



## STAFF REPORT

**TO:** Board of Directors  
**THRU:** John Enloe, Director of Natural Resources  
**FROM:** Randy Van Hoozer, Senior Hydrogeologist; Christian Kropf, Senior Hydrogeologist; Lauren Roaldson, Associate Hydrogeologist; and Nick White, Hydrogeologist  
**DATE:** June 06, 2016  
**SUBJECT:** **Informational report on groundwater aquifers**

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### SUMMARY

This staff report summarizes groundwater elevation fluctuations in monitoring wells from January 2001 through May 2016. The monitoring wells selected for this summary are intended to represent general groundwater conditions within a hydrographic basin. Groundwater conditions and hydrographs are also included in the 2016-2035 Water Resource Plan provided earlier this year.

Following several years of drought and the 2015 groundwater pumping season, groundwater elevations are generally recovering. Looking forward, groundwater elevation recoveries are expected to continue due to:

- The implementation of TROA – groundwater systems in all hydrographic basins will benefit from surface water storage capabilities defined in TROA and expanded conjunctive use operations;
- Active ASR projects – continued use of ASR within Basins 85, 87 and 92A and the operation of new and expanding ASR projects - begin recharge activities in Basins 87 and 88 and expand activities in Basin 85;
- The construction of a surface water treatment plant in the southwest part of Basin 87 - the treatment plant will provide treated creek water to the distribution system for use in Basins 87 and 88; and
- Importing groundwater from Fish Spring Ranch – currently TMWA owns and operates production wells and a distribution system that transports water from Fish Springs Ranch to Lemmon Valley. This resource will continue to be used to reduce pumping of the Lemmon Valley wells.

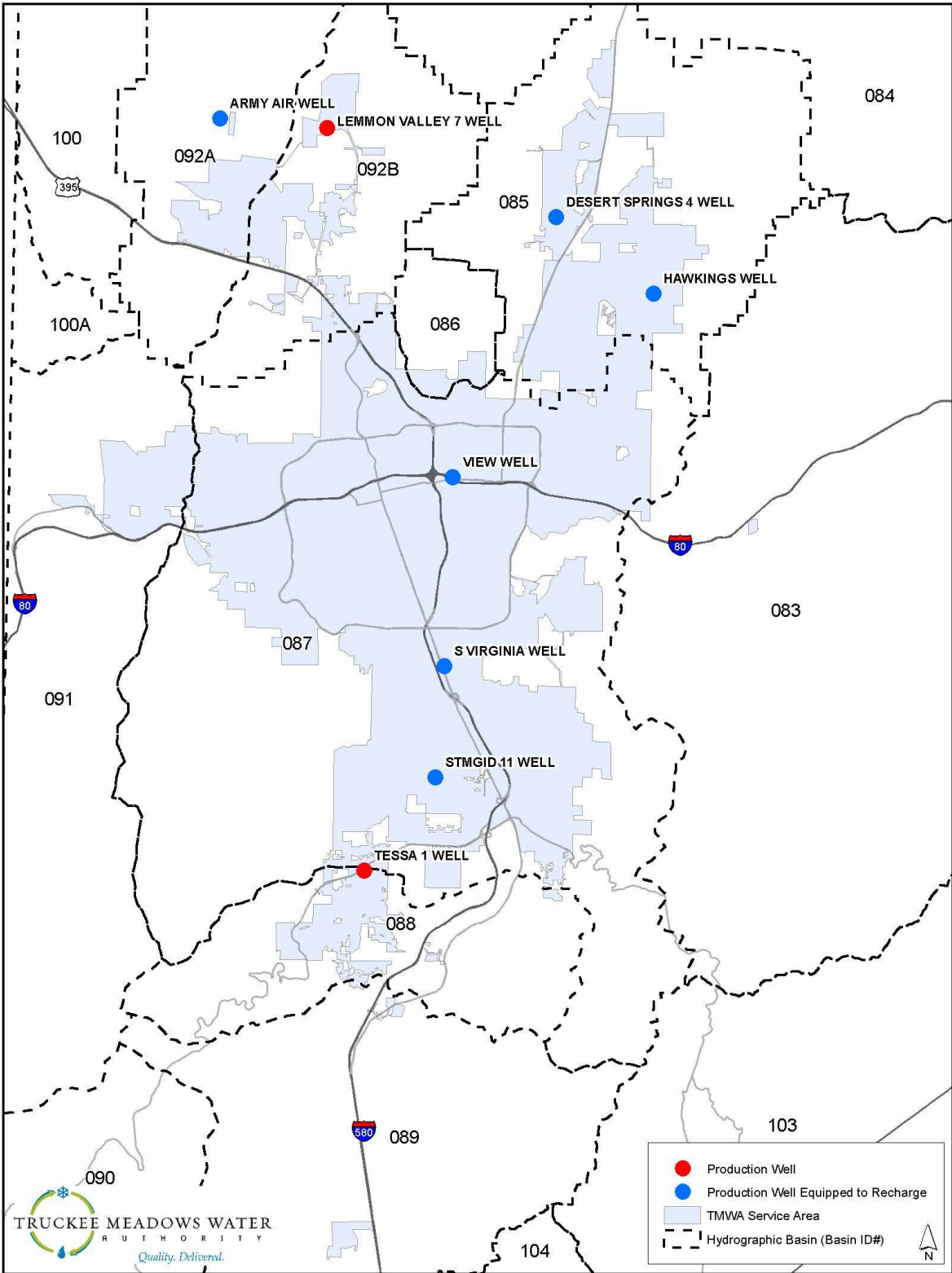
**DISCUSSION:**

The following hydrographs depict groundwater level measurements and nearby total monthly pumping volumes in acre-feet (AF) for municipal wells. If the municipal well also serves as a recharge well (Aquifer Storage and Recovery, ASR), those monthly injection volumes (AF) are depicted in purple.

The hydrographs represent changes in groundwater elevations resulting from the variation in precipitation/natural recharge, active or passive recharge, pumping of domestic and municipal wells, evapotranspiration, and aquifer properties.

The TMWA service area and a well location map are shown in Figure 1.

Figure 1: Service Area and Well Location Map



**HYDROGRAPHIC BASIN 87 – NORTH AND SOUTH TRUCKEE MEADOWS**

Basin 87 encompasses 195 square miles and includes the alluvial fan aquifer and the basin-fill aquifer. TMWA operates 44 production wells in this relatively large basin (12 wells are located on the alluvial fan and 32 wells are located in the basin-fill). There are also approximately 1,480 domestic wells located within this basin. Groundwater generally flows northeasterly to the valley floor then north

Groundwater elevations fluctuate seasonally with increases during non-pumping and recharge periods (winter months) and declines during pumping periods. The amount of precipitation also influences groundwater elevations.

Groundwater elevations in the southwest area declined when groundwater was the only water source. Water level increases are evident in areas where conjunctive use and ASR has occurred since the merger of water systems.

In the northern area, the municipal wells are primarily used to supplement summer peak demand. Groundwater elevations continue to be relatively stable. Typically, groundwater elevations decline during pumping and immediately rebound following non-pumping periods. Active ASR has resulted in expedited water level recovery and replenishment.

