



IN REPLY REFER TO: 415

United States Department of the Interior

U. S. GEOLOGICAL SURVEY
Colorado Water Science Center
Box 25046 MS 415
Denver Federal Center
Denver, CO 80225

MEMORANDUM

October 11, 2017

To: Grandview Estates Rural Water Conservation District

From: Rhett Everett, Hydrologist, and Suzanne Paschke, Ph.D., USGS, Lakewood, CO

Subject: Grandview Estates Groundwater-Level Monitoring report through August 2017

This memorandum from the U.S. Geological Survey (USGS) to the Grandview Estates Rural Water Conservation District (GERWCD) reports: (1) groundwater levels measured in selected GERWCD Denver Basin domestic wells from 2009 thru August 2017, (2) continuous water level and selected water-quality properties from 2014 thru August 2017, and (3) groundwater-quality results and estimated groundwater-age results for two GERWCD domestic wells sampled in 2004 and 2005 as part of the USGS National Water Quality Assessment Program (NAWQA). This memorandum summarizes all data collected in Grandview Estates since 2004 and supersedes all previous progress reports.

Introduction

Grandview Estates is a rural-residential subdivision, first established in the 1950s, of 1 to 2-acre lots located approximately two miles west of Parker, Colorado (fig. 1). Residents of Grandview Estates rely on domestic wells for water supply, and the GERWCD is responsible for oversight of water resources for the subdivision. Review of the Colorado State Division of Water Resources well-permit database indicates Grandview Estates domestic wells are primarily completed in the Dawson and Denver aquifers, which are the uppermost layers of the Denver Basin aquifer system in this area. Surrounding municipal wells are completed in the Dawson, Denver, Arapahoe, and Laramie-Fox Hills aquifers of the Denver Basin aquifer system. Concern for the effects of pumping on water levels in Grandview Estates domestic wells led to a cooperative water-level monitoring project between GERWCD and the USGS.

In 2009, a water-level monitoring network of 14 domestic wells (six completed in the Dawson aquifer, eight completed in the Denver aquifer) was established in Grandview Estates, and water levels were measured on a regular basis. In 2010, one Dawson well was dropped from the network and six additional domestic wells, all completed in the Dawson aquifer, were added to the water-level monitoring network to provide additional water-level measurements prior to the

construction of Chambers Reservoir. In 2011, one additional well completed in the Dawson aquifer was added to the network. In December 2011, transducers were installed in two wells and were programmed to record water levels on an hourly basis. In June 2013, one Dawson well was dropped from the network at the owner's request. In June 2014, one well was equipped with instrumentation to automatically measure and record the depth to water, water temperature and specific conductance at regular time intervals. In February 2016, one Denver well was dropped from the network when the property could no longer be accessed. In February 2017, two wells in the Dawson aquifer along 6th St. were added to the network. To date, water levels are routinely measured in 20 domestic wells in the Grandview Estates; 13 wells are completed in the Dawson aquifer, and 7 wells are completed in the Denver aquifer.

In 2004 and 2005, water-quality samples were collected by the USGS from two domestic wells in the Grandview Estates subdivision as part of a National Water Quality Assessment (NAWQA) Program water-quality characterization study in the Denver Basin.

Methods

Wells were selected for the Grandview Estates monitoring network based on well construction information and well accessibility. First, the GERWCD provided the USGS with a list of residents who had volunteered their wells for monitoring. The USGS then queried the Colorado Division of Water Resources well-permit database (<http://www.dwr.state.co.us/WellViewWeb/>) and examined well-drilling records in the permitting documents to determine which wells were considered suitable for water-level monitoring. Wells were considered suitable for water-level monitoring if the screened-interval depth and well-construction materials were known from the well-drilling records and if the well was accessible. Consideration also was given to the spatial distribution of the wells. Wells were chosen such that they were spread geographically across the subdivision and such that water levels could be monitored in both the Dawson and Denver aquifers beneath the subdivision. Well owners (some were the previously mentioned volunteers) were contacted and access permission was requested as suitable wells were identified from the well-permit database. Fourteen domestic wells were initially chosen for the water-level monitoring network (table 1; fig. 2). Six of the selected wells are completed in the Dawson aquifer, and eight of the selected wells are completed in the Denver aquifer. Each well was visited by Jim Collins of the USGS in January 2009 to confirm site access and to measure and record the latitude, longitude, measuring-point height, and land-surface altitude at each well.

Water levels were measured and recorded to within 0.01 feet (ft) by using a calibrated steel tape, whenever possible, following procedures outlined by Cunningham and Schalk (2011) (with the exception that a break-away weight was not used because of the concern the weight could become tangled in the pump wiring). When conditions such as inclement weather or the presence of condensation within the well casing prohibited the use of a steel tape, a calibrated electric tape

was used instead. Depth-to-water measurements were made from the measuring point, typically the top of the steel surface casing or well cap. To verify that the water level in the well was under static conditions, consecutive measurements were made until two measurements were within 0.02 ft of one another or the reason for lack of agreement was determined. If consecutive measurements indicated the water level was rising, or recovering, the shallowest measurement was used and remarked with a status of “R” for recently pumped. If consecutive measurements indicated the water level was slowly falling, or declining, the shallowest measurement was used and marked with a status of “S” for nearby pumping. If multiple measurements showed no trend but were within 0.1 ft of each other, the average of the measurements was used. If a pump was operated during a visit, the water level was allowed to recover for approximately 10 minutes until a measurement was made. If a pump was cycling during a visit, the tape was held in place during the recovery period until the pump turned on again and this single highest level was recorded. Depth to water below land surface was calculated by subtracting the measuring point (MP) height above land surface from the depth to water below the MP. The tape is disinfected with Clorox wipes between wells.

Pressure transducer instrumentation included two In-Situ Level TROLL 500 vented 30 pound per square inch pressure transducers equipped to record the depth to water and one In-Situ Aqua TROLL 200 vented 15 pound per square inch pressure transducer equipped to record depth to water, temperature, and specific conductance. Both types of probes have a pressure/level sensor accuracy, as rated by the manufacturer, of plus or minus 0.05 percent of the full scale at 15 degrees Celsius (°C) and a built in data logger (In-Situ Inc., 2015a). The Aqua Troll has a conductivity sensor accurate to 1 microsiemens per centimeter at 25°C ($\mu\text{S}/\text{cm}$) when reading under 80,000 $\mu\text{S}/\text{cm}$ and a temperature accuracy of 0.1 °C. The transducers were suspended in the well on a vented communication cable that allowed downloading the data without disturbing the probe. Once the transducer was in place, it was calibrated to a manual water-level measurement (depth below land surface) and programmed to record a water level every hour. The manual water-level measurements are used to calibrate the time-series water-level data and correct for instrument drift. The specific conductance probe is checked in a standard conductance solution of either 750 or 1,000 ($\mu\text{S}/\text{cm}$) during each visit, and the difference is used to correct the data. The temperature probe is calibrated at the factory, and the field values are not checked for calibration purposes. Graphs of the time-series data presented in this memorandum include the daily maximum groundwater elevation (Appendix 1), which is the highest of a given day’s 24 observations. The daily maximum groundwater elevation most often occurs when nearby pumping is at its lowest (usually during the early morning hours) and is most representative of the static water level. In some cases, the manual measurement (circle or triangle) plotted along with the time-series data is lower than the time-series daily maximum value. This slight difference observed on the graphs occurs because the instantaneous manual measurement is not always the daily maximum observation recorded by the data logger.

Water-quality samples were collected from two domestic wells in the Grandview Estates subdivision during 2004 and 2005 as part of the USGS NAWQA program. Site 393227104490101 is completed 300-340 ft below land surface in the Dawson aquifer, and site 393227104493001 is completed 361-441 ft below land surface in the Denver aquifer. Samples from both wells were analyzed for field parameters, major ions, and indicators of groundwater age including tritium, and chlorofluorocarbons. Samples from the Dawson well were additionally analyzed for trace metals, volatile organic compounds, and pesticides. Sampling and analytical methods followed standard USGS procedures.

Results

Site information and water-level data for all 21 domestic wells in the Grandview water-level network are accessible from the USGS National Water Information System (NWIS) database (<http://nwis.waterdata.usgs.gov/co/nwis/gwlevels>) by searching for data using the USGS Site Numbers listed in table 1. A summary of water-level measurements collected to date including the period of record, number of measurements, and maximum and minimum observed water levels are presented in table 2. All discrete water-level measurements and a comparison to the initial measurement and to the water level measurement from the previous year are presented in table 3. A bar graph showing average year-to-year changes in manual water-level measurements for each aquifer is shown in figure 4. The average change in seasonally high water level and average year-to-year change in water level for all measurements by aquifer is presented in table 4. Hydrographs showing temporal changes in water levels for individual wells from 2009 through August 2017 are shown in Appendix 1. Potentiometric water-level maps of the highest water levels in 2011 (January) and the lowest water levels in 2011 (September) for the Dawson and Denver aquifers are presented in Appendix 2.

In general, water levels in the monitored domestic wells display a seasonal pattern with the highest water levels occurring during the winter and the lowest water levels occurring during the summer. Water levels measured during the summer months are expected to be less than those measured during other seasons because of increased groundwater pumping for lawn irrigation during the summer. Water levels in most wells completed in the Dawson aquifer were highest during the spring of 2016 and lowest during the summer of 2012. In general, water levels exhibit a pattern of water-level decline from 2009 through 2013 followed by an increase through the spring of 2016 (table 4) (Appendix 1). Water levels in most wells completed in the Denver aquifer were highest during the winter or spring of 2010 and lowest during the summer 2012, and, in about half of the wells measured, both the winter maximum and summer minimum water levels exhibit a pattern of water-level decline for the period of record. The highest water levels observed since 2009 occurred during the spring of 2017 in four of the wells (GRNDAW2, GRNDAW7, GRNDAW8, and GRNDEV7) (table 2). The lowest water levels measured since 2009 were observed in three wells (GRNDAW7, GRNDAW8, and GRNDEV 6) in August 2017

(table 2). Because GRNDAW7 and GRNDAW8 were added to the network in 2017 (table 3), the highest and lowest observed water levels in the GRNDAW7 and GRNDAW8 wells are simply caused by the short period of record at these wells. Water levels at GRNDAW2 and GRNDEV7 have been on a steady rise since the fall of 2013 with the previous highest water level in both wells occurring in June 2016.

2009

In 2009, water-level measurements were made in 14 wells (6 Dawson, 8 Denver) in January, March, July, September, and November. Changes in water levels over the monitoring period are generally less than 30 ft in magnitude. The maximum change from January 2009 conditions was 28.9 ft of drawdown measured at well GRNDAW1 during the September water-level measurements. Water-level changes from January to September 2009, are variable, ranging from the maximum drawdown of 28.9 ft to a water-level rise of about 9 ft at well GRNDEV4 in July 2009. All of the wells except one (GRNDAW2) exhibited drawdown over the summer. About 5.5 ft of water-level rise was observed at well GRNDAW2. These observed water-level differences may be caused by recent pumping at the measured well, local pumping within the subdivision, or pumping from outside the subdivision.

2010

In 2010, bimonthly water levels were made in January, March, May, July, September, and November. In 2010, six additional domestic wells, all completed in the Dawson aquifer, were added to the water-level monitoring network (table 1; fig. 1) to provide additional water-level measurements prior to the construction of Chambers Reservoir. Five of the new wells are located in the northeast corner of Grandview Estates, along North 6th Street, and one of the wells is located in the southeast quarter, along North 5th Street. Three of the wells were added in May, two in July, and one in September 2010. Measurements were discontinued at one well in the Dawson aquifer (GRNDAW5) in July 2010 when the residence was sold.

Comparison of January (representing the seasonal high) manual water-level measurements in 2009 and 2010 shows that water levels declined in four of the wells and rose in nine. While the amount of the change varied by well and location, decline in the Dawson aquifer averaged 1.8 ft and a rise in the Denver aquifer averaged 8.1 ft (table 4). From January 2009 to 2010, the greatest decline in the Dawson aquifer of about 18.5 ft was observed in GRNDAW1, and the greatest decline in the Denver aquifer of about 21.8 ft was observed in GRNDEV2. Comparison of all year-to-year changes in manual water-level measurements for all wells in an aquifer indicates decline in the Dawson aquifer averaged 2.5 ft and decline in the Denver aquifer averaged 1.3 ft (table 4). During the fall and winter months, water levels recover from summer pumping with the highest water levels observed during the spring months of March through May prior to the following irrigation season. From September 2009 through March 2010, water-level rise was observed for all of the wells in the water-level monitoring network, except GRNDEV2.

In general, water levels in the monitored domestic wells were lowest during the summer and fall of 2010 and were increasing to November 2010. Water levels measured during the summer months are expected to be less than those measured during other seasons because of groundwater pumping for lawn irrigation, and the maximum drawdown (negative difference from January 2009 measurement) of 43.2 ft was measured at well GRNDEV2 during the September 2010

water-level measurements. Drawdown was observed during the summers of 2009 and 2010 at all of the wells except one (GRNDAW2). About 5.5 ft of water-level rise was observed at well GRNDAW2 in 2009 and 1.5 ft in 2010. Well GRNDAW2 is the shallowest well in the water-level monitoring network, completed 40-160 ft below land surface. Reduced pumping or lawn-irrigation return flows in the vicinity of GRNDAW2 could be contributing to the water-level rise at this location. From September 2009 through March 2010, water-level rise was observed for all of the wells in the water-level monitoring network, except GRNDEV2. The recovery of winter 2010 water levels to values greater than or equal to winter 2009 measurements indicates that bedrock potentiometric conditions beneath Grandview Estates are likely responding to decreased pumping during the winter months and possibly to increased precipitation recharge experienced during the fall of 2009 (http://www.crh.noaa.gov/bou/?n=denclim_monthly_annual). Water levels measured at GRNDEV 6 are consistently lower by as much as 200 ft from nearby wells. Well GRNDEV 6 has the deepest completion of all other wells in the network, completed 580-680 ft below land surface.

2011

In 2011, water levels were made in January, March, May, July, and September. Funding was suspended in November 2011. One additional well (GRNDAW2b) was added to the network in May 2011. Measurements were suspended at one well in the Dawson aquifer (GRNDAW2) in July 2011 when the residence was sold, water-level measurements in this well were resumed in October 2012 with permission from the new owner. In December 2011, transducers were installed in two wells (GRNDAW4, GRNDEV3) as part of the cooperative project between the USGS and the Rural Water Authority of Douglas County. The transducers were programmed to record water levels on an hourly basis.

Comparison of January (representing the seasonal high) manual water-level measurements in 2010 and 2011 shows that water levels declined in all 13 wells that were measured. Decline in the Dawson aquifer averaged 5.6 ft and decline in the Denver aquifer averaged 7.3 ft (table 4). From January 2010 to 2011 the greatest decline in the Dawson aquifer of about 23.7 ft was observed in GRNDAW4, and the greatest decline in the Denver aquifer of about 21.8 ft was observed in GRNDEV6. Comparison of all year-to-year changes in manual water-level measurements for all wells in an aquifer indicates decline in the Dawson aquifer averaged 5.0 ft and decline in the Denver aquifer averaged about 4.1 ft (table 4). A comparison of all changes in water levels from 2010 to 2011 indicate declining water levels with an average decline of 5.0 ft for the Dawson aquifer and a decline of 4.1 ft per year for the Denver aquifer (table 4). A comparison of all changes in water levels from year to year since 2009 indicate declining water levels with an average decline of 4.0 ft per year for the Dawson aquifer and a decline of 2.7 ft per year for the Denver aquifer.

Seven of the wells, three Dawson and four Denver, showed water level declines from the winter high in 2009 to the winter high in 2011. Comparing the seasonal low in 2009 with the seasonal low in 2011 showed declines in water levels in 10 of the wells (4 Dawson, 6 Denver).

2012

In 2012, funding was unavailable until October; therefore, the scope of work was reduced. Even with reduced funding, water levels were able to be measured in February, April, August,

October, and December. Water-level measurements in GRNDAW2, suspended in June 2011, were resumed in October 2012 with permission of the new owner.

Comparison of January 2011 and February 2012 (representing the seasonal high) manual water-level measurements show that water levels declined in 5 of the wells and rose in 13. Rise in the Dawson aquifer averaged 1.2 ft and decline in the Denver aquifer averaged 0.1 ft (table 4). The greatest change from January 2011 to February 2012 in the Dawson aquifer, a rise of about 3.4 ft, was observed in GRNDAW3. The greatest change in the Denver aquifer, a decline of about 4.2 ft was observed in GRNDEV6. A comparison of all changes in water levels from 2011 to 2012 indicate declining water levels with an average decline of 0.3 ft for the Dawson aquifer and a decline of 2.3 ft per year for the Denver aquifer (table 4). A comparison of all changes in water levels from year to year since 2009 indicate declining water levels with an average decline of 2.7 ft per year for the Dawson aquifer and a decline of 2.6 ft per year for the Denver aquifer.

The maximum drawdown (negative difference, or decline, from the January 2009 measurement) of 50.7 ft was observed at well GRNDAW1 during the August 2012 water-level measurements. Increased drawdown was observed during the summers of 2009, 2010, 2011, and 2012, at all of the wells except one (GRNDAW2). Compared to the January 2009 measurement, about 5.5 ft of water-level rise was observed at GRNDAW2 in 2009, and by February 2012, the water level was still 1.1 ft higher than in 2009. Well GRNDAW2 is the shallowest well in the water-level monitoring network, completed 40-160 ft below land surface. Reduced pumping or recharge from precipitation and lawn-irrigation return flows in the vicinity of GRNDAW2 could be contributing to the water-level rise at this location.

2013

In 2013, water levels were measured in February, April, June, August, October, and December. In June 2013, rust scale inside the well casing at GRNDAW2b was knocked loose during a measurement. This caused small particles of rust to clog the faucet and shower screens and sprinkler heads. After the problems were resolved, the well owner declined to continue participation in the monitoring network.

Comparison of the February 2012 and 2013 (representing the seasonal high) manual water-level measurements show that water levels declined in all 19 wells. Decline in the Dawson aquifer averaged 7.0 ft and decline in the Denver aquifer averaged 9.4 ft (table 4). The greatest decline from February 2012 to 2013 in the Dawson aquifer of about 11.43 ft was observed in GRNDAW3, and the greatest decline in the Denver aquifer of about 13.5 ft was observed in GRNDEV4. The greatest seasonal decline in water level observed during this study occurred between February 2012 and February 2013. Comparison of all year-to-year (2012 to 2013) changes in manual water-level measurements for all wells in an aquifer indicates a rise in both aquifers. Rise in the Dawson aquifer averaged 0.6 ft and rise in the Denver aquifer averaged 0.6 ft (table 4). A comparison of all changes in water levels from year to year since 2009 indicate declining water levels with an average decline of 1.6 ft per year for the Dawson aquifer and a decline of 1.7 ft per year for the Denver aquifer.

Water levels measured at GRNDEV6 are consistently lower than nearby wells by as much as 200 ft. Well GRNDEV6 has the deepest completion of all other wells in the network, completed 580-680 ft below land surface.

2014

In 2014, water levels were measured in February, April, June, and August, and October. In June 2014, GRNDAW1C was equipped with an In-Situ Aqua TROLL 200 transducer set to automatically measure and record the depth to water, water temperature and specific conductance at hourly intervals. Due to a program error, specific conductance was not recorded between August and October 2014 (Appendix 1).

Comparison of the February 2013 and 2014 (representing the seasonal high) manual water-level measurements show that water levels rose in 18 wells of the 19 wells. Rise in the Dawson aquifer averaged 5.5 ft and rise in the Denver aquifer averaged 6.2 ft (table 4). The greatest rise from February 2013 to 2014 in the Dawson aquifer of about 6.5 ft was observed in GRNDAW6, and the greatest rise in the Denver aquifer of about 14.3 ft was observed in GRNDEV2. Comparison of all year-to-year (2013 to 2014) changes in manual water-level measurements for all wells in an aquifer indicates a rise in both aquifers. Rise in the Dawson aquifer averaged 3.7 ft and rise in the Denver aquifer averaged 3.3 ft (table 4). A comparison of all changes in water levels from year to year since 2009 indicate declining water levels with an average decline of 0.2 ft per year for the Dawson aquifer and a decline of 0.6 ft per year for the Denver aquifer.

The observed rise in the seasonally high water levels is most likely due to the increased precipitation that occurred during the fall and winter of 2013 (http://www.crh.noaa.gov/bou/?n=denclim_monthly_annual).

Analysis of the continuous measurements of water level and selected water-quality properties collected from GRNDAW1C from June 13 through December 31, 2014 shows the water level ranged from 59.27 (December 24) to 89.06 ft below land surface (July 9), and the specific conductance ranged from 752 (October 19, 20, 21, and 22) to 852 $\mu\text{S}/\text{cm}$ (December 30 and 31) (Appendix 1). The greatest depth to water of 89.06 ft below land surface observed on July 9, 2014 most likely represents a water level that was observed when the pump was running. The rise in specific conductance between October 2014 and January 2015 corresponds with a rise in water level.

2015

In 2015, water levels were measured in February, June, and October. The transducer installed in GRNDAW1C was maintained to automatically measure and record the depth to water, water temperature, and specific conductance at hourly intervals (Appendix 1).

Comparison of the February 2014 and 2015 (representing the seasonal high) manual water-level measurements show that water levels rose in 15 of the 19 wells (table 3). Water levels rose in all of the wells in the Dawson aquifer averaging an increase of 1.9 ft (table 4). Changes in water levels in the wells in the Denver aquifer were mixed. Water levels rose in four wells (GRNDEV1, GRNDEV5, GRNDEV7, and GRNDEV8) and declined in four wells (GRNDEV2, GRNDEV3, GRNDEV4, and GRNDEV6) with an average decline of 0.5 ft (table 4). The greatest rise from February 2014 to 2015 in the Dawson aquifer of about 3.5 ft was observed in GRNDAW1C, and the greatest rise in the Denver aquifer of about 0.8 ft was observed in GRNDEV7 and GRNDEV8 (table 3). The greatest decline from February 2014 to 2015 in the Denver aquifer of about 4.7 ft was observed in GRNDEV6. Comparison of all year-to-year (2014 to 2015) changes in manual water-level measurements for all wells in an aquifer indicates a rise

in both aquifers. Rise in the Dawson aquifer averaged 3.5 ft and rise in the Denver aquifer averaged 2.5 ft (table 4). A comparison of all changes in water levels from year to year since 2009 indicate an average increase of 0.3 ft per year for the Dawson aquifer and a decline of 0.2 ft per year for the Denver aquifer.

Water levels in June were higher than in February in all wells except for GRNDEV6. The observed rise in water levels is most likely due to the increased precipitation that occurred during the spring of 2015 (<http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?co1401>). Water levels in most of the wells in the Douglas County network also were higher in June than in February suggesting that the observed rise in water levels in Grandview Estates is not a local event.

