	Threatened	not likely to adversely affect	not designated
Coastal-Puget Sound Bull Trout	Threatened	no effect	no effect

4.4. Historic properties and cultural resources

The drainage tunnel well replacement project area was examined by a Corps archaeologist who confirmed that it had been previously disturbed by past construction. The grout curtain modification and extension project was also field checked by a Corps archaeologist and it was also confirmed to be in a previously disturbed area. It is unlikely that the proposed reservoir refill and drawdown will damage vegetation leading to increased erosion that might expose unrecorded archaeological material in previously surveyed areas. For these reasons, the undertaking has little or no potential to affect historic properties and requires no further Section 106 consideration.

4.5. Recreation

The refill plan will have minor effects on recreation activities downstream of the dam. The one week storage above 1167 ft, if it occurs, will result in a delay in the hydrograph peak by several days. Boaters will likely not see an immediate increase in flow due to a storm or rapid snowmelt event as might be expected because the runoff will be stored in the reservoir as opposed to passed downstream. This flow increase would instead occur three or four days later.

4.6. Socioeconomic

For 2010, Tacoma has requested storage and use of the entire 20,000 acre-feet of water stored at HHD under the Additional Water Storage Project (AWSP) (Volkhardt 2010). This is due in part to the low snowpack and dry forecast for the upcoming spring. This is in contrast to 2009 when 8,000 acre-feet of water was requested by Tacoma. As stated above, the presumed drawdown alternative is a normal drawdown without restrictions. This alternative would provide for full storage and use of the 20,000 acre-feet of water stored under the AWSP and satisfy Tacoma's request for 2010. A normal drawdown is also expected to satisfy needs for 2011-2014. However, if the reservoir must be drafted in an expedited fashion for dam safety reasons, a percentage of Tacoma's water storage would be discharged to the lower river. The volume retained in the reservoir is likely to be similar to 2009 when the reservoir was drafted to about 1155 ft resulting in 9,000 acre-feet of water storage available for Tacoma. The effects of this level of water storage are discussed in the June 2009 Final EA. As reflected in the Final EA, water storage for municipal and industrial supply purposes is subordinated in priority to natural resource concerns in the event of conflict between the two considerations.

5. CUMULATIVE IMPACTS

Additional information on cumulative impacts can be found in the June 2009 Final EA titled "Howard Hanson Dam Right Abutment Investigation, Reservoir Refill, Reservoir Drawdown, and Interim Repair. This document can be found at: http://www.nws.usace.army.mil/ers/doc_table.cfm under Howard Hanson Dam Right Abutment.

A future project not described in the 2009 Final EA that the Corps is now planning is a permanent repair to the right abutment. Construction may occur over the next several years

depending on the results of study investigation and funding. This action will require further evaluation under NEPA. A preferred alternative for the repair has not yet been selected. This project will likely be limited to the geographic area previously disturbed by the original dam construction. This may include some disturbance to the hillside above the 2009 and 2010 grout curtain work in order to reroute roads.

There are several potential cumulative impact issues associated with the proposed reservoir refill and drawdown described in this SEA. The refill storage above 1167 ft is in addition to the water storage to elevation 1169 ft in 2009. It is possible, although considered unlikely that the repeated one week storage events above elevation 1167 ft will gradually alter the vegetation and ecosystem at that elevation. Other areas of the reservoir that are annually inundated are eventually converted to mudflats and this would be a likely evolution of any newly inundated lands. As stated previously, due to the limited number of instances this will occur along with the short duration of inundation, this action is not expected to alter the vegetation and ecosystem above 1167 ft. If these management activities were to persist for some indefinite period into the future, this conclusion will be revisited. The Corps plans to monitor vegetation around the reservoir to verify the negligible impact conclusion.

The 2010-2014 ‘presumed’ reservoir drawdown is the no action alternative. This is contingent on seepage monitoring data along the right abutment of the dam. If water storage must be reduced as a result of dam safety considerations, it may impact water supply for Tacoma Water and its partners. This would be in addition to the lost water storage in 2009. This is a new water storage project that has not yet been fully implemented nor has the water been fully needed as of this date. Tacoma and their water partners are depending on this water in the future. An expedited reservoir drawdown may therefore have a more limited effect on water supply resources today compared to the future. If limited water storage continues through 2014 and beyond, impacts to Tacoma and their partners may become more acute.

The proposed 2010 interim repair overlaps the 2009 construction footprint and areas previously disturbed by the original dam construction. The cumulative impact of the proposed interim repair is negligible.

The incremental effects of the proposed project, combined with other past, present, and future actions described above and in the June Final EA, are not expected to result in significant environmental impacts.

6. ENVIRONMENTAL COMPLIANCE

6.1. National Environmental Policy Act

This document was prepared pursuant to the National Environmental Policy Act (NEPA). A 30 day public review and comment period occurred from 11 March to 11 April 2010. In addition to the public comment period, the action was coordinated with the Washington Department of Ecology, Washington Department of Fish and Wildlife, National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and the Muckleshoot Indian Tribe.

Comments and Corps responses to the comments are located in Appendix E. A FONSI is included in Appendix F. The Final SEA and signed FONSI satisfy NEPA requirements for the proposed HHD reservoir refill, drawdown, and interim repair activities.

This SEA assesses a proposed course of HHD reservoir refill, reservoir drawdown, and several interim repair activities. These actions, including an expedited drawdown if required by monitoring data, have been evaluated in a June 2009 Final EA as supplemented herein. The timing and maximum elevations reflected in these measures have been selected so as to generate minimal risk to the structural integrity of HHD while necessary engineering investigations and monitoring are carried out. It is possible, although highly unlikely, that structural integrity concerns arising in the course of carrying out the refill or drawdown will require abandoning the proposed action. If abandoned, it is possible that an emergency rate of drawdown may be required. Such a drawdown would be managed in real time to conserve natural resources and minimize adverse effects downstream of HHD, to the maximum practicable extent. In such a case, this SEA and FONSI would be reevaluated to address any adverse effects of a deviation from the proposed course of action.

6.2. Endangered Species Act

In accordance with Section 7(a)(2) of the Endangered Species Act of 1973 (ESA), as amended, Federally funded, constructed, permitted, or licensed projects must take into consideration impacts to Federally listed or proposed threatened or endangered species. Section 4.3 evaluates the effects of the proposed action on threatened and endangered species.

These activities are expected to have minimal effect on threatened and endangered species. The determination for Chinook salmon, Chinook salmon critical habitat, and steelhead is “not likely to adversely affect”. The determination for all other ESA listed species is “no effect”. The proposed actions have been coordinated with NMFS. They have concurred with the Corps determination of “not likely to adversely affect” Chinook salmon, Chinook salmon critical habitat, and steelhead (See Appendix D).

6.3. Magnuson-Stevens Fishery Conservation and Management Act

The Act requires Federal agencies to consult with National Marine Fisheries Service regarding actions that may affect Essential Fish Habitat (EFH) for Pacific coast ground fish, coastal pelagic species, and Pacific salmon. The Act defined EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity”. Descriptions of EFH are provided in Fishery Management Plans produced by the Pacific Fisheries Management Council. The proposed project will have no effect on Pacific coast ground fish or coastal pelagic species. As described in section 4.3 and in the June 2009 Final EA, minimal effects to Pacific salmon EFH are anticipated.

6.4. Clean Water Act

Under Section 404 of the Clean Water Act (CWA), a Department of the Army permit is required for the discharge of dredged or fill material into waters of the United States including wetlands.

Under Section 401 of the CWA, State Water Quality Certification is required for discharges that may impact water quality. The certification ensures that the discharge will comply with the applicable provisions of Sections 301, 302, 303, 306 and 307 of the CWA. The proposed actions will not result in a discharge of fill material into waters of the United States and therefore does not require a Section 404 permit or Section 401 water quality certification.

Section 402(p) of the CWA provides that stormwater discharges associated with industrial activity that discharge to waters of the United States must be authorized by an National Pollutant Discharge Elimination System (NPDES) permit when construction footprints exceed one acre. The term “discharge” when used in the context of the NPDES program means the discharge of pollutants (40 CFR §122.2). The project does involve construction and potential for stormwater discharges. A stormwater permit or coverage under the EPA construction general permit will be necessary depending on the size of the final grout curtain construction footprint. The Corps anticipates applying for coverage under the construction general permit.

6.5. Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act of 1899 prohibits the unauthorized obstruction or alteration of any navigable water of the United States. Activities that involve the construction of dams, bridges, dikes etc. across any navigable water, or placing obstructions to navigation outside established Federal lines and excavating from or depositing material in such waters, require permits from the Corps. The Duwamish River from the mouth to RM 10 is a Federally designated Section 10 navigable water. At RM 10, the Duwamish River becomes the Green River which is not a Section 10 navigable water. The proposed activities will not obstruct or alter Section 10 navigable waters downstream of HHD. Anticipated water discharges are within the range expected to occur naturally.

