NCWA
Northern California Water Association

2019
ANNUAL GROUNDWATER QUALITY TREND MONITORING REPORT

for the Sacramento Valley Water Quality Coalition

May 1, 2020

Submitted by

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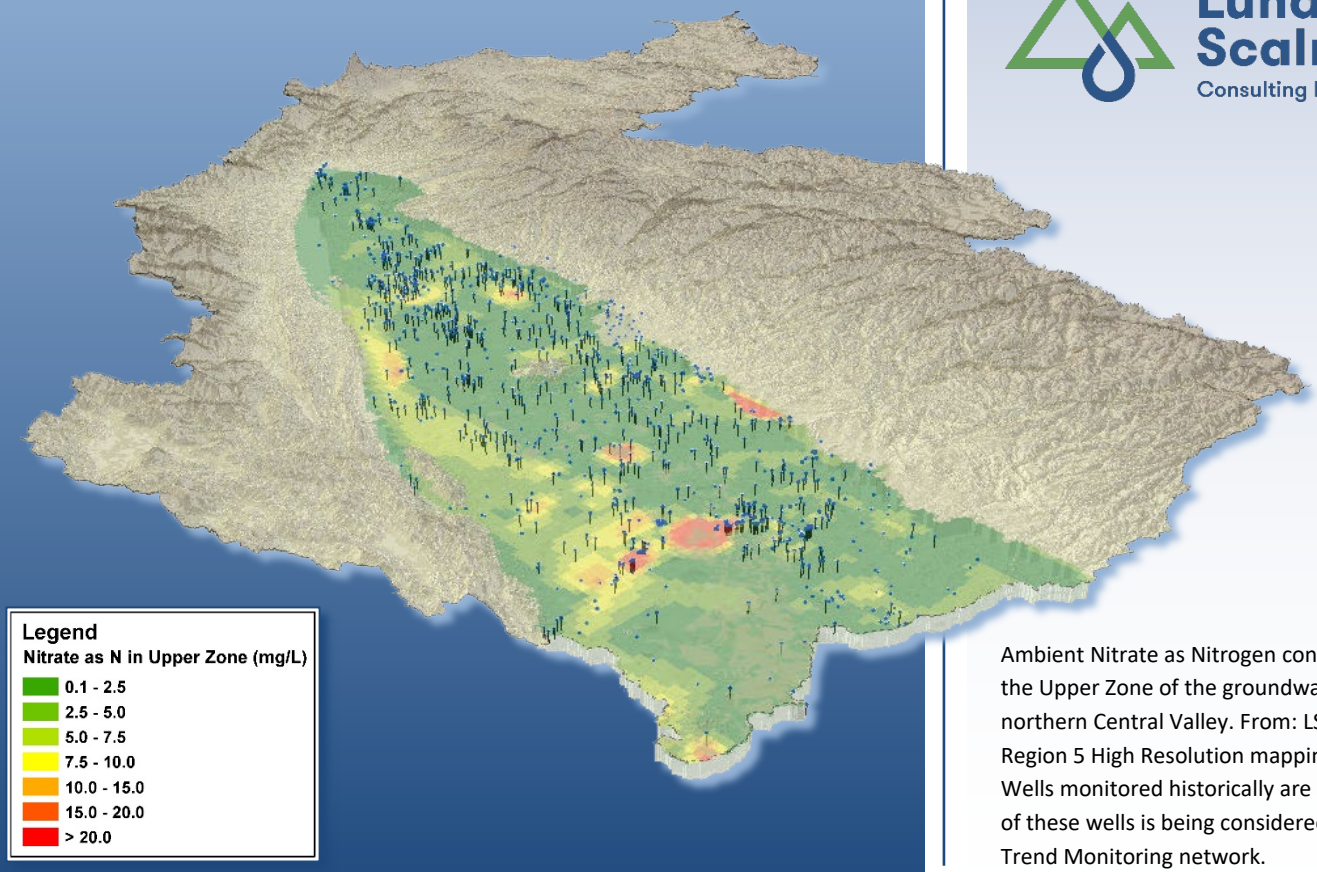

Ambient Nitrate as Nitrogen concentrations in the Upper Zone of the groundwater system in the northern Central Valley. From: LSCE et al. (2016), Region 5 High Resolution mapping for CV-SALTS. Wells monitored historically are shown. A subset of these wells is being considered for the ongoing Trend Monitoring network.

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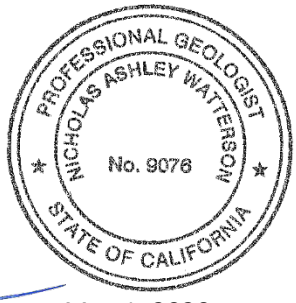

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1 EXECUTIVE SUMMARY

As part of compliance with the Central Valley Regional Water Quality Control Board's (Regional Board or CVRWQCB) *Order No. R5-2014-0030-R1 Waste Discharge Requirements General Order for Growers in the Sacramento River Watershed that are Members of the Third-Party Group*, hereafter referred to as the WDRs (CVRWQCB, 2014), the Sacramento Valley Water Quality Coalition (Coalition or SVWQC) must develop and implement a Groundwater Quality Trend Monitoring (GQTM) Program. This report presents results and discussion related to the SVWQC GQTM sampling activities conducted during 2019. The Coalition GQTM well network 2019 sampling event occurred during late July and early August 2019 and included sampling of a total of 28 wells. Five wells previously not included in the GQTM Workplan documents (LSCE, 2017, 2018a, 2018b) or the subsequent 2019 GQTM Workplan Update and Revisions (LSCE, 2019) were added to the GQTM network prior to the 2019 sampling event and were also sampled. One well previously included in the network was removed.

In accordance with the annual and five-year GQTM sampling schedule, eight wells sampled for the first time as part of the GQTM were tested for nitrate, total dissolved solids (TDS), and major cations and anions as required every five years, meanwhile twenty wells previously sampled for the GQTM were only tested for nitrate, as required for annual monitoring. All wells sampled for the GQTM were also tested for field parameters, including specific conductance, pH, temperature, dissolved oxygen, oxidation-reduction potential, and turbidity. The results from 2019 GQTM sampling, a discussion of GQTM trends and patterns, and a summary of the data quality assurance assessment are presented in this report.

The groundwater quality results from the 2019 sampling included nitrate concentrations above the primary drinking water maximum contaminant level (MCL) of 10 milligrams per liter (mg/L) in three network wells and two wells had nitrate concentrations very close to, but below, the MCL. Additionally, two of the eight wells sampled for total dissolved solids (TDS) had concentrations above the recommended secondary drinking water MCLs of 500 mg/L, but most other wells had TDS concentrations below 400 mg/L. In accordance with the SVWQC GQTM Workplan documents (LSCE, 2017, 2018a, 2018b, 2019), evaluation of patterns and trends in groundwater quality and any relationships with agricultural practices will be conducted at five-year intervals commencing after sufficient GQTM data have been developed for evaluating temporal trends in groundwater quality.

Ongoing GQTM network refinements have occurred during 2019 and early 2020. In response to correspondence from the Regional Board relating to SVWQC GQTM program and network design rationale provided with the Regional Board review of the 2019 GQTM Workplan Revisions and Update (CVRWQCB, 2019), an evaluation of the GQTM network and design, and updates to the 2020 GQTM well network, will be addressed through a separate 2020 GQTM Workplan Revisions and Update to be submitted at least 60 days prior to the 2020 GQTM sampling event. Consistent with the timing of the 2019 GQTM sampling event, the 2020 GQTM sampling is currently planned to occur during the July-August time period.

2 BACKGROUND AND GQTM OBJECTIVES

The Central Valley Regional Water Quality Control Board's (Regional Board or CVRWQCB) *Order No. R5-2014-0030-R1 Waste Discharge Requirements General Order for Growers in the Sacramento River Watershed that are Members of the Third-Party Group*, hereafter referred to as the WDRs (CVRWQCB, 2014), requires the Sacramento Valley Water Quality Coalition (Coalition or SVWQC) to develop and implement a Groundwater Quality Trend Monitoring (GQTM) Program. The WDRs Attachment B, Section IV.C. (p. 1-2) states:

> "*1. Objectives.* The objectives of Groundwater Quality Trend Monitoring are (1) to determine current water quality conditions of groundwater relevant to irrigated agriculture, and (2) to develop long-term groundwater quality information that can be used to evaluate the regional effects (i.e., not site-specific effects) of irrigated agriculture and its practices.
>
> *2. Implementation.* To reach the stated objectives for the Groundwater Quality Trend Monitoring program, the third-party shall develop a groundwater quality monitoring network that will (1) be implemented over both high and low vulnerability areas in the third-party area; and will (2) employ shallow wells, but not necessarily wells completed in the uppermost zone of first encountered groundwater. The use of existing wells is less costly than installing wells specifically designed for groundwater quality monitoring, while still yielding data which can be compared with historical and future data to evaluate long-term groundwater quality trends. The third party may also consider using existing monitoring networks such as those used by AB 3030 and SB 1938 plans.
>
> *3. Reporting.* The results of trend monitoring are to be included in the third-party's Monitoring Report and shall include a map of the sampled wells, tabulation of the analytical data, and time concentration charts. Groundwater quality monitoring data are to be submitted electronically to the State Water Board's GeoTracker Database and to the Central Valley Water Board.
>
> Following collection of sufficient data (sufficiency to be determined by the method of analysis proposed by the third-party or Trend Monitoring Group) from each well, the third-party is to evaluate the data for trends. The methods to be used to evaluate trends shall be proposed by the third-party or Trend Monitoring Group in the Groundwater Quality Trend Monitoring Workplan described in section IV.E below."

Between September 2017 and May 2018, the Coalition submitted two phases of the *Sacramento Valley Water Quality Coalition Groundwater Quality Trend Monitoring Workplan* (LSCE, 2017 and 2018a) to address the requirements for the GQTM Program as outlined in the WDRs Attachment B, Sections III.C and III.E. A subsequent Addendum to the Workplan was also submitted in July 2018 (LSCE, 2018b) to address comments on the Workplan provided by the Regional Board and presented an initial proposed GQTM well network. The Regional Board issued a Conditional Approval of the Addendum (CVRWQCB, 2018) and noted several additional requirements to be completed by May 1, 2019 including the submittal of a revised Workplan addressing a number of elements noted in the accompanying Regional Board staff review memorandum. The 2019 GQTM Workplan Update (LSCE, 2019) addressed the required revisions as noted in the Regional Board Conditional Approval letter and in the accompanying staff memorandum. A key element in the revised Workplan included establishing an increased number of wells in the GQTM network prior to 2019 sampling, recognizing that the GQTM well network presented in the 2019 Workplan Revisions and Update is considered an evolving network, not a static product.

Ongoing GQTM network refinements have occurred during 2019 and early 2020. In response to correspondence from the Regional Board relating to SVWQC GQTM program and network design

rationale provided with the Regional Board review of the 2019 GQTM Workplan Revisions and Update (CVRWQCB, 2019), an evaluation of the GQTM network and design, and updates to the 2020 GQTM well network, will be addressed through a separate 2020 GQTM Workplan Revisions and Update to be submitted at least 60 days prior to the 2020 GQTM sampling event. This report presents the results from 2019 GQTM sampling, a discussion of GQTM trends and patterns, and a summary of the data quality assurance assessment are presented in this report.