Analysis of the continuous measurements of water level and selected water-quality properties collected from GRNDAW1C from January 1 through December 31, 2015 shows the water level ranged from 53.64 (December 31) to 85.96 ft below land surface (October 12), and the specific conductance ranged from 823 (August 6) to 997 $\mu\text{S}/\text{cm}$ (November 7,8,9, and 10). The rapid decrease in specific conductance observed in late February and mid-April corresponds with increased pumping and a short term drop in water level at the site. The steady decrease in specific conductance observed late June through early August corresponds with a decrease in the water level at the site.

2016

In 2016, water levels were measured in February, June, October, and December. Measurements were suspended at one well in the Denver aquifer (GRNDEV5) in February 2016 when the property could no longer be accessed. The transducer installed in GRNDAW1C was maintained to automatically measure and record the depth to water, water temperature, and specific conductance at hourly intervals (Appendix 1).

Comparison of the February 2015 and 2016 (representing the seasonal high) manual water-level measurements show that water levels rose in all 18 wells (table 3). Water levels rose in all of the wells in the Dawson aquifer averaging an increase of 5.9 ft (table 4). Water levels rose in all of the wells in the Denver aquifer averaging an increase of 7.5 ft (table 4). The greatest rise from February 2015 to 2016 in the Dawson aquifer of about 9.1 ft was observed in GRNDAW3, and the greatest rise in the Denver aquifer of about 9.9 ft was observed in GRNDEV2 (table 3). Comparison of all year-to-year (2015 to 2016) changes in manual water-level measurements for all wells in an aquifer indicates a rise in both aquifers. Rise in the Dawson aquifer averaged 3.1 ft and rise in the Denver aquifer averaged 3.4 ft (table 4). A comparison of all changes in water levels from year to year since 2009 indicates an average increase of 0.1 ft per year for the Dawson aquifer and a decrease of 0.7 ft per year for the Denver aquifer (table 4).

The highest water levels observed since 2009 occurred during the spring of 2016 in nine of the wells (GRNDAW2, GRNDAW4, GRNDAW1A, GRNDAW1C, GRNDAW1D, GRNDAW1E, GRNDAW1F, GRNDEV1, and GRNDEV7) (table 2). The second highest water levels observed since 2009 occurred during the spring of 2016 in three wells (GRNDAW6, GRNDAW1B, GRNDEV8) (table 3). Water levels in June were equal to or higher than in February in five wells (GRNDAW2, GRNDAW6, GRNDEV3, GRNDEV6, GRNDEV7 (table 3). The observed rise in water levels may be related to above average precipitation that occurred during March and April 2016 (<http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?co1401>). Water

levels in several of the wells in the Douglas County network also were higher in June than in February suggesting that the observed rise in water levels in Grandview Estates is not a local event.

Analysis of the continuous measurements of water level and selected water-quality properties collected from GRNDAW1C from January 1 through December 31st, 2016 shows the water level ranged from 51.15 (April 30) to 86.48 ft below land surface (August 17) ,and the specific conductance ranged from 911 (February 25) to 986 $\mu\text{S}/\text{cm}$ (August 17).

Analysis of the continuous water level measurements collected from GRNDAW4 from January 1 through December 31st, 2016 shows the water level ranged from 40.40 (April 30) to 66.77 ft below land surface (September 29). Analysis of the continuous measurements of water level collected from GRNDEV3 from January 1 through December 31st, 2016 shows the water level ranged from 115.63 (May 3) to 180.84 ft below land surface (May 23).

2017

In 2017, water levels were measured in February, April, and June. Two new wells (GRNDAW7 and GRNDAW8) were added to the network in February. The transducer installed in GRNDAW1C was maintained to automatically measure and record the depth to water, water temperature, and specific conductance at hourly intervals (Appendix 1, Appendix 1b). Comparison of the February 2016 and 2017 (representing the seasonal high) manual water-level measurements show that water levels declined in 15 wells and rose in 3 (GRNDAW2, GRNDAW 6, and GRNDEV7) (table 3). Water levels in wells in the Dawson aquifer declined an average of 2.7 ft (table 4). Water levels in wells in the Denver aquifer declined an average of 6.1 ft (table 4). The greatest decline from February 2016 to 2017 in the Dawson aquifer of about 4.4 ft was observed in GRNDAW3, and the greatest decline in the Denver aquifer of about 13.3 ft was observed in GRNDEV4 (table 3). Comparison of all year-to-year (2016 to 2017) changes in manual water-level measurements for all wells in an aquifer indicates a decline in water level in both aquifers. Decline in the Dawson aquifer averaged 7.3 ft and decline in the Denver aquifer averaged 13.2 ft (table 4). A comparison of all year to year changes in water levels since 2009 indicates an average increase in water level in the Dawson aquifer of 0.1 ft per year and an average decline in water level in Denver aquifer of 0.7 ft per year (table 4).

The highest water levels observed since 2009 occurred during the spring of 2017 in four of the wells (GRNDAW2, GRNDAW7, GRNDAW8, and GRNDEV7) (table 2). Because GRNDAW7 and GRNDAW8 were added to the network in 2017 (table 3), the highest observed water levels in these wells is simply caused by the short period of record at these wells. The first water levels were measured in February, which are typically the highest water levels observed throughout the year. Water levels at GRNDAW2 and GRNDEV7 have been on a steady rise since the fall of 2013 with the previous highest water level in both wells occurring in June 2016.

The lowest water levels measured since 2009 were observed in three wells (GRNDAW7, GRNDAW8, and GRNDEV 6) in August 2017 (table 2). In all cases, these lowest observed water levels are most likely not representative of changes in the local aquifer system. For wells GRNDAW7 and GRNDAW8, water levels represent only a short period of record since 2017 (table 3). The lowest measured water level of 301.73 ft below land surface in GRNDEV6 (table

3) may be affected by recent pumping of the well as noted by the “R” in the water level status column.

Analysis of the continuous measurements of water level and selected water-quality properties collected from GRNDAW1C from January 1 through August 10th, 2017 shows the water level ranged from 51.15 (April 30) to 71.23 ft below land surface (May 24) ,and the specific conductance ranged from 911 (February 25) to 968 $\mu\text{S}/\text{cm}$ (June 6 and 7).

Analysis of the continuous water-level measurements collected from GRNDAW4 from January 1 through August 10h, 2017 shows the water level ranged from 44.30 (April 7) to 72.04 ft below land surface (July 12). Analysis of the continuous measurements of water level collected from GRNDEV3 from January 1 through August 10th, 2017 shows the water level ranged from 126.01 (April 7) to 180.85 ft below land surface (June 15).

Water Quality and Groundwater Age

Water-quality results for the sampled wells are available from the USGS NWIS website for water-quality data (<http://nwis.waterdata.usgs.gov/co/nwis/qwdata>) and selected results are presented in table 5. Observed water quality for these two wells is generally good with no detections of volatile organic compounds or pesticides in the shallower of the two wells (DAWMAS07). The sample from DENMAS08 was not analyzed for volatile organic compounds or pesticides. In general, groundwater quality in the shallower well contains total dissolved solids, major-ion concentrations, and a dissolved-oxygen concentration greater than those in the deeper well (DENMAS08). Nitrate, reported as nitrate plus nitrite as nitrogen, was detected at a concentration of 5.8 milligrams per liter (mg/L) in well DAWMAS07, which is less than the U.S. Environmental Protection Agency drinking water standard of 10 mg/L. Nitrate concentrations, reported as nitrate plus nitrite as nitrogen, in well DENMAS08 were below the analysis detection limit of 0.06 mg/L. Groundwater age (time since recharge) was estimated for these two wells on the basis of tritium concentrations and on the basis of chlorofluorocarbon (CFC) concentrations in the groundwater compared to historical graphs of CFC concentrations in the atmosphere. Tritium was detected in samples from both wells, indicating that the sampled groundwater or a portion of the sampled groundwater was less than 50 years in age. Comparison of groundwater CFC concentrations to historic atmospheric CFC concentrations indicates that the sample from well DAWMAS07 was recharged in about 1990 (estimated groundwater age of 15 years before the sample date, fig. 4) and that the sample from well DENMAS08 was recharged in about 1970 (estimated groundwater age of 35 years before the sample date, fig. 5) using a piston-flow model.

Summary

A water-level monitoring network domestic wells was established in Grandview Estates in 2009 by the USGS and the GERWCD. Between 2009 and 2014, 21 wells have been monitored for some portion of the study period. Since 2009, water levels were measured in the established Grandview Estates monitoring network on a regular basis; ranging from triennial to bi-monthly. In 2004 and 2005, two domestic wells in Grandview Estates were sampled by the USGS

NAWQA program. Results from the water-level monitoring indicate that during the summers water levels were less than initial conditions in January 2009, and water levels were lowest in the summer of 2012. Summer water-level declines are expected during the lawn-irrigation season when domestic wells are pumped for outdoor water use. Water-level rise is typically observed in all wells from September through May. This rise is likely in response to the reduction in pumping during the winter months and possibly in response to recharge from above average precipitation during the fall and spring. Water-level results indicate that potentiometric conditions in bedrock aquifers beneath Grandview Estates respond to changing pumping and climatic conditions, and water-quality results indicate that relatively young waters are present at depths as great as 400 ft below land surface. A comparison of all changes in water levels from year to year since 2009 indicate an average increase of 0.1 ft per year for the Dawson aquifer and a decrease of 0.7 ft per year for the Denver aquifer (table 4).

Water-quality is generally good for the two sampled wells. At the shallower well (DAWMAS07), total dissolved solids, major ion, dissolved oxygen, and nitrate concentrations were greater than at the deeper well (DENMAS08). Groundwater age was estimated from groundwater tritium and CFC concentrations. A groundwater age (years since recharge) of about 15 years before the sample date was estimated for well DAWMAS07 (recharge date of about 1990), and a groundwater age of about 35 years before the sample date was estimated for well DENMAS08 (recharge date of about 1970).

References

Cunningham, W.L., and Schalk, C.W., comps., 2011, Groundwater technical procedures of the U.S. Geological Survey: U.S. Geological Survey Techniques and Methods 1–A1, 151 p.

In-Situ Inc., 2015a, Level TROLL 400, 500 & 700 data loggers: In-Situ Inc., 2 p., accessed January 16, 2014, at https://in-situ.com/wp-content/uploads/2014/11/Level-TROLL-400-500-700-700h_Manual.pdf. [product description]

In-Situ Inc., 2015b, Aqua TROLL CTD Conductivity, Temperature Plus Water Level Logging: In-Situ Inc., 2 p., accessed January 16, 2014, at https://in-situ.com/wp-content/uploads/2014/11/Aqua-TROLL-100-and-200-Data-Loggers_Specs.pdf. [product description]

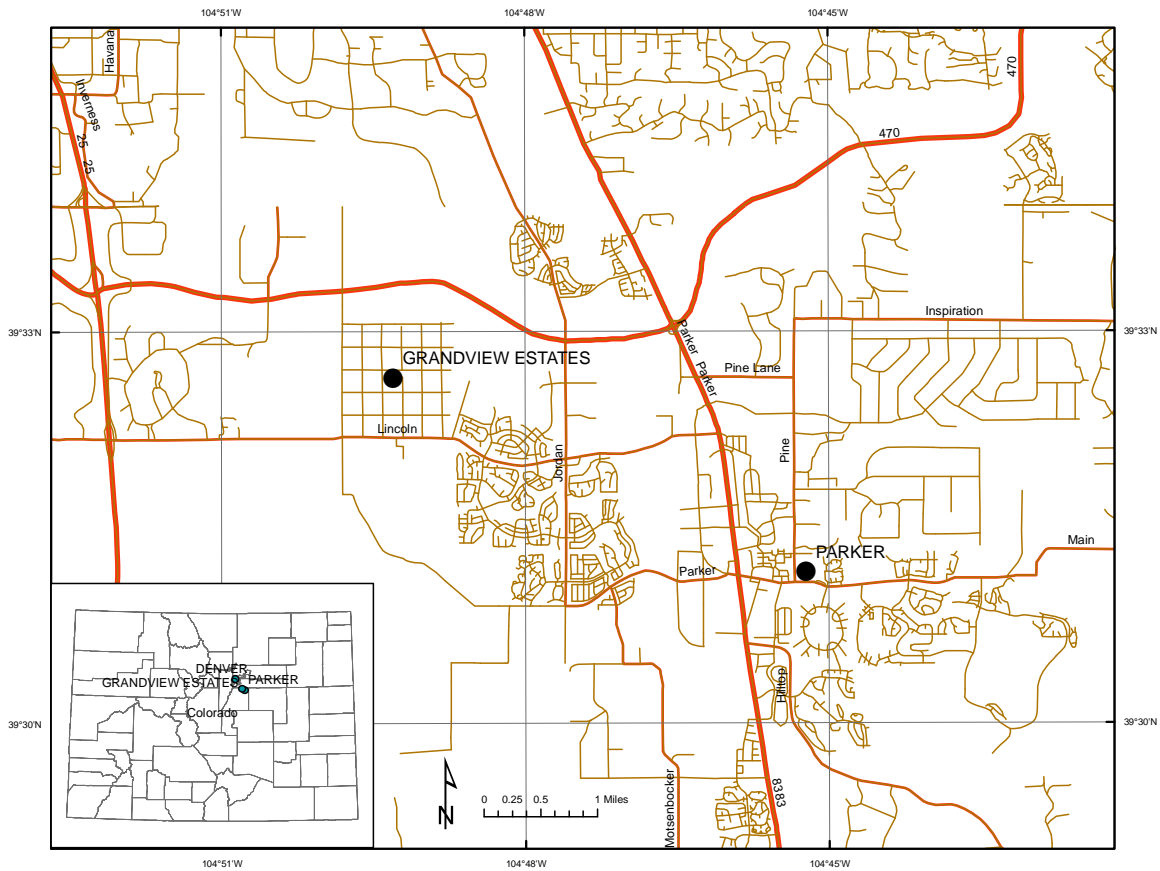


Figure 1. Location of Grandview Estates and Parker, Colorado.

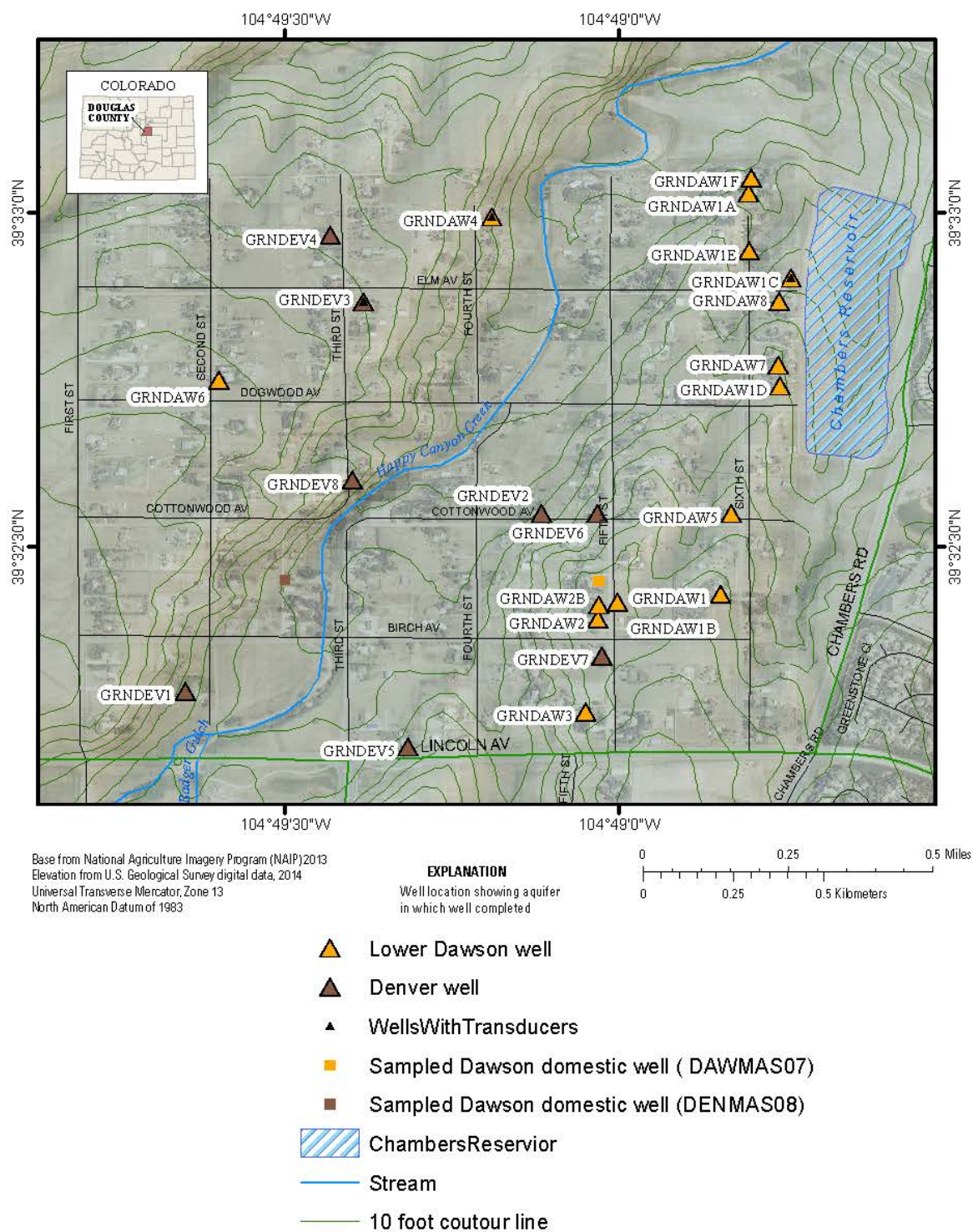


Figure 2. Location of well sites in the Grandview Estates water-level monitoring network, Douglas County, Colorado.

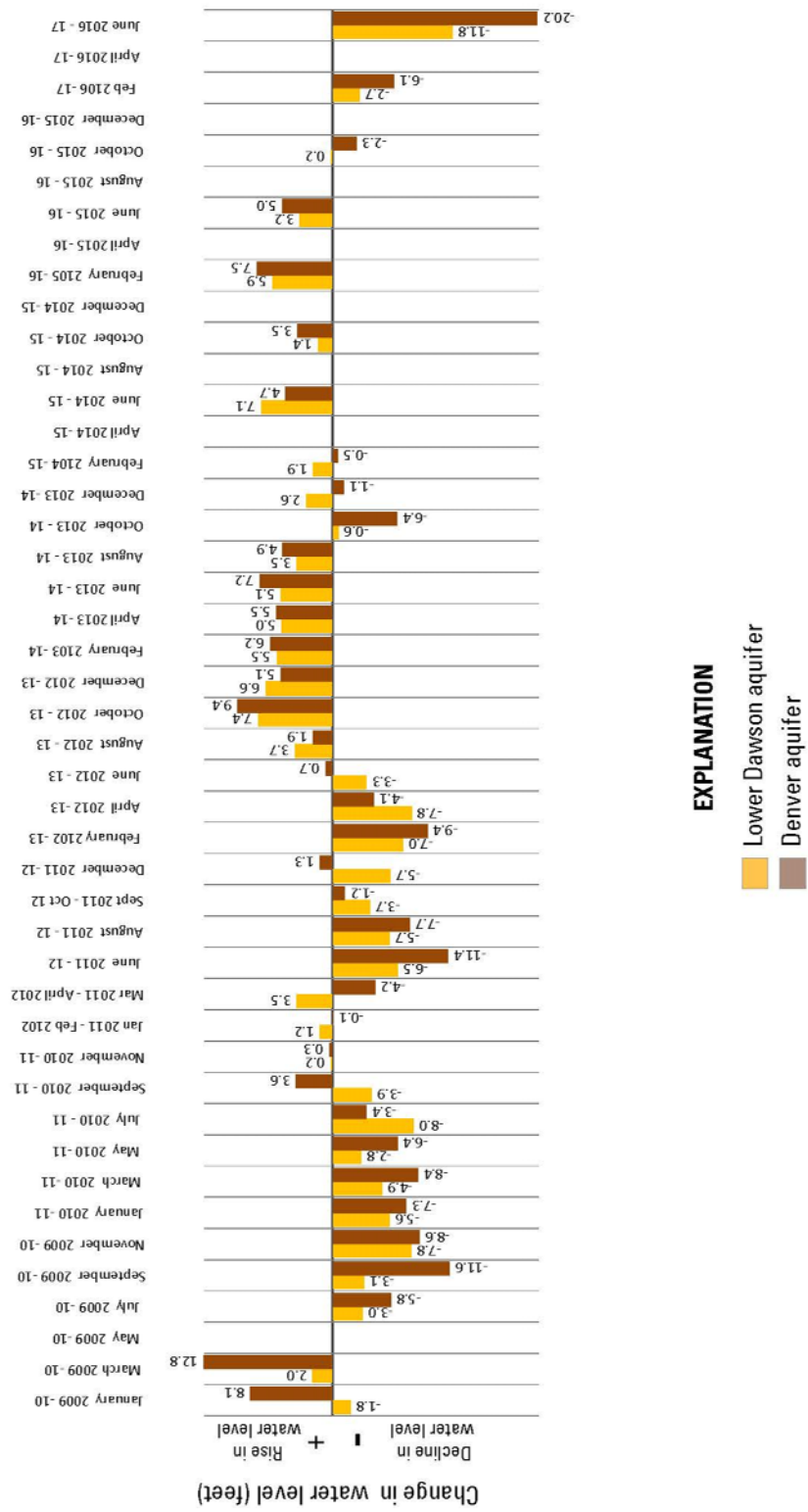
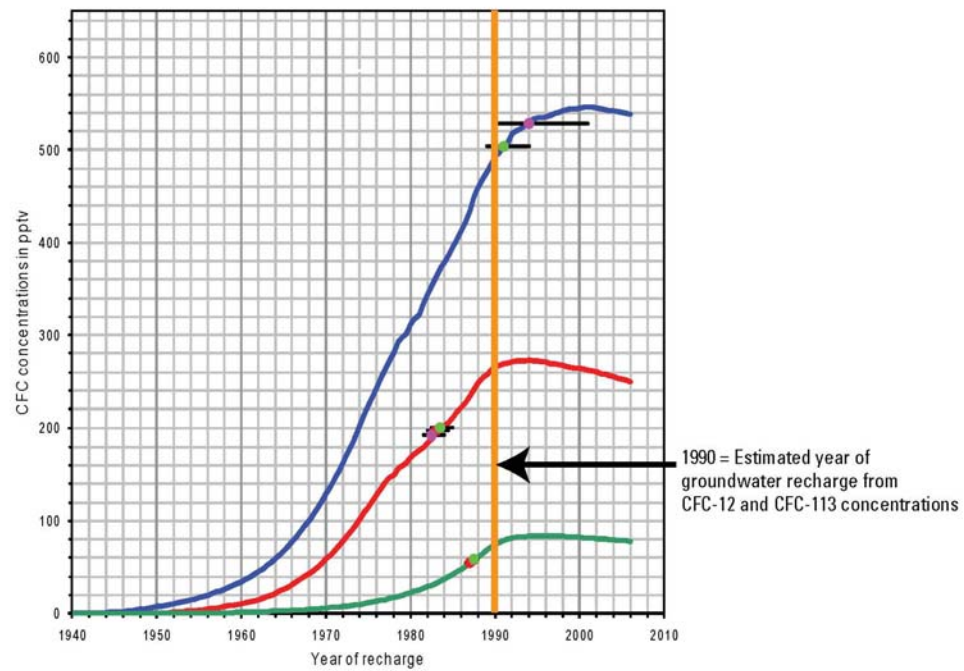


