NAPA COUNTY CALIFORNIA

NAPA VALLEY GROUNDWATER SUSTAINABILITY

A Basin Analysis Report for the Napa Valley Subbasin – APPENDICES

Part 2 of 2

DRAFT REPORT

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NAPA VALLEY GROUNDWATER SUSTAINABILITY:

A BASIN ANALYSIS REPORT FOR THE NAPA VALLEY SUBBASIN

APPENDIX D:

Napa Country Comprehensive Groundwater Monitoring Program, 2015 Annual Report and CASGEM Update

Napa County Comprehensive Groundwater Monitoring Program 2015 Annual Report and CASGEM Update

March 2016

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Napa County Comprehensive Groundwater Monitoring Program 2015 Annual Report and CASGEM Update

Prepared for
Napa County

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EXECUTIVE SUMMARY

ES 1 INTRODUCTION

Groundwater and surface water are highly important natural resources in Napa County. Together, the County and other municipalities, water districts, commercial and industrial operations, the agricultural community, and the general public, are stewards of the available water resources. Everyone living and working in Napa County has a stake in protecting the county's groundwater resources, including groundwater supplies, groundwater quality, and associated watersheds (GRAC, 2014).

Long-term, systematic monitoring programs are essential to provide data that allow for improved evaluation of water resources conditions and to facilitate effective water resources planning. For this reason, Napa County embarked on a countywide project referred to as the "Comprehensive Groundwater Monitoring Program, Data Review, and Policy Recommendations for Napa County's Groundwater Resources" (Comprehensive Groundwater Monitoring Program) in 2009, to meet action items identified in the 2008 General Plan update. The program emphasizes developing a sound understanding of groundwater conditions and implementing an expanded groundwater monitoring and data management program as a foundation for future coordinated, integrated water resources planning and dissemination of water resources information.

The *Napa County Groundwater Monitoring Plan 2013* (Plan) was prepared to formalize and augment groundwater monitoring efforts conducted as part of the Comprehensive Groundwater Monitoring Program. The Plan recommended annual reports on groundwater conditions and modifications to the countywide groundwater monitoring program as needed. Additionally, the Plan recommended a comprehensive triennial report. This report is the second Annual Report – *Napa County Comprehensive Groundwater Monitoring Program 2015 Annual Report and CASGEM*[1]*Update* (Report).

In addition to providing an update on groundwater level conditions and monitoring program modifications, this Report summarizes recent groundwater quality data.

ES 2 GROUNDWATER MONITORING GOALS AND OBJECTIVES

The California Department of Water Resources (DWR) has identified the major groundwater basins and subbasins in and around Napa County. The basins include the Napa-Sonoma Valley (which in Napa County includes the Napa Valley and Napa-Sonoma Lowlands Subbasins), Berryessa Valley, Pope Valley, and a small part of the Suisun-Fairfield Valley Groundwater Basins (**Figure 2-1**). For purposes of local planning, understanding, and studies, the County has been subdivided into a series of groundwater subareas (**Figure 2-2**). These subareas were delineated based on the main watersheds, groundwater basins, and the County's environmental resource planning areas.

Water level and quality objectives established for the countywide Comprehensive Groundwater Monitoring Program are linked to 1) the County's General Plan goals and action items presented in **Section 3.1** of this Report, and 2) hydrogeologic conditions and potential areas of concern (LSCE, 2013a).

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[1] CASGEM is the California Statewide Groundwater Elevation Monitoring program implemented under Water Code Part 2.11 Groundwater Monitoring and administered by DWR.

The focus of the countywide groundwater level monitoring includes the following objectives:

- Expand groundwater level monitoring in priority County subareas to improve the understanding of the occurrence and movement of groundwater; monitor local and regional groundwater levels including seasonal and long-term trends; and identify hydraulic connections in aquifer systems and aquifer-specific groundwater conditions, especially in areas where short- and long-term development of groundwater resources are planned;
- Detect the occurrence of, and factors attributable to, natural (e.g., direct infiltration of precipitation, surface water seepage to groundwater, groundwater discharge to streams) or induced factors (e.g., pumping, purposeful recharge operations) that affect groundwater levels and trends;
- Identify appropriate monitoring sites to further evaluate groundwater-surface water interaction and recharge/discharge mechanisms, including whether groundwater utilization is affecting surface water flows;
- Establish a monitoring network to aid in the assessment of changes in groundwater storage; and
- Generate data to better estimate groundwater basin conditions and assess local current and future water supply availability and reliability; update analyses as additional data become available.

Based on the analysis of existing groundwater data and conditions described in the report *Napa County Groundwater Conditions and Groundwater Monitoring Recommendations* (LSCE, 2011a) and with input received from the Groundwater Resources Advisory Committee (GRAC), the key objectives for future groundwater level monitoring for each subarea are summarized in LSCE (2013a) and **Section 3** of this Report.

ES 3 SUSTAINABLE GROUNDWATER MANAGEMENT ACT

In September 2014, the California Legislature passed the Sustainable Groundwater Management Act (Act). SGMA changes how groundwater is managed in the state. SGMA defines "sustainable groundwater management" as the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results (Section 10721 (u)). Undesirable results, as defined by SGMA, means one or more effects caused by groundwater conditions occurring throughout the basin (Section 10721 (w)) (see **Section 6.2**).

As noted in **Section 2** of this Report, SGMA applies to basins or subbasins that DWR designates as medium- or high-priority basins. Previously under the California Statewide Groundwater Elevation Monitoring Program (CASGEM), DWR classified California's groundwater basins and subbasins as either high, medium, low, or very low priority. The priority classifications are based on eight criteria that include the overlying population, the reliance on groundwater, and the number of wells in a basin or subbasin. In Napa County, the Napa Valley Subbasin was ranked medium priority. All other Napa County basins and subbasins were ranked as very low-priority (**Figure 2-1**).

For most basins designated by DWR as medium or high priority, SGMA requires the designation of groundwater sustainability agencies (GSA) and the adoption of groundwater sustainability plans (GSP); however, there is an alternative to a GSP, provided that the local entity (entities) can meet certain requirements. When required, GSPs must be developed to eliminate overdraft conditions in aquifers and to return them to a condition that assures their long-term sustainability within twenty years of GSP implementation. SGMA does not require the development of a GSP for basins that DWR ranks as low- or very low-priority basins; GSPs are voluntary for these basins.

As applicable, SGMA requires that a GSA be identified for medium- and high-priority groundwater basins by June 30, 2017. Counties are presumed to be the GSA for unmanaged areas of medium and high priority basins (Section 10724). However, counties are not required to assume this responsibility. When no entity steps forward, this can lead to state intervention (Section 10735 *et seq*.).

In addition to imposing a number of new requirements on local agencies related to groundwater management, SGMA also provides for state intervention – a “backstop” – when local agencies are unwilling or unable to manage their groundwater basin (Section 10735 *et seq*.).

Under SGMA, Section 10733.6, a local entity (or entities) can pursue an Alternative to a GSP provided that certain sustainability objectives are met. An Alternative to a GSP may include:

> (b) (3) “An analysis of basin conditions that demonstrates that the basin has operated within its sustainable yield over a period of at least 10 years. The submission of an alternative described by this paragraph shall include a report prepared by a registered professional engineer or geologist who is licensed by the state and submitted under that engineer’s or geologist’s seal.”

> The County would need to submit the alternative plan no later than January 1, 2017, and every five years thereafter.

> (d)The assessment required by subdivision (a) shall include an assessment of whether the alternative is within a basin that is in compliance with Part 2.11 (commencing with Section 10920). If the alternative is within a basin that is not in compliance with Part 2.11 (commencing with Section 10920), the department shall find the alternative does not satisfy the objectives of this part.

On February 18, 2016 DWR published draft regulations for the development of GSPs and GSP-alternatives. Napa County staff have met with DWR staff to discuss a possible approach for a GSP-alternative for the Napa Valley Subbasin. County staff have also provided comments to DWR on the draft regulations, which are required under SGMA to be finalized and adopted by June 1, 2016. County staff are currently seeking input from the Napa County Board of Supervisors and preparing for multiple paths forward pending direction from the Supervisors and the content of the final regulations with respect to the requirements for GSP-alternatives.

ES 4 GROUNDWATER MONITORING NETWORK DESIGN AND DEVELOPMENT

Groundwater level monitoring was conducted at a total of 113 sites across Napa County in 2015 (**Table ES-1)**. The overall number and distribution of monitored sites remained consistent with the monitoring conducted in 2014 and was increased relative to the 87 sites reported in the 2011(LSCE, 2013a) (**Table ES-1**).

Out of the total 113 sites monitored in 2015, 100 were monitored by Napa County. Four sites were monitored by DWR. The remaining nine sites were regulated facilities with data reported as part of the State Water Resources Control Board (SWRCB) Geotracker Program.

Minor changes in the sites monitored by Napa County between 2014 and 2015 occurred due to a combination of well-owner requests and decisions by the Napa County Department of Public Works. In the latter case, three wells were discontinued by the County where other nearby monitored wells were determined to be sufficient to meet the monitoring objectives. Three additional wells were added to the County's monitoring networks during 2015 based on requests by well owners for monitoring by the County in areas where additional monitoring sites were needed. As recommended in the 2014 Annual Report, the County also began monthly monitoring of a subset of eight wells in order to provide greater temporal resolution in areas where semi-annual measurements may not accurately reflect the peak groundwater levels.

ES 4.1 Local Groundwater Assistance Grant Program Monitoring

Funding from the DWR 2012 Local Groundwater Assistance Grant Program enabled Napa County to construct ten monitoring wells at five sites in Napa Valley in September 2014. These wells comprise the groundwater monitoring facilities for the Napa County Surface Water-Groundwater Monitoring Project.

Table ES-1 Current Groundwater Level Monitoring Sites in Napa County by Groundwater Subarea

Groundwater Subarea	Number of Monitored Sites Through 2011	Number of Monitored Sites, Fall 2014	Number of Monitored Sites, Fall 2015
Napa Valley Floor-Calistoga	6	10	9
Napa Valley Floor-MST	29	27	27
Napa Valley Floor-Napa	18	21	20
Napa Valley Floor-St. Helena	12	14	14
Napa Valley Floor-Yountville	9	12	14
Carneros	5	12	12
Jameson/American Canyon	1	1	1
Napa River Marshes	1	1	-
Angwin	-	5	5
Berryessa	3	2	3
Central Interior Valleys	1	1	2
Eastern Mountains	-	3	4
Knoxville	1	-	-
Livermore Ranch	-	-	-
Pope Valley	1	1	1
Southern Interior Valleys	-	-	-
Western Mountains	-	2	1
Unknown[1]	-	3	-
Total Sites	**87**	**115**	**113**

[1] In 2014 three sites in the Geotracker regulated groundwater monitoring network were reporting groundwater level data, but had not yet reported location information for the monitored wells.

Water level data collected at the five sites are presented in **Section 5.5**. Data from Sites 1, 3, and 4 show that groundwater levels were above or very near the riverbed at these sites, indicating connectivity between groundwater and surface water. Data from Site 1 indicates that little to no flow occurred between groundwater and the river at that location. Data from Sites 3 and 4 showed variability in the nature of groundwater-surface water connection during 2015, ranging from groundwater flow into the river to the opposite. At both Site 2 and Site 5 the direction of groundwater flow was away from the streambed. At Site 5 water level data indicate that the river was hydraulically connected to groundwater during the first half of the year, until flows in the river ceased in July, and again in December 2015 as storms generated runoff leading to renewed flow in the river. At Site 2, located along Dry Creek, groundwater levels were consistently below the streambed elevation in 2015, indicating that groundwater was disconnected from the stream, although recharge to the groundwater system was likely occurring when water flowed in the creek.

ES 5 SUMMARY OF CONDITIONS AND RECOMMENDATIONS

Groundwater level monitoring was conducted at a total of 113 sites across Napa County in 2015 (**Table ES-1)**. The overall number and distribution of monitored sites remained consistent with the monitoring conducted in 2014 and was increased relative to the 87 sites reported in the 2011(LSCE, 2013a).

Groundwater level trends in the Napa Valley Subbasin of the Napa-Sonoma Valley Groundwater Basin are stable in the majority of wells with long-term groundwater level records. While many wells have shown at least some degree of response to recent drought conditions, the water levels observed in recent years are generally higher than groundwater levels in the same wells during the 1976 to 1977 drought. Elsewhere in the County long-term groundwater level records are limited, with the exception of the Milliken-Sarco-Tulucay (MST) Subarea.

Although designated as a groundwater subarea for local planning purposes, the majority of the MST is not part of a groundwater basin as mapped by DWR. Groundwater level declines observed in the MST Subarea as early as the 1960s and 1970s have stabilized since about 2008. Groundwater level responses differ within the MST Subarea and even within the north, central, and southern sections of this subarea, indicating that localized conditions, whether geologic or anthropogenic in nature, might be the primary influence on groundwater conditions in the subarea.

While the majority of wells with long-term groundwater level records exhibit stable trends, periods of year to year declines in groundwater levels have been observed in a few wells. These wells are located near the Napa Valley margin in the northeastern Napa Subarea (NapaCounty-75 and Napa County-76), southwestern Yountville Subarea (NapaCounty-135) and southeastern St. Helena Subarea (NapaCounty-132). These locations are characterized in part by relatively thin alluvial deposits, which may contribute to more groundwater being withdrawn from the underlying semi-consolidated deposits.

Water levels in northeastern Napa Subarea wells NapaCounty-75 and Napa County-76, east of the Napa River, have stabilized since 2009, though declines were observed over roughly the prior decade. Despite the recent stability, given the potential for a hydraulic connection between the aquifer units in the vicinity of these wells and the aquifer units of the MST Subarea and an apparent increase in the number of new well permits in the area over the past 10 years[2], further study in this area is recommended.

Water levels at NapaCounty-135 and NapaCounty-132 declined most distinctly between 2013 and 2014. The increased monitoring frequency at these wells through the end of 2015 has shown groundwater levels already recovering to levels comparable to or higher than those of spring 2013. Groundwater level

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[2] In a Memorandum to David Morrison, Director of Planning, Building, and Environmental Services, dated December 7, 2015 regarding groundwater conditions in the northeastern corner of the Napa Subarea Steven Lederer, Director of Public Works, noted that “12 of the approximately 30 homes on Petra Drive have applied for new well permits in the past 10 years.”

declines in these wells observed in 2014 could have one or more contributing factors, including variations in groundwater recharge due to changes in the timing and intensity of precipitation and changes in the level of pumping at the monitored well or in the vicinity of the monitored well. Continuation of the increased monitoring frequency through 2016 is recommended to assist with interpretation of conditions at these wells in the future.

Groundwater quality data show stable conditions between 2009 and 2015 compared to the conditions reported previously with data through 2008 (LSCE, 2011a). Water quality standard exceedances in the Napa Valley Floor subareas and Napa Valley Subbasin were limited to the naturally-occurring constituent arsenic, with 4 of 26 sites showing maximum concentrations above the MCL of 10 µg/L. Water quality standard exceedances in the Napa-Sonoma Lowlands Subbasin, including portions of the Carneros and Jameson/American Canyon Subareas, occurred for arsenic (three wells), nitrate (one well), TDS (five wells).

Wells with long-term water quality data show stable TDS and Nitrate concentrations, with the exception of one well (06N04W27L002M) which had a peak of 7.7 mg/L NO3-N (nitrate as nitrogen) in 2007 compared to initial concentrations of 3.4 mg/L NO3-N and 4.0 mg/L NO3-N in 1982 and 1972, respectively. In the Napa-Sonoma Lowlands Subbasin, nitrate concentrations have been stable to decreasing in all five wells with long-term records in the Napa-Sonoma Lowlands Subbasin. Two wells have shown increasing TDS trends, though all four wells with long-term trends were initially at or above the secondary MCL.

The following recommendations have been developed based on the findings presented in this report.

ES 5.1 Northeast Napa Subarea Special Study

Previously observed groundwater level declines in the northeast Napa Subarea, east of the Napa River in the vicinity of NapaCounty-75 and NapaCounty-76, along with reports of increased well replacement activity along Petra Drive have raised questions about the cumulative impacts of existing and potential future groundwater use in this area. In addition to completing the standard project-level planning review of the proposed projects, a focused study of hydrogeologic conditions affecting groundwater availability is advisable for this area. The investigation should be designed to address existing and future water use in the area, sources of groundwater recharge, and the geologic setting in order to address the potential for cumulative impacts of future development. The investigation would also seek to address the influence of previously documented groundwater cones of depression in the MST subarea on both the study area east of the Napa River and the Napa Subarea west of the Napa River.

ES 5.2 Data Gap Refinement

Groundwater levels in two monitored wells located near to the Napa Valley margin showed year to year declines in groundwater levels. Additional information is needed in order to consider the full range of possible causes for these declines and more accurately determine if the present emerging trends. Recommended actions include a review of land use data in these areas and continuation of the increased frequency of data collection at a subset of wells. More frequent data collection could be accomplished, pending agreement with the well owner, by monthly manual groundwater level measurements.

For wells added to the County's monitoring networks in recent years without a record of key well construction details, continued efforts to locate construction information and link those data with aquifer units is recommended. In cases where a well owner does not have a record of the construction, a review of Well Completion Reports is recommended.

Once final Groundwater Sustainability Plan regulations are published by DWR later in 2016, there may be a need to add one or more wells to the CASGEM network near the southern boundary of the Napa Valley Subbasin. A well or wells in this area would be used to monitor groundwater gradients at the basin boundary where subsurface outflow occurs into the Napa-Sonoma Lowlands Subbasin. This data will be a component of the subbasin water budget that will be a key feature of the quantitative approach to groundwater management described in SGMA. For similar reasons, the County may benefit from updating reference point elevation data for some monitored wells with surveyed values in order more accurately monitor groundwater level gradients and any potential future seawater intrusion.

ES 5.3 Baseline Water Quality Sampling

The groundwater quality monitoring objectives contained in the *Napa County Groundwater Monitoring Plan 2013* (Plan) included the investigating of variations in water quality at different points within the groundwater subareas and at different aquifer units within a given subarea (LSCE, 2013a). The Plan recommended baseline sampling in wells at each of 18 Areas of Interest for additional monitoring and at the then proposed dedicated surface water-groundwater monitoring wells. It is recommended that wells added to the County monitoring networks in these areas be reviewed for suitability in light of the groundwater quality monitoring objectives, with baseline sampling conducted for those wells with sufficient well construction records to enable interpretation of the results for specific aquifer units.

A second round of baseline water quality sampling is also recommended for the five dual-completion monitoring wells constructed in 2014 at surface water-groundwater monitoring sites, as described in the Plan. An initial round of sampling and analysis was completed in June 2015 with a combination of County matching funds, DWR grant funds, and DWR in-kind support. Sampling these wells again in 2016 will provide a more robust baseline dataset that would be used to characterize any inter-annual variability at each well and provide a basis for interpreting future groundwater quality data.

ES 5.4 Coordination with Other Monitoring Efforts

Coordination with other county departments and other agencies that monitor groundwater data or receive groundwater data could provide an additional source of data in places where data are limited. Several local agencies, including Town of Yountville, City of St. Helena, City of Napa, already monitor groundwater levels at locations around the County.

1 INTRODUCTION

1.1 Purpose

Groundwater and surface water are highly important natural resources in Napa County. Together, the County and other municipalities, water districts, commercial and industrial operations, the agricultural community, and the general public, are stewards of the available water resources. Everyone living and working in Napa County has a stake in protecting the county's groundwater resources; including groundwater supplies, quality, and associated watersheds (GRAC, 2014). Without sustainable groundwater resources, the character of the County would be significantly different in terms of its economy, communities, rural character, ecology, housing, and lifestyles.

Similar to other areas in California, businesses and residents of Napa County face many water-related challenges including:

- Sustaining the quality, availability and reliability of local and imported water supplies;
- Meeting challenges arising during drought conditions;
- Avoiding environmental effects due to water use; and
- Changes in long-term availability due to global warming and/or climate change.

To address these challenges, long-term, systematic monitoring programs are essential to provide data that allow for improved evaluation of water resources conditions and to facilitate effective water resources planning. In 2009, Napa County embarked on a countywide project referred to as the "Comprehensive Groundwater Monitoring Program, Data Review, and Policy Recommendations for Napa County's Groundwater Resources" (Comprehensive Groundwater Monitoring Program), to meet identified action items in the 2008 General Plan update. The program emphasizes developing a sound understanding of groundwater conditions and implementing an expanded groundwater monitoring and data management program as a foundation for future coordinated, integrated water resources planning and dissemination of water resources information.

On June 28, 2011, the Napa County Board of Supervisors adopted a resolution to establish a Groundwater Resources Advisory Committee (GRAC), and an outreach effort for applicants began. On September 20, 2011, the Board of Supervisors appointed 15 residents to the GRAC, and the GRAC held its first organizational meeting on October 27, 2011. The members represented diverse interests, including environmental, agricultural, development, and community interests.

The GRAC was created to assist County staff and technical consultants with recommendations regarding:

- Synthesis of existing information and identification of critical data needs;
- Development and implementation of an ongoing non-regulatory groundwater monitoring program;
- Development of revised well pump test protocols and related revisions to the County's groundwater ordinance;
- Conceptualization of hydrogeologic conditions in various areas of the County and an assessment of groundwater resources as data become available;
- Development of groundwater sustainability objectives that can be achieved through voluntary means and incentives; and
- Building community support for these activities and next steps.

From January 2012 until January 2013, the GRAC reviewed and provided feedback on the development of the *Napa County Groundwater Monitoring Plan 2013* (Plan) (LSCE, 2013a). The Plan was prepared to formalize and augment groundwater monitoring efforts [levels and quality] to better understand the groundwater resources of Napa County, aid in making the County eligible for public funds administered by the California Department of Water Resources (DWR), and regularly evaluate trends to identify changes in levels and/or quality and factors related to those changes that warrant further examination to ensure sustainable water resources. The Plan included refinement of criteria used to identify priority monitoring areas and a proposed expanded monitoring network.

The Napa County groundwater monitoring program relies on both publicly-owned and volunteered private wells. To fulfill its mission and garner community interest and support, the GRAC developed a Communication and Education Plan, designed to implement the Plan through voluntary participation. This effort included the development of an outreach brochure and a series of fact sheets on specific topics.

Some of the many activities accomplished by the GRAC over a two and a half year period included:

- Provided updates to agriculture industry groups, environmental organizations and others;
- Led and supported outreach efforts to well owners for volunteer monitoring wells which has been very successful in adding new wells to the Napa County groundwater monitoring program;
- Held a joint public outreach meeting of the GRAC and Watershed Information and Conservation Council (WICC) Board (July 25, 2013);
- Reviewed and recommended modifications to the Napa County Water Availability Analysis and Groundwater Ordinance; and
- Developed and approved Groundwater Sustainability Objectives (GRAC, 2014).

The Plan recommended annual reports on groundwater conditions and modifications to the countywide groundwater monitoring program as needed. Additionally, the Plan recommended a comprehensive triennial report. This report is the second Annual Report – *Napa County Comprehensive Groundwater Monitoring Program 2015 Annual Report and CASGEM*[3] *Update* (Report).

1.2 Organization of Report

This Report summarizes activities implemented as part of the County's Comprehensive Groundwater Monitoring Program to improve the understanding of groundwater resource conditions and availability. This Report summarizes groundwater monitoring needed to fill the data gaps (i.e., relatively higher monitoring priorities) that were established in the Plan, recommendations made to address these priorities, and activities implemented since 2014. This Report also summarizes the overarching groundwater level and quality monitoring objectives defined by the County and the GRAC. These objectives provide the framework necessary to ensure that the data collected from the countywide monitoring facilities can address these objectives.

This Report includes the following sections:

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[3] CASGEM is the California Statewide Groundwater Elevation Monitoring program implemented under Water Code Part 2.11 Groundwater Monitoring and administered by DWR.

Section 2: Hydrogeology of Napa County

- DWR Basins/Subbasins and County Subareas
- Summary of Geology and Groundwater Resources
- Overview of Recent Groundwater Studies and Programs

Section 3: Groundwater Resources Goals and Monitoring Objectives

- Napa County Water Resources Goals and Policies
- Groundwater Level Monitoring Objectives
- Groundwater Quality Monitoring Objectives

Section 4: Groundwater Monitoring Network Design and Development

- Groundwater Level Monitoring
- Surface Water-Groundwater Monitoring

Section 5: Groundwater Level Trends and Flow Directions

- Napa Valley Floor Subareas
- Subareas South of the Napa Valley Floor
- Subareas East and West of the Napa Valley Floor
- Angwin and Pope Valley Subareas
- Napa Valley Surface Water-Groundwater Monitoring

Section 6: Groundwater Quality Conditions and Trends

- Napa Valley Floor Subareas
- Subareas South of the Napa Valley Floor
- Subareas East and West of the Napa Valley Floor
- Angwin and Pope Valley Subareas

Section 7: Coordination and Collaboration

- Integrated Regional Water Management Plans
- Groundwater Sustainability
- Napa County Watershed Information and Conservation Council

Section 8: Summary and Recommendations

- Ongoing Vetting and Review of Potential Monitoring Sites
- Data Gap Refinement
- Baseline Water Quality Sampling
- Coordination with Other Monitoring Efforts
- Existing Activities in the MST Subarea

2 HYDROGEOLOGY OF NAPA COUNTY

This section summarizes the countywide geologic and hydrologic setting, and includes information about DWR groundwater basin/subbasin delineations and a description of the Napa County groundwater monitoring subareas. The studies that form the basis of the understanding of County hydrogeology are referenced, including the work for the *Updated Hydrogeologic Conceptualization and Characterization of Conditions* (LSCE and MBK, 2013).

2.1 DWR Basins/ Subbasins and County Subareas

DWR has identified the major groundwater basins and subbasins in and around Napa County. The basins include the Napa-Sonoma Valley (which in Napa County includes the Napa Valley and Napa-Sonoma Lowlands Subbasins), Berryessa Valley, Pope Valley, and a small part of the Suisun-Fairfield Valley Groundwater Basins (**Figure 2-1**). These basins and subbasins are generally defined based on boundaries to groundwater flow and the presence of water-bearing geologic units. These groundwater basins defined by DWR are not confined within county boundaries, and DWR-designated "basin" or "subbasin" designations do not cover all of Napa County.

Groundwater conditions outside of the DWR-designated basins and subbasins are also very important in Napa County. An example of such an area is the Milliken-Sarco-Tulucay (MST) area, a locally identified groundwater deficient area. For purposes of local planning, understanding, and studies, the County has been subdivided into a series of groundwater subareas (**Figure 2-2**). These subareas were delineated based on the main watersheds, groundwater basins, and the County's environmental resource planning areas. These subareas include the Knoxville, Livermore Ranch, Pope Valley, Berryessa, Angwin, Central Interior Valleys, Eastern Mountains, Southern Interior Valleys, Jameson/American Canyon, Napa River Marshes, Carneros, Western Mountains Subareas and five Napa Valley Floor Subareas (Calistoga, St. Helena, Yountville, Napa, and MST).

DWR has given the Napa Valley Subbasin a "medium priority"[4] ranking according to the criteria specified in California Water Code Part 2.11 Groundwater Monitoring (i.e., this relates to the CASGEM program).

2.2 Summary of Geology and Groundwater Resources

2.2.1 Previous Studies

Previous hydrogeologic studies of Napa County and also mapping efforts are divisible into geologic studies and groundwater studies. The more significant studies and mapping efforts are mentioned in this section. **Table 2-1** shows the chronological sequence of these efforts that span more than six decades. Weaver (1949) presented geologic maps which covered the southern portion of the county and provided a listing of older geologic studies. Kunkel and Upson (1960) examined the groundwater and geology of the northern portion of the Napa Valley. DWR (Bulletin 99, 1962) presented a reconnaissance report on the geology and water resources of the eastern area of the County; Koenig (1963) compiled a regional geologic map which encompasses Napa County. Fox and others (1973) and Sims and others (1973) presented more detailed geologic mapping of Napa County. Faye (1973) reported on the

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[4] As part of the CASGEM Program, DWR has developed the Basin Prioritization process. The California Water Code (§10933 and §12924) requires DWR to prioritize California's groundwater basins and subbasins statewide. As such, DWR developed the CASGEM Groundwater Basin Prioritization Process. Details are available at http://www.water.ca.gov/groundwater/casgem/basin_prioritization.cfm.

groundwater of the northern Napa Valley. Johnson (1977) examined the groundwater hydrology of the MST area.

Helley and others (1979) summarized the flatland deposits of the San Francisco Bay Region, including those in Napa County. Fox (1983) examined the tectonic setting of Cenozoic rocks, including Napa County. Farrar and Metzger (2003) continued the study of groundwater conditions in the MST area.

Wagner and Bortugno (1982) compiled and revised the regional geologic map of Koenig (1963). Graymer and others (2002) presented detailed geologic mapping of the southern and portions of the eastern areas of the County, while Graymer and others (2007) compiled geologic mapping of the rest of Napa County.

In 2005 to 2007, DHI Water & Environment (DHI) contributed to the 2005 *Napa County Baseline Data Report* (DHI, 2006a and Jones & Stokes et al., 2005) which was part of the County's General Plan update (Napa County, 2008). A groundwater model was developed by DHI in conjunction with the Napa Valley and Lake Berryessa Surface Water models to simulate existing groundwater and surface water conditions on a regional basis primarily in the North Napa Valley and the MST and Carneros Subareas (DHI, 2006b). A 2007 technical memorandum, *Modeling Analysis in Support of Vineyard Development Scenarios Evaluation* (DHI, 2007), was prepared to document the groundwater model update which was used to evaluate various vineyard development scenarios.

Additional geologic maps, groundwater studies, and reports are listed in the references of the *Napa County Groundwater Conditions and Groundwater Monitoring Recommendations* (LSCE, 2011a). Additional work has been conducted to update the conceptualization and characterization of hydrogeologic conditions particularly for the Napa Valley Floor (LSCE and MBK, 2013 and LSCE, 2013b).

A new project, "Napa County Groundwater/Surface Water Monitoring Facilities to Track Resource Interrelationships and Sustainability", is currently underway (LSCE, in progress). This project, which is supported through grant funding from DWR, involves the installation of shallow dual-completion groundwater monitoring facilities at five sites adjacent to the Napa River system. The goals of the project are to implement groundwater and surface water monitoring to characterize the interrelationship between these water resources in Napa Valley. The project includes gathering data to:

1. Assess the response to surface water and groundwater use and the potential effect of future climate changes, and
2. Ensure water resources sustainability for the natural environment and future generations. The facilities will enable the collection of new data to augment existing monitoring activities and datasets and will fill groundwater data gaps previously identified by Napa County.

Table 2-1 Summary and Chronology of Hydrogeologic and Geologic Studies and Mapping Efforts in Napa County

Hydrogeologic and/or Geologic Studies and Mapping Efforts	Year of Report or Map Publication							
	1940s	1950s	1960s	1970s	1980s	1990s	2000s	2010-2019
Weaver, 1949	♦							
Kunkel and Upson,1960			♦					
DWR, 1962			🔷					
Koenig, 1963			🔶					
Fox et al., 1973				🔷				
Sims et al., 1973				🔶				
Faye, 1973				♦				
Johnson, 1977				🔷				
Helley et al., 1979				♦				
Wagner and Bortugno, 1982					🔶			
Fox, 1983					♦			
Graymer et al., 2002							🔶	
Farrar and Metzger, 2003							♦	
Graymer et al., 2007							🔶	
DHI, 2006 and 2007							🔷	
LSCE, 2011a								🔷
LSCE and MBK, 2013								♦
LSCE, 2013a								🔷
LSCE, 2013b								🔷
LSCE, 2014								🔷
LSCE, 2015								♦

♦ = Report and Map produced

🔷 = Report only

🔶 = Map only

2.2.2 Precipitation Monitoring and Water Year Classifications

Infiltration of precipitation has been shown to provide significant groundwater recharge in Napa County, particularly in unconsolidated geologic settings (Kunkel and Upson 1960, LSCE and MBK 2013).

Precipitation records in Napa County date to 1906 at the longest continually operating gauge at the Napa State Hospital (GHCND: USC00046074). In a separate analysis precipitation data from the Napa State Hospital gauge in Napa (elevation 35 feet) have been shown to have strong linear correlations (i.e., $R^2 \geq 0.90$) with monthly and annual precipitation totals from two other gauges in Saint Helena (elevation 1,780 feet) and Angwin (elevation 1,815 feet) (2NDNature, 2014). Based on the strength of those correlations, the Napa State Hospital gauge has been recommended for use as an index gauge for the Napa River Watershed.

The water year classification presented in **Table 2-2** is revised from the version developed by 2NDNature (2014) and presented in the 2014 Annual Report (LSCE, 2015). The classification presented here accounts for gaps in the daily precipitation record at the Napa State Hospital gauge. Specifically, missing daily precipitation data in the Napa State Hospital gauge record from water years 1920 through 2015 were estimated based on daily data from the Saint Helena precipitation gauge (GHCND: USC0004764) and Oakville precipitation gauge (elevation: 190 feet, CIMIS Station No. 77). These gauges show very strong linear correlations (i.e., $R^2 > 0.99$) for cumulative daily data from the Napa State hospital gauge. Estimated daily precipitation values were calculated to fill gaps in the Napa State Hospital gauge record using observed values form either the Oakville or Saint Helena gauges and the linear regression for cumulative daily precipitation between those gauges and the Napa State Hospital gauge.

A frequency analysis was used to define very dry, dry, normal, wet, and very wet water year types according to exceedance probabilities calculated from the 96-year period of record for precipitation at the Napa State Hospital gauge from water years 1920 through 2015. Data from water years prior to 1920 were excluded from the frequency analysis due to large gaps in the Napa State Hospital gauge record prior to that year that were not able to be estimated using data from other gauges.

Table 2-2 Napa River Watershed Water Year Classification

Year Type	Water Year Precipitation Total		Annual Precipitation Exceedance Probability (%)	Number of Years in Period of Record
	Lower Bound (inches)	Upper Bound (inches)		
Very Dry		15.19	≥ 91	9
Dry	15.20	19.67	≥ 67	23
Normal	19.68	26.99	≥ 33	33
Wet	27.00	36.75	≥ 10	22
Very Wet	36.76		< 10	9
Napa State Hospital (NSH) Average Annual Water Year Precipitation (1920 – 2015) = 24.86 inches Period of record used for frequency analysis: 1920 – 2015				

2.2.3 Summary of Geology and Groundwater Resources

The geology of Napa County can be divided into three broad geologic units based on their ages and geologic nature. These units are: 1) Mesozoic Basement Rocks (pre-65 million years (my)), which underlie all of Napa County, but are primarily exposed in the Eastern County area and the Western Mountains Subarea, 2) Older Cenozoic Volcanic and Sedimentary Deposits (65 my to 2.5 my), including Tertiary Sonoma Volcanics (Miocene and Pliocene; 10 my to 2.5 my) which are found throughout the county, especially in the mountains surrounding Napa Valley, and 3) Younger Cenozoic Volcanic and Sedimentary Deposits (post 2.6 my to present), including the Quaternary alluvium of the Valley Floor. The two primary water-bearing units in the county are the tuffaceous member of the Sonoma Volcanics and the Quaternary alluvium.

Outside of the Napa Valley Floor, percolation of surface water appears to be the primary source of recharge. The rate of recharge within areas such as the MST Subarea has been shown to be significantly higher where streams and tributaries cross highly permeable outcrops (e.g., the tuffaceous member of the Sonoma Volcanics or shallow alluvium). Direct infiltration of precipitation is a major component of recharge in the main Napa Valley. Recharge throughout much of the county is generally limited by underlying shallow bedrock of low permeability. An additional component of groundwater recharge that is less understood is deep percolation through fractured rock and fault zones. This type of recharge can be very difficult to quantify due to the highly variable size and distribution of faults, fractures, and joints in a given area.

Groundwater Occurrence and Quality in the Sonoma Volcanics

Groundwater occurs in the Sonoma Volcanics in Napa County and yields water to wells. Well yields are highly variable from less than 10 to several hundred gallons per minute (gpm). The most common yields are between 10 to 100 gpm. Faye (1973) reported well-test information which showed an average yield of 32 gpm and an average specific capacity of 0.6 gallons per minute per foot of drawdown. From the available well log data, the Tertiary marine sedimentary rocks are poor groundwater producers either for a lack of water or poor water quality (high salinity). At great depths, groundwater quality in the Tertiary marine sedimentary rocks is generally poor due to elevated chloride concentrations.

According to Kunkel and Upson (1960), groundwater in the Sonoma Volcanics is generally of good quality except in three areas. The first area with poor groundwater quality, the Tulucay Creek drainage basin, east of the City of Napa, contains groundwater with elevated iron, sulfate, and boron. The Suscol area, south of the City of Napa, is the second area where some wells exhibit poor quality groundwater due to elevated chloride concentrations, possibly from leakage from salty water in the Napa River, alluvial material above, or the existence of zones of unusually saline connate water deep within the Sonoma Volcanics. The third area of poor groundwater quality, the Calistoga area in the northern end of the Napa Valley, contains isolated wells with naturally occurring elevated chloride, boron, and some trace metal concentrations.

Kunkel and Upson (1960) reported that the principal water yielding units of the Sonoma Volcanics are the tuffs, ash-type beds, and agglomerates. The lava flows were reported to be generally non-water bearing. However, it may be possible that fractured, fragmental, or weathered lava flows could yield water to wells. The hydrogeologic properties of the volcanic-sourced sedimentary deposits of the Sonoma Volcanics are complex and poorly understood.

Groundwater Occurrence in Other Units and in the Quaternary Sedimentary Deposits

Several hundred wells and test holes on record have been drilled into the exposed Huichica Formation. Well yields tend to be low to modest (< 10 gpm to tens of gpm). Only a few known wells on record are completed in the Clear Lake Volcanics near the northern County line. Three wells report high yields of 400 to 600 gpm. Much of the Clear Lake Volcanics to the south appear to be thinner, limited in extent, and in ridge-top locations where possible groundwater production appears to be less likely.

Groundwater production from Quaternary alluvium is variable, with yields ranging from <10 gpm in the East and West mountainous areas to a high of 3,000 gpm along the Napa Valley Floor where the alluvium is thickest (>200 feet). According to Faye (1973), average yield of wells completed in the alluvium is 220 gpm. Many wells drilled in the alluvium within the last 30 years extend beyond the alluvium and into the underlying Cenozoic units. Kunkel and Upson (1960) report that groundwater in the alluvium is generally of good quality. The groundwater is somewhat hard and of the bicarbonate type, with small concentrations of sulfate, chloride, and total dissolved solids. A few isolated areas have increased chloride and boron concentrations.

2.3 Recent Groundwater Studies and Programs

This section summarizes the recently completed studies by Napa County and the recommendations relevant to ongoing groundwater monitoring that were developed.

2.3.1 Napa County's Comprehensive Groundwater Monitoring Program

In 2009, Napa County implemented a Comprehensive Groundwater Monitoring Program to meet action items identified in Napa County's 2008 General Plan update (Napa County, 2008). The program emphasizes developing a sound understanding of groundwater conditions and implementing an expanded groundwater monitoring and data management program as a foundation for future coordinated, integrated water resources planning and dissemination of water resources information. The program (and the Plan (LSCE, 2013a)) covers the continuation and refinement of countywide groundwater level and quality monitoring efforts (including many basins, subbasins and/or subareas throughout the county) for the purpose of understanding groundwater conditions (i.e., seasonal and long-term groundwater level trends and also quality trends) and availability. This information is critical to enable integrated water resources planning and the dissemination of water resources information to the public and state and local decision-makers. Napa County's combined efforts through the Comprehensive Groundwater Monitoring Program along with the related AB 303 Public Outreach Project on groundwater (CCP, 2010) and the efforts of the WICC of Napa County create a foundation for the County's continued efforts to increase public outreach and participation in water resources understanding, planning, and management.

Napa County's Comprehensive Groundwater Monitoring Program involved many tasks that led to the preparation of five technical memorandums and a report on *Napa County Groundwater Conditions and Groundwater Monitoring Recommendations* (LSCE, 2011a). This report and the other related documents can be found at: http://www.napawatersheds.org/. The report documents existing knowledge of countywide groundwater conditions and establishes a framework for the monitoring and reporting of groundwater levels and groundwater quality on a periodic basis. The report also summarizes priorities for groundwater level and quality monitoring for each of the county subareas.

As described above, the *Napa County Groundwater Monitoring Plan 2013* (LSCE, 2013a) was prepared to formalize and augment groundwater monitoring efforts [levels and quality] to better understand the groundwater resources of Napa County, aid in making the County eligible for public funds administered by the California Department of Water Resources (DWR), and regularly evaluate trends to identify changes in levels and/or quality and factors related to those changes that warrant further examination to ensure sustainable water resources. The Plan included refinement of criteria used to identify priority monitoring areas and a proposed expanded monitoring network. During Plan implementation, the GRAC led and supported outreach efforts to well owners for volunteer monitoring wells; the GRAC efforts were very successful in adding new wells to the Napa County groundwater monitoring program.

2.3.2 Napa County Statewide Groundwater Elevation Monitoring (CASGEM)

This section describes the DWR California Statewide Groundwater Elevation Monitoring (CASGEM) program. The wells included by the County in the CASGEM program are a *subset* of the overall network of wells monitored in Napa County.

In November 2009, Senate Bill SBX7 – 6 mandated that the groundwater elevations in all basins and subbasins in California be regularly and systematically monitored with the goal of demonstrating seasonal and long-term trends in groundwater elevations. In accordance with the mandate, DWR developed the CASGEM program. DWR is facilitating the statewide program which began with the opportunity for local entities to apply to DWR to assume the function of regularly and systematically collecting and reporting groundwater level data for the above purpose. These entities are referred to as Monitoring Entities.

Wells designated for inclusion in the CASGEM program are for purposes of measuring groundwater levels on a semi-annual or more frequent basis that are representative of groundwater conditions in the state's groundwater basins and subbasins. A key aspect of the program is to make certain elements of the groundwater level information available to the public.

On December 29, 2010, the County applied to DWR to become the local countywide Monitoring Entity responsible for designating wells as appropriate for monitoring and reporting groundwater elevations for purposes of the CASGEM program.

The wells selected by the County for this program are a *subset* of the overall wells monitored, i.e., the County has a much larger overall monitoring network. The County's participation in the CASGEM program complements other pre-existing groundwater monitoring that has been ongoing in Napa County for some time (the overall historical monitoring record began in 1920).

Following confirmation, the County, as the Monitoring Entity, proceeded to identify a *subset* of monitored wells to be included in the CASGEM network and to prepare a CASGEM Network Plan as required by DWR (LSCE, 2011b and LSCE, 2014). At the time the County's CASGEM Network Plan was initially submitted to DWR, fourteen wells were included in the program. DWR formally designated Napa County as the Monitoring Entity for two basins in August 2014, specifically:

- Napa County was designated as the Monitoring Entity for the 2-2.01 Napa Valley Subbasin (medium priority basin)
- Napa County was designated as the Monitoring Entity for the 2-2.03 Napa-Sonoma Lowlands Subbasin in Napa County (very low priority basin)

During the initial CASGEM monitoring year (beginning 2011), the County continued to monitor 14 wells that had already been part of the group of wells where groundwater levels are measured by the County and reported to DWR semi-annually, or are measured directly by DWR. The current 2014 CASGEM network wells are located primarily on the Napa Valley Floor, Carneros Subarea, and in the MST Subarea. Some of these wells do not have sufficient construction details to define which portion of the aquifer system is represented by measured water levels. Additional data gathering and surveying will be performed, and such information will be provided in future annual reports as it becomes available. Depending on the results of the County's evaluation, future actions may include removal and replacement of CASGEM wells with wells that are more representative of local groundwater conditions to better meet the objectives of the CASGEM program and also overall objectives of the County's Comprehensive Groundwater Monitoring Program.

In addition to the CASGEM well network described herein, the County is currently exploring the availability of additional monitoring wells in the Pope Valley Groundwater Basin[5]. Public outreach is underway through community organizations and other contacts. The Berryessa Valley Groundwater Basin has a very low DWR priority and extremely small utilization of groundwater[6]. Per discussions with DWR, outreach will continue but no monitoring is planned in this groundwater basin at this time. The County has submitted detailed information to DWR to support consideration of the removal of this basin through a Bulletin 118 update or other appropriate process (LSCE, 2014).

The Suisun-Fairfield Valley Basin and the Napa-Sonoma Lowlands Subbasin are two examples of basins that do not conform to county boundaries, and they are also basins with a very low-priority designation from DWR. While these two basins have low groundwater utilization and less extensive monitoring than other basins, they are situated adjacent to the bay and delta water ways and are important areas to monitor for protection against saltwater intrusion. The Suisun-Fairfield Valley Basin, which is mostly in Solano County and has only a very small area (less than 0.3% of the total basin area) in Napa County, is being monitored in its entirety by Solano County Water Agency as the CASGEM Monitoring Entity for Solano County. The monitoring of Napa-Sonoma Lowlands Subbasin, whose area is shared with Solano County in more equitable portions (63% in Napa County, 37% in Solano County), is anticipated to have monitoring that is coordinated between the two respective Monitoring Entities in the future. Currently, all monitoring is within the Napa County portion of the subbasin; in the future, monitoring in this subbasin will expand as necessary to ensure representative coverage and as coordinated between the two Monitoring Entities.

2.3.3 Updated Conceptualization and Characterization of Hydrogeologic Conditions

In 2012, activities were implemented to update the characterization and conceptualization of hydrogeologic conditions (LSCE and MBK, 2013). This work included: 1) an updated Napa Valley hydrogeologic conceptualization, 2) linking well construction information to groundwater level monitoring data, 3) groundwater recharge characterization and estimates, and 4) surface water/groundwater interrelationships.

Updated Napa Valley Geologic Conceptualization

As part of the updated hydrogeologic conceptualization (LSCE and MBK, 2013), eight cross- valley geologic sections were constructed (**Figure 2-3**). About 1,300 water well drillers' reports were reviewed and located on topographic base maps; 191 of these were selected for use in the cross sections.

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[5] DWR Overall Basin Ranking Score is "0.0"; the very low priority basin ranking range is 0-5.4. http://www.water.ca.gov/groundwater/casgem/pdfs/basin_prioritization/NCRO%2074.pdf

[6] DWR Overall Basin Ranking Score is "0.0"; the very low priority basin ranking range is 0-5.4. http://www.water.ca.gov/groundwater/casgem/pdfs/basin_prioritization/NCRO%2062.pdf

Geologic correlations seen on the cross sections were extended between sections by available well control and surficial geologic maps. From the geologic cross-sections and correlations of other water well drillers' reports, the Quaternary alluvium was separated from underlying units, and an isopach (contours of equal thickness) map was constructed.

The alluvium was divided into three facies according to patterns detected in the lithologic record and used to delineate the depositional environment which formed them: fluvial, alluvial fan, and sedimentary basin (LSCE and MBK, 2013 and LSCE, 2013b). The fluvial facies consists of a thin narrow band of stream channel sands and gravels deposited by the Napa River. The sand and gravel beds tend to be thicker and/or more numerous in the fluvial facies area. They are interbedded with finer-grained clay beds of probable floodplain origin. Wells constructed in the fluvial facies tend to be moderately high yielding (for the valley, roughly 50 to 200 gpm). Local areas where thicker sand and gravel beds are reported, the well yields are the highest in the valley, ranging from about 200 to 2,000 gpm.

These areas with thick sand and gravel beds occur in the Yountville Narrows area, which extends about five miles from Oakville south to Ragatz Lane. Local areas of relatively lower well yield values of 200 to 500 gpm occur to the north and south. Hydraulic properties of these deposits are recorded during airlift testing, and drawdown values are generally not reported. Only a few pump test results have been found, and these are in the high yielding area just north of the Yountville Narrows.

The alluvial plain facies of the Quaternary alluvium extends outward from the central fluvial facies and thins to zero thickness at the edge of the valley sides. These deposits appear to have been deposited as tributary streams and alluvial fans. These deposits appear to consist of interbedded sandy clays with thin beds (less than 10 feet thick) of sand and gravel. Wells constructed in the alluvial plain facies tend to be low yielding, ranging from a few gpm to a few tens of gpm. By at least 1970, most wells drilled on the alluvial plain facies were constructed to deeper depths into the underlying Sonoma Volcanics.

The alluvial facies shows some overlap with the shallowest depths to groundwater, as measured in spring 2010 (**Figures 2-4, 2-5, and 2-6**). These areas of overlap occur generally to the west of the Napa River and adjacent to mapped perennial streams, including Hopper Creek, Sulpher Creek, York Creek, Bale Slough (west of Highway 29), and possibly Dry Creek. These areas represent somewhat likely areas of connection between surface waters (including the Napa River and perennial streams described above) and groundwater.

At the northern end of the lower valley, the sedimentary basin facies of the alluvium occurs. This facies is characterized by fine-grained silt, sand, and clays with thin to scattered thicker beds of sand and gravel. The sedimentary facies is believed to be floodplain deposits that extend to the southern marshland/estuary deposits. As noted, the extent of this facies is poorly known due to lack of well control farther south. Limited information indicates low to moderate well yields of a few gpm to possibly up to 100 gpm. Again, the lack of pump test information makes hydraulic properties of the deposits difficult to assess.

Napa Creek and the Napa River east of Highway 29 in the vicinity of downtown Napa show a connection with groundwater in this portion of the Napa Valley (**Figure 2-6**).

Portions of Napa Valley north of Deer Park Road were not characterized according to their Quaternary alluvial facies by LSCE and MBK (2013). However, depths to groundwater in the vicinity of monitored wells indicate the potential for connection between surface water and groundwater in the vicinity of Garnett Creek and Cyrus Creek in and near Calistoga (**Figure 2-6**).

Beneath the alluvium is a complex sequence of Tertiary sedimentary deposits (Huichica Formation) and igneous deposits of the Sonoma Volcanics. These units are strongly deformed by folding and faulting and have complex stratigraphic relationships. From the geologic cross-sections, lateral correlations, and surficial map relationships, a structure contour map (elevations) of the top of these units and the subcrop[7] pattern were developed (LSCE and MBK, 2013). From north of the City of Napa and southward, these deposits are dominated by fine-grained basin fill with few sand and gravels of floodplain, estuary origin. North towards Yountville, sedimentary deposits of the Huichica Formation appear to overlie Sonoma Volcanics andesites and tuffs. Sonoma Volcanics and the older Mesozoic Great Valley sequence are exposed in a structural uplift area in the small hills in the Yountville area.

Further north, a Sonoma Volcanics andesite flow breccia appears to transition into a sedimentary conglomerate along the center of the valley. This unit is encountered in deep, high yielding wells also completed in the overlying alluvium fluvial facies, but it is not clear if this unit also is high yielding. Overlying the conglomerate/breccia on the east is the Tertiary sedimentary deposits sequence (Huichica Formation) of sandstones and mudstones. To the west of the unit occur older Sonoma Volcanics andesites, tuffs in the south, and possibly younger Sonoma Volcanics tuffs interbedded with Tertiary sedimentary deposits (Huichica Formation) of sand and gravels and clays. All of the Tertiary units beneath the Napa Valley Floor appear to be low to moderately water yielding with poor aquifer characteristics (LSCE and MBK, 2013).

Linking Well Construction Information to Groundwater Monitoring Data

As part of the updated hydrogeologic characterization, existing monitoring well construction data from all available public sources were reviewed to determine the distribution of aquifer-specific monitoring data in Napa Valley. This effort addresses recommendations of the Comprehensive Groundwater Monitoring Program to identify and fill data gaps that will allow for analysis of groundwater occurrence and flow as a more robust understanding of the extent of groundwater resources in the county is developed. A major component of this work has been to identify construction information for previously monitored wells in Napa Valley.

Groundwater level monitoring needs identified through the Comprehensive Groundwater Management Program include improved spatial distribution of groundwater level monitoring, additional characterization of subsurface geologic conditions in county subareas to identify aquifer characteristics, further examination of well construction information to define which portion of the aquifer system is represented by water levels measured in the currently monitored wells (and in many cases to link construction information to the monitored wells), and improve the understanding of surface water/groundwater interactions and relationships.

Groundwater Recharge Characterization and Estimates

Another important feature of the updated hydrogeologic investigation was the development of improved characterization of groundwater recharge in the areas of greatest groundwater development, with an emphasis on Napa Valley. Understanding the volume of and mechanisms driving groundwater recharge in the county are essential in determining where and how much groundwater can be produced without incurring negative impacts (LSCE, 2011a). The high permeability of the alluvial sediments in the Napa Valley permits precipitation and surface water to readily infiltrate and recharge groundwater throughout the majority of the valley. These high permeability soils combined with the large volume of

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[7] Occurrence of strata in contact with the undersurface of a stratigraphic unit, which in this case includes the strata beneath the alluvium.

water that flows through the Napa River create the potential for significant recharge to occur under the hydrologic circumstances and hydraulic gradient that allow for recharge from the river to groundwater to occur.

Mass balance and streamflow infiltration methods were used to estimate regional and local recharge. Streamflow infiltration can be characterized by comparing the elevation of surface water to the shallowest adjacent groundwater. Detailed remotely sensed elevation data of the mainstem Napa River and several major tributaries were obtained for this purpose. LiDAR data were paired with previously collected groundwater level data and estimates of areas of greatest recharge potential to estimate the potential for recharge to groundwater.

In addition, mass balance recharge estimates have been developed for the Napa River watershed and major tributary watersheds using a range of available data (LSCE and MBK, 2013). Available records for streamflow, precipitation, land use, and vegetative cover throughout these watersheds have been used to develop spatially-distributed estimates of annual hydrologic inputs and outputs in order to solve for the volume of groundwater recharge at the watershed scale. Key components of this work included quantifying the distribution of precipitation across the land surface, quantifying the amount of water that returns to the atmosphere by evapotranspiration, and quantifying the hydraulic properties of soil and alluvial materials through which water must infiltrate to reach groundwater. Estimates developed through the mass balance approach have been evaluated using a sensitivity analysis to determine the degree to which any individual or set of inputs affects the recharge estimate.

Groundwater-Surface Water Interrelationships

Depth to Groundwater Relative to Stream Thalweg

The groundwater surface elevation and the estimated stream thalweg elevation data are important components for characterizing the groundwater-surface water relationship in the Napa Valley area. The spring 2010 contours of equal groundwater elevation were used to provide a snapshot representation of groundwater conditions with which to compare the vertical relationship between groundwater and surface water (LSCE and MBK, 2013 and LSCE, 2013b). This spatial relationship assisted in developing an understanding of the nature of water exchange between the groundwater and surface water systems. This analysis focused specifically on the degree of connectivity between the Napa River thalweg and the elevation of the regional groundwater surface in the Napa Valley in spring 2010.

Calculated depths to groundwater equal to or above the estimated thalweg alignment indicate that for spring 2010 the interpreted groundwater elevation was above the bottom of the Napa River thalweg. The data suggest areas where a direct connection between the water table and the river may have existed in spring 2010 and where groundwater has the potential to discharge into the stream channel. In other areas, the depth to groundwater is below the bottom of the Napa River thalweg such that surface flows in the river have the potential to percolate and recharge the groundwater system.

Despite the uncertainty in the data in parts of the valley, depths to groundwater (both measured and calculated) show generally shallow groundwater throughout much of the valley, particularly in the northern end of the valley. The calculated depths to groundwater appear to be reasonably represented in the Napa Subarea east of the Napa River because this area has the greatest density of monitored sites. **Figure 2-6** presents the depths to groundwater for Napa Valley based on water level measurement for wells constructed in the alluvial aquifer system (LSCE, 2013b). This figure reflects the generally shallow groundwater levels measured particularly along the axis of the valley.

Other Areas of County

Potential connections between surface water and groundwater in other areas of the county are less well known. Perennial water courses have been mapped by Napa County in other portions of the county with state-designated groundwater basins. In the Pope Valley Groundwater Basin, these include Pope Creek, Burton Creek, and Maxwell Creek. In the small portion of the Suisun-Fairfield Valley Groundwater Basin that extends into Napa County, in the Southern Interior Valley Subarea, Wooden Valley Creek is mapped as a probable perennial stream.

Blueline Stream Locations

Napa County's Planning, Building, and Environmental Services Department maintains a GIS dataset of perennial streams throughout the county, included as a part of the larger "bluelines" shapefile (LSCE, 2013b). The dataset includes both unnamed and 48 named streams, creeks, rivers, and other surface water courses classified as known perennial or probable perennial (**Figure 2-7**). The known and probable classifications are a subset of all water courses originally digitized from U.S. Geological Survey (USGS) topographic maps of Napa County. Metadata for the dataset describe the known perennial water courses as those determined by "stream reports or other known data sources", while probable perennial water courses are defined as having been determined by "computer analysis of probable streams". As shown in **Figure 2-7**, known or probable perennial water courses are present in all Napa County subareas except for the Livermore Ranch, Knoxville, Berryessa, and Jameson/American Canyon Subareas.

3 GROUNDWATER RESOURCES GOALS AND MONITORING OBJECTIVES

3.1 Napa County Water Resources Goals and Policies

The County's General Plan (2008, amended June 23, 2009) recognizes, "water is one of the most complex issues related to land use planning, development, and conservation; it is governed and affected by hundreds of federal, state, regional, and local mandates pertaining to pollution, land use, mineral resources, flood protection, soil erosion, reclamation, etc. Every year, the state legislature considers hundreds of bills relating to water issues, and in Napa County, more than two dozen agencies have some say in decisions and regulations affecting water quality and water use."

As part of the General Plan update in 2008, and within the Conservation Element, six goals are set forth relating to the county's water resources, including surface water and groundwater. Complementing these goals are twenty-eight policies and ten water resources action items (one of which is "reserved" for later description). Napa County's six water resources goals are included below (the entire group of water resources goals, policies, and action items is included in LSCE, 2011a).

> **Goal CON-8:** Reduce or eliminate groundwater and surface water contamination from known sources (e.g., underground tanks, chemical spills, landfills, livestock grazing, and other dispersed sources such as septic systems).
>
> **Goal CON-9:** Control urban and rural storm water runoff and related non-point source pollutants, reducing to acceptable levels pollutant discharges from land-based activities throughout the county.
>
> **Goal CON-10:** Conserve, enhance and manage water resources on a sustainable basis to attempt to ensure that sufficient amounts of water will be available for the uses allowed by this General Plan, for the natural environment, and for future generations.
>
> **Goal CON-11:** Prioritize the use of available groundwater for agricultural and rural residential uses rather than for urbanized areas and ensure that land use decisions recognize the long-term availability and value of water resources in Napa County.
>
> **Goal CON-12:** Proactively collect information about the status of the County's surface and groundwater resources to provide for improved forecasting of future supplies and effective management of the resources in each of the County's watersheds.
>
> **Goal CON-13:** Promote the development of additional water resources to improve water supply reliability and sustainability in Napa County, including imported water supplies and recycled water projects.

Addressing the six water resources goals above, Napa County has produced specific General Plan Action Items related to the focus and objective of this Plan. Those action items include:

> **Action Item CON WR-1:** Develop basin-level watershed management plans for each of the three major watersheds in Napa County (Napa River, Putah Creek, and Suisun Creek). Support each basin-level plan with focused sub-basin (drainage-level) or evaluation area-level implementation strategies, specifically adapted and scaled to address identified water resource problems and

restoration opportunities. Plan development and implementation shall utilize a flexible watershed approach to manage surface water and groundwater quality and quantity. The watershed planning process should be an iterative, holistic, and collaborative approach, identifying specific drainage areas or watersheds, eliciting stakeholder involvement, and developing management actions supported by sound science that can be effectively implemented. [Implements Policies 42 and 44]

Action Item CON WR-4: Implement a countywide watershed monitoring program to assess the health of the County’s watersheds and track the effectiveness of management activities and related restoration efforts. Information from the monitoring program should be used to inform the development of basin-level watershed management plans as well as focused sub-basin (drainage-level) implementation strategies intended to address targeted water resource problems and facilitate restoration opportunities. Over time, the monitoring data will be used to develop overall watershed health indicators and as a basis of employing adaptive watershed management planning. [Implements Policies 42, 44, 47, 49, 63, and 64]

Action Item CON WR-6: Establish and disseminate standards for well pump testing and reporting and include as a condition of discretionary projects that well owners provide to the County upon request information regarding the locations, depths, yields, drilling and well construction logs, soil data, water levels and general mineral quality of any new wells. [Implements Policy 52 and 55]

Action Item CON WR-7: The County, in cooperation with local municipalities and districts, shall perform surface water and groundwater resources studies and analyses and work toward the development and implementation of an integrated water resources management plan (IRWMP) that covers the entirety of Napa County and addresses local and state water resource goals, including the identification of surface water protection and restoration projects, establishment of countywide groundwater management objectives and programs for the purpose of meeting those objectives, funding, and implementation. [Implements Policy 42, 44, 61 and 63]

Action Item CON WR-8: The County shall monitor groundwater and interrelated surface water resources, using County-owned monitoring wells and stream and precipitation gauges, data obtained from private property owners on a voluntary basis, data obtained via conditions of approval associated with discretionary projects, data from the State Department of Water Resources, other agencies and organizations. Monitoring data shall be used to determine baseline water quality conditions, track groundwater levels, and identify where problems may exist. Where there is a demonstrated need for additional management actions to address groundwater problems, the County shall work collaboratively with property owners and other stakeholders to prepare a plan for managing groundwater supplies pursuant to State Water Code Sections 10750-10755.4 or other applicable legal authorities. [Implements Policy 57, 63 and 64]

Action Item CON WR-9.5: The County shall work with the SWRCB[8], DWR, DPH, CalEPA, and applicable County and City agencies to seek and secure funding sources for the County to develop and expand its groundwater monitoring and assessment and undertake community-based planning efforts aimed at developing necessary management programs and enhancements.

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[8] SWRCB is the California State Water Resources Control Board. DPH is the California Department of Public Health.

The County continues to address the General Plan goals and actions. Additionally, through the efforts embarked upon through the implementation of the County's Comprehensive Groundwater Monitoring Program, those persons whose livelihoods depend upon the county's natural resources can help ensure the sustainability of groundwater resources for future generations and the environment.

Based on the GRAC's charge from the Napa County Board of Supervisors and a review of many definitions in published literature, the GRAC (2014) defined "groundwater sustainability[9]" as:

> *Groundwater sustainability depends on the development and use of groundwater in a manner that can be maintained indefinitely without causing unacceptable economic, environmental, or social consequences, while protecting economic, environmental, and social benefits.*

The GRAC concluded that groundwater sustainability is both a goal and a process; most importantly, it is a shared responsibility. Everyone living and working in the county has a stake in protecting groundwater resources; including groundwater supplies, quality, and associated watersheds (GRAC, 2014). The GRAC further found that healthy communities, healthy agriculture and healthy environments exist together and not in isolation. Without sustainable groundwater resources, the character of the county would be significantly different in terms of its economy, communities, rural character, ecology, housing, and lifestyles.

The GRAC also developed a set of groundwater sustainability objectives (GRAC, 2014):

1. Initiate and carry out outreach and education efforts.
    a. Develop public outreach programs and materials to make everyone who lives and works in the County aware that the protection of water supplies is a shared responsibility and everyone needs to participate.
    b. Through education, enable people to take action.
2. Optimize existing water supplies and systems.
    a. Support landowners in implementing best sustainable practices.
    b. Enhance the water supply system and infrastructure – including but not limited to system efficiencies, reservoir dredging, recycled water, groundwater storage and recharge, conjunctive use – to improve water supply reliability.
3. Continue long-term monitoring and evaluation.
    a. Collect groundwater and surface water data and maintain a usable database that can provide information about the status of the county's groundwater and surface water resources and help forecast future supplies.
    b. Evaluate data using best analytical methods in order to better understand characteristics of the county's groundwater and water resources systems.
    c. Share data and results of related analytical efforts while following appropriate confidentiality standards.
4. Improve our scientific understanding of groundwater recharge and groundwater-surface water interactions.

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[9] The definition for Groundwater Sustainability developed by the GRAC is separate from the definition of Sustainable Groundwater Management applied in the 2014 Sustainable Groundwater Management Act, see Section 7.2 of this Report for additional information.

5. Improve preparedness to address groundwater issues that might emerge.
    a. Improve preparedness for responding to long-term trends and evolving issues, such as adverse groundwater trends (including levels and quality), changes in precipitation and temperature patterns, and saltwater intrusion.
    b. Improve preparedness for responding to acute crises, such as water supply disruptions and multiyear drought conditions.

3.2 Overarching Groundwater Monitoring Objectives

This section describes the water level and quality objectives established for the countywide Comprehensive Groundwater Monitoring Program[10] (LSCE, 2013a). The overarching groundwater monitoring objectives are linked to 1) the County's General Plan goals and action items presented above, and 2) hydrogeologic conditions and potential areas of concern, including (but not limited to):

- Monitoring trends in groundwater levels and storage (e.g., groundwater balance) to assess and ensure long-term groundwater availability and reliability;
- Monitoring of groundwater-surface water interactions to ensure sufficient amounts of water are available to the natural environment and for future generations;
- Monitoring in significant recharge areas to assess factors (natural and human-influenced) that may affect groundwater recharge (including climate change) and also aid the identification of opportunities to enhance groundwater recharge and storage;
- Monitoring to establish baseline conditions in areas of potential saline water intrusion;
- Monitoring of general water quality to establish baseline conditions, trends, and protect and preserve water quality.
- Identify where data gaps occur in the key subareas and provide infill, replacement, and/or project-specific monitoring (e.g., such as may occur for planned projects or expansion of existing projects) as needed; and
- Coordinate with other entities on the collection, utilization, and incorporation of groundwater level data in the countywide Data Management System (DMS).

Although this Report focuses on an update of the groundwater monitoring network and groundwater level trends and conditions, groundwater quality objectives are also included for completeness.

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[10] These objectives were developed by the Napa County GRAC prior to passage of the 2014 Sustainable Groundwater Management Act. SGMA defines Measurable Objectives as quantitative means of evaluating the efficacy of groundwater basin management, which is different from the approach applied by the GRAC.

3.2.1 Groundwater Level Monitoring Objectives

The focus of the countywide groundwater level monitoring program includes the following objectives:

- Expand groundwater level monitoring in priority County subareas to improve the understanding of the occurrence and movement of groundwater; monitor local and regional groundwater levels including seasonal and long-term trends; and identify vertical hydraulic head differences in the aquifer system and aquifer-specific groundwater conditions, especially in areas where short- and long-term development of groundwater resources are planned (this includes additional monitoring of the Tertiary formation aquifer in the area between the NVF-MST Subarea and the northeastern part of the NVF-Napa Subarea to determine whether groundwater water conditions in the NVF-MST are affecting other areas (LSCE and MBK, 2013);
- Detect the occurrence of, and factors attributable to, natural (e.g., direct infiltration of precipitation, surface water seepage to groundwater, groundwater discharge to streams) or induced factors (e.g., pumping, purposeful recharge operations) that affect groundwater levels and trends;
- Identify appropriate monitoring sites to further evaluate groundwater-surface water interaction and recharge/discharge mechanisms, including whether groundwater utilization is affecting surface water flows;
- Establish a monitoring network to aid in the assessment of changes in groundwater storage; and
- Generate data to better estimate groundwater basin conditions and assess local current and future water supply availability and reliability; update analyses as additional data become available.

Based on the analysis of existing groundwater data and conditions described in the report *Napa County Groundwater Conditions and Groundwater Monitoring Recommendations* (LSCE, 2011a) and with input received from the GRAC, the key objectives for future groundwater level monitoring for each subarea are summarized in the Plan (LSCE, 2013a).

3.2.2 Groundwater Quality Monitoring Objectives

The primary objectives of the countywide groundwater quality monitoring program include (LSCE, 2013a):

- Evaluate groundwater quality conditions in the various county subareas and identify differences in water quality spatially between areas and vertically in the aquifer system within a subarea;
- Detect the occurrence of and factors attributable to natural (e.g., general minerals and trace metals) or other constituents of concern;
- Establish baseline conditions in areas of potential saltwater intrusion, including the extent and natural occurrence and/or causes of saltwater beneath the Carneros, Jameson/American Canyon and Napa River Marshes Subareas;
- Assess the changes and trends in groundwater quality; and
- Identify the natural and human factors that affect changes in water quality.

Based on the analysis of existing groundwater data and conditions described in the report *Napa County Groundwater Conditions and Groundwater Monitoring Recommendations* (LSCE, 2011a) and with input received from the GRAC, the key objectives for future groundwater quality monitoring for each subarea are summarized in the Plan (LSCE, 2013a).

4 GROUNDWATER MONITORING NETWORK

4.1 Groundwater Level Monitoring

Groundwater level monitoring was conducted at a total of 113 sites across Napa County in 2015 (**Table 4-1)**. The overall number and distribution of monitored sites remained consistent with the monitoring conducted in 2014 and was increased relative to the 87 sites reported in the 2011(LSCE, 2013a). **Figure 4-1** shows the distribution of sites monitored in 2015 according to the monitoring entity.

Table 4-1 Current Groundwater Level Monitoring Sites in Napa County by Reporting Entity

Entity	Reporting Program	Number of Monitored Sites, Fall 2015
Napa County	CASGEM	28
	State Water Data Library	19
	County Volunteer Groundwater Monitoring Program	48
	Surface Water-Groundwater Monitoring	10
California Department of Water Resources	Volunteered Sites	4
State Water Resources Control Board	Geotracker	9
	Total Sites	**113**

Out of the total 113 sites monitored in 2015, 100 were monitored by Napa County. Four sites were monitored by DWR. The remaining nine sites were regulated facilities with data reported as part of the State Water Resources Control Board (SWRCB) Geotracker Program (**Table 4-1**).

Minor reductions in the number of sites monitored by Napa County between 2014 and 2015 occurred due to a combination of well-owner requests and decisions by the Napa County Department of Public Works. In the latter case, three wells were discontinued by the County where other nearby monitored wells were determined to be sufficient to meet the monitoring objectives. Three additional wells were added to the County's monitoring networks during 2015 based on requests by well owners for monitoring by the County in areas where additional monitoring sites were needed.

Additional summary information for currently monitored sites is provided in **Appendix A**.

Table 4-2 Current Groundwater Level Monitoring Sites in Napa County by Groundwater Subarea

Groundwater Subarea	Number of Monitored Sites Through 2011	Number of Monitored Sites, Fall 2014	Number of Monitored Sites, Fall 2015
Napa Valley Floor-Calistoga	6	10	9
Napa Valley Floor-MST	29	27	27
Napa Valley Floor-Napa	18	21	20
Napa Valley Floor-St. Helena	12	14	14
Napa Valley Floor-Yountville	9	12	14
Carneros	5	12	12
Jameson/American Canyon	1	1	1
Napa River Marshes	1	1	-
Angwin	-	5	5
Berryessa	3	2	3
Central Interior Valleys	1	1	2
Eastern Mountains	-	3	4
Knoxville	1	-	-
Livermore Ranch	-	-	-
Pope Valley	1	1	1
Southern Interior Valleys	-	-	-
Western Mountains	-	2	1
Unknown[1]	-	3	-
Total Sites	**87**	**115**	**113**

[1] In 2014 three sites in the Geotracker regulated groundwater monitoring network were reporting groundwater level data, but had not yet reported location information for the monitored wells.

4.1.1 Napa County Monitoring Network

In 2015, Napa County conducted semi-annual groundwater level monitoring at 82 sites across the county, with the majority of sites located within the Napa Valley Floor Subareas. Eight sites were monitored by Napa County on a monthly interval, to begin to address temporal data gaps identified in the 2014 Annual Monitoring Report (LSCE, 2015). Five sites were monitored using continuously recording instrumentation at dedicated monitoring wells constructed as part of the County's Surface Water–Groundwater Monitoring Project.

4.1.2 CASGEM Monitoring Network

As of fall 2015 the Napa County CASGEM Monitoring Network included 23 privately-owned wells monitored by Napa County and the five dual-completion dedicated monitoring wells from the Surface Water-Groundwater Monitoring Project (**Figure 4-3**). Wells in the CASGEM monitoring network are distributed across all five Napa Valley Floor Subareas (Calistoga, St. Helena, Yountville, Napa, and MST) as well as the Carneros, Angwin, Eastern Mountains, and Western Mountains Subareas (**Table 4-3**). Half of the CASGEM Network wells in Napa County, 14, are located in the medium priority Napa Valley

Subbasin of the Napa-Sonoma Valley Groundwater Basin (**Table 4-4**). In addition, six CASGEM Network wells are located in the very low priority Napa-Sonoma Lowlands Subbasin of the Napa-Sonoma Valley, while eight are not located in any groundwater basin or subbasin.

Table 4-3 Current CASGEM Network Sites in Napa County by Groundwater Subarea

Groundwater Subarea	Number of Monitored Sites, Fall 2015
Napa Valley Floor-Calistoga	1
Napa Valley Floor-MST	4
Napa Valley Floor-Napa	6
Napa Valley Floor-St. Helena	4
Napa Valley Floor-Yountville	4
Carneros	6
Jameson/American Canyon	-
Napa River Marshes	-
Angwin	1
Berryessa	-
Central Interior Valleys	-
Eastern Mountains	1
Knoxville	-
Livermore Ranch	-
Pope Valley	-
Southern Interior Valleys	-
Western Mountains	1
Total Sites	**28**

4.1.3 DWR Monitoring Network

The DWR currently monitors four wells in Napa County as part of its voluntary groundwater monitoring efforts (**Table 4-1**). Three of these sites are monitored at monthly intervals, while one is monitored semi-annually. These wells are located in each of the Napa Valley Floor subareas, excluding the MST Subarea.

Table 4-4 Current CASGEM Network Sites in Napa County by Groundwater Basin

Basin Name	Subbasin Name	Number of Monitored Sites, Fall 2015
Napa-Sonoma Valley	Napa Valley	14
Napa-Sonoma Valley	Napa-Sonoma Lowlands	6
Berryessa Valley	-	-
Pope Valley	-	-
Suisun-Fairfield Valley	-	-
Non-basin Areas	-	8
	Total Sites	**28**

4.1.4 State Water Resources Control Board Geotracker Network

The State Water Resources Control Board (SWRCB) stores environmental data for regulated facilities in California in their Geotracker database, including groundwater levels and groundwater quality. Data from these regulated facilities usually includes manual measurements and samples from groundwater monitoring wells (typically shallow) at each site. Groundwater level data are available for 9 Geotracker sites located throughout Napa County in 2015 (**Table 4-1**). The groundwater level monitoring frequency is typically semi-annual or quarterly, although more frequent measurements are sometimes recorded. Geotracker sites with data reported in 2015 were located in the Napa Valley Floor-Napa, Berryessa, and Central Interior Valleys subareas (**Figure 4-1**).

4.2 Surface Water-Groundwater Monitoring

Funding from the DWR 2012 Local Groundwater Assistance Grant Program enabled Napa County to construct ten monitoring wells at five sites in Napa Valley in September 2014. These wells comprise the groundwater monitoring facilities for the Napa County Surface Water-Groundwater Monitoring Project. In addition to grant funding from DWR, Napa County is providing matching funds to cover a portion of the monitoring well construction and instrumentation costs.

4.2.1 Monitoring Network

Figure 4-4 shows the location of the five project sites, with four sites along the Napa River and one adjacent to Dry Creek. The five sites selected for the project are within the Napa, Yountville, and St. Helena Subareas of the Napa Valley Floor. These are three of the six subareas where paired surface water-groundwater monitoring was recommended in the 2013 Plan (**Table 2-3**).

Each of the five sites includes a dual-completion monitoring well to enable monitoring of groundwater conditions at specific depth intervals. These dual-completion wells consist of two separate casings in a single borehole. Each casing is independent of the other with distinct total depths and screen intervals.

The construction details for each casing were developed based on sites specific hydrogeologic and surface water channel considerations.

In general, groundwater monitoring facilities at each site consist of one shallow casing constructed to represent groundwater conditions at the water table surface and at elevations similar to the adjacent surface water channel. The second casing at each site is constructed to a deeper depth with screen intervals coinciding with aquifer materials and depths likely to be accessed by production wells in the vicinity. Paired casings are separated within the borehole by intermediate seals designed to provide a physical separation such that groundwater conditions reflected by each casing are not influenced by conditions in other portions of the groundwater system.

5 GROUNDWATER LEVEL TRENDS AND FLOW DIRECTIONS

Groundwater data availability in Napa County varies widely among the subareas. The bulk of the historical and current groundwater level and quality data is located in the Napa Valley Floor Subarea with limited to no data in the other Napa County subareas. This section presents discussions of groundwater levels, with a focus on groundwater level characteristics by subarea.

Napa County received below average precipitation at the Napa State Hospital gauge during water years[11] 2012, 2013, 2014, and 2015. Water year 2013 registered as a Dry year on the five stage rating system of Very Dry, Dry, Normal, Wet and Very Wet water year types (**Table 5-1**). Since 1949 when most long-term groundwater monitoring records begin, comparable multi-year periods with below average precipitation occurred in 1990 – 1991 (both Dry), 1976 – 1977 (both Very Dry), and 1959 – 1962 (all Dry), 1954 – 1955 (both Dry), and 1947-1949 (all Dry).

Successive years of below average precipitation in water years 2012 through 2015 provide an important context for the review of recent groundwater level trends. **Figure 5-1** depicts both the annual water year precipitation recorded at the Napa State Hospital gauge along with the cumulative departure from the mean water year precipitation value for water years 1970 through 2015 The cumulative departure values calculated for **Figure 5-1** provide a tally of precipitation received relative to the mean value over time.

Notably, the eight-year span from 1987 through 1994, with only one year of above average precipitation, resulted in a net cumulative departure deficit of 38.55 inches (**Figure 5-1**). This protracted period contrasts with the Very Dry years of 1976 and 1977, which although more acute, produced a less severe net cumulative departure deficit of 26.13 inches. Groundwater level records from the Napa Valley Groundwater Subbasin that include both of these time periods generally show the lowest spring groundwater levels in 1977, as compared to the 1987 to 1994 period. This indicates that the subbasin experienced sufficient recharge to maintain relatively stable spring groundwater levels over an eight-year period when precipitation totals were below average on the whole.

The four year span from 2012 through 2015 produced a net cumulative departure deficit of 17.04 inches.

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[11] A water year is defined as the period from October 1 through the following September 30 and is numbered according to the calendar year on its final day. In this way, water years maintain continuity between the times when water supplies typically increase and the following dry season when water demand is greatest.

Table 5-1 Recent Napa State Hospital Annual Precipitation Totals and Napa River Watershed Water Year Types

Water Year	Annual Precipitation (in) (updated values from LSCE)	Water Year Type
2009	21.31	Normal (below average)
2010	28.85	Wet
2011	36.62	Wet
2012	21.75	Normal (below average)
2013	20.26	Normal (below average)
2014	19.67	Dry
2015	20.72	Normal (below average)
Napa State Hospital (NSH) Average Annual Water Year Precipitation (1920 – 2015) = 24.86 inches		

Geologic setting and differences in aquifer zones within a subarea or groundwater subbasin are additional considerations relevant to the interpretation of groundwater levels, particularly for wells constructed entirely or partially within the alluvium in Napa Valley. **Figure 5-2** depicts two wells located relatively near each other at the land surface which exhibit distinct groundwater levels due in part to having been constructed within different aquifer zones. Well 07N05W09Q2 is located near the center of Napa Valley, where the alluvium extends to approximately 200 feet below ground surface (LSCE and MBK, 2013). NapaCounty-138 has a total depth of 321 feet and is located closer to the western edge of Napa Valley in an area where the alluvium extends only about 50 feet below ground surface. The lower static water levels measured in the fall at NapaCounty-138 indicate that the well draws water from a geologic formation below the alluvium. Knowledge of the geologic setting and construction details for a given well are important considerations when interpreting groundwater level data.

Figure 5-3 depicts another example of the influence that aquifer zones can have on water levels in wells located in the same area. In this case, the well located east of the Napa River is constructed in the Sonoma Volcanics, while the wells west of the Napa River are constructed within alluvial sediments. Additional discussion of these wells is provided in **Section 5.1.2**.

The groundwater elevation contours described below are derived from available depth to water measurements made in wells. Prior to interpolating groundwater elevations across the valley, depth to water values were converted to groundwater elevation values by subtracting the measured depth to water from the reference point elevation at each monitored well. In this way the depth to water measurements were related to the North American Vertical Datum 1988 (NAVD88) as a standard point of reference. The resulting groundwater elevation values at each well were used to interpolate groundwater elevation contours throughout the Napa Valley Floor and in the MST area. A contour line represents a line of equal elevation of the water surface similar to the way a topographic map contour line shows a line of equal elevation of ground surface. The direction of groundwater flow is perpendicular to the contour lines.

5.1 Napa Valley Floor Subareas

The Napa Valley Floor Subarea is subdivided into five smaller subareas. From north to south these areas are Calistoga, St. Helena, Yountville, Napa, and the MST. The groundwater level conditions in each of these areas are described below.

Over the length of the Napa Valley, groundwater is contained in and moves primarily through the older and younger alluvium from Calistoga to San Pablo Bay, and is assumed for purposes of contouring groundwater data on a regional basis, to represent a single aquifer. Groundwater levels that were determined to represent a non-alluvial part of the aquifer system were excluded from the contouring dataset.

Interpreted groundwater elevation contours for spring and fall 2015 are shown in **Figures 5-4** and **5-5,** respectively. Groundwater elevation contours for Napa Valley spring 2015 appear similar to those developed for spring 2014 and spring 2010 (LSCE, 2013b and 2015). Contours across these time periods show a generally southeasterly to east-southeasterly groundwater gradient paralleling the valley axis from Calistoga to Yountville with similar groundwater elevation ranges. In the southern portion of the valley, near the City of Napa, contours indicate a more eastward flow direction consistent with the spring 2014 contours. Through the valley, groundwater elevations in spring 2015 ranged from 378 feet near Calistoga to 5 feet along the Napa River near First Street in Napa.

5.1.1 Napa Valley Floor – Calistoga and St. Helena Subareas

The hydrographs for the representative wells illustrated on **Figure 5-6** show groundwater elevations and corresponding depth to groundwater from 1970 to present, as available. Groundwater levels have been generally stable over time in the Calistoga Subarea and northern portion of the St. Helena Subarea. Groundwater levels in the representative wells are frequently very shallow at less than ten feet below the ground surface in the spring. Minor seasonal groundwater level variations of about 10 feet occur between spring and fall in the Calistoga Subarea. Groundwater levels in well 8N6W10Q1 have been lower in the late September to December timeframe in seven years since 2001. However, in every year since 1970, including 2015 groundwater levels returned to within 10 feet of the ground surface the following spring.

Elsewhere in the St. Helena Subarea, groundwater levels exhibit greater seasonal declines of about 20 feet. Groundwater levels at well 7N5W09Q2 have remained relatively stable although somewhat susceptible to dry years. An example of this occurred in 1976 and 1977, two Very Dry years in the Napa River Watershed. In 1976, the spring groundwater level measurement was 19.3 feet below ground surface, lower by more than 10 feet from the prior spring. In 1977, the spring groundwater level measurement was 27.2 feet below ground surface, down almost 8 feet from the spring 1976 measurement. Spring water levels in the same well in 2014 and 2015 were 18.6 feet and 13.2 feet below ground surface, respectively; the spring 2014 and 2015 levels are above the levels measured in 1976 and 1977.

NapaCounty-132 was noted in the 2014 Annual Monitoring Report for possible signs of declining water levels. This well is recorded as having a total depth of 265 feet, screened from 25 feet to 265 feet, in an area where the thickness of alluvial deposits is likely less than 100 feet. The Driller’s Log for the well indicates extensive clay (or fine grained, low permeability) layers were encountered, particularly in the upper 100 feet of the boring. In spring 2015 a depth to groundwater of 16.1 feet was measured at this well, which is more comparable to levels seen prior to 2014. A site visit to this well conducted in 2015 showed that much of the surrounding acreage is planted in young vines. A subsequent review of aerial photography showed that a large scale vineyard replanting took place in 2007. Given these observations it is possible that changing irrigation demands have been a factor in this area since 2007.

5.1.2 Napa Valley Floor – Yountville and Napa Subareas

The representative hydrographs shown in **Figure 5-7** show groundwater elevations and corresponding depths to water in the Yountville and Napa Subareas. Long-term groundwater elevations have remained for the most part stable in the Yountville Subarea. In the Yountville Subarea, the depth to groundwater in the spring is generally less than ten feet, similar in nature to the Calistoga and St. Helena Subareas to the north. Seasonal fluctuations vary by proximity to the center of the valley. Along the western and eastern edges of the subarea, levels are more subject to larger seasonal fluctuations. Groundwater elevations in the center of the valley fluctuate seasonally approximately 10 to 25 feet, and near the edge of the valley fluctuate approximately 25 to 35 feet.

In the Napa Subarea, depth to water ranges from about 20 to 50 feet below ground surface during the spring. Seasonal groundwater elevations in this subarea generally fluctuate from 10 to 40 feet. Long-term trends have been generally stable with the exception of the northeastern area at NapaCounty-75 and Napa County-76 where groundwater levels have locally declined by about 20 feet to 30 feet over the past 15 years[12]. Reasons for the declines in water levels at these wells are not yet fully understood. One possible factor is that lowered groundwater elevations in the northern MST Subarea could be drawing water from the northeast corner of the Napa Subarea towards the MST Subarea. Another possible factor is that the northeast corner of the Napa Subarea experiences limited groundwater recharge compared to the rest of the Napa Subarea as a result of being bounded by the East Napa Fault and Soda Creek Fault (**Figure 5-8**).

NapaCounty-75 and NapaCounty-76 are located east of the Napa River and East Napa Fault and west of Soda Creek Fault. Both wells are completed below the alluvium in the Sonoma Volcanics formation. The Sonoma Volcanics formation is also present in the MST Subarea to the east, where previous monitoring has shown several pumping depressions (LSCE, 2011a). The two nearest monitoring wells located west of the Napa River in the northeastern Napa Subarea constructed to depths of 120 feet or less and are completed in the alluvium. These wells have shown stable groundwater level trends. The monitoring well in the alluvium that is closest to the well constructed in the Sonoma Volcanics has shown stable water levels since the 1960s. It appears that the extent of the pumping depression beyond the MST subarea is limited to the northeastern Napa Subarea east of the Napa River.

Although NapaCounty-75 is no longer actively monitored by Napa County, two additional wells have been added to the County's monitoring networks in this area in the last two years, NapaCounty-182 and NapaCounty-228. In addition to adding new monitoring wells in the northeast portion of the Napa Subarea, the County is considering a focused investigation of groundwater conditions and hydrogeologic constraints in the area east of the Napa River and west of the Soda Creek Fault to address concerns regarding groundwater conditions in this area.

In the southwestern part of the Yountville Subarea and at the Napa Valley margin, groundwater levels in well NapaCounty-135 have also declined by about 30 feet since the first measurements were recorded in the late 1970s and early 1980s, with a particularly low spring groundwater level measurement recorded in 2014. In response to these observations Napa County began monitoring this well at monthly intervals in summer 2015. The increased frequency of data collection is intended to fill temporal data

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[12] NapaCounty-75 is among the wells that left the monitoring network in 2015. The latest available measurement from this well was recorded in October 2014.

gaps in the record for this well to understand whether groundwater levels are recovering at different times relative to other wells.

Very little construction information is available for NapaCounty-135. All that is known is that it has a total depth of 125 feet. It is located in an area where the total thickness of the alluvium is likely less than 50 feet, based on contours of alluvium thickness developed as part of the Updated Hydrogeologic Conceptualization and Characterization of Conditions Report (LSCE and MBK Engineers, 2013).

In March 2015, the water level at NapaCounty-135 rebounded to a depth of 40.9 feet, comparable to the value recorded in 2013. The dedicated monitoring wells for Site 2 of the Surface Water Groundwater Monitoring Project are less than a mile from NapaCounty-135. Data from those wells will also be used in the future to differentiate between observations at that well and water level trends in the alluvial aquifer system at Site 2.

5.1.3 Napa Valley Floor – Milliken-Sarco-Tulucay (MST) Subarea

Although designated as a groundwater subarea for local planning purposes, the majority of the MST is not part of a groundwater basin as mapped by DWR. In the MST, the aquifer system is composed primarily of the Sonoma Volcanics and associated Tertiary sedimentary deposits. These aquifer materials have different hydraulic properties than the Napa Valley alluvial deposits and the level of communication and connectivity between the two areas is believed to be limited. Groundwater levels used for contour mapping in the MST Subarea generally represent conditions of a composite aquifer system as previously described by Farrar and Metzger (2003).

Historically, groundwater flow directions in the MST Subarea were generally from the Howell Mountains in the east toward the Napa River to the west. Beginning in the 1970s, investigators have identified pumping depressions in the northern, central, and southern parts of the MST (Johnson 1975, Farrar and Metzger 2003). The current coverage of wells does not extend to the former location of the central (and deepest) pumping depression and therefore flow directions cannot be visualized and evaluated; however, the coverage does extend to the former locations of the northern and southern depressions, and they are shown in the spring and fall 2015 groundwater level contour maps (**Figure 5-8** and **5-9**).

In the northern MST, groundwater flow directions in 2015 were more varied than in 2014. The highest groundwater elevations occurred between Monticello Road and Hagen Road along the lower one mile of Sarco Creek. Groundwater flow directions were to the east and north of this area. Flows to the east were towards an area of -40 feet groundwater elevations. Flows to the north were toward Milliken Creek where two monitored wells recorded spring groundwater elevations of -14 feet and -18 feet, respectively. A positive groundwater elevation value of 3 feet recorded at a well along Hardman Avenue indicates a southward flow direction in that vicinity.

In the southern MST, groundwater flow continues to be generally northwest (unchanged direction since 2008) in the spring and fall 2015with a minimum spring groundwater elevation of about -45 feet (NAVD88) in the southern MST; however, the western portion of this area has no coverage of wells with water levels which would be necessary to define the extent of the pumping depression.

Representative hydrographs for the MST illustrated on **Figures 5-10 and 5-11** show groundwater elevations and corresponding depth to groundwater since 1970 in the northern (**Figure 5-10**) and central/southern parts of the MST (**Figure 5-11**). In the northern MST, groundwater levels were stable throughout the late seventies until the mid-1980s (1986), at which time a decline of about 10 to 40 feet occurred. Following this decline, groundwater levels stabilized until the late 1990s to early 2000s. After that time, groundwater levels experienced a gradual decline of about 10 to 30 feet until approximately 2008. After 2008 groundwater levels have shown signs of stabilizing in three of four currently monitored wells in the northern MST (NapaCounty-2, NapaCounty-43, and NapaCounty-122), while NapaCounty-56 has shown continued declines, possibly resulting from recent dry years. Depth to groundwater in the northern part of the MST Subarea currently ranges from about 60 to 200 feet.

An important feature within the northern part of the MST is the Soda Creek Fault that several previous investigators have described as an occasional barrier to groundwater flow. It is described by Weaver (1949) as a normal fault with more than 700 feet vertical displacement downward on the western side. Johnson (1977) and Farrar and Metzger (2003) describe groundwater elevations were about 10 feet higher on the eastern side of the fault during their respective study periods. Recent measurements (post-2000) indicate that groundwater levels are about 20 to 30 feet higher on the eastern side of the fault.

In **Figure 5-11**, groundwater elevations in the central and southern portion of the MST have stabilized since about 2008. The groundwater elevations in the central portion of the MST began to decline in the 1950s and currently have declined up to 250 feet in some locations. The central portion of the MST also corresponds to an area in which the primary aquifer of the Sonoma Volcanics, the tuffaceous member of that unit, is not present. Based on the groundwater level trends and local geologic conditions, some of these trends may be the result of variations in geologic conditions or increasing levels of development relative to conditions 40 to 50 years ago. However, the stability of water levels over the past seven years indicates that rate of groundwater extraction is being balanced by rates of groundwater recharge.

5.2 Subareas South of the Napa Valley Floor

South of the Napa Valley Floor the only subareas with current groundwater level monitoring sites in 2015 were the Carneros and Jameson/American Canyon Subareas.

In 2015, the Carneros Subarea had 12 current groundwater level monitoring sites. The longest period of record among them extended back to October 2011. All four monitored wells are located in the southern half of the subarea at land surface elevations between 100 feet to 25 feet (NAVD88). Patterns of groundwater level fluctuations in these wells have shown annual variations of approximately 5 feet from spring to fall, with groundwater elevations ranging from about 20 feet, relative to mean sea level, to -5 feet, relative to mean sea level. Depths to groundwater below ground surface have varied more widely from 10 feet to 100 feet.

Groundwater elevation contours for spring and fall 2015 (**Figures 5-12** and **5-13**) show flow directions were generally southeast to eastward, with very little seasonal variation.

In the Jameson/American Canyon Subarea the only current groundwater level data are from one well recently volunteered for monitoring. Spring and fall measurements recorded in that well in 2014 and 2015 found depths to groundwater ranging from 5 feet in the spring to 14 feet in the fall.

5.3 Subareas East and West of the Napa Valley Floor

The Eastern Mountains and Western Mountains Subareas flank the Napa Valley Floor Subareas and comprise the uplands of the Napa River Watershed. The geology of these large subareas is complex and highly variable. Recent efforts to expand the Napa County monitoring network have identified five new volunteered monitoring wells between the two subareas (**Table 4-2**).

Groundwater level monitoring data for these wells are limited to no more than two years of semi-annual measurements. The depths to groundwater in these wells ranged from 44 feet to 240 feet from ground surface elevations ranging from 390 feet to 1660 feet, mean sea level.

5.4 Angwin and Pope Valley Subareas

In 2015, groundwater level monitoring in the Angwin and Pope Valley Subareas was performed by Napa County at recently volunteered wells. In the Angwin Subarea five wells were monitored, while one well was monitored in the Pope Valley Subarea (**Table 4-2**).

Groundwater level monitoring data for the Angwin Subarea wells are only available for 2014 and 2015. Depths to groundwater in these wells ranged from 95 feet to 207 feet from ground surface elevations ranging from 1678 feet to 1860 feet, mean sea level.

The only groundwater level monitoring data point for the single volunteered well in Pope Valley is from 2014 and 2015, when the depth to groundwater was measured to 16 feet below ground surface.

5.5 Napa Valley Surface Water-Groundwater Monitoring

Data from Sites 1 (**Figure 5-12**), 3 (**Figure 5-14**), and 4 (**Figure 5-15**) show that groundwater levels were above or very near the riverbed at these sites, indicating connectivity between groundwater and surface water in 2015.

Site 1 is located within the City of Napa and is currently the farthest downstream of the four project monitoring sites along the Napa River (**Figure 4-4**). The river is perennially wetted and tidally-influenced at this site with a 5 to 7 foot tidal range observed during the period of record. Data collected at this site have shown very similar water level elevations at all three monitoring locations including a similar, though dampened, response to the tidal cycles in the two piezometers. Data from Site 1 show that groundwater levels were above the elevation of the riverbed and near to or slightly above the elevation of water in the river channel, indicating a connection between groundwater and surface water.

Data from Sites 3 and 4 along the Napa River showed variability in the nature of groundwater-surface water connection during 2015, ranging from groundwater flow into the river to the opposite. Data from these two sites suggest groundwater flowed into the river channel from January through at least the end of July. Through the late summer and fall of 2015 the data indicate no significant flow of water between groundwater and surface water. Then in December 2015, as storms generated runoff in the watershed and flow in the river channel, the direction of flow was away from the riverbed.

At both Site 2 (**Figure 5-13**) and Site 5 (**Figure 5-16**) the direction of groundwater flow was away from the streambed in 2015.

At Site 5 water level data indicate that the river was hydraulically connected to groundwater during the first half of the year, until flows in the river ceased in July, and again in December 2015 as storms generated runoff leading to renewed flow in the river. At Site 2, located along Dry Creek, groundwater levels were consistently below the streambed elevation in 2015, indicating that groundwater was disconnected from the stream, although recharge to the groundwater system was likely occurring when water flowed in the creek.

Sites 2 and 5 also showed groundwater level differences between the shallow and deep casings of at least 5 feet for most or all of 2015. Given that most groundwater withdrawals in Napa Valley occur from depths greater than 50 feet, these water level differences show how the groundwater system's response to pumping from deeper aquifer units does not necessarily lead to an equivalent reduction in shallow groundwater levels.

Although the period of record at these sites is short compared to many wells monitored by Napa County, **Figure 5-17** demonstrates how the range of groundwater elevations monitored at a Surface Water –Groundwater Network site are comparable to a well constructed in a similar part of the aquifer system nearby. NapaCounty-133 is located approximately 0.5 miles from Site 4 and a similar distance from the Napa River. Data from NapaCounty-133 from 1978 through 2015 show a similar range and stable trend in groundwater elevations from spring to fall across the full period of record, including 2015.

6 GROUNDWATER QUALITY CONDITIONS AND TRENDS

Groundwater quality data in Napa County are collected primarily at sites regulated by the SWRCB through the Division of Drinking Water and Geotracker program, although data are available from other public agencies as well.

For this Report groundwater quality data reported between 2009 and 2015 were reviewed in order to provide an updated understanding of conditions and trends relative to the most recent County-wide review of groundwater quality data published as part of the Napa County Groundwater Conditions and Groundwater Monitoring Recommendations Report (LSCE, 2011a). Between 2009 and 2015, groundwater quality data were available from a total of 81 sites (**Table 6-1 and Figure 6-1**).

In addition to the regulated sites overseen by the SWRCB, data were available from voluntary data collection efforts conducted by Napa County at the ten Surface Water-Groundwater Project monitoring wells and by the U.S. Geological Survey and DWR at privately-owned wells. Water quality data from the ten Napa County Surface Water-Groundwater Project monitoring wells consists of a single round of baseline sampling conducted in June 2015. Results from the monitoring well and surface water samples are included in **Appendix D**.

Table 6-1 Recent Groundwater Quality Monitoring Sites in Napa County by Entity and Monitoring Program

Entity	Reporting Program	Number of Monitored Sites, 2009 - 2015
Napa County	Napa Berryessa Resort Improvement District	2
	Lake Berryessa Resort Improvement District	5
	Surface Water-Groundwater Monitoring Sites	10
California Department of Water Resources	Volunteered Sites	8
State Water Resources Control Board	Division of Drinking Water	35
	Geotracker	3
U.S. Geological Survey	-	18
	Total Sites	**81**

Figures 6-2 through **6-8** summarize the available water quality results reported between 2009 and 2015 for a range of constituents. These figures are intended to provide an indication of recent water quality conditions. **Figures 6-9** through **6-12** present time series plots for wells with the longest records of

nitrate and total dissolved solids data (TDS). These figures provide a perspective on the trends in groundwater quality over time at a given well and location.

6.1 Napa Valley Floor Subareas

Groundwater quality data show generally good water quality with stable conditions in the Napa Valley Floor Subareas between 2009 and 2015 compared to the conditions reported previously based on data reported through 2008 (LSCE, 2011a). Water quality standard exceedances in the Napa Valley Floor subareas and Napa Valley Subbasin included arsenic, with 4 of 26 sites showing maximum concentrations above the Maximum Contaminant Level (MCL) of 10 µg/L (**Figure 6-2**). With a Total Dissolved Solids[13] (TDS) concentration of 683 mg/L the deep monitoring well at Site 1 of the Surface Water-Groundwater Project, in Napa Subarea within the Napa Valley Subbasin, exceeded the secondary MCL of 500 mg/L. The same well and the deep well at Site 3 of the Surface Water-Groundwater Project, located near the Napa River at the boundary of the Napa and Yountville Subareas, had boron concentrations of 1,400 µg/L and 9,100 µg/L, respectively, well above the 1,000 µg/L Notification Level. The results from these dedicated monitoring wells may indicate the dominant influence of a geologic source on water quality in these wells.

Wells with long-term water quality data show stable TDS and nitrate concentrations, with one exception (**Figures 6-9** and **6-11)**. Well (06N04W27L002M) in the Napa Subarea which had a peak of 7.7 mg/L NO3-N (nitrate as nitrogen) in 2011 compared to initial concentrations of 3.4 mg/L NO3-N and 4.0 mg/L NO3-N in 1982 and 1972, respectively.

6.2 Subareas South of the Napa Valley Floor

Subareas south of the Napa Valley Floor may be susceptible to seawater intrusion originating from San Pablo Bay. As documented previously, groundwater in the Carneros and Jameson/American Canyon Subareas show elevated concentrations of several constituents, including TDS, chloride, and Electrical Conductivity (EC) (LSCE, 2011a). Water quality standard exceedances in the Napa-Sonoma Lowlands Subbasin, including portions of the Carneros and Jameson/American Canyon Subareas, occurred for arsenic (three wells), nitrate (one well), TDS (five wells) (**Figures 6-2**, **6-5**, and **6-8**). Sodium concentrations were above the agricultural water quality limit of 69 mg/L at all seven sites (**Figure 6-6**).

In the Napa-Sonoma Lowlands Subbasin and Carneros Subarea, available data show that nitrate concentrations have been stable to decreasing in all five wells with long-term records in the Napa-Sonoma Lowlands Subbasin (**Figures 6-10**). Two wells have shown increasing TDS trends, though all four wells with long-term trends were initially at or above the secondary MCL (**Figure 6-12**).

Construction data for monitored wells in the three subarea south of the Napa Valley Floor are very limited, making it difficult to conclusively determine the source and distribution of observed salinity. For example, it is not clear whether high salinity groundwater in the Carneros Subarea is a result of saltwater intrusion or interaction of groundwater with the geologic units present in and around the subarea.

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[13] Total Dissolved Solids is a measure of “all solid material in solution, whether ionized or not. It does not include suspended sediment, colloids, or dissolved gases” (Davis and DeWiest, 1966).

6.3 Subareas East and West of the Napa Valley Floor

Recent groundwater quality data from the Eastern and Western Subareas are limited. The available data show a wide range in water quality. TDS values ranged from 120 mg/L to 941 mg/L across eight sites with data, with three sites above the 500 mg/L secondary MCL (**Figure 6-8**). Boron concentrations ranged from 13 µg/L to 3,560 µg/L, with two exceedances of the 1,000 µg/L Notification Level (Figure 6-3). Sodium concentrations ranged from 7.6 mg/L to 384 mg/L, with two exceedances of the agricultural water quality limit of 69 mg/L at all seven sites (**Figure 6-6**). The pattern of the water quality standard exceedances appears to coincide with areas in the Western Mountains characterized by Great Valley Sequence sedimentary rocks.

6.4 Berryessa and Pope Valley Subareas

Recent groundwater quality data in Berryessa and Pope Valley Subareas are limited to three sites. TDS concentrations at all but one well at one site in the Berryessa Subarea exceeded the 500 mg/L secondary MCL. TDS concentrations ranged from 92 mg/L to 5,600 mg/L (**Figure 6-8**). Boron concentrations were also above the Notification Level at all but one well (**Figure 6-3**). The values ranged from non-detect to 15,000 µg/L (**Figure 6-3**). Nitrate concentrations were elevated, though below the 10 mg/L MCL, at two wells (**Figure 6-5**). Sodium concentrations ranged from non-detect to 1,300 mg/L, with three wells above the agricultural water quality limit of 69 mg/L. Spatial and temporal trends in the data from these Subareas are not evident due to the limited available data.

7 COORDINATION AND COLLABORATION

7.1 Integrated Regional Water Management Plans

Integrated Regional Water Management (IRWM) is defined by DWR as "a collaborative effort to identify and implement water management solutions on a regional scale that increase self-reliance, reduce conflict, and manage water to concurrently achieve social, environmental, and economic objectives" (DWR, 2015a).

7.1.1 Napa County's Participation in San Francisco Bay Area and Westside IRWMPs

In 2005, the County formed the Napa County regional water management group (RWMG), a working group of local water agencies, where the Napa County Flood Control and Water Conservation District served as the lead agency. The County RWMG worked together to draft the Napa-Berryessa Integrated Regional Water Management Plan (IRWMP) Functional Equivalent (Napa-Berryessa Regional Water Management Group, 2005).

In 2009, DWR established IRWM regions that have been accepted through the Regional Acceptance Process (DWR, 2009). Currently, there are two formally accepted regions that include Napa County; these regions are: 1) the San Francisco Bay Area Region (which covers the generally southern part of Napa County and focuses on the Napa River and Suisun Creek watersheds), and 2) the Westside Sacramento Region (which covers the generally northern part of Napa County and focuses on the Putah Creek/Lake Berryessa watershed; the Westside Region also covers parts of Yolo, Solano, Lake, and Colusa Counties).

The County has contributed to two larger regional IRWMPs. The County actively collaborated with the San Francisco Bay and Westside RWMGs to update the IRWMP for the San Francisco Bay (Kennedy Jenks et al., 2013) and to develop a new IRWMP for the Westside Sacramento Region (Kennedy Jenks, 2013). The County's representation and participation in the San Francisco Bay and Westside IRWMPs enables further coordination and sharing of information on water resources management planning programs and projects (particularly those that are a high priority for the County) and other information for IRWMP grant funding and implementation.

7.2 Groundwater Sustainability

In September 2014, the California Legislature passed the Sustainable Groundwater Management Act (Act) (DWR, 2015b). SGMA changes how groundwater is managed in the state. SGMA defines "sustainable groundwater management" as the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results (Section 10721 (u)). Undesirable results, as defined by SGMA, means one or more of the following effects caused by groundwater conditions occurring throughout the basin (Section 10721 (w)):

(1) Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage

during other periods.

(2) Significant and unreasonable reduction of groundwater storage.

(3) Significant and unreasonable seawater intrusion.

(4) Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.

(5) Significant and unreasonable land subsidence that substantially interferes with surface land uses.

(6) Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

7.2.1 DWR Prioritization of Groundwater Basins

As noted in **Section 2** of this Report, DWR has prioritized groundwater basins and subbasins in accordance with the requirements of Water Code Section 10933. SGMA applies to basins or subbasins that DWR designates as medium- or high-priority basins. Previously under CASGEM, DWR ranked California's basins and subbasins. In Napa County, the Napa Valley Subbasin was ranked medium-priority. All other Napa County basins or subbasins were ranked as very low-priority basins.

Under SGMA, DWR must review and update the ranking of each of the basins or subbasins as a very low-, low-, medium-, or high-priority basin based on requirements contained in Section 10933. DWR was required to complete its initial ranking by January 31, 2015. Because of the expediency of this requirement, DWR's CASGEM basin rankings were used to meet this requirement.

Under SGMA, DWR must also consider adverse impacts on local habitat and local streamflows. The factors for basin ranking and prioritization include:

- Overlying population;
- Projected growth of overlying population;
- Public supply wells;
- Total wells;
- Overlying irrigated acreage;
- Reliance on groundwater as the primary source of water;
- Impacts on the groundwater, including overdraft, subsidence, saline intrusion, and other water quality degradation; and
- Any other information determined to be relevant, including adverse impacts on local habitat and local streamflows.

For most basins designated by DWR as medium or high priority, SGMA requires the designation of groundwater sustainability agencies (GSA) and the adoption of groundwater sustainability plans (GSP); however, there is an alternative to a GSP, pending the local entity (entities) can meet the requirements. When required, GSPs must be developed to eliminate overdraft conditions in aquifers and to return them to a condition that assures their long-term sustainability within twenty years of GSP implementation.

SGMA does not require the development of a GSP for basins that DWR ranks as low- or very low-priority basins; GSPs are voluntary for these basins. SGMA planning requirements also do not apply to adjudicated groundwater basins that are managed by the courts. As discussed below, under certain groundwater basin conditions, local entities can pursue an Alternative Report (i.e., a document other than a GSP).

As applicable, SGMA requires that a GSA be identified for medium- and high-priority groundwater basins by June 30, 2017. Counties are presumed to be the GSA for unmanaged areas of medium- and high priority basins (Section 10724). However, counties are not required to assume this responsibility. When no entity steps forward, this can lead to state intervention (Section 10735 *et seq*.).

SGMA requires GSAs for medium- and high-priority basins to adopt a GSP by January 31, 2022 (Section 10720.7). For basins subject to critical overdraft conditions, the GSP must be adopted by January 31, 2020.

Upon adoption of a GSP, the designated GSA must submit the GSP to DWR for review. SGMA requires that DWR develop regulations for evaluating GSPs by June 1, 2016. On February 18, 2016 DWR released draft GSP regulations. The draft regulations discuss alternatives to a GSP only briefly and appear to require a level of analysis equivalent to that of a GSP. The public comment period for the draft GSP regulations is set to close on April 1, 2016.

Upon completion of its review of a GSP, DWR has the power to request changes to the GSP to address deficiencies. DWR is required to re-evaluate GSPs every five years to ensure continued compliance and sufficiency. After adoption of a GSP, the GSA must submit to DWR an annual compliance report containing basin groundwater data, including groundwater elevation data, annual aggregated extraction data, surface water supply for or available for use for groundwater recharge or in-lieu use, total water use, and any changes in groundwater storage (Section 10728).

In addition to imposing a number of new requirements on local agencies related to groundwater management, SGMA also provides for state intervention – a “backstop” – when local agencies are unwilling or unable to manage their groundwater basin (Section 10735 *et seq*.).

7.2.2 Alternatives to GSPs

Under SGMA, Section 10733.6, a local entity (or entities) can pursue an Alternative to a GSP under the following circumstances:

(a) If a local agency believes that an alternative described in subdivision (b) satisfies the objectives of this part, the local agency may submit the alternative to the department for evaluation and assessment of whether the alternative satisfies the objectives of this part for the basin.

(b) An alternative is any of the following:

- (1) A plan developed pursuant to Part 2.75 (commencing with Section 10750) or other law authorizing groundwater management.
- (2) Management pursuant to an adjudication action.
- (3) An analysis of basin conditions that demonstrates that the basin has operated within its sustainable yield over a period of at least 10 years. The submission of an alternative described by this paragraph shall include a report prepared by a registered professional engineer or geologist who is licensed by the state and submitted under that engineer’s or geologist’s seal.

(c) A local agency shall submit an alternative pursuant to this section no later than January 1, 2017, and every five years thereafter.

(d) The assessment required by subdivision (a) shall include an assessment of whether the alternative is within a basin that is in compliance with Part 2.11 (commencing with Section 10920). If the alternative is within a basin that is not in compliance with Part 2.11 (commencing

> with Section 10920), the department shall find the alternative does not satisfy the objectives of this part.

On February 18, 2016 DWR published draft regulations for the development of GSPs and GSP-alternatives. Napa County staff have met with DWR staff to discuss an approach for a GSP-alternative for the Napa Valley Subbasin. County staff have also provided comments to DWR on the draft regulations, which are required under SGMA to be finalized and adopted by June 1, 2016. County staff are currently seeking input from the Napa County Board of Supervisors and preparing for multiple paths forward pending direction from the Supervisors and the content of the final regulations with respect to the requirements for GSP-alternatives.

More details about SGMA are available at http://www.water.ca.gov/groundwater/sgm/index.cfm.

7.3 Napa County Watershed Information and Conservation Council

The Watershed Information and Conservation Council[14] (WICC) Board was established in 2002 to serve as an advisory committee to Napa County Board of Supervisors – assisting with the Board's decision making and serving as a conduit for citizen input by gathering, analyzing, and recommending options related to the management of watershed resources (WICC, 2015). The WICC has achieved significant accomplishments in its 12-year history – both alone and in partnership with nonprofits, public agencies, and private landowners.

The WICC Mission is: improving the health of Napa County's watersheds by informing, engaging and fostering partnerships within the community.

The 2015 WICC Strategic Plan outlines five goals, including (WICC, 2015):

- Goal 1: Coordinate and facilitate watershed planning, research, and monitoring efforts among Napa County organizations, agencies, landowners and citizens.
- Goal 2: Strengthen and expand community understanding, connections and involvement to improve the health of Napa County's watersheds.
- Goal 3: Support informed decision-making on topics that affect the health of Napa County's watersheds.
- Goal 4: Improve WICC Board efficiency and effectiveness.
- Goal 5: Explore additional funding opportunities to support the goals of the WICC.

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[14] Prior to 2015 this organization was named the Watershed Information Center and Conservancy.

Additionally, Subgoal 1B to Goal 1 includes the WICC serving as the local clearinghouse for groundwater resource data, mapping, and monitoring (Implements: Napa County General Plan Action Item CON WR-4). As part of developing education and outreach for the community regarding groundwater conditions, the WICC is expanding groundwater information on the WICC website at www.napawatersheds.org. This new initiative has involved adding groundwater summary data and graphs for the County's groundwater basins and/or subareas that are already delineated on the website's maps. Specifically, the WICC has established a portion of the WICC website dedicated to groundwater. Data and information are at a watershed scale and not be project or parcel specific scale. Information includes:

- Updates on groundwater resource issues locally and throughout California.
- Articles explaining key technical issues related to groundwater.
- Updates on groundwater mapping and monitoring in Napa County.
- Educational materials and resources on groundwater recharge areas and ways to improve these areas.
- Report on the Napa County Voluntary Groundwater Level Monitoring Program.

8 SUMMARY AND RECOMMENDATIONS

Groundwater level monitoring was conducted at a total of 113 sites across Napa County in 2015 (**Table 4-1)**. The overall number and distribution of monitored sites remained consistent with the monitoring conducted in 2014 and was increased relative to the 87 sites reported in the 2011(LSCE, 2013a).

Groundwater level trends in the Napa Valley Subbasin of the Napa-Sonoma Valley Groundwater Basin are stable in the majority of wells with long-term groundwater level records. While many wells have shown at least some degree of response to recent drought conditions, the water levels observed in recent years are generally higher than groundwater levels in the same wells during the 1976 to 1977 drought. Elsewhere in the County long-term groundwater level records are limited, with the exception of the Milliken-Sarco-Tulucay (MST) Subarea.

Although designated as a groundwater subarea for local planning purposes, the majority of the MST is not part of a groundwater basin as mapped by DWR. Groundwater level declines observed in the MST Subarea as early as the 1960s and 1970s have stabilized since about 2008. Groundwater level responses differ within the MST Subarea and even within the north, central, and southern sections of this subarea, indicating that localized conditions, whether geologic or anthropogenic in nature, might be the primary influence on groundwater conditions in the subarea.

While the majority of wells with long-term groundwater level records exhibit stable trends, periods of year to year declines in groundwater levels have been observed in a few wells. These wells are located near the Napa Valley margin in the northeastern Napa Subarea (NapaCounty-75 and Napa County-76), southwestern Yountville Subarea (NapaCounty-135) and southeastern St. Helena Subarea (NapaCounty-132). These locations are characterized in part by relatively thin alluvial deposits, which may contribute to more groundwater being withdrawn from the underlying semi-consolidated deposits.

Water levels in northeastern Napa Subarea wells NapaCounty-75 and Napa County-76, east of the Napa River, have stabilized since 2009, though declines were observed over roughly the prior decade (**Figure 5-7**). Despite the recent stability, given the potential for a hydraulic connection between the aquifer units in the vicinity of these wells and the aquifer units of the MST Subarea and an apparent increase in the number of new well permits in the area over the past 10 years[15], further study in this area is recommended.

Water levels at NapaCounty-135 and NapaCounty-132 declined most distinctly between 2013 and 2014 (**Figures 5-6 and 5-7**). The increased monitoring frequency at these wells through the end of 2015 has shown groundwater levels already recovering to levels comparable to or higher than those of spring 2013. Groundwater level declines in these wells observed in 2014 could have one or more contributing factors, including variations in groundwater recharge due to changes in the timing and intensity of precipitation and changes in the level of pumping at the monitored well or in the vicinity of the monitored well. Continuation of the increased monitoring frequency is recommended to assist with interpretation of conditions at these wells in the future.

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[15] In a Memorandum to David Morrison, Director of Planning, Building, and Environmental Services, dated December 7, 2015 regarding groundwater conditions in the northeastern corner of the Napa Subarea Steven Lederer, Director of Public Works, noted that “12 of the approximately 30 homes on Petra Drive have applied for new well permits in the past 10 years.”

Groundwater quality data show stable conditions between 2009 and 2015 compared to the conditions reported previously with data through 2008 (LSCE, 2011a). Water quality standard exceedances in the Napa Valley Floor subareas and Napa Valley Subbasin were limited to the naturally-occurring constituent arsenic, with 4 of 26 sites showing maximum concentrations above the MCL of 10 µg /L (**Figure 6-2**). Water quality standard exceedances in the Napa-Sonoma Lowlands Subbasin, including portions of the Carneros and Jameson/American Canyon Subareas, occurred for arsenic (three wells), nitrate (one well), TDS (five wells) (**Figures 6-2**, **6-5**, and **6-8**). Construction information for monitored wells those three subarea are very limited, making it difficult to conclusively determine the source and distribution of observed salinity. For example, it is not clear whether high salinity groundwater in the Carneros Subarea is a result of saltwater intrusion or interaction of groundwater with the geologic units present in and around the subarea.

Wells with long-term water quality data in the Napa Valley Subbasin show stable TDS and nitrate concentrations, with one exception (**Figures 6-9** and **6-11)**. Well (06N04W27L002M) in the Napa Subarea which had a peak of 7.7 mg/L NO3-N (nitrate as nitrogen) in 2011 compared to initial concentrations of 3.4 mg/L NO3-N and 4.0 mg/L NO3-N in 1982 and 1972, respectively. In the Napa-Sonoma Lowlands Subbasin, nitrate concentrations have been stable to decreasing in all five wells with long-term records in the Napa-Sonoma Lowlands Subbasin (**Figures 6-10**). Two wells have shown increasing TDS trends, though all four wells with long-term trends were initially at or above the secondary MCL (**Figure 6-12**).

The following recommendations have been developed based on the findings presented in this report.

8.1 Northeast Napa Subarea Hydrogeologic Investigation

Previously observed groundwater level declines in the northeast Napa Subarea, east of the Napa River in the vicinity of NapaCounty-75 and NapaCounty-76, along with reports of increased well replacement activity along Petra Drive have raised questions about the cumulative impacts of existing and potential future groundwater use in this area. In addition to completing the standard project-level planning review of the proposed projects, a focused study of hydrogeologic conditions affecting groundwater availability is advisable for this area. The investigation should be designed to address existing and future water use in the area, sources of groundwater recharge, and the geologic setting in order to address the potential for cumulative impacts of future development. The investigation would also seek to address the influence of previously documented groundwater cones of depression in the MST subarea on both the study area east of the Napa River and the Napa Subarea west of the Napa River.

8.2 Data Gap Refinement

Groundwater levels in two monitored wells located near to the Napa Valley margin showed year to year declines in groundwater levels. Additional information is needed in order to consider the full range of possible causes for these declines and more accurately determine if the present emerging trends. Recommended actions include a review of land use data in these areas and continuation of the increased frequency of data collection at a subset of wells. More frequent data collection could be accomplished, pending agreement with the well owner, by monthly manual groundwater level measurements.

For wells added to the County's monitoring networks in recent years without a record of key well construction details, continued efforts to locate construction information and link those data with aquifer units is recommended. In cases where a well owner does not have a record of the construction, a review of Well Completion Reports is recommended.

Once final Groundwater Sustainability Plan regulations are published by DWR later in 2016, there may be a need to add one or more wells to the CASGEM network near the southern boundary of the Napa Valley Subbasin. A well or wells in this area would be used to monitor groundwater gradients at the basin boundary where subsurface outflow occurs into the Napa-Sonoma Lowlands Subbasin. This data will be a component of the subbasin water budget that will be a key feature of the quantitative approach to groundwater management described in SGMA. For similar reasons, the County may benefit from updating reference point elevation data for some monitored wells with surveyed values in order more accurately monitor groundwater level gradients and any potential future seawater intrusion.

8.3 Baseline Water Quality Sampling

The groundwater quality monitoring objectives contained in the *Napa County Groundwater Monitoring Plan 2013* (Plan) included the investigating of variations in water quality at different points within the groundwater Subareas and at different aquifer units within a given subarea (LSCE, 2013a). The Plan recommended baseline sampling in wells at each of 18 Areas of Interest for additional monitoring and at the then proposed dedicated surface water-groundwater monitoring wells. It is recommended that wells added to the County monitoring networks in these areas be reviewed for suitability in light of the groundwater quality monitoring objectives, with baseline sampling conducted for those wells with sufficient well construction records to enable interpretation of the results for specific aquifer units.

A second round of baseline water quality sampling is also recommended for the five dual-completion monitoring wells constructed in 2014 at surface water-groundwater monitoring sites, as described in the Plan. An initial round of sampling and analysis was completed in June 2015 with a combination of County matching funds, DWR grant funds, and DWR in-kind support. Sampling these wells again in 2016 will provide a more robust baseline dataset that would be used to characterize any inter-annual variability at each well and provide a basis for interpreting future groundwater quality data.

8.4 Coordination with Other Monitoring Efforts

Coordination with other county departments and other agencies that collect or utilize groundwater data could provide an additional source of data in places where data are limited. Several local agencies, including the Town of Yountville, City of St. Helena, and City of Napa, already monitor groundwater levels at locations around the county. Another potential source of coordination would be a continuation of the in-kind support for laboratory analysis of water quality samples, as occurred in 2015.

8.5 Existing Activities in the MST Subarea

In 1999 the County passed a Groundwater Ordinance which, among other things, limited approval of discretionary permits in the MST Subarea to those projects that could meet the “Fair Share” requirement of 0.3 acre-foot/per acre of land. In 2004, discretionary approvals were further limited to those projects that could meet a “no net increase” standard. These actions were intended to slow the decline of water levels in the MST Subarea while a more permanent solution could be found.

It was recognized at the time that these actions by themselves would not “fix” the problem, but were a good step given the constraints of land use and groundwater law. It is reasonable to assume that these actions restricting increased use of groundwater have had beneficial impacts. However, ministerial projects (such as a single family home on a parcel without any other development, or Track II replants) were not so regulated, nor were existing (pre-1999) water users regulated.

In 2014 construction commenced on a pipeline that will deliver tertiary treated recycled waste water to the MST Subarea. It is expected that customers for approximately 400 acre-feet of recycled water will commence receiving deliveries upon completion of the pipeline in 2016. The pipeline capacity allows for delivery of up to 2,000 acre-feet of water. If customer demand for the recycled water increases, as anticipated, this new source of supply may further offset demand for groundwater in the subarea. Continued monitoring of groundwater levels will improve the understanding of groundwater trends related to any reduced demand for groundwater in the area.

