Peace River Facility ASR System 2022 Annual Report

Prepared for

Peace River Manasota
Regional Water Supply Authority

August 2023

ASRus, LLC
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Contents

Appendices

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Acronyms and Abbreviations

µg/L	micrograms per liter
APHPZ	Avon Park high permeability zone
ASR	aquifer storage and recovery
Authority	Peace River Manasota Regional Water Supply Authority
BG	billion gallons
bls	below land surface
BMDL	below method detection level
CFU/100 mL	colony forming units per 100 milliliters
CT1	Cycle Test 1
CT2	Cycle Test 2
EPA	U.S. Environmental Protection Agency
FDEP	Florida Department of Environmental Protection
gpm/ft	gallon(s) per minute per foot (of drawdown or rise)
IAS	Intermediate Aquifer System
MCL	maximum contaminant level
MG	million gallons
mg/L	milligrams per liter
mg/L/MG	milligrams per liter per million gallons
mgd	million gallon(s) per day
NAVD	North American Vertical Datum
NGVD	National Geodetic Vertical Datum
POR	Period of Record
PRF	Peace River Regional Water Supply Facility
PTW	partially treated water
Q	pumping rate (in gallons per minute)
Q/s	specific capacity (gpm/foot of drawdown)
s	drawdown (feet)
SI	specific injectivity (gpm/foot of water level increase)
Tampa Zone	Tampa Member of the Arcadia Formation
TDS	total dissolved solids
UFA	Upper Floridan aquifer
UIC	underground injection control
WF1	ASR Wellfield No. 1
WF2	ASR Wellfield No. 2
WQCE	Water Quality Criteria Exemption
WUP	Water Use Permit
ZOD	zone of discharge

Professional Geologist

The evaluation and interpretations in *The Peace River Facility ASR System 2022 Annual Report* on behalf of the Peace River Manasota Regional Water Supply Authority were prepared by or reviewed by a Licensed Professional Geologist in the State of Florida.

James P. Larkin, P. G.

8/16/2023
Date

2793
License No.

Certification Signature

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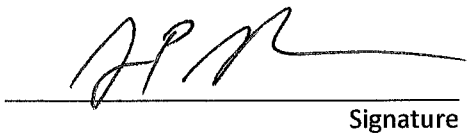

Signature

James P. Guida

Printed Name

Director, Water Resources

Title

8/17/23

Date

Executive Summary

The Peace River Manasota Regional Water Supply Authority (Authority) operates an Aquifer Storage and Recovery (ASR) system that includes ASR Wellfield No. 1 (WF1) and ASR Wellfield No. 2 (WF2) at the Peace River Regional Water Supply Facility (PRF). The Underground Injection Control (UIC) Permit for those wellfields requires completion and submittal of an annual report on ASR operations. This annual report summarizes data collected from the ASR system through calendar year 2022 and provides analysis of the operations and performance of the ASR system.

The Florida Department of Environmental Protection (FDEP) UIC operation permit was issued April 24, 2013, including both WF1 and WF2. The permit had a five-year duration, and therefore an application renewal was submitted February 19, 2018. In addition to requesting authorization to continue to inject fully treated finished water at both wellfields, the permit application requested authorization to inject Partially Treated Water (PTW), from the Authority's above ground reservoirs as a new source water for the WF2 ASR system. However, since the permit application was submitted within 60 days of the expiration of the current permit it was deemed to be a timely renewal. Therefore, operation of the ASR system is permitted to continue under the conditions of the 2013 operation permit while the permit renewal application is being processed. A draft permit was issued June 8, 2023 to include potable water and PTW (with disinfection) as a new source water. An accompanying water quality criteria exemption (WQCE) was drafted for some secondary drinking water standards associated with PTW use, but the final order has not yet been signed. The new permit does not require a WQCE for arsenic.

The two primary issues associated with the operation of the potable water ASR wellfields are increasing salinity during recovery and arsenic mobilization. During recovery events, increasing salinity is caused by a combination of recharged potable water mixing with the storage zone native water and, to a greater extent, upconing from higher salinity permeable units below the storage zone. Upconing is a term used to describe the upward movement of water to the well bore versus lateral movement of water to the well bore in response to pumping.

Regarding permitting, the second issue that has affected operation of ASR is the mobilization of arsenic. FDEP UIC regulations state that injection activities of an ASR system cannot cause an exceedance of a primary drinking water standard maximum contaminant level (MCL) in the aquifer. The Authority was issued a water quality criteria exemption (WQCE) on February 12, 2013 to mitigate increases in arsenic concentration within the storage zone and allow exceedances of arsenic standards on land under the institutional control of the Authority. After issuance of the WQCE and operation permit, the U.S. Environmental Protection Agency (EPA) sent a letter to FDEP that allows potable water ASR projects to be permitted if arsenic is being mobilized provided the permit is protective of groundwater and other groundwater users. That September 27, 2013, letter from EPA to FDEP is referenced in the new draft permit and will allow exceedances of the arsenic standard without a WQCE.

Arsenic naturally present in the aquifer is mobilized at most, if not all, ASR sites in Florida, including WF1 and WF2. However, the following points demonstrate that public health has not been endangered through operation of this ASR system. These factors are the primary basis for issuance of the 2013 WQCE for arsenic and the subsequent EPA guidance letter that allows arsenic exceedances for ASR systems:

- Water recovered from the ASR system is re-treated at the PRF to meet all state and federal drinking water standards prior to distribution of potable water to the public.
- The Authority has an extensive monitoring well network that has shown the areal extent of arsenic exceedances to be limited to land owned or controlled by the Authority.
- There is strong evidence that arsenic is unstable in groundwater when influenced by ASR operations and adsorbs to the host rock matrix relatively near the ASR boreholes.

- No competing users of the storage zone are located near either of the wellfields.
- The Authority owns or controls a large area of land surrounding the ASR wellfields providing institutional control of the stored water.
- Arsenic concentrations have decreased with continued use of the ASR system, with most of the ASR wells now operating within the established drinking water MCL.

This report details the operational and water quality data of the ASR wells. Recommendations and considerations for future operation of the wellfields, based on the analysis presented herein, are presented at the end of the report. The following are a few of the more significant findings and recommendations made in this report:

- Two consecutive recovery cycles were conducted in 2021 and 2022 from both WF1 and WF2 totaling 1.17 billion gallons (BG). These back-to-back recovery events confirmed that the ASR system could reliably produce approximately 1 billion gallons (BG) of water at a rate up to approximately 15 mgd while maintaining water quality acceptable for distribution. However, more water can be recovered from the ASR system when factoring in blending capacity with the fresher reservoir water.
- During the 2022 recovery event, arsenic concentrations from the ASR wells were slightly elevated due to the consecutive recovery events but overall were still relatively low. At WF1 the highest concentration recorded was 24.6 μg/L but the average was 6.1 μg/L. At WF2 the high was 19.4 μg/L and the average was 10.1 μg/L.
- Recharge was conducted at the end of 2022 totaling 111 MG at WF1 and 765 MG at WF2. Cumulative storage balance in the ASR system at the end of 2021 was approximately 7.9 BG.
- Monitoring wells continue to confirm the limited extent of arsenic mobilization from the ASR wells as most are below the regulatory limit of 10 μg/L. In 2022, only M-22 at the WF1 monitor wells recorded levels greater than 10 μg/L with two samples at 12 μg/L. At the WF2 monitor wells M-11, M-12, M-14, and M-15 had levels over 10 μg/L, the highest recorded at M-11 (19.7 μg/L).
- The increased storage volume committed at WF1 and WF2 since 2009 has improved the resiliency of the wellfield water quality. To maintain water quality in the ASR wells, recovering from the wells in consecutive years without recharging water between the recovery events should be avoided if conditions allow. Data analysis has shown that the starting total dissolved solid (TDS) concentrations is a major factor influencing TDS concentrations at the end of recovery.
- The addition of PTW to the ASR permit should continue to be pursued. Treating the water stored and recovered in the ASR wells once instead of twice will continue to protect water resources and provide a more cost-effective alternative to the Authority while delivering a high-quality water supply to its customers.

SECTION 1

Introduction

The Peace River Manasota Regional Water Supply Authority (Authority) operates a potable water Aquifer Storage and Recovery (ASR) system referred to as ASR Wellfield No. 1 (WF1) and ASR Wellfield No. 2 (WF2). WF1 consists of nine ASR wells located on the Peace River Regional Water Supply Facility (PRF) property and has been in operation since the mid-1980s. Each well has the capacity to inject or recover approximately 1 million gallons per day (mgd). WF2 consists of 12 ASR wells, each with a capacity of approximately 1 mgd. WF2 is located directly west of the PRF and south of Surface Reservoir No. 1.

Permitting of the Authority's ASR system is under the oversight of the Florida Department of Environmental Protection's (FDEP's) Underground Injection Control (UIC) Program. A water quality criteria exemption (WQCE) was issued February 12, 2013, that waived the arsenic standard in the ASR zone within property under institutional control of the Authority. The WQCE was issued based on the extensive historical dataset collected at the PRF monitoring wells that showed that elevated arsenic concentrations did not extend far from the ASR wells, arsenic concentrations decreased over time, and groundwater exceedances of the arsenic standard did not extend beyond the property under control of the Authority. Supported by the WQCE, a Class V Operation Permit was issued to the Authority on April 24, 2013, for operation of the two wellfields under a single permit. The two wellfields are now operated as one ASR system.

A draft permit was issued June 8, 2023 that included the use of either potable or PTW at WF2. A water quality criteria exemption (WQCE) for secondary drinking water standards was shared with the Authority, but the final order has not been signed. Under the draft permit, a WQCE is no longer deemed necessary by the Department to allow minor exceedance of the arsenic standard on property under institutional control of the Authority based on the September 27, 2013 letter from the U.S. Environmental Protection Agency to the FDEP. Until the final permit is issued the ASR system will continue to operate under the conditions of the 2013 operation permit. A copy of the 2013 Class V Operation Permit and the June 8, 2023 Draft Permit is included in **Appendix A**.

Figure 1-1 shows the location of the PRF in southwest DeSoto County, Florida. **Figure 1-2** is a site plan showing the locations of the 21 ASR wells and monitoring well network.

The purpose of this report is to evaluate data collected through 2022 at WF1 and WF2, and to comply with specific condition III.A.2 of operation permit 0136595-014-UO/5Q. **Figure 1-3** presents a site plan showing the locations of WF1 ASR and monitoring wells. **Figure 1-4** presents a site plan of WF2 showing the locations of the ASR wells and associated monitoring wells. **Tables 1-1** and **1-2** provide the well construction details for WF1 and WF2 wells, respectively.

WF1 consists of eight ASR wells completed into the Suwannee Limestone (Suwannee Zone, "S" well names) of the Upper Floridan aquifer (UFA) and one ASR well completed into the Tampa Member of the Arcadia Formation (Tampa Zone, T-1) of the intermediate aquifer system (IAS). Recently this aquifer system has been renamed the Hawthorn aquifer system. However, to remain consistent with the legacy "I" identifier for the IAS monitor wells, this report will continue to use the IAS nomenclature. The final casing depths of the Suwannee Zone ASR wells range from 510 to 650 feet below land surface (bls) and the total well depths range from 623 to 955 feet bls. The Tampa Zone ASR well has an open hole interval from 380 to 482 feet bls. **Figure 1-5** is a cross-section of the WF1 ASR wells and shows well construction details and hydrogeologic intervals intercepted by each well. Previous data analysis reports for WF1 are referenced in the Bibliography, Section 9 of this report.

The 12 ASR wells in WF2 were completed in 2002 into the Suwannee Limestone permeable zone of the UFA. The final casing depths of the ASR wells range from 566 to 621 feet bls and the total original well depths range from 883 to 905 feet bls. **Figure 1-6** is a cross-section of the ASR wells and shows well construction details and hydrogeologic intervals intercepted by each well. The wells were installed in a grid pattern with approximately 300 feet between each ASR well. Operation of WF2 began in June 2002.

In support of the State of Florida's investigation into the mobilization of arsenic in ASR wells, an enhanced groundwater monitoring well network was completed in 2005, adding 12 more Suwannee Zone monitoring wells and 1 more Tampa Zone monitoring well at the PRF. Water quality sampling of these wells continues today. Data from these and the other ASR monitoring wells are included in Section 4 of this report.

The remainder of the report is organized into the following sections:

- Section 2 – ASR Well Recharge and Recovery Volumes
- Section 3 – ASR Well Capacity Data Evaluation
- Section 4 – Water Quality Data Evaluation
- Section 5 – Water Level Data
- Section 6 – Partially Treated Surface Water ASR
- Section 7 – Summary and Conclusions
- Section 8 – Recommendations
- Section 9 – Bibliography

Data evaluations for WF1 are typically provided first, followed by WF2. Monitoring wells are presented with each corresponding wellfield.

Table 1-1

WF1 ASR Wells and Monitoring Well Construction Details

Well	Casing Diameter (inches)	Casing Depth (feet bls)	Total Depth (feet bls)	Latitude	Longitude	Hydrogeologic Interval
T-1	12	380	482	27 5' 29.04"	82 0' 9.78"	LPZ
S-1	8	570	920	27 5' 27.96"	82 0' 17.28"	Suwannee Zone
S-2	12	570	900	27 5' 29.46"	82 0' 9.24"	Suwannee Zone
S-6	12	580	910	27 5' 17.52"	82 0' 26.34"	Suwannee Zone
S-7	12	575	915	27 5' 11.76"	82 0' 25.2"	Suwannee Zone
S-8	12	510	623	27 5' 22.2"	82 0' 33.3"	Suwannee Zone
S-3R	16	580	769	27 5' 22.2"	82 0' 9.3"	Suwannee Zone
S-5R	16	650	808	27 5' 24.06"	82 0' 16.56"	Suwannee Zone
S-9R	16	580	906	27 5' 16.14"	82 0' 16.26"	Suwannee Zone
E	6	140	200	27 05' 28"	82 00' 06"	UPZ
T-2	4	393	490	27 06' 24"	82 00' 30"	LPZ
M-2	6	596	900	27 06' 24"	82 00' 30"	Suwannee Zone
I-4 (MW-8)	*8*	*205*	*330*	*27 07' 37"*	*82 02' 25"*	*LPZ*
M-4 (MW-5)	*12*	*505*	*800*	*27 07' 37"*	*82 02' 51"*	*Suwannee Zone*
M-6	6	579	640	27 03' 39.6114"	82 01' 19.6979"	Suwannee Zone
I-7	6	220	261	27 05' 21.2475"	82 00' 25.7496"	LPZ
T-7	6	349	400	27 05' 21.1874"	82 00' 25.8985"	LPZ
M-7	6	584	688	27 5.472'	82 0.304'	Suwannee Zone
M-20	6	575	672	27 5.186'	82 0.457'	Suwannee Zone
M-21	6	565	572	27 5.490'	82 0.151'	Suwannee Zone
M-22	6	580	605	27 05' 21.1291"	82 00' 26.0461"	Suwannee Zone

LPZ = lower producing zone of the Intermediate Aquifer System

UPZ = upper producing zone of the Intermediate Aquifer System

Suwannee Zone = refers to the Upper Floridan aquifer permeable unit within the Suwannee Limestone Formation

MW-8 and MW-5 are previous SWFWMD nomenclature

** abandoned*

Table 1-2

WF2 ASR Wells and Monitoring Wells Construction Details

Well	Casing Diameter (inches)	Casing Depth (feet bls)	Total Depth (feet bls)	Latitude	Longitude	Hydrogeologic Interval
S-4	12	570	905	27 05’ 06.1042”	82 01’ 06.4977”	Suwannee Zone
S-10	16	620	906	27 04’ 57.1407”	82 01’ 03.3015”	Suwannee Zone
S-11	16	585	900	27 05’ 00.1137”	82 01’ 03.2584”	Suwannee Zone
S-12	16	600	900	27 04’ 57.1524”	82 01’ 06.6125”	Suwannee Zone
S-13	16	621	898	27 05’ 00.1531”	82 01’ 06.5644”	Suwannee Zone
S-14	16	568	900	27 04’ 57.2286”	82 01’ 09.9465”	Suwannee Zone
S-15	16	583	900	27 05’ 00.2032”	82 01’ 09.8760”	Suwannee Zone
S-16	16	583	902	27 05’ 03.0748”	82 01’ 03.2110”	Suwannee Zone
S-17	16	579	883	27 05’ 06.0299”	82 01’ 03.1812”	Suwannee Zone
S-18	16	592	900	27 05’ 03.1111”	82 01’ 06.5295”	Suwannee Zone
S-19	16	585	900	27 05’ 05.7252”	82 01’ 03.2877”	Suwannee Zone
S-20	16	566	898	27 05’ 03.2466”	82 01’ 02.7664”	Suwannee Zone
T11	6	350	400	27 5.117'	82 1.225'	LPZ
M11	6	570	677	27 5.125'	82 1.222'	Suwannee Zone
M12	6	585	705	27 5.037'	82 1.230'	Suwannee Zone
M13	6	550	670	27 5.108'	82 1.284'	Suwannee Zone
M14	6	575	676	27 5.077'	82 1.187'	Suwannee Zone
M15	6	570	678	27 4.976'	82 1.270'	Suwannee Zone
M16	6	560	673	27 4.988'	82 1.138'	Suwannee Zone
M17	6	565	670	27 5.051'	82 1.074'	Suwannee Zone
M18	6	575	700	27 4.914'	82 1.071'	Suwannee Zone
M19	6	580	680	27 5.100'	82 0.958'	Suwannee Zone
I-8	6	155	190	27 05' 09.3137''	82 01' 19.0732''	UPZ
T-8	12	354	401	27 05' 09.4042''	82 01' 18.5632''	LPZ
M-8	10	570	860	27 05' 09.1883''	82 01' 19.6788''	Suwannee Zone
*I-9**	*12*	*280*	*320*	*27 05' 45.3058''*	*82 01' 36.0568''*	*LPZ*
I-10	6	260	312	27 05' 04.0074''	82 02' 19.8766''	LPZ

LPZ = lower producing zone of the Intermediate Aquifer System Intermediate Aquifer System

UPZ = upper producing zone of the Intermediate Aquifer System

Suwannee Zone = refers to the Upper Floridan aquifer permeable unit within the Suwannee Limestone Formation

** abandoned*

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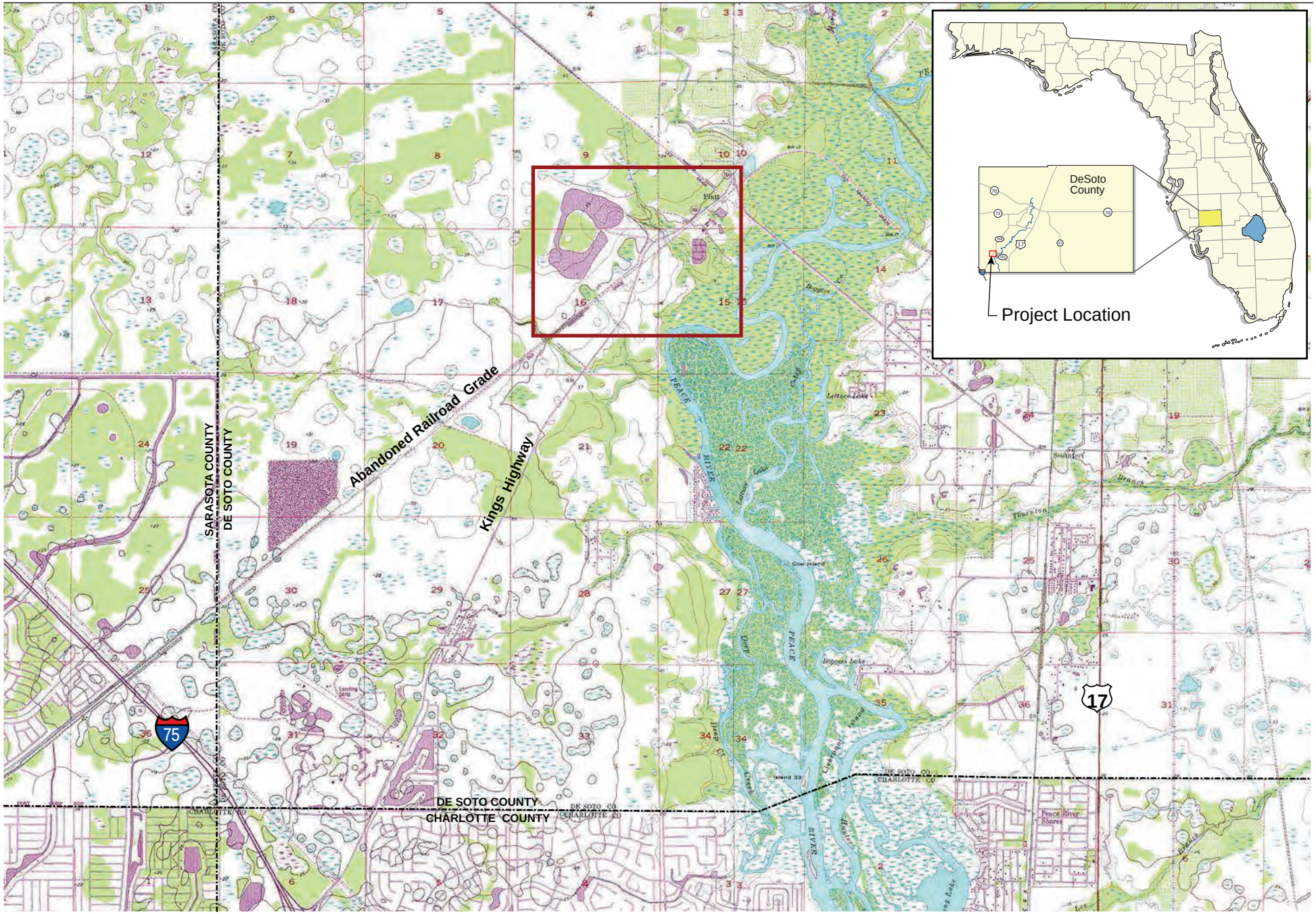


Peace River Manasota
Regional Water Supply Authority

North

0 1/2 1

Scale in Miles

USGS Quad Maps:
Murdock SE, Florida, 1987
Fort Ogden, Florida, 1987

FIGURE 1-1
Project Location Map

ASR US, LLC

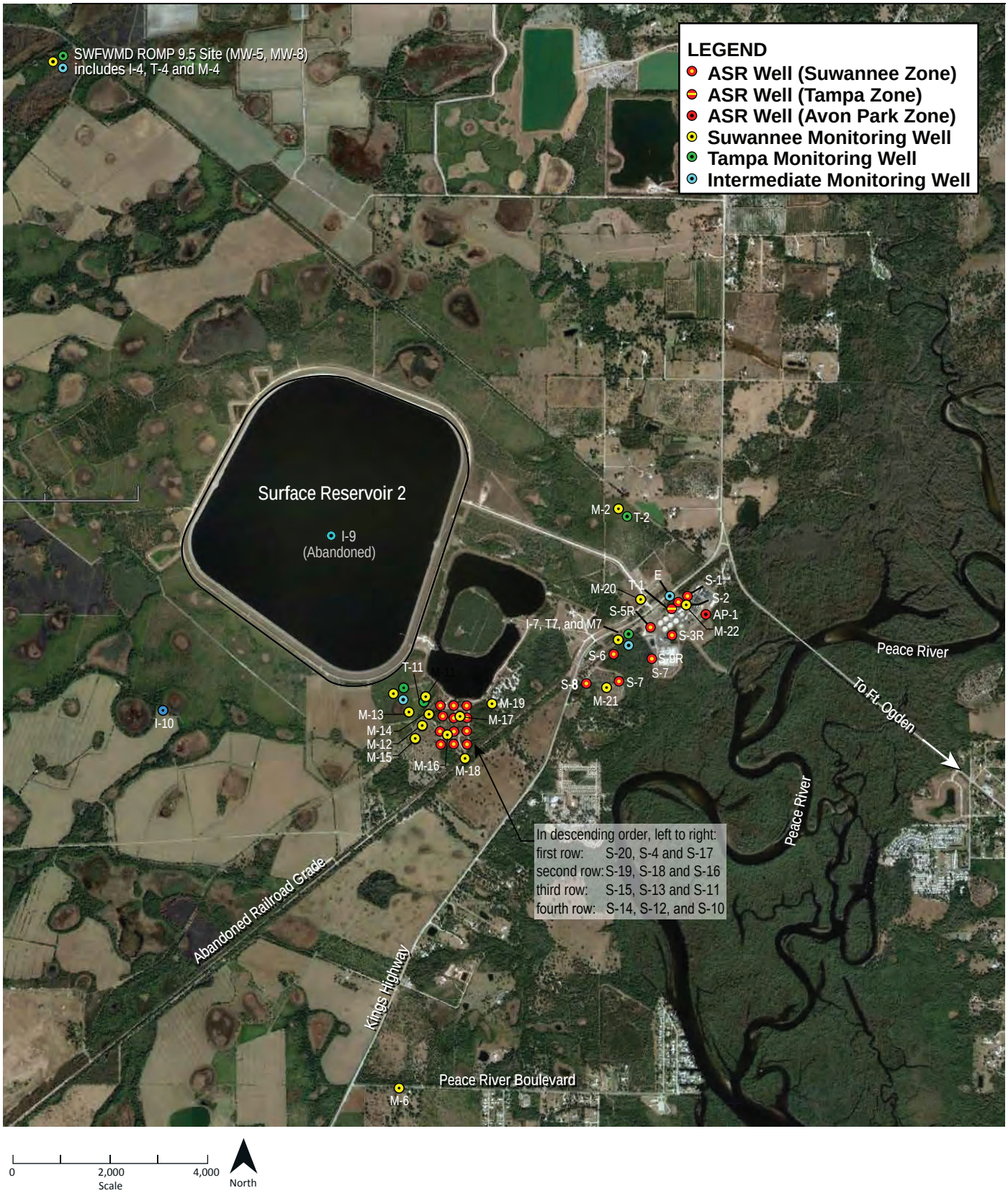


FIGURE 1-2
Peace River Facility ASR Site Plan

Peace River Manasota Regional Water Supply Authority

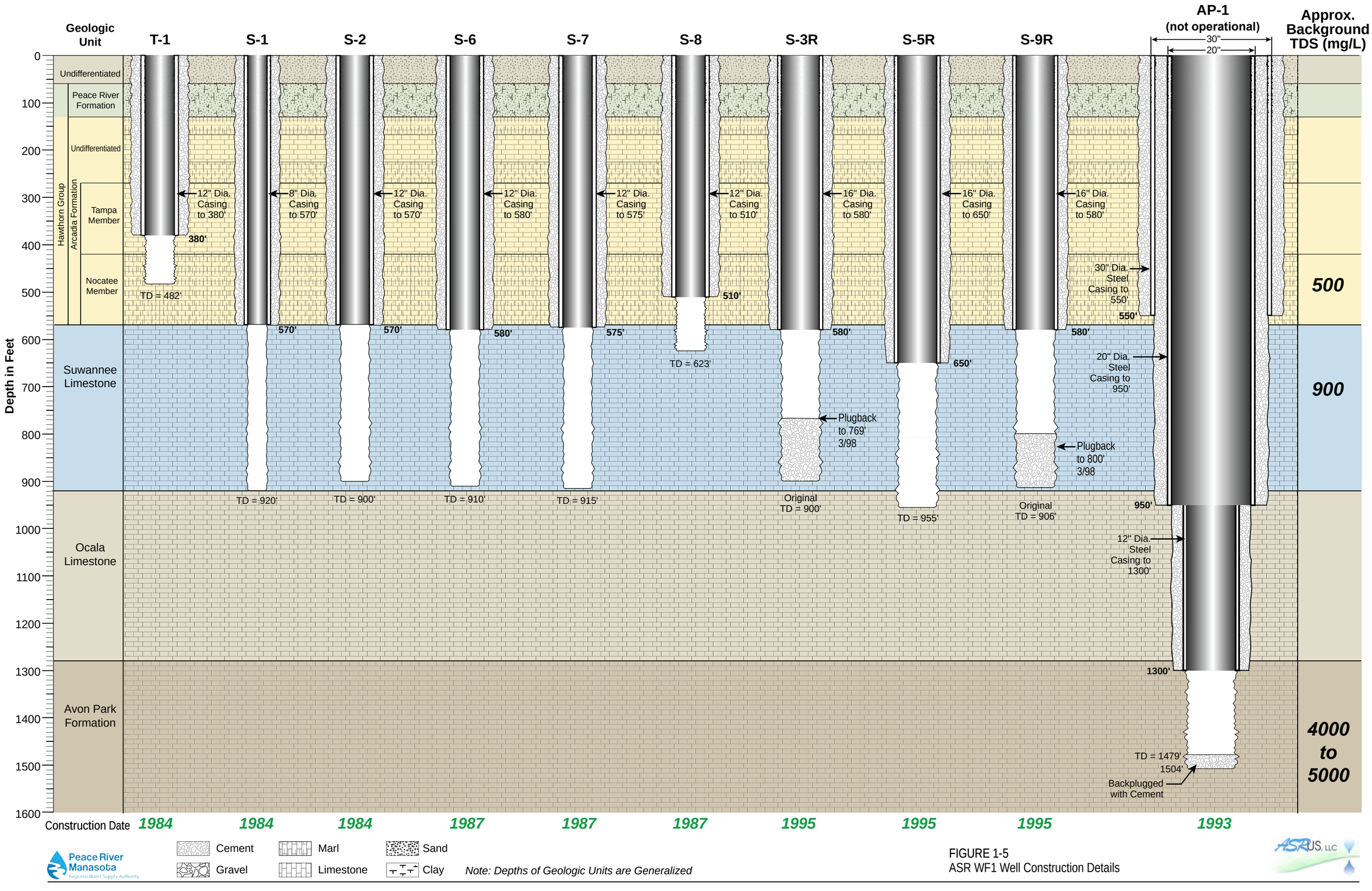
FIGURE 1-3
WF1 Site Plan

ASR US, LLC

Peace River Manasota Regional Water Supply Authority

FIGURE 1-4
WF2 Site Plan

ASR US, LLC



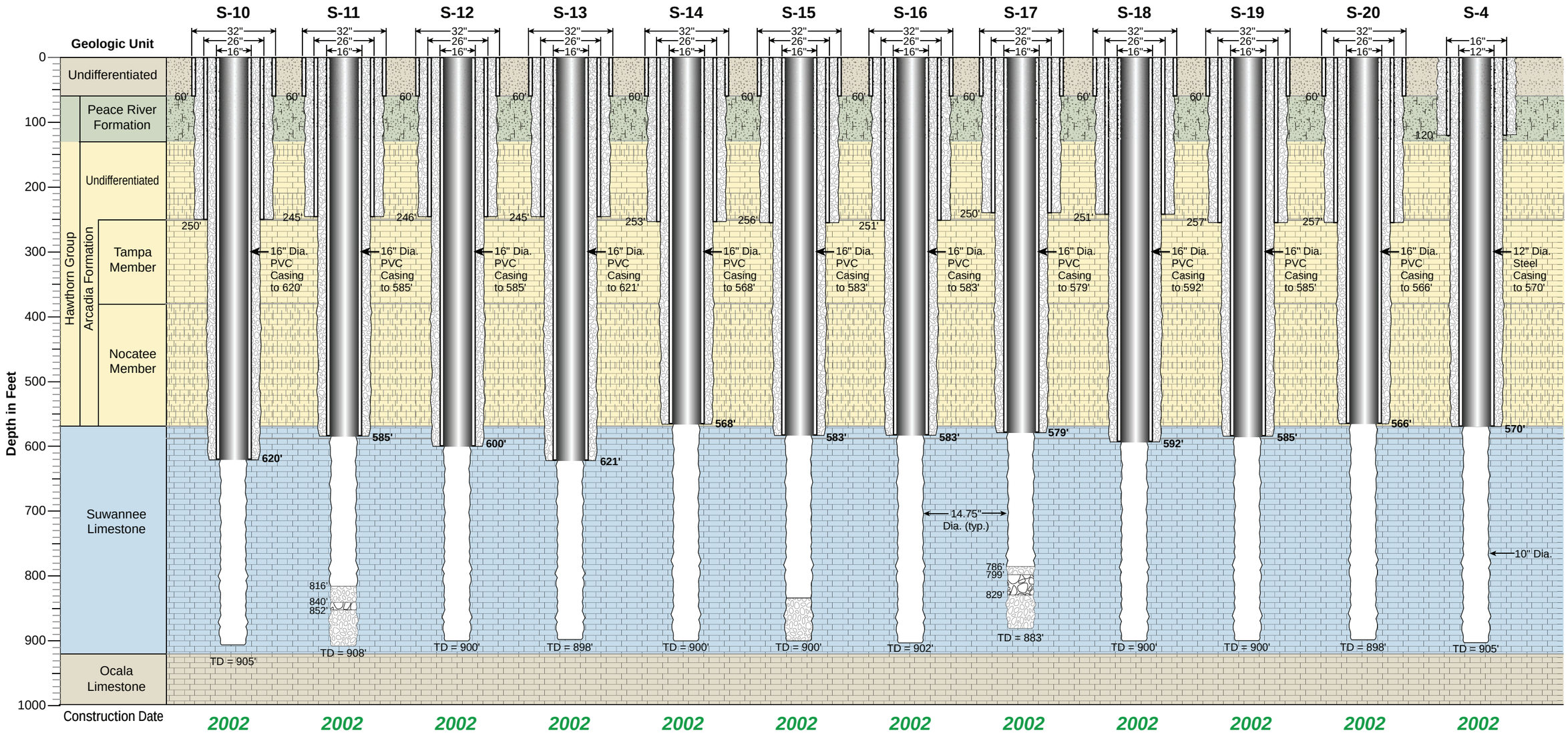
Cement
Gravel
Marl
Limestone
Sand
Clay

Note: Depths of Geologic Units are Generalized

Peace River Manasota Regional Water Supply Authority

FIGURE 1-5
ASR WF1 Well Construction Details

ASR US, LLC



Cement
Gravel
Marl
Limestone
Sand
Clay

Note: Depths of Geologic Units are Generalized

FIGURE 1-6
ASR WF2 Well Construction Details

SECTION 2

ASR Well Recharge and Recovery Volumes

2.1 Recharge and Recovery Volumes

The ASR wellfields and surface reservoirs at the PRF provide a storage mechanism to meet water supply demands during the dry season. The recharge and recovery volumes of the wells are subject to many factors that ultimately dictate how, and to what capacity the wells are used. Expansions of the PRF in 2009 and 2014 increased treatment capacity from 24 to 48 mgd and from 48 to 51 mgd, respectively, providing a significant amount of treatment capacity available to recharge the ASR system. The addition of Surface Reservoir No. 2 in 2009 provided the Authority with adequate surface water storage capacity to meet typical dry season demands with less dependence upon the ASR system except during extreme droughts. The ASR wells now serve to supplement the surface reservoirs and improve reliability in the Authority's water storage management strategy.

Prior to April 24, 2013, WF2 was regulated under an FDEP UIC construction permit, which required cycle testing. A typical cycle test consisted of a recharge period during the wet season, a storage period, and a recovery period during the subsequent dry season. During cycle testing, the Authority attempted to maintain the volumes listed in the FDEP construction permit, but that was possible only when the availability of water and system demands allowed. During severe water shortages, such as those the region faced in 2006, 2007, and 2009 prior to the completion of Reservoir No. 2 the ASR system was used as needed to meet the water supply demands of the public; therefore, cycle test targeted recovery volumes were exceeded. This is no longer an issue because in 2013, WF1 and WF2 were both permitted under a single operation permit (0136595-014-UO/5Q) that does not require a formal cycle testing program.

WF1 has been regulated under an operation permit since August 2008. Prior to that it was operated under an "authorization to use" permitting mechanism. Both permits offered greater flexibility in the operation of the wellfield than the construction permit that WF2 operated under prior to April 2013. This allowed the Authority to use WF1 to supply water during short intermittent periods of high demand or to store water during short-term water supply surplus periods without being overly restricted by the operational limits of a cycle test plan.

Figures 2-1 and **2-2** show the historical recharge minus recovery balance and the effective storage volume from WF1 and WF2, respectively. The cumulative recharge/recovery balance is the total amount of recharge minus the total amount of recovery. The effective storage volume is the amount of water stored. The distinction between the two is that the effective storage volume does not calculate negative recovery volumes because once all the stored water is removed the "negative" is assumed to be native groundwater, and its inclusion in the calculation of storage does not accurately reflect the volume of subsequent water stored. Once the storage balance becomes negative (native groundwater) the amount in storage is considered to be zero for the calculation of effective storage volume.

WF1 has been in operation since the mid-1980s. During its existence, the volume of storage at WF1 has been greater than the volume of recovered water. However, drought years between 2000 and 2001 and 2006 and 2009 are evident as higher recovery volumes were recorded during these periods. Since 2009 more emphasis was placed on increasing the storage volume in WF1, reaching 2,058 MG of storage in 2020. Two consecutive recovery events were conducted in 2021 and 2022 with no recharge between the two recovery events. A series of relatively short recovery periods were conducted throughout 2021 which consisted of 10 days of recovery at a rate of approximately 4.5 mgd followed by a storage period of 70 to 90 days in between the recovery events. Four recovery periods were completed totaling 181

MG of recovery. In April of 2022 another recovery period was conducted totaling 298 MG, resulting in two back-to-back recovery seasons totaling 479 MG.

At the end of 2022, approximately 111 MG was recharged resulting in 1,689 MG of water in storage at WF1. Since WF1 has always maintained a positive storage balance there is no graph of "effective storage" since it is the same as the recharge minus recovery balance for WF1.

WF2 has been in operation since 2002. The operation permit was issued in April 2013 during the middle of the Cycle 12 recovery. The Cycle 12 recovery period ended on June 5, 2013. For the purposes of this report, the cycle testing period of this wellfield will include Cycles 1 through 12 recovery events. Subsequent recharge and recovery events will be referred to by the event (recharge or recovery) and the year that the event occurred. During cycles 1 through 12, approximately 7,672 MG of water was recharged, and approximately 7,489 MG was recovered. Due to the drought conditions from 2006 to 2009, water available for recharge was limited and demand was high, resulting in lower recharge volumes and higher recovery volumes than typical, ultimately resulting in full recovery of all water stored in WF2 during that period.

Since 2009 the storage volume committed to WF2 has progressively increased, reaching 7,172 MG in 2020. In 2021 no water was recharged, and 236 MG recovered at WF2. A successive recovery event was conducted in 2022 with no recharge between the 2021 recovery event and 2022 recovery event using a similar protocol as WF1. A total of 692 MG was recovered during the 2021 and 2022 recovery events followed by 765 MG of recharge at the end of 2022. The cumulative recharge/recovery balance at WF2 at the end of 2022 was approximately 6,193 MG, and the effective storage volume was 7,245 MG.

Figure 2-3 is a graph showing the cumulative recharge/recovery balance and the effective storage volume of WF1 and WF2. This shows that the ASR system historically has maintained a positive storage balance through most of its operation. The combined wellfields exhibited a negative recharge/recovery balance in 2009 and 2010 because of surplus withdrawal from WF2. At the end of 2022, the Peace River ASR system had a recharge/recovery balance of approximately 7,882 MG and an effective storage volume of 8,934 MG.

2.2 Rainfall Data

Rainfall data for the PRF are shown on **Figure 2-4**. Monthly rainfall totals (upper graph) and annual rainfall totals (lower graph) are shown for the period from January 2002 through December 2022. The seasonal variation of rainfall is clear on the monthly rainfall graph. Highest monthly rainfall totals typically are recorded from June through September each year, whereas the drier months are typically October through May. From 2002 to 2022, annual rainfall at the PRF ranged from 33 to 73 inches and averaged 55 inches. Rainfall in 2007, 2009, and 2010 represented the lowest average rainfall conditions all greater than 10-percent below the POR average, with 2007 having the most significant rainfall deficit (22 inches below the average over the period of record [POR]). The highest annual rainfall over this period occurred in 2022 with a record of 73 inches resulting from Hurricane Ian, 7 inches higher than the previous POR high of 66 inches recorded in 2016.

Rainfall in 2022 was 18 inches above the POR average. October was the driest month and September was the wettest month, with 0.65 and 24.79 inches of total monthly rainfall, respectively. Since 2011, rainfall has been more consistent with each year totaling over 50 inches of rain with no significant deficits as observed between 2007 to 2010. The average annual rainfall from 2022 to 2012 was 52 inches. From 2012 through 2022, the average annual rainfall total was 58 inches.

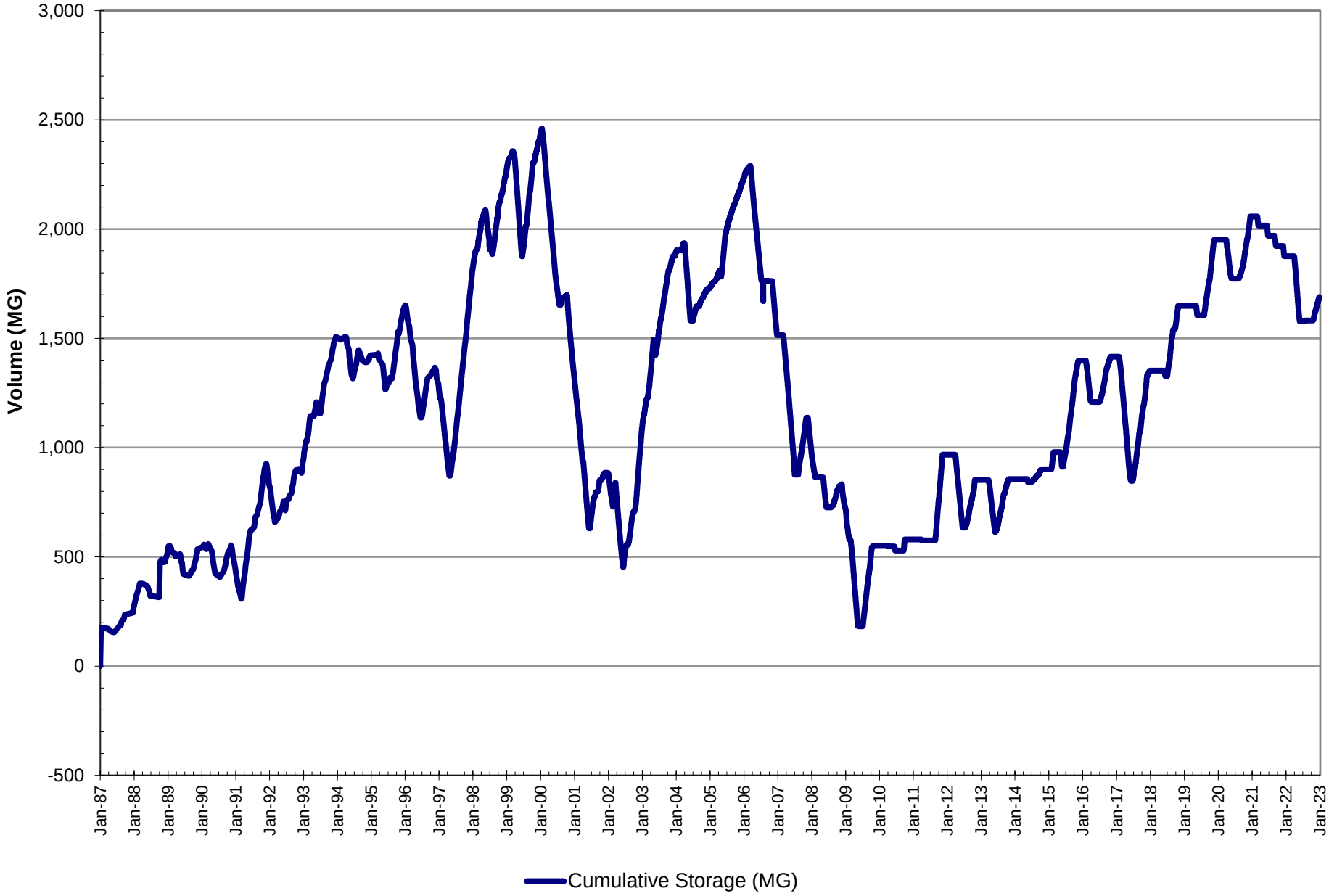


Figure 2-1
WF1 Historical Cumulative Storage Summary

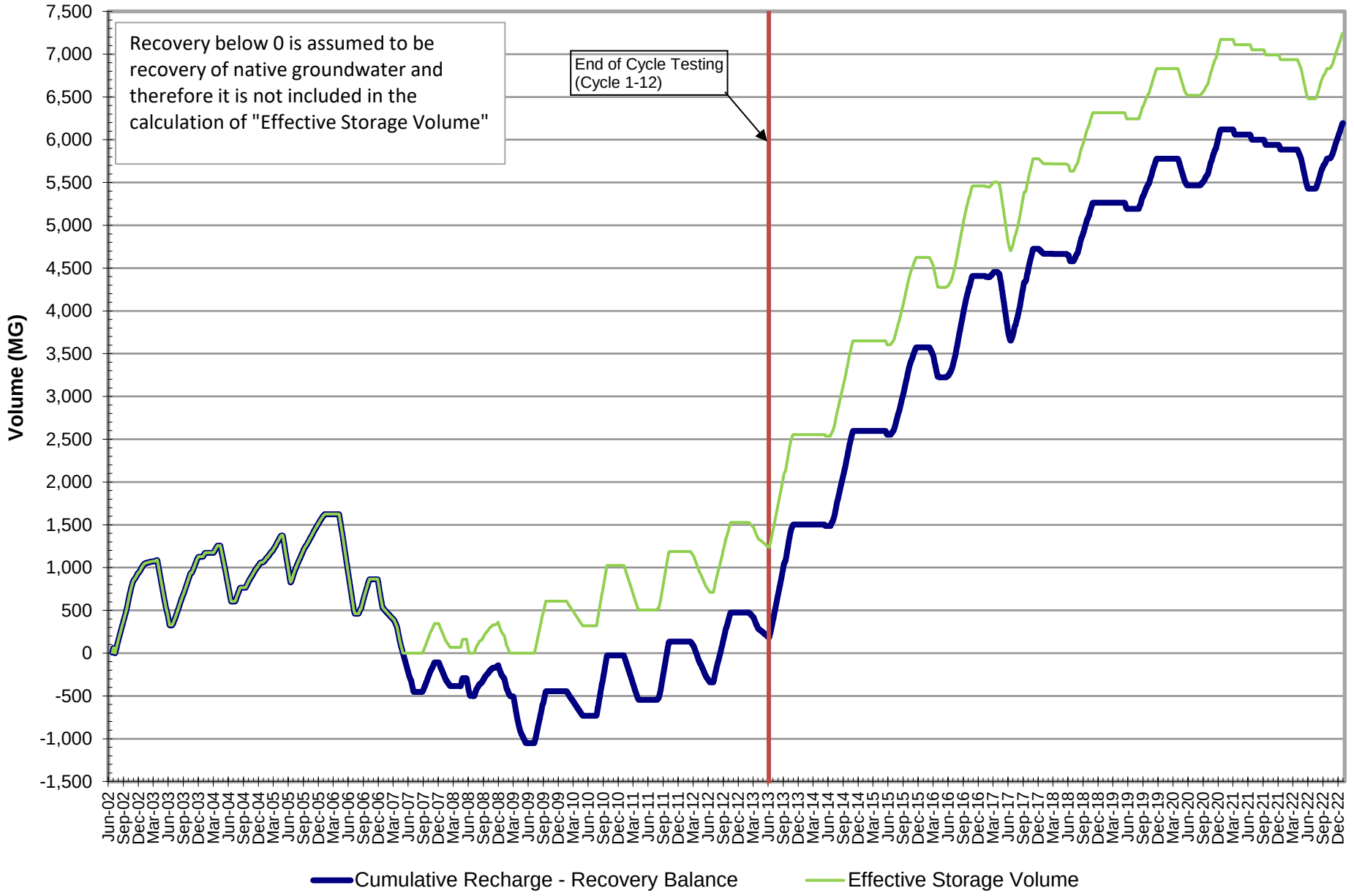


Figure 2-2
WF2 Historical Cumulative Storage Summary

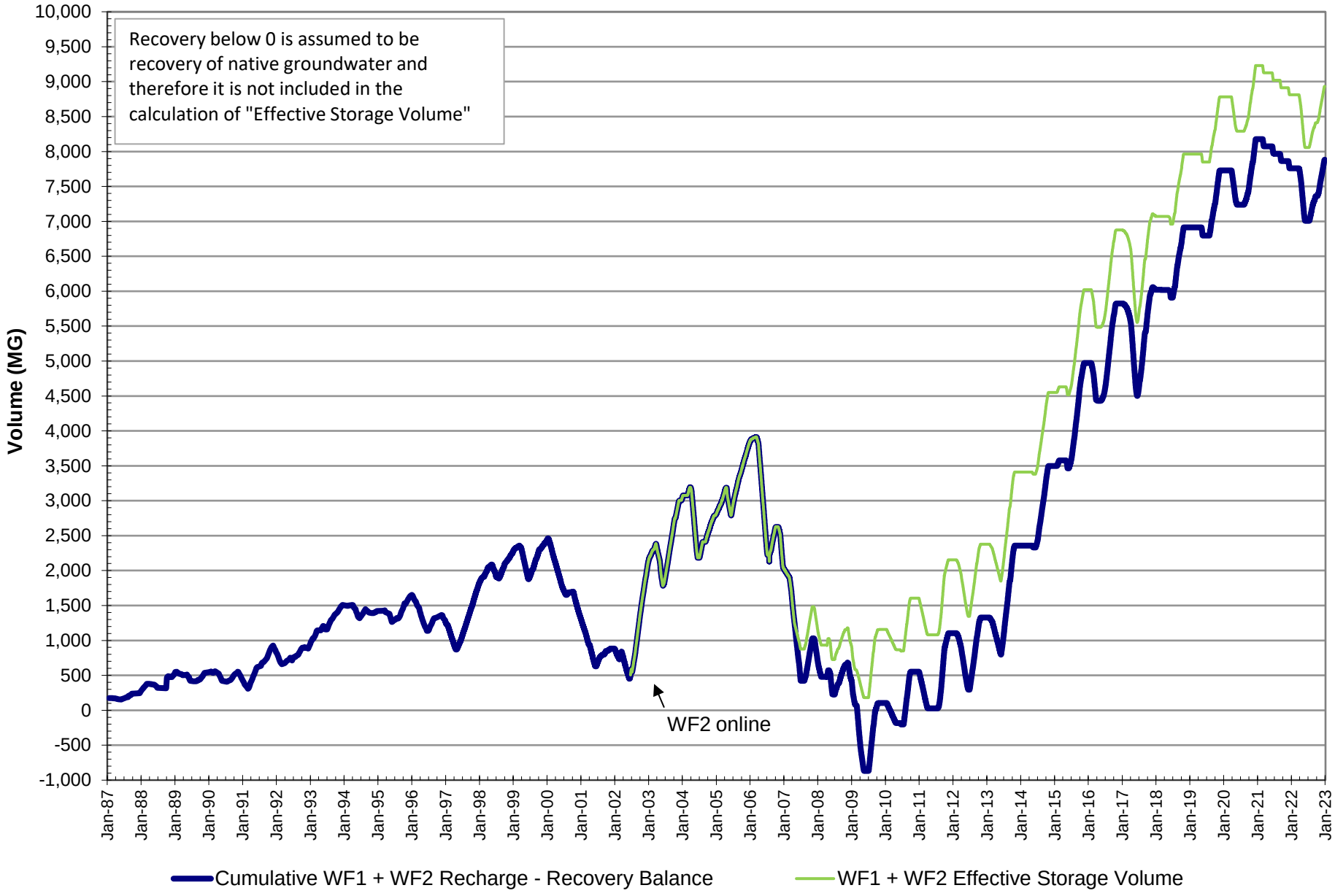
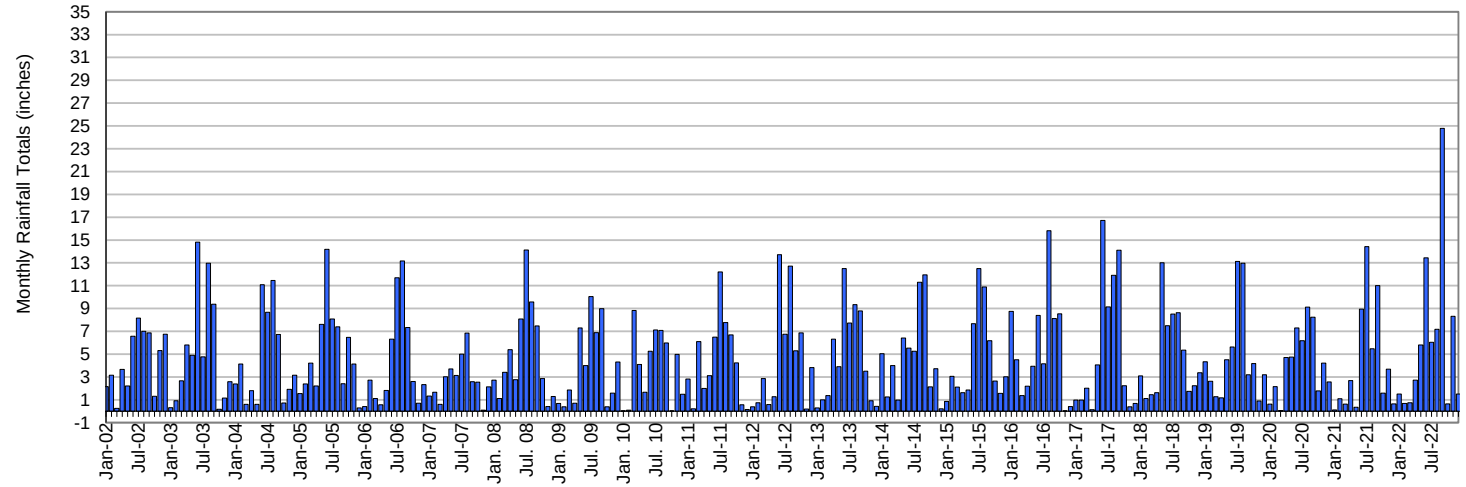


Figure 2-3

Peace River ASR (WF1 and WF2) Cumulative Historical Storage Summary



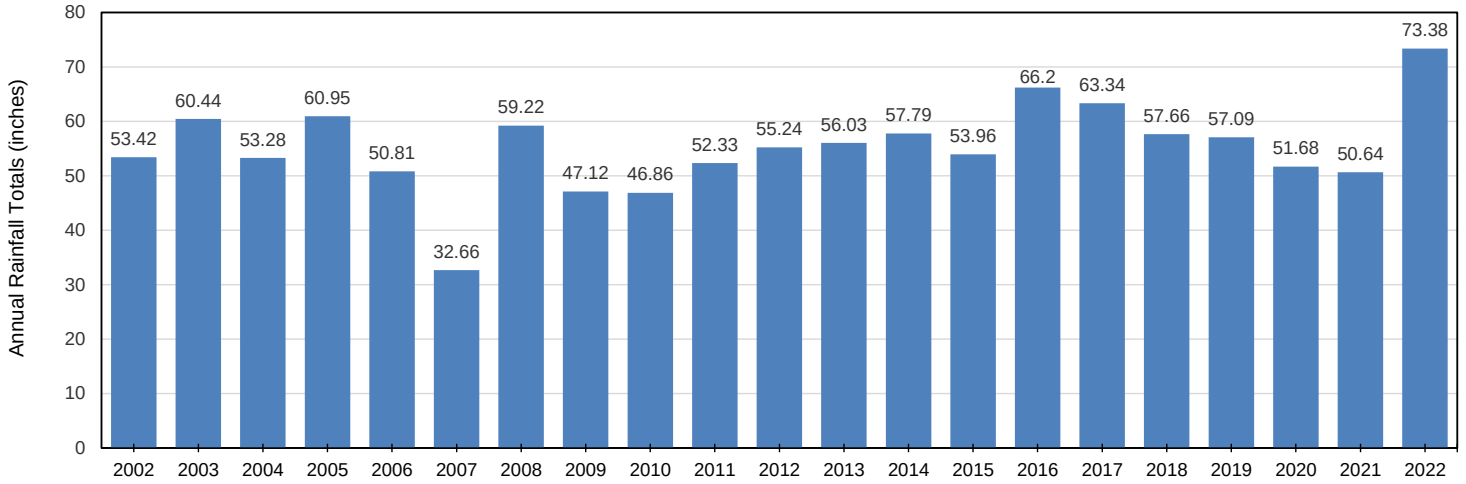


Figure 2-4
Monthly and Annual Rainfall Totals
SWFWMD Station ID: 24573

SECTION 3

ASR Well Capacity Data Evaluation

3.1 Overview

Performance of the ASR wells is evaluated in terms of specific injectivity (SI) during recharge and specific capacity (Q/s) during recovery. SI is calculated as the flow rate into the well divided by the resulting change in water level (head pressure). Q/s is the pumping rate (Q) divided by the change in water level (s, drawdown). Both values are recorded in units of gallons per minute per foot (gpm/ft) of drawdown or rise. The starting (static) water level used to calculate the change in water level is the last recorded water level measurement available from a period of no activity in the wellfield. Changes in water levels are measured during ASR operations generally when all wells or multiple wells are pumping/injecting simultaneously; therefore, the actual Q/s and SI values (if the well was operated independently) are greater than what is reported. Fluctuation in well and wellfield flow rates and water level changes attributed to well interference significantly affect the Q/s and SI and make it difficult to accurately assess the relative change in a well's performance from year to year. Nonetheless, these data are useful in evaluating general trends in well performance and providing a comparative analysis among the wells.

