FINAL

Northern Cities Management Area Technical Group

Northern Cities Management Area 2019 Annual Monitoring Report

Prepared for

City of Arroyo Grande ▪ City of Grover Beach ▪ Oceano Community Services District ▪ City of Pismo Beach

April 23, 2020

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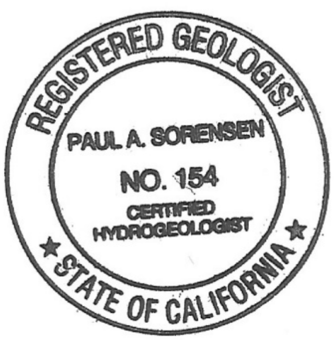
Northern Cities Management Area 2019 Annual Monitoring Report

This report was prepared by the staff of GSI Water Solutions, Inc., in collaboration with GEI Consultants, Inc., under the supervision of professionals whose signatures appear below. The findings or professional opinion were prepared in accordance with generally accepted professional engineering and geologic practice.



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Abbreviations and Acronyms

2007 County IRWMP	2007 San Luis Obispo County Integrated Regional Water Management Plan
2019 Annual Report	Northern Cities Management Area 2019 Annual Monitoring Report
ACO	San Luis Obispo County Agricultural Commissioner's Office
AFY	acre-feet per year
Arroyo Grande	City of Arroyo Grande
CIMIS	California Irrigation Management Information System
County	San Luis Obispo County
CSA	County Service Area
CUP	Consumptive Use Program
DDW	Division of Drinking Water
Delta	Sacramento-San Joaquin Delta
DRI	Desert Research Institute
DWR	California Department of Water Resources
ET	evapotranspiration
Grover Beach	City of Grover Beach
gpcd	gallons per capita daily
IDC	2015 Integrated Water Flow Model Demand Calculator
IWFM	2015 Integrated Water Flow Model
LRRP	Low Reservoir Response Plan
NAVD 88	North American Vertical Datum of 1988
NCMA Monitoring Program	Monitoring Program for the Northern Cities Management Area
NCMA	Northern Cities Management Area
Nipomo station	Nipomo Station (No. 202)
NMMA	Nipomo Mesa Management Area
NRCS	Natural Resources Conservation Service
Oceano CSD	Oceano Community Services District
OCSD	Oceano Community Services District
PE	Professional Engineer
PG&E	Pacific Gas & Electric
Pismo Beach	City of Pismo Beach
SGMA	Sustainable Groundwater Management Act
SLOFCWCD	County of San Luis Obispo Flood Control and Water Conservation District
SMGB	Santa Maria River Valley Groundwater Basin
SMGBMA	Santa Maria Groundwater Basin Management Area

SMVMA	Santa Maria Valley Management Area
SSLOCSD	South San Luis Obispo County Sanitation District
SWP	California State Water Project
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TG	NCMA Technical Group
UWMP	Urban Water Management Plan

Executive Summary

The 2019 Annual Monitoring Report for the Northern Cities Management Area (NCMA) (Annual Report) is prepared pursuant to the requirements of the 2005 Stipulation for the Santa Maria Groundwater Basin Adjudication (2005 Stipulation) and the January 25, 2008 Judgment After Trial (2008 Judgment). This 2019 Annual Report provides an assessment of hydrologic conditions for the NCMA based on data collected during the calendar year of record. As specified in the Judgment, the NCMA agencies, consisting of the City of Arroyo Grande, City of Grover Beach, City of Pismo Beach, and Oceano Community Services District (OCSD), regularly monitor groundwater in the NCMA and analyze other data pertinent to water supply and demand, including the following:

- Land and water uses in the Santa Maria River Valley Groundwater Basin (SMGB or basin)
- Sources of supply to meet water demand
- Groundwater conditions (including water levels and water quality)
- Amount and disposition of NCMA water supplies that are not groundwater

Results of the data compilation and analysis for calendar year 2019 are documented and discussed in this 2019 Annual Report.

Groundwater Conditions

During 2019, water elevations generally increased slightly throughout most of the NCMA portion of the SMGB in response to above-average rainfall in 2019. The generally observed increase in water levels throughout most of the area can be also be attributed to ongoing efforts by all NCMA agencies to minimize groundwater extraction and maximize surface water supply sources while maintaining the water conservation practices and requirements of the recent drought.

Groundwater Levels

The best indicator of whether the NCMA portion of the SMGB can prevent seawater intrusion is the water elevation in the NCMA sentry wells near the coastline. The average water elevations of three of the key sentry wells make up a Deep Well Index. This index was developed by the NCMA in 2007 to gauge the health of the aquifer. A Deep Well Index value above 7.5 feet above sea level generally indicates that sufficient freshwater flow occurs from the east to the coastline to prevent seawater intrusion. History has shown that a prolonged period in which the Deep Well Index level is below 7.5 feet develops groundwater conditions that pose a risk of seawater intrusion.

- **Spring 2019.** In the mostly urbanized areas north of Arroyo Grande Creek, groundwater is extracted from the deep groundwater aquifers of the Paso Robles Formation and the Careaga sandstone. The water elevation contours in the deep aquifer system in spring of 2019 generally showed a westerly to southwesterly groundwater flow (see Figure 8). These positive groundwater gradients have been developed and maintained primarily because the NCMA agencies have collaborated on water management and conservation efforts. Those efforts have been in response to lower water levels in the Deep Well Index. The combined NCMA efforts are to ensure that flow to the ocean continues to prevent seawater intrusion. April 2019 groundwater elevations in the deep aquifer system main production zone along the coast ranged from 7.5 to 11.1 feet North American Vertical Datum 1988 (NAVD 88).[1] Because

[1] North American Vertical Datum of 1988 (NAVD 88). Note that NAVD 88 is 2.72 feet lower than mean sea level, as recorded at the Port San Luis tide station datum. https://tidesandcurrents.noaa.gov/datums.html?id=9412110

of a limited number of wells and water level data in the southernmost portion of the area dominated by sensitive-species dunes and California State Parks land, the groundwater gradient and flow are generally inferred on the basis of historical records and trends as well as water level data from the Nipomo Mesa Management Area (NMMA) farther east.

- The Cienega Valley is in the central area of the NCMA south of Arroyo Grande Creek. Agricultural groundwater production resulted in seasonal drawdown of the alluvial aquifer. Groundwater elevations in the alluvial aquifer in the Cienega Valley were in the range of 10 to 30 feet NAVD 88 in spring 2019. These data show an increase in alluvial groundwater elevations by as much as 13 feet from April 2018 to April 2019. During the recent drought, spring alluvial groundwater elevations showed a subdued pumping trough in the Cienega Valley, with groundwater elevations generally below sea level (NAVD 88) in the center of the depression.
- **Fall 2019.** Groundwater level contours for October 2019 are presented in Figure 9. Groundwater elevations in the alluvial aquifer within the Cienega Valley in October 2019 were 8 to 28 feet lower than elevations in April 2019. These conditions are consistent with the pumping depressions observed historically during the fall within the Cienega Valley. The alluvial groundwater elevation in the pumping depression in October 2019, at (-) 17.6 feet NAVD 88, was 2 feet lower than was present in October 2018. October 2019 groundwater elevations in the deep aquifer system main production zone along the coast ranged from 6.1 to 8.3 feet NAVD 88.
- **Deep Wells.** In 2019, the Deep Well Index started the year above the trigger value with an index value of more than 9 feet in January. It continued to rise, reached a high more than 11 feet in late March, and then began to decline. The index value dropped down to the 7.5-foot trigger value briefly in late October and then immediately began to rise. The index value continued to rise throughout the end of the year and finished 2019 at about 10.5 feet NAVD 88.
- **NCMA/NMMA Boundary.** The water elevation in the San Luis Obispo County monitoring well (Well 32C03) installed to monitor aquifer conditions along the NCMA/NMMA boundary typically exhibits regular seasonal fluctuations. Similar to 2018, the water elevation in the well remained above sea level throughout all of 2019, in contrast to the 2013 through 2016 period when the water levels in the NCMA/NMMA boundary area typically dropped below sea level in August and remained at a low elevation until early October.

Change in Groundwater in Storage

The change in groundwater in storage in the NCMA portion of the SMGB between April 2018 and April 2019 was estimated on the basis of a comparison of water level contour maps created for these periods. Separate estimates of change in groundwater in storage were computed for both the deep aquifer system and for the alluvial aquifer and then summed together to represent the total NCMA estimated change in groundwater in storage. Comparison of April water levels was chosen to comply with the California Department of Water Resources reporting requirements under the Sustainable Groundwater Management Act (SGMA) to calculate an annual change of groundwater in storage.

An increase of groundwater in storage is a reflection of a net increase in water levels across the aquifer. During the period of April 2018 to April 2019, the NCMA portion of the SMGB experienced a net increase of groundwater in storage. The net increase in groundwater levels represented an increase of groundwater in storage from April 2018 to April 2019 of approximately 1,500 acre-feet (AF); that is, there was approximately 1,500 AF more groundwater stored in the NCMA portion of the SMGB in April 2019 than in April 2018.

Groundwater Quality

Analytical results of key water quality data (chloride, total dissolved solids [TDS], and sodium) in 2019 were generally consistent with historical concentrations and observed ranges of constituent concentrations. In general, no water quality results were observed that are a cause of concern.

None of the water quality results from monitoring wells throughout 2019 indicate an incipient episode or immediate threat of seawater intrusion. Incipient seawater intrusion was indicated in 2009 by elevated concentrations of TDS, sodium, and chloride (i.e., water quality degradation) in wells 30N02, 30N03, and MW-Blue, all of which are screened in the Paso Robles Formation. No indications of seawater intrusion have been observed in wells screened in the underlying Careaga sandstone. As TDS, sodium, and chloride concentrations declined following the 2009–2010 seasons, the location and inland extent of the seawater-freshwater interface is unknown.

Water Supply and Production/Deliveries

- Total water use in the NCMA in 2019 (including urban use by the NCMA agencies as well as agricultural irrigation and private pumping by rural water users) was 8,296 AF. Except for the water usage in 2016, this is the lowest estimated total water use in the past 30 years or more. Of this amount, Lopez Lake deliveries were 4,385 AF, State Water Project deliveries totaled 567 AF, and groundwater pumping from the NCMA portion of the SMGB accounted for approximately 3,320 AF. This is the lowest production volume from the SMGB in more than 20 years. The City of Arroyo Grande produced 24 AF from its Pismo Formation wells, outside the SMGB, in 2019. The breakdown is shown in Table ES- 1 (following page).
- Urban water use in 2019 among the NCMA agencies was 5,660 AF, the second-lowest urban water use in the past 20 years (second only to 2016, at 5,477 AF). Urban water use has ranged from 5,477 AF (2016) to 8,982 AF (2007). Water use generally declined from 2007 to 2016—with only slight increases in the trend in 2012 and 2013—and has only varied slightly since 2016. The decline in pumpage since 2013 was in direct response to a state-wide order by the governor to reduce the amount of water used in urban areas by 25 percent. That goal has been achieved locally by conservation activities implemented by the NCMA agencies.
- Agricultural acreage has remained fairly constant. Thus, the annual applied water requirement for agricultural irrigation has been relatively stable though it varies with weather conditions. Acknowledging the variability resulting from weather conditions, agricultural applied water is not expected to change significantly given the relative stability of applied irrigation acreage and cropping patterns in the NCMA. Changes in rural domestic pumping have not been significant.

Table ES- 1. 2019 Water Production by Source (AF)

Source	Lopez Lake	State Water Project	SMGB Groundwater	Other Supplies[1]	Total
Urban Area					
Arroyo Grande	2,033	0	81	24	2,138
Grover Beach	782	0	412	0	1,194
Pismo Beach	1048	556	44	0	1,648
Oceano CSD	522	11	147	0	680
Urban Water Use Total	**4,385**	**567**	**684**	**24**	**5,660**
Non-Urban Area					
Agricultural Irrigation Applied Water	0	0	2,506	0	2,506
Rural Water Users	0	0	82	0	82
Non-potable Irrigation by Arroyo Grande	0	0	48	0	48
Total	**4,385**	**567**	**3,320**	**24**	**8,296**

Notes:

[1] Other Supplies includes groundwater pumped from outside the NCMA boundaries.

AF = acre-feet, SMGB = Santa Maria Groundwater Basin, CSD = Community Services District

Threats to Water Supply

- Total groundwater pumping (urban, agriculture, and rural domestic) from the SMGB in the NCMA was 3,320 AF in 2019, which is 35 percent of the calculated 9,500 acre-feet per year (AFY) long-term basin yield of the NCMA portion of the SMGB.
- When pumping is less than the yield of an aquifer, groundwater in storage increases, as evidenced by rising water levels. Groundwater elevations throughout the NCMA portion of the SMGB should rise significantly if several consecutive years of groundwater pumping continues at 30 to 40 percent of the safe yield. Although groundwater levels increased some during 2019 as a result of the relatively wet rainfall year, the data show that the aquifer is still in a tenuous position. The fragile health of the aquifer is illustrated by water elevations at just a few feet above sea level, coupled with the formation of a pumping depression in the alluvial aquifer within the Cienega Valley just west of the NCMA/NMMA boundary. The data indicate that the aquifer has very little ability to withstand any future droughts. Any increase in

regional pumping, or any other changes that reduce recharge, either directly or through subsurface outflow to the east (Nipomo Mesa) will leave the NCMA with a serious groundwater deficit that may result in seawater intrusion.

- Historically, there has been a groundwater high between the NCMA and NMMA, which caused groundwater in the NCMA to flow westward towards the ocean, thereby acting to prevent seawater intrusion. The well-documented pumping depression within the deep aquifer system in the NMMA to the east appears to have lowered the historical groundwater high between the NCMA and the NMMA (as documented in NMMA annual reports). With the loss of this groundwater high, there has been a reversal of groundwater gradients. The apparent development of a landward gradient in the southern portion of the NCMA including the elimination of the groundwater divide likely reduces the historical recharge volume of subsurface inflow into the NCMA. The reduction of groundwater flow to the NCMA creates conditions more likely to result in seawater intrusion in the NCMA and NMMA.
- During 2019, there were no indications of seawater intrusion but any increase of groundwater pumping or decrease in rainfall can quickly result in a greater risk of seawater intrusion.

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SECTION 1: **Introduction**

This Northern Cities Management Area 2019 Annual Monitoring Report (2019 Annual Report, or Annual Report) summarizes hydrologic conditions for calendar year 2019 in the Northern Cities Management Area (NCMA) of the Santa Maria River Valley Groundwater Basin (SMGB or the basin) in San Luis Obispo County (County), California (Figure 1). This report was prepared on behalf of four public agencies collectively referred to as the Northern Cities, which include the City of Arroyo Grande (Arroyo Grande), City of Grover Beach (Grover Beach), City of Pismo Beach (Pismo Beach), and the Oceano Community Services District (OCSD; Oceano CSD)[2,3] (Figure 2). These agencies, along with local landowners, the County, and the County of San Luis Obispo Flood Control & Water Conservation District (SLOFCWCD) have managed local surface water and groundwater resources since the late 1970s to preserve the long-term integrity of water supplies.

1.1 History of the Litigation

The rights to pump groundwater from the SMGB have been in litigation (adjudication) since the late 1990s. The physical solution set forth in the 2005 Stipulation for the Santa Maria Groundwater Basin Adjudication (2005 Stipulation) and the January 25, 2008 Judgment After Trial (2008 Judgment)[4] established requirements and goals for the management of the entire SMGB. The Superior Court of California, County of Santa Clara (Court) established three separate management areas, including the NCMA, the Nipomo Mesa Management Area (NMMA), and the Santa Maria Valley Management Area (SMVMA). The Court mandated that each management area form a technical group to monitor the groundwater conditions of its area, to continuously assess the hydrologic conditions of each area, and to prepare an annual report each year to provide the Court with a summary of the previous year's conditions, actions, and threats.

The requirements for the annual report, as directed by the Court in the 2005 Stipulation (June 30, 2005, version, paragraph IV.D.3), are as follows:

> Within one hundred and twenty days after each Year end, the Management Area Engineers will file an Annual Report with the Court. The Annual Report will summarize the results of the Monitoring Program, changes in groundwater supplies, and any threats to Groundwater supplies. The Annual Report shall also include a tabulation of Management Area water use, including Imported Water availability and use, Return Flow entitlement and use, other Developed Water availability and use, and Groundwater use. Any Stipulating Party may object to the Monitoring Program, the reported results, or the Annual Report by motion.

This 2019 Annual Report satisfies the requirements of the Court. The annual report for each calendar year (January 1 to December 31) is submitted to the Court by April 30 of the following calendar year, pursuant to the 2005 Stipulation. As a result of legislation passed by the State of California related to the Sustainable Groundwater Management Act (SGMA) that requires submittal of annual reports and supporting information and data for each adjudicated groundwater basin by April 1 of each year, the 2019 Annual Report is also published to the California Department of Water Resources (DWR) adjudicated basin reporting website.[5]

The collaborative water supply management approach of the NCMA agencies was recognized by the Court in the 2001 Groundwater Management Agreement (which was based on the 1983 Gentlemen's Agreement),

[2] Each agency may also be individually referred to as an NCMA agency.
[3] Portions of Arroyo Grande and Pismo Beach extend outside the NCMA.
[4] Santa Maria Valley Water Conservation District v. City of Santa Maria, et al., Case #1-97-CV-770214 Filing #G-79046. (Cal. 2015).
[5] The link to the reporting system is available on this DWR page: https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management/Adjudicated-Areas.

formalized in the Settlement Agreement Between Northern Cities, Northern Cities Landowners, and Other Parties (2002 Settlement Agreement or Settlement Agreement) and incorporated in the 2005 Stipulation . On June 30, 2005, the 2005 Stipulation was agreed upon by numerous parties, including the NCMA agencies. The Stipulation included the 2002 Settlement Agreement. The approach then was adopted by the Court in its 2008 Judgment. Although appeals to that decision were filed, a subsequent decision by the Sixth Appellate District (filed November 21, 2012) upheld the Judgment. On February 13, 2013, the Supreme Court of California denied a petition to review the decision.

Pursuant to the Court's continuing jurisdiction, Arroyo Grande, Pismo Beach, and Grover Beach filed a motion on September 29, 2015, requesting that the Court impose moratoriums on certain water extraction and use by stipulating parties within the NMMA. Judge Kirwan denied the motion without prejudice. He did, however, order the parties to meet and confer to address the issues raised in the motion. The meet and confer process continued throughout 2019. The order by the Court precipitated a series of meetings and collaborative actions between the NCMA and NMMA agencies, including the tentative formation of a Seawater Intrusion Working Group to discuss the threat and potential solutions for possible seawater intrusion.

1.2 Description of the NCMA Technical Group

Pursuant to a requirement in the 2005 Stipulation, the NCMA Technical Group (TG) was formed (Paragraph IV.C and Paragraph VII). The TG is composed of representatives of each of the NCMA agencies Table 1.

Table 1. NCMA TG Representatives

Agency	Representative
City of Arroyo Grande	Bill Robeson Public Works Director
	Shane Taylor Utilities Manager
City of Grover Beach	Gregory A. Ray, PE Director of Public Works/City Engineer
	R.J. (Jim) Garing, PE Consulting City Engineer for Water and Sewer
City of Pismo Beach	Benjamin A. Fine, PE Director of Public Works/City Engineer
Oceano CSD	Will Clemens General Manager
	Tony Marracino Utility Systems Supervisor

Notes

CSD = Community Services District, PE = Professional Engineer

Arroyo Grande, Pismo Beach, and Grover Beach contract with Water Systems Consulting, Inc. (WSC), to serve as staff extension to assist the TG in its roles and responsibilities in managing the water supply resources. The full NCMA TG contracts with GSI Water Solutions, Inc., and its subconsulting partner, GEI Consultants, Inc., to conduct the quarterly groundwater monitoring and sampling tasks, evaluate water demand and available supply, identify threats to water supply, and assist the TG in preparation of the annual report.

1.3 NCMA TG Mission Statement

The NCMA TG developed the following Mission Statement to help guide ongoing initiatives and to capture the requirements outlined in the 2001 Groundwater Management Agreement, 2002 Settlement Agreement 2005 Stipulation, and 2008 Judgment:

Preserve and enhance the s*ustainability* of water supplies *for* the Northern Cities Area by:

- Enhancing supply *reliability*
- Protecting water *quality*
- Maintaining *cost-effective* water supplies
- Advancing the legacy of *cooperative* water resources management
- Promoting conjunctive use

1.4 Coordination with Management Areas

Since 1983, management of the NCMA has been based on cooperative efforts of the four NCMA agencies in continuing collaboration with the County, SLOFCWCD, and other local and state agencies. Specifically, the NCMA agencies have jointly monitored and managed their groundwater production and, in cooperation with the SLOFCWCD, invested in surface water supplies to reduce dependence on groundwater pumping and protect the groundwater resource. In addition to the efforts discussed in this 2019 Annual Report, cooperative management occurs through many means including communication by the NCMA agencies in their respective public meetings, participation in the SLOFCWCD Zone 3[6] Advisory Committee (related to the management and operation of Lopez Lake, which is described further in Section 4.1.1), and participation in the Water Resources Advisory Council (the County-wide advisory panel on water issues). The NCMA agencies are active participants in current and ongoing integrated regional water management efforts and participated in preparation and adoption of the 2007 San Luis Obispo County Integrated Regional Water Management Plan (2007 County IRWMP) as well as the 2014 update of the County IRWMP. The IRWMP promotes integrated regional water management to ensure sustainable water uses, reliable water supplies, better water quality, environmental stewardship, efficient urban development, protection of agriculture, and a strong economy.

Since the 2008 Judgment, the NCMA TG has taken the lead in cooperative management of its management area. The NCMA TG has met monthly for many years and continued to do so throughout 2019. The TG also participates in the Santa Maria Groundwater Basin Management Area (SMGBMA) technical subcommittee, formed in 2009. The purpose of the SMGBMA technical subcommittee is to coordinate efforts among the three management areas (NCMA, NMMA, SMVMA) such as sharing data throughout the year and during preparation of the annual report, reviewing and commenting on technical work efforts of other management areas, standardizing monitoring protocols, considering projects and grant opportunities of joint interest and benefit, and sharing information and data among the managers of the three management areas.

The outcomes of the motion that Arroyo Grande, Pismo Beach, and Grover Beach filed on September 29, 2015, include increased discussion and collaboration between the NCMA and NMMA. One of the initiatives was the formation of an NCMA-NMMA Management Coordination Committee that met several times in 2018 and 2019 to discuss items of mutual concern and develop strategies for addressing the concerns. Another area of increased mutual collaboration between the NCMA and NMMA was the formation in 2016 of a technical team to collaboratively develop a single data set of water level data points as part of preparing a consistent set of semiannual water level contour maps for the NCMA and NMMA. Those efforts continued into

[6] Flood Control Zone 3 (Lopez Project) is operated by the County of San Luis Obispo Flood Control and Water Conservation District to operate Lopez Reservoir for municipal and agricultural water supplies. It was established to operate the Lopez water supply system and is a wholesale supplier. The contractors in Zone 3 include the communities of Oceano, Grover Beach, Pismo Beach, Arroyo Grande, and County Service Area 12 (including the Avila Beach area).

and throughout 2019 and resulted in the development of consistent water level contouring (and enhanced understanding of groundwater conditions) throughout the NCMA and NMMA.

1.5 Development of Monitoring Program

The 2008 Judgment orders the stipulating parties to comply with all terms of the 2005 Stipulation. As specified in the Judgment and as outlined in the Monitoring Program for the Northern Cities Management Area (Todd Groundwater, Inc. [Todd], 2008) (NCMA Monitoring Program), the NCMA agencies are to conduct groundwater monitoring of wells in the NCMA. In accordance with requirements of the Judgment, the NCMA agencies collect and analyze data pertinent to water supply and demand, including the following:

- Land and water uses in the NCMA portion of the SMGB
- Sources of supply to meet those uses
- Groundwater conditions (including water levels and water quality)
- Amount and disposition of other sources of water supply in the NCMA

The NCMA Monitoring Program requires that the NCMA agencies gather and compile pertinent information on a calendar-year basis; this is accomplished through data collected by NCMA agencies (including necessary field work), the SLOFCWCD, and by other public agencies. Periodic reports, such as Urban Water Management Plans (UWMPs) prepared by Arroyo Grande, Grover Beach, and Pismo Beach, provide information about demand, supply, and water supply facilities. Annual data are added to the comprehensive NCMA database and analyzed. Results of the data compilation and analysis for 2019 are documented and discussed in this 2019 Annual Report.

As shown in Figure 1, the NCMA represents the northernmost portion of the SMGB as defined in the 2005 Stipulation and by DWR (2019; GSI, 2018). Adjoining the NCMA to the south and east is the NMMA; the SMVMA encompasses the remainder of the SMGB. Figure 2 shows the locations of the four NCMA agencies in the NCMA.

1.6 Groundwater Monitoring Network

The NCMA Monitoring Program includes (1) compilation of groundwater elevation data from the County, (2) water quality and groundwater elevation monitoring data from the network of sentry and monitoring wells in the NCMA, (3) water quality data from the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW), and (4) groundwater elevation data from municipal pumping wells. Analysis of these data is summarized below in accordance with the NCMA Monitoring Program (Todd, 2008) and as modified as additional well data and data sources have become available over the years.

Approximately 150 wells within the NCMA were monitored by the County at some time during the past few decades. The County currently monitors 50 wells on a semiannual basis, in April and October, within the NCMA. The County monitoring program includes four sentry well clusters (piezometers) along the coast, a four-well cluster in Oceano, and County Monitoring Well No. 3 (12N/35W-32C03) (County Monitoring Well No. 3 [32C03]) located on the eastern NCMA boundary between the NCMA and NMMA (Figure 3). The County monitors more than 125 additional wells in the NMMA portion of the SMGB within the County. Beginning in 2009, the NCMA agencies initiated a quarterly sentry well monitoring program to supplement the County's semiannual schedule.

To monitor overall changes in groundwater conditions, representative wells within the NCMA were selected for preparation of hydrographs and evaluation of water level changes. Wells were selected based on the following criteria:

- The wells must be part of the County's current monitoring program or part of a public agency's regular monitoring program.
- Detailed location information must be available.
- Construction details of the wells must be available.
- The locations of the wells should have a wide geographic distribution.
- The historical record of water level data must be long and relatively complete.

Many of the wells that have been used in the program are production wells that were not designed for monitoring purposes, or, in other words, are screened across various production zones. Moreover, many of the wells are active production wells or are located near active wells and are therefore potentially subject to localized pumping effects that result in measurements that are lower than the regionally representative water level. These effects are not always apparent at the time of measurement and data cannot easily be identified as representing static groundwater levels in specific zones (e.g., unconfined or deep confined to semi-confined). Therefore, data should be considered as a whole in developing a general representation of groundwater conditions.

The "sentry" wells (32S/12E-24Bxx, 32S/13E-30Fxx, 32S/13E-30Nxx, and 12N/36W-36Lxx) are a critical element of the groundwater monitoring network and are designed to provide an early warning system to identify potential seawater intrusion in the aquifer (Figure 3). Each sentry well consists of a cluster of multiple wells that allows for the measurement of groundwater elevation and quality from discrete depths. Also shown in Figure 3 is the OCSD observation well cluster, a dedicated monitoring well cluster located just seaward of OCSD production wells 7 and 8, and County Monitoring Well No. 3 (32C03). Figure 4 shows the depth and well names of the sentry well clusters, the OCSD observation well cluster, and County Monitoring Well No. 3 (32C03).

Traditionally, the wells were divided into three basic depth categories including shallow, intermediate, and deep to describe the relative depths of each monitoring well within the cluster. The basic depth categories do not necessarily describe the geologic unit and relative depth of the unit that the screened portion of the well monitors. More recently, however, it is becoming apparent that it is important to recognize and identify the geologic unit that each well monitors. The water level responses and water quality changes are quite different between the shallow alluvial unit (24B01, 30F01, and 30N01), the Paso Robles Formation (24B02, 30F02, 30N02, 30N03, 36L01, OCSD MW-Green, OCSD MW-Blue, and 32C03), and the deeper Careaga Sandstone (24B03, 30F03, 36L02, OCSD MW-Silver, and OCSD MW-Yellow). The significance of this level of differentiation will be studied more extensively in the future.

Since the sentry well monitoring program began in 2009, 45 monitoring events have been conducted. These monitoring events include collection of synoptic groundwater elevation data and water quality samples for laboratory analysis.

1.7 Recent and Ongoing Strategic Initiatives

1.7.1 Strategic Plan

An NCMA Strategic Plan was developed in 2014 to provide the NCMA TG with a mission statement to guide future initiatives, provide a framework for identifying and communicating water resource planning goals and objectives, and formalize a 10-year work plan for implementation of those efforts. Several key objectives were identified related to enhancing water supply reliability, improving water resource management, and increasing effective public outreach. Implementation of some of these efforts continued throughout 2019.

Work began in 2019 to update the 2014 NCMA Strategic Plan. The Strategic Plan was developed over a series of strategic planning sessions and NCMA TG meetings. The purpose of the Strategic Plan is to provide the NCMA TG with the following:

- A Mission Statement to guide future initiative
- A framework for communicating water resource goals
- A formalized Work Plan for the next 10 years

Through the strategic planning process, the NCMA TG identified several key strategies to guide future efforts. These key strategies include the following:

- Enhance groundwater management
- Develop supplemental water supply
- Improve understanding of the NCMA groundwater
- Improve water management governance
- Increase inter-agency coordination

Several strategic initiatives were developed for each key strategy, and an extensive screening and objective ranking process was applied. Utilizing the ranked and grouped strategic initiatives, the NCMA TG is developing an implementation plan for the key strategies. The implementation plan will include for each initiative the key participants, the NCMA lead, an estimated budget, and an implementation time frame.

1.7.2 Central Coast Blue

Central Coast Blue is a regional recycled water project that includes advanced treatment of water from the Pismo Beach and South San Luis Obispo County Sanitation District (SSLOCSD) wastewater treatment plants and injection of the highly treated effluent into the SMGB to reduce the risk of seawater intrusion and improve water supply sustainability for the region. Currently the water from both wastewater treatment plants is being treated and discharged to the ocean. Central Coast Blue will provide an opportunity to capture this lost water and use it to recharge the SMGB to create a drought proof, sustainable water supply for the community. Tasks related to the development of the project that were performed prior to and throughout 2019 include feasibility study analysis, preliminary design, pilot plant development and operation, funding appropriation, cost/benefit sharing analysis, groundwater modeling, and initial environmental review.

The intent of Central Coast Blue is to enable Pismo Beach, partnering NCMA agencies and the SSLOCSD to construct an Advanced Treatment Facility (ATF) to produce Advanced Purified Water (APW) to augment its water supply through injection to recharge the aquifer and develop a seawater intrusion barrier to improve water supply reliability for the area.

1.7.3 Phase 1B Groundwater Model

As part of Central Coast Blue planning and technical studies, a localized groundwater flow model (the Phase 1A model) was developed for the northern portion of the NCMA that evaluated the concept of injecting APW into the SMGB to increase aquifer recharge, improve water supply reliability, and help prevent future occurrences of seawater intrusion. Based on the results of the Phase 1A model and through funding by the SSLOCSD Supplemental Environmental Program, work was initiated in 2017 and continued through 2018 and 2019 for development of the Phase 1B groundwater flow model. The domain of the Phase 1B model covers the entire NCMA, NMMA, and the portion of the SMVMA north of the Santa Maria River. The purpose of the model is to evaluate additional groundwater injection and extraction scenarios to further support Central Coast Blue. The model has now been used to (1) more completely understand the groundwater conditions of the

NCMA portion of the SMGB, (2) understand the groundwater flow dynamics and components of the groundwater water balance of the aquifer, (3) identify the locations of the proposed injection wells, (4) quantify the amount of water that can be injected, (5) evaluate strategies for preventing seawater intrusion, and (6) develop estimates of the overall yield that the Central Coast Blue stakeholders will be able to receive from the project.

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SECTION 2: **Basin Setting**

2.1 Setting

The northern portion of the NCMA is dominantly urban (residential/commercial). The Cienega Valley, a low-lying coastal stream and valley regime, is the area south of Arroyo Grande Creek in the central part of the area and is predominantly agricultural. The southern and southwestern portions of the area are composed of beach dunes and small lakes. That area is primarily managed by California Department of Parks and Recreation as a recreational area and a sensitive species habitat.

2.2 Precipitation

Each year, climatological and hydrologic (stream flow) data for the NCMA are added to the NCMA database. Annual precipitation from 1950 to 2019 is presented in Figure 5.

Historical rainfall data are compiled on a monthly basis for the following two stations:[7]

- DWR California Irrigation Management Information System (CIMIS) Nipomo Station (No. 202) (Nipomo station) for 2006 to present
- San Luis Obispo County-operated rain gauge (No. SLO 795) in Oceano for 2000 to present

The locations of the two stations are shown in Figure 6. In recent years, it was noted that the CIMIS Nipomo station may have been recording irrigation overspray as precipitation and the precipitation data from the station may not be reliable. However, the evapotranspiration data is still considered reliable. For this reason and because the DRI station was discontinued in 2017, the County-operated gauge (No. SLO 795) was the sole source of precipitation data used in this 2019 Annual Report. Figure 5 is a composite graph combining data from the DRI and County stations and illustrating annual rainfall totals from available data from 1950 through 2019 (on a calendar-year basis). Annual average rainfall for the NCMA is approximately 15.7 inches.

Monthly rainfall and evapotranspiration (ET) for 2019 as well as average monthly historical rainfall and ET are presented in Figure 7. During 2019, below-average rainfall occurred during 6 months and above-average rainfall occurred during the other 6 months. The total for the year was 20.0 inches, more than 4 inches above the average annual rainfall for the area.

Figure 5 illustrates annual rainfall and shows several multi-year drought cycles (e.g., 6 years, 1984 through 1990) followed by cycles of above-average rainfall (e.g., 7 years, 1991 through 1998). With the exception of 2010, the period 2007 through 2015 (8 years) experienced below-average annual rainfall indicating a dry hydrologic period. This pattern continued into late 2016, when the hydrologic pattern appeared to have broken the serious drought that the area (and state) had experienced for the previous 5 years. Annual rainfall totals since 2016 have generally been above average (with the exception of 2018), as illustrated in Figure 5.

2.3 Evapotranspiration

CIMIS maintains weather stations in locations throughout the state to provide real-time wind speed, humidity, and evapotranspiration data. The nearest CIMIS station to the NCMA is the Nipomo station (see Figure 6). The Nipomo station has gathered data since 2006. While this station may have been subject to irrigation overspray in recent years (noted in Section 2.2, Precipitation, above), the apparent irrigation overspray does not have a

[7] The Desert Research Institute (DRI): Western Regional Climate Center Pismo Station (Coop ID: 046943) was discontinued in August of 2017.

significant impact on the measurements used for calculating ET. The monthly ET data for the Nipomo station is shown in Figure 7 for 2019 and average conditions (over 10 years). The ET rate affects recharge potential of rainfall and the amount of outdoor water use (irrigation).

2.4 Geology and Hydrogeology

The current understanding of the geologic framework and hydrogeologic setting is based on numerous previous investigations, particularly Woodring and Bramlette (1950), Worts (1951), Miller and Evenson (1966), DWR (1979, 2002), and Fugro (2015).

The NCMA overlies the northwest portion of the SMGB. There are two principal aquifers in the NCMA portion of the SMGB. Groundwater pumped from the sedimentary deposits that make up the main municipal production aquifer underlying the NCMA is derived from the Paso Robles Formation and the underlying Careaga Sandstone. The Paso Robles Formation and Careaga Sandstone aquifers together are referred to as the deep aquifer system in this report. All municipal production in the NCMA is from the deep aquifer.

The second principal aquifer is the alluvial aquifer, consisting of Quaternary-age alluvial sediments of Arroyo Grande Creek, Los Berros Creek, and the Cienega Valley. All agricultural groundwater production in the Cienega Valley is presumed to be extracted from the alluvial aquifer.

Several faults either cross or form the boundary of the NCMA, as identified by DWR (2002), Pacific Gas & Electric (PG&E, 2014) (PG&E), and others. The Oceano Fault (USGS, 2006) trends northwest-southeast across the central portion of NCMA and has been extensively studied by PG&E (2014). Offshore, the Oceano Fault connects with the Hosgri and Shoreline fault systems several miles west of the coast. Onshore, the Oceano Fault consists of two mapped fault splays, including the main trace of the Oceano Fault as well as the Santa Maria River Fault, which diverges northward of the Oceano Fault through the Cienega Valley before trending into and across the Nipomo Mesa.

It is unknown the extent to which the Oceano and Santa Maria River faults impede groundwater flow within the deep aquifer system materials. However, movement on the faults, as mapped by PG&E (2014), may suggest a possible impediment to flow with the Careaga Formation and possibly the Paso Robles Formation. PG&E (2014) suggests that the existence of the Santa Maria River Fault is “uncertain.” However, the water elevation contour maps of the NCMA (Figures 8 and 9, discussed in more detail in Section 3.4.1) may suggest that the Santa Maria River Fault plays a potential, but unknown, role in groundwater flow across the NCMA.

The Wilmar Avenue Fault generally forms the northern boundary of the NCMA, apparently acting as a barrier to groundwater flow from the older consolidated materials north of the fault southward into the SMGB. There is no evidence, however, that the Wilmar Avenue Fault impedes alluvial flow in the Pismo Creek, Meadow Creek, or Arroyo Grande Creek alluvial valleys.

2.5 Groundwater Flow

The groundwater system of the NCMA has several sources of recharge including precipitation, agricultural return flow, seepage from stream flow, and subsurface inflow from adjacent areas. In addition, some return flows occur from imported surface supply sources including Lopez Lake and the California State Water Project (SWP). Discharge in the region is dominated by groundwater production from pumping wells, but minor discharge certainly occurs through phreatophyte[8] consumption and surface water outflow. Historically,

[8] A phreatophyte is a deep-rooted plant that obtains a significant portion of the water that it needs from the water table. Phreatophytes are plants that are supplied with surface water or the upper portion of the near-surface water table and often have their roots constantly in touch with moisture.

groundwater elevations in wells throughout the NCMA and resulting hydraulic gradients show that subsurface outflow discharge occurs westward from the groundwater basin to the ocean. This subsurface outflow is an important control to limit the potential of seawater intrusion. This westward gradient and direction of groundwater flow still is prevalent throughout the northern portion of NCMA, although there is some evidence recently that the westward gradient may have reversed in the area of Cienega Valley.

The following descriptions of the boundary conditions of the NCMA are derived primarily from Todd (2007). The eastern boundary is coincident with the SLOFCWCD Zone 3 management boundary and with the northwestern boundary of the NMMA. Aquifer materials of similar formation, provenance, and characteristics are present across the majority of this boundary, which allows subsurface flow to occur between the NCMA and NMMA.

The northern and northwestern boundary, established by the Court during the 2005 Stipulation, is coincident with the Wilmar Avenue Fault, which is located approximately along Highway 101 from Pismo Creek to the southeastern edge of the Arroyo Grande Valley. There is likely insignificant subsurface flow from the consolidated materials (primarily Pismo Formation) north of the Wilmar Avenue Fault across the boundary into the SMGB; however, basin inflow occurs within the underflow associated with alluvial valleys of Arroyo Grande and Pismo creeks.

The southern boundary of the NCMA is an east-west line, roughly located along the trend of Black Lake Canyon and perpendicular to the coastline. Historically, it appears that groundwater flow is typically roughly parallel to the boundary. This suggests that little to no subsurface inflow occurs across this boundary.

The western boundary of the NCMA follows the coastline from Pismo Creek in the north to Black Lake Canyon. Given the generally westward groundwater gradient in the area, this boundary is the site of subsurface outflow and is an important impediment to seawater intrusion. However, the boundary is susceptible to seawater intrusion if groundwater elevations onshore decline, such as may be occurring seasonally in the southeast portion of NCMA along the boundary with NMMA.

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SECTION 3: **Groundwater Conditions**

3.1 Groundwater Levels

Groundwater elevation data are gathered from the network of wells throughout the NCMA to monitor the effects of groundwater use and recharge, and to monitor the threat of seawater intrusion. Over time, analysis of these groundwater elevation data has included development of groundwater surface contour maps, hydrographs, and an index of key sentry well water elevations.

3.1.1 Groundwater Level Contour Maps

Contoured groundwater elevations for the spring (April 2019) and fall (October 2019) monitoring events, including data from the County monitoring program, are shown in Figures 8 and 9, respectively. From an increased understanding of the groundwater basin aquifer system and to be consistent with recent work completed for the Phase IB model, the groundwater elevation analysis was performed separately for each of the two principal aquifers. As described earlier (Section 2.4), the two principal aquifers are the deep aquifer, consisting of the Paso Robles Formation and the Careaga Sandstone and from which all municipal production is pumped, and the alluvial aquifer within the Cienega Valley, from which all agricultural production is pumped.

Groundwater level contours for April 2019 are presented in Figure 8. Spring groundwater elevation contours in the deep aquifer system north of the Santa Maria River Fault show a westerly to southwesterly groundwater flow. The groundwater gradient and flow in the deep aquifer system in the southern portion of the NCMA are generally inferred on the basis of historical records, historical trends, and water level data from the NMMA farther east. This is due to a limited number of wells and water level data in the southernmost portion of the NCMA that is dominated by sensitive-species dunes and California State Parks land.

Spring groundwater contours in the alluvial aquifer exhibit a gradient and flow direction that generally follows the alignment of Arroyo Grande Creek. The alluvial groundwater contours also indicate an inflow of groundwater from the Los Berros Creek drainage (Figure 8).

Agricultural groundwater pumping results in seasonal drawdown of the alluvial aquifer in the Cienega Valley south and east of Arroyo Grande Creek. As shown on Figure 8, the April 2019 alluvial groundwater elevations in the Cienega Valley are in the range of less than 10 feet North American Vertical Datum 1988 (NAVD 88) to more than 30 feet NAVD 88. These data show an increase in alluvial groundwater elevations by as much as 13 feet from April 2018 to April 2019 (see Figure 8 from NCMA, 2018). During the recent drought, spring alluvial groundwater elevations showed a subdued pumping trough in the Cienega Valley, with groundwater elevations generally below sea level (NAVD 88) in the center of the depression.

April 2019 groundwater elevations in the deep aquifer system main production zone along the coast ranged from 7.5 to 11.1 feet NAVD 88. A pumping depression occasionally formed in the deep aquifer system north and west of Arroyo Grande Creek in the area of concentrated municipal pumping. This depression occurred historically mostly in response to the recent drought. This pumping depression has not been observed since 2017, most likely due to a couple years of above-average rainfall, continued groundwater conservation efforts, and increased reliance on imported surface water.

Groundwater elevation contours for October 2019 are presented in Figure 9. Fall groundwater contours in the deep aquifer system north of the Santa Maria River Fault show a generally west to southwesterly groundwater flow, similar to conditions in the spring, but with some minor pumping effects evident in the area of the municipal wells. Fall groundwater contours in the alluvial aquifer show pumping effects from agricultural groundwater production, including a pronounced pumping depression in the southeast portion of the Cienega

Valley (Figure 9). Similar to spring 2019, the fall alluvial groundwater contours indicate an inflow of groundwater from the Los Berros Creek drainage (Figure 9).

The alluvial aquifer groundwater conditions in October 2019 shows a decline of approximately 8 to 28 feet from April 2019. These conditions are consistent with the pumping depressions observed historically during the fall within the Cienega Valley. The alluvial groundwater elevation in the pumping depression in October 2019, at (-) 17.6 feet NAVD 88, was 2 feet lower than was present in October 2018. October 2019 groundwater elevations in the deep aquifer system main production zone along the coast ranged from 6.1 to 8.3 feet NAVD 88.

3.1.2 Historical Water Level Trends

Hydrographs of several water wells in the NCMA are presented in Figure 10.

The hydrographs for wells 32D03 and 32D11 (Figure 10) are paired hydrographs for wells in the vicinity of the municipal wellfields. Depending on the duration of pumping of the municipal wells, historically water levels in these wells have been below levels in other areas of the NCMA for prolonged periods of time. The hydrographs show that, historically, groundwater elevations in these wells generally have been above mean sea level. In 2007 to 2009, when groundwater pumping was at its peak in comparison with pumping of the last 30 years and contributed to the apparent seawater intrusion event in the coastal wells in 2009, an area of lower groundwater elevations (a trough) beneath the active wellfield appeared.

As illustrated in Figure 10, the water elevations of all the wells, including the paired wells 32D03 and 32D11, exhibited a steady decline from 2011 to 2016, during which time rainfall was below normal every year. In this period, groundwater elevations declined to near sea level or, in the case of well 33K03, to below sea level. By October 2016 the groundwater elevations in these wells were generally below the levels observed in 2009–2010.

However, in 2016 and 2017, all of the wells exhibited an overall increase in water levels except for the normal, seasonal decline during the summer. Water levels have remained approximately steady in all of the wells since 2017. The water level in well 33K03, located near the NCMA/NMMA boundary, is currently several feet above sea level (NAVD 88).

3.1.3 Sentry Wells and the Deep Well Index

Regular monitoring of water elevations in clustered sentry wells located along the coast are an essential tool for tracking critical groundwater elevation changes at the coast. Groundwater elevations in these wells are monitored quarterly as part of the sentry well monitoring program. As shown by the hydrographs for the five sentry well clusters (Figure 11), the sentry wells provide a long history of groundwater elevations.

Inspection of the recent data shown in Figure 11 compared with the historical record illustrates some noteworthy trends:

- From 2013 until near the end of 2016, the water level trend of well 30N02, one of the wells that experienced elevated TDS and chloride levels in 2009–2010 (i.e. water quality degradation), looked quite similar to the water level trend of the well in 2007–2010, immediately before and during the period of incipient seawater intrusion. This trend was noteworthy and alarming. However, since the end of 2016 and continuing through 2019, the water level reversed the downward trend and now has water elevations seasonally fluctuating around 8 feet NAVD 88.
- The decline in water levels from 2005 to 2016 in the Oceano Dunes wells (36L01 and 36L02) was also notable and potentially significant, particularly in well 36L01, which is screened across the Paso Robles

Formation. In 2016, both wells reached historical low-water elevations. However, since late 2016, both wells have started recovering to less-alarming levels.

The deepest wells in the clusters, 24B03, 30F03, and 30N02, were previously identified as key wells to monitor for potential seawater intrusion and were suggested to reflect the net effect of changing groundwater recharge and discharge conditions in the primary production zone of the deep aquifer system. One of the thresholds to track the status and apparent health of the aquifer is to average the groundwater elevations from these three deep sentry wells to generate a single, representative index, called the Deep Well Index. Previous studies suggested a Deep Well Index value of 7.5 feet NAVD 88 as a minimum threshold, or trigger value, below which the aquifer is at risk for eastward migration of seawater and a subsequent threat of encroaching seawater intrusion. Historical variation of this index is represented by the average deep sentry well elevations in Figure 12.

Inspection of the Deep Well Index in 2008–2009, prior to the period of water quality degradation in wells 30N03 and 30N02, the Deep Well Index dropped below the 7.5-foot trigger value and remained below that level for almost 2 years. It appears that prolonged levels below the threshold may be causing the degradation. Since the start of the recent drought in 2012, the Deep Well Index dropped several times below the threshold, but usually for only a few months at a time.

In 2019, the Deep Well Index started the year above the trigger value with an index value of more than 9 feet in January. It continued to rise, reached a high more than 11 feet in late March, and then began to decline. The index value dropped down to the 7.5-foot trigger value briefly in late October and then immediately began to rise. The index value continued to rise throughout the end of the year and finished 2019 at about 10.5 feet NAVD 88 (Figure 12).

Key wells, including 24B03, 30F03, 30N02, 36L01, 36L02, and 32C03, are instrumented with pressure transducers equipped with conductivity probes that periodically record water level, water temperature, and conductivity (Figures 13 through 18). It should be noted that transducer malfunctions have resulted in variable conductivity data in some of the wells during certain years, including 2015 and 2019. Malfunctioning transducers have been replaced and continue to be monitored in an ongoing effort to maintain a properly functioning monitoring network.

Wells 24B03, 30F03, and 30N02 comprise the wells used to calculate the Deep Well Index. Wells 36L01 and 36L02 are adjacent to the coast. Well 32C03 is the easternmost well and adjacent to the boundary between the NCMA and NMMA. The following discusses 2019 water levels for these key wells:

- **Deep Well Index Wells**: The Deep Well Index wells exhibited a pattern throughout 2019 that is consistent with previous years. The water levels in wells 24B03, 30F03, and 30N02 generally declined starting in March or April 2019 and continued to decline into October when they began to rise.

  Also consistent with patterns seen in previous years is the variability of aquifer response among the three wells. Well 24B03, the northernmost well and located in the North Beach Campground, maintains a relatively stable and moderated water level throughout the year and consistently sustains groundwater elevations higher than the Deep Well Index value. The water level in 24B03 mitigates the water levels in 30N02, which typically maintain levels consistently deeper than the Deep Well Index. Well 30F03 generally closely follows the Deep Well Index value.
- **Coastal Wells:** The groundwater elevation in well 36L01, screened within the Paso Robles Formation, remained 4 to 10 feet above sea level (NAVD 88) throughout 2019 and remained stable within the relatively narrow historical range. The water level in well 36L02, which is screened within the Careaga Sandstone, illustrates a much greater seasonal fluctuation than is observed in 36L01. Similar to 2017 and 2018, the water elevation in 36L02 remained above sea level throughout 2019, in comparison with

2015 and 2016 when the water elevation in the well dropped below sea level in late September and remained below sea level into mid-October.

- **NCMA/NMMA Boundary:** Well 32C03, which shows regular seasonal fluctuations, remained above sea level throughout all of 2017, 2018, and 2019, in contrast with the prior 4 years when the water level dropped below sea level in August and remained at a low elevation until early October. The groundwater elevation in 32C03 at the end of 2019 is the highest year-end elevation observed since the end of 2012.

3.2 Change in Groundwater in Storage

The relative change of groundwater levels and associated change in groundwater in storage in the NCMA portion of the SMGB between April 2018 and April 2019 were estimated using a comparison of water level contour maps created for these periods. Separate estimates of change in groundwater in storage were computed for both the deep aquifer system and for the alluvial aquifer and then summed together to represent the total NCMA estimated change in groundwater in storage. The comparison of the April water levels was chosen to comply with DWR reporting requirements and SGMA.

For each aquifer, the groundwater contour lines from each period were compared and the volumetric difference between the two periods were calculated. The results are presented in Figure 19 and Figure 20, which show contours of equal difference between April 2018 and April 2019 water elevations in the deep aquifer system and the alluvial aquifer, respectively. Figure 19 shows that deep aquifer system water elevations increased over a majority of the NCMA area, resulting in a net increase of groundwater in storage in the deep aquifer system. Figure 20 shows that alluvial aquifer water elevations increased everywhere within the extent of alluvium in the Cienega Valley, resulting in a net increase of groundwater in storage in the alluvial aquifer.

From the change of water levels maps, a volumetric change in groundwater in storage estimate was made for each aquifer, based on assumed aquifer properties[9], and then summed to represent the total NCMA estimated change in groundwater in storage. The net increase in groundwater levels in both aquifers represents a net increase of groundwater in storage from April 2018 to April 2019 of approximately 1,500 acre-feet (AF).

3.3 Water Quality

Water is used in several ways in the NCMA and each use requires a certain minimum water quality. Because contaminants from seawater intrusion or from anthropogenic sources can potentially impact the quality of water in the aquifer, water quality is monitored at each of the sentry well locations in the NCMA and County Monitoring Well No. 3 (32C03).

3.3.1 Quarterly Groundwater Monitoring

Quarterly groundwater monitoring events occurred in January, April, July, and October 2019. During each event, depths to groundwater were measured, and wells were sampled using procedures, sampling equipment, and in-field sample preservation protocol pursuant to ASTM International Standard D4448-01. The water quality data from these events and historical data from these wells are provided in Appendix A.

[9] A storage coefficient of 0.02 was used for the deep aquifer system. This is representative of the Paso Robles Formation and Careaga Sandstone in the area, as documented in the SMGB Characterization Project (Fugro, 2015).
A specific yield value for the alluvial aquifer of 0.09 was back calculated using the 2019 estimated change in alluvial groundwater in storage represented by the calculated agricultural demand (Section 4.2.1) and an alluvial groundwater elevation change map representing the total volume change that occurred between April 2019 and October 2019.

Graphs of historical chloride and total dissolved solids (TDS) concentrations over time are presented in Figures 21 and 22, respectively, to monitor for trends that may aid in the detection of impending seawater intrusion.

The historical water quality data show that concentration levels of chlorides and TDS, as well as other constituents, have remained relatively stable within a very narrow historical range since 2009. Improved management of municipal groundwater use, because of an overall reduction in pumping since 2009, has likely contributed to the past several years of relatively stable groundwater quality.

3.3.2 Analytical Results Summary

Analytical results of key water quality data, including chloride, TDS, and sodium, were generally consistent with historical concentrations and observed ranges of constituent concentrations during 2019. In general, no water quality results were observed that are a cause of concern.

Figure 23 is a Piper diagram, one of several means of graphically representing water quality. There appear to be three separate water quality types found in the monitoring wells:

1. The Pier Avenue deep well (30N02), screened in the Paso Robles Formation from 175 to 255 feet bgs, and Oceano Dunes intermediate well (36L01), screened in the Paso Robles Formation from 227 to 237 feet bgs, are screened in the same production zone. This is despite their different nomenclature as “deep” compared with “intermediate” wells. Relative to the other wells in the area, these two wells are high in sulfates and have calcium-magnesium-sulfate-rich water. Both wells are relatively low in chloride. This is significant because this zone, and well 30N02, was the site of an apparent seawater intrusion event in 2009–2010.

2. The County Monitoring Well No. 3 (32C03), screened from 90 to 170 feet bgs, in the Paso Robles Formation, has an apparent water quality that is different than any of the other wells in the area. It is relatively high in sodium, chloride, and potassium. Its location in the right quadrant of the diamond-shaped part of the Piper diagram (Figure 23) commonly characterizes a sodium-chloride-rich groundwater representative of marine or deep ancient groundwater, even though it is a relatively shallow well and screened within the Paso Robles Formation, a Plio-Pleistocene-age alluvial deposit. Although its overall water quality signature is quite different from seawater, it is more closely representative of seawater than any of the other wells in the area.

3. All of the other wells in the monitoring network fall into the third category of groundwater water quality. These wells are all generally a calcium-bicarbonate groundwater that is commonly associated with shallow groundwater. This grouping of water quality represents groundwater from wells that are screened in both the Paso Robles Formation and the Careaga sandstone (wells 24B03, 30F03, and 36L02 are screened in the Careaga sandstone; the others are screened in the Paso Robles Formation).

None of the water quality results from monitoring wells throughout 2019 indicate an incipient episode or immediate threat of seawater intrusion. Since the decline of TDS, sodium, and chloride concentrations following the 2009–2010 seasons, it is also clear that the location and inland extent of the seawater-fresh water interface is not known, except for the apparent indication that it was detected in well 30N02, 30N03, and OCSD MW-Blue, all of which are screened in the Paso Robles Formation. No indications of seawater intrusion have been observed in wells screened in the underlying Careaga sandstone. At this time, without additional offshore data, the location of the interface or mixing zone is not known and will not be known unless and until it intercepts a monitoring well.

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SECTION 4: **Water Supply and Production/Delivery**

4.1 Water Supply

The NCMA water supply consists of three major sources including Lopez Lake, the SWP, and groundwater. Each source of supply has a defined delivery volume that varies from year to year.

4.1.1 Lopez Lake

The Lopez Project consists of Lopez Lake, Lopez Dam, Lopez Terminal Reservoir, and Lopez Water Treatment Plant and is operated by SLOFCWCD Zone 3. SLOFCWCD Zone 3 provides treated water directly to the Zone 3 contractors and releases water to Arroyo Grande Creek for habitat conservation and agricultural use. The Zone 3 contractors include Arroyo Grande, Grover Beach, Pismo Beach, Oceano CSD, and CSA 12, which serves Avila Beach and is not in the NCMA.

The operational safe yield of Lopez Lake is 8,730 acre-feet per year (AFY), which reflects the amount of sustainable water supply during a drought of defined severity. Of this, 4,530 AFY is apportioned to the contractors and 4,200 AFY is reserved for downstream releases to maintain flows in Arroyo Grande Creek and provide groundwater recharge. The 2019 SLOFCWCD Zone 3 allocations are shown in Table 2.

Table 2. Lopez Lake (SLOFCWCD Zone 3 Contractors) Water Allocations (AFY)

Contractor	Normal Water Allocation, (AFY)
City of Arroyo Grande	2,290
City of Grover Beach	800
City of Pismo Beach	892
Oceano CSD	303
CSA 12 (not in NCMA)	245
Total	**4,530**
Downstream Releases	4,200
Safe Yield of Lopez Lake	8,730

Notes

AFY = acre-feet per year, CSA = County Service Area, CSD = Community Services District, SLOFCWCD = County of San Luis Obispo Flood Control & Water Conservation District, NCMA = Northern Cities Management Area

In December 2014, SLOFCWCD Zone 3 adopted the Low Reservoir Response Plan (LRRP). The LRRP establishes actions that SLOFCWCD Zone 3 can take when the amount of water in storage in the reservoir drops below 20,000 AF, provided that the SLOFCWCD Board of Supervisors declares a drought emergency. The purpose of the LRRP is to limit downstream releases and municipal diversions from Lopez Lake to preserve water within the reservoir, above the minimum pool, for a minimum of 3 to 4 years under drought conditions.

The reduction strategies for the LRRP are tied to the amount of water in the reservoir. As the amount of water in the reservoir drops below the triggers (20,000; 15,000; 10,000; 5,000; and 4,000 AF), the hydrologic conditions are reviewed, and adaptive management is used to meet the LRRP objectives. The municipal diversions are to be reduced according to the strategies shown in Table 3.

Table 3. Lopez Lake Municipal Diversion LRRP Reduction Strategy

Amount of Water in Storage (AF)	Municipal Diversion	
	Reduction	AFY
20,000	0%	4,530
15,000	10%	4,077
10,000	20%	3,624
5,000	35%	2,941
4,000	100%	0

Notes

AF= acre-feet, AFY = acre-feet per year

The mandatory actions after the LRRP is enacted include (1) reductions in entitlement water deliveries; (2) reductions in downstream releases; (3) no new allocations of surplus water from unreleased downstream releases; and (4) extension of time that agencies can take delivery of existing unused water throughout the duration of the drought emergency, subject to evaporation losses if the water is not used in the year of original allocation. Included in the LRRP is an adaptive management provision that allows modification of the terms of the LRRP to match the initially prescribed reductions based on actual hydrologic conditions.

The downstream releases are to be reduced according to the strategies described in Table 4. The release strategies represent the maximum amount of water that can be released. The SLOFCWCD Zone 3 controls the timing of the reduced releases to meet the needs of the agricultural stakeholders and to address environmental requirements.

Table 4. Lopez Lake Downstream Release LRRP Reduction Strategy

Amount of Water in Storage (AF)	Downstream Release	
	Reduction	AFY
20,000	9.5%	3,800
15,000	9.5%	3,800
10,000	75.6%	1,026
5,000	92.9%	300
4,000	100%	0

Notes

AF= acre-feet, AFY = acre-feet per year

The LRRP was put into effect on April 1, 2015. Throughout 2015 and all of 2016, SLOFCWCD Zone 3 operated Lopez Lake pursuant to the 15,000 AF diversion reduction trigger that required a 10 percent reduction in municipal diversions. The 10,000 AF trigger requiring a 20 percent reduction was avoided because agencies enacted mandatory water conservation measures and utilized other sources of water including some minimal rainfall and SWP water.

Lopez Lake recovered from a low of 11,000 AF in storage to a peak of more than 30,000 AF in May 2017, ending with approximately 25,000 AF at the start of 2018 because of the relatively heavy rainfall year of late 2016 and early 2017. Although contractually the LRRP is no longer in effect when both triggers are rescinded (Board of Supervisors declaration of water emergency and reservoir levels drop below 20,000 AF), the

SLOFCWCD Zone 3 agencies resolved to keep the LRRP in effect until there is clear evidence that the drought was over. Because the reservoir volume was above 20,000 AF, no mandatory reductions in municipal deliveries were required in 2017 or 2018.

In 2019, the reservoir level stayed above 20,000 AF all year, reaching a high of 29,405 AF in May 2019. As a result, there were no mandatory reductions in municipal deliveries in 2019. The status of the reservoir and management actions related to the LRRP will be monitored throughout 2020 and adjusted accordingly based on winter 2020 rainfall and storage in Lopez Lake.

Total discharge from Lopez Lake in 2019 was 7,099 AF, of which 4,385 AF were delivered to NCMA contractors, 69 AF were delivered to CSA 12, and 2,645 AF were released downstream to maintain flow in Arroyo Grande Creek (Table 5).

When management of releases results in a portion of the 4,200 AFY remaining in the reservoir, or the contractors do not use their full entitlement for the year, the water is offered to the contractors as surplus water. Surplus water deliveries to the NCMA agencies in 2019 equaled 384 AF (Table 5).

Table 5. Lopez Lake 2019 Deliveries

Contractor	2019 Allocation Usage (AF)	2019 Surplus Usage (AF)	2019 Total Lopez Lake Water Delivery (AF)
City of Arroyo Grande	2,034	0	2,034
City of Grover Beach	772	9	781
City of Pismo Beach	892	156	1,048
Oceano CSD	303	219	522
Total NCMA 2019 Usage	**4,001**	**384**	**4,385**
CSA 12 (not in NCMA)	69	0	69
Downstream Releases	2,645	--	2,645
Total 2019 Lopez Lake Deliveries	**6,715**	**384**	**7,099**

Notes

AF= acre-feet, CSD = Community Services District, NCMA = Northern Cities Management Area

Source: SLOFCWCD Zone 3 Monthly Operations Reports

4.1.2 State Water Project

Pismo Beach and OCSD have contracts with SLOFCWCD Zone 3 to receive water from the SWP. The SLOFCWCD serves as the SWP contractor and provides imported water to local retailers through the SWP Coastal Branch (Coastal Branch) pipeline. Pismo Beach and OCSD, as subcontractors to SLOFCWCD, have annual contractual water delivery allocations, commonly referred to as Table A water, of 1,240[10] AFY and 750 AFY, respectively (Table 6). In addition to its Table A allocation, Pismo Beach holds 1,240 AFY of additional allocation known as "drought buffer" and OCSD holds an additional allocation of 750 AFY of drought buffer. The additional drought

[10] 140 AF of which is owned by private parties.

buffer allocation held by the agencies is available to augment the SWP water supply when the SWP annual allocation, i.e., percentage of SWP water available, is less than 100 percent. The additional allocations also increase each agency's water held in storage. In any given year, however, Pismo Beach's and OCSD's total SWP deliveries cannot exceed 1,240 AF and 750 AF, respectively.

Table 6. 2019 NCMA SWP Deliveries

Agency	Table A Allocation, AFY	Drought Buffer, AFY	2019 Delivery, AF
City of Arroyo Grande	--	--	--
City of Grover Beach	--	--	--
City of Pismo Beach[1]	1,100	1,240	556
Oceano CSD	750	750	11
Total Allocation/Usage, AFY	**1,850**	**1,990**	**567**

Notes:

[1] Pismo Beach contracts for 1,240 AF of Table A water from the SWP, but 140 AF are owned by private parties

AF=acre feet, AFY= acre-feet per year, CSD = Community Services District, NCMA = Northern Cities Management Area

The SWP annual allocation for all contractors throughout California (including SLOFCWCD, Pismo Beach and Oceano CSD) for 2019 was initially set on November 30, 2018 at 10 percent of the Table A contractual allocation. The 2019 SWP allocation was then increased three times in 2019: to 15 percent on January 25; to 35 percent on February 20; and to 70 percent on March 20. SWP contractors have the opportunity to store undelivered Table A water at the SWP facility called San Luis Reservoir (limitations exist on the amount that can be stored in any one year). This stored water is called "carryover water" and can be delivered in subsequent years but total annual deliveries cannot exceed their Table A allocation due to capacity restrictions in the Coastal Branch. In addition, carryover water can be lost (or "spilled") if its storage interferes with storage of current year SWP water for project needs.

