



Water Resources Division

2016 Delamar, Dry Lake, and Cave Valleys Hydrologic Monitoring, Management, and Mitigation Plan Status and Data Report

March 2017

Prepared by
Southern Nevada Water Authority
Water Resources Division
P.O. Box 99956
Las Vegas, Nevada 89193-9956

Submitted to the
Nevada State Engineer
and the DDC Stipulation
Executive Committee

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Suggested citation:

Southern Nevada Water Authority, 2017, 2016 Delamar, Dry Lake, and Cave Valleys hydrologic monitoring, management, and mitigation plan status and data report: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. WRD-ED-0040, 108 p.

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ACRONYMS

BLM	Bureau of Land Management
BRT	Biological Resource Team
CFA	Cooperative Funding Agreement
CY	Calendar Year
DDC	Delamar, Dry Lake, and Cave valleys
DOI	U.S. Department of the Interior
EC	Executive Committee
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NDOW	Nevada Department of Wildlife
NDWR	Nevada Division of Water Resources
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NSE	Nevada State Engineer
SNOTEL	SNOWpack TELelemetry
SNWA	Southern Nevada Water Authority
SR	State Route
TRP	Technical Review Panel
US 93	U.S. Highway 93
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
WRCC	Western Regional Climate Center

ABBREVIATIONS

afy	acre-feet per year
amsl	above mean sea level
bgs	below ground surface
cfs	cubic feet per second
ft	foot
gpm	gallons per minute
in.	inch
mi	mile



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1.0 INTRODUCTION

This report was prepared by the Southern Nevada Water Authority (SNWA) in satisfaction of monitoring and reporting requirements set forth in the *Hydrologic Monitoring and Mitigation Plan for Delamar, Dry Lake, and Cave Valleys* (DDC3M Plan) (SNWA, 2011a). The location of the primary monitoring area associated with this plan is presented in [Figure 1-1](#). This is the tenth hydrologic data report in a series of reports associated with the Delamar, Dry Lake, and Cave valleys (DDC) hydrologic monitoring, management, and mitigation program. The reports document historic hydrologic conditions and plan status since 2007 (SNWA, 2008, 2009, 2010, 2011b, 2012, 2013, 2014, 2015, and 2016).

The report provides the Nevada State Engineer (NSE) hydrologic data collected in 2016 and the current status of each element of the DDC3M Plan. This report also satisfies the hydrologic data collection and reporting requirements of SNWA and the U.S. Department of the Interior (DOI) Stipulation for the Withdrawal of Protests (Stipulation). The DDC3M Plan contains all the hydrologic monitoring elements of the Stipulation as well as monitoring required by the NSE that relate to senior non-federal water-rights.

1.1 Background

On January 7, 2008, prior to the NSE hearing for applications 53987 through 53992, the Stipulation was established between SNWA and DOI on behalf of the Bureau of Indian Affairs, the Bureau of Land Management (BLM), the National Park Service, and the U.S. Fish and Wildlife Service (USFWS) (collectively known as the DOI Bureaus) (Stipulation, 2008). Exhibits A and B of the Stipulation require the development of biologic and hydrologic monitoring plans. As part of the Stipulation, an Executive Committee (EC) was established to oversee the implementation of the agreement. A Technical Review Panel (TRP), composed of technical representatives of parties to the Stipulation, was established to develop and oversee implementation of the hydrologic monitoring, management, and mitigation plan. A Biological Resource Team (BRT) was also established to oversee the development and implementation of the biological monitoring plan.

On July 9, 2008, SNWA was granted groundwater rights in DDC hydrographic areas (HA180-182) for municipal and industrial uses under permits 53987 through 53992. Ruling 5875 required the development of biologic and hydrologic monitoring plans. The hydrologic DDC3M Plan associated with this ruling was approved by the NSE on December 22, 2009.

Since the issuance of Ruling 5875, an opinion by the Nevada Supreme Court (NSC) concluded that the NSE must re-notice SNWA's original groundwater applications and reopen the protest period (Great Basin Water Network, et. al. v. NSE, et. al., June 17, 2010) (NSC, 2010). A second administrative hearing was held by the NSE during September through November 2011 regarding the

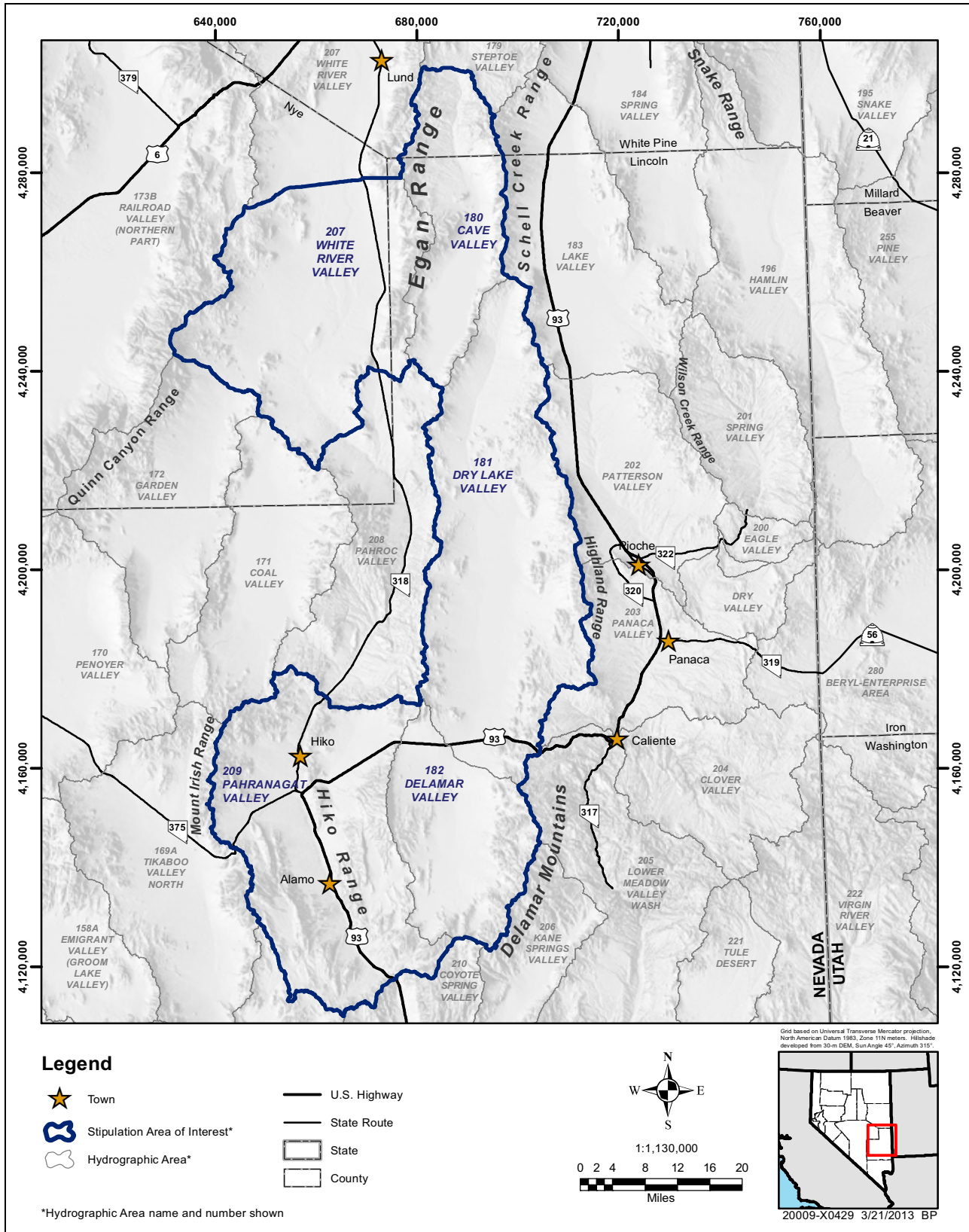


Figure 1-1
DDC3M Plan Primary Monitoring Area

applications. On March 22, 2012, the NSE issued Rulings 6165 through 6167 granting SNWA DDC permit numbers 53987 through 53992. Rulings 6165 through 6167 also approved the SNWA Hydrologic Monitoring and Mitigation Plan for DDC and required annual data reports be submitted to the NSE. After several appeals of Rulings 6165 through 6167 were filed, White Pine County Seventh Judicial District Court Senior Judge Estes sent the rulings back to the NSE for further consideration on four issues. The Nevada Supreme Court declined to review the subsequent appeals, and the NSE remand hearings are currently scheduled for September and October 2017.

1.2 Major Activities Performed in 2016

Major activities associated with the DDC3M Plan completed in 2016 are as follows:

- Continued implementation of the DDC3M Plan.
- Performed periodic water-level measurements on monitoring network wells. Maintained continuous water-level and spring discharge recording instrumentation at locations specified in the plan.
- Submitted required monitoring data quarterly to the NSE and the TRP. Maintained the SNWA data-exchange web site accessible by the NSE, EC, TRP, and BRT.
- Maintained BLM right-of-way access for three future monitor-well locations.

1.3 Document Organization

[Section 2.0](#) of this report presents the hydrologic data collected from the groundwater, spring, and precipitation monitoring networks associated with the DDC3M Plan. [Section 3.0](#) presents anticipated activities in 2017. [Section 4.0](#) documents report references. [Appendix A](#) through [Appendix F](#) present tables and graphs of various hydrologic data discussed in the report. Photos documenting 2016 spring and fall conditions of selected program springs located within DDC are also presented.



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2.0 DDC3M PLAN STATUS AND DATA

The hydrologic data collected in Calendar Year (CY) 2016 and the current status of each major element of the DDC3M Plan are presented in this section.

2.1 Hydrologic Monitoring Program

The DDC3M Plan requires that a hydrologic monitoring program and network be established to collect data for the purposes of defining baseline hydrologic conditions prior to SNWA groundwater withdrawals in DDC and evaluating the effects of these withdrawals. The network includes monitor wells and springs located within DDC and adjacent hydrographic areas. The monitoring locations are presented on [Figure 2-1](#). The plan also requires reporting of available data associated with regional precipitation stations with established historical records.

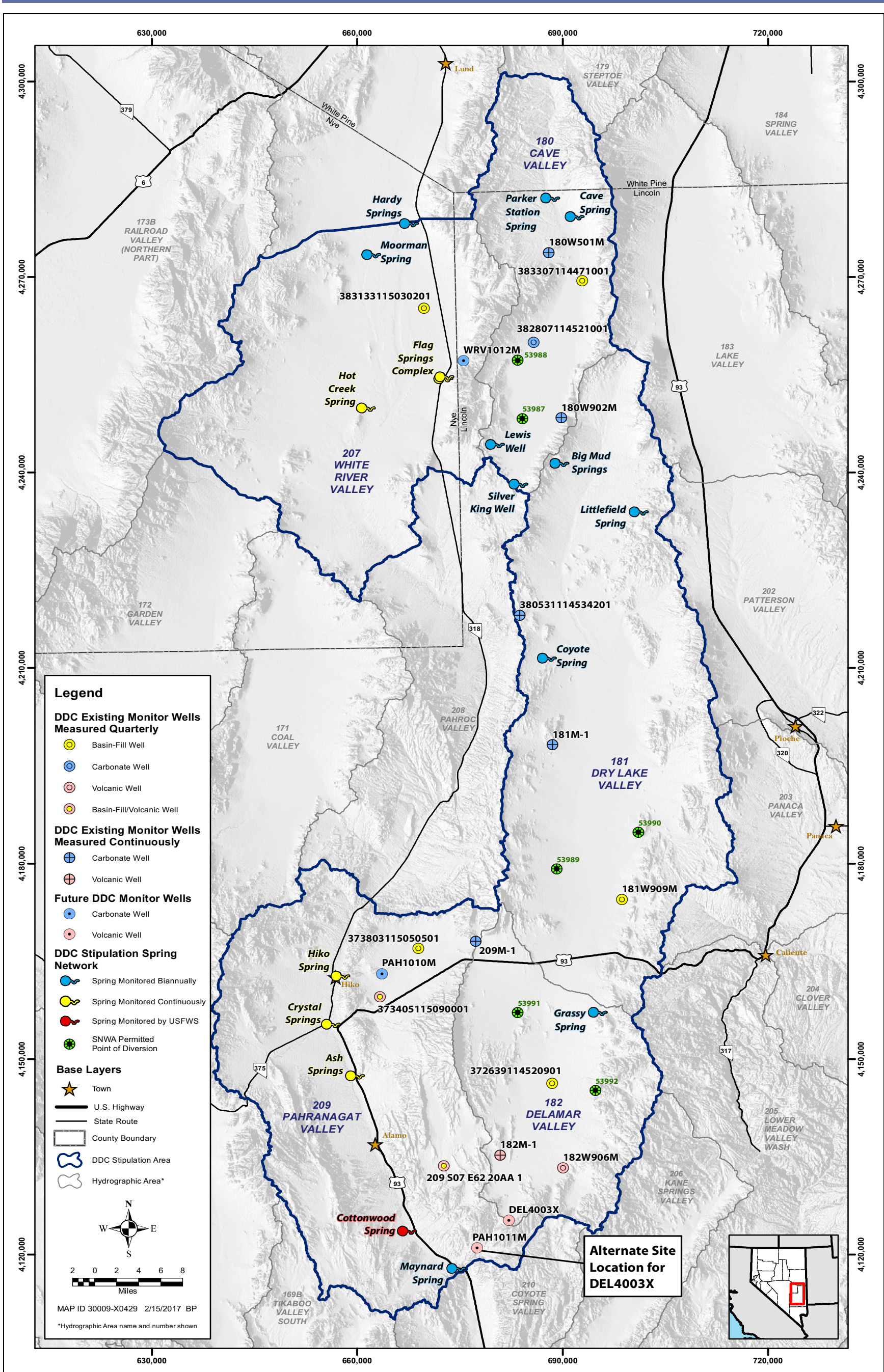
2.2 Monitor-Well Network

The DDC3M Plan requires monitoring of new and existing wells completed in the basin-fill, carbonate-rock, and volcanic-rock aquifers at strategic locations to provide representative groundwater data across the program area. Monitor-well locations were selected with consideration of the hydrogeologic conditions at each location. Water-level measurements were regularly collected from the wells in accordance with SNWA field operating procedures. Geologic reconnaissance, stratigraphic and structural field mapping, aerial photo documentation, surface geophysics, and a review of existing hydrogeologic data were performed to assist in well-site selection. This network will provide long-term monitoring of groundwater conditions and early detection of drawdown propagation, if any, induced by SNWA groundwater development that might adversely affect senior water-right holders and groundwater-dependent areas sustaining critical habitat for endangered and/or threatened species.

2.2.1 Existing-Well Monitoring Network

The DDC3M plan requires collection of continuous groundwater level data at six representative monitor wells in the project area. Groundwater levels are also measured quarterly at nine additional network wells associated with the DDC3M Plan. This network includes seven SNWA wells, three private wells, four U.S. Geological Survey (USGS) MX wells, and one BLM well located in DDC and the adjacent White River Valley and Pahranaagat Valley hydrographic areas. The locations of the monitor wells in the network are shown on [Figure 2-1](#). Well-location coordinates, elevation, construction attributes, and monitoring frequencies are presented in [Table 2-1](#). Professional surveys of location coordinates, ground-surface elevations, and measuring-point elevations of the wells were completed in 2008, 2009, and 2011.

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Note: Flag Springs Complex has been monitored biannually; continuous monitoring of Flag Spring 2 was implemented in fall 2009.

Figure 2-1
DDC Monitor-Well and Spring Network

**Table 2-1
DDC Existing-Well Monitoring Network**

SNWA Site Number	NDWR Station Local Number ^b	Location ^a		Surface ^c Elevation (ft amsl)	Completion Date	Drill Depth (ft bgs)	Well Depth (ft bgs)	Well Casing Diameter (in.)	Screened Interval (ft bgs)	Open Interval (ft bgs)	Aquifer	Monitor Frequency
		UTM Northing (m)	UTM Easting (m)									
180W902M	180 N06 E64 19ADCC1	4,248,355.59	689,816.08	5,984.89	10/19/2005	917	903	12	195-882	77-917	Carbonate	Continuous
382807114521001	180 N07 E63 14BADD1	4,259,963.15	685,737.56	6,012.39	9/30/1980	460	460	10	210-250, 375-435	40-460	Carbonate ^d	Quarterly
383307114471001	180 N08 E64 15BCBC1	4,269,378.23	692,859.57	6,162.55	---	---	---	7	---	---	Basin Fill	Quarterly
180W501M	180 N09 E64 31CBBD1	4,273,712.79	687,971.03	6,428.63	9/23/2005	1,215	1,212	6	788-1,192	54-1,215	Carbonate	Continuous
182W906M	182 S07 E64 19ACDB1	4,133,304.57	690,065.21	4,796.96	9/2/2005	1,735	1,703	6	1,275-1,678	130-1,735	Volcanic	Quarterly
182M-1	182 S07 E63 18AAAA1	4,135,293.37	680,867.32	4,597.78	7/10/2005	1,345	1,331	12	1,006-1,290	58-1,345	Volcanic	Continuous
372639114520901	182 S06 E63 12AD 1	4,146,220.24	688,472.41	4,706.30	5/10/1980	1,215	1,195	10	920-980, 1,040-1,180	40-1,215	Basin Fill	Quarterly ^e
181W909M	181 S03 E65 07CCDA1	4,174,462.59	698,676.17	4,799.41	10/16/2007	1,285	1,260	12	637-1,240	183-1,285	Basin Fill	Quarterly
181M-1	181 N01 E63 36ABAA1	4,198,199.90	688,534.99	4,963.07	8/30/2005	1,501	1,471	6	765-1,451	58-1,501	Carbonate	Continuous
380531114534201	181 N03 E63 27CAA 1	4,218,085.09	683,720.32	5,456.35	1/1/1981	2,395	2,395	10	---	775-2,395	Carbonate	Continuous ^d
209 S07 E62 20AA 1	209 S07 E62 20AA 1	4,133,610.32	672,648.88	4,082.46	1/10/1981	695	695	8	600-695	55-695	Basin Fill/ Volcanic	Quarterly
373405115090001	209 S04 E61 28CD 1	4,159,504.38	663,314.66	4,230.58	9/19/1968	1,314	1,314	12	1,200-1,300	52-1,314	Basin Fill/ Volcanic	Quarterly
373803115050501	209 S04 E61 01AACB1	4,166,944.29	668,927.03	4,528.90	---	---	1,020	8	---	---	Basin Fill	Quarterly
209M-1	209 S03 E62 35DAAD1	4,168,065.79	677,323.46	5,097.30	8/4/2005	1,616	1,616	6	1,274-1,595	50-1,616	Carbonate	Continuous
383133115030201	207 N08 E62 30CD 1	4,265,229.62	669,732.25	5,290.20	---	---	101	2	---	---	Basin Fill	Quarterly

^aProfessional survey complete on location and elevation. All coordinates are Universal Transverse Mercator, North American Datum, 1983, Zone 11.

^bStation Local Numbers provided by the Nevada Division of Water Resources.

^cElevations are North American Vertical Datum of 1988 (NAVD88).

^dCarbonate bedrock was encountered at 265 ft bgs according to the well log.

^eWell is monitored continuously by the USGS.

Well-construction data are based upon best available information from well logs, MX Project Report (Ertec Western Inc., 1981), and direct field measurements.

Monitoring frequency agreed to by the TRP.



SNWA constructed seven monitor wells associated with this network in 2005. These consist of four 6-in. diameter and three 12-in. diameter monitor wells in DDC. Geologic analysis reports were completed for each of the seven SNWA monitor wells included in the network (Eastman, 2007a through g). Copies of the reports have been posted on the SNWA data-exchange web site.

Continuous water-level data were collected at the six designated monitor wells within the network. Site visits were performed approximately once every quarter to obtain periodic water-level measurements and download continuous data for processing and analysis. Physical measurements of water levels were compared to pressure transducer data to verify proper function of the instrumentation.

The USGS collects continuous data at two USGS-MX wells within the network 372639114520901 USGS-MX (Delamar Well) and 380531114534201 USGS-MX (N. Dry Lake).

Periodic water-level measurements collected by SNWA in CY 2016 are presented in Appendix A. Period of record and CY 2016 hydrographs for the nine network wells that are monitored quarterly are also presented in Appendix A. Water-level data collected by SNWA and USGS at the six continuously monitored network wells are presented in Appendix B. Appendix B also includes tables presenting periodic and mean daily continuous water-level data as well as associated CY 2016 and period of record hydrographs. Period of record USGS data are presented at the National Water Information System’s website at <http://waterdata.usgs.gov/nv/nwis/gw>.

2.2.2 Future Monitor Wells

The installation of four new monitor wells is required by the monitoring plan. In 2009, three primary sites and one contingency site were selected by the TRP and NSE for the installation of three of these monitor wells. The location of the fourth well will be selected after additional baseline data are collected and information is known regarding future production-well locations. Location coordinates of future monitor wells, estimated surface elevation and depth to groundwater are presented in Table 2-2. The future monitor-well location sites are presented in Figure 2-1.

**Table 2-2
Future DDC Monitor Wells**

Well Name	Location ^a		Estimated Surface Elevation (ft amsl)	Estimated Depth to Water (ft)
	UTM Northing (m)	UTM Easting (m)		
WRV1012M	4,257,087	675,519	5,794	420
PAH1010M	4,163,098	663,576	4,380	700
DEL4003X (PAH1011M alternate site)	4,125,223 (4,121,019)	682,153 (677,508)	4,738 (3,727)	1,450 (635)
Future Monitor Well #4	TBD	TBD	TBD	TBD

^aAll coordinates are Universal Transverse Mercator, North American Datum, 1983, Zone 11.
TBD - To be determined.

The northernmost future monitor well, WRV1012M, is located on the west side of the Egan Range northeast of Flag Springs in White River Valley. This well is anticipated to be completed in the Ely Springs Dolomite. The location was selected as a monitoring point between Flag Springs and southern Cave Valley. The new well and other existing monitor wells in Cave Valley will provide water-level data to assist in the evaluation of the hydraulic gradient through Shingle Pass. The depth to groundwater is estimated to be approximately 420 ft bgs at this location.

The second future monitor well, PAH1010M, is located on the east side of the Hiko Range in Sixmile Flat in Pahranaagat Valley. The site is located 3.5 mi east of Hiko Spring. The target completion zone is saturated fractured carbonate rocks within the middle to lower units of the Guilmette Formation and possibly the Simonson Dolomite. Carbonate bedrock is anticipated to be encountered within 50 ft of land surface, and it is expected that rocks will be fractured at depth because of the movement along the range-front fault and ancillary normal faults. The depth to water in this area is estimated to be approximately 700 ft bgs.

Both WRV1012M and PAH1010M are located on BLM managed land, and right-of-way applications have been approved and are being maintained.

The third future monitor well will be installed at the well site of a potential SNWA exploratory well, DEL4003X, which is located near the southern boundary of Delamar Valley within a structural feature of the Pahranaagat Shear Zone. This well is anticipated to be completed in volcanic materials. An alternative site, PAH1011M, was identified and is also located along a major structural feature of the Pahranaagat Shear Zone but southwest of the exploratory well site. The right-of-way applications have been approved by BLM for both locations. Selection of the primary or alternative site for a monitor well will be determined in consensus with the TRP.

The fourth future monitor well location has not yet been selected. It will be selected after the configuration of the production well network is established.

2.2.3 Exploratory- and Production-Well Monitoring

The exploratory- and production-well monitoring section of the DDC3M Plan states that SNWA shall record discharge and water levels in all completed SNWA production wells on a continuous basis. SNWA has not constructed any production wells associated with this project; however, continuous measurements will be collected from all future production wells. Quarterly water-level measurements are required in all SNWA exploratory wells.

Water-level data were collected quarterly from one SNWA exploratory test well and its associated monitor well. The wells, one 6-in. diameter monitor well (CAV6002M2) and one 20-in. diameter test well (CAV6002X), were installed in southern Cave Valley near Monitor Well 180W902M on October 13 and 28, 2007, respectively. Well-construction attributes and the locations of the two wells are presented in [Table 2-3](#) and [Figure 2-2](#). Periodic water-level data and the associated hydrographs from the test and exploratory wells are presented in [Appendix C](#).

**Table 2-3
SNWA DDC Exploratory Test Well and Associated Monitor Well**

Site Number	Station Local Number ^b	Location ^a		Surface ^c Elevation (ft amsl)	Completion Date	Drill Depth (ft bgs)	Well Depth (ft bgs)	Well Casing Diameter (in.)	Screened Interval (ft bgs)	Open Interval (ft bgs)	Aquifer	Monitor Frequency
		UTM Northing (m)	UTM Easting (m)									
CAV6002X	180 N06 E64 19DABB1	4,248,307.58	689,819.01	5,987.97	10/28/2007	917	901	20	219-901	50-917	Carbonate	Quarterly
CAV6002M2	180 N06 E64 19ACDD1	4,248,365.83	689,782.96	5,982.81	10/13/2007	893	885	6	159-882	50-893	Carbonate	Quarterly

^aProfessional survey complete on location and elevation. All coordinates are Universal Transverse Mercator, North American Datum, 1983, Zone 11.

^bStation Local Numbers provided by the Nevada Division of Water Resources.

^cElevations are North American Vertical Datum of 1988 (NAVD88).



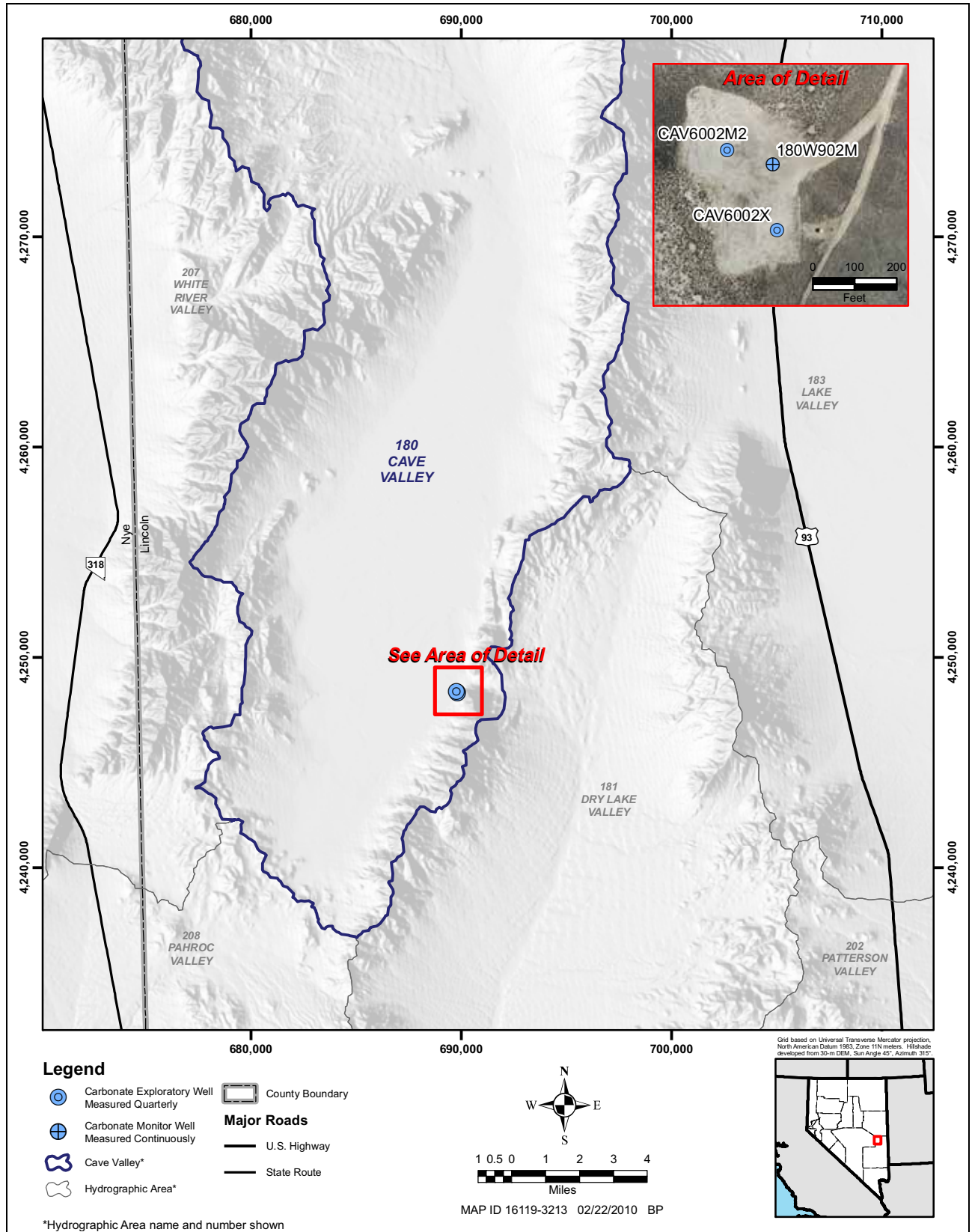


Figure 2-2
SNWA DDC Exploratory Test Well and Associated Monitor Well



2.2.4 Aquifer Testing

A constant-rate pumping test will be performed on each future production well to evaluate aquifer properties. Aquifer-testing results will be used to assess well performance, provide aquifer-property data and assist in evaluating potential future pumping effects. Well-performance step tests and 72-hour constant-rate tests have been performed on SNWA Test Well CAV6002X and Monitor Well 180W902M located in Cave Valley. A summary and results of the tests are presented in *Hydrologic Data Analysis Report for Test Well CAV6002X in Cave Valley Hydrographic Area 180* (Prieur et al., 2011).

2.3 Spring Monitoring Network

The DDC3M Plan spring monitoring network has two components each of which were implemented in 2009. The first component consists of nine springs in White River and Pahranaagat valleys that are monitored for discharge. The second component consists of eight springs within DDC that are monitored biannually for discharge (if measurable), field water-quality parameters, and general physical condition. The spring locations and monitoring frequency are listed in [Table 2-4](#) and presented in [Figure 2-3](#). Baseline photos of all spring locations and detailed descriptions were presented in SNWA (2009). A description of each spring and corresponding discharge data are presented in this section.

2.3.1 White River and Pahranaagat Valleys Springs

Nine springs located in White River and Pahranaagat valleys are included in the spring monitoring network. Hot Creek, Ash, and Crystal springs are currently being monitored continuously through a cooperative funding agreement (CFA) between SNWA, USGS, and the Nevada Division of Water Resources (NDWR). USGS also measures discharge biannually at Flag Springs and Moorman Spring as part of the CFA.

SNWA established spring discharge monitoring sites at Hardy and Hiko springs in 2009. SNWA and NSE staff collaborated to secure property access and install the flume at Hardy Springs, and a flow meter and data logger at Hiko Spring. The flow meter provides continuous discharge data on the agricultural diversion pipeline to which Hiko Spring is diverted.

SNWA coordinated with the Nevada Department of Wildlife (NDOW) to install a flume and continuous-monitoring instrumentation at Flag Spring 2 (Middle Flag Spring) in 2009. Flag Spring 1 and 3 continue to be measured at least quarterly by SNWA and biannually by USGS.

Maynard Spring is monitored quarterly by SNWA. SNWA will document conditions at this site dependent upon continued property access. Cottonwood Spring is monitored by USFWS, however no data were provided by USFWS for inclusion in this report.

Table 2-4
DDC3M Plan Spring Monitoring Locations and Monitoring Frequencies

Basin Number	Station Number	Station Name	Elevation ^a	Location ^b		Monitoring Frequency
				UTM Northing (m)	UTM Easting (m)	
180	1800101	Cave Spring	6,490	4,279,249	691,760	Biannual
	1800301	Parker Station Spring	6,490	4,282,096	688,179	
	381624114540302	USBLM Silver King Well	6,230	4,238,220	683,551	
	381943114562201	Lewis Well	6,260	4,244,297	680,106	
181	1810301	Littlefield Spring	6,150	4,233,949	701,112	Biannual
	1810401	Coyote Spring	5,220	4,211,513	687,693	
	1810501	Big Mud Springs	6,430	4,241,387	689,547	
182	1820101	Grassy Spring	5,790	4,157,193	695,124	
207	2070501	Hot Creek Spring near Sunnyside, NV	5,230	4,249,926	661,290	Continuous
	2071101	Moorman Spring	5,300	4,273,440	662,053	Biannual
	2071501	Hardy Springs	5,350	4,278,196	667,553	
209	2090101	Hiko Spring	3,880	4,162,744	657,549	Continuous
	2090201	Cottonwood Spring	3,240	4,123,643	667,261	Quarterly ^c
	2090801	Maynard Spring	3,110	4,117,909	674,444	Biannual ^d
Flag Springs						
207	2071301	Flag Spring 3 (South)	5,290	4,254,416	672,579	Quarterly
	2071302	Flag Spring 2 (Middle)	5,280	4,254,570	672,576	Continuous
	2071303	Flag Spring 1 (North)	5,290	4,254,696	672,719	Quarterly
Crystal Springs						
209	09415589	Crystal Springs Diversion near Hiko, NV	3,820	4,155,336	656,011	Continuous
	2090401	Crystal Springs near Hiko, NV	3,800	4,155,348	656,165	
Ash Springs						
209	09415639	Ash Springs Diversion at Ash Springs, NV	3,600	4,147,415	659,716	Continuous
	2090501	Ash Springs	3,600	4,147,460	659,684	

^aAll elevations are rounded to the nearest 10 ft, North American Vertical Datum, 1988 (NAVD88). High-resolution Global Positioning System (GPS) will be used to determine elevations at a later date.

^bAll coordinates are Universal Transverse Mercator, North American Datum, 1983 (NAD83) Zone 11.

^cMonitoring performed by USFWS and data to be provided to SNWA and presented in the annual data report.

^dMonitoring frequency will be increased to quarterly after monitoring points are established in consultation with USFWS and BLM.

2.3.1.1 Flag Springs

The Flag Springs are located in Nye County at the NDOW Headquarters for the Wayne Kirsch Wildlife Management Area approximately 60 mi south of Ely, Nevada, along Nevada State Route (SR) 318 (Figure 2-3). Three primary springs (South, Middle, and North) compose the Flag Springs complex which forms the headwaters of Sunnyside Creek. Sunnyside Creek flows into the Adams-McGill Reservoir where the water is used for livestock, wildlife, and recreation.

Monitoring of the Flag Springs complex currently consists of continuous monitoring of Flag Spring 2 (Middle Flag Spring), using a Parshall flume which was installed through a cooperative project with

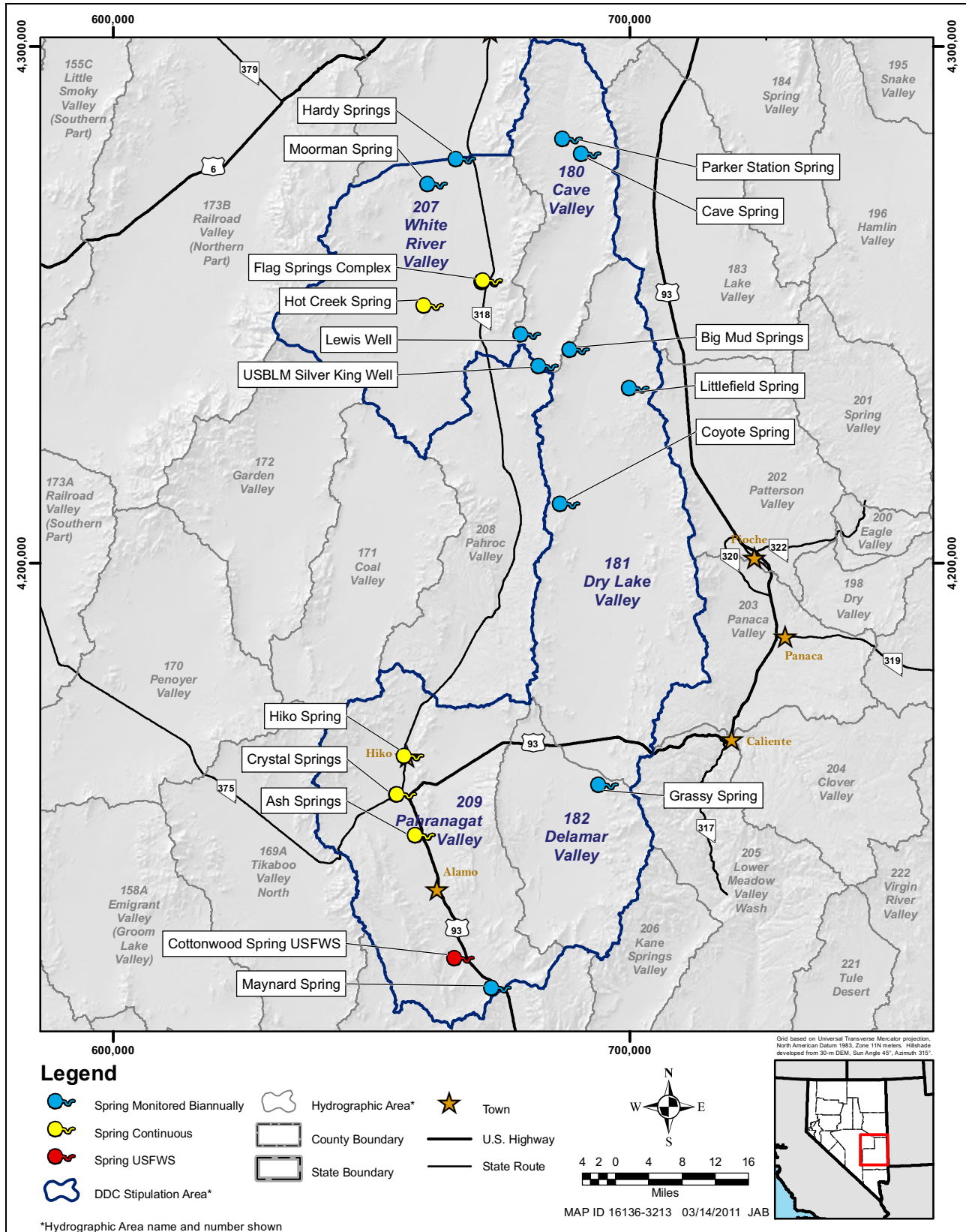


Figure 2-3
Locations of DDC3M Plan Spring Monitoring Sites

NDOW and SNWA, in November 2009, and monitoring of Flag Spring 1 and 3 (North and South Flag Spring) orifices at least quarterly by SNWA and twice a year by USGS.

