Appendix I

Additional Background Information

I.1 Water Supply Capacity Memorandum (Mark Morgan, Hermiston Water Department, July 14, 2025)

1.2 Data Center Water Use Facts (Mark Morgan, Assistance City Manager, May 2024)

MEMORANDUM

TO: UGB Expansion Team
FROM: Mark Morgan
DATE: July 14, 2025
SUBJ: Water Supply Capacity- Feedville Road Corridor

HERMISTON OREGON™
Water Department

This memo is to explain:

1. Data Center Water Demands
    a. Liquid Cooling vs. Air Cooling
    b. A.I. Chips Densifying Data Centers
    c. Peak Instantaneous Needs
    d. Intra-Day Variation
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    b. Water Rights Allocations
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3. Future Campuses

1. Data Center Water Demands

The City of Hermiston, as operator of the Regional Water System, has supplied cooling water to several cloud computing operations for the past several years. This has provided system operators with a detailed understanding of the true water demands for this type of operation. This data allows operators to establish a model for future data center demand. Direct first-hand knowledge has been supplemented by Water Department Leadership attending the national "Data Center World" conference in Washington, D.C. in 2024 and 2025 to gain insight in to broader industry trends in water consumption.

A. Liquid Cooling vs. Air Cooling

Air Cooling is the cooling method predominantly used by hyperscale data centers in Oregon, whereby a media is soaked in water and then heat is transferred to the water by blowing air across the media.

Liquid Cooling is a closed-loop system which primarily utilizes glycol, or some other liquid, to carry heat away from data center components before disposing of the heat and returning. Liquid cooling utilizes almost no water once the closed-loop system is initially "charged." Historically, air cooling has been preferred to liquid cooling due to cost.

B. A.I. Chips Densifying Data Centers

The Chief Data Center Engineer for Nvidia, Wade Vinson, was a Keynote Speaker at the 2025 Data Center World Conference, where he discussed the implications of more dense, hotter, A.I. chips being implemented in data centers, and their impacts on cooling. It is evident from his discussion, and the ensuing conference "conventional wisdom" from representatives ranging from Google and Meta to smaller "Edge" data center operators, that water used for air cooling will likely be used in tandem with closed-loop liquid cooling in the future. Essentially, liquid cooling will help dissipate the higher peak heat amounts, while air cooling will then carry the baseline heat load away. Therefore, it is not anticipated that denser A.I. chip enabled data centers will require a significant increase in cooling water supply.

C. Peak Instantaneous Needs

Due to the nature of how the water is used in cooling, Data Centers feature large fluctuations in demand throughout the year and even throughout the same day.

Based on direct knowledge and projections supplemented by industry consensus, it is estimated that new data centers in the Columbia Basin will feature a peak instantaneous demand equivalent to 0.002 Gallons Per Minute (GPM) per Gross Square Foot of data center building. Therefore, a 100,000 square foot data center would require approximately 200 GPM of peak instantaneous water supply for it's cooling needs.

C. Seasonal Variation

Water demands for the data center industry in Umatilla County are almost entirely for cooling during the warmest months. Therefore, non-potable cooling water demand drops to nearly zero October through March, with the only water demand coming from baseline employee drinking water needs and some minor maintenance needs.

D. Intra-Day Variation

Water demand from the data center industry in Umatilla County sees significant intra-day variation during the warmest months, with facilities taking advantage of cool overnight ambient air temperatures. The hottest months of the year in Hermiston, July and August, feature average daily high temperatures of 92.7* and 91.0* respectively, with average daily low temperatures of 58.6* and 56.8*. As a result, non-potable cooling water demand drops to nearly zero between 1am and 8am daily during July and August.

E. Baseline Employee & Maintenance Demand

The baseline volume of water required for meeting employee drinking water and system maintenance throughout the year for the data center industry in Umatilla County is approximately 0.006 gallons per day per square foot. This is equivalent to 609.7 gallons per day, or 222,000 gallons per year for 100,000 square feet of data center capacity; equivalent to the usage of 1.3 typical homes in Hermiston.

Based on water consumption, and development standards for existing data center campuses within the greater Hermiston area, when accounting for the total land-area necessary for accommodating a data center, including areas for evaporation ponds, backup power generation, electrical substations, etc. the typical data center in the greater Hermiston area utilizes approximately 18,000 gallons of potable drinking water per acre per year.