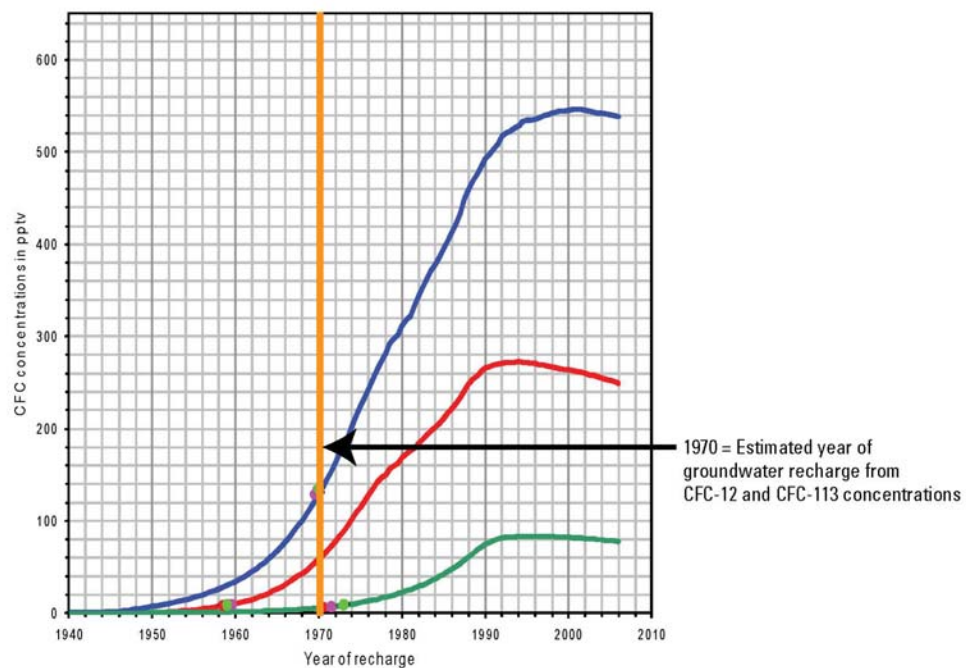
Figure 3. Bar graph showing average year-to-year changes in manual water-level measurements, Grandview Estates, Douglas County, Colorado



Local air curves and data

Blue line = CFC-12						
Red line = CFC-11						
Green line = CFC-113						
Number	Name	Date	pptv CFC-11	pptv CFC-12	pptv CFC-113	Symbol Color
1	DAWMAS07	12/10/04	197.30	839.98	55.03	
2	DAWMAS07	12/10/04	191.94	528.84	57.79	
3	DAWMAS07	12/10/04	200.26	503.71	58.59	

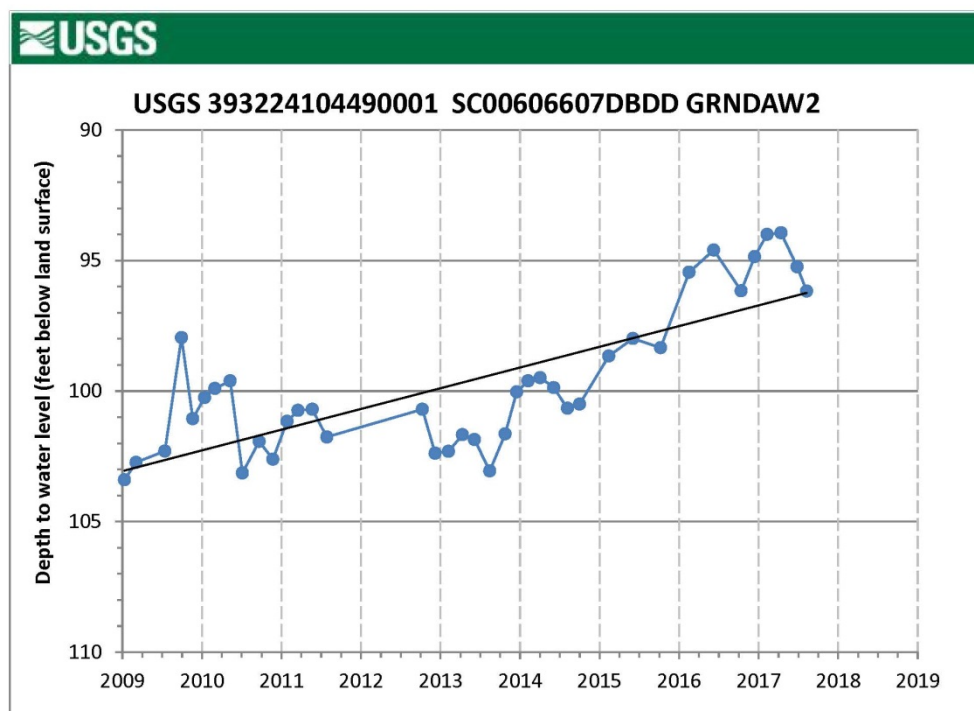
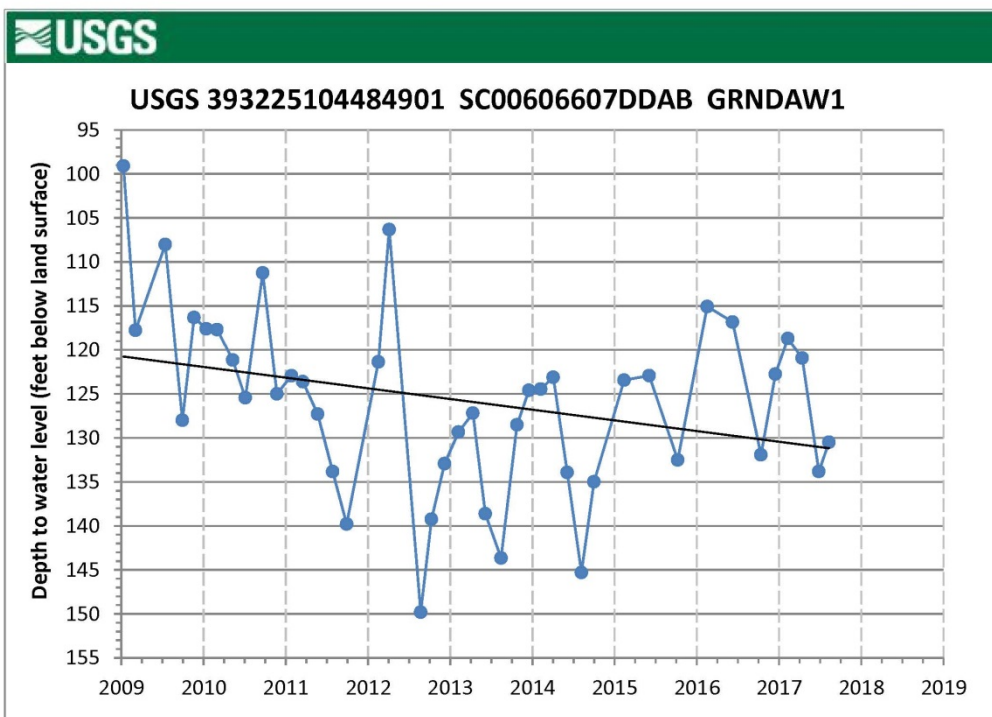
Figure 4. Chlorofluorocarbon concentrations for local air and for groundwater in well DAWMAS07 used to estimate year of groundwater recharge.

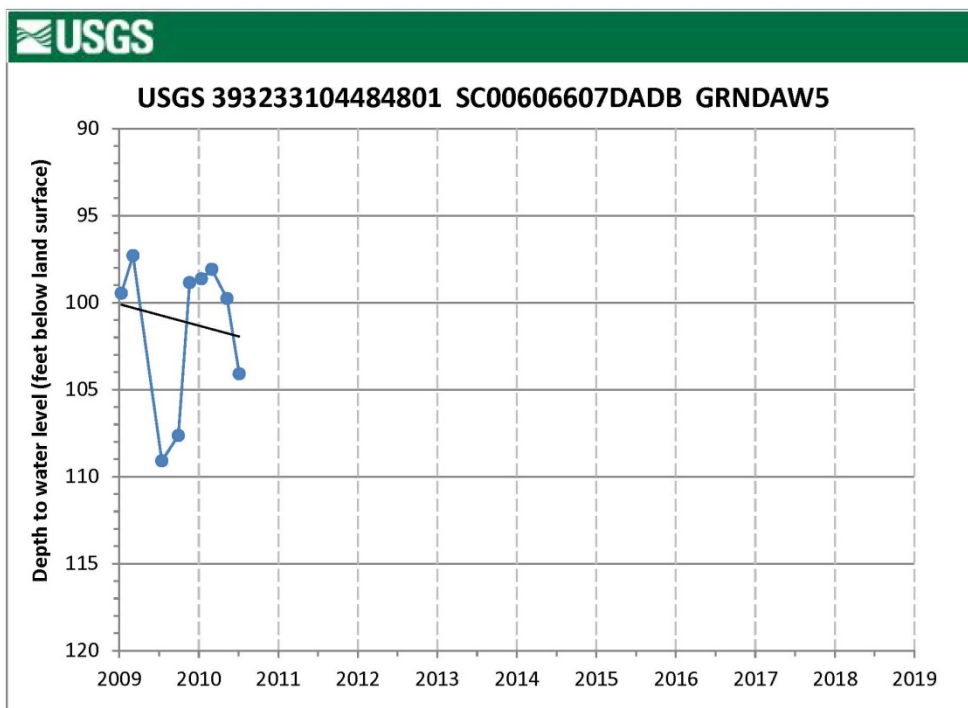
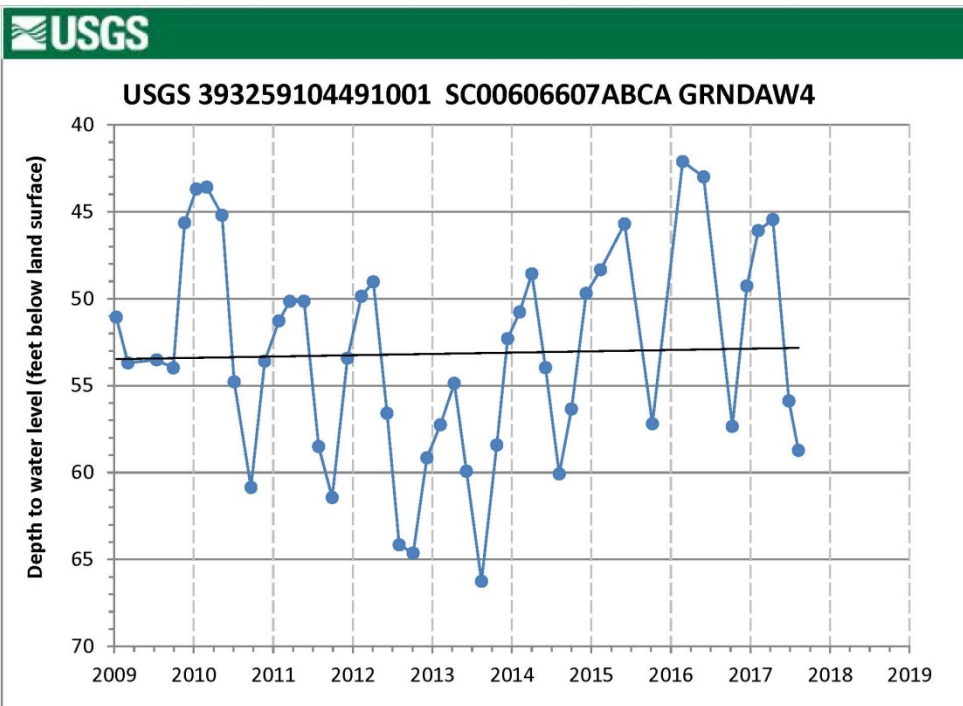


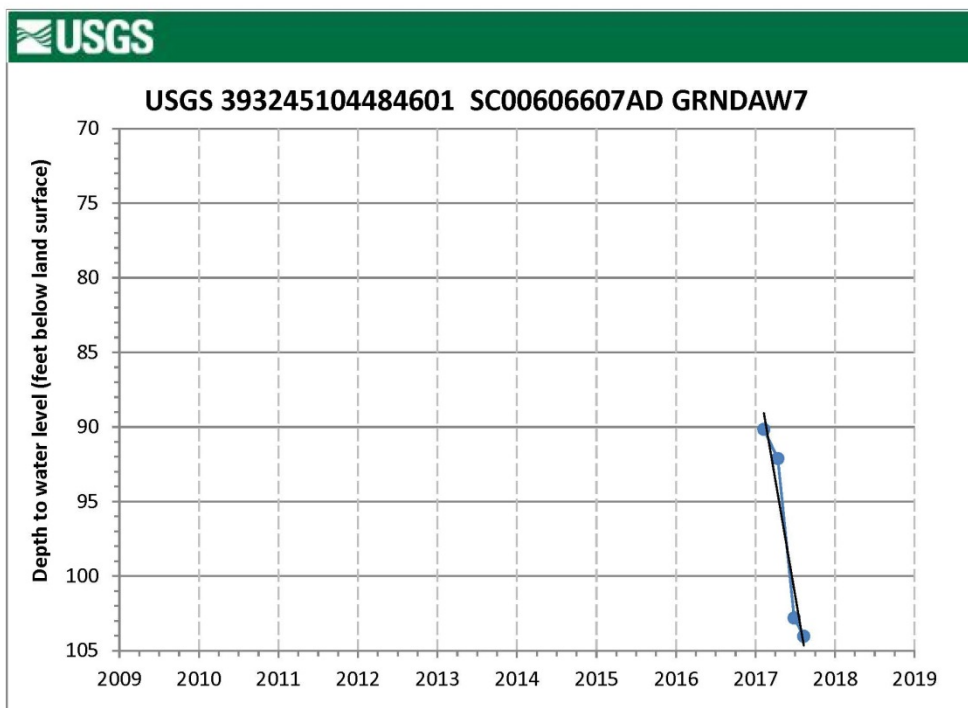
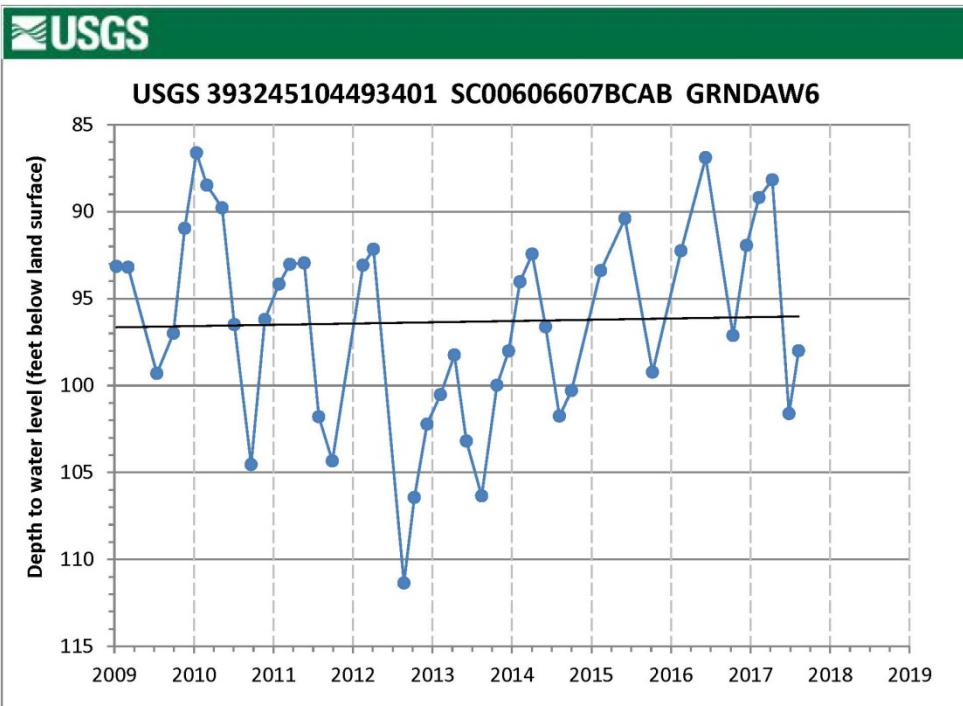
Local air curves and data							
Blue line = CFC-12							
Red line = CFC-11							
Green line = CFC-113							
	Number	Name	Date	pptv CFC-11	pptv CFC-12	pptv CFC-113	Symbol Color
	23	Denver 08	10/13/05	8.38	131.36	6.41	
	24	Denver 08	10/13/05	9.48	129.01	7.25	
	25	Denver 08	10/13/05	9.06	135.52	9.21	

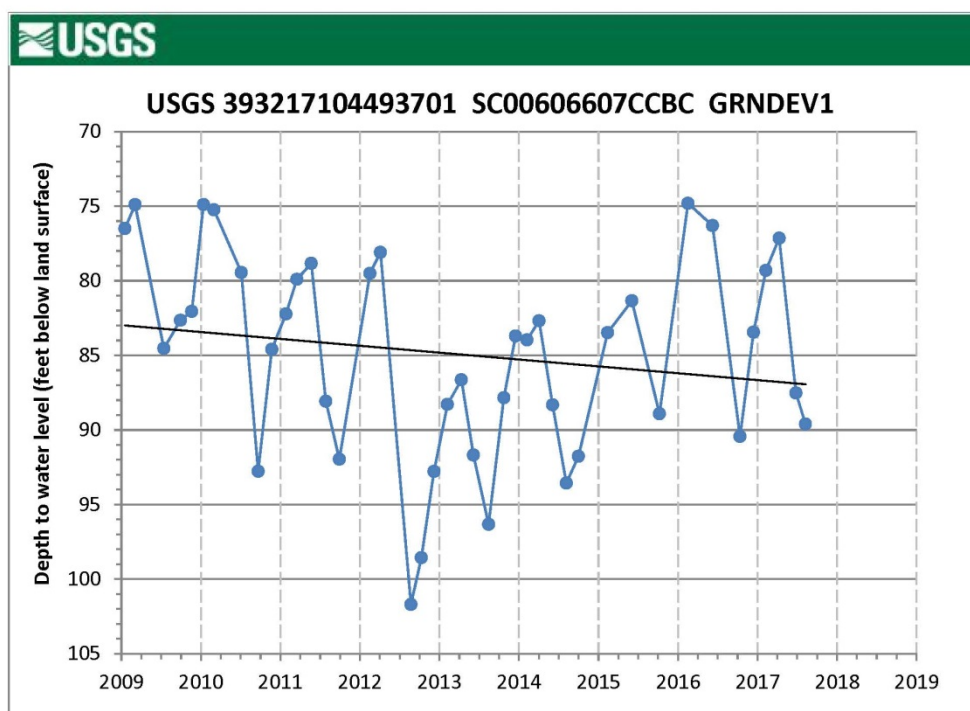
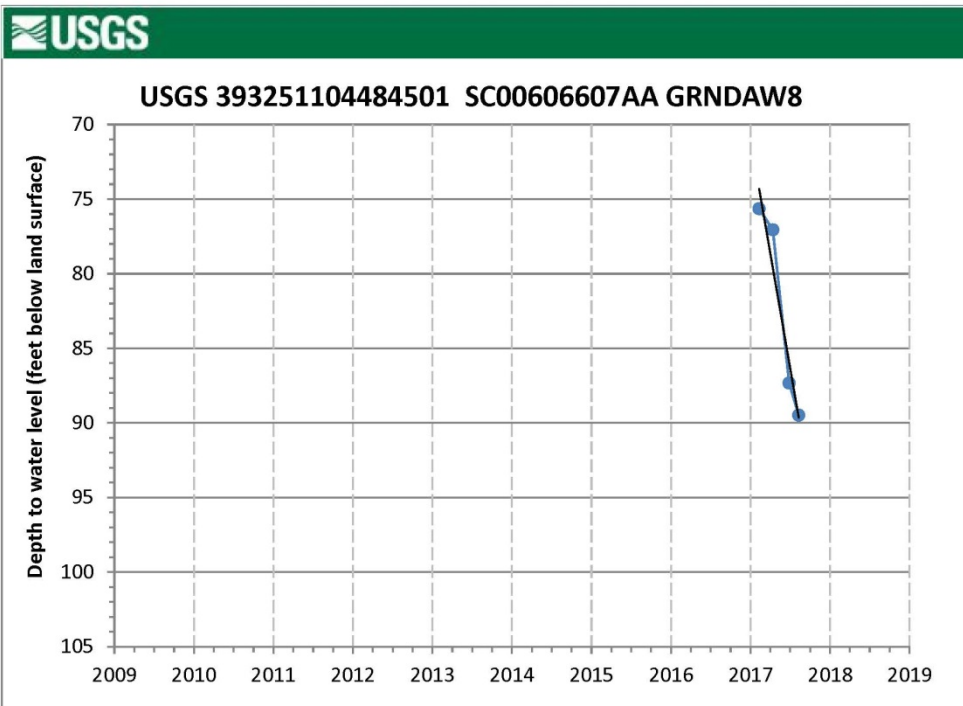
Figure 5. Chlorofluorocarbon concentrations for local air and for groundwater in well Denver08 used to estimate year of groundwater recharge.

Appendix 1. Water-level hydrographs for monitored domestic wells in Grandview Estates, Colorado.