The following paragraphs provide a summary of the Q/s and SI data for WF1 and WF2. A detailed analysis of the historical SI and Q/s data recorded at each ASR well was provided in the 2007 annual report titled *Data Analysis for the Peace River Facility ASR System Including Wellfield 2 Cycle Test 6* (CH2M HILL and ASRus, 2008). This report will focus on general trends in well capacity performance, highlighting any significant changes noted over the past year. Figures showing the historical Q/s and SI data for each well are provided at the end of this section.

3.2 ASR WF1 Well Capacity Summary

Table 3-1 provides a summary of the SI and Q/s data for the nine operational ASR wells in WF1 in 2022. The wells with the highest capacity at WF1 are S-8, S-9R, S-2, and T-1. The remaining wells have similar well capacities with SI and Q/s in the 3 to 14 gpm/ft range.

Figure 3-1 shows the SI data for each well, comparing earlier data to the most recent data from 2022. The SI generally has been consistent at most of the ASR wells, suggesting that well plugging is not occurring at WF1. Variability in the SI at wells S-2 and S-8 is believed to be related to the sensitivity of these high-capacity wells to fluctuating flow rates and overall wellfield flow rates, and not actual changes in the wells' capacity. There was no recharge into WF1 in 2021. In 2022, only T-1, S-1, S-2 and S-3R had significant recharge.

Figure 3-2 shows the Q/s data from each of the wells during 2002, 2020, 2021 and 2022 recovery. The Q/s data in 2022 generally were similar to earlier Q/s data, suggesting that no discernable decline in well performance has occurred.

Appendix B (Figures B-1 through **B-9)** shows the historical SI and Q/s data for each of the WF1 ASR wells. The data values for SI and Q/s generally vary over a wide range, and occasional changes are observed. However, these changes likely are not indications of increasing or decreasing well capacity. Rather, they are likely the result of other factors including fluctuating flow rates in the well, overall wellfield flow rate changes (well interference), natural seasonal changes in the aquifer's potentiometric head, and drift or errors in the water level transducer readings. The general consistency of the SI and Q/s data set from year to year suggests that no significant decrease in well performance has occurred over the POR at the ASR wells in WF1.

3.3 ASR WF2 Well Capacity Summary

Table 3-2 provides a summary of 2022 SI and Q/s data for the ASR wells in WF2. The highest SI values are observed at wells S-19 and S-20. The SI of these wells are approximately two times higher than the other wells in WF2.

Figure 3-3 shows the SI data for each well comparing earlier data to the most recent data in 2022. The graph represents the average SI selected during a period of consistent flow rates. The SI data in 2022 are similar to historical data, suggesting that significant well plugging is not occurring at WF2. Wells S-11 and S-17 both have values lower than they did in 2002, which is attributed to the partial back-plugging of those wells in 2007. **Figure 3-4** shows the Q/s data from each of the wells during 2003, 2020, 2021 and 2022 recovery. The Q/s data in 2022 are similar to earlier Q/s data. The Q/s is significantly lower in S-11 and S-17 compared to the early data as a result of the wells being partially back-plugged in 2007. Based on the Q/s data from 2022 no significant decline in well capacity is observed.

Appendix B (Figures B-10 through **B-21)** shows the historical SI and Q/s data for each of the WF2 ASR wells. As stated for WF1, the data values for SI and Q/s vary and are influenced by multiple factors including flow rate, well interference, regional water level changes, and drift or errors in the water level transducer readings. However, the general consistency of the SI and Q/s data set from year to year at the WF2 wells suggests that no significant decrease in well performance has occurred over the POR.

TABLE 3-1
Summary of Specific Capacity and Specific Injectivity Data 2022 – WF1

Well No.	Specific Injectivity	Specific Capacity Q/s
T-1	18	20
S-1	4	9
S-2	16	28
S-6	7	7
S-7	NA	12
S-8	NA	11
S-3R	NA	10
S-5R	NA	71
S-9R	NA	73

2022 Wellfield Injection Rate 1-2.5 MGD. 2022 Wellfield Recovery Rate 5.5 MGD
SI and Q/s = gpm / foot of water level change
NA – data not available

TABLE 3-2
Summary of Specific Capacity and Specific Injectivity Data 2022 – WF2

Well No.	Specific Injectivity	Specific Capacity Q/s
S-4	8	5
S-10	8	8
S-11	4	4
S-12	7	7
S-13	9	9
S-14	10	16
S-15	7	NA
S-16	6	8
S-17	18	9
S-18	11	11
S-19	23	22
S-20	23	23

2022 Wellfield Injection Rate 2-9 MGD. 2022 Wellfield Recovery Rate 3-9 MGD
SI and Q/s = gpm / foot of water level change
NA – data not available or transducer malfunction

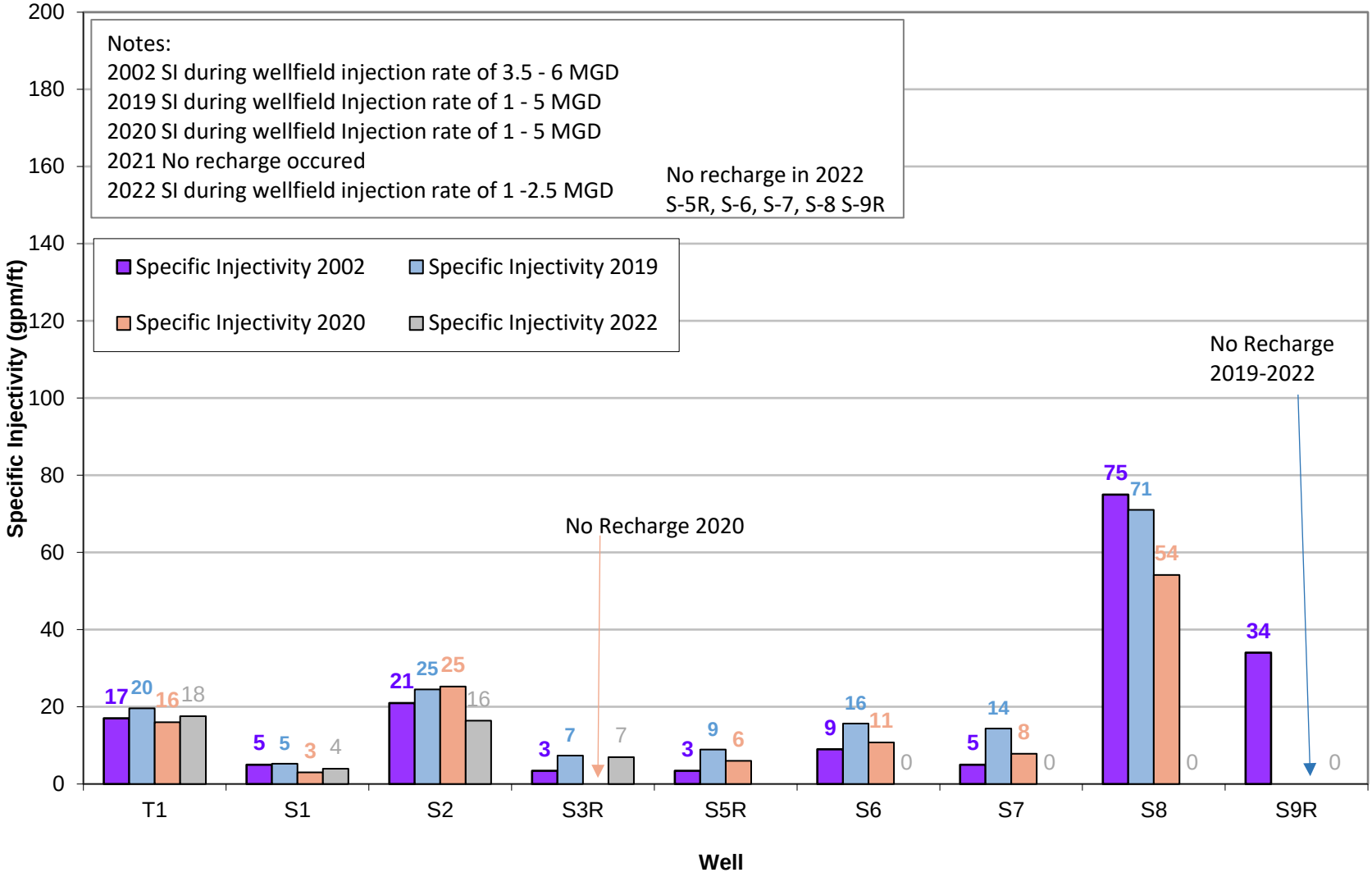


Figure 3-1
WF1 Specific Injectivity Summary

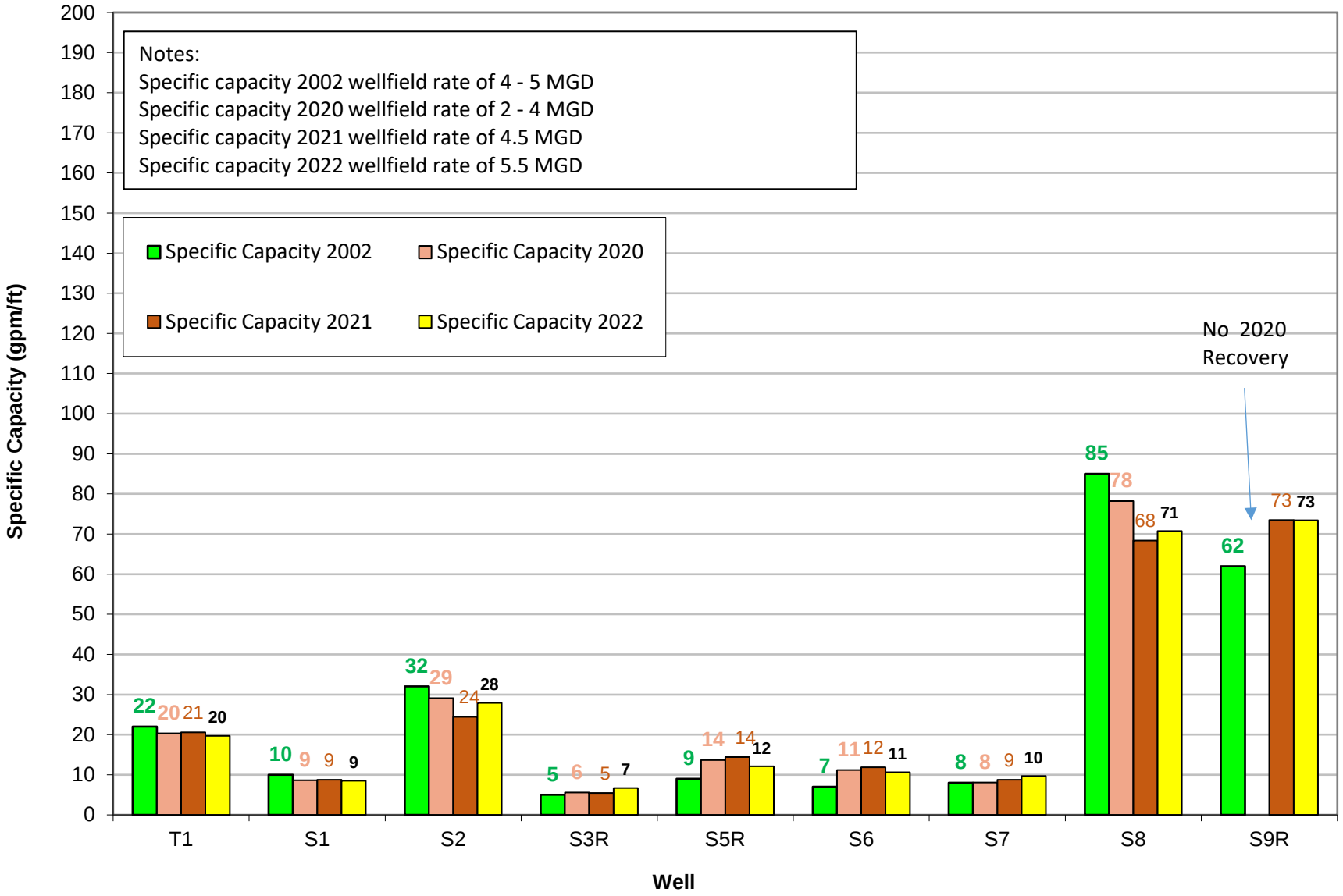


Figure 3-2
WF1 Specific Capacity Summary

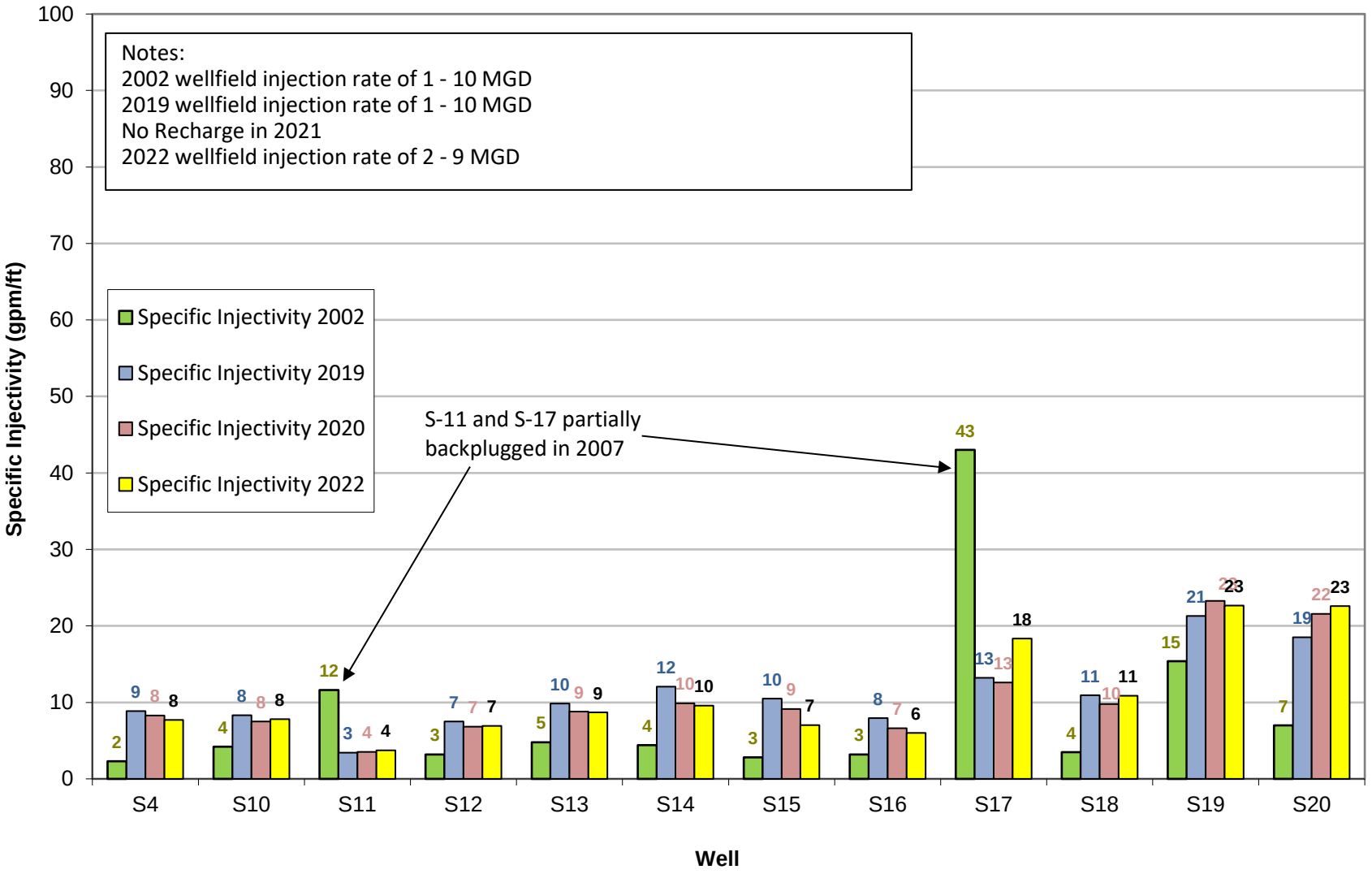


Figure 3-3
WF2 Specific Injectivity Summary

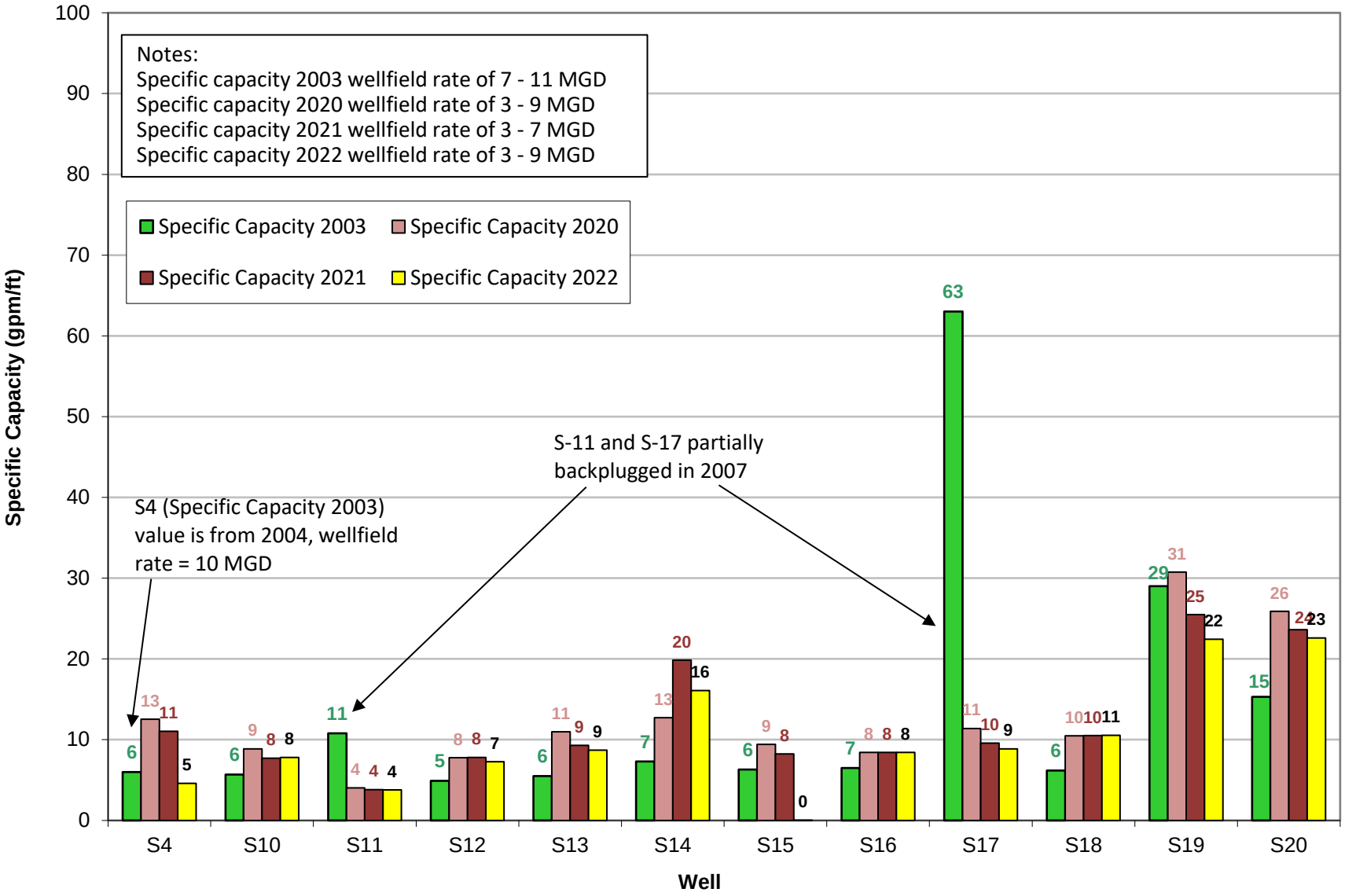


Figure 3-4
WF2 Specific Capacity Summary

SECTION 4

Water Quality Data Evaluation

The Authority collects water samples for laboratory analysis from the ASR wells and monitoring wells in accordance with UIC permit requirements. This section presents water quality information for the finished water (potable water source), ASR wells, and monitoring wells, focusing on the water quality parameters that are of most interest. These are salinity parameters (such as total dissolved solids [TDS], chloride, and sulfate) and arsenic, which has been shown to mobilize from the host rock in response to ASR operations. All tables and figures referenced in Section 4 are located at the end of the section. Additional water quality tables containing the data from which the graphs were constructed are provided in **Appendix C**.

4.1 ASR Wells Water Quality Data

4.1.1 Finished Water Quality

Water stored in the ASR wells is potable water treated at the PRF that meets primary and secondary drinking water standards. **Figure 4-1** is a graph of selected finished water quality parameters from 2006 through 2022 showing TDS, chloride, sulfate, total alkalinity (through 2012), and dissolved oxygen. There is no 2021 data due to a lack of recharge. The graph shows the seasonal fluctuations in finished water quality from the PRF. Only finished water during ASR recharge events is shown since 2010. Finished water quality has been consistent since 2010 because of the addition of the 6-billion-gallon Regional Reservoir No. 2. TDS concentration of the recharge water in 2022 ranged from 278 to 330 milligrams per liter (mg/L), and chloride concentrations ranged from 32 to 50 mg/L, both slightly higher than the 2020 TDS and chloride ranges of 272 to 290 mg/L and 30 to 37 mg/L, respectively. Overall, the quality of the recharge water in terms of salinity was excellent in 2022.

4.1.2 WF1 ASR Water Quality Data

WF1 has been in operation since the mid-1980s. Water quality analyses from the ASR wells and have focused on TDS to evaluate the recovery success of the ASR wells and the lateral extent of water movement during recharge. After arsenic mobilization became an issue during cycle testing of WF2 in 2006, the water quality sampling program of WF1 and its associated monitoring wells was expanded to include arsenic, chloride, and sulfate analyses and trending of these parameters to evaluate recovery efficiency and arsenic mobilization began. Graphs of the WF1 ASR wells (Figures 4-2 through 4-10) are presented at the end of Section 4. Table 4-1 at the end of this section is a summary of the TDS, chloride, and sulfate concentrations from each well over the period of record. Tables of the 2022 water quality data are available in **Appendix C**.

All the ASR wells in WF1 are completed into the Suwannee Limestone of the UFA except for ASR well T-1, which is completed into the overlying Tampa Member and Nocatee Member of the Arcadia Formation, part of the IAS. The two critical water quality concerns in the operation of the Peace River ASR system are salinity and arsenic; therefore, the following discussion focuses on these two issues.

Due to drought conditions, consecutive recovery events with minimal storage were completed between 2006 and 2009 with a reduction in water storage volume from 2,289 MG in 2006 to 182 MG prior to the summer of 2009. During this period recovery TDS, chloride and sulfate concentrations increased above historic levels typically observed at WF1. Increases in salinity are observed during recovery from each of the wells at a relatively consistent slope. Since 2009, more recharge has been committed to WF1, increasing the storage balance from 182 MG at the end of the recovery event in 2009 to 2,058 MG at the end of 2020, the highest since 2005. The increase in storage volume has improved the starting water

quality at the beginning of seasonal recovery periods resulting in overall improved water quality during the recovery event.

No recharge occurred in 2021. A series of relatively short recovery periods were conducted throughout the year which consisted of 10 days of recovery at a rate of approximately 4.5 mgd followed by a storage period of 70 to 90 days in between the recovery events. Four recovery periods were completed totaling 181 MG of recovery. In April of 2022 another recovery period was conducted at a rate of approximately 5.5 mgd for 60 consecutive days totaling 298 MG, resulting in two back-to-back recovery seasons totaling 479 MG. The starting TDS, chloride, and sulfate concentration of the 2022 recovery event generally was the ending point of water quality after the 2021 event as expected with no recharge occurring between the two events. Salinity trends during 2022 recovery indicated a relatively predictable rate of increase. Water quality at the end of the 2022 recovery period was similar to water quality observed at the end of the 2017 recovery event that occurred over a period of approximately 4 months totaling 568 MG.

Sampling of arsenic at the WF1 ASR wells began during recovery events starting in 2006. Over the POR arsenic concentrations have been relatively low, with all samples from WF1 ASR wells below 50 µg/L. The greatest arsenic concentrations were observed between 2006 and 2009 when recovery volumes were greatest and minimal recharge was invested in the wellfield. Since then, concentrations have been significantly lower and showing an overall declining trend, except for S-9R where concentrations were highest in the 2016 recovery event that followed the first significant recharge event in the previous 9 years. During the 2021 and 2022 recovery events arsenic concentrations remained below 10 µg/L at all of the wells except S5, S3, and S9R. S5 reached 10 µg/L and S3 reached 25 µg/L, the notable difference being that S3 had not been recharged between 3 consecutive recovery events. S9R reached a high of 14 µg/L in 2021 but was less than 10 µg/L in 2022.

4.1.3 WF2 ASR Water Quality Data

WF2 ASR well graphs (Figures 4-11 through 4-22) are presented at the end of Section 4. The graphs show trends of chloride, sulfate, TDS, and arsenic over time as well as the wellfield storage volume. The wellfield volume is used in the graphs rather than the individual well's storage volume as seen in the WF1 graphs. Since the wells in WF2 are all within proximity of one another, they are assumed to operate like a system, with injected and recovered water coalescing among the ASR wells. Table 4-1 at the end of this section is a summary of the TDS, chloride, and sulfate concentrations from each well over the period of record.

During recovery, TDS, chloride, and sulfate concentrations increase as the stored water is removed and the ratio of native water increases. Typically, at the later stages of a recovery event, the concentrations of TDS, sulfate, and chloride reach levels higher than the native water in the storage zone, suggesting that the water quality is influenced by upconing of more brackish water from beneath the wellfield. Upconing is a term used to describe the upward movement of water to the well bore versus lateral movement of water to the well bore in response to pumping. Data have demonstrated that the upconing effect is observed even beneath wells that are idle as a result of pumping from nearby wells. The rate at which TDS, chloride, and sulfate increase during recovery cycles generally has been consistent from cycle to cycle. The increase also begins at the start of recovery, further suggesting that a percentage of the water contribution is from beneath the wellfield.

The rate at which TDS concentrations increase, versus volume and percent recharge volume recovered, is generally the same from cycle to cycle and concentrations generally climb at a linear rate even after the previous recharge volume is removed. In general, TDS, chloride, and sulfate concentrations showed an increasing trend during periods of greater recovery and lower recharge as observed from 2006 through 2009. Since 2010, salinity concentrations have decreased as a result of higher storage volumes and more moderate recovery volumes. Data over the POR suggest that increased recharge volumes improve the starting salinity of the subsequent recovery cycle, thereby lowering the overall salinity

concentrations over the recovery period. The rate of salinity increase during recovery is generally consistent and is not significantly dependent on the pumping rate.

TDS, chloride and sulfate concentrations at the start of recovery are typically low as expected. TDS concentrations are around 300-350 mg/L, chloride concentrations are around 25-30 mg/L, and sulfate concentrations are around 120-130 mg/L. During recovery events concentrations increase at a relatively consistent slope. During early operations at WF2 when excessive recovery volumes were necessary due to drought conditions (e.g., 2007) TDS, chloride, and sulfate reached their highest levels. At some of the wells TDS increased to over 1,000 mg/L, chloride increased to over 300 mg/L and sulfate increased to over 250 mg/L with no sign of stabilizing before recovery operations ceased.

A significant increase in storage at WF2 has improved recovered water quality as demonstrated during the significant recovery event in 2017 at WF2 (780 MG). At the end of the recovery event, TDS generally was below the secondary drinking water standard of 500 mg/L, and chloride and sulfate both remained far below their respective standards of 250 mg/L at each of the wells. This suggests that if adequate storage is maintained a significant amount of water can be recovered during the dry season.

A similar operating regime to WF1 was followed at WF2 in 2021 and 2022. No recharge occurred between the recover events in 2021 and 2022. A series of short duration recovery events were conducted throughout the year in 2021 which consisted of 10 days of recovery at a rate between 5-6 mgd followed by storage period of 70 to 90 days in between the recovery events. Four recovery periods were completed totaling 236 MG of recovery. In March of 2022 another recovery period was conducted at a rate of approximately 5 mgd for 21 days, 9 mgd for 33 days, and 5 mgd for the final 11 days, totaling 456 MG. These consecutive recovery events in 2021 and 2022 totaled 692 MG.

As observed at WF1, the starting TDS, chloride, and sulfate concentration of the 2022 recovery event at WF2 generally was the ending point of water quality after the 2021 event as a result of no recharge occurring between the two events. Salinity trends during 2022 recovery indicated a relatively predictable rate of increase. Water quality at the end of the 2022 recovery period was similar to water quality observed at the end of the 2017 recovery event that occurred over a period of approximately 80 days totaling 801 MG.

In general, arsenic concentrations have shown improvement with successive recovery events when larger recharge volumes are invested. Arsenic concentrations from the WF2 ASR wells since approximately 2013 have been mostly below the maximum contaminant level (MCL; 10 µg/L) but above detection limits. Concentrations above 10 µg/L have been occasionally recorded. However, during the recovery period in 2022, arsenic concentrations were slightly more elevated with approximately 52 percent of the samples over 10 µg/L. The average was relatively low at 10.1 µg/L and the highest was 19.4 µg/L recorded at S-11. S-14, S-16, and S-18 had the lowest concentrations with all samples below 10 µg/L except for one sample at S-14.

4.2 Monitoring Well Water Quality Data

Monitoring well water level data and water quality data were reviewed as part of this annual ASR operations report. Each monitoring well is potentially influenced more by either WF1 or WF2; therefore, this section is organized to reflect monitoring wells associated with each ASR wellfield. Several monitoring wells have long-term data while others were installed after ASR operation began. Several of the monitoring wells were constructed as part of the ASR expansion for the Peace River Option (WF2) and 13 additional monitoring wells were constructed in 2005 as part of an enhanced groundwater monitoring program. Most of the wells constructed in 2005 were in the vicinity of WF2 in order to better understand the geochemical interactions between the stored (treated) surface water and the host rock. Wells associated with WF1 are presented first, followed by the monitoring wells associated with WF2.

4.2.1 WF1 Monitoring Well Water Quality Data

WF1 has four monitor wells that monitor the outer extent of ASR influences in the storage zone and in the overlying permeable zone ("Tampa zone"), these include wells M-2, T-2, T-7, and M-21. These four wells are analyzed more frequently to evaluate arsenic concentrations at distances representative of the Authority's institutional boundary. Water quality data from these four wells are described individually in the following paragraphs. Locations of the wells are shown on **Figure 1-2**, presented previously.

4.2.1.1 Monitoring Well M-2

Water quality data for Suwannee Limestone monitoring well M-2 over the POR are presented on **Figure 4-23**. Chloride, sulfate, and TDS concentrations have been relatively stable in this well but do show some fluctuations in response to ASR activities. In 2022, chloride, sulfate, and TDS concentrations remained within the ranges observed over the POR, with averages of 112, 321, and 821 mg/L, respectively. Arsenic concentrations at well M-2 have ranged from 8 µg/L to BMDL over the POR. None of the samples collected have exceeded the groundwater standard of 10 µg/L. Since 2007, arsenic concentrations at this well have remained at or below 4 µg/L. In 2022, all but three of the samples collected were below the laboratory detection limit for arsenic with the highest concentration at 4 µg/L.

4.2.1.2 Monitoring Well T-2

Figure 4-24 presents the water quality data for the POR for monitoring well T-2. This well monitors the slightly lower salinity groundwater present in the Tampa Zone at a depth of 393 to 490 feet bls. Over the POR minor fluctuations in water quality are observed in response to ASR operations but the responses are muted when compared to the Suwannee Limestone monitor wells. However, during the 2021 recovery event TDS, sulfate, and, to a lesser extent, chloride decreased over the duration of the recovery event and remained lower through 2022. Arsenic concentrations are generally below detection levels in this well, but have shown more frequent detections during ASR recovery events. The highest detected arsenic concentration during the POR was 3 µg/L in September of 2006. Water quality changes in 2021 may suggest that the lateral extent of the storage zone within the Tampa member is at T-2, however changes from other regional influences cannot be discounted.

4.2.1.3 Monitoring Well T-7

Figure 4-25 presents water quality data for the POR for monitoring well T-7. This well also monitors the slightly lower salinity groundwater present in the Tampa Zone near monitoring well M-7. Chloride concentration in this zone is modestly higher than the sulfate concentration, which is different than the Suwanee Limestone monitoring horizon. The stability of the salinity parameters at T-7 in contrast to those of T-2 suggest significantly less hydraulic connectivity between the shallower monitor zone of T-7, as T-7 is approximately half the distance (approximately 1,000 feet) from ASR well T-1 in comparison to T-2. Arsenic concentrations have generally been below detection levels in this well. All but four of the 41 arsenic samples were BMDL in 2022, with a maximum concentration of 2 µg/L, below the PQL. These data suggest that the extent of arsenic mobilization is limited to localized areas near the ASR wells within the Suwannee Limestone, and that geochemical interactions do not extend into the overlying zone above the ASR storage interval.

4.2.1.4 Monitoring Well M-21

Figure 4-26 presents water quality data available for monitoring well M-21. This well was constructed in 2005 as part of the enhanced groundwater monitoring program and the POR data are presented. This well is located approximately 200 feet west of ASR well S-7 (**Figure 1-3**). Chloride, sulfate, and TDS concentrations at well M-21 show some response to ASR operations, particularly during recovery events. TDS concentrations fluctuate between approximately 580 to 750 mg/L, sulfate concentrations between approximately 200 and 350 mg/L, and chloride concentrations between approximately 90 and 200 mg/L over the POR. Since 2012 concentration have been more stable. Over the POR, arsenic

concentrations have not exceeded the groundwater standard of 10 µg/L. In 2022 more detections of arsenic were recorded however the highest was 2 µg/L, and most samples were BMDL.

4.2.1.5 Shallow Monitoring Wells E and I-7

Water quality data for WF1 monitoring wells E and I-7 are included in **Appendix D** (**Figures D-1** and **D-2**). Monitoring well E is among the shallowest of the monitoring wells evaluated, monitoring a zone from 140 to 200 feet bls. As expected, this well has the lowest salinity among the monitoring wells evaluated for WF1. The salinity and arsenic concentrations are within the range of background values suspected to be representative of this zone. Data support the lack of geochemical influences above the Suwannee Limestone storage zone at this site.

Monitoring well I-7 monitors the IAS from 220 feet to 261 feet bls in the vicinity of the other 7-series monitoring wells. Chloride, sulfate, and TDS concentrations in this well have been relatively stable to date. Each of these constituents are higher at monitoring well I-7 compared to monitoring well E. This is believed to be a function of water quality variability in this zone rather than a result of ASR operations in this area. Arsenic values have all been 4 µg/L or below at monitoring wells I-7 and E for the POR with most samples BMDL. No significant changes in water quality were observed in 2022. Arsenic concentrations were BMDL in all samples collected from monitoring wells E and I-7 in 2022.

4.2.1.6 Monitoring Wells M-6, M-7, M-20, and M-22

Water quality data for WF1 monitoring wells M-6, M-7, M-20, and M-22 are included in **Appendix D** (**Figures D-3**, **D-4**, **D-5,** and **D-6**). Monitoring well M-6 is located at a considerable distance to the south of ASR operations (**Figure 1-2**). Salinity parameters have been relatively stable in this well for the POR. The majority of the arsenic data have been BMDL. The range in salinity values and arsenic concentrations at this well is likely representative of ambient concentrations in the Suwannee Limestone in this area. Arsenic was not detected above BMDL in all 4 of the samples collected in 2022.

Monitoring well M-7 is located approximately 400 feet north of ASR well S-6 (**Figure 1-3**). Salinity concentrations are influenced by ASR operations in WF1. Salinity values are considerably lower than ambient TDS concentrations in the Suwannee Limestone, supporting the assumption that this zone at this location has experienced an overall freshening since WF1 ASR operations began. No arsenic concentrations above the MCL have been observed in this monitoring well. Since 2006, all samples have had an arsenic concentration of less than 4 µg/L. All but one of the monthly samples for arsenic was BMDL in 2022 with one sample recorded at 0.62 µg/L which is below the PQL.

Monitoring well M-20 was constructed approximately 400 feet north of well S-5R in 2005 as part of the enhanced groundwater monitoring program. Salinity concentrations have shown minor influence from ASR operations in WF1. Salinity parameters are somewhat lower than ambient TDS concentrations in the Suwannee Limestone, suggesting that this zone has experienced some freshening from WF1 ASR operations. Over the POR, arsenic concentrations have not exceeded the groundwater standard of 10 µg/L. In 2022, all but one of the monthly samples for arsenic was BMDL with one sample recorded at 0.55 µg/L which is below the PQL.

Monitoring well M-22 was constructed in 2005 as part of the enhanced groundwater monitoring program. This storage zone monitoring well is located closer to an ASR well than any other monitoring well, approximately 60 feet east of ASR well S-2. Salinity concentrations are influenced considerably by ASR WF1 operations, as demonstrated by the much fresher water in this well compared to ambient Suwannee zone conditions and the noticeable response during recharge and recovery events. This monitoring well is within the influence of the stored water from well S-2. Arsenic concentrations historically have risen during periods of WF1 recovery, increasing to approximately 38 µg/L in 2006, but improving during subsequent cycles. In 2022, two of the 12 samples were above 10 µg/L with the highest recorded at 12.4 µg/L.

4.2.2 WF2 Monitoring Well Water Quality Data

Storage zone monitoring wells M-15, M-18, and M-19 surround WF2 in each direction from the property boundary. Monitoring well T-11 is the nearest well (approximately 500 feet northwest of WF2) that monitors the lower producing zone of the intermediate aquifer from 350 to 400 feet below land surface. The location of these wells is shown on **Figure 1-4** presented previously. The water quality data from these four wells are described individually in the following paragraphs.

4.2.2.1 Intermediate Aquifer Well T-11

Figure 4-27 shows the TDS, chloride, sulfate, and arsenic concentrations from monitoring well T-11, which monitors the first permeable unit above the ASR storage zone. TDS, chloride, and sulfate concentrations have shown a gradual increasing trend from 2011 to 2017 which correlates with an increasing storage volume at WF2 over this period. Salinity has stabilized since 2017. However, TDS and chloride decreased during the 2021 recover event while sulfate increased. Water quality changes at T-11 have been relatively minor and appear to be localized, as trending at T-8 has been stable. Over the POR, arsenic concentrations have generally remained below the MDL.

4.2.2.2 Monitoring Well M-15

A graph of the TDS, chloride, sulfate, and arsenic concentrations from monitoring well M-15 is provided on **Figure 4-28**. Water quality changes at well M-15 correlate with WF2 injection and recovery activities, with freshening generally occurring during recharge activities and increases in salinity observed during recovery activities. During the 2022 recovery event TDS, chloride, and sulfate concentrations increased steadily ranging from 400 to 600, 50 to 100, and 150 to 200 mg/L, respectively. These data suggest that recharged water has arrived at M-15 and the well is influenced by WF2 operations. As a result of the increased recharge volumes, arsenic concentrations increased at monitoring well M-15 between 2014 and 2022 however maximum concentrations have generally remained below 10 µg/L since 2020. Arsenic concentrations in 2022 were slightly elevated however only 3 of the 41 samples were over 10 µg/L with the highest recorded at 12 µg/L. Data suggests that arsenic concentrations are consistently below the MCL of 10 µg/L and confirm the limited extent of arsenic mobilization.

4.2.2.3 Monitoring Well M-18

Figure 4-29 shows the TDS, chloride, sulfate, and arsenic concentrations at well M-18. Fluctuations in water quality in response to ASR activities are observed at well M-18. Between 2011 and 2017, TDS, sulfate, and chloride concentrations have decreased in response to an increase in storage in WF2 during that period. From 2018 through 2021 TDS, chloride, and sulfate concentrations have been stable. During the recover events in 2021 and 2022 TDS, chloride, and sulfate concentrations have increased from approximately 400 to 500 mg/L, 40 to 80 mg/L, and 160 to 200 mg/L, respectively. During the POR, arsenic concentrations have generally remained below 2 µg/L. The maximum arsenic concentration in 2022 was 2 µg/L and more than half of the samples were below the MDL.

4.2.2.4 Monitoring Well M-19

A graph of the TDS, chloride, sulfate, and arsenic concentrations from this well is provided on **Figure 4-30**. Monitoring well M-19 shows a correlation to the ASR injection and recovery activities even though it is one of the farthest monitoring wells from WF2. TDS decreased from approximately 800 to 400 mg/L over the POR. Chloride and sulfate concentrations decreased from approximately 200 to 50 mg/L and 300 to 170 mg/L, respectively, over the POR. Since 2018 TDS, chloride, and sulfate concentrations have been relatively stable with more variation in the data in 2022. Over the POR, all samples were below the arsenic MCL of 10 µg/L. Between 2014 and 2022 more samples had arsenic concentrations above the laboratory MDL. Arsenic concentrations reached their highest levels in 2021, reaching a maximum of 8.92 µg/L, but showed a steady decline through 2022. Data suggest that concentrations have increased

in response to an increase in storage volumes at WF2, however concentrations are consistently below 10 µg/L.

4.2.2.5 Other WF2 Monitoring Wells

Other monitoring wells in WF2 include two IAS wells (I-8 and I-10), one Tampa Zone well (T-8), and seven Suwannee Zone wells (M-8, M-11, M-12, M-13, M-14, M-16, and M-17). POR water quality data for these 10 other monitoring wells are included in **Appendix D** (**D-7** through **D-16**). Water quality data are summarized by zone below.

4.2.2.6 Intermediate Aquifer System Monitoring Wells I-8 and I-10

IAS monitoring wells I-8 and I-10 (**Figures D-7** and **D-8**) show stable salinity parameters for the POR. The stable salinity data indicate that ASR operations have negligible, if any, impact on these wells in the Intermediate aquifer above the Suwannee Zone.

4.2.2.7 Tampa Zone Monitoring Well T-8

Monitoring well T-8 has an open hole from 354 to 401 feet bls and monitors a permeability zone in the lower portion of the IAS and above the ASR zone approximately 600 feet northwest of WF2. POR data are stable for salinity parameters and arsenic even with the increase in storage in WF2 beginning in 2013, indicating that wellfield operations have no discernable impact on this zone (**Figure D-9**) at this distance.

4.2.2.8 Suwannee Zone Monitoring Wells M-8, M-11, M-12, M-13, M-14, M-16, and M-17

Monitoring wells M-8, M-11, M-12, M-13, M-16, and M-17 (**Figures D-10** through **D-16**, respectively) salinity data indicate varying degrees of water quality changes that correlate to recharge or recovery activities that are generally dependent on the distance of the monitoring well to the ASR wellfield. Monitoring well M-14 shows the most direct influence of ASR operations as changes in TDS and chloride concentrations correlate to ASR recharge and recovery events. Less variability is noted in the remaining wells; however, a slight decreasing trend in TDS and chloride is observed due to the increased storage volume at WF2. Generally, as the freshening trend arrives at the monitor wells arsenic detections become more frequent however concentrations are relatively low with most samples under 10 µg/L. Monitor wells M-11, M-12, M-14, and M-15 had levels over 10 µg/L in 2022, the highest recorded at M-11 (19.7 µg/L). Each of these wells are located to the west of WF2. M-13 and M-8 are also located to the west but at a greater distance and minimal arsenic detection have been observed at these wells. These data confirm the limited extent of arsenic mobilization from the ASR wellfield.

TABLE 4-1

ASR Wells Period Of Record Water Quality During Recovery

		TDS		Chloride		Sulfate	
WF	Well	Range	Average	Range	Average	Range	Average
WF1	**T-1**	230 - 870	378	25 - 132	53	102 - 206	157
	S-1	210 - 704	402	28 - 155	73	119 - 203	158
	S-2	210 - 944	509	34 - 249	128	118 - 222	188
	S-3R	281 - 984	591	43 - 279	137	112 - 250	183
	S-5R	165 - 748	461	27 - 149	75	118 - 215	173
	S-6	196 - 684	375	25 - 211	57	113 - 241	158
	S-7	200 - 828	444	35 - 188	88	122 - 229	175
	S-8	200 - 1,010	514	28 - 258	113	121 - 243	175
	S-9R	256 - 1,052	659	70 - 297	168	170 - 259	204
WF2	**S-4**	336 - 1,292	533	26 - 273	105	74 - 281	176
	S-10	280 - 1,384	535	27 - 475	109	109 - 276	182
	S-11[A]	328 - 2,110	697	30 - 770	172	128 - 317	229
	S-11[B]	272 900	465	28 219	78	114 260	176
	S-12	280 - 1,424	544	29 - 480	111	104 - 343	186
	S-13	276 - 1,316	570	29 - 445	118	118 - 286	194
	S-14	272 - 985	530	27 - 231	99	114 - 243	186
	S-15	264 - 836	462	27 - 209	78	113 - 244	171
	S-16	260 - 1,544	517	1 - 552	99	100 - 320	184
	S-17[A]	352 - 2,131	735	59 - 946	199	133 - 282	194
	S-17[B]	292 - 1,576	486	31 - 565	91	127 - 289	175
	S-18	284 - 1,232	535	29 - 405	108	106 - 269	186
	S-19	272 - 1,264	584	32 - 409	124	112 - 288	189
	S-20	79 - 1,044	480	27 - 294	111	79 - 277	185

Notes:

A = data prior to partial backplugging of the open hole

B = data following partial backplugging of the open hole

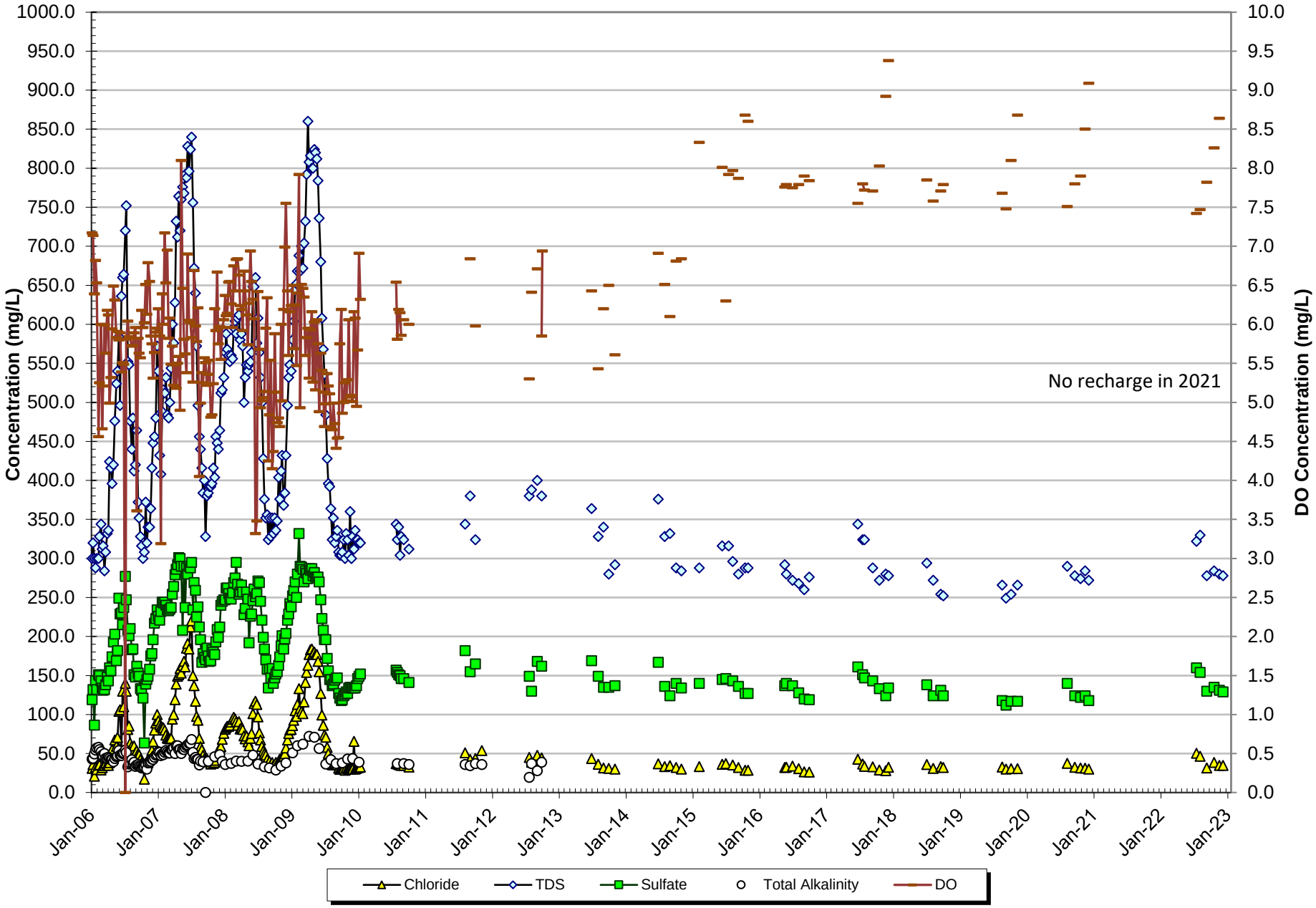


Figure 4-1
Finished Water Quality

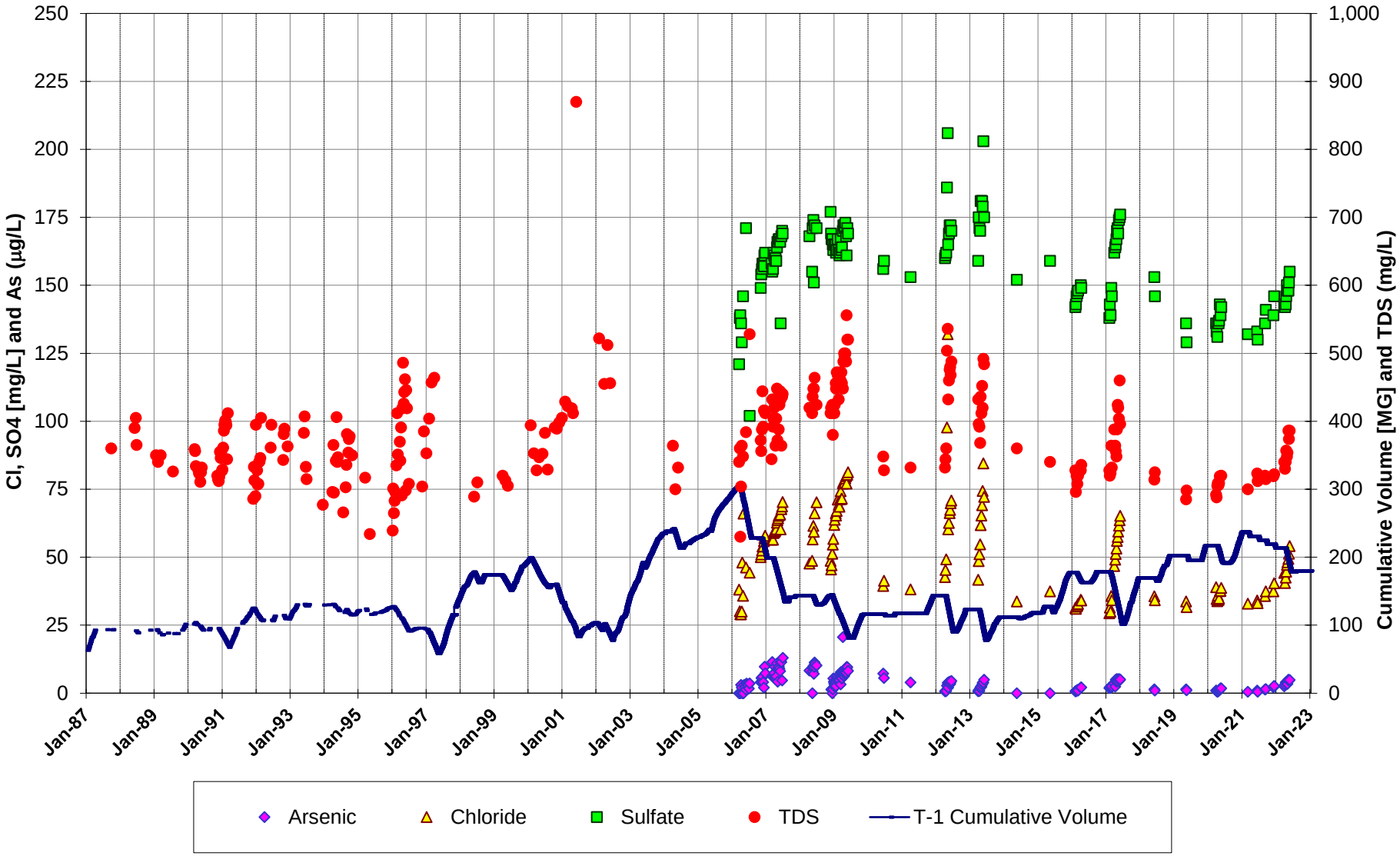


Figure 4-2
WF1 T-1 Water Quality Data

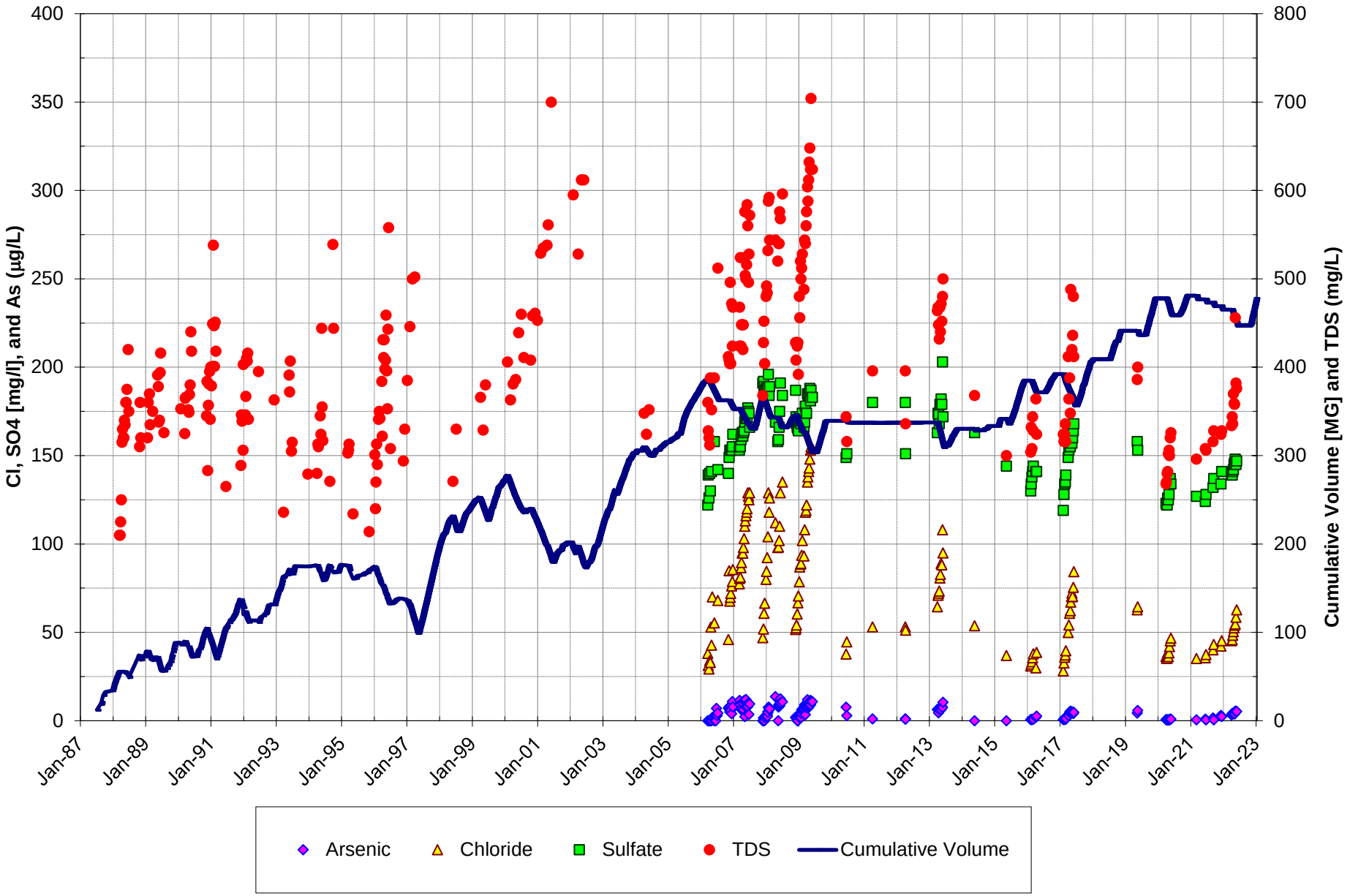


Figure 4-3
WF1 S-1 Water Quality Data

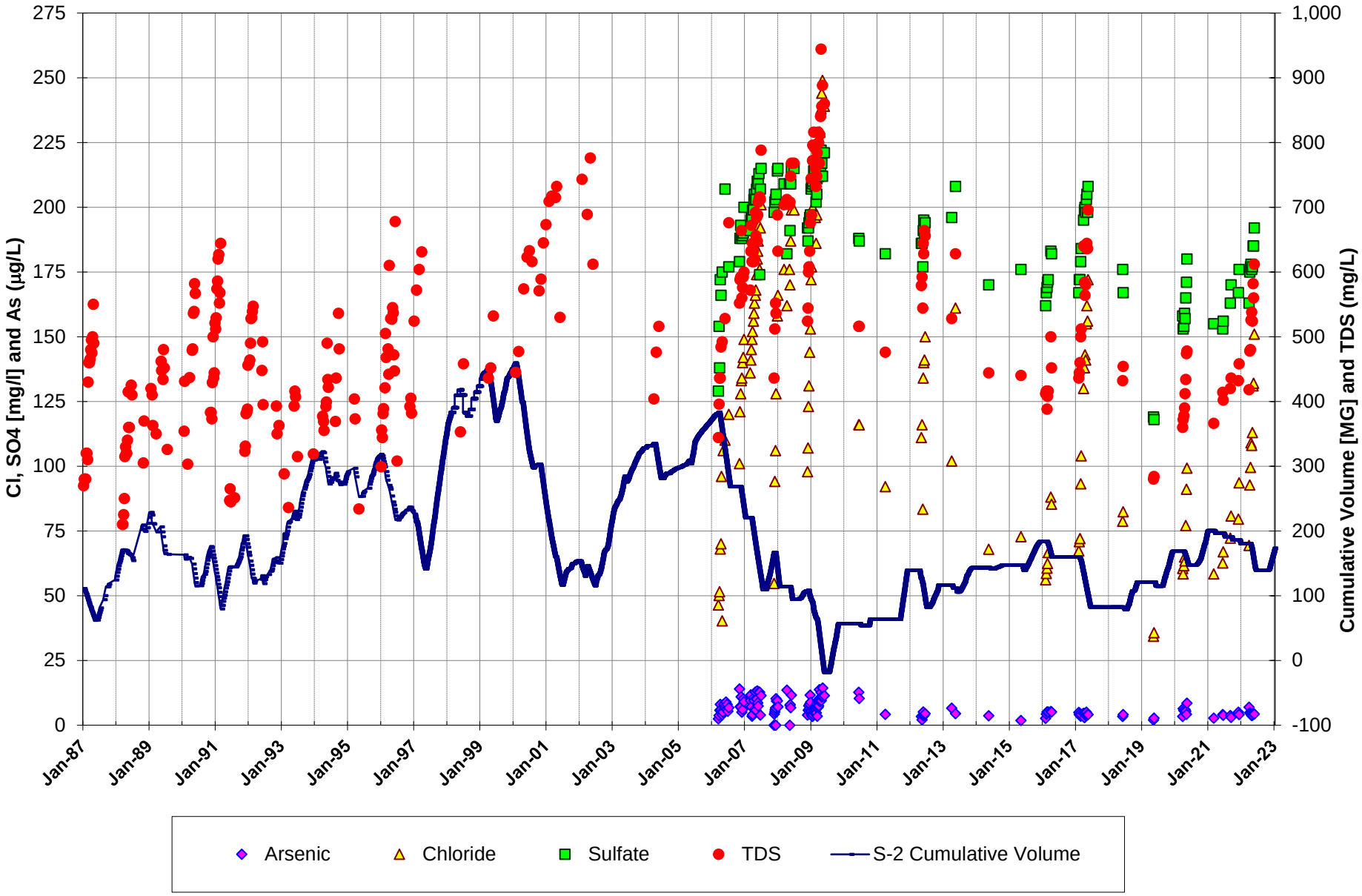


Figure 4-4
WF1 S-2 Water Quality Data

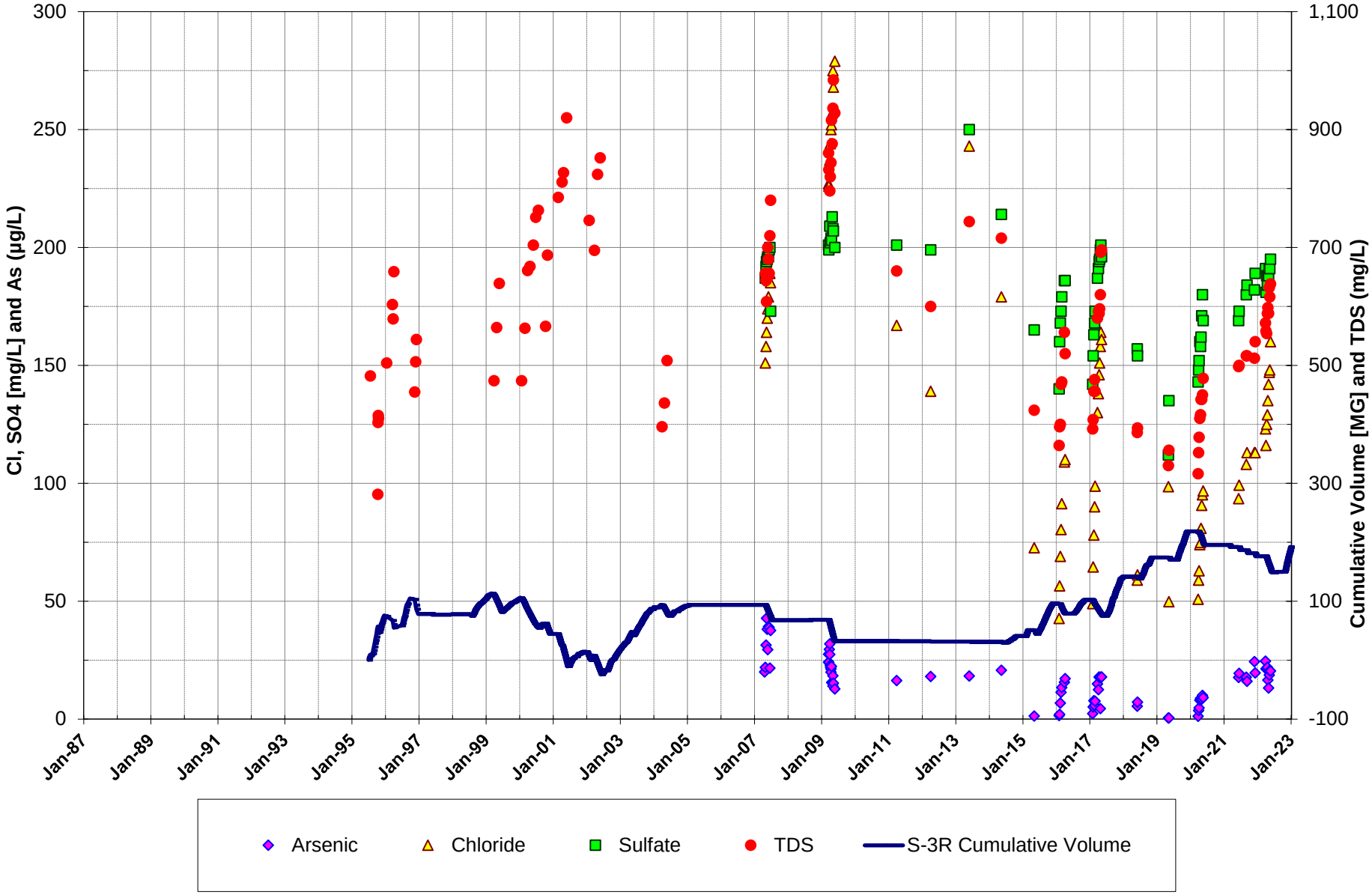


Figure 4-5
WF1 S-3R Water Quality Data

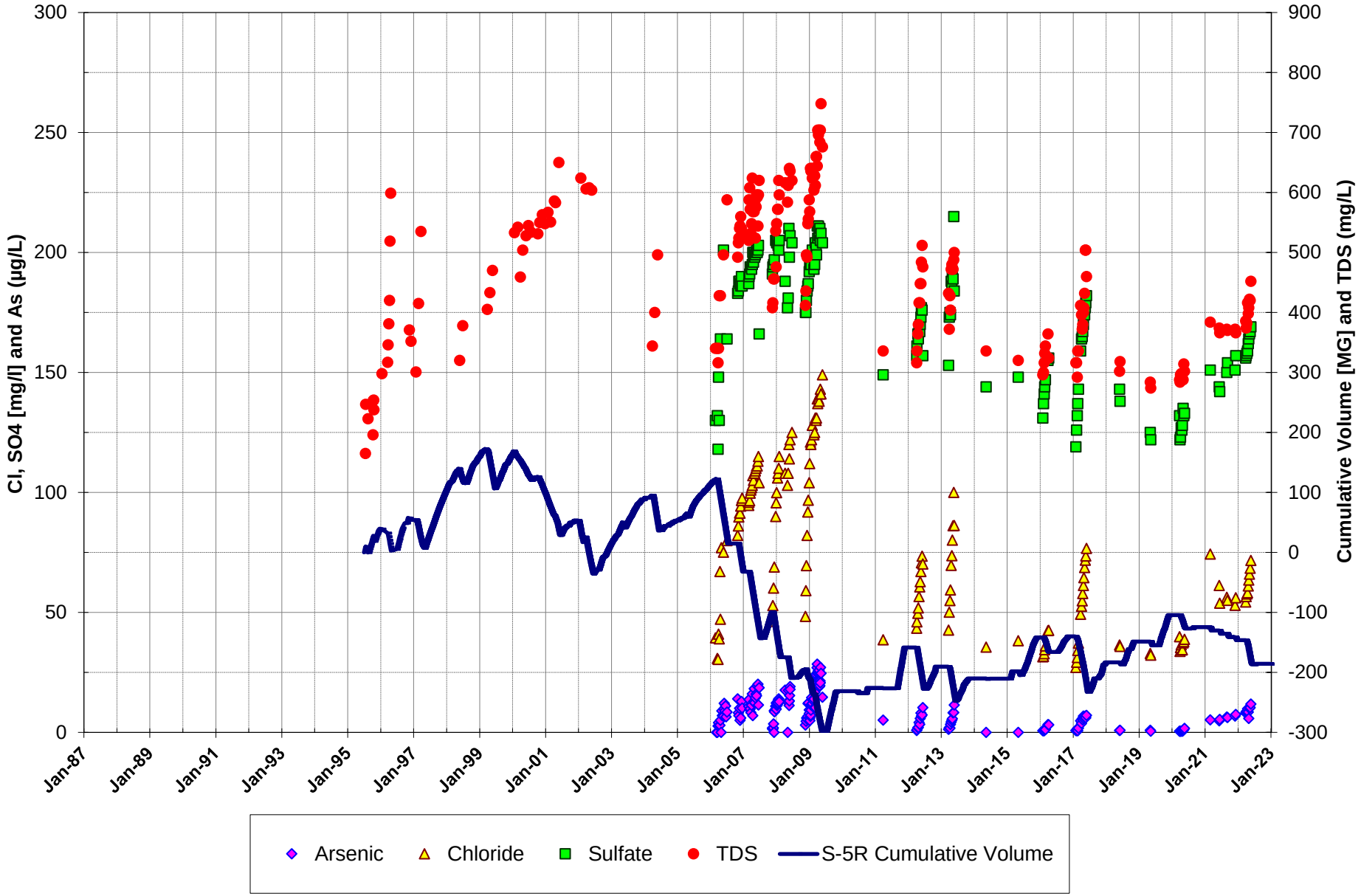


Figure 4-6
WF1 S-5R Water Quality Data

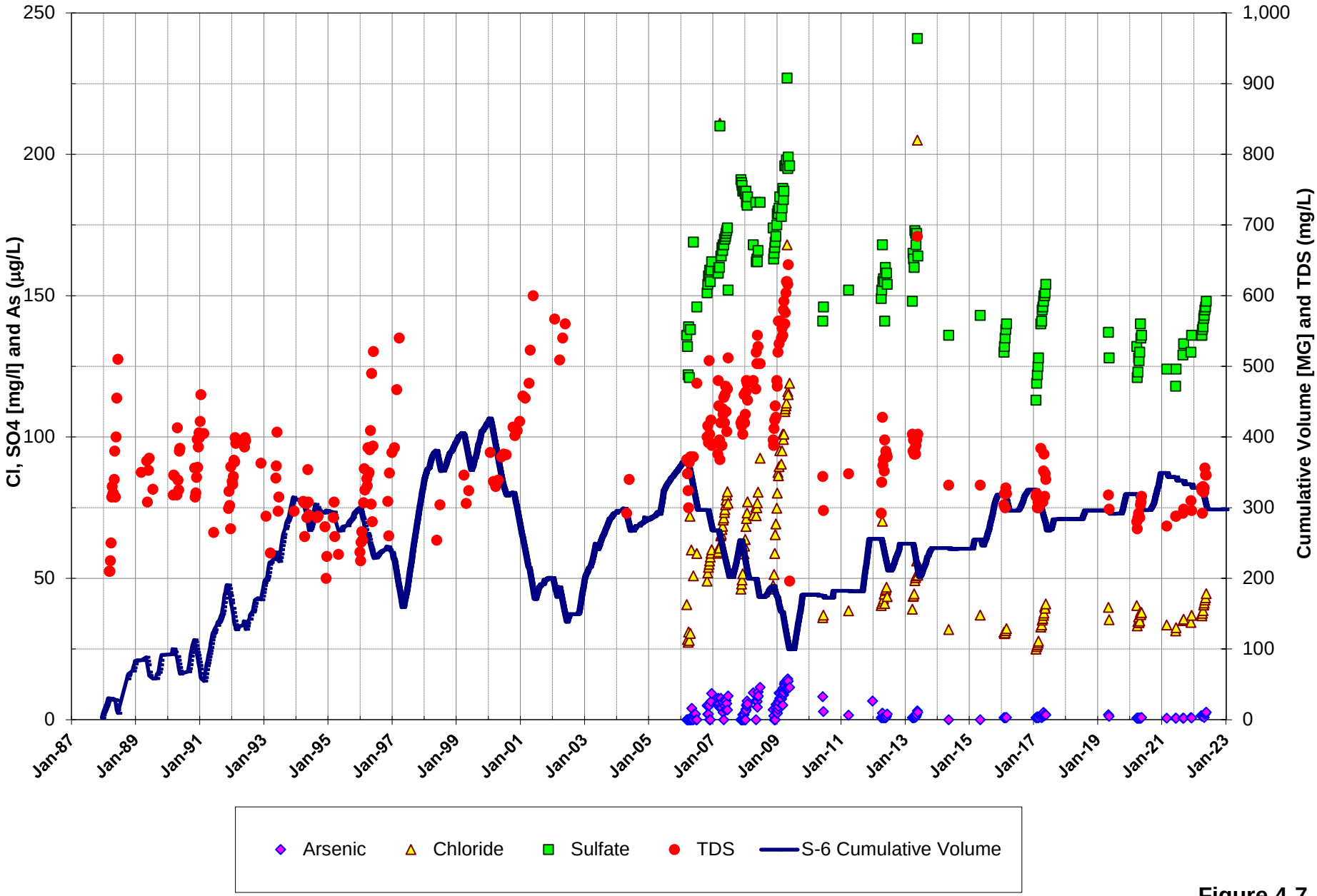


Figure 4-7
WF1 S-6 Water Quality Data

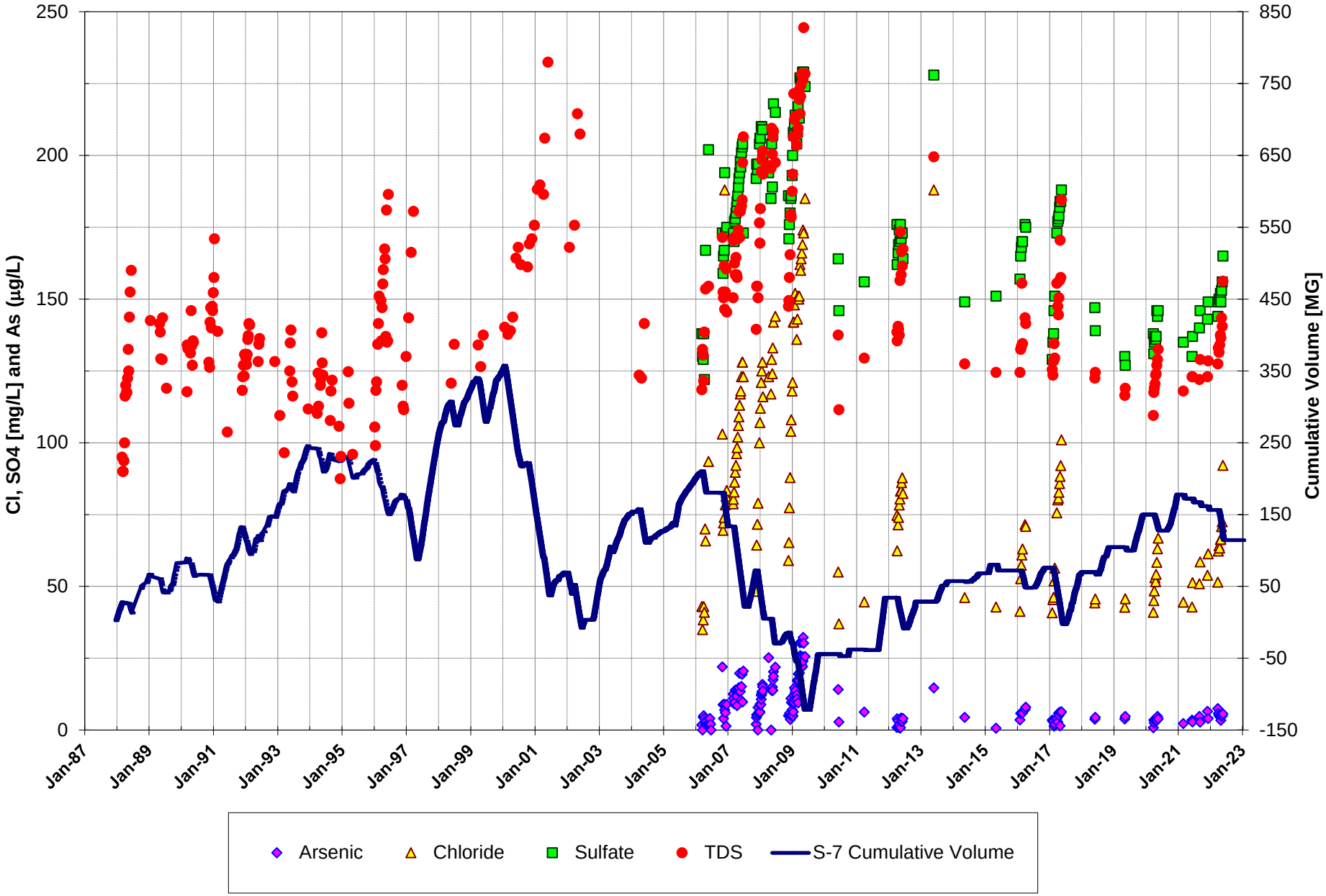


Figure 4-8
WF1 S-7 Water Quality Data

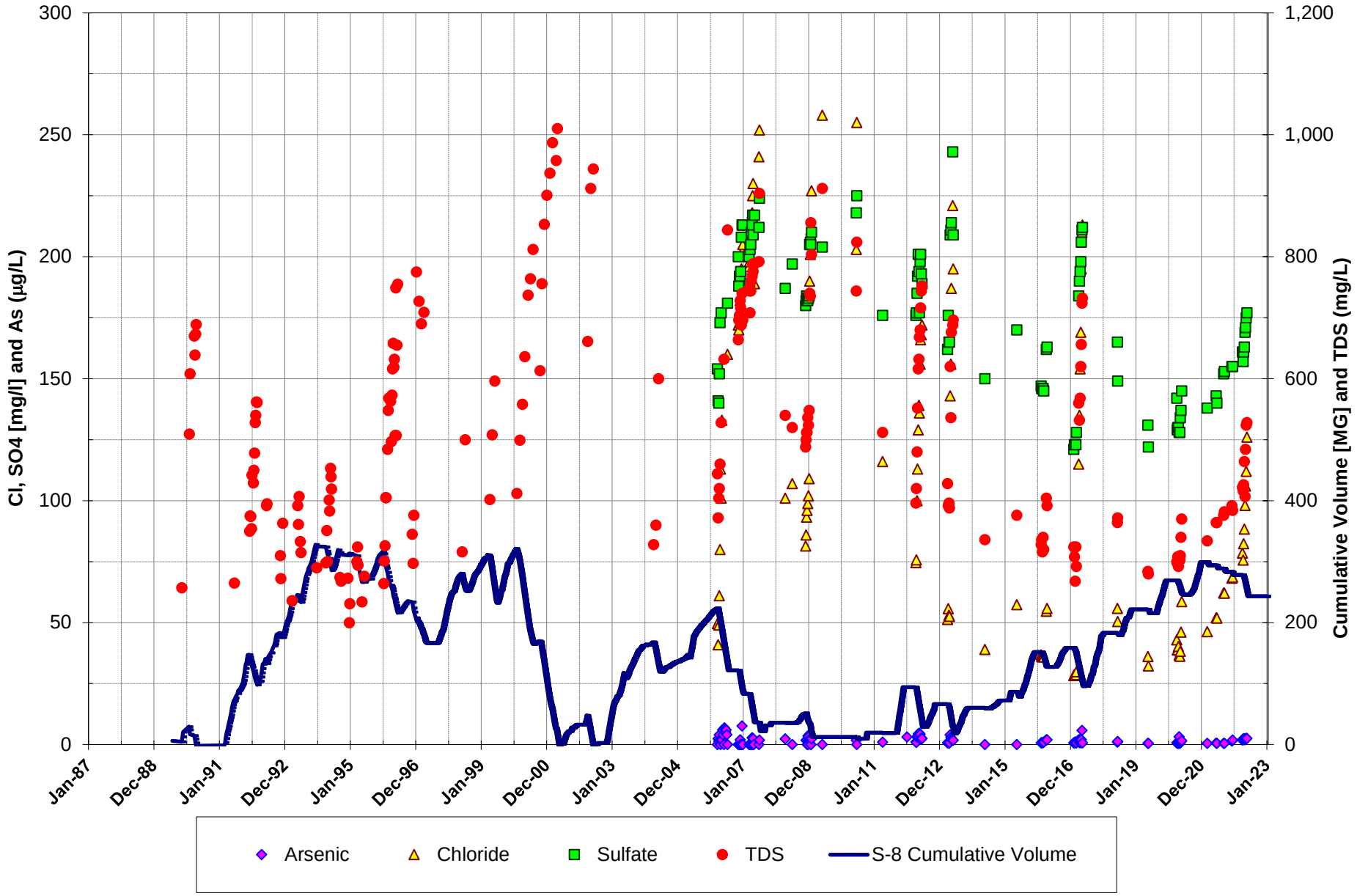


Figure 4-9
WF1 S-8 Water Quality Data

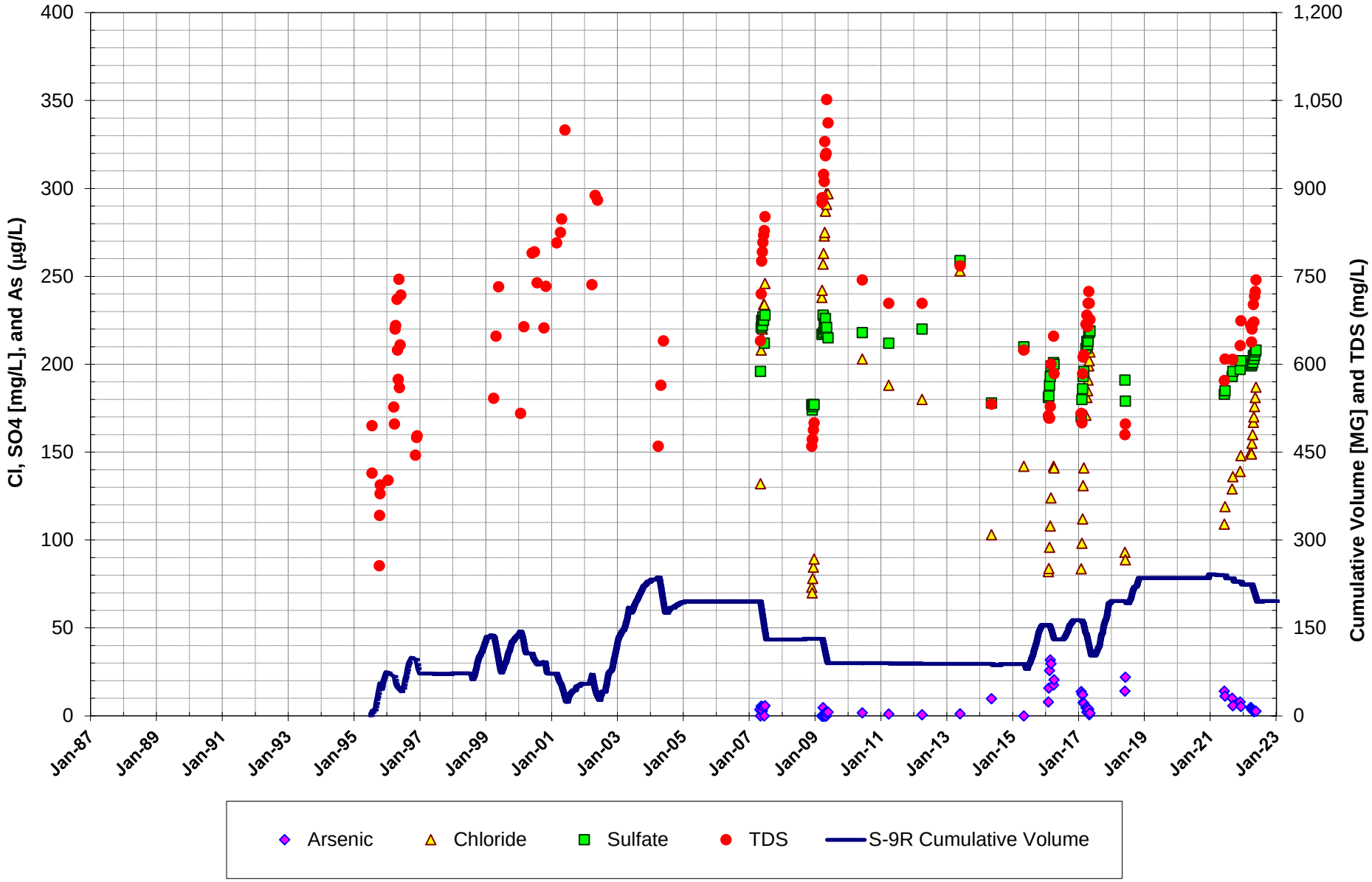


Figure 4-10
WF1 S-9R Water Quality Data

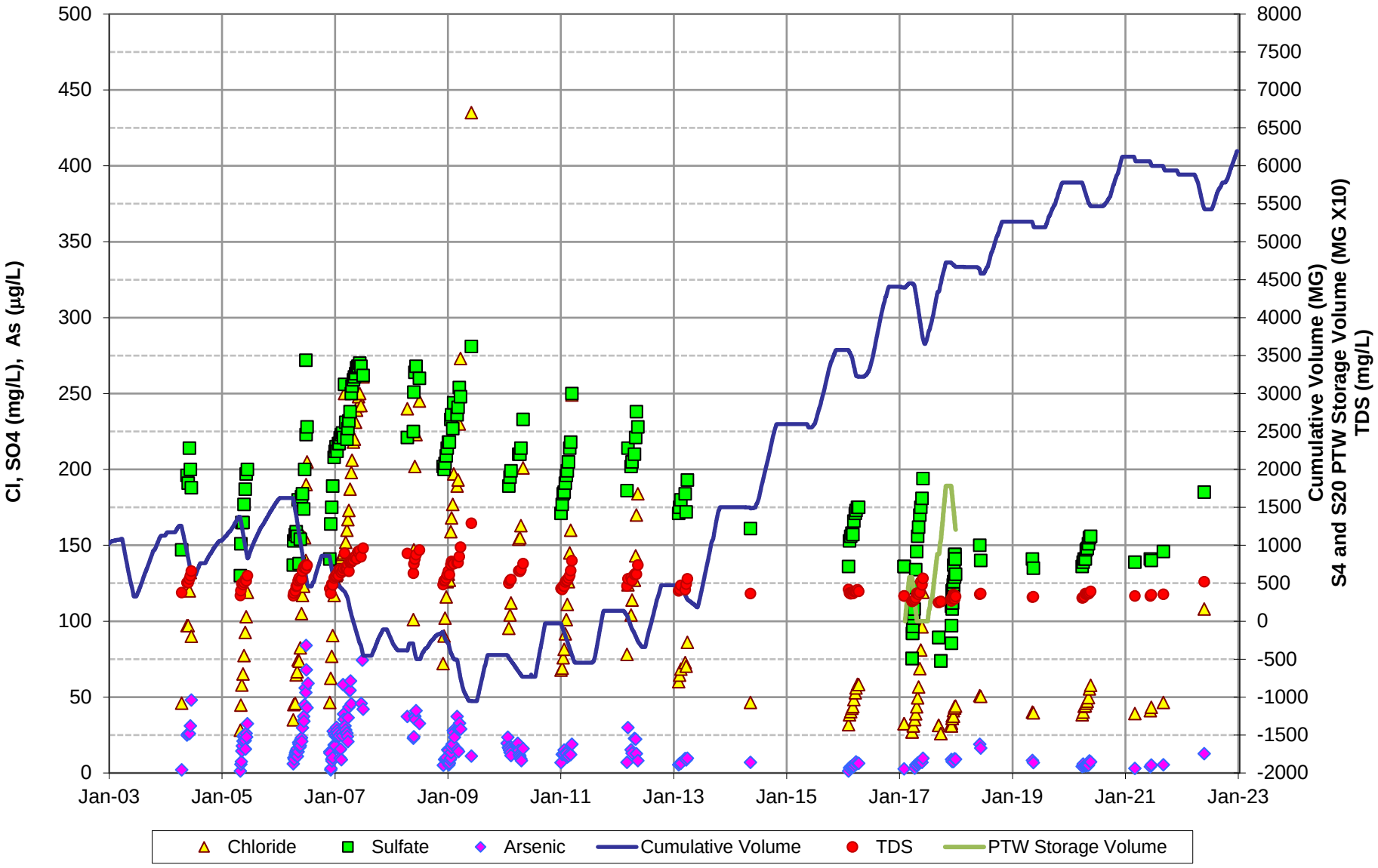


Figure 4-11
WF2 S-4 Water Quality Data

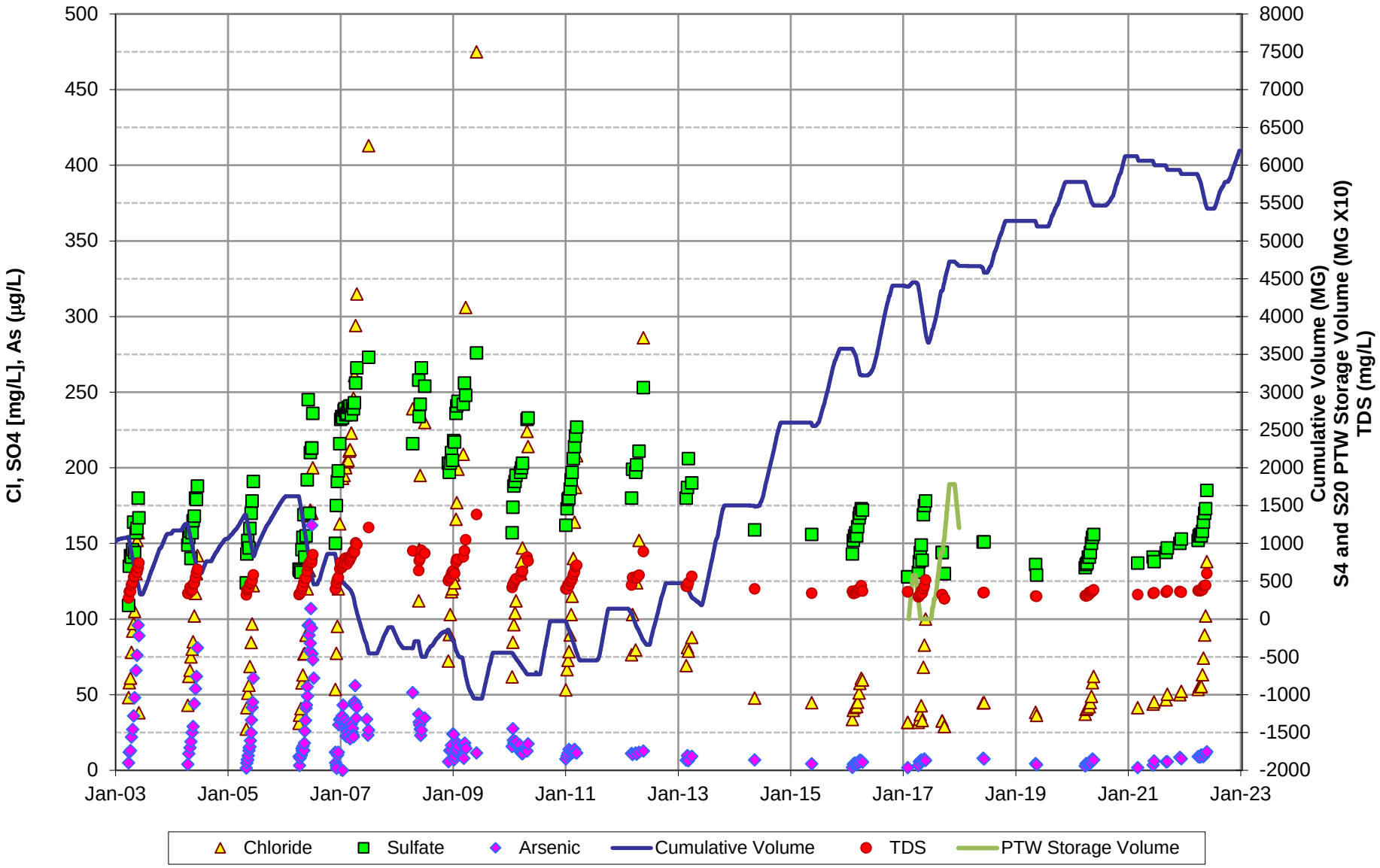


Figure 4-12
WF2 S-10 Water Quality Data

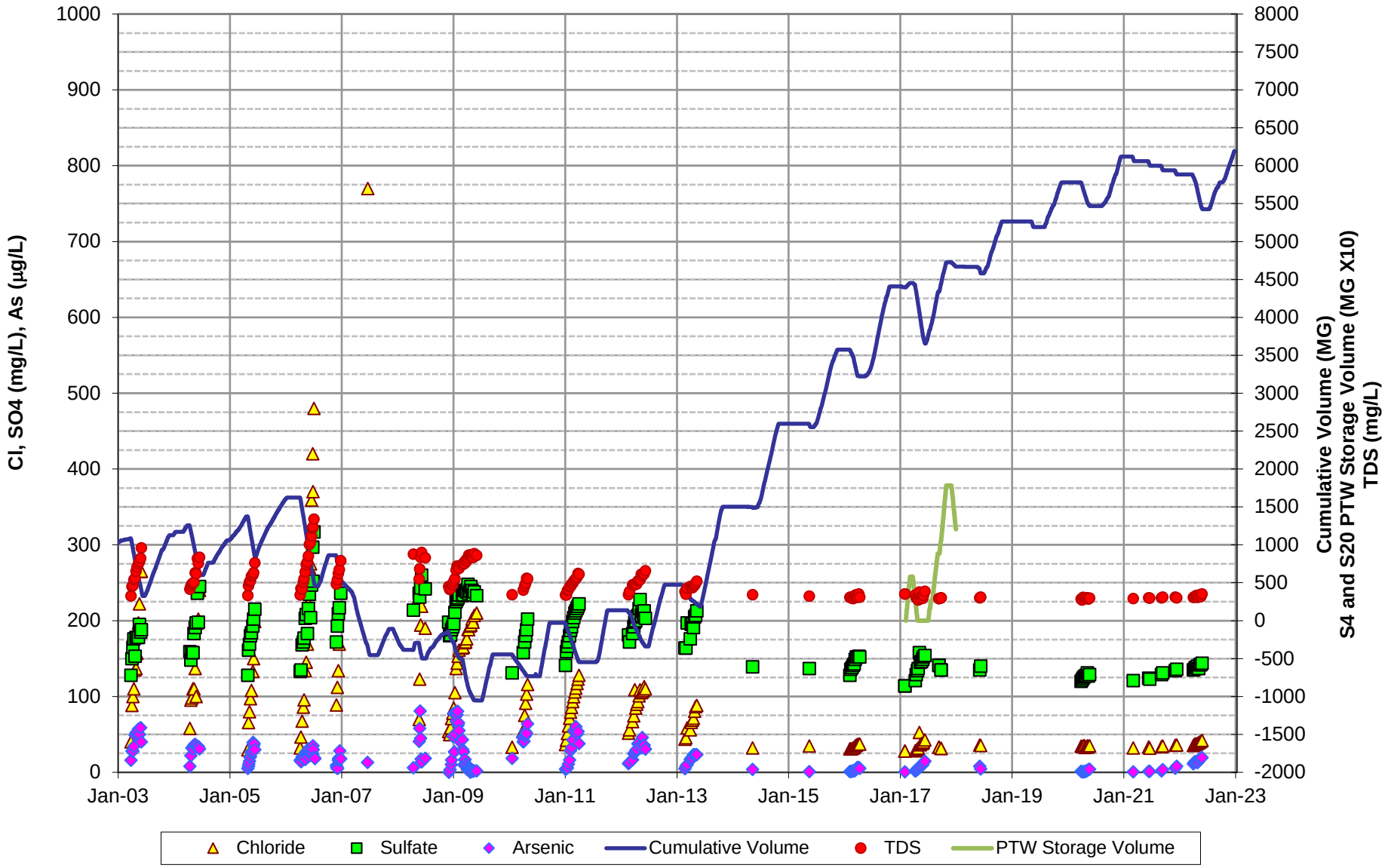


Figure 4-13
WF2 S-11 Water Quality Data

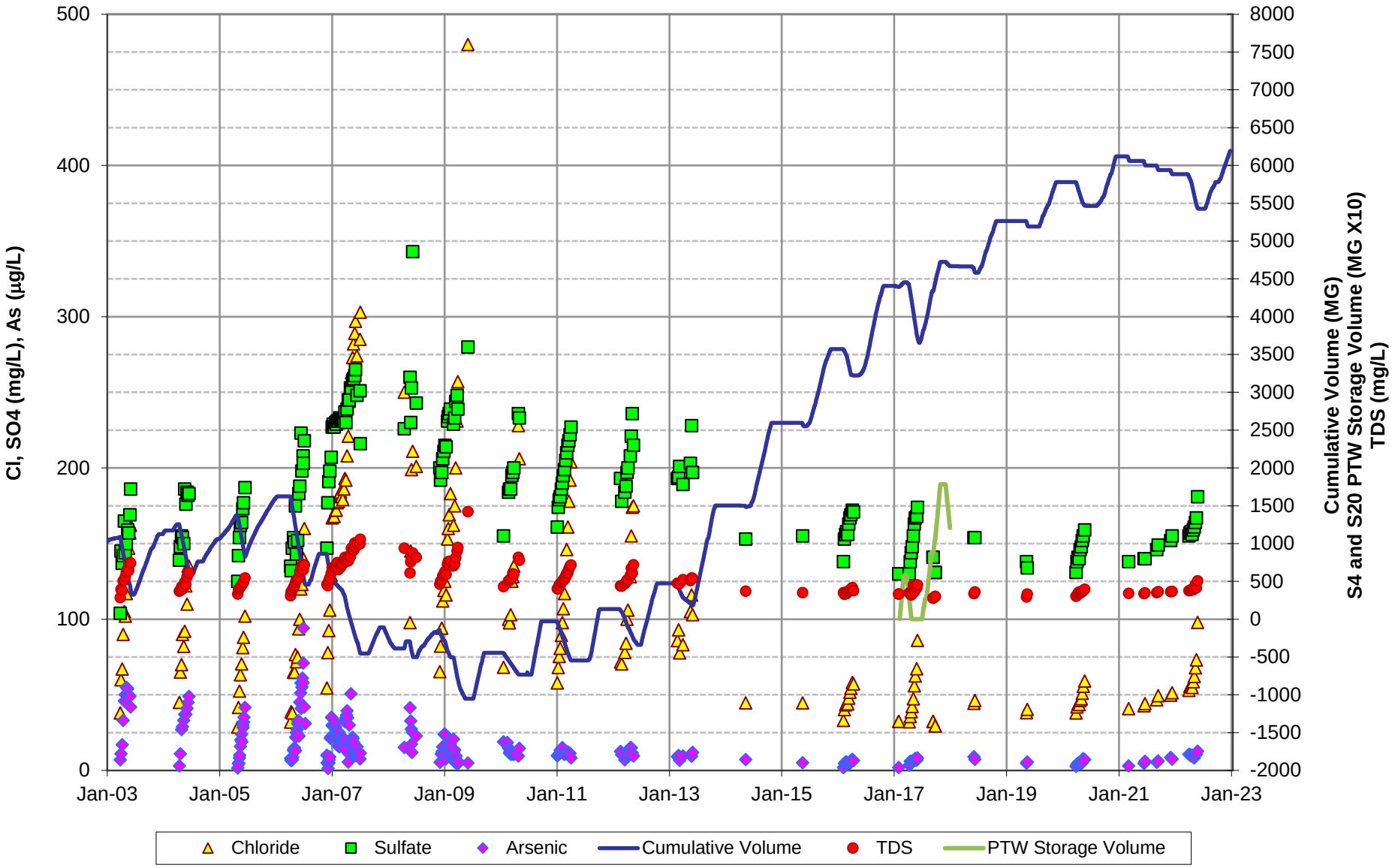


Figure 4-14
WF2 S-12 Water Quality Data

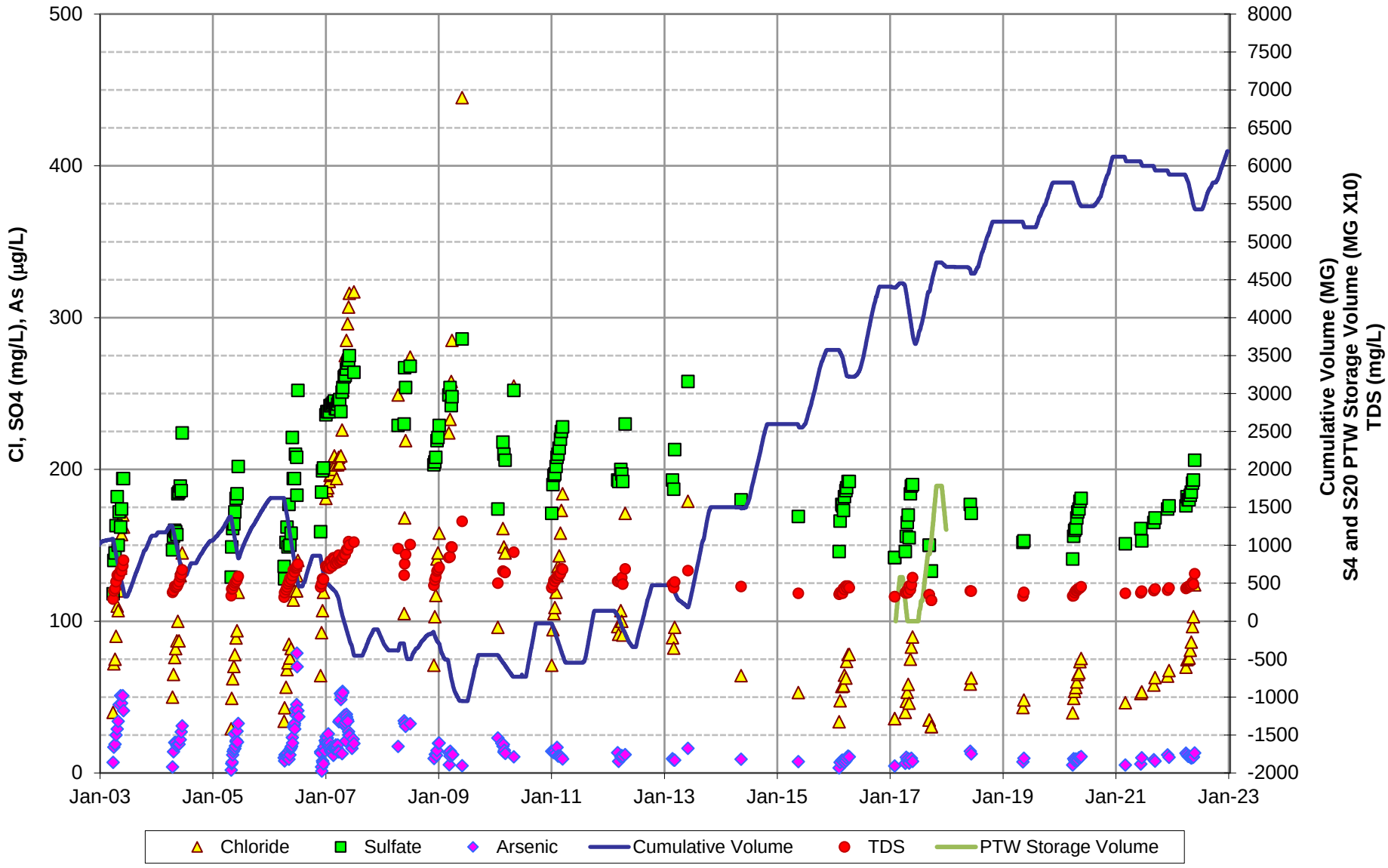


Figure 4-15
WF2 S-13 Water Quality Data

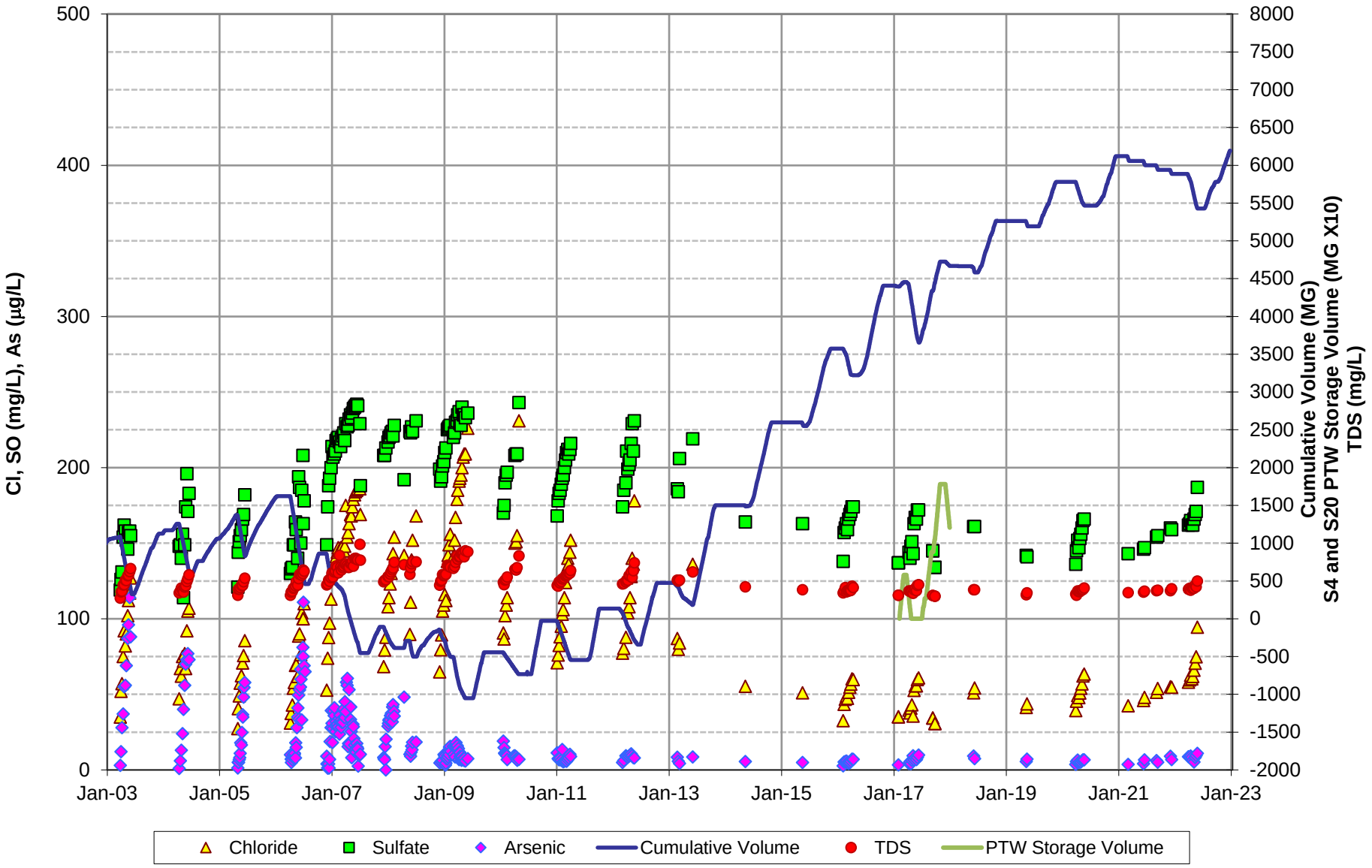


Figure 4-16
WF2 S-14 Water Quality Data

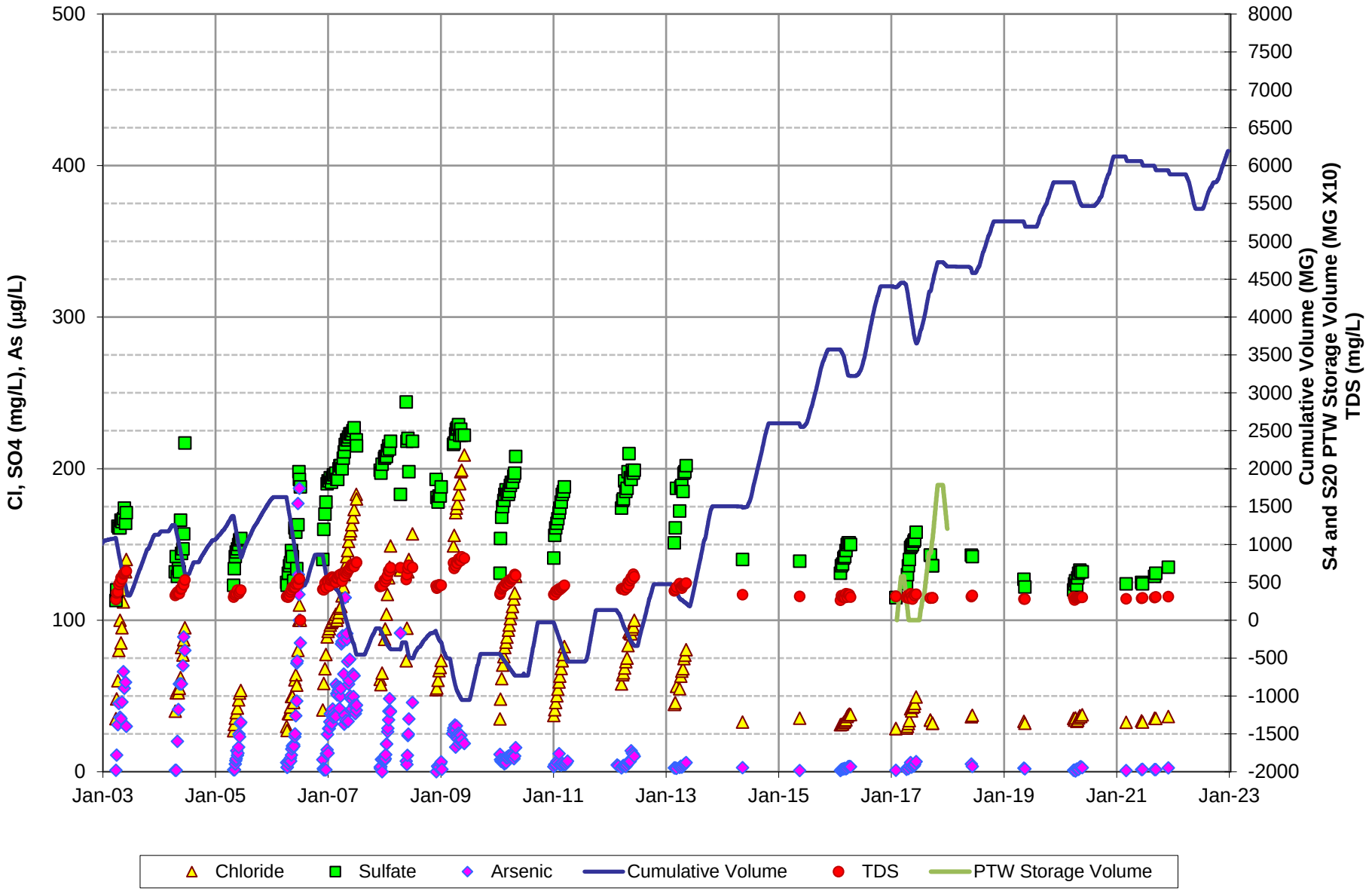


Figure 4-17
WF2 S-15 Water Quality Data

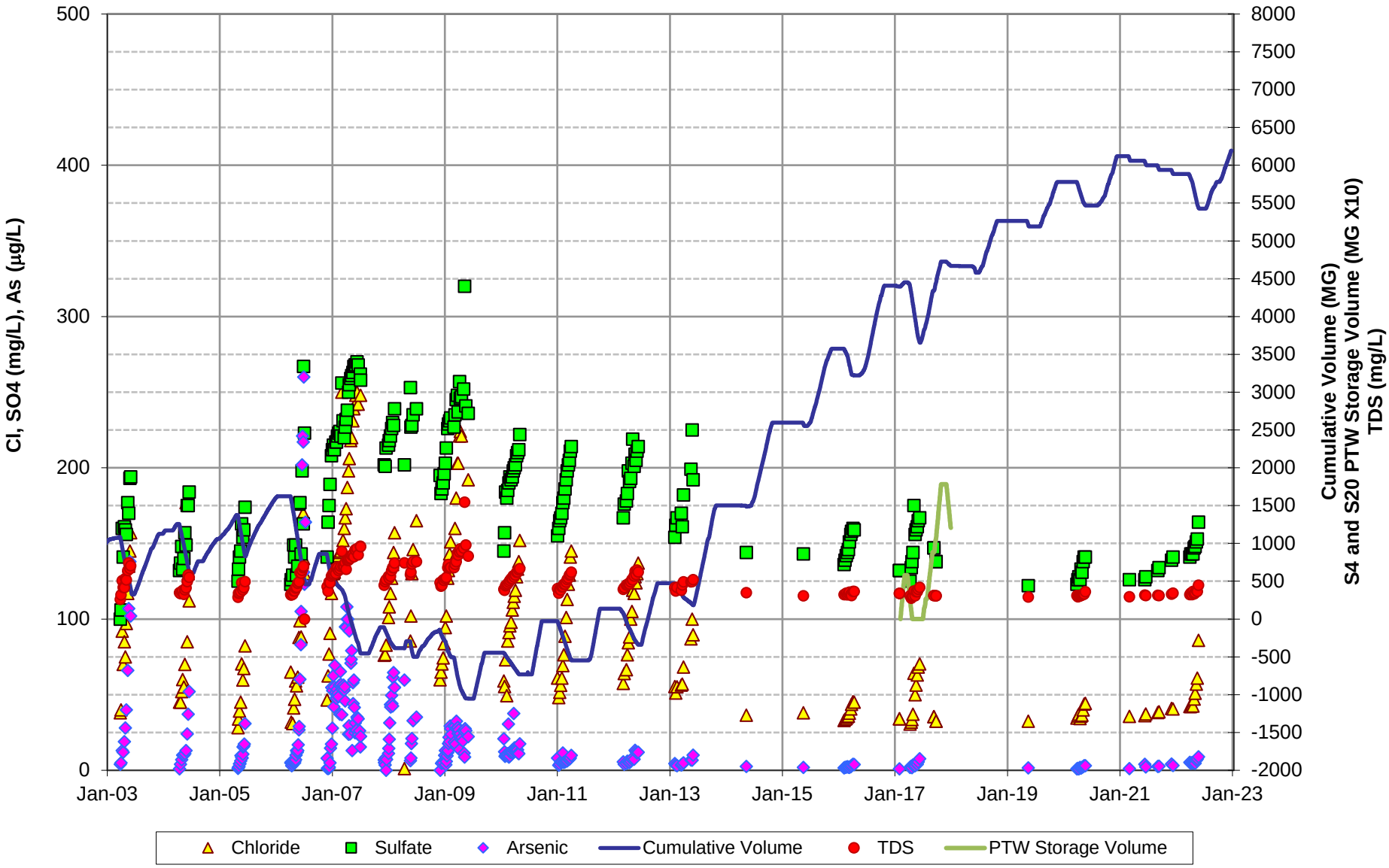


Figure 4-18
WF2 S-16 Water Quality Data

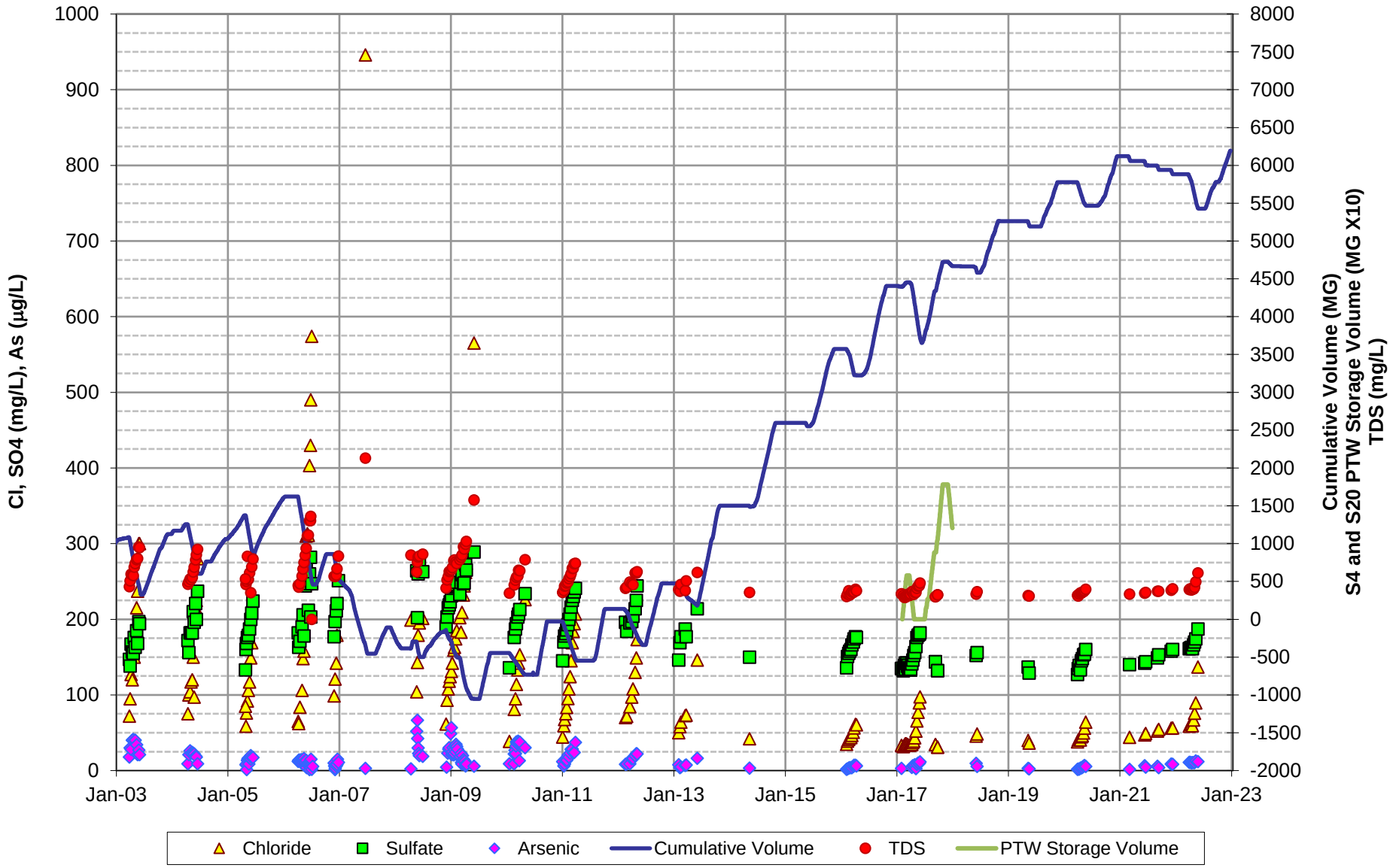


Figure 4-19
WF2 S-17 Water Quality Data

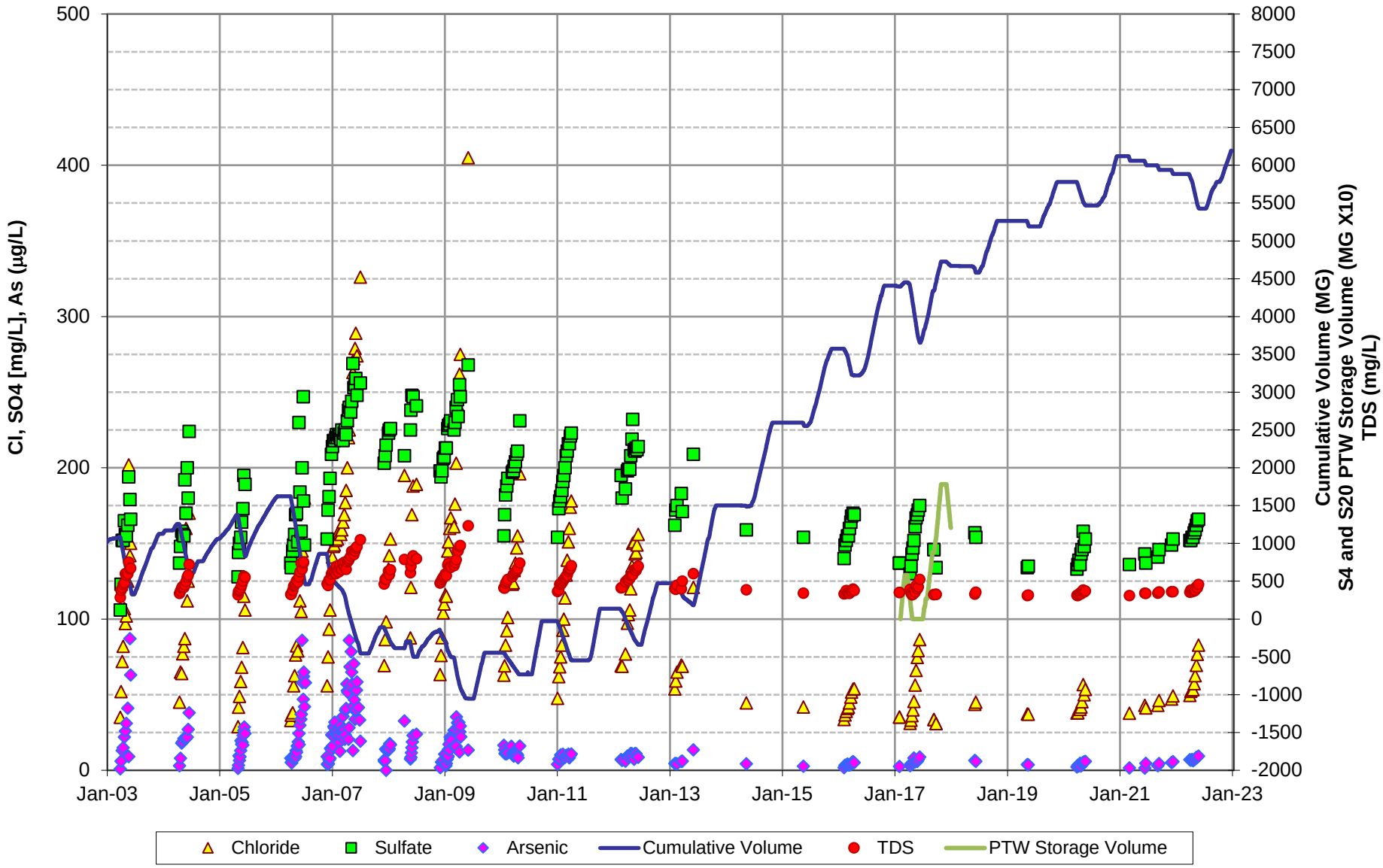


Figure 4-20
WF2 S-18 Water Quality Data

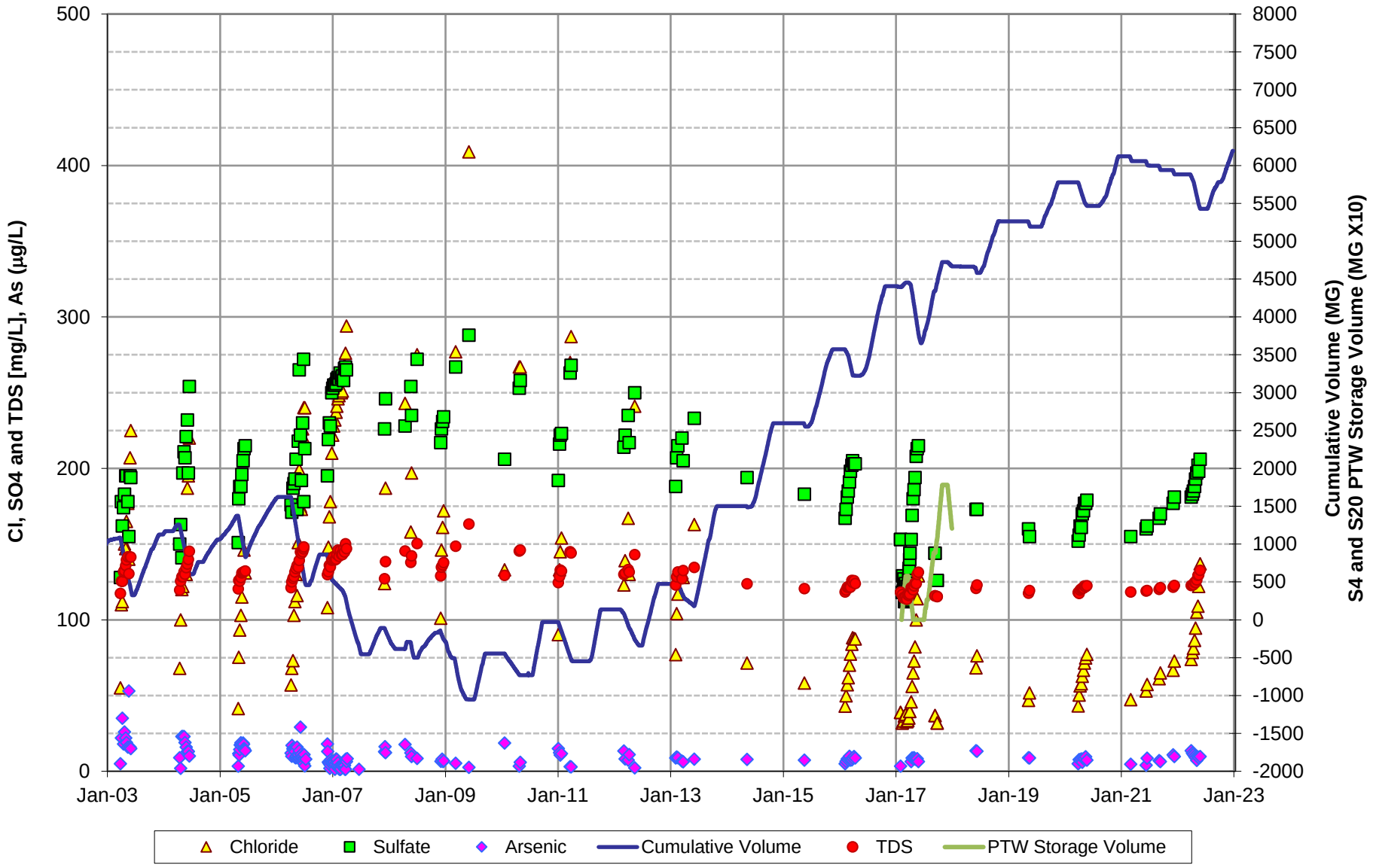


Figure 4-21
WF2 S-19 Water Quality Data

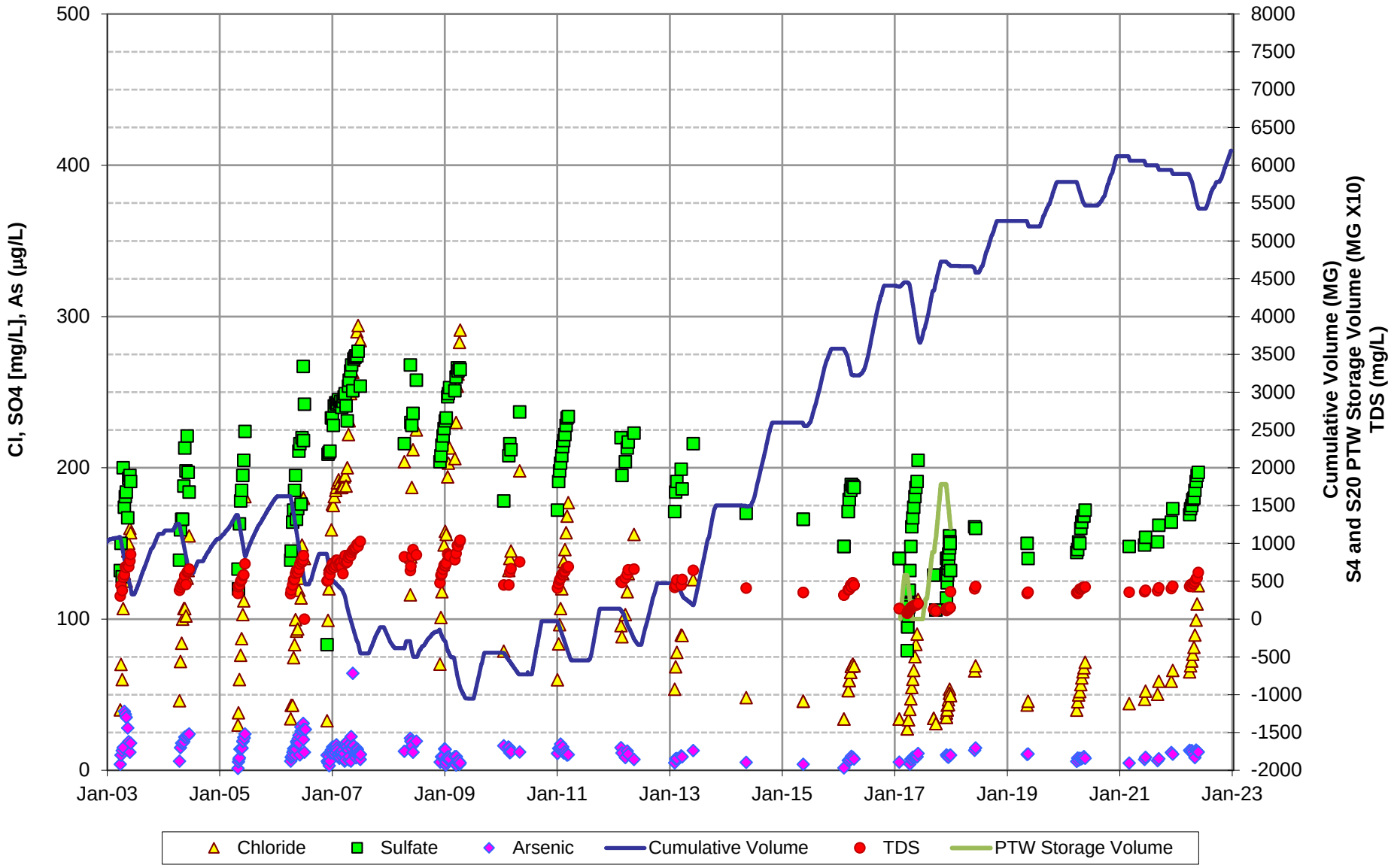


Figure 4-22
WF2 S-20 Water Quality Data

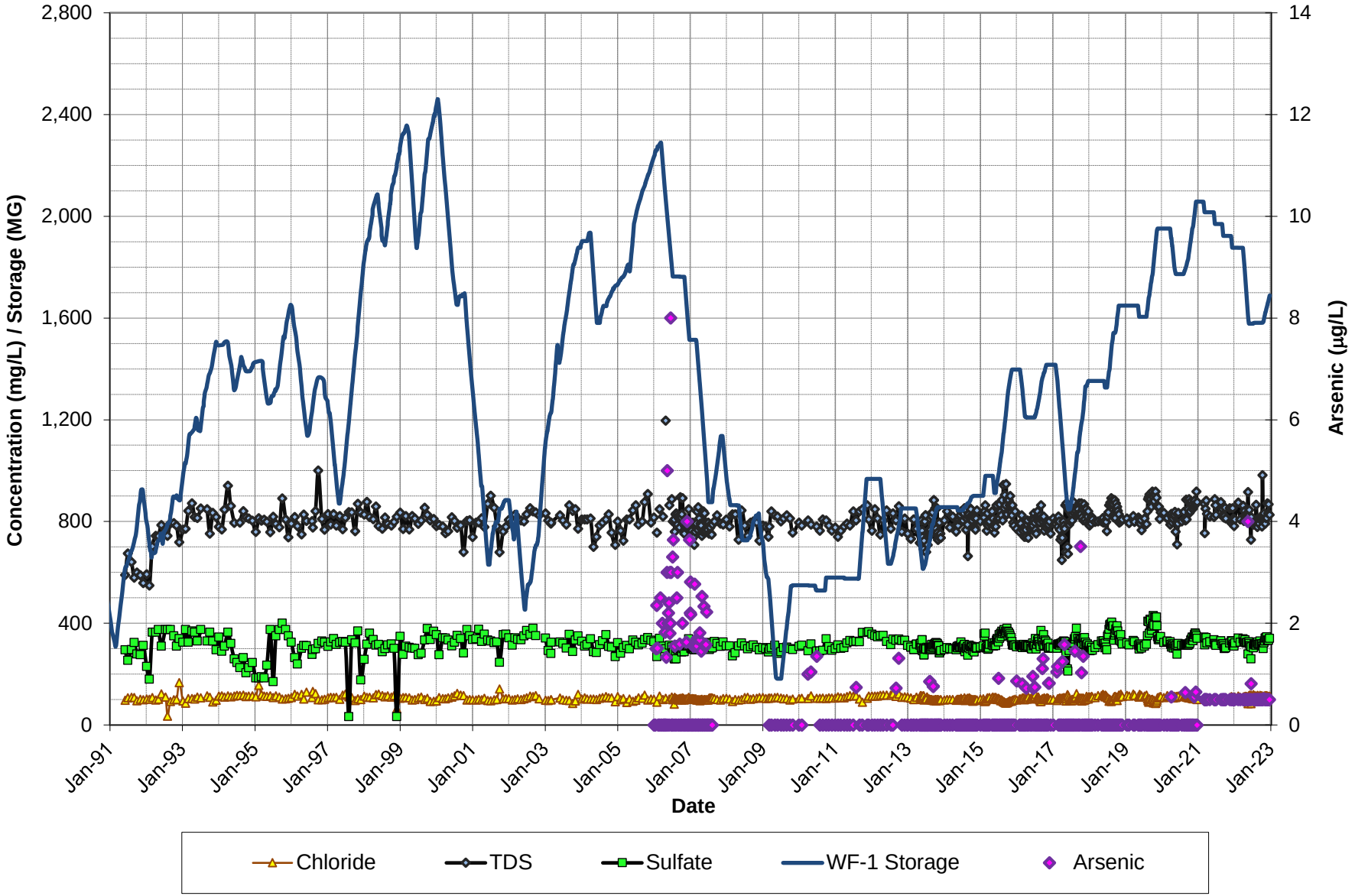


Figure 4-23
WF-1 Monitoring Well M-2 Water Quality

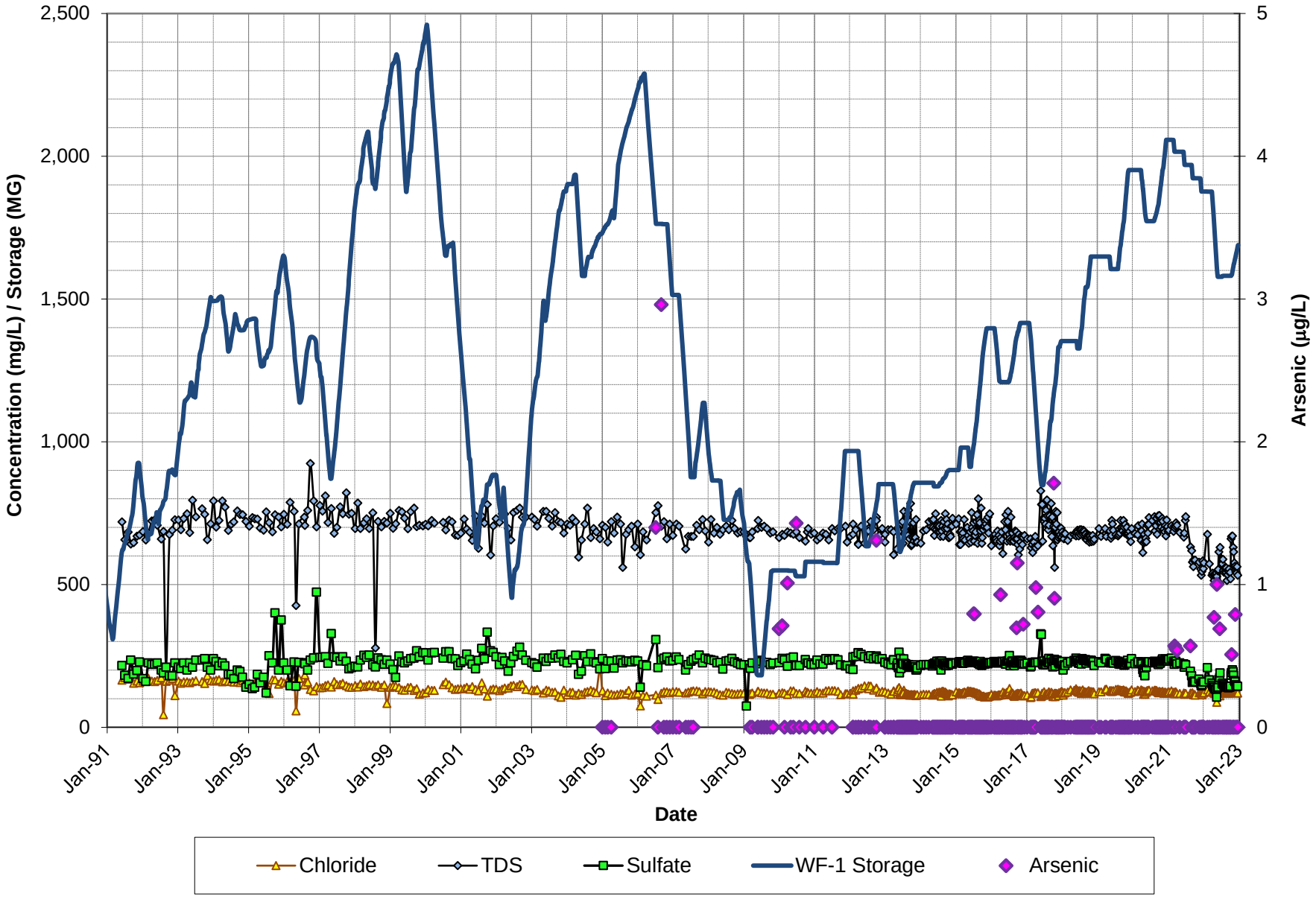


Figure 4-24
WF-1 Monitoring Well T-2 Water Quality

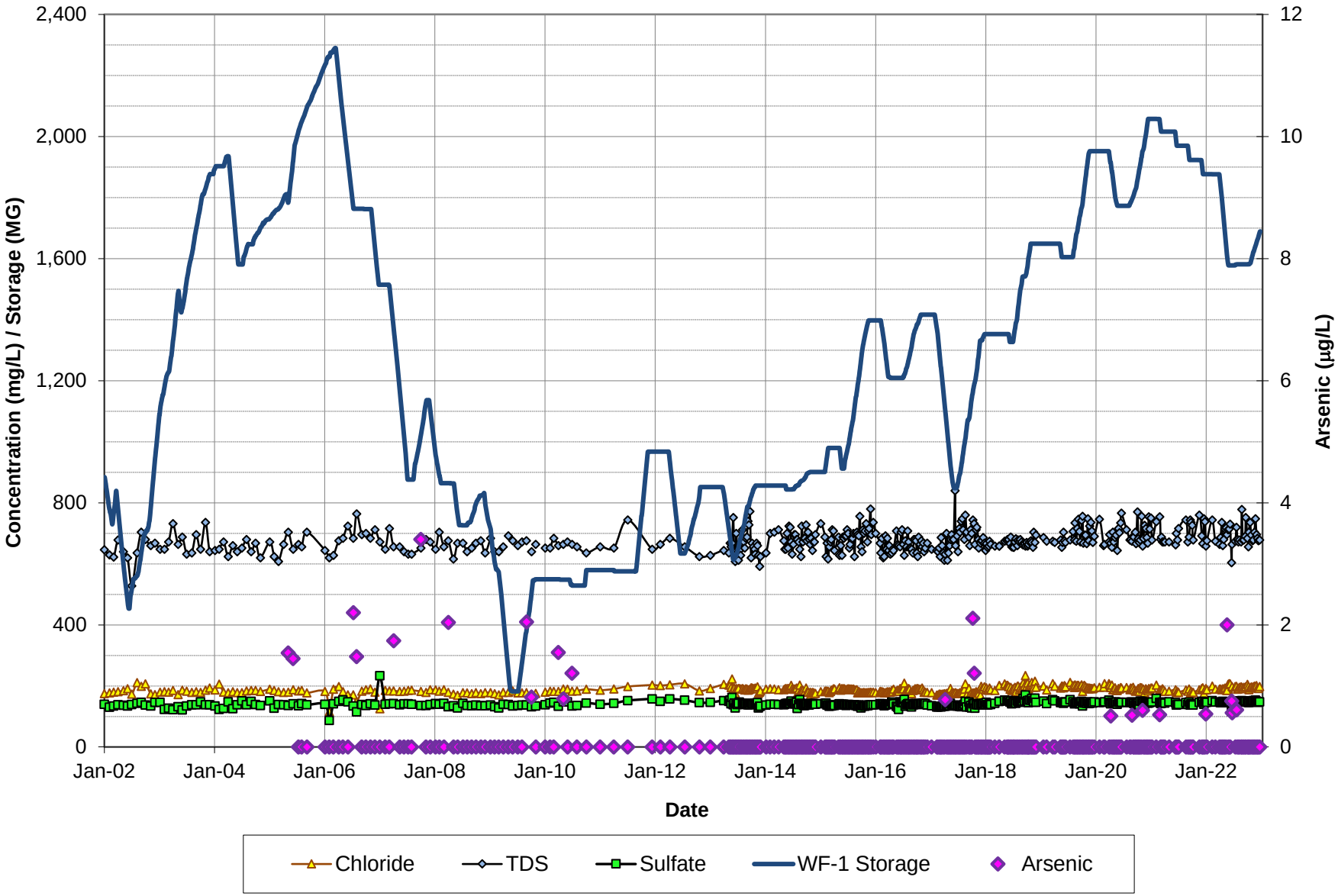


Figure 4-25
WF-1 Monitoring Well T-7 Water Quality

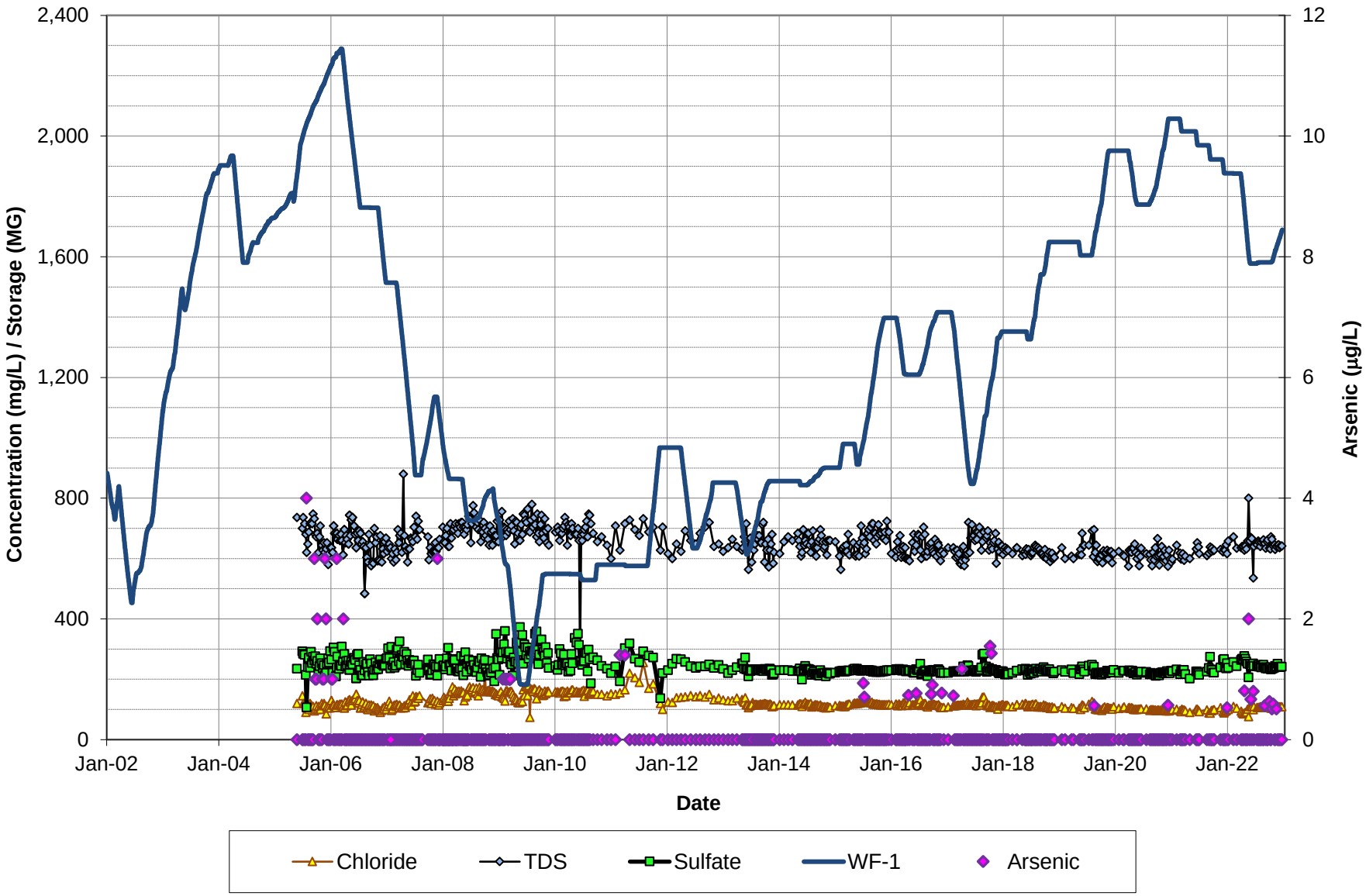
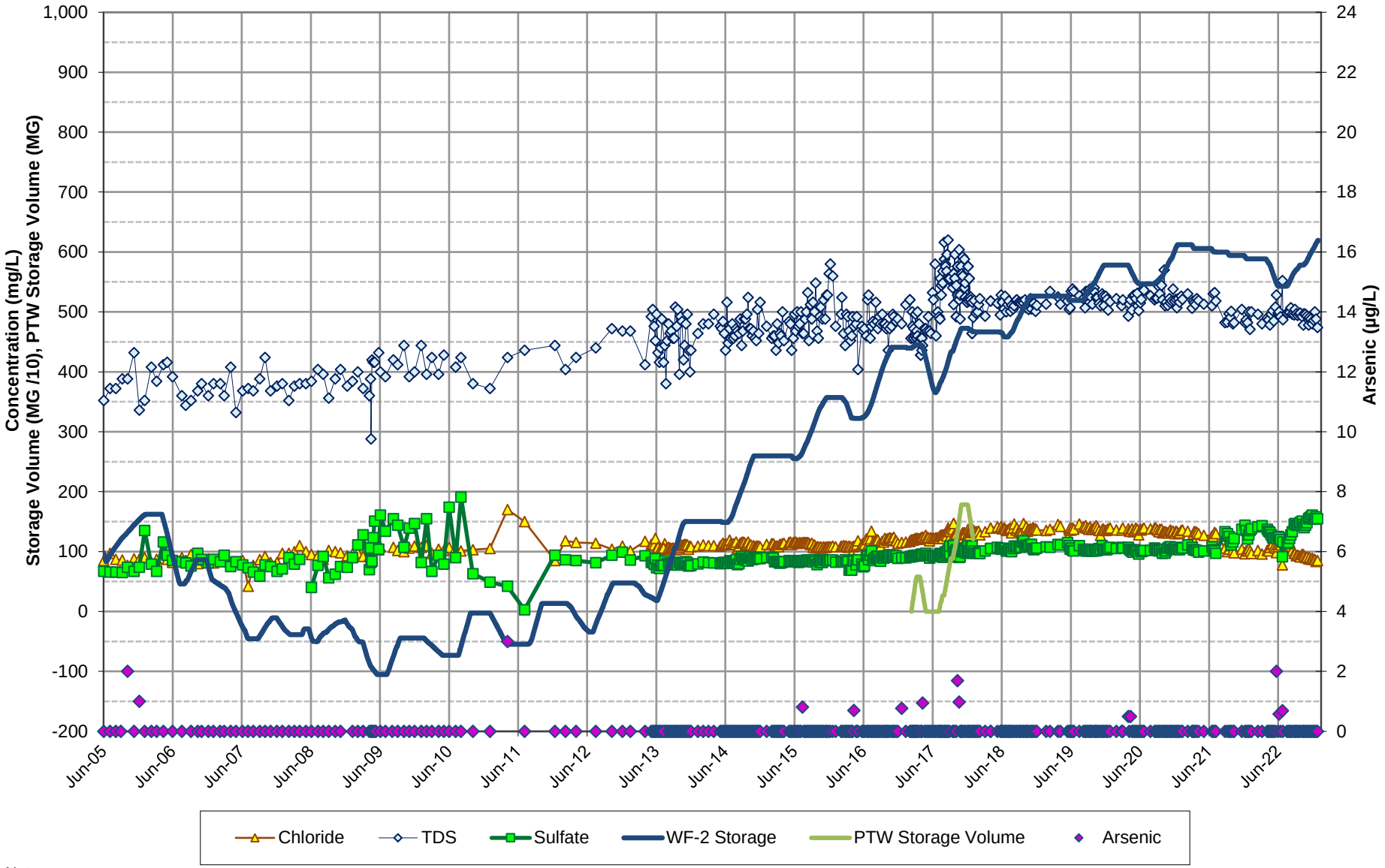
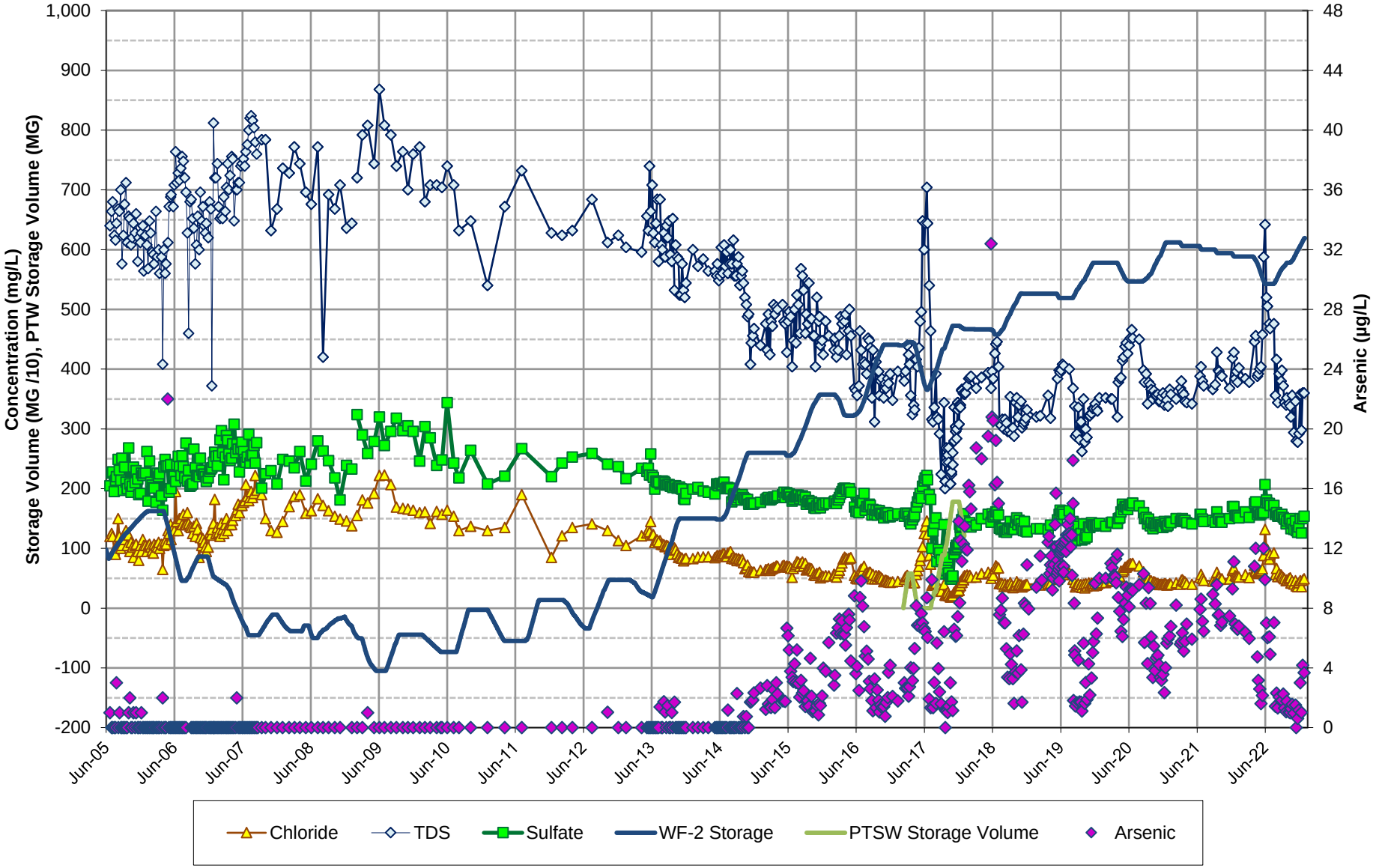


Figure 4-26
WF-1 Monitoring Well M-21 Water Quality



Notes:
For the purpose of this graphic any readings below the laboratory method detection limit were assigned zero
Sampling events for the PTSW testing occasionally resulted in duplicate samples on the same day, in that instance the result with the higher concentration of the two samples was used.

Figure 4-27
WF2 Monitoring Well T-11 Water Quality



Notes:
For the purpose of this graphic any readings below the laboratory method detection limit were assigned zero
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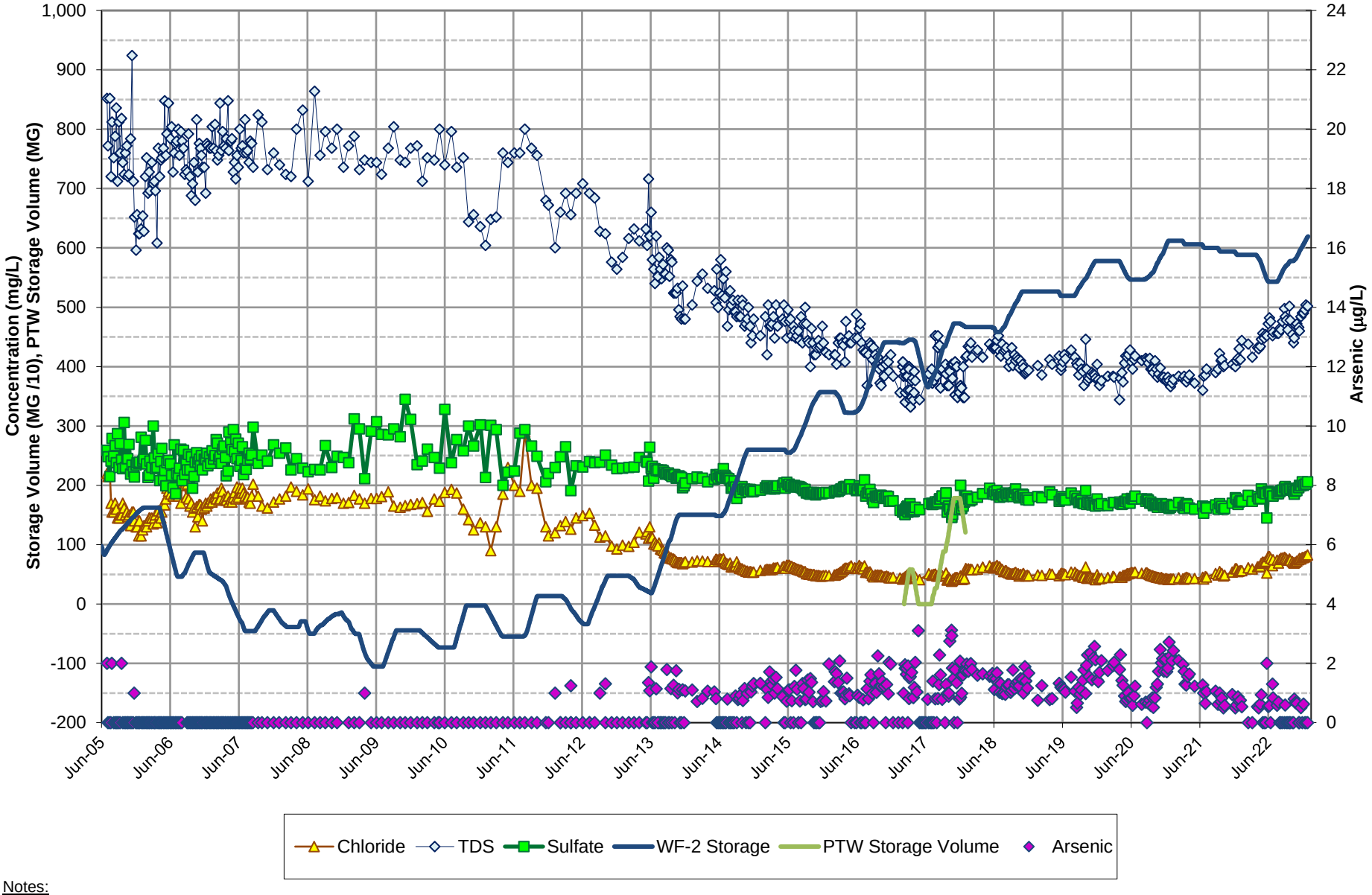
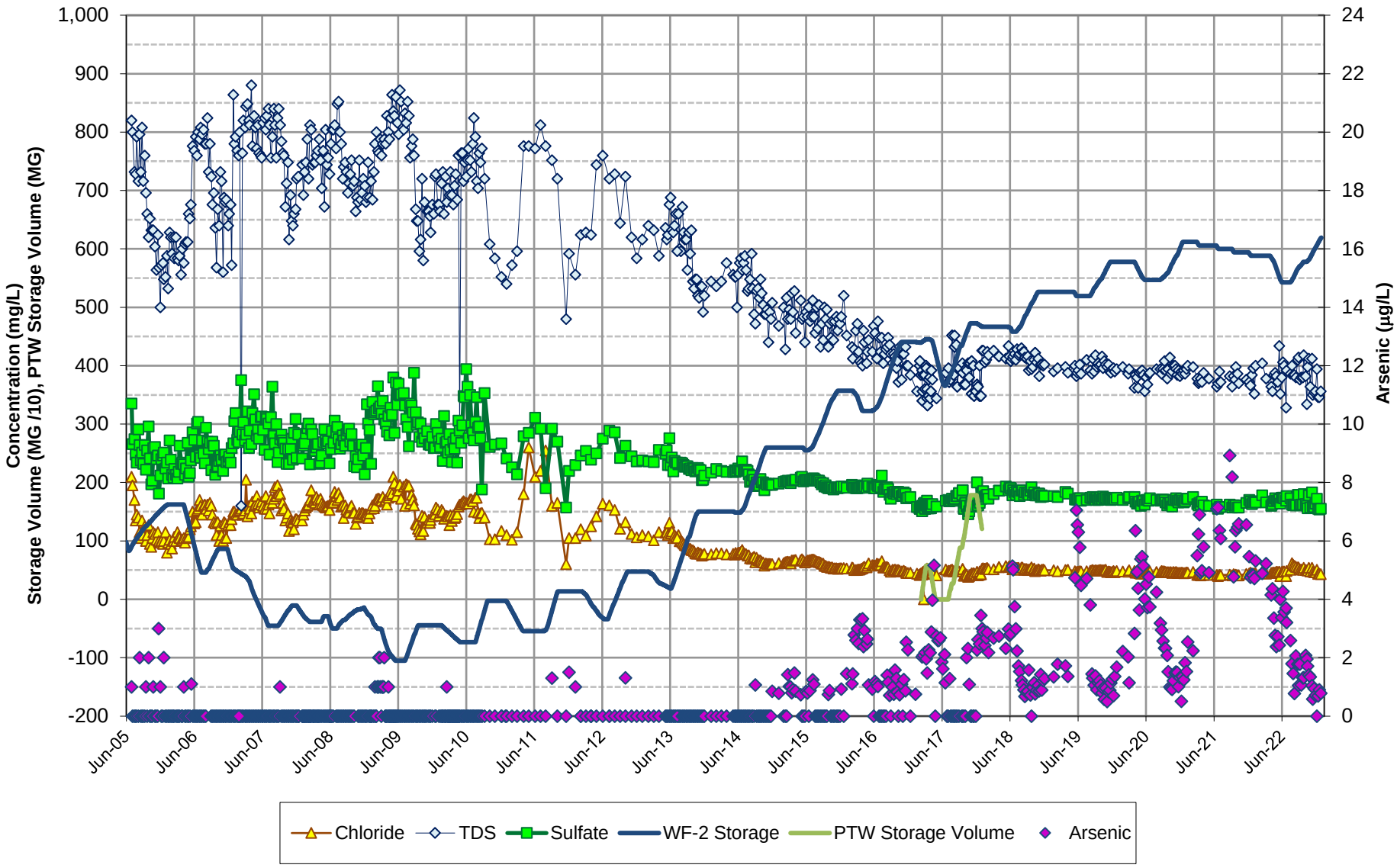
Figure 4-28
WF2 Monitoring Well M-15 Water Quality



Notes:
For the purpose of this graphic any readings below the laboratory method detection limit were assigned zero
Sampling events for the PTSW testing occasionally resulted in duplicate samples on the same day, in that instance the result with the higher concentration of the two samples was used

Figure 4-29
WF2 Monitoring Well M-18 Water Quality



Note: For the purpose of this graphic any readings below the laboratory method detection limit were assigned zero

Figure 4-30
WF2 Monitoring Well M-19 Water Quality

SECTION 5

Water Level Data

This section presents summaries of water level data from the 21 ASR wells at the PRF and associated monitoring wells. Water level data are evaluated to investigate whether long-term trends may be developing. This section first presents water level data for WF1 and its monitoring wells, followed by data for WF2 ASR wells and its associated monitoring wells. Water level elevation data datum is reported in National Geodetic Vertical Datum (NGVD).

5.1 WF1 ASR Wells