Miscellaneous discharge measurements for 2016 and a historical hydrograph are presented in [Appendix D](#). A continuous discharge hydrograph for Flag Spring 2 is also presented in [Appendix D](#).

2.3.1.2 Hardy Springs

Hardy Springs is located approximately 16 mi south of Lund, Nevada, and 1.5 mi west of SR 318 in White River Valley in Nye County ([Figure 2-3](#)). Hardy Springs is composed of five individual spring orifices that discharge into a main channel that is a tributary to the White River. In August 2009, SNWA installed a new flume to obtain biannual discharge measurements upstream of an old diversion approximately 100 to 150 ft downstream of the confluence of Hardy Springs.

The channel between Hardy Springs and the flume was modified in 2011 by a contractor with permission from the landowner to provide a water source to a power transmission line construction project. Photographs of the original condition of the channel and the modified condition with reservoir are presented in SNWA (2014). Discharge measurements performed by SNWA in 2016 used a 3-in. modified Parshall flume located between the confluence of the five springs and reservoir inlet. Hydrologic data collected in 2016 are presented in [Appendix D](#).

2.3.1.3 Moorman Spring

Moorman Spring is located in White River Valley approximately 20 mi southwest of Lund, Nevada, in Nye County ([Figure 2-3](#)). The spring discharges from the alluvium along a fault scarp. The spring forms a small pool, approximately 30 ft long and 15 to 20 ft wide, behind an old irrigation diversion structure. The discharge at Moorman Spring is currently measured biannually by the USGS through the CFA.

Discharge data collected at Moorman Spring during 2016 and a hydrograph of the historical data are presented in [Appendix D](#).

2.3.1.4 Hot Creek Spring

Hot Creek Spring is located in southern White River Valley, approximately 36 mi southwest of Lund, Nevada, and 2 mi west of Adams-McGill Reservoir in Nye County ([Figure 2-3](#)). The spring discharge forms Hot Creek, which flows southeast to the Adams-McGill Reservoir. The spring and reservoir are located on the Wayne Kirch Wildlife Management Area, administered by NDOW. At one time, the flow of Hot Creek could be diverted to the Dacey Reservoir to the northeast. Spring discharge is currently being monitored continuously by USGS through the CFA.

A detailed description, site photos, and discussion of historical measurements at Hot Creek Spring are presented in SNWA (2009). Data collected through 2016, along with historical mean daily discharge data from 2006 to 2016 are provided in [Appendix D](#). Discharge measurements prior to 2006 were measured below the current gage, 50 to 60 ft below the ponded swimming area.



2.3.1.5 Ash Springs

Ash Springs is located in Ash Springs, Nevada, approximately 600 ft east of U.S. Highway 93 (US 93) (Figure 2-3). The spring, which has been historically used for irrigation and domestic supply, is composed of many orifices that extend more than a quarter mile along the north-south-trending Hiko Fault. The spring area was developed in the 1970s and through the 1980s as a privately owned resort. The main orifice is on public land administered by the BLM. Ash Springs discharge and irrigation diversion are currently measured by the USGS using two gaging stations which are funded through the CFA. The two stations were relocated by the USGS in 2011.

A detailed description, photos, and discussion of historical data collected at Ash Springs are presented in SNWA (2009). Hydrologic data collected through WY 2016, historical mean daily discharge, and a 30-day moving average of mean daily discharge values for Ash Springs are presented in Appendix D.

2.3.1.6 Crystal Springs

Crystal Springs is located approximately a quarter mile west of the SR 318/SR 375 junction and a half mile west of the US 93/SR 318 junction in Lincoln County. Crystal Springs is approximately 4 mi south of Hiko, Nevada, and 5 mi north of Ash Springs, Nevada (Figure 2-3). This locale, used as a watering location and campsite, was the principal stopover on the Mormon Trail alternate route (State of Nevada, 2004). Discharge from the main channel of the spring and irrigation diversion is currently monitored by USGS through the CFA.

A detailed description and photo documentation of Crystal Springs are presented in SNWA (2009), including a discussion of the historical data collected at the spring complex. Hydrologic data collected through WY 2016, historical mean daily discharge, days of diversion, and annual discharge data are presented in Appendix D.

2.3.1.7 Hiko Spring

Hiko Spring is located on the Cannon Ranch approximately a half mile northeast of Hiko, Nevada, in the north end of Pahrangat Valley (Figure 2-3) and has historically provided water for various uses. Hiko Spring discharges from the base of the Hiko Range and currently provides water for domestic, agricultural, and wildlife purposes.

SNWA monitors discharge at Hiko Spring continuously using a flow meter and datalogger installed on the 18-in.-diameter pipe located approximately 0.5 mi southwest of the spring. The monitoring station was constructed in June 2009 in cooperation with the Hiko Spring Irrigation District and the owners of the Cannon and Whipple Ranches.

The Hiko Irrigation Company uses a perpetual calendar which assigns irrigation times to each of the twelve members of the company. One complete rotation of the 12 users equates to 11.5 days. There are time intervals during each rotation when water is diverted above the flow meter. Daily discharge

rates as measured at the gaging station vary between approximately 4 and 8 cfs depending upon the season and irrigation needs of the individual users.

A detailed description and photo documentation of Hiko Spring are presented in SNWA (2009), including a discussion of the historical data collected at the spring complex. Hydrologic data collected during WY 2016 and a historical hydrograph are presented in [Appendix D](#).

2.3.1.8 Maynard Spring

Maynard Spring is located off of US 93 about 14 mi southeast of Alamo, Nevada, and 2.5 mi southeast of Lower Pahranaagat Lake on BLM land in Pahranaagat Valley ([Figure 2-3](#)). The spring is composed of two springheads, referred to as North Maynard Spring and South Maynard Spring, which are separated by a distance of approximately 400 ft. Photos of Maynard Spring in May and November 2016 are presented in [Figures E-1 and E-2](#) of [Appendix E](#). Observations in 2016 indicated no measurable discharge.

Currently, there are multiple water-level monitor points at Maynard Spring. The USFWS installed two standpipes without screens using a drive head at Maynard Spring in 2015. Information on the standpipe construction and data collected by USFWS is provided in the 2015 DDC3M Report (SNWA, 2016). No additional data has been provided by USFWS for inclusion in this report.

Upon initiation of monitoring at Maynard Spring by SNWA, an existing 1-in. standpipe was discovered within the northern spring pool. Completion information is not available. SNWA has collected depth-to-water data from this 1-in. standpipe. This depth-to-water data are presented in [Appendix D](#) and are measured from the top of the standpipe. A professional survey has not been performed by SNWA at this site.

2.3.1.9 Cottonwood Spring

Cottonwood Spring is approximately 9.5 mi south of Alamo, Nevada, 1 mi west of US 93 on the USFWS Pahranaagat Wildlife Refuge ([Figure 2-3](#)), and 1.5 mi south of the Refuge Headquarters along the Corn Creek/Alamo Road. As per Exhibit A of the Stipulation, USFWS will provide available data collected from Cottonwood Spring to the TRP; however, no data has been provided for inclusion in this report. SNWA will include any future discharge measurements collected and provided by USFWS in the annual data report. The water at Cottonwood Spring is used for wildlife. Photo documentation and historical data reported for Cottonwood Spring is presented in SNWA (2009).

2.3.2 DDC Springs Biannual Monitoring

Eight spring monitoring locations within the DDC valleys were selected by the TRP in consultation with the NSE for biannual monitoring. These springs are generally characterized as being sourced in the mountain block and having no hydraulic connection to the regional aquifer. However, biannual baseline monitoring is being performed to document variability in spring conditions.



Springs included in the program are Grassy Spring in Delamar Valley; Coyote, Big Mud, and Littlefield springs in Dry Lake; Parker Station and Cave springs in northern Cave Valley; and Lewis Well and Silver King Well in southern Cave Valley. Spring locations are presented in [Figure 2-3](#). Several of the springs (Grassy, Big Mud, Coyote, and Lewis Well) have been modified in the past with a collector system to transmit water to distribution points away from the spring. Silver King Well is a shallow dug well with a gravity discharge line routed to a stock-watering area. However, the discharge line was removed in 2016.

Field visits to the sites are conducted in the spring and fall of each year when site-access conditions permit. Water-quality parameters of the spring discharge are measured in the field and include: pH, electrical conductivity, and temperature. Photographs are taken to document site conditions.

Physical descriptions, photos, and historical hydrologic and water-chemistry data for the springs are presented in SNWA (2009).

Site visits were performed in May and October 2016. Data collected during the visit and photo documentation are presented in [Appendices D](#) and [E](#), respectively.

2.3.2.1 Cave Spring

Cave Spring is located at the far southwest corner of a low northeast-southwest-trending hill approximately 3 mi southeast of Parker Station, Nevada ([Figure 2-3](#)). The decrease in discharge rates during the summer months and the cold temperature of the water indicate that this spring is fed solely by local recharge. Biannual discharge measurements and conditions are being documented at the spring with permission from the owner, Cave Valley Ranch, LLC.

A detailed description and photo documentation of Cave Spring are presented in SNWA (2009), including a discussion of historical data collected at the spring. Hydrologic data collected during 2016 are presented in [Appendix D](#). A photo of the spring, taken in May 2016, is presented in [Figure E-3](#). The photo taken in October 2016 is presented in [Figure E-4](#). Both photos show dry conditions.

Currently, there are no active diversions at the spring. Historically, it appears that a small, hand-dug well was constructed in the stream channel and was used to divert water by pump. The water now flows freely down the channel into a small reservoir in the center of the valley where it is used for livestock watering.

2.3.2.2 Parker Station

Parker Station is in north-central Cave Valley, approximately 16 mi southeast of Lund, Nevada. Parker Station was once used as a stagecoach station. This site is located in Lincoln County, nearly a mile south of the White Pine/Lincoln County line.

Parker Station Spring lies on Cave Valley Ranch, LLC, property. Photos of spring discharge in the Parker Station Area in May and October 2016 are presented in [Figures E-5](#) and [E-6](#), respectively. A photo of a permanent flume installed in the southern reservoir discharge channel and owned by Cave

Valley Ranch, LLC. is presented in [Figure E-7](#). Currently some water flows around the flume. Discharge just upstream of the southern reservoir channel is measured by SNWA using a temporary flume twice a year.

2.3.2.3 Lewis Well

The Lewis Well is located in southern Cave Valley, approximately 36 mi south of Lund, Nevada, and 6 mi east of SR 318 ([Figure 2-3](#)). It is located at the base of the Egan Range on the eastern slope. The well was reportedly constructed in 1925 and was completed with a 42-in. steel casing to a depth of 26 ft. Photos of the springhead area for Lewis Well taken in May and October 2016 are presented in [Figures E-8](#) and [E-9](#), respectively. A photo of spring discharge at a manhole access to a collection system near the spring head is presented in [Figure E-10](#).

2.3.2.4 Silver King Well

The Silver King Well is a hand-dug well located within Lincoln County, Nevada, in southern Cave Valley as shown in [Figure 2-3](#). The dug well may have been a modification to a historic spring. Water is discharged from the Silver King Well by gravity drainage through approximately 600 ft of 2-in. pipe into a partially buried trough. Photos of the Silver King Well and discharge area are presented in SNWA (2009). Photos taken May and October 2016 are presented in [Figures E-11](#) and [E-12](#), respectively.

The Silver King Well cattle trough was removed along with the discharge piping as shown in [Figure E-12](#). Stock water was observed being trucked into the site in October 2016.

The depth-to-water in the dug well was measured at 11.26 and 10.15 ft bgs on May 16 and October 18, 2016, respectively.

2.3.2.5 Coyote Spring

Coyote Spring is located in Dry Lake Valley on SNWA property approximately 8 mi west-southwest of Bristol Wells, Nevada ([Figure 2-3](#)), and lies at the center of an abandoned homestead compound now used for livestock management. Two spring orifices exist at the site. Photos of Coyote Spring and the discharge area in 2009 are presented in SNWA (2009). Photos taken in May and October 2016 are presented in [Figures E-13](#) and [E-14](#), respectively.

Coyote Spring discharges from the base of an escarpment approximately 15 ft high in volcanic rocks. The spring discharge is collected and piped to a large concrete tank. Two site visits occurred during CY 2016. During the spring and fall visits on May 16 and October 18, 2016, there was no measurable discharge.



2.3.2.6 Big Mud Springs

Big Mud Springs are located in northern Dry Lake Valley as shown in [Figure 2-3](#). The springs are located in the Schell Creek Range along Big Mud Pass approximately 7 mi north of Silver King Mountain. A wood fence is present at the springs. The area is surrounded by dense vegetation, such as junipers, willows, and wild roses. A collection basin is in place to divert the spring discharge for stock watering.

Photos of Big Mud Springs and water storage tanks in 2009 are presented in SNWA (2009). Photos of the springhead taken in May and October 2016 are presented in [Figures E-15](#) and [E-16](#), respectively.

2.3.2.7 Littlefield Spring

Littlefield Spring is located approximately 3 mi south of Meloy Spring on the east side of Dry Lake Valley ([Figure 2-3](#)). Littlefield Spring discharges from the alluvium near an outcrop of volcanic rock. This spring had a reported discharge of 0.02 cfs in May 1980 (Bunch and Harrill, 1984). No diversions exist near the spring. The spring head for Littlefield Spring was restored in 2004. Photos of the spring discharge area taken in May and October 2016 are presented in [Figure E-17](#) and [Figure E-18](#), respectively. Discharge measurements were made during these site visits on May 16 and October 18, 2016. They were 0.02 cfs each.

2.3.2.8 Grassy Spring

Grassy Spring is located in Delamar Valley approximately 40 mi south of Bristol Wells, Nevada, along the western flank of the Delamar Mountains ([Figure 2-3](#)). Photos of Grassy Spring taken in May and October 2016 are presented in [Figures E-19](#) and [E-20](#). Grassy Spring is currently used for stock watering. The discharge is captured at the source and is transferred to livestock-watering tanks through black polyvinyl tubing.

The spring discharges from alluvial sediments in close contact with volcanic rocks. During the two site visits in the Spring and Fall on May 16 and October 18, 2016, the tank was dry and there was no measurable discharge.

2.4 Precipitation-Station Network

Precipitation-station data from selected network sites which are currently operating and have an established historical record in the vicinity of the study area were compiled and are presented in [Appendix F](#). Data collected from the precipitation network will assist in assessing climate variability in the vicinity of the project basins and discerning pumping effects from natural variability. The precipitation stations associated with the network are listed in [Table 2-5](#) and are presented on [Figure 2-4](#).

**Table 2-5
DDC Precipitation-Station Locations**

Station Number	Station Name	Location ^a		Surface Elevation ^b (ft amsl)	Data Source
		UTM Northing (m)	UTM Easting (m)		
RP1830101	Mount Wilson (NDWR)	4,254,245	731,613	7,370	NDWR
RP1730201	Blue Eagle Ranch Hanks	4,264,579	626,889	4,780	WRCC
RP1790202	McGill	4,365,043	691,693	6,270	WRCC
RP2010201	Spring Valley State Park	4,214,070	747,476	5,950	WRCC
RP2020201	Pioche	4,201,608	724,101	5,990	WRCC
RP2050201	Caliente	4,166,217	719,251	4,400	WRCC
RP2050202	Elgin	4,136,286	717,627	3,420	WRCC
RP2070201	Sunnyside	4,254,668	672,599	5,297	WRCC
RP2070202	Lund	4,303,974	672,091	5,546	WRCC
RP2090201	Hiko	4,158,266	656,900	3,900	WRCC
RP2090202	Pahranagat Wildlife Refuge	4,126,390	666,716	3,400	WRCC
RP2070301	Ward Mountain	4,333,574	677,187	9,200	NRCS (SnoTel)

^aAll coordinates in Universal Transverse Mercator, North American Datum, 1983 (NAD83), Zone 11.

^bElevations are North American Vertical Datum, 1988 (NAVD88).

Based on the high cost and low quality of the precipitation data collected by the USGS at the high altitude precipitation stations, monitoring of high-altitude precipitation stations by the USGS was discontinued in 2016. The current precipitation-station network includes the following:

- One high-altitude precipitation station operated by NDWR located in the Wilson Creek Range. These data are cited from Nevada Division of Water Resources (NDWR, 2016).
- Ten National Oceanic and Atmospheric Administration, National Weather Service (NOAA/NWS) Stations. Data were obtained through the Western Regional Climate Center (WRCC). These data are cited from Western Regional Climate Center (WRCC, 2016).
- One U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) SNOWpack TElemetry (SNOTEL) site located in the Egan Range. This site provides precipitation and snow-accumulation data. These data are cited from the USDA NRCS (USDA, 2016).

Provisional CY 2016 precipitation data for the stations, along with historical data and statistics, are presented in [Appendix F](#). SNWA will continue to compile and report precipitation data from these sites as long as the data are made available and the stations are operational.

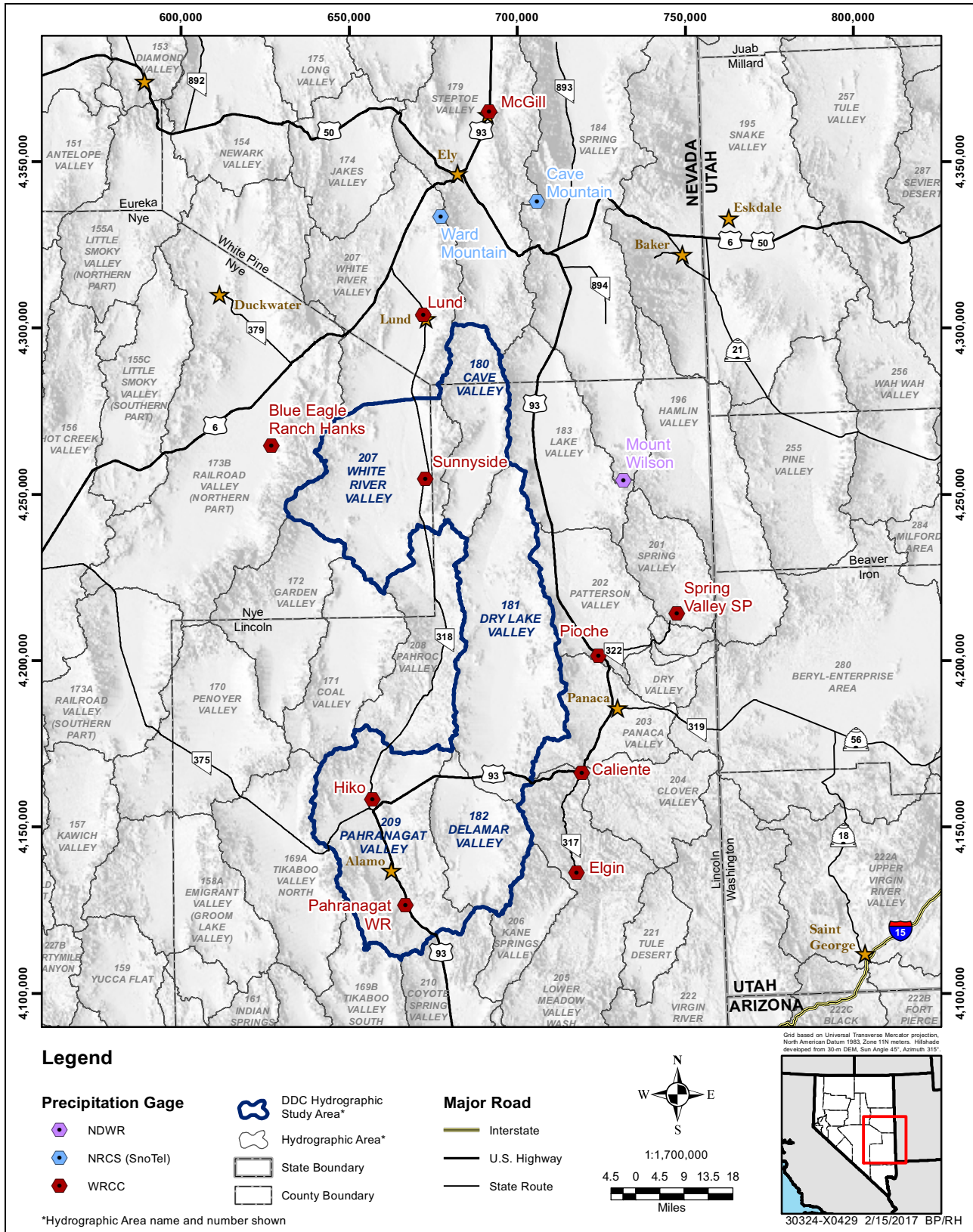


Figure 2-4
DDC Precipitation-Station Locations

2.5 Water Chemistry

A summary of historical water-chemistry data for samples collected from program wells and springs were presented in SNWA (2009). The historical samples were collected by SNWA, USGS, and Desert Research Institute. Additionally, data reported in published reports dating as far back as 1912 (Carpenter, 1915) were included in the report. On July 2, 2009, water samples were collected by SNWA from Hiko and Hardy springs and analyzed for a suite of chemical constituents. The results for these samples were presented in SNWA (2010).

On March 31, 2010, the TRP held a conference call to discuss the water-chemistry sampling programs required by the DDC3M Plan. The TRP recommended to the EC that the water-chemistry sampling program be postponed and implemented after the three future monitor wells specified in the DDC3M Plan have been installed. The EC approved the TRP recommendation. Implementation of the program will include collection of two rounds of water-chemistry samples six months apart at 10 locations selected by the TRP. SNWA will collect and submit samples for chemical analysis for the water-chemistry parameters listed in [Table 2-6](#). Subsequent sampling will be performed once every 5 years following the start of SNWA groundwater production.

Table 2-6
Water-Chemistry Parameters

Field Parameters	Major Ions	Isotopes	Minor and Trace Elements
Water temperature	TDS	Oxygen-18	Arsenic
Air temperature	Calcium	Deuterium	Barium
pH	Sodium	Tritium	Cadmium
Electrical conductivity	Potassium	Chlorine-36 ^a	Chromium
Dissolved oxygen	Chloride	Carbon-14 ^a	Lead
	Bromide	Carbon-13 ^a	Mercury
	Fluoride	Strontium-87 ^a	Selenium
	Nitrate	Uranium-238 ^a	Silver
	Phosphate		Manganese
	Sulfate		Aluminum
	Alkalinity		Iron
	Silica		Bromide
	Magnesium		Fluoride

^aThese parameters shall be included only in the first sampling event and shall not be included in any further water-chemistry sampling performed pursuant to this plan.

2.6 Data Reporting

A data-exchange web site accessible by the NSE, EC, TRP, and BRT members was created in April 2008. The data-exchange web site is used to distribute DDC3M Plan monitoring data to the TRP within 90 days of collection. Data is also submitted directly to the NSE on a quarterly basis in electronic format.

An annual report providing program status and monitoring data is submitted to the TRP and NSE.



2.7 Proposed Schedule of Groundwater Withdrawals

No groundwater production is scheduled until the project is authorized and constructed.

3.0 ANTICIPATED 2017 SNWA DDC3M PLAN ACTIVITIES

Anticipated DDC3M Plan activities in CY 2017 are summarized below.

- Continue to collect all groundwater, surface-water, and precipitation data as required by the DDC3M Plan sites throughout 2017.
- Data will be submitted to the NSE in an approved electronic format quarterly, and included in the annual data report to be submitted in March 2018.
- Data will be submitted quarterly to other TRP members through the SNWA data-exchange web site.
- SNWA will continue to work with the NSE and the other members of the TRP participants to implement the DDC3M Plan and identify and address technical issues related to the program.



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4.0 REFERENCES

- Bunch, R.L., and Harrill, J.R., 1984, Compilation of selected hydrologic data from the MX missile-siting investigation, east-central Nevada and western Utah: U.S. Geological Survey Open-File Report 84-702, 123 p.
- Carpenter, E., 1915, Ground water in southeastern Nevada: U.S. Geological Survey Water-Supply Paper 365, 86 p.
- Eastman, H.S., 2007a, Geologic data analysis report for Monitor Well 180W501M in Cave Valley: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. RDS-ED-0004, 29 p.
- Eastman, H.S., 2007b, Geologic data analysis report for Monitor Well 180W902M in Cave Valley: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. RDS-ED-0003, 31 p.
- Eastman, H.S., 2007c, Geologic data analysis report for Monitor Well 181M-1 in Dry Lake Valley: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. RDS-ED-0005, 28 p.
- Eastman, H.S., 2007d, Geologic data analysis report for Monitor Well 181W909M in Dry Lake Valley: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. RDS-ED-0007, 30 p.
- Eastman, H.S., 2007e, Geologic data analysis report for Monitor Well 182M-1 in Delamar Valley: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. RDS-ED-0002, 29 p.
- Eastman, H.S., 2007f, Geologic data analysis report for Monitor Well 182W906M in Delamar Valley: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. RDS-ED-0001, 30 p.
- Eastman, H.S., 2007g, Geologic data analysis report for Monitor Well 209M-1 in Pahrnagat Valley: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. RDS-ED-0006, 29 p.
- Ertec Western, Inc., 1981, MX Siting Investigation—Geotechnical Evaluation—Verification Study—Cave Valley, Nevada, Volume II: Ertec Western, Inc., Long Beach, California, Report E-TR-27-CV-II, 102 p.
- NDWR, see Nevada Division of Water Resources.
- Nevada Division of Water Resources, 2017, Precipitation Data [Internet], [accessed March 2017], available from <http://water.nv.gov>.
- Nevada Supreme Court, 2010, Great Basin Water Network v. State Engineer, 126 Nev., Ad. Op. No. 20, June 17, 2010.



NSC, see Nevada Supreme Court

Prieur, J.P., Acheampong, S.Y., Ashinhurst, C.S., and Fryer, W., 2011, Hydrologic data analysis report for Test Well CAV6002X in Cave Valley Hydrographic Area 180: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. DAR-ED-0008, 95 p.

SNWA, see Southern Nevada Water Authority.

Southern Nevada Water Authority, 2008, Delamar, Dry Lake, and Cave Valley stipulation agreement hydrologic monitoring plan status and data report: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. WRD-ED-0002, 31 p.

Southern Nevada Water Authority, 2009, Delamar, Dry Lake, and Cave valleys stipulation agreement hydrologic monitoring plan status and historical data report: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. WRD-ED-0005, 162 p.

Southern Nevada Water Authority, 2010, 2009 Delamar, Dry Lake, and Cave Valleys hydrologic monitoring and mitigation plan status and data report: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. WRD-ED-0008, 117 p.

Southern Nevada Water Authority, 2011a, Hydrologic monitoring and mitigation plan for Delamar, Dry Lake, and Cave valleys: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. WRD-ED-0011, 44 p.

Southern Nevada Water Authority, 2011b, 2010 Delamar, Dry Lake, and Cave Valleys hydrologic monitoring and mitigation plan status and data report: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. WRD-ED-0009, 116 p.

Southern Nevada Water Authority, 2012, 2011 Delamar, Dry Lake, and Cave Valleys hydrologic monitoring, management, and mitigation plan status and data report: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. WRD-ED-0013, 108 p.

Southern Nevada Water Authority, 2013, 2012 Delamar, Dry Lake, and Cave Valleys hydrologic monitoring, management, and mitigation plan status and data report: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. WRD-ED-0018, 106 p.

Southern Nevada Water Authority, 2014, 2013 Delamar, Dry Lake, and Cave Valleys hydrologic monitoring, management, and mitigation plan status and data report: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. WRD-ED-0024, 109 p.

Southern Nevada Water Authority, 2015, 2014 Delamar, Dry Lake, and Cave Valleys hydrologic monitoring, management, and mitigation plan status and data report: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. WRD-ED-0021, 105 p.

Southern Nevada Water Authority, 2016, 2015 Delamar, Dry Lake, and Cave Valleys Hydrologic monitoring, management, and mitigation plan status and data report: Southern Nevada Water Authority, Las Vegas, Nevada, Doc. No. WRD-ED-0035, 110 p.

State of Nevada, 2004, Department of Cultural Affairs, State Historic Preservation Office, Nevada, Crystal Springs–Historical Marker 205 [Internet], [accessed July 14, 2005], available from <http://nvshpo.org>.

Stipulation for Withdrawal of Protests: U.S. Bureau of Indian Affairs, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service, Southern Nevada Water Authority. (Jan. 7, 2008).

USDA, see U.S. Department of Agriculture.

U.S. Department of Agriculture, 2017, Natural Resources Center Service (NRCS) National Water & Climate Center (WCC) [Internet], [accessed February 2017], available from <http://www.wcc.nrcs.usda.gov>.

U.S. Geological Survey, 2017, National Water Information System (NWIS Web) [Internet], [accessed February 2017], available from <http://waterdata.usgs.gov/nwis>.

USGS, see U.S. Geological Survey.

Western Regional Climate Center (WRCC), 2017, Historical Climate Information [Internet], [accessed February 2017], available from <http://www.wrcc.dri.edu>.

WRCC, see Western Regional Climate Center.



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Appendix A

DDC3M Plan
Periodic Water-Level Data

Table A-1
Periodic Water-Level Measurement Data from the DDC
Existing-Well Monitoring Network
 (Page 1 of 2)

Site Number	Station Local Number ^a	Well Depth (ft bgs)	Surface ^b Elevation (ft amsl)	Water Level			
				Date	Depth to Water (ft bgs)	Well Status ^c	Measurement Method ^d
180W902M ^e	180 N06 E64 19ADCC1	903	5,984.89	1/13/2016 ^f	---	---	---
				2/24/2016	144.81	S	T
				4/6/2016	145.02	S	T
				7/13/2016	145.05	S	T
				10/5/2016	145.13	S	T
382807114521001	180 N07 E63 14BADD 1	460	6,012.39	1/13/2016 ^f	---	---	---
				4/6/2016	217.16	S	T
				7/13/2016	217.05	S	T
				10/5/2016	216.96	S	T
383307114471001	180 N08 E64 15BCBC1	---	6,162.55	1/13/2016 ^f	---	---	---
				4/6/2016	263.20	S	T
				7/13/2016	262.99	S	T
				10/5/2016 ^f	---	P	---
180W501M ^e	180 N09 E64 31CBBD1	1,212	6,428.63	1/11/2016 ^f	---	---	---
				4/6/2016	1,060.61	S	T
				7/12/2016	1,060.67	S	T
				10/5/2016	1,061.09	S	T
182W906M	182 S07 E64 19ACDB1	1,703	4,796.96	1/4/2016	1,316.72	S	T
				4/4/2016	1,317.37	S	T
				7/11/2016	1,316.92	S	T
				10/5/2016	1,316.82	S	T
182M-1 ^e	182 S07 E63 18AAAA1	1,321	4,597.78	1/4/2016	827.01	S	T
				4/4/2016	827.08	S	T
				7/11/2016	826.98	S	T
				10/5/2016	826.91	S	T
181W909M	181 S03 E65 07CCDA1	1,260	4,799.41	1/13/2016	498.57	S	T
				4/4/2016	498.70	S	T
				7/11/2016	498.58	S	T
				10/4/2016	498.51	S	T
181M-1 ^e	181 N01 E63 36ABAA1	1,472	4,963.07	1/13/2016	675.09	S	T
				4/4/2016	675.09	S	T
				7/11/2016	674.96	S	T
				10/4/2016	674.91	S	T
380531114534201 ^e	181 N03 E63 27CAA 1	2,395	5,456.35	1/6/2016	844.21	S	T
				4/4/2016	844.53	S	T
				7/11/2016	844.24	S	T
				10/4/2016	844.03	S	T
209 S07 E62 20AA 1	209 S07 E62 20AA 1	695	4,082.46	1/4/2016	600.20	S	T
				4/4/2016	---	O	---
				7/11/2016	---	O	---
				10/4/2016	---	O	---



Table A-1
Periodic Water-Level Measurement Data from the DDC
Existing-Well Monitoring Network
 (Page 2 of 2)

Site Number	Station Local Number ^a	Well Depth (ft bgs)	Surface ^b Elevation (ft amsl)	Water Level			
				Date	Depth to Water (ft bgs)	Well Status ^c	Measurement Method ^d
373405115090001	209 S04 E61 28CD 1	980	4,230.58	1/4/2016	586.69	S	T
				4/6/2016	586.93	S	T
				7/13/2016	586.74	S	T
				10/4/2016	586.74	S	T
373803115050501	209 S04 E61 01AACB1	1,020	4,528.90	1/4/2016	785.32	S	T
				4/6/2016	785.76	S	T
				7/13/2016	785.47	S	T
				10/4/2016	785.25	S	T
209M-1 ^e	209 S03 E62 35DAAD1	1,616	5,097.30	1/4/2016	1,200.18	S	T
				4/6/2016	1,200.60	S	T
				7/11/2016	1,200.28	S	T
				10/4/2016	1,200.34	S	T
383133115030201	207 N08 E62 30CD 1	101	5,290.20	1/11/2016	64.42	S	T
				4/4/2016	64.29	S	T
				7/11/2016	64.20	S	T
				10/3/2016	64.31	S	T
372639114520901	182 S06 E63 12AD 1	1,195	4,706.30	1/4/2016	863.29	S	T
				4/4/2016	863.49	S	T
				7/11/2016	863.38	S	T
				10/5/2016	863.21	S	T

^aStation Local Numbers provided by the Nevada Division of Water Resources.

