To:	Peter Martins, P.E., City of Hillsboro Dave Carlson, P.E., Black & Veatch
From:	Nicki Pozos, P.E., HDR Ronan Igloria, P.E., HDR
Date:	November 7, 2012
RE:	**Technical Memorandum 10 – Criteria Evaluation – *FINAL*** **City of Hillsboro - Long Term Water Supply Study**

1.0 INTRODUCTION

The City of Hillsboro (City) is evaluating long-term water supply options that will deliver 80 million gallons per day (mgd) of additional treated water for itself and its Joint Water Commission (JWC) partners. The focus of this memorandum is to outline the criteria evaluation process, present the criteria as accepted by the Hillsboro Utilities Commission (Commission), and present the evaluations of each water supply option in each of the criteria.

2.0 EVALUATION PROCESS

The criteria evaluation process was presented to the Commission on June 12, 2012. The goals were to create a process to meet the needs of the Commission and the public by being understandable, transparent, and representative.

The criteria evaluation process included three phases:

1. Identification of appropriate criteria.
2. Evaluation of options according to those criteria.
3. Identification of the preliminary preferred option based on the criteria evaluation.

Phase 1 - Identification of Appropriate Criteria

A wealth of technical information has been generated through the Long-Term Water Supply Study. The team's goal in developing the criteria was to translate that technical information into understandable and relatable criteria for the Commission and public. A list of draft criteria was first generated with Hillsboro staff and the consultant team. The process was then repeated with the Commission to generate the list of final criteria discussed in Section 3.

The consultant team along with Hillsboro staff used the following process to generate an initial list of draft criteria:

1. *Step 1 - Brainstorm Potential Criteria.* Brainstormed criteria thought to be of interest to the Commission and the public. This exercise drew on topics investigated through the current study, as well as results of initial public engagement efforts conducted by the City.

2. *Step 2 – Refine Criteria.* Divided criteria where necessary to ensure transparency, and combined categories where separate criteria did not add value. The goal was to develop a list of criteria that were discrete from each other, while encompassing all of the critical issues.
3. *Step 3 – Map Technical Work to Criteria.* Mapped the technical work generated through the current study to the relevant criteria. In some cases, there were multiple technical memoranda that applied to a given criterion. Similarly, some technical memoranda applied to multiple criteria.

The process was then repeated with the Commission at the June 12, 2012 meeting.

1. *Step 1 – Brainstorm with Commission.* Members of the Commission brainstormed their own ideas of criteria important to themselves and the public. This brainstorming session was conducted without the Commissioners viewing the list of draft criteria developed by staff.
2. *Step 2 – Map Feedback from Public Involvement Efforts to the Criteria.* Hillsboro staff helped map specific feedback received from previous public involvement efforts to the criteria generated by the Commissioners.
3. *Step 3 – Map Staff Criteria to the Commissioners' Criteria.* Consultant and Hillsboro staff mapped the draft criteria developed by staff to the Commissioners' criteria.
4. *Step 4 – Refine Criteria.* Consultant and Hillsboro staff refined the criteria, grouping some ideas together and refining the specific words used to describe each criteria.
5. *Step 5 – Finalize Criteria.* Hillsboro staff finalized the draft criteria list based on the Commission's discussions, which was presented to and accepted by the Commission at the June 20, 2012 meeting.

The above process resulted in the final list of criteria presented in Section 3 of this tech memo.

Phase 2 – Evaluation of Options According to the Criteria

The next phase in the process was to evaluate each of the water supply options according to the criteria. The evaluation was conducted on a three-tier scale, defined as:

- "+"– The option is beneficial, relative to the other options, with respect to the evaluation criterion.
- "0" – The option is neutral (neither beneficial nor detrimental), relative to the other options, with respect to the evaluation criterion.
- "-" – The option is detrimental, relative to the other options, with respect to the evaluation criterion.

