DEQ Requests Comments on Proposed Willamette Water Supply System Thermal Trading Plan Approval

The Oregon Department of Environmental Quality invites the public to provide written comment on the Willamette Water Supply System Commission’s proposed thermal trading plan, known officially as a water quality trading plan.

Summary
Subject to public review and comment, DEQ intends to approve the water quality trading plan, which allows Willamette Water Supply System Commission to meet regulations for temperature impacts to the Willamette River in their water quality certification. Part of the review process is an opportunity for public comment on the draft trading plan, based on the draft plan and other DEQ information.

Where can I get more information?
View information about this proposed plan, including the related water quality certification, draft trading plan and underlying documents, either online at https://go.usa.gov/xdkWj, or by contacting Wade Peerman to make an appointment to review the documents in person:

Phone: 503-229-5046 or 800-452-4011
Fax: 503-229-6124
Email: Peerman.Wade@deq.state.or.us

How do I participate?
You may submit your comments by mail, fax or email to:

Wade Peerman, Alternative Compliance Specialist
Oregon Department of Environmental Quality
700 NE Multnomah Street, Suite 600
Portland, OR 97232

Fax: 503-229-6124
Email: 401publiccomments@deq.state.or.us

All comments are due by 5 p.m., Friday, March 20, 2020. All comments will become part of the public record.

DEQ may hold a public hearing on the plan, if one is requested by 10 or more people or an organization representing 10 or more members.

About the facility and the receiving water
The Willamette Water Supply System Commission is an Oregon intergovernmental entity formed by Tualatin Valley Water District, the City of Hillsboro and the City of Beaverton. The Commission was formed to build the Willamette Water Supply System in response to planned growth in their service areas. The system will provide an additional, resilient water supply for Washington County. When complete, it will be one of Oregon’s most seismically-resilient water systems—built to better withstand natural disasters, protect public health and speed regional economic recovery through restoring critical services more quickly.

The Willamette Water Supply System will include more than 30 miles of water transmission pipelines, taking untreated water from the Willamette River at facilities in Wilsonville where it will be pumped through the treatment plant and sent to Hillsboro and the Tualatin Valley Water District service areas. The Willamette Water Supply System also includes constructing two finished-water storage tanks (terminal storage) and expanding the water treatment facilities, including replacing the fish screens and seismic improvements at the existing intake facility on the Willamette River.

Water withdrawals, like this water system taking water from the Willamette, can lead to temperature increases in the river downstream. The proposed trading plan seeks to fulfill the temperature offset requirement of the Clean Water Act, Section 401 water quality certification as it pertains to the water system. The plan describes actions the water system will take to offset the thermal impacts of the water withdrawal.

What types of pollutants does the plan cover?
This plan sets conditions for how the facility deals with the following pollutants: Temperature.

The proposed plan sets requirements to generate credits in kilocalories per day to offset the thermal impacts of the facility.

How did DEQ determine the proposed plan requirements?
DEQ evaluates types and amounts of pollutants and the water quality of the surface water or groundwater where the pollutants are proposed to be discharged, and determines permit requirements to ensure the proposed discharges will meet
applicable statutes, rules, regulations and effluent guidelines of Oregon and the U.S. Environmental Protection Agency.

For this action, DEQ evaluated Oregon Administrative Rules, Chapter 340, Division 039. These are Oregon’s rules for water quality trading programs. These rules may be reviewed online at: https://go.usa.gov/xdkSH.

DEQ finds this trading plan is consistent with Oregon Administrative Rules Chapter 340 Division 039 and therefore proposes to approve the trading plan.

How does DEQ monitor compliance with the plan requirements?
This plan will require the facility to monitor Best Management Practices described in the plan using the proposed monitoring practices and BMP quality standards. DEQ reviews the facility’s annual reports to check for compliance with plan and certification conditions. DEQ also reviews the reports to determine if the appropriate thermal credits have been created to offset the impact.

What happens after the public comment period closes?
DEQ will consider and respond to all comments received and may modify the proposed plan based on comments. DEQ gives equal weight to written and oral comments.

Alternative formats
DEQ can provide documents in an alternate format or in a language other than English upon request. Call DEQ at 800-452-4011 or email deqinfo@deq.state.or.us.
Regulatory Background Supporting Trading in Oregon

The Oregon Department of Environmental Quality (DEQ) has been issuing permits that include thermal credit trading since 2004, when a permit was issued to Clean Water Services that allowed two publicly owned treatment works (POTWs) to receive thermal credits by restoring and managing riparian areas to create shade and releasing cold water from an upstream reservoir. The thermal trading credits allowed the POTWs to comply with water quality-based effluent limitations for temperature in their National Pollutant Discharge Elimination System (NPDES) permits.

In 2015, the Oregon Environmental Quality Commission (EQC) approved Oregon Administrative Rule (OAR) 340 Division 039, a set of rules outlining the basic requirements for a viable water quality trading program. Following this, in 2016, DEQ updated its Water Quality Trading Internal Management Directive (IMD)¹ to complement the changes in the new rules.

The Willamette Water Supply System Commission (WWSS Commission) is an Oregon intergovernmental entity formed by Tualatin Valley Water District (TVWD), the City of Hillsboro, and the City of Beaverton. The WWSS Commission was formed to build the Willamette Water Supply System (WWSS) in response to planned growth in their service areas. The WWSS will provide an additional, resilient water supply for Washington County. When complete, the WWSS will be one of Oregon’s most seismically-resilient water systems—built to better withstand natural disasters, protect public health, and speed regional economic recovery through restoring critical services more quickly.

The Willamette River, one of Oregon’s largest rivers, is the WWSS’s new supply source. The raw water intake is located at the Willamette River Water Treatment Plant in Wilsonville. From there, raw water will be pumped to the WWSS Water Treatment Plant, a new state-of-the-art water filtration plant where multiple treatment processes will produce high quality drinking water. Drinking water will be pumped to reservoir facilities on Cooper Mountain, then will be gravity-fed to additional storage and customers in the TVWD, Hillsboro, and Beaverton service areas. The new system will be completed by 2026.

TVWD has been designated the Managing Agency for the WWSS Commission, and TVWD operates the Willamette Water Supply Program (WWSP) to plan, design, and construct the WWSS.

The WWSS will include more than 30 miles of water transmission pipelines ranging in diameter from 36 inches to 66 inches from the raw water facilities in Wilsonville north to Hillsboro and the TVWD service areas. The WWSS also includes constructing two finished-water storage tanks (terminal storage) and expanding the raw water facilities, including replacing the fish screens and seismic improvements at the existing intake facility on the Willamette River. The WWSS will provide the Partners and the region with a seismically resilient water supply to meet future water demands and provide redundancy in case of a future emergency event.

This Thermal Trading Plan (TTP) seeks to fulfill the temperature offset requirement of the Clean Water Act (CWA), Section 401 water quality certification (WQC) as it pertains to the WWSS.

Previous TTPs have been used to address discharges under NPDES permits. This TTP differs because it describes the plan for offsetting the temperature impact of a water withdrawal, as opposed to a discharge, and because it is associated with a Clean Water Act (CWA) Section 401 water quality certification (WQC), rather than a NPDES permit. While discharges typically result in their maximum impact at the discharge point, a withdrawal is different—it’s impact is likely to occur well downstream of the withdrawal after atmospheric conditions have had

time to act on the reduced volume of water remaining in the river. These impacts are further discussed below in
the section describing the trading area.

This TTP is consistent with OAR 340 Division 039 and the 2016 Water Quality Trading IMD.

Eligibility

OAR 340-039-0015: ELIGIBILITY
The WWSS Commission is pursuing this trading program as part of its Section 401 WQC and is therefore eligible to
trade under OAR 340-039-0015(1). Temperature is one of the water quality parameters eligible for trading under
OAR 340-039-0015(2). The Willamette River is eligible for trading under OAR 340-039-0015 (3) because it is
consistent with water quality management plan in the 2006 temperature TMDL.²

Proposed Trading Plan

The following subsections describe how the WWSS Commission’s proposed trading plan aligns with each of the
required components of a trading plan, as described in OAR 340-039-0025(5).

OAR 340-039-0025(5)(A): TEMPERATURE TRADING
A trading plan must identify the parameter for which water quality trading is proposed. The WWSS Commission’s
trading plan is proposed for water temperature.

OAR 340-039-0025(5)(B): BASELINE
Oregon defines the “trading baseline” as the “pollutant load reductions, BMP requirements, or site conditions that
must be met under regulatory requirements in place at the time of trading project initiation.” OAR 340-039-
0005(6). A trading plan must identify “any applicable regulatory requirements from OAR 340-039-0030(1) that
apply within the trading area and that must be implemented to achieve baseline requirements.” Credits are
generated when the trading project results in water quality benefits above the trading baseline. Establishing a
baseline ensures that credits are not used to meet an existing regulatory obligation or used by more than one
entity at any given time. Applicable regulatory requirements can include³:

• NPDES permit requirements
• CWA section 401 certifications
• Agricultural water quality management area rules
• Oregon Board of Forestry rules
• Federal management plans or agreements between the state and a federal agency
• Local ordinances
• Tribal laws or rules
• Requirements derived from a TMDL by designated management agencies responsible for TMDL
  implementation.

The WWSS Commission will evaluate whether any of the baseline requirements described in the rule apply to the
potential trading sites. If affirmative requirements do apply to trading project sites, baseline BMPs can be installed
or deductions to site thermal benefit totals can be made to ensure that credit is not being taken for actions that
were required under baseline obligations. If no baseline obligations exist at the proposed trading project site

https://www.oregon.gov/deq/wq/tmdls/Pages/TMDLs-Willamette-Basin.aspx
³ Draft City of Ashland Trading Plan v3 (March 2018)
(described below), the baseline obligation would be equal to current conditions. Table 1 provides an overview of the baseline requirements listed in the trading rule that might apply to the proposed trading projects.

Table 1. Overview of Baseline Requirements Potentially Applicable to WWSS Commission Proposed Trading Projects within the Trading Area.

<table>
<thead>
<tr>
<th>ORS 340-039-0030(1)</th>
<th>BASELINE REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) NPDES permit requirements</td>
<td>None</td>
</tr>
<tr>
<td>(b) Rules issued by Oregon Department of Agriculture for an agricultural water quality management area under OAR chapter 603 division 095</td>
<td>The WWSS Commission has identified potential trading projects in the Tualatin River Watershed Agricultural Water Quality Management Program and the Molalla/Pudding/French Prairie/North Santiam Agricultural Water Quality Management Program. Requirements will be evaluated on a case-by-case basis as trading projects are further defined.</td>
</tr>
<tr>
<td>(c) Rules issued by Oregon Board of Forestry under OAR chapter 629 divisions 610-680</td>
<td>Not currently applicable; forestry-zoned sites are not currently under consideration for implementation.</td>
</tr>
<tr>
<td>(d) Requirements of a federal land management plan, or an agreement between a federal agency and the state</td>
<td>Any projects within National Wildlife refuges will follow associated Comprehensive Conservation Plans. Other requirements will be evaluated on a case-by-case basis as trading projects are further defined.</td>
</tr>
<tr>
<td>(e) Requirements established in a Clean Water Act Section 401 water quality certification</td>
<td>Other than the Section 401 WQC, which this Thermal Trading Plan is intended to address, the WWSS Commission is not aware of any WQCs applicable to the proposed trading projects.</td>
</tr>
<tr>
<td>(f) Local ordinances</td>
<td>Not applicable. No applicable local ordinances have been identified that would impact the potential trading projects. The WWSS Commission will continue to evaluate any applicable local ordinances on a case-by-case basis as trading projects are further defined.</td>
</tr>
<tr>
<td>(g) Tribal laws, rules, or permits</td>
<td>Not currently applicable. The WWSS Commission is not aware of Tribal laws, rules or permits applicable to the potential trading projects. Requirements will be evaluated on a case-by-case basis as trading projects are further defined.</td>
</tr>
<tr>
<td>(h) Other applicable rules affecting nonpoint source requirements</td>
<td>Not currently applicable. The WWSS Commission is not aware of any other applicable rules affecting nonpoint source requirements at the potential trading projects. Requirements will be evaluated on a case-by-case basis as trading projects are further defined.</td>
</tr>
</tbody>
</table>
(i) Projects completed as part of compensatory mitigation, or projects required under a permit or approval issued pursuant to Clean Water Act section 404, or a supplemental environmental project used to settle a civil penalty imposed under OAR chapter 340 division 012 of the Clean Water Act.

Project sites are being evaluated. On a case-by-case basis, the WWSS Commission will verify that the baseline requirements for a CWA or Supplemental Environmental Project site are met prior to calculating credits.

(j) Regulatory requirements a designated management agency established to comply with a DEQ-issued TMDL, water quality management plan or another water pollution control plan adopted by rule or issued by order under ORS 468B.015 or 468B.110.

The WWSS Commission will ensure that projects comply with baseline requirements associated with the Willamette River TMDL prior to calculating credits. Oregon State Parks is a designated management agency in the Willamette Temperature TMDL and may have requirements related to their land management activities. If any trading projects occur on state parks land, the associated baseline requirements will apply. Requirements will be evaluated on a case-by-case basis as trading projects are further defined.

The WWSS Commission will verify that all baseline requirements identified in Table 1 for its trading projects are met before calculating credits for its trading BMPs.

**OAR 340-039-0025(5)(C): TRADING AREA**

A trading plan must include a “description of the trading area including identification of the location of the discharge to be offset, its downstream point of impact, if applicable, where trading projects are expected to be implemented, and the relationship of the trading projects to beneficial uses in the trading area.” Trades must occur within the same watershed or area covered by a TMDL so that the benefits of the trades occur in same waterbody where the discharge is occurring. A trading area is also required to “encompass the location of the discharge to be offset, or its downstream point of impact, if applicable, and the trading project to be implemented.” Trading areas must also be consistent with the TMDL water quality management plans (WQMP), where they exist.

