



Oregon

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MEMORANDUM

TO: Water Resources Commission

FROM: Justin Iverson, Groundwater Section Manager
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SUBJECT: Agenda Item A, September 5, 2019
Water Resources Commission Meeting

Mosier Basin Groundwater Update

I. Introduction

This informational report provides an update on recent projects related to the Columbia River Basalt aquifers underlying the Mosier Basin.

II. Background

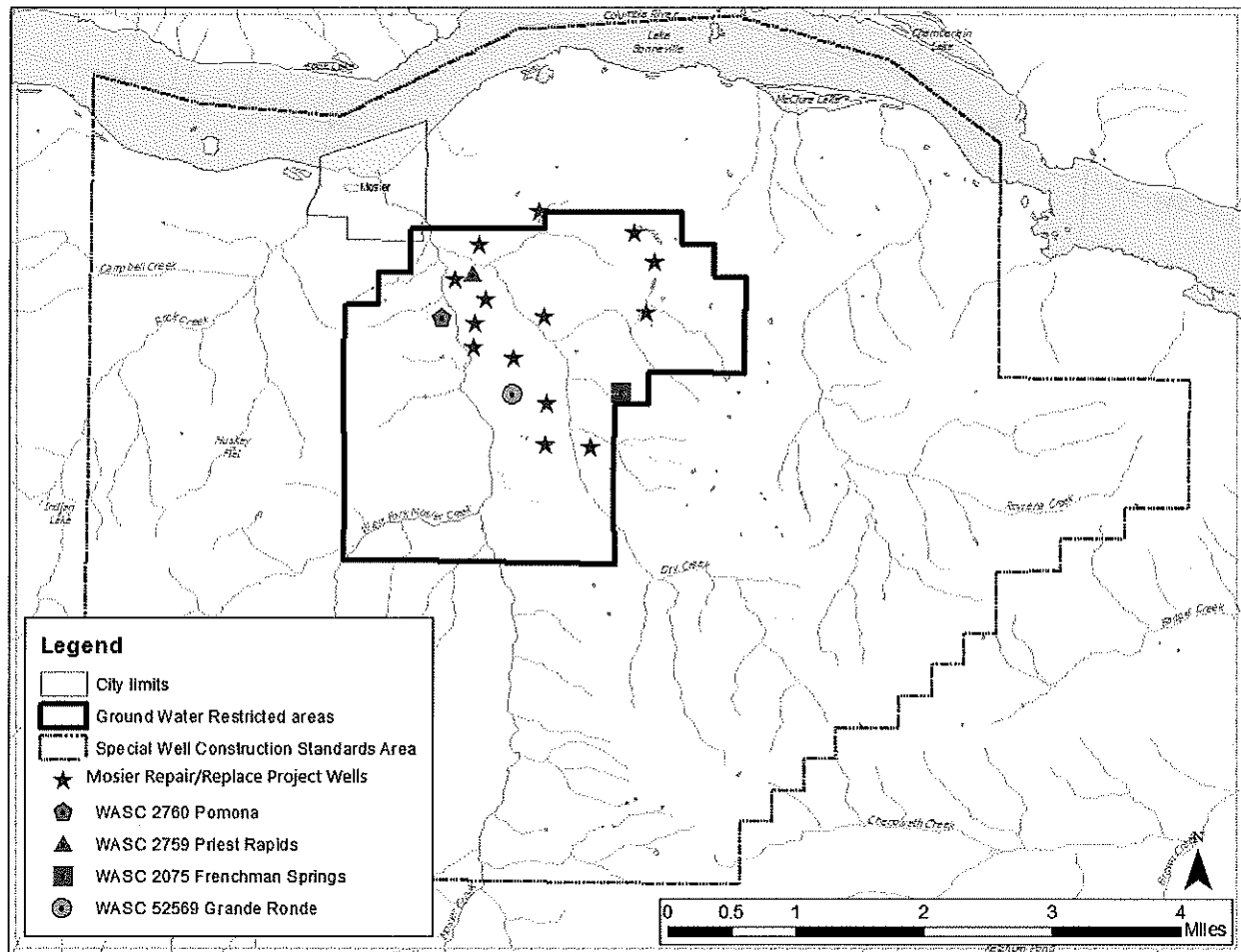
Groundwater levels in Columbia River Basalt Group aquifers underlying the Mosier Basin have declined approximately 40 to more than 200 feet since the 1960s, depending on the specific aquifer and location in the basin. Water level declines have continued, despite two basalt aquifers being withdrawn from further appropriation in 1988 (Figure 1). The Oregon Water Resources Department (Department) and the U.S. Geological Survey (USGS) have independently concluded that groundwater level declines in the basin are the result of overdrafted basalt aquifers, and drilled wells interconnecting and depressurizing several discrete aquifers (termed commingling)^{1,2}.