This simplified scale was selected over a more numeric approach to improve transparency and create information that is more representative of the benefits and risks of each supply option. In a numeric approach, each option is scored on a numerical (e.g., 1 to 5) scale for each criterion and also assigned a weighting. The product of the scorings and the weightings provides an overall score for ranking of options.

The challenge of using a numeric approach for the water supply decision is two-fold. First, individuals rarely perceive the final outcome or result of a complicated numerical matrix as a whole, which means to agree with the outcome they need to agree with all of the individual entries. This tends to focus individuals on the specific criteria scores that are of interest to them, whether or not those scores had a big impact on the outcome. Though this approach is technically transparent in that none of the scorings are hidden, the process can easily feel non-transparent. Second, weightings assigned to each of the criteria need to reflect their relative value. Numeric approaches are much more appropriate when the criteria are primarily based on quantifiable categories such as land area, distance, etc. Numeric methods are less appropriate when the criteria are largely based on individual's values. Different people have different values; hence there is not one "right" set of weightings.

The goal of using the three-tier scale is to highlight the *relative* advantages and disadvantages of each option compared to the other options, while using supporting text to accurately describe the relative merits. This process does not result in an overall "score" for each option. The alternative process for identifying the preferred long-term water supply option is described under Phase 3.

Draft evaluations of each option against each criterion were developed with Hillsboro staff and the consultant team at the Technical Advisory Committee (TAC) meeting on June 26, 2012. These draft evaluations are presented in Section 4 of this tech memo and were reviewed at the TAC meeting on July 24, 2012.

Phase 3 – Identification of the Preferred Option

The purpose of Phase 3 was to use the information generated through the criteria evaluation process to support identification of the preferred long-term water supply option. The goal through this process was to narrow and define the decision space to support the Commission in: (1) identifying a preferred option to obtain input from the public; and (2) making a decision based on the Commission's values assessment after the public outreach report is presented.

The overall rationale is that the most important criteria are those that are both important *and* differentiating. Hillsboro staff and the consultant team, through the technical evaluations and the criteria selection, have attempted to include criteria they believe are important to the Commission and the public.

To implement this approach, patterns in the criteria evaluations are used to progressively narrow the decision space by either eliminating options from consideration as the preferred alternative, or eliminating criteria that do not differentiate remaining options. The goal is to develop a simplified table of the long-term supply options and as few criteria as are still relevant to the decision to support the decision process.

The proposed decision process for this study was presented at the TAC meeting on July 24, 2012 and the Commission on August 14, 2012. The Commission directed staff to initiate the public outreach process focusing on gathering input on the preliminary preferred long-term water supply option for Hillsboro at their September 18, 2012 meeting.

3.0 SELECTED CRITERIA

As discussed above, the selected criteria were developed through interactive processes with the Commission, Hillsboro staff, and the consultant team. The City also conducted several customer focus groups during a public outreach study that occurred in 2010 to initially identify values important to the public in long term supply decision making processes. Cost, source water quality, and ownership were determined to be very important to the Hillsboro customers. Table 1 lists the criteria, their descriptions, and the source of technical information considered in the evaluation.

Table 1. Long Term Water Supply Criteria

Criterion	Corresponding Technical Information
Cost Overall cost of the option including cost to both build and then operate the supply.	• Estimated costs and economic analysis (TM 9)
Reliability Ability of the option to consistently deliver needed water, including consideration of events with the potential for causing water supply shortages, such as droughts or earthquakes.	• Water rights reliability (TM 4) • Description of identified water supply reliability risks (TM 10) • TBWSP Technical Memorandum: Operations Modeling and Results Workshop (MWH, 2009)
Redundancy Ability of the option to provide an additional, independent water supply.	• Construction impacts to water supply (TM 8) • Independence of water supply (TM 10)
Ownership Ability of the City to control decisions regarding supply improvements, operations, and costs.	• Decision making and operational control (TM 10) • Water rights ownership (TM 4)
Operational Complexity Potential level of difficulty in running a water supply and treatment system that maintains Hillsboro's current high level of service quality.	• Water supply option configurations (TM 3)
Implementation Risk Risk that the project would not be completed on time, or at all, due to unforeseen circumstances, political roadblocks, or level of project complexity.	• Water rights (TM 4) • Permitting (TM 7) • Partnership risks (e.g., Bureau of Reclamation) (TM 10)
Source Water Quality Fewer potential sources of contamination located upstream of option.	• Raw water quality (TM 6)