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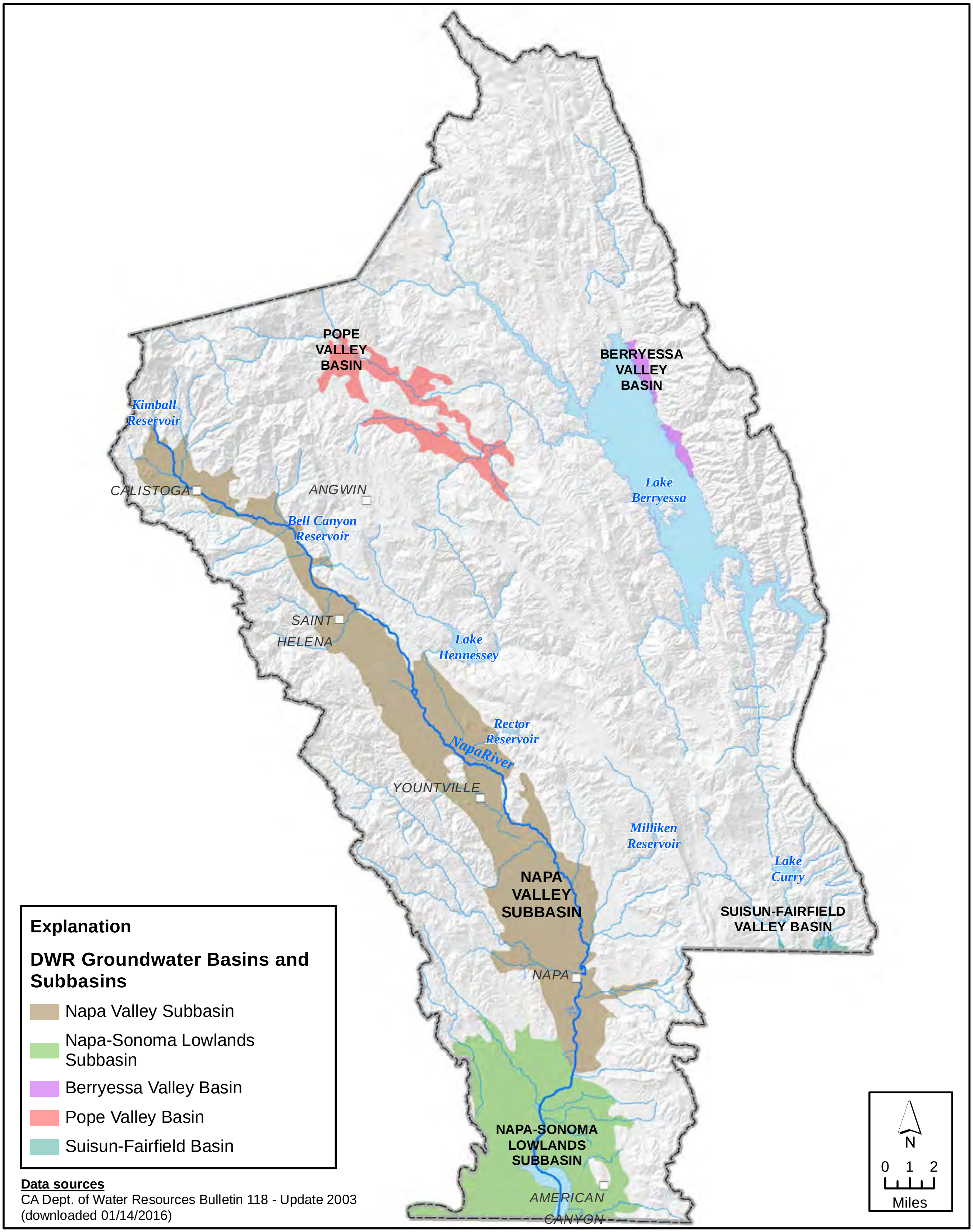
FIGURES



Data sources
CA Dept. of Water Resources Bulletin 118 - Update 2003
(downloaded 01/14/2016)

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\GW Basins in Napa County.mxd

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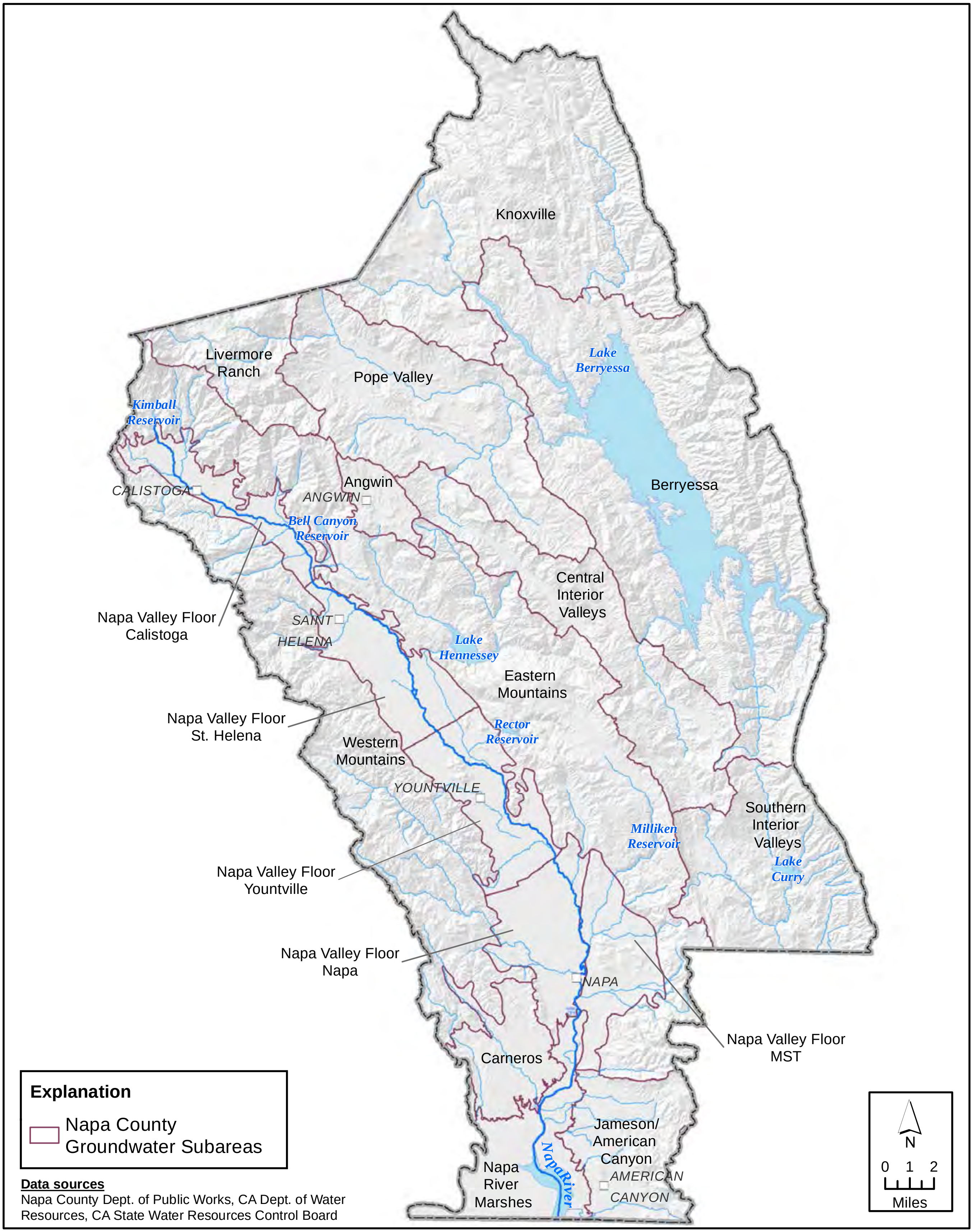
FIGURE 2-1
Groundwater Basins and Subbasins in Napa County, CA



Data sources
Napa County Dept. of Public Works, CA Dept. of Water Resources, CA State Water Resources Control Board

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FIGURE 2-2
Napa County Groundwater Subareas

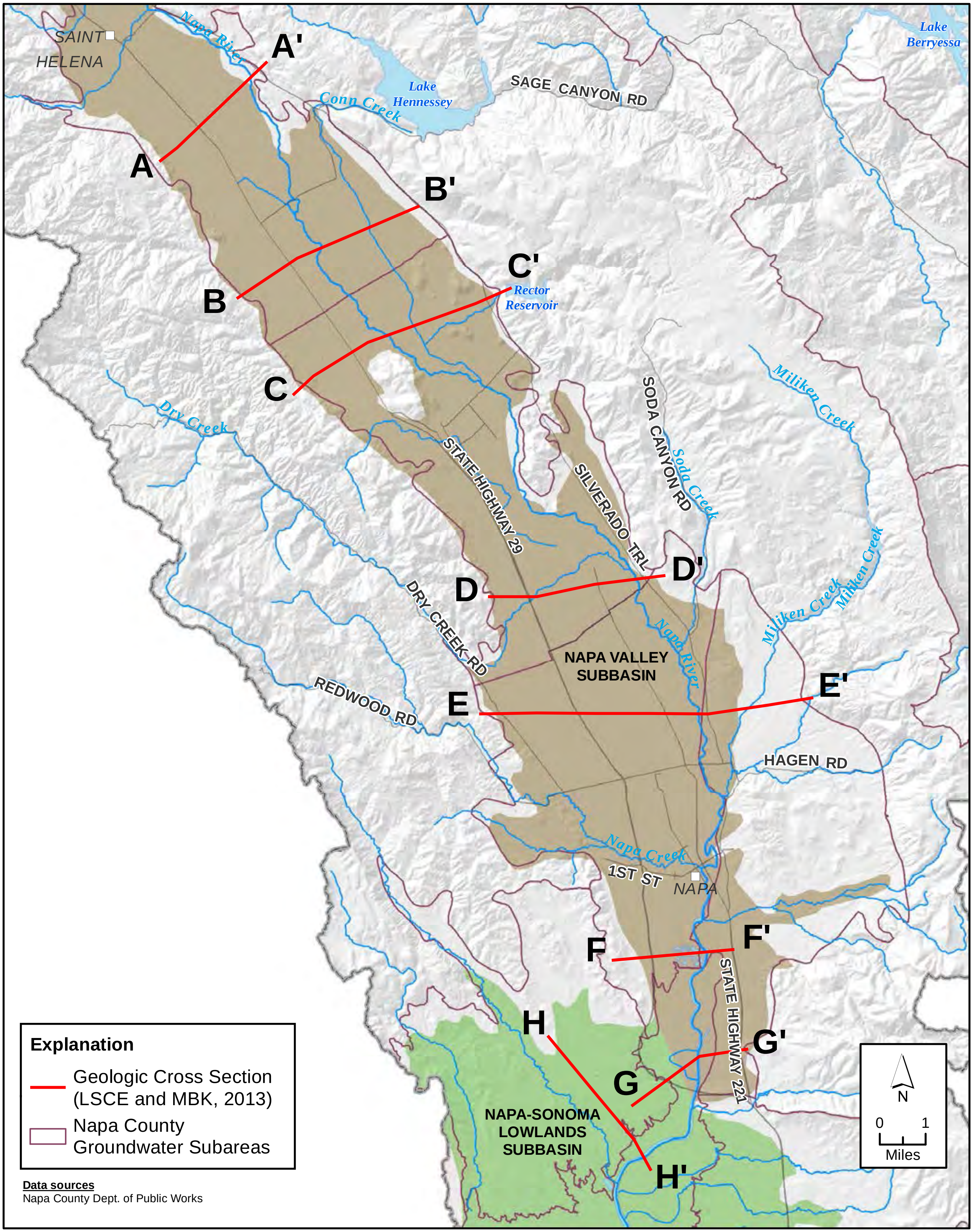

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FIGURE 2-3
Updated Hydrogeologic Conceptualization
Geologic Cross Section Locations

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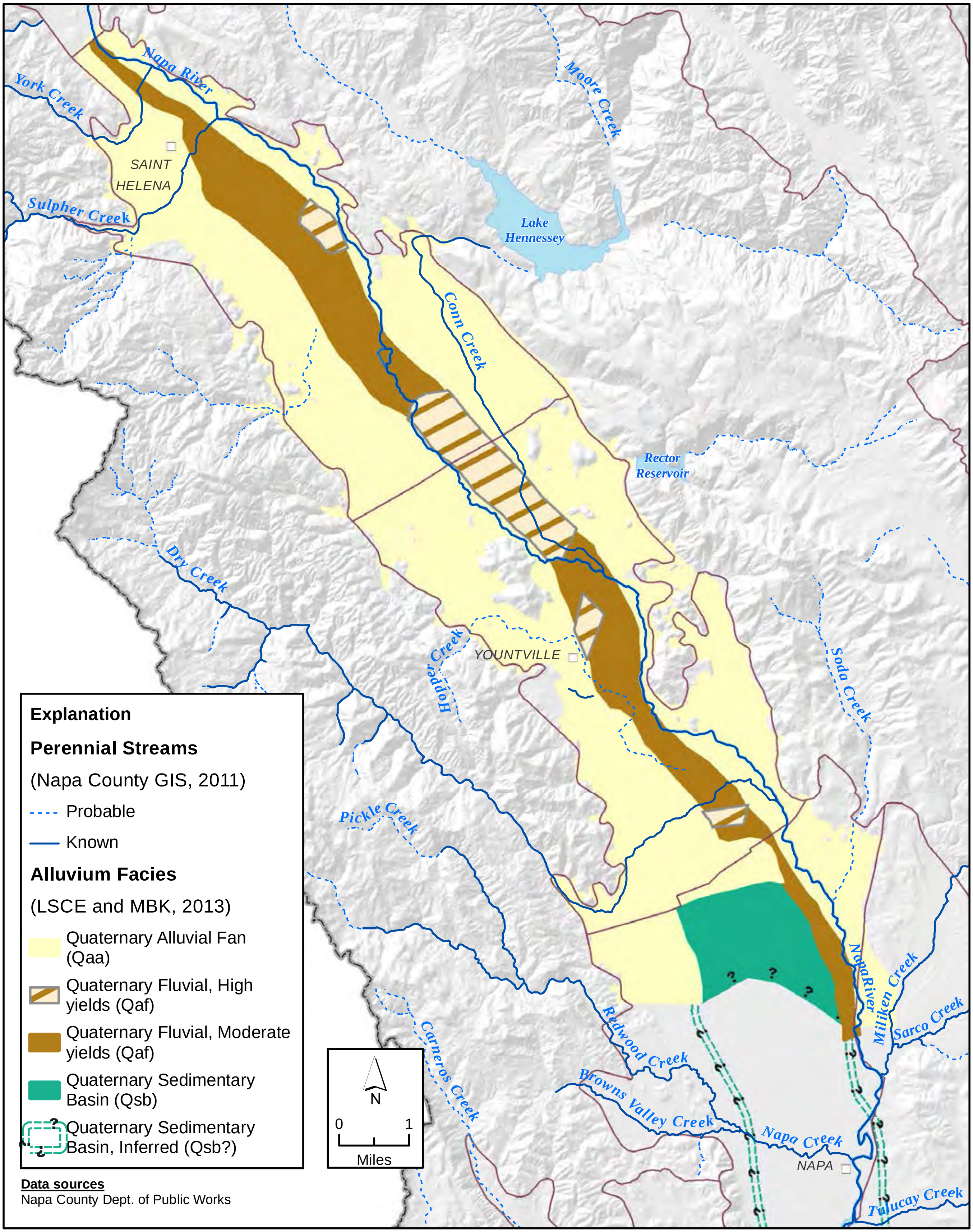

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FIGURE 2-4

Perennial Streams and Alluvium Facies
Napa Valley Floor, Napa County, CA

Napa County Comprehensive Groundwater Monitoring Program
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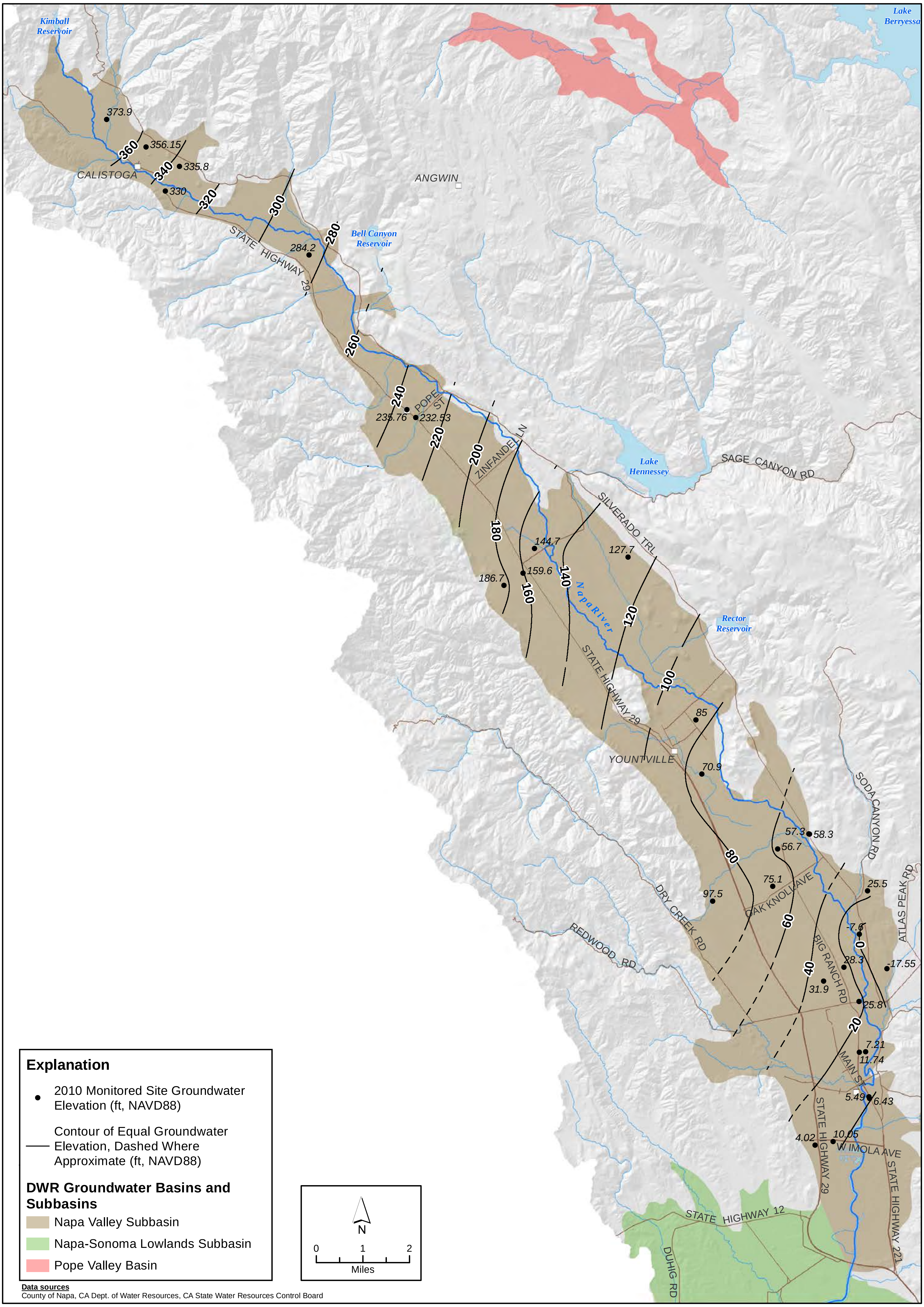

Data sources
County of Napa, CA Dept. of Water Resources, CA State Water Resources Control Board

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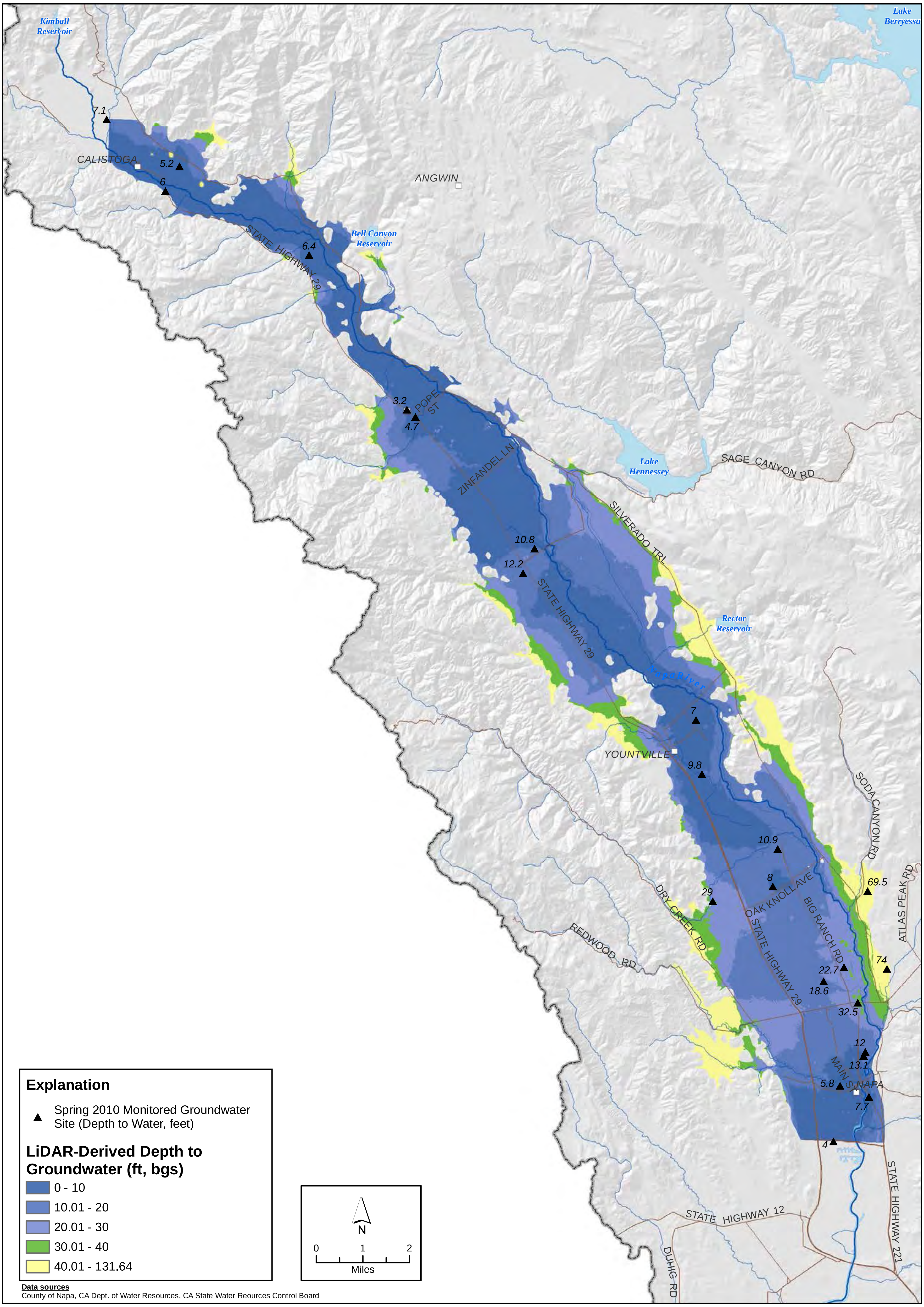
FIGURE 2-5
Contours of Equal Groundwater Elevation, Spring 2010
Napa Valley Floor, Napa County, CA

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Explanation

▲ Spring 2010 Monitored Groundwater Site (Depth to Water, feet)

LiDAR-Derived Depth to Groundwater (ft, bgs)

■	0 - 10
■	10.01 - 20
■	20.01 - 30
🟩	30.01 - 40
🟨	40.01 - 131.64

Data sources
County of Napa, CA Dept. of Water Resources, CA State Water Reources Control Board

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FIGURE 2-6
Spring 2010 Calculated Depth to Groundwater, Napa Valley Floor, Napa County, CA

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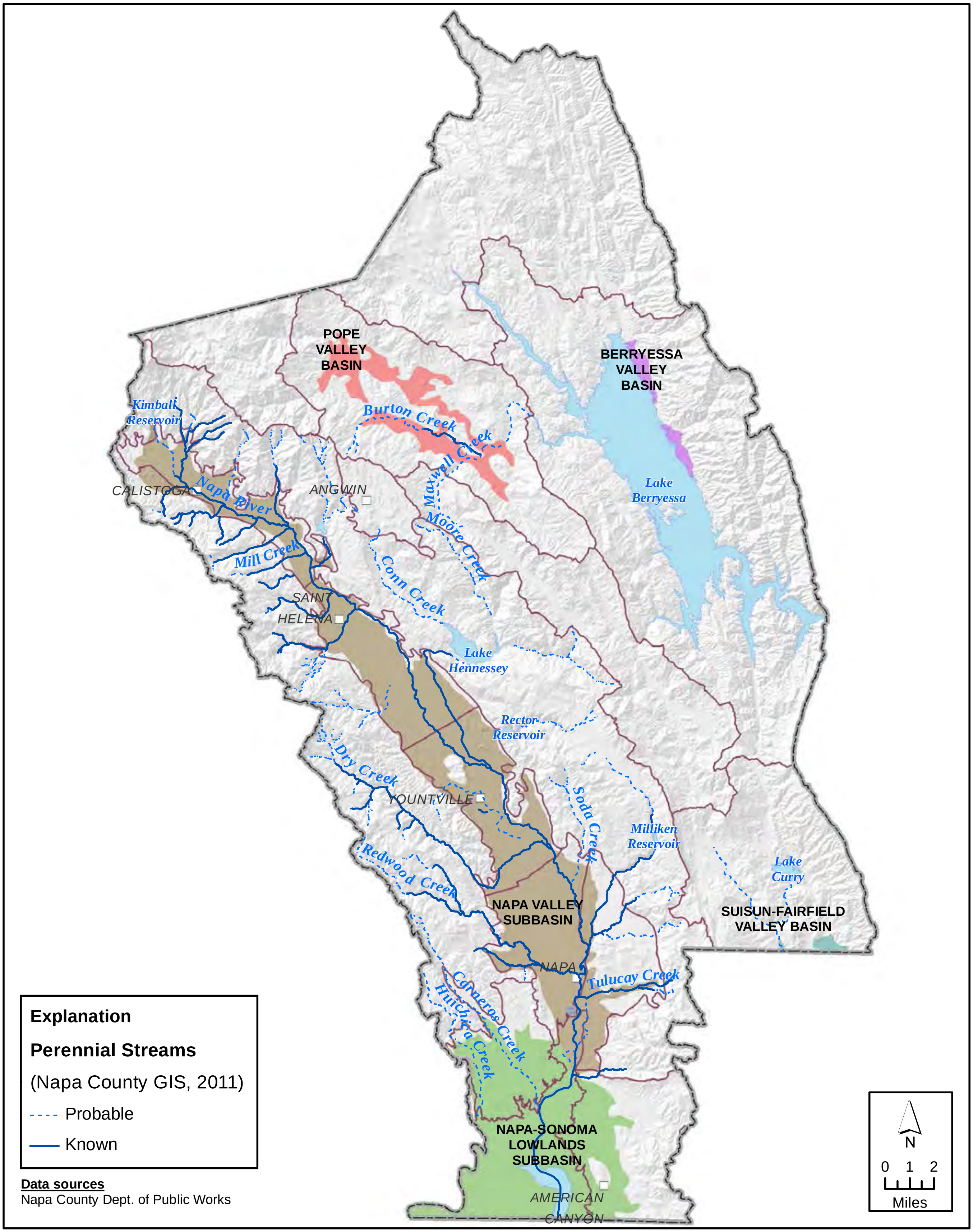

Data sources
Napa County Dept. of Public Works

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\Perennial Streams in Napa County.mxd

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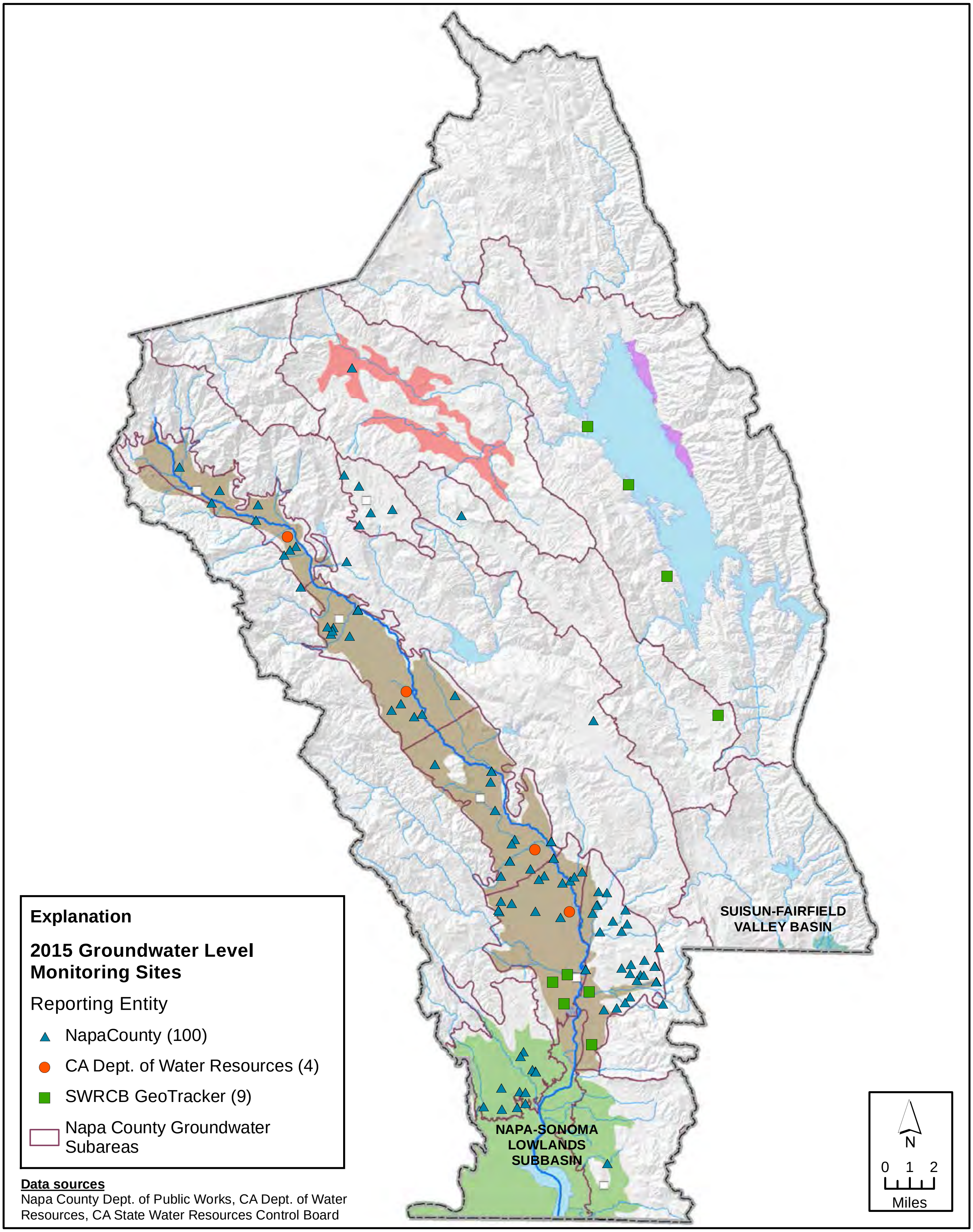
FIGURE 2-7
Perennial Streams in Napa County



Data sources
Napa County Dept. of Public Works, CA Dept. of Water Resources, CA State Water Resources Control Board

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\2015 Current GWL Monitoring Sites by Entity.mxd

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FIGURE 4-1
Current Groundwater Level Monitoring Sites by Reporting Entity

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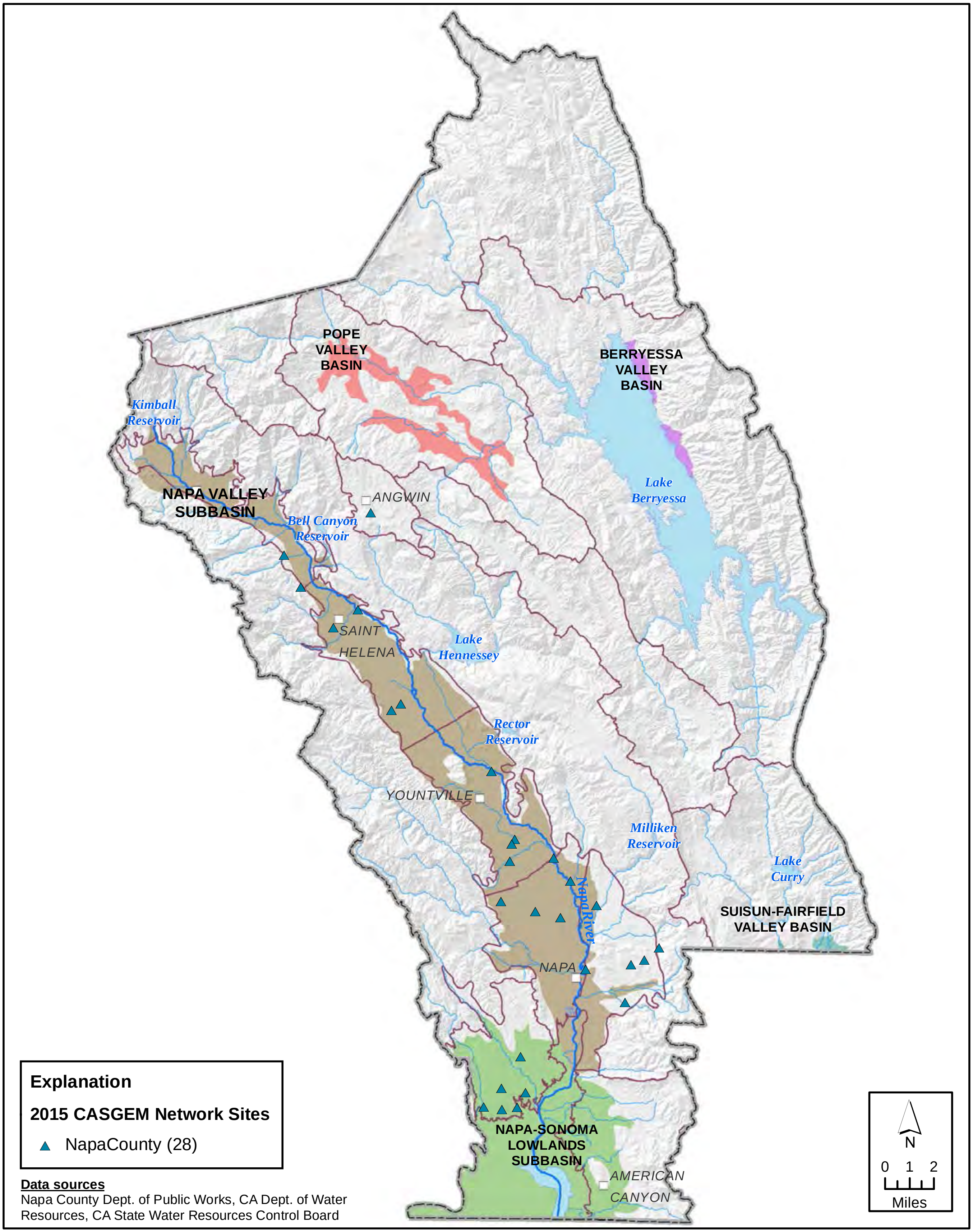
2015 Annual Report and CASGEM Update



Data sources
Napa County Dept. of Public Works, CA Dept. of Water Resources, CA State Water Resources Control Board

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\2015 CASGEM Network Sites.mxd

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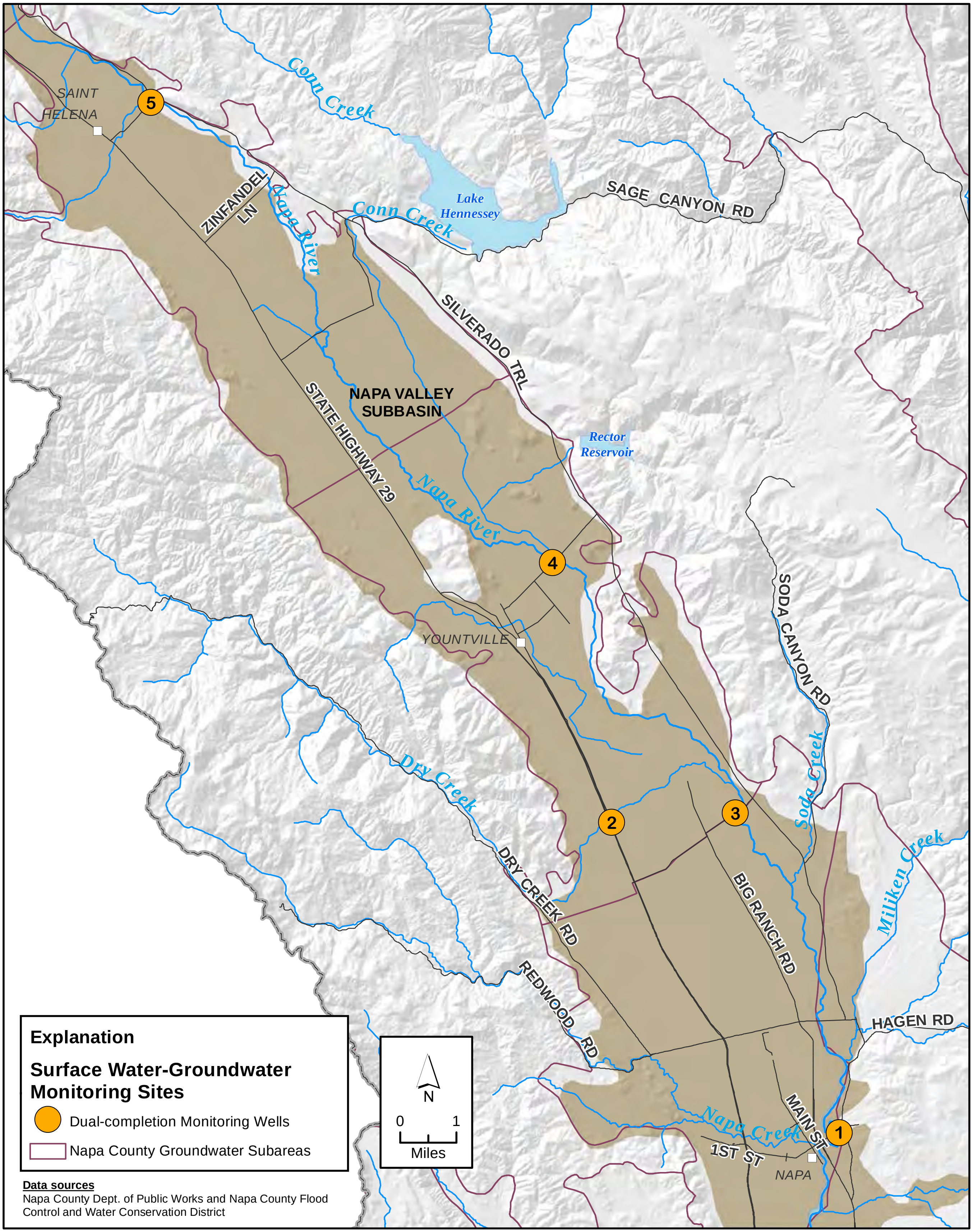
FIGURE 4-2
2015 CASGEM Network Sites
Napa County, CA

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Data sources
Napa County Dept. of Public Works and Napa County Flood Control and Water Conservation District

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FIGURE 4-3
Napa County Surface Water-Groundwater Monitoring Sites

Napa County Comprehensive Groundwater Monitoring Program
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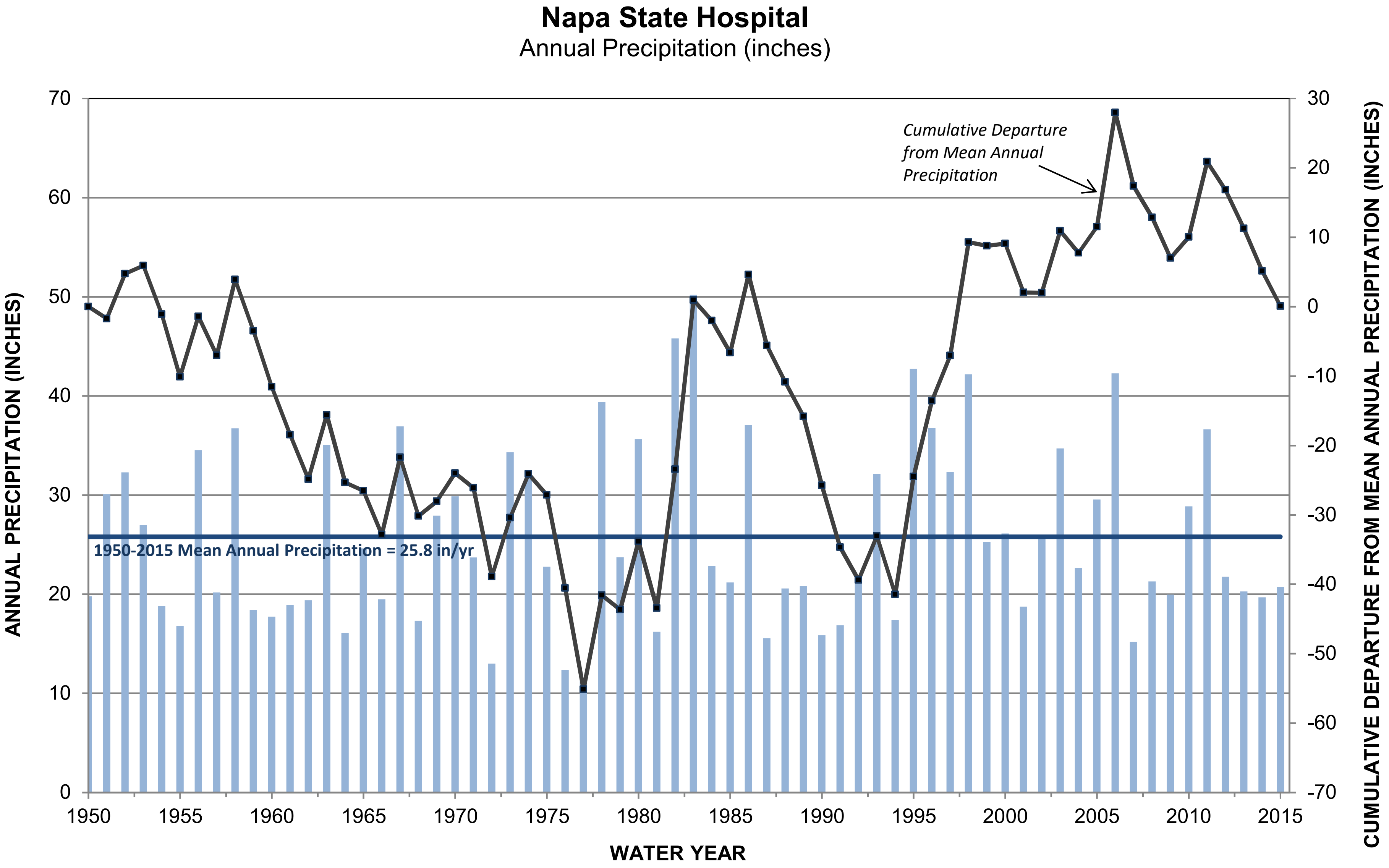

NOTE: Gaps in this data record have been reconstructed using data from the Oakville CIMIS station (77) and NOAA Saint Helena, CA US station (GHCND:USC0004764).

X:\2014 Job Files\14-054\Data\Precip\NCDC Data Summary UPDATED Feb2016.xlsx\NSH_CD_50-15plot Annual Rep (2

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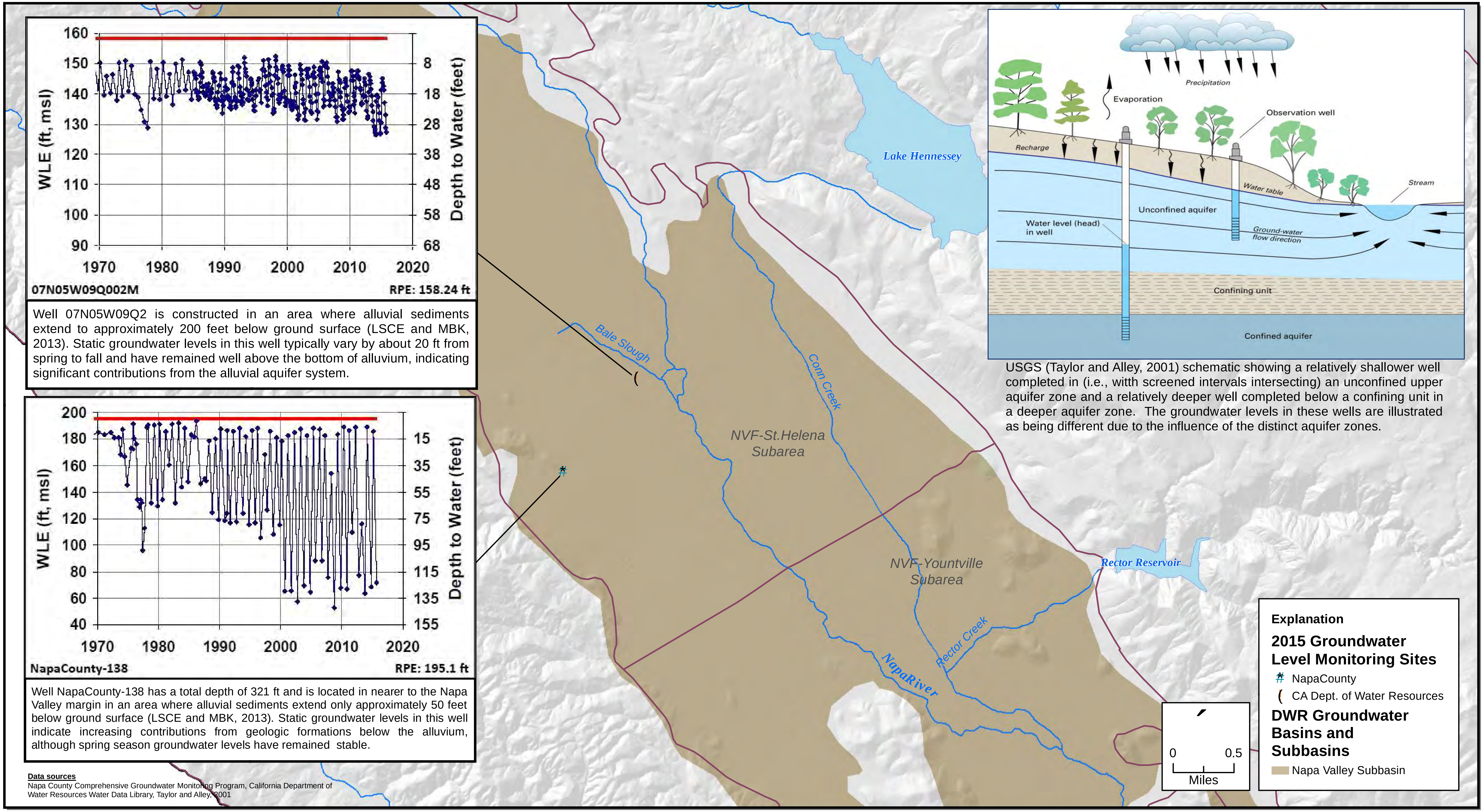
Figure 5-1

Napa State Hospital Water Year Precipitation and Cumulative Departure , Water Years 1950 - 2015



Well 07N05W09Q2 is constructed in an area where alluvial sediments extend to approximately 200 feet below ground surface (LSCE and MBK, 2013). Static groundwater levels in this well typically vary by about 20 ft from spring to fall and have remained well above the bottom of alluvium, indicating significant contributions from the alluvial aquifer system.

Well NapaCounty-138 has a total depth of 321 ft and is located in nearer to the Napa Valley margin in an area where alluvial sediments extend only approximately 50 feet below ground surface (LSCE and MBK, 2013). Static groundwater levels in this well indicate increasing contributions from geologic formations below the alluvium, although spring season groundwater levels have remained stable.

USGS (Taylor and Alley, 2001) schematic showing a relatively shallower well completed in (i.e., with screened intervals intersecting) an unconfined upper aquifer zone and a relatively deeper well completed below a confining unit in a deeper aquifer zone. The groundwater levels in these wells are illustrated as being different due to the influence of the distinct aquifer zones.

Data sources

Napa County Comprehensive Groundwater Monitoring Program, California Department of Water Resources Water Data Library, Taylor and Alley, 2001

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FIGURE 5-2

Southern St. Helena Subarea Aquifer Zone Schematic and Representative Hydrographs

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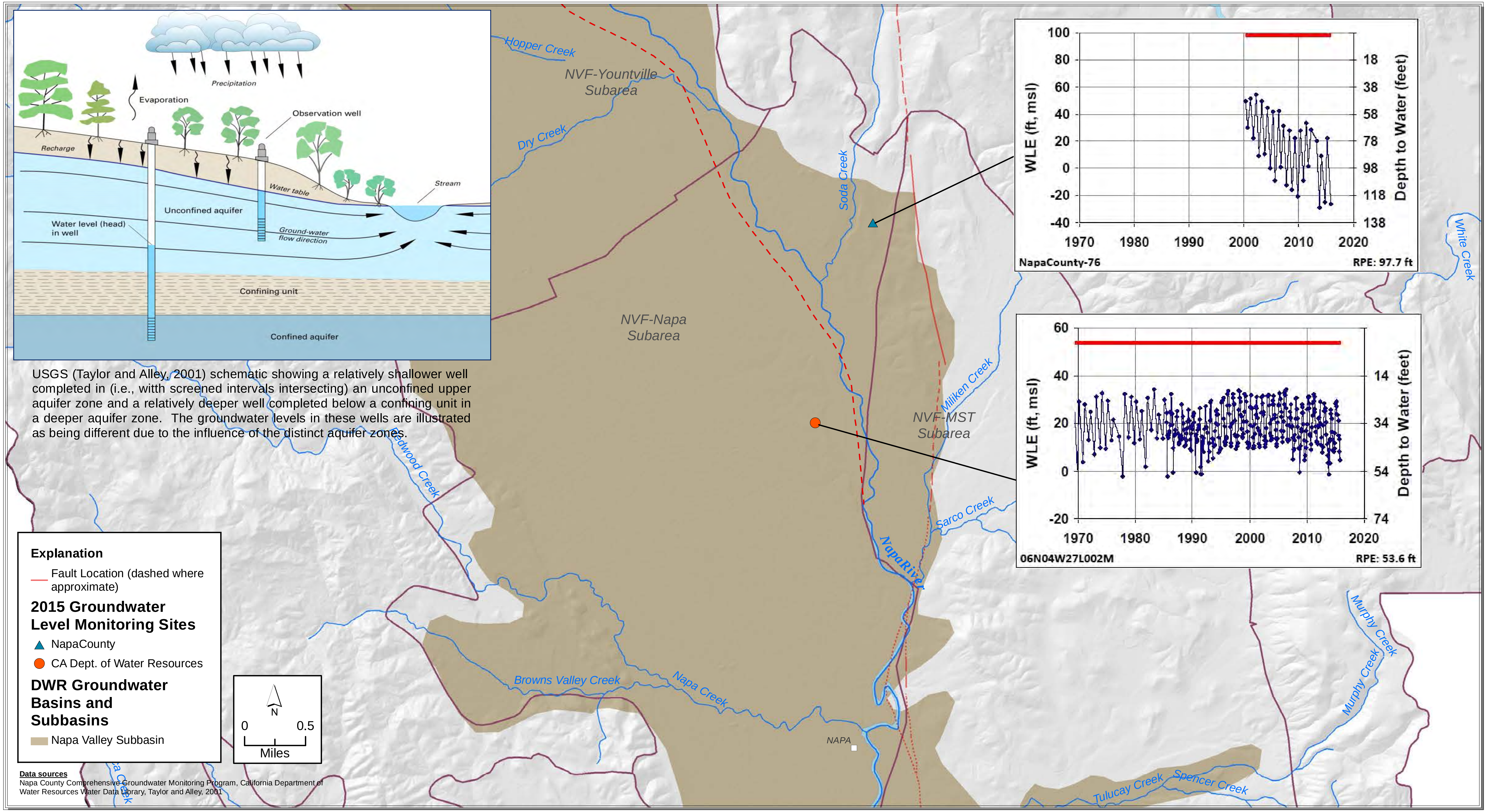
2015 Annual Report and CASGEM Update



USGS (Taylor and Alley, 2001) schematic showing a relatively shallower well completed in (i.e., witth screened intervals intersecting) an unconfined upper aquifer zone and a relatively deeper well completed below a confining unit in a deeper aquifer zone. The groundwater levels in these wells are illustrated as being different due to the influence of the distinct aquifer zones.

Data sources
Napa County Comprehensive Groundwater Monitoring Program, California Department of Water Resources Water Data Library, Taylor and Alley, 2001

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FIGURE 5-3

Northeast Napa Subarea Aquifer Zone Schematic and Representative Hydrographs

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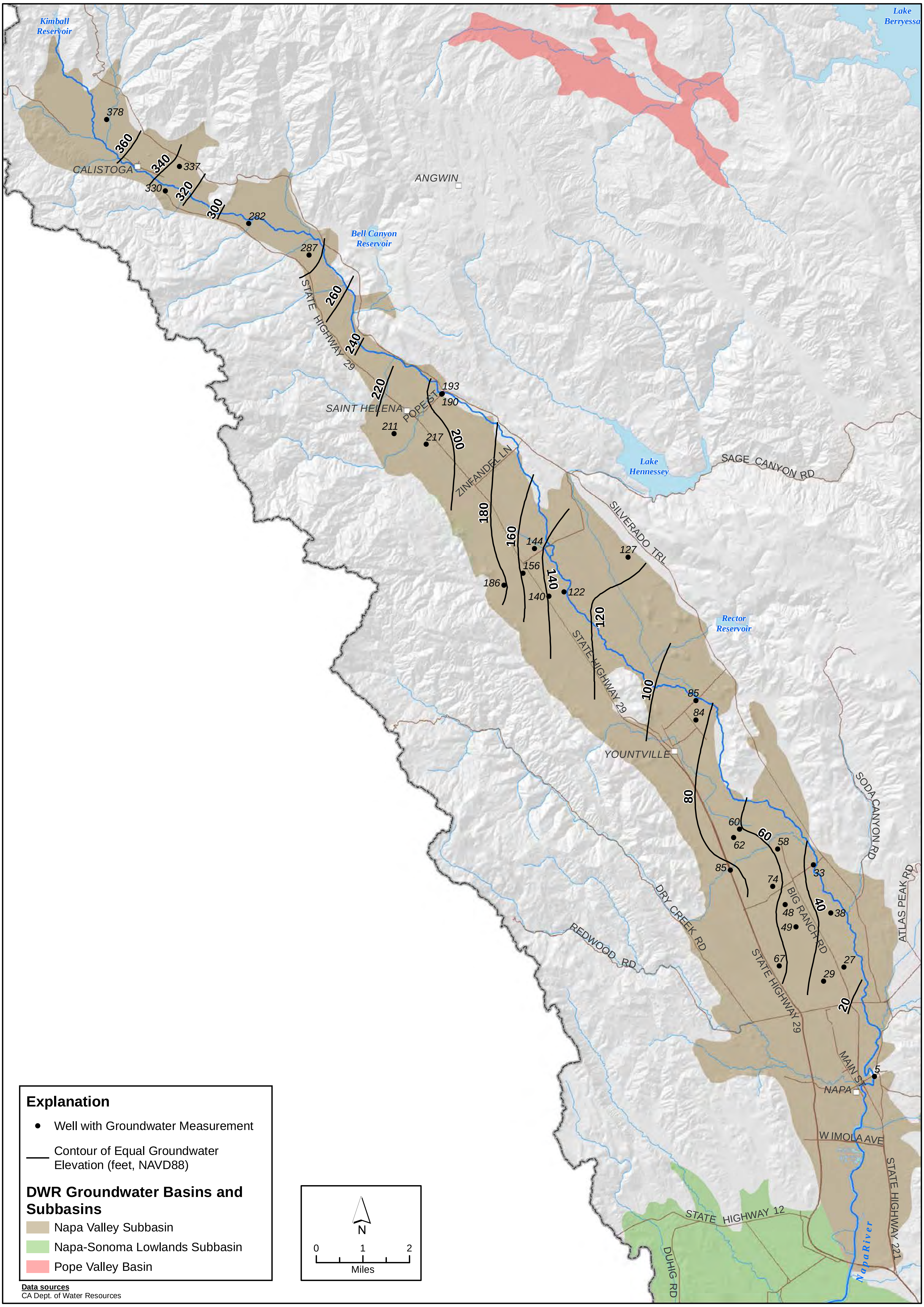
2015 Annual Report and CASGEM Update



Data sources
CA Dept. of Water Resources

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FIGURE 5-4
Contours of Equal Groundwater Elevation, Spring 2015
Napa Valley Subbasin, Napa County, CA

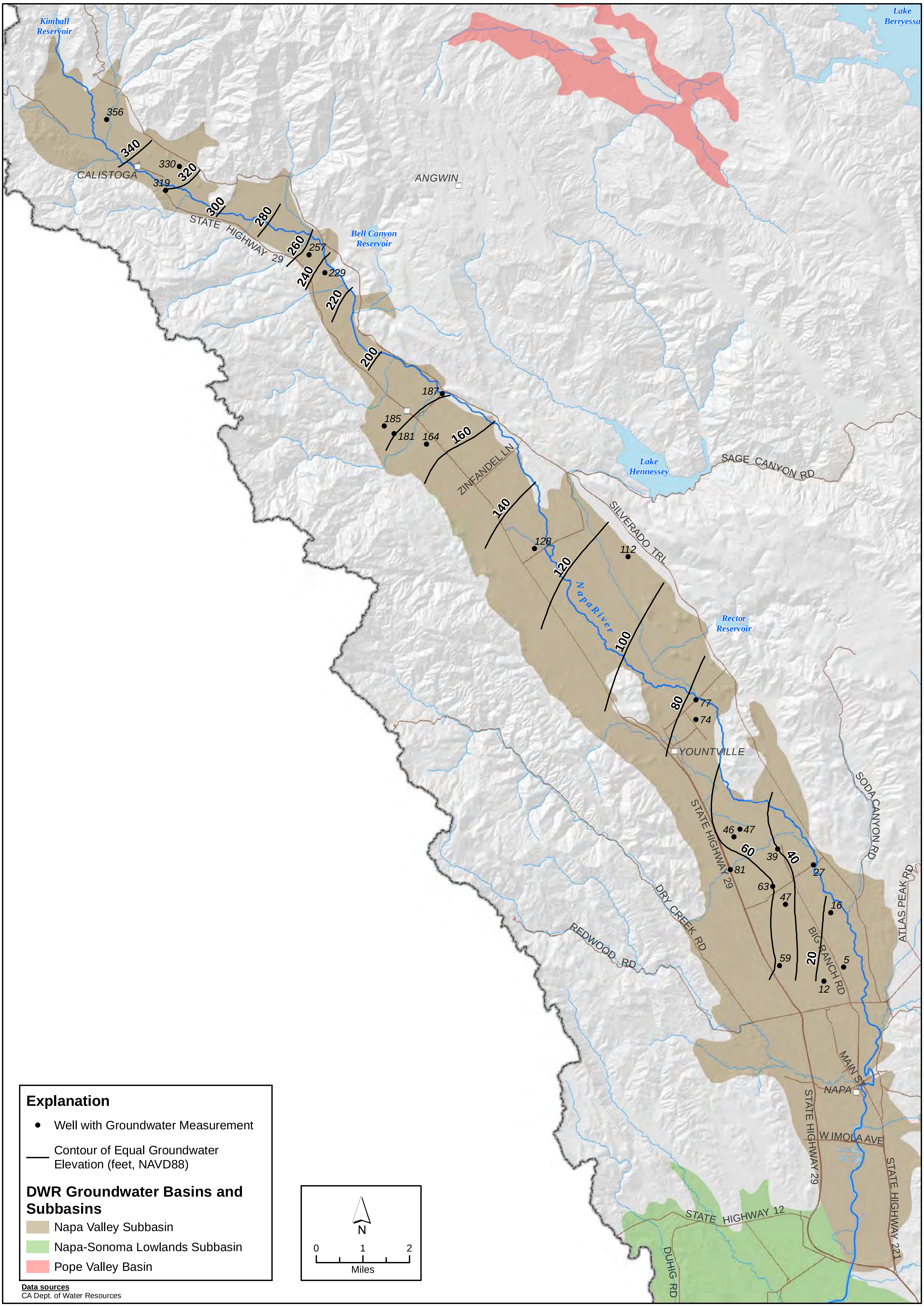

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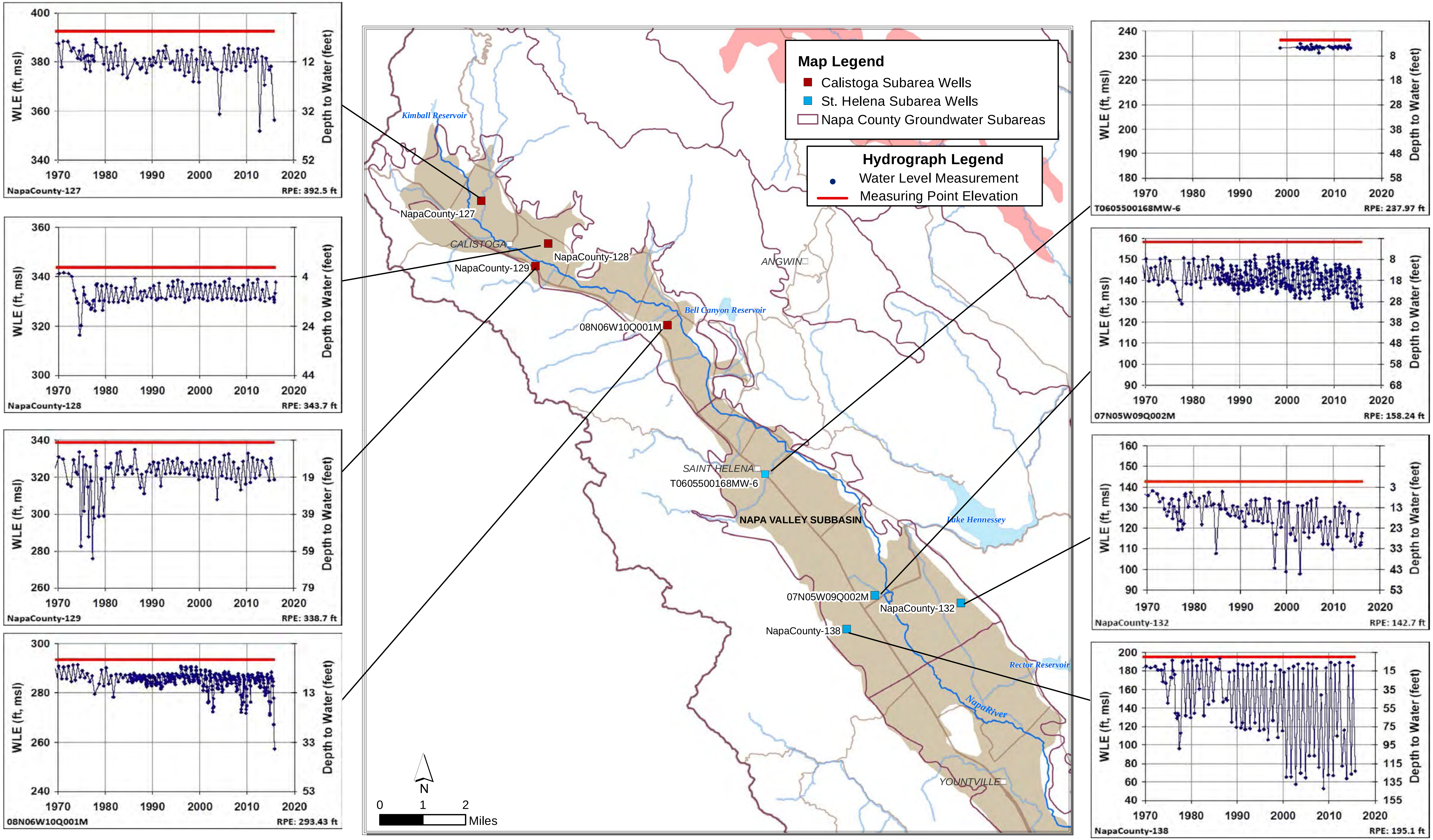
FIGURE 5-5
Contours of Equal Groundwater Elevation, Fall 2015
Napa Valley Floor, Napa County, CA

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Path: X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\HydrographNorthernNapaValley_thru2015.mxd

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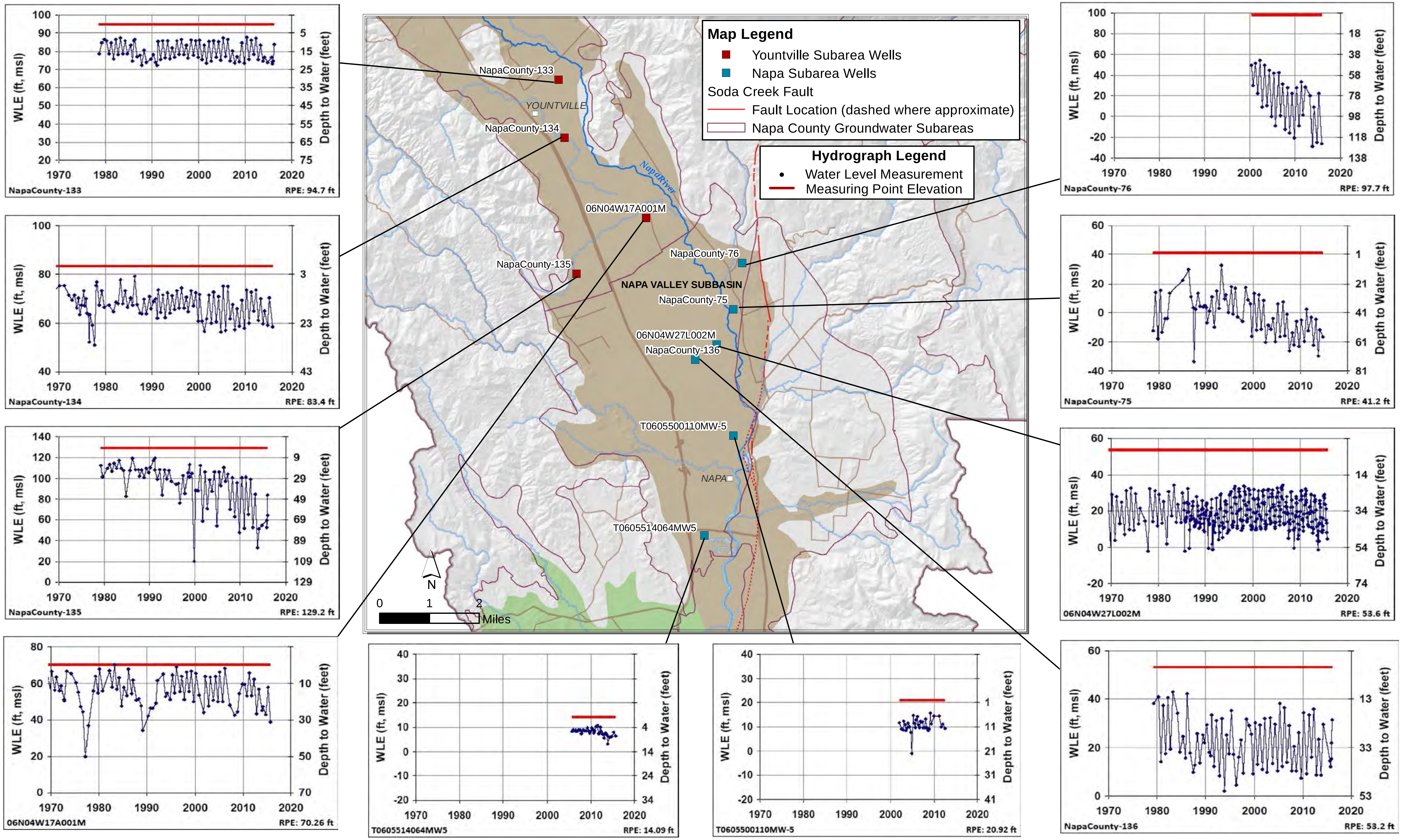
FIGURE 5-6
Representative Groundwater Hydrographs Northern Napa Valley

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Path: X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\Hydrograph_SouthernNapaValley.mxd

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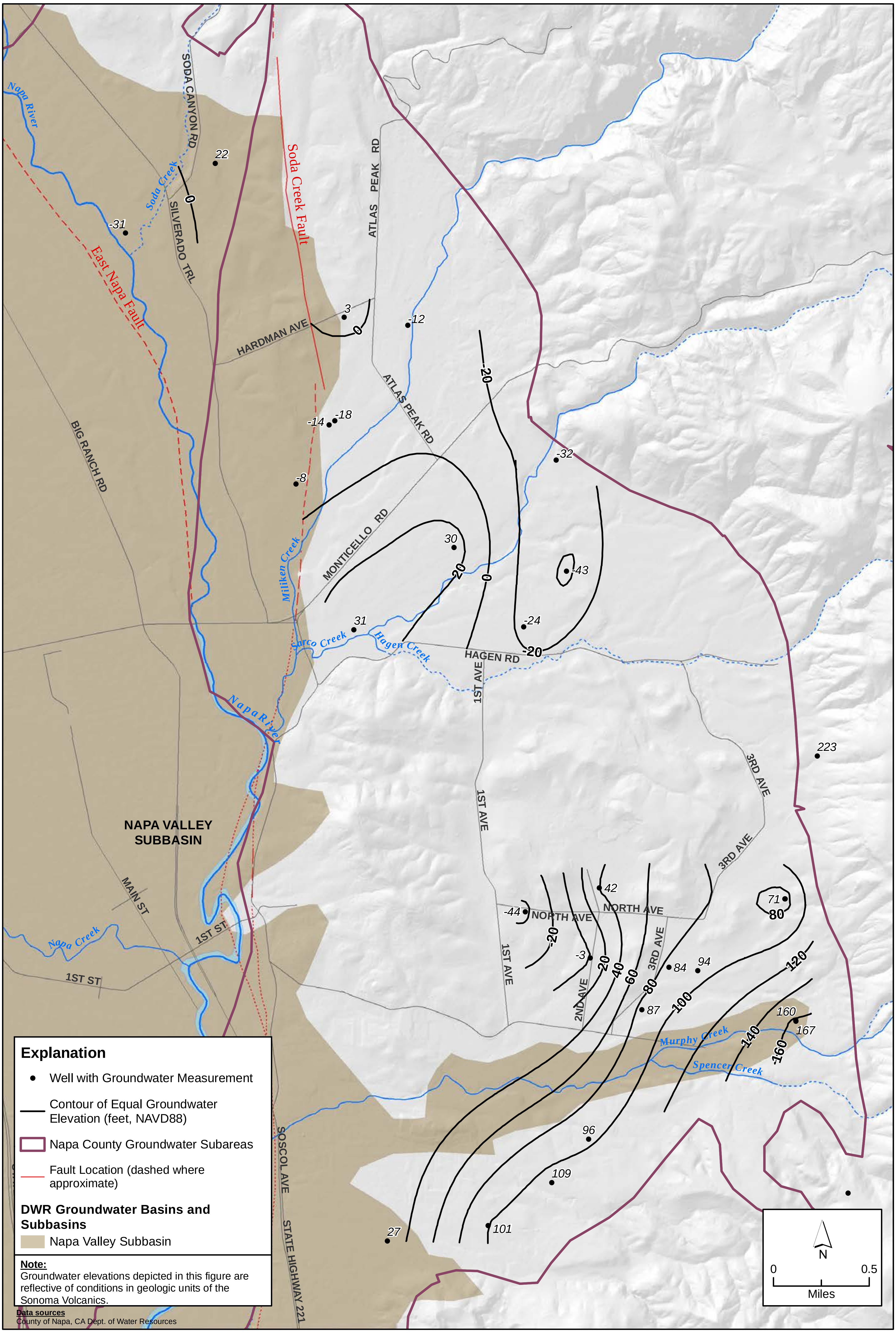
FIGURE 5-7
Representative Groundwater Hydrographs Southern Napa Valley

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Note: Groundwater elevations depicted in this figure are reflective of conditions in geologic units of the Sonoma Volcanics.

Data sources
County of Napa, CA Dept. of Water Resources

X:\2014 Job Files\14-108\GIS\Mapfiles\Spring 2015 MST WL Contour Map.mxd

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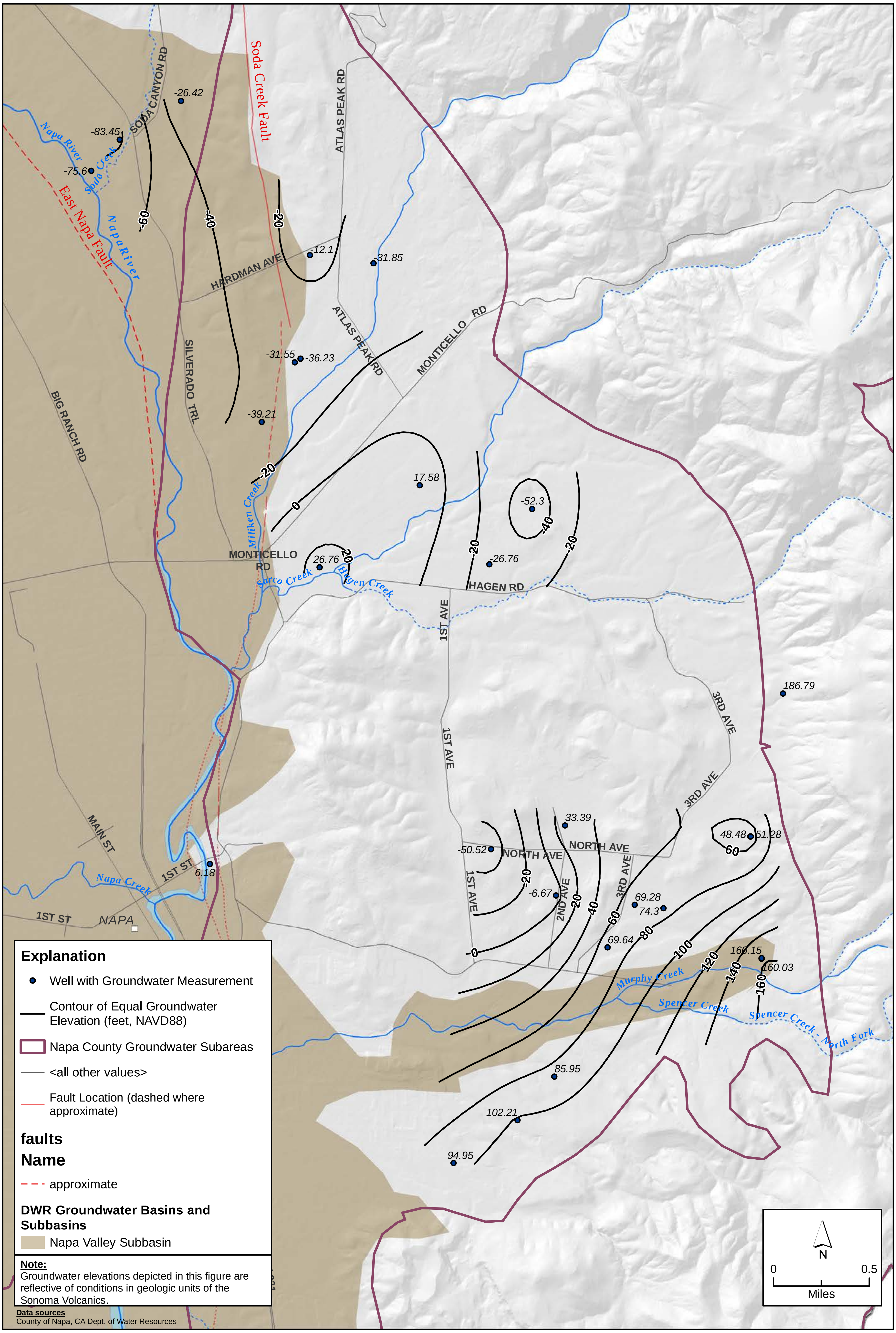
FIGURE 5-8

Contours of Equal Groundwater Elevation, Spring 2015
MST Subarea, Napa County, CA

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Note: Groundwater elevations depicted in this figure are reflective of conditions in geologic units of the Sonoma Volcanics.

Data sources
County of Napa, CA Dept. of Water Resources

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\Fall 2015 MST WL Contour Map.mxd

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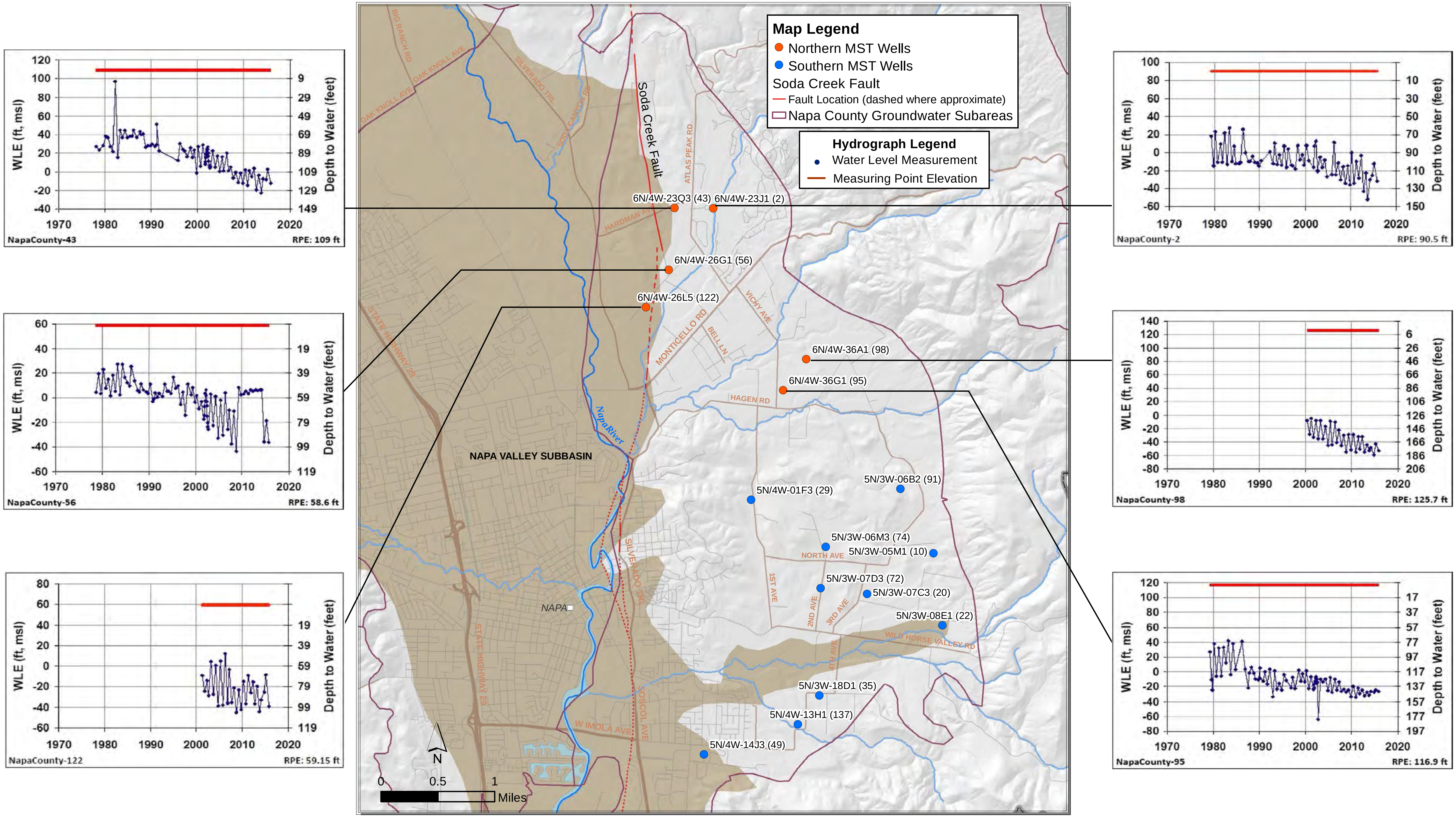
FIGURE 5-9

Contours of Equal Groundwater Elevation, Fall 2015
MST Subarea, Napa County, CA

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Path: X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\HydrographNorthernMST_thru2015.mxd

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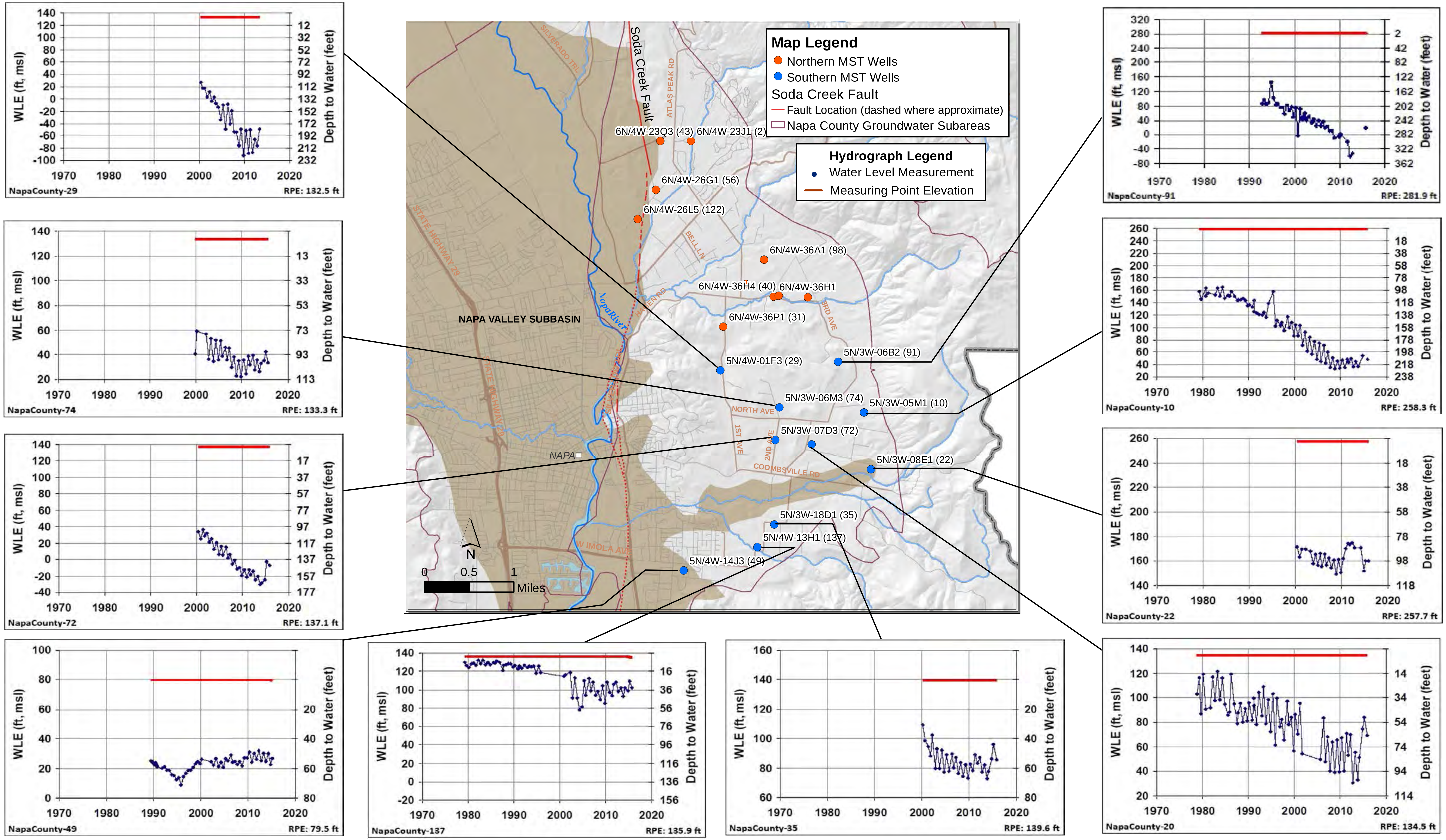
FIGURE 5-10

Representative Groundwater Hydrographs Northern MST Subarea

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Path: X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\HydrographsSouthernMST_thru2015.mxd

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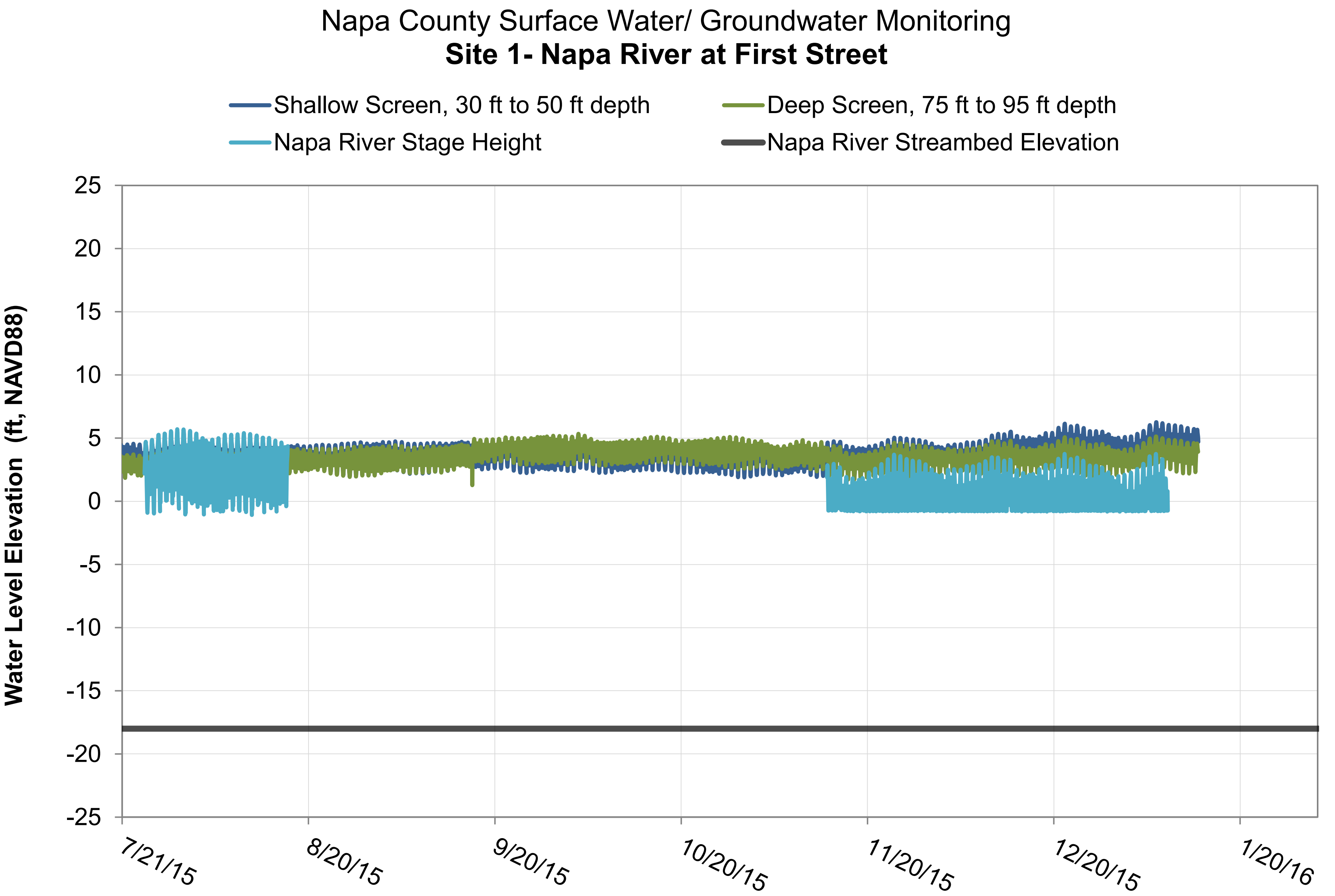
FIGURE 5-11
Representative Groundwater Hydrographs Southern MST Subarea

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\WL Site 1

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Figure 5-12
Surface Water-Groundwater Hydrograph
Site 1: Napa River at First Street

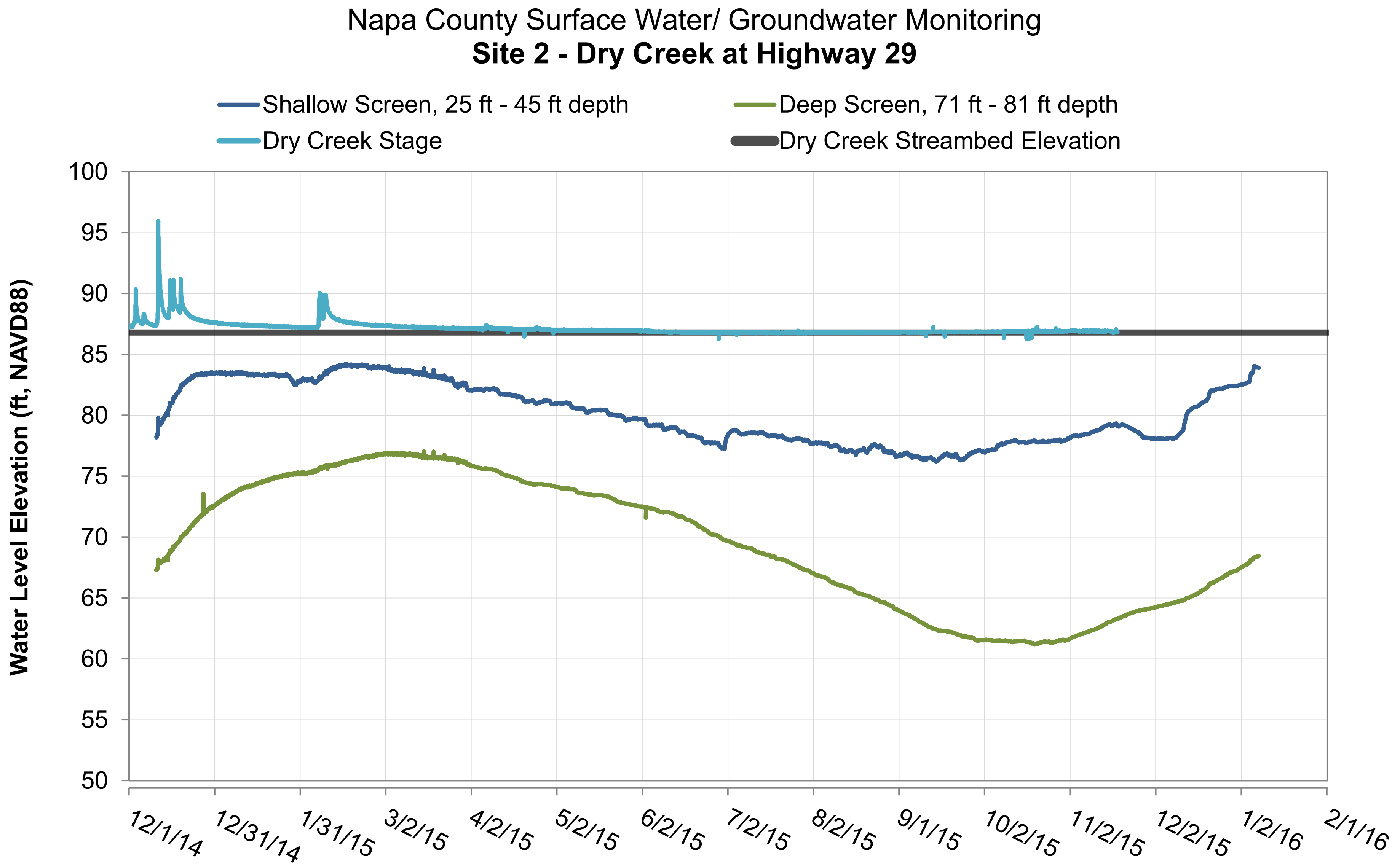

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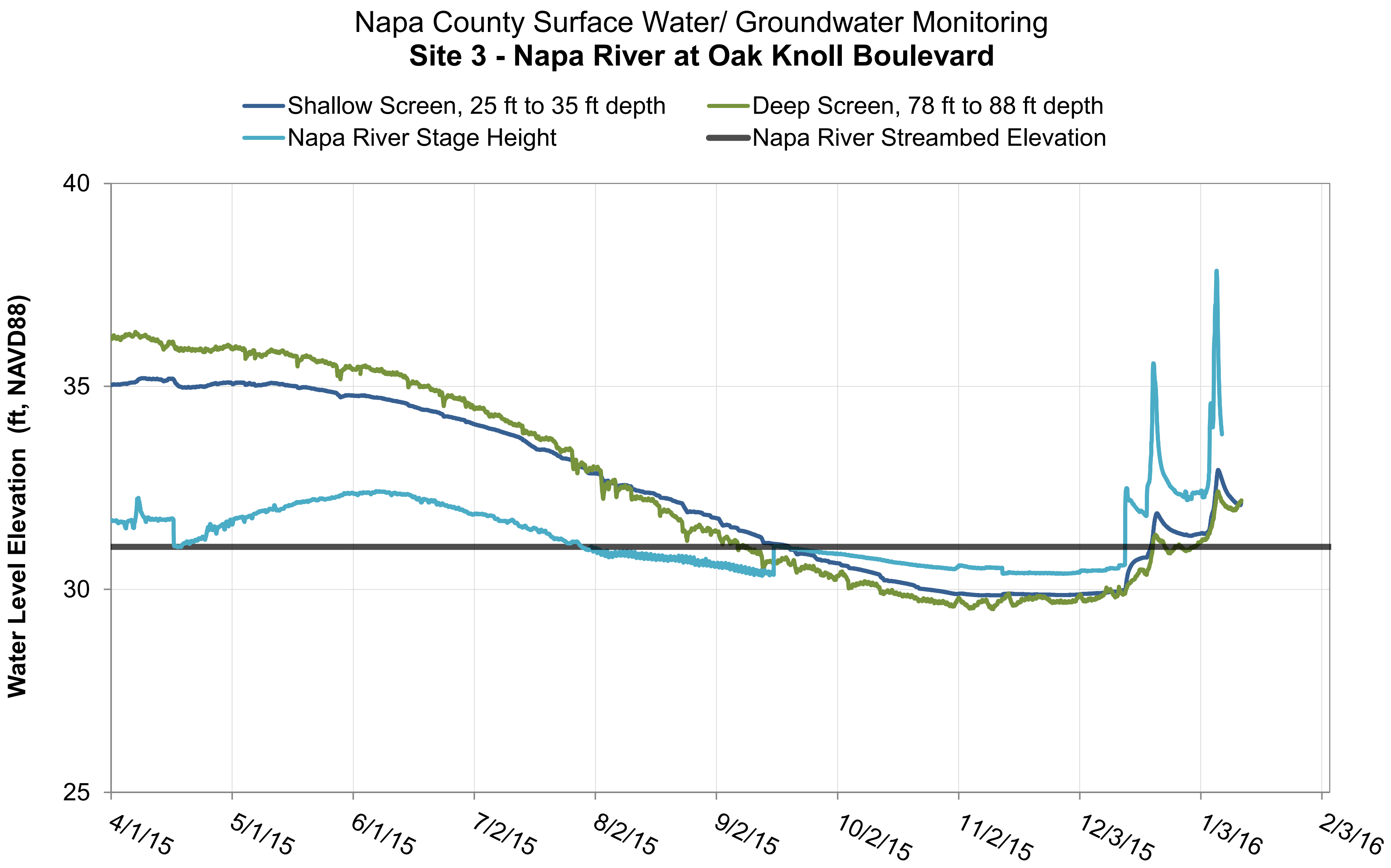
Figure 5-13
Surface Water-Groundwater Hydrograph
Site 2: Dry Creek at Highway 29



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\WL Site 3

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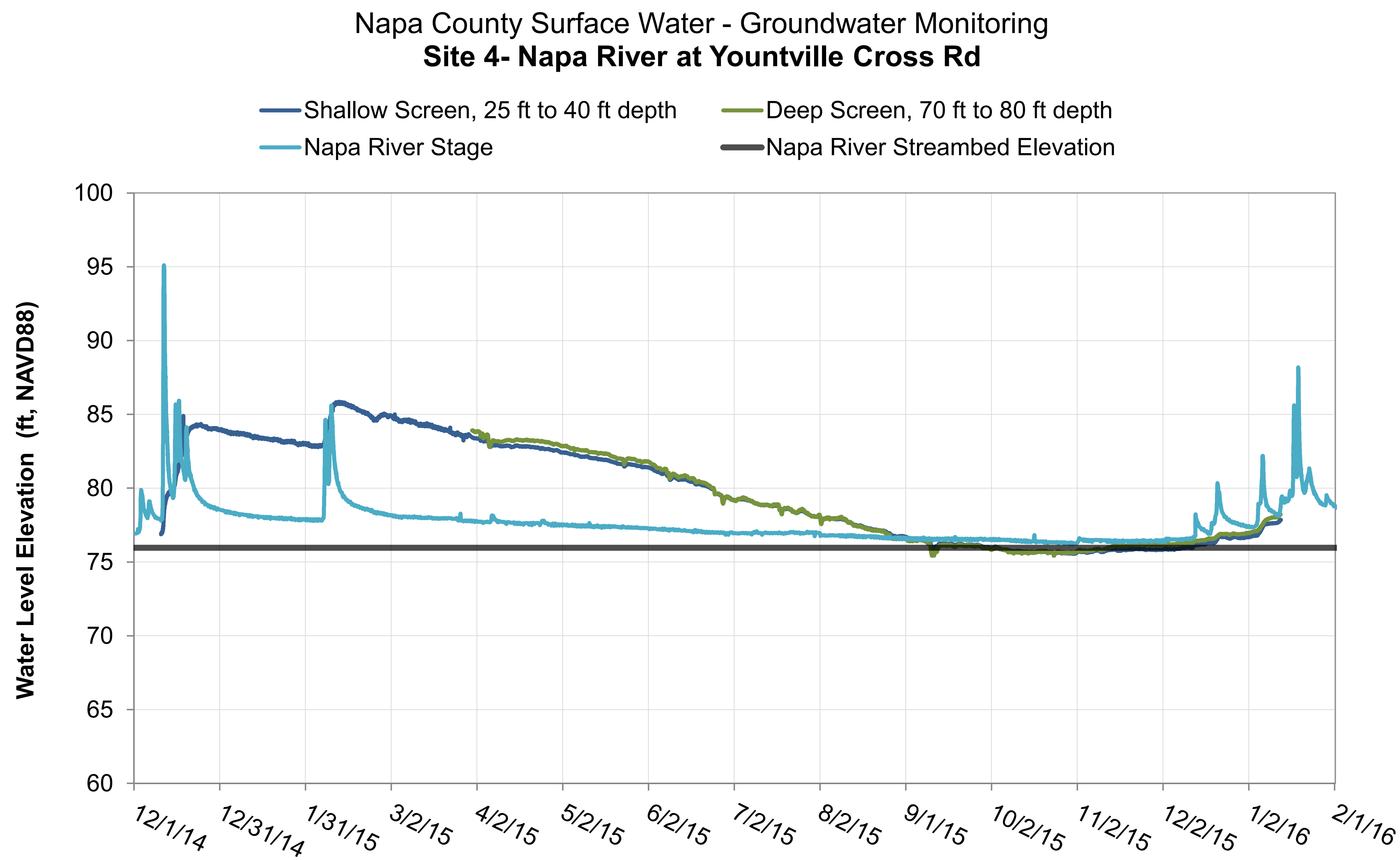
Figure 5-14
Surface Water-Groundwater Hydrograph
Site 3: Napa River at Oak Knoll Avenue



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\WL Site 4

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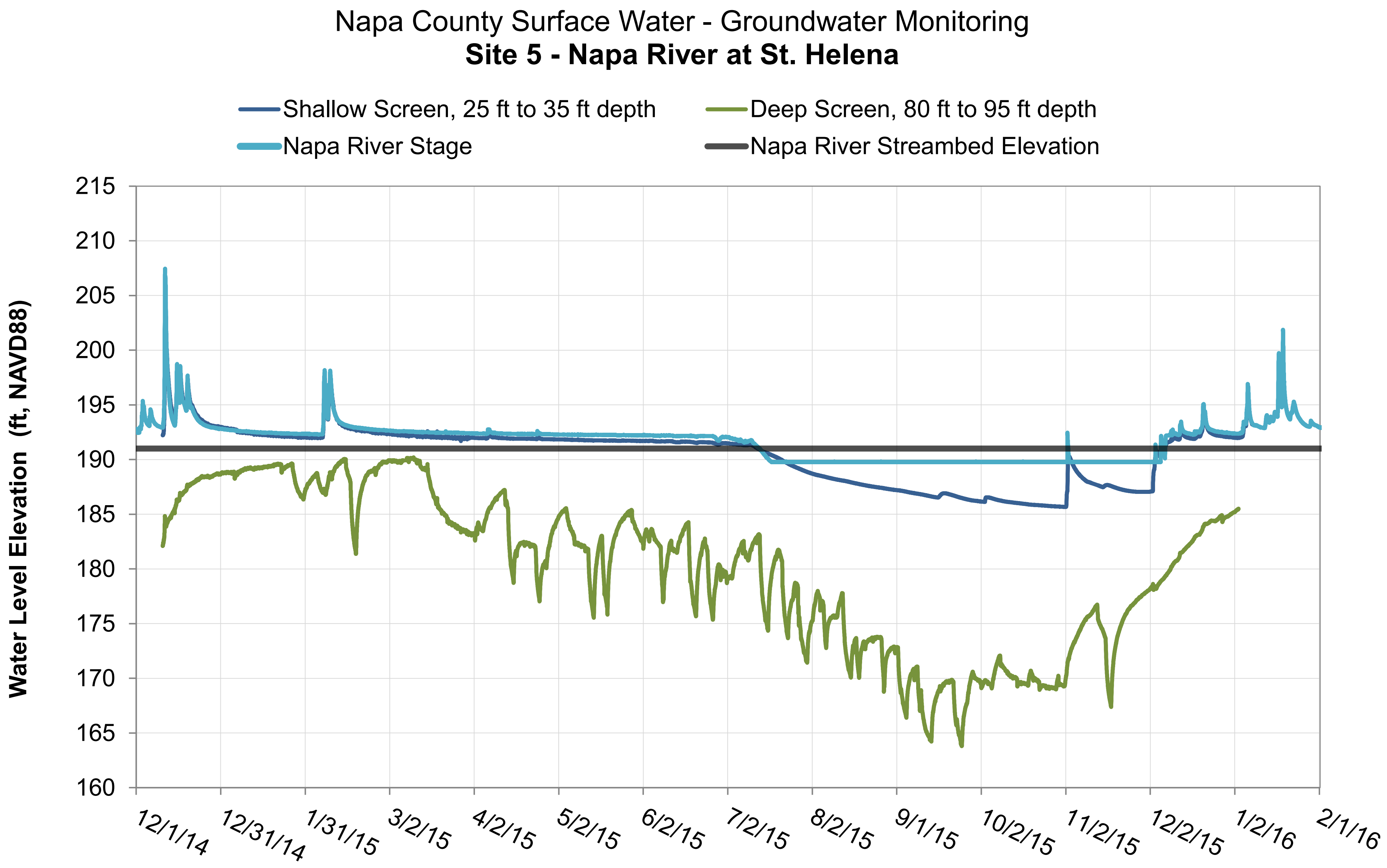
Figure 5-15
Surface Water-Groundwater Hydrograph
Site 4: Napa River at Yountville Cross Road



Napa County Surface Water - Groundwater Monitoring

Site 5 - Napa River at St. Helena

X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\WL Site5

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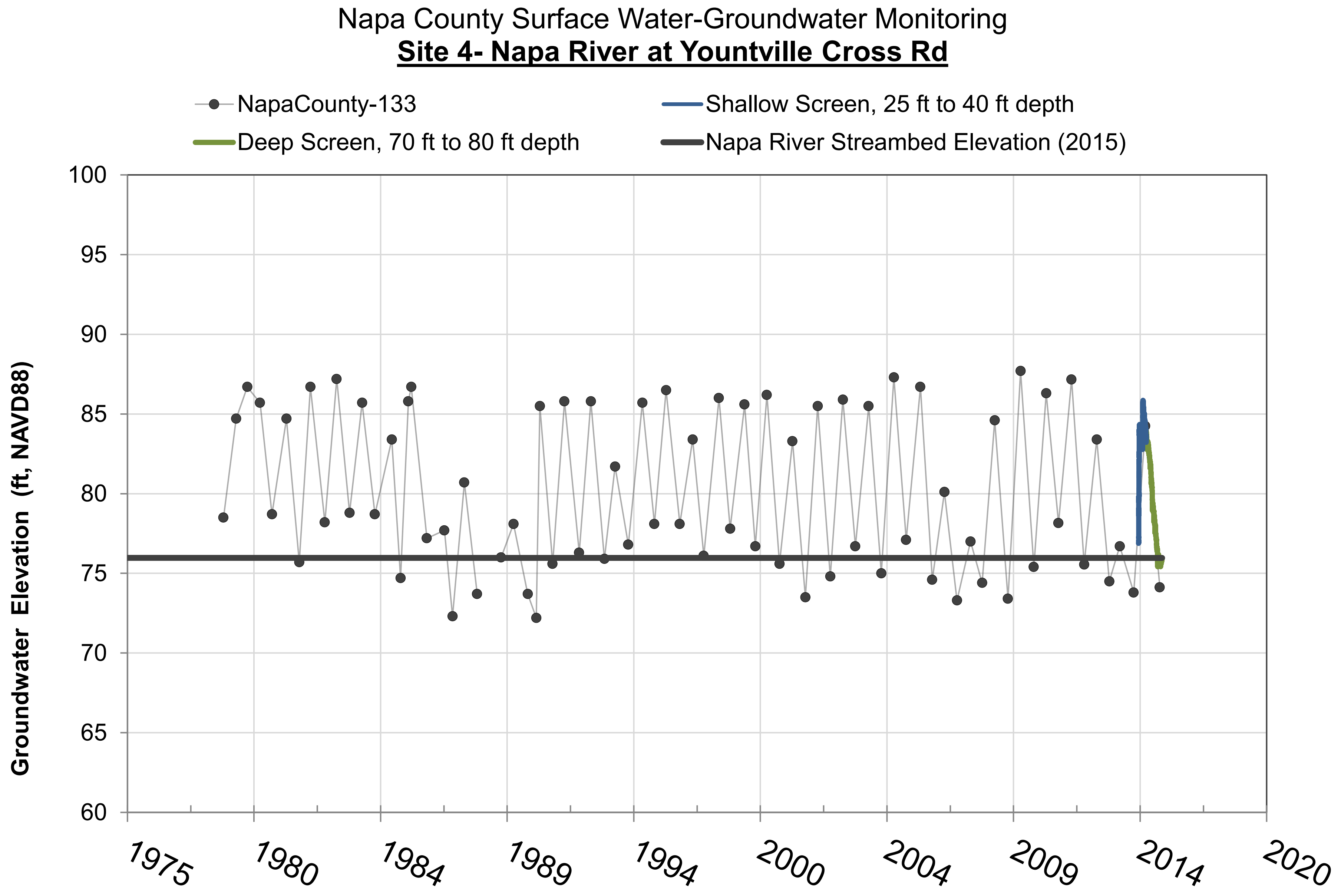
Figure 5-16
Surface Water-Groundwater Hydrograph
Site 5: Napa River at Pope Street



X:\2012 Job Files\12-071\Data__Current Project Data Charts\Site_4_Surface-GW_Chart.xlsx\Chart_GWL_historical

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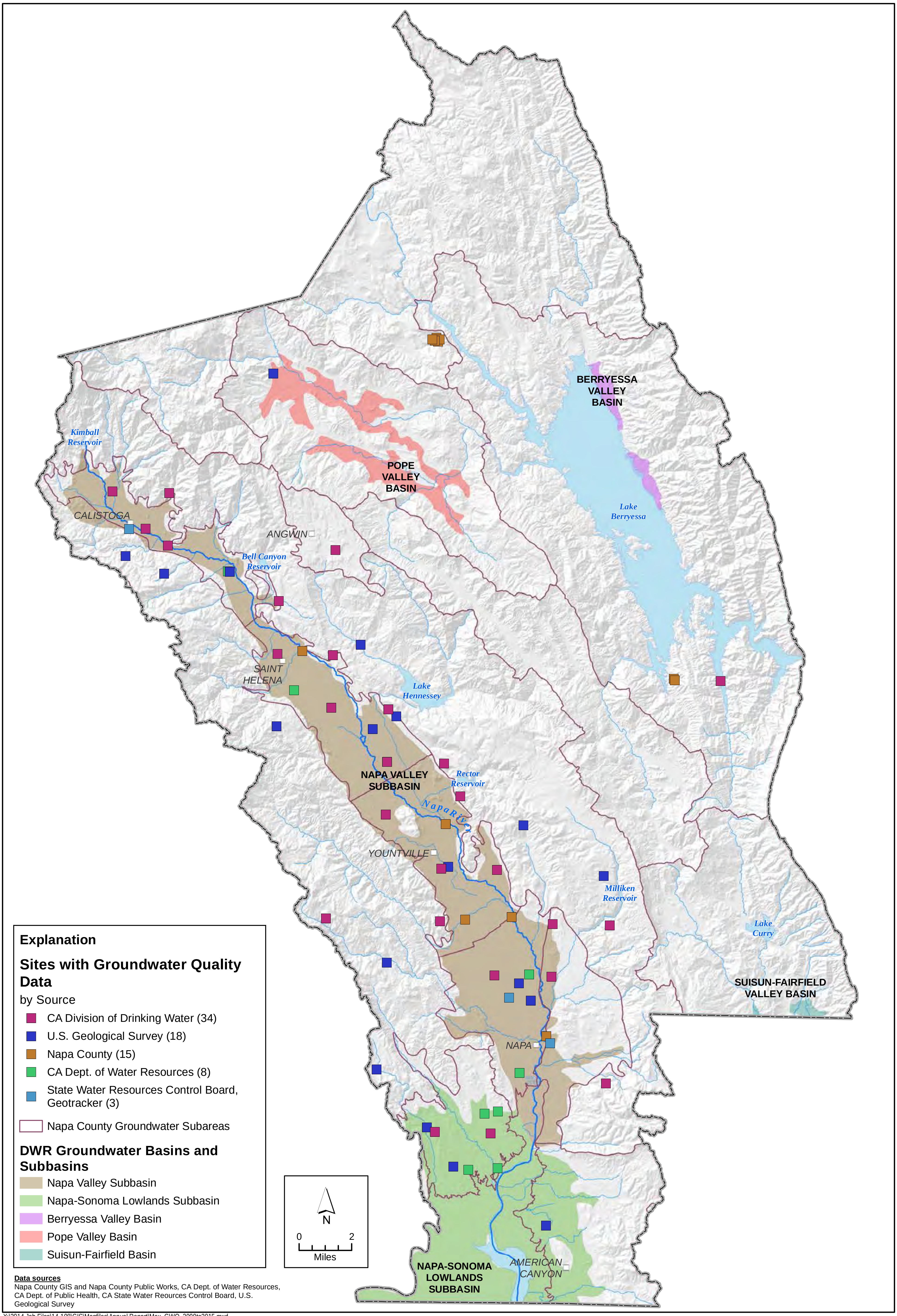
Figure 5-17
Surface Water-Groundwater Network Site Historical Comparison
Site 4: Napa River at Yountville Cross Road



Data sources
Napa County GIS and Napa County Public Works, CA Dept. of Water Resources, CA Dept. of Public Health, CA State Water Reources Control Board, U.S. Geological Survey

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\Max_GWQ_2009to2015.mxd

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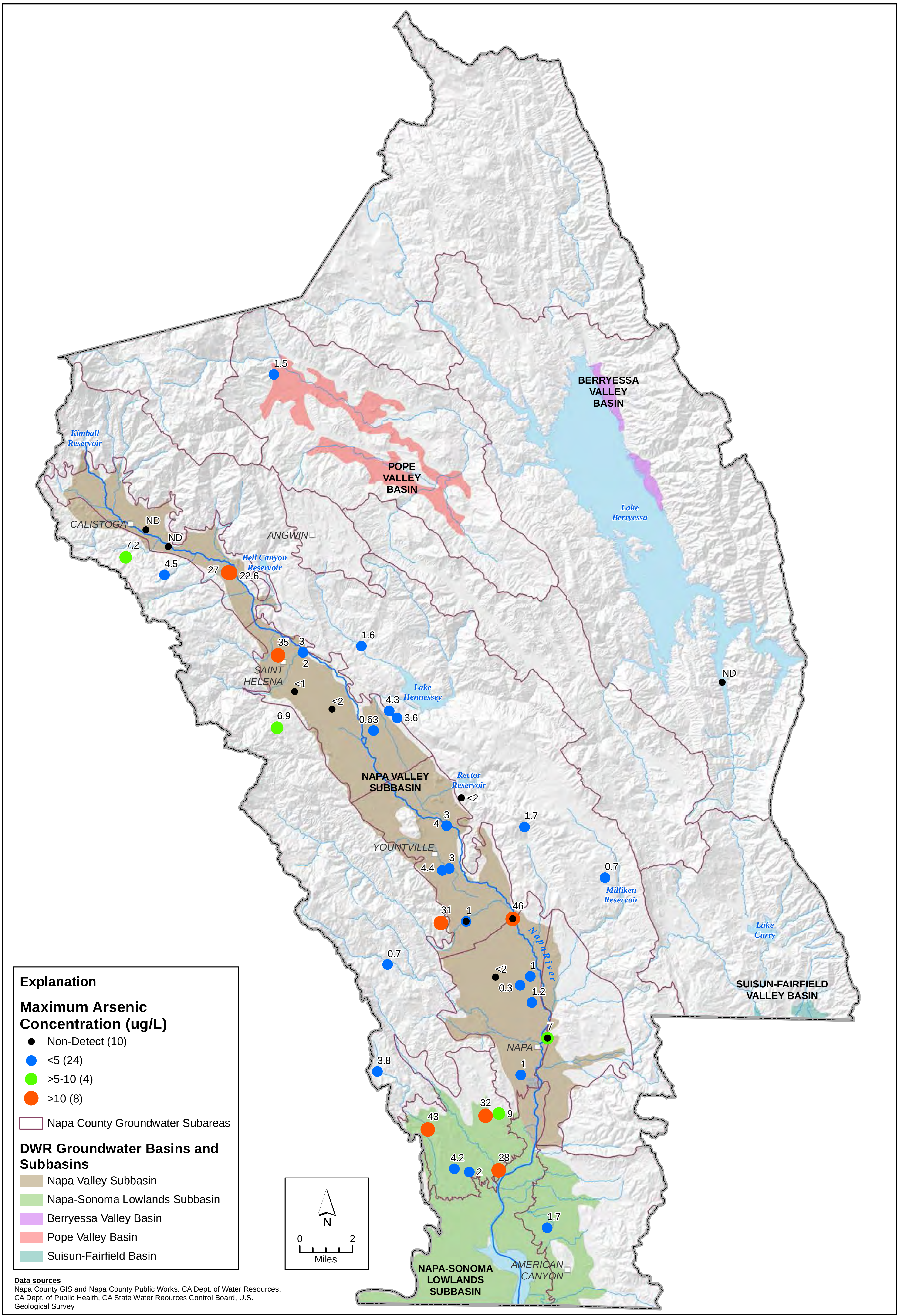
FIGURE 6-1
Groundwater Quality Sites, 2009 - 2015
Napa County, CA

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Data sources
Napa County GIS and Napa County Public Works, CA Dept. of Water Resources, CA Dept. of Public Health, CA State Water Resources Control Board, U.S. Geological Survey

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\Max_Arsenic_2009to2015.mxd

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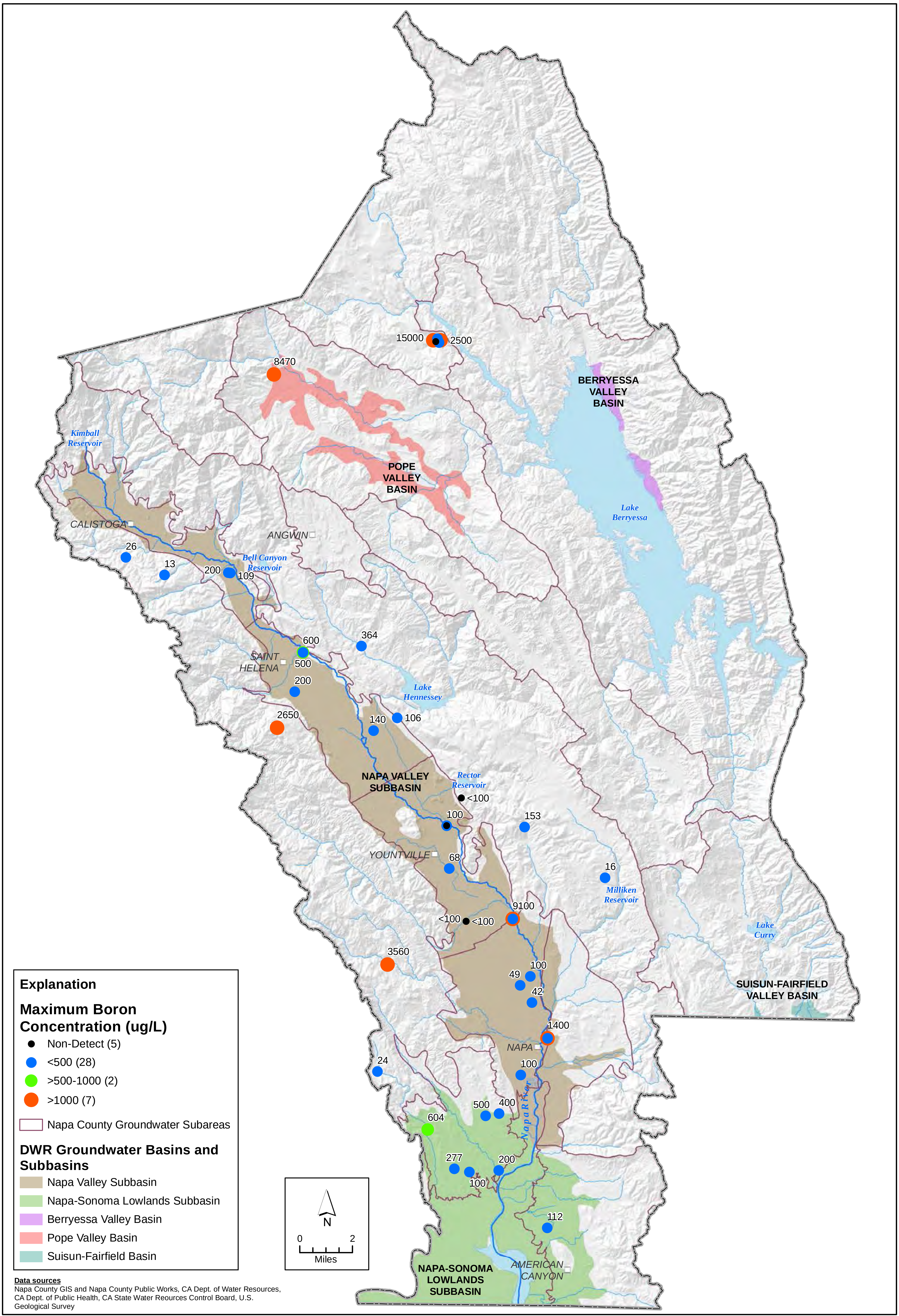
FIGURE 6-2
Maximum Arsenic Concentrations in Groundwater, 2009 - 2015
Napa County, CA

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Data sources
Napa County GIS and Napa County Public Works, CA Dept. of Water Resources, CA Dept. of Public Health, CA State Water Reources Control Board, U.S. Geological Survey

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\Max_Boron_2009to2015.mxd

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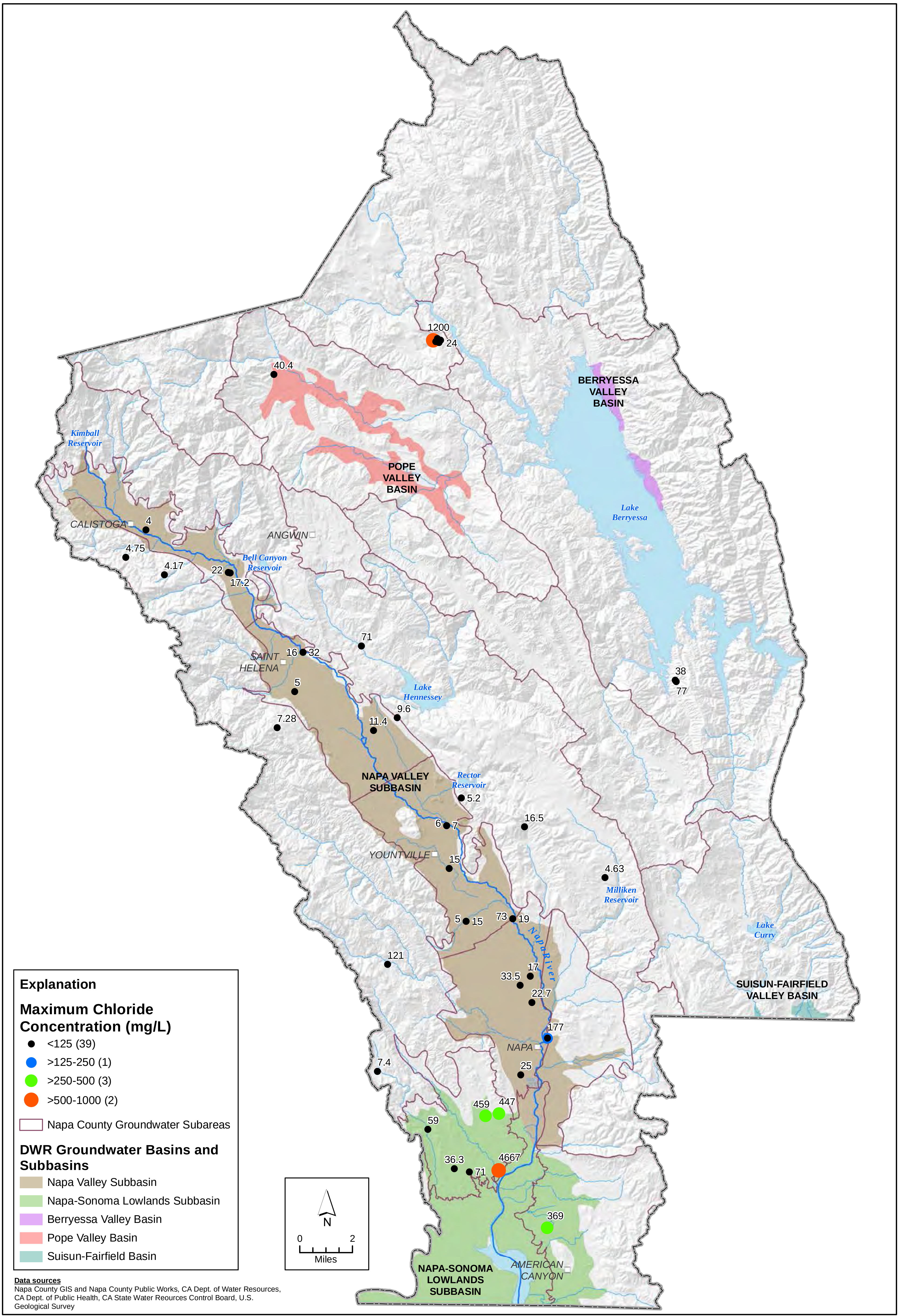
FIGURE 6-3
Maximum Boron Concentrations in Groundwater, 2009 - 2015
Napa County, CA
Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Data sources
Napa County GIS and Napa County Public Works, CA Dept. of Water Resources, CA Dept. of Public Health, CA State Water Reources Control Board, U.S. Geological Survey

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\Max_Chloride_2009to2015.mxd

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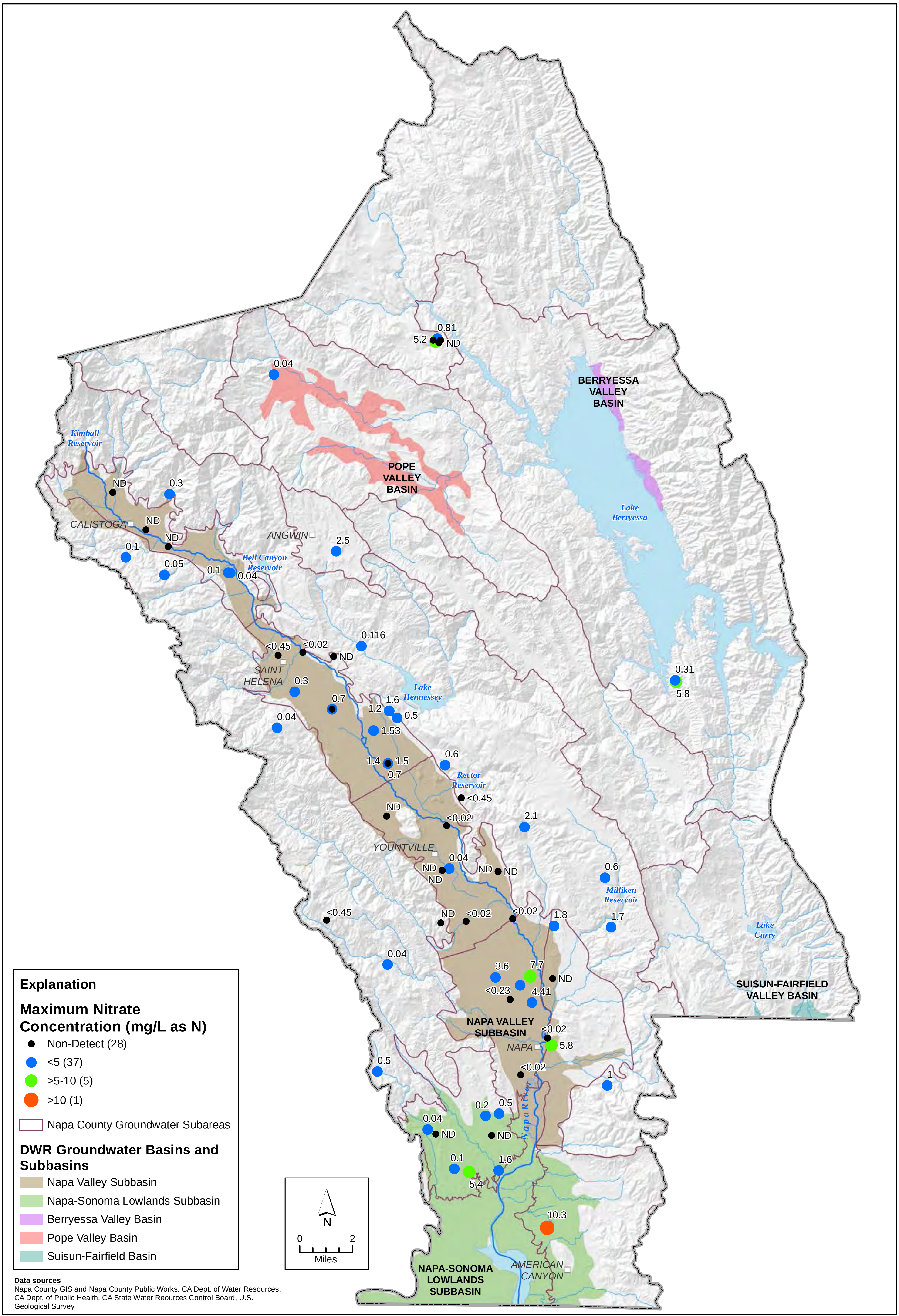
FIGURE 6-4
Maximum Chloride Concentrations in Groundwater, 2009 - 2015
Napa County, CA

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Data sources
Napa County GIS and Napa County Public Works, CA Dept. of Water Resources, CA Dept. of Public Health, CA State Water Reources Control Board, U.S. Geological Survey

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\Max_Nitrate_2009to2015.mxd

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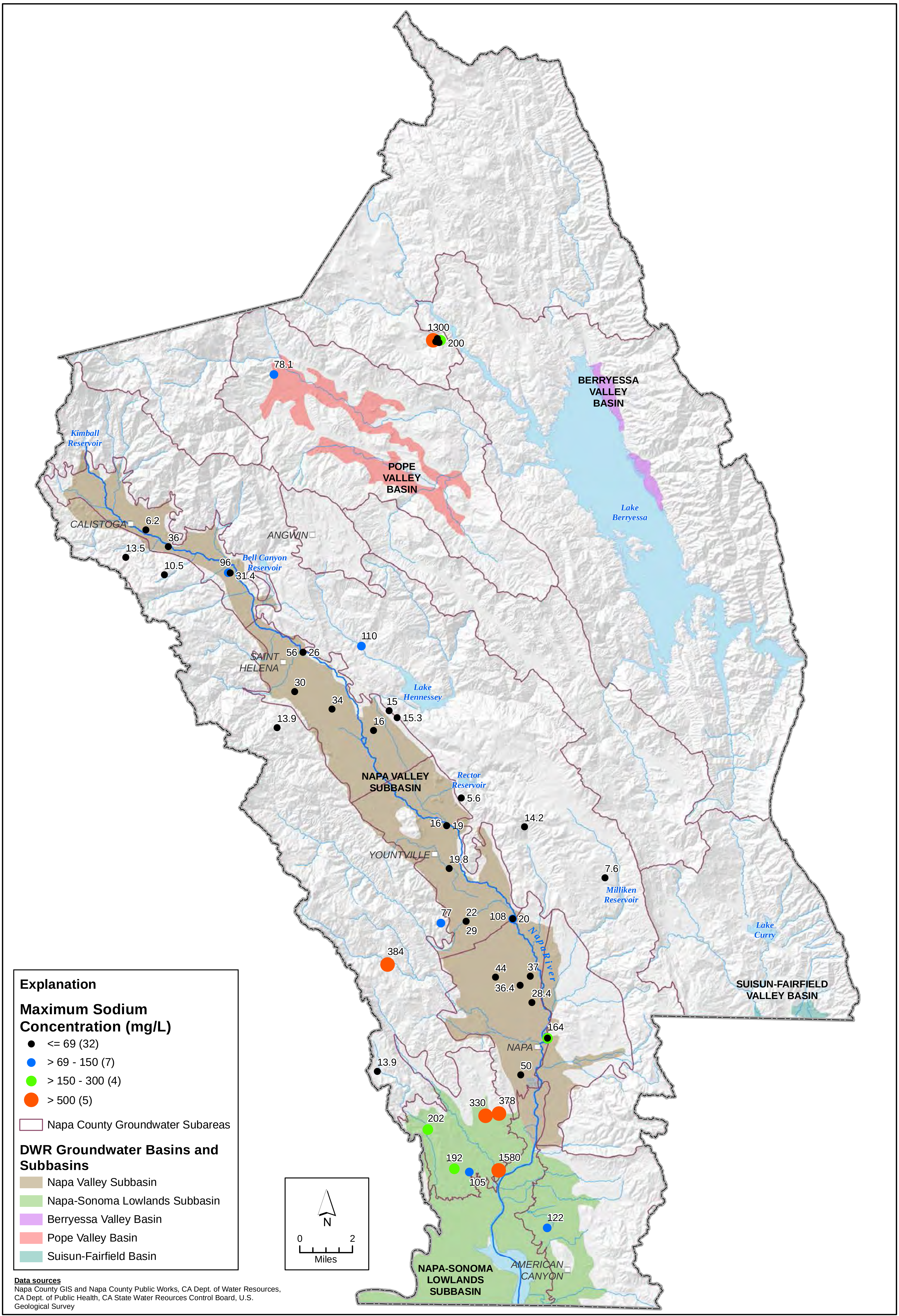
FIGURE 6-5
Maximum Nitrate Concentrations in Groundwater, 2009 - 2015
Napa County, CA

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Data sources
Napa County GIS and Napa County Public Works, CA Dept. of Water Resources, CA Dept. of Public Health, CA State Water Reources Control Board, U.S. Geological Survey

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\Max_Sodium_2009to2015.mxd

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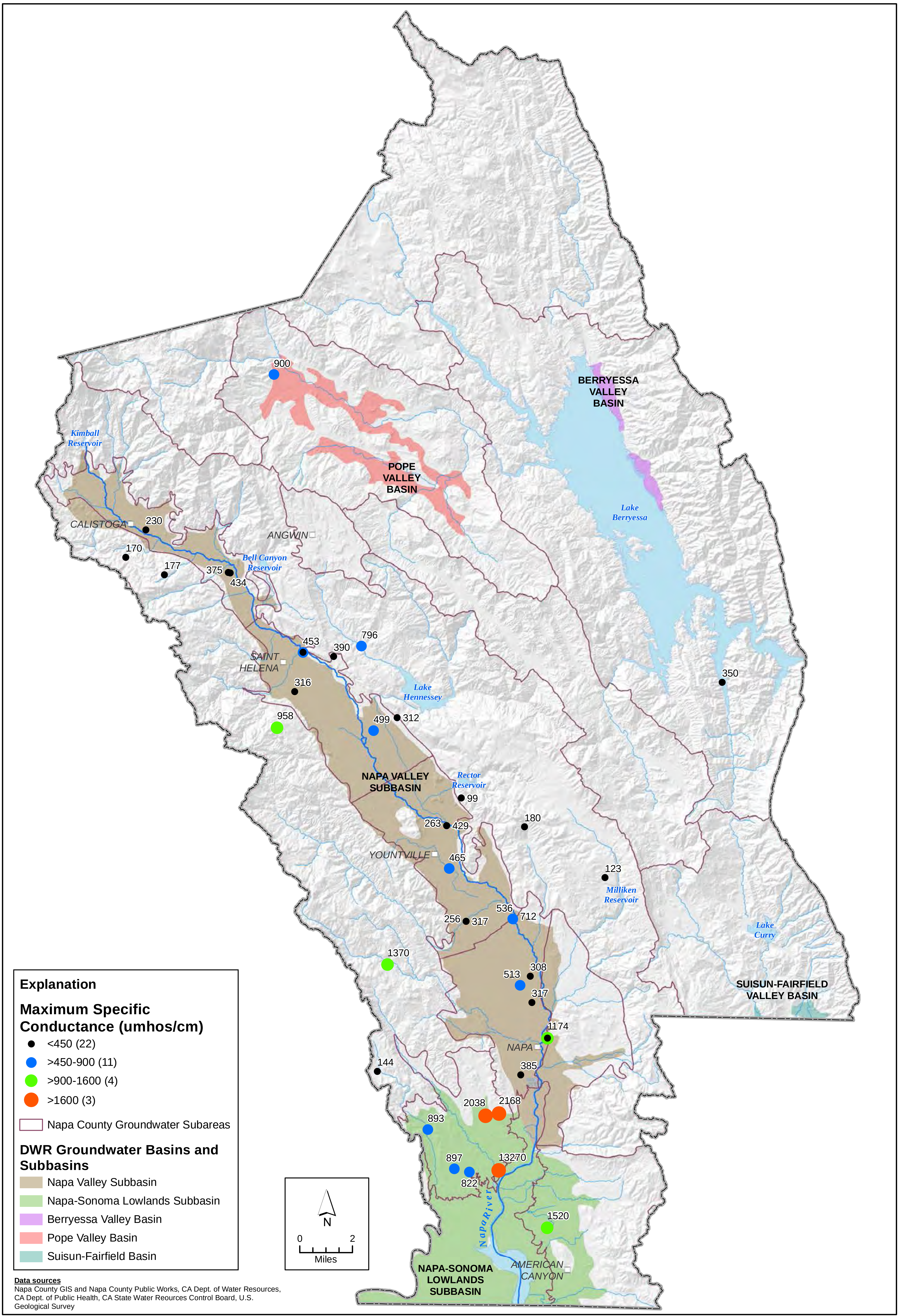
FIGURE 6-6
Maximum Sodium Concentrations in Groundwater, 2009 - 2015
Napa County, CA

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Data sources
Napa County GIS and Napa County Public Works, CA Dept. of Water Resources, CA Dept. of Public Health, CA State Water Reources Control Board, U.S. Geological Survey

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\Max_EC_2009to2015.mxd

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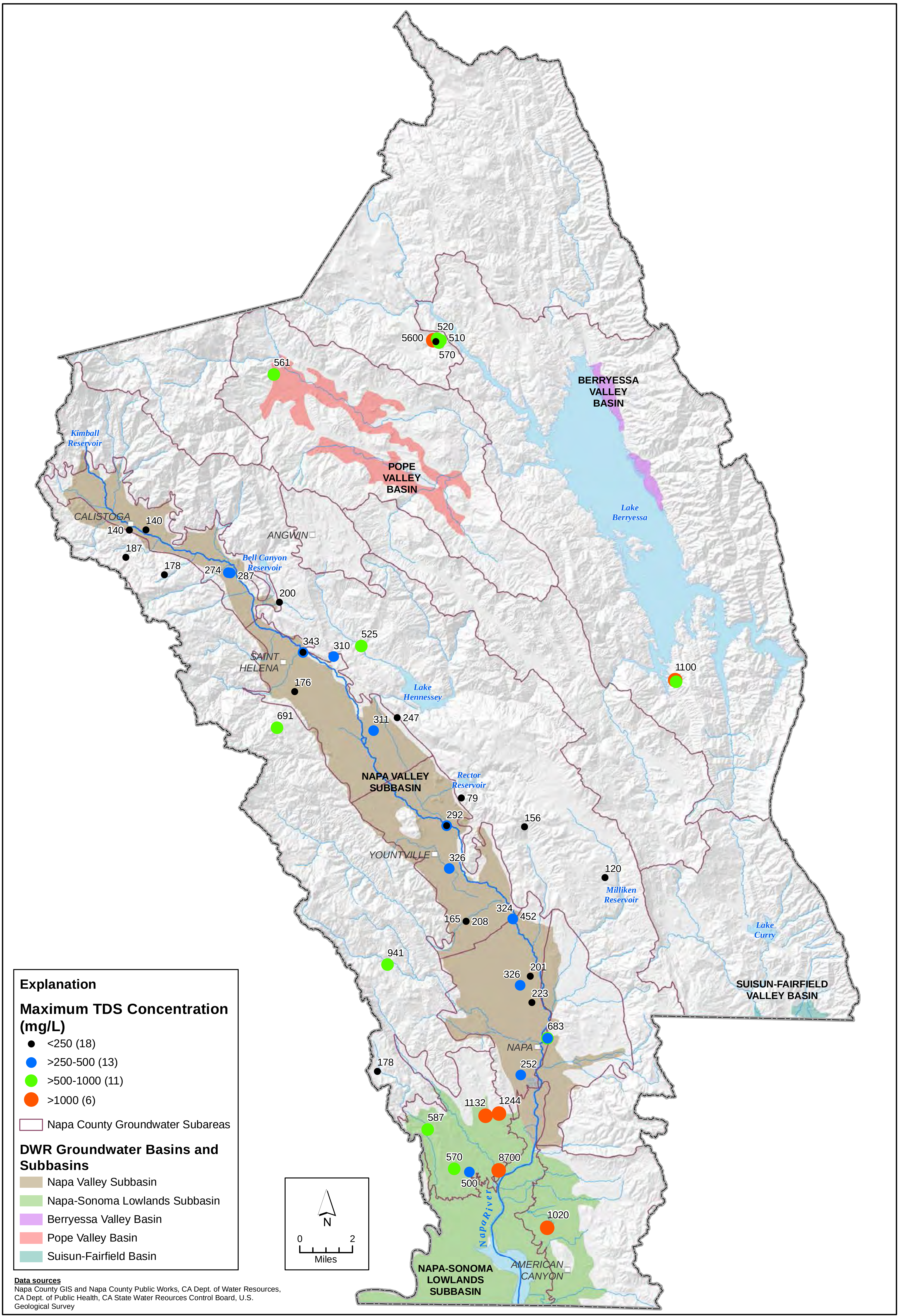
FIGURE 6-7
Maximum Specific Conductance Concentrations in Groundwater, 2009 - 2015
Napa County, CA

Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update



Data sources
Napa County GIS and Napa County Public Works, CA Dept. of Water Resources, CA Dept. of Public Health, CA State Water Reources Control Board, U.S. Geological Survey

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\Max_TDS_2009to2015.mxd

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FIGURE 6-8
Maximum TDS Concentrations in Groundwater, 2009 - 2015
Napa County, CA
Napa County Comprehensive Groundwater Monitoring Program
2015 Annual Report and CASGEM Update

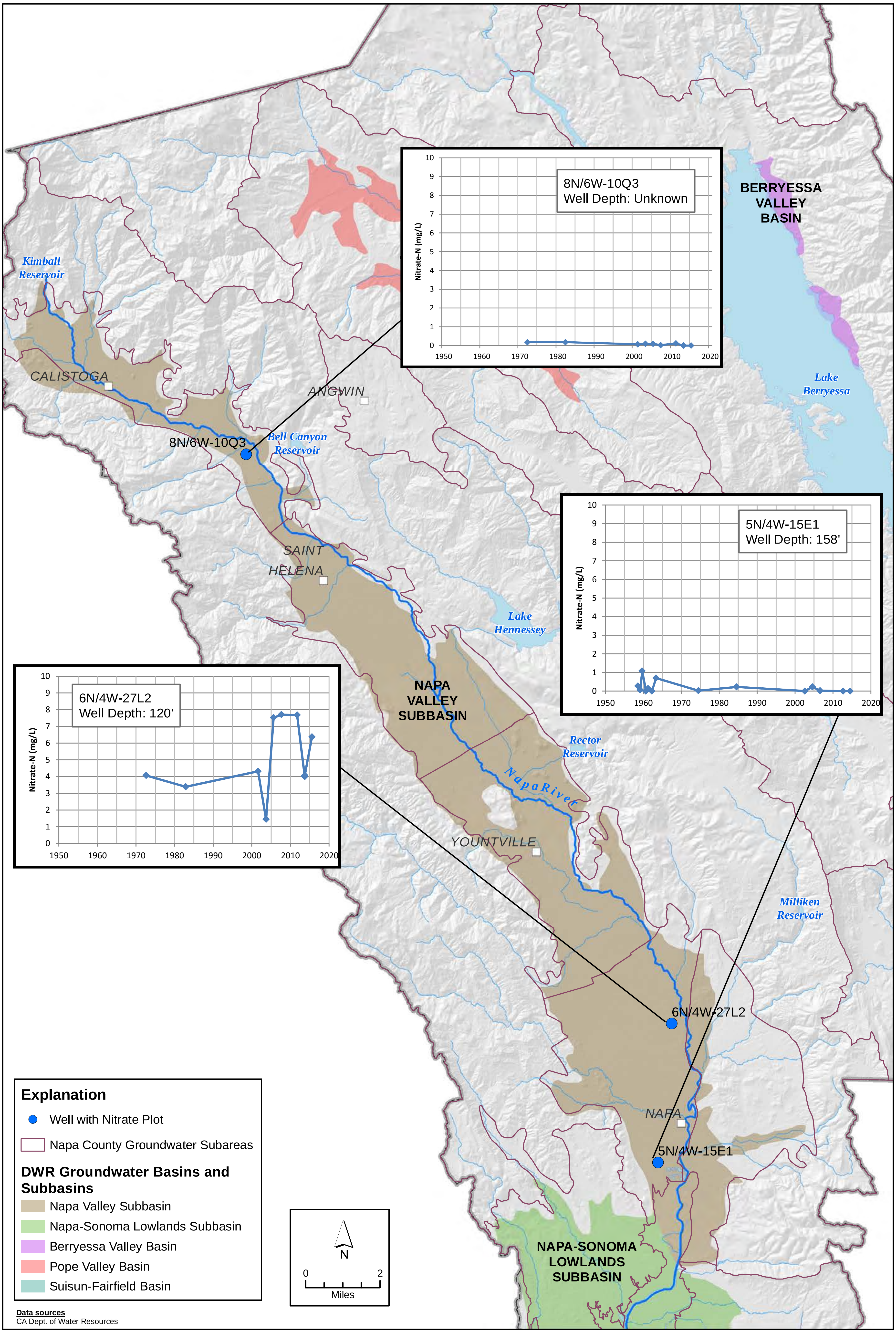

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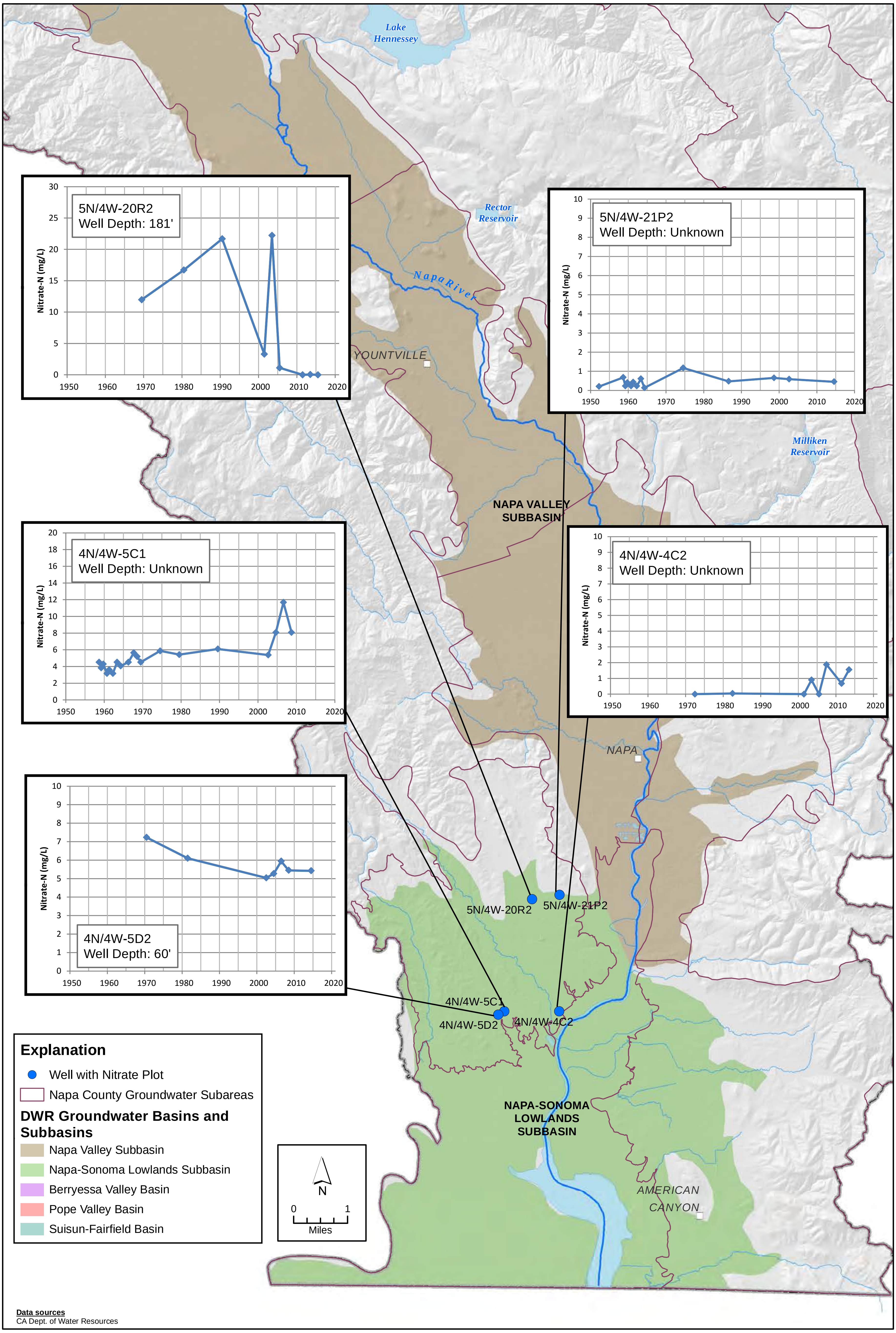
FIGURE 6-9
Nitrate Concentrations Time-Series Plots
Napa Valley Groundwater Subbasin, Napa County, CA



Data sources
CA Dept. of Water Resources

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\NapaGWQ_Map_NitratePlots_Lowlands.mxd

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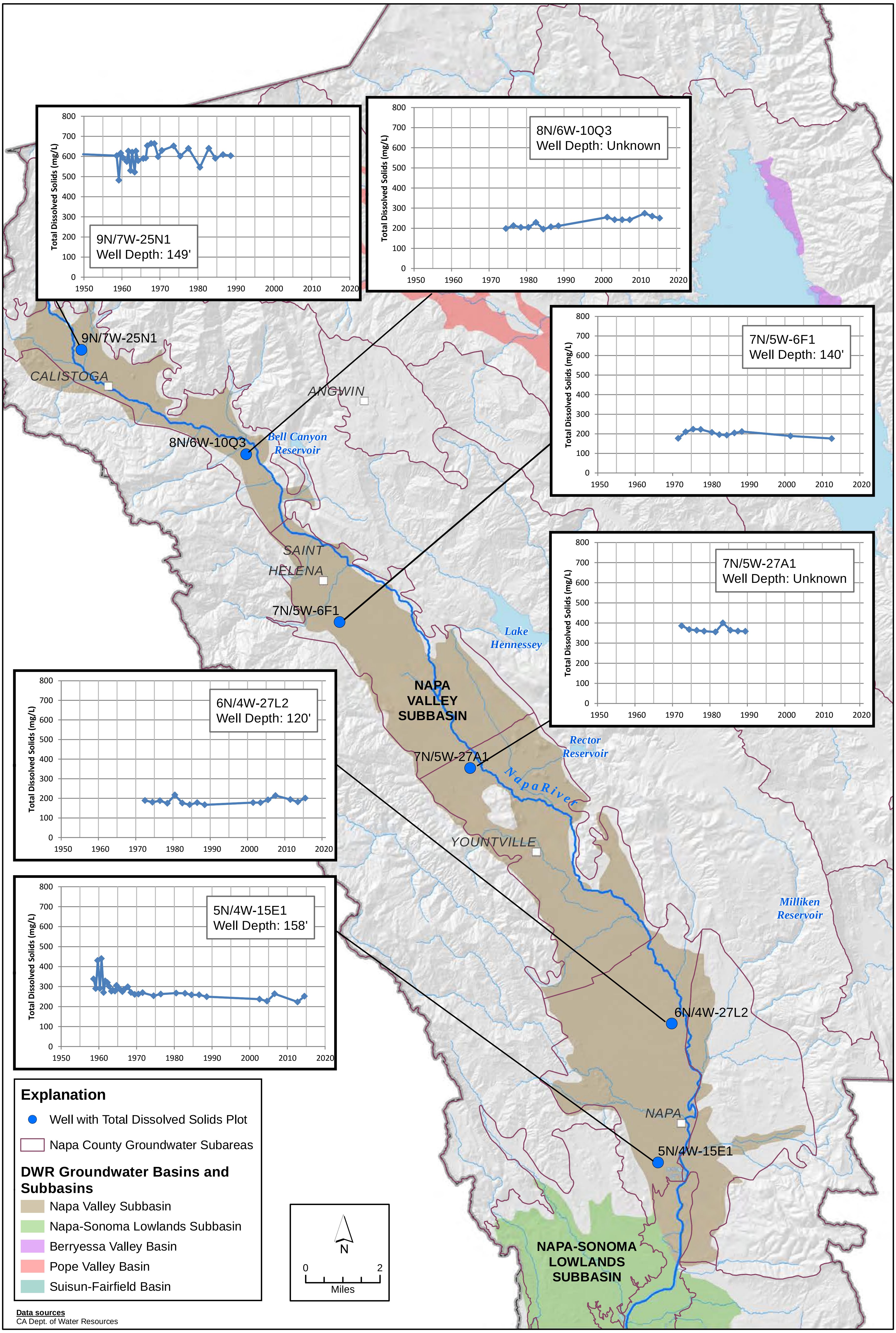
FIGURE 6-10
Nitrate Concentrations Time-Series Plots
Napa-Sonoma Lowlands Groundwater Subbasin, Napa County, CA



X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\NapaGWQ_Map_TDSPlots_NapaValley__.mxd

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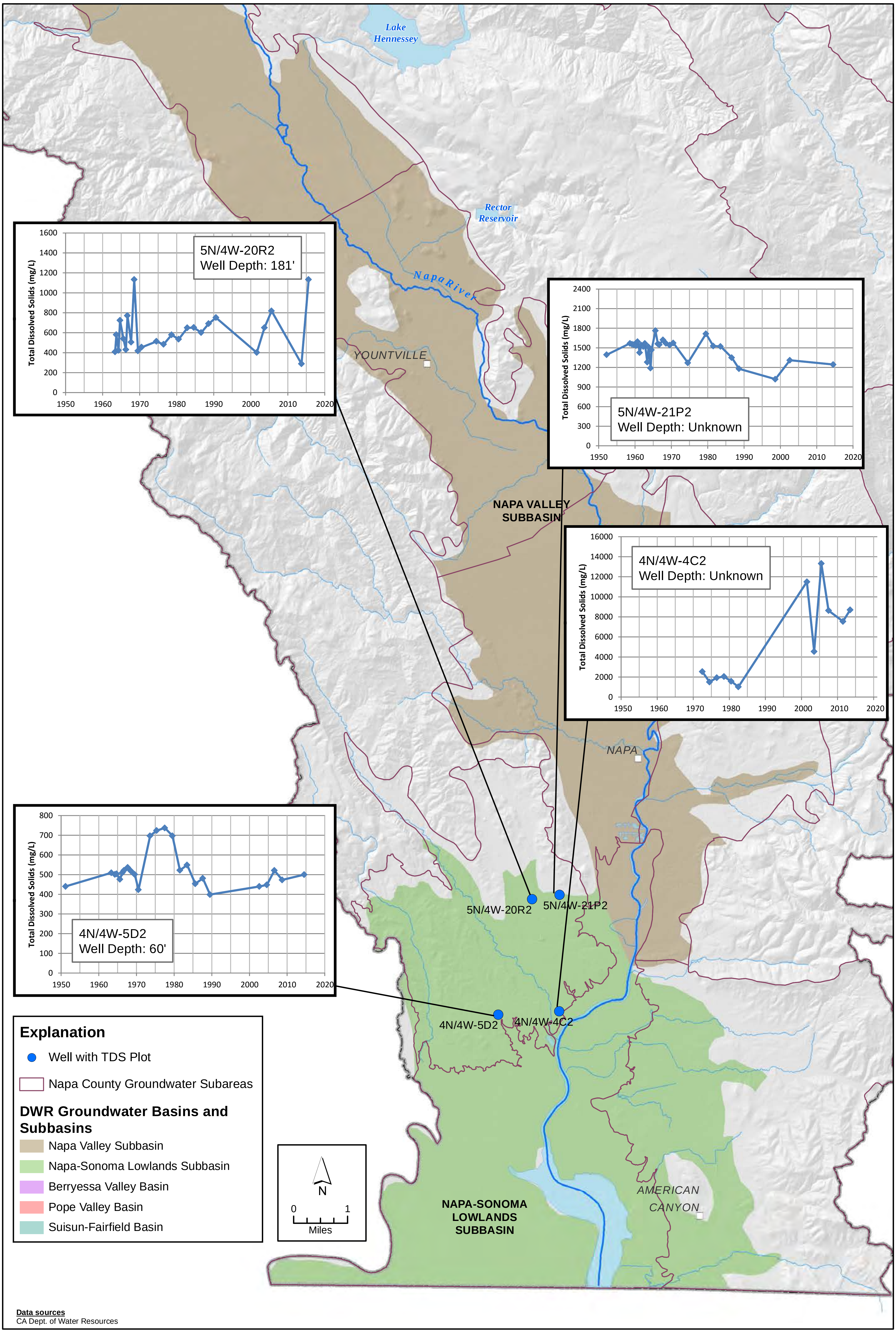
FIGURE 6-11
TDS Concentrations Time-Series Plots
Napa Valley Groundwater Subbasin, Napa County, CA



Data sources
CA Dept. of Water Resources

X:\2014 Job Files\14-108\GIS\Mapfiles\Annual Report\NapaGWQ_Map_TDS_Plots_Lowlands__.mxd

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FIGURE 6-12
TDS Concentrations Time-Series Plots
Napa-Sonoma Lowlands Groundwater Subbasin, Napa County, CA

APPENDIX A

Summary of Current Groundwater Level Monitoring Locations

Subarea	SWN	Well ID	Network as of 2015	Period of Record
Angwin		NapaCounty-165	No Reporting County Only	2014 - 2015
Angwin		NapaCounty-166	No Reporting County Only	2014 - 2015
Angwin		NapaCounty-167	No Reporting County Only	2014 - 2015
Angwin		NapaCounty-168	No Reporting County Only	2014 - 2015
Angwin		NapaCounty-202	CASGEM	2014 - 2015
Berryessa		T0605500298	Geotracker	2004 - 2015
Berryessa		T0605500304	Geotracker	2002 - 2015
Berryessa		T0605591908	Geotracker	2006 - 2015
Carneros	004N004W05C001M	NapaCounty-150	CASGEM	2011 - 2015
Carneros	004N004W05A001M	NapaCounty-153	CASGEM	2012 - 2015
Carneros	005N004W31R001M	NapaCounty-154	CASGEM	2012 - 2015
Carneros	004N004W06M001M	NapaCounty-155	CASGEM	2012 - 2015
Carneros		NapaCounty-176	No Reporting County Only	2014 - 2015
Carneros		NapaCounty-194	No Reporting County Only	2014 - 2015
Carneros		NapaCounty-195	CASGEM	2014 - 2015
Carneros		NapaCounty-200	CASGEM	2014 - 2015
Carneros		NapaCounty-201	CASGEM	2014 - 2015
Carneros		NapaCounty-205	No Reporting County Only	2014 - 2015
Carneros		NapaCounty-206	No Reporting County Only	2014 - 2015
Carneros		NapaCounty-207	No Reporting County Only	2014 - 2015
Central Interior Valleys		L10003756160	Geotracker	1990 - 2015
Central Interior Valleys		NapaCounty-209	No Reporting County Only	2014 - 2015
Eastern Mountains		NapaCounty-175	No Reporting County Only	2014 - 2015
Eastern Mountains		NapaCounty-193	No Reporting County Only	2014 - 2015
Eastern Mountains		NapaCounty-210	No Reporting County Only	2014 - 2015
Jameson American Canyon		NapaCounty-196	No Reporting County Only	2014 - 2015
NVF-Calistoga	008N006W10Q001M	08N06W10Q001M	Monthly DWR	1949 - 2015
NVF-Calistoga	009N007W25N001M	NapaCounty-127	Voluntary Reporting	1962 - 2015
NVF-Calistoga	009N006W31Q001M	NapaCounty-128	CASGEM	1962 - 2016
NVF-Calistoga	008N006W06L004M	NapaCounty-129	Voluntary Reporting	1962 - 2015
NVF-Calistoga		NapaCounty-178	No Reporting County Only	2014 - 2015
NVF-Calistoga		NapaCounty-203	No Reporting County Only	2014 - 2015
NVF-Calistoga		NapaCounty-224	No Reporting County Only	2014 - 2015

