

PROGRESS REPORT – WMCP CONSERVATION MEASURES BENCHMARK

To: Kerry Cope
Oregon Water Resources Department
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From: Robert Long, *RG, LHG, CWRE*
Ian Godwin, *RG*

CC: Jolynn Becker, *City Manager for the City of Banks*
Robert Peacock, *City Engineer for the City of Banks*

Date: January 23, 2024

Subject: City of Banks WMCP – Conservation Measures Benchmark Progress Report

CwM presents this progress report on behalf of the City of Banks (City) in fulfillment of the conditions of the 2021 Water Management and Conservation Plan (WMCP) and its Final Order (FO). The WMCP contains several 5-year benchmarks aimed at improving water production and usage metering and reducing historically high water loss in the City’s distribution system. One of these benchmarks under the Annual Water Audit and Reporting requirement includes the completion of a progress report on two of the City’s proposed pipeline replacement projects (Item 8, WMCP FO):

- i. With two (2) years of approval of this WMCP, the City shall provide the results of the replacement of the two major identified sources of water loss (Sellers Road and Park Street) in the transmission system and the results of the subsequent water loss audit in a progress report to the Department no later than **January 31, 2024**.*
- ii. If the above identified transmission line replacement does not result in water losses of 10% or less, the City shall implement a regularly scheduled system survey to identify the location of additional leakage within the transmission system and prioritize them for repair.*

The two pipeline projects identified in the WMCP condition, Sellers Road and Park Street, were completed by December 2021. Therefore, October 2023 marks the end of the second full water year since the majority of the pipeline replacement activities were completed. This progress report summarizes the work completed during these projects, presents a summary of water production and water usage in the 2022 and 2023 water years, and a water loss audit for that timeframe (FO Item 8 i.). Average annual loss remains above 10% (FO Item 8 ii.), so this progress report also outlines the City’s efforts to identify and address the sources of leaks within the system.

SUMMARY OF PIPELINE PROJECTS

Although the City has completed other leak repairs and pipeline projects over the last five years, the two main water-saving efforts were the Sellers Road Pipeline, or Transmission Line project, and the Park Street project. Both of these projects were started before or during the completion of the current 2021 WMCP report. However, they were not finished in time to be accounted for in the water data used to prepare the WMCP.

The Sellers Road transmission line carries water from the City's Slow Sand Filter Plant (SSFP) and Clearwell Reservoir to the Northstar Reservoir and eventually to the Carsten Reservoirs, a distance of over 4 miles. The original pipeline was highly corroded and accounted for the majority of all system loss. Considering just the portion of the line between the Northstar Reservoir and the Carsten Reservoirs, the pipeline was estimated to have lost an average of at least 20 gpm from 2015 to 2019, though this rate varied significantly. The Sellers Road project was completed in December 2021 and included the replacement of 17,133 linear feet (LF), or 3.25 miles, of pipe.

Park Street is located in downtown Banks north of Banks High School. The pipeline along this short roadway was found to be losing an average of about 7 gpm in 2018. By November 2020, the City had replaced 620 LF of pipe along Park Street to address this loss.

Water production and consumption data from the 2022 and 2023 water years (October 2021 through September 2023) were reviewed for this progress report. Although the Sellers Road project was not completely finished until December 2021, this two-year timeframe demonstrates the impact of these conservation projects have had on water loss for the City.

WATER PRODUCTION AND USAGE: SUMMARY STATISTICS

The City of Banks has four water sources. The City maintains and operates two groundwater wells in the Columbia River Basalts, Well-1 and Well-2, which are located within the City limits. The Green Mountain Springs, referred to as the west (large) spring and east (small) springs, are located several miles north of the City. Historically, the springs have accounted for about 2/3rd of overall water production. Since March 2023, the City has been performing maintenance work on Well-1 and it has been off-line. Well-2 has continued to operate on a regular basis.

Finished Water production from the two wells is measured just after chlorination at the wellhead and before the water is pumped to customers along Banks Road or into the Carsten Reservoirs. For the purposes of this water audit, Finished Water production from the springs was measured at the Clearwell Reservoir outflow. In the past, Finished Water has been measured at the outflow of the SSFP where chlorination occurs. The Clearwell acts as a chlorine contact reservoir before water flows into the Sellers Road transmission line. The City of Banks has been performing ongoing tests and reconfigurations of the SSFP in the last three years to assess available spring flows and optimize treatment capacity. This progress report uses the total Finished Water production volume as reported at the outflow from the Clearwell, after water is diverted and passes through the SSFP where this work has occurred.