The Coalition's boundary coincides with the boundary of the Sacramento River watershed and encompasses more than 18.2 million acres, including about 1.3 million acres of irrigated agricultural land. The Groundwater Quality Assessment Report (CH2M, 2016) prepared for the Coalition region provides an overview of hydrogeologic and groundwater quality conditions in the Coalition region.

3 GROUNDWATER QUALITY TREND MONITORING

The 2019 GQTM sampling event occurred in Summer 2019 and the results from this sampling event are presented in this report. The GQTM program involves groundwater quality sampling utilizing a network of wells selected to accomplish the GQTM Program objectives of monitoring regional and long-term trends in groundwater quality in relation to agricultural practices as outlined in Coalition GQTM Workplan submittals. These workplans discuss the dynamic nature of the GQTM network design, including the expectation that the network would evolve and be expanded or otherwise modified in future years, as needed to achieve the program objectives. The GQTM network proposed for the 2019 sampling event consisted of network wells identified in the 2019 GQTM Workplan Revisions and Update (LSCE, 2019) submitted in May 2019. In accordance with the annual and five-year GQTM sampling schedule, wells being sampled for the first time as part of the GQTM were tested for nitrate, total dissolved solids (TDS), and major cations and anions as required every five years, meanwhile wells previously sampled for the GQTM were only tested for nitrate, as required for annual monitoring. All wells sampled for the GQTM were also tested for field parameters, including specific conductance, pH, temperature, dissolved oxygen, oxidation-reduction potential, and turbidity.

3.1 2019 GQTM Network Sampling Activities

Information related to the GQTM network wells sampled in 2019 are summarized in **Table 1** and their locations are displayed on **Figure 1**. The 2019 groundwater quality sampling for the SVWQC GQTM Program took place between July 22nd and August 8th, 2019. A total of 25 wells were previously identified for the 2019 GQTM network in the 2019 GQTM Workplan Revisions and Update. The well owner for one well (SVWQC00025), who is not a Coalition member, elected to withdraw from participation in the program. Four additional wells, confirmed after submittal of the 2019 Workplan Revisions and Update, were included in the 2019 GQTM sampling event. A total of 28 GQTM network wells were sampled in 2019.

The 2019 GQTM network well sampling event was conducted without notable issues. Wells were measured for depth to water (if access to water level measurements was available) upon arrival at each site and prior to conducting any well purging. All wells were purged and sampled in accordance with the standard operation procedures (SOP) for sampling activities using existing pumping equipment or

installed sampling pumping equipment. All sampled wells were monitored for field parameters including pH, temperature, electrical conductivity (EC), dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity during the well purging and sampling event. In all wells sampled, the pumped water had achieved stabilization of field parameters prior to sample collection and no remarkable occurrences during the sampling process were noted. All water samples were stored on ice after collection and delivered to California Laboratory Services in Sacramento for analysis of nitrate and major cations and anions, in accordance with the GQTM requirements. Field forms from the sampling activities are provided as part of the electronic data submittal package submitted together with this document.

Table 1: 2019 GQTM Network Wells

GQTM Well ID	State Well Number	WCR Number	Well Use	Well Construction Information					Latitude (NAD83)	Longitude (NAD83)	Depth Bottom of Upper Zone (feet)[1]	Percent Screen in Upper Zone	Explanation of Monitored Depth
				Seal Depth (feet)	Seal Mat.	Total Well Depth (feet)	Depth Top of Screen (feet)	Depth Bottom of Screen (feet)					
SVWQC00001	17N/03E-18		PWS	20	Bent				39.32260	-121.67860	113		Small size of well casing (6 inches) indicates likely completion in the Upper Zone.
SVWQC00002	11N/03E-20	E0123283	Irrig	20		270	255	270	38.78590	-121.65650	182	0%	Well is somewhat deeper than Upper Zone, under consideration for future replacement; well results to be evaluated considering well depth/location.
SVWQC00003	18N/02E-35		Irrig	24	Bent	105			39.36560	-121.70920	117	100%	Screens entirely in Upper Zone
SVWQC00004	18N/01W-16		PWS	50		120			39.41960	-121.96700	137	100%	Screens entirely in Upper Zone
SVWQC00005	22N/02W-32	369971	PWS	80	Bent	225	145	225	39.71070	-122.10610	139	0%	Older very shallow domestic wells skew delineated Upper Zone depth; recent wells are typically deeper. Well has gravel envelope below 80 feet and likely reflects groundwater quality in 80 to 225 ft interval.
SVWQC00006	13N/01W-19	702875	PWS	60	Cem	260	180	260	38.96060	-122.01810	234	68%	Mostly in Upper Zone; bottom of screens are at similar depth as average domestic well depth in area (260 feet).
SVWQC00007	13N/09W-10	916600	PWS	50	Cem	121	55	105	38.98350	-122.84660	105[1]	100%	Screens entirely above average domestic well depth in area (105 feet).
SVWQC00008	13N/05E-13		Dom			111	70	110	38.97400	-121.36060	98	70%	Mostly in Upper Zone; screens above average domestic well depth in area (140 feet).
SVWQC00009	42N/09E-25	138832	PWS	120		400	120	400	41.44680	-120.87940			Outside Central Valley - Upper Zone not defined. Well intake depth is partially above average domestic well depth in area (191 feet). Well depths range from 75 to 640 feet in the area.

GQTM Well ID	State Well Number	WCR Number	Well Use	Well Construction Information					Latitude (NAD83)	Longitude (NAD83)	Depth Bottom of Upper Zone (feet)[1]	Percent Screen in Upper Zone	Explanation of Monitored Depth
				Seal Depth (feet)	Seal Mat.	Total Well Depth (feet)	Depth Top of Screen (feet)	Depth Bottom of Screen (feet)					
SVWQC00010	21N/15E-12		Dom			159			39.69030	-120.25010			Relatively shallow well; outside Central Valley Floor area - Upper Zone not defined.
SVWQC00011	06N/01E-17	116111	Other	20	Cem	120	70	80	38.36600	-121.89610	207	100%	Screens entirely in Upper Zone
SVWQC00012	07N/02E-17	51591	Dom	20		165	115	165	38.44920	-121.77670	260	100%	Screens entirely in Upper Zone
SVWQC00013	23N/15E-30	1089364	Stock	95	Cem	203	23	203	39.81700	-120.34780			Relatively shallow well; outside Central Valley - Upper Zone not defined.
SVWQC00015	10N/02E-08		PWS	65	Cem	226			38.72670	-121.76940	227	100%	Screens entirely in Upper Zone
SVWQC00016	09N/02E-09	72206	PWS	80	Cem	157	134	157	38.64050	-121.76380	273	100%	Screens entirely in Upper Zone
SVWQC00017	10N/01W-18	428830	Irrig	60	Cem	210	80	210	38.70900	-122.01270	185	80%	Screens mostly in Upper Zone
SVWQC00018	20N/02E-26	141495	Dom	20		80	60	80	39.56190	-121.70780	142	100%	Screens entirely in Upper Zone
SVWQC00019	13N/02W-03	2734	Dom			126			39.01040	-122.06760	228	100%	Screens entirely in Upper Zone
SVWQC00020	24N/03W-08	77262	Dom	21	Cem	152	144	152	39.94540	-122.22980	163	100%	Screens entirely in Upper Zone
SVWQC00021	18N/01W-30	E0113243	Dom	28	Bent	120	90	120	39.37720	-122.01330	142	100%	Screens entirely in Upper Zone
SVWQC00022	12N/01E-13	E067697	Dom	80	Bent	160	110	150	38.88300	-121.81910	248	100%	Screens entirely in Upper Zone
SVWQC00023	21N/02E-29		Dom			130			39.646613	-121.76629	141	100%	Screens entirely in Upper Zone
SVWQC00024	26N/02W-17		PWS			200			40.106317	-122.10759	131		Likely mostly within Upper Zone although screen depths are unknown.
~~SVWQC00025~~	~~05N/07E-08~~	-	~~PWS~~	-	-	~~250~~	~~200~~	~~250~~	~~38.295024~~	~~-121.24084~~	~~269~~	~~100%~~	~~Screens entirely in Upper Zone~~
SVWQC00026	15N/10W-12		PWS	52	Cem	130	80	130	39.167853	-122.9122			Shallow well; outside Central Valley - Upper Zone not defined. Screens sampling primarily above the local average domestic well depth (101 ft).

GQTM Well ID	State Well Number	WCR Number	Well Use	Well Construction Information					Latitude (NAD83)	Longitude (NAD83)	Depth Bottom of Upper Zone (feet)[1]	Percent Screen in Upper Zone	Explanation of Monitored Depth
				Seal Depth (feet)	Seal Mat.	Total Well Depth (feet)	Depth Top of Screen (feet)	Depth Bottom of Screen (feet)					
SVWQC00027	15N/09W-07	70806	PWS			200	140	200	39.78037	-121.95486	134	0%	Relatively shallow; represents water quality at typical depth of drinking water wells in the area.
SVWQC00028	22N/01W-11	555247	Dom			110	90	110	38.82314	-122.18724	136	100%	Screens entirely in Upper Zone
SVWQC00030	11N/03W-10	176623	Dom						38.29530	-121.16223	243		Small size of well casing (6 inches) indicates likely completion in the Upper Zone.
SVWQC00031	05N/07E-12		Dom			98[2]			41.07955	-121.51882			Shallow well; outside Central Valley Floor area - Upper Zone not defined.

Notes: strikethrough text indicates proposed network well in 2019 Workplan Revisions and Update that has been removed from network.

New 2020 GQTM network well added since 2019 Workplan Update.

[1] The Upper Zone is defined by CV-SALTS (LSCE and LWA, 2016) based on typical domestic well depths and other hydrogeologic characteristics. The depth of bottom of Upper Zone from CV-SALTS ranges from less than 100 feet to about 300 feet in the Coalition region. Average domestic well depth in the vicinity is presented where Upper Zone depth was not determined by CV-SALTS.

[2] Depth of well reported by owner, unverified at this time.

PWS = public water supply; Dom = domestic; Irrig = irrigation; Bent = bentonite; Cem = cement

3.2 2019 GQTM Network Sampling Results

The results from the 2019 GQTM sampling event are presented in **Table 2**. Water quality results exceeding applicable drinking water standards are highlighted in bold in **Table 2**. For the purpose of comparing results with water quality objectives, the results are discussed below relative to drinking water standards. Some of the more notable water quality results from the sampling are discussed below.