For 2020, the initial allocation of the SWP contractors was set at 10 percent of Table A contractual allocation amounts on December 2, 2019 and increased to 15 percent on January 24, 2020.

The SWP supply has the potential to be affected by drought and environmental issues, particularly because of the endangered Delta smelt in the Delta. However, OCSD and Pismo Beach, as well as the other SLOFCWCD sub-contractors have not been negatively affected to date by reduced SWP supplies because of the SLOFCWCD's large amount of unsubscribed Table A allocation which has been used to fulfill subcontractors' requests, even in dry years. Therefore, even when SWP supplies are decreased, the SLOFCWCD's unsubscribed allocation and any carryover water in San Luis Reservoir provides a buffer so that contracted volumes to subcontractors, such as OCSD and Pismo Beach, still may be provided in full. During 2019, Pismo Beach took delivery of 556 AF of SWP water and OCSD took delivery of 11 AF of SWP water.

4.1.3 Groundwater

The 2008 Judgment and the 2002 Settlement Agreement govern the use of groundwater in the NCMA and establish that groundwater will continue to be allotted and independently managed by the NCMA agencies, NCMA overlying owners, and SLOFCWCD (Northern Parties). Each of the NCMA agencies has the capability to extract groundwater from municipal water supply wells located in the central and northern portions of the

NCMA (Figure 24). Groundwater also satisfies agricultural irrigation and rural domestic use throughout the NCMA.

The calculated, consensus safe yield value of 9,500 AFY for the NCMA portion of the SMGB was included in the 2002 Settlement Agreement through affirmation of the 2001 Groundwater Management Agreement among the NCMA agencies. The basis of the safe yield was established in 1982 by a Technical Advisory Committee, consisting of representatives from Arroyo Grande, Grover Beach, Pismo Beach, OCSD, Avila Beach Community Water District, Port San Luis Harbor District, the Farm Bureau, and the County to deal with a safe yield allocation strategy and agreement not to exceed the safe yield of what was then called the Arroyo Grande Groundwater Basin. The basis for the committee's analysis was DWR (1979). The Technical Advisory Committee concluded that the safe yield was 9,500 AFY. These findings and the allocation of the safe yield then were incorporated into a voluntary groundwater management plan (1983 Gentlemen's Agreement) and were further formalized in the 2002 Settlement Agreement and the 2005 Stipulation.

According to Todd (2007), the safe yield allotment for agricultural irrigation is significantly higher than the actual agricultural irrigation demand and the calculated amount for subsurface outflow is unreasonably low. Todd (2007) recognized that maintaining sufficient subsurface outflow to the coast and preservation of a westward groundwater gradient are essential to preventing seawater intrusion. A regional outflow of 3,000 AFY was estimated as a reasonable approximation although the minimum subsurface outflow necessary to prevent seawater intrusion is unknown.

The 9.500 safe yield provides allotments for agricultural irrigation of 5,300 AFY, subsurface outflow to the ocean of 200 AFY, and urban use of 4,000 AFY. The volume of the allotment for urban use was subdivided as follows:

- Arroyo Grande: 1,202 AFY
- Grover Beach: 1,198 AFY
- Pismo Beach: 700 AFY
- OCSD: 900 AFY

The 2001 Groundwater Management Agreement provides that groundwater allotments of each of the urban agencies can be increased when land within the corporate boundaries is converted from agricultural use to urban use, which is referred to as an agricultural conversion credit. Agricultural conversion credits equal to 121 AFY and 209 AFY were developed in 2011 for Arroyo Grande and Grover Beach, respectively. These agricultural credits were unchanged during 2019.

Total groundwater production in the NCMA, including agricultural irrigation and rural uses, is shown in Table 7 (descriptions of agricultural irrigation applied water and rural use estimation are provided in Sections 4.2.1 and 4.2.2, respectively). Total estimated groundwater pumpage in the NCMA in 2019 from the SMGB was 3,320 AF.

Table 7. NCMA Groundwater Allotment and Production from Santa Maria Groundwater Basin, 2019

Total Allotment/Use	Groundwater Allotment + Ag Conversion Credit (AF)	2019 Groundwater Use from SMGB (AF)
Total Urban Groundwater Allotment / Use	**4,000 + 330 = 4,330**	**684**
Total NCMA Groundwater Allotment / Use	**9,500**	**3,320**

Notes:

AF= acre-feet, Ag = agriculture, SMGB = Santa Maria Groundwater Basin, CSD = Community Services District,

4.1.4 Developed Water

The 2005 Stipulation states that "developed water" is "groundwater derived from human intervention" and states that this includes infiltration from the following sources: "Lopez Lake water, return flow, and recharge resulting from storm water percolation ponds." Return flow results from deep percolation of water used in irrigation that is in excess of a plant's requirements. Return flows have not been estimated recently but would be considered part of the groundwater basin inflow.

In 2008, Arroyo Grande, Grover Beach, and Pismo Beach prepared stormwater management plans. To control stormwater runoff and to increase groundwater recharge, each city now requires that new development construct onsite retention or detention ponds. As these new ponds or basins are constructed, the increase in groundwater recharge could result in recognition of substantial augmentation of basin yield and provision of recharge credits to one or more of the NCMA agencies (Todd, 2007). Thus, a re-evaluation of estimated stormwater recharge is warranted as new recharge facilities are installed and as additional information on flow rates, pond size, infiltration rates, and tributary watershed area becomes available. Pursuant to the 2001 Groundwater Management Agreement, calculation of recharge credits would be based on a mutually accepted methodology to evaluate the amount of recharge, including quantification of factors such as Lopez Lake and SWP recharge, stormwater runoff amounts, determination of effective recharge under various conditions, and methods to document actual recharge to developed aquifers.

4.1.5 Other Supplies

Arroyo Grande owns three water wells that are located outside the SMGB and pump groundwater from the Pismo Formation, which is the geologic bedrock unit in the area. Two of the wells are pumped by the City and used for municipal consumption; the third well is likely to be used in the future. There is no established allocation that limits the volume of groundwater that Arroyo Grande can pump from these wells, but for planning purposes the City assumes that they have the ability to pump up to 160 AFY for municipal use. The volume that Arroyo Grande pumps from these wells varies from year to year and is included in summary totals for urban water use, but the volume is not included in the summary totals for SMGB production.

4.1.6 Total Water Supply Availability

The baseline, or full allocation, water supply available to the NCMA agencies is summarized in Table 8. The baseline water supplies include 100 percent Lopez Lake allocation, SMGB groundwater allotments, agricultural credits, and 100 percent delivery of SWP allocations. This baseline water supply does not include Lopez Lake surplus or SWP carryover, because these supplies vary from year to year and are not always available. The category "Other Supplies" includes groundwater pumped from outside the NCMA boundaries (outside the SMGB). The baseline supply for the NCMA agencies totals 10,625 AFY.

Table 8. Baseline (Full Allotment) Available Urban Water Supplies (AFY)

Agency	Lopez Lake	SWP Allocation (at 100%)	Groundwater Allotment	Ag Credit	Other Supplies	Total
City of Arroyo Grande	2,290	0	1,202	121	160	3,773
City of Grover Beach	800	0	1,198	209	0	2,207
City of Pismo Beach	892	1,100	700	0	0	2,692
Oceano CSD	303	750	900	0	0	1,953
Total	**4,285**	**1,850**	**4,000**	**330**	**160**	**10,625**

Notes:

AFY= acre-feet per year, Ag = agriculture, CSD = Community Services District, SWP = State Water Project

Table 9 summarizes the available water supply to the NCMA agencies in 2019, including Lopez Lake, Lopez Lake carryover (surplus) water, the 2019 SWP 70 percent Table A delivery schedule, and the available SWP carryover water. The total available water supply is a compilation of all components of each agency's portfolio.

Table 9. 2019 Available Urban Water Supply, (AF)

Agency	Lopez Lake Allocation	Lopez Lake Surplus	2019 SWP Allocation with Drought Buffer (at 70% Delivery)	2019 SWP Carryover	Ground-water Allotment	Ag Credit	Other Supplies	Total (2019)
Arroyo Grande	2,290	378	0	0	1,202	121	160	4,151
Grover Beach	800	132	0	0	1,198	209	0	2,339
Pismo Beach	892	147	1,638[1]	1,860[2]	700	0	0	2,979[1]
Oceano CSD	303	50	1,050[1]	1,125[2]	900	0	0	2,003[1]
Total	**4,285**	**707**	**2,688**	**2,985**	**4,000**	**330**	**160**	**11,472**

Notes:

[1] In any given year, Pismo Beach's total SWP deliveries cannot exceed 1,240 AF and OCSD's deliveries cannot exceed 750 AF. In years when the Table A SWP allocation, plus drought buffer, plus carryover exceed 1,240 AF for Pismo Beach and 750 AF for OCSD, the total available SWP supply is capped at 1,240 AF or 750 AF for Pismo Beach and OCSD, respectively.

[2] Based on personal communication with Jill Ogren, SLOFCWCD, on January 29, 2020.

AF = acre-feet, CSD = Community Services District, SWP = State Water Project

4.2 Water Use

Water use refers to the total amount of water used to satisfy the needs of all water user groups. In the NCMA, water use predominantly serves urban production and agricultural applied water; a relatively small component of rural domestic use, including small community water systems; and domestic, recreational, and agriculture-related businesses.

4.2.1 Agricultural Water Supply Requirements

For the 2019 Annual Report, the applied irrigation demand estimations were updated using the 2015 Integrated Water Flow Model (IWFM) Demand Calculator (IDC). The IDC is a stand-alone program that simulates land surface and root zone flow processes, and, importantly for this report, the agricultural water supply requirements for each crop type. IDC applies user-specified soil, weather, and land-use data to estimate and track the soil moisture balances. More specifically, available water within the root zone is tracked for each of the crops to simulate when irrigation events take place based on crop requirements and cultural irrigation practices. The data used in the IDC program for NCMA are described below along with their respective sources.

Data Used in the IDC

- **Land-use Information.** The San Luis Obispo County Agricultural Commissioner's Office (ACO) compiles an annual estimate of irrigated acres in the County. A view displaying the irrigated agricultural lands within NCMA for 2019 is shown in Figure 25. The 2019 survey indicates a total of 1,463 acres of irrigated agriculture in the NCMA consisting predominantly of rotational crops. Table 10 lists the crop types and acreages found in the NCMA that were used in the IDC program.
- **Climate Data.** 2019 weather data from the SLOFCWCD rain gauge in Oceano and the CIMIS Nipomo Station were used for precipitation and data related to reference ET values, respectively. The data needed to calculate reference ET values include solar radiation, humidity, air temperature, and wind speed. Both weather stations are shown in Figure 6.
- **ET Values by Crop Category.** The DWR Consumptive Use Program (CUP) was used to estimate potential ET values based on specific annual climate data and crop type. The CUP used monthly climate data from the closest CIMIS station (Nipomo station) and includes crop coefficients to calculate ET values for the irrigated crop categories.

Assumptions used in the analysis include the following:

- As the NCMA is located near the coast, agricultural practices are influenced significantly by the marine layer, a mass of air that may be of lower temperature and have higher humidity than air over inland areas. As seen in Figure 6, the Nipomo CIMIS station used for climatological data in both the CUP and IDC is located farther inland than the easternmost boundary of NCMA and the recorded weather data does not fully account for the cooling and moisture effects of the marine layer.
- Use of an unadjusted calculated ET value results in a higher ET value than that actually taking place in the NCMA. Studies[11] have identified that ET values within the influence of the marine layer can be as much as 20 to 25 percent lower than ET values for the same crop located just outside of the marine layer influence. The distance the marine layer extends inland can vary from less than one-half mile to as much as 4 to 5

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[11] Irrigation Training and Research Center <http://www.itrc.org/etdata/etmain.htm> (Cal Poly, 2019) provides typical-year (1997 Hydrology) ET values using various irrigation methods for Zone 3, the coastal outside marine layer, and Zone 1, the marine layer. The computed percentage reduction in ET to Zone 3 values range from 11 percent for rotational crops (small vegetables) to 19 percent for strawberries.

miles, depending on land topography. Low-lying areas have a higher frequency of marine layer coverage and for longer periods throughout the day.

- The NCMA is considered a low-lying area with boundaries extending between 2 and 5 miles inland. Recognizing that not all the crops would be affected by the marine layer, but accounting for the cooling influence over some of the area, monthly ET values calculated based on the CIMIS Nipomo Station data were adjusted lower by 12 percent[12] and are shown in Table 10.
- **Soil Data**. The Natural Resources Conservation Service Soil Survey Geographic Database) was used to collect soil parameters in the NCMA for use in the IDC. The soil properties used include saturated hydraulic conductivity, porosity, and the runoff curve numbers. The field capacity and wilting points were developed on the basis of the described soil textures (i.e., sand, loam, sandy clay, etc.) and industry standards. The IDC relies on soil properties for estimating water storage, deep percolation, and runoff; all of which lead to a refined estimation of applied water.

Table 10. 2019 NCMA Crop Acreages and Calculated Evapotranspiration

Crop Type	Acreage	2019 Potential ET[1] (AF/Acre)
Rotational Crops	1,284	1.9[2]
Strawberry	155	1.0
Avocados	24	2.0

Notes:

[1] See ET Values by Crop Category, in text section above.

[2] Rotational crop ET is based on a rotation of two to three crops.

ET = evapotranspiration, AF = acre-feet

Model Development and Computations

The IDC is written in FORTRAN 2003 using an object-oriented programming approach. The program consists of three main components: (1) input data files, (2) output data files, and (3) the numerical engine that reads data from input files, computes applied water demands, routes water through the root zone, and exports the results to the output files. The flow terms used in the root zone routing are defined in Table 11 and shown in the graphic below the table. Drainage from ponded areas (Dr) was not applicable because there are no ponded crops in the NCMA; data related to generic soil moisture (G) were not available.

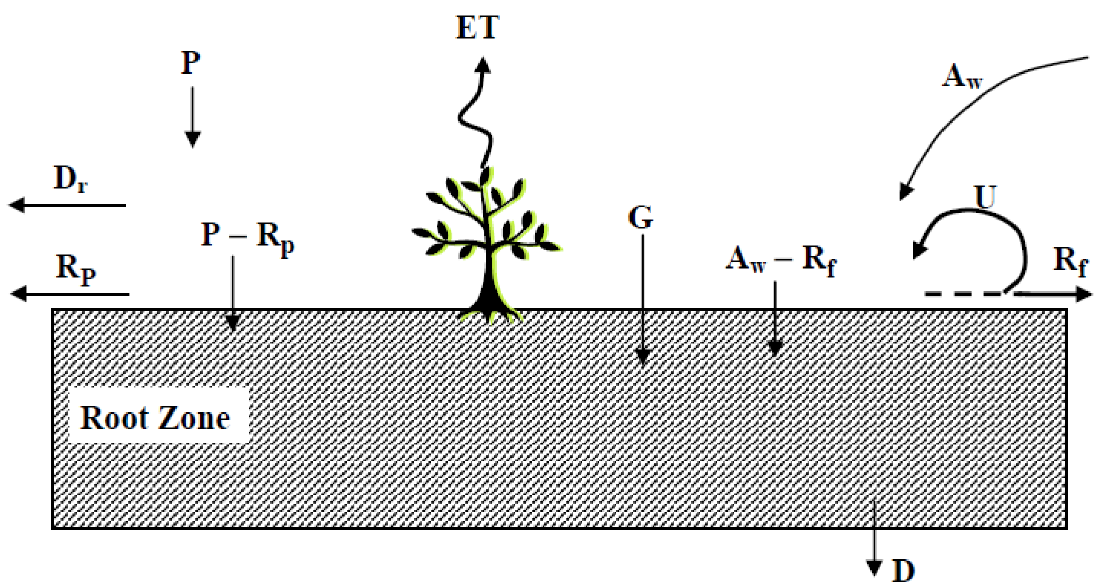
[12] A single ET reduction value is used based on changing location and rotation of crop types relative to influence of marine layer.

Table 11. Flow Terms Used in Root Zone Routing for IDC Model

Abbreviation	Term	Notes
P	Precipitation	User Specified
ET	Evapotranspiration	IDC Output
G	Generic source of moisture (i.e., fog, dew)	Data Not Available
A_w	Applied water	IDC Output
D_r	Outflow resulting from drainage of ponded areas (e.g., rice, refuges)	Not Applicable
R_P	Direct runoff	IDC Output
Rf	Return flow	User Specified (fraction of applied water)
U	Re-used portion of return flow	User Specified (fraction of return flow)
D	Deep percolation	IDC Output

Notes:

Integrated Water Flow Model (IWFM) Demand Calculator (IDC) (California Department of Water Resources Bay Delta Office, 2016)



Source: California DWR (2016).

All extracted geospatial information was applied to a computational grid within the IDC framework to simulate the root zone moisture for 2019 in NCMA agricultural areas. The IDC provides the total water supply requirement for each crop category met through rainfall and applied irrigation water in agricultural areas based on user-defined parameters for crop evaporation and transpiration requirements, climate conditions, soil properties, and agricultural management practices. Sources for data related to crop demands (i.e., potential ET), climate conditions, and soil properties are discussed above. The computations for actual crop ET (versus potential ET), applied water, and deep percolation are described below.

The potential ET is the amount of water a given crop will consume through evaporation and/or transpiration under ideal conditions (i.e., fully irrigated 100 percent of the time). Fully irrigated conditions mean that the water required to meet all crop demands is available. Water is available to the crops when the soil moisture content within the root zone is between the field capacity and the wilting point. When the soil moisture is above the field capacity, some water will go to runoff and/or deep percolation; when the soil moisture is below the wilting point, it is contained in the smallest pore spaces within the root zone and considered unavailable to the crops.

The difference between the field capacity and the wilting point is the total available water (TAW). In IDC, when the soil moisture is above one-half of the TAW, the crop ET will be equal to the potential ET. However, if the soil moisture is below one-half of the TAW, the plants will experience water stress and ET decreases linearly until it reaches zero at the wilting point. This method of simulating water stress is similar to the method described in Allen et al. (1998) to compute non-standard crop ET under water stress conditions.

The IDC monitors the moisture content within the root zone and applies water by triggering an irrigation event when the calculated soil moisture is below a user-specified minimum allowable soil moisture requirement. For this application of the IDC, the minimum soil moisture requirement was set to trigger an irrigation event when the soil moisture fell below one-half the TAW to limit water stress in the crops. During an irrigation event, the soil moisture content in the root zone reaches field capacity. If precipitation occurs, soil moisture may increase above field capacity, generating deep percolation, and potentially runoff, both depending on the quantity and temporal distribution of rainfall.

Deep percolation is the vertical movement of water through the soil column flowing out of the root zone resulting in the potential for groundwater recharge. The IDC applies the van Genuchten-Mualem equation (Mualem, 1976; van Genuchten, 1985) to compute deep percolation using the user-defined saturated hydraulic conductivity and pore size distribution.

Results

The total agricultural water supply requirements for 2019 was estimated to be 2,506 AF, and the effective precipitation (i.e., rainwater used by the crop) was 606 AF. Figure 26 illustrates the estimated crop water requirement in the NCMA as calculated by the IDC and displays the three identified crop types and their estimated monthly applied water. The rotational crops have the highest water supply requirements because they cover the greatest area (see Figure 25) and have the greatest annual ET (Table 12).

The estimated agricultural water supply requirement of 2,506 AF in 2019 is comparable to the estimated 2,651 AF in 2018; 2,536 AF in 2017; 2,494 AF in 2016; 3,008 AF in 2015; and 2,955 AF in 2014. In 2014, the methodology of estimating agricultural water requirements was modified from an estimated applied rate based on hydrologic conditions to the IWFM IDC methodology described here.

Table 12. 2019 IDC Model Results of Monthly Applied Water

	Monthly Applied Water (AF)												Annual Total (AF)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Rotational Crops	0	0	0	131	362	143	448	392	323	275	254	0	2,329
Strawberry	0	0	0	0	0	14	21	33	32	30	21	0	152
Avocados	1	0	0	0	0	0	5	6	5	4	4	0	25
Total	**1**	**0**	**0**	**131**	**362**	**157**	**474**	**431**	**361**	**309**	**279**	**0**	**2,506**
	Monthly Precipitation (inches)												**Annual Total (inches)**
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Precipitation	4.7	4.8	3.2	0.2	1.4	0	0	0	0	0	2.4	3.4	20.1
	Monthly Unit Water Demand (AF/Acre)												**Annual Total (AF/Acre)**
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Rotational Crops	0	0	0	0.1	0.28	0.11	0.35	0.31	0.25	0.21	0.2	0	1.81
Strawberry	0	0	0	0	0	0.09	0.13	0.22	0.21	0.19	0.14	0	0.98
Avocados	0.03	0	0	0	0	0	0.21	0.27	0.2	0.18	0.16	0	1.05
Area Weighted Average	**0.00**	**0.00**	**0.00**	**0.09**	**0.25**	**0.11**	**0.32**	**0.30**	**0.25**	**0.21**	**0.19**	**0.00**	**1.71**

Notes:

AF = acre-feet, AF/Acre = acre-feet per acre

4.2.2 Rural Use

In the NCMA, rural water use refers to groundwater pumping not designated as urban use or agricultural irrigation applied water and includes small community water systems, individual domestic water systems, recreational uses, and agriculture-related business systems. Small community water systems using groundwater in the NCMA were identified initially through a review of a list of water purveyors compiled in the 2007 County IRWMP. These include the Halcyon Water System, Ken Mar Gardens, and Pacific Dunes RV Resort. The Halcyon Water System serves 35 homes in the community of Halcyon, and Ken Mar Gardens provides water supply to 48 mobile homes on South Halcyon Road. The Pacific Dunes RV Resort, with 215 RV sites, provides water supply to a largely transitory population and a nearby riding stable. In addition, an inspection of aerial photographs of rural areas within NCMA has identified about 25 homes and businesses that are served by private wells. Two mobile home communities, Grande Mobile and Halcyon Estates, are served by OCSD through the distribution system of Arroyo Grande. Therefore, the production summary of OCSD includes these two communities. Based on prior reports, it is assumed that the number of private wells is negligible within the service areas of the NCMA agencies.

The Pismo Beach Golf Course (Le Sage Riviera Campground) uses an onsite water well for turf irrigation. The pumped water is not metered, and the golf course operators do not know the total water use. An estimate of water demand for the golf course is based on the irrigated acreage, sandy soils, near-ocean climate, and water duty factors from the U.S. Golf Association, Alliance for Water Efficiency, U.S. Golf Courses Organization of America, and several other sources. The estimated rural water demand is provided in Table 13.

Table 13. Estimated Rural Water Production

Groundwater User	No. of Units	Estimated Water Production, AFY per Unit	Estimated Annual Water Production, AF	Notes
Halcyon Water System	35	0.40	14	1
Ken Mar Gardens	48	--	7	2
Pacific Dunes RV Resort	215	0.03	6	3
Pismo Beach Golf Course	--	--	45	4
Rural Users	25	0.40	10	1
Current Estimated Rural Production			**82**	

Notes:

1 Water use/unit based on 2000 and 2005 Grover Beach water use per connection, 2005 UWMP.

2 Demand based on metered water usage.

3 Water use/unit assumes 50 percent annual occupancy and 0.06 AFY per occupied site.

4 Estimated golf course demand, based on estimated water duty factor, annual ET, and irrigated acreage.

AF=acre feet, AFY = acre-feet per year

ET = evapotranspiration

UWMP = Urban Water Management Plan

4.2.3 Urban Production for Potable Use

Urban water production for potable use is presented in Table 14 for each of the NCMA agencies from 2005 through 2019. These values reflect Lopez Lake deliveries, SWP deliveries, groundwater production data, and system losses, and represent all water used within the service areas of the four NCMA agencies. In the last 15 years, urban water production has ranged from 5,476 AF (2016) to 8,982 AF (2007). There has been an overall decline in urban production since 2007, although there were slight increases in 2012, 2013, 2017, and 2018. The long-term declining trend in production is likely attributed to the relatively slow economy from 2009 through 2012 and conservation activities implemented by the NCMA agencies in response to the historic drought. Since 2013, when urban production was 7,939 AF, urban production declined dramatically to 2016 to the lowest level in at least the past 20 years. The urban production increased slightly in 2017 and 2018 but declined in 2019 to 5,660 AF.

Table 14. Urban Water Production for Potable Use (Groundwater and Surface Water, AF)

Year	Arroyo Grande	Grover Beach	Pismo Beach	OCSD	Total Urban
2005	3,460	2,082	2,142	931	8,615
2006	3,425	2,025	2,121	882	8,453
2007	3,690	2,087	2,261	944	8,982
2008	3,579	2,051	2,208	933	8,771
2009	3,315	1,941	2,039	885	8,180
2010	2,956	1,787	1,944	855	7,542
2011	2,922	1,787	1,912	852	7,473
2012	3,022	1,757	2,029	838	7,646
2013	3,111	1,792	2,148	888	7,939
2014	2,752	1,347	1,949	807	6,856
2015	2,239	1,265	1,736	703	5,943
2016	1,948	1,210	1,646	672	5,476
2017	2,194	1,248	1,700	718	5,860
2018	2,212	1,221	1,720	725	5,878
2019	2,139	1,193	1,648	680	5,660

Notes:

AF = acre-feet, OCSD = Oceano Community Services District

4.2.4 2019 Groundwater Pumpage

Total SMGB groundwater production in the NCMA, including urban production, applied agricultural water requirements, and rural pumping, is shown in Table 15. Total estimated SMGB groundwater pumpage in the NCMA in 2019 was 3,320 AF, which represents a decrease from 2018 (3,557 AF) and the lowest volume of groundwater production from the NCMA portion of the SMGB in at least the last 20 years.

Table 15. NCMA Groundwater Pumpage from Santa Maria Groundwater Basin, 2019 (AF)

Agency/Water User or Use	Groundwater Allotment + Ag Conversion Credit (AF)	2019 Groundwater Use from SMGB (AF)	Percent Pumped of Groundwater Allotment
City of Arroyo Grande	1,202 + 121 = 1,323	81	7%
City of Grover Beach	1,198 + 209 = 1,407	412	34%
City of Pismo Beach	700	44	6%
Oceano CSD	900	147	16%
Total Urban Groundwater Allotment / Use	**4,000 + 330 = 4,330**	**684**	**17%**
Agricultural Irrigation Applied Water	5,300 - 330 = 4,970	2,506	50%
Nonpotable Irrigation by City of Arroyo Grande	--	48	--
Rural Water Users	--	82	--
Estimated Subsurface Outflow to Ocean (2001 Groundwater Management Agreement)	200	--	--
Total NCMA Groundwater Allotment / Use	**9,500**	**3,320**	**35%**

Notes:

AF = acre-feet, Ag = agriculture, CSD = Community Services District, NCMA = Northern Cities Management Area

The total estimated groundwater pumpage of 3,320 in 2019 represents about 35 percent of the calculated yield of 9,500 AFY for the NCMA portion of the SMGB.

A graphical depiction of water use by supply source for each NCMA agency since 2000 is presented as Figure 27. The graphs depict changes in water supply availability and use over time, including the increased use of SWP water during the early years of the period when SWP Table A deliveries were greater. The increased dependence in 2017, 2018, and 2019 on Lopez Lake is illustrated in this graphic. Although all four agencies pumped groundwater as part of their supply portfolios in 2019, groundwater pumped from the SMGB constituted a minor part of the overall water supply, an amount of 732 AF[13] or 13 percent of overall urban use.

As shown in Figure 28, groundwater pumpage reached a peak in 2007 and then declined in 2008, 2009, and 2010. From 2010 through 2013, pumpage increased slightly every year, but even so, overall groundwater use remained significantly lower than previous annual pumpage rates. From 2013 through the present, annual pumpage totals have been on a downward trend. In 2019, urban potable groundwater use declined to 708 AF; which is 16 percent of the 4,330 AF of combined urban groundwater allotment and agricultural conversion credit.

[13] This total includes the 684 AF pumped by Arroyo Grande and 48 AF of non-potable irrigation production.

4.2.5 Changes in Water Production

Historical water use for urban uses, agricultural irrigation, and rural uses is shown in Table 16.

Table 16. Total Water Use (Groundwater and Surface Water, AF)

Year	Arroyo Grande	Grover Beach	Pismo Beach	OCSD	Total Urban	Agricultural Irrigation[1]	Rural Water	Total Use
2005	3,460	2,082	2,142	931	8,615	2,056	36	10,707
2006	3,425	2,025	2,121	882	8,453	2,056	36	10,545
2007	3,690	2,087	2,261	944	8,982	2,742	36	11,760
2008	3,579	2,051	2,208	933	8,771	2,742	36	11,549
2009	3,315	1,941	2,039	885	8,180	2,742	36	10,958
2010	2,956	1,787	1,944	855	7,542	2,056	38	9,636
2011	2,922	1,787	1,912	852	7,473	2,742	38	10,253
2012	3,022	1,757	2,029	838	7,646	2,742	41	10,429
2013	3,111	1,792	2,148	888	7,939	2,742	42	10,722
2014	2,752	1,347	1,949	807	6,855	2,955	38	9,848
2015	2,239	1,266	1,736	703	5,943	3,008	38	8,990
2016	1,948	1,210	1,646	672	5,476	2,551	81	8,108
2017	2,194	1,248	1,700	718	5,860	2,579	80	8,519
2018	2,212	1,221	1,720	725	5,878	2,713	81	8,672
2019	2,139	1,193	1,648	680	5,660	2,554	82	8,296

Notes:

[1] Irrigation applied water includes agricultural irrigation plus SMGB non-potable irrigation by Arroyo Grande.

AF = acre-feet, CSD = Community Services District

In general, urban water production has ranged from 8,982 AF in 2007 (Table 16) to 5,476 AF in 2016. Water use since 2007 has been on a general downward trend; this overall decline in water use may be attributed to conservation activities implemented by the NCMA agencies in response to the drought.

In the agricultural irrigation category, agricultural acreage has remained fairly constant. Thus, annual applied water for agricultural irrigation varies mostly with weather conditions. Acknowledging the variability caused by weather conditions, agricultural irrigation applied water is not expected to change significantly given the relative stability of applied irrigation acreage and cropping patterns in the NCMA south of Arroyo Grande Creek.

Changes in rural domestic pumping have not been significant.

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SECTION 5: **Comparison of Water Supply and Water Production**

The Baseline Available Urban Water Supplies for each of the NCMA agencies is 10,625 AFY, assuming 100 percent delivery of SWP allocation and assuming no Lopez Lake surplus water or SWP carryover (Table 8). In 2019, because of the availability of Lopez Lake surplus water and SWP carryover water, the total available urban water supply was 11,472 AF (Table 9).

As described in the 2001 Groundwater Management Agreement and affirmed in the 2002 Settlement Agreement, the calculated safe yield from the NCMA portion of the SMGB is 9,500 AFY (Tables 8 and 15). Because all agricultural irrigation water use is supplied by groundwater, the total available agricultural irrigation supply is a portion of the estimated safe yield; this portion was allocated as 5,300 AFY for agricultural and rural use. The agricultural conversion of 330 AFY reduces this allocation to 4,970 AFY. Of the estimated safe yield of 9,500 AFY, other than what is allocated for agricultural irrigation and rural use, the remaining 4,330 AFY is allocated for urban water use (4,330 AFY, including 4,000 AFY groundwater allocation plus 330 AFY in agricultural conversion credit) and an estimated 200 AFY for subsurface outflow to the ocean.

In 2019, the total estimated NCMA water production was 8,296 AF (Table 17). The 2019 water production, by source, of each city and agency is shown in Table 17). Note that the production volumes described here are gross production (if pumped groundwater) and gross deliveries (if surface water deliveries) and equal net consumptive demand plus losses and return water.

Table 17. Water Production by Source, 2019 (AF)

Source	Lopez Lake	State Water Project	SMGB Groundwater	Other Supplies[1]	Total
Urban Area					
Arroyo Grande	2,033	0	81	24	2,138
Grover Beach	782	0	412	0	1,194
Pismo Beach	1048	556	44	0	1,648
Oceano CSD	522	11	147	0	680
Urban Water Use Total	**4,385**	**567**	**684**	**24**	**5,660**
Non-Urban Area					
Agricultural Irrigation Applied Water	0	0	2,506	0	2,506
Rural Water Users	0	0	82	0	82
Non-potable Irrigation by Arroyo Grande	0	0	48	0	48
Total	**4,385**	**567**	**3,320**	**24**	**8,296**

Notes:

[1] Other Supplies includes groundwater pumped from outside the NCMA boundaries.

AF = acre-feet, SMGB = Santa Maria Groundwater Basin, CSD = Community Services District

As shown in Table 17, urban water use in 2019 to the NCMA was supplied from 4,385 AF of Lopez Lake water; 567 AF of SWP water; and 684 AF of groundwater. Arroyo Grande produced 24 AF from its Pismo Formation wells in 2019.

Based on the calculated yield of the NCMA portion of the SMGB, the baseline, or full allocation, of total available supply for all uses is 15,595 AFY, which is the sum of 10,625 AFY for urban use plus the allocation for agricultural irrigation and rural area of 4,970 AFY. In 2019, factoring in the SWP delivery schedule and availability of SWP carryover water and Lopez Lake surplus, the total available supply for all uses was 11,472 AF (Table 9) compared with actual 2019 NCMA water use of 8,296 AF (Table 17). It must be noted, however, that this comparative review of available 2019 supply versus production must be viewed with caution because of the potential threats to the groundwater supply (see Section 6.1, below). As described earlier, the NCMA agencies pumped only 17 percent of their “available” groundwater allotment. Such minimal utilization of the groundwater resource resulted in a minor gain of groundwater in storage in the NCMA portion of the SMGB, which is likely attributable to the year of above average rainfall. It is clear that the NCMA agencies could not have used their entire groundwater allotment in 2019 without significantly lowering water elevations below current conditions and potentially seriously exacerbating the threat of seawater intrusion.

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SECTION 6: **Threats to Water Supply**

Because the NCMA agencies depend on both local and imported water supplies, changes in either state-wide or local conditions can threaten the NCMA water supply. Water supply imported from other areas of the state may be threatened by state-wide drought, effects of climate change in the SWP source area, management and environmental protection issues in the Delta that affect the amount and reliability of SWP deliveries, and risk of seismic damage to the SWP delivery system. Local threats to the NCMA water supply similarly include extended drought and climate change that may affect the yield from Lopez Lake and reduced recharge to the NCMA. In addition, the NCMA is not hydrologically isolated from the NMMA and the rest of the SMGB, and water supply threats in the NMMA are a potential threat to the water supply sustainability of the NCMA.

There is a potential impact from seawater intrusion if the groundwater system as a whole, including the entire SMGB, is not adequately monitored and managed. In particular, management of the SMGB may need to account for sea level rise and the relative change in groundwater gradient along the shoreline.

6.1 Threats to Local Groundwater Supply

6.1.1 Declining Water Levels

Water levels in the NCMA portion of the SMGB exhibited an overall declining trend for many years but have started to recover since about 2016. Important factors to maintaining water levels are managing inflow and outflow to the aquifer.

- **Inflow:** An important inflow component to the NCMA area is subsurface inflow into the aquifers that supply water wells serving the NCMA. Historically, subsurface inflow to the NCMA from the Nipomo Mesa along the southeast boundary of the NCMA has been an important component of groundwater recharge. This inflow is reduced from historical levels, as first recognized in 2008–2009, to “something approaching no subsurface flow” because of lower groundwater levels in the NMMA (NMMA 2nd Annual Report CY 2009, page 43) (NMMA, 2010). This condition continues, as described in all subsequent NMMA Annual Reports.
- **Outflow:** A major outflow component is groundwater pumpage. Total SMGB groundwater pumping in the NCMA (urban, agriculture, and rural domestic) was 3,320 AF in 2019, which is 35 percent of the court-accepted 9,500 AF safe yield of the NCMA portion of the SMGB. Such minimal utilization of the groundwater resource resulted in only a minor gain of groundwater in storage in the aquifer and a relatively slight rise in water level elevations. However, it is clear that the NCMA agencies could not have used their entire groundwater allotment in 2019 without significantly lowering water elevations below current conditions and potentially seriously exacerbating the threat of seawater intrusion.

The serious drought from 2011 to 2015 resulted in a steady decline in groundwater in storage in the NCMA portion of the SMGB. The recent slight increase of groundwater in storage (despite groundwater pumping at only 35 percent of the safe yield, which seemingly should have resulted in significant increases in groundwater in storage) illustrates the impacts of the recent drought. However, it also illustrates the impacts of reduced subsurface inflow recharge from the east (Nipomo Mesa). This condition of a long-term decline in groundwater in storage in the NCMA, even though total pumping is currently 35 percent of the basin safe yield, will be exacerbated if the NCMA agencies are required to increase groundwater withdrawals because of a reduction or total loss in local surface water supplies or SWP deliveries.

6.1.2 Seawater Intrusion

The NCMA is underlain by an accumulation of alluvial materials that slope gently offshore and extend for many miles under the ocean (DWR 1970, 1975). Coarser materials within the alluvial materials comprise aquifer zones that receive freshwater recharge in areas above sea level. If sufficient outflow from the aquifer occurs, the dynamic interface between seawater and fresh water will be prevented from moving onshore. Sufficient differential pressure to maintain a net outflow is indicated by onshore groundwater elevations that are above mean sea level and establish a seaward gradient to maintain that outflow.

The 2008 NCMA Annual Report documented that a portion of the aquifer underlying the NCMA exhibited water surface elevations below sea level (NCMA, 2008). Hydrographs for NCMA sentry wells and the Deep Well Index (Figures 11 through 15) show that coastal groundwater elevations were at relatively low levels for as long as 2 years during that time. Such sustained low levels had not occurred previously in the historical record and reflected the impact of drought on groundwater levels. The low coastal groundwater levels indicated a potential for seawater intrusion.

Elevated concentrations of TDS, chloride, and sodium were observed in wells 30N03 and 30N02 beginning in May 2009, indicating potential seawater intrusion (Figures 29 and 30). OCSD MW-Blue also showed elevated concentrations of TDS and chlorides, but a concurrent decline in sodium (Figure 30). Concentrations declined to historical levels in well 30N03 by July 2010 and declined in well 30N02, one of the sentry wells comprising the Deep Well Index, to historical levels by October 2009. Comparing well 30N02 to the other Deep Well Index wells, the other Deep Well Index wells showed no elevated concentrations during the same period. However, comparing well 30N02 to wells with similar screen elevations (Figure 4), wells 36L01 (approximately 12,000 feet south of well 30N02) and the OCSD MW-Blue well, approximately 3,300 feet east-southeast of well 30N02, suggested that seawater intrusion perhaps progressed eastward as far as the OCSD MW-Blue well, but not as far south as well 36L01 (Figure 30). While the TDS and chloride concentrations were elevated from August 2009 to July 2011 in the OCSD MW-Blue well, the sodium concentrations remained within historical levels. During the same period, TDS, chloride, and sodium concentrations remained within historical levels in well 36L01.

During 2019, there were no indications of seawater intrusion.

6.1.3 Measures to Avoid Seawater Intrusion

In recognition of the risk of seawater intrusion, the NCMA agencies have developed and implemented a water quality monitoring program for the sentry wells and OCSD observation wells. The NCMA agencies and SLOFCWCD have worked cooperatively toward the protection of the sentry wells as long-term monitoring sites. Several measures are employed by the NCMA agencies to reduce the potential for seawater intrusion. Specifically, the NCMA agencies have voluntarily reduced coastal groundwater pumping, decreased overall water use via conservation, and initiated plans, studies, and institutional arrangements to secure additional surface water supplies. As a result, each of the four major municipal water users in the NCMA reduced groundwater use between 25 and 95 percent during the past several years. In 2019, municipal groundwater use was 684 AF, which constitutes 17 percent of the urban user's groundwater allotment (including agricultural conversion credits) of the basin safe yield (Table 7).

Any action that results in reduced groundwater recharge, whether it is from drought or reduction of subsurface inflow from the north and east, reduces overall recharge to the groundwater basin, lowers the gradient (or head) of the groundwater near the shoreline, and reduces subsurface outflow to the ocean, thereby increasing the potential threat of seawater intrusion. Alternatively, any action that results in increased groundwater recharge lessens the threat of seawater intrusion.

A major initiative that will provide significant protection to the threat of seawater intrusion is the development of Central Coast Blue. Central Coast Blue is a regional recycled water project that includes advanced treatment of water from the wastewater treatment plants of Pismo Beach and SSLOCSD and injection into the NCMA portion of the SMGB. Injection of the highly treated effluent will reduce the threat of seawater intrusion and improve water supply sustainability for the region. Tasks related to the development of the project that were performed prior to and throughout 2019 include feasibility study analysis, preliminary design, pilot plant development and operation, funding appropriation, cost/benefit sharing analysis, groundwater modeling, and initial environmental review.

6.2 Threats to State Water Project Supply

Both extended drought and long-term reduction in snowpack from climate change can affect SWP deliveries. Above-average precipitation in 2016, 2017, and 2019 have resulted in a modest reprieve from drought conditions, locally. However, storage capacity levels of the state's two largest reservoirs, Lake Shasta and Lake Oroville, were 50 and 29 percent capacity, respectively, as of the start of 2019, both down from the previous year.

Leading into 2020, rainfall during the last 8 months of 2019 resulted in 7.21 inches of rain. The initial allocation announcement by DWR, announced on December 2, 2019, informed SWP contractors that their 2020 allocation would be 10 percent of requests for deliveries. The Table A allocation was subsequently increased on January 24, 2020, to 15 percent. As the winter rainfall season progresses, the allocations often increase by March or April. The last 100 percent allocation—difficult to achieve even in wet years largely because of Delta pumping restrictions to protect threatened and endangered fish species—was in 2006.

The immediate threat of allocation reductions to Pismo Beach and OCSD, the only SWP subcontractors in the NCMA, has not significantly materialized during the past several years. The SLOFCWCD's large amount of unsubscribed Table A allocation provides a buffer, in addition to the agency's drought buffer, so that contracted volumes to SWP subcontractors, such as the OCSD and Pismo Beach, still may be provided in full. However, the SWP supply has the potential to be affected by drought as well as environmental issues, particularly involving the Delta smelt.

6.3 Threats to Lopez Lake Water Supply

Extended drought conditions in recent years have contributed to record low water levels in Lopez Lake; the impacts of climate change may affect future precipitation amounts in the Lopez Creek watershed. As discussed in Section 4.1.1, the Zone 3 agencies developed and implemented the LRRP in response to reduced water in storage in the lake. The LRRP is intended to reduce municipal diversions and downstream releases as water levels drop in order to preserve water within the reservoir for an extended drought. Despite below-average precipitation in 2018, above-average precipitation in 2016, 2017, and 2019 resulted in a return to non-drought conditions in the lake. However, even with reduced diversions and releases, water from Lopez Lake may be significantly reduced or unavailable to the Zone 3 agencies in the event of future drought. Without access to water from Lopez Lake, the NCMA agencies and local agriculture stakeholders may be forced to rely more heavily on their groundwater supplies and increase pumping during extended drought conditions, which could result in lowering water levels in the aquifer and an increased threat from seawater intrusion. Moreover, a reduction in downstream releases from the reservoir, as mandated by the LRRP, likely will lead to reduced recharge to the NCMA portion of the SMGB and further contribute to declining groundwater levels.

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SECTION 7: **Management Activities**

The NCMA and overlying private well users have actively managed surface water and groundwater resources in the NCMA agencies area for more than 30 years. Management objectives and responsibilities were first established in the 1983 Gentlemen's Agreement, recognized in the 2001 Groundwater Management Agreement, and affirmed in the 2002 Settlement Agreement. The responsibility and authority of the Northern Parties for NCMA groundwater management was formally established through the 2002 Settlement Agreement, 2005 Stipulation, and 2008 Judgment. Throughout the long history of collaborative management, which was formalized through the Agreement, Stipulation, and Judgment, the overall management goal for the NCMA agencies is to preserve the long-term integrity of water supplies in the NCMA portion of the SMGB.

7.1 Management Objectives

Eight basic Water Management Objectives have been established for ongoing NCMA groundwater management:

1. Share Groundwater Resources and Manage Pumping
2. Enhance Management of NCMA Groundwater
3. Monitor Supply and Demand and Share Information
4. Manage Groundwater Levels and Prevent Seawater Intrusion
5. Protect Groundwater Quality
6. Manage Cooperatively
7. Encourage Water Conservation
8. Evaluate Alternative Sources of Supply

Each of these objectives is discussed in the following sections. Under each objective, the NCMA TG has identified strategies to meet the objectives. These strategies are listed and then discussed under each of the eight objectives listed below. Other potential objectives are outlined in the final section.

An NCMA Strategic Plan was developed in 2014 to provide the NCMA TG with a mission statement to guide future initiatives, provide a framework for identifying and communicating water resource planning goals and objectives, and formalize a 10-year work plan for implementation of those efforts. Several key objectives were identified related to enhancing water supply reliability, improving water resource management, and increasing effective public outreach. Implementation of some of these efforts continued throughout 2019.

Work began in 2019 to update the 2014 NCMA Strategic Plan. The Strategic Plan was developed over a series of strategic planning sessions and NCMA TG meetings. The purpose of the Strategic Plan is to provide the NCMA TG with the following:

- A Mission Statement to guide future initiatives;
- A framework for communicating water resource goals; and
- A formalized Work Plan for the next 10 years.

Through the strategic planning process, the NCMA TG identified several key strategies to guide future efforts. These key strategies include the following:

- Enhance groundwater management;
- Develop supplemental water supply;
- Improve understanding of the NCMA groundwater;
- Improve water management governance; and
- Increase inter-agency coordination.

Several strategic initiatives were developed for each key strategy, and an extensive screening and objective ranking process was applied. Utilizing the ranked and grouped strategic initiatives, the NCMA TG is developing an implementation plan for the key strategies. The implementation plan will include for each initiative the key participants, the NCMA lead, an estimated budget, and an implementation time frame.

Through the 2019 strategic planning process, the NCMA TG identified several key strategic initiatives for each strategy. These initiatives include the following:

A. Enhance Groundwater Management

- Complete an update to the 2002 Management Agreement, including the development of a Low Basin Response Plan
- Use the Phase 1B groundwater model to simulate regional groundwater management scenarios
- Prepare a groundwater sustainability plan consistent with SGMA requirements
- Develop a conjunctive use plan to optimize use of available groundwater storage

B. Develop Supplemental Water Supply

- Implement Central Coast Blue
- Prepare a stormwater capture feasibility study

C. Improve Understanding of the NCMA Groundwater

- Re-evaluate the NCMA Deep Well Index
- Expand the water quality database to include all water quality data
- Construct additional monitoring well
- Complete Phase 2 groundwater flow model for SMGB

D. Improve Water Management Governance

- Improve managerial and legal coordination
- Prepare bi-annual presentation to County Board of Supervisors

E. Increase Inter-Agency Coordination

- Complete intertie plan for NCMA agencies
- Select a NCMA logo
- Prepare an infrastructure resiliency analysis

In January 2015, the NCMA agencies developed a Water Supply, Production and Delivery Plan (WSPDP) that applies the strategic objectives to the various supplies available to the area. The NCMA area receives supplies from Lopez Lake, the SWP, and the SMGB.

The purpose of the WSPDP is to provide the NCMA agencies with a delivery plan that optimizes use of existing infrastructure and minimizes groundwater pumping from the SMGB. The plan includes the development of a water supply and delivery modeling tool for the NCMA agencies, evaluation of three delivery scenarios, and development of recommendations for water delivery.

The WSPDP made recommendations that were implemented or subject to further study. These recommendations are summarized in subsequent sections, and include the following:

- Continue ongoing water conservation efforts to limit demand and make additional supply available for potentially future dry years.
- Immediately implement the strategies identified in Scenario 1, Baseline Delivery, to minimize SMGB groundwater pumping in the near term.

These recommendations reinforce the ongoing management efforts by the NCMA and provide potential projects to improve water supply reliability and protect water quality during the ongoing drought. Ongoing work to implement the recommendations includes evaluation of additional delivery facilities to add operational flexibility to ensure optimum use of all supplies.

Implementing the WSPDP has allowed the NCMA to minimize the use of groundwater thereby protecting against seawater intrusion while meeting the needs of its customers and other water users.

The NCMA agencies, in conjunction with the other Zone 3 agencies and SLOFCWCD, continue efforts to evaluate potential drought emergency options and implement drought emergency actions. This initiative includes identification, evaluation, and ranking of potential options available to Zone 3 to improve the reliability of its water supplies. The Zone 3 agencies and the County have pledged to work collaboratively to continue to evaluate and implement emergency water supply reliability options as required in conditions of extended drought.

A drought emergency action initiated by Zone 3 is cloud seeding. In 2019, the County Board of Supervisors, in coordination with the NCMA agencies and other Zone 3 partners, approved a professional services contract for the 2019-2020 Winter Season Cloud Seeding Program for the Lopez Lake Watershed. The program is conceived to be a 3-year program. At this time, Zone 3 is committing to the first year (2019-2020) only and will return to the Board in subsequent years for further approval.

Additional potential drought emergency options that the Zone 3 agencies have evaluated in the past few years include the following:

Zone 3 Extended Drought Emergency Options:

- **State Water Project.** Maximize importation of SLOFCWCD SWP supplies, including subcontractor supplies and the large amount of unsubscribed Table A allocation.
- **Surplus Nacimiento Water Project (NWP) Water.** Investigate transfer/exchange opportunities to obtain surplus NWP water for the Zone 3 agencies (i.e., exchange agreements with the City of San Luis Obispo and the Chorro Valley pipeline SWP subcontractors).
- **Water Market Purchases.** Investigate opportunities to obtain additional imported water and deliver it to the Zone 3 agencies through the SWP infrastructure (e.g., exchange agreements with San Joaquin/Sacramento Valley farmers, water broker consultation, groundwater banking exchange agreements, and others).
- **Morro Bay Desalination Plant Exchanges.** Investigate opportunities to obtain SWP water from Morro Bay by providing incentives for Morro Bay to fully utilize its desalination plant capacity.
- **Land Fallowing.** Evaluate potential agreements with local agriculture representatives to offer financial incentives to fallow land within the Arroyo Grande and Cienega Valleys to make that irrigation water available for municipal use.
- **Enhanced Conservation.** Evaluate opportunities for enhanced water conservation by the Zone 3 agencies (e.g., water rationing, no outdoor watering, agriculture water restrictions) to preserve additional water.
- **Nacimiento/California Men's Colony Intertie.** Complete design of a pipeline that would connect the NWP pipeline to the California Men's Colony (CMC) Water Treatment Plant. Investigate opportunities for Zone 3

agencies to purchase NWP water and use exchange agreements and existing infrastructure to deliver additional water to Zone 3 through the Coastal Branch pipeline.

7.1.1 Share Groundwater Resources and Manage Pumping

Strategies:

- Continued reduction of groundwater pumping; maintain pumping below safe yield.
- Coordinated delivery of Lopez Lake water to the maximum amount available, pursuant to the LRRP.
- Continue to import SWP supplies to OCSD and Pismo Beach.
- Maintain surface water delivery infrastructure to maximize capacity.
- Utilize Lopez Lake to store additional SWP water within San Luis Obispo County.
- Modify Zone 3 agency contracts to incorporate storage provisions in the contract.

Discussion:

A longstanding objective of water users in the NCMA has been to cooperatively share and manage groundwater resources. In 1983, the Northern Parties mutually agreed on an initial safe yield estimate and an allotment of pumping between the urban users and agricultural irrigation users of 57 percent and 43 percent, respectively. In this agreement, the NCMA agencies also established pumping allotments among themselves. Subsequently, the 2001 Groundwater Management Agreement included provisions to account for changes such as agricultural land conversions. The agreements provide that any change in the accepted safe yield based on ongoing assessments would be shared on a pro rata basis. Pursuant to the 2005 Stipulation, the NCMA agencies conducted a water balance study to update the safe yield estimate (Todd, 2007). As a result, the NCMA agencies agreed to maintain the existing pumping allotment among the urban users and established a consistent methodology to address agricultural land use conversion.

In addition to cooperatively sharing and managing groundwater resources, the NCMA agencies have coordinated delivery of water from Lopez Lake. At the same time, Pismo Beach and OCSD have continued to import SWP water. Both actions maximize use of available surface water supplies. In 2016, in response to the ongoing drought at that time and the threat of diminishing water supplies, Arroyo Grande approved a measure authorizing the City to purchase SWP water from the SLOFCWCD's excess allotment on a temporary basis and only during a declared local water emergency. That condition was not reached in 2017 nor subsequent years, and Arroyo Grande has not purchased SWP water to date.

An initiative to modify the Zone agency contracts to incorporate storage provisions into agency contracts was started in late 2019. By the end of 2019, the Zone 3 Technical Advisory Committee was evaluating contract language changes to allow for the following:

- Allow for year-over-year individual agency storage;
- Account for evaporation losses of stored water;
- Allow for the reduction of entitlements or to utilize stored water to meet downstream release requirements;
- Develop mechanisms to address the condition when the Zone 3 agencies do not have water to contribute to downstream release obligations;
- Clarify Lopez turnout delivery capacity limitations;
- Remove antiquated language from the contract that is no longer relevant, and;

- Allow for exchanges of Lopez Lake water with SWP water during times when there is a curtailment of delivery of Lopez Lake water due to maintenance projects.

The benefits of the initiative to modify the contract language is to provide the ability of each agency to store water for future drought, improve flexibility of multi-year water supply planning, and provides an incentive for agencies to preserve water in the reservoir.

The WSPDP now provides a framework for the NCMA, as a whole, to actively and effectively manage the groundwater resource, particularly in years of below-normal rainfall and below “normal” SWP delivery schedules. The WSPDP outlined a strategy to provide sufficient supplies to NCMA water users in instances of reduced SWP delivery. Specifically, in 2019, municipal groundwater pumpage at 684 AF (732 AF including non-potable water pumped by Arroyo Grande) was less than any other year during the 21-year period from 1999 through 2019 (inclusive).

Seawater intrusion is the most important potential adverse impact for the NCMA agencies to consider in the efforts to effectively manage the aquifer. Seawater intrusion, a concern since the 1960s, would degrade the quality of water in the aquifer and potentially render portions of the SMGB unsuitable for groundwater production (DWR, 1970). A Deep Well Index of the three primary deep sentry wells of 7.5 feet (NAVD 88) has been recognized as the threshold, above which it is thought that there is sufficient fresh water (groundwater) outflow to prevent seawater intrusion. From late 2009 to April 2013, the NCMA agencies’ management of groundwater levels and groundwater pumpage maintained the Deep Well Index above the 7.5-foot level. Then in mid-to-late 2013, 2014, and 2015, groundwater levels dropped below the target index value on several occasions and often remained below the target elevation for several months on end. In 2015, the groundwater levels were generally between 4 and 7 feet below the 7.5-foot target index level. Groundwater elevations dropped below the Deep Well Index threshold several months in 2016, but this occurred for a shorter duration than in 2015, with groundwater elevations reaching less than 2 feet below the target value. In 2017, the Deep Well Index remained above the 7.5-foot threshold value the entire year for the first time since 2012 (except for a very brief period between August 18 and August 29, 2017, when the agencies were forced to increase groundwater pumping due to a maintenance shutdown of the Lopez Lake water supply). In 2018, the Deep Well Index started the year above the trigger value, then dropped below the 7.5-foot threshold in early July. For more than 4 months, the Deep Well Index remained below the index trigger value, reaching an index value of approximately 6.5 feet in late October. In late November 2018, it rose above the threshold value where it remained through the end of the year (Figure 12).

In 2019, the Deep Well Index started the year above the trigger value with an index value of more than 9 feet in January. It continued to rise, reached a high at more than 11 feet in late March, and then began to decline. The index value dropped down to the 7.5-foot trigger value briefly in late October and then immediately began to rise. The index value continued to rise throughout the end of the year and finished 2019 at about 10.5 feet NAVD 88 (Figure 12).

Another potential adverse impact of localized pumping includes reduction of flow in local streams, notably Arroyo Grande Creek (Todd, 2007). The NCMA agencies (as Zone 3 contractors) have participated with SLOFCWCD in preparation of the Arroyo Grande Creek Habitat Conservation Plan (HCP) that addresses reservoir releases to maintain both groundwater levels and habitat diversity in the creek. Efforts by the SLOFCWCD to conduct the hydraulic studies to finalize the HCP have been started are ongoing. The scheduled completion of the HCP is not certain.

7.1.2 Enhance Management of NCMA Groundwater

Strategies:

- Develop a groundwater model for the NCMA/NMMA or the entire SMGB.

- Coordinate with the County and NMMA to develop new monitoring well(s) in key locations within the SMGB.
- Develop a Salt and Nutrient Management Plan (SNMP) for the NCMA/NMMA.
- Develop and implement a framework for groundwater storage/conjunctive use, including return flows.
- Update the 2001 Management Agreement.

Discussion:

The NCMA agencies participated in the oversight of the performance of the SMGB characterization study (Fugro, 2015) that was finalized with the distribution of the complete data sets in March 2016. The project was conducted as part of the County IRWMP 2014 update, in part to prepare for and to provide the foundational data for development of a numerical groundwater flow model and preparation of a basin-wide SNMP. To date, the SNMP has not been initiated, but the groundwater flow modeling work has been completed through Phase 1B, as described below. This groundwater flow model is associated with Central Coast Blue, a recycled water project formerly known as the Regional Groundwater Sustainability Project. The intent of Central Coast Blue is to enable Pismo Beach, partnering NCMA agencies, and the SSLOCSD to construct an advanced treatment facility (ATF) to produce advanced purified water (APW) to augment its water supply through injection to recharge the aquifer and develop a seawater intrusion barrier to improve water supply reliability for the area. As part of Central Coast Blue planning and technical studies, a localized groundwater flow model (the Phase 1A model) was developed for the northern portion of the NCMA that evaluated the concept of injecting APW into the aquifer to increase recharge, improve water supply reliability and help prevent future occurrences of seawater intrusion.

Based on the results of the Phase 1A model and through funding by SSLOCSD Supplemental Environmental Program, work was initiated in 2017 and continued through 2019 for development of the Phase 1B groundwater flow model. The model domain of the Phase 1B model covers the entire NCMA, NMMA, and the portion of the SMVMA north of the Santa Maria River. The purpose of the Phase 1B model is to evaluate additional groundwater injection and extraction scenarios to further support Central Coast Blue. It will be utilized to identify the locations of the proposed injection wells, quantify the amount of water that can be injected, evaluate strategies for preventing seawater intrusion, and develop estimates of the overall yield that the Central Coast Blue stakeholders will be able to receive from the project. The Phase 1B model will be a tool for the NCMA agencies to further evaluate basin yield and basin management initiatives. The Phase 1B modeling work was completed in December 2019.

As part of the SLOFCWCD's SMGB characterization study (Fugro, 2015), continuous monitoring transducers were installed in 2015 in coastal sentry wells 36L01 and 36L02 (which are part of the NCMA monitoring program) and in wells 11N/36W-12C01 and 11N/36W-12C02 (located in the NMMA and monitored by the County and by NMMA). As a result, continuous water level and field-parameter water quality data were collected from these wells throughout 2019.

As discussed in Section 7.1, the 2019 update of the NCMA strategic plan has placed a high priority on updating the 2001 Management Agreement. This effort will likely be a major effort in 2020.

The monthly NCMA TG meetings provide for collaborative development of joint budget proposals for studies and plans and shared water resources. In addition, the monthly meetings provide a forum for discussing the data collected as part of the quarterly monitoring reports.

7.1.3 Monitor Supply and Demand and Share Information

Strategies:

- Develop coordinated Urban Water Management Plans (UWMPs) for the NCMA agencies.

- Develop a coordinated Water Shortage Contingency Plan to respond to a severe water shortage condition in the NCMA.
- Share groundwater pumping data at monthly NCMA TG meetings.
- Evaluate future water demands through comparison with the following UWMP projections:
  - Arroyo Grande 2015 UWMP (revised and updated, January 2017)
  - Pismo Beach 2015 UWMP (June 2016)
  - Grover Beach 2010 UWMP (June 2011)
  - OCSD is not required to prepare an UWMP because the community population does not meet the minimum requirement threshold.

Discussion:

Arroyo Grande and Pismo Beach prepared updated UWMPs in 2016 and 2017, respectively. Grover Beach is currently developing an updated UWMP that is expected to be complete by this summer. OCSD is not required to prepare an UWMP because the community population does not meet the minimum requirement threshold; however, many of the aspects of a UWMP are addressed through OCSD's participation in the NCMA planning process.

Regular monitoring of activities that affect the groundwater basin and sharing that information have occurred for many years. The monitoring efforts include gathering data on hydrologic conditions, water supply and demand, and groundwater pumping, levels, and quality. The current monitoring program is managed by the NCMA agencies in accordance with the 2005 Stipulation and the 2008 Judgment, guided by the July 2008 Monitoring Program for the NCMA. The monitoring data and a summary of groundwater management activities are summarized in the annual reports. Arroyo Grande, Grover Beach, and Pismo Beach have each evaluated their future water demands as part of their respective UWMPs. The NCMA shares information with the two other management areas (NMMA and SMVMA) through data exchange and regular meetings throughout the annual report preparation cycle. The NCMA TG believes that the UWMP process by each individual agency is adequate and that a coordinated UWMP is not necessary.

Management activities have become more closely coordinated among the NCMA agencies as a result of the 2011 through 2016 drought. In particular, the NCMA agencies implemented the LRRP to limit municipal diversions and downstream releases from Lopez Lake to ensure that water is available for future potentially dry years. In addition, the Zone 3 agencies (which include the NCMA agencies) initiated a long-term drought planning effort. The planning effort is intended to prepare water supplies for periods of extended drought conditions.

7.1.4 Manage Groundwater Levels and Prevent Seawater Intrusion

Strategies:

- Use stormwater ponds to capture stormwater runoff and recharge the groundwater basin.
- Install transducers in key monitoring wells to provide continuous groundwater elevation data. The following wells have transducers:
  - 24B03
  - 30F03
  - 30N02
  - 36L01
  - 36L02
  - 32C03 (County Monitoring Well No. 3)

- Collect and evaluate daily municipal pumping data to determine the impact on local groundwater elevation levels.

Discussion:

Prevention of seawater intrusion through the management of groundwater levels is essential to protect the shared resource. The NCMA agencies increase groundwater recharge with stormwater infiltration and closely monitoring groundwater levels and water quality in sentry wells along the coast.

Arroyo Grande and Grover Beach each maintain stormwater retention ponds within their jurisdictions; the SLOFCWCD maintains the stormwater system, including retention ponds, in OCSD. These ponds collect stormwater runoff, allowing it to recharge the underlying aquifers. There are approximately 140 acres of detention ponds in Arroyo Grande and 48 acres of detention ponds in Grover Beach. The stormwater detention pond in OCSD is approximately one-half acre. Grover Beach modified its stormwater system in 2012 to direct additional flow into one of its recharge basins.

The San Luis Obispo County Stormwater Resources Plan (Stormwater Resources Plan) (SLO Co., 2019) was submitted to the SWRCB for review on February 28, 2019. The purpose of this Stormwater Resources Plan is to identify and prioritize stormwater and dry weather runoff capture projects in the County through detailed analyses of watershed conditions and processes, surface and groundwater resources, and the multiple benefits that can be achieved through stormwater-related capital projects and other programmatic actions (SLO Co., 2019). The Stormwater Management Plan identifies four proposed projects within the NCMA, including the Pismo Preserve Roads Improvement Project, the Oceano Drainage Improvement Project (which is nearly complete and will be completed in 2020), South Halcyon Green/Complete Street, and a stormwater infiltration basins project. In 2019, Oceano CSD started design of the Oceano Stormwater Capture and Groundwater Recharge Project These proposed projects emphasize water supply augmentation, environmental restoration and other community benefits, including an estimated annual infiltration capacity of 26 AF and an instantaneous floodwater capture capacity of 3.37 AF (SLO Co., 2019).