Subarea	SWN	Well ID	Network as of 2015	Period of Record
NVF-Calistoga		NapaCounty-225	No Reporting County Only	2014 - 2015
NVF-MST	005N003W05M001M	NapaCounty-10	Voluntary Reporting	1979 - 2015
NVF-MST	005N003W07B00_My	NapaCounty-118	No Reporting County Only	2001 - 2015
NVF-MST	006N004W26L00_M	NapaCounty-122	No Reporting County Only	2001 - 2015
NVF-MST	005N004W13H001M	NapaCounty-137	CASGEM	1979 - 2015
NVF-MST	006N004W25G00_M	NapaCounty-142	No Reporting County Only	2001 - 2015
NVF-MST	005N003W05M00_M	NapaCounty-148	Voluntary Reporting	2009 - 2015
NVF-MST	005N003W08E00_M	NapaCounty-149	No Reporting County Only	2010 - 2015
NVF-MST	005N004W13G004M	NapaCounty-18	No Reporting County Only	2000 - 2015
NVF-MST		NapaCounty-191	CASGEM	2014 - 2015
NVF-MST		NapaCounty-192	No Reporting County Only	2014 - 2015
NVF-MST	006N004W23J001M	NapaCounty-2	Voluntary Reporting	1979 - 2015
NVF-MST	005N003W07C003M	NapaCounty-20	Voluntary Reporting	1978 - 2015
NVF-MST	005N003W08E001M	NapaCounty-22	No Reporting County Only	2000 - 2015
NVF-MST		NapaCounty-226	No Reporting County Only	2015 - 2015
NVF-MST	005N003W18D001M	NapaCounty-35	No Reporting County Only	2000 - 2015
NVF-MST	006N004W23Q003M	NapaCounty-43	CASGEM	1978 - 2015
NVF-MST	005N004W14J003M	NapaCounty-49	CASGEM	1899 - 2015
NVF-MST	006N004W26G001M	NapaCounty-56	Voluntary Reporting	1978 - 2015
NVF-MST	006N004W35G005M	NapaCounty-69	No Reporting County Only	2000 - 2015
NVF-MST	005N003W07D003M	NapaCounty-72	No Reporting County Only	2000 - 2015
NVF-MST	005N003W06M001M	NapaCounty-74	CASGEM	1999 - 2015
NVF-MST	005N003W07F003M	NapaCounty-81	No Reporting County Only	2000 - 2015
NVF-MST	005N003W06B002M	NapaCounty-91	CASGEM	1992 - 2014
NVF-MST	005N003W06A001M	NapaCounty-92	CASGEM	1999 - 2015
NVF-MST	006N004W36G001M	NapaCounty-95	Voluntary Reporting	1979 - 2015
NVF-MST	006N004W36A001M	NapaCounty-98	No Reporting County Only	2000 - 2015
NVF-MST		T0605500200	Geotracker	2014 - 2015
NVF-MST		T10000005248	Geotracker	2013 - 2015
NVF-Napa	006N004W27L002M	06N04W27L002M	Monthly DWR	1966 - 2015
NVF-Napa	006N004W27N001M	NapaCounty-136	CASGEM	1979 - 2016
NVF-Napa	006N004W28Mx	NapaCounty-152	No Reporting County Only	2012 - 2015
NVF-Napa		NapaCounty-182	CASGEM	2014 - 2016

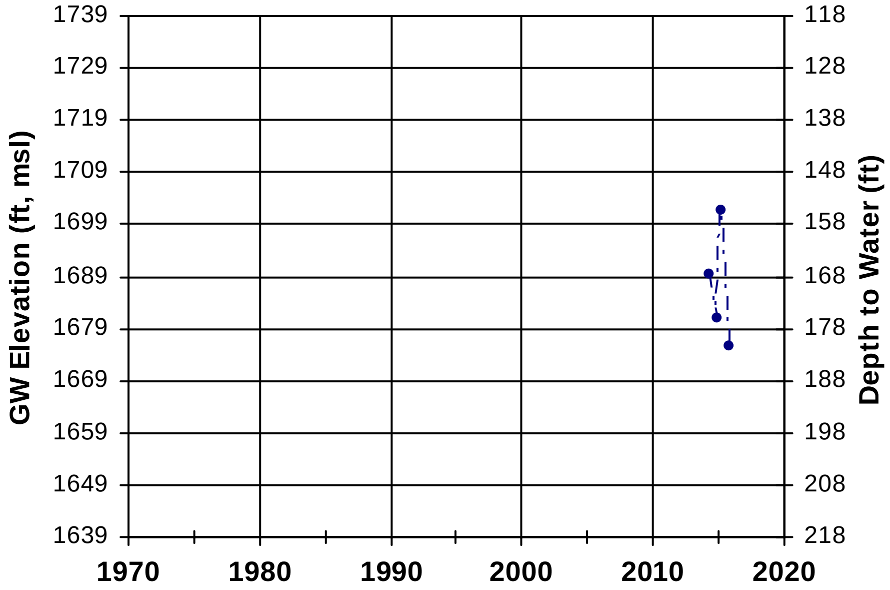
Subarea	SWN	Well ID	Network as of 2015	Period of Record
NVF-Napa		NapaCounty-183	No Reporting County Only	2014 - 2015
NVF-Napa		NapaCounty-184	No Reporting County Only	2014 - 2015
NVF-Napa		NapaCounty-185	No Reporting County Only	2014 - 2016
NVF-Napa		NapaCounty-187	No Reporting County Only	2014 - 2015
NVF-Napa		NapaCounty-188	No Reporting County Only	2014 - 2015
NVF-Napa		NapaCounty-189	No Reporting County Only	2014 - 2015
NVF-Napa		NapaCounty-227	CASGEM	2015 - 2015
NVF-Napa		NapaCounty-228	No Reporting County Only	2015 - 2015
NVF-Napa	006N004W15R003M	NapaCounty-76	No Reporting County Only	2000 - 2015
NVF-Napa		NapaCounty-swgw1	CASGEM	2014 - 2015
NVF-Napa		NapaCounty-swgw3	CASGEM	2014 - 2015
NVF-Napa		SL0605536682	Geotracker	2005 - 2015
NVF-Napa		T0605500009	Geotracker	2005 - 2015
NVF-Napa		T0605514064	Geotracker	2005 - 2015
NVF-Saint Helena	007N005W09Q002M	07N05W09Q002M	Monthly DWR	1949 - 2015
NVF-Saint Helena	007N005W16L001M	NapaCounty-131	CASGEM	1963 - 2015
NVF-Saint Helena	007N005W14B002M	NapaCounty-132	CASGEM	1962 - 2016
NVF-Saint Helena	007N005W16N002M	NapaCounty-138	CASGEM	1949 - 2015
NVF-Saint Helena		NapaCounty-169	CASGEM	2014 - 2015
NVF-Saint Helena		NapaCounty-171	No Reporting County Only	2014 - 2016
NVF-Saint Helena		NapaCounty-172	No Reporting County Only	2014 - 2015
NVF-Saint Helena		NapaCounty-173	No Reporting County Only	2014 - 2015
NVF-Saint Helena		NapaCounty-174	No Reporting County Only	2014 - 2015
NVF-Saint Helena		NapaCounty-177	No Reporting County Only	2014 - 2015
NVF-Saint Helena		NapaCounty-204	No Reporting County Only	2014 - 2015
NVF-Saint Helena		NapaCounty-212	No Reporting County Only	2015 - 2015
NVF-Saint Helena		NapaCounty-swgw5	CASGEM	2014 - 2015
NVF-Yountville	006N004W17A001M	06N04W17A001M	Semi-annual DWR	1949 - 2015
NVF-Yountville	006N004W09Q001M	NapaCounty-125	CASGEM	1979 - 2015
NVF-Yountville	006N004W09Q002M	NapaCounty-126	CASGEM	1984 - 2015
NVF-Yountville	007N004W31M001M	NapaCounty-133	Voluntary Reporting	1978 - 2016
NVF-Yountville	006N004W06L002M	NapaCounty-134	CASGEM	1963 - 2015
NVF-Yountville	006N004W19B001M	NapaCounty-135	Voluntary Reporting	1979 - 2016

Subarea	SWN	Well ID	Network as of 2015	Period of Record
NVF-Yountville	006N004W17R002M	NapaCounty-139	CASGEM	1978 - 2015
NVF-Yountville		NapaCounty-179	CASGEM	2014 - 2015
NVF-Yountville		NapaCounty-180	CASGEM	2014 - 2015
NVF-Yountville		NapaCounty-181	No Reporting County Only	2014 - 2015
NVF-Yountville		NapaCounty-swgw2	CASGEM	2014 - 2015
NVF-Yountville		NapaCounty-swgw4	CASGEM	2014 - 2015
Pope Valley		NapaCounty-211	No Reporting County Only	2014 - 2015
Western Mountains		NapaCounty-208	CASGEM	2014 - 2015
Western Mountains		NapaCounty-213	CASGEM	2014 - 2015

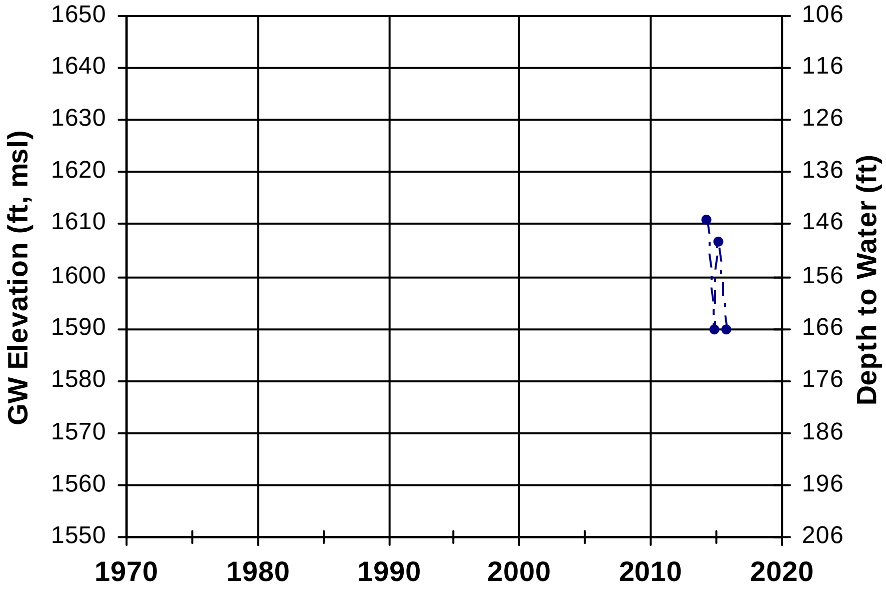
APPENDIX B

Groundwater Level Hydrographs for Current Monitoring Locations

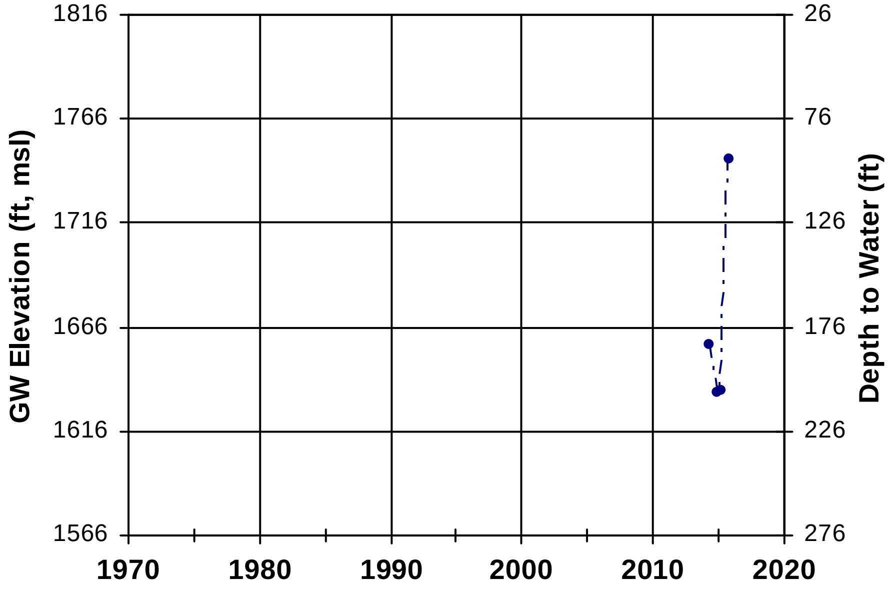
WellID: **NapaCounty-165** RPE: 1857 ft, msl ▬ Subarea: Ang
SWN: Unknown Source: NapaCounty



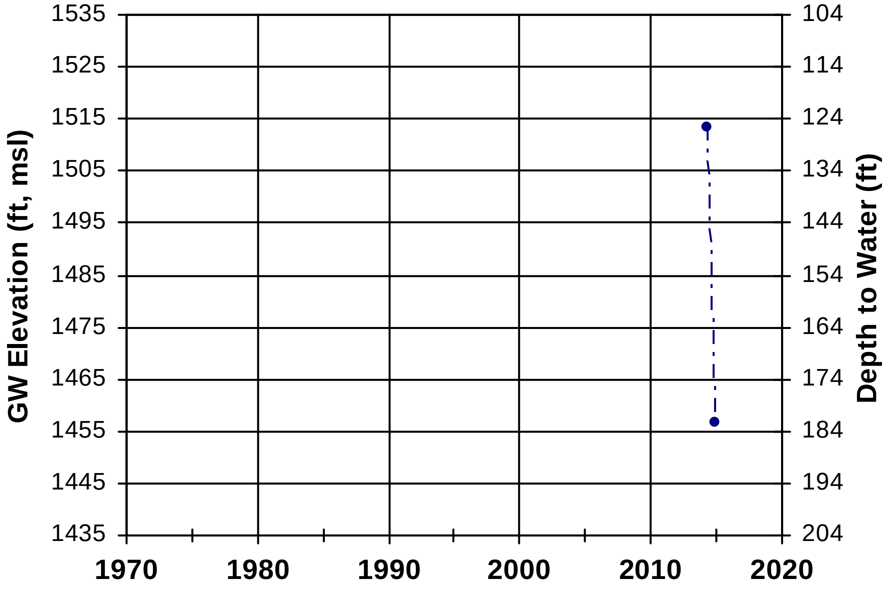
WellID: **NapaCounty-166** RPE: 1755.8 ft, msl ▬ Subarea: Ang
SWN: Unknown Source: NapaCounty



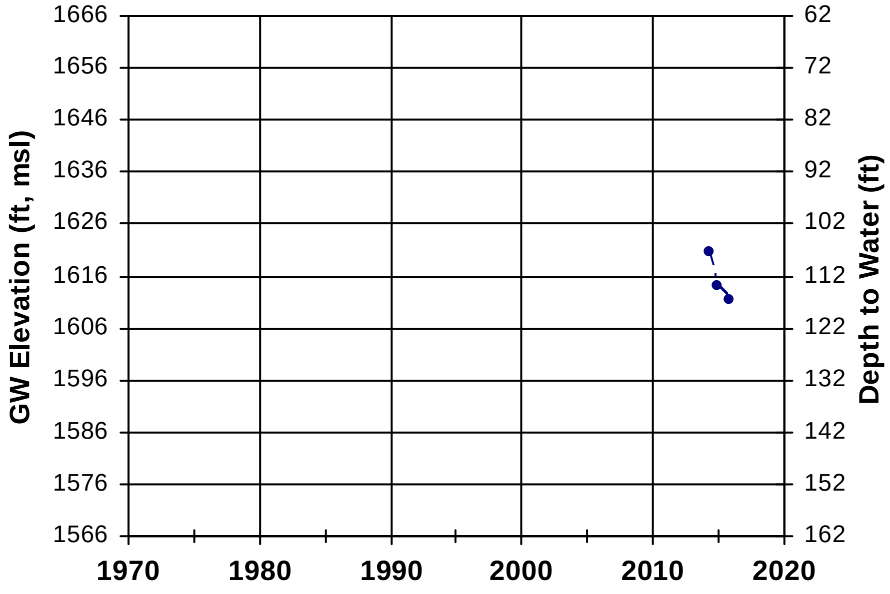
WellID: **NapaCounty-167** RPE: 1842.3 ft, msl ▬ Subarea: Ang
SWN: Unknown Source: NapaCounty



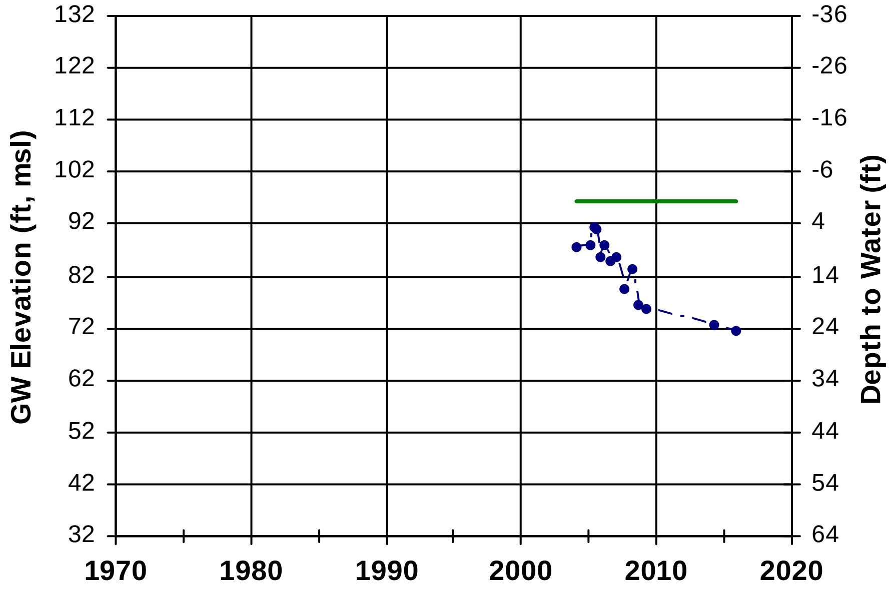
WellID: **NapaCounty-168** RPE: 1639 ft, msl ▬ Subarea: Ang
SWN: Unknown Source: NapaCounty



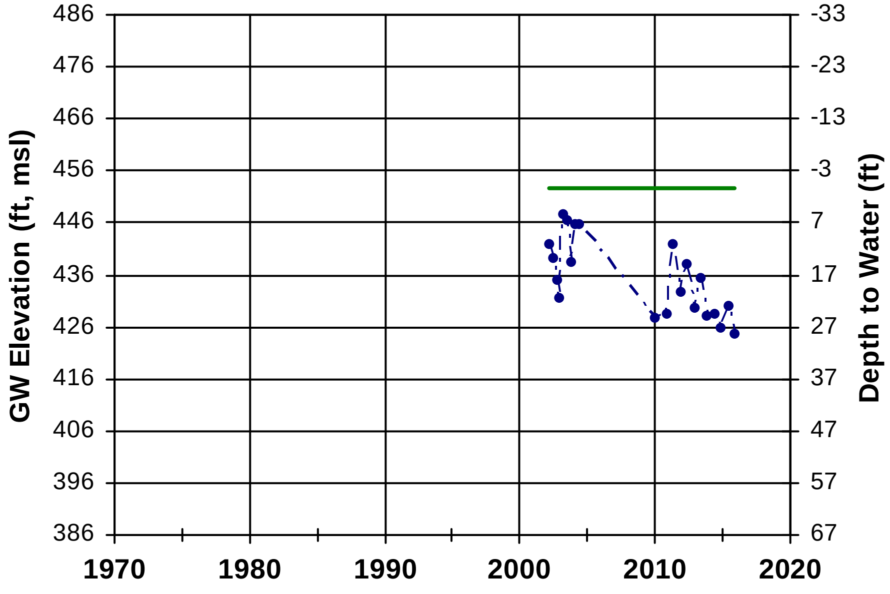
WellID: **NapaCounty-202** RPE: 1728.2 ft, msl Subarea: Ang
SWN: Unknown Source: NapaCounty



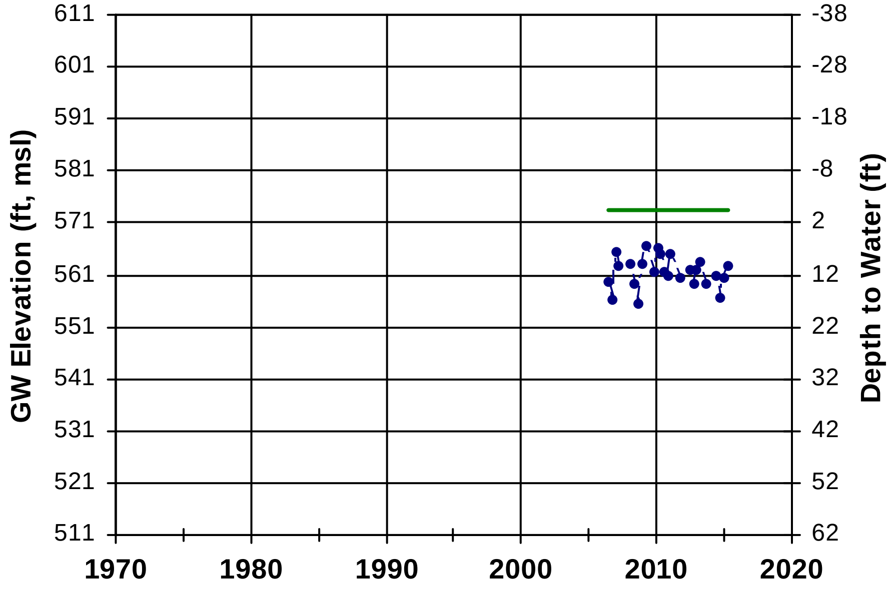
WellID: **T0605500298MW-1** RPE: 96.47 ft, msl Subarea: Berryessa
SWN: Unknown Source: Geotracker



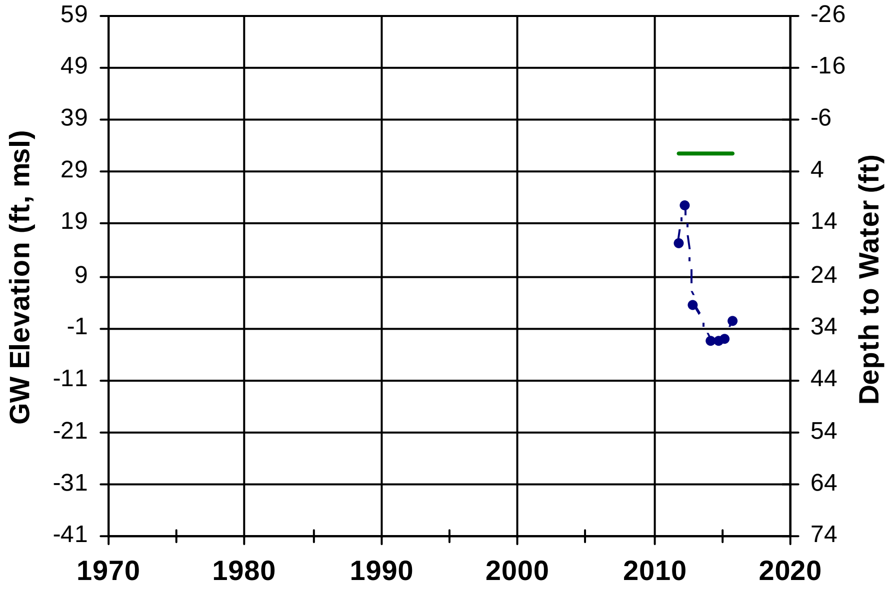
WellID: **T0605500304MW-1** RPE: 452.82 ft, msl Subarea: Berryessa
SWN: Unknown Source: Geotracker



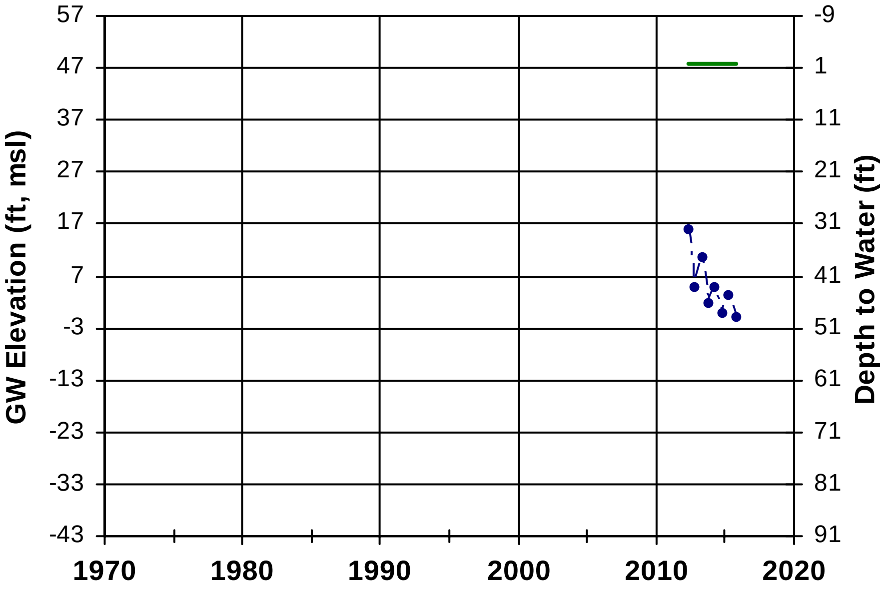
WellID: **T0605591908MW-1** RPE: 573.28 ft, msl Subarea: Berryessa
SWN: Unknown Source: Geotracker



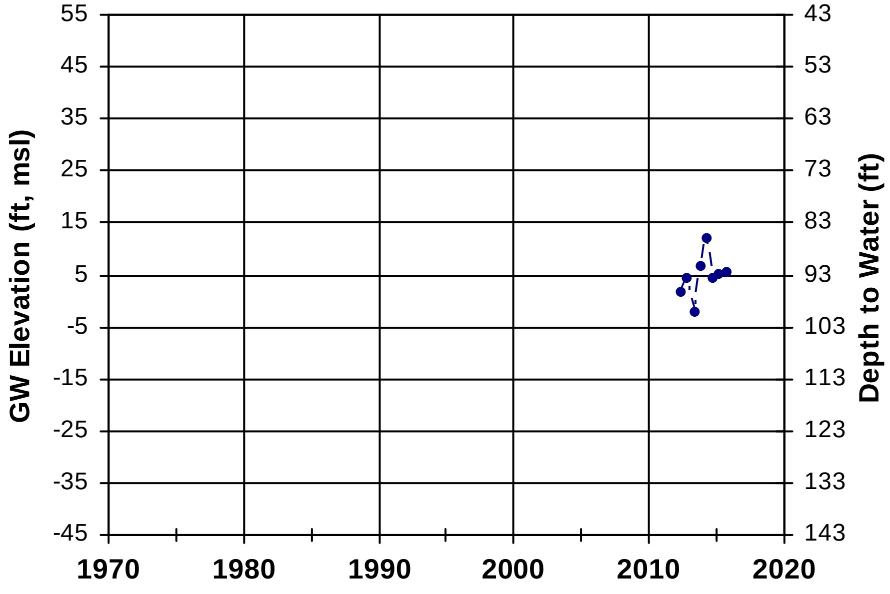
WellID: **NapaCounty-150** RPE: 32.7 ft, msl — Subarea: Carn
SWN: 004N004W05C001M Source: NapaCounty



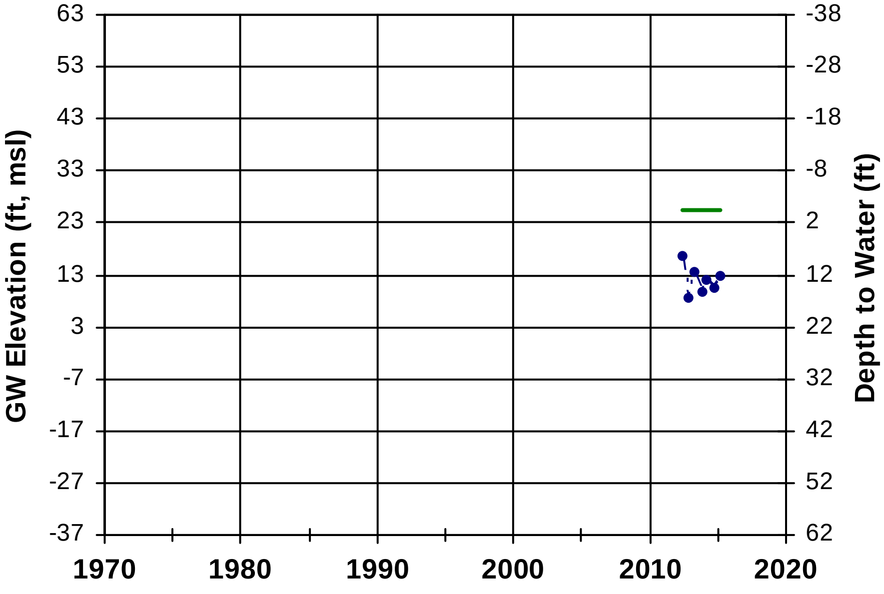
WellID: **NapaCounty-153** RPE: 47.65 ft, msl — Subarea: Carn
SWN: 004N004W05A001M Source: NapaCounty



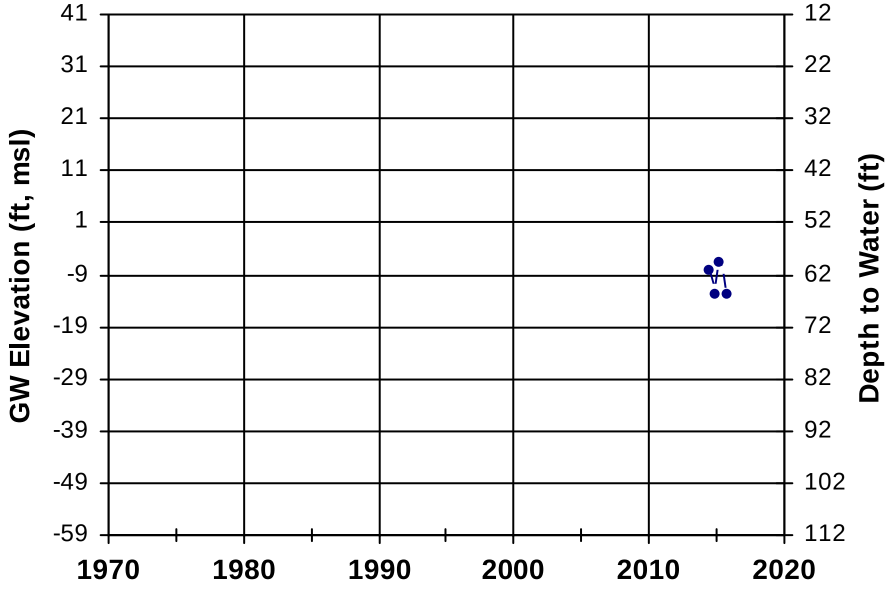
WellID: **NapaCounty-154** RPE: 98.3 ft, msl — Subarea: Carn
SWN: 005N004W31R001M Source: NapaCounty



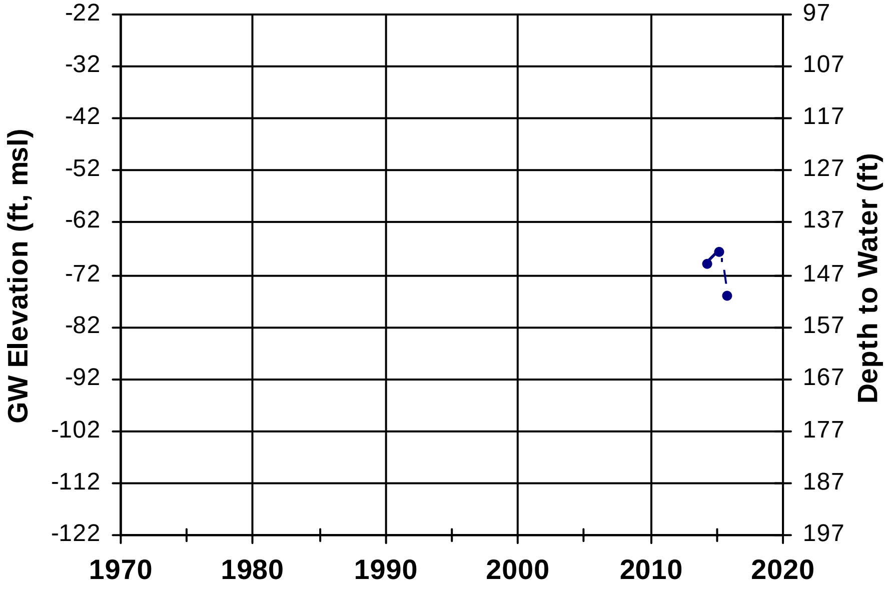
WellID: **NapaCounty-155** RPE: 25.3 ft, msl — Subarea: Carn
SWN: 004N004W06M001M Source: NapaCounty



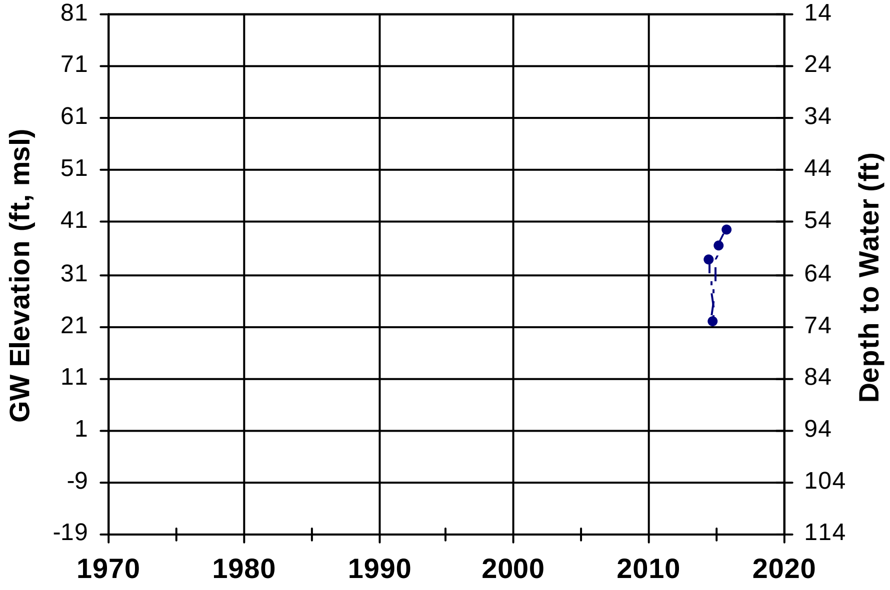
WellID: **NapaCounty-176** RPE: 53.4 ft, msl Subarea: Carn
SWN: Unknown Source: NapaCounty



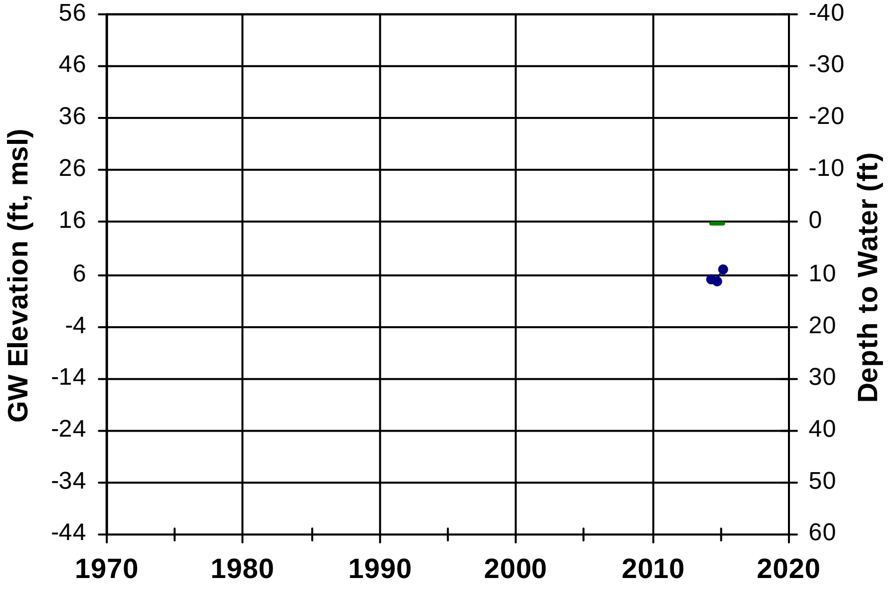
WellID: **NapaCounty-194** RPE: 75.1 ft, msl Subarea: Carn
SWN: Unknown Source: NapaCounty



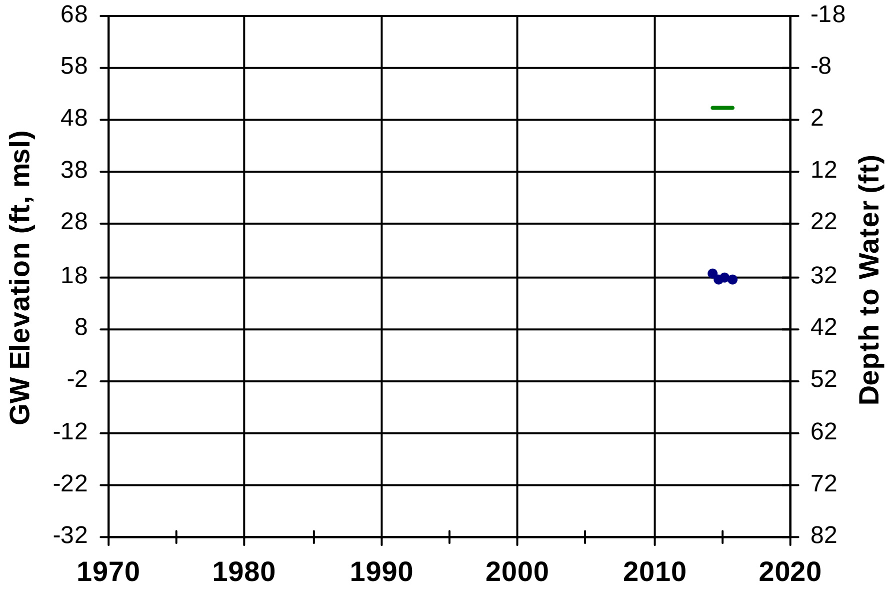
WellID: **NapaCounty-195** RPE: 94.8 ft, msl Subarea: Carn
SWN: Unknown Source: NapaCounty



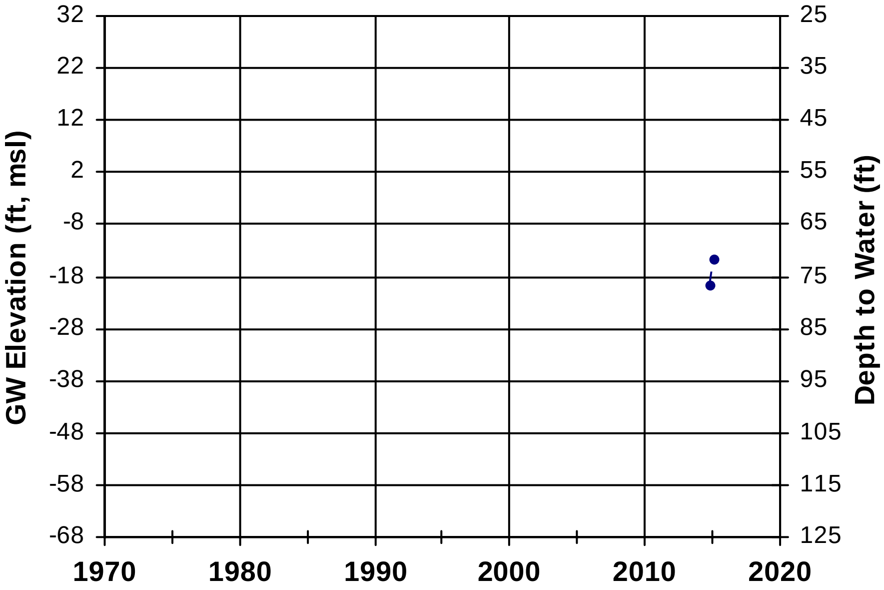
WellID: **NapaCounty-200** RPE: 15.7 ft, msl Subarea: Carn
SWN: Unknown Source: NapaCounty



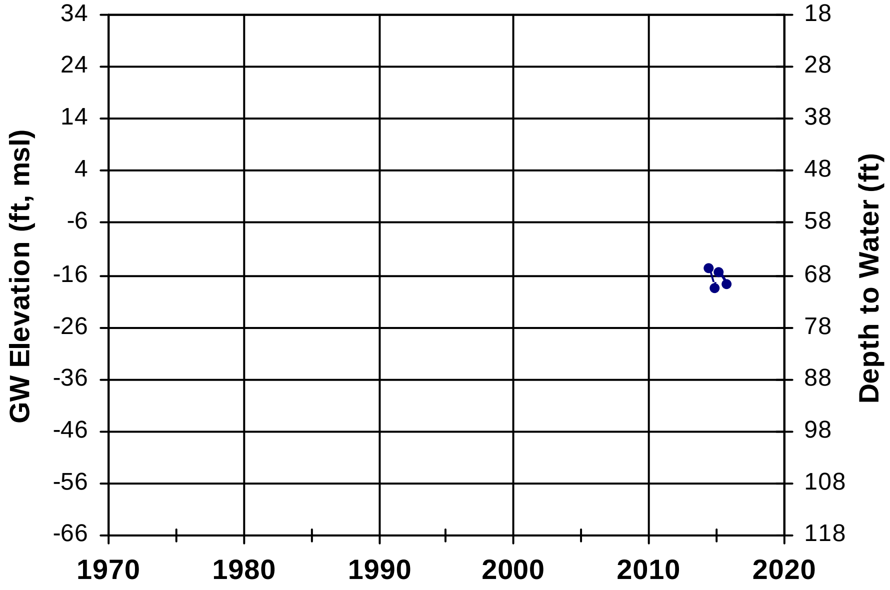
WellID: **NapaCounty-201** RPE: 50.4 ft, msl Subarea: Carn
SWN: Unknown Source: NapaCounty



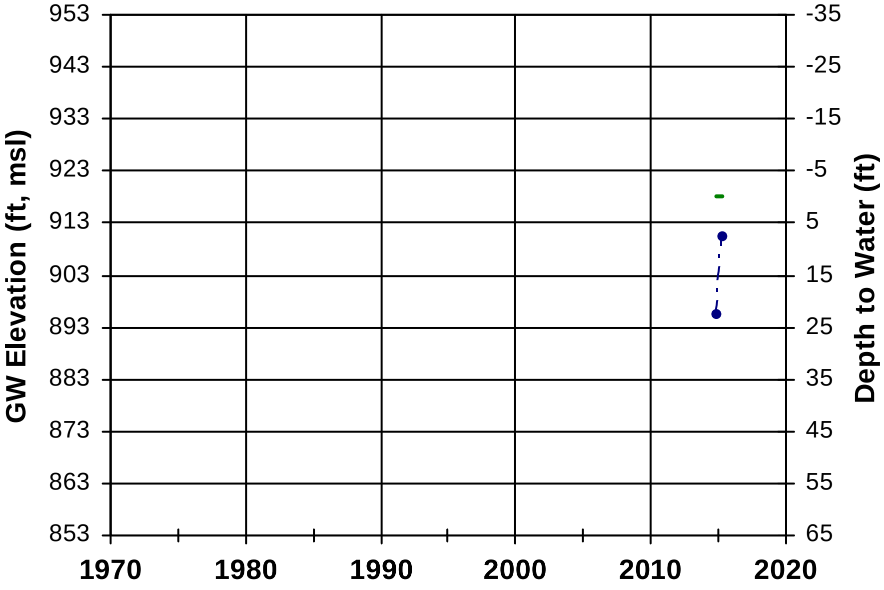
WellID: **NapaCounty-205** RPE: 56.8 ft, msl Subarea: Carn
SWN: Unknown Source: NapaCounty



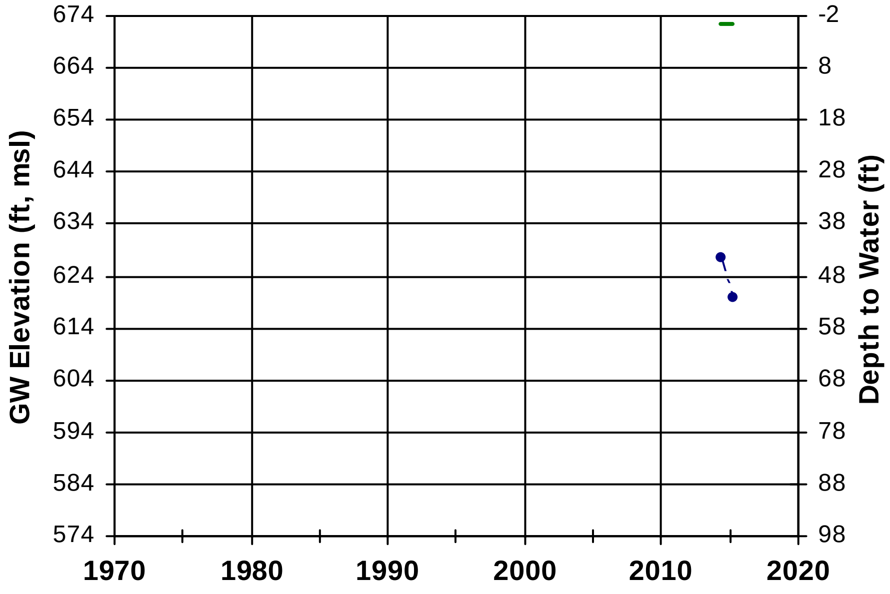
WellID: **NapaCounty-206** RPE: 52.4 ft, msl Subarea: Carn
SWN: Unknown Source: NapaCounty



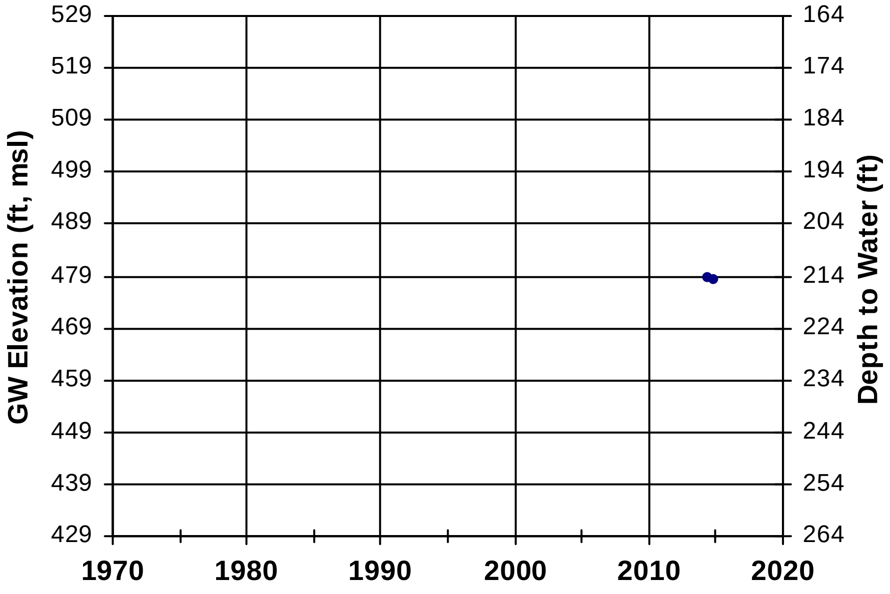
WellID: **NapaCounty-209** RPE: 918 ft, msl Subarea: Cent_Int_Val
SWN: Unknown Source: NapaCounty



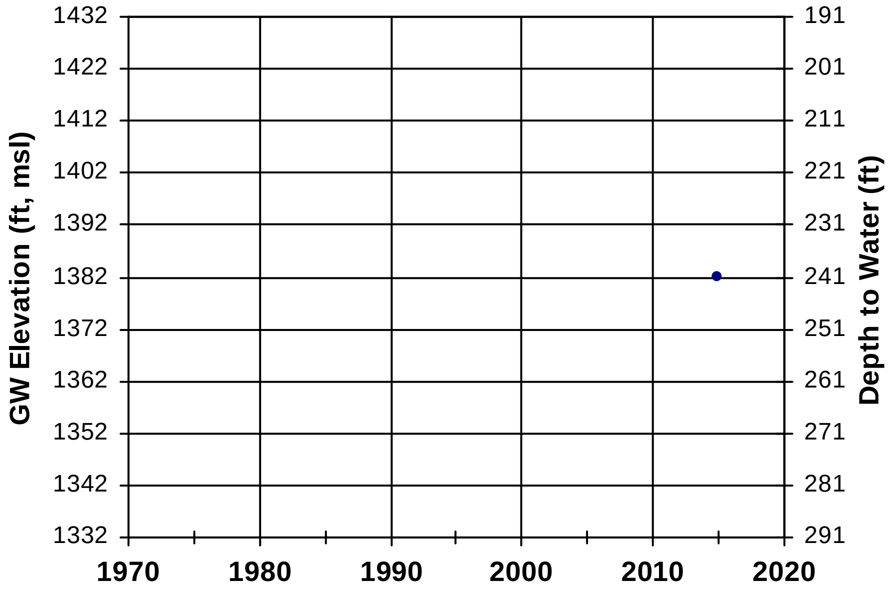
WellID: **NapaCounty-175** RPE: 672.3 ft, msl ▬ Subarea: East_Mnts
SWN: Unknown Source: NapaCounty



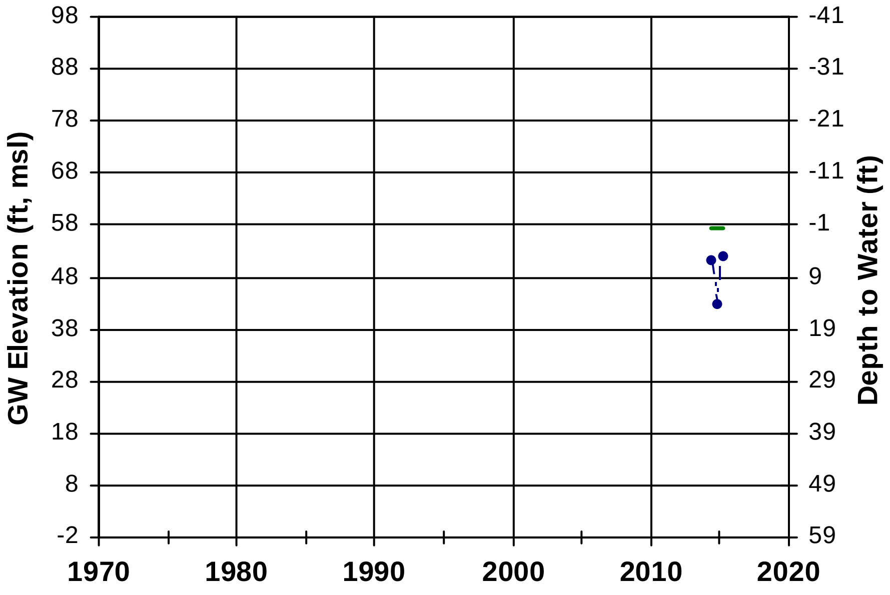
WellID: **NapaCounty-193** RPE: 693.1 ft, msl ▬ Subarea: East_Mnts
SWN: Unknown Source: NapaCounty



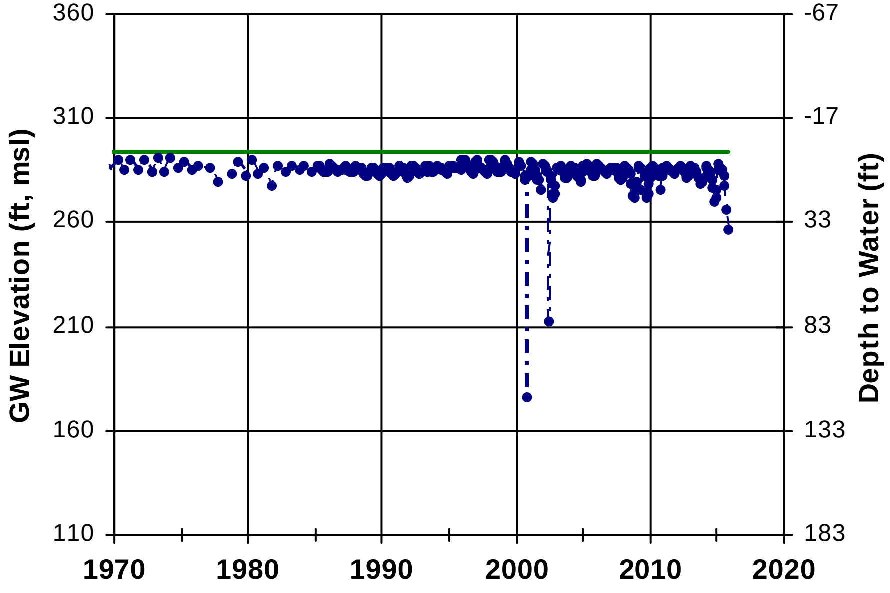
WellID: **NapaCounty-210** RPE: 1622.9 ft, msl ▬ Subarea: East_Mnts
SWN: Unknown Source: NapaCounty



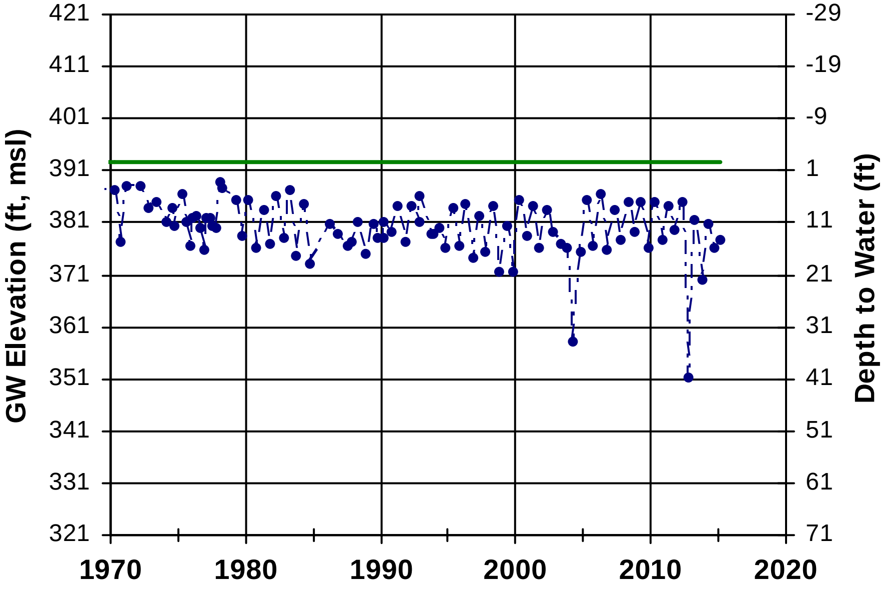
WellID: **NapaCounty-196** RPE: 57.4 ft, msl ▬ Subarea: Jam_AmerCan
SWN: Unknown Source: NapaCounty



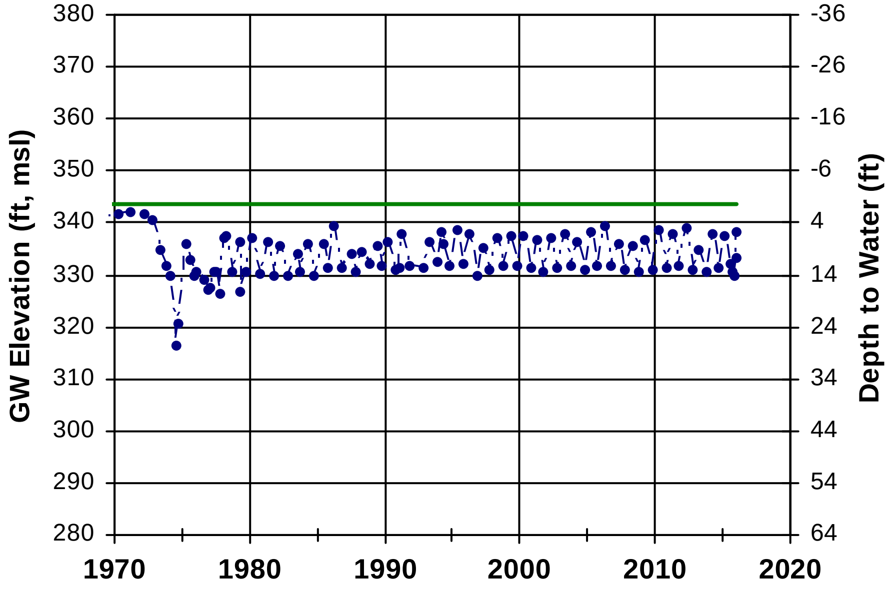
WellID: **08N06W10Q001M** RPE: 293.43 ft, msl Subarea: NVF_Calis
SWN: 008N006W10Q001M Source: DWR



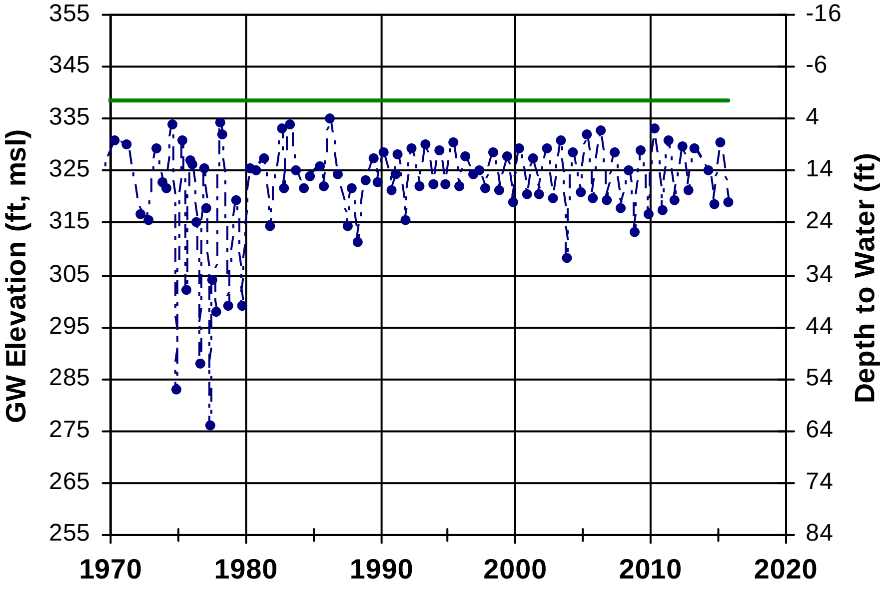
WellID: **NapaCounty-127** RPE: 392.5 ft, msl Subarea: NVF_Calis
SWN: 009N007W25N001M Source: NapaCounty



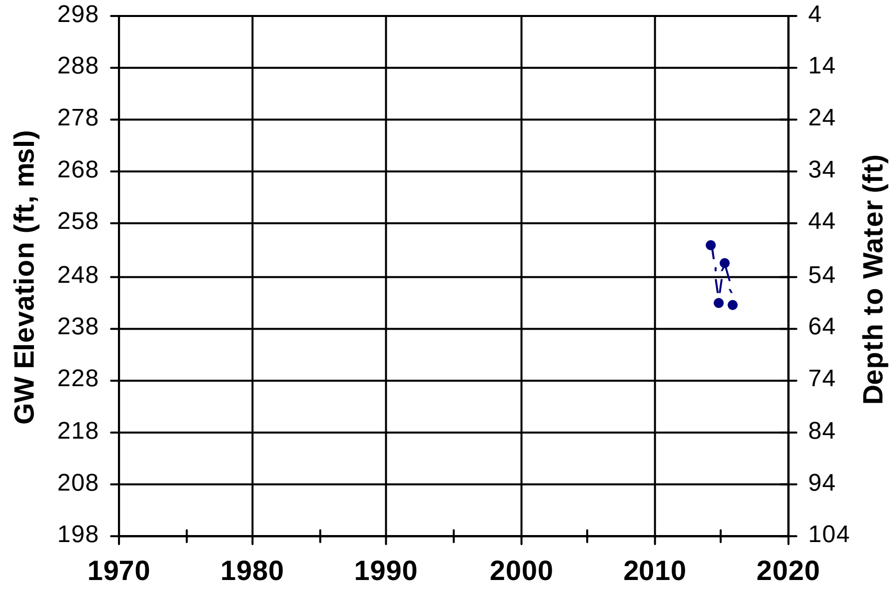
WellID: **NapaCounty-128** RPE: 343.7 ft, msl Subarea: NVF_Calis
SWN: 009N006W31Q001M Source: NapaCounty



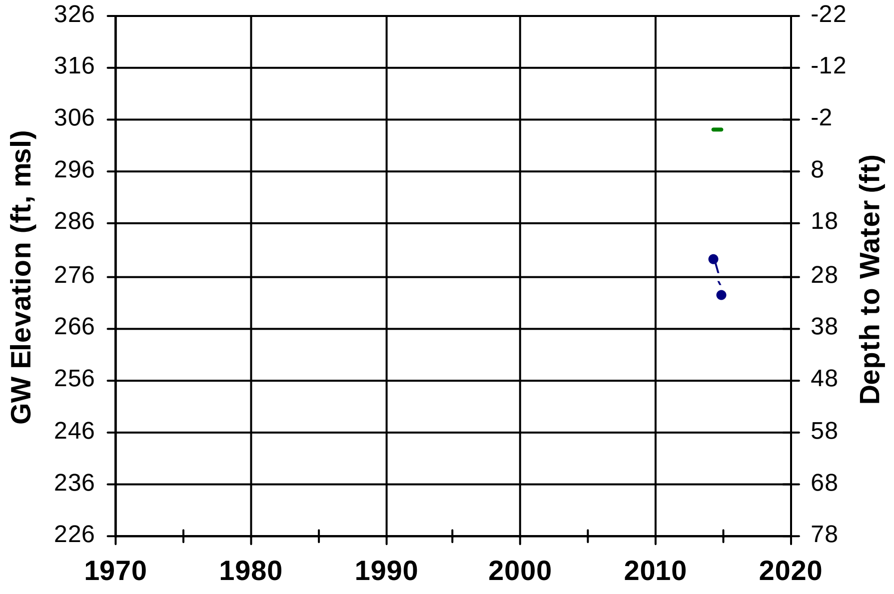
WellID: **NapaCounty-129** RPE: 338.7 ft, msl Subarea: NVF_Calis
SWN: 008N006W06L004M Source: NapaCounty



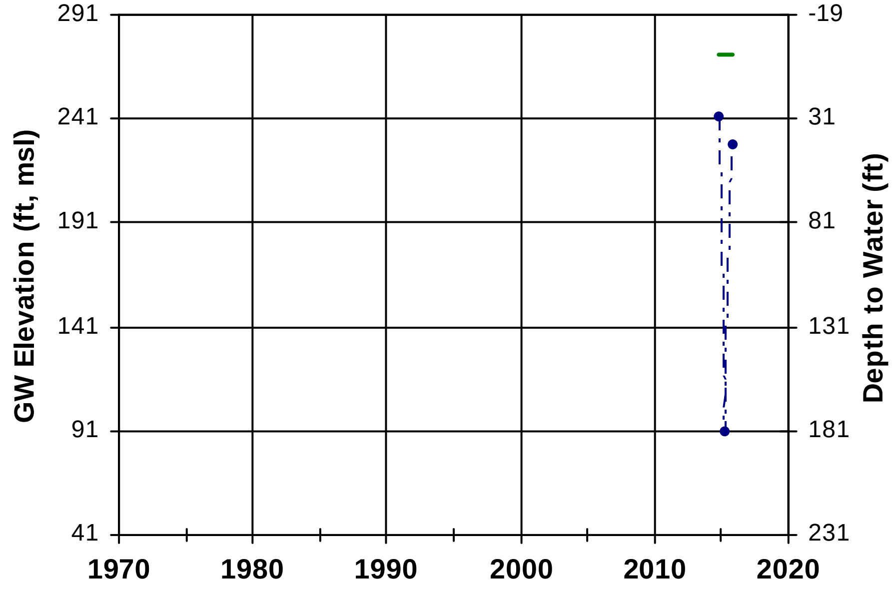
WellID: **NapaCounty-178** RPE: 301.5 ft, msl Subarea: NVF_Calis
SWN: Unknown Source: NapaCounty



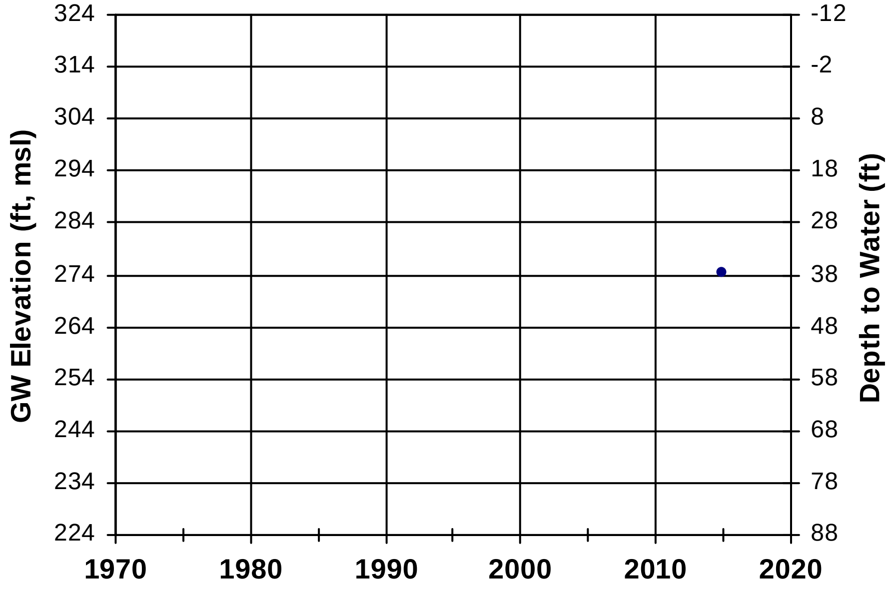
WellID: **NapaCounty-203** RPE: 304 ft, msl Subarea: NVF_Calis
SWN: Unknown Source: NapaCounty



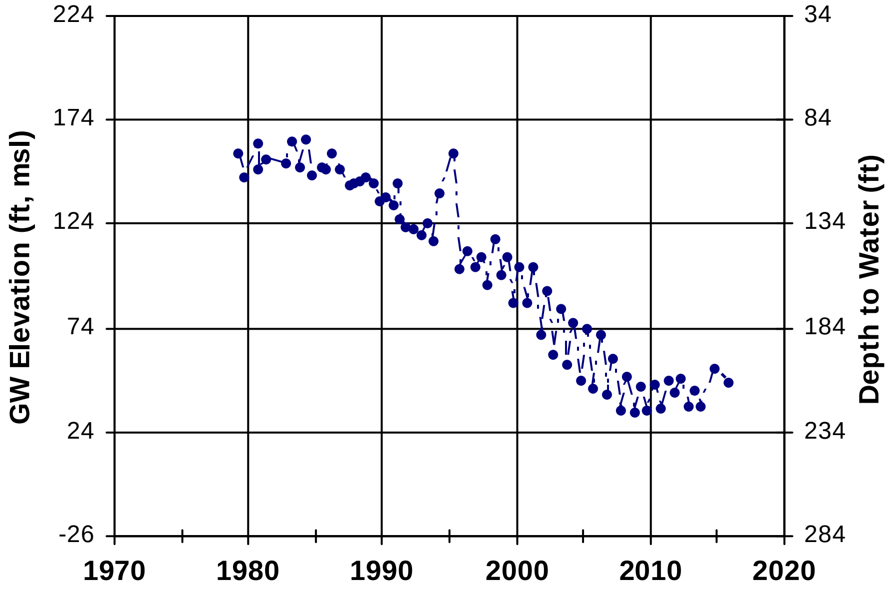
WellID: **NapaCounty-224** RPE: 272 ft, msl Subarea: NVF_Calis
SWN: Unknown Source: NapaCounty



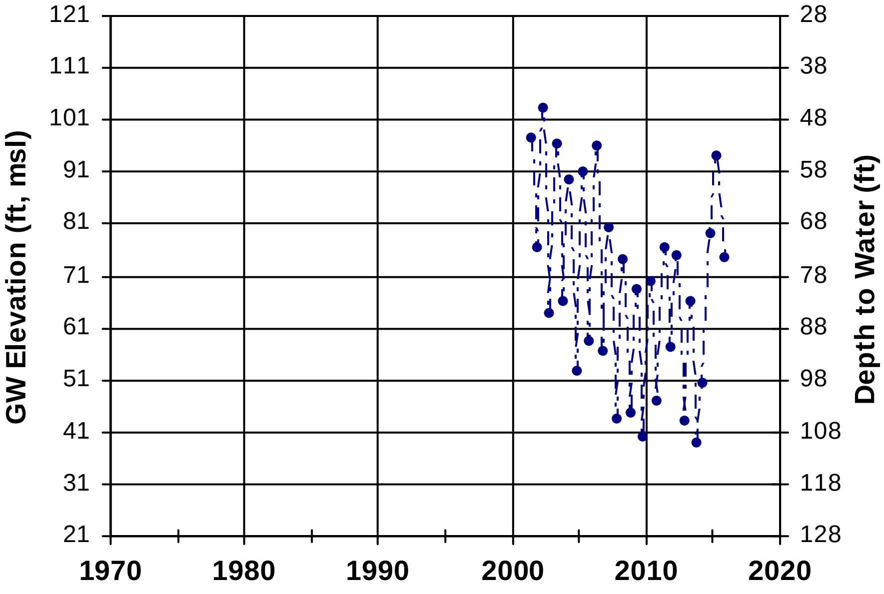
WellID: **NapaCounty-225** RPE: 311.75 ft, msl Subarea: NVF_Calis
SWN: Unknown Source: NapaCounty



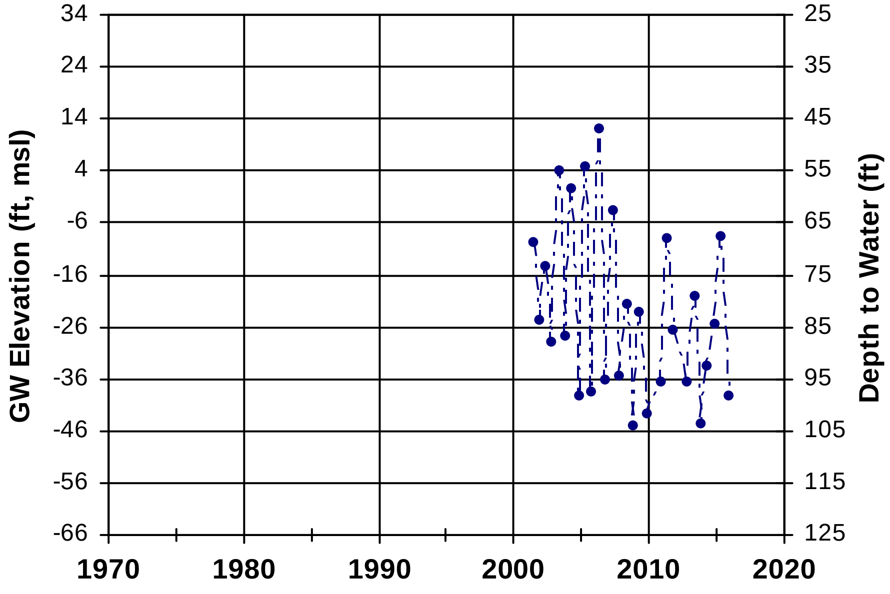
WellID: **NapaCounty-10** RPE: 258.3 ft, msl Subarea: NVF_MST
SWN: 005N003W05M001M Source: NapaCounty



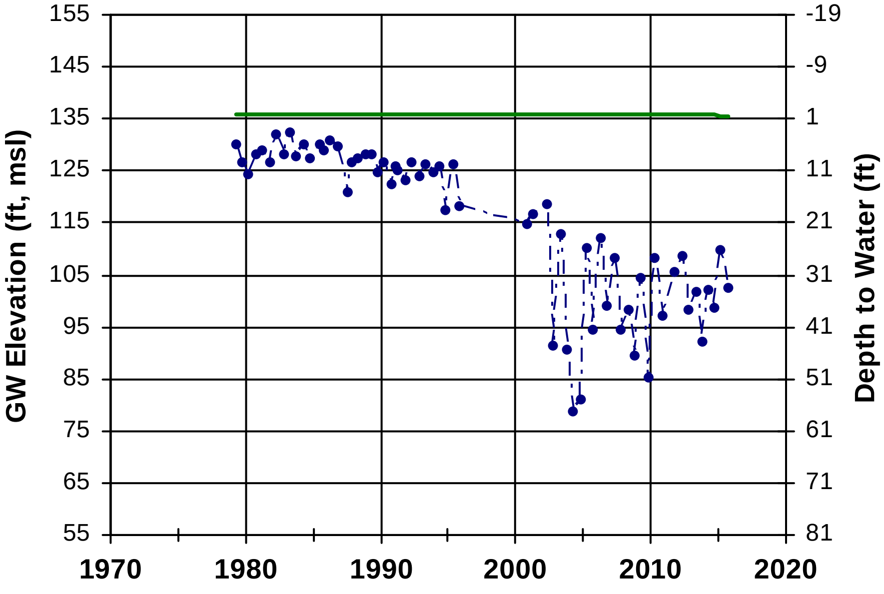
WellID: **NapaCounty-118** RPE: 148.65 ft, msl Subarea: NVF_MST
SWN: 005N003W07B00_My Source: NapaCounty



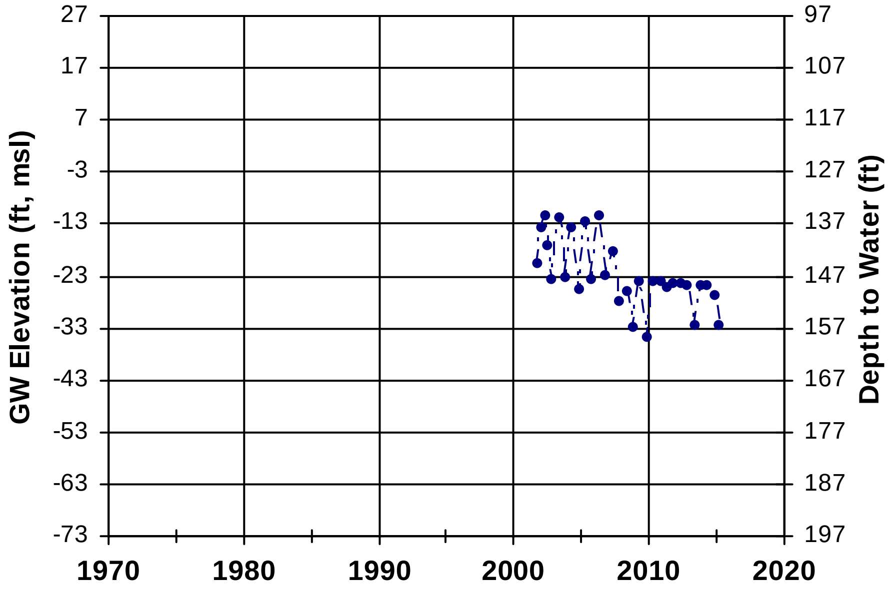
WellID: **NapaCounty-122** RPE: 59.15 ft, msl Subarea: NVF_MST
SWN: 006N004W26L00_M Source: NapaCounty



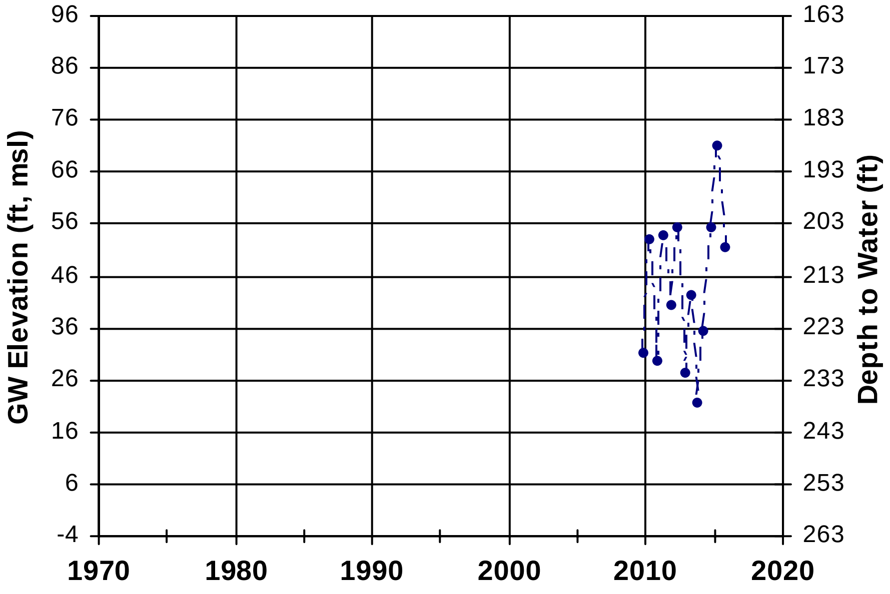
WellID: **NapaCounty-137** RPE: 135.6 ft, msl Subarea: NVF_MST
SWN: 005N004W13H001M Source: NapaCounty



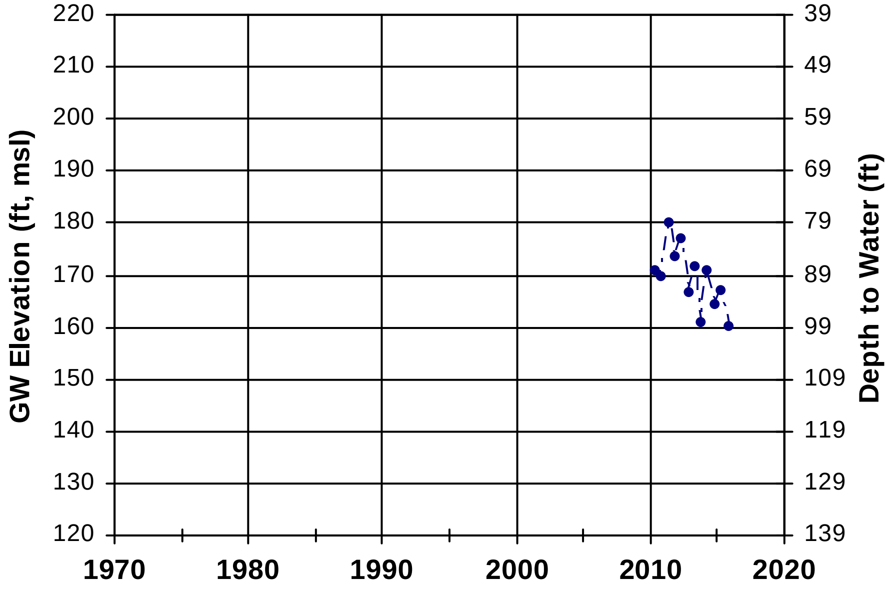
WellID: **NapaCounty-142** RPE: 124.2 ft, msl ▬ Subarea: NVF_MST
SWN: 006N004W25G00_M Source: NapaCounty



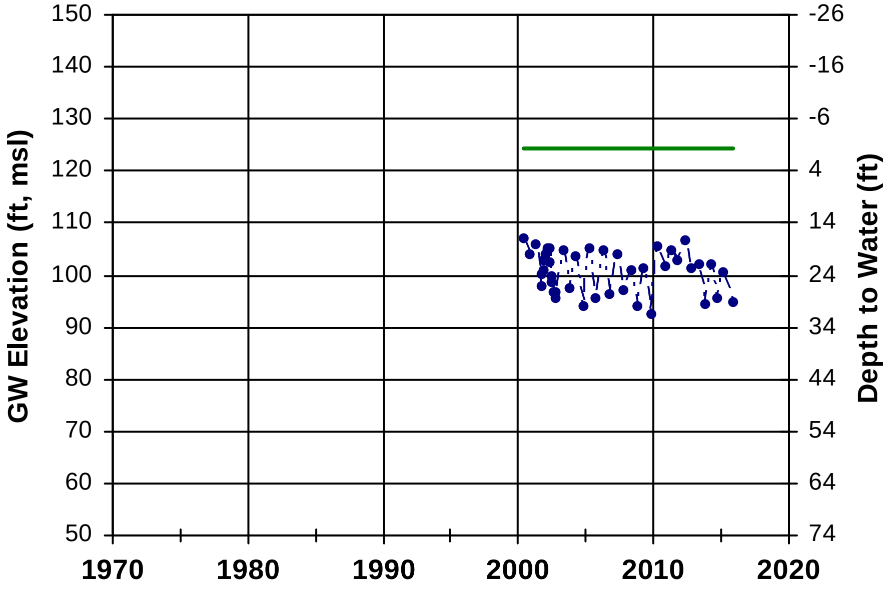
WellID: **NapaCounty-148** RPE: 258.6 ft, msl ▬ Subarea: NVF_MST
SWN: 005N003W05M00_M Source: NapaCounty



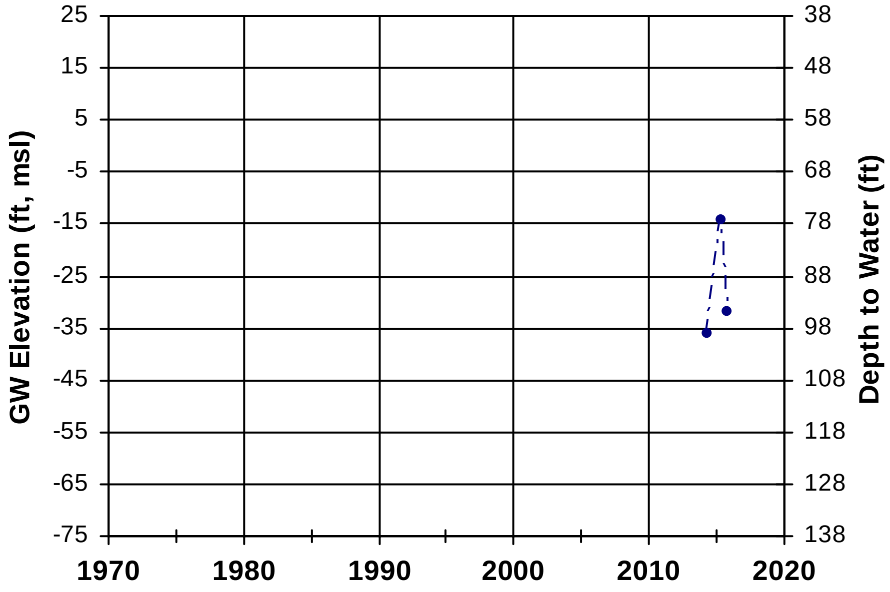
WellID: **NapaCounty-149** RPE: 258.9 ft, msl ▬ Subarea: NVF_MST
SWN: 005N003W08E00_M Source: NapaCounty



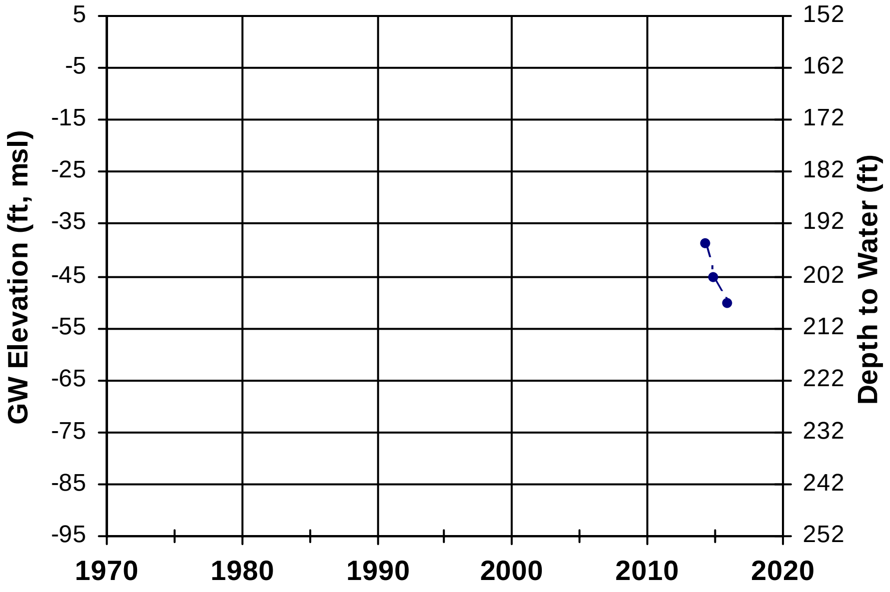
WellID: **NapaCounty-18** RPE: 124.3 ft, msl ▬ Subarea: NVF_MST
SWN: 005N004W13G004M Source: NapaCounty



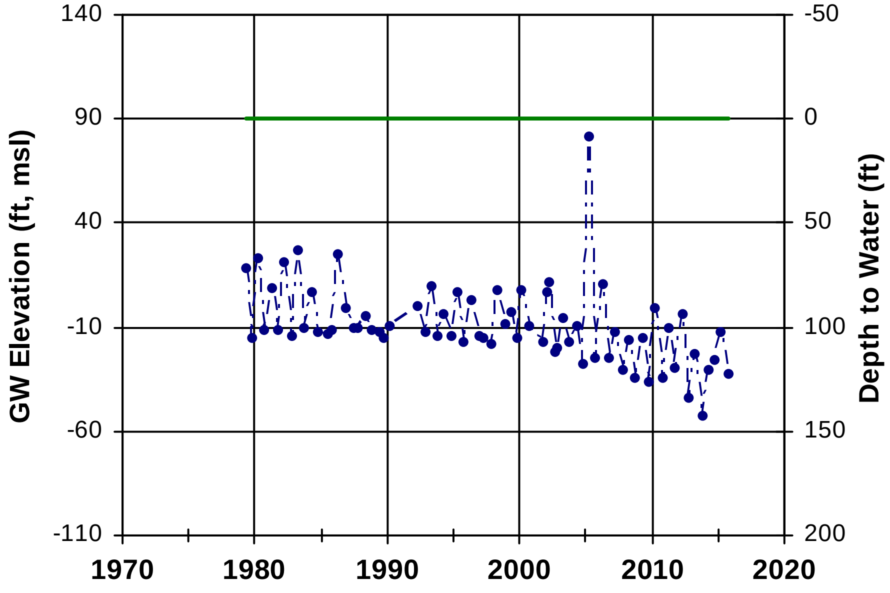
WellID: **NapaCounty-191** RPE: 63.1 ft, msl Subarea: NVF_MST
SWN: Unknown Source: NapaCounty



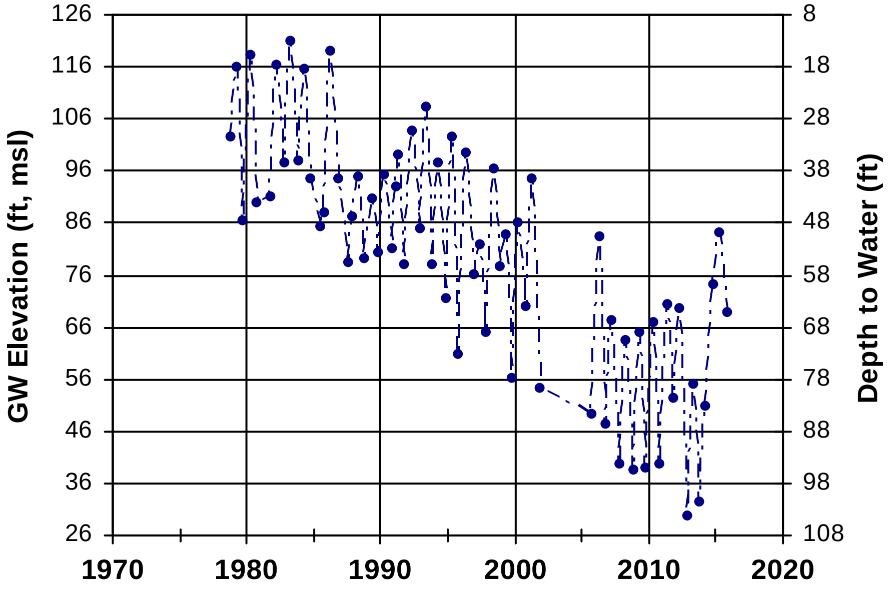
WellID: **NapaCounty-192** RPE: 156.8 ft, msl Subarea: NVF_MST
SWN: Unknown Source: NapaCounty



WellID: **NapaCounty-2** RPE: 90.5 ft, msl Subarea: NVF_MST
SWN: 006N004W23J001M Source: NapaCounty

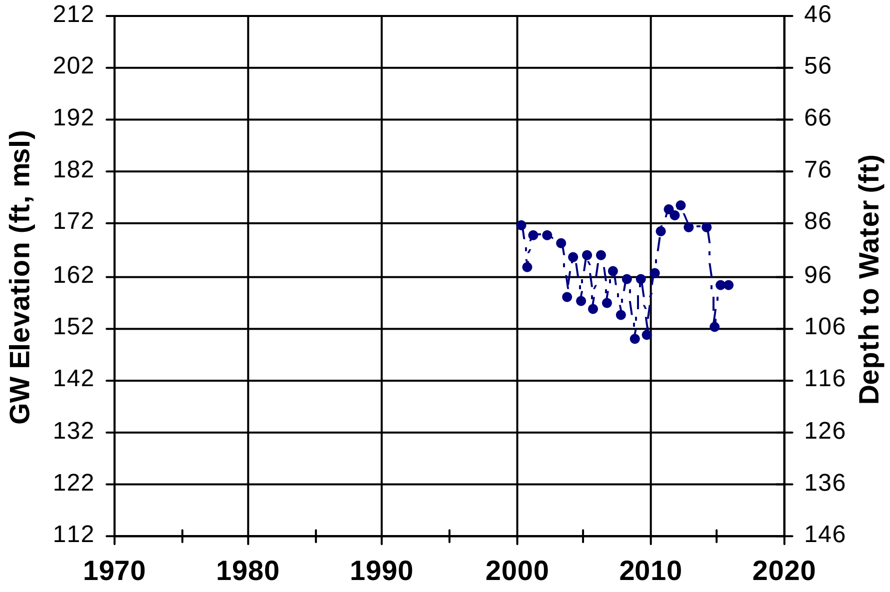


WellID: **NapaCounty-20** RPE: 134.5 ft, msl Subarea: NVF_MST
SWN: 005N003W07C003M Source: NapaCounty



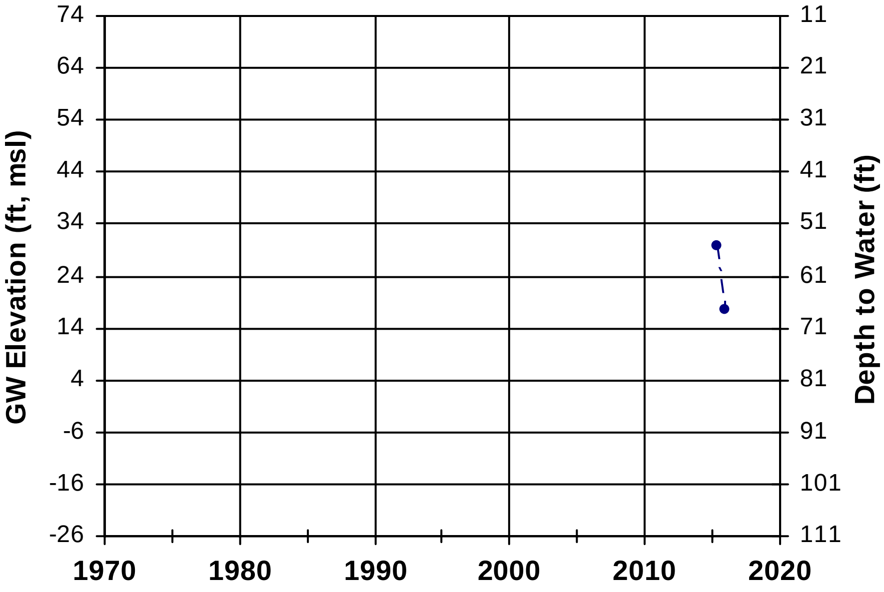
WellID: **NapaCounty-22** RPE: 257.7 ft, msl Subarea: NVF_MST

SWN: 005N003W08E001M Source: NapaCounty



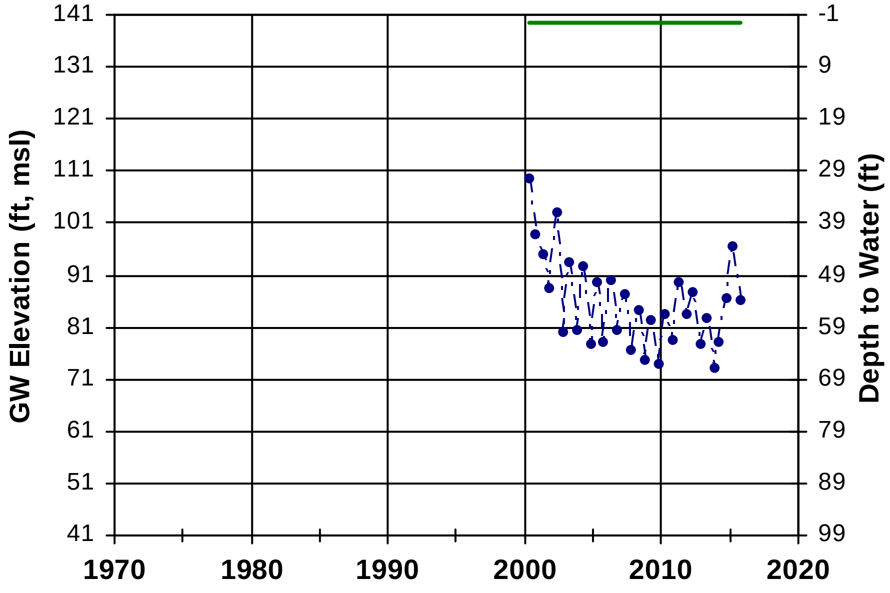
WellID: **NapaCounty-226** RPE: 84.9 ft, msl Subarea: NVF_MST

SWN: Unknown Source: NapaCounty



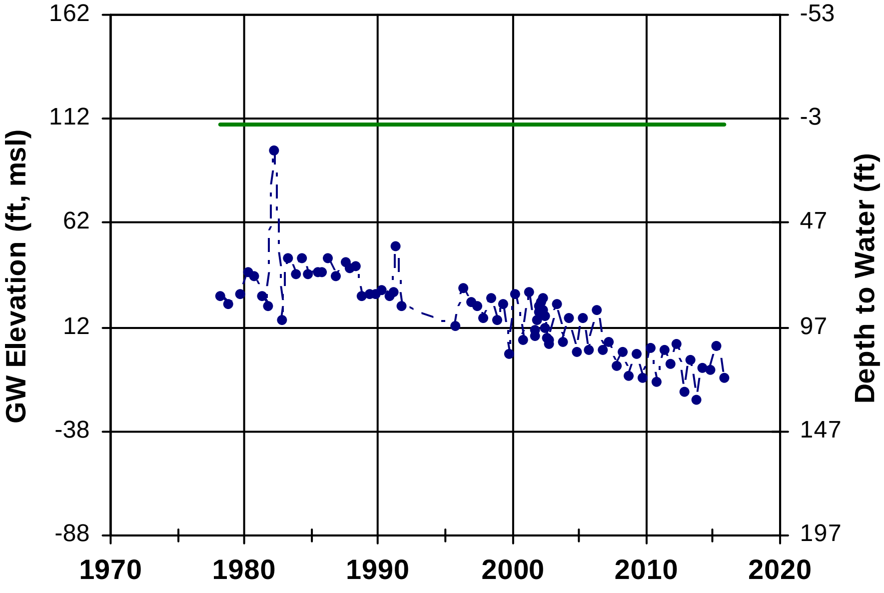
WellID: **NapaCounty-35** RPE: 139.6 ft, msl Subarea: NVF_MST

SWN: 005N003W18D001M Source: NapaCounty

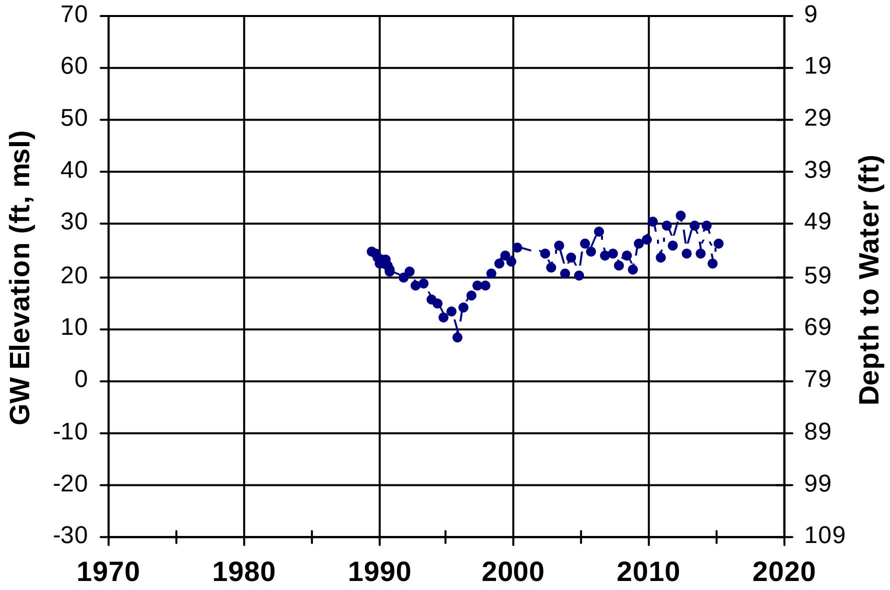


WellID: **NapaCounty-43** RPE: 109 ft, msl Subarea: NVF_MST

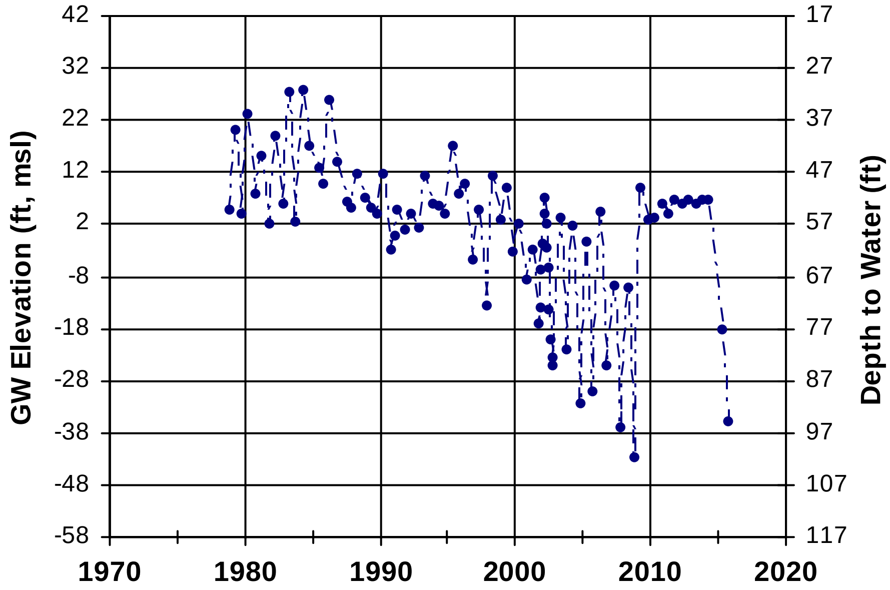
SWN: 006N004W23Q003M Source: NapaCounty



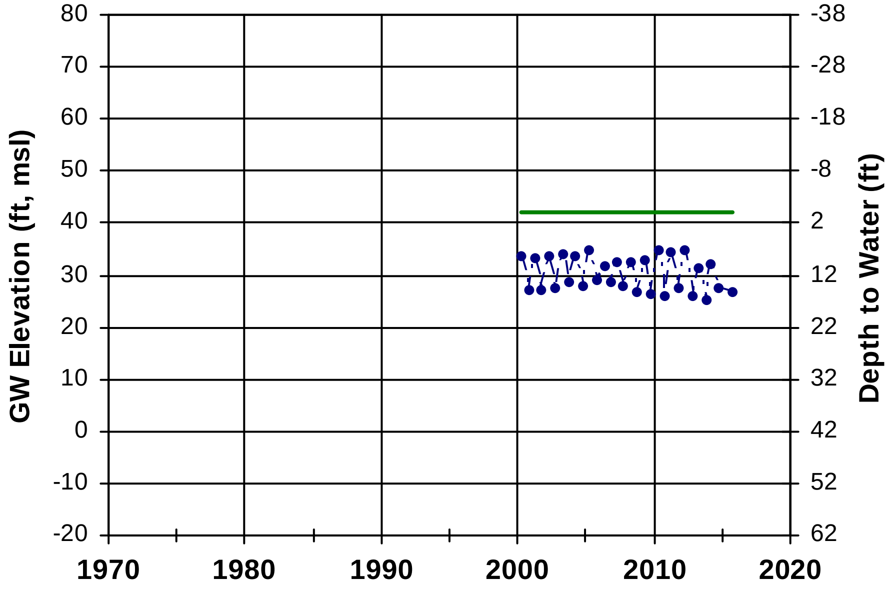
WellID: **NapaCounty-49** RPE: 79.2 ft, msl Subarea: NVF_MST
SWN: 005N004W14J003M Source: NapaCounty



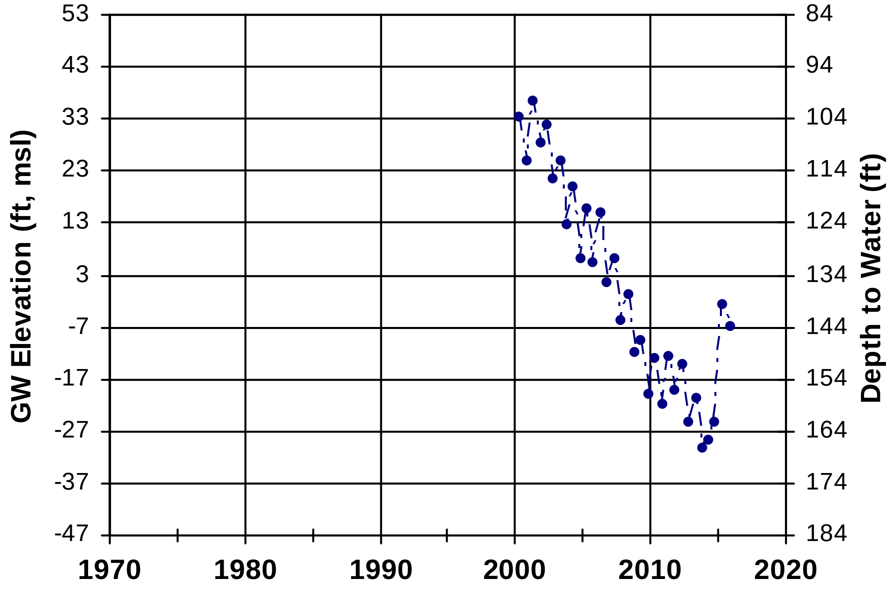
WellID: **NapaCounty-56** RPE: 58.6 ft, msl Subarea: NVF_MST
SWN: 006N004W26G001M Source: NapaCounty



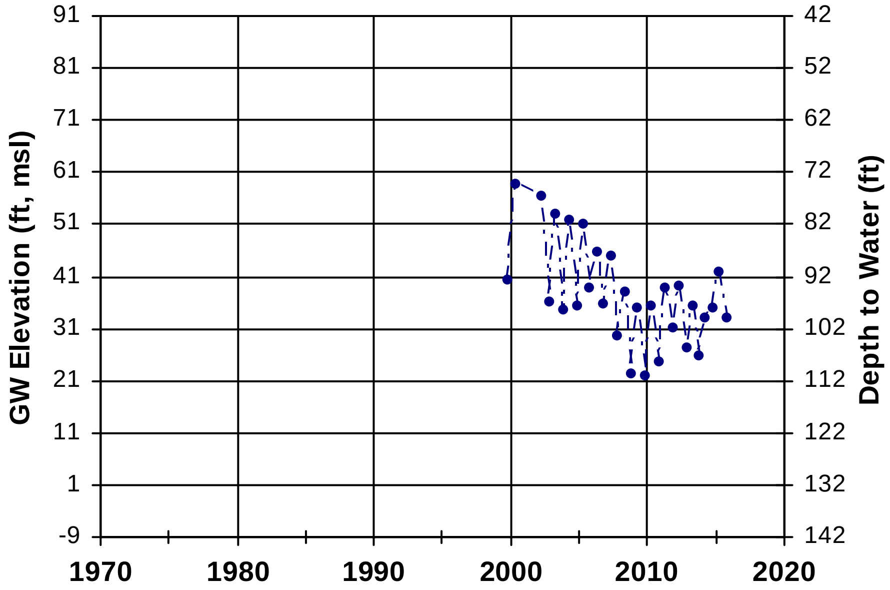
WellID: **NapaCounty-69** RPE: 42.1 ft, msl Subarea: NVF_MST
SWN: 006N004W35G005M Source: NapaCounty



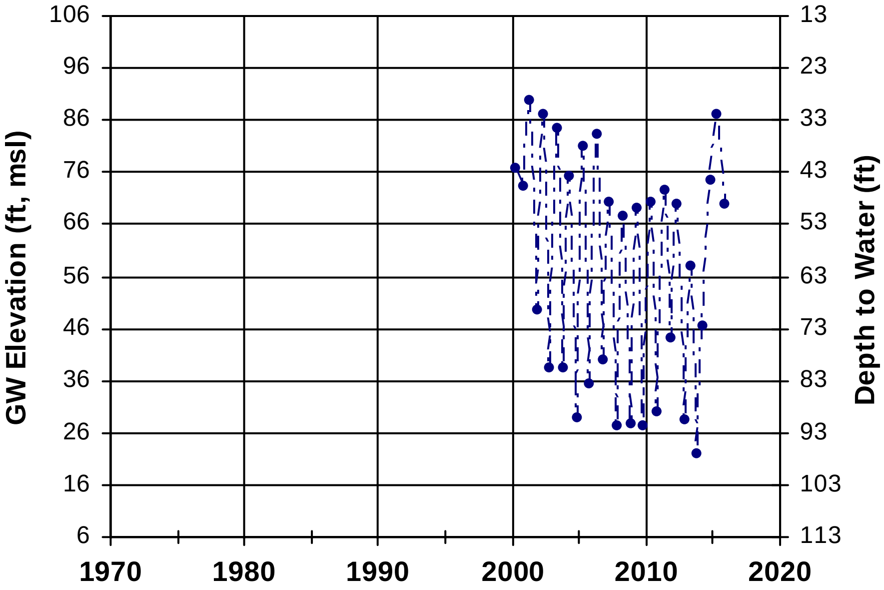
WellID: **NapaCounty-72** RPE: 137.1 ft, msl Subarea: NVF_MST
SWN: 005N003W07D003M Source: NapaCounty



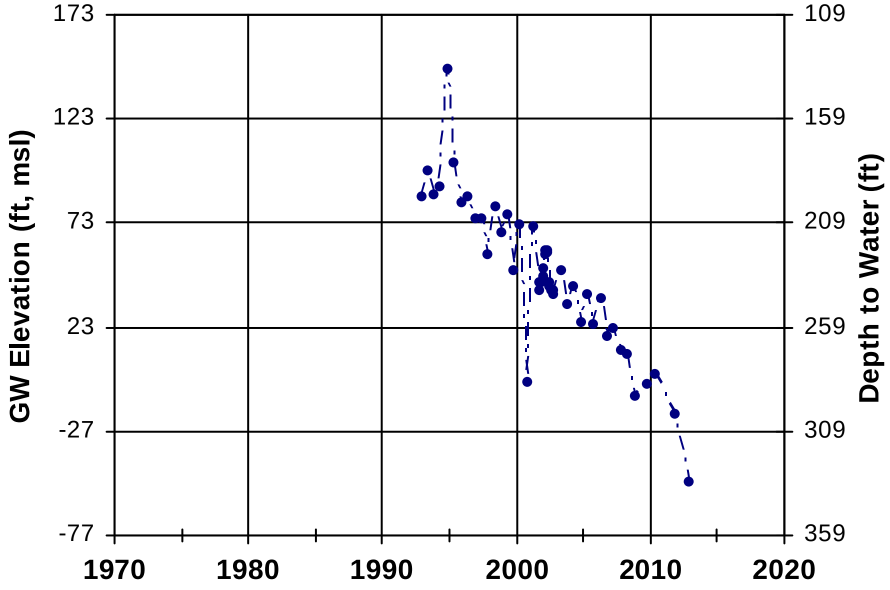
WellID: **NapaCounty-74** RPE: 133.3 ft, msl ▬ Subarea: NVF_MST
SWN: 005N003W06M001M Source: NapaCounty



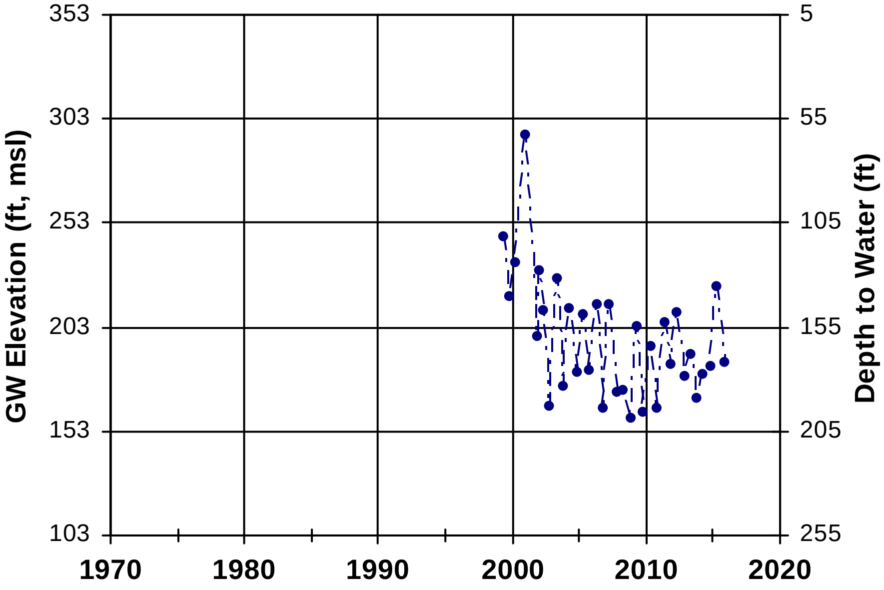
WellID: **NapaCounty-81** RPE: 118.6 ft, msl ▬ Subarea: NVF_MST
SWN: 005N003W07F003M Source: NapaCounty



WellID: **NapaCounty-91** RPE: 281.9 ft, msl ▬ Subarea: NVF_MST
SWN: 005N003W06B002M Source: NapaCounty

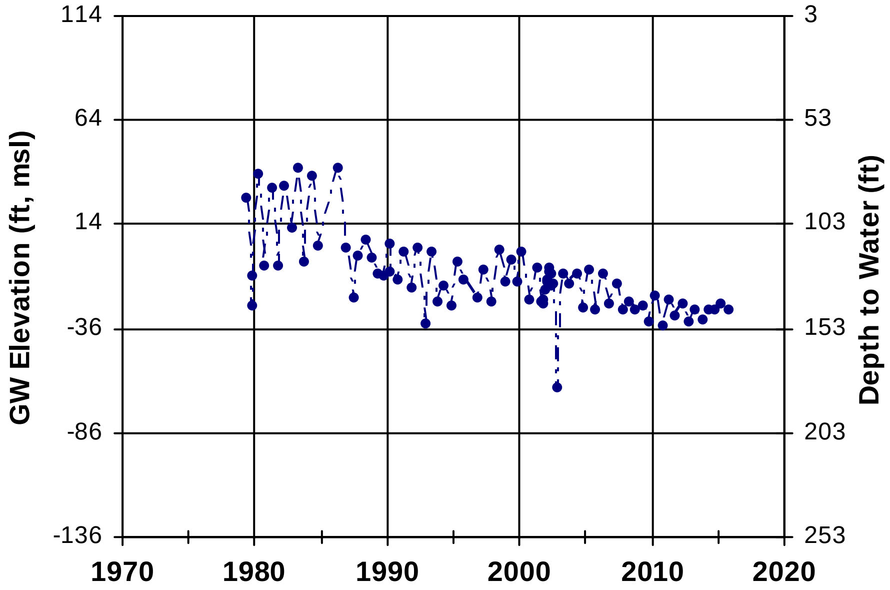


WellID: **NapaCounty-92** RPE: 358.2 ft, msl ▬ Subarea: NVF_MST
SWN: 005N003W06A001M Source: NapaCounty



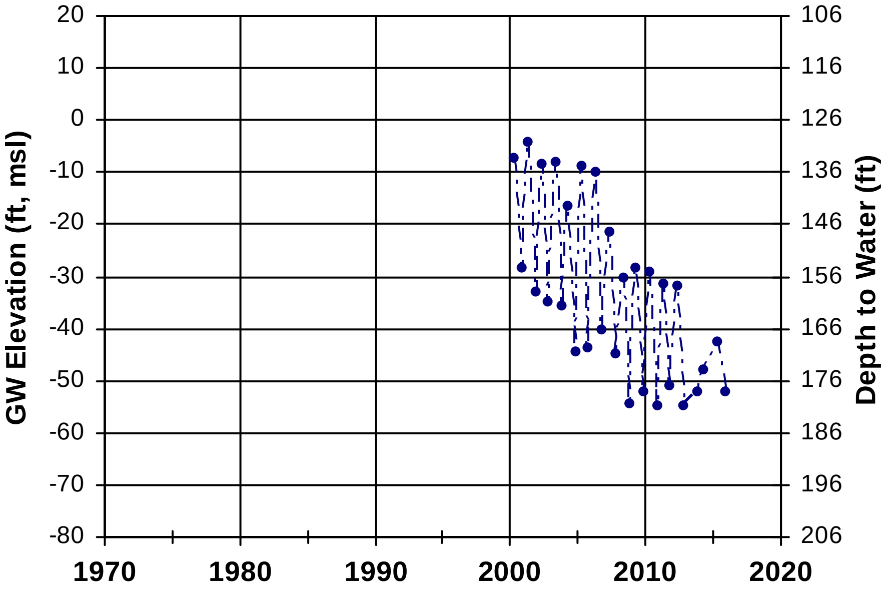
WellID: **NapaCounty-95** RPE: 116.9 ft, msl Subarea: NVF_MST

SWN: 006N004W36G001M Source: NapaCounty



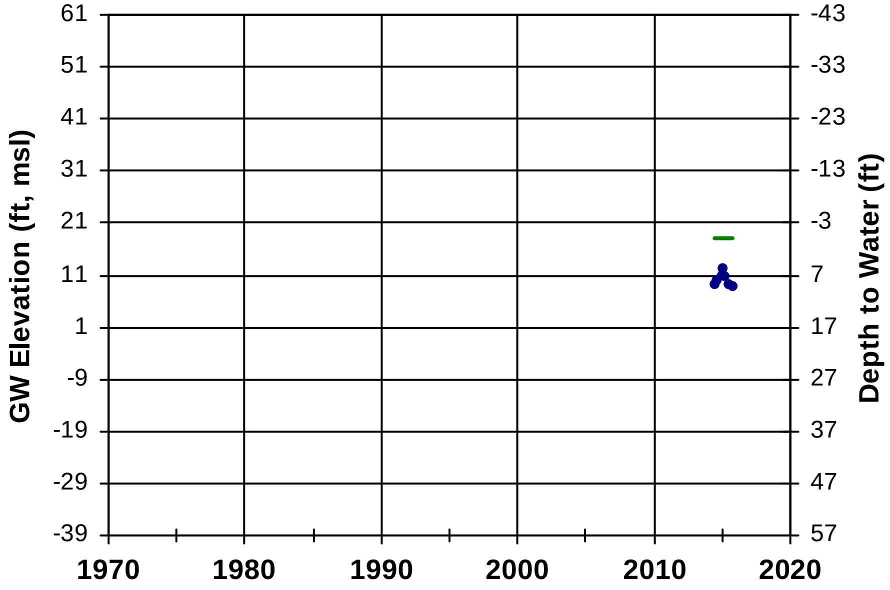
WellID: **NapaCounty-98** RPE: 125.7 ft, msl Subarea: NVF_MST

SWN: 006N004W36A001M Source: NapaCounty



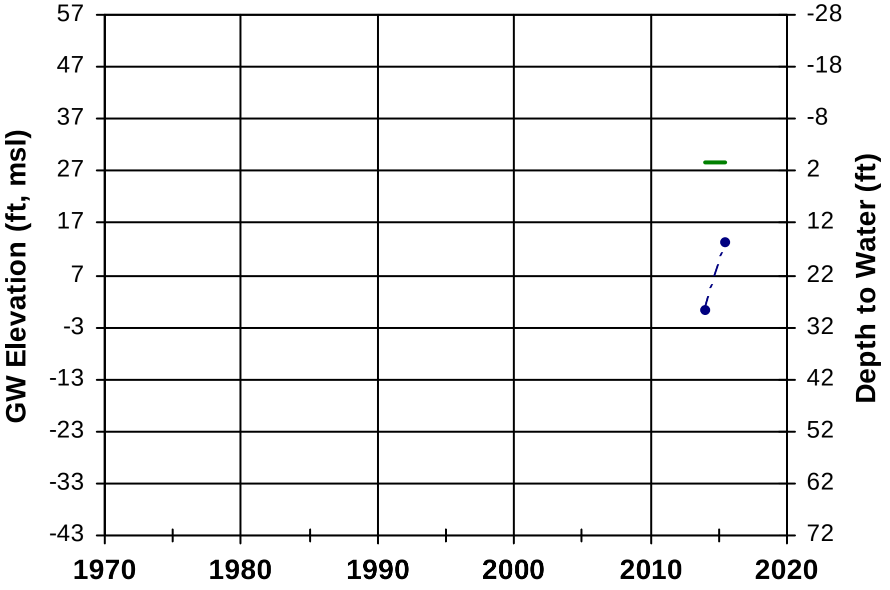
WellID: **T0605500200MW-1** RPE: 18.16 ft, msl Subarea: NVF_MST

SWN: Unknown Source: Geotracker

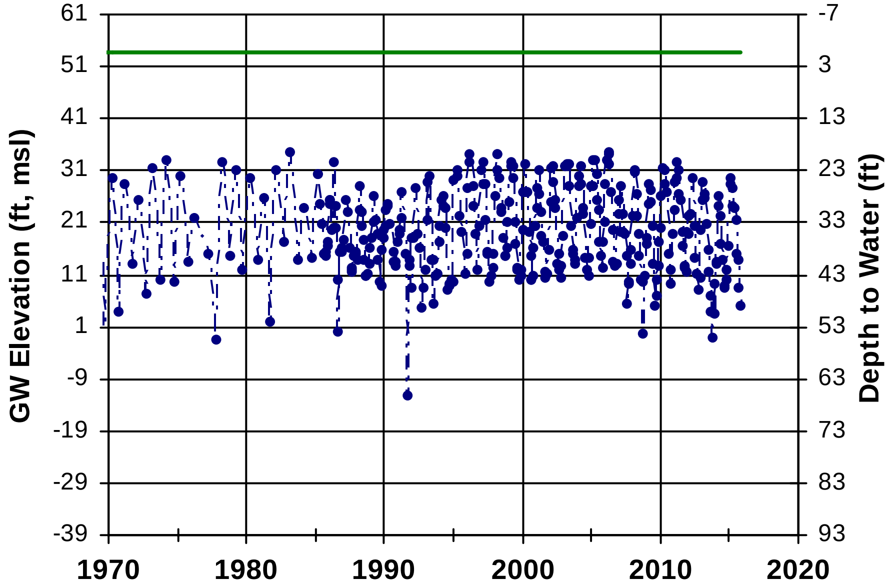


WellID: **T10000005248MW-** RPE: 28.81 ft, msl Subarea: NVF_MST

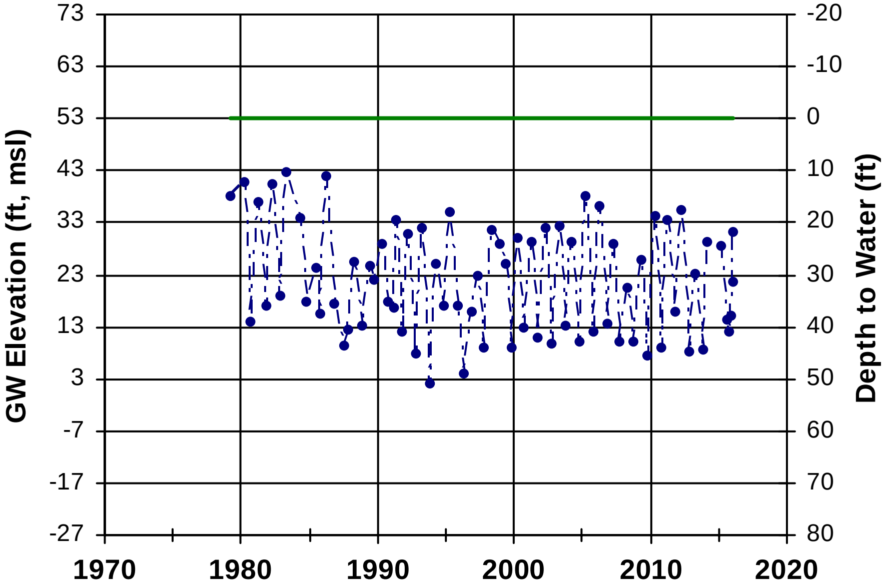
SWN: Unknown Source: Geotracker



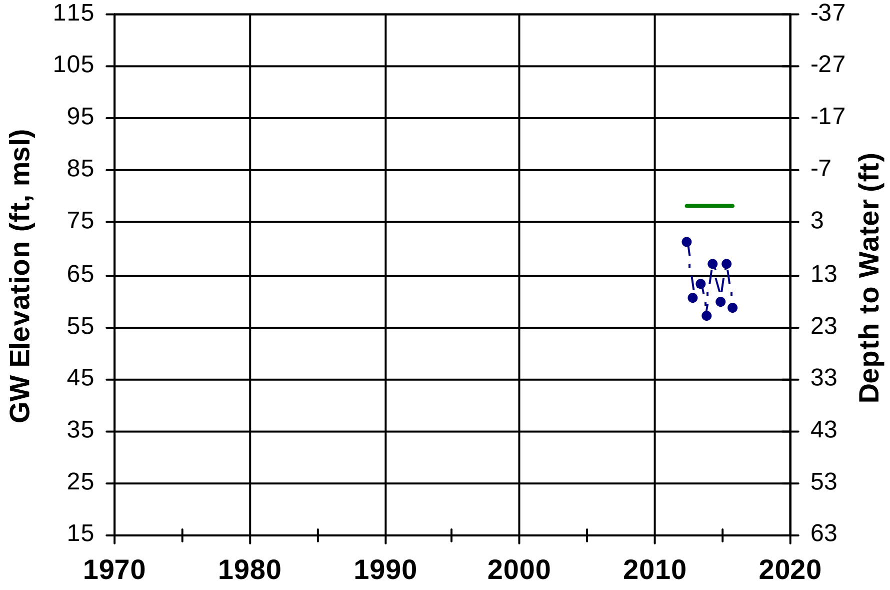
WellID: **06N04W27L002M** RPE: 53.6 ft, msl Subarea: NVF_Napa
SWN: 006N004W27L002M Source: DWR



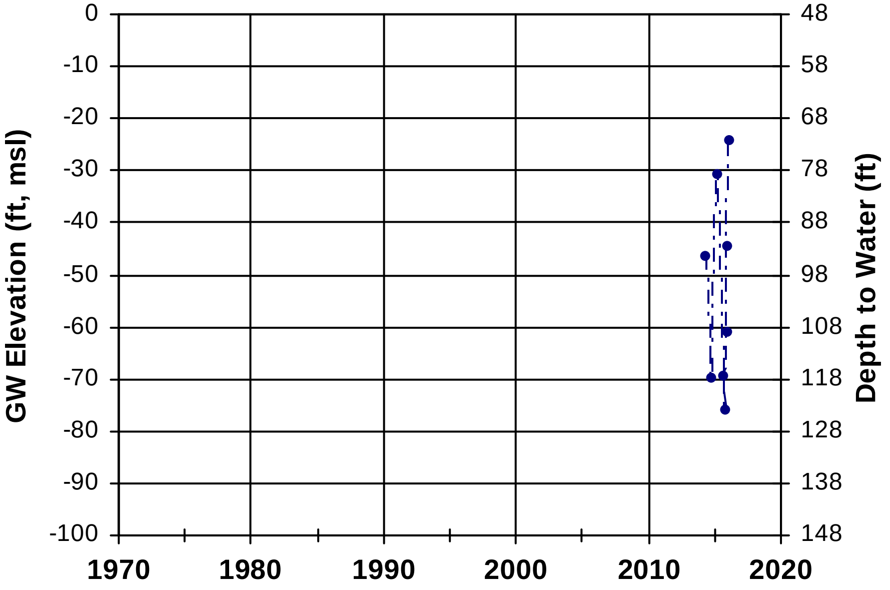
WellID: **NapaCounty-136** RPE: 53.2 ft, msl Subarea: NVF_Napa
SWN: 006N004W27N001M Source: NapaCounty



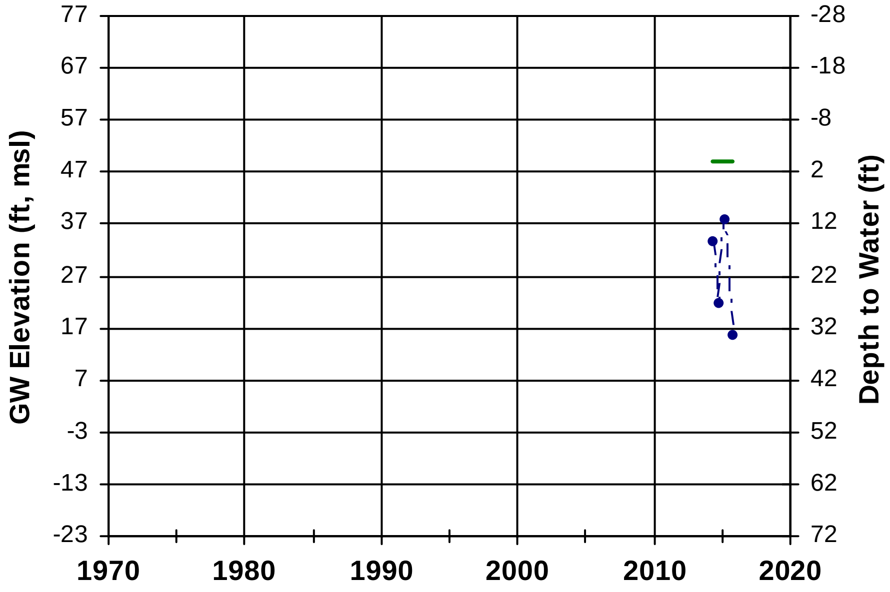
WellID: **NapaCounty-152** RPE: 78.3 ft, msl Subarea: NVF_Napa
SWN: 006N004W28Mx Source: NapaCounty



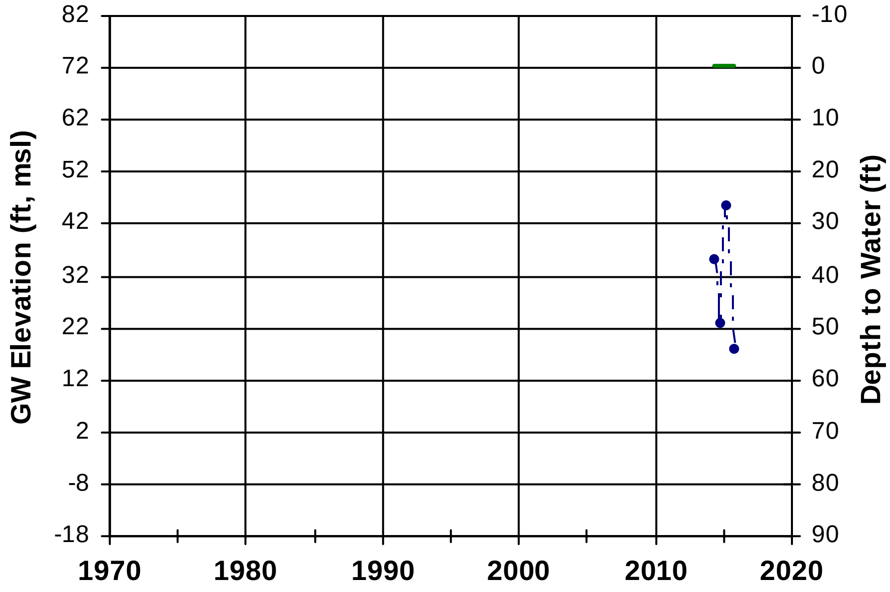
WellID: **NapaCounty-182** RPE: 48.1 ft, msl Subarea: NVF_Napa
SWN: Unknown Source: NapaCounty



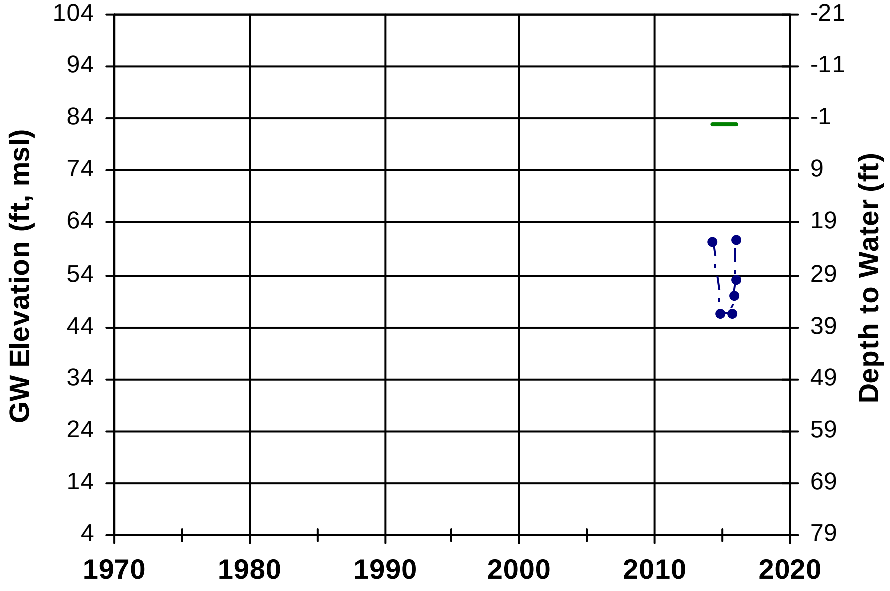
WellID: **NapaCounty-183** RPE: 48.9 ft, msl ▬ Subarea: NVF_Napa
SWN: Unknown Source: NapaCounty



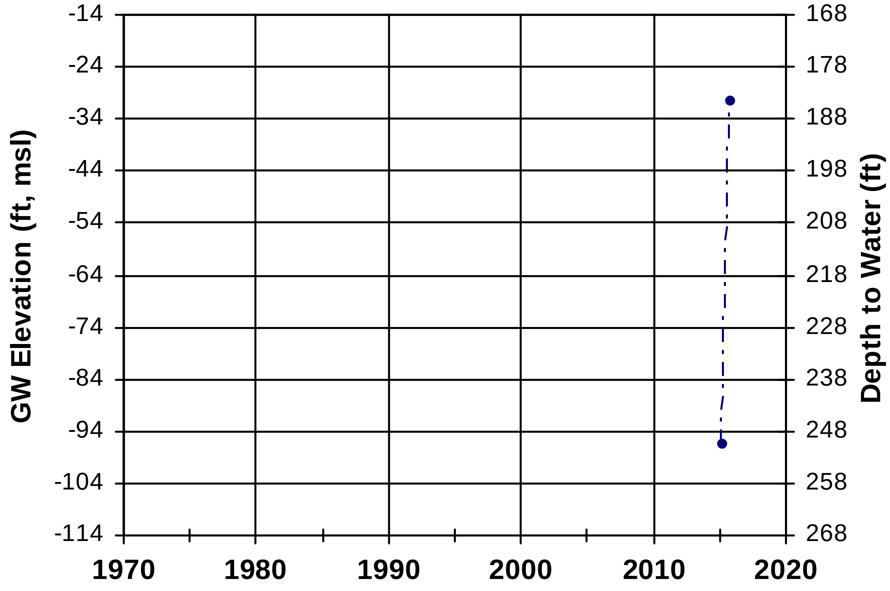
WellID: **NapaCounty-184** RPE: 72.5 ft, msl ▬ Subarea: NVF_Napa
SWN: Unknown Source: NapaCounty



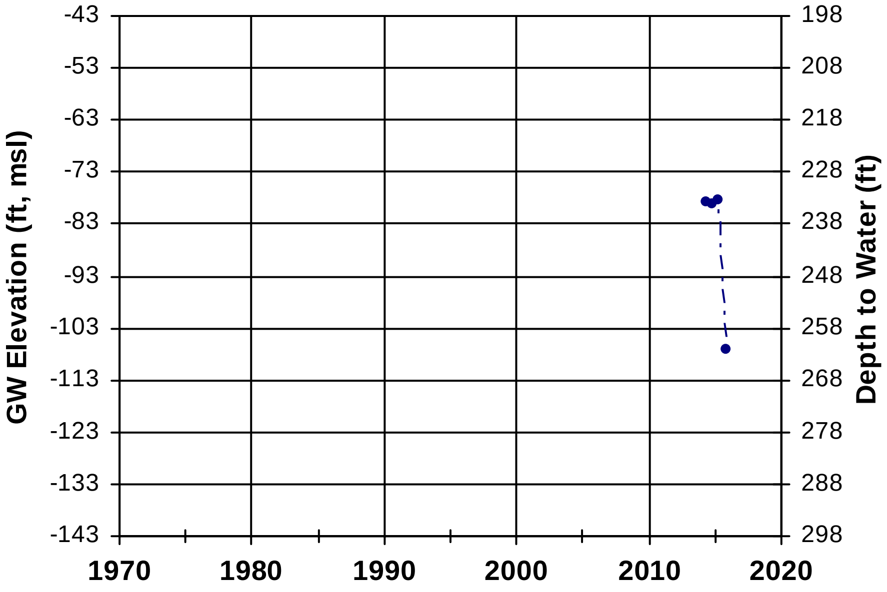
WellID: **NapaCounty-185** RPE: 83 ft, msl ▬ Subarea: NVF_Napa
SWN: Unknown Source: NapaCounty



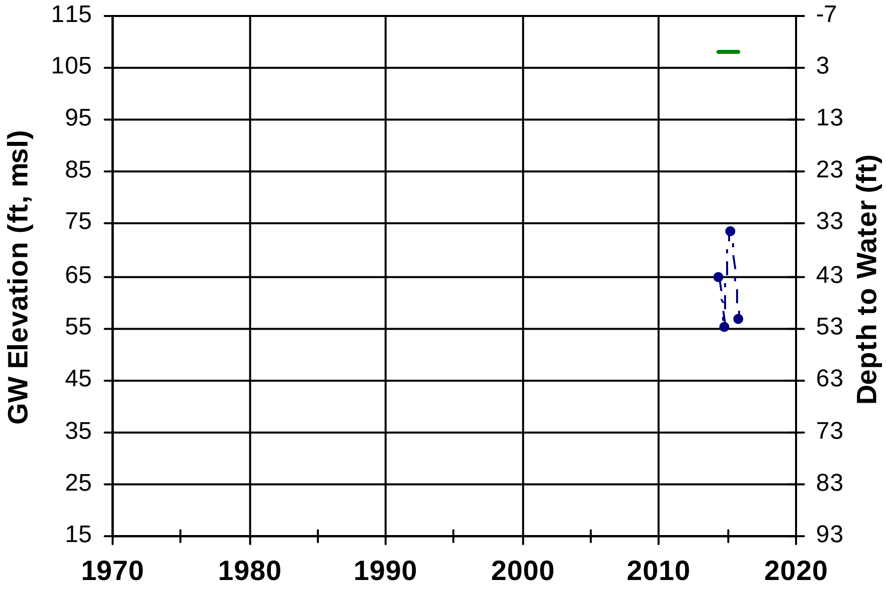
WellID: **NapaCounty-187** RPE: 153.5 ft, msl ▬ Subarea: NVF_Napa
SWN: Unknown Source: NapaCounty



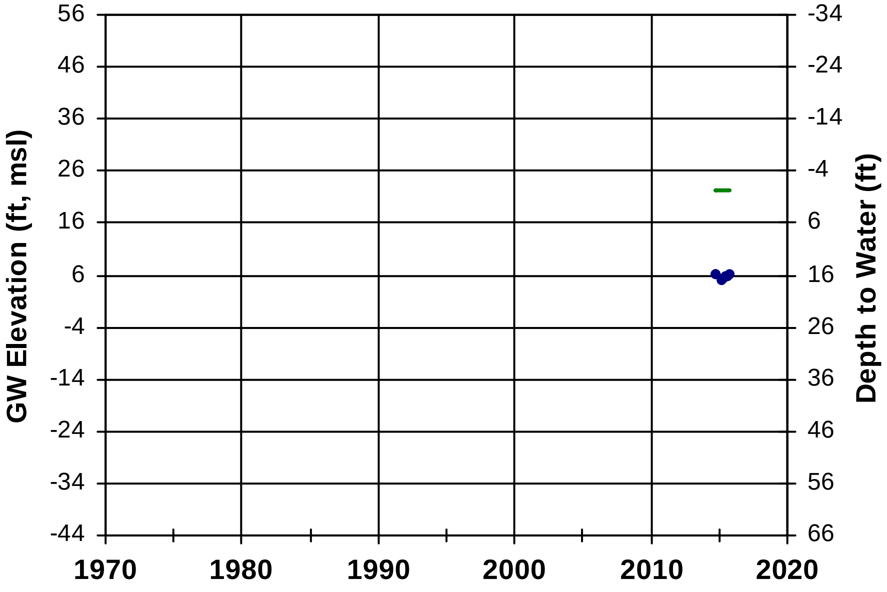
WellID: **NapaCounty-188** RPE: 154.6 ft, msl ▬ Subarea: NVF_Napa
SWN: Unknown Source: NapaCounty



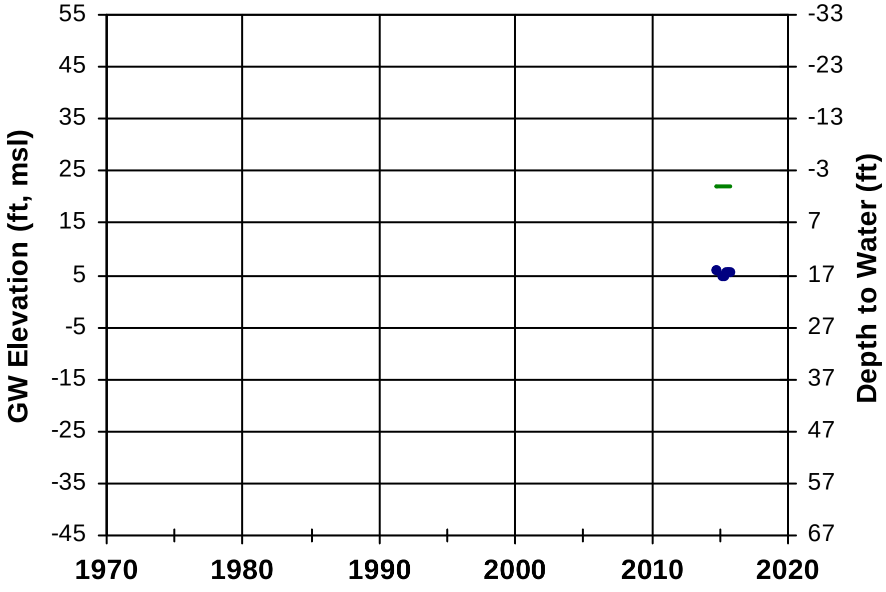
WellID: **NapaCounty-189** RPE: 108.25 ft, msl ▬ Subarea: NVF_Napa
SWN: Unknown Source: NapaCounty



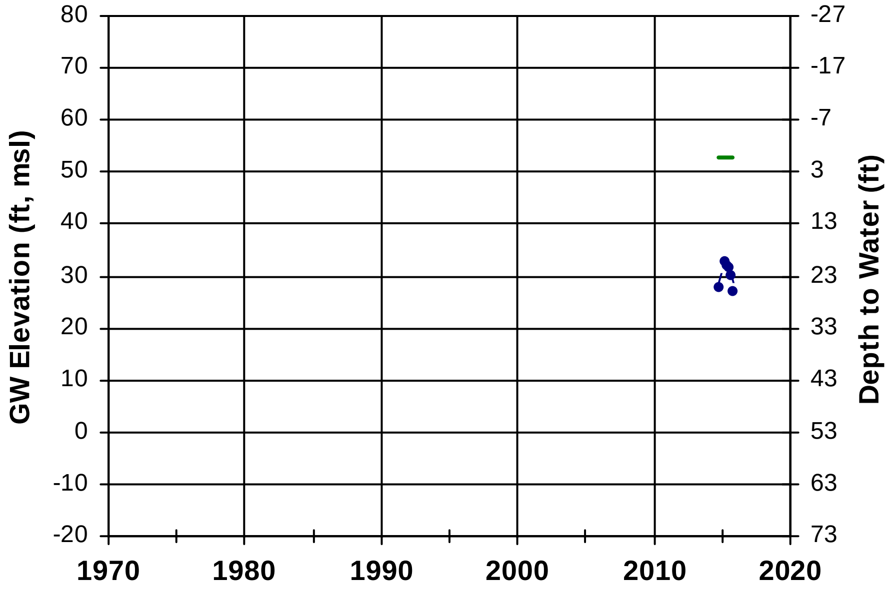
WellID: **NapaCounty-214s-s** RPE: 22.1 ft, msl ▬ Subarea: NVF_Napa
SWN: Unknown Source: NapaCounty