In the 2019 sampling, analytical water quality results for three of the sampled wells, SVWQC00012, SVWQC00016, and SVWQC00020, exceeded the primary drinking water MCL of 10 mg/L for nitrate (as nitrogen) and two wells (SVWQC00019 and SVWQC00027) had nitrate concentrations just below the MCL. The three wells with nitrate exceedances had also previously tested high in nitrate concentrations in 2018 and SVWQC 00019 also had a nitrate result just below the MCL in 2018. The 2019 sampling was the first GQTM sampling event for SVWQC0027. Five wells had nitrate concentrations between 5.0 and 7.5 mg/L in 2019 and half (14) of the sampled wells had undetectable nitrate concentrations or concentrations below 2.5 mg/L. Only eight wells were sampled for the broader suite of analytes required for the GQTM at five-year intervals. Of the eight GQTM network wells sampled for total dissolved solids (TDS), two wells exceeded the secondary recommended drinking water MCLs of 500 mg/L for TDS, but all others were below the recommended MCL, most with concentrations less than 400 mg/L. The two wells exceeding the recommended MCL for TDS were SVWQC00012 and SVWQC028.

The owners of the two domestic wells used for drinking water that had concentrations of nitrate above the drinking water MCL were notified in October 2019 of the exceedance and provided a Drinking Water Notification Template form to complete and return. Letters summarizing the 2019 sampling results for individual wells and noting any identified water quality exceedances have been transmitted to all GQTM network well owners. Additional communication with owners of network wells exhibiting nitrate exceedances is also in process to make well owners aware of management practices contained in the Coalition's Groundwater Quality Management Plan or other management practices intended to protect groundwater quality. These practices may include actions related to wellhead protection as well as agricultural management practices.

A spreadsheet with tabulated results for the 2019 sampling is included with the accompanying electronic data submittal package. All laboratory analytical report files and chain of custody forms associated the sampling and analytical testing are also provided in the electronic data submittal package.

Table 2: 2019 GQTM Sampling Results

Site ID	Sample Date		Nitrate (as nitrogen)	Total Dissolved Solids (TDS)	Boron	Calcium	Magnesium	Potassium	Sodium	Chloride	Sulfate	Nitrite (as nitrogen)	Bicarbonate Alkalinity (as HCO3)	Carbonate Alkalinity (as CO3)	Hydroxide Alkalinity (as CaCO3)	Total Alkalinity (as CaCO3)	pH	Specific Conductance (EC)	Temperature	Dissolved Oxygen (DO)	Oxidation-Reduction Potential (ORP)	Turbidity	Depth to Water
		UNITS:	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	pH units	uS/cm	°C	mg/L	mV	NTU	ft, bgs
		MCL:	10 [1]	500/ 1,000 [2]	1.0 [4]					250/ 500[2]	250/ 500[2]	1					6.5/ 8.5 [3]						
SVWQC00001	7/30/19		4.3														7.52	507	17.7	4.08	485.1	0.46	
SVWQC00002	7/22/19		ND														8.07	700	18.3	4.69	-16.2	0.18	
SVWQC00003	7/30/19		1.3														7.68	404	18.4	1.51	122.1	0.47	19
SVWQC00004	7/30/19		1.9									ND					7.83	945	19.4	8.17	58.5	0.12	18.99
SVWQC00005	7/24/19		4.9									ND					7.4	611	19.7	3.75	161.3	0.57	
SVWQC00006	7/23/19		5.6														7.53	642	21.3	3.86	145.5	0.7	
SVWQC00007	7/23/19		0.53														7.66	381	17.2	4.67	143.4	0.2	32
SVWQC00008	7/31/19		2.1														7.56	492	20.4	4.97	94.3	0.55	
SVWQC00009	8/7/19		ND									ND					7.86	548	28.3	15.03	-	0.14	
SVWQC00010	8/7/19		ND														7.79	316	15.3	2.4	141.8	0.3	85.1
SVWQC00011	7/25/19		7.3														7.4	1,279	18.7	2.7	125.6	0.32	10.44
SVWQC00012	7/31/19		**11**	**660**	0.91	61	84	1.3	54	29	49	ND	520	ND	ND	520	7.9	1,077	18.1	5.6	88.1	0.11	35.5
SVWQC00013	8/7/19		ND									ND					7.73	1,171	12.2	8.7	1527	0.09	15
SVWQC00015	7/22/19		7.2									ND					7.58	948	18.5	4.85	140.1	3.4	49.62
SVWQC00015 (duplicate)	7/22/19		7.3									ND					7.58	948	18.5	4.85	140.1	3.4	49.62
SVWQC00016	7/25/19		**17**									ND					7.56	1,342	18.5	4.45	172.1	0.47	
SVWQC00016 (duplicate)	7/25/19		**17**									ND					7.56	1,342	18.5	4.45	172.1	0.47	
SVWQC00017	7/23/19		0.92														7.93	656	18.9	6.93	136	0.15	
SVWQC00018	7/30/19		6.6														7.24	584	18.7	8.89	150	2.85	
SVWQC00019	7/22/19		10														7.14	691	19.7	6.38	194	0.13	72.5

Site ID	Sample Date		Nitrate (as nitrogen)	Total Dissolved Solids (TDS)	Boron	Calcium	Magnesium	Potassium	Sodium	Chloride	Sulfate	Nitrite (as nitrogen)	Bicarbonate Alkalinity (as HCO3)	Carbonate Alkalinity (as CO3)	Hydroxide Alkalinity (as CaCO3)	Total Alkalinity (as CaCO3)	pH	Specific Conductance (EC)	Temperature	Dissolved Oxygen (DO)	Oxidation-Reduction Potential (ORP)	Turbidity	Depth to Water
		UNITS:	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	pH units	uS/cm	°C	mg/L	mV	NTU	ft, bgs
		MCL:	10 [1]	500/ 1,000 [2]	1.0 [4]					250/ 500[2]	250/ 500[2]	1					6.5/ 8.5 [3]						
SVWQC00020	7/24/19		**15**														7.44	483	19.4	3.37	162.3	0.51	
SVWQC00021	7/24/19		ND														8.01	604	18.8	4.92	-55.3	0.2	
SVWQC00022	7/22/19		ND														7.85	680	16.8	2.2	53.2	0.03	
SVWQC00023	7/30/19		8.2	490	ND	60	45	ND	14	12	68		260	ND	ND	260	7.32	691	17.6	4.5	141	2.83	42
SVWQC00023 (duplicate)	7/30/19		8	490	ND	56	44	ND	14	12	66		240	ND	ND	240	7.32	691	17.6	4.5	141	2.83	42
SVWQC00024	7/24/19		4.8	420	0.34	45	34	2.2	16	34	47		210	ND	ND	210	6.99	638	18	3.34	146.8	0.41	
SVWQC00026	7/23/19		ND	140	0.064	22	12	ND	7.7	3	8		110	ND	ND	110	6.68	317	14.9	2.83	167	0.55	
SVWQC00027	7/24/19		9.6	370	ND	46	30	2.1	13	11	32		210	ND	ND	210	7.48	589	18.7	4.61	161.5	0.59	
SVWQC00028	7/23/19		6	**690**	0.77	85	46	1.9	69	120	170		280	ND	ND	280	7.08	1,081	19.9	5.73	177.3	0.09	
SVWQC00030	7/31/19		1.6	170	0.023	11	5.5	2	15	4.5	2.4		67	ND	ND	67	7.56	262	20.5	6.43	116.6	0.57	
SVWQC00031	8/8/19		ND	150	0.084	11	7.6	3.9	16	4	1		93	ND	ND	93	7.46	245	12.1	12.81	36.1	0.19	
SVWQC00031 (duplicate)	8/8/19		ND	140	0.086	11	7.8	4	16	4	1	ND	100	ND	ND	100	7.46	245	12.2	12.81	36.1	0.19	

[1] Primary Maximum Contaminant Level (MCL) for drinking water. [2] Secondary MCL (recommended/upper range) for drinking water. [3] Suggested lower/upper acceptable range for drinking water.

[4] State Notification (Action) level - A health-based level established by the State of California for some constituents lacking MCLs; if a public water system detects a constituent at concentrations above the action level, local governing bodies must be notified.

ND = Not detected above laboratory minimum detection level or reporting limit (MDL) shown; N/A = no access to water level reading.

Bold values indicate results above an MCL or action level

Wells previously sampled for broader set of constituents in accordance with five-year schedule were only sampled for nitrate and field parameters in accordance with annual requirement.

3.3 Groundwater Quality Trends and Patterns

A map of locations and concentrations of nitrate in GQTM network wells in 2019 is presented as **Figure 2**. Land uses mapped in 2016 based on Department of Water Resources (DWR)[1] data are also shown in **Figure 2** in relation to the GQTM network wells and 2019 nitrate concentrations. As discussed above and illustrated in **Figure 2**, nitrate concentrations in wells sampled in 2019 were generally, low although three nitrate MCL exceedances (>10 mg/L) did occur and two additional wells had concentrations very close to the MCL. The wells exceeding the nitrate MCL are symbolized in red in **Figure 2**; wells with nitrate concentrations between 7.5 and 10 mg/L are displayed in orange in **Figure 2**. All three nitrate exceedances occurred in wells located within the Central Valley Floor area of the Coalition region. Two of the nitrate exceedance wells were in the more southern part of the Coalition in the Yolo and Solano Subwatershed areas and one well was further north in the Shasta-Tehama Subwatershed area. Of the wells with nitrate concentrations between 7.5 and 10 mg/L, two are located in the Butte-Yuba-Sutter Subwatershed area and one is located in the Glenn-Colusa Subwatershed area. Half of the wells sampled in 2019 had nitrate concentrations of less than 2.5 mg/L and no detectable nitrate concentrations occurred in samples collected from wells located in the groundwater basins outside of the Central Valley. Otherwise no notable spatial patterns in nitrate concentrations are apparent from the 2019 GQTM sampling results.

The primary objective of the GQTM Program is to evaluate regional temporal trends in groundwater quality as they relate to agricultural practices. As discussed in the GQTM Workplan, more extensive evaluation of groundwater quality data and identification of any trends and associated relationships with agricultural practices will be conducted and summarized at five-year intervals and once a sufficient period of record of groundwater quality data has been developed for assessing such trends.

The groundwater quality results from the 2019 sampling event represent the first or second groundwater quality datapoint for the Sacramento Valley Water Quality Coalition GQTM network wells. Charts of time-series nitrate concentration data for network wells with multiple historical datapoints are presented in **Appendix A.** Most of the charts with sufficient historical data show relatively stable to decreasing trends in nitrate concentrations based on available historical groundwater quality data for GQTM network wells. One well (SVWQC00016) appears to exhibit an increasing trend in nitrate since the mid-2000s based on historical data records, but no data on nitrate concentrations in the well exist between about 2009 and the commencement of GQTM monitoring in 2018. A longer-term record of recent nitrate concentrations will be important in understanding any current trends in groundwater quality. The period of available data record for most wells is very limited. As network wells develop a time-series record of multiple datapoints, charts will be developed and maintained for all network wells to inform the analysis and evaluation of groundwater quality trends in GQTM network wells as implementation of the Program continues. More extensive summary and analysis of GQTM results will be conducted every five years.