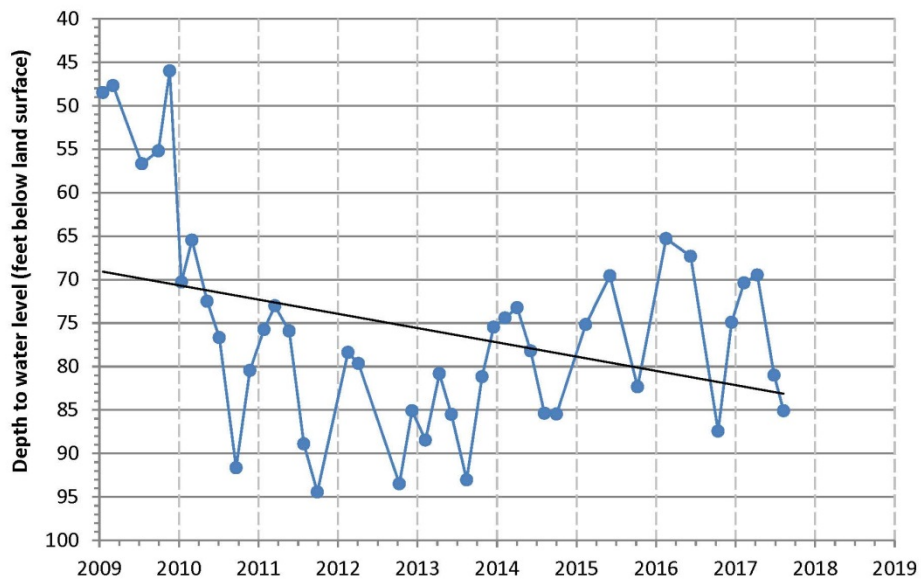




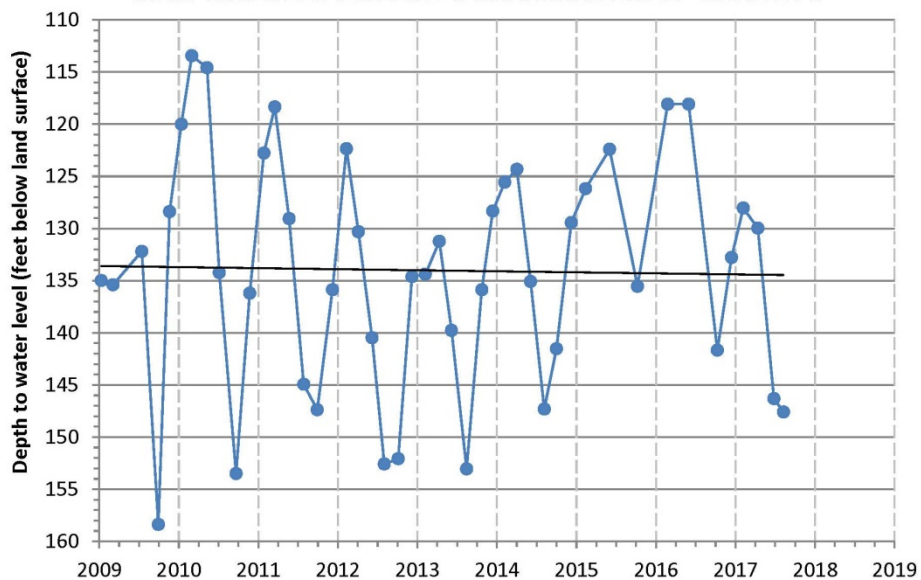




USGS 393233104490501 SC00606607DBAC GRNDEV2

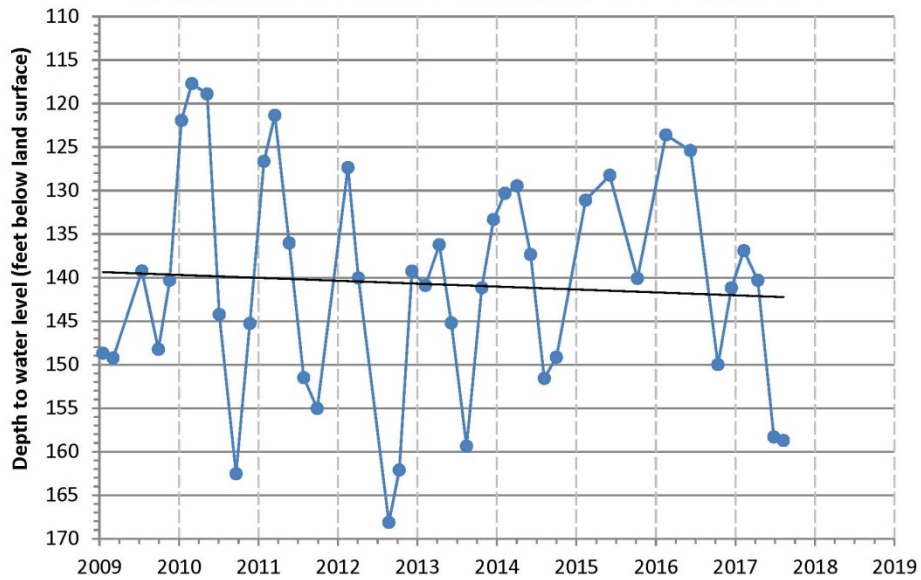


USGS 393252104492101 SC00606607BDAB GRNDEV3

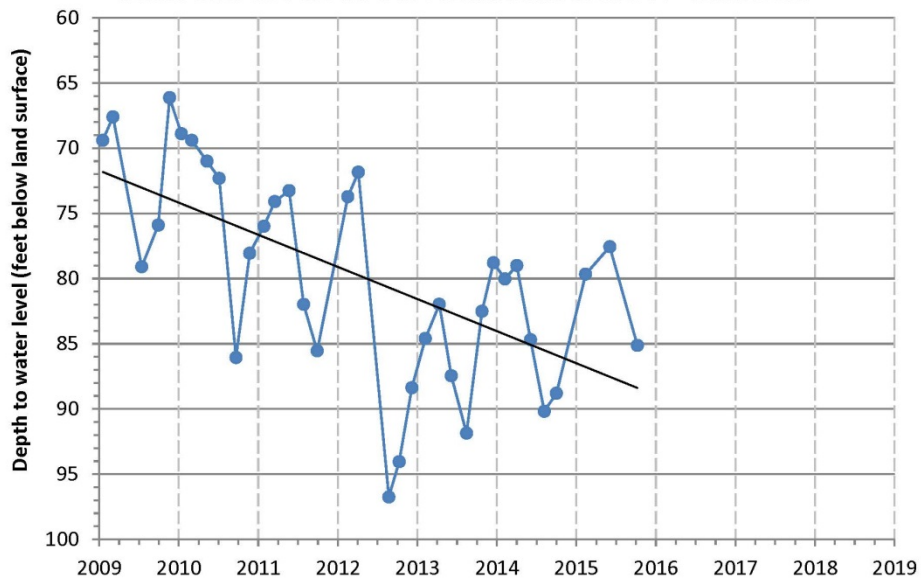


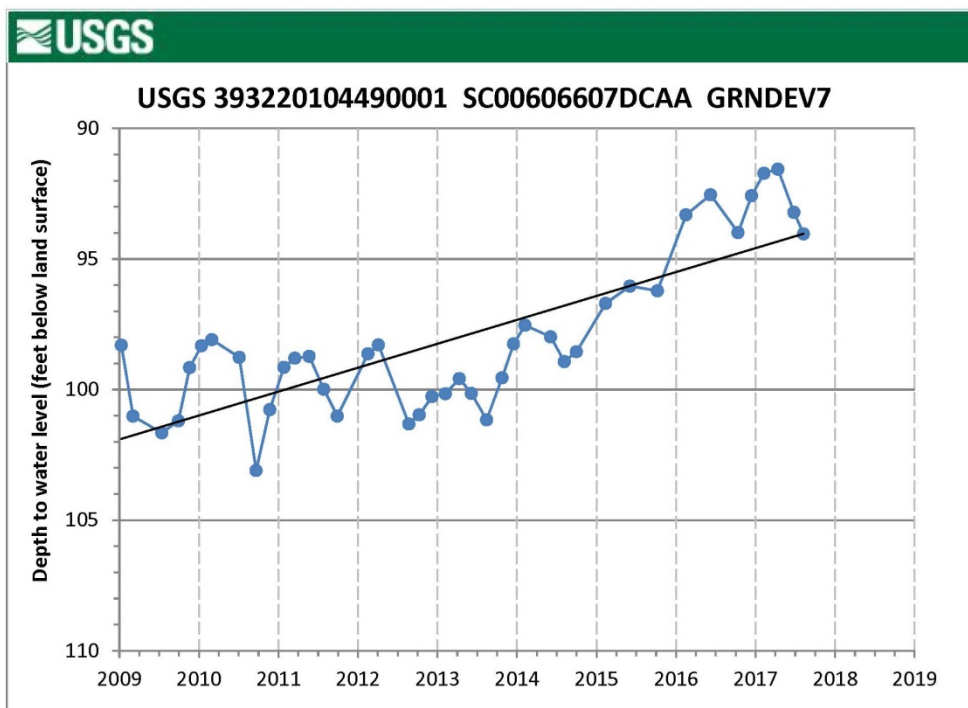
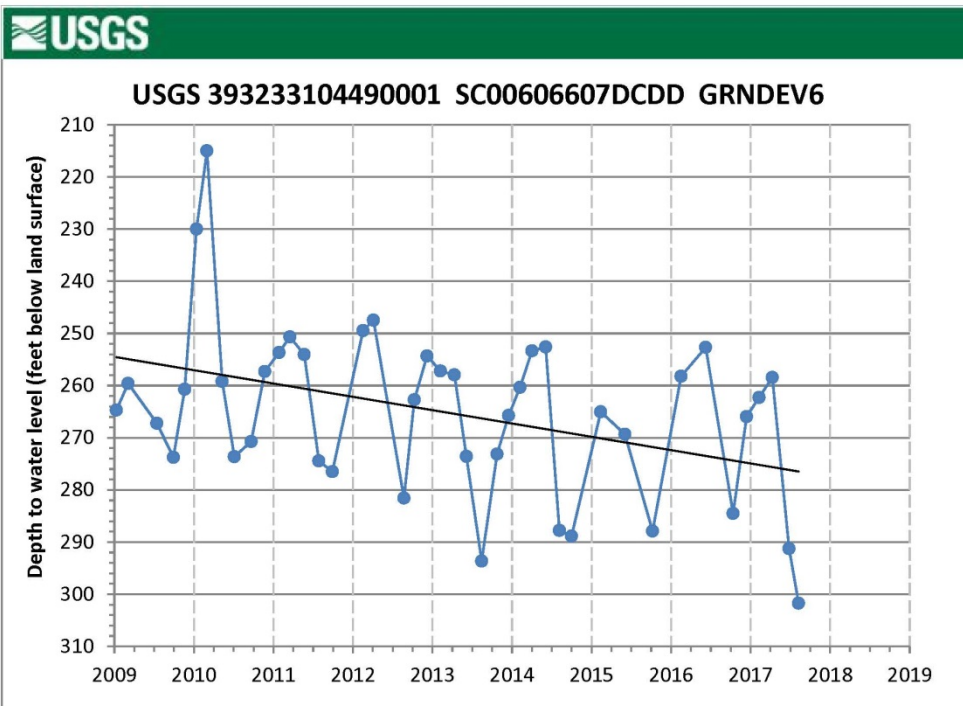


USGS 393258104492401 SC00606607BABD GRNDEV4



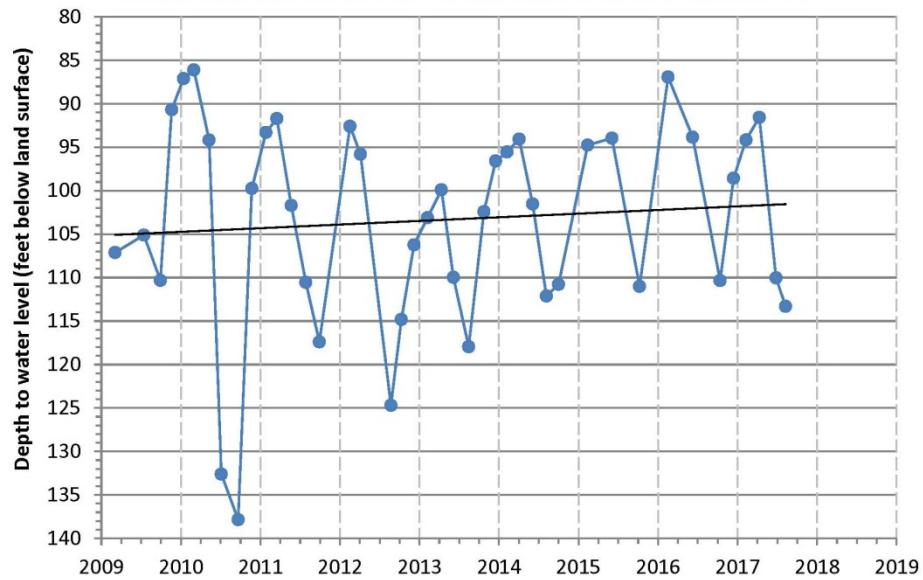
USGS 393212104491701 SC00606607BAAD GRNDEV5



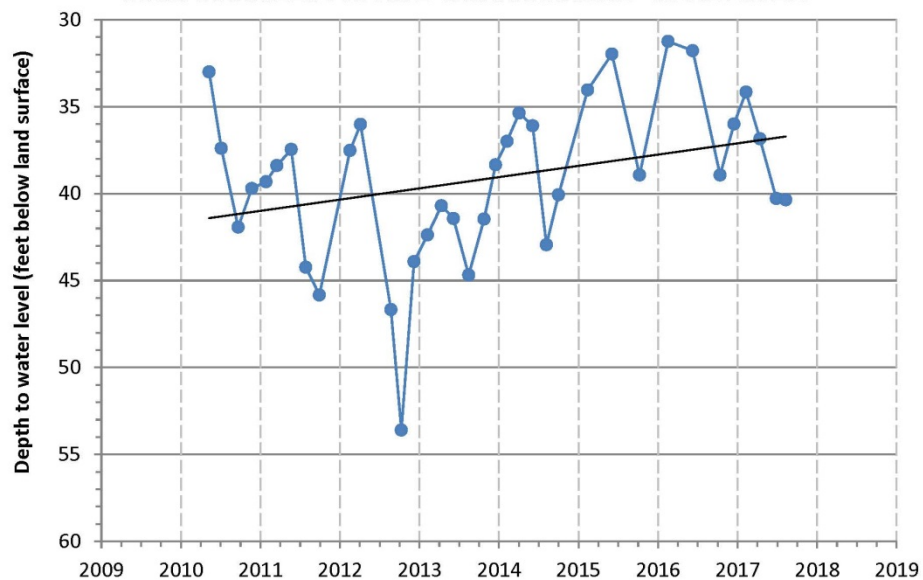




USGS 393236104492201 SC00606607CAAB GRNDEV8

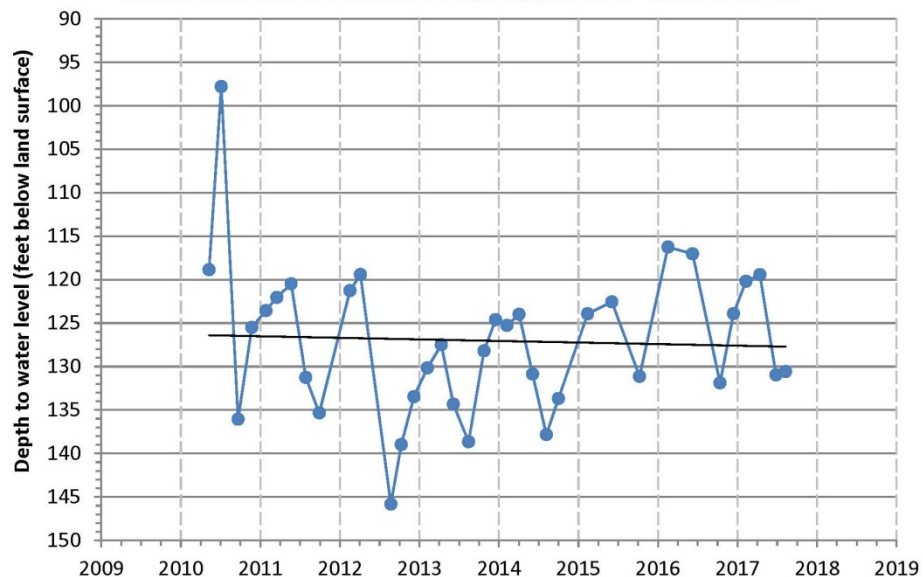


USGS 393301104484801 SC00606608BB GRNDAW1A

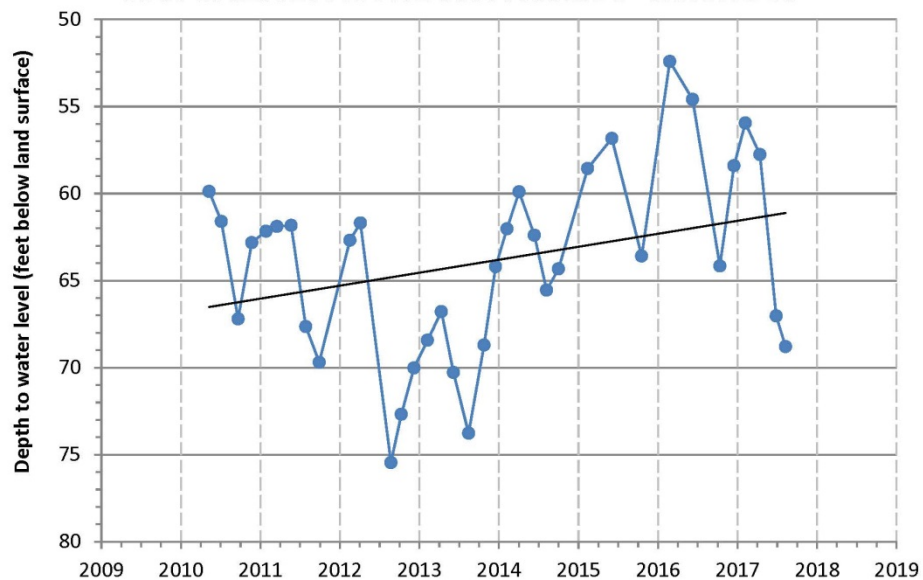


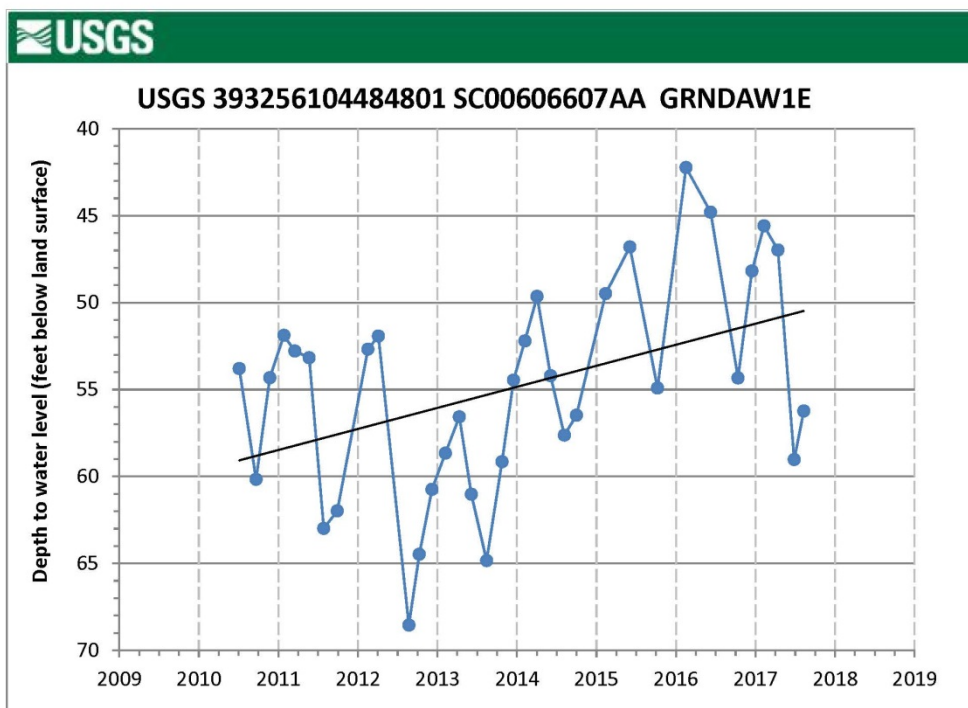
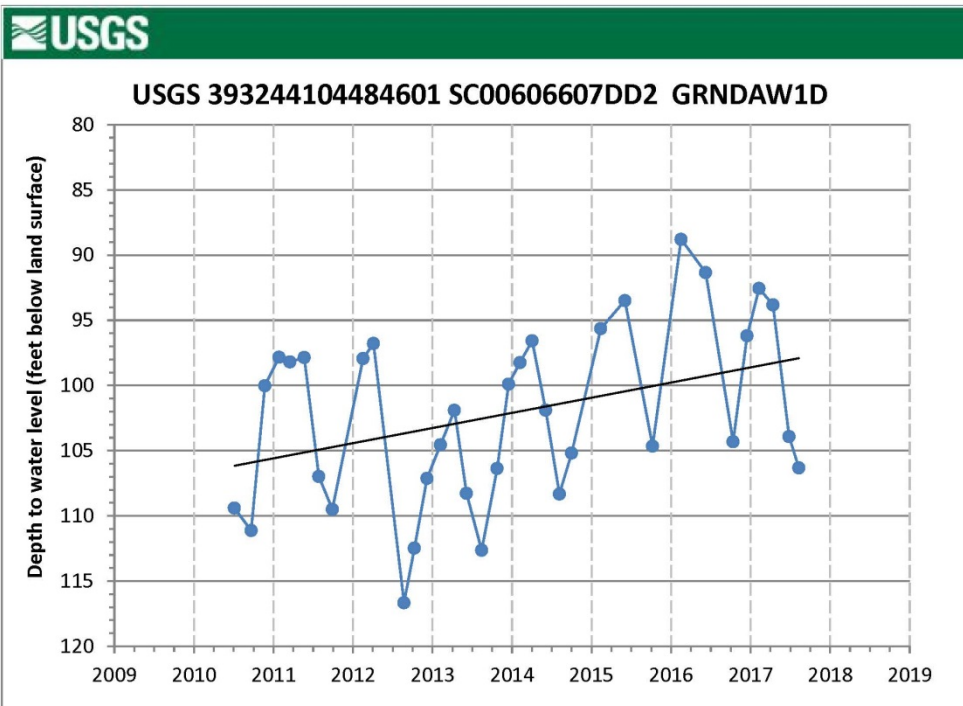