Although closely related to the objectives to manage pumping, monitor supply and demand, and share information, this objective also specifically recognizes the proximity of production wells to the coast and the threat of seawater intrusion. The NCMA agencies and SLOFCWCD have long cooperated in the monitoring of groundwater levels, including quarterly measurement by the NCMA of groundwater levels in sentry wells at the coast. Upon assuming responsibility for the coastal monitoring wells, the NCMA became aware of the need to upgrade the condition of the sentry wells. In July 2010 the wellheads (surface completions) at the four sentry monitoring well clusters in the NCMA were renovated (Todd, 2010). The renovations included raising the elevations of the top of each individual well casing by 2 to 3 feet and resurveying relative to the NAVD 88 standard in late September 2010 (Wallace Group, 2010). The individual well casings are now above the ground surface and protective locking steel risers enclose each cluster. As a result of this work, the sentry wells in the NCMA now are protected from surface contamination and tampering.

Quarterly measurement of groundwater levels aids in assessing the risk of seawater intrusion along the coast. To enhance the data collection and assessment efforts, the NCMA installed transducers in four of the key sentry monitoring wells to provide continuous groundwater levels at key locations (originally, a transducer was placed in the shallow completion 24B01, but was later removed). By combining this with the collection and evaluation of daily municipal pumping data, the NCMA is better able to determine the response of local groundwater levels to extractions and, therefore, is able to better manage the aquifer and NCMA portion of the SMGB.

To gain insight into water level fluctuation and water quality variation in the area between the NCMA and NMMA, a continuous monitor was installed in County Monitoring Well #3 (32C03), which was constructed and is owned by the County as part of the County-wide groundwater monitoring network. Water level monitoring was initiated in April 2012, when sensors were installed to document water level, temperature, and specific conductivity.

In 2015, continuous monitoring sensors were installed in coastal monitoring wells 36L01 and 36L02 located in the Oceano Dunes. Data from the transducers in these wells now are collected on a quarterly basis along with the other sentry wells.

Additional studies to enhance basin management efforts that have been discussed by the NCMA TG include the following:

- Consider implementation of a monthly water level elevation data analysis of the sentry wells during periods when the Deep Well Index value is below the index target of 7.5 feet NAVD 88 for an extended period of time. Given that the index generally has remained steady because of reduced groundwater pumping, the NCMA has deferred the issue of monthly analysis.
- Consider implementation of a monthly analysis of electrical conductivity data from the wells with downhole transducers during periods when the Deep Well Index value is below the index target of 7.5 feet to track potential water quality degradation (an enhanced monitoring schedule of County Monitoring Well No. 3 is not necessary because background water quality does not change or fluctuate significantly). If electrical conductivity data suggest water quality degradation, implement a monthly sampling and monitoring program. (Given that the index generally has remained steady because of reductions in groundwater pumping, the NCMA has deferred the issue of monthly analysis.)
- Assess the potential impacts on sentry well water level elevations from extended periods of increased groundwater pumping by conducting analytical modeling analyses to predict water level responses given certain pumping scenarios. These analyses may prove fruitful as scenarios unfold regarding decreased SWP deliveries or short-term emergency cuts to Lopez Lake deliveries. Utilization of the Phase 1B model may be used for this purpose in 2020 and beyond.
- The 2005 Stipulation requires Nipomo Community Services District (NCSD) and the other NMMA parties to develop a Nipomo Supplemental Water Project (NSWP) to import a minimum of 2,500 AFY to mitigate overpumping that may impact groundwater inflow to the NCMA, and thus may facilitate seawater intrusion in both NCMA and NMMA. On July 2, 2015, the NCSD began taking deliveries of water from the City of Santa Maria. The NSWP is designed to deliver 3,000 AFY, however current deliveries are about 950 AFY. The additional stages of the NSWP and funding sources to implement the project to allow increased water delivery to meet the requirements of the 2008 Judgment are being planned; full implementation of the project is apparently planned for 2025–2026.

7.1.5 Protect Groundwater Quality

Strategies:

- Perform quarterly water quality monitoring at all sentry wells and County Well No. 3.
- Gather temperature and electrical conductivity data from monitoring wells to continuously track water quality indicators for seawater intrusion.
- Prepare an SNMP pursuant to state policy using the results of the SMGB characterization study (Fugro, 2015).
- Construct Central Coast Blue.
- Support regional recycled water project planning through performance of a Recycled Water Facility Planning Study (RWFPS) by the SSLOCSD. The RWFPS was completed in 2017.

Discussion:

The objective to protect groundwater quality is closely linked with the objective for monitoring and data sharing. To meet this objective, all sources of water quality degradation, including the threat of seawater intrusion, need to be recognized. Water quality threats and possible degradation affect the integrity of the groundwater basin, potentially resulting in loss of use or the need for expensive water treatment processes. Sentry wells are monitored quarterly and data from other NCMA production wells are assessed annually. The monitoring program includes evaluation of potential contaminants in addition to those that might indicate seawater intrusion. Temperature and electrical conductivity probes have been installed in five monitoring wells to provide continuous water quality tracking for early indication of seawater intrusion. A sixth sentry well cluster (36L) in the Oceano Dunes was instrumented in April 2015 as part of the SMGB characterization study (Fugro, 2015). The results of the SMGB characterization study provide the foundation for preparation of an SNMP.

Investigations continued throughout 2019 for work associated with Pismo Beach's Central Coast Blue project. These efforts continue to follow up on Pismo Beach's RWFPS to investigate alternatives for constructing a recycled water system that will enable the NCMA agencies to beneficially use recycled water to augment their groundwater supply and provide a new, drought-proof source of water supply for the area.

7.1.6 Manage Cooperatively

Strategies:

- Improve agriculture outreach by enhancing coordination with local growers.
- Coordinate groundwater monitoring data sharing and annual report preparation with the NCMA, NMMA, and the SMVMA.
- Improve interagency coordination among the NCMA agencies and include the County.

Discussion:

Since 1983, NCMA management has been based on cooperative efforts of the affected parties, including the NCMA agencies, private agricultural groundwater users, the County, the SLOFCWCD, and other local and state agencies. Specifically, the NCMA agencies have limited their pumping and, in cooperation with SLOFCWCD, invested in surface water supplies to not exceed the safe yield of the NCMA portion of the SMGB. Other organizations participate, as appropriate. In addition to the efforts discussed in this 2019 Annual Report, cooperative management occurs through many other venues and forums, including communication by the NCMA agencies in their respective public meetings and participation in the Water Resources Advisory Council (the county-wide advisory panel on water issues).

The NCMA agencies participated in preparation and adoption of the 2014 update of the County IRWMP. The IRWMP promotes integrated regional water management to ensure sustainable water uses, reliable water supplies, better water quality, environmental stewardship, efficient urban development, protection of agriculture, and a strong economy. The IRWMP integrates all of the programs, plans, and projects within the region into water supply, water quality, ecosystem preservation and restoration, groundwater monitoring and management, and flood management programs.

Since the 2008 Judgment, the NCMA has taken the lead in cooperative management of its management area. The NCMA TG met monthly throughout 2019 and has been a willing and active participant in the SMGBMA technical subcommittee, which first met in 2009 (the SMGBMA technical subcommittee did not meet in 2019). The purpose of the SMGBMA technical subcommittee is to coordinate efforts— such as enhanced monitoring of groundwater levels and improved sharing of data—among the management areas. With the current threats to water supply in all management areas, greater communication, analytical collaboration, and data sharing are encouraged, especially between NCMA and NMMA.

An outcome of actions initiated by NCMA in early 2016 resulted in increased discussion and collaboration between the NCMA and NMMA in the past three years. The NCMA-NMMA Management Coordination Committee met several times in 2017, 2018, and 2019 to discuss items of mutual concern and develop strategies for addressing the concerns.

Another area of increased mutual collaboration between the NCMA and NMMA was the formation of a technical team, consisting of representatives from the NCMA and NMMA, to collaboratively develop a single data set of water level data points to prepare a consistent set of semiannual water level contour maps for the NCMA and NMMA, so that the maps from each management area would represent a mutually agreed upon condition at the NCMA/NMMA boundary. This collaboration continued throughout 2019 through continued assessment and evaluation of the water level database, sharing of new data, and discussions of knowledge of hydrogeologic conditions gained. The result has been a series of groundwater elevation contour maps of both the NCMA and the NMMA that reflect water level conditions at the NCMA/NMMA boundary.

A third initiative was to create a Modeling Subcommittee, composed of representatives from the NCMA and NMMA, to discuss the feasibility and possible work scope for the development of a numerical groundwater flow model of the SMGB, or at least the portion of the basin north of the Santa Maria River. When the Phase 1B groundwater flow model project was initiated in 2017, representatives from this subcommittee formed a technical review and advisory committee to provide input to the modeling consultant and monitor progress. An NMMA representative participated in the technical review and in an advisory capacity throughout the development of the Phase 1B model.

7.1.7 Encourage Water Conservation

Strategies:

- Share updated water conservation information.
- Implement UWMPs.

Discussion:

Water conservation, or water use efficiency, is linked to the monitoring of supply and demand and the management of pumping. Water conservation reduces overall demand on all sources, including groundwater, and supports management objectives to manage groundwater levels and prevent seawater intrusion. In addition, water conservation is consistent with state policies seeking to achieve a 20 percent reduction in water use by the year 2020. Water conservation activities in the NCMA are summarized in various documents produced by the NCMA agencies, including the 2015 UWMPs of Arroyo Grande and Pismo Beach and the 2010 UWMP of Grover Beach. OCSD is not required to prepare an UWMP.

In addition to ongoing water conservation efforts, the drought conditions that extended throughout 2016 led the NCMA agencies to increase their efforts to reduce water use. The statewide mandatory water conservation requirements (signed into law on April 1, 2015, by the governor [Executive Order B-29-15] that enacted mandatory water conservation requirements because of the ongoing drought conditions and the historic low Sierra snowpack measurements) were continued throughout 2016 and into early 2017. On April 7, 2017, the State of California lifted the drought emergency and State mandated water use restrictions throughout the state.

The water conservation measures instituted by each NCMA agency are summarized below.

Arroyo Grande

On April 7, 2017, the State of California took action to lift the drought emergency and State mandated water use restrictions throughout the state. The action also eliminated the State's mandate for Arroyo Grande to save 28 percent of its water use. In response, the Arroyo Grande City Council approved and adopted a resolution in May 2017, rescinding the Stage 1 Water Shortage Emergency in the City, which removes temporary water use limitations that established individualized water budgets for all residential customers. During the State-mandated Stage 1 restrictions, Arroyo Grande's water use reduction was, on average, 42 percent compared with 2013, thereby meeting and exceeding the state mandates.

The City Council's action was based on a determination that there is no immediate or imminent threat to the City's ability to meet the community's water supply needs. However, all established mandatory water use restrictions remained in effect, including limitations on outdoor irrigation and continued adherence to four-day outdoor irrigation based on the property address. These mandatory water use restrictions remained in place throughout 2019.

Mandatory water conservation measures include the following:

- Use of water that results in excessive gutter runoff is prohibited.
- No water will be used for cleaning driveways, patios, parking lots, sidewalks, streets, or other such use except where necessary to protect the public health and safety.
- Outdoor water use for washing vehicles will be attended and have hand-controlled water devices.
- Outdoor irrigation is prohibited between 10 a.m. and 4 p.m.
- Irrigation of private and public landscaping, turf areas, and gardens is permitted at even-numbered addresses only on Mondays and Thursdays, and at odd-numbered addresses only on Tuesdays and Fridays.
- No irrigation of private and public landscaping, turf areas, and gardens is permitted on Wednesdays. Irrigation is permitted at all addresses on Saturdays and Sundays.
- In all cases, customers are directed to use no more water than necessary to maintain landscaping.
- Emptying and refilling swimming pools and commercial spas is prohibited except to prevent structural damage and/or to provide for the public health and safety.
- Use of potable water for soil compaction or dust control purposes in construction activities is prohibited.
- New swimming pools may be constructed; however, they will have a cover that conforms to the size and shape of the pool and acts as an effective barrier to evaporation. The cover must be in place during periods when use of the pool is not reasonably expected to occur.
- Hotel, motel, or other commercial lodging establishments will offer patrons the option to forego the daily laundering of towels, sheets, and other linens.
- Restaurants or other commercial food service establishments will not serve water except upon the request of a patron.

To help manage the use of water, the City offers water conservation incentive programs designed to decrease overall water use. The conservation and incentive programs include the following:

- **Plumbing Retrofit Program.** This program includes installation or adjustment of showerheads, toilets, faucet aerators, and pressure regulators for single-family and multi-family residential units constructed before 1992. This program has been in place since 2004 at an expense to the City of more than $1.55 million.

- **Water-Wise Landscaping Program.** This program provides resources for designing and installing water-wise landscaping in San Luis Obispo County, selecting climate-appropriate plants, and irrigation and drainage improvements that will help residents improve their landscaping and protect the watershed.
- **Washing Machine Rebate.** This program pays water customers a one-time rebate for the installation of a certified energy-efficient Tier 3 washing machine.
- **Mandatory Plumbing Retrofit.** Upon change of ownership of any residential property, the seller must retrofit the property's plumbing fixtures to meet defined low-water-use criteria.
- **Water Conservation Hotline.**

Pismo Beach

In 2014, Pismo Beach introduced the first-in-the-state waterless urinal mandate and a 0.5-gallon per minute (gpm) restroom aerator retrofit requirement. The components of this program include the following:

- **Waterless urinal retrofits.** All existing urinals in the City were retrofitted to waterless urinals before February 14, 2016.
- **Faucet aerators.** New residential restroom construction requires faucets that are fitted with aerators that emit no more than 0.5 gpm. Restroom faucets in all publicly accessible restrooms, including those in hotel rooms, lobbies and restrooms, restaurants, schools, commercial and retail buildings, public buildings, and similar publicly accessible restrooms were retrofitted to install aerators that emit no more than 0.5 gpm.
- **Sub-meters in new construction.** All new multi-unit buildings, regardless of proposed use, were required to have a separate sub-meter capable of measuring the water use of every usable unit, separate common space, and landscaping that is expected to use at least 25 gallons of water per day on average for the course of a year, regardless of the overall size of the building. Buildings that have a separate water meter for each unit are exempt.

Also in 2014, Pismo Beach adopted several Water Conservation Incentive Programs to help reduce water consumption and ensure reliable future water supply. On February 16, 2016, the Pismo Beach City Council updated the Water Conservation Incentive Programs list to include:

- **Cash for Grass.** This program reimburses residents for each square foot of lawn removed (minimum 300 square feet) and replaced with drought-tolerant landscaping, which is required to have drip or micro-spray irrigation and be on an automatic timer.
- **Free Catch Bucket Program.** This program gives residents one free shower catch bucket for capturing unused shower water and re-purposing it for irrigation or utility purposes.
- **Rain Barrel Rebate Program.** This program reimburses residents up to $100 ($50 per rain barrel) when up to two rain barrels are purchased and installed to use rainwater, conserve potable water, and reduce stormwater runoff.
- **Water-Wise Landscaping Program.** This program provides resources for designing and installing water-wise landscaping in San Luis Obispo County, selecting climate-appropriate plants, and irrigation and drainage improvements that will help residents improve their landscaping and protect the watershed.
- **High Efficiency Toilet Rebate Program.** This program provides a one-time rebate for each 3.5-gallon-per-flush or higher toilet replaced with a 1.28-gallon-per-flush or lower toilet.
- **Water Conservation Hotline.**

In January, 2017, Pismo Beach adopted an updated schedule of development impact fees to include new recycled water fees for all new development, redevelopment, and additions to existing buildings that create additional dwelling units or additional non-residential floor area, to help fund the cost of the Central Coast Blue project.

In June, 2017, in response to the State of California action to lift the drought emergency and State mandated water use restrictions throughout the state, Pismo Beach declared a "Normal Water Supply" and adopted an Urgency Ordinance O-2017-003, revising the restrictions associated with each water supply status to conform to State mandates. The restrictions for a Normal Water Supply include the following:

- Use of water that causes runoff onto adjacent properties, non-irrigated areas, private and public walkways, roadways, gutters, parking lots or structures is prohibited.
- Outdoor water use for washing vehicles, boats, paved surfaces, buildings, and similar uses shall be attended and have hand-controlled water devices, which shut off the water immediately when not in use.
- No water will be used for cleaning driveways, patios, parking lots, sidewalks, streets, or other such uses except as found necessary by the city to protect the public health or safety.
- Outdoor Irrigation:
  - Outdoor irrigation is prohibited between 10 a.m. and 4 p.m.
  - Applying water to outdoor landscapes during and within 48 hours following measurable precipitation is prohibited.
- Restaurants will serve drinking water only in response to a specific request by a customer.
- Using water in a fountain or other decorative water feature, except where the water is part of a recirculating system, is prohibited.
- The use of outdoor irrigation during, and 48 hours following, measurable precipitation is prohibited.

Grover Beach

Between 2011 and 2014, Grover Beach declared Stage I and Stage II water shortage conditions and implemented conservation measures including public outreach and education and voluntary prohibitions on water use. In June 2014, Grover Beach declared a Stage III Water Shortage that required all water customers to reduce their water usage by 10 percent. Many of the prohibitions that had previously been voluntary since declaration of the Stage II Water Shortage Declaration became mandatory with the Stage III declaration. The declaration also provided the City with the authority to impose penalties for failure to comply with the water reduction or use prohibitions. The Stage III Water Shortage declaration, with associated prohibitions, continued throughout 2019. These prohibitions include the following:

- Washing of sidewalks, driveways, or roadways where air blowers or sweeping provides a reasonable alternative.
- Refilling of private pools except to maintain water levels.
- Planting of turf and other new landscaping, unless it consists of drought-tolerant plants.
- Washing vehicles, boats, etc. without a quick-acting shut-off nozzle on the hose.
- Washing any exterior surfaces unless using a quick-acting shut-off nozzle on the hose.
- Restaurant water service, unless requested.
- Use of potable water for construction purposes, unless no other source of water or method can be used.
- Operation of ornamental fountain or car wash unless water is re-circulated.

As of January 2020, Grover Beach is considering making changes to its water conservation program that would be incorporated into a Water Shortage Contingency Plan (WSCP),[14] enacted when water supplies are insufficient to support demand. As droughts and other events impacting water supply occur more frequently and intensely, the WSCP helps prepare for and respond to water shortages. The proposed changes include six stages of action tied to actual water shortage conditions in 10 percent increments. Each stage relates a supply reduction range to an associated demand reduction target, which may vary based on the nature of Triggering Conditions that are dependent on the cause, severity, and anticipated duration of the water supply shortage. If adopted, the Grover Beach city staff would continuously monitor the availability of water supply sources[15] and, if one or more set of triggering conditions were met, the Public Works Director would notify the City Council and recommend declaration of the appropriate stage of water shortage.

In addition to mandatory water use prohibitions, Grover Beach has implemented water conservation incentive programs including the following:

- Cash for Grass Rebate Program
- Smart Irrigation Controller and Sensor Rebate Program
- Toilet Fixture, Showerhead, and Sink Aerator Retrofit Rebate Program
- Washing Machine Rebate Program

Oceano CSD

Given the population of its service area, OCSD is not required to prepare an UWMP or reduce water consumption as mandated by the Governor for urban water suppliers. Outdoor water use restrictions have been adopted, as required. In April 2015, OCSD adopted a rate increase that included tiered rates to promote water conservation. These tiered rates remain in effect, but were reduced in July 2017, upon adoption of the Post Drought Consumption Charges and Supplemental Water Charge Ordinance.

OCSD pumped only 16 percent of its groundwater allotment in 2019 and is utilizing Lopez Lake surplus water in addition to its Lopez Lake allocation. Meanwhile, OCSD's conservation efforts continue to exceed the Governor's drought-mandated goal (since rescinded) of 25 percent. Overall consumption has declined to approximately 79 gallons per capita daily (gpcd) after the implementation of drought conservation rates, illustrating that, as a disadvantaged community, it is responding effectively to conservation rates.

OCSD's demand is less than its annual allocation of SWP water, preserving local supplies if needed in subsequent years, depending on SWP deliveries. In the event that SWP deliveries are decreased to a level that is insufficient to meet OCSD demand, then mandatory conservation efforts will be implemented to match the available supply. If the supply is less than the s55 gpcd needed to meet health and safety needs, then the supply shortfall will be supplemented from Lopez Lake supplies. Current SWP reliability analyses prepared by the DWR illustrate a low probability that SWP water will not be able to meet OCSD demands in any two consecutive years.

Additional strategies exist in the event of temporary non-delivery of SWP and Lopez Lake water and other unforeseen circumstances. Post-drought strategies include resumption of groundwater pumping, resumption of Lopez Lake deliveries, and storage of SWP water as provided in SWP contracts.

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[14] The WSCP is a required component of the City of Grover Beach's updated 2020 UWMP, currently under development for submission to the State this summer.

[15] Including monitoring of Lopez Lake supplies and monitoring of groundwater availability based on the Deep Well Index as compared with its threshold value of 7.5 feet NAVD 88.

7.1.8 Evaluate Alternative Sources of Supply

Strategies:

- Evaluate expanded use of recycled water, including implementation of Central Coast Blue.
- Analyze the capacity of the Lopez Lake and Coastal Branch pipelines to maximize deliveries of surface water. The following analyses have been completed:
  - Lopez Lake Pipeline Capacity Evaluation (WSC, 2011a)
  - Lopez Lake Pipeline Capacity Re-Evaluation (WSC, 2011b)
  - Coastal Branch Capacity Assessment (WSC, 2011a)
  - Lopez Bypass and State Water Delivery Evaluation (WSC, 2017)
- Optimize existing surface water supplies, including surface water storage, through the development of a framework for interagency exchanges and transfers, including SWP and Lopez Lake supplies.
- Maximize Lopez Lake pipeline capacity.

Discussion:

The NCMA agencies continue to evaluate alternative sources of water supply that could provide a more reliable and sustainable water supply for the NCMA. An expanded portfolio of water supply sources will support sustainable management of the groundwater resource and help to reduce the risk of water shortages. These alternative sources include the following:

- **State Water Project.** OCSD and Pismo Beach are currently SWP customers. Both agencies increased their SWP allocations by securing “drought buffers” to increase the availability of supply during periods of SWP shortfalls. Grover Beach and Arroyo Grande are not SWP customers. However, Arroyo Grande approved a measure in 2016 authorizing the City to purchase SWP water from the SLOFCWCD’s excess allotment on a temporary basis and only during a declared local water emergency. To date, Arroyo Grande has not declared such an emergency and has not purchased SWP water.
- **Water Recycling.** As discussed in Section 7.1.5, Pismo Beach and the SSLOCSD both prepared RWFPSs to evaluate alternatives for a recycled water program that could provide a supplemental water supply source and improve the water supply reliability for the Pismo Beach and the SSLOCSD member agencies (Arroyo Grande, Grover Beach, and OCSD).

  Section 7.1.5 also describes ongoing efforts for Central Coast Blue that will enable the NCMA agencies to produce recycled water to augment their water supplies. Construction of the new facility will allow for the use of recycled water to recharge the groundwater basin and provide a new, drought-proof source of water supply for the area. As conceived, the project includes construction of a distribution system that will inject advanced purified water into the SMGB and will allow the NCMA agencies to increase recharge to the aquifer, improve water supply reliability, and help to prevent future occurrences of seawater intrusion.
- **Lopez Lake Expansion.** In 2008, the County sponsored a preliminary assessment of the concept of installing an inflatable rubber dam at the Lopez Dam spillway. Subsequently, the SLOFCWCD CSA 12 and Arroyo Grande, Grover Beach, and Pismo Beach funded a study to further analyze the feasibility of increasing the yield of Lopez Lake by raising the spillway height with an inflatable dam or permanent extension. The study was finalized in 2013 and identified the potential to increase the annual yield from Lopez Lake by 500 AFY with a spillway height increase of 6 feet (Stetson, 2013). The NCMA agencies are continuing to evaluate other aspects of the project, including pipeline capacity and impacts on the HCP process.

- **Desalination.** In 2006, Arroyo Grande, Grover Beach, and OCSD used Proposition 50 funds to complete a feasibility study on desalination as an additional water supply option for the NCMA. This alternative supply is not considered to be a viable option at this time.

  When PG&E announced plans to close its Diablo Canyon Power Plant, previous efforts by the SLOFCWCD to (1) evaluate the potential to expand the existing desalination facility at the PG&E Diablo Canyon Power Plant and (2) connect it to the Lopez Lake pipeline to provide a supplemental water supply for the Zone 3 agencies were terminated.

- **Nacimiento Pipeline Extension.** In 2006, Arroyo Grande, Grover Beach, and OCSD completed an evaluation of a Nacimiento pipeline extension to determine the feasibility of delivery of water from the Nacimiento reservoir to the NCMA. This alternative supply is not considered to be a viable option at this time.

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FIGURES

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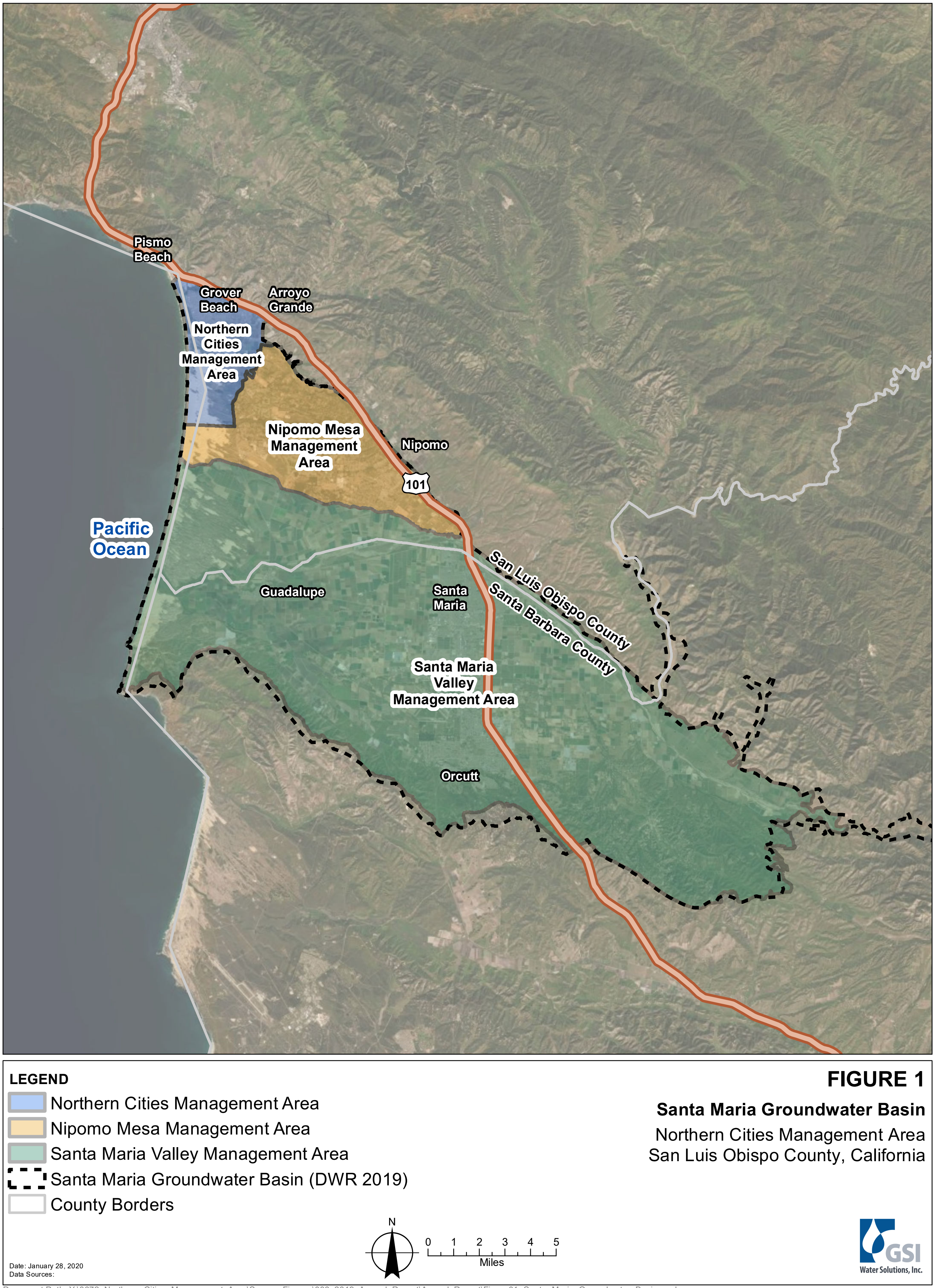

FIGURE 1

Santa Maria Groundwater Basin

Northern Cities Management Area
San Luis Obispo County, California

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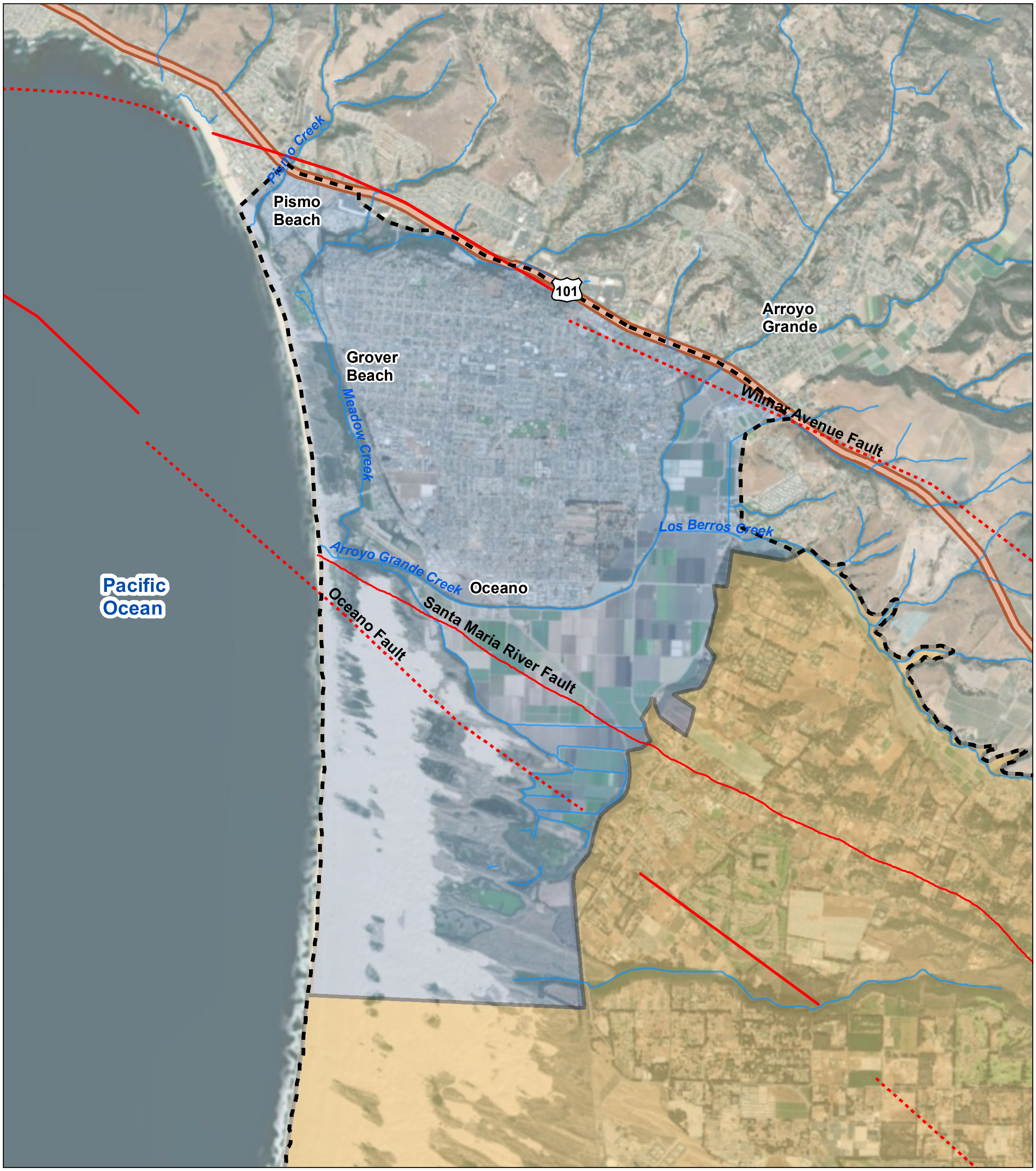

LEGEND

- Northern Cities Management Area
- Nipomo Mesa Management Area
- Santa Maria Groundwater Basin (DWR 2019)
- Faults
- Streams

N

0 1 Miles

FIGURE 2

Northern Cities Management Area

San Luis Obispo County, California

GSI Water Solutions, Inc.

Date: February 26, 2020
Data Sources:

Document Path: Y:_nonGISP\0672_Northern_Cities_Management_Area\Source_Figures\006_2019_Annual_Report\Annual_Report\Figure02_Northern_Cities_ManagementArea.mxd

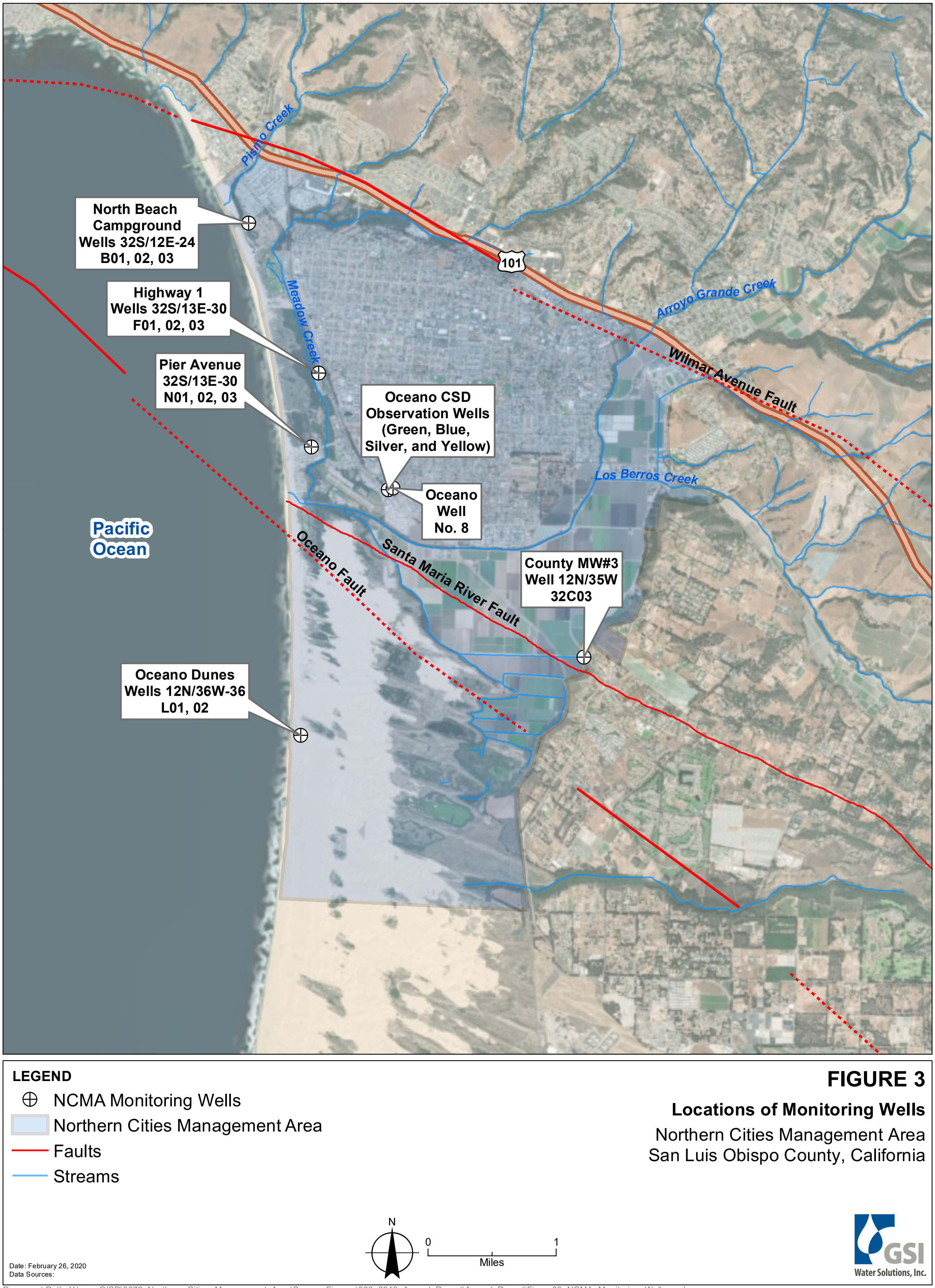

FIGURE 3

Locations of Monitoring Wells

Northern Cities Management Area
San Luis Obispo County, California

Date: February 26, 2020
Data Sources:

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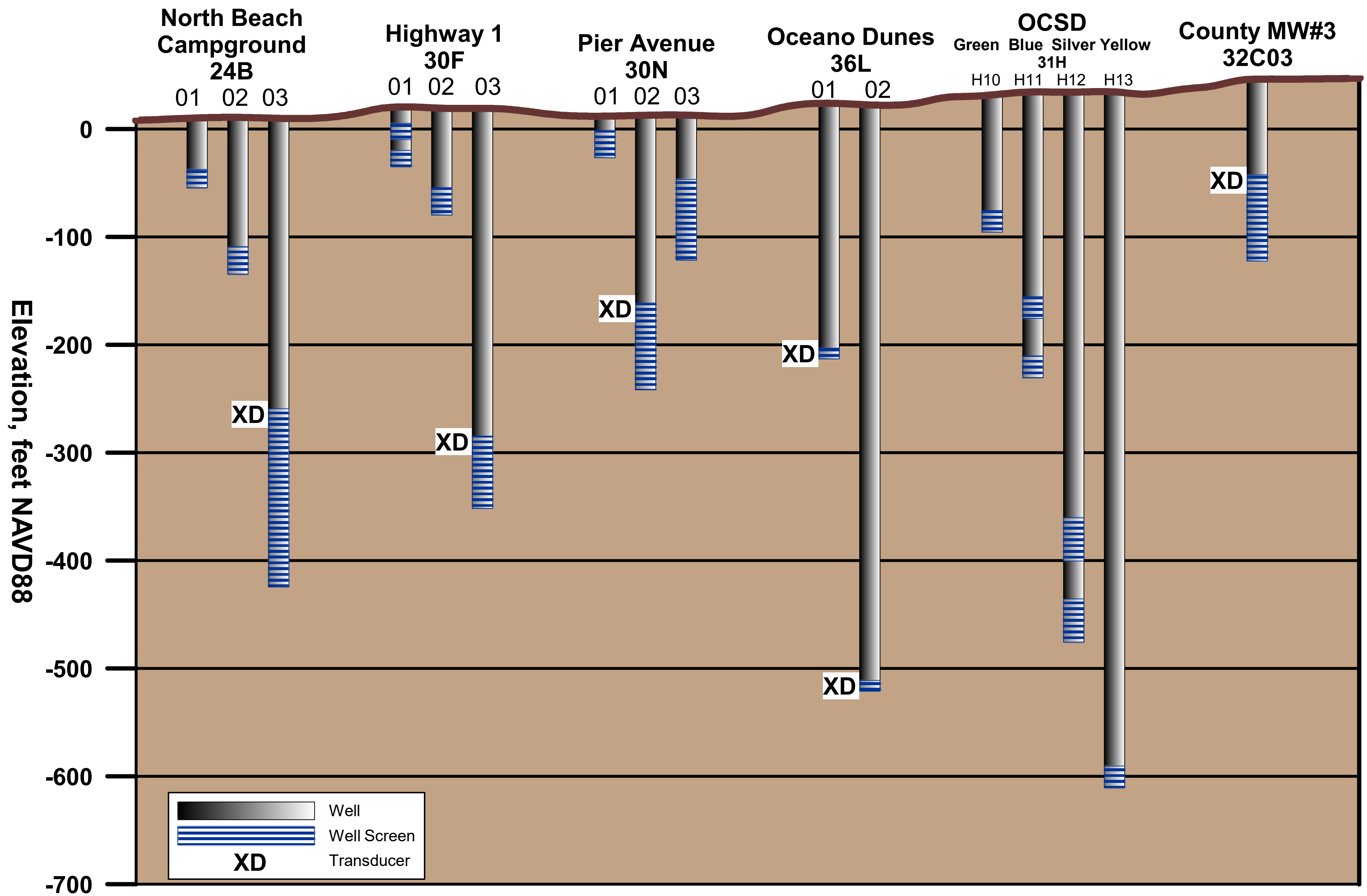

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FIGURE 4

DEPTHS OF MONITORING WELLS
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.

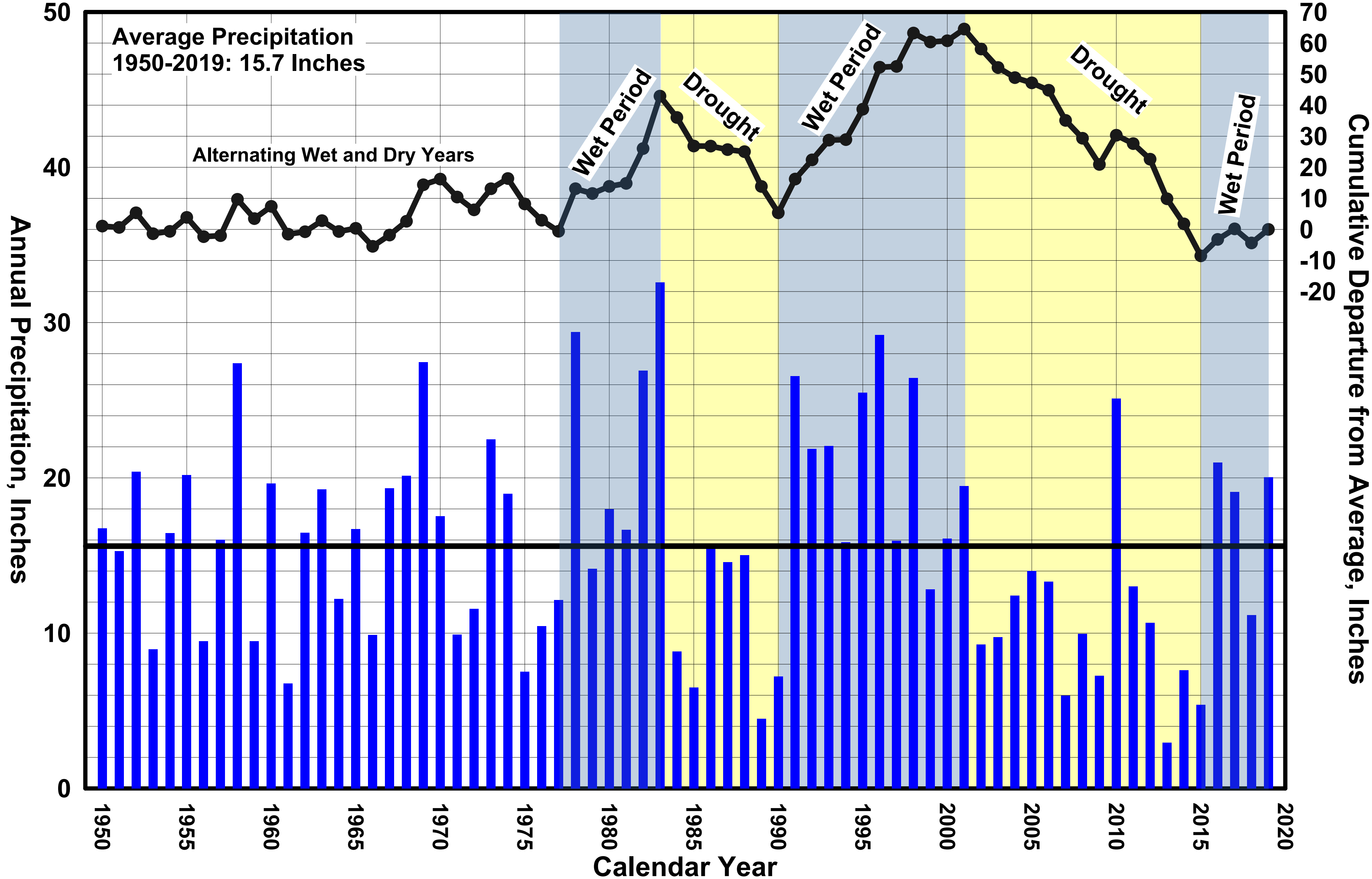

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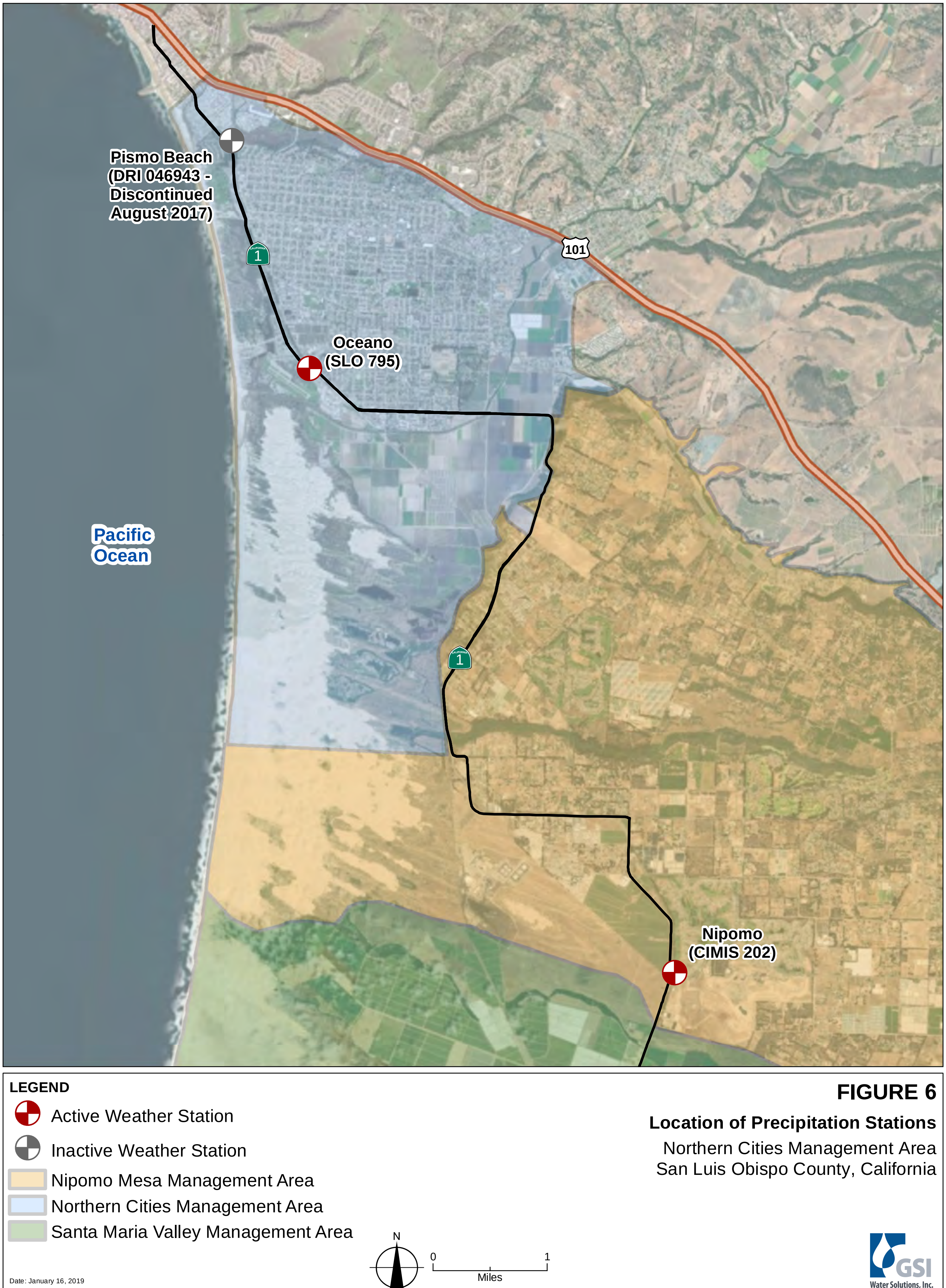
FIGURE 5

ANNUAL PRECIPITATION 1950 TO 2019
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.



Date: January 16, 2019

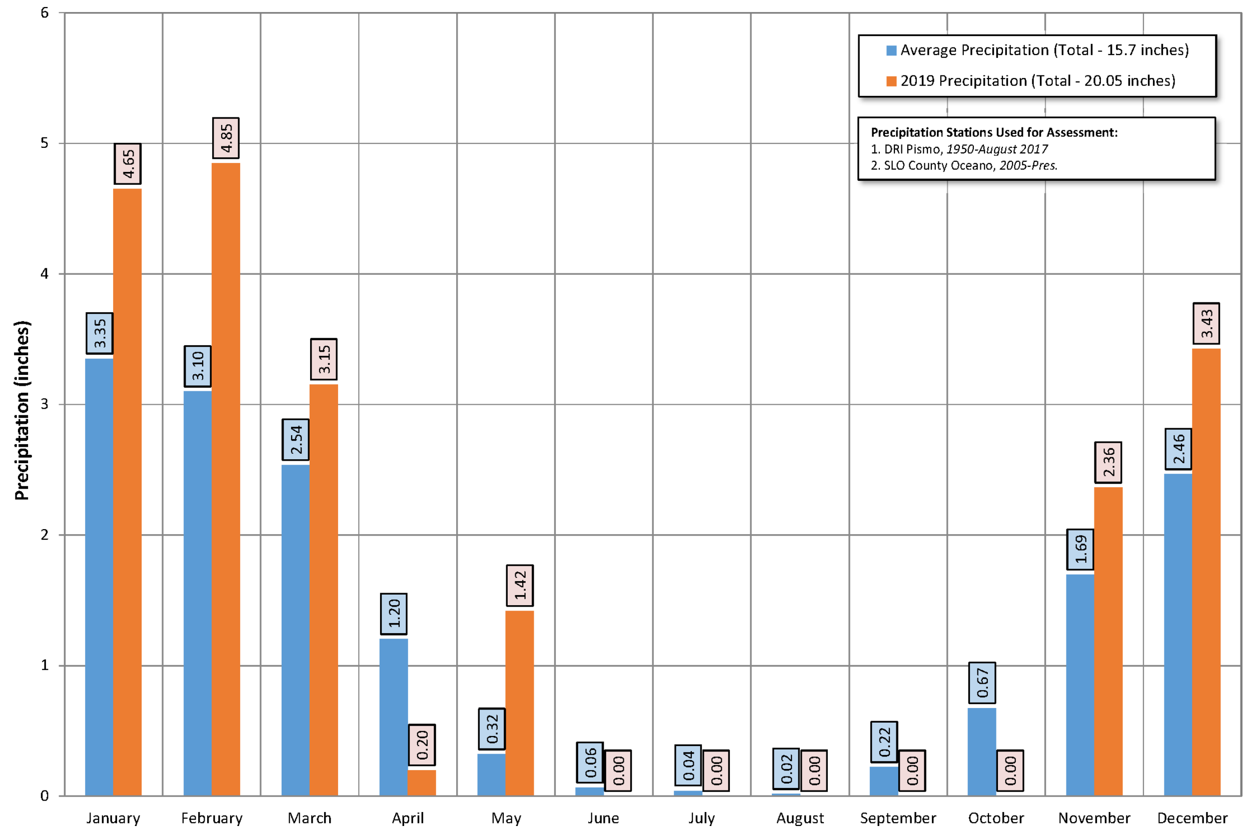
FIGURE 6

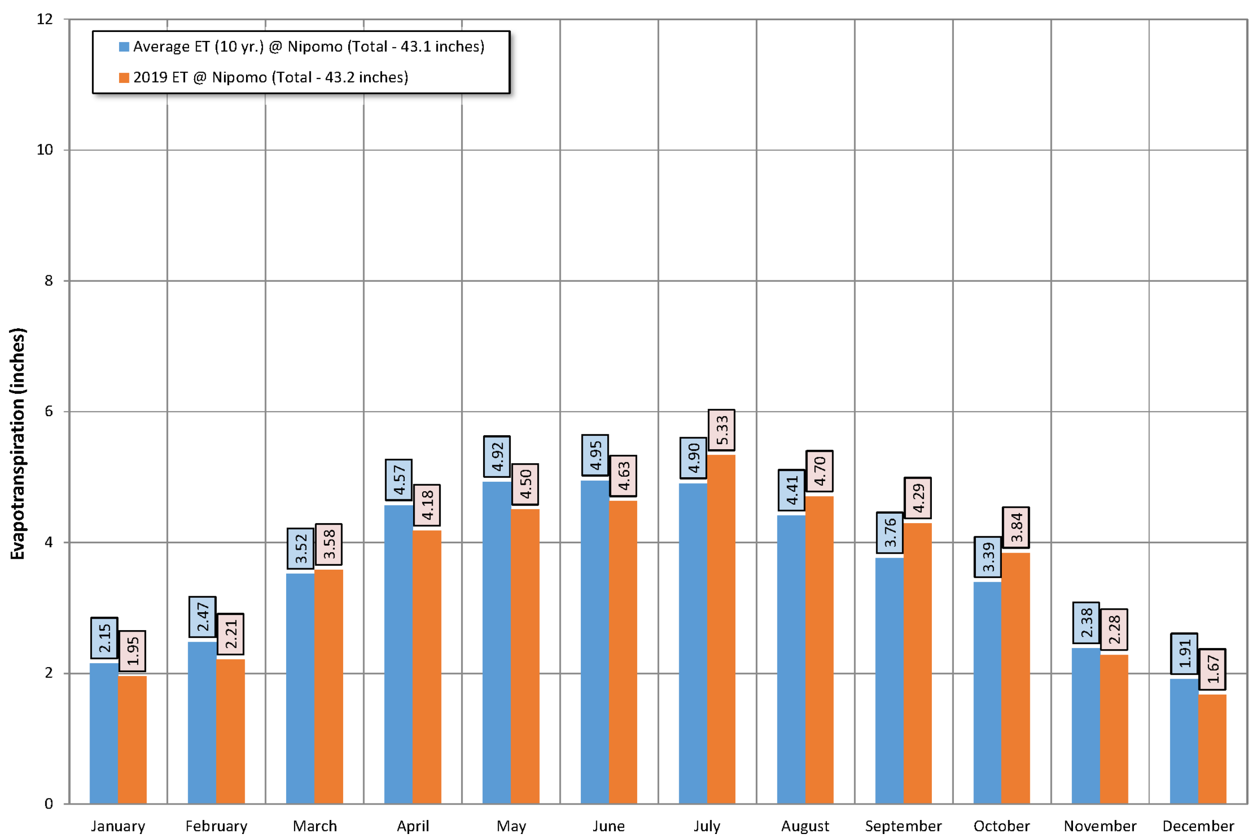
Location of Precipitation Stations

Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.

Document Path: Y:\0672_Northern_Cities_Management_Area\Source_Figures\005_2018_Annual_Report\Figure_4_NCMA_Precipitation_Station_Locations.mxd





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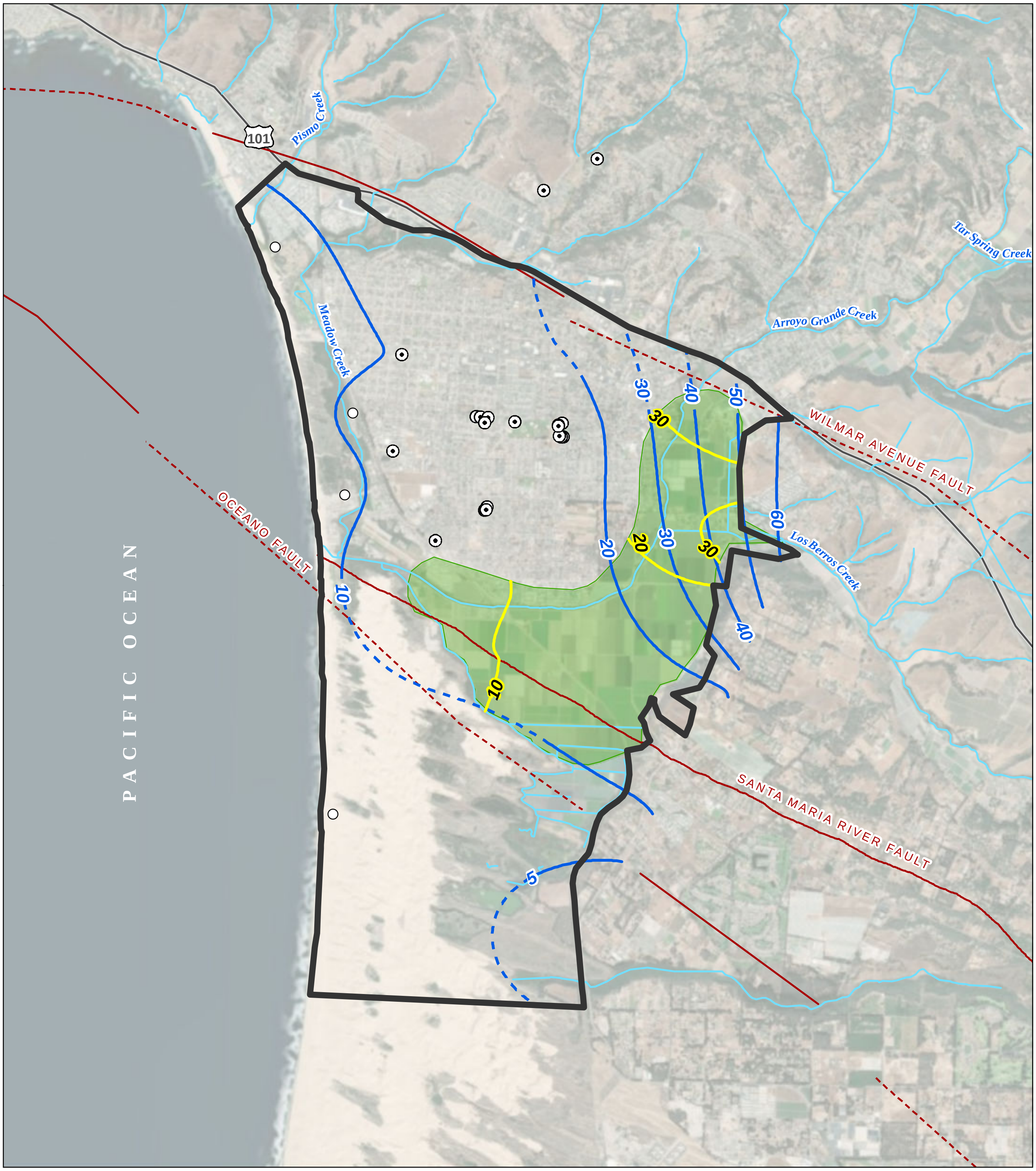
GSI Water Solutions, Inc.

MONTHLY AND AVERAGE PRECIPITATION AND EVAPOTRANSPIRATION
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 7



LEGEND

- Municipal Well
- Sentry Well
- Alluvial Groundwater Contour (feet, NAVD88)
- Deep Groundwater Contour (feet, NAVD88)
- Fault

All Other Features

- Northern Cities Management Area
- Alluvial Aquifer Extent
- Highway
- Watercourse

FIGURE 8

Groundwater Elevation Contours Spring 2019

Northern Cities Management Area
San Luis Obispo County, California

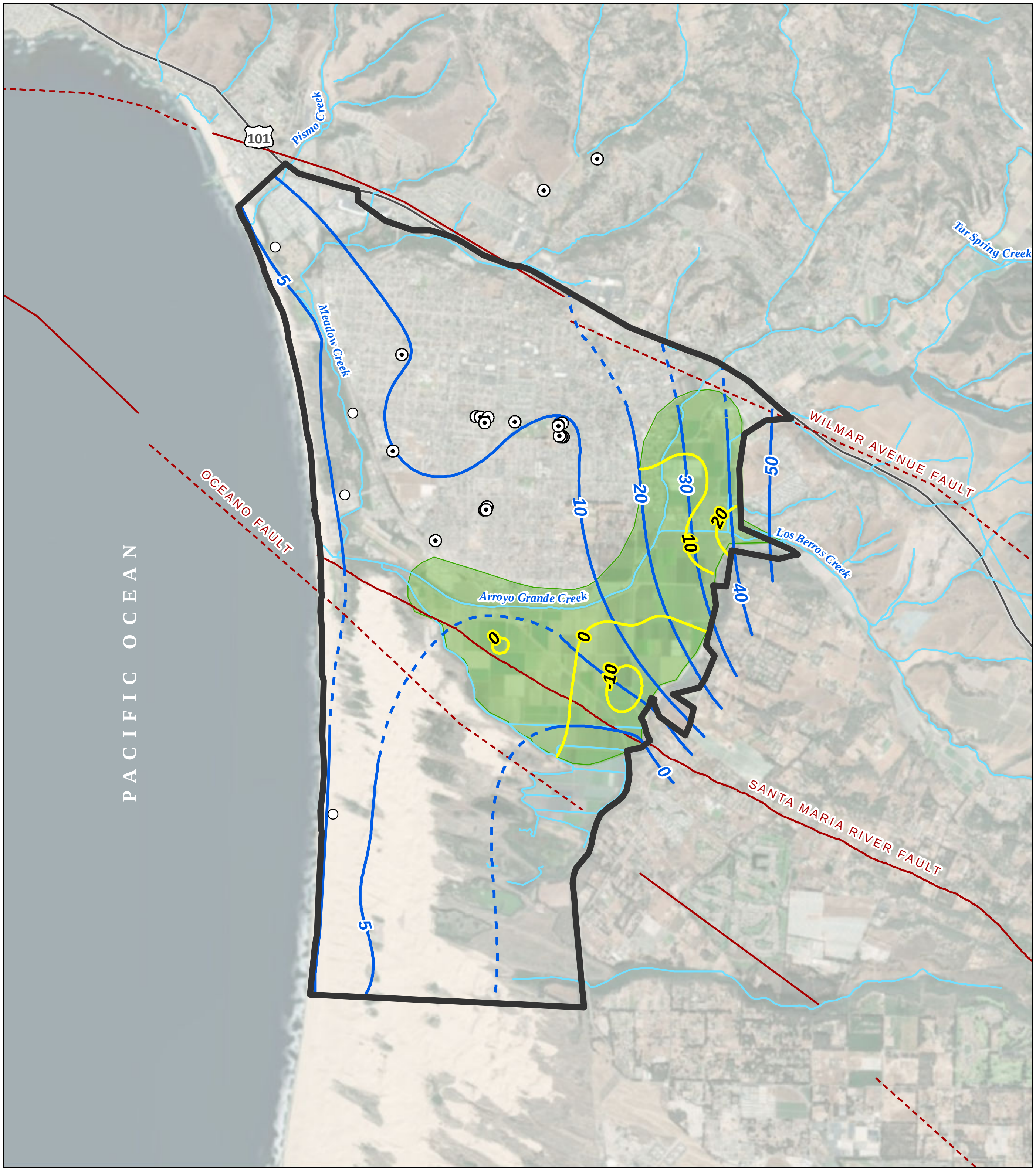
N

0 1
Miles

GSI Water Solutions, Inc.