[1] https://data.cnra.ca.gov/dataset/statewide-crop-mapping

3.4 Summary of Quality Assurance Evaluation for 2019 Sampling Event

Consistent with the QAPP, field measurements of electrical conductivity (EC) at 25°C, pH, dissolved oxygen (DO) and temperature (T) were obtained during the sample retrieval and the laboratory performed analysis for nitrate as nitrogen (NO3 as N), boron (B), sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), chloride (Cl), sulfate (SO4), carbonate and bicarbonate alkalinity, and total dissolved solids (TDS), in accordance with the annual and five-year sampling schedule in the GQTM Workplan and QAPP. Additional field parameters of turbidity and oxidation-reduction potential (ORP) were also recorded during sampling.

3.4.1 Purging, sample handling, and custody

Wells were purged according to the SOP. Samples were retrieved upon stabilization of indicator parameters (i.e., EC and pH) and after the turbidity of the discharging water dropped below 10 NTUs. Purging and sampling activities were documented on field sheets provided in the QAPP. Samples were collected in laboratory-supplied bottles and transported under prescribed chain of custody to the laboratory according to the QAPP.

3.4.2 Field and analytical completeness

A total of 28 wells were planned for sampling, and 28 wells were able to be sampled in 2019 resulting in an overall 100 percent completeness for well sampling and field parameters (**Table 3**). One well was not tested for the optional field parameter of ORP. Additionally, all well samples collected were analyzed at the laboratory resulting in 100 percent analytical completeness (**Table 3**). For the purpose of field quality control (QC), the QAPP prescribes the collection of one duplicate sample and one blank sample for every 20 samples retrieved (each must be at least 5 percent of total samples). In accordance with the QAPP, four duplicate samples were retrieved representing eleven percent of the wells sampled for nitrate and 20 percent of the wells sampled for all other constituents. Three field blank samples were submitted to the laboratory resulting in nine percent of the samples analyzed for nitrate; no field blanks were analyzed for other constituents. One of the primary reasons for analyzing field blanks is to detect contamination (usually of trace constituents) that may occur during sampling activities and transport. Since nitrate is the main constituent of concern in the GQTM program, field blanks for other major ions are not deemed essential. The assessment of completeness for field QC sampling is summarized in **Table 4.** A summary of the hold times specified in the QAPP for the laboratory analyses is presented in **Table 5**. All analyses except for one analytical test for nitrate (SVWQC00019) were conducted within the specified hold time. The nitrate analysis on SVWQC00019 was outside of the allowable hold time of 48 hours by about 1 hour; this is not expected to affect the reliability or acceptability of the analysis results.

3.4.3 Analytical precision and accuracy

The laboratory performed all QA/QC for laboratory precision and accuracy in accordance with the QAPP including lab blanks, lab duplicates, matrix spikes, and lab control spikes. Results of the assessment of precision and accuracy are summarized in **Tables 6 and 7** and include evaluation of chemistry QC with field and laboratory blank samples; laboratory control and matrix spikes to evaluate accuracy; and field, laboratory, and matrix spike duplicates to evaluate precision. Analytical precision and accuracy met all acceptability requirements for most analytes tested. As noted above and shown in **Table 6**, the analysis

of field blanks for only nitrate is deemed acceptable as this is the constituent of interest in the GQTM program. The percent recovery for matrix spike testing for a number of analytes was outside acceptability limits of 90 percent including for alkalinity as CaCO3 (50% acceptable) sulfate (60% acceptable), and boron, magnesium, calcium, and potassium (all 83% acceptable). The QAPP does not prescribe matrix spikes for alkalinity as CaCO3. The analytical precision and accuracy were deemed acceptable for all constituents based on the combined results from laboratory controls, including laboratory blanks.

3.4.4 Quality assurance evaluation conclusions

All groundwater quality data are considered acceptable based on the review of QA/QC procedures and results in accordance with the requirements in the QAPP. One nitrate sample analyzed one hour outside of the specified hold time is not believed to affect the usability of the result. The recovery percentages outside of acceptability range for some matrix spikes were reviewed and are not believed to be caused by issues related to laboratory accuracy and precision based on combined evaluation of all other laboratory controls. A narrative of the laboratory quality control related to these results was included on the analytical reports. None of these issues have been determined to significantly affect the reliability or usability of the data obtained as part of the 2019 sampling event; therefore, all data were accepted and are considered useable.

Table 3: Completeness of Field and Analytical Testing

Constituent	Test Type	Analytical Method	Matrix	Wells Planned for Sampling	Wells Sampled	Field and Transport Completeness	Total Samples Analyzed	Analytical Completeness
Dissolved Oxygen (DO)	Field parameter	SM4500-O G-2001	Groundwater	28	28	100%	28	100%
Electrical Conductivity (EC) at 25 °C	Field parameter	SM2510-B 1997	Groundwater	28	28	100%	28	100%
pH	Field parameter	SM4500-H+ B-2000	Groundwater	28	28	100%	28	100%
Temperature	Field parameter	SM2550-B 2000	Groundwater	28	28	100%	28	100%
*Oxidation-reduction potential (ORP)	Field parameter	-	Groundwater	28	28	100%	27	96%
*Turbidity	Field parameter	EPA180.1	Groundwater	28	28	100%	28	100%
Nitrate + Nitrite as N	Laboratory	EPA 300.0	Groundwater	28	28	100%	28	100%
Alkalinity as CaCO3	Laboratory	SM 2320B	Groundwater	8	8	100%	8	100%
Carbonate	Laboratory	SM 2330B	Groundwater	8	8	100%	8	100%
Chloride	Laboratory	EPA 300.0	Groundwater	8	8	100%	8	100%
Bicarbonate	Laboratory	SM 2330B	Groundwater	8	8	100%	8	100%
Sulfate (SO4)	Laboratory	EPA 300.0	Groundwater	8	8	100%	8	100%
Boron	Laboratory	EPA 200.7	Groundwater	8	8	100%	8	100%
Calcium	Laboratory	EPA 200.7	Groundwater	8	8	100%	8	100%
Magnesium	Laboratory	EPA 200.7	Groundwater	8	8	100%	8	100%
Potassium	Laboratory	EPA 200.7	Groundwater	8	8	100%	8	100%
Sodium	Laboratory	EPA 200.7	Groundwater	8	8	100%	8	100%
Total Dissolved Solids (TDS)	Laboratory	SM2540C	Groundwater	8	8	100%	8	100%
			Total	284	284	100%	283	100%

* ORP and turbidity are optional field parameters.

Table 4: Completeness of Field QC

Constituent	Analytical Method	Matrix	Total Well Samples Analyzed	Field Duplicate Samples Analyzed	Field Blank Samples Analyzed	Total Samples Analyzed (well and duplicates)	Field Duplicate Completeness	Field Blank Completeness
Nitrate + Nitrite as N	EPA 300.0	Groundwater	28	4	3	35	11.4%	9%
Alkalinity as CaCO3	SM 2320B	Groundwater	8	2	0	10	20.0%	0%
Carbonate	SM 2330B	Groundwater	8	2	0	10	20.0%	0%
Chloride	EPA 300.0	Groundwater	8	2	0	10	20.0%	0%
Bicarbonate	SM 2330B	Groundwater	8	2	0	10	20.0%	0%
Sulfate (SO4)	EPA 300.0	Groundwater	8	2	0	10	20.0%	0%
Boron	EPA 200.7	Groundwater	8	2	0	10	20.0%	0%
Calcium	EPA 200.7	Groundwater	8	2	0	10	20.0%	0%
Magnesium	EPA 200.7	Groundwater	8	2	0	10	20.0%	0%
Potassium	EPA 200.7	Groundwater	8	2	0	10	20.0%	0%
Sodium	EPA 200.7	Groundwater	8	2	0	10	20.0%	0%
Total Dissolved Solids (TDS)	SM2540C	Groundwater	8	2	0	10	20.0%	0%
		Total	116	26	3	145	17.9%	9%

Completeness values below the acceptability requirement of 5 percent are presented in **bold**.

Table 5: Evaluation of Sample Hold Times

Constituent	Analytical Method	Matrix	Hold Time	Total Samples Analyzed (well and duplicates)	Samples Analyzed within Hold Time	Acceptability
Nitrate + Nitrite as N	EPA 300.0	Groundwater	48 hours	32	31	97%
Alkalinity as CaCO3	SM 2320B	Groundwater	14 days	10	10	100%
Carbonate	SM 2330B	Groundwater	14 days	10	10	100%
Chloride	EPA 300.0	Groundwater	28 days	10	10	100%
Bicarbonate	SM 2330B	Groundwater	14 days	10	10	100%
Sulfate (SO4)	EPA 300.0	Groundwater	28 days	10	10	100%
Boron	EPA 200.7	Groundwater	6 months	10	10	100%
Calcium	EPA 200.7	Groundwater	6 months	10	10	100%
Magnesium	EPA 200.7	Groundwater	6 months	10	10	100%
Potassium	EPA 200.7	Groundwater	6 months	10	10	100%
Sodium	EPA 200.7	Groundwater	6 months	10	10	100%
Total Dissolved Solids (TDS)	SM2540C	Groundwater	7 days	10	10	100%
			Total	142	141	99%

Acceptability values below 90 percent are presented in **bold**.

Table 6: Evaluation of Field Duplicates and Blanks

Constituent	Analytical Method	Matrix	Sample Type	Acceptability Requirement	Total Samples	Samples within Acceptability	Acceptability
Nitrate + Nitrite as N	EPA 300.0	Groundwater	Field duplicate	RPD≤25%	4	4	100%
Alkalinity as CaCO3	SM 2320B	Groundwater	Field duplicate	RPD≤25%	2	2	100%
Carbonate	SM 2330B	Groundwater	Field duplicate	RPD≤25%	2	2	100%
Chloride	EPA 300.0	Groundwater	Field duplicate	RPD≤25%	2	2	100%
Bicarbonate	SM 2330B	Groundwater	Field duplicate	RPD≤25%	2	2	100%
Sulfate (SO4)	EPA 300.0	Groundwater	Field duplicate	RPD≤25%	2	2	100%
Boron	EPA 200.7	Groundwater	Field duplicate	RPD≤25%	2	2	100%
Calcium	EPA 200.7	Groundwater	Field duplicate	RPD≤25%	2	2	100%
Magnesium	EPA 200.7	Groundwater	Field duplicate	RPD≤25%	2	2	100%
Potassium	EPA 200.7	Groundwater	Field duplicate	RPD≤25%	2	2	100%
Sodium	EPA 200.7	Groundwater	Field duplicate	RPD≤25%	2	2	100%
Total Dissolved Solids (TDS)	SM2540C	Groundwater	Field duplicate	RPD≤25%	2	2	100%
				Field Duplicate Total	26	26	100%

Acceptability values below 90 percent are presented in **bold**.