USGS 393225104490001 SC00606607DD GRNDW1B

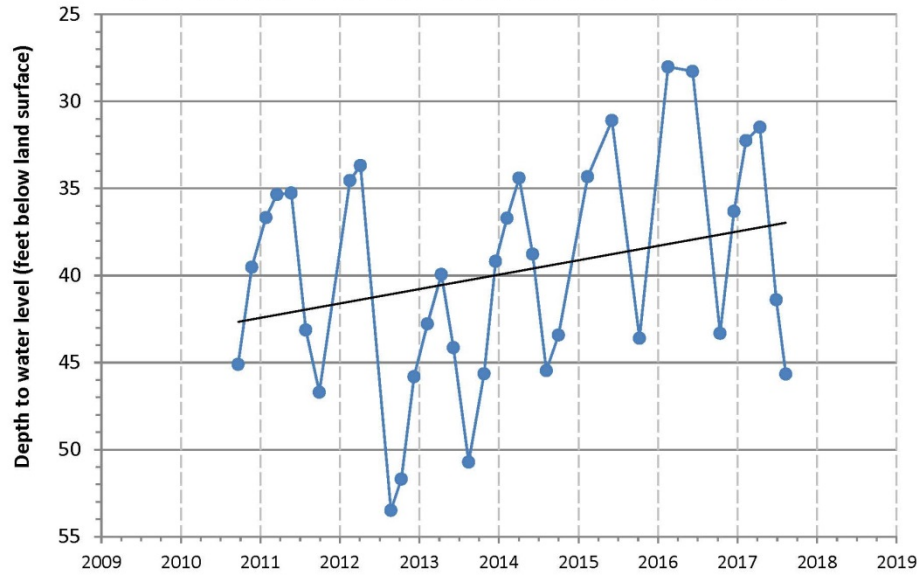


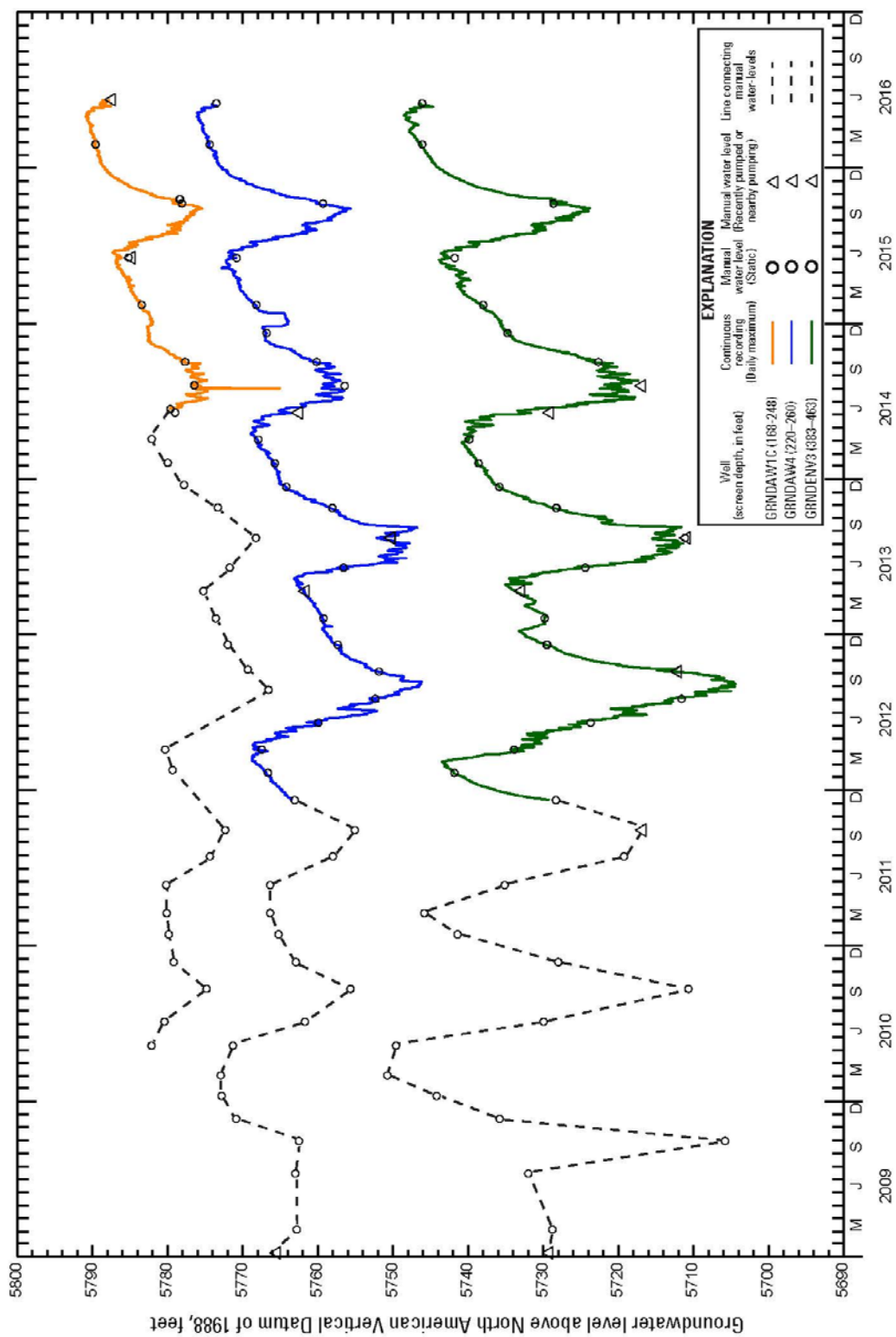
USGS 393253104484401 SC00606509BB GRNDW1C



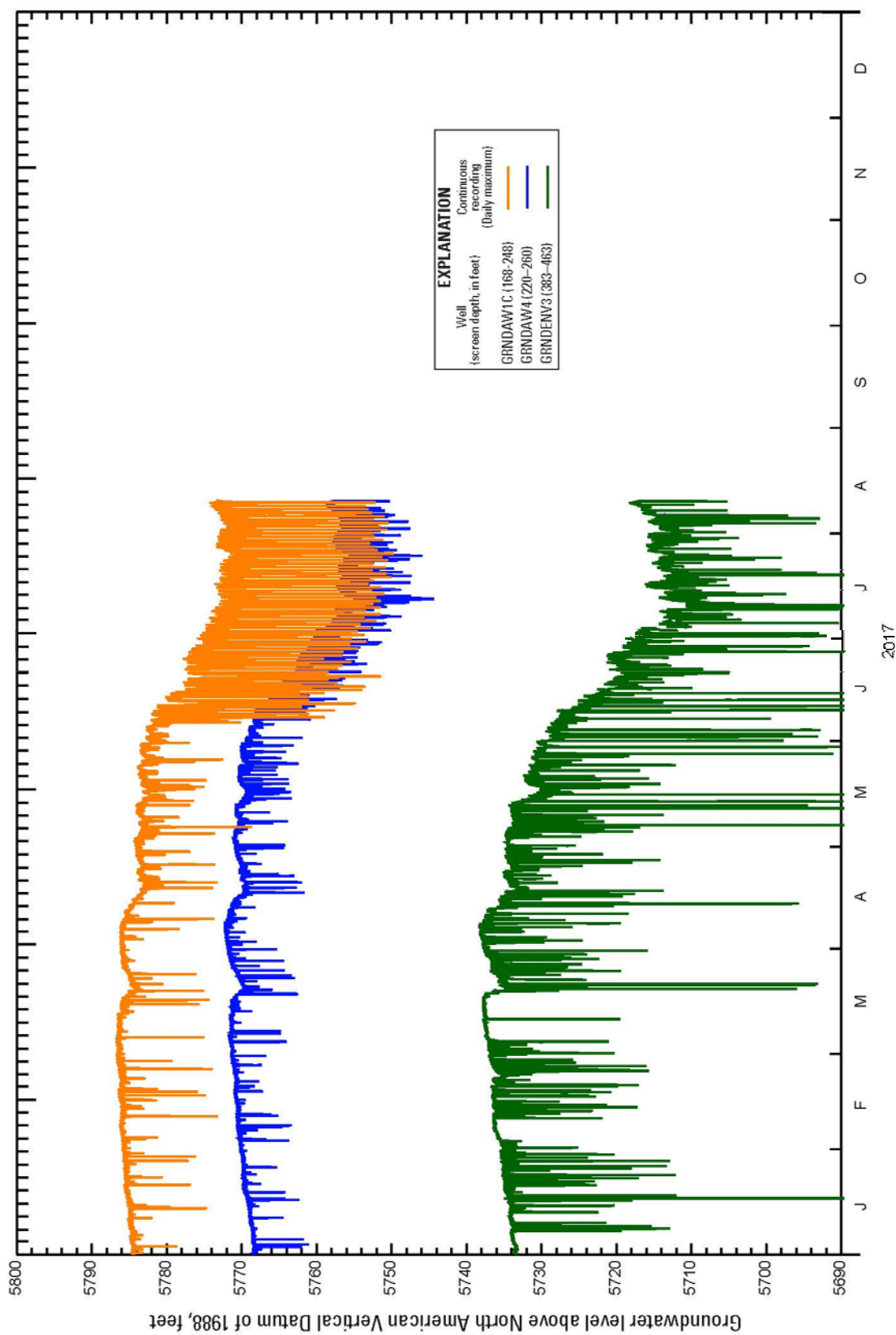


USGS 393303104484801 SC00606607AAA GRNDW1F

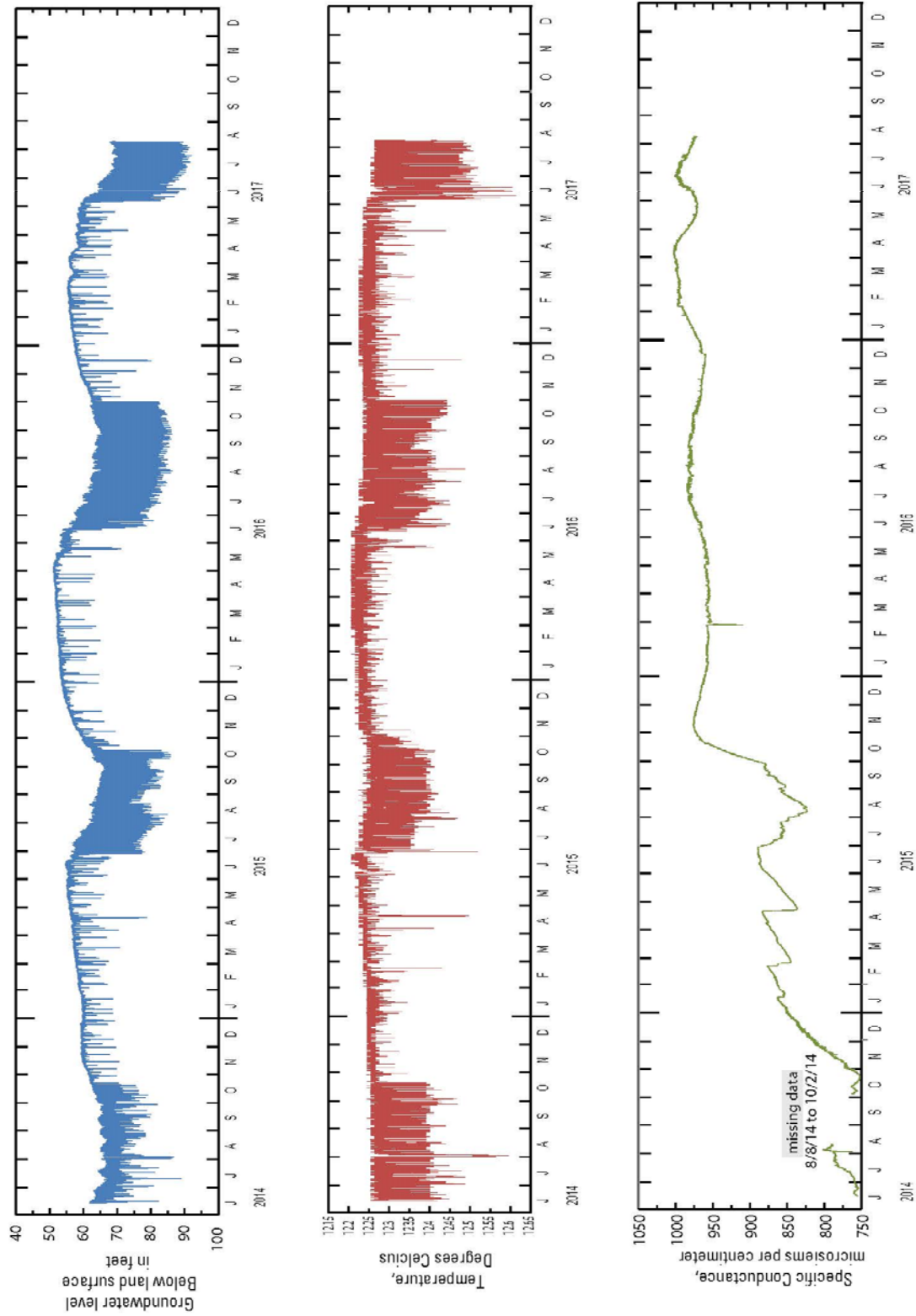




Appendix 1. Water-level hydrograph from GRNDAW1C, GRNDAW4, and GRNDEV3, from January 10, 2009 to July 9, 2016, Douglas County, Colorado.

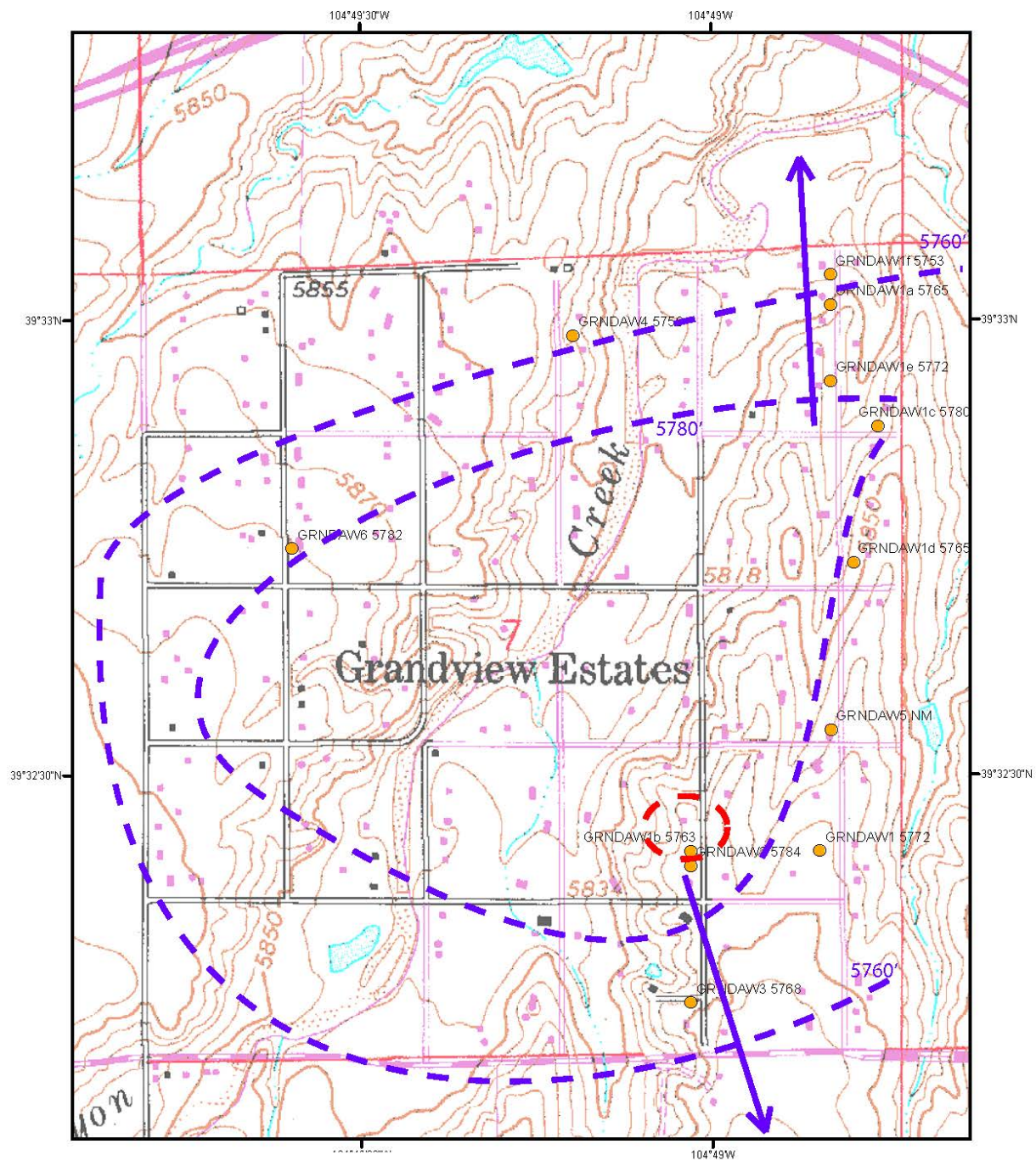


Appendix 1b. Water-level hydrograph from GRNDW1C, GRNDW4, and GRNDEV3, from January 1st to August 10th, 2017, Douglas County, Colorado.



Appendix 1. Water-level hydrograph, temperature, and specific conductance from GRNDAW1C, from June 8 2009 to August 10, 2017, Douglas County, Colorado.

Appendix 2. Potentiometric surface maps for monitored domestic wells in Grandview Estates, Colorado, 2011.



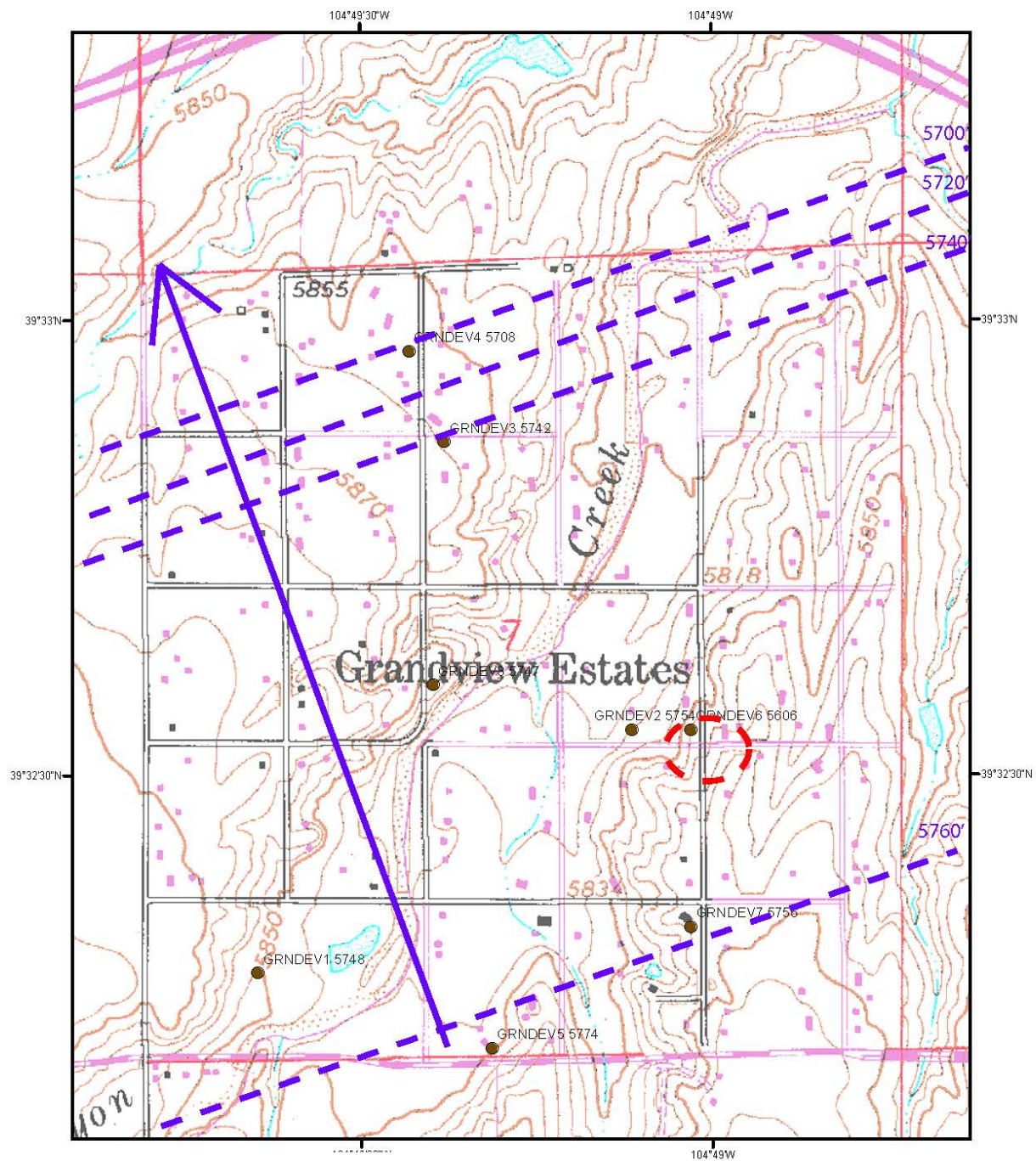
Potentiometric map for Dawson aquifer for January 2011