Date: January 30, 2020
Data Sources: SLO County, NCMA and NMMA Agencies

Document Path: Y:\0672_Northern_Cities_Management_Area\Source_Figures\006_2019_Annual_Report\Annual_Report\new style\Figure08_NCMA_Water_Level_Contours_April_2019.mxd



LEGEND

- Municipal Well
- Sentry Well
- Alluvial Groundwater Contour (feet, NAVD88)
- Deep Groundwater Contour (feet, NAVD88)
- Fault

All Other Features

- Northern Cities Management Area
- Alluvial Aquifer Extent
- Highway
- Watercourse

FIGURE 9

Groundwater Elevation Contours Fall 2019

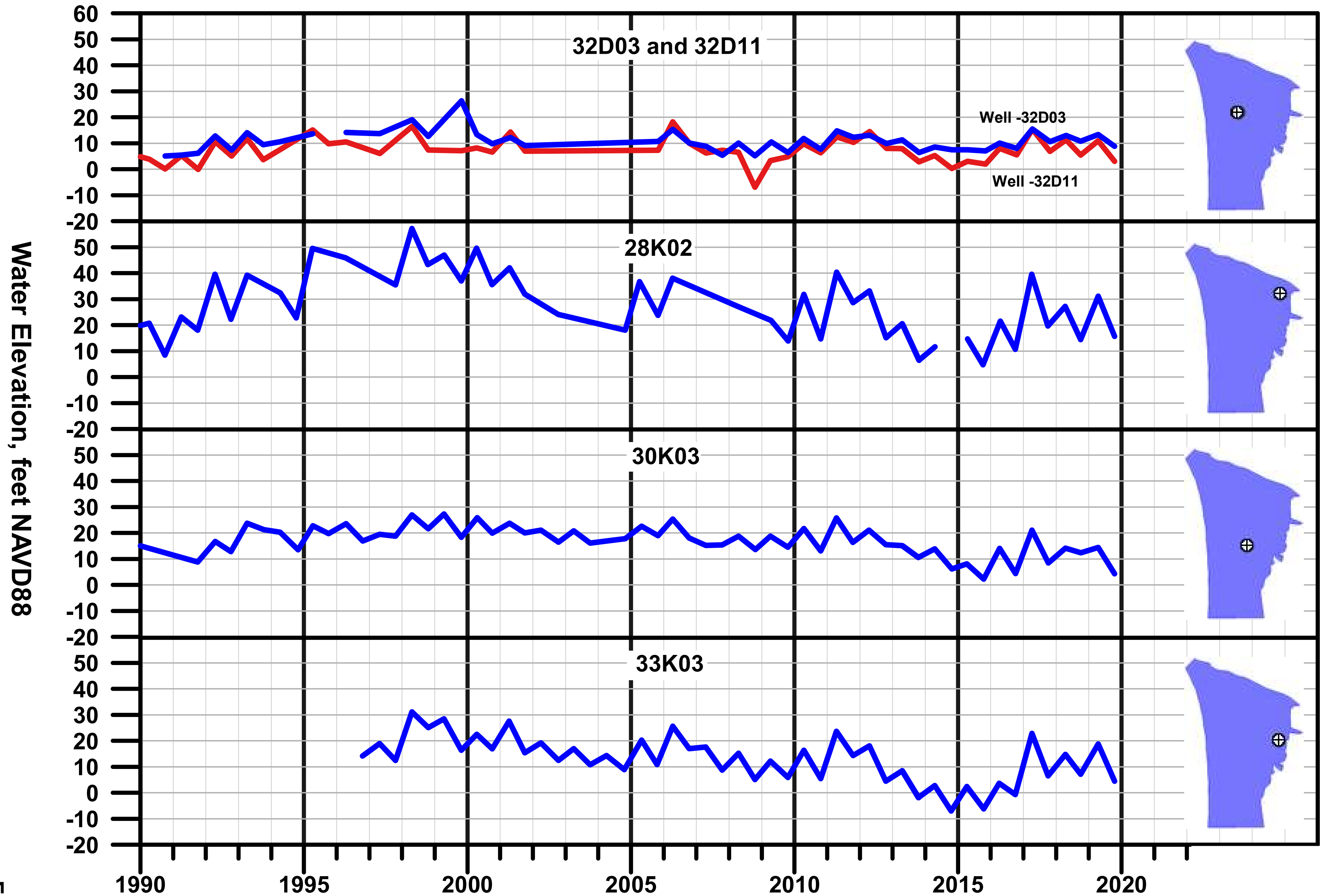
Northern Cities Management Area
San Luis Obispo County, California

N
0 Miles 1

GSI Water Solutions, Inc.

Date: January 30, 2020
Data Sources: SLO County, NCMA and NMMA Agencies

Document Path: Y:\0672_Northern_Cities_Management_Area\Source_Figures\006_2019_Annual_Report\Annual_Report\new style\Figure09_NCMA_Water_Level_Contours_Oct_2019.mxd



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SELECTED HYDROGRAPHS
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 10

GSI Water Solutions, Inc.

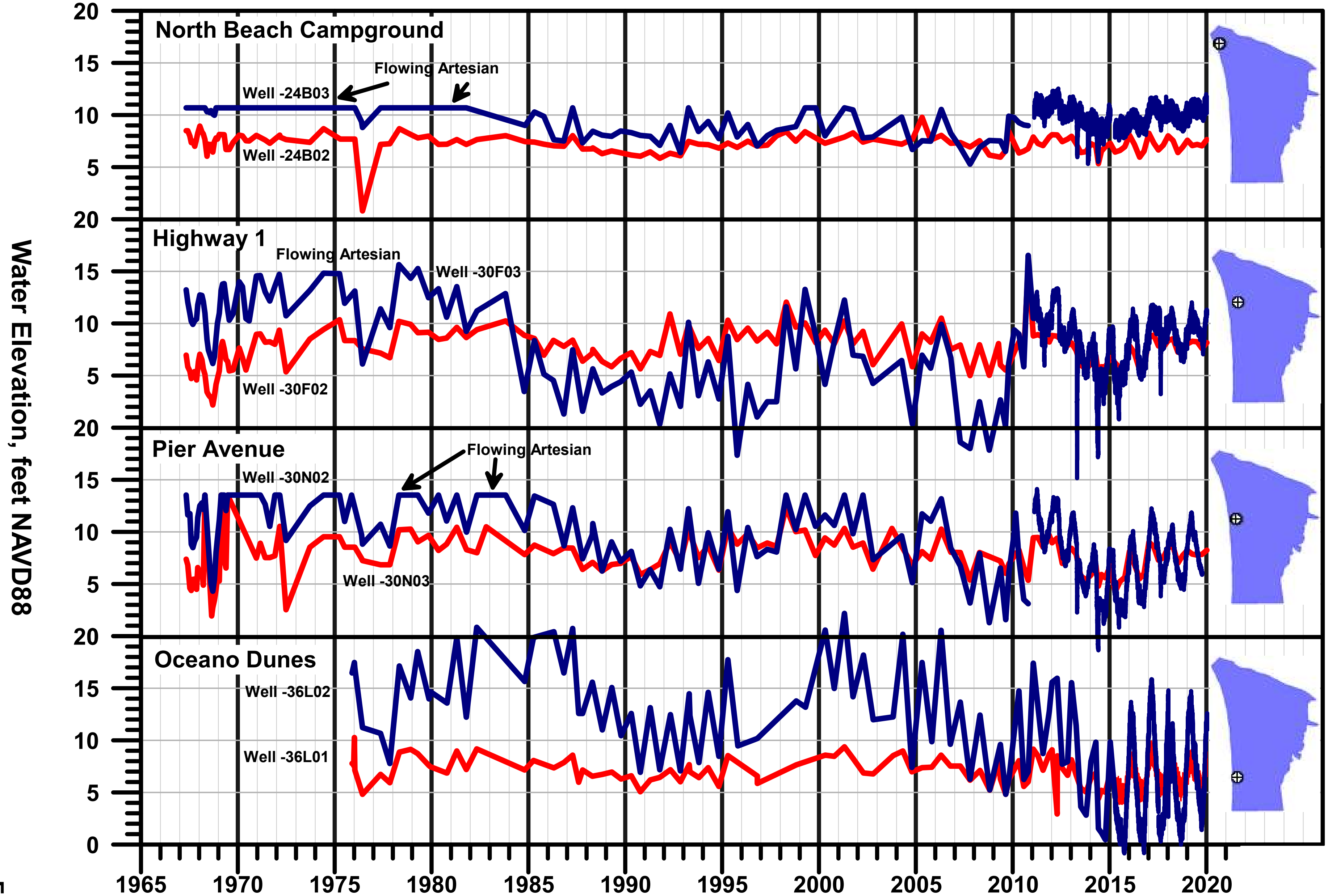

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FIGURE 11

SENTRY WELL HYDROGRAPHS
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.

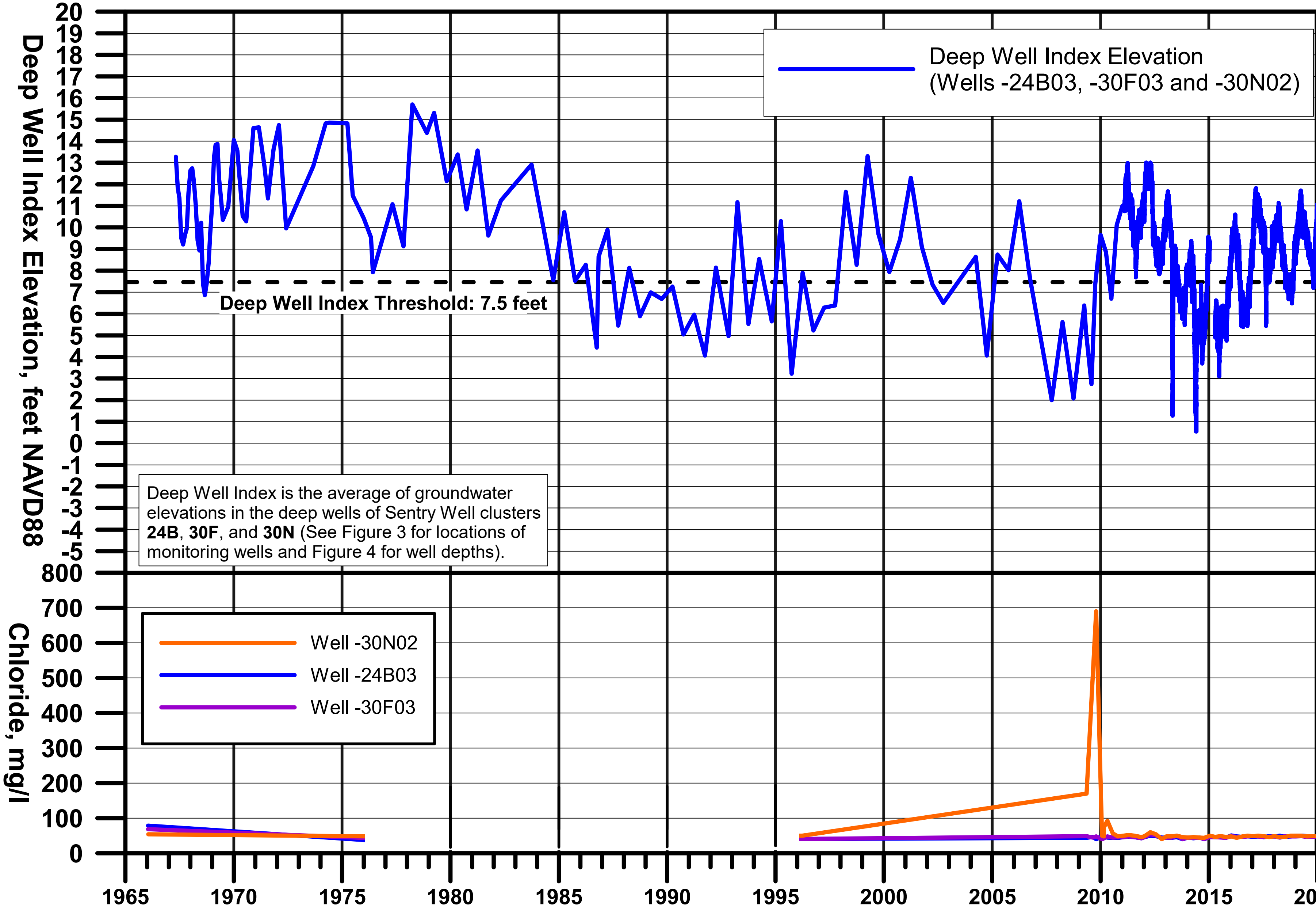


FIGURE 12

HYDROGRAPH OF DEEP WELL INDEX ELEVATION
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.

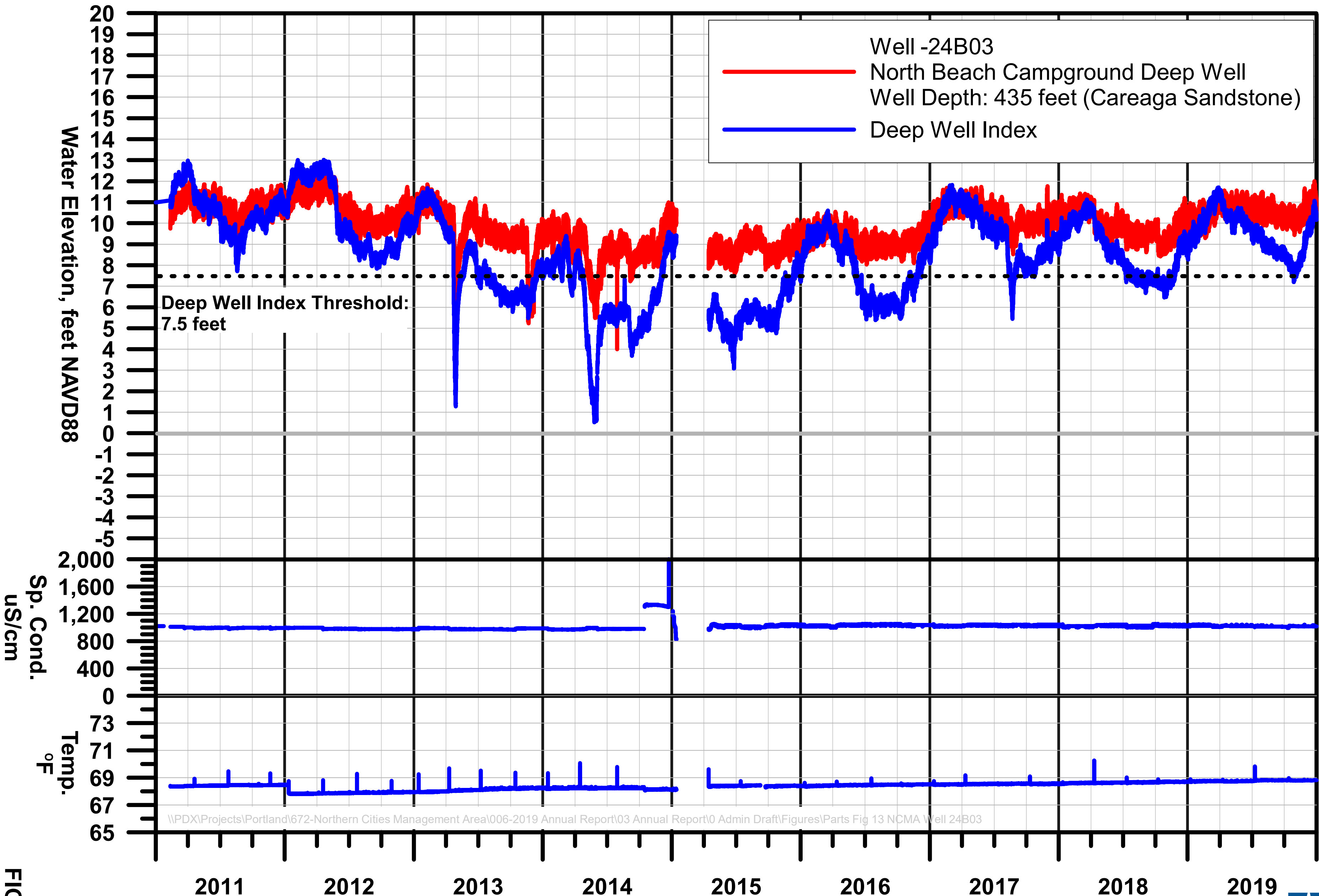


FIGURE 13

WATER ELEVATION, CONDUCTIVITY, AND TEMPERATURE, WELL 24B03
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.

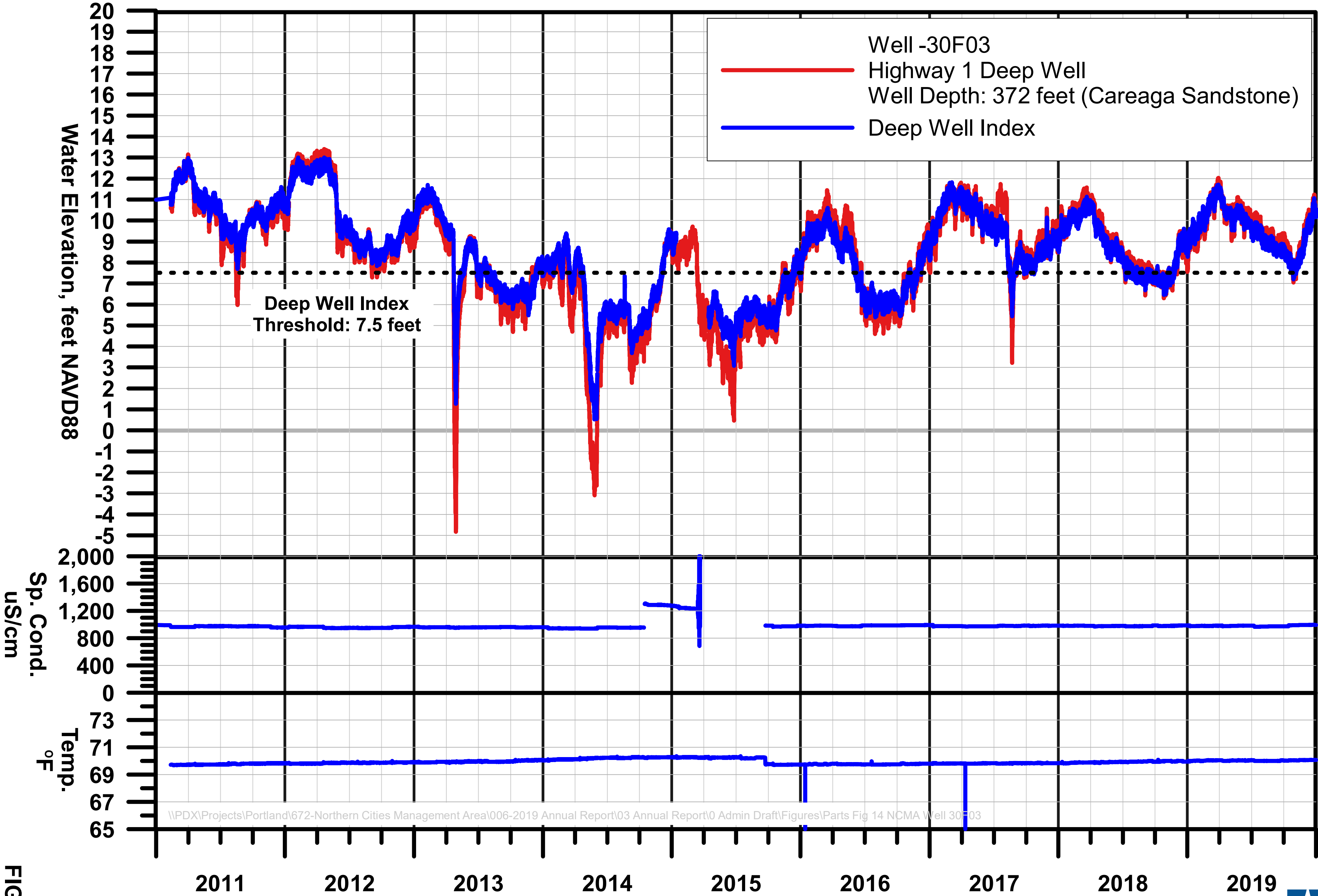


FIGURE 14

WATER ELEVATION, CONDUCTIVITY, AND TEMPERATURE, WELL 30F03
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.

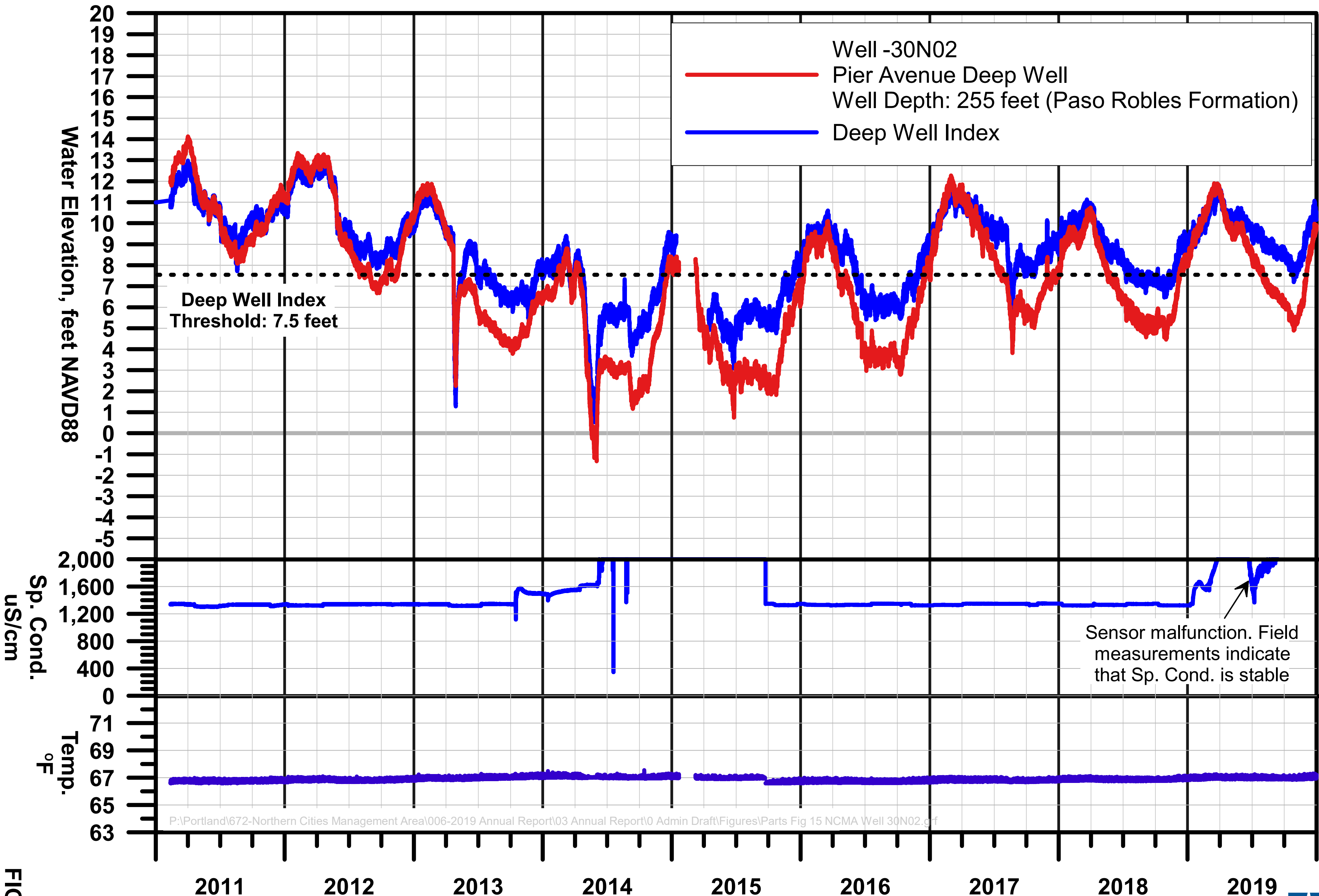


FIGURE 15

WATER ELEVATION, CONDUCTIVITY, AND TEMPERATURE, WELL 30N02
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.

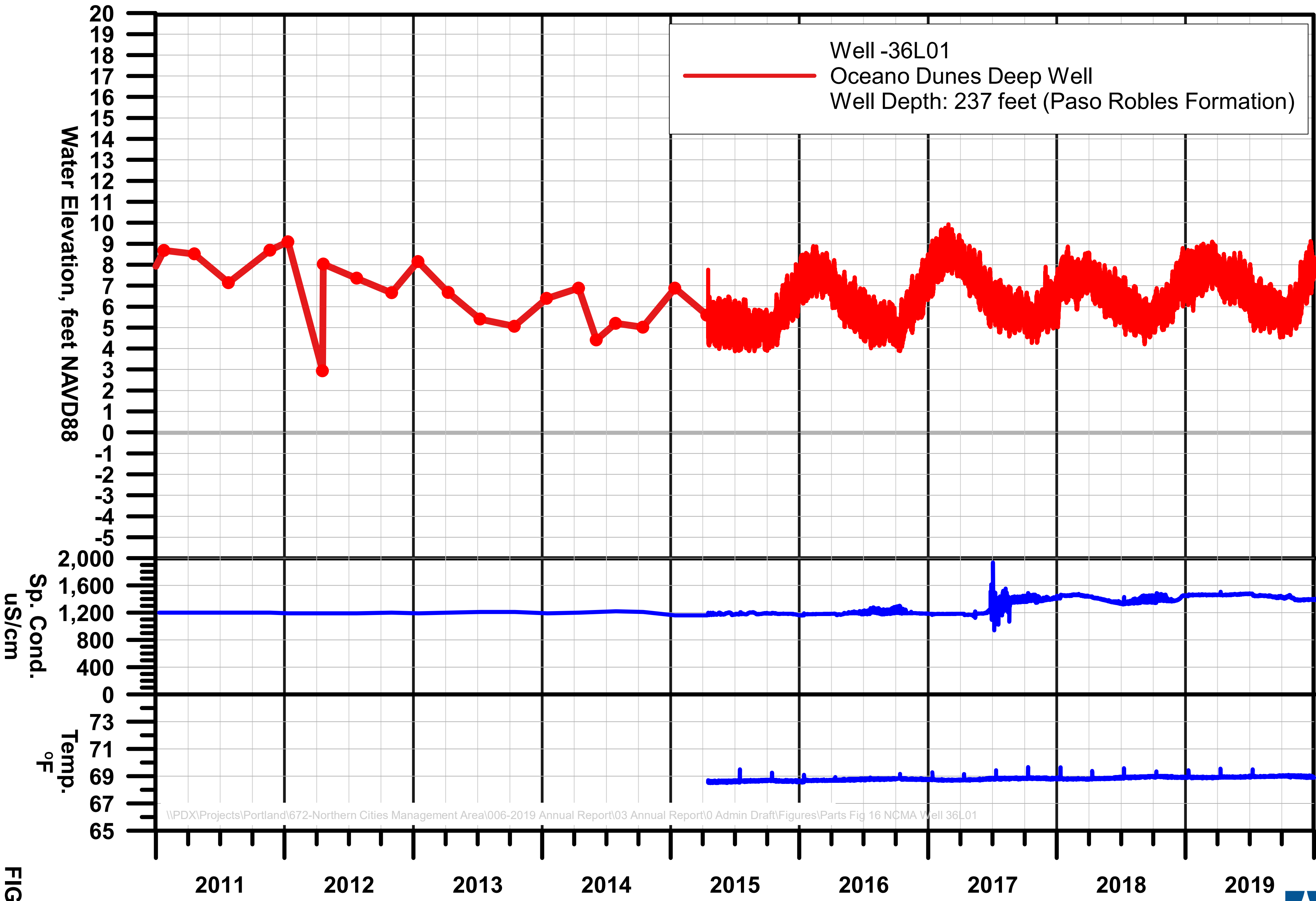


FIGURE 16

WATER ELEVATION, CONDUCTIVITY, AND TEMPERATURE, WELL 36L01
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.

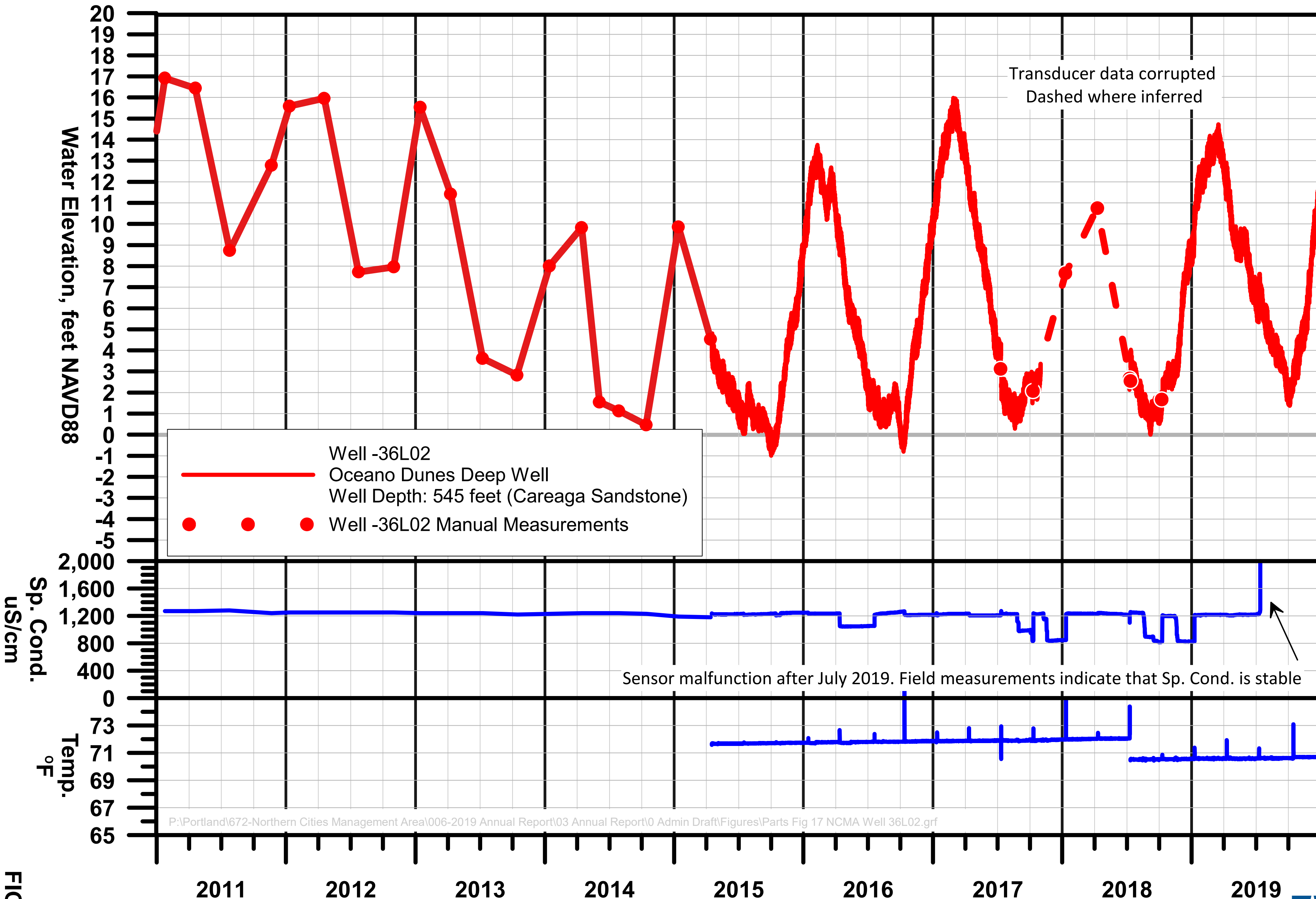


FIGURE 17

WATER ELEVATION, CONDUCTIVITY, AND TEMPERATURE, WELL 36L02
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.

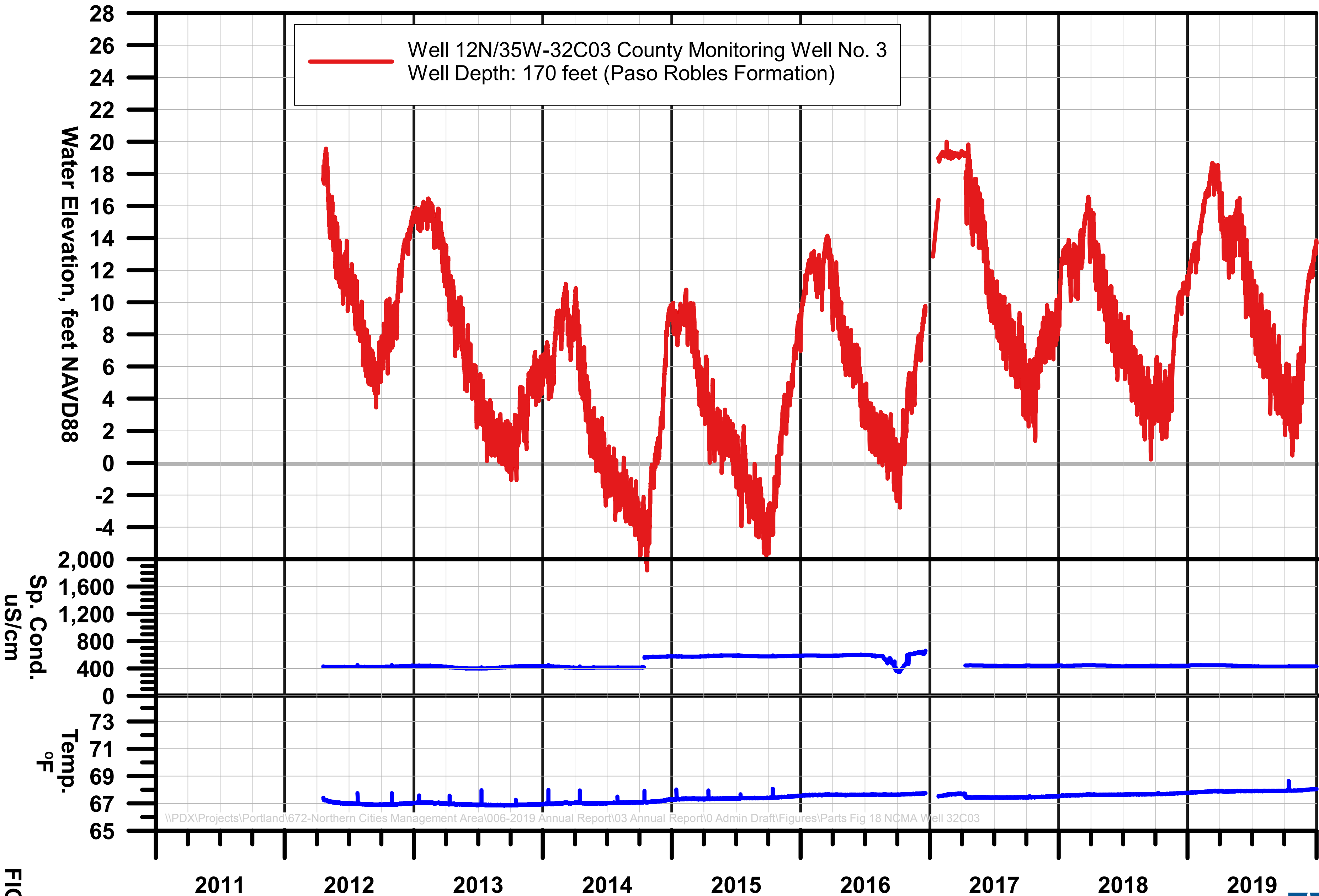
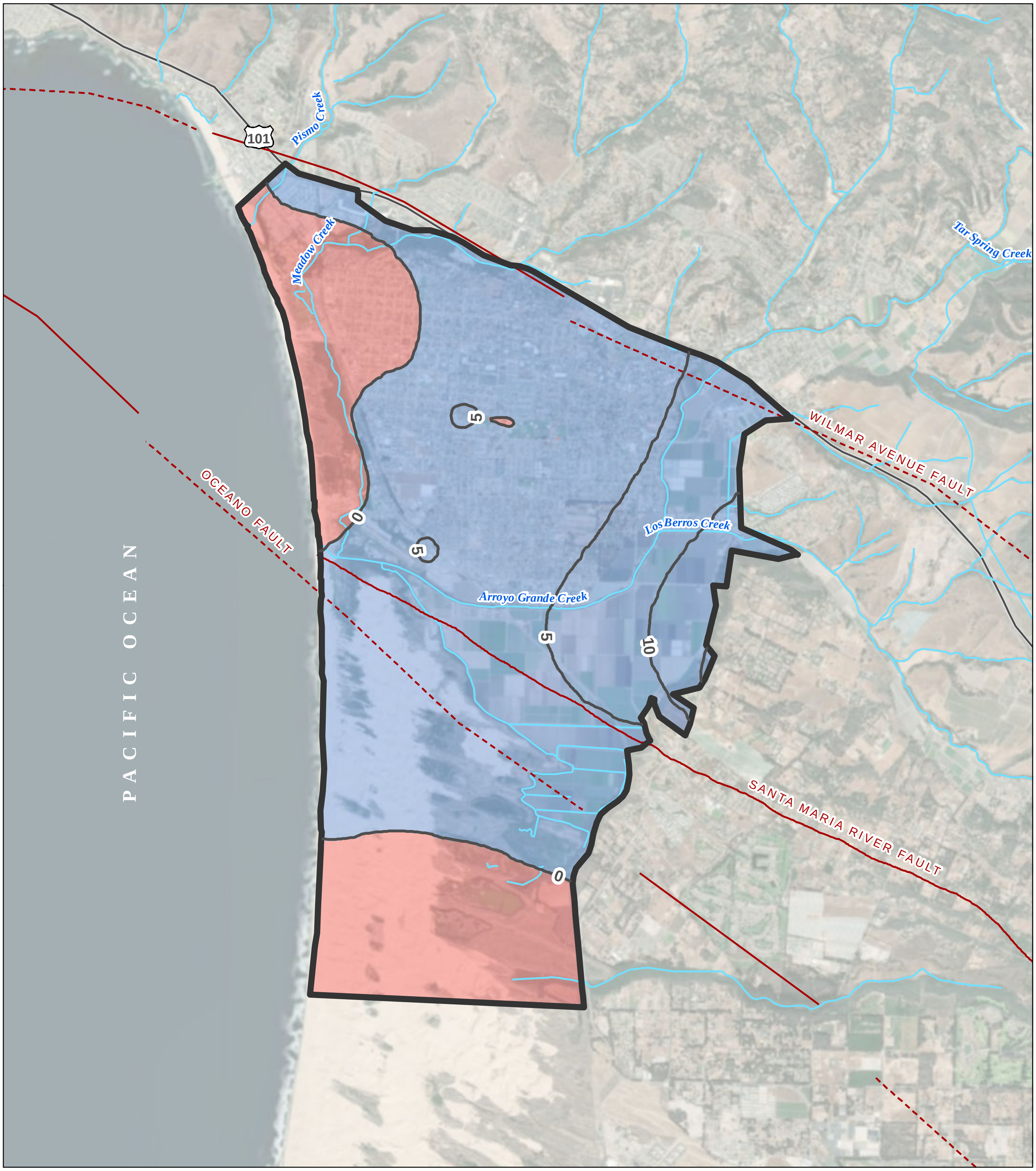


FIGURE 18

WATER ELEVATION, CONDUCTIVITY, AND TEMPERATURE, WELL 32C03
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.



LEGEND

- Contour of Equal Difference in Water Level, feet
- Area of Net Decline
- Area of Net Rise
- Fault
- Highway
- Watercourse

All Other Features

- Northern Cities Management Area

FIGURE 19

Change in Groundwater Elevation, Deep Aquifer System April 2018 to April 2019

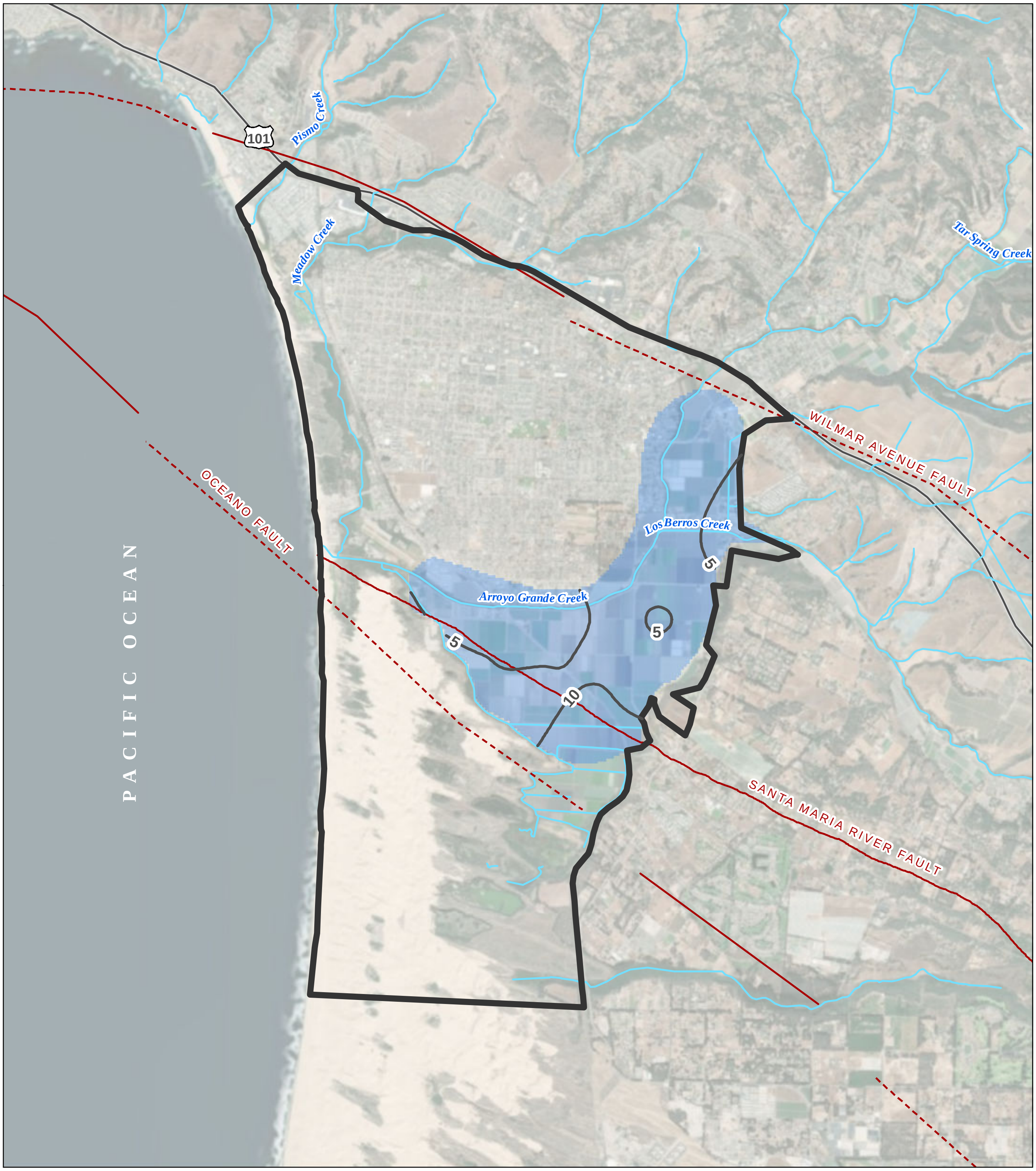
Northern Cities Management Area
San Luis Obispo County, California

N
0 1
Miles

GSI Water Solutions, Inc.

Date: January 30, 2020
Data Sources: SLO County, NCMA and NMMA Agencies

Document Path: Y:\0672_Northern_Cities_Management_Area\Source_Figures\006_2019_Annual_Report\Annual_Report\new style\Figure19_Water Level Change_April_2018_2019_Deep.mxd



LEGEND

- Contour of Equal Difference in Water Level, feet
- Area of Net Decline
- Area of Net Rise

All Other Features

- Northern Cities Management Area
- Fault
- Highway
- Watercourse

FIGURE 20

Change in Groundwater Elevation, Alluvial Aquifer April 2018 to April 2019

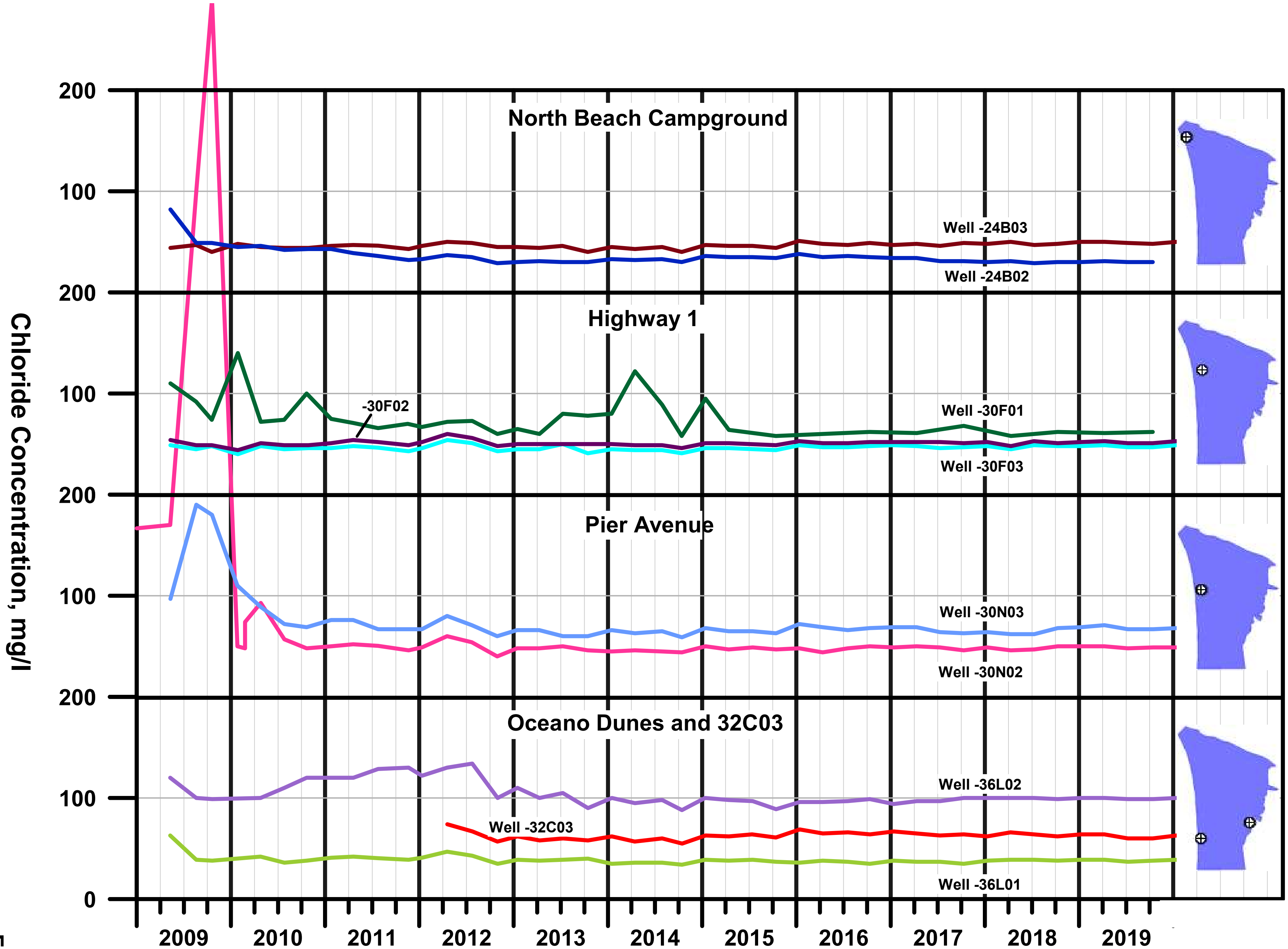
Northern Cities Management Area
San Luis Obispo County, California

N
0 1
Miles

GSI Water Solutions, Inc.

Date: January 30, 2020
Data Sources: SLO County, NCMA and NMMA Agencies

Document Path: Y:\0672_Northern_Cities_Management_Area\Source_Figures\006_2019_Annual_Report\Annual_Report\new style\Figure20_Water Level Change_April_2018_2019_Qal.mxd



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CHLORIDE CONCENTRATIONS IN MONITORING WELLS
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.

FIGURE 21

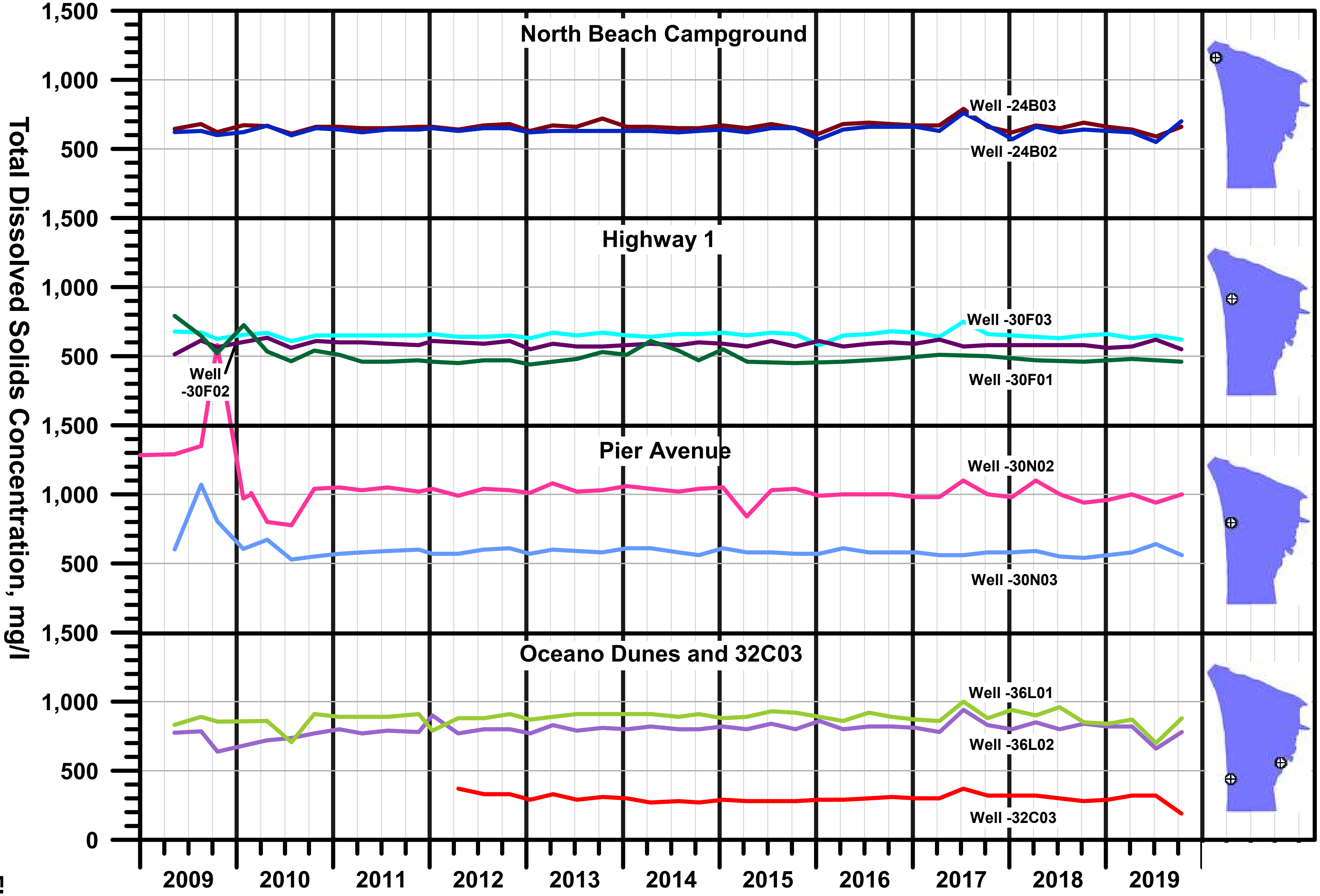

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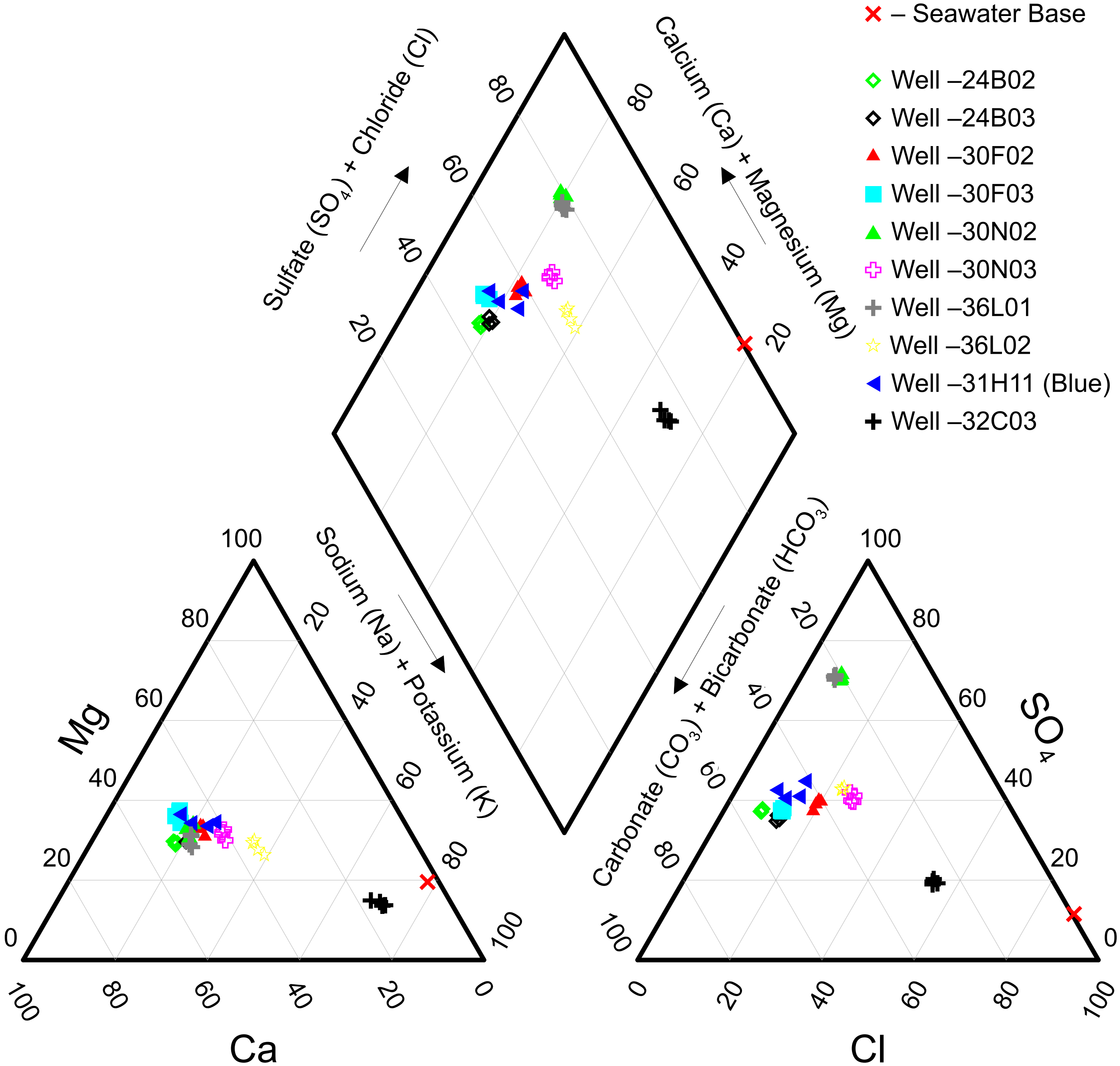
FIGURE 22

TOTAL DISSOLVED SOLIDS CONCENTRATIONS IN MONITORING WELLS
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.



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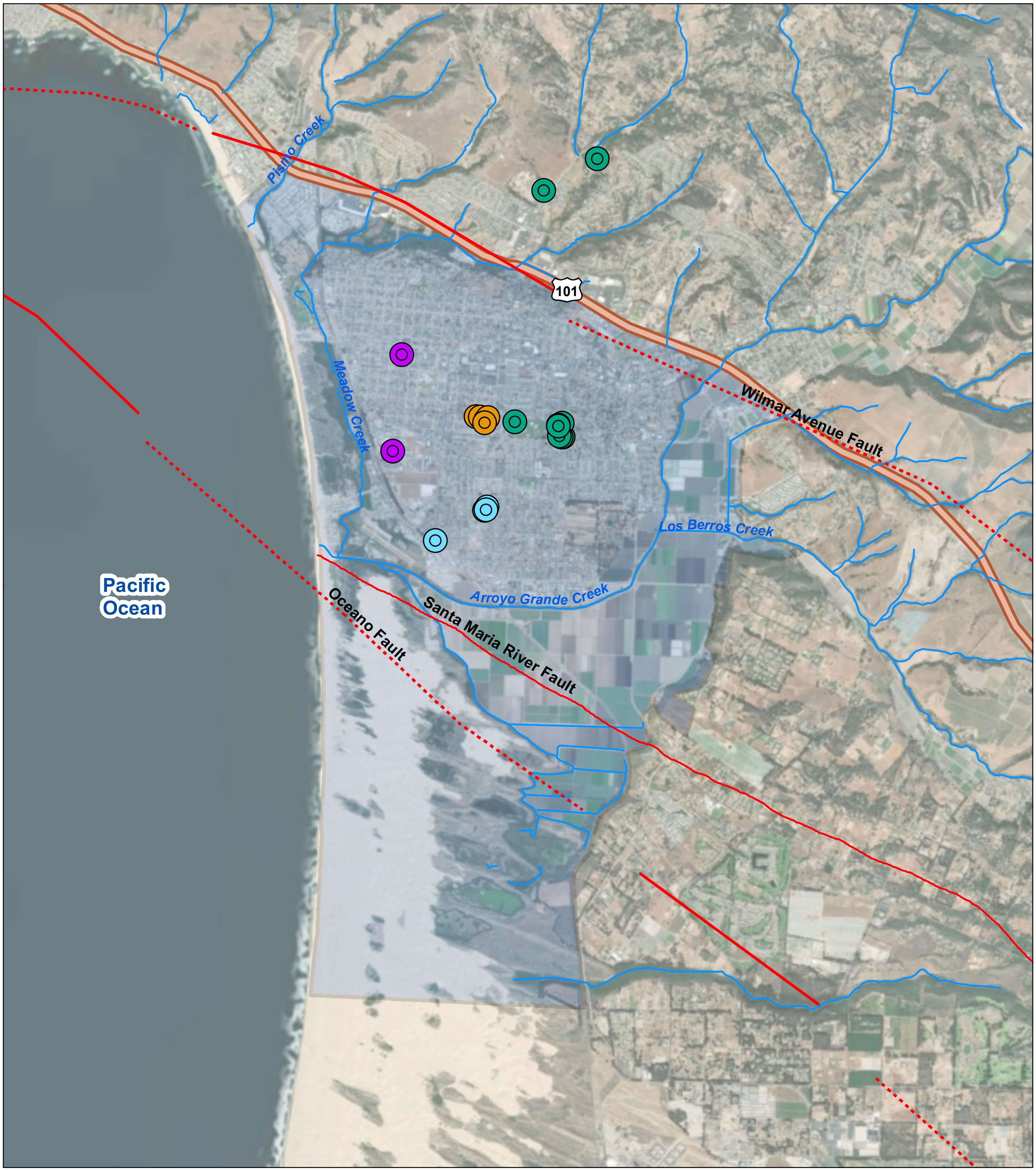
Note: Data include "middle" and "deep" wells from 2019 quarterly sampling events.

GSI Water Solutions, Inc.

PIPER DIAGRAM OF WATER QUALITY IN SELECT MONITORING WELLS
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 23



LEGEND

- City of Arroyo Grande Well
- City of Grover Beach Well
- City of Pismo Beach Well
- Oceano Community Services District Well
- Northern Cities Management Area
- Faults
- Streams

N

0 1 Miles

Date: February 26, 2020
Data Sources:

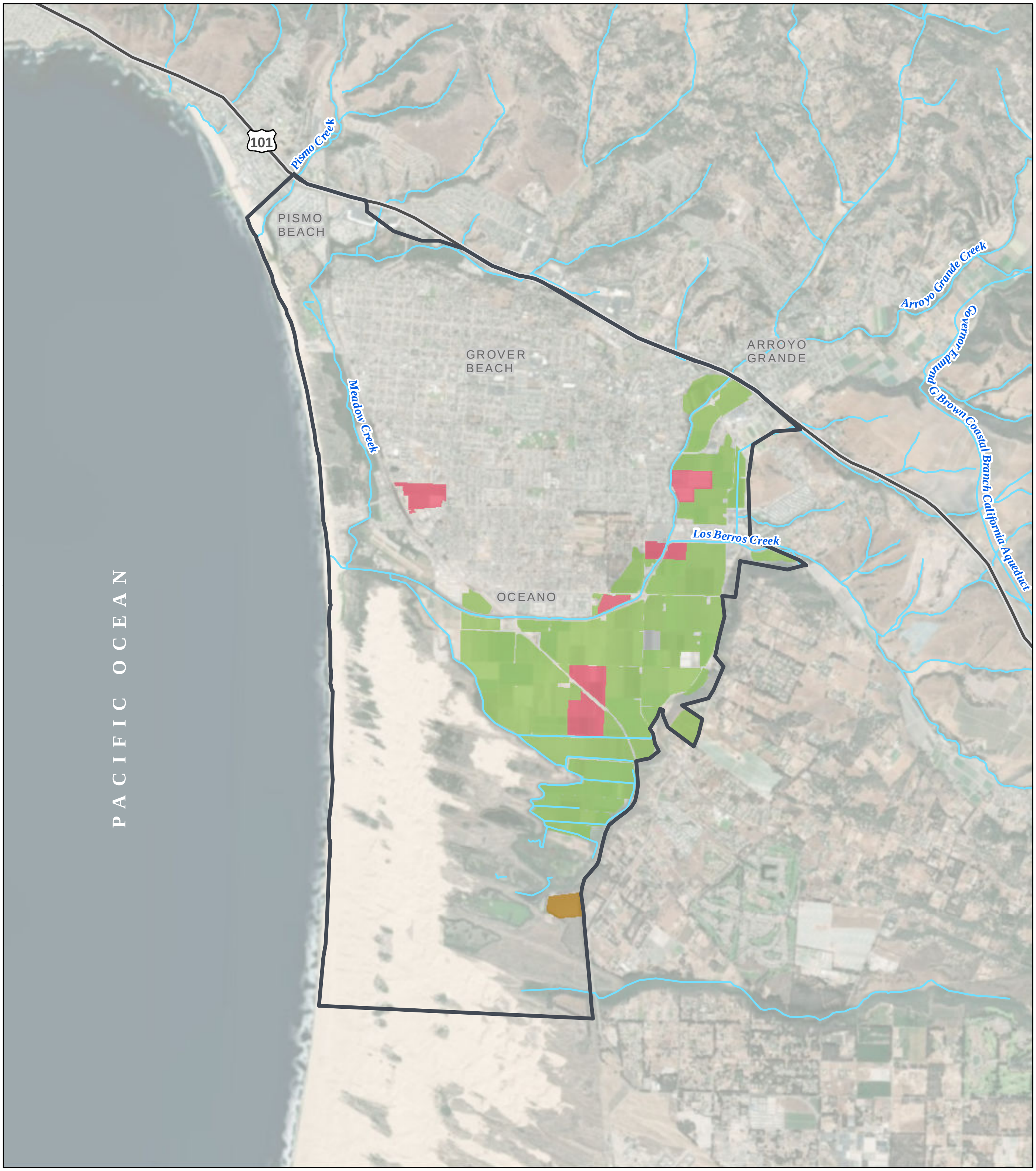
FIGURE 24

Locations of Municipal Production Wells

Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.