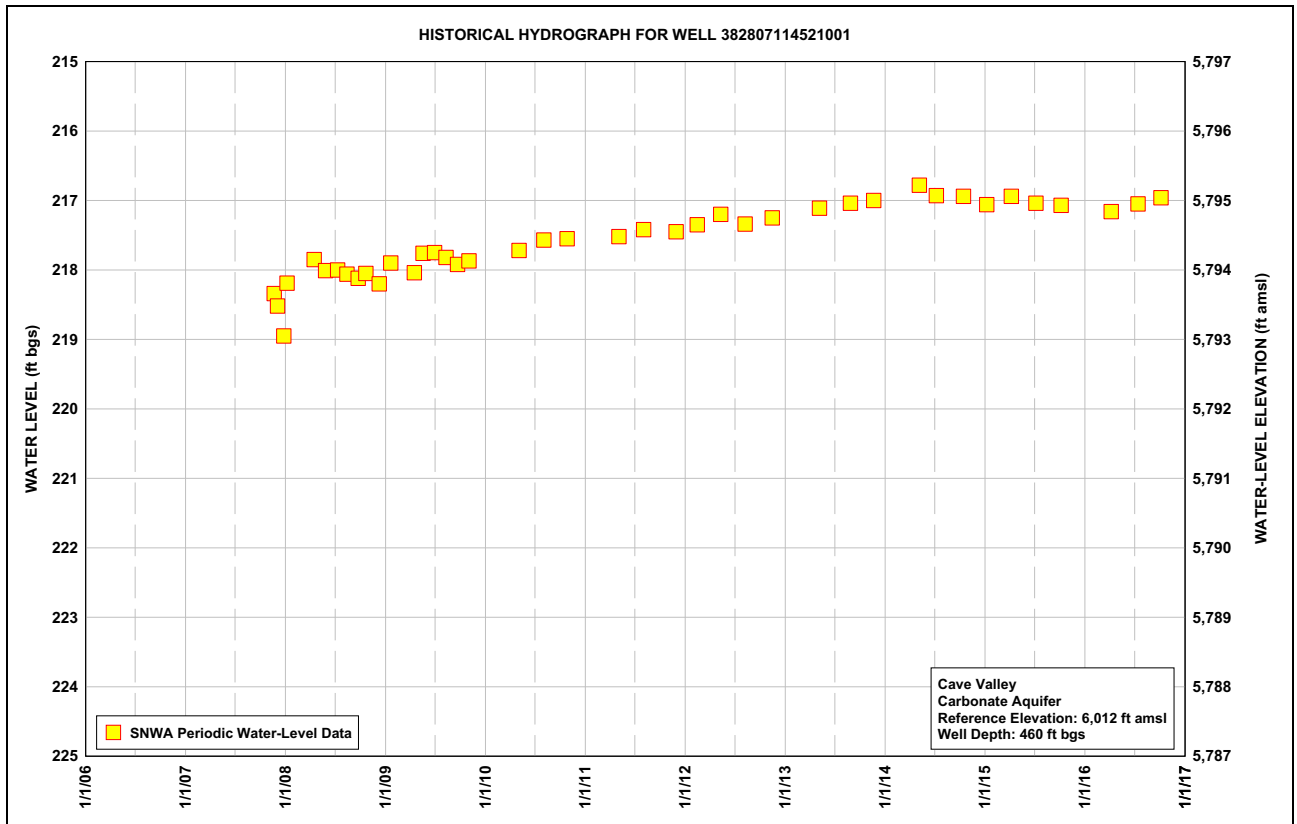
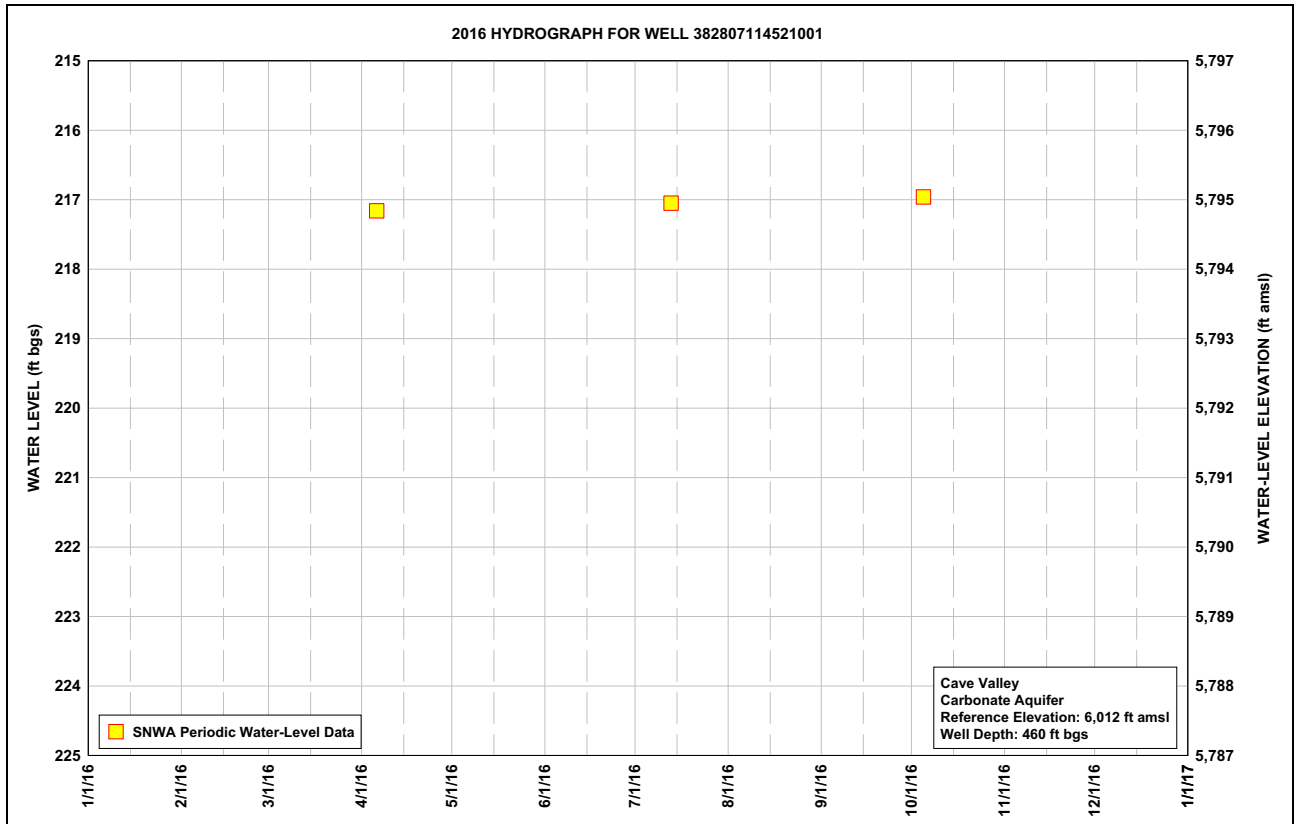
^bElevations are North American Vertical Datum of 1988 (NAVD88).

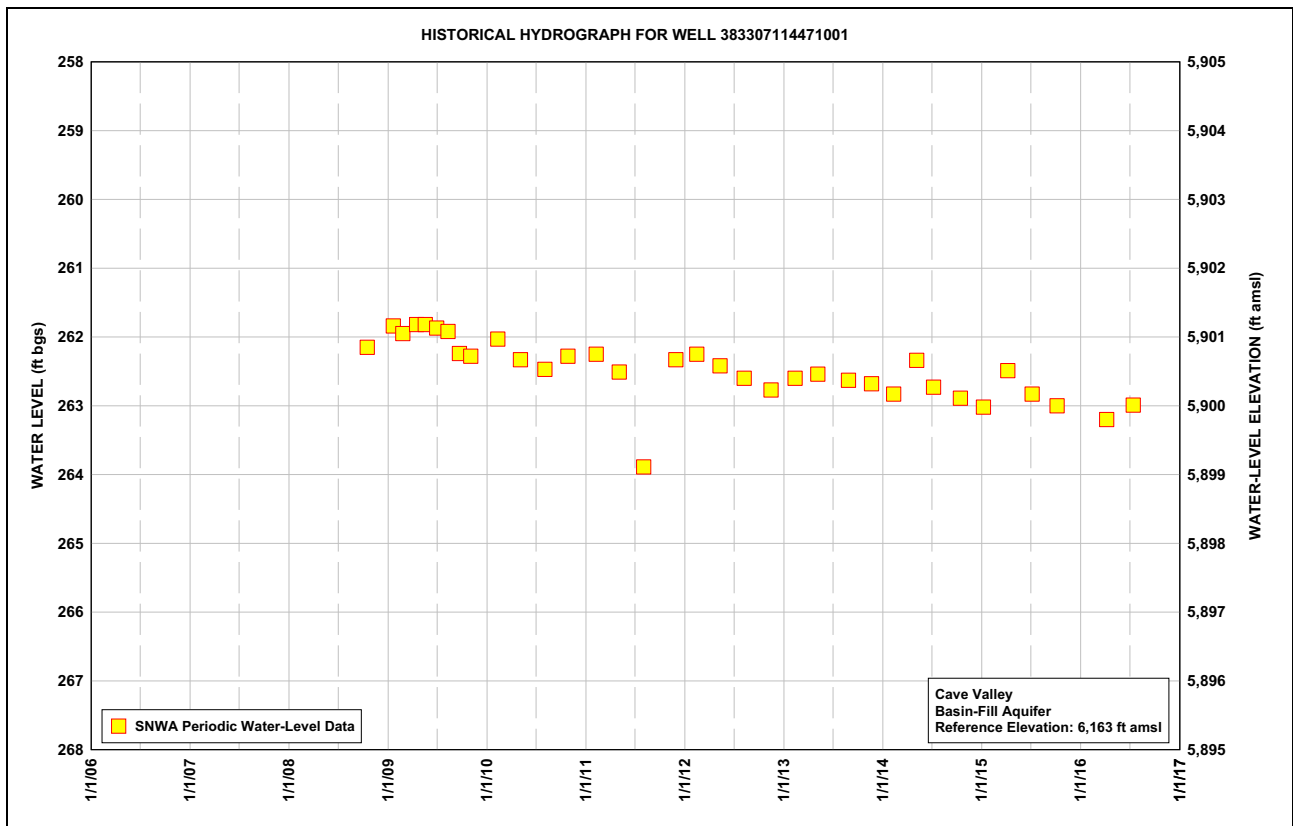
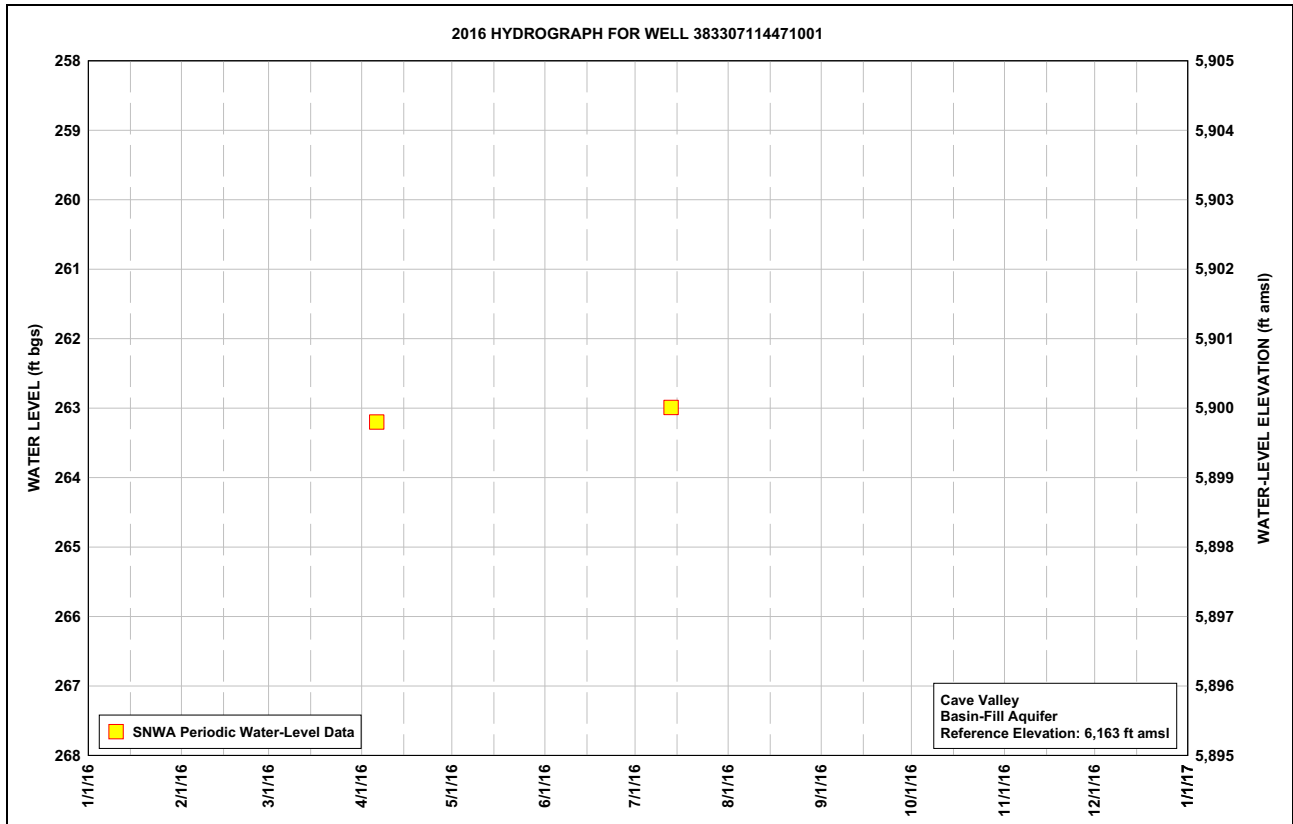
^cS = Static conditions, P = Pumping Conditions, O = Obstruction in Well.

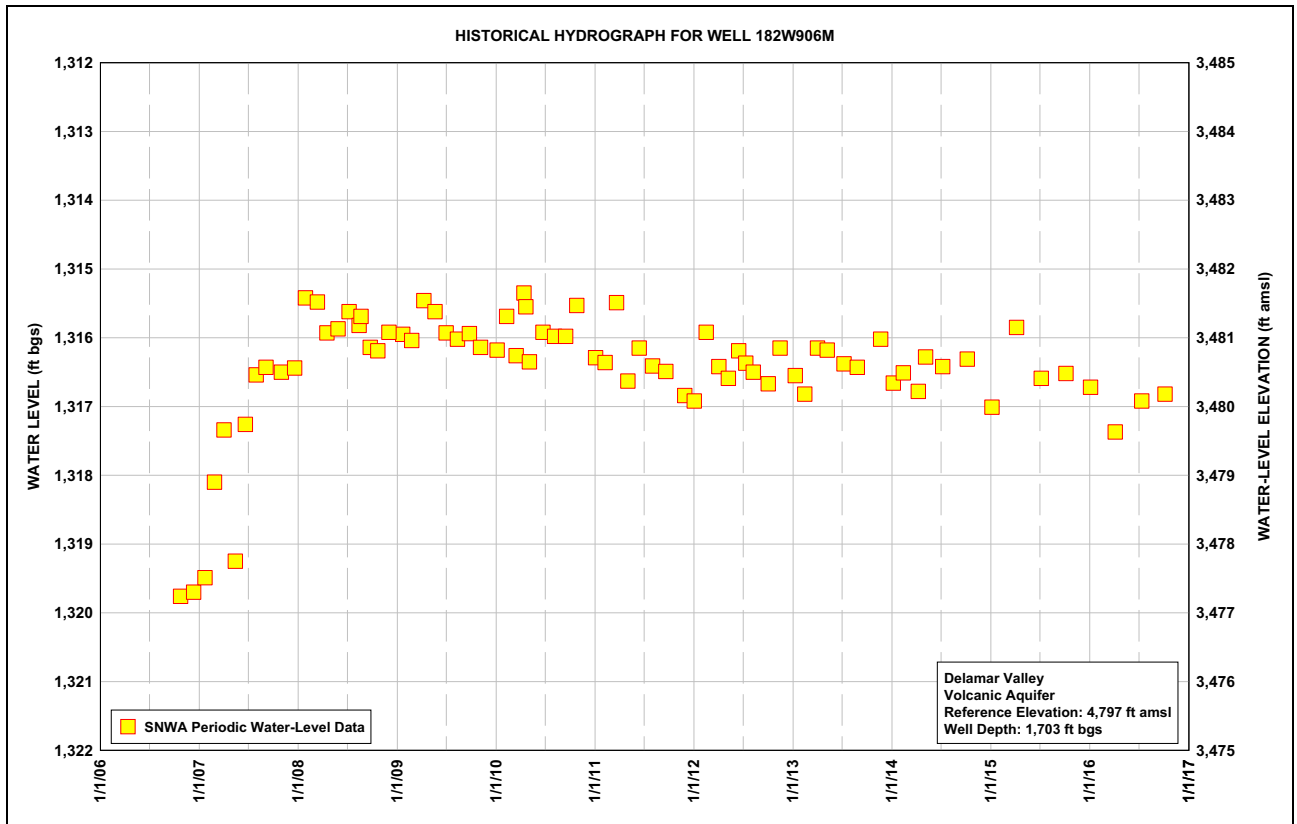
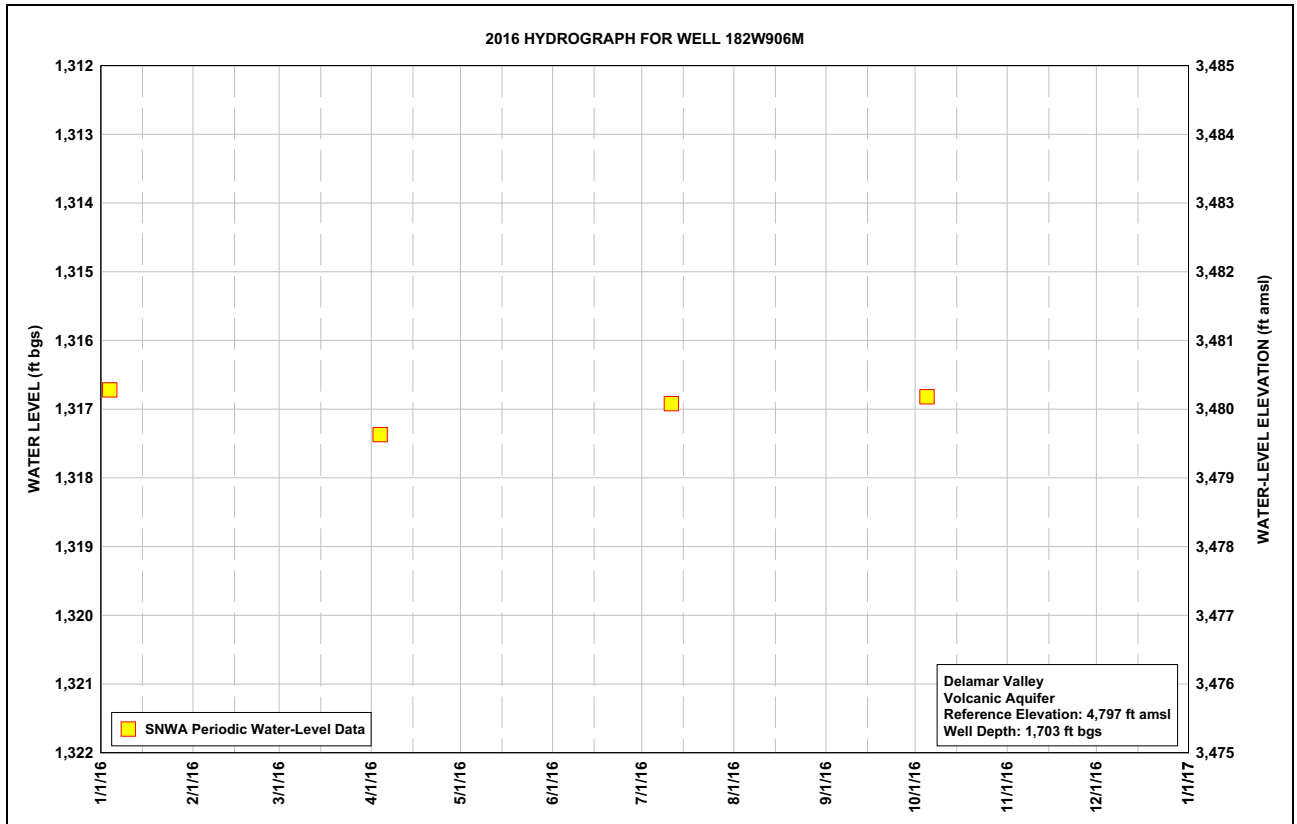
^dT = Electric tape measurement

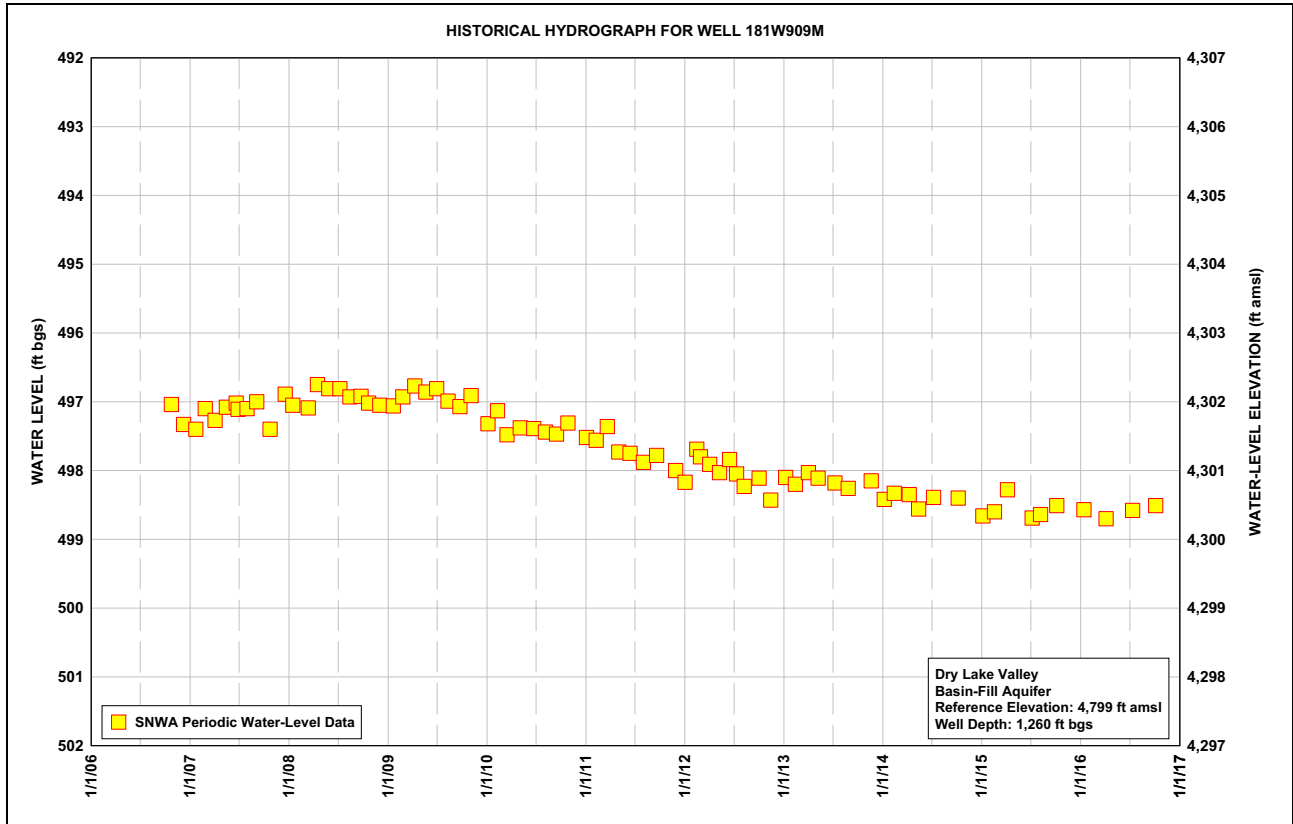
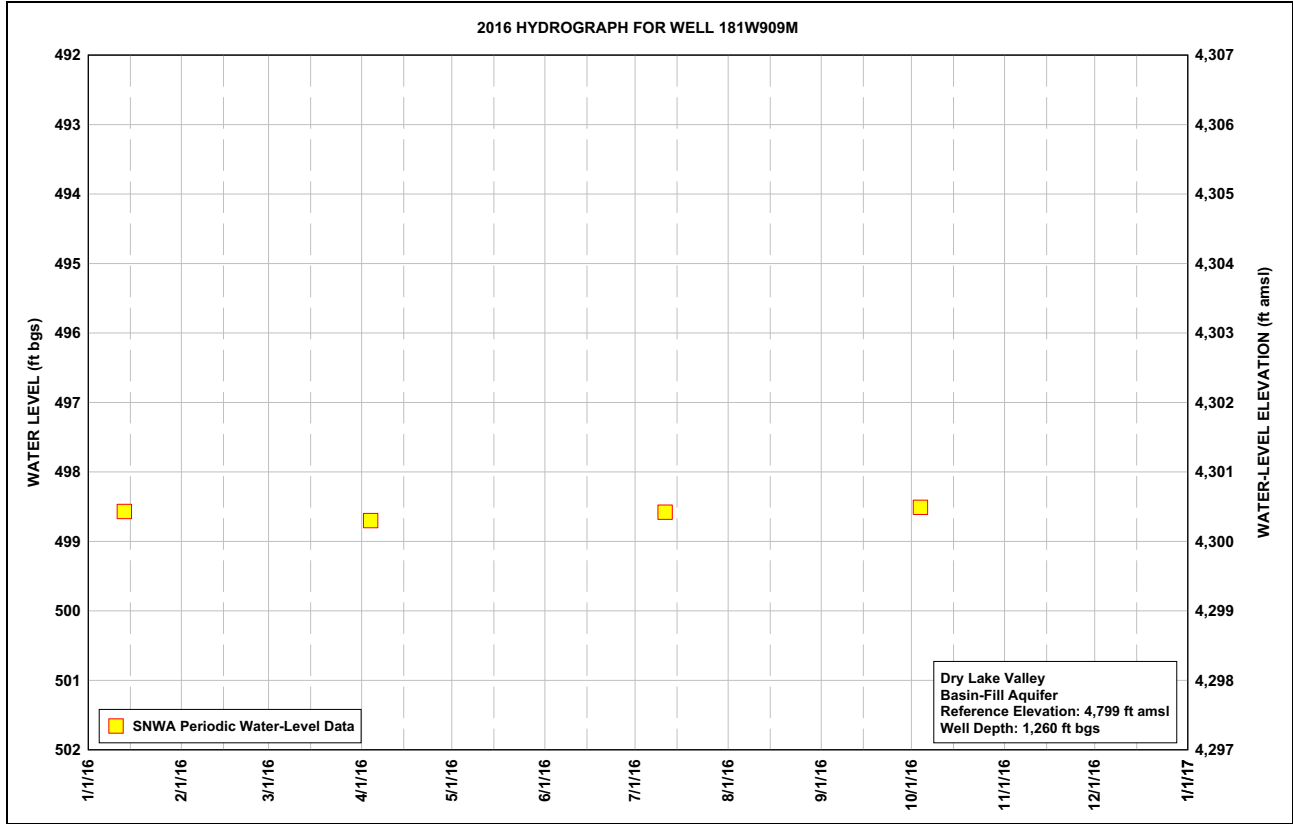
^eCurrent year and historical hydrographs with periodic and continuous data are presented in [Appendix B](#).

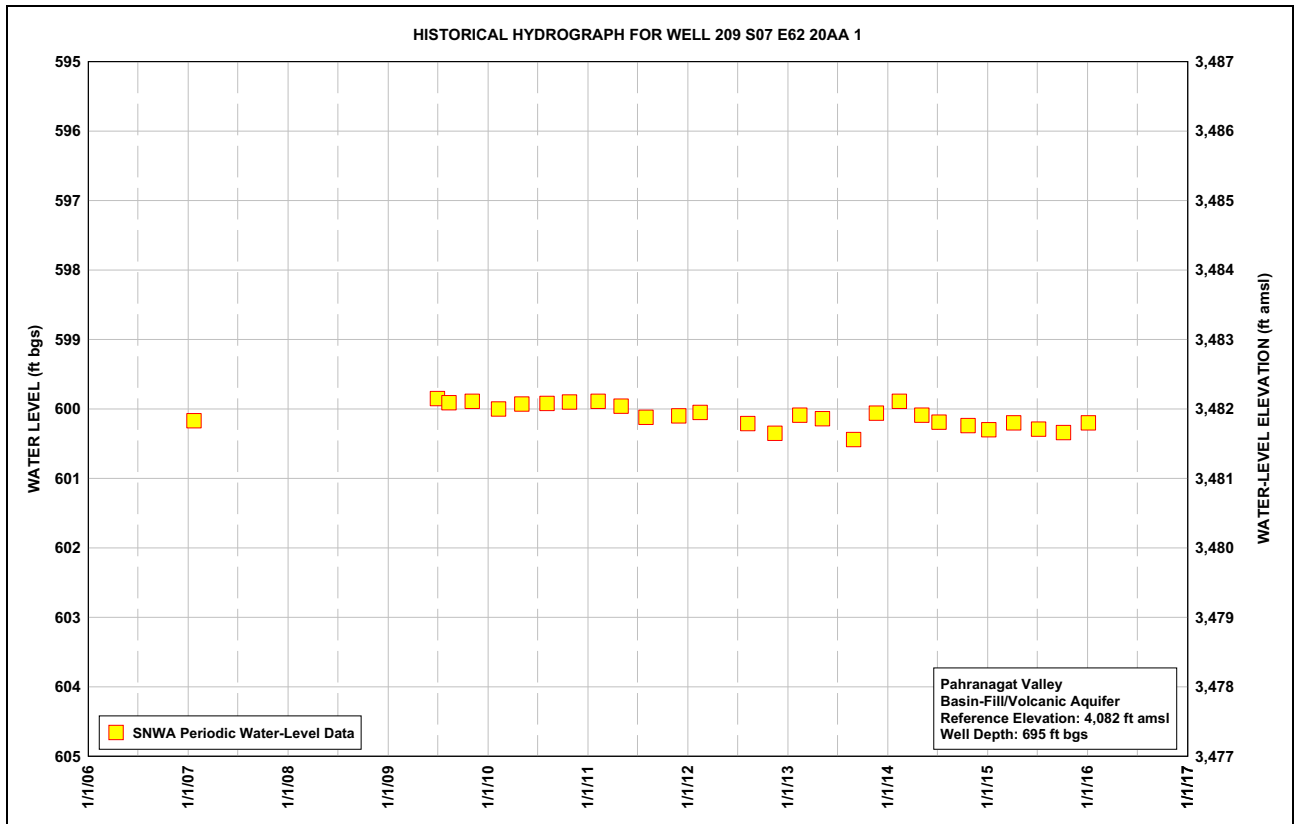
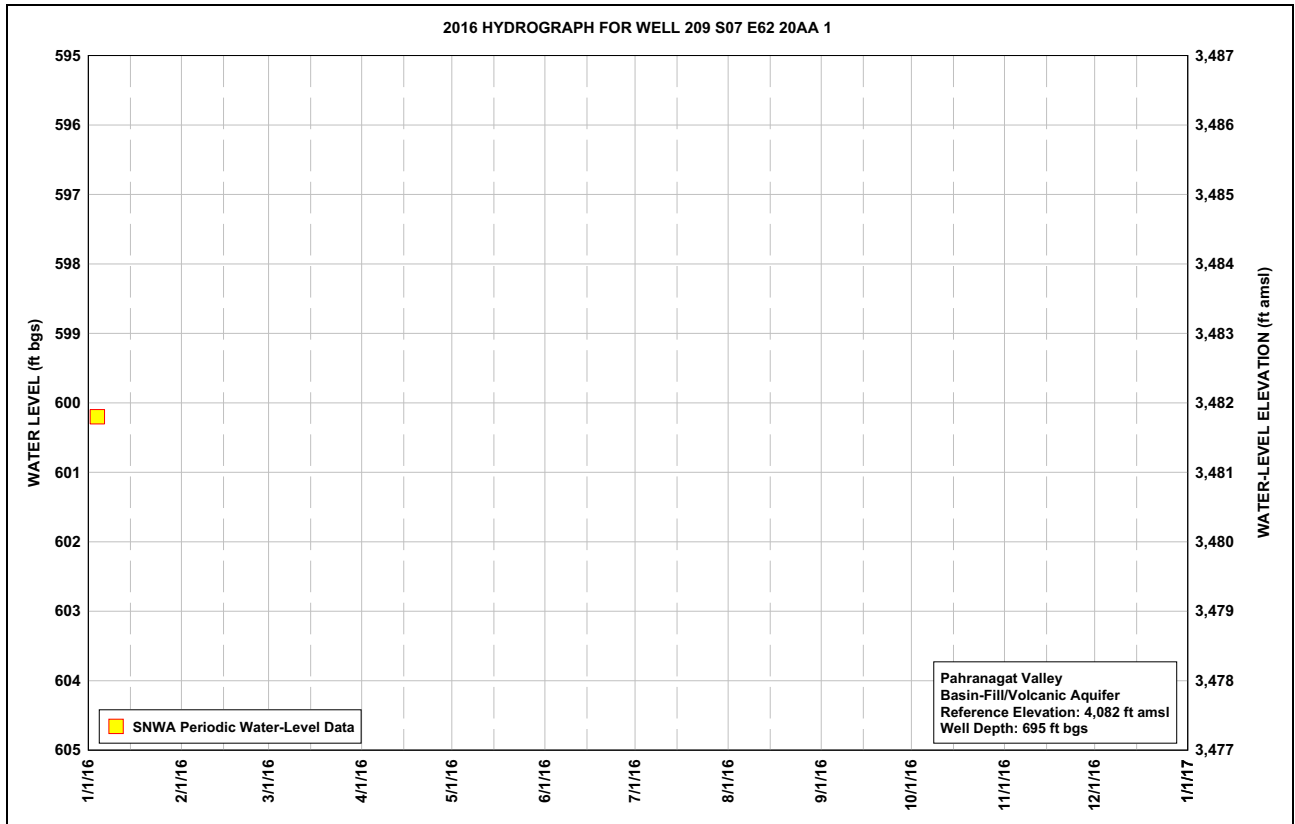
^fData unavailable.

