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TECHNICAL MEMORANDUM

To: ✓ Baker County Commissioners

From: David W. Wildman, P.E.

Subject: **Hewitt and Holcomb Parks Water Supply - Hydraulic Analysis**

Date: November 30, 2022

Job/File No. 90-54-02 (w/encl.)

cc: Doni Bruland, Baker County (w/encl.)
Mayor Patrick Lattin, City of Richland (w/encl.)
Gary Chamberlin, City of Richland (w/encl.)

REGISTERED PROFESSIONAL ENGINEER 67076PE OREGON JAN. 15, 2002 DAVID W. WILDMAN
RENEWS 6-30-24

Purpose/Background

The purpose of this Technical Memorandum is to summarize the hydraulic analysis conducted on the City of Richland, Oregon's water system to determine the feasibility of incorporating a potential water supply to Hewitt and Holcomb Parks. Baker County intends to develop water system infrastructure to support improving the potable water supply to the parks. Currently, the parks have wells that supply both potable and irrigation water. Recent well tests have been positive for total coliform bacteria and very high iron levels, which are leading to water taste and appearance concerns. Therefore, the City's water is being considered as a potential source of potable water service to the parks, and the existing wells would continue to be used for irrigation purposes.

Design Criteria/Approach

To determine the impact that the parks would have on the City's water system, the demand for both systems has been determined for use in the hydraulic analysis. Typical water system demands used for water system models include the following:

- Average Daily Demand (ADD). This is the typical average demand the water system experiences, which represents the average demand over a one-year period. Winter demands are typically lower than the ADD, and summer demands are typically higher than the ADD.

- Peak Daily Demand (PDD). This is the peak demand of the water system, which is intended to represent the highest demand day of the year without considering fire flow. The PDD usually occurs during the summer when summer-related water use is the highest.

Richland Water System Demand

The City's water system demand was obtained from the 2017 Water System Consolidation Feasibility Study developed for the City. The demand presented in the Study was determined by using historical water data from the City as well as the community of New Bridge (which is proposed

to connect to the Richland water system in 2023). The projected year 2036 ADD of 115 gallons per minute (gpm) and PDD of 408 gpm were used for the hydraulic analysis. Both flows were evaluated in the hydraulic analysis, but the PDD is typically used for sizing water system components.

Potential additional future demands along the pipeline route were also modeled in some of the alternatives described herein to determine how they would affect the system. Where appropriate, five additional demand points were assigned to mimic potential future demand needs along the pipeline route. The additional points of demand along the water main line were modeled under Alternative 1 below.

The Parks' Water Demand

The demand for the parks was based on current data from 2021 and 2022. The busiest time of the year for the parks is typically June and July. During the busiest months at the parks, it was reported that Hewitt Park used a total of 879,900 gallons in July 2022, and Holcomb Park used a total of 120,600 gallons in June 2022. These data included the irrigation system and fish cleaning stations' water demand. It was proposed not to include the irrigation system and the fish cleaning stations in the water demands potentially using the Richland water supply. It was confirmed with Oregon Health Authority staff that the existing site well water could be used for fish cleaning purposes. Therefore, the parks' potable water demand was then evaluated based on the total RV spaces, shower facilities, and restrooms to determine the approximate demand (excluding the irrigation system and fish cleaning stations). RV spaces typically require approximately 125 gallons per day. Shower facilities can have a demand of approximately 2 to 3 gpm per shower.

Hewitt and Holcomb Parks combined currently have 52 RV sites, seven showers, and three restroom facilities. County staff have indicated a potential future expansion to add up to 10 RV sites and six showers. Using the number of anticipated water consuming facilities at each of the parks, the total projected parks water demand has been estimated. Regarding the RV sites, the average demands noted above need to be converted to a peak flow. A "peaking factor" of 3.0 was utilized to convert average flows to projected peak flows (assuming, for instance, that the majority of the RV sites are all using water at a higher rate at the end of a day of fishing). This resulted in a peak demand for the projected full 62 RV sites of approximately 16 gpm. Calculating the demand for the restroom and shower facilities, assuming the worst case of all being used at the same time, the demand associated with just the shower and restroom facilities would be approximately 39 gpm. If all the showers and restrooms were being used at the same time that there was peak use at the RV sites, the maximum projected demand could be as high as 55 gpm. However, all site facilities being used at the same time is unlikely to occur, so a reasonable peak demand estimate of 45 gpm was used for the parks in the water model.