Constituent	Analytical Method	Matrix	Sample Type	Acceptability Requirement	Total Samples	Samples within Acceptability	Acceptability
Nitrate + Nitrite as N	EPA 300.0	Groundwater	Field blank	<RL or < sample/5	3	3	100%
Alkalinity as CaCO3	SM 2320B	Groundwater	Field blank	<RL or < sample/5	0	0	0%
Carbonate	SM 2330B	Groundwater	Field blank	<RL or < sample/5	0	0	0%
Chloride	EPA 300.0	Groundwater	Field blank	<RL or < sample/5	0	0	0%
Bicarbonate	SM 2330B	Groundwater	Field blank	<RL or < sample/5	0	0	0%
Sulfate (SO4)	EPA 300.0	Groundwater	Field blank	<RL or < sample/5	0	0	0%
Boron	EPA 200.7	Groundwater	Field blank	<RL or < sample/5	0	0	0%
Calcium	EPA 200.7	Groundwater	Field blank	<RL or < sample/5	0	0	0%
Magnesium	EPA 200.7	Groundwater	Field blank	<RL or < sample/5	0	0	0%
Potassium	EPA 200.7	Groundwater	Field blank	<RL or < sample/5	0	0	0%
Sodium	EPA 200.7	Groundwater	Field blank	<RL or < sample/5	0	0	0%
Total Dissolved Solids (TDS)	SM2540C	Groundwater	Field blank	<RL or < sample/5	0	0	0%
				Field Blank Total	3	3	100%

Acceptability values below 90 percent are presented in **bold**.

Table 7: Evaluation of Lab Controls and Spikes

Constituent	Analytical Method	Matrix	Sample Type	Acceptability Requirement	Total Samples	Samples within Acceptability	Acceptability
Lab Blanks							
Nitrate + Nitrite as N	EPA 300.0	Groundwater	Lab blank	<RL	4	4	100%
Alkalinity as CaCO3	SM 2320B	Groundwater	Lab blank	<RL	4	4	100%
Chloride	EPA 300.0	Groundwater	Lab blank	<RL	4	4	100%
Sulfate (SO4)	EPA 300.0	Groundwater	Lab blank	<RL	4	4	100%
Boron	EPA 200.7	Groundwater	Lab blank	<RL	4	4	100%
Calcium	EPA 200.7	Groundwater	Lab blank	<RL	4	4	100%
Magnesium	EPA 200.7	Groundwater	Lab blank	<RL	4	4	100%
Potassium	EPA 200.7	Groundwater	Lab blank	<RL	4	4	100%
Sodium	EPA 200.7	Groundwater	Lab blank	<RL	4	4	100%
Total Dissolved Solids (TDS)	SM2540C	Groundwater	Lab blank	<RL	4	4	100%
				Lab Blank Total	40	40	100%
Lab Control Spikes							
Nitrate + Nitrite as N	EPA 300.0	Groundwater	LCS	PR 90-110	4	4	100%
Alkalinity as CaCO3	SM 2320B	Groundwater	LCS	PR 75-125	4	4	100%
Chloride	EPA 300.0	Groundwater	LCS	PR 75-125	4	4	100%
Sulfate (SO4)	EPA 300.0	Groundwater	LCS	PR 75-125	4	4	100%
Boron	EPA 200.7	Groundwater	LCS	PR 75-125	4	4	100%
Calcium	EPA 200.7	Groundwater	LCS	PR 75-125	4	4	100%
Magnesium	EPA 200.7	Groundwater	LCS	PR 75-125	4	4	100%
Potassium	EPA 200.7	Groundwater	LCS	PR 75-125	4	4	100%
Sodium	EPA 200.7	Groundwater	LCS	PR 75-125	4	4	100%
Total Dissolved Solids (TDS)	SM2540C	Groundwater	LCS	PR 80-120	4	4	100%
				Lab Control Total	40	40	100%
Matrix Spikes							
Nitrate + Nitrite as N	EPA 300.0	Groundwater	MS	PR 80-120	5	5	100%
Alkalinity as CaCO3	SM 2320B	Groundwater	MS	PR 75-125	4	2	**50%**
Chloride	EPA 300.0	Groundwater	MS	PR 75-125	5	5	100%
Sulfate (SO4)	EPA 300.0	Groundwater	MS	PR 75-125	5	3	**60%**
Boron	EPA 200.7	Groundwater	MS	PR 75-125	6	5	**83%**
Calcium	EPA 200.7	Groundwater	MS	PR 75-125	6	5	**83%**
Magnesium	EPA 200.7	Groundwater	MS	PR 75-125	6	5	**83%**
Potassium	EPA 200.7	Groundwater	MS	PR 75-125	6	5	**83%**
Sodium	EPA 200.7	Groundwater	MS	PR 75-125	6	6	100%
				Matrix Spike Total	49	41	84%

Constituent	Analytical Method	Matrix	Sample Type	Acceptability Requirement	Total Samples	Samples within Acceptability	Acceptability
Analytical Duplicates							
Nitrate + Nitrite as N	EPA 300.0	Groundwater	MSD/LCSD	RPD≤25	9	9	100%
Alkalinity as CaCO3	SM 2320B	Groundwater	MSD/LCSD	RPD≤25	4	4	100%
Chloride	EPA 300.0	Groundwater	MSD/LCSD	RPD≤25	9	9	100%
Sulfate (SO4)	EPA 300.0	Groundwater	MSD/LCSD	RPD≤25	9	9	100%
Boron	EPA 200.7	Groundwater	MSD/LCSD	RPD≤25	1	1	100%
Calcium	EPA 200.7	Groundwater	MSD/LCSD	RPD≤25	1	1	100%
Magnesium	EPA 200.7	Groundwater	MSD/LCSD	RPD≤25	1	1	100%
Potassium	EPA 200.7	Groundwater	MSD/LCSD	RPD≤25	1	1	100%
Sodium	EPA 200.7	Groundwater	MSD/LCSD	RPD≤25	1	1	100%
Total Dissolved Solids (TDS)	SM2540C	Groundwater	MSD/LCSD	RPD≤25	4	4	100%
				Analytical Duplicate Total	40	40	100%

Acceptability values below 90 percent are presented in **bold**.
LCS=lab control spike; MS=matrix spike; MSD=matrix spike duplicate; LCSD=lab control spike duplicate

3.5 GQTM Network Discussion

An initial network of wells was selected for the GQTM and presented in the Workplan (LSCE, 2017, 2018a, 2018b) based on evaluation of candidate wells and their individual well characteristics in combination with locational considerations identified in the Workplan and Addendum. The Workplan presented the prioritization of areas for monitoring derived through a quantitative evaluation using factors based on required GQTM considerations indicated in the WDRs, including historical water quality, high vulnerability areas delineated in the GAR, proximity and flow direction relative to any communities, and land use and agricultural areas. Identified Monitoring Areas (MAs) delineate general areas of higher monitoring priority. Unlike a random design approach, this focuses monitoring efforts in areas where impacts from agricultural activities are more likely to manifest in the groundwater. As described in the Workplan, the target depth zone for the GQTM network is the Upper Zone as delineated by CV-SALTS (LSCE and LWA, 2016). The depth of the Upper Zone is defined based on hydrogeologic considerations and the typical depth of domestic wells. The bottom of the Upper Zone within the SVWQC is typically not defined by any distinct hydrogeologic feature(s).

The Workplan discusses the dynamic nature of the GQTM network design, including the expectation that the network would evolve and be expanded or otherwise modified in future years, as needed to achieve the program objectives. The Coalition submitted a 2019 GQTM Workplan Revisions and Update (LSCE, 2019) in May 2019, including discussion of modifications and additions to the GQTM network and additional rationale for the network design. The Regional Board provided a review of the 2019 GQTM Workplan Revisions and Update in a November 5, 2019 letter (CVRWQCB, 2019). In this review, Regional Board staff noted several elements that should be addressed through providing additional rationale for the network design. The major considerations highlighted in the Regional Board's review with respect to the GQTM network wells and their suitability to meet the objectives of the program include: 1) well types, 2) well depths, 3) surface water influences, 4) nearby land uses, 5) proximity to drinking water supply, and 6) overall well representativeness of agricultural impacts on groundwater quality. On December 11, 2019, the Coalition met with Regional Board staff to discuss the GQTM network design. In accordance with the Regional Board's request for submittal of a revised GQTM Workplan prior to the 2020 sampling event, network updates for 2020 and additional discussion of the network rationale as it relates to the elements identified in the Regional Board review letter will be addressed in a separate 2020 GQTM workplan update document submitted in advance of the 2020 sampling event.

4 OTHER ANNUAL REPORTING REQUIREMENTS

In accordance with the WDRs, this Annual Groundwater Quality Trend Monitoring Report provides information on the Coalition monitoring activities and results related to the GQTM program. Additional required annual reporting elements identified in the Monitoring and Reporting Program (MRP) are addressed in the Annual Monitoring Report, or other submittal documents, as appropriate.

4.1 Electronic Data Submittal and Data Uploaded to GeoTracker

In accordance with the requirements for reporting of annual groundwater monitoring results, an electronic data submittal with information related to the Coalition's GQTM activities is being provided to accompany this report (**Appendix B**). Included in the electronic data submittal are the following items:

- Excel worksheet containing export of data uploaded to GeoTracker
- Excel worksheet containing:
    - Summary table of information on 2019 GQTM network wells, including latitude and longitude information
    - Summary table of results from 2019 GQTM sampling event in tabular form
    - Summary sheet of laboratory analytical methods
- GIS shapefile dataset with locations of 2019 GQTM network wells
- Field forms for 2019 GQTM sampling event
- Laboratory analytical report files including chain of custody forms and laboratory narrative of QC failures and identification of any analytical problems and anomalies

All other electronic data and information relating to the Coalition's other monitoring activities is addressed in the Annual Monitoring Report submittal, or other associated submittals, as appropriate.

5 SUMMARY AND CONCLUSIONS

The 2019 GQTM sampling event was successfully completed with 28 GQTM wells being sampled. The 28 wells sampled included 24 wells presented in the 2019 Workplan Revisions and Update (LSCE, 2019) and four additional wells identified subsequent to the submittal of the 2019 Workplan Revisions and Update. Water quality results from the 2019 sampling indicate three wells with nitrate concentrations above the MCL and two additional wells with nitrate concentrations very close to, but below, the MCL. Half of the wells sampled had nitrate concentrations below 2.5 mg/L. Of the eight wells sampled for TDS, two wells had concentrations over the recommended MCL, although most others had TDS concentrations of less than 400 mg/L. Insufficient data are available for evaluating trends and patterns in groundwater quality at this point in the GQTM program implementation. In accordance with the GQTM Workplan, such evaluations will be conducted at five-year intervals starting in reporting on the first five years of GQTM data.

In September 2019, all owners of GQTM network wells used for drinking water that had concentrations of nitrate above the drinking water MCL were notified of the exceedance and provided a Drinking Water Notification Template form to complete and return. Letters summarizing the 2019 sampling results for individual wells and noting any identified water quality exceedances were prepared and transmitted to

all GQTM network well owners in September 2019. Additional communication by the Coalition with owners of network wells exhibiting nitrate exceedances will continue to make well owners aware of management practices contained in the Coalition's Groundwater Quality Management Plan or other management practices intended to protect groundwater quality.

6 REFERENCES

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CH2M. 2016. Groundwater Quality Assessment Report, Prepared for Central Valley Regional Water Quality Control Board On Behalf Of Northern California Water Association & Sacramento Valley Water Quality Coalition. Final. January 2016.