F. Gross Volumetric Demands

Due to the large fluctuation in cooling water needs, the actual volume of water needed by data centers is significantly less than an industry which uses water consistently year-round and may be assumed from the peak demand GPM figures.

	Gallons/SF
January	0.05
February	0.19
March	1.22
April	0.71
May	0.52
June	7.86
July	15.37
August	12.01
September	6.70
October	1.61
November	0.05
December	0.04
Annual	**46.32**

i. Data Center Water Volumes-

1. The table at right shows the total gallons per square foot used by cloud computing operations in the greater Hermiston area over the course of a year.

2. A 100,000 square foot data center would therefore utilize approximately 4,632,000

gallons of water per year.

ii. Comparable Municipal Uses within Hermiston-
   1. The median residential water customer in Hermiston uses 171,400 gallons per year. Therefore, a 100,000 square foot data center uses approximately the same volume of water per year as 27 homes.
   2. A typical elementary school in Hermiston uses approximately 24,000,000 gallons per year. Therefore, a 100,000 square foot data center uses approximately 1/5 as much volume of water per year as an elementary school.

iii. Comparable Agricultural Uses within Hermiston Area
   1. Potatoes, corn, and alfalfa are the predominant agricultural crops produced in the greater Hermiston area. Based on the soil type, climate, and other factors, the commonly accepted water need for viably growing a full season of these crops in the Hermiston area is all approximately 2.5 acre-feet per acre. This translates to approximately 815,000 gallons of water per acre per year for potato/corn/alfalfa production, much of which is typically mined from groundwater.

   2. Based on water consumption, and development standards for existing data center campuses within the greater Hermiston area, when accounting for the total land-area necessary for accommodating a data center, including areas for evaporation ponds, backup power generation, electrical substations, etc. the typical data center in the greater Hermiston area utilizes approximately 380,000 gallons of water per acre per year.

iv. Net Impact on Groundwater from Data Center Land Conversion
   1. Based on the above, a new data center located within the Hermiston area utilizes approximately 53.4% less input water per acre as agricultural production of potatoes, corn, and alfalfa.

Hermiston-Area Water Use	
	Gallons/Acre (Land Total)
Alfalfa	815,000
Corn	815,000
Potatoes	815,000
Data Center	379,833

2. Regional Water System Supply

A. Existing System Summary

The Regional Water System (RWS) pulls water from the Columbia River's "McNary Pool," just east of McNary Dam, and sends it approximately 9 miles south to the intersection of OR207 and Feedville Road via a 42" diameter pipe. Up until this point, the water is non-potable, untreated Columbia River water. The RWS has a potable water treatment plant located at OR207 & Feedville capable of treating approximately 1,755 gallons per minute to drinking water standards, in addition to sending out un-treated Columbia River Water to customers who don't need potable water.

The RWS is co-owned by the Port of Umatilla (POU) and the City of Hermiston. The RWS utilizes City of Hermiston Water Department Staff to operate and maintain the system.

Although the City of Hermiston is a co-owner of the RWS, the City of Hermiston's municipal water system purchases potable water from the RWS as one of the municipal system's water sources. This potable water is capable of delivery and tie-in to the City's system via an 8" diameter main which runs north along OR207 to connect at Joseph Avenue. A second and third delivery points exist along Feedville Road via a 16" diameter main with connections at SE 9th Street and at Kelli Boulevard. This potable water source is capable of producing approximately 600 million gallons per year, and is currently un-allocated within the City of Hermiston's Water System Master Plan.

B. RWS Water Rights Allocation

The Columbia River Water Rights for the RWS are derived from Port of Umatilla Water Rights totaling approximately 150CFS (67,000GPM). The RWS has been allocated 27,000 GPM of those water rights, which is approximately the carrying capacity of the existing 42" diameter 9 mile pipeline. From there, the Port has engaged in long-term Water Supply Agreements with industrial users who have paid to upgrade pumps, motors, and delivery capacity in order to "fully develop" capacity within that 27,000GPM RWS allocation.

Of the undeveloped water rights capacity, 4,700GPM is allocated for exclusive use within the City Limits of Hermiston, and an additional 1,800GPM is available as un-allocated Port of Umatilla Capacity, which may also be used within the City Limits of Hermiston.