6.6. Coastal Zone Management Act

The Coastal Zone Management Act of 1972, as amended, requires Federal agencies to carry out their activities in a manner that is consistent to the maximum extent practicable with the enforceable policies of a state’s approved Coastal Zone Management (CZM) Program. The Shoreline Management Act of 1971 (SMA) (RCW 90.58) is the core authority of Washington’s CZM Program. Primary responsibility for implementation of the SMA is assigned to local governments. In the case of Howard Hanson Dam and the Green River, the local government is King County. The project was evaluated against the King County Shoreline Management Master Program and determined to be consistent with the plan to the maximum extent practicable (Appendix B). Appendix C contains a letter of concurrence from the Washington Department of Ecology.

6.7. National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires that Federal agencies identify, evaluate and assess the effects of undertakings on cultural resources such as sites, buildings, structures, or objects listed in or eligible for listing in the National Register of Historic Places (NRHP). Eligible properties must generally be at least 50 years old, possess integrity of

physical characteristics, and meet at least one of four criteria for significance. Cultural resources found to be eligible for the NRHP are referred to as historic properties. Regulations implementing Section 106 (36 CFR Part 800) encourage maximum coordination with the environmental review process required by NEPA and with other statutes. Recently amended Washington State laws also apply on non-Federal lands, including the Archaeological Sites and Resources Act (RCW 27.53), Indian Graves and Records Act (27.44 RCW) and the Abandoned and Historic Cemeteries and Historic Graves Act (68.60 RCW).

NHPA compliance for construction and operation activities at the Howard Hanson Dam Reservoir and associated restoration and mitigation projects was addressed in a 2003 MOA signed by the Corps, Tacoma, and the Washington Department of Archaeology and Historic Preservation (DAHP). The Muckleshoot Tribe was consulted during development of the MOA and did not sign, but supports its provisions. In order to comply with Section 106, the Corps has evaluated the construction plans and determined that all areas appear to have been previously disturbed by dam construction and related activities. The proposed project includes a drainage tunnel well replacement project; a grout curtain modification and extension project; and a reservoir refill and drawdown. For the drainage tunnel well replacement project a Corps archaeologist examined the area on 10 March 2010 and confirmed that it had been previously disturbed by past construction. The grout curtain modification and extension project was also field checked on the same day and it was also confirmed to be in a previously disturbed area. It is unlikely that the proposed reservoir refill plan will damage vegetation leading to increased erosion that might expose unrecorded archaeological material in previously surveyed areas. Corps archaeologists will field-check selected areas during their annual archaeological monitoring of the reservoir to ensure that no new archaeological sites are being exposed as a result of long term yearly reservoir refills by both Operations and the AWSP. For these reasons, the undertaking has little or no potential to affect historic properties and requires no further Section 106 consideration.

If, during construction activities, the Contractor observes items that might have historical or archeological value, such observations shall be reported immediately to the Contracting Officer, or, if present, the Corps' Construction Supervisor so that the appropriate authorities may be notified and a determination can be made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in the destruction of these resources and shall prevent his employees from trespassing on, removing, or otherwise damaging such resources.

6.8. Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act (NAGPRA) (25 U.S.C. 3001) addresses processes and requirements for federal agencies regarding the discovery, identification, treatment, and repatriation of Native American and Native Hawaiian human remains and cultural items (associated funerary objects, unassociated funerary objects, sacred objects, and objects of cultural patrimony). Consistent with procedures set forth in applicable Federal laws, regulations, and policies, the Corps will proactively work to preserve and protect natural and cultural resources, and establish NAGPRA protocols and procedures.

6.9. Clean Air Act

The Clean Air Act requires states to develop plans, called State Implementation Plans (SIP), for eliminating or reducing the severity and number of violations of National Ambient Air Quality Standards (NAAQS) while achieving expeditious attainment of the NAAQS. The Act requires Federal actions to conform to the appropriate SIP. An action that conforms with a SIP is defined as an action that will not: (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area. The proposed actions will have negligible effects on air quality. The project is exempted from the conformity requirements of the Clean Air Act because actions taken to repair and maintain existing facilities are specifically excluded from the CAA conformity requirements where the action, as here, would result in an increase in emissions that are clearly de minimis (40 CFR § 93.153(c)(2)(iv)).

6.10. Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712) as amended establishes a Federal prohibition, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird."

It is possible that a reservoir increase above 1167 ft will flood some bird nests. Depending on the time of year and species, there may or may not be eggs in the nest. If eggs are flooded as a result of the action between mid-May and June, it is possible that a second clutch of eggs will be laid since this is still relatively early in the year. The Corps has coordinated this with the USFWS regional migratory birds office. The Corps plans to develop and implement a monitoring plan to document any effects to nesting birds. Monitoring shall consist of nest surveys in several defined areas prior to water storage above 1167 ft in order to estimate nest density across the newly flooded lands. Mitigation likely in the form of bird boxes and nesting platforms will be developed if monitoring determines there are effects resulting from the action.

6.11. Bald and Golden Eagle Protection Act

The Bald Eagle and Golden Eagle Protection Act (16 U.S.C. 668-668d) prohibits the taking, possession or commerce of bald and golden eagles, except under certain circumstances. Information about bald eagles around HHD and potential for affects was presented in the June 2009 Final EA. Based on this analysis, the proposed activities are not expected to affect bald eagles.

6.12. Executive Order 12898: Environmental Justice

Executive Order 12898 directs every Federal agency to identify and address disproportionately high and adverse human health or environmental effects of agency programs and activities on minority and low income populations. HHD is within the Tacoma Water Green River Watershed that is closed to the public. Downstream flows resulting from the proposed project are expected to have negligible effects on the human population. No effects on minority or low income populations are expected.

6.13. Executive Order 11990: Protection of Wetlands

This executive order encourages Federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands when undertaking Federal activities and programs. Wetlands along the mainstem Green River and North Fork Green River may be inundated by water storage above 1167 ft. This is not expected to have any measureable effects on the functions or values of these wetlands.

6.14. Executive Order 11988: Floodplain Management Guidelines

This executive order requires Federal agencies to evaluate the potential effects of actions on floodplains and to avoid undertaking actions that directly or indirectly induce growth in the floodplain or adversely effect natural floodplain values. The proposed reservoir refill, drawdown, and interim repair will have no effect on floodplain development. The projects are designed to maintain the existing level of flood protection.

6.15. Tribal Treaty Rights

In the mid-1850's, the United States entered into treaties with a number of Native American tribes in Washington. These treaties guaranteed the signatory tribes the right to "take fish at usual and accustomed grounds and stations . . . in common with all citizens of the territory" [U.S. v. Washington, 384 F. Supp. 312 at 332 (WDWA 1974)]. In U.S. v. Washington, 384 F. Supp. 312 at 343 - 344, the court also found that the Treaty tribes had the right to take up to 50 percent of the harvestable anadromous fish runs passing through those grounds, as needed to provide them with a moderate standard of living (Fair Share). Over the years, the courts have held that this right comprehends certain subsidiary rights, such as access to their "usual and accustomed" fishing grounds. More than de minimis impacts affecting access to usual and accustomed fishing areas violates this treaty right [Northwest Sea Farms v. Wynn, 931 F. Supp. 1515 at 1522 (W.D. WA 1996)]. Project activities will occur within the usual and accustomed fishing grounds of the Muckleshoot Tribe. The tribe has been consulted about the project, and minimal effects to fish and wildlife resources are expected. There should be no effect to tribal treaty rights.

7. CONCLUSION

Based on this assessment, the proposed actions are not considered major Federal actions having a significant impact on the quality of the human environment and do not require preparation of an environmental impact statement.

8. REFERENCES

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Washington Department of Fish and Wildlife. 2008. 2006 Juvenile Salmonid Production Evaluation Report: Green River, Dungeness River, and Cedar Creek.

Appendix A

Figures

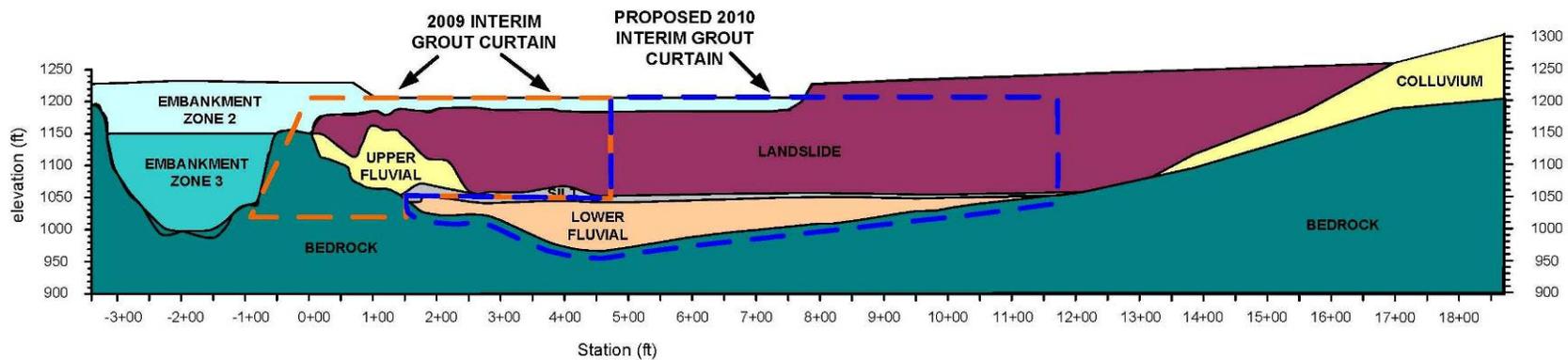


Figure 1. Cross section view of 2009 constructed grout curtain (orange) and proposed 2010 grout curtain (blue).