The WWSS withdrawal is located at Willamette River Mile (RM) 38.7, approximately 3 miles upstream of the point where the Molalla River enters the Willamette (RM 35.6). The point of maximum impact of the WWSS withdrawal is located at RM 27.1, approximately 11.6 miles downstream of the withdrawal. The trading area will be the full Willamette River basin upstream of the point of maximum impact (see the map in Appendix A). The map indicates the location of the withdrawal, the point of maximum impact and the location of the reservoirs associated with the U.S. Army Corps of Engineers Willamette Valley Project, from which stored water may be available. The map also indicates the location of the Tualatin River, Pudding River and Molalla River, which enter the Willamette River between the withdrawal and the point of maximum impact. Riparian Shading, Floodplain Resiliency and In-stream Habitat Restoration BMPs (discussed below) may be identified and conducted on the Willamette River mainstem and its tributaries upstream of the point of maximum impact. Additionally, as discussed below, purchase of stored water that would enter the Willamette upstream of the point of maximum impact would be quantitatively assigned.

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5 OAR 340-039-0005(5)
6 OAR 340-039-0035(2)
demonstrated to reduce the temperature impact at the point of maximum impact. The full trading area is within the Willamette River basin and covered by the 2006 Temperature TMDL.

OAR 340-039-0025(5)(D): BMPS

Pursuant to the trading rule, a trading plan must include a “description of the water quality benefits that will be generated, the BMPs that will be used to generate water quality benefits, and applicable BMP quality standards.” A BMP is defined as “in-water or land-based conservation, enhancement or restoration actions that will reduce pollutant loading or create other water quality benefits. BMPs include, but are not limited to, structural and nonstructural controls and practices and flow augmentation.” A BMP quality standard must include “specifications for the design, implementation, maintenance and performance tracking of a particular BMP that ensure the estimated water quality benefits of a trading project are achieved, and that allow for verification that the BMP is performing as described in an approved trading plan.”

The primary BMP that will be used to generate thermal benefits under this thermal trading plan is the riparian shade BMP (Appendix B) at the proposed trading projects. The main purpose of the riparian shade BMP is to reduce thermal loading by blocking solar radiation. The methodology for calculating thermal credits will be discussed in the next section.

The BMP quality standard proposed by the WWSS Commission for riparian shade will include the following components:

- Projects will be implemented on public lands that have an established restoration plan and the intent of the land is for restoration and similar public benefit purposes. Conducting restoration on such properties will allow the associated benefits to be adequately preserved. If projects are to be implemented on private property, the appropriate easements and encumbrances will be acquired.

- Riparian Shade BMPs will be designed, implemented, monitored, verified, and tracked consistent with the TTP Standards for Riparian Restoration Projects (see Appendix B), which are based on the Willamette Partnership’s Performance Standards for Riparian Revegetation (Willamette Partnership 2016).

- In accordance with maintenance plans developed at the outset of credit projects, BMPs will be visited regularly for maintenance, especially in early “establishment” years. During site establishment, minimum maintenance on most sites will usually include one spring ring spray, one summer mow or cut, and one fall spot spray. In irrigated riparian areas with water rights, irrigation may be an appropriate option during the first several years. Once a site has become established, maintenance activities will continue, but may occur at less frequent intervals.

- Details on the performance tracking and verification aspects of the WWSS Commission’s proposed BMP quality standards are described below in the subsections corresponding with OAR 340-039-0025(5)(G) verification, and (H) tracking/reporting.

- Projects will include the removal of invasive species and replanting of native trees to increase stream side shading. Habitat restoration will be incorporated where replanting occurs.

- In addition to riparian shading, consideration will be given to increasing instream habitat complexity, enhancing riparian habitat, and reconnecting off-channel habitats. Where possible, efforts will be made to create cold water refugia, which are identified in the 2006 Willamette River TMDL as an important consideration because of the importance of offering migrating

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7 OAR 340-039-0005(1)
8 OAR 340-039-0005(2)
salmonids refugia from warmer river temperatures in the summer.

Two additional types of BMPs, Floodplain Resiliency and In-stream Habitat Restoration BMPs, are discussed in Appendix C. The floodplain habitat resiliency BMP focuses on habitat improvements along floodplains (generally within the 10-year floodplain and consisting of riparian and upland habitats) to improve the functions of native aquatic ecosystems. These improvements will allow for continued stream shading after a channel migrates across the floodplain, rather than channel migration into more degraded areas. The in-stream habitat BMP focuses on activities within the stream channel, including side channels inundated with at least a 2-year return interval. Key activities may include increasing stream habitat complexity, reconnecting or creating new side channels, improving cold water refugia access to fish and other activities supporting habitat for key species.

Additional BMP types may be proposed during the life of this TTP. Each new BMP type will be detailed in an addendum to this TTP, with review and approval by DEQ prior to implementation.

**Stored Water**

Water stored behind U.S. Army Corps of Engineers (USACE)-operated dams as part of the Willamette River Valley Project is in the process of being allocated; some of this water will be allocated to municipalities, including the WWSS partners. This water will become available for water supply and releasing some of this stored water may be a potential mitigation strategy for river water temperature impacts and augmenting summer water supplies for the WWSS partners.

The impact of utilizing stored water could be quantified through CE-QUAL-W2 model simulations. The releases would be added to the model(s) at the appropriate upstream locations and the impact on water temperatures, particularly at the point of maximum impact, could be evaluated using the CE-QUAL-W2 models developed for the Willamette River Temperature TMDL.

**OAR 340-039-0025(S)(E): TRADING RATIOS**

Trading ratios are “a numeric value used to adjust the number of credits generated from a trading project, or to adjust the number of credits that a credit user needs to obtain.” In Oregon, trading ratios can be used to account for time lags, attenuation of water quality benefits, among other uncertainties. A trading plan must include a “description of applicable trading ratios, the basis for each applicable trading ratio, including underlying assumptions for the ratio, and a statement indicating whether those ratios increase or decrease the size of a credit obligation or the number of credits generated from an individual trading project.”

To date, in Oregon riparian shade restoration trading programs, DEQ has approved a 2:1 trading ratio. Based on a minimum 20-year credit life, this ratio accounts for the temporal lag in thermal benefits between planting (Year 0) and when the planted vegetation (e.g., trees and others) reach full shade-producing heights (Year 20). The ratio is based on the growth curves of riparian vegetation. For example, Black Cottonwoods (*Populus trichocarpa*), under typical regional conditions, grow to 43 feet tall after ten years and 81 feet tall after twenty years. Thus, by year 10, approximately half of the anticipated future thermal benefits will have been achieved at the site, supporting the use of a 2:1 ratio. Black Cottonwood is an appropriate example since it is a native species regularly planted by riparian restoration practitioners in Oregon. The growth curve for Black Cottonwoods is representative of typical species used for riparian restoration in Oregon.

Temperature model simulations were conducted using the previously developed CE-QUAL-W2 model (from the 2006 Willamette River Temperature TMDL) to evaluate the temperature impact of the WWSS withdrawal over

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9 OAR 340-039-0005(10)
10 Draft City of Ashland Trading Plan v3 (March 2018)
time and longitudinally along the river. As was done for the TMDL study, the models were run for April-October 2001 and 2002 for the Middle Willamette River (Salem to Willamette Falls, River Mile (RM) 85.5 to 26.8) and April-September 2001 and 2002 for the Lower Willamette River (Willamette Falls to the Columbia River). The analysis demonstrated that the impact on 7-Day average of daily maximum (7DADM) water temperatures in the Willamette River is very small, with a maximum of 0.078 degrees C. Additional analyses were conducted because the maximum withdrawals will not occur until decades after withdrawals begin in 2026. The temperature impacts of the withdrawal were evaluated based on water demand estimates for 2026, 2035, 2045, and 2065 as described in David Evans and Associates (2017). For purposes of evaluating curtailment, it was assumed that any withdrawal above the currently permitted amount for Wilsonville would be curtailed based on the conditions of the City of Beaverton’s permit number S-54940 (applicable only for the 2065 demand simulation). It was further assumed that 112.4 cfs of water were available for the Willamette River Water Coalition Permit S-49240 for 2026, 2035, and 2045 conditions (following GSI, 2017) and that access to 127.6 cfs (82.5 million gallons per day (MGD) were available for the 2065 conditions (to match total estimated 2065 demand from Tualatin Valley Water District, Sherwood, and Tigard). Figure 1 shows the simulated maximum Willamette River water temperature impact of the WWSS withdrawal over time beginning in 2026.

Figure 1. Simulated maximum 7DADM temperature impact (based on modeling calendar year 2001) for the WWSS withdrawal as a function of time, using water demand estimates from David Evans and Associates (2017).

Based on the results in Figure 1, the maximum water temperature impact of the WWSS withdrawal (based on flow conditions from calendar year 2001) will be reached at full build out in 2085. The maximum impact in years prior to 2085 will be approximately 52% of the 2085 maximum in 2026, 63% in 2035, 79% in 2045, and 97% in 2065. Overall, it is estimated that, from 2026 through 2085, the cumulative maximum water temperature impact will be approximately 84% as great as if the full withdrawal began in 2026. It is important to note that this value is a very conservative estimate because it is based on river flows from 2001, a very dry year, and accounts for all withdrawals including the 70-MGD Willamette River Water Treatment Plant (WRWTP) withdrawal that has already been permitted.

Based on the results above, The WWSS Commission proposes to modify the standard 2:1 trading ratio, because the lag time for plant growth will be offset in part by the delay in accessing the water (2026) and in reaching the full impact of the withdrawal (2085). Using the 84% result above and multiplying by the standard 2:1 ratio, an adjusted ratio of 1.68:1 is obtained. Rounding this ratio up (to be conservative), a 1.7:1 ratio is proposed for the WWSS withdrawal. Floodplain Resiliency and In-stream Habitat Restoration BMPs, which are difficult to quantify in terms of kilocalories, will nevertheless provide benefits to fish and overall aquatic ecosystem health. While the extended timeline for the full thermal impact of the withdrawal is the basis for the reduced trading ratio, Floodplain Resiliency and In-Stream Habitat Restoration projects will provide additional support and justification for the reduced ratio.

OAR 340-039-0025(5)(F): CREDITS
The trading rule requires that a trading plan include a “description of the credits needed to meet water quality-based requirements of an NPDES permit or 401 water quality certifications, including:

- Quantity and timing: The number of credits needed and any credit generation milestones, including a schedule for credit generation;
- Methods used: How credits will be quantified, including the assumptions and inputs used to derive the number of credits; and
- Duration of credits: A description of the length of time credits are expected to be used.”

Credits Needed
This subsection identifies the projected excess thermal load exceedance(s) throughout the year. For a discharge, thermal exceedance is equal to: \( \text{Facility Excess Thermal Load} - \text{Excess Thermal Load Limit} \), or \( \text{ETL} - \text{ETLL} \), where:

\[
\text{ETL} = (\text{Flow effluent (cfs)}) \times (\text{°C effluent} - \text{°C Temperature Criteria}) \times (\text{Conversion Factor})
\]

\[
\text{ETLL} = (\text{Flow river (cfs)} + \text{Flow effluent (cfs)}) \times (\text{Human Use Allowance}) \times (\text{Conversion Factor})
\]

Because the WWSS Commission’s trading plan is for a withdrawal rather than a discharge, the credits to be offset must be calculated differently. Calendar year 2001 was a very dry year in which Willamette River flows were below the 7Q10 flows for much of the summer, making it an appropriate year for consideration of the water temperature impacts of the WWSS withdrawal. Calendar year 2002 was a more typical year, and previous modeling\(^\text{14}\) indicated smaller water temperature increases. For each day during the modeled period for Calendar Year 2001 (April through October), a heat load was calculated as follows:

\[
\Delta T \ast Q \ast 1000 \frac{kg}{m^3} \ast 86400 \frac{s}{day} \ast \frac{1 \text{ kcal}}{kg \ast °C} = \text{Heat Load (kcal/day)}
\]

Where:
\( \Delta T \) is the increase in Daily Maximum water temperature (above the baseline scenario discussed below), in degrees C
Q is the Daily Average flow in the river at the location of maximum impact, in cubic meters per second (cms)

The previous analysis considered two baseline scenarios:
- TMDL model, with no adjustment
- TMDL model, with 70 MGD of withdrawal to account for the already-permitted WRWTP withdrawal (Baseline-1)

For this analysis, an additional baseline scenario was considered (Baseline-2):

- TMDL model, with the 70-MGD WRWTP withdrawal and a 56-cfs (1.586 cms) withdrawal at the upstream end of the Middle Willamette River model to account for the 56-cfs water right purchased by the City of Hillsboro under Permit S-45565 (GSI, 2017).

The purchase of the 56 cfs water right guarantees that this amount of water remains in the river downstream to the point of the WWSS withdrawal under future conditions. This is analogous to flow augmentation and comparing the maximum WWSS withdrawal scenario to a baseline scenario which includes the 56 cfs of withdrawal upstream of the WWSS withdrawal provides an accurate assessment of the net impact of the increased WWSS withdrawal, which is partially offset by the augmentation of river flows in the middle Willamette River upstream of the withdrawal.

For consistency with the impact quantification approach applied in other trading plans (the City of Ashland Draft Trading Plan\textsuperscript{15} and the Clean Water Services Thermal Load Management Plan\textsuperscript{16}), after calculation of the heat load for each day according to the above formula, the maximum rolling 30-day average heat load was determined.

Based on this analysis, the maximum rolling 30-day average heat load is **30.2 million kcal/day**.

More detailed results are presented in Figure 2, which shows the backwards-looking rolling 30-day average heat load increase for the maximum scenario relative to the two baseline scenarios. The value for a given date is the average of the heat load increases for the preceding 30 days. For dates where the line is not visible, the 30-day average heat load increase is negative (i.e. the maximum scenario is colder than the baseline scenario). The figure indicates that the maximum rolling 30-day average heat load increase above the “Baseline-1” scenario is 237.3 million kcal/day. The maximum 30-day average heat load increase above the “Baseline-2” scenario, which accounts for the “flow augmentation” guaranteed by the purchase of the 56-cfs water right, occurs 10-days later and is 30.2 million kcal/day, 12.7% of the increase above “Baseline-1.”