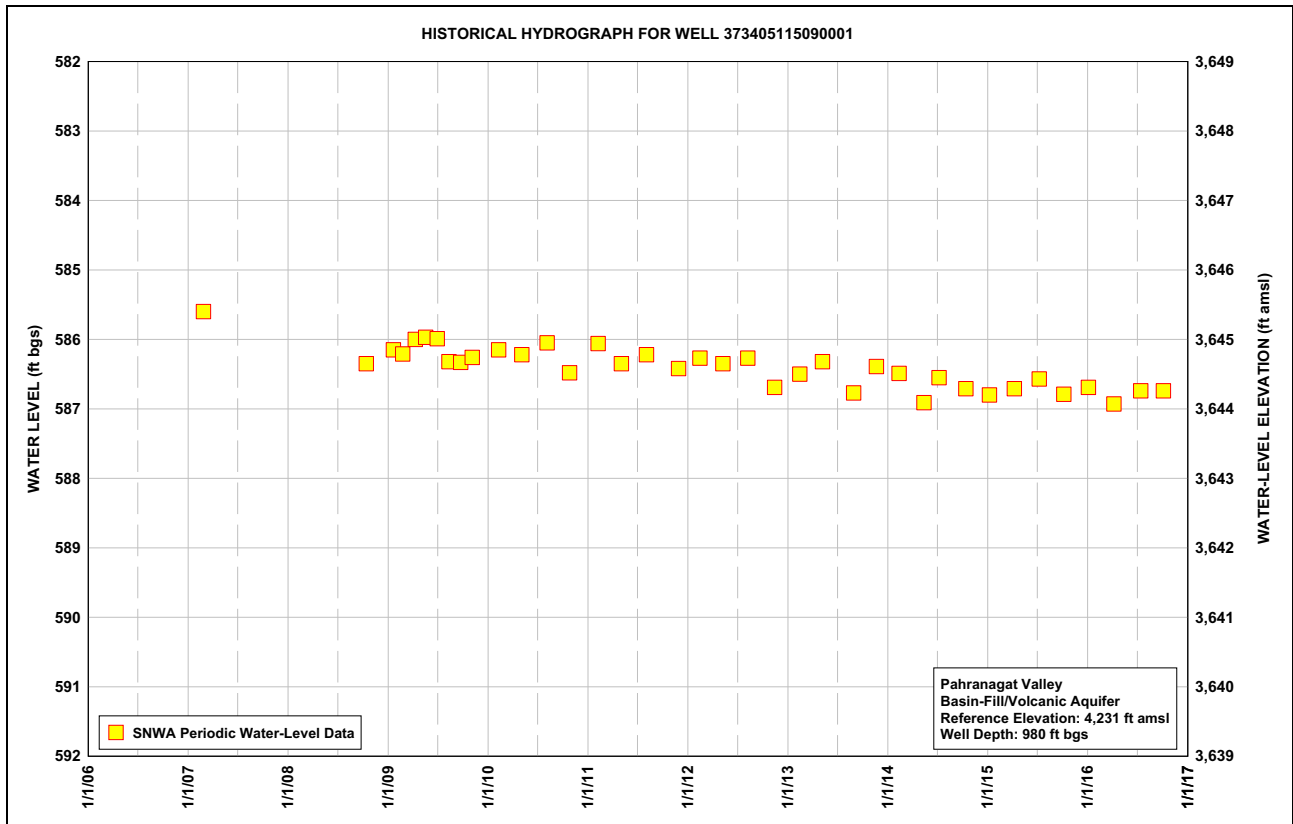
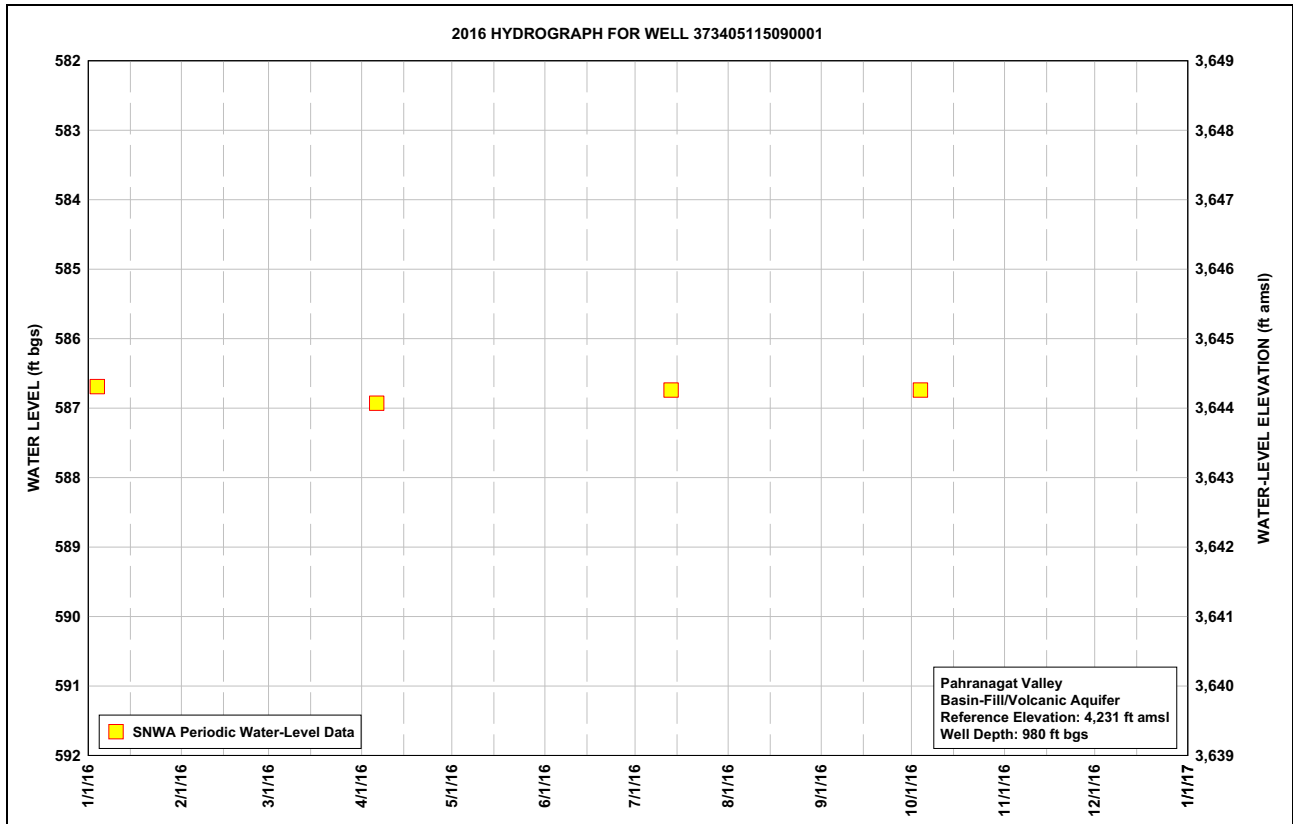


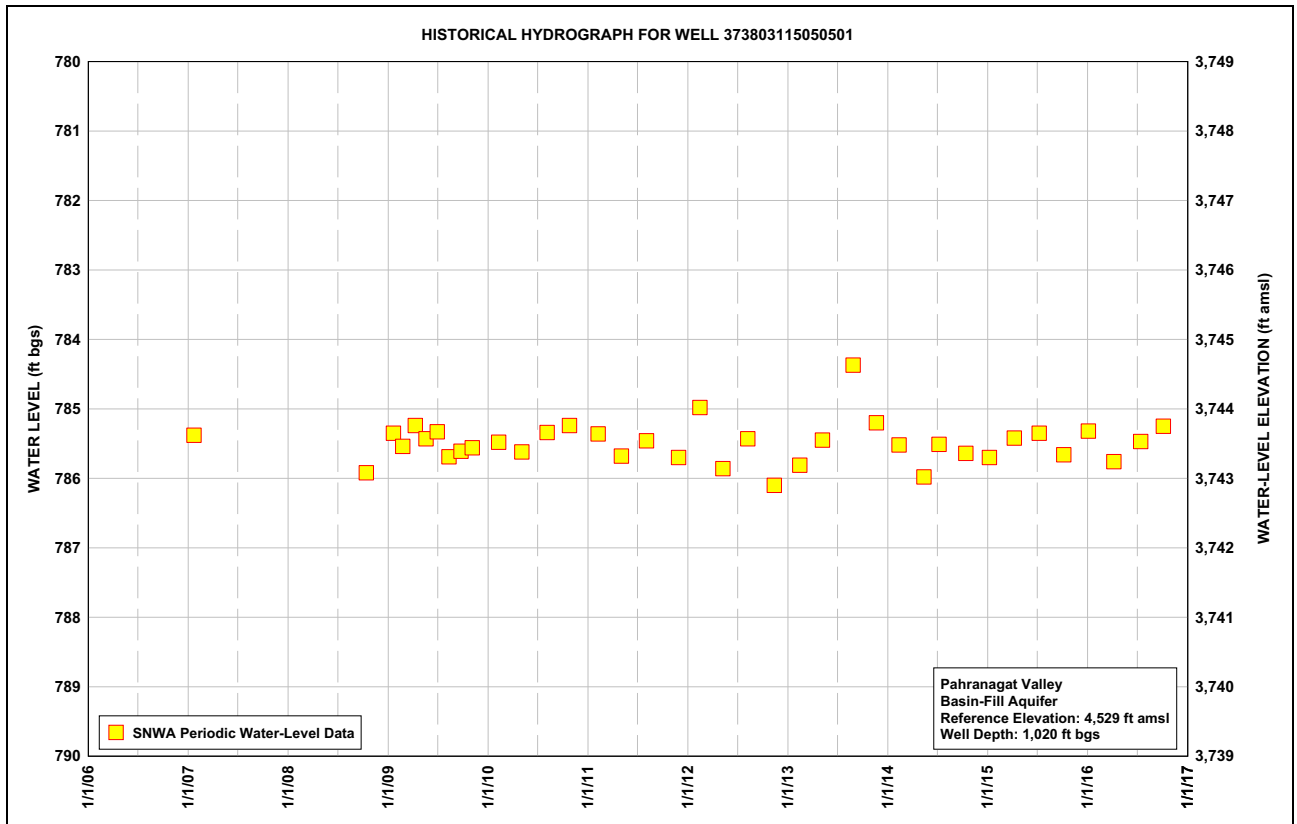
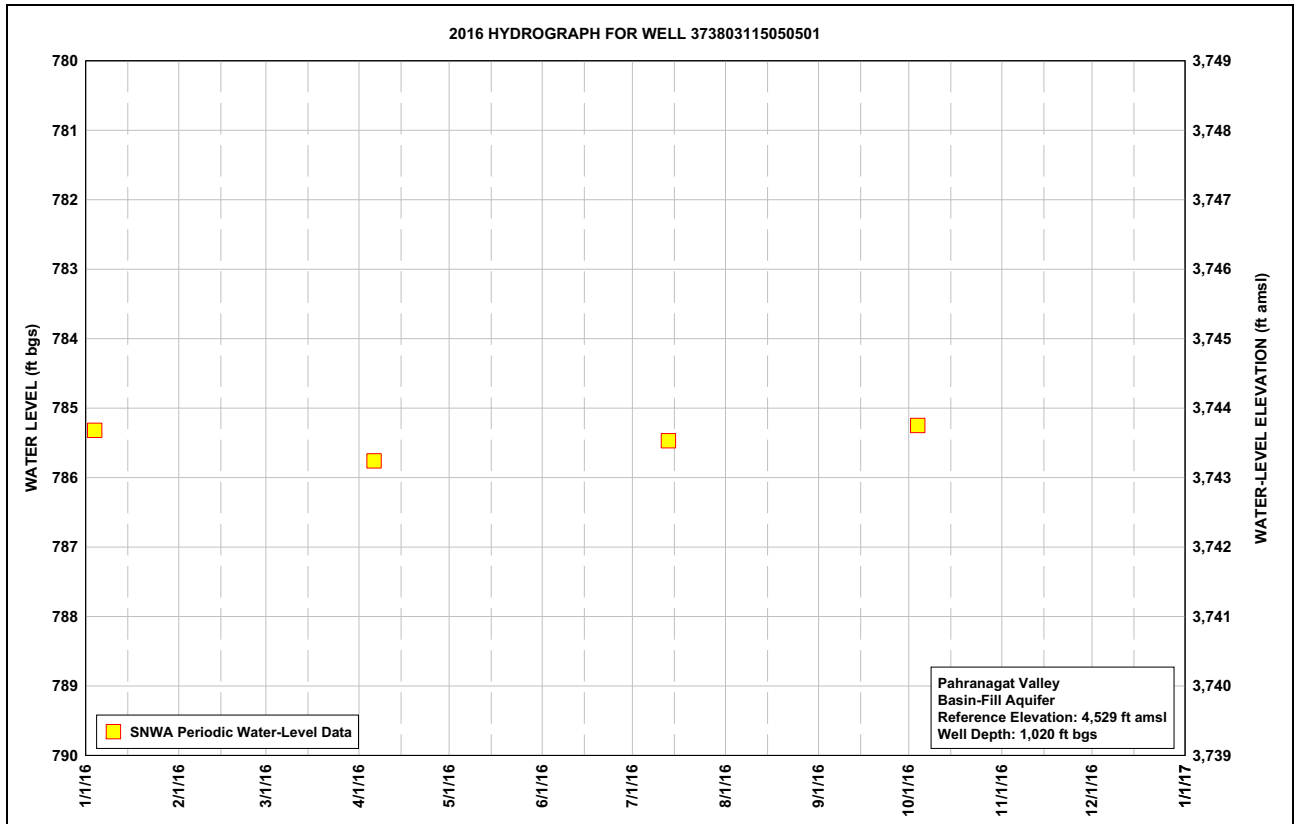


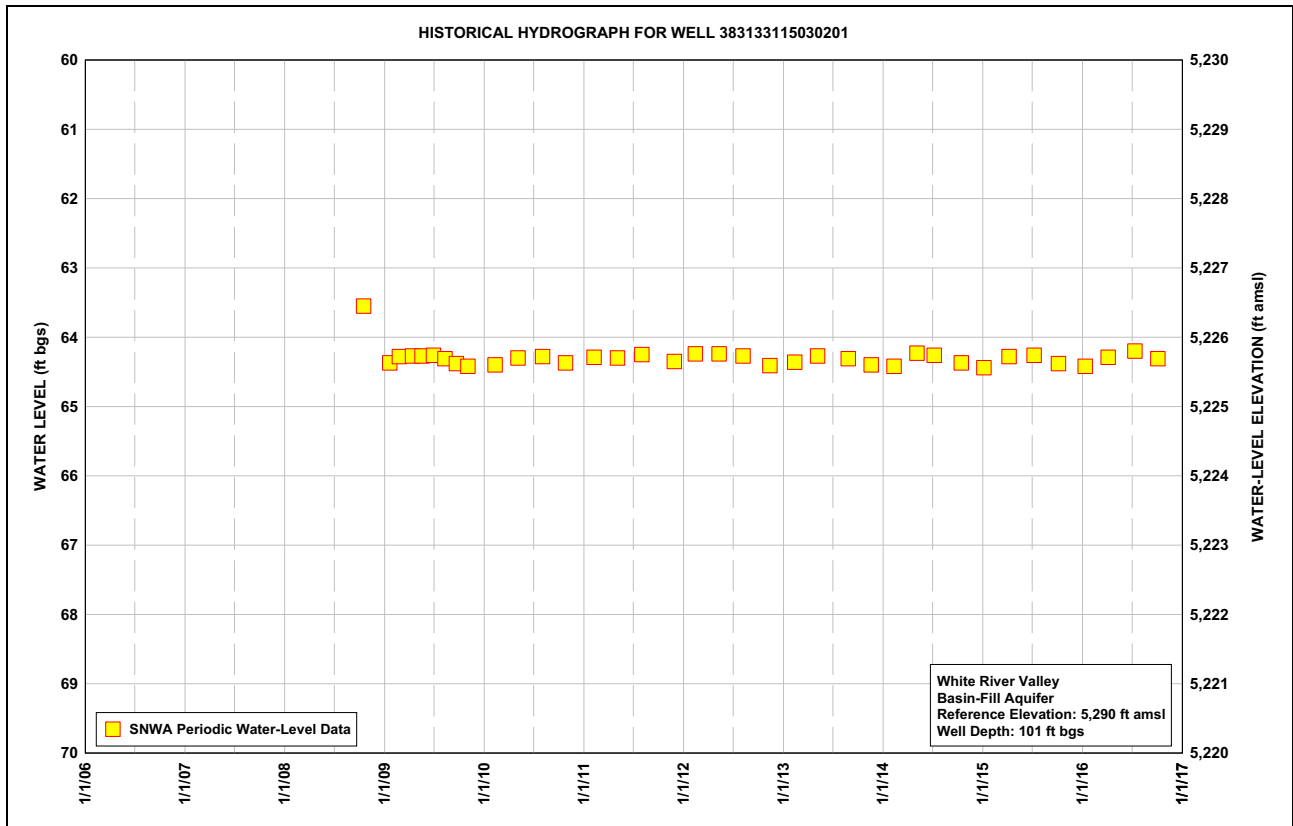
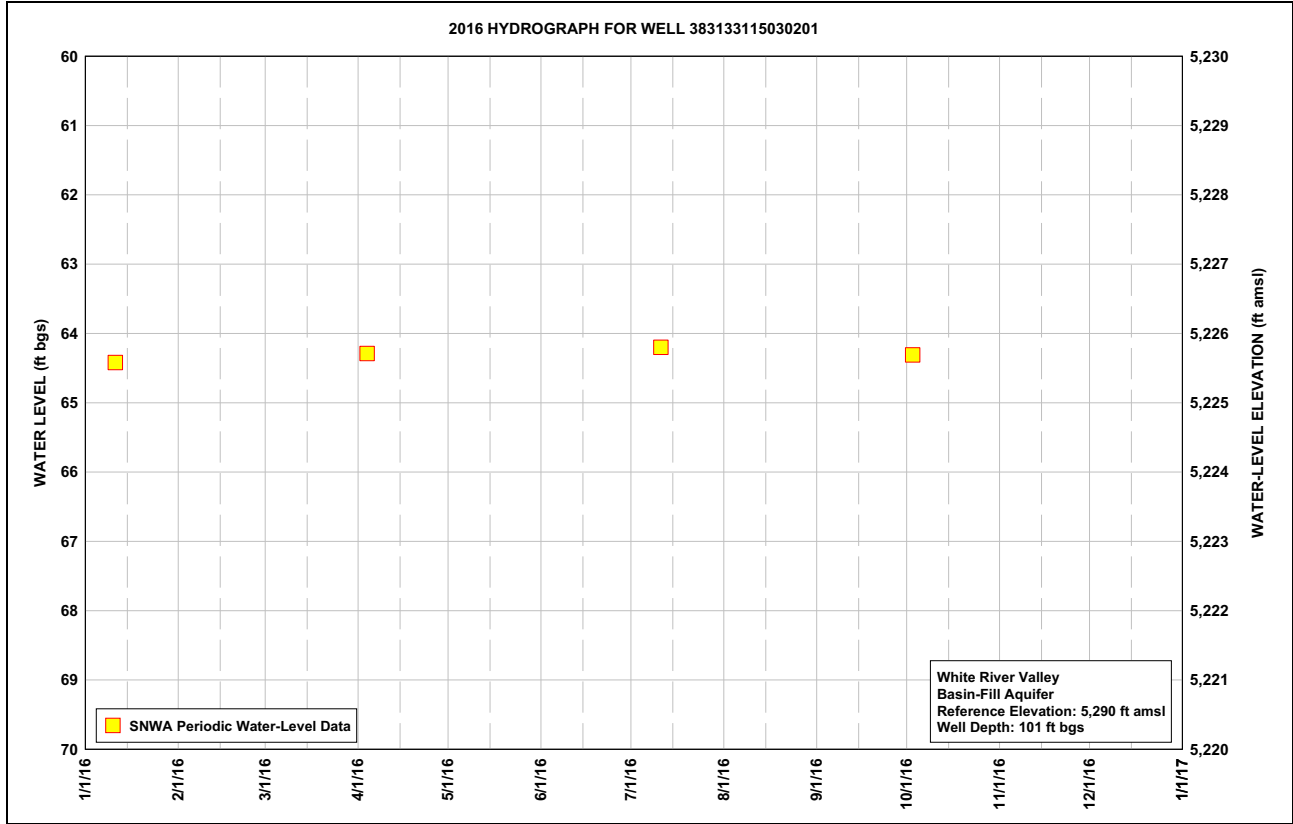


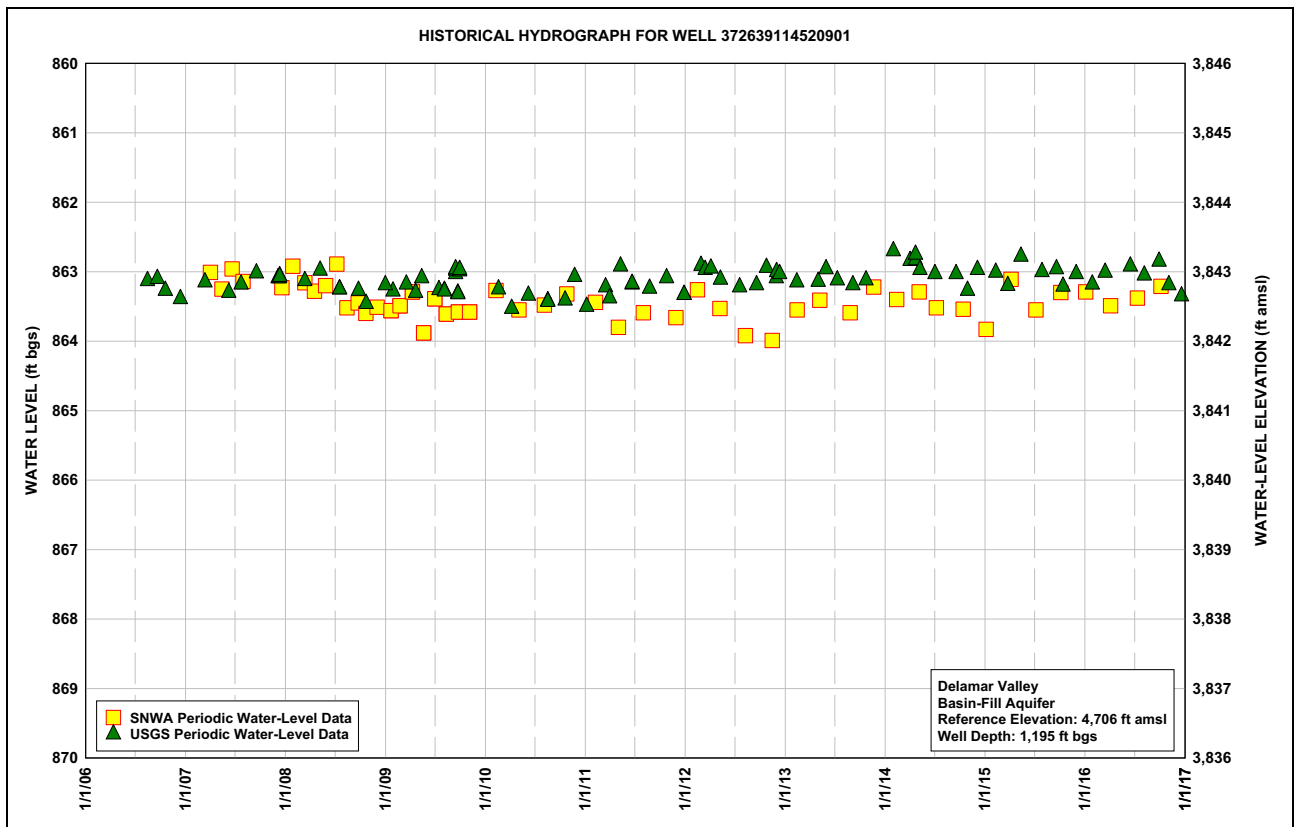
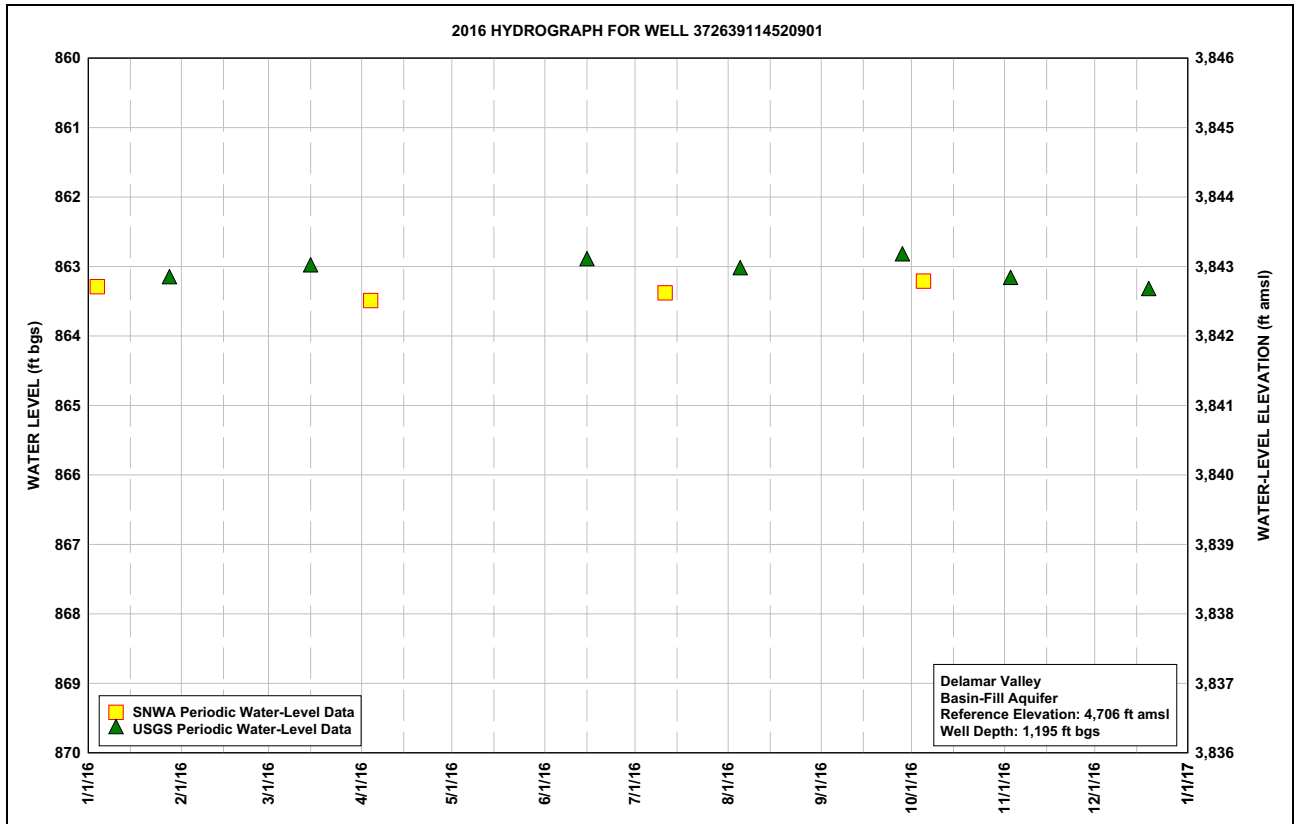














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Appendix B

DDC3M Plan
Continuous Water-Level Data

B.1.0 MONITORING PROGRAM WELLS WITH CONTINUOUS TRANSDUCER DATA

Continuous data collection was performed in CY 2016 for the following monitor wells:

- Cave Valley Well 180W902M
- Cave Valley Well 180W501M
- Delamar Valley Well 182M-1
- Dry Lake Valley Well 181M-1
- Dry Lake Valley Well 380531114534201
- Pahranaagat Valley Well 209M-1

For these sites, two hydrographs are presented that include data collected in CY 2016 and during the historical period of record. Continuous data have been corrected for temperature and transducer cable stretch.



Table B-1
Cave Valley Well 180W902M, Calendar Year 2016
Water-Level Data, Daily-Mean Values

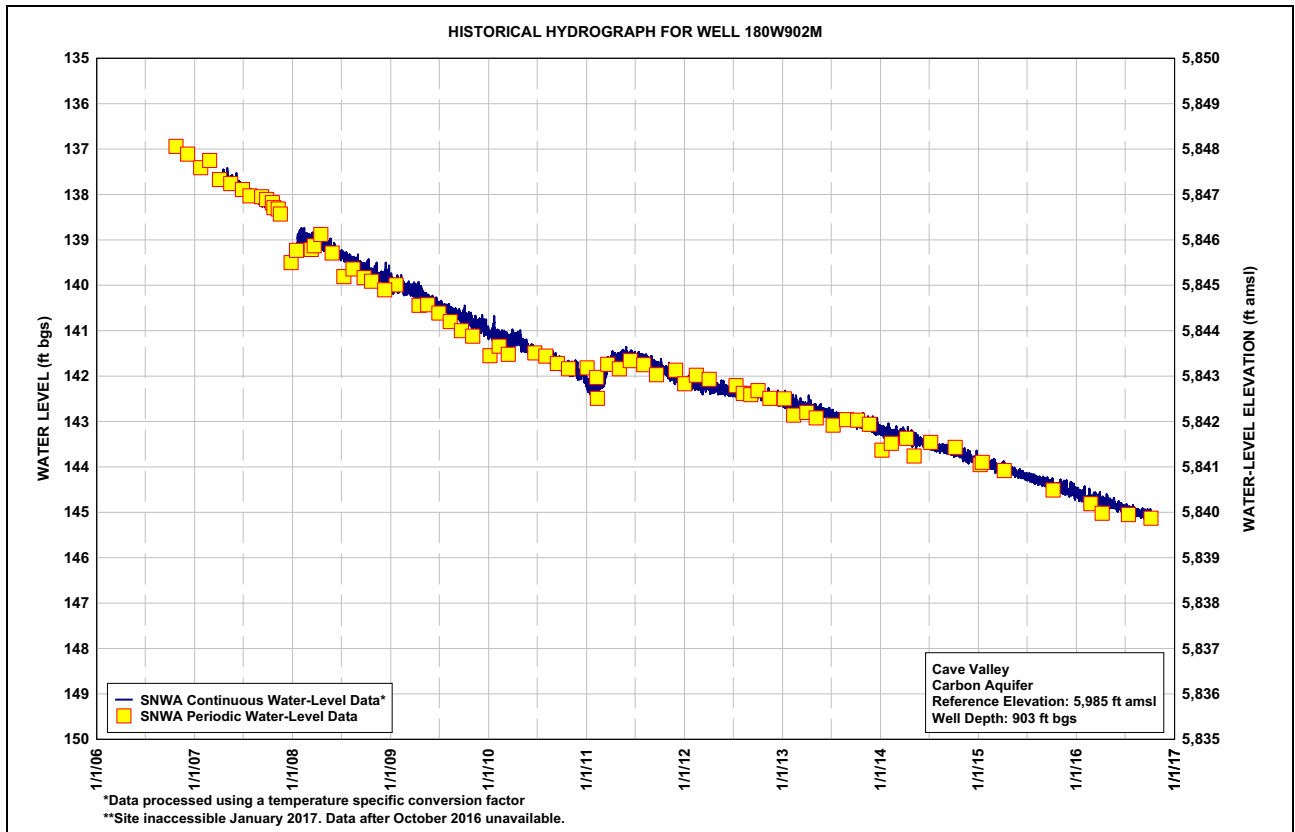
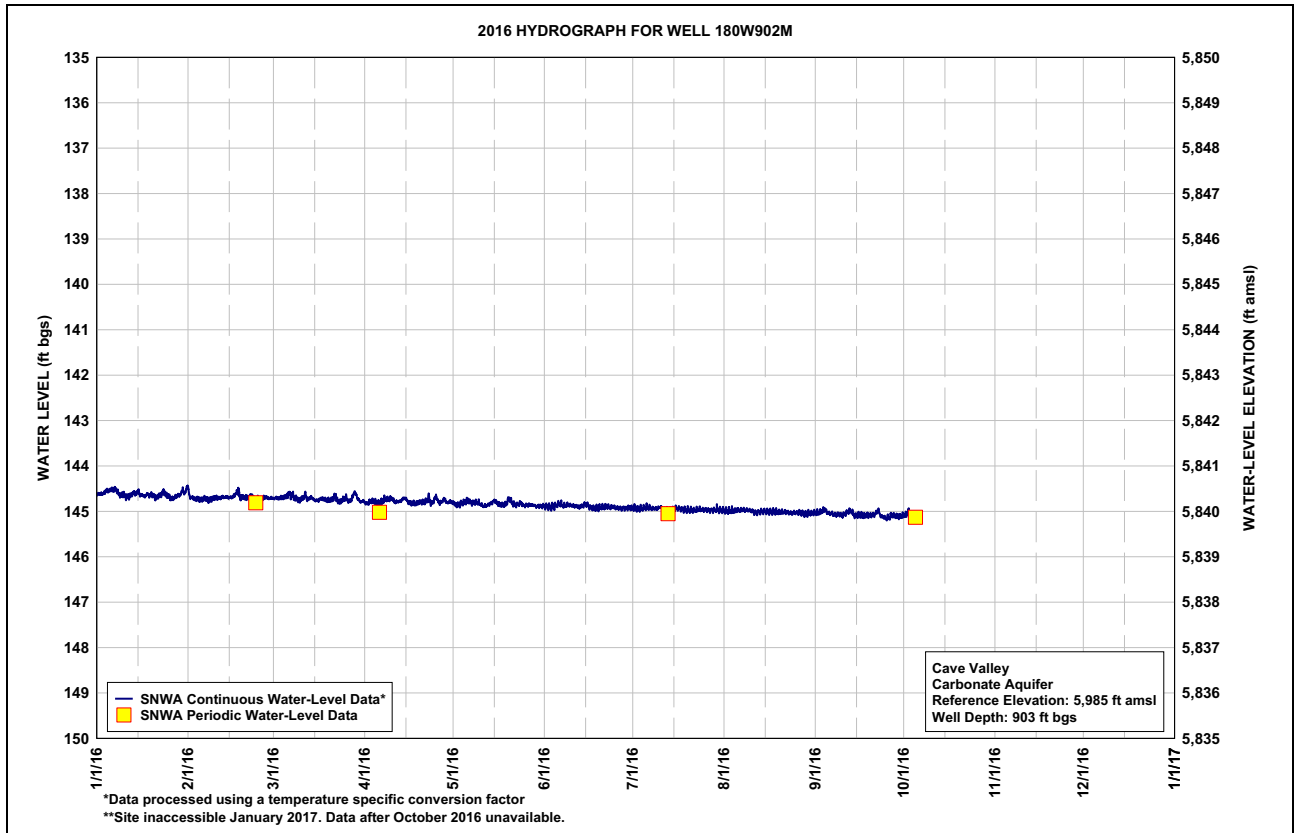
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	144.63	144.65	144.72	144.82	144.83	144.89	144.94	145.00	145.04	--- ^a	--- ^a	--- ^a
2	144.62	144.70	144.72	144.80	144.86	144.88	144.93	145.00	145.03	--- ^a	--- ^a	--- ^a
3	144.60	144.74	144.71	144.78	144.84	144.91	144.94	144.99	145.00	--- ^a	--- ^a	--- ^a
4	144.54	144.73	144.69	144.80	144.81	144.89	144.94	144.99	144.98	--- ^a	--- ^a	--- ^a
5	144.53	144.74	144.67	144.82	144.78	144.86	144.93	144.98	145.04	--- ^a	--- ^a	--- ^a
6	144.52	144.71	144.62	144.82	144.78	144.85	144.93	144.98	145.05	--- ^a	--- ^a	--- ^a
7	144.52	144.73	144.65	144.75	144.81	144.88	144.94	144.98	145.08	--- ^a	--- ^a	--- ^a
8	144.62	144.73	144.70	144.73	144.80	144.88	144.95	144.98	145.07	--- ^a	--- ^a	--- ^a
9	144.63	144.70	144.74	144.72	144.82	144.87	144.95	144.98	145.09	--- ^a	--- ^a	--- ^a
10	144.64	144.70	144.73	144.73	144.85	144.88	144.92	145.00	145.08	--- ^a	--- ^a	--- ^a
11	144.67	144.70	144.67	144.80	144.89	144.89	144.94	145.02	145.04	--- ^a	--- ^a	--- ^a
12	144.65	144.69	144.72	144.79	144.87	144.90	144.95	145.02	145.00	--- ^a	--- ^a	--- ^a
13	144.60	144.69	144.70	144.76	144.84	144.89	144.97	145.01	145.02	--- ^a	--- ^a	--- ^a
14	144.61	144.69	144.73	144.71	144.78	144.85	144.95	145.00	145.09	--- ^a	--- ^a	--- ^a
15	144.62	144.69	144.76	144.78	144.78	144.86	144.94	145.01	145.09	--- ^a	--- ^a	--- ^a
16	144.65	144.67	144.75	144.81	144.84	144.90	144.93	145.01	145.08	--- ^a	--- ^a	--- ^a
17	144.66	144.60	144.73	144.83	144.85	144.93	144.95	145.01	145.10	--- ^a	--- ^a	--- ^a
18	144.62	144.65	144.74	144.82	144.85	144.93	144.96	145.02	145.10	--- ^a	--- ^a	--- ^a
19	144.64	144.69	144.76	144.80	144.77	144.93	144.98	145.02	145.09	--- ^a	--- ^a	--- ^a
20	144.66	144.70	144.75	144.80	144.76	144.92	144.97	145.01	145.08	--- ^a	--- ^a	--- ^a
21	144.69	144.69	144.70	144.79	144.84	144.91	144.99	145.02	145.04	--- ^a	--- ^a	--- ^a
22	144.64	144.67	144.73	144.74	144.85	144.90	144.97	145.02	145.01	--- ^a	--- ^a	--- ^a
23	144.58	144.72	144.79	144.82	144.83	144.91	144.97	145.04	145.12	--- ^a	--- ^a	--- ^a
24	144.63	144.72	144.76	144.79	144.85	144.91	144.97	145.02	145.14	--- ^a	--- ^a	--- ^a
25	144.66	144.71	144.71	144.73	144.87	144.93	144.97	145.03	145.15	--- ^a	--- ^a	--- ^a
26	144.71	144.71	144.76	144.80	144.87	144.93	144.97	145.03	145.12	--- ^a	--- ^a	--- ^a
27	144.69	144.69	144.74	144.77	144.86	144.93	144.97	145.04	145.10	--- ^a	--- ^a	--- ^a
28	144.65	144.71	144.61	144.79	144.88	144.94	144.98	145.05	145.11	--- ^a	--- ^a	--- ^a
29	144.62	144.72	144.71	144.81	144.89	144.92	144.98	145.05	145.10	--- ^a	--- ^a	--- ^a
30	144.58	---	144.78	144.81	144.88	144.93	144.97	145.04	145.10	--- ^a	--- ^a	--- ^a
31	144.50	---	144.78	---	144.88	---	144.99	145.03	---	--- ^a	---	--- ^a
Max	144.71	144.74	144.79	144.83	144.89	144.94	144.99	145.05	145.15	--- ^a	--- ^a	--- ^a
Min	144.50	144.60	144.61	144.71	144.76	144.85	144.92	144.98	144.98	--- ^a	--- ^a	--- ^a

Year 2016 Statistics: Year Max ---^b, Year Min ---^b

Note: Water level in ft bgs

^aSite Inaccessible. Data currently unavailable.

^bAnnual statistics only reported for years when all valid and obtainable data are reported.