**Figure 2:** Groundwater Hydrograph for the South-central Area of Basin 87

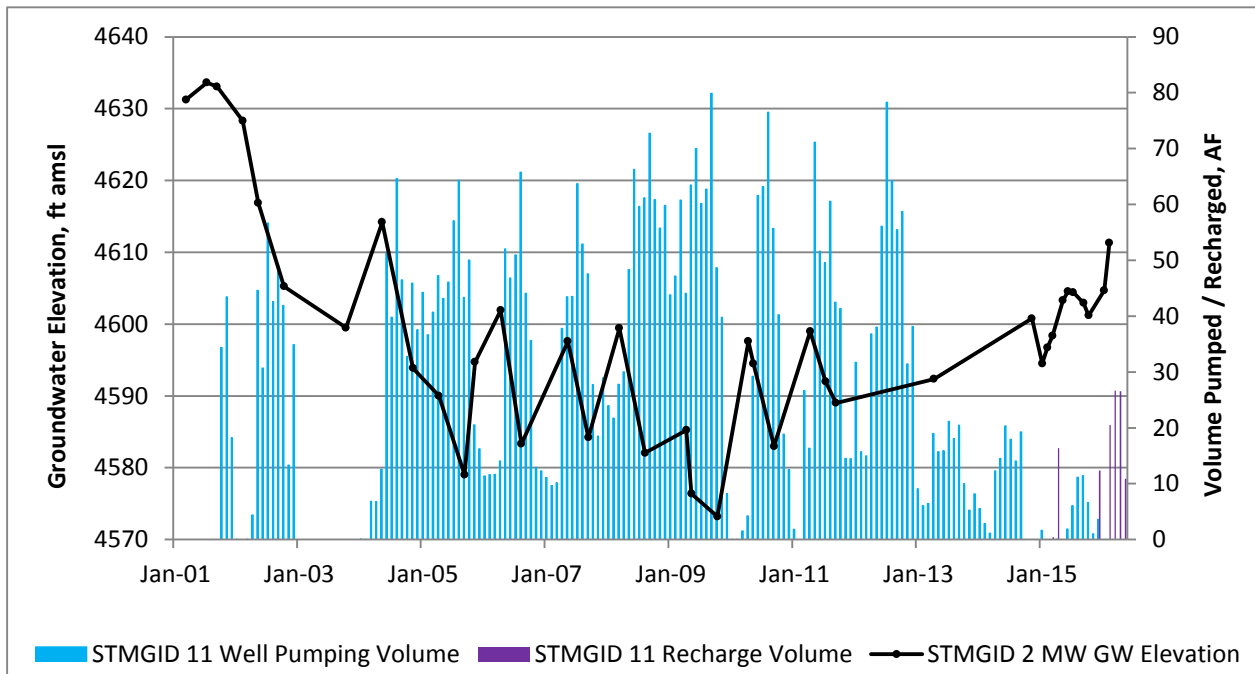


Figure 3: Groundwater Hydrograph for the Central Area of Basin 87

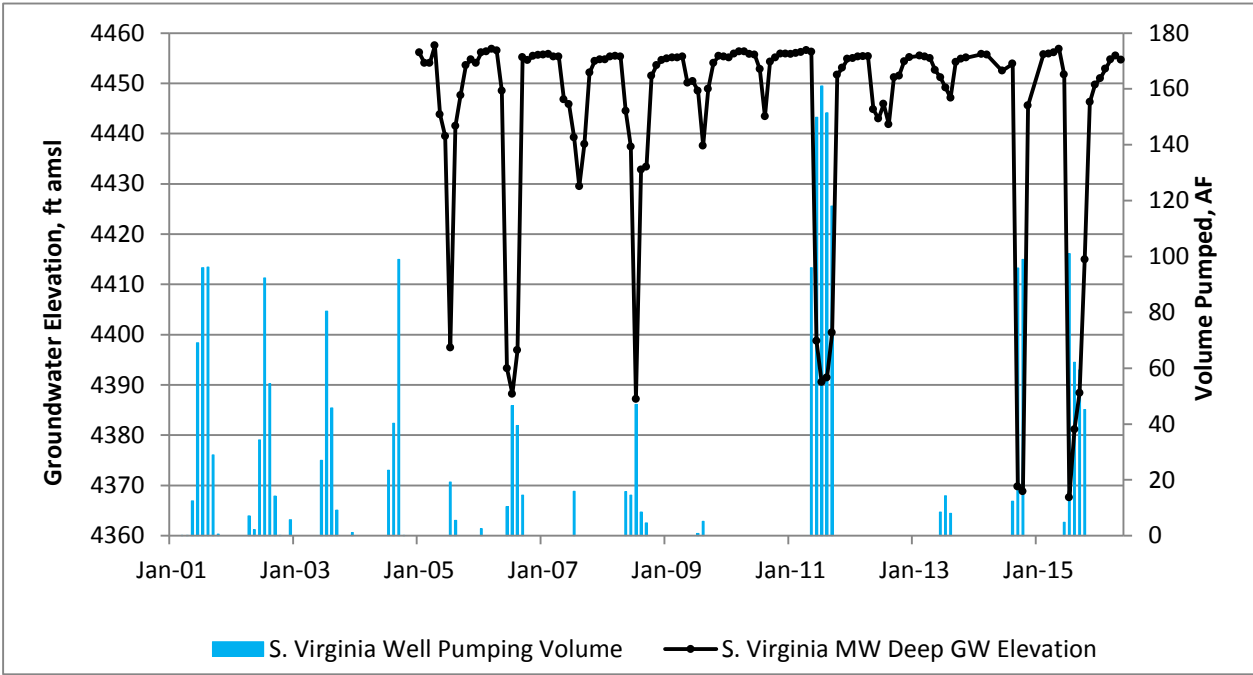
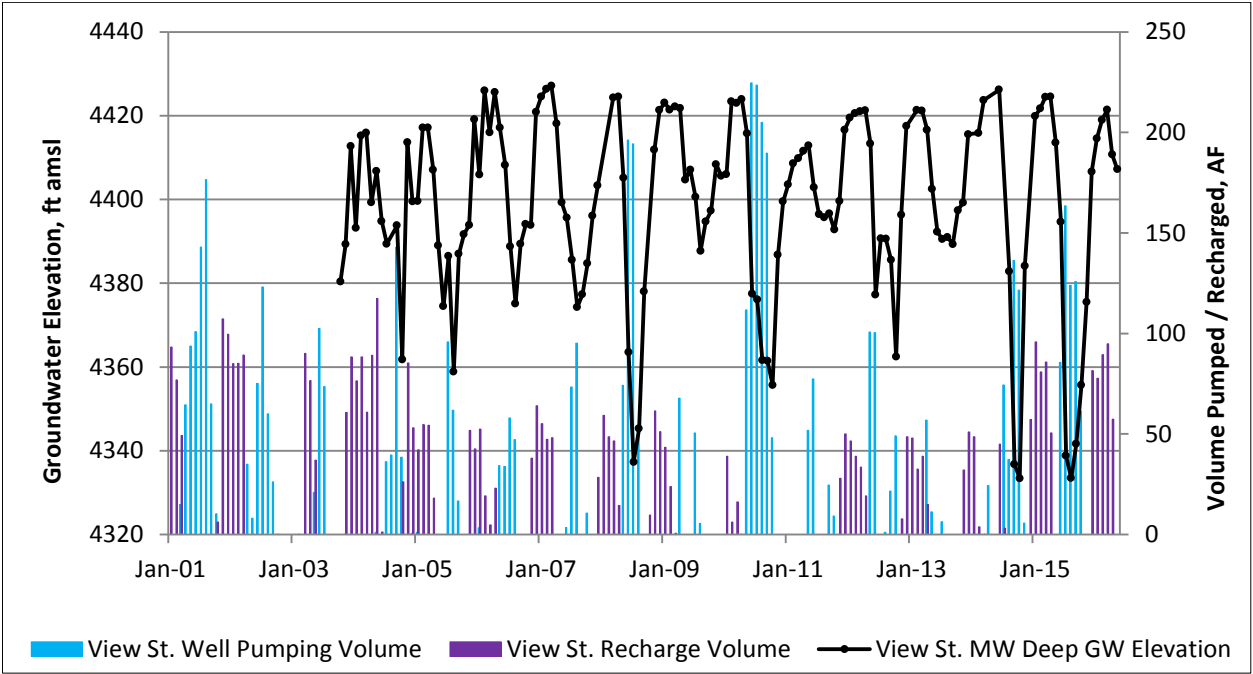