Table 1. Long Term Water Supply Criteria	
Criterion	**Corresponding Technical Information**
Treated Water Quality Ability of treated water to meet a standard of quality comparable to treated water currently received by the City.	• Finished water quality (TM 6)
Environmental Impacts Environmental impacts due to construction and/or operation of the supply.	• Power usage (TM 9A) • Construction impacts (based on permitting, TM 7) • Identified Endangered Species Act (ESA) listed species (aquatic and terrestrial; TM 10) • Bureau of Reclamation (2009) • Hicks (2012)
Responsiveness to Demand Growth Ability to supply full projected growth in demand, and phase improvements in response to slower or faster growth	• Projected demands (TM 1) • Project phasing (TM 9C)

4.0 DRAFT CRITERIA EVALUATION

The consultant team and Hillsboro staff conducted an initial evaluation of each water supply option against the criteria on June 26, 2012. Those draft evaluations, as well as brief descriptions supporting each evaluation, are shown in Table 2.[1] The supplies are shown from left to right in order from lowest *total cost* to highest total cost (see Cost Criteria discussion below). Additional summary criteria descriptions for the benefits and risks for each option compared to the lowest cost option are described in more detail below.

Cost - "Overall cost of the option including cost to both build and then operate the supply"

Costs were not evaluated according to the three-tier scale (+, -, 0); actual cost data are instead provided in Table 2. Two values are shown in Table 2 for each option: (1) the total combined estimated cost to implement each supply for all regional providers and (2) the share of that estimated cost that would be paid by the City of Hillsboro. The total combined costs (for all of the agencies) for each of the options are based on the risk-adjusted net present values (NPVs) in 2012 dollars, which include the construction and non-construction costs to build and then operate each supply. The cost analysis is presented in TM 9E. The City of Hillsboro's cost share is also shown in Table 2. Information on the City of Hillsboro's cost share is also based on information presented in TM 9E. The cost share estimates all assume construction of the total project with partners; Hillsboro's cost share for a project built without a partner would be higher.

[1] The Mid-Willamette Option is the same as the Willamette-Wilsonville option referred to in previous TMs. The Southern Willamette-West option is the same as the Newberg-West option referred to in previous TMs. The Southern Willamette-East (formerly referred to as Newberg-East) option is not shown here, as it differs from the Southern Willamette-West option only in pipeline routing, and the Newberg-West option was found to have a lower cost.

The options were listed from lowest cost to highest *total regional cost* and compared amongst the remaining criteria. The objective of the comparison of the remaining criteria weightings was to assist the Commission in determining whether an increased weighting of one option is worth the additional cost to build and operate that particular supply option.

The Mid-Willamette option had the lowest *total regional cost* of all options, with the Northern Groundwater option having the highest total regional cost.

The cost estimate for the TBWSP option does not reflect two significant uncertainties. It does not include costs associated with water purchases or leasing that would be necessary during any significant delay in project schedule related to uncertainty of federal funding availability. It also does not include costs for mitigation of impacts on two newly-identified endangered species.

Reliability - "Ability of the option to consistently deliver needed water, including consideration of events with the potential for causing water supply shortages, such as droughts or earthquakes"

Each option was rated based on the ability of that option to reliably deliver water to Hillsboro's customers.

The Southern Willamette, Mid-Willamette, and Northern Groundwater were given positive relative scores. These sources are considered to have a lower susceptibility to drought and climate change given the water available via storage in upstream impoundments and larger basins to deliver supply. These options would also be constructed to the current higher seismic construction standards.