\textsuperscript{15} Draft City of Ashland Trading Plan v3 (March 2018)

The average values for each calendar month (average of the daily heat-load increases for each day within the calendar month) are shown in Table 2. The calendar months where the average increases are negative (i.e. a decrease) are indicated. For both scenarios, the maximum rolling 30-day average includes dates from both August and September, explaining why the maximum values in Table 2 are lower than those indicated in Figure 1.

Table 2. Average Daily Heat Load Increase for each calendar month for the Maximum Scenario above Two Baseline Scenarios, at the Point of Maximum Impact (RM 27.1).

<table>
<thead>
<tr>
<th>Month</th>
<th>Maximum – Baseline-1 (million kcal/day)</th>
<th>Maximum – Baseline-2 (million kcal/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>April</td>
<td>70.2</td>
<td>&lt;0</td>
</tr>
<tr>
<td>May</td>
<td>13.8</td>
<td>&lt;0</td>
</tr>
<tr>
<td>June</td>
<td>24.7</td>
<td>&lt;0</td>
</tr>
<tr>
<td>July</td>
<td>77.5</td>
<td>&lt;0</td>
</tr>
<tr>
<td>August</td>
<td>107.7</td>
<td>&lt;0</td>
</tr>
<tr>
<td>September</td>
<td>193.6</td>
<td>18.7</td>
</tr>
<tr>
<td>October</td>
<td>&lt;0</td>
<td>&lt;0</td>
</tr>
</tbody>
</table>

Table 3 presents the highest backwards-looking rolling 30-day average heat load increase for each calendar month (e.g. the value for a given date represents the preceding 30 days—the value reported for July 31 would represent
the average heat load increase for July 1 – July 30). April is thus omitted from the table because the first backwards-looking 30-day average heat load is reported in May. The table indicates that the maximum values occur in September, which is also demonstrated in Figure 1.

Table 3. Highest Backwards-Looking Rolling 30-Day Average Heat Load Increase Ending in Each Calendar Month for the Maximum Scenario above Two Baseline Scenarios, at the Point of Maximum Impact (RM 27.1).

<table>
<thead>
<tr>
<th>Month</th>
<th>Maximum – Baseline-1 (million kcal/day)</th>
<th>Maximum – Baseline-2 (million kcal/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>86.2</td>
<td>&lt;0</td>
</tr>
<tr>
<td>June</td>
<td>48.9</td>
<td>&lt;0</td>
</tr>
<tr>
<td>July</td>
<td>139.2</td>
<td>&lt;0</td>
</tr>
<tr>
<td>August</td>
<td>120.8</td>
<td>&lt;0</td>
</tr>
<tr>
<td>September</td>
<td>237.3</td>
<td>30.2</td>
</tr>
<tr>
<td>October</td>
<td>201.7</td>
<td>26.3</td>
</tr>
</tbody>
</table>

The methodology for calculating the credits will be demonstrated in a subsequent section. As previously discussed, the WWSS Commission proposes to use a trading ratio of 1.7:1.

Methods Used:
The WWSS Commission will estimate the thermal benefits from riparian shade best management practice projects (BMPs) using version 8 of DEQ’s Shade-a-Lator model. Shade-a-Lator is a part of the Heat Source model, which is a stream assessment tool used by DEQ.¹⁷ Heat Source was developed in 1996 as a Master’s Thesis at Oregon State University in the Departments of Bioresource Engineering and Civil Engineering. DEQ currently maintains the Heat Source methodology and software. TTools, an ArcGIS extension maintained by DEQ, will be used to sample geospatial data and assemble high-resolution topographic and vegetative inputs necessary to run the Heat Source model.

Shading credits will be evaluated using the Shade-a-Lator component of the Heat Source tool, not the full Heat Source model. This eliminates the need to use a model that has been calibrated to water temperature data since only the solar radiation blocked by baseline and project conditions shade will be considered.

To determine the potential reduction in solar loading that results from its project, the WWSS Commission will compare the current project area to a future conditions scenario that assumes BMP conditions at maturity. The difference in the incoming solar load (expressed in kilocalories per day) between the two scenarios represents the net thermal benefits generated from the BMPs.

Model inputs such as the upstream and downstream boundaries of the modeled stream reach, local topography, bank slope, and stream orientation will be assumed to be the same in the current condition and future condition scenarios. An exception is the wetted width of the stream, which may differ between future conditions scenarios due to the potential creation of new side channels during the project. The future conditions scenario will use the tree height and density based on the expected conditions after the project is complete.

For both the current and future conditions scenarios, the model calculates the sun angle at a series of calculation

¹⁷ Boyd & Kasper, Analytical Methods for Dynamic Open Channel Heat and Mass Transfer: Methodology for the Heat Source Model Version 7.0 (2003), available at http://www.deq.state.or.us/wq/TMDLs/tools.htm. DEQ has posted this document on its website as a resource for generally describing the math and assumptions used in Heat Source. While the document explicitly covers Heat Source version 7 (and therefore Shade-a-Lator version 7), the math and assumptions in version 7 are mostly the same as version 8, and so DEQ considers this document appropriate for summarizing both versions 7 and 8.
points (nodes along the center of the modeled stream reach for every model time step (typically once per minute). At each node, the model calculates the total load of incoming solar radiation by considering the physical characteristics surrounding the node and the characteristics of the topographic and vegetation present on the streambanks (Figure 3).

Figure 3 demonstrates that the sun angle is a key parameter in the Shade-a-Lator model. The time of day and time of year affect the sun angle and the associated incoming solar radiation that reaches the surface of the stream.

![Figure 3. Schematic of the processes included in Shade-a-Lator modeling. When the sun angle is less than $\theta_{\text{none}}$, all incoming solar radiation is blocked by the local topography. When the sun angle is greater than $\theta_{\text{full}}$, all incoming solar radiation reaches the surface of the stream. When the sun angle is between $\theta_{\text{none}}$ and $\theta_{\text{full}}$, vegetation attenuates a portion of the incoming solar radiation.](image)

Credit Duration:

Credit duration refers to the “length of time credits are expected to be used.” This refers to the time period between when a credit becomes usable as an offset and when the credit is no longer valid. Credits are generated after a trading plan has been approved by DEQ and the restoration action has been implemented and verified. BMPs such as riparian restoration require time to realize their full benefits. Because of this, the projects must be durable and verification and ongoing monitoring and maintenance of project sites are critical parts of the program. The 2003 EPA Trading Policy provides that “credits may be generated as long as the pollution controls or management practices are functioning as expected.” In addition, the Oregon rule definition of a credit identifies the need to specify the period over which water quality benefits will be generated.

For the purposes of this TTP, the WWSS Commission suggests both a minimum credit life consistent with the rules, and the appropriate start date for the credit life. For reference, the City of Ashland proposed a 20-year credit life for its credits. The City of Medford’s program uses an average 20-year credit life, protected by long-term leasehold interests in the properties where the restoration occurs. Clean Water Services also uses a minimum 20-year credit life in its temperature management plan. Consistent with the 2003 EPA Trading Policy and these previous programs, the WWSS Commission proposes that the credits it produces from riparian vegetation projects

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18 OAR 340-039-0025(5)(f)(C)
20 Draft City of Ashland Trading Plan v3 (March 2018)
have a minimum 20-year credit life, with the possibility of extending those credits beyond the minimum life for as long as the restoration sites and shade continue to function as expected and as long as the credits are needed to offset the temperature impact. This approach is consistent with the minimum time period for which these projects are expected to function and the 2003 EPA Trading Policy. The WWSS Commission proposes that the credit life begins in 2026, when the withdrawals will begin. This would be conservative because benefits of trading projects will begin before 2026. Implementation of credit trading projects is expected to begin in Winter 2022. Table 4 below, shows a schedule for key events relevant to the timing of trading projects and the thermal impact of the withdrawal.

Table 4. Selected events relevant to the timing of trading projects and the thermal impact of the withdrawal.

<table>
<thead>
<tr>
<th>Approximate Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter 2020</td>
<td>Expected TTP Approval</td>
</tr>
<tr>
<td>Winter 2022</td>
<td>Beginning of Credit Generation</td>
</tr>
<tr>
<td>2026</td>
<td>WWSS Comes Online</td>
</tr>
<tr>
<td>2085</td>
<td>Full Water Temperature Impact Reached</td>
</tr>
</tbody>
</table>

OAR 340-039-0025(5)(G): MONITORING

Pursuant to the trading rule, a trading plan must include a “description of the following: (A) Proposed methods and frequency of trading project BMP monitoring; and (B) Proposed methods and frequency of how water quality benefits generated by a trading project will be monitored.” In addition, an entity that engages in trading must submit an annual report that includes all of the elements described in OAR 340-039-0017(3) (See Appendix D).

The WWSS Commission will submit an annual report that includes the elements described in OAR 340-039-0017(3). In addition to submitting an annual monitoring report, the WWSS Commission proposes a monitoring schedule (Appendix B) that is based in part on the Willamette Partnership’s February 2016 riparian addendum to its General Crediting Protocol. Consistent with that protocol, a specific combination of the following three types of monitoring approaches will be applied throughout the life of each riparian restoration project to demonstrate that the project continues to function as expected as it relates to the performance metrics identified in Appendix B:

1) **Quantitative monitoring**: the project developer, on behalf of the WWSS Commission, will implement a vegetation monitoring protocol (Appendix B) by sampling random plots on site; implementing repeat photo monitoring; and reporting on a comparison of monitoring data to performance standards.

2) **Qualitative monitoring**: an on-site, rapid, but standardized, qualitative review of site conditions and progress toward performance metrics will be accompanied by a subset of repeat photos from on-the-ground camera points used in quantitative years. The same set of camera points will be used in all qualitative monitoring years.

3) **Remote monitoring**: remote sensing information will be collected to provide visual evidence that the site still exists (e.g., a current year aerial image or LiDAR taken during the growing season to document site persistence). To remain consistent with Willamette Partnership approaches, the WWSS Commission proposes to monitor sites according to the schedule in Table 5.
Table 5. Monitoring and reporting approaches over the life of a project.

<table>
<thead>
<tr>
<th>Monitoring Approach</th>
<th>Completed Growing Seasons After Planting and Initial Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Y0</td>
</tr>
<tr>
<td>Quantitative</td>
<td>•</td>
</tr>
<tr>
<td>Monitoring</td>
<td></td>
</tr>
<tr>
<td>Qualitative</td>
<td></td>
</tr>
<tr>
<td>Monitoring</td>
<td></td>
</tr>
<tr>
<td>Remote Monitoring</td>
<td></td>
</tr>
<tr>
<td>Monitoring</td>
<td></td>
</tr>
<tr>
<td>Quantitative</td>
<td>•</td>
</tr>
<tr>
<td>Monitoring</td>
<td></td>
</tr>
<tr>
<td>Qualitative</td>
<td></td>
</tr>
<tr>
<td>Monitoring</td>
<td></td>
</tr>
<tr>
<td>Remote Monitoring</td>
<td>•</td>
</tr>
<tr>
<td>Monitoring</td>
<td></td>
</tr>
</tbody>
</table>

In addition to this standard proposed site monitoring, if project sites are damaged by causes beyond the reasonable control of the WWSS Commission (such as wildlife damage or vandalism), the WWSS Commission will report that damage to DEQ. The WWSS Commission proposes reporting such incidents to DEQ within 90 days of learning of the damage. The reporting would include a description of the event, including an assessment of the damage; a plan for addressing the damage; and a schedule for implementing the plan. Following the City of Ashland’s Draft TTP, WWSS Commission proposes that natural restoration and/or active replanting of the damaged site be allowed if repair or continued maintenance of the damaged site provides the reasonable potential for long-term restoration of the thermal benefits of the site in an ecologically appropriate manner. Replacement with an alternative site or sites could also be pursued. The WWSS Commission proposes that damage to a project site that is beyond the reasonable control of the WWSS Commission should not in and of itself be considered a violation of its WQC requirements. Under such conditions, the WWSS Commission will demonstrate to DEQ that the sites will be restored, or alternative solutions will be implemented within a reasonable timeframe. This suggested approach follows the City of Ashland Draft TTP\(^{23}\) and is consistent with the approach outlined in the City of Medford’s NPDES permit.\(^{25}\)

After the first 20 years, so long as credits are still required to offset the temperature impact of the WWSS, the WWSS Commission proposes that quantitative monitoring be conducted every 10 years. For qualitative and remote monitoring, the WWSS Commission proposes that the Year 11-20 pattern shown in Table 5 be repeated in each subsequent decade. For example, in Years 21, 23, 24, 26, 28, and 29 remote monitoring would be conducted and in years 22 and 27 qualitative monitoring would be conducted.

OAR 340-039-0025(5)(H): TRADING PLAN PERFORMANCE VERIFICATION

Pursuant to the trading rule, a trading plan must include a “description of how the entity will verify and document for each trading project that BMPs are conforming to applicable quality standards and credits are generated as planned.”

The Oregon trading rules require an entity to verify and document that BMPs conform to quality standards, and

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\(^{23}\) If remote information is not available for a monitoring year designated for remote monitoring, the qualitative monitoring approach can instead be used for that year. If this occurs, a later year designated as qualitative monitoring may be remotely monitored if this does not result in more than two consecutive years of remote monitoring in the first 10 years.

\(^{24}\) Draft City of Ashland Trading Plan v3 (March 2018)

that the credits are tracked and made available to the public. To be consistent with the Oregon water quality trading rule, the WWSS Commission will pursue a verification approach consistent with the Willamette Partnership’s standards for verification.26

Specifically, after a project site has been implemented with BMPs, the project will undergo a review for verification. The review will include administrative review of the site’s eligibility, an independent technical review of credit calculation, and a site visit to demonstrate that the project has been implemented in a manner consistent with the BMP quality standards included in this trading plan. Prior to Year 5 of the project, verifiers will review monitoring reports and attest that the site does not appear at risk of failure. At later milestones in the project (specifically, Years 5, 10 and 15), a third-party verifier will confirm that the site is continuing to mature and develop on a trajectory that is materially consistent with the as-built site and quality standards. In the years between these milestone verifications, verifiers will review annual monitoring reports and attest that the site does not appear at risk of failure. At year 20, a third-party verifier will review originally estimated credit calculations versus final credit calculations, a comparison of predicted Year 20 site conditions versus actual Year 20 site conditions, and an on-site visit to confirm that Year 20 quality standards have been met.