Figure 4: Groundwater Hydrograph for the North Area of Basin 87

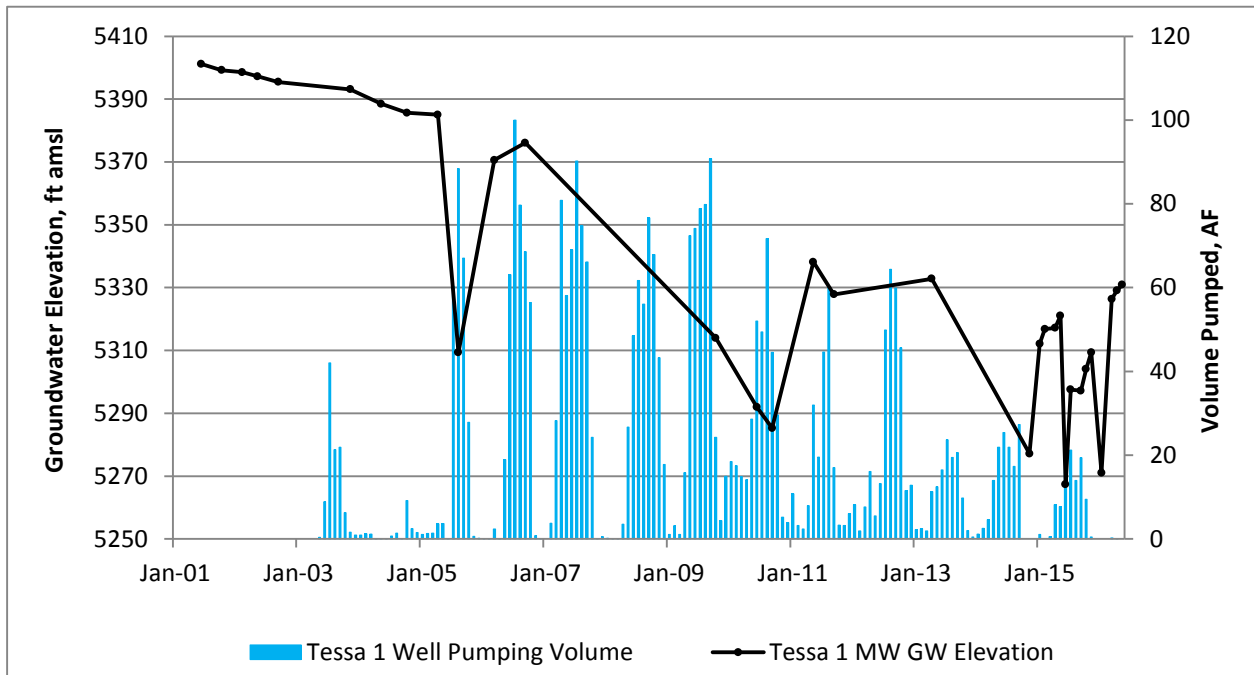


**HYDROGRAPHIC BASIN 88 – PLEASANT VALLEY**

Basin 88 encompasses 39 square miles and includes a fractured volcanic rock aquifer and a basin-fill aquifer from which water is used by TMWA and domestic wells. TMWA operates nine production wells in this basin. There are also approximately 820 domestic wells in Basin 88. Groundwater generally flows eastward from the Carson Range through the alluvial fan highlands to the basin fill lowland areas and Steamboat Creek. Steamboat Creek flows northward into Basin 87.

Until recently, groundwater has been the only water source in this area resulting in declining groundwater elevations. The groundwater elevations fluctuate seasonally with increases during non-pumping and natural recharge periods (winter months) and declines during pumping periods. The amount of precipitation also influences groundwater elevations. As shown in Figure 5, reductions in pumping over the last several years have helped stabilize groundwater levels.

**Figure 5:** Groundwater Hydrograph for the Northwest Area of Basin 88



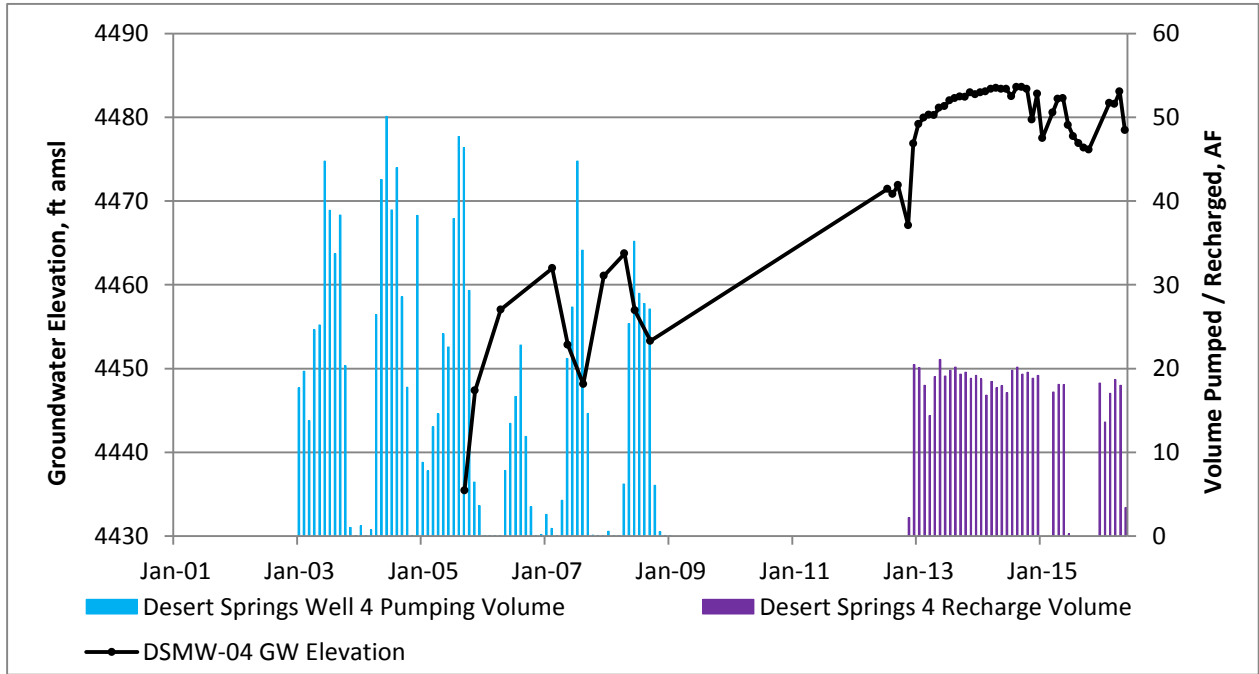
**HYDROGRAPHIC BASIN 85 – SPANISH SPRINGS VALLEY (SSV)**

Basin 85 encompasses 80 square miles and includes a volcanic rock aquifer on the east side and an alluvial aquifer on the western and central portion of SSV. TMWA operates 4 production wells that are in the Desert Springs system (west side) and 4 production wells in the Spring Creek and Hawkings System (east side). There are also approximately 410 domestic wells in SSV. Groundwater generally flows west to east from the mountain ridges toward the center of SSV, and then north and south to neighboring basins.