The Portland option was given a neutral relative score. Its dual-source supply is considered to have a lower susceptibility to drought and climate change. However, it has a greater susceptibility to seismic events, because most of the infrastructure was not built under the current seismic standards (though it has been upgraded to some degree).

The TBWSP was given a negative relative score, because of its susceptibility to drought and climate change. The TBWSP would be built under newer seismic standards, but requires raw water pump back during the winter to improve reliability.

Redundancy - "The ability of the option to provide an additional, independent water supply"

Hillsboro currently receives all of its water from the Tualatin Basin from either live natural flow in the river, stored water from Henry Hagg Lake, or stored water released to the upper Tualatin Basin from Barney Reservoir. Any source that provides an additional source not associated with the Tualatin River will provide the City redundancy. Redundancy is important in the instance of one source experiencing drought, natural disaster, contamination, or some other event that requires it to be taken off line. Even though these events are rare in occurrence and frequency, it

is an important consideration for the Commission's emergency response planning. All of the options were given a positive score with the exception of the Tualatin Basin Water Supply Project, which does not provide a redundant source of supply.

Ownership - "Ability of the City to control decisions regarding supply improvements, operations, and costs"

Through information gathered in public surveys, it was clear that Hillsboro citizens place a high value on the ability of the City to own its water right assets and infrastructure facilities. Currently, Hillsboro owns a number of water rights, water treatment plant capacity, and water transmission system capacity through the JWC. Additionally, part of Hagg Lake, which is owned by U.S. Bureau of Reclamation (BOR), is contracted to Hillsboro for the use of the stored water. Currently, BOR owns the dam at Hagg Lake and the intake structure where water is taken out of the Tualatin River, as well as the water rights associated with the lake.

The Mid-Willamette, Southern Willamette, and Northern Groundwater options were all given positive scores relative to the other options due to the fact that Hillsboro would jointly own all of the water rights and infrastructure related to those options with various partners.

The TBWSP was given a neutral score, because even though it is similar to the ownership of facilities that Hillsboro has currently, the long-term water supply expansion of this option is extremely dependent on funding, schedules, and authorizations from the federal government (BOR).

The Portland option was given a negative score since Hillsboro would only have access to a wholesale contract via a water supply agreement, subject to periodic renewal, with the City of Portland. Therefore, Hillsboro would not have operation or governance control for a majority of the infrastructure associated with that option.

Operational Complexity - "Potential level of difficulty in running a water supply and treatment system that maintains Hillsboro's current high level of service quality"

Hillsboro currently manages the largest conventional water treatment plant in Oregon and a transmission system that serves approximately 300,000 Washington County residents.

The anticipated treatment and delivery systems for Mid-Willamette, Southern Willamette, and Northern Groundwater options are substantially similar to Hillsboro's existing facilities; therefore each of these options was given a positive score relative to the other options.

The Portland option was given a neutral score due to the complexity of managing the Portland supply within contractual limits, and the potential long-term cost implications of short-term water management decisions.

The TBWSP was given a negative score due to the complexity associated with running the raw water pump-back facility to fill the expanded reservoir and the potential supply and cost impacts of various operational changes.

Implementation Risk - "Risk that the project would not be completed on time, or at all, due to unforeseen circumstances, political roadblocks or level of project complexity"

Several potential roadblocks could impact the ability for an option to be implemented on time to meet the projected demands. Categories of potential risks in the analysis of this criterion included permitting risks and complexities, ability to obtain a water right, potential land use issues, and multiple layers of approval processes.

The Mid-Willamette option was given a positive relative score, because a raw water intake already exists. Construction of a new raw water intake is considered a complex permitting challenge. The Mid-Willamette also has water rights available in the peak season either through new permits or through agreements with existing municipalities.

