EXHIBIT A

PROJECT:	Bull Run Filtration Project
PROJECT NUMBER:	W02229
PREPARED BY:	Christopher Bowker
DATE:	August 31, 2018
SUBJECT:	Filtration Plant Key Decisions and Process

1.0 Executive Summary

In August 2017, the Portland City Council voted to construct a water filtration treatment facility to meet the treatment requirements for *Cryptosporidium*. On December 18, 2017 the Oregon Health Authority-Drinking Water Services (OHA) and the Portland Water Bureau (PWB) signed a bilateral compliance agreement that laid out a schedule for construction of a new filtration treatment system on the Bull Run Supply by September 30, 2027. The approved filtration schedule includes three primary phases – Planning, Design, and Construction. It will take approximately 10 years until the treatment facility is operational.

The Bull Run Filtration Project (filtration project) will be one of the largest PWB projects to date. PWB has already begun the planning phase of this project, which included answering four preliminary questions related to filtration of the water supply: project delivery (procurement) method, plant capacity, location, and filtration technology. The results from this process were four preferred alternatives that the project will build upon moving forward.

To reach a decision, each question was evaluated and discussed by the project team (which included stakeholders with broad technical and organizational representation) and the Executive Committee (comprised of PWB Management Team members) at a series of workshop sessions between January and June 2018. Three consultants were hired to assist in gathering and understanding relevant information for these decisions: Barney & Worth (community outreach), HDR (procurement, location, and capacity), and Jacobs (decision framework and filtration technology).

Technical memorandums were used to explain and document this process. Three of the decisions (capacity, location, and filtration technology) used a decision-making process generally referred to as a decision framework, which is discussed in the first document enclosed herein. This decision framework was used to help compare and contrast more complex issues related to these questions. The development and application of the decision framework components were accomplished through the workshops. Decisions were made by the Executive Committee.

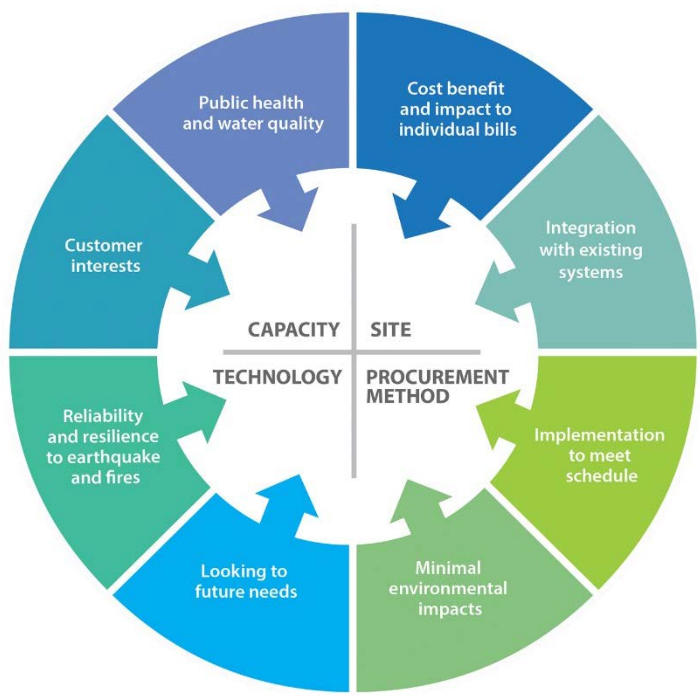
The collection of documents enclosed herein represents the initial work performed during the planning phase of the Bull Run Filtration Project and includes technical memorandums on the decision framework, the four key questions, as well as supporting documents. These documents are summarized below.

Decision Framework

The capacity, location, and filtration technology decisions were complex and had multiple components to consider and weigh. With consultant support, PWB produced a decision framework comprised of building blocks that provided the specific steps to reach the decisions. This framework was paramount to reaching these decisions because it designated who was included in the process, established their roles within the process, provided continuity of decision-making across the three decisions, clarified how conclusions would be reached, structured the inclusion of important values in the process, and characterized how information was presented in workshop settings. This information was captured in the Decision Framework technical memo (Document 1).

Once the framework was established, the next step was to identify and prioritize community and PWB values that were important and relevant to the filtration project, resulting in a values hierarchy. Values were the guiding principles to be considered when making decisions and were used to characterize, understand, and communicate tradeoffs. Criteria were then developed that supported these values. Specific and measurable performance scales were then identified that could be used to evaluate and compare alternatives; these are specific to each fundamental decision. The values, criteria, and performance scales were developed using surveyed community input and project team input. The organization of values, their descriptions, and the criteria that refine the values are incorporated in the Values Hierarchy.