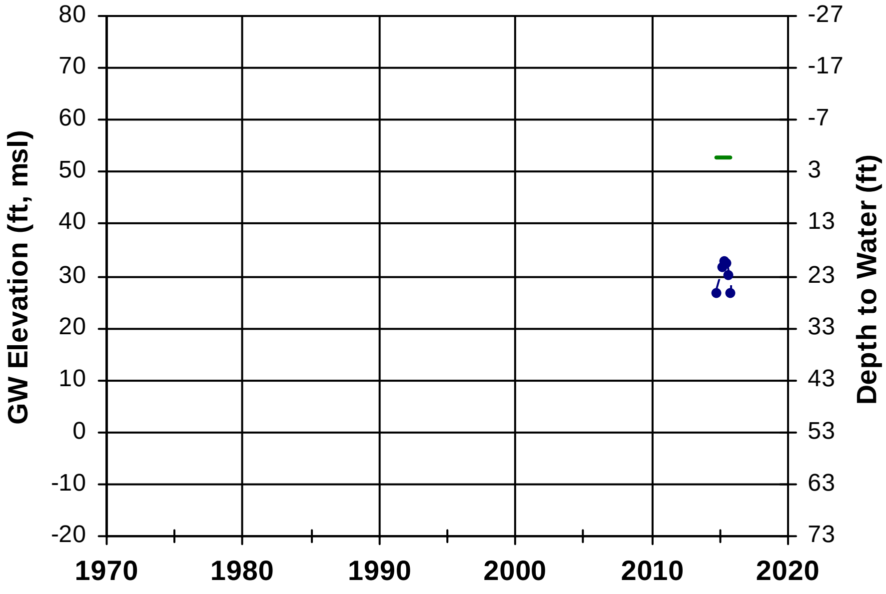
WellID: **NapaCounty-215d-s** RPE: 22.05 ft, msl ▬ Subarea: NVF_Napa
SWN: Unknown Source: NapaCounty



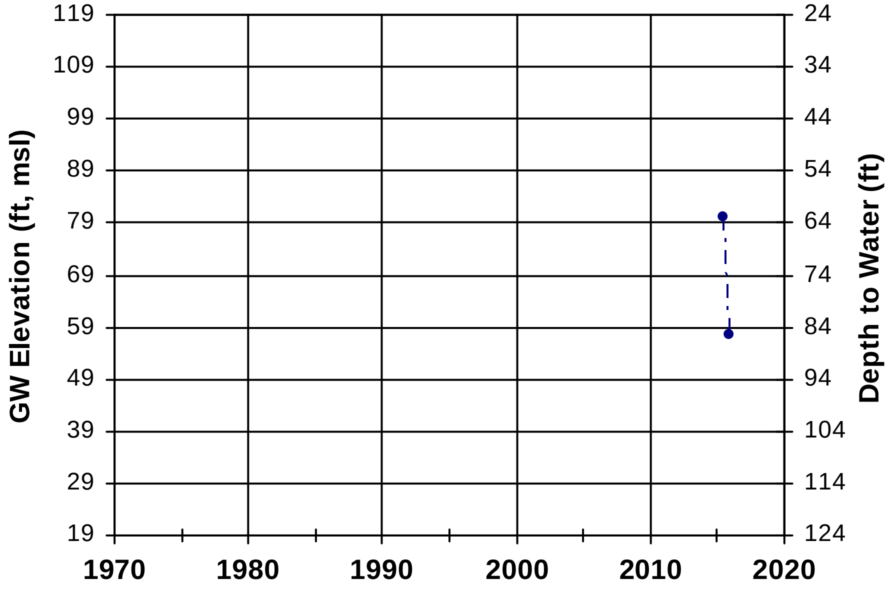
WellID: **NapaCounty-218s-s** RPE: 52.8 ft, msl Subarea: NVF_Napa
SWN: Unknown Source: NapaCounty



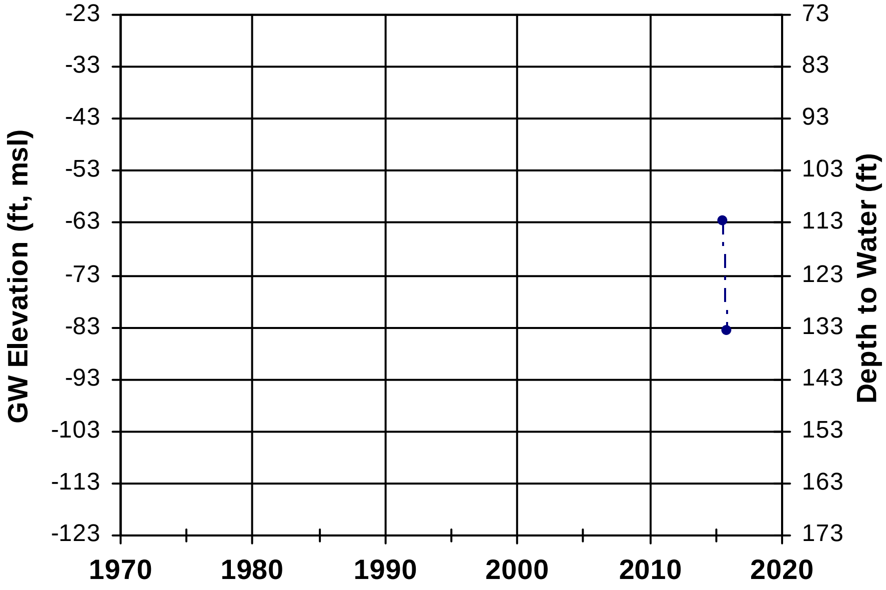
WellID: **NapaCounty-219d-s** RPE: 52.75 ft, msl Subarea: NVF_Napa
SWN: Unknown Source: NapaCounty



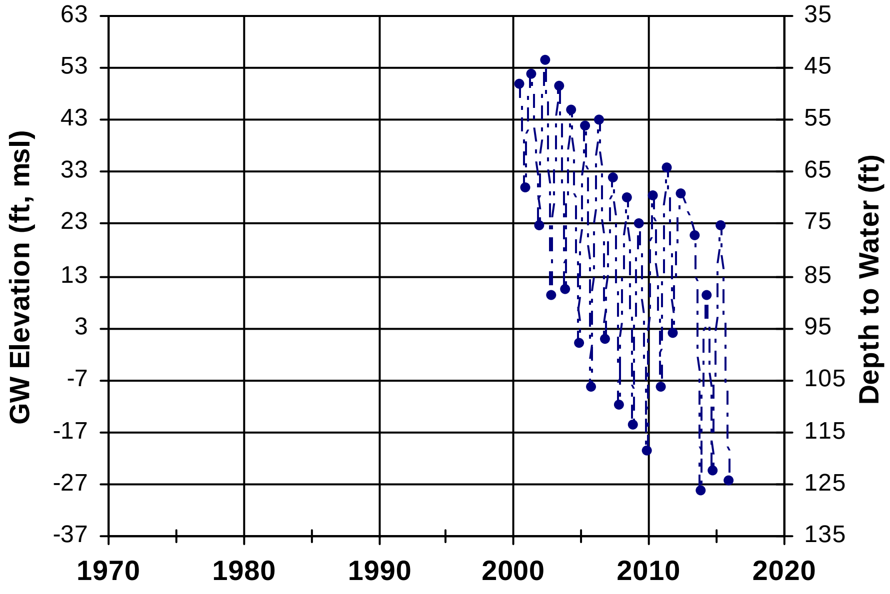
WellID: **NapaCounty-227** RPE: 143.3 ft, msl Subarea: NVF_Napa
SWN: Unknown Source: NapaCounty



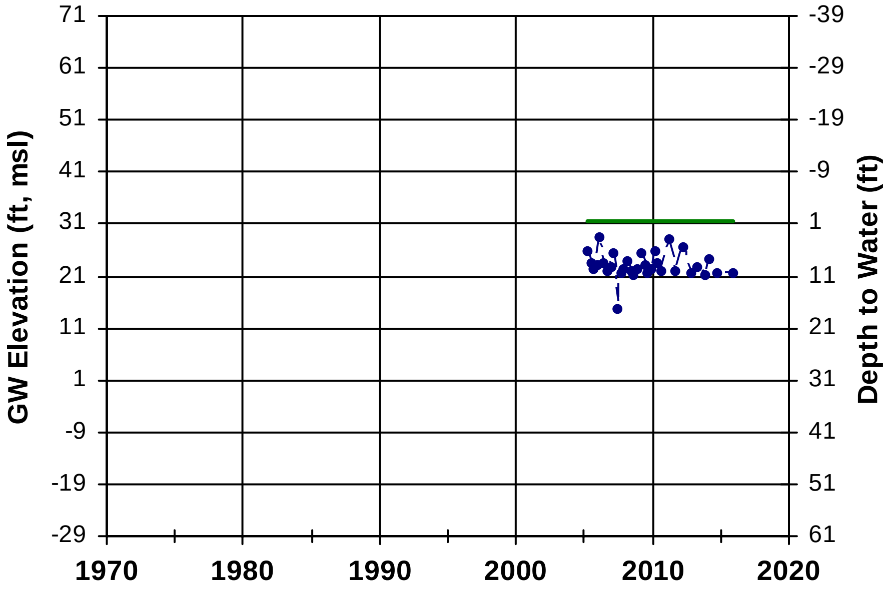
WellID: **NapaCounty-228** RPE: 50.2 ft, msl Subarea: NVF_Napa
SWN: Unknown Source: NapaCounty



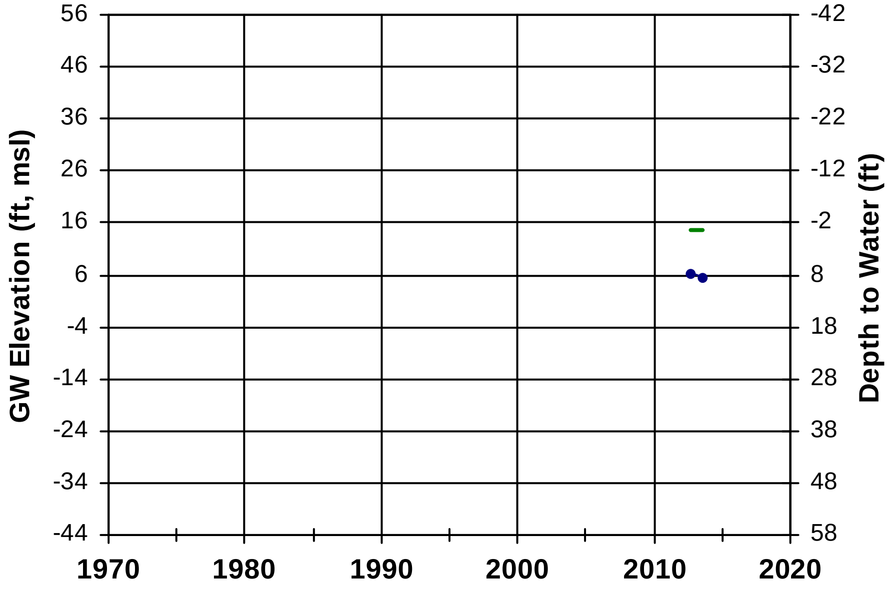
WellID: **NapaCounty-76** RPE: 97.7 ft, msl Subarea: NVF_Napa
SWN: 006N004W15R003M Source: NapaCounty



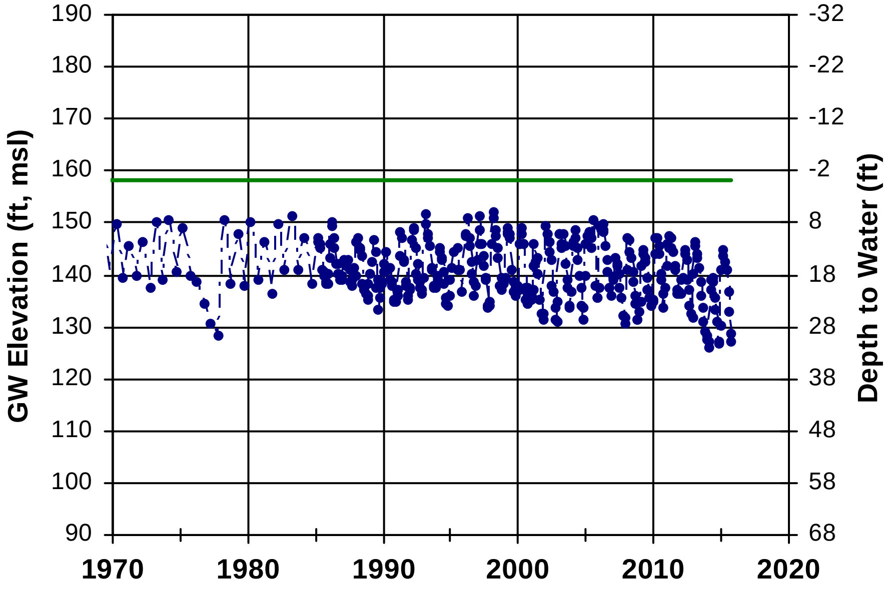
WellID: **SL0605536682MW-** RPE: 31.63 ft, msl Subarea: NVF_Napa
SWN: Unknown Source: Geotracker



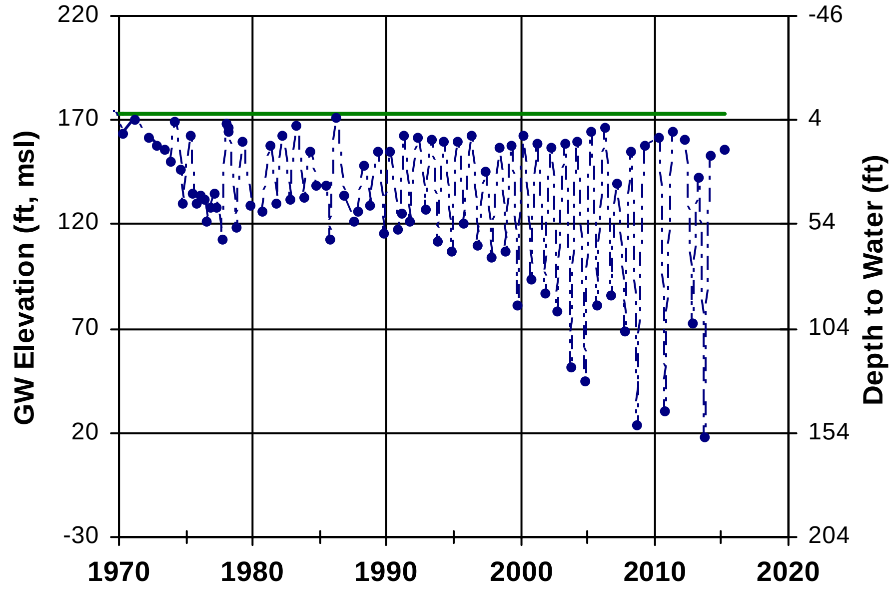
WellID: **T0605514064DPE1** RPE: 14.47 ft, msl Subarea: NVF_Napa
SWN: Unknown Source: Geotracker



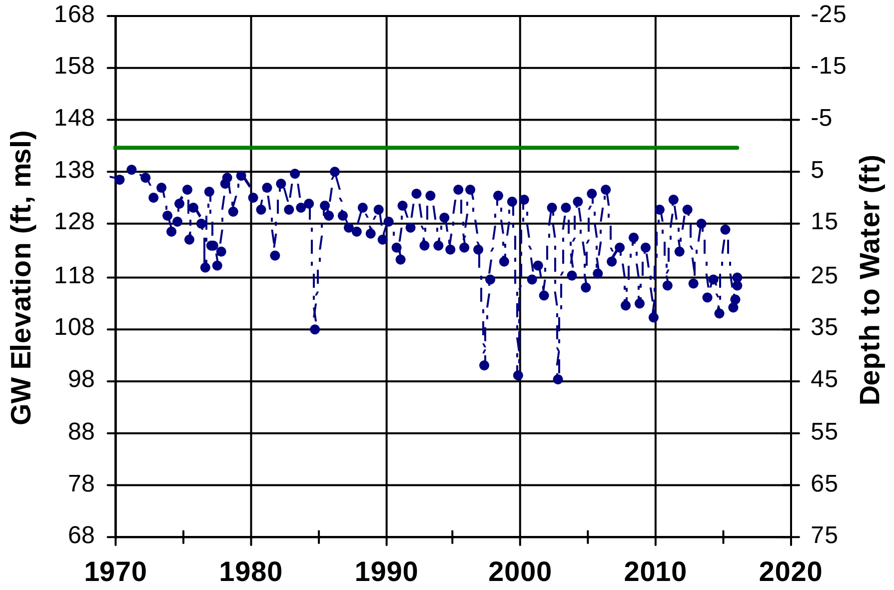
WellID: **07N05W09Q002M** RPE: 158.24 ft, msl Subarea: NVF_SH
SWN: 007N005W09Q002M Source: DWR



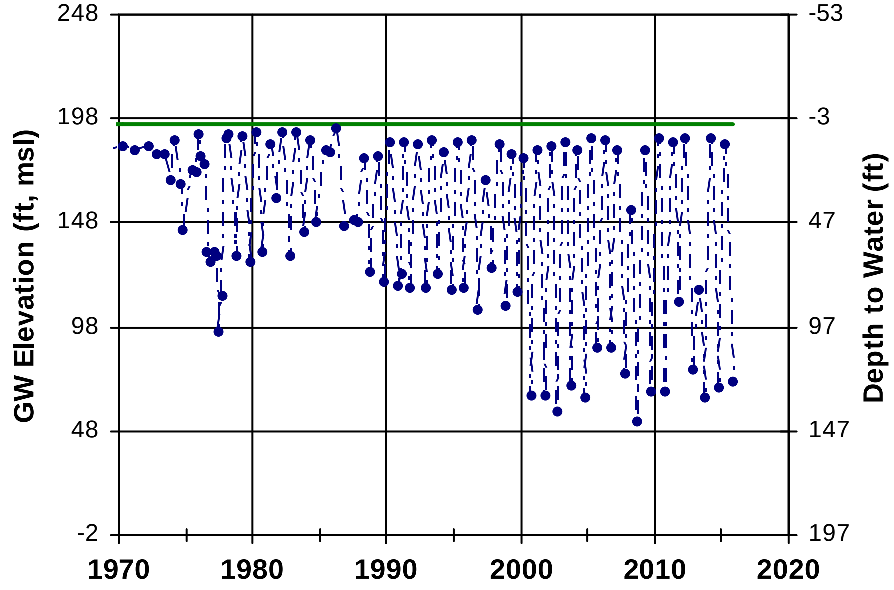
WellID: **NapaCounty-131** RPE: 173.5 ft, msl — Subarea: NVF_SH
SWN: 007N005W16L001M Source: NapaCounty



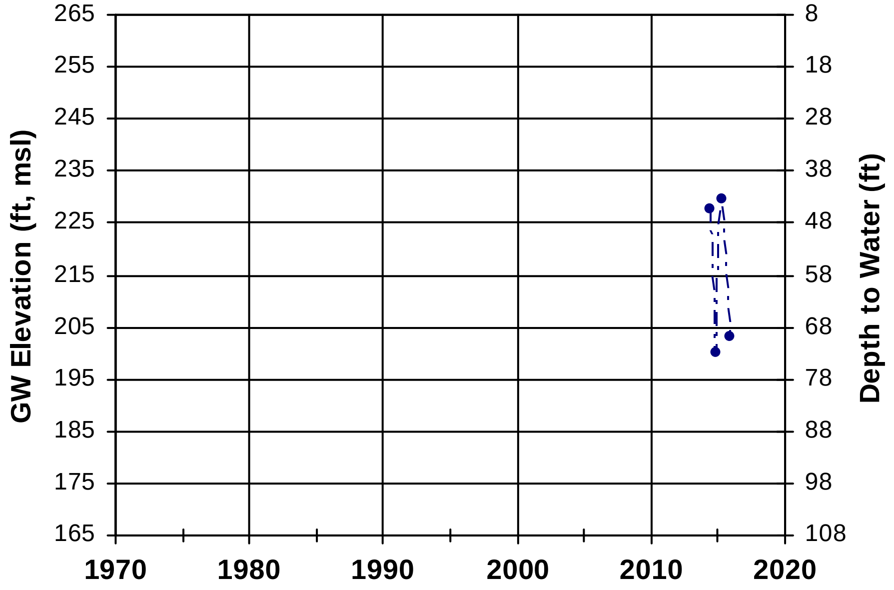
WellID: **NapaCounty-132** RPE: 142.7 ft, msl — Subarea: NVF_SH
SWN: 007N005W14B002M Source: NapaCounty



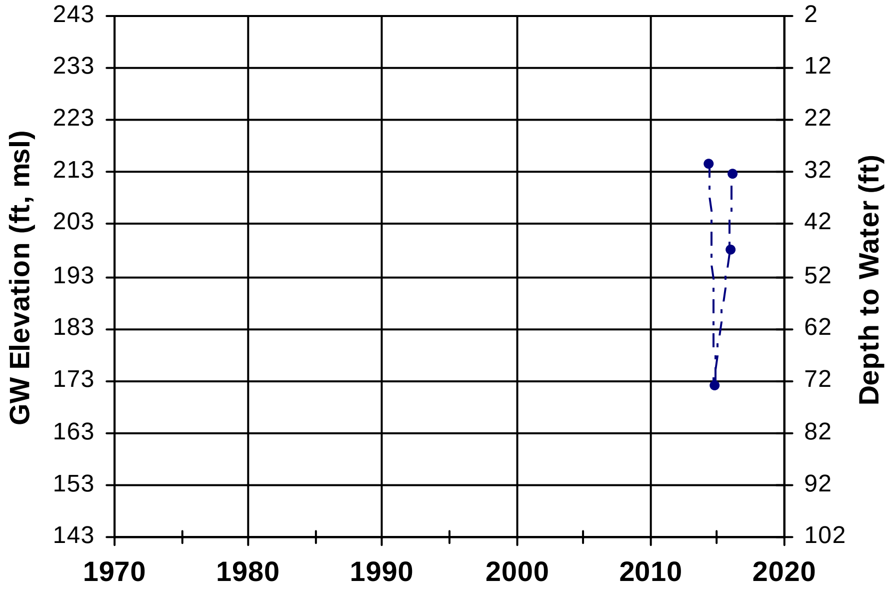
WellID: **NapaCounty-138** RPE: 195.1 ft, msl — Subarea: NVF_SH
SWN: 007N005W16N002M Source: NapaCounty



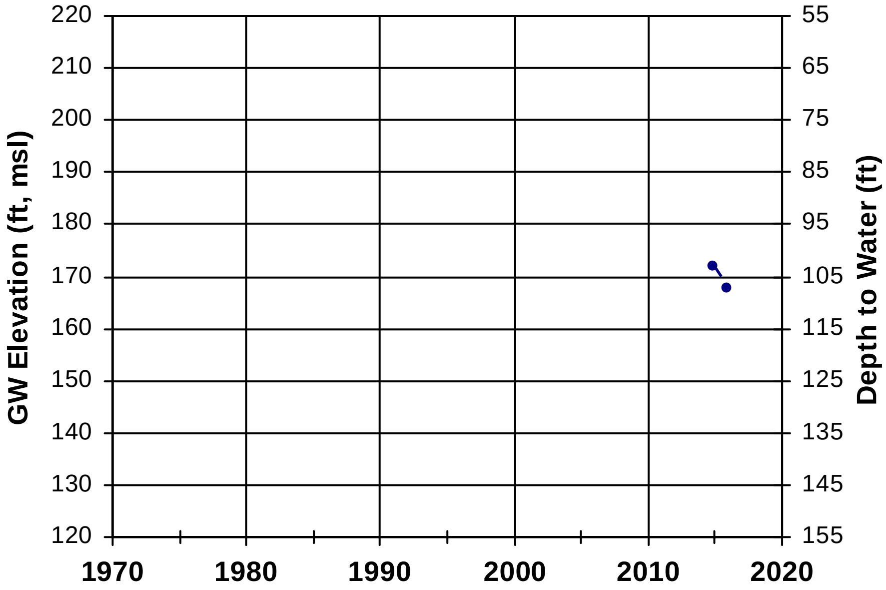
WellID: **NapaCounty-169** RPE: 273.4 ft, msl — Subarea: NVF_SH
SWN: Unknown Source: NapaCounty



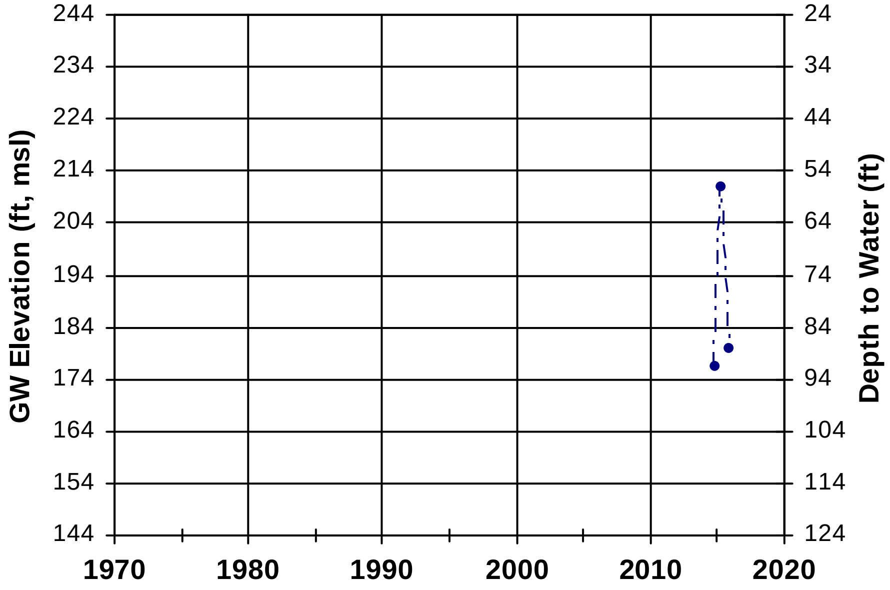
WellID: **NapaCounty-171** RPE: 245.1 ft, msl Subarea: NVF_SH
SWN: Unknown Source: NapaCounty



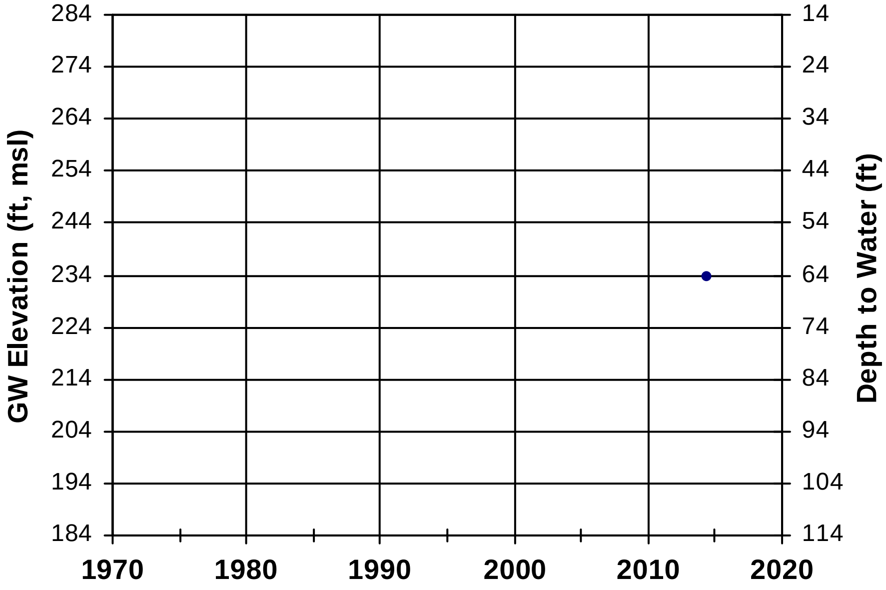
WellID: **NapaCounty-172** RPE: 275.2 ft, msl Subarea: NVF_SH
SWN: Unknown Source: NapaCounty



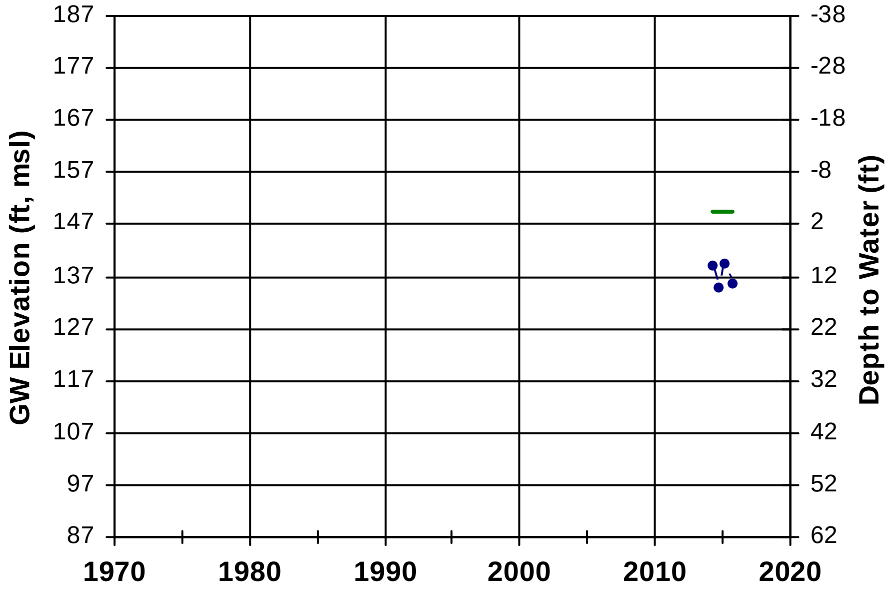
WellID: **NapaCounty-173** RPE: 268.3 ft, msl Subarea: NVF_SH
SWN: Unknown Source: NapaCounty



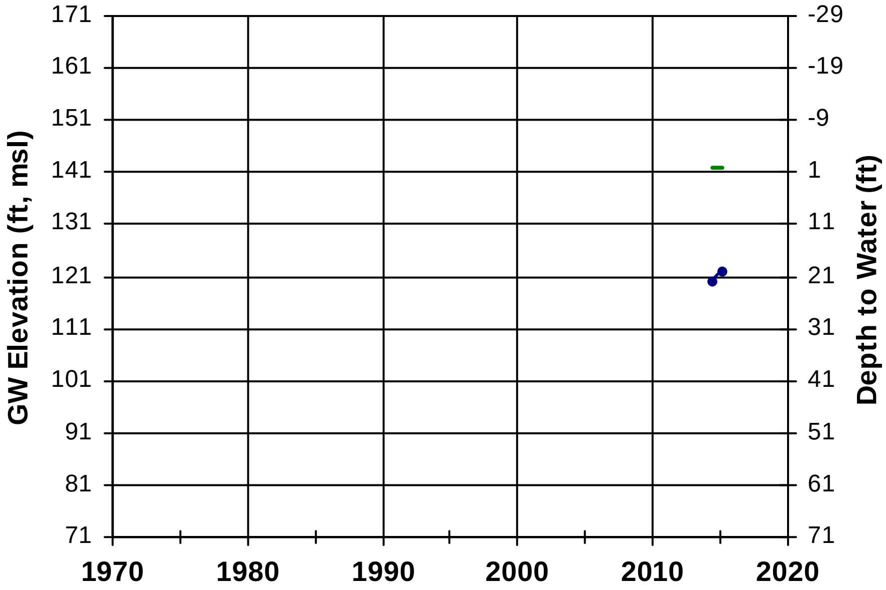
WellID: **NapaCounty-174** RPE: 298.2 ft, msl Subarea: NVF_SH
SWN: Unknown Source: NapaCounty



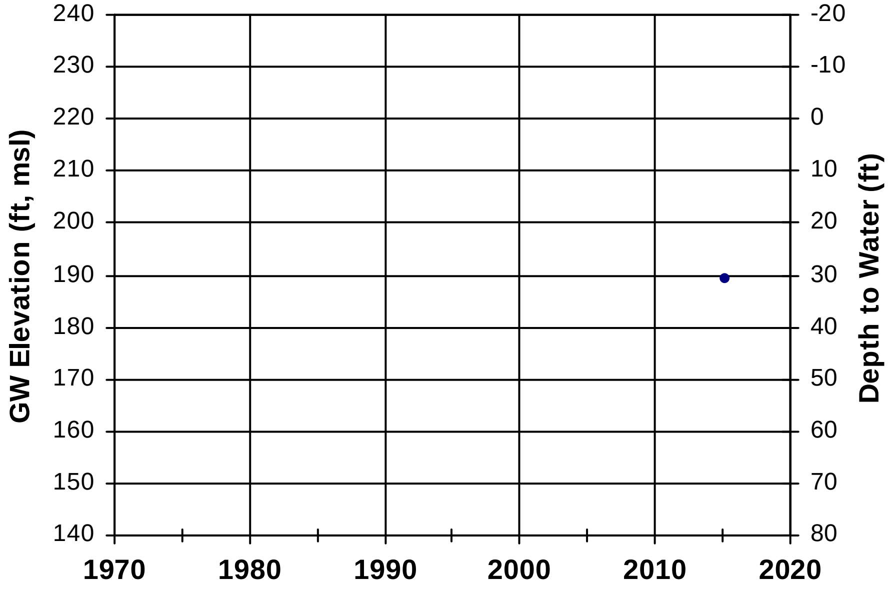
WellID: **NapaCounty-177** RPE: 149.3 ft, msl ▬ Subarea: NVF_SH
SWN: Unknown Source: NapaCounty



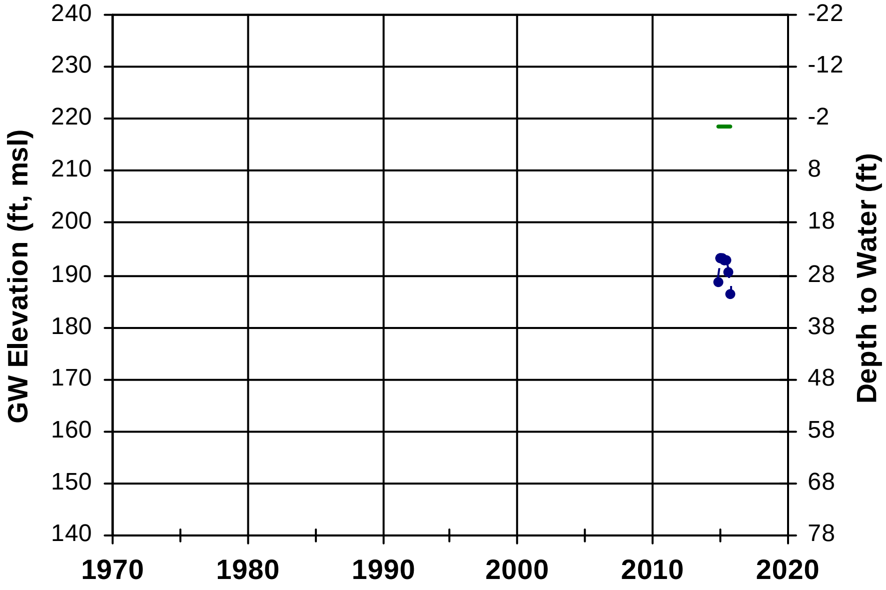
WellID: **NapaCounty-204** RPE: 141.7 ft, msl ▬ Subarea: NVF_SH
SWN: Unknown Source: NapaCounty



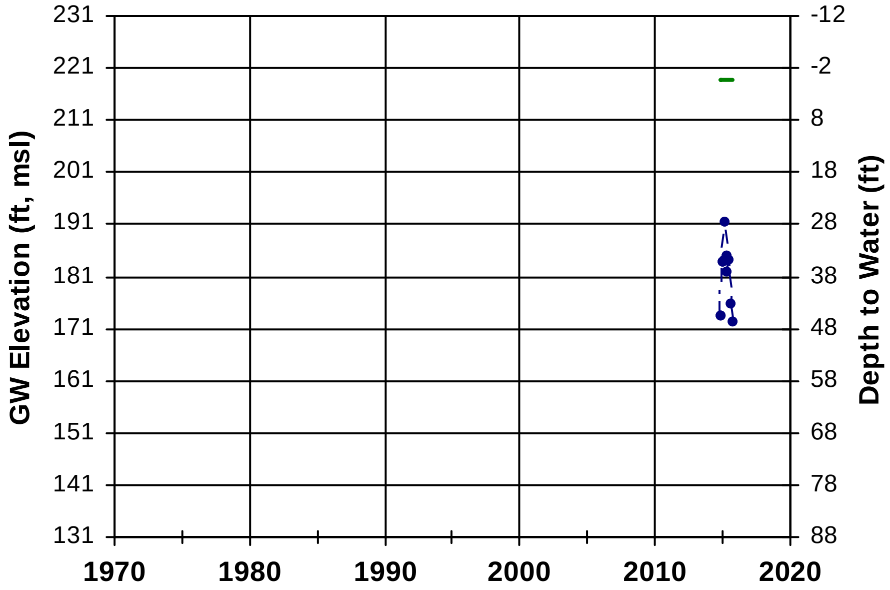
WellID: **NapaCounty-212** RPE: 220.5 ft, msl ▬ Subarea: NVF_SH
SWN: Unknown Source: NapaCounty



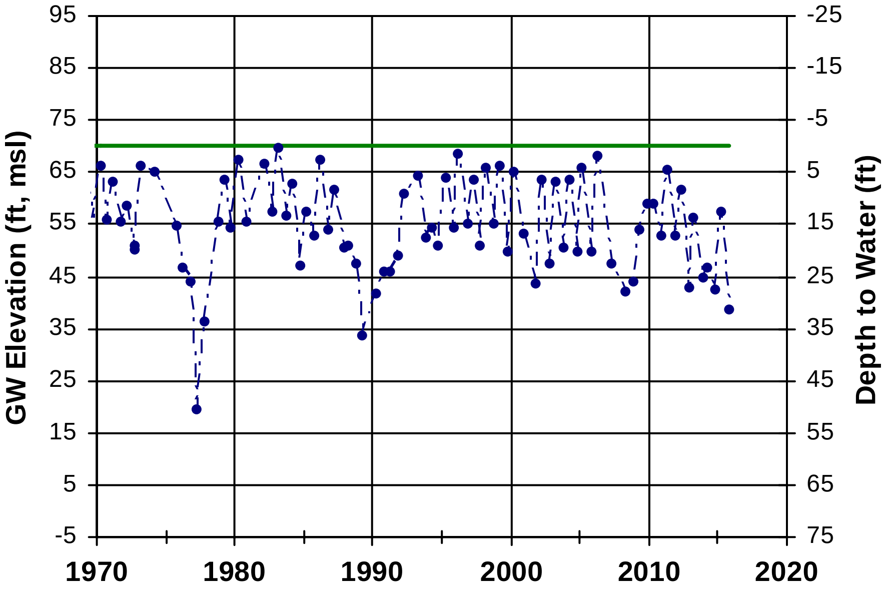
WellID: **NapaCounty-222s-s** RPE: 218.5 ft, msl ▬ Subarea: NVF_SH
SWN: Unknown Source: NapaCounty



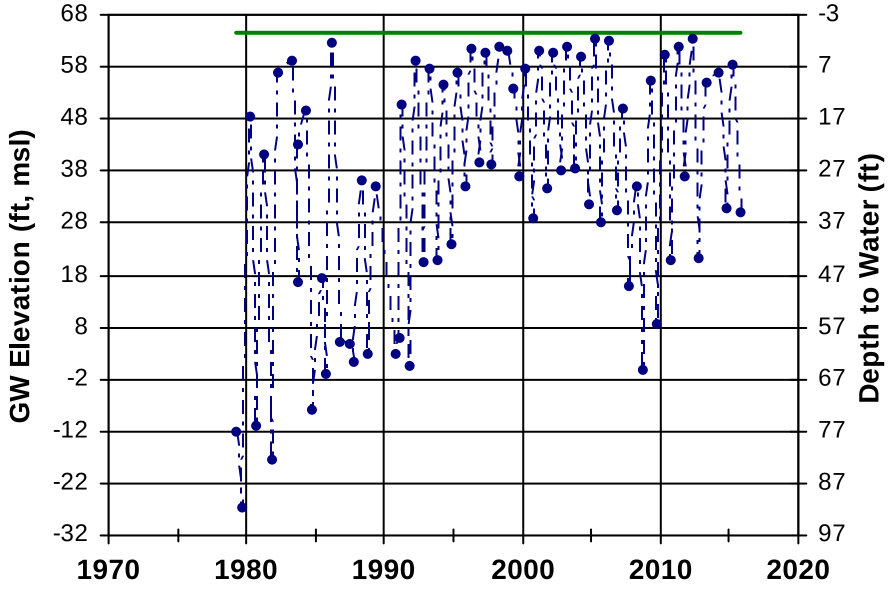
WellID: **NapaCounty-223d-s** RPE: 218.55 ft, msl Subarea: NVF_SH
SWN: Unknown Source: NapaCounty



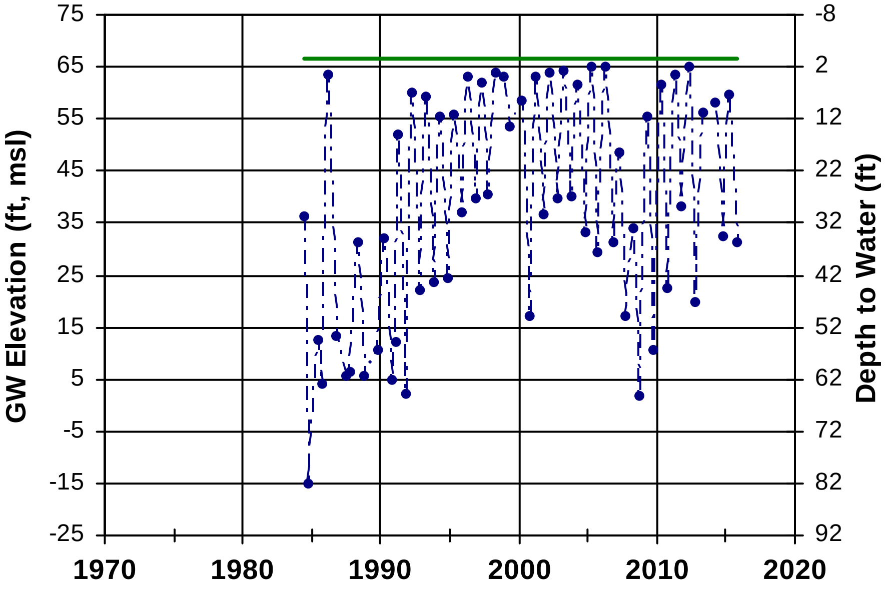
WellID: **06N04W17A001M** RPE: 70.26 ft, msl Subarea: NVF_Yount
SWN: 006N004W17A001M Source: DWR



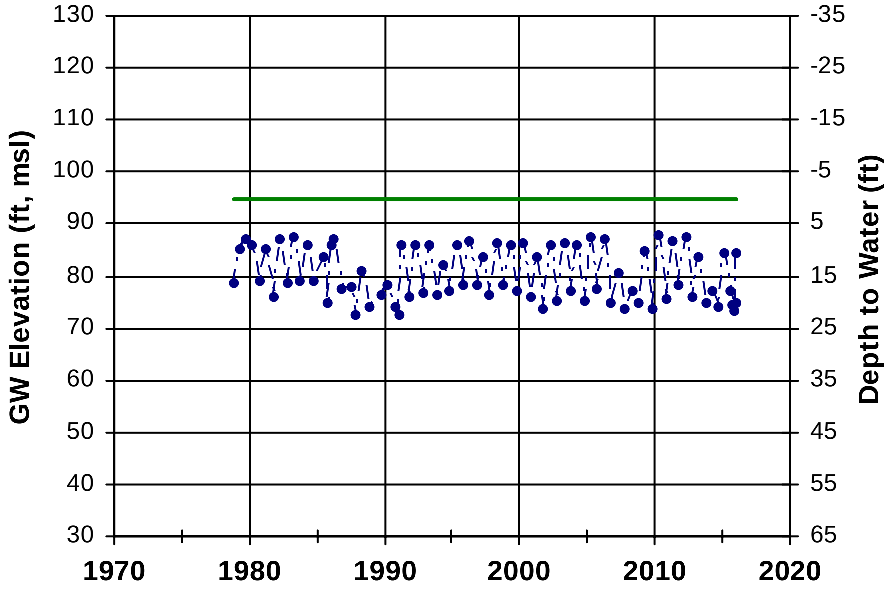
WellID: **NapaCounty-125** RPE: 64.6 ft, msl Subarea: NVF_Yount
SWN: 006N004W09Q001M Source: NapaCounty



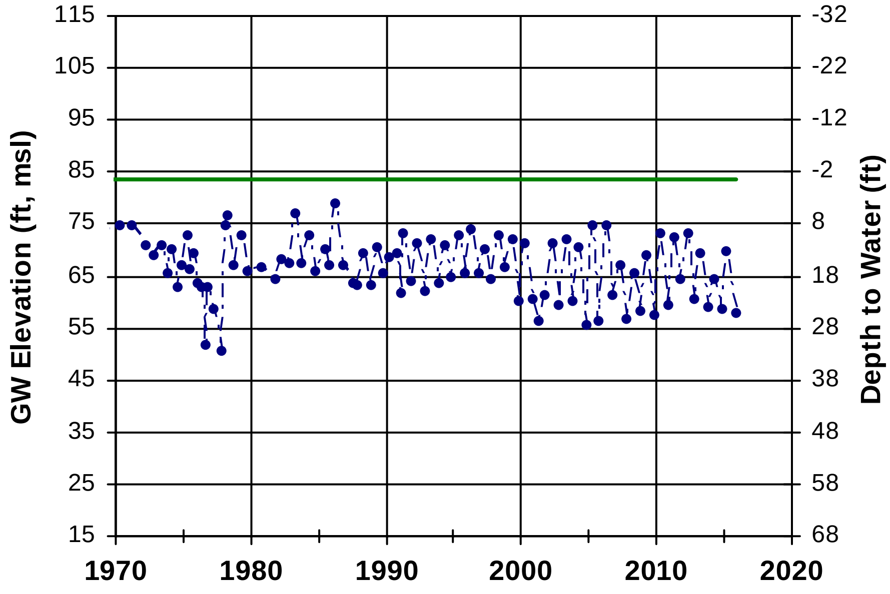
WellID: **NapaCounty-126** RPE: 66.7 ft, msl Subarea: NVF_Yount
SWN: 006N004W09Q002M Source: NapaCounty



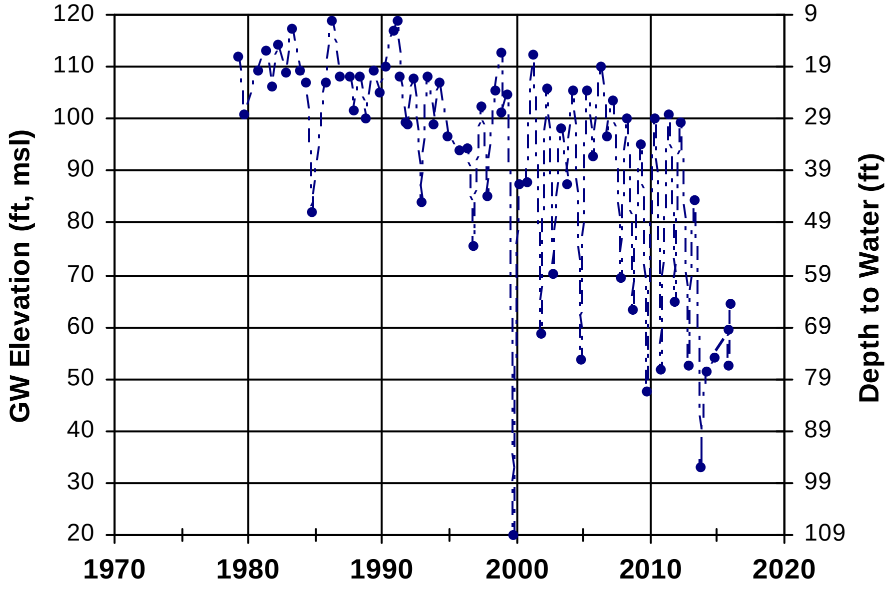
WellID: **NapaCounty-133** RPE: 94.7 ft, msl Subarea: NVF_Yount
SWN: 007N004W31M001M Source: NapaCounty



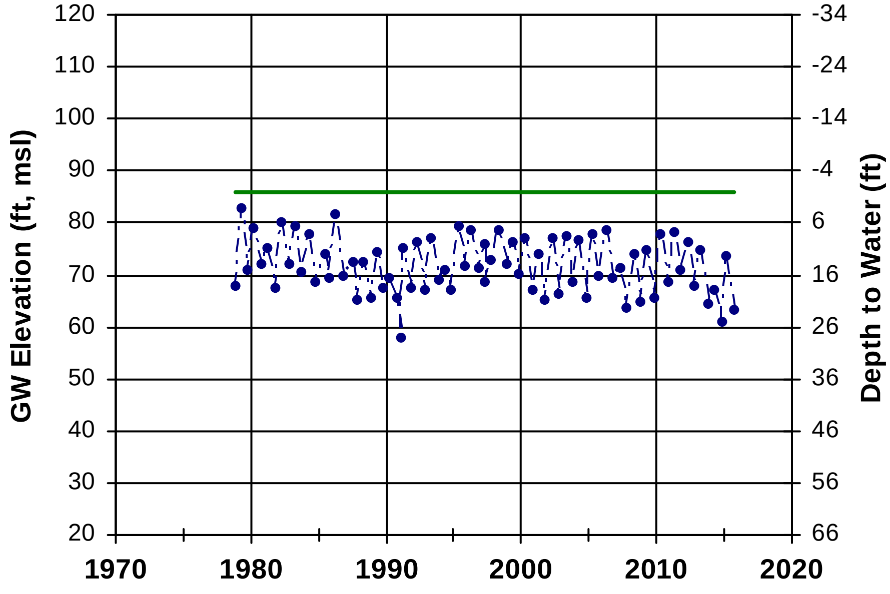
WellID: **NapaCounty-134** RPE: 83.4 ft, msl Subarea: NVF_Yount
SWN: 006N004W06L002M Source: NapaCounty



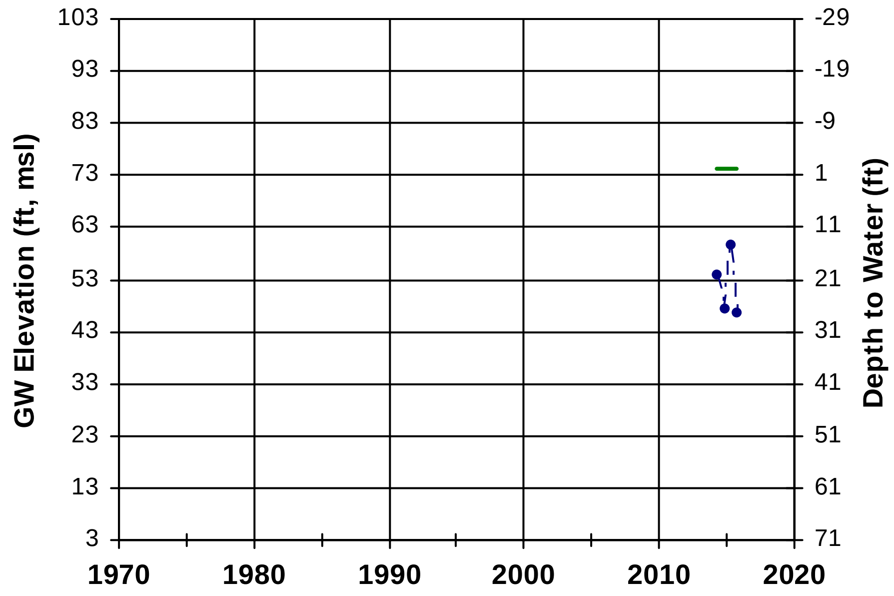
WellID: **NapaCounty-135** RPE: 129.2 ft, msl Subarea: NVF_Yount
SWN: 006N004W19B001M Source: NapaCounty



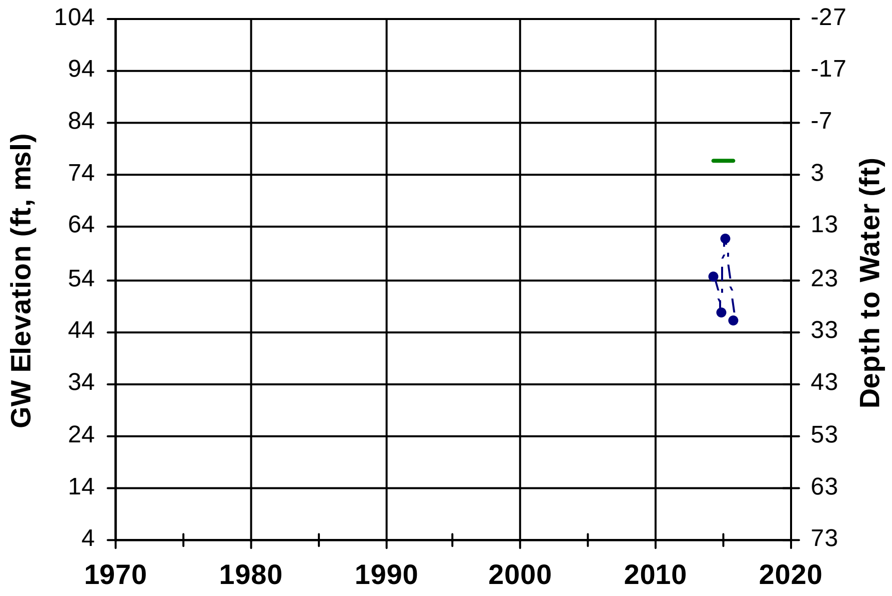
WellID: **NapaCounty-139** RPE: 85.8 ft, msl Subarea: NVF_Yount
SWN: 006N004W17R002M Source: NapaCounty



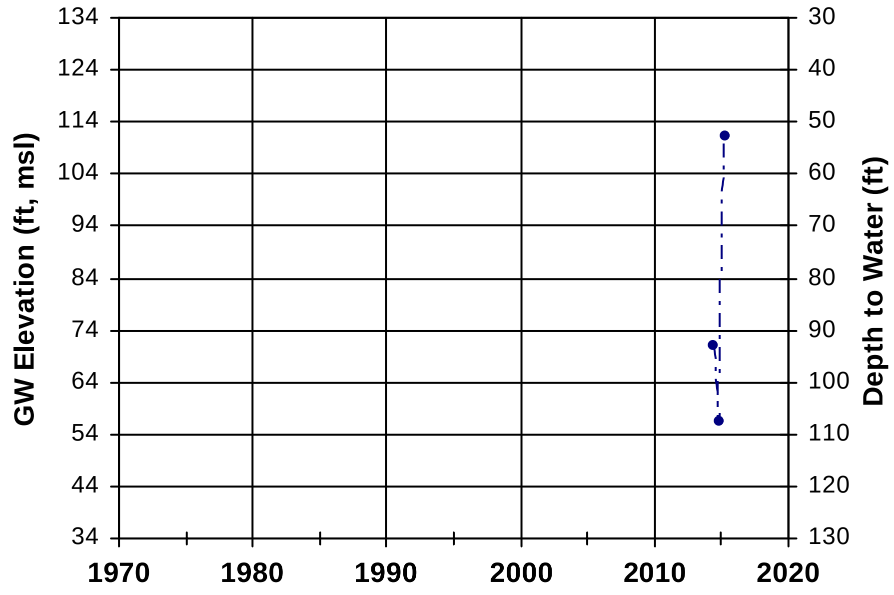
WellID: **NapaCounty-179** RPE: 74.3 ft, msl Subarea: NVF_Yount
SWN: Unknown Source: NapaCounty



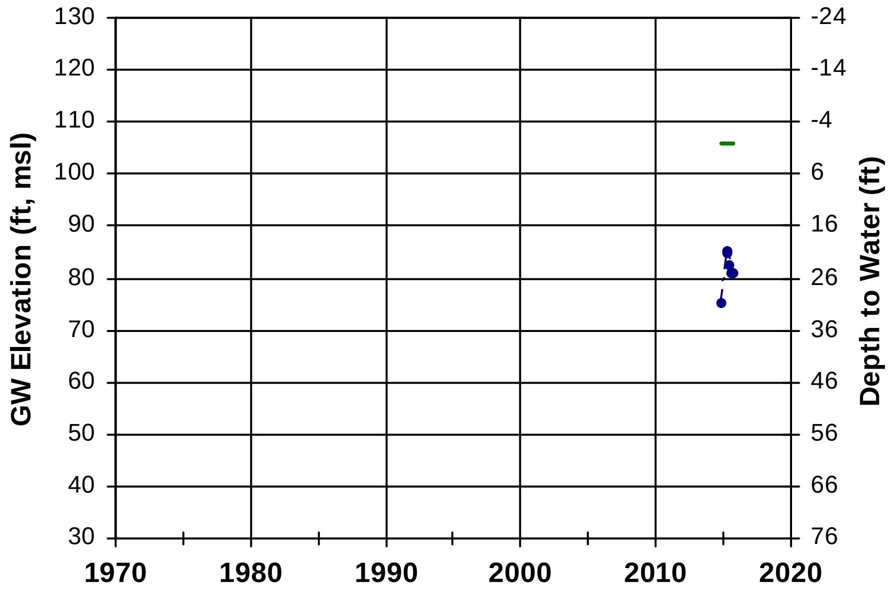
WellID: **NapaCounty-180** RPE: 76.9 ft, msl Subarea: NVF_Yount
SWN: Unknown Source: NapaCounty



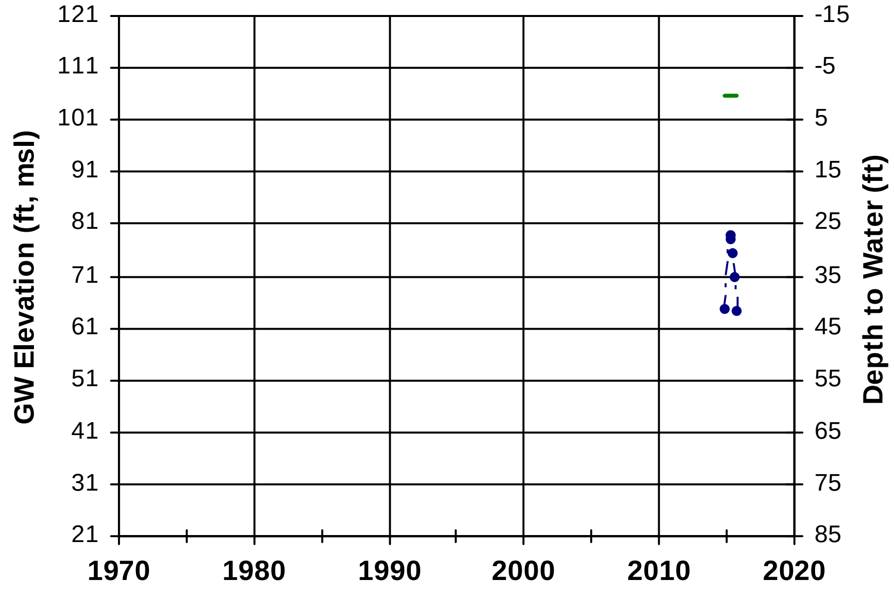
WellID: **NapaCounty-181** RPE: 163.6 ft, msl Subarea: NVF_Yount
SWN: Unknown Source: NapaCounty



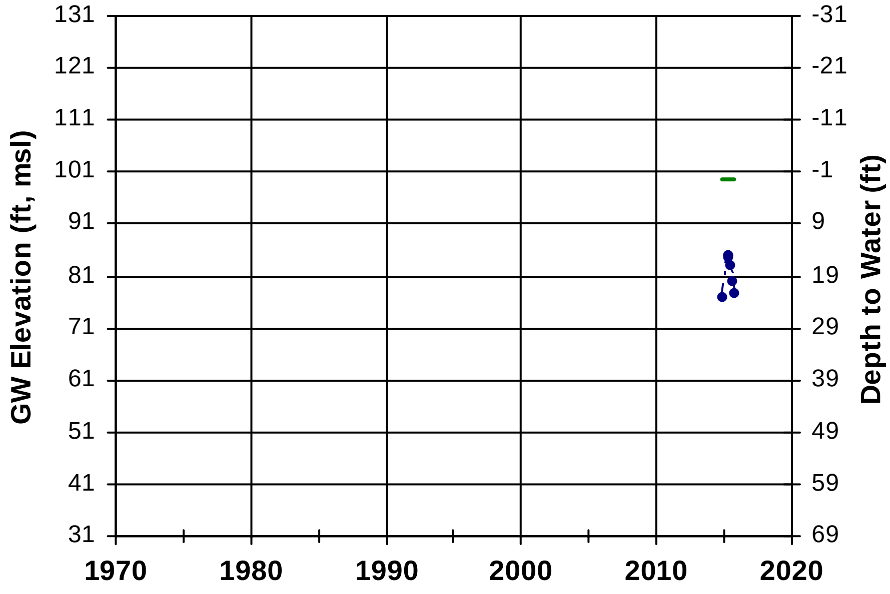
WellID: **NapaCounty-216s-s** RPE: 105.8 ft, msl Subarea: NVF_Yount
SWN: Unknown Source: NapaCounty



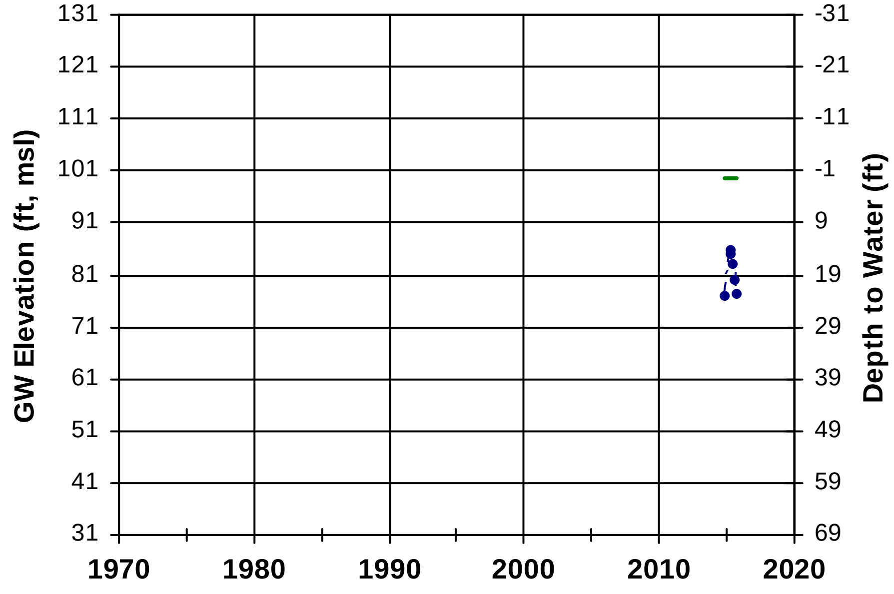
WellID: **NapaCounty-217d-s** RPE: 105.8 ft, msl Subarea: NVF_Yount
SWN: Unknown Source: NapaCounty



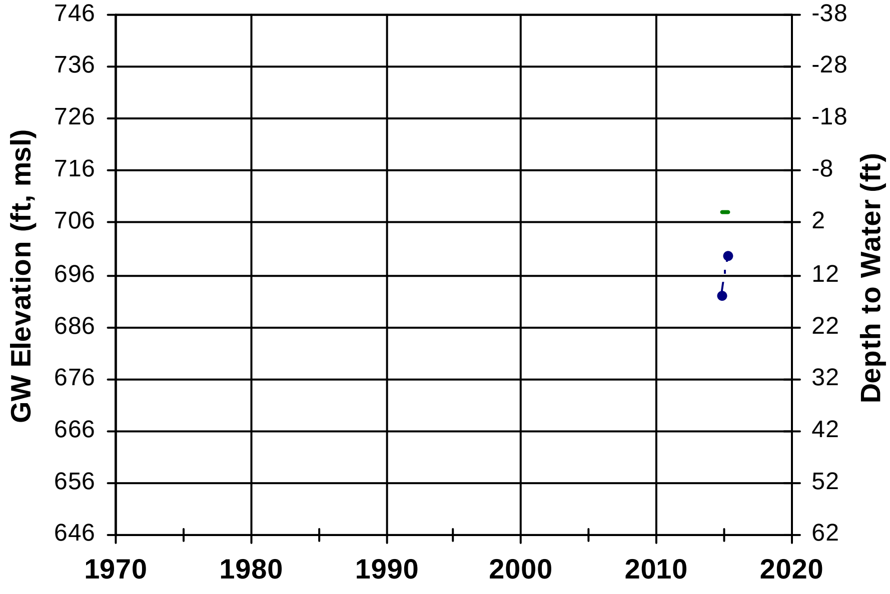
WellID: **NapaCounty-220s-s** RPE: 99.7 ft, msl Subarea: NVF_Yount
SWN: Unknown Source: NapaCounty



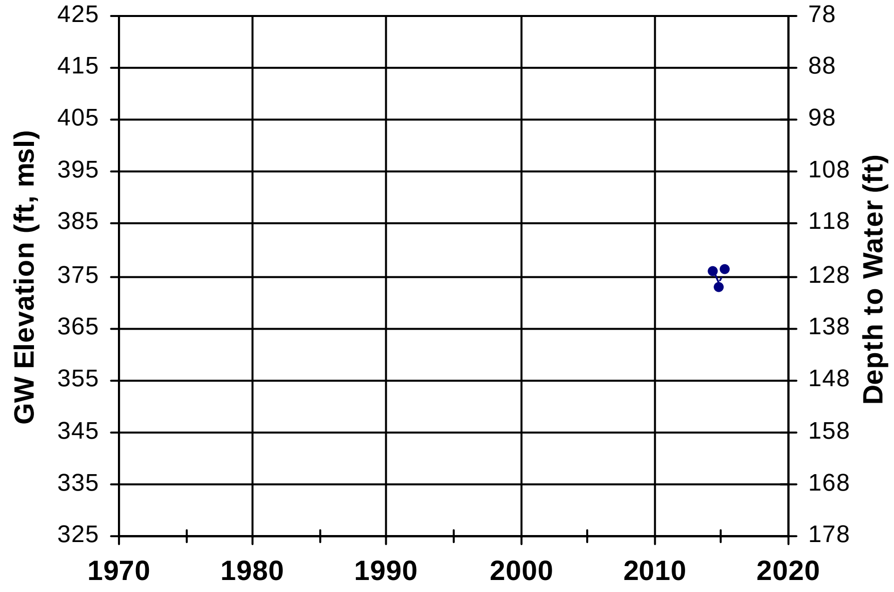
WellID: **NapaCounty-221d-s** RPE: 99.7 ft, msl Subarea: NVF_Yount
SWN: Unknown Source: NapaCounty



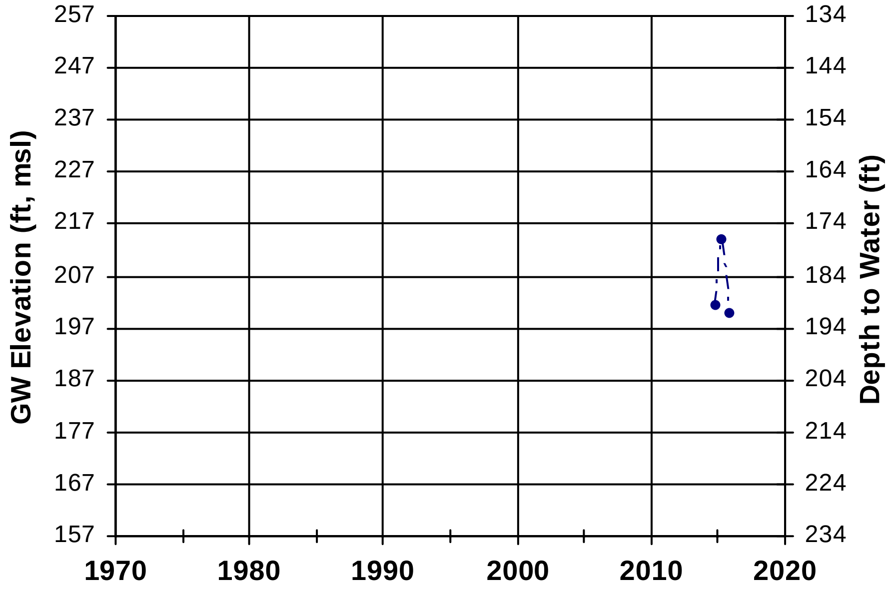
WellID: **NapaCounty-211** RPE: 708.2 ft, msl Subarea: PV
SWN: Unknown Source: NapaCounty



WellID: **NapaCounty-208** RPE: 503.4 ft, msl Subarea: West_Mnts
SWN: Unknown Source: NapaCounty



WellID: **NapaCounty-213** RPE: 390.8 ft, msl Subarea: West_Mnts
SWN: Unknown Source: NapaCounty



APPENDIX C

Napa County Procedure for Measuring Groundwater Levels

NAPA COUNTY PROCEDURE FOR MEASURING THE DEPTH TO WATER IN MONITORING AND PRODUCTION WELLS

Purpose

To obtain an accurate dated and timed measurement of the static depth to water in a well that can be converted into a water level elevation in reference to a commonly used reference datum (e.g., NAVD 1988). In this context, static means that the water level in the well is not influenced by pumping of the well. For comparability, measurements should be obtained according to an established schedule designed to capture times of both highest and lowest seasonal water level elevations. Also for comparability, measurements during a particular field campaign should be obtained consecutively and without delay within the shortest reasonable time.

Measurement Procedure

- If a well is being pumped, do not measure; return later, but not sooner than 60 minutes and preferably after 24 hours (see below “Special Circumstances” for additional instructions).
- Turn on water level indicator signaling device and check battery by hitting the test button.

- Remove access plug or well cap from the well cover and lower probe (electric sounder) into the well.

- When probe hits water a loud “beep” will sound and signal light will turn red.

- Retract slightly until the tone stops.

- Slowly lower the probe until the tone sounds.

- Note depth measurement at rim (i.e., the surveyed reference point for water level readings) of well to the nearest 0.01 foot and rewind probe completely out of well.

- Remove excess water and lower probe once again into well and measure again.

- If difference is within ±0.02 foot of first measurement, record measurement.

- If difference is greater repeat the same procedure until three consecutive measurements are recorded within ± 0.02 foot.

- Rewind and remove probe from well and replace the access plug or well cap in the well cover.

- Clean and dry the measuring device/probe and continue to next well.

Special Circumstances

Oil Encountered in Well

If oil is detected in the well structure, the depth to the air-oil interface is measured. To obtain such a measurement, the electric sounder is used similar to the way chalked steel tapes were traditionally used for depth-to-water measurements.

1. Lower the cleaned probe well below the air-oil interface (e.g., 1 foot). Read and record the depth at the reference point (since this depth is chosen somewhat arbitrarily by the field technician, an even number can be chosen, e.g., 37.00 feet). This measurement is the length of cable lowered into the well and corresponds to a line that the oil leaves on the probe or cable (i.e., the oil inundation line). Above this line, smudges of oil may appear on the cable. Below this line, the cable/probe is completely covered with oil. If the probe is lowered too far, completely penetrates the oil, and is far submerged in the water below the oil, parts of the probe/cable below the oil inundation line may also appear smudgy.
2. Retrieve probe, identify and record the oil inundation line on the cable (e.g., 2.72 feet). This measurement does not reflect the thickness of the oil. It reflects the length of the cable below the air-oil interface.
3. Compute the depth to oil by subtracting the length of line below the air-oil interface from the corresponding measurement at the reference point: Depth to oil = 37.00 feet – 2.72 feet = 34.28 feet.

Since oil has a slightly smaller density than water, a depth-to-oil measurement will always be smaller than a corresponding depth-to-water measurement in the same well if oil were not present. Depth-to-oil measurements yield a reasonable approximation to depth-to-water measurements unless the oil thickness is great. For each foot of oil in the well casing, the depth-to-oil measurement will be approximately 0.12 foot smaller than a corresponding depth-to-water measurement if oil were not present.

Pumping Water Level on Arrival

If well is being pumped, do not measure. Return later when the water level has stabilized. Using past field notes, the field technician will use his/her experience to determine the appropriate duration necessary for static measurements. Upon returning to the well site (at a location where pumping was previously noted on the same day), the technician will measure the water level. The technician will have available historical water level data to determine whether the measurement is consistent with past measurements. If the initial measurement appears anomalous, the technician will measure water levels every 10 minutes over a period of 30 minutes.[8] If measurements vary significantly from past measurements (taking into account seasonal variations), the technician will note the circumstances (i.e., the date and time when the well was first visited, total time it was pumping (if known), when it was shutoff, when the technician returned, and subsequent water level measurements [on the same day, or as the case may be based on experience, the day immediately following]). Subsequent consideration of pumping effects at a site-specific well location will be addressed as necessary.

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[8] During this period, if the groundwater level difference is greater [than +/- 0.02 feet], repeat the same procedure until three consecutive measurements are recorded within ± 0.02 foot.

Recordation

1. Name of field technician
2. Unique identification of well
3. Weather and site conditions (e.g., clear, sunny, strong north wind, intense dust blowing over wellhead from nearby plowed field; dry ground, easy access)
4. Condition of well structure (e.g., well cap cracked – replaced with new one; wasp hive between well casing and well housing; no action, discuss with project manager)
5. Time and date of depth-to-water reading
6. Any other pertinent comments (e.g., sounder hangs up at 33 feet, thus no measurement; or: fifth measurement of ~55.68 feet in a row…residual water in end cap?; or: oil in well…measurement is depth to oil; or: intense sulfur odor upon opening well cap; or: nearby (west ~100 feet) irrigation well pumping)

APPENDIX D

Surface Water-Groundwater Monitoring Sites Water Quality Sample Results

Site	Sample ID	Sample Date	Total Alkalinity mg/L as CaCO3 Std Method 2320 B [1]*	Dissolved Aluminum mg/L EPA 200.8 (D) [1]*	Dissolved Antimony mg/L EPA 200.8 (D) [1]*	Dissolved Arsenic mg/L EPA 200.8 (D) [1]*	Dissolved Barium mg/L EPA 200.8 (D) [1]*	Dissolved Beryllium mg/L EPA 200.8 (D) [1]*	Dissolved Bicarbonate (HCO3-) mg/L as CaCO3 Std Method 4500-CO2 D [1]*	Dissolved Boron mg/L EPA 200.7 (D) [1]*	Dissolved Bromide mg/L EPA 300.0 28d Hold [1]*	Dissolved Cadmium mg/L EPA 200.8 (D) [1]*	Dissolved Calcium mg/L EPA 200.7 (D) [1]*
Site 1	NapaCounty-214s	6/3/2015 8:09	117	<0.01	<0.001	<0.001	0.081	<0.001	117	0.2	0.07	<0.001	19
Site 1	NapaCounty-215d	6/3/2015 7:16	258	<0.01	<0.001	0.007	0.103	<0.001	258	1.4	0.63	<0.001	41
Site 1	NapaCounty-swgw_SW1	6/4/2015 13:39	145	0.02	<0.001	0.015	0.136	<0.001	144	1.4	15.9	<0.001	145
Site 2	NapaCounty-216s	6/3/2015 13:03	93	0.089	<0.001	<0.001	0.046	<0.001	93	<0.1	0.12	<0.001	22
Site 2	NapaCounty-217d	6/3/2015 12:23	116	0.432	<0.001	0.001	0.027	<0.001	116	<0.1	0.06	<0.001	15
Site 2	NapaCounty-swgw_SW2	6/3/2015 13:15	154	0.029	<0.001	<0.001	0.059	<0.001	153	0.1	0.02	<0.001	34
Site 3	NapaCounty-218s	6/3/2015 11:02	192	<0.01	<0.001	<0.001	0.091	<0.001	192	0.1	0.13	<0.001	47
Site 3	NapaCounty-219d	6/3/2015 10:04	225	<0.01	<0.001	0.046	0.088	<0.001	224	9.1	0.33	<0.001	17
Site 3	NapaCounty-swgw_SW3	6/4/2015 12:46	176	0.012	<0.001	0.003	0.073	<0.001	175	0.5	0.2	<0.001	36
Site 4	NapaCounty-220s	6/4/2015 8:19	199	<0.01	<0.001	0.003	0.078	<0.001	199	0.1	0.1	<0.001	32
Site 4	NapaCounty-221d	6/4/2015 7:52	124	<0.01	<0.001	0.004	0.05	<0.001	124	<0.1	0.03	<0.001	14
Site 4	NapaCounty-swgw_SW4	6/4/2015 8:50	98	<0.01	<0.001	0.001	0.042	<0.001	98	<0.1	0.08	<0.001	22
Site 5	NapaCounty-222s	6/4/2015 11:29	117	<0.01	<0.001	0.003	0.041	<0.001	117	0.6	0.12	<0.001	28
Site 5	NapaCounty-223d	6/4/2015 10:56	213	<0.01	<0.001	0.002	0.104,0.105**	<0.001	213	0.5	0.07	<0.001	16
Site 5	NapaCounty-swgw_SW5	6/4/2015 11:56	92,93**	<0.01	<0.001	0.004	0.039	<0.001	93	0.8	0.12	<0.001	21

Site	Sample ID	Sample Date	Dissolved Carbonate (CO3--) mg/L as CaCO3 Std Method 4500-CO2 D [1]*	Dissolved Chloride mg/L EPA 300.0 28d Hold [1]*	Dissolved Chromium mg/L EPA 200.8 (D) [1]*	Dissolved Cobalt mg/L EPA 200.8 (D) [1]*	Conductance (EC) µS/cm Std Method 2510-B [1]*	Dissolved Copper mg/L EPA 200.8 (D) [1]*	Dissolved Fluoride mg/L EPA 300.0 28d Hold [1]*	Dissolved Hardness mg/L as CaCO3 Std Method 2340 B [1]*	Dissolved Hydroxide (OH-) mg/L as CaCO3 Std Method 4500-CO2 D [1]*	Dissolved Iron mg/L EPA 200.8 (D) [1]*	Dissolved Lead mg/L EPA 200.8 (D) [1]*
Site 1	NapaCounty-214s	6/3/2015 8:09	<1	28	<0.001	<0.005	416	<0.001	0.2	144	<1	0.009	<0.001
Site 1	NapaCounty-215d	6/3/2015 7:16	1	177	<0.001	<0.005	1174	0.001	0.2	226	<1	0.042	<0.001
Site 1	NapaCounty-swgw_SW1	6/4/2015 13:39	1	4699	0.002	<0.005	14319	0.006	<0.1	1717	<1	0.025	<0.001
Site 2	NapaCounty-216s	6/3/2015 13:03	<1	15	0.001	<0.005	317	0.003	0.2	116	<1	0.066	<0.001
Site 2	NapaCounty-217d	6/3/2015 12:23	<1	5	0.001	<0.005	255	0.001	0.6	74	<1	0.331	<0.001
Site 2	NapaCounty-swgw_SW2	6/3/2015 13:15	1	12	0.005	<0.005	411	0.006	0.2	159	<1	0.091	<0.001
Site 3	NapaCounty-218s	6/3/2015 11:02	<1	19	0.001	<0.005	536	<0.001	<0.1	247	<1	0.008	<0.001
Site 3	NapaCounty-219d	6/3/2015 10:04	1	73	<0.001	<0.005	712	0.005	0.3	116	<1	0.021	<0.001
Site 3	NapaCounty-swgw_SW3	6/4/2015 12:46	1	27	<0.001	<0.005	515	0.001	0.2	215	<1	0.022	<0.001
Site 4	NapaCounty-220s	6/4/2015 8:19	<1	7	<0.001	<0.005	429	<0.001	0.2	190	<1	<0.005	<0.001
Site 4	NapaCounty-221d	6/4/2015 7:52	<1	6	<0.001	<0.005	263	<0.001	0.2	100	<1	0.009	<0.001
Site 4	NapaCounty-swgw_SW4	6/4/2015 8:50	<1	18	<0.001	<0.005	328	0.001	0.1	128	<1	0.046	<0.001
Site 5	NapaCounty-222s	6/4/2015 11:29	<1	32	<0.001	<0.005	372	<0.001	0.3	123	<1	0.014	<0.001
Site 5	NapaCounty-223d	6/4/2015 10:56	<1	16	0.001	<0.005	453	<0.001	0.3	113	<1	0.473,0.476**	<0.001
Site 5	NapaCounty-swgw_SW5	6/4/2015 11:56	<1	34	<0.001	<0.005	346	0.002	0.4	100	<1	0.019	<0.001

*Codes in brackets ([]) following the analyte name refer to the Method Comparability Code. For more information, please refer to http://www.water.ca.gov/waterdatalibrary/includes/mtc_code.cfm.

**More than one analysis was made for this sample

Site	Sample ID	Sample Date	Dissolved Lithium mg/L EPA 200.8 (D) [1]*	Dissolved Magnesium mg/L EPA 200.7 (D) [1]*	Dissolved Manganese mg/L EPA 200.8 (D) [1]*	Dissolved Mercury mg/L EPA 200.8 (Hg Dissolved) [1]*	Dissolved Molybdenum mg/L EPA 200.8 (D) [1]*	Dissolved Nickel mg/L EPA 200.8 (D) [1]*	Dissolved Nitrate mg/L as N EPA 300.0 28d Hold [1]*	Dissolved Nitrite mg/L as N Std Method 4500-NO2 B (48Hr) [1]*	Dissolved Potassium mg/L EPA 200.7 (D) [1]*	Dissolved Selenium mg/L EPA 200.8 (D) [1]*	Dissolved Silver mg/L EPA 200.8 (D) [1]*
Site 1	NapaCounty-214s	6/3/2015 8:09	0.011	23	2.53	<0.0002	<0.005	0.003	7.3	0.02	1.1	<0.001	<0.001
Site 1	NapaCounty-215d	6/3/2015 7:16	0.059	30	1.13	<0.0002	<0.005	0.002	<0.1	<0.01	4.5	0.002	<0.001
Site 1	NapaCounty-swgw_SW1	6/4/2015 13:39	0.067	329	0.076	<0.0002	<0.005	0.007	12.6	<0.01	106.5	0.046	<0.001
Site 2	NapaCounty-216s	6/3/2015 13:03	0.012	15	0.041	<0.0002	<0.005	0.002	5.4	0.01	0.9	<0.001	<0.001
Site 2	NapaCounty-217d	6/3/2015 12:23	0.014	9	0.643	<0.0002	0.005	0.002	<0.1	<0.01	1.3	<0.001	<0.001
Site 2	NapaCounty-swgw_SW2	6/3/2015 13:15	0.008	18	0.024	<0.0002	<0.005	0.013	0.5	<0.01	2.1	<0.001	<0.001
Site 3	NapaCounty-218s	6/3/2015 11:02	0.01	31	<0.005	<0.0002	<0.005	0.003	1.8	<0.01	0.7	<0.001	<0.001
Site 3	NapaCounty-219d	6/3/2015 10:04	0.037,0.038**	18	0.241,0.242**	<0.0002	0.013,0.014**	0.001	<0.1	<0.01	5.2	<0.001	<0.001
Site 3	NapaCounty-swgw_SW3	6/4/2015 12:46	0.046	30	0.038	<0.0002	<0.005	0.004	<0.1	<0.01	2.9	<0.001	<0.001
Site 4	NapaCounty-220s	6/4/2015 8:19	<0.005	26	0.568	<0.0002	<0.005	0.005	0.7	0.03	3.6	<0.001	<0.001
Site 4	NapaCounty-221d	6/4/2015 7:52	<0.005	16	0.728	<0.0002	<0.005	0.002	<0.1	<0.01	4.7	<0.001	<0.001
Site 4	NapaCounty-swgw_SW4	6/4/2015 8:50	<0.005	17	0.041	<0.0002	<0.005	0.003	<0.1	<0.01	1.7	<0.001	<0.001
Site 5	NapaCounty-222s	6/4/2015 11:29	0.063	13	0.641	<0.0002	<0.005	0.01	<0.1	<0.01	3.8	<0.001	<0.001
Site 5	NapaCounty-223d	6/4/2015 10:56	0.075,0.076**	18	0.219,0.223**	<0.0002	<0.005	0.002	0.3	<0.01	7.1	<0.001	<0.001
Site 5	NapaCounty-swgw_SW5	6/4/2015 11:56	0.095	11	0.048	<0.0002	<0.005	0.003	<0.1	<0.01	3.7	<0.001	<0.001

Site	Sample ID	Sample Date	Dissolved Sodium mg/L EPA 200.7 (D) [1]*	Total Dissolved Solids mg/L Std Method 2540 C [1]*	Dissolved Strontium mg/L EPA 200.8 (D) [1]*	Dissolved Sulfate mg/L EPA 300.0 28d Hold [1]*	Dissolved Thallium mg/L EPA 200.8 (D) [1]*	Turbidity N.T.U. EPA 180.1 [D-2]*	Dissolved Vanadium mg/L EPA 200.8 (D) [1]*	Dissolved Zinc mg/L EPA 200.8 (D) [1]*	pH pH Units Std Method 2320 B [1]*
Site 1	NapaCounty-214s	6/3/2015 8:09	31	268	0.144	45	<0.001	1.21	<0.005	<0.005	6.9
Site 1	NapaCounty-215d	6/3/2015 7:16	164	683	0.32	74	<0.001	2.75	<0.005	<0.005	7.3
Site 1	NapaCounty-swgw_SW1	6/4/2015 13:39	2590	8830	2.19	667	<0.001	20.6	0.018	0.012	7.8
Site 2	NapaCounty-216s	6/3/2015 13:03	22	208	0.169	38	<0.001	77.4	<0.005	<0.005	6.8
Site 2	NapaCounty-217d	6/3/2015 12:23	29	164	0.107	9	<0.001	7.29	<0.005	<0.005	7.4
Site 2	NapaCounty-swgw_SW2	6/3/2015 13:15	28	255	0.269	44	<0.001	1.37	<0.005	0.027	7.6
Site 3	NapaCounty-218s	6/3/2015 11:02	20	324	0.357	65	<0.001	5.06	<0.005	<0.005	6.7
Site 3	NapaCounty-219d	6/3/2015 10:04	108	452	0.125,0.126**	32	<0.001	1.16	<0.005	0.006	7.4
Site 3	NapaCounty-swgw_SW3	6/4/2015 12:46	27	313	0.248	54	<0.001	7.48	<0.005	<0.005	7.8
Site 4	NapaCounty-220s	6/4/2015 8:19	19	292	0.199	11	<0.001	3.29	<0.005	<0.005	6.7
Site 4	NapaCounty-221d	6/4/2015 7:52	16	204	0.079	6	<0.001	7.11	<0.005	<0.005	7.1
Site 4	NapaCounty-swgw_SW4	6/4/2015 8:50	17	250	0.131	39	<0.001	3.4	<0.005	<0.005	7.3
Site 5	NapaCounty-222s	6/4/2015 11:29	26	241	0.155	21	<0.001	1.33,1.48**	<0.005	<0.005	7.1
Site 5	NapaCounty-223d	6/4/2015 10:56	56	343	0.104,0.105**	6	<0.001	18.8	<0.005	<0.005	7.2
Site 5	NapaCounty-swgw_SW5	6/4/2015 11:56	30	220	0.111	25	<0.001	1.68	<0.005	0.006	7.4

*Codes in brackets ([]) following the analyte name refer to the Method Comparability Code. For more information, please refer to http://www.water.ca.gov/waterdatalibrary/includes/mtc_code.cfm.

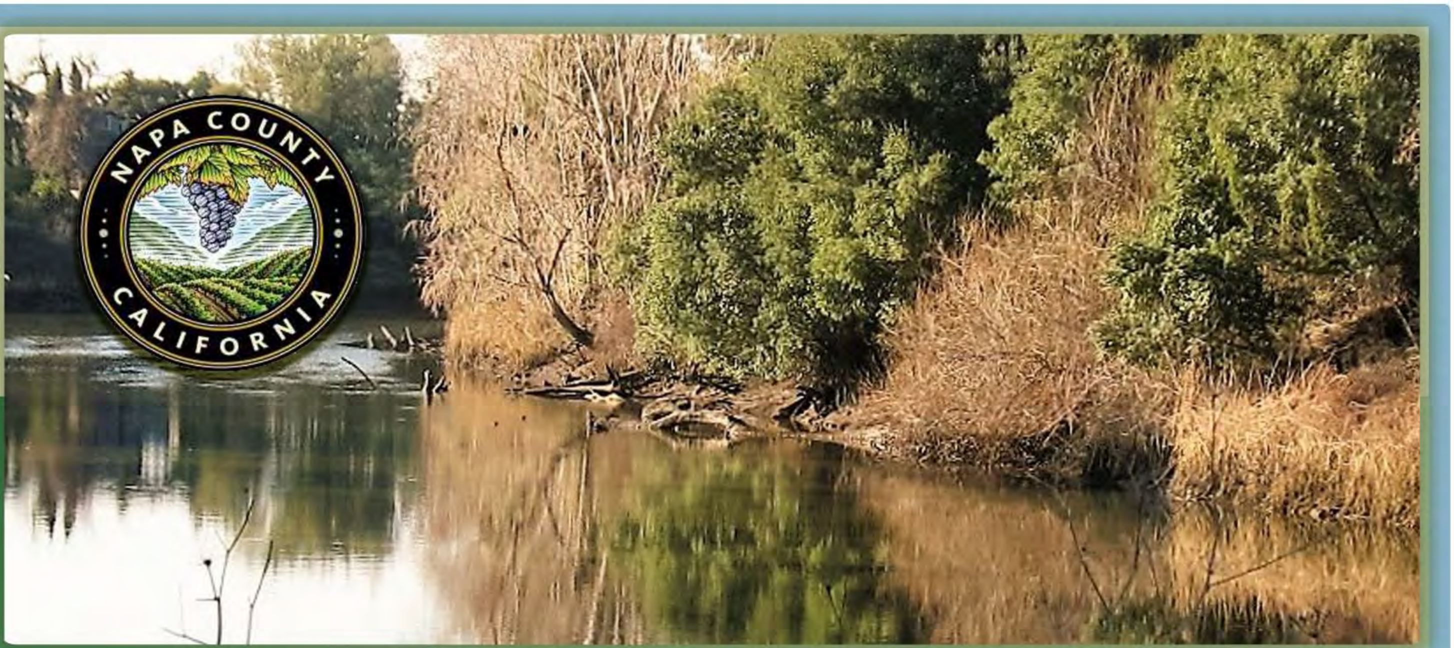
**More than one analysis was made for this sample

NAPA VALLEY GROUNDWATER SUSTAINABILITY:

A BASIN ANALYSIS REPORT FOR THE NAPA VALLEY SUBBASIN

APPENDIX E:

Napa County groundwater-surface water monitoring
facilities project report



Napa County

Groundwater/Surface Water Monitoring Facilities Report

California Department of Water Resources Local Groundwater Assistance Grant Program

October, 2016

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Napa County Groundwater-Surface Water Monitoring Facilities Project Report

Prepared for
Napa County

Prepared by

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

October, 2016

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Figure 4.18 Piper Diagram – June 2015 Surface Water Samples

LIST OF ABBREVIATIONS AND ACRONYMS

bgs	below ground surface
°C	degrees Celsius
cfs	cubic feet per second
ft	feet
meq/l	milliequivalents per liter
mg/l	milligrams per liter
µS/cm	microSiemens per centimeter
DWR	California Department of Water Resources
MCL	Maximum Contaminant Limit
NAD83	North American Datum of 1983
Napa RCD	Napa County Resource Conservation District
NAVD88	North American Vertical Datum of 1988
TOC	Top of Casing
USGS	U.S. Geological Survey
WCR	Well Completion Report
WICC	Watershed Information & Conservation Council of Napa County

EXECUTIVE SUMMARY

In January of 2014 the County of Napa began implementation of a project to monitor interactions between groundwater and surface water resources in the Napa Valley Groundwater Subbasin. Funding for the project was provided by the California Department of Water Resources (DWR), through the Local Groundwater Assistance Grant Program, and the County of Napa. The project scope included monitoring facilities construction, data collection, and presentation of the results of initial data collection efforts.

Work completed for the grant took place from the first quarter of 2014 through the second quarter of 2016 and included the construction of five dual-completion monitoring wells adjacent to the Napa River and Dry Creek in the Napa Valley Groundwater Subbasin (**Figure 1.1**). Prior to construction of the monitoring facilities, hydrologic and geologic data were compiled and evaluated for each site in order to inform the monitoring well design. Monitoring well construction and development occurred in September and October of 2014. Data collection at the sites began in October of 2014 with manual groundwater level measurements followed by the installation of continuously recording transducers in December 2014 through July 2015.

Data were regularly downloaded from project transducers in 2015 and 2016, with transducers re-calibrated and serviced as needed. Project data were reviewed for quality control purposes and incorporated into an existing Napa County Data Management System. Data analysis occurred as the data were collected to track groundwater-surface water interactions and at the end of the grant period to more fully consider the data collected over the course of the project, through June 2016. Project outreach occurred through a variety of means, including presentations to the Napa County Watershed Information & Conservation Council (WICC), presentations to community groups around Napa Valley, and a field tour organized by the Sacramento-based Water Education Foundation.

The construction of dedicated monitoring facilities to track groundwater-surface water interactions in the Napa Valley Subbasin provides the County with an important source of data about these interconnected resources. Data collected in 2015 and 2016 show that shallow groundwater and surface waters were hydraulically connected throughout much of the winter and spring at the mainstem Napa River sites, and longer in some locations. The direction of flow indicated by monitoring data varied between gain stream (flow of groundwater into surface water) and losing stream (flow of surface water into the groundwater system) at most sites. The only site located on a tributary to the Napa River maintained losing stream conditions throughout 2015. Water year 2015 marked the fourth year of California's current statewide drought. Continued data collection in subsequent years will provide a more robust understanding of the range of conditions at these sites.

Implementation of groundwater-surface water monitoring in the Napa Valley Subbasin has already proven to be very valuable for improving the understanding of surface water and groundwater interactions. Similar facilities at additional locations would help further this understanding and aid in on-going efforts to sustainably manage the Napa Valley Subbasin. Additional monitoring will also be key to the objective of maintaining or improving streamflow during drier years and/or seasons. As a result, it is recommended that in coordination with the Napa RCD and others, as appropriate, the County:

- Evaluate stream gaging network objectives, particularly with respect to the water budget requirements contained in the recently finalized Groundwater Sustainability Plan regulations, and determine the need and feasibility of additional streamflow monitoring sites.

- Consider additional areas that may also benefit from nearby shallow nested groundwater monitoring wells (similar to the facilities constructed as part of the current project) to monitor groundwater/surface water interactions in areas where data are lacking or where geologic conditions indicate that conditions not adequately represented by the current monitoring network.

- Continue efforts to integrate data collected at the groundwater/surface water monitoring sites with existing remote data acquisition systems in order to facilitate monitoring aquifer conditions in real-time.

1 INTRODUCTION

This report describes the implementation of the Napa County Groundwater-Surface Water Monitoring Project, including monitoring facilities construction, data collection, and presentation of the results of initial data collection. Funding for the project was provided by the California Department of Water Resources (DWR) and the County of Napa. The project was developed to track groundwater-surface water interrelationships in the Napa Valley Groundwater Subbasin in order to inform local decision-making processes and advance sustainable groundwater management.

1.1 Project Background and Objectives

The 2013 Napa County Groundwater Monitoring Plan identifies five priority sites for monitoring of groundwater and surface water interactions (LSCE, 2013). All five sites are located within the Napa Valley Subbasin of the Napa-Sonoma Valley Groundwater Basin, as described in DWR Bulletin 118 (**Figure 1.1**). The Napa Valley Subbasin is currently classified as a medium priority subbasin through the California Statewide Groundwater Elevation Monitoring (CASGEM) Program. Of the five groundwater basins or subbasins in Napa County, the Napa Valley Subbasin experiences the highest overall demands on groundwater resources in Napa County and was the focus of the 2013 report, *Updated Hydrogeologic Conceptualization and Characterization of Conditions* (LSCE and MBK, 2013).

Project objectives emphasize the collection of data necessary to evaluate relationships between groundwater and surface water resources. Specifically, the project objectives include:

- Install dedicated shallow groundwater monitoring facilities and groundwater and surface water instrumentation to continuously record water levels and selected water quality parameters.
- Collect groundwater and surface water data to detect changes in groundwater levels and groundwater quality and corresponding surface water stage, flow, and quality conditions.
- Collect groundwater and surface water data to establish baseline conditions that will facilitate assessments of the potential effects due to future climate change.
- Collect data that will help identify mechanisms for and quantify exchanges of water between the groundwater aquifers and surface water resources, and response of the hydrologic system due to surface and groundwater use.
- Incorporate the proposed groundwater monitoring facilities in the countywide monitoring program and also in the Napa County CASGEM program as appropriate.
- Incorporate surface water monitoring (including temperature and electrical conductivity) in the streamflow network managed by the Napa County Flood Control and Water Conservation District (NCFCWCD).
- Collect groundwater and surface water data that will help formulate strategies to address targeted water resource problems and facilitate surface waterway restoration opportunities.

Report Organization

This report summarizes the construction of dedicated monitoring facilities developed to track groundwater-surface water interrelationships in the Napa Valley Groundwater Subbasin. The report also presents the results of initial data collection at project facilities.

The report includes the following sections:

Section 2. Monitoring Facilities Construction and Instrumentation

- Monitoring Facilities Locations
- Monitoring Wells As-Built Summaries

Section 3. Hydrogeologic Site Characterization

- Geologic Cross Sections

Section 4. Groundwater and Surface Water Conditions

- Water Level and Water Quality Data

Section 5. Hydraulic Properties Analysis

- Groundwater-Surface Water Gradients and Statistical Comparisons
- Estimates of Groundwater-Surface Water Interaction

Section 6. Summary and Recommendations

- Monitoring Network Maintenance
- Future Monitoring Efforts

2 MONITORING FACILTIES CONSTRUCTION AND INSTRUMENTATION

Project monitoring facilities include project-specific groundwater monitoring wells and a combination of project specific and pre-existing surface water monitoring facilities. Project sites are located in Napa Valley from the City of Napa to the City of St. Helena (**Figure 2.1**). Sites 1, 3, 4, and 5 are located along the Napa River. Site 2 is located on Dry Creek, a tributary to the Napa River that drains portions of the Coast Range Mountains west of the Town of Yountville.

2.1 Groundwater Monitoring Wells and Surface Water Monitoring Sites

Dual-completion, nested monitoring wells[1] were constructed in September 2014 at each site to allow for data collection at discrete depths within the alluvial aquifer system (**Figure 2.2**). The upper completions, referenced in this report as the shallow casing, are screened in shallow portions of the Napa Valley Groundwater Subbasin, including the uppermost zone of saturated aquifer materials encountered, to enable observation of the groundwater processes driving groundwater-surface water interaction. Lower completions at each site, referenced in this report as the deep casing, are screened in the best available aquifer materials located at a depth of about 100 feet below ground surface. The deeper casing completions enable monitoring of the alluvial aquifer units that well completion reports reviewed by LSCE indicate is the portion of the groundwater system in Napa Valley that is more commonly developed for beneficial uses (LSCE and MBK, 2013). Project monitoring wells were constructed with multiple bentonite seals to provide hydraulic separation between the shallow and deep casings to facilitate monitoring of vertical hydraulic gradients at each site.

Table 2.1 summarizes the locations of the project monitoring wells. Shallow casing screen intervals range from 25 feet below ground surface (bgs) to 50 feet bgs. Deep casing screen intervals range from 70 feet bgs to 95 feet bgs. **Table 2.2** summarizes the locations of the project monitoring wells. Well Completion Reports for all monitoring wells are also included in **Appendix A**.

Project monitoring wells and surface water sites are instrumented with continuously recording water level and water quality transducers. The transducers are CT2X models manufactured by Instrumentation Northwest/Seametrics of Kent, Washington and Leveloger Edge models manufactured by Solinst of Georgetown, Ontario, Canada. Transducers are set to record at hourly intervals. Data downloads, regular maintenance, and field calibrations were performed at regular intervals throughout the project.

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[1] Nested monitoring wells consist of multiple casings installed within a single borehole. Independent casings are visible at the surface. This construction enables monitoring and sampling at different points within an aquifer system.

Table 2.1 Monitoring Wells As-built Summary

Site	Ground Surface Elevation (ft. NAVD88)	Shallow Screen Start (ft bgs)	Shallow Screen End (ft bgs)	Deep Screen Start (ft bgs)	Deep Screen End (ft bgs)
Site 1- Napa River at First Street	18.58	30	50	75	95
Site 2- Dry Creek at Washington Street	103.41	25	45	71	81
Site 3- Napa River at Oak Knoll Avenue	56.32	25	35	78	88
Site 4- Napa River at Yountville Cross Road	98.40	25	40	70	80
Site 5- Napa River at Pope Street	212.36	25	35	80	95

2.1.1 Site 1 - Napa River at First Street

Site 1 is located adjacent to the Napa River on a vacant lot owned by the Napa County Flood Control and Water Conservation District (**Figure 2.3**). Land uses in the vicinity are predominantly commercial/retail and residential. The monitoring well at this site was constructed with screen intervals at 30 feet bgs to 50 feet bgs and 75 feet bgs to 95 feet bgs, respectively (**Figures 2.4 and 2.5**). No pre-existing surface water gauging facilities are present at this site. A surface water monitoring transducer was installed for the project on the east side of the river channel immediately downstream of the 1st Street Bridge.

2.1.2 Site 2 – Dry Creek at Washington Street

Site 2 is adjacent to Dry Creek. The monitoring well at this site was constructed within the Napa County right-of-way on Washington Street (**Figure 2.6**). Land uses in the vicinity are predominantly agricultural and residential. The monitoring well at this site was constructed with screen intervals at 25 feet bgs to 45 feet bgs and 71 feet bgs to 81 feet bgs, respectively (**Figures 2.7 and 2.8**). The Napa County Resource Conservation District (Napa RCD) has an existing surface water stage and discharge gauging site at this location (Napa RCD Site ID: Dry Creek at Hwy 29). An additional surface water monitoring transducer was installed to monitor water quality parameters for the project in the stream channel adjacent to a railroad bridge footing.

2.1.3 Site 3 - Napa River at Oak Knoll Avenue

Site 3 is adjacent to the Napa River. The monitoring well at this site was constructed within the Napa County right-of-way on Oak Knoll Avenue (**Figure 2.9**). Land uses in the vicinity are predominantly agricultural. The monitoring well at this site was constructed with screen intervals at 25 feet bgs to 35 feet bgs and 78 feet bgs to 88 feet bgs, respectively (**Figures 2.10 and 2.11**). The U.S. Geological Survey

(USGS) has an existing surface water stage and discharge gauging site at this location (USGS Site ID: 11458000). An additional surface water monitoring transducer was installed to monitor water quality parameters for the project on the western side of the river channel adjacent an Oak Knoll Avenue bridge footing.

2.1.4 Site 4 – Napa River at Yountville Cross Road

Site 4 is adjacent to the Napa River. The monitoring well at this site was constructed within the Napa County right-of-way on Yountville Cross Road (**Figure 2.12**). Land uses in the vicinity are predominantly agricultural. The monitoring well at this site was constructed with screen intervals at 25 feet bgs to 40 feet bgs and 70 feet bgs to 80 feet bgs, respectively (**Figures 2.13 and 2.14**). Napa County Resource Conservation District (Napa RCD) has an existing surface water stage gauging site at this location (Napa RCD Site ID: Napa River at Yountville Cross Rd). An additional surface water monitoring transducer was installed to monitor water quality parameters and surface water stage for the project on the eastern side of the river channel upstream of the Yountville Cross Road Bridge.

2.1.5 Site 5 – Napa River at Pope Street

Site 5 is adjacent to the Napa River. The monitoring well at this site was constructed within a City of St. Helena park (**Figure 2.15**). Land uses in the vicinity are mixture of residential, agricultural, and commercial. A City of St. Helena irrigation well is present approximately 100 feet from the project monitoring well and is used for seasonal irrigation demands for municipal parks on both side of Pope Street at this site (J. Haller, personal communication, 2014). The monitoring well at this site was constructed with screen intervals at 25 feet bgs to 35 feet bgs and 80 feet bgs to 95 feet bgs, respectively (**Figures 2.16 and 2.17**). The U.S. Geological Survey (USGS) has an existing surface water stage and discharge gauging site at this location (USGS Site ID: 11456000). An additional surface water monitoring transducer was installed to monitor water quality parameters in the river channel upstream of the Pope Street Bridge.

Table 2.2 Project Monitoring Facilities Locations

Site	WellID	Easting	Northing	Reference Point Elevation (ft, NAVD88)	Easting/Northing Coordinate System	RPE Description
Site 1 Napa River at First Street	NapaCounty-214s-swgw1	6481766.104	1871996.470	20.12	NAD83 StatePlane California II	North side of top of casing (TOC)
	NapaCounty-215d-swgw1	6481765.835	1871996.349	20.07	NAD83 StatePlane California II	North side of top of casing (TOC)
	NapaCounty-swgw-1	6481679.575	1872053.093	-0.70	NAD83 StatePlane California II	About 2 inches from bottom of slanted 1-inch diameter pipe (normal transducer location)
Site 2 Dry Creek at Washington Street	NapaCounty-216s-swgw2	6464900.944	1894991.705	103.10	NAD83 StatePlane California II	North side of top of casing (TOC)
	NapaCounty-217d-swgw2	6464900.778	1894991.734	103.08	NAD83 StatePlane California II	North side of top of casing (TOC)
	NapaCounty-swgw-2	*6464737.707*	*1894929.658*	86.48	NAD83 StatePlane California II	Bolt at bottom of vertical 1-inch pipe with transducer
Site 3 Napa River at Oak Knoll Avenue	NapaCounty-218s-swgw3	*6474230.877*	*1895714.71*	56.12	NAD83 StatePlane California II	North side of top of casing, approx. (TOC)
	NapaCounty-219d-swgw3	*6474230.877*	*1895714.71*	56.14	NAD83 StatePlane California II	North side of top of casing, approx. (TOC)
	NapaCounty-swgw-3	*6474657.005*	*1895984.265*	30.02	NAD83 StatePlane California II	Riverbed elevation at transducer site
Site 4 Napa River at Yountville Cross Road	NapaCounty-220s-swgw4	6460605.516	1914091.523	98.22	NAD83 StatePlane California II	North side of top of casing (TOC)
	NapaCounty-221d-swgw4	6460605.169	1914091.530	98.28	NAD83 StatePlane California II	North side of top of casing (TOC)
	NapaCounty-swgw-4	*6460833.732*	*1914345.444*	75.30	NAD83 StatePlane California II	Bolt at bottom of verticle 1-inch pipe with transducer
Site 5 Napa River at Pope Street	NapaCounty-222s-swgw5	*6431064.168*	*1948207.919*	217.07	NAD83 StatePlane California II	North side of top of casing (TOC)
	NapaCounty-223d-swgw5	*6431064.168*	*1948207.919*	217.10	NAD83 StatePlane California II	North side of top of casing (TOC)
	NapaCounty-swgw-5	*6431196.072*	*1948347.598*	191.01	NAD83 StatePlane California II	Riverbed elevation at transducer site

Note: Location data are based on a survey conducted on 9/25/2015 with a Topcon GRS-1 RTK Rover and Zeiss Ni2 Level. Horizontal coordinates in italics were calculated using GIS software here survey data were unavailable.

3 HYDROGEOLOGIC SITE CHARACTERIZATION

The Napa River flows southeastward and southward out of the Coast Range, through Napa Valley and lowland marshes before entering San Pablo Bay at American Canyon (**Figure 1.1**). The Napa Valley Groundwater Subbasin (Subbasin) underlies much of Napa Valley from a southern boundary near the Highway 12/29 Bridge over the Napa River northward for approximately 30 miles to the head of Napa Valley upstream of Calistoga. The Subbasin extends laterally within Napa Valley to the extent of surficial alluvial deposits that are contiguous with the main valley floor.

The *Updated Hydrogeologic Conceptualization and Characterization of Conditions* report (LSCE and MBK, 2013) describes the geologic units and hydrogeology of Napa Valley in greater detail and provides a basis for the site characterizations presented in this report. Napa County's Groundwater-Surface Water monitoring sites are generally located within the fluvial facies of the Napa Valley Floor Quaternary alluvium:

> "The fluvial facies consists of a thin narrow band of stream channel sands and gravels deposited by the Napa River. The sand and gravel beds tend to be thicker and/or more numerous in the fluvial facies area. They are interbedded with finer-grained clay beds of probable floodplain origin." (LSCE and MBK, 2013)

Geologic cross section prepared for this report are consistent with those presented in the *Updated Hydrogeologic Conceptualization and Characterization of Conditions* report in that they present the lithologic descriptions provided by well drillers for wells along the cross section and delineate major geologic formations based on the information from individual wells and the larger hydrogeologic conceptualization. **Figure 3.1** lists the major surficial geologic deposits and rock types in Napa Valley, according to relative time of formation.

The cross sections presented in this report are focused on the areas near to the project sites, rather than spanning the entirety of the Napa Valley Floor, to support the interpretation of project data. **Figure 3.2** shows the location of the project cross sections relative to the location of geologic cross sections developed for the *Updated Hydrogeologic Conceptualization and Characterization of Conditions* report, which provides a more thorough evaluation of Napa Valley hydrogeology (LSCE and MBK, 2013).

3.1 Site 1 – Napa River at First Street

Site 1 is located near the eastern margin of the Napa Valley Floor. USGS surficial geologic mapping indicates that the alluvium at the site consists of younger alluvium (Qhay) with terrace deposits (Qht) also in the vicinity (Graymer et al. 2007). Four Well Completion Reports (WCRs) used for cross section preparation at this site indicate the following (**Figure 3.3**):

- Quaternary alluvium (Qa) thicknesses range from approximate 50 feet bgs east of Site 1 to approximate 200 feet bgs west of the project site.

- WCRs for a shallow monitoring well drilled nearest to the proposed monitoring well site indicates an alluvium largely composed of sandy silt and silty sand, with sand and gravel units beginning at 19 feet to 25 feet bgs. The WRC for well 05N04W02N-01, a 560-feet boring approximately 800 feet west of the project site, records two coarse-grained units beginning at 20 feet bgs and continuing to 70 feet bgs. The project monitoring well encountered similar materials from 29 feet bgs to 52 feet bgs.

- The lithologic log for well 05N04W02N-01 (approximately 800 feet west of the project site) records a transition from alluvial deposits to volcanic deposits at a depth of about 220 feet. Construction records for 05N04W02L-80b and 05N04W02L to the east of the project site indicate a more shallow contact with volcanic rock at depths of less than 100 feet. This offset is interpreted to occur in part due to displacement by the East Napa Fault Zone (LSCE and MBK, 2013).

3.2 Site 2 – Dry Creek at Washington Street

Site 2 is located near the western margin of the Napa Valley Floor. The cross section at this site is oriented north-south, which is generally parallel to the Napa Valley axis in this area. An alluvium thickness of approximately 100 feet occurs along the cross section at Site 2 (**Figure 3.4**). LSCE and MBK (2013) note the occurrence of alluvial fan deposits in the vicinity of this site. USGS surficial geologic mapping indicates that the alluvium at the site consists of younger alluvium (Qhay), which borders Dry Creek as it traverses the Napa Valley Floor (Graymer et al. 2007). Sub-alluvium mapping indicates that the alluvium is underlain by Sonoma Volcanics sedimentary rocks (Tss/h), which overlie a tuffaceous formation (Tsvt).

Four WCRs were identified in the vicinity of Site 2, among these was a well drilled within 500 feet of the project monitoring well site. Information in the WCRs includes:

- Quaternary alluvium (Qa) thickness ranges from 90 feet to 130 feet below ground surface.
- WCRs for two wells drilled nearest to the proposed monitoring well site, 06N04W18j1-71 and 06N04W18h-03, indicate an alluvium largely composed of sandy clay, with interbedded gravels or sands.

3.3 Site 3 – Napa River at Oak Knoll Avenue

Site 3 is located near the eastern margin of the Napa Valley Floor. **Figure 3.5** shows the alluvium increasing in thickness from the valley margin to the east to approximately 100 feet in the vicinity of the project monitoring well. As on the opposite side of the valley at Site 2, the alluvium at Site 3 is underlain by Sonoma Volcanics sedimentary rocks (Tss/h). Here the sedimentary rocks are more thin and underlain by the andesite flows and breccias (Tsva).

Four WCRs for wells nearest to the project monitoring well at Site 3 indicate the following:

- Quaternary alluvium (Qa) thickness ranges from approximately 30 feet to 100 feet below ground surface.
- WCRs on the west side of the Napa River indicate locally-thick coarse-grained lithologic units distributed throughout the alluvium. These are consistent with observations reported for wells

used in the development of Cross Section D-D’ in the *Updated Hydrogeologic Conceptualization and Characterization of Conditions* report (LSCE and MBK, 2013).

3.4 Site 4 – Napa River at Yountville Cross Road

Site 4 is located near the center of the Napa Valley Floor north of the Town of Yountville. The Quaternary alluvium (Qa) extends to depths of approximately 120 feet to 170 feet at this Site (**Figure 3.6**). The alluvium in this area of the Napa Valley Floor contains thick beds of fluvial sand and gravel and has been noted as having some of the highest reported well yields in the valley, at up to 2,200 gallons per minute (LSCE and MBK, 2013). Wells in the vicinity of Site 4, particularly west of the Napa River indicate the presence of a unit described as Tertiary Sonoma Volcanics conglomerate/breccias (Tcg/ab), which has not been correlated with a surficial formation and therefore has not been differentiated as either a sedimentary conglomerate or a volcanic breccia (LSCE and MBK, 2013). East of the Napa River at Site 4 the alluvium is underlain by an andesitic unit of the Sonoma Volcanics (Tsva) that dips westward and continues beneath the conglomerate/breccia (Tcg/ab).

Three WCRs for wells in the vicinity of Site 4 indicate the following:

- Quaternary alluvium (Qa) thickness ranges from 120 feet to 170 feet below ground surface.
- All WCRs showed multiple coarse-grained lithologic units distributed throughout the alluvium. The first of these units was consistently reported to be about 20 feet thick beginning between 22 feet and 37 feet below ground surface.

3.5 Site 5 – Napa River at Pope Street

Site 5 is located within the City of St. Helena near the eastern Napa Valley margin. The Quaternary alluvium (Qa) at Site 5 ranges in thickness from approximately 70 feet to 120 feet to the west of the Napa River (**Figure 3.7**). The river channel is aligned very near the valley margin at Site 5 leaving little thickness in the alluvial materials to the east of the Napa River. Here a tuff formation (Tsvt) outcropped adjacent to the valley may be bound by faulting at the contact with the Tertiary sedimentary rocks (Tss/h), as indicated in Cross Section A-A' developed previously (LSCE and MBK, 2013). USGS surficial geologic mapping indicates that the alluvium at the site consists predominately of terrace deposits that span both sides of the Napa River mainstem (Graymer et al. 2007). Sub-alluvium mapping indicates that the alluvium is underlain by Sonoma Volcanics sedimentary rocks (Tss/h), which outcrop at the surface beginning in the hills approximately one-half mile northeast of the site (LSCE and MBK, 2013).

Five WCRs were identified in the vicinity of Site 5 indicate the following:

- Quaternary alluvium (Qa) thickness ranges from approximately 70 feet to 120 feet below ground surface, west of the Napa River.
- While some thick coarse-grained units are recorded within the alluvium, they are less extensive with lower well yields reported than well farther south..
- Geologic units below the alluvium are consistent with mapping by LSCE (LSCE and MBK, 2013) showing Sonoma Volcanics sedimentary rocks (tss/h), described in these WCRs as large gravels (often cemented) or sandy blue clay.

4 GROUNDWATER AND SURFACE WATER CONDITIONS

As described above, project monitoring facilities were constructed to track interrelationships between surface water and groundwater within the Napa Valley Groundwater Subbasin. While the geologic structure of Napa Valley is very complex, the project monitoring wells are constructed to monitor conditions in the upper portions of the alluvial aquifer system where direct connection to surface waters is possible and lower portions of the alluvial aquifer system which are more likely to be influenced by groundwater pumping. The following sections summarize the results of continuous water level and water quality monitoring (**Section 4.1**) and a baseline round of water quality sample collection at all sites (**Section 4.2**)

4.1 Water Level and Water Quality Monitoring

4.1.1 Site 1 – Napa River at First Street

At Site 1 the Napa River is perennially wetted and tidally-influenced with a 5 to 7 foot tidal range observed during the period of record[2] (**Figure 4.1**). Data collected at this site have shown very similar heads at all three monitoring locations, including a similar, though dampened, response to the tidal cycles in the shallow and deep casings. Heads in both monitoring well casings and the river have been more than 15 feet above the thalweg elevation over the period of record. Taken together, the water level elevations and the tidal cycle fluctuations in the shallow casing indicate some degree of hydraulic connection at this location. During the summer baseflow period, short-lived head separations of less than five feet occur during low tides between the Napa River and the shallow casing. Monitoring during the winter and spring showed heads in both casings increasing both seasonally and with peaks in the river stage. From January through March, heads in the monitoring wells were consistently a couple of feet above the river stage. During this period the magnitude of tidal fluctuations in the river stage appears to have decreased, indicating that the flow of water upstream due to incoming tides was overcome by increased river discharge due to winter rains.

Temperature (**Figure 4.2**) and conductivity (**Figure 4.3**) data from the shallow and deep monitoring well casings show relatively stable conditions compared to readings measured in the Napa River. Conductivity readings in the deep casing were above 1,500 µS/cm throughout the period of record, which were the highest conductivity values recorded across all of the project monitoring wells. Conductivity values in the Napa River at Site 1 were above 30,000 µS/cm in July and August of 2015, indicating presence of brackish water at this site, where the streambed elevation is 15 feet to 20 feet below mean sea level (**Figure 4.3**). Napa River conductivity values were similar to conductivity values in the shallow casing in March while streamflow was elevated. As streamflow declined in April and May, conductivity values in the river entered a transitional period of greatest daily variability while the balance between freshwater outflows and saline inflows from San Pablo Bay shifts with the reduction in stormwater runoff. Temperatures in the Napa River varied much more widely than did groundwater at

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[2] Elevated conductivity levels in the Napa River at Site 1 resulted in a failure of the instrument in August 2015. A temporary transducer was installed in November with a full replacement transducer, including conductivity sensor installed in March 2016.

this site, likely due to seasonal temperature variations with increased heat gain in the summer due to the degree of solar exposure (**Figure 4.2**).

4.1.2 Site 2 – Dry Creek at Washington Street

Dry Creek at Site 2 is an intermittent stream, with flows typically dropping to about 1 cubic feet per second (cfs) or less over summer. Over the period of record from December 2014 through June 2016 the surface water and groundwater were only directly during the winter and spring of 2016, when the elevation of groundwater in the shallow casing was at or above the stream thalweg elevation (**Figure 4.4**). Heads between the shallow and deep casings were separated by as little as six feet in the spring of 2015, increasing to 15 feet by October 2015, indicating a downward vertical gradient in the upper 80 feet of the alluvial aquifer system.

Water temperature data at Site 2 show generally stable temperatures in both monitoring well casings with much more variable temperatures in Dry Creek (**Figure 4.5**). Temperatures in the shallow casing appear to show a delayed response relative to temperatures in Dry Creek. From August 2015 through mid-November 2015 shallow casing water temperatures climbed slowly from 18.6°C to 20.1°C. Dry Creek temperatures were generally above 20°C in August and September, but declined substantially with the transition to cooler air temperatures in the fall and winter precipitation and runoff in December. Shallow casing temperatures began a more gradual decline in December 2015, coinciding with the period when shallow casing water levels suggest that the stream and shallow groundwater reconnected.

Conductivity values at Site 2 are consistent with showing a direct connection between surface water and shallow groundwater from December through April 2016, when sharp declines in surface water conductivity (likely due to precipitation induced runoff) are followed by more gradual declines in conductivity in the shallow casing (**Figure 4.6**). A similar pattern also occurred from August through October 2015, with shallow groundwater conductivity values tracking fluctuations in surface water conductivity.

4.1.3 Site 3 – Napa River at Oak Knoll Avenue

The Napa River at Site 3 is intermittent, with flows typically dropping to about 1 cfs or less over summer. Groundwater levels in the shallow casing at Site 3 indicate that surface water and groundwater experienced consistent to intermittent direct hydraulic connection[3] (**Figure 4.7**). Overall, water level data show heads in the shallow and deep casing were generally within a foot of each other. The groundwater heads also tended to remain elevated relative to the surface water elevation, except during times of sharp stream stage peaks in the winter and spring of 2016 and during the fall when surface water stages were lowest. In addition, sharp peaks in the surface water elevation were followed

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[3] The surface water transducer installed at Site 3 is located in a depression that is lower than the thalweg, which accounts for some surface water levels shown to be below the thalweg elevation during late summer and fall of 2015.

by lesser peaks in the shallow and deep casings. Together these observations suggest a potential for direct hydraulic connection throughout much of the period of record.

While water temperatures in both the deep and shallow casing at Site 3remained consistent and within one degree of each other throughout the period of record, one temporary water temperature decline occurred 3/12/2016, 30 hours after the second highest surface water stage peak of the period of record and 144 hours (6 days) following the highest surface water stage peak of the period of record (**Figure 4.7 and Figure 4.8**). This may indicate that the magnitude of flow from surface water to groundwater is relatively low except during peak surface water stages, leading to limited temperature responses in the shallow casing in response to storm runoff peaks in the Napa River.

Conductivity values at Site 3 show similar concentrations at all three monitored locations from September through November 2015, when the river stage was below the thalweg (**Figure 4.9**). As river stages increased with storm runoff in December 2015, the surface water conductivity declined quickly from about 600 to 263 µS/cm. Conductivity values in the Napa River remained generally below 300 µS/cm through the spring of 2016, with short term peaks coinciding with the recession limb of storm hydrographs, when baseflow contributions increase.

Well completion reports for wells in the vicinity suggest that alluvial materials, particularly in the shallow alluvium, become less permeable from west to east (**Figure 3.5**). This supports the observations suggesting that the degree of flow between groundwater and surface water at this site may be limited, although water levels indicate a direct hydraulic connection over much of the period of record.

4.1.4 Site 4 – Napa River at Yountville Cross Road

Existing stream gauging, by the Napa RCD, at Site 4 on the Napa River includes surface water stage monitoring, although discharge monitoring is not a focus of the Napa RCD monitoring effort. Nevertheless, for this project's period of record the Napa River remained perennially wetted (**Figure 4.10a**). Groundwater levels in the shallow casing at Site 4 indicate that surface water and groundwater experienced a consistent direct hydraulic connection from December 2014 through May 2015. Overall, water level data show heads in the shallow and deep casing are generally within a foot of each other. The groundwater heads also tend to remain elevated relative to the surface water elevation, except during times of sharp surface water stage peaks in the winter and spring and during the fall when surface water stages were lowest. However, even during the latter case shallow groundwater levels remained at an elevation above the river thalweg at the site.

Figure 4.10b shows continuous monitoring data collected at Site 4 for this project along with a long-term groundwater levels recorded manually by Napa County. The manually monitored well, NapaCounty-133, is located approximately 0.5 miles southeast of Site 4, at a similar land surface elevation at a total well depth of 120 feet. The long-term record from NapaCounty-133 shows that the fluctuations in groundwater levels at the Site 4 shallow and deep casings are comparable to those observed in the vicinity since 1978.

Water temperature data from Site 4 show a pattern similar to observations at Sites 1 and 3. While water temperatures in the Napa River at Site 4 ranged from 23.75°C to 5.18°C, groundwater temperatures were much more stable[4] (**Figure 4.11**). These observations could indicate that the magnitude of flow from surface water to groundwater during peak stream stages is limited.

Conductivity data from Site 4 are somewhat limited temporally, but tend to show similarities in values in the Napa River and shallow casing, as would be expected under a direct hydraulic connection (**Figure 4.12**). Conductivity measurements in the deep casing were lower and more stable than values in the shallow casing, possibly indicating the influence of different geologic source material in the deeper alluvium.

4.1.5 Site 5 – Napa River at Pope Street

The Napa River at Site 5 is intermittent, with flows typically dropping to about 1 cfs or less over summer. Over the period of record from December 2014 through June 2016 the surface water and groundwater were directly connected during the winter, spring, and early summer months, when the elevation of groundwater in the shallow casing was at or above the stream thalweg elevation (**Figure 4.13a**). Shallow casing groundwater elevations closely tracked the surface water elevation while water remained in the river channel. Once the river channel became dry, groundwater levels dropped by as much as five feet over the course of the late summer and fall of 2015, before quickly rebounding when flow returned to the river channel.

Heads between the shallow and deep casings were separated by as little as three feet in the spring of 2015, increasing to 15 feet by October 2015, indicating a downward vertical gradient in the upper 80 feet of the alluvial aquifer system. Water level data in the deep casing at Site 5 show the most influence from groundwater pumping in the vicinity. At Site 5, the pumping influence may be from the City of St. Helena irrigation well nearby (see **Section 2.1.5**). Manual groundwater level measurements recorded at that well (NapaCounty-212) show a close agreement with groundwater levels in the monitoring well deep casing at the time of the spring and fall 2015 measurements (**Figure 4.13b**). Despite the pumping influence seen in the deep casing, head in that casing fully recovered over the winter of 2016 relative to the winter 2015 condition. A manual measurement recorded in NapaCounty-212 shows that water levels in that nearby well recovered even further through into the spring of 2016 (**Figure 4.13b**).

Water temperatures recorded at Site 5 showed more variability in the shallow casing than at any other site (**Figure 4.14**). While temperature data from the Napa River are limited at this site, the general pattern of increasing shallow casing water temperatures during the summer of 2015 followed by declining temperatures in the winter of 2016 is similar to the pattern observed at Site 2. This along with the similarities between shallow casing and Napa River water temperatures from mid-January through mid-March 2016 also indicate a direct hydraulic connection during that time.

Conductivity data from Site 5 are somewhat limited temporally, but tend to show similarities in values in the Napa River and shallow casing, as would be expected under a direct hydraulic connection (**Figure 4.15**).

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[4] A temporary failure in the shallow casing transducer at Site 4 from mid-January through mid-March 2016 resulted in a data gap during that time period.

4.2 Water Quality Sampling

Baseline water quality samples were collected at all project monitoring wells and surface water monitoring sites in on June 3, 2015 and June 4, 2015. Results from the fifteen sites samples are summarized in **Tables 4.1a** and **4.1b**. Groundwater samples were collected by submersible pump after purging for a minimum of three casing volumes and achieving field parameter stabilization. When monitoring well casings were pumped dry during the purge process a grab sample was collected following sufficient water level recovery. Surface water samples were collected as grab samples.

Samples were analyzed for general mineral, general physical, and drinking water metals by DWR's Bryte Laboratory. All reports provided by the lab and purge logs are provided in **Appendix C**.

In general, results from the water quality sampling were consistent with previously documented groundwater quality conditions in the Napa Valley Groundwater Subbasin and with the conductivity values recorded by transducers at each project site (LSCE, 2011 and LSCE, 2016).

Only one exceedance of a primary drinking water Maximum Contaminant Level (MCL) was noted in the groundwater samples collected in June 2015. The dissolved arsenic concentration in the sample collected at the deep casing at Site 3 was 0.046 mg/l, above the primary drinking water MCL of 0.010 mg/l. Nitrate concentrations were below the primary drinking water MCL in all groundwater samples collected; however, the Site 1 surface water sample had a concentration of 12.6 mg/l NO3-N compared to the primary drinking water MCL of 10 mg/l NO3-N.

A dissolved aluminum concentration of 0.432 mg/l at the deep casing at Site 2 was above the drinking water secondary MCL of 0.200 mg/l. Dissolved iron concentrations were above the drinking water secondary MCL of 0.300 mg/l in samples collected at the deep casings at Sites 2 and 5. Dissolved boron in the sample collected at the deep casing at Site 3 had a concentration of 9.1 mg/l, above the California Notification Level of 1.0 mg/l. Dissolved manganese was detected at concentration above the drinking water secondary MCL of 0.050 mg/l in all five deep casings, as well as the shallow casings at Sites 1, 4, and 5 and the surface water sample at Site 1.

A few spatial correlations between water quality constituents are evident in the Piper Diagrams (in meq/l) of **Figures 4.16**, **4.17,** and **4.18**. While the shallow casing water quality samples are generally not spatially correlated, the elevated alkalinity at Site 4 in the shallow casing (NapaCounty-220s) stands out (**Figure 4.16**). However, among the deep casing samples, similarly elevated alkalinities were found in samples from Sites 2, 4, and 5 (**Figure 4.17**). The similarity between alkalinities, and the complete cation/anion composition as well, at the shallow and deep casings at Site 4 suggests a similar geologic source. The similar alkalinities also suggest carbonate rock as a primary geologic material along the groundwater flowpath.

A Piper Diagram of deep casing water quality data suggest a spatial trend of increasing chloride concentrations in the deeper alluvium (**Figure 4.17**). A corresponding Piper Diagram of the surface water samples shows a slightly increasing trend in chloride concentration. Conductivity data records from transducers at Site 1, including stable conductivity values in shallow groundwater of between 400 µS/cm and 500 µS/cm, do not indicate that brackish water intermittently present in the Napa River at this site is impacting conductivity in either the shallow or deeper alluvium. In light of this, the trend in chloride concentrations in the deeper alluvium is more likely due to a combination of increasing distance along the groundwater flowpath and longer contact time with geologic source materials contributing to chloride enrichment.

Table 4.1a June 2015 Baseline Water Quality Results Summary

Site	Sample ID	Sample Date	Total Alkalinity mg/L as CaCO3 Std Method 2320 B [1]*	Dissolved Aluminum mg/L EPA 200.8 (D) [1]*	Dissolved Antimony mg/L EPA 200.8 (D) [1]*	Dissolved Arsenic mg/L EPA 200.8 (D) [1]*	Dissolved Barium mg/L EPA 200.8 (D) [1]*	Dissolved Beryllium mg/L EPA 200.8 (D) [1]*	Dissolved Bicarbonate (HCO3-) mg/L as CaCO3 Std Method 4500-CO2 D [1]*	Dissolved Boron mg/L EPA 200.7 (D) [1]*	Dissolved Bromide mg/L EPA 300.0 28d Hold [1]*	Dissolved Cadmium mg/L EPA 200.8 (D) [1]*	Dissolved Calcium mg/L EPA 200.7 (D) [1]*
Site 1	NapaCounty-214s	6/3/2015 8:09	117	<0.01	<0.001	<0.001	0.081	<0.001	117	0.2	0.07	<0.001	19
Site 1	NapaCounty-215d	6/3/2015 7:16	258	<0.01	<0.001	0.007	0.103	<0.001	258	1.4	0.63	<0.001	41
Site 1	NapaCounty-swgw_SW1	6/4/2015 13:39	145	0.02	<0.001	0.015	0.136	<0.001	144	1.4	15.9	<0.001	145
Site 2	NapaCounty-216s	6/3/2015 13:03	93	0.089	<0.001	<0.001	0.046	<0.001	93	<0.1	0.12	<0.001	22
Site 2	NapaCounty-217d	6/3/2015 12:23	116	0.432	<0.001	0.001	0.027	<0.001	116	<0.1	0.06	<0.001	15
Site 2	NapaCounty-swgw_SW2	6/3/2015 13:15	154	0.029	<0.001	<0.001	0.059	<0.001	153	0.1	0.02	<0.001	34
Site 3	NapaCounty-218s	6/3/2015 11:02	192	<0.01	<0.001	<0.001	0.091	<0.001	192	0.1	0.13	<0.001	47
Site 3	NapaCounty-219d	6/3/2015 10:04	225	<0.01	<0.001	0.046	0.088	<0.001	224	9.1	0.33	<0.001	17
Site 3	NapaCounty-swgw_SW3	6/4/2015 12:46	176	0.012	<0.001	0.003	0.073	<0.001	175	0.5	0.2	<0.001	36
Site 4	NapaCounty-220s	6/4/2015 8:19	199	<0.01	<0.001	0.003	0.078	<0.001	199	0.1	0.1	<0.001	32
Site 4	NapaCounty-221d	6/4/2015 7:52	124	<0.01	<0.001	0.004	0.05	<0.001	124	<0.1	0.03	<0.001	14
Site 4	NapaCounty-swgw_SW4	6/4/2015 8:50	98	<0.01	<0.001	0.001	0.042	<0.001	98	<0.1	0.08	<0.001	22
Site 5	NapaCounty-222s	6/4/2015 11:29	117	<0.01	<0.001	0.003	0.041	<0.001	117	0.6	0.12	<0.001	28
Site 5	NapaCounty-223d	6/4/2015 10:56	213	<0.01	<0.001	0.002	0.104,0.105**	<0.001	213	0.5	0.07	<0.001	16
Site 5	NapaCounty-swgw_SW5	6/4/2015 11:56	92,93**	<0.01	<0.001	0.004	0.039	<0.001	93	0.8	0.12	<0.001	21

Site	Sample ID	Sample Date	Dissolved Carbonate (CO3--) mg/L as CaCO3 Std Method 4500-CO2 D [1]*	Dissolved Chloride mg/L EPA 300.0 28d Hold [1]*	Dissolved Chromium mg/L EPA 200.8 (D) [1]*	Dissolved Cobalt mg/L EPA 200.8 (D) [1]*	Conductance (EC) µS/cm Std Method 2510-B [1]*	Dissolved Copper mg/L EPA 200.8 (D) [1]*	Dissolved Fluoride mg/L EPA 300.0 28d Hold [1]*	Dissolved Hardness mg/L as CaCO3 Std Method 2340 B [1]*	Dissolved Hydroxide (OH-) mg/L as CaCO3 Std Method 4500-CO2 D [1]*	Dissolved Iron mg/L EPA 200.8 (D) [1]*	Dissolved Lead mg/L EPA 200.8 (D) [1]*
Site 1	NapaCounty-214s	6/3/2015 8:09	<1	28	<0.001	<0.005	416	<0.001	0.2	144	<1	0.009	<0.001
Site 1	NapaCounty-215d	6/3/2015 7:16	1	177	<0.001	<0.005	1174	0.001	0.2	226	<1	0.042	<0.001
Site 1	NapaCounty-swgw_SW1	6/4/2015 13:39	1	4699	0.002	<0.005	14319	0.006	<0.1	1717	<1	0.025	<0.001
Site 2	NapaCounty-216s	6/3/2015 13:03	<1	15	0.001	<0.005	317	0.003	0.2	116	<1	0.066	<0.001
Site 2	NapaCounty-217d	6/3/2015 12:23	<1	5	0.001	<0.005	255	0.001	0.6	74	<1	0.331	<0.001
Site 2	NapaCounty-swgw_SW2	6/3/2015 13:15	1	12	0.005	<0.005	411	0.006	0.2	159	<1	0.091	<0.001
Site 3	NapaCounty-218s	6/3/2015 11:02	<1	19	0.001	<0.005	536	<0.001	<0.1	247	<1	0.008	<0.001
Site 3	NapaCounty-219d	6/3/2015 10:04	1	73	<0.001	<0.005	712	0.005	0.3	116	<1	0.021	<0.001
Site 3	NapaCounty-swgw_SW3	6/4/2015 12:46	1	27	<0.001	<0.005	515	0.001	0.2	215	<1	0.022	<0.001
Site 4	NapaCounty-220s	6/4/2015 8:19	<1	7	<0.001	<0.005	429	<0.001	0.2	190	<1	<0.005	<0.001
Site 4	NapaCounty-221d	6/4/2015 7:52	<1	6	<0.001	<0.005	263	<0.001	0.2	100	<1	0.009	<0.001
Site 4	NapaCounty-swgw_SW4	6/4/2015 8:50	<1	18	<0.001	<0.005	328	0.001	0.1	128	<1	0.046	<0.001
Site 5	NapaCounty-222s	6/4/2015 11:29	<1	32	<0.001	<0.005	372	<0.001	0.3	123	<1	0.014	<0.001
Site 5	NapaCounty-223d	6/4/2015 10:56	<1	16	0.001	<0.005	453	<0.001	0.3	113	<1	0.473,0.476**	<0.001
Site 5	NapaCounty-swgw_SW5	6/4/2015 11:56	<1	34	<0.001	<0.005	346	0.002	0.4	100	<1	0.019	<0.001

*Codes in brackets ([]) following the analyte name refer to the Method Comparability Code. For more information, please refer to http://www.water.ca.gov/waterdatalibrary/includes/mtc_code.cfm.
**More than one analysis was made for this sample

Table 4.1b June 2015 Baseline Water Quality Results Summary

Site	Sample ID	Sample Date	Dissolved Lithium mg/L EPA 200.8 (D) [1]*	Dissolved Magnesium mg/L EPA 200.7 (D) [1]*	Dissolved Manganese mg/L EPA 200.8 (D) [1]*	Dissolved Mercury mg/L EPA 200.8 (Hg Dissolved) [1]*	Dissolved Molybdenum mg/L EPA 200.8 (D) [1]*	Dissolved Nickel mg/L EPA 200.8 (D) [1]*	Dissolved Nitrate mg/L as N EPA 300.0 28d Hold [1]*	Dissolved Nitrite mg/L as N Std Method 4500-NO2 B (48Hr) [1]*	Dissolved Potassium mg/L EPA 200.7 (D) [1]*	Dissolved Selenium mg/L EPA 200.8 (D) [1]*	Dissolved Silver mg/L EPA 200.8 (D) [1]*
Site 1	NapaCounty-214s	6/3/2015 8:09	0.011	23	2.53	<0.0002	<0.005	0.003	7.3	0.02	1.1	<0.001	<0.001
Site 1	NapaCounty-215d	6/3/2015 7:16	0.059	30	1.13	<0.0002	<0.005	0.002	<0.1	<0.01	4.5	0.002	<0.001
Site 1	NapaCounty-swgw_SW1	6/4/2015 13:39	0.067	329	0.076	<0.0002	<0.005	0.007	12.6	<0.01	106.5	0.046	<0.001
Site 2	NapaCounty-216s	6/3/2015 13:03	0.012	15	0.041	<0.0002	<0.005	0.002	5.4	0.01	0.9	<0.001	<0.001
Site 2	NapaCounty-217d	6/3/2015 12:23	0.014	9	0.643	<0.0002	0.005	0.002	<0.1	<0.01	1.3	<0.001	<0.001
Site 2	NapaCounty-swgw_SW2	6/3/2015 13:15	0.008	18	0.024	<0.0002	<0.005	0.013	0.5	<0.01	2.1	<0.001	<0.001
Site 3	NapaCounty-218s	6/3/2015 11:02	0.01	31	<0.005	<0.0002	<0.005	0.003	1.8	<0.01	0.7	<0.001	<0.001
Site 3	NapaCounty-219d	6/3/2015 10:04	0.037,0.038**	18	0.241,0.242**	<0.0002	0.013,0.014**	0.001	<0.1	<0.01	5.2	<0.001	<0.001
Site 3	NapaCounty-swgw_SW3	6/4/2015 12:46	0.046	30	0.038	<0.0002	<0.005	0.004	<0.1	<0.01	2.9	<0.001	<0.001
Site 4	NapaCounty-220s	6/4/2015 8:19	<0.005	26	0.568	<0.0002	<0.005	0.005	0.7	0.03	3.6	<0.001	<0.001
Site 4	NapaCounty-221d	6/4/2015 7:52	<0.005	16	0.728	<0.0002	<0.005	0.002	<0.1	<0.01	4.7	<0.001	<0.001
Site 4	NapaCounty-swgw_SW4	6/4/2015 8:50	<0.005	17	0.041	<0.0002	<0.005	0.003	<0.1	<0.01	1.7	<0.001	<0.001
Site 5	NapaCounty-222s	6/4/2015 11:29	0.063	13	0.641	<0.0002	<0.005	0.01	<0.1	<0.01	3.8	<0.001	<0.001
Site 5	NapaCounty-223d	6/4/2015 10:56	0.075,0.076**	18	0.219,0.223**	<0.0002	<0.005	0.002	0.3	<0.01	7.1	<0.001	<0.001
Site 5	NapaCounty-swgw_SW5	6/4/2015 11:56	0.095	11	0.048	<0.0002	<0.005	0.003	<0.1	<0.01	3.7	<0.001	<0.001

Site	Sample ID	Sample Date	Dissolved Sodium mg/L EPA 200.7 (D) [1]*	Total Dissolved Solids mg/L Std Method 2540 C [1]*	Dissolved Strontium mg/L EPA 200.8 (D) [1]*	Dissolved Sulfate mg/L EPA 300.0 28d Hold [1]*	Dissolved Thallium mg/L EPA 200.8 (D) [1]*	Turbidity N.T.U. EPA 180.1 [D-2]*	Dissolved Vanadium mg/L EPA 200.8 (D) [1]*	Dissolved Zinc mg/L EPA 200.8 (D) [1]*	pH pH Units Std Method 2320 B [1]*
Site 1	NapaCounty-214s	6/3/2015 8:09	31	268	0.144	45	<0.001	1.21	<0.005	<0.005	6.9
Site 1	NapaCounty-215d	6/3/2015 7:16	164	683	0.32	74	<0.001	2.75	<0.005	<0.005	7.3
Site 1	NapaCounty-swgw_SW1	6/4/2015 13:39	2590	8830	2.19	667	<0.001	20.6	0.018	0.012	7.8
Site 2	NapaCounty-216s	6/3/2015 13:03	22	208	0.169	38	<0.001	77.4	<0.005	<0.005	6.8
Site 2	NapaCounty-217d	6/3/2015 12:23	29	164	0.107	9	<0.001	7.29	<0.005	<0.005	7.4
Site 2	NapaCounty-swgw_SW2	6/3/2015 13:15	28	255	0.269	44	<0.001	1.37	<0.005	0.027	7.6
Site 3	NapaCounty-218s	6/3/2015 11:02	20	324	0.357	65	<0.001	5.06	<0.005	<0.005	6.7
Site 3	NapaCounty-219d	6/3/2015 10:04	108	452	0.125,0.126**	32	<0.001	1.16	<0.005	0.006	7.4
Site 3	NapaCounty-swgw_SW3	6/4/2015 12:46	27	313	0.248	54	<0.001	7.48	<0.005	<0.005	7.8
Site 4	NapaCounty-220s	6/4/2015 8:19	19	292	0.199	11	<0.001	3.29	<0.005	<0.005	6.7
Site 4	NapaCounty-221d	6/4/2015 7:52	16	204	0.079	6	<0.001	7.11	<0.005	<0.005	7.1
Site 4	NapaCounty-swgw_SW4	6/4/2015 8:50	17	250	0.131	39	<0.001	3.4	<0.005	<0.005	7.3
Site 5	NapaCounty-222s	6/4/2015 11:29	26	241	0.155	21	<0.001	1.33,1.48**	<0.005	<0.005	7.1
Site 5	NapaCounty-223d	6/4/2015 10:56	56	343	0.104,0.105**	6	<0.001	18.8	<0.005	<0.005	7.2
Site 5	NapaCounty-swgw_SW5	6/4/2015 11:56	30	220	0.111	25	<0.001	1.68	<0.005	0.006	7.4

*Codes in brackets ([]) following the analyte name refer to the Method Comparability Code. For more information, please refer to http://www.water.ca.gov/waterdatalibrary/includes/mtc_code.cfm.
**More than one analysis was made for this sample

5 SUMMARY AND RECOMMENDATIONS

The construction of dedicated monitoring facilities to track groundwater-surface water interactions in the Napa Valley Subbasin provides resource managers with an important source of data about these interconnected resources. Data collected in 2015 and 2016 show that shallow groundwater and surface waters were hydraulically connected throughout much of the winter and spring at the mainstem Napa River sites, and longer in some locations. Data from Site 1, the farthest downstream site, show a consistent hydraulic connection during the year, with little variability in groundwater levels. Sites on the mainstem Napa River at Oak Knoll Avenue and Yountville Cross Rd, Sites 3 and 4, showed groundwater elevations above the river stage elevation inducing groundwater flow into the Napa River (gaining conditions) from January until September, when shallow and deep groundwater elevations continued to decline, inducing losing streamflow conditions. These losing conditions persisted into the 2015 winter storms, when high magnitude stormwater Napa River flows (with high stage elevations) induced groundwater recharge.