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Luhdorff and Scalmanini (LSCE). 2018b. Sacramento Valley Water Quality Coalition Groundwater Quality Trend Monitoring Workplan: Addendum. July 31, 2018.

Luhdorff & Scalmanini (LSCE). 2017. Groundwater Quality Trend Monitoring Workplan, Phase 1 – Monitoring Design Approach, for the Sacramento Valley Water Quality Coalition. September 18, 2017.

Map Figures

Explanation

2019 GQTM Network Well

Monitoring Priority

- Low
- Medium
- High
- Very High
- Monitoring_Areas
- Subwatersheds
- Sacramento Valley WQC Boundary

Goose Lake

SVWQC00009

1

Pit River

2

SVWQC00031

3

Shasta - Tehama

4

SVWQC00024

5

SVWQC00020

SVWQC00027

6

SVWQC00005

SVWQC00023

SVWQC00018

Colusa - Glenn

SVWQC00004

7

Butte - Yuba - Sutter

SVWQC00021

SVWQC00001

SVWQC00003

SVWQC00026

9

10

8

SVWQC00007

SVWQC00019

SVWQC00008

Lake

SVWQC00006

SVWQC00022

SVWQC00028

SVWQC00002

SVWQC00017

SVWQC00015

Napa

Yolo

SVWQC00016

11

12

SVWQC00012

Sac - Amador

Solano

SVWQC00011

SVWQC00030

13

Upper Feather River

SVWQC00013

14

SVWQC00010

Placer - Nevada - South Sutter - North Sac

El Dorado

N

0 5 10 20

Miles

Data sources:
Land Use: DWR, 2019
Projection:
California Teale Albers, NAD1983

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FIGURE 1
2019 GQTM Network Wells

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Explanation

Nitrate Concentration
(mg/L as N)

- Not Detected
- 0.1 - 2.5
- 2.6 - 5.0
- 5.1 - 7.5
- 7.6 - 10.0
- >10.0

2016 Land Use

- Citrus/Subtropical
- Deciduous Fruit/Nuts
- Field Crops
- Grain/Hay
- Pasture
- Vegetable/Seed/Fruit Crops
- Vineyard
- Young Perennial
- Rice
- Idle
- Native
- Urban
- Monitoring_Areas
- Subwatersheds
- Sacramento Valley WQC Boundary

Goose Lake
Pit River
Shasta - Tehama
Upper Feather River
Colusa - Glenn
Butte - Yuba - Sutter
Placer - Nevada - South Sutter - North Sac
Lake
El Dorado
Napa
Yolo
Solano
Sac - Amador

SVWQC00009
SVWQC00031
SVWQC00024
SVWQC00020
SVWQC00027
SVWQC00005
SVWQC00023
SVWQC00018
SVWQC00004
SVWQC00021
SVWQC00003
SVWQC00001
SVWQC00026
SVWQC00007
SVWQC00019
SVWQC00006
SVWQC00022
SVWQC00028
SVWQC00002
SVWQC00017
SVWQC00015
SVWQC00016
SVWQC00029
SVWQC00012
SVWQC00011
SVWQC00025
SVWQC00030
SVWQC00008
SVWQC00013
SVWQC00010

1 2 3 4 5 6 7 8 9 10 11 12 13 14

N

0 5 10 20
Miles

Data sources:
Land Use: DWR, 2019
Projection:
California Teale Albers, NAD1983

X:\2019\19-107 Sac Valley WQC - 2020 GW Services\GIS\Figure 2 2019 GQTM Sampling Results Nitrate.mxd

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FIGURE 1
2019 GQTM Sampling Results: Nitrate Concentrations

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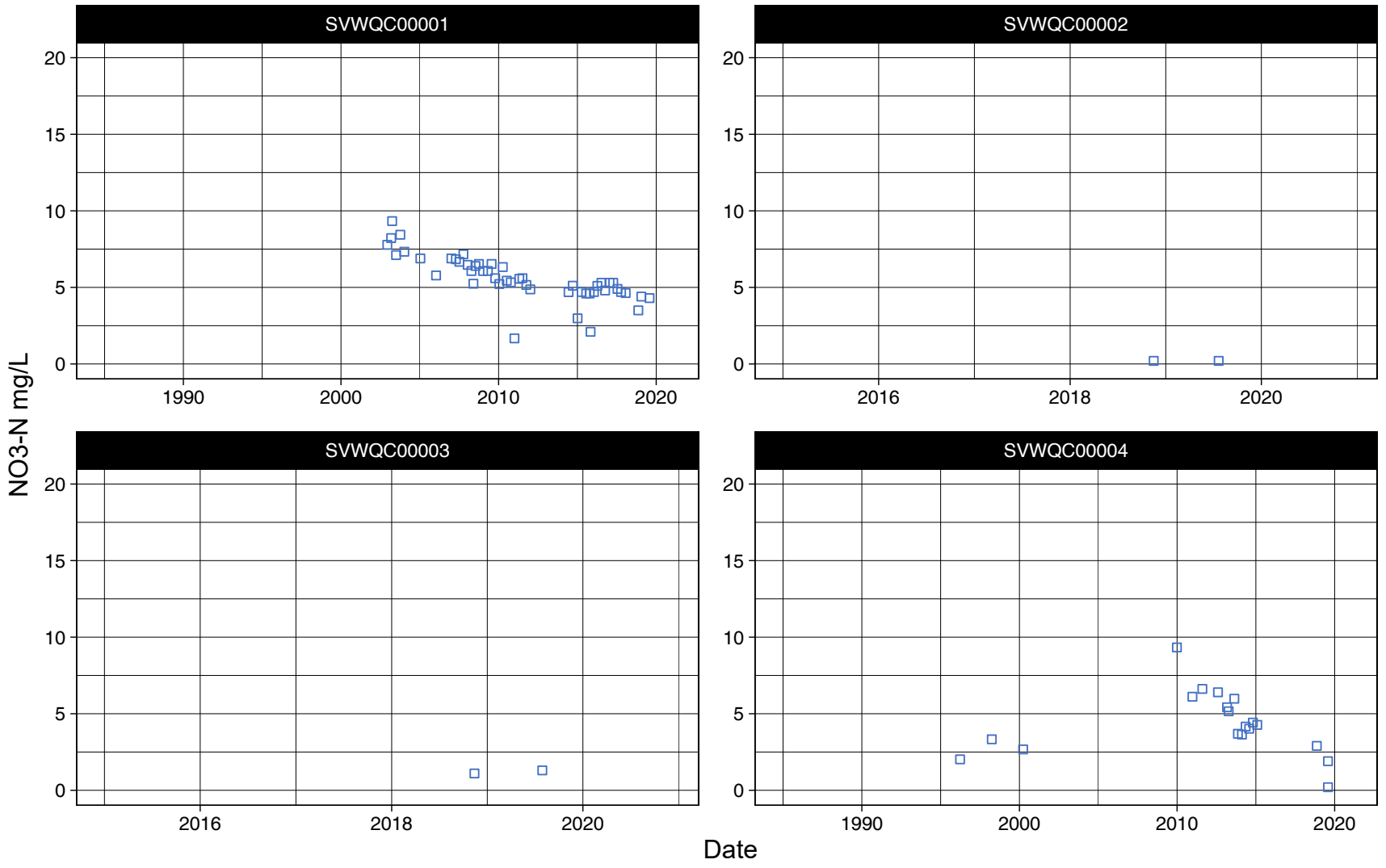
Sacramento Valley Water Quality Coalition

Appendix A:
GQTM Network Well Nitrate Concentration Time-Series Plots

This appendix presents time-series nitrate concentration plots for GQTM network wells for which sufficient data are available. Observed nitrate concentrations above the primary drinking water MCL of 10 mg/L are symbolized in red on the plots and concentrations at or below 10 mg/L are symbolized in blue.



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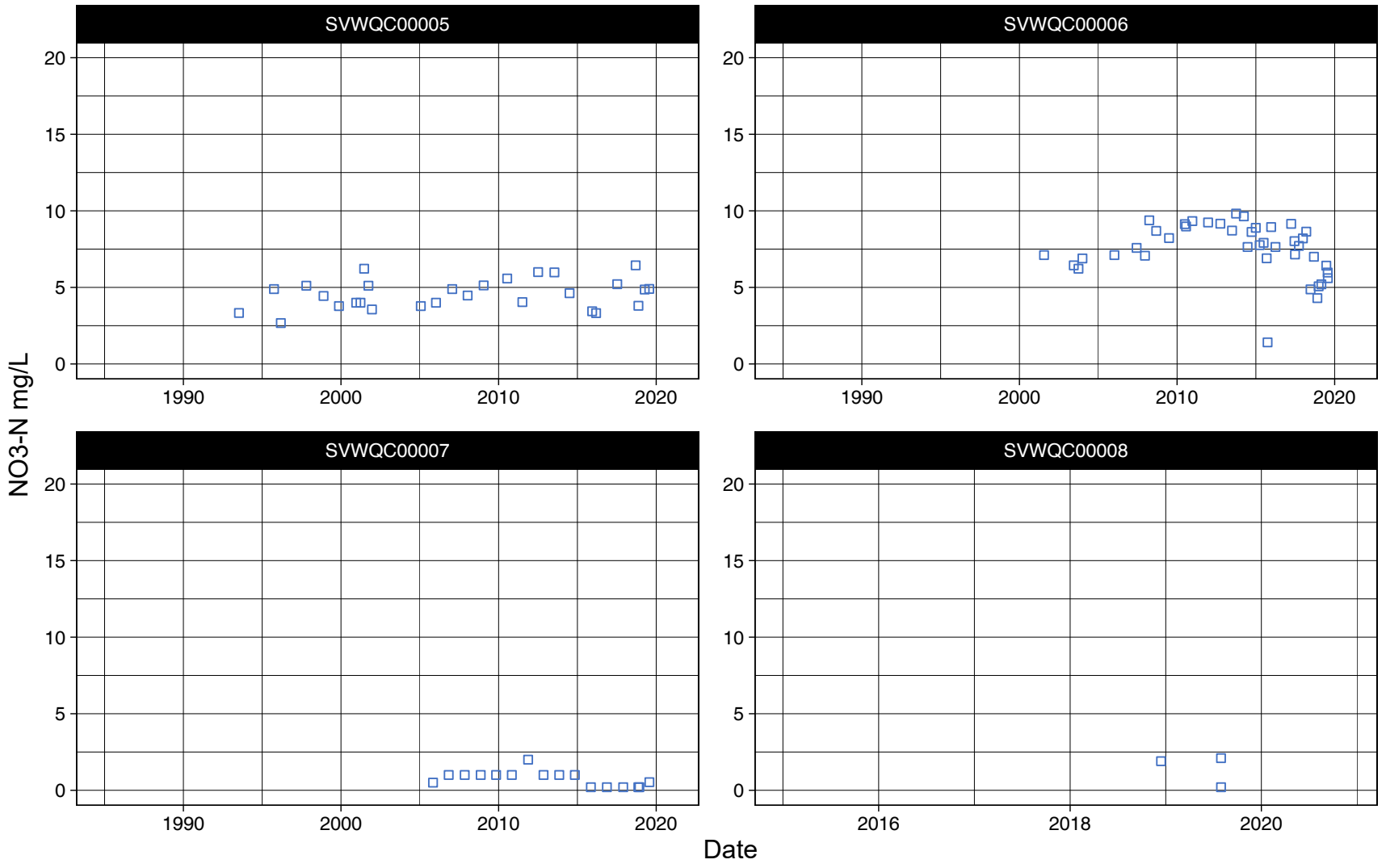
GQTM Network Well Nitrate Concentration Time-Series Plots