The Northern Groundwater option was given a neutral score. Even though it does not require a new raw water intake, well siting in predominantly rural farm areas has resulted in significant delays on similar projects and difficulties in obtaining access to water rights. The Portland option was also given a neutral score. It has existing infrastructure in place, such as an intake, but construction of a new pipeline would be required from Powell Butte through a highly urbanized area, which may prove to be a complex challenge.

The Southern Willamette was given a negative score, because a new raw water intake would need to be permitted and built, and existing water rights may need to be moved upstream to accommodate the demands of all the partners. No clear partnerships exist for this option, which would increase the overall project cost for Hillsboro.

The TBWSP was given a negative score, because permitting and implementation schedule risks are considered very high. Two new species, federally endangered Fender's Blue Butterfly species (*Icaricia icarioides fenderi*) and threatened Kincaid's lupine species (*Lupinus oreganus*), have been identified within the area that would be inundated by the expansion of the dam in the TBWSP option. The raw water pump-back also includes significant permitting risks for the raw water intake and challenges in maintaining operation of the current water diversion during construction. As stated previously, the TBWSP option is extremely dependent on funding, schedules, and authorizations from the federal government (BOR), which may result in significant delays.

Source Water Quality - "Fewer potential sources of contamination located upstream of option"

Previous efforts of this study evaluated existing water quality data. Most of the source options had extensive water quality data available for analysis with the exception of the Northern Groundwater option. No specific contamination was identified for any of the options. However, the City recognizes that options with larger drainage basins and varying land uses upstream of the withdrawal point could be subject to potential risks to water quality, even with a commitment by the City to source protection and response programs.

The TBWSP and Portland options were given a positive relative score. The TBWSP has a smaller drainage basin with agricultural and forestry land uses and recreation, but a low amount of urban land uses. The Portland option has a protected watershed in the Bull Run basin. The Columbia South Shore Wellfield, despite detections of emerging contaminants in small concentrations, has a groundwater protection program.

The Southern and Mid-Willamette options were given a neutral relative score. Despite having a large drainage basin, extensive water quality data is available from existing municipalities, and the point of diversion is upstream of the Portland urban area and Portland Harbor superfund site.

The only option that was given a negative relative score was the Northern Groundwater, because of lack of available information on the source; its location downstream of the Portland superfund site; and the potential hydraulic connection to surface water in the Columbia River. It is strongly recommended that Hillsboro conduct additional water quality testing, and obtain water quality data from communities utilizing similar treatment techniques on that source of water if it were selected as the preferred option.

Treated Water Quality - "Ability of treated water to meet a standard of quality comparable to treated water currently received by the City"

Treatment assumptions for all of the options were designed to treat the specific source water to a high water quality standard for drinking water, and to be comparable to that produced by the City's current source of supply (JWC). Though there may be differences between potential risks for varying source water, each option would be treated to meet or surpass all U.S. Environmental Protection Agency and Oregon Health Authority's Safe Drinking Water Act standards. For each option, the type of treatment was selected to provide a treated water quality equivalent to the City's existing supply.

All of the options were given a neutral score as all options will provide treated water quality equivalent to that currently received by the City's customers.

Environmental Impacts - "Environmental impacts due to construction and/or operation of the supply."

The Commission and the public expressed interest in comparing the relative environmental impacts of the options during the decision making process. Each of the options represents some level of environmental impact. However, some of the options have higher energy use and additional potential endangered species impacts to consider.

The Portland option was given a positive rating relative to the other options since the environmental impacts would mainly occur during construction. Portland also has an existing habitat conservation plan to mitigate impacts to aquatic ESA species and the lowest power use of all the options.

The Mid-Willamette, Southern Willamette, and Northern Groundwater options were all given a neutral score since the environmental impacts occur mainly during construction and these options have moderate power usage. Though there are aquatic ESA species associated with each of these supplies, these impacts may be mitigated.