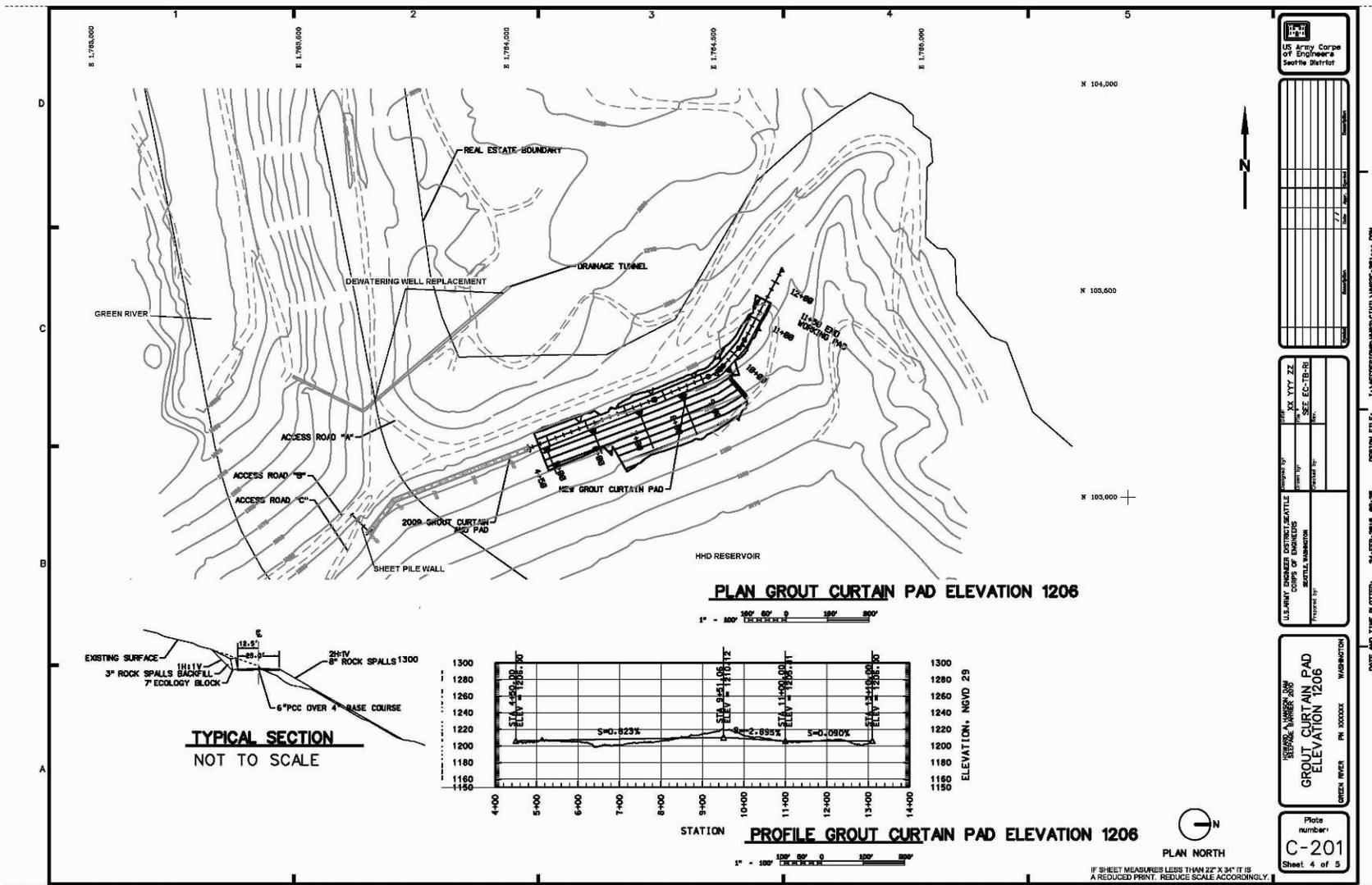


Figure 2. Plan view of features for 2010 interim repair work.

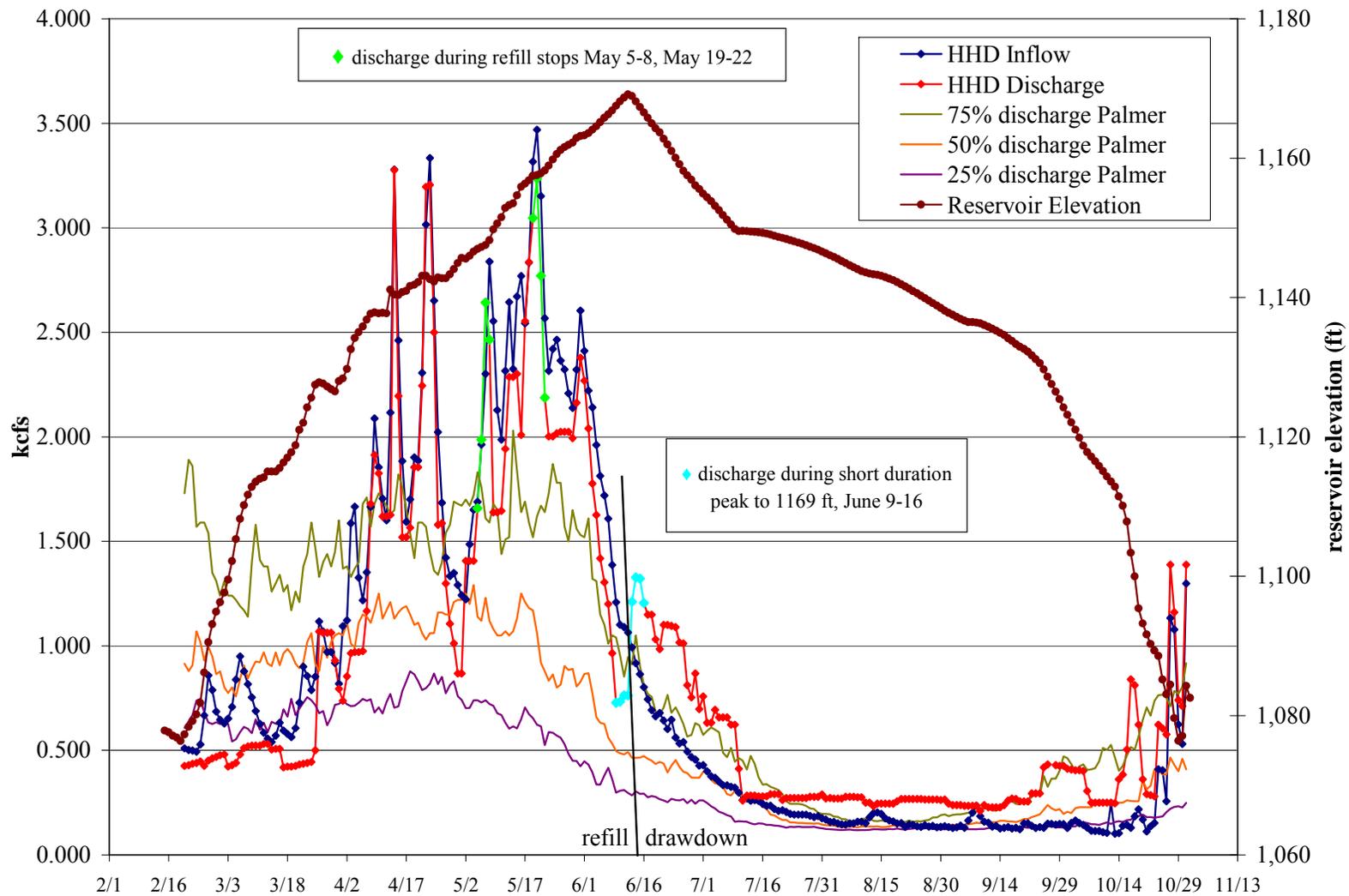


Figure 3. Comparison of 2009 HHD inflow, discharge, and actions related to the right abutment compared to median discharge at the USGS Palmer stream gage four miles downstream.