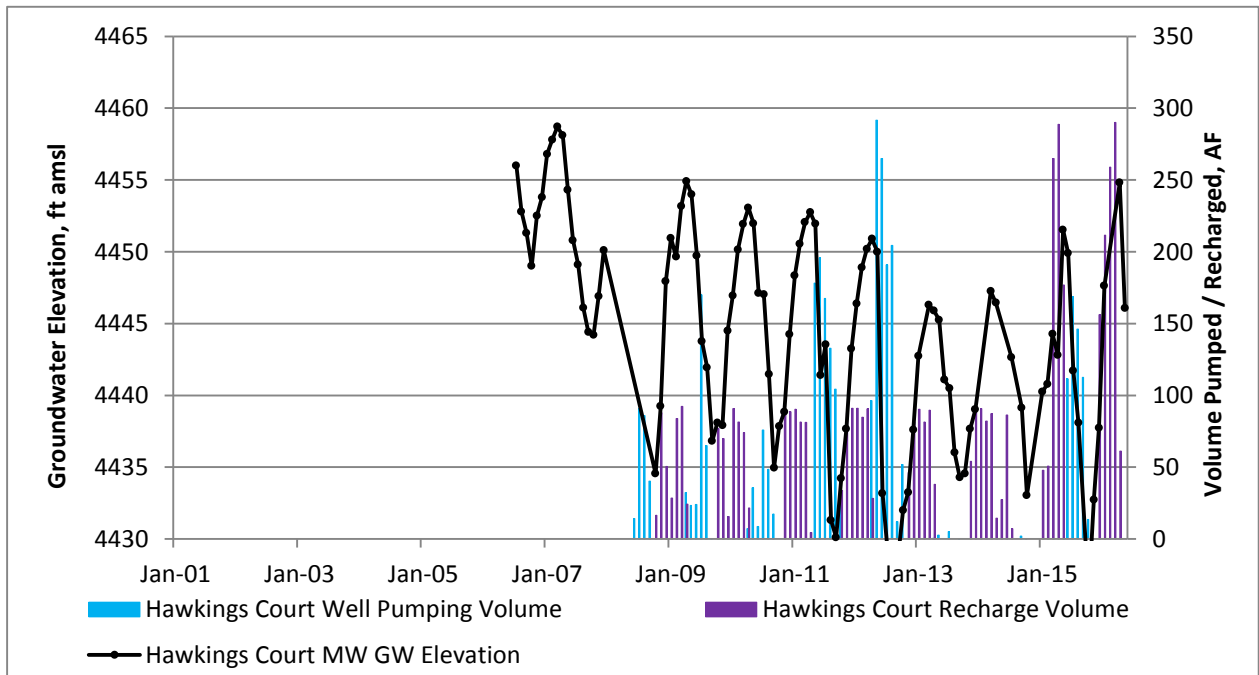
Groundwater pumping in Basin 85 has transitioned with reduced usage on the west side to increased usage on the east side. This has resulted in groundwater elevation increases on the west

side and decreases on the east side. Overall, groundwater elevations fluctuate seasonally. Active ASR enhances water level recovery as seen in monitoring wells.

**Figure 6:** Groundwater Hydrograph for the West Side of Basin 85



**Figure 7:** Groundwater Hydrograph for the East Side of Basin 85



**HYDROGRAPHIC BASINS 92A AND 92B – WEST AND EAST LEMMON VALLEY**

Basin 92A, West Lemmon Valley (WLV), and 92B, East Lemmon Valley (ELV), encompass 97 square miles separated by the Airport fault that runs down the middle of the basin. Lemmon Valley is comprised of mountain ridges, unconsolidated basin-fill deposits and two playa lakes. TMWA operates 3 production wells in WLV and 5 production wells in ELV. There are approximately 730 domestic wells in WLV and approximately 1,370 domestic wells in ELV. Groundwater generally flows from the mountain ridges toward the lower-lying playa areas.

Water levels in WLV and ELV fluctuate annually with rises during non-pumping and recharge periods and declines during pumping periods. The amount of precipitation also influences groundwater elevations. Groundwater elevations in WLV are relatively stable and ASR activities have enhanced water level recovery, with water levels increasing by over 10 feet in the past 10 years. Groundwater elevations in ELV have declined over time but by reducing pumping, made possible by the FSR importation project, water levels have stabilized and began to rebound. Also, the number of domestic well is decreasing as residences connect to the municipal water system.

**Figure 8:** Groundwater Hydrograph for Basin 92A

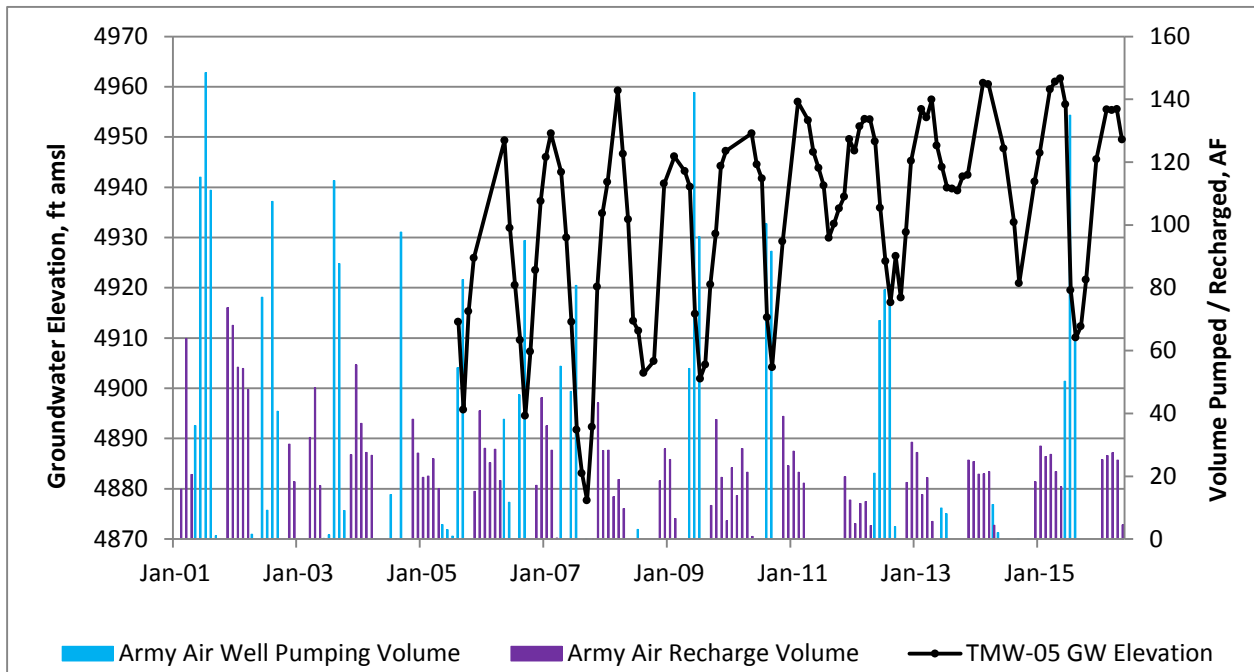
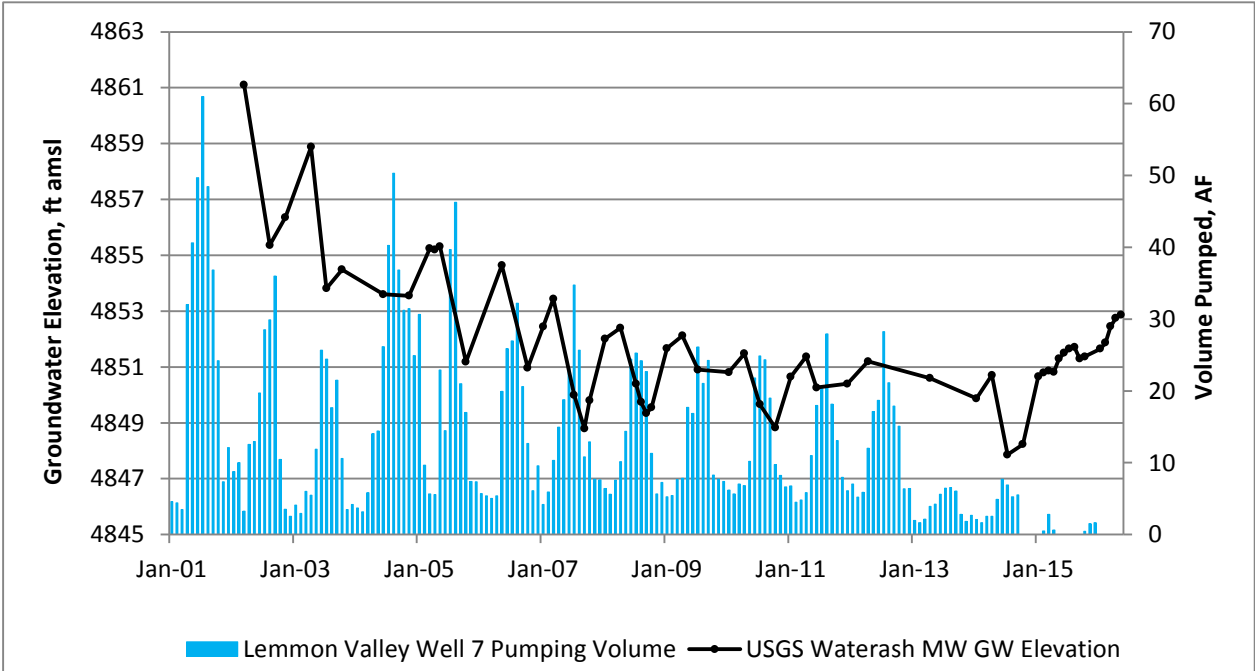