Figures 5-1 through **5-9** show the water level elevation data (NGVD) for the ASR wells at WF1 for the POR. Water level elevations in WF1 have ranged from approximately 225 to -75 feet during ASR operations but vary greatly from well to well. Static water level elevations typically range from 40 to 50 feet. Outlying maximum and minimum water level values beyond that range are generally the effect of malfunctioning water level meters. Typically, these data outliers are flagged and not included in graphs. The greatest water level changes are seen at wells S-1, S-3R, S-5R, S-6, and S-7, which have the lowest specific capacities in WF1. During recharge events, water levels in these wells have increased by 125 to 175 feet. During recovery events, water levels at these wells decrease by 50 to 150 feet.

ASR Wells T-1, S-2, S-8, and S-9R show significantly less water level response during ASR operations than other ASR wells. During recharge events, water levels in these wells typically increase by 50 to 100 feet. During recovery events, water levels in these wells generally decrease by 40 to 75 feet. Unfortunately, the low water-level fluctuations observed at wells S-2, S-8, and S-9R do not translate into lower TDS concentrations because these wells are also among the highest in TDS concentrations during recovery. It is possible that the high productivity from these wells is due to fracture systems that may have vertical connections to the more saline waters in the permeable units below the Suwannee Limestone, but this cannot be confirmed. The moderate water level response in well T-1 is in part attributed to this ASR well being completed into the overlying Tampa Zone storage interval.

In 2022, water levels at WF1 remained within the ranges observed in previous years. No discernible long-term trend in aquifer potentiometric head conditions is observed over the POR. Data logger malfunctions/failures were observed in S-2, S-3R, and S-5R in 2021 resulting in partial water level data at these wells.

5.2 WF1 Surrounding Monitoring Wells

Water-level elevation data for monitoring wells surrounding WF1 were reviewed as part of this investigation. Two monitoring wells with long-term data (T-2 and M-2) were evaluated together. Other monitoring wells constructed as part of the ASR expansion for the Peace River Option and those constructed as part of the enhanced groundwater monitoring program have shorter monitoring periods and are also graphed together for comparison purposes. Finally, monitoring well water level elevation data are presented for the three distinct horizons monitored at Site 7 (I-7, M-7, and T-7 cluster) to compare water level elevations among these three permeable units in this area. The well construction details for the monitoring wells at the PRF were listed in **Tables 1-1** and **1-2**, presented previously.

5.2.1 Monitoring Wells M-2 and T-2 Water Level Data

A water level hydrograph for the POR (1991 through 2022) for monitoring wells M-2 and T-2 is presented on **Figure 5-10**. Monitoring well M-2 is located north of WF1 and the water levels show a correlation with ASR well recharge during the wet season and recovery during the dry season. Typical

seasonal water level fluctuations in this well range from 10 to 20 feet. The long-term data show the recharge and recovery events as well as drought events. Typical water level elevations in the wet season (recharge periods) range from 45 to 55 feet. Typical water levels in the dry season (recovery periods) range from 35 to 45 feet, but have been below 30 feet, as observed in 2007. In 2022, water levels at monitoring well M-2 were within normal ranges.

Monitoring well T-2 is located north of WF1, adjacent to monitoring well M-2. Water levels at well T-2 change with seasonal variations in the aquifer and show some correlation with ASR well operations. Typical seasonal water level fluctuations in this well range from 10 to 20 feet. The long-term data show the recharge and recovery events as well as drought events. Typical water level elevations in the wet season range from 45 to 55 feet. Typical water level elevations in the dry season range from 30 to 40 feet but have been observed below 25 feet. From fall 2013 to fall 2019, water levels in well T-2 were below normal and did not correlate with a period of drought or a significant ASR recovery event and it is suspected that these data are in error due to a transducer malfunction. The data logger/transducer has since been replaced and is functioning properly, with water levels being within the POR range.