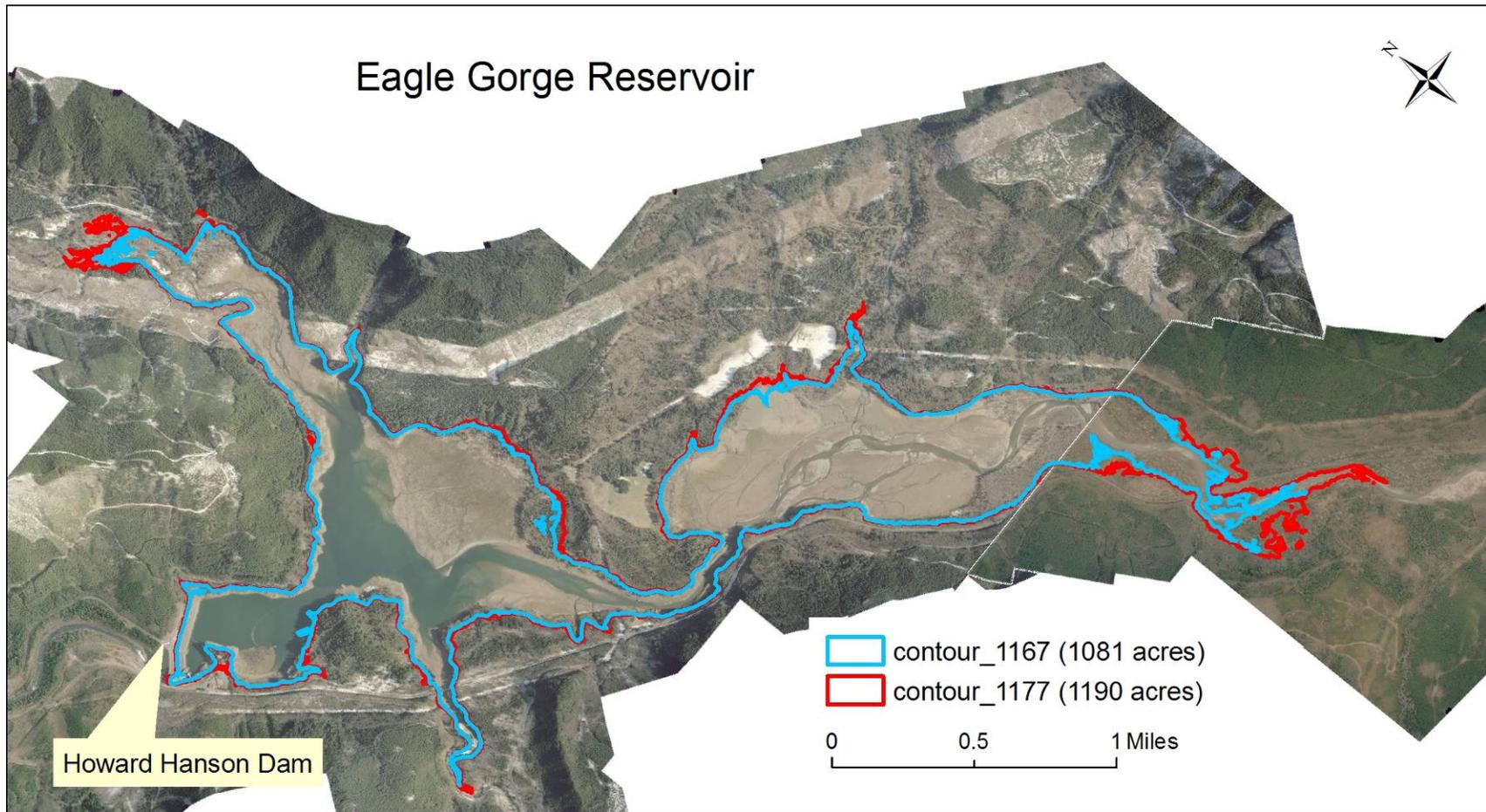


Figure 4. Potential flooded area during one week water storage to 1177 ft.

Appendix B

COASTAL ZONE MANAGEMENT ACT

Consistency Determination

COASTAL ZONE MANAGEMENT ACT CONSISTENCY DETERMINATION

Howard Hanson Dam Right Abutment Investigation, Reservoir Refill, Reservoir Drawdown, and Interim Repair

The proposed reservoir refill, drawdown, and interim repair at Howard Hanson Dam (HHD) are activities undertaken by the U.S. Army Corps of Engineers, a Federal agency. The following constitutes a Federal consistency determination with the enforceable provisions of the Washington State Coastal Zone Management Program.

1. INTRODUCTION

This consistency determination is applicable to the Howard Hanson Dam (HHD) Right Abutment Investigation, Reservoir Refill, Reservoir Drawdown, and Interim Repair. During a rain storm in January 2009, water was stored at HHD to elevation 1189 ft to prevent flooding downstream. This was a record flood storage height for the dam. During this time, two small depressions formed on the upstream face of the right abutment of the dam. Turbid water was observed from one of the drains in the right abutment drainage tunnel. These facts create concern that a flow path through the right abutment could potentially be developing that could ultimately lead to dam failure. Dam failure is not considered an imminent threat at this time. In spring 2009, the annual reservoir refill and drawdown strategy was modified to ensure that these actions could be conducted in a safe manner and to evaluate the integrity of the right abutment. In summer 2009, an interim repair of the right abutment was constructed to decrease seepage. This consisted of drilling several drainage wells and constructing a grout curtain along approximately 475 ft of the right abutment. Beginning in 2010, and continuing for up to a period of five years, the Corps proposes to modify the typical reservoir refill and drawdown strategy used since 2007 defined by the Additional Water Storage Project. The 2010-2014 reservoir refill plan includes water storage to 1167 ft with potential for additional water storage for a one week period up to a maximum elevation of 1177 ft. The 2010-2014 reservoir drawdown plan is presumed to be a normal drawdown without any reservoir restrictions. However, the actual drawdown plan is proposed to be determined in real time based on monitoring data. The interim repair initiated in 2009 is proposed to be extended in 2010. This includes extending the existing grout curtain to the northeast by approximately 650 ft, deepening a 350 ft segment of the 2009 grout curtain so that it extends into bedrock, installing a 60-70 foot long sheet pile wall at the south end of the 2009 grout curtain footprint, and replacing existing drainage wells. The interim repair work is currently planned for 2010, but may be delayed depending on funding and/or authority considerations. More detail regarding these actions can be found in the draft Supplemental Environmental Assessment dated March 2010. This determination of consistency with the Washington Coastal Zone Management Act is based on review of applicable sections of the State of Washington Shoreline Management Program and policies and standards of the King County Shoreline Management Plan.

2. STATE OF WASHINGTON SHORELINE MANAGEMENT PROGRAM

The Coastal Zone Management Act of 1972, as amended, requires Federal agencies to carry out their activities in a manner which is consistent to the maximum extent practicable with the enforceable policies of the approved state Coastal Zone Management (CZM) Programs. The Shoreline Management Act of 1971 (SMA) (RCW 90.58) is the core authority of Washington's CZM Program. Primary responsibility for the implementation of the SMA is assigned to local governments. In the case of Howard Hanson Dam and the Green River, the local government is King County. King County implements the SMA through the King County Shoreline Master Program (SMP) adopted in 1978 (KCC Title 25).

3. KING COUNTY SHORELINE MANAGEMENT PROGRAM

The King County SMP designates the area around HHD as conservancy, excluding Federal lands. The implementation of the refill and drawdown strategies as well as the interim repair activities occur primarily on Federal lands. The drainage well work does extend beyond the boundary of the Federal reservation. While most of the work occurs on Federal lands, the practical effects of these actions extend beyond the Federal reservation to the reservoir itself and the downstream river. The majority of land comprising the reservoir is not Federally owned and is designated conservancy under the SMP. This includes the land where the drainage tunnel work is planned. Lands along the Green River downstream of the HHD Federal boundary are designated either conservancy, rural, natural, or urban. As stated above, the SMP specifically excludes Federal lands from regulation under the SMP. The analysis below therefore evaluates the project effects to SMP covered lands upstream and downstream of the Federal reservation.

Applicable portions of the King County SMP are presented below with an explanation of consistency indicated in *italics*.

Project consistency upstream and in the immediate vicinity of Howard Hanson Dam.

Land designation: conservancy.

25.24.010 Purpose. Conservancy areas are intended to maintain their existing character. This designation is designed to protect, conserve, and manage existing natural resources and valuable historic and cultural areas. The preferred uses are those nonconsumptive of the physical and biological resources of the area.

Project is consistent. The proposed project will temporarily exceed the normal high reservoir elevation of 1167 ft up to a maximum of 1177 ft for about one week thereby inundating new lands for this period of time. The project is designed to minimize the duration, extent, and depth of inundation in order to minimize effects on resources above 1167 ft. Consequently, no long term effects to resources or changes to land use are expected. The drainage tunnel work will occur along existing roads or on lands previously cleared, and no roads will be constructed off Federal lands. No clearing or effects on resources is expected from the 2010 drainage work. The actions are designed to be nonconsumptive of the area resources.