Total water production from all four City sources decreased in the 2022 and 2023 water years compared to the WMCP reporting period (2015-2019). The total annual Finished Water Production, defined as the volume pumped from the wells plus the volume produced from the Clearwell Reservoir, was 24% lower in the last two years than in 2015-2019 (Table 1 – 2022-2023 vs 2015-2019: Summary Statistics). The primary reason for this is the reduction in losses along the Sellers Road transmission line from the Clearwell to the Carsten Reservoirs. There was also a 7% reduction in consumption between the two periods of record, which further contributed to the decline in demands on production. Overall annual loss of Finished Water dropped from more than 36% in 2015-2019 to an apparent average of 18.0% in 2022-2023. This average 18% loss amounts to about 1.04 MG per month.

Table 1 – 2022-2023 vs 2015-2019: Summary Statistics					
Period	Annual Finished Water (MG)	Average Monthly Finished Water (MG)	Annual Water Consumption (MG)	Average Monthly Consumption (MG)	Average Annual Loss
2015-2019	91.0	7.58	57.8	5.06	36.4%
2022	67.04	5.59	55.03	4.59	17.9%
2023	71.36	5.95	58.41	4.87	18.1%
2022-2023 Average	69.20	5.77	56.72	4.73	18.0%

The peak demand season for the City of Banks continues to be the months of July-September. In 2022-2023, the average peak season monthly production was 7.94 MG, with a peak monthly production of 8.77 MG in August 2023. Average peak season consumption was 6.80 MG, with a peak monthly consumption of 7.85 MG in August 2022. Together, these statistics indicate an average peak-demand season loss of about 12.4%.

In contrast, the low demand season is defined as November-April. The average low demand season monthly production in 2022 to 2023 was 4.62 MG, with average monthly consumption of 3.73 MG. The minimum monthly production and consumption values were both recorded in April 2023 and were 4.05 MG and 3.32 MG, respectively. These figures indicate an average low-demand season loss of about 18.7%.

From 2015-2019, the Green Mountain Spring sources accounted for about 2/3rd of annual Finished Water production, with the remaining 1/3rd coming from the wells (Table 2). Of the groundwater that was produced, about 85% was from Well-2. This balance of water sources shifted significantly after the completion of the Sellers Road transmission line project. In 2022-2023, the springs accounted for the vast majority of annual Finished Water production. Well-2 accounted for essentially all of the remainder, with Well-1 producing less than 30,000 gallons per year on average (Well-1 has been off-line for repairs since March 2023).

Table 2 – Finished Water Production by Source		
Source	2015-2019 Average Annual Contribution	2022-2023 Average Annual Contribution
Green Mountain Springs (total Clearwell output)	61.6%	84.5%
Well-2	32.6%	15.5%
Well-1	5.8%	<0.1%

Despite the apparent shift towards production from the springs, there was not a significant increase in the volume of Finished Water produced from those sources. The average annual outflow from the Clearwell in 2015-2019 was 54.6 MG. This increased only 7% to an average of 58.5 MG per year from 2022-2023, which is disproportionate to the apparent 23% increase in the springs’ contribution to supply. This is attributed to savings along the Sellers Road transmission line. So much water was historically lost along this pipeline that the wells had to pump more frequently to meet demands. Now that losses have been cut significantly, a much greater percentage of the water produced at the springs actually makes it to consumption endpoints and the wells have been relied upon to a lesser extent.

DESCRIPTION OF LOSSES

The City maintains a system of production and transmission meters to track Finished Water from the sources and throughout the distribution system. Historically, errors with one or more meters have made accurate monthly and annual estimation of loss challenging. Many of these issues have been addressed since the 2021 WMCP reporting period. To illustrate the potential areas of continued loss across the distribution system, CwM compared losses between 2015-2019 and 2022-2023 in two main sections of the system: along the Sellers Road transmission line between the Clearwell and Carsten Reservoirs, and within the City distribution system below the Carsten Reservoir outflow.