OAR 340-039-0025(5)(i): TRACKING AND REPORTING
Pursuant to the trading rule, a trading plan must include a “description of how credit generation, acquisition and usage will be tracked and how this information will be made available to the public.”

Transparency is critical to a credible trading program. Therefore, in addition to completing monitoring (as described above), submitting annual compliance reports to DEQ and completing performance verification, the WWSS Commission will evaluate posting trading credit information on a publicly accessible website to disclose progress at the proposed trading project site. One example of a publicly accessible portal for information is MarkIt, an environmental credit registry being used for the City of Medford temperature compliance plan managed by the Freshwater Trust.

Regarding tracking and reporting, the WWSS Commission will verify that:

- Individual thermal benefits and transactions are accounted for and can be tracked,
- Program implementation progress can be tracked, and
- Enough information is provided related to individual project site trajectory (i.e., annual monitoring reports).

OAR 340-039-0025(6): ADAPTIVE MANAGEMENT
Pursuant to the trading rule, a trading plan must include a “description of how monitoring and other information may be used over time to adjust trading projects and under what circumstances.” Significant program amendments may require public review and comment (see OAR 340-039-0025(7)), but other small changes will fall under the scope of adaptive management.

The WWSS Commission recognizes the importance of long-term maintenance and monitoring to verify that the overall trading program and specific projects are successful, demonstrate ecological improvement in program areas, and are meeting the temperature condition of the 401 WQC. The monitoring plan described in this TTP is a key part of evaluating progress towards achieving the needed credits and achieving the thermal benefit described in this TTP. Because the proposed project will extend over a long (multi-decade) time frame, the ability to adapt any aspect of the program (monitoring, maintenance, implementation or reporting) is important. As technologies, BMP implementation, and monitoring practices evolve, the WWSS Commission will evaluate approaches to adapt its implementation plan as appropriate.

To adapt and improve the program over time, the WWSS Commission proposes a five-year adaptive management cycle. This length of time is an appropriate cycle to review information from the previous cycle and apply any new technologies, standards or lessons learned to update the plan to maintain sufficient progress towards the goals of the project. Periodic review also affords transparency and quality control. A five-year cycle is also an appropriate length of time to take into account any time-lag in measuring the effectiveness of the BMPs and provides more flexibility to appropriately collect and analyze these data. This process will be internal, but if substantive changes are required, the requirements of OAR 340-039-0025(7) will be met.

OAR 340-039-0025(7): TRADING PLAN REVISION
The WWSS Commission will comply with the requirements in OAR 340-039-0025(7) for trading plan revision if there are substantive changes that affect one of the trading plan elements as required by OAR 340-039-0025(5). Any revised trading plan will be submitted to DEQ for review.

Consistency with Water Quality Trading Purpose and Policy

OAR 340-039-0001: PURPOSE AND POLICY
“(1) Purpose. This rule implements ORS 468B.555 to allow entities regulated under the CWA to meet pollution control requirements through water quality trading. This rule establishes the requirements for water quality trading in Oregon.

(2) Policy. The Oregon Department of Environmental Quality may approve water quality trading only if it promotes one or more of the following Environmental Quality Commission policies: (a) Achieves pollutant reductions and progress towards meeting water quality standards; (b) Reduces the cost of implementing Total Maximum Daily Loads (TMDLs); (c) Establishes incentives for voluntary pollutant reductions from point and nonpoint sources within a watershed; (d) Offsets new or increased discharges resulting from growth; (e) Secures long-term improvement in water quality; or (f) Results in demonstrable benefits to water quality or designated uses the water quality standards are intended to protect.”

This TTP is consistent with the EQC policies. The WWSS Commission trading plan is expected to create thermally cooler water and thermal refugia for fish and will have substantial habitat benefits.

While not a discharge, the thermal impact of the WWSS withdrawal results in increased water temperatures downstream and the trading plan will offset the thermal impact of the increased withdrawal.

Consistency with Water Quality Trading Objectives

OAR 340-039-0003: WATER QUALITY TRADING OBJECTIVES
As stated in OAR 340-039-0003, Water quality trading under this rule must:

1) Be consistent with anti-degradation policies
2) Not cause or contribute to an exceedance of water quality standards
3) Be consistent with local, state, and federal water quality laws
4) Be designed to result in a net reduction of pollutants from participating sources in the trading area
5) Be designed to assist the state in attaining or maintaining water quality standards
6) Be designed to assist in implementing TMDLs when applicable
7) Be based on transparent and practical Best Management Practices (BMPs) quality standards to ensure that
water quality benefits and credits are generated as planned

8) Not create localized adverse impacts on water quality and existing and designated beneficial uses.

This TTP is consistent with these objectives, as follows:

**(1, 2, 4) Anti-degradation & Net Reduction in Pollutant Loading:** Oregon’s anti-degradation policy is found in OAR 340-041-0004. Oregon’s anti-degradation policy generally prohibits the lowering of existing water quality. In line with the 2003 EPA Trading Policy, the 2016 water quality trading IMD instructs DEQ staff to ensure that trades are designed to result in a net reduction of pollutants in the trading area as required in OAR 340-039-0003(4). The WWSS withdrawal has an impact only on temperature, and not other pollutants. This TTP describes how the temperature impact of the WWSS withdrawal will be mitigated and will not violate the anti-degradation or water quality standards.

**(3) Consistent with local, state, and federal water quality laws:**

The proposed trading program is consistent with Oregon’s anti-degradation policy, the 2006 Willamette River Temperature TMDL and the Oregon trading rule (OAR 340-039). The TTP considers and is consistent with baseline regulations that ensure credits will be achieved above the baseline condition. A requirement for the development of this TTP is incorporated into the WWSS Commission’s 401 WQC.

**(5,6) Designed to Assist State in Attaining Water Quality Standards and Implementing a TMDL:**

The 2006 Willamette River Temperature TMDL did not consider water temperature impacts of withdrawals, with the exception of temporary diversion along the McKenzie River. As a result, the WWSS is not assigned a heat load in the TMDL. The WWSS Commission will use water temperature credit trading, as described in this TTP, to offset its thermal impact. This TTP will assist the State in attaining water quality standards and meeting the criteria of the Willamette River mainstem TMDL.

**(8) Based on transparent and practical BMPs quality standards:**

The proposed BMP quality standards are described in detail above.

**(9) Avoidance of Localized Impacts on Fish:**

The WWSS withdrawal location is at River Mile (RM) 38.7 and the point of maximum impact is at RM 27.1. The thermal impact of the withdrawal is not localized, because it takes time for the reduced river flow to result in increased water temperatures. Therefore, this criterion is not applicable to the WWSS withdrawal. In addition, the point of maximum impact is temporary in time and space and, as noted above, the maximum water temperature increase is very small (i.e. less than one-tenth of a degree).

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Appendix A: Willamette Water Supply System Trading Area Map
Scoggins Dam, owned by the U.S. Bureau of Reclamation, is not operated by the U.S. Army Corps of Engineers but provides additional storage and is often included on Willamette Project Maps.
Appendix B: Riparian Shade BMP Performance Standards for the Willamette Water Supply System Thermal Trading Plan
Riparian Shade BMP Performance Standards for the
Willamette Water Supply System Commission’s Temperature Trading Plan

Introduction
The following performance standards are to be applied to the Riparian Shade Best Management Practice (BMP) associated with the Willamette Water Supply System (WWSS) Commission’s Temperature Trading Program (TTP). These standards have been developed based on the Performance Standards for Riparian Vegetation (Willamette Partnership 2016). Instances where the proposed standards deviate from the Willamette Partnership’s are noted below (i.e. use of reference sites).

Performance Criteria
At the end of the 5th, 10th, 15th, and 20th restoration project year, monitoring data will demonstrate that the project meets the standard performance criteria shown in Table 1. Alternate performance criteria may be allowed if supported by appropriate documentation of suitable reference site conditions. Alternate criteria should be documented and approved by the Oregon Department of Environmental Quality (DEQ) prior to restoration project implementation.

TABLE 1 STANDARD PERFORMANCE CRITERIA FOR WWSS TTP RIPARIAN SHADE PROJECTS

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Performance Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EITHER:</strong> Mean stem density of native shrubs and woody vines * OR Site average for combined native shrub and woody vine cover</td>
<td>Year 5: Meets or exceeds 1,600 live native woody stems per acre 80% of the native woody stem density identified at the end of the fifth growing season 70% of the native woody stem density identified at the end of the fifth growing season Same as performance criteria for year 15</td>
</tr>
<tr>
<td></td>
<td>Year 10: Site average for combined native shrub and woody vine cover &gt;= 25%</td>
</tr>
<tr>
<td>% Canopy closure or cover</td>
<td>N/A</td>
</tr>
<tr>
<td>Native trees/acre</td>
<td>None</td>
</tr>
<tr>
<td>Number of native woody species</td>
<td>At least 5 native woody species present</td>
</tr>
<tr>
<td>Invasive woody and herbaceous cover</td>
<td>No greater than 20% cover invasive herbaceous species. No greater than 10% cover invasive woody species</td>
</tr>
<tr>
<td>Non-native woody and herbaceous cover</td>
<td>Take and document actions reasonably necessary to evaluate the risk posed to project site by non-native species, where they are problematic (e.g., <em>Phalaris arundinacea</em> (reed canarygrass), <em>Hedera helix</em> (English ivy), <em>Ilex aquifolium</em> (English holly)), taking the steps</td>
</tr>
</tbody>
</table>
necessary to control those non-native species such that their presence does not prevent the successful establishment and propagation of native ecosystem characteristics and functions. This includes monitoring and reporting percent cover of such species.

* Mean woody stem density is determined by counting all live woody stems taller than six inches (regardless of vigor) by species within reference sites. Count multi-stem species (e.g., *Symphoricarpos*, *Rosa*) as one stem per square foot (1’ x 1’).

** Based on Willamette Partnership (2016) criteria for wet ecoregions

The following definitions are associated with the above performance criteria:

**Canopy closure**

Canopy closure is an upward-looking point estimate of the coverage of a forest canopy, and may be measured in the field with a spherical densitometer (also called a mirror optometer) or by analyzing upward-looking hemispherical photographs.

**Cover (or Absolute Cover):**

Cover is a downward-looking measure of the percentage of the ground surface covered by living plant leaves and stems. Areas not covered by vegetation are counted as unvegetated substrate. Total cover may be greater than 100% if species are present in multiple strata (i.e., tree, shrub, and herbaceous layers.)

**Cover (Canopy)**

Absolute cover as viewed from above tree height

**Cover (Native Shrub and Vine)**

Absolute cover as viewed from beneath tree height.

**Invasive species**

A plant species should automatically be labeled as invasive if it appears on the current Oregon Department of Agriculture Noxious Weed list, plus known problem species including Mentha pulegium (pennyroyal) and *Elaeagnus angustifolia* (Russian olive).

**Project year**

Project year is measured as the number of completed growing seasons following initial verification, starting at 0. For example, where plantings are installed in the winter, the following fall would be considered the beginning of the project year 1, because the plantings have gone through one spring and summer growing season.

**Shrub**

A perennial woody plant that is usually multi-stemmed and normally grows no taller than 16 feet

**Tree**

A perennial woody plant, usually with a single stem or few stems, that normally grows taller than 16 feet
Reference Sites

The following discussion of reference sites contains a minor deviation from that proposed by the Willamette Partnership (2016). It allows for less intensive documentation of reference sites when using the standard performance criteria provided in Table 1.

Reference sites should be used to develop proposed restoration plans. Reference sites should be situated in similar ecological settings as the proposed restoration site (e.g. similar soils, hydrologic regime, general elevation range, geomorphic setting). The reference sites should have plant community characteristics similar to the desired mature condition of the proposed restoration site (e.g. moderate to high plant species diversity, percent cover by invasive plants less than 20 percent). If the standard criteria provided in Table 1 are used, then collection of reference site data may be of a qualitative nature to help develop a plant species list and general proportions of each species contribution to its plant community stratum (e.g. tree stratum cover totals approximately 80 percent, with approximately 60 percent black cottonwood and 20 percent Oregon ash). However, if the standard criteria are not being used, then quantitative sampling of the reference site will be required in order to justify changes to the standard criteria.

Monitoring

Annual monitoring shall occur that documents site conditions, management actions over the past year and proposed for the upcoming year, and overall progress toward the performance standards. Monitoring efforts shall be commensurate with the performance criteria listed in Table 1, with the scheduled intensity level as noted in the WWSS Commission’s TTP (i.e. quantitative, qualitative, and remote monitoring). Monitoring shall include the use of random plots, repeat photo stations, and reporting on a comparison of monitoring data to performance standards.

Other BMPs

Additional BMP types may be proposed during the life of the WWSS Commission’s TTP (e.g. improved summer time connectivity to cold-water refugia, floodplain vegetation management). Each new BMP type will be detailed in an addendum to the TTP, with review and approval by DEQ to occur prior to implementation.
Appendix C: Floodplain Resiliency BMP
and In-stream Habitat Restoration BMP
Supplement to Willamette Water Supply System Thermal Trading Plan

Floodplain Resiliency BMP and In-stream Habitat Restoration BMP

Prepared for:

Willamette Water Supply
Our Reliable Water

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2100 SW River Parkway
Portland, Oregon 97201

August 2019
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1 INTRODUCTION

This report discusses proposed floodplain and in-stream habitat restoration Best Management Practices (BMPs) associated with the Willamette Water Supply System (WWSS) Commission’s Thermal Trading Plan (TTP). These habitat restoration BMPs are distinguished from the Riparian Shade BMPs that have been included in the WWSS Commission’s TTP as follows: the Riparian Shade BMP is focused solely on the thermal benefits associated with direct shading of streams from revegetation projects that can be quantified through the DEQ approved Shade-a-lator model (i.e. kilocalorie heat load reduction can be calculated). The floodplain and aquatic habitat restoration BMPs discussed in this report are focused on other types of habitat restoration actions that benefit the physical, chemical, and biological aspects of aquatic ecosystems but are currently difficult to quantify directly, in terms of their thermal load reduction benefits. However, the literature (see list of resources below) reveal the important linkages between habitat restoration actions and improvements to ecosystem functions – including benefits to water quality and improved vigor of native biological communities. These benefits help to offset the potential adverse effects of increased heat load in the main stem Willamette River that may result from water withdrawals for the WWSS.