Hydraulic Analysis Overview

The City's existing water system model was used as the starting point for developing the updated water system model. The existing water system model had been developed using WaterCAD as part of the City's 2005 Water System Improvements project. Before updating the model, first it had to be converted from WaterCAD to InfoWater Pro. InfoWater Pro is hydraulic modeling software that is fully integrated into Esri ArcGIS Pro. This allows users to combine the hydraulic modeling capabilities of InfoWater Pro with the spatial analysis capabilities of Esri ArcGIS Pro. With the conversion, all data contained in the existing water system model were able to be retained and were converted to the InfoWater Pro system.

To provide accurate water model results, elevations at the locations of water system features, such as reservoirs, pipe connections, etc., were needed. Preliminary elevation data and previous design elevations were utilized and assigned to all City water system features. The converted model was updated and verified based on Record Drawings of the City's water system. The projected 2036 City demands for both ADD and PDD were input into the model to develop the City's current water system model. Once a model of the current water system and demands was created, three alternative models were then created and analyzed to determine the pipe sizes required to supply the water demand for the parks. The three alternatives are discussed below.

Water Supply System Alternatives

Three alternatives were evaluated to meet the water demand needs for the parks:

- Alternative 1, a direct pipe from the City to serve the parks and houses along the pipe route
- Alternative 2, a pipe with a water storage tank to act as an equalizing chamber to help reduce pipe sizes
- Alternative 3, a direct pipe from the City to serve only the parks

Alternative 1 would start by connecting to the City's existing 6-inch water main on 1st Street. The new water line would be placed along 1st Street to the south and run east on Sullivan Lane to Robinette Road. The water pipe would turn southeast on Robinette Road to the intersection of Robinette Road and Hewitt Drive. The water line would provide water service to residents along the water line route on 1st Street and Sullivan Lane. The water line would connect to Hewitt Park as needed at that location. There would also be a junction at the entrance to Holcomb Park, which would allow the new water line to connect to the existing Holcomb Park water system. Both parks would require isolating the irrigation system from the new potable water system, and the existing wells would be used for irrigation and fish cleaning purposes.

Alternative 2 would include the required pipe as discussed above for Alternative 1 but would also incorporate a water storage tank. The water storage tank would act as an equalizing chamber to help reduce peak demand on the City's water system and reduce pipe sizes to meet the parks' water demand needs. If Alternative 2 is selected, the water storage tank would likely be placed near Holcomb Park and Robinette Road. This location would be ideal to provide storage requirements for the parks.

Alternative 3 would be similar to Alternative 1 and start by connecting to the City's existing 6-inch water main on 1st Street. The new water line would be placed along the same route as described in Alternative 1. However, additional demand for water service to residents along the route is not included. With Alternative 3, a new 6-inch water line would be extended south from the existing 6-inch line on 1st Street to Sullivan Lane. A 3- or 4-inch water line would then be extended from Sullivan Lane to the parks. At each park's entrance, 2-inch water pipes would be utilized to supply water to each park. Both parks would utilize the existing well water supply for the irrigation system and fish cleaning station(s) separate from the new potable water system.

Results

Multiple scenarios for the water system were evaluated in InfoWater Pro. The existing Richland water system and projected water system demands associated with Hewitt and Holcomb Parks were evaluated as discussed in the Hydraulic Analysis Overview section above.

Existing Water System Conditions

Currently, based on the ADD and PDD, the City experiences a range from 32 to 45 pounds per square inch (psi) throughout the City's water system. This provides adequate water pressure for the City's users. This was used to evaluate the proposed water systems and ensure that the existing system pressure needs would continue to be met.

The City of Richland also currently utilizes a booster pump system to provide fire flow protection to the City. These booster pumps maintain the water pressures noted above while reportedly being able to deliver flows of more than 2,000 gpm. It should be noted that if a fire occurs on the east side of the City and the City is providing water to Hewitt and Holcomb Parks, flow and pressure limitations in excess of those noted herein may be seen.