Historically, the majority of Finished Water losses have occurred along the Sellers Road transmission line. In 2015-2019, 44.4% of the Finished Water that left the Clearwell was lost before it reached the Carsten Reservoirs, or about 2.02 MG per month on average. This loss was equivalent to 27.1% of total Finished Water production, including the spring and well sources. Since the Sellers Road transmission project was completed, the loss between the Clearwell and Carsten Reservoirs has decreased to about 0.72 MG per month on average, or 15.1% of all Finished Water that leaves the Clearwell. The project has therefore saved an average of 1.3 MG per month, 15.6 MG per year, equivalent to 22.5% of current annual production. The City continues to evaluate potential locations of water loss between the Clearwell and Carsten Reservoirs.

From 2015-2019, an average of 11.1% of water that left the Carsten Reservoirs and flowed into the City service area was lost, or about 0.63 MG per month. In 2022-2023, this value has apparently decreased to 3.3%, or about 0.13 MG per month. However, a metering issue at the reservoirs

caused a negative loss value (more water consumed than recorded leaving the reservoirs) from June to September 2022 that artificially reduced this loss estimate. The City is currently assessing options to fix this metering issue at the Carsten Reservoir outflow.

Losses along Sellers Road and the in-City distribution system should be roughly equivalent to total system loss, or the difference between Finished Water production and measured consumption. Based on the measured losses along the Sellers Road transmission line, the actual average loss within the City is likely about 0.31 MG per month, or about 5.4% of Finished Water production. The repair of the Park Street pipeline in 2020 has therefore not completely addressed losses within the City distribution network but had made some progress. The City is aware of and is in the process of addressing several other major leaks, as well as metering issues.

IDENTIFICATION AND REPAIR OF LEAKS

The City’s system of production and transmission meters divide the distribution system into six areas. When the meters are functioning properly, this allows the City to detect potential leaks by area on a monthly basis. However, frequent transmission meter errors have often made it difficult to identify discrepancies in water data as real or apparent losses in the distribution system. The City intends to continue to improve its metering infrastructure, test and repair meters in a timely manner, and install additional distribution meters to further narrow down the locations of potential leaks.

The City has historically recorded customer meter readings mid-month and calculated monthly losses by comparing these to first-of-the-month production meter readings. The difference in timing between production, transmission, and customer meter readings may introduce some errors into the City’s calculations. The City plans to switch the customer meter readings to the same day as the production and transmission meter checks starting by March 2024.

The City will continue to review monthly water production and consumption data across their six metering areas to identify potential leaks in the distribution system, which will be addressed as quickly as is feasible. The City will also work with customers to report and address leaks at customer connections, which will help to maintain low per capita consumption rates.

FIGURES and TABLES

Attachment 1	Monthly Water Production, Consumption, and Non-revenue Water
Attachment 2	Proposed Conservation Measures to Reduce Loss to 10% or Less
Figure 1	Monthly Water Production by Source and Comparison to 2015-2019

Attachment 1 - Water Audit Table

2022 Water Year							
Month	Green Mountain Springs	Groundwater Wells		Total Finished	Billed Consumption	Non-Revenue Water (loss)	
	Clearwell Output (gal)	Well-1 (gal)	Well-2 (gal)	Water (gal)	(gal)	Volume (gal)	Percent
Oct	4,317,685	37,369	364,166	4,719,220	3,894,109	825,111	17%
Nov	3,582,583	-	899,000	4,481,583	3,557,272	924,311	21%
Dec	4,849,931	3,000	182,000	5,034,931	3,687,558	1,347,373	27%
Jan	3,852,276	-	561,000	4,413,276	4,088,569	324,707	7%
Feb	4,250,397	-	229,200	4,479,597	4,002,750	476,847	11%
Mar	4,226,180	13,000	103,000	4,342,180	3,729,498	612,682	14%
Apr	3,935,290	-	1,225,000	5,160,290	4,433,057	727,233	14%
May	4,440,818	-	228,000	4,668,818	3,912,913	755,905	16%
Jun	4,260,777	-	1,759,600	6,020,377	3,900,992	2,119,385	35%
Jul	5,466,856	-	2,984,000	8,450,856	5,333,636	3,117,220	37%
Aug	6,221,414	-	2,165,000	8,386,414	7,849,617	536,797	6%
Sep	6,536,597	-	350,000	6,886,597	6,641,111	245,486	4%
Annual	55,940,804	53,369	11,049,966	67,044,139	55,031,082	12,013,057	18%