Losing stream conditions were observed throughout 2015 at Sites 2 and 5 where the direction of groundwater flow is away from the streambed. At Site 5, water level data indicate that the river was hydraulically connected to shallow groundwater during the first half of the year, until flows in the river ceased in July, and again in December 2015 as storms generated runoff leading to renewed flow in the river. At Site 2, located along Dry Creek, groundwater levels were consistently below the streambed elevation in 2015, indicating that groundwater was disconnected from the stream, although recharge to the groundwater system was likely occurring when water flowed in the creek.

Sites 2 and 5 also showed groundwater level differences between the shallow and deep casings of at least 5 feet for most or all of 2015. Given that most groundwater withdrawals in Napa Valley occur from depths greater than 50 feet, these water level differences show how the groundwater system’s response to pumping from deeper aquifer units does not necessarily lead to an equivalent reduction in shallow groundwater levels.

Water year 2015 marked the fourth year of California’s current statewide drought. Continued data collection in subsequent years will provide a more robust understanding of the range of conditions at these sites.

5.1 Recommendations

Implementation of groundwater/surface water monitoring in the Napa Valley Subbasin has already proven to be very valuable for improving the understanding of surface water and groundwater interactions. Similar facilities at additional locations would help further this understanding and aid in on-going efforts to sustainably manage the Napa Valley Subbasin. Additional monitoring will also be key to the objective of maintaining or improving streamflow during drier years and/or seasons. As a result, it is recommended that in coordination with the Napa RCD and others, as appropriate, the County:

- Evaluate stream gaging network objectives, particularly with respect to the water budget requirements contained in the recently finalized Groundwater Sustainability Plan regulations, and determine the need and feasibility of additional streamflow monitoring sites.

- Consider additional areas that may also benefit from nearby shallow nested groundwater monitoring wells (similar to the facilities constructed as part of the current project) to monitor groundwater/surface water interactions in areas where data are lacking or where geologic conditions indicate that conditions not adequately represented by the current monitoring network.

- Continue efforts to integrate data collected at the groundwater/surface water monitoring sites with existing remote data acquisition systems in order to facilitate monitoring aquifer conditions in real-time.

6 REFERENCES

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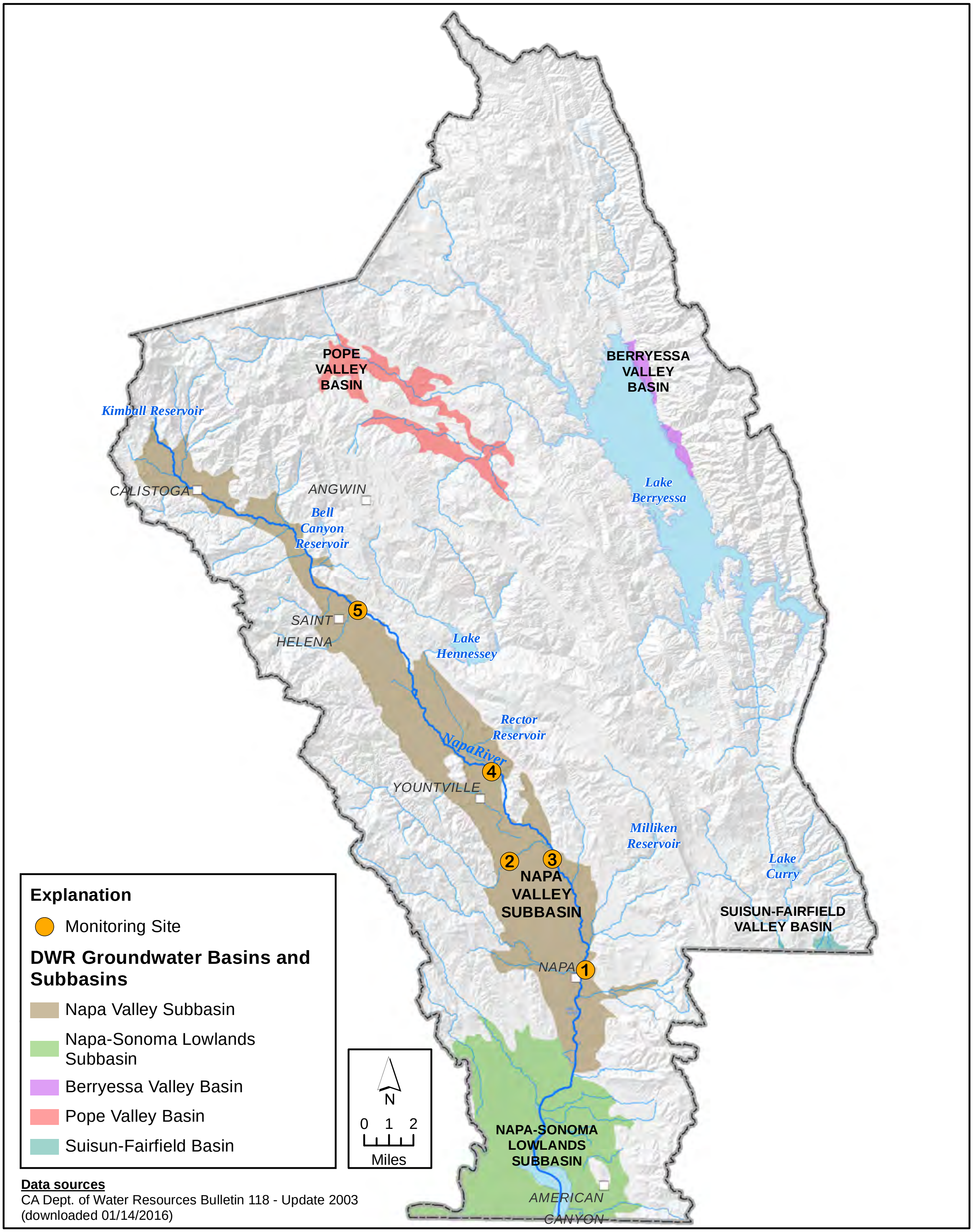
FIGURES



Data sources
CA Dept. of Water Resources Bulletin 118 - Update 2003
(downloaded 01/14/2016)

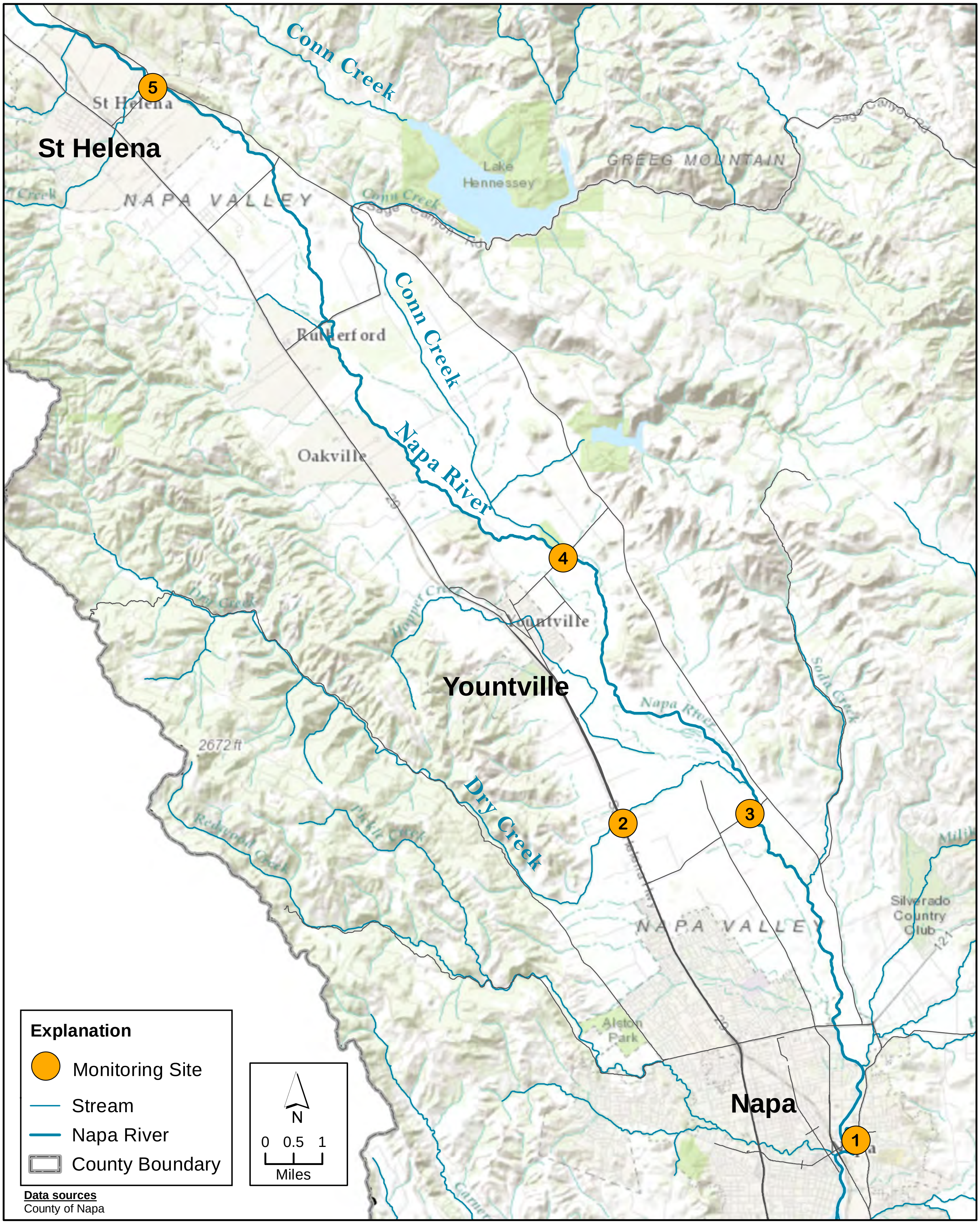
X:\2012 Job Files\12-071\GIS\Figure 1.1 GW-SW Sites and GW Basins.mxd

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

FIGURE 1.1

Napa County Groundwater-Surface Water Monitoring Sites and Groundwater Basins and Subbasins

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program



X:\2012 Job Files\12-071\GIS\Figure 2.1 GW-SW Monitoring Sites.mxd

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FIGURE 2.1
Napa County Groundwater-Surface Water Monitoring Sites Overview

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program

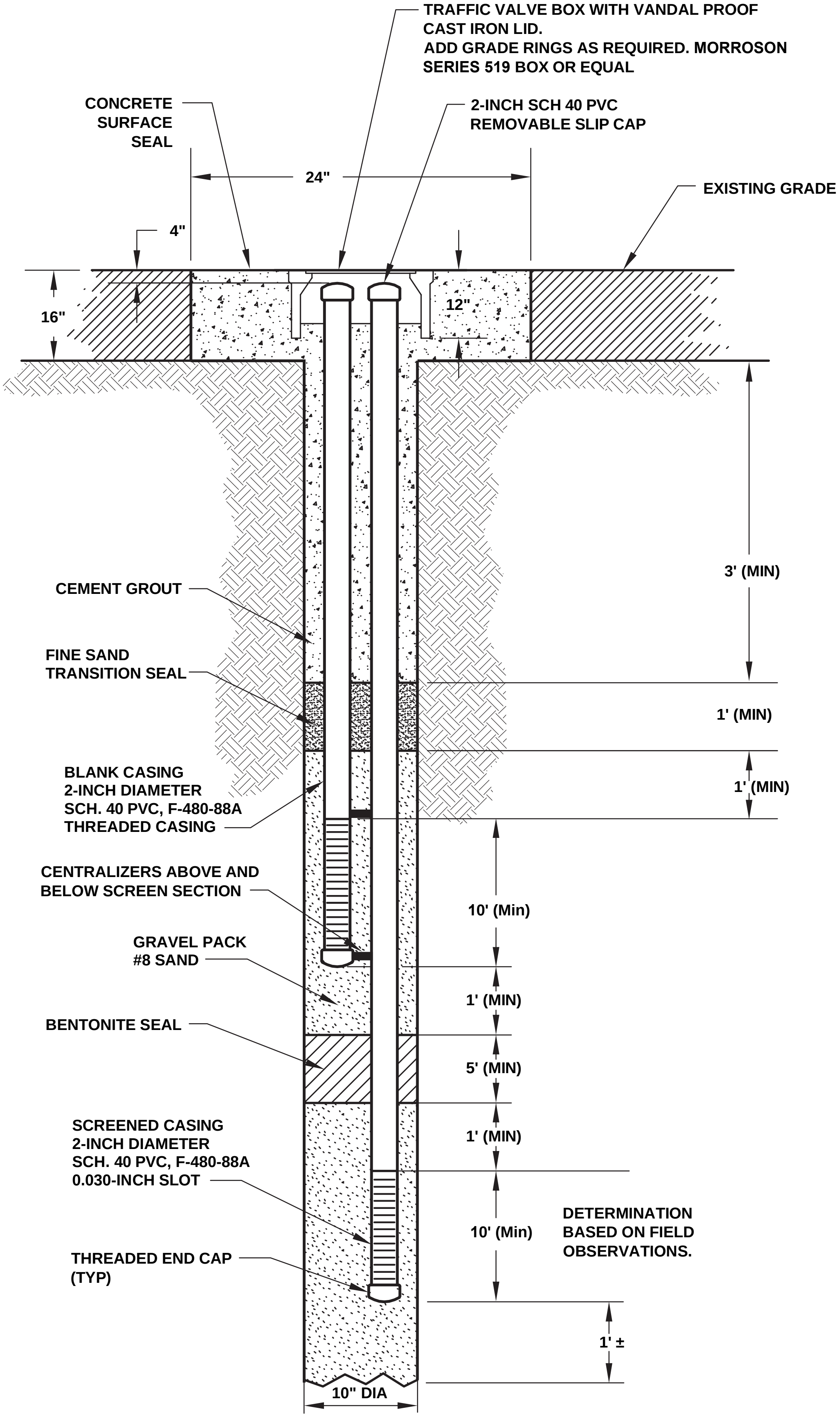

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Figure 2.2
Typical Nested Groundwater Monitoring Well Profile

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program

Data sources
County of Napa, U.S. Geological Survey, Napa County Resource

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FIGURE 2.3
Site Map
Site 1: Napa River at 1st St

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program

LSCE Project No. 12-1-071
Well Name: Napa County-214s-swgw1
Lat./Long.: 38.30223/-122.27845
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #1- Napa River at 1st Street
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/2/14 - 9/4/14
Well Depth (ft): 53
Boring Depth (ft): 100
Well Screen (ft): 30-50

Lithologic Description

0-10': Silty Sand- 70% fine to medium sand, 30% non-plastic fines, minor clay, brown, dry

Slightly moist

10-16': Sandy Clay- 70% medium plastic fines, 30% fine sand, brown, stiff, moist

16-18': Sand- 95% very fine to coarse sand, 5% gravel, poorly sorted, gravel up to 1/4", minor clay, saturated, first encountered water at 16 ft.

18-26': Clay- brown, soft, medium plastic, 10% fine sand, wet

26-26.5': Sand- 95% fine to coarse sand, 5% gravel, saturated

26.5-29': Clay- 95% medium plastic fines, 5% fine sand, brown mottled greenish gray

29-29.5': Gravel stringer, wet, approximately 2" thick

29.5-30': Clay- 95% medium plastic fines, 5% fine sand, brown mottled greenish gray

30-37': Sand- 85% very fine to coarse sand, 15% gravel, gravel up to 1/4", saturated, gravel up to 25% at 35 ft.

37-37.5': Clay- greenish gray, medium plastic, sticky, lense approximately 3" thick

37.5-52': Sand and Gravel- 70% fine to coarse sand, sub-rounded to sub-angular, 30% gravel up to 1", saturated, greenish gray in overall color, multi-colored lithics

52-56': Clay- 95% medium plastic fines, 5% fine sand, yellowish brown mottled light gray, hard, slightly moist

56-63': Sand and Gravel with Clay- 40% fine to coarse sand, 20% gravel, 40% medium plastic fines, yellowish brown, saturated, sand sub-rounded to sub-angular, gravel up to 1", trace cobbles

63-74.5': Clay- >95% medium plastic fines, yellowish brown mottled light gray, hard, slightly moist

74.5-75': approximately 1" thick sandy lense, wet

75-92': Clay with Sand and Gravel- 30% fine to coarse sand, 20% gravel, 50% medium plastic fines, brown mottled reddish brown, wet, gravel up to 1/4"

92-100': Clay- >95% medium plastic fines, yellowish brown mottled light gray, hard, moist, trace sand

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

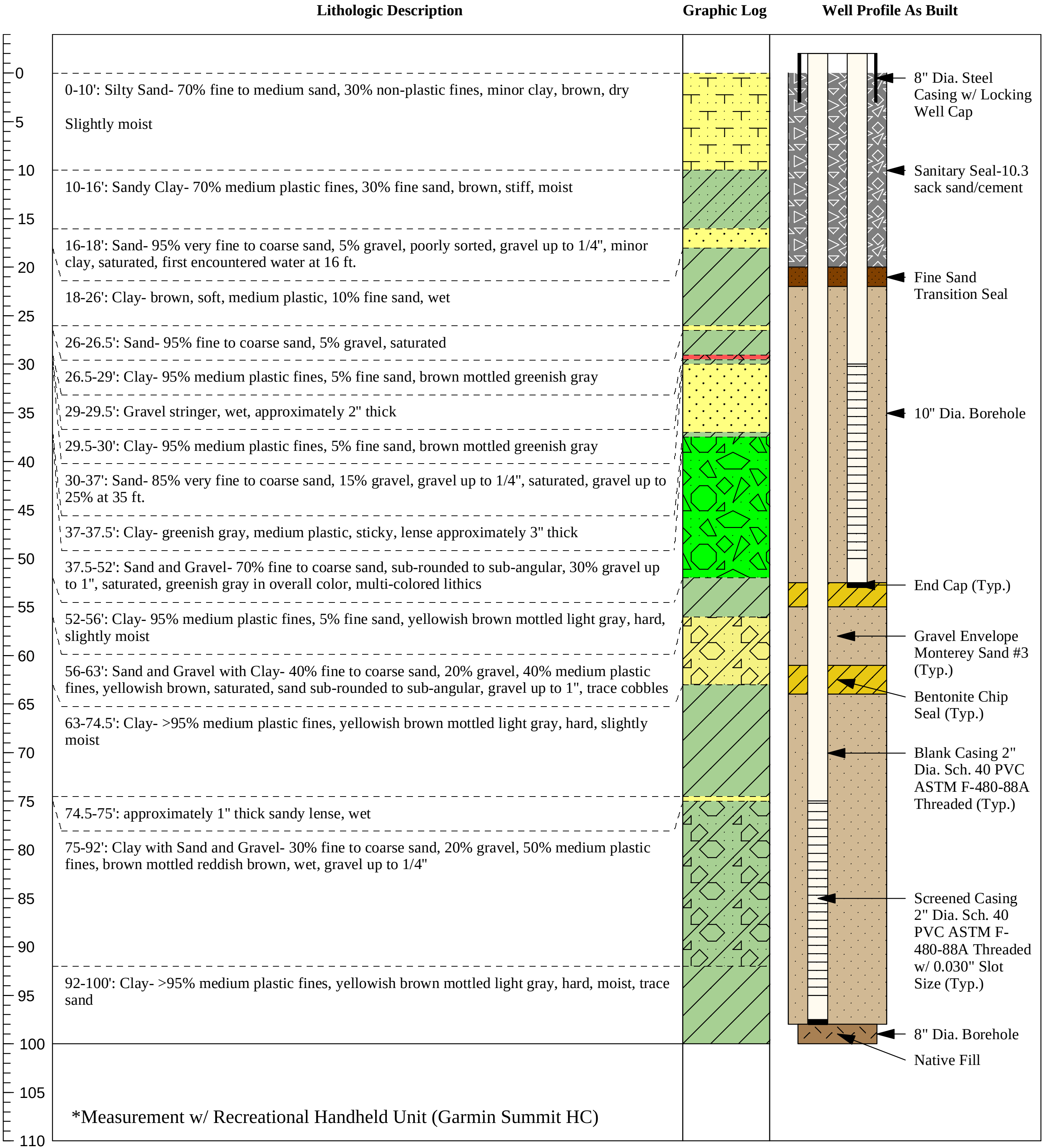

FIGURE 2.4

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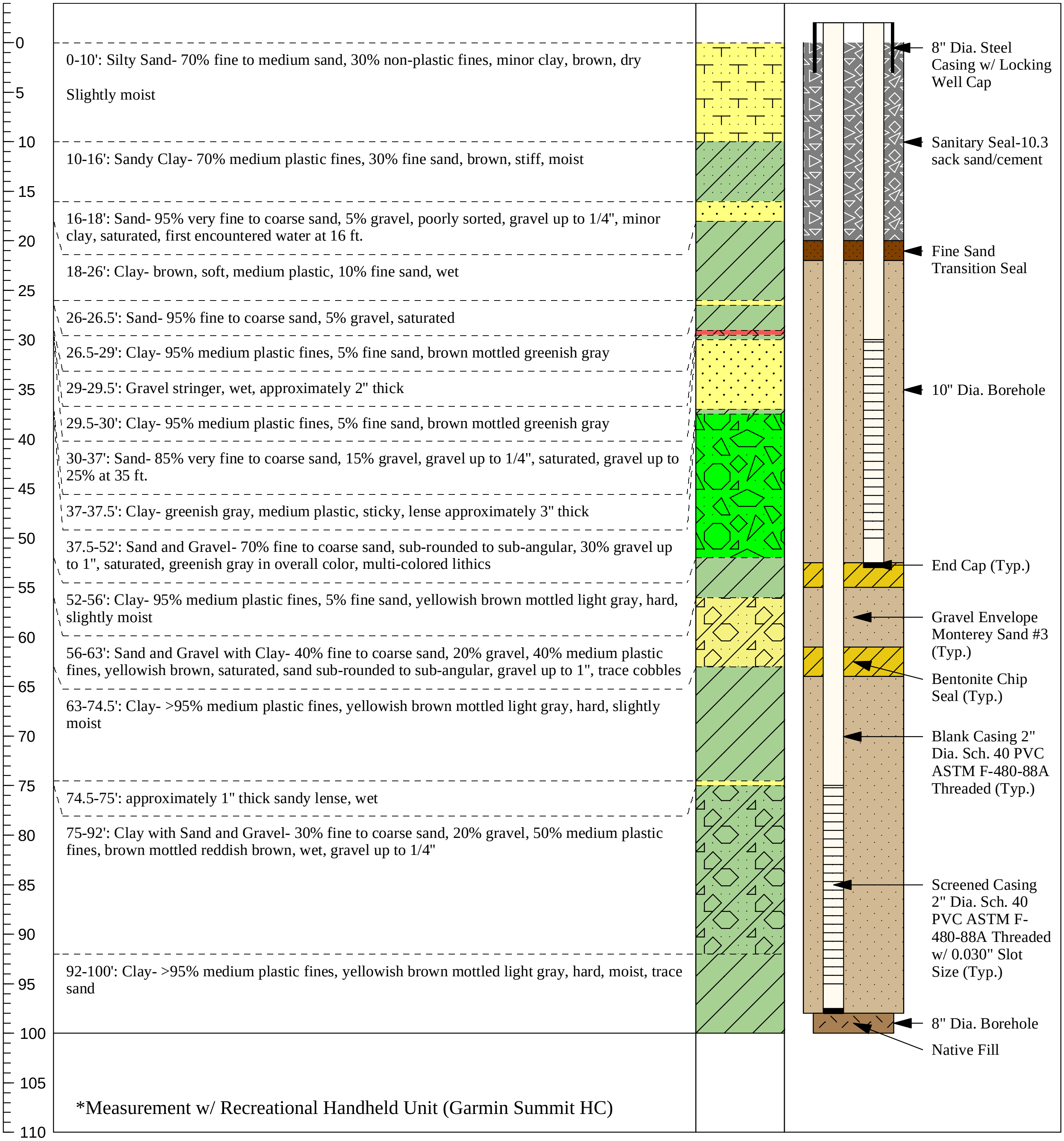
Monitoring Well As-Built Diagram - Site 1 NapaCounty-214s-swgw1

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program

LSCE Project No. 12-1-071
Well Name: Napa County-215d-swgw1
Lat./Long.: 38.30223/-122.27845
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #1- Napa River at 1st Street
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/2/14 - 9/4/14
Boring Depth (ft): 100
Well Depth (ft): 98
Well Screen (ft): 75-95



0-10': Silty Sand- 70% fine to medium sand, 30% non-plastic fines, minor clay, brown, dry

Slightly moist

10-16': Sandy Clay- 70% medium plastic fines, 30% fine sand, brown, stiff, moist

16-18': Sand- 95% very fine to coarse sand, 5% gravel, poorly sorted, gravel up to 1/4", minor clay, saturated, first encountered water at 16 ft.

18-26': Clay- brown, soft, medium plastic, 10% fine sand, wet

26-26.5': Sand- 95% fine to coarse sand, 5% gravel, saturated

26.5-29': Clay- 95% medium plastic fines, 5% fine sand, brown mottled greenish gray

29-29.5': Gravel stringer, wet, approximately 2" thick

29.5-30': Clay- 95% medium plastic fines, 5% fine sand, brown mottled greenish gray

30-37': Sand- 85% very fine to coarse sand, 15% gravel, gravel up to 1/4", saturated, gravel up to 25% at 35 ft.

37-37.5': Clay- greenish gray, medium plastic, sticky, lense approximately 3" thick

37.5-52': Sand and Gravel- 70% fine to coarse sand, sub-rounded to sub-angular, 30% gravel up to 1", saturated, greenish gray in overall color, multi-colored lithics

52-56': Clay- 95% medium plastic fines, 5% fine sand, yellowish brown mottled light gray, hard, slightly moist

56-63': Sand and Gravel with Clay- 40% fine to coarse sand, 20% gravel, 40% medium plastic fines, yellowish brown, saturated, sand sub-rounded to sub-angular, gravel up to 1", trace cobbles

63-74.5': Clay- >95% medium plastic fines, yellowish brown mottled light gray, hard, slightly moist

74.5-75': approximately 1" thick sandy lense, wet

75-92': Clay with Sand and Gravel- 30% fine to coarse sand, 20% gravel, 50% medium plastic fines, brown mottled reddish brown, wet, gravel up to 1/4"

92-100': Clay- >95% medium plastic fines, yellowish brown mottled light gray, hard, moist, trace sand

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

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FIGURE 2.5

Monitoring Well As-Built Diagram - Site 1 NapaCounty-215d-swgw1

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program

Data sources
County of Napa, U.S. Geological Survey, Napa County Resource

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FIGURE 2.6

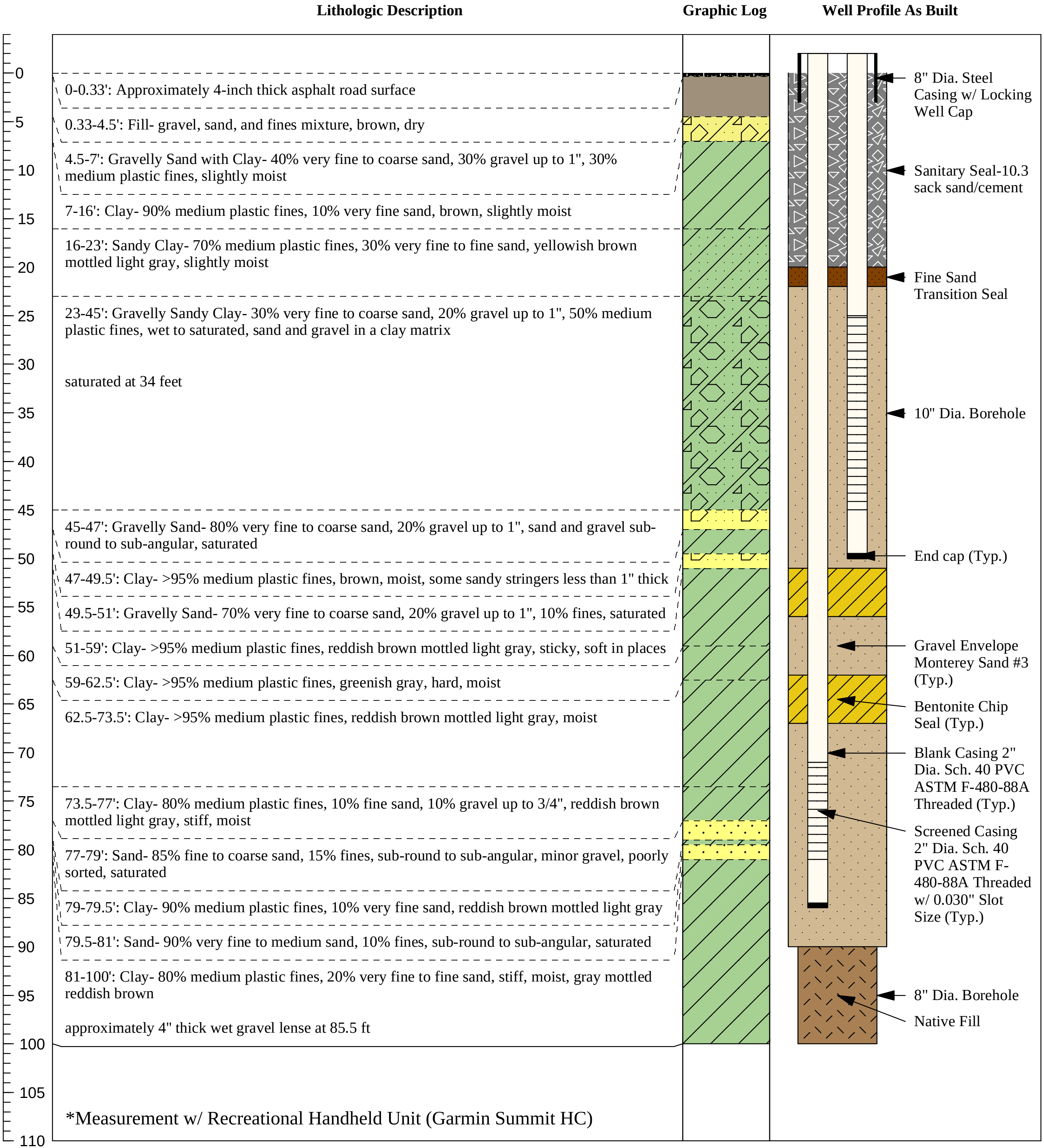
Site Map

Site 2: Dry Creek at Washington St

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program

LSCE Project No. 12-1-071
Well Name: Napa County-216s-swgw2
Lat./Long.: 38.365231/-122.337532
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #2- Dry Creek at Washington Street
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/22/14 - 9/23/14
Well Depth (ft): 50
Boring Depth (ft): 100
Well Screen (ft): 25-45



0-0.33': Approximately 4-inch thick asphalt road surface

0.33-4.5': Fill- gravel, sand, and fines mixture, brown, dry

4.5-7': Gravelly Sand with Clay- 40% very fine to coarse sand, 30% gravel up to 1", 30% medium plastic fines, slightly moist

7-16': Clay- 90% medium plastic fines, 10% very fine sand, brown, slightly moist

16-23': Sandy Clay- 70% medium plastic fines, 30% very fine to fine sand, yellowish brown mottled light gray, slightly moist

23-45': Gravelly Sandy Clay- 30% very fine to coarse sand, 20% gravel up to 1", 50% medium plastic fines, wet to saturated, sand and gravel in a clay matrix

saturated at 34 feet

45-47': Gravelly Sand- 80% very fine to coarse sand, 20% gravel up to 1", sand and gravel sub-round to sub-angular, saturated

47-49.5': Clay- >95% medium plastic fines, brown, moist, some sandy stringers less than 1" thick

49.5-51': Gravelly Sand- 70% very fine to coarse sand, 20% gravel up to 1", 10% fines, saturated

51-59': Clay- >95% medium plastic fines, reddish brown mottled light gray, sticky, soft in places

59-62.5': Clay- >95% medium plastic fines, greenish gray, hard, moist

62.5-73.5': Clay- >95% medium plastic fines, reddish brown mottled light gray, moist

73.5-77': Clay- 80% medium plastic fines, 10% fine sand, 10% gravel up to 3/4", reddish brown mottled light gray, stiff, moist

77-79': Sand- 85% fine to coarse sand, 15% fines, sub-round to sub-angular, minor gravel, poorly sorted, saturated

79-79.5': Clay- 90% medium plastic fines, 10% very fine sand, reddish brown mottled light gray

79.5-81': Sand- 90% very fine to medium sand, 10% fines, sub-round to sub-angular, saturated

81-100': Clay- 80% medium plastic fines, 20% very fine to fine sand, stiff, moist, gray mottled reddish brown

approximately 4" thick wet gravel lense at 85.5 ft

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

FIGURE 2.7

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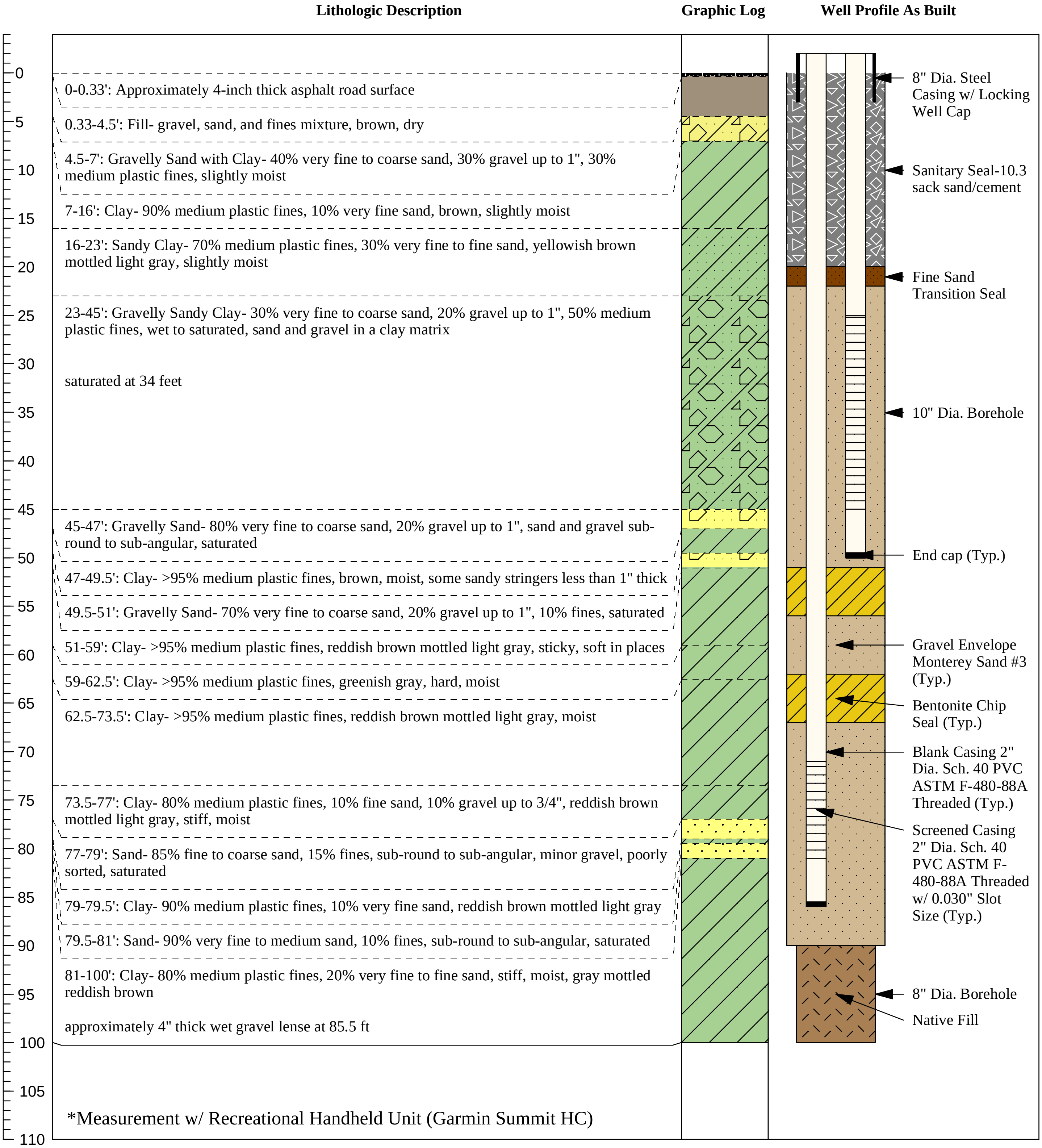
Monitoring Well As-Built Diagram - Site 2 NapaCounty-216s-swgw2

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program

LSCE Project No. 12-1-071
Well Name: Napa County-217d-swgw2
Lat./Long.: 38.365231/-122.337532
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #2- Dry Creek at Washington Street
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/22/14 - 9/23/14
Well Depth (ft): 86
Boring Depth (ft): 100
Well Screen (ft): 71-81



0-0.33': Approximately 4-inch thick asphalt road surface

0.33-4.5': Fill- gravel, sand, and fines mixture, brown, dry

4.5-7': Gravelly Sand with Clay- 40% very fine to coarse sand, 30% gravel up to 1", 30% medium plastic fines, slightly moist

7-16': Clay- 90% medium plastic fines, 10% very fine sand, brown, slightly moist

16-23': Sandy Clay- 70% medium plastic fines, 30% very fine to fine sand, yellowish brown mottled light gray, slightly moist

23-45': Gravelly Sandy Clay- 30% very fine to coarse sand, 20% gravel up to 1", 50% medium plastic fines, wet to saturated, sand and gravel in a clay matrix

saturated at 34 feet

45-47': Gravelly Sand- 80% very fine to coarse sand, 20% gravel up to 1", sand and gravel sub-round to sub-angular, saturated

47-49.5': Clay- >95% medium plastic fines, brown, moist, some sandy stringers less than 1" thick

49.5-51': Gravelly Sand- 70% very fine to coarse sand, 20% gravel up to 1", 10% fines, saturated

51-59': Clay- >95% medium plastic fines, reddish brown mottled light gray, sticky, soft in places

59-62.5': Clay- >95% medium plastic fines, greenish gray, hard, moist

62.5-73.5': Clay- >95% medium plastic fines, reddish brown mottled light gray, moist

73.5-77': Clay- 80% medium plastic fines, 10% fine sand, 10% gravel up to 3/4", reddish brown mottled light gray, stiff, moist

77-79': Sand- 85% fine to coarse sand, 15% fines, sub-round to sub-angular, minor gravel, poorly sorted, saturated

79-79.5': Clay- 90% medium plastic fines, 10% very fine sand, reddish brown mottled light gray

79.5-81': Sand- 90% very fine to medium sand, 10% fines, sub-round to sub-angular, saturated

81-100': Clay- 80% medium plastic fines, 20% very fine to fine sand, stiff, moist, gray mottled reddish brown

approximately 4" thick wet gravel lense at 85.5 ft

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

FIGURE 2.8

Monitoring Well As-Built Diagram - Site 2 NapaCounty-217d-swgw2

Data sources
County of Napa, U.S. Geological Survey, Napa County Resource

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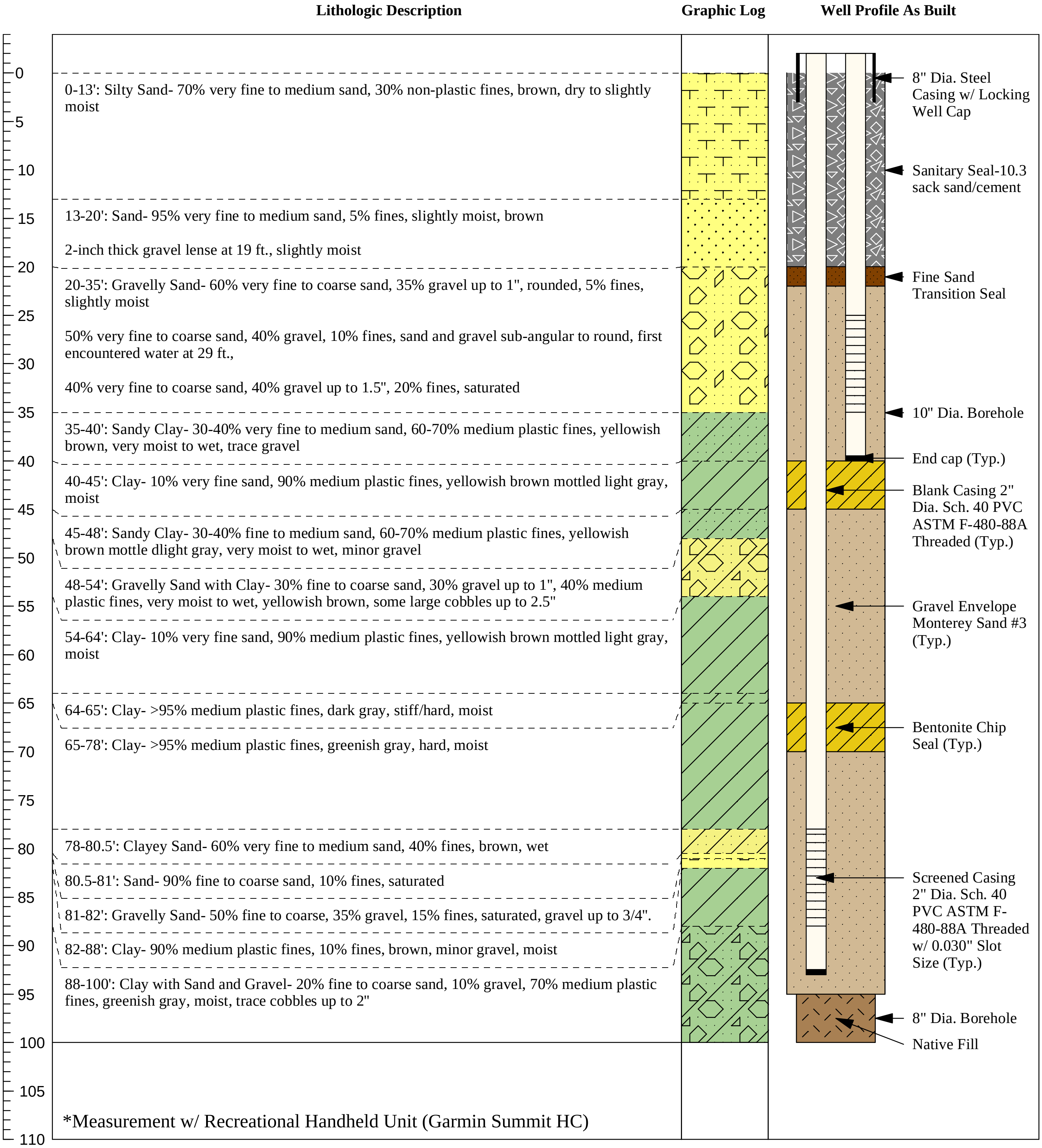
FIGURE 2.9
Site Map
Site 3:Napa River at Oak Knoll Ave

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program

LSCE Project No. 12-1-071
Well Name: Napa County-218s-swgw3
Lat./Long.: 38.367255/-122.304954
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #3- Napa River at Oak Knoll Avenue
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/8/14 - 9/9/14
Well Depth (ft): 40
Boring Depth (ft): 100
Well Screen (ft): 25-35



0-13': Silty Sand- 70% very fine to medium sand, 30% non-plastic fines, brown, dry to slightly moist

13-20': Sand- 95% very fine to medium sand, 5% fines, slightly moist, brown

2-inch thick gravel lense at 19 ft., slightly moist

20-35': Gravelly Sand- 60% very fine to coarse sand, 35% gravel up to 1", rounded, 5% fines, slightly moist

50% very fine to coarse sand, 40% gravel, 10% fines, sand and gravel sub-angular to round, first encountered water at 29 ft.,

40% very fine to coarse sand, 40% gravel up to 1.5", 20% fines, saturated

35-40': Sandy Clay- 30-40% very fine to medium sand, 60-70% medium plastic fines, yellowish brown, very moist to wet, trace gravel

40-45': Clay- 10% very fine sand, 90% medium plastic fines, yellowish brown mottled light gray, moist

45-48': Sandy Clay- 30-40% fine to medium sand, 60-70% medium plastic fines, yellowish brown mottle dlight gray, very moist to wet, minor gravel

48-54': Gravelly Sand with Clay- 30% fine to coarse sand, 30% gravel up to 1", 40% medium plastic fines, very moist to wet, yellowish brown, some large cobbles up to 2.5"

54-64': Clay- 10% very fine sand, 90% medium plastic fines, yellowish brown mottled light gray, moist

64-65': Clay- >95% medium plastic fines, dark gray, stiff/hard, moist

65-78': Clay- >95% medium plastic fines, greenish gray, hard, moist

78-80.5': Clayey Sand- 60% very fine to medium sand, 40% fines, brown, wet

80.5-81': Sand- 90% fine to coarse sand, 10% fines, saturated

81-82': Gravelly Sand- 50% fine to coarse, 35% gravel, 15% fines, saturated, gravel up to 3/4".

82-88': Clay- 90% medium plastic fines, 10% fines, brown, minor gravel, moist

88-100': Clay with Sand and Gravel- 20% fine to coarse sand, 10% gravel, 70% medium plastic fines, greenish gray, moist, trace cobbles up to 2"

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

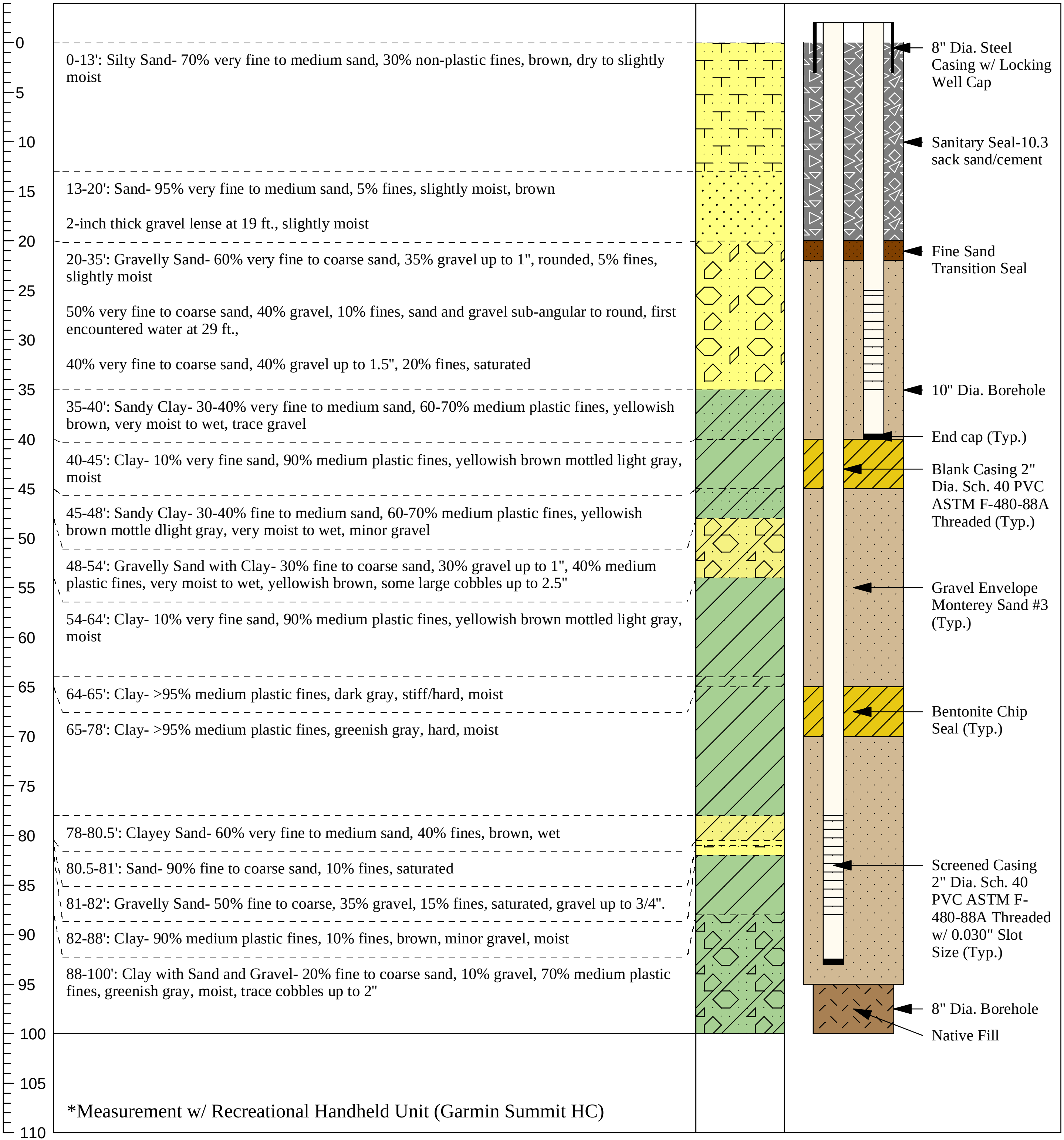
FIGURE 2.10

Monitoring Well As-Built Diagram - Site 3 NapaCounty-218s-swgw3

LSCE Project No. 12-1-071
Well Name: Napa County-219d-swgw3
Lat./Long.: 38.367255/-122.304954
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #3- Napa River at Oak Knoll Avenue
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/8/14 - 9/9/14
Well Depth (ft): 93
Boring Depth (ft): 100
Well Screen (ft): 78-88

Lithologic Description | **Graphic Log** | **Well Profile As Built**



0-13': Silty Sand- 70% very fine to medium sand, 30% non-plastic fines, brown, dry to slightly moist

13-20': Sand- 95% very fine to medium sand, 5% fines, slightly moist, brown

2-inch thick gravel lense at 19 ft., slightly moist

20-35': Gravelly Sand- 60% very fine to coarse sand, 35% gravel up to 1", rounded, 5% fines, slightly moist

50% very fine to coarse sand, 40% gravel, 10% fines, sand and gravel sub-angular to round, first encountered water at 29 ft.,

40% very fine to coarse sand, 40% gravel up to 1.5", 20% fines, saturated

35-40': Sandy Clay- 30-40% very fine to medium sand, 60-70% medium plastic fines, yellowish brown, very moist to wet, trace gravel

40-45': Clay- 10% very fine sand, 90% medium plastic fines, yellowish brown mottled light gray, moist

45-48': Sandy Clay- 30-40% fine to medium sand, 60-70% medium plastic fines, yellowish brown mottle dlight gray, very moist to wet, minor gravel

48-54': Gravelly Sand with Clay- 30% fine to coarse sand, 30% gravel up to 1", 40% medium plastic fines, very moist to wet, yellowish brown, some large cobbles up to 2.5"

54-64': Clay- 10% very fine sand, 90% medium plastic fines, yellowish brown mottled light gray, moist

64-65': Clay- >95% medium plastic fines, dark gray, stiff/hard, moist

65-78': Clay- >95% medium plastic fines, greenish gray, hard, moist

78-80.5': Clayey Sand- 60% very fine to medium sand, 40% fines, brown, wet

80.5-81': Sand- 90% fine to coarse sand, 10% fines, saturated

81-82': Gravelly Sand- 50% fine to coarse, 35% gravel, 15% fines, saturated, gravel up to 3/4".

82-88': Clay- 90% medium plastic fines, 10% fines, brown, minor gravel, moist

88-100': Clay with Sand and Gravel- 20% fine to coarse sand, 10% gravel, 70% medium plastic fines, greenish gray, moist, trace cobbles up to 2"

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

FIGURE 2.11

Monitoring Well As-Built Diagram - Site 3 NapaCounty-219d-swgw3

Data sources
County of Napa, U.S. Geological Survey, Napa County Resource

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FIGURE 2.12
Site Map
Site 4: Napa River at Yountville Cross Rd

LSCE Project No. 12-1-071
Well Name: Napa County-220s-swgw4
Lat./Long.: 38.417573/-122.352665
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #4- Napa River at Yountville Cross Road
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/10/14 - 9/11/14
Well Depth (ft): 45
Boring Depth (ft): 100
Well Screen (ft): 25-40

Lithologic Description

0-3': Fill- gravel, sand, and fines mixture, brown, dry

3-5': Silty Sand- 70% fine to medium sand, 30% fines, brown, dry

5-20': Clay- 90% medium plastic fines, 10% very fine sand, dark brown, slightly moist

2-inch thick sandy lense at 19.5 ft., damp

20-34': Sandy Clay- 25% very fine to medium sand, 75% low plastic fines, moist, brown

34-35': Sand- 85% very fine to medium sand, 15% fines, sub-round to sub-angular, saturated

35-48.5': Gravelly Sand- 60% fine to coarse sand, 30% gravel up to 3/4", 10% fines, saturated

cobbles up to 2"

48.5-51': Clay- 90% medium plastic fines, 10% very fine sand, brown mottled light gray, moist

51-56': Silty Sand- 60% fine to medium sand, 40% fines, overall dark brown, partially weakly cemented, wet

56-65': Sand- 85% very fine to medium sand, 15% fines, wet, loose, minor gravel

65-67.5': Clay- 80% medium plastic fines, 20% very fine sand, dark brown, moist

67.5-74': Sandy Clay- 30% very fine to fine sand, 70% low plastic fines, very moist, greenish gray

74-78': Sand- 70% very fine to coarsae sand, 30% fines, sub-round to sub-angular, wet, overall greenish gray with multi-colored lithics

78-88': Clay- >95% medium plastic fines, yellowish brown mottled light gray, moist

3-inch thick sand lense at 81 ft., very fine to coarse, saturated

88-91.5': Sand- 90% very fine to coarse sand, 10% fines, wet to saturated

91.5-100': Clay- 90% medium plastic fines, 10% fine sand, brown, hard, moist

5-inch thick gravelly lense at 96 ft., saturated

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

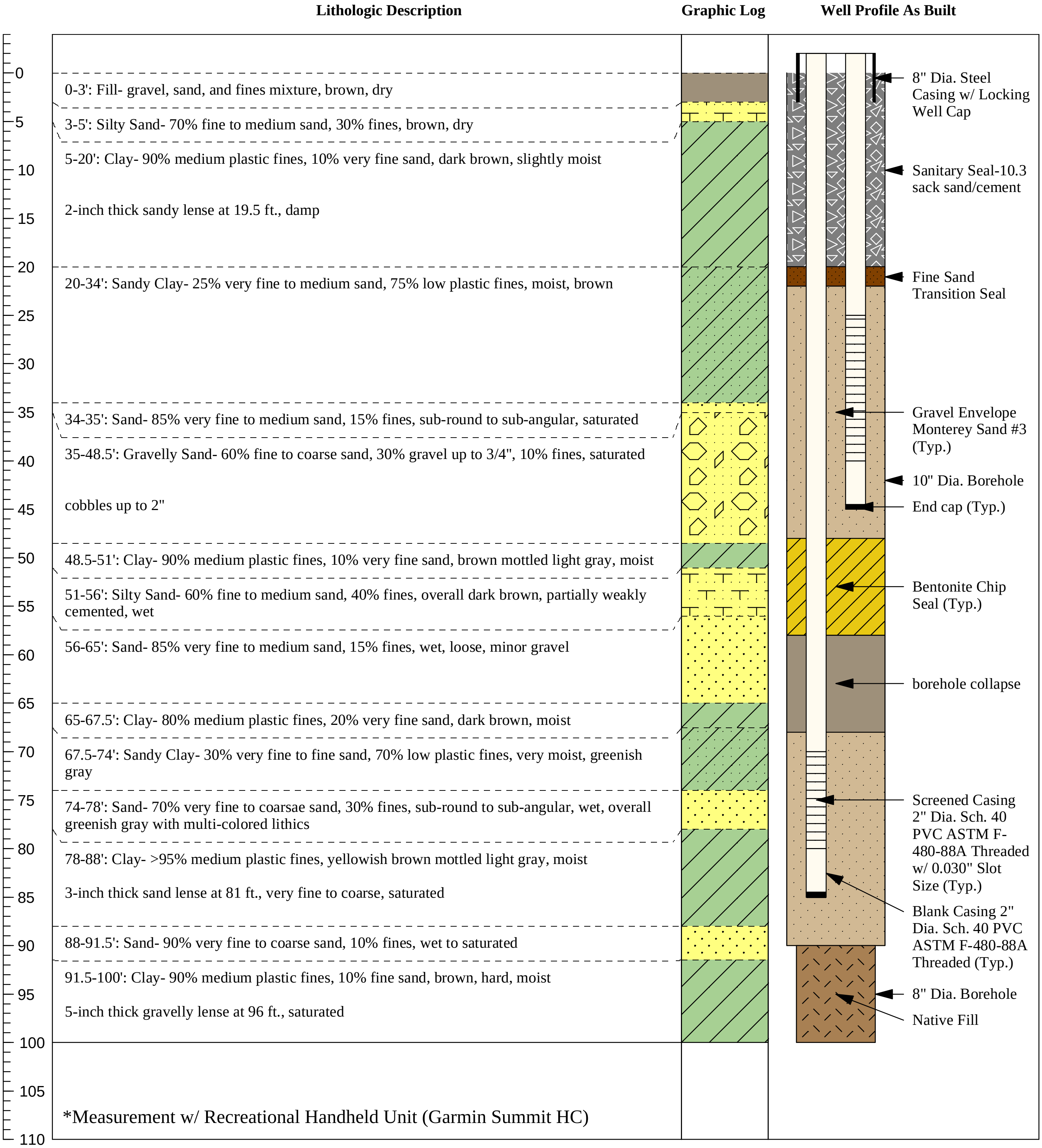

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FIGURE 2.13

Monitoring Well As-Built Diagram - Site 4 NapaCounty-220s-swgw4

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program

LSCE Project No. 12-1-071
Well Name: Napa County-221d-swgw4
Lat./Long.: 38.417573/-122.352665
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #4- Napa River at Yountville Cross Road
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/10/14 - 9/11/14
Well Depth (ft): 85
Boring Depth (ft): 100
Well Screen (ft): 70-80

Lithologic Description

0-3': Fill- gravel, sand, and fines mixture, brown, dry

3-5': Silty Sand- 70% fine to medium sand, 30% fines, brown, dry

5-20': Clay- 90% medium plastic fines, 10% very fine sand, dark brown, slightly moist

2-inch thick sandy lense at 19.5 ft., damp

20-34': Sandy Clay- 25% very fine to medium sand, 75% low plastic fines, moist, brown

34-35': Sand- 85% very fine to medium sand, 15% fines, sub-round to sub-angular, saturated

35-48.5': Gravelly Sand- 60% fine to coarse sand, 30% gravel up to 3/4", 10% fines, saturated

cobbles up to 2"

48.5-51': Clay- 90% medium plastic fines, 10% very fine sand, brown mottled light gray, moist

51-56': Silty Sand- 60% fine to medium sand, 40% fines, overall dark brown, partially weakly cemented, wet

56-65': Sand- 85% very fine to medium sand, 15% fines, wet, loose, minor gravel

65-67.5': Clay- 80% medium plastic fines, 20% very fine sand, dark brown, moist

67.5-74': Sandy Clay- 30% very fine to fine sand, 70% low plastic fines, very moist, greenish gray

74-78': Sand- 70% very fine to coarsae sand, 30% fines, sub-round to sub-angular, wet, overall greenish gray with multi-colored lithics

78-88': Clay- >95% medium plastic fines, yellowish brown mottled light gray, moist

3-inch thick sand lense at 81 ft., very fine to coarse, saturated

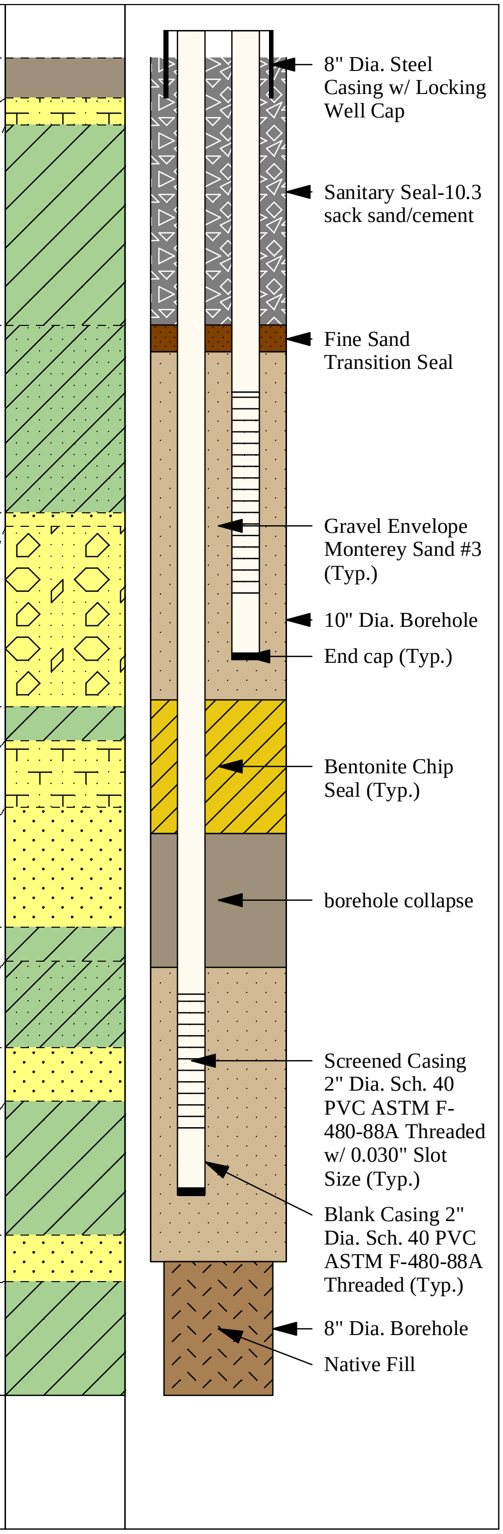
88-91.5': Sand- 90% very fine to coarse sand, 10% fines, wet to saturated

91.5-100': Clay- 90% medium plastic fines, 10% fine sand, brown, hard, moist

5-inch thick gravelly lense at 96 ft., saturated

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

Graphic Log **Well Profile As Built**



Depth scale (ft): 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110

FIGURE 2.14

Monitoring Well As-Built Diagram - Site 4 NapaCounty-221d-swgw4

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program

Data sources
County of Napa, U.S. Geological Survey, Napa County Resource

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FIGURE 2.15
Site Map
Site 5: Napa River at Pope St

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program

LSCE Project No. 12-1-071
Well Name: Napa County-222s-swgw5
Lat./Long.: 38.510898/-122.456426
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #5- Napa River at Pope Street
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/15/14 - 9/16/14
Boring Depth (ft): 100
Well Depth (ft): 40
Well Screen (ft): 25-35

Lithologic Description

0-1': Topsoil- brown, with organics

1-15': Silty Sand- 70% very fine to medium sand, 30% fines, dark brown, slightly moist, minor gravel

15-20': Sand- 90% fine to medium sand, 10% fines, brown, slightly moist

20-25': Gravelly Sand with Clay- 40% very fine to coarse sand, 20% gravel up to 1", 40% medium plastic fines, wet, first encountered water at 20 ft

25-43': Sand with Gravel- 70% fine to coarse sand, 20% gravel up to 1/2", 10% fines, wet, loose

43-51': Clay- 90% medium plastic fines, 10% very fine sand, moist, gray

51-65': Sandy Silt- 40% very fine to medium sand, 60% fines, greenish gray, wet, partially weakly cemented

65-80': Silt- 15% very fine sand, 85% fines, greenish gray, partially cemented, hard, moist

80-90': Sandy Silt- 25% very fine to fine sand, 75% fines, greenish gray, moist to wet, scattered medium grained sand, black, sub-angular, partially cemented

90-93': Sand- 85% very fine to medium sand, 15% fines, overall greenish gray color, lithic grains, wet

93-100': Sandy Silt- 25% very fine to fine sand, 75% fines, greenish gray, partially weakly cemented, moist

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

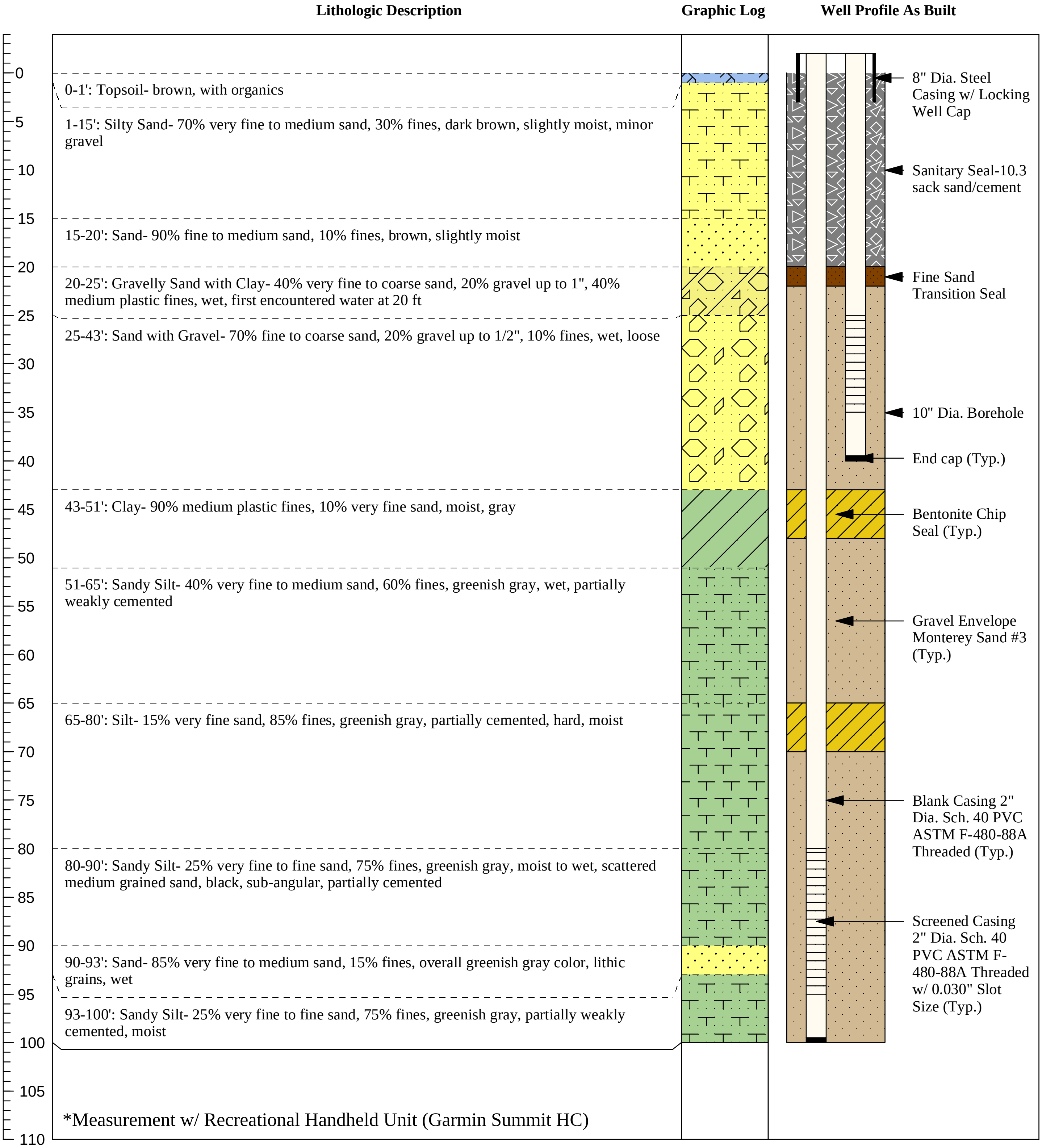

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FIGURE 2.16

Monitoring Well As-Built Diagram - Site 5 NapaCounty-222s-swgw5

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program

LSCE Project No. 12-1-071
Well Name: Napa County-223d-swgw5
Lat./Long.: 38.510898/-122.456426
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #5- Napa River at Pope Street
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/15/14 - 9/16/14
Well Depth (ft): 100
Boring Depth (ft): 100
Well Screen (ft): 80-95

Lithologic Description

0-1': Topsoil- brown, with organics

1-15': Silty Sand- 70% very fine to medium sand, 30% fines, dark brown, slightly moist, minor gravel

15-20': Sand- 90% fine to medium sand, 10% fines, brown, slightly moist

20-25': Gravelly Sand with Clay- 40% very fine to coarse sand, 20% gravel up to 1", 40% medium plastic fines, wet, first encountered water at 20 ft

25-43': Sand with Gravel- 70% fine to coarse sand, 20% gravel up to 1/2", 10% fines, wet, loose

43-51': Clay- 90% medium plastic fines, 10% very fine sand, moist, gray

51-65': Sandy Silt- 40% very fine to medium sand, 60% fines, greenish gray, wet, partially weakly cemented

65-80': Silt- 15% very fine sand, 85% fines, greenish gray, partially cemented, hard, moist

80-90': Sandy Silt- 25% very fine to fine sand, 75% fines, greenish gray, moist to wet, scattered medium grained sand, black, sub-angular, partially cemented

90-93': Sand- 85% very fine to medium sand, 15% fines, overall greenish gray color, lithic grains, wet

93-100': Sandy Silt- 25% very fine to fine sand, 75% fines, greenish gray, partially weakly cemented, moist

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

Graphic Log **Well Profile As Built**

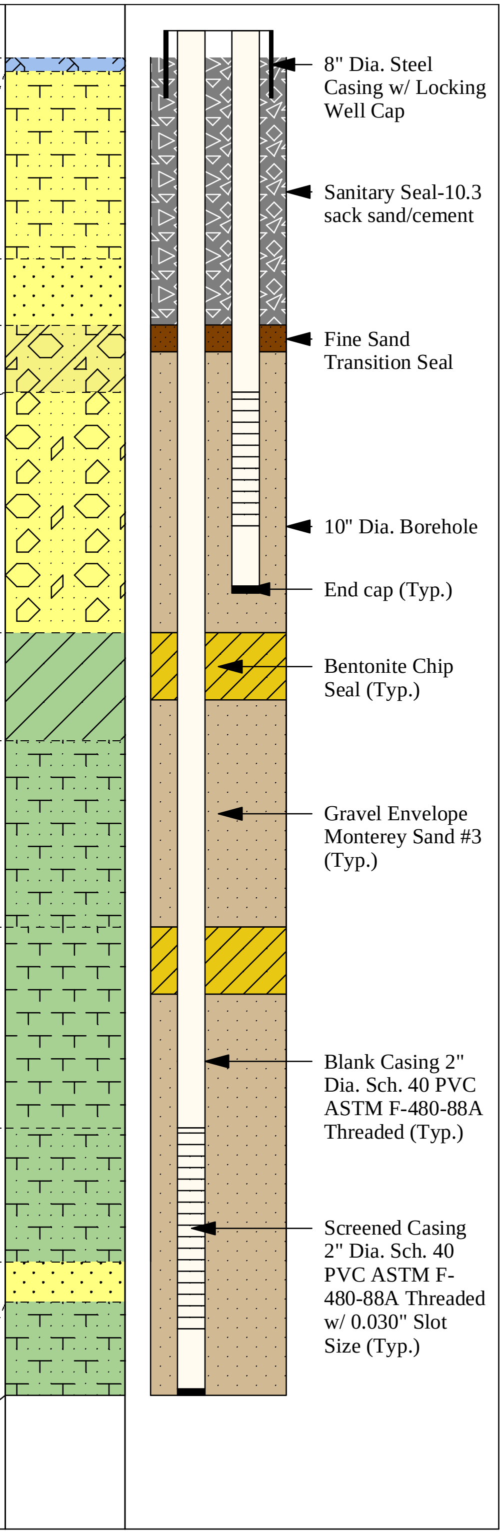

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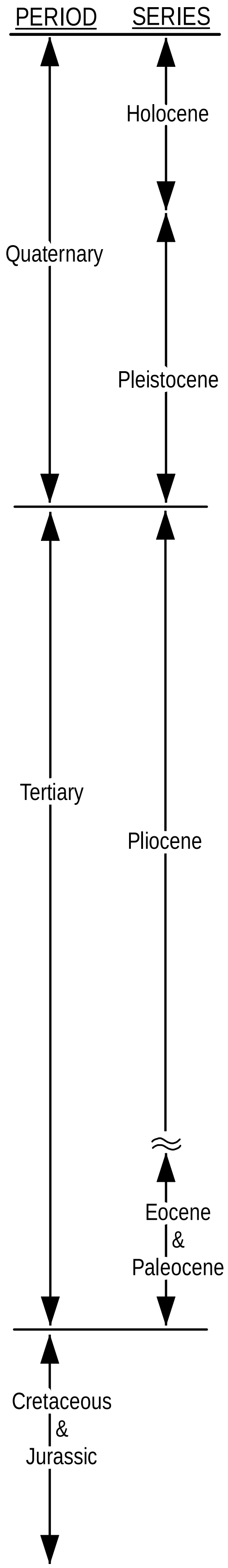
FIGURE 2.17

Monitoring Well As-Built Diagram - Site 5 NapaCounty-223d-swgw5

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program



Surficial Deposits

⬛ af Artificial fill
🟨 Qhc Stream channel deposits
🟫 Qha(y) Alluvium (younger)
🟨 Qhf Alluvial Fan deposits
🟩 Qht Terrace deposits
⬜ Qa Alluvium
🟨 Qt Terrace deposits
🟫 Qf Alluvial fan deposits
🟨 Qls Landslide deposits
🟩 Qpa Pleistocene alluvium
🟪 Qpt Pleistocene terrace deposits
🟨 Qpf Pleistocene alluvial fan deposits
🟫 Qoa Older alluvium

Tertiary Rocks

Sonoma Volcanics

Upper Member

St. Helena Ryholite
🟫 Tsr - flows and breccias

Petrified Forest
🟧 Tsvt - tuffs and sediments

MST Cauldera
🟫 Tstx - tuff?
🟩 Tsrb - breccia
🟧 Tslt - tuff breccia

Dacite of Mt. George
🟪 Tsvdg - flows and domes

Lower Member

Stags Leap Andesite
🟧 Tsva - flows, breccias, tuffs
🟪 Tsvab - flow breccia
🟥 Tsvt - tuff
🟪 Tsai - intrusive plug

Sedimentary Rocks

Carneros Area
🟪 QTh - Huichica formation

Conn Valley Area
🟧 Tss/h - sands and clays

MST Area
🟧 Tss/h - sands and clays
🟥 Tssd - diatomite

Marine Sedimentary Rocks

🟦 Td - Domingene sandstone

** other units not shown*

Mesozoic Rocks

Franciscan Complex
🟩 KJfm - melange
🟧 KJfs - graywacke
🟩 KJfgs - greenstone

Great Valley Complex
🟪 Kgvu - upper
🟨 KJgvl - lower
🟩 KJgv - sandstones and shales

Coast Range Ophiolite
🟦 sp - serpentinite

Document Path: X:\2012 Job Files\12-071\GIS\LSCE geo legend.mxd

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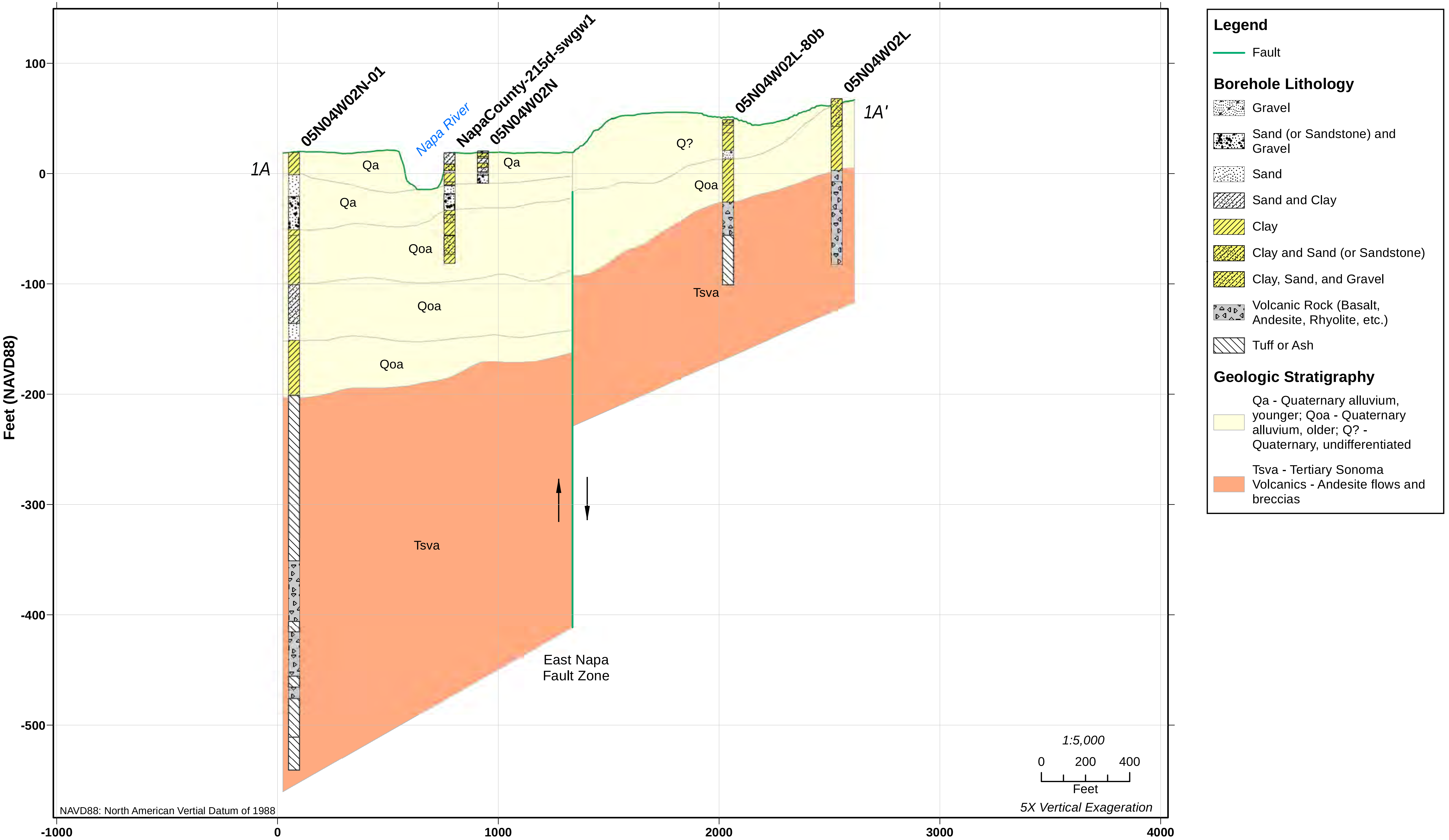
FIGURE 3.1
Major Surficial Deposits and Rocks of Napa Valley

Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program



Document Path: X:\2012 Job Files\12-071\GIS\Cross Section\Figure 3.3 xsection_site1.mxd

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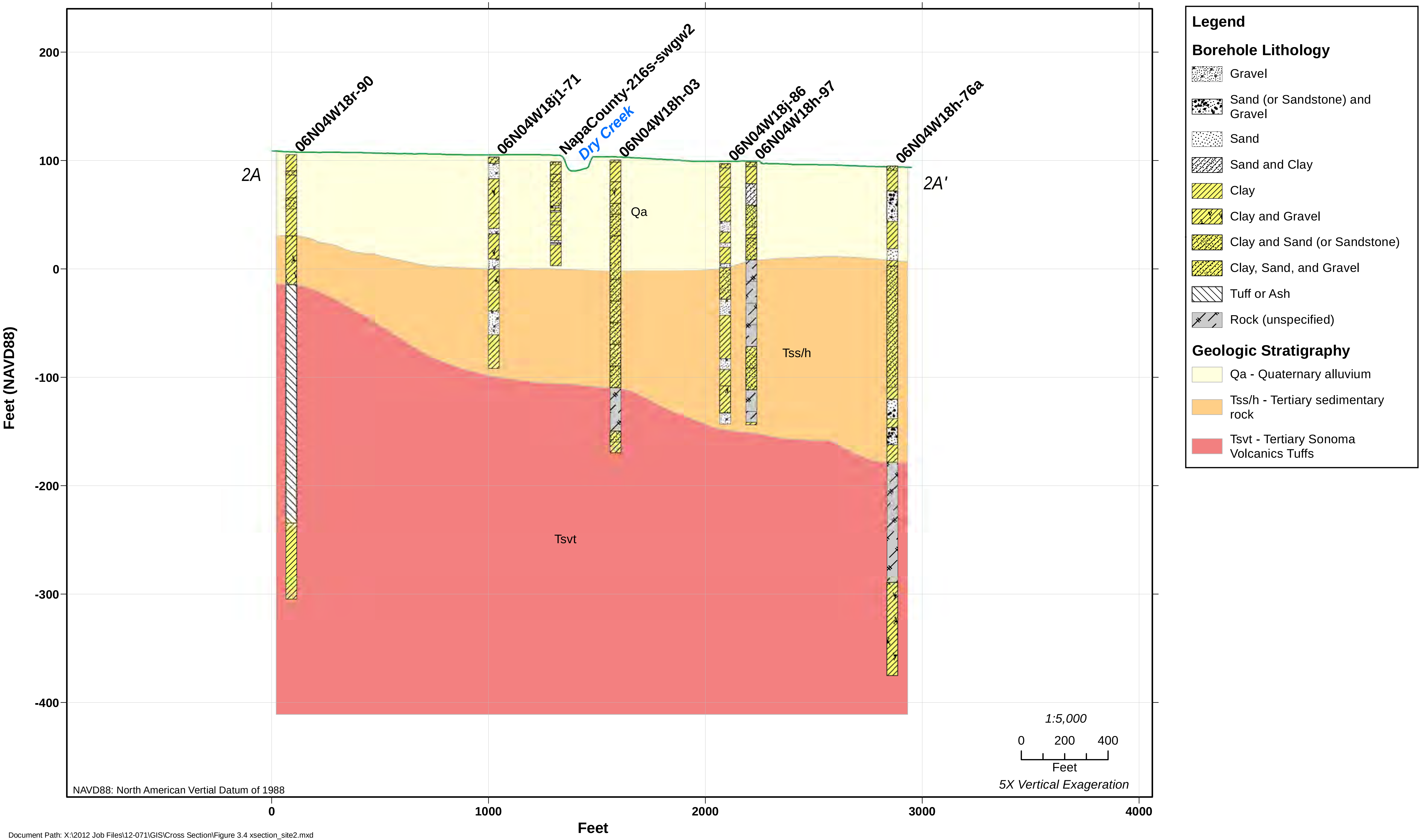
Figure 3.3
Geologic Cross Section
Site 1 - Napa River at First Street

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program



Document Path: X:\2012 Job Files\12-071\GIS\Cross Section\Figure 3.4 xsection_site2.mxd

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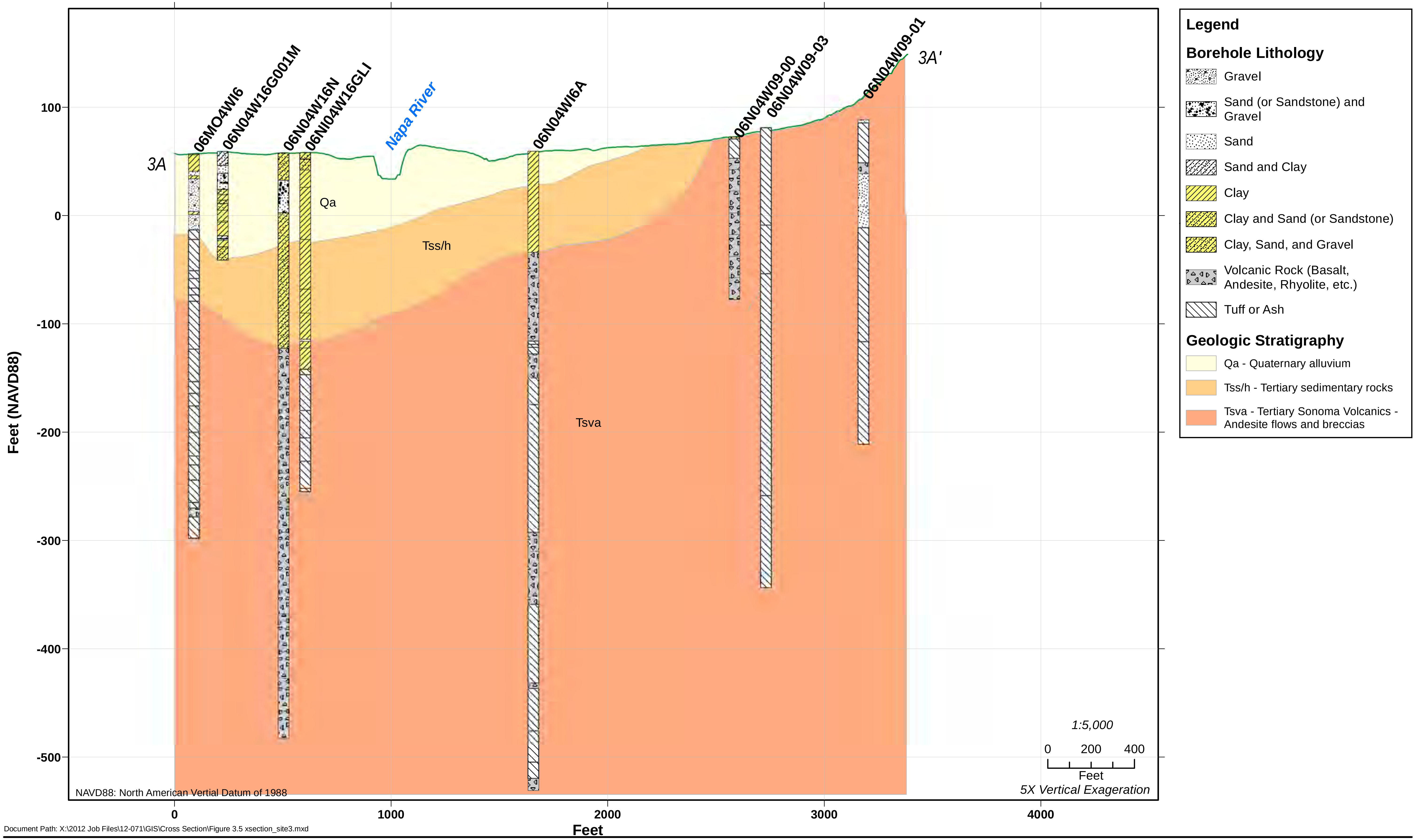
Figure 3.4
Geologic Cross Section
Site 2 - Dry Creek at Washington Street

Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program



Document Path: X:\2012 Job Files\12-071\GIS\Cross Section\Figure 3.5 xsection_site3.mxd

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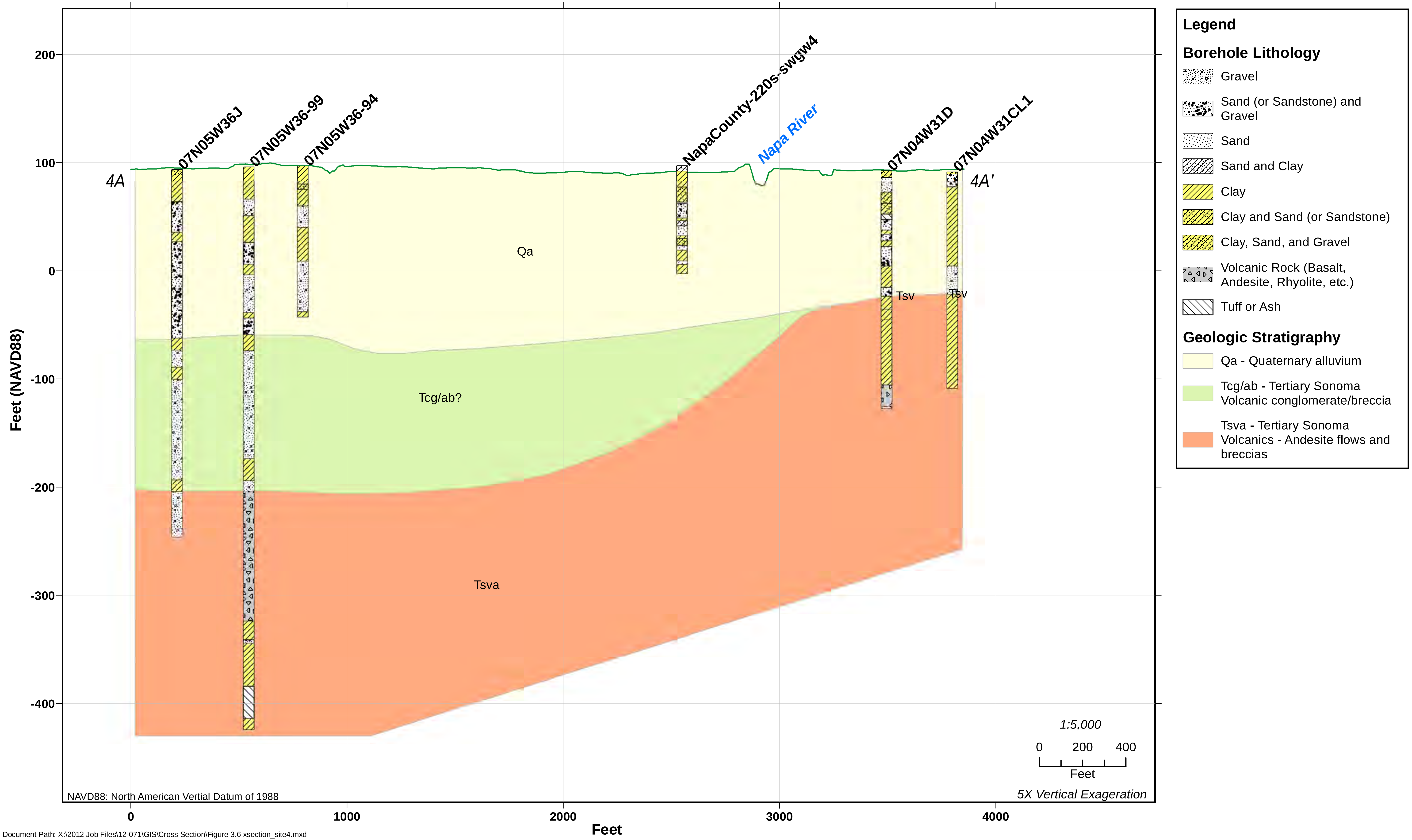
Figure 3.5
Geologic Cross Section
Site 3 - Napa River at Oak Knoll Avenue

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program



Document Path: X:\2012 Job Files\12-071\GIS\Cross Section\Figure 3.6 xsection_site4.mxd

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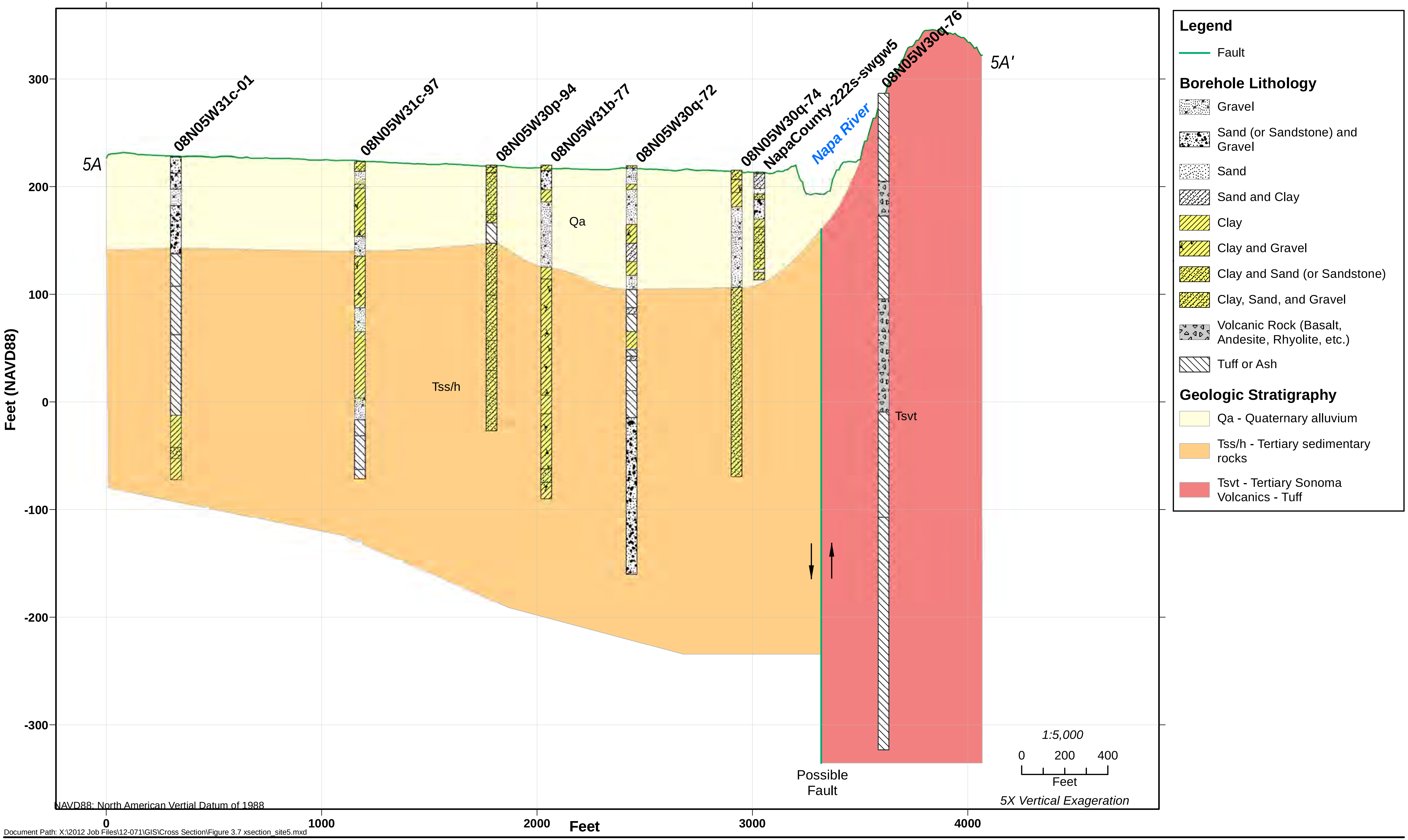
Figure 3.6
Geologic Cross Section
Site4 - Napa River at Yountville

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program



NAVD88: North American Vertial Datum of 1988

Document Path: X:\2012 Job Files\12-071\GIS\Cross Section\Figure 3.7 xsection_site5.mxd

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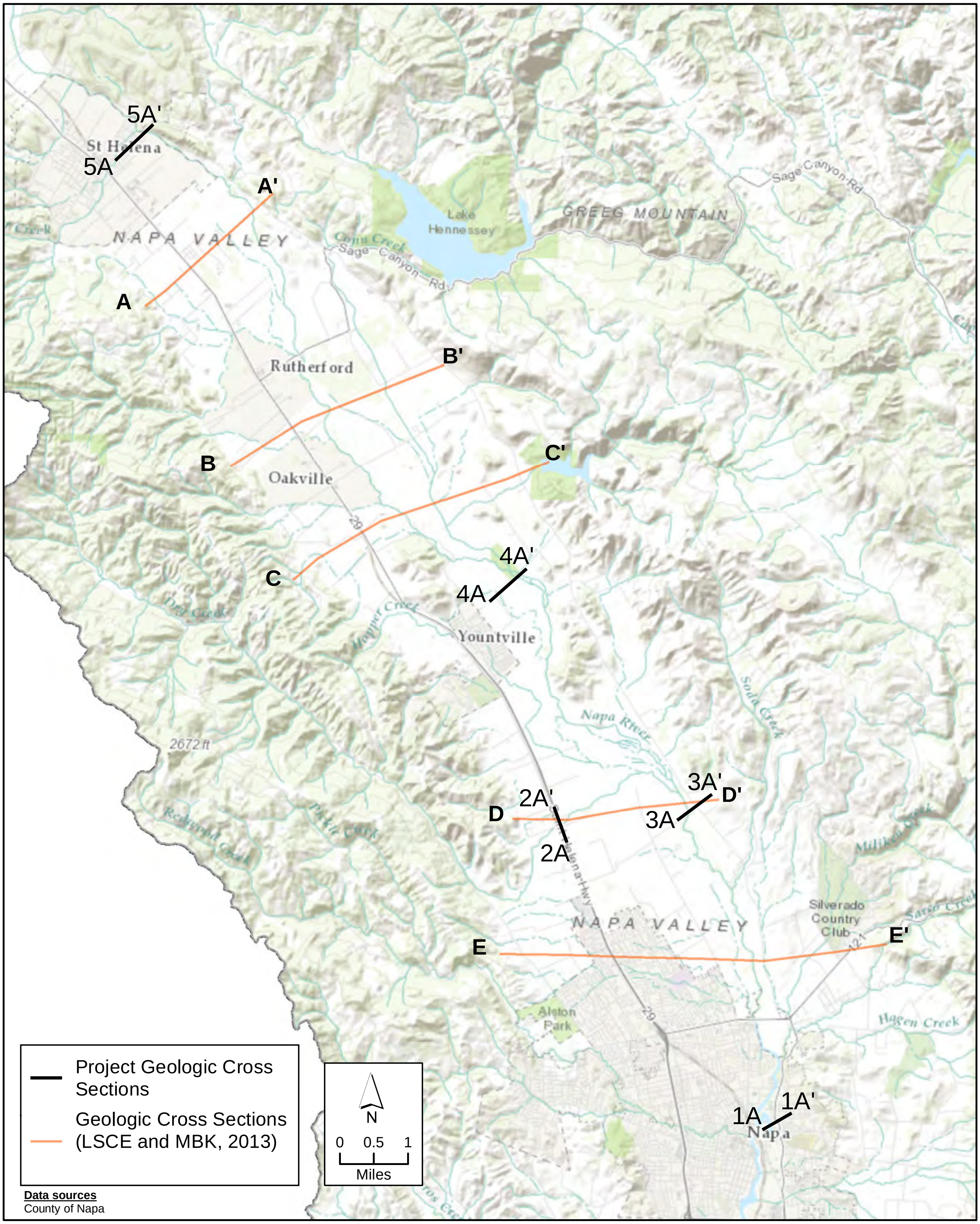
Figure 3.7
Geologic Cross Section
Site 5 - Napa River at Pope Street

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program



Data sources
County of Napa

X:\2012 Job Files\12-071\GIS\FIGURE 3.2 GW-SW Project Geologic Cross Section Locations.mxd

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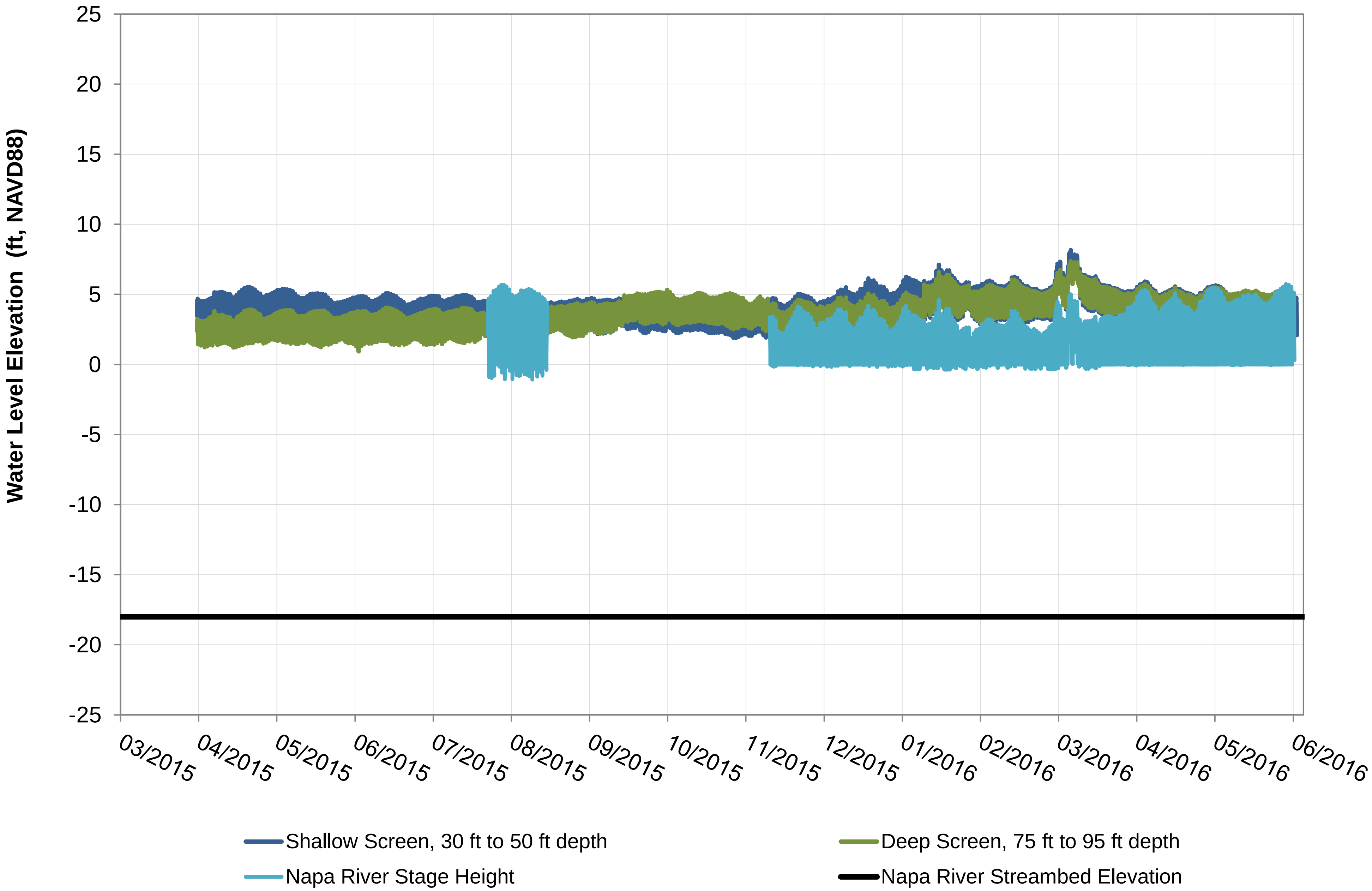
FIGURE 3.2

Geologic Cross Section Locations

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\WL Site 1

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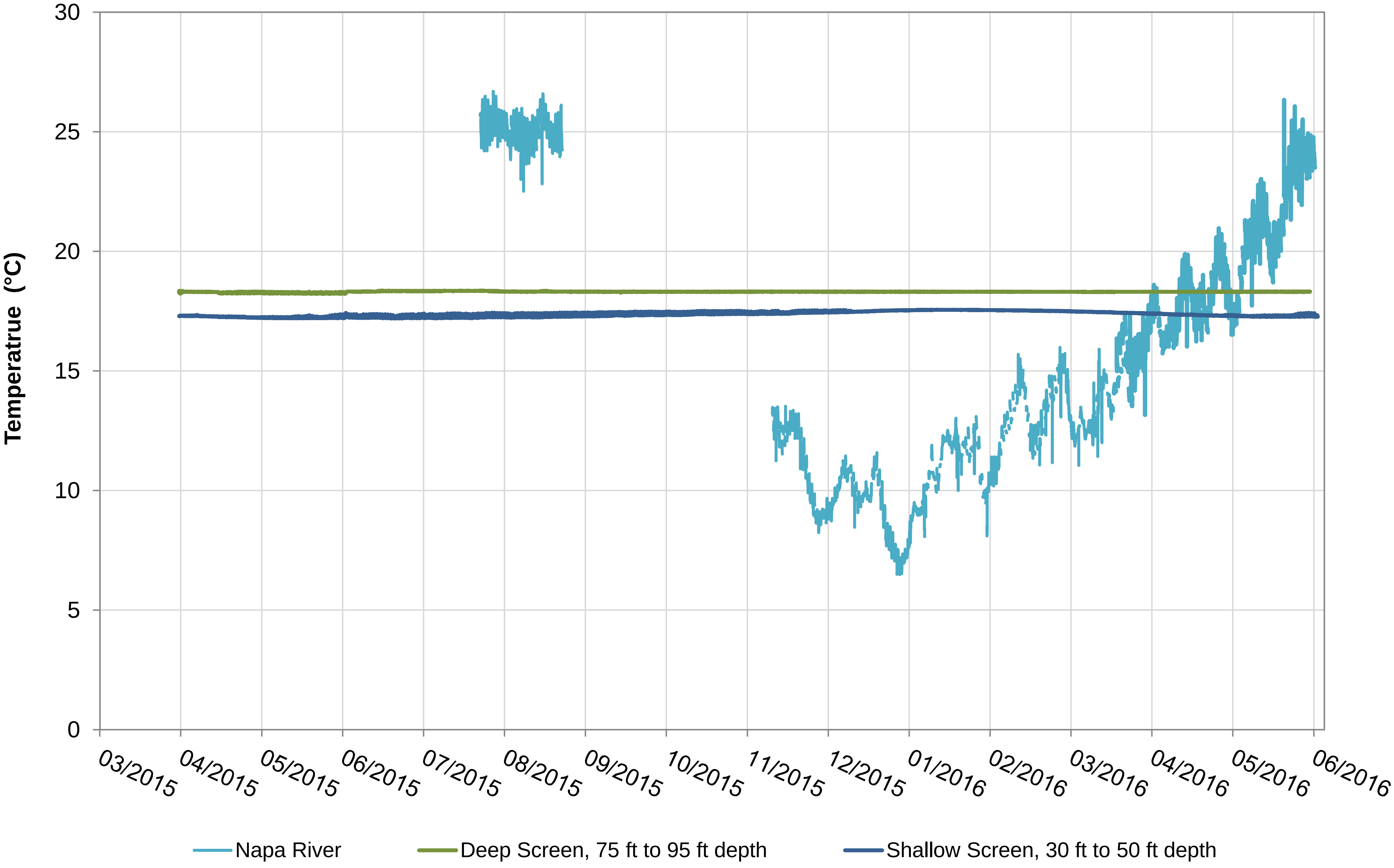
Figure 4.1
Water Level Hydrograph
Site 1: Napa River at First Street
Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\Site 1 Charts Chart 3

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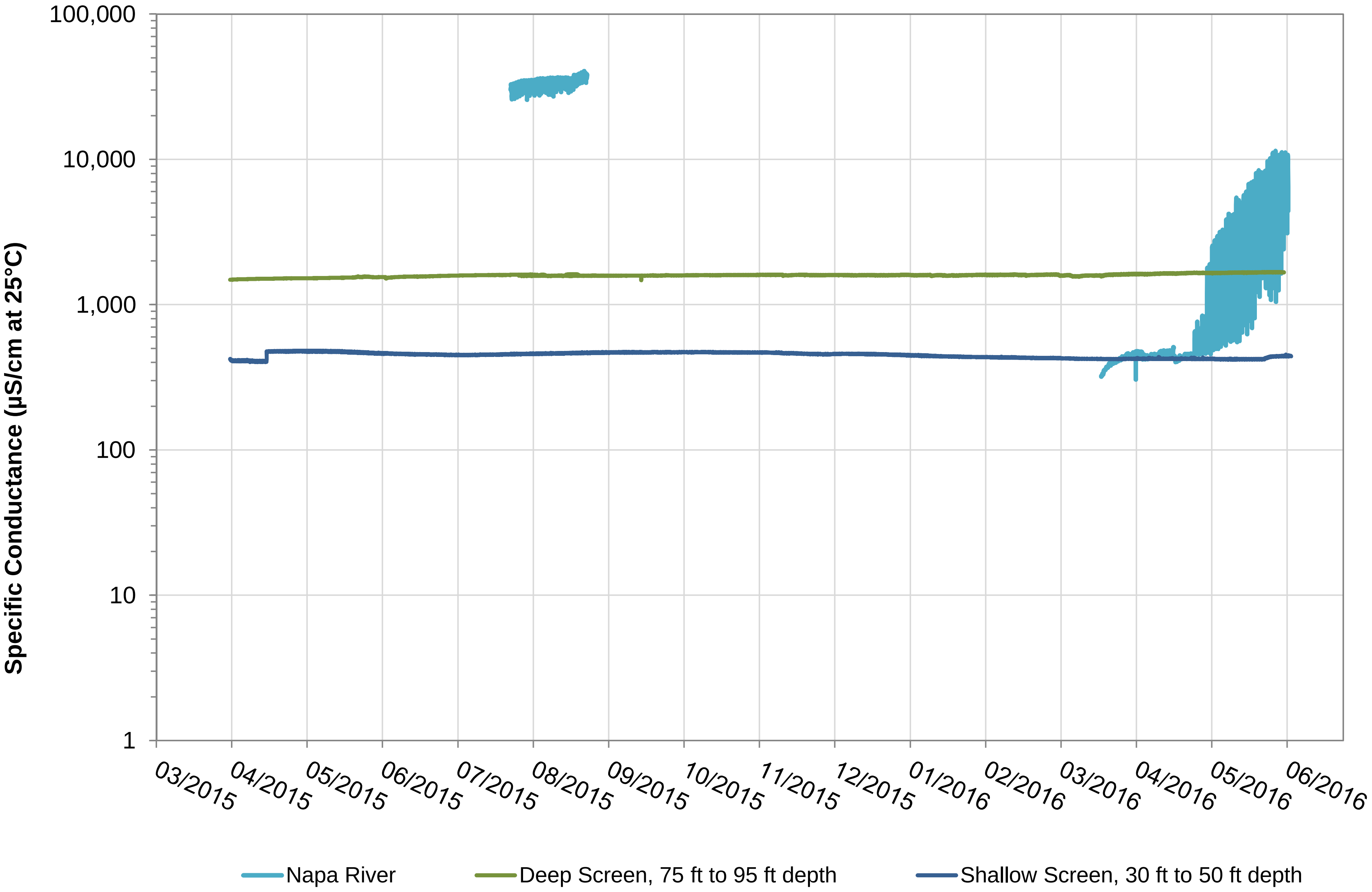
Figure 4.2
Temperature Hydrograph
Site 1: Napa River at First Street

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\Site 1 Charts Chart 2

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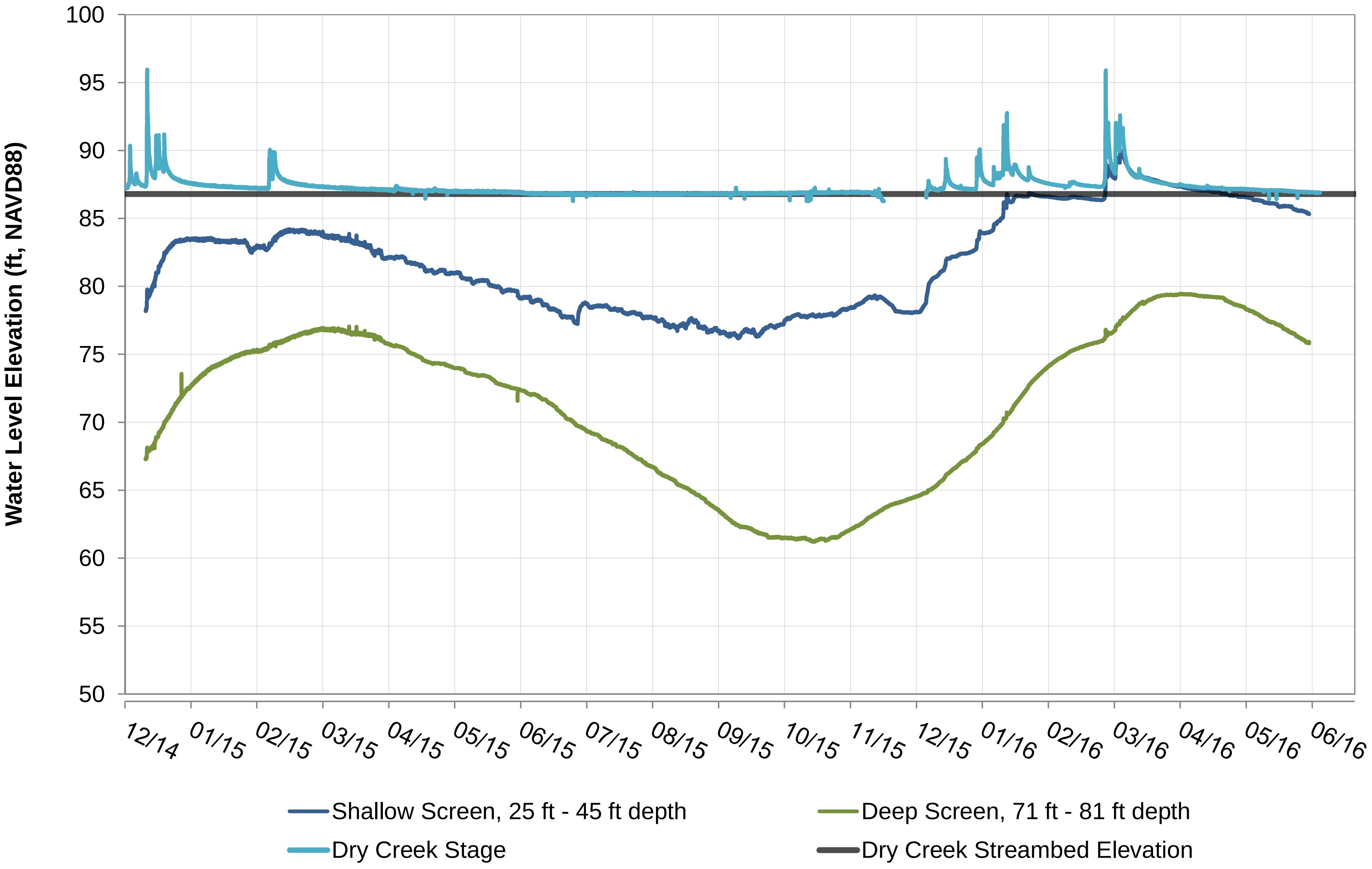
Figure 4.3
Specific Conductance Hydrograph
Site 1: Napa River at First Street

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\WL Site 2

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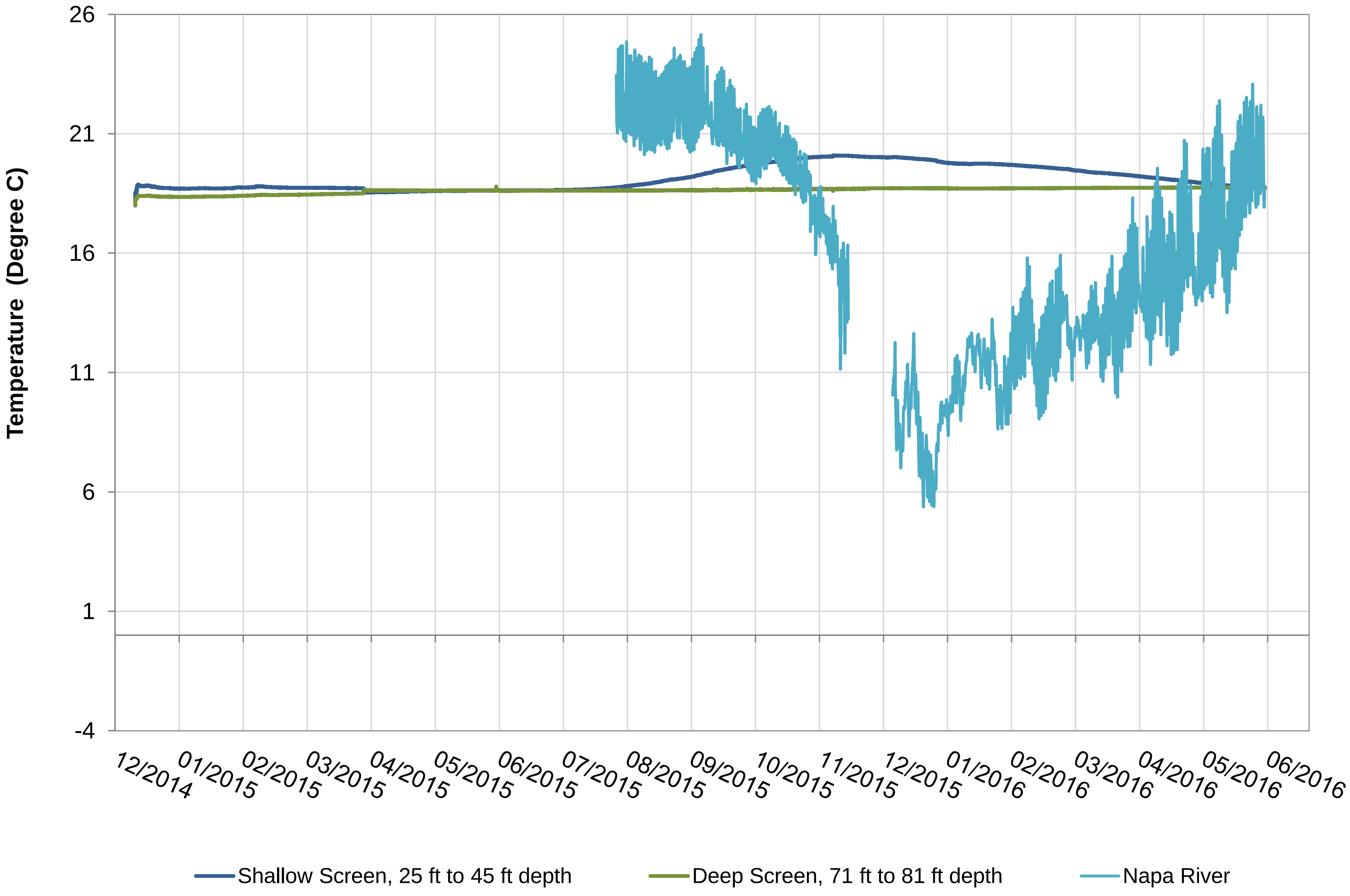
CONSULTING ENGINEERS

Figure 4.4
Water Level Hydrograph
Site 2: Dry Creek at Washington Street
Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\Site 2 Charts Chart 3

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CONSULTING ENGINEERS

Figure 4.5
Temperature Hydrograph
Site 2: Dry Creek at Washington Street
Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program

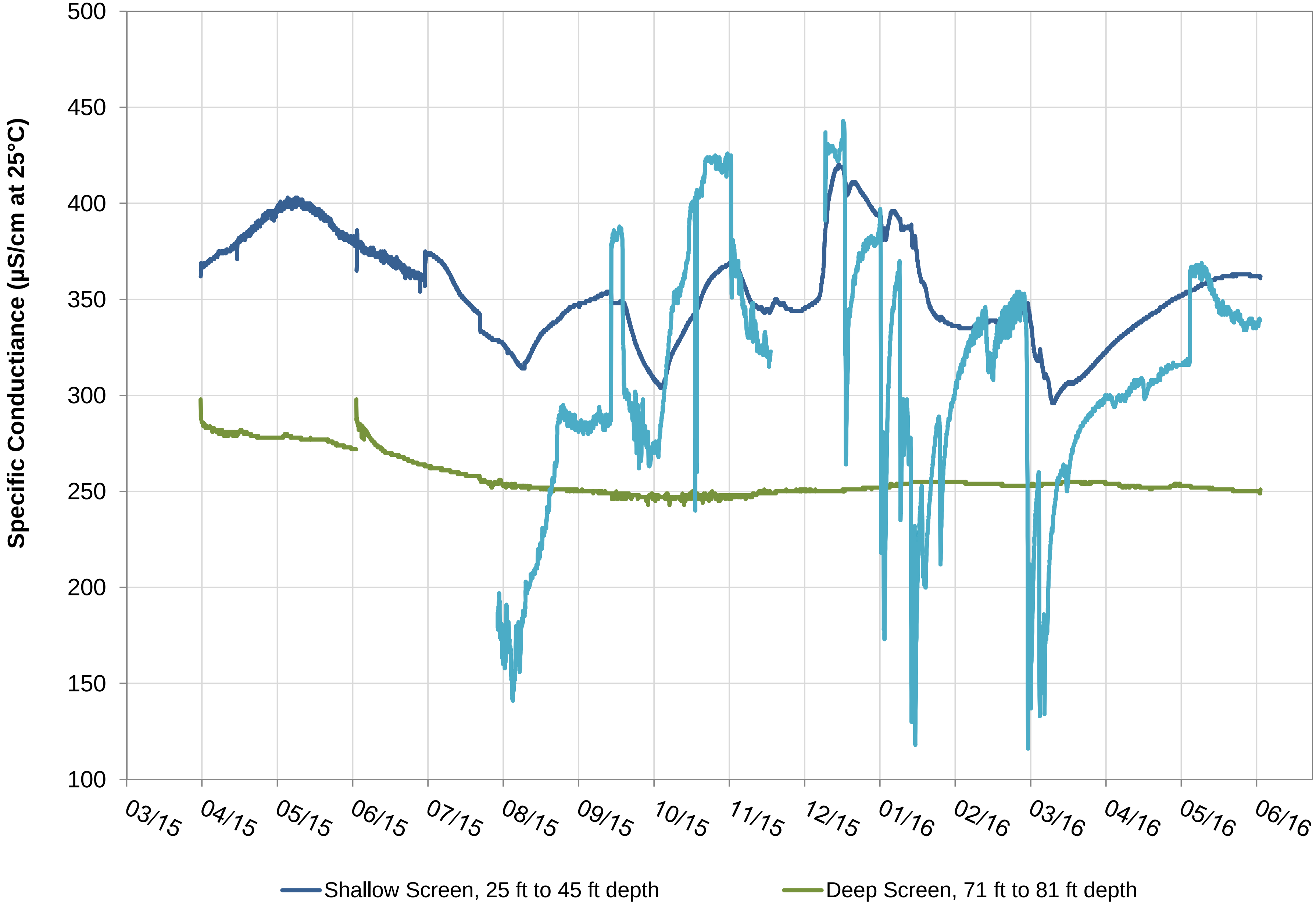

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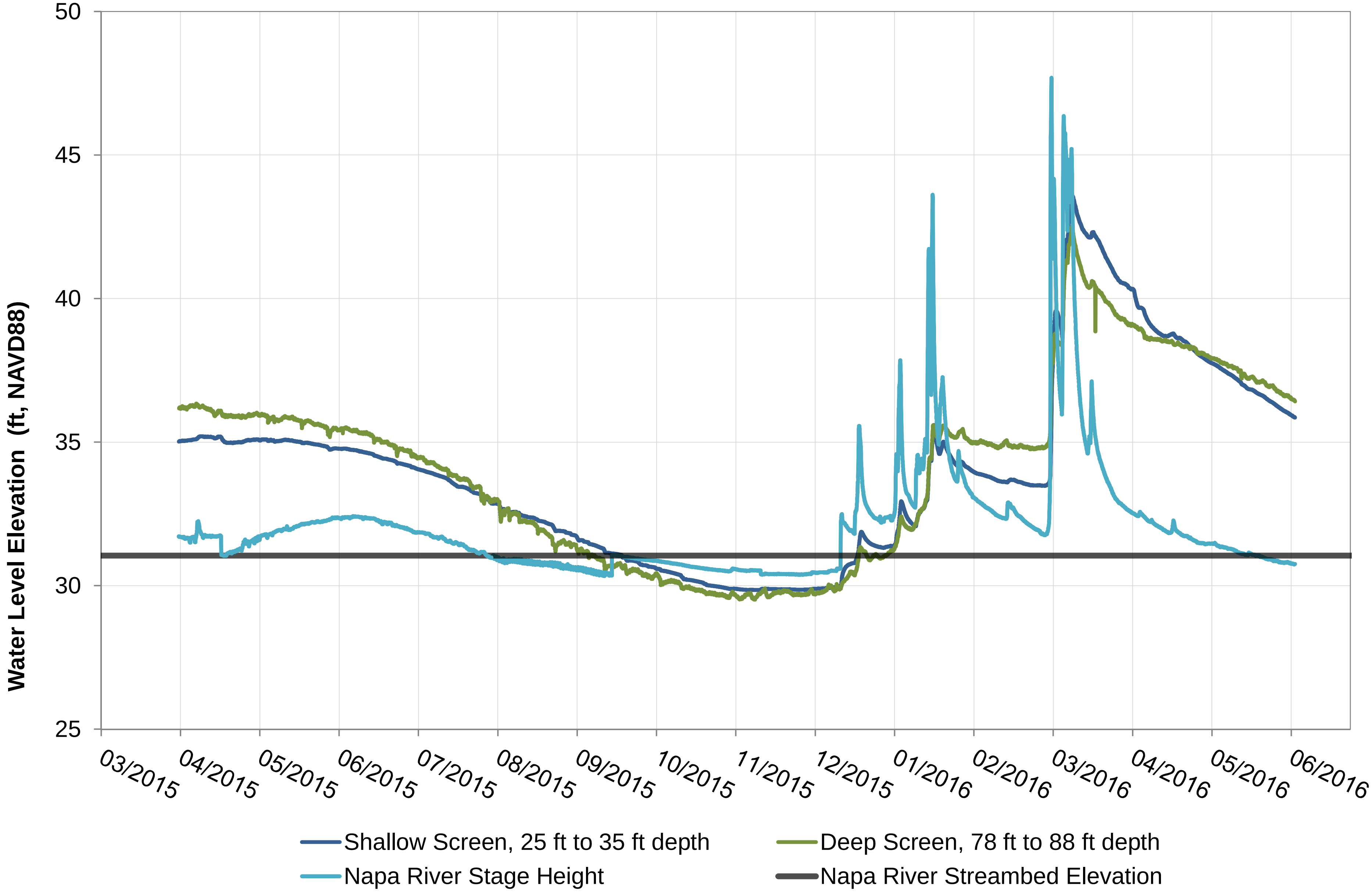
Figure 4.6
Specific Conductance Hydrograph
Site 2: Dry Creek at Washington Street
Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\WL Site 3

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Figure 4.7
Water Level Hydrograph
Site 3: Napa River at Oak Knoll Avenue
Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program

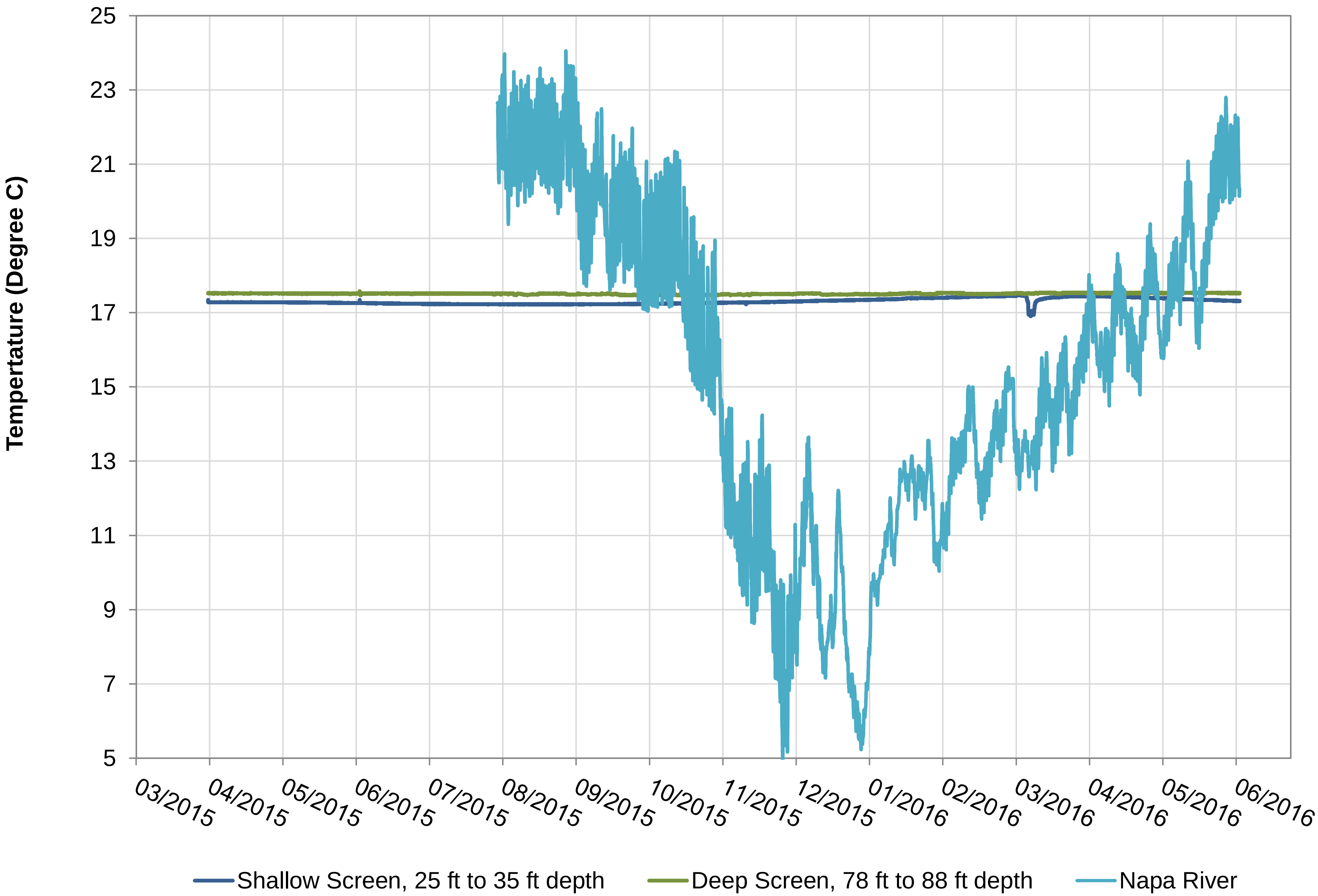

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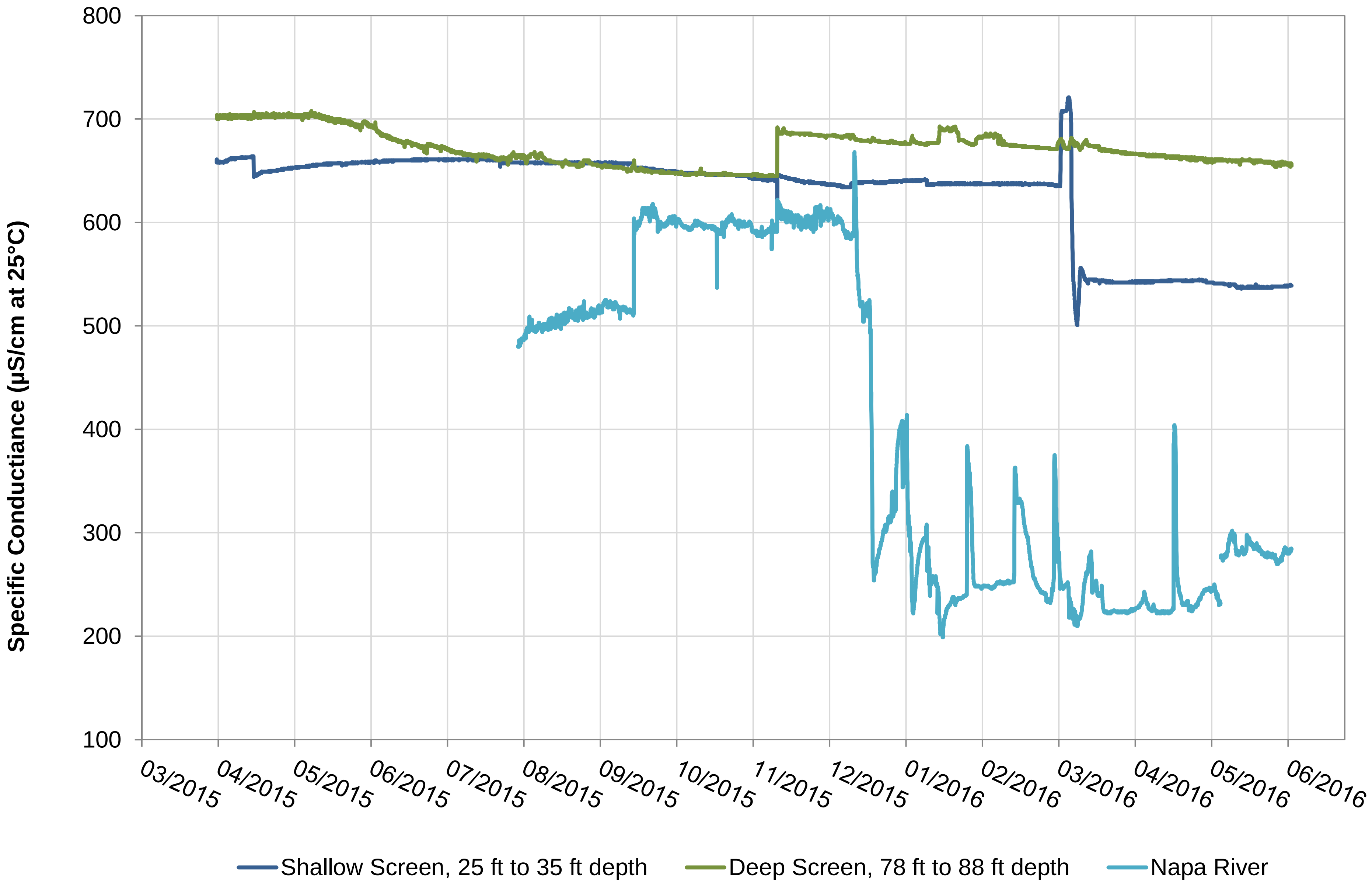
Figure 4.8
Temperature Hydrograph
Site 3: Napa River at Oak Knoll Avenue

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\Site 3 Charts Chart 2

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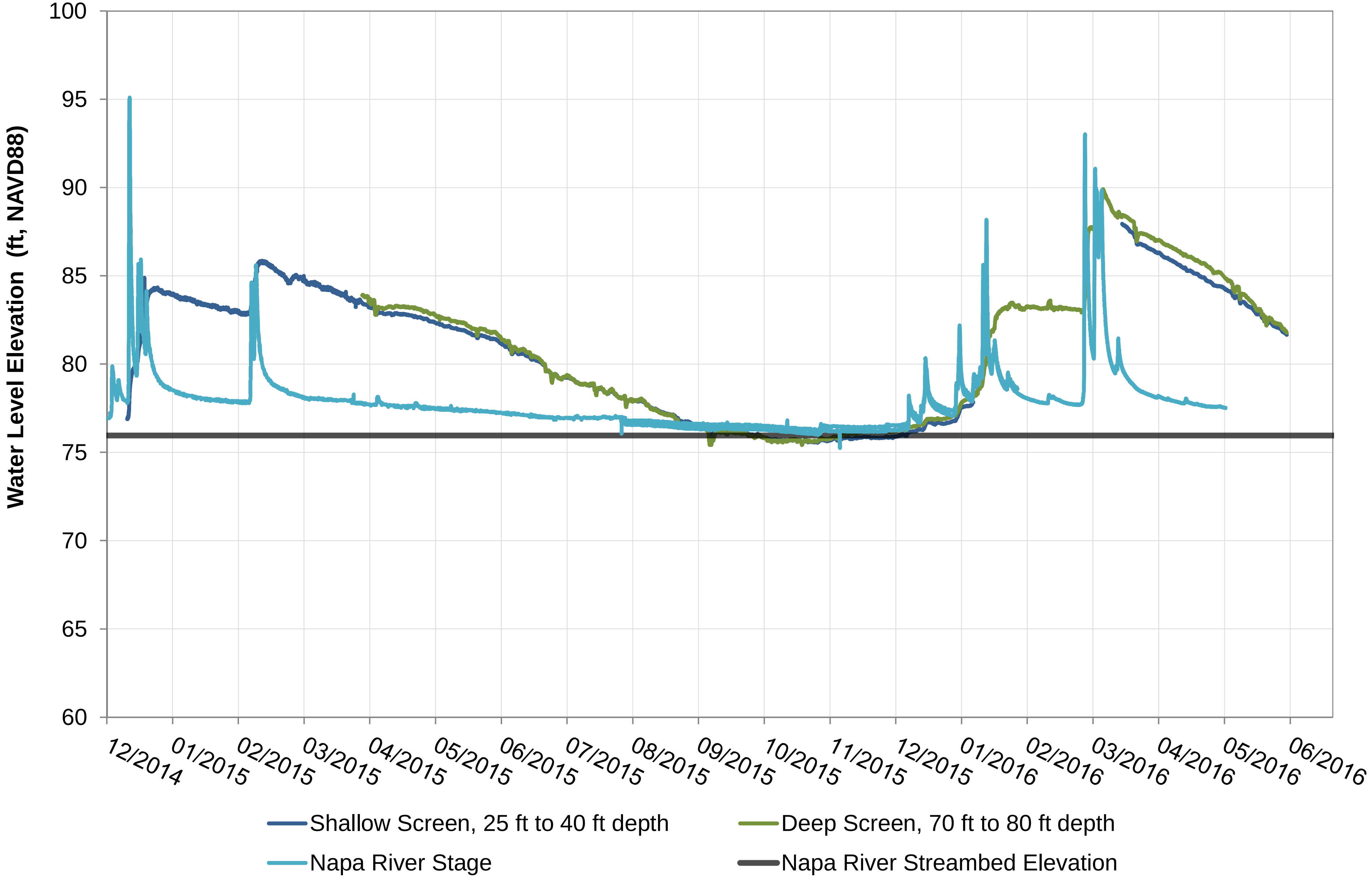
Figure 4.9
Specific Conductance Hydrograph
Site 3: Napa River at Oak Knoll Avenue
Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\WL Site 4