The TBWSP was given a negative relative score. As with the other options, the TBWSP would potentially impact aquatic ESA species though these impacts may be mitigated. However, this impoundment option results in permanent flooding impacts to terrestrial ESA species, including loss of habitat for the recently identified federally-endangered Fender's Blue Butterfly species (*Icaricia icarioides fenderi*) and threatened Kincaid's lupine species (*Lupinus oreganus*). A recent study indicated the location may have the largest known population of that particular butterfly species (Hicks, 2012).

More information on threatened or endangered species in Oregon can be found in the Bureau of Reclamation's Biological Assessment of the Tualatin Project (BOR, 2009), Status of Fender's Blue Butterfly on Clean Water Service Property: Tanner Creek, Henry Hagg Lake, Washington Co., Oregon. (Hicks, 2012), and at the following website: http://www.dfw.state.or.us/wildlife/diversity/species/threatened_endangered_candidate_list.asp.

Responsiveness to Demand Growth - "Ability to supply full projected growth in demand, and phase improvements in response to slower or faster growth"

The Commission was interested in whether options had the ability to phase the infrastructure to delay portions of the capital investments, and if the options could be expanded in the future to meet demands beyond the planning window of this study. All options include some capital investment to be completed initially.

The Portland option was given a positive relative score. Even though this option includes construction of a second Washington County supply pipeline, the capacity of the existing facilities and infrastructure allows large capital investments to be phased further out in time.

The Mid-Willamette, Southern Willamette, and Northern Groundwater options were all given a neutral relative score. These options require the transmission pipelines to be built initially, but allow some flexibility in the ability to phase the development for treatment plant capacity and well sites. There were also no fatal flaws identified that would prohibit the ability to expand these options beyond the window of this study.

The TBWSP option was given a negative score relative to the other options. This option allows only phasing of treatment plant capacity, with the majority of the infrastructure required up front. The dam expansion also does not allow for expansion beyond the planning window of this study.

5.0 NEXT STEPS

At its August 2012 meeting, the Commission received a preliminary rating of the evaluation criteria prepared by staff for the source options. Table 2, attached, shows the ratings that were applied to each of the options. The ratings also included estimated net present values for total

costs of construction, operation and maintenance for each option. The criteria rating matrix allowed the Commission to compare the relative costs, benefits, and risks of all of the source options. Based on their balancing of those ratings, the Commission designated a Preliminary Preferred Option that reflects the values the Utilities Commission and the community consider most important in selecting a long-term water supply source.

The ratings demonstrate that the Mid-Willamette option delivers significant value and cost benefits for Hillsboro. In order to designate one of the other options as the Preliminary Preferred Option, that option would need to deliver significant net benefits to offset its higher cost. Instead the other options fall into two categories. One group provides no additional benefits in comparison to the Mid-Willamette option; the other group also includes significant disadvantages (indicated by negative ratings) to compound the disadvantage of their higher cost.

Based on its review of the findings in the Long-Term Water Supply Study reports, and after balancing the ratings of the different source options, the Utilities Commission designated the Mid-Willamette option as the Preliminary Preferred Alternative at its September 2012 meeting. The Mid-Willamette option is the least risk and least cost option, and the Commission concluded, best reflects the values that the Commission believes should be delivered by a new water supply source. The Commission also authorized staff to conduct an information and public outreach program regarding the Preliminary Preferred Alternative. The program will solicit input from customers and stakeholders on the Commission's evaluation criteria and suggested topics for additional study. Staff will compile the feedback received during the outreach program into a report for presentation to the Commission.