5.2.2 Suwannee Zone Monitoring Wells

Water level data for the Suwannee Zone monitoring wells are included in **Appendix E**. **Figure E-1** presents data from several monitoring wells installed to monitor water level and water quality in the Suwannee Limestone ASR storage zone near WF1. Monitoring well hydrographs are presented for monitoring wells M-6, M-7, M-20, M-21, and M-22 for the 14-year period from January 2006 through December 2021. Water level elevation data during static periods generally were similar between 40 and 50 feet. However, when the ASR wells are in operation, water levels in Suwannee Zone monitoring wells are driven largely by the recharge and recovery rates of the nearby ASR wells and the distances of the monitoring wells from the nearby ASR wells. Water levels change by approximately 20-30 feet during recharge and recovery events. Recovery water levels in 2021 and 2022 were similar to historical events. Recharge during 2022 was at low rates which resulted in muted responses in the monitor wells.

5.2.3 Site 7 Water Level Data

Figure E-2 shows the water level data for the three monitoring wells at Site 7. Monitoring wells are completed at this site into the Suwannee Limestone, the Tampa Member, and the IAS permeable units. Static water level elevation data in all zones are approximately 40 to 45 feet. Water level change in the Suwannee Limestone due to ASR operations is approximately 20 to 35 feet. The Tampa Member well (T-7) and the IAS monitoring well (I-7) showed a similar water level response during recharge and recovery periods. A response of approximately 4 to 5 feet was observed in monitoring well I-7 during normal ASR operations, much of which is attributed to the regional water level trends. In 2022, water levels changed in response to the recovery activities at each of the monitor wells. During recharge in 2022 water level changes were observed at M-7, though muted due to the low recharge rate.

5.3 WF2 ASR Wells

Water level elevation data (NGVD) for the ASR wells in WF2 are summarized in the following paragraphs. **Figures 5-11** through **5-22** show the water level data from each ASR well for the POR through 2021. The water level data from the ASR wells are primarily a function of the injection/pumping rate and the Q/s. Water level data are useful in evaluating well interference and establishing maximum water level responses during recharge and recovery periods.

Static water level elevation at the ASR wells during storage periods ranged from 24 to 55 feet, but static water level elevations typically fluctuated between 35 and 50 feet. Water level elevations have ranged from approximately 250 feet during recharge to -140 feet during recovery. Typical water level elevations

during recharge were between 50 and 200 feet. During recovery, levels were between 0 and -100 feet. The wells have similar water level responses, except for wells S-19 and S-20 which both have high specific capacities and therefore less water level impact during ASR operations. For the earlier period, wells S-11 and S-17 showed lower water level responses; however, these wells were back-plugged in November 2007. Subsequent data have shown a greater water level response during ASR activities at these two wells, as expected. Water level responses in 2022 were generally within the historical range during both during both recharge and recovery events.

5.4 WF2 Surrounding Monitoring Wells

Water level elevation data from the WF2 monitoring wells were reviewed as part of this investigation. Monitoring well I-10 monitors water levels within the IAS and has a POR dating back to 2002. Cluster 8 wells (M-8, T-8, and I-8) were constructed as part of the ASR expansion for the Peace River Option. This site monitors three distinct horizons to compare water level elevations among these three permeable units at one location. The remaining wells were constructed as part of the enhanced groundwater monitoring program and have a shorter POR. Water level data are recorded every half hour with an installed pressure transducer data logger and the data are downloaded monthly. Wellhead pressure gauge readings are used in the event of a failed pressure transducer. Obvious instances of failed monitoring equipment resulting in inaccurate data were removed from the data sets. All figures referenced in this section are provided in **Appendix E**.

5.4.1 Intermediate Aquifer Well I-10

Well I-10 is a monitoring well that was constructed into the upper zones of the IAS. The zone monitored by well I-10 historically has been referred to as PZ-2 of the IAS. This well serves to monitor the potential regional impacts to the IAS from ASR operations. Well I-10 is located approximately 5,500 feet west of WF2. Well I-10 has casing to 260 feet bls and an open hole interval to 312 feet bls. A graph of the water level elevation from this well is provided in **Figure E-3**.

Well I-10 appears to exhibit minimal to no water level responses due to ASR operations. The water level elevation of well I-10 has fluctuated from 35 to 48 feet. However, approximately 5 to 10 feet of water level change typically is observed at well I-10 seasonally. It is difficult to determine the degree of influence attributed to ASR operations because other factors, such as withdrawals by irrigation users and seasonal fluctuations in the aquifer likely have more impact to the IAS.

5.4.2 Monitoring Well Cluster I-8, T-8, and M-8

The 8-series monitoring well cluster is located approximately 900 feet west-northwest of ASR well S-20. Monitoring well I-8 has casing to 155 feet bls and an open hole interval to 190 feet bls, monitoring the upper portion of the IAS often referred to as PZ-1. Monitoring well T-8 is cased to 354 feet bls, with a total depth to 404 feet bls. This well monitors the first permeable unit above the ASR storage zone and historically has been referred to as PZ-3 of the IAS, which includes the Tampa Zone. Monitoring well M-8 is constructed into the same zone as the ASR storage zone, the Suwannee Limestone. The well has casing to 570 feet bls and has an open hole interval to 860 feet bls.

Figure E-4 is a graph of water level elevations from wells I-8, T-8, and M-8 from January 2003 through December 2022. In general, water levels decline during recovery and then rebound during recharge in all three wells. Water level variations between recharge and recovery periods were greatest (as much as 65 feet) in well M-8, which would be expected because this is the same zone as the WF2 ASR storage zone. Water level variations were less in well T-8, which has shown up to approximately 30 feet of water level change. In 2019 the maximum water level variation at T-8 was 42 feet deviating substantially from the previous maximum of 15 feet. The large increase in water level fluctuation at T-8 is unexplained but is suspected to be a result of data logger/transducer malfunction. In 2022 water level variations at T-8 were

within historical ranges. Well I-8 had up to approximately 10 feet of water level variations during recharge and recovery events; however, a significant portion of the water level responses in wells T-8 and I-8 are seasonal changes in the aquifer that occur regardless of whether the ASR system is in operation.

5.4.3 Monitoring Well Cluster T-11 and M-11

Monitoring wells T-11 and M-11 were constructed as part of the enhanced groundwater monitoring program. They are located approximately 340 feet west of ASR well S-20. Well T-11 is cased to 350 feet bls with an open hole interval to 400 feet bls. This well monitors the first permeable unit above the ASR storage zone, historically referred to as PZ-3 of the Intermediate aquifer. Well M-11 monitors the same zone as the ASR storage zone interval and is cased to 570 feet bls with an open hole interval to 677 feet bls. **Figure E-5** shows the water level elevation data of both wells T-11 and M-11 from January 2006 through December 2022. Water level variations are minor at well T-11 but suggest some response to ASR activities. Water levels at well T-11 increased by approximately 5 feet in response to the WF2 recharge periods. Water level elevations at well M-11 have ranged from approximately -5 to 110 feet during the POR. The highest elevation was recorded during recharge of WF2 and WF1 in October 2017, the lowest elevation of -5 was recorded in May 2017. Static water elevations at wells T-11 and M-11 were between 40 and 48 feet. Water level responses at wells T-11 and M-11 in 2022 were within the range of water levels observed in previous years.

5.4.4 Suwannee Zone Monitoring Wells (M-series)

Water level data for Suwannee Zone monitoring wells M-12 through M-19 are provided in **Appendix E** as **Figures E-6** through **E-13,** respectively, showing data from January 2006 through December 2021. The monitoring wells surround the wellfield and are located at distances varying from 640 to 100 feet from the ASR wells.

Water level elevations during ASR storage periods at the M-series wells are similar to the ASR wells during static periods, typically ranging from 40 to 50 feet. Water level elevation changes during ASR operations at the interior monitoring wells (M-14, M-16, M-17, and M-18) ranged from as high as 141 feet during recharge events to a low of -34 feet during recovery. The other Suwannee Zone monitoring wells typically range from approximately 80 to 135 feet during recharge events and 30 to -18 feet during recovery events with wellfield flow rates influencing the degree of water level change; wells closer to the ASR wellfield showed greater responses, as expected. Water level responses from the monitoring wells in 2022 were generally within the normal ranges observed over the POR.