Proposed Conditions

The proposed conditions model incorporated the water supply alternatives. First, the existing model was updated to include the proposed pipe and the additional demand for the parks. Then the model was modified to determine the required pipe sizes based on the velocity and pressures throughout the system. Typically, pipes are sized not to exceed a velocity of 5 feet per second (ft/s) based on the PDD. A summary of the potential hydraulic conditions of different pipe sizes under different demand conditions is shown on Table 1.

TABLE 1
PIPELINE HYDRAULIC SUMMARY

Pipe Size (inches)	Demand (gpm)	Velocity (ft/s)	Headloss (ft/ft)
1.5	22.5	4.08	0.065
2	22.5	2.3	0.161
3	45	2.19	0.010
4	45	1.15	0.002

ft/ft = feet of pressure loss per foot of pipeline

Alternative 1

The direct pipe from the City to the parks was evaluated at multiple sizes to determine the correct sizing. The analysis concluded that the proposed water line from the City's water system to the entrance to Holcomb Park would be 4-inch pipe. The 4-inch line would transition to two 3-inch pipes near Holcomb Park and Robinette Road to serve each park. The proposed alternative would be able to supply more than 80 psi of pressure to the parks. The pressure throughout the City would be maintained by supplying 32 to 45 psi. Three-inch lines would be utilized to tie in to the existing park systems. It is anticipated that 1-1/2-inch lines would be installed within the parks to provide potable water service to each RV site, showers, and

restrooms as needed. More detailed information and further analysis of the existing parks' water system piping would be required prior to construction.

Alternative 2

Based on the analysis, the water storage tank would not be needed. The parks' additional demands are not significant enough to require a water storage tank to help reduce the potential impact of increased demands on the City's system. Potential water stagnation and a potential associated reduction in Richland's treated water chlorine levels would also be a concern with this alternative.

Alternative 3

The analysis shows that when there are not additional demands along the water main line to the parks, the water main line size can be reduced. A 3-inch (modeled as 2.9-inch inside diameter) water main line could be utilized to transition to two 2-inch pipes near Holcomb Park and Robinette Road to serve each park. The combination of 3- and 2-inch lines is projected to provide a minimum of 37 psi to the parks under the peak demands noted herein. Similar to Alternative 1, it is anticipated that 1-1/2-inch lines would be installed within the parks to provide potable water service to each RV site, shower, and restroom as needed.

It is important to recognize the potential pressure fluctuation in the system that may occur with this alternative. During low demand periods, such as during the night when there is very little water use, system pressures could be as high as 80 psi at the parks, as noted with Alternative 1. However, when restroom, shower, and RV water use occurs at the same time, pressures may drop to approximately 37 psi. While 37 psi is an adequate service water pressure, a 43 psi pressure fluctuation during a normal summer day's water use at the parks may result in some customer concerns and operational difficulties. Pressure control valves may need to be installed at each RV site to regulate pressures delivered to RV water systems. The unfortunate consequence of installing pressure regulators would be further reduction of water pressure during low pressure periods. More detailed information and further analysis of the existing parks' water system piping and on RV water supply pressure regulation is recommended with this alternative prior to construction.

On-site Treatment Alternative

Another alternative that could be evaluated is the installation of a water filtration and/or disinfection system within the existing water system at the parks. The capital cost associated with this alternative could be lower than the pipeline extension. However, the additional annual operational requirements, along with operator certification needs, are anticipated to offset any upfront project cost savings. This alternative would need to be further evaluated to determine the feasibility of different treatment options and both the capital and operational costs associated with it.

Potential Implementation

Based on the hydraulic analysis, Alternative 1 could be implemented if there was a desire to have potential capacity to serve additional future demands or if pressure fluctuations at the parks were to be limited. Alternative 1 is shown on Figures 1 and 2. Alternative 3 could be implemented if the assumed

water system demands and potential daily pressure fluctuations (estimated to be approximately 43 psi) noted herein are acceptable to the County and park users. As previously noted, with each of these alternatives, the existing site well water system would be isolated from the potable system and continue to be used as the irrigation and fish cleaning supply source.