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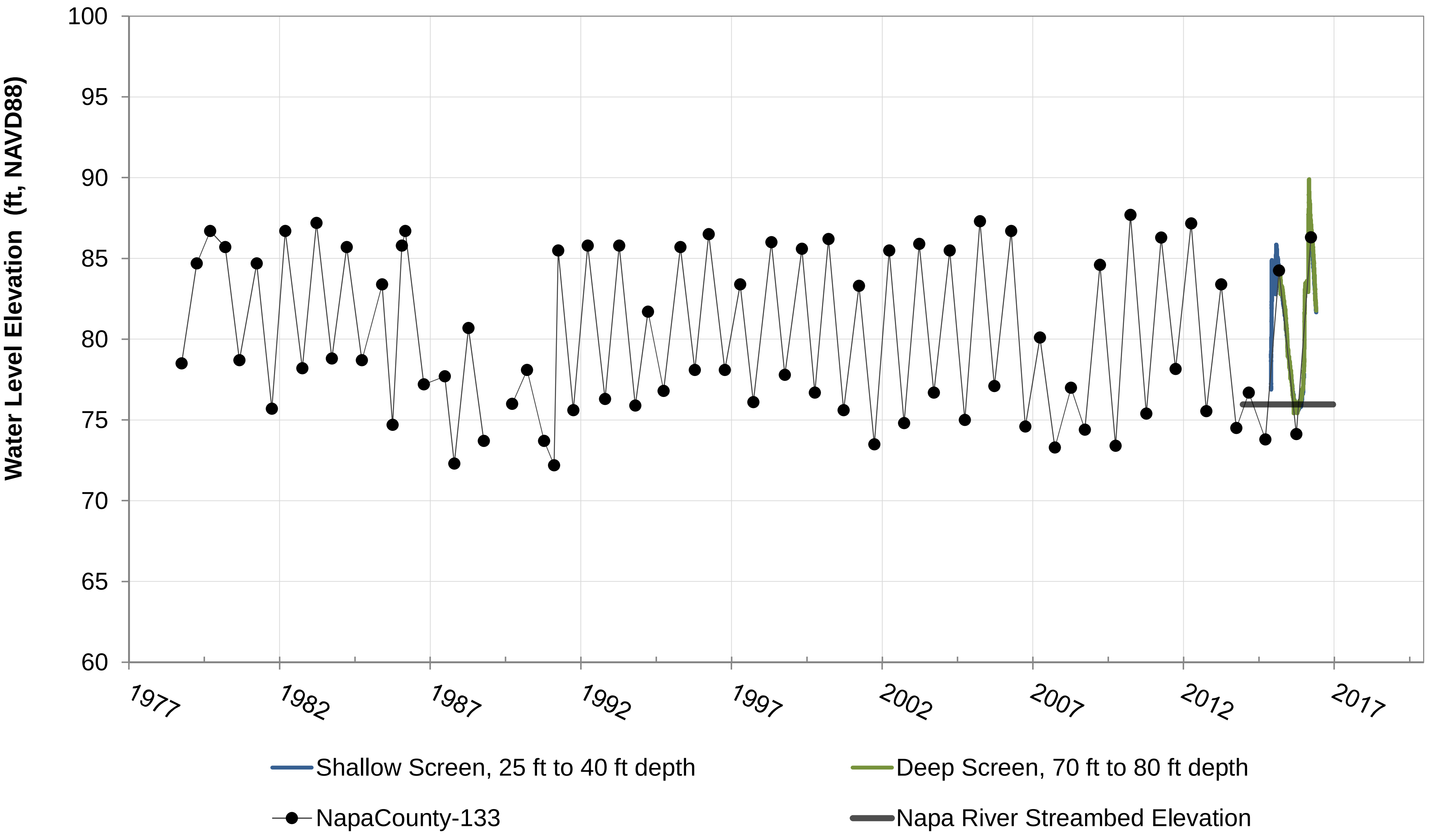
Figure 4.10a
Water Level Hydrograph
Site 4: Napa River at Yountville Cross Road

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\WL Site 4

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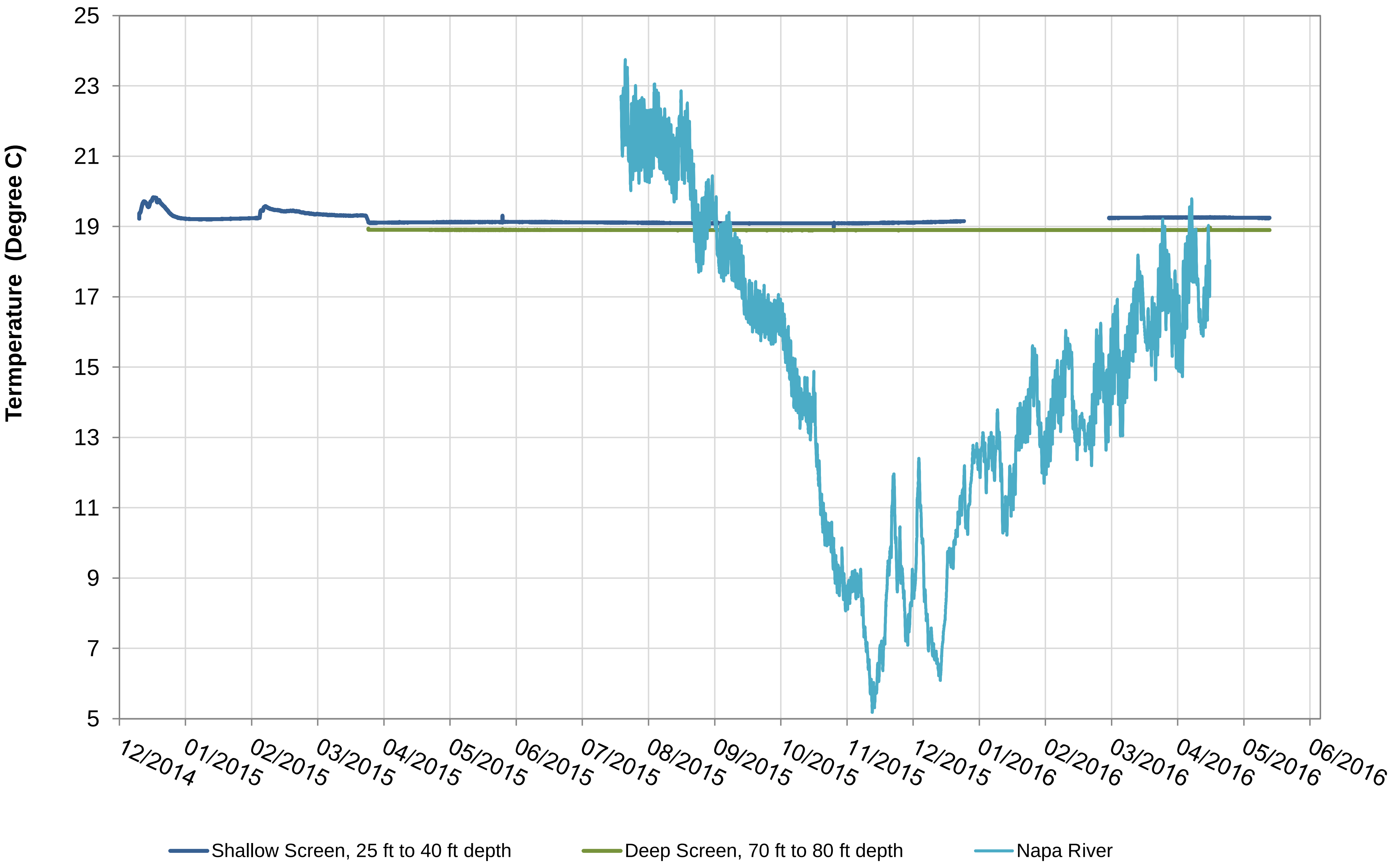
Figure 4.10b
Water Level Hydrograph
Site 4: Napa River at Yountville Cross Road
Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\Site 4 Charts Chart 6

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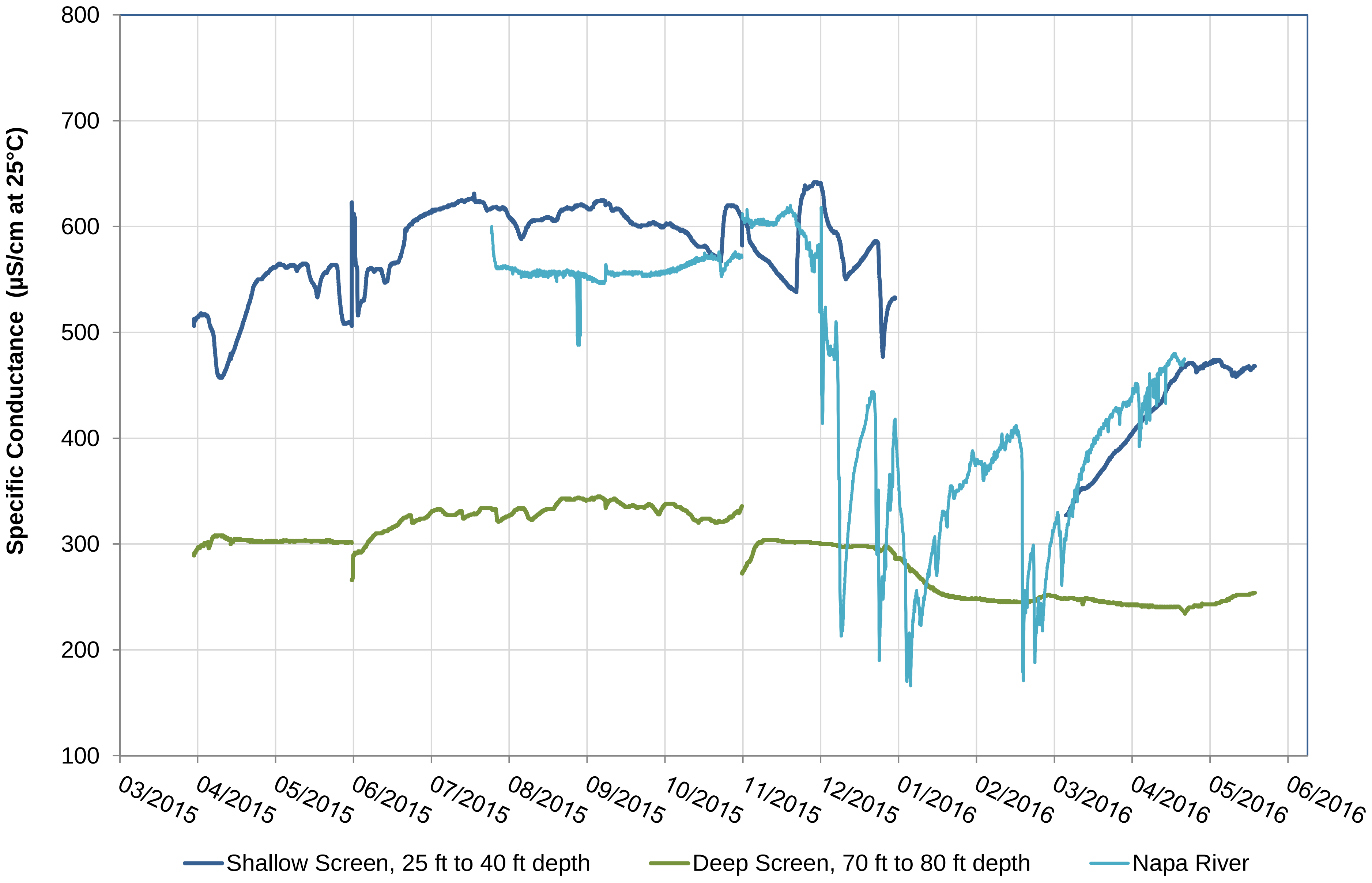
Figure 4.11
Temperature Hydrograph
Site 4: Napa River at Yountville Cross Road
Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\Site 4 Charts Chart 2

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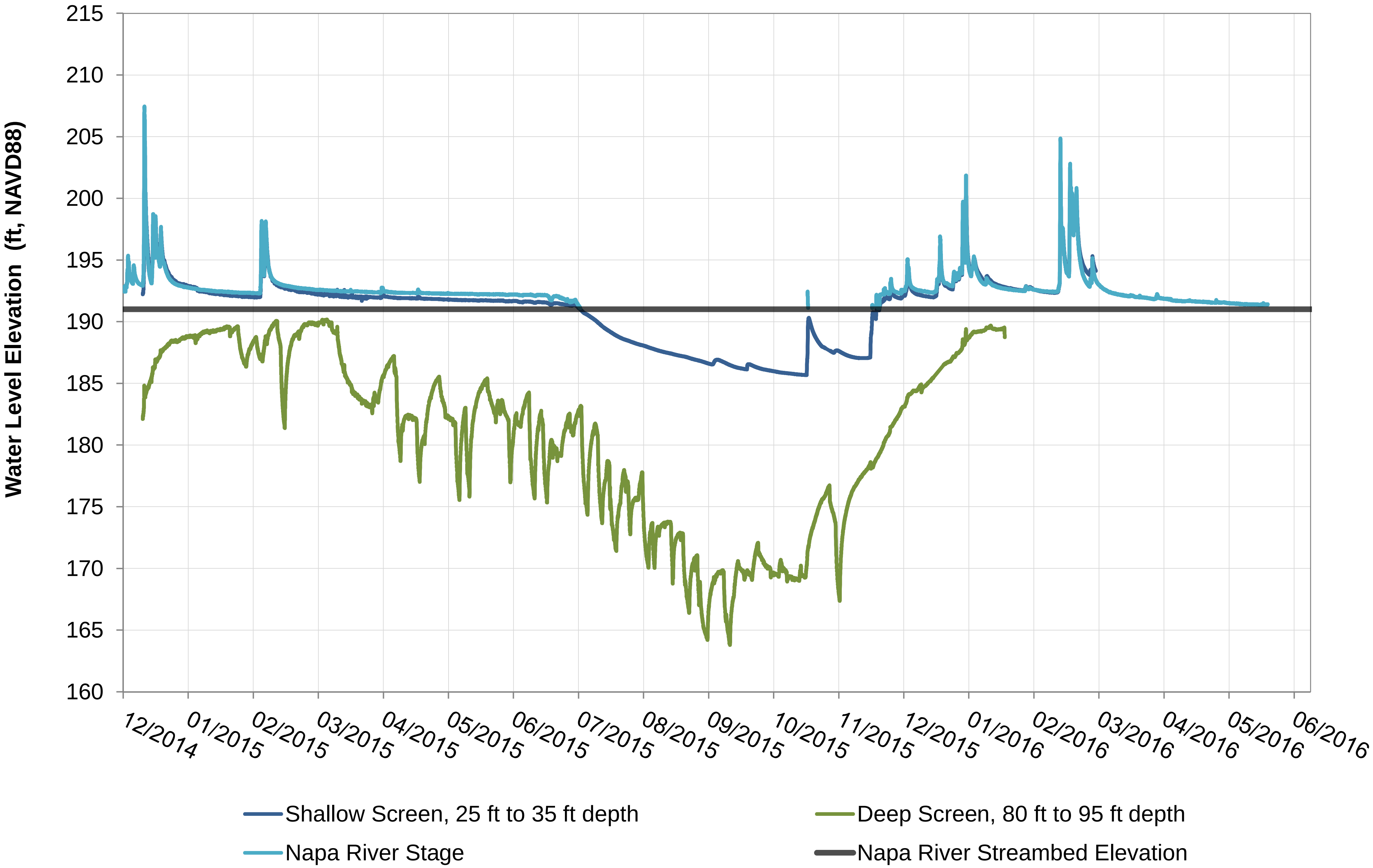
Figure 4.12
Specific Conductance Hydrograph
Site 4: Napa River at Yountville Cross Road

Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\WL Site5

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Figure 4.13a
Water Level Hydrograph
Site 5: Napa River at Pope Street
Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program

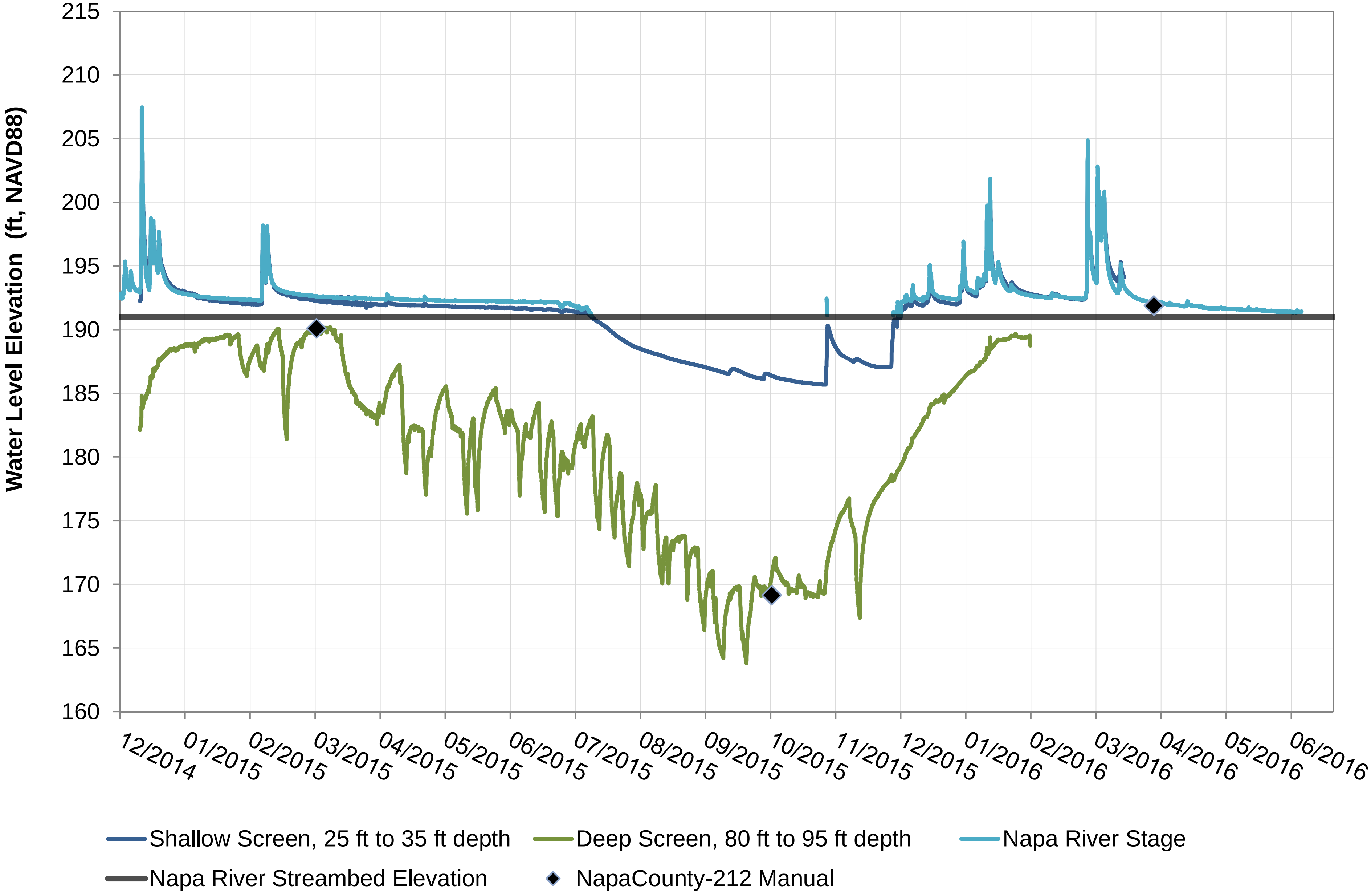

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Figure 4.13b
Water Level Hydrograph
Site 5: Napa River at Pope Street
Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program

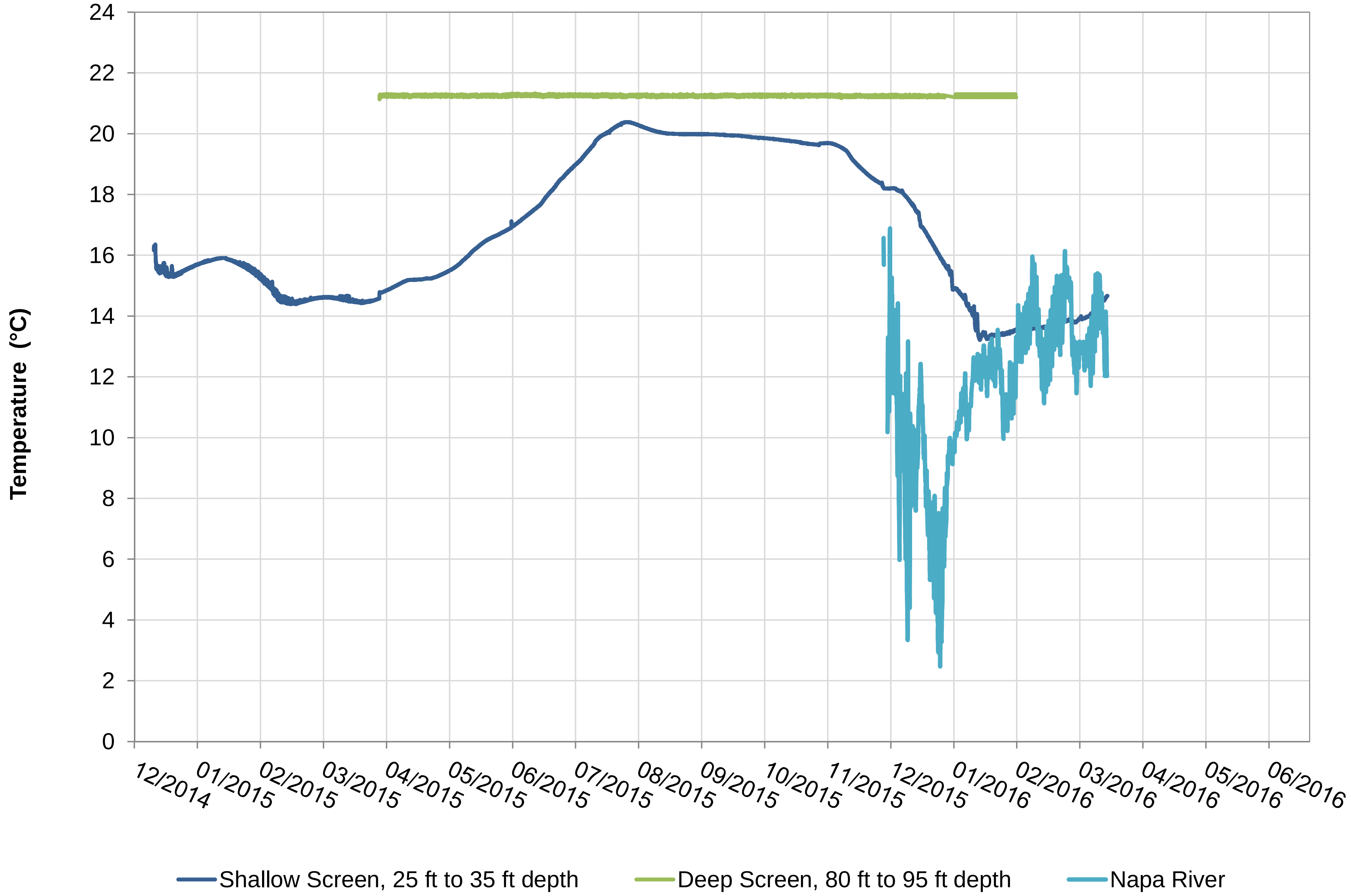

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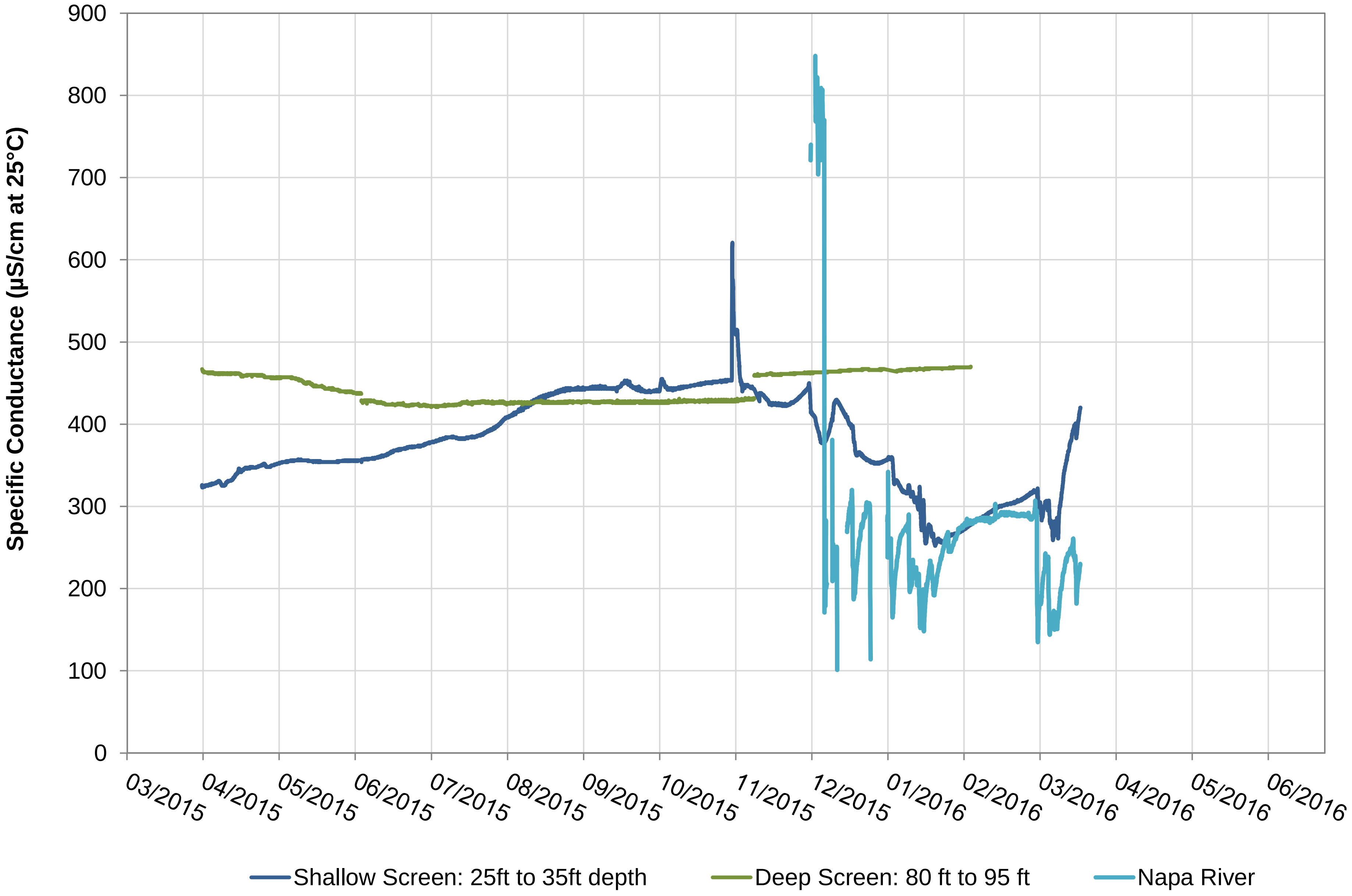
Figure 4.14
Temperature Hydrograph
Site 5: Napa River at Pope Street
Napa County Groundwater/Surface Water Monitoring Facilities Report, DWR LGA Grant Program



X:\2012 Job Files\12-071\Data__Current Project Data Charts\DatabaseCharts.xlsm\Site 5 SC

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Figure 4.15
Specific Conductance Hydrograph
Site 5: Napa River at Pope Street
Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program

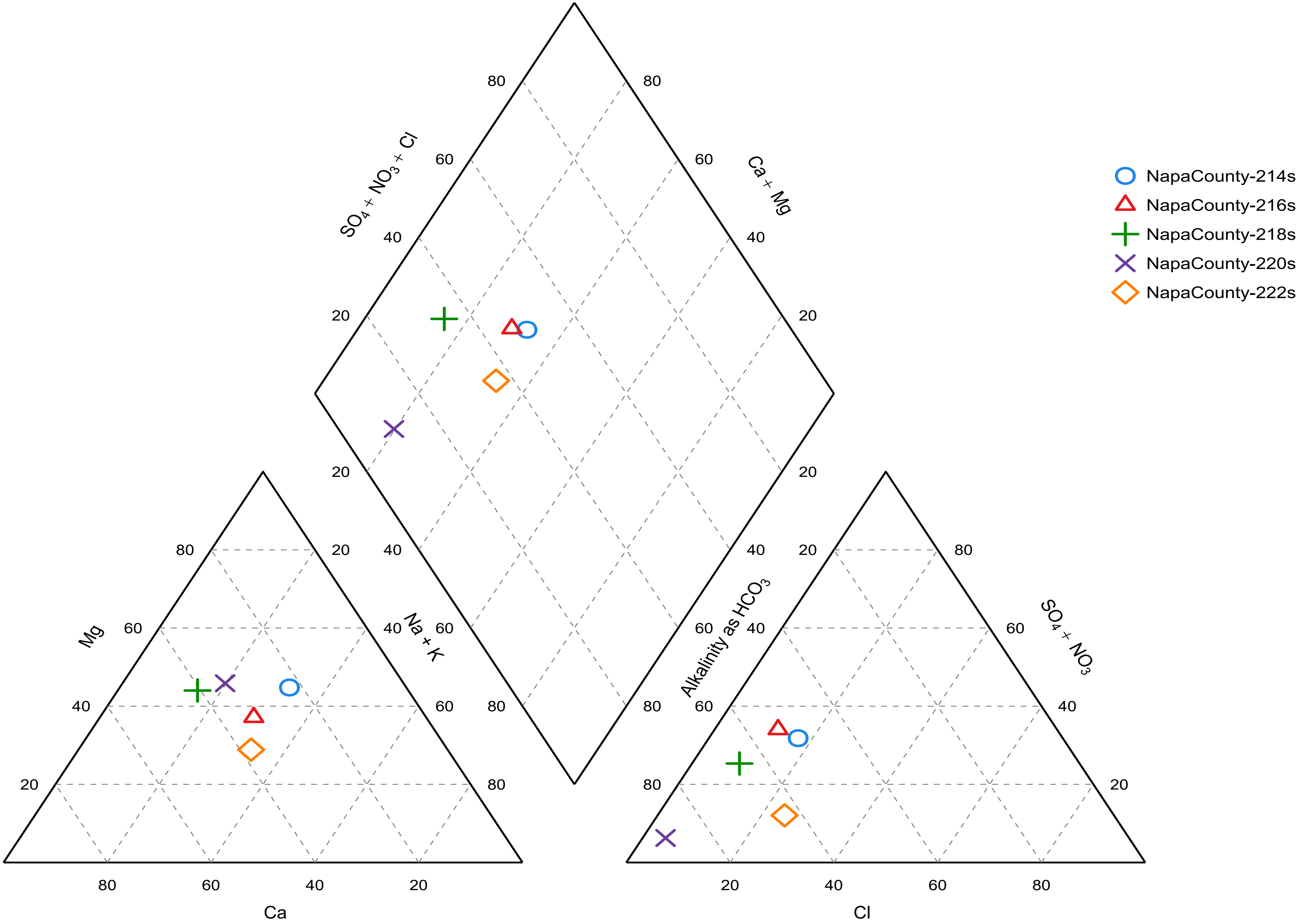

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FIGURE 4.16

Piper Diagram - June 2015 Monitoring Well Shallow Casing Samples

Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program

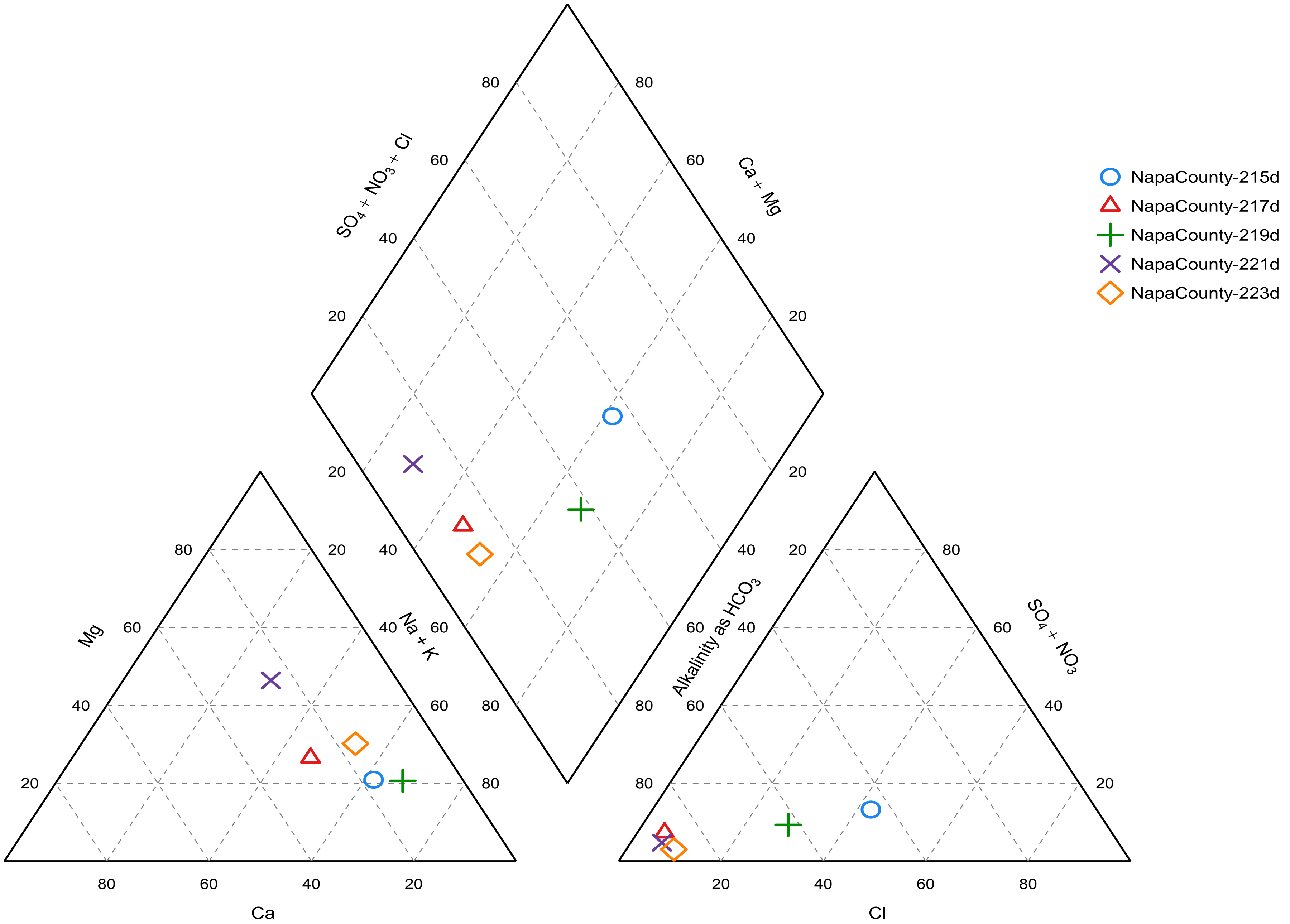

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FIGURE 4.17

Piper Diagram - June 2015 Monitoring Well Deep Casing Samples

Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program

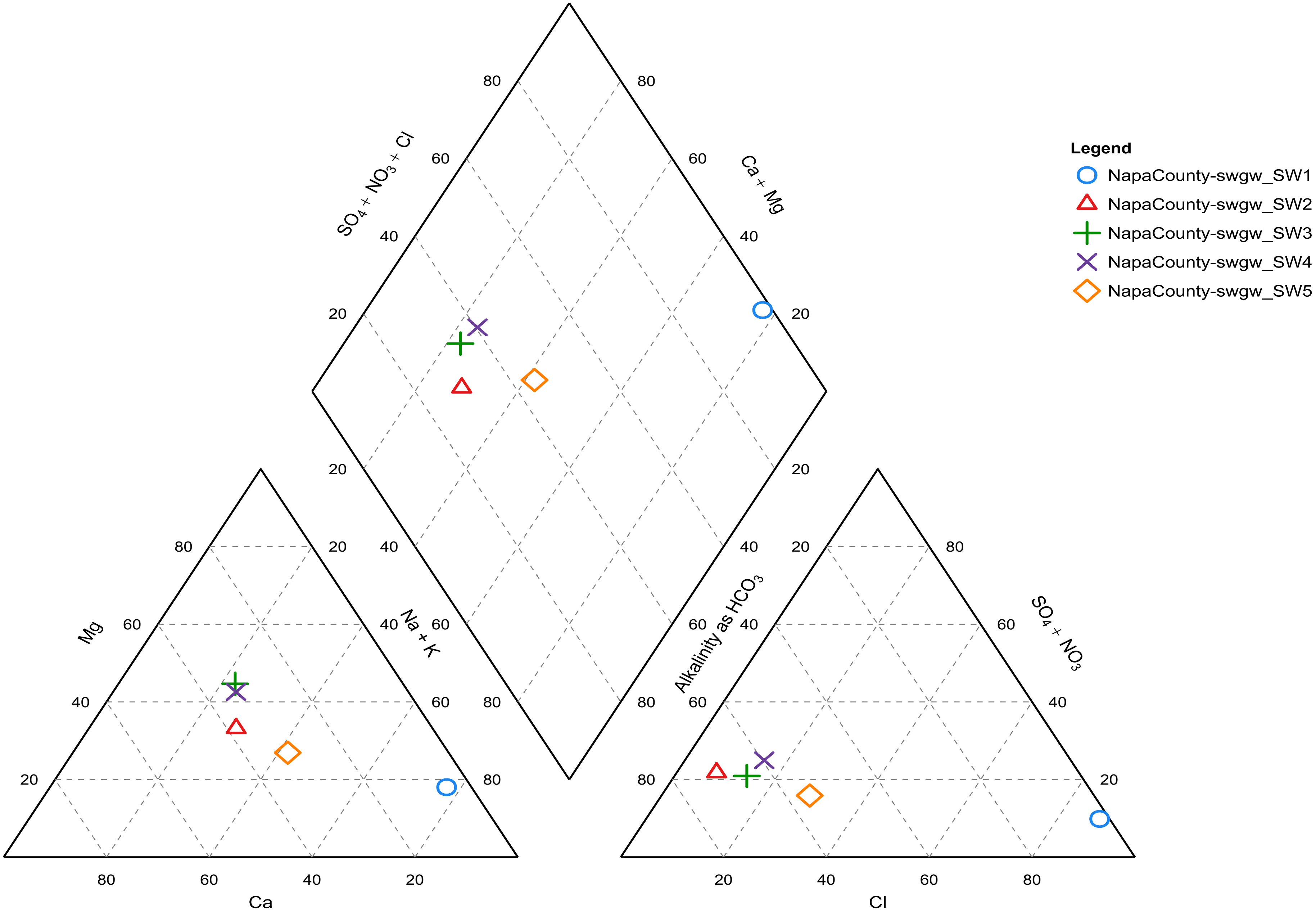

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Figure 4.18
Piper Diagram - June 2015 Surface Water Samples
Napa County Groundwater/Surface Water Monitoring
Facilities Report, DWR LGA Grant Program

APPENDIX A

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0236840

Page 1 of 3

Owner's Well Number NapaCounty-214s-swgw1

Date Work Began 09/02/2014 Date Work Ended 9/4/2014

Local Permit Agency Napa County Department of Environmental Management

Permit Number E14-00666 Permit Date 8/20/14

DWR Use Only – Do Not Fill In

State Well Number/Site Number: 05N04W02N002M

Latitude: 38 18 08 N Longitude: 122 16 42 W

APN/TRS/Other:

Geologic Log

Orientation ● Vertical ○ Horizontal ○ Angle Specify

Drilling Method Hollow stem augers Drilling Fluid No

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
		SEE ATTACHED WELL LOG
		NOTE: NapaCounty-214s-swgw1 well and
		NapaCounty-215d-swgw1 well are in the same
		borehole.

Total Depth of Boring 100 Feet

Total Depth of Completed Well 53 Feet

Well Owner

Name County of Napa

Mailing Address 804 First Street

City Napa State CA Zip 94559

Well Location

Address Site #1- Napa River at First Street

City Napa County Napa

Latitude ___ Deg. ___ Min. ___ Sec. N Longitude ___ Deg. ___ Min. ___ Sec. W

Datum ___ Dec. Lat. 38.30223 Dec. Long. -122.27845

APN Book ___ Page ___ Parcel ___

Township ___ Range ___ Section ___

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

SEE ATTACHED

West SITE LOCATION East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

● New Well

○ Modification/Repair

- ○ Deepen
- ○ Other

○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply

- ☐ Domestic ☐ Public
- ☐ Irrigation ☐ Industrial

○ Cathodic Protection

○ Dewatering

○ Heat Exchange

○ Injection

● Monitoring

○ Remediation

○ Sparging

○ Test Well

○ Vapor Extraction

○ Other

Water Level and Yield of Completed Well

Depth to first water 16 (Feet below surface)

Depth to Static Water Level ___ (Feet) Date Measured ___

Estimated Yield * ___ (GPM) Test Type ___

Test Length ___ (Hours) Total Drawdown ___ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	30	10	Blank	PVC Sch. 40	.308	2.375		
30	50	10	Screen	PVC Sch. 40	.308	2.375	Milled Slots	0.030
50	53	10	Blank	PVC Sch. 40	.308	2.375		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	20	Cement	10.3 sack mix
20	53	Filter Pack	#3 sand

Attachments

☑ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☑ Other Site Location

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name CLEAR HEART DRILLING, INC.
Person, Firm or Corporation

555 W. College Ave. Ste. B Santa Rosa CA 95401
Address City State Zip

Signed
C-57 Licensed Water Well Contractor

Date Signed 10/15/2014 C-57 License Number 780357

DWR 188 REV. 1/2006

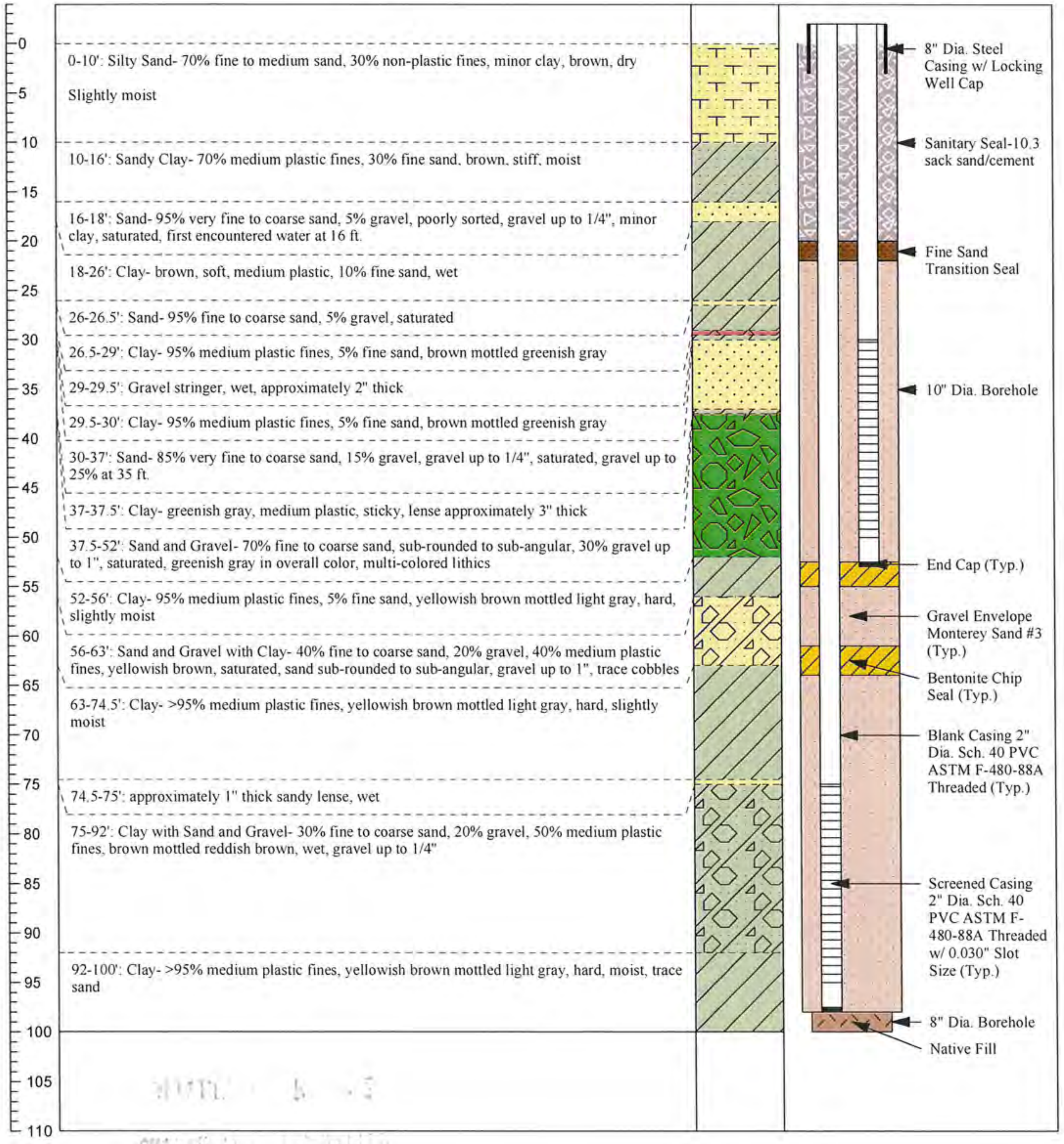
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

e0236840

LSCE Project No. 12-1-071
Well Name: Napa County-214s-swgw1
Lat./Long.: 38.30223/-122.27845
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #1- Napa River at Napa
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/2/14 - 9/4/14
Well Depth (ft): 53
Boring Depth (ft): 100
Well Screen (ft): 30-50

Lithologic Description **Graphic Log** **Well Profile As Built**



0-10': Silty Sand- 70% fine to medium sand, 30% non-plastic fines, minor clay, brown, dry

Slightly moist

10-16': Sandy Clay- 70% medium plastic fines, 30% fine sand, brown, stiff, moist

16-18': Sand- 95% very fine to coarse sand, 5% gravel, poorly sorted, gravel up to 1/4", minor clay, saturated, first encountered water at 16 ft.

18-26': Clay- brown, soft, medium plastic, 10% fine sand, wet

26-26.5': Sand- 95% fine to coarse sand, 5% gravel, saturated

26.5-29': Clay- 95% medium plastic fines, 5% fine sand, brown mottled greenish gray

29-29.5': Gravel stringer, wet, approximately 2" thick

29.5-30': Clay- 95% medium plastic fines, 5% fine sand, brown mottled greenish gray

30-37': Sand- 85% very fine to coarse sand, 15% gravel, gravel up to 1/4", saturated, gravel up to 25% at 35 ft.

37-37.5': Clay- greenish gray, medium plastic, sticky, lense approximately 3" thick

37.5-52': Sand and Gravel- 70% fine to coarse sand, sub-rounded to sub-angular, 30% gravel up to 1", saturated, greenish gray in overall color, multi-colored lithics

52-56': Clay- 95% medium plastic fines, 5% fine sand, yellowish brown mottled light gray, hard, slightly moist

56-63': Sand and Gravel with Clay- 40% fine to coarse sand, 20% gravel, 40% medium plastic fines, yellowish brown, saturated, sand sub-rounded to sub-angular, gravel up to 1", trace cobbles

63-74.5': Clay- >95% medium plastic fines, yellowish brown mottled light gray, hard, slightly moist

74.5-75': approximately 1" thick sandy lense, wet

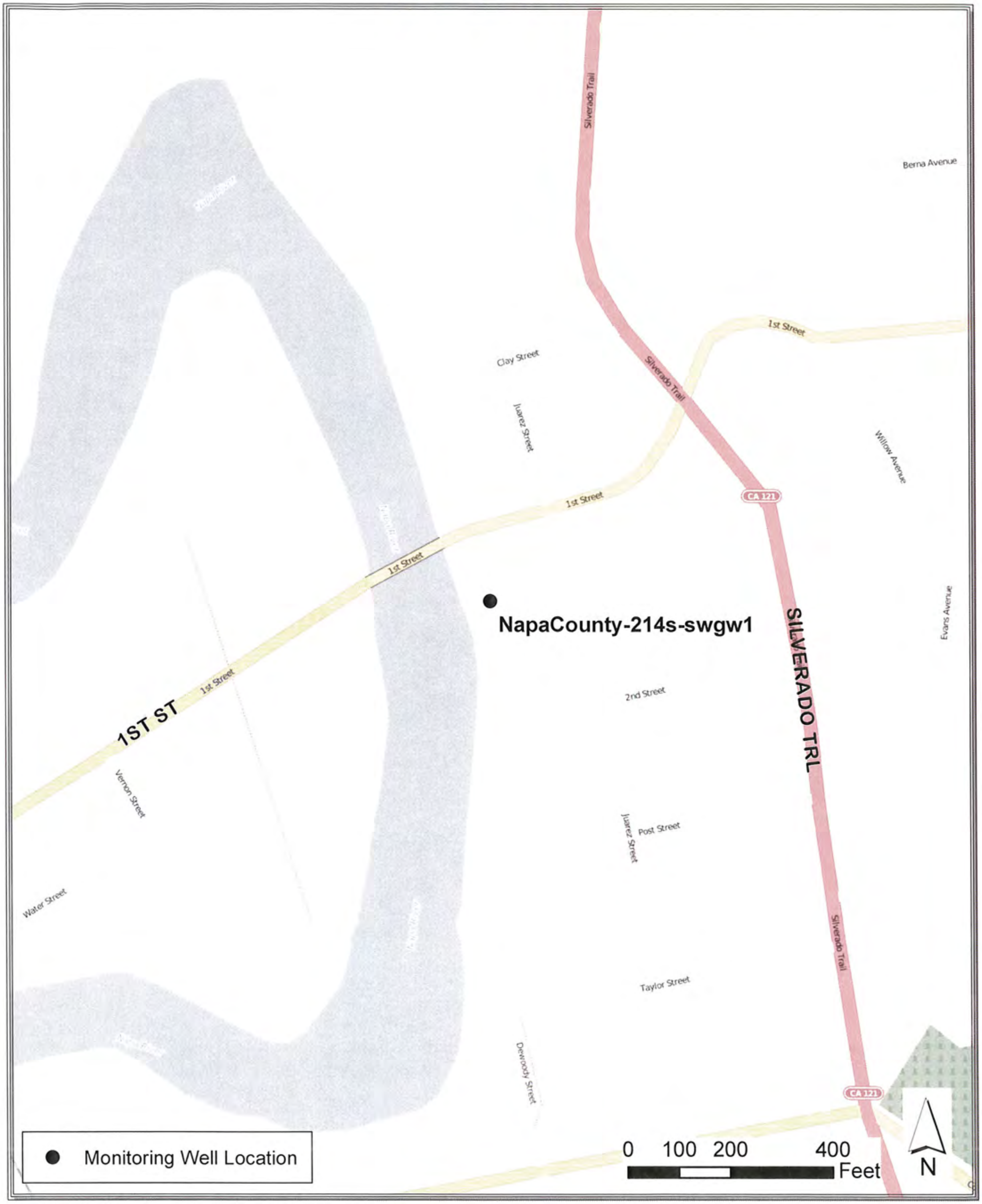
75-92': Clay with Sand and Gravel- 30% fine to coarse sand, 20% gravel, 50% medium plastic fines, brown mottled reddish brown, wet, gravel up to 1/4"

92-100': Clay- >95% medium plastic fines, yellowish brown mottled light gray, hard, moist, trace sand

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

e0236840



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LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Napa County Five Dual-Completion Monitoring Wells Project

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0236873

Page 1 of 3

Owner's Well Number NapaCounty-215d-swgw1

Date Work Began 09/02/2014 Date Work Ended 9/4/2014

Local Permit Agency Napa County Department of Environmental Management

Permit Number E14-00666 Permit Date 8/20/14

DWR Use Only – Do Not Fill In

05N04W02N001M

State Well Number/Site Number

38 18 08 N 122 16 42 W

Latitude Longitude

APN/TRS/Other

Geologic Log

Orientation ● Vertical ○ Horizontal ○ Angle Specify

Drilling Method Hollow stem augers Drilling Fluid No

Depth from Surface Feet	to Feet	**Description** Describe material, grain size, color, etc
		SEE ATTACHED WELL LOG
		NOTE: NapaCounty-214s-swgw1 well and NapaCounty-215d-swgw1 well are in the same borehole.

Total Depth of Boring 100 Feet

Total Depth of Completed Well 98 Feet

Well Owner

Name County of Napa

Mailing Address 804 First Street

City Napa State CA Zip 94559

Well Location

Address Site #1- Napa River at First Street

City Napa County Napa

Latitude ___ Deg. ___ Min. ___ Sec. N Longitude ___ Deg. ___ Min. ___ Sec. W

Datum ___ Dec. Lat. 38.30223 Dec. Long. -122.27845

APN Book ___ Page ___ Parcel ___

Township ___ Range ___ Section ___

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

SEE ATTACHED

West SITE LOCATION East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

○ New Well

○ Modification/Repair

○ Deepen

○ Other

○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply

☐ Domestic ☐ Public

☐ Irrigation ☐ Industrial

○ Cathodic Protection

○ Dewatering

○ Heat Exchange

○ Injection

● Monitoring

○ Remediation

○ Sparging

○ Test Well

○ Vapor Extraction

○ Other

Water Level and Yield of Completed Well

Depth to first water 16 (Feet below surface)

Depth to Static Water Level ___ (Feet) Date Measured ___

Estimated Yield * ___ (GPM) Test Type ___

Test Length ___ (Hours) Total Drawdown ___ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	75	10	Blank	PVC Sch. 40	.308	2.375		
75	95	10	Screen	PVC Sch. 40	.308	2.375	Milled Slots	0.030
95	98	10	Blank	PVC Sch. 40	.308	2.375		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	20	Cement	10.3 sack mix
20	53	Filter Pack	#3 sand
53	55	Bentonite	
55	61	Filter Pack	#3 sand
61	64	Bentonite	
64	100	Filter Pack	#3 sand

Attachments

☑ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☑ Other Site Location

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name CLEAR HEART DRILLING, INC.

Person, Firm or Corporation

555 W. College Ave. Ste.B Santa Rosa CA 95401

Address City State Zip

Signed ___ 10/15/2014 780357

C-57 Licensed Water Well Contractor Date Signed C-57 License Number

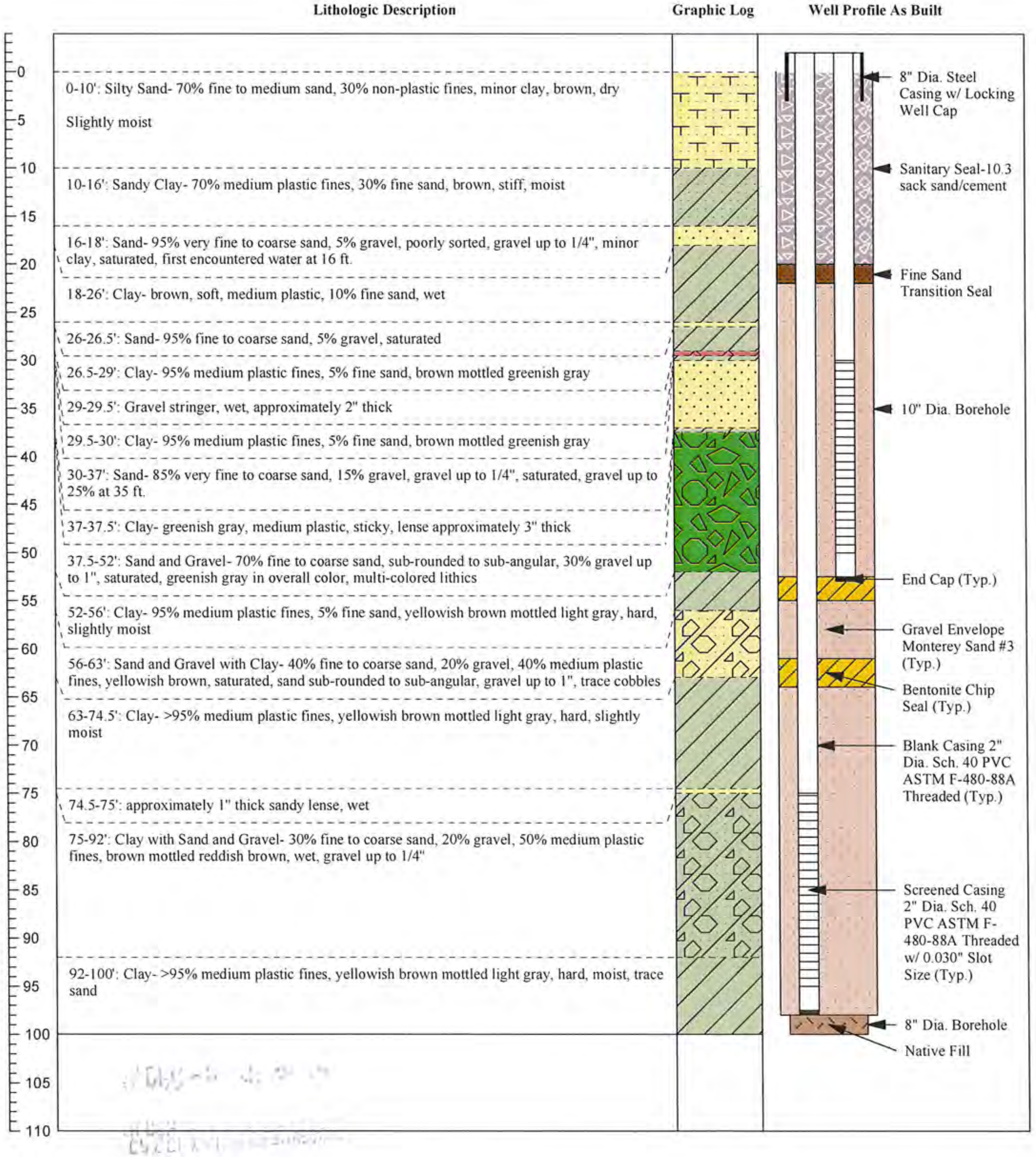
DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

e0236873

LSCE Project No. 12-1-071
Well Name: Napa County-215d-swgw1
Lat./Long.: 38.30223/-122.27845
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #1- Napa River at Napa
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/2/14 - 9/4/14
Well Depth (ft): 98
Boring Depth (ft): 100
Well Screen (ft): 75-95



Lithologic Description

0-10': Silty Sand- 70% fine to medium sand, 30% non-plastic fines, minor clay, brown, dry

Slightly moist

10-16': Sandy Clay- 70% medium plastic fines, 30% fine sand, brown, stiff, moist

16-18': Sand- 95% very fine to coarse sand, 5% gravel, poorly sorted, gravel up to 1/4", minor clay, saturated, first encountered water at 16 ft.

18-26': Clay- brown, soft, medium plastic, 10% fine sand, wet

26-26.5': Sand- 95% fine to coarse sand, 5% gravel, saturated

26.5-29': Clay- 95% medium plastic fines, 5% fine sand, brown mottled greenish gray

29-29.5': Gravel stringer, wet, approximately 2" thick

29.5-30': Clay- 95% medium plastic fines, 5% fine sand, brown mottled greenish gray

30-37': Sand- 85% very fine to coarse sand, 15% gravel, gravel up to 1/4", saturated, gravel up to 25% at 35 ft.

37-37.5': Clay- greenish gray, medium plastic, sticky, lense approximately 3" thick

37.5-52': Sand and Gravel- 70% fine to coarse sand, sub-rounded to sub-angular, 30% gravel up to 1", saturated, greenish gray in overall color, multi-colored lithics

52-56': Clay- 95% medium plastic fines, 5% fine sand, yellowish brown mottled light gray, hard, slightly moist

56-63': Sand and Gravel with Clay- 40% fine to coarse sand, 20% gravel, 40% medium plastic fines, yellowish brown, saturated, sand sub-rounded to sub-angular, gravel up to 1", trace cobbles

63-74.5': Clay- >95% medium plastic fines, yellowish brown mottled light gray, hard, slightly moist

74.5-75': approximately 1" thick sandy lense, wet

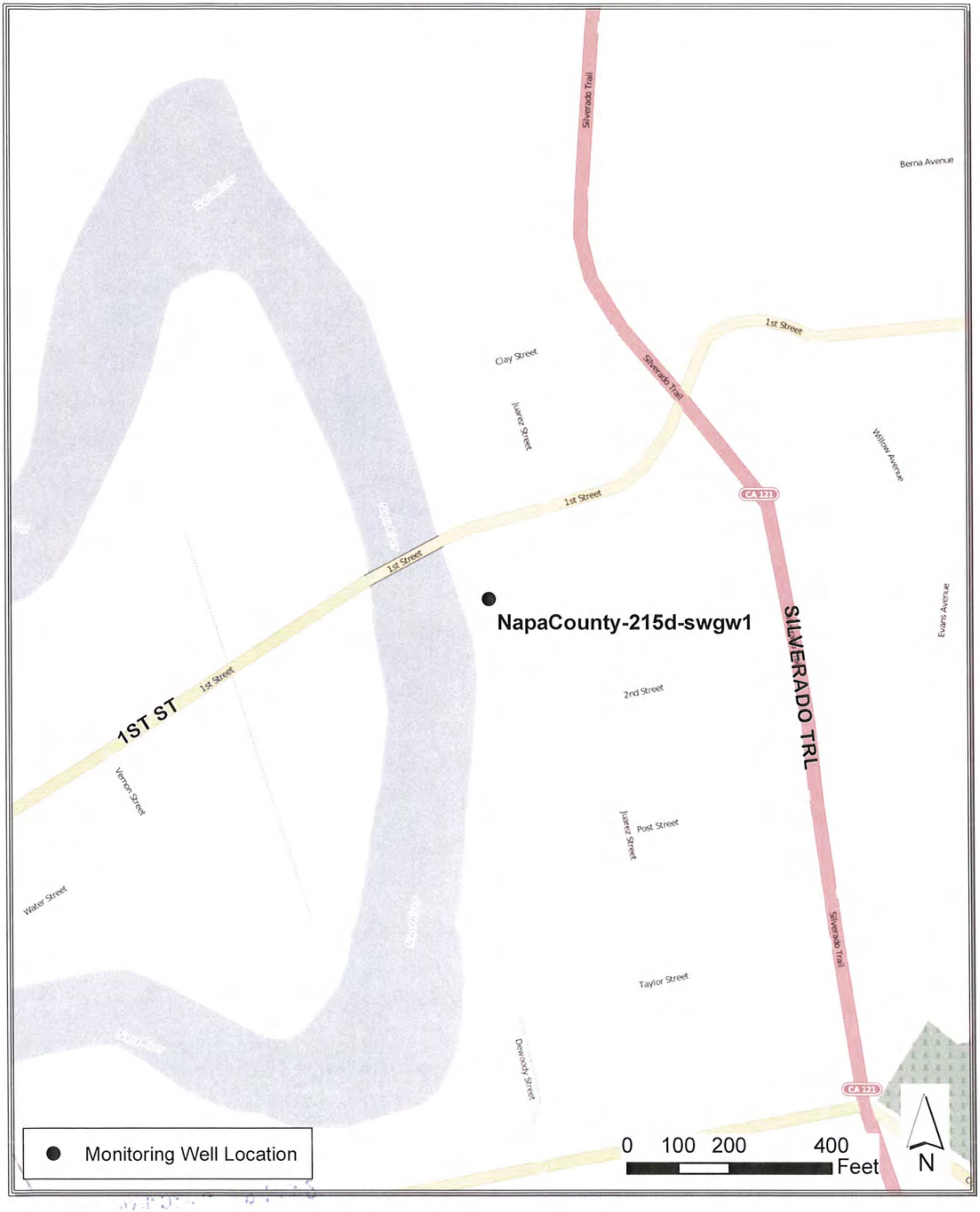
75-92': Clay with Sand and Gravel- 30% fine to coarse sand, 20% gravel, 50% medium plastic fines, brown mottled reddish brown, wet, gravel up to 1/4"

92-100': Clay- >95% medium plastic fines, yellowish brown mottled light gray, hard, moist, trace sand

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

e0236873



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CONSULTING ENGINEERS

Napa County Five Dual-Completion Monitoring Wells Project

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File Original with DWR

Page 1 of 3

Owner's Well Number NapaCounty-216s-swgw2

Date Work Began 09/22/2014

Local Permit Agency Napa County Department of Environmental Management

Permit Number E14-00667

State of California

Well Completion Report

Refer to Instruction Pamphlet

e0236731

Date Work Ended 9/24/2014

Permit Date 8/20/14

DWR Use Only – Do Not Fill In

State Well Number/Site Number: 06N04W18J003M

Latitude: 38 21 55 N

Longitude: 122 20 15 W

APN/TRS/Other:

Geologic Log

Orientation ● Vertical ○ Horizontal ○ Angle Specify

Drilling Method Hollow-stem augers Drilling Fluid no

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
		SEE ATTACHED WELL LOG
		NOTE: NapaCounty-216s-swgw2 well and NapaCounty-217d-swgw2 well are in the same borehole.

Total Depth of Boring 100 Feet

Total Depth of Completed Well 50 Feet

Well Owner

Name County of Napa

Mailing Address 804 First Street

City Napa State CA Zip 94559

Well Location

Address Site #2-Dry Creek at Washington Street

City Napa County Napa

Latitude __ Deg. __ Min. __ Sec. N Longitude __ Deg. __ Min. __ Sec. W

Datum __ Dec. Lat. 38.365231 Dec. Long. -122.337532

APN Book __ Page __ Parcel __

Township __ Range __ Section __

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West

SEE ATTACHED

SITE LOCATION

East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

● New Well

○ Modification/Repair

○ Deepen

○ Other

○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply

☐ Domestic ☐ Public

☐ Irrigation ☐ Industrial

○ Cathodic Protection

○ Dewatering

○ Heat Exchange

○ Injection

● Monitoring

○ Remediation

○ Sparging

○ Test Well

○ Vapor Extraction

○ Other

Water Level and Yield of Completed Well

Depth to first water 23 (Feet below surface)

Depth to Static Water Level __ (Feet) Date Measured __

Estimated Yield * __ (GPM) Test Type __

Test Length __ (Hours) Total Drawdown __ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size If Any (Inches)
0	25	10	Blank	PVC Sch. 40	.308	2.375		
25	45	10	Screen	PVC Sch. 40	.308	2.375	Milled Slots	0.030
45	50	10	Blank	PVC Sch. 40	.308	2.375		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	20	Cement	10.3 sack mix
20	51	Filter Pack	#3 sand

Attachments

☑ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☑ Other Site Location

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name CLEAR HEART DRILLING, INC.

Person, Firm or Corporation

555 W. College Ave. Ste. B Santa Rosa CA 95401

Address City State Zip

Signed __ 10/15/2014 780357

C-57 Licensed Water Well Contractor Date Signed C-57 License Number

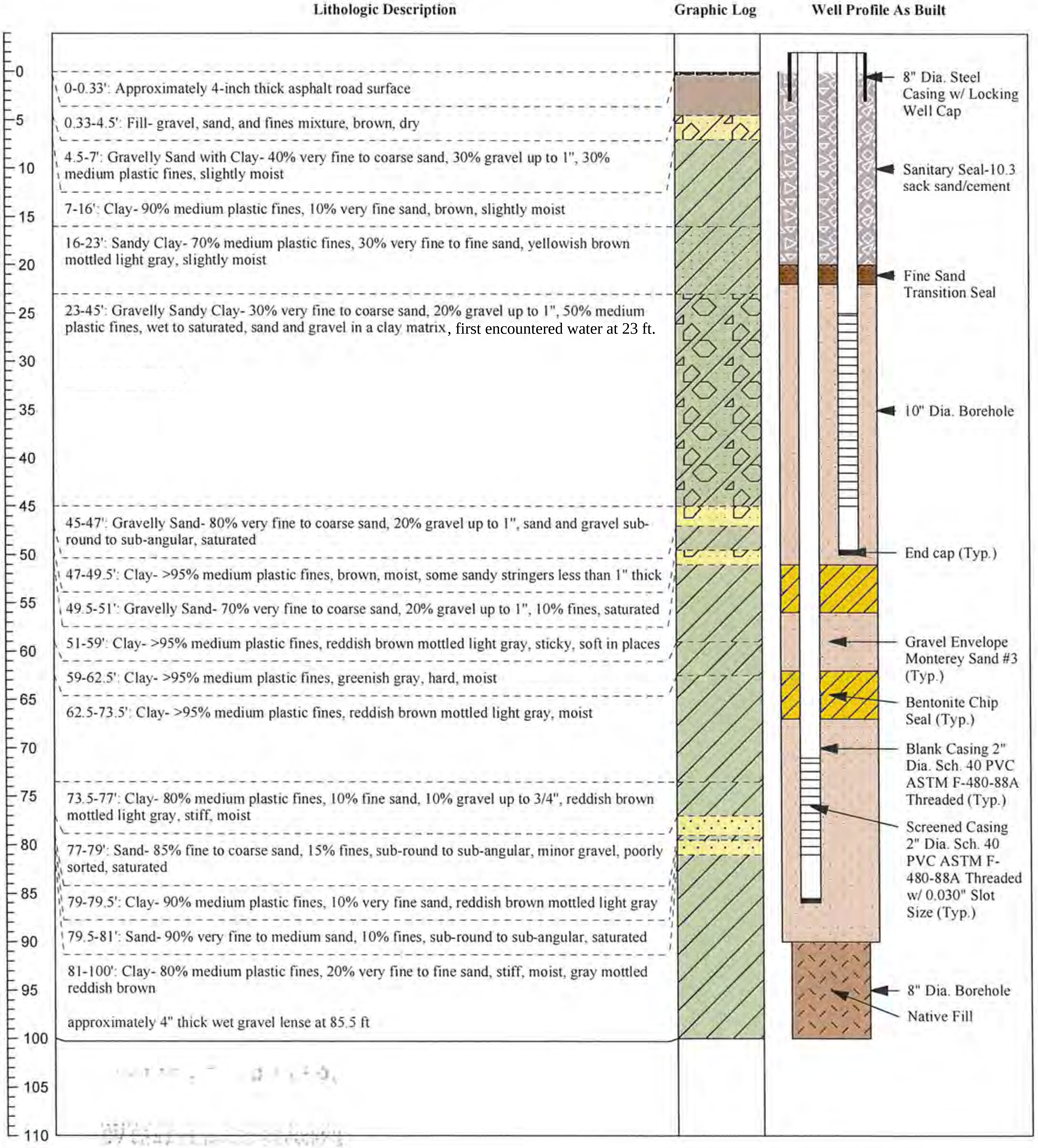
DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

e0236731

LSCE Project No. 12-1-071
Well Name: Napa County-216s-swgw2
Lat./Long.: 38.365231/-122.337532
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #2- Dry Creek at Washington Street
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/22/14 - 9/23/14
Well Depth (ft): 50
Boring Depth (ft): 100
Well Screen (ft): 25-45



0-0.33': Approximately 4-inch thick asphalt road surface

0.33-4.5': Fill- gravel, sand, and fines mixture, brown, dry

4.5-7': Gravelly Sand with Clay- 40% very fine to coarse sand, 30% gravel up to 1", 30% medium plastic fines, slightly moist

7-16': Clay- 90% medium plastic fines, 10% very fine sand, brown, slightly moist

16-23': Sandy Clay- 70% medium plastic fines, 30% very fine to fine sand, yellowish brown mottled light gray, slightly moist

23-45': Gravelly Sandy Clay- 30% very fine to coarse sand, 20% gravel up to 1", 50% medium plastic fines, wet to saturated, sand and gravel in a clay matrix, first encountered water at 23 ft.

45-47': Gravelly Sand- 80% very fine to coarse sand, 20% gravel up to 1", sand and gravel sub-round to sub-angular, saturated

47-49.5': Clay- >95% medium plastic fines, brown, moist, some sandy stringers less than 1" thick

49.5-51': Gravelly Sand- 70% very fine to coarse sand, 20% gravel up to 1", 10% fines, saturated

51-59': Clay- >95% medium plastic fines, reddish brown mottled light gray, sticky, soft in places

59-62.5': Clay- >95% medium plastic fines, greenish gray, hard, moist

62.5-73.5': Clay- >95% medium plastic fines, reddish brown mottled light gray, moist

73.5-77': Clay- 80% medium plastic fines, 10% fine sand, 10% gravel up to 3/4", reddish brown mottled light gray, stiff, moist

77-79': Sand- 85% fine to coarse sand, 15% fines, sub-round to sub-angular, minor gravel, poorly sorted, saturated

79-79.5': Clay- 90% medium plastic fines, 10% very fine sand, reddish brown mottled light gray

79.5-81': Sand- 90% very fine to medium sand, 10% fines, sub-round to sub-angular, saturated

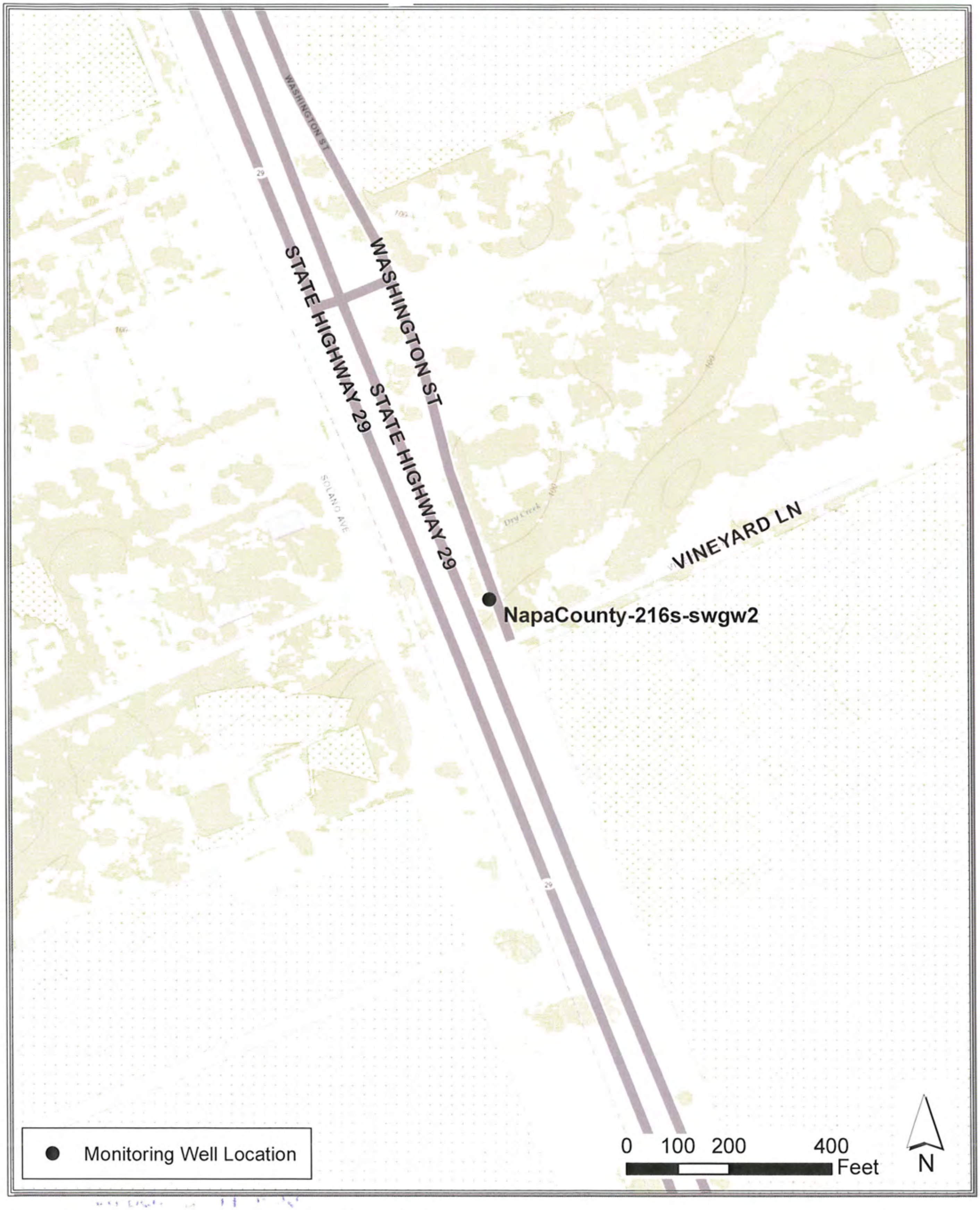
81-100': Clay- 80% medium plastic fines, 20% very fine to fine sand, stiff, moist, gray mottled reddish brown

approximately 4" thick wet gravel lense at 85.5 ft

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

e0236731



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LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Napa County Five Dual-Completion Monitoring Wells Project

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File Original with DWR

Page 1 of 3

Owner's Well Number NapaCounty-217d-swgw2

Date Work Began 09/22/2014 Date Work Ended 9/24/2014

Local Permit Agency Napa County Department of Environmental Management

Permit Number E14-00667 Permit Date 8/20/14

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0236740

DWR Use Only – Do Not Fill In

06N04W18J004M

State Well Number/Site Number

382155 N 1222015 W

Latitude Longitude

APN/TRS/Other

Geologic Log

Orientation ● Vertical ○ Horizontal ○ Angle Specify

Drilling Method Hollow stem augers Drilling Fluid No

Depth from Surface Feet to Feet		**Description** Describe material, grain size, color, etc
		SEE ATTACHED WELL LOG
		NOTE: NapaCounty-216s-swgw2 well and NapaCounty-217d-swgw2 are in the same borehole.

Total Depth of Boring 100 Feet

Total Depth of Completed Well 86 Feet

Well Owner

Name County of Napa

Mailing Address 804 First St.

City Napa State CA Zip 94559

Well Location

Address Site #2- Dry Creek at Washington Street

City Napa County Napa

Latitude Deg. Min. Sec. N Longitude Deg. Min. Sec. W

Datum Dec. Lat. 38.365231 Dec. Long.-122.337532

APN Book Page Parcel

Township Range Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

SEE ATTACHED

West SITE LOCATION East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

- ● New Well
- ○ Modification/Repair
  - ○ Deepen
  - ○ Other
- ○ Destroy
  Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

- ○ Water Supply
  - ☐ Domestic ☐ Public
  - ☐ Irrigation ☐ Industrial
- ○ Cathodic Protection
- ○ Dewatering
- ○ Heat Exchange
- ○ Injection
- ● Monitoring
- ○ Remediation
- ○ Sparging
- ○ Test Well
- ○ Vapor Extraction
- ○ Other

Water Level and Yield of Completed Well

Depth to first water 23 (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	71	10	Blank	PVC Sch. 40	.308	2.375		
71	81	10	Screen	PVC Sch. 40	.308	2,375	Milled Slots	0.030
81	86	10	Blank	PVC Sch. 40	.308	2.375		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	20	Cement	10.3 sack mix
20	51	Filter Pack	#3 sand
51	56	Bentonite	
56	62	Filter Pack	#3 sand
62	67	Bentonite	
67	90	Filter Pack	#3 sand

Attachments

- ☑ Geologic Log
- ☐ Well Construction Diagram
- ☐ Geophysical Log(s)
- ☐ Soil/Water Chemical Analyses
- ☑ Other Site Location

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name CLEAR HEART DRILLING, INC.
Person, Firm or Corporation

555 W. College Ave. Ste.B Santa Rosa CA 95401
Address City State Zip

Signed C-57 Licensed Water Well Contractor 10/15/2014 Date Signed 780357 C-57 License Number

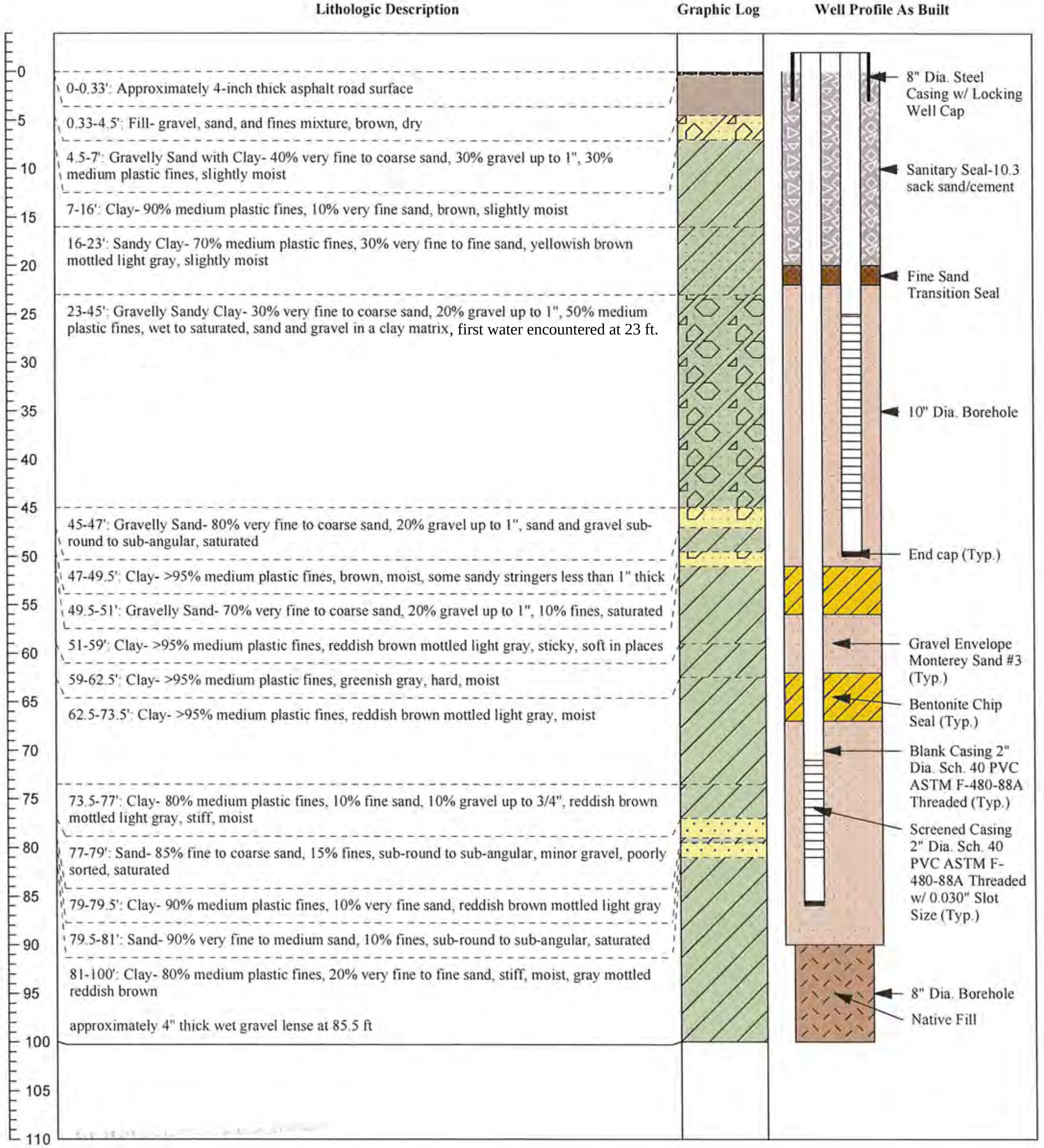
DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

e0236740

LSCE Project No. 12-1-071
Well Name: Napa County-217d-swgw2
Lat./Long.: 38.365231/-122.337532
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #2- Dry Creek at Washington Street
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/22/14 - 9/23/14
Well Depth (ft): 86
Boring Depth (ft): 100
Well Screen (ft): 71-81



0-0.33': Approximately 4-inch thick asphalt road surface

0.33-4.5': Fill- gravel, sand, and fines mixture, brown, dry

4.5-7': Gravelly Sand with Clay- 40% very fine to coarse sand, 30% gravel up to 1", 30% medium plastic fines, slightly moist

7-16': Clay- 90% medium plastic fines, 10% very fine sand, brown, slightly moist

16-23': Sandy Clay- 70% medium plastic fines, 30% very fine to fine sand, yellowish brown mottled light gray, slightly moist

23-45': Gravelly Sandy Clay- 30% very fine to coarse sand, 20% gravel up to 1", 50% medium plastic fines, wet to saturated, sand and gravel in a clay matrix, first water encountered at 23 ft.

45-47': Gravelly Sand- 80% very fine to coarse sand, 20% gravel up to 1", sand and gravel sub-round to sub-angular, saturated

47-49.5': Clay- >95% medium plastic fines, brown, moist, some sandy stringers less than 1" thick

49.5-51': Gravelly Sand- 70% very fine to coarse sand, 20% gravel up to 1", 10% fines, saturated

51-59': Clay- >95% medium plastic fines, reddish brown mottled light gray, sticky, soft in places

59-62.5': Clay- >95% medium plastic fines, greenish gray, hard, moist

62.5-73.5': Clay- >95% medium plastic fines, reddish brown mottled light gray, moist

73.5-77': Clay- 80% medium plastic fines, 10% fine sand, 10% gravel up to 3/4", reddish brown mottled light gray, stiff, moist

77-79': Sand- 85% fine to coarse sand, 15% fines, sub-round to sub-angular, minor gravel, poorly sorted, saturated

79-79.5': Clay- 90% medium plastic fines, 10% very fine sand, reddish brown mottled light gray

79.5-81': Sand- 90% very fine to medium sand, 10% fines, sub-round to sub-angular, saturated

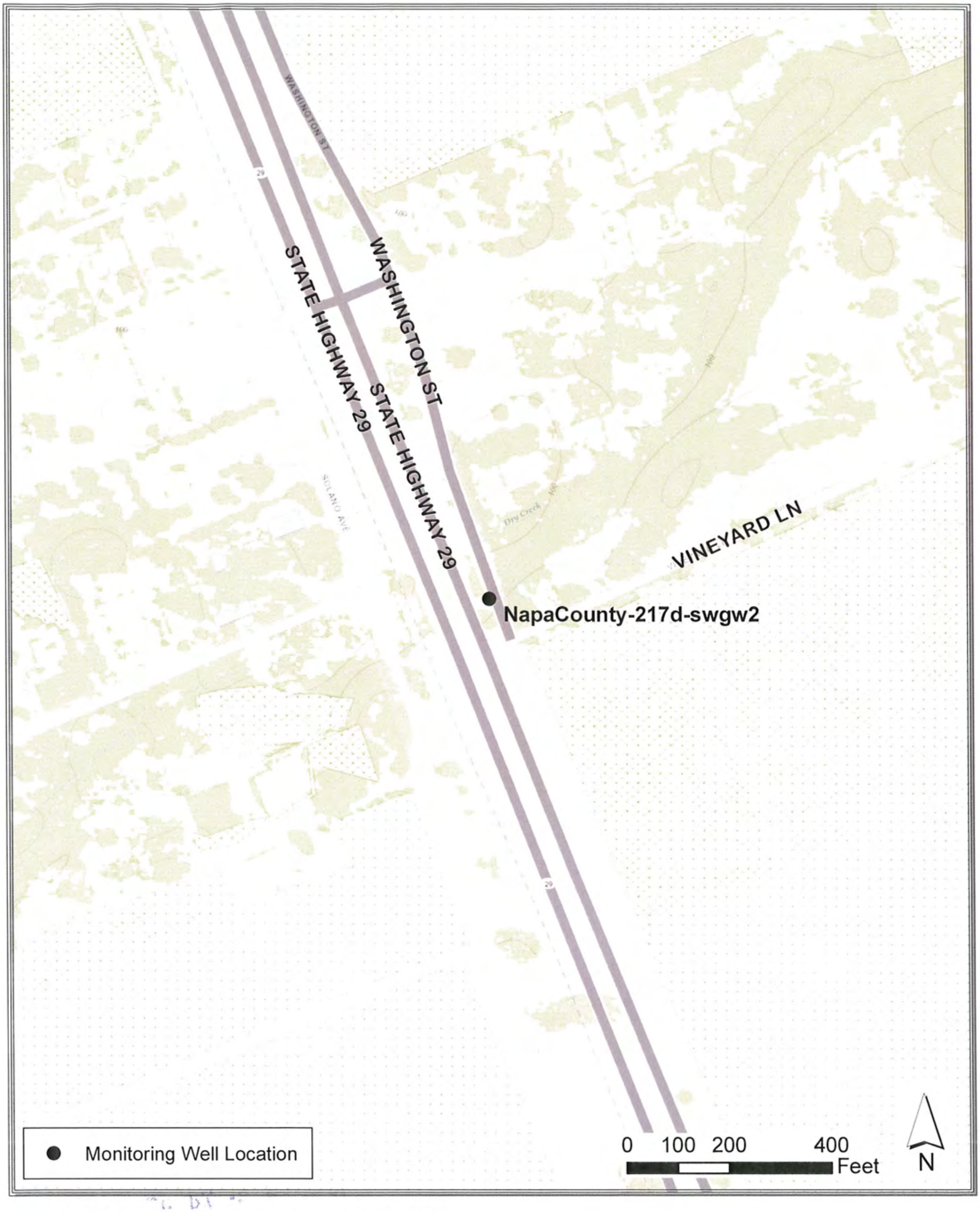
81-100': Clay- 80% medium plastic fines, 20% very fine to fine sand, stiff, moist, gray mottled reddish brown

approximately 4" thick wet gravel lense at 85.5 ft

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

e0236740



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LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Napa County Five Dual-Completion Monitoring Wells Project

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

Page 1 of 3

Owner's Well Number NapaCounty-218s-swgw3

Date Work Began 09/08/2014 Date Work Ended 9/10/2014

Local Permit Agency Napa County Department of Environmental Health

Permit Number E14-00668 Permit Date 8/20/14

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0236894

DWR Use Only – Do Not Fill In

State Well Number/Site Number: 06N04W16G001M

Latitude: 38 22 02 N Longitude: 122 18 18 W

APN/TRS/Other:

Geologic Log

Orientation ● Vertical ○ Horizontal ○ Angle Specify

Drilling Method Hollow stem augers Drilling Fluid No

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
		SEE ATTACHED WELL LOG
		NOTE: NapaCounty-218s-swgw3 well and
		NapaCounty-219d-swgw3 well are in the same
		borehole.

Total Depth of Boring 100 Feet

Total Depth of Completed Well 40 Feet

Well Owner

Name County of Napa

Mailing Address 804 First Street

City Napa State CA Zip 94559

Well Location

Address Site #3- Napa River at Oak Knoll Boulevard

City Napa County Napa

Latitude Deg. Min. Sec. N Longitude Deg. Min. Sec. W

Datum Dec. Lat. 38.367255 Dec. Long. -122.304954

APN Book Page Parcel

Township Range Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

SEE ATTACHED SITE LOCATION

West East South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

● New Well

○ Modification/Repair

○ Deepen

○ Other

○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply

☐ Domestic ☐ Public

☐ Irrigation ☐ Industrial

○ Cathodic Protection

○ Dewatering

○ Heat Exchange

○ Injection

● Monitoring

○ Remediation

○ Sparging

○ Test Well

○ Vapor Extraction

○ Other

Water Level and Yield of Completed Well

Depth to first water 29 (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	25	10	Blank	PVC Sch. 40	.308	2.375		
25	35	10	Screen	PVC Sch. 40	.308	2.375	Milled Slots	0.030
35	40	10	Blank	PVC Sch. 40	.308	2.375		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	20	Cement	10.3 sack mix
20	40	Filter Pack	#3 sand

Attachments

☑ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☑ Other Site Location

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name CLEAR HEART DRILLING, INC.

Person, Firm or Corporation

555 W. College Ave. Ste. B Santa Rosa CA 95401

Address City State Zip

Signed C-57 Licensed Water Well Contractor

10/15/2014 Date Signed

780357 C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

e0236894

LSCE Project No. 12-1-071

Well Name: Napa County-218s-swgw3

Lat./Long.: 38.367255/-122.304954

Drilled By: Clear Heart Drilling

Driller: Rick Schneider

Site Geologist: Charlie Jenkins, P.G.

Site: Site #3- Napa River at Oak Knoll Boulevard

Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter

Sampling Method: Core Sample Barrel

Drilling/Installation Date: 9/8/14 - 9/9/14

Well Depth (ft): 40

Boring Depth (ft): 100

Well Screen (ft): 25-35

Lithologic Description

0-13': Silty Sand- 70% very fine to medium sand, 30% non-plastic fines, brown, dry to slightly moist

13-20': Sand- 95% very fine to medium sand, 5% fines, slightly moist, brown

2-inch thick gravel lense at 19 ft., slightly moist

20-35': Gravelly Sand- 60% very fine to coarse sand, 35% gravel up to 1", rounded, 5% fines, slightly moist

50% very fine to coarse sand, 40% gravel, 10% fines, sand and gravel sub-angular to round, first encountered water at 29 ft.,

40% very fine to coarse sand, 40% gravel up to 1.5", 20% fines, saturated

35-40': Sandy Clay- 30-40% very fine to medium sand, 60-70% medium plastic fines, yellowish brown, very moist to wet, trace gravel

40-45': Clay- 10% very fine sand, 90% medium plastic fines, yellowish brown mottled light gray, moist

45-48': Sandy Clay- 30-40% fine to medium sand, 60-70% medium plastic fines, yellowish brown mottle dlight gray, very moist to wet, minor gravel

48-54': Gravelly Sand with Clay- 30% fine to coarse sand, 30% gravel up to 1", 40% medium plastic fines, very moist to wet, yellowish brown, some large cobbles up to 2.5"

54-64': Clay- 10% very fine sand, 90% medium plastic fines, yellowish brown mottled light gray, moist

64-65': Clay- >95% medium plastic fines, dark gray, stiff/hard, moist

65-78': Clay- >95% medium plastic fines, greenish gray, hard, moist

78-80.5': Clayey Sand- 60% very fine to medium sand, 40% fines, brown, wet

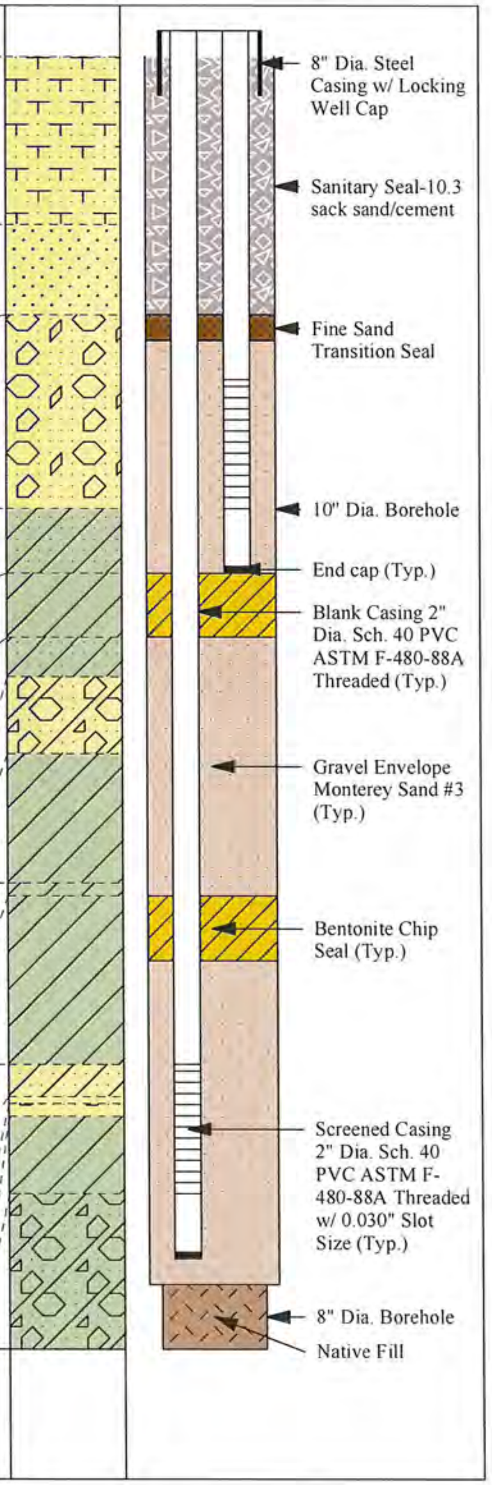
80.5-81': Sand- 90% fine to coarse sand, 10% fines, saturated

81-82': Gravelly Sand- 50% fine to coarse, 35% gravel, 15% fines, saturated, gravel up to 3/4".

82-88': Clay- 90% medium plastic fines, 10% fines, brown, minor gravel, moist

88-100': Clay with Sand and Gravel- 20% fine to coarse sand, 10% gravel, 70% medium plastic fines, greenish gray, moist, trace cobbles up to 2"

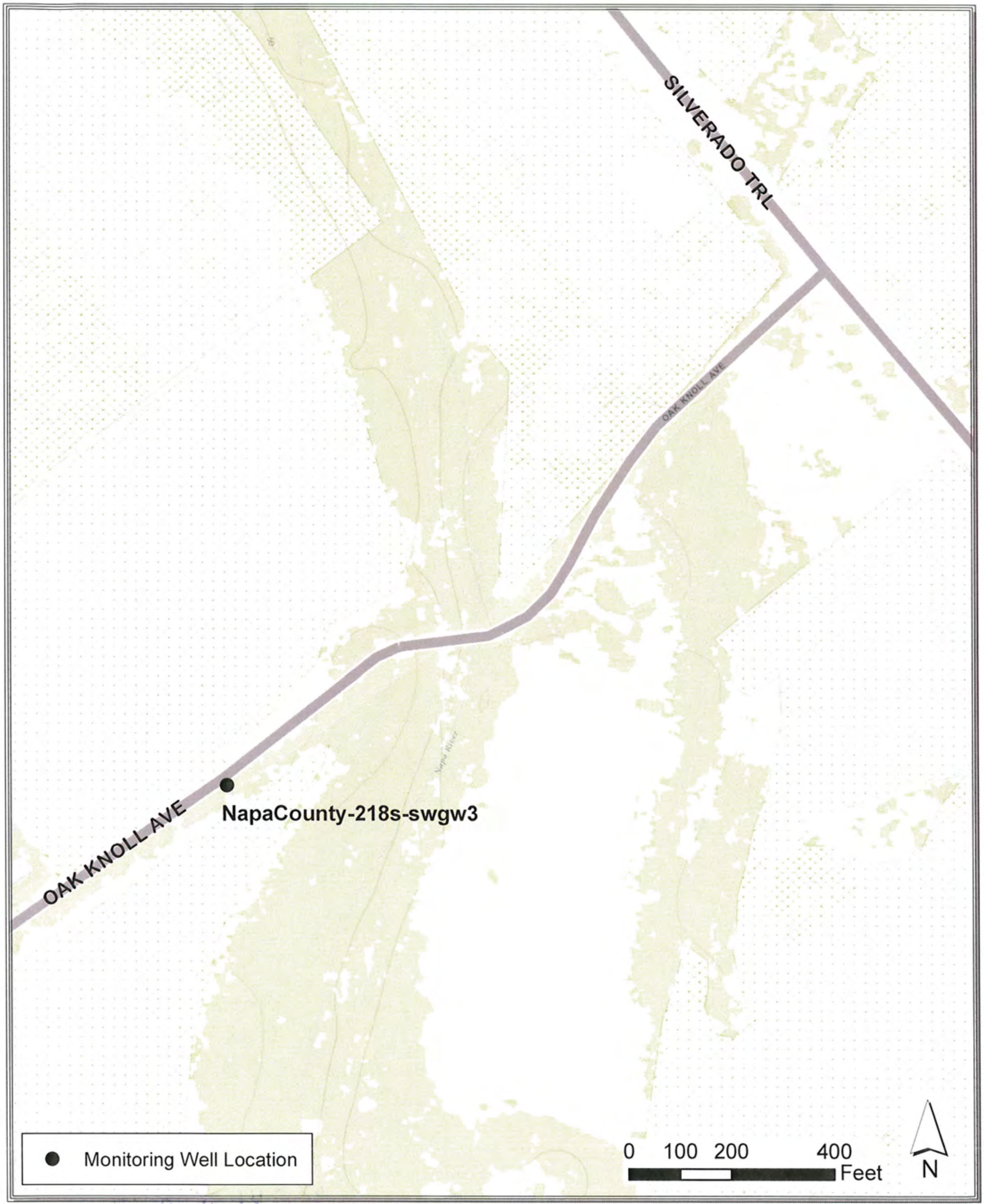
Graphic Log **Well Profile As Built**



LUHDORFF & SCALMANINI CONSULTING ENGINEERS

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

e0236894



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LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Napa County Five Dual-Completion Monitoring Wells Project

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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. **e0236902**

Page 1 of 3

Owner's Well Number NapaCounty-219d-swgw3

Date Work Began 09/08/2014 Date Work Ended 9/10/2014

Local Permit Agency Napa County Department of Environmental Management

Permit Number E14-00668 Permit Date 8/20/14

DWR Use Only – Do Not Fill In

06N04W16G002M

State Well Number/Site Number

382202 N 1221818 W

Latitude Longitude

APN/TRS/Other

Geologic Log

Orientation ● Vertical ○ Horizontal ○ Angle Specify ____

Drilling Method Hollow stem augers Drilling Fluid No

Depth from Surface Feet to	Feet	Description Describe material, grain size, color, etc
		SEE ATTACHED WELL LOG
		NOTE: NapaCounty-218s-swgw3 well and
		NapaCounty-219d-swgw3 well are not in the
		borehole.

Total Depth of Boring 100 Feet

Total Depth of Completed Well 93 Feet

Well Owner

Name County of Napa

Mailing Address 804 First Street

City Napa State CA Zip 94559

Well Location

Address Site #3- Napa River at Oak Knoll Boulevard

City Napa County Napa

Latitude ____ Deg. ____ Min. ____ Sec. N Longitude ____ Deg. ____ Min. ____ Sec. W

Datum ____ Dec. Lat. 38.367255 Dec. Long. -122.304954

APN Book ____ Page ____ Parcel ____

Township ____ Range ____ Section ____

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

SEE ATTACHED

West SITE LOCATION East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

● New Well

○ Modification/Repair

○ Deepen

○ Other ____

○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply

☐ Domestic ☐ Public

☐ Irrigation ☐ Industrial

○ Cathodic Protection

○ Dewatering

○ Heat Exchange

○ Injection

● Monitoring

○ Remediation

○ Sparging

○ Test Well

○ Vapor Extraction

○ Other ____

Water Level and Yield of Completed Well

Depth to first water 29 (Feet below surface)

Depth to Static

Water Level ____ (Feet) Date Measured ____

Estimated Yield * ____ (GPM) Test Type ____

Test Length ____ (Hours) Total Drawdown ____ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet to	Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	78	10	Blank	PVC Sch. 40	.308	2.375		
78	88	10	Screen	PVC Sch. 40	.308	2.375	Milled Slots	0.030
88	93	10	Blank	PVC Sch. 40	.308	2.375		

Annular Material

Depth from Surface Feet to	Feet	Fill	Description
0	20	Cement	10.3 sack mix
20	40	Filter Pack	#3 sand
40	45	Bentonite	
45	65	Filter Pack	#3 sand
65	70	Bentonite	
70	100	Filter Pack	#3 sand

Attachments

☑ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☑ Other Site Location

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name CLEAR HEART DRILLING, INC.

Person, Firm or Corporation

555 W. College Ave. Ste.B Santa Rosa CA 95401

Address City State Zip

Signed ____ 10/15/2014 780357

C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

e0236902

LSCE Project No. 12-1-071
Well Name: Napa County-219d-swgw3
Lat./Long.: 38.367255/-122.304954
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #3- Napa River at Oak Knoll Boulevard
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter
reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/8/14 - 9/9/14
Boring Depth (ft): 100
Well Depth (ft): 93
Well Screen (ft): 78-88

Lithologic Description

0-13': Silty Sand- 70% very fine to medium sand, 30% non-plastic fines, brown, dry to slightly moist

13-20': Sand- 95% very fine to medium sand, 5% fines, slightly moist, brown

2-inch thick gravel lense at 19 ft., slightly moist

20-35': Gravelly Sand- 60% very fine to coarse sand, 35% gravel up to 1", rounded, 5% fines, slightly moist

50% very fine to coarse sand, 40% gravel, 10% fines, sand and gravel sub-angular to round, first encountered water at 29 ft.,

40% very fine to coarse sand, 40% gravel up to 1.5", 20% fines, saturated

35-40': Sandy Clay- 30-40% very fine to medium sand, 60-70% medium plastic fines, yellowish brown, very moist to wet, trace gravel

40-45': Clay- 10% very fine sand, 90% medium plastic fines, yellowish brown mottled light gray, moist

45-48': Sandy Clay- 30-40% fine to medium sand, 60-70% medium plastic fines, yellowish brown mottle dlight gray, very moist to wet, minor gravel

48-54': Gravelly Sand with Clay- 30% fine to coarse sand, 30% gravel up to 1", 40% medium plastic fines, very moist to wet, yellowish brown, some large cobbles up to 2.5"

54-64': Clay- 10% very fine sand, 90% medium plastic fines, yellowish brown mottled light gray, moist

64-65': Clay- >95% medium plastic fines, dark gray, stiff/hard, moist

65-78': Clay- >95% medium plastic fines, greenish gray, hard, moist

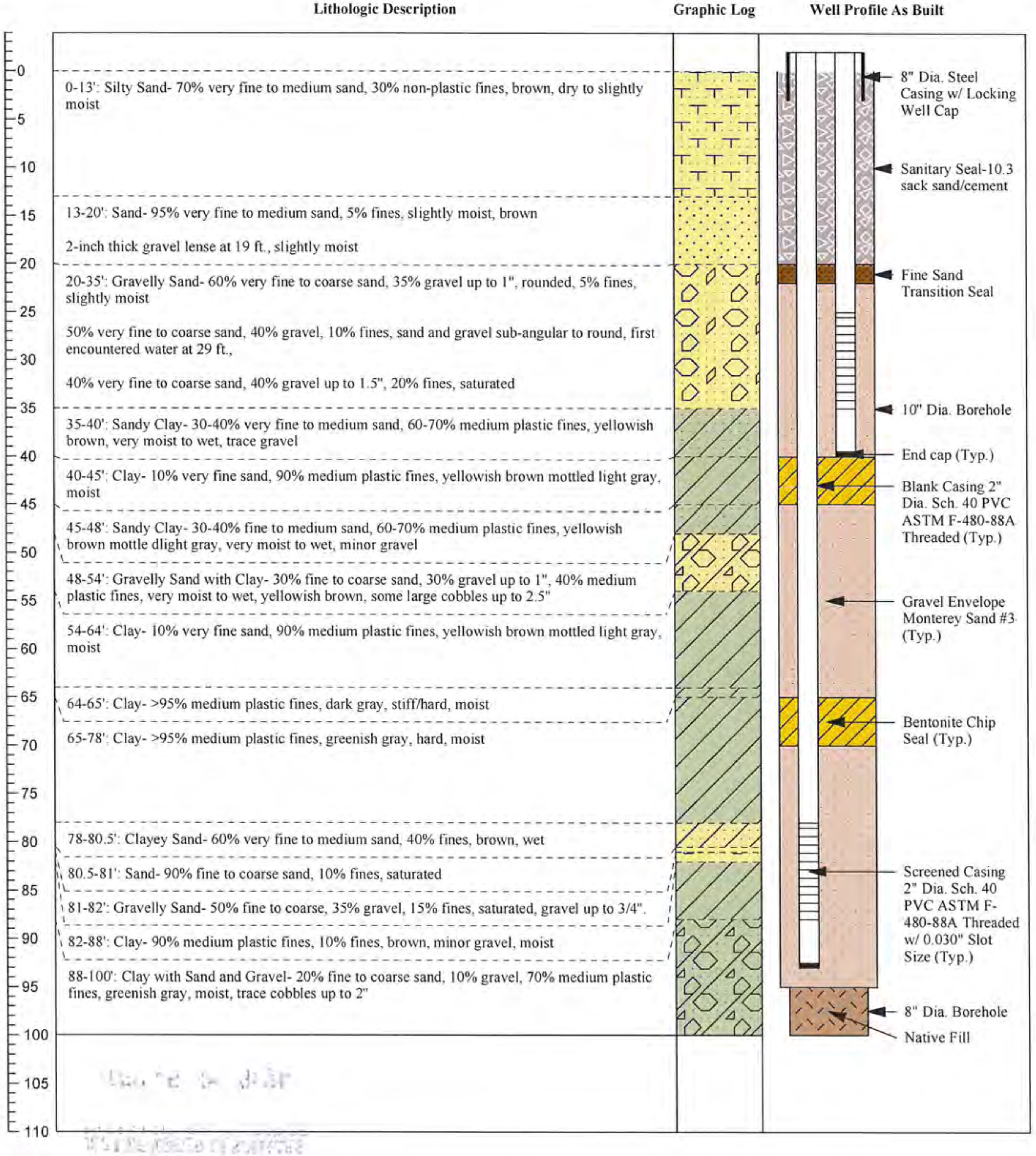
78-80.5': Clayey Sand- 60% very fine to medium sand, 40% fines, brown, wet

80.5-81': Sand- 90% fine to coarse sand, 10% fines, saturated

81-82': Gravelly Sand- 50% fine to coarse, 35% gravel, 15% fines, saturated, gravel up to 3/4".

82-88': Clay- 90% medium plastic fines, 10% fines, brown, minor gravel, moist

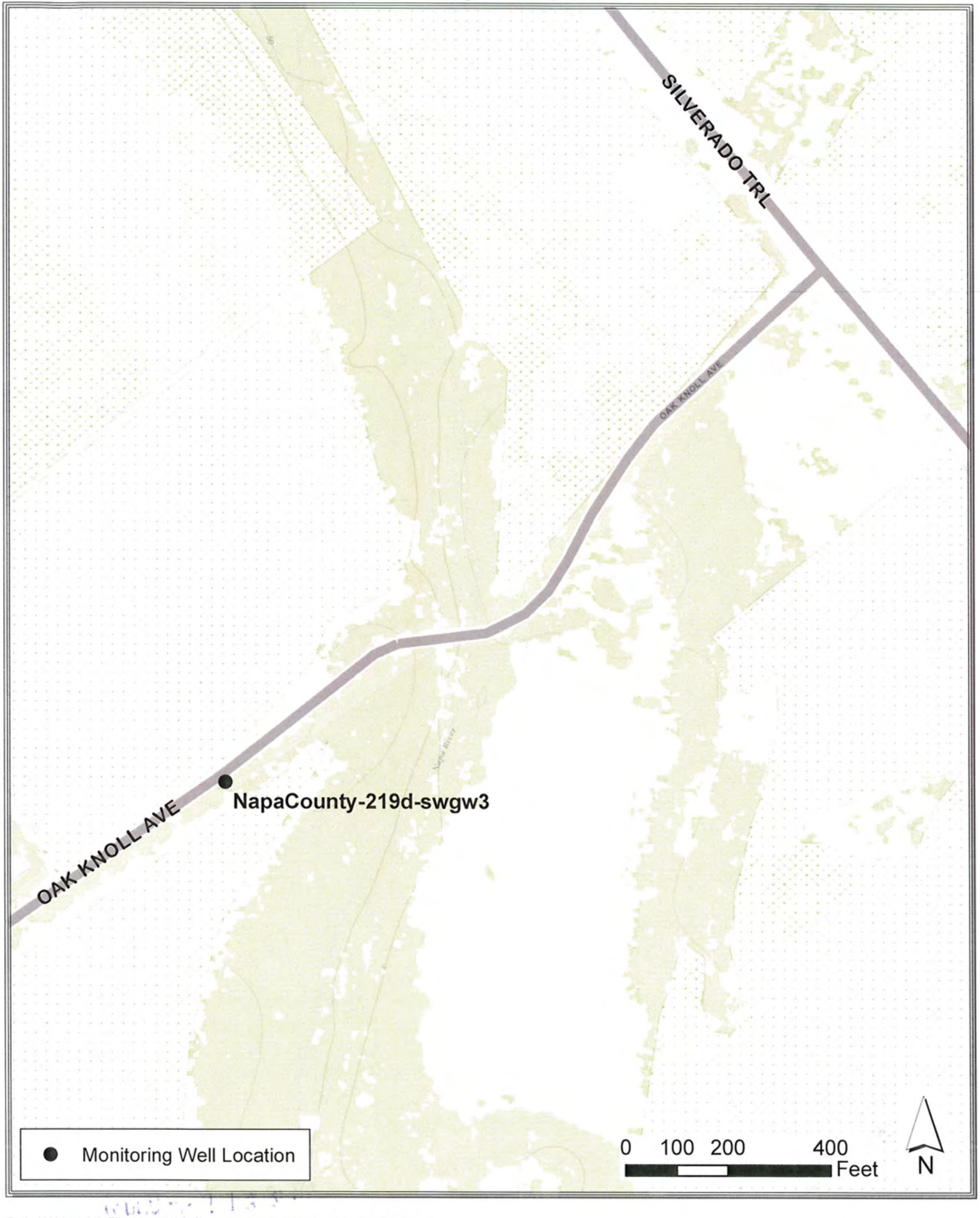
88-100': Clay with Sand and Gravel- 20% fine to coarse sand, 10% gravel, 70% medium plastic fines, greenish gray, moist, trace cobbles up to 2"



LUHDORFF & SCALMANINI CONSULTING ENGINEERS

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

e0236902



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CONSULTING ENGINEERS

Napa County Five Dual-Completion Monitoring Wells Project

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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. **e0236741**

Page 1 of 3

Owner's Well Number NapaCounty-220s-swgw4

Date Work Began 09/10/2014 Date Work Ended 9/12/2014

Local Permit Agency Napa County Department of Environmental Management

Permit Number E14-00669 Permit Date 8/20/14

DWR Use Only – Do Not Fill In

State Well Number/Site Number 07N04W31D001M

Latitude 382503 N Longitude 1222110 W

APN/TRS/Other

Geologic Log

Orientation ● Vertical ○ Horizontal ○ Angle Specify

Drilling Method Hollow stem augers Drilling Fluid No

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
		SEE ATTACHED WELL LOG
		NOTE: NapaCounty-220s-swgw4 well and
		NapaCounty-221d-swgw4 well are in the same
		borehole.

Total Depth of Boring 100 Feet

Total Depth of Completed Well 45 Feet

Well Owner

Name County of Napa

Mailing Address 804 First Street

City Napa State CA Zip 94559

Well Location

Address Site #4- Napa River at Younville Cross Road

City Yountville County Napa

Latitude ___ Deg. ___ Min. ___ Sec. N Longitude ___ Deg. ___ Min. ___ Sec. W

Datum ___ Dec. Lat. 38.417573 Dec. Long. -122.352665

APN Book ___ Page ___ Parcel ___

Township ___ Range ___ Section ___

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

SEE ATTACHED

SITE LOCATION

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

- ● New Well
- ○ Modification/Repair
  - ○ Deepen
  - ○ Other ___
- ○ Destroy
  Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

- ○ Water Supply
  - ☐ Domestic ☐ Public
  - ☐ Irrigation ☐ Industrial
- ○ Cathodic Protection
- ○ Dewatering
- ○ Heat Exchange
- ○ Injection
- ● Monitoring
- ○ Remediation
- ○ Sparging
- ○ Test Well
- ○ Vapor Extraction
- ○ Other ___

Water Level and Yield of Completed Well

Depth to first water 34 (Feet below surface)

Depth to Static Water Level ___ (Feet) Date Measured ___

Estimated Yield * ___ (GPM) Test Type ___

Test Length ___ (Hours) Total Drawdown ___ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	25	10	Blank	PVC Sch. 40	.308	2.375		
25	40	10	Screen	PVC Sch. 40	.308	2.375	Milled Slots	0.030
40	45	10	Blank	PVC Sch. 40	.308	2.375		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	20	Cement	10.3 sack mix
20	48	Filter Pack	#3 sand

Attachments

- ☑ Geologic Log
- ☐ Well Construction Diagram
- ☐ Geophysical Log(s)
- ☐ Soil/Water Chemical Analyses
- ☑ Other Site Location

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name CLEAR HEART DRILLING, INC.
Person, Firm or Corporation

555 W. College Ave. Ste. B Santa Rosa CA 95401
Address City State Zip

Signed ___ C-57 Licensed Water Well Contractor

Date Signed 10/14/2014 C-57 License Number 780357

DWR 188 REV. 1/2006

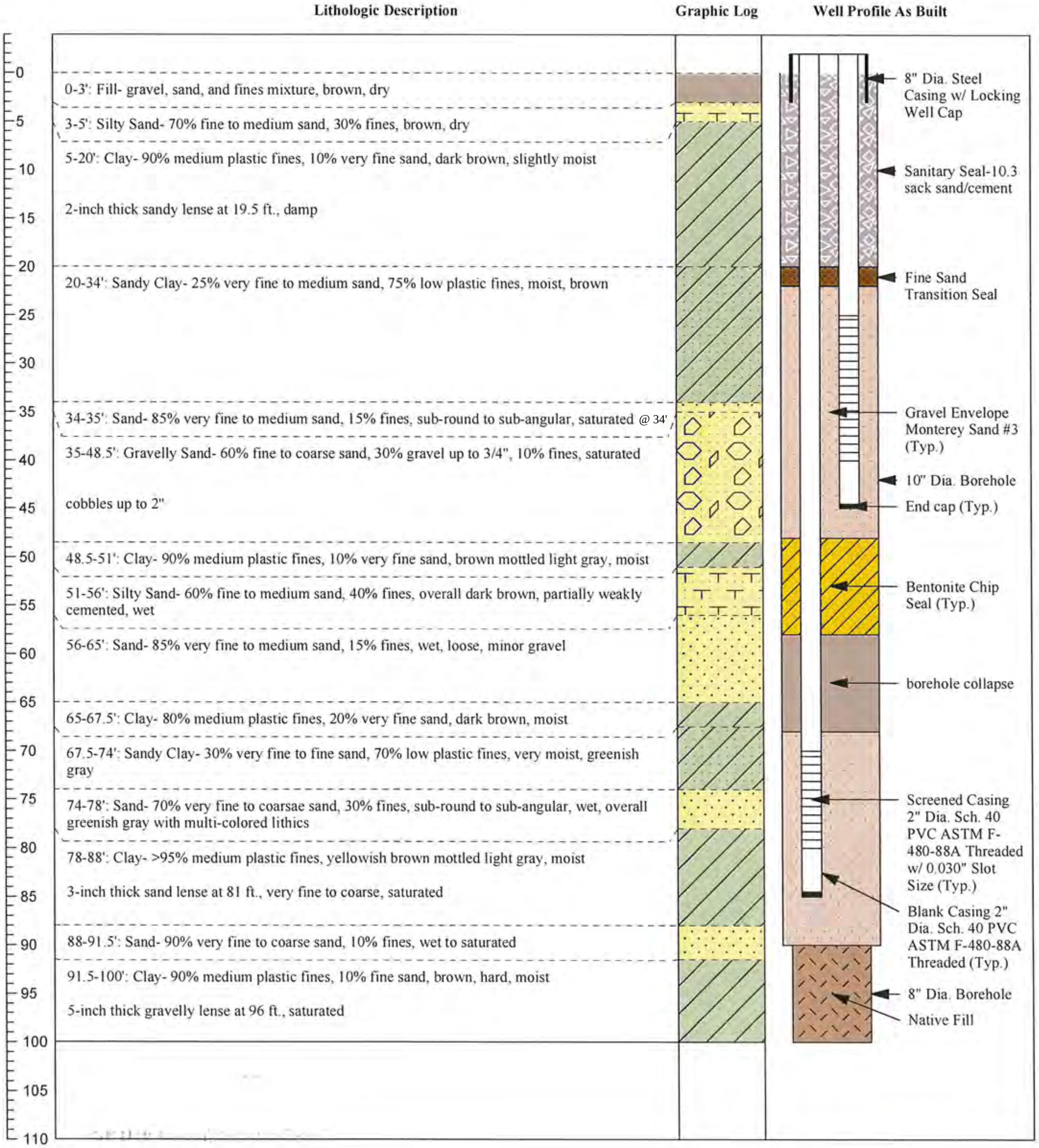
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

e0236741

LSCE Project No. 12-1-071
Well Name: Napa County-220s-swgw4
Lat./Long.: 38.417573/-122.352665
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #4- Napa River at Yountville Cross Road
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/10/14 - 9/11/14
Well Depth (ft): 45
Boring Depth (ft): 100
Well Screen (ft): 25-40

Lithologic Description | **Graphic Log** | **Well Profile As Built**



0-3': Fill- gravel, sand, and fines mixture, brown, dry

3-5': Silty Sand- 70% fine to medium sand, 30% fines, brown, dry

5-20': Clay- 90% medium plastic fines, 10% very fine sand, dark brown, slightly moist

2-inch thick sandy lense at 19.5 ft., damp

20-34': Sandy Clay- 25% very fine to medium sand, 75% low plastic fines, moist, brown

34-35': Sand- 85% very fine to medium sand, 15% fines, sub-round to sub-angular, saturated @ 34'

35-48.5': Gravelly Sand- 60% fine to coarse sand, 30% gravel up to 3/4", 10% fines, saturated

cobbles up to 2"

48.5-51': Clay- 90% medium plastic fines, 10% very fine sand, brown mottled light gray, moist

51-56': Silty Sand- 60% fine to medium sand, 40% fines, overall dark brown, partially weakly cemented, wet

56-65': Sand- 85% very fine to medium sand, 15% fines, wet, loose, minor gravel

65-67.5': Clay- 80% medium plastic fines, 20% very fine sand, dark brown, moist

67.5-74': Sandy Clay- 30% very fine to fine sand, 70% low plastic fines, very moist, greenish gray

74-78': Sand- 70% very fine to coarsae sand, 30% fines, sub-round to sub-angular, wet, overall greenish gray with multi-colored lithics

78-88': Clay- >95% medium plastic fines, yellowish brown mottled light gray, moist

3-inch thick sand lense at 81 ft., very fine to coarse, saturated

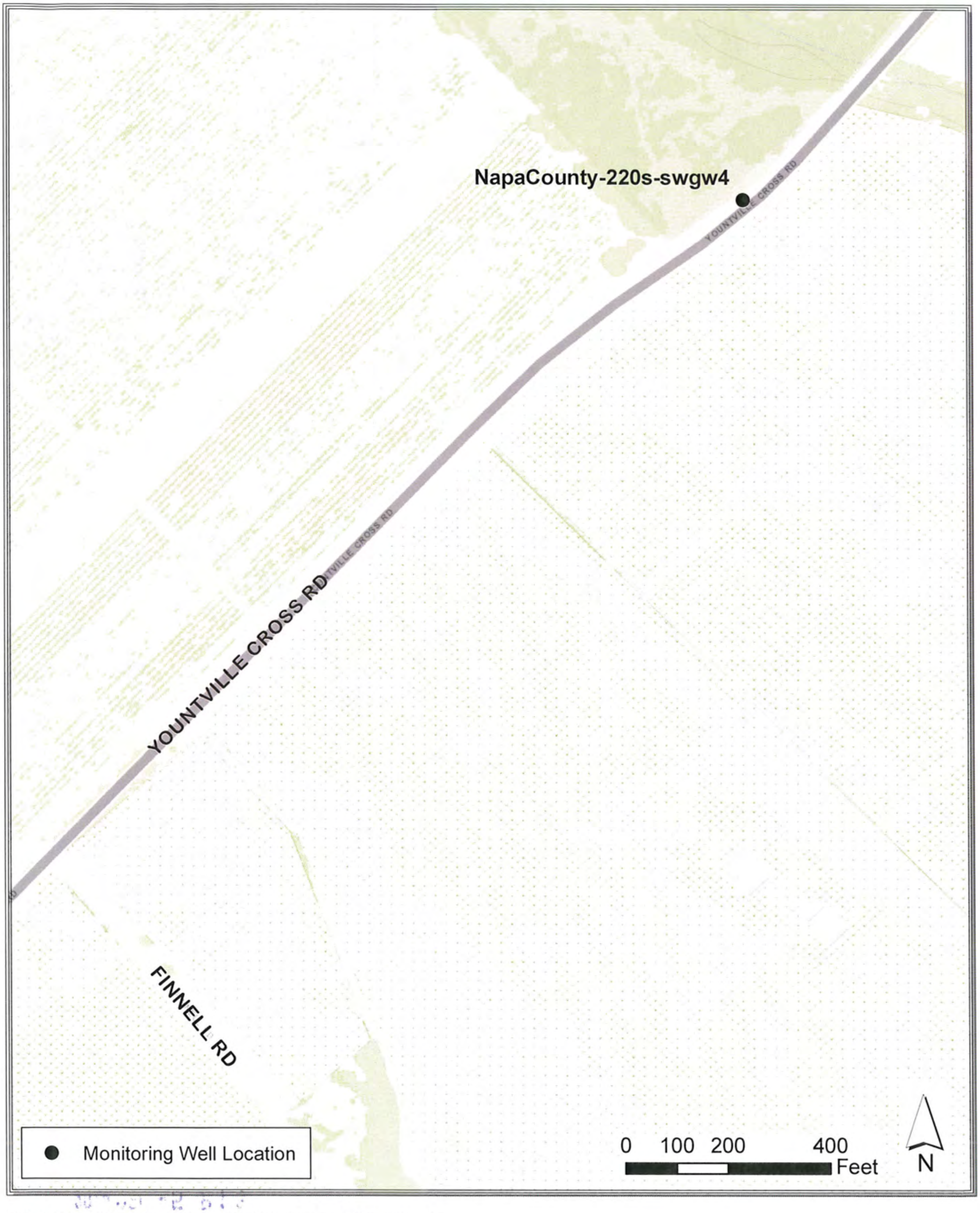
88-91.5': Sand- 90% very fine to coarse sand, 10% fines, wet to saturated

91.5-100': Clay- 90% medium plastic fines, 10% fine sand, brown, hard, moist

5-inch thick gravelly lense at 96 ft., saturated

*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

e0236741



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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0236743

Page 1 of 3

Owner's Well Number NapaCounty-221d-swgw4

Date Work Began 09/10/2014 Date Work Ended 9/12/2014

Local Permit Agency Napa County Department of Environmental Management

Permit Number E14-00669 Permit Date 8/20/14

DWR Use Only – Do Not Fill In

0 7 N 0 4 W 3 1 D 0 0 2 M

State Well Number/Site Number

3 8 2 5 0 3 N 1 2 2 2 1 1 0 W

Latitude Longitude

APN/TRS/Other

Geologic Log

Orientation ● Vertical ○ Horizontal ○ Angle Specify

Drilling Method Hollow stem augers Drilling Fluid No

Depth from Surface Feet to Feet		Description Describe material, grain size, color, etc
		SEE ATTACHED WELL LOG
		NOTE: NapaCounty-220s-swgw4 well and NapaCounty-221d-swgw4 well are in the same borehole.

Total Depth of Boring 100 Feet

Total Depth of Completed Well 85 Feet

Well Owner

Name County of Napa

Mailing Address 804 First Street

City Napa State CA Zip 94559

Well Location

Address Site #4- Napa River at Yountville Cross Road

City Yountville County Napa

Latitude Deg. Min. Sec. N Longitude Deg. Min. Sec. W

Datum Dec. Lat. 38.417573 Dec. Long.-122.352665

APN Book Page Parcel

Township Range Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

SEE ATTACHED

West SITE LOCATION East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

● New Well

○ Modification/Repair

○ Deepen

○ Other

○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply

☐ Domestic ☐ Public

☐ Irrigation ☐ Industrial

○ Cathodic Protection

○ Dewatering

○ Heat Exchange

○ Injection

● Monitoring

○ Remediation

○ Sparging

○ Test Well

○ Vapor Extraction

○ Other

Water Level and Yield of Completed Well

Depth to first water 34 (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	70	10	Blank	PVC Sch. 40	.308	2.375		
70	80	10	Screen	PVC Sch. 40	.308	2.375	Milled Slots	0.030
80	85	10	Blank	PVC Sch. 40	.308	2.375		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	20	Cement	10.3 sack mix
20	48	Filter Pack	#3 sand
48	58	Bentonite	
58	68	Fill	
68	90	Filter Pack	#3 sand

Attachments

☑ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☑ Other Site Location

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name CLEAR HEART DRILLING, INC.
Person, Firm or Corporation

555 W. College Ave. Ste. B Santa Rosa CA 95401
Address City State Zip

Signed Gary M. Fodor 10/14/2014 780357
C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

e0236743

LSCE Project No. 12-1-071
Well Name: Napa County-221d-swgw4
Lat./Long.: 38.417573/-122.352665
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #4- Napa River at Yountville Cross Road
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/10/14 - 9/11/14
Well Depth (ft): 85
Boring Depth (ft): 100
Well Screen (ft): 70-80

Lithologic Description

0-3': Fill- gravel, sand, and fines mixture, brown, dry

3-5': Silty Sand- 70% fine to medium sand, 30% fines, brown, dry

5-20': Clay- 90% medium plastic fines, 10% very fine sand, dark brown, slightly moist

2-inch thick sandy lense at 19.5 ft., damp

20-34': Sandy Clay- 25% very fine to medium sand, 75% low plastic fines, moist, brown

34-35': Sand- 85% very fine to medium sand, 15% fines, sub-round to sub-angular, saturated @34'

35-48.5': Gravelly Sand- 60% fine to coarse sand, 30% gravel up to 3/4", 10% fines, saturated

cobbles up to 2"

48.5-51': Clay- 90% medium plastic fines, 10% very fine sand, brown mottled light gray, moist

51-56': Silty Sand- 60% fine to medium sand, 40% fines, overall dark brown, partially weakly cemented, wet

56-65': Sand- 85% very fine to medium sand, 15% fines, wet, loose, minor gravel

65-67.5': Clay- 80% medium plastic fines, 20% very fine sand, dark brown, moist

67.5-74': Sandy Clay- 30% very fine to fine sand, 70% low plastic fines, very moist, greenish gray

74-78': Sand- 70% very fine to coarsae sand, 30% fines, sub-round to sub-angular, wet, overall greenish gray with multi-colored lithics

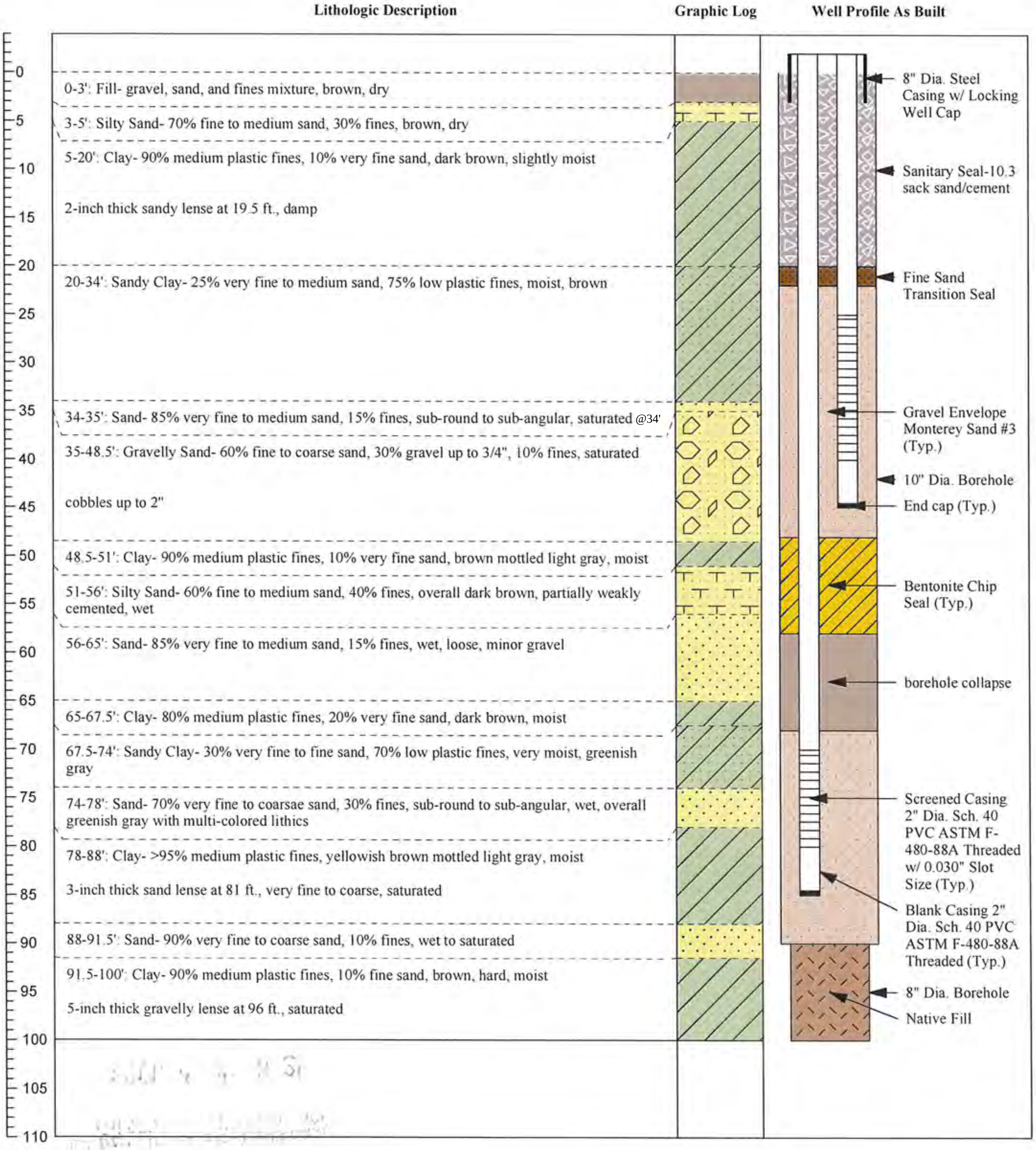
78-88': Clay- >95% medium plastic fines, yellowish brown mottled light gray, moist

3-inch thick sand lense at 81 ft., very fine to coarse, saturated

88-91.5': Sand- 90% very fine to coarse sand, 10% fines, wet to saturated

91.5-100': Clay- 90% medium plastic fines, 10% fine sand, brown, hard, moist

5-inch thick gravelly lense at 96 ft., saturated



*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

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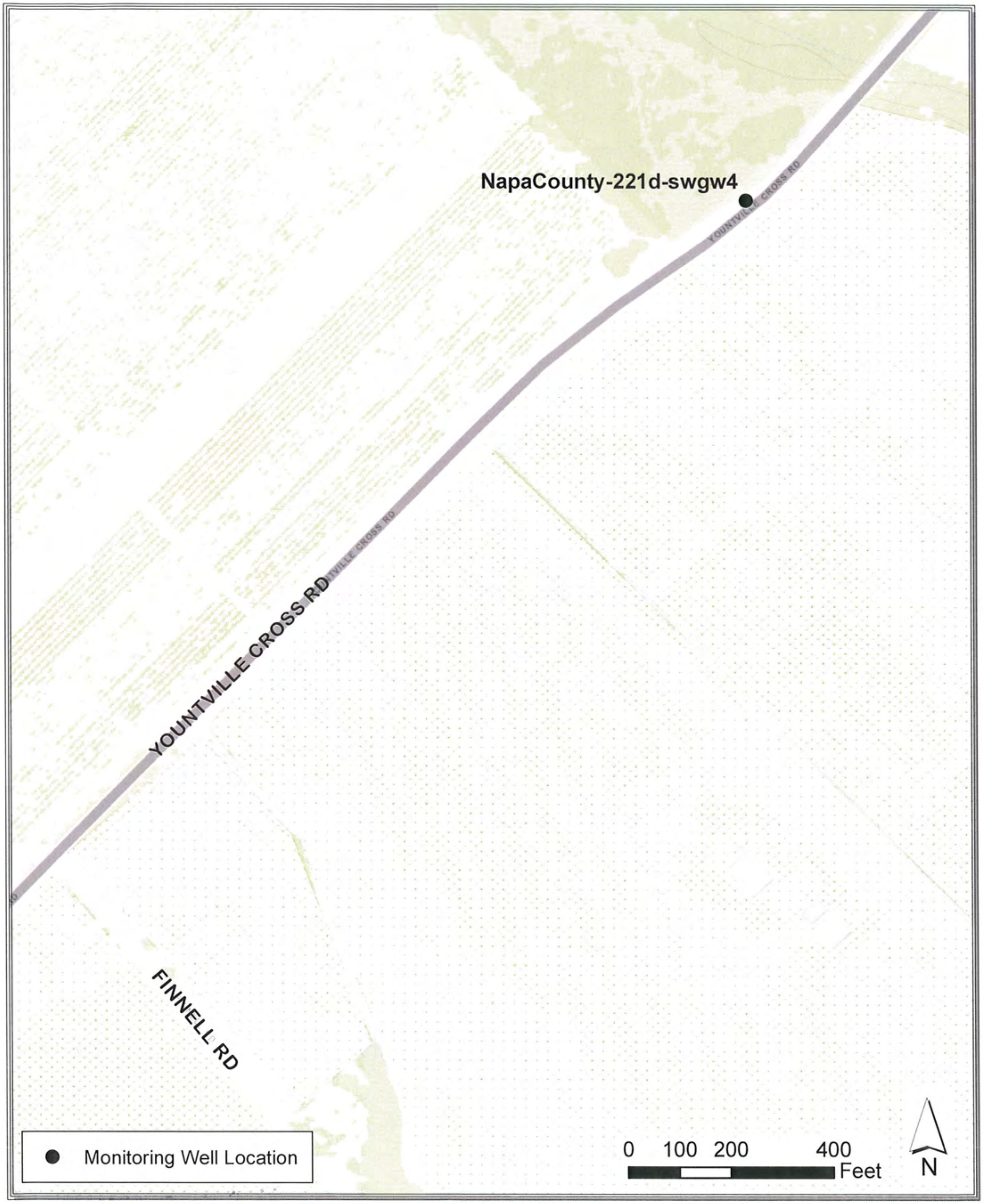

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CONSULTING ENGINEERS

Napa County Five Dual-Completion Monitoring Wells Project

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. **e0236824**

Page 1 of 3

Owner's Well Number NapaCounty-222s-swgw5

Date Work Began 09/15/2014 Date Work Ended 9/18/2014

Local Permit Agency Napa County Department of Environmental Management

Permit Number E14-00670 Permit Date 8/20/14

DWR Use Only – Do Not Fill In

08N05W30Q001M
State Well Number/Site Number

38303A N Latitude

1222728 W Longitude

APN/TRS/Other

Geologic Log

Orientation ● Vertical ○ Horizontal ○ Angle Specify

Drilling Method Hollow stem augers Drilling Fluid No

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
		SEE ATTACHED WELL LOG
		NOTE: NapaCounty-222s-swgw5 well and NapaCounty-223d-swgw5 well are in the same borehole

Total Depth of Boring 100 Feet

Total Depth of Completed Well 40 Feet

Well Owner

Name County of Napa

Mailing Address 804 First Street

City Napa State CA Zip 94559

Well Location

Address Site #5- Napa River at Stonebridge Park

City St. Helena County Napa

Latitude ___ Deg. ___ Min. ___ Sec. N Longitude ___ Deg. ___ Min. ___ Sec. W

Datum ___ Dec. Lat. 38.510898 Dec. Long.-122.456426

APN Book ___ Page ___ Parcel ___

Township ___ Range ___ Section ___

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

SEE ATTACHED

West SITE LOCATION East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

● New Well

○ Modification/Repair

  ○ Deepen

  ○ Other

○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply

  ☐ Domestic ☐ Public

  ☐ Irrigation ☐ Industrial

○ Cathodic Protection

○ Dewatering

○ Heat Exchange

○ Injection

● Monitoring

○ Remediation

○ Sparging

○ Test Well

○ Vapor Extraction

○ Other

Water Level and Yield of Completed Well

Depth to first water 20 (Feet below surface)

Depth to Static Water Level ___ (Feet) Date Measured ___

Estimated Yield * ___ (GPM) Test Type ___

Test Length ___ (Hours) Total Drawdown ___ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	25	10	Blank	PVC Sch. 40	.308	2.375		
25	35	10	Screen	PVC Sch. 40	.308	2.375	Milled Slots	0.030
35	40	10	Blank	PVC Sch. 40	.308	2.375		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	20	Cement	10.3 sack mix
20	43	Filter Pack	#3 sand

Attachments

☑ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☑ Other Site Location

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name CLEAR HEART DRILLING, INC.
Person, Firm or Corporation

555 W. College Ave. Ste.B Santa Rosa CA 95401
Address City State Zip

Signed ___ C-57 Licensed Water Well Contractor

10/15/14 Date Signed

780357 C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

e02 36824

LSCE Project No. 12-1-071

Well Name: Napa County-222s-swgw5

Lat./Long.: 38.510898/-122.456426

Drilled By: Clear Heart Drilling

Driller: Rick Schneider

Site Geologist: Charlie Jenkins, P.G.