Figure 9: Groundwater Hydrograph for Basin 92B





## **Groundwater Level Update**

R. Van Hoozer and C. Kropf, Senior Hydrologists

TMWA Board of Directors Meeting

June 15, 2016

# Figure 1: Well Locations for Groundwater Hydrograph Review

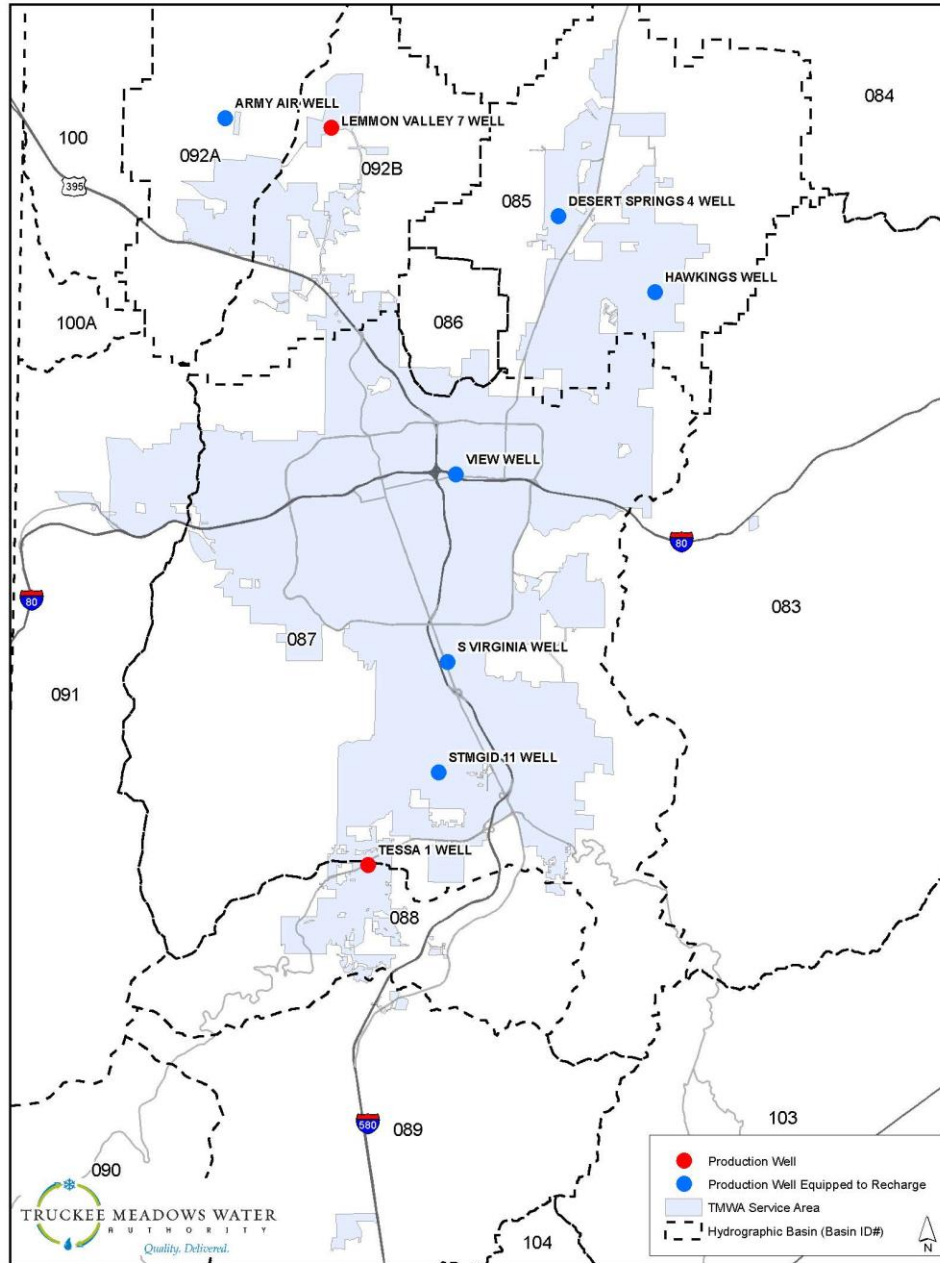