The following BMPs are reviewed in this report:

- Floodplain Habitat Resiliency BMP
- In-stream Habitat Restoration BMP

To avoid the risk of double counting thermal load reductions, different BMP types proposed by the WWSS Commission will not overlap geographically with one another. However, it is anticipated that some BMPs will often occur adjacent to one another and will also be supportive of one another (e.g., the Riparian Shade BMP will support the In-stream BMP beyond just providing thermal benefits). Figure 1 shows how this may look at a single site with multiple BMP types, including BMP’s that could be part of another entity’s TTP.
The following resources have informed this effort:

- A Scientific Rationale in Support of the Stream Function Assessment Method for Oregon (SFAM, Version 1.0) (Nadeau et. al 2018a)
- Stream Function Assessment Method for Oregon (SFAM, Version 1.0) Oregon Dept. of State Lands, Salem, OR, EPA 910-D-18-001, U.S. Environmental Protection Agency, Region 10, Seattle, WA. (Nadeau et. al. 2018b)
- Performance Standards for Riparian Revegetation (Willamette Partnership 2016)
- Willamette Model Watershed Program Conceptual Model (Bonneville Environment Foundation date not specified)
- Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead (ODFW and NMFS 2011)
2 BMP RATIONALE

The floodplain and in-stream BMPs may include a number of different actions that result in a net benefit to the aquatic ecosystems affected by the WWSS withdrawal by improving ecological processes and functions. For example, the Floodplain Habitat Resiliency BMP could include the following types of activities: controlling invasive species, planting native species, improving off-channel habitat, improving hydrologic connectivity between floodplain and associated streams, and promoting beaver activity. The In-stream Habitat Restoration BMP could include the following types of activities: improving in-stream habitat complexity (e.g. re-meandering straightened creek channels, placing large wood), removing fish barriers, increasing the amount of cold-water refugia, and improving access to cold-water refugia. These activities are intended as examples and do not preclude other types of activities from being considered.

The connection between the activities listed above for each WWSS BMP and their associated benefits to aquatic ecosystems is described for each BMP in later sections of this report. A description of how the WWSS BMPs tie into the strategies proposed by various Willamette River watershed ecosystem improvement efforts is provided below.

The Willamette Model Watershed Program, coordinated by the Bonneville Environment Foundation (BEF), has developed a detailed conceptual model that highlights the connections between key focal targets (e.g. aquatic ecosystems and native species) in the Willamette River basin, threats to these targets, and enhancement strategies to protect and improve conditions for the focal targets (BEF date not specified). Similarly, the Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead (Recovery Plan) (ODFW and NMFS 2011) provides a list of strategies to support the recovery of these species. Willamette Model Watershed Program and Recovery Plan strategies that directly relate to the proposed WWSS BMPs are listed in Table 1.
Table 1. Willamette Model Watershed Program and Upper Willamette River Chinook and Steelhead Recovery Plan Enhancement Strategies Related to the WWSS BMPs

<table>
<thead>
<tr>
<th>Willamette Model Watershed Enhancement Strategies Related to WWSS BMPs</th>
<th>UWR Chinook and Steelhead Recovery Plan General Strategies Related to WWSS BMPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Manage invasive species</td>
<td>• Protect and conserve natural ecological processes that support the viability of wild salmon and steelhead populations and their life history strategies throughout their life cycle.</td>
</tr>
<tr>
<td>• Reconnect floodplains/wetlands</td>
<td>• Restore floodplain connectivity and function</td>
</tr>
<tr>
<td>• Support persistence of beavers in appropriate areas</td>
<td>• Restore riparian condition and large woody debris recruitment</td>
</tr>
<tr>
<td>• Increase hydraulic diversity and wood</td>
<td>• Restore passage and connectivity to habitats blocked or impaired by artificial barriers.</td>
</tr>
<tr>
<td>• Reconnect side channels, alcoves, and remeander channels</td>
<td>• Restore and maintain hydrologic regimes that support ecological needs of wild salmon and steelhead populations.</td>
</tr>
<tr>
<td>• Revegetate riparian areas</td>
<td>• Restore channel structure and complexity.</td>
</tr>
<tr>
<td>• Remove artificial fish passage and sediment transport barriers</td>
<td>• Restore impaired food web dynamics and function.</td>
</tr>
</tbody>
</table>

3 DESCRIPTION OF PROPOSED BMPS

3.1 FLOODPLAIN HABITAT RESILIENCY BMP

The Floodplain Habitat Resiliency BMP will consist of habitat improvements along floodplains, typically within the 100-year floodplain and consisting of wetland or upland riparian habitats, that will improve the long-term functions of native aquatic ecosystems. Actions will typically involve vegetation management (i.e., invasive species removal and native plant establishment) similar to the Riparian Shade BMP. Floodplain Habitat Resiliency BMP actions will be situated beyond the geographic extent of the Riparian Habitat BMP and, therefore, are not intended to provide direct shading/temperature benefits to the current location of an adjacent stream channel. However, such activities will still benefit the aquatic ecosystem by making it more resilient to future change. For example, as stream channels laterally migrate across the floodplain over time they will migrate into areas with high functioning riparian conditions, including forested vegetation that will continue to provide shade to the stream. Without this BMP, streams may otherwise migrate out of higher quality areas into degraded areas.

Supporting native riparian community development along the floodplain will also provide important benefits in the form of a host of important ecological functions that are highlighted by the Recovery Plan and Willamette Model Watershed Program, such as nutrient cycling; sediment retention; flood storage and delay; increased floodwater infiltration and subsequent release of cold water to the stream system; food and dam building material for beaver; and food and cover for other native wildlife. In addition to vegetation management actions, additional activities may include wetland habitat restoration or
enhancement including potential grading activities, and placement of large wood or other habitat structures. Other opportunities for floodplain improvements may also occur and will be evaluated on a case-by-case basis. Table 2 provides a list of activities that may be conducted as part of this BMP, along with the anticipated benefits to aquatic ecosystem processes.

**Table 2: List of Potential Floodplain Habitat Resiliency BMP Activities and Anticipated Benefits to Aquatic Ecosystem (benefits derived from Nadeau et. al. 2018a and 2018b, and Adamus et. al. 2016)**

<table>
<thead>
<tr>
<th>Floodplain Habitat Resiliency BMP Activities</th>
<th>Example Benefits to Aquatic Ecosystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control of invasive species and re-planting with native species</td>
<td>Invasive plant species can reduce the long-term viability of existing native plant communities and prevent the successful establishment of native plant communities. Native plant communities are typically more supportive of native ecosystem functions.</td>
</tr>
<tr>
<td>Improvement of off-channel habitat</td>
<td>Provides off-channel habitat and refugia during times of flood. This can include side channels that are typically only connected during high flood events (e.g., greater than the ordinary high water elevation or 2-year channel forming flood event) or the broader floodplain.</td>
</tr>
<tr>
<td>Improving hydrologic connectivity between floodplain and associated streams (e.g. through levee removal)</td>
<td>Provides water quality benefits by allowing sediment to settle out onto floodplain, expanding area for biochemical processes to occur that support nutrient cycling processes, increased opportunity for groundwater recharge to occur with subsequent cool water return flow downstream. Allows for more diverse and complex habitat conditions to form, which support a greater diversity of native wildlife.</td>
</tr>
<tr>
<td>Promoting beaver activity (this may include activities similar to those listed above, but with emphasis on supporting beavers. For example, focusing plantings on species highly desired by beavers.)</td>
<td>Beavers are a keystone species in the Willamette River basin and their activities (e.g., dam building) are highly beneficial to supporting aquatic ecosystem processes. Beaver dams add complexity to streams and rivers while slowing water velocity. The ponds behind these dams store water, which is slowly released during low flow conditions (Beavers Northwest 2019). They also increase groundwater recharge and retention, store sediment and increase riparian habitat. Supporting recovery of beaver through increasing food and dam building material, particularly in protected areas, will benefit native ecosystems and water quality functions.</td>
</tr>
</tbody>
</table>

**3.2 IN-STREAM HABITAT RESTORATION BMP**

The In-stream Habitat Restoration BMP will entail restoration activities within the bed and banks of stream channels, including side channels that typically are inundated at least every other year (i.e., 2-year recurrence interval). Side channels that are inundated less frequently would likely fall within the Floodplain Resiliency BMP. As previously described, activities will include efforts that increase in-stream habitat complexity, creating new, or reconnecting old, side channels, removing fish barriers, improving cold water refugia access, and supporting beaver dam formation through installation of beaver dam analogs (i.e. simple structures that act like beaver dams and provide the scaffolding for beavers to further build upon).

The activities described above are highlighted by the Recovery Plan and Willamette Model Watershed Program as providing important functions that benefit the stream system and recovery of listed fish species. These activities also work hand in hand with the other WWSS BMPs. For example, restoring in-stream channel characteristics will help restore connectivity between the stream and its floodplain. Similarly, supporting native plant communities as part of the Floodplain Resiliency BMP and Riparian
Shade BMP will provide dam building materials for beavers within the active stream channel. Table 3 provides a list of activities that may be conducted as part of this BMP, along with the anticipated benefits to aquatic ecosystem processes.

**Table 3. List of Potential In-stream Habitat Restoration BMP Activities and Anticipated Benefits to Aquatic Ecosystem (benefits derived from Nadeau et. al. 2018a and 2018b)**

<table>
<thead>
<tr>
<th>In-stream Habitat Restoration</th>
<th>Example Benefits to Aquatic Ecosystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improving in-stream habitat complexity (e.g. remeandering straightened creek channels, restoring channel form, placement of large wood)</td>
<td>Provides habitat for a more diverse array of native species and also better provides the variety of habitats needed by individual species (e.g., formation of deep pools provides cold water refuge for fish, while riffles provide sediment free substrates and oxygenated water for macroinvertebrates which are food sources for fish and amphibians and also improved spawning habitat for fish.).</td>
</tr>
<tr>
<td>Creation of side channel habitat</td>
<td>Provides for expanded in-stream habitat area. Provides refuge during periods of high flows.</td>
</tr>
<tr>
<td>Removing fish barriers</td>
<td>Allows fish and other aquatic species to migrate freely up and down the stream network. Also allows for geomorphic processes to occur more naturally (e.g., sediment transport).</td>
</tr>
<tr>
<td>Creation of and/or improved access to cold-water refugia</td>
<td>Allows fish and other native aquatic species to access areas of colder water during times of overall high water temperatures. High water temperatures can be adverse to the health and survival of individual organisms.</td>
</tr>
<tr>
<td>Beaver dam analogs</td>
<td>These features act as artificial beaver dams and also provide the scaffolding for beavers to further build upon. Beaver dams provide a host of ecological functions to the aquatic ecosystem (see Table 2 -Promoting Beaver Activity for additional details).</td>
</tr>
</tbody>
</table>

## 4 PERFORMANCE CRITERIA

Each BMP project will be required to meet a set of performance standards that can be readily monitored. These are described for each BMP below.

### 4.1 FLOODPLAIN RESILIENCY BMP PERFORMANCE CRITERIA

The majority of Floodplain Resiliency BMP project activities will consist of invasive vegetation control and establishment of native plant communities. These activities are similar to those described for the Riparian Shading BMP and, therefore, the same performance criteria are proposed. For some projects, additional activities may be proposed, such as installation of large woody debris habitat features or grading to improve hydrologic conditions. Performance criteria for such activities will be based on successful construction of such features in the approximate locations and quantities specified in the design plans (i.e. comparison of design to as-built conditions).

For vegetation management projects, the following performance criteria are provided and are the same as for the Riparian Shade BMP. At the end of the 5th, 10th, 15th, and 20th restoration project year, monitoring data will demonstrate that the project meets the standard vegetation performance criteria shown in Table 4. Alternate performance criteria may be allowed if supported by appropriate documentation of suitable reference site conditions or based on documented standard vegetation management practices (e.g., Clean Water Services Design and Construction Standards planting requirements). Table 5 provides the
Floodplain Resiliency and In-stream Habitat Restoration BMPs

performance criteria for potential non-vegetation related project elements. Alternate criteria, if proposed, should be documented and approved by DEQ prior to restoration project implementation.

### Table 4. Standard Vegetation Performance Criteria for WWSP TTP Floodplain Resiliency BMP Projects

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Performance Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EITHER:</strong> Mean stem density of native shrubs and woody vines *</td>
<td>Meets or exceeds 1,600 live native woody stems per acre in Year 5, 80% in Year 10, 70% in Year 15, same as performance criteria for Year 20</td>
</tr>
<tr>
<td>OR: Site average for combined native shrub and woody vine cover</td>
<td>Site average for combined native shrub and woody vine cover &gt;= 25% in Year 5, 80% in Year 10, 70% in Year 15, same as performance criteria for Year 20</td>
</tr>
<tr>
<td>% Canopy closure or cover</td>
<td>N/A in Year 5, N/A in Year 10, &gt;=25% in Year 20</td>
</tr>
<tr>
<td>Native trees/acre</td>
<td>None in Year 5, &gt;=100 trees/acre ** in Year 10</td>
</tr>
<tr>
<td>Number of native woody species</td>
<td>At least 5 native woody species present in Year 5, at least 5 native woody species present in Year 10, 10 in Year 15, 10 in Year 20</td>
</tr>
<tr>
<td>Invasive woody and herbaceous cover</td>
<td>No greater than 20% cover invasive herbaceous species in Year 5, 10% in Year 10, 10% in Year 15, 10% in Year 20</td>
</tr>
<tr>
<td>Non-native woody and herbaceous cover</td>
<td>Take and document actions reasonably necessary to evaluate the risk posed to project site by non-native species, where they are problematic (e.g., <em>Phalaris arundinacea</em> (reed canarygrass), <em>Hedera helix</em> (English ivy), <em>Ilex aquifolium</em> (English holly)), taking the steps necessary to control those non-native species such that their presence does not prevent the successful establishment and propagation of native ecosystem characteristics and functions. This includes monitoring and reporting percent cover of such species.</td>
</tr>
</tbody>
</table>

*Mean woody stem density is determined by counting all live woody stems taller than six inches (regardless of vigor) by species within reference sites. Count multi-stem species (e.g., *Symphoricarpos*, *Rosa*) as one stem per square foot (1' x 1').