Site: Site #5- Napa River at Stonebridge Park

Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter

Sampling Method: Core Sample Barrel

Drilling/Installation Date: 9/15/14 - 9/16/14

Well Depth (ft): 40

Boring Depth (ft): 100

Well Screen (ft): 25-35

Lithologic Description

0-1': Topsoil- brown, with organics

1-15': Silty Sand- 70% very fine to medium sand, 30% fines, dark brown, slightly moist, minor gravel

15-20': Sand- 90% fine to medium sand, 10% fines, brown, slightly moist

20-25': Gravelly Sand with Clay- 40% very fine to coarse sand, 20% gravel up to 1", 40% medium plastic fines, wet, first encountered water at 20 ft

25-43': Sand with Gravel- 70% fine to coarse sand, 20% gravel up to 1/2", 10% fines, wet, loose

43-51': Clay- 90% medium plastic fines, 10% very fine sand, moist, gray

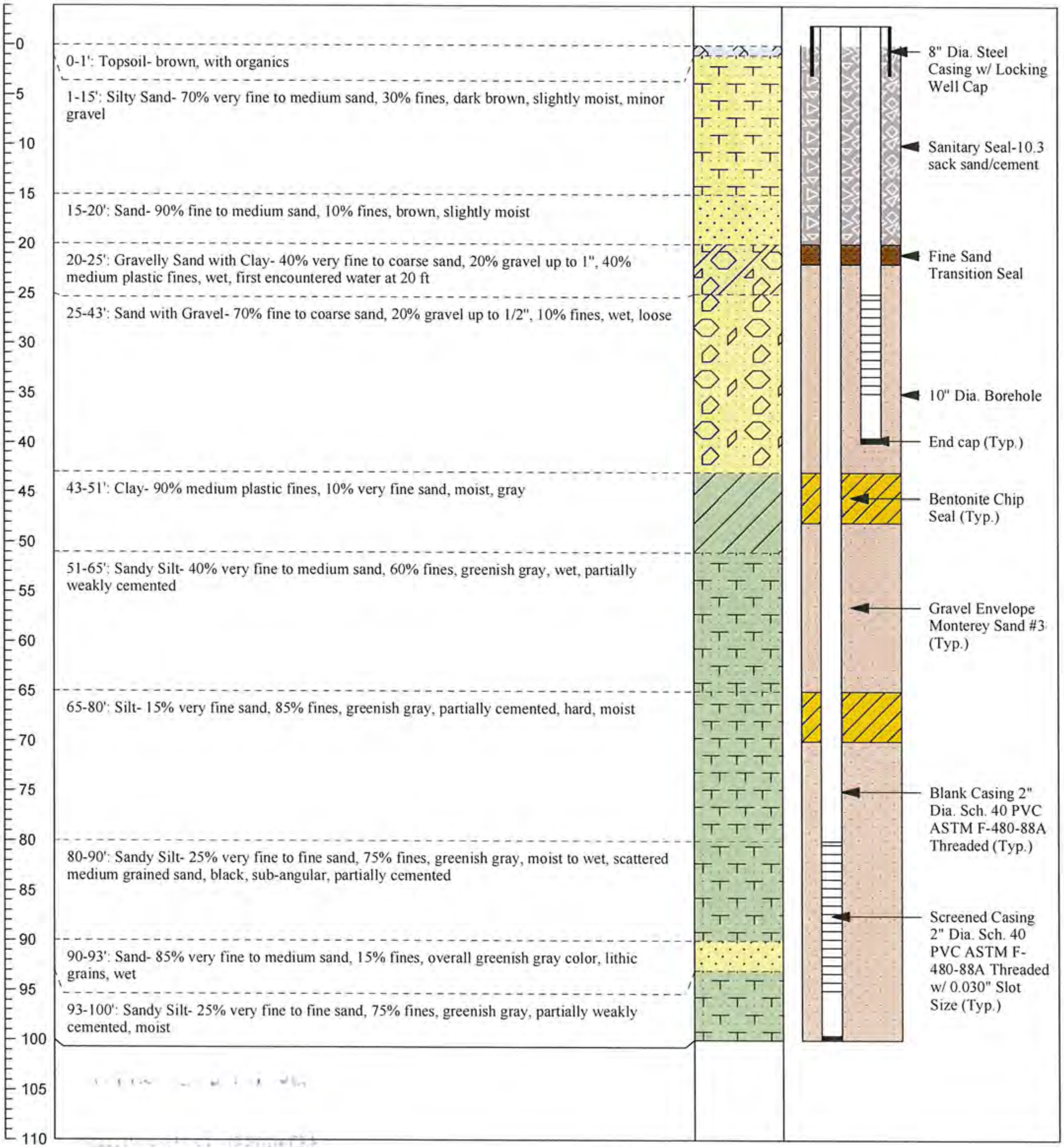
51-65': Sandy Silt- 40% very fine to medium sand, 60% fines, greenish gray, wet, partially weakly cemented

65-80': Silt- 15% very fine sand, 85% fines, greenish gray, partially cemented, hard, moist

80-90': Sandy Silt- 25% very fine to fine sand, 75% fines, greenish gray, moist to wet, scattered medium grained sand, black, sub-angular, partially cemented

90-93': Sand- 85% very fine to medium sand, 15% fines, overall greenish gray color, lithic grains, wet

93-100': Sandy Silt- 25% very fine to fine sand, 75% fines, greenish gray, partially weakly cemented, moist



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*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

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CONSULTING ENGINEERS

Napa County Five Dual-Completion Monitoring Wells Project

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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

e02368836

Page 1 of 3

Owner's Well Number NapaCounty-223d-swgw5

Date Work Began 09/15/2014 Date Work Ended 9/18/2014

Local Permit Agency Napa County Department of Environmental Management

Permit Number E14-00670 Permit Date 8/20/14

DWR Use Only – Do Not Fill In

08N05W30Q0062M
State Well Number/Site Number

383039 N Latitude

1222723 W Longitude

APN/TRS/Other

Geologic Log

Orientation ● Vertical ○ Horizontal ○ Angle Specify

Drilling Method Hollow-stem augers Drilling Fluid no

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
		SEE ATTACHED WELL LOG
		NOTE: NapaCounty-222s-swgw5 well and
		NapaCounty-223d-swgw5 well are in the same
		borehole.

Total Depth of Boring 100 Feet

Total Depth of Completed Well 100 Feet

Well Owner

Name County of Napa

Mailing Address 804 First Street

City Napa State CA Zip 94559

Well Location

Address Site #5-Napa River at Stonebridge Park

City St. Helena County Napa

Latitude Deg. Min. Sec. N Longitude Deg. Min. Sec. W

Datum Dec. Lat. 38.510898 Dec. Long. -122.456426

APN Book Page Parcel

Township Range Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

SEE ATTACHED

SITE LOCATION

West East South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

● New Well

○ Modification/Repair
  ○ Deepen
  ○ Other

○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply
  ☐ Domestic ☐ Public
  ☐ Irrigation ☐ Industrial

○ Cathodic Protection

○ Dewatering

○ Heat Exchange

○ Injection

● Monitoring

○ Remediation

○ Sparging

○ Test Well

○ Vapor Extraction

○ Other

Water Level and Yield of Completed Well

Depth to first water 20 (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size If Any (Inches)
0	80	10	Blank	PVC Sch. 40	.308	2.375		
80	95	10	Screen	PVC Sch. 40	.308	2.375	Milled Slots	0.030
95	100	10	Blank	PVC Sch. 40	.308	2.375		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	20	Cement	10.3 sack mix
20	43	Filter Pack	#3 sand
43	48	Bentonite	
48	65	Filter Pack	
65	70	Bentonite	
70	100	Filter Pack	#3 sand

Attachments

☑ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☑ Other Site Location

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name CLEAR HEART DRILLING, INC
Person, Firm or Corporation

555 W. College Ave. Ste. B7 Santa Rosa CA 95401
Address City State Zip

Signed Gary M. 10/15/2014 780357
C-57 Licensed Water Well Contractor Date Signed C-57 License Number

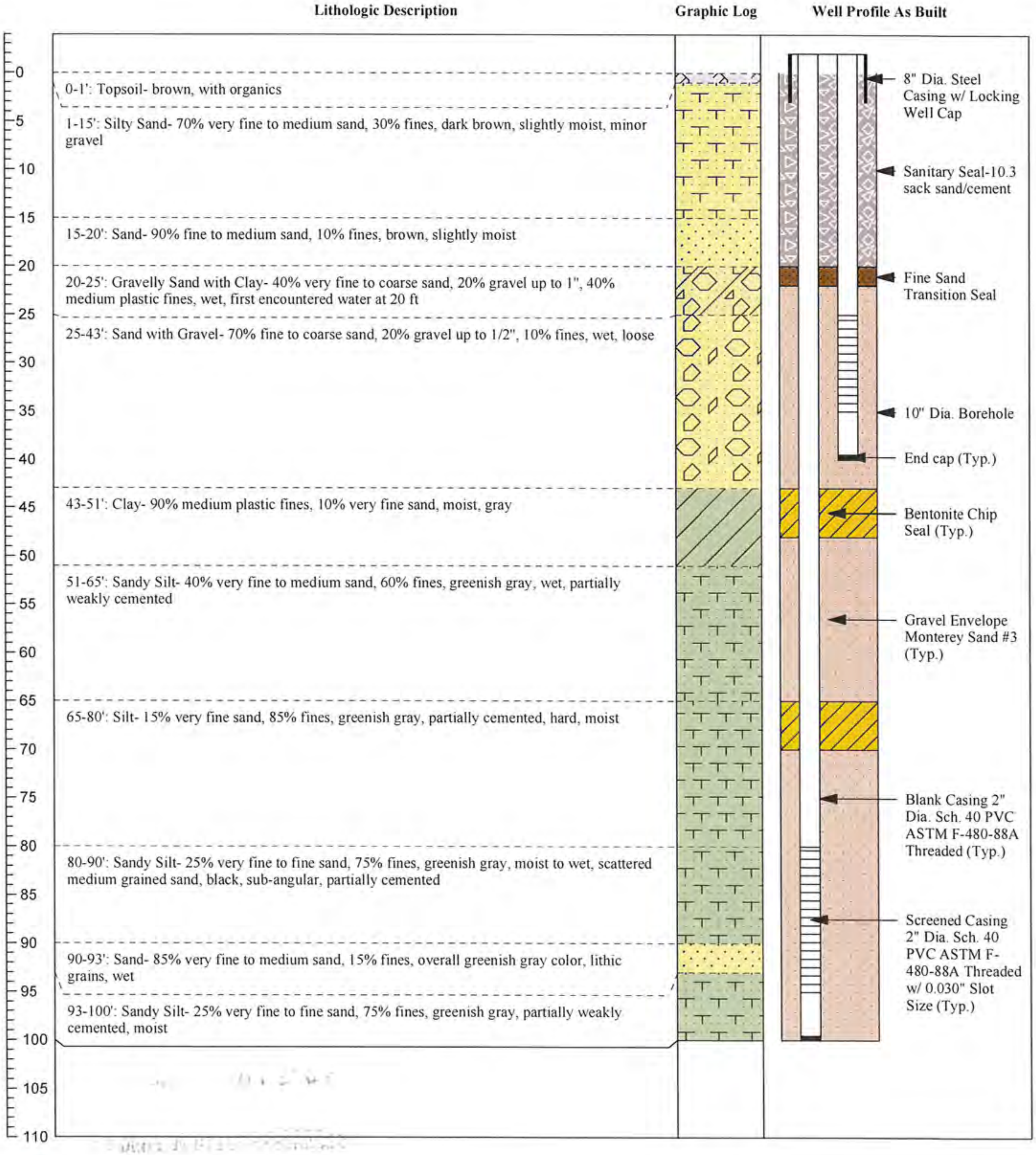
DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

e0236836

LSCE Project No. 12-1-071
Well Name: Napa County-223d-swgw5
Lat./Long.: 38.510898/-122.456426
Drilled By: Clear Heart Drilling
Driller: Rick Schneider
Site Geologist: Charlie Jenkins, P.G.

Site: Site #5- Napa River at Stonebridge Park
Drilling Method: Hollow Stem Auger; pilot hole 8"-diameter reamed hole 10"-diameter
Sampling Method: Core Sample Barrel
Drilling/Installation Date: 9/15/14 - 9/16/14
Well Depth (ft): 100
Boring Depth (ft): 100
Well Screen (ft): 80-95



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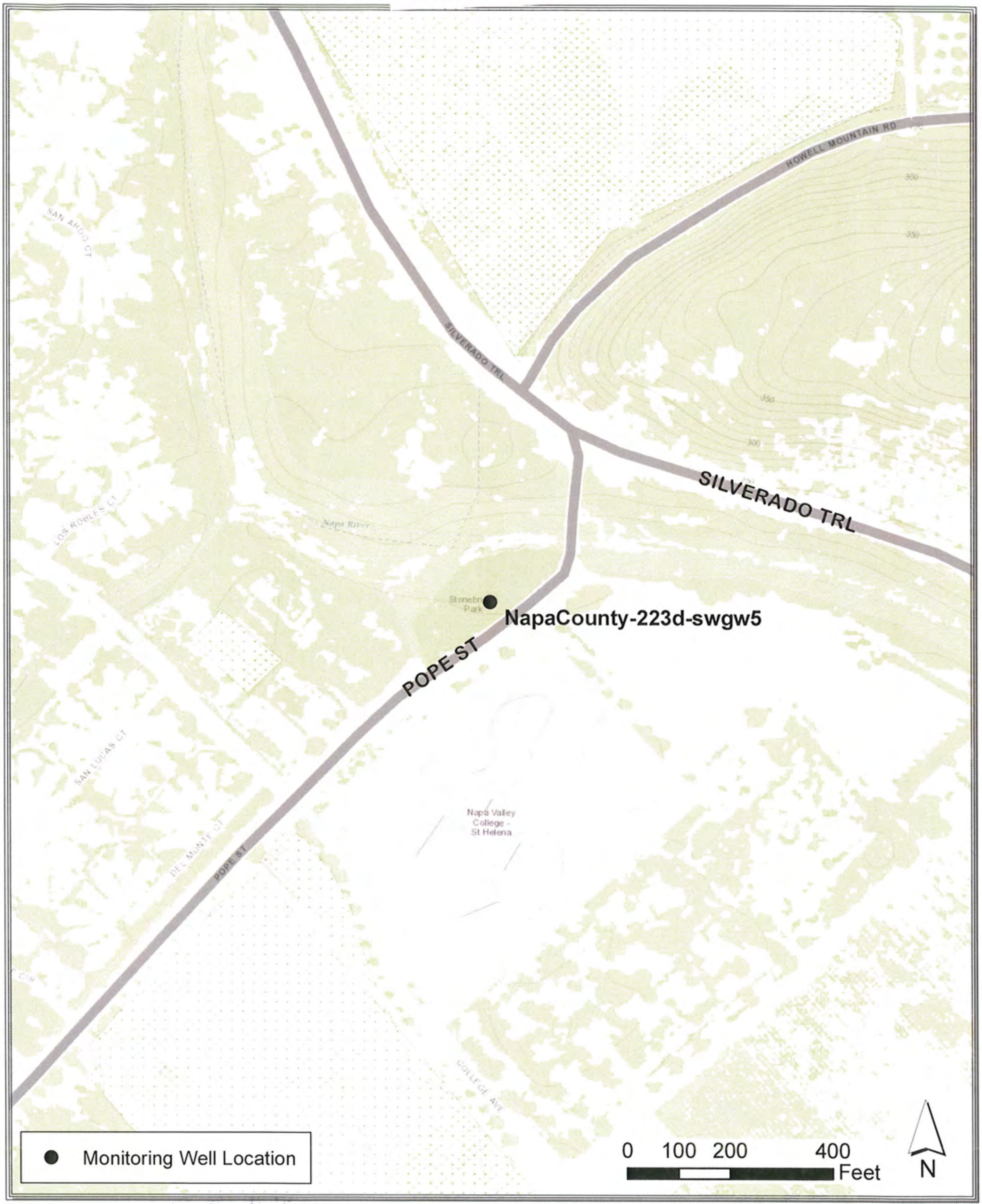
*Measurement w/ Recreational Handheld Unit (Garmin Summit HC)

e0236836



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CONSULTING ENGINEERS

Napa County Five Dual-Completion Monitoring Wells Project

APPENDIX B

Appendix B: Summary of Wells Used for Hydrogeologic Site Characterization

Site	Well Completion Report	Approx. Distance from Site (miles)	Borehole Total Depth (ft, bgs)	Approx. Bottom of Alluvium/Unconsolidated material (ft, bgs)	First Sand/Gravel (ft, bgs)	Second Sand/Gravel (ft, bgs)	Third Sand/Gravel (ft, bgs)	Fourth Sand/Gravel (ft, bgs)	Fifth Sand/Gravel (ft, bgs)	Sand/Gravel Description	Drilling method
Site 1	769450	0.15	560	75	20-40	40-70	155-170	-	-	black sands, brown sands and gravel, black sand	Rotary
	475430	0.5	26	unk	22-26			-	-	brown sand	Auger
	49958	0.2	150	36	28-36	-	-	-	-	gravel	Rotary
	342791 - 342792 (2 MWs)	0.05	30	unk	19.2-20.7	22-29.2	-	-	-	sand medium to coarse grained, sands and gravels	Auger
Site 2	774352	0.3	200	???	30-45	-	-	-	-	boulders & gravel	Rotary
	121101	0.3	470	92	23-51	76-87	215-233	-	-	Small gravel and sand, coarse sand, sand and gravel	Rotary
	323987	0.2	242	90	-	-	-	-	-	sand stringers noted from 20' to 60'	Rotary
	818722	0.05	270	110-130	-	-	-	-	-	imbedded gravel noted at 20' to 40' and again at 50' to 70'	Rotary
Site 3	482277	0.05	355	70	16-20	23-53	56-70	-	-	sand, gravel and clay, gravel	
	119532		590	93	unk	unk	unk	-	-	unk	
	11077	0.1	313	>180	32-80	80-126	172-174	-	-	clay and gravel, clay and gravel, gravel	
	15236	0.25	328	321	23-28	38-51	51-70	-	-	loose sand and gravel, loose gravel and rocks, gravel and clay, loose gravel, loose sand and gravel	

Appendix B: Summary of Wells Used for Hydrogeologic Site Characterization

Site	Well Completion Report	Approx. Distance from Site (miles)	Borehole Total Depth (ft, bgs)	Approx. Bottom of Alluvium/Unconsolidated material (ft, bgs)	First Sand/Gravel (ft, bgs)	Second Sand/Gravel (ft, bgs)	Third Sand/Gravel (ft, bgs)	Fourth Sand/Gravel (ft, bgs)	Fifth Sand/Gravel (ft, bgs)	Sand/Gravel Description	Drilling method
	119576	0.06	540	180	25-55	-	-	-	-	gravel and sand	
Site 4	437070	.	520	300	30-45	70-90	100-135	140-155	170-270	1/4" pea gravel, sand and 1/2" gravel, 1/2" pea gravel, sand and 1/4" gravel, 1/4" gravel	Rotary
	121202	0.45	340	167	30-58	67-156	-			sand and gravel, small gravel and sand	Rotary
	281504	0.5	280	240	22-40	80-140	160-190	190-220	240-280	gravel, gravel, gravel, gravel and coarse sand, gravel	Rotary
	462631	0.35	140	n/a	37-57	88-135	-	-	-	gravel and boulders, gravel and boulders	Rotary
Site 5	110119	0.05	285	21	-	-	-	-	-		Rotary
	482209	0.3	300	34	-	-	-	-	-		Rotary
	427004	0.2	247	54	-	-	-	-	-		Rotary
	72914	0.05	380	22	2-17	-	-	-	-	gravel	Rotary
	151102	0.25	256	80	25-80	-	-	-	-	sand and gravel with clay stringers	Rotary

APPENDIX C

Site	Sample ID	Sample Date	Total Alkalinity mg/L as CaCO3 Std Method 2320 B [1]*	Dissolved Aluminum mg/L EPA 200.8 (D) [1]*	Dissolved Antimony mg/L EPA 200.8 (D) [1]*	Dissolved Arsenic mg/L EPA 200.8 (D) [1]*	Dissolved Barium mg/L EPA 200.8 (D) [1]*	Dissolved Beryllium mg/L EPA 200.8 (D) [1]*	Dissolved Bicarbonate (HCO3-) mg/L as CaCO3 Std Method 4500-CO2 D [1]*	Dissolved Boron mg/L EPA 200.7 (D) [1]*	Dissolved Bromide mg/L EPA 300.0 28d Hold [1]*	Dissolved Cadmium mg/L EPA 200.8 (D) [1]*	Dissolved Calcium mg/L EPA 200.7 (D) [1]*
Site 1	NapaCounty-214s	6/3/2015 8:09	117	<0.01	<0.001	<0.001	0.081	<0.001	117	0.2	0.07	<0.001	19
Site 1	NapaCounty-215d	6/3/2015 7:16	258	<0.01	<0.001	0.007	0.103	<0.001	258	1.4	0.63	<0.001	41
Site 1	NapaCounty-swgw_SW1	6/4/2015 13:39	145	0.02	<0.001	0.015	0.136	<0.001	144	1.4	15.9	<0.001	145
Site 2	NapaCounty-216s	6/3/2015 13:03	93	0.089	<0.001	<0.001	0.046	<0.001	93	<0.1	0.12	<0.001	22
Site 2	NapaCounty-217d	6/3/2015 12:23	116	0.432	<0.001	0.001	0.027	<0.001	116	<0.1	0.06	<0.001	15
Site 2	NapaCounty-swgw_SW2	6/3/2015 13:15	154	0.029	<0.001	<0.001	0.059	<0.001	153	0.1	0.02	<0.001	34
Site 3	NapaCounty-218s	6/3/2015 11:02	192	<0.01	<0.001	<0.001	0.091	<0.001	192	0.1	0.13	<0.001	47
Site 3	NapaCounty-219d	6/3/2015 10:04	225	<0.01	<0.001	0.046	0.088	<0.001	224	9.1	0.33	<0.001	17
Site 3	NapaCounty-swgw_SW3	6/4/2015 12:46	176	0.012	<0.001	0.003	0.073	<0.001	175	0.5	0.2	<0.001	36
Site 4	NapaCounty-220s	6/4/2015 8:19	199	<0.01	<0.001	0.003	0.078	<0.001	199	0.1	0.1	<0.001	32
Site 4	NapaCounty-221d	6/4/2015 7:52	124	<0.01	<0.001	0.004	0.05	<0.001	124	<0.1	0.03	<0.001	14
Site 4	NapaCounty-swgw_SW4	6/4/2015 8:50	98	<0.01	<0.001	0.001	0.042	<0.001	98	<0.1	0.08	<0.001	22
Site 5	NapaCounty-222s	6/4/2015 11:29	117	<0.01	<0.001	0.003	0.041	<0.001	117	0.6	0.12	<0.001	28
Site 5	NapaCounty-223d	6/4/2015 10:56	213	<0.01	<0.001	0.002	0.104,0.105**	<0.001	213	0.5	0.07	<0.001	16
Site 5	NapaCounty-swgw_SW5	6/4/2015 11:56	92,93**	<0.01	<0.001	0.004	0.039	<0.001	93	0.8	0.12	<0.001	21

Site	Sample ID	Sample Date	Dissolved Carbonate (CO3--) mg/L as CaCO3 Std Method 4500-CO2 D [1]*	Dissolved Chloride mg/L EPA 300.0 28d Hold [1]*	Dissolved Chromium mg/L EPA 200.8 (D) [1]*	Dissolved Cobalt mg/L EPA 200.8 (D) [1]*	Conductance (EC) µS/cm Std Method 2510-B [1]*	Dissolved Copper mg/L EPA 200.8 (D) [1]*	Dissolved Fluoride mg/L EPA 300.0 28d Hold [1]*	Dissolved Hardness mg/L as CaCO3 Std Method 2340 B [1]*	Dissolved Hydroxide (OH-) mg/L as CaCO3 Std Method 4500-CO2 D [1]*	Dissolved Iron mg/L EPA 200.8 (D) [1]*	Dissolved Lead mg/L EPA 200.8 (D) [1]*
Site 1	NapaCounty-214s	6/3/2015 8:09	<1	28	<0.001	<0.005	416	<0.001	0.2	144	<1	0.009	<0.001
Site 1	NapaCounty-215d	6/3/2015 7:16	1	177	<0.001	<0.005	1174	0.001	0.2	226	<1	0.042	<0.001
Site 1	NapaCounty-swgw_SW1	6/4/2015 13:39	1	4699	0.002	<0.005	14319	0.006	<0.1	1717	<1	0.025	<0.001
Site 2	NapaCounty-216s	6/3/2015 13:03	<1	15	0.001	<0.005	317	0.003	0.2	116	<1	0.066	<0.001
Site 2	NapaCounty-217d	6/3/2015 12:23	<1	5	0.001	<0.005	255	0.001	0.6	74	<1	0.331	<0.001
Site 2	NapaCounty-swgw_SW2	6/3/2015 13:15	1	12	0.005	<0.005	411	0.006	0.2	159	<1	0.091	<0.001
Site 3	NapaCounty-218s	6/3/2015 11:02	<1	19	0.001	<0.005	536	<0.001	<0.1	247	<1	0.008	<0.001
Site 3	NapaCounty-219d	6/3/2015 10:04	1	73	<0.001	<0.005	712	0.005	0.3	116	<1	0.021	<0.001
Site 3	NapaCounty-swgw_SW3	6/4/2015 12:46	1	27	<0.001	<0.005	515	0.001	0.2	215	<1	0.022	<0.001
Site 4	NapaCounty-220s	6/4/2015 8:19	<1	7	<0.001	<0.005	429	<0.001	0.2	190	<1	<0.005	<0.001
Site 4	NapaCounty-221d	6/4/2015 7:52	<1	6	<0.001	<0.005	263	<0.001	0.2	100	<1	0.009	<0.001
Site 4	NapaCounty-swgw_SW4	6/4/2015 8:50	<1	18	<0.001	<0.005	328	0.001	0.1	128	<1	0.046	<0.001
Site 5	NapaCounty-222s	6/4/2015 11:29	<1	32	<0.001	<0.005	372	<0.001	0.3	123	<1	0.014	<0.001
Site 5	NapaCounty-223d	6/4/2015 10:56	<1	16	0.001	<0.005	453	<0.001	0.3	113	<1	0.473,0.476**	<0.001
Site 5	NapaCounty-swgw_SW5	6/4/2015 11:56	<1	34	<0.001	<0.005	346	0.002	0.4	100	<1	0.019	<0.001

*Codes in brackets ([]) following the analyte name refer to the Method Comparability Code. For more information, please refer to http://www.water.ca.gov/waterdatalibrary/includes/mtc_code.cfm.

**More than one analysis was made for this sample

Site	Sample ID	Sample Date	Dissolved Lithium mg/L EPA 200.8 (D) [1]*	Dissolved Magnesium mg/L EPA 200.7 (D) [1]*	Dissolved Manganese mg/L EPA 200.8 (D) [1]*	Dissolved Mercury mg/L EPA 200.8 (Hg Dissolved) [1]*	Dissolved Molybdenum mg/L EPA 200.8 (D) [1]*	Dissolved Nickel mg/L EPA 200.8 (D) [1]*	Dissolved Nitrate mg/L as N EPA 300.0 28d Hold [1]*	Dissolved Nitrite mg/L as N Std Method 4500-NO2 B (48Hr) [1]*	Dissolved Potassium mg/L EPA 200.7 (D) [1]*	Dissolved Selenium mg/L EPA 200.8 (D) [1]*	Dissolved Silver mg/L EPA 200.8 (D) [1]*
Site 1	NapaCounty-214s	6/3/2015 8:09	0.011	23	2.53	<0.0002	<0.005	0.003	7.3	0.02	1.1	<0.001	<0.001
Site 1	NapaCounty-215d	6/3/2015 7:16	0.059	30	1.13	<0.0002	<0.005	0.002	<0.1	<0.01	4.5	0.002	<0.001
Site 1	NapaCounty-swgw_SW1	6/4/2015 13:39	0.067	329	0.076	<0.0002	<0.005	0.007	12.6	<0.01	106.5	0.046	<0.001
Site 2	NapaCounty-216s	6/3/2015 13:03	0.012	15	0.041	<0.0002	<0.005	0.002	5.4	0.01	0.9	<0.001	<0.001
Site 2	NapaCounty-217d	6/3/2015 12:23	0.014	9	0.643	<0.0002	0.005	0.002	<0.1	<0.01	1.3	<0.001	<0.001
Site 2	NapaCounty-swgw_SW2	6/3/2015 13:15	0.008	18	0.024	<0.0002	<0.005	0.013	0.5	<0.01	2.1	<0.001	<0.001
Site 3	NapaCounty-218s	6/3/2015 11:02	0.01	31	<0.005	<0.0002	<0.005	0.003	1.8	<0.01	0.7	<0.001	<0.001
Site 3	NapaCounty-219d	6/3/2015 10:04	0.037,0.038**	18	0.241,0.242**	<0.0002	0.013,0.014**	0.001	<0.1	<0.01	5.2	<0.001	<0.001
Site 3	NapaCounty-swgw_SW3	6/4/2015 12:46	0.046	30	0.038	<0.0002	<0.005	0.004	<0.1	<0.01	2.9	<0.001	<0.001
Site 4	NapaCounty-220s	6/4/2015 8:19	<0.005	26	0.568	<0.0002	<0.005	0.005	0.7	0.03	3.6	<0.001	<0.001
Site 4	NapaCounty-221d	6/4/2015 7:52	<0.005	16	0.728	<0.0002	<0.005	0.002	<0.1	<0.01	4.7	<0.001	<0.001
Site 4	NapaCounty-swgw_SW4	6/4/2015 8:50	<0.005	17	0.041	<0.0002	<0.005	0.003	<0.1	<0.01	1.7	<0.001	<0.001
Site 5	NapaCounty-222s	6/4/2015 11:29	0.063	13	0.641	<0.0002	<0.005	0.01	<0.1	<0.01	3.8	<0.001	<0.001
Site 5	NapaCounty-223d	6/4/2015 10:56	0.075,0.076**	18	0.219,0.223**	<0.0002	<0.005	0.002	0.3	<0.01	7.1	<0.001	<0.001
Site 5	NapaCounty-swgw_SW5	6/4/2015 11:56	0.095	11	0.048	<0.0002	<0.005	0.003	<0.1	<0.01	3.7	<0.001	<0.001

Site	Sample ID	Sample Date	Dissolved Sodium mg/L EPA 200.7 (D) [1]*	Total Dissolved Solids mg/L Std Method 2540 C [1]*	Dissolved Strontium mg/L EPA 200.8 (D) [1]*	Dissolved Sulfate mg/L EPA 300.0 28d Hold [1]*	Dissolved Thallium mg/L EPA 200.8 (D) [1]*	Turbidity N.T.U. EPA 180.1 [D-2]*	Dissolved Vanadium mg/L EPA 200.8 (D) [1]*	Dissolved Zinc mg/L EPA 200.8 (D) [1]*	pH pH Units Std Method 2320 B [1]*
Site 1	NapaCounty-214s	6/3/2015 8:09	31	268	0.144	45	<0.001	1.21	<0.005	<0.005	6.9
Site 1	NapaCounty-215d	6/3/2015 7:16	164	683	0.32	74	<0.001	2.75	<0.005	<0.005	7.3
Site 1	NapaCounty-swgw_SW1	6/4/2015 13:39	2590	8830	2.19	667	<0.001	20.6	0.018	0.012	7.8
Site 2	NapaCounty-216s	6/3/2015 13:03	22	208	0.169	38	<0.001	77.4	<0.005	<0.005	6.8
Site 2	NapaCounty-217d	6/3/2015 12:23	29	164	0.107	9	<0.001	7.29	<0.005	<0.005	7.4
Site 2	NapaCounty-swgw_SW2	6/3/2015 13:15	28	255	0.269	44	<0.001	1.37	<0.005	0.027	7.6
Site 3	NapaCounty-218s	6/3/2015 11:02	20	324	0.357	65	<0.001	5.06	<0.005	<0.005	6.7
Site 3	NapaCounty-219d	6/3/2015 10:04	108	452	0.125,0.126**	32	<0.001	1.16	<0.005	0.006	7.4
Site 3	NapaCounty-swgw_SW3	6/4/2015 12:46	27	313	0.248	54	<0.001	7.48	<0.005	<0.005	7.8
Site 4	NapaCounty-220s	6/4/2015 8:19	19	292	0.199	11	<0.001	3.29	<0.005	<0.005	6.7
Site 4	NapaCounty-221d	6/4/2015 7:52	16	204	0.079	6	<0.001	7.11	<0.005	<0.005	7.1
Site 4	NapaCounty-swgw_SW4	6/4/2015 8:50	17	250	0.131	39	<0.001	3.4	<0.005	<0.005	7.3
Site 5	NapaCounty-222s	6/4/2015 11:29	26	241	0.155	21	<0.001	1.33,1.48**	<0.005	<0.005	7.1
Site 5	NapaCounty-223d	6/4/2015 10:56	56	343	0.104,0.105**	6	<0.001	18.8	<0.005	<0.005	7.2
Site 5	NapaCounty-swgw_SW5	6/4/2015 11:56	30	220	0.111	25	<0.001	1.68	<0.005	0.006	7.4

*Codes in brackets ([]) following the analyte name refer to the Method Comparability Code. For more information, please refer to http://www.water.ca.gov/waterdatalibrary/includes/mtc_code.cfm.

**More than one analysis was made for this sample

DWR Bryte Analytical Lab

1450 Riverbank Road, West Sacramento, CA 95605

Report of Analytical Results

22-Jun-15

Submittal Name: Napa L&S 2015

Submittal ID: CH0615B0001

These results are also available to DWR staff in electronic form via the DWR Water Data Library (WDL) http://wdl.water.ca.gov. Contact Kelley Pepper (kelley.pepper@water.ca.gov) to set up access.

(First) Collection Date: 6/3/2015

Received Date: 6/3/2015 3:50:00 PM

Report to:

Bill Brewster
DWR North Central Region Office

, CA

Priority: 5

Submitted By: John MacDougall

Received By: Carroll, Marilyn

Instructions to Lab:

Samples:

CH0615B0001
CH0615B0002
CH0615B0003
CH0615B0004
CH0615B0005
CH0615B0006
CH0615B0013
CH0615B0016
CH0615B0017

Analyst Summary:

16 - Carroll, Marilyn
20 - Chan, Elaine
5 - Hernandez, Richard
9 - Pineda, Maritza
10 - Quiambao, Josie
13 - Thind, Pritam

Submittal Review Notes From Lab:

Sample and Analyte Flag Summary

Flag	*Flag Description*
R4	Analyte Reporting Limit raised due to high analyte level.

N.A.=Not Analyzed R.L..=Reporting Limit (Reporting Limits Adjusted For Dilution)

Report of Field Results

Sample Number **CH0615B0001** ***Field Results***

StationNumber:	StationName	Matrix	Cost Code:	Collection Date
05N04W02N990M	NapaCounty-214s	Water, Natural	L10583900000	6/03/2015 8:09 AM

Method	Analyte	Result	Rpt.Lmt.	Units	Time	Footnotes
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		
Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number **CH0615B0002** ***Field Results***

StationNumber:	StationName	Matrix	Cost Code:	Collection Date
05N04W02N991M	NapaCounty-215d	Water, Natural	L10583900000	6/03/2015 7:16 AM

Method	Analyte	Result	Rpt.Lmt.	Units	Time	Footnotes
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		
Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number **CH0615B0003** ***Field Results***

StationNumber:	StationName	Matrix	Cost Code:	Collection Date
06N04W18J992M	NapaCounty-216s	Water, Natural	L10583900000	6/03/2015 1:03 PM

Method	Analyte	Result	Rpt.Lmt.	Units	Time	Footnotes
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		
Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number **CH0615B0004** ***Field Results***

StationNumber:	StationName	Matrix	Cost Code:	Collection Date
06N04W18J993M	NapaCounty-217d	Water, Natural	L10583900000	6/03/2015 12:23 PM

Method	Analyte	Result	Rpt.Lmt.	Units	Time	Footnotes
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		
Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number **CH0615B0005** ***Field Results***

StationNumber:	StationName	Matrix	Cost Code:	Collection Date
06N04W16G994M	NapaCounty-218s	Water, Natural	L10583900000	6/03/2015 11:02 AM

Method	Analyte	Result	Rpt.Lmt.	Units	Time	Footnotes
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		

Sample Number CH0615B0005 **Field Results**

Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number CH0615B0006 **Field Results**

StationNumber:	StationName	Matrix	Cost Code:	Collection Date
06N04W16G995M	NapaCounty-219d	Water, Natural	L10583900000	6/03/2015 10:04 AM

Method	Analyte	Result	Rpt.Lmt.	Units	Time	Footnotes
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		
Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number CH0615B0013 **Field Results**

StationNumber:	StationName	Matrix	Cost Code:	Collection Date
E3012234	NapaCounty-swgw_SW2	Water, Natural	L10583900000	6/03/2015 1:15 PM

Method	Analyte	Result	Rpt.Lmt.	Units	Time	Footnotes
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		
Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number CH0615B0016 **Field Results**

StationNumber:	StationName	Matrix	Cost Code:	Collection Date
06N04W18J993M	NapaCounty-217d	Water, Natural	L10583900000	6/03/2015 12:23 PM

Method	Analyte	Result	Rpt.Lmt.	Units	Time	Footnotes
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		
Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number CH0615B0017 **Field Results**

StationNumber:	StationName	Matrix	Cost Code:	Collection Date
Blank; Field	Blank; Field	Water, Purified	L10583900000	6/03/2015 1:06 PM

Method	Analyte	Result	Rpt.Lmt.	Units	Time	Footnotes
Specific Conductance	Conductance (EC)		1	µS/cm		
pH (Field)	pH					
Temperature, Water (Field)	Water Temperature			°C		

Report of Inorganic Analytical Results

Including Misc Physical Measurements

Sample Number CH0615B0001 **Inorganic Analytical Results**

CH0615B0001 ***Sample Type(Purpose):*** Normal Sample ***Depth:*** 1 m ***Collection Date:*** 6/3/2015 8:09:00 AM

StationNumber: 05N04W02N990M ***StationName:*** NapaCounty-214s ***Matrix:*** Water, Natural ***Cost Code:*** L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	Analyte	Result	Units	R.L.	Dilution	ChemID	Analysis Date	Flags and Notes:
Std Method 2510-B	Conductance (EC)	416	µS/cm	1.	1.	20	6/4/2015	

Sample Number CH0615B0001

Inorganic Analytical Results

EPA 200.8 (D)	Dissolved Aluminum	< 0.01	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	0.081	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	117	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.7 (D)	Dissolved Boron	0.1853	mg/L	0.1	1.	10	6/11/2015	
EPA 300.0 28d Hold	Dissolved Bromide	0.07	mg/L	0.01	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Calcium	19.02	mg/L	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 300.0 28d Hold	Dissolved Chloride	28	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Chromium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Copper	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Fluoride	0.17	mg/L	0.1	1.	9	6/9/2015	
Std Method 2340 B	Dissolved Hardness	144	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Iron	0.009	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	0.011	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	23.39	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	2.53	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.003	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Nitrate	7.33	mg/L	0.1	1.	9	6/9/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	0.02	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	1.064	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	31.35	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	0.144	mg/L	0.005	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	45.29	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	< 0.005	mg/L	0.005	1.	13	6/4/2015	
Std Method 2320 B	pH	6.9		0.1	1.	20	6/4/2015	
Std Method 2320 B	Total Alkalinity	117	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	268	mg/L	1.	1.	20	6/5/2015	
Std Method 2540 C	Total Dissolved Solids	268	mg/L	1.	1.	20	6/5/2015	Dup-CH0615B0001
EPA 180.1	Turbidity	1.21	N.T.U.	1.	1.	16	6/4/2015	

Sample Number CH0615B0002

Inorganic Analytical Results

CH0615B0002 *Sample Type(Purpose):* Normal Sample *Depth:* 1 m *Collection Date:* 6/3/2015 7:16:00 AM

StationNumber: 05N04W02N991M *StationName:* NapaCounty-215d *Matrix:* Water, Natural *Cost Code:* L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	Analyte	Result	Units	R.L.	Dilution	ChemID	Analysis Date	Flags and Notes:
Std Method 2510-B	Conductance (EC)	1174	µS/cm	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Aluminum	< 0.01	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	0.007	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	0.103	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	

Sample Number **CH0615B0002** ***Inorganic Analytical Results***

Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	258	mg/L as CaCO3	1.	1.	20	6/4/2015		
EPA 200.7 (D)	Dissolved Boron	1.416	mg/L	0.1	1.	10	6/11/2015		
EPA 300.0 28d Hold	Dissolved Bromide	0.63	mg/L	0.01	1.	9	6/9/2015		
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 200.7 (D)	Dissolved Calcium	40.57	mg/L	1.	1.	10	6/11/2015		
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	1	mg/L as CaCO3	1.	1.	20	6/4/2015		
EPA 300.0 28d Hold	Dissolved Chloride	177	mg/L	10.	10.	9	6/9/2015	R4	Dil-CH0615B0002
EPA 200.8 (D)	Dissolved Chromium	< 0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Copper	0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 300.0 28d Hold	Dissolved Fluoride	0.18	mg/L	0.1	1.	9	6/9/2015		
Std Method 2340 B	Dissolved Hardness	226	mg/L as CaCO3	1.	1.	10	6/11/2015		
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015		
EPA 200.8 (D)	Dissolved Iron	0.042	mg/L	0.005	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Lithium	0.059	mg/L	0.005	1.	13	6/4/2015		
EPA 200.7 (D)	Dissolved Magnesium	30.24	mg/L	1.	1.	10	6/11/2015		
EPA 200.8 (D)	Dissolved Manganese	1.13	mg/L	0.005	1.	13	6/4/2015		
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015		
EPA 200.8 (D)	Dissolved Molybdenum	< 0.005	mg/L	0.005	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Nickel	0.002	mg/L	0.001	1.	13	6/4/2015		
EPA 300.0 28d Hold	Dissolved Nitrate	< 0.1	mg/L	0.1	1.	9	6/9/2015		
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015		
EPA 200.7 (D)	Dissolved Potassium	4.505	mg/L	0.5	1.	10	6/11/2015		
EPA 200.8 (D)	Dissolved Selenium	0.002	mg/L	0.001	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 200.7 (D)	Dissolved Sodium	163.5	mg/L	1.	1.	10	6/11/2015		
EPA 200.8 (D)	Dissolved Strontium	0.32	mg/L	0.005	1.	13	6/4/2015		
EPA 300.0 28d Hold	Dissolved Sulfate	74	mg/L	1.	1.	9	6/9/2015		
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Zinc	< 0.005	mg/L	0.005	1.	13	6/4/2015		
Std Method 2320 B	pH	7.3		0.1	1.	20	6/4/2015		
Std Method 2320 B	Total Alkalinity	258	mg/L as CaCO3	1.	1.	20	6/4/2015		
Std Method 2540 C	Total Dissolved Solids	683	mg/L	1.	1.	20	6/5/2015		
EPA 180.1	Turbidity	2.75	N.T.U.	1.	1.	16	6/4/2015		

Sample Number **CH0615B0003** ***Inorganic Analytical Results***

CH0615B0003 ***Sample Type(Purpose):*** Normal Sample ***Depth:*** 1 m ***Collection Date:*** 6/3/2015 1:03:00 PM

StationNumber: 06N04W18J992M ***StationName:*** NapaCounty-216s ***Matrix:*** Water, Natural ***Cost Code:*** L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*	
Std Method 2510-B	Conductance (EC)	317	µS/cm	1.	1.	20	6/4/2015		
EPA 200.8 (D)	Dissolved Aluminum	0.089	mg/L	0.01	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Arsenic	< 0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Barium	0.046	mg/L	0.005	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015		
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	93	mg/L as CaCO3	1.	1.	20	6/4/2015		
EPA 200.7 (D)	Dissolved Boron	< 0.1	mg/L	0.1	1.	10	6/11/2015		Measured: 0.0927
EPA 300.0 28d Hold	Dissolved Bromide	0.12	mg/L	0.01	1.	9	6/9/2015		Dup-CH0615B0003
EPA 300.0 28d Hold	Dissolved Bromide	0.12	mg/L	0.01	1.	9	6/9/2015		
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015		

Sample Number **CH0615B0003** ***Inorganic Analytical Results***

EPA 200.7 (D)	Dissolved Calcium	22.26	mg/L	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 300.0 28d Hold	Dissolved Chloride	15.34	mg/L	1.	1.	9	6/9/2015	
EPA 300.0 28d Hold	Dissolved Chloride	15.33	mg/L	1.	1.	9	6/9/2015	Dup-CH0615B0003
EPA 200.8 (D)	Dissolved Chromium	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Copper	0.003	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Fluoride	0.16	mg/L	0.1	1.	9	6/9/2015	Dup-CH0615B0003
EPA 300.0 28d Hold	Dissolved Fluoride	0.16	mg/L	0.1	1.	9	6/9/2015	
Std Method 2340 B	Dissolved Hardness	116	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Iron	0.066	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	0.012	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	14.61	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	0.041	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.002	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Nitrate	5.4	mg/L	0.1	1.	9	6/9/2015	Dup-CH0615B0003
EPA 300.0 28d Hold	Dissolved Nitrate	5.4	mg/L	0.1	1.	9	6/9/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	0.01	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	0.8767	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	21.55	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	0.169	mg/L	0.005	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	38.3	mg/L	1.	1.	9	6/9/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	38.3	mg/L	1.	1.	9	6/9/2015	Dup-CH0615B0003
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	< 0.005	mg/L	0.005	1.	13	6/4/2015	
Std Method 2320 B	pH	6.8		0.1	1.	20	6/4/2015	
Std Method 2320 B	Total Alkalinity	93	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	208	mg/L	1.	1.	20	6/5/2015	
EPA 180.1	Turbidity	77.4	N.T.U.	3.	3.	16	6/4/2015	R4

Sample Number **CH0615B0004** ***Inorganic Analytical Results***

CH0615B0004 ***Sample Type(Purpose):*** Normal Sample ***Depth:*** 1 m ***Collection Date:*** 6/3/2015 12:23:00 PM

StationNumber: 06N04W18J993M ***StationName:*** NapaCounty-217d ***Matrix:*** Water, Natural ***Cost Code:*** L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*
Std Method 2510-B	Conductance (EC)	255	µS/cm	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Aluminum	0.432	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	0.027	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	116	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.7 (D)	Dissolved Boron	< 0.1	mg/L	0.1	1.	10	6/11/2015	Measured: 0.0798
EPA 300.0 28d Hold	Dissolved Bromide	0.06	mg/L	0.01	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Calcium	15.21	mg/L	1.	1.	10	6/11/2015	

Sample Number **CH0615B0004** ***Inorganic Analytical Results***

Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 300.0 28d Hold	Dissolved Chloride	5	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Chromium	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Copper	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Fluoride	0.56	mg/L	0.1	1.	9	6/9/2015	
Std Method 2340 B	Dissolved Hardness	74	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Iron	0.331	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	0.014	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	8.758	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	0.643	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.002	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Nitrate	< 0.1	mg/L	0.1	1.	9	6/9/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	1.309	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	28.53	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	0.107	mg/L	0.005	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	9.31	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	< 0.005	mg/L	0.005	1.	13	6/4/2015	
Std Method 2320 B	pH	7.4		0.1	1.	20	6/4/2015	
Std Method 2320 B	Total Alkalinity	116	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	164	mg/L	1.	1.	20	6/5/2015	
EPA 180.1	Turbidity	7.29	N.T.U.	1.	1.	16	6/4/2015	

Sample Number **CH0615B0005** ***Inorganic Analytical Results***

CH0615B0005 ***Sample Type(Purpose):*** Normal Sample ***Depth:*** 1 m ***Collection Date:*** 6/3/2015 11:02:00 AM

StationNumber: 06N04W16G994M ***StationName:*** NapaCounty-218s ***Matrix:*** Water, Natural ***Cost Code:*** L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*
Std Method 2510-B	Conductance (EC)	536	µS/cm	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Aluminum	< 0.01	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	0.091	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	192	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.7 (D)	Dissolved Boron	0.1072	mg/L	0.1	1.	10	6/11/2015	
EPA 300.0 28d Hold	Dissolved Bromide	0.13	mg/L	0.01	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Calcium	47.39	mg/L	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 300.0 28d Hold	Dissolved Chloride	19	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Chromium	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Copper	< 0.001	mg/L	0.001	1.	13	6/4/2015	

Sample Number **CH0615B0005** ***Inorganic Analytical Results***

EPA 300.0 28d Hold	Dissolved Fluoride	< 0.1	mg/L	0.1	1.	9	6/9/2015
Std Method 2340 B	Dissolved Hardness	247	mg/L as CaCO3	1.	1.	10	6/11/2015
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015
EPA 200.8 (D)	Dissolved Iron	0.008	mg/L	0.005	1.	13	6/4/2015
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015
EPA 200.8 (D)	Dissolved Lithium	0.01	mg/L	0.005	1.	13	6/4/2015
EPA 200.7 (D)	Dissolved Magnesium	31.18	mg/L	1.	1.	10	6/11/2015
EPA 200.8 (D)	Dissolved Manganese	< 0.005	mg/L	0.005	1.	13	6/4/2015
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015
EPA 200.8 (D)	Dissolved Molybdenum	< 0.005	mg/L	0.005	1.	13	6/4/2015
EPA 200.8 (D)	Dissolved Nickel	0.003	mg/L	0.001	1.	13	6/4/2015
EPA 300.0 28d Hold	Dissolved Nitrate	1.8	mg/L	0.1	1.	9	6/9/2015
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015
EPA 200.7 (D)	Dissolved Potassium	0.7058	mg/L	0.5	1.	10	6/11/2015
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015
EPA 200.7 (D)	Dissolved Sodium	20.11	mg/L	1.	1.	10	6/11/2015
EPA 200.8 (D)	Dissolved Strontium	0.357	mg/L	0.005	1.	13	6/4/2015
EPA 300.0 28d Hold	Dissolved Sulfate	65.1	mg/L	1.	1.	9	6/9/2015
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015
EPA 200.8 (D)	Dissolved Zinc	< 0.005	mg/L	0.005	1.	13	6/4/2015
Std Method 2320 B	pH	6.7		0.1	1.	20	6/4/2015
Std Method 2320 B	Total Alkalinity	192	mg/L as CaCO3	1.	1.	20	6/4/2015
Std Method 2540 C	Total Dissolved Solids	324	mg/L	1.	1.	20	6/5/2015
EPA 180.1	Turbidity	5.06	N.T.U.	1.	1.	16	6/4/2015

Sample Number **CH0615B0006** ***Inorganic Analytical Results***

CH0615B0006 ***Sample Type(Purpose):*** Normal Sample ***Depth:*** 1 m ***Collection Date:*** 6/3/2015 10:04:00 AM

StationNumber: 06N04W16G995M ***StationName:*** NapaCounty-219d ***Matrix:*** Water, Natural ***Cost Code:*** L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*
Std Method 2510-B	Conductance (EC)	712	µS/cm	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Aluminum	< 0.01	mg/L	0.01	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Aluminum	< 0.01	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Arsenic	0.046	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	0.046	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Barium	0.088	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	0.088	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	224	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.7 (D)	Dissolved Boron	9.063	mg/L	0.1	1.	10	6/11/2015	
EPA 300.0 28d Hold	Dissolved Bromide	0.33	mg/L	0.01	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.7 (D)	Dissolved Calcium	16.74	mg/L	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 300.0 28d Hold	Dissolved Chloride	73	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Chromium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Chromium	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	

Sample Number **CH0615B0006** ***Inorganic Analytical Results***

EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Copper	0.005	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Copper	0.005	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Fluoride	0.25	mg/L	0.1	1.	9	6/9/2015	
Std Method 2340 B	Dissolved Hardness	116	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Iron	0.021	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Iron	0.021	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	0.038	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Lithium	0.037	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	17.9	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	0.242	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Manganese	0.241	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	0.014	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Molybdenum	0.013	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 300.0 28d Hold	Dissolved Nitrate	< 0.1	mg/L	0.1	1.	9	6/9/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015	Dup-CH0615B0006
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	5.163	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	107.9	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	0.125	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Strontium	0.126	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 300.0 28d Hold	Dissolved Sulfate	32	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Zinc	0.006	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	0.006	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
Std Method 2320 B	pH	7.4		0.1	1.	20	6/4/2015	
Std Method 2320 B	Total Alkalinity	225	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	452	mg/L	1.	1.	20	6/5/2015	
EPA 180.1	Turbidity	1.16	N.T.U.	1.	1.	16	6/4/2015	

Sample Number **CH0615B0013** ***Inorganic Analytical Results***

CH0615B0013 ***Sample Type(Purpose):*** Normal Sample ***Depth:*** 1 m ***Collection Date:*** 6/3/2015 1:15:00 PM

StationNumber: E3012234 ***StationName:*** NapaCounty-swgw_SW2 ***Matrix:*** Water, Natural ***Cost Code:*** L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*
Std Method 2510-B	Conductance (EC)	411	µS/cm	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Aluminum	0.029	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	0.059	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	153	mg/L as CaCO3	1.	1.	20	6/4/2015	

Sample Number **CH0615B0013** ***Inorganic Analytical Results***

EPA 200.7 (D)	Dissolved Boron	0.1329	mg/L	0.1	1.	10	6/11/2015	
EPA 300.0 28d Hold	Dissolved Bromide	0.02	mg/L	0.01	1.	9	6/8/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Calcium	33.74	mg/L	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 300.0 28d Hold	Dissolved Chloride	12.13	mg/L	1.	1.	9	6/8/2015	
EPA 200.8 (D)	Dissolved Chromium	0.005	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	Measured: 0.001
EPA 200.8 (D)	Dissolved Copper	0.006	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Fluoride	0.17	mg/L	0.1	1.	9	6/8/2015	
Std Method 2340 B	Dissolved Hardness	159	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Iron	0.091	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	0.008	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	18.05	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	0.024	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.013	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Nitrate	0.5	mg/L	0.1	1.	9	6/8/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	2.142	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	28.27	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	0.269	mg/L	0.005	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	44.13	mg/L	1.	1.	9	6/8/2015	
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	0.027	mg/L	0.005	1.	13	6/4/2015	
Std Method 2320 B	pH	7.6		0.1	1.	20	6/4/2015	
Std Method 2320 B	Total Alkalinity	154	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	255	mg/L	1.	1.	20	6/5/2015	
EPA 180.1	Turbidity	1.37	N.T.U.	1.	1.	16	6/4/2015	

Sample Number **CH0615B0016** ***Inorganic Analytical Results***

CH0615B0016 ***Sample Type(Purpose):*** Duplicate Sample CH0615B0004 ***Depth:*** 1 m ***Collection Date:*** 6/3/2015 12:23:00 PM

StationNumber: 06N04W18J993M ***StationName:*** NapaCounty-217d ***Matrix:*** Water, Natural ***Cost Code:*** L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*
Std Method 2510-B	Conductance (EC)	256	µS/cm	1.	1.	20	6/4/2015	Dup-CH0615B0016
Std Method 2510-B	Conductance (EC)	256	µS/cm	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Aluminum	0.422	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	0.027	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	118	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	118	mg/L as CaCO3	1.	1.	20	6/4/2015	Dup-CH0615B0016
EPA 200.7 (D)	Dissolved Boron	< 0.1	mg/L	0.1	1.	10	6/11/2015	Measured: 0.0808
EPA 300.0 28d Hold	Dissolved Bromide	0.06	mg/L	0.01	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	

Sample Number **CH0615B0016** ***Inorganic Analytical Results***

EPA 200.7 (D)	Dissolved Calcium	15.05	mg/L	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	Dup-CH0615B0016
EPA 300.0 28d Hold	Dissolved Chloride	5	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Chromium	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Copper	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Fluoride	0.549	mg/L	0.1	1.	9	6/9/2015	
Std Method 2340 B	Dissolved Hardness	74	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	Dup-CH0615B0016
EPA 200.8 (D)	Dissolved Iron	0.331	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	0.014	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	8.798	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	0.635	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.002	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Nitrate	< 0.1	mg/L	0.1	1.	9	6/9/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	1.349	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	28.53	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	0.109	mg/L	0.005	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	9.2	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	< 0.005	mg/L	0.005	1.	13	6/4/2015	
Std Method 2320 B	pH	7.4		0.1	1.	20	6/4/2015	
Std Method 2320 B	pH	7.4		0.1	1.	20	6/4/2015	Dup-CH0615B0016
Std Method 2320 B	Total Alkalinity	118	mg/L as CaCO3	1.	1.	20	6/4/2015	Dup-CH0615B0016
Std Method 2320 B	Total Alkalinity	118	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	165	mg/L	1.	1.	20	6/5/2015	
EPA 180.1	Turbidity	6.68	N.T.U.	1.	1.	16	6/4/2015	Dup-CH0615B0016
EPA 180.1	Turbidity	6.23	N.T.U.	1.	1.	16	6/4/2015	

Sample Number **CH0615B0017** ***Inorganic Analytical Results***

CH0615B0017 ***Sample Type(Purpose):*** Blank; Field ***Depth:*** 0 m ***Collection Date:*** 6/3/2015 1:06:00 PM

StationNumber: Blank; Field ***StationName:*** Blank; Field ***Matrix:*** Water, Purified ***Cost Code:*** L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*
Std Method 2510-B	Conductance (EC)	< 1	µS/cm	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Aluminum	< 0.01	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	2	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.7 (D)	Dissolved Boron	< 0.1	mg/L	0.1	1.	10	6/11/2015	
EPA 300.0 28d Hold	Dissolved Bromide	< 0.01	mg/L	0.01	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	

Sample Number **CH0615B0017**

Inorganic Analytical Results

EPA 200.7 (D)	Dissolved Calcium	< 1	mg/L	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 300.0 28d Hold	Dissolved Chloride	< 1	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Chromium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Copper	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Fluoride	< 0.1	mg/L	0.1	1.	9	6/9/2015	
Std Method 2340 B	Dissolved Hardness	< 1	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Iron	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	< 1	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Nitrate	< 0.1	mg/L	0.1	1.	9	6/9/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	< 0.5	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	< 1	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	< 1	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	< 0.005	mg/L	0.005	1.	13	6/4/2015	
Std Method 2320 B	pH	5.2		0.1	1.	20	6/4/2015	
Std Method 2320 B	Total Alkalinity	2	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	< 1	mg/L	1.	1.	20	6/5/2015	
EPA 180.1	Turbidity	< 1	N.T.U.	1.	1.	16	6/4/2015	Measured: 0.09

DWR Bryte Analytical Lab

1450 Riverbank Road, West Sacramento, CA 95605

Report of Analytical Results

22-Jun-15

Submittal Name: Napa L&S 2015

Submittal ID: CH0615B0001

These results are also available to DWR staff in electronic form via the DWR Water Data Library (WDL) http://wdl.water.ca.gov. Contact Kelley Pepper (kelley.pepper@water.ca.gov) to set up access.

(First) Collection Date: 6/3/2015

Received Date: 6/3/2015 3:50:00 PM

Report to:

Bill Brewster
DWR North Central Region Office

, CA

Priority: 5

Submitted By: John MacDougall

Received By: Carroll, Marilyn

Instructions to Lab:

Samples:

CH0615B0001	CH0615B0002	CH0615B0003	CH0615B0004	CH0615B0005	CH0615B0006
CH0615B0013	CH0615B0016	CH0615B0017			

Analyst Summary:

16 - Carroll, Marilyn	20 - Chan, Elaine	5 - Hernandez, Richard	9 - Pineda, Maritza	10 - Quiambao, Josie
13 - Thind, Pritam				

Submittal Review Notes From Lab:

Sample and Analyte Flag Summary

Flag	*Flag Description*
R4	Analyte Reporting Limit raised due to high analyte level.

Report of Field Results

Sample Number CH0615B0001 **Field Results**

StationNumber:	StationName	Matrix	Cost Code:	Collection Date
05N04W02N990M	NapaCounty-214s	Water, Natural	L10583900000	6/03/2015 8:09 AM

Method	Analyte	Result	Rpt.Lmt.	Units	Time	Footnotes
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		
Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number CH0615B0002 **Field Results**

StationNumber:	StationName	Matrix	Cost Code:	Collection Date
05N04W02N991M	NapaCounty-215d	Water, Natural	L10583900000	6/03/2015 7:16 AM

Method	Analyte	Result	Rpt.Lmt.	Units	Time	Footnotes
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		
Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number CH0615B0003 **Field Results**

StationNumber:	StationName	Matrix	Cost Code:	Collection Date
06N04W18J992M	NapaCounty-216s	Water, Natural	L10583900000	6/03/2015 1:03 PM

Method	Analyte	Result	Rpt.Lmt.	Units	Time	Footnotes
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		
Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number CH0615B0004 **Field Results**

StationNumber:	StationName	Matrix	Cost Code:	Collection Date
06N04W18J993M	NapaCounty-217d	Water, Natural	L10583900000	6/03/2015 12:23 PM

Method	Analyte	Result	Rpt.Lmt.	Units	Time	Footnotes
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		
Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number CH0615B0005 **Field Results**

StationNumber:	StationName	Matrix	Cost Code:	Collection Date
06N04W16G994M	NapaCounty-218s	Water, Natural	L10583900000	6/03/2015 11:02 AM

Method	Analyte	Result	Rpt.Lmt.	Units	Time	Footnotes
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		

Sample Number **CH0615B0005** ***Field Results***

Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number **CH0615B0006** ***Field Results***

StationNumber:	*StationName*	*Matrix*	*Cost Code:*	*Collection Date*
06N04W16G995M	NapaCounty-219d	Water, Natural	L10583900000	6/03/2015 10:04 AM

Method	*Analyte*	*Result*	*Rpt.Lmt.*	*Units*	*Time*	*Footnotes*
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		
Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number **CH0615B0013** ***Field Results***

StationNumber:	*StationName*	*Matrix*	*Cost Code:*	*Collection Date*
E3012234	NapaCounty-swgw_SW2	Water, Natural	L10583900000	6/03/2015 1:15 PM

Method	*Analyte*	*Result*	*Rpt.Lmt.*	*Units*	*Time*	*Footnotes*
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		
Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number **CH0615B0016** ***Field Results***

StationNumber:	*StationName*	*Matrix*	*Cost Code:*	*Collection Date*
06N04W18J993M	NapaCounty-217d	Water, Natural	L10583900000	6/03/2015 12:23 PM

Method	*Analyte*	*Result*	*Rpt.Lmt.*	*Units*	*Time*	*Footnotes*
Specific Conductance	Conductance (EC)		1	µS/cm		
Dissolved Oxygen (Electrode)	Dissolved Oxygen			mg/L		
pH (Field)	pH					
Oxidation-Reduction Potential	Redox Potential		10	mV		
Turbidity, Nephalometry (Fiel	Turbidity		1	N.T.U.		
Temperature, Water (Field)	Water Temperature (w/time)			°C		

Sample Number **CH0615B0017** ***Field Results***

StationNumber:	*StationName*	*Matrix*	*Cost Code:*	*Collection Date*
Blank; Field	Blank; Field	Water, Purified	L10583900000	6/03/2015 1:06 PM

Method	*Analyte*	*Result*	*Rpt.Lmt.*	*Units*	*Time*	*Footnotes*
Specific Conductance	Conductance (EC)		1	µS/cm		
pH (Field)	pH					
Temperature, Water (Field)	Water Temperature			°C		

Report of Inorganic Analytical Results

Including Misc Physical Measurements

Sample Number **CH0615B0001** ***Inorganic Analytical Results***

CH0615B0001 ***Sample Type(Purpose):*** Normal Sample ***Depth:*** 1 m ***Collection Date:*** 6/3/2015 8:09:00 AM

StationNumber: 05N04W02N990M ***StationName:*** NapaCounty-214s ***Matrix:*** Water, Natural ***Cost Code:*** L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*
Std Method 2510-B	Conductance (EC)	416	µS/cm	1.	1.	20	6/4/2015	

Sample Number **CH0615B0001** ***Inorganic Analytical Results***

EPA 200.8 (D)	Dissolved Aluminum	< 0.01	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	0.081	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	117	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.7 (D)	Dissolved Boron	0.1853	mg/L	0.1	1.	10	6/11/2015	
EPA 300.0 28d Hold	Dissolved Bromide	0.07	mg/L	0.01	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Calcium	19.02	mg/L	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 300.0 28d Hold	Dissolved Chloride	28	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Chromium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Copper	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Fluoride	0.17	mg/L	0.1	1.	9	6/9/2015	
Std Method 2340 B	Dissolved Hardness	144	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Iron	0.009	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	0.011	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	23.39	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	2.53	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.003	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Nitrate	7.33	mg/L	0.1	1.	9	6/9/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	0.02	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	1.064	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	31.35	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	0.144	mg/L	0.005	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	45.29	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	< 0.005	mg/L	0.005	1.	13	6/4/2015	
Std Method 2320 B	pH	6.9		0.1	1.	20	6/4/2015	
Std Method 2320 B	Total Alkalinity	117	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	268	mg/L	1.	1.	20	6/5/2015	
Std Method 2540 C	Total Dissolved Solids	268	mg/L	1.	1.	20	6/5/2015	Dup-CH0615B0001
EPA 180.1	Turbidity	1.21	N.T.U.	1.	1.	16	6/4/2015	

Sample Number **CH0615B0002** ***Inorganic Analytical Results***

CH0615B0002 ***Sample Type(Purpose):*** Normal Sample ***Depth:*** 1 m ***Collection Date:*** 6/3/2015 7:16:00 AM

StationNumber: 05N04W02N991M ***StationName:*** NapaCounty-215d ***Matrix:*** Water, Natural ***Cost Code:*** L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*
Std Method 2510-B	Conductance (EC)	1174	µS/cm	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Aluminum	< 0.01	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	0.007	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	0.103	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	

Sample Number **CH0615B0002** ***Inorganic Analytical Results***

Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	258	mg/L as CaCO3	1.	1.	20	6/4/2015		
EPA 200.7 (D)	Dissolved Boron	1.416	mg/L	0.1	1.	10	6/11/2015		
EPA 300.0 28d Hold	Dissolved Bromide	0.63	mg/L	0.01	1.	9	6/9/2015		
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 200.7 (D)	Dissolved Calcium	40.57	mg/L	1.	1.	10	6/11/2015		
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	1	mg/L as CaCO3	1.	1.	20	6/4/2015		
EPA 300.0 28d Hold	Dissolved Chloride	177	mg/L	10.	10.	9	6/9/2015	R4	Dil-CH0615B0002
EPA 200.8 (D)	Dissolved Chromium	< 0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Copper	0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 300.0 28d Hold	Dissolved Fluoride	0.18	mg/L	0.1	1.	9	6/9/2015		
Std Method 2340 B	Dissolved Hardness	226	mg/L as CaCO3	1.	1.	10	6/11/2015		
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015		
EPA 200.8 (D)	Dissolved Iron	0.042	mg/L	0.005	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Lithium	0.059	mg/L	0.005	1.	13	6/4/2015		
EPA 200.7 (D)	Dissolved Magnesium	30.24	mg/L	1.	1.	10	6/11/2015		
EPA 200.8 (D)	Dissolved Manganese	1.13	mg/L	0.005	1.	13	6/4/2015		
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015		
EPA 200.8 (D)	Dissolved Molybdenum	< 0.005	mg/L	0.005	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Nickel	0.002	mg/L	0.001	1.	13	6/4/2015		
EPA 300.0 28d Hold	Dissolved Nitrate	< 0.1	mg/L	0.1	1.	9	6/9/2015		
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015		
EPA 200.7 (D)	Dissolved Potassium	4.505	mg/L	0.5	1.	10	6/11/2015		
EPA 200.8 (D)	Dissolved Selenium	0.002	mg/L	0.001	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 200.7 (D)	Dissolved Sodium	163.5	mg/L	1.	1.	10	6/11/2015		
EPA 200.8 (D)	Dissolved Strontium	0.32	mg/L	0.005	1.	13	6/4/2015		
EPA 300.0 28d Hold	Dissolved Sulfate	74	mg/L	1.	1.	9	6/9/2015		
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Zinc	< 0.005	mg/L	0.005	1.	13	6/4/2015		
Std Method 2320 B	pH	7.3		0.1	1.	20	6/4/2015		
Std Method 2320 B	Total Alkalinity	258	mg/L as CaCO3	1.	1.	20	6/4/2015		
Std Method 2540 C	Total Dissolved Solids	683	mg/L	1.	1.	20	6/5/2015		
EPA 180.1	Turbidity	2.75	N.T.U.	1.	1.	16	6/4/2015		

Sample Number **CH0615B0003** ***Inorganic Analytical Results***

CH0615B0003 ***Sample Type(Purpose):*** Normal Sample ***Depth:*** 1 m ***Collection Date:*** 6/3/2015 1:03:00 PM

StationNumber: 06N04W18J992M ***StationName:*** NapaCounty-216s ***Matrix:*** Water, Natural ***Cost Code:*** L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*	
Std Method 2510-B	Conductance (EC)	317	µS/cm	1.	1.	20	6/4/2015		
EPA 200.8 (D)	Dissolved Aluminum	0.089	mg/L	0.01	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Arsenic	< 0.001	mg/L	0.001	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Barium	0.046	mg/L	0.005	1.	13	6/4/2015		
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015		
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	93	mg/L as CaCO3	1.	1.	20	6/4/2015		
EPA 200.7 (D)	Dissolved Boron	< 0.1	mg/L	0.1	1.	10	6/11/2015		Measured: 0.0927
EPA 300.0 28d Hold	Dissolved Bromide	0.12	mg/L	0.01	1.	9	6/9/2015		Dup-CH0615B0003
EPA 300.0 28d Hold	Dissolved Bromide	0.12	mg/L	0.01	1.	9	6/9/2015		
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015		

Sample Number CH0615B0003 *Inorganic Analytical Results*

EPA 200.7 (D)	Dissolved Calcium	22.26	mg/L	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 300.0 28d Hold	Dissolved Chloride	15.34	mg/L	1.	1.	9	6/9/2015	
EPA 300.0 28d Hold	Dissolved Chloride	15.33	mg/L	1.	1.	9	6/9/2015	Dup-CH0615B0003
EPA 200.8 (D)	Dissolved Chromium	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Copper	0.003	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Fluoride	0.16	mg/L	0.1	1.	9	6/9/2015	Dup-CH0615B0003
EPA 300.0 28d Hold	Dissolved Fluoride	0.16	mg/L	0.1	1.	9	6/9/2015	
Std Method 2340 B	Dissolved Hardness	116	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Iron	0.066	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	0.012	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	14.61	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	0.041	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.002	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Nitrate	5.4	mg/L	0.1	1.	9	6/9/2015	Dup-CH0615B0003
EPA 300.0 28d Hold	Dissolved Nitrate	5.4	mg/L	0.1	1.	9	6/9/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	0.01	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	0.8767	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	21.55	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	0.169	mg/L	0.005	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	38.3	mg/L	1.	1.	9	6/9/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	38.3	mg/L	1.	1.	9	6/9/2015	Dup-CH0615B0003
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	< 0.005	mg/L	0.005	1.	13	6/4/2015	
Std Method 2320 B	pH	6.8		0.1	1.	20	6/4/2015	
Std Method 2320 B	Total Alkalinity	93	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	208	mg/L	1.	1.	20	6/5/2015	
EPA 180.1	Turbidity	77.4	N.T.U.	3.	3.	16	6/4/2015	R4

Sample Number CH0615B0004 *Inorganic Analytical Results*

CH0615B0004 *Sample Type(Purpose):* Normal Sample *Depth:* 1 m *Collection Date:* 6/3/2015 12:23:00 PM

StationNumber: 06N04W18J993M *StationName:* NapaCounty-217d *Matrix:* Water, Natural *Cost Code:* L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*
Std Method 2510-B	Conductance (EC)	255	µS/cm	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Aluminum	0.432	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	0.027	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	116	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.7 (D)	Dissolved Boron	< 0.1	mg/L	0.1	1.	10	6/11/2015	Measured: 0.0798
EPA 300.0 28d Hold	Dissolved Bromide	0.06	mg/L	0.01	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Calcium	15.21	mg/L	1.	1.	10	6/11/2015	

Sample Number CH0615B0004 **Inorganic Analytical Results**

Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 300.0 28d Hold	Dissolved Chloride	5	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Chromium	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Copper	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Fluoride	0.56	mg/L	0.1	1.	9	6/9/2015	
Std Method 2340 B	Dissolved Hardness	74	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Iron	0.331	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	0.014	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	8.758	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	0.643	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.002	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Nitrate	< 0.1	mg/L	0.1	1.	9	6/9/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	1.309	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	28.53	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	0.107	mg/L	0.005	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	9.31	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	< 0.005	mg/L	0.005	1.	13	6/4/2015	
Std Method 2320 B	pH	7.4		0.1	1.	20	6/4/2015	
Std Method 2320 B	Total Alkalinity	116	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	164	mg/L	1.	1.	20	6/5/2015	
EPA 180.1	Turbidity	7.29	N.T.U.	1.	1.	16	6/4/2015	

Sample Number CH0615B0005 **Inorganic Analytical Results**

CH0615B0005 ***Sample Type(Purpose):*** Normal Sample ***Depth:*** 1 m ***Collection Date:*** 6/3/2015 11:02:00 AM

StationNumber: 06N04W16G994M ***StationName:*** NapaCounty-218s ***Matrix:*** Water, Natural ***Cost Code:*** L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	Analyte	Result	Units	R.L.	Dilution	ChemID	Analysis Date	Flags and Notes:
Std Method 2510-B	Conductance (EC)	536	µS/cm	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Aluminum	< 0.01	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	0.091	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	192	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.7 (D)	Dissolved Boron	0.1072	mg/L	0.1	1.	10	6/11/2015	
EPA 300.0 28d Hold	Dissolved Bromide	0.13	mg/L	0.01	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Calcium	47.39	mg/L	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 300.0 28d Hold	Dissolved Chloride	19	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Chromium	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Copper	< 0.001	mg/L	0.001	1.	13	6/4/2015	

Sample Number **CH0615B0005** **Inorganic Analytical Results**

EPA 300.0 28d Hold	Dissolved Fluoride	< 0.1	mg/L	0.1	1.	9	6/9/2015	
Std Method 2340 B	Dissolved Hardness	247	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Iron	0.008	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	0.01	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	31.18	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.003	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Nitrate	1.8	mg/L	0.1	1.	9	6/9/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	0.7058	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	20.11	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	0.357	mg/L	0.005	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	65.1	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	< 0.005	mg/L	0.005	1.	13	6/4/2015	
Std Method 2320 B	pH	6.7		0.1	1.	20	6/4/2015	
Std Method 2320 B	Total Alkalinity	192	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	324	mg/L	1.	1.	20	6/5/2015	
EPA 180.1	Turbidity	5.06	N.T.U.	1.	1.	16	6/4/2015	

Sample Number **CH0615B0006** **Inorganic Analytical Results**

CH0615B0006 ***Sample Type(Purpose):*** Normal Sample ***Depth:*** 1 m ***Collection Date:*** 6/3/2015 10:04:00 AM

StationNumber: 06N04W16G995M ***StationName:*** NapaCounty-219d ***Matrix:*** Water, Natural ***Cost Code:*** L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*
Std Method 2510-B	Conductance (EC)	712	µS/cm	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Aluminum	< 0.01	mg/L	0.01	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Aluminum	< 0.01	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Arsenic	0.046	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	0.046	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Barium	0.088	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	0.088	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	224	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.7 (D)	Dissolved Boron	9.063	mg/L	0.1	1.	10	6/11/2015	
EPA 300.0 28d Hold	Dissolved Bromide	0.33	mg/L	0.01	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.7 (D)	Dissolved Calcium	16.74	mg/L	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 300.0 28d Hold	Dissolved Chloride	73	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Chromium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Chromium	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	

Sample Number **CH0615B0006**

Inorganic Analytical Results

EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Copper	0.005	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Copper	0.005	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Fluoride	0.25	mg/L	0.1	1.	9	6/9/2015	
Std Method 2340 B	Dissolved Hardness	116	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Iron	0.021	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Iron	0.021	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	0.038	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Lithium	0.037	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	17.9	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	0.242	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Manganese	0.241	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	0.014	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Molybdenum	0.013	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 300.0 28d Hold	Dissolved Nitrate	< 0.1	mg/L	0.1	1.	9	6/9/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015	Dup-CH0615B0006
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	5.163	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	107.9	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	0.125	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Strontium	0.126	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 300.0 28d Hold	Dissolved Sulfate	32	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
EPA 200.8 (D)	Dissolved Zinc	0.006	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	0.006	mg/L	0.005	1.	13	6/4/2015	Dup-CH0615B0006
Std Method 2320 B	pH	7.4		0.1	1.	20	6/4/2015	
Std Method 2320 B	Total Alkalinity	225	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	452	mg/L	1.	1.	20	6/5/2015	
EPA 180.1	Turbidity	1.16	N.T.U.	1.	1.	16	6/4/2015	

Sample Number **CH0615B0013**

Inorganic Analytical Results

CH0615B0013 *Sample Type(Purpose):* Normal Sample *Depth:* 1 m *Collection Date:* 6/3/2015 1:15:00 PM

StationNumber: E3012234 *StationName:* NapaCounty-swgw_SW2 *Matrix:* Water, Natural *Cost Code:* L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*
Std Method 2510-B	Conductance (EC)	411	µS/cm	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Aluminum	0.029	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	0.059	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	153	mg/L as CaCO3	1.	1.	20	6/4/2015	

Sample Number **CH0615B0013** ***Inorganic Analytical Results***

EPA 200.7 (D)	Dissolved Boron	0.1329	mg/L	0.1	1.	10	6/11/2015	
EPA 300.0 28d Hold	Dissolved Bromide	0.02	mg/L	0.01	1.	9	6/8/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Calcium	33.74	mg/L	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 300.0 28d Hold	Dissolved Chloride	12.13	mg/L	1.	1.	9	6/8/2015	
EPA 200.8 (D)	Dissolved Chromium	0.005	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	Measured: 0.001
EPA 200.8 (D)	Dissolved Copper	0.006	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Fluoride	0.17	mg/L	0.1	1.	9	6/8/2015	
Std Method 2340 B	Dissolved Hardness	159	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Iron	0.091	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	0.008	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	18.05	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	0.024	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.013	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Nitrate	0.5	mg/L	0.1	1.	9	6/8/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	2.142	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	28.27	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	0.269	mg/L	0.005	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	44.13	mg/L	1.	1.	9	6/8/2015	
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	0.027	mg/L	0.005	1.	13	6/4/2015	
Std Method 2320 B	pH	7.6		0.1	1.	20	6/4/2015	
Std Method 2320 B	Total Alkalinity	154	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	255	mg/L	1.	1.	20	6/5/2015	
EPA 180.1	Turbidity	1.37	N.T.U.	1.	1.	16	6/4/2015	

Sample Number **CH0615B0016** ***Inorganic Analytical Results***

CH0615B0016 ***Sample Type(Purpose):*** Duplicate Sample CH0615B0004 ***Depth:*** 1 m ***Collection Date:*** 6/3/2015 12:23:00 PM

StationNumber: 06N04W18J993M ***StationName:*** NapaCounty-217d ***Matrix:*** Water, Natural ***Cost Code:*** L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*
Std Method 2510-B	Conductance (EC)	256	µS/cm	1.	1.	20	6/4/2015	Dup-CH0615B0016
Std Method 2510-B	Conductance (EC)	256	µS/cm	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Aluminum	0.422	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	0.027	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	118	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	118	mg/L as CaCO3	1.	1.	20	6/4/2015	Dup-CH0615B0016
EPA 200.7 (D)	Dissolved Boron	< 0.1	mg/L	0.1	1.	10	6/11/2015	Measured: 0.0808
EPA 300.0 28d Hold	Dissolved Bromide	0.06	mg/L	0.01	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	

Sample Number CH0615B0016 — *Inorganic Analytical Results*

EPA 200.7 (D)	Dissolved Calcium	15.05	mg/L	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	Dup-CH0615B0016
EPA 300.0 28d Hold	Dissolved Chloride	5	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Chromium	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Copper	0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Fluoride	0.549	mg/L	0.1	1.	9	6/9/2015	
Std Method 2340 B	Dissolved Hardness	74	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	Dup-CH0615B0016
EPA 200.8 (D)	Dissolved Iron	0.331	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	0.014	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	8.798	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	0.635	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	0.002	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Nitrate	< 0.1	mg/L	0.1	1.	9	6/9/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	1.349	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	28.53	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	0.109	mg/L	0.005	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	9.2	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	< 0.005	mg/L	0.005	1.	13	6/4/2015	
Std Method 2320 B	pH	7.4		0.1	1.	20	6/4/2015	
Std Method 2320 B	pH	7.4		0.1	1.	20	6/4/2015	Dup-CH0615B0016
Std Method 2320 B	Total Alkalinity	118	mg/L as CaCO3	1.	1.	20	6/4/2015	Dup-CH0615B0016
Std Method 2320 B	Total Alkalinity	118	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	165	mg/L	1.	1.	20	6/5/2015	
EPA 180.1	Turbidity	6.68	N.T.U.	1.	1.	16	6/4/2015	Dup-CH0615B0016
EPA 180.1	Turbidity	6.23	N.T.U.	1.	1.	16	6/4/2015	

Sample Number CH0615B0017 — *Inorganic Analytical Results*

CH0615B0017 *Sample Type(Purpose):* Blank; Field *Depth:* 0 m *Collection Date:* 6/3/2015 1:06:00 PM

StationNumber: Blank; Field *StationName:* Blank; Field *Matrix:* Water, Purified *Cost Code:* L10583900000

Sample Condition: 2.0 °C when received. Iced.

Method	*Analyte*	*Result*	*Units*	*R.L.*	*Dilution*	*ChemID*	*Analysis Date*	*Flags and Notes:*
Std Method 2510-B	Conductance (EC)	< 1	µS/cm	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Aluminum	< 0.01	mg/L	0.01	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Antimony	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Arsenic	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Barium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Beryllium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
Std Method 4500-CO2 D	Dissolved Bicarbonate (HCO3-)	2	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.7 (D)	Dissolved Boron	< 0.1	mg/L	0.1	1.	10	6/11/2015	
EPA 300.0 28d Hold	Dissolved Bromide	< 0.01	mg/L	0.01	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Cadmium	< 0.001	mg/L	0.001	1.	13	6/4/2015	

Report of Analytical Results, Cont

Sample Number CH0615B0017

Inorganic Analytical Results

EPA 200.7 (D)	Dissolved Calcium	< 1	mg/L	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Carbonate (CO3--)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 300.0 28d Hold	Dissolved Chloride	< 1	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Chromium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Cobalt	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Copper	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Fluoride	< 0.1	mg/L	0.1	1.	9	6/9/2015	
Std Method 2340 B	Dissolved Hardness	< 1	mg/L as CaCO3	1.	1.	10	6/11/2015	
Std Method 4500-CO2 D	Dissolved Hydroxide (OH-)	< 1	mg/L as CaCO3	1.	1.	20	6/4/2015	
EPA 200.8 (D)	Dissolved Iron	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lead	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Lithium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Magnesium	< 1	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Manganese	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (Hg Dissolved)	Dissolved Mercury	< 0.0002	mg/L	0.0002	1.	13	6/18/2015	
EPA 200.8 (D)	Dissolved Molybdenum	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Nickel	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Nitrate	< 0.1	mg/L	0.1	1.	9	6/9/2015	
Std Method 4500-NO2 B (48	Dissolved Nitrite	< 0.01	mg/L as N	0.01	1.	5	6/4/2015	
EPA 200.7 (D)	Dissolved Potassium	< 0.5	mg/L	0.5	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Selenium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Silver	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.7 (D)	Dissolved Sodium	< 1	mg/L	1.	1.	10	6/11/2015	
EPA 200.8 (D)	Dissolved Strontium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 300.0 28d Hold	Dissolved Sulfate	< 1	mg/L	1.	1.	9	6/9/2015	
EPA 200.8 (D)	Dissolved Thallium	< 0.001	mg/L	0.001	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Vanadium	< 0.005	mg/L	0.005	1.	13	6/4/2015	
EPA 200.8 (D)	Dissolved Zinc	< 0.005	mg/L	0.005	1.	13	6/4/2015	
Std Method 2320 B	pH	5.2		0.1	1.	20	6/4/2015	
Std Method 2320 B	Total Alkalinity	2	mg/L as CaCO3	1.	1.	20	6/4/2015	
Std Method 2540 C	Total Dissolved Solids	< 1	mg/L	1.	1.	20	6/5/2015	
EPA 180.1	Turbidity	< 1	N.T.U.	1.	1.	16	6/4/2015	Measured: 0.09

State of California **Department of Water Resources** **The Resources Agency**

Bryte Chemical Laboratory Chain of Custody

Submittal ID & Run/Submittal Name: CH0615B0001 - Napa L&S 2015

Send Report To: Bill Brewster
DWR North Central Region Office

CA

Activity Unit: 6200

Container Summary

Polyethylene, 1 Pint, HNO3, pH <2, Filt	~~19~~ 9
Polyethylene, 1 Pint	~~19~~ 9
Polyethylene, 1 Quart, Filt	~~19~~ 9
Polyethylene, 1/2 Pint, Filt	~~19~~ 9
Polyethylene, 1/2 Pint, HNO3, pH <2, Filt	~~19~~ 9
Bottle Check: Lab Initials: MC Field Initials: JM Total:	~~95~~ 45

Sampler(s): John MacDougall

Instructions to Lab:

Notice: Please deliver samples to the lab as soon as possible. Allow time for lab handling and preparation after delivery. The lab is not responsible for missed holding times due to late delivery. SEE YOUR LAB ANALYSIS GROUPS FOR MINIMUM SAMPLE HOLD TIME. Samples must be transported in accordance with method and handling requirements, on ice and arrive below 6°C if transported overnight.

Submitted By: Signature: John M Date Relinquished: 6-3-15

Print Name: John MacDougall Phone Number: 530-908-4200

Received By: Signature: Carroll Print Name Marilyn Carroll

Date and Time Received: 6/3/15 15:50 Condition When Received: 2 °C Iced? Yes ☒ No ☐

Submittal ID: CH0615B0001

DWR Sample Number **CH0615B0001**

Collection Date 6/3/2015 Collection Time: 08:09 EC: 483 µS/cm

Station No.: 05N04W02N990M Station Name: NapaCounty-214s Matrix: Water, Natural

Add'l Note: Cost Code: L10583900000

Alkalinity	Fld Filtered	Carbonate by Calculation	Fld Filtered
Electrical Conductivity (EC)		Dissolved Boron	Fld Filtered
Dissolved Calcium	Fld Filtered	Dissolved Magnesium	Fld Filtered
Dissolved Potassium	Fld Filtered	Dissolved Sodium	Fld Filtered
Dissolved Aluminum	Fld Filtered	Dissolved Antimony	Fld Filtered
Dissolved Arsenic	Fld Filtered	Dissolved Barium	Fld Filtered
Dissolved Beryllium	Fld Filtered	Dissolved Cadmium	Fld Filtered
Dissolved Chromium	Fld Filtered	Dissolved Cobalt	Fld Filtered
Dissolved Copper	Fld Filtered	Dissolved Iron	Fld Filtered
Dissolved Lead	Fld Filtered	Dissolved Lithium	Fld Filtered
Dissolved Manganese	Fld Filtered	Dissolved Molybdenum	Fld Filtered
Dissolved Nickel	Fld Filtered	Dissolved Selenium	Fld Filtered
Dissolved Silver	Fld Filtered	Dissolved Strontium	Fld Filtered
Dissolved Thallium	Fld Filtered	Dissolved Vanadium	Fld Filtered
Dissolved Zinc	Fld Filtered	Dissolved Bromide	Fld Filtered
Dissolved Chloride	Fld Filtered	Dissolved Fluoride	Fld Filtered
Dissolved Nitrate	Fld Filtered	Dissolved Sulfate	Fld Filtered
Dissolved Mercury	Fld Filtered	Dissolved Nitrite	Fld Filtered
Total Dissolved Solids (TDS)	Fld Filtered	Total Hardness By Calculation	Fld Filtered
Turbidity			

DWR Sample Number Collection Date 6/3/2015 Collection Time: 07 : 16 EC: 1217 µS/cm

CH0615B0002 Station No.: 05N04W02N991M Station Name: NapaCounty-215d Matrix: Water, Natural

Add'l Note: Cost Code: L10583900000

Alkalinity		Fld Filtered	Carbonate by Calculation		Fld Filtered
Electrical Conductivity (EC)			Dissolved Boron		Fld Filtered
Dissolved Calcium		Fld Filtered	Dissolved Magnesium		Fld Filtered
Dissolved Potassium		Fld Filtered	Dissolved Sodium		Fld Filtered
Dissolved Aluminum		Fld Filtered	Dissolved Antimony		Fld Filtered
Dissolved Arsenic		Fld Filtered	Dissolved Barium		Fld Filtered
Dissolved Beryllium		Fld Filtered	Dissolved Cadmium		Fld Filtered
Dissolved Chromium		Fld Filtered	Dissolved Cobalt		Fld Filtered
Dissolved Copper		Fld Filtered	Dissolved Iron		Fld Filtered
Dissolved Lead		Fld Filtered	Dissolved Lithium		Fld Filtered
Dissolved Manganese		Fld Filtered	Dissolved Molybdenum		Fld Filtered
Dissolved Nickel		Fld Filtered	Dissolved Selenium		Fld Filtered
Dissolved Silver		Fld Filtered	Dissolved Strontium		Fld Filtered
Dissolved Thallium		Fld Filtered	Dissolved Vanadium		Fld Filtered
Dissolved Zinc		Fld Filtered	Dissolved Bromide		Fld Filtered
Dissolved Chloride		Fld Filtered	Dissolved Fluoride		Fld Filtered
Dissolved Nitrate		Fld Filtered	Dissolved Sulfate		Fld Filtered
Dissolved Mercury		Fld Filtered	Dissolved Nitrite		Fld Filtered
Total Dissolved Solids (TDS)		Fld Filtered	Total Hardness By Calculation		Fld Filtered
Turbidity					

DWR Sample Number Collection Date 6/3/2015 Collection Time: ~~07:16~~ 13:03 EC: 347 µS/cm

CH0615B0003 Station No.: 06N04W18J992M Station Name: NapaCounty-216s Matrix: Water, Natural

Add'l Note: Cost Code: L10583900000

Alkalinity		Fld Filtered	Carbonate by Calculation		Fld Filtered
Electrical Conductivity (EC)			Dissolved Boron		Fld Filtered
Dissolved Calcium		Fld Filtered	Dissolved Magnesium		Fld Filtered
Dissolved Potassium		Fld Filtered	Dissolved Sodium		Fld Filtered
Dissolved Aluminum		Fld Filtered	Dissolved Antimony		Fld Filtered
Dissolved Arsenic		Fld Filtered	Dissolved Barium		Fld Filtered
Dissolved Beryllium		Fld Filtered	Dissolved Cadmium		Fld Filtered
Dissolved Chromium		Fld Filtered	Dissolved Cobalt		Fld Filtered
Dissolved Copper		Fld Filtered	Dissolved Iron		Fld Filtered
Dissolved Lead		Fld Filtered	Dissolved Lithium		Fld Filtered
Dissolved Manganese		Fld Filtered	Dissolved Molybdenum		Fld Filtered
Dissolved Nickel		Fld Filtered	Dissolved Selenium		Fld Filtered
Dissolved Silver		Fld Filtered	Dissolved Strontium		Fld Filtered
Dissolved Thallium		Fld Filtered	Dissolved Vanadium		Fld Filtered
Dissolved Zinc		Fld Filtered	Dissolved Bromide		Fld Filtered
Dissolved Chloride		Fld Filtered	Dissolved Fluoride		Fld Filtered
Dissolved Nitrate		Fld Filtered	Dissolved Sulfate		Fld Filtered
Dissolved Mercury		Fld Filtered	Dissolved Nitrite		Fld Filtered
Total Dissolved Solids (TDS)		Fld Filtered	Total Hardness By Calculation		Fld Filtered
Turbidity					

DWR Sample Number
CH0615B0004
Collection Date 6/3/2015
Collection Time: 12: 23
EC: 293 µS/cm
Station No.: 06N04W18J993M
Station Name: NapaCounty-217d
Matrix: Water, Natural
Add'l Note:
Cost Code: L10583900000

Alkalinity		Fld Filtered	Carbonate by Calculation		Fld Filtered
Electrical Conductivity (EC)			Dissolved Boron		Fld Filtered
Dissolved Calcium		Fld Filtered	Dissolved Magnesium		Fld Filtered
Dissolved Potassium		Fld Filtered	Dissolved Sodium		Fld Filtered
Dissolved Aluminum		Fld Filtered	Dissolved Antimony		Fld Filtered
Dissolved Arsenic		Fld Filtered	Dissolved Barium		Fld Filtered
Dissolved Beryllium		Fld Filtered	Dissolved Cadmium		Fld Filtered
Dissolved Chromium		Fld Filtered	Dissolved Cobalt		Fld Filtered
Dissolved Copper		Fld Filtered	Dissolved Iron		Fld Filtered
Dissolved Lead		Fld Filtered	Dissolved Lithium		Fld Filtered
Dissolved Manganese		Fld Filtered	Dissolved Molybdenum		Fld Filtered
Dissolved Nickel		Fld Filtered	Dissolved Selenium		Fld Filtered
Dissolved Silver		Fld Filtered	Dissolved Strontium		Fld Filtered
Dissolved Thallium		Fld Filtered	Dissolved Vanadium		Fld Filtered
Dissolved Zinc		Fld Filtered	Dissolved Bromide		Fld Filtered
Dissolved Chloride		Fld Filtered	Dissolved Fluoride		Fld Filtered
Dissolved Nitrate		Fld Filtered	Dissolved Sulfate		Fld Filtered
Dissolved Mercury		Fld Filtered	Dissolved Nitrite		Fld Filtered
Total Dissolved Solids (TDS)		Fld Filtered	Total Hardness By Calculation		Fld Filtered
Turbidity					

DWR Sample Number
CH0615B0005
Collection Date 6/3/2015
Collection Time: 11 : 02
EC: 554 µS/cm
Station No.: 06N04W16G994M
Station Name: NapaCounty-218s
Matrix: Water, Natural
Add'l Note:
Cost Code: L10583900000

Alkalinity		Fld Filtered	Carbonate by Calculation		Fld Filtered
Electrical Conductivity (EC)			Dissolved Boron		Fld Filtered
Dissolved Calcium		Fld Filtered	Dissolved Magnesium		Fld Filtered
Dissolved Potassium		Fld Filtered	Dissolved Sodium		Fld Filtered
Dissolved Aluminum		Fld Filtered	Dissolved Antimony		Fld Filtered
Dissolved Arsenic		Fld Filtered	Dissolved Barium		Fld Filtered
Dissolved Beryllium		Fld Filtered	Dissolved Cadmium		Fld Filtered
Dissolved Chromium		Fld Filtered	Dissolved Cobalt		Fld Filtered
Dissolved Copper		Fld Filtered	Dissolved Iron		Fld Filtered
Dissolved Lead		Fld Filtered	Dissolved Lithium		Fld Filtered
Dissolved Manganese		Fld Filtered	Dissolved Molybdenum		Fld Filtered
Dissolved Nickel		Fld Filtered	Dissolved Selenium		Fld Filtered
Dissolved Silver		Fld Filtered	Dissolved Strontium		Fld Filtered
Dissolved Thallium		Fld Filtered	Dissolved Vanadium		Fld Filtered
Dissolved Zinc		Fld Filtered	Dissolved Bromide		Fld Filtered
Dissolved Chloride		Fld Filtered	Dissolved Fluoride		Fld Filtered
Dissolved Nitrate		Fld Filtered	Dissolved Sulfate		Fld Filtered
Dissolved Mercury		Fld Filtered	Dissolved Nitrite		Fld Filtered
Total Dissolved Solids (TDS)		Fld Filtered	Total Hardness By Calculation		Fld Filtered
Turbidity					

DWR Sample Number Collection Date 6/3/2015 Collection Time: 10:04 EC: 704 µS/cm

CH0615B0006 Station No.: 06N04W16G995M Station Name: NapaCounty-219d Matrix: Water, Natural

Add'l Note: Cost Code: L10583900000

Alkalinity		Fld Filtered	Carbonate by Calculation		Fld Filtered
Electrical Conductivity (EC)			Dissolved Boron		Fld Filtered
Dissolved Calcium		Fld Filtered	Dissolved Magnesium		Fld Filtered
Dissolved Potassium		Fld Filtered	Dissolved Sodium		Fld Filtered
Dissolved Aluminum		Fld Filtered	Dissolved Antimony		Fld Filtered
Dissolved Arsenic		Fld Filtered	Dissolved Barium		Fld Filtered
Dissolved Beryllium		Fld Filtered	Dissolved Cadmium		Fld Filtered
Dissolved Chromium		Fld Filtered	Dissolved Cobalt		Fld Filtered
Dissolved Copper		Fld Filtered	Dissolved Iron		Fld Filtered
Dissolved Lead		Fld Filtered	Dissolved Lithium		Fld Filtered
Dissolved Manganese		Fld Filtered	Dissolved Molybdenum		Fld Filtered
Dissolved Nickel		Fld Filtered	Dissolved Selenium		Fld Filtered
Dissolved Silver		Fld Filtered	Dissolved Strontium		Fld Filtered
Dissolved Thallium		Fld Filtered	Dissolved Vanadium		Fld Filtered
Dissolved Zinc		Fld Filtered	Dissolved Bromide		Fld Filtered
Dissolved Chloride		Fld Filtered	Dissolved Fluoride		Fld Filtered
Dissolved Nitrate		Fld Filtered	Dissolved Sulfate		Fld Filtered
Dissolved Mercury		Fld Filtered	Dissolved Nitrite		Fld Filtered
Total Dissolved Solids (TDS)		Fld Filtered	Total Hardness By Calculation		Fld Filtered
Turbidity					

DWR Sample Number Collection Date 6/3/2015 Collection Time: : EC: µS/cm

CH0615B0007 Station No.: 07N04W31D996M Station Name: NapaCounty-220s Matrix: Water, Natural

Add'l Note: Cost Code: L10583900000

Alkalinity		Fld Filtered	Carbonate by Calculation		Fld Filtered
Electrical Conductivity (EC)			Dissolved Boron		Fld Filtered
Dissolved Calcium		Fld Filtered	Dissolved Magnesium		Fld Filtered
Dissolved Potassium		Fld Filtered	Dissolved Sodium		Fld Filtered
Dissolved Aluminum		Fld Filtered	Dissolved Antimony		Fld Filtered
Dissolved Arsenic		Fld Filtered	Dissolved Barium		Fld Filtered
Dissolved Beryllium		Fld Filtered	Dissolved Cadmium		Fld Filtered
Dissolved Chromium		Fld Filtered	Dissolved Cobalt		Fld Filtered
Dissolved Copper		Fld Filtered	Dissolved Iron		Fld Filtered
Dissolved Lead		Fld Filtered	Dissolved Lithium		Fld Filtered
Dissolved Manganese		Fld Filtered	Dissolved Molybdenum		Fld Filtered
Dissolved Nickel		Fld Filtered	Dissolved Selenium		Fld Filtered
Dissolved Silver		Fld Filtered	Dissolved Strontium		Fld Filtered
Dissolved Thallium		Fld Filtered	Dissolved Vanadium		Fld Filtered
Dissolved Zinc		Fld Filtered	Dissolved Bromide		Fld Filtered
Dissolved Chloride		Fld Filtered	Dissolved Fluoride		Fld Filtered
Dissolved Nitrate		Fld Filtered	Dissolved Sulfate		Fld Filtered
Dissolved Mercury		Fld Filtered	Dissolved Nitrite		Fld Filtered
Total Dissolved Solids (TDS)		Fld Filtered	Total Hardness By Calculation		Fld Filtered
Turbidity					

DWR Sample Number Collection Date 6/3/2015 Collection Time: : EC: µS/cm

CH0615B0008 Station No.: 07N04W31D997M Station Name: NapaCounty-221d Matrix: Water, Natural

Add'l Note: Cost Code: L10583900000

Alkalinity		Fld Filtered	Carbonate by Calculation		Fld Filtered
Electrical Conductivity (EC)			Dissolved Boron		Fld Filtered
Dissolved Calcium		Fld Filtered	Dissolved Magnesium		Fld Filtered
Dissolved Potassium		Fld Filtered	Dissolved Sodium		Fld Filtered
Dissolved Aluminum		Fld Filtered	Dissolved Antimony		Fld Filtered
Dissolved Arsenic		Fld Filtered	Dissolved Barium		Fld Filtered
Dissolved Beryllium		Fld Filtered	Dissolved Cadmium		Fld Filtered
Dissolved Chromium		Fld Filtered	Dissolved Cobalt		Fld Filtered
Dissolved Copper		Fld Filtered	Dissolved Iron		Fld Filtered
Dissolved Lead		Fld Filtered	Dissolved Lithium		Fld Filtered
Dissolved Manganese		Fld Filtered	Dissolved Molybdenum		Fld Filtered
Dissolved Nickel		Fld Filtered	Dissolved Selenium		Fld Filtered
Dissolved Silver		Fld Filtered	Dissolved Strontium		Fld Filtered
Dissolved Thallium		Fld Filtered	Dissolved Vanadium		Fld Filtered
Dissolved Zinc		Fld Filtered	Dissolved Bromide		Fld Filtered
Dissolved Chloride		Fld Filtered	Dissolved Fluoride		Fld Filtered
Dissolved Nitrate		Fld Filtered	Dissolved Sulfate		Fld Filtered
Dissolved Mercury		Fld Filtered	Dissolved Nitrite		Fld Filtered
Total Dissolved Solids (TDS)		Fld Filtered	Total Hardness By Calculation		Fld Filtered
Turbidity					

DWR Sample Number Collection Date 6/3/2015 Collection Time: : EC: µS/cm

CH0615B0009 Station No.: 08N05W30Q998M Station Name: NapaCounty-222s Matrix: Water, Natural

Add'l Note: Cost Code: L10583900000

Alkalinity		Fld Filtered	Carbonate by Calculation		Fld Filtered
Electrical Conductivity (EC)			Dissolved Boron		Fld Filtered
Dissolved Calcium		Fld Filtered	Dissolved Magnesium		Fld Filtered
Dissolved Potassium		Fld Filtered	Dissolved Sodium		Fld Filtered
Dissolved Aluminum		Fld Filtered	Dissolved Antimony		Fld Filtered
Dissolved Arsenic		Fld Filtered	Dissolved Barium		Fld Filtered
Dissolved Beryllium		Fld Filtered	Dissolved Cadmium		Fld Filtered
Dissolved Chromium		Fld Filtered	Dissolved Cobalt		Fld Filtered
Dissolved Copper		Fld Filtered	Dissolved Iron		Fld Filtered
Dissolved Lead		Fld Filtered	Dissolved Lithium		Fld Filtered
Dissolved Manganese		Fld Filtered	Dissolved Molybdenum		Fld Filtered
Dissolved Nickel		Fld Filtered	Dissolved Selenium		Fld Filtered
Dissolved Silver		Fld Filtered	Dissolved Strontium		Fld Filtered
Dissolved Thallium		Fld Filtered	Dissolved Vanadium		Fld Filtered
Dissolved Zinc		Fld Filtered	Dissolved Bromide		Fld Filtered
Dissolved Chloride		Fld Filtered	Dissolved Fluoride		Fld Filtered
Dissolved Nitrate		Fld Filtered	Dissolved Sulfate		Fld Filtered
Dissolved Mercury		Fld Filtered	Dissolved Nitrite		Fld Filtered
Total Dissolved Solids (TDS)		Fld Filtered	Total Hardness By Calculation		Fld Filtered
Turbidity					

DWR Sample Number Collection Date 6/3/2015 Collection Time: : EC: µS/cm

CH0615B0010 Station No.: 08N05W30Q999M Station Name: NapaCounty-223d Matrix: Water, Natural

Add'l Note: Cost Code: L10583900000

Alkalinity	Fld Filtered	Carbonate by Calculation	Fld Filtered
Electrical Conductivity (EC)		Dissolved Boron	Fld Filtered
Dissolved Calcium	Fld Filtered	Dissolved Magnesium	Fld Filtered
Dissolved Potassium	Fld Filtered	Dissolved Sodium	Fld Filtered
Dissolved Aluminum	Fld Filtered	Dissolved Antimony	Fld Filtered
Dissolved Arsenic	Fld Filtered	Dissolved Barium	Fld Filtered
Dissolved Beryllium	Fld Filtered	Dissolved Cadmium	Fld Filtered
Dissolved Chromium	Fld Filtered	Dissolved Cobalt	Fld Filtered
Dissolved Copper	Fld Filtered	Dissolved Iron	Fld Filtered
Dissolved Lead	Fld Filtered	Dissolved Lithium	Fld Filtered
Dissolved Manganese	Fld Filtered	Dissolved Molybdenum	Fld Filtered
Dissolved Nickel	Fld Filtered	Dissolved Selenium	Fld Filtered
Dissolved Silver	Fld Filtered	Dissolved Strontium	Fld Filtered
Dissolved Thallium	Fld Filtered	Dissolved Vanadium	Fld Filtered
Dissolved Zinc	Fld Filtered	Dissolved Bromide	Fld Filtered
Dissolved Chloride	Fld Filtered	Dissolved Fluoride	Fld Filtered
Dissolved Nitrate	Fld Filtered	Dissolved Sulfate	Fld Filtered
Dissolved Mercury	Fld Filtered	Dissolved Nitrite	Fld Filtered
Total Dissolved Solids (TDS)	Fld Filtered	Total Hardness By Calculation	Fld Filtered
Turbidity			

DWR Sample Number Collection Date 6/3/2015 Collection Time: : EC: µS/cm

CH0615B0011 Station No.: E3012228 Station Name: NapaCounty-swgw_SW1 Matrix: Water, Natural

Add'l Note: Cost Code: L10583900000

Alkalinity	Fld Filtered	Carbonate by Calculation	Fld Filtered
Electrical Conductivity (EC)		Dissolved Boron	Fld Filtered
Dissolved Calcium	Fld Filtered	Dissolved Magnesium	Fld Filtered
Dissolved Potassium	Fld Filtered	Dissolved Sodium	Fld Filtered
Dissolved Aluminum	Fld Filtered	Dissolved Antimony	Fld Filtered
Dissolved Arsenic	Fld Filtered	Dissolved Barium	Fld Filtered
Dissolved Beryllium	Fld Filtered	Dissolved Cadmium	Fld Filtered
Dissolved Chromium	Fld Filtered	Dissolved Cobalt	Fld Filtered
Dissolved Copper	Fld Filtered	Dissolved Iron	Fld Filtered
Dissolved Lead	Fld Filtered	Dissolved Lithium	Fld Filtered
Dissolved Manganese	Fld Filtered	Dissolved Molybdenum	Fld Filtered
Dissolved Nickel	Fld Filtered	Dissolved Selenium	Fld Filtered
Dissolved Silver	Fld Filtered	Dissolved Strontium	Fld Filtered
Dissolved Thallium	Fld Filtered	Dissolved Vanadium	Fld Filtered
Dissolved Zinc	Fld Filtered	Dissolved Bromide	Fld Filtered
Dissolved Chloride	Fld Filtered	Dissolved Fluoride	Fld Filtered
Dissolved Nitrate	Fld Filtered	Dissolved Sulfate	Fld Filtered
Dissolved Mercury	Fld Filtered	Dissolved Nitrite	Fld Filtered
Total Dissolved Solids (TDS)	Fld Filtered	Total Hardness By Calculation	Fld Filtered
Turbidity			

DWR Sample Number Collection Date 6/3/2015 Collection Time: : EC: µS/cm

CH0615B0012 Station No.: E3012230 Station Name: E3012230 Matrix: Water, Natural

Add'l Note: Cost Code: L10583900000

Alkalinity		Fld Filtered	Carbonate by Calculation		Fld Filtered
Electrical Conductivity (EC)			Dissolved Boron		Fld Filtered
Dissolved Calcium		Fld Filtered	Dissolved Magnesium		Fld Filtered
Dissolved Potassium		Fld Filtered	Dissolved Sodium		Fld Filtered
Dissolved Aluminum		Fld Filtered	Dissolved Antimony		Fld Filtered
Dissolved Arsenic		Fld Filtered	Dissolved Barium		Fld Filtered
Dissolved Beryllium		Fld Filtered	Dissolved Cadmium		Fld Filtered
Dissolved Chromium		Fld Filtered	Dissolved Cobalt		Fld Filtered
Dissolved Copper		Fld Filtered	Dissolved Iron		Fld Filtered
Dissolved Lead		Fld Filtered	Dissolved Lithium		Fld Filtered
Dissolved Manganese		Fld Filtered	Dissolved Molybdenum		Fld Filtered
Dissolved Nickel		Fld Filtered	Dissolved Selenium		Fld Filtered
Dissolved Silver		Fld Filtered	Dissolved Strontium		Fld Filtered
Dissolved Thallium		Fld Filtered	Dissolved Vanadium		Fld Filtered
Dissolved Zinc		Fld Filtered	Dissolved Bromide		Fld Filtered
Dissolved Chloride		Fld Filtered	Dissolved Fluoride		Fld Filtered
Dissolved Nitrate		Fld Filtered	Dissolved Sulfate		Fld Filtered
Dissolved Mercury		Fld Filtered	Dissolved Nitrite		Fld Filtered
Total Dissolved Solids (TDS)		Fld Filtered	Total Hardness By Calculation		Fld Filtered
Turbidity					

DWR Sample Number Collection Date 6/3/2015 Collection Time: 13:15 EC: 426 µS/cm

CH0615B0013 Station No.: E3012234 Station Name: NapaCounty-swgw_SW2 Matrix: Water, Natural

Add'l Note: Cost Code: L10583900000

Alkalinity		Fld Filtered	Carbonate by Calculation		Fld Filtered
Electrical Conductivity (EC)			Dissolved Boron		Fld Filtered
Dissolved Calcium		Fld Filtered	Dissolved Magnesium		Fld Filtered
Dissolved Potassium		Fld Filtered	Dissolved Sodium		Fld Filtered
Dissolved Aluminum		Fld Filtered	Dissolved Antimony		Fld Filtered
Dissolved Arsenic		Fld Filtered	Dissolved Barium		Fld Filtered
Dissolved Beryllium		Fld Filtered	Dissolved Cadmium		Fld Filtered
Dissolved Chromium		Fld Filtered	Dissolved Cobalt		Fld Filtered
Dissolved Copper		Fld Filtered	Dissolved Iron		Fld Filtered
Dissolved Lead		Fld Filtered	Dissolved Lithium		Fld Filtered
Dissolved Manganese		Fld Filtered	Dissolved Molybdenum		Fld Filtered
Dissolved Nickel		Fld Filtered	Dissolved Selenium		Fld Filtered
Dissolved Silver		Fld Filtered	Dissolved Strontium		Fld Filtered
Dissolved Thallium		Fld Filtered	Dissolved Vanadium		Fld Filtered
Dissolved Zinc		Fld Filtered	Dissolved Bromide		Fld Filtered
Dissolved Chloride		Fld Filtered	Dissolved Fluoride		Fld Filtered
Dissolved Nitrate		Fld Filtered	Dissolved Sulfate		Fld Filtered
Dissolved Mercury		Fld Filtered	Dissolved Nitrite		Fld Filtered
Total Dissolved Solids (TDS)		Fld Filtered	Total Hardness By Calculation		Fld Filtered
Turbidity					

DWR Sample Number **CH0615B0014** Collection Date 6/3/2015 Collection Time: : EC: µS/cm

Station No.: E3012235 Station Name: E3012235 Matrix: Water, Natural

Add'l Note: Cost Code: L10583900000

Alkalinity	Fld Filtered	Carbonate by Calculation	Fld Filtered
Electrical Conductivity (EC)		Dissolved Boron	Fld Filtered
Dissolved Calcium	Fld Filtered	Dissolved Magnesium	Fld Filtered
Dissolved Potassium	Fld Filtered	Dissolved Sodium	Fld Filtered
Dissolved Aluminum	Fld Filtered	Dissolved Antimony	Fld Filtered
Dissolved Arsenic	Fld Filtered	Dissolved Barium	Fld Filtered
Dissolved Beryllium	Fld Filtered	Dissolved Cadmium	Fld Filtered
Dissolved Chromium	Fld Filtered	Dissolved Cobalt	Fld Filtered
Dissolved Copper	Fld Filtered	Dissolved Iron	Fld Filtered
Dissolved Lead	Fld Filtered	Dissolved Lithium	Fld Filtered
Dissolved Manganese	Fld Filtered	Dissolved Molybdenum	Fld Filtered
Dissolved Nickel	Fld Filtered	Dissolved Selenium	Fld Filtered
Dissolved Silver	Fld Filtered	Dissolved Strontium	Fld Filtered
Dissolved Thallium	Fld Filtered	Dissolved Vanadium	Fld Filtered
Dissolved Zinc	Fld Filtered	Dissolved Bromide	Fld Filtered
Dissolved Chloride	Fld Filtered	Dissolved Fluoride	Fld Filtered
Dissolved Nitrate	Fld Filtered	Dissolved Sulfate	Fld Filtered
Dissolved Mercury	Fld Filtered	Dissolved Nitrite	Fld Filtered
Total Dissolved Solids (TDS)	Fld Filtered	Total Hardness By Calculation	Fld Filtered
Turbidity			

DWR Sample Number **CH0615B0015** Collection Date 6/3/2015 Collection Time: : EC: µS/cm

Station No.: E3012246 Station Name: NapaCounty-swgw_SW5 Matrix: Water, Natural

Add'l Note: Cost Code: L10583900000

Alkalinity	Fld Filtered	Carbonate by Calculation	Fld Filtered
Electrical Conductivity (EC)		Dissolved Boron	Fld Filtered
Dissolved Calcium	Fld Filtered	Dissolved Magnesium	Fld Filtered
Dissolved Potassium	Fld Filtered	Dissolved Sodium	Fld Filtered
Dissolved Aluminum	Fld Filtered	Dissolved Antimony	Fld Filtered
Dissolved Arsenic	Fld Filtered	Dissolved Barium	Fld Filtered
Dissolved Beryllium	Fld Filtered	Dissolved Cadmium	Fld Filtered
Dissolved Chromium	Fld Filtered	Dissolved Cobalt	Fld Filtered
Dissolved Copper	Fld Filtered	Dissolved Iron	Fld Filtered
Dissolved Lead	Fld Filtered	Dissolved Lithium	Fld Filtered
Dissolved Manganese	Fld Filtered	Dissolved Molybdenum	Fld Filtered
Dissolved Nickel	Fld Filtered	Dissolved Selenium	Fld Filtered
Dissolved Silver	Fld Filtered	Dissolved Strontium	Fld Filtered
Dissolved Thallium	Fld Filtered	Dissolved Vanadium	Fld Filtered
Dissolved Zinc	Fld Filtered	Dissolved Bromide	Fld Filtered
Dissolved Chloride	Fld Filtered	Dissolved Fluoride	Fld Filtered
Dissolved Nitrate	Fld Filtered	Dissolved Sulfate	Fld Filtered
Dissolved Mercury	Fld Filtered	Dissolved Nitrite	Fld Filtered
Total Dissolved Solids (TDS)	Fld Filtered	Total Hardness By Calculation	Fld Filtered
Turbidity			

DWR Sample Number Collection Date 6/3/2015 Collection Time: 12 : 23 EC: 293 µS/cm

CH0615B0016 Station No.: (NONE) Station Name: (None) Matrix: Water, Natural

Add'l Note: DUP of Napa County - 217 d (CH0615B0004) Cost Code: L10583900000

Alkalinity		Fld Filtered	Carbonate by Calculation		Fld Filtered
Electrical Conductivity (EC)			Dissolved Boron		Fld Filtered
Dissolved Calcium		Fld Filtered	Dissolved Magnesium		Fld Filtered
Dissolved Potassium		Fld Filtered	Dissolved Sodium		Fld Filtered
Dissolved Aluminum		Fld Filtered	Dissolved Antimony		Fld Filtered
Dissolved Arsenic		Fld Filtered	Dissolved Barium		Fld Filtered
Dissolved Beryllium		Fld Filtered	Dissolved Cadmium		Fld Filtered
Dissolved Chromium		Fld Filtered	Dissolved Cobalt		Fld Filtered
Dissolved Copper		Fld Filtered	Dissolved Iron		Fld Filtered
Dissolved Lead		Fld Filtered	Dissolved Lithium		Fld Filtered
Dissolved Manganese		Fld Filtered	Dissolved Molybdenum		Fld Filtered
Dissolved Nickel		Fld Filtered	Dissolved Selenium		Fld Filtered
Dissolved Silver		Fld Filtered	Dissolved Strontium		Fld Filtered
Dissolved Thallium		Fld Filtered	Dissolved Vanadium		Fld Filtered
Dissolved Zinc		Fld Filtered	Dissolved Bromide		Fld Filtered
Dissolved Chloride		Fld Filtered	Dissolved Fluoride		Fld Filtered
Dissolved Nitrate		Fld Filtered	Dissolved Sulfate		Fld Filtered
Dissolved Mercury		Fld Filtered	Dissolved Nitrite		Fld Filtered
Total Dissolved Solids (TDS)		Fld Filtered	Total Hardness By Calculation		Fld Filtered
Turbidity					

DWR Sample Number Collection Date 6/3/2015 Collection Time: 13:06 EC: ____ µS/cm

CH0615B0017 Station No.: Blank; Field Station Name: Blank; Field Matrix: Water, Purified

Add'l Note: Cost Code: L10583900000

Alkalinity		Fld Filtered	Carbonate by Calculation		Fld Filtered
Electrical Conductivity (EC)			Dissolved Boron		Fld Filtered
Dissolved Calcium		Fld Filtered	Dissolved Magnesium		Fld Filtered
Dissolved Potassium		Fld Filtered	Dissolved Sodium		Fld Filtered
Dissolved Aluminum		Fld Filtered	Dissolved Antimony		Fld Filtered
Dissolved Arsenic		Fld Filtered	Dissolved Barium		Fld Filtered
Dissolved Beryllium		Fld Filtered	Dissolved Cadmium		Fld Filtered
Dissolved Chromium		Fld Filtered	Dissolved Cobalt		Fld Filtered
Dissolved Copper		Fld Filtered	Dissolved Iron		Fld Filtered
Dissolved Lead		Fld Filtered	Dissolved Lithium		Fld Filtered
Dissolved Manganese		Fld Filtered	Dissolved Molybdenum		Fld Filtered
Dissolved Nickel		Fld Filtered	Dissolved Selenium		Fld Filtered
Dissolved Silver		Fld Filtered	Dissolved Strontium		Fld Filtered
Dissolved Thallium		Fld Filtered	Dissolved Vanadium		Fld Filtered
Dissolved Zinc		Fld Filtered	Dissolved Bromide		Fld Filtered
Dissolved Chloride		Fld Filtered	Dissolved Fluoride		Fld Filtered
Dissolved Nitrate		Fld Filtered	Dissolved Sulfate		Fld Filtered
Dissolved Mercury		Fld Filtered	Dissolved Nitrite		Fld Filtered
Total Dissolved Solids (TDS)		Fld Filtered	Total Hardness By Calculation		Fld Filtered
Turbidity					

This was Received! 6/3/2015

DWR Sample Number Collection Date 6/3/2015 Collection Time: ~~13 : 00~~ EC: µS/cm

CH0615B0018 Station No.: Blank; Field Station Name: Blank; Field Matrix: Water, Purified

Add'l Note: Cost Code: L10583900000

Alkalinity		Fld Filtered	Carbonate by Calculation		Fld Filtered
Electrical Conductivity (EC)			Dissolved Boron		Fld Filtered
Dissolved Calcium		Fld Filtered	Dissolved Magnesium		Fld Filtered
Dissolved Potassium		Fld Filtered	Dissolved Sodium		Fld Filtered
Dissolved Aluminum		Fld Filtered	Dissolved Antimony		Fld Filtered
Dissolved Arsenic		Fld Filtered	Dissolved Barium		Fld Filtered
Dissolved Beryllium		Fld Filtered	Dissolved Cadmium		Fld Filtered
Dissolved Chromium		Fld Filtered	Dissolved Cobalt		Fld Filtered
Dissolved Copper		Fld Filtered	Dissolved Iron		Fld Filtered
Dissolved Lead		Fld Filtered	Dissolved Lithium		Fld Filtered
Dissolved Manganese		Fld Filtered	Dissolved Molybdenum		Fld Filtered
Dissolved Nickel		Fld Filtered	Dissolved Selenium		Fld Filtered
Dissolved Silver		Fld Filtered	Dissolved Strontium		Fld Filtered
Dissolved Thallium		Fld Filtered	Dissolved Vanadium		Fld Filtered
Dissolved Zinc		Fld Filtered	Dissolved Bromide		Fld Filtered
Dissolved Chloride		Fld Filtered	Dissolved Fluoride		Fld Filtered
Dissolved Nitrate		Fld Filtered	Dissolved Sulfate		Fld Filtered
Dissolved Mercury		Fld Filtered	Dissolved Nitrite		Fld Filtered
Total Dissolved Solids (TDS)		Fld Filtered	Total Hardness By Calculation		Fld Filtered
Turbidity					

DWR Sample Number Collection Date 6/3/2015 Collection Time: : EC: µS/cm

CH0615B0019 Station No.: Blank; Field Station Name: Blank; Field Matrix: Water, Purified

Add'l Note: Cost Code: L10583900000

Alkalinity		Fld Filtered	Carbonate by Calculation		Fld Filtered
Electrical Conductivity (EC)			Dissolved Boron		Fld Filtered
Dissolved Calcium		Fld Filtered	Dissolved Magnesium		Fld Filtered
Dissolved Potassium		Fld Filtered	Dissolved Sodium		Fld Filtered
Dissolved Aluminum		Fld Filtered	Dissolved Antimony		Fld Filtered
Dissolved Arsenic		Fld Filtered	Dissolved Barium		Fld Filtered
Dissolved Beryllium		Fld Filtered	Dissolved Cadmium		Fld Filtered
Dissolved Chromium		Fld Filtered	Dissolved Cobalt		Fld Filtered
Dissolved Copper		Fld Filtered	Dissolved Iron		Fld Filtered
Dissolved Lead		Fld Filtered	Dissolved Lithium		Fld Filtered
Dissolved Manganese		Fld Filtered	Dissolved Molybdenum		Fld Filtered
Dissolved Nickel		Fld Filtered	Dissolved Selenium		Fld Filtered
Dissolved Silver		Fld Filtered	Dissolved Strontium		Fld Filtered
Dissolved Thallium		Fld Filtered	Dissolved Vanadium		Fld Filtered
Dissolved Zinc		Fld Filtered	Dissolved Bromide		Fld Filtered
Dissolved Chloride		Fld Filtered	Dissolved Fluoride		Fld Filtered
Dissolved Nitrate		Fld Filtered	Dissolved Sulfate		Fld Filtered
Dissolved Mercury		Fld Filtered	Dissolved Nitrite		Fld Filtered
Total Dissolved Solids (TDS)		Fld Filtered	Total Hardness By Calculation		Fld Filtered
Turbidity					

Checklist for Sample Submittal by Field Personnel

☑ Correct collection dates and times are on the COC.

☑ An EC result per collection event has been written on the COC.

☑ The number of containers being submitted matches the container count on the COC.

☑ * Please correct the count if it is not the same and initial the appropriate area to confirm.

☑ Container label's DWR Sample Number matches what is on the COC .

☑ Samples/stations/collection events not collected are crossed out and clearly marked as not sampled "N.S." with your initials.

☑ *If the N.S. reason needs to go to the WDL please write the reason on the COC or make sure it is entered in FLIMS on the canceled collection event with the "Reason Going to WDL" checkbox checked.

☐ Volumes for chlorophyll samples are written on either the label or the packet.

☑ The "Send Report To:" contact on the COC is correct.

☑ The "Submitted By:" signature, printed name and phone number are on the COC.

☑ Sample submittal date and time are on the COC.

Checklist for Bryte Lab Sample Receiving Personnel

☑ The DWR Sample Number on the container labels matches the COC.

☑ Collection dates and times are on the COC for every sample.

☑ The EC for each collection event is written on the COC.

☑ The Priority Code for the submittal/samples is 5. If it is >5 alert Bryte management prior to field personnel leaving.

☐ ~~The volume~~ for chlorophyll samples are written on the packet or label.

☑ The container count matches COC.

☑ The container count has been initialed on COC by both parties to confirm.

☑ UNFROZEN sample temperature is written on the COC.

☑ Note on the COC either "frozen", "will be frozen within required time" or "not frozen" for samples that should be frozen.

☑ Sites that are not collected are crossed out and clearly marked as not sampled "N.S." with field personnel initials. Not Sampled will be collected tomorrow

☐ If the "N.S." reason needs to go to the Water Data Library (WDL) the reason is written on the COC.

☐ -- CHECKLIST FOR SAMPLE RECEIVING IN FLIMS (LAB INTERNAL USE ONLY) --

☑ All EC's are in FLIMS before the project is submitted. Please do not enter any other field data (including pH) besides EC per Sid Fong and Allan W. Wong.

☑ The collection date and time in FLIMS matches the COC.

☐ ~~The N.S.~~ stations/collection events have been canceled.

☐ ~~If there is a~~ N.S. reason written on the COC it is in FLIMS and "Reason Going to WDL" box is checked.

FIELD PURGE DATA
Monitoring Wells

Client: Napa County

Date: 6-3-15

Project: [illegible]

Project No.: 12-1-071

Well ID: 214S

Measured By: John MacDougall

TOTAL WELL DEPTH (ft)	CASING DIAMETER (in)	STICKUP (ft)	STATIC WATER LEVEL (ft)
53'	2" [✓ PVC] / Steel		16.32

STANDING WATER COLUMN (ft)	x	0.17 (for 2" casing): 0.37 (for 3" casing) 0.65 (for 4" casing): 1.0 (for 5" casing) 1.47 (for 6" casing): 2.61 (for 8" casing) 4.08 (for 10" casing): 5.88 (for 12" casing) 10.45 (for 16" casing): 16.32 (for 20" casing)	=	WET CASING VOLUME, Vc (gal)	3 Vc (gal)
36.68				6.24	18.7

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Cond. at 25°C (μs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
0749	0	200	1	0	16.32	62.68	6.93	532	150	3.21	360.9	turbid
0754	5	200	1	5		63.14	6.62	490	26.6	0.19	387.4	Clear
0759	10	200	1	10		63.33	6.55	484	8.60	0.14	405.6	Cloudy
0804	15	200	1	15		62.84	6.52	483	4.84	0.13	418.1	Clear
0809	20	200	1	20		62.92	6.51	483	3.66	0.12	411.3	Clear

Water Sample Collection (number of bottles and sample I.D.)

Trans Pulled 0740 In 0620

520-908-9089

FIELD PURGE DATA
Monitoring Wells

Client: Napa

Date: 6-3-15

Project:

Project No.: 12-1-071

Well ID: 215d

Measured By: JM

TOTAL WELL DEPTH (ft)	CASING DIAMETER (in)	STICKUP (ft)	STATIC WATER LEVEL (ft)
98FT	2 PVC / Steel		16.28

STANDING WATER COLUMN (ft)	x	0.17 (for 2" casing); 0.37 (for 3" casing) 0.65 (for 4" casing); 1.0 (for 5" casing) 1.47 (for 6" casing); 2.61 (for 8" casing) 4.08 (for 10" casing); 5.88 (for 12" casing) 10.45 (for 16" casing); 16.32 (for 20" casing)	=	WET CASING VOLUME, Vc (gal)	3 Vc (gal)
81.72				13.89	41.68

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Cond. at 25°C (µs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
0635	0	200	1	0	16.28	63.62	7.27	1396	4.30	0.28	414.8	Sulfer smell
0648	13	240	1	13	—	64.11	7.27	1350	11.47	0.66	360.9	clear smells
0655	20	240	1	20	—	64.48	7.19	1330	8.51	0.23	387	Clear
0705	30	240	1	30	—	64.50	7.13	1291	7.31	0.14	410.9	Clear
0716	41	240	1	41	30.78	64.46	7.08	1217	5.31	0.11	420.7	Clear

Water Sample Collection (number of bottles and sample I.D.)

Transducer Pulled at 0540 Trans Back 0739

Cant fit Sounder with Pump in well

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FIELD PURGE DATA
Monitoring Wells

Client: Napa

Date: 6-3-15

Project:

Project No.: 12-1-071

Well ID: 216s

Measured By: JJM

TOTAL WELL DEPTH (ft)	CASING DIAMETER (in)	STICKUP (ft)	STATIC WATER LEVEL (ft)
50	2" PVC / Steel	0	23.47

STANDING WATER COLUMN (ft)				WET CASING VOLUME, Vc (gal)	3 Vc (gal)
26.53	x	0.17 (for 2" casing): 0.37 (for 3" casing) 0.65 (for 4" casing): 1.0 (for 5" casing) 1.47 (for 6" casing): 2.61 (for 8" casing) 4.08 (for 10" casing): 5.88 (for 12" casing) 10.45 (for 16" casing): 16.32 (for 20" casing)	=	4.5	13.53

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Cond. at 25°C (µs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
1248	0	240	1	0	23.47	67.84	7.21	383	355	373	311	Turbid
1253	5	240	1	5	26.53	67.81	6.63	361	68.9	1.92	421	"
1258	10	240	1	10	26.90	67.86	6.62	349	66.5	1.46	452	"
1303	15	240	1	15		67.88	6.62	347	63.0	1.11	389	"

Water Sample Collection (number of bottles and sample I.D.)

Trans out 1243 Back ~~1245~~ 1315

Pump at 40'

FIELD PURGE DATA
Monitoring Wells

Client: Nafa
Date: 6-3-15
Project:
Project No.: 12-1-071
Well ID: 217d
Measured By: JJM

TOTAL WELL DEPTH (ft)	CASING DIAMETER (in)	STICKUP (ft)	STATIC WATER LEVEL (ft)
86	2" PVC / Steel	0	30.63

STANDING WATER COLUMN (ft)	x	0.17 (for 2" casing); 0.37 (for 3" casing) 0.65 (for 4" casing); 1.0 (for 5" casing) 1.47 (for 6" casing); 2.61 (for 8" casing) 4.08 (for 10" casing); 5.88 (for 12" casing) 10.45 (for 16" casing); 16.32 (for 20" casing)	=	WET CASING VOLUME, Vc (gal)	3 Vc (gal)
55.37				9.42	28.23

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Cond. at 25°C (µs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
1158	~~300~~	300	2	0	30.63	68.02	7.2	306	107	0.63	338.1	Turbid
1203	5	300	2	10	35.69	68.23	7.33	307	29.4	0.19	363.1	Turbid
1208	10	300	2	20	36.56	68.17	7.34	301	13.70	0.13	426	
1213	15	300	2	30	37.53	68.28	7.31	297	13.61	0.11	404	
1218	20	300	2	40	37.92	68.09	7.28	294	8.35	0.10	439	clear
1223	25	300	2	50		68.09	7.27	293	4.76	0.09	449	clear

Water Sample Collection (number of bottles and sample I.D.)

Trans Pulled 1150 Back in 1242

Dupe

FIELD PURGE DATA
Monitoring Wells

Client: Napa

Date: 6-3-15

Project:

Project No.: 12-1-071

Well ID: 2185

Measured By: JJM

TOTAL WELL DEPTH (ft)	CASING DIAMETER (in)	STICKUP (ft)	STATIC WATER LEVEL (ft)
40	PVC / Steel	0	21.23

STANDING WATER COLUMN (ft)	x	0.17 (for 2" casing); 0.37 (for 3" casing) 0.65 (for 4" casing); 1.0 (for 5" casing) 1.47 (for 6" casing); 2.61 (for 8" casing) 4.08 (for 10" casing); 5.88 (for 12" casing) 10.45 (for 16" casing); 16.32 (for 20" casing)	=	WET CASING VOLUME, Vc (gal)	3 Vc (gal)
18.77				3.19	9.5

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Cond. at 25°C (μs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
1044	0	250	1.	0	21.23	64.52	6.62	5.76	24.7	5.58	374	
1049	5	251	1	5		64.54	6.51	5.60	19.86	2.27	374.1	
1051	7	251	1	7		64.47	6.46	556	13.15	2.20	396.1	
1053	9	251	1	9		64.50	6.43	555	12.03	2.17	406	
1055	11	251	1	11	21.69	64.52	6.42	555	6.22	2.13	411	
1059	15	251	1	15	21.73	64.50	6.41	554	6.03	2.15	434.1	
1102	18	251	1	18		64.52	6.41	554	6.30	2.18	435	

Water Sample Collection (number of bottles and sample I.D.)

Pulled Trans 1027 Returned 11:15
Pump 35'

FIELD PURGE DATA
Monitoring Wells

Client: Napa

Date: 6-3-19

Project:

Project No.: 12-1-071

Well ID: 219d

Measured By: JJM

TOTAL WELL DEPTH (ft)		CASING DIAMETER (in)		STICKUP (ft)	STATIC WATER LEVEL (ft)
93		PVC / Steel		0	20.69
STANDING WATER COLUMN (ft)				**WET CASING VOLUME, Vc (gal)**	**3 Vc (gal)**
72.31	x	0.17 (for 2" casing): 0.37 (for 3" casing) 0.65 (for 4" casing): 1.0 (for 5" casing) 1.47 (for 6" casing): 2.61 (for 8" casing) 4.08 (for 10" casing): 5.88 (for 12" casing) 10.45 (for 16" casing): 16.32 (for 20" casing)	=	12.29	36.87

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Cond. at 25°C (µs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
941	0	240	1	0	20.69	62.99	7.38	692	60.7	1.88	318.4	Turbid
946	5	240	1	5		63.22	7.30	696	6.98	0.80	255.3	Clear
951	10	240	1.2	11		63.41	7.26	702	1.68	0.41	168.7	clear
956	15	240	1.2	17		63.53	7.25	702	1.48	0.3	163	Clear
1001	20	240	1.2	23		63.66	7.24	703	0.39	0.26	247.1	clear
1006	25	240	1.2	29		63.76	7.23	704	0	0.21	295.4	clear
1012	30	240	1.2	35		63.94	7.23	704	0	0.26	345.8	Clear
1014	32	240	1.2	37.5		63.90	7.23	704	0	0.20	346.7	Clear

Water Sample Collection (number of bottles and sample I.D.)

trans Removed 0920 Back in 1027

006

FIELD PURGE DATA
Monitoring Wells

Client: Napa County

Date: 6-4-15

Project:

Project No.: 121-071

Well ID: 220s

Measured By: JM

TOTAL WELL DEPTH (ft)	CASING DIAMETER (in)	STICKUP (ft)	STATIC WATER LEVEL (ft)
45	2" [✓ PVC] / Steel	0	16.94 @ 0700

STANDING WATER COLUMN (ft)	x	0.17 (for 2" casing): 0.37 (for 3" casing) 0.65 (for 4" casing): 1.0 (for 5" casing) 1.47 (for 6" casing): 2.61 (for 8" casing) 4.08 (for 10" casing): 5.88 (for 12" casing) 10.45 (for 16" casing): 16.32 (for 20" casing)	=	WET CASING VOLUME, Vc (gal)	3 Vc (gal)
28.06				4.77	14.31

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Cond. at 25°C (µs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
809	0	200			16.94	65.90	2.03	450	69.1	0.36	353	Turbid
811	2	200	1.5	3	21.12	66.40	6.88	452	14.41	0.14	363	cloudy
813	4	200	1.5	4.5	21.29	66.89	6.80	443	8.45	0.10	394	Clear
8.16	7	200	1.5	10.5		67.02	6.76	440	5.35	0.09	398	Clear
8.19	10	200	1.5	15	21.69	67.00	6.74	440	3.73	0.08	413	Clear

Water Sample Collection (number of bottles and sample I.D.)

Trans out @ 8:05 Back @ 830

Pump @ 40'

07

FIELD PURGE DATA
Monitoring Wells

Client: Napa Co

Date: 6-4-15

Project:

Project No.: 12-1-021

Well ID: 221d

Measured By: JJm

TOTAL WELL DEPTH (ft)	CASING DIAMETER (in)	STICKUP (ft)	STATIC WATER LEVEL (ft)
85	2" [✓ PVC]/ Steel	0	16.73 @ 0702

STANDING WATER COLUMN (ft)	x	0.17 (for 2" casing): 0.37 (for 3" casing) 0.65 (for 4" casing): 1.0 (for 5" casing) 1.47 (for 6" casing): 2.61 (for 8" casing) 4.08 (for 10" casing): 5.88 (for 12" casing) 10.45 (for 16" casing): 16.32 (for 20" casing)	=	WET CASING VOLUME, Vc (gal)	3 Vc (gal)
68.27				11.6	34.81

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Cond. at 25°C (µs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
7:24	0	250	1.25	0	16.73	64.12	7.87	319	9.68	3.21	328.9	Turbid
7:28	4	250	1.25	5	27.46	66.07	7.37	310	363	0.27	354	Turbid
7:32	8	250	1.25	10	28.02	66.21	7.36	298	45.9	0.16	381.8	"
7:36	12	250	1.25	15	28.16	66.38	7.34	296	32.0	0.13	362.0	Sandy
7:40	16	250	1.25	20	28.29	66.60	7.30	295	12.27	0.1	344.9	"
7:44	20	250	1.25	25	28.33	66.21	7.26	293	6.90	0.09	383.4	clear
7:48	24	250	1.25	30	28.38	66.78	7.22	293	9.51	0.06	392.1	"
7:52	28	250	1.25	35	28.32	66.69	7.21	293	5.77	0.08	360.1	"

Water Sample Collection (number of bottles and sample I.D.)

trans out 7:11 In 8:04

Pump at 70'

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FIELD PURGE DATA
Monitoring Wells

Client: Nafa

Date: 6-4-15

Project: Nc

Project No.: 12-1-071

Well ID: 2225

Measured By: JJM

TOTAL WELL DEPTH (ft)	CASING DIAMETER (in)	STICKUP (ft)	STATIC WATER LEVEL (ft)
40	2" [✓ PVC] / Steel	5.4"	25.30 @ 10:30

STANDING WATER COLUMN (ft)	x		=	WET CASING VOLUME, Vc (gal)	3 Vc (gal)
20.1		0.17 (for 2" casing): 0.37 (for 3" casing) 0.65 (for 4" casing): 1.0 (for 5" casing) 1.47 (for 6" casing): 2.61 (for 8" casing) 4.08 (for 10" casing): 5.88 (for 12" casing) 10.45 (for 16" casing): 16.32 (for 20" casing)		3.42	10.25

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Cond. at 25°C (μs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
11:19	0	225	1	0	25.30	65.73	7.15	405	101	2.26	390.0	Turbid
11:24	5	225	1	5		64.77	7.03	380	13.03	0.20	449.0	
11:29	10	228	1	10		64.68	7.01	380	2.55	0.12	486.0	Clear

Water Sample Collection (number of bottles and sample I.D.)

Trans out @ 11:12 Back @ 11:45

Pump @ 35 9

FIELD PURGE DATA
Monitoring Wells

Client: Napa

Date: 6-4-15

Project:

Project No.: 12-1-071

Well ID: 223d

Measured By: JJm

TOTAL WELL DEPTH (ft)	CASING DIAMETER (in)	STICKUP (ft)	STATIC WATER LEVEL (ft)
100	2" [✓ PVC] / Steel	5.4'	34.92 @ 1030

STANDING WATER COLUMN (ft)	x	0.17 (for 2" casing); 0.37 (for 3" casing) 0.65 (for 4" casing); 1.0 (for 5" casing) 1.47 (for 6" casing); 2.61 (for 8" casing) 4.08 (for 10" casing); 5.88 (for 12" casing) 10.45 (for 16" casing); 16.32 (for 20" casing)	= WET CASING VOLUME, Vc (gal)	3 Vc (gal)
70.58			11.9	35.99

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Cond. at 25°C (µs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
1041	0	300	1.25	0	34.92	65.10	7.44	457	4.22	2.11	361.9	Clear
1046	5	300	1.25	6.25		66.87	7.18	457	30.3	0.33	436.3	Turbid
1051	10	300	11.25	11.25	74.22	Well		De watered				
			Well	De	watered			at	1	casing		
1056		300	1.25	13		66.92	7.25	453	48.2	0.27	501	~~Clear~~ Turbid

Water Sample Collection (number of bottles and sample I.D.)