25.24.030 General requirements.

- A. Nonwater related, water related and residential development shall not be permitted waterward of the ordinary high water mark.
- B. Except in those cases when the height requirements of the underlying zone are more restrictive, no structure except agricultural structures may exceed a height of thirty-five feet above average grade level.
- C. All development shall be required to comply with K.C.C. chapter 9.04 to control runoff and to provide adequate surface water and erosion and sediment control during the construction period.
- D. Development shall maintain the first fifty feet of property abutting a natural environment as required open space.
- E. Parking facilities except parking facilities associated with detached single-family and agricultural development shall maintain a shoreline setback of one hundred feet from the ordinary high water mark and retain existing vegetation or be planted in conformance with the landscape standards enumerated in the general requirements (K.C.C. 25.16.030) of the urban environment.
- F. Water quality treatment in compliance with K.C.C. chapter 9.04 shall be required where stormwater runoff would materially degrade or add to the pollution of recipient waters or adjacent properties.
- G. The regulations of this chapter have been categorized in a number of sections; regardless of the categorization of the various regulations, all development must comply with all applicable regulations.
- H. Development proposed in shorelines of the state shall maintain setbacks, provide easements or otherwise develop the site to permit a trail to be constructed or public access to continue where:
1. There is a proposed trail in the King County trail system; or
 2. Part of the site is presently being used and has historically been used for public access.
- I. Along shorelines of the state on Lake Sammamish, no building shall be placed on lands below thirty-two and one-half feet mean sea level.
- J. The regulations of this chapter are in addition to other adopted ordinances and rules. Where conflicts exist, that which provides more protection to a sensitive area shall apply; provided except that water dependent uses shall adhere to the applicable regulations and policies of the King County Shoreline Master Program and shall comply with other ordinances and rules to the greatest extent feasible.

Project is consistent. Construction in the conservancy zone is limited to the drainage tunnel work. This will occur on the right abutment of the dam at least 400 ft from the Green River. Individual construction footprints are expected to be small on the order of 10x35 ft for an individual drill rig and 15x20 ft as a staging area. Work is along existing gravel roads so no additional clearing is required. All stormwater will be controlled as necessary per applicable regulations.

25.24.040 Agricultural practices. Agricultural practices may be permitted in the conservancy environment subject to the agricultural provisions (Section 25.16.040) of the urban environment.

Project is consistent. There are no agricultural practices proposed.

25.24.050 Aquatic resource practices. Aquatic resource practices may be permitted in the conservancy environment subject to the aquatic resource provisions (Section 25.16.050) of the urban environment, except that mechanical harvesting of shellfish shall not be permitted.

Project is consistent. There are no aquatic resource practices proposed.

25.24.060 Forest management practices. Forest management practices may be permitted in the conservancy environment subject to the forest management practices provisions (Section 25.20.060) of the rural environment.

Project is consistent. There are no forest management practices proposed.

25.24.070 Commercial development. Commercial development shall not be permitted in the conservancy environment.

Project is consistent. There is no commercial development proposed.

25.24.080 Signs. Signs, except educational signs of not more than twenty-five square feet erected within recreational developments and signs as permitted for single detached residences by K.C.C. 21A.20.080, are not permitted in the conservancy environment.

Project is consistent. Temporary construction signs may be placed at the intersection of Kanaskat-Palmer road and the Green River Headworks Road. This is a location that currently and has in the past contained similar signs including a sign for the Tacoma Headworks and signs for other construction projects.

25.24.090 Residential development. A. Multifamily development is prohibited in the conservancy environment, except that the clustering of dwelling units into multifamily development may be permitted to avoid development of sensitive or hazardous areas such as marshes, swamps, bogs, flood plains, or steep or unstable slopes; provided, that the density standards enumerated in K.C.C. 25.24.100 shall not be exceeded. This provision is not intended to promote intensive development in the conservancy environment. The intent of this provision is to permit development which would have less adverse impact on sensitive or hazardous areas than traditional lot by lot development.

B. Single-family residential development may be permitted in the conservancy environment subject to the general requirements of this chapter and the single-family provisions K.C.C. 25.16.090 through 25.16.140 of the urban environment. Single-family residential development shall maintain a minimum setback of fifty feet from the ordinary high water mark, except that:

1. If the minimum setback from the ordinary high water mark of a river or stream falls within the floodway, the development shall be required to be located past the upland edge of the floodway,
2. If development is proposed on shorelines, including one or more sensitive areas, as defined in K.C.C. 21A.06, such development shall be done in accordance with regulations and procedures set forth in K.C.C. 21A.24.
3. A farmhouse permitted under the reasonable use exception provisions of K.C.C. 21A.24 shall be exempt from the setback requirements of this section.

C. Any pier, moorage, float or launching facility permitted accessory to single-family development or common use facility accessory to subdivision, short subdivision or planned unit development in the conservancy environment shall be subject to the pier, moorage, float and launching facility provisions K.C.C. 25.16.090 through 25.16.140 of the urban environment; provided, no such authorized structure shall be located within two hundred feet of any other such structure.

Project is consistent. There is no residential development proposed.

25.24.110 Utilities. Utility facilities may be permitted in the conservancy environment subject to the general requirements (K.C.C. 25.24.030) of this chapter and the utility provisions (K.C.C. 25.16.160) of the urban environment.

Project is consistent. The drainage wells could be considered utilities. The work should have a negligible effect on fish and wildlife habitat. No trees or vegetation is expected to be removed since the project footprint is already cleared or is along existing roads.

25.24.120 Industrial development. Industrial development shall not be permitted in the conservancy environment.

Project is consistent. There is no industrial development proposed.

25.24.130 Shoreline protection. A. Shoreline protection may be permitted in the conservancy environment, subject to the shoreline protection provisions (K.C.C. 25.16.180) of the urban environment.

B. Breakwaters shall not be permitted.

Project is consistent. No shoreline protection is proposed.

25.24.140 Excavation, dredging and filling. Excavation, dredging and filling may be permitted in the conservancy environment, subject to the excavation, dredging and filling provisions in K.C.C. 25.16.190 of the urban environment, provided:

A. Excavation, dredging or filling below the ordinary high water mark shall be permitted only as follows:

1. To mitigate conditions which endanger public safety or fisheries resources; or
2. As part of and necessary to roadside or agricultural ditch maintenance that is performed consistent with best management practices promulgated through administrative rules pursuant to the sensitive areas provisions of K.C.C. chapter 21A.24 and if:
 - a. the maintenance does not involve any expansion of the ditch beyond its previously excavated size. This limitation shall not restrict the county's ability to require mitigation, pursuant to K.C.C. chapter 21A.24, or other applicable laws;
 - b. the ditch was not constructed or created in violation of law;
 - c. the maintenance is accomplished with the least amount of disturbance to the stream or ditch as possible;

- d. the maintenance occurs during the summer low flow period and is timed to avoid disturbance to the stream or ditch during periods critical to salmonids; and
 - e. the maintenance complies with standards designed to protect salmonids and salmonid habitat, consistent with K.C.C. chapter 21A.24;
- B. Channelizing, straightening or relocating rivers or streams shall not be permitted;
- C. Excavation or dredging of marshes, swamps or bogs shall not be permitted, except for water transmission pipelines within existing utilized transmission pipeline corridors, provided that no practicable alternatives exist, impacts are minimized, and appropriate compensatory mitigation is provided consistent with K.C.C. 21A.24.

Project is consistent. Earthwork associated with the proposed drainage wells includes drilling. This work is above the ordinary high water and will not affect any wetlands. The wells are designed to drain the higher ground water levels that result when HHD reservoir contains a large volume of water.

25.24.150 Recreation. Recreational development may be permitted in the conservancy environment subject to the general requirements of this chapter (Section 25.24.030) and the recreation provisions (Section 25.16.200) of the urban environment provided:

- A. The recreational development will not require any significant filling, excavating or regarding involving more than twenty-five percent of that portion of the site within the shorelines of the state.
- B. The construction of indoor swimming pools, gyms and other indoor recreational facilities is prohibited.
- C. Piers, moorages, floats or launching facilities constructed in conjunction with recreational development shall not be:
 1. Longer than one hundred twenty feet; or
 2. Larger than 1350 square feet in surface area.

Project is consistent. No recreational development is proposed.

Project consistency downstream of Howard Hanson Dam.

Land designation: natural, conservancy, rural, urban. For the purposes of this evaluation, the most restrictive designation, natural, was evaluated for consistency.

25.28.010 Purpose. The purpose of designating the natural environment is to preserve and restore those natural resource systems existing relatively free of human influence. These systems require severe restrictions of intensities and types of uses permitted so as to maintain the integrity of the natural environment.

Project is consistent. The proposed project will alter the natural river hydrograph by temporarily storing water for three days beyond the normal reservoir storage period. This will occur some time between mid-May and late June thus decreasing river flows downstream of HHD for this period. The stored water will then be released 3-4 days later thereby increasing flows in the downstream river to a level higher than they would

otherwise be without the project action. All discharge from the dam should be within the range of flows that can occur naturally during this time of year. Water storage will likely be timed to coincide with a storm event. The practical effect of this is to delay the hydrologic effect of a storm event on the downstream river by 3-4 days. A lesser volume of water may be stored if there is no timely storm event. In this latter case, the reservoir will rise about a couple feet and the resulting change in discharge upon drawdown will be minor. Since the resulting flows will be within the normal range observed in the river for this time of year, no unusual erosion, inundation, or permanent effects should result. The integrity of the natural environment should be maintained when the project is complete.