C. Additional POU Water Rights

The Port of Umatilla, beginning in 2018, entered in to a new 20-year lease with the East Improvement District (EID) for the remaining 40,000 GPM of Columbia River Water Rights with the intention of allowing use of these Port

water rights for agriculture in the interim until industrial demand needs it in the future. This use of water was based upon a 2013 determination by the Oregon Water Resources Department that Municipal and Industrial Water Rights may be used for agricultural purposes. Therefore, this 40,000GPM lease began providing irrigation water in 2020 to farmland in central Umatilla County which had never been irrigated previously.

Therefore, approximately 49,000GPM, or 73% of the Port's overall existing water rights capacity, remains available for municipal & industrial development through existing or expanded Regional Water System infrastructure. The City and Port, in conjunction with Anderson Perry & Associates, have been working since July, 2024 in developing a Water System Master Plan for future build-out of the port's remaining water rights. This planning process has involved the EID, Hermiston Irrigation District, Central Improvement District, Northeast Oregon Water Association, IRZ Consulting, Umatilla County, and the U.S. Bureau of Reclamation.

D. Feedville Road Infrastructure Extensions in Development

Amazon Data Services has secured approximately 4,700GPM of instantaneous RWS non-potable water capacity through Water Supply Agreements from the Port of Umatilla for development of campuses along Feedville Road. ADS has initiated approximately $20M of projects to upgrade RWS pumps and motors, and to extend a 30" diameter non-potable pipeline in Feedville Road from OR207 to Kelli Boulevard. These improvements are anticipated to be fully operational by the end of 2024.

The City of Hermiston is also currently in development of an Aquifer Storage & Recovery (ASR) system in order to make use of it's currently completely un-utilized 1,500GPM of potable water supply capacity which goes un-used all Winter. This system will store upwards of 400 million gallons of potable Columbia River-sourced water every winter which will be available for cooling needs in the summer.

2. UGB Expansion Area

b. The UGB Expansion area borders Feedville Road on the north, where the new RWS infrastructure mentioned above is being developed.

c. Based on the improvements discussed above, this area has direct access to non-potable cooling water capable of supporting full build-out of the entire UGB expansion area as data centers by a factor of 4x.

d. The UGB Expansion area is also adjacent to the existing 16" diameter potable water pipeline in Feedville Road discussed in section 2.A above, which is capable of supplying approximately 600 million gallons per year of potable water. Based on the volumetric demands for potable drinking water of data center campuses outlined in section 1.D above, this is enough water to supply approximately 33,000 acres of data center campuses with drinking water.

e. The UGB Expansion area may also make use of the ASR water source, mentioned in section 2.D above as delivered via the Feedville Road potable water pipeline.

Umatilla County Data Center Water Use Facts

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The City of Hermiston provides cooling water to several hyper-scale data centers which have been in full operation within Umatilla County for several years. This provides direct insight in to actual gross input water consumption.

Annual Water Usage Hermiston-Area	
	Gallons/Acre
Alfalfa	815,000
Corn	815,000
Potatoes	815,000
Data Center	379,833

Less Gross Consumption than Primary Agricultural Uses
Based on available first-hand data, it is clear that hyper-scale data centers in Umatilla County use nearly half as much input water, acre for acre, as the primary agricultural production activities seen in the area.

Beneficial Re-Use of Data Center Discharge Water
Discharge water from Data Centers may be sent to neighboring irrigation canals and subsequently used for irrigation by regional farmers. However, the City does not have direct first-hand data yet on the volume of discharge water available; although it is assumed to be approximately 50% of the input amounts. Under that assumption, then the net amount of water consumed per acre by data centers which isn't returned to the local environment for irrigation use drops to roughly 200,000 gallons. Meanwhile, nearly all water used by sprinkler-based irrigators leaves the region either in the form of evaporation, transpiration, or contained within the product itself.

Industry "Paying the Freight" For Increased reliable Irrigation Water
The source-water for cooling water in Hermiston is pumped from the Columbia River at a cost which makes it financially infeasible for irrigation, but is palatable for industrial users like data centers. Meanwhile, agricultural users in the area are dependent on mining depleting groundwater aquifers or using potentially volatile surface-water rights which can be curtailed in low water years. The discharge water from data centers can be delivered to existing irrigation canals at no cost to irrigation districts, and significantly stabilize surface water management by supplementing stored water capacity. This allows local farmers to expand acreage or have the certainty to plant higher value full-season crops without the concern for curtailment.