**Table B-2
Cave Valley Well 180W501M, Calendar Year 2016
Water-Level Data, Daily-Mean Values**

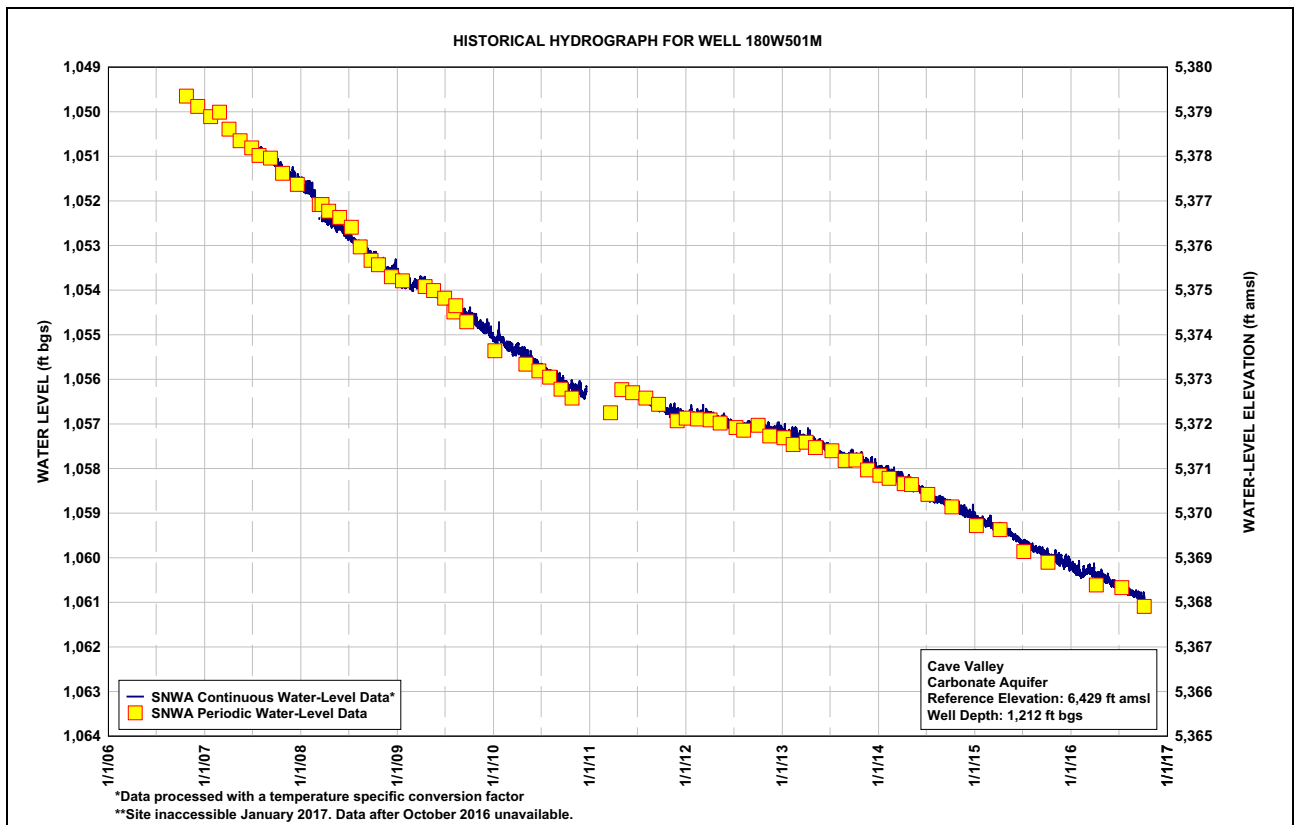
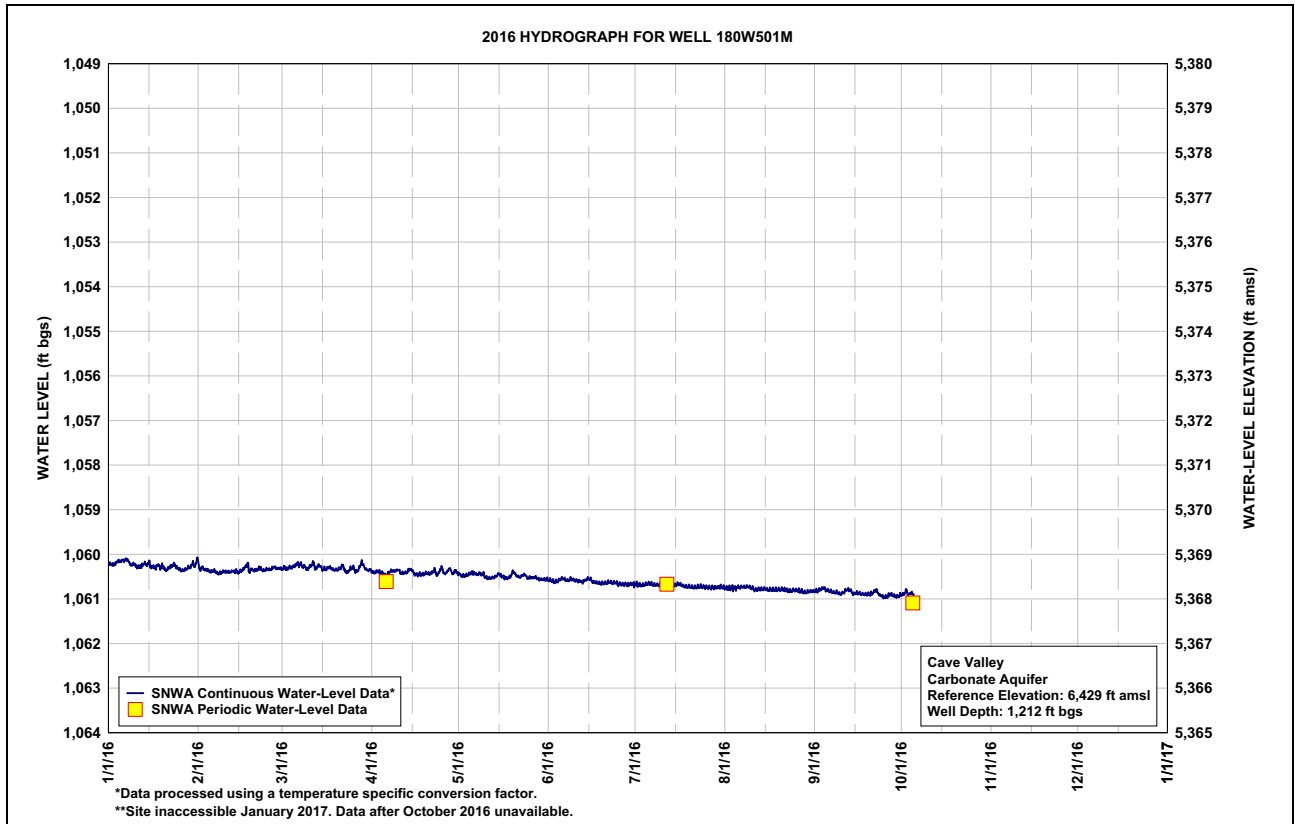
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	1,060.22	1,060.32	1,060.31	1,060.40	1,060.45	1,060.58	1,060.68	1,060.77	1,060.84	--- ^a	--- ^a	--- ^a
2	1,060.23	1,060.30	1,060.33	1,060.40	1,060.48	1,060.60	1,060.68	1,060.78	1,060.82	--- ^a	--- ^a	--- ^a
3	1,060.20	1,060.35	1,060.31	1,060.39	1,060.48	1,060.62	1,060.69	1,060.76	1,060.78	--- ^a	--- ^a	--- ^a
4	1,060.16	1,060.36	1,060.29	1,060.42	1,060.46	1,060.59	1,060.68	1,060.76	1,060.76	--- ^a	--- ^a	--- ^a
5	1,060.14	1,060.39	1,060.25	1,060.45	1,060.42	1,060.56	1,060.67	1,060.74	1,060.82	--- ^a	--- ^a	--- ^a
6	1,060.13	1,060.38	1,060.22	1,060.44	1,060.43	1,060.55	1,060.67	1,060.74	1,060.83	--- ^a	--- ^a	--- ^a
7	1,060.13	1,060.41	1,060.22	1,060.38	1,060.45	1,060.58	1,060.69	1,060.74	1,060.86	--- ^a	--- ^a	--- ^a
8	1,060.22	1,060.43	1,060.28	1,060.38	1,060.43	1,060.58	1,060.69	1,060.74	1,060.86	--- ^a	--- ^a	--- ^a
9	1,060.23	1,060.40	1,060.32	1,060.36	1,060.45	1,060.57	1,060.67	1,060.74	1,060.88	--- ^a	--- ^a	--- ^a
10	1,060.25	1,060.40	1,060.29	1,060.36	1,060.51	1,060.58	1,060.64	1,060.77	1,060.88	--- ^a	--- ^a	--- ^a
11	1,060.28	1,060.40	1,060.22	1,060.43	1,060.54	1,060.61	1,060.67	1,060.80	1,060.82	--- ^a	--- ^a	--- ^a
12	1,060.26	1,060.39	1,060.30	1,060.42	1,060.53	1,060.61	1,060.68	1,060.80	1,060.80	--- ^a	--- ^a	--- ^a
13	1,060.22	1,060.38	1,060.27	1,060.37	1,060.51	1,060.58	1,060.72	1,060.80	1,060.82	--- ^a	--- ^a	--- ^a
14	1,060.23	1,060.39	1,060.28	1,060.34	1,060.45	1,060.56	1,060.71	1,060.79	1,060.88	--- ^a	--- ^a	--- ^a
15	1,060.26	1,060.39	1,060.34	1,060.41	1,060.46	1,060.56	1,060.69	1,060.79	1,060.88	--- ^a	--- ^a	--- ^a
16	1,060.28	1,060.34	1,060.33	1,060.44	1,060.50	1,060.62	1,060.68	1,060.80	1,060.88	--- ^a	--- ^a	--- ^a
17	1,060.28	1,060.28	1,060.30	1,060.46	1,060.53	1,060.63	1,060.70	1,060.81	1,060.90	--- ^a	--- ^a	--- ^a
18	1,060.25	1,060.38	1,060.33	1,060.46	1,060.52	1,060.65	1,060.73	1,060.81	1,060.90	--- ^a	--- ^a	--- ^a
19	1,060.28	1,060.34	1,060.36	1,060.43	1,060.42	1,060.66	1,060.74	1,060.80	1,060.91	--- ^a	--- ^a	--- ^a
20	1,060.31	1,060.36	1,060.34	1,060.43	1,060.43	1,060.66	1,060.74	1,060.81	1,060.90	--- ^a	--- ^a	--- ^a
21	1,060.33	1,060.34	1,060.29	1,060.43	1,060.50	1,060.64	1,060.75	1,060.80	1,060.84	--- ^a	--- ^a	--- ^a
22	1,060.28	1,060.30	1,060.33	1,060.38	1,060.50	1,060.63	1,060.75	1,060.81	1,060.81	--- ^a	--- ^a	--- ^a
23	1,060.24	1,060.36	1,060.40	1,060.45	1,060.47	1,060.65	1,060.73	1,060.83	1,060.91	--- ^a	--- ^a	--- ^a
24	1,060.29	1,060.35	1,060.34	1,060.37	1,060.49	1,060.64	1,060.74	1,060.82	1,060.94	--- ^a	--- ^a	--- ^a
25	1,060.33	1,060.34	1,060.32	1,060.33	1,060.53	1,060.67	1,060.75	1,060.81	1,060.96	--- ^a	--- ^a	--- ^a
26	1,060.37	1,060.33	1,060.37	1,060.42	1,060.52	1,060.68	1,060.75	1,060.82	1,060.93	--- ^a	--- ^a	--- ^a
27	1,060.35	1,060.29	1,060.33	1,060.35	1,060.52	1,060.67	1,060.75	1,060.83	1,060.91	--- ^a	--- ^a	--- ^a
28	1,060.31	1,060.32	1,060.22	1,060.38	1,060.55	1,060.69	1,060.76	1,060.86	1,060.94	--- ^a	--- ^a	--- ^a
29	1,060.27	1,060.31	1,060.30	1,060.40	1,060.56	1,060.67	1,060.75	1,060.86	1,060.95	--- ^a	--- ^a	--- ^a
30	1,060.25	---	1,060.35	1,060.42	1,060.56	1,060.67	1,060.73	1,060.84	1,060.93	--- ^a	--- ^a	--- ^a
31	1,060.14	---	1,060.34	---	1,060.57	---	1,060.75	1,060.84	---	--- ^a	---	--- ^a
Max	1,060.37	1,060.43	1,060.40	1,060.46	1,060.57	1,060.69	1,060.76	1,060.86	1,060.96	--- ^a	--- ^a	--- ^a
Min	1,060.13	1,060.28	1,060.22	1,060.33	1,060.42	1,060.55	1,060.64	1,060.74	1,060.76	--- ^a	--- ^a	--- ^a

Year 2016 Statistics: Year Max ---^b; Year Min ---^b

Note: Water level in ft bgs

^aSite Inaccessible. Data currently unavailable.

^bAnnual statistics only reported for years when all valid and obtainable data are reported.





**Table B-3
Delamar Valley Well 182M-1, Calendar Year 2016
Water-Level Data, Daily-Mean Values**

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	827.12	827.04	826.96	827.13	826.95	826.92	826.94	826.92	826.89	826.87	826.83	826.80
2	827.11	827.05	826.93	827.08	827.00	826.95	826.93	826.90	826.86	826.81	826.97	826.89
3	827.05	827.05	826.93	827.01	826.91	826.96	826.92	826.89	826.81	826.91	826.90	826.88
4	826.77	827.00	826.90	826.92	826.83	826.90	826.90	826.88	826.82	826.91	826.84	826.76
5	826.74	826.99	826.86	826.95	826.78	826.82	826.86	826.85	826.92	826.92	826.79	826.72
6	826.76	826.94	826.83	826.94	826.86	826.83	826.89	826.85	826.96	826.94	826.82	826.72
7	826.76	826.95	826.87	826.76	826.92	826.91	826.92	826.85	826.98	826.90	826.92	826.95
8	826.94	826.97	827.00	826.82	826.86	826.91	826.92	826.87	826.95	826.87	826.89	826.91
9	826.95	826.91	827.06	826.82	826.89	826.90	826.93	826.88	826.94	826.86	826.84	826.86
10	826.90	826.90	826.98	826.83	826.96	826.91	826.83	826.93	826.94	826.82	826.84	826.74
11	826.95	826.90	826.85	826.96	827.00	826.92	826.88	826.96	826.88	826.83	826.85	826.80
12	826.86	826.91	827.04	826.91	826.94	826.95	826.86	826.93	826.78	826.87	826.84	826.80
13	826.78	826.88	826.96	826.83	826.87	826.90	826.92	826.89	826.87	826.86	826.87	826.83
14	826.80	826.92	826.98	826.74	826.80	826.83	826.89	826.87	827.00	826.78	826.85	826.81
15	826.84	826.92	827.06	826.89	826.80	826.85	826.83	826.88	826.95	826.77	826.73	826.71
16	826.94	826.84	827.01	826.98	826.92	826.98	826.82	826.90	826.93	826.78	826.61	826.56
17	826.91	826.77	826.92	826.96	826.96	826.98	826.88	826.90	826.95	826.87	826.95	827.01
18	826.80	826.90	826.99	826.90	826.91	826.97	826.91	826.92	826.94	826.91	826.92	827.02
19	826.89	826.98	827.02	826.84	826.76	826.95	826.91	826.89	826.91	826.99	826.81	826.94
20	826.90	826.97	826.98	826.84	826.77	826.93	826.89	826.88	826.91	826.86	826.77	826.79
21	826.96	826.93	826.91	826.85	826.95	826.89	826.90	826.91	826.85	826.77	826.71	826.77
22	826.81	826.88	826.97	826.79	826.95	826.87	826.88	826.92	826.76	826.79	826.93	826.70
23	826.74	827.00	827.14	826.93	826.85	826.91	826.84	826.95	827.01	826.88	826.84	826.71
24	826.90	826.97	826.98	826.81	826.93	826.89	826.87	826.89	827.04	826.88	826.93	826.53
25	826.96	826.95	826.91	826.74	826.95	826.94	826.89	826.86	827.01	826.87	826.80	826.98
26	827.01	826.94	827.05	826.94	826.91	826.95	826.87	826.90	826.92	826.86	826.61	827.04
27	826.92	826.88	827.02	826.83	826.87	826.93	826.86	826.94	826.88	826.79	826.75	826.87
28	826.84	826.94	826.75	826.85	826.92	826.93	826.88	826.95	826.93	826.78	826.77	826.86
29	826.79	826.94	826.98	826.92	826.94	826.90	826.86	826.91	826.97	826.86	826.92	826.87
30	826.70	---	827.11	826.87	826.90	826.90	826.86	826.88	826.91	826.77	826.82	826.65
31	826.68	---	827.08	---	826.91	---	826.90	826.87	---	826.81	---	826.68
Max	827.12	827.05	827.14	827.13	827.00	826.98	826.94	826.96	827.04	826.99	826.97	827.04
Min	826.68	826.77	826.75	826.74	826.76	826.82	826.82	826.85	826.76	826.77	826.61	826.53

Year 2016 Statistics: Year Max 827.14; Year Min 826.53

Note: Water level in ft bgs

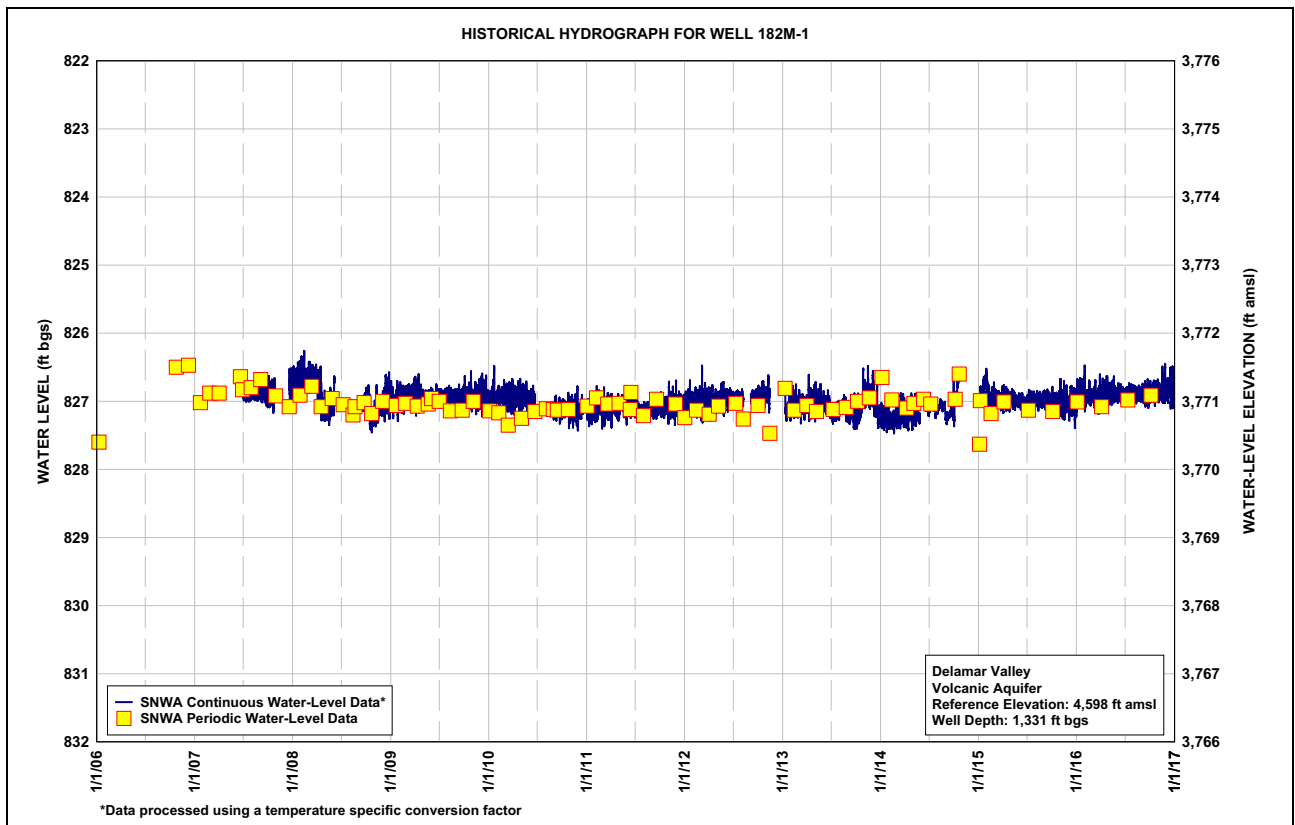
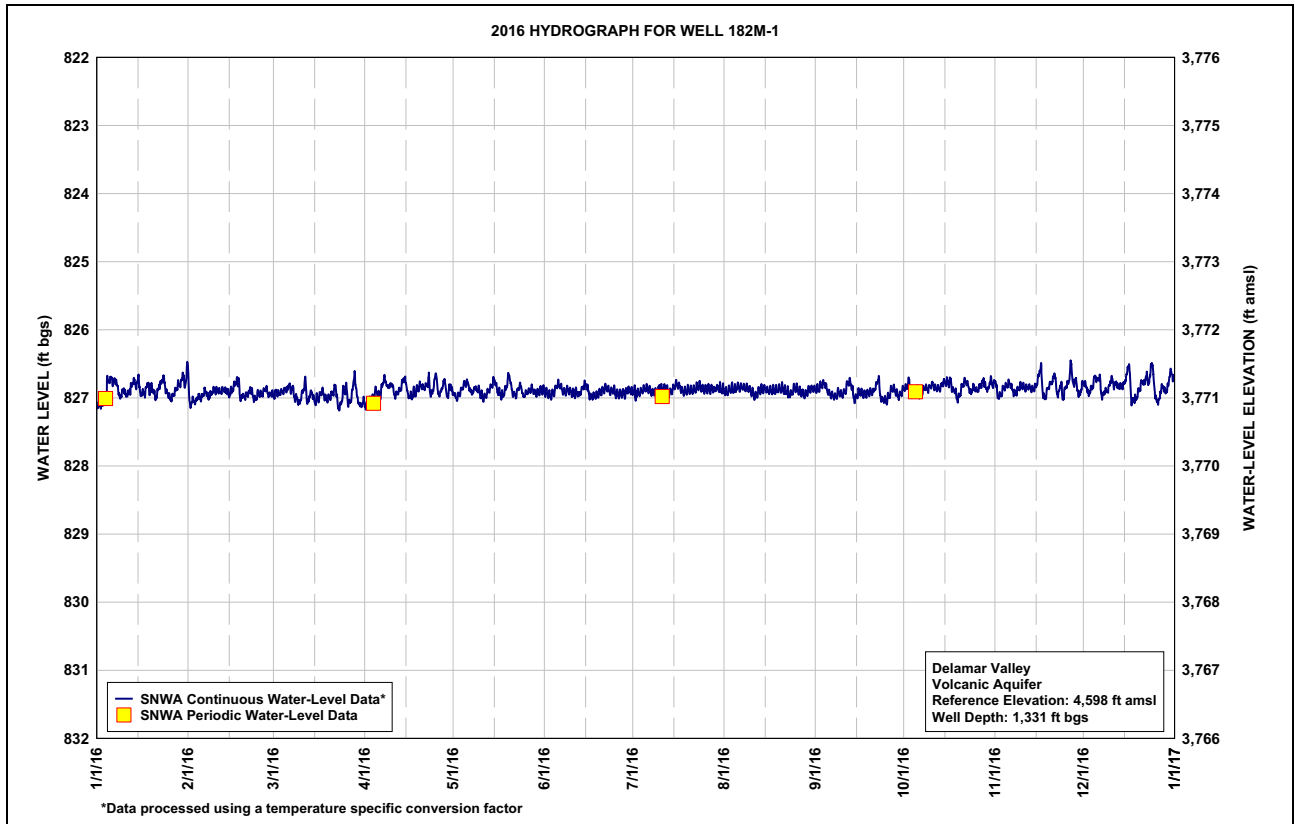


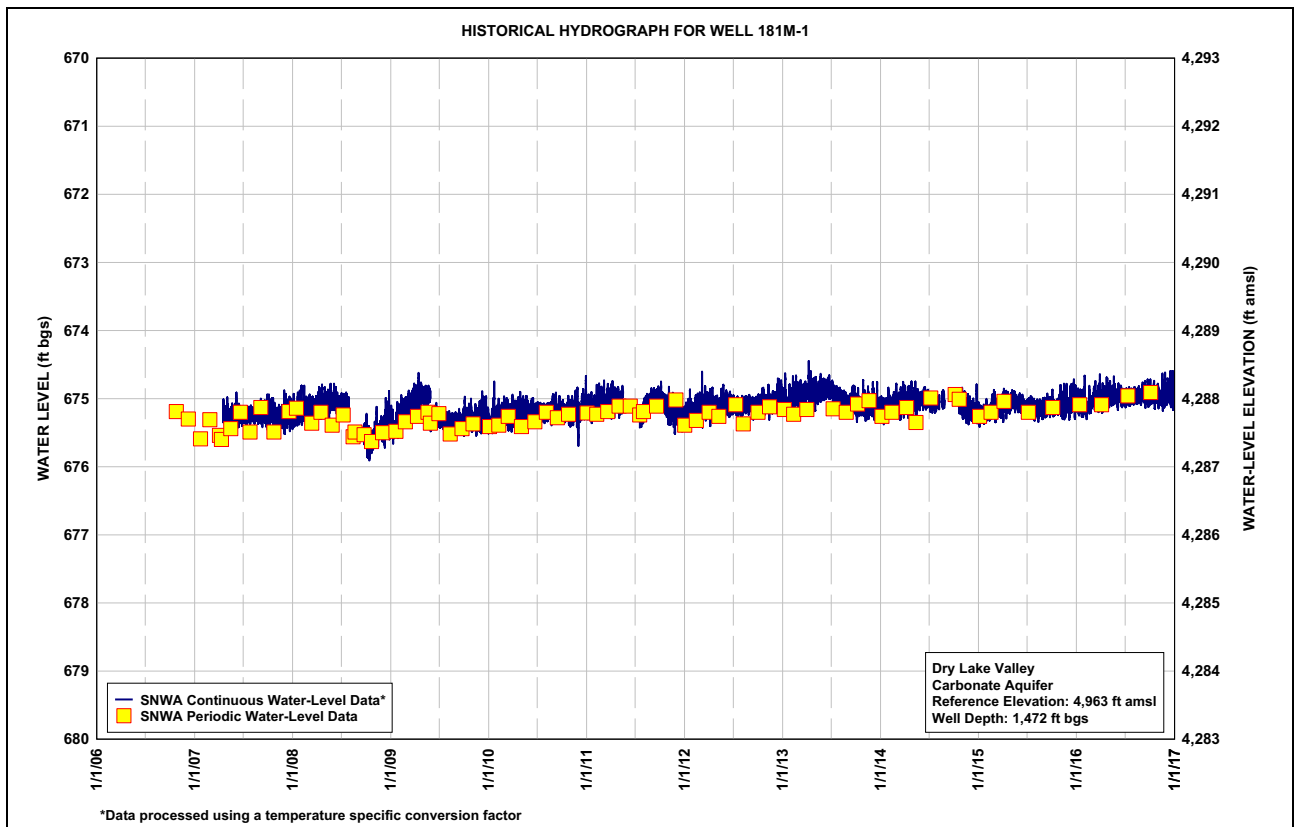
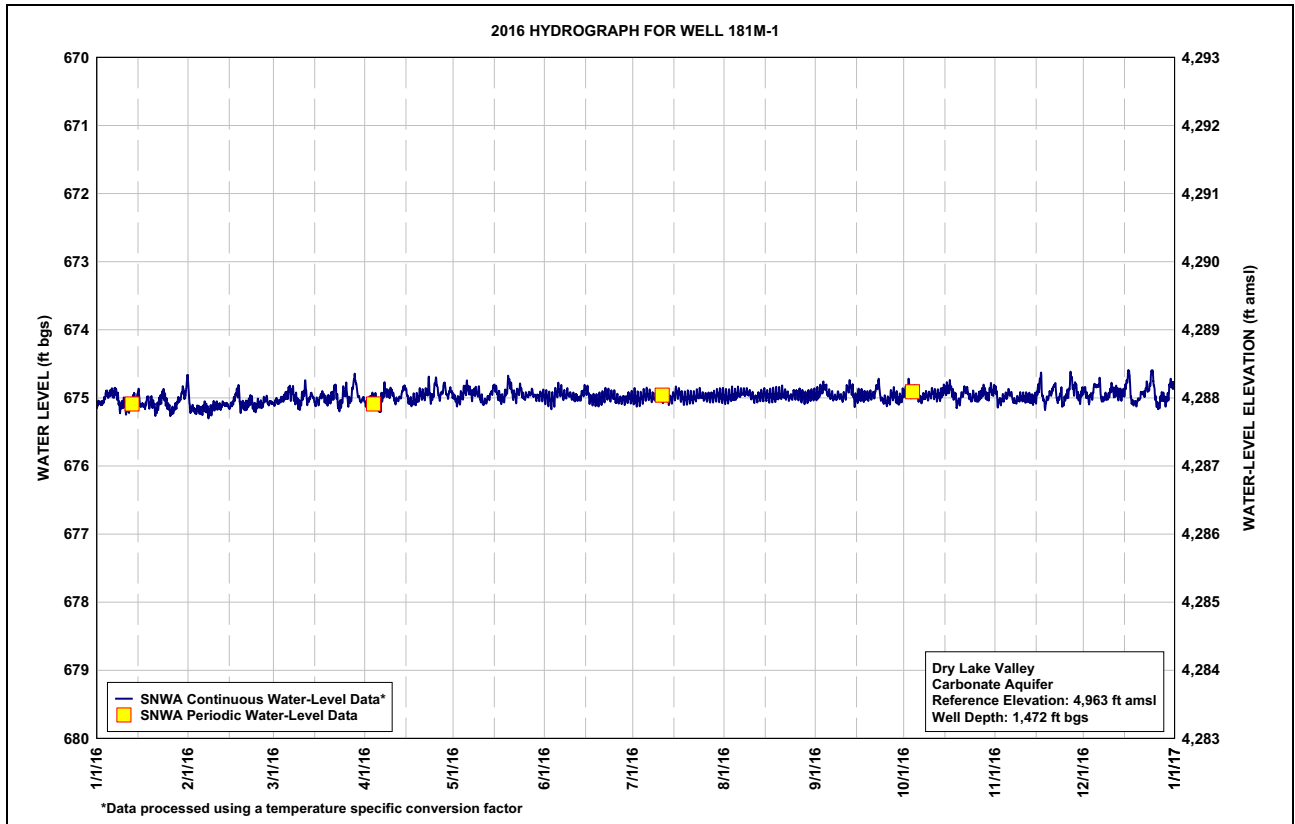


Table B-4
Dry Lake Valley Well 181M-1, Calendar Year 2016
Water-Level Data, Daily-Mean Values

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	675.09	675.08	675.08	675.09	675.00	674.98	675.03	675.00	674.96	674.92	674.92	674.88
2	675.09	675.14	675.06	675.05	675.04	675.01	675.02	675.00	674.93	674.85	675.06	674.99
3	675.03	675.19	675.04	675.00	674.99	675.04	675.01	674.98	674.87	674.92	675.02	674.97
4	674.94	675.15	675.00	675.03	674.93	675.00	674.98	674.98	674.85	674.91	674.99	674.87
5	674.94	675.19	674.96	675.07	674.86	674.92	674.96	674.95	674.94	674.94	674.94	674.82
6	674.93	675.14	674.89	675.09	674.89	674.91	674.96	674.95	674.99	675.03	674.96	674.80
7	674.91	675.17	674.92	674.93	674.94	674.96	675.00	674.94	675.00	675.00	675.05	675.04
8	675.07	675.19	675.01	674.93	674.90	674.99	675.01	674.94	674.97	674.97	675.04	675.00
9	675.11	675.14	675.07	674.92	674.92	674.95	675.02	674.94	674.98	674.96	675.01	674.98
10	675.10	675.12	675.04	674.93	675.03	674.98	674.91	674.98	674.97	674.94	675.00	674.88
11	675.15	675.12	674.91	675.04	675.09	674.99	674.99	674.99	674.92	674.94	675.00	674.91
12	675.08	675.11	675.04	675.02	675.04	675.01	674.96	674.98	674.84	674.97	675.00	674.90
13	674.98	675.09	674.99	674.94	674.97	674.96	675.02	674.97	674.89	674.96	675.02	674.93
14	675.02	675.11	674.99	674.85	674.87	674.88	674.99	674.96	675.01	674.90	675.01	674.92
15	675.02	675.12	675.07	674.97	674.86	674.90	674.94	674.97	674.99	674.87	674.91	674.81
16	675.11	675.05	675.04	675.05	674.97	675.01	674.93	674.97	674.97	674.85	674.74	674.66
17	675.11	674.94	674.96	675.06	675.01	675.02	674.97	674.97	674.99	674.92	675.03	675.05
18	675.01	675.01	675.01	675.04	674.98	675.04	675.01	674.98	674.98	674.97	675.03	675.07
19	675.08	675.10	675.04	674.97	674.84	675.03	675.01	674.96	674.97	675.06	674.95	675.03
20	675.10	675.11	675.01	674.94	674.82	675.00	675.00	674.95	674.96	674.98	674.89	674.94
21	675.16	675.09	674.91	674.95	674.95	674.97	675.00	674.96	674.88	674.89	674.83	674.94
22	675.04	675.03	674.97	674.87	674.96	674.95	674.99	674.98	674.83	674.91	675.03	674.86
23	674.94	675.12	675.11	675.00	674.89	674.99	674.97	674.99	675.01	675.00	674.96	674.83
24	675.05	675.12	675.02	674.94	674.94	674.98	674.99	674.94	675.05	674.98	675.04	674.62
25	675.13	675.10	674.92	674.82	674.99	675.04	674.99	674.94	675.06	675.00	674.97	675.00
26	675.20	675.09	675.03	674.97	674.97	675.04	674.97	674.96	674.99	674.99	674.75	675.11
27	675.15	675.02	675.02	674.91	674.94	675.01	674.97	674.99	674.95	674.92	674.85	675.00
28	675.06	675.08	674.74	674.90	674.96	675.02	674.98	675.00	674.98	674.89	674.83	675.00
29	675.01	675.07	674.92	674.95	674.98	674.99	674.97	674.99	675.03	674.98	674.98	675.00
30	674.91	---	675.04	674.91	674.96	675.01	674.96	674.96	674.98	674.89	674.92	674.81
31	674.83	---	675.02	---	674.97	---	674.98	674.95	---	674.90	---	674.81
Max	675.20	675.19	675.11	675.09	675.09	675.04	675.03	675.00	675.06	675.06	675.06	675.11
Min	674.83	674.94	674.74	674.82	674.82	674.88	674.91	674.94	674.83	674.85	674.74	674.62

Year 2016 Statistics: Year Max 675.20; Year Min 674.62

Note: Water level in ft bgs





**Table B-5
Dry Lake Valley Well 380531114534201, Calendar Year 2016
Water-Level Data, Daily-Mean Values**

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	844.35	843.87	844.15	844.34	--- ^a	--- ^a	844.09	844.05	843.99	843.94	843.90	844.04
2	844.31	844.21	844.13	844.37	--- ^a	--- ^a	844.10	844.09	843.94	843.79	844.18	844.16
3	844.21	844.41	844.10	844.27	--- ^a	--- ^a	844.12	844.03	843.82	843.81	844.24	844.22
4	844.02	844.47	844.04	--- ^a	--- ^a	--- ^a	844.06	843.97	843.74	843.81	844.16	844.09
5	843.94	844.52	843.95	--- ^a	--- ^a	--- ^a	843.99	843.92	843.87	843.81	844.04	843.91
6	843.89	844.44	843.84	--- ^a	--- ^a	--- ^a	843.96	843.89	843.97	843.99	844.01	843.86
7	843.88	844.45	843.84	--- ^a	--- ^a	--- ^a	844.01	843.86	844.08	844.06	844.15	844.15
8	844.11	844.47	844.00	--- ^a	--- ^a	--- ^a	844.05	843.87	844.11	844.02	844.22	844.23
9	844.30	844.35	844.19	--- ^a	--- ^a	--- ^a	844.07	843.87	844.13	844.01	844.15	844.26
10	844.36	844.26	844.23	--- ^a	--- ^a	--- ^a	843.93	843.95	844.15	843.94	844.10	844.08
11	844.46	844.22	843.99	--- ^a	--- ^a	--- ^a	844.00	844.07	844.02	843.91	844.09	844.07
12	844.41	844.18	--- ^a	--- ^a	--- ^a	--- ^a	843.94	844.10	843.81	843.96	844.08	844.07
13	844.18	844.13	844.08	844.12	--- ^a	--- ^a	844.07	844.06	843.80	843.96	844.11	844.11
14	844.12	844.14	--- ^a	--- ^a	--- ^a	--- ^a	844.09	844.01	844.02	843.85	844.11	844.11
15	844.09	844.17	844.24	--- ^a	--- ^a	--- ^a	843.99	843.98	844.09	843.77	843.95	843.96
16	844.25	844.06	844.25	--- ^a	--- ^a	844.04	843.92	844.00	844.08	843.72	843.63	843.65
17	844.30	843.85	844.12	--- ^a	--- ^a	844.17	843.98	844.00	844.11	843.79	843.92	844.10
18	844.19	843.85	844.13	--- ^a	--- ^a	844.23	844.06	844.00	844.12	843.97	844.14	844.40
19	844.22	844.09	844.20	--- ^a	--- ^a	844.24	844.10	843.98	844.10	844.22	844.06	844.48
20	844.30	844.19	844.17	--- ^a	--- ^a	844.20	844.10	843.96	844.06	844.20	843.96	844.36
21	844.41	844.19	844.02	--- ^a	--- ^a	844.11	844.11	843.95	843.95	844.01	843.82	844.20 ^b
22	844.23	844.12	843.97	--- ^a	--- ^a	844.04	844.08	844.00	843.75	843.90	844.07	--- ^a
23	844.00	844.24	844.26	--- ^a	--- ^a	844.05	844.01	844.07	843.96	843.99	844.09	--- ^a
24	--- ^a	844.26	844.20	--- ^a	--- ^a	844.03	843.99	844.05	844.16	844.04	844.27	--- ^a
25	844.25	844.24	844.01	--- ^a	--- ^a	844.13	844.03	844.00	844.29	--- ^a	844.15	843.92 ^b
26	844.42	844.20	844.11	--- ^a	--- ^a	844.17	844.03	843.99	844.22	844.09	843.84	844.31 ^b
27	844.39	844.08	844.11	--- ^a	--- ^a	844.17	844.04	844.04	844.07	843.99	843.73	844.31 ^b
28	844.23	844.13	843.74	--- ^a	--- ^a	844.18	844.04	844.11	844.05	843.88	843.78	844.31 ^b
29	844.06	844.14	843.78	--- ^a	--- ^a	844.13	844.03	844.12	844.11	--- ^a	844.04	844.32 ^b
30	843.86	---	--- ^a	--- ^a	--- ^a	844.08	843.98	844.06	844.05	843.88	844.07	843.98 ^b
31	843.71	---	844.18	--- ^a	--- ^a	---	844.00	844.00	---	843.86	---	843.87 ^b
Max	844.46	844.52	844.26	--- ^c	--- ^c	--- ^c	844.12	844.12	844.29	844.22	844.27	844.48
Min	843.71	843.85	843.74	--- ^c	--- ^c	--- ^c	843.92	843.86	843.74	843.72	843.63	843.65