These problems have led some artesian wells to no longer flow, pumping yields to decrease to a rate not adequate for the permitted or intended use, and drying of formerly saturated portions of basalt aquifers and associated wells. Declining aquifer levels are also suspected to affect surface water resources in the hydraulically connected portions of Mosier Creek.

¹ Lite, K.E., Jr., Grondin, G.H., 1988, Hydrogeology of the basalt Aquifers near Mosier, Oregon: A Ground Water Resource Assessment: Oregon Water Resources Ground Water Report No.33, 138p.
https://www.oregon.gov/owrd/wrdreports/GW_Reports_No_33_1988.pdf

² Burns, E.R., Morgan, D.S., Lee, K.K., Haynes, J.V., and Conlon, T.D., 2012, Evaluation of long-term water-level declines in basalt aquifers near Mosier, Oregon: U.S. Geological Survey Scientific Investigations Report 2012-5002, 134 p.
<https://pubs.usgs.gov/sir/2012/5002/>

Figure 1: Mosier Groundwater Restricted Area. Special Well Construction Standards Area and Select Well Locations (referenced later in this report)



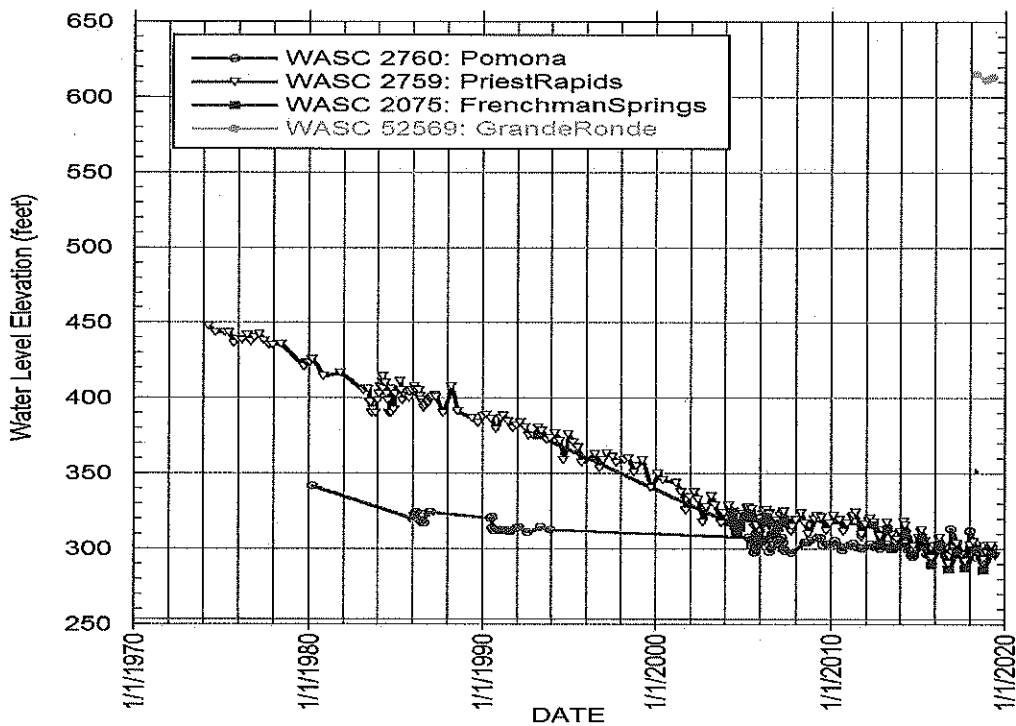
Several distinct basalt aquifers have been identified in the Mosier area, separated from one another by sedimentary units and dense lava flow interiors³. Table 1 presents a simplified basalt aquifer stratigraphy, from shallowest (youngest) to deepest (oldest) units, and associated aquifer uses. Figure 2 shows hydrographs of water level trends from select wells completed in the identified basalt aquifers, where the degree of aquifer commingling through other drilled wells has affected water level trends over time.

³ Lite, K.E., Jr., 2013, The influence of depositional environment and landscape evolution on groundwater flow in Columbia River Basalt—Examples from Mosier, Oregon, *in* Reidel, S.P., Camp, V.E., Ross, M.E., Wolff, J.A., Martin, B.S., Tolan, T.L., and Wells, R.E., eds., *The Columbia River Flood Basalt Province: Geological Society of America Special Paper 497*, p. 429–440.