- 25.28.030 General requirements.** A. Nonwater related, water related and residential development shall not be permitted waterward of the ordinary high water mark.
B. No structure shall exceed a height of thirty feet.
C. All development shall be required to comply with K.C.C. chapter 9.04 to control runoff and to provide adequate surface water and erosion and sediment control during the construction period.
D. Water quality treatment in compliance with K.C.C. chapter 9.04 shall be required where stormwater runoff would materially degrade or add to the pollution of recipient waters or adjacent properties.
E. Parking areas must maintain a shoreline setback of two hundred feet from the ordinary high water mark and retain existing vegetation or be planted to conform to the landscape standards enumerated in the general requirements (K.C.C. 25.16.030) of the urban environment.

Project is consistent. No development or construction will occur downstream of HHD.

25.28.040 Agricultural practices. Agricultural practices shall not be permitted in the natural environment.

Project is consistent. There are no agricultural practices proposed.

- 25.28.050 Aquatic resources practices.** Aquatic resource practices may be permitted in the natural environment of the Green River at Icy Creek subject to a public hearing and the general requirements set forth in Section 25.28.030 and provided;
- A. The aquatic resources practices shall be limited to natural hatcheries;
 - B. The development and operation of the natural hatchery shall be within state and federal guidelines for the quality of surface water and groundwater;
 - C. All facilities shall be installed with a minimum disturbance to shoreline banks and existing channels;
 - D. Benefits of the natural hatchery will significantly outweigh the impacts;
 - E. That the benefits cannot be achieved at another location on the Green River not designated as a natural environment.

Project is consistent. There are no aquatic resource practices proposed.

25.28.060 Forest management practices. Forest management practices shall not be permitted in the natural environment.

Project is consistent. There are no forest management practices proposed.

25.28.070 Commercial development. Commercial development shall not be permitted in the natural environment.

Project is consistent. No commercial development is proposed downstream of HHD.

25.28.080 Signs. Signs, except educational signs of no more than twenty-five square feet within recreational developments and signs which are permitted for single detached residences by K.C.C. 21A.20.080 are not permitted in the natural environment.

Project is consistent. No signs will be installed downstream of HHD

25.28.090 Residential development. A. Multifamily and accessory development is prohibited in the natural environment.

B. Single-family residential development may be permitted in the natural environment subject to the general requirements of K.C.C. 25.28.030 and the single-family provisions 25.16.090 through 25.16.140 of the urban environment; provided, single-family residential development shall maintain a minimum setback of one-hundred feet from the ordinary high water mark, except that:

1. If the minimum setback from the ordinary high water mark of a river or stream falls within the floodway, the development shall be required to locate past the upland edge of the floodway.
2. If development is proposed on shorelines, including one or more sensitive areas, as defined in K.C.C. 21A.06, such development shall be done in accordance with regulations and procedures set forth in K.C.C. 21A.24.

C. Piers, moorages, floats or launching facilities accessory to single-family development shall not be permitted in the natural environment.

Project is consistent. There is no residential development proposed.

25.28.110 Utilities. Utility facilities may be permitted in the natural environment subject to the general requirements (Section 25.28.030) of this chapter and the utility requirements (Section 25.16.160) of the urban environment.

Project is consistent. No utilities are proposed downstream of HHD.

25.28.120 Industrial development. Industrial development shall not be permitted in the natural environment.

Project is consistent. No industrial development is proposed downstream of HHD.

25.28.130 Shoreline protection. Shoreline protection shall not be permitted in the natural environment.

Project is consistent. No shoreline protection is proposed downstream of HHD.

25.28.140 Excavation, dredging and filling. Excavation, dredging, and filling may be permitted in the natural environment subject to the provisions K.C.C. 25.16.190 of the urban environment, provided:

- A. Excavation, dredging, or filling below the ordinary high water mark shall be permitted only to mitigate conditions which endanger public safety or fisheries resources;
- B. Fill or excavation above the ordinary high water mark shall be permitted only to the extent permitted and necessary to construct development allowed in the natural environment;
- C. Channelizing, straightening or relocating rivers or streams shall not be permitted;
- D. Excavation or dredging of marshes, swamps or bogs shall not be permitted.

Project is consistent. No excavation, dredging, or filling will occur downstream of HHD.

25.28.150 Recreation. Recreational development may be permitted in the natural environment subject to the general requirements (Section 25.28.030) of this chapter, provided:

- A. The recreational development will not require any significant filling, excavation or regarding involving more than fifteen percent of that portion of the site within the shorelines of the state.
- B. The construction of indoor swimming pools, gyms and other indoor recreational facilities is prohibited.
- C. Piers, moorages, floats or launching facilities constructed in conjunction with recreational development shall not be permitted, except that floating walkways or other similar over water pedestrian structures facilitating access to observation points or viewing areas may be permitted.

Project is consistent. No recreational development will occur.

4. STATEMENT OF CONSISTENCY

Based on the above evaluation, the Corps has determined that the proposed modified reservoir refill, drawdown, and grout curtain extension at Howard Hanson Dam comply with the policies, general conditions, and activities as specified in the King County Shoreline Management Plan. The proposed action is thus considered to be consistent to the maximum extent practicable with the State of Washington Shoreline Management Program and the Coastal Zone Management Act of 1972.

Appendix C

COASTAL ZONE MANAGEMENT ACT

Concurrence Letter



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

April 21, 2010

U.S. Army Corps of Engineers
Planning Branch
Attn: Scott Pozarycki (PM-PL-ER)
Post Office Box 3755
Seattle, Washington 98124-3755

RE: Federal Consistency – Howard Hanson Dam Right Abutment 2010

Dear Mr. Pozarycki:

The Department of Ecology, Shorelands and Environmental Assistance Program received your letter for a Coastal Zone Consistency Determination regarding the investigation, reservoir refill, reservoir drawdown, and interim repair of the Howard Hanson Dam right abutment, located on the Green River, King County, Washington.

Upon review of the Draft Supplemental Environmental Assessment & Biological Assessment, Consistency Determination document, and the Public Notice, Ecology agrees with your determination that the proposed changes are consistent to the maximum extent practicable with the enforceable policies of Washington's Coastal Zone Management Program and will not result in any significant impacts to the State's coastal resources.

If you have any questions regarding this letter please contact Jessica Moore at (360) 407-7421.

Sincerely,

Brenden McFarland, Section Manager
Environmental Review and Transportation Section
Shorelands and Environmental Assistance Program

cc: Jessica Moore, Ecology



Appendix D

ENDANGERED SPECIES ACT

Concurrence Letter



**UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration**

NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

May 5, 2010

Anthony O. Wright, Colonel
U. S. Army Corps of Engineers
P.O. Box 3755
Seattle, Washington 98124-3755

Attention: Scott Pozarycki
Environmental Resources Section

Subject: Endangered Species Act Section 7 Informal Consultation for the Howard Hansen Dam Right Abutment Investigation, Reservoir Refill, Reservoir Drawdown, and Interim Repair. NMFS Consultation No. 2010/01889.

Dear Colonel Wright:

This correspondence is in response to your request for consultation under the Endangered Species Act (ESA).

Endangered Species Act

NOAA's National Marine Fisheries Service (NMFS) reviewed your March 11, 2010 request for consultation for Puget Sound (PS) Chinook salmon and PS steelhead, which are listed as threatened species under the Endangered Species Act (ESA) and for PS Chinook critical habitat. This consultation with NMFS is conducted under Section 7(a)(2) of the ESA and its implementing regulations, (*50 CFR Part 402*).

Background

According to the supplemental May 2009 Biological Assessment, the United States Army Corps of Engineers (Corps) is conducting testing and repair activities related to damage that occurred to the right abutment of Howard Hanson Dam (HHD) during the rain storm in January 2009. Water was stored to elevation 1,189 feet to prevent downstream flooding. This was a record flood storage elevation for the dam. While dam failure is not considered an imminent threat, depressions on the upstream face of the right abutment and turbid water in one of the drains in the right abutment tunnel create concerns that conditions may develop that could ultimately lead to dam failure.



Proposed Action

The proposed action is identified as the new alternative 6: Refill to 1,167 feet with potential for water storage above 1,167 feet for 7 days. The interim repair work includes 1) extending the 2009 grout curtain by 650 feet; 2) deepening 375 feet of the 2009 grout curtain; 3) constructing a concrete drill pad to support the 2010 grout extension; 4) installing a sheet pile wall at the south end of the 2009 grout curtain; and 5) replacing 10 existing vertical drains.

Effects of the Action

The reservoir refill should be unaffected by the proposed plan until elevation 1,167 feet is reached at which time the Corps will try to store additional water over a one week period. Weather conditions will determine if and how high the reservoir is raised above 1,167 feet. Based on probability, it is unlikely that 1,177 feet will be achieved during the five-year period of the proposed plan. The more likely outcome is several more feet of water storage above 1,167 feet during two out of the five years. A second attempt at increased storage above 1,167 feet would only occur if the first attempt achieves no more than a moderate reservoir elevation increase (2-3 feet). The second attempt to raise the reservoir above 1,167 feet will be subservient to the needs of downstream resources.