Groundwater Quality Trend Monitoring
Sacramento Valley Water Quality Coalition

Appendix A



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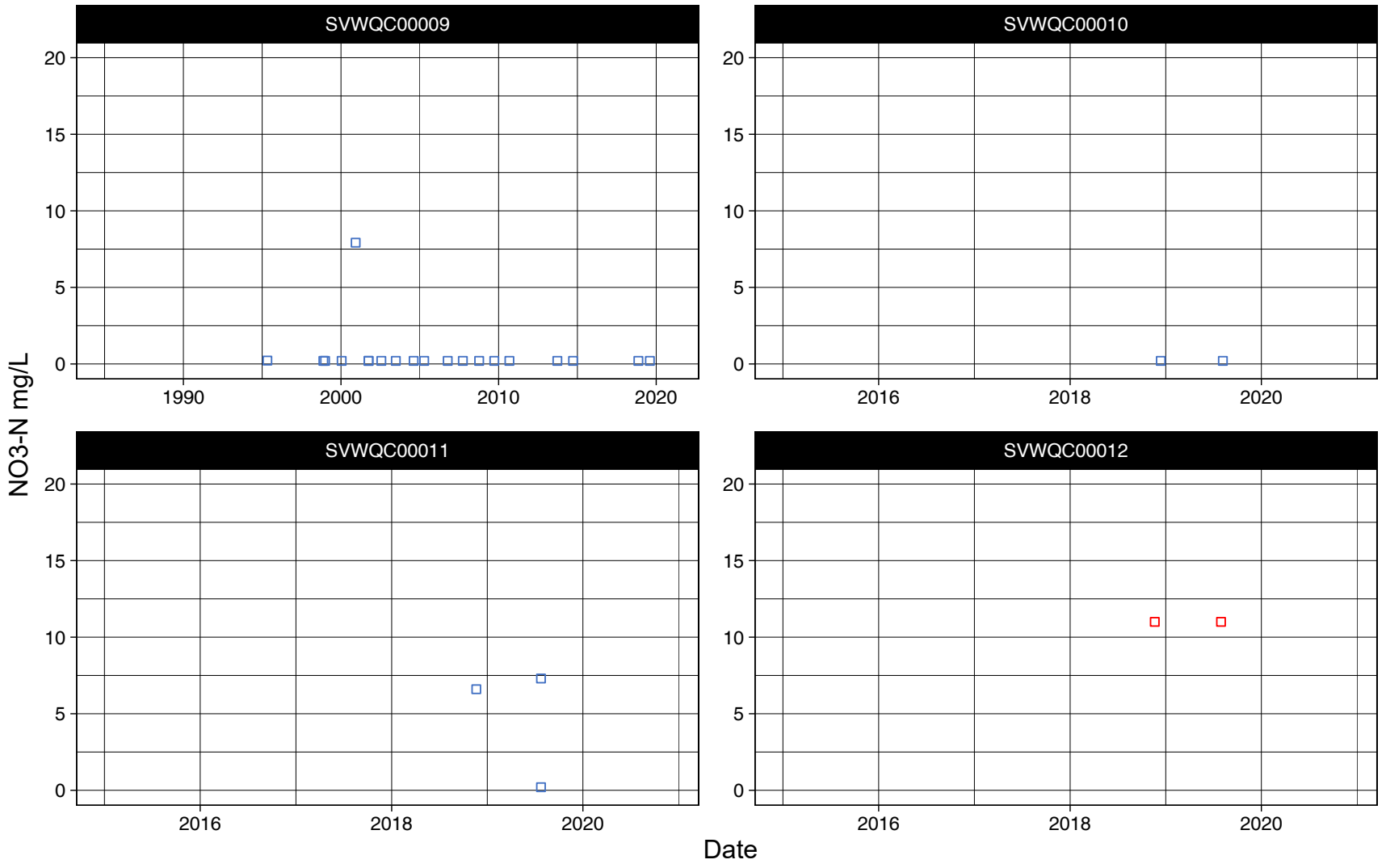

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Sacramento Valley Water Quality Coalition

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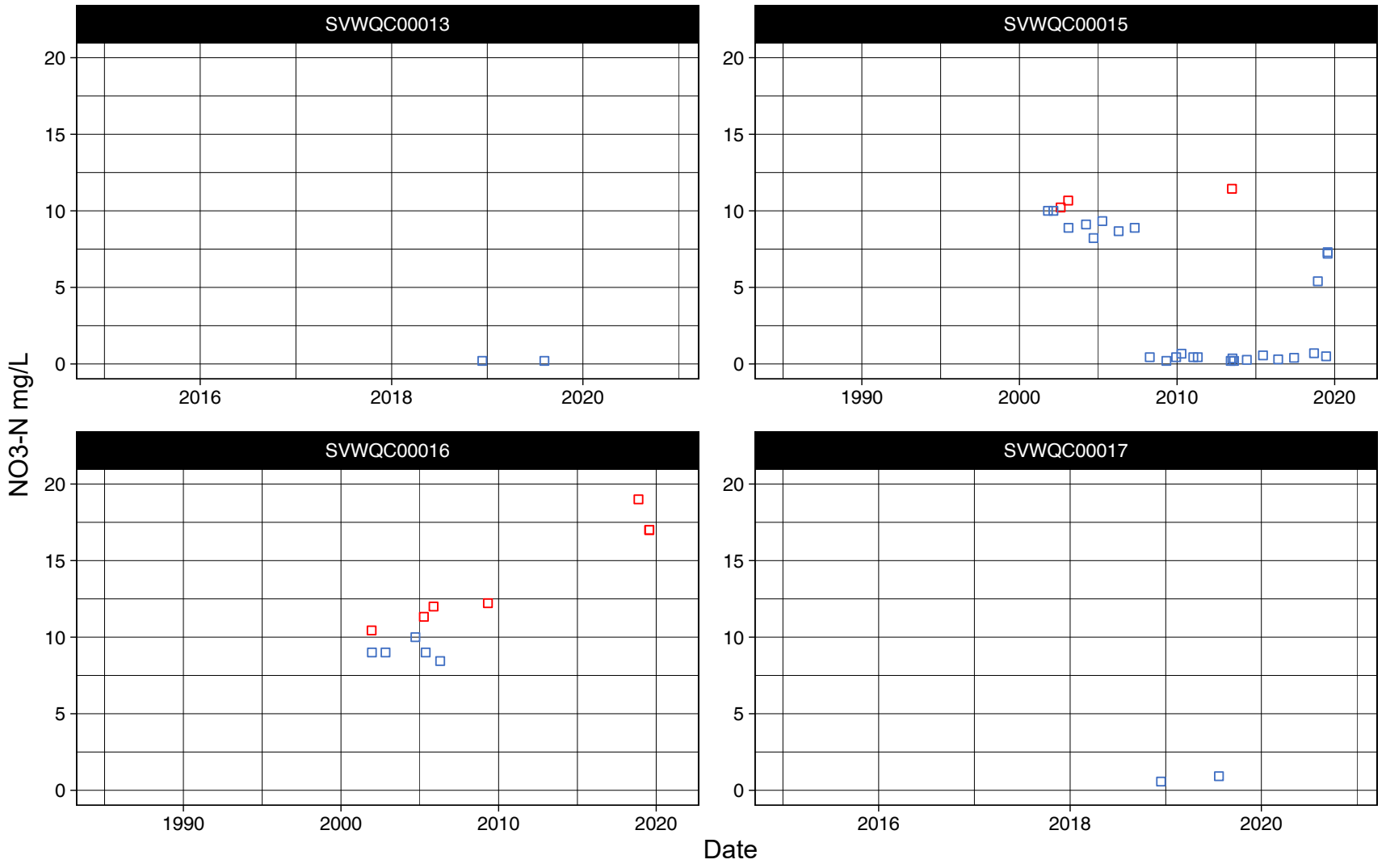

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Sacramento Valley Water Quality Coalition

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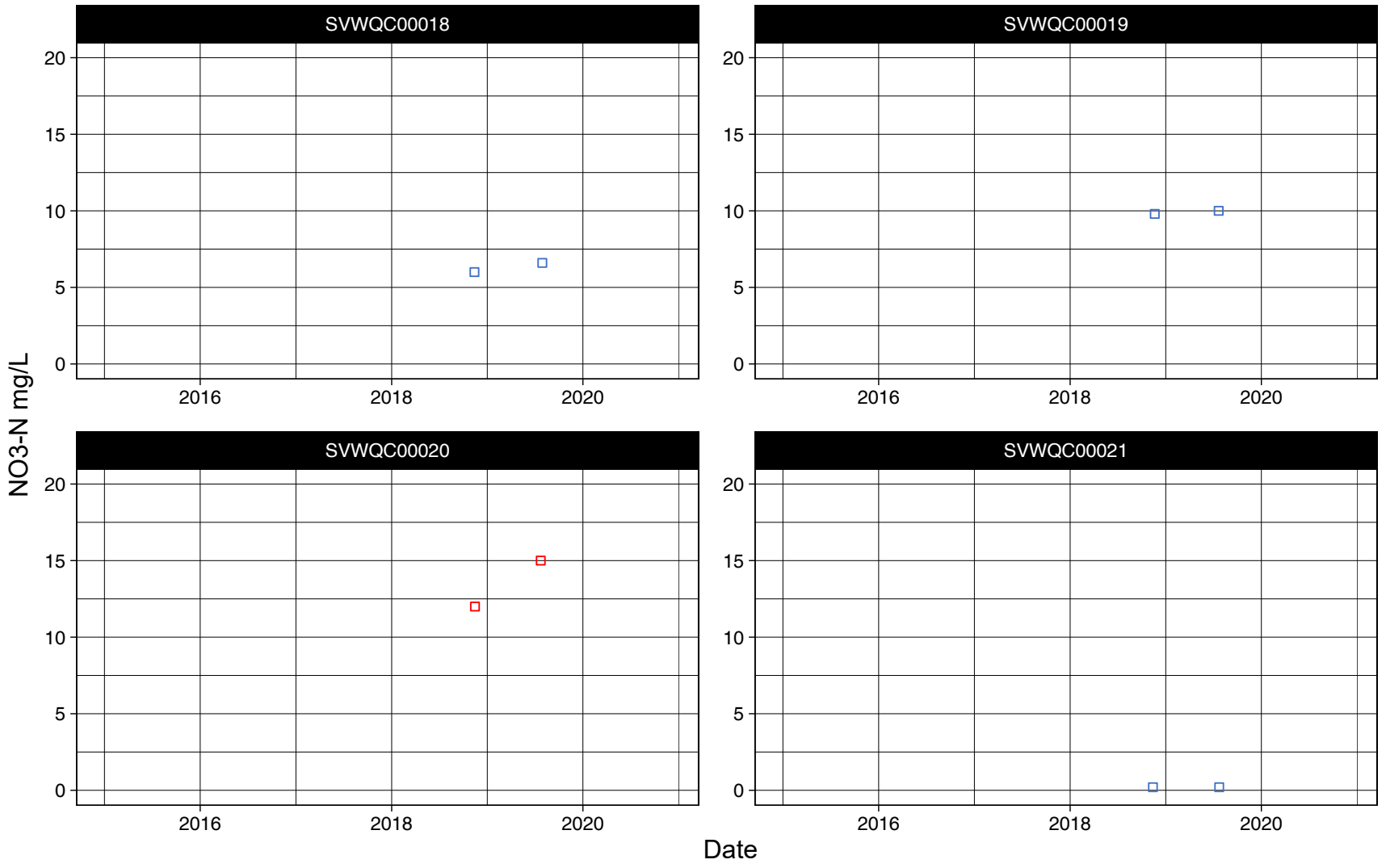