Cost Estimate

A preliminary cost estimate was developed for Alternative 1, as shown on Figure 3. Alternative 1 is estimated to have a year 2023 project cost of $1,625,000, which also includes a 40 percent allowance for contingencies, engineering, administration, and other fees associated with this project. This cost estimate was based on construction prices in 2022. The construction prices shown have been taken from similar projects and include allowances for prevailing wages and a contractor's overhead and profit. It should be noted that construction costs have inflated significantly in 2021 and 2022, and future prices may continue to fluctuate. Should the County determine that Alternative 3 is preferred, the cost estimate may be updated to reflect an anticipated reduction in price.

Potential Project Funding

Recent federal funding allocations to support water and wastewater infrastructure development are at a very high level. Programs such as the Safe Drinking Water Revolving Loan Fund and USDA Rural Development are anticipated to offer unprecedented grant/loan funding options. In some cases, no penalties may be assessed for paying back the loan portion of these funding programs prior to the loan repayment date. These programs may offer a means for the County to leverage its limited pool of funds to maximize grant dollars available to support the parks water supply improvements project.

Summary

Baker County is considering connecting Hewitt and Holcomb Parks' water systems to the City of Richland's existing water system to improve the quality of potable water at the parks. A pre-design analysis was conducted to determine potential pipe routes, sizes, and layout within the parks. The hydraulic analysis concluded that a direct 4-inch line from the City to the parks (without a demand equalizing storage tank) would serve the parks without significant pressure fluctuations. A 3-inch line could be considered, but daily 43 psi pressure fluctuations are anticipated during peak demand periods at the parks. It was determined that neither of these alternatives would significantly impact the City's water system pressures. The estimated project cost to install approximately 3 miles of piping and associated accessories and isolate the existing wells and irrigation system from the potable water system is $1,625,000.

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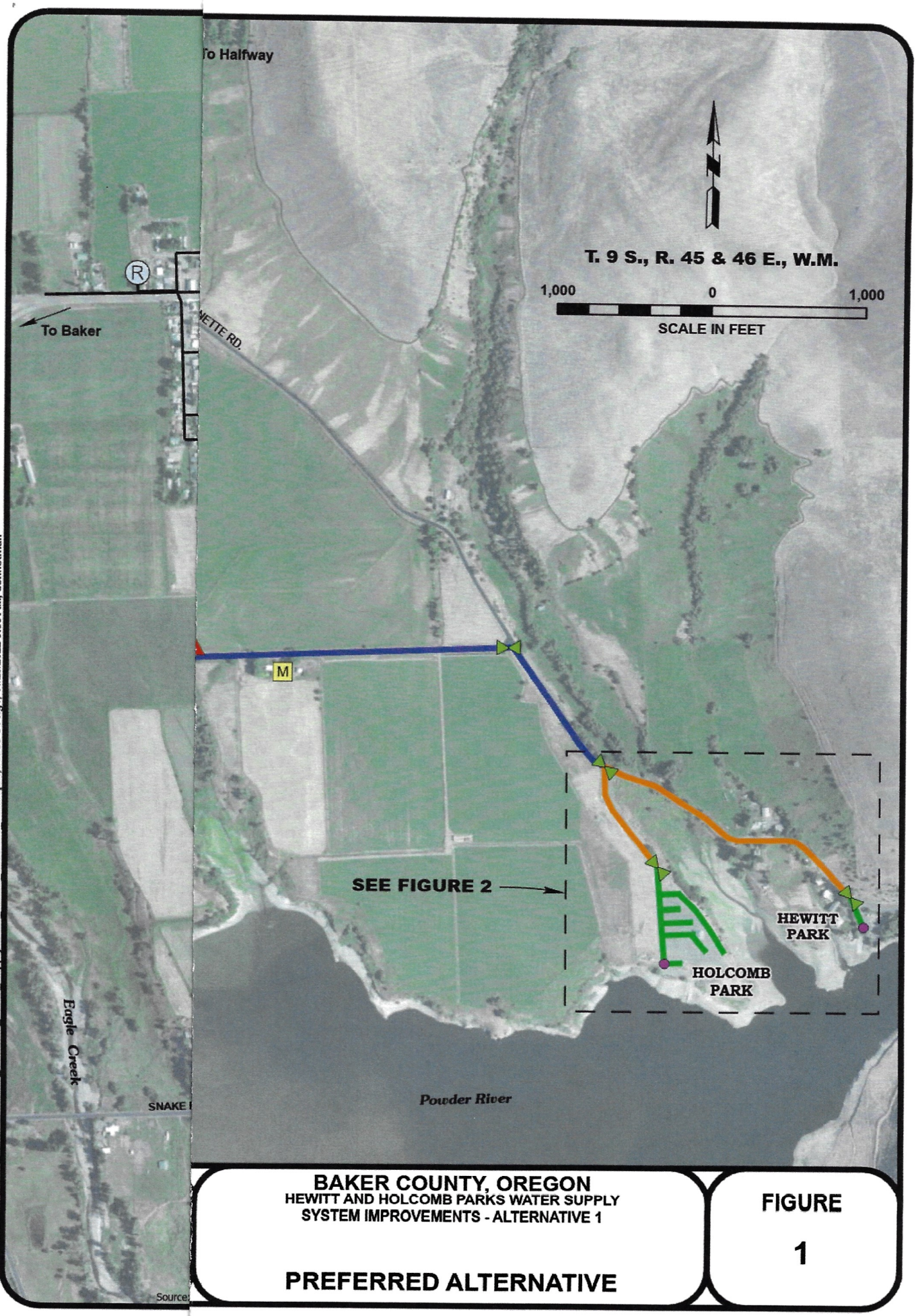