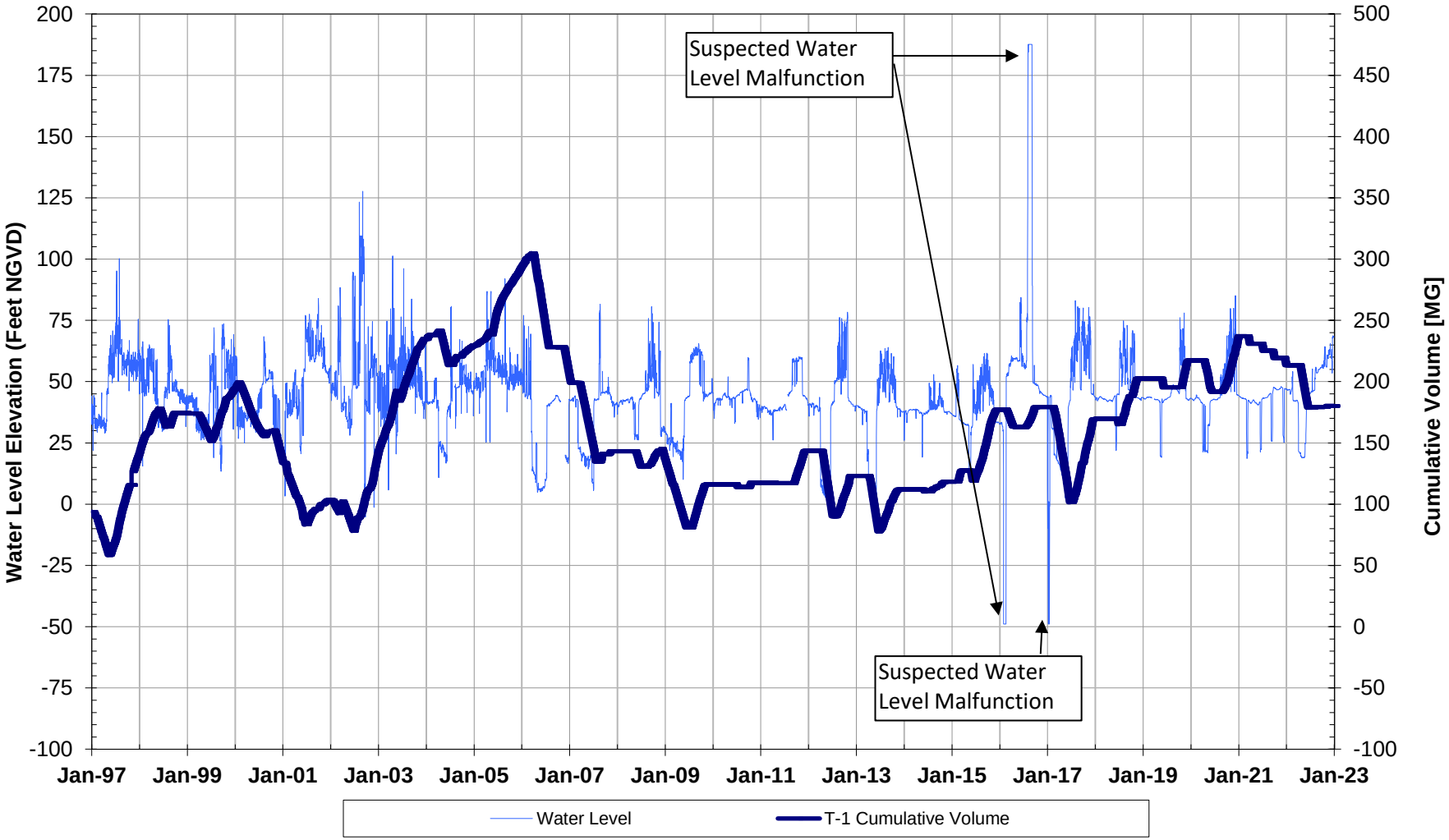


Figure 5-1
WF1 T-1 Water Level Data

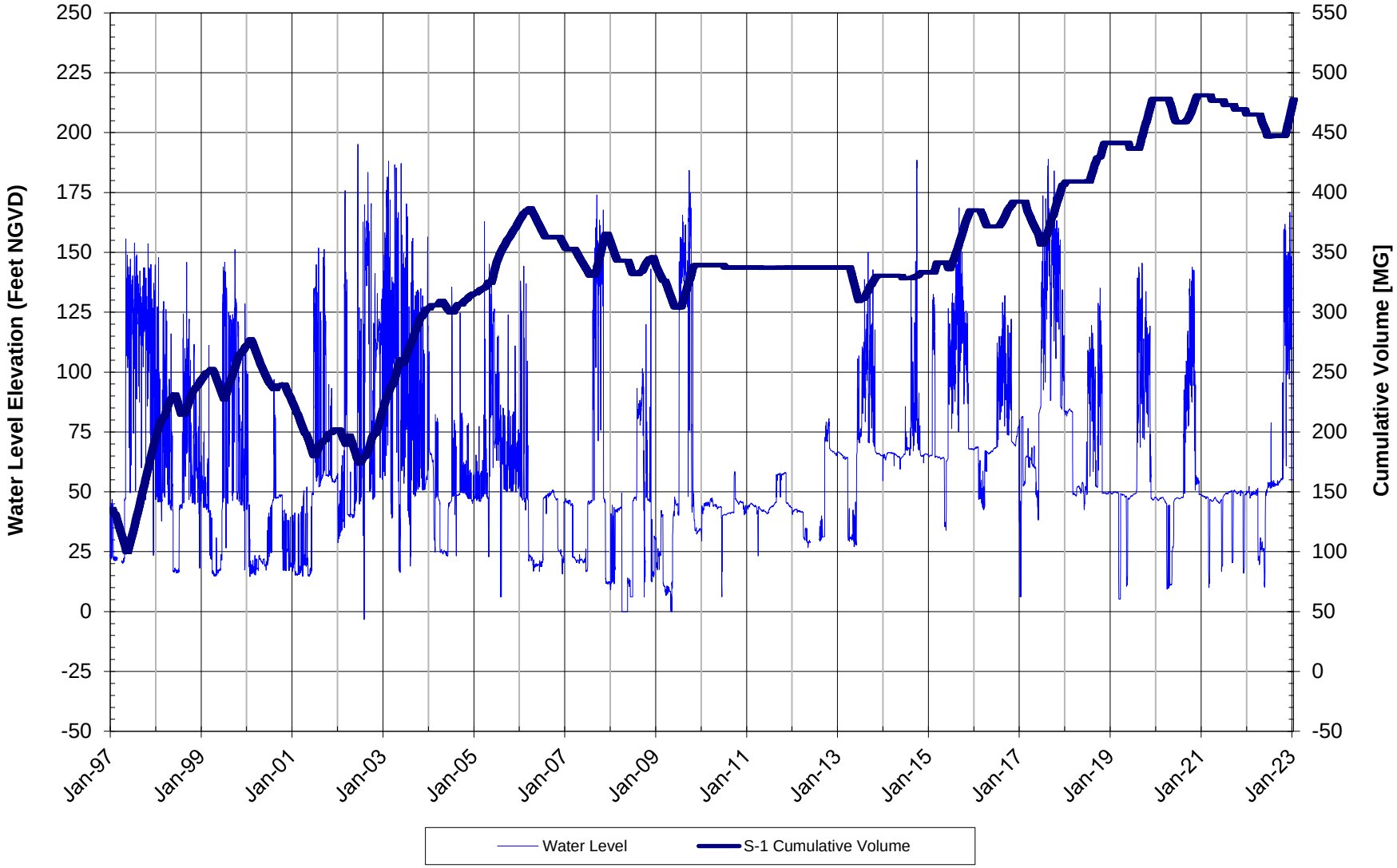


Figure 5-2
WF1 S-1 Water Level Data

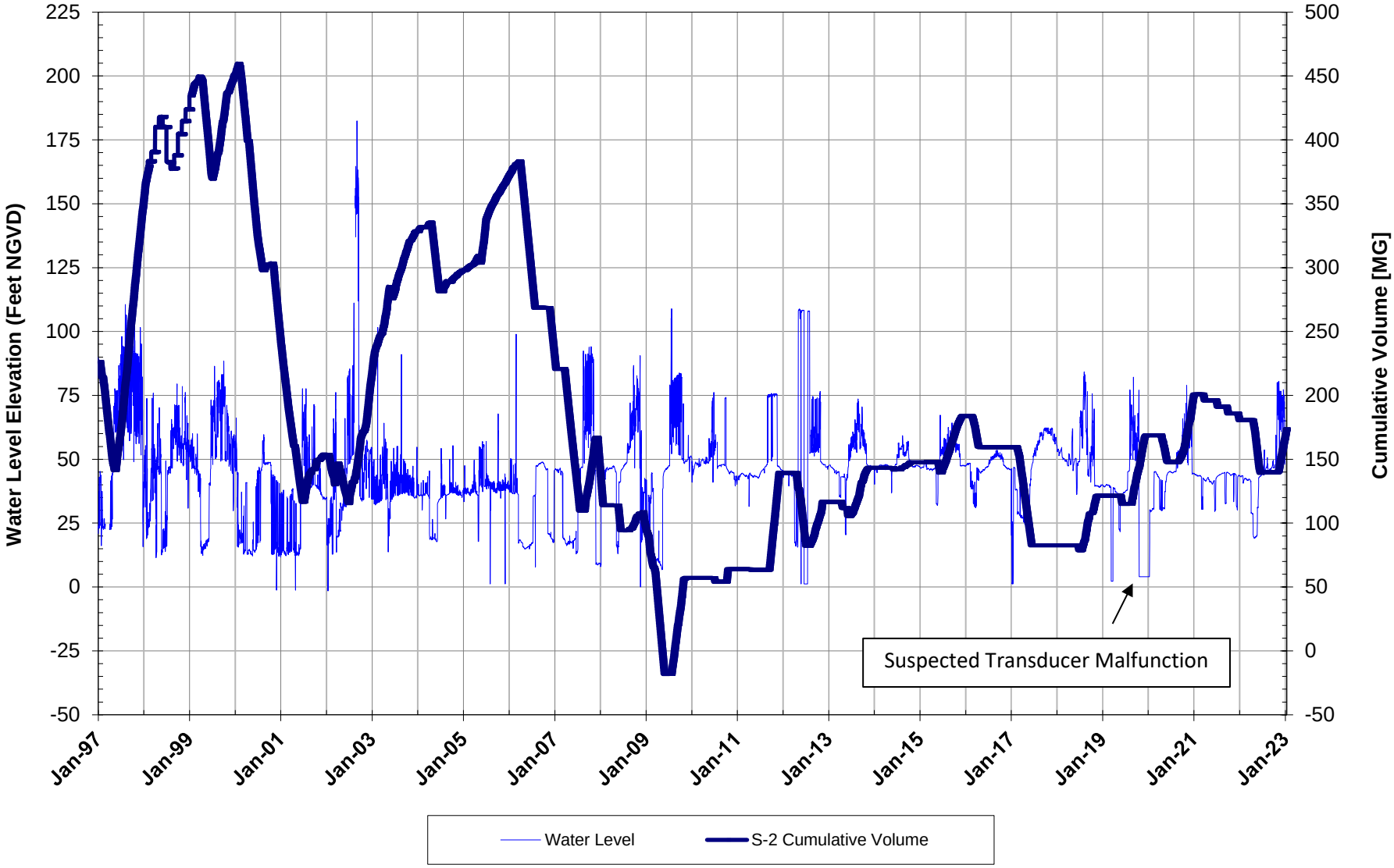


Figure 5-3
WF1 S-2 Water Level Elevation

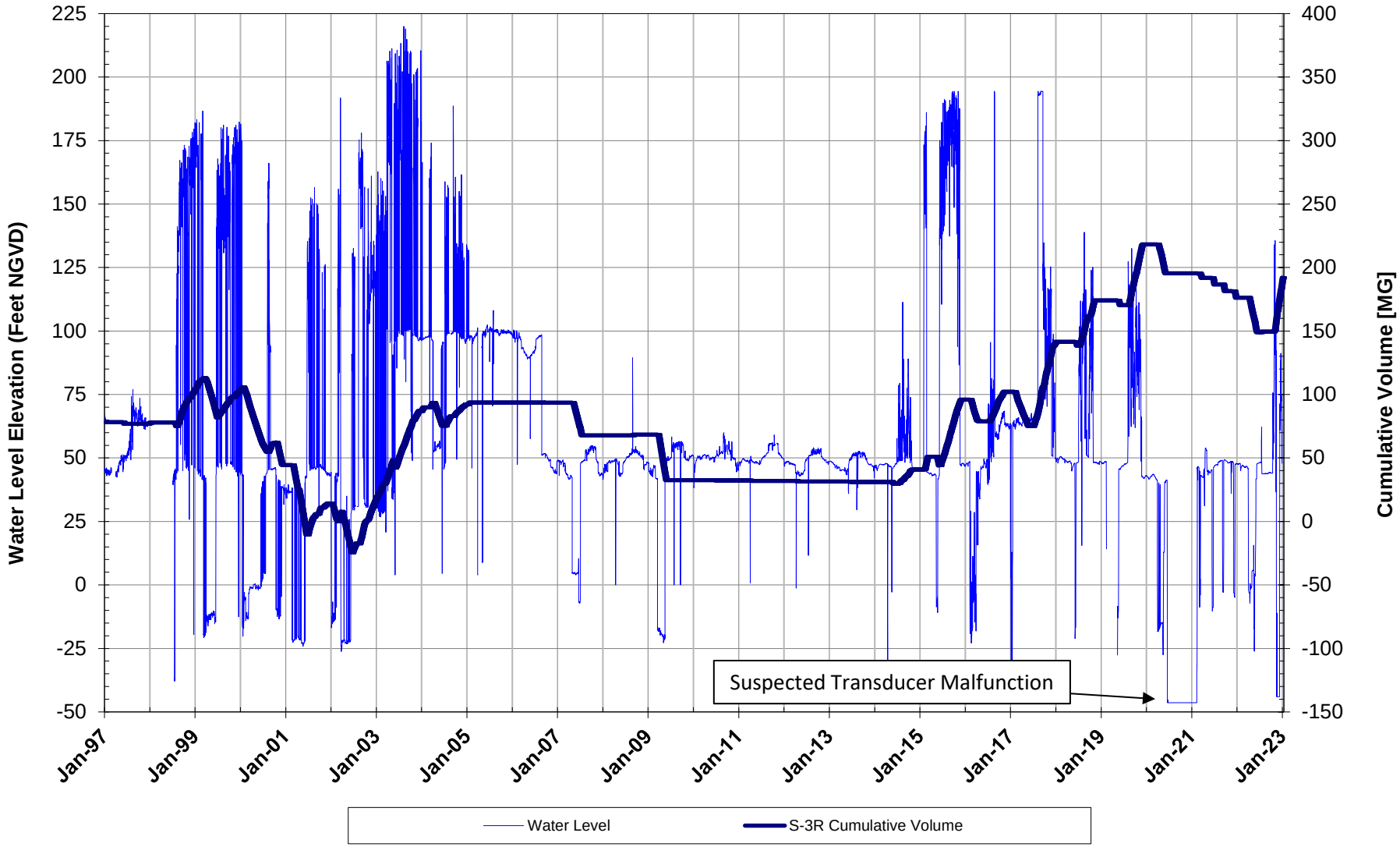


Figure 5-4
WF1 S-3R Water Level Elevation

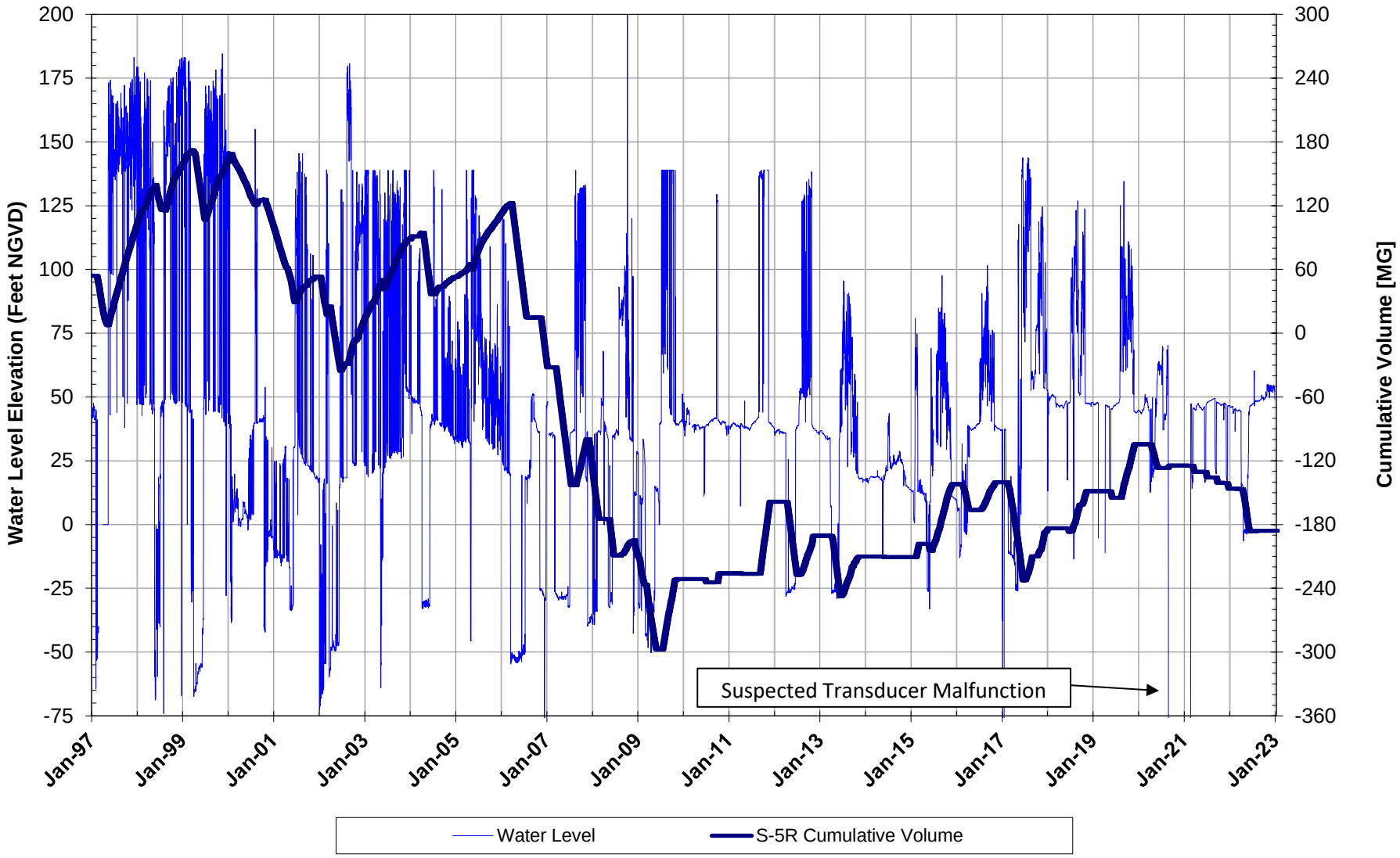


Figure 5-5
WF1 S-5R Water Level Elevation

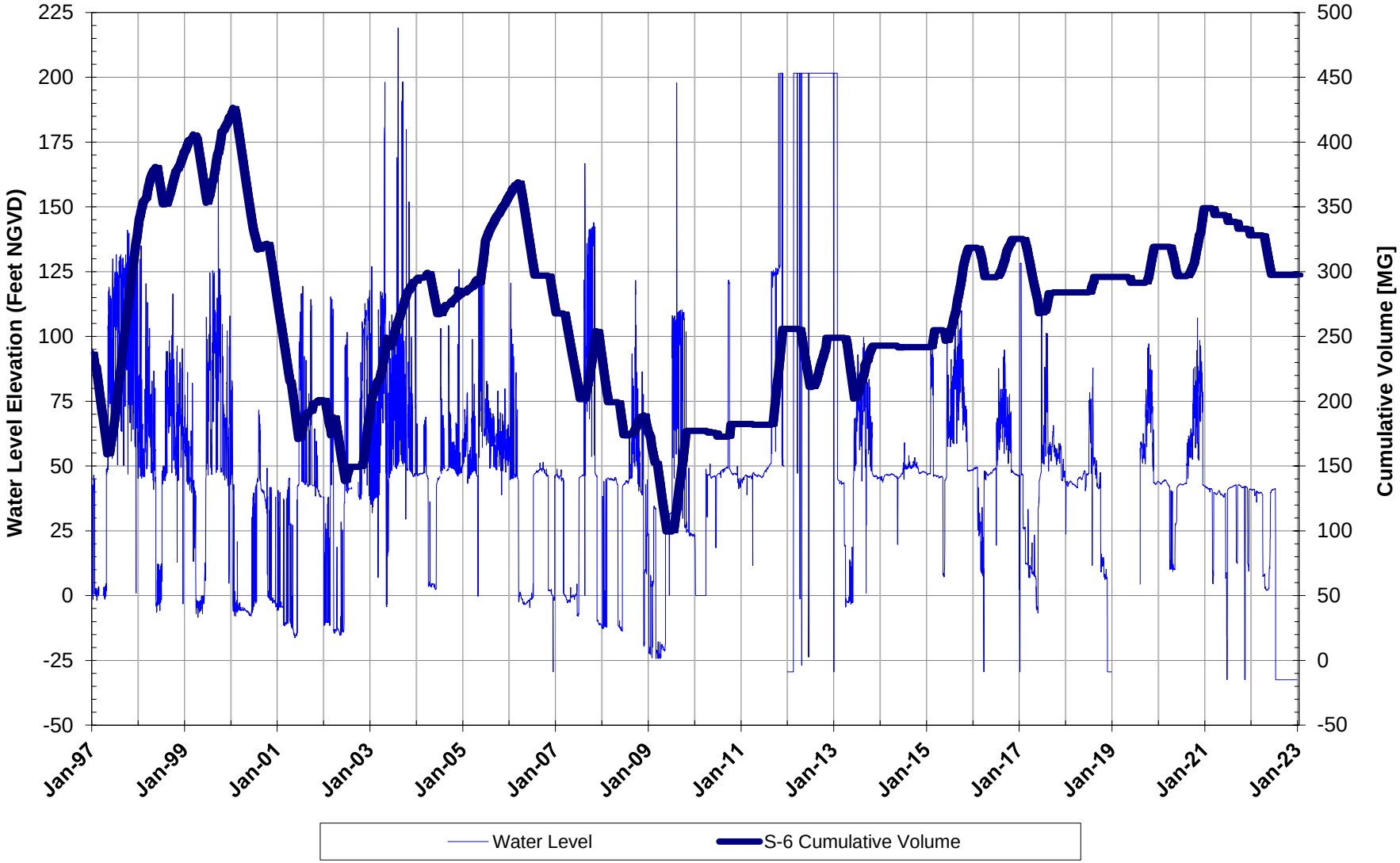


Figure 5-6
WF1 S-6 Water Level Elevation

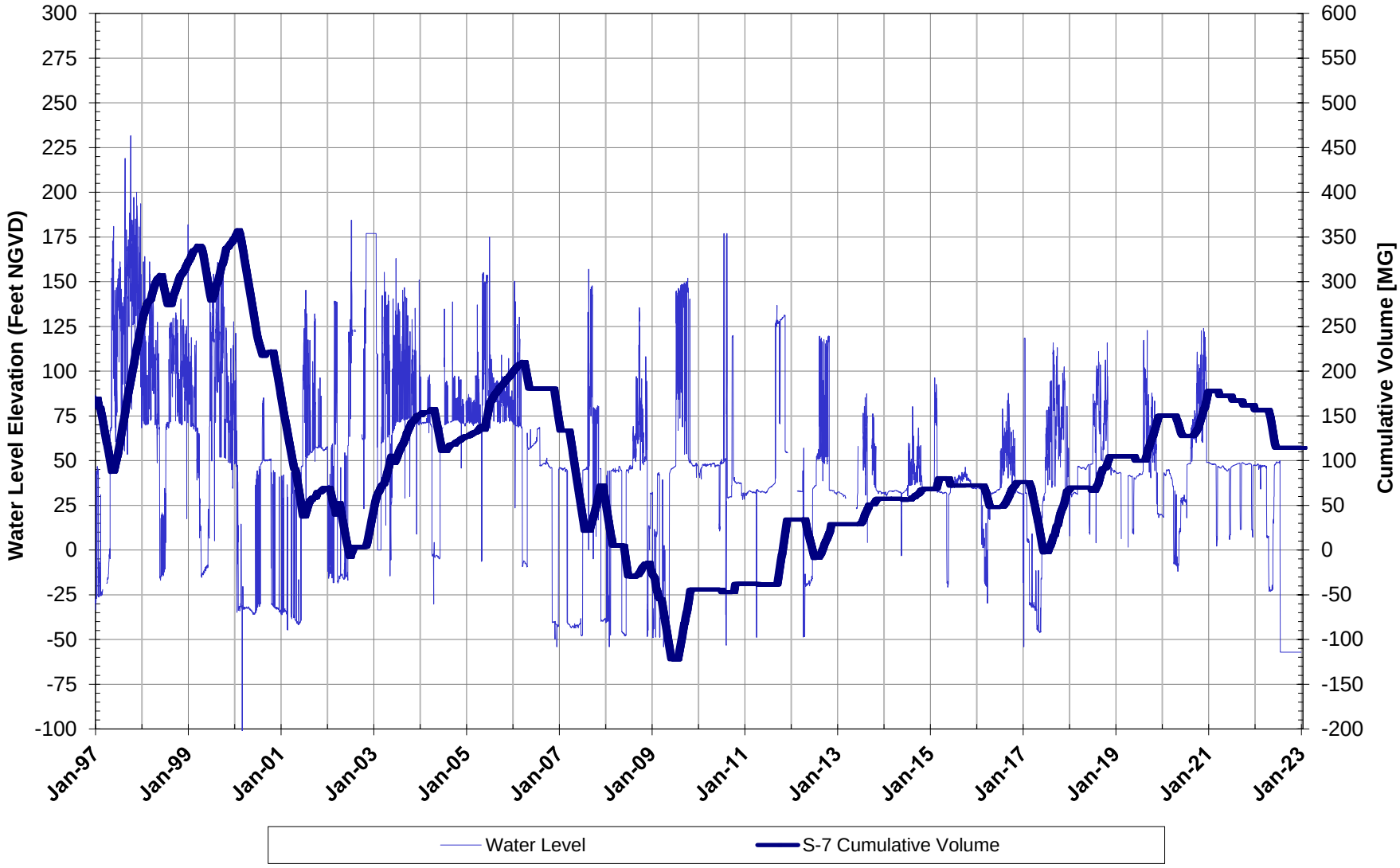


Figure 5-7
WF1 S-7 Water Level Elevation

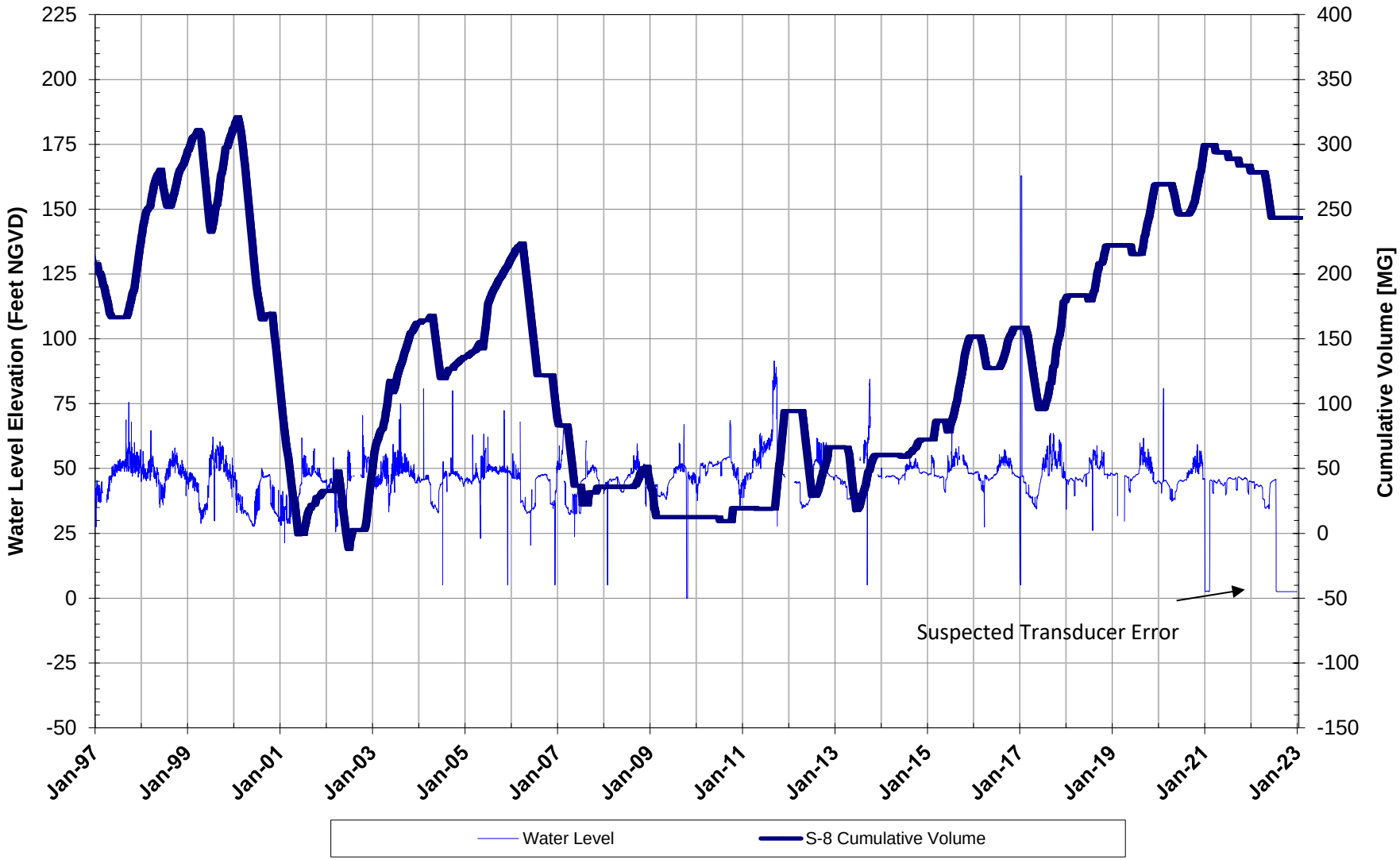


Figure 5-8
WF1 S-8 Water Level Elevation

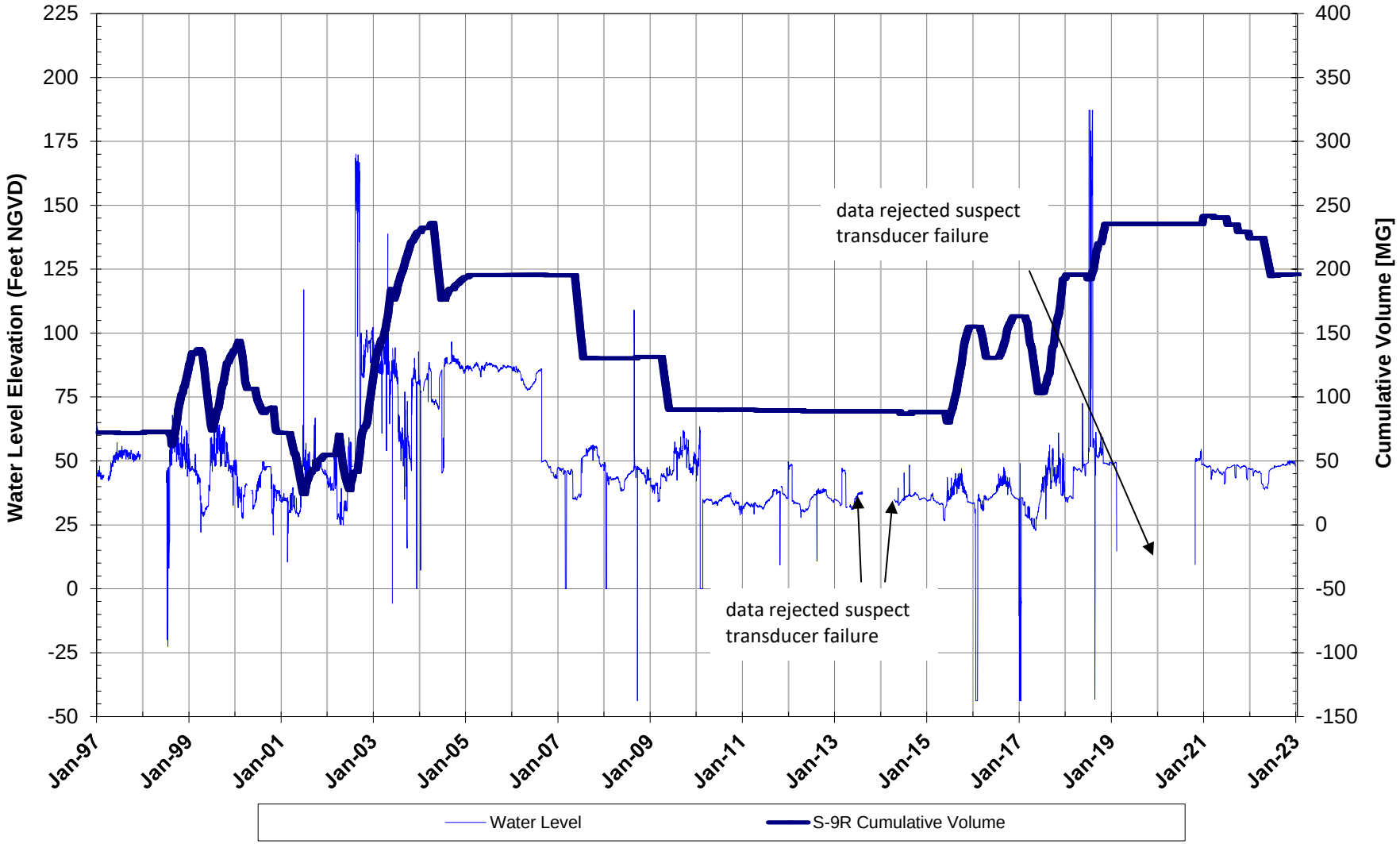


Figure 5-9
WF1 S-9R Water Level Elevation

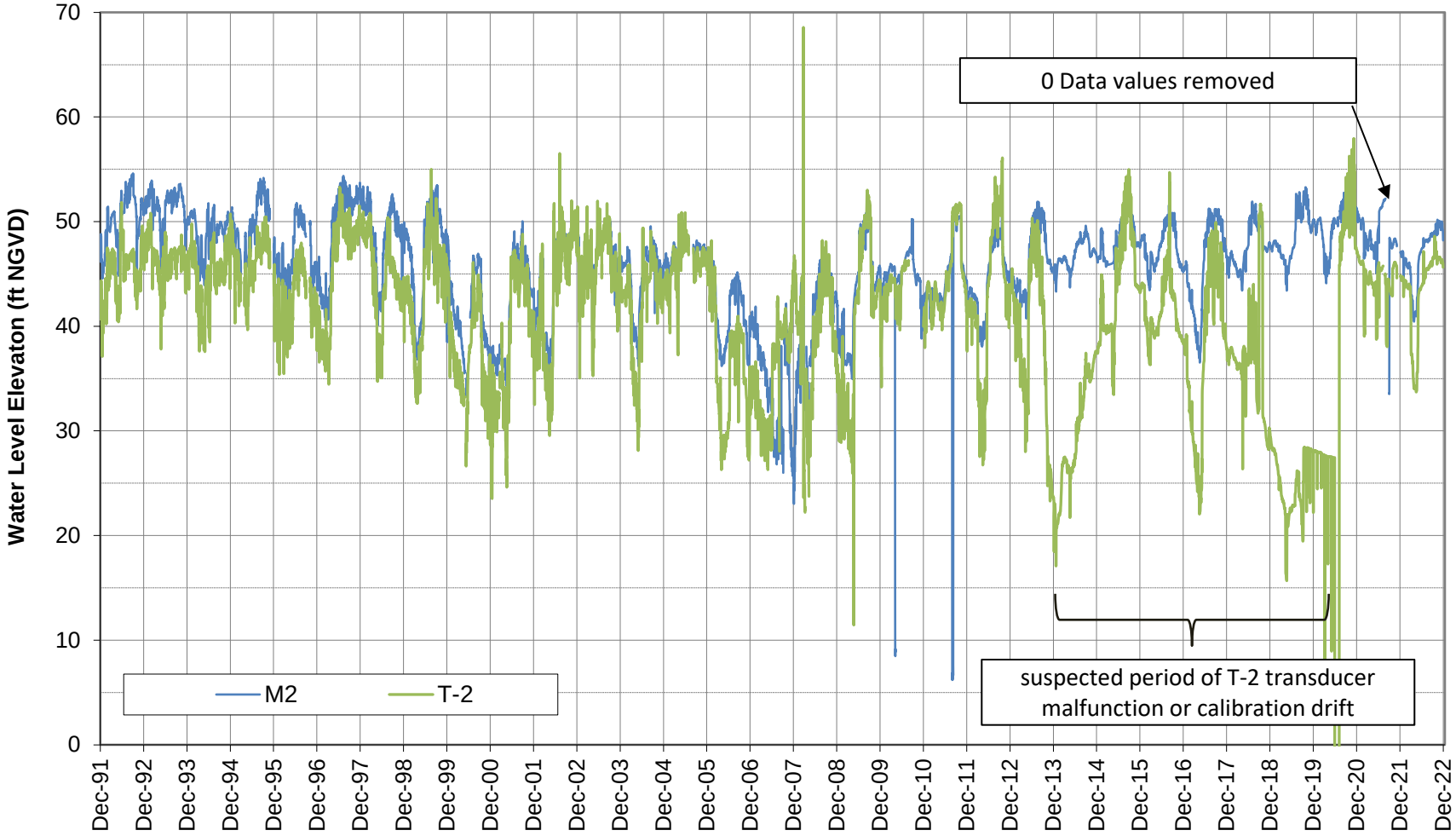


Figure 5-10

WF-1 Monitoring Wells M-2 and T-2 Hydrographs

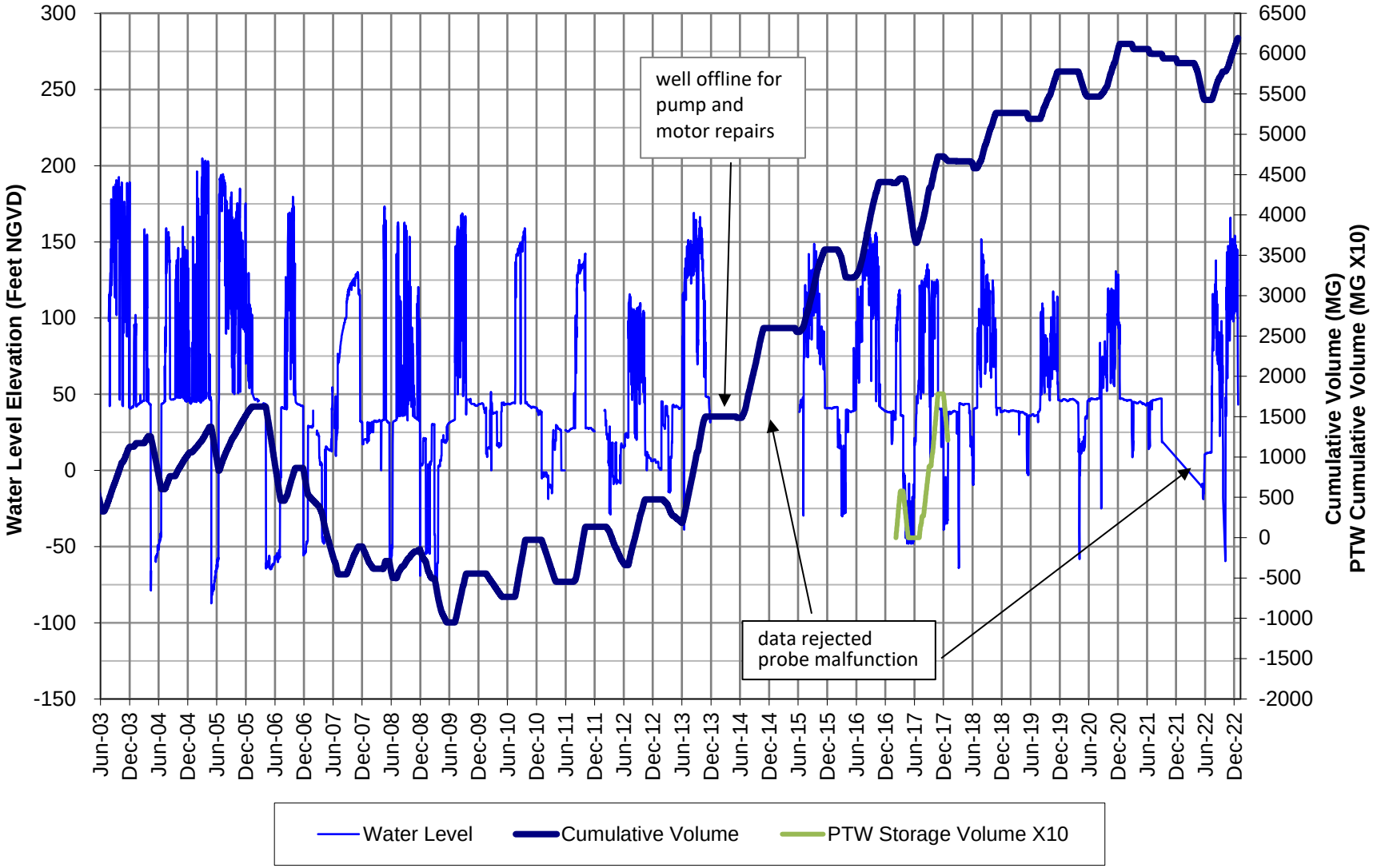


Figure 5-11
WF2 S-4 Water Level Elevation

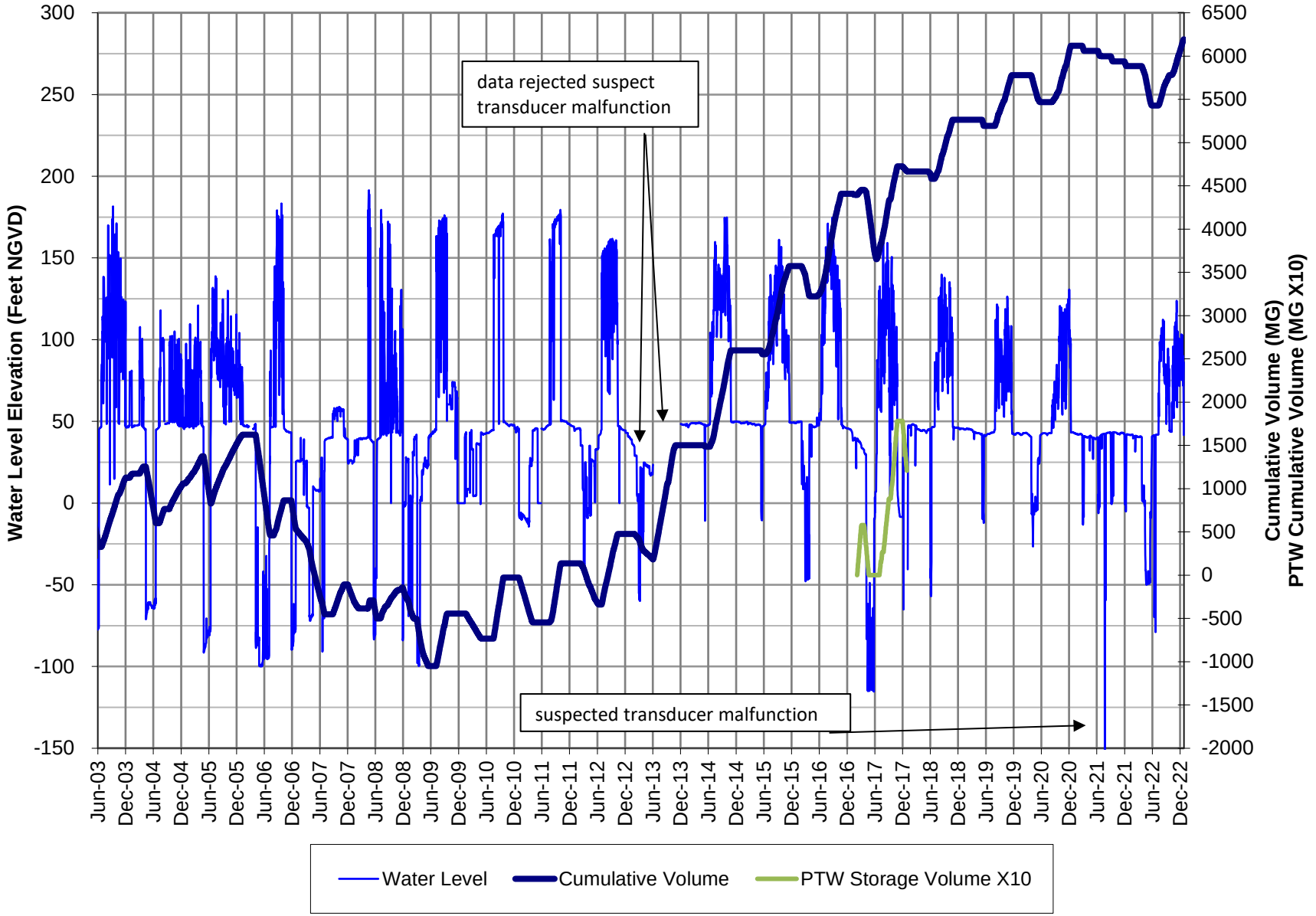


Figure 5-12
WF2 S-10 Water Level Elevation

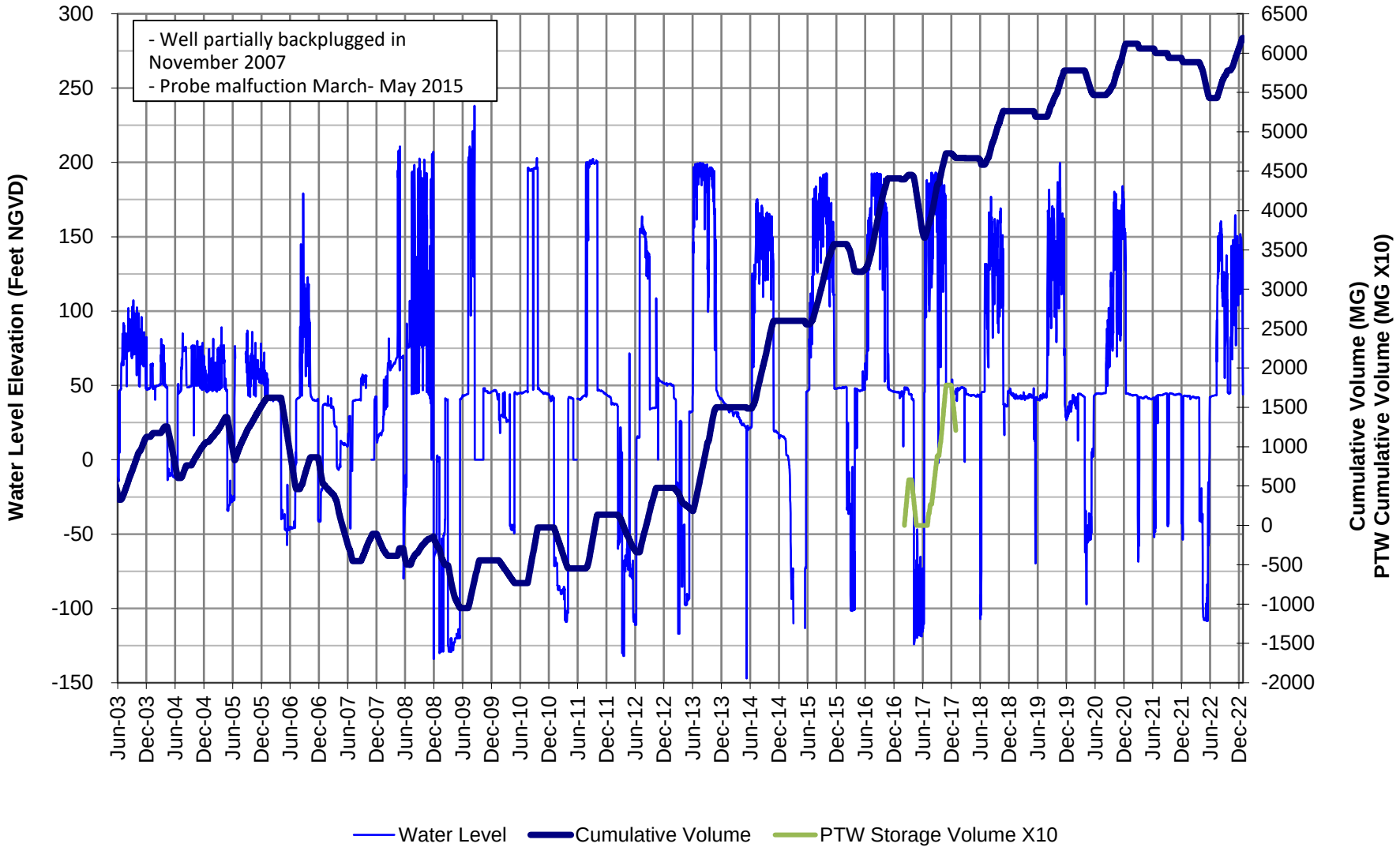


Figure 5-13
WF2 S-11 Water Level Elevation

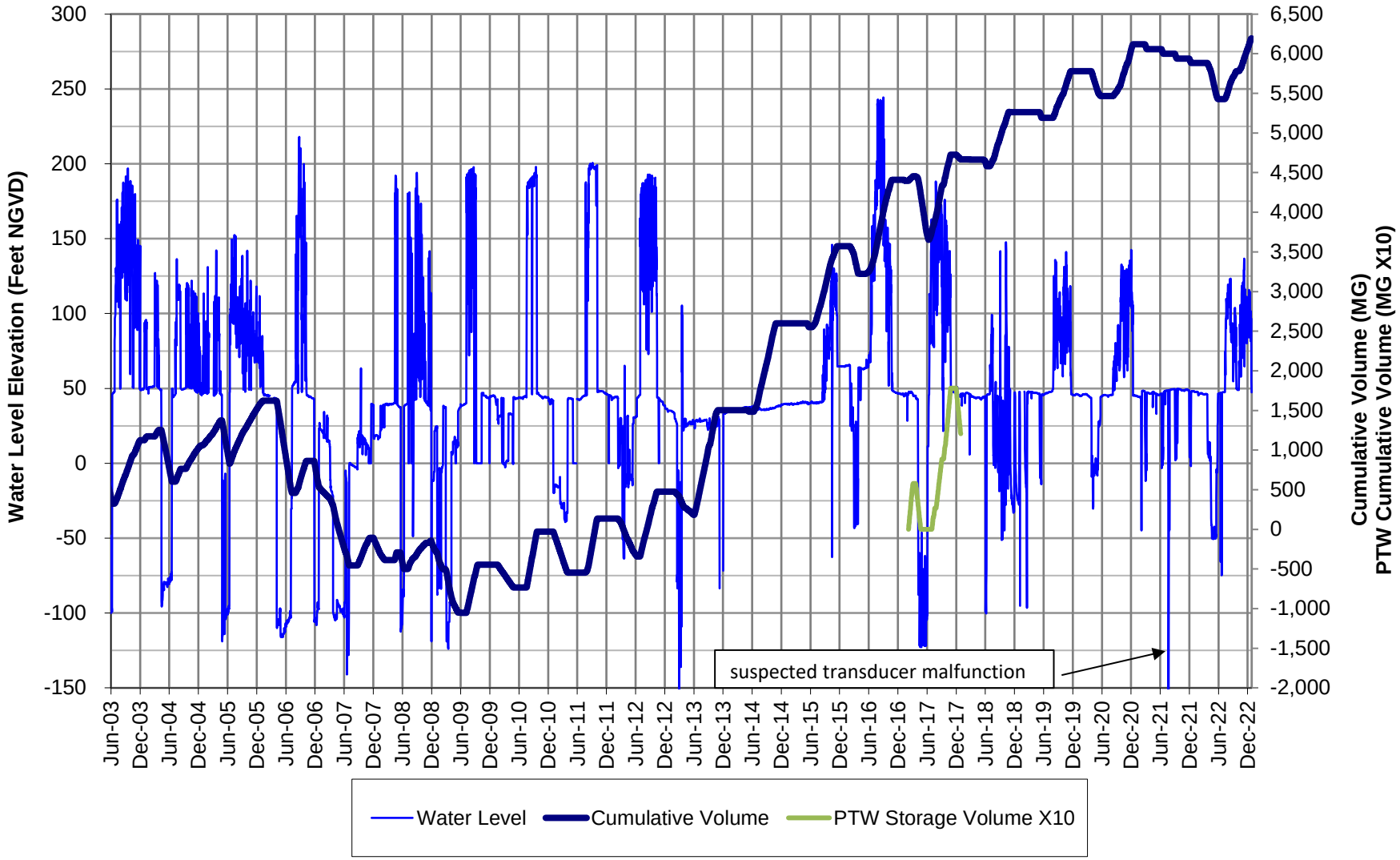


Figure 5-14
WF2 S-12 Water Level Elevation

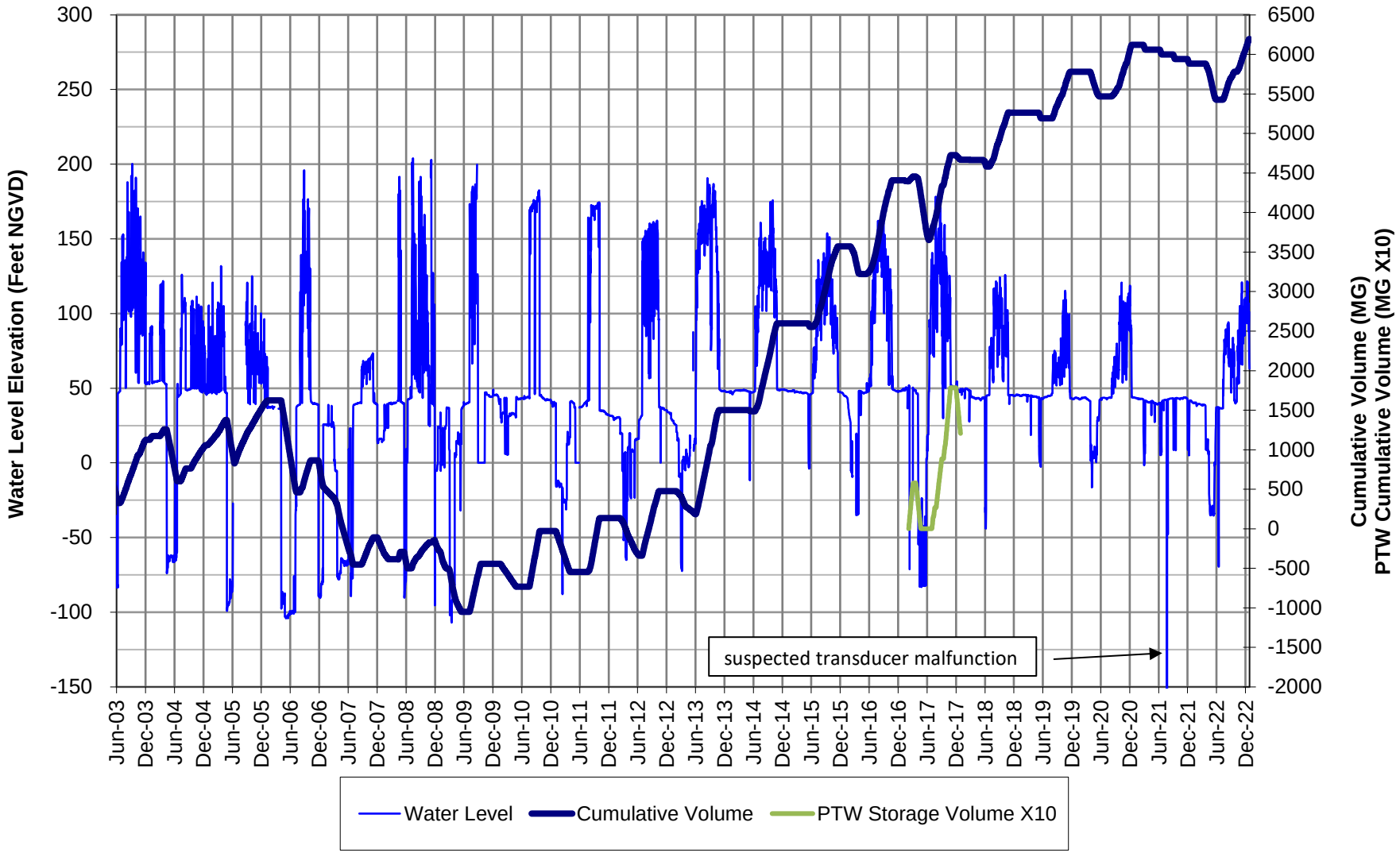


Figure 5-15
WF2 S-13 Water Level Elevation

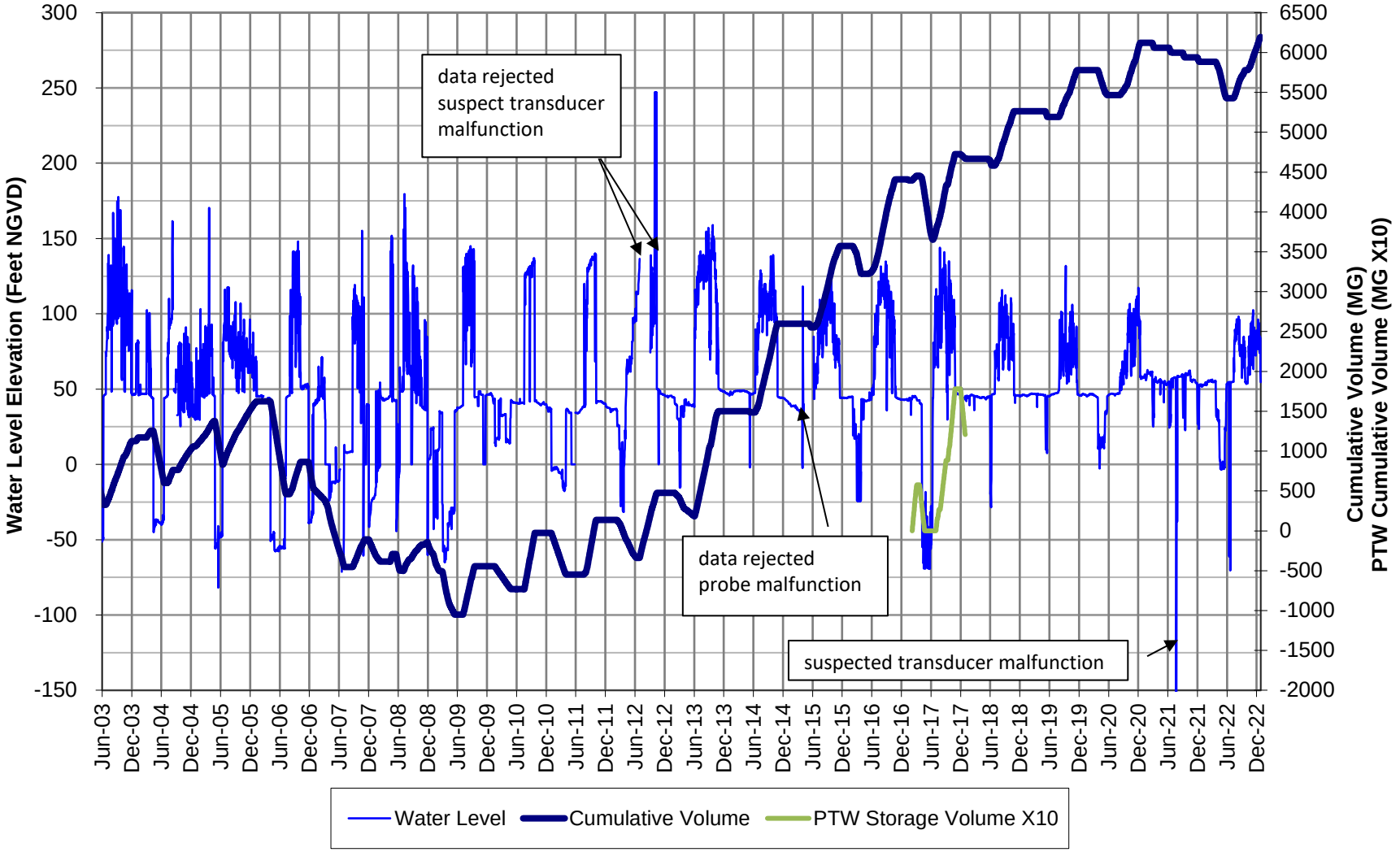


Figure 5-16
WF2 S-14 Water Level Elevation

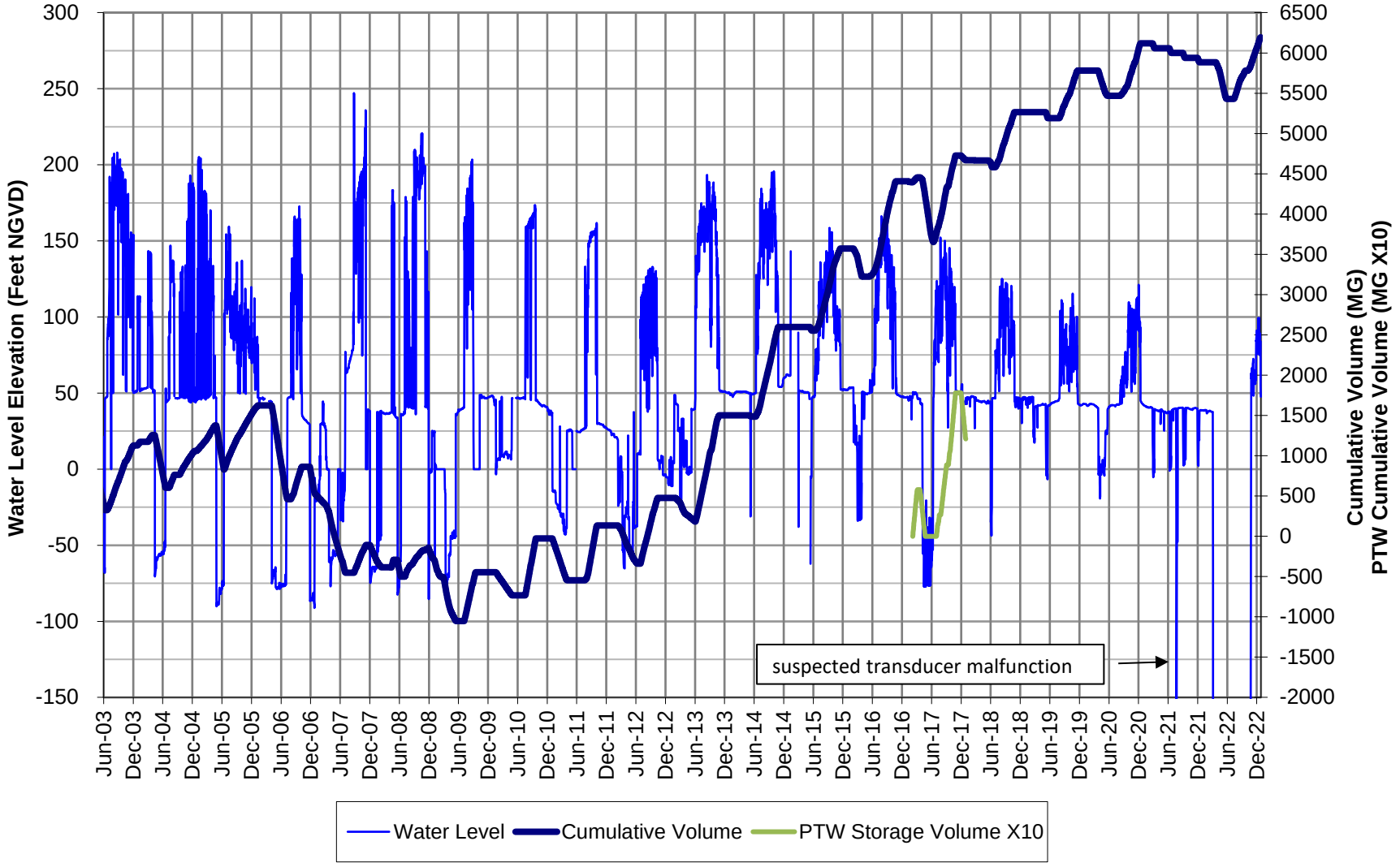


Figure 5-17
WF2 S-15 Water Level Elevation

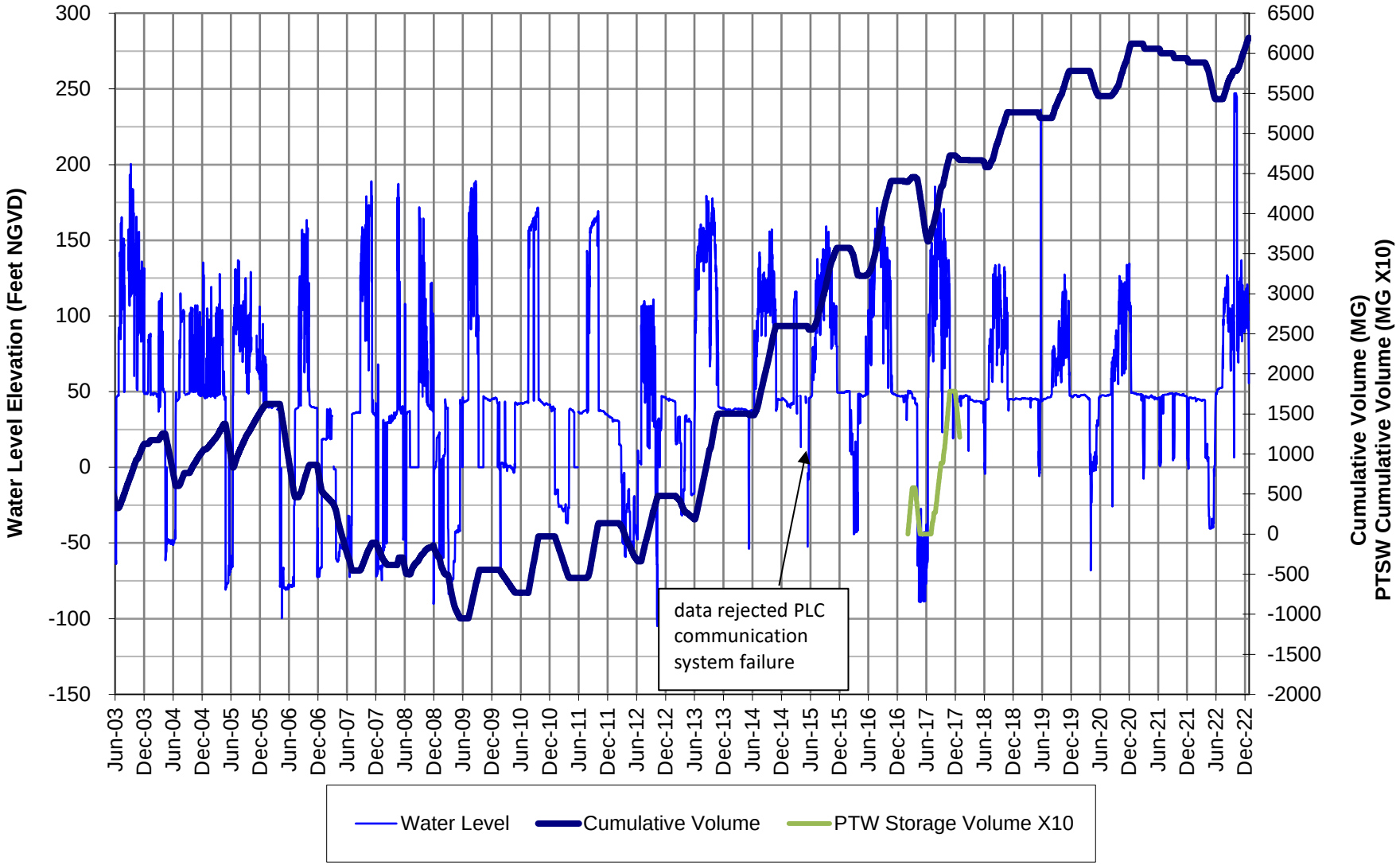


Figure 5-18
WF2 S-16 Water Level Elevation

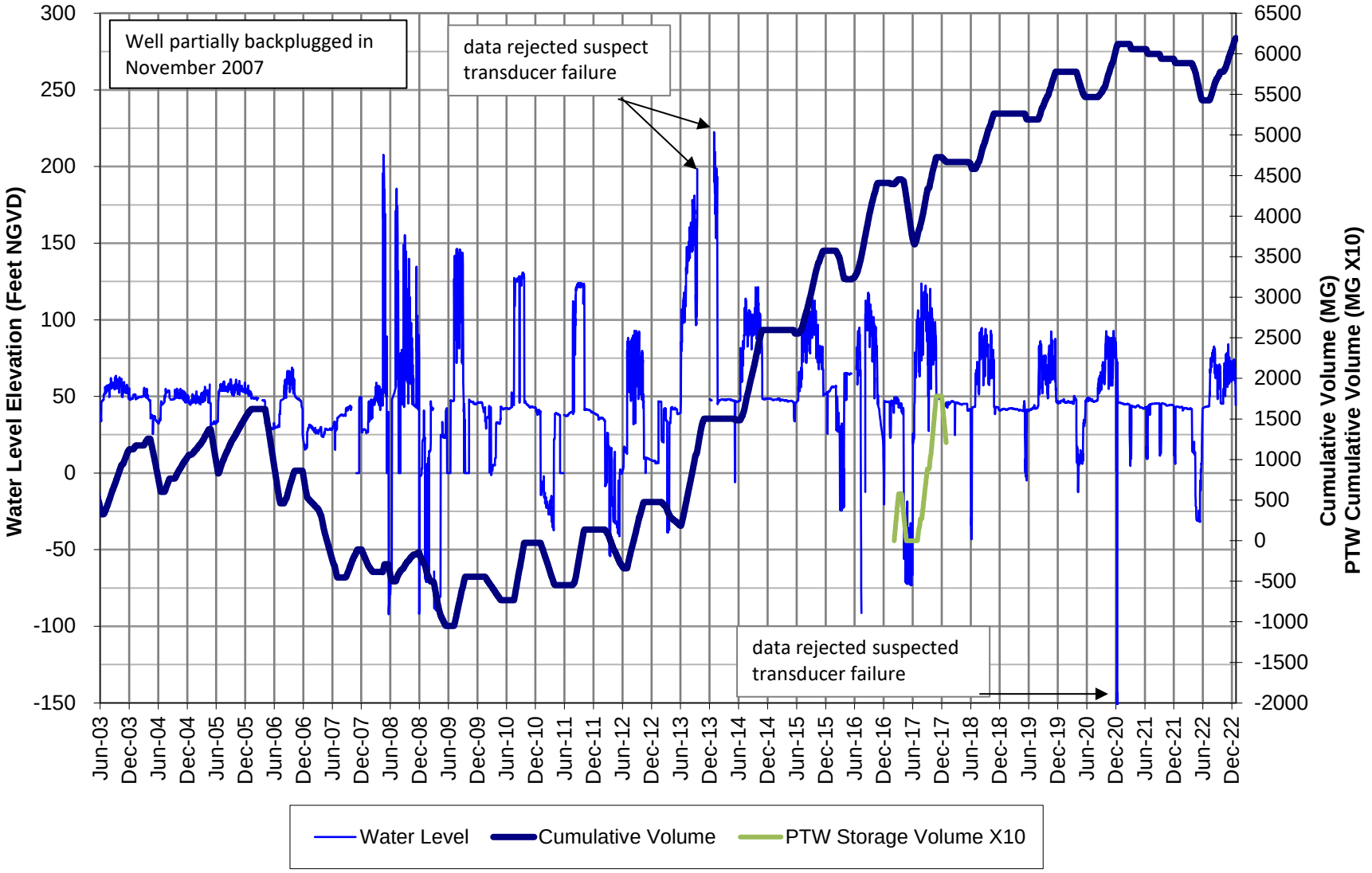


Figure 5-19
WF2 S-17 Water Level Elevation

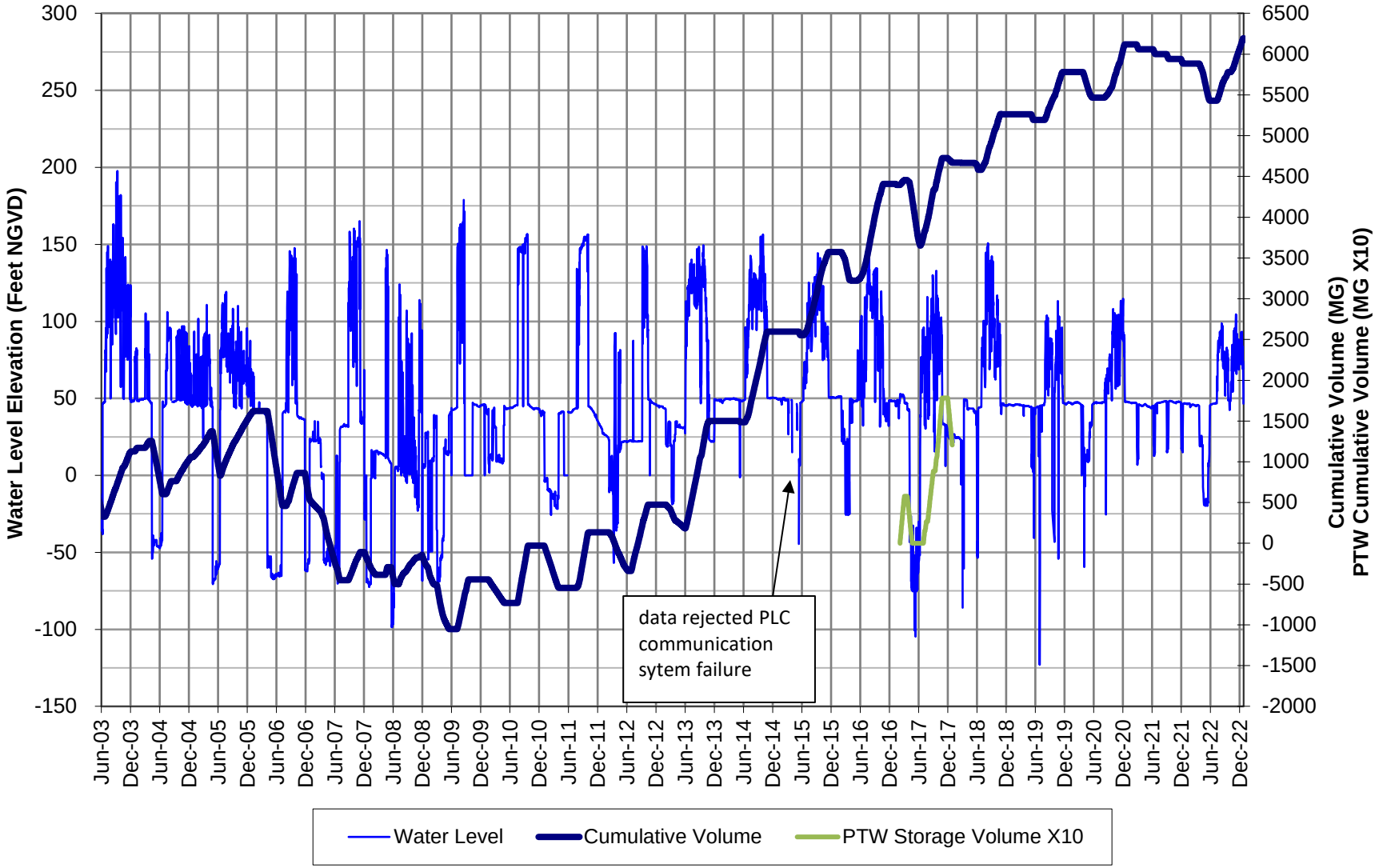


Figure 5-20
WF2 S-18 Water Level Elevation

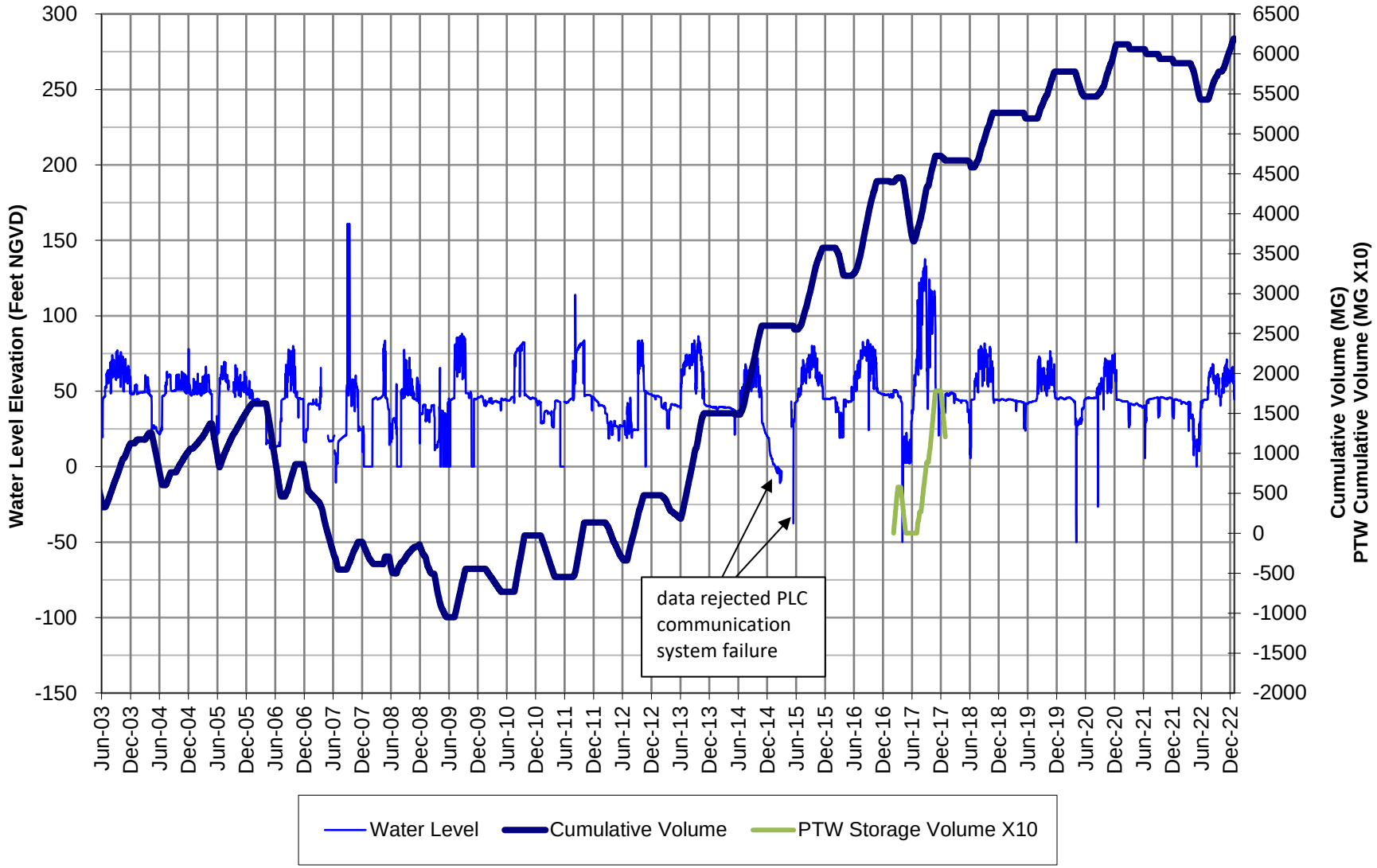


Figure 5-21
WF2 S-19 Water Level Elevation

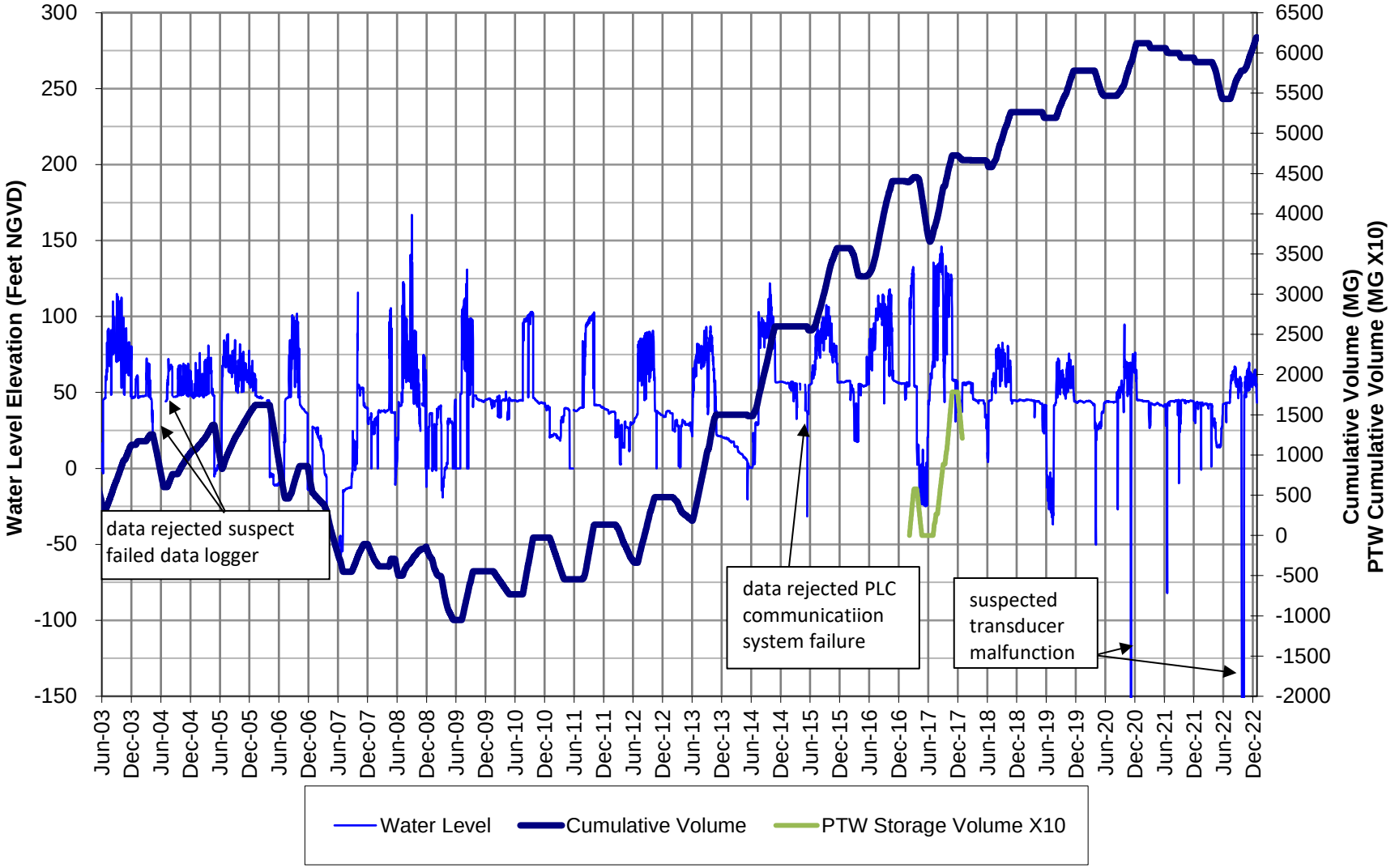


Figure 5-22
WF2 S-20 Water Level Elevation

SECTION 6

Partially Treated Water ASR

The Authority is committed to exploring options to bolster regional water supply system resiliency by increasing water supply capacity, improving water quality, adding supply diversity, increasing system storage for drought tolerance, and reducing operational costs. Sometimes projects are identified that can meet several of these objectives at the same time. Implementing partially treated water (PTW) instead of fully treated potable water as a recharge water source for the ASR system provides for additional storage capability, has expected water quality benefits, and offers a significant decrease in overall delivery costs. Rather than the current ASR operating practice of fully treating stored river water to potable standards twice before distributing treated water to the public (once for injection/recharge to ASR and again after recovery from ASR), the Authority would only need to fully treat raw water once through the PRF. Also, ASR injection is currently limited by treatment capacity, and compulsory maintenance often can take treatment trains out of operation for several months, which can constrain ASR recharge potential. Therefore, the Authority could more opportunistically inject water when it is available from the river since the water would not need to be routed through the PRF first.

The concept of using PTW at this location was first evaluated in a desk top study, *Partially Treated Surface Water ASR Desktop Study* (CH2M and ASRus, March 2016). Based on the findings of that study, a modification to the permit was requested and approved by the Florida Department of Environmental Protection (FDEP) to allow pilot testing at 2 of the 12 ASR wells in WF2 using PTW. PTW is surface water from the Peace River that is stored in the Authority's reservoir system and filtered prior to recharge into the ASR wells. The objectives of the pilot test included evaluating how water quality aspects associated with PTW differ from those associated with potable water ASR and observation of overall well performance with respect to production and recharge capacities.

Two cycles, each consisting of a period of recharge, storage, and recovery, were completed at ASR wells S-4 and S-20 as part of the pilot testing. Cycle Test 1 (CT1) began in February 2017 and included recharging ASR wells S-4 and S-20, with a total of 59 MG of PTW, and storing the water for approximately two weeks. A total of 25.1 MG was then subsequently recovered from these two wells before seasonally dry conditions warranted recovery operation from the other wells in the same wellfield.

Cycle Test 2 (CT2) began in July 2017, recharging a total of 178 MG of PTW, storing the water for approximately 1 month in November 2017, and then recovering approximately 57 MG from the same ASR wells during December 2017 and early January 2018. Unlike CT1, no other wells in the same wellfield were in recovery mode during the entirety of CT2 recovery. During the pilot test, water quality data were collected from the extensive monitoring well network surrounding WF2.

Data from the monitoring wells showed clear indications of arrival of the PTW from water quality indicators such as color, total organic carbon, and total coliform, and subsequent "die-off" or "inactivation" of total coliform reaching the regulatory groundwater standard of 4 colony forming units per 100 milliliters (CFU/100 mL) from a too-numerous-to-count CFU/100 mL in approximately 3 to 4 weeks.

Conclusions of the PTW pilot testing suggest that water quality issues likely can be managed, although a regulatory relief mechanism would be needed to allow for temporary exceedances of total coliform and some secondary drinking water standards on property owned or controlled by the Authority. Despite the positive results of the PTW pilot testing and preponderance of evidence showing the efficacy of pathogen removal in the aquifer, FDEP has indicated that they do not support the use of PTW without disinfection.

In June 2023 a draft permit was issued that includes PTW with disinfection and a requirement for a WQCE for the secondary drinking water standards aluminum, color, and iron. The petition has been drafted but the final order has not yet been signed. FDEP has informed that a WQCE is no longer required for arsenic due to the EPA guidance document (September 27, 2013 letter from EPA to the Department) that authorizes elevated arsenic concentration for ASR systems under certain conditions, the most important related to institutional control. Reference to this guidance was included in the permit to allow the localized exceedances of arsenic to continue.

The Authority is evaluating possible disinfection treatment options for PTW recharge. This, along with appropriate monitoring and management strategies, can be used to demonstrate compliance with drinking water standards.

SECTION 7

Summary and Conclusions

The Authority continued to increase storage volumes in the ASR wellfields through 2020. However, two consecutive recovery events were conducted in 2021 and 2022 at both wellfields with no recharge between the two events. Water quality at the start of the 2022 recovery event generally started at the concentrations observed at the end of the 2021 recovery period. Increasing trends in salinity parameters were observed to be similar to previous events. However due to the large investment of storage in both wellfields a significant volume of water was able to be recovered from both wellfields while maintaining acceptable water quality during the 2022 recovery event. A total of 1.17 BG of water was recovered from the ASR system between the two recovery events in 2021 and 2022 signifying the resiliency the ASR system can provide. Following a recharge event of 876 MG in 2022 the net storage balance of WF1 and WF2 at the end of 2022 was 7.9 BG. It is evident that a significant portion of the water invested in the wellfields will not be recoverable, however the investment will benefit reliability of the source with respect to maintaining acceptable water quality going forward, particularly if a typical seasonal recharge and recovery operating protocol can be maintained.

The Q/s and SI of the ASR wells have remained relatively stable with no significant decreasing trends observed other than at wells S-11 and S-17 in 2007, when the wells were partially back-plugged to address upconing of poor quality water from the Avon Park Formation.

During the 2022 recovery event, arsenic concentrations in the ASR wells were slightly elevated resulting from the consecutive recovery events. At WF1 all the wells remained below 10 µg/L except S-3R and S-5R with a high of 24.6 µg/L recorded at S-3R. The average from all samples during the recovery period was 6.1 µg/L. At WF2 all the wells reached concentrations greater than 10 µg/L except S-16 and S-18. However, the maximum concentration observed was 19.4 µg/L, and the average from all the wells during the recovery period was 10.1 µg/L.

In 2022, all arsenic samples from the WF1 monitoring wells were less than 10 µg/L except M-22 reaching a high of 12.4 µg/L. At the WF2 monitor wells M-11, M-12, M-14, and M-15 had levels over 10 µg/L, the highest recorded at M-11 (19.7 µg/L).

The TDS concentrations observed in the storage zone monitoring wells vary depending on proximity to ASR wells and the mode of operation. Many of the monitoring wells near WF2 have shown a freshening trend correlating to the increased storage volumes in the ASR wells. In 2022, TDS concentrations were comparable with recent trends with some wells showing more pronounced responses to the recovery events in 2021 and 2022. Water quality in the shallower monitoring wells has been consistent, showing neutral water quality trends through 2022, however responses to ASR recovery events in 2021 and 2022 and the recharge event in 2022 were observed in T-11 and T-2.

Water levels in the monitoring wells change in response to ASR operations and seasonal variations in aquifer conditions. In 2022, the water level fluctuations observed in the monitoring wells were within the normal ranges observed in previous years.

A draft permit was issued in June 2023 that includes both finished water and PTW at WF2. A WQCE for secondary drinking water standards aluminum, color, iron has been drafted and a final order is awaiting signatures.

SECTION 8

Recommendations

The following recommendations are offered based on review of the ASR system operational data:

1. **Continue evaluating variables that impact wellfield recovery efficiency.** Limiting the recovery flow rates and stopping recovery once a TDS threshold is reached may limit excessively high TDS concentrations as seen in past recovery events. One of the main factors influencing TDS during recovery is the starting TDS concentration (y-intercept), as found in the yield modeling effort (updated in the 2016 Annual report). By conditioning the aquifer each season and avoiding successive recovery events without recharge, an improved (or stable) recovery curve can be expected during the subsequent recovery period. Data should continue to be collected and evaluated to validate and refine the new model developed in the 2020 Aquifer Storage and Recovery System TDS Yield Update completed in February 2021.
2. **Continue to closely monitor arsenic mobilization.** A WQCE was issued in 2013 to allow arsenic mobilization within property under the control of the Authority. The draft permit for the ASR system does not include a requirement for a WQCE for arsenic. The September 27, 2013 letter from EPA to the Department (that offers an opinion on the regulation of potable ASR systems that observe arsenic mobilization) is presumed to be adequate to support the permitting of the Authority's ASR system since the Authority meets the objective of protecting public health through demonstration of institutional control. Reference to this is included in the new permit.
3. **PTW ASR.** The Authority is pursuing this option as the cost of the infrastructure is anticipated to be relatively low, and the treatment cost required to disinfect the water will be significantly less than the cost of full treatment. PTW does not commit treatment plant capacity for aquifer recharge, potentially deferring future treatment plant expansion. Exceedances of three aesthetic based secondary drinking water standards are being addressed through a WQCE. Opportunities should continue to be monitored for changes in the regulatory environment that may allow for PTW without disinfection so the full benefit of this concept can be realized.
4. **Continue to evaluate water level transducer/data loggers and replace or calibrate as needed.** Data should be evaluated regularly to assure transducer/data loggers are functioning properly.

SECTION 9

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28. **CH2M HILL and ASRus, July 2008.** *Data Analysis for the Peace River Facility ASR System Including Wellfield 2 Cycle Test 6.* Prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

29. **CH2M HILL and ASRus, May 2009.** *Peace River Facility ASR System 2008 Annual Report.* Prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

30. **CH2M HILL and ASRus, October 2009.** *Florida Department of Environmental Protection Class V, Group 7, Injection Well Construction Permit Application Drinking Water Aquifer Storage Recovery at the Avon Park Test Well.* Prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

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35. **CH2M HILL and ASRus, May 2012.** *Peace River Facility ASR System 2011 Annual Report.* Prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

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37. **CH2M HILL and ASRus, January 2013.** *Preliminary Investigation of Brackish Groundwater Development Opportunities at the Peace River Facility - Well Completion Report for the Peace River Exploratory Well.* Prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

38. **CH2M HILL and ASRus, May 2013.** *Peace River Facility ASR System 2012 Annual Report.* Prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

39. **CH2M HILL and ASRus, December 2, 2013.** *Aquifer Storage and Recovery System Yield Study Update 2013.* Technical Memorandum prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

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41. **CH2M HILL and ASRus, August 2014.** *Peace River Facility ASR System 2013 Annual Report.* Prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

42. **CH2M HILL and ASRus, August 2015.** *Peace River Facility ASR System 2014 Annual Report.* Prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

43. **CH2M HILL and ASRus, March 2016.** *Partially Treated Surface Water Desktop Study.* Prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

44. **CH2M HILL and ASRus, August 2016.** *Peace River Facility ASR System 2015 Annual Report.* Prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

45. **CH2M HILL and ASRus, August 2016.** *Florida Department of Environmental Protection Class V, Group 7, Operation Permit Aquifer Storage Recovery – Request for Major Modification to Permit Peace River Regional Water Supply Facility Aquifer Peace River Facility.* Prepared for the Florida Department of Environmental Protection on behalf of the Peace River Manasota Regional Water Supply Authority.

46. **CH2M HILL and ASRus, August 2016.** *Peace River Facility ASR System 2015 Annual Report.* Prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

47. **CH2M HILL and ASRus, August 2017.** *Peace River Facility ASR System 2016 Annual Report.* Prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

48. **CH2M HILL and ASRus, February 2018.** *Florida Department of Environmental Protection Class V, Group 7, Aquifer Storage and Recovery (ASR) Well System Operation Permit Peace River Facility Aquifer Storage and Recovery System.* Prepared for the Florida Department of Environmental Protection on behalf of the Peace River Manasota Regional Water Supply Authority.

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51. **CH2M HILL and ASRus, August 2019.** *Peace River Facility ASR System 2018 Annual Report.* Prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

52. **CH2M HILL and ASRus, August 2020.** *Peace River Facility ASR System 2019 Annual Report.* Prepared for the Peace River/Manasota Regional Water Supply Authority, Bradenton, Florida.

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58. **PR/MRWSA, July 10, 1997.** *ASR Wells S-4 and S-5 Capacity and Water Quality Test Program Final Report – WUP No. 2010420.02.* Prepared for the Southwest Florida Water Management District, Venice, Florida.

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62. **ViroGroup and Boyle Engineering, October 1998.** *Peace River Option – Peace River Facility/ASR Wellfield Expansion. Letter Modification for Relocation of Approved Wells*. Prepared for the Peace River/Manasota Regional Water Supply Authority, Sarasota, Florida.

Appendix A
FDEP Underground Injection Control Permits and Letter from EPA to FDEP

Florida Department of
Environmental Protection
Southwest District Office
13051 North Telecom Parkway
Temple Terrace, Florida 33637-0926

Underground Injection Control
Class V, Group 7
Aquifer Storage and Recovery (ASR) Well System
Operation Permit

Permittee:

Patrick Lehman, P.E.
Executive Director
Peace River/Manasota Regional
Water Supply Authority
9415 Town Center Parkway
Lakewood Ranch, FL 34202
plehman@regionalwater.org

Permit/Certification

PA File Number:	0136595-014-UO/5Q
Facility ID Number:	614-2734
WACS ID:	40593
Date of Issuance:	April 24, 2013
Date of Expiration:	April 23, 2018
Permit Processor:	Rommy Lahera-Aument, P.G.

Facility

Peace River Regional Water Supply Facility
8998 SW County Road 769
Arcadia, FL 34269

Location

County:	DeSoto
Latitude:	27˚05'27.85" N
Longitude:	83˚00' 3.87" W

Project: Class V, Group 7 ASR Wells in Well Field 1: T-1, S-1, S-2, S-6, S-7, S-8, S-3R, S-5R, S-9R
Class V, Group 7 ASR Wells in Well Field 2: S-4, S-10 through S-20

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code (F.A.C.), Chapters 62-4, 62-520, 62-528, and 62-550. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows.

The permittee is reminded of the necessity to comply with the pertinent regulations of any other regulatory agency, as well as any county, municipal, and federal regulations applicable to the project. These regulations may include, but are not limited to, those of the Federal Emergency Management Agency in implementing flood control measures. This permit should not be construed to imply compliance with the rules and regulations of other regulatory agencies.

TO OPERATE: 21 ASR and 24 monitor wells in Well Fields 1 & 2, at a typical flow rate of 0.5 to 1 million gallons per day (MGD) for each ASR well for the storage and recovery of potable water.

IN ACCORDANCE WITH: The Application to Operate DEP Form No. 62-528.900(1) received August 20, 2012 and technical specifications, drawings, plan of study and addenda submitted to this agency.

LOCATION: The Peace River Regional Water Supply Facility is located at 8998 SW County Road 769, Arcadia, DeSoto County, Florida. Well Field 1 is located on the facility or east side of County Road 769, and Well Field 2 is on the reservoir or west side.

The ASR and monitoring wells at this facility are designated as follows:

ASR Wells:

Well Name	*WACS Effluent Test-site ID*	*Total Well Depth*	*Diameter (inches)*	*Interval Type*	*Interval (feet bls)*
T-1		482	12	LPZ	380-482
S-1		920	8	Suwannee Zone	570-920
S-2		900	12	Suwannee Zone	570-900
S-6		910	12	Suwannee Zone	580-910
S-7		915	12	Suwannee Zone	575-915
S-8		623	12	Suwannee Zone	510-623
S-3R		769	16	Suwannee Zone	580-769
S-5R		955	16	Suwannee Zone	650-955
S-9R		800	16	Suwannee Zone	580-800
S-4		905	12	Suwannee zone	570-905
S-10		906	16	Suwannee Zone	620-906
S-11		816	16	Suwannee Zone	585-816
S-12		900	16	Suwannee Zone	600-900
S-13		898	16	Suwannee Zone	621-898
S-14		900	16	Suwannee Zone	586-900
S-15		833	16	Suwannee Zone	583-833
S-16		902	16	Suwannee Zone	583-902
S-17		786	16	Suwannee Zone	579-786
S-18		900	16	Suwannee Zone	592-900
S-19		900	16	Suwannee Zone	585-900
S-20		898	16	Suwannee Zone	566-898

LPZ = lower producing zone of the Intermediate Aquifer system (a.k.a. Tampa Zone)
Suwannee Zone = refers to the Upper Floridan aquifer permeable unit within the Suwannee Limestone Formation

Monitoring Wells:

Well Name	*WACS Monitoring Well Testsite ID*	*Diameter (inches)*	*Interval Type*	*Depth Cased (ft bls)-Total (ft bls)*
E		6	UPZ	140-200
T-2		4	LPZ	393-490
M-2		6	Suwannee Zone	596-900
I-7		6	LPZ	220-261
T-7		6	LPZ	349-400

M-7		6	Suwannee Zone	580-605
M-20		6	Suwannee Zone	584-688
M-21		6	Suwannee Zone	575-672
M-22		6	Suwannee Zone	565-572
T-11		6	LPZ	350-400
M-11		6	Suwannee Zone	570-677
M-12		6	Suwannee zone	585-705
M-13		6	Suwannee Zone	550-670
M-14		6	Suwannee Zone	575-676
M-15		6	Suwannee Zone	570-678
M-16		6	Suwannee Zone	560-673
M-17		6	Suwannee Zone	565-670
M-18		6	Suwannee Zone	575-700
M-19		6	Suwannee Zone	580-680
I-10		6	LPZ	260-320
M-6		6	Suwannee Zone	579-640
I-8		6	UPZ	155-190
T-8		12	LPZ	354-401
M-8		10	Suwannee Zone	570-860

UPZ = upper producing zone of the Intermediate Aquifer System
LPZ = lower producing zone of the Intermediate Aquifer system (a.k.a. Tampa Zone)
Suwannee Zone = refers to the Upper Floridan aquifer permeable unit within the Suwannee Limestone Formation

SUBJECT TO: Specific Conditions I - IV and General Conditions 1- 24.

Specific Conditions

I. OPERATING REQUIREMENTS

A. General

1. Injection of fluids other than those permitted into the ASR well will constitute a violation of this permit and shall constitute cause for permit revocation and possible enforcement action for water quality violation. Only water from the Peace River Regional Water Supply Facility, a surface water drinking water facility, may be injected.

2. No underground injection is allowed that causes or allows movement of fluid into a USDW if such fluid movement may cause a violation of any Primary Drinking Water Standard or may otherwise affect the health of persons unless such activities are specifically authorized by permit or through the Water Quality Criteria Exemption issued for this facility. [62-528.440(2)(c)]

3. All equipment of this facility shall be operated and maintained so as to function consistently as designed in removing pollutants. [62-528.307(3)(b) and 62-528.400(1)

4. In the event a well must be plugged or abandoned, the permittee shall obtain a permit from the Department as required by Chapter 62-528, Florida Administrative Code. When no longer used for their intended purpose, these wells shall be properly plugged and abandoned. Within 180 days of well abandonment, the permittee shall submit to the Department the proposed plugging method, pursuant to Rule 62-528.460, F.A.C. [62-528.460(1) and 62-528.435(6)]

5. In accordance with rules 62-4.090 and 62-528.640(3), F.A.C., the permittee shall submit an application for permit renewal at least 60 days prior to expiration of this permit. [62-528.307(3)(a)]

6. Hurricane Preparedness: Preparations to be made by permittee upon issuance of a "Hurricane Watch" by the National Weather Service include, but are not limited to:
    a. Secure all onsite salt and other stockpiled additive materials to prevent surface and/or ground water contamination.
    b. Properly secure equipment to prevent damage to well(s) and onsite treatment process equipment.

    [62-528.307(3)(b)]

7. This ASR facility shall be operated in conformance with the criteria contained in Water Quality Criteria Exemption OGC File 12-1502.