Finally, a decision model was developed. Utilizing weighted scenarios and data-plots, the model incorporated the values, criteria, and performance evaluation into a structure allowing for comparative assessment of the alternatives considered for each of the four key areas.



Developing the decision framework, values hierarchy and decision model standardized a methodical evaluation process, assured incorporation of community and PWB values, and transparently displayed how pre-planning phase filtration decisions were reached.

Filtration Plant Alternative Delivery

The planning, design, construction, and commissioning of a filtration plant is estimated to cost between $350 and $500 million. In order to minimize project delivery risk and cost and schedule impacts, PWB evaluated alternative delivery (AD) procurement methods as allowed under ORS 279.015 and compared them to traditional design-bid-build (DBB or "low bid").

The Filtration Plant AD Methods technical memo (Document 2) described three potential AD methods available to deliver the filtration plant design, construction, and commissioning; discussed the advantages/disadvantages of each compared to traditional Design-Bid-Build (DBB) procurement; and presented a comparison of the alternatives to assist in the determination of the most appropriate delivery method for the filtration project. These three methods are Construction Manager/General Contractor (CM/GC), Fixed-Price Design-Build (FPDB), and Progressive Design-Build (PDB).

To select an AD method, a workshop was held with the consultants, PWB, and City of Portland procurement staff. The purpose of the workshop was to describe the contractual arrangements for DBB, CM/GC, FPDB, and PDB; differentiate the AD methods by their specific characteristics; and compare each AD method and its advantages over DBB with a list of criteria specific to the filtration plant project and PWB concerns.

The starting considerations for the workshop are summarized below:

- All three alternative delivery (AD) methods would reduce project schedule compared with the standard DBB approach. This is due to the elimination of the need to bring the design to 100% completion prior to the advertisement and bidding period required in DBB procurement. In addition, design and early construction activities can occur concurrently. In each case, the selection of the eventual contractor is done early in the design process.
- All three AD methods would require an exemption to competitive bidding under ORS 279.015. However, none would limit competition, and all have the potential to save costs through the shorter delivery schedule and collaborative working relationships they promote.
- All three AD methods have been successfully used by public works agencies in the U.S. However, the default selection would be CM/GC, unless one of the other two options proves superior.

The delivery methods were then evaluated for their ability to satisfy primary PWB considerations under four main categories: project-specific attributes, PWB culture, management and reporting, and past experience. The workshop discussion on these topics revolved around the varied experience of the participants, including current City experience with PDB.

In the workshop, staff deliberated on what AD method best met PWB’s project needs. The participants determined that CM/GC procurement was the most advantageous method for delivery of the filtration project. CM/GC would allow greater control of project decision-making, as well as engineering and operations input into the facility design. CM/GC is also anticipated to maximize Disabled/Minority/Women/Emerging Small Business (D/M/W/ESB) participation in both the design and construction contracts. Additionally, PWB has successful prior experience with CM/GC and was more confident in its application for the filtration project.

Filtration Plant Capacity

The capacity decision was a complex decision based on forecasted demands and population growth. The project team and Executive Committee reached a conclusion with the assistance of the decision framework. PWB staff identified the criteria and performance scales used as part of the decision-making process to identify the plant capacity. The performance scales applied to the capacity decision were considered independently of two other key areas: location and filtration technology. The choice of capacity then informed the choice of location and filtration technology.

The capacity decision includes considerations for future demands, level of service goals (both quantity and quality), costs (capital and operations and maintenance) or different filtration plant capacity and supplementary supply alternatives), and other factors. The Filtration Plant Capacity Alternatives technical memo (Document 3) presents the initial plant capacity alternatives, likelihood of need to rely on other PWB management strategies to meet peak demands, applicable decision model criteria related to capacity, and evaluation of each capacity alternative.

Five capacity alternatives for the future filtration plant were initially identified by PWB and HDR (Table 1). The capacity for each alternative was established based on a combination of the physical constraints of the existing Bull Run supply system and PWB demand projections.

Both the 200 mgd capacity and 100 mgd capacity alternatives were found to be unsuitable and eliminated from further consideration. The 200 mgd capacity was rejected from further consideration because it is 40 mgd higher than the projected PDD of 160 mgd in a stress year for 2045 (i.e., the highest demand day between 2027 and 2045). A 100 mgd capacity facility was also rejected because it would not meet system demand up to 50 percent of the time and alternative management strategies would be needed on a regular basis. This is inconsistent with PWB's groundwater policy (Appendix B).

The remaining alternatives were carried forward for evaluation using the decision model and criteria. The range of 115 – 120 mgd was reduced to 115 mgd to simplify the subsequent analysis. Similarly, the range of 135 – 145 mgd became 145 mgd. The potential plant capacities of 115, 145, and 160 mgd took into consideration the projected peak daily demand (PDD), peak 3-day demand (P3D) in a stress year (an unusually warm and dry year) for 2045, and their ability to consistently meet projected PWB water system demands.