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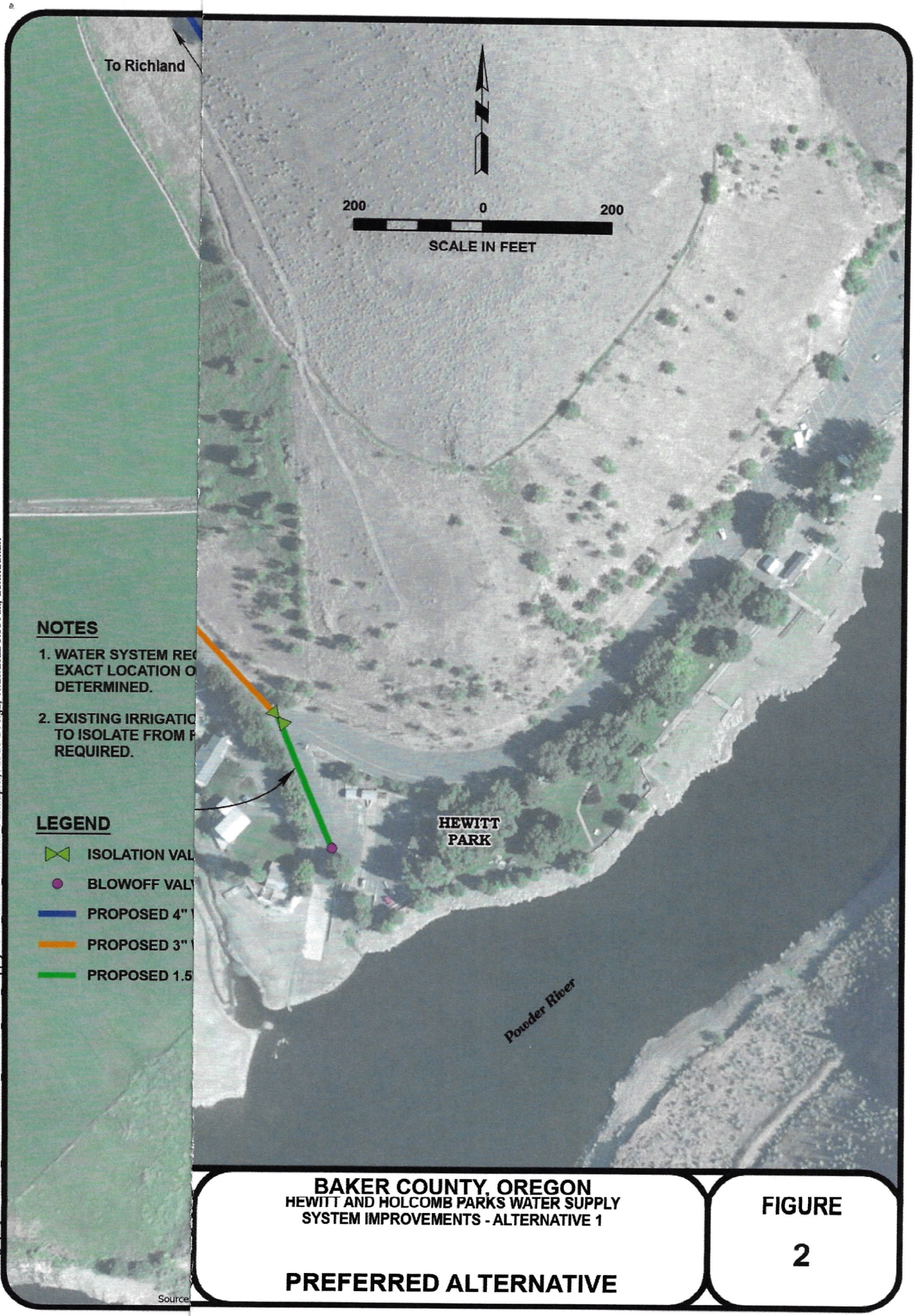
BAKER COUNTY, OREGON
HEWITT AND HOLCOMB PARKS WATER SUPPLY SYSTEM IMPROVEMENTS - ALTERNATIVE 1