Table 1: Simplified Columbia River Basalt Group Aquifer Stratigraphy in the Mosier Basin

<u>Generalized Aquifer Unit</u>	<u>Aquifer Uses</u>
Pomona (Member of the Saddle Mountains Basalt)	mainly domestic
Priest Rapids (Member of the Wanapum Basalt; Lolo and Rosalia Flows create distinct aquifers)	domestic & irrigation
Frenchman Springs (Member of the Wanapum Basalt; Sentinel Gap, Sand Hollow, and Ginko Flows create distinct aquifers)	domestic & irrigation
Grande Ronde Basalt	irrigation

Figure 2: Hydrographs for select wells in the Pomona, Priest Rapids, Frenchman Springs, and Grand Ronde basalt aquifers.



III. Project Updates

Several efforts to stabilize the basalt groundwater levels in the basin have recently been undertaken. In 2015, the Commission adopted special well construction standards for the Mosier area to help ensure new wells are constructed to prevent further commingling. In 2015, the Legislature authorized \$1 million to fix commingling wells in the Mosier area. In addition, in 2016, the Wasco County Soil and Water Conservation District applied for and received a grant from the Department’s Water Project Grants and Loans Fund to share costs with two groundwater irrigators in the basin to drill deep wells into a previously untapped basalt aquifer.

A. Mosier Special Area Well Construction Standards

The Department has facilitated the construction of approximately 60 water supply wells (new construction, alterations, deepenings, and abandonments) since special area well construction standards were adopted by the Commission in 2015. The time staff spend on each well varies greatly from less than an hour of desktop research and a quick phone call to multiple hours of research, travel time, cuttings evaluation, data collection, and consultation. The approach has been successful; there have been no well construction deficiencies resulting in commingling since the special area standards were promulgated.

B. Mosier Well Repair and Replacement Project Update

The 2015 Oregon Legislature authorized \$1 million of general funds to repair or decommission and replace commingling water wells in the Mosier area. The Department has been working with the Wasco County Soil and Water Conservation District and their drilling contractor to implement this project, which is nearing completion.

The project's scope covers the abandonment, replacement, and/or alteration of existing priority commingling wells, and covers installation of new power and water lines to service the new wells, pump removal, and pump installation. The initial scope identified 15 prioritized commingling wells to be replaced or repaired based on planning-level cost estimates and available budget. As of July 2019, the following tasks have been completed:

- 4 replacement Columbia River Basalt (CRB) irrigation wells
- 1 alteration of a CRB domestic/irrigation well (altered to isolate development from the overlying sedimentary aquifer and eliminate local CRB aquifer depressurization)
- 1 alteration of a CRB domestic well (altered to isolate development from the overlying sedimentary aquifer and eliminate local CRB aquifer depressurization)
- 7 replacement CRB domestic wells
- 10 abandonments of commingling CRB wells (irrigation and domestic uses)
- 12 pumps removed from commingling wells and reinstalled/installed into repaired/replacement wells
- Power, plumbing, and measuring tubes have been lined in and installed on all replacement wells and altered wells

As project closure approaches, a total of 14 wells are projected to be completed given current cost estimates for the remaining work. Cost overages on 2 irrigation wells where complications were encountered during drilling and well construction in 2018 resulted in the scope adjustment. Additional wells have been identified for potential replacement or repair in the event of future funding.

C. Mosier Deep Wells Project Update

In 2016, the Wasco County Soil and Water Conservation District applied for and received a grant from the Department's Water Project Grants and Loans to share costs with two groundwater irrigators in the basin to drill deep wells into a previously untapped basalt aquifer. The goal of the project is to reduce demand on the upper and administratively withdrawn Columbia River

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Basalt aquifers near Mosier to improve long-term groundwater supply and streamflows in Mosier Creek.

Drilling began for the installation of the first well (WASC 52569) in June 2017. The well was drilled to a total depth of 1,223 feet below ground surface in late 2017, where a high-pressure, water-bearing zone was encountered. Several months of work were required before the driller sealed-off the upper water bearing zones and controlled the underlying high-pressure zone in January 2018. Complications with casing set depth during placement of the final well seal necessitated additional work before the well was completed in March 2018. The extraordinary and unique challenges of drilling and completing WASC 52569 resulted in a significant budget overrun.

The District, the contracted driller, Department staff, and the owners of the second well site met in mid-April to discuss the project budget and well design modifications to the second well based on drilling experience with WASC 52569. The District has an application pending in the Water Project Grants and Loans program for funds to drill the second deep well.

IV. Conclusion

Several projects initiated since 2015 to address the causes of declining water levels in the basalt aquifer system in the Mosier Basin are underway or nearing completion. The Department will continue to collect groundwater level data to assess aquifer trends and the impacts of these projects in the coming years.

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