Table 1: Initial Capacity Alternatives

Capacity (mgd)	Description
200	Approximately equal to maximum Bull Run conduit capacity
160	Slightly higher than the projected 2045 PDD and P3D demands in a stress year
145	Covers 90% of 2045 PDD and P3D demands in a stress year
115	Slightly higher than the projected 2045 PDD and P3D in a weather normalized year.
100	Slightly higher than the projected 2045 summer average demand in a weather-normalized year

The project team, with agreement from the Executive Team, used the results of the decision model to first remove the 115 mgd alternative from further consideration. This alternative provided the fewest overall benefits to PWB in most of the evaluation scenarios that the team considered and discussed, as well as having the highest cost per unit value of the three modeled scenarios.

The scoring between the 145 mgd and 160 mgd alternatives was very similar. After another analysis of the criteria, with and without scoring, the project team and the Executive Committee merged the two alternatives into a single conclusion.

It was decided that the desired capacity is 160 mgd, with an understanding that the capacity ultimately constructed may be somewhat smaller. This could be due to subsequent decisions about siting and filtration technology as well as later design choices. However, the lowest installed capacity that the PWB would accept is 145 mgd. This decision of a desired capacity and hard lower limit provides adequate direction at this early phase of the project and reflects PWB's current understanding of projected PDD, while providing flexibility during treatment plant design in the coming years.

Filtration Plant Site Alternatives

Based on previous studies, six sites were evaluated for their ability to host a filtration-type treatment facility: Carpenter Lane, Lusted Hill (with expansion), Headworks, Larson's Ranch, Powell Butte, and Roslyn Lake (see Figure 1). These sites were selected on their anticipated ability to meet essential criteria.

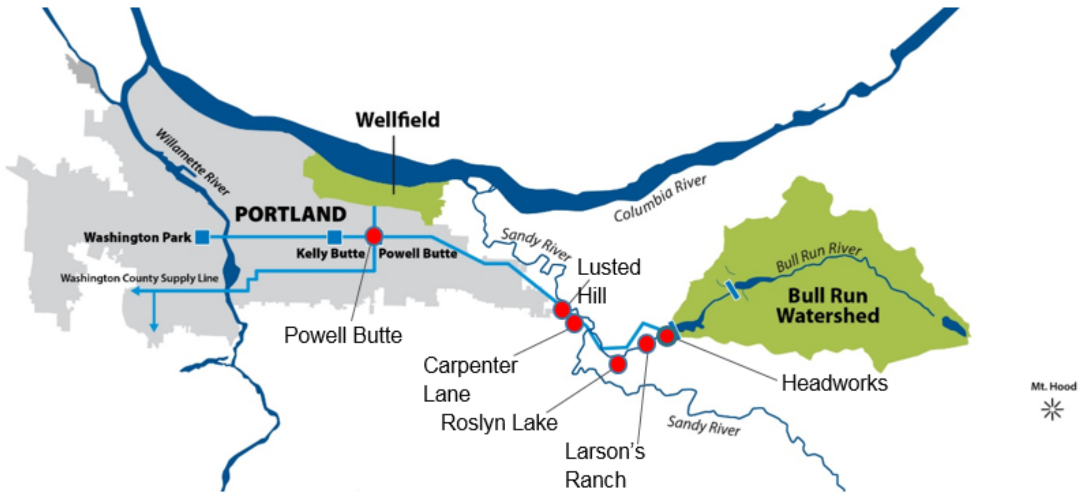


Figure 1: Approximate locations of the six potential filtration sites reviewed.

The location decision was likely the most difficult decision to make. Although the decision framework was used, the final two sites were essentially equal in their value scores. Compounding this was the added difficulty of anticipating how the Bull Run supply transmission system may change in the future. HDR coordinated closely with PWB and their other consultants, Jacobs and Barney & Worth, to develop the criteria and performance scales that drove the location decision. The site was selected after a plant capacity was identified, (see Filtration Plant Capacity Alternatives), but before the filtration technology was determined.

Several major considerations exist that affected site choice such as cost/benefit impacts, meeting future needs, and regulatory compliance. The team developed specific siting criteria that supported these broader values. The criteria used in the evaluation were: maximizing gravity flow, site proximity to existing and future conduit rights-of-ways (ROWs), site size, site slopes and geologic conditions, and impacts to the compliance schedule.

The six potential filtration facility sites were evaluated for their ability to meet these essential criteria. Sites needed to meet all essential criteria or else were considered to have a fatal flaw. Table 2 summarizes each sites' ability to meet the essential criteria (using a pass/fail scoring). Four of the sites failed to meet all essential criteria. Only two sites, Carpenter Lane and Lusted Hill, passed all essential criteria and were therefore evaluated further using the decision framework.