Table 2. Draft Criteria Evaluation of Water Supply Options

Criteria	Mid-Willamette	Southern Willamette	Tualatin Basin Water Supply Project	Portland Supply	Northern Groundwater
Total Project Cost	**$870,000,000** Lowest-overall cost option	**$995,000,000** +14% ($125,000,000) compared to lowest-cost option	**$1,080,000,000** +24% ($210,000,000) compared to lowest-cost option	**$1,115,000,000** +28% ($245,000,000) compared to lowest-cost option	**$1,140,000,000** +31% ($270,000,000) compared to lowest-cost option
Hillsboro's Cost Share (assumes partner(s) will share project costs)	**$370,000,000**	**$370,000,000** (No partners identified for Southern Willamette at this time. Actual Hillsboro cost share will be higher without partners)	**$335,000,000** (Does not include costs associated with water purchases/leases from a significant delay in schedule or mitigation for the two newly identified endangered species)	**$725,000,000**	**$450,000,000**
Reliability	+ Limited susceptibility to drought and climate change, new construction to current seismic standards	+ Limited susceptibility to drought and climate change, new construction to current seismic standards	- Susceptible to drought and climate change, need for pump-back due to insufficient flows	0 Limited susceptibility to drought and climate change, infrastructure not constructed to current standards	+ Limited susceptibility to drought and climate change, new construction to current seismic standards
Redundancy	+ Provides independent, redundant supply to the City of Hillsboro	+ Provides independent, redundant supply to the City of Hillsboro	- Does not provide redundant supply to the City of Hillsboro	+ Provides independent, redundant supply to the City of Hillsboro	+ Provides independent, redundant supply to the City of Hillsboro
Ownership	+ Hillsboro-owned supply, limited local partners, high degree of control	+ Hillsboro-owned supply, limited local partners, high degree of control	0 Bureau of Reclamation management of dam facilities with limited local control (without title transfer)	- Wholesale purchase of water without ownership	+ Hillsboro-owned supply, limited local partners, high degree of control
Operational Complexity	+ Complexity similar to existing JWC supply	+ Complexity similar to existing JWC supply	- Operation of pump-back would increase complexity of operations	0 Increased complexity due to need to manage peaking factor to Portland contract	+ Complexity similar to existing JWC supply
Implementation Risk	+ Existing intake, existing treatment plant site, pipelines through rural areas	- New intake facility, pipelines through rural areas, option not being considered by TVWD	- Numerous potential roadblocks, congressional funding approval required, significant permitting issues	0 Existing impoundment and intake, pipeline traversing heavily urbanized corridor	0 New well facilities, pipelines through rural areas
Source Water Quality	0 Potential contamination from upstream urban and agricultural influences	0 Potential contamination from upstream urban and agricultural influences	+ Limited potential contamination from upstream agriculture	+ Protected watershed, groundwater with little potential contamination	- Potential contamination from upstream sources, including superfund site; lack of water quality data
Treated Water Quality	0 With planned level of treatment, equivalent to current JWC source	0 With planned level of treatment, equivalent to current JWC source	0 Expansion of current JWC source of supply	0 With planned level of treatment, equivalent to current JWC source	0 With planned level of treatment, equivalent to current JWC source
Environmental Impacts	0 Impacts mainly during construction, potential mitigation for impacts to aquatic ESA species, moderate power usage	0 Impacts mainly during construction, potential mitigation for impacts to aquatic ESA species, moderate power usage	- Permanent flooding due to impoundment, potential mitigation for impacts both aquatic and terrestrial ESA species including loss of habitat	+ Impacts mainly during construction, existing habitat conservation plan to mitigate impacts to aquatic ESA species, lowest power usage	0 Impacts mainly during construction, potential mitigation for impacts to aquatic ESA species, higher power usage
Responsiveness to Demand Growth	0 Further expansion possible, small proportion of investment can be phased	0 Further expansion possible, small proportion of investment can be phased	- No ability to further expand supply, small proportion of investment can be phased	+ Further expansion possible, major improvements delayed compared to other options, minimum purchase requirement	0 Further expansion possible, moderate proportion of investment can be phased

References:

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Oregon Department of Fish and Wildlife. 2012. Threatened and Endangered Species List: http://www.dfw.state.or.us/wildlife/diversity/species/threatened_endangered_species.asp