The practical effect of the increased storage will be to shift the hydrograph peak in time by three to four days. If this event occurs, it will be from mid-May to late June if it occurs at all. Peak inflows have been as high as 6,800 cfs, but are generally 2,800 cfs or less. If a high inflow occurs, only a portion of the peak flow could be stored, so above average discharges from HHD would occur.

If higher discharges occur, it will be during the latter part of the juvenile Chinook salmon outmigration. The result, Chinook smolts will experience either normal or higher than normal late spring outmigration flows. No adverse effect is anticipated.

Juvenile steelhead may still be outmigrating during the period when increased reservoir discharges may occur. Newly spawned steelhead eggs will be incubating during this time. No adverse effect is anticipated for outmigrating steelhead smolts. Incubating steelhead eggs could be scoured from redds if stream discharge exceeds 2,800 cfs, but such flows would only occur from natural processes, not reservoir operations.

Species Determination

Puget Sound Chinook salmon
Puget Sound steelhead

In the Green River Basin, Chinook salmon fry emerge from the stream gravel from January to early spring. Juvenile Chinook migrate beginning mid-January until early July. Returning adult Chinook salmon migrate into the river in August and September, spawning in September and October. Steelhead spawn from early to late spring, and most juveniles reside in the river about two years. Juvenile steelhead emigrate to salt water in March through June each year.

The proposed action has the potential to modify reservoir discharge by changing the schedule of operations of refill and drawdown. However, the amount and timing of the changed flows do not rise to the level of adverse effects on Puget Sound Chinook salmon or Puget Sound steelhead. Therefore, NMFS concurs with the effects determination of “may affect, but not likely to adversely affect,” for PS Chinook and steelhead.

Critical Habitat Determination

Puget Sound Chinook critical habitat

NMFS designated critical habitat for the PS Chinook salmon Evolutionarily Significant Unit (ESU) on September 2, 2005 (70 FR 52630). The three primary constituent elements (PCEs) for the PS Chinook salmon ESU critical habitat in this action area are freshwater migration, spawning, and juvenile rearing habitats. NMFS analyzed the potential effects of the proposed action on these PCEs and determined that the effects will be insignificant because:

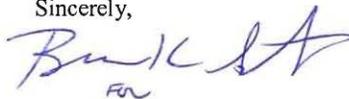
1. The actions will not result in a barrier to migration. Effects on migratory behavior are expected to be insignificant.
2. Potential effects on spawning habitats, while measurable, are likely insignificant in light of the normal snowpack and expected reservoir operations that will enable flows that support typical spawning conditions.

Therefore, NMFS concurs with your “may affect, not likely to adversely affect” determination for critical habitat for PS Chinook salmon.

This concluded informal consultation pursuant to the regulations implementing the ESA, 50 CFR 402.10. The Corps should reanalyze this project if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this consultation. The proposed action should also be reanalyzed if it is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this consultation, and or if a new species is listed or critical habitat for another species is designated that may be affected by this action.

The efforts by the Corps to design this action to minimize effects on listed species and habitat are appreciated. If you have any questions, please contact Steve Fransen at 360-753-6038 or steven.m.fransen@noaa.gov.

Sincerely,



Donna Darm
Acting Regional Administrator

Appendix E

Comments on Draft EA and Corps Responses

Comments received from Melissa Calvert, Assistant Tribal Operations Manager, Administration and Community Services, Muckleshoot Indian Tribe; received by letter dated April 8, 2010:

1.

Part of the project proposes to allow additional water storage for a one week period up to a maximum elevation of 1177 ft. This does not depart much from the 2009 approved short-term increase between two and 10 feet over 1167 ft. for less than seven days.

Our main concern is that water levels above 1167 may permanently affect actively growing vegetation and that those effects will not be mitigated. The difference between 1167 and 1177 is 109 acres, but not all of that would be covered during the entire week due to refill and discharge time.

In our comment letter last year we pointed out that mitigation areas WL-11, 23, 24, and 25 might be affected by storage above 1167. Our concern remains the same, these areas were designed to mitigate for storage to 1167 but now might be affected by the proposed temporary storage above 1167.

The SEA states:

“The purpose of limiting the height and duration of this action is to minimize stress on vegetation around the reservoir.”

“The Corps will undertake refill above 1167 feet, up to 1177 feet, no more than three times during the five-year project period.”

“The most likely scenario is several additional feet of water storage above 1167 ft during two out of the five years. This is the preferred alternative because it maximizes data collected about the right abutment and minimizes potential adverse effects.”

It appears from the above statements that the Corps is sensitive to vegetation effects if the water rises above 1167 for lengthy time periods. If the Corps raises water above 1167 no more than three times during the five year period, and the duration above 1167 is less than seven days, then the project may have little impact to vegetation above 1167.

The Corps should have permanent vegetation plots in place prior to raising the water level above 1167 to monitor the effects on vegetation. If plant death occurs, then the Corps must mitigate for those effects.

Corps response: Wildlife mitigation areas WL-11, 23, 24, and 25 were sedge plantings around the reservoir. There were several concerns about the success of these particular projects including, 1) the fact that soil conditions would not be consistent with sedge growth until after many years of inundation at the new water storage elevation, and 2) that it was likely natural sedge migration to these new elevations would occur similar to what

happened after the reservoir increase from 1141 ft to 1147 ft. As a result, a decision was made to construct alternate mitigation sites and monitor the sedge migration around the reservoir. This decision was coordinated with the resource agencies including the Muckleshoot Tribe. The alternate mitigation sites were constructed outside of the inundation zone at the Maywood, Cougar, and the North Fork sites.

The Corps will develop and implement a monitoring plan to confirm that any water storage above 1167 ft does not adversely impact vegetation around the reservoir. Monitoring will likely include vegetation surveys at several different locations conducted before the reservoir is increased above 1167 ft and during the falling autumn if the reservoir exceeds 1167 ft that spring. This would result in a maximum of ten vegetation surveys. Any measured adverse effects of greater than minimal significance will be mitigated.

Comment from David Vales, Wildlife Biologist, Muckleshoot Indian Tribe; received by email dated April 9, 2010:

2. One thing that should have been included in the comments sent yesterday was the "bathtub ring" of debris left behind after waters recede. If the bathtub ring ends up higher than 1167 then the debris may make animal travel more difficult and limit access to vegetation. We'd rather not see a bunch of large logs, etc, piled up higher than 1167.

Corps response: The vast majority of wood debris enters the reservoir during winter storms. During these storms, the Corps collects and corrals the debris behind storage booms until the summer at which time the debris is managed for various purposes. The reservoir storage above 1167 ft will occur after mid-May. By this time all debris received from the prior winter will be contained behind log booms so will not drift to higher elevations. There are two areas around the reservoir, near the North Fork Green River and near Baldi Field, where wood is contained behind log booms as an in-reservoir habitat project. At these locations wood is not prevented from drifting landward to elevations above 1167 ft. Depending on the volume of wood received at the reservoir, wood is annually sorted and managed at McDonald Field where it is beached during the high reservoir pool. During the period of this project, this beaching is likely to take place when the reservoir is at its maximum (ie greater than 1167 ft). Except for these three geographically small locations, the project should not result in wood depositing above 1167 ft around the reservoir. There is debris that ends up at elevations greater than 1167 ft as a result of floods. This occurs when flood storage exceeds 1167 ft and debris from the flood has not yet been corralled and is therefore still floating in the reservoir. It can become trapped among existing vegetation at those higher elevations because the Corps has no mechanism to retrieve it.

Comments from Holly Coccoli, Fisheries Biologist, Muckleshoot Indian Tribe; received by email April 9, 2010:

3. Thank you for the opportunity to review the draft Supplemental EA referenced above. The purpose of the proposed activities from 2010 to 2014 is to ensure a safe reservoir refill and drawdown, and to evaluate the integrity of the right abutment and the effectiveness of interim repairs. These activities include a grout curtain extension, a sheet pile wall, and drainage well replacement to control seepage through the right abutment. In addition, when water conditions allow, the Corps plans to store water above 1167 feet for a short duration for dam safety testing. Otherwise, spring reservoir refill and drawdown is expected to be normal in that “stops” during the refill period are not planned, nor is any restriction in storage volume or duration below 1167 feet unless monitoring shows a dam safety concern.

The EA discussion of effects on downstream fishery resources from short duration storage above 1167 feet should note that effects will only be negligible, as predicted in the draft Supplemental EA, if certain conditions are met. In addition to those described, these conditions are that (1) storage above 1167 feet should not decrease flows below any downstream flow targets that may be established in each year to protect existing steelhead redds; and (2) artificial flow peaks should be minimized and effectively mirror the inflow hydrograph to discourage new steelhead redds at high streambed elevations and minimize juvenile Chinook, coho, and steelhead stranding and trapping mortality downstream of the dam. We expect to work closely with the Corps and the Howard Hanson Dam Water Management Coordination Group during reservoir refill and drawdown operations for the protection of downstream fishery resources.