Table 2. Pass/Fail Results of How Well Each Initial Site Met the Essential Criteria.

Site	Hydraulic Grade Line	Proximity to Conduits	Tax Lot Size	Slopes and Geologic Hazards	Schedule
Carpenter Lane	**Pass**	**Pass**	**Pass**	**Pass**	**Pass**
Headworks	Fail	Pass	Fail	Fail	Pass
Larson's Ranch	Fail	Pass	Pass	Pass	Pass
Lusted Hill	**Pass**	**Pass**	**Pass (with site expansion)**	**Pass**	**Pass**
Powell Butte	Pass	Pass	Pass	Pass	Fail
Roslyn Lake	Fail	Pass	Pass	Pass	Pass

The results from the decision model were discussed at length by the project team and the Executive Committee. The scores for both the alternatives were very close in all three weighting scenarios and the filtration team and the Executive Committee were split between the two sites. A major concern with expanding Lusted Hill was related to part of the area being zoned as Exclusive Farm Use (EFU), although the site had other benefits. Receiving a conditional land use approval on EFU zoned land was identified as a significant hurdle. Team members with more extensive knowledge of state land use decisions felt an approval was unlikely to be granted. Others felt that even if an approval could eventually be granted, the approval process would be drawn out to the point where it would likely prevent PWB from meeting the compliance deadline.

The team was very concerned about the risk to the schedule of siting the facility within an EFU zone. To be better informed about this risk, the Executive Committee consulted with the City Attorney. Based upon the City Attorney's explanation of potential timelines related to obtaining land use approvals, the Executive Committee decided that attempting to build on EFU land would be an unacceptable risk to the schedule. Therefore, Carpenter Lane was selected by the Executive Committee as the preferred filtration plant site.

Filtration Plant Filtration Technology

The filtration technology decision was made with the assistance of the decision framework and is captured in the Filtration Plant Technology Assessment (Document 4). Jacobs coordinated closely with PWB and their other consultants, HDR and Barney & Worth, to identify the criteria and performance scales that PWB staff used as part of the decision-making process to identify the filtration plant technology. The performance scales applied to the technology decision were considered after capacity and location were determined because these may have impacted the technology decision.

The Environmental Protection Agency (EPA) recognizes several filtration strategies for compliance with the Surface Water Treatment Rules, including the latest Long-term 2 Enhanced Surface Water Treatment Rule that sets out treatment requirements for *Cryptosporidium* removal and inactivation. These technologies include granular media filtration, membrane filtration, slow sand filtration, cartridge and bag filtration, and diatomaceous filtration. Of these filtration technologies, there are no known large (greater than 50 mgd) cartridge, bag, or diatomaceous earth filtration facilities. Therefore, the team proposed to focus the evaluation on the remaining three technologies.

The consultant team met with PWB and identified a list of filtration benefits that would have measurable impact on evaluating the differences among the remaining three filtration technologies being considered. These filtration benefits are based on the benefits originally described by PWB to City Council in the August 1, 2017 memo identifying the probable benefits of filtration over UV treatment. Potential benefits of filtration are as follows:

- Provide pathogen removal for *Cryptosporidium, Giardia*, bacteria and viruses
- Produce biologically stable water
- Reduce disinfection by-products
- Increase supply reliability
- Reduce distribution system flushing, and lower turbidity levels
- Reduce iron and manganese concentrations
- Improve water quality stability; reduce lead and copper release at customer taps
- Reduce water quality impacts due to warmer weather (such as algae)
- Reduce organic discoloration events
- Improve ability to respond to changes in regulations
- Increase ability to meet several critical service levels
- Treat a sustained elevated turbidity event
- Reduce customer cost of water treatment at the tap

The three technologies were then evaluated for their ability to provide the above desired system benefits. For evaluation purposes, some pre- or post-treatment measures were assumed so that PWB could evaluate the full treatment systems ability to achieve the required desired benefits of filtration. This was done to develop capital and operating costs so that decision-makers could fairly evaluate the alternatives. Actual pre- or post-treatment processes will be determined later. None of the treatment configurations for slow sand filtration provided a good or excellent rating for all filtration benefits. Therefore, it was recommended that only granular media filtration and membrane filtration be evaluated for potential filtration technology to use on the Bull Run supply.

These two technologies were then compared using the decision model. In all three weighing schemes, granular media filtration resulted in higher performance. Granular media filtration provides greater value at less cost while providing the desired filtration benefits. The membrane filtration option costs more and provides less value. The project team and Executive Committee selected granular media filtration as the preferred treatment technology.

Supporting Documents

The technical memorandums described above (Documents 1-4) are not attached to this Executive Summary.