Document Path: Y:_nonGISP\0672_Northern_Cities_Management_Area\Source_Figures\006_2019_Annual_Report\Annual_Report\Figure24_Locations of Municipal Production Well.mxd



LEGEND

- Avocado
- Rotational Crops
- Strawberry

All Other Features

- Highway
- Watercourse
- Northern Cities Management

Date: January 30, 2020
Data Sources:

FIGURE 25

NCMA Agricultural Land 2019

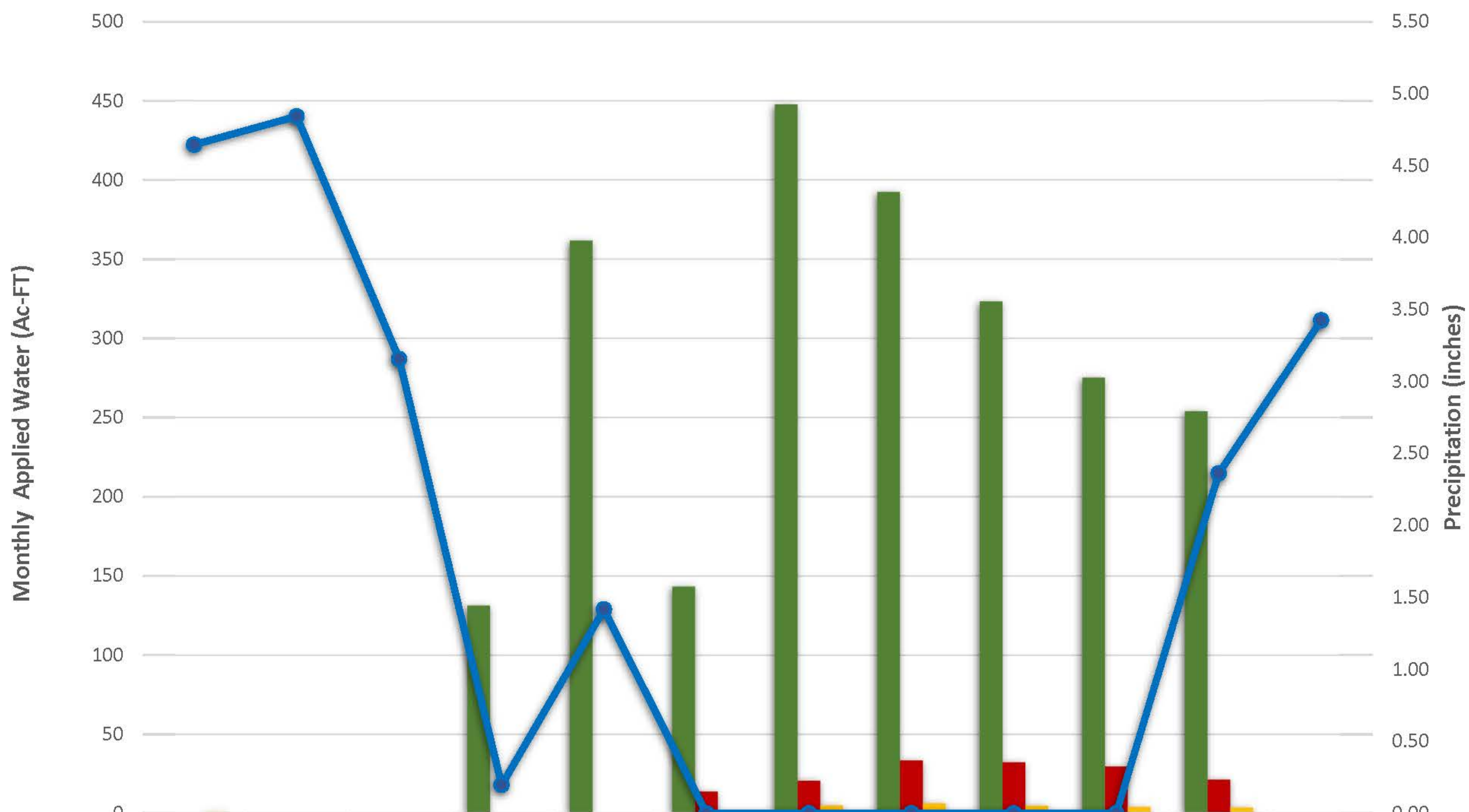
Northern Cities Management Area
San Luis Obispo County, California

N

0 0.5 1
Miles

GSI Water Solutions, Inc.

Document Path: Y:\0672_Northern_Cities_Management_Area\Source_Figures\006_2019_Annual_Report\Annual_Report\new style\Figure25_NCMA Agricultural Land_2019.mxd



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rotational Crops	0	0	0	131	362	143	448	392	323	275	254	0
Strawberries	0	0	0	0	0	14	21	34	32	30	21	0
Avocados	1	0	0	0	0	0	5	6	5	4	4	0
Precipitation (in)	4.65	4.84	3.16	0.20	1.42	0.00	0.00	0.00	0.00	0.00	2.36	3.43

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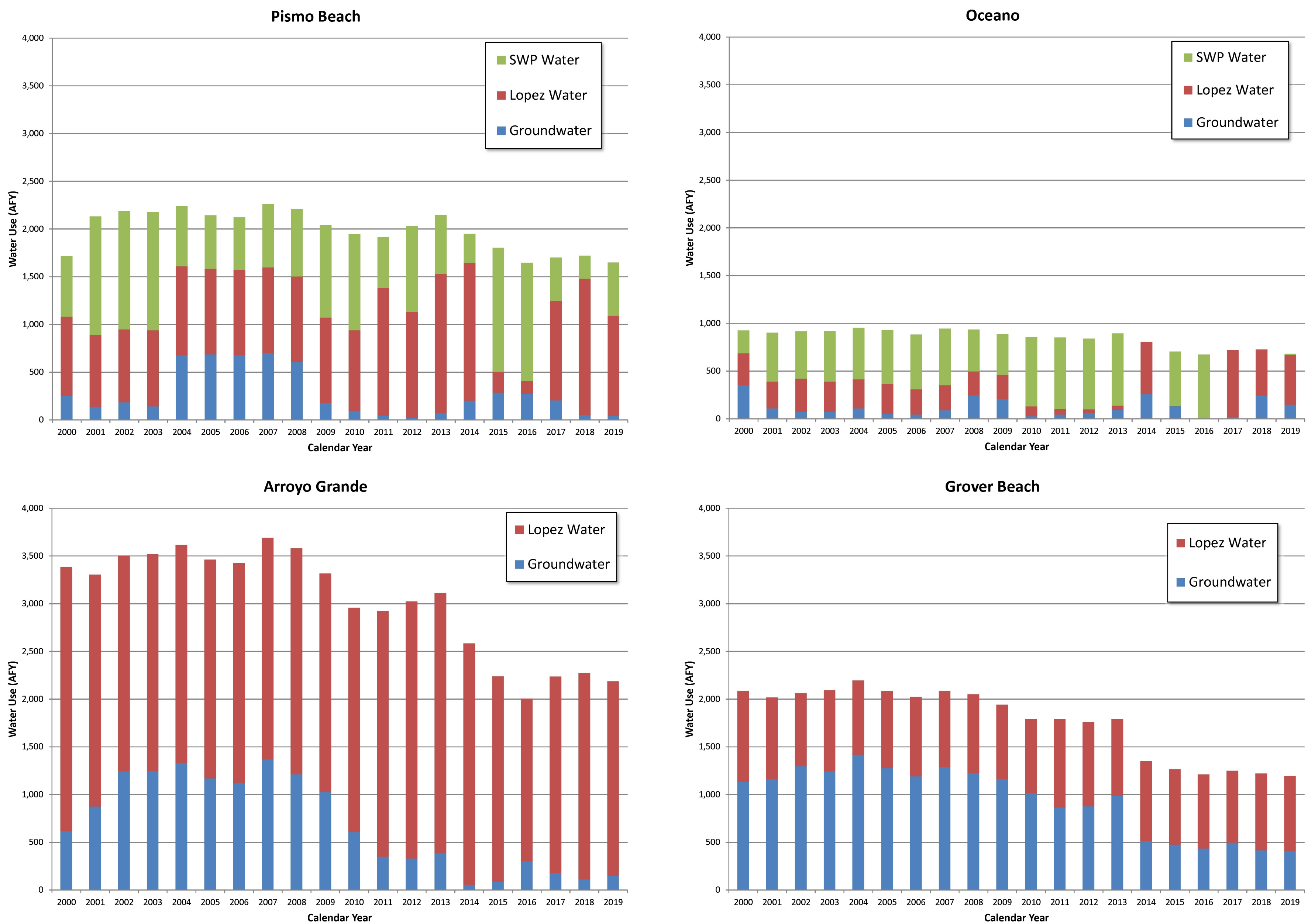
FIGURE 26

2019 ESTIMATED AGRICULTURAL WATER DEMAND AND MONTHLY PRECIPITATION AT THE SLO NO. 795 GAUGE

Northern Cities Management Area

San Luis Obispo County, California

GSI Water Solutions, Inc.



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MUNICIPAL WATER USE BY SOURCE
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 27

GSI Water Solutions, Inc.

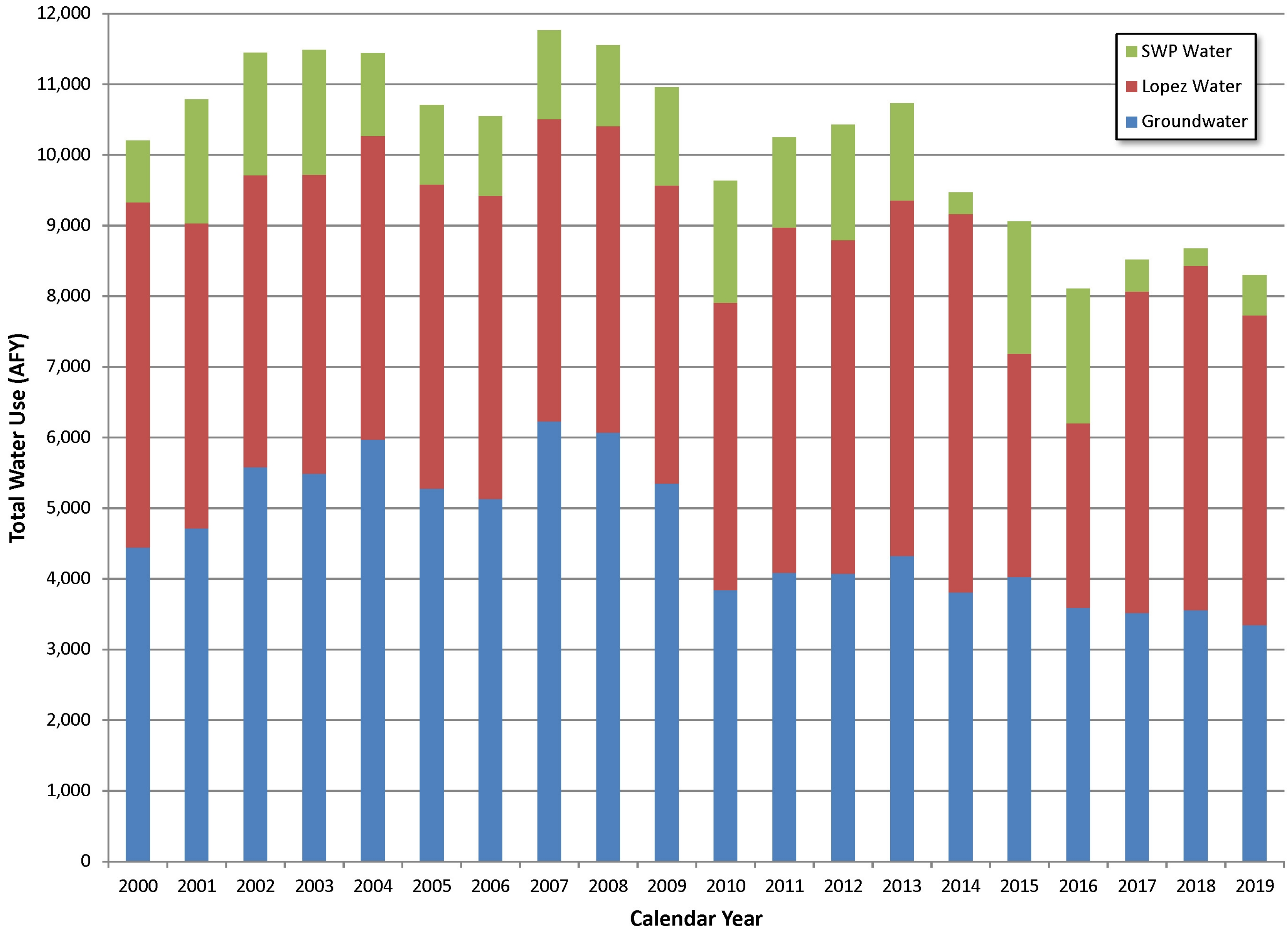

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FIGURE 28

TOTAL WATER USE (URBAN, RURAL, AG) BY SOURCE
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.

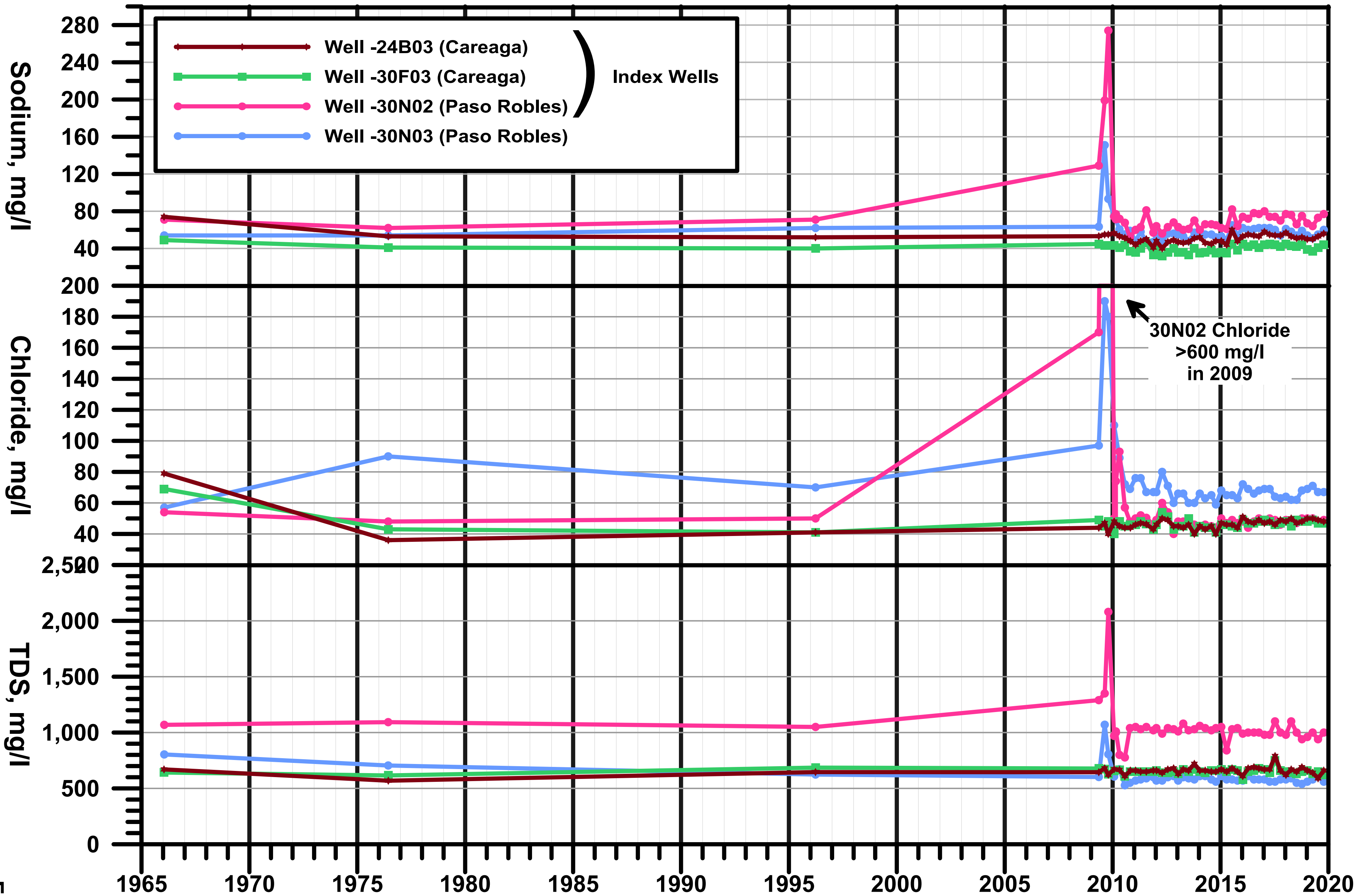

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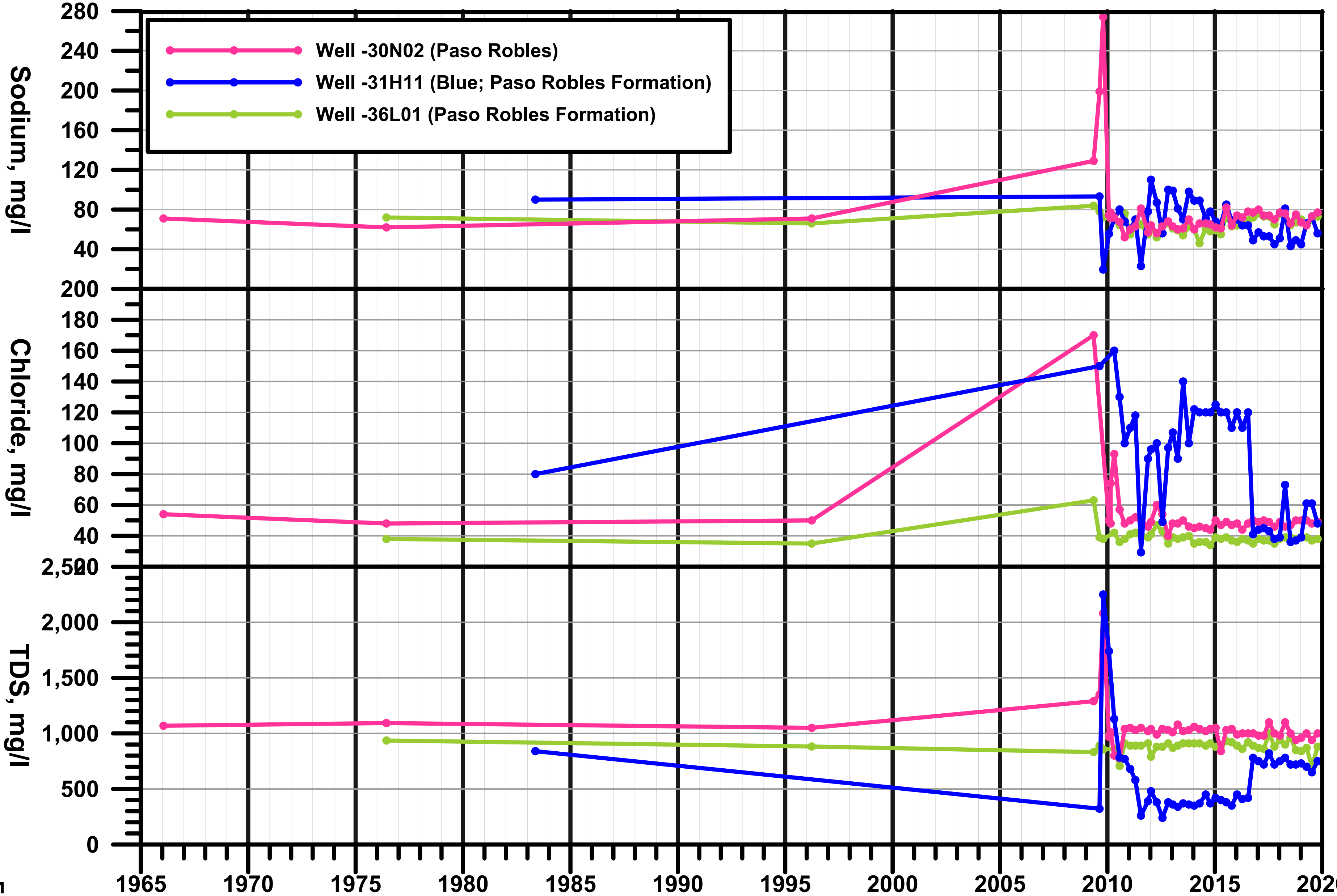
FIGURE 29

HISTORICAL TDS, CHLORIDE AND SODIUM, INDEX WELLS AND 30N03
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.



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HISTORICAL TDS, CHLORIDE AND SODIUM, WELLS 30N02, MW-BLUE AND 36L01
Northern Cities Management Area
San Luis Obispo County, California

GSI Water Solutions, Inc.

FIGURE 30

APPENDIX A

NCMA Monitoring Well Water Level and Water Quality Data

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Appendix A: NCMA Sentry Wells Water Level Data

Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
32S/12E-24B01	North Beach Shallow	Alluvium	10/9/2019	6.22	Stove Pipe	Top of Steel	13.58	7.36
32S/12E-24B01	North Beach Shallow	Alluvium	7/9/2019	6.07	Stove Pipe	Top of Steel	13.58	7.51
32S/12E-24B01	North Beach Shallow	Alluvium	4/9/2019	7.18	Stove Pipe	Top of Steel	13.58	6.4
32S/12E-24B01	North Beach Shallow	Alluvium	1/8/2019	5.95	Stove Pipe	Top of Steel	13.58	7.63
32S/12E-24B01	North Beach Shallow	Alluvium	10/9/2018	6.29	Stove Pipe	Top of Steel	13.58	7.29
32S/12E-24B01	North Beach Shallow	Alluvium	7/10/2018	7.00	Stove Pipe	Top of Steel	13.58	6.58
32S/12E-24B01	North Beach Shallow	Alluvium	4/10/2018	6.48	Stove Pipe	Top of Steel	13.58	7.10
32S/12E-24B01	North Beach Shallow	Alluvium	1/10/2018	6.00	Stove Pipe	Top of Steel	13.58	7.58
32S/12E-24B01	North Beach Shallow	Alluvium	10/10/2017	6.12	Stove Pipe	Top of Steel	13.58	7.46
32S/12E-24B01	North Beach Shallow	Alluvium	7/11/2017	6.74	Stove Pipe	Top of Steel	13.58	6.84
32S/12E-24B01	North Beach Shallow	Alluvium	4/11/2017	6.30	Stove Pipe	Top of Steel	13.58	7.28
32S/12E-24B01	North Beach Shallow	Alluvium	1/10/2017	5.54	Stove Pipe	Top of Steel	13.58	8.04
32S/12E-24B01	North Beach Shallow	Alluvium	10/12/2016	6.54	Stove Pipe	Top of Steel	13.58	7.04
32S/12E-24B01	North Beach Shallow	Alluvium	7/19/2016	6.78	Stove Pipe	Top of Steel	13.58	6.80
32S/12E-24B01	North Beach Shallow	Alluvium	4/12/2016	6.35	Stove Pipe	Top of Steel	13.58	7.23
32S/12E-24B01	North Beach Shallow	Alluvium	1/12/2016	5.17	Stove Pipe	Top of Steel	13.58	8.41
32S/12E-24B01	North Beach Shallow	Alluvium	10/13/2015	5.73	Stove Pipe	Top of Steel	13.58	7.85
32S/12E-24B01	North Beach Shallow	Alluvium	7/14/2015	6.06	Stove Pipe	Top of Steel	13.58	7.52
32S/12E-24B01	North Beach Shallow	Alluvium	4/14/2015	6.22	Stove Pipe	Top of Steel	13.58	7.36
32S/12E-24B01	North Beach Shallow	Alluvium	1/13/2015	5.83	Stove Pipe	Top of Steel	13.58	7.75
32S/12E-24B01	North Beach Shallow	Alluvium	10/14/2014	5.76	Stove Pipe	Top of Steel	13.58	7.82
32S/12E-24B01	North Beach Shallow	Alluvium	7/29/2014	5.99	Stove Pipe	Top of Steel	13.58	7.59
32S/12E-24B01	North Beach Shallow	Alluvium	6/4/2014	6.52	Stove Pipe	Top of Steel	13.58	7.06
32S/12E-24B01	North Beach Shallow	Alluvium	4/15/2014	5.95	Stove Pipe	Top of Steel	13.58	7.63
32S/12E-24B01	North Beach Shallow	Alluvium	1/14/2014	5.75	Stove Pipe	Top of Steel	13.58	7.83
32S/12E-24B01	North Beach Shallow	Alluvium	10/14/2013	6.07	Stove Pipe	Top of Steel	13.58	7.51
32S/12E-24B01	North Beach Shallow	Alluvium	7/9/2013	6.09	Stove Pipe	Top of Steel	13.58	7.49
32S/12E-24B01	North Beach Shallow	Alluvium	4/10/2013	7.00	Stove Pipe	Top of Steel	13.58	6.58
32S/12E-24B01	North Beach Shallow	Alluvium	1/14/2013	5.72	Stove Pipe	Top of Steel	13.58	7.86
32S/12E-24B01	North Beach Shallow	Alluvium	10/29/2012	5.92	Stove Pipe	Top of Steel	13.58	7.66
32S/12E-24B01	North Beach Shallow	Alluvium	7/23/2012	5.79	Stove Pipe	Top of Steel	13.58	7.79
32S/12E-24B01	North Beach Shallow	Alluvium	4/18/2012	5.58	Stove Pipe	Top of Steel	13.58	8.00
32S/12E-24B01	North Beach Shallow	Alluvium	1/11/2012	5.72	Stove Pipe	Top of Steel	13.58	7.86
32S/12E-24B01	North Beach Shallow	Alluvium	11/21/2011	5.80	Stove Pipe	Top of Steel	13.58	7.78
32S/12E-24B01	North Beach Shallow	Alluvium	7/26/2011	6.38	Stove Pipe	Top of Steel	13.58	7.20
32S/12E-24B01	North Beach Shallow	Alluvium	4/20/2011	6.40	Stove Pipe	Top of Steel	13.58	7.18
32S/12E-24B01	North Beach Shallow	Alluvium	1/24/2011	5.78	Stove Pipe	Top of Steel	13.58	7.80
32S/12E-24B01	North Beach Shallow	Alluvium	10/21/2010	6.37	Stove Pipe	Top of Steel	13.58	7.21
32S/12E-24B01	North Beach Shallow	Alluvium	7/27/2010	6.48	Stove Pipe	Top of Steel	13.58	7.1
32S/12E-24B01	North Beach Shallow	Alluvium	4/27/2010	3.84	Flush	Top Flush Mount	10.70	6.86
32S/12E-24B01	North Beach Shallow	Alluvium	1/27/2010	3.13	Flush	Top Flush Mount	10.70	7.57
32S/12E-24B01	North Beach Shallow	Alluvium	10/19/2009	2.28	Flush	Top Flush Mount	10.70	8.42
32S/12E-24B01	North Beach Shallow	Alluvium	8/20/2009	3.25	Flush	Top Flush Mount	10.70	7.45
32S/12E-24B01	North Beach Shallow	Alluvium	5/12/2009	3.58	Flush	Top Flush Mount	10.70	7.12
32S/12E-24B01	North Beach Shallow	Alluvium	4/7/2009	1.61	Flush	Top Flush Mount	11.70	10.09

Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
32S/12E-24B02	North Beach Middle	Paso Robles	10/9/2019	6.52	Stove Pipe	Top of Steel	13.58	7.06
32S/12E-24B02	North Beach Middle	Paso Robles	7/9/2019	6.40	Stove Pipe	Top of Steel	13.58	7.18
32S/12E-24B02	North Beach Middle	Paso Robles	4/9/2019	6.50	Stove Pipe	Top of Steel	13.58	7.08
32S/12E-24B02	North Beach Middle	Paso Robles	1/8/2019	6.00	Stove Pipe	Top of Steel	13.58	7.58
32S/12E-24B02	North Beach Middle	Paso Robles	10/9/2018	6.65	Stove Pipe	Top of Steel	13.58	6.93
32S/12E-24B02	North Beach Middle	Paso Robles	7/10/2018	7.17	Stove Pipe	Top of Steel	13.58	6.41
32S/12E-24B02	North Beach Middle	Paso Robles	4/10/2018	6.02	Stove Pipe	Top of Steel	13.58	7.56
32S/12E-24B02	North Beach Middle	Paso Robles	1/10/2018	5.57	Stove Pipe	Top of Steel	13.58	8.01
32S/12E-24B02	North Beach Middle	Paso Robles	10/10/2017	6.46	Stove Pipe	Top of Steel	13.58	7.12
32S/12E-24B02	North Beach Middle	Paso Robles	7/11/2017	6.93	Stove Pipe	Top of Steel	13.58	6.65
32S/12E-24B02	North Beach Middle	Paso Robles	4/11/2017	6.26	Stove Pipe	Top of Steel	13.58	7.32
32S/12E-24B02	North Beach Middle	Paso Robles	1/10/2017	5.33	Stove Pipe	Top of Steel	13.58	8.25
32S/12E-24B02	North Beach Middle	Paso Robles	10/12/2016	7.05	Stove Pipe	Top of Steel	13.58	6.53
32S/12E-24B02	North Beach Middle	Paso Robles	7/19/2016	7.61	Stove Pipe	Top of Steel	13.58	5.97
32S/12E-24B02	North Beach Middle	Paso Robles	4/12/2016	6.37	Stove Pipe	Top of Steel	13.58	7.21
32S/12E-24B02	North Beach Middle	Paso Robles	1/12/2016	5.51	Stove Pipe	Top of Steel	13.58	8.07
32S/12E-24B02	North Beach Middle	Paso Robles	10/13/2015	6.61	Stove Pipe	Top of Steel	13.58	6.97
32S/12E-24B02	North Beach Middle	Paso Robles	7/14/2015	6.97	Stove Pipe	Top of Steel	13.58	6.61
32S/12E-24B02	North Beach Middle	Paso Robles	4/14/2015	7.13	Stove Pipe	Top of Steel	13.58	6.45
32S/12E-24B02	North Beach Middle	Paso Robles	1/13/2015	6.28	Stove Pipe	Top of Steel	13.58	7.30
32S/12E-24B02	North Beach Middle	Paso Robles	10/14/2014	6.61	Stove Pipe	Top of Steel	13.58	6.97
32S/12E-24B02	North Beach Middle	Paso Robles	7/29/2014	7.05	Stove Pipe	Top of Steel	13.58	6.53
32S/12E-24B02	North Beach Middle	Paso Robles	6/4/2014	8.25	Stove Pipe	Top of Steel	13.58	5.33
32S/12E-24B02	North Beach Middle	Paso Robles	4/15/2014	6.55	Stove Pipe	Top of Steel	13.58	7.03
32S/12E-24B02	North Beach Middle	Paso Robles	1/14/2014	6.34	Stove Pipe	Top of Steel	13.58	7.24
32S/12E-24B02	North Beach Middle	Paso Robles	10/14/2013	7.08	Stove Pipe	Top of Steel	13.58	6.50
32S/12E-24B02	North Beach Middle	Paso Robles	7/9/2013	7.17	Stove Pipe	Top of Steel	13.58	6.41
32S/12E-24B02	North Beach Middle	Paso Robles	4/10/2013	6.33	Stove Pipe	Top of Steel	13.58	7.25
32S/12E-24B02	North Beach Middle	Paso Robles	1/14/2013	5.61	Stove Pipe	Top of Steel	13.58	7.97
32S/12E-24B02	North Beach Middle	Paso Robles	10/29/2012	5.88	Stove Pipe	Top of Steel	13.58	7.7
32S/12E-24B02	North Beach Middle	Paso Robles	7/23/2012	6.12	Stove Pipe	Top of Steel	13.58	7.46
32S/12E-24B02	North Beach Middle	Paso Robles	4/18/2012	5.48	Stove Pipe	Top of Steel	13.58	8.1
32S/12E-24B02	North Beach Middle	Paso Robles	1/11/2012	5.47	Stove Pipe	Top of Steel	13.58	8.11
32S/12E-24B02	North Beach Middle	Paso Robles	11/21/2011	5.69	Stove Pipe	Top of Steel	13.58	7.89
32S/12E-24B02	North Beach Middle	Paso Robles	7/26/2011	6.51	Stove Pipe	Top of Steel	13.58	7.07
32S/12E-24B02	North Beach Middle	Paso Robles	4/20/2011	6.30	Stove Pipe	Top of Steel	13.58	7.28
32S/12E-24B02	North Beach Middle	Paso Robles	1/24/2011	5.69	Stove Pipe	Top of Steel	13.58	7.89
32S/12E-24B02	North Beach Middle	Paso Robles	10/21/2010	6.79	Stove Pipe	Top of Steel	13.58	6.79
32S/12E-24B02	North Beach Middle	Paso Robles	7/27/2010	7.05	Stove Pipe	Top of Steel	13.58	6.53
32S/12E-24B02	North Beach Middle	Paso Robles	4/27/2010	4.34	Flush	Top Flush Mount	10.70	6.36
32S/12E-24B02	North Beach Middle	Paso Robles	1/27/2010	3.38	Flush	Top Flush Mount	10.70	7.32
32S/12E-24B02	North Beach Middle	Paso Robles	10/19/2009	2.26	Flush	Top Flush Mount	10.70	8.44
32S/12E-24B02	North Beach Middle	Paso Robles	8/20/2009	4.09	Flush	Top Flush Mount	10.70	6.61
32S/12E-24B02	North Beach Middle	Paso Robles	5/12/2009	4.74	Flush	Top Flush Mount	10.70	5.96

Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
32S/12E-24B03	North Beach Deep	Careaga	10/9/2019	3.36	Stove Pipe	Top of Steel	13.58	10.22
32S/12E-24B03	North Beach Deep	Careaga	7/9/2019	3.39	Stove Pipe	Top of Steel	13.58	10.19
32S/12E-24B03	North Beach Deep	Careaga	4/9/2019	3.08	Stove Pipe	Top of Steel	13.58	10.50
32S/12E-24B03	North Beach Deep	Careaga	1/8/2019	3.12	Stove Pipe	Top of Steel	13.58	10.46
32S/12E-24B03	North Beach Deep	Careaga	10/9/2018	3.80	Stove Pipe	Top of Steel	13.58	9.78
32S/12E-24B03	North Beach Deep	Careaga	7/10/2018	4.18	Stove Pipe	Top of Steel	13.58	9.40
32S/12E-24B03	North Beach Deep	Careaga	4/10/2018	2.55	Stove Pipe	Top of Steel	13.58	11.03
32S/12E-24B03	North Beach Deep	Careaga	1/10/2018	2.51	Stove Pipe	Top of Steel	13.58	11.07
32S/12E-24B03	North Beach Deep	Careaga	10/10/2017	3.60	Stove Pipe	Top of Steel	13.58	9.98
32S/12E-24B03	North Beach Deep	Careaga	7/11/2017	3.75	Stove Pipe	Top of Steel	13.58	9.83
32S/12E-24B03	North Beach Deep	Careaga	4/11/2017	2.90	Stove Pipe	Top of Steel	13.58	10.68
32S/12E-24B03	North Beach Deep	Careaga	1/10/2017	2.59	Stove Pipe	Top of Steel	13.58	10.99
32S/12E-24B03	North Beach Deep	Careaga	10/12/2016	4.70	Stove Pipe	Top of Steel	13.58	8.88
32S/12E-24B03	North Beach Deep	Careaga	7/19/2016	5.10	Stove Pipe	Top of Steel	13.58	8.48
32S/12E-24B03	North Beach Deep	Careaga	4/12/2016	3.81	Stove Pipe	Top of Steel	13.58	9.77
32S/12E-24B03	North Beach Deep	Careaga	1/12/2016	3.01	Stove Pipe	Top of Steel	13.58	10.57
32S/12E-24B03	North Beach Deep	Careaga	10/13/2015	4.62	Stove Pipe	Top of Steel	13.58	8.96
32S/12E-24B03	North Beach Deep	Careaga	7/14/2015	4.76	Stove Pipe	Top of Steel	13.58	8.82
32S/12E-24B03	North Beach Deep	Careaga	4/14/2015	4.86	Stove Pipe	Top of Steel	13.58	8.72
32S/12E-24B03	North Beach Deep	Careaga	1/13/2015	3.59	Stove Pipe	Top of Steel	13.58	9.99
32S/12E-24B03	North Beach Deep	Careaga	10/14/2014	4.60	Stove Pipe	Top of Steel	13.58	8.98
32S/12E-24B03	North Beach Deep	Careaga	7/29/2014	4.78	Stove Pipe	Top of Steel	13.58	8.80
32S/12E-24B03	North Beach Deep	Careaga	6/4/2014	7.33	Stove Pipe	Top of Steel	13.58	6.25
32S/12E-24B03	North Beach Deep	Careaga	5/5/2014	5.36	Stove Pipe	Top of Steel	13.58	8.22
32S/12E-24B03	North Beach Deep	Careaga	4/15/2014	3.94	Stove Pipe	Top of Steel	13.58	9.64
32S/12E-24B03	North Beach Deep	Careaga	1/14/2014	3.81	Stove Pipe	Top of Steel	13.58	9.77
32S/12E-24B03	North Beach Deep	Careaga	10/14/2013	4.50	Stove Pipe	Top of Steel	13.58	9.08
32S/12E-24B03	North Beach Deep	Careaga	7/9/2013	4.48	Stove Pipe	Top of Steel	13.58	9.1
32S/12E-24B03	North Beach Deep	Careaga	4/10/2013	3.41	Stove Pipe	Top of Steel	13.58	10.17
32S/12E-24B03	North Beach Deep	Careaga	1/14/2013	2.48	Stove Pipe	Top of Steel	13.58	11.1
32S/12E-24B03	North Beach Deep	Careaga	10/29/2012	3.01	Stove Pipe	Top of Steel	13.58	10.57
32S/12E-24B03	North Beach Deep	Careaga	7/23/2012	2.98	Stove Pipe	Top of Steel	13.58	10.6
32S/12E-24B03	North Beach Deep	Careaga	4/18/2012	1.93	Stove Pipe	Top of Steel	13.58	11.65
32S/12E-24B03	North Beach Deep	Careaga	1/12/2012	2.15	Stove Pipe	Top of Steel	13.58	11.43
32S/12E-24B03	North Beach Deep	Careaga	11/21/2011	2.93	Stove Pipe	Top of Steel	13.58	10.65
32S/12E-24B03	North Beach Deep	Careaga	7/26/2011	3.17	Stove Pipe	Top of Steel	13.58	10.41
32S/12E-24B03	North Beach Deep	Careaga	4/20/2011	3.25	Stove Pipe	Top of Steel	13.58	10.33
32S/12E-24B03	North Beach Deep	Careaga	1/24/2011	2.65	Stove Pipe	Top of Steel	13.58	10.93
32S/12E-24B03	North Beach Deep	Careaga	10/21/2010	4.60	Stove Pipe	Top of Steel	13.58	8.98
32S/12E-24B03	North Beach Deep	Careaga	7/27/2010	4.54	Stove Pipe	Top of Steel	13.58	9.04
32S/12E-24B03	North Beach Deep	Careaga	4/27/2010	1.43	Flush	Top Flush Mount	10.70	9.27
32S/12E-24B03	North Beach Deep	Careaga	1/27/2010	0.94	Flush	Top Flush Mount	10.70	9.76
32S/12E-24B03	North Beach Deep	Careaga	10/19/2009	0.81	Flush	Top Flush Mount	10.70	9.89
32S/12E-24B03	North Beach Deep	Careaga	8/19/2009	4.18	Flush	Top Flush Mount	10.70	6.52
32S/12E-24B03	North Beach Deep	Careaga	5/12/2009	3.18	Flush	Top Flush Mount	10.70	7.52

Appendix A: NCMA Sentry Wells Water Level Data

Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	10/9/2019	14.78	Stove Pipe	Top of Steel	23.16	8.38
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	7/9/2019	13.60	Stove Pipe	Top of Steel	23.16	9.56
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	4/9/2019	13.03	Stove Pipe	Top of Steel	23.16	10.13
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	1/8/2019	14.54	Stove Pipe	Top of Steel	23.16	8.62
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	10/9/2018	15.23	Stove Pipe	Top of Steel	23.16	7.93
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	7/10/2018	14.81	Stove Pipe	Top of Steel	23.16	8.35
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	4/10/2018	14.03	Stove Pipe	Top of Steel	23.16	9.13
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	1/10/2018	14.40	Stove Pipe	Top of Steel	23.16	8.76
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	10/10/2017	14.65	Stove Pipe	Top of Steel	23.16	8.51
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	7/11/2017	13.73	Stove Pipe	Top of Steel	23.16	9.43
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	4/11/2017	13.25	Stove Pipe	Top of Steel	23.16	9.91
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	1/10/2017	13.99	Stove Pipe	Top of Steel	23.16	9.17
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	10/12/2016	17.08	Stove Pipe	Top of Steel	23.16	6.08
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	7/19/2016	16.42	Stove Pipe	Top of Steel	23.16	6.74
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	4/12/2016	14.83	Stove Pipe	Top of Steel	23.16	8.33
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	1/12/2016	15.00	Stove Pipe	Top of Steel	23.16	8.16
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	10/13/2015	17.11	Stove Pipe	Top of Steel	23.16	6.05
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	7/14/2015	16.93	Stove Pipe	Top of Steel	23.16	6.23
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	4/14/2015	16.01	Stove Pipe	Top of Steel	23.16	7.15
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	1/13/2015	15.41	Stove Pipe	Top of Steel	23.16	7.75
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	10/14/2014	17.05	Stove Pipe	Top of Steel	23.16	6.11
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	7/29/2014	17.11	Stove Pipe	Top of Steel	23.16	6.05
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	6/4/2014	16.82	Stove Pipe	Top of Steel	23.16	6.34
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	4/15/2014	15.56	Stove Pipe	Top of Steel	23.16	7.60
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	1/14/2014	16.58	Stove Pipe	Top of Steel	23.16	6.58
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	10/14/2013	17.07	Stove Pipe	Top of Steel	23.16	6.09
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	7/9/2013	16.17	Stove Pipe	Top of Steel	23.16	6.99
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	4/10/2013	14.58	Stove Pipe	Top of Steel	23.16	8.58
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	1/14/2013	14.36	Stove Pipe	Top of Steel	23.16	8.8
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	10/30/2012	14.95	Stove Pipe	Top of Steel	23.16	8.21
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	7/24/2012	14.00	Stove Pipe	Top of Steel	23.16	9.16
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	4/18/2012	13.42	Stove Pipe	Top of Steel	23.16	9.74
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	1/10/2012	13.80	Stove Pipe	Top of Steel	23.16	9.36
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	11/21/2011	13.78	Stove Pipe	Top of Steel	23.16	9.38
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	7/26/2011	13.50	Stove Pipe	Top of Steel	23.16	9.66
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	4/20/2011	12.82	Stove Pipe	Top of Steel	23.16	10.34
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	1/24/2011	13.33	Stove Pipe	Top of Steel	23.16	9.83
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	10/21/2010	16.55	Stove Pipe	Top of Steel	23.16	6.61
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	7/26/2010	15.68	Stove Pipe	Top of Steel	23.16	7.48
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	4/27/2010	11.02	Stove Pipe	Top of Steel	23.16	12.14
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	1/28/2010	12.73	Stove Pipe	Top of Steel	23.16	10.43
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	10/19/2009	14.33	Stove Pipe	Top of Steel	23.16	8.83
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	8/19/2009	14.34	Stove Pipe	Top of Steel	23.16	8.82
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	5/12/2009	12.38	Stove Pipe	Top of Steel	23.16	10.78
32S/13E-30F01	Highway 1 Shallow	Alluvium / Paso Robles	4/7/2009	11.67	Stove Pipe	Top of Steel	24.16	12.49

Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
32S/13E-30F02	Highway 1 Middle	Paso Robles	10/9/2019	15.55	Stove Pipe	Top of Steel	23.16	7.61
32S/13E-30F02	Highway 1 Middle	Paso Robles	7/9/2019	14.90	Stove Pipe	Top of Steel	23.16	8.26
32S/13E-30F02	Highway 1 Middle	Paso Robles	4/9/2019	14.87	Stove Pipe	Top of Steel	23.16	8.29
32S/13E-30F02	Highway 1 Middle	Paso Robles	1/8/2019	15.11	Stove Pipe	Top of Steel	23.16	8.05
32S/13E-30F02	Highway 1 Middle	Paso Robles	10/9/2018	15.94	Stove Pipe	Top of Steel	23.16	7.22
32S/13E-30F02	Highway 1 Middle	Paso Robles	7/10/2018	15.90	Stove Pipe	Top of Steel	23.16	7.26
32S/13E-30F02	Highway 1 Middle	Paso Robles	4/10/2018	14.62	Stove Pipe	Top of Steel	23.16	8.54
32S/13E-30F02	Highway 1 Middle	Paso Robles	1/10/2018	14.79	Stove Pipe	Top of Steel	23.16	8.37
32S/13E-30F02	Highway 1 Middle	Paso Robles	10/10/2017	15.45	Stove Pipe	Top of Steel	23.16	7.71
32S/13E-30F02	Highway 1 Middle	Paso Robles	7/11/2017	15.30	Stove Pipe	Top of Steel	23.16	7.86
32S/13E-30F02	Highway 1 Middle	Paso Robles	4/11/2017	14.27	Stove Pipe	Top of Steel	23.16	8.89
32S/13E-30F02	Highway 1 Middle	Paso Robles	1/10/2017	14.53	Stove Pipe	Top of Steel	23.16	8.63
32S/13E-30F02	Highway 1 Middle	Paso Robles	10/12/2016	17.35	Stove Pipe	Top of Steel	23.16	5.81
32S/13E-30F02	Highway 1 Middle	Paso Robles	7/19/2016	17.63	Stove Pipe	Top of Steel	23.16	5.53
32S/13E-30F02	Highway 1 Middle	Paso Robles	4/12/2016	15.98	Stove Pipe	Top of Steel	23.16	7.18
32S/13E-30F02	Highway 1 Middle	Paso Robles	1/12/2016	15.29	Stove Pipe	Top of Steel	23.16	7.87
32S/13E-30F02	Highway 1 Middle	Paso Robles	10/13/2015	17.29	Stove Pipe	Top of Steel	23.16	5.87
32S/13E-30F02	Highway 1 Middle	Paso Robles	7/14/2015	17.44	Stove Pipe	Top of Steel	23.16	5.72
32S/13E-30F02	Highway 1 Middle	Paso Robles	4/14/2015	16.94	Stove Pipe	Top of Steel	23.16	6.22
32S/13E-30F02	Highway 1 Middle	Paso Robles	1/13/2015	16.41	Stove Pipe	Top of Steel	23.16	6.75
32S/13E-30F02	Highway 1 Middle	Paso Robles	10/14/2014	17.33	Stove Pipe	Top of Steel	23.16	5.83
32S/13E-30F02	Highway 1 Middle	Paso Robles	7/29/2014	17.31	Stove Pipe	Top of Steel	23.16	5.85
32S/13E-30F02	Highway 1 Middle	Paso Robles	6/4/2014	18.00	Stove Pipe	Top of Steel	23.16	5.16
32S/13E-30F02	Highway 1 Middle	Paso Robles	4/15/2014	16.27	Stove Pipe	Top of Steel	23.16	6.89
32S/13E-30F02	Highway 1 Middle	Paso Robles	1/14/2014	17.01	Stove Pipe	Top of Steel	23.16	6.15
32S/13E-30F02	Highway 1 Middle	Paso Robles	10/14/2013	17.52	Stove Pipe	Top of Steel	23.16	5.64
32S/13E-30F02	Highway 1 Middle	Paso Robles	7/9/2013	17.15	Stove Pipe	Top of Steel	23.16	6.01
32S/13E-30F02	Highway 1 Middle	Paso Robles	4/10/2013	15.76	Stove Pipe	Top of Steel	23.16	7.4
32S/13E-30F02	Highway 1 Middle	Paso Robles	1/14/2013	15.01	Stove Pipe	Top of Steel	23.16	8.15
32S/13E-30F02	Highway 1 Middle	Paso Robles	10/30/2012	15.27	Stove Pipe	Top of Steel	23.16	7.89
32S/13E-30F02	Highway 1 Middle	Paso Robles	7/24/2012	14.82	Stove Pipe	Top of Steel	23.16	8.34
32S/13E-30F02	Highway 1 Middle	Paso Robles	4/18/2012	14.38	Stove Pipe	Top of Steel	23.16	8.78
32S/13E-30F02	Highway 1 Middle	Paso Robles	1/12/2012	14.31	Stove Pipe	Top of Steel	23.16	8.85
32S/13E-30F02	Highway 1 Middle	Paso Robles	11/21/2011	14.94	Stove Pipe	Top of Steel	23.16	8.22
32S/13E-30F02	Highway 1 Middle	Paso Robles	7/26/2011	14.46	Stove Pipe	Top of Steel	23.16	8.7
32S/13E-30F02	Highway 1 Middle	Paso Robles	4/20/2011	14.23	Stove Pipe	Top of Steel	23.16	8.93
32S/13E-30F02	Highway 1 Middle	Paso Robles	1/24/2011	14.36	Stove Pipe	Top of Steel	23.16	8.80
32S/13E-30F02	Highway 1 Middle	Paso Robles	10/21/2010	7.39	Stove Pipe	Top of Steel	23.16	15.77
32S/13E-30F02	Highway 1 Middle	Paso Robles	7/26/2010	16.21	Stove Pipe	Top of Steel	23.16	6.95
32S/13E-30F02	Highway 1 Middle	Paso Robles	4/27/2010	12.14	Flush	Top Flush Mount	20.36	8.22
32S/13E-30F02	Highway 1 Middle	Paso Robles	1/28/2010	13.09	Flush	Top Flush Mount	20.36	7.27
32S/13E-30F02	Highway 1 Middle	Paso Robles	10/19/2009	14.36	Flush	Top Flush Mount	20.36	6.00
32S/13E-30F02	Highway 1 Middle	Paso Robles	8/19/2009	14.81	Flush	Top Flush Mount	20.36	5.55
32S/13E-30F02	Highway 1 Middle	Paso Robles	5/12/2009	14.34	Flush	Top Flush Mount	20.36	6.02
32S/13E-30F02	Highway 1 Middle	Paso Robles	4/7/2009	12.28	Flush	Top Flush Mount	20.36	8.08

Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
32S/13E-30F03	Highway 1 Deep	Careaga	10/9/2019	14.40	Stove Pipe	Top of Steel	23.16	8.76
32S/13E-30F03	Highway 1 Deep	Careaga	7/9/2019	13.38	Stove Pipe	Top of Steel	23.16	9.78
32S/13E-30F03	Highway 1 Deep	Careaga	4/9/2019	12.55	Stove Pipe	Top of Steel	23.16	10.61
32S/13E-30F03	Highway 1 Deep	Careaga	1/8/2019	14.27	Stove Pipe	Top of Steel	23.16	8.89
32S/13E-30F03	Highway 1 Deep	Careaga	10/9/2018	15.48	Stove Pipe	Top of Steel	23.16	7.68
32S/13E-30F03	Highway 1 Deep	Careaga	7/10/2018	16.11	Stove Pipe	Top of Steel	23.16	7.05
32S/13E-30F03	Highway 1 Deep	Careaga	4/10/2018	12.16	Stove Pipe	Top of Steel	23.16	11.00
32S/13E-30F03	Highway 1 Deep	Careaga	1/10/2018	12.85	Stove Pipe	Top of Steel	23.16	10.31
32S/13E-30F03	Highway 1 Deep	Careaga	10/10/2017	14.70	Stove Pipe	Top of Steel	23.16	8.46
32S/13E-30F03	Highway 1 Deep	Careaga	7/11/2017	13.64	Stove Pipe	Top of Steel	23.16	9.52
32S/13E-30F03	Highway 1 Deep	Careaga	4/11/2017	12.36	Stove Pipe	Top of Steel	23.16	10.80
32S/13E-30F03	Highway 1 Deep	Careaga	1/10/2017	14.25	Stove Pipe	Top of Steel	23.16	8.91
32S/13E-30F03	Highway 1 Deep	Careaga	10/12/2016	17.82	Stove Pipe	Top of Steel	23.16	5.34
32S/13E-30F03	Highway 1 Deep	Careaga	7/19/2016	17.22	Stove Pipe	Top of Steel	23.16	5.94
32S/13E-30F03	Highway 1 Deep	Careaga	4/12/2016	14.90	Stove Pipe	Top of Steel	23.16	8.26
32S/13E-30F03	Highway 1 Deep	Careaga	1/12/2016	14.84	Stove Pipe	Top of Steel	23.16	8.32
32S/13E-30F03	Highway 1 Deep	Careaga	10/13/2015	18.87	Stove Pipe	Top of Steel	23.16	4.29
32S/13E-30F03	Highway 1 Deep	Careaga	7/14/2015	18.87	Stove Pipe	Top of Steel	23.16	4.29
32S/13E-30F03	Highway 1 Deep	Careaga	4/14/2015	17.92	Stove Pipe	Top of Steel	23.16	5.24
32S/13E-30F03	Highway 1 Deep	Careaga	1/13/2015	14.13	Stove Pipe	Top of Steel	23.16	9.03
32S/13E-30F03	Highway 1 Deep	Careaga	10/14/2014	18.98	Stove Pipe	Top of Steel	23.16	4.18
32S/13E-30F03	Highway 1 Deep	Careaga	7/29/2014	18.62	Stove Pipe	Top of Steel	23.16	4.54
32S/13E-30F03	Highway 1 Deep	Careaga	6/4/2014	22.27	Stove Pipe	Top of Steel	23.16	0.89
32S/13E-30F03	Highway 1 Deep	Careaga	5/5/2014	21.34	Stove Pipe	Top of Steel	23.16	1.82
32S/13E-30F03	Highway 1 Deep	Careaga	4/15/2014	16.14	Stove Pipe	Top of Steel	23.16	7.02
32S/13E-30F03	Highway 1 Deep	Careaga	1/14/2014	15.35	Stove Pipe	Top of Steel	23.16	7.81
32S/13E-30F03	Highway 1 Deep	Careaga	10/14/2013	17.30	Stove Pipe	Top of Steel	23.16	5.86
32S/13E-30F03	Highway 1 Deep	Careaga	7/9/2013	16.61	Stove Pipe	Top of Steel	23.16	6.55
32S/13E-30F03	Highway 1 Deep	Careaga	4/10/2013	14.69	Stove Pipe	Top of Steel	23.16	8.47
32S/13E-30F03	Highway 1 Deep	Careaga	1/14/2013	12.62	Stove Pipe	Top of Steel	23.16	10.54
32S/13E-30F03	Highway 1 Deep	Careaga	10/30/2012	14.61	Stove Pipe	Top of Steel	23.16	8.55
32S/13E-30F03	Highway 1 Deep	Careaga	7/24/2012	14.50	Stove Pipe	Top of Steel	23.16	8.66
32S/13E-30F03	Highway 1 Deep	Careaga	4/18/2012	10.43	Stove Pipe	Top of Steel	23.16	12.73
32S/13E-30F03	Highway 1 Deep	Careaga	1/12/2012	12.37	Stove Pipe	Top of Steel	23.16	10.79
32S/13E-30F03	Highway 1 Deep	Careaga	11/21/2011	13.24	Stove Pipe	Top of Steel	23.16	9.92
32S/13E-30F03	Highway 1 Deep	Careaga	7/26/2011	14.22	Stove Pipe	Top of Steel	23.16	8.94
32S/13E-30F03	Highway 1 Deep	Careaga	4/20/2011	12.51	Stove Pipe	Top of Steel	23.16	10.65
32S/13E-30F03	Highway 1 Deep	Careaga	1/24/2011	12.67	Stove Pipe	Top of Steel	23.16	10.49
32S/13E-30F03	Highway 1 Deep	Careaga	10/21/2010	6.62	Stove Pipe	Top of Steel	23.16	16.54
32S/13E-30F03	Highway 1 Deep	Careaga	7/26/2010	17.32	Stove Pipe	Top of Steel	23.16	5.84
32S/13E-30F03	Highway 1 Deep	Careaga	4/27/2010	11.38	Flush	Top Flush Mount	20.36	8.98
32S/13E-30F03	Highway 1 Deep	Careaga	1/28/2010	10.98	Flush	Top Flush Mount	20.36	9.38
32S/13E-30F03	Highway 1 Deep	Careaga	10/19/2009	14.18	Flush	Top Flush Mount	20.36	6.18
32S/13E-30F03	Highway 1 Deep	Careaga	8/19/2009	20.23	Flush	Top Flush Mount	20.36	0.13
32S/13E-30F03	Highway 1 Deep	Careaga	5/12/2009	17.68	Flush	Top Flush Mount	20.36	2.68

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Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
32S/13E-30N01	Pier Ave Shallow	Alluvium	10/9/2019	9.63	Stove Pipe	Top of Steel	16.13	6.50
32S/13E-30N01	Pier Ave Shallow	Alluvium	7/9/2019	9.25	Stove Pipe	Top of Steel	16.13	6.88
32S/13E-30N01	Pier Ave Shallow	Alluvium	4/9/2019	8.91	Stove Pipe	Top of Steel	16.13	7.22
32S/13E-30N01	Pier Ave Shallow	Alluvium	1/8/2019	8.60	Stove Pipe	Top of Steel	16.13	7.53
32S/13E-30N01	Pier Ave Shallow	Alluvium	10/9/2018	9.35	Stove Pipe	Top of Steel	16.13	6.78
32S/13E-30N01	Pier Ave Shallow	Alluvium	7/10/2018	9.46	Stove Pipe	Top of Steel	16.13	6.67
32S/13E-30N01	Pier Ave Shallow	Alluvium	4/10/2018	9.04	Stove Pipe	Top of Steel	16.13	7.09
32S/13E-30N01	Pier Ave Shallow	Alluvium	1/10/2018	8.97	Stove Pipe	Top of Steel	16.13	7.16
32S/13E-30N01	Pier Ave Shallow	Alluvium	10/10/2017	9.35	Stove Pipe	Top of Steel	16.13	6.78
32S/13E-30N01	Pier Ave Shallow	Alluvium	7/11/2017	9.00	Stove Pipe	Top of Steel	16.13	7.13
32S/13E-30N01	Pier Ave Shallow	Alluvium	4/11/2017	8.70	Stove Pipe	Top of Steel	16.13	7.43
32S/13E-30N01	Pier Ave Shallow	Alluvium	1/10/2017	7.89	Stove Pipe	Top of Steel	16.13	8.24
32S/13E-30N01	Pier Ave Shallow	Alluvium	10/12/2016	10.21	Stove Pipe	Top of Steel	16.13	5.92
32S/13E-30N01	Pier Ave Shallow	Alluvium	7/19/2016	9.91	Stove Pipe	Top of Steel	16.13	6.22
32S/13E-30N01	Pier Ave Shallow	Alluvium	4/12/2016	8.93	Stove Pipe	Top of Steel	16.13	7.20
32S/13E-30N01	Pier Ave Shallow	Alluvium	1/12/2016	8.73	Stove Pipe	Top of Steel	16.13	7.40
32S/13E-30N01	Pier Ave Shallow	Alluvium	10/13/2015	10.11	Stove Pipe	Top of Steel	16.13	6.02
32S/13E-30N01	Pier Ave Shallow	Alluvium	7/14/2015	9.91	Stove Pipe	Top of Steel	16.13	6.22
32S/13E-30N01	Pier Ave Shallow	Alluvium	4/14/2015	9.51	Stove Pipe	Top of Steel	16.13	6.62
32S/13E-30N01	Pier Ave Shallow	Alluvium	1/13/2015	9.03	Stove Pipe	Top of Steel	16.13	7.10
32S/13E-30N01	Pier Ave Shallow	Alluvium	10/14/2014	9.95	Stove Pipe	Top of Steel	16.13	6.18
32S/13E-30N01	Pier Ave Shallow	Alluvium	7/29/2014	9.88	Stove Pipe	Top of Steel	16.13	6.25
32S/13E-30N01	Pier Ave Shallow	Alluvium	6/4/2014	9.54	Stove Pipe	Top of Steel	16.13	6.59
32S/13E-30N01	Pier Ave Shallow	Alluvium	4/15/2014	9.17	Stove Pipe	Top of Steel	16.13	6.96
32S/13E-30N01	Pier Ave Shallow	Alluvium	1/14/2014	9.61	Stove Pipe	Top of Steel	16.13	6.52
32S/13E-30N01	Pier Ave Shallow	Alluvium	10/14/2013	9.86	Stove Pipe	Top of Steel	16.13	6.27
32S/13E-30N01	Pier Ave Shallow	Alluvium	7/9/2013	9.40	Stove Pipe	Top of Steel	16.13	6.73
32S/13E-30N01	Pier Ave Shallow	Alluvium	4/10/2013	8.98	Stove Pipe	Top of Steel	16.13	7.15
32S/13E-30N01	Pier Ave Shallow	Alluvium	1/14/2013	8.60	Stove Pipe	Top of Steel	16.13	7.53
32S/13E-30N01	Pier Ave Shallow	Alluvium	10/29/2012	8.96	Stove Pipe	Top of Steel	16.13	7.17
32S/13E-30N01	Pier Ave Shallow	Alluvium	7/23/2012	8.54	Stove Pipe	Top of Steel	16.13	7.59
32S/13E-30N01	Pier Ave Shallow	Alluvium	4/18/2012	8.53	Stove Pipe	Top of Steel	16.13	7.60
32S/13E-30N01	Pier Ave Shallow	Alluvium	1/9/2012	8.74	Stove Pipe	Top of Steel	16.13	7.39
32S/13E-30N01	Pier Ave Shallow	Alluvium	11/21/2011	8.78	Stove Pipe	Top of Steel	16.13	7.35
32S/13E-30N01	Pier Ave Shallow	Alluvium	7/26/2011	9.01	Stove Pipe	Top of Steel	16.13	7.12
32S/13E-30N01	Pier Ave Shallow	Alluvium	4/20/2011	8.59	Stove Pipe	Top of Steel	16.13	7.54
32S/13E-30N01	Pier Ave Shallow	Alluvium	1/24/2011	8.18	Stove Pipe	Top of Steel	16.13	7.95
32S/13E-30N01	Pier Ave Shallow	Alluvium	10/21/2010	9.99	Stove Pipe	Top of Steel	16.13	6.14
32S/13E-30N01	Pier Ave Shallow	Alluvium	7/27/2010	8.97	Stove Pipe	Top of Steel	16.13	7.16
32S/13E-30N01	Pier Ave Shallow	Alluvium	4/27/2010	6.14	Flush	Top Flush Mount	13.53	7.39
32S/13E-30N01	Pier Ave Shallow	Alluvium	1/26/2010	4.90	Flush	Top Flush Mount	13.53	8.63
32S/13E-30N01	Pier Ave Shallow	Alluvium	10/20/2009	6.53	Flush	Top Flush Mount	13.53	7.00
32S/13E-30N01	Pier Ave Shallow	Alluvium	8/20/2009	6.71	Flush	Top Flush Mount	13.53	6.82
32S/13E-30N01	Pier Ave Shallow	Alluvium	5/11/2009	6.03	Flush	Top Flush Mount	13.53	7.50
32S/13E-30N01	Pier Ave Shallow	Alluvium	4/7/2009	5.83	Flush	Top Flush Mount	13.53	7.70