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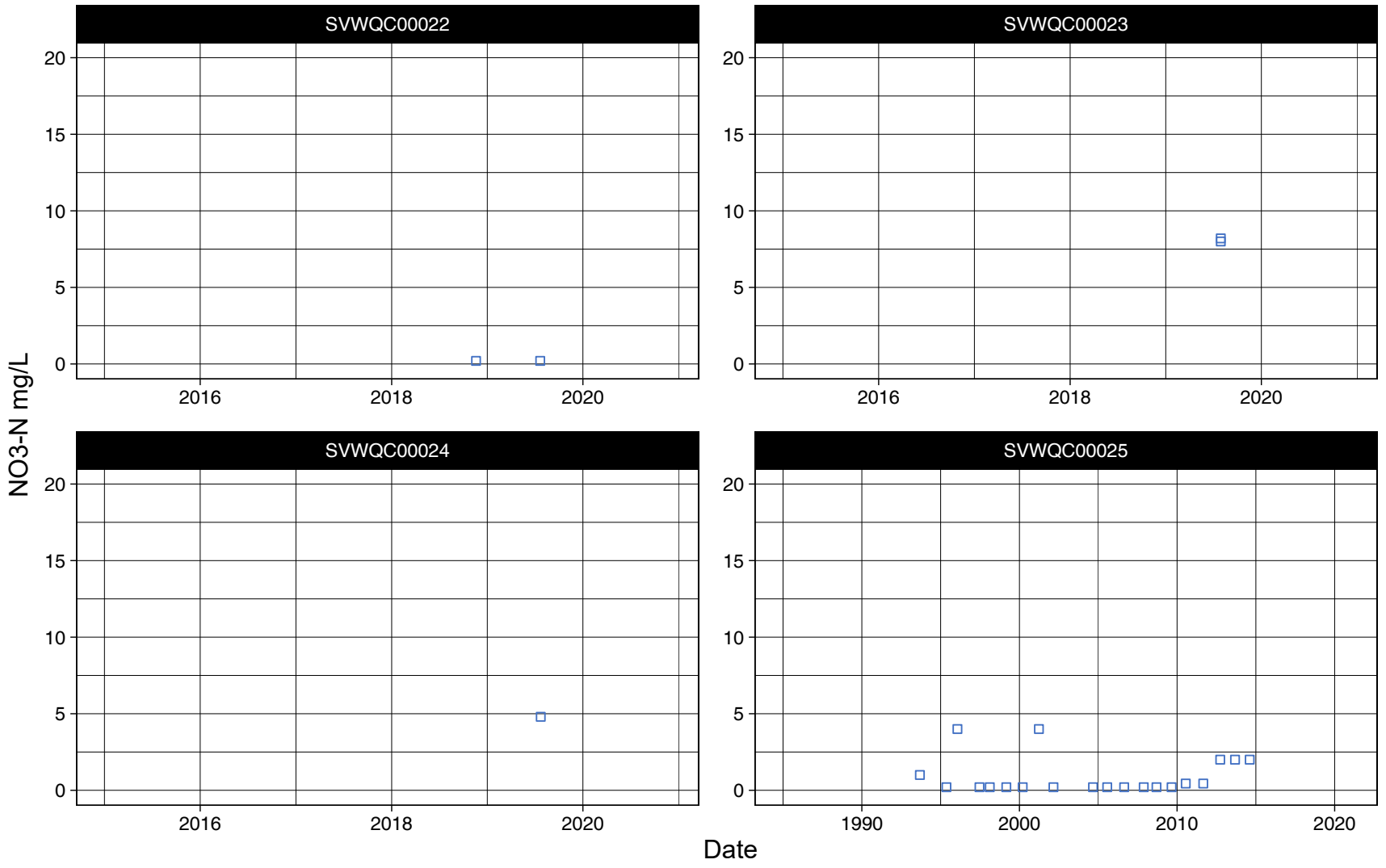

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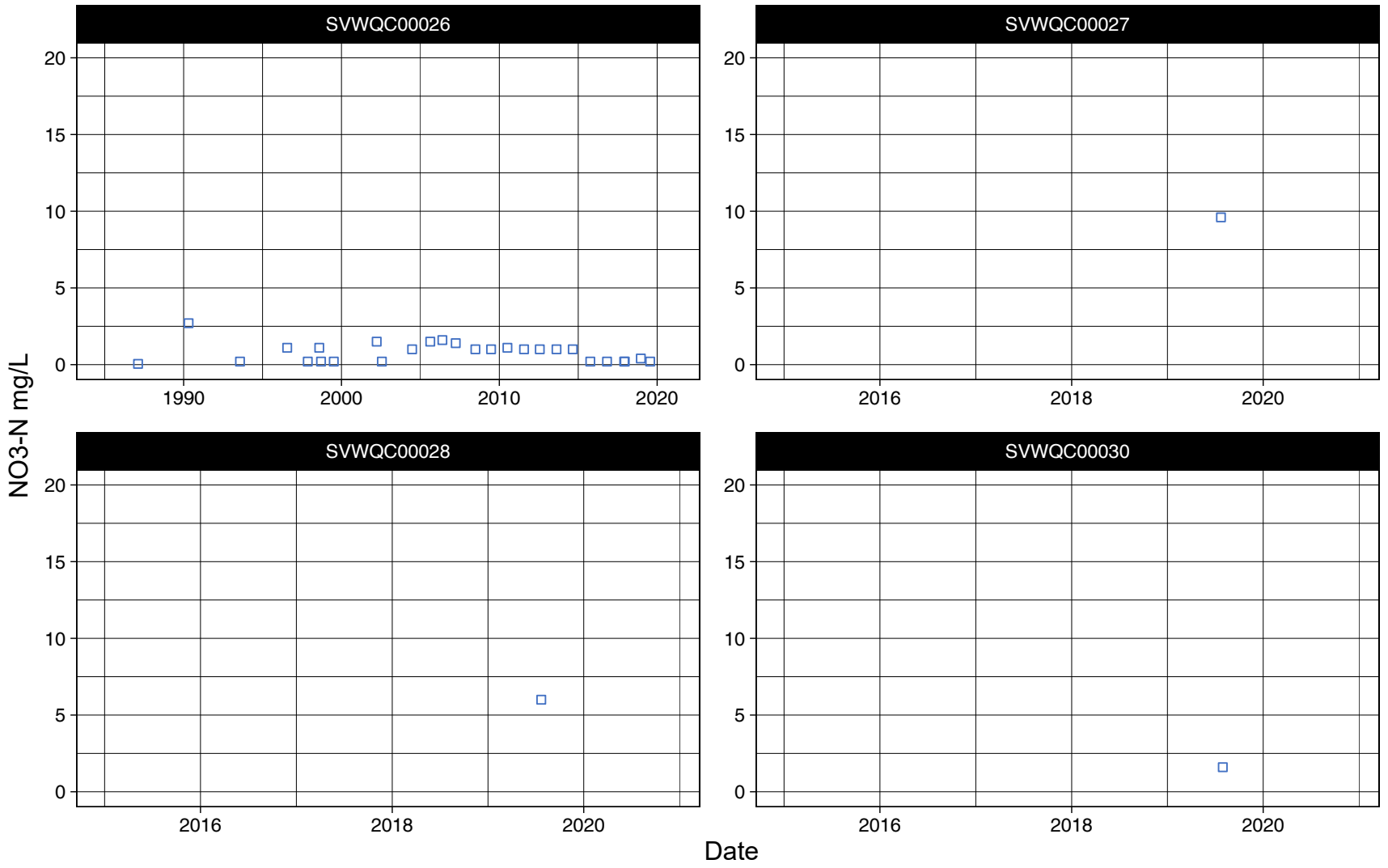

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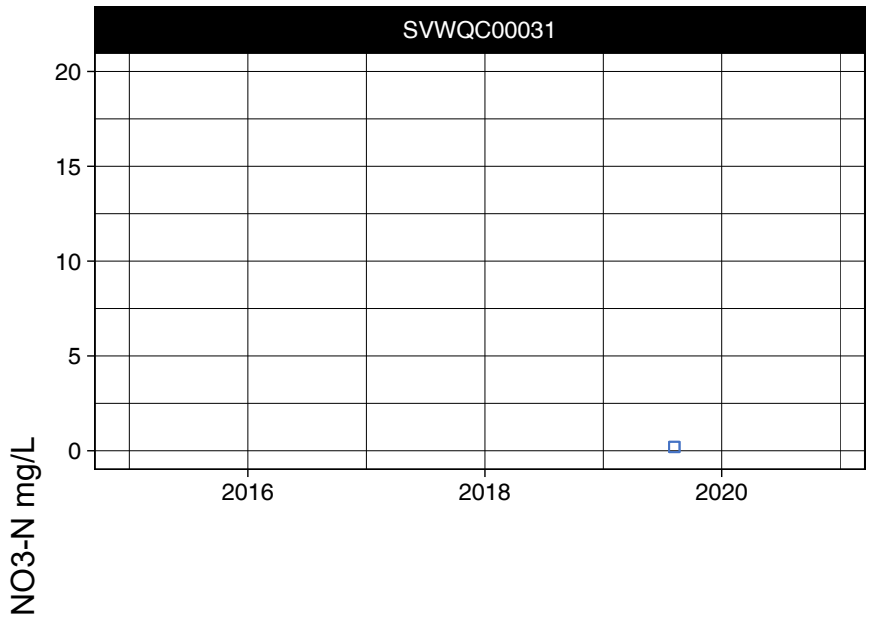
SVWQC00031
20
15
10
5
0
2016
2018
2020
NO3-N mg/L
Date

Appendix B:
Electronic Data Submittal

This appendix is submitted separately as an electronic data submittal containing data submittal requirements including tabular summary data sheets of sampling results, original laboratory analytical report files, field forms, analytical methods, and GIS files