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November 5, 2019

Jake Fergeson, District Manager
South Davis Water District
407 W 3100 S
Bountiful, UT
jake@southdaviswater.us

Re: South Davis Water District Aquifer Evaluation

Dear Jake:

We have completed a review of the District's wells and of several published and unpublished geologic studies in the North Salt Lake and Bountiful areas and summarized our findings below. In short, the aquifer that provides culinary water for the South Davis Water District's wells is generally in unconfined conditions. This means that there is no confining layer and anything that happens at the surface (changes in recharge from irrigation or precipitation for example) more directly and rapidly have impacts on aquifer conditions in this location than in the confined aquifer farther to the west.

As irrigation, which has historically been credited with as much as 40% of the recharge to the aquifer in this area, decreases, groundwater levels will likely continue to drop unless this is made up with some sort of artificial recharge to supplement the water lost through these reductions. Over a longer period of time, these reductions in recharge will start to have a larger impact on other downstream aquifer users as well. If there are to be any additional decreases in irrigation in the area, beyond the 30% reduction that has occurred in the past 15 years, groundwater levels in this area will continue to drop and will begin to impact production from the District's wells.

Geologic Setting

The geology and hydrogeology surrounding the District has been previously described by several sources including Anderson et al. (1994), Bolke and Waddell (1972), Clark (1991), Clark et al. (1990), Davis (1983), Plantz et al. (1986), Price (1988), and Smith and Gates (1963). This information was summarized in the District's Drinking Water Source Protection Plans (DWSPP) and these plans contain additional geologic maps, potentiometric surface maps, recharge maps, well logs and pump test data for wells in the area.

The East Shore groundwater area, as described by Bolke and Waddell (1972), Clark (1991), Clark et al. (1990), and Plantz et al. (1986) runs from the Salt Lake County/Davis County line northward to Box Elder County and is located between the mountain block of the Wasatch Range and the Great Salt Lake. The District is located in the southeast part of the East Shore area. Along the East Shore area, precipitation increases in proportion to increasing elevation. As a result, precipitation in the mountains to the east is approximately three times more that in the lower elevations. The majority of precipitation occurs as snowfall between October and April. Most creeks in the area leaving the mountains fully infiltrate into the coarse lacustrine, alluvial, and colluvial deposits of the basin with the exception of flows that continue to flow to the west during unusually wet years.

The aquifer which underlies the District is comprised of semi-consolidated and unconsolidated basin fill including material ranging from cobbles and boulders in size down to clays and silts. Most of the deposits in the area include sands and gravels

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deposited from flows out of the mountains in high runoff events. The surrounding mountains are consolidated rock with little to no ability to transmit water except for through fractures in the rock caused by the seismic activity in the area. The valley is a closed basin with all drainage flowing into the Great Salt Lake. The primary boundary between the unconsolidated basin sediments and the Wasatch Mountains is the Wasatch Fault Zone. Spurs of the Wasatch Fault zone (the Bountiful Segment) trend through the eastern portion of the District along the base of the mountain front.

Groundwater Conditions

This system is comprised of saturated alluvial fill materials. While the east shore area includes both confined artesian zones and deep unconfined aquifers, the area underlying the District are primarily made up of a deep unconfined zone along the mountain front. This unconfined aquifer is made up primarily of coarse-grained deposits with some interspersed areas having thin layers of finer grained materials. These coarse-grained materials allow rapid infiltration of precipitation, streamflow, and irrigation water as well as inflow from bedrock to reach the deep unconfined aquifer system. As outlined in several of the reports, water infiltrating in this primary recharge zone along the mountain front moves in a northwest direction towards the Great Salt Lake. The recharge that infiltrates in this area provides a large source of water for the aquifers relied on by downstream users to the west.

In several reports, water levels for many wells in this area see the highest water levels in May, June, July and August when irrigation is at its peak for the season. This shows the rapid and direct link between irrigation and groundwater conditions in this area. Fortunately, throughout the entire East Shore area, groundwater withdrawals from the aquifer have decreased by several thousand acre-feet per year in recent years due to conservation. If production had remained at the higher levels of the earlier 2000's, groundwater levels in the District would have likely dropped more than they already have.