Figure 2: Groundwater Hydrograph for the South-central Area of Basin 87

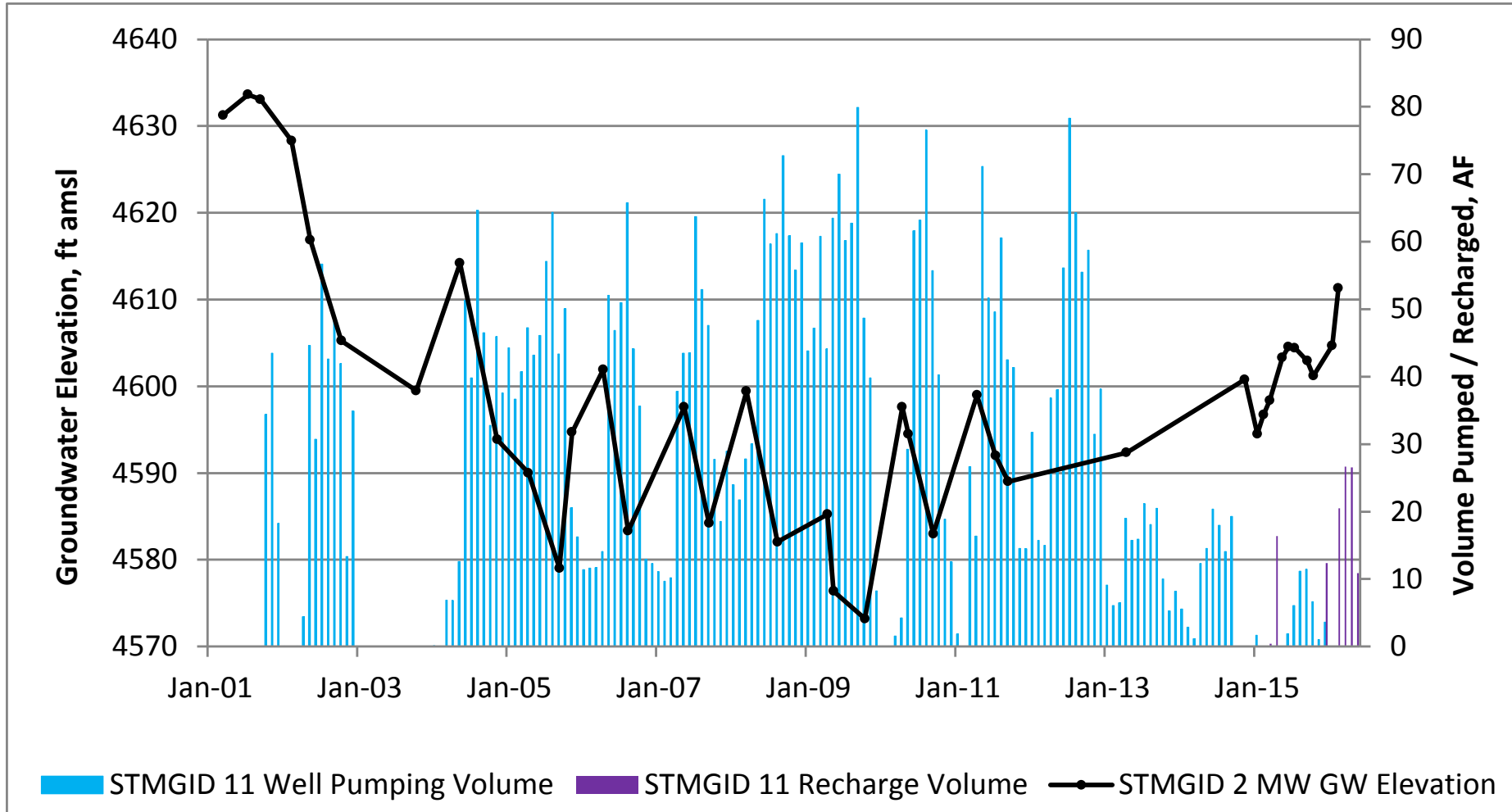


Figure 3: Groundwater Hydrograph for the Central Area of Basin 87

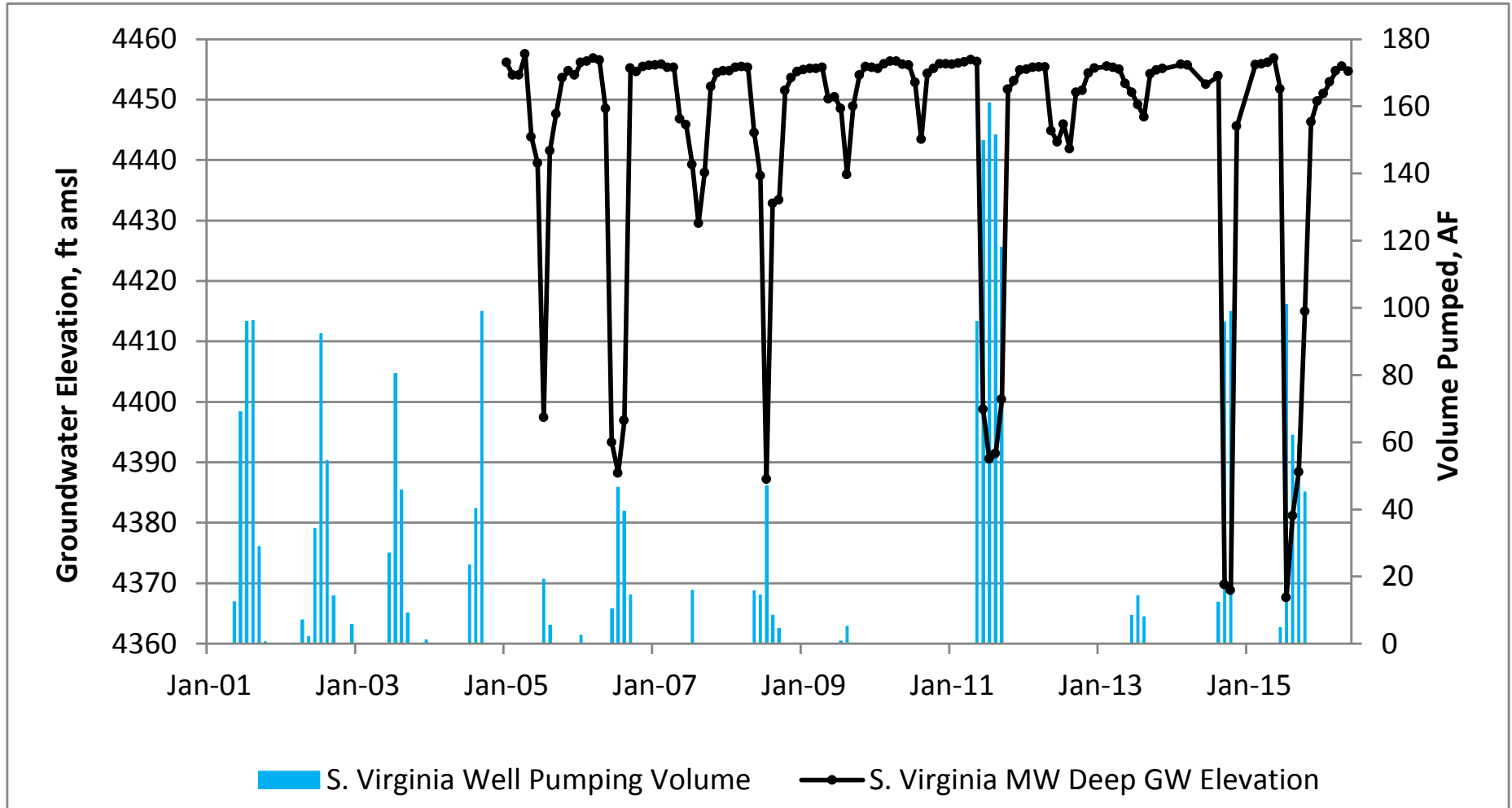