Explanation

● Dawson Wells



Generalized groundwater flow direction



Potentiometric map for Denver aquifer for January 2011

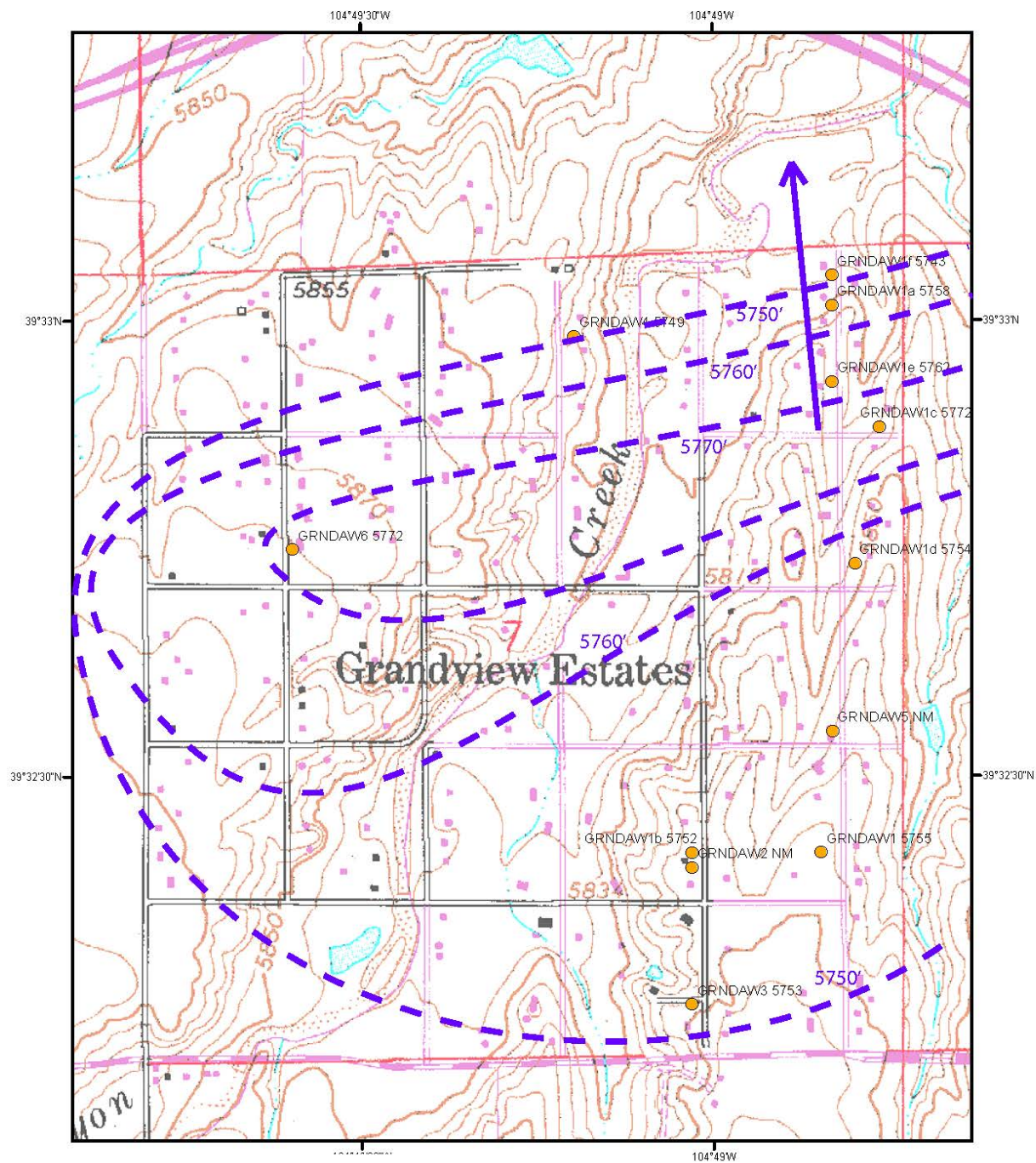
0 0.05 0.1 0.2 Miles

Explanation

● Denver Wells



Generalized groundwater flow direction



Potentiometric map for Dawson aquifer for September 2011

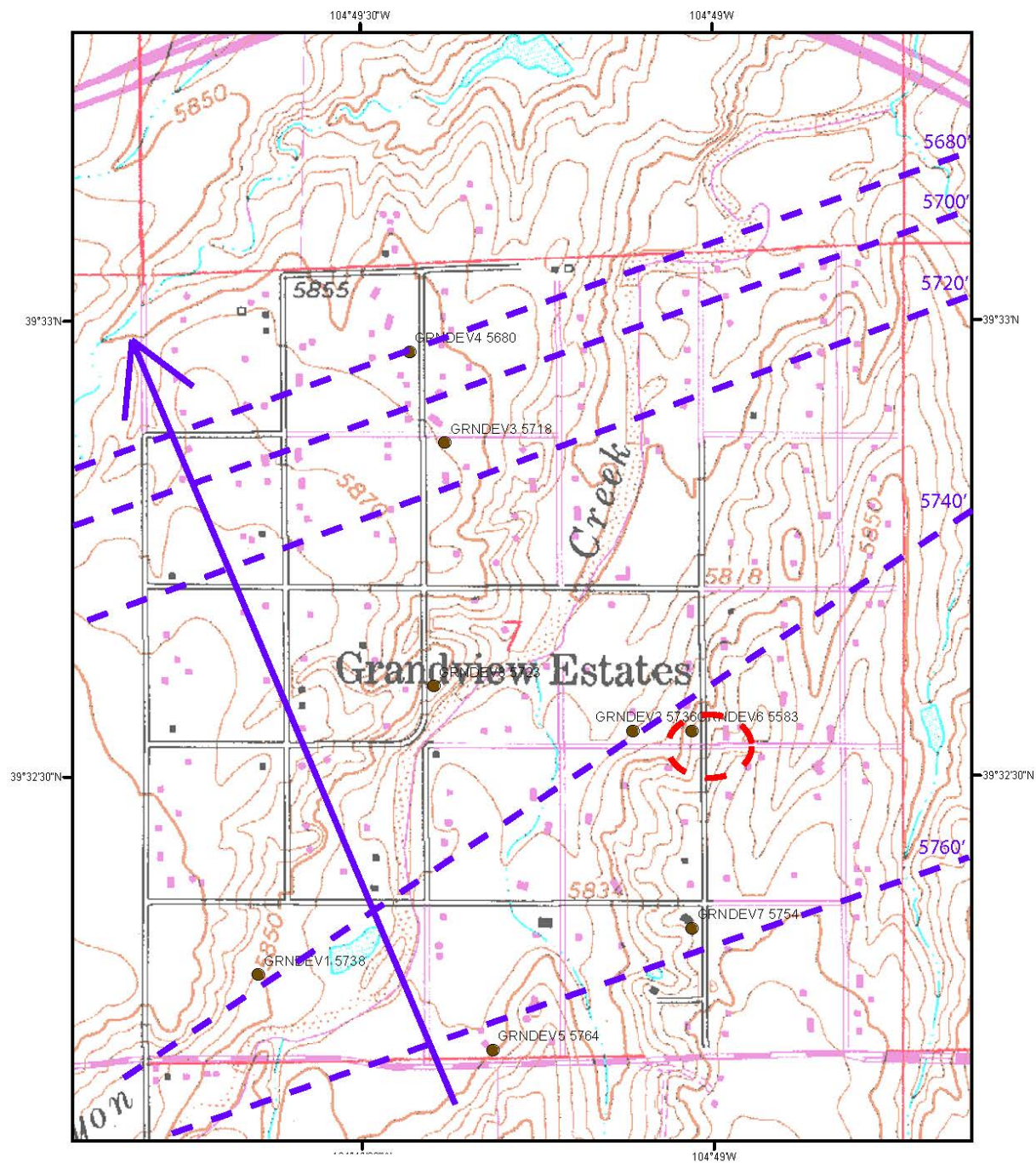
0 0.05 0.1 0.2 Miles

Explanation

● Dawson Wells



Generalized groundwater flow direction



Potentiometric map for Denver aquifer for September 2011

0 0.05 0.1 0.2 Miles

Explanation

● Denver Wells



Generalized groundwater flow direction

Table 1. Identification, location, and construction information for selected wells located in the Grandview Estates, Douglas County, Colorado.

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. The (C#) indicates USGS NWIS database parameter code. The altitude of the Land Surface Datum (LSD) is described in feet above the North American Vertical Datum of 1988 (NAVD 88.) Abbreviations: °, degrees; ', minutes; ", seconds; LSD, land surface datum; ft, feet; ft bls, feet below land surface; YYYY, year; MM, month; DD, day; --, data not available; *, altitude converted to NAVD88.]

Site identification number (C1)	Site identification name (C12)	Common name	Latitude (NAD83) (C9)	Longitude (NAD83) (C10)	Altitude of LSD (ft above NAVD88) (C16)	Depth to bottom of hole (ft bls) (C27)	Depth to bottom of well (ft bls) (C28)	Depth to top of perforations (ft bls) (C83)	Depth to bottom of perforations (ft bls) (C84)
393225104484901	SC00606607DDAB	GRNDAW1	39° 22' 25"	104° 84' 49"	5898*	357	357	217	357
393224104490001	SC00606607DBDD	GRNDAW2	39° 22' 24"	104° 90' 00"	5888*	160	160	40	160
393231104493001	SC00606607DB	GRNDAW2B	39° 22' 23"	104° 92' 29"	5854	224	224	132	224
393215104490001	SC00606607DCDA	GRNDAW3	39° 21' 15"	104° 90' 00"	5898*	304	304	259	304
393259104491001	SC00606607ABCA	GRNDAW4	39° 25' 59"	104° 91' 10"	5816.50	280	280	220	260
393233104484801	SC00606607DADB	GRNDAW5	39° 23' 33"	104° 84' 48"	5878*	308	308	268	308
393245104493401	SC00606607BCAB	GRNDAW6	39° 24' 45"	104° 93' 34"	5879*	264	264	204	264
393245104484601	SC00606607AD	GRNDAW7	39° 32' 46"	104° 48' 45"	5858	303	303	250	303
393251104484501	SC00606607AA	GRNDAW8	39° 32' 51"	104° 48' 45"	5839	320	320	160	320
393217104493701	SC00606607CCBC	GRNDEV1	39° 21' 17"	104° 93' 37"	5833*	600	600	400	600
393233104490501	SC00606607DBAC	GRNDEV2	39° 23' 33"	104° 90' 05"	5863*	496	496	376	496
393252104492101	SC00606607BDAB	GRNDEV3	39° 25' 52"	104° 92' 21"	5864.18	463	463	383	463
393258104492401	SC00606607BABD	GRNDEV4	39° 25' 58"	104° 92' 24"	5838*	520	520	420	520
393212104491701	SC00606607BAAD	GRNDEV5	39° 25' 58"	104° 91' 17"	5853*	505	505	400	505
393233104490001	SC00606607DCDD	GRNDEV6	39° 23' 33"	104° 90' 00"	5863*	680	680	580	680
393220104490001	SC00606607DCAA	GRNDEV7	39° 22' 20"	104° 90' 00"	5858*	402	402	282	402
393236104492201	SC00606607CAAB	GRNDEV8	39° 23' 36"	104° 92' 22"	5843*	440	440	360	440
393301104484801	SC00606608BB	GRNDAW1A	39° 30' 01"	104° 84' 48"	5804	187	187	157	187
393225104490001	SC00606607DD	GRNDAW1B	39° 22' 25"	104° 90' 00"	5887	330	330	270	330
393253104484401	SC00606509BB	GRNDAW1C	39° 25' 53"	104° 84' 44"	5842	248	248	168	248
393244104484601	SC00606607DD2	GRNDAW1D	39° 24' 44"	104° 84' 46"	5863	285	285	205	285
393256104484801	SC00606607AA	GRNDAW1E	39° 25' 56"	104° 84' 48"	5824	275	275	175	275
393303104484801	SC00606607AAA	GRNDAW1F	39° 30' 03"	104° 84' 48"	5793*	244	244	48	244

Table 2. Summary of sites with manual water level measurements including period of record, number of measurements, and minimum and maximum observed water levels for selected wells in Grandview Estates, Douglas County, Colorado.

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figures 1 for well locations. The altitude of the LSD is described in feet above the North American Vertical Datum of 1988 (NAVD 88). Abbreviations: ft, feet; LSD, land surface datum; *, altitude converted to NAVD88, +, minimum or maximum water level observed within the last 12 months. Dates with "00" listed for the day indicates the exact day is unknown.]

Site identification number	Site identification name	Common name	Land Surface Elevation (NAVD88)	Period of Record		Number of Measurements	Minimum Water-level below LSD (ft)	Minimum Water-level date	Maximum Water-level below LSD (ft)	Maximum Water-level date
				Begin Date (MM/DD/YYYY)	End Date (MM/DD/YYYY)					
393225104484901	SC00606607DDAB	GRNDAW1	5898*	1/10/2009	8/11/2017	43	99.10	1/10/2009	149.81	8/23/2012
393224104490001	SC00606607DBDD	GRNDAW2	5888*	1/10/2009	8/10/2017	39	93.94 ⁺	4/14/2017	103.40	1/10/2009
393231104493001	SC00606607DB	GRNDAW2B	5854	5/23/2011	6/6/2013	11	98.97	4/5/2012	101.99	10/10/2012
393215104490001	SC00606607DCDA	GRNDAW3	5898*	1/10/2009	8/11/2017	43	110.10	1/10/2009	148.97	8/23/2012
393259104491001	SC00606607ABCA	GRNDAW4	5816.50	1/10/2009	8/10/2017	53	42.12	2/25/2016	66.34	8/15/2013
393233104484801	SC00606607DADB	GRNDAW5	5878*	1/10/2009	7/6/2010	10	97.30	3/5/2009	109.10	7/15/2009
393245104493401	SC00606607BCAB	GRNDAW6	5879*	1/10/2009	8/10/2017	43	86.62	1/13/2010	111.36	8/23/2012
393245104484601	SC00606607AD	GRNDAW7	5858	1/20/2017	8/11/2017	5	90.17+	2/9/2017	104.04+	8/11/2017
393251104484501	SC00606607AA	GRNDAW8	5839	2/10/2017	8/11/2017	4	75.65+	2/10/2017	89.49+	8/11/2017
393217104493701	SC00606607CCBC	GRNDEV1	5833*	1/17/2009	8/10/2017	42	74.81	2/17/2016	101.70	8/23/2012
393233104490501	SC00606607DBAC	GRNDEV2	5863*	1/17/2009	8/10/2017	42	46.00	11/20/2009	94.44	9/29/2011
393252104492101	SC00606607BDAB	GRNDEV3	5864.18	1/10/2009	8/10/2017	54	113.44	3/2/2010	158.38	9/29/2009
393258104492401	SC00606607BABD	GRNDEV4	5838*	1/17/2009	8/10/2017	43	117.72	3/2/2010	168.14	8/23/2012
393212104491701	SC00606607BAAD	GRNDEV5	5853*	1/17/2009	10/9/2015	35	66.13	11/20/2009	96.75	8/23/2012
393233104490001	SC00606607DCDD	GRNDEV6	5863*	1/10/2009	8/10/2017	43	215.00	3/2/2010	301.73+	8/10/2017
393220104490001	SC00606607DCAA	GRNDEV7	5858*	1/10/2009	8/10/2017	41	91.56+	4/14/2017	103.10	9/21/2010
393236104492201	SC00606607CAAB	GRNDEV8	5843*	1/10/2009	8/10/2017	43	86.12	3/2/2010	177.32	1/10/2009
393301104484801	SC00606608BB	GRNDAW1A	5804	5/11/2010	8/11/2017	36	31.25	2/17/2016	53.60	10/10/2012
393225104490001	SC00606607DD	GRNDAW1B	5887	5/11/2010	8/10/2017	36	97.80	7/6/2010	145.84	8/23/2012
393253104484401	SC00606509BB	GRNDAW1C	5842	5/11/2010	8/10/2017	49	52.41	2/25/2016	75.45	8/23/2012
393244104484601	SC00606607DD2	GRNDAW1D	5863	7/6/2010	8/11/2017	35	88.79	2/17/2016	116.66	8/23/2012
393256104484801	SC00606607AA	GRNDAW1E	5824	7/6/2010	8/11/2017	35	42.23	2/17/2016	68.55	8/23/2012
393303104484801	SC00606607AAA	GRNDAW1F	5793*	9/21/2010	8/11/2017	34	28.01	2/17/2016	53.49	8/23/2012

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393225104484901	5898	1/10/2009	99.10	A	5798.9	--	--
GRNDAW1		3/5/2009	117.77		5780.2	-18.7	--
		7/15/2009	108.03		5790.0	-8.9	--
		9/29/2009	128.00		5770.0	-28.9	--
		11/20/2009	116.33		5781.7	-17.2	--
		1/13/2010	117.60		5780.4	-18.5	-18.5
		3/2/2010	117.70		5780.3	-18.6	0.1
		5/11/2010	121.14		5776.9	-22.0	--
		7/6/2010	125.44		5772.6	-26.3	-17.4
		9/21/2010	111.44		5786.6	-12.3	16.6
		11/23/2010	125.00		5773.0	-25.9	-8.7
		1/27/2011	122.94		5775.1	-23.8	-5.3
		3/18/2011	123.61		5774.4	-24.5	-5.9
		5/23/2011	127.29	R	5770.7	-28.2	-6.2
		7/29/2011	133.84		5764.2	-34.7	-8.4
		9/29/2011	139.79	R	5758.2	-40.7	-28.4
		12/8/2011	nm		--	--	--
		2/17/2012	121.36		5776.6	-22.3	1.6
		4/5/2012	106.32		5791.7	-7.2	17.3
		6/7/2012	nm		--	--	--
		8/23/2012	149.81		5748.2	-50.7	-16.0
		10/10/2012	139.25		5758.8	-40.2	0.5
		12/7/2012	132.92		5765.1	-33.8	--
		2/7/2013	129.34		5768.7	-30.2	-8.0
		4/12/2013	127.19		5770.8	-28.1	-20.9
		6/6/2013	138.63	R	5759.4	-39.5	--
		8/15/2013	143.65		5754.4	-44.6	6.2
		10/25/2013	128.51		5769.5	-29.4	10.7
		12/17/2013	124.59	R	5773.4	-25.5	8.3
		2/7/2014	124.45	R	5773.6	-25.4	4.9
		4/4/2014	123.12		5774.9	-24.0	4.1
		6/5/2014	133.92		5764.1	-34.8	4.7
		8/7/2014	145.30	R	5752.7	-46.2	-1.7
		10/2/2014	134.99	S	5763.0	-35.9	-6.5
		2/13/2015	123.44		5774.6	-24.3	1.0
		6/4/2015	122.93		5775.1	-23.8	11.0
		10/9/2015	132.51	S	5765.5	-33.4	2.5
		2/17/2016	115.07		5782.9	-16.0	8.4
		6/9/2016	116.84		5781.2	-17.7	6.1
		10/13/2016	131.93	R	5766.1	-32.8	0.6
		12/16/2016	122.76		5775.2	-23.7	--
		2/9/2017	118.72		5779.3	-19.6	-3.7
		4/14/2017	120.93	R	5777.1	-21.8	--
		6/27/2017	133.82		5764.2	-34.7	-17.0
		8/11/2017	130.49		5767.5	-31.4	--

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393224104490001	5888	1/10/2009	103.40	A	5784.6	--	--
GRNDAW2		3/5/2009	102.73		5785.3	0.7	--
		7/15/2009	102.30		5785.7	1.1	--
		9/29/2009	97.95		5790.1	5.5	--
		11/20/2009	101.06		5786.9	2.3	--
		1/13/2010	100.25		5787.8	3.2	3.2
		3/2/2010	99.90		5788.1	3.5	2.8
		5/11/2010	99.61		5788.4	3.8	--
		7/6/2010	103.14		5784.9	0.3	-0.8
		9/21/2010	101.93		5786.1	1.5	-4.0
		11/23/2010	102.61		5785.4	0.8	-1.6
		1/27/2011	101.16		5786.8	2.2	-0.9
		3/18/2011	100.74		5787.3	2.7	-0.8
		5/23/2011	100.70		5787.3	2.7	-1.1
		7/29/2011	101.76		5786.2	1.6	1.4
		9/29/2011	nm		--	--	--
		12/8/2011	nm		--	--	--
		2/17/2012	nm		--	--	--
		4/5/2012	nm		--	--	--
		6/7/2012	nm		--	--	--
		8/23/2012	nm		--	--	--
		10/10/2012	100.70	R	5787.3	2.7	--
		12/7/2012	102.38		5785.6	1.0	--
		2/7/2013	102.31		5785.7	1.1	--
		4/12/2013	101.67		5786.3	1.7	--
		6/6/2013	101.86	R	5786.1	1.5	--
		8/15/2013	103.06		5784.9	0.3	--
		10/25/2013	101.64		5786.4	1.8	-0.9
		12/17/2013	100.03		5788.0	3.4	2.3
		2/7/2014	99.61		5788.4	3.8	2.7
		4/4/2014	99.49		5788.5	3.9	2.2
		6/5/2014	99.87		5788.1	3.5	2.0
		8/7/2014	100.66		5787.3	2.7	2.4
		10/2/2014	100.50		5787.5	2.9	1.1
		2/13/2015	98.66		5789.3	4.7	1.0
		6/4/2015	97.99	R	5790.0	5.4	1.9
		10/9/2015	98.34		5789.7	5.1	2.2
		2/17/2016	95.45		5792.6	8.0	3.2
		6/9/2016	94.60		5793.4	8.8	3.4
		10/13/2016	96.16		5791.8	7.2	2.2
		12/14/2016	94.85		5793.2	8.6	--
		2/9/2017	94.00	R	5794.0	9.4	1.5
		4/14/2017	93.94		5794.1	9.5	--
		6/27/2017	95.24		5792.8	8.2	-0.6
		8/10/2017	96.17		5791.8	7.2	--

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; -, not available; A, affected by atmospheric pressure; R, recently pumped, S, nearby pumping]

393231104493001	5854	1/10/2009	nm	--	--	--
GRNDAW2b		3/5/2009	nm	--	--	--
		7/15/2009	nm	--	--	--
		9/29/2009	nm	--	--	--
		11/20/2009	nm	--	--	nm
		1/13/2010	nm	--	--	--
		3/2/2010	nm	--	--	--
		5/11/2010	nm	--	--	--
		7/6/2010	nm	--	--	--
		9/21/2010	nm	--	--	--
		11/23/2010	nm	--	--	--
		1/27/2011	nm	--	--	--
		3/18/2011	nm	--	--	--
		5/23/2011	99.50	--	--	--
		7/29/2011	100.54	R	5753.5	-1.0
		9/29/2011	101.76		5752.2	-2.3
		12/8/2011	nm	--	--	--
		2/17/2012	99.38		5754.6	0.1
		4/5/2012	98.97	R	5755.0	0.5
		6/7/2012	nm	--	--	--
		8/23/2012	101.97		5752.0	-2.5
		10/10/2012	101.99		5752.0	-2.5
		12/7/2012	101.43		5752.6	-1.9
		2/7/2013	101.34		5752.7	-1.8
		4/12/2013	100.57		5753.4	-1.1
		6/6/2013	100.67		5753.3	-1.2
						--

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393215104490001	5898	1/10/2009	110.10	A	5787.9	--	--
GRNDAW3		3/5/2009	115.80		5782.2	-5.7	--
		7/15/2009	130.20		5767.8	-20.1	--
		9/29/2009	125.80		5772.2	-15.7	--
		11/20/2009	114.52		5783.5	-4.4	--
		1/13/2010	120.10		5777.9	-10.0	-10.0
		3/2/2010	120.93		5777.1	-10.8	-5.1
		5/11/2010	122.30		5775.7	-12.2	--
		7/6/2010	136.39		5761.6	-26.3	-6.2
		9/21/2010	139.70		5758.3	-29.6	-13.9
		11/23/2010	129.97		5768.0	-19.9	-15.5
		1/27/2011	126.86		5771.1	-16.8	-6.8
		3/18/2011	127.59		5770.4	-17.5	-6.7
		5/23/2011	121.69	R	5776.3	-11.6	0.6
		7/29/2011	147.40	P	5750.6	-37.3	-11.0
		9/29/2011	142.03		5756.0	-31.9	-2.3
		12/8/2011	nm		--	--	--
		2/17/2012	123.46		5774.5	-13.4	3.4
		4/5/2012	120.75		5777.3	-10.7	6.8
		6/7/2012	nm		--	--	--
		8/23/2012	148.97	R	5749.0	-38.9	-1.6
		10/10/2012	145.62		5752.4	-35.5	-3.6
		12/7/2012	139.00	R	5759.0	-28.9	--
		2/7/2013	134.89		5763.1	-24.8	-11.4
		4/12/2013	132.32		5765.7	-22.2	-11.6
		6/6/2013	138.47		5759.5	-28.4	--
		8/15/2013	142.25		5755.8	-32.2	6.7
		10/25/2013	131.48		5766.5	-21.4	14.1
		12/17/2013	128.30		5769.7	-18.2	10.7
		2/7/2014	130.48		5767.5	-20.4	4.4
		4/4/2014	129.10		5768.9	-19.0	3.2
		6/5/2014	136.95		5761.1	-26.9	1.5
		8/7/2014	142.65		5755.4	-32.6	-0.4
		10/2/2014	140.47		5757.5	-30.4	-9.0
		2/13/2015	129.90		5768.1	-19.8	0.6
		6/4/2015	128.25		5769.8	-18.2	8.7
		10/9/2015	136.15		5761.9	-26.1	4.3
		2/17/2016	120.84	R	5777.2	-10.7	9.1
		6/9/2016	123.30	R	5774.7	-13.2	5.0
		10/13/2016	138.86		5759.1	-28.8	-2.7
		12/14/2016	130.14		5767.9	-20.0	--
		2/9/2017	125.23	R	5772.8	-15.1	-4.4
		4/14/2017	127.14	R	5770.9	-17.0	--
		6/27/2017	133.50		5764.5	-23.4	-10.2
		8/11/2017	134.92	R	5763.1	-24.8	--