Year 2016 Statistics: Year Max ---^d; Year Min ---^d

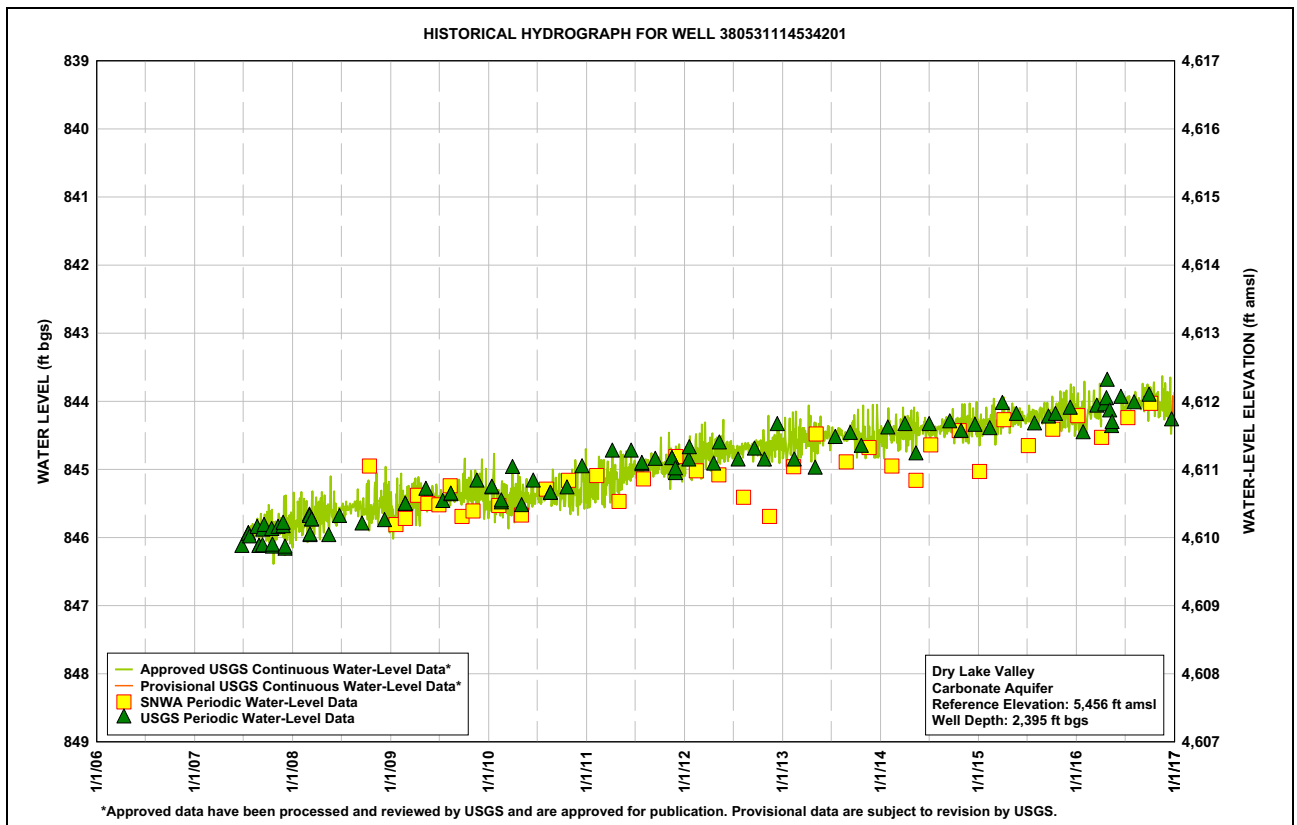
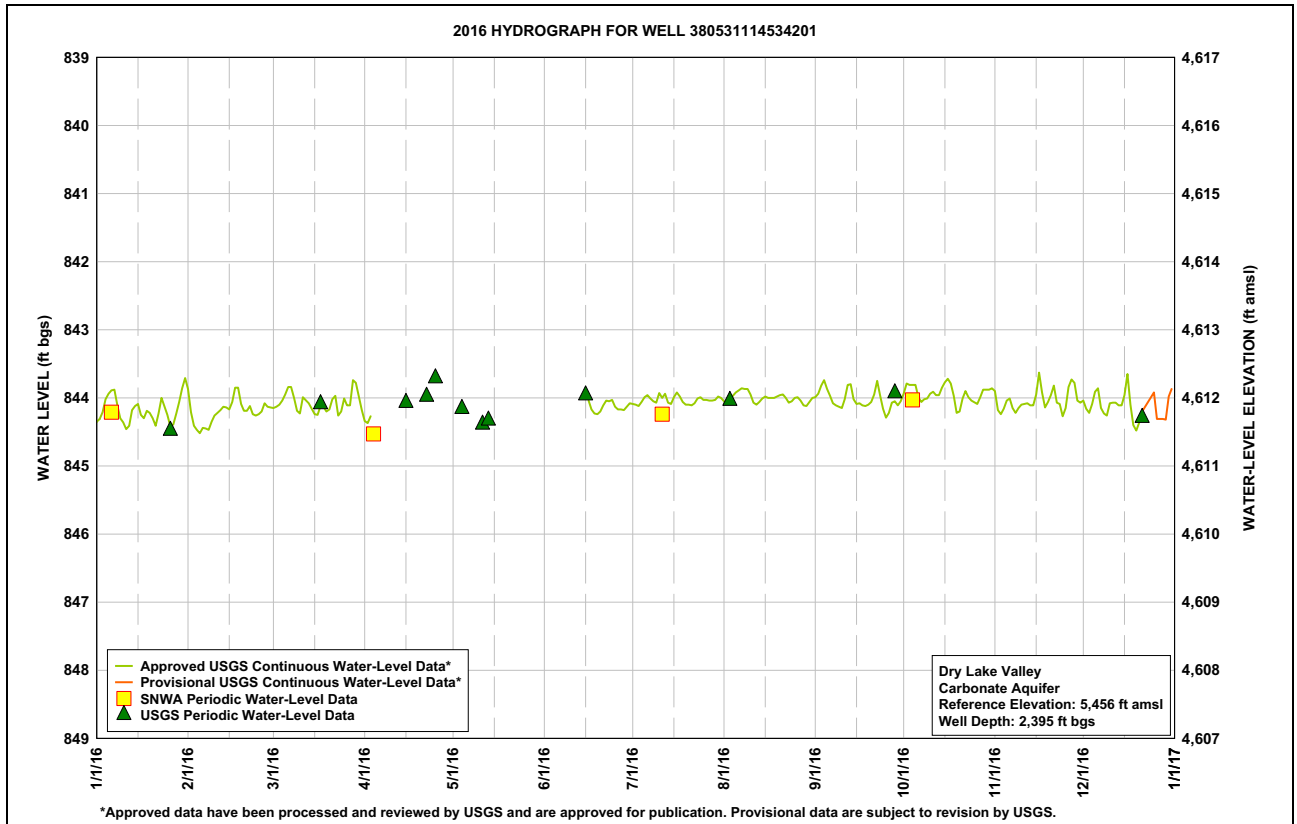
Note: Water level in ft bgs

^aMissing data.

^bProvisional data provided by the USGS.

^cMonthly statistics only reported for months when a majority of valid and obtainable data are reported.

^dAnnual statistics only reported for years when all valid and obtainable data are reported.



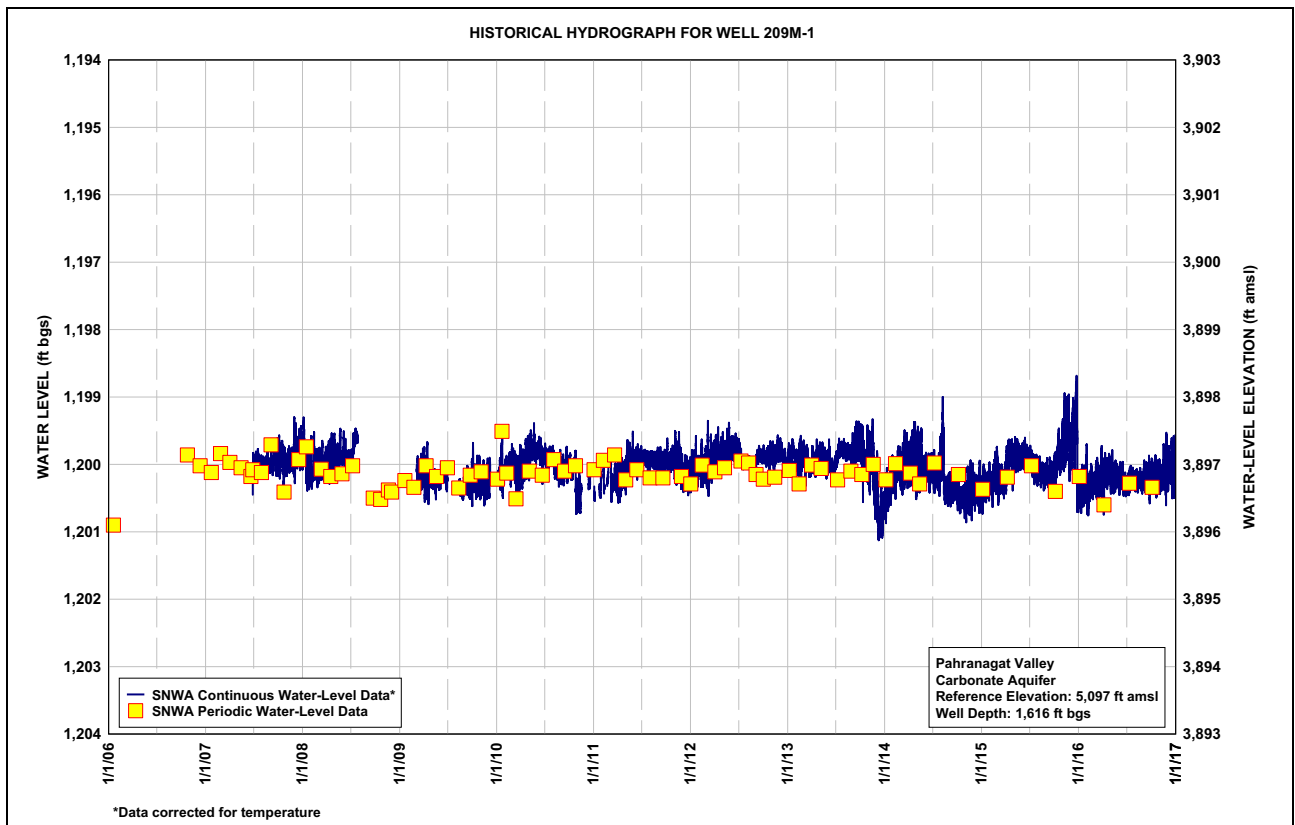
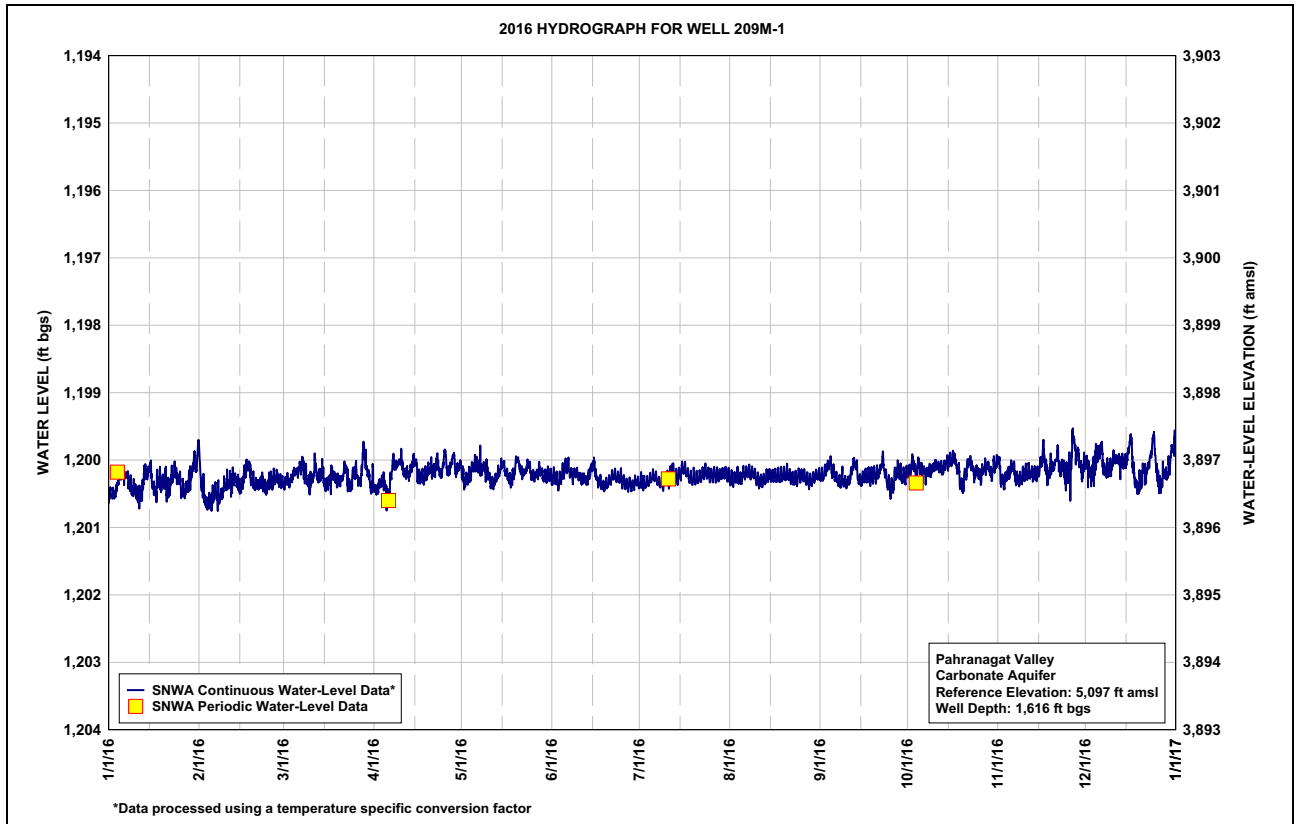


**Table B-6
Pahrangat Valley Well 209M-1, Calendar Year 2016
Water-Level Data, Daily-Mean Values**

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	1,200.52	1,200.19	1,200.31	1,200.42	1,200.20	1,200.26	1,200.36	1,200.32	1,200.26	1,200.17	1,200.04	1,200.07
2	1,200.54	1,200.48	1,200.30	1,200.42	1,200.31	1,200.30	1,200.35	1,200.32	1,200.21	1,200.04	1,200.32	1,200.14
3	1,200.48	1,200.62	1,200.30	1,200.35	1,200.26	1,200.34	1,200.37	1,200.28	1,200.11	1,200.13	1,200.31	1,200.16
4	1,200.29	1,200.64	1,200.21	1,200.36	1,200.14	1,200.22	1,200.33	1,200.28	1,200.05	1,200.08	1,200.20	1,200.03
5	1,200.24	1,200.63	1,200.18	1,200.45	1,200.09	1,200.13	1,200.27	1,200.23	1,200.19	1,200.09	1,200.10	1,199.86
6	1,200.22	1,200.50	1,200.12	1,200.31	1,200.05	1,200.11	1,200.28	1,200.21	1,200.27	1,200.17	1,200.12	1,199.83
7	1,200.23	1,200.53	1,200.05	1,200.08	1,200.14	1,200.17	1,200.34	1,200.18	1,200.32	1,200.19	1,200.27	1,200.17
8	1,200.33	1,200.54	1,200.25	1,200.07	1,200.13	1,200.21	1,200.35	1,200.21	1,200.33	1,200.15	1,200.32	1,200.21
9	1,200.43	1,200.41	1,200.33	1,200.06	1,200.10	1,200.20	1,200.36	1,200.23	1,200.35	1,200.16	1,200.25	1,200.14
10	1,200.41	1,200.36	1,200.33	1,200.05	1,200.23	1,200.25	1,200.25	1,200.31	1,200.34	1,200.10	1,200.22	1,199.95
11	1,200.54	1,200.37	1,200.19	1,200.21	1,200.35	1,200.29	1,200.26	1,200.32	1,200.21	1,200.09	1,200.20	1,200.00
12	1,200.45	1,200.33	1,200.24	1,200.22	1,200.31	1,200.28	1,200.15	1,200.31	1,200.07	1,200.10	1,200.19	1,200.00
13	1,200.19	1,200.29	1,200.23	1,200.16	1,200.21	1,200.24	1,200.26	1,200.29	1,200.10	1,200.13	1,200.23	1,200.04
14	1,200.20	1,200.32	1,200.23	1,200.02	1,200.12	1,200.14	1,200.24	1,200.26	1,200.32	1,200.04	1,200.21	1,200.04
15	1,200.12	1,200.39	1,200.37	1,200.05	1,200.06	1,200.08	1,200.16	1,200.28	1,200.26	1,199.99	1,200.07	1,199.91
16	1,200.41	1,200.22	1,200.31	1,200.28	1,200.18	1,200.27	1,200.14	1,200.22	1,200.24	1,199.99	1,199.91	1,199.74
17	1,200.41	1,200.11	1,200.21	1,200.28	1,200.30	1,200.31	1,200.21	1,200.23	1,200.25	1,200.02	1,200.09	1,200.11
18	1,200.33	1,200.07	1,200.27	1,200.27	1,200.25	1,200.40	1,200.29	1,200.26	1,200.25	1,200.13	1,200.19	1,200.36
19	1,200.38	1,200.29	1,200.30	1,200.19	1,200.09	1,200.37	1,200.32	1,200.24	1,200.24	1,200.36	1,200.08	1,200.42
20	1,200.40	1,200.38	1,200.29	1,200.14	1,200.01	1,200.35	1,200.31	1,200.22	1,200.22	1,200.25	1,200.07	1,200.19
21	1,200.49	1,200.36	1,200.23	1,200.15	1,200.14	1,200.28	1,200.29	1,200.27	1,200.15	1,200.06	1,199.98	1,200.15
22	1,200.32	1,200.28	1,200.13	1,200.05	1,200.18	1,200.24	1,200.26	1,200.30	1,200.07	1,200.02	1,200.11	1,200.12
23	1,200.22	1,200.37	1,200.40	1,200.15	1,200.12	1,200.28	1,200.18	1,200.29	1,200.22	1,200.12	1,200.10	1,199.92
24	1,200.25	1,200.40	1,200.31	1,200.11	1,200.11	1,200.26	1,200.20	1,200.24	1,200.36	1,200.16	1,200.28	1,199.66
25	1,200.32	1,200.34	1,200.15	1,199.92	1,200.23	1,200.33	1,200.23	1,200.25	1,200.42	1,200.17	1,200.11	1,200.13
26	1,200.48	1,200.32	1,200.26	1,200.18	1,200.22	1,200.37	1,200.23	1,200.27	1,200.29	1,200.18	1,199.74	1,200.39
27	1,200.39	1,200.26	1,200.27	1,200.05	1,200.18	1,200.36	1,200.24	1,200.31	1,200.18	1,200.14	1,199.80	1,200.29
28	1,200.31	1,200.28	1,199.88	1,199.95	1,200.19	1,200.39	1,200.24	1,200.32	1,200.24	1,200.10	1,199.90	1,200.21
29	1,200.21	1,200.31	1,200.10	1,200.14	1,200.26	1,200.35	1,200.23	1,200.31	1,200.27	1,200.18	1,200.09	1,200.19
30	1,200.05	---	1,200.27	1,200.07	1,200.22	1,200.35	1,200.23	1,200.26	1,200.22	1,200.14	1,200.08	1,199.88
31	1,199.91	---	1,200.35	---	1,200.22	---	1,200.27	1,200.24	---	1,200.04	---	1,199.85
Max	1,200.54	1,200.64	1,200.40	1,200.45	1,200.35	1,200.40	1,200.37	1,200.32	1,200.42	1,200.36	1,200.32	1,200.42
Min	1,199.91	1,200.07	1,199.88	1,199.92	1,200.01	1,200.08	1,200.14	1,200.18	1,200.05	1,199.99	1,199.74	1,199.66

Year 2016 Statistics: Year Max 1,200.64; Year Min 1,199.66

Note: Water level in ft bgs





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Appendix C

DDC3M Plan
Exploratory Water-Level Data

Table C-1
Periodic Water-Level Measurements Collected
at SNWA Exploratory and Test Wells

Site Number	Station Local Number ^a	Well Depth (ft bgs)	Surface ^b Elevation (ft amsl)	Water Level			
				Date	Depth to Water (ft bgs)	Well Status ^c	Measurement Method ^d
CAV6002X	180 N06 E64 19DABB1	901	5,987.97	1/13/2016	--- ^e	---	---
				2/24/2016	147.40	S	T
				4/6/2016	147.57	S	T
				7/13/2016	147.64	S	T
				10/5/2016	147.80	S	T
CAV6002M2	180 N06 E64 19ACDD1	885	5,982.81	1/13/2016	--- ^e	---	---
				2/24/2016	142.45	S	T
				4/6/2016	142.68	S	T
				7/13/2016	142.79	S	T
				10/5/2016	142.94	S	T

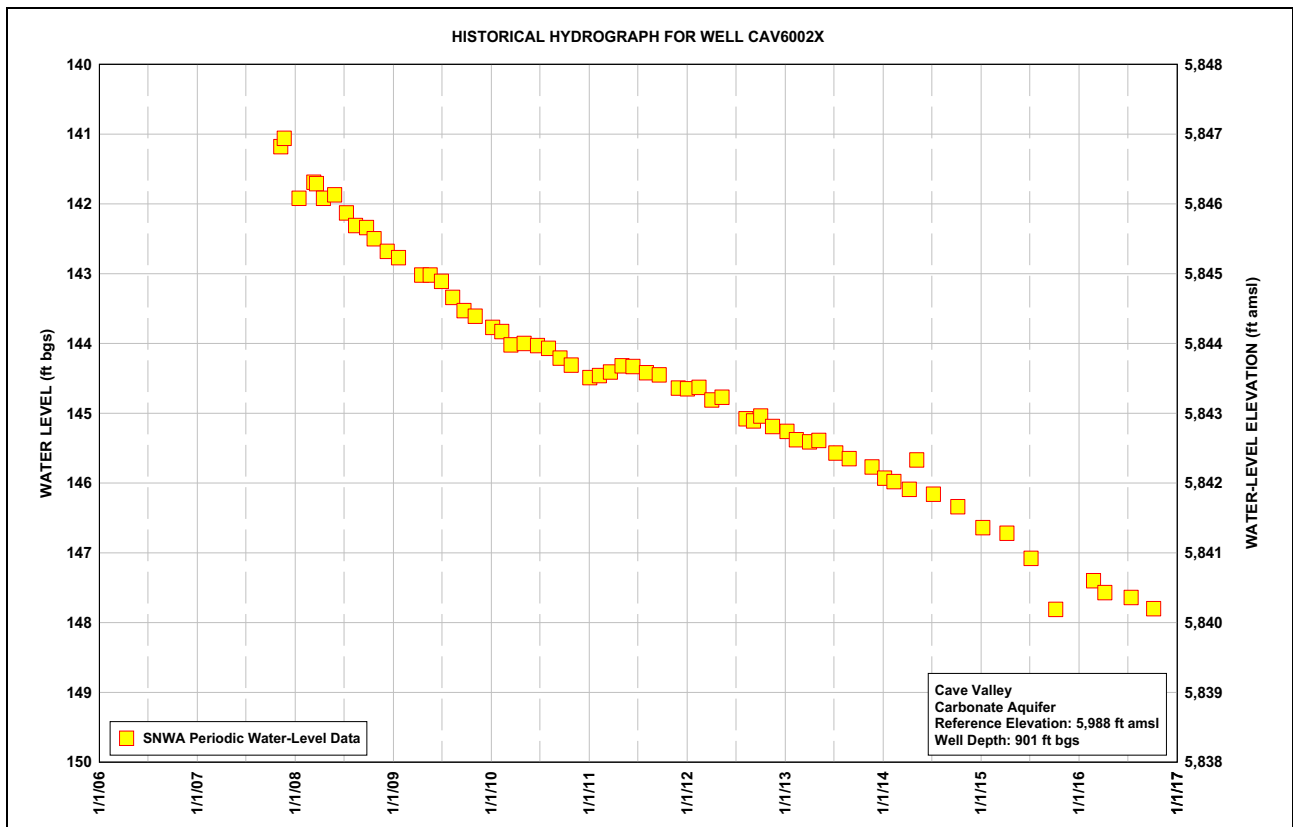
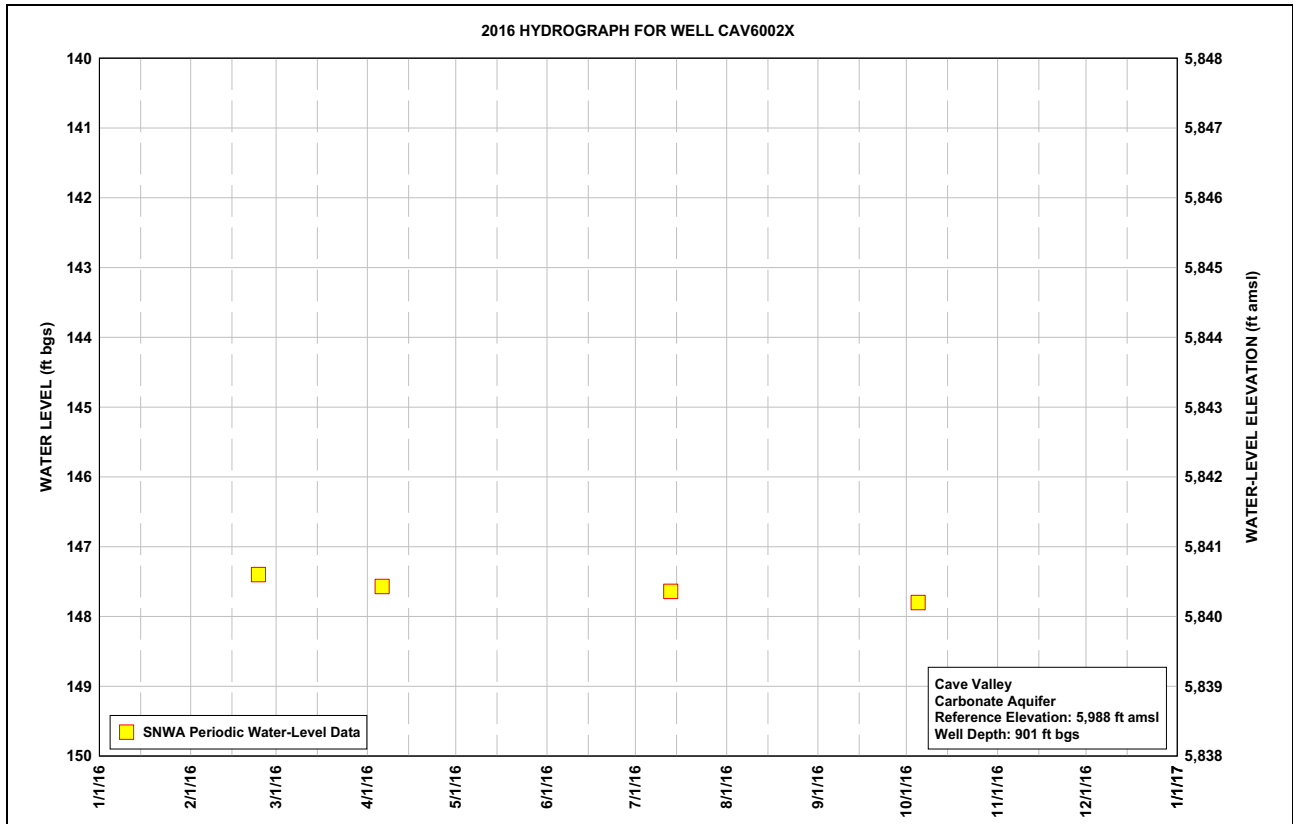
^aStation Local Numbers provided by the Nevada Division of Water Resources.

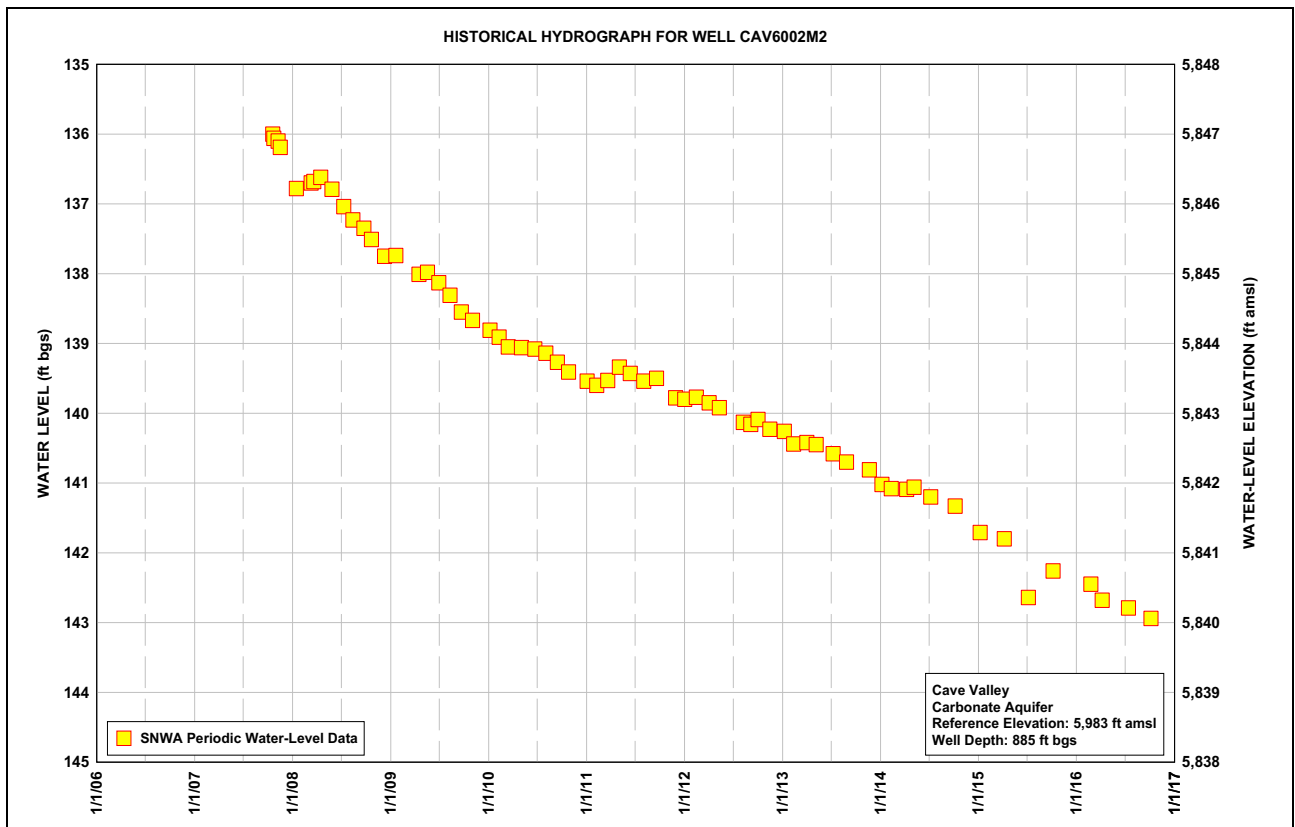
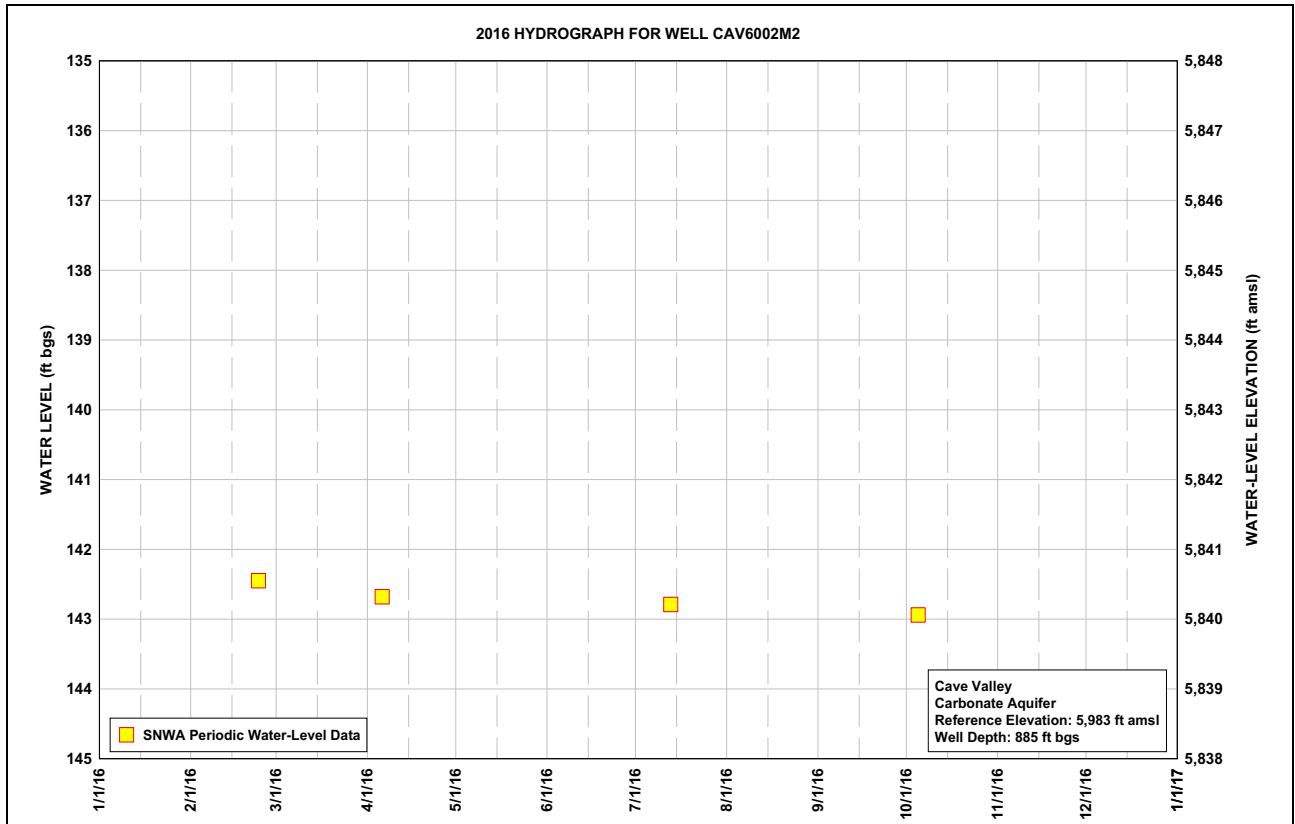
^bElevations are North American Vertical Datum of 1988 (NAVD88).

^cS = Static conditions

^dT = Electric tape measurement

^eData unavailable.