**Based on Willamette Partnership (2016) criteria for wet ecoregions.

The following definitions are associated with the above performance criteria:

**Canopy closure**

Canopy closure is an upward-looking point estimate of the coverage of a forest canopy, and may be measured in the field with a spherical densitometer (also called a mirror optometer) or by analyzing upward-looking hemispherical photographs.

**Cover (or Absolute Cover)**

Cover is a downward-looking measure of the percentage of the ground surface covered by living plant leaves and stems. Areas not covered by vegetation are counted as unvegetated substrate. Total cover may be greater than 100% if species are present in multiple strata (i.e., tree, shrub, and herbaceous layers.)

**Cover (Canopy)**

Absolute cover as viewed from above tree height
Cover
(Native Shrub and Vine)
Absolute cover as viewed from beneath tree height.

Invasive species
A plant species should automatically be labeled as invasive if it appears on the current Oregon Department of Agriculture Noxious Weed list, plus known problem species including Mentha pulegium (pennyroyal) and Elaeagnus angustifolia (Russian olive).

Project year
Project year is measured as the number of completed growing seasons following initial verification, starting at 0. For example, where plantings are installed in the winter, the following fall would be considered the beginning of the project year 1, because the plantings have gone through one spring and summer growing season.

Shrub
A perennial woody plant that is usually multi-stemmed and normally grows no taller than 16 feet.

Tree
A perennial woody plant, usually with a single stem or few stems, that normally grows taller than 16 feet.

Table 5. Standard Non-Vegetation Performance Criteria for WWSP TTP Floodplain Resiliency BMP Projects

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Performance Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 0</td>
</tr>
<tr>
<td>Design feature intent has been met</td>
<td>As-built matches design</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 This criterion acknowledges that floodplains are dynamic systems and that conditions are likely to change over time. So long as the constructed features function as intended, then they have met this criterion.

4.2 IN-STREAM HABITAT RESTORATION BMP PERFORMANCE CRITERIA

In-stream habitat restoration projects are likely to consist of several different activities (e.g., grading, installation of root wads and beaver dam analogs, removal of structures impeding fish passage, and potentially plantings). Due to the diverse nature of potential activities and because the proposed activities are likely to be very site dependent, it is not practical to provide a discreet set of performance criteria similar to the revegetation performance criteria provided for the Floodplain Resiliency and Riparian Shade BMPs. Therefore, performance criteria for the In-stream Habitat Restoration BMP will be tied more to a comparison of designed conditions to constructed conditions. In addition, performance criteria will be tied to a demonstration of increased stream function over time. Table 6 provides the proposed design elements performance criteria and Table 7 provides the functional performance criteria for the In-stream Habitat Restoration BMP.
Table 6. Design Performance Criteria for WWSP TTP In-stream Habitat Restoration BMP Projects

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Performance Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design feature intent has been met</td>
<td>As-built matches design</td>
</tr>
</tbody>
</table>

1 This criterion acknowledges that streams are dynamic systems and that conditions are likely to change over time. So long as the constructed features function as intended, then they have met this criterion.

Table 7. Functional Performance Criteria for WWSP TTP In-stream Habitat Restoration BMP Projects

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Performance Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream functional assessment shows increased functions relative to pre-project baseline conditions</td>
<td>A functional assessment will be conducted to establish pre-project baseline conditions.</td>
</tr>
</tbody>
</table>

1 Stream Functional Assessment Method (SFAM) to be used or other method if in the future SFAM is no longer supported.

5 MONITORING

5.1 PERFORMANCE STANDARDS MONITORING

Annual monitoring shall occur that documents site conditions, management actions over the past year and proposed for the upcoming year, and overall progress toward the performance standards. Monitoring efforts shall be commensurate with the performance criteria. Monitoring shall include, as appropriate to the specific criteria, the use of random vegetation plots, repeat photo stations, comparison of design intent to as-built conditions, and reporting on a comparison of monitoring data to performance standards. Monitoring and reporting during in-between years (i.e. years not specified in Performance Criteria) will typically be of a lower intensity with the intent of directing management activities as needed in order to meet the Performance Criteria at the next specified Performance Criteria year. Reporting of monitoring results will be governed by the requirements provided in the TTP document.

5.2 SUPPLEMENTAL MONITORING AND DOCUMENTATION TO SUPPORT ADAPTIVE MANAGEMENT

Supplemental monitoring may occur on a voluntary basis to support management decisions and to gain a better understanding of ecological processes and project effectiveness. Such potential monitoring, along with the required monitoring described above, will support adaptive management.

Potential voluntary supplemental monitoring may include:

- Measurement of stream temperature and/or other water quality parameters
- Documentation of fish use
- Macroinvertebrate sampling

6 REFERENCES


Bonneville Environment Foundation. date not specified. Willamette Model Watershed Program Conceptual Model.


Appendix D: Requirements for Annual Reporting

Consistent with the annual reporting requirements in OAR 340-039-0017(3), the annual reports submitted by the WWSS Commission will include:

(a) The location of each trading project and BMPs implemented in the preceding year;
(b) The trading project baseline;
(c) The trading ratios used;
(d) Trading project monitoring results;
(e) Verification of trading plan performance including the quantity of credits acquired from each trading project, and the total quantity of credits generated under the trading plan to date;
(f) A demonstration of compliance with OAR 340-039-0040(4), if applicable; and
(g) Adaptive management measures implemented under the trading plan, if applicable.
October 12, 2018

Mark Knudson
Chief Executive Officer
Tualatin Valley Water District
1850 SW 170th Avenue
Beaverton, OR 97003

Kevin Hanway
Water Department Director
City of Hillsboro
150 E. Main Street
Hillsboro, OR 97123

RE: 2015-00041; Willamette Water Supply System 401 Water Quality Certification

The Department of Environmental Quality (DEQ) has reviewed the U.S. Army Corps of Engineers (USACE) Permit application #2015-00041, pursuant to a request for a Clean Water Act Section 401 Water Quality Certification (WQC) received on October 12, 2017. DEQ’s 401 WQC public comment opportunity was circulated with the USACE public notice, and DEQ received one water quality comment. This comment was considered in making this final certification decision.

According to the application, the Tualatin Valley Water District (TVWD) and the City of Hillsboro ("the Applicant") propose to impact the Willamette River in order to provide a seismically resilient water supply and increase available water supply to meet population growth projections for the City of Hillsboro and Tualatin Valley Water District service areas. The project is located in the Willamette River, the Tualatin River, and multiple wetlands and tributaries to the Willamette River and Tualatin River, in the Cities of Wilsonville, Sherwood, Beaverton, Tigard, Tualatin, and Hillsboro in Clackamas and Washington Counties, Oregon.

Project Description: The project involves seismically upgrading a raw water intake structure, constructing a new water treatment plant, constructing new reservoir facilities, and installing water transmission lines. Raw water withdrawal from the Willamette River will be pumped through two transmission lines to two water treatment plants: the existing Willamette River Water Treatment Plant and a proposed new water treatment plant to be constructed as part of this project. The new water treatment plant and new reservoir facilities will serve both TVWD and the City of Hillsboro. In addition to serving TVWD and the City of Hillsboro, the transmission lines will tie into the City of Beaverton's and Joint Water Commission's transmission systems to provide emergency access between the systems.
This project will provide for up to 150 million gallons per day (mgd) of water withdrawal from the Willamette River. The capacity of the raw water facilities will be increased from 70 mgd to 150 mgd. The new water treatment plant will be constructed in phases to a capacity of 120 mgd. The new reservoir facilities will contain two above-ground water storage tanks, with a combined storage capacity of 30 million gallons.

**Raw Water Facilities**
The upgrade to the existing raw water facilities includes replacing the fish screens with larger fish screens, and modifying or replacing up to all of the 10-H piles that protect the fish screens. Sixteen, 4-foot diameter concrete tangent piles, approximately thirty-seven 10-foot diameter piles and a jet grout block above the ordinary high water line near the intake pipe will be constructed for seismic stabilizatoin of the bank. The fish screens will be replaced using a barge mounted crane to maneuver the screens and divers to unbolt the old screens and bolt on the new screens. The H-piles will either be 1) modified by divers who will cut the piles and attach them to brackets or 2) removed by a vibratory hammer and replaced with either steel H-piles or wood piles that have not been treated with preservatives or pesticides using vibratory and impact hammers. About sixteen, 4-foot diameter tangent piles will be built into the bank above the intake screen to form a pile wall to stabilize the area; one of these piles is anticipated to be below the ordinary high water elevation. An auger will drill the shafts, then steel casing will be installed and concrete pumped in to backfill the shaft. Existing access roads to the intake will be upgraded using geotextile fabric and crushed rock.

Additionally, the raw water pump station will be upgraded, increasing the total impervious surface area of 2.86 acres by an additional 1.36 acres. All of this new impervious surface area will be in uplands.

**Water Treatment Plant**
The new water treatment plant will be on a site of about 20 acres, of which 10.05 acres will be impervious surface. To construct the water treatment plant, 1.18 acres of wetlands will be filled.

**Reservoir Facilities**
The new reservoir facilities will be constructed in uplands, with an impervious surface area of 3.56 acres.

**Water Transmission Lines**
The water transmission lines will convey water from the pump station, to the new water treatment plant, to the new reservoir facilities on South Copper Mountain to the connections with existing City of Hillsboro and TVWD water supplies. The transmission lines will be installed using trench excavation and trenchless construction (i.e., jack and bore, pipe ramming, shielded tunneling and microtunneling). See Table 1, which includes a list of waterbodies which the transmission lines will cross. To provide construction access, numerous ditches will also be temporarily impacted by adding 1 foot of crushed rock fill over geotextile fabric for equipment access and/or for placing the waterline beneath the ditch.

Some of the water transmission lines have already been installed; the installation of these transmission lines are not part of this certification:
• PLM_2.0, the Kinsman Road Partnership Project. The City of Wilsonville received a 401 water quality certification for the Kinsman Road Extension (USACE No. 2014-00134) on January 16, 2015. The waterline construction was completed prior to the installation of this roadway.

• PLM_3.0, the 124th Avenue Partnership Project has already been certified. Washington County received a 401 water quality certification for The SW 124th Avenue Extension (USACE No. 2014-462) on October 28, 2015. As stated in the project description of the 401 water quality certification, "Construction will include...installation of a section of waterline for the Willamette Water Supply Program beneath the new roadway”.

Mitigation
The project would permanently impact 0.86 acres of wetlands for the new water treatment plant near the City of Sherwood, and 13 square feet of the Willamette River for the tangent pipe wall installed as part of the intake upgrade. No other permanent wetland or waterway impacts are associated with the project. The project would temporarily impact 4.51 acres of wetland, 0.28 acre of non-wetland waters and 1.58 acres of roadside ditches. A portion of the temporary wetland impacts (0.47 acres) will occur to forested wetlands; however, vegetation type will be permanently converted from forested to emergent wetland vegetation. Mitigation will be provided by purchasing 1.33 wetland mitigation bank credits, which is intended to offset permanent wetland impacts and the permanent conversion of forested wetland to emergent wetland condition.

Table 1 Impacts to Waterways

<table>
<thead>
<tr>
<th>Impact</th>
<th>Impact Duration</th>
<th>Location</th>
<th>Water</th>
<th>Tributary to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake</td>
<td>Permanent for the water withdrawal and intake fill; temporary for the intake installation</td>
<td>Wilsonville</td>
<td>Willamette River at RM 39</td>
<td>Columbia River</td>
</tr>
<tr>
<td>Water Transmission Line Crossing</td>
<td>Avoided due to trenchless installation</td>
<td>Roy Rogers Rd</td>
<td>Tualatin River</td>
<td>Willamette River</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arrowhead Creek Lane</td>
<td>Arrowhead Creek</td>
<td>Coffee Lake Creek</td>
</tr>
<tr>
<td></td>
<td></td>
<td>South Hillsboro</td>
<td>Butternut Creek</td>
<td>Tualatin River</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cornelius Pass Rd</td>
<td>Reedville Creek</td>
<td>Rock Creek (LLID 1229444454907)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Millikan Way</td>
<td>Beaverton Creek</td>
<td>Rock Creek (LLID 1229444454907)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Beef Bend Rd #2</td>
<td>Unnamed drainage</td>
<td>Tualatin River at RM 20.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bridge north of Bull Mountain Rd</td>
<td>Unnamed perennial creek</td>
<td>Tualatin River at RM 20.1</td>
</tr>
</tbody>
</table>
### Status of Affected Waters of the State:

The Section 303(d) list of impaired water bodies and EPA-approved Total Maximum Daily Loads (TMDLs), based on Oregon's 2012 Integrated Report, are listed in Table 2 below. Reedville Creek, Arrowhead Creek, Tapman Creek, McKernan Creek, did not have specific listings. Coffee Lake Creek had insufficient data to determine impairments. Numerous ditches and wetlands will be temporarily impacted by adding 1 foot of crushed rock fill over geotextile fabric for equipment access and/or for placing the waterline beneath the ditch, these ditches are within the basins of the waterbodies listed in Table 2 below.