Figure 4: Groundwater Hydrograph for the North Area of Basin 87

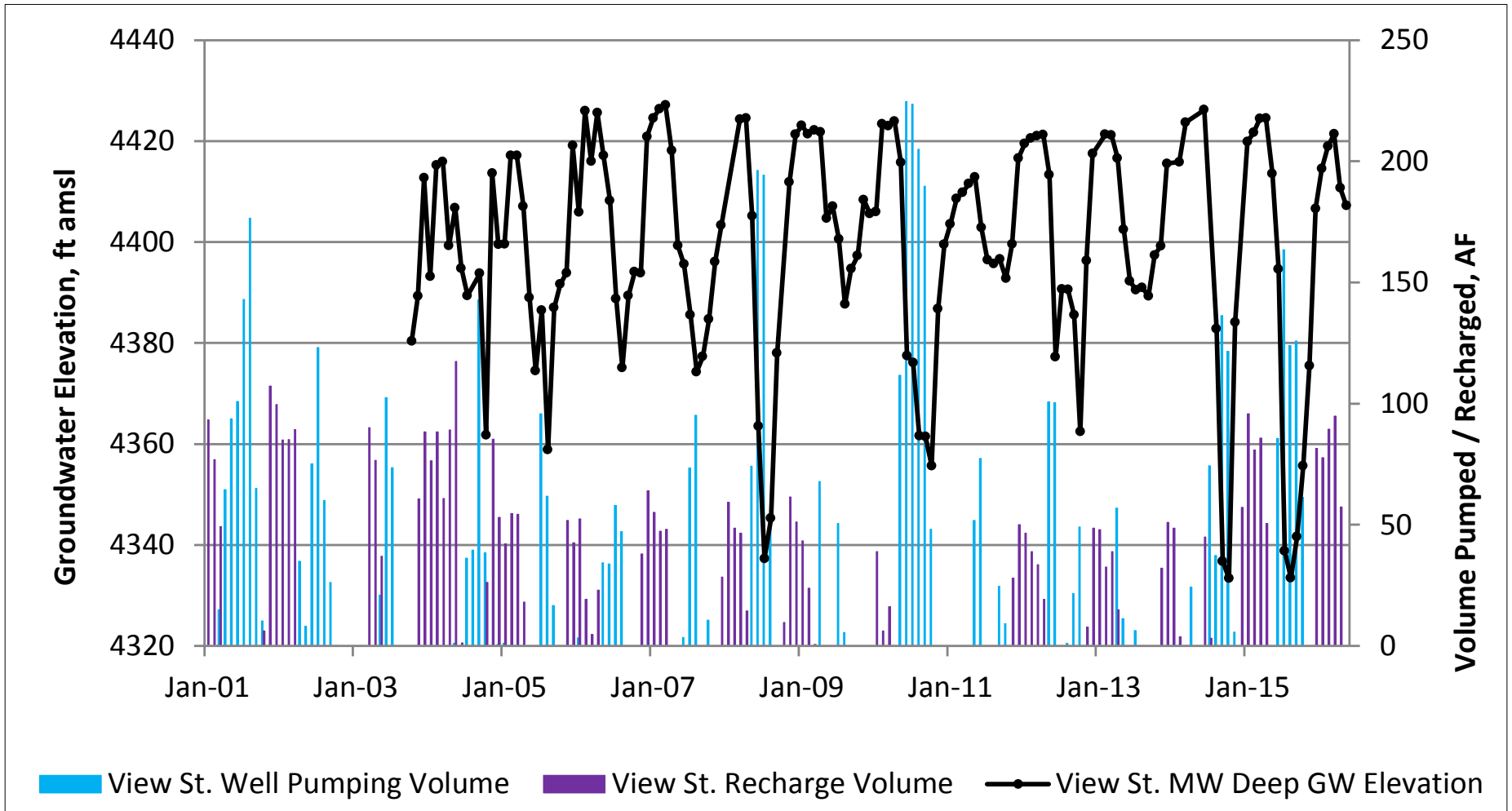


Figure 5: Groundwater Hydrograph for the North Area of Basin 88

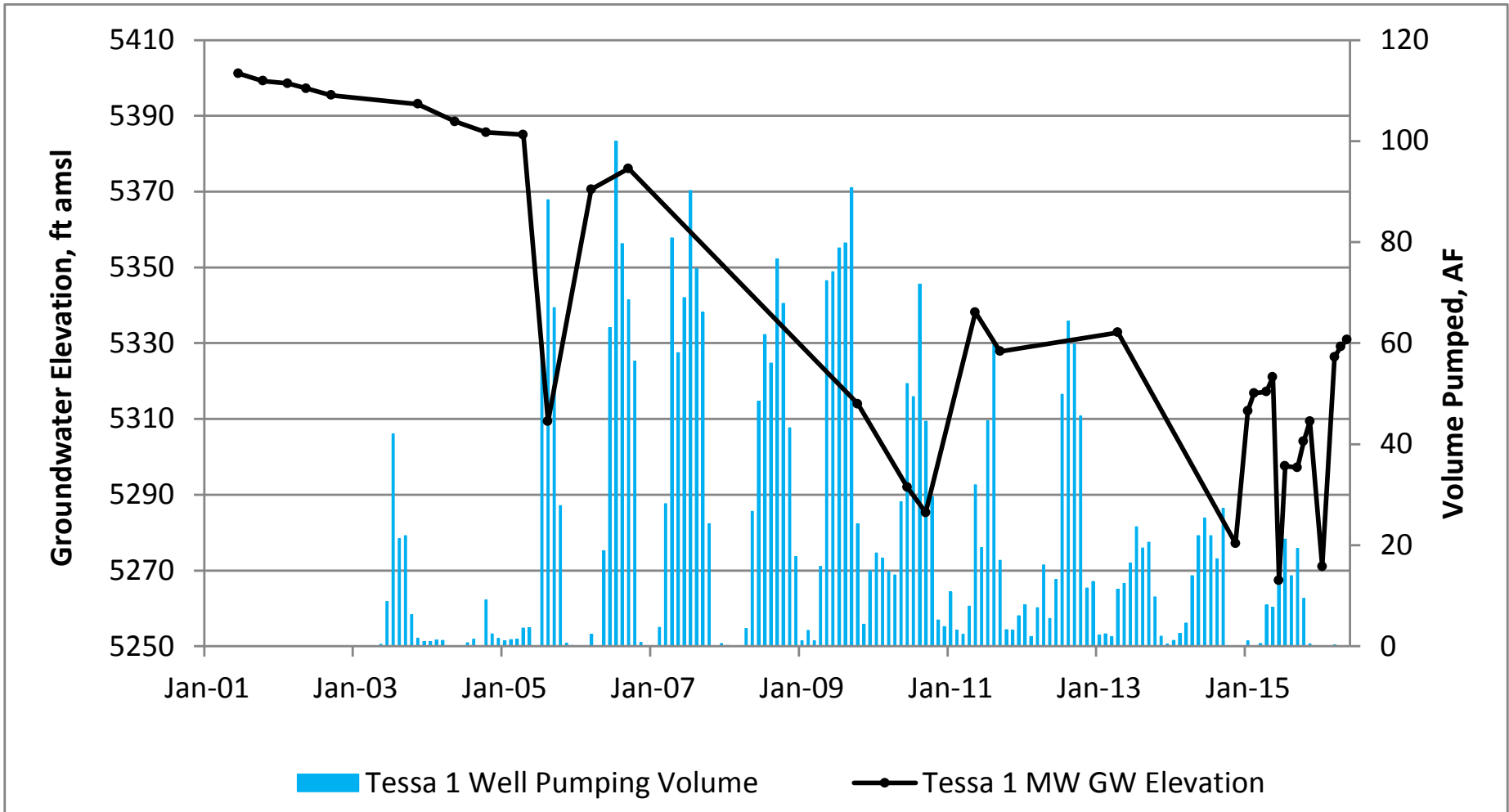


Figure 6: Groundwater Hydrograph for the West Side of Basin 85