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Appendix D

DDC3M Plan
Spring-Discharge Data

Table D-1
Spring Discharge Measurements
 (Page 1 of 4)

Station Name	Primary Name	Date	Discharge	Unit	Agency
Lewis Well	381943114562201	10/18/2016	0.0	CFS	SNWA
Cave Spring	1800101	5/17/2016	3.1	CFS	SNWA
		6/13/2016	0.97	CFS	SNWA
		7/7/2016	0.17	CFS	SNWA
		10/19/2016	0.0	CFS	SNWA
Parker Station Spring	1800301	5/17/2016	0.24	CFS	SNWA
		10/19/2016	0.11	CFS	SNWA
Silver King Well	381624114540302	5/16/2016	1.7	GPM	SNWA
		10/18/2016	0.0	CFS	SNWA
Big Mud Springs	1810501	10/18/2016	0.0	CFS	SNWA
Coyote Spring	1810401	5/16/2016	0.0	CFS	SNWA
		10/18/2016	0.0	CFS	SNWA
Littlefield Spring	1810301	5/16/2016	0.02	CFS	SNWA
		10/18/2016	0.02	CFS	SNWA
Grassy Spring	1820101	5/16/2016	0.0	CFS	SNWA
		10/18/2016	0.0	CFS	SNWA
Ash Springs Creek below Diversion at HWY 93 at Ash Springs, NV	09415645	1/21/2016	13.8	CFS	USGS
		1/21/2016	13.9	CFS	USGS
		3/14/2016	18.1	CFS	USGS
		4/28/2016	16.8	CFS	USGS
		6/8/2016	16.7	CFS	USGS
		7/15/2016	17.1	CFS	USGS
		7/15/2016	17.2	CFS	USGS
		9/1/2016	17.9	CFS	USGS
		9/1/2016	17.0	CFS	USGS
		10/11/2016	18.3	CFS	USGS
		11/15/2016	15.5	CFS	USGS
11/15/2016	15.4	CFS	USGS		
Ash Springs Creek Diversion Ditch below HWY 93 at Ash Springs, NV	094156395	1/21/2016	1.75	CFS	USGS
		1/21/2016	1.72	CFS	USGS
		3/14/2016	0.0	CFS	USGS
		4/28/2016	0.0	CFS	USGS
		6/8/2016	0.0	CFS	USGS
		7/15/2016	0.0	CFS	USGS
		9/1/2016	0.0	CFS	USGS
		10/11/2016	0.0	CFS	USGS
		11/2/2016	1.78	CFS	USGS



Table D-1
Spring Discharge Measurements
 (Page 2 of 4)

Station Name	Primary Name	Date	Discharge	Unit	Agency
Ash Springs Creek Diversion Ditch below HWY 93 at Ash Springs, NV (cont.)	094156395	11/2/2016	1.77	CFS	USGS
		11/15/2016	1.26	CFS	USGS
		11/15/2016	1.39	CFS	USGS
		12/9/2016	1.14	CFS	USGS
Crystal Springs near Hiko, NV	2090401	1/27/2016	12.3	CFS	USGS
		3/15/2016	12.0	CFS	USGS
		4/5/2016	3.34	CFS	USGS
		5/5/2016	11.8	CFS	USGS
		6/15/2016	3.07	CFS	USGS
		8/3/2016	3.04	CFS	USGS
		9/9/2016	12.7	CFS	USGS
		11/3/2016	13.0	CFS	USGS
Crystal Springs Diversion near Hiko, NV	09415589	3/14/2016	0.13	CFS	USGS
		3/14/2016	0.14	CFS	USGS
		4/5/2016	8.76	CFS	USGS
		5/5/2016	0.066	CFS	USGS
		6/15/2016	8.78	CFS	USGS
		8/3/2016	8.11	CFS	USGS
		9/9/2016	0.0	CFS	USGS
		11/3/2016	0.0	CFS	USGS
Flag Spring 1	2071303	2/3/2016	1.8	CFS	SNWA
		3/24/2016	1.7	CFS	SNWA
		5/5/2016	2.0	CFS	SNWA
		5/11/2016	1.75	CFS	USGS
		5/11/2016	1.94	CFS	USGS
		6/9/2016	1.6	CFS	SNWA
		7/7/2016	1.8	CFS	SNWA
		8/24/2016	2.0	CFS	SNWA
		8/24/2016	2.0	CFS	SNWA
		9/26/2016	1.91	CFS	USGS
		9/26/2016	1.79	CFS	USGS
		10/17/2016	1.6	CFS	SNWA
		10/17/2016	1.5	CFS	SNWA
		11/10/2016	1.7	CFS	SNWA
Flag Spring 2	2071302	2/3/2016	2.7	CFS	SNWA
		3/24/2016	2.7	CFS	SNWA
		5/5/2016	2.4	CFS	SNWA
		5/5/2016	2.4	CFS	SNWA

Table D-1
Spring Discharge Measurements
 (Page 3 of 4)

Station Name	Primary Name	Date	Discharge	Unit	Agency
Flag Spring 2 (cont.)	2071302	5/11/2016	3.36	CFS	USGS
		5/11/2016	3.21	CFS	USGS
		5/17/2016	2.6	CFS	SNWA
		5/17/2016	2.5	CFS	SNWA
		6/9/2016	2.4	CFS	SNWA
		7/7/2016	2.4	CFS	SNWA
		8/24/2016	2.5	CFS	SNWA
		8/24/2016	2.6	CFS	SNWA
		9/26/2016	2.26	CFS	USGS
		9/26/2016	2.16	CFS	USGS
		10/17/2016	2.4	CFS	SNWA
		10/17/2016	2.5	CFS	SNWA
		10/17/2016	2.5	CFS	SNWA
Flag Spring 3	2071301	2/3/2016	2.1	CFS	SNWA
		3/24/2016	1.7	CFS	SNWA
		5/5/2016	1.4	CFS	SNWA
		5/11/2016	1.6	CFS	USGS
		5/11/2016	1.5	CFS	USGS
		5/17/2016	1.5	CFS	SNWA
		5/17/2016	1.5	CFS	SNWA
		6/9/2016	1.6	CFS	SNWA
		7/7/2016	1.4	CFS	SNWA
		8/24/2016	1.4	CFS	SNWA
		8/24/2016	1.4	CFS	SNWA
		9/26/2016	1.5	CFS	USGS
		9/26/2016	1.6	CFS	USGS
10/17/2016	1.5	CFS	SNWA		
11/10/2016	1.8	CFS	SNWA		
Hardy Springs	2071501	3/24/2016	0.35	CFS	SNWA
		6/9/2016	0.30	CFS	SNWA
		6/9/2016	0.31	CFS	SNWA
		7/7/2016	0.31	CFS	SNWA
		11/10/2016	0.36	CFS	SNWA
		11/28/2016	0.31	CFS	SNWA
Hot Creek Spring near Sunnyside, NV	09415558	1/26/2016	13.0	CFS	USGS
		3/17/2016	13.9	CFS	USGS
		5/6/2016	14.6	CFS	USGS
		6/15/2016	14.0	CFS	USGS
		8/15/2016	13.2	CFS	USGS



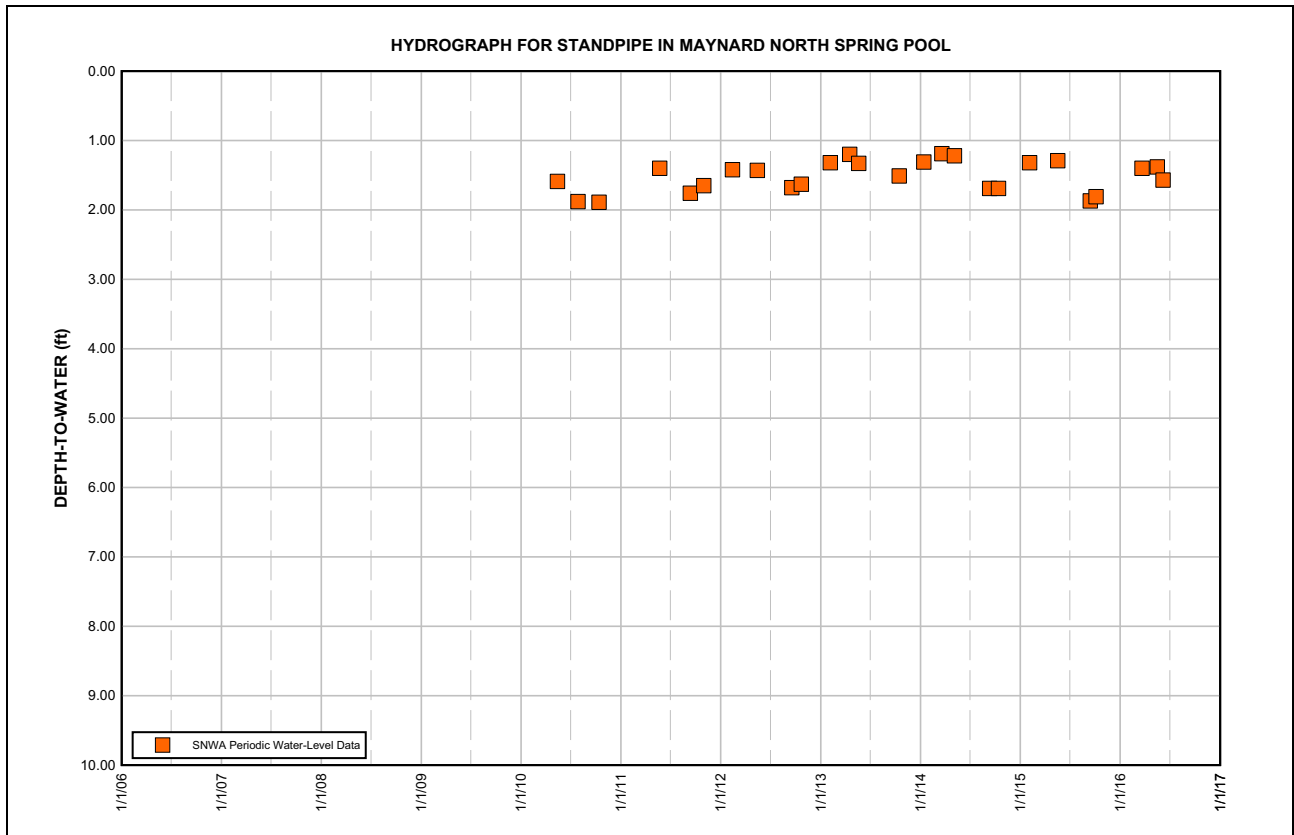
Table D-1
Spring Discharge Measurements
(Page 4 of 4)

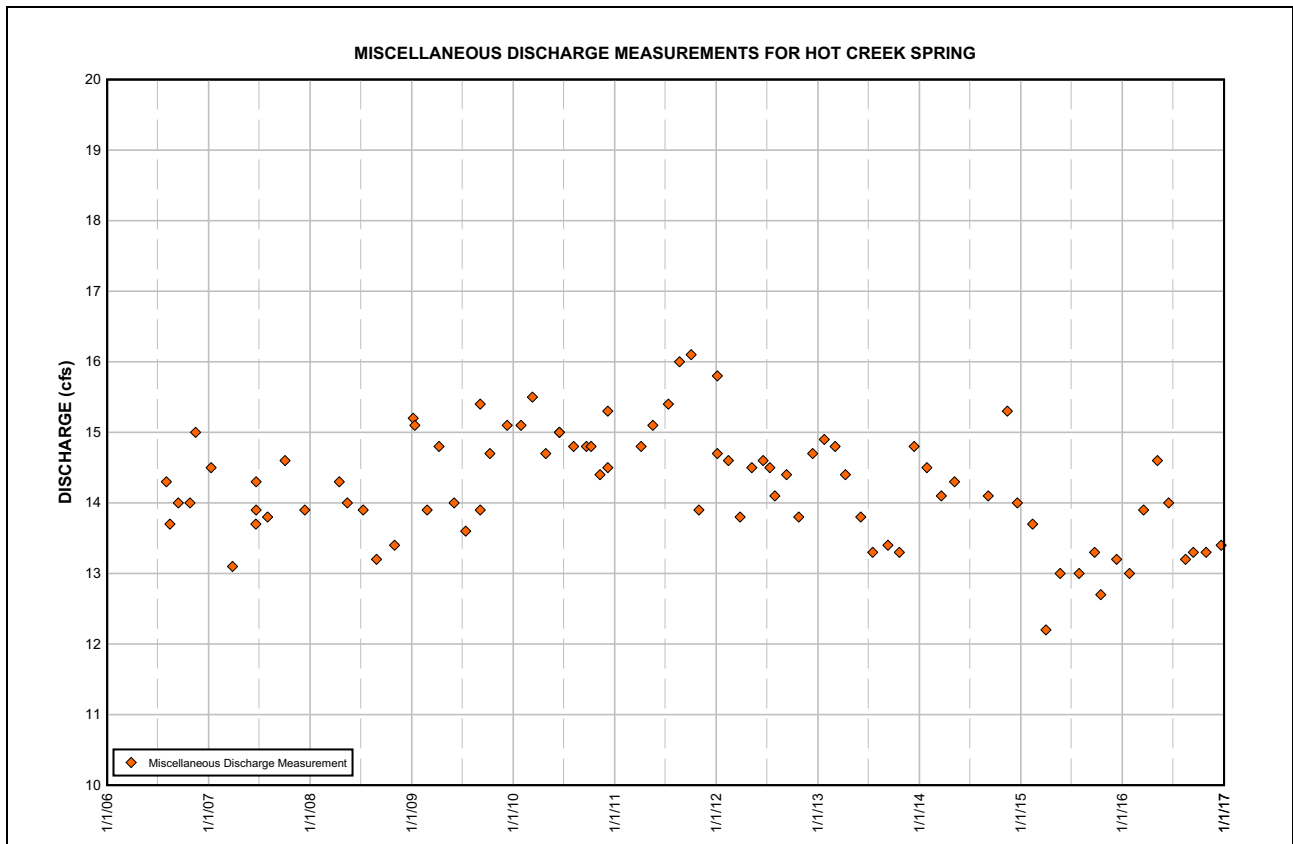
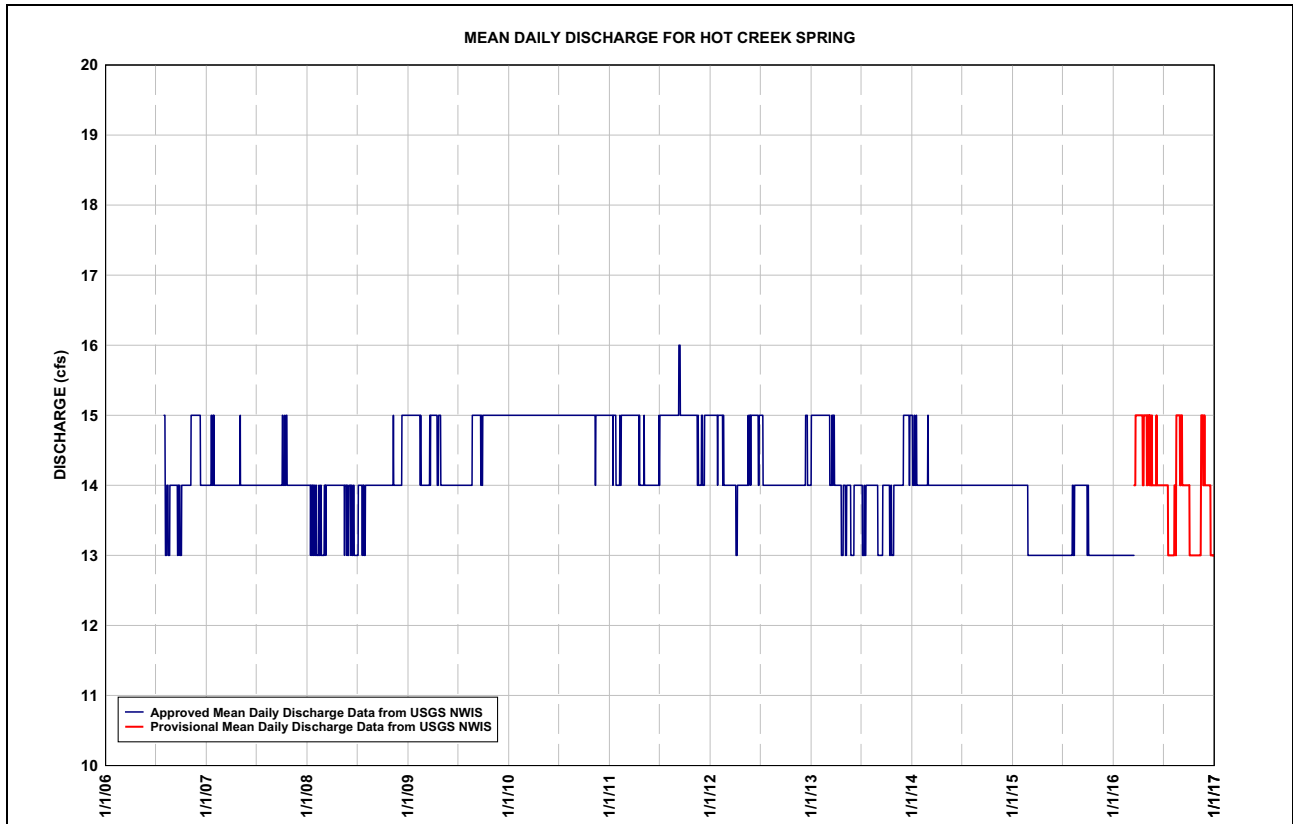
Station Name	Primary Name	Date	Discharge	Unit	Agency
Hot Creek near Sunnyside, NV (cont.)	09415558	9/12/2016	13.3	CFS	USGS
		10/28/2016	13.3	CFS	USGS
		12/21/2016	13.4	CFS	USGS
Moorman Spring	2071101	5/12/2016	0.29	CFS	USGS
		5/12/2016	0.30	CFS	USGS
		9/28/2016	0.30	CFS	USGS
		9/28/2016	0.29	CFS	USGS
Maynard Spring	2090801	3/21/2016	0.0	CFS	SNWA
		5/16/2016	0.0	CFS	SNWA
		6/6/2016	0.0	CFS	SNWA
		11/10/2016	0.0	CFS	SNWA

**Table D-2
Maynard Spring 1-Inch Standpipe DTW Measurements**

Date	DTW ^a (ft)	Date	DTW ^a (ft)
5/14/2010	1.59	1/13/2014	1.31
7/28/2010	1.88	3/20/2014	1.19
10/13/2010	1.89	5/5/2014	1.22
5/23/2011	1.40	9/11/2014	1.69
9/12/2011	1.76	10/13/2014	1.69
10/31/2011	1.65	2/4/2015	1.32
2/13/2012	1.42	5/18/2015	1.29
5/14/2012	1.43	9/14/2015	1.87
9/17/2012	1.68	10/5/2015	1.81
10/22/2012	1.63	3/21/2016	1.40
2/5/2013	1.32	5/16/2016	1.38
4/17/2013	1.20	6/6/2016	1.57
5/20/2013	1.33	11/10/2016	---
10/15/2013	1.51		

^aMeasurement from top of casing. Not corrected to ground surface.





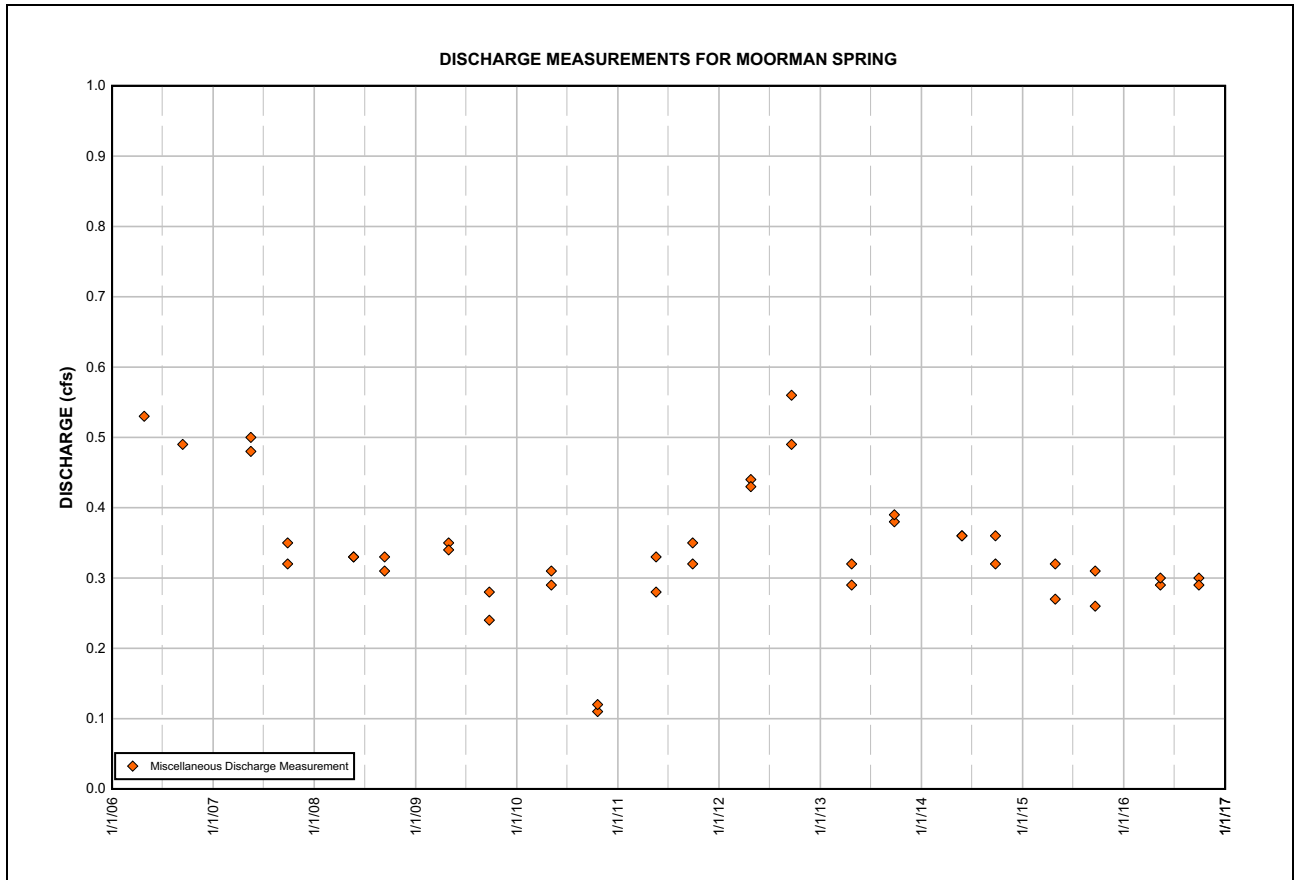




Table D-3
Discharge Measurement Summary of Flag Springs Complex

Spring Name	Average Discharge ^a (cfs)	Minimum Discharge ^a (cfs)	Maximum Discharge ^a (cfs)	Standard Deviation ^a (cfs)	May 2016 Discharge ^b (cfs)	September 2016 Discharge ^b (cfs)
Flag Spring 1 (North)	2.30	1.54	3.49	0.39	1.85	1.85
Flag Spring 2 (Middle)	2.82	0.50	3.64	0.40	3.28	2.21
Flag Spring 3 (South)	2.08	1.22	3.66	0.43	1.54	1.52

^aPeriod of record (1982-2016).

^b2016 Discharge measurements are the average of two reported measurements.

Source: USGS (2017)

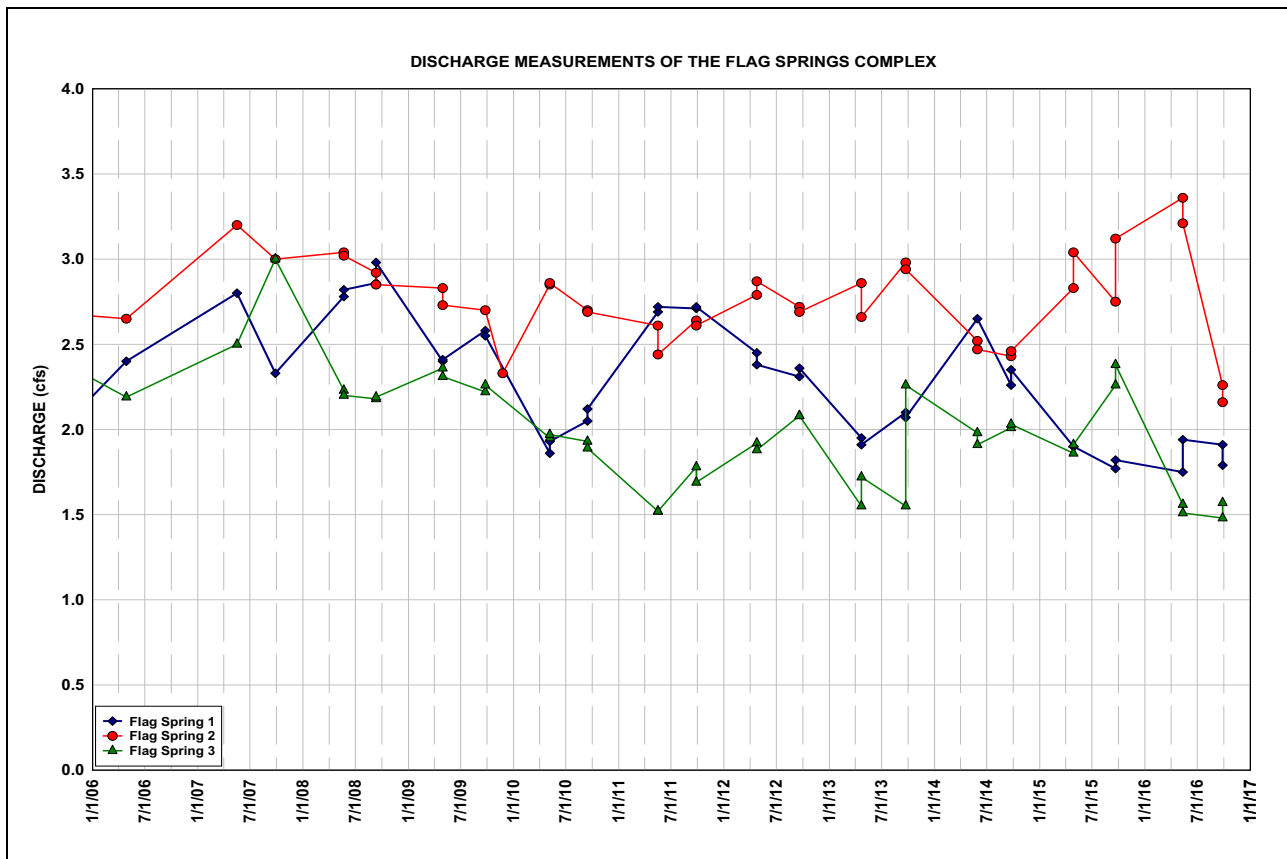


Table D-4
Station Number 2071302 - Flag Spring 2 near Sunnyside, NV, Water Year 2016
Mean Daily Discharge Values

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.3	2.4	2.6	2.7	2.7	2.7	2.6	2.4	2.5	2.4	2.5	2.5
2	2.3	2.3	2.6	2.7	2.7	2.6	2.6	2.4	2.5	2.4	2.5	2.5
3	2.3	2.3	2.6	2.7	2.7	2.7	2.6	2.4	2.5	2.4	2.5	2.5
4	2.3	2.3	2.6	2.7	2.7	2.7	2.6	2.4	2.5	2.4	2.5	2.5
5	2.3	2.3	2.6	2.7	2.7	2.7	2.6	2.4	2.5	2.4	2.5	2.5
6	2.3	2.3	2.7	2.7	2.7	2.7	2.6	2.3	2.4	2.4	2.5	2.5
7	2.3	2.3	2.7	2.7	2.7	2.7	2.6	2.3	2.4	2.4	2.5	2.5
8	2.3	2.3	2.7	2.7	2.7	2.7	2.6	2.4	2.4	2.4	2.5	2.5
9	2.3	2.3	2.7	2.7	2.6	2.7	2.6	2.4	2.4	2.4	2.5	2.5
10	2.3	2.3	2.7	2.7	2.6	2.7	2.6	2.4	2.4	2.4	2.5	2.5
11	2.3	2.3	2.7	2.7	2.6	2.7	2.6	2.4	2.4	2.4	2.5	2.5
12	2.3	2.3	2.7	2.7	2.7	2.7	2.6	2.4	2.4	2.4	2.5	2.5
13	2.3	2.3	2.7	2.7	2.7	2.7	2.6	2.4	2.4	2.4	2.5	2.5
14	2.3	2.3	2.7	2.7	2.7	2.7	2.6	2.5	2.4	2.4	2.5	2.5
15	2.3	2.4	2.7	2.7	2.7	2.7	2.5	2.5	2.4	2.4	2.5	2.5
16	2.4	2.4	2.7	2.7	2.7	2.7	2.6	2.5	2.4	2.4	2.5	2.5
17	2.4	2.4	2.7	2.7	2.7	2.7	2.5	2.5	2.4	2.4	2.5	2.5
18	2.4	2.4	2.7	2.7	2.7	2.7	2.5	2.5	2.4	2.4	2.5	2.5
19	2.4	2.4	2.7	2.7	2.7	2.7	2.5	2.5	2.4	2.4	2.5	2.5
20	2.4	2.4	2.7	2.7	2.7	2.7	2.5	2.5	2.4	2.4	2.5	2.5
21	2.4	2.4	2.7	2.7	2.7	2.7	2.5	2.6	2.4	2.4	2.5	2.5
22	2.3	2.5	2.7	2.7	2.7	2.7	2.5	2.6	2.4	2.4	2.5	2.5
23	2.3	2.5	2.7	2.7	2.7	2.7	2.5	2.5	2.4	2.4	2.5	2.5
24	2.4	2.5	2.7	2.7	2.7	2.7	2.5	2.5	2.4	2.4	2.5	2.5
25	2.3	2.5	2.7	2.7	2.7	2.7	2.5	2.5	2.4	2.4	2.5	2.5
26	2.3	2.5	2.7	2.7	2.7	2.7	2.4	2.5	2.4	2.4	2.5	2.5
27	2.3	2.5	2.7	2.7	2.7	2.6	2.5	2.5	2.4	2.4	2.5	2.5
28	2.3	2.5	2.7	2.7	2.7	2.6	2.5	2.5	2.4	2.4	2.5	2.5
29	2.4	2.6	2.7	2.7	2.7	2.6	2.4	2.5	2.4	2.5	2.5	2.5
30	2.4	2.6	2.7	2.7	--	2.6	2.4	2.5	2.4	2.5	2.5	2.5
31	2.4	--	2.7	2.7	--	2.6	--	2.5	--	2.5	2.5	--
Total	72	72	83	84	78	83	76	76	72	75	78	75
Min	2.3	2.3	2.6	2.7	2.6	2.6	2.4	2.3	2.4	2.4	2.5	2.5
Max	2.4	2.6	2.7	2.7	2.7	2.7	2.6	2.6	2.5	2.5	2.5	2.5
Mean	2.33	2.39	2.68	2.70	2.69	2.68	2.54	2.46	2.42	2.41	2.50	2.50
Acre-ft	143	142	165	166	154	165	151	151	144	148	154	148

Note: Values are in cfs unless noted otherwise. e= Estimated day.

LOCATION: UTM NAD 1983 Zone 11N (meters), Northing 4,254,570 m, Easting 672,576 m, in SW1/4 SW1/4 NW1/4 sec. 33 T. 7N., R. 62E., Nye County.

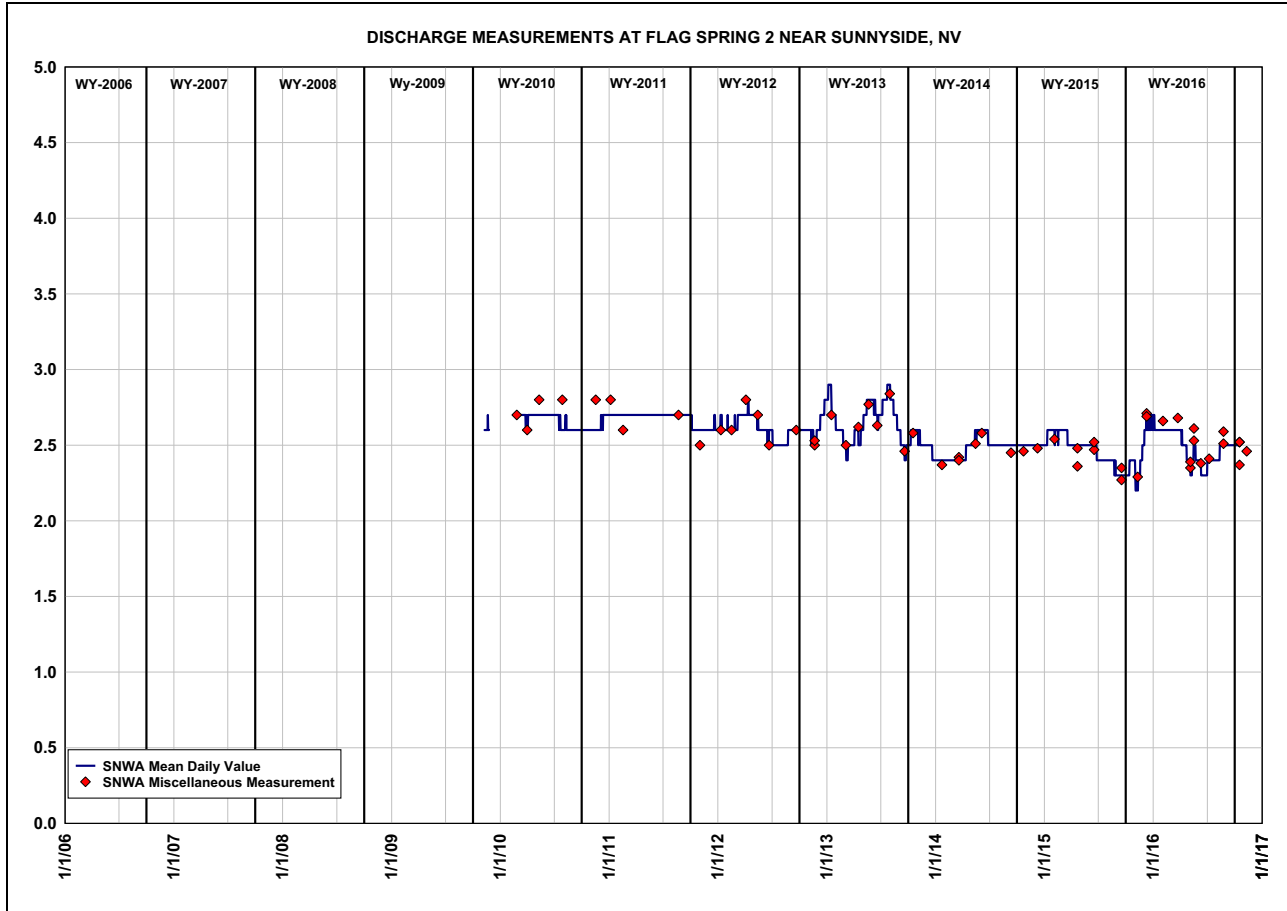
DRAINAGE AREA: Indeterminate.

PERIOD OF RECORD: November 2009 to current year.

GAGE: Bubbler/Pressure sensor. Elevation of the gage is estimated at 5,285 ft amsl NAVD88.

REMARKS: Records are rated as good except for estimated days which are rated as poor.

Annual Statistics	
Min:	2.3
Max:	2.7
Annual Total (Acre-ft):	1,830
Annual Mean (cfs):	2.53

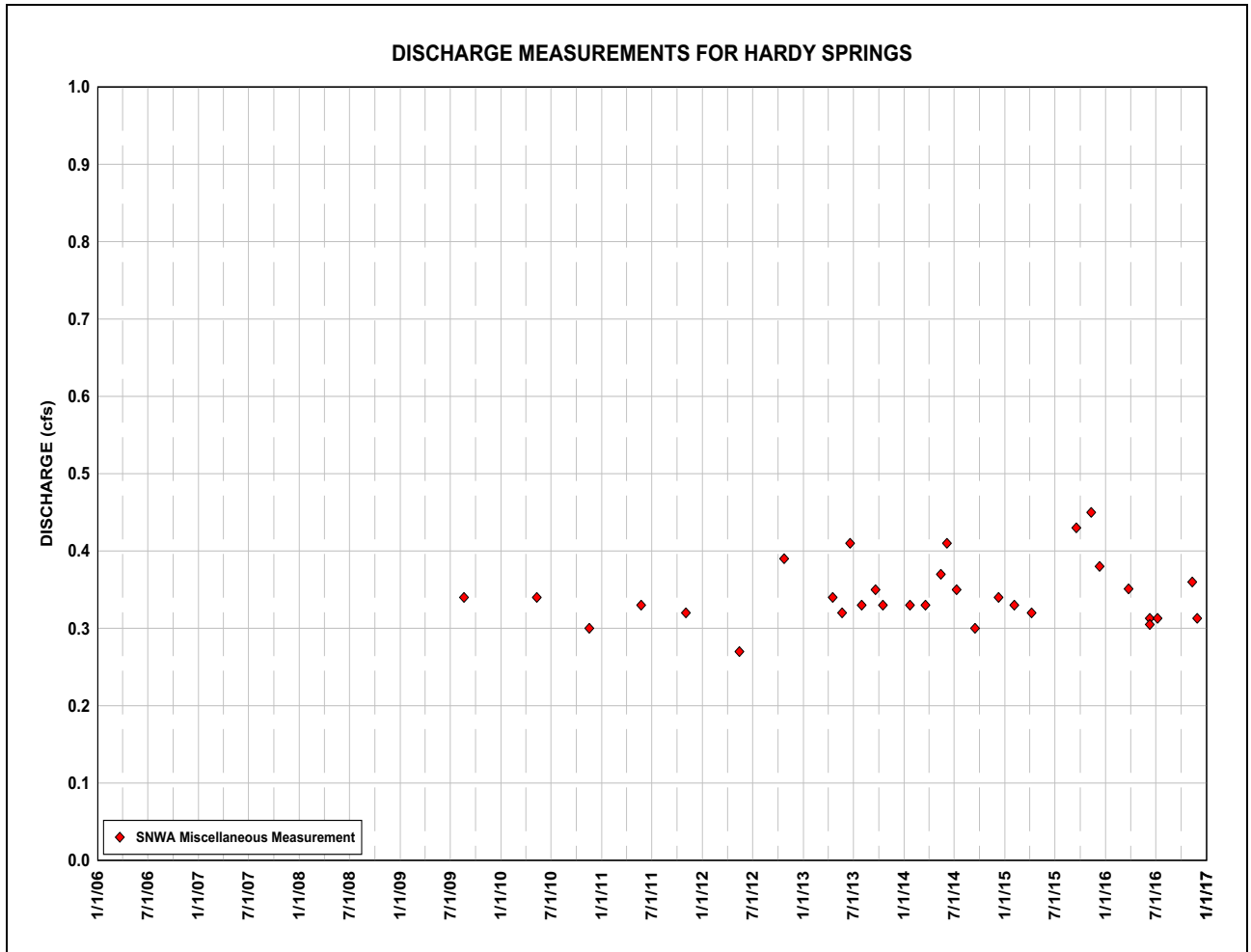


**Table D-5
Discharge Measurement Summary of Hardy Springs**

Spring Name	Average Discharge ^{a,b} (cfs)	Minimum Discharge ^{a,b} (cfs)	Maximum Discharge ^{a,b} (cfs)	Standard Deviation (cfs)	November 2016 Average Discharge ^b (cfs)
Hardy Springs	0.35	0.27	0.45	0.04	0.34

^aBased on single measurements in 2004 and 2009 and multiple measurements per year from 2010 through 2016.