Corps response: The Corps anticipates 1) meeting any flow targets established by the Coordination Group for steelhead redds, including during any opportunistic reservoir fill above elevation 1167ft; and 2) managing artificial flow peaks to minimize juvenile stranding, and steelhead spawning at high stream bed elevations. As indicated in section 4.2, the reservoir and discharge will be managed to mimic as much as practicable the actual inflow hydrograph, only delayed by three or four days. These are objectives for the project.

4. The EA notes that capturing additional storage above 1167 feet during a spring refill provides for data collection to help manage and operate the dam during floods, and to determine the need and design for a permanent repair to the right abutment. Permanent repairs to the right abutment address one aspect of the flood risk reduction system in the Green River. The downstream levee system is closely coordinated with Howard Hanson Dam operations. Because the dam and the levees are a coordinated flood control system it is appropriate that the cumulative effects section of the EA describe the levee system, future plans for rehabilitation and replacement, environmental issues including the Corps levee vegetation policy, and the relationship between the dam, dam safety status, and the levee system.

Corps response: The cumulative impacts section of the June 2009 Final EA that is referenced in the SEA discusses the downstream levee system and levee maintenance. There is also discussion in section 1 of the June Final EA about flow management in the

Green River with respect to downstream channel capacity (i.e. the levied lower river) and the interaction between the two.

Future levee repair work is dependent on flooding in the Green River. In general, repairs of flood-damaged levee structures are made by the Corps at the request of a local sponsor and after an evaluation of levee damage. Levees in the Green River valley are maintained by the local sponsor. The purpose of Federal levee repair assistance, when conducted, is to restore the pre-existing level of flood risk reduction. Any levee repair work requested by local interests and conducted by the Corps, therefore, is not expected to adversely affect the flood risk reduction capacity of the Green River system, and is expected to complement the flood risk reduction mission served by HHD; levee repair work is further expected to be consistent with the purpose and need of the action evaluated in this SEA: to facilitate the continued safe and effective operation of HHD. The levee vegetation policy referenced in the comment is presently under consideration, and is the subject of a separate NEPA analysis, including opportunity for public comment. The objective of the policy development effort is to establish an approach that balances the interests of maintaining vegetation on levees to preserve, protect, and enhance natural resources and/or protect rights of Native Americans, with the safety, structural integrity, and functionality of the levee. The Corps' levee vegetation policy, when developed following consideration of public comment, is thus expected to be fully consistent with the flood risk reduction purposes served by HHD and fostered by the action evaluated in this SEA.

Appendix F

Finding of No Significant Impact



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

Environmental Resources Section

**Howard Hanson Dam
Right Abutment Investigation, Reservoir Refill,
Reservoir Drawdown, and Interim Repair
Green River, King County, Washington**

FINDING OF NO SIGNIFICANT IMPACT

1. Background. During a rain storm in January 2009, water was stored at Howard Hanson Dam (HHD) to elevation 1189 ft to prevent flooding downstream. This was a record flood storage height for the dam. During this time, two small depressions formed on the upstream face of the right abutment of the dam. Turbid water was observed from one of the drains in the right abutment drainage tunnel. The sediment movement combined with depression formation is an indication of potential piping. Piping is the movement of soil particles by percolating water leading to the development of a channel, and has been identified as a credible failure mode for the right abutment of the dam. Dam failure is not considered an imminent threat at this time. In spring 2009, the annual reservoir refill and drawdown strategy were modified to ensure that these actions could be conducted in a safe manner. In summer 2009, drainage wells and a grout curtain were installed along approximately 475 ft of the right abutment of the dam to control seepage.

2. Purpose and Need. The purpose of the proposed activities is to 1) ensure a safe reservoir refill and drawdown, 2) evaluate the integrity of the right abutment, including the effectiveness of the 2009 interim repair activities, and 3) control seepage through the right abutment of the dam. Furthermore, the actions will provide data to determine acceptable flood, conservation, and municipal and industrial water storage elevations so that HHD can be effectively operated to meet its authorized purposes.

3. Proposed Action. The selected alternative for reservoir refill from 2010-2014 is refill to 1167 ft with potential for water storage above 1167 ft for seven days up to a maximum elevation of 1177 ft. As a result of the 2009 grout curtain and drainage well construction, seepage through the right abutment is expected to be reduced. Therefore the presumed 2010-2014 reservoir drawdown plan is the no action – normal drawdown alternative without any reservoir restrictions. However, the actual drawdown plan will be determined in real time based on monitoring data. If monitoring data indicates an expedited drawdown is warranted, it could occur at any point during the refill. Its character is expected to be similar to the 2009 drawdown. This consisted of a two to three week draft of the reservoir from 1167 ft to 1155 ft. The selected interim repair alternative is a grout curtain and dewatering well replacement. This includes extending the 2009 constructed grout curtain to the northeast by approximately 650 ft, deepening

a 350 ft segment of the 2009 grout curtain so that it extends into bedrock, installing a 60-70 foot long sheet pile wall at the south end of the 2009 grout curtain footprint, and replacing ten existing drainage wells. The interim repair work is currently planned for 2010, but may be delayed depending on funding and/or authority considerations.

4. Summary of Impacts. Pursuant to the National Environmental Policy Act, the attached Supplemental Environmental Assessment (SEA) has been prepared. The SEA is intended to supplement the June 2009 final Environmental Assessment that evaluated the 2009 reservoir refill, drawdown, and interim repair activities. Potential environmental impacts of the proposed reservoir refill alternative include inundation and stress to flora and fauna during the one week period the reservoir exceeds elevation 1167 ft. This may potentially result in the loss of some bird nests and eggs, temporary displacement of some wildlife, some stranding of fish as the reservoir is quickly drafted from 1177ft, and some sloughing around the reservoir. The project is designed to minimize these effects by limiting the duration and the magnitude of the water storage above 1167 ft. Monitoring of vegetation and nesting birds will occur around the reservoir to verify the negligible impact assumptions. Any documented impacts of more than minimal significance will be mitigated. Downstream effects include altering the natural hydrograph by decreasing natural flows for a period of three to four days and then increasing flows for a similar timeframe. Since the range of flows expected should be within that which would naturally occur this time of year, effects on in stream resources including steelhead and Chinook salmon that are listed under the Endangered Species Act should be minimal.

The presumed no action - normal reservoir drawdown alternative will result in no impacts, as compared with normal operations. However, if right abutment monitoring data require a more expedited drawdown, this will result in decreased municipal and industrial water available for Tacoma. Due to an agreement between Tacoma and the Muckleshoot Tribe, this may result in decreased flows for fisheries and less water available to meet in stream flow requirements.

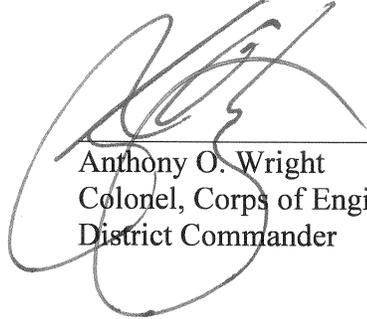
The proposed interim repair occurs entirely within the already disturbed footprint of the right abutment of the dam. Negligible impact to the upland environment is anticipated. No trees should be removed. There is potential for water quality effects associated with grout escaping into the reservoir. Based on results from the 2009 grout curtain, best management practices should successfully contain all grout at the project site. A monitoring plan will be employed to verify this. The dewatering wells will be constructed along an existing road. No additional land should be cleared. Negligible impact is expected from the well work.

The project will result in no discharge of fill to waters of the United States. Therefore a Clean Water Act Section 404 evaluation is not required. The work has been analyzed pursuant to the Coastal Zone Management Act. The Washington Department of Ecology has concurred with the Corps assessment that the proposed plan is consistent to the maximum extent practicable with the enforceable policies of the Washington Coastal Zone Management Program. The National Marine Fisheries Service has concurred with the Corps determination that the proposed actions are *not likely to adversely affect* steelhead, Chinook salmon, and Chinook salmon critical habitat. Both steelhead and Chinook salmon are listed as threatened under the Endangered Species Act (ESA). The Corps determination for all other ESA listed species is *no effect*.

National Historic Preservation Act compliance for construction and operation activities at the Howard Hanson Dam Reservoir and associated projects was addressed in a 2003 Memorandum of Agreement (MOA) signed by the Corps, Tacoma Water, and the Washington Department of Archaeology and Historic Preservation. The Muckleshoot Tribe was consulted during development of the MOA and did not sign, but supports its provisions. The Corps has reached a determination of no potential to cause effects to historic properties for the proposed actions.

5. Finding. For the reasons described above, I have determined that the proposed actions will not result in significant environmental impacts. The project will not constitute a major Federal action with significant impacts on the environment and, therefore, does not require an environmental impact statement.

7 May 2010
Date



Anthony O. Wright
Colonel, Corps of Engineers
District Commander