2023 Water Year							
Month	Green Mountain Springs	Groundwater Wells		Total Finished	Billed Consumption	Non-Revenue Water (loss)	
	Clearwell Output (gal)	Well-1 (gal)	Well-2 (gal)	Water (gal)	(gal)	Volume (gal)	Percent
Oct	4,362,211	-	1,181,000	5,543,211	5,598,679	(55,468)	-1%
Nov	4,287,915	-	498,018	4,785,933	3,464,026	1,321,907	28%
Dec	4,773,501	2,000	99,000	4,874,501	3,687,558	1,186,943	24%
Jan	4,107,505	-	144,000	4,251,505	3,525,962	725,543	17%
Feb	3,855,941	-	621,000	4,476,941	3,820,167	656,774	15%
Mar	4,966,025	-	60,000	5,026,025	3,416,427	1,609,598	32%
Apr	4,049,232	-	-	4,049,232	3,323,028	726,204	18%
May	5,411,474	-	784,000	6,195,474	4,185,487	2,009,987	32%
Jun	6,988,838	-	1,245,000	8,233,838	6,441,015	1,792,823	22%
Jul	6,167,910	-	1,575,000	7,742,910	6,506,511	1,236,399	16%
Aug	6,517,830	-	2,249,000	8,766,830	7,564,308	1,202,522	14%
Sep	5,494,965	-	1,921,000	7,415,965	6,878,324	537,641	7%
Annual	60,983,347	2,000	10,377,018	71,362,365	58,411,492	12,950,873	18%



January 23, 2024

Kerri Cope
Oregon Water Resources Department
725 Summer St NE A
Salem, OR 97301

ATTACHMENT 2 – PROPOSED CONSERVATION MEASURES TO REDUCE LOSS TO 10% OR LESS

Dear Ms. Cope,

The City of Banks (City) has performed an updated water production and water consumption audit and has presented the results in a WMCP Progress Report. The City has greatly improved water conservation efforts over the last decade through a variety of methods. The most significant impact has come from the Sellers Road Pipeline Replacement project and leak repairs in the Park Street area of the City. The estimated water loss in the City's total distribution system was cut in half from the 2015-2019 WMCP reporting period (estimated 36.4% loss) to 2022-2023 (estimated 18.0% loss), the two years after these pipeline projects were completed.

Overall annual water loss appears to remain above 10% for the City's distribution system. Much of this loss is expected to be a real loss due to aging distribution system infrastructure. However, a portion of the apparent loss may be due to metering and accounting inaccuracies. The City's WMCP Final Order (FO) includes condition 8.ii. which is activated if losses remain above 10%. The condition requires that the City implement a system survey and project for identifying and prioritizing leaks for repair and addressing loss generally. This City's proposed plan is outlined in this memo.

Prioritized Leak Repair Projects

The City is already aware of several sections of the distribution system which are contributing significantly to the overall annual loss. Due to the age and declining condition of the City's original piping, loss can occur over a diffuse area instead of at a discrete leak. The City has identified such areas of loss through monthly water audits, City staff observations, customer reporting, and leak location surveys. The City plans to prioritize efforts, design work, and funding towards replacing the following sections of the distribution system to cut down on continuous losses:

- Banks Road Reach A
 - A 3,000-ft section of 12" pipeline running from the City's supply wells eastward to the junction of Banks and Aerts roads. The entire section will be replaced.
- Banks Road Reach B
 - A 3,600-ft section of pipeline of variable diameter running east of Aerts Road and serving several dozen customers. This City plans to replace this pipeline with 8" and 12" line and add fire hydrants along the reach.

The City has included these two projects in their Capital Improvement Plan (CIP) and expects they will be completed in the next several years. Although meter placement makes precise measurement

of losses along Banks Road difficult, the City estimates losses could be as high as about 0.3 MG per month, or nearly 1/3rd of overall system losses.

Identification of Additional Leaks

The City will continue to monitor monthly water production and billing data to identify potential new leaks that arise. Long-term trends will be used to locate larger leaks of diffuse loss along sections of the distribution system. There are several distribution system expansion and pipeline looping projects on the City CIP that will provide opportunities for new meter installations. Increasing the number of monitoring points within the distribution system will make detecting and location leaks more efficient. New meters will be incorporated into the City's regular water audits and water tracking reviews.

Addressing Metering Issues

The City will continue to regularly assess, repair, and replace production and transmission meters when apparent data errors and detected in consecutive monthly water audits. Historically, data inaccuracies due to meter failures or errors have resulted in variable loss estimates. Now that the Sellers Road pipeline from the Slow Sand Filter Plan (SSFP) to the Carsten Reservoirs has been completed, the City will pay particular attention to the meters at the reservoirs and in the in-City distribution system.