^bSource: SNWA data





**Table D-6
Annual Discharge at Crystal Springs**

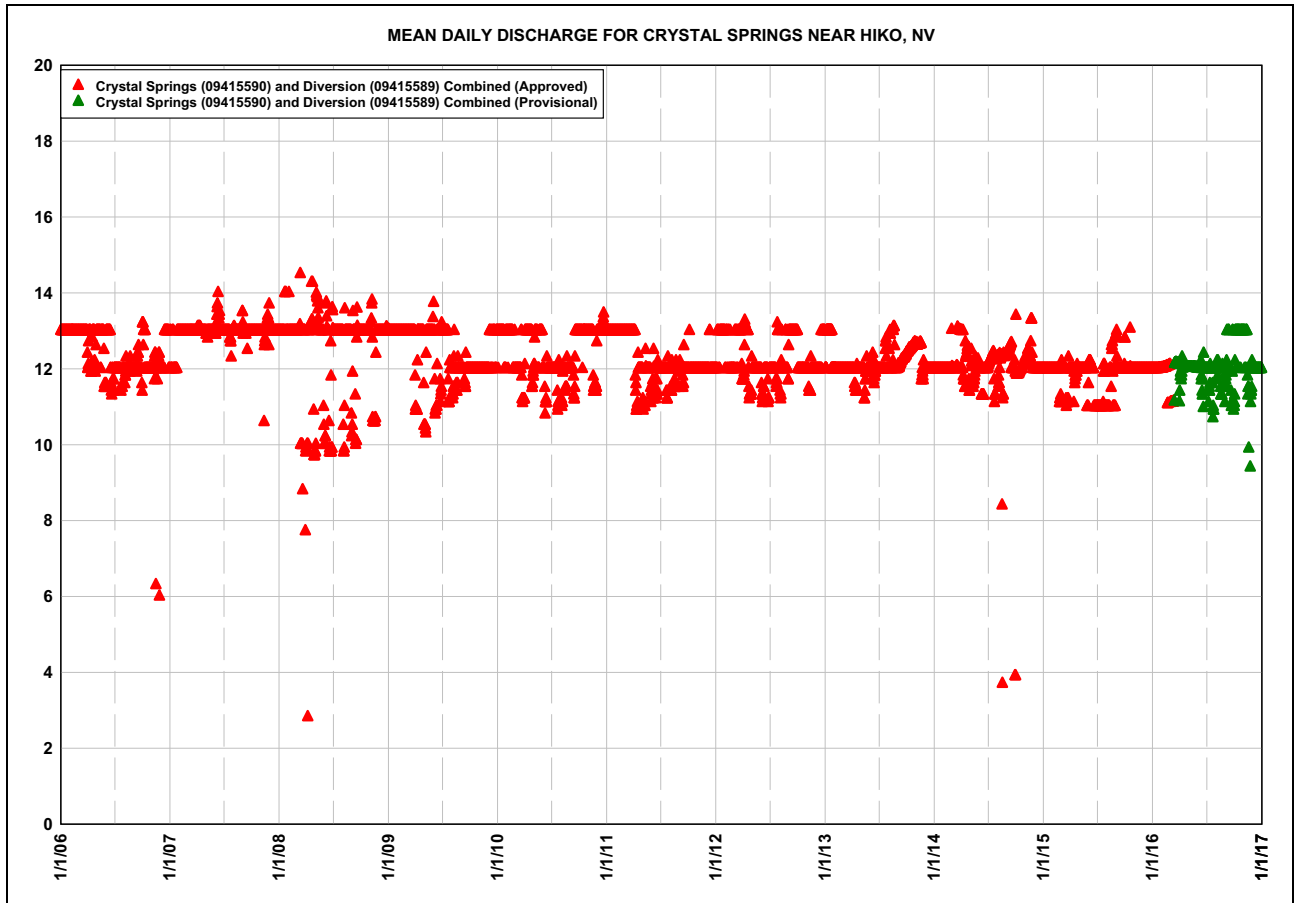
Water Year ^{a,b}	Crystal Springs (09415590)		Crystal Springs Diversion (09415589)			Total Combined Discharge (afy)
	Annual Discharge (afy)	Average Annual Discharge (cfs)	Annual Discharge (afy)	Average Annual Discharge (cfs)	Days Diverted	
2005	8,110	11.2	1,230	1.70	78	9,340
2006	8,190	11.3	923	1.28	67	9,113
2007	8,230	11.4	998	1.38	67	9,228
2008	8,100	11.2	1,020	1.40	80	9,120
2009	8,090	11.2	987	1.36	74	9,077
2010	8,120	11.2	743	1.03	52	8,863
2011	7,860	10.9	1,100	1.52	78	8,960
2012	8,160	11.2	710	0.98	50	8,870
2013	7,960	11.0	800	1.11	56	8,760
2014	7,814	10.8	1,117	1.54	117	8,931
2015	7,564	10.4	1,013	1.40	111	8,577
2016 ^c	7,800	10.8	856	1.18	193	8,656
Average for the period of record ^d	8,000	11.0	958	1.32	85	8,958

^aWater years 1990, 1991, 1992, 1993, and 1999 are excluded as explained in the text.

^bData are from USGS Water Resources Data - Nevada water years 2005 through 2016 (USGS, 2017).

^c2016 Data are preliminary.

^dThese values are extrapolated from the Crystal Springs gaging station records published by USGS (USGS, 2017).





**Table D-7
Annual Discharge at Ash Springs**

Water Year ^{a,b}	Ash Springs ^c (09415640 and 09415645)		Ash Springs Diversion ^d (09415639 and 094156395)			Total Combined Discharge (afy)
	Annual Discharge (afy)	Average Annual Discharge (cfs)	Annual Discharge (afy)	Average Annual Discharge (cfs)	Days Diverted	
2005	10,080	13.9	2,190	3.03	365	12,270
2006	8,780	12.1	2,810	3.88	365	11,590
2007	11,570	16.0	2,480	3.43	365	14,050
2008	11,740	16.2	2,600	3.58	366	14,340
2009	11,900	16.4	1,860	2.57	365	13,760
2010	12,710	17.6	1,570	2.17	365	14,280
2011	12,260	16.9	1,560	2.16	282	13,820
2012	12,970	17.9	430	0.59	70	13,420
2013	13,010	18.0	126	0.17	24	13,136
2014	11,892	16.4	511	0.706	112	12,403
2015	12,249	16.9	152	0.211	34	12,401
2016 ^e	12,331	17.0	114	0.158	79	12,445
Average for the period of record ^f	11,791	16.3	1,367	1.89	233	13,160

^aData from USGS Water Resources Data-Nevada water years 2005 through 2016 (USGS, 2017).

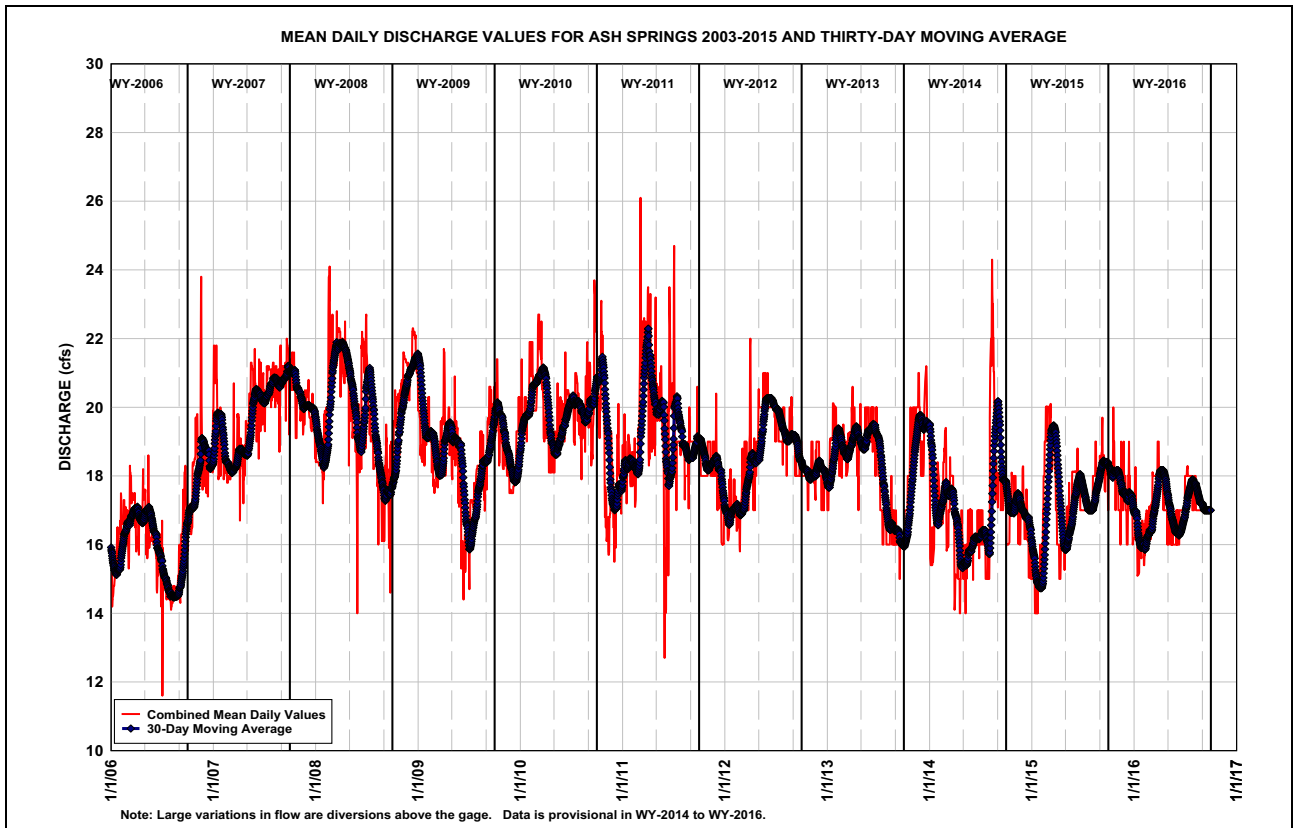
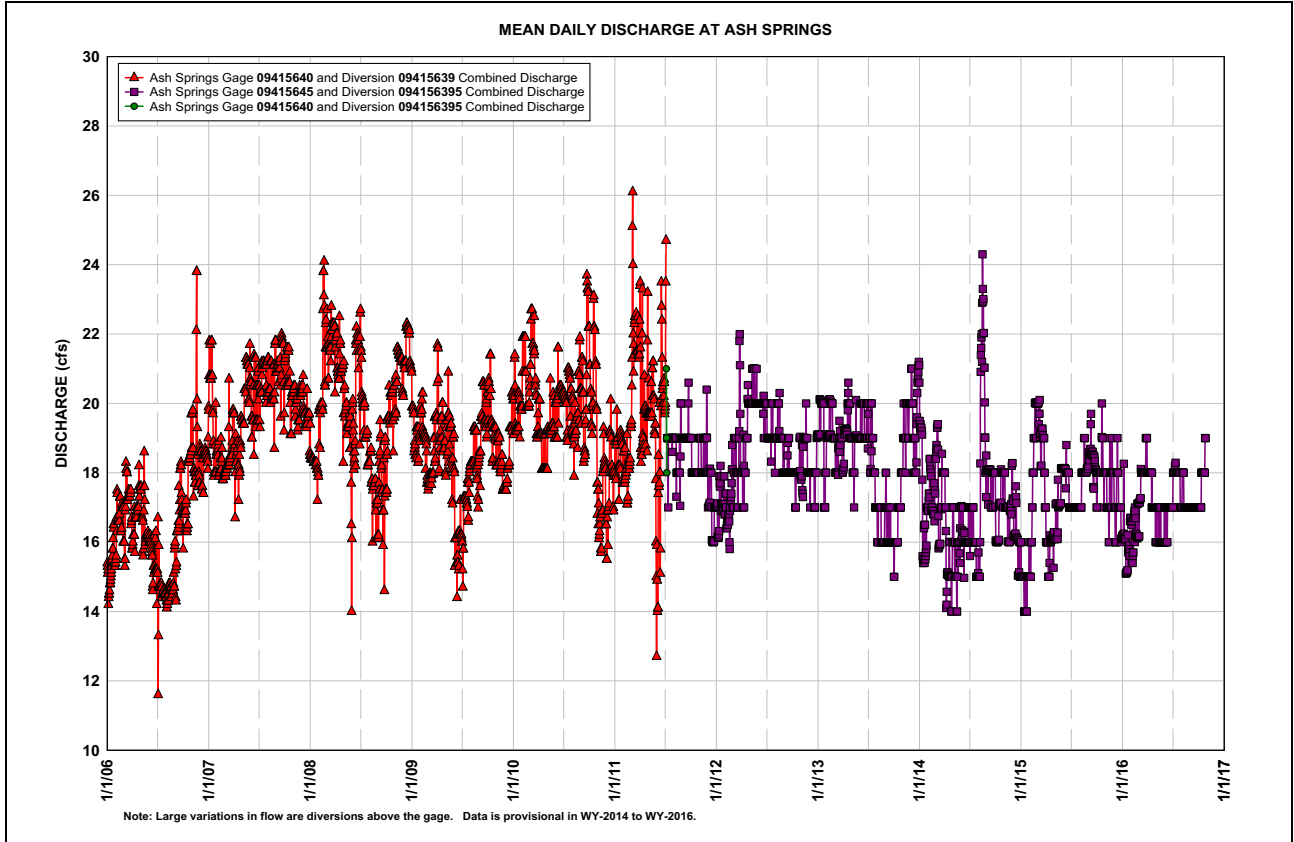
^bPeriod of record for Ash Springs Diversion (09415639) is December 12, 2003 to July 7, 2011. The 2004 water year is incomplete.

^cMean daily values for new site (09415645) used from July 8, 2011 to present.

^dMean daily values for new site (094156395) used from July 5, 2011 to present.

^e2016 Data are preliminary.

^fThese values are extrapolated from the Ash Springs gaging station records published by USGS (USGS, 2017).





**Table D-8
Station Number 2090102 - Hiko Spring at Hiko, NV, Water Year 2016
Mean Daily Discharge Values**

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.2	6.2	6.2	6.2	0.0	5.5	6.1	7.2	6.2	0.0	6.3	7.6
2	6.2	6.4	6.2	6.0	0.0	5.9	6.0	6.0	6.2	6.4	6.1	0.0
3	6.3	6.9	6.1	6.1	0.0	6.2	7.5	5.6	6.3	6.3	6.2	5.6
4	6.2	6.7	6.2	6.0	6.3	6.3	0.0	5.7	0.0	6.2	6.2	5.7
5	6.2	5.9	6.2	6.0	6.5	6.3	0.0	6.1	0.0	6.0	6.6	5.7
6	6.2	6.0	6.2	6.0	6.5	6.2	5.9	6.2	0.0	6.1	7.3	5.2
7	0.0	5.9	5.8	5.7	6.3	6.2	6.0	6.2	7.7	6.2	0.0	5.8
8	0.0	5.7	6.4	5.9	5.8	6.0	5.3	6.2	6.4	6.1	0.0	6.0
9	6.1	6.1	6.4	6.0	5.4	5.8	5.8	6.4	6.1	6.1	0.0	6.1
10	0.0	6.2	5.4	6.1	5.8	6.3	6.1	0.0	5.5	6.2	6.1	6.2
11	0.0	6.2	5.9	6.0	6.2	7.2	6.2	0.0	6.0	6.6	6.2	6.2
12	0.0	6.1	5.9	6.1	6.6	0.0	6.1	0.0	6.2	0.0	6.1	0.0
13	0.0	6.1	5.8	6.0	0.0	0.0	6.1	6.5	6.2	0.0	6.0	0.0
14	5.9	6.8	6.1	6.1	0.0	5.6	6.5	6.0	6.2	0.0	6.0	0.0
15	6.1	7.8	6.2	6.2	0.0	5.9	0.0	6.0	6.2	0.0	6.1	0.0
16	6.2	7.0	6.2	6.1	6.0	6.0	0.0	5.3	6.7	5.9	6.2	7.2
17	6.2	6.9	6.2	6.1	5.5	6.2	7.5	5.0	0.0	6.1	6.1	6.4
18	6.2	6.6	6.2	6.2	5.7	6.2	7.0	6.0	7.7	6.0	7.3	6.0
19	6.2	6.2	6.2	6.1	6.0	6.2	6.0	6.2	0.0	6.0	0.0	5.3
20	6.2	6.2	6.2	6.1	5.9	6.6	5.9	6.1	0.0	6.1	0.0	5.9
21	6.3	6.3	6.2	6.1	6.4	0.0	5.3	6.1	5.8	6.1	0.0	6.0
22	5.9	6.3	6.3	6.0	7.0	0.0	5.8	6.8	5.5	6.1	5.8	5.9
23	5.6	6.2	6.3	6.0	6.7	0.0	6.0	5.8	5.4	5.9	6.1	6.1
24	5.8	6.2	6.3	6.0	0.0	7.3	6.1	6.3	5.8	7.1	5.9	6.0
25	5.4	6.2	6.2	6.0	0.0	0.0	6.2	0.0	5.8	0.0	6.0	7.0
26	6.1	6.2	5.8	5.9	6.5	5.9	6.1	0.0	6.0	0.0	6.2	0.0
27	6.2	6.2	6.1	5.8	5.8	5.4	7.2	5.7	6.1	0.0	6.2	0.0
28	6.3	6.2	6.2	5.5	6.0	5.9	5.8	5.5	6.1	5.6	6.2	0.0
29	6.3	6.2	6.2	6.0	5.8	6.0	6.6	0.0	0.0	6.4	6.1	6.0
30	6.3	6.2	6.1	6.4	--	6.0	0.0	5.6	0.0	6.1	6.6	5.9
31	6.2	--	6.1	0.0	--	6.1	--	6.0	--	6.2	7.7	--
Total	153	190	190	181	129	153	155	150	136	142	158	134
Min	0	5.7	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max	6.3	7.8	6.4	6.4	7.0	7.3	7.5	7.2	7.7	7.1	7.7	7.6
Mean	4.93	6.34	6.12	5.83	4.44	4.94	5.17	4.85	4.54	4.57	5.08	4.46
Acre-ft	303	376	376	358	255	303	307	298	270	281	312	265

Note: Values are in cfs unless noted otherwise. e = Estimated day.

LOCATION: UTM NAD 1983 Zone 11N (meters), Northing 4,162,554 m, Easting 656,915 m, in SW1/4 NE1/4 SW1/4 sec.14, T. 4S., R. 60E, Lincoln County, 0.5 mi southwest of the orifice.

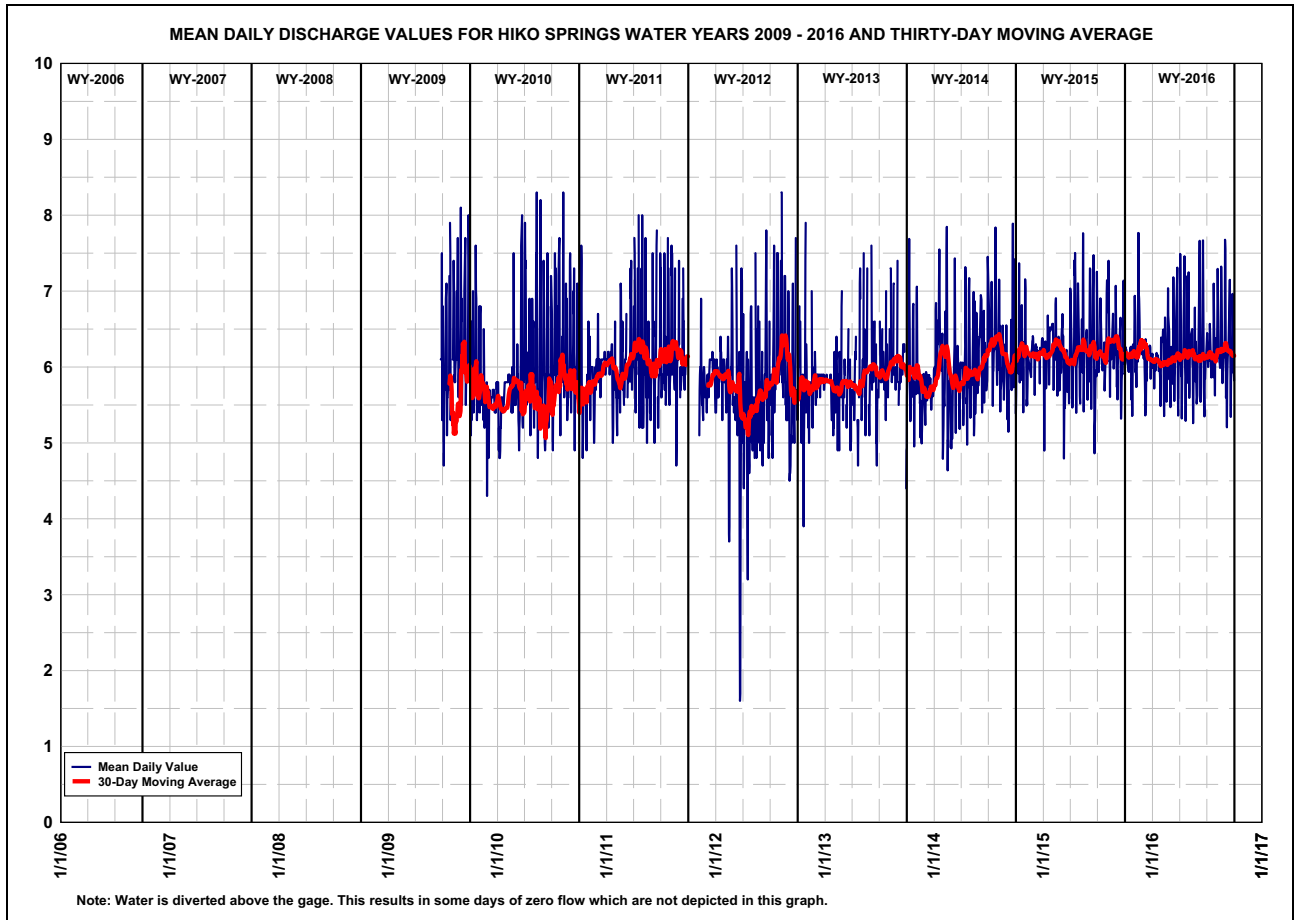
DRAINAGE AREA: Indeterminate.

PERIOD OF RECORD: June 2009 to current year.

GAGE: Ultra-sonic flow meter. Elevation of the gage is 3,868 ft amsl NAVD88.

REMARKS: Records are good. Discharge records are affected by both upstream and downstream agricultural diversions.

Annual Statistics	
Min:	0.0
Max:	7.8
Annual Total (Acre-ft):	3,704
Annual Mean (cfs):	5.11





References

U.S. Geological Survey, 2017, National water information system (NWIS Web), [Internet], [accessed February 2017], available from <http://waterdata.usgs.gov/nwis>.

USGS, see U.S. Geological Survey.

Appendix E

DDC3M Plan
2016 Springs Site Photos

E.1.0 INTRODUCTION

This appendix presents photos taken in CY 2016 during the biannual field visits to document DDC spring conditions. Many of the DDC springs are controlled by collector systems and have been modified from their natural condition. Others, such as Littlefield and Cave Springs, remain in their natural condition.



Figure E-1
Maynard Spring, May 2016



Figure E-2
Maynard Spring, November 2016



Figure E-3
Cave Spring, May 2016



Figure E-4
Cave Spring, October 2016



Figure E-5
Parker Station, May 2016



Figure E-6
Parker Station, October 2016



Figure E-7
Parker Station Flume, May 2016



Figure E-8
Lewis Well, May 2016



Figure E-9
Lewis Well, October 2016



Figure E-10
Lewis Well Spring Collector Line Access Discharge, October 2016



Figure E-11
Silver King Well, May 2016



Figure E-12
Silver King Well, October 2016



Figure E-13
Coyote Spring, May 2016



Figure E-14
Coyote Spring, October 2016



Figure E-15
Big Mud Spring, May 2016



Figure E-16
Big Mud Spring, October 2016



Figure E-17
Littlefield Spring, May 2016



Figure E-18
Littlefield Spring, October 2016



Figure E-19
Grassy Spring, May 2016



Figure E-20
Grassy Spring, October 2016

Appendix F
Precipitation-Station Data

Table F-1
2016 Regional Precipitation Data
 (Page 1 of 2)

Blue Eagle Ranch Hanks (RP1730201)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2016	1.67a	0.63l	0.26	1.38	1.44	0.67	0.00	0.69	0.11	0.19	0.49	0.69	7.59a
Period of Record Statistics (1978 to Present)													
Mean	0.71	0.65	0.84	0.90	0.92	0.38	0.51	0.72	0.68	0.85	0.69	0.52	8.28
Min	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.41
Max	1.67	1.97	2.43	2.93	3.43	1.52	2.94	3.92	3.95	4.23	2.53	1.54	15.11
No. Yrs	38	36	38	38	38	39	39	39	38	39	38	39	33
McGill (RP1790202)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2016	1.61	0.77	1.47	1.79	0.60	1.80	0.00	0.43	0.99	0.10	0.24	0.34	10.14
Period of Record Statistics (1892 to Present)													
Mean	0.60	0.64	0.75	0.96	1.04	0.75	0.66	0.78	0.70	0.80	0.56	0.61	8.82
Min	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.76
Max	2.21	2.38	2.54	3.19	3.33	4.30	3.03	3.25	5.57	3.38	1.90	3.05	16.21
No. Yrs	106	106	109	108	107	108	106	107	106	106	107	106	89
Spring Valley State Park (RP2010201)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2016	0.45g	0.15b	0.05	1.80a	0.37e	0.64	0.51	2.51e	0.00c	0.91j	0.42n	0.01r	6.03d
Period of Record Statistics (1974 to Present)													
Mean	1.02	1.13	1.36	0.96	1.14	0.42	0.95	1.38	0.95	1.18	0.72	0.82	12.60
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.06
Max	4.21	3.65	4.38	3.92	3.70	2.14	3.68	5.41	4.62	4.95	3.43	6.62	23.48
No. Yrs	32	35	38	34	37	41	38	42	38	33	37	35	16
Pioche (RP2020201)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2016	--z	--z	--z	0.80a	1.00	0.76	0.46	1.00e	0.00	--z	--z	--z	4.02f
Period of Record Statistics (1888 to Present)													
Mean	1.50	1.39	1.58	1.02	0.96	0.39	1.01	1.38	0.96	1.04	0.96	1.32	13.43
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.81
Max	6.74	6.02	5.22	4.63	4.30	2.75	4.99	5.01	3.87	3.78	4.79	7.88	27.29
No. Yrs	78	80	78	83	80	79	80	80	79	76	76	74	60
Caliente (RP2050201)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2016	1.08c	0.98	0.85	1.33	0.47	1.04	1.25	1.11	0.02h	0.86b	0.29a	2.06	11.32a
Period of Record Statistics (1903 to Present)													
Mean	0.84	0.94	1.00	0.69	0.56	0.35	0.83	0.90	0.61	0.75	0.67	0.68	8.64
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.84
Max	3.47	3.98	4.59	3.71	2.84	2.18	5.36	4.18	3.14	4.29	3.38	3.76	18.73
No. Yrs	92	92	90	93	91	91	91	93	91	90	93	91	69



Table F-1
2016 Regional Precipitation Data
 (Page 2 of 2)

Sunnyside (RP2070201)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2016	1.73	0.70	0.38	1.58	0.89	1.02	0.40	0.43	0.04	0.27	0.20d	1.38	9.02
Period of Record Statistics (1891 to Present)													
Mean	0.69	0.76	0.93	0.78	0.82	0.47	0.76	0.82	0.87	0.87	0.54	0.66	9.78
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.73
Max	2.64	3.55	4.82	2.81	3.23	2.79	4.37	3.89	3.69	3.76	4.19	2.80	17.65
No. Yrs	54	55	56	55	55	55	56	56	53	53	54	48	30
Lund (RP2070202)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2016	1.75	0.68	0.82	1.60	0.45	0.74	0.03	0.34	1.22	0.34	0.20	0.86	9.03
Period of Record Statistics (1957 to Present)													
Mean	0.81	0.81	0.96	0.96	0.93	0.78	0.66	0.88	0.82	0.90	0.67	0.74	9.70
Min	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.99
Max	4.13	2.22	3.44	3.44	3.45	5.37	3.05	4.58	5.01	3.66	2.62	2.91	16.82
No. Yrs	58	58	55	59	58	59	58	58	59	59	60	59	48
Hiko (RP2090201)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2016	1.27	0.59	0.27	1.38	0.40	0.65	0.50	1.40	0.02	0.61	0.26	1.84	9.19
Period of Record Statistics (1989 to Present)													
Mean	0.78	1.03	0.77	0.54	0.41	0.31	0.47	0.56	0.52	0.75	0.40	0.83	7.54
Min	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.45
Max	2.94	4.13	4.45	1.56	1.69	1.66	1.65	2.52	2.89	3.38	1.91	4.02	13.68
No. Yrs	26	26	27	26	27	27	27	27	28	28	28	28	24
Ward Mountain (RP2070301)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2016	4.2	1.1	2.1	4.3	1.4	2.4	0.1	0.7	1.3	0.8	1.8	4.8	25.0
Period of Record Statistics (1980 to Present)													
Mean	2.51	2.70	2.61	2.42	2.30	0.93	1.02	1.38	1.55	2.00	1.88	2.28	23.56
Min	0.2	0.4	0.3	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	12.8
Max	6.1	9.5	8.1	5.7	7.0	3.9	5.0	4.6	7.9	6.6	7.9	10.7	39.7
No. Yrs	36	36	36	36	36	36	36	37	37	37	37	37	36

Note: a = 1 day missing, b = 2 days missing, c = 3 days missing, etc..., z = 26 or more days missing; Long-term means based on summation of period of record monthly mean row values.

Table F-2
2016 High-Altitude Precipitation Data

Source	Station Number	Station Name	2016 Precipitation (in.)	Period of Record Statistics				
				Time Period	Mean	Min	Max	No. Yrs.
NDWR	RP1830101	Mount Wilson (NDWR)	16.90	1954 - 2016	16.58	7.50	28.30	60



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SOUTHERN NEVADA WATER AUTHORITY

100 City Parkway, Suite 700 • Las Vegas, NV 89106
MAILING ADDRESS: P.O. Box 99956 • Las Vegas, NV 89193-9956
(702) 862-3400 • snwa.com

March 29, 2017

Jason King, P.E., State Engineer
Nevada Division of Water Resources
901 S. Stewart Street, Suite 2002
Carson City, Nevada 89701

Dear Mr. King:

SUBJECT: SUBMITTAL OF ANNUAL MONITORING REPORTS FOR SELECTED SNWA AND LVVWD PERMITS IN SOUTHERN AND EASTERN NEVADA

The enclosed reports are submitted in satisfaction of hydrologic monitoring and reporting requirements associated with water-right permits held by the Southern Nevada Water Authority (SNWA) and Las Vegas Valley Water District (LVVWD) in eastern and southern Nevada. The reports included in this submittal are described below:

2016 Annual SNWA Monitoring Report for Coyote Spring, Garnet, and Hidden Valleys, Clark and Lincoln Counties, Nevada (Hydrographic Areas 210, 216 and 217) for Permit Numbers 54073, 54074, 68822, 77291-77306, 70429, 70430, 74094, 74095, 79001-79010 and 83490. The report also includes data collected at monitoring sites located in adjacent hydrographic basins.

2016 Spring Valley Hydrologic Monitoring, Management, and Mitigation Plan Status and Data Report (Hydrographic Area 184) in satisfaction of reporting requirements set forth in the hydrologic monitoring plan approved by the Nevada State Engineer (NSE) associated with Ruling 6164.

2016 Delamar, Dry Lake and Cave Valleys Hydrologic Monitoring, Management, and Mitigation Plan Status and Data Report (Hydrographic Areas 180, 181 and 182) in satisfaction of reporting requirements set forth in the hydrologic monitoring plan approved by the NSE associated with Rulings 6165 through 6167.

2016 Annual Monitoring Report for LVVWD Groundwater Permits in Ivanpah Valley, Nevada (Hydrographic Area 164A) for Permits Numbers 17691, 21997, 51133, 51543, 51544, 52733-52735, 54983, 76210, 81346, 83076 and 83077. A CD containing electronic files of water-level data in the format requested by your office is included in the report.

SNWA MEMBER AGENCIES

Big Bend Water District • Boulder City • Clark County Water Reclamation District • City of Henderson • City of Las Vegas • City of North Las Vegas • Las Vegas Valley Water District

Jason King, P.E., State Engineer

March 29, 2017

Page 2

Electronic files containing the 2016 hydrologic and groundwater-production data collected under the various monitoring programs associated with these permits have previously been submitted to your office in the required format.

If you have any questions concerning these reports, please contact Andrew Burns at (702) 862-3772.

Sincerely,



Colby N. Pellegrino

Director of Water Resources

CNP:AB:JP:lmv

Enclosures (4)

c: Adam Sullivan, Hydrology Section Chief, Nevada Division of Water Resources
Matt Dillion, Water Resource Specialist, Nevada Division of Water Resources
John Guillory, Supervising Engineer, Nevada Division of Water Resources



SOUTHERN NEVADA WATER AUTHORITY

100 City Parkway, Suite 700 • Las Vegas, NV 89106
MAILING ADDRESS: P.O. Box 99956 • Las Vegas, NV 89193-9956
(702) 862-3400 • snwa.com

March 29, 2017

Steve Mietz, Superintendent
Great Basin National Park
100 Great Basin National Park
Baker, Nevada 89311

William Dunkelberger, Forest Supervisor
U.S. Forest Service
1200 Franklin Way
Sparks, Nevada 89431

Glen Knowles, Field Supervisor
U.S. Fish and Wildlife Service
4701 N. Torrey Pines Dr.
Las Vegas, Nevada 89130

Michael Herder, Ely District Manager
Bureau of Land Management
702 N. Industrial Way
HC 33 Box 3350
Ely, Nevada 89301

Cathy Wilson, Area Director
Bureau of Indian Affairs, Western Region
2600 N. Central Avenue, MS#460
Phoenix, Arizona 85004

Dear Stipulation Executive Committee Members:

SUBJECT: SUBMITTAL OF THE 2016 SPRING VALLEY AND DDC VALLEYS HYDROLOGIC MONITORING, MANAGEMENT, AND MITIGATION PLAN STATUS AND DATA REPORTS

The Southern Nevada Water Authority (SNWA) hereby submits the subject reports to the Stipulation Executive Committee (EC). These reports are submitted in satisfaction of reporting requirements set forth in hydrologic monitoring plans associated with Exhibit A of the Stipulation for Withdrawal of Protests for both Spring Valley and Delamar, Dry Lake, and Cave (DDC) valleys.

These reports provide the EC and Technical Review Panel with hydrologic data for calendar year 2016 and a status update of monitoring activities performed by SNWA. Copies of the reports and electronic data submittal have also been posted on the Spring Valley and DDC valleys data-exchange website.

If you have any questions regarding these reports, please contact Andrew Burns at (702) 862-3772.

Sincerely,

Colby N. Pellegrino
Director of Water Resources

CNP:AB:JP:lmv
Enclosures (2)

c: Andy Gault, Bureau of Land Management
Ray Roessel, Bureau of Indian Affairs, Western Region
Sue Braumiller, U.S. Fish and Wildlife Service
Joe Gurrieri, U.S. Forest Service
Gary Karst, National Park Service
Jose Noriega, U.S. Forest Service
Andrew Burns, Southern Nevada Water Authority
James Prieur, Southern Nevada Water Authority

SNWA MEMBER AGENCIES