Appendix A: NCMA Sentry Wells Water Level Data

Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
32S/13E-30N03	Pier Ave Middle	Paso Robles	10/9/2019	8.29	Stove Pipe	Top of Steel	16.13	7.84
32S/13E-30N03	Pier Ave Middle	Paso Robles	7/9/2019	8.35	Stove Pipe	Top of Steel	16.13	7.78
32S/13E-30N03	Pier Ave Middle	Paso Robles	4/9/2019	8.25	Stove Pipe	Top of Steel	16.13	7.88
32S/13E-30N03	Pier Ave Middle	Paso Robles	1/8/2019	7.90	Stove Pipe	Top of Steel	16.13	8.23
32S/13E-30N03	Pier Ave Middle	Paso Robles	10/9/2018	8.37	Stove Pipe	Top of Steel	16.13	7.76
32S/13E-30N03	Pier Ave Middle	Paso Robles	7/10/2018	9.12	Stove Pipe	Top of Steel	16.13	7.01
32S/13E-30N03	Pier Ave Middle	Paso Robles	4/10/2018	7.50	Stove Pipe	Top of Steel	16.13	8.63
32S/13E-30N03	Pier Ave Middle	Paso Robles	1/10/2018	7.61	Stove Pipe	Top of Steel	16.13	8.52
32S/13E-30N03	Pier Ave Middle	Paso Robles	10/10/2017	8.61	Stove Pipe	Top of Steel	16.13	7.52
32S/13E-30N03	Pier Ave Middle	Paso Robles	7/11/2017	8.84	Stove Pipe	Top of Steel	16.13	7.29
32S/13E-30N03	Pier Ave Middle	Paso Robles	4/11/2017	7.55	Stove Pipe	Top of Steel	16.13	8.58
32S/13E-30N03	Pier Ave Middle	Paso Robles	1/10/2017	7.11	Stove Pipe	Top of Steel	16.13	9.02
32S/13E-30N03	Pier Ave Middle	Paso Robles	10/12/2016	10.13	Stove Pipe	Top of Steel	16.13	6.00
32S/13E-30N03	Pier Ave Middle	Paso Robles	7/19/2016	10.62	Stove Pipe	Top of Steel	16.13	5.51
32S/13E-30N03	Pier Ave Middle	Paso Robles	4/12/2016	9.21	Stove Pipe	Top of Steel	16.13	6.92
32S/13E-30N03	Pier Ave Middle	Paso Robles	1/12/2016	7.98	Stove Pipe	Top of Steel	16.13	8.15
32S/13E-30N03	Pier Ave Middle	Paso Robles	10/13/2015	10.48	Stove Pipe	Top of Steel	16.13	5.65
32S/13E-30N03	Pier Ave Middle	Paso Robles	7/14/2015	10.88	Stove Pipe	Top of Steel	16.13	5.25
32S/13E-30N03	Pier Ave Middle	Paso Robles	4/14/2015	11.88	Stove Pipe	Top of Steel	16.13	4.25
32S/13E-30N03	Pier Ave Middle	Paso Robles	1/13/2015	9.40	Stove Pipe	Top of Steel	16.13	6.73
32S/13E-30N03	Pier Ave Middle	Paso Robles	10/14/2014	10.52	Stove Pipe	Top of Steel	16.13	5.61
32S/13E-30N03	Pier Ave Middle	Paso Robles	7/29/2014	10.22	Stove Pipe	Top of Steel	16.13	5.91
32S/13E-30N03	Pier Ave Middle	Paso Robles	6/4/2014	11.33	Stove Pipe	Top of Steel	16.13	4.80
32S/13E-30N03	Pier Ave Middle	Paso Robles	4/15/2014	9.31	Stove Pipe	Top of Steel	16.13	6.82
32S/13E-30N03	Pier Ave Middle	Paso Robles	1/14/2014	10.26	Stove Pipe	Top of Steel	16.13	5.87
32S/13E-30N03	Pier Ave Middle	Paso Robles	10/14/2013	10.72	Stove Pipe	Top of Steel	16.13	5.41
32S/13E-30N03	Pier Ave Middle	Paso Robles	7/9/2013	10.36	Stove Pipe	Top of Steel	16.13	5.77
32S/13E-30N03	Pier Ave Middle	Paso Robles	4/10/2013	8.26	Stove Pipe	Top of Steel	16.13	7.87
32S/13E-30N03	Pier Ave Middle	Paso Robles	1/14/2013	7.71	Stove Pipe	Top of Steel	16.13	8.42
32S/13E-30N03	Pier Ave Middle	Paso Robles	10/29/2012	8.01	Stove Pipe	Top of Steel	16.13	8.12
32S/13E-30N03	Pier Ave Middle	Paso Robles	7/23/2012	9.15	Stove Pipe	Top of Steel	16.13	6.98
32S/13E-30N03	Pier Ave Middle	Paso Robles	4/18/2012	6.72	Stove Pipe	Top of Steel	16.13	9.41
32S/13E-30N03	Pier Ave Middle	Paso Robles	1/11/2012	7.17	Stove Pipe	Top of Steel	16.13	8.96
32S/13E-30N03	Pier Ave Middle	Paso Robles	11/21/2011	6.45	Stove Pipe	Top of Steel	16.13	9.68
32S/13E-30N03	Pier Ave Middle	Paso Robles	7/26/2011	7.59	Stove Pipe	Top of Steel	16.13	8.54
32S/13E-30N03	Pier Ave Middle	Paso Robles	4/20/2011	6.65	Stove Pipe	Top of Steel	16.13	9.48
32S/13E-30N03	Pier Ave Middle	Paso Robles	1/24/2011	6.68	Stove Pipe	Top of Steel	16.13	9.45
32S/13E-30N03	Pier Ave Middle	Paso Robles	10/21/2010	10.76	Stove Pipe	Top of Steel	16.13	5.37
32S/13E-30N03	Pier Ave Middle	Paso Robles	7/27/2010	9.53	Stove Pipe	Top of Steel	16.13	6.60
32S/13E-30N03	Pier Ave Middle	Paso Robles	4/27/2010	5.26	Flush	Top Flush Mount	13.53	8.27
32S/13E-30N03	Pier Ave Middle	Paso Robles	1/26/2010	5.88	Flush	Top Flush Mount	13.53	7.65
32S/13E-30N03	Pier Ave Middle	Paso Robles	10/20/2009	6.56	Flush	Top Flush Mount	13.53	6.97
32S/13E-30N03	Pier Ave Middle	Paso Robles	8/20/2009	7.50	Flush	Top Flush Mount	13.53	6.03
32S/13E-30N03	Pier Ave Middle	Paso Robles	5/12/2009	6.33	Flush	Top Flush Mount	13.53	7.20

Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
32S/13E-30N02	Pier Ave Deep	Paso Robles	10/9/2019	10.00	Stove Pipe	Top of Steel	16.13	6.13
32S/13E-30N02	Pier Ave Deep	Paso Robles	7/9/2019	8.05	Stove Pipe	Top of Steel	16.13	8.08
32S/13E-30N02	Pier Ave Deep	Paso Robles	4/9/2019	5.23	Stove Pipe	Top of Steel	16.13	10.90
32S/13E-30N02	Pier Ave Deep	Paso Robles	1/8/2019	7.60	Stove Pipe	Top of Steel	16.13	8.53
32S/13E-30N02	Pier Ave Deep	Paso Robles	10/9/2018	10.77	Stove Pipe	Top of Steel	16.13	5.36
32S/13E-30N02	Pier Ave Deep	Paso Robles	7/10/2018	10.23	Stove Pipe	Top of Steel	16.13	5.90
32S/13E-30N02	Pier Ave Deep	Paso Robles	4/10/2018	5.96	Stove Pipe	Top of Steel	16.13	10.17
32S/13E-30N02	Pier Ave Deep	Paso Robles	1/10/2018	7.43	Stove Pipe	Top of Steel	16.13	8.70
32S/13E-30N02	Pier Ave Deep	Paso Robles	10/10/2017	10.40	Stove Pipe	Top of Steel	16.13	5.73
32S/13E-30N02	Pier Ave Deep	Paso Robles	7/11/2017	8.38	Stove Pipe	Top of Steel	16.13	7.75
32S/13E-30N02	Pier Ave Deep	Paso Robles	4/11/2017	5.35	Stove Pipe	Top of Steel	16.13	10.78
32S/13E-30N02	Pier Ave Deep	Paso Robles	1/10/2017	7.34	Stove Pipe	Top of Steel	16.13	8.79
32S/13E-30N02	Pier Ave Deep	Paso Robles	10/12/2016	13.44	Stove Pipe	Top of Steel	16.13	2.69
32S/13E-30N02	Pier Ave Deep	Paso Robles	7/19/2016	12.40	Stove Pipe	Top of Steel	16.13	3.73
32S/13E-30N02	Pier Ave Deep	Paso Robles	4/12/2016	8.57	Stove Pipe	Top of Steel	16.13	7.56
32S/13E-30N02	Pier Ave Deep	Paso Robles	1/12/2016	7.48	Stove Pipe	Top of Steel	16.13	8.65
32S/13E-30N02	Pier Ave Deep	Paso Robles	10/13/2015	14.14	Stove Pipe	Top of Steel	16.13	1.99
32S/13E-30N02	Pier Ave Deep	Paso Robles	7/14/2015	13.55	Stove Pipe	Top of Steel	16.13	2.58
32S/13E-30N02	Pier Ave Deep	Paso Robles	4/14/2015	10.02	Stove Pipe	Top of Steel	16.13	6.11
32S/13E-30N02	Pier Ave Deep	Paso Robles	1/13/2015	7.85	Stove Pipe	Top of Steel	16.13	8.28
32S/13E-30N02	Pier Ave Deep	Paso Robles	10/14/2014	13.69	Stove Pipe	Top of Steel	16.13	2.44
32S/13E-30N02	Pier Ave Deep	Paso Robles	7/29/2014	13.27	Stove Pipe	Top of Steel	16.13	2.86
32S/13E-30N02	Pier Ave Deep	Paso Robles	6/4/2014	15.20	Stove Pipe	Top of Steel	16.13	0.93
32S/13E-30N02	Pier Ave Deep	Paso Robles	5/5/2014	13.19	Stove Pipe	Top of Steel	16.13	2.94
32S/13E-30N02	Pier Ave Deep	Paso Robles	4/15/2014	8.57	Stove Pipe	Top of Steel	16.13	7.56
32S/13E-30N02	Pier Ave Deep	Paso Robles	1/14/2014	9.30	Stove Pipe	Top of Steel	16.13	6.83
32S/13E-30N02	Pier Ave Deep	Paso Robles	10/14/2013	12.13	Stove Pipe	Top of Steel	16.13	4.00
32S/13E-30N02	Pier Ave Deep	Paso Robles	7/9/2013	11.05	Stove Pipe	Top of Steel	16.13	5.08
32S/13E-30N02	Pier Ave Deep	Paso Robles	4/10/2013	7.06	Stove Pipe	Top of Steel	16.13	9.07
32S/13E-30N02	Pier Ave Deep	Paso Robles	1/14/2013	4.98	Stove Pipe	Top of Steel	16.13	11.15
32S/13E-30N02	Pier Ave Deep	Paso Robles	10/29/2012	8.52	Stove Pipe	Top of Steel	16.13	7.61
32S/13E-30N02	Pier Ave Deep	Paso Robles	7/23/2012	8.31	Stove Pipe	Top of Steel	16.13	7.82
32S/13E-30N02	Pier Ave Deep	Paso Robles	4/18/2012	3.45	Stove Pipe	Top of Steel	16.13	12.68
32S/13E-30N02	Pier Ave Deep	Paso Robles	1/11/2012	4.88	Stove Pipe	Top of Steel	16.13	11.25
32S/13E-30N02	Pier Ave Deep	Paso Robles	11/21/2011	5.35	Stove Pipe	Top of Steel	16.13	10.78
32S/13E-30N02	Pier Ave Deep	Paso Robles	7/26/2011	7.25	Stove Pipe	Top of Steel	16.13	8.88
32S/13E-30N02	Pier Ave Deep	Paso Robles	4/20/2011	3.53	Flush	Top Flush Mount	13.53	10.00
32S/13E-30N02	Pier Ave Deep	Paso Robles	1/24/2011	3.67	Flush	Top Flush Mount	13.53	9.86
32S/13E-30N02	Pier Ave Deep	Paso Robles	10/21/2010	10.42	Flush	Top Flush Mount	13.53	3.11
32S/13E-30N02	Pier Ave Deep	Paso Robles	7/27/2010	10.02	Flush	Top Flush Mount	13.53	3.51
32S/13E-30N02	Pier Ave Deep	Paso Robles	4/27/2010	6.14	Flush	Top Flush Mount	13.53	7.39
32S/13E-30N02	Pier Ave Deep	Paso Robles	2/25/2010	1.72	Flush	Top Flush Mount	13.53	11.81
32S/13E-30N02	Pier Ave Deep	Paso Robles	2/25/2010	1.72	Flush	Top Flush Mount	13.53	11.81
32S/13E-30N02	Pier Ave Deep	Paso Robles	1/26/2010	3.72	Flush	Top Flush Mount	13.53	9.81
32S/13E-30N02	Pier Ave Deep	Paso Robles	10/20/2009	7.38	Flush	Top Flush Mount	13.53	6.15
32S/13E-30N02	Pier Ave Deep	Paso Robles	8/20/2009	11.94	Flush	Top Flush Mount	13.53	1.59
32S/13E-30N02	Pier Ave Deep	Paso Robles	5/11/2009	6.98	Flush	Top Flush Mount	13.53	6.55

Appendix A: NCMA Sentry Wells Water Level Data

Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
32S/13E-31H10	Oceano Green	Paso Robles	10/9/2019	27.50	Manhole	Top Flush Mount	34.63	7.13
32S/13E-31H10	Oceano Green	Paso Robles	7/9/2019	28.68	Manhole	Top Flush Mount	34.63	5.95
32S/13E-31H10	Oceano Green	Paso Robles	4/9/2019	22.35	Manhole	Top Flush Mount	34.63	12.28
32S/13E-31H10	Oceano Green	Paso Robles	1/8/2019	24.48	Manhole	Top Flush Mount	34.63	10.15
32S/13E-31H10	Oceano Green	Paso Robles	10/9/2018	27.35	Manhole	Top Flush Mount	34.63	7.28
32S/13E-31H10	Oceano Green	Paso Robles	7/10/2018	27.94	Manhole	Top Flush Mount	34.63	6.69
32S/13E-31H10	Oceano Green	Paso Robles	4/10/2018	24.15	Manhole	Top Flush Mount	34.63	10.48
32S/13E-31H10	Oceano Green	Paso Robles	1/10/2018	24.15	Manhole	Top Flush Mount	34.63	10.48
32S/13E-31H10	Oceano Green	Paso Robles	10/10/2017	26.53	Manhole	Top Flush Mount	34.63	8.10
32S/13E-31H10	Oceano Green	Paso Robles	7/11/2017	25.11	Manhole	Top Flush Mount	34.63	9.52
32S/13E-31H10	Oceano Green	Paso Robles	4/11/2017	21.98	Manhole	Top Flush Mount	34.63	12.65
32S/13E-31H10	Oceano Green	Paso Robles	1/10/2017	24.50	Manhole	Top Flush Mount	34.63	10.13
32S/13E-31H10	Oceano Green	Paso Robles	10/12/2016	30.74	Manhole	Top Flush Mount	34.63	3.89
32S/13E-31H10	Oceano Green	Paso Robles	7/19/2016	29.77	Manhole	Top Flush Mount	34.63	4.86
32S/13E-31H10	Oceano Green	Paso Robles	4/12/2016	25.64	Manhole	Top Flush Mount	34.63	8.99
32S/13E-31H10	Oceano Green	Paso Robles	1/12/2016	20.83	Manhole	Top of Casing	30.49	9.66
32S/13E-31H10	Oceano Green	Paso Robles	10/13/2015	31.88	Manhole	Top Flush Mount	34.63	2.75
32S/13E-31H10	Oceano Green	Paso Robles	7/14/2015	31.61	Manhole	Top Flush Mount	34.63	3.02
32S/13E-31H10	Oceano Green	Paso Robles	4/14/2015	28.81	Manhole	Top Flush Mount	34.63	5.82
32S/13E-31H10	Oceano Green	Paso Robles	1/13/2015	26.11	Manhole	Top Flush Mount	34.63	8.52
32S/13E-31H10	Oceano Green	Paso Robles	10/14/2014	31.64	Manhole	Top Flush Mount	34.63	2.99
32S/13E-31H10	Oceano Green	Paso Robles	7/29/2014	32.30	Manhole	Top Flush Mount	34.63	2.33
32S/13E-31H10	Oceano Green	Paso Robles	6/4/2014	32.82	Manhole	Top Flush Mount	34.63	1.81
32S/13E-31H10	Oceano Green	Paso Robles	4/15/2014	27.98	Manhole	Top Flush Mount	34.63	6.65
32S/13E-31H10	Oceano Green	Paso Robles	1/14/2014	28.55	Manhole	Top Flush Mount	34.63	6.08
32S/13E-31H10	Oceano Green	Paso Robles	10/14/2013	30.31	Manhole	Top Flush Mount	34.63	4.32
32S/13E-31H10	Oceano Green	Paso Robles	7/9/2013	29.98	Manhole	Top Flush Mount	34.63	4.65
32S/13E-31H10	Oceano Green	Paso Robles	4/10/2013	23.30	Manhole	Top Flush Mount	34.63	11.33
32S/13E-31H10	Oceano Green	Paso Robles	1/14/2013	23.59	Manhole	Top Flush Mount	34.63	11.04
32S/13E-31H10	Oceano Green	Paso Robles	10/30/2012	27.31	Manhole	Top Flush Mount	34.63	7.32
32S/13E-31H10	Oceano Green	Paso Robles	7/25/2012	27.15	Manhole	Top Flush Mount	34.63	7.48
32S/13E-31H10	Oceano Green	Paso Robles	4/18/2012	21.65	Manhole	Top Flush Mount	34.63	12.98
32S/13E-31H10	Oceano Green	Paso Robles	1/12/2012	23.29	Manhole	Top Flush Mount	34.63	11.34
32S/13E-31H10	Oceano Green	Paso Robles	11/21/2011	22.46	Manhole	Top Flush Mount	34.63	12.17
32S/13E-31H10	Oceano Green	Paso Robles	7/26/2011	25.51	Manhole	Top Flush Mount	34.63	9.12
32S/13E-31H10	Oceano Green	Paso Robles	4/20/2011	114.79	Manhole	Top Flush Mount	34.63	-80.16
32S/13E-31H10	Oceano Green	Paso Robles	1/24/2011	106.59	Manhole	Top Flush Mount	34.63	-71.96
32S/13E-31H10	Oceano Green	Paso Robles	10/21/2010	112.71	Manhole	Top of Casing	30.49	-82.22
32S/13E-31H10	Oceano Green	Paso Robles	7/26/2010	95.61	Manhole	Top of Casing	30.49	-65.12
32S/13E-31H10	Oceano Green	Paso Robles	4/26/2010	63.90	Manhole	Top of Casing	30.49	-33.41
32S/13E-31H10	Oceano Green	Paso Robles	1/27/2010	43.71	Manhole	Top of Casing	30.49	-13.22
32S/13E-31H10	Oceano Green	Paso Robles	10/20/2009	29.20	Manhole	Top of Casing	30.49	1.29
32S/13E-31H10	Oceano Green	Paso Robles	8/19/2009	24.55	Manhole	Top of Casing	30.49	5.94
32S/13E-31H10	Oceano Green	Paso Robles	4/7/2009	28.12	Manhole	Top of Casing	30.49	2.37

Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
32S/13E-31H11	Oceano Blue	Paso Robles	10/9/2019	28.31	Manhole	Top Flush Mount	34.63	6.32
32S/13E-31H11	Oceano Blue	Paso Robles	7/9/2019	26.69	Manhole	Top Flush Mount	34.63	7.94
32S/13E-31H11	Oceano Blue	Paso Robles	4/9/2019	22.61	Manhole	Top Flush Mount	34.63	12.02
32S/13E-31H11	Oceano Blue	Paso Robles	1/8/2019	25.18	Manhole	Top Flush Mount	34.63	9.45
32S/13E-31H11	Oceano Blue	Paso Robles	10/9/2018	28.82	Manhole	Top Flush Mount	34.63	5.81
32S/13E-31H11	Oceano Blue	Paso Robles	7/10/2018	28.60	Manhole	Top Flush Mount	34.63	6.03
32S/13E-31H11	Oceano Blue	Paso Robles	4/10/2018	23.98	Manhole	Top Flush Mount	34.63	10.65
32S/13E-31H11	Oceano Blue	Paso Robles	1/10/2018	25.08	Manhole	Top Flush Mount	34.63	9.55
32S/13E-31H11	Oceano Blue	Paso Robles	10/10/2017	28.03	Manhole	Top Flush Mount	34.63	6.6
32S/13E-31H11	Oceano Blue	Paso Robles	7/11/2017	26.18	Manhole	Top Flush Mount	34.63	8.45
32S/13E-31H11	Oceano Blue	Paso Robles	4/11/2017	21.90	Manhole	Top Flush Mount	34.63	12.73
32S/13E-31H11	Oceano Blue	Paso Robles	1/10/2017	25.00	Manhole	Top Flush Mount	34.63	9.63
32S/13E-31H11	Oceano Blue	Paso Robles	10/12/2016	30.74	Manhole	Top Flush Mount	34.63	3.89
32S/13E-31H11	Oceano Blue	Paso Robles	7/19/2016	29.62	Manhole	Top Flush Mount	34.63	5.01
32S/13E-31H11	Oceano Blue	Paso Robles	4/12/2016	25.13	Manhole	Top Flush Mount	34.63	9.50
32S/13E-31H11	Oceano Blue	Paso Robles	1/12/2016	22.00	Manhole	Top of Casing	30.54	8.54
32S/13E-31H11	Oceano Blue	Paso Robles	10/13/2015	32.70	Manhole	Top Flush Mount	34.63	1.93
32S/13E-31H11	Oceano Blue	Paso Robles	7/14/2015	32.21	Manhole	Top Flush Mount	34.63	2.42
32S/13E-31H11	Oceano Blue	Paso Robles	4/14/2015	28.41	Manhole	Top Flush Mount	34.63	6.22
32S/13E-31H11	Oceano Blue	Paso Robles	1/13/2015	25.98	Manhole	Top Flush Mount	34.63	8.65
32S/13E-31H11	Oceano Blue	Paso Robles	10/14/2014	32.70	Manhole	Top Flush Mount	34.63	1.93
32S/13E-31H11	Oceano Blue	Paso Robles	7/29/2014	32.69	Manhole	Top Flush Mount	34.63	1.94
32S/13E-31H11	Oceano Blue	Paso Robles	6/4/2014	34.02	Manhole	Top Flush Mount	34.63	0.61
32S/13E-31H11	Oceano Blue	Paso Robles	4/15/2014	27.07	Manhole	Top Flush Mount	34.63	7.56
32S/13E-31H11	Oceano Blue	Paso Robles	1/14/2014	27.86	Manhole	Top Flush Mount	34.63	6.77
32S/13E-31H11	Oceano Blue	Paso Robles	10/14/2013	30.98	Manhole	Top Flush Mount	34.63	3.65
32S/13E-31H11	Oceano Blue	Paso Robles	7/9/2013	29.36	Manhole	Top Flush Mount	34.63	5.27
32S/13E-31H11	Oceano Blue	Paso Robles	4/10/2013	24.45	Manhole	Top Flush Mount	34.63	10.18
32S/13E-31H11	Oceano Blue	Paso Robles	1/14/2013	23.14	Manhole	Top Flush Mount	34.63	11.49
32S/13E-31H11	Oceano Blue	Paso Robles	10/30/2012	27.68	Manhole	Top Flush Mount	34.63	6.95
32S/13E-31H11	Oceano Blue	Paso Robles	7/25/2012	27.18	Manhole	Top Flush Mount	34.63	7.45
32S/13E-31H11	Oceano Blue	Paso Robles	4/18/2012	20.10	Manhole	Top Flush Mount	34.63	14.53
32S/13E-31H11	Oceano Blue	Paso Robles	1/12/2012	22.26	Manhole	Top Flush Mount	34.63	12.37
32S/13E-31H11	Oceano Blue	Paso Robles	11/21/2011	22.73	Manhole	Top Flush Mount	34.63	11.90
32S/13E-31H11	Oceano Blue	Paso Robles	7/26/2011	25.29	Manhole	Top Flush Mount	34.63	9.34
32S/13E-31H11	Oceano Blue	Paso Robles	4/20/2011	22.59	Manhole	Top Flush Mount	34.63	12.04
32S/13E-31H11	Oceano Blue	Paso Robles	1/24/2011	24.87	Manhole	Top Flush Mount	34.63	9.76
32S/13E-31H11	Oceano Blue	Paso Robles	10/21/2010	30.11	Manhole	Top of Casing	30.54	0.43
32S/13E-31H11	Oceano Blue	Paso Robles	7/26/2010	24.74	Manhole	Top of Casing	30.54	5.80
32S/13E-31H11	Oceano Blue	Paso Robles	4/26/2010	18.52	Manhole	Top of Casing	30.54	12.02
32S/13E-31H11	Oceano Blue	Paso Robles	1/27/2010	22.06	Manhole	Top of Casing	30.54	8.48
32S/13E-31H11	Oceano Blue	Paso Robles	10/20/2009	27.50	Manhole	Top of Casing	30.54	3.04
32S/13E-31H11	Oceano Blue	Paso Robles	8/19/2009	24.65	Manhole	Top of Casing	30.54	5.89
32S/13E-31H11	Oceano Blue	Paso Robles	4/7/2009	27.65	Manhole	Top of Casing	30.54	2.89

Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
32S/13E-31H12	Oceano Silver	Careaga	10/9/2019	26.50	Manhole	Top Flush Mount	34.63	8.13
32S/13E-31H12	Oceano Silver	Careaga	7/9/2019	24.59	Manhole	Top Flush Mount	34.63	10.04
32S/13E-31H12	Oceano Silver	Careaga	4/9/2019	27.90	Manhole	Top Flush Mount	34.63	6.73
32S/13E-31H12	Oceano Silver	Careaga	1/8/2019	28.15	Manhole	Top Flush Mount	34.63	6.48
32S/13E-31H12	Oceano Silver	Careaga	10/9/2018	39.15	Manhole	Top Flush Mount	34.63	-4.52
32S/13E-31H12	Oceano Silver	Careaga	7/10/2018	28.92	Manhole	Top Flush Mount	34.63	5.71
32S/13E-31H12	Oceano Silver	Careaga	4/10/2018	23.50	Manhole	Top Flush Mount	34.63	11.13
32S/13E-31H12	Oceano Silver	Careaga	1/10/2018	23.90	Manhole	Top Flush Mount	34.63	10.73
32S/13E-31H12	Oceano Silver	Careaga	10/10/2017	28.06	Manhole	Top Flush Mount	34.63	6.57
32S/13E-31H12	Oceano Silver	Careaga	7/11/2017	24.09	Manhole	Top Flush Mount	34.63	10.54
32S/13E-31H12	Oceano Silver	Careaga	4/11/2017	21.14	Manhole	Top Flush Mount	34.63	13.49
32S/13E-31H12	Oceano Silver	Careaga	1/10/2017	24.80	Manhole	Top Flush Mount	34.63	9.83
32S/13E-31H12	Oceano Silver	Careaga	10/12/2016	31.00	Manhole	Top Flush Mount	34.63	3.63
32S/13E-31H12	Oceano Silver	Careaga	7/19/2016	26.95	Manhole	Top of Casing	30.48	3.53
32S/13E-31H12	Oceano Silver	Careaga	4/12/2016	25.32	Manhole	Top Flush Mount	34.63	9.31
32S/13E-31H12	Oceano Silver	Careaga	1/12/2016	21.44	Manhole	Top of Casing	30.48	9.04
32S/13E-31H12	Oceano Silver	Careaga	10/13/2015	32.30	Manhole	Top Flush Mount	34.63	2.33
32S/13E-31H12	Oceano Silver	Careaga	7/14/2015	32.58	Manhole	Top Flush Mount	34.63	2.05
32S/13E-31H12	Oceano Silver	Careaga	4/14/2015	30.38	Manhole	Top Flush Mount	34.63	4.25
32S/13E-31H12	Oceano Silver	Careaga	1/13/2015	26.19	Manhole	Top Flush Mount	34.63	8.44
32S/13E-31H12	Oceano Silver	Careaga	10/14/2014	43.01	Manhole	Top Flush Mount	34.63	-8.38
32S/13E-31H12	Oceano Silver	Careaga	7/29/2014	33.65	Manhole	Top Flush Mount	34.63	0.98
32S/13E-31H12	Oceano Silver	Careaga	6/4/2014	36.33	Manhole	Top Flush Mount	34.63	-1.70
32S/13E-31H12	Oceano Silver	Careaga	4/15/2014	42.20	Manhole	Top Flush Mount	34.63	-7.57
32S/13E-31H12	Oceano Silver	Careaga	1/14/2014	27.78	Manhole	Top Flush Mount	34.63	6.85
32S/13E-31H12	Oceano Silver	Careaga	10/14/2013	30.92	Manhole	Top Flush Mount	34.63	3.71
32S/13E-31H12	Oceano Silver	Careaga	7/9/2013	30.91	Manhole	Top Flush Mount	34.63	3.72
32S/13E-31H12	Oceano Silver	Careaga	4/10/2013	26.08	Manhole	Top Flush Mount	34.63	8.55
32S/13E-31H12	Oceano Silver	Careaga	1/14/2013	23.12	Manhole	Top Flush Mount	34.63	11.51
32S/13E-31H12	Oceano Silver	Careaga	10/30/2012	27.14	Manhole	Top Flush Mount	34.63	7.49
32S/13E-31H12	Oceano Silver	Careaga	7/25/2012	27.68	Manhole	Top Flush Mount	34.63	6.95
32S/13E-31H12	Oceano Silver	Careaga	4/18/2012	20.13	Manhole	Top Flush Mount	34.63	14.5
32S/13E-31H12	Oceano Silver	Careaga	1/11/2012	23.00	Manhole	Top Flush Mount	34.63	11.63
32S/13E-31H12	Oceano Silver	Careaga	11/21/2011	22.85	Manhole	Top Flush Mount	34.63	11.78
32S/13E-31H12	Oceano Silver	Careaga	7/26/2011	25.23	Manhole	Top Flush Mount	34.63	9.4
32S/13E-31H12	Oceano Silver	Careaga	4/20/2011	21.27	Manhole	Top Flush Mount	34.63	13.36
32S/13E-31H12	Oceano Silver	Careaga	1/24/2011	22.02	Manhole	Top Flush Mount	34.63	12.61
32S/13E-31H12	Oceano Silver	Careaga	10/21/2010	29.11	Manhole	Top Flush Mount	34.63	5.52
32S/13E-31H12	Oceano Silver	Careaga	7/26/2010	24.24	Manhole	Well Casing	30.48	6.24
32S/13E-31H12	Oceano Silver	Careaga	4/26/2010	19.04	Manhole	Well Casing	30.48	11.44
32S/13E-31H12	Oceano Silver	Careaga	1/27/2010	21.05	Manhole	Well Casing	30.48	9.43
32S/13E-31H12	Oceano Silver	Careaga	10/20/2009	27.52	Manhole	Well Casing	30.48	2.96
32S/13E-31H12	Oceano Silver	Careaga	8/19/2009	29.34	Manhole	Well Casing	30.48	1.14
32S/13E-31H12	Oceano Silver	Careaga	4/7/2009	31.32	Manhole	Well Casing	30.48	-0.84

Appendix A: NCMA Sentry Wells Water Level Data

Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
32S/13E-31H13	Oceano Yellow	Careaga	10/9/2019	26.35	Manhole	Top Flush Mount	34.63	8.28
32S/13E-31H13	Oceano Yellow	Careaga	7/9/2019	24.47	Manhole	Top Flush Mount	34.63	10.16
32S/13E-31H13	Oceano Yellow	Careaga	4/9/2019	28.05	Manhole	Top Flush Mount	34.63	6.58
32S/13E-31H13	Oceano Yellow	Careaga	1/8/2019	28.35	Manhole	Top Flush Mount	34.63	6.28
32S/13E-31H13	Oceano Yellow	Careaga	10/9/2018	37.38	Manhole	Top Flush Mount	34.63	-2.75
32S/13E-31H13	Oceano Yellow	Careaga	7/10/2018	28.90	Manhole	Top Flush Mount	34.63	5.73
32S/13E-31H13	Oceano Yellow	Careaga	4/10/2018	23.55	Manhole	Top Flush Mount	34.63	11.08
32S/13E-31H13	Oceano Yellow	Careaga	1/10/2018	23.85	Manhole	Top Flush Mount	34.63	10.78
32S/13E-31H13	Oceano Yellow	Careaga	10/10/2017	27.96	Manhole	Top Flush Mount	34.63	6.67
32S/13E-31H13	Oceano Yellow	Careaga	7/11/2017	23.68	Manhole	Top Flush Mount	34.63	10.95
32S/13E-31H13	Oceano Yellow	Careaga	4/11/2017	21.18	Manhole	Top Flush Mount	34.63	13.45
32S/13E-31H13	Oceano Yellow	Careaga	1/10/2017	24.79	Manhole	Top Flush Mount	34.63	9.84
32S/13E-31H13	Oceano Yellow	Careaga	10/12/2016	30.91	Manhole	Top Flush Mount	34.63	3.72
32S/13E-31H13	Oceano Yellow	Careaga	7/19/2016	29.58	Manhole	Top Flush Mount	34.63	5.05
32S/13E-31H13	Oceano Yellow	Careaga	4/12/2016	25.25	Manhole	Top Flush Mount	34.63	9.38
32S/13E-31H13	Oceano Yellow	Careaga	1/12/2016	21.66	Manhole	Top of Casing	30.52	8.86
32S/13E-31H13	Oceano Yellow	Careaga	10/13/2015	32.28	Manhole	Top Flush Mount	34.63	2.35
32S/13E-31H13	Oceano Yellow	Careaga	7/14/2015	32.60	Manhole	Top Flush Mount	34.63	2.03
32S/13E-31H13	Oceano Yellow	Careaga	4/14/2015	30.42	Manhole	Top Flush Mount	34.63	4.21
32S/13E-31H13	Oceano Yellow	Careaga	1/13/2015	26.32	Manhole	Top Flush Mount	34.63	8.31
32S/13E-31H13	Oceano Yellow	Careaga	10/14/2014	41.12	Manhole	Top Flush Mount	34.63	-6.49
32S/13E-31H13	Oceano Yellow	Careaga	7/29/2014	33.72	Manhole	Top Flush Mount	34.63	0.91
32S/13E-31H13	Oceano Yellow	Careaga	6/4/2014	36.55	Manhole	Top Flush Mount	34.63	-1.92
32S/13E-31H13	Oceano Yellow	Careaga	4/15/2014	39.06	Manhole	Top Flush Mount	34.63	-4.43
32S/13E-31H13	Oceano Yellow	Careaga	1/14/2014	27.80	Manhole	Top Flush Mount	34.63	6.83
32S/13E-31H13	Oceano Yellow	Careaga	10/14/2013	30.83	Manhole	Top Flush Mount	34.63	3.80
32S/13E-31H13	Oceano Yellow	Careaga	7/9/2013	30.41	Manhole	Top Flush Mount	34.63	4.22
32S/13E-31H13	Oceano Yellow	Careaga	4/10/2013	26.09	Manhole	Top Flush Mount	34.63	8.54
32S/13E-31H13	Oceano Yellow	Careaga	1/14/2013	23.25	Manhole	Top Flush Mount	34.63	11.38
32S/13E-31H13	Oceano Yellow	Careaga	10/30/2012	27.23	Manhole	Top Flush Mount	34.63	7.40
32S/13E-31H13	Oceano Yellow	Careaga	7/25/2012	27.69	Manhole	Top Flush Mount	34.63	6.94
32S/13E-31H13	Oceano Yellow	Careaga	4/18/2012	20.05	Manhole	Top Flush Mount	34.63	14.58
32S/13E-31H13	Oceano Yellow	Careaga	1/12/2012	23.08	Manhole	Top Flush Mount	34.63	11.55
32S/13E-31H13	Oceano Yellow	Careaga	11/21/2011	22.98	Manhole	Top Flush Mount	34.63	11.65
32S/13E-31H13	Oceano Yellow	Careaga	7/26/2011	26.73	Manhole	Top Flush Mount	34.63	7.90
32S/13E-31H13	Oceano Yellow	Careaga	4/20/2011	21.30	Manhole	Top Flush Mount	34.63	13.33
32S/13E-31H13	Oceano Yellow	Careaga	1/24/2011	22.01	Manhole	Top Flush Mount	34.63	12.62
32S/13E-31H13	Oceano Yellow	Careaga	10/21/2010	28.22	Manhole	Well Casing	30.52	2.30
32S/13E-31H13	Oceano Yellow	Careaga	7/26/2010	25.50	Manhole	Well Casing	30.52	5.02
32S/13E-31H13	Oceano Yellow	Careaga	4/26/2010	19.17	Manhole	Well Casing	30.52	11.35
32S/13E-31H13	Oceano Yellow	Careaga	1/27/2010	20.58	Manhole	Well Casing	30.52	9.94
32S/13E-31H13	Oceano Yellow	Careaga	10/20/2009	25.80	Manhole	Well Casing	30.52	4.72
32S/13E-31H13	Oceano Yellow	Careaga	8/19/2009	31.04	Manhole	Well Casing	30.52	-0.52
32S/13E-31H13	Oceano Yellow	Careaga	4/7/2009	34.78	Manhole	Well Casing	30.52	-4.26

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Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	10/9/2019	20.85	Stove Pipe	Top of Steel	26.77	5.92
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	7/9/2019	20.39	Stove Pipe	Top of Steel	26.77	6.38
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	4/9/2019	19.93	Stove Pipe	Top of Steel	26.77	6.84
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	1/8/2019	19.00	Stove Pipe	Top of Steel	26.77	7.77
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	10/9/2018	20.80	Stove Pipe	Top of Steel	26.77	5.97
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	7/10/2018	20.74	Stove Pipe	Top of Steel	26.77	6.03
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	4/10/2018	19.11	Stove Pipe	Top of Steel	26.77	7.66
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	1/10/2018	19.32	Stove Pipe	Top of Steel	26.77	7.45
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	10/10/2017	21.23	Stove Pipe	Top of Steel	26.77	5.54
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	7/11/2017	21.59	Stove Pipe	Top of Steel	26.77	5.18
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	4/11/2017	19.38	Stove Pipe	Top of Steel	26.77	7.39
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	1/10/2017	19.70	Stove Pipe	Top of Steel	26.77	7.07
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	10/12/2016	21.86	Stove Pipe	Top of Steel	26.77	4.91
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	7/19/2016	22.21	Stove Pipe	Top of Steel	26.77	4.56
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	4/12/2016	20.56	Stove Pipe	Top of Steel	26.77	6.21
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	1/12/2016	18.76	Stove Pipe	Top of Steel	26.77	8.01
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	10/13/2015	22.14	Stove Pipe	Top of Steel	26.77	4.63
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	7/14/2015	21.84	Stove Pipe	Top of Steel	26.77	4.93
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	4/14/2015	21.18	Stove Pipe	Top of Steel	26.77	5.59
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	1/13/2015	19.89	Stove Pipe	Top of Steel	26.77	6.88
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	10/14/2014	21.75	Stove Pipe	Top of Steel	26.77	5.02
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	7/29/2014	21.57	Stove Pipe	Top of Steel	26.77	5.20
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	6/4/2014	22.36	Stove Pipe	Top of Steel	26.77	4.41
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	4/15/2014	19.89	Stove Pipe	Top of Steel	26.77	6.88
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	1/14/2014	20.38	Stove Pipe	Top of Steel	26.77	6.39
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	10/14/2013	21.71	Stove Pipe	Top of Steel	26.77	5.06
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	7/9/2013	21.37	Stove Pipe	Top of Steel	26.77	5.4
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	4/10/2013	20.10	Stove Pipe	Top of Steel	26.77	6.67
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	1/14/2013	18.62	Stove Pipe	Top of Steel	26.77	8.15
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	10/31/2012	20.11	Stove Pipe	Top of Steel	26.77	6.66
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	7/24/2012	19.42	Stove Pipe	Top of Steel	26.77	7.35
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	4/20/2012	18.26	Stove Pipe	Top of Steel	26.77	8.51
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	4/18/2012	23.83	Stove Pipe	Top of Steel	26.77	2.94
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	1/11/2012	17.68	Stove Pipe	Top of Steel	26.77	9.09
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	11/21/2011	18.08	Stove Pipe	Top of Steel	26.77	8.69
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	7/26/2011	19.63	Stove Pipe	Top of Steel	26.77	7.14
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	4/20/2011	18.26	Stove Pipe	Top of Steel	26.77	8.51
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	1/24/2011	17.61	Stove Pipe	Top of Steel	26.77	9.16
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	10/21/2010	20.75	Stove Pipe	Top of Steel	26.77	6.02
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	7/27/2010	21.18	Stove Pipe	Top of Steel	26.77	5.59
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	4/26/2010	15.94	Flush	Top Flush Mount	23.98	8.04
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	10/21/2009	17.72	Flush	Top Flush Mount	23.98	6.26
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	8/20/2009	19.16	Flush	Top Flush Mount	23.98	4.82
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	5/11/2009	17.68	Flush	Top Flush Mount	23.98	6.30
12N/36W-36L01	Oceano Dunes Middle	Paso Robles	4/18/2009	15.95	Flush	Top Flush Mount	23.98	8.03

Appendix A: NCMA Sentry Wells Water Level Data

Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
12N/36W-36L02	Oceano Dunes Deep	Careaga	10/9/2019	24.32	Stove Pipe	Top of Steel	26.77	2.45
12N/36W-36L02	Oceano Dunes Deep	Careaga	7/9/2019	21.30	Stove Pipe	Top of Steel	26.77	5.47
12N/36W-36L02	Oceano Dunes Deep	Careaga	4/9/2019	15.72	Stove Pipe	Top of Steel	26.77	11.05
12N/36W-36L02	Oceano Dunes Deep	Careaga	1/8/2019	17.45	Stove Pipe	Top of Steel	26.77	9.32
12N/36W-36L02	Oceano Dunes Deep	Careaga	10/9/2018	25.10	Stove Pipe	Top of Steel	26.77	1.67
12N/36W-36L02	Oceano Dunes Deep	Careaga	7/10/2018	24.11	Stove Pipe	Top of Steel	26.77	2.66
12N/36W-36L02	Oceano Dunes Deep	Careaga	4/10/2018	16.02	Stove Pipe	Top of Steel	26.77	10.75
12N/36W-36L02	Oceano Dunes Deep	Careaga	1/10/2018	19.11	Stove Pipe	Top of Steel	26.77	7.66
12N/36W-36L02	Oceano Dunes Deep	Careaga	10/10/2017	24.70	Stove Pipe	Top of Steel	26.77	2.07
12N/36W-36L02	Oceano Dunes Deep	Careaga	7/11/2017	23.65	Stove Pipe	Top of Steel	26.77	3.12
12N/36W-36L02	Oceano Dunes Deep	Careaga	4/10/2017	15.00	Stove Pipe	Top of Steel	26.77	11.77
12N/36W-36L02	Oceano Dunes Deep	Careaga	1/10/2017	16.15	Stove Pipe	Top of Steel	26.77	10.62
12N/36W-36L02	Oceano Dunes Deep	Careaga	10/12/2016	27.86	Stove Pipe	Top of Steel	26.77	-1.09
12N/36W-36L02	Oceano Dunes Deep	Careaga	7/19/2016	25.76	Stove Pipe	Top of Steel	26.77	1.01
12N/36W-36L02	Oceano Dunes Deep	Careaga	4/12/2016	18.43	Stove Pipe	Top of Steel	26.77	8.34
12N/36W-36L02	Oceano Dunes Deep	Careaga	1/12/2016	16.27	Stove Pipe	Top of Steel	26.77	10.50
12N/36W-36L02	Oceano Dunes Deep	Careaga	10/13/2015	27.17	Stove Pipe	Top of Steel	26.77	-0.40
12N/36W-36L02	Oceano Dunes Deep	Careaga	7/14/2015	26.11	Stove Pipe	Top of Steel	26.77	0.66
12N/36W-36L02	Oceano Dunes Deep	Careaga	4/14/2015	22.24	Stove Pipe	Top of Steel	26.77	4.53
12N/36W-36L02	Oceano Dunes Deep	Careaga	1/13/2015	16.91	Stove Pipe	Top of Steel	26.77	9.86
12N/36W-36L02	Oceano Dunes Deep	Careaga	10/14/2014	26.30	Stove Pipe	Top of Steel	26.77	0.47
12N/36W-36L02	Oceano Dunes Deep	Careaga	7/29/2014	25.64	Stove Pipe	Top of Steel	26.77	1.13
12N/36W-36L02	Oceano Dunes Deep	Careaga	6/4/2014	25.22	Stove Pipe	Top of Steel	26.77	1.55
12N/36W-36L02	Oceano Dunes Deep	Careaga	4/15/2014	16.94	Stove Pipe	Top of Steel	26.77	9.83
12N/36W-36L02	Oceano Dunes Deep	Careaga	1/14/2014	18.76	Stove Pipe	Top of Steel	26.77	8.01
12N/36W-36L02	Oceano Dunes Deep	Careaga	10/14/2013	23.94	Stove Pipe	Top of Steel	26.77	2.83
12N/36W-36L02	Oceano Dunes Deep	Careaga	7/9/2013	23.15	Stove Pipe	Top of Steel	26.77	3.62
12N/36W-36L02	Oceano Dunes Deep	Careaga	4/10/2013	15.35	Stove Pipe	Top of Steel	26.77	11.42
12N/36W-36L02	Oceano Dunes Deep	Careaga	1/14/2013	11.24	Stove Pipe	Top of Steel	26.77	15.53
12N/36W-36L02	Oceano Dunes Deep	Careaga	10/31/2012	18.81	Stove Pipe	Top of Steel	26.77	7.96
12N/36W-36L02	Oceano Dunes Deep	Careaga	7/24/2012	19.05	Stove Pipe	Top of Steel	26.77	7.72
12N/36W-36L02	Oceano Dunes Deep	Careaga	4/18/2012	10.81	Stove Pipe	Top of Steel	26.77	15.96
12N/36W-36L02	Oceano Dunes Deep	Careaga	1/11/2012	11.18	Stove Pipe	Top of Steel	26.77	15.59
12N/36W-36L02	Oceano Dunes Deep	Careaga	11/21/2011	13.99	Stove Pipe	Top of Steel	26.77	12.78
12N/36W-36L02	Oceano Dunes Deep	Careaga	7/26/2011	18.03	Stove Pipe	Top of Steel	26.77	8.74
12N/36W-36L02	Oceano Dunes Deep	Careaga	1/24/2011	9.37	Stove Pipe	Top of Steel	26.77	17.40
12N/36W-36L02	Oceano Dunes Deep	Careaga	10/21/2010	19.77	Stove Pipe	Top of Steel	26.77	7.00
12N/36W-36L02	Oceano Dunes Deep	Careaga	7/27/2010	20.53	Stove Pipe	Top of Steel	26.77	6.24
12N/36W-36L02	Oceano Dunes Deep	Careaga	4/26/2010	9.24	Flush	Top Flush Mount	23.98	14.74
12N/36W-36L02	Oceano Dunes Deep	Careaga	10/21/2009	17.65	Flush	Top Flush Mount	23.98	6.33
12N/36W-36L02	Oceano Dunes Deep	Careaga	8/20/2009	19.15	Flush	Top Flush Mount	23.98	4.83
12N/36W-36L02	Oceano Dunes Deep	Careaga	5/11/2009	14.38	Flush	Top Flush Mount	23.98	9.60

Well	Common Name	Aquifer	Date	Depth to Water (feet)	Surface Completion	RP Description	RP Elev, feet NAVD88	Groundwater Elevation (feet VD88)
12N/35W-32C03	County MW-3	Paso Robles	10/9/2019	42.42	Flush	Top Flush Mount	47.70	5.28
12N/35W-32C03	County MW-3	Paso Robles	7/9/2019	37.20	Flush	Top Flush Mount	47.70	10.50
12N/35W-32C03	County MW-3	Paso Robles	4/9/2019	32.50	Flush	Top Flush Mount	47.70	15.20
12N/35W-32C03	County MW-3	Paso Robles	1/8/2019	35.45	Flush	Top Flush Mount	47.70	12.25
12N/35W-32C03	County MW-3	Paso Robles	10/9/2018	43.85	Flush	Top Flush Mount	47.70	3.85
12N/35W-32C03	County MW-3	Paso Robles	7/10/2018	40.00	Flush	Top Flush Mount	47.70	7.70
12N/35W-32C03	County MW-3	Paso Robles	4/10/2018	32.80	Flush	Top Flush Mount	47.70	14.90
12N/35W-32C03	County MW-3	Paso Robles	1/10/2018	35.10	Flush	Top Flush Mount	47.70	12.60
12N/35W-32C03	County MW-3	Paso Robles	10/10/2017	42.05	Flush	Top Flush Mount	47.70	5.65
12N/35W-32C03	County MW-3	Paso Robles	7/11/2017	38.34	Flush	Top Flush Mount	47.70	9.36
12N/35W-32C03	County MW-3	Paso Robles	4/11/2017	28.44	Flush	Top Flush Mount	47.70	19.26
12N/35W-32C03	County MW-3	Paso Robles	1/10/2017	34.85	Flush	Top Flush Mount	47.70	12.85
12N/35W-32C03	County MW-3	Paso Robles	10/12/2016	47.49	Flush	Top Flush Mount	47.70	0.21
12N/35W-32C03	County MW-3	Paso Robles	7/19/2016	44.51	Flush	Top Flush Mount	47.70	3.19
12N/35W-32C03	County MW-3	Paso Robles	4/12/2016	36.41	Flush	Top Flush Mount	47.70	11.29
12N/35W-32C03	County MW-3	Paso Robles	1/12/2016	36.48	Flush	Top Flush Mount	47.70	11.22
12N/35W-32C03	County MW-3	Paso Robles	10/13/2015	51.21	Flush	Top Flush Mount	47.70	-3.51
12N/35W-32C03	County MW-3	Paso Robles	7/14/2015	49.07	Flush	Top Flush Mount	47.70	-1.37
12N/35W-32C03	County MW-3	Paso Robles	4/14/2015	44.00	Flush	Top Flush Mount	47.70	3.70
12N/35W-32C03	County MW-3	Paso Robles	1/13/2015	38.90	Flush	Top Flush Mount	47.70	8.80
12N/35W-32C03	County MW-3	Paso Robles	10/14/2014	50.50	Flush	Top Flush Mount	47.70	-2.80
12N/35W-32C03	County MW-3	Paso Robles	7/29/2014	44.02	Flush	Top Flush Mount	47.70	3.68
12N/35W-32C03	County MW-3	Paso Robles	6/4/2014	45.46	Flush	Top Flush Mount	47.70	2.24
12N/35W-32C03	County MW-3	Paso Robles	4/15/2014	41.51	Flush	Top Flush Mount	47.70	6.19
12N/35W-32C03	County MW-3	Paso Robles	1/14/2014	41.00	Flush	Top Flush Mount	47.70	6.70
12N/35W-32C03	County MW-3	Paso Robles	10/14/2013	45.26	Flush	Top Flush Mount	47.70	2.44
12N/35W-32C03	County MW-3	Paso Robles	7/9/2013	43.83	Flush	Top Flush Mount	47.70	3.87
12N/35W-32C03	County MW-3	Paso Robles	4/10/2013	37.89	Flush	Top Flush Mount	47.70	9.81
12N/35W-32C03	County MW-3	Paso Robles	1/14/2013	32.26	Flush	Top Flush Mount	47.70	15.44
12N/35W-32C03	County MW-3	Paso Robles	10/30/2012	40.05	Flush	Top Flush Mount	47.70	7.65
12N/35W-32C03	County MW-3	Paso Robles	7/25/2012	38.62	Flush	Top Flush Mount	47.70	9.08
12N/35W-32C03	County MW-3	Paso Robles	4/19/2012	23.02	Flush	Top Flush Mount	47.70	24.68

Appendix A: NCMA Sentry Wells Water Quality Data

Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
32S/12E-24B01	10/14/2019	3,100	1,300	540	29	180	180	410	180	ND	2	0.15	0	0.01	1.3	3.7	410	ND	ND	4,900	2.7	0.0028	351
32S/12E-24B01	4/10/2019	2,800	1,400	520	35	180	190	430	200	ND	2	0.15	ND	0.11	1.4	4.0	430	ND	ND	5,260	2.1	0.0029	350
32S/12E-24B01	10/9/2018	2,800	1,400	600	35	180	190	410	190	ND	2	0.15	ND	0.11	1.4	2.8	410	ND	ND	5,040	22	0.0020	500
32S/12E-24B01	4/11/2018	3,000	1,400	560	33	170	180	430	200	0.25	2.0	0.15	ND	0.11	1.4	5.1	430	ND	ND	5,150	2.2	0.0036	275
32S/12E-24B01	10/11/2017	3,100	1,400	590	36	180	190	430	190	ND	2.3	0.17	0.13	0.11	1.4	0.64	430	ND	ND	5,180	1.7	0.0005	2188
32S/12E-24B01	4/11/2017	3,400	1,400	680	41	190	210	420	190	ND	2.4	0.16	0.17	0.11	1.6	4.7	420	ND	ND	5,020	1.8	0.0034	298
32S/12E-24B01	10/11/2016	3,100	1,400	700	44	210	220	450	190	0.26	2.1	0.18	ND	0.12	1.6	4.1	450	ND	ND	5,020	1.3	0.0029	341
32S/12E-24B01	4/12/2016	2,800	1,400	640	37	170	180	420	190	<0.48	2.2	0.16	<0.055	0.081	1.3	4.8	420	<8.2	<8.2	5,000	0.73	0.0034	292
32S/12E-24B01	10/15/2015	3,230	230	560	34	160	170	413	42	<0.05	2.2	0.14	<0.10	0.091	1.1	0.68	413	<10	<10	4,880	0.54	0.0030	338
32S/12E-24B01	4/15/2015	3,010	1,300	510	30	150	160	410	220	<0.05	2.9	0.15	<0.5	0.023	1.0	3.4	410	<10	<10	4,760	0.72	0.0026	382
32S/12E-24B01	1/14/2015	2,980	1,300	520	30	150	170	400	210	<0.25	2.2	0.14	<0.5	<0.021	1.0	2.9	400	<10	<10	4,640	0.52	0.0022	448
32S/12E-24B01	10/14/2014	3,160	1,100	530	32	150	170	390	180	0.32	2.2	0.16	<0.5	<0.01	1.1	<0.5	390	<10	<10	4,780	0.67	NA	NA
32S/12E-24B01	7/30/2014	2,950	1,300	520	29	140	170	440	190	<0.25	1.9	0.11	<0.5	0.03	1.1	2.6	440	<10	<10	4,830	0.62	0.0020	500
32S/12E-24B01	4/16/2014	2,880	1,200	560	29	140	140	390	190	<0.05	2.2	0.130	<0.5	0.03	0.92	2.9	390	<10	<10	4,790	0.72	0.0024	414
32S/12E-24B01	1/15/2014	2,870	1,300	540	30	140	160	380	214	<0.25	2.4	0.17	<0.5	<0.01	1.0	3.0	380	<10	<10	4,800	0.71	0.0023	433
32S/12E-24B01	10/15/2013	2,860	1,200	560	31	150	160	380	200	<0.25	2.2	0.13	<0.5	<0.01	1.0	3.0	380	<10	<10	4,810	0.75	0.0025	400
32S/12E-24B01	7/9/2013	2,960	1,300	560	32	150	160	395	215	<0.25	2.4	0.16	<0.5	<0.01	1.1	2.0	395	<10	<10	4,850	0.81	0.0015	650
32S/12E-24B01	4/10/2013	2,920	1,300	540	30	140	150	410	220	<0.25	1.9	0.16	<0.1	<0.01	1.00	3.5	410	<10	<10	4,830	0.67	0.0027	371
32S/12E-24B01	1/14/2013	2,630	1,300	540	30	140	140	410	220	<0.05	2.7	0.15	<0.1	<0.01	0.96	2.8	410	<10	<10	4,790	0.72	0.0022	464
32S/12E-24B01	10/29/2012	2,950	1,200	590	34	150	160	360	200	<0.25	2.4	0.18	<0.5	<0.01	1.1	11	360	<10	<10	4,750	0.78	0.0092	109
32S/12E-24B01	7/23/2012	3,010	1,400	530	30	120	130	397	210	<0.05	2.1	0.15	<0.1	0.041	0.86	3	397	<10	<10	4,720	1.4	0.0021	467
32S/12E-24B01	4/18/2012	3,000	1,500	450	27	120	120	400	230	<0.1	2	0.13	0.13	<0.01	0.89	3.12	400	<10	<10	4,660	0.6	0.0021	481
32S/12E-24B01	1/11/2012	2,750	1,200	520	30	140	140	400	170	<0.1	4	0.18	0.1	0.033	0.94	3.2	400	<10	<10	4,560	0.55	0.0027	375
32S/12E-24B01	11/21/2011	2,740	1,200	410	25	130	120	380	200	<0.3	2.3	0.13	<0.6	0.053	0.9	2.73	380	<10	<10	4,470	0.7	0.0023	440
32S/12E-24B01	7/25/2011	3,690	1,200	530	33	140	150	380	200.2	<0.05	1.8	0.14	<0.1	0.053	0.91	3.281	380	<5	<5	4,900	0.73	0.0027	366
32S/12E-24B01	4/20/2011	2,810	1,214	500	27	140	130	400	216	<0.05	1.7	0.24	0.18	0.067	0.95	3.3	400	<2.0	<2.0	4,430	NA	0.0027	368
32S/12E-24B01	1/24/2011	2,380	1,100	370	24	110	120	380	180	<0.15	1.8	0.16	<0.3	0.63	0.68	2.8	380	<2.0	<2.0	4,020	0.89	0.0025	393
32S/12E-24B01	10/28/2010	2,330	960	390	25	140	140	350	160	<0.1	3.9	0.15	<0.1	NA	0.75	2.6	350	<10	<10	3,860	1.3	0.0027	369
32S/12E-24B01	7/27/2010	616	43	52.5	6.21	115	44.7	341	160	< 0.10	2.9	0.063	< 0.10	0.11	0.274	0.18	341	< 1.0	< 1.0	1,000	9.34	0.0042	239
32S/12E-24B01	4/27/2010	676	47	54.7	4.60	107	43.6	327	140	< 0.10	0.98	0.0714	< 0.10	< 0.10	0.0458	0.18	327	< 1.0	< 1.0	990	4.06	0.0038	261
32S/12E-24B01	1/27/2010	694	55	56.2	6.80	123	43.2	340	150	0.40	1.7	0.12	< 0.10	0.33	0.875	0.19	340	< 1.0	< 1.0	1,000	16.6	0.0035	289
32S/12E-24B01	10/19/2009	766	140	121	16.7	111	52.4	303	150	0.25	2.8	0.0959	0.11	< 0.10	0.208	0.47	303	< 1.0	< 1.0	1,200	7.79	0.0034	298
32S/12E-24B01	8/20/2009	705	94	86.8	11.7	116	35.6	286	150	0.21	2.7	NA	< 0.10	0.12	0.248	0.38	286	< 1.0	< 1.0	1,000	7.15	0.0040	247
32S/12E-24B01	5/12/2009	695	100	82.1	13.2	108	45	288	150	NA	NA	NA	0.11	NA	0.66	0.29	288	< 1.0	< 1.0	1,100	23.9	0.0029	345
32S/12E-24B01	3/26/1996	1,870	773	380	24.0	125	95	427	154	0.2	NA	0.27	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32S/12E-24B01	6/9/1976	1,706	667	400	16.2	94	95	474	159	0.4	NA	0.12	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32S/12E-24B01	1/17/1966	1,700	652	406	20.0	95	83	440	175	1	NA	0.07	0.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
32S/12E-24B02	10/14/2019	700	30	45	3.7	110	35	310	160	ND	0.10	0.078	0.046	0	0.18	ND	310	ND	ND	931	0.62	NA	NA
32S/12E-24B02	7/10/2019	550	30	48	4.2	120	37	320	160	ND	0.34	0.074	0.037	0	0.18	ND	320	ND	ND	931	0.62	NA	NA
32S/12E-24B02	4/10/2019	620	31	42	3.6	110	35	320	160	ND	0.31	0.070	0.059	ND	0.17	0.130	320	ND	ND	941	0.59	0.0042	238
32S/12E-24B02	1/8/2019	630	30	43	3.6	110	35	310	160	ND	0.27	0.072	0.056	0.013	0.17	0.096	310	ND	ND	938	0.59	0.0032	313
32S/12E-24B02	10/9/2018	640	30	48	3.8	120	37	320	160	ND	0.34	0.068	0.025	0.013	0.18	0.06	320	ND	ND	952	0.62	0.0020	492
32S/12E-24B02	7/12/2018	620	29	46	3.7	120	36	320	150	ND	0.30	0.072	0.042	0.013	0.17	0.11	320	ND	ND	962	0.69	0.0038	264
32S/12E-24B02	4/11/2018	660	31	45	3.5	110	35	320	160	0.034	0.28	0.069	0.050	0.011	0.17	0.10	320	ND	ND	942	0.58	0.0032	310
32S/12E-24B02	1/12/2018	570	30	53	3.8	120	38	320	160	ND	0.32	0.071	0.068	0.015	0.18	0.11	320	ND	ND	930	0.56	0.0037	273
32S/12E-24B02	10/11/2017	670	31	45	3.7	120	38	330	160	ND	0.41	0.077	0.045	0.014	0.18	0.1	330	ND	ND	962	0.74	0.0032	310
32S/12E-24B02	7/12/2017	760	31	48	4	130	39	310	160	ND	0.18	0.072	0.04	0.015	0.2	0.12	310	ND	ND	948	0.93	0.0039	258
32S/12E-24B02	4/11/2017	630	34	46	3.7	120	35	310	170	ND	0.31	0.062	0.09.	0.017	0.17	0.12	310	ND	ND	933	0.59	0.0035	283
32S/12E-24B02	1/12/2017	660	34	47	3.7	120	36	320	170	ND	0.26	0.069	0.031	0.023	0.2	0.097	320	ND	ND	938	0.79	0.0029	351
32S/12E-24B02	10/11/2016	660	35	48	4	120	39	320	170	ND	0.26	0.069	0.038	0.023	0.18	0.12	320	ND	ND	953	0.75	0.0034	292
32S/12E-24B02	7/19/2016	660	36	50	3.9	120	38	320	160	<0.096	0.15	0.07	0.036	0.016	0.17	0.15	320	<4.1	<4.1	947	0.67	0.0042	240
32S/12E-24B02	4/12/2016	640	35	48	3.8	110	37	300	160	<0.096	0.38	0.064	0.045	0.011	0.17	0.13	300	<4.1	<4.1	939	0.53	0.0037	269
32S/12E-24B02	1/12/2016	570	38	48	3.8	110	36	290	170	<0.022	0.27	0.044	0.11	0.015	0.16	0.15	290	<4.1	<4.1	951	0.48	0.0039	253
32S/12E-24B02	10/15/2015	650	34	41	3.8	100	33	306	160	<0.05	<1	0.054	<0.10	0.014	0.18	<0.10	306	<10	<10	950	0.72	NA	NA
32S/12E-24B02	7/15/2015	650	35	50	3.0	120	36	295	160	<0.05	<1	0.069	<0.1	0.01	0.16	<0.1	295	<10	<10	950	0.69	NA	NA
32S/12E-24B02	4/15/2015	620	35	40	3.4	100	31	300	170	<0.05	<1	0.066	<0.1	0.01	0.14	<0.1	300	<10	<10	900	0.45	NA	NA
32S/12E-24B02	1/14/2015	640	36	41	3.3	110	32	290	170	<0.05	<1	0.062	<0.1	<0.01	0.14	<0.1	290	<10	<10	900	0.48	NA	NA
32S/12E-24B02	10/14/2014	630	30	41	3.9	100	32	290	140	<0.05	<1	0.065	<0.1	<0.01	0.15	<0.1	290	<10	<10	940	0.44	NA	NA
32S/12E-24B02	7/29/2014	620	33	42	3.5	100	33	300	150	<0.05	<1	<0.1	<0.1	<0.01	0.14	<0.1	300	<10	<10	940	0.37	NA	NA
32S/12E-24B02	4/16/2014	630	32	43	4.3	88	28	300	150	<0.05	<1	0.067	<0.1	<0.01	0.12	<0.1	300	<10	<10	940	0.32	NA	NA
32S/12E-24B02	1/15/2014	630	33	46	3.9	100	34	290	165	<0.05	<1	<0.05	<0.1	<0.01	0.14	<0.1	290	<10	<10	940	0.37	NA	NA
32S/12E-24B02	10/15/2013	630	30	44	3.8	98	32	290	170	<0.05	<1	<0.05	<0.1	<0.01	0.13	<0.1	290	<10	<10	920	0.39	NA	NA
32S/12E-24B02	7/9/2013	630	30	43	3.9	110	33	295	170	<0.05	<1	0.076	<0.1	<0.01	0.14	<0.1	295	<10	<10	940	0.6	NA	NA
32S/12E-24B02	4/10/2013	630	31	44	4	100	32	310	160	<0.05	<1	0.08	<0.1	<0.01	0.13	<0.1	310	<10	<10	940	0.41	NA	NA
32S/12E-24B02	1/14/2013	620	30	43	4	97	31	305	170	<0.05	<1	0.079	<0.1	<0.01	0.12	<0.1	305	<10	<10	950	0.72	NA	NA
32S/12E-24B02	10/29/2012	650	29	45	4.2	100	32	280	160	<0.05	<1	0.074	0.14	<0.01	0.13	<0.1	280	<10	<10	950	0.56	NA	NA
32S/12E-24B02	7/23/2012	650	35	45	4.3	87	27	297	170	<0.05	<1	<0.1	<0.1	<0.01	0.12	<0.1	297	<10	<10	950	0.43	NA	NA
32S/12E-24B02	4/18/2012	630	37	39	3.7	88	28	310	171	<0.1	<1	<0.1	0.16	<0.01	0.099	<0.2	310	<10	<10	950	0.26	NA	NA
32S/12E-24B02	1/11/2012	650	33	46	4.6	110	32	300	150	<0.1	1.3	<0.1	0.21	<0.02	0.13	0.03	300	<10	<10	950	1.7	0.0010	971
32S/12E-24B02	11/21/2011	640	32	39	3.9	93	29	290	150	<0.05	<1	0.064	<0.1	<0.01	0.096	<0.1	290	<10	<10	930	0.32	NA	NA
32S/12E-24B02	7/25/2011	640	36	48	4.2	97	31	290	165.3	<0.05	<1	<0.1	<0.1	<0.01	0.096	<0.1	290	<5	<5	950	0.88	NA	NA
32S/12E-24B02	4/20/2011	620	39	46	7.4	90	36	320	174	<0.05	<1	0.17	0.14	0.014	<0.005	<0.1	320	<2.0	<2.0	950	NA	NA	NA
32S/12E-24B02	1/24/2011	640	43	44	5.9	87	28	270	170	<0.05	<1.0	0.11	<0.1	0.14	0.085	<0.1	270	<2.0	<2.0	940	1.3	NA	NA
32S/12E-24B02	10/28/2010	650	43	50	4.5	110	35	270	160	<0.1	<1.0	0.12	<0.1	NA	0.085	<0.3	270	<10	<10	970	0.63	NA	NA
32S/12E-24B02	7/27/2010	598	42	48.9	4.29	111	40.5	318	160	< 0.10	1.3	0.0609	< 0.10	0.11	0.106	0.15	318	< 1.0	< 1.0	980	2.84	0.0036	280
32S/12E-24B02	4/27/2010	668	46	52.7	4.73	111	43.2	349	150	< 0.10	1.3	0.0666	< 0.10	0.14	0.101	0.16	349	< 1.0	< 1.0	980	6.66	0.0035	288
32S/12E-24B02	1/27/2010	622	45	58.0	5.39	115	32.2	270	160	0.18	0.84	0.117	< 0.10	0.14	0.209	0.16	270	< 1.0	< 1.0	920	3.49	0.0036	281
32S/12E-24B02	10/19/2009	600	49	59.1	5.12	112	30.1	281	160	< 0.10	0.98	0.0776	0.14	< 0.10	0.163	0.19	281	< 1.0	< 1.0	870	1.14	0.0039	258
32S/12E-24B02	8/20/2009	630	49	63.5	5.85	128	30.1	288	150	< 0.10	0.98	NA	< 0.10	< 0.10	0.203	0.20	288	< 1.0	< 1.0	920	3.22	0.0041	245
32S/12E-24B02	5/12/2009	622	82	67.5	6.33	114	34.5	282	150	NA	NA	NA	0.11	NA	0.252	0.24	282	< 1.0	< 1.0	990	6.76	0.0029	342
32S/12E-24B02	3/26/1996	652	54	46	5	107	24	344	169	0.2	NA	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32S/12E-24B02	6/9/1976	565	34	52	4	104	27	337	153	0.6	NA	0.02	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32S/12E-24B02	1/17/1966	651	62	79	5	101	32	380	147	0	NA	0.05	0.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix A: NCMA Sentry Wells Water Quality Data

Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
32S/12E-24B03	10/14/2019	660	48	56	4.0	120	40	330	170	ND	0.11	0.068	0.029	0.018	0.011	0.18	330	ND	ND	1,010	0.26	0.0038	267
32S/12E-24B03	7/10/2019	590	49	53	4.2	110	44	330	160	ND	0.15	0.065	0.020	0.018	0.010	0.18	330	ND	ND	1,000	0.18	0.0037	272
32S/12E-24B03	4/10/2019	640	50	50	3.7	110	43	320	160	ND	0.15	0.063	0.037	0.017	0.012	0.16	320	ND	ND	1,020	0.44	0.0032	313
32S/12E-24B03	1/8/2019	660	50	50	3.9	110	43	320	160	ND	0.12	0.065	0.039	0.021	0.011	0.14	320	ND	ND	1,020	0.21	0.0028	357
32S/12E-24B03	10/9/2018	690	48	52	4.1	110	45	320	160	ND	0.19	0.065	ND	0.020	0.011	0.10	320	ND	ND	1,030	0.19	0.0020	500
32S/12E-24B03	7/12/2018	650	47	51	3.8	110	42	320	150	ND	0.14	0.062	0.023	0.020	0.10	0.16	320	ND	ND	1,040	0.18	0.0034	294
32S/12E-24B03	4/11/2018	670	50	53	4.0	110	44	320	160	ND	0.11	0.065	0.017	0.019	0.011	0.19	320	ND	ND	1,010	0.19	0.0038	263
32S/12E-24B03	1/12/2018	620	48	57	3.9	110	45	330	160	ND	0.13	0.061	0.041	0.023	0.011	0.18	330	ND	ND	993	0.19	0.0038	267
32S/12E-24B03	10/11/2017	660	49	54	4	120	45	330	160	ND	0.16	0.069	0.022	0.02	0.011	0.19	330	ND	ND	1020	0.20	0.0039	258
32S/12E-24B03	7/12/2017	790	46	54	4	120	45	320	160	ND	ND	0.062	0.015	0.02	0.011	0.18	320	ND	ND	1,010	0.19	0.0039	256
32S/12E-24B03	4/11/2017	670	48	55	4.1	120	45	330	160	ND	0.17	0.058	ND	0.019	0.012	0.21	330	ND	ND	988	0.23	0.0044	229
32S/12E-24B03	1/12/2017	670	47	58	4.3	130	50	340	160	ND	ND	0.068	0.012	0.024	0.014	0.18	340	ND	ND	1,000	0.27	0.0038	261
32S/12E-24B03	10/11/2016	680	49	53	4	110	47	340	160	ND	ND	0.06	0.015	0.025	0.013	0.17	340	ND	ND	1020	0.22	0.0035	288
32S/12E-24B03	7/19/2016	690	47	54	4.1	110	46	340	160	<0.096	0.32	0.063	0.017	0.016	0.013	0.20	340	<8.2	<8.2	1,010	0.32	0.0043	235
32S/12E-24B03	4/12/2016	680	48	55	4.1	110	45	320	160	<0.096	0.21	0.056	0.019	0.018	0.012	0.17	320	<8.2	<8.2	1,010	0.28	0.0035	282
32S/12E-24B03	1/12/2016	610	51	53	4.0	110	46	320	170	<0.022	0.11	0.037	0.038	<0.10	0.015	0.19	320	<8.2	<8.2	1,050	0.27	0.0037	268
32S/12E-24B03	10/15/2015	650	44	48	4.4	100	42	325	160	<0.05	<1	<0.05	<0.10	0.016	0.010	<0.10	325	<10	<10	1,020	0.21	NA	NA
32S/12E-24B03	7/15/2015	680	46	60	40.0	120	47	333	160	<0.05	<1	0.064	<0.1	0.01	0.010	<0.1	333	<10	<10	1,020	0.20	NA	NA
32S/12E-24B03	4/15/2015	650	46	44	3.5	96	38	330	170	<0.05	<1	0.061	<0.1	0.012	0.0080	<0.1	330	<10	<10	980	0.17	NA	NA
32S/12E-24B03	1/14/2015	670	47	48	3.6	110	43	330	170	<0.05	<1	0.052	<0.10	0.01	0.090	<0.1	330	<10	<10	970	0.17	NA	NA
32S/12E-24B03	10/14/2014	650	40	48	4.1	100	41	330	142	<0.05	<1	0.061	<0.1	<0.01	0.010	<0.1	330	<10	<10	1,010	0.19	NA	NA
32S/12E-24B03	7/30/2014	650	45	45	3.1	94	40	390	150	<0.05	<1	<0.1	<0.1	<0.01	<0.005	<0.1	390	<10	<10	1,020	0.19	NA	NA
32S/12E-24B03	4/16/2014	660	43	46	4.3	90	35	330	150	0.23	<1	0.056	<0.1	<0.01	<0.005	0.11	330	<10	<10	1,010	0.16	0.0026	391
32S/12E-24B03	1/15/2014	660	45	52	4.0	100	41	320	165	<0.05	<1	<0.05	<0.1	<0.01	0.0090	<0.1	320	<10	<10	1,010	0.17	NA	NA
32S/12E-24B03	10/15/2013	720	40	51	4.0	100	40	310	170	<0.05	<1	<0.05	<0.1	<0.01	0.0090	<0.1	310	<10	<10	1,010	0.2	NA	NA
32S/12E-24B03	7/9/2013	660	46	47	3.9	110	41	310	170	<0.05	<1	0.066	<0.1	<0.01	0.0100	<0.1	310	<10	<10	1,010	0.27	NA	NA
32S/12E-24B03	4/10/2013	670	44	46	3.8	96	38	320	160	<0.05	<1	0.071	<0.1	<0.01	0.0080	<0.1	320	<10	<10	1,010	0.19	NA	NA
32S/12E-24B03	1/14/2013	630	45	47	3.9	96	37	320	170	<0.05	<1	0.065	<0.1	<0.01	0.0080	<0.1	320	<10	<10	1,010	0.26	NA	NA
32S/12E-24B03	10/29/2012	680	45	49	4.1	100	39	305	158	<0.05	<1	0.069	0.1	<0.01	0.0090	<0.1	305	<10	<10	1,010	0.22	NA	NA
32S/12E-24B03	7/23/2012	670	49	47	4.1	86	35	318	170	<0.05	<1	<0.1	<0.1	<0.01	0.0150	<0.1	318	<10	<10	1,010	0.24	NA	NA
32S/12E-24B03	4/18/2012	640	50	40	3.4	84	33	320	160	<0.1	<1	<0.1	<0.2	<0.01	0.0070	<0.2	320	<10	<10	1,010	0.23	NA	NA
32S/12E-24B03	1/12/2012	660	46	48	3.2	92	36	300	150	<0.1	<1	<0.1	0.35	<0.02	0.0080	<0.2	300	<10	<10	1,000	0.15	NA	NA
32S/12E-24B03	11/21/2011	660	43	41	3.7	91	34	310	150	<0.05	1.6	0.046	<0.1	0.014	0.0090	<0.1	310	<10	<10	970	0.12	NA	NA
32S/12E-24B03	7/25/2011	650	46	50	6.0	98	38	310	159.6	<0.05	<1	<0.1	<0.1	0.011	0.0100	<0.1	310	<5	<5	1,010	0.21	NA	NA
32S/12E-24B03	4/20/2011	650	47	48	4.6	95	31	310	168	<0.05	<1	0.11	0.08	0.015	0.0080	<0.1	310	<2.0	<2.0	1,020	NA	NA	NA
32S/12E-24B03	1/24/2011	660	46	44	5.6	87	33	320	160	<0.05	<1.0	NA	<0.1	0.15	0.0096	<0.1	320	<2.0	<2.0	1,020	0.22	NA	NA
32S/12E-24B03	10/28/2010	660	44	48	3.8	110	39	315	50	<0.1	<1.0	0.089	<0.1	NA	0.0120	<0.3	315	<10	<10	1,020	0.55	NA	NA
32S/12E-24B03	7/27/2010	610	44	51.4	8.34	112	41.6	328	160	< 0.10	1.8	0.0533	< 0.10	0.17	0.0602	0.16	328	< 1.0	< 1.0	1,000	6.7	0.0036	275
32S/12E-24B03	4/27/2010	666	45	53.2	4.84	118	44	357	150	< 0.10	1.5	0.0636	< 0.10	0.1	0.0519	0.17	357	< 1.0	< 1.0	980	9.71	0.0038	265
32S/12E-24B03	1/27/2010	672	48	56.4	5.40	119	43.4	336	150	< 0.10	1.4	0.101	< 0.10	0.15	0.140	0.15	336	< 1.0	< 1.0	1,000	5.18	0.0031	320
32S/12E-24B03	10/19/2009	622	40	55.1	3.93	110	42.6	342	160	< 0.10	< 0.50	0.0613	< 0.10	0.13	0.0181	0.14	342	< 1.0	< 1.0	880	0.343	0.0035	286
32S/12E-24B03	8/19/2009	680	47	54.9	5.21	128	43.4	337	150	< 0.10	2.2	NA	< 0.10	0.66	0.182	0.15	337	< 1.0	< 1.0	1,000	14.3	0.0032	313
32S/12E-24B03	5/12/2009	645	44	53.2	4.53	108	41.8	332	140	NA	NA	NA	< 0.10	NA	0.124	0.16	332	< 1.0	< 1.0	1,000	5.9	0.0036	275
32S/12E-24B03	3/26/1996	646	41	52	4.3	104	42	412	164	0.2	NA	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32S/12E-24B03	6/9/1976	569	36	53	3.7	85	39	330	165	0	NA	0.06	0.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32S/12E-24B03	1/17/1966	670	79	74	5	103	36	345	158	1	NA	0	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix A: NCMA Sentry Wells Water Quality Data

Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
32S/13E-30F01	10/14/2019	460	62	69	2	43	18	82	120	13	0.11	0.092	0.046	ND	ND	0.29	82	ND	ND	696	0.061	0.0047	214
32S/13E-30F01	4/10/2019	480	61	60	2.1	41	19	85	120	13	0.12	0.089	0.063	ND	ND	0.19	85	ND	ND	693	0.035	0.0031	321
32S/13E-30F01	10/10/2018	460	62	72	2.3	44	21	84	120	13	0.09	0.09	0.034	ND	ND	0.16	84	ND	ND	696	ND	0.0026	388
32S/13E-30F01	4/12/2018	470	58	69	2.3	44	21	82	110	12	0.14	0.09	0.030	ND	ND	0.23	82	ND	ND	699	ND	0.0040	252
32S/13E-30F01	10/11/2017	500	68	67	2.2	46	23	97	120	13	0.18	0.093	0.045	ND	0.018	0.28	97	ND	ND	752	0.061	0.0041	243
32S/13E-30F01	4/12/2017	510	61	65	2.1	42	20	85	120	13	0.12	0.074	0.062	ND	ND	0.28	85	ND	ND	682	0.045	0.0046	218
32S/13E-30F01	10/11/2016	480	62	72	2.3	46	23	91	120	12	0.13	0.09	0.046	ND	ND	0.32	91	ND	ND	702	ND	0.0052	194
32S/13E-30F01	4/13/2016	460	60	70	2.3	43	21	90	120	52	0.2	0.086	0.054	<0.01	<.0040	0.30	90	<4.1	<4.1	696	<0.030	0.0050	200
32S/13E-30F01	10/14/2015	450	58	61	2.1	39	19	87	120	13	<1	0.084	<0.10	<0.01	<0.005	0.18	87	<10	<10	700	<0.05	0.0031	322
32S/13E-30F01	4/15/2015	460	64	60	2.0	40	19	90	130	12	<1	0.081	<0.1	<0.01	<0.005	0.202	90	<10	<10	700	<0.05	0.0032	317
32S/13E-30F01	1/14/2015	550	95	69	2	50	24	98	140	12.50	<1	0.085	<0.1	<0.01	<0.005	0.2	98	<10	<10	820	<0.05	0.0018	562
32S/13E-30F01	10/14/2014	470	58	64	2	42	19	84	120	10.00	<1	0.081	<0.1	<0.01	<0.005	0.2	84	<10	<10	730	<0.05	0.0030	337
32S/13E-30F01	7/30/2014	540	89	71	2	46	24	94	130	13.6	<1	<0.1	<0.1	<0.01	<0.005	0.101	94	<10	<10	860	<0.05	0.0011	881
32S/13E-30F01	4/16/2014	610	122	78	3.3	47	22	100	140	12	<1	0.100	<0.1	<0.01	<0.005	0.17	100	<10	<10	970	<0.05	0.0014	718
32S/13E-30F01	1/15/2014	510	80	69	2.3	45	22	94	136	12.6	13.00	<0.1	<0.1	<0.01	<0.005	0.19	94	<10	<10	810	<0.05	0.0024	421
32S/13E-30F01	10/15/2013	530	78	73	2.3	47	22	86	140	12	<1	0.072	<0.1	<0.01	<.005	0.17	86	<10	<10	830	<0.05	0.0022	459
32S/13E-30F01	7/10/2013	480	80	64	2.2	49	22	85	140	12.2	<1	0.089	<0.1	<0.01	<0.005	<0.1	85	<10	<10	770	<0.05	NA	NA
32S/13E-30F01	4/11/2013	460	60	60	2.20	38	18	78	120	12	<1	0.091	<0.1	<0.01	<0.005	0.2	78	<10	<10	710	<0.05	0.0033	300
32S/13E-30F01	1/15/2013	440	65	64	2.40	40	19	95	130	12	<1	0.090	<0.1	<0.01	<0.005	0.11	95	<10	<10	720	0.05	0.0017	591
32S/13E-30F01	10/30/2012	470	60	66	2.50	43	20	75	123	12	<1	0.087	<0.1	<0.01	<0.005	0.13	75	<10	<10	720	<0.05	0.0022	462
32S/13E-30F01	7/24/2012	470	73	66	2.70	36	18	86	120	13	<1	<0.1	<0.1	<0.01	0.019	0.11	86	<10	<10	720	<0.05	0.0015	664
32S/13E-30F01	4/19/2012	450	72	52	1.90	32	15	81	130	13	<1	<0.1	<0.2	<0.01	<0.005	<0.2	81	<10	<10	700	<0.1	NA	NA
32S/13E-30F01	1/10/2012	460	67	61	2.00	35	17	81	120	11	<1	<0.1	0.12	<0.01	<0.005	<0.1	81	<10	<10	720	<0.1	NA	NA
32S/13E-30F01	11/17/2011	470	70	82	2.40	40	19	78	120	12	<1	<0.1	<0.1	<0.01	<0.005	0.16	78	<10	<10	720	<0.1	0.0023	438
32S/13E-30F01	7/25/2011	460	66	68	4.40	37	19	78	117.4	12.17	<1	0.100	0.101	<0.01	0.014	0.178	78	<5	<5	720	0.11	0.0027	370
32S/13E-30F01	4/20/2011	460	71	69	2.60	36	14	87	124	12	<1	0.180	0.11	<0.01	<0.005	0.17	87	<2.0	<2.0	730	NA	0.0024	418
32S/13E-30F01	1/24/2011	510	75	64	4.00	34	18	83	140	11	<1.0	0.170	0.11	<0.10	<0.005	<0.1	83	<2.0	<2.0	780	<0.1	NA	NA
32S/13E-30F01	10/21/2010	540	100	73	2.00	43	21	88	120	13	<1.0	0.067	<0.1	NA	<0.005	<0.3	88	<10	<10	894	<.1	NA	NA
32S/13E-30F01	7/26/2010	464	74	82.2	2.16	47.9	25.1	88.0	120	12	< 0.50	0.098	< 0.10	< 0.10	0.0817	0.37	88.0	< 1.0	< 1.0	710	0.79	0.0050	200
32S/13E-30F01	4/27/2010	534	72	77.1	2.59	45.8	23.6	100	140	9.8	0.56	0.129	< 0.10	< 0.10	0.112	0.29	100	< 1.0	< 1.0	780	1.02	0.0040	248
32S/13E-30F01	1/28/2010	725	140	99.9	2.70	76.4	35.8	214	170	1.6	0.84	0.120	< 0.10	< 0.10	0.112	0.56	214	< 1.0	< 1.0	1,200	0.640	0.0040	250
32S/13E-30F01	10/19/2009	522	74	85.6	2.35	52.8	26.3	102	150	13	0.70	0.136	0.13	< 0.10	0.123	0.32	102	< 1.0	< 1.0	770	1.30	0.0043	231
32S/13E-30F01	8/19/2009	648	92	98.9	3.84	63.1	31.9	113	190	10	0.56	NA	< 0.10	0.12	1.03	0.32	113	< 1.0	< 1.0	970	4.52	0.0035	288
32S/13E-30F01	5/12/2009	792	110	108	2.89	80.2	39.9	136	280	NA	NA	NA	< 0.10	NA	0.0353	0.39	136	< 1.0	< 1.0	1,200	0.281	0.0035	282

Appendix A: NCMA Sentry Wells Water Quality Data

Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
32S/13E-30F02	10/14/2019	550	51	50	2.7	83	32	180	130	14	ND	0.097	0.077	ND	0.150	0.63	180	ND	ND	841	0.06	0.0124	81
32S/13E-30F02	7/9/2019	620	51	47	2.5	82	35	190	120	14	0.130	0.092	0.084	ND	0.017	0.49	190	ND	ND	838	ND	0.0096	104
32S/13E-30F02	4/10/2019	570	53	43	2.7	78	32	180	130	14	0.085	0.093	0.090	ND	0.046	0.47	180	ND	ND	852	0.05	0.0089	113
32S/13E-30F02	1/8/2019	560	52	44	2.7	80	34	190	130	14	0.059	0.094	0.091	ND	0.013	0.62	190	ND	ND	845	ND	0.0119	84
32S/13E-30F02	10/10/2018	580	51	50	2.9	83	35	190	130	14	0.07	0.094	0.07	ND	0.020	0.42	190	ND	ND	848	0.07	0.0082	121
32S/13E-30F02	7/10/2018	580	53	48	2.7	83	36	190	130	14	0.23	0.095	0.11	ND	0.026	0.59	190	ND	ND	893	0.045	0.0111	90
32S/13E-30F02	4/12/2018	580	48	48	2.8	82	35	190	120	13	0.12	0.097	0.072	ND	0.022	0.48	190	ND	ND	854	ND	0.0100	100
32S/13E-30F02	1/11/2018	580	52	51	2.7	82	36	200	130	14	0.14	0.091	0.12	ND	0.032	0.68	200	ND	ND	846	ND	0.0131	76
32S/13E-30F02	10/11/2017	580	51	46	2.6	80	34	200	130	14	0.16	0.094	0.083	ND	0.037	0.65	200	ND	ND	877	0.037	0.0127	78
32S/13E-30F02	7/12/2017	570	52	49	2.9	89	39	200	130	13	ND	0.094	0.096	ND	0.15	0.66	200	ND	ND	861	ND	0.0127	79
32S/13E-30F02	4/12/2017	620	52	51	2.9	88	38	200	130	13	ND	0.088	0.063	ND	0.022	0.67	200	ND	ND	856	0.041	0.0129	78
32S/13E-30F02	1/10/2017	590	52	50	2.8	90	37	220	140	13	ND	0.09	0.08	ND	1.1	0.6	220	ND	ND	884	0.15	0.0115	87
32S/13E-30F02	10/11/2016	600	52	50	2.9	89	40	220	140	13	0.089	0.09	0.074	ND	0.025	0.6	220	ND	ND	886	ND	0.0115	87
32S/13E-30F02	7/20/2016	590	51	51	3.0	88	38	220	130	58	0.14	0.091	0.072	<0.010	0.170	0.57	220	<4.1	<4.1	880	0.033	0.0112	89
32S/13E-30F02	4/13/2016	570	51	51	2.9	89	40	200	130	58	0.08	0.1	0.086	<0.010	0.014	0.60	200	<4.1	<4.1	876	<0.030	0.0118	85
32S/13E-30F02	1/13/2016	610	53	51	2.9	89	38	210	140	13	0.14	0.091	0.15	<0.010	0.035	0.47	210	<4.1	<4.1	858	<0.030	0.0089	113
32S/13E-30F02	10/14/2015	570	49	45	2.8	80	35	212	130	13	<1	0.085	<0.10	<0.01	0.20	0.39	212	<10	<10	890	0.078	0.0080	126
32S/13E-30F02	7/15/2015	610	50	51	2.0	88	38	204	140	13	<1	0.091	<0.1	<0.01	0.048	0.30	204	<10	<10	890	<0.05	0.0060	167
32S/13E-30F02	4/15/2015	570	51	43	2.7	78	34	200	140	13.5	<1	0.085	<0.1	<0.01	0.087	0.42	200	<10	<10	850	<0.05	0.0082	121
32S/13E-30F02	1/14/2015	590	51	42	2.4	80	34	210	140	13	<1	0.08	<0.1	<0.01	0.014	0.324	210	<10	<10	860	<0.05	0.0064	157
32S/13E-30F02	10/14/2014	600	46	42	2.6	76	32	310	120	12	<1	0.08	<0.1	<0.01	0.22	0.37	310	<10	<10	890	<0.05	0.0080	124
32S/13E-30F02	7/30/2014	580	49	46	2.6	80	35	210	130	13	<1	<0.1	<0.1	<0.01	0.02	0.27	210	<10	<10	890	<0.05	0.0055	181
32S/13E-30F02	4/16/2014	590	49	45	3.3	68	30	200	130	12	<1	0.089	<0.1	<0.01	0.011	0.44	200	<10	<10	890	<0.05	0.0090	111
32S/13E-30F02	1/15/2014	580	50	45	2.7	76	31	190	136	13.1	13.4	<0.1	<0.1	<0.01	0.054	0.4	190	<10	<10	890	<0.05	0.0080	125
32S/13E-30F02	10/15/2013	570	50	45	2.7	75	33	190	140	12	<1	0.69	0.19	<0.01	0.099	0.38	190	<10	<10	890	<0.05	0.0076	132
32S/13E-30F02	7/10/2013	570	50	38	2.6	78	32	190	180	<0.05	<1	0.08	0.13	<0.01	0.14	<0.1	190	<10	<10	880	<0.05	NA	NA
32S/13E-30F02	4/11/2013	590	50	41	2.6	70	30	190	140	14	<1	0.09	0.1	<0.01	0.082	0.43	190	<10	<10	880	<0.05	0.0086	116
32S/13E-30F02	1/15/2013	550	50	44	2.9	72	31	200	140	13	<1	0.09	0.1	<0.01	0.011	0.32	200	<10	<10	880	0.12	0.0064	156
32S/13E-30F02	10/30/2012	610	48	45	3.0	79	34	188	135	13	<1	0.09	<0.1	<0.01	0.06	0.31	188	<10	<10	890	0.011	0.0065	155
32S/13E-30F02	7/24/2012	590	56	46	3.2	69	30	194	140	14	<1	<0.1	0.11	<0.01	0.038	0.27	194	<10	<10	880	<0.05	0.0048	207
32S/13E-30F02	4/19/2012	600	60	40	2.7	68	30	200	140	14	<1	<0.1	<0.2	<0.01	0.19	0.3	200	<10	<10	890	0.11	0.0050	200
32S/13E-30F02	1/12/2012	610	52	45	3.0	73	32	200	130	12	<1	<0.1	0.25	<0.02	0.29	0.33	200	<10	<10	890	<0.1	0.0063	158
32S/13E-30F02	11/21/2011	580	49	38	2.7	73	30	190	120	13	<1	0.07	<0.1	<0.01	0.022	0.34	190	<10	<10	870	<0.1	0.0069	144
32S/13E-30F02	7/25/2011	590	52	46	5.1	73	31	190	134.3	13.19	<1	<0.1	0.127	<0.1	0.025	0.387	190	<5	<5	900	<0.1	0.0074	135
32S/13E-30F02	4/20/2011	600	54	57	4.2	74	29	200	141	13	<1	0.18	0.17	<0.01	0.025	0.38	200	<2.0	<2.0	920	NA	0.0070	142
32S/13E-30F02	1/24/2011	600	51	43	4.9	71	31	210	140	12	<1.0	0.15	0.12	0.27	0.041	0.3	210	<2.0	<2.0	920	<0.1	0.0059	170
32S/13E-30F02	10/28/2010	610	49	38	2.3	70	30	210	130	11	<1.0	0.10	<0.1	NA	0.0094	<0.3	210	<10	<10	920	<0.1	NA	NA
32S/13E-30F02	7/26/2010	560	49	45.8	2.95	85.4	36.8	223	130	11	2.5	0.0928	< 0.10	0.13	0.0646	0.59	223	< 1.0	< 1.0	890	< 0.100	0.0120	83
32S/13E-30F02	4/27/2010	634	51	50.3	3.12	87.9	38.6	225	130	10	0.8	0.112	< 0.10	< 0.10	0.615	0.51	225	< 1.0	< 1.0	880	3.28	0.0100	100
32S/13E-30F02	1/28/2010	604	44	52.2	4.47	92.1	38.5	230	150	11	1.4	0.127	< 0.10	< 0.10	0.913	0.48	230	< 1.0	< 1.0	920	4.55	0.0109	92
32S/13E-30F02	10/19/2009	566	49	49.5	2.80	88.3	37.6	240	140	11	1.0	0.0942	0.17	< 0.10	0.924	0.51	240	< 1.0	< 1.0	850	2.15	0.0104	96
32S/13E-30F02	8/19/2009	614	49	51.8	3.19	87.3	36.8	225	130	11	2.00	NA	0.10	< 0.10	2.24	0.54	225	< 1.0	< 1.0	920	19.4	0.0110	91
32S/13E-30F02	5/12/2009	514	54	48.7	3.26	81.1	34.9	206	120	NA	NA	NA	0.11	NA	1.87	0.53	206	< 1.0	< 1.0	890	3.23	0.0098	102
32S/13E-30F02	3/27/1996	678	49	52	3.8	98	42	305	166	49	NA	0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32S/13E-30F02	6/9/1976	637	48	55	2.8	98	43	343	172	17.6	NA	0.1	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32S/13E-30F02	1/20/1966	580	68	47	2	94	38	280	152	27	NA	0.08	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix A: NCMA Sentry Wells Water Quality Data

Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
32S/13E-30F03	10/14/2019	620	47	44	2.7	110	44	300	170	ND	ND	0.064	0.12	0.035	0.021	0.16	300	ND	ND	980	0.09	0.0034	294
32S/13E-30F03	7/9/2019	650	47	41	2.5	110	49	310	170	ND	0.094	0.061	0.14	0.039	0.020	0.21	310	ND	ND	975	0.04	0.0045	224
32S/13E-30F03	4/10/2019	630	49	37	2.5	100	45	310	170	ND	0.140	0.060	0.14	0.030	0.020	0.19	310	ND	ND	988	0.05	0.0039	258
32S/13E-30F03	1/8/2019	660	48	39	2.6	110	46	310	170	ND	0.068	0.063	0.15	0.037	0.020	0.22	310	ND	ND	990	0.08	0.0046	218
32S/13E-30F03	10/10/2018	650	48	44	2.9	120	51	310	170	ND	0.12	0.067	0.10	0.036	0.022	0.16	310	ND	ND	981	0.05	0.0033	300
32S/13E-30F03	7/10/2018	630	49	42	2.6	110	49	310	170	ND	ND	0.062	0.18	0.035	0.019	0.22	310	ND	ND	1,030	ND	0.0045	223
32S/13E-30F03	4/12/2018	640	45	43	2.6	110	46	300	160	ND	0.15	0.066	0.14	0.036	0.021	0.16	300	ND	ND	980	0.035	0.0036	281
32S/13E-30F03	1/11/2018	650	48	45	2.8	120	51	310	170	ND	0.13	0.044	0.15	0.041	0.021	0.26	310	ND	ND	966	0.037	0.0054	185
32S/13E-30F03	10/11/2017	660	47	42	2.6	110	50	320	170	ND	0.13	0.067	0.13	0.037	0.021	0.2	320	ND	ND	996	0.056	0.0043	235
32S/13E-30F03	7/12/2017	750	46	44	3	120	53	280	170	ND	ND	0.064	0.14	0.035	0.023	0.2	280	ND	ND	980	0.046	0.0043	230
32S/13E-30F03	4/12/2017	640	48	45	2.9	120	51	310	170	ND	ND	0.076	0.16	0.035	0.022	0.22	310	ND	ND	972	0.065	0.0046	218
32S/13E-30F03	1/10/2017	670	49	44	2.7	120	51	330	170	ND	ND	0.064	0.13	0.045	0.023	0.31	330	ND	ND	993	0.14	0.0063	158
32S/13E-30F03	10/11/2016	680	48	41	2.6	110	49	320	170	ND	0.11	0.056	0.13	0.042	0.02	0.22	320	ND	ND	992	ND	0.0046	218
32S/13E-30F03	7/20/2016	660	47	44	2.9	110	51	320	170	<0.096	<0.080	0.062	0.12	0.032	0.023	0.20	320	<4.1	<4.1	992	0.04	0.0043	235
32S/13E-30F03	4/13/2016	650	47	42	2.7	110	51	310	170	<0.096	0.2	0.072	0.13	0.028	0.021	0.22	310	<4.1	<4.1	981	0.03	0.0047	214
32S/13E-30F03	1/14/2016	580	49	45	2.8	120	52	310	180	0.05	0.1	0.061	0.2	<0.010	0.025	0.21	310	<4.1	<4.1	947	0.054	0.0043	233
32S/13E-30F03	10/14/2015	660	44	38	2.8	100	44	306	160	<0.05	<1	<0.05	0.13	0.028	0.021	0.10	306	<10	<10	990	<0.05	0.0023	440
32S/13E-30F03	7/15/2015	670	45	45	1.9	120	51	305	170	<0.05	<1	0.060	0.11	0.03	0.019	<0.1	305	<10	<10	990	<0.05	NA	NA
32S/13E-30F03	4/15/2015	650	46	35	2.3	99	44	300	170	<0.05	<1	0.056	0.126	0.02	0.015	0.1	300	<10	<10	950	<0.05	NA	NA
32S/13E-30F03	1/14/2015	670	46	36	2.2	100	45	310	180	<0.05	<1	0.05	0.121	0.02	0.016	<0.1	310	<10	<10	950	0.01	NA	NA
32S/13E-30F03	10/14/2014	660	41	35	3.0	99	42	310	150	<0.05	<1	<0.05	<0.1	0.011	0.017	<0.1	310	<10	<10	990	<0.05	NA	NA
32S/13E-30F03	7/30/2014	660	44	38	2.6	96	46	300	160	<0.05	<1	0.28	0.12	0.02	0.015	<0.1	300	<10	<10	990	<0.05	NA	NA
32S/13E-30F03	4/16/2014	640	44	36	3.3	55	38	310	169	<0.05	<1	0.062	0.12	0.02	0.011	0.11	310	<10	<10	990	<0.05	0.0025	400
32S/13E-30F03	1/15/2014	650	45	35	2.5	90	41	300	173	<0.05	<1	<0.05	0.13	0.01	0.015	0.12	300	<10	<10	990	<0.05	0.0027	375
32S/13E-30F03	10/15/2013	670	41	40	2.7	100	44	280	179	<0.05	<1	<0.05	0.14	0.02	0.016	<0.1	280	<10	<10	990	<0.05	NA	NA
32S/13E-30F03	7/10/2013	650	50	33	2.4	100	43	290	140	13.5	<1	0.055	<0.1	0.02	0.017	0.23	290	<10	<10	990	<0.05	0.0046	217
32S/13E-30F03	4/11/2013	670	45	36	2.7	94	42	300	170	<0.05	<1	0.06	0.13	0.02	0.016	0.12	300	<10	<10	990	<0.05	0.0027	375
32S/13E-30F03	1/15/2013	630	45	36	2.3	92	41	295	180	<0.05	<1	0.06	0.11	<0.01	0.015	<0.1	295	<10	<10	980	<0.05	NA	NA
32S/13E-30F03	10/30/2012	650	43	40	3.1	100	46	280	170	<0.05	<1	0.06	<0.1	0.03	0.016	<0.1	280	<10	<10	990	0.02	NA	NA
32S/13E-30F03	7/24/2012	640	51	36	2.7	81	37	296	180	<0.05	<1	<0.1	0.17	<0.01	0.016	0.2	296	<10	<10	990	<0.05	0.0039	255
32S/13E-30F03	4/19/2012	640	54	32	2.3	84	36	290	180	<0.1	<1	<0.1	<0.2	0.01	0.014	<0.2	290	<10	<10	990	<0.1	NA	NA
32S/13E-30F03	1/12/2012	660	46	39	2.1	94	42	280	160	<0.1	<1	<0.1	0.2	0.025	0.016	<0.2	280	<10	<10	990	<0.1	NA	NA
32S/13E-30F03	11/21/2011	650	43	33	2.6	93	39	290	160	<0.05	<1	0.04	0.15	0.028	0.016	<0.1	290	<10	<10	960	<0.1	NA	NA
32S/13E-30F03	7/25/2011	650	47	46	5.1	73	31	190	170.5	<0.05	<1	<0.1	0.155	0.02	0.025	<0.1	190	<5	<5	900	<0.1	NA	NA
32S/13E-30F03	4/21/2011	650	48	40	3.8	91	34	280	179	<0.05	<1	0.1	0.2	0.029	0.015	0.11	280	<2.0	<2.0	1,000	NA	0.0023	436
32S/13E-30F03	1/24/2011	650	46	36	4.7	87	38	300	170	<0.05	<1.0	0.11	0.17	0.24	0.016	<0.1	300	<2.0	<2.0	990	<0.1	NA	NA
32S/13E-30F03	10/28/2010	650	46	37	2.7	100	43	280	160	<0.1	<1.0	0.10	<0.1	NA	0.032	<0.3	280	<10	<10	1,000	0.53	NA	NA
32S/13E-30F03	7/26/2010	608	45	43.8	2.94	107	46.8	294	160	1.3	0.84	0.0479	< 0.10	0.10	0.129	0.24	294	< 1.0	< 1.0	900	7.55	0.0053	188
32S/13E-30F03	4/27/2010	668	48	40.8	2.91	101	44.7	304	160	0.21	0.84	0.0733	0.14	0.11	0.0694	0.23	304	< 1.0	< 1.0	940	2.62	0.0048	209
32S/13E-30F03	1/28/2010	656	40	43.1	3.91	112	47.2	310	180	< 0.20	2.8	0.0833	0.13	< 0.10	0.287	0.21	310	< 1.0	< 1.0	980	4.80	0.0053	190
32S/13E-30F03	10/19/2009	626	48	43.3	3.14	108	46.2	308	170	< 0.10	1.8	0.0646	0.22	< 0.10	0.255	0.17	308	< 1.0	< 1.0	910	2.09	0.0035	282
32S/13E-30F03	8/19/2009	672	45	43.1	3.15	111	44.3	290	170	< 0.10	2.5	NA	0.14	< 0.10	0.468	0.19	290	< 1.0	< 1.0	980	18.5	0.0042	237
32S/13E-30F03	5/12/2009	678	49	44.8	3.32	109	42.9	276	180	NA	NA	NA	0.17	NA	0.146	0.18	276	< 1.0	< 1.0	960	1.16	0.0037	272
32S/13E-30F03	3/27/1996	686	41	40	3.4	109	48	379	197	0.2	NA	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32S/13E-30F03	6/7/1976	616	43	41	2.6	96	49	333	190	0.4	NA	0.05	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32S/13E-30F03	1/19/1966	642	69	49	4	109	40	321	182	1	NA	0.05	0.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix A: NCMA Sentry Wells Water Quality Data

Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
32S/13E-30N01	10/15/2019	830	150	110	32.0	86	57.0	330	170	ND	0.66	0.22	0.32	0	0.12	1.30	330	ND	ND	1,340	2.6	0.0087	115
32S/13E-30N01	4/9/2019	860	160	94	30.0	81	59.0	310	180	ND	0.64	0.23	0.36	0	0.11	1.20	310	ND	ND	1,370	2.8	0.0075	133
32S/13E-30N01	10/10/2018	920	200	130	36.0	96	73.0	370	140	ND	0.62	0.21	0.36	0	0.14	0.85	370	ND	ND	1,500	3.0	0.0043	235
32S/13E-30N01	4/11/2018	800	140	110	31	73	55	290	150	ND	0.73	0.2	0.36	0.017	0.1	1.1	290	ND	ND	1,280	2.4	0.0079	127
32S/13E-30N01	10/11/2017	870	150	120	31.0	78	57.0	320	170	ND	0.68	0.24	0.38	0	0.12	1.50	320	ND	ND	1,350	3.0	0.0100	100
32S/13E-30N01	4/11/2017	960	260	160	35.0	92	73.0	350	150	ND	0.84	0.23	0.42	0	0.14	1.50	350	ND	ND	1,690	3.9	0.0058	173
32S/13E-30N01	10/12/2016	900	180	130	32.0	77	61.0	290	180	ND	0.53	0.19	0.34	0	0.11	1.70	290	ND	ND	1,420	2.7	0.0094	106
32S/13E-30N01	4/12/2016	790	110	110	27.0	55	46.0	230	190	0.2	0.51	0.18	0.42	0	0.07	1.70	230	<8.2	<8.2	1,190	1.7	0.0155	65
32S/13E-30N01	10/15/2015	740	120	100	27.0	52	41.0	250	190	<0.05	<1	0.18	0.43	0	0.07	1.30	250	<10	<10	1,220	1.8	0.0108	92
32S/13E-30N01	4/14/2015	930	190	130	28.0	69	54.0	360	170	<0.05	1.40	0.23	0.33	0	0.09	1.20	360	<10	<10	1,500	2.5	0.0063	158
32S/13E-30N01	1/14/2015	845	170	110	29.0	71	54.0	320	180	<0.05	<1	0.21	0.33	0	0.09	1.21	320	<10	<10	1,360	2.3	0.0071	140
32S/13E-30N01	10/15/2014	790	140	110	30.0	62	53.0	300	160	0.7	<1	0.21	0.29	<0.01	0.08	1.20	300	<10	<10	1,350	2.5	0.0086	117
32S/13E-30N01	7/30/2014	800	150	110	27.0	61	52.0	310	160	<0.05	<1	0.81	0.33	0	0.08	1.10	310	<10	<10	1,360	2.4	0.0073	136
32S/13E-30N01	4/16/2014	850	160	112	26.0	55	43.0	310	170	<0.05	<1	0.20	0.33	0	0.08	1.30	310	<10	<10	1,410	2.4	0.0081	123
32S/13E-30N01	1/15/2014	790	154	110	26.0	56	45.0	260	190	<0.05	<1	0.19	0.41	<0.01	0.08	1.40	260	<10	<10	1,340	2.5	0.0091	110
32S/13E-30N01	10/15/2013	950	200	140	32.0	74	60.0	330	180	<0.05	<1	0.21	0.33	0	0.10	1.30	330	<10	<10	1,570	2.8	0.0065	154
32S/13E-30N01	7/10/2013	830	175	120	29.0	71	54.0	310	185	<0.05	<1	0.22	0.32	0	0.09	0.84	310	<10	<10	1,430	2.3	0.0048	208
32S/13E-30N01	4/10/2013	860	180	120	29.0	67	54.0	320	180	<0.05	1.10	0.21	0.31	0	0.09	1.20	320	<10	<10	1,470	2.5	0.0067	150
32S/13E-30N01	1/14/2013	800	170	120	32.0	66	53.0	280	200	<0.05	1.10	0.22	0.26	<0.01	0.09	1.20	280	<10	<10	1,380	2.5	0.0071	142
32S/13E-30N01	10/29/2012	900	180	120	34.0	77	60.0	300	190	<0.05	<1	0.21	0.40	0	0.10	1.20	300	<10	<10	1,500	2.8	0.0067	150
32S/13E-30N01	7/23/2012	840	190	120	31.0	56	45.0	266	200	<0.05	<1	0.22	0.43	<0.01	0.10	1.20	266	<10	<10	1,370	2.3	0.0063	158
32S/13E-30N01	4/18/2012	1,050	280	140	31.0	59	47.0	330	210	<0.1	1.40	0.20	0.50	<0.01	0.08	1.30	330	<10	<10	1,680	2.4	0.0046	215
32S/13E-30N01	1/9/2012	1,050	260	170	34.0	68	52.0	307	200	<0.05	2.70	0.21	0.41	<0.01	0.09	1.90	307	<10	<10	1,760	2.9	0.0073	137
32S/13E-30N01	11/17/2011	1,300	360	320	40.0	90	69.0	390	220	<0.1	<1	0.23	0.38	0	0.11	2.50	390	<10	<10	2,210	3.4	0.0069	144
32S/13E-30N01	7/25/2011	1,680	445	230	42.0	99	81.0	380	256	<0.05	1.20	0.21	<0.1	<0.01	0.12	3.02	380	<5	<5	2,480	4.2	0.0068	148
32S/13E-30N01	4/20/2011	890	210	130	26.0	68	46.0	180	215	<0.05	<1	0.24	0.39	0	0.09	4.57	180	<2.0	<2.0	1,550	NA	0.0218	46
32S/13E-30N01	1/24/2011	870	180	100	28.0	84	46.0	240	210	<0.05	<1.0	<0.1	0.34	0	0.24	3.63	240	<2.0	<2.0	1,430	18.0	0.0202	50
32S/13E-30N01	10/21/2010	890	190	120	26.0	58	45.0	246	200	<0.1	<1.0	<0.1	0.37	NA	0.08	2.30	246	<10	<10	1,498	<0.1	0.0121	83
32S/13E-30N01	7/27/2010	917	200	130	30.0	75	56.2	241	220	< 0.10	< 0.50	0.17	0.29	0	0.10	2.80	241	< 1.0	< 1.0	1,400	2.6	0.0140	71
32S/13E-30N01	4/27/2010	808	150	130	29.0	136	55.6	286	210	0.8	1.70	0.17	0.37	0	0.28	2.60	286	< 1.0	< 1.0	1,300	20.4	0.0173	58
32S/13E-30N01	1/26/2010	902	210	155	33.5	156	66.4	307	230	< 0.10	1.70	0.32	0.30	0	0.33	3.20	307	< 1.0	< 1.0	1,500	27.3	0.0152	66
32S/13E-30N01	10/20/2009	828	200	159	34.3	118	59.8	238	230	< 0.10	1.30	0.24	0.38	< 0.10	0.16	3.20	238	< 1.0	< 1.0	1,300	5.3	0.0160	63
32S/13E-30N01	8/20/2009	835	160	150	27.8	121	49.4	235	220	< 0.10	1.30	NA	0.37	0	0.23	2.90	235	< 1.0	< 1.0	1,400	15.9	0.0181	55
32S/13E-30N01	5/11/2009	960	180	175	33.5	87	46.2	274	220	NA	NA	NA	0.36	NA	0.11	3.20	274	< 1.0	< 1.0	1,500	2.3	0.0178	56

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Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
32S/13E-30N03	10/15/2019	560	67	60	3.2	76	31.0	150	140	17.0	0.14	0.09	0.17	ND	0.11	0.86	150	ND	ND	875	0.150	0.0128	78
32S/13E-30N03	7/9/2019	640	67	55	3.0	72	33.0	140	130	16.0	0.14	0.08	0.18	ND	ND	0.77	140	ND	ND	860	ND	0.0115	87
32S/13E-30N03	4/9/2019	580	71	51	3.1	68	30.0	150	130	16.0	0.18	0.09	0.18	ND	0.03	0.60	150	ND	ND	867	ND	0.0085	118
32S/13E-30N03	1/9/2019	560	69	54	3.2	72	31.0	150	130	16.0	0.08	0.09	0.20	ND	ND	0.71	150	ND	ND	858	ND	0.0103	97
32S/13E-30N03	10/10/2018	540	68	59	3.4	71	32.0	150	130	16.0	ND	0.09	0.21	ND	0.01	0.53	150	ND	ND	847	0.030	0.0078	128
32S/13E-30N03	7/12/2018	550	62	54	3.2	69	31	150	120	15	0.16	0.084	0.17	ND	0.063	0.61	150	ND	ND	866	0.076	0.0098	102
32S/13E-30N03	4/11/2018	590	62	58	3.3	72	33	150	120	14	0.19	0.094	0.16	ND	0.006	0.51	150	ND	ND	839	ND	0.0082	122
32S/13E-30N03	1/11/2018	580	64	61	3.3	74	34	150	140	14	0.20	0.09	0.19	ND	0.33	0.61	150	ND	ND	836	0.120	0.0095	105
32S/13E-30N03	10/11/2017	580	63	54	3.2	73	33.0	150	130	15.0	0.24	0.10	0.16	ND	0.86	0.64	150	ND	ND	836	0.590	0.0102	98
32S/13E-30N03	7/11/2017	560	64	60	3.2	77	34.0	150	140	14.0	0.10	0.09	0.14	ND	0.54	0.66	150	ND	ND	871	0.180	0.0103	97
32S/13E-30N03	4/11/2017	560	69	62	3.6	82	36.0	160	140	14.0	0.12	0.08	0.15	ND	0.62	0.69	160	ND	ND	866	0.430	0.0100	100
32S/13E-30N03	1/12/2017	580	69	62	3.6	83	38.0	170	150	14.0	0.13	0.09	0.13	ND	3.30	0.74	170	ND	ND	878	1.500	0.0107	93
32S/13E-30N03	10/12/2016	580	68	62	3.5	80	37.0	170	140	15.0	ND	0.09	0.16	ND	0.56	0.76	170	ND	ND	879	0.170	0.0112	89
32S/13E-30N03	7/19/2016	580	66	61	3.6	75	36.0	160	130	65.0	0.20	0.08	0.16	<0.010	0.03	0.76	160	<4.1	<4.1	864	<0.030	0.0115	87
32S/13E-30N03	4/12/2016	610	69	60	3.4	75	36.0	160	130	64.0	0.16	0.08	0.18	<0.010	0.01	0.78	160	<4.1	<4.1	895	<0.05	0.0113	88
32S/13E-30N03	1/13/2016	570	72	62	3.4	77	35.0	160	140	15.0	0.15	0.08	0.22	<0.010	0.01	0.66	160	<4.1	<4.1	867	0.079	0.0092	109
32S/13E-30N03	10/15/2015	570	63	54	3.3	69	32.0	162	130	15.0	<1	0.02	0.23	<0.01	0.02	0.56	162	<10	<10	860	<0.05	0.0089	113
32S/13E-30N03	7/16/2015	580	65	65	3.0	81	35.0	160	140	15.0	15.30	0.08	0.14	0	0.01	0.46	160	<10	<10	880	<0.05	0.0071	141
32S/13E-30N03	4/14/2015	580	65	49	2.9	65	31.0	160	140	15.2	<1	0.08	<0.1	<0.01	<0.005	0.47	160	<10	<10	860	<0.05	0.0072	138
32S/13E-30N03	1/14/2015	610	68	53	3.0	73	34.0	170	150	15.3	<1	0.07	0.15	<0.01	0.05	0.43	170	<10	<10	870	0.490	0.0063	158
32S/13E-30N03	10/15/2014	560	59	52	3.5	67	32.0	160	130	14.0	0.54	0.07	0.14	<0.01	<0.005	0.45	160	<10	<10	890	<0.05	0.0077	131
32S/13E-30N03	7/30/2014	580	65	55	3.2	69	32.0	170	130	15.0	<1	<0.1	0.16	<0.01	<0.005	0.34	170	<10	<10	910	<0.05	0.0052	191
32S/13E-30N03	4/16/2014	610	63	55	4.3	65	29.0	170	140	13.0	<1	0.08	0.15	<0.01	0.06	0.38	170	<10	<10	910	<0.05	0.0060	166
32S/13E-30N03	1/15/2014	610	66	54	3.2	67	31.0	170	149	14.8	15.00	<0.1	0.16	<0.01	0.07	0.46	170	<10	<10	910	0.270	0.0070	143
32S/13E-30N03	10/15/2013	580	60	57	3.3	71	32.0	170	150	14.0	<1	0.06	0.16	<0.01	0.37	0.41	170	<10	<10	910	0.100	0.0068	146
32S/13E-30N03	7/10/2013	590	60	48	3.1	71	31.0	160	150	15.1	<1	0.07	0.18	<0.01	1.30	0.17	160	<10	<10	900	0.430	0.0028	353
32S/13E-30N03	4/10/2013	600	66	53	3.3	69	31.0	160	150	15.0	<1	0.11	0.18	<0.01	0.06	0.35	160	<10	<10	910	<0.05	0.0053	189
32S/13E-30N03	1/14/2013	570	66	55	3.4	68	30.0	165	150	14.8	<1	0.09	0.17	<0.01	0.03	0.27	165	<10	<10	900	0.084	0.0041	244
32S/13E-30N03	10/29/2012	610	60	56	3.7	74	33.0	155	148	14.0	<1	0.08	0.20	<0.01	0.03	0.30	155	<10	<10	900	0.040	0.0050	200
32S/13E-30N03	7/23/2012	600	71	56	3.5	61	28.0	152	200	<0.05	<1	0.10	<0.1	<.002	0.12	0.30	152	<10	<10	890	0.440	0.0042	237
32S/13E-30N03	4/18/2012	570	80	47	3.0	57	25.0	150	150	16.0	<1	0.10	0.30	<0.01	<0.005	0.28	150	<10	<10	880	<0.1	0.0035	286
32S/13E-30N03	1/11/2012	570	67	55	3.9	68	30.0	140	130	14.0	<1	0.10	0.22	<0.02	0.05	0.39	140	<10	<10	870	0.170	0.0058	172
32S/13E-30N03	11/21/2011	600	67	47	3.2	64	28.0	140	130	15.0	1.20	0.09	0.23	<0.01	<0.005	0.62	140	<10	<10	850	<0.1	0.0093	108
32S/13E-30N03	7/25/2011	590	67	47	5.0	54	24.0	290	140	15.4	<1	<0.1	0.19	<0.01	0.05	0.79	290	<5	<5	890	0.140	0.0118	85
32S/13E-30N03	4/20/2011	580	76	58	4.2	62	23.0	140	142	16.0	<1	0.12	0.24	<0.1	0.05	0.92	140	<2.0	<2.0	890	NA	0.0121	83
32S/13E-30N03	1/24/2011	570	76	48	4.8	55	25.0	130	130	16.0	<1.0	0.12	0.20	<0.10	0.01	1.70	130	<2.0	<2.0	900	<0.1	0.0224	45
32S/13E-30N03	10/21/2010	550	69	59	3.3	65	31.0	133	130	15.0	<1.0	<0.1	0.10	NA	<0.005	1.10	133	<10	<10	886	<0.1	0.0159	63
32S/13E-30N03	7/27/2010	528	72	55	3.4	69	31.0	139	130	15.0	< 0.50	0.07	0.14	0	< 0.00500	1.30	139	< 1.0	< 1.0	860	< 0.100	0.0181	55
32S/13E-30N03	4/27/2010	672	89	61	3.7	71	32.5	134	130	14.0	< 0.50	0.08	0.18	0	< 0.00500	1.20	134	< 1.0	< 1.0	870	< 0.100	0.0135	74
32S/13E-30N03	1/26/2010	606	110	75	4.5	78	34.3	126	130	14.0	1.40	0.07	0.15	< 0.10	0.01	1.30	126	< 1.0	< 1.0	990	0.653	0.0118	85
32S/13E-30N03	10/20/2009	806	180	93	25.5	92	41.5	162	150	9.7	2.20	0.11	0.26	< 0.10	0.25	1.40	162	< 1.0	< 1.0	1,200	0.344	0.0078	129
32S/13E-30N03	8/20/2009	1,070	190	151	61.6	112	44.2	130	130	16.0	3.40	NA	0.20	< 0.10	0.15	1.60	130	< 1.0	< 1.0	1,700	1.930	0.0084	119
32S/13E-30N03	5/12/2009	602	97	63	4.0	73	32.2	122	120	NA	NA	NA	0.22	NA	24.00	1.20	122	< 1.0	< 1.0	900	2.240	0.0124	81
32S/13E-30N03	3/27/1996	624	70	62	4.0	78	35.0	150	161	106.8	NA	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32S/13E-30N03	6/7/1976	705	90	54	2.9	99	43.0	189	168	112.5	NA	0.08	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32S/13E-30N03	1/21/1966	804	57	54	3.0	132	59.0	410	250	1.0	NA	0.08	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
32S/13E-30N02	10/15/2019	1,000	49	77	4.8	160	58.0	190	510	0.2	0.10	0.16	0.09	ND	ND	0.17	190	ND	ND	1,350	0.150	0.0035	288
32S/13E-30N02	7/9/2019	940	48	73	4.6	150	64.0	190	470	0.2	0.45	0.15	0.10	ND	ND	0.12	190	ND	ND	1,340	ND	0.0025	400
32S/13E-30N02	4/9/2019	1,000	50	64	4.6	140	56.0	190	480	0.2	0.14	0.15	0.12	ND	ND	0.14	190	ND	ND	1,350	0.040	0.0028	357
32S/13E-30N02	1/9/2019	960	50	67	4.6	150	59.0	190	490	0.2	0.19	0.15	0.12	ND	ND	0.16	190	ND	ND	1,360	ND	0.0032	313
32S/13E-30N02	10/10/2018	940	50	75	4.9	150	64.0	190	500	0.2	0.16	0.16	0.07	ND	ND	0.09	190	ND	ND	1,340	0.220	0.0017	581
32S/13E-30N02	7/12/2018	1,000	47	66	4.5	140	59	190	480	0.19	0.19	0.14	0.099	ND	ND	0.12	190	ND	ND	1,390	0.17	0.0026	392
32S/13E-30N02	4/11/2018	1,100	46	76	4.9	160	65	190	480	0.17	0.15	0.16	0.097	ND	0.007	0.14	190	ND	ND	1,350	0.41	0.0030	329
32S/13E-30N02	1/11/2018	980	49	77	4.6	150	63	190	510	0.19	0.10	0.15	0.13	ND	ND	0.16	190	ND	ND	1,330	0.2	0.0033	306
32S/13E-30N02	10/11/2017	1,000	46	70	4.8	160	65.0	200	510	0.2	0.19	0.17	0.11	ND	0.01	0.27	200	ND	ND	1,340	0.280	0.0059	170
32S/13E-30N02	7/11/2017	1,100	49	74	4.8	150	64.0	190	480	0.2	0.13	0.15	0.08	ND	0.02	0.16	190	ND	ND	1,360	2.000	0.0033	306
32S/13E-30N02	4/11/2017	980	50	74	4.8	160	64.0	190	510	0.2	0.12	0.14	0.14	ND	ND	0.18	190	ND	ND	1,320	0.220	0.0036	278
32S/13E-30N02	1/13/2017	980	49	80	5.1	170	69.0	200	490	0.2	0.12	0.16	0.08	ND	0.01	0.16	200	ND	ND	1,340	0.630	0.0033	306
32S/13E-30N02	10/12/2016	1,000	50	77	5.0	160	69.0	200	500	0.2	ND	0.15	0.11	ND	ND	0.27	200	ND	ND	1,370	ND	0.0054	185
32S/13E-30N02	7/19/2016	1,000	48	78	5.0	160	68.0	200	500	1.0	0.17	0.15	0.11	<0.010	<0.0040	0.20	200	<8.2	<8.2	1,350	<0.030	0.0042	240
32S/13E-30N02	4/12/2016	1,000	44	72	4.8	150	67.0	190	470	1.0	<0.080	0.14	0.10	<0.010	<0.0040	0.21	190	<8.2	<8.2	1,390	<0.030	0.0048	210
32S/13E-30N02	1/13/2016	990	48	74	4.9	150	64.0	190	520	0.3	0.12	0.14	0.22	<0.010	<0.0040	<0.046	190	<8.2	<8.2	1,300	0.041	NA	NA
32S/13E-30N02	10/15/2015	1,040	47	64	4.6	140	60.0	192	480	0.7	<1	0.13	0.18	<0.01	<0.005	<0.10	192	<10	<10	1,350	<0.05	NA	NA
32S/13E-30N02	7/16/2015	1,030	49	82	4.4	170	70.0	190	480	1.4	1.52	0.15	<0.1	<0.01	<0.005	0.11	190	<10	<10	1,360	<0.05	0.0022	445
32S/13E-30N02	4/14/2015	840	47	61	4.3	130	58.0	190	500	0.6	<1	0.14	<0.3	<0.01	<0.005	<0.3	190	<10	<10	1,330	<0.05	NA	NA
32S/13E-30N02	1/14/2015	1,050	50	62	4.2	140	59.0	190	520	0.4	<1	0.13	0.12	<0.01	<0.005	<0.1	190	<10	<10	1,320	<0.05	NA	NA
32S/13E-30N02	10/15/2014	1,040	44	65	5.0	140	58.0	200	440	0.8	<1	0.13	<0.1	<0.01	<0.005	<0.1	200	<10	<10	1,370	<0.05	NA	NA
32S/13E-30N02	7/30/2014	1,020	45	66	4.6	140	60.0	220	470	0.5	<1	0.10	0.13	<0.01	<0.005	<0.4	220	<10	<10	1,340	<0.05	NA	NA
32S/13E-30N02	4/16/2014	1,040	46	66	5.0	120	50.0	190	520	0.5	<1	0.14	0.10	<0.01	<0.005	<0.1	190	<10	<10	1,350	<0.05	NA	NA
32S/13E-30N02	1/15/2014	1,060	45	60	4.1	120	49.0	190	477	0.7	1.10	0.13	0.43	<0.01	<0.005	<0.2	190	<10	<10	1,370	<0.05	NA	NA
32S/13E-30N02	10/15/2013	1,030	46	70	4.9	140	58.0	190	541	0.5	<1	0.12	0.18	<0.01	<0.005	<0.2	190	<10	<10	1,360	<0.05	NA	NA
32S/13E-30N02	7/10/2013	1,020	50	61	4.5	140	59.0	185	500	0.6	<1	0.14	0.12	<0.01	<0.005	<0.1	185	<10	<10	1,370	<0.05	NA	NA
32S/13E-30N02	4/10/2013	1,080	48	60	4.3	120	52.0	185	500	0.5	<1	0.15	<0.2	<0.01	<0.005	<0.2	185	<10	<10	1,360	<0.05	NA	NA
32S/13E-30N02	1/14/2013	1,010	48	63	4.5	120	53.0	188	530	0.4	<1	0.14	<0.2	<0.01	<0.005	<0.2	188	<10	<10	1,350	0.068	NA	NA
32S/13E-30N02	10/29/2012	1,030	40	68	5.0	140	58.0	180	500	<0.25	<1	0.14	<0.5	<0.01	<0.005	<0.5	180	<10	<10	1,360	<0.05	NA	NA
32S/13E-30N02	7/23/2012	1,040	54	63	4.5	110	48.0	188	510	0.1	<1	0.15	0.15	<0.01	0.01	<0.1	188	<10	<10	1,360	<0.05	NA	NA
32S/13E-30N02	4/18/2012	990	60	56	4.2	110	47.0	190	560	0.1	<1	0.12	0.21	<0.01	<0.005	0.28	190	<10	<10	1,360	<0.1	0.0047	214
32S/13E-30N02	1/11/2012	1,040	49	64	4.9	130	54.0	180	460	1.3	<1	0.17	0.16	<0.02	<0.005	<0.2	180	<10	<10	1,360	<0.1	NA	NA
32S/13E-30N02	11/21/2011	1,020	46	57	4.5	130	54.0	180	450	0.2	<1	0.15	<0.2	<0.01	<0.005	<0.2	180	<10	<10	1,360	<0.1	NA	NA
32S/13E-30N02	7/25/2011	1,050	50	81	7.7	150	62.0	180	479	0.2	<1	0.16	0.14	<0.01	0.01	<0.1	180	<5	<5	1,370	0.490	NA	NA
32S/13E-30N02	4/20/2011	1,030	52	63	5.4	130	44.0	180	508	0.2	<1	0.19	0.20	<0.01	<0.005	<0.1	180	<2.0	<2.0	1,380	NA	NA	NA
32S/13E-30N02	1/24/2011	1,050	50	60	6.4	120	49.0	190	490	0.2	<1.0	0.17	0.17	<0.10	0.06	<0.1	190	<2.0	<2.0	1,380	0.120	NA	NA
32S/13E-30N02	10/21/2010	1,040	48	52	3.5	100	45.0	181	460	0.2	<1.0	<0.1	<0.1	NA	<0.005	<0.3	181	<10	<10	1,377	<0.1	NA	NA
32S/13E-30N02	7/27/2010	777	57	68	7.3	141	58.5	190	470	0.3	3.50	0.14	< 0.10	0	0.10	0.28	190	< 1.0	< 1.0	1,300	3.430	0.0049	204
32S/13E-30N02	4/27/2010	800	93	72	12.5	108	46.3	159	300	7.0	3.20	0.12	0.13	0	0.08	0.70	159	< 1.0	< 1.0	1,100	3.270	0.0075	133
32S/13E-30N02	2/25/2010	1,000	48	71	4.7	141	58.1	195	490	0.2	< 0.50	0.15	0.15	< 0.10	0.04	0.16	195	< 1.0	< 1.0	1,300	3.300	0.0033	300
32S/13E-30N02	2/25/2010	1,010	74	77	10.2	138	55.8	195	440	0.1	2.40	0.14	0.16	< 0.10	0.06	0.24	195	< 1.0	< 1.0	1,400	1.690	0.0032	308
32S/13E-30N02	1/26/2010	970	50	74	4.8	152	62.2	195	510	0.1	< 0.50	0.13	0.11	< 0.10	< 0.00500	0.16	195	< 1.0	< 1.0	1,300	< 0.100	0.0032	313
32S/13E-30N02	10/20/2009	2,080	690	274	151.0	239	101.0	220	400	< 0.10	7.00	0.20	0.16	1	0.40	2.00	220	< 1.0	< 1.0	2,800	5.500	0.0029	345
32S/13E-30N02	8/20/2009	1,350	500	199	82.2	123	49.0	199	220	6.4	6.30	NA	0.23	0	0.34	2.80	199	< 1.0	< 1.0	2,100	4.910	0.0056	179
32S/13E-30N02	5/11/2009	1,290	170	129	52.0	137	66.9	176	470	NA	NA	NA	0.18	NA	0.13	0.56	176	< 1.0	< 1.0	1,800	5.240	0.0033	304
32S/13E-30N02	3/27/1996	1,050	50	71	5.5	145	60.0	243	516	0.9	NA	0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32S/13E-30N02	6/7/1976	1,093	48	62	4.7	150	60.0	248	484	0.0	NA	0.13	0.70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32S/13E-30N02	1/21/1966	1,069	54	71	5.0	148	63.0	232	483	0.0	NA	0.12	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix A: NCMA Sentry Wells Water Quality Data

Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
32S/13E-31H10	10/14/2019	630	34	42	3.9	110	52.0	350	150	ND	ND	0.08	0.14	ND	0.20	ND	350	ND	ND	974	6.600	NA	NA
32S/13E-31H10	7/9/2019	650	44	50	3.4	110	57.0	320	200	ND	0.24	0.09	0.18	0	0.21	0.19	320	ND	ND	1,030	6.000	0.0043	232
32S/13E-31H10	4/9/2019	630	43	48	3.4	100	50.0	320	200	ND	0.17	0.10	0.21	0	0.18	0.15	320	ND	ND	1,040	4.800	0.0035	287
32S/13E-31H10	1/8/2019	620	35	41	3.3	100	54.0	340	160	ND	0.17	0.08	0.18	0	0.16	0.14	340	ND	ND	973	5.600	0.0040	250
32S/13E-31H10	10/9/2018	590	33	45	5.3	88	54.0	330	120	ND	0.20	0.08	0.11	0	0.16	0.08	330	ND	ND	916	6.5	0.0023	429
32S/13E-31H10	7/12/2018	510	34	46	6.0	45	54	300	96	ND	0.23	0.080	0.12	0.012	0.12	0.16	300	ND	ND	846	3.8	0.0047	213
32S/13E-31H10	4/10/2018	690	41	51	3.5	120	55	310	200	ND	0.16	0.089	0.19	0.016	0.21	0.15	310	ND	ND	1,020	4.7	0.0037	273
32S/13E-31H10	1/10/2018	660	35	44	3.3	110	56	350	170	ND	0.23	0.075	0.20	0.016	0.2	0.17	350	ND	ND	1,020	5.3	0.0049	206
32S/13E-31H10	10/11/2017	640	33	41	3.1	120	57.0	360	160	ND	0.38	0.08	0.18	ND	0.21	0.13	450	89	ND	1,070	4.3	0.0039	254
32S/13E-31H10	7/11/2017	720	36	48	3.8	120	60.0	350	170	ND	0.17	0.09	0.15	0	0.17	0.13	350	ND	ND	1,020	4.7	0.0036	277
32S/13E-31H10	4/12/2017	600	39	47	3.4	120	62.0	340	190	ND	ND	0.09	0.19	0	0.19	0.22	340	ND	ND	1,020	5.2	0.0056	177
32S/13E-31H10	1/13/2017	670	34	45	3.4	130	60.0	370	180	ND	0.16	0.08	0.17	0	0.22	0.10	370	ND	ND	1,020	7.8	0.0029	340
32S/13E-31H10	10/12/2016	700	33	40	3.2	120	59.0	380	170	ND	0.22	0.06	0.18	0	0.15	0.12	380	ND	ND	1,040	5.3	0.0036	275
32S/13E-31H10	7/20/2016	630	33	42	4.4	99	57.0	370	150	<0.096	0.30	0.07	0.14	<0.01	0.19	0.14	370	<8.2	<8.2	991	8.9	0.0042	236
32S/13E-31H10	4/13/2016	670	37	46	3.4	120	57.0	350	180	<0.096	0.21	0.08	0.19	0	0.23	0.14	350	<8.2	<8.2	1,030	6.7	0.0038	264
32S/13E-31H10	1/13/2016	380	37	49	9.9	7	46.0	170	54	<0.022	0.43	0.04	0.09	0	0.08	0.19	210	34	<4.1	603	2.2	0.0051	195
32S/13E-31H10	10/14/2015	320	32	33	2.7	17	48.0	216	68	<0.05	<1	0.09	0.12	0	0.10	<0.10	227	11	<10	600	1.4	NA	NA
32S/13E-31H10	7/15/2015	330	34	44	3.4	15	54.0	195	81	<0.05	<1	0.08	<0.1	<0.01	0.08	<0.1	213	18	<10	610	1.0	NA	NA
32S/13E-31H10	4/16/2015	660	35	33	2.7	99	48.0	360	170	<0.05	<1	0.08	0.16	<0.01	0.17	<0.1	360	<10	<10	1,000	4.6	NA	NA
32S/13E-31H10	1/14/2015	760	55	56	3.0	110	50.0	300	250	<0.05	<1	0.11	0.16	0	0.17	<0.1	300	<10	<10	1,070	4.2	NA	NA
32S/13E-31H10	10/16/2014	720	41	46	3.7	110	53.0	330	200	<0.05	<1	0.10	<0.1	<0.01	0.17	<0.1	330	<10	<10	1,090	6.5	NA	NA
32S/13E-31H10	7/30/2014	660	34	35	2.4	95	49.0	420	160	<0.05	<1	<0.1	0.16	<0.01	0.17	<0.1	420	<10	<10	1,040	6.5	NA	NA
32S/13E-31H10	4/17/2014	890	55	70	5.4	100	45.0	250	380	<0.05	<1	0.15	0.12	0	0.31	0.13	250	<10	<10	1,260	4.9	0.0024	423
32S/13E-31H10	1/16/2014	900	57	66	4.6	110	50.0	240	360	<0.05	<1	0.18	0.20	0	0.32	<0.1	240	<10	<10	1,260	6.0	NA	NA
32S/13E-31H10	10/16/2013	690	30	40	3.4	100	49.0	340	190	<0.05	<1	0.09	0.14	<0.01	0.23	<0.1	340	<10	<10	1,050	7.4	NA	NA
32S/13E-31H10	7/11/2013	860	60	50	4.4	110	47.0	240	340	<0.05	<1	0.18	0.15	0	0.28	<0.1	240	<10	<10	1,230	4.9	NA	NA
32S/13E-31H10	4/11/2013	900	60	69	4.6	110	47.0	250	350	0.8	<1	0.20	0.12	0	0.28	<0.2	250	<10	<10	1,250	5.7	NA	NA
32S/13E-31H10	1/16/2013	820	66	76	5.0	100	47.0	260	320	<0.1	<1	0.21	0.13	<0.01	0.31	<0.2	260	<10	<10	1,230	4.2	NA	NA
32S/13E-31H10	10/30/2012	780	65	75	4.7	100	46.0	255	280	<0.05	<1	0.19	0.14	0	0.23	<0.1	255	<10	<10	1,190	4.0	NA	NA
32S/13E-31H10	7/25/2012	830	76	80	5.3	96	45.0	250	310	<0.05	<1	0.22	0.15	0	0.24	<0.1	250	<10	<10	1,220	6.7	NA	NA
32S/13E-31H10	4/19/2012	790	87	69	4.5	52	37.0	250	270	<0.1	<1	0.19	0.21	0	0.17	<0.2	250	<10	<10	1,180	4.0	NA	NA
32S/13E-31H10	1/12/2012	760	76	85	4.0	79	40.0	270	190	<0.1	<1	0.23	0.21	0	0.23	<0.2	270	<10	<10	1,150	4.8	NA	NA
32S/13E-31H10	11/21/2011	720	39	38	3.4	96	43.0	320	180	<0.05	3.50	0.08	0.19	0	0.17	<0.1	320	<10	<10	1,050	4.8	NA	NA
32S/13E-31H10	7/25/2011	760	69	66	6.4	80	35.0	310	209	<0.05	<1	0.16	0.17	0	0.23	0.20	310	<5	<5	1,170	5.3	0.0029	348
32S/13E-31H10	1/24/2011	310	98	22	8.1	34	9.2	19	53	<0.05	<1.0	<0.1	0.20	4	0.40	0.63	19	<2.0	<2.0	480	10.0	0.0064	156
32S/13E-31H10	10/28/2010	290	81	26	9.3	64	11.0	160	68	<0.1	<1.0	<0.1	0.20	NA	0.85	0.36	160	<10	<10	520	38.0	0.0044	225
32S/13E-31H10	7/26/2010	438	85	34	1.9	62	30.4	30	210	< 0.10	< 0.50	0.04	0.58	0	1.46	0.32	30	< 1.0	< 1.0	690	35.5	0.0038	266
32S/13E-31H10	4/26/2010	560	83	48	5.7	86	48.3	62	310	< 0.10	0.84	< 0.02	< 0.1	1	2.54	0.31	62	< 1.0	< 1.0	880	233.0	0.0037	268
32S/13E-31H10	1/27/2010	460	130	45	25.4	682	124.0	112	100	0.6	NA	< 0.0200	0.21	0	32.40	0.49	112	< 1.0	< 1.0	760	4,360	0.0038	265
32S/13E-31H10	10/20/2009	362	92	40	2.9	19	45.1	77	110	< 0.10	< 0.50	0.07	< 0.10	< 0.10	0.24	0.39	80	3	< 1.0	590	11.4	0.0042	236
32S/13E-31H10	8/19/2009	420	160	48	3.4	50	20.4	18	54	< 0.10	1.10	NA	< 0.10	0	1.76	0.68	18	< 1.0	< 1.0	690	242.0	0.0043	235
32S/13E-31H10	5/16/1983	665	35	40	NA	85	65.0	360	90	< 4	NA	NA	0.20	NA	0.01	NA	360	ND	ND	950	0.1	NA	NA

Appendix A: NCMA Sentry Wells Water Quality Data

Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
32S/13E-31H11	10/14/2019	750	48	56	3.7	120	50.0	320	200	ND	ND	0.11	0.16	0	0.24	0.15	320	ND	ND	1,070	5.7	0.0031	320
32S/13E-31H11	7/9/2019	650	61	73	4.0	110	52.0	310	210	ND	0.17	0.16	0.17	0	0.24	0.28	310	ND	ND	1,110	5.9	0.0046	218
32S/13E-31H11	4/9/2019	700	61	66	3.7	110	48.0	300	240	ND	0.18	0.14	0.20	0	0.19	0.27	300	ND	ND	1,140	3.7	0.0044	226
32S/13E-31H11	1/8/2019	730	39	45	3.6	120	52.0	340	220	ND	0.14	0.09	0.18	0	0.24	0.13	340	ND	ND	1,090	8.2	0.0033	300
32S/13E-31H11	10/9/2018	720	37	49	3.8	130	59.0	340	210	ND	0.24	0.09	0.15	0	0.23	0.08	340	ND	ND	1,090	8.2	0.0021	481
32S/13E-31H11	7/12/2018	720	36	43	3.6	120	54	340	190	ND	0.27	0.08	0.17	0.014	0.25	0.15	340	ND	ND	1,110	7.2	0.0042	240
32S/13E-31H11	4/10/2018	780	73	81	3.8	110	47	300	210	ND	0.090	0.17	0.18	0.066	0.24	0.40	300	ND	ND	1,130	7.3	0.0055	183
32S/13E-31H11	1/10/2018	750	39	51	3.7	130	57	340	220	ND	0.17	0.089	0.20	0.021	0.28	0.16	340	ND	ND	1,090	5.9	0.0041	244
32S/13E-31H11	10/11/2017	720	38	45	3.7	120	56.0	350	200	ND	0.22	0.13	0.18	0	0.22	0.14	350	ND	ND	1,080	5.6	0.0037	271
32S/13E-31H11	7/11/2017	820	43	53	3.9	130	58.0	320	230	ND	0.11	0.11	0.13	0	0.29	0.19	320	ND	ND	1,100	9.7	0.0044	226
32S/13E-31H11	4/12/2017	720	45	53	3.8	120	56.0	320	250	ND	ND	0.11	0.17	0	0.25	0.18	320	ND	ND	1,100	6.3	0.0040	250
32S/13E-31H11	1/13/2017	750	44	57	4.0	130	58.0	340	240	ND	0.11	0.11	0.13	0	0.29	0.15	340	ND	ND	1,100	7.2	0.0034	293
32S/13E-31H11	10/12/2016	780	41	49	3.9	120	57.0	350	220	ND	0.12	0.10	0.16	0	0.28	0.16	350	ND	ND	1,100	8.1	0.0039	256
32S/13E-31H11	7/20/2016	420	120	64	6.8	4	38.0	60	39	<0.096	0.10	0.12	0.06	0	0.08	0.59	89	29	<4.1	617	9.0	0.0049	203
32S/13E-31H11	4/13/2016	410	110	64	604.0	4	40.0	51	56	<0.096	<0.080	0.11	0.06	0	0.05	0.58	92	41	<4.1	628	6.7	0.0053	190
32S/13E-31H11	1/13/2016	450	120	70	7.7	5	36.0	49	65	<0.022	<0.080	0.11	0.10	0	0.07	0.76	86	37	<4.1	675	8.6	0.0063	158
32S/13E-31H11	10/14/2015	350	110	69	9.2	4	31.0	42	74	<0.05	<1	0.16	<0.10	0	0.04	0.44	75	33	<10	670	5.7	0.0040	250
32S/13E-31H11	7/15/2015	380	120	85	11.0	4	35.0	40	85	<0.05	<1	0.19	<0.1	0	0.05	0.41	65	25	<10	690	9.6	0.0034	293
32S/13E-31H11	4/16/2015	400	120	66	7.6	5	36.0	54	100	<0.05	<1	0.17	<0.1	0	0.04	0.48	76	22	<10	700	6.6	0.0040	249
32S/13E-31H11	1/14/2015	420	125	68	7.0	6	37.0	45	126	<0.05	<1	0.15	<0.1	0	0.04	0.39	65	20	<10	720	3.5	0.0031	325
32S/13E-31H11	10/16/2014	370	120	78	13.0	4	29.0	53	77	<0.05	<1	0.17	<0.1	0	0.04	0.35	88	<10	<10	740	4.5	0.0029	343
32S/13E-31H11	7/30/2014	450	120	71	4.4	10	43.0	53	130	0.1	<1	0.15	0.12	0	0.08	0.29	73	20	<10	800	8.0	0.0024	414
32S/13E-31H11	4/17/2014	370	120	89	14.0	2	17.0	76	39	<0.05	<1	0.16	<0.1	0	0.03	0.43	121	45	<10	720	3.7	0.0036	279
32S/13E-31H11	1/16/2014	350	122	89	15.0	2	18.0	68	42	<0.05	<1	0.17	0.10	0	0.03	0.48	125	58	<10	710	2.3	0.0039	254
32S/13E-31H11	10/16/2013	360	100	98	20.0	3	15.0	66	36	<0.05	<1	0.19	<0.1	0	0.06	0.38	139	73	<10	710	4.1	0.0038	263
32S/13E-31H11	7/11/2013	370	140	70	6.3	4	23.0	82	40	0.4	<1	0.20	0.11	0	0.04	0.44	117	35	<10	730	3.2	0.0031	318
32S/13E-31H11	4/11/2013	340	90	81	14.0	3	18.0	78	30	<0.05	<1	0.19	0.12	0	0.05	0.30	155	78	<10	650	3.2	0.0033	300
32S/13E-31H11	1/16/2013	360	107	99	7.1	3	24.0	110	36	<0.05	<1	0.25	<0.1	<0.01	0.05	0.40	165	55	<10	720	3.7	0.0037	268
32S/13E-31H11	10/30/2012	380	97	100	6.4	5	24.0	130	38	<0.05	<1	0.28	<0.1	0	0.09	0.20	168	38	<10	720	6.1	0.0021	485
32S/13E-31H11	7/25/2012	240	49	56	11.0	5	22.0	99	43	<0.05	<1	0.16	0.19	0	0.11	<0.1	132	33	<10	470	6.6	NA	NA
32S/13E-31H11	4/19/2012	380	100	87	5.5	4	26.0	150	79	<0.1	<1	0.27	0.26	0	0.03	0.68	180	30	<10	750	1.6	0.0068	147
32S/13E-31H11	1/12/2012	480	96	110	4.9	6	33.0	154	95	<0.1	<1	0.28	<0.2	0	0.01	0.31	180	26	<10	850	0.2	0.0032	314
32S/13E-31H11	11/21/2011	390	90	78	4.6	5	24.0	111	86	<0.05	<1	0.19	0.13	0	0.01	0.28	128	17	<10	720	0.5	0.0031	321
32S/13E-31H11	7/25/2011	260	29	23	5.3	9	20.0	84	80	<0.05	<1	<0.1	0.20	0	0.04	<0.1	89	<5	<5	440	2.7	NA	NA
32S/13E-31H11	4/21/2011	580	118	70	19.0	49	17.0	9	274	<0.05	<1	<0.1	0.29	0	0.09	0.40	11	3	<2.0	950	NA	0.0034	295
32S/13E-31H11	1/24/2011	680	110	60	17.0	64	22.0	5	330	<0.05	<1.0	<0.1	0.22	1	0.16	0.31	11	6	<2.0	1,040	10.0	0.0028	355
32S/13E-31H11	10/21/2010	770	100	68	12.0	88	31.0	14	380	<0.1	<1.0	<0.1	0.28	NA	0.05	<0.3	14	<10	<10	1,163	2.2	NA	NA
32S/13E-31H11	7/26/2010	783	130	80	8.6	142	42.0	3	450	< 0.10	< 0.50	< 0.0200	0.26	0	3.97	0.77	3	< 1.0	< 1.0	1,200	593.0	0.0059	169
32S/13E-31H11	4/26/2010	1,130	160	70	6.5	208	50.7	8	530	< 0.10	0.56	< 0.02	0.23	1	3.10	0.97	8	< 1.0	< 1.0	1,600	383.0	0.0061	165
32S/13E-31H11	1/27/2010	1,740	430	56	5.0	282	43.0	< 1.0	680	< 0.10	< 0.50	0.08	0.14	0	9.41	2.00	< 1.0	< 1.0	< 1.0	2,300	170.0	0.0047	215
32S/13E-31H11	10/20/2009	2,250	1,000	20	2.4	487	22.5	5	410	< 0.10	0.98	0.05	0.13	< 0.10	13.10	4.50	5	< 1.0	< 1.0	3,100	236.0	0.0045	222
32S/13E-31H11	8/19/2009	322	150	93	16.7	24	12.1	3	4	< 0.10	1.30	NA	0.19	1	0.71	0.74	23	20	< 1.0	640	153.0	0.0049	203
32S/13E-31H11	5/16/1983	840	80	90	NA	100	50.0	250	160	< 4	NA	ND	0.20	NA	0.14	NA	250	ND	ND	1,200	0.1	NA	NA

Appendix A: NCMA Sentry Wells Water Quality Data

Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
32S/13E-31H12	4/21/2011	410	97	100	7.2	4	21.0	80	134	<0.05	<1	0.23	0.18	0	0.07	0.42	100	20	<2.0	770	NA	0.0043	231
32S/13E-31H12	1/24/2011	440	92	90	9.2	3	27.0	90	140	<0.05	<1.0	0.25	0.11	1	0.04	0.35	110	20	<2.0	810	2.2	0.0038	263
32S/13E-31H12	10/21/2010	460	90	110	15.0	7	32.0	94	140	<0.1	<1.0	0.20	0.10	NA	0.10	0.38	124	30	<10	868	3.5	0.0042	237
32S/13E-31H12	7/26/2010	478	83	109	5.9	53	30.4	122	94	< 0.10	<0.50	0.26	< 0.10	0	0.48	0.56	130	8	< 1.0	730	61.0	0.0067	148
32S/13E-31H12	4/26/2010	452	83	83	7.4	29	34.5	72	190	< 0.1	0.56	0.13	< 0.10	1	0.70	0.40	86	14	< 1.0	810	71.0	0.0048	208
32S/13E-31H12	1/27/2010	496	71	92	10.6	23	39.1	13	230	<0.10	< 0.50	0.32	< 0.10	0	0.60	0.29	51	38	< 1.0	780	54.4	0.0041	245
32S/13E-31H12	10/20/2009	564	71	81	8.6	33	49.8	50	310	<0.10	< 0.50	0.15	< 0.10	< 0.10	0.34	0.32	64	14	< 1.0	850	20.0	0.0045	222
32S/13E-31H12	8/19/2009	522	180	148	71.6	95	8.4	30	4	<0.10	1.70	NA	0.24	1	2.36	0.76	170	140	< 1.0	1,000	278.0	0.0042	237
32S/13E-31H12	5/16/1983	630	40	40	NA	90	50.0	330	80	< 4	NA	NA	0.10	NA	0.02	NA	330	ND	ND	900	0.1	NA	NA

Appendix A: NCMA Sentry Wells Water Quality Data

Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
32S/13E-31H09	10/14/2019	670	43	51	2.7	120	50.0	360	170	ND	0.10	0.07	0.11	0	0.04	0.16	360	ND	ND	1,060	0.23	0.0037	269
32S/13E-31H09	7/9/2019	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32S/13E-31H09	4/9/2019	620	43	44	2.5	110	50.0	360	170	ND	0.11	0.08	0.14	0	0.03	0.14	360	ND	ND	1,060	0.05	0.0033	307
32S/13E-31H09	1/8/2019	690	44	44	2.6	110	52.0	370	170	0.0	0.11	0.08	0.16	0	0.04	0.15	370	ND	ND	1,060	0.08	0.0034	293
32S/13E-31H09	10/9/2018	690	42	46	2.7	110	54.0	360	170	0.0	0.15	0.07	0.11	0	0.04	0.09	360	ND	ND	1,080	0.04	0.0022	447
32S/13E-31H09	7/10/2018	630	46	47	2.6	120	53	360	170	ND	0.11	0.073	0.13	0.018	0.032	0.17	360	ND	ND	1,100	0.041	0.0037	271
32S/13E-31H09	4/10/2018	700	44	45	2.5	110	51	360	170	0.074	0.11	0.068	0.13	0.016	0.035	0.17	360	ND	ND	1,060	0.10	0.0039	259
32S/13E-31H09	1/10/2018	680	40	46	2.6	120	53	360	160	ND	0.14	0.062	0.16	0.019	0.048	0.14	360	ND	ND	1,040	0.38	0.0035	286
32S/13E-31H09	10/11/2017	640	40	47	2.6	120	55.0	370	160	0.0	0.12	0.08	0.13	0	0.05	0.13	370	ND	ND	1,020	0.34	0.0033	308
32S/13E-31H09	7/11/2017	750	40	48	2.8	120	56.0	360	170	ND	ND	0.08	0.11	0	0.06	0.15	360	ND	ND	1,050	0.42	0.0038	267
32S/13E-31H09	4/12/2017	620	42	52	3.1	130	60.0	360	170	0.0	ND	0.08	0.17	0	0.05	0.14	360	ND	ND	1,040	0.30	0.0033	300
32S/13E-31H09	1/11/2017	640	61	53	3.0	100	48.0	320	150	ND	ND	0.07	0.16	0	0.05	0.24	320	ND	ND	976	0.40	0.0039	254
32S/13E-31H09	10/12/2016	720	46	49	2.8	120	56.0	370	170	0.0	0.18	0.07	0.12	0	0.04	0.18	370	ND	ND	1,070	0.36	0.0039	256
32S/13E-31H09	7/20/2016	680	45	50	2.9	120	56.0	370	160	0.2	0.14	0.08	0.15	0	0.05	0.16	370	<8.2	<8.2	1,060	0.33	0.0036	281
32S/13E-31H09	4/13/2016	670	43	48	2.9	110	57.0	350	160	<0.096	0.20	0.06	0.14	0	0.06	0.18	350	<8.2	<8.2	1,040	0.46	0.0042	239
32S/13E-31H09	1/12/2016	630	48	48	2.8	110	54.0	350	180	0.1	0.14	0.04	0.24	0	0.05	0.36	350	<8.2	<8.2	1,100	0.46	0.0075	133
32S/13E-31H09	10/14/2015	680	43	44	3.1	100	50.0	360	160	<0.05	<1	0.09	0.28	0	0.03	<0.10	360	<10	<10	1,060	0.18	NA	NA
32S/13E-31H09	7/15/2015	680	43	52	2.4	120	56.0	360	170	<0.05	<1	0.08	0.11	0	0.03	<0.1	360	<10	<10	1,070	0.13	NA	NA
32S/13E-31H09	4/16/2015	680	49	41	2.4	100	47.0	350	170	<0.05	<1	0.07	0.11	<0.01	0.04	<0.1	350	<10	<10	1,030	0.47	NA	NA
32S/13E-31H09	10/16/2014	670	40	43	2.8	110	50.0	3,500	150	<0.05	<1	0.06	0.10	<0.01	0.03	<0.1	350	<10	<10	1,060	0.06	NA	NA
32S/13E-31H09	7/30/2014	670	43	43	2.2	110	48.0	360	160	<0.05	<1	<0.1	0.15	<0.01	0.03	<0.1	360	<10	<10	1,070	0.06	NA	NA
32S/13E-31H09	4/15/2014	680	42	43	3.3	87	43.0	340	170	<0.05	<1	0.09	0.11	<0.01	0.02	<0.1	340	<10	<10	1,070	0.05	NA	NA
32S/13E-31H09	1/16/2014	680	45	42	2.6	100	46.0	360	171	<0.05	<1	<0.05	0.13	<0.01	0.03	<0.1	360	<10	<10	1,060	0.18	NA	NA
32S/13E-31H09	10/16/2013	670	40	44	2.6	100	47.0	350	180	0.5	<1	<0.05	0.15	<0.01	0.03	<0.1	350	<10	<10	1,053	0.11	NA	NA
32S/13E-31H09	7/10/2013	670	44	43	2.8	110	52.0	350	180	<0.05	<1	0.07	0.12	<0.01	0.03	<0.1	350	<10	<10	1,070	0.11	NA	NA
32S/13E-31H09	4/11/2013	720	43	40	2.7	98	46.0	350	170	<0.05	<1	0.07	0.14	<0.01	0.03	<0.1	350	<10	<10	1,070	0.12	NA	NA
32S/13E-31H09	1/16/2013	660	43	43	2.7	100	47.0	360	180	<0.05	<1	0.07	0.10	<0.01	0.03	<0.1	360	<10	<10	1,060	0.13	NA	NA
32S/13E-31H09	10/30/2012	660	40	44	2.9	110	49.0	345	170	<0.05	<1	0.07	0.14	<0.01	0.03	<0.1	345	<10	<10	1,070	0.09	NA	NA
32S/13E-31H09	7/24/2012	700	47	44	2.8	93	45.0	356	180	<0.05	<1	<0.1	0.17	<0.01	0.03	<0.1	356	<10	<10	1,070	0.66	NA	NA
32S/13E-31H09	4/25/2012	680	48	44	2.7	95	43.0	350	200	<0.1	<1	<0.1	0.26	<0.01	0.03	<0.2	350	<10	<10	1,070	0.20	NA	NA
32S/13E-31H09	1/10/2012	690	45	44	2.6	100	44.0	340	160	<0.05	<1	<0.1	0.20	<0.01	0.02	<0.1	340	<10	<10	1,070	0.10	NA	NA
32S/13E-31H09	11/22/2011	690	41	39	2.7	100	46.0	350	160	<0.1	<1	0.05	<0.2	0	0.03	<0.2	350	<10	<10	1,010	0.03	NA	NA
32S/13E-31H09	7/25/2011	690	44	39	4.5	86	40.0	340	167	<0.05	<1	<0.1	0.15	<0.01	0.03	<0.1	340	<5	<5	1,070	<0.1	NA	NA

Appendix A: NCMA Sentry Wells Water Quality Data

Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
32S/13E-31H13	10/14/2019	280	99	93	4.7	3	32.0	180	1	ND	ND	0.18	0.06	0	0.05	0.30	210	37	ND	675	0.34	0.0030	330
32S/13E-31H13	7/9/2019	500	90	83	4.7	4	36.0	170	1	ND	0.08	0.16	0.06	0	0.08	0.35	200	26	ND	654	2.90	0.0039	257
32S/13E-31H13	4/9/2019	460	100	79	4.0	4	34.0	180	8	ND	0.05	0.18	0.08	0	0.07	0.31	210	27	ND	690	2.10	0.0031	323
32S/13E-31H13	1/8/2019	400	99	79	4.3	7	42.0	180	19	ND	0.06	0.17	0.06	0	0.13	0.29	200	19	ND	703	2.20	0.0029	341
32S/13E-31H13	10/9/2018	400	84	79	4.2	5	43.0	190	13	ND	0.05	0.16	0.04	0	0.08	0.18	220	23	ND	678	2.10	0.0021	467
32S/13E-31H13	7/12/2018	470	81	72	3.9	3.9	38	190	13	ND	0.096	0.14	0.041	0.045	0.064	0.31	220	25	ND	699	0.86	0.0038	261
32S/13E-31H13	4/10/2018	490	82	78	3.8	4.5	44	190	20	ND	ND	0.14	0.039	0.041	0.083	0.30	220	30	ND	676	4.2	0.0037	273
32S/13E-31H13	1/10/2018	430	75	75	3.8	4.3	38	190	7.2	ND	ND	0.14	0.050	0.046	0.07	0.25	210	26	ND	626	2.50	0.0033	300
32S/13E-31H13	10/11/2017	390	77	70	3.7	5	38.0	190	15	ND	0.11	0.16	0.03	0	0.08	0.28	220	29	ND	648	1.10	0.0036	275
32S/13E-31H13	7/11/2017	390	76	80	3.9	8	45.0	190	30	ND	ND	0.15	0.03	0	0.13	0.28	210	19	ND	680	2.20	0.0037	271
32S/13E-31H13	4/12/2017	430	79	87	4.4	4	44.0	180	21	ND	0.13	0.17	0.02	0	0.77	0.28	220	40	ND	667	4.50	0.0035	282
32S/13E-31H13	1/13/2017	480	81	95	4.7	4	41.0	190	14	ND	ND	0.19	0.04	0	0.07	0.31	220	33	ND	652	3.30	0.0038	261
32S/13E-31H13	10/12/2016	410	80	87	4.3	4	43.0	190	22	ND	ND	0.18	0.04	0	0.07	0.29	220	33	ND	678	2.30	0.0036	276
32S/13E-31H13	7/20/2016	510	91	99	5.1	2	34.0	170	19	<0.096	<0.080	0.22	0.04	0	0.04	0.43	210	44	<4.1	694	1.20	0.0047	212
32S/13E-31H13	4/13/2016	450	94	99	4.6	3	33.0	150	25	<0.096	<0.080	0.22	0.05	0	0.04	0.44	200	51	<4.1	701	1.20	0.0047	214
32S/13E-31H13	1/13/2016	460	99	97	4.8	3	32.0	150	30	<0.022	<0.080	0.19	0.08	<0.010	0.04	0.53	190	43	<4.1	717	0.33	0.0054	187
32S/13E-31H13	10/14/2015	370	85	91	4.8	3	32.0	159	45	<0.05	<1	0.23	<0.10	0	0.04	0.26	189	30	<10	710	0.30	0.0031	327
32S/13E-31H13	7/15/2015	390	90	99	4.4	3	34.0	145	55	<0.05	<1	0.21	<0.1	0	0.03	0.24	185	40	<10	730	0.24	0.0027	375
32S/13E-31H13	4/16/2015	360	89	86	4.8	3	31.0	137	58	<0.05	<1	0.20	<0.1	0	0.03	0.27	172	35	<10	680	0.42	0.0030	335
32S/13E-31H13	1/14/2015	390	90	84	4.8	2	31.0	140	61	<0.05	<1	0.18	<0.1	0	0.04	0.24	170	30	<10	670	0.47	0.0026	383
32S/13E-31H13	10/16/2014	370	80	84	5.0	3	32.0	146	59	<0.05	<1	0.19	<0.1	0	0.04	0.18	170	24	<10	720	0.61	0.0023	444
32S/13E-31H13	7/30/2014	380	86	81	4.2	4	35.0	158	61	<0.05	<1	0.16	<0.1	0	0.05	0.17	175	17	<10	730	0.25	0.0020	506
32S/13E-31H13	4/17/2014	380	84	86	5.2	3	26.0	120	87	<0.05	<1	0.18	<0.1	0	0.03	0.30	143	23	<10	730	0.45	0.0036	280
32S/13E-31H13	1/16/2014	390	89	91	5.0	4	34.0	119	103	<0.05	<1	0.20	<0.1	0	0.04	0.34	136	17	<10	740	0.30	0.0038	262
32S/13E-31H13	10/16/2013	410	84	87	4.7	5	33.0	114	130	<0.05	<1	0.17	<0.1	0	0.05	0.30	124	10	<10	760	0.28	0.0036	280
32S/13E-31H13	7/11/2013	420	80	70	4.8	5	35.0	116	120	<0.05	<1	0.19	<0.1	0	0.05	0.21	136	20	<10	760	0.19	0.0026	381
32S/13E-31H13	4/11/2013	450	77	77	4.7	6	38.0	113	150	<0.05	<1	0.19	<0.1	0	0.07	0.20	128	15	<10	780	0.15	0.0026	385
32S/13E-31H13	1/15/2013	420	74	78	4.7	7	40.0	110	180	<0.05	<1	0.18	<0.1	<0.01	0.09	<0.1	125	15	<10	810	0.55	NA	NA
32S/13E-31H13	10/30/2012	380	88	99	5.7	3	30.0	160	63	<0.05	<1	0.25	<0.1	0	0.04	0.30	168	8	<10	740	0.33	0.0034	293
32S/13E-31H13	7/25/2012	390	108	107	5.5	3	29.0	13	66	<0.05	<1	0.28	<0.1	0	0.00	0.23	168	155	<10	750	0.84	0.0021	470
32S/13E-31H13	4/19/2012	390	110	83	4.3	3	26.0	400	68	<0.1	<1	0.22	0.23	0	0.03	0.39	420	20	<10	790	0.24	0.0035	282
32S/13E-31H13	1/12/2012	410	94	95	4.5	3	28.0	300	68	<0.1	<1	0.24	<0.2	0	0.03	0.31	320	20	<10	760	0.89	0.0033	303
32S/13E-31H13	11/21/2011	410	94	83	4.6	3	30.0	152	72	<0.05	<1	0.21	<0.1	0	0.04	0.30	160	8	<10	730	0.65	0.0032	313
32S/13E-31H13	7/25/2011	420	90	84	7.1	4	31.0	148	92	<0.05	<1	0.20	<0.1	0	0.05	0.30	150	3	<5	760	1.90	0.0033	302
32S/13E-31H13	4/21/2011	380	88	110	6.3	4	27.0	140	101	<0.05	<1	0.41	0.14	0	0.13	0.33	140	<2.0	<2.0	750	N/A	0.0038	267
32S/13E-31H13	1/24/2011	430	83	73	6.0	6	31.0	160	100	<0.05	<1.0	0.22	0.11	1	0.08	0.28	160	<2.0	<2.0	780	0.49	0.0034	296
32S/13E-31H13	10/21/2010	410	87	100	3.9	6	33.0	148	100	<0.1	<1.0	0.14	<0.1	NA	0.09	<0.3	148	<10	<10	796	0.66	NA	NA
32S/13E-31H13	7/26/2010	446	94	93	8.8	10	32.0	38	120	< 0.10	< 0.50	0.14	< 0.10	0	0.20	0.48	56	18	< 1.0	700	22.40	0.0051	196
32S/13E-31H13	4/26/2010	416	96	88	9.9	15	37.1	46	150	< 0.1	0.63	0.13	< 0.10	0	0.58	0.44	58	12	< 1.0	780	56.20	0.0046	218
32S/13E-31H13	1/27/2010	498	89	80	10.2	16	38.0	31	180	< 0.10	0.56	0.13	< 0.10	0	0.28	0.38	51	20	< 1.0	810	23.60	0.0043	234
32S/13E-31H13	10/20/2009	446	100	97	12.8	16	37.9	27	180	< 0.10	0.56	0.17	0.15	< 0.10	0.18	0.42	43	16	< 1.0	760	18.90	0.0042	238
32S/13E-31H13	8/19/2009	426	160	101	18.9	93	29.1	64	36	< 0.10	0.98	NA	0.16	0	5.49	0.60	84	20	< 1.0	790	682.00	0.0038	267
32S/13E-31H13	5/16/1983	770	60	70	NA	90	70.0	330	120	9.0	NA	NA	0.10	NA	0.02	NA	330	ND	ND	1,100	0.24	NA	NA

Appendix A: NCMA Sentry Wells Water Quality Data

Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
12N/36W-36L01	10/15/2019	880	38	73	3.6	140	45.0	180	440	0.5	0.09	0.18	0.04	ND	ND	0.12	180	ND	ND	1,190	0.078	0.0032	NA
12N/36W-36L01	7/10/2019	700	37	70	3.6	140	51.0	180	430	0.4	0.15	0.17	0.05	ND	ND	ND	180	ND	ND	1,180	ND	NA	NA
12N/36W-36L01	4/10/2019	870	39	64	3.5	130	48.0	180	440	0.5	1.50	0.16	0.06	ND	ND	0.14	180	ND	ND	1,190	0.078	0.0036	NA
12N/36W-36L01	1/9/2019	840	39	70	3.4	140	46.0	180	420	0.5	0.23	0.17	0.06	ND	ND	0.09	180	ND	ND	1,200	ND	0.0023	NA
12N/36W-36L01	10/10/2018	850	38	67	3.5	140	49.0	180	430	0.4	0.16	0.16	0.03	ND	ND	ND	180	ND	ND	1,190	0.190	NA	NA
12N/36W-36L01	7/10/2018	960	39	64	3.4	130	47	180	430	0.50	0.11	0.17	0.12	ND	ND	0.063	180	ND	ND	1,230	ND	0.0016	619
12N/36W-36L01	4/11/2018	900	39	70	3.5	140	49	180	430	0.48	0.11	0.16	0.052	ND	ND	0.10	180	ND	ND	1,190	ND	0.0026	390
12N/36W-36L01	1/11/2018	940	38	76	3.5	140	50	180	440	0.37	0.19	0.17	0.073	ND	ND	0.097	180	ND	ND	1,180	ND	0.0026	392
12N/36W-36L01	10/11/2017	880	35	65	3.7	140	50.0	190	430	0.4	0.14	0.19	0.05	ND	0.05	ND	190	ND	ND	1,210	0.230	NA	NA
12N/36W-36L01	7/12/2017	1,000	37	73	3.9	150	55.0	180	420	0.4	0.15	0.17	0.03	ND	0.00	ND	180	ND	ND	1,180	0.230	NA	NA
12N/36W-36L01	4/12/2017	860	37	73	4.0	130	49.0	180	420	0.5	0.14	0.17	0.02	ND	0.01	0.06	180	ND	ND	1,170	0.430	0.0017	597
12N/36W-36L01	1/12/2017	870	38	76	3.8	150	55.0	190	430	0.5	0.12	0.21	0.04	ND	ND	0.07	190	ND	ND	1,180	0.110	0.0018	543
12N/36W-36L01	10/12/2016	890	35	72	3.8	140	56.0	190	430	0.4	0.11	0.17	0.04	ND	ND	0.12	190	ND	ND	1,220	0.037	0.0034	292
12N/36W-36L01	7/19/2016	920	37	69	3.6	130	50.0	180	430	1.9	0.25	0.15	0.04	<0.010	<0.0040	0.10	180	<8.2	<8.2	1,200	<0.030	0.0027	370
12N/36W-36L01	4/12/2016	860	38	65	3.5	130	49.0	180	390	2.0	<0.080	0.16	0.04	<0.010	<0.0040	0.12	180	<8.2	<8.2	1,210	<0.05	0.0032	317
12N/36W-36L01	1/14/2016	890	36	64	3.4	130	49.0	180	410	0.5	<0.080	0.15	0.06	<0.010	<0.0040	0.10	180	<8.2	<8.2	1,210	0.070	0.0028	360
12N/36W-36L01	10/15/2015	920	37	63	4.2	120	47.0	180	400	0.7	<1	0.15	<0.20	<0.01	<0.005	<0.20	180	<10	<10	1,210	<0.05	NA	NA
12N/36W-36L01	7/16/2015	930	39	74	2.8	140	50.0	180	410	1.2	<1	0.15	<0.1	<0.01	<0.005	<0.1	180	<10	<10	1,210	<0.05	NA	NA
12N/36W-36L01	4/14/2015	890	38	55	3.1	110	44.0	180	440	0.8	1.00	0.16	<0.2	<0.01	<0.005	<0.2	180	<10	<10	1,160	<0.05	NA	NA
12N/36W-36L01	1/13/2015	880	39	59	3.0	120	45.0	180	440	0.6	<1	0.14	<0.1	<0.01	<0.005	<0.1	180	<10	<10	1,160	<0.05	NA	NA
12N/36W-36L01	10/15/2014	910	34	58	3.7	120	43.0	180	380	1.0	<1	0.14	<0.2	<0.01	<0.005	<0.2	180	<10	<10	1,210	<0.05	NA	NA
12N/36W-36L01	7/30/2014	890	36	61	3.2	120	47.0	180	390	0.6	<1	0.12	<0.2	<0.01	<0.005	<0.2	180	<10	<10	1,220	<0.05	NA	NA
12N/36W-36L01	4/16/2014	910	36	46	2.6	76	27.0	180	440	0.8	<1	0.15	<0.1	<0.01	<0.005	<0.1	180	<10	<10	1,200	<0.05	NA	NA
12N/36W-36L01	1/16/2014	910	35	60	3.1	110	42.0	180	416	1.0	1.10	0.14	<0.2	<0.01	<0.005	<0.2	180	<10	<10	1,190	<0.05	NA	NA
12N/36W-36L01	10/16/2013	910	40	63	4.5	120	43.0	170	460	0.8	<1	0.13	<0.2	<0.01	<0.005	<0.2	170	<10	<10	1,210	<0.05	NA	NA
12N/36W-36L01	7/10/2013	910	39	54	3.2	120	42.0	175	430	0.8	<1	0.14	<0.1	<0.01	<0.005	<0.1	175	<10	<10	1,210	0.180	NA	NA
12N/36W-36L01	4/11/2013	890	38	59	3.6	110	43.0	180	420	0.8	<1	0.16	<0.2	<0.01	<0.005	<0.2	180	<10	<10	1,200	<0.05	NA	NA
12N/36W-36L01	1/15/2013	870	39	61	3.4	110	41.0	178	440	0.6	<1	0.15	<0.2	<0.01	<0.005	<0.2	178	<10	<10	1,190	0.130	NA	NA
12N/36W-36L01	10/31/2012	910	35	66	4.0	130	46.0	165	400	1.6	<1	0.16	0.20	<0.01	<0.005	<0.5	165	<10	<10	1,200	<0.05	NA	NA
12N/36W-36L01	7/24/2012	880	43	65	3.9	110	41.0	168	420	<0.05	<1	0.16	<0.1	<0.01	0.02	<0.1	168	<10	<10	1,190	0.190	NA	NA
12N/36W-36L01	4/18/2012	880	47	52	3.2	95	36.0	180	450	0.4	<1	0.12	<0.2	<0.01	<0.005	<0.2	180	<10	<10	1,190	<0.1	NA	NA
12N/36W-36L01	1/11/2012	790	41	64	4.1	120	44.0	170	380	1.3	<1	0.19	0.18	<0.02	<0.005	<0.2	170	<10	<10	1,190	<0.1	NA	NA
12N/36W-36L01	11/21/2011	910	39	55	3.5	110	40.0	180	380	0.4	<1	0.16	<0.2	<0.01	<0.005	<0.2	180	<10	<10	1,200	<0.1	NA	NA
12N/36W-36L01	7/25/2011	890	41	65	5.7	110	43.0	170	409	0.4	<1	0.15	<0.1	<0.01	<0.005	<0.1	170	<5	<5	1,200	0.024	NA	NA
12N/36W-36L01	4/21/2011	890	42	61	4.2	100	30.0	170	415	0.6	<1	0.19	0.07	<0.01	<0.005	<0.1	170	<2.0	<2.0	1,200	NA	NA	NA
12N/36W-36L01	1/24/2011	890	41	55	5.1	98	36.0	180	400	0.5	<1.0	0.20	0.15	<0.10	<0.005	<0.1	180	<2.0	<2.0	1,200	<0.1	NA	NA
12N/36W-36L01	10/21/2010	910	38	76	3.6	130	47.0	169	400	0.4	<1.0	0.10	<0.1	NA	<0.005	<0.3	169	<10	<10	1,213	<0.1	NA	NA
12N/36W-36L01	7/27/2010	707	36	64	3.7	127	47.4	182	420	0.4	< 0.50	0.16	< 0.10	< 0.10	< 0.00500	0.11	182	< 1.0	< 1.0	1,100	< 0.100	0.0031	327
12N/36W-36L01	4/26/2010	860	42	70	4.1	129	48.9	191	400	0.5	0.77	0.22	< 0.1	0	0.06	0.14	191	< 1.0	< 1.0	1,100	4.530	0.0033	300
12N/36W-36L01	10/21/2009	856	38	72	4.6	131	48.2	192	420	0.5	0.84	0.15	0.12	< 0.10	0.10	0.13	192	< 1.0	< 1.0	1,100	1.680	0.0034	292
12N/36W-36L01	8/20/2009	890	39	78	4.2	138	48.1	184	390	0.5	0.56	NA	< 0.10	< 0.10	0.19	0.14	184	< 1.0	< 1.0	1,200	2.030	0.0036	279
12N/36W-36L01	5/11/2009	832	63	84	4.9	111	45.4	204	330	NA	NA	NA	0.12	NA	0.55	0.22	204	< 1.0	< 1.0	1,200	4.020	0.0035	286
12N/36W-36L01	3/26/1996	882	35	66	4.8	124	47.0	233	408	2.0	NA	0.24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12N/36W-36L01	6/8/1976	936	38	72	3.5	130	48.0	223	423	0.6	NA	0.15	0.70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix A: NCMA Sentry Wells Water Quality Data

Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
12N/36W-36L02	10/15/2019	780	99	120	6.3	100	41.0	270	240	ND	2.00	0.35	0.08	0	0.17	0.66	270	ND	ND	1,210	0.490	0.0067	150
12N/36W-36L02	7/10/2019	660	99	100	5.9	94	44.0	260	240	ND	1.90	0.33	0.10	0	0.15	0.60	260	ND	ND	1,200	0.140	0.0061	165
12N/36W-36L02	4/10/2019	820	100	100	5.7	96	43.0	270	240	ND	2.00	0.32	0.09	0	0.15	0.53	270	ND	ND	1,220	0.170	0.0053	189
12N/36W-36L02	1/9/2019	820	100	110	6.1	99	42.0	270	240	ND	2.20	0.33	0.10	0	0.15	0.50	270	ND	ND	1,220	0.420	0.0050	200
12N/36W-36L02	10/10/2018	840	99	110	7.2	100	46.0	260	240	ND	2.20	0.33	0.06	0	0.19	0.40	260	ND	ND	1,200	5.200	0.0040	248
12N/36W-36L02	7/10/2018	800	100	99	5.6	89	41	260	240	ND	2.0	0.33	0.14	0.14	0.14	0.62	260	ND	ND	1,260	0.9	0.0062	161
12N/36W-36L02	4/11/2018	850	100	110	6.0	96	42	260	230	0.044	1.8	0.32	0.097	0.16	0.17	0.66	260	ND	ND	1,210	2.1	0.0066	152
12N/36W-36L02	1/11/2018	800	100	110	6.3	97	44	260	230	ND	2.0	0.38	0.12	0.17	0.17	0.65	260	ND	ND	1,190	0.510	0.0065	154
12N/36W-36L02	10/11/2017	830	100	100	5.9	97	44.0	280	230	ND	1.80	0.36	0.09	0	0.16	0.66	280	ND	ND	1,220	0.410	0.0066	152
12N/36W-36L02	7/12/2017	940	97	100	6.1	98	45.0	250	230	ND	2.20	0.32	0.10	0	0.16	0.59	250	ND	ND	1,200	0.750	0.0061	164
12N/36W-36L02	4/12/2017	780	97	120	6.7	98	43.0	250	240	ND	2.20	0.35	0.08	0	0.16	0.51	250	ND	ND	1,190	0.770	0.0053	190
12N/36W-36L02	1/12/2017	810	94	120	6.6	110	48.0	270	240	ND	2.00	0.36	0.08	0	0.19	0.53	270	ND	ND	1,200	1.100	0.0056	177
12N/36W-36L02	10/12/2016	820	99	120	6.6	110	50.0	270	240	ND	2.00	0.35	0.08	0	0.17	0.58	270	ND	ND	1,230	0.100	0.0059	171
12N/36W-36L02	7/19/2016	820	97	110	6.2	95	45.0	270	240	<0.096	2.00	0.33	0.08	0	0.15	0.65	270	<8.2	<0.82	1,220	0.140	0.0067	149
12N/36W-36L02	4/12/2016	800	96	100	6.0	94	44.0	270	230	<0.096	1.80	0.32	0.12	0	0.14	0.81	270	<8.2	<0.82	1,240	0.370	0.0084	119
12N/36W-36L02	1/14/2016	860	96	110	6.4	99	47.0	260	230	<0.018	1.60	0.34	0.10	0	0.17	0.65	260	<8.2	<8.2	1,240	1.900	0.0068	148
12N/36W-36L02	10/15/2015	800	89	96	6.0	91	0.2	266	230	<0.05	2.20	0.32	0.22	0	0.15	0.37	266	<10	<10	1,220	0.320	0.0042	241
12N/36W-36L02	7/16/2015	840	97	120	5.9	110	46.0	260	240	<0.05	2.44	0.34	0.11	0	0.15	0.59	260	<10	<10	1,230	0.160	0.0061	164
12N/36W-36L02	4/14/2015	800	98	88	5.3	83	39.0	270	240	<0.05	2.90	0.33	0.10	0	0.13	0.38	270	<10	<10	1,180	0.400	0.0039	258
12N/36W-36L02	1/13/2015	820	100	91	5.5	86	39.0	250	250	<0.05	2.20	0.31	0.11	0	0.13	0.32	250	<10	<10	1,190	0.077	0.0032	311
12N/36W-36L02	10/15/2014	800	88	96	6.4	91	40.0	260	210	<0.05	2.10	0.32	<0.1	0	0.14	0.36	260	<10	<10	1,230	0.120	0.0041	246
12N/36W-36L02	7/30/2014	800	98	99	5.8	88	39.0	280	210	<0.05	2.40	0.28	0.11	0	0.14	0.19	280	<10	<10	1,240	0.270	0.0019	516
12N/36W-36L02	4/16/2014	820	95	89	6.3	73	31.0	280	210	<0.05	2.30	0.31	<0.1	0	0.13	0.35	280	<10	<10	1,240	0.220	0.0037	271
12N/36W-36L02	1/16/2014	800	100	87	5.0	76	33.0	270	230	<0.05	2.30	0.31	0.23	0	0.14	0.44	270	<10	<10	1,230	0.410	0.0044	227
12N/36W-36L02	10/16/2013	810	90	110	6.4	91	40.0	260	240	<0.05	2.20	0.32	<0.1	0	0.15	0.32	260	<10	<10	1,220	0.540	0.0036	281
12N/36W-36L02	7/10/2013	790	105	94	5.8	88	38.0	260	240	<0.05	2.50	0.34	<0.1	0	0.13	0.11	260	<10	<10	1,240	0.310	0.0010	955
12N/36W-36L02	4/11/2013	830	100	99	6.2	83	37.0	260	220	<0.05	2.20	0.35	<0.1	0	0.14	0.45	260	<10	<10	1,240	0.600	0.0045	222
12N/36W-36L02	1/15/2013	770	110	110	6.7	84	38.0	265	220	<0.05	2.80	0.36	<0.1	0	0.14	0.20	265	<10	<10	1,240	0.610	0.0018	550
12N/36W-36L02	10/31/2012	800	100	120	7.3	90	39.0	265	200	<0.1	2.40	0.40	0.34	0	0.14	0.34	265	<10	<10	1,250	0.300	0.0034	294
12N/36W-36L02	7/24/2012	800	134	125	7.4	83	35.0	277	200	<0.05	2.30	0.42	0.13	0	0.14	0.31	277	<10	<10	1,250	0.520	0.0023	432
12N/36W-36L02	4/18/2012	770	130	95	6.2	75	33.0	270	210	0.4	4.00	0.35	0.36	0	0.13	<0.2	270	<10	<10	1,250	0.770	NA	NA
12N/36W-36L02	1/11/2012	900	122	110	7.2	95	37.0	290	170	<0.1	4.80	0.48	0.28	<0.02	0.17	0.45	290	<10	<10	1,250	1.800	0.0037	271
12N/36W-36L02	11/21/2011	780	130	95	6.1	77	33.0	270	160	<0.1	<1	0.40	<0.2	<0.01	0.13	0.45	270	<10	<10	1,240	0.400	0.0035	289
12N/36W-36L02	7/25/2011	790	129	110	9.1	74	33.0	280	177	<0.05	2.30	0.36	0.12	0	0.13	0.51	280	<5	<5	1,280	2.300	0.0040	252
12N/36W-36L02	4/21/2011	770	120	90	5.3	86	26.0	280	206	<0.05	2.30	0.24	0.26	0	0.00	0.57	280	<2.0	<2.0	1,270	NA	0.0048	211
12N/36W-36L02	1/24/2011	800	120	95	7.6	75	30.0	300	190	<0.05	2.30	0.39	0.16	1	0.13	0.53	300	<2.0	<2.0	1,270	1.400	0.0044	226
12N/36W-36L02	10/21/2010	770	120	130	7.6	89	44.0	275	160	<0.1	3.40	0.48	<0.1	NA	0.15	0.54	275	<10	<10	1,293	0.120	0.0045	222
12N/36W-36L02	7/27/2010	737	110	121	7.8	91	38.9	268	190	< 0.10	< 0.50	0.43	0.10	1	0.18	0.80	268	< 1.0	< 1.0	1,200	0.845	0.0073	138
12N/36W-36L02	4/26/2010	720	100	116	6.9	85	32.4	215	210	1.5	0.77	0.38	0.20	0	0.17	0.70	215	< 1.0	< 1.0	1,100	3.870	0.0070	143
12N/36W-36L02	10/21/2009	638	99	113	6.2	82	23.0	172	200	< 0.10	3.20	0.27	0.33	57	0.13	0.61	172	< 1.0	< 1.0	940	0.255	0.0062	162
12N/36W-36L02	8/20/2009	785	100	131	6.7	90	36.6	290	190	< 0.10	3.80	NA	0.15	0	0.31	0.75	290	< 1.0	< 1.0	1,200	0.830	0.0075	133
12N/36W-36L02	5/11/2009	775	120	132	7.2	84	39.7	294	180	NA	NA	NA	0.18	NA	0.43	0.78	294	< 1.0	< 1.0	1,300	0.958	0.0065	154
12N/36W-36L02	3/26/1996	772	127	130	8.7	86	36.0	390	148	0.2	NA	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12N/36W-36L02	6/8/1976	820	126	118	6.6	94	44.0	393	184	0.0	NA	NA	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix A: NCMA Sentry Wells Water Quality Data

Well	Date	TDS	Chloride	Sodium	Potassium	Calcium	Magnesium	Bicarbonate as CaCO3	Sulfate	Nitrate (as N)	Total Kjeldahl Nitrogen	Boron	Fluoride	Iodide	Manganese	Bromide	Total Alkalinity as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Specific Conductivity	Iron	Bromide / Chloride Ratio	Chloride / Bromide Ratio
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	umhos/cm	mg/l		
12N/35W-32C03	10/14/2019	190	60	63	2.6	12	5.6	48	25	8.5	ND	0.10	0.04	ND	ND	0.18	48	ND	ND	422	0.130	0.0030	333
12N/35W-32C03	7/9/2019	320	60	64	2.5	13	6.2	51	25	8.3	ND	0.10	0.05	ND	ND	0.15	51	ND	ND	426	ND	0.0025	400
12N/35W-32C03	4/9/2019	320	64	60	2.7	14	6.2	54	28	8.4	0.09	0.10	0.06	ND	0.01	0.16	54	ND	ND	446	0.350	0.0025	400
12N/35W-32C03	1/9/2019	290	64	70	2.8	14	6.2	53	29	8.6	0.19	0.12	0.05	ND	ND	0.18	53	ND	ND	440	0.038	0.0028	356
12N/35W-32C03	10/9/2018	280	62	64	2.8	14	6.2	50	28	8.4	0.07	0.09	0.03	ND	ND	0.13	50	ND	ND	446	0.087	0.0021	477
12N/35W-32C03	7/10/2018	300	64	60	2.5	13	5.8	54	27	8.5	ND	0.089	0.11	ND	ND	0.18	54	ND	ND	458	0.047	0.0028	356
12N/35W-32C03	4/10/2018	320	66	62	2.6	13	6.1	51	30	8.4	ND	0.087	0.047	ND	ND	0.23	51	ND	ND	450	0.26	0.0035	287
12N/35W-32C03	1/10/2018	320	62	67	2.7	14	6.4	50	27	8.2	0.11	0.09	0.073	ND	ND	0.20	50	ND	ND	438	0.210	0.0032	310
12N/35W-32C03	10/11/2017	320	64	63	2.8	14	6.5	53	28	8.4	0.11	0.11	0.04	ND	0.01	0.17	53	ND	ND	445	0.600	0.0027	376
12N/35W-32C03	7/11/2017	370	63	71	2.9	16	7.0	55	28	7.9	ND	0.09	0.04	ND	0.01	0.21	55	ND	ND	450	0.300	0.0033	300
12N/35W-32C03	4/11/2017	300	65	66	2.8	14	6.6	52	28	8.0	ND	0.08	0.04	ND	ND	0.19	52	ND	ND	442	0.077	0.0029	342
12N/35W-32C03	1/13/2017	300	67	72	3.0	16	7.1	53	29	8.2	ND	0.09	0.03	ND	ND	0.21	53	ND	ND	449	0.072	0.0031	319
12N/35W-32C03	10/13/2016	310	64	68	2.9	14	6.5	53	25	8.1	0.12	0.09	0.08	ND	ND	0.18	53	ND	ND	433	ND	0.0028	356
12N/35W-32C03	7/20/2016	300	66	65	2.8	13	6.4	57	26	35.0	<0.08	0.09	0.03	<0.010	<0.0040	0.16	57	<4.1	<4.1	450	0.039	0.0024	413
12N/35W-32C03	4/13/2016	290	65	66	2.8	14	6.5	51	26	36.0	0.09	0.08	0.04	<0.010	<0.0040	0.22	51	<4.1	<4.1	438	0.080	0.0034	295
12N/35W-32C03	1/14/2016	290	69	68	2.9	14	6.3	50	27	8.6	<0.08	0.09	0.08	<0.010	<0.0040	0.16	50	<4.1	<4.1	430	0.079	0.0023	431
12N/35W-32C03	10/14/2015	280	61	57	2.6	12	5.8	51	28	8.4	<1	0.09	<0.10	<0.01	<0.005	<0.10	51	<10	<10	430	0.330	NA	NA
12N/35W-32C03	7/14/2015	280	64	67	2.7	14	6.2	50	30	8.0	<1	0.10	<0.1	<0.01	<0.005	<0.1	50	<10	<10	440	0.220	NA	NA
12N/35W-32C03	4/15/2015	280	62	52	2.4	12	5.4	51	30	7.8	<1	0.08	<0.1	<0.01	<0.005	0.11	51	<10	<10	420	0.110	0.0018	564
12N/35W-32C03	1/14/2015	290	63	56	2.3	13	5.8	51	30	8.2	<1	0.08	<0.1	<0.01	<0.005	0.10	51	<10	<10	420	0.380	0.0016	630
12N/35W-32C03	10/16/2014	270	55	54	2.7	13	5.7	51	26	7.3	0.30	0.07	<0.1	<0.01	0.01	<0.1	51	<10	<10	430	0.350	NA	NA
12N/35W-32C03	7/30/2014	280	60	58	1.9	14	6.5	60	29	7.3	<1	<0.1	<0.1	<0.01	<0.005	<0.1	60	17	<10	450	0.160	NA	NA
12N/35W-32C03	4/15/2014	270	57	55	2.2	12	5.0	54	29	7.1	<1	0.10	<0.1	<0.01	<0.005	0.11	54	<10	<10	430	0.210	0.0019	518
12N/35W-32C03	1/16/2014	300	62	57	2.8	14	6.3	54	35	8.1	8.20	<0.1	<0.1	<0.01	0.01	0.12	54	<10	<10	450	0.470	0.0019	517
12N/35W-32C03	10/16/2013	310	58	62	2.9	15	6.4	54	38	7.5	<1	0.06	<0.1	<0.01	0.01	0.10	54	<10	<10	450	0.210	0.0017	580
12N/35W-32C03	7/11/2013	290	60	45	2.4	14	5.9	61	30	7.4	<1	0.07	<0.1	<0.01	0.01	<0.1	61	<10	<10	440	0.170	NA	NA
12N/35W-32C03	4/12/2013	330	58	55	2.9	16	6.6	60	35	7.5	<1	0.09	<0.1	<0.01	0.02	0.10	60	<10	<10	460	0.490	0.0017	580
12N/35W-32C03	1/15/2013	290	62	57	2.8	15	6.3	55	38	8.3	<1	0.09	<0.1	<0.01	0.01	<0.1	55	<10	<10	470	0.230	NA	NA
12N/35W-32C03	10/30/2012	330	57	60	3.3	19	7.5	60	36	7.8	<1	0.09	<0.1	<0.01	0.03	<0.1	60	<10	<10	470	1.900	NA	NA
12N/35W-32C03	7/25/2012	330	67	61	3.3	17	6.4	59	35	8.2	<1	<0.1	<0.1	<0.01	0.07	<0.1	59	<10	<10	460	0.490	NA	NA
12N/35W-32C03	4/19/2012	370	74	52	2.9	30	12.0	120	58	5.0	<1	0.17	0.20	<0.01	0.06	<0.2	120	<10	<10	580	1.300	NA	NA