<table>
<thead>
<tr>
<th>Water Transmission Line Crossing</th>
<th>SW Ridder Road</th>
<th>Tapman Creek</th>
<th>Coffee Lake Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoided due to installation under the roadway located above the creek</td>
<td>Tualatin-Sherwood Road</td>
<td>Rock Creek</td>
<td>Tualatin River</td>
</tr>
<tr>
<td>Industrial Way/Ore-Pac Ave.</td>
<td>Coffee Lake Creek</td>
<td>Willamette River</td>
<td></td>
</tr>
<tr>
<td>Roy Rogers Rd.</td>
<td>Chicken Creek</td>
<td>Tualatin River</td>
<td></td>
</tr>
<tr>
<td>Grabhorn Rd.</td>
<td>McKernan Creek</td>
<td>Tualatin River</td>
<td></td>
</tr>
<tr>
<td>Cornelius Pass Rd.</td>
<td>Beaverton Creek</td>
<td>Rock Creek (LID 12294444454907)</td>
<td></td>
</tr>
<tr>
<td>SW 124th Ave/Tualatin-Sherwood Rd intersection</td>
<td>Rock Creek</td>
<td>Tualatin River</td>
<td></td>
</tr>
<tr>
<td>Beef Bend Rd #1</td>
<td>Unnamed tributary to Tualatin River</td>
<td>Tualatin River</td>
<td></td>
</tr>
<tr>
<td>Roy Rogers Rd</td>
<td>Agricultural drainage</td>
<td>Unnamed tributary to the Tualatin River at RM. 20.1</td>
<td></td>
</tr>
<tr>
<td>Scholls Ferry Rd near Vandermost Rd</td>
<td>Unnamed tributary to Tualatin River</td>
<td>Tualatin River</td>
<td></td>
</tr>
<tr>
<td>Grabhorn Rd</td>
<td>Unnamed tributary to McKernan Creek</td>
<td>Tualatin River</td>
<td></td>
</tr>
<tr>
<td>At Tanabe Property</td>
<td>Unnamed seasonal drainage</td>
<td>McKernan Creek</td>
<td></td>
</tr>
<tr>
<td>Clark Hill Rd</td>
<td>Unnamed swale/drainage through pasture wetland</td>
<td>McKernan Creek</td>
<td></td>
</tr>
<tr>
<td>Rosedale Rd</td>
<td>Unnamed seasonal drainage</td>
<td>Tualatin River at RM 34.1</td>
<td></td>
</tr>
<tr>
<td>Cornelius Pass Rd</td>
<td>Unnamed tributary to Butternut Creek</td>
<td>Butternut Creek</td>
<td></td>
</tr>
</tbody>
</table>
Table 2: Status of Water bodies

<table>
<thead>
<tr>
<th>Waterbody</th>
<th>303-d listings (year-round unless otherwise indicated)</th>
<th>EPA-approved TMDLs (year-round unless otherwise indicated)</th>
<th>Impairments (not requiring a TMDL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willamette River</td>
<td>aldrin, biological criteria, DDE 4,4, DDT 4,4, dieldrin, iron, PCBs, lead, chlorophyll a (summer), mercury</td>
<td>dioxin (2,3,7,8-TCDD), temperature, E. Coli (fall/winter/spring)</td>
<td>none listed</td>
</tr>
<tr>
<td>Tualatin River</td>
<td>ammonia, biological criteria, copper, iron, lead, mercury, zinc</td>
<td>chlorophyll a, dissolved oxygen, phosphorus (Jun 1–Sept 30), temperature (summer), E. Coli</td>
<td>none listed</td>
</tr>
<tr>
<td>Rock Creek</td>
<td>arsenic, dissolved oxygen (Jan 1–May 15 for spawning), iron, lead</td>
<td>ammonia (Jun 1–Sept 30), chlorophyll a (summer), dissolved oxygen, E. Coli, phosphorus (Jun 1–Sept 30), temperature (summer)</td>
<td>biological criteria</td>
</tr>
<tr>
<td>(LLID 1229444454907)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beaverton Creek</td>
<td>arsenic, iron, lead</td>
<td>phosphorus (Jun 1–Sept 30), dissolved oxygen, E. Coli, temperature (summer)</td>
<td>biological criteria</td>
</tr>
<tr>
<td>(LLID 1229133455196)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butternut Creek</td>
<td>none listed</td>
<td>phosphorus (Jun 1–Sept 30), fecal coliform, temperature (summer), dissolved oxygen (May 1–Oct 31)</td>
<td>biological criteria</td>
</tr>
<tr>
<td>Chicken Creek</td>
<td>dissolved oxygen (Jan 1–May 15 for spawning), iron, lead</td>
<td>ammonia (Jun –Sept 30), dissolved oxygen, E. Coli, phosphorus (Jun 1–Sept 30)</td>
<td>none listed</td>
</tr>
<tr>
<td>Hedges Creek</td>
<td>none listed</td>
<td>phosphorus (Jun 1–Sept 30), temperature (summer), E. Coli, dissolved oxygen (May 1–Oct 31)</td>
<td>biological criteria</td>
</tr>
<tr>
<td>(LLID 1228322453862)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rock Creek</td>
<td>none listed</td>
<td>none listed</td>
<td>biological criteria</td>
</tr>
</tbody>
</table>

Certification Decision: Based on the information provided by the Applicant and the USACE, DEQ is reasonably assured that implementation of the project will be consistent with applicable provisions of Sections 301, 302, 303, 306, and 307 of the federal Clean Water Act, state water quality standards set forth in Oregon Administrative Rules Chapter 340 Division 41, and other appropriate requirements of state law, provided the following conditions are strictly adhered to by the Applicant.
401 WQC GENERAL CONDITIONS

1) **Responsible parties:** This 401 WQC applies to the Applicant. The Applicant is responsible for the work of its contractors and sub-contractors, as well as any other entity that performs work related to this WQC.

2) **Work Authorized:** Work authorized by this 401 WQC is limited to the work described in the Joint Permit Application signed on March 28, 2017 and additional application materials (hereafter “the permit application materials”), unless otherwise authorized by DEQ. If the project is operated in a manner not consistent with the project description contained in the permit application materials, the Applicant is not in compliance with this 401 WQC and may be subject to enforcement.

3) **Duration of Certificate:** This 401 WQC for impacts to waters, including dredge and fill activities, is valid for ten years from the date of issuance of the USACE 404 permit. A new or modified 401 WQC must be requested prior to any modification of the USACE 404 permit for project changes or project activities not consistent with the scope of the Work Authorized as defined in General Condition 2 (above). Post-construction stormwater facilities must be maintained for the life of the facility.

4) A copy of this 401 WQC letter must be kept on the job site and readily available for reference by the Applicant and its contractors, as well as by DEQ, USACE, National Marine Fisheries Service (NMFS), Oregon Department of Fish and Wildlife (ODFW), and other appropriate state and local government inspectors.

5) **Modification:** Any approved modifications to this 401 WQC will incur a Tier 1 fee of $985 at a minimum. Complex modifications may be charged a higher fee.

6) The Applicant must notify DEQ of any change in ownership or control of this project and obtain DEQ review and approval before undertaking any change to the project that might affect water quality.

7) DEQ may modify or revoke this 401 WQC, in accordance with OAR 340-048-0050, if the project changes or project activities are having an adverse impact on state water quality or beneficial uses, or if the Applicant is otherwise in violation of the conditions of this certification.

8) The Applicant and its contractors must allow DEQ access to the project site, staging areas, and mitigation sites to monitor compliance with these 401 WQC conditions, including
   a. Access to any records, logs, and reports that must be kept under the conditions of this 401 WQC;
   b. To inspect best management practices (BMPs), monitoring or operational equipment or methods;
   c. To collect samples or monitor any discharge of pollutants.

9) Failure of any person or entity to comply with this Order may result in the issuance of civil penalties or other actions, whether administrative or judicial, to enforce its terms.
CONSTRUCTION SPECIFIC CONDITIONS

10) Erosion Control: During construction, erosion control measures must be implemented to prevent or control movement of soil into waters of the state. The Applicant is required to develop and implement an effective erosion and sediment control plan. Any project that disturbs more than one acre is required to obtain an NPDES 1200-C or 1200-CN construction stormwater general permit from DEQ or DEQ agent, as applicable. In addition, the Applicant must do the following, unless otherwise authorized by DEQ in writing:

a. Maintain an adequate supply of materials necessary to control erosion at the project construction site.
b. Deploy compost berms, impervious materials, or other effective methods during rain events or when stockpiles are not moved or reshaped for more than 48 hours. Erosion of stockpiles is prohibited.
c. Inspect erosion control measures daily and maintain erosion control measures as often as necessary to ensure the continued effectiveness of measures. Erosion control measures must remain in place until all exposed soil is stabilized.
   i. If monitoring or inspection shows that the erosion and sediment controls are ineffective, the Applicant must mobilize immediately to make repairs, install replacements, or install additional controls as necessary.
   ii. If sediment has reached 1/3 of the exposed height of a sediment or erosion control, the Applicant must remove the sediment to its original contour.
d. Use removable pads or mats to prevent soil compaction at all construction access points through, and staging areas in, riparian or wetland areas to prevent soil compaction, unless otherwise authorized by DEQ.
e. Flag or fence off wetlands not specifically authorized to be impacted to protect from disturbance and/or erosion.
f. Place dredged or other excavated material on upland areas with stable slopes to prevent materials from eroding back into waterways or wetlands.
g. Place clean aggregate at all construction entrances, and utilize other BMPs, including, but not limited to truck or wheel washes, when earth moving equipment is leaving the site and traveling on paved surfaces. The tracking of sediment off site by vehicles is prohibited.
h. This certification does not authorize the placement of BMPs into waters of the state unless specifically outlined in the application and authorized by DEQ.

11) Deleterious waste materials: The Applicant is prohibited from placing biologically harmful materials and construction debris including, but not limited to petroleum products, chemicals, cement cured less than 24 hours, welding slag and grindings, concrete saw cutting by-products, sandblasted materials, chipped paint, tires, wire, steel posts, asphalt and waste concrete where such materials could enter waters of the state, including wetlands (wetlands are waters of the state). The Applicant must do the following:

a. Cure concrete, cement, or grout for at least 24 hours prior to any contact with flowing waters;
b. Use only clean fill, free of waste and polluted substances;
c. Employ all practicable controls to prevent discharges of spills of deleterious materials to surface or ground water;

d. Maintain at the project construction site, and deploy as necessary, an adequate supply of materials needed to contain deleterious materials during a weather event;

e. Remove all foreign materials, refuse, and waste from the project area; and

f. Employ general good housekeeping practices at all times.

12) **Spill Prevention:** The Applicant must fuel, operate, maintain and store vehicles and equipment, and must store construction materials, in areas that will not disturb habitat either directly or result in potential discharges. In addition, the following specific requirements apply:

a. Vehicle staging, cleaning, maintenance, refueling, and fuel storage must take place in a vehicle staging area placed 150 feet or more from any waters of the state. An exception to this distance may be authorized upon written approval by DEQ if all practicable prevention measures are employed and this distance is not possible because of any of the following site conditions:

   i. Physical constraints that make this distance not feasible (e.g., steep slopes, rock outcroppings);

   ii. Natural resource features would be degraded as a result of this setback; or

   iii. Equal or greater spill containment and effect avoidance is provided even if staging area is less than 150 feet of any waters of the state.

b. If staging areas are within 150 feet of any waters of the state, as allowed under subsection (a)(iii) of this condition, full containment of potential contaminants must be provided to prevent soil and water contamination as appropriate.

c. All vehicles operated within 150 feet of any waters of the state must be inspected daily for fluid leaks before leaving the vehicle staging area. Any leaks detected in the vehicle staging area must be repaired before the vehicle resumes operation.

d. Before operations begin and as often as necessary during operation, equipment must be steam cleaned (or undergo an approved equivalent cleaning) until all visible external oil, grease, mud, and other visible contaminants are removed if the equipment will be used below the bank of a waterbody.

e. All stationary power equipment (e.g., generators, cranes, stationary drilling equipment) operated within 150 feet of any waters of the state must be covered by an absorbent mat to prevent leaks, unless other suitable containment is provided to prevent potential spills from entering any waters of the state.

f. An adequate supply of materials (such as straw matting/bales, geotextiles, booms, diapers, and other absorbent materials) needed to contain spills must be maintained at the project construction site and deployed as necessary.

g. All equipment operated in state waters must use bio-degradable hydraulic fluid.

h. Implement BMPs to prevent spills of drilling fluid, including controlling the operating pressure, maintaining the necessary distance below the ground surface during drilling and using a drill casing, if needed.

i. A maintenance log documenting equipment maintenance inspections and actions must be kept on-site and available upon request.

13) **Transmission Pipelines:**
a. Provide a minimum of two pipe diameters depth of cover for transmission pipelines below active stream channels, or deep enough to avoid active scour as indicated by a subsequent site-specific analysis.

b. Unless infeasible, set transmission pipelines under active stream channels at a depth to allow medium rooting vegetation along the stream banks.

c. Include anti-seep collars or equivalent technology to prevent draining the wetlands for utility lines through wetlands.

14) Hydrostatic Testing Water: Discharges of hydrostatic testing water must be less than the bankfull discharge of the receiving stream and must not cause water quality criteria to be exceeded. Prior to discharge to waters of the state, hydrostatic testing water must be tested for pH, chlorine, and turbidity.

15) Dewatering of Transmission Pipelines: Discharges from dewatering the transmission pipelines, must be less than the bankfull discharge of the receiving stream and must not cause water quality criteria to be exceeded. Prior to discharge to waters of the state, water from the dewatering of transmission pipelines must be tested for residual chlorine.