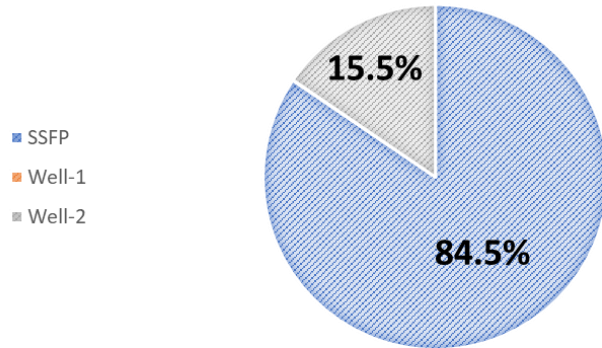
The City will evaluate the feasibility adding a SCADA network at the spring diversions and SSFP basin outflows. Such a system would allow the City to monitor water production in real time from the City's Public Works office. This would greatly improve the ability to detect leaks or water losses in the upper system. This City will also evaluate the feasibility of replacing older production meters at the SSFP and Clearwell Reservoir. These tasks can be completed in 2024-2025.

Water Accounting

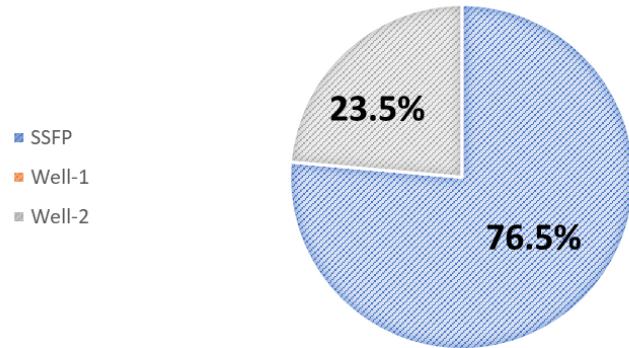
Starting in early 2024, the City will adopt a new meter reading schedule. Historically, production and transmission meters have been checked on different dates than customer consumption meters. The difference in meter reading schedules has introduced some uncertainty in the City's regular water audits. The City will begin checking all meters on the same day to ensure data consistency throughout the distribution system and water audit program. As mentioned above, the City will evaluate the feasibility of a SCADA system for all production and transmission meters to improve the efficiency and accuracy of water tracking.

2022-2023 Water Years

ANNUAL WATER PRODUCTION

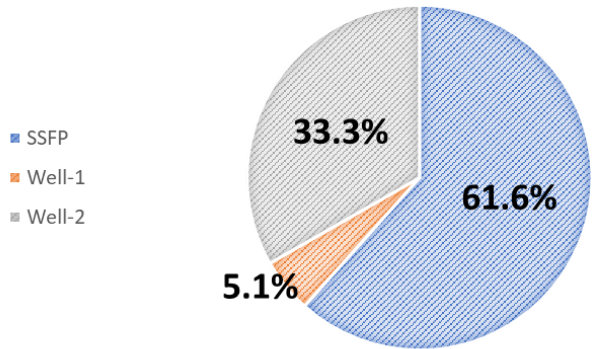


PEAK-SEASON WATER PRODUCTION

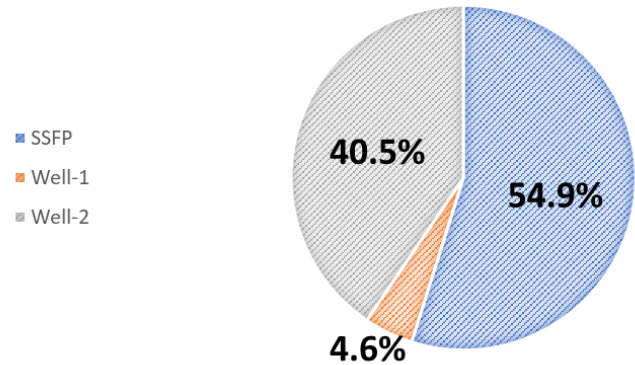


2015-2019 Water Years

ANNUAL WATER PRODUCTION



PEAK-SEASON WATER PRODUCTION



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Project #: 1501014 City of Banks WMCP Benchmark Progress Report			
1	DATE	AUTH	DRAFT
No.	Date	By	Revisions

Figure 1
Monthly Water Production by Source
Comparison to 2015-2019