PREFERRED ALTERNATIVE

FIGURE 1



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BAKER COUNTY, OREGON
HEWITT AND HOLCOMB PARKS WATER SUPPLY SYSTEM IMPROVEMENTS - ALTERNATIVE 1

PREFERRED ALTERNATIVE

FIGURE
2

BAKER COUNTY, OREGON
PRELIMINARY COST ESTIMATE
HEWITT AND HOLCOMB PARKS WATER SUPPLY SYSTEM IMPROVEMENTS
ALTERNATIVE 1
(YEAR 2023 COSTS)
November 2022

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 48,450	All Req'd	$ 48,450
2	Temporary Protection and Direction of Traffic/Project Safety	LS	17,000	All Req'd	17,000
3	4-inch Water Line	LF	55	10,250	563,750
4	3-inch Water Line	LF	48	2,300	110,400
5	1-1/2-inch Water Line	LF	32	2,200	70,400
6	Connection to Existing Water Line	EA	2,500	3	7,500
7	Air Release Valve	EA	6,500	1	6,500
8	4-inch Gate Valve	EA	1,250	4	5,000
9	3-inch Gate Valve	EA	1,000	2	2,000
10	Blowoff Valve	EA	1,000	2	2,000
11	Flowmeter Vault	EA	15,000	1	15,000
12	Existing Irrigation System Isolation	LS	30,000	All Req'd	30,000
13	Asphalt Surface Restoration	SY	125	900	112,500
14	Gravel Surface Restoration	SY	15	1,500	22,500
15	Seeding and Restoration	LS	10,000	All Req'd	10,000
16	Project Erosion Control	LS	10,000	All Req'd	10,000
				Total Estimated Construction Cost	**$ 1,033,000**
				Administration, Legal, Engineering, and Contingencies @ 40%	411,000
				Natural Resources Permitting*	20,000
				Cultural Resource Investigations and Monitoring**	80,000
				Agency Review and Permitting	5,000
				TOTAL ESTIMATED PROJECT COST (2022)	**$ 1,549,000**
				Inflation to the Start of Construction @ 5%	76,000
				TOTAL ESTIMATED FUTURE PROJECT COST (2023)	**$ 1,625,000**

Notes:
*Assumes a federal nexus requires a wetland delineation, and associated Joint Permit Applications for potential temporary impacts to wetlands will be needed.

**Assumes a federal nexus requires cultural resource investigation during the design phase and cultural resource monitoring will be needed during pipeline installation.

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BAKER COUNTY, OREGON
HEWITT AND HOLCOMB PARKS WATER SUPPLY SYSTEM IMPROVEMENTS - ALTERNATIVE 1

PRELIMINARY COST ESTIMATE

FIGURE 3