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped, S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393259104491001	5816.5	1/10/2009	51.07	A	5765.4	- -	- -
GRNDAW4		3/5/2009	53.70		5762.8	-2.6	- -
		7/15/2009	53.52		5763.0	-2.5	- -
		9/29/2009	54.00		5762.5	-2.9	- -
		11/20/2009	45.64		5770.9	5.4	- -
		1/13/2010	43.70		5772.8	7.4	7.4
		3/2/2010	43.59		5772.9	7.5	10.1
		5/11/2010	45.21		5771.3	5.9	- -
		7/6/2010	54.79		5761.7	-3.7	-1.3
		9/21/2010	60.86		5755.6	-9.8	-6.9
		11/23/2010	53.60		5762.9	-2.5	-8.0
		1/27/2011	51.28		5765.2	-0.2	-7.6
		3/18/2011	50.16		5766.3	0.9	-6.6
		5/23/2011	50.15		5766.4	0.9	-4.9
		7/29/2011	58.51		5758.0	-7.4	-3.7
		9/29/2011	61.44		5755.1	-10.4	-0.6
		12/8/2011	53.43		5763.1	-2.4	0.2
		2/10/2012	49.87		5766.6	1.2	1.4
		4/5/2012	49.04		5767.5	2.0	1.1
		6/7/2012	56.60		5759.9	-5.5	-6.5
		8/2/2012	64.16		5752.3	-13.1	-5.7
		10/5/2012	64.64		5751.9	-13.6	-3.2
		12/7/2012	59.16		5757.3	-8.1	-5.7
		2/7/2013	57.26		5759.2	-6.2	-7.4
		4/12/2013	54.87	R	5761.6	-3.8	-5.8
		6/7/2013	59.93		5756.6	-8.9	-3.3
		8/15/2013	66.26	S	5750.2	-15.2	-2.1
		10/24/2013	58.42		5758.1	-7.4	6.2
		12/13/2013	52.30		5764.2	-1.2	6.9
		2/6/2014	50.78		5765.7	0.3	6.5
		4/3/2014	48.58		5767.9	2.5	6.3
		6/5/2014	53.97	S	5762.5	-2.9	6.0
		8/7/2014	60.08		5756.4	-9.0	6.2
		10/2/2014	56.35		5760.2	-5.3	2.1
		12/9/2014	49.70		5766.8	1.4	2.6
		2/13/2015	48.34		5768.2	2.7	2.4
		6/3/2015	45.70		5770.8	5.4	8.3
		10/9/2015	57.20		5759.3	-6.1	-0.9
		2/25/2016	42.12		5774.4	9.0	6.2
		5/31/2016	43.00		5773.5	8.1	2.7
		10/10/2016	57.35		5759.2	-6.3	-0.1
		12/16/2016	49.27		5767.2	1.8	- -
		2/6/2017	46.09		5770.4	5.0	-4.0
		4/14/2017	45.45		5771.1	5.6	- -
		6/27/2017	55.89		5760.6	-4.8	-12.9
		8/10/2017	58.73		5757.8	-7.7	- -

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; -, not available; A, affected by atmospheric pressure; R, recently pumped, S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393233104484801	5878	1/10/2009	99.47	A	5778.5	--	--
GRNDAW5		3/5/2009	97.30		5780.7	2.2	--
		7/15/2009	109.10	A	5768.9	-9.6	--
		9/29/2009	107.60		5770.4	-8.1	--
		11/20/2009	98.86		5779.1	0.6	--
		1/13/2010	98.64		5779.4	0.8	0.8
		3/2/2010	98.09		5779.9	1.4	-0.8
		5/11/2010	99.77		5778.2	-0.3	--
		7/6/2010	104.10		5773.9	-4.6	5.0
				Measurment discontinued			

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393245104493401	5879	1/10/2009	93.15	A	5785.9	- -	- -
GRNDAW6		3/5/2009	93.20		5785.8	0.0	- -
		7/15/2009	99.31		5779.7	-6.2	- -
		9/29/2009	97.00		5782.0	-3.8	- -
		11/20/2009	90.96		5788.0	2.2	- -
		1/13/2010	86.62		5792.4	6.5	6.5
		3/2/2010	88.48		5790.5	4.7	4.7
		5/11/2010	89.79		5789.2	3.4	- -
		7/6/2010	96.50		5782.5	-3.3	2.8
		9/21/2010	104.55		5774.5	-11.4	-7.6
		11/23/2010	96.20		5782.8	-3.1	-5.2
		1/27/2011	94.17		5784.8	-1.0	-7.6
		3/18/2011	93.03		5786.0	0.1	-4.6
		5/23/2011	92.95		5786.1	0.2	-3.2
		7/29/2011	101.80		5777.2	-8.6	-5.3
		9/29/2011	104.34		5774.7	-11.2	0.2
		12/8/2011	nm		- -	- -	- -
		2/17/2012	93.08	R	5785.9	0.1	1.1
		4/5/2012	92.16		5786.8	1.0	0.9
		6/7/2012	nm		- -	- -	- -
		8/23/2012	111.36		5767.6	-18.2	-9.6
		10/10/2012	106.44	R	5772.6	-13.3	-2.1
		12/7/2012	102.22		5776.8	-9.1	- -
		2/7/2013	100.53		5778.5	-7.4	-7.5
		4/12/2013	98.25	R	5780.8	-5.1	-6.1
		6/6/2013	103.20		5775.8	-10.1	- -
		8/15/2013	106.35	R	5772.7	-13.2	5.0
		10/24/2013	99.99		5779.0	-6.8	6.5
		12/17/2013	98.02		5781.0	-4.9	4.2
		2/7/2014	94.04	R	5785.0	-0.9	6.5
		4/4/2014	92.44		5786.6	0.7	5.8
		6/5/2014	96.63	R	5782.4	-3.5	6.6
		8/7/2014	101.76	R	5777.2	-8.6	4.6
		10/2/2014	100.29		5778.7	-7.1	-0.3
		2/13/2015	93.40		5785.6	-0.3	0.6
		6/4/2015	90.40		5788.6	2.8	6.2
		10/9/2015	99.23		5779.8	-6.1	1.1
		2/17/2016	92.25		5786.8	0.9	1.2
		6/9/2016	86.90	R	5792.1	6.3	3.5
		10/13/2016	97.13	R	5781.9	-4.0	2.1
		12/14/2016	91.95		5787.1	1.2	- -
		2/9/2017	89.19		5789.8	4.0	3.1
		4/11/2017	88.17	R	5790.8	5.0	- -
		6/27/2017	101.62	R	5777.4	-8.5	-14.7
		8/10/2017	98.00	R	5781.0	-4.8	- -

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393245104484601	5858	2/9/2017	90.17		5788.8	--	--
GRNDAW7		4/14/2017	92.13	R	5786.9	-2.0	--
		6/28/2017	102.81		5776.2	--	--
		8/11/2017	104.04		5775.0	--	--
393251104484501	5839	2/10/2017	75.65		5803.4	--	--
GRNDAW8		4/14/2017	77.06		5801.9	-1.4	--
		6/28/2017	87.34	R	5791.7	-11.7	--
		8/11/2017	89.49		5789.5	-13.8	--
393217104493701	5833	1/17/2009	76.50		5756.5	--	--
GRNDEV1		3/5/2009	74.90		5758.1	1.6	--
		7/15/2009	84.54		5748.5	-8.0	--
		9/29/2009	82.65		5750.4	-6.2	--
		11/20/2009	82.06		5750.9	-5.6	--
		1/13/2010	74.89		5758.1	1.6	1.6
		3/2/2010	75.25		5757.8	1.3	-0.3
		5/11/2010	nm		--	--	--
		7/6/2010	79.45		5753.6	-3.0	5.1
		9/21/2010	92.78		5740.2	-16.3	-10.1
		11/23/2010	84.60		5748.4	-8.1	-2.5
		1/27/2011	82.23		5750.8	-5.7	-7.3
		3/18/2011	79.91		5753.1	-3.4	-4.7
		5/23/2011	78.84		5754.2	-2.3	--
		7/29/2011	88.08	R	5744.9	-11.6	-8.6
		9/29/2011	91.97		5741.0	-15.5	0.8
		12/8/2011	nm		--	--	--
		2/17/2012	79.51		5753.5	-3.0	2.7
		4/5/2012	78.10		5754.9	-1.6	1.8
		6/7/2012	nm		--	--	--
		8/23/2012	101.70		5731.3	-25.2	-13.6
		10/10/2012	98.56	R	5734.4	-22.1	-6.6
		12/7/2012	92.79		5740.2	-16.3	--
		2/7/2013	88.29		5744.7	-11.8	-8.8
		4/12/2013	86.64	R	5746.4	-10.1	-8.5
		6/6/2013	91.68		5741.3	-15.2	--
		8/15/2013	96.33		5736.7	-19.8	5.4
		10/24/2013	87.84	R	5745.2	-11.3	10.7
		12/17/2013	83.71		5749.3	-7.2	9.1
		2/7/2014	83.97		5749.0	-7.5	4.3
		4/4/2014	82.69		5750.3	-6.2	4.0
		6/5/2014	88.32		5744.7	-11.8	3.4
		8/7/2014	93.57		5739.4	-17.1	2.8
		10/2/2014	91.77		5741.2	-15.3	-3.9
		2/13/2015	83.48		5749.5	-7.0	0.5
		6/4/2015	81.35		5751.7	-4.8	7.0
		10/9/2015	88.92		5744.1	-12.4	2.8
		2/17/2016	74.81	S	5758.2	1.7	8.7
		6/9/2016	76.31		5756.7	0.2	5.0
		10/13/2016	90.44		5742.6	-13.9	-1.5
		12/14/2016	83.45		5749.6	-7.0	--
		2/9/2017	79.31		5753.7	-2.8	-4.5
		4/11/2017	77.15		5755.9	-0.7	--
		6/27/2017	87.52		5745.5	-11.0	-11.2
		8/10/2017	89.61	R	5743.4	-13.1	--

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393233104490501	5863	1/17/2009	48.50		5814.5	- -	- -
GRNDEV2		3/5/2009	47.70		5815.3	0.8	- -
		7/15/2009	56.68		5806.3	-8.2	- -
		9/29/2009	55.20		5807.8	-6.7	- -
		11/20/2009	46.00		5817.0	2.5	- -
		1/13/2010	70.29		5792.7	-21.8	-21.8
		3/2/2010	65.47		5797.5	-17.0	-17.8
		5/11/2010	72.50		5790.5	-24.0	- -
		7/6/2010	76.68		5786.3	-28.2	-20.0
		9/21/2010	91.66		5771.3	-43.2	-36.5
		11/23/2010	80.45		5782.6	-32.0	-34.5
		1/27/2011	75.76		5787.2	-27.3	-5.5
		3/18/2011	73.03		5790.0	-24.5	-7.6
		5/23/2011	75.93		5787.1	-27.4	-3.4
		7/29/2011	88.90	R	5774.1	-40.4	-12.2
		9/29/2011	94.44	R	5768.6	-45.9	-2.8
		12/8/2011	nm		- -	- -	- -
		2/17/2012	78.38	R	5784.6	-29.9	-2.6
		4/5/2012	79.66	R	5783.3	-31.2	-6.6
		6/7/2012	nm		- -	- -	- -
		8/23/2012	nm		- -	- -	- -
		10/10/2012	93.50		5769.5	-45.0	0.9
		12/7/2012	85.10		5777.9	-36.6	- -
		2/7/2013	88.46		5774.5	-40.0	-10.1
		4/12/2013	80.82	R	5782.2	-32.3	-1.2
		6/6/2013	85.50	R	5777.5	-37.0	- -
		8/15/2013	93.04	R	5770.0	-44.5	- -
		10/25/2013	81.17	R	5781.8	-32.7	12.3
		12/17/2013	75.48	R	5787.5	-27.0	9.6
		2/7/2014	74.43		5788.6	-25.9	14.0
		4/4/2014	73.24	R	5789.8	-24.7	7.6
		6/5/2014	78.22		5784.8	-29.7	7.3
		8/7/2014	85.38	R	5777.6	-36.9	7.7
		10/2/2014	85.47	R	5777.5	-37.0	-4.3
		2/13/2015	75.18		5787.8	-26.7	-0.8
		6/4/2015	69.58	R	5793.4	-21.1	8.6
		10/9/2015	82.35	R	5780.7	-33.9	3.1
		2/17/2016	65.29	R	5797.7	-16.8	9.9
		6/9/2016	67.33	R	5795.7	-18.8	2.3
		10/13/2016	87.44	R	5775.6	-38.9	-5.1
		12/14/2016	74.92	R	5788.1	-26.4	- -
		2/9/2017	70.39	R	5792.6	-21.9	-5.1
		4/11/2017	69.48	R	5793.5	-21.0	- -
		6/27/2017	81.00		5782.0	-32.5	-13.7
		8/10/2017	85.09	R	5777.9	-36.6	- -

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393252104492101	5864.18	1/10/2009	135.00	A	5729.2	- -	- -
GRNDEV3		3/5/2009	135.40		5728.8	-0.4	- -
		7/15/2009	132.20		5732.0	2.8	- -
		9/29/2009	158.40		5705.8	-23.4	- -
		11/20/2009	128.38		5735.8	6.6	- -
		1/13/2010	120.00		5744.2	15.0	15.0
		3/2/2010	113.44		5750.7	21.6	22.0
		5/11/2010	114.59		5749.6	20.4	- -
		7/6/2010	134.24		5729.9	0.8	-2.0
		9/21/2010	153.50		5710.7	-18.5	4.9
		11/23/2010	136.20		5728.0	-1.2	-7.8
		1/27/2011	122.78		5741.4	12.2	-2.8
		3/18/2011	118.35		5745.8	16.7	-4.9
		5/23/2011	129.06		5735.1	5.9	-14.5
		7/29/2011	144.94		5719.2	-9.9	-10.7
		9/29/2011	147.38	R	5716.8	-12.4	6.1
		12/8/2011	135.87		5728.3	-0.9	0.3
		2/10/2012	122.36		5741.8	12.6	0.4
		4/5/2012	130.32		5733.9	4.7	-12.0
		6/7/2012	140.48		5723.7	-5.5	-11.4
		8/2/2012	152.59		5711.6	-17.6	-7.7
		10/5/2012	152.08	R	5712.1	-17.1	-4.7
		12/7/2012	134.62		5729.6	0.4	1.3
		2/7/2013	134.38		5729.8	0.6	-12.0
		4/12/2013	131.24	R	5732.9	3.8	-0.9
		6/6/2013	139.78		5724.4	-4.8	0.7
		8/15/2013	153.05		5711.1	-18.1	-0.5
		10/24/2013	135.88		5728.3	-0.9	16.2
		12/13/2013	128.34		5735.8	6.7	6.3
		2/6/2014	125.57		5738.6	9.4	8.8
		4/3/2014	124.33		5739.9	10.7	6.9
		6/5/2014	135.09	R	5729.1	-0.1	4.7
		8/7/2014	147.32	R	5716.9	-12.3	5.7
		10/2/2014	141.53		5722.7	-6.5	-5.7
		12/9/2014	129.44		5734.7	5.6	-1.1
		2/13/2015	126.18		5738.0	8.8	-0.6
		6/3/2015	122.41		5741.8	12.6	12.7
		10/9/2015	135.54		5728.6	-0.5	6.0
		2/25/2016	118.08		5746.1	16.9	8.1
		5/31/2016	118.08		5746.1	16.9	4.3
		10/10/2016	141.68		5722.5	-6.7	-6.1
		12/14/2016	132.79		5731.4	2.2	- -
		2/6/2017	128.04		5736.1	7.0	-10.0
		4/14/2017	129.97		5734.2	5.0	- -
		6/27/2017	146.31		5717.9	-11.3	-28.2
		8/10/2017	147.60		5716.6	-12.6	- -

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393258104492401	5838	1/17/2009	148.70	A	5689.3	- -	- -
GRNDEV4		3/5/2009	149.30		5688.7	-0.6	- -
		7/15/2009	139.25		5698.8	9.4	- -
		9/29/2009	148.30		5689.7	0.4	- -
		11/20/2009	140.32		5697.7	8.4	- -
		1/13/2010	121.95		5716.1	26.8	26.8
		3/2/2010	117.72		5720.3	31.0	31.6
		5/11/2010	118.90		5719.1	29.8	- -
		7/6/2010	144.26		5693.7	4.4	-5.0
		9/21/2010	162.55		5675.5	-13.9	-14.3
		11/23/2010	145.29		5692.7	3.4	-5.0
		1/27/2011	126.65		5711.4	22.1	-4.7
		3/18/2011	121.36		5716.6	27.3	-3.6
		5/23/2011	136.04	R	5702.0	12.7	-17.1
		7/29/2011	151.52		5686.5	-2.8	-7.3
		9/29/2011	155.05		5683.0	-6.4	7.5
		12/8/2011	nm		- -	- -	- -
		2/17/2012	127.36		5710.6	21.3	-0.7
		4/5/2012	140.05		5698.0	8.6	-18.7
		6/7/2012	nm		- -	- -	- -
		8/23/2012	168.14		5669.9	-19.4	-16.6
		10/10/2012	162.12		5675.9	-13.4	-7.1
		12/7/2012	139.26		5698.7	9.4	- -
		2/7/2013	140.91	R	5697.1	7.8	-13.6
		4/12/2013	136.23		5701.8	12.5	3.8
		6/6/2013	145.22	S	5692.8	3.5	- -
		8/15/2013	159.38	R	5678.6	-10.7	8.8
		10/24/2013	141.19	R	5696.8	7.5	20.9
		12/17/2013	133.34		5704.7	15.4	5.9
		2/7/2014	130.32		5707.7	18.4	10.6
		4/4/2014	129.47		5708.5	19.2	6.8
		6/5/2014	137.36		5700.6	11.3	7.9
		8/7/2014	151.59	R	5686.4	-2.9	7.8
		10/2/2014	149.15		5688.9	-0.5	-8.0
		2/13/2015	131.11		5706.9	17.6	-0.8
		6/4/2015	128.25	R	5709.8	20.5	9.1
		10/9/2015	140.10		5697.9	8.6	9.1
		2/17/2016	123.62		5714.4	25.1	7.5
		6/9/2016	125.42	R	5712.6	23.3	2.8
		10/13/2016	150.01		5688.0	-1.3	-9.9
		12/14/2016	141.19		5696.8	7.5	- -
		2/9/2017	136.92	R	5701.1	11.8	-13.3
		4/14/2017	140.32	R	5697.7	8.4	- -
		6/27/2017	158.32	R	5679.7	-9.6	-32.9
		8/10/2017	158.72		5679.3	-10.0	- -

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; -, not available; A, affected by atmospheric pressure; R, recently pumped, S, nearby pumping]

[illegible]

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393233104490001	5863	1/10/2009	264.72	A	5598.3	- -	- -
GRNDEV6		3/5/2009	259.60		5603.4	5.1	- -
		7/15/2009	267.24		5595.8	-2.5	- -
		9/29/2009	273.80		5589.2	-9.1	- -
		11/20/2009	260.71		5602.3	4.0	- -
		1/13/2010	230.00		5633.0	34.7	34.7
		3/2/2010	215.00		5648.0	49.7	44.6
		5/11/2010	259.22		5603.8	5.5	- -
		7/6/2010	273.64		5589.4	-8.9	-6.4
		9/21/2010	270.74		5592.3	-6.0	3.1
		11/23/2010	257.30		5605.7	7.4	3.4
		1/27/2011	253.68		5609.3	11.0	-23.7
		3/18/2011	250.68		5612.3	14.0	-35.7
		5/23/2011	254.06	R	5608.9	10.7	5.2
		7/29/2011	274.44		5588.6	-9.7	-0.8
		9/29/2011	276.52	R	5586.5	-11.8	-5.8
		12/8/2011	nm		- -	- -	- -
		2/17/2012	249.48		5613.5	15.2	4.2
		4/5/2012	247.48	R	5615.5	17.2	3.2
		6/7/2012	nm		- -	- -	- -
		8/23/2012	281.58		5581.4	-16.9	-7.1
		10/10/2012	262.74	R	5600.3	2.0	13.8
		12/7/2012	254.33	R	5608.7	10.4	- -
		2/7/2013	257.22	R	5605.8	7.5	-7.7
		4/12/2013	257.96	R	5605.0	6.8	-10.5
		6/6/2013	273.59	R	5589.4	-8.9	- -
		8/15/2013	293.65	R	5569.4	-28.9	-12.1
		10/25/2013	273.12	R	5589.9	-8.4	-10.4
		12/17/2013	265.74	R	5597.3	-1.0	-11.4
		2/7/2014	260.33	R	5602.7	4.4	-3.1
		4/3/2014	253.34		5609.7	11.4	4.6
		6/5/2014	252.60	R	5610.4	12.1	21.0
		8/7/2014	287.77	R	5575.2	-23.1	5.9
		10/2/2014	288.86	S	5574.1	-24.1	-15.7
		2/13/2015	265.04		5598.0	-0.3	-4.7
		6/4/2015	269.34	R	5593.7	-4.6	-16.7
		10/9/2015	287.91	R	5575.1	-23.2	0.9
		2/17/2016	258.23		5604.8	6.5	6.8
		6/9/2016	252.68	R	5610.3	12.0	16.7
		10/13/2016	284.51	R	5578.5	-19.8	3.4
		12/14/2016	265.96		5597.0	-1.2	- -
		2/9/2017	262.30	R	5600.7	2.4	-4.1
		4/11/2017	258.45		5604.6	6.3	- -
		6/27/2017	291.25	R	5571.8	-26.5	-38.6
		8/10/2017	301.73	R	5561.3	-37.0	- -

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393220104490001	5858	1/10/2009	98.30	A	5759.7	- -	- -
GRNDEV7		3/5/2009	101.00		5757.0	-2.7	- -
		7/15/2009	101.66		5756.3	-3.4	- -
		9/29/2009	101.20		5756.8	-2.9	- -
		11/20/2009	99.16		5758.8	-0.9	- -
		1/13/2010	98.32		5759.7	0.0	0.0
		3/2/2010	98.09		5759.9	0.2	2.9
		5/11/2010	nm		- -	- -	- -
		7/6/2010	98.77		5759.2	-0.5	2.9
		9/21/2010	103.10		5754.9	-4.8	-1.9
		11/23/2010	100.77		5757.2	-2.5	-1.6
		1/27/2011	99.15		5758.9	-0.9	-0.8
		3/18/2011	98.80		5759.2	-0.5	-0.7
		5/23/2011	98.73		5759.3	-0.4	- -
		7/29/2011	99.99		5758.0	-1.7	-1.2
		9/29/2011	101.02		5757.0	-2.7	2.1
		12/8/2011	nm		- -	- -	- -
		2/17/2012	98.63		5759.4	-0.3	0.5
		4/5/2012	98.29		5759.7	0.0	0.5
		6/7/2012	nm		- -	- -	- -
		8/23/2012	101.32	R	5756.7	-3.0	-1.3
		10/10/2012	100.97		5757.0	-2.7	0.0
		12/7/2012	100.27		5757.7	-2.0	- -
		2/7/2013	100.16		5757.8	-1.9	-1.5
		4/12/2013	99.58		5758.4	-1.3	-1.3
		6/6/2013	100.15	S	5757.9	-1.9	- -
		8/15/2013	101.16		5756.8	-2.9	0.2
		10/25/2013	99.55		5758.5	-1.3	1.4
		12/17/2013	98.25	R	5759.8	0.0	2.0
		2/7/2014	97.54		5760.5	0.8	2.6
		4/3/2014	nm		- -	- -	- -
		6/5/2014	97.98		5760.0	0.3	2.2
		8/7/2014	98.93		5759.1	-0.6	2.2
		10/2/2014	98.55		5759.5	-0.3	1.0
		2/13/2015	96.70		5761.3	1.6	0.8
		6/4/2015	96.04		5762.0	2.3	1.9
		10/9/2015	96.22		5761.8	2.1	2.3
		2/17/2016	93.31		5764.7	5.0	3.4
		6/9/2016	92.54		5765.5	5.8	3.5
		10/13/2016	93.99		5764.0	4.3	2.2
		12/14/2016	92.58		5765.4	5.7	- -
		2/9/2017	91.72		5766.3	6.6	1.6
		4/14/2017	91.56		5766.4	6.7	- -
		6/27/2017	93.22	R	5764.8	5.1	-0.7
		8/10/2017	94.04	R	5764.0	4.3	- -