Trans out @ 10:30 Back in @ 11:12

10

FIELD PURGE DATA
Monitoring Wells

Client: Napa

Date: 6-4-15

Project:

Project No.: 12-1-021

Well ID: SW-1

Measured By: JJM

TOTAL WELL DEPTH (ft)	CASING DIAMETER (in)	STICKUP (ft)	STATIC WATER LEVEL (ft)
	PVC / Steel		

STANDING WATER COLUMN (ft)				WET CASING VOLUME, Vc (gal)	3 Vc (gal)
	x	0.17 (for 2" casing); 0.37 (for 3" casing) 0.65 (for 4" casing); 1.0 (for 5" casing) 1.47 (for 6" casing); 2.61 (for 8" casing) 4.08 (for 10" casing); 5.88 (for 12" casing) 10.45 (for 16" casing); 16.32 (for 20" casing)	=		

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Cond. at 25°C (μs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
1339	—	—	—	—	—	72.35	7.61	12967	25.0	5.0	441	

Water Sample Collection (number of bottles and sample I.D.)

011

Blank 19

FIELD PURGE DATA
Monitoring Wells

Client: Napa

Date: 6-3-15

Project:

Project No.: 12-1-071

Well ID: SW-2

Measured By: JJM

TOTAL WELL DEPTH (ft)	CASING DIAMETER (in)	STICKUP (ft)	STATIC WATER LEVEL (ft)
	PVC / Steel		

STANDING WATER COLUMN (ft)				WET CASING VOLUME, Vc (gal)	3 Vc (gal)
	x	0.17 (for 2" casing): 0.37 (for 3" casing) 0.65 (for 4" casing): 1.0 (for 5" casing) 1.47 (for 6" casing): 2.61 (for 8" casing) 4.08 (for 10" casing): 5.88 (for 12" casing) 10.45 (for 16" casing): 16.32 (for 20" casing)	=		

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Coud. at 25°C (µs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
1315	0	0	0	0	0	65.14	6.96	426	2.43	5.24	477.6	Clear

Water Sample Collection (number of bottles and sample I.D.)

FIELD PURGE DATA
Monitoring Wells

Client: Napa

Date: 6-4-15

Project:

Project No.: 12-1-071

Well ID: SW-3

Measured By: JJM

TOTAL WELL DEPTH (ft)	CASING DIAMETER (in)	STICKUP (ft)	STATIC WATER LEVEL (ft)
	PVC / Steel		

STANDING WATER COLUMN (ft)				WET CASING VOLUME, Vc (gal)	3 Vc (gal)
	x	0.17 (for 2" casing); 0.37 (for 3" casing) 0.65 (for 4" casing); 1.0 (for 5" casing) 1.47 (for 6" casing); 2.61 (for 8" casing) 4.08 (for 10" casing); 5.88 (for 12" casing) 10.45 (for 16" casing); 16.32 (for 20" casing)	=		

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Cond. at 25°C (µs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
1246	—	—	—	—	—	68.36		503	6.87	5.85	430	
							7.74					

Water Sample Collection (number of bottles and sample I.D.) 012

FIELD PURGE DATA
Monitoring Wells

Client: Napa

Date: 6-4-15

Project:

Project No.: 12-1-071

Well ID: SW-4

Measured By: JJM

TOTAL WELL DEPTH (ft)	CASING DIAMETER (in)	STICKUP (ft)	STATIC WATER LEVEL (ft)
	PVC / Steel		

STANDING WATER COLUMN (ft)				WET CASING VOLUME, Vc (gal)	3 Vc (gal)
	x	0.17 (for 2" casing); 0.37 (for 3" casing) 0.65 (for 4" casing); 1.0 (for 5" casing) 1.47 (for 6" casing); 2.61 (for 8" casing) 4.08 (for 10" casing); 5.88 (for 12" casing) 10.45 (for 16" casing); 16.32 (for 20" casing)	=		

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Cond. at 25°C (µs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
0850	—	—	—	—	—	60.98	7.86	336	1.78	7.16	263.6	

Water Sample Collection (number of bottles and sample I.D.)

14

FIELD PURGE DATA
Monitoring Wells

Client: Napa

Date: 6-4-15

Project:

Project No.: 12-1-071

Well ID: SW-5

Measured By: JJM

TOTAL WELL DEPTH (ft)	CASING DIAMETER (in)	STICKUP (ft)	STATIC WATER LEVEL (ft)
	PVC / Steel		

STANDING WATER COLUMN (ft)				WET CASING VOLUME, Vc (gal)	3 Vc (gal)
	x	0.17 (for 2" casing): 0.37 (for 3" casing) 0.65 (for 4" casing): 1.0 (for 5" casing) 1.47 (for 6" casing): 2.61 (for 8" casing) 4.08 (for 10" casing): 5.88 (for 12" casing) 10.45 (for 16" casing); 16.32 (for 20" casing)	=		

Clock Time	Pumping Time (min)	Pump Rate (Hz)	Flow Rate (gpm)	Cumulative Flow (gals)	DTW (ft)	Temp (°F / °C)	pH	Sp. Cond. at 25°C (µs/cm)	Turbidity (NTU)	DO (mg/L)	ORP (milliVolt)	Observations (redox, color, odor, etc.)
1156	—	—	—	—	—	70.90	7.83	353	2.57	5.34	265	clear

Water Sample Collection (number of bottles and sample I.D.)

16

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NAPA VALLEY GROUNDWATER SUSTAINABILITY:

A BASIN ANALYSIS REPORT FOR THE NAPA VALLEY SUBBASIN

APPENDIX F:

Groundwater Monitoring Protocols

Appendix F

NAPA COUNTY PROCEDURE FOR MEASURING THE DEPTH TO WATER IN MONITORING AND PRODUCTION WELLS

Purpose

To obtain an accurate dated and timed measurement of the static depth to water in a well that can be converted into a water level elevation in reference to a commonly used reference datum (e.g., NAVD 1988). In this context, static means that the water level in the well is not influenced by pumping of the well. For comparability, measurements should be obtained according to an established schedule designed to capture times of both highest and lowest seasonal water level elevations. Also for comparability, measurements during a particular field campaign should be obtained consecutively and without delay within the shortest reasonable time.

Measurement Procedure

- If a well is being pumped, do not measure; return later, but not sooner than 60 minutes and preferably after 24 hours (see below “Special Circumstances” for additional instructions).
- Turn on water level indicator signaling device and check battery by hitting the test button.
- Remove access plug or well cap from the well cover and lower probe (electric sounder) into the well.
- When probe hits water a loud “beep” will sound and signal light will turn red.
- Retract slightly until the tone stops.
- Slowly lower the probe until the tone sounds.
- Note depth measurement at rim (i.e., the surveyed reference point for water level readings) of well to the nearest 0.01 foot and rewind probe completely out of well.
- Remove excess water and lower probe once again into well and measure again.
- If difference is within ±0.02 foot of first measurement, record measurement.
- If difference is greater repeat the same procedure until three consecutive measurements are recorded within ± 0.02 foot.
- Rewind and remove probe from well and replace the access plug or well cap in the well cover.
- Clean and dry the measuring device/probe and continue to next well.

Special Circumstances

Oil Encountered in Well

If oil is detected in the well structure, the depth to the air-oil interface is measured. To obtain such a measurement, the electric sounder is used similar to the way chalked steel tapes were traditionally used for depth-to-water measurements.

1. Lower the cleaned probe well below the air-oil interface (e.g., 1 foot). Read and record the depth at the reference point (since this depth is chosen somewhat arbitrarily by the field

technician, an even number can be chosen, e.g., 37.00 feet). This measurement is the length of cable lowered into the well and corresponds to a line that the oil leaves on the probe or cable (i.e., the oil inundation line). Above this line, smudges of oil may appear on the cable. Below this line, the cable/probe is completely covered with oil. If the probe is lowered too far, completely penetrates the oil, and is far submerged in the water below the oil, parts of the probe/cable below the oil inundation line may also appear smudgy.

2. Retrieve probe, identify and record the oil inundation line on the cable (e.g., 2.72 feet). This measurement does not reflect the thickness of the oil. It reflects the length of the cable below the air-oil interface.
3. Compute the depth to oil by subtracting the length of line below the air-oil interface from the corresponding measurement at the reference point: Depth to oil = 37.00 feet – 2.72 feet = 34.28 feet.

Since oil has a slightly smaller density than water, a depth-to-oil measurement will always be smaller than a corresponding depth-to-water measurement in the same well if oil were not present. Depth-to-oil measurements yield a reasonable approximation to depth-to-water measurements unless the oil thickness is great. For each foot of oil in the well casing, the depth- to-oil measurement will be approximately 0.12 foot smaller than a corresponding depth-to-water measurement if oil were not present.

Pumping Water Level on Arrival

If well is being pumped, do not measure. Return later when the water level has stabilized. Using past field notes, the field technician will use his/her experience to determine the appropriate duration necessary for static measurements. Upon returning to the well site (at a location where pumping was previously noted on the same day), the technician will measure the water level. The technician will have available historical water level data to determine whether the measurement is consistent with past measurements. If the initial measurement appears anomalous, the technician will measure water levels every 10 minutes over a period of 30 minutes.[1]8 If measurements vary significantly from past measurements (taking into account seasonal variations), the technician will note the circumstances (i.e., the date and time when the well was first visited, total time it was pumping (if known), when it was shutoff, when the technician returned, and subsequent water level measurements [on the same day, or as the case may be based on experience, the day immediately following]). Subsequent consideration of pumping effects at a site-specific well location will be addressed as necessary.

Recordation

1. Name of field technician
2. Unique identification of well
3. Weather and site conditions (e.g., clear, sunny, strong north wind, intense dust blowing over wellhead from nearby plowed field; dry ground, easy access)
4. Condition of well structure (e.g., well cap cracked – replaced with new one; wasp hive between well casing and well housing; no action, discuss with project manager)

---

[1] During this period, if the groundwater level difference is greater [than +/- 0.02 feet], repeat the same procedure until three consecutive measurements are recorded within +- 0.02 foot.

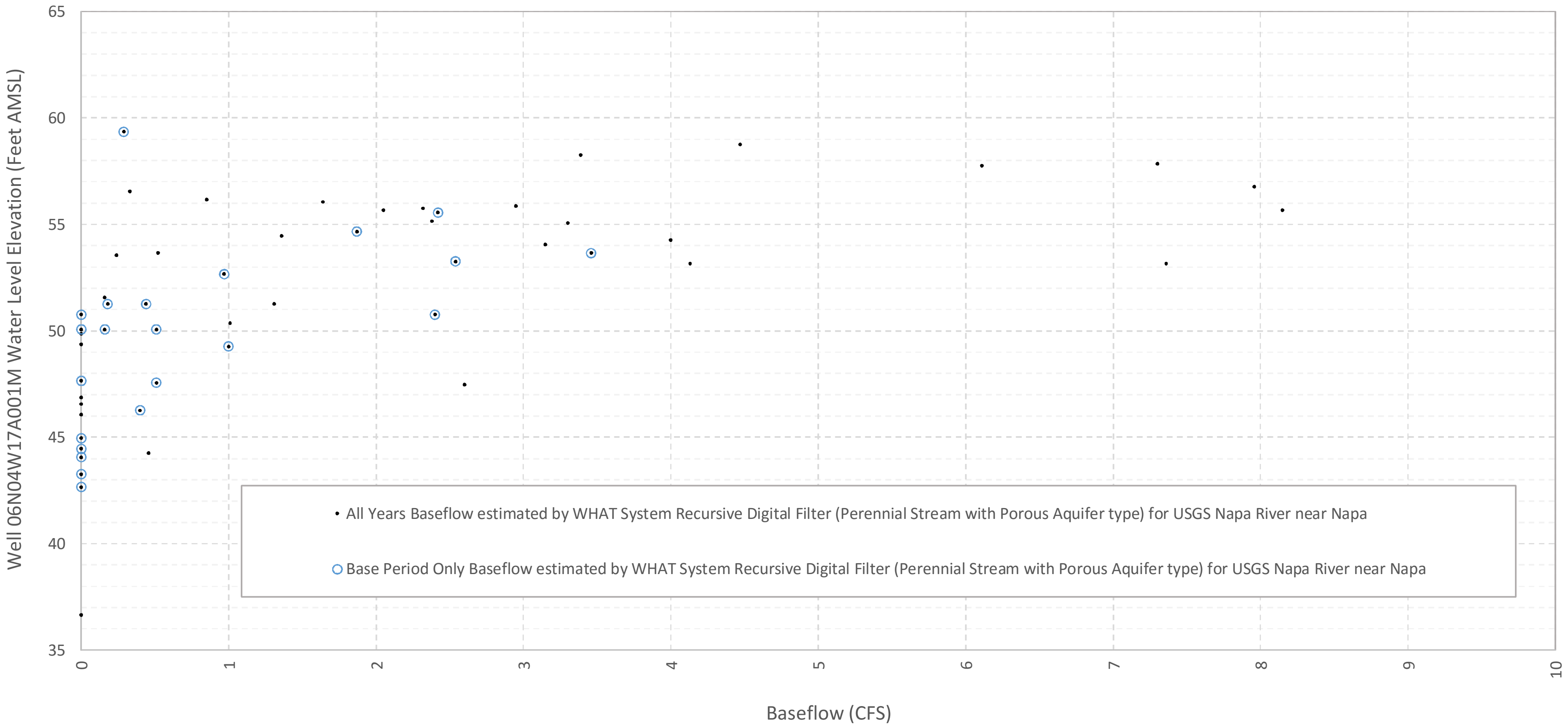
5. Time and date of depth-to-water reading
6. Any other pertinent comments (e.g., sounder hangs up at 33 feet, thus no measurement; or: fifth measurement of ~55.68 feet in a row…residual water in end cap?; or: oil in well…measurement is depth to oil; or: intense sulfur odor upon opening well cap; or: nearby (west ~100 feet) irrigation well pump)

NAPA VALLEY GROUNDWATER SUSTAINABILITY:

A BASIN ANALYSIS REPORT FOR THE NAPA VALLEY SUBBASIN

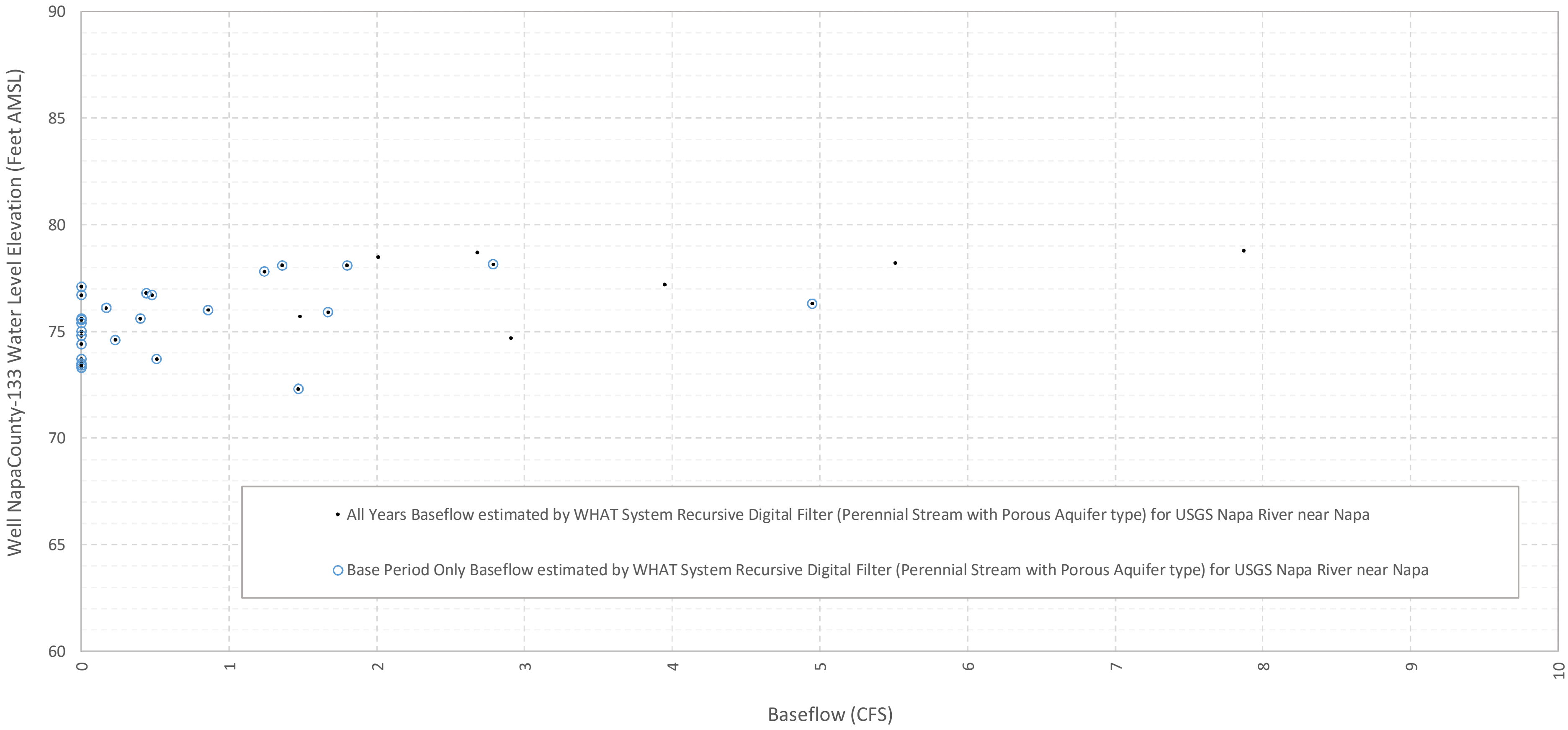
APPENDIX G:

Surface Water-Groundwater Plots for Representative Station Pairs



LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Appendix 4-1
Baseflow USGS Napa River Near Napa and Well 06N04W17A001M Groundwater Elevation (All Years and Base Period, Fall)



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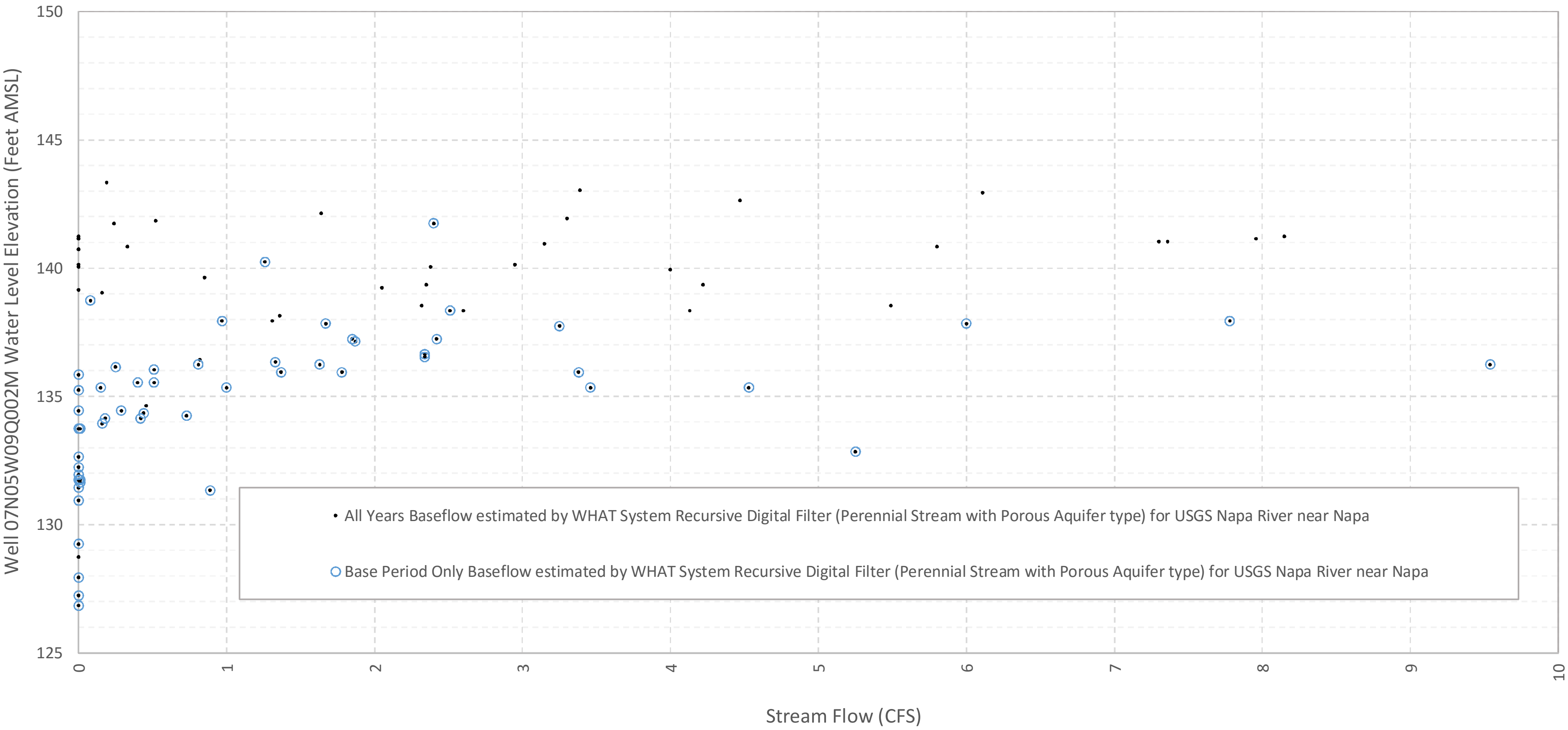
CONSULTING ENGINEERS

Appendix 4-2

Baseflow USGS Napa River Near Napa and Well NapaCounty-133 Groundwater Elevation (All Years and Base Period, Fall)



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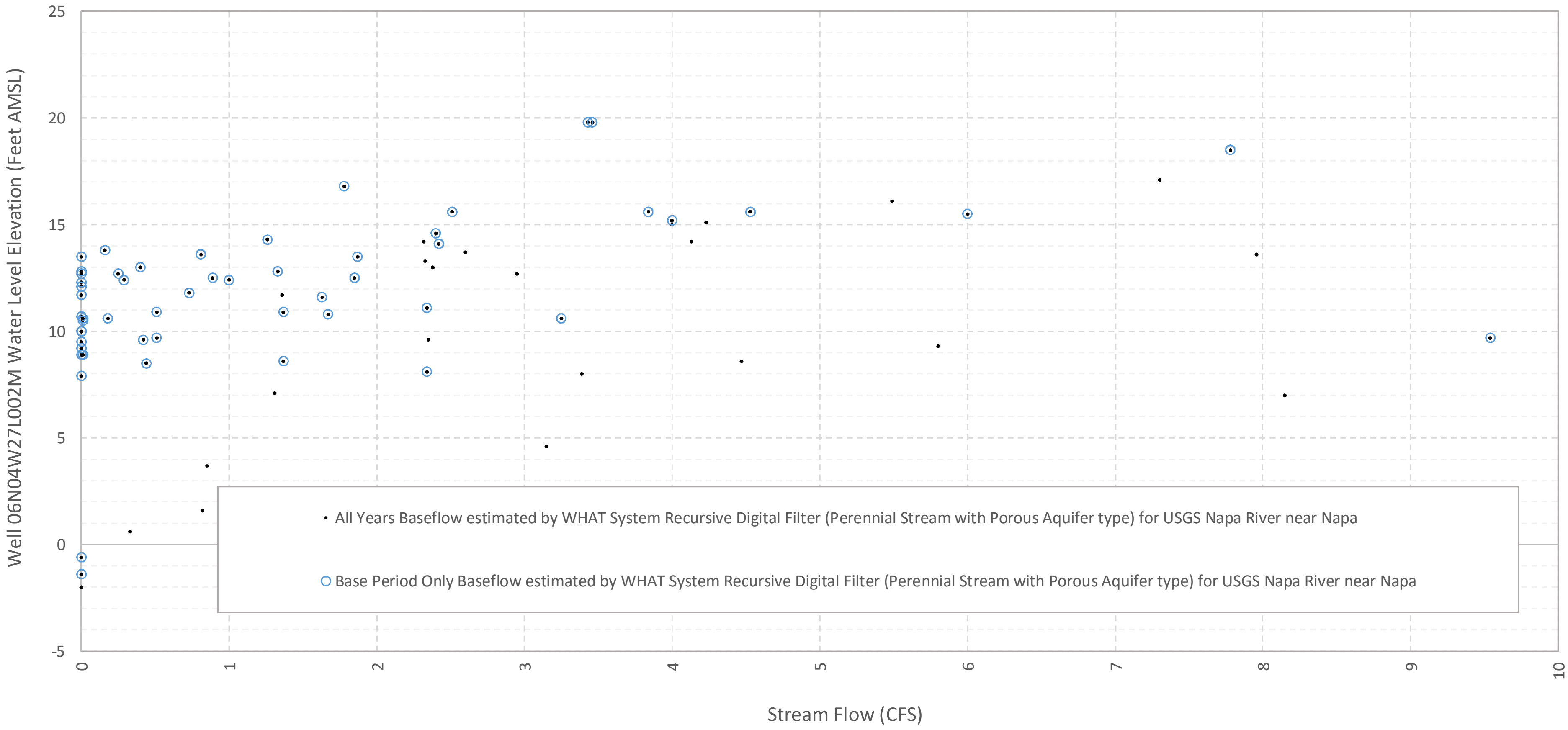
Appendix 4-3

Baseflow USGS Napa River Near Napa and Well 07N05W09Q002M Groundwater Elevation (All Years and Base Period, Fall)



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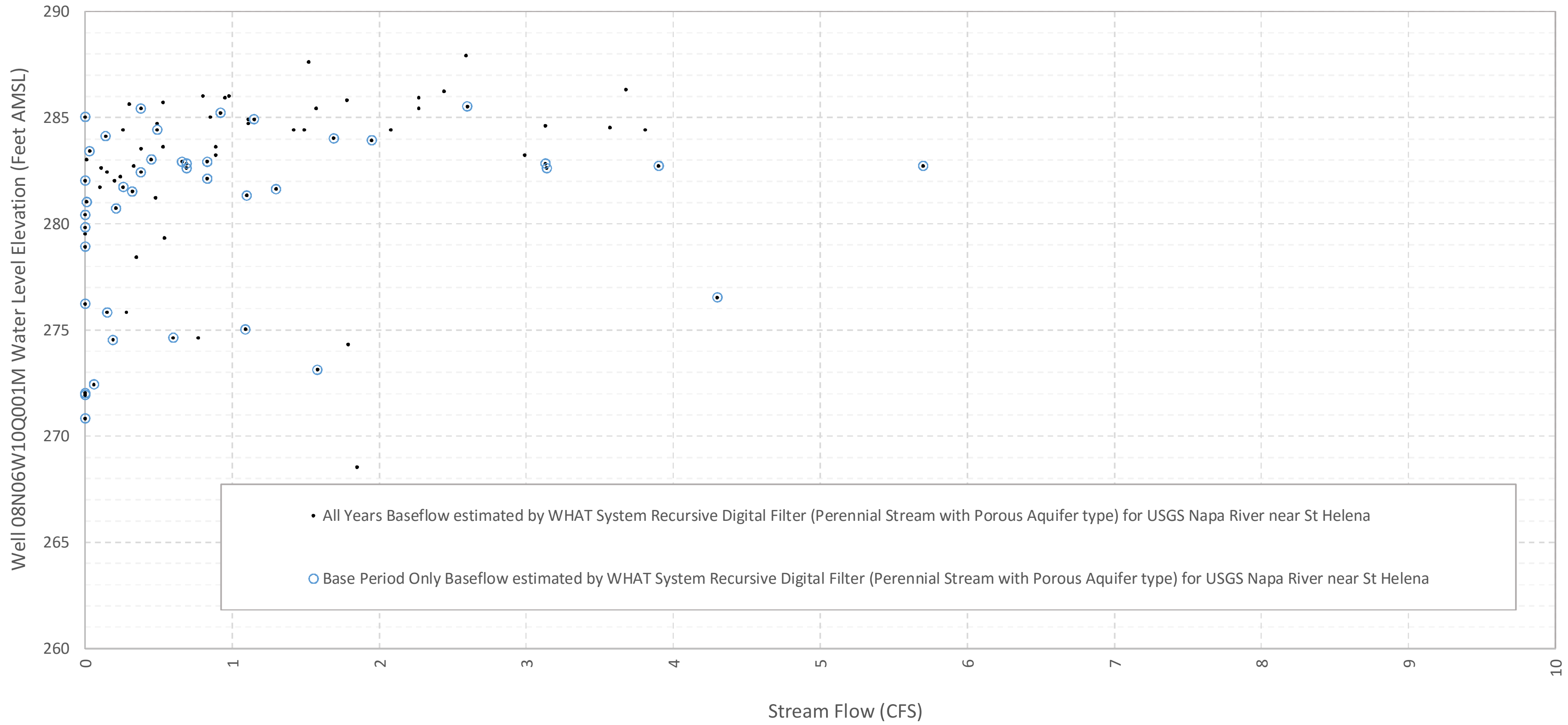
Appendix 4-4

Baseflow USGS Napa River Near Napa and Well 06N04W27L002M Groundwater Elevation (All Years and Base Period, Fall)



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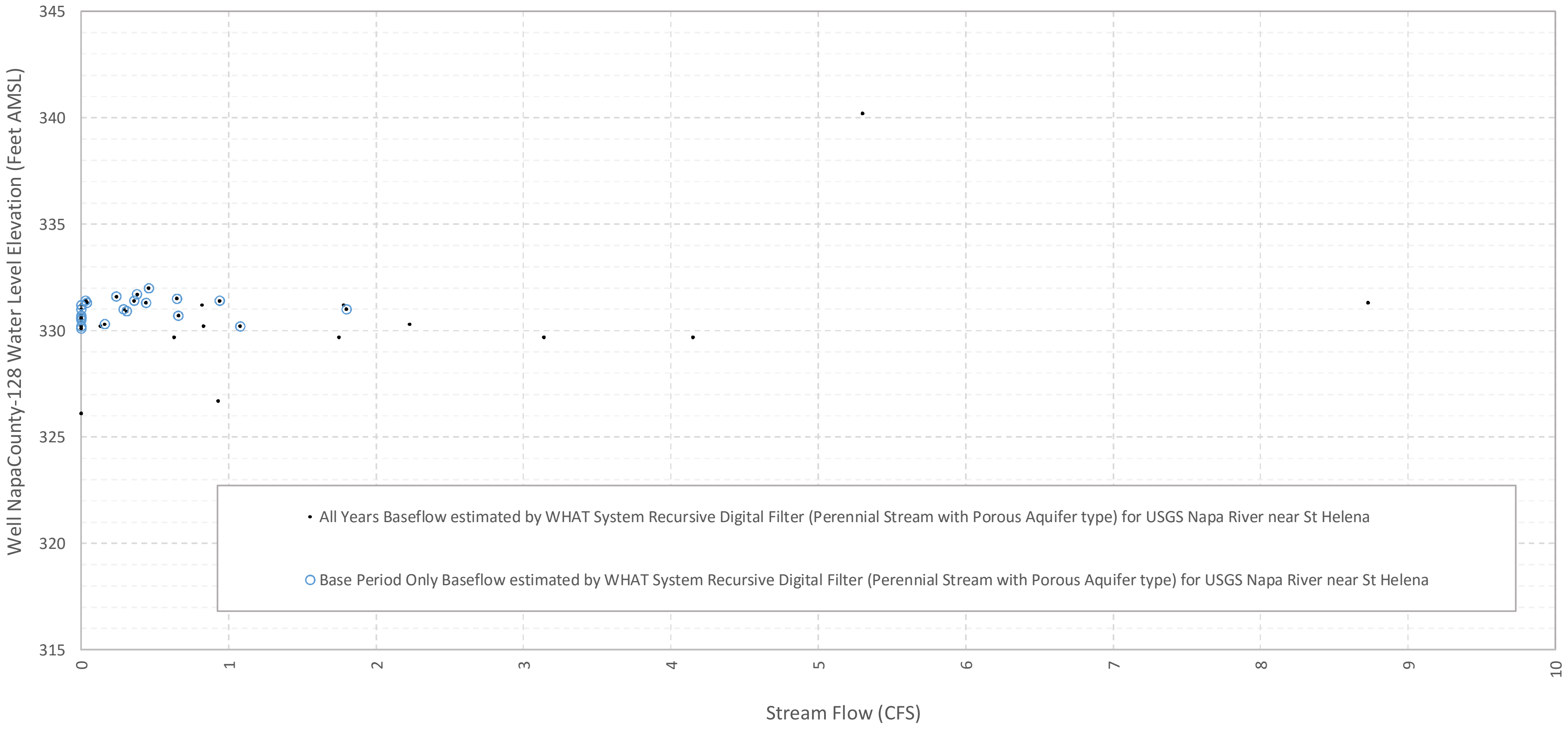
Appendix 4-5

Baseflow USGS Napa River Near St Helena and Well 08N06W10Q001M Groundwater Elevation (All Years and Base Period, Fall)



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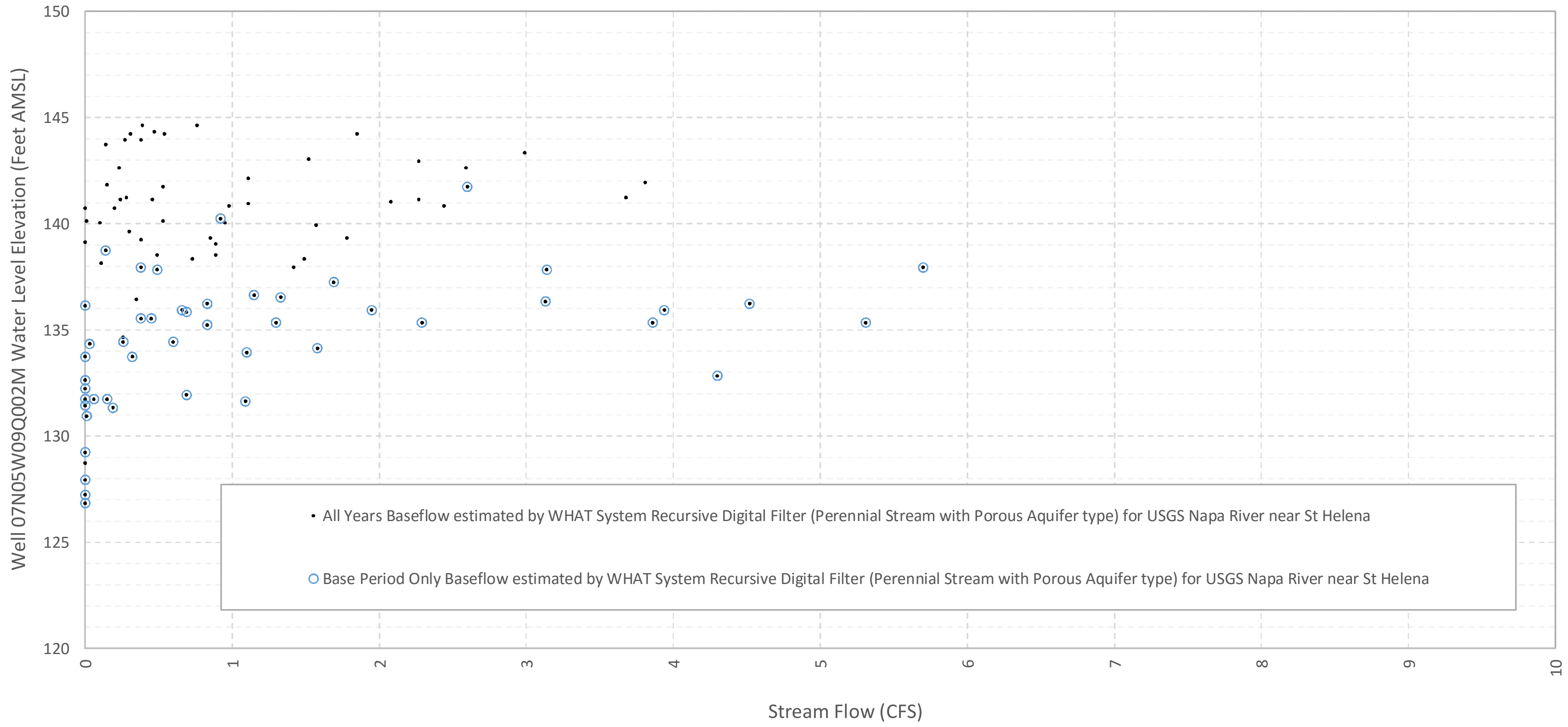
Appendix 4-6

Baseflow USGS Napa River Near St Helena and Well NapaCounty-128 Groundwater Elevation (All Years and Base Period, Fall)



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Appendix 4-7
Baseflow USGS Napa River Near St Helena and Well 07N05W09Q002M Groundwater Elevation (All Years and Base Period, Fall)

NAPA VALLEY GROUNDWATER SUSTAINABILITY:

A BASIN ANALYSIS REPORT FOR THE NAPA VALLEY SUBBASIN

APPENDIX H:

Napa County’s Voluntary Groundwater Level Monitoring, Data Management and Disclosure

Napa County's Voluntary Groundwater Level Monitoring

Data Management and Disclosure

The Voluntary Groundwater Level Monitoring Program has two participation levels; each having different levels of data management and disclosure. The County will make every effort to keep the data it collects confidential. However, the County cannot guarantee that all data provided will be kept confidential if a Public Records Act request is filed.

California Water Code §13752 was amended in 2015 to allow public access to Well Completion Reports. However, the law requires the Department of Water Resource to comply with The Information Practices Act of 1977, redacting personal information from the Well Completion Reports before making them public. Please see: http://www.water.ca.gov/groundwater/wells/well_completion_reports.cfm for more information.

1) **Napa County Program**

- Groundwater level measurements are collected twice a year (spring and fall) and reported to the well owner if requested.
- Well construction details, well location, reference and ground surface elevations and water elevation data will be kept confidential as permitted by law and will not be made available to the public (see disclosure statement above). The water elevation data collected will be used internally by the County to gain a better understanding of general groundwater level conditions across the County's groundwater basins.
- Groundwater quality testing (if applicable) is conducted twice a year (spring and fall) and reported to the well owner.
- Level of Disclosure: **Low**
  - Well construction detail, location, ground surface elevation, and water elevation data NOT made available to the public. Data collected will be used internally by the county to understand general groundwater level fluctuations across the larger basin. Groundwater quality testing (if applicable) conducted twice annually in April and October and reported to the well owner.

2) **California Statewide Groundwater Elevation Monitoring (CASGEM) Program**

- Groundwater level measurements are collected twice a year (spring and fall) and reported to the well owner if requested.
- Well construction detail (including completion type, total depth, construction data, screen intervals [if available], whether or not a well completion report available [y/n], report # [if available], well location, reference and ground surface elevations, and water elevation data) will be made available to the public via websites (State and/or County) or through other means. Data is available on the CASGEM website at: http://www.water.ca.gov/groundwater/casgem/.
- All information provided to CASGEM should be assumed to be available to the public.
- Level of Disclosure: **High**
  - Well construction detail, completion type, total depth, construction data, screen intervals (if available), whether or not a well completion report is available (y/n), report # (if available), well location, ground surface elevation, and water elevation data are made available to the public via websites (State and/or County or through other means. Data Currently available on:

    http://www.water.ca.gov/groundwater/casgem/

Napa County's Voluntary Groundwater Level Monitoring

Frequently Asked Questions for Well Owners

What is the Voluntary Groundwater Level Monitoring Program and why is it important?

The Voluntary Groundwater Level Monitoring Program provides the opportunity to measure the depth to groundwater in wells throughout the County twice per year. Monitoring groundwater elevation helps assess the overall status of Napa County aquifers. The expanding network of privately owned volunteer wells augments County data from publicly monitored wells.

What is required to participate?

Participating well owners must sign an agreement allowing (1) the release of depth-to-groundwater data and (2) access to the property, allowing Napa County Department of Public Works or its contractor to access the well to measure the groundwater elevations twice per year.

Who collects the well measurements and how often are measurements taken?

Groundwater measurements are taken by the Napa County Department of Public Works or its contractor. Measurements generally take place twice per year in the spring and fall.

How will the collected information be used?

The information will be used to monitor and track groundwater levels, understand the relationship between surface water and groundwater, maintain a central database of monitoring results, and improve the accuracy and reliability of relevant water resource models.

What does participation mean to well owners?

Volunteers will (1) receive accurate groundwater level readings twice per year (spring and fall), (2) be able to see seasonal and long-term groundwater level trends of their well, (3) receive water quality data if testing is agreed to and conducted, and (4) gain improved understanding of our groundwater resources countywide.

Will the County measure how much water I use?

No. The amount of groundwater used is not measured. The only measurement taken is the depth to groundwater in the well (water level). If water quality testing is available and agreed to, a sample of well water will be collected and sent to an independent testing laboratory for analysis.

Will someone try to curtail my groundwater use if I participate in the program?

No. The Voluntary Groundwater Level Monitoring Program is a non-regulatory, volunteer program that only measures the groundwater elevation/level (and quality if testing is available and agreed to) in volunteer wells. Groundwater use is not being measured or monitored as part of this program.

Will my well information be kept confidential?

Napa County will make every effort to maintain the confidentiality of a well owner's information. However, such information could be accessed through a public records request. In such a case the County will notify the owner.

Scan with your phone to sign up for the groundwater list serve

http://www.countyofnapa.org/groundwater/

NAPA VALLEY GROUNDWATER SUSTAINABILITY:

A BASIN ANALYSIS REPORT FOR THE NAPA VALLEY SUBBASIN

APPENDIX I:

Water Availability Analysis

(guidance document)

WATER AVAILABILITY ANALYSIS (WAA)

Adopted May 12, 2015

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Introduction and Purpose

The County is required by the California Environmental Quality Act (CEQA) (Public Resources Code 21000–21177) and the CEQA Guidelines (California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000–15387) to conduct an environmental analysis of all discretionary permits submitted for approval. CEQA requires analysis of literally dozens of environmental aspects, including the following:

"Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?"

The purpose of this document, the Water Availability Analysis (WAA), is to provide guidance and a procedure to assist county staff, decision makers, applicants, neighbors, and other interested parties to gather the information necessary to adequately answer that question. The WAA is not an ordinance, is not prescriptive, and project specific conditions may require more, less, or different analysis in order to meet the requirements of CEQA. However, the WAA is used procedurally as the baseline to commence analysis of any given discretionary project.

A Water Availability Analysis is required for any discretionary project that may utilize groundwater or will increase the intensity of groundwater use of any parcel through an existing, improved, or new water supply system[1]. As such, it will most commonly be used for discretionary development applications using groundwater such as wineries and commercial uses. Since CEQA does not apply to non-discretionary ("ministerial") projects, it does not apply to projects such as building permits, single family homes, track II replants, etc. While discretionary vineyard projects are welcome to borrow from the WAA, such vineyard projects, due to their size and scope, generally receive a much more exhaustive analysis under longstanding processes managed by the Conservation Division of the Planning Building & Environmental Services (PBES) Department.

The WAA may also apply when a discretionary Groundwater Permit is required by the Groundwater Conservation Ordinance, Section 13.15.010 of the Napa County Code. The ordinance's provisions are summarized below. (Should there be any conflict between the summary below and the Ordinance, the Ordinance shall prevail).

Outside of Designated Groundwater Deficient Areas

Most non-discretionary development in any area of the county, except for designated groundwater deficient areas, is exempt from the need to secure any type of groundwater permit. This includes projects to develop an on-site or off-site water source serving agriculture, projects to construct or develop rainwater harvesting or graywater recycling systems and minor and convenience water supply system improvements (see definitions in 13.15.010). Other

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[1] The Groundwater Conservation Ordinance (Section 13.15.010) defines a water supply system as "any system including the water source the purpose of which is to extract and distribute groundwater".

exemptions outside groundwater deficient areas include projects such as building permits, well and septic permits, lot line adjustments, track II replants, etc. The following, however, are not exempt:

- Projects to develop or improve a water supply to serve *more* than a single contiguous parcel (agricultural development for multiple contiguous parcels is eligible for an exemption under certain conditions) or
- Projects that can be served by a public water supply.

Within Designated Groundwater Deficient Areas

Most any type of development in groundwater deficient areas (as defined in Napa County Code, Section 13.15.010.C) will trigger the need for a discretionary groundwater permit unless specifically exempted or unless eligible for a ministerial groundwater permit (see 13.15.030C). Ministerial groundwater permits are specifically for (1) a single family residence with associated well and landscaping when no other uses exist on the property, or (2) for agricultural re-plants. Specific exemptions include applications to construct or develop rainwater harvesting or graywater recycling systems and minor and convenience improvements (see definitions in 13.15.010) which include:

- Changes to existing water supply systems for the purposes of repair or rendering a system more efficient or to add to or improve existing legal uses on a property such as swimming pools (if provided with a cover and initially filled with trucked in water),
- Replacement dwellings (when an existing legal dwelling unit had previously existed on the property),
- Additional potential bedrooms whether or not attached to the single-family dwelling, and replacement of a site's existing well (provided the old well is destroyed and the new well is drilled to the same or smaller diameter as the existing well) are all exempt.

WAA Procedure

The Water Availability Analysis (WAA) uses a screening process for discretionary permit applications (both for new projects and for project modifications that change groundwater use) and determines if a proposal may have an adverse impact on the groundwater basin as a whole or on the water levels of neighboring non-project wells or on surface waters.[2] The WAA also provides procedures for further analysis when screening criteria are exceeded. An important sidelight to the process is public education and awareness. The WAA is based on an application which requires the applicant to gather information about existing non-project groundwater wells and water uses at the applicant's site, to describe planned project well operations, to document existing uses of groundwater on the property, and to estimate future water

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[2] For the purposes of this procedure, surface waters are defined to include only those surface waters known or likely to support special status species or surface waters with an associated water right; however, as with all of the procedures in this WAA, there may be unique circumstances that require additional site-specific analysis to adequately evaluate a project's potential impacts on surface water bodies.

demands associated with the proposed project. In addition, other information relating to the geology, proximity to surface water bodies (e.g., river, creeks, etc.), and the location and construction of existing non-project wells located near the applicant's property or project well(s) will also be important to evaluate, as warranted, for the potential for well interference and effects on surface water. County staff can provide assistance to the applicant in obtaining and reviewing the latter information as part of the application data collection process.

WAA Application Procedure

A WAA groundwater permit application may be prepared by the applicant or their agent. (NOTE TO PUBLIC: PBES WILL CREATE/UPDATE AN APPLICATION FORM BASED ON THIS DOCUMENT ONCE APPROVED). **It must be signed by the applicant. If prepared by the applicant's agent, it must contain the letterhead of the agent, the name of the agent, and the agent's signature.** The WAA application contains the following information:

1. The name and contact information of the property owner and the person preparing the application.

2. Site map of the project parcel and adjoining parcels. The map should include: Assessor's Parcel Number (APN), parcel size in acres, location of existing or proposed project well(s) and other water sources, general layout of structures on the subject parcel, location of agricultural development and general location within the county. Approximate locations of existing non-project wells on other parcels within 500 feet of the existing or proposed project well(s) should also be identified based on the applicant's knowledge and available public information. All surface waters within 1500 feet of the existing or proposed project well(s) should also be identified, based on the applicant's knowledge and available public information. County staff can provide assistance to the applicant in obtaining adjacent well location, APNs and parcel size information.

3. A narrative on the nature of the proposed project, including all land uses on the subject parcel, projected future water uses in normal and dry years, details of current and proposed operations related to water use, description of interconnecting plumbing between the various water sources and any other pertinent information.

4. Tabulation of existing water use compared to projected water use for all land uses current and proposed on the parcel. Should the water use extend to other parcels, they should be included in the analysis (see Appendix E for additional information on determining water use screening criteria when multiple parcels are involved). **These estimates should reflect the specific requirements of the applicant's operations.** Guidelines attached in **Appendix B** are an example of one way to calculate projected water demand. The applicant shall use these, other publicly available guidelines, other guidelines that may be provided by the Department of Planning, Building, and Environmental Services (PBES), or project specific estimates, whichever best approximate the proposed water use for the specific project and account for all other existing water uses at the subject parcel(s).

PBES and Public Works (PW) staff will review the application for completeness and reasonableness, review the County's groundwater data management system for additional information about the characteristics of the areas/basin and nearby wells, compare the analysis to the screening criteria, and determine if additional analysis is required. In reviewing available information, County staff will consider:

1. The characteristics of the groundwater area or basin (such as confined or unconfined aquifer system; alluvial or hard rock geological setting) and related aquifer properties; and,

2. The location and present use of all existing non-project wells that are within 500 feet of the project well(s), identifying well depths and construction information for existing wells, if known; and,

3. The distance to surface waters within 500 feet of any Very Low pumping capacity project well(s) or 1500 feet of project well(s) with a capacity greater than 10 gallons per minute (gpm). [3]

Screening Criteria

Applications will be evaluated based on project information, to be provided by the applicant, and available geologic and hydrologic information, to be provided by County staff. As shown in **Table 1,** projects on the Napa Valley Floor and the Milliken-Sarco-Tulucay (MST) that meet the Tier 1 criteria (water use) will generally not be subject to second tier criteria evaluation, unless substantial evidence[4] in the record indicates the need to do so. Parcels in all other areas will generally be required to conduct a Tier 2 evaluation. Projects will be subject to Tier 3 criteria and analysis only when substantial evidence in the record determines the need for such analysis. All criteria are based on information outlined in this procedure, as well as a detailed conceptualization of hydrogeologic conditions in the Napa Valley and substantial evidence in the form of monitoring and hydrologic data, past studies, and well drillers' logs. Procedures for three tiers of screening criteria will be used on each project as designated herein and as needed for projects with unique issues:

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[3] For the purposes of this WAA, "very low pumping capacity wells" are defined as wells with a casing diameter of six inches or less and an installed pump capable of producing less than 10 gallons per minute (gpm). Pumping capacities referenced throughout this WAA were developed as part of a separate analysis of potential streamflow depletion in unconsolidated alluvial settings. Details of this analysis are provided in a separate Technical Memorandum (LSCE, 2013).

[4] Substantial evidence is defined by case law as evidence that is of ponderable legal significance, reasonable in nature, credible and of solid value. The following constitute substantial evidence: facts, reasonable assumptions predicated on facts; and expert opinions supported by facts. Argument, speculation, unsubstantiated opinion or narrative, or clearly inaccurate or erroneous information do not constitute substantial evidence.

Table 1: Project Screening Criteria Applicability

Tier	**Criteria Type**	**Napa Valley Floor**	**MST**	**All Other Areas**
1	Water Use	Yes	Yes	Yes
2	Well and Spring Interference	No[1]	No[1]	Yes
3	Groundwater/Surface Water Interaction	No[1]	No[1]	No[1]

1. Further analysis may be required under CEQA if substantial evidence, in the record, indicates a potentially significant impact may occur from the project.

The three tiers of screening criteria are discussed below. **Appendices B-F** provide additional detail.

Tier 1--Water Use Criteria

For projects on the Napa Valley Floor and in the MST, water use criteria will be compared to the water use estimate provided by the applicant in the WAA application. Water use criteria vary according to the location of the project parcel(s). As such, projects must meet the applicable water use criterion, through project revisions or water use estimate refinements, if necessary and reasonable, in order to be considered in compliance with this criterion.

Table 2A presents the water use criteria. Napa Valley Floor areas include all locations that are within the Napa Valley except for areas specified as groundwater deficient areas. Groundwater deficient areas are areas that have been so designated by the Board of Supervisors. PBES staff can assist the applicant with determining which area a project is located in.

Currently the only designated groundwater deficient area in Napa County is the MST Subarea. Areas of the county not within the Napa Valley Floor or the MST Groundwater Deficient Area are classified as All Other Areas. Public Works can assist applicants in determining the correct classification for project parcel(s). **Appendix B** contains a discussion of the origins of these water use criteria.

Table 2A: Water Use Criteria

Project parcel location	**Water Use Criteria** (acre-feet per acre per year)
Napa Valley Floor	1.0
MST Groundwater Deficient Area	0.3 or no net increase, whichever is less [1]
All Other Areas	Parcel Specific [2]

1. Does not apply to the Ministerial Exemption as outlined in the Groundwater Conservation Ordinance
2. Water use criteria for project shall be considered in relation to the average annual recharge available to project property, as calculated by the applicant or their consultant.

In general, the acceptable water use screening criterion for parcels located on the Napa Valley Floor is 1 acre-foot per acre of land per year (an acre-foot of water is the amount of water it takes to cover one acre of land to a depth of one foot, or 325,851 gallons). Therefore, a 40-acre parcel will meet this criterion if the projected groundwater use would not exceed 40 acre-feet per year.

Areas designated as groundwater deficient areas as defined in the Groundwater Conservation Ordinance will have criteria established for that specific area. For example, the MST Subarea screening criterion is 0.3 acre-feet per acre per year or “no net increase” over existing conditions, whichever is less (see **Appendices B and C**).

Water Use Criterion including Estimated Recharge

The water use criterion for parcels termed All Other Areas (i.e. not located in the Napa Valley Floor or a groundwater deficient area), will be determined on a parcel specific basis. No single criterion can be established for “All Other Areas” due to the uncertainty of the geology, and the increasingly fractured rock aquifer systems in the mountainous and non-Napa Valley areas, including Carneros, Pope Valley, Wooden Valley, and Capell Valley. The project applicant will need to estimate the average annual recharge occurring on the project parcel(s) and consider the amount of recharge relative to the estimation of project water use (e.g., all current and projected water demands for the property on which the planned project is located). The estimate of average annual recharge can be made by various methods including water balance methods. The selected method should be based on data from the parcel or watershed where the proposed project is located. The estimated project water use, including existing and proposed uses of water on the project parcel(s), shall include estimates for normal and dry water years. If an alternative water source will be used for dry years (e.g. trucked in water for non-potable uses), that information shall be provided by the applicant along with the alternate source location and estimated water volume.

Projects on the Napa Valley Floor and in the MST that meet the Tier 1 screening criteria are considered to be in compliance with the standards of the WAA, unless other substantial evidence in the record indicates the need for further evaluation. Projects in “All Other Areas” shall complete Tier 1, and then proceed to Tier 2.

Tier 2--Well and Spring Interference Criterion

When applicable (see **Table 1**), the Tier 2 well interference criterion is presumptively met if there are no non-project wells located within 500 feet[5] of the existing or proposed project well(s). For those projects with neighboring wells located within 500 feet of the project well(s), additional evaluation will be required to assess the potential drawdown in those existing wells resulting from project well operation relative to the Tier 2 criterion described below. Though highly recommended, if the neighboring well is located on a parcel that is also owned by the applicant, the Tier 2 evaluation for that well may be waived, however certain safeguards must be in place to ensure that the water allotment and transfer between parcels is clearly documented and

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[5] Distance is measured horizontally from the well.

recorded, especially in cases where the water from more than one parcel will ultimately serve a use on a single parcel (see **Appendix E**).

The potential interference will be determined based on data including the distance between the project well(s) and the neighboring non-project well(s), the hydrogeologic setting, and well construction information and operational configurations for the project well(s). Well construction information and operational configurations provided by the applicant will include:

- the planned pumping rate of well(s)[6],
- well depth(s),
- well screen intervals and
- well seal locations.

Table 2B presents default well interference criteria that the County may apply in the determination of significant adverse effects. The minimum significant drawdown values presented in **Table 2B** are intended for use in cases where information about existing non-project wells is limited or non-existent. However, when the status and configuration of an existing non-project well are known, for example the depths of screen intervals, locations of any annular seals, and/or water levels in the well and the pump depth setting, then site-specific measures of significance should be used. Site-specific measures of significance should also account for known seasonal variations[7] in groundwater elevations in the vicinity of the proposed project and mutual well interference (i.e., interference between the planned project well usage (new and/or existing) and one or more neighboring wells. County staff shall inform the applicant of the site-specific Tier 2 well interference criteria that will be applied in the evaluation of a project before the applicant conducts a site-specific analysis.

Table 2B. Default Well Interference Criteria

Type of wells within 500 ft. screened within the same aquifer as project well	**Estimated Drawdown at Neighboring Non-Project Wells**
Wells with a casing diameter of six inches or less	10 feet
Wells with a casing diameter greater than six inches	15 feet

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[6] Estimates of well yield shown on driller's logs are not sufficient for this purpose. The planned pumping rate should be determined based on the pump and related equipment installed, or planned to be installed, in the well and, if available, constant rate aquifer test data for tests conducted for a minimum of 8 hours.

[7] As used here, seasonal variations refer to typical changes over the course of a year.

Low pumping capacity project wells in unconfined aquifers will typically require a minimum amount of information due to the limited drawdown that they induce. [8]

Springs

Napa County enjoys the occurrence of many natural springs, and the potential for planned projects to affect spring flow has been considered. A spring is defined as: "A place where groundwater flows naturally from a rock or the soil onto the land surface or into a body of surface water. Its occurrence depends on the nature and relationship of rocks, esp. permeable and impermeable strata, on the position of the water table, and on the topography" (Jackson, J. 1997. *Glossary of Geology*. American Geological Institute). Springs can be formed by multiple causes, including the interception of groundwater by the land surface; permeability differences that can cause groundwater to emerge; flow from faults or fractures; and drainage from landslides. Springs are ephemeral geologic features which may cease to flow due to natural causes such as changes to flow paths, water level declines, porosity lost by mineral precipitation, or sediment plugging.

Because springs originate as groundwater, springs are eligible for WAA Tier 2 analysis. It is required that any proposed project wells within 1,500 feet[9] of natural springs that are being used for domestic or agricultural purposes be evaluated to assess potential connectivity between the part of the aquifer system from which groundwater is planned to be produced and the spring(s). Springs exist in complex hydrogeologic environments. Other substantial evidence in the record may result in the need for such an analysis even though the spring(s) is located a greater distance from the planned well site. Where evaluation of potential connectivity between the project well(s) and springs is required, site-specific spring interference criteria will be established as appropriate for the springs(s) under consideration.

Although the Tier 2 analyses described above relate to mutual well interference and the avoidance of significant interference, potential pumping effects on springs may result in spring flow depletion. Springs are also commonly observed in locations where little to no quantitative records have been kept relating to the spatial occurrence or temporal variability of spring flow. Therefore, projects located in the vicinity of springs, where potential impacts of pumping are possible but unknown, may require monitoring and further analysis.

Tier 3--Groundwater/Surface Water Interaction Criteria

Tier 3 analysis is only conducted when substantial evidence in the record determines the need for such an analysis.

The groundwater/surface water criteria are presumptively met if the distance standards and project well construction assumptions are met (see **Tables 3, 4, and 5).** The distance standards vary according to groundwater pumping capacity, well construction information and operational

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[8] For the purposes of this WAA, low pumping capacity wells are defined as wells with a casing diameter of six inches or less and an installed pump capable of producing between 10 gpm up to 30 gpm. As shown in Appendix F, Table F-6, a well pumping 30 gpm continuously for one day in an unconfined aquifer, even in an aquifer with a low hydraulic conductivity, is expected to induce a drawdown of two feet or less at radial distances as small as 25 feet.

[9] Distance is measured horizontally from the well.

configurations for the project well(s), and aquifer properties as described in **Appendix F**. The criteria are also based on a 140-day period to account for the effect of groundwater withdrawal on surface waters throughout the dry season (typically late May through early October).

The distance standards and construction assumptions in **Tables 3, 4, and 5** are provided as examples of conditions that, if applicable, would be expected to preclude any significant adverse effects on surface waters. The distance standards and construction assumptions in **Tables 3, 4, and 5** were developed as part of a separate analysis of streamflow depletion for surface waters and wells in unconsolidated alluvial geologic settings (LSCE, 2013). Project wells located in other geologic settings, particularly consolidated formations more common in locations deemed All Other Areas, will be subject to other distance standards based on site-specific aquifer conditions. Distance standards for project wells completed in consolidated formations will generally be no more restrictive than those shown in **Tables 3, 4, and 5** for hydraulic conductivity values of 0.5 ft/day.

The distance standards and construction assumptions in **Tables 3, 4, and 5** are not intended to serve as absolute setback criteria. Instead, if the proposed project is located in an equivalent geologic setting but does not meet the distance standards and conform to the associated well construction assumptions (See **Tables 3, 4, and 5)**, then additional analysis will be required to determine project impacts relative to site-specific criteria. The site-specific groundwater/surface water interaction criteria will be established as appropriate for the surface water(s) under consideration[10] (see **Appendix F**).

Additional evaluation will be required to identify the potential for impacts of very low pumping capacity wells within 500 feet[11] of surface waters, low pumping capacity wells within 1000 feet of surface waters, and moderate to high pumping capacity wells within 1500 feet of surface waters, as described in **Appendix F**.[12] The potential impacts will be determined based on data including distance(s) between the project well(s) and the surface water features of concern, the hydrogeologic setting, the streambed (or equivalent feature) hydraulic properties, and well construction information and operational configurations for the proposed project wells. Well construction information and operational configurations provided by the applicant will include:

- the planned pumping rate of well(s) [13],
- well depth(s),
- well screen intervals and
- well seal locations.

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[10] Site-specific criteria will be developed to address project impacts on beneficial uses of affected surface waters.

[11] Distance is measured horizontally from the well.

[12] For the purposes of this WAA, moderate to high pumping capacity wells are defined as wells with a casing diameter greater than six inches and an installed pump capable of producing more than 30 gpm

[13] Estimates of well yield shown on driller's logs are not sufficient for this purpose. The planned pumping rate should be determined based on the pump and related equipment installed, or planned to be installed, in the well and, if available, constant rate aquifer test data for tests conducted for a minimum of 8 hours.

Very low pumping capacity wells in unconfined aquifers will typically require a minimum amount of information due to the limited potential for surface water flow depletion. Other well types located at distances of 1500 feet or greater from surface waters will also likely require a minimum amount of information, particularly when it can be shown that the project well targets aquifer units not hydraulically connected to surface water.

Table 3. Well Distance Standards and Construction Assumptions; Very low capacity pumping rates (i.e., less than 10 gpm), constructed in unconsolidated deposits in the upper part of the aquifer system (unconfined aquifer conditions).

Aquifer Hydraulic Conductivity (ft/day)	**Acceptable Distance from Surface Water Channel**			**Minimum Surface Seal Depth (feet)**	**Depth of Uppermost Perforations (feet)**
	500 feet	1000 feet	1500 feet		
80	✓			50	100
50	✓			50	100
30	✓			50	100
0.5	✓			50	100

Table 4. Well Distance Standards and Construction Assumptions; Low capacity pumping rates (i.e., between 10 gpm and 30 gpm), constructed in unconsolidated deposits in the upper part of the aquifer system (unconfined aquifer conditions).

Aquifer Hydraulic Conductivity (ft/day)	**Acceptable Distance from Surface Water Channel**			**Minimum Surface Seal Depth (feet)**	**Depth of Uppermost Perforations (feet)**
	500 feet	1000 feet	1500 feet		
80			✓	50	150
50			✓	50	150
30			✓	50	100
0.5		✓		50	100

Table 5. Well Distance Standards and Construction Assumptions; Moderate to high capacity pumping rates (i.e., greater than 30 gpm), constructed in unconsolidated deposits in the upper part of the aquifer system (unconfined aquifer conditions).

Aquifer Hydraulic Conductivity (ft/day)	**Acceptable Distance from Surface Water Channel**			**Minimum Surface Seal Depth (feet)**	**Depth of Uppermost Perforations (feet)**
	500 feet	1000 feet	1500 feet		
80			✓	50	150
50			✓	50	150
30			✓	50	100
0.5			✓	50	100

If distance standards and construction criteria in **Tables 3, 4, and 5** above are not met, project approval may still be possible pending additional analysis (see below).

If the minimum surface seal depth is not met, and if available information does not indicate a hydraulic separation provided by geologic conditions at the site, then these cases would require additional analysis by the applicant. Shorter seals can allow for significant flow into the well from shallow portions of an aquifer, even if the screens are at greater depths.

Additional Analysis Required

If the proposed project exceeds one or more of the screening criteria and the applicant is unable to modify the project (i.e., different location, well construction, water usage, or operations) to meet the screening criteria, then further analysis will be required (see **Appendix F**). Additional analysis will also be required if insufficient information exists in the project application to evaluate conformance with the criteria.

The applicant or the applicant's agent should consult with County staff regarding the required scope of the analysis, which is likely to include consultation with a professional hydrologist, geologist, or engineer, and may include field testing. Projects requiring additional analysis regarding Tier 2 or Tier 3 criteria may be subject to state requirements for preparation by a California registered professional geologist or professional engineer. **Appendix F** describes the additional analyses that will be required if the project screening criteria are applicable and are not met or if substantial evidence in the record indicates that a potentially significant impact may result from the project.

The geology of many areas of Napa County is very complex (LSCE and MBK, 2013). Accurate determination of hydrologic parameters (See **Appendix F**) is important to the additional analyses that may be necessary to evaluate potential well interference or impacts on surface water. Several approaches may be considered. One approach, applicable in areas with unconsolidated aquifer materials, is to estimate aquifer hydraulic conductivity values, based on evaluation and interpretation of lithologic data reported for wells drilled in the vicinity of project or well(s) and published hydraulic conductivity values for similar aquifer materials. This method may be applicable in areas of the Napa Valley Floor where the unconsolidated aquifer system has been previously characterized (LSCE and MBK, 2013). This method is not applicable in areas with consolidated or hard rock aquifer materials, including the MST subarea and All Other Areas, due to the increased likelihood of significant variations in aquifer characteristics over relatively small distances.

The County's preferred method for determining the aquifer hydraulic conductivity or other parameters is by conducting an aquifer test and analyzing aquifer test data. In some cases, pump test data may be recorded by a well driller at the time of well construction and included as part of the Well Completion Report submitted to the California Department of Water Resources. However, these tests are not always conducted to standards that result in meaningful aquifer parameters (i.e., the pumping rate may not be constant, the pumping rate may not be large enough to analyze aquifer parameters, the test may be of too short a duration, and groundwater level measurements may not have been made during the test in the pumped well and one or more observation wells, etc.). If adequate aquifer test data are not available, and there is substantial evidence in the record that the project (including the proposed location, construction and operation of any project wells) regarding potential impacts on neighboring non-project wells or nearby surface waters, then an aquifer test may be required of the applicant's project well(s). A constant rate aquifer test is generally required for projects in All Other Areas, if acceptable test data are not already available. Interpretation of pump test data provided in driller's logs is not intended for consolidated aquifers. Pending the proposed project details, the County may also require installation of a monitoring well or monitoring of a nearby existing non-project well.

As described in the Groundwater Conservation Ordinance, the County may require applicants in groundwater deficient areas to install a water meter to verify actual groundwater usage. In addition to the above screening criteria, if the actual usage exceeds the projected use, or the screening criteria, the applicant may be required to reduce groundwater consumption and/or find alternate water sources (See **Appendix D**).

WAA Application Submittals

WAA applications for all use permits and parcel divisions, as well as for all Groundwater Conservation Ordinance permits must be submitted to the Department of Planning, Building and Environmental Services (PBES), which will consult with the Department of Public Works, and be the conduit for communication between the County and the applicant. All subsequent communication should likewise pass through PBES. Any mitigation measures identified via the additional analysis will become either project modifications to, or conditions of approval for, the proposed project. Details of the use permit, land division, or groundwater ordinance can be obtained from PBES, along with mapping of groundwater deficient areas.

Conclusions

The Napa County Board of Supervisors has long been committed to the preservation of groundwater for agriculture and rural residential uses within the County. It is their belief that through proper management, the excellent groundwater resources found within the County can be sustained for future generations. Several conclusions can be drawn from application of the Water Availability Analysis process to date:

- In the process of conducting the analysis, applicants develop a greater awareness of water use by their project, providing a higher level of awareness and potentially leading to more efficient use of the resource.
- Information submitted by applicants has led to a broader database for future study and management.
- Groundwater use can vary widely depending upon its availability, local hydrogeologic constraints, and periodic hydrologic constraints which may affect the recharge and replenishment of the aquifer system.
- On the Napa Valley Floor and in the MST, the practice of evaluating an applicant's WAA by using screening criteria is an accepted method for making groundwater determinations. Based on the significant information available on Napa County groundwater basins, the screening criteria present a reasonable approach to the process. Because of the variability in parcel conditions in "All Other Areas", these parcels warrant a site-specific analysis, as discussed elsewhere in this document.
- The Water Availability Analysis is based upon the basic premise that each landowner has equal right to the groundwater resource below his or her property, so long as it doesn't significantly impact others. Furthermore, the WAA provides sufficient information and supporting documentation to enable the County to determine whether a proposed project may significantly affect groundwater resources and the reasonable and beneficial uses in the proposed area. By implementing policies to prevent wasteful or harmful use of groundwater, it is intended that sufficient groundwater will be available for both current and future property owners. Ensuring wells are located and constructed so as to avoid impacts on neighboring wells and surface water bodies will minimize neighbor disputes and avoid significant environmental impacts. In summary, this WAA implements a process that recognizes:
    - The current understanding of the occurrence and availability of the County's groundwater resources,
    - The hydrogeologic constraints that can locally affect the utilization of those resources, and
    - The periodic hydrologic constraints that may also affect the utilization of the resource and replenishment of the aquifer system.

Appendix A: Water Availability Analysis Background

At the height of the 1990 drought in Napa County, the Napa County Board of Supervisors and the Napa County Planning Commission became very concerned with the approval of use permits and parcel divisions that would cause an increased demand on groundwater supplies within Napa County. During several Commission hearings, conflicting testimony was entered as to the impact of such groundwater extraction on water levels in neighboring wells. The Commission asked the Department of Public Works to evaluate what potential impact an approval might have on neighboring wells and on the groundwater system as a whole. In order to simplify a very complex analysis, the Department developed a three phase Water Availability Analysis to provide a cost-effective answer to the question.

On March 6, 1991 an interim policy report, prepared by County staff, was presented to and approved by the Commission requiring use permit and parcel division applicants to submit a Water Availability Analysis with their application. The staff policy report provided a procedure by which applicants could achieve compliance with the Commission policy. Oversight of groundwater development within the County's jurisdiction was later refined by the Board of Supervisors approval of Napa County Ordinance No.1162 (Groundwater Conservation Ordinance) on August 3, 1999. A revised staff policy report was subsequently adopted by the Board of Supervisors in August 2007. The 2007 Policy Report updated the Water Availability Analysis procedure and restated the purpose and functionality of the analysis relative to the Groundwater Conservation Ordinance.

In January 2011, as part of the County's Comprehensive Groundwater Monitoring Program initiated in 2009, the County's technical consultant, Luhdorff & Scalmanini, Consulting Engineers, completed a review of the County's Groundwater Conservation Ordinance and procedures, and recommended updating the staff policy report and Water Availability Analysis procedure. The consultant's review found that the initial "phase one" analysis was valuable as a screening process, but that the pump test envisioned in "phase two" was not the best way to assess whether projects exceeding the screening criteria would have detrimental groundwater impacts.

On September 11, 2011, the Board of Supervisors appointed a Groundwater Resources Advisory Committee (GRAC) to assist with development of a groundwater monitoring program, and to recommend updates to the Groundwater Conservation Ordinance, as needed. As part of their work, the GRAC also reviewed changes to this Water Availability Analysis policy report in late 2013.

Appendix B: Estimated Water Use for Specified Land Use

Each project applicant is responsible for determining estimated water usage for their proposed project. While some guidelines are provided below, other industry standards exist, PBES may be able to provide data based on previous applications, and each project has its own unique characteristics. The most appropriate data should be used by the applicant to estimate water use for their specific project.

Guidelines for Estimating Residential Water Use:

The typical water use associated with residential buildings is as follows:

Primary Residence	0.5 to 0.75 acre-feet per year (includes minor to moderate landscaping)
Secondary Residence or Farm Labor Dwelling	0.20 to 0.50 acre-feet per year

Additional Usage to Be Added

1. Add an additional 0.1 acre-feet of water for each additional 1000 square feet of drought tolerant lawn or 2000 square feet of non-xeriscape landscaping above the first 1000 square feet.
2. Add an additional 0.05 acre-feet of water for a pool with a pool cover.
3. Add an additional 0.1 acre-feet of water for a pool without a cover.

Residential water use can be estimated using the typical water uses above. All typical uses are dependent on the type of fixtures and appliances, the amount and type of landscaping, and the number of people living onsite. If a residence uses low-flow fixtures and has appliances installed, is using xeriscape landscaping, and is occupied by two people, the water use estimates will be on the low side of the ranges listed above.

Examples of Residential Water Usage:

Residential water use can vary dramatically from house to house depending on the number of occupants, the number and type of appliances and water fixtures, the amount and types of lawn and landscaping. Two homes sitting side by side on the same block can consume dramatically different quantities of water.

Example 1:

Home #1 is 2500 square feet. Outside the house there is an extensive bluegrass lawn, a lot of water loving landscaping, and a swimming pool with no pool cover. Inside the house all the appliances and fixtures, including toilets and shower-heads, are old and have not been upgraded or replaced by water saving types. The owners wash their cars weekly but they don't have nozzles or sprayers on the hose. They do not shut off the water while they are soaping up the vehicles, allowing the water to run across the ground instead. Water is commonly used as a broom to wash off the driveways, walkways, patio, and other areas. The estimated water usage for Home #1 is 1.2 acre-feet of water per year

Example 2:

Home #2 is also 2500 square feet. Outside of the house there is a small lawn of drought tolerant turf, extensive usage of xeriscape landscaping, and no swimming pool. Inside the house all of the appliances and fixtures, including toilets and showerheads, are of the low flow water saving types. The owners wash their cars weekly, but have nozzles or sprayers on the hose to shut off the water while they are soaping up the vehicles. Driveways, walkways, patios, and other areas are swept with brooms instead of washed down with water. Estimated water usage for Home #2 is 0.5 acre-feet of water per year.

The above are only examples of unique situations. The estimated water use for each project will vary depending on existing parcel conditions.

Guidelines For Estimating Non-Residential Water Usage:

Agricultural:

Vineyards	
Irrigation Only	0.2 to 0.5 acre-feet per acre per year
Heat Protection	0.25 acre-feet per acre per year
Frost Protection	0.25 acre-feet per acre per year
Irrigated Pastures	4.0 acre-feet per acre per year
Orchards	4.0 acre-feet per acre per year
Livestock (sheep or cows)	0.01 acre-feet per acre per year

Winery:

Process Water	2.15 acre-feet per 100,000 gal. of wine
Domestic and Landscaping	0.50 acre-feet per 100,000 gal. of wine
Employees	15 gallons per shift
Tasting Room Visitation	3 gallons per visitor
Events and Marketing, with on-site catering	15 gallons per visitor

Industrial:

Food Processing	31.0 acre-feet per employee per year
Printing/Publishing	0.60 acre-feet per employee per year

Commercial:

Office Space	0.01 acre-feet per employee per year
Warehouse	0.05 acre-feet per employee per year

Estimates of water use for other categories are available in the technical literature from sources such as the American Water Works Association's Water Distribution Systems Handbook (Mays, 2000).

Parcel Location Factors:

The water use screening criterion for each parcel is based on the location of the parcel. There are three different location classifications: Napa Valley Floor, MST Groundwater Deficient Area, and All Other Areas. Napa Valley Floor areas include all locations that are within the Napa Valley excluding areas designated as groundwater deficient areas. Groundwater deficient areas are areas determined by the Department of Public Works as having a history of insufficient or declining groundwater availability or quality. At present the only designated groundwater deficient area in Napa County is the MST Subarea. Areas of the County not within the Napa Valley Floor and MST Groundwater Deficient Area are classified as All Other Areas. Public Works can assist applicants in determining the appropriate classification for project parcel(s).

Project Parcel Location	Water Use Criteria
Napa Valley Floor	1.0 acre feet per acre per year
MST Groundwater Deficient Area	0.3 acre feet per acre per year or no net increase, whichever is less*
All Other Areas	Parcel Specific
* Does not apply to the Ministerial Exemption as outlined in the Groundwater Conservation Ordinance	

The criterion for the Napa Valley Floor Area was agreed to 1991 by the Board of Supervisors. The criterion of 0.3 acre feet per acre per year for the MST Groundwater Deficient Area was determined using data from the 1977 USGS report on the Hydrology of the MST Subarea (Johnson, 1977). The value is calculated by dividing the "safe annual yield," as determined by the USGS (Johnson, 1977), by the total acreage of the affected area (10,000 acres). The addition of the "no net increase" standard reflects the County's obligation to assess potential cumulative impacts under CEQA. In a groundwater deficient area, any discretionary project that increases groundwater use may contribute to the declining groundwater levels in the aquifer.

No single criterion can be established for "All Other Areas" due to the uncertainty of the geology, and the increased complexity of the fractured rock aquifer systems in the mountainous and non-Napa Valley areas, including Carneros, Pope Valley, Wooden Valley, and Capell Valley. The project applicant will need to estimate the average annual recharge occurring in the project area and consider the amount of recharge relative to the estimation of project water use (e.g., all current and projected water demands for the property on which the planned project is located). The estimated project water use shall include estimates for normal and dry water years for both current and proposed water uses. If an alternative water source will be used for dry years (e.g.

trucked-in water for non-potable uses), that information shall be provided by the applicant including the source and estimated water volume.

The criteria above were reviewed by the County's groundwater consultants in 2011-2013 and are considered to be reasonable indicators on a watershed scale of the levels below which significant environmental impacts would be unlikely to occur. The review was based on existing monitoring data and an updated hydrogeologic conceptualization of the Napa Valley aquifer system (LSCE and MBK, 2013) and is consistent with the County's experience since establishment of the water use criteria in 1991. In addition, these criteria have been successfully applied as part of the WAA procedure since their establishment.

Appendix C: Guidance for MST Subarea Permit Applications

Historical data collected from the monitoring of wells within the MST Subarea over many decades indicate that it may be in overdraft, leading to the conclusion that the existing water users within the basin historically pumped more water from the ground than is being naturally replaced each winter season. To offset the overdraft trend, a recycled water pipeline is being installed, and once operating, its beneficial effects will be measured. However, as no other reasonable water resources currently exist in the MST, to avoid a ban on all new construction, the County has permitted each property owner to develop their property with the uses involving ministerial approvals under Section 13.15.030(C) of the groundwater ordinance, which are limited to a "reasonable" level of water use that may reduce the rate at which the groundwater levels are being lowered.

Single Family Dwellings on Small Parcels In the MST Subarea: The average, single family dwelling will likely use between 0.5 and 0.75 acre-feet of groundwater per year. Using a criterion of 0.3 acre-ft/year/acre, the minimum parcel size able to support the above range is between 1.5 to 2.5 acres. However, in order to ensure that all property owners have viable use of their land, applications for the construction of a single family home in these instances can be approved ministerially if the owner agrees to the conditions outlined in the Groundwater Ordinance. If the conditions are not agreed upon, or if the project involves a secondary dwelling or other groundwater uses not consistent with a single family dwelling, then the project would be subject to the analysis outlined in the WAA report. The County cannot approve the groundwater permit unless the proposed use is off-set by reductions elsewhere, such that the "no net increase" and "fair share"[14] water use screening criterion is met.

Agricultural Development In the MST Subarea: Agriculture in the MST Subarea is not exempt from the groundwater permit process. In these cases, such development will require an application for a groundwater permit and a WAA detailing the existing and proposed water use(s) on the project parcel(s). All new agricultural development in the MST will be required to meter all wells supplying water to the property with periodic reports to the County. The County cannot approve the groundwater permit unless the proposed use is off-set by reductions elsewhere, such that the "no net increase" and "fair share" water use screening criterion is met.

Existing Vineyard, New Primary or Secondary Residence In the MST Subarea: On an application related to a new residence on a parcel with an existing vineyard or residence, the WAA shall include all water use on the property, both existing and proposed. Projects on parcels with an established vineyard will be required to meter all wells supplying water to the property with periodic reports to the County. The County cannot approve the groundwater permit unless the proposed use is off-set by reductions elsewhere, such that the "no net increase" and "fair share" water use screening criterion is met.

Wineries and Other Use Permits In the MST Subarea: On a use permit application, the applicant is required to provide a WAA. Should the application be approved, a specific condition

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[14] The "fair share" allotment for water use is based on the parcel(s) location in the Napa Valley Floor, MST Groundwater Deficient Area or All Other Areas (see additional information in Appendix B).

of approval will be required to meter all wells supplying groundwater to the property with periodic reports to the County. It is also possible that water conservation measures will be a condition of approval. All new use permits must meet the criterion for water use for the project parcel. The County cannot approve the groundwater permit unless the proposed use is off-set by reductions elsewhere, such that the “no net increase” and “fair share” water use screening criterion is met.

Appendix D: Water Meters (in Groundwater Deficient Areas Only)

If required, water meters shall measure all groundwater used on the parcel. Additional meters may also be required for monitoring the water use of individual facilities or operations, such as a winery, residence, or vineyard located on the same parcel. If a meter(s) is installed, the applicant shall read the meter(s) and provide the readings to the County Engineer at a frequency determined by the County Engineer. The applicant shall also convey to the County Engineer, or his designated representative, the right to access and verify the operation and reading of the meter(s) at any time.

If the meters indicate that the water consumption of a parcel in the MST Subarea exceeds the fair share amount, the applicant will be required to submit a plan which will be approved by the Director of Public Works to reduce water usage. The applicant may be required to find additional sources of water to reduce their groundwater usage. Additional sources may include using water provided by the City of Napa, the installation of water tanks which are filled by water trucks, or other means which will ensure that the groundwater usage will not exceed the fair share amounts.

The readings from water meters may also be used to assist the County in determining trends in groundwater usage, adjusting baseline water use estimates, and estimating overall groundwater usage in the MST Subarea.

Appendix E: Determining water use numbers with multiple parcels

The Water Availability Analysis is based on the premise that each landowner has equal right to the groundwater resource below his or her property. There will be cases where one person or entity owns multiple contiguous parcels and requests that the total water allotment below all of his or her parcels be considered in the Water Availability Analysis. Determining the total water demand based on multiple contiguous parcels is acceptable; however, to protect future property owners, certain safeguards must be in place to ensure that the water allotment and transfer between parcels is clearly documented and recorded, especially in cases where the water from more than one parcel will ultimately serve a use on a single parcel.

When multiple parcels are involved, the parcels for which the total water usage is being based on must be contiguous and clearly identified on a site plan with the Assessor's parcel numbers noted. The transfer of water from these parcels to the parcel on which the requested use is located must be documented using the form provided by the Department of Public Works. The form must be approved by the County and subsequently recorded by the applicant prior to commencement of any activity authorized by the groundwater permit or other county permit or approval. A condition requiring such will be placed on the use permit, groundwater permit or other permit for approval.

Alternatively, if the method above is not feasible, the applicant may provide an additional analysis for each project parcel, with the understanding that the water use on each individual parcel must not exceed the water use screening criterion for that parcel (see additional information in Appendix B).

Appendix F: Water Availability Analysis Tiers 2 & 3 Screening Criteria & Additional Analysis

County staff will conduct, or require the applicant to conduct, additional analysis of the proposed project according to any screening criteria that are not met. Additional analysis is required for projects that are not located on the Napa Valley Floor or in the MST (i.e. “All Other Areas”). Additional analysis will also be required if insufficient information exists in the project application to judge conformance with one or more of the criteria.

Water Use Evaluation (Tier 1)

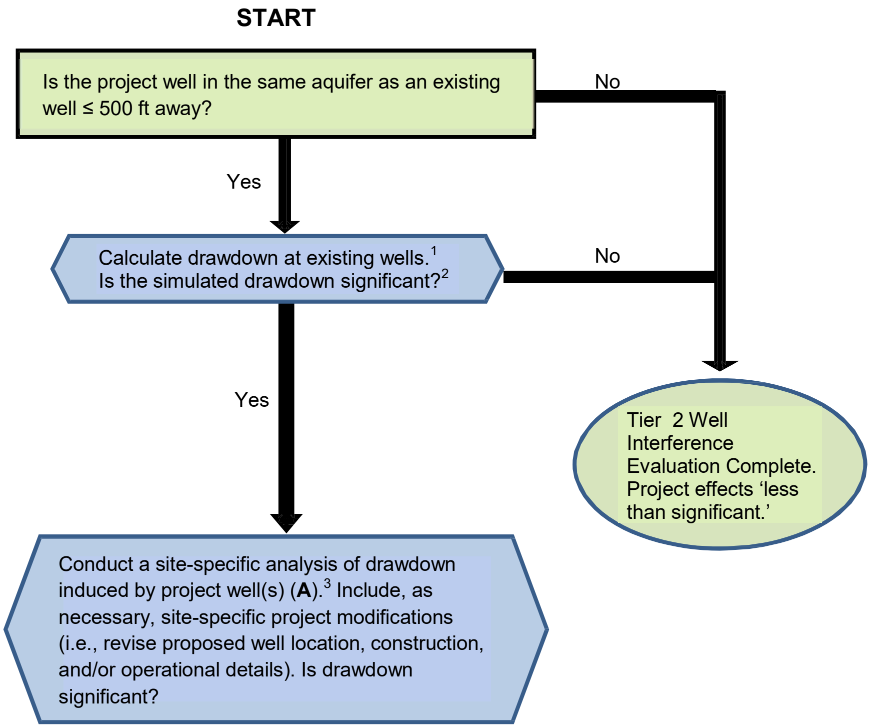
When the proposed project’s estimated water demand does not meet the applicable water use criterion, the applicant will be encouraged to first revise the project and/or refine the water use estimate based on project details not adequately reflected in the water use screening criterion. County staff will then review the revised estimate and determine if the acceptable water use criterion has been met.

Well and Spring Interference Evaluation (Tier 2)

The Tier 2 well interference criterion is presumptively met if there are no non- project wells located within 500 feet of the existing or proposed project well(s). When a project well is within 500 feet of a neighboring non-project well(s) additional analysis of well interference will be required (see **Figure F-1**) for projects located in “All Other Areas”. It may also be required for the Napa Valley Floor and the MST when substantial evidence in the record indicates the need to do so under CEQA. The analysis will first determine whether the existing or proposed project and non-project wells are, or are proposed to be, screened in the same aquifer unit and, if so, whether any drawdown induced in the non-project well(s) may constitute a significant adverse effect. **Table F-1** provides standard well interference criteria for induced drawdown in a non-project well that will be used in the absence of site-specific information regarding the susceptibility of existing non-project wells to drawdown induced by project well(s). Site-specific susceptibility information would include the pump depth setting and construction of project and non-project wells.

The Tier 2 spring interference criterion is presumptively met if no natural springs in use for domestic or agricultural purposes are located within 1,500 feet of any proposed project wells. When a project well is within 1,500 feet of a natural spring additional analysis of connectivity between the part of the aquifer system from which groundwater is planned to be produced and spring(s). When additional analysis is required, site-specific spring interference criteria will be established as appropriate for the springs(s) under consideration.

FIGURE F-1. WAA Additional Analysis Decision Tree (as shown, for well interference evaluation), where designated A = applicant responsibility, C = County staff responsibility



[1] Drawdown to be calculated using industry standard method(s) appropriate to the aquifer under consideration, such methods include the Theis Equation applicable for confined or unconfined aquifers (**A** or **C**).

[2] See Table F-1 or similar, superseding criteria provided by County staff (C).

[3] This site-specific analysis may include an aquifer test or an alternative study at the proposed well site to refine aquifer properties used in drawdown calculations and must include details of the project well(s) construction and operation relative to the site hydrogeology and any known information concerning the construction of any existing non-project wells under consideration (**A**).

The additional analysis will consider site-specific information including:

- the distance between the project well(s) and any existing non-project wells within 500 feet or natural springs within 1,500 feet;
- depth, screen intervals, and pump design flow rate for project well(s);
- depth, screen intervals, and pumping capacity/well type for the existing non- project well(s) or elevation and historical records of spring production;
- site hydrogeology (including aquifer units accessed by the project well and by existing non-project well(s) or natural springs and aquifer hydraulic properties (see **Tables F-2 and F-3**).

Data collected for the analysis will initially come from the WAA application, including information about existing non-project wells and site hydrogeology provided by County staff. These data will be used to calculate drawdown at any existing non-project wells, completed in the same aquifer unit, resulting from planned operation of the project well(s). Drawdown will be calculated using industry standard methods appropriate to the aquifer unit under consideration; such methods include the Theis Equation applicable for confined or unconfined aquifers (Theis, 1935).

If the initial calculated drawdown exceeds the Tier 2 well interference criteria, the applicant shall be required to submit a site-specific analysis prepared by a qualified professional demonstrating that the proposed project will not have an adverse effect (direct, indirect, or cumulative), on groundwater resources or neighboring non-project wells. This site-specific analysis may include an aquifer test or an alternative study at the proposed well site to refine aquifer properties used in drawdown calculations. The site-specific analysis may also demonstrate less than significant impacts by proposing modifications to the location, construction, or operation of project well(s).

If available data indicate a possible hydraulic connection between the project well(s) and any identified springs, an analysis of the hydraulic connection induced by the project well(s) will be conducted. Potential spring flow depletion induced by the project well(s) will be compared to site-specific spring interference criteria to determine if they constitute a significant adverse effect. The site-specific spring interference criteria will be established as appropriate for the spring(s) under consideration. Depending on site-specific concerns, more or less restrictive criteria may be required.

Table F-1 presents well interference criteria that the County may apply in the determination of significant adverse effects. The minimum significant drawdown values presented in **Table F-1** are intended for use in cases where information about existing non-project wells is limited or nonexistent. However, when the status and configuration of an existing non-project well are known, for example the depths of screen intervals, locations of any annular seals, and/or water levels in the well and the pump depth setting, then site-specific measures of significance should be used. Site-specific measures of significance should also account for known seasonal variations[15] in groundwater elevations in the vicinity of the proposed project and mutual well interference (i.e., interference between the planned project well usage (new and/or existing) and one or more neighboring wells). County staff shall inform the applicant of the site-specific Tier 2 well interference criteria that will be applied in the evaluation of a project before the applicant conducts a site-specific analysis.

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[15] As used here, seasonal variations refer to typical changes over the course of a year.

Table F-1. Default Well Interference Criteria

Type of wells within 500 ft. screened within the same aquifer as project well	**Estimated Drawdown at Neighboring Non-Project Wells**
Wells with a casing diameter of six inches or less	10 feet
Wells with a casing diameter greater than six inches	15 feet

Groundwater/Surface Water Interaction Evaluation (Tier 3)

When Tier 3 analysis is required[16], it shall be conducted as described below. The analysis will first determine whether the project well(s) are, or are proposed to be, screened in an aquifer unit hydraulically connected to the surface water(s) within the applicable distance specified by **Tables 3, 4, and 5** for unconsolidated aquifers (see also Figure F-2). If a hydraulic connection does exist, even one of limited temporal extent, then an analysis of the streamflow or surface water depletion induced by the project well(s) will be conducted. The streamflow depletion induced by the project well(s) will be compared to site-specific groundwater/surface water interaction criteria to determine if they constitute a significant adverse effect. The site-specific groundwater/surface water interaction criteria will be established as appropriate for the surface water(s) under consideration. Depending on the temporal extent of hydraulic connection and the special status species and/or surface water rights under consideration, more or less restrictive criteria may be required, up to and including no measurable streamflow depletion.

The additional analysis will consider site-specific information including:

- the distance between the proposed well and naturally-present surface water bodies within 1500 feet;
- depth, screened intervals, seal depths, and pumping capacity of applicant's well(s);
- site hydrogeology (including aquifer zones accessed by proposed well and existing wells and aquifer hydraulic properties (see **Tables F-2, F-3 and F-4**); and
- streambed (or equivalent feature) hydraulic properties.

Data collected for the analysis will initially come from the WAA application, including information about existing non-project wells and site hydrogeology provided by County staff. The evaluation will include calculation of streamflow depletion due to planned operation of the project well(s). Streamflow depletion will be calculated using industry standard methods appropriate to the

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[16] Tier 3 analysis may be required under CEQA if substantial evidence, in the record, indicates a potentially significant impact may occur from the project.

aquifer under consideration; such methods include the Hantush Equation applicable for aquifers hydraulically connected with surface waters (Hantush, 1965).[17] If the initial calculated streamflow depletion exceeds the groundwater/surface water interaction criteria, the applicant shall be required to submit a site-specific analysis prepared by a qualified professional demonstrating that the proposed project will not have an adverse effect (direct, indirect, or cumulative), on surface water resources. This site-specific analysis may include an aquifer test or an alternative study at the proposed well site to refine aquifer properties used in streamflow depletion calculations. The site-specific analysis may also demonstrate less than significant impacts by proposing modifications to the location, construction, or operation of project well(s).

Modifications to the proposed project will be considered acceptable in satisfying the criteria where project well(s) can be shown to have a sufficient geologic or hydraulic separation from the surface water(s) that would prevent the well from causing streamflow depletion at least as much as would be expected at the minimum distance specified by the WAA Tables 3, 4, and 5. The California Department of Water Resources (DWR) and U.S. Bureau of Reclamation (USBR) allow for similar exemptions when considering the potential effect on surface water flows of groundwater pumping proposed for water transfers involving groundwater substitution pumping in the Sacramento Valley. Some example circumstances for exception to the stated criteria (based on DWR and USBR, 2013) include:

- Sufficient information, including site-specific geologic or hydrologic data, is provided to demonstrate that the well does not have significant hydraulic connection to the surface water system;
- The well's uppermost perforations are planned to be deeper than recommended (see **Tables 3, 4, 5**) and there is demonstration of low permeability deposits overlying the zone from which extraction is proposed to occur (i.e., a confining unit at least 20 feet thick exists above the depth of the uppermost perforation). In this case a somewhat lesser distance from the surface channel may be considered, pending the well type and planned well operations;
- The well's uppermost perforations are planned to be shallower than recommended (see **Tables 3, 4, 5**) and there is demonstration of low permeability deposits overlying the zone from which extraction is proposed to occur (i.e., a confining unit at least 40 feet thick exists above the depth of the uppermost perforation). In this case a somewhat lesser distance from the surface channel may be considered, pending the well type and planned well operations;
- The project well is a moderate to high pumping capacity well and the uppermost perforations are located no shallower than 150 feet deep, the perforations may be shallower (e.g., 100 feet deep), if there is a total of at least 50 percent fine-grained

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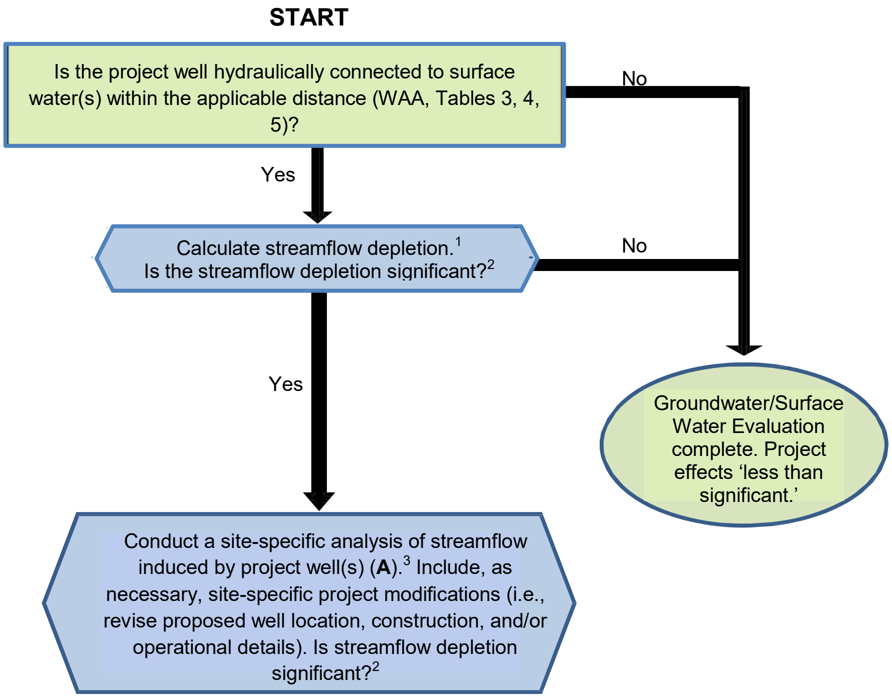
[17] Streamflow depletion is to be calculated using industry standard method(s) appropriate to the aquifer and surface water source under consideration, such methods include the Hantush Equation applicable for unconfined aquifers with a direct hydraulic connection to a surface water body (Hantush, 1965).

materials in the interval above 100 feet below ground surface (bgs), and at least one fine-grained layer that exceeds 40 feet in thickness in the interval above 100 feet bgs.

FIGURE F-2. WAA Additional Analysis Decision Tree (as shown, for groundwater/surface water evaluation), where designated A = applicant responsibility, C = County staff responsibility



[1] Streamflow depletion to be calculated using industry standard method(s) appropriate to the aquifer under consideration, such methods include the Hantush Equation applicable for aquifers hydraulically connected with surface waters (**A** or **C**).

[2] Streamflow depletion criteria will be determined according to site-specific conditions (C).

[3] This site-specific analysis may include an aquifer test or an alternative study at the proposed well site to refine aquifer properties used in drawdown calculations and must include details of the project well(s) construction and operation relative to the site hydrogeology and any known information concerning the surface water(s) under consideration (**A**).

Data Needs for Additional Analysis

Hydrogeologic information at or in the vicinity of the subject parcel may be available from previous activities, or may be reasonably estimated from prior work conducted by the County. Previous activities may include (but are not limited to) aquifer tests, well completion reports with lithologic logs, water level, and well yield data collected on the parcel, and water level data collected as part of other groundwater monitoring activities. County staff will determine whether and how to best include such data in the WAA evaluation process. If no geologic information exists in the vicinity of the subject parcel, additional analysis may be required of the applicant.

The hydrogeologic information needed for WAA evaluation may include the aquifer storage coefficient, specific yield, hydraulic conductivity, transmissivity, and aquifer thickness. The aquifer storage coefficient for confined aquifers, or storativity, is defined as the volume of water that can be drained from a unit area of aquifer materials per unit decline in head. The storage coefficient can be calculated by multiplying the aquifer thickness and specific storage. In unconfined aquifers a similar property is represented by the specific yield of the aquifer materials.[18] Specific yield is defined as the volume of water that can be drained from a unit area of an unconfined aquifer in response to a unit decline in the water table elevation. **Table F-2** presents a range of values for specific yield for a variety of potential aquifer materials. In a confined aquifer the specific storage of aquifer materials can be calculated as the storage coefficient multiplied by aquifer thickness, where the storage coefficient is the volume of water produced by a unit volume of aquifer material per unit decline in head. **Table F-3** presents a range of possible specific storage values for potential aquifer materials. Storage coefficients for confined aquifers typically range from 5×10^{-5} to 5×10^{-3} (Todd, 2005). Specific yield for unconfined aquifers typically range from 0.1 to 0.3 (Lohman, 1972).

Table F-2. Representative Specific Yield[1] Ranges for Selected Earth Materials
(adapted from Walton, 1970)

Sediment	**Specific Yield**
Clay	0.01 – 0.10
Sand	0.10 – 0.30
Gravel	0.15 – 0.30
Sand and Gravel	0.15 – 0.25
Sandstone (e.g., Great Valley formation)	0.05 – 0.15
Shale (e.g., Great Valley formation)	0.005 – 0.05

[1] Specific yield can be considered equivalent to the storage coefficient for unconfined aquifers where aquifer compressibility is negligible.

Table F-3. Representative Specific Storage Ranges for Selected Materials
(adapted from Batu, 1998)

Material	**Specific Storage (ft^{-1})**		
Loose Sand	1.5×10^{-4}	to	3.1×10^{-4}
Dense Sand	3.9×10^{-5}	to	6.2×10^{-5}
Dense Sandy Gravel	1.5×10^{-5}	to	3.1×10^{-5}
Rock, fissured	1×10^{-6}	to	2.1×10^{-5}

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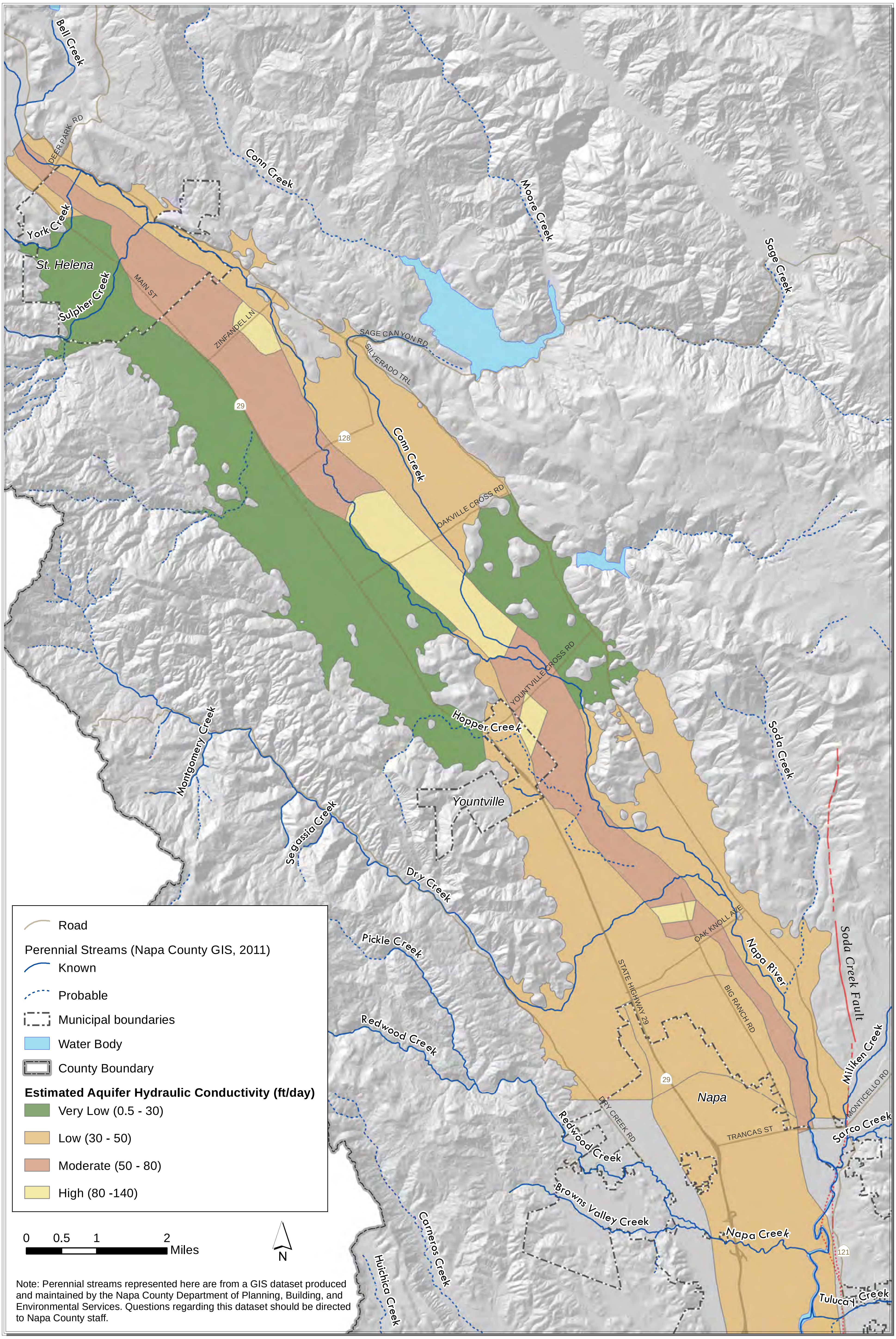
[18] An unconfined aquifer is defined by a water table that occurs where pore space pressures coincide with atmospheric pressure and where water released from aquifer storage occurs in large part due to the draining of saturated pore spaces in the aquifer material.

Transmissivity is another frequently used aquifer parameter. Transmissivity is defined as the capacity of the aquifer to transmit water across its entire thickness, calculated as the product of the aquifer hydraulic conductivity and the aquifer thickness. **Table F-4** presents representative hydraulic conductivity values found in the literature. Hydraulic conductivity ranges for the alluvial aquifer system have been mapped in Napa Valley by the US Geological Survey (USGS) (Faye, 1973), with more recent interpretations provided here based on a review of well driller's logs and other geologic data available through 2011 (LSCE and MBK, 2013). These ranges for hydraulic conductivity are depicted in **Figure F-3** and described in **Table F-5**, as interpreted by the County's groundwater consultants. Recent hydrogeologic investigations performed for the County have also produced maps and cross sections of subsurface geologic conditions which may be consulted for the determination of aquifer thickness in the vicinity of a proposed project (LSCE and MBK, 2013).

Table F-4. Representative Hydraulic Conductivity Ranges for Selected Materials
(adapted from Leap, 1999 and Batu, 1998)

Material	**Hydraulic Conductivity (ft/day)**		
Gravel (Alluvium)	10^1	to	10^5
Sand (Alluvium)	10^{-1}	to	10^3
Silty Sand (Alluvium)	10^{-2}	to	10^2
Silt (Alluvium)	10^{-4}	to	1
Sandstone (e.g. Great Valley formation)	10^{-5}	to	10^{-1}
Shale (e.g., Great Valley formation)	10^{-8}	to	10^{-4}
Fractured Basalt (e.g., Sonoma Volcanics)	10^{-2}	to	10^2



Note: Perennial streams represented here are from a GIS dataset produced and maintained by the Napa County Department of Planning, Building, and Environmental Services. Questions regarding this dataset should be directed to Napa County staff.

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CONSULTING ENGINEERS

Figure F-3
Estimated Alluvial Aquifer Hydraulic Conductivity Ranges, Napa Valley Floor

Table F-5. Representative Hydraulic Conductivity values for WAA analysis of Napa Valley Floor unconsolidated alluvial aquifer materials[3]

Hydraulic Conductivity, K, class	**Hydraulic Conductivity range[1], ft./day**	**Hydraulic Conductivity value, ft./day** (used for scenario results)
high	80 - 140	80
moderate	50 - 80	50
low	30 - 50	30
very low[2]	0.5 - 30	0.5, 10

[1] Hydraulic conductivity range have been developed from mapped values from Faye (1973) and interpretations based on a review of well driller's logs and other geologic data available through 2011 (LSCE and MBK, 2013).

[2] A hydraulic conductivity value of 0.5 ft./day was applied for calculations of groundwater and surface water interaction (Tables 3, 4 and 5). A hydraulic conductivity value of 10 ft./day was applied for calculations of well interference (Table 2B and F1).

[3]Representative hydraulic conductivity values shown here are applicable to the unconsolidated alluvial aquifer materials in the Napa Valley Floor and not aquifer zones beneath the Napa Valley Floor alluvium or outside of the Napa Valley Floor.

County staff will review well construction permits and records for wells within 500 feet of the proposed project. Information about existing wells within 500 feet of the proposed project site will include the following as available: the location of those wells relative to the project well(s), total depth, depth of screened intervals, annular seal depths, the geologic or lithologic record made as part of well construction, the elevation of the static water level in the well post-construction, the elevation of water levels while pumping, and the pump depth setting.

Tables F-6 to F-9 present, for comparison purposes, the results of scenarios intended to represent the groundwater drawdown experienced in the vicinity of a proposed project after a 24-hour continuous pumping period. The results in **Tables F-6 and F-7** indicate that drawdown in a confined aquifer would be greater than drawdown in an unconfined aquifer for a given pumping rate. These results also indicate that wells pumping at rates less than 30 gallons per minute (gpm) for periods of time less than 24-consecutive hours will likely have negligible drawdown effects at distances beyond 25 feet in a confined aquifer.

These scenarios are presented for comparison purposes. Actual drawdown due to well interference will have to be calculated using well construction information and site-specific hydrogeologic information and/or values from **Tables F-2, F-3, F-4 and F-5** that are applicable to site-specific conditions.

Table F-6: Simulated effect of a project well on water levels at an existing non-project well after one day of pumping at the stated flow rate in a confined aquifer

30 gpm Scenarios, calculated drawdown (ft)					
aquifer thickness = 75 ft. time = 1 day		distance between project well and existing non project well (ft)			
Specific Storage	Hydraulic Conductivity (ft./day)	**25**	**50**	**100**	**500**
0.0005	10	5.3	4.4	3.6	1.6
0.001	10	4.8	4.0	3.1	1.2

Table F-7: Simulated effect of a project well on water levels at an existing non-project well after one day of pumping at the stated flow rate in a confined aquifer

100 gpm Scenarios, calculated drawdown (ft)					
aquifer thickness = 75 ft. time = 1 day		distance between project well and existing non-project well (ft)			
Specific Storage	Hydraulic Conductivity (ft./day)	**25**	**50**	**100**	**500**
0.0005	10	13.6	11.5	9.4	4.5
0.001	10	12.5	10.4	8.3	3.5

Table F-8: Simulated effect of a project well on water levels at an existing non-project well after one day of pumping at the stated flow rate in an unconfined aquifer

30 gpm Scenarios, calculated drawdown (ft)					
aquifer thickness = 75 ft. time = 1 day		distance between project well and existing non-project well (ft)			
Specific Storage	Hydraulic Conductivity (ft./day)	**25**	**50**	**100**	**125**
0.1	80	0.4	0.3	0.2	n/a
0.1	50	0.6	0.4	n/a	n/a
0.1	30	0.9	0.6	n/a	n/a
0.1	10	2.0	n/a	n/a	n/a

"n/a" denotes cases where Theis equation results are not available due to mathematical constraints on valid parameter values.

Table F-9: Simulated effect of a project well on water levels at an existing non-project well after one day of pumping at the stated flow rate in an unconfined aquifer

100 gpm Scenarios, calculated drawdown (ft)					
aquifer thickness = 100 ft. time = 1 day		distance between project well and existing non-project well (ft)			
Specific Storage	Hydraulic Conductivity (ft./day)	**25**	**50**	**100**	**125**
0.1	80	1.1	0.8	0.6	0.5
0.1	50	1.6	1.2	n/a	n/a
0.1	30	2.4	1.7	n/a	n/a
0.1	10	5.5	n/a	n/a	n/a

"n/a" denotes cases where Theis equation results are not available due to mathematical constraints on valid parameter values.

Example Applications of Additional Analysis Methods

Example 1: *Addition of a commercial tasting room facility with 10 acres of new vineyard and landscaping to an existing winery in a non-groundwater deficient area. The project involves construction of a new well proposed to be 30 feet from an existing six-inch diameter non-project well.*

Is well proposed to be completed in the same aquifer as an existing well ≤ 500 ft. away?

Yes, County well construction records indicate that the existing non-project well was constructed to a total depth of 160 feet in an unconfined aquifer, with a total screened interval of 80 feet throughout the older alluvium that is also mapped in the vicinity of the proposed well.

Calculate drawdown at all existing wells within 500 ft. of the proposed well. Is the calculated drawdown significant?

Yes, 10.9 feet of drawdown is calculated at the existing non-project well, based on available information about the existing well and the hydrogeology of the site (see **Table F-10**). This amount of drawdown exceeds the default well interference criterion of 10 feet and represents a potentially significant impact on groundwater resources.

Table F-10. Example 1: Drawdown calculated at an existing non-project well as a result of pumping a proposed well at 300 gallons per minute, where hydraulic conductivity = 30 ft./day, storage coefficient = 0.02, and aquifer thickness = 80 feet.

	Distance between Proposed Well and Existing Well (ft.)	**Calculated Drawdown in Existing Well (ft.)**[1]
Initial Project Well Location	30	10.9
Alternate Project Well Location A	50	9.0
Alternate Project Well Location B	70	7.7

[1] Drawdown at an existing non-project well as a result of pumping the project well calculated using the Theis Equation.

Conduct a site-specific analysis of drawdown induced by project well(s). Include, as necessary, site-specific project modifications (i.e., revise proposed well location, construction, and/or operational details).

Is simulated drawdown significant (see Table F-1)?

No, after reviewing the site's existing and proposed infrastructure the project applicant modified the proposed well location to a location 50 feet away from the existing non-project well. Calculated drawdown values at the existing wells using the same available information about the existing wells, site hydrogeology, and the new proposed well location show less than significant drawdown at the existing non-project well (i.e., 9.0 feet). The applicant's groundwater use permit was approved on the condition of adherence to the revised well location and County standards for well construction.

Example 2: *Modification of an existing 40-year old irrigation well on a 12-acre parcel. The parcel also includes a primary, single-family residence with an existing (or available) connection to a public water supply system. The applicant proposes installing a new 80 gallon per minute pump to supply irrigation water for 10 acres of replanted winegrapes on lands which had not been actively farmed for several years. The applicant proposes operating the pump for 3 days at a time during the irrigation season. One existing non-project well is located 50 feet from the applicant's project well on one adjacent parcel and another existing non-project well is located 120 feet from the applicant's project well on another adjacent parcel. Both non-project wells are six-inch diameter wells.*

Is well proposed to be completed in the same aquifer as an existing well ≤ 500 ft. away?

Yes, well construction records provided by the applicant (or available from the County) indicate that the applicant's existing well is constructed to a total depth of 140 feet, with a total screened interval of 60 feet, in the older, unconsolidated alluvium.

County well construction records indicate that the existing non-project 50 feet from the project well was constructed to a total depth of 115 feet, with a total screened interval of 50 feet throughout the older alluvium.

Calculate drawdown at all existing wells within 500 ft. of the proposed well. Is the calculated drawdown significant?

No, 5.8 feet of drawdown is calculated to occur at the existing non-project well, based on available information about the existing well and the hydrogeology of the site (see **Table F-11**). This amount of drawdown does not exceed the default well interference criterion of 10 feet and represents a less than significant impact on groundwater resources. The applicant's groundwater use permit was approved contingent upon the proposed pumping duration.

Table F-11. Example 2: Drawdown calculated at an existing non-project well as a result of pumping the applicant's existing project well, where hydraulic conductivity = 10 ft./day, storage coefficient = 0.1, and aquifer thickness = 60 feet.

	Applicant's well pumping rate (gpm)	**Applicant's well seasonal pumping duration (days)**	**Calculated Drawdown in Existing Well (ft.)[1]**
Initial Proposal	80	3	5.8

[1] Drawdown calculated using the Theis Equation at an existing non-project well as a result of pumping the applicant's existing project well located 50 feet away.

Definitions

Aquifer – A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Aquifer Unit - One part of a number of units that comprise a larger aquifer system.

Hydraulic Conductivity – The capacity of subsurface materials to permit flow through interconnected pores, fractures, or other void spaces, subject to intrinsic properties of the fluid. As applied in this WAA, hydraulic conductivity is equivalent to saturated hydraulic conductivity.

Specific Storage– an aquifer hydraulic property which is the volume of water that can be drained from a unit volume of aquifer materials per unit decline in head.

Specific Yield – an aquifer hydraulic property which is the volume of water that can be drained from a unit area of an unconfined aquifer in response to a unit decline in the water table elevation.

Storage Coefficient (also Storativity) – an aquifer hydraulic property which is the volume of water released or added to aquifer storage per unit surface area of a confined aquifer per unit change in head.

Substantial Evidence - Defined by case law as evidence that is of ponderable legal significance, reasonable in nature, credible and of solid value. The following constitute substantial evidence: facts, reasonable assumptions predicated on facts; and expert opinions supported by facts. Argument, speculation, unsubstantiated opinion or narrative, or clearly inaccurate or erroneous information do not constitute substantial evidence.

Surface Water - For the purposes of this procedure, surface waters are defined to include only those surface waters known or likely to support special status species or surface waters with an associated water right; however, as with all of the procedures in this WAA, there may be unique circumstances that require additional site-specific analysis to adequately evaluate a project's potential impacts on surface water bodies.

Transmissivity – an aquifer hydraulic property which reflects the capacity of the aquifer to transmit water across its entire thickness, calculated as the product of the aquifer hydraulic conductivity and the aquifer thickness.

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NAPA VALLEY GROUNDWATER SUSTAINABILITY:

A BASIN ANALYSIS REPORT FOR THE NAPA VALLEY SUBBASIN

APPENDIX J:

Communication and Education Plan

A Tradition of Stewardship
A Commitment to Service

Napa County
Groundwater Resources
Advisory Committee

COMMUNICATION AND EDUCATION PLAN

August 23, 2012

I. Purpose and Overview

The purpose of this plan is to serve as a strategic guide for the public communication and education activities of the Napa County Groundwater Resources Advisory Committee (GRAC). The **communication goal** of the plan is to ensure that interested parties, and Napa County residents as a whole, are well-informed of the deliberations and activities of the GRAC. The **education goal** of the plan is to increase the understanding of groundwater resources so that interested parties and Napa County residents as a whole have a factual basis for discussion and decision making. Key elements of this plan include a set of objectives and guiding principles, a list of potential audiences and partners, and fundamental messages. A series of communication and education strategies are also provided. The last element of the plan includes a recommendation for periodic evaluation of the plan's implementation and effectiveness.

II. Objectives

A. Ensure that interested parties and residents as a whole are aware of the GRAC's work, schedule, progress, and deliberations, and have opportunities to provide input.
B. Expand participation in the County's voluntary groundwater level monitoring efforts and potential optional groundwater quality monitoring.
C. Establish a common understanding of groundwater resources in the County, including conditions and trends evidenced by monitoring data and scientific analyses.
D. Support informed public dialogue and policy decision-making regarding groundwater resources in Napa County.
E. Establish consensus from the GRAC members on the Communication and Education Plan and its purpose.

III. Guiding Principles

A. Be proactive and utilize GRAC member's existing networks to help locate appropriate well owners.
B. Partner with interested groups and individuals to leverage existing communication networks and programs.
C. Provide information and materials in a timely manner, allow interested parties to provide input and participate.
D. Characterize messages and activities, so that interested parties in different areas hear the same messages.

E. Tailor messages and materials to different audiences to increase their effectiveness.

IV. Priorities

The following is a prioritized list of communication and education actions:

1) Develop a GRAC brochure (folded 11x17 tabloid) and informative slip-sheets (8.5x11 maps, current activities, report summaries, staff contacts and GRAC membership…).
2) Actively reach out to well owners to participate in voluntary groundwater level monitoring in high priority sub-areas.
3) Utilize outreach and education to attract well owners to participate in the voluntary groundwater level monitoring program.
4) Identify education and communication partners and partnerships (particularly those identified in the 2010 Groundwater Stakeholder Assessment).
5) Maintain and promote use of GRAC website (http://www.countyofnapa.org/bos/grac/).

V. Audiences and Partners

Groundwater resource issues involve a broad range of geographical and interest-based audiences and partners. Below is a partial list of likely audiences:

1) Well owners who voluntarily participate in groundwater level monitoring and water quality monitoring (which may become available at a later date);
2) Landowners and other interested parties in under represented groundwater basins identified by the CA Dept. of Water Resources (Pope Valley, Clearlake Pleistocene Volcanic Area, and Berryessa Valley groundwater basins);
3) Landowners and other interested parties in the Napa-Sonoma Valley groundwater basin, including the Milliken-Sarco-Tulocay, Angwin, Carneros, Calistoga, St. Helena, Yountville, and Napa sub-areas;
4) County residents (incorporated and unincorporated);
5) Agricultural and wine industry groups;
6) Environmental and park/open-space groups;
7) Residential and commercial developers;
8) Community groups interested in water resources;
9) Landowner/Homeowner groups and associations;
10) Public agencies (local, regional, state, federal); and
11) Elected officials.

In general, messages and materials will need to be addressed to County residents as a whole. However, in many cases information should be tailored to specific audiences. Additional special audiences will need identification; for example the elderly, minorities, non-English speakers and disadvantaged communities[1].

Some members of the audiences listed above may choose to support the GRAC's communication and education efforts, thereby becoming GRAC partners in outreach. In the 2010 Stakeholder Assessment (see GRAC website), several organizations volunteered to use their existing networks to help share information and news with their constituencies. Creating partnerships with these organizations and use of their networks will be critical to maximizing the efficiency and effectiveness of GRAC outreach efforts. Additional partners will be solicited as GRAC activities are developed.

VI. Partners

Various partners in groundwater education and communication **may** include: local growers, geologists, well drillers, professional groups and associations in priority areas throughout the County. GRAC members will utilize existing contacts as partners in education and outreach.

Partners may also include press and media outlets throughout Napa County including: local newspapers, radio and television stations.

VII. Messages

The GRAC will identify several key messages to be used for outreach and education. Examples of global messages regarding groundwater are:

a. Groundwater is a vital water source for residential, commercial and agricultural users in Napa County.

b. Napa County has a number of unique and hydrologically distinctive groundwater subareas.

c. The Napa Valley Floor (St. Helena, Yountville, and Napa areas), except for the Milliken-Sarco-Tulocay (MST) Subarea, generally has stable long term trends and a shallow depth to groundwater level (10-30 feet below ground surface).

d. High priority subareas and monitoring needs will be determined as part of the GRAC's work plan.

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[1] CAL. PRC 75005(g) "Disadvantaged community" means a community with a median household income less than 80% of the statewide average. "Severely disadvantaged community" means a community with a median household income less than 60% of the statewide average.

e. Ground-water systems are dynamic and adjust continually to short-term and long-term changes in climate, ground-water withdrawal, and land use.

f. A common fact-based understanding of groundwater resources in the County supports more informed public dialogue and public-policy decision-making. While observation helps to identify concerns, factual information and thoughtful technical analyses provides the foundation for informed decision-making.

Examples of messages that will need to be tailored to match the objectives and purpose of the GRAC may include:

a. The importance of better understanding of county-wide hydrogeologic conditions in order to better understand groundwater priority areas within Napa County.

b. How to participate in voluntary groundwater level monitoring and optional water quality monitoring.

c. How groundwater information will be used and refined as resources and monitoring information becomes available.

d. What kind of groundwater data will be gathered, when and by whom, and how will it be used?

e. What is the confidentiality of the data collected?

f. What are the benefits to and incentives for, participants in the voluntary monitoring program?

g. The importance of voluntary groundwater level data is to help anticipate future groundwater issues.

h. Groundwater level data is primarily collected within the Napa Valley Floor Subareas, leaving the rest of the County unaccounted for.

i. Groundwater quality monitoring data is more spatially distributed than groundwater level data.

Additional messages will be developed as needed for specific areas, special audiences, specific groundwater topics and actions undertaken by the GRAC.

VIII. Communication and Education Strategies

This section identifies seven primary communication and education strategies that provide a framework for more specific activities. Each strategy includes information on supporting materials, audiences that would benefit, next step timelines, potential constraints and potential partners.

1. Develop a standardized series of general promotional and educational brochures (press materials), as well as activity/topic-specific materials as needed.

Materials: GRAC brochure (folded 11x17 tabloid) and informative slip-sheets (8.5x11 maps, current activities, report summaries, staff contacts and GRAC membership…), informational letters to current and potential groundwater level monitoring volunteers, newsletter articles to targeted groups, answers to frequently asked questions (all in electronic and hard copy)
Special Target Audiences: county residents and others as appropriate
Next Steps & Timelines: general promotional materials during 3rd quarter of 2012, activity and topic-specific materials in coordination with the GRAC's work plan
Constraints: need for subject matter expertise, graphic design and printing
Potential partners: none, GRAC members will work with County staff to develop materials (staff may enlist graphical support, outside printing)

2. GRAC members periodic briefing of the geographical or interest-based groups they represent, participate in, or serve as appointed members on the GRAC.

Materials: standard promotional materials mentioned above; PowerPoint presentations with talking points about work plan, progress, and milestones
Special Target Audiences: constituencies represented on the GRAC, regional and sub-regional groups, community-based groups, groups listed as potential partners
Next Steps & Timelines: identify initial dates for briefings, prepare materials, assign appropriate GRAC members
Constraints: need for consistent messaging and characterization of the GRAC's activities
Potential partners: organizations that GRAC members participate in, potential partners listed above, the GRAC members themselves

3. GRAC members and County staff conduct an annual round of briefings for elected officials and agency executive officers, including but not limited to members of the Watershed Information Center and Conservancy (WICC) Board of Napa County.

Materials: standard promotional materials mentioned above
Special Target Audiences: state legislative representatives, county supervisors, mayors and council members, federal and state agency executive officers and staff

Next Steps & Timelines: identify appropriate period for briefings and schedule well in advance (e.g., Joint GRAC-WICC meeting-July 26, 2012), identify appropriate briefing format and appropriate group (staff/GRAC members) to conduct briefings, develop key messages and supporting materials
Constraints: limited availability of elected officials and agency executive officers
Potential partners: none (GRAC members will work with County staff)

4. GRAC hosting of public workshops or other public events. Including events that may coincide with the rollout of key deliverables, such as the County's monitoring program, revised pump test protocols and related revisions to the groundwater ordinance, and groundwater sustainability objectives.

Materials: special announcements; materials to support the event activities
Special Target Audiences: Napa County residents as a whole, perhaps with identical workshops in the northern and southern parts of the County. Collaborate with industry groups to develop workshop topics. Potential topics may include best sustainable practices and water use efficiency. Showcase examples of better sustainable practices.
Next Steps & Timelines: agree upon deliverables that will need a public rollout component, the type of public input desired (e.g., comment on draft, comment on final), and a corresponding timeframe (See GRAC Work Plan)
Constraints: advance scheduling and publicity required to ensure turnout, significant logistical and administrative work, and associated costs.
Potential partners: WICC, other local organizations or educational groups listed above as potential partners

5. Use the GRAC's website (http://www.countyofnapa.org/bos/grac/) as an informational clearinghouse for materials associated with the GRAC meetings and general communication and education efforts.

Materials: standard promotional materials mentioned above, special meeting/workshop materials developed, and posting of existing materials developed for regular GRAC meetings and activities
Special Target Audiences: all audiences
Next Steps & Timelines: continual, the website has been official and functioning since June, 2011, redesign of the site as needed to accommodate the assimilation of information over time
Constraints: organization and accessibility as documents accumulate, staffing resources and expertise for upkeep and maintenance
Potential partners: none (County staff will maintain the website)

6. Development and maintenance of an interested-parties email and address distribution list, including denotation of parties that express an interest in partnering with the GRAC.

Materials: email and address data management software, and existing news, promotional and educational materials
Special Target Audiences: individual interested parties
Next Steps & Timelines: develop and solicit initial list during 3rd quarter of 2012, with ongoing expansion and maintenance
Constraints: staffing resources needed to maintain up-to-date entries
Potential partners: none (County staff will develop and maintain the list)

7. Proactively develop and regularly utilize relationships with key public relations, press and media outlets for the purpose of sharing news and information.

Materials: meeting synopses, statements developed by the GRAC, telephone calls, talking points, frequently asked questions
Special Target Audiences: Napa County residents as a whole
Next Steps & Timelines: County staff to identify and contact major press and media outlets as needed
Constraints: inability to control final product, need to adhere to GRAC Media Protocol
Potential partners: See potential list above

IX. Evaluation

As part of its normal business, the GRAC will periodically evaluate the effectiveness of its communication and education efforts, and revise this plan accordingly.

NAPA VALLEY GROUNDWATER SUSTAINABILITY:

A BASIN ANALYSIS REPORT FOR THE NAPA VALLEY SUBBASIN

APPENDIX K:

Groundwater Resources in Napa County, Monitoring for Sustainability and Napa County’s Voluntary Groundwater Level Monitoring Program (outreach brochure)

Napa County's Voluntary Groundwater Level Monitoring Program

The Voluntary Groundwater Level Monitoring Program measures groundwater levels in spring and fall. These measurements improve the understanding of groundwater for both the well owner and the County. A network of privately volunteer wells, along with publicly owned wells, provide a greater understanding of our aquifers. The program is strengthened by expanding the voluntary well network to areas where data is lacking or nonexistent.

Well owners who participate in the program:

- Receive accurate groundwater level readings twice per year *(spring and fall*);
- See seasonal and long-term groundwater level trends for their well;
- Receive water quality data for their well *(if testing is agreed to and conducted);* and
- Receive notification if anyone submits a public records request for information.

The County currently monitors wells throughout our community and is not in need of additional wells at this time. However, if you are interested in volunteering your well for County monitoring, please contact us, as we periodically update our monitoring network. The County publishes an annual report on the status of overall groundwater conditions.

Do it Yourself (DIY) Groundwater Level Monitoring

Napa County has a Groundwater Self-Monitoring Program. This DIY program offers training and a special hand-held sonic measuring device to determine the depth to water in most wells.

How do I borrow the tool from the County?

1. Contact County staff and indicate your interest ,
2. Napa County Resource Conservation District staff will demonstrate the equipment at your well and help with initial tool calibration,
3. Then borrow the equipment seasonally to measure your water level.

Reserve the tool or learn more:
Charles Schembre,
707-252-4189 x113,
charles@naparcd.org
Jeff Sharp, 707-259-5936,
jeff.sharp@countyofnapa.org

FAQ'S

Why should I measure water depth in my well?
To know how water depth changes over the course of the year and better understand how the groundwater reservoir beneath your land responds to winter recharge and use over the dry months. Measurements are best taken in spring and fall over multiple years to see long-term trends in recharge.

Will someone curtail my well use if I participate?
No. The Voluntary Groundwater Level Monitoring Program is a non-regulatory, voluntary program that measures the depth to groundwater (level only). Groundwater use is not being measured or monitored as part of the program.

Will my well information be kept confidential?
Napa County will make every effort to maintain the confidentiality of a well owner's information. However, such information may be accessed through a public records request. In such a case the County will notify the well owner.

How long is the voluntary groundwater level monitoring program going to last?
The monitoring is intended to be long-term, however an individual well owner may leave the program at any time.

Who is eligible to participate?
If your well is in an area where data is lacking and well construction information is available, your well may be eligible to participate in the program.

How will the collected information be used?
The information will be used to monitor and track groundwater levels to help the County understand relationships between surface water and groundwater, maintain a centralized data management system, and improve the accuracy and reliability of relevant water resource models.

Groundwater Resources in Napa County

Monitoring for Sustainability

The Importance of Groundwater in Napa County

Groundwater is water below ground contained in formations known as aquifers, which supply significant quantities of water to wells and springs. **Groundwater is a vital source of water supply in Napa County**. Many residents, businesses and agriculture reply on groundwater, as do fish, wildlife and natural habitats. These water demands make it essential that we:

- Preserve the quality and availability of local and imported water supplies;
- Sustain groundwater supplies and meet water needs during drought conditions;
- Anticipate and avoid potential negative environmental effects due to groundwater use; and
- Anticipate and avoid adverse changes in long-term groundwater availability and quality.

What we know

Napa County and other public agencies have been monitoring groundwater resources since the mid 1900s. Based on long-term data and recent studies by the County's consultants, Luhdorff & Scalmanini Consulting Engineers (LSCE) and MBK Engineers, the County continues to:

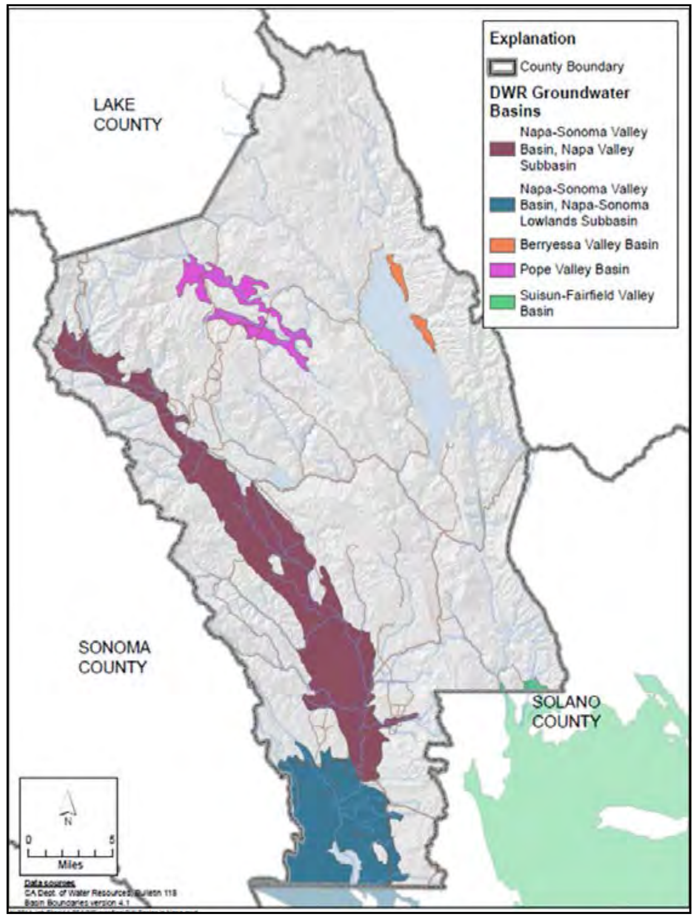
- Expand voluntary groundwater monitoring in key locations to provide better data and fill data gaps;
- Develop and implement better groundwater data collection procedures;
- Report on annual groundwater conditions and trends;
- Estimate the rates of aquifer replenishment and study groundwater and surface water interaction;
- Update groundwater basin water budgets and models; and
- Implement actions in compliance with the Sustainable Groundwater Management Act (SGMA).

What Are We Trying to Learn?

- How does groundwater move through our aquifer system?
- What is the overall status of the ground water aquifers within the county?
- What are the amounts of loss and replenishment to creeks, rivers and aquifers?
- What are the key relationships between ground water surface water in our creeks, rivers, and lakes?

DWR Groundwater Basins

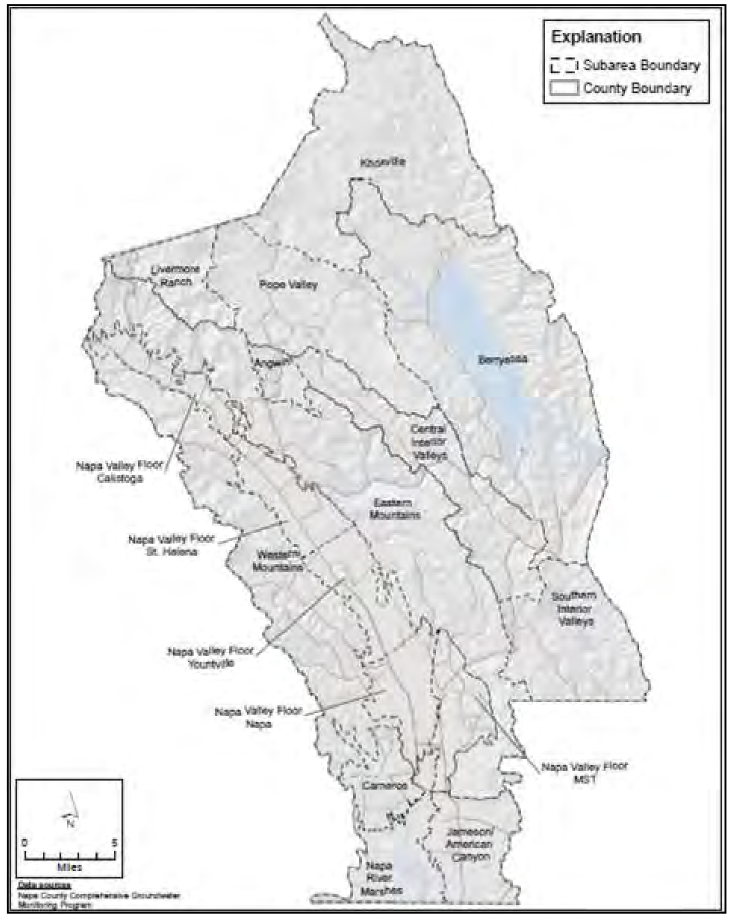
The Department of Water Resources (DWR) collects, summarizes, and evaluates groundwater data. DWR has defined 5 alluvial groundwater basins in Napa County (see map). The 2014 Sustainable Groundwater Management Act (SGMA) sets basin management priorities based upon those basin boundaries. The Napa Valley Sub-basin is designated a Medium Priority basin under SGMA.



DWR Groundwater Basin Map

Groundwater Subareas

Groundwater conditions outside of DWR designated basins are also important in Napa County. To improve our understanding of groundwater throughout the county, seventeen subareas have been designated. These subareas are used for local planning and are based upon watershed boundaries, groundwater basin boundaries, and other data. There are five subareas covering the floor of the Napa Valley. Other subareas include the MST, Carneros, Angwin, eastern/western mountains, interior valleys, among others.



Napa Groundwater Subareas Map

Groundwater Quality

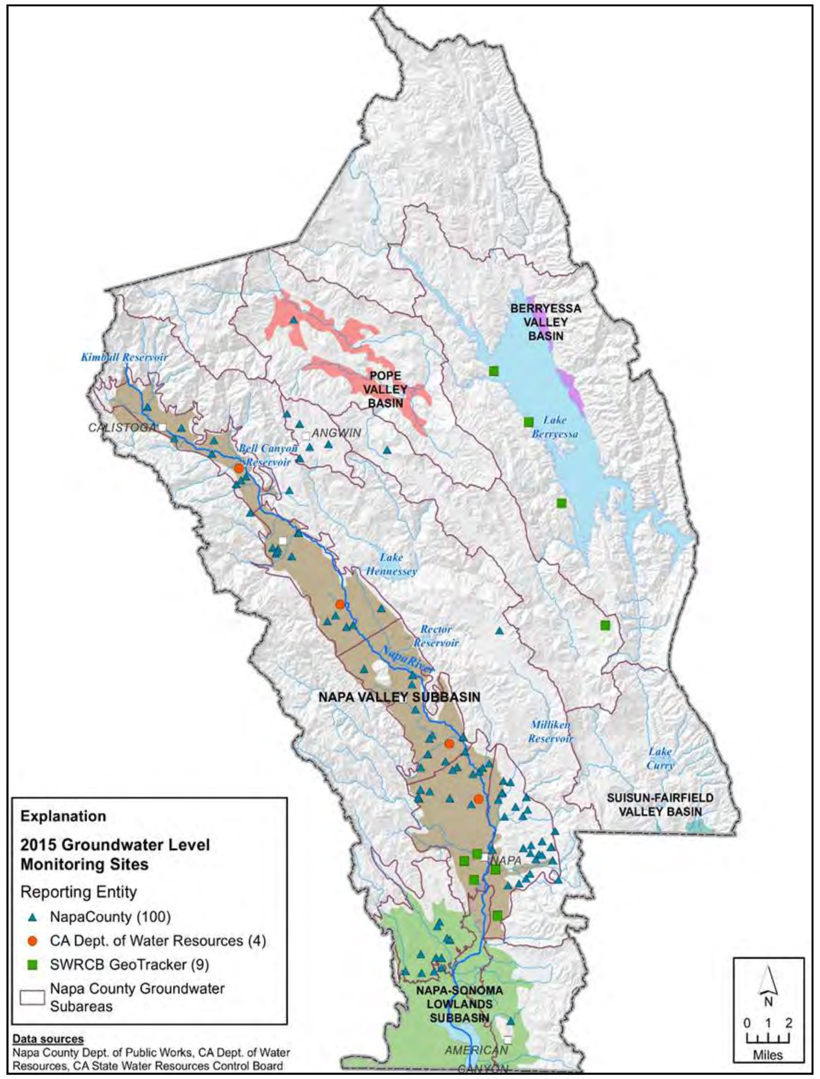
While there is limited long-term data is available on groundwater quality, overall quality appears to be good except in select areas in the most northern and southern parts of the County. Areas near Calistoga exhibit geothermal influences and the southern lowlands of the County exhibit elevated levels of naturally occurring dissolved solids and chlorides, likely due to their proximity to San Pablo Bay. Additional groundwater quality monitoring is currently underway and also planned for the upcoming year.

Groundwater Levels and Trends

Based on recent studies and on-going bi-annual monitoring of groundwater levels in nearly 100 volunteered wells, level trends in the Napa Valley Sub-basins of the Napa-Sonoma Valley Groundwater Basin are stable in the majority of wells with long-term records. Although some wells show a response to drought conditions, levels in recent drought years are generally higher than those during the 1976 to 1977 drought.

Elsewhere in the County long-term groundwater level records are more limited, with the exception of the Milliken-Sarco-Tulucay (MST) Subarea. Groundwater level declines observed in the MST Subarea as early as the 1960s and 1970s have stabilized since about 2008. The observation that groundwater level responses differ within the MST Subarea and even within the north, central, and southern sections of this subarea indicate that localized conditions, whether geologic or anthropogenic in nature, might be the primary influence on conditions in the subarea.

Over the past 5 years, Napa County has developed a more focused understanding of the geology that controls the occurrence and availability of groundwater and doubled the number and distribution of wells that it monitors. Additionally, the County has constructed dedicated monitoring facilities in key locations designed specifically to provide data on the interactions between groundwater and surface water.



Groundwater Monitoring Network Map

Contact Information and Resources

More Information:

Learn more about Napa County's groundwater resources, levels, trends and reports at:

http://www.napawatersheds.org/groundwater

Join the Napa County Groundwater Email List:

http://www.countyofnapa.org/groundwater

Scan with your phone to sign up for the groundwater list serve

For Questions Contact:

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Jeff.Sharp@countyofnapa.org

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