Methods for Stabilizing Groundwater Levels

In many areas there are efforts in place to mitigate for the regional groundwater level decreases that are being seen throughout the state of Utah. These decreases are due to two main factors. First, increased groundwater withdrawals over the past 30 years to provide drinking water to a growing population has strained the groundwater aquifers. Second, decreases in recharge due to several reasons, including development of previously irrigated land, decreases in general irrigation due to conservation efforts and drought conditions providing less precipitation for recharge, have continued to decrease inflows to the aquifers.

The most common recharge methods in place in Utah are injection wells and recharge basins. Recharge basins are large basins constructed in the primary recharge zones where water is directed and allowed to infiltrate into the groundwater aquifers. Injection wells are wells constructed for the purpose of directly injecting water through wells into the receiving aquifer. This second option requires that injected water meet drinking water standards prior to injection. Water recharged through basins must only be clean from pollutants that would remain with the water as it infiltrates down to the aquifer, which makes it a more ideal option in many cases a long as enough land is available to use.

If additional efforts are to be made to further decrease irrigation within the District, one of these methods will need to be employed to recharge the aquifer and replace the historic recharge that will be lost with additional conservation. Without recharge options in place, the District should be careful with efforts to further limit irrigation with the exception of excessive or overwatering that ends up on hardscape surfaces or in the storm drain system.

If you have any additional questions, please feel free to contact me directly at (801)556-1765.

Sincerely,
CRS Engineers

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REFERENCES

Carter and Burgess. 2003. Drinking Water Source Protection Plan Update for Wells for South Davis Water Improvement District, October 2003. Department of Environmental Quality, Division of Drinking Water.

Clark, D.W. 1991. State of Utah Department of Natural Resources Technical Publication No. 95. Ground-Water Resources and Simulated Effects of Withdrawals in the Bountiful Area, Utah, United States Geological Survey, pp. 13–19.

Gates, J.S. 1982. Written Commun., U.S. Geological Survey, adapted from Thomas and Nelson (1948, p. 195) and Feth and others (1966).

Kirby, S. M., and Others. 2019. Mapping Groundwater Quality and Chemistry Adjacent to Great Salt Lake, Utah. Open-File Report 699, Utah Geological Survey.

Lowe, M. 1990. Geologic Hazards and Land-Use Planning: Background, Explanation, and Guidelines for Development in Davis County in Designated Geological Hazards Special Study Areas. Open-File Report 198, Utah Geological and Mineral Survey.

McKean, A. P. and Others. 2019. Booklet to accompany three geologic maps: Geologic Map of the Antelope Island South Quadrangle, Salt Lake, Davis, and Tooele Counties, Utah., Geologic Map of the Baileys Lake Quadrangle, Salt Lake and Davis Counties, Utah., & Geologic Map of the Saltair NE Quadrangle, Salt Lake and Davis Counties, Utah. Utah Geological Survey.

Morgan, R. L. 1995. Ground-Water Management Plan for the Bountiful sub-area of the East Shore Area, Utah Department of Natural Resources, Division of Water Rights.

Nelson W. B., & Thomas H. E. 1948. Technical Publication No. 5 Ground Water in the East Shore Area, Utah Part 1: Bountiful District, Davis county. United States Department of the Interior, pp.116 & 182.

Price, D. 1985. Ground Water in Utah's Densely Populated Wasatch Front Area - The Challenge and the Choices, paper 2232 Ground Water in Utah's Densely Populated Wasatch Front Area - The Challenge and the Choices. Washington: United States Government Printing Office.

Smith, L. R. 2019. Ground Water Conditions in Utah, Spring of 2018. Cooperative Investigation Report No. 59. U.S. Geological Survey, Utah Department of Natural Resources.

Wallace, J. and Others. 2012. Groundwater Quality Classification for the Principal Basin-Fill Aquifer, East Shore Area, Davis County, Utah. Open-File Report 592, Utah Geological Survey.