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393236104492201	5843	1/10/2009	nm		--	--	--
GRNDEV8		3/5/2009	107.12		5735.9	--	--
		7/15/2009	105.12		5737.9	2.0	--
		9/29/2009	110.30		5732.7	-3.2	--
		11/20/2009	90.69		5752.3	16.4	--
		1/13/2010	87.12		5755.9	20.0	--
		3/2/2010	86.12		5756.9	21.0	21.0
		5/11/2010	94.18		5748.8	12.9	--
		7/6/2010	132.62		5710.4	-25.5	-27.5
		9/21/2010	137.85		5705.2	-30.7	-27.6
		11/23/2010	99.75		5743.3	7.4	-9.1
		1/27/2011	93.32		5749.7	13.8	-6.2
		3/18/2011	91.71		5751.3	15.4	-5.6
		5/23/2011	101.71		5741.3	5.4	-7.5
		7/29/2011	110.56		5732.4	-3.4	22.1
		9/29/2011	117.40		5725.6	-10.3	20.5
		12/8/2011	nm		--	--	--
		2/17/2012	92.59		5750.4	14.5	0.7
		4/5/2012	95.82	R	5747.2	11.3	-4.1
		6/7/2012	nm		--	--	--
		8/23/2012	124.69	R	5718.3	-17.6	-14.1
		10/10/2012	114.83		5728.2	-7.7	2.6
		12/7/2012	106.24	R	5736.8	0.9	--
		2/7/2013	103.12	R	5739.9	4.0	-10.5
		4/12/2013	99.90		5743.1	7.2	-4.1
		6/6/2013	109.98	R	5733.0	-2.9	--
		8/15/2013	117.95	R	5725.1	-10.8	6.7
		10/24/2013	102.42		5740.6	4.7	12.4
		12/17/2013	96.60		5746.4	10.5	9.6
		2/7/2014	95.56		5747.4	11.6	7.6
		4/4/2014	94.07		5748.9	13.1	5.8
		6/5/2014	101.53	R	5741.5	5.6	8.5
		8/7/2014	112.13		5730.9	-5.0	5.8
		10/2/2014	110.78	R	5732.2	-3.7	-8.4
		2/13/2015	94.77		5748.2	12.4	0.8
		6/4/2015	93.97	R	5749.0	13.2	7.6
		10/9/2015	111.01	R	5732.0	-3.9	-0.2
		2/17/2016	86.93		5756.1	20.2	7.8
		6/9/2016	93.85		5749.2	13.3	0.1
		10/13/2016	110.35		5732.7	-3.2	0.7
		12/14/2016	98.57		5744.4	8.6	--
		2/9/2017	94.17	R	5748.8	13.0	-7.2
		4/11/2017	91.57	R	5751.4	15.6	--
		6/27/2017	110.04	R	5733.0	-2.9	-16.2
		8/10/2017	113.31	R	5729.7	-6.2	--

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393301104484801	5804	5/11/2010	33.00		5771.0	- -	- -
GRNDAW1A		7/6/2010	37.40		5766.6	-4.4	- -
		9/21/2010	41.93		5762.1	-8.9	- -
		11/23/2010	39.71		5764.3	-6.7	- -
		1/27/2011	39.32		5764.7	-6.3	- -
		3/18/2011	38.39		5765.6	-5.4	- -
		5/23/2011	37.46		5766.5	-4.5	-4.5
		7/29/2011	44.24		5759.8	-11.2	-6.8
		9/29/2011	45.83		5758.2	-12.8	-3.9
		12/8/2011	nm		- -	- -	- -
		2/17/2012	37.52		5766.5	-4.5	1.8
		4/5/2012	36.02	R	5768.0	-3.0	2.4
		6/7/2012	nm		- -	- -	- -
		8/23/2012	46.67		5757.3	-13.7	-2.4
		10/10/2012	53.60		5750.4	-20.6	-7.8
		12/7/2012	43.91		5760.1	-10.9	- -
		2/7/2013	42.38	R	5761.6	-9.4	-4.9
		4/12/2013	40.70		5763.3	-7.7	-4.7
		6/6/2013	41.43		5762.6	-8.4	- -
		8/15/2013	44.68	R	5759.3	-11.7	2.0
		10/25/2013	41.46		5762.5	-8.5	12.1
		12/17/2013	38.34	R	5765.7	-5.3	5.6
		2/7/2014	36.99		5767.0	-4.0	5.4
		4/4/2014	35.37	R	5768.6	-2.4	5.3
		6/5/2014	36.10		5767.9	-3.1	5.3
		8/7/2014	42.94		5761.1	-9.9	1.7
		10/2/2014	40.07		5763.9	-7.1	1.4
		2/13/2015	34.04		5770.0	-1.0	3.0
		6/4/2015	31.97		5772.0	1.0	4.1
		10/9/2015	38.93		5765.1	-5.9	1.1
		2/17/2016	31.25	S	5772.8	1.8	2.8
		6/9/2016	31.78		5772.2	1.2	0.2
		10/13/2016	38.93		5765.1	-5.9	0.0
		12/16/2016	35.99		5768.0	-3.0	- -
		2/9/2017	34.16		5769.8	-1.2	-2.9
		4/14/2017	36.85		5767.2	-3.9	- -
		6/28/2017	40.28	R	5763.7	-7.3	-8.5
		8/11/2017	40.36		5763.6	-7.4	- -

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393225104490001	5887	5/11/2010	118.87		5768.1	- -	- -
GRNDAW1B		7/6/2010	97.80		5789.2	21.1	- -
		9/21/2010	136.07		5750.9	-17.2	- -
		11/23/2010	125.51		5761.5	-6.6	- -
		1/27/2011	123.57		5763.4	-4.7	- -
		3/18/2011	122.06		5764.9	-3.2	- -
		5/23/2011	120.49		5766.5	-1.6	-1.6
		7/29/2011	131.26		5755.7	-12.4	-33.5
		9/29/2011	135.34		5751.7	-16.5	0.7
		12/8/2011	nm		- -	- -	- -
		2/17/2012	121.29		5765.7	-2.4	2.3
		4/5/2012	119.42		5767.6	-0.5	2.6
		6/7/2012	nm		- -	- -	- -
		8/23/2012	145.84		5741.2	-27.0	-14.6
		10/10/2012	138.98		5748.0	-20.1	-3.6
		12/7/2012	133.47		5753.5	-14.6	- -
		2/7/2013	130.16		5756.8	-11.3	-8.9
		4/12/2013	127.49		5759.5	-8.6	-8.1
		6/6/2013	134.34		5752.7	-15.5	- -
		8/15/2013	138.66	R	5748.3	-19.8	7.2
		10/25/2013	128.21		5758.8	-9.3	10.8
		12/17/2013	124.61		5762.4	-5.7	8.9
		2/7/2014	125.28		5761.7	-6.4	4.9
		4/4/2014	124.00		5763.0	-5.1	3.5
		6/5/2014	130.88		5756.1	-12.0	3.5
		8/7/2014	137.84		5749.2	-19.0	0.8
		10/2/2014	133.69		5753.3	-14.8	-5.5
		2/13/2015	123.94		5763.1	-5.1	1.3
		6/4/2015	122.56		5764.4	-3.7	8.3
		10/9/2015	131.14		5755.9	-12.3	2.6
		2/17/2016	116.26		5770.7	2.6	7.7
		6/9/2016	117.04		5770.0	1.8	5.5
		10/13/2016	131.89		5755.1	-13.0	-0.8
		12/14/2016	123.92		5763.1	-5.1	- -
		2/9/2017	120.20		5766.8	-1.3	-3.9
		4/14/2017	119.44		5767.6	-0.6	- -
		6/27/2017	130.98		5756.0	-12.1	-13.9
		8/10/2017	130.60		5756.4	-11.7	- -

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393253104484401	5842	5/11/2010	59.88		5782.1	- -	- -
GRNDAW1C		7/6/2010	61.60		5780.4	-1.7	- -
		9/21/2010	67.20		5774.8	-7.3	- -
		11/23/2010	62.82		5779.2	-2.9	- -
		1/27/2011	62.16		5779.8	-2.3	- -
		3/18/2011	61.89		5780.1	-2.0	- -
		5/23/2011	61.83		5780.2	-2.0	-2.0
		7/29/2011	67.64		5774.4	-7.8	-6.0
		9/29/2011	69.69		5772.3	-9.8	-2.5
		12/8/2011	nm		- -	- -	- -
		2/17/2012	62.68		5779.3	-2.8	-0.5
		4/5/2012	61.69		5780.3	-1.8	0.2
		6/7/2012	nm		- -	- -	- -
		8/23/2012	75.45		5766.6	-15.6	-7.8
		10/10/2012	72.68		5769.3	-12.8	-3.0
		12/7/2012	70.02		5772.0	-10.1	- -
		2/7/2013	68.43		5773.6	-8.6	-5.8
		4/12/2013	66.78		5775.2	-6.9	-5.1
		6/6/2013	70.28		5771.7	-10.4	- -
		8/15/2013	73.77		5768.2	-13.9	1.7
		10/25/2013	68.70		5773.3	-8.8	4.0
		12/17/2013	64.20		5777.8	-4.3	5.8
		2/7/2014	62.03		5780.0	-2.2	6.4
		4/4/2014	59.90		5782.1	0.0	6.9
		6/13/2014	62.39		5779.6	-2.5	7.9
		8/8/2014	65.55		5776.5	-5.7	8.2
		10/2/2014	64.33		5777.7	-4.5	4.4
		2/13/2015	58.56		5783.4	1.3	3.5
		6/4/2015	56.83		5785.2	3.1	5.6
		10/19/2015	63.71		5778.3	-3.8	0.6
		2/25/2016	52.41		5789.6	7.5	6.2
		6/9/2016	54.59	R	5787.4	5.3	2.2
		10/12/2016	64.16		5777.8	-4.3	-0.4
		12/16/2016	58.40		5783.6	1.5	- -
		2/6/2017	55.95		5786.1	3.9	-3.5
		4/14/2017	57.76		5784.2	2.1	- -
		6/28/2017	67.03		5775.0	-7.2	-12.4
		8/10/2017	68.79		5773.2	-8.9	- -

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped; S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393244104484601	5863	7/6/2010	109.40		5753.6	--	--
GRNDAW1D		9/21/2010	111.12		5751.9	-1.7	--
		11/23/2010	100.02		5763.0	9.4	--
		1/27/2011	97.84		5765.2	11.6	--
		3/18/2011	98.19		5764.8	11.2	--
		5/23/2011	97.86	R	5765.1	11.5	--
		7/29/2011	106.98		5756.0	2.4	2.4
		9/29/2011	109.50		5753.5	-0.1	1.6
		12/8/2011	nm		--	--	--
		2/17/2012	97.94		5765.1	11.5	-0.1
		4/5/2012	96.78	R	5766.2	12.6	1.4
		6/7/2012	nm		--	--	--
		8/23/2012	116.66		5746.3	-7.3	-9.7
		10/10/2012	112.47		5750.5	-3.1	-3.0
		12/7/2012	107.12		5755.9	2.3	--
		2/7/2013	104.55	R	5758.5	4.9	-6.6
		4/12/2013	101.90	R	5761.1	7.5	-5.1
		6/6/2013	108.27	R	5754.7	1.1	--
		8/15/2013	112.64		5750.4	-3.2	4.0
		10/25/2013	106.37	R	5756.6	3.0	6.1
		12/17/2013	99.90		5763.1	9.5	7.2
		2/7/2014	98.24	R	5764.8	11.2	6.3
		4/4/2014	96.58	R	5766.4	12.8	5.3
		6/5/2014	101.89		5761.1	7.5	6.4
		8/7/2014	108.32	R	5754.7	1.1	4.3
		10/2/2014	105.18	S	5757.8	4.2	1.2
		2/13/2015	95.64		5767.4	13.8	2.6
		6/4/2015	93.49		5769.5	15.9	8.4
		10/9/2015	104.65		5758.4	4.8	0.5
		2/17/2016	88.79	R	5774.2	20.6	6.8
		6/9/2016	91.35	R	5771.7	18.1	2.1
		10/13/2016	104.32		5758.7	5.1	0.3
		12/16/2016	96.19		5766.8	13.2	--
		2/9/2017	92.56		5770.4	16.8	-3.8
		4/14/2017	93.82	R	5769.2	15.6	--
		6/27/2017	103.92		5759.1	5.5	-12.6
		8/11/2017	106.32		5756.7	3.1	--

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped, S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393256104484801	5824	7/6/2010	53.80		5770.2	--	--
GRNDAW1E		9/21/2010	60.17		5763.8	-6.4	--
		11/23/2010	54.32		5769.7	-0.5	--
		1/27/2011	51.89		5772.1	1.9	--
		3/18/2011	52.79	R	5771.2	1.0	--
		5/23/2011	53.17		5770.8	0.6	--
		7/29/2011	62.99		5761.0	-9.2	-9.2
		9/29/2011	61.98		5762.0	-8.2	-1.8
		12/8/2011	nm		--	--	--
		2/17/2012	52.68		5771.3	1.1	-0.8
		4/5/2012	51.93		5772.1	1.9	0.9
		6/7/2012	nm		--	--	--
		8/23/2012	68.55	R	5755.5	-14.8	-5.6
		10/10/2012	64.48		5759.5	-10.7	-2.5
		12/7/2012	60.75		5763.3	-7.0	--
		2/7/2013	58.66		5765.3	-4.9	-6.0
		4/12/2013	56.57		5767.4	-2.8	-4.6
		6/6/2013	61.03		5763.0	-7.2	--
		8/15/2013	64.84		5759.2	-11.0	3.7
		10/25/2013	59.15		5764.9	-5.4	5.3
		12/17/2013	54.46	R	5769.5	-0.7	6.3
		2/7/2014	52.21	R	5771.8	1.6	6.5
		4/4/2014	49.65		5774.4	4.2	6.9
		6/5/2014	54.21		5769.8	-0.4	6.8
		8/7/2014	57.63		5766.4	-3.8	7.2
		10/2/2014	56.48	S	5767.5	-2.7	2.7
		2/13/2015	49.49		5774.5	4.3	2.7
		6/4/2015	46.80		5777.2	7.0	7.4
		10/9/2015	54.92		5769.1	-1.1	1.6
		2/17/2016	42.23		5781.8	11.6	7.3
		6/9/2016	44.80	R	5779.2	9.0	2.0
		10/13/2016	54.34	R	5769.7	-0.5	0.6
		12/16/2016	48.18		5775.8	5.6	--
		2/9/2017	45.59	R	5778.4	8.2	-3.4
		4/14/2017	46.98		5777.0	6.8	--
		6/28/2017	59.03	R	5765.0	-5.2	-14.2
		8/11/2017	56.24	R	5767.8	-2.4	--

Table 3. Depth to water and groundwater altitude for selected domestic wells, Grandview Estates, Colorado, January 2009 to August 2013

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. See figure 1 for well locations. Abbreviations: nm, not measured; - -, not available; A, affected by atmospheric pressure; R, recently pumped, S, nearby pumping]

Site Number and Local well name	Land surface altitude, in feet (NAVD 88)	Measurement Date	Depth to water, in feet below land surface	Water level status	Ground- water altitude, in feet	Difference from first measurement, in feet	Difference from previous year, in feet
393303104484801 GRNDAW1F	5793	9/21/2010	45.10		5747.9	- -	- -
		11/23/2010	39.52		5753.5	5.6	- -
		1/27/2011	36.67		5756.3	8.4	- -
		3/18/2011	35.35		5757.7	9.8	- -
		5/23/2011	35.26		5757.7	9.8	- -
		7/29/2011	43.13		5749.9	2.0	- -
		9/29/2011	46.70		5746.3	-1.6	-1.6
		12/8/2011	nm		- -	- -	- -
		2/17/2012	34.54	R	5758.5	10.6	2.1
		4/5/2012	33.68		5759.3	11.4	1.7
		6/7/2012	nm		- -	- -	- -
		8/23/2012	53.49		5739.5	-8.4	-10.4
		10/10/2012	51.69		5741.3	-6.6	-5.0
		12/7/2012	45.81	R	5747.2	-0.7	- -
		2/7/2013	42.77		5750.2	2.3	-8.2
		4/12/2013	39.94		5753.1	5.2	-6.3
		6/6/2013	44.14	R	5748.9	1.0	- -
		8/15/2013	50.72		5742.3	-5.6	2.8
		10/25/2013	45.64		5747.4	-0.5	6.1
		12/17/2013	39.18	R	5753.8	5.9	6.6
		2/7/2014	36.71		5756.3	8.4	6.1
		4/4/2014	34.40		5758.6	10.7	5.5
		6/5/2014	38.77		5754.2	6.3	5.4
		8/7/2014	45.46		5747.5	-0.4	5.3
		10/2/2014	43.42	S	5749.6	1.7	2.2
		2/13/2015	34.32		5758.7	10.8	2.4
		6/4/2015	31.09		5761.9	14.0	7.7
		10/9/2015	43.60		5749.4	1.5	-0.2
		2/17/2016	28.01		5765.0	17.1	6.3
		6/9/2016	28.27		5764.7	16.8	2.8
		10/13/2016	43.32		5749.7	1.8	0.3
		12/16/2016	36.31		5756.7	8.8	- -
		2/9/2017	32.25		5760.8	12.9	-4.2
		4/14/2017	31.48		5761.5	13.6	- -
		6/28/2017	41.39		5751.6	3.7	-13.1
		8/11/2017	45.66		5747.3	-0.6	- -

Table 4. Average change in seasonally high water level and average yearly change in water level for all measurements Grandview Estates, Douglas County, Colorado.

Average change in seasonally high (February) water level (ft)		
Year-to-year period	Aquifer	
	Dawson	Denver
2009 to 2010	-1.8	8.1
2010 to 2011	-5.6	-7.3
2011 to 2012	1.2	-0.1
2012 to 2013	-7.0	-9.4
2013 to 2014	5.5	6.2
2014 to 2015	1.9	-0.6
2015 to 2016	5.9	7.5
2016 to 2017	-2.7	-6.1
Average all measurments	0.7	0.4

Average year-to-year change in water level for all measurments (ft)		
Year-to-year period	Aquifer	
	Dawson	Denver
2009 to 2010	-2.5	-1.3
2010 to 2011	-5.0	-4.1
2011 to 2012	-0.3	-2.3
2012 to 2013	0.6	0.6
2013 to 2014	3.7	3.3
2014 to 2015	3.5	2.5
2015 to 2016	3.1	3.4
2016 to 2017*	-7.3	-13.2
Average all measurments	0.1	-0.7

*Does not represent a full year of data. Water levels from October and December 2017 are not included in this report.

Table 5. Water-quality results for selected wells in Grandview Estates, Douglas County, Colorado.

[Site identification numbers in this table are hyperlinked directly to the data on NWISWeb. Abbreviations:: E, concentration estimated below method detection limit; < less than; -, no data]

Parameter	Value	
USGS Site ID	393227104490101	393227104493001
Local well name	DAWMAS07	DENMAS08
Sample date	12/10/2004	10/13/2005
Sample time	10:15	12:00
Colorado well-permit number	102174	149947
Total depth, in feet below land surface	340	441
Depth to top of screened interval, in feet below land surface	300	361
Depth to bottom of screened interval, in feet below land surface	340	441
Temperature, water, degrees Celsius	12.5	14.7
Depth to water level, feet below land surface	112.78	-
Specific conductance, microsiemens per centimeter at 25 degrees Celsius	934	354
Dissolved solids, milligrams per liter	610	220
Dissolved oxygen, water, unfiltered, milligrams per liter	4.5	0.2
pH, water, unfiltered, field, standard units	6.9	8.3
pH, water, unfiltered, laboratory, standard units	7.5	7.1
Ammonia, water, filtered, milligrams per liter as nitrogen	E 0.02	0.09
Ammonia, water, filtered, milligrams per liter as NH4	E 0.03	0.11
Nitrite, water, filtered, milligrams per liter as nitrogen	< 0.008	< 0.008
Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	5.79	< 0.06
Total nitrogen, water, filtered, analytically determined, milligrams per liter	5.78	0.09
Orthophosphate, water, filtered, milligrams per liter	0.172	E 0.012
Orthophosphate, water, filtered, milligrams per liter as phosphorus	0.056	E 0.004
Organic carbon, water, filtered, milligrams per liter	1.8	0.7
Bicarbonate, in milligrams per liter	290	158
Alkalinity, water, filtered, field, milligrams per liter as calcium carbonate	239	132
Hardness, water, milligrams per liter as calcium carbonate	440	63
Calcium, water, filtered, milligrams per liter	146	21.8
Magnesium, water, filtered, milligrams per liter	18.8	2.02
Sodium, water, filtered, milligrams per liter	30.7	54.5
Potassium, water, filtered, milligrams per liter	3.38	3.46
Chloride, water, filtered, milligrams per liter	91.6	10.1
Sulfate, water, filtered, milligrams per liter	101	34.2
Fluoride, water, filtered, milligrams per liter	0.55	1.04
Silica, water, filtered, milligrams per liter as SiO2	39.9	11
Arsenic, water, filtered, micrograms per liter	2.2	0.42
Copper, water, filtered, micrograms per liter	4.9	9
Iron, water, filtered, micrograms per liter	8	< 6
Lead, water, filtered, micrograms per liter	0.25	0.1
Manganese, water, filtered, micrograms per liter	0.2	19.1
Selenium, water, filtered, micrograms per liter	10.6	< 0.08
Uranium (natural), water, filtered, micrograms per liter	20.3	1.78
Deuterium/Protium ratio, water, unfiltered, per mil	-104	-109
Oxygen-18/Oxygen-16 ratio, water, unfiltered, per mil	-13.69	-14.38
Tritium, water, unfiltered, picocuries per liter	43.2	7
Tritium 2-sigma combined uncertainty, water, picocuries per liter	2.6	1
Basis for piston-flow age estimation	CFC-12, CFC-113	CFC-12, CFC-113
Estimated age from chlorofluorocarbon concentrations, in years before sample date	15	35
Estimated recharge date from chlorofluorocarbon concentrations	1990	1970