16) Spill & Incident Reporting:

a. In the event that petroleum products, chemicals, or any other deleterious materials are discharged into state waters, or onto land with a potential to enter state waters, the Applicant must promptly report the discharge to the Oregon Emergency Response System (OERS, 1-800-452-0311). The Applicant must immediately begin containment and complete cleanup as soon as possible.

b. If the project operations cause a water quality problem which results in distressed or dying fish, the Applicant must immediately do the following: cease operations; take appropriate corrective measures to prevent further environmental damage; collect fish specimens and water samples; and notify DEQ, ODFW and other appropriate regulatory agencies.

17) Vegetation Protection and Restoration:

a. The Applicant must protect riparian, wetland, and shoreline vegetation in the authorized project area (as defined in the permit application materials) from disturbance through one or more of the following:
   i. Minimization of project and impact footprint;
   ii. Designation of staging areas and access points in open, upland areas;
   iii. Fencing and other barriers demarcating construction areas; and
   iv. Use of alternative equipment (e.g., spider hoe or crane).

b. Replant impacted riparian, wetland, and shoreline vegetation, providing medium (or deeper) rooting vegetation along stream banks, unless infeasible.

c. If authorized work results in riparian, wetland, or shoreline vegetative disturbance and the disturbance has not been accounted for in planned mitigation actions, the Applicant must successfully reestablish vegetation to a degree of function equivalent to or better than before the disturbance. The standard for success is
80% cover for native plant species. The vegetation must be reestablished by the completion of authorized work and include the following:

i. Restoring damaged streambanks to a natural slope, pattern, and profile suitable for establishment of permanent woody vegetation, unless precluded by pre-project conditions (e.g., a natural rock wall).

ii. Replanting or reseeding each area requiring revegetation before the end of the first planting season following construction.

iii. Planting disturbed areas with native plants and trees in all cases except where the use of non-native plant materials may be essential for erosion control.

iv. Using invasive species to reestablish vegetation is prohibited.

v. Herbicides, pesticides and fertilizers must be applied per manufacturer’s instructions, and only if necessary for vegetation establishment. If chemical treatment is necessary, the Applicant is responsible for ensuring that pesticide application laws, including with the 2300-A pesticide NPDES general permit are met. Please review the information on the following website for more information: www.deq.state.or.us/wq/wqpermit/pesticides.htm.

Additionally:

1. Unless otherwise approved in writing by DEQ, applying surface fertilizer within stormwater treatment facilities or within 50 feet of any stream channel is prohibited;

2. Other than spot application to cut stems, no herbicides are allowed within stormwater treatment facilities or within 150 feet of waters of the state. Mechanical, hand, or other methods may be used to control weeds and unwanted vegetation within stormwater treatment facilities or within 150 feet of waters of the state; and

3. No pesticides may be used within stormwater treatment facilities or within 150 feet of waters of the state.

vi. Install wildlife-friendly fencing as necessary to prevent access to revegetated sites by livestock or unauthorized persons.

vii. Minimize soil compaction, especially in areas that are designated to be replanted. If soils are compacted, decompact staging areas and work construction areas prior to replanting. Leave topsoil when possible. Chip materials from clear and grub operation and spread on soil surface, unless cleared areas contained invasive species.

18) Provide a minimum 50-foot buffer zone to protect existing riparian areas and wetlands, wherever feasible. Impacts to buffer areas will be restored, where possible, according to the project’s Conceptual Post-Construction Site Restoration Plan.

19) **Notification to DEQ:** The Applicant must provide pre-construction notification to DEQ one week prior to the start of construction. Contact information can be found at the end of the certification.

**SPECIFIC CONDITIONS FOR IN-STREAM WORK**
20) **Fish protection/ Oregon Department of Fish and Wildlife timing:** The Applicant must perform in-water work only within the ODFW preferred time window as specified in the *Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources*, or as authorized otherwise under a Department of State Lands removal/fill permit. Exceptions to the timing window must be recommended by ODFW and/or the NMFS as appropriate.

**Aquatic life movements:** Any activity that may disrupt the movement of aquatic life living in the water body, including those species that normally migrate through the area, is prohibited. The Applicant must provide unobstructed fish passage at all times during any authorized activity unless one of the following conditions occurs and the method is approved by ODFW; (1) The ability to completely block fish movement will be limited in duration to no more than ten days and will only be allowed when water quality conditions preclude the likelihood that salmonids will use the area, and (2) upstream fish movement will be required in locations where blocking upstream movement, even for short durations, will unduly stress salmonids using the area. Exceptions must be reviewed and recommended by Oregon Department of Fish and Wildlife and/or NMFS as appropriate.

21) **Isolation of in-water work areas:** The Applicant must isolate in-water work areas from the active flowing stream, unless otherwise authorized as part of the approved application, or authorized by DEQ. The Applicant is referred to DEQ's *Oregon Sediment and Erosion Control Manual*, April 2005, for isolation techniques (see [http://www.deq.state.or.us/wq/stormwater/docs/escmanual/appxd.pdf](http://www.deq.state.or.us/wq/stormwater/docs/escmanual/appxd.pdf)). During open-trench construction, use cofferdams, sheet piles, or diversion pipes, as appropriate.

22) **Cessation of Work:** The Applicant must cease project operations under high flow conditions that will result in inundation of the project area. Only efforts to avoid or minimize turbidity or other resource damage as a result of inundation of the exposed project area are allowed during high flow conditions.

23) **Turbidity:** The Applicant must implement best management practices (BMPs) to minimize turbidity during in-water work. Any activity that causes turbidity to exceed 10% above natural stream turbidities is prohibited except as specifically provided below:

a. **Monitoring:** Turbidity monitoring must be conducted and recorded as described below. Monitoring must occur at two hour intervals each day during daylight hours when in-water work is being conducted. A properly calibrated turbidimeter is required.

   i. **Representative Background Point:** The Applicant must take and record a turbidity measurement every two hours during in-water work at an undisturbed area 100 feet upcurrent from the in-water disturbance, in order to establish background turbidity levels. The background turbidity, location, date, and time must be recorded immediately prior to monitoring downcurrent at the compliance point described below.

   ii. **Compliance Point:** The Applicant must monitor every two hours, 100 feet downstream from the disturbance, at approximately mid-depth of the waterbody and within any visible plume. The turbidity, location, date, and time must be recorded for each measurement.
b. **Compliance:** The Applicant must compare turbidity monitoring results from the compliance points to the representative background levels taken during each two-hour monitoring interval. Pursuant to OAR 340-041-0036, short term exceedances are allowed as follows:

<table>
<thead>
<tr>
<th>TURBIDITY LEVEL</th>
<th>Restrictions to Duration of Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 4 NTU above background</td>
<td>No Restrictions</td>
</tr>
<tr>
<td>5 to 29 NTU above background</td>
<td>Work may continue for a maximum of 4 Hours. If turbidity remains 5-29 NTU above background, stop work and modify BMPs. Work may resume when NTU is 0-5 above background.</td>
</tr>
<tr>
<td>30 to 49 NTU above background</td>
<td>Work may continue for a maximum of 2 Hours. If turbidity remains 30-49 NTU above background, stop work and modify BMPs. Work may resume when NTU is 0-5 above background.</td>
</tr>
<tr>
<td>50 NTU or more above background</td>
<td>Stop work immediately and inform DEQ</td>
</tr>
</tbody>
</table>

c. **Reporting:** The Applicant must record all turbidity monitoring required by subsections (a) and (b) above in daily logs. The daily logs must include calibration documentation; background NTUs; compliance point NTUs; comparison of the points in NTUs; location; date; and time for each reading. Additionally, a narrative must be prepared discussing all exceedances with subsequent monitoring, actions taken, and the effectiveness of the actions. The Applicant must make available copies of daily logs for turbidity monitoring to DEQ, USACE, NMFS, USFWS, and ODFW upon request. An example turbidity log is attached to this certification.

d. **BMPs to Minimize In-stream Turbidity:** The Applicants must implement the following BMPs, unless accepted in writing by DEQ:

i. **Sequence/Phasing of work** – The Applicant must schedule work activities so as to minimize in-water disturbance and duration of in-water disturbances;

ii. **Bucket control** - All in-stream digging passes by excavation machinery and placement of fill in-stream using a bucket must be completed so as to minimize turbidity. All practicable techniques such as employing an experienced equipment operator, not dumping partial or full buckets of material back into the wetted stream, adjusting the volume, speed, or both of the load, or using a closed-lipped environmental bucket must be implemented;

iii. The Applicant must limit the number and location of stream crossing events. Establish temporary crossing sites as necessary at the least sensitive areas and amend these crossing sites with clean gravel or other...
temporary methods as appropriate, so as to discharge sediments to the waterbody;
iv. Machinery may not be driven into the flowing channel, unless authorized in writing by DEQ;
v. Excavated material must be placed so that it is isolated from the water’s edge or wetlands, and not placed where it could re-enter waters of the state uncontrolled; and
vi. Containment measures such as silt curtains, geotextile fabric, and silt fences must be implemented and properly maintained in order to minimize in-stream sediment suspension and resulting turbidity.

SPECIFIC CONDITIONS FOR PILING REMOVAL

24) Piling Removal: The Applicant will use vibratory extraction for pile removal wherever feasible. If not feasible, pile cutoff methods may be used as an alternative removal method. The Applicant must implement the following measures to reduce the incidence of sediment disturbance and contaminant mobilization:

a. Use an adequately trained equipment and crane operator;
b. Install a floating surface boom for capture and containment of debris and floatable pollutants;
c. Vibrate each pile to break the skin friction bond between pile and sediment, to avoid pulling out a large block of soil and possibly breaking off the pile in the process;
   i. Remove each pile slowly;
   ii. Do not allow extraction equipment (e.g., bucket, steel cable, vibratory hammer) to enter the water; and,
   iii. Once loose, immediately transfer the piling along the most direct route to a contained, dry storage site.
d. If vibratory extraction or pulling is not feasible due to slope stability or pile breakage, pile cutoff may be used. When pile cutting is performed, the Applicant or its contractors must
   i. Time work to occur at lowest water possible;
   ii. Use a pneumatic underwater chainsaw; and,
   iii. In areas that are tidally influenced or prone to scour, cut the pile at least two feet below the sediment surface.

e. Pile Handling and Disposal
   i. No treated wood debris may fall into waters of the state. If any treated wood debris enters waters of the state, it must be removed immediately and disposed of properly;
   ii. The Applicant or its contractors must immediately place removed pilings into a contained, dry storage site;
   iii. Treated wood pile(s) may not be left in the water or stacked on the streambank; and
   iv. The Applicant or its contractors must dispose of all treated wood debris removed during a project at an upland facility in accordance with all applicable state and federal requirements.
SPECIFIC CONDITIONS FOR POST CONSTRUCTION STORMWATER MANAGEMENT

25) **Post Construction Stormwater Management:** The Applicant must implement and comply with the terms of the approved post-construction stormwater management plan, which describes best management practices (BMPs) to prevent or treat pollution in stormwater anticipated to be generated by the project, in order to comply with state water quality standards. Two bioretention ponds will be provided at the raw water facilities site to provide stormwater treatment. A bioretention pond at the water treatment plant and a bioretention pond at the reservoir facilities will provide stormwater treatment at these locations. **Clean Water Services has jurisdiction of the stormwater treatment at the water treatment plant and the reservoir facilities; stormwater review for these facilities is deferred to Clean Water Services.**

The Applicant must implement BMPs as proposed in the stormwater management plan, including operation and maintenance, dated April 2017. If proposed stormwater facilities change due to site conditions, the Applicant must notify DEQ, and receive approval in writing.

**Within 30 days of project completion, the Applicant must submit a copy of the 'As-Builts' or red-lined construction drawings showing all stormwater management facilities.**

26) **Stormwater Management & System Maintenance:** The Applicant is required to implement effective operation and maintenance practices for the lifetime of the proposed facility. These include but are not limited to
   a. Maintenance techniques and frequency for each system component must follow appropriate recommendations in accepted manuals.
   b. Long-term operation and maintenance of stormwater treatment facilities will be the responsibility of the Applicant, unless and until an agreement transferring that responsibility to another entity is submitted to DEQ.

27) **Corrective Action May Be Required:** The Department retains the authority to require corrective action in the event the stormwater management facilities are not built or performing as described in the plan.

SPECIFIC CONDITIONS FOR TEMPERATURE IMPACTS

28) The Applicant must address the temperature impacts of Willamette River water withdrawal to the satisfaction of DEQ prior to increasing withdrawal. The Applicant may do this in stages, documenting offsets to temperature impacts incrementally, as withdrawal increases. To demonstrate that temperature is adequately addressed, the Applicant must do all of the following, prior to increasing withdrawal:
   a. At least six months prior to desired increase, submit a plan to DEQ that quantifies how temperature impacts will be offset. The Applicant has expressed its intent to offset temperature impacts through water quality trading per OAR 340-039-0017(2). Therefore, the plan submittal must meet the requirements of a Water Quality Trading Plan in OAR 340-039-0025. Should the Applicant choose to pursue offsetting temperature impacts through other means a sufficient plan must be submitted to DEQ.
b. Update and revise the Water Quality Trading Plan as necessary to meet water quality standards and receive approval from DEQ.

c. Implement the Water Quality Trading Plan as approved by DEQ.

If the Applicant is dissatisfied with the conditions contained in this certification, a contested case hearing may be requested in accordance with OAR 340-048-0045. Such request must be made in writing to the DEQ Office of Compliance and Enforcement at the Lloyd 700 Building, 700 NE Multnomah St #600, Portland, OR 97232 within 20 days of the mailing of this certification. The DEQ hereby certifies this project with the above conditions in accordance with the Clean Water Act and state rules. If you have any questions, please contact Sara Christensen at christensen.sara@deq.state.or.us, or by phone at 541-633-2007.

Sincerely,

Steve Mrazik
Water Quality Manager
Northwest Region

2015-41_WillametteWaterSupply_401WQC.docm

ec: Michael Ladouceur, USACE
Jaimee Davis, USACE
Anita Huffman, DSL
Annie Birnie, NOAA Fisheries
Ethan Rosenthal, David Evans and Associates, Inc.
Niki Iverson, City of Hillsboro
Jill Chomycia, Willamette Water Supply
Wade Peerman, ODEQ