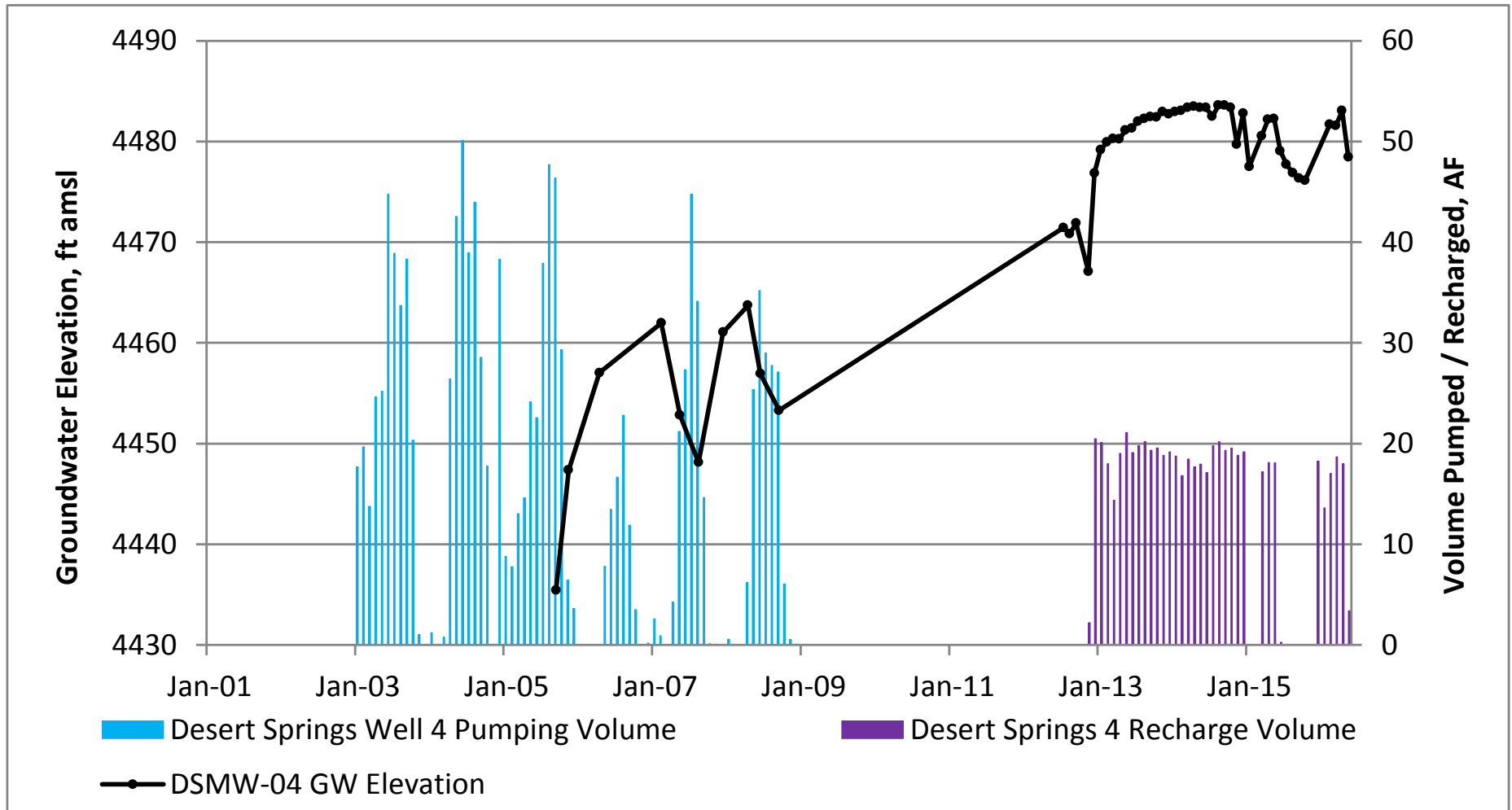


Figure 7: Groundwater Hydrograph for the East Side of Basin 85

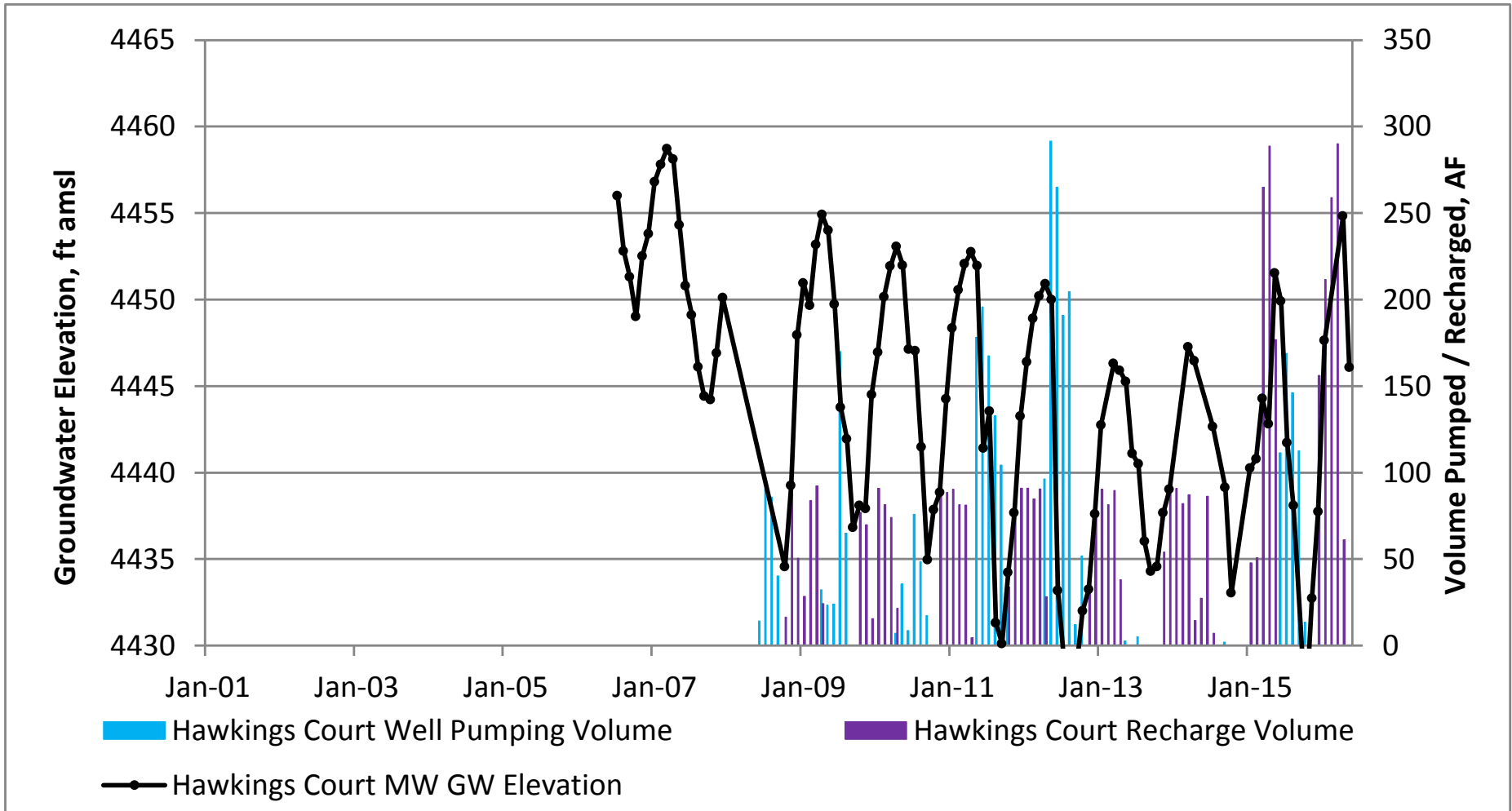
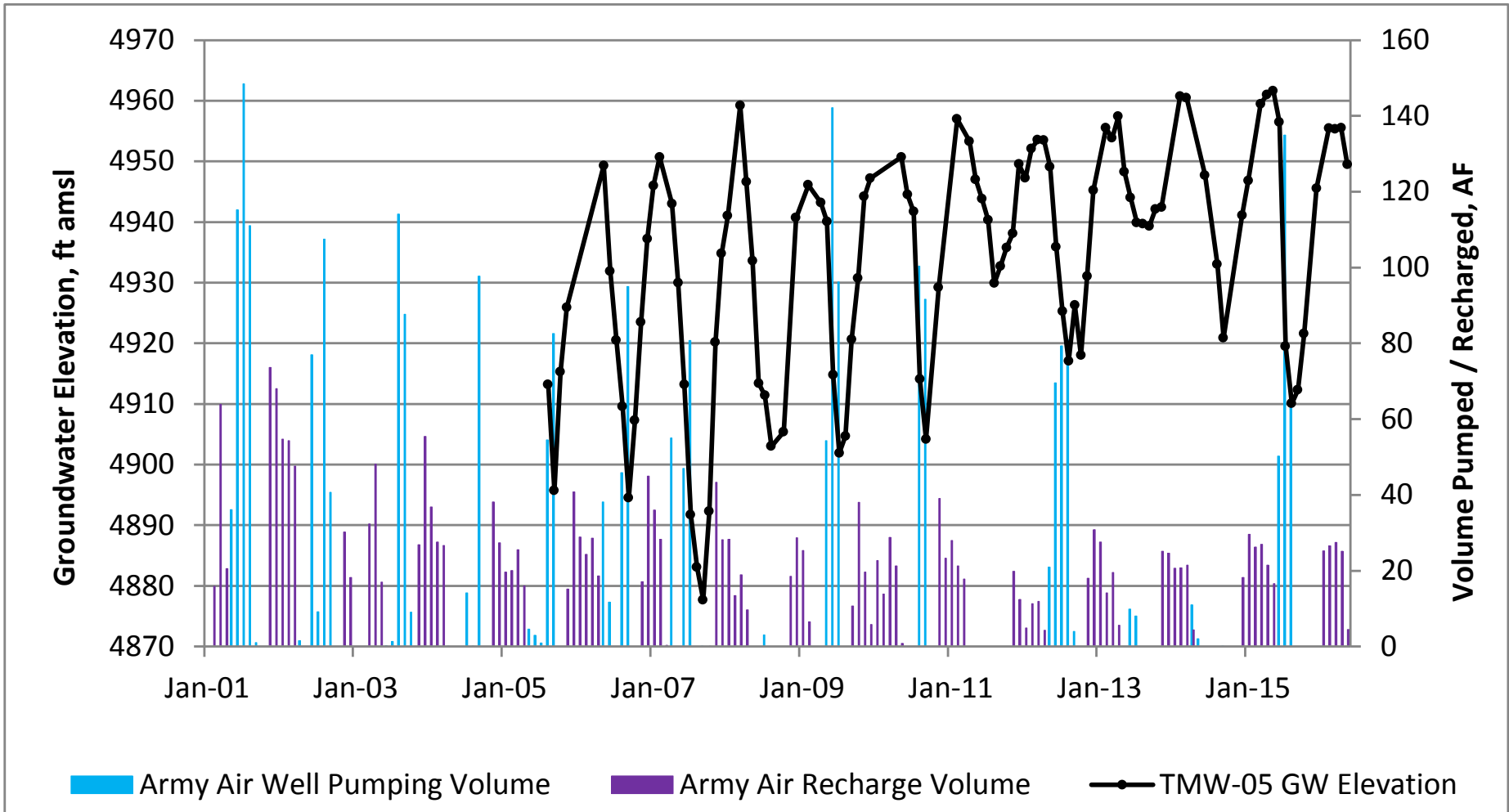


Figure 8: Groundwater Hydrograph for Basin 92A



### Figure 9: Groundwater Hydrograph for Basin 92B