B. Surface Equipment

1. The integrity of the monitoring zone sampling systems shall be maintained at all times. Sampling lines shall be clearly and unambiguously identified by monitoring zone at the point at which samples are drawn. All reasonable and prudent precautions shall be taken to ensure that samples are properly identified by monitoring zone and that samples obtained are representative of those zones. Sampling lines and equipment shall be kept free of contamination with independent discharges and no interconnections with any other lines. [62-528.307(1)(f) and 62-528.307(3)(b)]

2. The surface equipment for each ASR well shall maintain compliance with Chapter 62-528.450(2)(j), F.A.C. for water hammer control, screening, access for logging and testing, and reliability and flexibility in the event of damage to the well and surface piping. A regular program of exercising the valves integral to the well head shall be instituted. A record shall be maintained at the facility that documents the exercising of the valves. [62-528.307(1)(f) and 62-528.307(3)(b)]

3. The surface equipment and piping for the ASR and monitoring wells shall be kept free of corrosion, to the extent practical, at all times. [62-528.307(1)(f) and 62-528.307(3)(b)]

4. The ASR well pads shall be maintained and retained in service for the life of the ASR wells. The ASR and monitoring well pads are not, unless specific approval is obtained from the Department, to be used for storage of any material or equipment at any time. [62-528.307(1)(f) and 62-528.307(3)(b)]

II. QUALITY ASSURANCE/QUALITY CONTROL

1. The permittee shall ensure that the operation of this ASR well system shall be as described in the application and supporting documents. Any proposed modifications to the permit shall be submitted in writing to the Underground Injection Control Program for review and clearance prior to implementation. Changes of negligible impact to the environment and staff time will be reviewed by the program manager, cleared when appropriate and incorporated into this permit. Changes or modifications other than those described above will require submission of a completed application and appropriate processing fee as per Rule 62-4.050, F.A.C. [62-528.100, 62-4.050]

2. Proper operation and maintenance include effective performance and appropriate quality assurance procedures; adequate operator staffing and training; and adequate laboratory and process controls. [62-528.307(3)(b)]

3. All water quality samples required by this permit shall be collected in accordance with the appropriate Department Standard Operation Procedures (SOP), pursuant to Chapter 62-160, Quality Assurance, Part II, Field Procedures, F.A.C. A certified laboratory shall conduct the analytical work, as provided by Chapter 62-160, Quality Assurance, Part III, Laboratory Certification and Procedures, F.A.C. Department approved test methods shall be utilized, unless otherwise stated in this permit. All calibration procedures for field testing and laboratory equipment shall follow manufacturer's instrumentation manuals and satisfy the requirements of the Department SOPs. A listing of the SOPs pertaining to field and laboratory activities is available at the FDEP website at: **http://www.dep.state.fl.us/water/sas/sop/sops.htm**. [62-4.246, 62-160]

4. All indicating, recording and totalizing devices associated with the ASR well system shall be maintained in good operating condition and calibrated annually at a minimum. United States Environmental Protection Agency (USEPA) laboratory guidelines as expressed in Standard Methods for the Examination of Water and Wastewater. The pressure gauges, flow meter, and chart records shall be calibrated using standard engineering methods. [62-528.307(1)(f) and 62-528.307(3)(b)]

5. All reports submitted to satisfy the requirements of this permit shall be signed by a person authorized under Rule 62-528.340(1), F.A.C., or a duly authorized representative of that person under Rule 62-528.340(2), F.A.C. All reports required by this permit which are submitted to the Department shall contain the following certification as required by Rule 62-528.340(4), F.A.C.:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

[62-528.340(1), (2), and (4)]

6. Analyses shall be conducted on unfiltered samples, unless filtered samples have been previously approved as being more representative of ground water conditions. [62-520.310(5)]

III. TESTING AND REPORTING REQUIREMENTS

A. General

1. The permittee shall submit monthly to the Department the results of all ASR well and monitoring well data required by this permit no later than the last day of the month immediately following the month of record. The report shall include:

    a. A cover page summarizing the current status of all monthly activities, including the certification and signature required in condition II.5.;
    b. Operational and water quality data in a tabular format. Standardized forms for the project may be provided by the Department if deemed necessary;
    c. Laboratory pages and supporting documentation;
    d. The following identifying information (to be provided by the Department) must be included on each data sheet:

        - Facility Name
        - Well Name
        - UIC Permit Number
        - WACS Facility ID
        - WACS Test site ID
        - WACS Test site Name

    The Monthly Operating Report (MOR) shall be submitted *via* direct internet electronic mail (e-mail) to UIC Staff at the South District (david.rhodes@dep.state.fl.us) and Tallahassee Offices (joe.haberfeld@dep.state.fl.us) in Adobe™ (.pdf) format. A compact disc may be sent instead of the e-mail format to the South District (2285 Victoria Avenue, Suite 364, Fort Myers, FL 33902-2549) and the Department of Environmental Protection, UIC Program (Mail Station 3530, 2600 Blair Stone Road, Tallahassee, FL 32399-2400). [62-528.307(3)(d)]

2. An Annual Summary Report shall be submitted to the Department South District and Tallahassee Underground Injection Control Program by September 1 of each year. A single report combining all ASR systems is acceptable. The report shall address and summarize the preceding year of operations (January 1 through December 31) and shall include at a minimum:

    a. All ASR well system monitoring data from the preceding year in both graphic and tabular formats;
    b. A summary of system specific injectivity efficiency;
    c. Proposed changes (if any) to the monitoring program.

    [62-528.307(1)(m)1.]

B. Monitoring

1. The ASR system shall be monitored in accordance with Rules 62-528.425(l)(g) and 62-528.430(2), F.A.C. The following ASR well performance data and monitor zone data shall be recorded and reported in the MOR as indicated below during each recharge, storage and recovery phase. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. [62-528.307(3)(d) and 528.430(2)]

PARAMETER	UNIT	RECORDING FREQUENCY	FREQUENCY OF ANALYSES			
			ASR wells	**M-2,M-15, M -18,M-19, M-21,T-2,T-7,T-11**	M-7, M-8, M-14, M-16, M-22 M-17, M-20	E,I-7,I-8, I-10, T-8,M-6, M-11, M-12,M-13
Flow Rate, max.	gpm	continuous	[a]			
Flow Rate, min.	gpm	continuous	[a]			
Flow Rate, avg.	gpm	continuous	[a]			
Total Volume Recharged	mg	Daily/Monthly				
Total Volume Recovered		Daily/Monthly				
Net Storage	MG	Monthly				
ASR Well Pressure, max.	psi	continuous	[a]			
ASR Well Pressure, min.	psi	continuous	[a]			
ASR Well Pressure, avg.	psi	continuous	[a]			
Water Level, max.[g]	feet (NGVD) / PSI	continuous		[a]	[a]	[a]
Water Level, min.[g]	feet (NGVD) / PSI	continuous		[a]	[a]	[a]
Water Level, avg.[g]	feet (NGVD) / PSI	continuous		[a]	[a]	[a]
pH [b]	std. units	Grab	W[c]	W	M	Q
Specific Conductivity [b]	µmhos/cm	Grab	W[c]	W	M	Q
Temperature [b]	°C	Grab	W[c]	W	M	Q
Dissolved Oxygen [b]	mg/L	Grab	W[c]	W	M	Q
Turbidity [b]	NTU	Grab	W[c]	W	M	Q
Oxidation – Reduction Potential [b]	mV	Grab	W[c]	W	M	Q
Total Dissolved Solids	mg/L	Grab	W[c]	W	M	Q
Chloride	mg/L	Grab	W[c]	W	M	Q
Sulfate	mg/L	Grab	W[c]	W	M	Q
Arsenic	µg/L	Grab	W[c]	W	M	Q
Gross Alpha	pCi/L	Grab	Q	Q	Q	
Total Uranium	µg/L	Grab	Q[e]	Q[e]	Q[e]	
Total Trihalomethanes	mg/L	Grab	A[d]	A	A	
Primary and Secondary stds.		Grab	A[f]			

W – Weekly; M - Monthly; Q - Quarterly; A – Annually.
No Sampling of ASR wells during storage.
[a] - Operational data reporting for flows, pressures and water levels: daily max, min and average from continuous reporting; monthly max, min and average (calculated from daily averages).
[b] – Field samples
[c] – Weekly during recovery from currently operating wells, monthly from common distribution during recharge
[d] – During recovery only
[e] – Analyzed only if Gross Alpha exceeds 15 pci/L
[f] – July (finished water)
[g] – Water Level readings from monitor wells M-11 through M-22 will be manual readings recorded monthly
Bolded wells are compliance wells.

2. During extended storage periods (greater than 30 days) the monitoring well water quality parameters listed above may be sampled and analyzed monthly. [62-528.615(2)]

3. A record shall be included in each MOR that documents the monthly exercising of valves. For each valve, this record shall include the valve identification number (tag), type of valve, date and time when exercised, and the initials of operator(s) performing the work. The record shall be maintained at the facility and shall be available for review by FDEP personnel at all times. [62-528.430(2)(b)2.b.]

4. Pertaining to the evacuation (purging) of monitoring wells, which is required prior to the collection of samples for the MOR, the facility may elect to follow either one of the following two purging protocols:

   a. <u>The protocol stated below</u>:

      A minimum of three well volumes of fluid shall be evacuated from the monitoring systems prior to sampling for the chemical parameters listed above. Sufficient purging shall have occurred when either of the following has occurred:

      1) pH, specific conductance <u>and</u> temperature when sampled, upon purging the third or subsequent well volume, each vary less than 5% from that sampled upon purging the previous well volume; or
      2) Upon purging the fifth well volume.

   b. <u>The following protocol taken from DEP-SOP-001/01(Field Procedures)</u>:

      1) Purge until the water level has stabilized (well recovery rate equals the purge rate), then purge a minimum of one well volume, and then collect the first set of stabilization parameters, namely pH, specific conductance and temperature;
      2) Thereafter, collect stabilization parameters ≥ every ¼ well volume;
      3) Purging shall be complete when either of the following have occurred:

a) 3 consecutive readings of the parameters listed below are within the following ranges[1]:
   - pH ± 0.2 Standard Units
   - Specific Conductance ± 5.0% of reading
   - Temperature ± 0.2°C

b) Upon purging the fifth well volume.

[62-160.210(1) and 62-528.430(2)]

IV. ABNORMAL EVENTS

1. In the event the permittee is temporarily unable to comply with any of the conditions of a permit due to breakdown of equipment, power outages or destruction by hazard of fire, wind, or by other cause, the permittee of the facility shall notify the Southwest District Office. [62-528.415(4)(a)]

2. Notification shall be made in person, by telephone, or by electronic mail (e-mail) within 24 hours of breakdown or malfunction to the Southwest District Office. [62-528.307(1)(x)]

3. A written report of any noncompliance referenced in Specific Condition (1) above shall be submitted to the Southwest District and the Tallahassee offices within five days after its occurrence. The report shall describe the nature and cause of the breakdown or malfunction, the steps being taken or planned to be taken to correct the problem and prevent its reoccurrence, emergency procedures in use pending correction of the problem, and the time when the facility will again be operating in accordance with permit conditions. [62-528.415(4)(b)]

General Conditions

1. The terms, conditions, requirements, limitations and restrictions set forth in this permit are "permit conditions" and are binding and enforceable pursuant to section 403.141, F.S. [62-528.307(1)(a)]

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action. [62-528.307(1)(b)]

3. As provided in subsection 403.087(7), F.S., the issuance of this permit does not convey any vested rights or exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor infringement of federal, state, or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in this permit. [62-528.307(1)(c)]

[1] Provided dissolved oxygen in the groundwater of the zone being monitored is ≤ 20% of saturation for the measured temperature and turbidity is ≤ 20 NTUs. This assumption holds true for groundwater in most zones of the Floridan aquifer.

4. This permit conveys no title to land, water, does not constitute State recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title. [62-528.307(1)(d)]

5. This permit does not relieve the permittee from liability for harm to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties there from; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department. [62-528.307(1)(e)]

6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed and used by the permittee to achieve compliance with the conditions of this permit, or are required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules. [62-528.307(1)(f)]

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at reasonable times, access to the premises where the permitted activity is located or conducted to:

    a. Have access to and copy any records that must be kept under conditions of this permit;
    b. Inspect the facility, equipment, practices, or operations regulated or required under this permit; and
    c. Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.
    d. Reasonable time will depend on the nature of the concern being investigated.

    [62-528.307(1)(g)]

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

    a. A description of and cause of noncompliance; and
    b. The period of noncompliance, including dates and times; or, if not corrected the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent the recurrence of the noncompliance. The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

    [62-528.307(1)(h)]

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except

where such use is proscribed by sections 403.111 and 403.73, F.S. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules. [62-528.307(1)(i)]

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules. [62-528.307(1)(j)]

11. This permit is transferable only upon Department approval in accordance with rules 62-4.120 and 62-528.350, F.A.C. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department. [62-528.307(1)(k)]

12. This permit or a copy thereof shall be kept at the work site of the permitted activity. [62-528.307(1)(l)]

13. The permittee shall comply with the following:

    a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records shall be extended automatically unless the Department determines that the records are no longer required.
    b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.
    c. Records of monitoring information shall include:
        i. the date, exact place, and time of sampling or measurements;
        ii. the person responsible for performing the sampling or measurements;
        iii. the dates analyses were performed;
        iv. the person responsible for performing the analyses;
        v. the analytical techniques or methods used; and
        vi. the results of such analyses.
    d. The permittee shall furnish to the Department, within the time requested in writing, any information which the Department requests to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit.
    e. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

    [62-528.307(1)(m)]

14. All applications, reports, or information required by the Department shall be certified as being true, accurate, and complete. [62-528.307(1)(n)]

15. Reports of compliance or noncompliance with, or any progress reports on, requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each scheduled date. [62-528.307(1)(o)]

16. Any permit noncompliance constitutes a violation of the Safe Drinking Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. [62-528.307(1)(p)]

17. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. [62-528.307(1)(q)]

18. The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit. [62-528.307(1)(r)]

19. This permit may be modified, revoked and reissued, or terminated for cause, as provided in 40 C.F.R. sections 144.39(a), 144.40(a), and 144.41 (1998). The filing of a request by the permittee for a permit modification, revocation or reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition. [62-528.307(1)(s)]

20. The permittee shall retain all records of all monitoring information concerning the nature and composition of injected fluid until five years after completion of any plugging and abandonment procedures specified under rule 62-528.435, F.A.C. The permittee shall deliver the records to the Department office that issued the permit at the conclusion of the retention period unless the permittee elects to continue retention of the records. [62-528.307(1)(t)]

21. All reports and other submittals required to comply with this permit shall be signed by a person authorized under rules 62-528.340(1) or (2), F.A.C. All reports shall contain the certification required in rule 62-528.340(4), F.A.C. [62-528.307(1)(u)]

22. The permittee shall notify the Department as soon as possible of any planned physical alterations or additions to the permitted facility. In addition, prior approval is required for activities described in rule 62-528.410(1)(h). [62-528.307(1)(v)]

23. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or injection activity which may result in noncompliance with permit requirements. [62-528.307(1)(w)]

24. The permittee shall report any noncompliance which may endanger health or the environment including:

    a. Any monitoring or other information which indicates that any contaminant may cause an endangerment to an underground source of drinking water; or
    b. Any noncompliance with a permit condition or malfunction of the injection system which may cause unauthorized fluid migration into or between underground sources of drinking water.

c. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause, the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. [62-528.307(1)(x)]

Issued this 24th day of April, 2013

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Mary E. Yeargan

Mary E. Yeargan, P.G.
District Director
Southwest District Office

FLORIDA DEPARTMENT OF Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Shawn Hamilton
Secretary

Sent Via Electronic Mail

June 8, 2023

In the Matter of an Application for Permit by:

Mike Coates
Director
Peace River Manasota Regional Water Supply Authority
9415 Town Center Parkway
Lakewood Ranch, Florida 34202
MCoates@RegionalWater.org

UIC Permit File: 0136595-018-038-UO/5SR
WACS Facility ID: 40593
County: DeSoto
Class V ASR Injection Well System:
T-1, S-1, S-2, S-6, S-7, S-8, S-3R, S-5R, S-9R, S-4, S-10 through S-20
Operation Permit
Peace River Facility

Notice of Draft Permit

The Department of Environmental Protection (Department) hereby gives notice that a draft permit has been developed for the proposed project as detailed in the application specified above, for the reasons stated below.

The applicant, Peace River Manasota Regional Water Supply Authority, Mike Coates, Director, 9415 Town Center Parkway, Lakewood Ranch, Florida 34202 applied on February 26, 2018 for a permit to operate a Class V ASR injection well system.

The Department has permitting jurisdiction under Chapter 403 of the Florida Statutes (F.S.) and the rules adopted thereunder. The project is not exempt from permitting procedures. The Department has determined that an Underground Injection Control permit is required for the proposed work.

Pursuant to Section 403.815, F.S., and Rule 62-528.315(6)(b) of the Florida Administrative Code, the applicant is required to publish at their own expense the enclosed Notice of Draft Permit. The notice must be published one time only within 30 days in a newspaper of general circulation in the area affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. The applicant shall provide proof of publication to the Tallahassee

Office of the Department within seven (7) days of publication. Failure to publish the notice and provide proof of publication within the allotted time may result in the denial of the permit.

Any interested person may submit written comments on the draft permit within 30 days of the public notice. Written comments may be submitted to the Department of Environmental Protection, Aquifer Protection Program, 2600 Blair Stone Road, MS 3530, Tallahassee, Florida 32399-2400. All comments received within the 30-day period and during the public meeting will be considered by the Department in formulating a final decision concerning this project. If a public meeting is arranged, it must be held in the area of the well no less than 30 days after publication of this notice for the purpose of receiving verbal and written comment concerning this project. If a public meeting is not arranged prior to publication, the notice must provide an opportunity for a public meeting. If a public meeting is later scheduled, there will be another 30-day notice period for that meeting. Please contact James Dodson, Professional Geologist II at 850-245-8653 for additional information.

Executing and Clerking:
Executed in Tallahassee, Florida
State of Florida Department of Environmental Protection

Cindy Fischler

Cindy Fischler, P.G.
Environmental Administrator
Aquifer Protection Program
Division of Water Resource Management

Certificate of Service

The undersigned duly designated clerk hereby certifies that this Notice of Draft Permit and all copies were sent on the filing date June 8, 2023, to the following listed persons:

Cindy Fischler, DEP/TLH, Cindy.Fischler@FloridaDEP.gov
Annette Solveigh, DEP/TLH, Annette.Solveigh@FloridaDEP.gov
James Dodson, DEP/TLH, James.Dodson@FloridaDEP.gov
Richard Lobinske, DEP/TLH, Richard.Lobinske@FloridaDEP.gov
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Ryan Messer, PE, HDR, Ryan.Messer@HDRInc.com
Mark McNeal, PG, ASRus, MMcNeal@ASRus.net
Joe Haberfeld, PG, ASRus, JHaberfeld@ASRus.net
Jason Meadows, USEPA/ATL, Meadows.JasonB@EPA.gov

Filing and Acknowledgment

Filed, on this date, pursuant to Section.120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Andrew Baker
Clerk

06/08/2023
Date

State of Florida
Department of Environmental Protection

Notice of Draft Permit

The Department of Environmental Protection hereby provides notice that it has prepared the draft permit for the proposed project as detailed in the application, subject to the conditions specified in the draft permit and summarized below. The applicant, Peace River Manasota Regional Water Supply Authority, Mike Coates, Director, 9415 Town Center Parkway, Lakewood Ranch, Florida 34202 applied on February 26, 2018, for a permit to operate a Class V ASR injection well system. The project is located at the Peace River Facility, 8998 Southwest County Road 769, Arcadia, Florida 34269, in DeSoto County (File No. 0136595-018-038-UO/5SR, WACS ID No. 40593).

The facility will operate twenty-one (21) Class V Aquifer Storage and Recovery (ASR) wells (T-1, S-1, S-2, S-6, S-7, S-8, S-3R, S-5R, S-9R, S-4, S-10 through S-20) and 25 monitor wells (E, T-2, M-2, I-7, T-7, M-7, M-20, M-21, M-22, AP-1, T-11, M-11 through M-19, I-10, M-6, I-8, T-8, and M-8) for the storage and recovery of potable water and partially treated surface water (PTSW) from the Peace River ASR Facility. The PTSW system will treat surface water from Reservoir No. 1 and will include a new pump station, pressurized course media filtration, and side stream chloramine disinfection system. Wellfield 1 is authorized to only receive potable water. The PTSW system will serve to recharge only the ASR wells within Wellfield 2. Wellfield 2 is also authorized to continue to receive potable water. No injection of PTSW is authorized until the PTSW system is operational and required water quality criteria exemptions are in effect. The maximum injection rate for ASR wells shall be 1.25 million gallons per day per ASR well. Each ASR well is constructed with an 8, 12 or 16-inch diameter casing set to a depth ranging from 380 to 650 feet below land surface (bls) with a cemented annulus, and with total depths ranging from 482 to 955 feet bls. The single-zone monitor wells are completed in the ASR production zones with monitor intervals in the lower producing zone of the Intermediate aquifer ranging from 260 to 482 feet bls and the Suwannee Limestone with a monitor interval ranging from 550 to 900 feet bls, in the Avon Park Formation with a monitor interval ranging from 1,300 to 1,479 feet bls, and in the upper producing zone of the Intermediate aquifer ranging from 140 to 200 feet bls. The plugging and abandonment of monitor wells I-10, E, and M-22 is authorized through this permit.

The Department has permitting jurisdiction under Chapter 403 of the Florida Statutes (F.S.) and the rules adopted thereunder. The project is not exempt from permitting procedures. The Department has determined that an Underground Injection Control permit is required for the proposed work.

Any interested person may submit written comments on the draft permit and may request a public meeting within 30 days after publication of this public notice. A request for a public meeting shall be submitted in writing and shall state the nature of the issues proposed to be raised in the meeting. If a public meeting is later scheduled, there will be another 30-day notice period for that meeting. Written comments or a public meeting

request shall be submitted to the Department of Environmental Protection, Aquifer Protection Program, 2600 Blair Stone Road, MS 3530, Tallahassee, Florida 32399-2400, which is the office processing this permit application. All comments received within the 30-day period will be considered in formulation of the Department's final decision regarding permit issuance.

The files associated with this order are available for public inspection during normal business hours, 8 a.m. to 5 p.m., Monday through Friday, except state holidays, at the Department of Environmental Protection, South District, and at the Department of Environmental Protection, 2600 Blair Stone Road, Tallahassee, FL 32399-2400. Any additional information concerning this project may be obtained by contacting James Dodson, Professional Geologist II, at 850-245-8653.

FLORIDA DEPARTMENT OF Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Shawn Hamilton
Secretary

Underground Injection Control
Class V, Group 7, Aquifer Storage and Recovery Well System
Operation Permit

Permittee

Mike Coates
Director
Peace River Manasota Regional
Water Supply Authority
9415 Town Center Parkway
Lakewood Ranch, Florida 34202
MCoates@RegionalWater.org

Permit/Certification

UIC Permit Number: 0136595-018-038-UO/5SR
WACS Facility ID: 40593
Date of Issuance: Draft
Date of Expiration: Draft
Permit Processor: James Dodson

Facility

Peace River Facility
8998 Southwest County Road 769
Arcadia, Florida 34269

Location

County: DeSoto
Latitude: 27° 05' 00.1" N
Longitude: 82° 01' 03.3" W

Project: Class V ASR Injection Well system T-1, S-1, S-2, S-6, S-7, S-8, S-3R, S-5R, S-9R, S-4, S-10 through S-20

This permit is issued under the provisions of Chapter 403, Florida Statutes (F.S.), and the rules adopted thereunder, particularly Chapter 62-528, Florida Administrative Code (F.A.C.). The above-named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents attached hereto or on file with the Department of Environmental Protection (Department) and made a part hereof and specifically described as follows.

To Operate: Twenty-one (21), Class V aquifer storage and recovery (ASR) wells (T-1, S-1, S-2, S-6, S-7, S-8, S-3R, S-5R, S-9R, S-4, S-10 through S-20) and twenty-five (25) monitor wells (E, T-2, M-2, I-7, T-7, M-7, M-20, M-21, M-22, AP-1, T-11, M-11 through M-19, I-10, M-6, I-8, T-8, and M-8) for the storage and recovery of potable water and partially treated surface water (PTSW) from the Peace River ASR Facility. The PTSW system will treat surface water from Reservoir No. 1 and will include a new pump station, pressurized course media filtration, and side stream chloramine disinfection system. Wellfield 1 is authorized to only receive potable water. The PTSW system will

serve to recharge only the ASR wells within Wellfield 2. Wellfield 2 is also authorized to continue to receive potable water. No injection of PTSW is authorized until the PTSW system is operational and required water quality criteria exemptions are in effect. The maximum injection rate for ASR wells shall be 1.25 million gallons per day (mgd) per ASR well. Each ASR well is constructed with an 8, 12 or 16-inch diameter casing set to a depth ranging from 380 to 650 feet below land surface (bls) with a cemented annulus, and with total depths ranging from 482 to 955 feet bls. The single-zone monitor wells are completed in the ASR production zones with monitor intervals in the lower producing zone of the Intermediate aquifer ranging from 260 to 482 feet bls and the Suwannee Limestone with a monitor interval ranging from 550 to 900 feet bls, in the Avon Park Formation with a monitor interval ranging from 1,300 to 1,479 feet bls, and in the upper producing zone of the Intermediate aquifer ranging from 140 to 200 feet bls. The plugging and abandonment of monitor wells I-10, E, and M-22 is authorized through this permit.

In Accordance With: The Application to Operate DEP Form No. 62-528.900(1) received February 26, 2018, response to the Department's request for additional information dated September 28, 2018, and supporting information submitted to the Aquifer Protection Program (APP) Tallahassee office.

Location: Peace River Facility, 8998 Southwest County Road 769, Arcadia, Florida 34269, in DeSoto County.

The injection and monitor wells, as designated below by well name and Water Assurance Compliance System (WACS) testsite identification (ID), and construction details at this facility are designated as follows:

Injection Wells (IWs)

Well Name	WACS Testsite ID	Well Depth (Feet bls)	Casing Diameter (Inches[3])	Casing Thickness (Inches)	Casing or Tubing Type	Casing Depth or Interval (Feet bls)
T-1[1] 0136595-018-UO/5SR	9125	482	12	0.375	Steel	380
			Open Hole			380-482
S-1[1] 0136595-019-UO/5SR	9126	920	8	0.375	Steel	570
			Open Hole			570-920
S-2[1] 0136595-020-UO/5SR	9127	900	12	0.375	Steel	570
			Open Hole			570-900
S-6[1] 0136595-021-UO/5SR	9128	910	12	0.375	Steel	580
			Open Hole			580-910
S-7[1] 0136595-022-UO/5SR	9129	915	12	0.375	Steel	575
			Open Hole			575-915

S-8[1] 0136595-023-UO/5SR	9130	623	12	0.375	Steel	510
			Open Hole			510-623
S-3R[1] 0136595-024-UO/5SR	9131	769	16	0.375	Steel	580
			Open Hole			580-769
S-5R[1] 0136595-025-UO/5SR	9132	955	16	0.375	Steel	650
			Open Hole			650-955
S-9R[1] 0136595-026-UO/5SR	9133	800	16	0.375	Steel	580
			Open Hole			580-800
S-4[2] 0136595-027-UO/5SR	9145	905	12	0.375	Steel	570
			Open Hole			570-905
S-10[2] 0136595-028-UO/5SR	9134	906	32	0.375	Steel	60
			26	0.375	Steel	250
			17.4	SDR17[4]	PVC[5]	620
			Open Hole			620-906
S-11[2] 0136595-029-UO/5SR	9135	816	32	0.375	Steel	60
			26	0.375	Steel	245
			17.4	SDR17[4]	PVC[5]	585
			Open Hole			585-816
S-12[2] 0136595-030-UO/5SR	9136	900	32	0.375	Steel	60
			26	0.375	Steel	246
			17.4	SDR17[4]	PVC[5]	600
			Open Hole			600-900
S-13[2] 0136595-031-UO/5SR	9137	898	32	0.375	Steel	57
			26	0.375	Steel	245
			17.4	SDR17[4]	PVC[5]	621
			Open Hole			621-898
S-14[2] 0136595-032-UO/5SR	9138	900	32	0.375	Steel	40
			26	0.375	Steel	253
			17.4	SDR17[4]	PVC[5]	568
			Open Hole			568-900
S-15[2] 0136595-033-UO/5SR	9139	833	32	0.375	Steel	60
			26	0.375	Steel	256
			17.4	SDR17[4]	PVC[5]	583
			Open Hole			583-833
S-16[2] 0136595-034-UO/5SR	9140	902	32	0.375	Steel	60
			26	0.375	Steel	251
			17.4	SDR17[4]	PVC[5]	583
			Open Hole			583-902

S-17[2] 0136595-035-UO/5SR	9141	786	32	0.375	Steel	60
			26	0.375	Steel	250
			17.4	SDR17[4]	PVC[5]	579
			Open Hole			579-786
S-18[2] 0136595-036-UO/5SR	9142	900	32	0.375	Steel	60
			26	0.375	Steel	251
			17.4	SDR17[4]	PVC[5]	592
			Open Hole			592-900
S-19[2] 0136595-037-UO/5SR	9143	900	32	0.375	Steel	60
			26	0.375	Steel	257
			17.4	SDR17[4]	PVC[5]	585
			Open Hole			585-900
S-20[2] 0136595-038-UO/5SR	9144	898	32	0.375	Steel	57
			26	0.375	Steel	257
			17.4	SDR17[4]	PVC[5]	566
			Open Hole			566-898

ASR Well Notes: [1]Wellfield 1, [2]Wellfield 2, [3]Outside diameter, [4]Standard Dimensional Ratio (SDR), [5]Polyvinyl chloride (PVC) Constructed with new, unused steel or PVC with a cemented annulus.

Monitor Wells (MWs)

Well Name	WACS Testsite ID	Monitor Zone	Casing Diameter (Inches[4])	Casing Thickness (Inches)	Casing Type	Casing Depth (Feet bls)	Monitoring Depth (Feet bls)
E	00212	UPZ[1]	6	SDR17	PVC	140	
			Open				140-200
T-2	00211	LPZ[2]	4	SDR17	PVC	393	
			Open				393-490
M-2	00236	Suwannee[3]	6	SDR17	PVC	596	
			Open				596-900
I-7	19546	LPZ[2]	14	0.375	Steel	42	
			6		PVC	220	
			Open				220-261
T-7	19547	LPZ[2]	14	0.25	Steel	62	
			6.9	SDR17	PVC	349	
			Open				349-400
M-7	19548	Suwannee[3]	14	0.375	Steel	63	
			6	SDR17	PVC	580	
			Open				580-605

M-20	21783	Suwannee[3]	20	0.375	Steel	66	
			14	0.375	Steel	250	
			6	SDR17	PVC	584	
			Open				584-688
M-21	21784	Suwannee[3]	20	0.375	Steel	50	
			14	0.375	Steel	250	
			6	SDR17	PVC	575	
			Open				575-672
M-22	21785	Suwannee[3]	20	0.375	Steel	64	
			14	0.375	Steel	252	
			12	SDR17	PVC	565	
			Open				565-572
AP-1	30104	Avon Park[4]	30	0.375	Steel	550	
			20	0.375	Steel	950	
			12		Steel	1,300	
			Open				1,300-1,479
T-11	21772	LPZ[2]	14		Steel	63	
			6	SDR17	PVC	350	
			Open				350-400
M-11	21774	Suwannee[3]	20		Steel	64	
			14		Steel	253	
			6	SDR17	PVC	570	
			Open				570-677
M-12	21775	Suwannee[3]	20		Steel	65	
			14		Steel	250	
			6	SDR17	PVC	585	
			Open				585-705
M-13	21776	Suwannee[3]	20		Steel	63	
			14		Steel	253	
			6	SDR17	PVC	550	
			Open				550-670
M-14	21777	Suwannee[3]	20		Steel	63	
			14		Steel	250	
			6	SDR17	PVC	575	
			Open				575-676
M-15	21778	Suwannee[3]	20		Steel	63	
			14		Steel	250	
			6	SDR17	PVC	570	
			Open				570-678

M-16	21779	Suwannee[3]	20	0.25	Steel	63	
			14	0.25	Steel	250	
			6	SDR17	PVC	560	
			Open				560-673
M-17	21780	Suwannee[3]	20	0.25	Steel	63	
			14	0.25	Steel	250	
			6	SDR17	PVC	565	
			Open				565-670
M-18	21781	Suwannee[3]	20	0.25	Steel	59	
			14	0.25	Steel	250	
			6	SDR17	PVC	575	
			Open				575-700
M-19	21782	Suwannee[3]	20	0.25	Steel	52	
			14	0.25	Steel	249	
			6	SDR17	PVC	580	
			Open				580-680
I-10	19552	LPZ[2]	14	0.25	Steel	40	
			6	SDR17	PVC	260	
			Open				260-320
M-6	19545	Suwannee[3]	14	0.25	Steel	63	
			6	SDR17	PVC	579	
			Open				579-640
I-8	19549	UPZ[1]	14	0.25	Steel	61	
			6	SDR17	PVC	155	
			Open				155-190
T-8	19550	LPZ[2]	14	0.25	Steel	61	
			6	SDR17	PVC	354	
			Open				354-401
M-8	19544	Suwannee[3]	20	0.375	Steel	100	
			12	0.375	Steel	570	
			Open				570-860

Monitor Well Notes: Constructed with new, unused steel and PVC and cemented to land surface. [1]Upper Production Zone (UPZ) of the Intermediate aquifer system, [2]Lower Production Zone (LPZ) of the Intermediate aquifer system, [3]Upper Floridan aquifer permeable unit within the Suwannee Limestone (Suwannee), [4]Avon Park Formation (Avon Park). [5]Outside diameter.

Subject To: Specific Conditions I-VII and General Conditions 1-24.

Specific Conditions

I. Operating Requirements

A. General

1. Only injectate as described in this permit and purge water from the on-site monitor wells (associated with the injection well system) may be discharged into the aquifer storage & recovery (ASR) wells. *[62-528.610(1) and (3), F.A.C.]*
2. No underground injection is allowed that causes or allows movement of fluid into an underground source of drinking water if such fluid movement may cause a violation of any Primary Drinking Water Standard or may otherwise affect the health of persons. [62-528.440(2)(c), F.A.C.]
3. All equipment of this facility shall be operated and maintained so as to function consistently as designed in removing pollutants. *[62-528.307(3)(b) and 62-528.400(1), F.A.C.]*
4. In the event a well must be plugged or abandoned, the permittee shall obtain a permit from the Department as required by Chapter 62-528, F.A.C. When no longer used for their intended purpose, these wells shall be properly plugged and abandoned. Within 180 days of well abandonment, the permittee shall submit to the Department the proposed plugging method, pursuant to Rule 62-528.460, F.A.C. *[62-528.460(1) and 62-528.435(6), F.A.C.]*
5. In accordance with rules 62-4.090 and 62-528.455(3)(a), F.A.C., the permittee shall submit an application for permit renewal at least 60 days prior to expiration of this permit. *[62-528.307(3)(a), F.A.C.]*
6. Hurricane Preparedness: Preparations to be made by permittee upon issuance of a "Hurricane Watch" by the National Weather Service include, but are not limited to:
   a. Secure all onsite salt and other stockpiled additive materials to prevent surface and/or ground water contamination.
   b. Properly secure equipment to prevent damage to well(s) and onsite treatment process equipment.

   [62-528.307(1)(f), F.A.C.]

B. Surface Equipment

1. The integrity of the monitoring zone sampling systems shall be maintained at all times. Sampling lines shall be clearly and unambiguously identified by monitoring zone at the point at which samples are drawn. All reasonable and prudent precautions shall be taken to ensure that samples are properly identified by monitoring zone and that samples obtained are representative of those zones. Sampling lines and equipment shall be kept free of contamination with independent discharges and no interconnections with any other lines. *[62-528.307(1)(f) and 62-528.307(3)(b), F.A.C.]*

2. The surface equipment for each ASR well disposing of domestic (municipal) effluent shall maintain compliance with Rule 62-600.540(5), F.A.C., for water hammer control, screening, access for logging and testing, and reliability and flexibility in the event of damage to the well and effluent piping. *[62-600.540(5), 62-528.307(1)(f), and 62-528.307(2)(b), F.A.C.]*
3. ASR wells not disposing of domestic (municipal) effluent shall maintain compliance with Rule 62-528.450(2)(j), F.A.C. for water hammer control, as well as access for logging and testing, and reliability and flexibility in the event of damage to the well and effluent piping. *[62-528.450(2)(j), 62-528.307(1)(f), and 62-528.307(3)(b), F.A.C.]*
4. The surface equipment and piping for the ASR and monitor wells shall be kept free of corrosion at all times. *[62-528.307(1)(f) and 62-528.307(3)(b), F.A.C.]*
5. Spillage onto the ASR well pad(s) during construction activities, and any waters spilled during mechanical integrity testing, other maintenance, testing or repairs to the system(s) shall be contained on the pad(s) and directed to a sump which in turn discharges to the pumping station wet well or via other approved means to the ASR well system(s). *[62-528.307(1)(f) and 62-528.307(3)(b), F.A.C.]*
6. The ASR well pads are not, unless specific approval is obtained from the Department, to be used for storage of any material or equipment at any time. *[62-528.307(1)(f) and 62-528.307(3)(b), F.A.C.]*
7. The surficial aquifer monitor wells adjacent to the ASR and monitor well pads shall be secured, maintained, and retained in service for subsequent sampling that may be needed (i.e., should there be an accidental discharge to the surficial aquifer); alternatively, the facility may submit a request to the Department for cessation of sampling followed by capping, or plugging and abandonment of these wells. *[62-528.307(3)(b) and 62-520.600(6)(k), F.A.C.]*

II. Quality Assurance/Quality Control

1. The permittee shall ensure that the operation of this ASR well system shall be as described in the application and supporting documents. Any proposed modifications to the permit shall be submitted in writing to the Underground Injection Control Program for review and clearance prior to implementation. Changes of negligible impact to the environment and staff time will be reviewed by the program manager, cleared when appropriate and incorporated into this permit. Changes or modifications other than those described above will require submission of a completed application and appropriate processing fee as per Rule 62-4.050, F.A.C. *[62-4.050, F.A.C.]*

2. Proper operation and maintenance include effective performance and appropriate quality assurance procedures; adequate operator staffing and training; and adequate laboratory and process controls. *[62-528.307(3)(b), F.A.C.]*

3. All water quality samples required by this permit shall be collected in accordance with the appropriate Department Standard Operation Procedures (SOP), pursuant to Rule 62-160.210, F.A.C., *Approved Field Procedures*. A certified laboratory shall conduct the analytical work, as provided by Rule 62-160.300, F.A.C., *Laboratory Certification*. Department approved test methods shall be utilized, unless otherwise stated in this permit. All calibration procedures for field testing and laboratory equipment shall follow manufacturer's instrumentation manuals and satisfy the requirements of the Department SOPs. A listing of the SOPs pertaining to field and laboratory activities is available at the Department website at: https://floridadep.gov/dear/quality-assurance/content/dep-sops. *[62-4.246, 62-160, F.A.C.]*

4. All indicating, recording and totalizing devices associated with the ASR well system shall be maintained in good operating condition and calibrated annually at a minimum. The pressure gauges, flow meter, and chart records shall be calibrated using standard engineering methods. *[62-528.307(1)(f) and 62-528.307(3)(b), F.A.C.]*

5. All reports submitted to satisfy the requirements of this permit shall be signed by a person authorized under Rule 62-528.340(1), F.A.C., or a duly authorized representative of that person under Rule 62-528.340(2), F.A.C. All reports required by this permit which are submitted to the APP Tallahassee office shall contain the following certification as required by Rule 62-528.340(4), F.A.C.:

   > I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.
   > *[62-528.340(1), (2), and (4), F.A.C.]*

6. Analyses shall be conducted on unfiltered samples, unless filtered samples have been approved by the Department as being more representative of ground water conditions. *[62-520.310(5), F.A.C.]*

7. An operation and maintenance manual, including a description of surge and water hammer control and procedures to cease recharge if sampling results of

recharge water show it does not meet the water quality applicable to the ASR zone, shall be submitted to the Department within 60 days of the issuance of this permit. This requirement does not apply if an operation and maintenance manual was previously submitted to the Department.

III. Protection of the Underground Source of Drinking Water (USDW) for ASR Wells Used by Public Water Systems

1. The mobilization of arsenic at ASR facilities serving public water systems is addressed by the September 27, 2013 letter from the U.S. Environmental Protection Agency to the Department. The letter addresses the permitting of these ASR facilities when increases of arsenic concentration greater than the maximum contaminant level (MCL) in the USDW result from geochemical reactions in the aquifer. The Authority has the capability to re-treat all recovered water at the water treatment plant as necessary to meet drinking water standards prior to distribution. In addition, an institutional control is in place in the form of land ownership and perpetual easements between the permittee and the Southwest Florida Water Management District (SWFWMD; see below).
2. The ASR wells are located on land owned by the permittee, Peace River Manasota Regional Water Supply Authority (Authority) and land owned by SWFWMD. The permittee holds perpetual easements over all SWFWMD land at this site (approximately 6,000 acres), which convey the right for the permittee to utilize such properties for water supply related purposes and confers land management responsibilities to the Authority. Since the installation of water wells on the subject properties by parties other than the permittee could be inconsistent with the Authority's current and planned use of the properties, the placement of water wells by parties other than the Authority anywhere on the owned or easement-controlled property is prohibited unless such wells are approved by the Authority and the State of Florida.
3. No injection of PTSW is authorized until the PTSW system is operational and the required water quality criteria exemptions are in effect. Recharge with PTSW under this permit shall not commence without written authorization from the Department per Special Conditions V.1-3.

IV. Plugging and Abandonment of Monitor Wells

1. The Department's South District and Tallahassee Aquifer Protection Program (APP) offices shall be notified 72 hours prior to the start of plugging and abandonment operations. [62-528.307(1)(g), F.A.C.]
2. Waters spilled during abandonment activities shall be contained and properly disposed. [62-528.410(9)(b), 62-528.435, F.A.C.]

3. The permittee shall submit a monitor well plugging and abandonment plan to the Department for approval prior to beginning operations to plug and abandon monitor wells I-10, E, and M-22. Any proposed modifications to the approved plugging and abandonment plan shall be submitted in writing to the Tallahassee APP for review and clearance prior to implementation. Changes of negligible impact to the environment and staff time will be reviewed by the program manager, cleared when appropriate and incorporated into this permit. Changes or modifications other than those described above will require submission of a completed application and appropriate processing fee as per Rule 62-4.050, F.A.C. [62-528.100, 62-4.050, 62-528.435, F.A.C.]

4. Prior to plugging and abandonment, the permittee or his authorized representative shall check each well to insure there are no obstructions that will interfere with the plugging and abandonment operation. The contractor shall tag the bottom of the monitor well and insure there are no obstructions that will interfere with the plugging and abandonment of the well. [62-528.435, F.A.C.]

5. The Department shall be notified, within 24 hours, if an obstruction is encountered during tagging or plugging and abandonment of the wells, and no subsequent work shall be performed without approval from the Department. [62-528.435, F.A.C.]

6. The contractor shall fill the monitor well with neat cement, or a Department approved equivalent, with no more than 6% bentonite gel using the tremie method of grouting. [62-528.435(3), F.A.C.]

7. In accordance with rule 62-528.435(11), F.A.C., the permittee shall submit to the Tallahassee APP and the South District office of the Department a report of the plugging and abandonment details within 90 days of completion of plugging and abandonment operations. The report shall be certified by a Professional Engineer or Professional Geologist. [62-528.435(11), F.A.C.]

V. Operation with Partially Treated Surface Water (PTSW), Wellfield 2

1. Recharge with PTSW is limited to ASR wells in Wellfield 2.

2. Recharge with PTSW under this permit shall not commence without written authorization from the Department. [62-528.450(3)(b), F.A.C.]

3. Prior to ASR operations with PTSW, the following items must be submitted for Department review and approval:

    a. Signed and sealed record "as-built" engineering drawings of the surface piping, equipment, and appurtenances added or modified from existing

piping, equipment, and appurtenances to convey PTSW to and recover water from ASR wells.

b. Draft operation and maintenance (O&M) manual revision to address the ASR operations using PTSW and procedures to cease recharge if sampling results of recharge water show it does not meet the water quality applicable to the ASR zone.

c. If not included in the O&M manual revision, a description of the PTSW ASR operations to be conducted under this permit, including which ASR wells will be used, volumes to be recharged and recovered, and durations of recharge, storage, and recovery.

d. How the volumes and durations of PTSW recharge will be distinguished from that of potable water recharge.
[62 528.450(3)(a)3. and 62-528.455(1)(c)6., F.A.C.]

VI. Testing and Reporting Requirements

A. General

1. The permittee shall submit monthly to the Department the results of all injection well and monitor well data required by this permit no later than the last day of the month immediately following the month of record. The report shall include:
   a. A cover page summarizing the current status of all monthly activities, including, but not limited to, the certification and signature required in Special Condition Number II.5 above.
   b. Operational and water quality data in a tabular format. The following identifying information must be included on each data sheet:
      i. Facility Name
      ii. Well Name
      iii. UIC Permit Number
      iv. WACS Facility ID
      v. WACS Testsite ID number (on appropriate data sheet) as provided on the injection well and monitor well tables on pages 2, 3, 4, 5, and 6 of this permit.
   c. Laboratory pages and original supporting documentation including DEP Form FD 9000-24, *Groundwater Sampling Log*, for the purging of each monitor well.

   [62-528.307(3)(d), F.A.C.]

2. The report may be sent via electronic mail in Adobe™ (.pdf) format to the following Program e-mail addresses:

South District	SouthDistrict@FloridaDEP.gov
Tallahassee - APP Program	TAL_UIC@FloridaDEP.gov

If a paper copy of the report is submitted, it should be sent to Department staff at the following addresses:

South District	2295 Victoria Avenue, Suite 364 Ft. Myers, Florida 33901-3875
Tallahassee - APP Program	2600 Blair Stone Road, MS 3530 Tallahassee, Florida 32399-2400

[62-528.307(3)(d), F.A.C.]

3. An Annual Summary Report shall be submitted to the Department's South District and Tallahassee Aquifer Protection Program by September 1 of each year. The report shall address and summarize the preceding year of operations (January 1 through December 31) and shall include at a minimum:
   a. All injection well system monitoring data from the preceding year in both graphic and tabular formats;
   b. A summary of system specific injectivity efficiency and pressure falloff test results, as applicable;
   c. Proposed changes (if any) to the monitoring program.

B. Monitoring

1. The ASR system shall be monitored in accordance with Rules 62-528.425(1)(g) and 62-528.430(2), F.A.C. The following ASR well performance data and monitor zone data shall be recorded and reported in the Monthly Operating Report (MOR) as indicated below. Sampling of ASR wells during storage is not required. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
   [62-528.307(3)(d) and 528.430(2), F.A.C.]
   a. During recharge, ASR common distribution point and monitoring wells are sampled per the parameter schedule;
   b. During recovery, ASR wells and monitoring wells are sampled per the parameter schedule table. At least one sample needs to be taken during recovery if it doesn't fall during the sample time period;
   c. During storage periods (greater than 30 days), ASR wells are not sampled;
   d. If a change in operational status (recharge, recovery) occurs that requires a change in the sampling schedule, the sampling schedule for that mode will begin within one week of the operational change.
2. During extended storage periods (greater than 30 days) the monitor well water quality parameters listed below as weekly or bi-weekly shall be sampled and analyzed monthly. *[62-528.615(2), F.A.C.]*

Permittee: Mike Coates, Director
Peace River Manasota Regional Water Supply Authority
Peace River Facility

UIC Permit ID No.: 0136595-018-038-UO/5SR
WACS Facility ID: 40593
Date: June 8, 2023

Parameters	Unit	Recording Frequency or Sampling Method	Frequency of Analyses						
			ASR Wells				Monitor Wells		
			Wellfield 1 T-1, S-1, S-2, S-6, S-7, S-8, S-3R, S-5R, S-9R	Wellfield 1 Injectate *9125*	Wellfield 2 S-4, S-10 S-11, S-12 S-13, S-14 S-15, S-16 S-17, S-18 S-19, S-20	Wellfield 2 Injectate *9134*	E, T-2, M-2, I-7, M-7, M-20, M-21, M-22	AP-1, M6, M12, M13, M16	T11, M11, M14, M15, M17, M18, M19, I-8, T-8, M-8, I-10
ASR Well Pressure, Max.	psi	Continuous	D/M [a]		D/M [a]				
ASR Well Pressure, Min.	psi	Continuous	D/M [a]		D/M [a]				
ASR Well Pressure, Avg.	psi	Continuous	D/M [a]		D/M [a]				
Flow Rate, Max.	gpm	Continuous	D/M [a]	D/M	D/M [a]	D/M			
Flow Rate, Min.	gpm	Continuous	D/M [a]	D/M	D/M [a]	D/M			
Flow Rate, Avg.	gpm	Continuous	D/M [a]	D/M	D/M [a]	D/M			
Volume Recharged - PTSW	MG	Daily/Monthly			D/M	D/M			
Volume Recharged - Potable	MG	Daily/Monthly	D/M	D/M	D/M	D/M			
Total Volume Recharged per Wellfield	MG	Daily/Monthly		D/M		D/M			
Volume Recovered per Well - PTSW	MG	Daily/Monthly			D/M	D/M			
Total Volume Recovered	MG	Daily/Monthly	D/M		D/M				
Net Storage	MG	Monthly		D/M		D/M			
Pressure or Water Level Max.[c]	psi or ft NAVD	Continuous					D/M [a]	D/M [a]	D/M [a]
Pressure or Water Level Min.[c]	psi or ft NAVD	Continuous					D/M [a]	D/M [a]	D/M [a]
Pressure or Water Level Avg.[c]	psi or ft NAVD	Continuous					D/M [a]	D/M [a]	D/M [a]
pH[b]	standard units	Grab/Purge	M	W	M	W	M		M
Specific Conductance[b]	µmhos/cm	Grab/Purge	M	W	M	W	M		M
Temperature[b]	°C	Grab/Purge	M	W	M	W	M		M
Dissolved Oxygen[b]	mg/L	Grab/Purge	M	W	M	W	M		M
Oxidation-Reduction Potential[b]	mV	Grab/Purge	M	W	M	W	M		M
Turbidity[b]	NTU	Grab/Purge	M	W	M	W	M		M
Arsenic	mg/L	Grab/Purge	M	W	M	W	M		M
Color	color units	Grab/Purge			M	M[d]			M
Odor	TON	Grab/Purge			M	M[d]			M
Aluminum	mg/L	Grab/Purge			M	M[d]			M
Chloride	mg/L	Grab/Purge	M	M[d]	M	M[d]	M		M
Sulfate	mg/L	Grab/Purge	M	M[d]	M	M[d]	M		M
Total Dissolved Solids	mg/L	Grab/Purge	M	M[d]	M	M[d]	M		M
Nitrate + Nitrite as N	mg/L	Grab/Purge				M[d]	M		M
Ammonia as N	mg/L	Grab/Purge				M[d]	M		M
Total Kjeldahl Nitrogen	mg/L	Grab/Purge				M[d]	M		M
Bicarbonate	mg/L	Grab/Purge	M	M[d]	M	M[d]	M		M
Calcium	mg/L	Grab/Purge	M	M[d]	M	M[d]	M		M
Total Iron	mg/L	Grab/Purge	M	M[d]	M	M[d]	M		M
Magnesium	mg/L	Grab/Purge	M	M[d]	M	M[d]	M		M
Potassium	mg/L	Grab/Purge	M	M[d]	M	M[d]	M		M
Sodium	mg/L	Grab/Purge	M	M[d]	M	M[d]	M		M
Total Organic Carbon (TOC)	mg/L	Grab/Purge				M[e]	M		M
Total Organic Halogen (TOX)	mg/L	Grab/Purge				M[e]			
Total Haloacetic Acids (HAA5)	mg/L	Grab/Purge				M[e]			M
Total Trihalomethanes	mg/L	Grab/Purge				M[e]			M

Parameters	Unit	Recording Frequency or Sampling Method	Frequency of Analyses						
			ASR Wells				Monitor Wells		
			Wellfield 1 T-1, S-1, S-2, S-6, S-7, S-8, S-3R, S-5R, S-9R	Wellfield 1 Injectate *9125*	Wellfield 2 S-4, S-10 S-11, S-12 S-13, S-14 S-15, S-16 S-17, S-18 S-19, S-20	Wellfield 2 Injectate *9134*	E, T-2, M-2, I-7, M-7, M-20, M-21, M-22	AP-1, M6, M12, M13, M16	T11, M11, M14, M15, M17, M18, M19, I-8, T-8, M-8, I-10
Total Coliform	cfu/100 ml	Grab/Purge				B/W[f]			
Fecal Coliform	cfu/100 ml	Grab/Purge				B/W[f]			
Enterococci	cfu/100 ml	Grab/Purge				B/W[f]			
E. Coli	cfu/100 ml	Grab/Purge				B/W[f]			
Giardia Lamblia	cysts/100ml	Grab/Purge				B/W[f]			
Cryptosporidium	Oocysts/100ml	Grab/Purge				B/W[f]			
Total Suspended Solids	mg/L	Grab				B/W[f]			
Fecal Coliform, monthly maximum	cfu/100ml	See Below				M[f]			
Fecal Coliform, % below detection limit	%	See Below				M[f]			
Primary & Secondary Drinking Water Standards, Source Water		Grab		A		A			

D – Daily; W – Weekly; B/W – Biweekly (twice per week) during recharge for first 24 months then frequency adjusted dependent upon performance of system; M – Monthly; Q- Quarterly; SA – Semiannual, A – Annually

[a] Operational data reporting for flows, pressures and water levels: daily maximum, minimum and average from continuous reporting; monthly maximum, minimum and average calculated from daily averages.

[b] Field samples.

[c] Water Level readings from monitor wells M-11 through M-22 will be manual readings recorded monthly. Water level readings from AP-1 collected continuously.

[d] Single sample collected monthly during recharge from common distribution for Wellfield 1 and Wellfield 2. When Wellfield 2 begins PTSW injection frequency moves to twice per month. No sampling required from injection well during storage or recovery.

[e] Prior to beginning PTSW injection, no sample is required. Single sample collected monthly during recharge from a common distribution point after PTSW injection begins. No samples required from injection well during storage or recovery.

[f] Collected only during recharge after PTSW begins. Single sample collected from a common distribution point. No samples required from injection well during storage or recovery. Water not meeting standards will be returned to the reservoir for follow-up treatment and the treatment system adjusted and retested before injection can continue. If water quality standards continue to be exceeded enforcement could be taken.

Refer the tables on pages 2, 3, 4, 5, and 6 for the appropriate WACS testsite IDs to be used for reporting.

Once PTSW testing begins, monitoring of WF2 will continue under this monitoring program regardless of whether the source water is PTSW or potable. Changes back to the potable sampling schedule (in the event PTSW ceases) may be requested by the permittee and approved by DEP under this permit.

3. A laboratory analysis for the Primary and Secondary Drinking Water Standards of Chapter 62-550, F.A.C., shall be submitted annually. One sample shall be for the potable drinking water and one sample shall be for the partially treated surface water after recharge of this water begins. See the attachment to this permit for the parameters.

   a) For facilities permitted to inject domestic wastewater, the domestic wastewater annual sample results may be the same as submitted for the domestic wastewater program if taken within the last 12 months. Primary and Secondary Drinking Water Standards of Chapter 62-550, F.A.C., not included

in the domestic wastewater annual sample requirements shall be included in the same sample or in a separate sample. If not required annually for the domestic wastewater program, a separate sample shall be taken and reported for this permit. The samples shall be composite and grab samples as appropriate for the domestic wastewater program. The permittee may choose to take a combined annual sample from multiple domestic wastestreams if they are authorized for injection in this permit.

b) For facilities permitted to inject water other than domestic wastewater, the source water samples shall not be combined with domestic wastewater samples. The samples shall be grab samples. The permittee may choose to take a combined annual sample from multiple non-domestic wastestreams if they are authorized for injection in this permit.

For renewal of this permit, the permittee shall submit a separate laboratory analysis for each permitted injectate source.
[62-528.425(1)(a), F.A.C.]

4. Monitor well purging and field stabilization parameter measurement is required prior to the collection of laboratory samples for the Monthly Operating Reports (MORs). The facility shall conduct the monitor well sampling following the monitor well sampling protocols taken from FS 2200-*Groundwater Sampling* in the DEP-SOP-001/01 Field Sampling Procedures Manual. The following protocol for UIC monitor wells is based on this standard and the facility shall follow this purging protocol. The results of the purging techniques and field stabilization parameters shall be provided on DEP Form FD 9000-24 or a similar alternative approved by the Department, and the completed forms shall be submitted to the Department with the MORs.
   a. Calculate the volume of water in the well casing (or sample pipe if installed), and the monitoring interval. For dual zone monitor wells calculate the upper monitor zone volume with allowance for reduced volume due to the hollow cylinder created by the lower zone tubing. Purge until the water level has stabilized (well recovery rate equals the purge rate), purging a minimum of one well volume, and then collect the first set of stabilization parameters.
   b. Thereafter, collect stabilization parameters after every ¼ well volume beyond the initial one volume.
   c. Purging shall be complete when three consecutive readings of the parameters listed below are within the following ranges[1] and a minimum of 1.5 well casing volumes of fluid since the beginning of purging have been evacuated from the monitor well:

[1] Provided dissolved oxygen in the groundwater of the zone being monitored is ≤ 20% of saturation for the measured temperature and turbidity is ≤ 20 NTUs. This assumption holds true for groundwater in most zones of the Floridan aquifer.

- pH ± 0.2 Standard Units
- Specific Conductance ± 5.0% of reading
- Temperature ± 0.2° C
- Dissolved Oxygen ≤ 20% Saturation or ± 0.2 mg/L
- Turbidity ≤20 NTU

d. If necessary, continue to take the above readings every additional ¼ well volume until three consecutive readings meet the above criteria.

e. Typical field conditions may not allow the temperature parameter to be met. The sampling team leader may decide whether to collect a sample if a parameter has not been met (DEP SOP FS2212 Section 3.6). Documentation as to why the sample was collected without meeting a field parameter must be recorded in the groundwater sampling log.

f. If three consecutive ¼ well volume readings have not reached the stabilization criteria listed above by the time the fifth well volume has been reached, the monitor well sample shall be taken, and document the reason(s) in the groundwater sampling log.

g. If a sampling pipe is used for purging, the sampling pipe volume will substitute for the well casing volume.

The Department will consider an alternate purging method meeting monitor well sampling protocol in FS 2200-*Groundwater Sampling* in the DEP-SOP-001/01 Field Sampling Procedures Manual in the case where the above procedure causes a hardship to the facility. The permittee shall request an alternate method and receive written Department approval before implementing it. *[62-160.210(1) and 62-528.430(2), F.A.C.]*

5. The flow from the ASR and monitoring zones during well evacuation and sampling shall not be discharged to surface waters or aquifers containing an underground source of drinking water. Waters purged from monitor wells in preparation for sampling shall be diverted to the ASR well head via the pad drainage system, wet well, or treatment plant, or to another location with Department approval. *[62-4.030, 62-620.320, 62-520.420 and .430, F.A.C.]*

VII. Abnormal Events

1. In the event the permittee is temporarily unable to comply with any of the conditions of a permit due to breakdown of equipment, power outages or destruction by hazard of fire, wind, or by other cause, the permittee of the facility shall notify the South District. *[62-528.415(4)(a), F.A.C.]*

2. Notification shall be made in person, by telephone, or by electronic mail (e-mail) within 24 hours of breakdown or malfunction to the South District. *[62-528.307(1)(x), F.A.C.]*

3. A written report of any noncompliance referenced in Specific Condition Number VII.1. above shall be submitted to the South District and the APP Tallahassee office within five days after its occurrence. The report shall describe the nature and cause of the breakdown or malfunction, the steps being taken or planned to be taken to correct the problem and prevent its reoccurrence, emergency procedures in use pending correction of the problem, and the time when the facility will again be operating in accordance with permit conditions. *[62-528.415(4)(b), F.A.C.]*

4. Reporting Requirements

   The permittee shall report to the Department's South District any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within five days of the time the permittee becomes aware of the circumstances. The written submission shall contain: a description of the noncompliance and its cause; the period of noncompliance including exact dates and time, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

   a. The following shall be included as information which must be reported within 24 hours under this condition:
      1) Any unanticipated bypass which causes any reclaimed water or effluent to exceed any permit limitation or results in an unpermitted discharge,
      2) Any upset which causes any reclaimed water or the effluent to exceed any limitation in the permit,
      3) Violation of a maximum daily discharge limitation for any of the pollutants specifically listed in the permit for such notice, and
      4) Any unauthorized discharge to surface or ground waters.

   b. Oral reports as required by this subsection shall be provided as follows:
      1) For unauthorized releases or spills of treated or untreated wastewater reported pursuant to subparagraph (a)4. that are in excess of 1,000 gallons per incident, or where information indicates that public health or the environment will be endangered, oral reports shall be provided to the State Watch Office Toll-Free Number 800-320-0519, as soon as practical, but no later than 24 hours from the time the permittee becomes aware of the discharge. The permittee, to the extent known, shall provide the following information to the State Watch Office:
         a) Name, address, and telephone number of person reporting;
         b) Name, address, and telephone number of permittee or responsible person for the discharge;

c) Date and time of the discharge and status of discharge (ongoing or ceased);
d) Characteristics of the wastewater spilled or released (untreated or treated, industrial or domestic wastewater);
e) Estimated amount of the discharge;
f) Location or address of the discharge;
g) Source and cause of the discharge;
h) Whether the discharge was contained on-site, and cleanup actions taken to date;
i) Description of area affected by the discharge, including name of water body affected, if any; and
j) Other persons or agencies contacted

2) Oral reports, not otherwise required to be provided pursuant to subparagraph b.1 above, shall be provided to the Department's South District within 24 hours from the time the permittee becomes aware of the circumstances.

c. If the oral report has been received within 24 hours, the noncompliance has been corrected, and the noncompliance did not endanger health or the environment, the Department's South District shall waive the written report.

[403.077(2)(d), F.S., 62-528.307(1)(e) and 62-528.307(1)(x), F.A.C.]

5. Pollution Notification

a. In accordance with subsection 403.077, F.S., in the event of a reportable pollution release, an owner or operator of the installation at which the reportable pollution release occurs must provide to the department information reported to the State Watch Office within the Division of Emergency Management pursuant to any department rule, permit, order, or variance, within 24 hours after the owner's or operator's discovery of such reportable pollution release. The Department's Pollution Notice website is at https://floridadep.gov/pollutionnotice.

b. If multiple parties are subject to the notification requirements based on a single reportable pollution release, a single notification made by one party in accordance with this section constitutes compliance on behalf of all parties subject to the requirement. However, if the notification is not made in accordance with this section, the department may pursue enforcement against all parties subject to the requirement.

c. If, after providing notice pursuant to paragraph (a), the owner or operator of the installation determines that a reportable pollution release did not occur or that an amendment to the notice is warranted, the owner or operator may submit a letter to the department documenting such determination.

d. If, after providing notice pursuant to paragraph (a), the installation owner or operator discovers that a reportable pollution release has migrated outside the property boundaries of the installation, the owner or operator must provide an additional notice to the department that the release has migrated outside the property boundaries within 24 hours after its discovery of the migration outside of the property boundaries.

[403.077(2)(d), F.S., 62-528.307(1)(e) and 62-528.307(1)(x), F.A.C.]

General Conditions

1. The terms, conditions, requirements, limitations and restrictions set forth in this permit are "permit conditions" and are binding and enforceable pursuant to section 403.141, F.S. *[62-528.307(1)(a), F.A.C.]*
2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action. *[62-528.307(1)(b), F.A.C.]*
3. As provided in subsection 403.087(7), F.S., the issuance of this permit does not convey any vested rights or exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor infringement of federal, state, or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in this permit. *[62-528.307(1)(c), F.A.C.]*
4. This permit conveys no title to land, water, does not constitute State recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title. *[62-528.307(1)(d), F.A.C.]*
5. This permit does not relieve the permittee from liability for harm to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties there from; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department. *[62-528.307(1)(e), F.A.C.]*
6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed and used by the permittee to achieve compliance with the conditions of this permit, or are required by Department rules. This provision includes the operation of backup or

auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules. *[62-528.307(1)(f), F.A.C.]*

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at reasonable times, access to the premises where the permitted activity is located or conducted to:
   a. Have access to and copy any records that must be kept under conditions of this permit;
   b. Inspect the facility, equipment, practices, or operations regulated or required under this permit; and
   c. Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.
   d. Reasonable time will depend on the nature of the concern being investigated.
   [62-528.307(1)(g), F.A.C.]

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:
   a. A description of and cause of noncompliance; and
   b. The period of noncompliance, including dates and times; or, if not corrected the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent the recurrence of the noncompliance. The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.
   [62-528.307(1)(h), F.A.C.]

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the APP Tallahassee office may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is proscribed by sections 403.111 and 403.73, F.S. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules. *[62-528.307(1)(i), F.A.C.]*

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules. *[62-528.307(1)(j), F.A.C.]*

11. This permit is transferable only upon Department approval in accordance with rules 62-4.120 and 62-528.350, F.A.C. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department. *[62-528.307(1)(k), F.A.C.]*

12. This permit or a copy thereof shall be kept at the work site of the permitted activity. *[62-528.307(1)(l), F.A.C.]*

13. The permittee shall comply with the following:
    a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records shall be extended automatically unless the Department determines that the records are no longer required.
    b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.
    c. Records of monitoring information shall include:
        1) the date, exact place, and time of sampling or measurements;
        2) the person responsible for performing the sampling or measurements;
        3) the dates analyses were performed;
        4) the person responsible for performing the analyses;
        5) the analytical techniques or methods used;
        6) the results of such analyses.
    d. The permittee shall furnish to the APP Tallahassee office, within the time requested in writing, any information which the Department requests to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit.

    If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the APP Tallahassee office, such facts or information shall be corrected promptly.
    [62-528.307(1)(m), F.A.C.]

14. All applications, reports, or information required by the Department shall be certified as being true, accurate, and complete. *[62-528.307(1)(n), F.A.C.]*

15. Reports of compliance or noncompliance with, or any progress reports on, requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each scheduled date. *[62-528.307(1)(o), F.A.C.]*

16. Any permit noncompliance constitutes a violation of the Safe Drinking Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. *[62-528.307(1)(p), F.A.C.]*

17. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. *[62-528.307(1)(q), F.A.C.]*

18. The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit. *[62-528.307(1)(r), F.A.C.]*

19. This permit may be modified, revoked and reissued, or terminated for cause, as provided in 40 C.F.R. sections 144.39(a), 144.40(a), and 144.41 (1998). The filing of a request by the permittee for a permit modification, revocation or reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition. *[62-528.307(1)(s), F.A.C.]*

20. The permittee shall retain all records of all monitoring information concerning the nature and composition of injected fluid until five years after completion of any plugging and abandonment procedures specified under rule 62-528.435, F.A.C. The permittee shall deliver the records to the Department office that issued the permit at the conclusion of the retention period unless the permittee elects to continue retention of the records. *[62-528.307(1)(t), F.A.C.]*

21. All reports and other submittals required to comply with this permit shall be signed by a person authorized under rules 62-528.340(1) or (2), F.A.C. All reports shall contain the certification required in rule 62-528.340(4), F.A.C. *[62-528.307(1)(u), F.A.C.]*

22. The permittee shall notify the APP Tallahassee office as soon as possible of any planned physical alterations or additions to the permitted facility. In addition, prior approval is required for activities described in rule 62-528.410(1)(h). *[62-528.307(1)(v), F.A.C.]*

23. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or injection activity which may result in noncompliance with permit requirements. *[62-528.307(1)(w), F.A.C.]*

24. The permittee shall report any noncompliance which may endanger health or the environment including:
    a. Any monitoring or other information which indicates that any contaminant may cause an endangerment to an underground source of drinking water; or

b. Any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between underground sources of drinking water.

Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause, the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.
[62-528.307(1)(x), F.A.C.]

Issued this (Day) day of (Month) 2023

State of Florida
Department of Environmental Protection

Cindy Fischler, P.G.
Environmental Administrator
Aquifer Protection Program
Division of Water Resource Management

Fact Sheet

Peace River Manasota Regional Water Supply Authority

Peace River Facility

Class V

Permit Number: 0136595-018-038-UO/5SR

WACS ID: 40593

June 8, 2023

Operation permit for the Peace River Aquifer Storage and Recovery Facility Class V Group 7 injection wells in Wellfield 1: T-1, S-1, S-2, S-6, S-7, S-8, S-3R, S-9R and Wellfield 2: S-4, S-10 through S-20.

1. General Information

A. Statutory Basis for Requiring/Issuing Permit

The Department has permitting jurisdiction under Chapter 403, Florida Statutes (F.S.), and the rules adopted thereunder. The project is not exempt from permitting procedures. The Department has determined that an Underground Injection Control permit is required for the project.

B. Name and Address of Applicant

Mike Coates, PG
Director
Peace River Manasota Regional Water Supply Authority
9415 Town Center Parkway
Lakewood Ranch, Florida 34202
MCoates@RegionalWater.org

Facility Location

Peace River Facility
8998 Southwest County Road 769
Arcadia, Florida 34269
DeSoto County

C. Description of Applicant's Operation

To operate twenty-one (21), Class V aquifer storage and recovery (ASR) wells (T-1, S-1, S-2, S-6, S-7, S-8, S-3R, S-5R, S-9R, S-4, S-10 through S-20) and twenty-five (25) monitor wells (E, T-2, M-2, I-7, T-7, M-7, M-20, M-21, M-22, AP-1, T-11, M-11 through M-19, I-10, M-6, I-8, T-8, and M-8) for the storage and recovery of potable water and partially treated surface water (PTSW) from the Peace River ASR Facility. The PTSW system will treat surface water from Reservoir No. 1 and will include a new pump station, pressurized course media filtration, and side stream chloramine disinfection system. Wellfield 1 is authorized to only receive potable water. The PTSW system will serve to recharge only the ASR wells within Wellfield 2. Wellfield 2 is also authorized to continue to receive potable water. No injection of PTSW is authorized until the PTSW system is operational and required water quality criteria exemptions are in effect. The maximum injection rate for ASR wells shall be 1.25 million gallons per day (mgd) per ASR well. Each ASR well is constructed with an 8, 12 or 16-inch diameter casing set to a depth

ranging from 380 to 650 feet below land surface (bls) with a cemented annulus, and with total depths ranging from 482 to 955 feet bls. The single-zone monitor wells are completed in the ASR production zones with monitor intervals in the lower producing zone of the Intermediate aquifer ranging from 260 to 482 feet bls and the Suwannee Limestone with a monitor interval ranging from 550 to 900 feet bls, in the Avon Park Formation with a monitor interval ranging from 1,300 to 1,479 feet bls, and in the upper producing zone of the Intermediate aquifer ranging from 140 to 200 feet bls. The plugging and abandonment of monitor wells I-10, E, and M-22 is authorized through this permit.

D. Permitting History of this Facility

1. March 2, 1984: Construction permit issued for four Tampa/Suwannee ASR wells.
2. November 19, 1985: Operation permit UO14-106472 issued for three Tampa/Suwannee ASR wells.
3. May 1, 1987: Construction permit issued for three additional Tampa/Suwannee ASR wells.
4. November 25, 1987: Operation permit UO14-106472 was modified to include the three additional wells constructed under the May 1,1987 permit.
5. January 30, 1991: Operation permit was renewed.
6. December 4, 1992: Construction permit UC14-215320 was issued for the Avon Park ASR well.
7. November 1, 1993: Construction permit UC14-231483 was issued authorizing the construction of three Suwannee ASR wells.
8. February 7, 1996: A letter of authorization was issued to use nine Tampa/Suwannee ASR wells.
9. June 21, 1999: Construction permit 136595-001-UC/5Q was issued for the construction of S-4 and S-10 through S-20.
10. April 13, 2005: Construction permit 136595-004-UC/5Q was issued for continued operational testing and monitor well construction.
11. July 18, 2007: Construction permit was modified under minor modification 136595-006-UC/MN to modify sampling frequency.
12. August 4, 2008: Operation permit 136595-005-UO/5Q was issued for ASR Wellfield 1.
13. September 1, 2010: Construction permit modification 136595-012-UC/MN was issued to modify the sampling schedule.
14. December 12, 2011: Construction permit 136595-010-UC/5Q was issued for ASR Wellfield 2.
15. December 14, 2011: Construction permit 306057-001-UC/5X was issued for a Class V, Group 9 Exploratory Well.
16. February 12, 2013: Water quality criteria exemption 136595-015-UO/V1 granted to allow the ASR system to be operated such that the arsenic concentration does not exceed 0.010 mg/L at the property boundary of land owned by the Peace River Manasota River Regional Water Authority or at the boundary of easements granted to the Authority by the Southwest Florida Water Management District.
17. December 14, 2016: Permit 136595-016-017-UO/M5 was issued to modify the operating permit to allow cycle tests of wells S-4 and S-20 at Wellfield 2 while

receiving partially treated surface water. This permit action also moved monitor well AP-1 under the operating permit.

18. May 31, 2022: Petition for secondary water quality criteria exemption received. Assigned Office of General Council case number OGC-22-2247.

E. Documents Used in Permitting Decision

1. Jacobs "Florida Department of Environmental Protection Class V, Group 7, Aquifer Storage and Recovery Well System Operation Permit Application Peace River Aquifer Storage Recovery System" dated February 21, 2018. Received February 26, 2018.
2. Water Resource Solutions "Peace River Option, Well Completion Report" dated November 1, 2000.
3. CH2M Hill "Preliminary Investigation of Brackish Groundwater Development Opportunities at the Peace River Facility: Well Completion Report for the Peace River Exploratory Well" dated January 21, 2013.
4. CH2M "2016 Annual Report: Peace River Facility ASR System" dated August 2017.
5. Peace River Manasota Regional Water Supply Authority "Petition for Secondary Water Quality Criteria Exemption" dated May 24, 2022, submitted May 31, 2022. Assigned Florida Department of Environmental Protection Office of General Council case number OGC 22-2247.
6. Florida Department of Environmental Protection "First Request for Additional Information regarding Secondary Water Quality Criteria Exemption" dated July 18, 2022.
7. Peace River Manasota Authority "First Response to Request for Additional Information regarding Secondary Water Quality Criteria Exemption" dated August 10, 2022.
8. Florida Department of Environmental Protection "Second Request for Additional Information regarding Secondary Water Quality Criteria Exemption" dated August 25, 2022.

2. Reasons Permit was Issued, Derivation of Decision

A. Area of Review (Rule 62-528.440(6), Florida Administrative Code (F.A.C.))

The facility is located at latitude 27°05'00.1"N and longitude 82°01'03.3"W. Wells located within a two-mile radius from the injection facility were located on a map and the well information listed. There were no wells identified that were not properly completed or plugged within the one-mile area of review.

See Document Number 1 Above.

B. Mechanical Integrity Demonstration (Rule 62-528.300(6), F.A.C.)

Not required by Chapter 62-528, F.A.C. for Class V wells.

C. Confinement (Rule 62-528.405(2), F.A.C.)

Confinement not required by Chapter 62-528, F.A.C. for Class V wells if injection will not cause violations of ground water quality standards.

D. Underground Source of Drinking Water (Rule 62-528.405(1)(a), F.A.C.)

The base of the lowermost underground source of drinking water (10,000 mg/l total dissolved solids (TDS) interface), as estimated from the construction of monitor well AP-1 is 1,530 bls.

See Document Number 4 above.

E. Injection Zone Testing (Rule 62-528.405(2)&(3), F.A.C.)

Performed through lithologic sampling, water quality tests, geophysical logs, formation sampling, pump-out and injection tests. A 72-hour wellfield pump test occurred in June 2000 pumping wells S4, S18, S13, and S12 at rates of 595 to 695 gallons per minute. Transmissivity in the injection zone was calculated to be 7,100 ft^2/day. The injection zone is in the Suwannee Limestone aquifer between 380 and 955 feet bls. *See Document Number 1 above.*

F. Well Construction

Injection Well(s):

Well Name	WACS Testsite ID	Well Depth (Feet bls)	Casing Diameter (Inches[3])	Casing Thickness (Inches)	Casing or Tubing Type	Casing Depth or Interval (Feet bls)
T-1[1] 0136595-018-UO/5SR	9125	482	12	0.375	Steel	380
			Open Hole			380-482
S-1[1] 0136595-019-UO/5SR	9126	920	8	0.375	Steel	570
			Open Hole			570-920
S-2[1] 0136595-020-UO/5SR	9127	900	12	0.375	Steel	570
			Open Hole			570-900
S-6[1] 0136595-021-UO/5SR	9128	910	12	0.375	Steel	580
			Open Hole			580-910
S-7[1] 0136595-022-UO/5SR	9129	915	12	0.375	Steel	575
			Open Hole			575-915
S-8[1] 0136595-023-UO/5SR	9130	623	12	0.375	Steel	510
			Open Hole			510-623
S-3R[1] 0136595-024-UO/5SR	9131	769	16	0.375	Steel	580
			Open Hole			580-769
S-5R[1] 0136595-025-UO/5SR	9132	955	16	0.375	Steel	650
			Open Hole			650-955
S-9R[1] 0136595-026-UO/5SR	9133	800	16	0.375	Steel	580
			Open Hole			580-800
S-4[2] 0136595-027-UO/5SR	9145	905	12	0.375	Steel	570
			Open Hole			570-905

S-10[2] 0136595-028-UO/5SR	9134	906	32	0.375	Steel	60
			26	0.375	Steel	250
			17.4	SDR17[4]	PVC[5]	620
			Open Hole			620-906
S-11[2] 0136595-029-UO/5SR	9135	816	32	0.375	Steel	60
			26	0.375	Steel	245
			17.4	SDR17[4]	PVC[5]	585
			Open Hole			585-816
S-12[2] 0136595-030-UO/5SR	9136	900	32	0.375	Steel	60
			26	0.375	Steel	246
			17.4	SDR17[4]	PVC[5]	600
			Open Hole			600-900
S-13[2] 0136595-031-UO/5SR	9137	898	32	0.375	Steel	57
			26	0.375	Steel	245
			17.4	SDR17[4]	PVC[5]	621
			Open Hole			621-898
S-14[2] 0136595-032-UO/5SR	9138	900	32	0.375	Steel	40
			26	0.375	Steel	253
			17.4	SDR17[4]	PVC[5]	568
			Open Hole			568-900
S-15[2] 0136595-033-UO/5SR	9139	833	32	0.375	Steel	60
			26	0.375	Steel	256
			17.4	SDR17[4]	PVC[5]	583
			Open Hole			583-833
S-16[2] 0136595-034-UO/5SR	9140	902	32	0.375	Steel	60
			26	0.375	Steel	251
			17.4	SDR17[4]	PVC[5]	583
			Open Hole			583-902
S-17[2] 0136595-035-UO/5SR	9141	786	32	0.375	Steel	60
			26	0.375	Steel	250
			17.4	SDR17[4]	PVC[5]	579
			Open Hole			579-786
S-18[2] 0136595-036-UO/5SR	9142	900	32	0.375	Steel	60
			26	0.375	Steel	251
			17.4	SDR17[4]	PVC[5]	592
			Open Hole			592-900
S-19[2] 0136595-037-UO/5SR	9143	900	32	0.375	Steel	60
			26	0.375	Steel	257
			17.4	SDR17[4]	PVC[5]	585
			Open Hole			585-900

S-20[2] 0136595-038-UO/5SR	9144	898	32	0.375	Steel	57
			26	0.375	Steel	257
			17.4	SDR17[4]	PVC[5]	566
			Open Hole			566-898

ASR Well Notes: [1]Wellfield 1, [2]Wellfield 2, [3]Outside diameter, [4]Standard Dimensional Ratio (SDR), [5]Polyvinyl chloride (PVC) Constructed with new, unused steel or PVC with a cemented annulus.

Monitor Well(s):

Well Name	WACS Testsite ID	Monitor Zone	Casing Diameter (Inches[4])	Casing Thickness (Inches)	Casing Type	Casing Depth (Feet bls)	Monitoring Depth (Feet bls)
E	00212	UPZ[1]	6	SDR17	PVC	140	
			Open				140-200
T-2	00211	LPZ[2]	4	SDR17	PVC	393	
			Open				393-490
M-2	00236	Suwannee[3]	6	SDR17	PVC	596	
			Open				596-900
I-7	19546	LPZ[2]	14	0.375	Steel	42	
			6		PVC	220	
			Open				220-261
T-7	19547	LPZ[2]	14	0.25	Steel	62	
			6.9	SDR17	PVC	349	
			Open				349-400
M-7	19548	Suwannee[3]	14	0.375	Steel	63	
			6	SDR17	PVC	580	
			Open				580-605
M-20	21783	Suwannee[3]	20	0.375	Steel	66	
			14	0.375	Steel	250	
			6	SDR17	PVC	584	
			Open				584-688
M-21	21784	Suwannee[3]	20	0.375	Steel	50	
			14	0.375	Steel	250	
			6	SDR17	PVC	575	
			Open				575-672
M-22	21785	Suwannee[3]	20	0.375	Steel	64	
			14	0.375	Steel	252	
			12	SDR17	PVC	565	
			Open				565-572

AP-1	30104	Avon Park[4]	30	0.375	Steel	550	
			20	0.375	Steel	950	
			12		Steel	1,300	
			Open				1,300-1,479
T-11	21772	LPZ[2]	14		Steel	63	
			6	SDR17	PVC	350	
			Open				350-400
M-11	21774	Suwannee[3]	20		Steel	64	
			14		Steel	253	
			6	SDR17	PVC	570	
			Open				570-677
M-12	21775	Suwannee[3]	20		Steel	65	
			14		Steel	250	
			6	SDR17	PVC	585	
			Open				585-705
M-13	21776	Suwannee[3]	20		Steel	63	
			14		Steel	253	
			6	SDR17	PVC	550	
			Open				550-670
M-14	21777	Suwannee[3]	20		Steel	63	
			14		Steel	250	
			6	SDR17	PVC	575	
			Open				575-676
M-15	21778	Suwannee[3]	20		Steel	63	
			14		Steel	250	
			6	SDR17	PVC	570	
			Open				570-678
M-16	21779	Suwannee[3]	20	0.25	Steel	63	
			14	0.25	Steel	250	
			6	SDR17	PVC	560	
			Open				560-673
M-17	21780	Suwannee[3]	20	0.25	Steel	63	
			14	0.25	Steel	250	
			6	SDR17	PVC	565	
			Open				565-670
M-18	21781	Suwannee[3]	20	0.25	Steel	59	
			14	0.25	Steel	250	
			6	SDR17	PVC	575	
			Open				575-700

M-19	21782	Suwannee[3]	20	0.25	Steel	52	
			14	0.25	Steel	249	
			6	SDR17	PVC	580	
			Open				580-680
I-10	19552	LPZ[2]	14	0.25	Steel	40	
			6	SDR17	PVC	260	
			Open				260-320
M-6	19545	Suwannee[3]	14	0.25	Steel	63	
			6	SDR17	PVC	579	
			Open				579-640
I-8	19549	UPZ[1]	14	0.25	Steel	61	
			6	SDR17	PVC	155	
			Open				155-190
T-8	19550	LPZ[2]	14	0.25	Steel	61	
			6	SDR17	PVC	354	
			Open				354-401
M-8	19544	Suwannee[3]	20	0.375	Steel	100	
			12	0.375	Steel	570	
			Open				570-860

Monitor Well Notes: Constructed with new, unused steel and PVC and cemented to land surface. [1]Upper Production Zone (UPZ) of the Intermediate aquifer system, [2]Lower Production Zone (LPZ) of the Intermediate aquifer system, [3]Upper Floridan aquifer permeable unit within the Suwannee Limestone (Suwannee), [4]Avon Park Formation (Avon Park). [5]Outside diameter.

G. Monitor Plan (Rule 62-528.425(1), F.A.C.)

There are currently 10 single-zone monitor wells operating at Wellfield 1. Monitor well E is cased to monitor the upper producing zone of the Hawthorn aquifer system. Monitor wells T-2, I-7, and T-7 are cased to monitor the lower producing zone of the Hawthorn aquifer system. Monitor wells M-2, M-6, M-7, M-20, M-21, and M-22 are cased to monitor the Upper Floridan aquifer permeable unit within the Suwannee Limestone. Monitor well AP-1 was originally drilled as an exploratory well and converted to a monitor well. Monitor Well AP-1 monitors the Avon Park high permeability zone.

There are currently 14 single-zone monitor wells operating at Wellfield 2. Monitor Well I8 monitors the upper producing zone of the Hawthorn aquifer system. Monitor wells T11, I-10, and T-8 monitor the lower producing zone of the Hawthorn aquifer system. Monitor wells M8, M11, M12, M13, M14, M15, M16, M17, M18 and M19 monitor the Upper Floridan aquifer permeable unit within the Suwannee Limestone formation.

The construction details of these monitor wells can be found on the table above.

H. Financial Responsibility (Rule 62-528.435(9) and 62-528.455(3)(b)8 and (3)(c)3, F.A.C.)

Not required by Chapter 62-528, F.A.C., for Class V wells.

I. Emergency Discharge (Rule 62-528.455(1)(d), F.A.C.)

Not required by Chapter 62-528, F.A.C., for Class V wells.

3. Agency Action

A draft permit will be issued as per Rule 62-528.310, F.A.C.

4. Public Rights

Public notice of this draft permit will include the details of a public meeting, or will state that any interested person may request a public meeting within 30 days of the public notice. A request for a public meeting shall be in writing and shall state the nature of the issues proposed to be raised at the meeting. If a public meeting is later scheduled, there will be another 30-day notice period for that meeting. Any interested person may submit written comments on the draft permit within 30 days of the public notice or through the public meeting date, as appropriate. Written comments or a public meeting request may be submitted to the Department of Environmental Protection, Aquifer Protection Program, 2600 Blair Stone Road, MS 3530, Tallahassee, Florida 32399-2400. All comments received within the 30-day period and through the public meeting date will be considered in formulation of the Department's final decision regarding permit issuance.

After the conclusion of the public comment period and public meeting described above the Department may revise the conditions of the permit based on such public comment. Then the applicant will publish Notice of the Proposed Agency Action. A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing). Accordingly, the Department's final action may be different from the position taken by it in the Notice of the Proposed Agency Action. The petition must conform to the requirements specified in the Notice and be filed (received) within 14 days of publication of the Notice in the Office of General Counsel, M.S. 35, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399-3000. The failure of any person to file a Petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative (hearing) under Section l20.569 and Section 120.57 of the Florida Statutes, or to intervene in this proceeding and participate as a party to it. Any subsequent intervention (in a proceeding initiated by another party) will only be at the discretion of the presiding officer upon filing of a motion in compliance with Rule 28-106.205 of the Florida Administrative Code.

The application, draft permit, and fact sheet are available for public inspection during normal business hours, 8 a.m. to 5 p.m., Monday through Friday, except legal holidays, at the Department of Environmental Protection, South District Office, 2295 Victoria Avenue, Suite 364, Ft. Myers, Florida 33901-3875, and at the Department of Environmental Protection, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Any additional information concerning this project may be obtained by contacting James Dodson, Professional Geologist II, at 850-245-8653.

5. Agency Contact

James Dodson, PG
Professional Geologist II, Aquifer Protection Program
Florida Department of Environmental Protection
2600 Blair Stone Road, MS 3530
Tallahassee, Florida 32399-2400
Phone: 850-245-8576

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME:	SITE LOCATION:
WELL NO:	SAMPLE ID:	DATE:

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH: feet to feet	STATIC DEPTH TO WATER (feet):	PURGE PUMP TYPE OR BAILER:

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)

= (feet – feet) X gallons/foot = gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)

= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING INITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (gallons):

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (^{O}C)	COND. (circle units) μmhos/cm or μS/cm	DISSOLVED OXYGEN (circle units) mg/L or % saturation	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.0006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

PURGING EQUIPMENT CODES: **B** = Bailer; **BP** = Bladder Pump; **ESP** = Electric Submersible Pump; **PP =** Peristaltic Pump; **O** = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:	FIELD-FILTERED: Y N Filtration Equipment Type:	FILTER SIZE: _____ μm
FIELD DECONTAMINATION: PUMP Y N	TUBING Y N (replaced)	DUPLICATE: Y N	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION (including wet ice)			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH			

REMARKS:

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **HDPE** = High Density Polyethylene; **LDPE** = Low Density Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O** = Other (Specify)

SAMPLING EQUIPMENT CODES: **APP** = After (Through) Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP** = Electric Submersible Pump; **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **O** = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 ^{o}C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

FLORIDA DEPARTMENT OF
Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Shawn Hamilton
Secretary

Attachment:
Primary and Secondary Drinking Water Standards for Injection Permit Background Water Samples and Wastestream Analyses
Table Numbers are from Chapter 62-550, F.A.C

Table 1

Maximum Contaminant Levels for Inorganic Compounds		
Federal Contaminant ID Number	Contaminant	MCL (mg/L)
1074	Antimony	0.006
1005	Arsenic	0.010
1010	Barium	2
1075	Beryllium	0.004
1015	Cadmium	0.005
1020	Chromium	0.1
1024	Cyanide (as free Cyanide)	0.2
1025	Fluoride	4.0
1030	Lead	0.015
1035	Mercury	0.002
1036	Nickel	0.1
1040	Nitrate	10 (as N)
1041	Nitrite	1 (as N)
	Total Nitrate and Nitrite	10 (as N)
1045	Selenium	0.05
1052	Sodium	160
1085	Thallium	0.002

Table 2

Maximum Residual Disinfectant Levels		
Federal Contaminant ID Number	Disinfectant Residual	MRDL (mg/L)
1012	Chlorine	4.0 (as Cl_2)
1006	Chloramines	4.0 (as Cl_2)
1008	Chlorine Dioxide	0.8 (as ClO_2)

Table 4

Maximum Contaminant Levels for Volatile Organic Contaminants		
Federal Contaminant ID Number	Contaminant (CAS NUMBER)	MCL (mg/L)
2977	1,1-Dichloroethylene (75-35-4)	0.007
2981	1,1,1-Trichloroethane (71-55-6)	0.2
2985	1,1,2-Tricholoroethane (79-00-5)	0.005
2980	1,2-Dichloroethane (107-06-2)	0.003
2983	1,2-Dichloropropane (78-87-5)	0.005
2378	1,2,4-Tricholorobenzene (120-82-1)	0.07
2990	Benzene (71-43-2)	0.001
2982	Carbon tetrachloride (56-23-5)	0.003
2380	cis-1,2-Dichloroethylene (156-59-2)	0.07
2964	Dichloromethane (75-09-2)	0.005
2992	Ethylbenzene (100-41-4)	0.7
2989	Monochlorobenzene (108-90-7)	0.1
2968	o-Dichlorobenzene (95-50-1)	0.6
2969	para-Dichlorobenzene (106-46-7)	0.075
2996	Styrene (100-42-5)	0.1
2987	Tetrachloroethylene (127-18-4)	0.003
2991	Toluene (108-88-3)	1
2979	trans-1,2-Dichloroethylene (156-60-5)	0.1
2984	Trichloroethylene (79-01-6)	0.003
2976	Vinyl chloride (75-01-4)	0.001
2955	Xylenes (total) (1330-20-7)	10

Table 5

Maximum Contaminant Levels for Synthetic Organic Contaminants		
Federal Contaminant ID Number	Contaminant (CAS NUMBER)	MCL (mg/L)
2063	2,3,7,8-TCDD (Dioxin) (1746-01-6)	3×10^{-8}
2105	2,4-D (94-75-7)	0.07
2110	2,4,5-TP (Silvex) (93-72-1)	0.05
2051	Alachlor (15972-60-8)	0.002
2050	Atrazine (1912-24-9)	0.003
2306	Benzo(a)pyrene (50-32-8)	0.0002
2046	Carbofuran (1563-66-2)	0.04
2959	Chlordane (57-74-9)	0.002
2031	Dalapon (75-99-0)	0.2
2035	Di(2-ethylhexyl)adipate (103-23-1)	0.4
2039	Di(2-ethylhexyl)phthalate (117-81-7)	0.006
2931	Dibromochloropropane (DBCP) (96-12-8)	0.0002
2041	Dinoseb (88-85-7)	0.007
2032	Diquat (85-00-7)	0.02
2033	Endothall (145-73-3)	0.1
2005	Endrin (72-20-8)	0.002
2946	Ethylene dibromide (EDB) (106-93-4)	0.00002
2034	Glyphosate (1071-83-6)	0.7
2065	Heptachlor (76-44-8)	0.0004
2067	Heptachlor epoxide (1024-57-3)	0.0002
2274	Hexachlorobenzene (118-74-1)	0.001
2042	Hexachlorocyclopentadiene (77-47-4)	0.05
2010	Lindane (58-89-9)	0.0002
2015	Methoxychlor (72-43-5)	0.04
2036	Oxamyl (vydate) (23135-22-0)	0.2
2326	Pentachlorophenol (87-86-5)	0.001
2040	Picloram (1918-02-1)	0.5
2383	Polychlorinated biphenyls (PCBs)	0.0005
2037	Simazine (122-34-9)	0.004
2020	Toxaphene (8001-35-2)	0.003

Table 6

Secondary Drinking Water Standards		
Federal Contaminant ID Number	Contaminant	MCL (mg/L)
1002	Aluminum	0.2
1017	Chloride	250
1022	Copper	1
1025	Fluoride	2.0
1028	Iron	0.3
1032	Manganese	0.05
1050	Silver	0.1
1055	Sulfate	250
1095	Zinc	5
1905	Color	15 color units
1920	Odor	3 (threshold odor number)
1925	pH	6.5 - 8.5
1930	Total Dissolved Solids	500
2905	Foaming Agents	0.5

Other Primary Drinking Water Standards from Chapter 62-550

Disinfectant Byproducts	
Disinfectant Byproducts	MCL (mg/L)
Bromate	0.010
Chlorite	1.0
Total Trihalomethanes (TTHM)	0.080
Haloacetic Acids (Five) (HAA5)	0.060

Radionuclides	
Contaminant	MCL
Combined radium226 and radium228	5 pCi/L
Gross alpha particle activity including radium226 but excluding radon and uranium	15 pCi/L
Uranium	30 ug/L

Abbreviations Used:
MCL = maximum contaminant level
mg/L = milligrams per liter.
pCi/L = picoCuries per liter
MRDL = maximum residual disinfectant level
CAS Number = Chemical Abstract System Number

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

SEP 27 2013

OFFICE OF WATER

Mr. Mark Thomasson
Director, Division of Water Resource Management
Florida Department of Environmental Protection
2600 Blair Stone Road, Mail Station 3500
Tallahassee, Florida 32399-2400

Dear Mr. Thomasson:

Thank you for your interest in clarifying EPA's regulations as they apply to the injection and storage of water in underground formations for later withdrawal and use. This practice, known as aquifer storage and recovery, or ASR, can be used to provide water for a number of purposes. This letter addresses the need for public water systems experiencing water shortages to store treated drinking water underground for later use as a source of drinking water.

The EPA applauds Florida's efforts to account for existing and alternative water supplies in its regional water supply planning. As population growth, land use changes and changes in local climatic weather patterns impact water supplies in many areas of the country, innovative water management tools will be increasingly important to sustain water availability. We recognize that using ASR to conserve water that would otherwise be lost can be an important component of a long-term water management strategy.

A particular challenge to the safe use of ASR in some parts of the country, including Florida, is that the underground formations available for drinking water storage contain minerals that can be mobilized when in contact with injected water. For example, in Florida, arsenic is present in the sulfide-bearing minerals in the carbonate formations used for storing water underground. The oxygen in injected water can cause the arsenic to move from the formation into the ground water. This letter describes how Florida can apply the Underground Injection Control program (UIC) requirements to ASR wells used by public water systems when mobilization of arsenic is a concern.

Safe Drinking Water Act and Underground Injection Control Regulations

When Congress passed the Safe Drinking Water Act (SDWA), a stated goal was "to protect not only currently-used sources of drinking water, but also potential drinking water sources for the future" (H.R. Report No. 1185, 93rd Congress, 2nd Session, 1974). SDWA requires that the EPA establish a UIC program to prevent "endangerment" as described in SDWA Section 1421(d)(2):

> *Underground injection endangers drinking water sources if such injection may result in the presence in underground water...of any contaminant, and if the presence of such contaminant may result in such systems not complying with any national primary drinking water regulation or may otherwise adversely affect the health of persons.*

To implement this section of the SDWA, the EPA developed regulations that generally prohibit injection that causes fluid movement into a underground source of drinking water (USDW). Thus, the EPA regulations provide that "*No owner or operator shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into USDWs, if the presence of that contaminant may cause a violation of any primary drinking water regulations . . . . or may otherwise adversely affect the health of persons.*" (40 CFR §144.12(a) and §144.82(a)). Any state that has been approved by the EPA to administer a UIC program in lieu of a federal program must implement its programs in accordance with this provision. (40 CFR §145.1(f) and §145.11(a)(6)).

In most cases, ASR wells are regulated as Class V wells. The Class V provisions allow the Director some discretion in addressing fluid movement under limited circumstances. 40 CFR §144.12(c) indicates that:

> *For Class V wells, if at any time the Director learns that a Class V well may cause a violation of primary drinking water regulations under 40 CFR part 142, he or she shall: (1) Require the injector to obtain an individual permit; (2) Order the injector to take such actions (including, where required, closure of the injection well) as may be necessary to prevent the violation. For EPA administered programs, such orders shall be issued in accordance with the appropriate provisions of the SDWA; or (3) Take enforcement action.*

Additionally, 40 CFR §144.84(b)(1) defines circumstances in which permits or other actions are required for Class V wells including when "*You fail to comply with the prohibition of fluid movement standard in §144.12(a) and described in §144.82(a)*". In this case, the regulation states that "*you have to get a permit, close your well, and/or comply with other conditions determined by the UIC Program Director in your State or EPA Region.*"

Note that these regulations apply only to Class V wells. Any wells that could be classified as Classes I-IV or VI must not be permitted under Class V regulations even if the injection is also for the purpose of storing water for future use as drinking water.[1]

Application of UIC Regulations to Class V ASR wells

As the EPA understands it, Florida plans to prevent and control arsenic liberation through methods such as selection of injection locations, water cycling, limiting the injection rate and degasification. We recognize, however, that this can be challenging given local geologic conditions and that there may be cases in which a drinking water facility is operating an ASR injection well under a permit to store water in anticipation of drinking water shortfalls and there is evidence that the injection causes arsenic in the formation to be released. The UIC Class V regulations as described above (40 CFR §144.12(c) and §144.84(b)(1)) provide authority for the UIC Program Director to issue a permit for a UIC well that does not meet the prohibition of fluid movement provision in §144.12(a). Should the UIC Program Director choose not to close the well, 40 CFR §144.84 allows the Director to address individual situations such as those in Florida on a case-by-case basis by requiring a permit that would prevent endangerment as described in SDWA 1421(d)(2). Accordingly, Florida could decide in some cases that it is appropriate

[1] For example, in Florida, fluids injected under the authority of the *UIC Requirements for Class I Municipal Disposal Wells in Florida* must be permitted as Class I, regardless of the end use of the injected fluid (40 CFR §146.15). In another example, any fluid brought to the surface in connection with oil or natural gas production or injected for the purposes of enhanced recovery must be permitted as Class II (40 CFR §144.6).

for those ASR wells to remain open under permits with conditions designed to protect public health and maximize protection of the USDW.

Consistent with the goals of the SDWA, in a situation where Florida determines ASR to be the best option to improve long term sustainability of drinking water resources despite arsenic mobilization, a permit could be used to prevent endangerment as described in SDWA 1421(d)(2) if it includes conditions to prevent any pathway for human consumption of waters that exceed the Maximum Contaminant Level (MCL) for arsenic, without relying solely on treatment of drinking water by the public water system before supplying water to customers. The UIC regulations protect underground sources of water, not merely the supply of water delivered by a public water system. In this context, the EPA expects that when arsenic is mobilized in a USDW through ASR activities, in order to satisfy the goals and requirements of the SDWA and the UIC regulations, the permitted conditions would encompass a suite of activities to minimize the mobilization, limit the spatial extent of any potential contamination, and protect public health.

Additionally, in balancing the use of ASR for drinking water management with the potential for USDW contamination, a guiding principle should be that the burden of public health protection should not be transferred from the public water system to another user of the USDW (either in the storage zone or downgradient). Water withdrawn beyond the area of control of the owner/operator of the ASR system should not need treatment to address the contamination caused by ASR. A user of the USDW other than the public water system operating the injection well should not have access to the impacted area of the aquifer as a water source. This may be accomplished by implementation of "site access controls" such as institutional controls, property interests, ordinances restricting use, rules that restrict well construction within the impacted area, implementation of setbacks in the state's water well construction rules or similar measures that will control access to contaminated groundwater.

Class V ASR Permit Conditions

When a Class V permit is issued, it must contain certain conditions applicable to all permits (see 40 CFR §144.51 and §145.11(a)(19)) and any additional conditions as determined by the UIC Program Director in the state or EPA Region with primacy authority. The EPA recommends that when Florida decides to issue a permit because arsenic mobilization is a factor in drinking water ASR projects, conditions in the UIC permit should be designed to meet the goals described above. Conditions should ensure that injected water only be withdrawn by the public water system that injected it, because that entity is aware of the situation, is accountable for the presence of arsenic, and as a public water system must comply with other regulations under the SDWA. For example, Florida could use one or more of the "site access controls" described above to assure that there are no public or private users of the USDW where arsenic mobilization is a concern, other than the public water system operating the ASR well. This would also prevent the burden of public health protection from being transferred to any entity other than the ASR operator responsible for the injection.

Permit conditions should require practices designed to reduce arsenic mobilization and minimize the area within which potential arsenic mobilization could occur. Florida is at the forefront of developing the kinds of tools that can minimize the extent of any potential arsenic mobilization. These tools include degasification pretreatment, consistent operation to maintain constant volume, and full recovery of injected water when necessary. To ensure effectiveness, these controls should include requirements for monitoring wells and triggers to define circumstances where further protective action is needed.

Conclusion

This letter explains how SDWA and the UIC regulations allow States to address water shortages and at the same time protect the quality of future water supplies. It provides a solution for public water systems experiencing water shortages who wish to use ASR. By clarifying how to permit ASR wells so that they may be used to augment drinking water supplies while at the same time protecting USDWs, the EPA is addressing a critical need for Florida and others facing water shortages.

As the state agency with primacy authority to permit UIC Class V wells, the Florida Department of Environmental Protection has the discretion to make site specific determinations. This discretion includes whether or not to issue a UIC permit and what conditions should be included in the permit, provided determinations are consistent with the SDWA, applicable EPA UIC regulations and approved state programs.

The EPA recognizes the value of ASR as a tool to maintain the availability of water now and in the future and appreciates the emphasis Florida has given to trying to resolve this complex issue. The EPA believes that ASR is a viable option to enhance the long-term sustainability of drinking water supplies as long as adequate steps are taken to address potential mineral mobilization caused by injection. We look forward to continued collaboration with the State of Florida in ensuring safe drinking water now and in the future.

Sincerely,

Peter Grevatt, Director
Office of Ground Water and Drinking Water

Appendix B
ASR Well Specific Injectivity, Specific Capacity, and Flow Rates

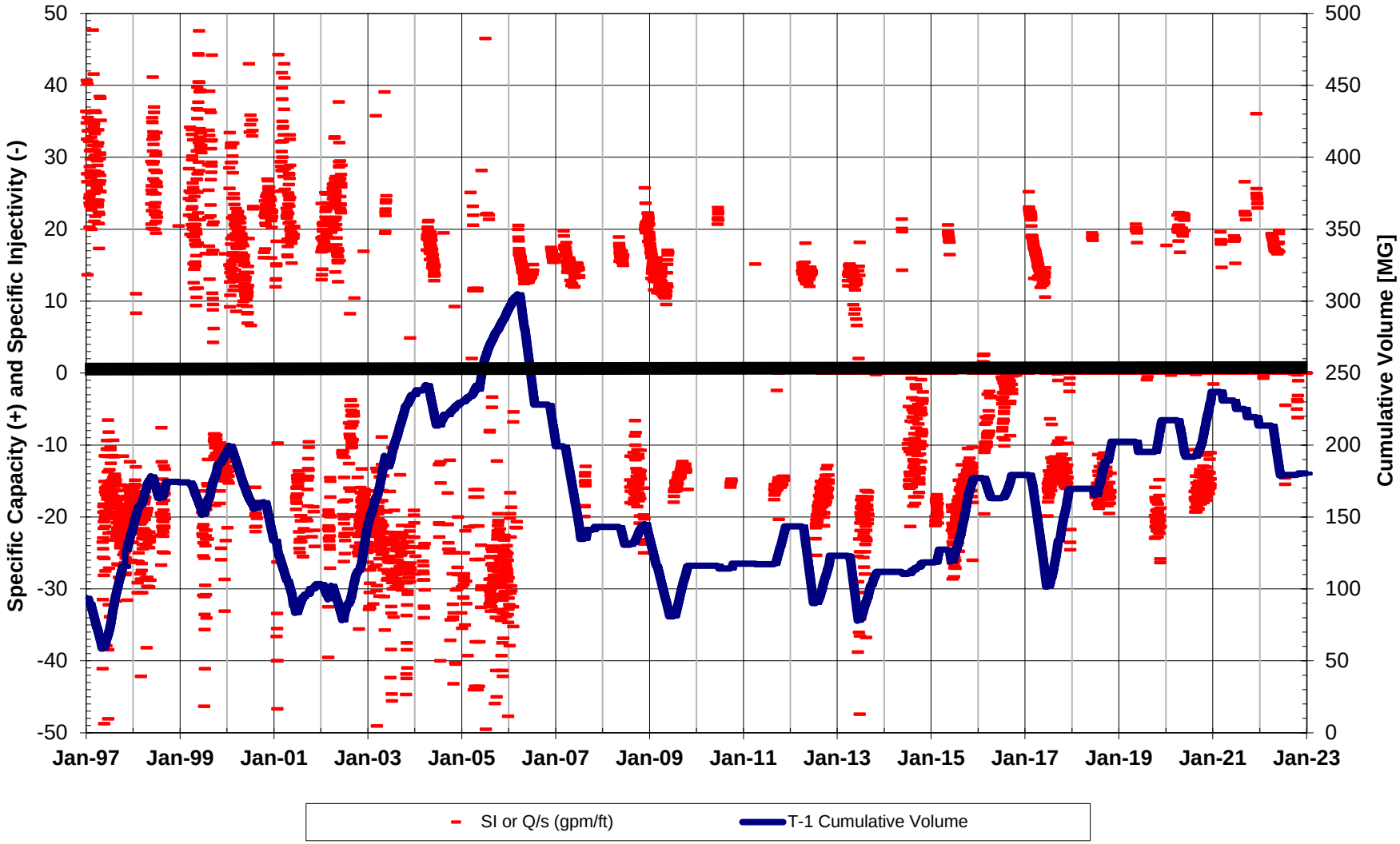


Figure B-1

WF1 T-1 Specific Capacity and Specific Injectivity

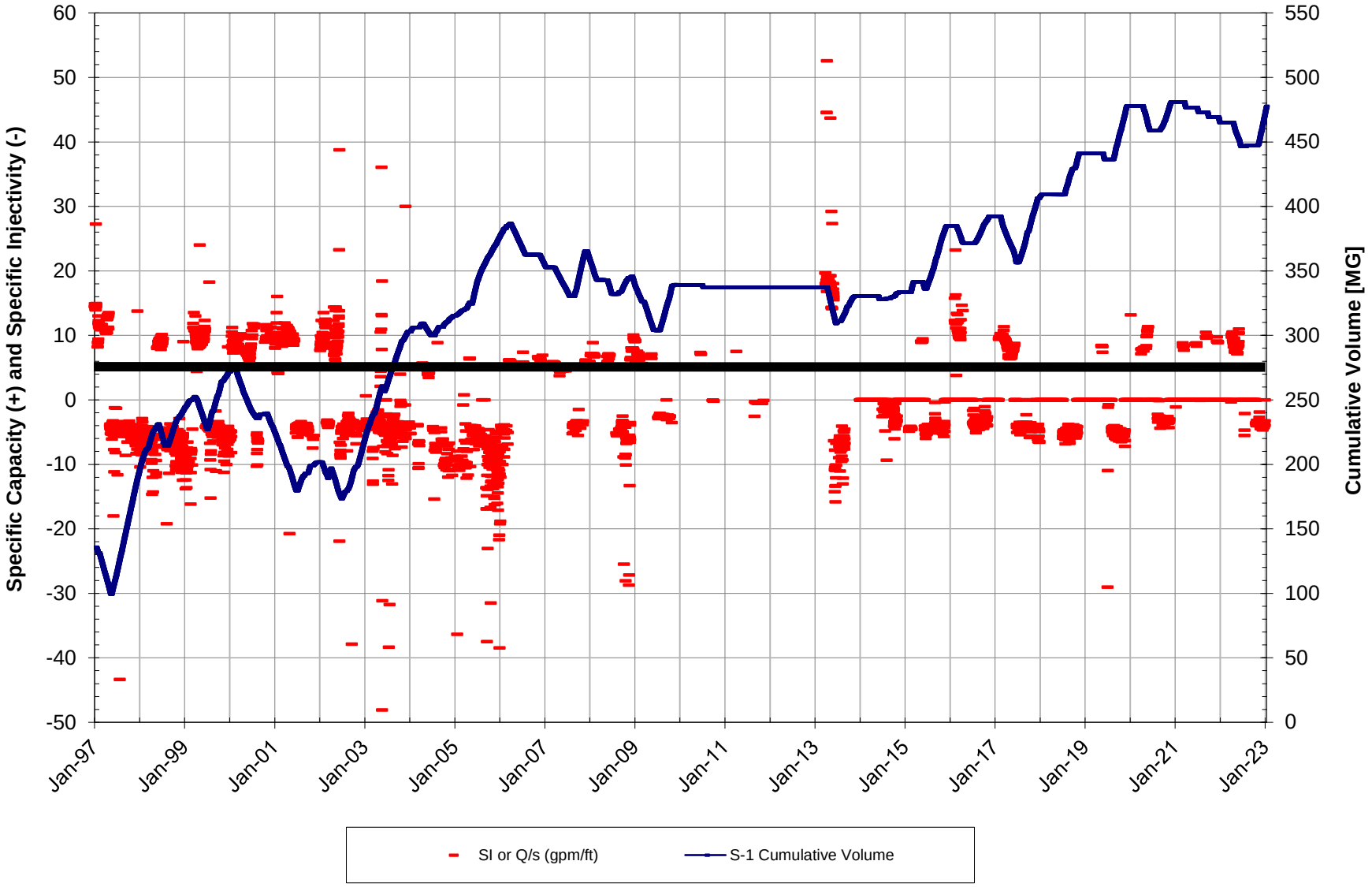


Figure B-2

WF1 S-1 Specific Capacity and Specific Injectivity

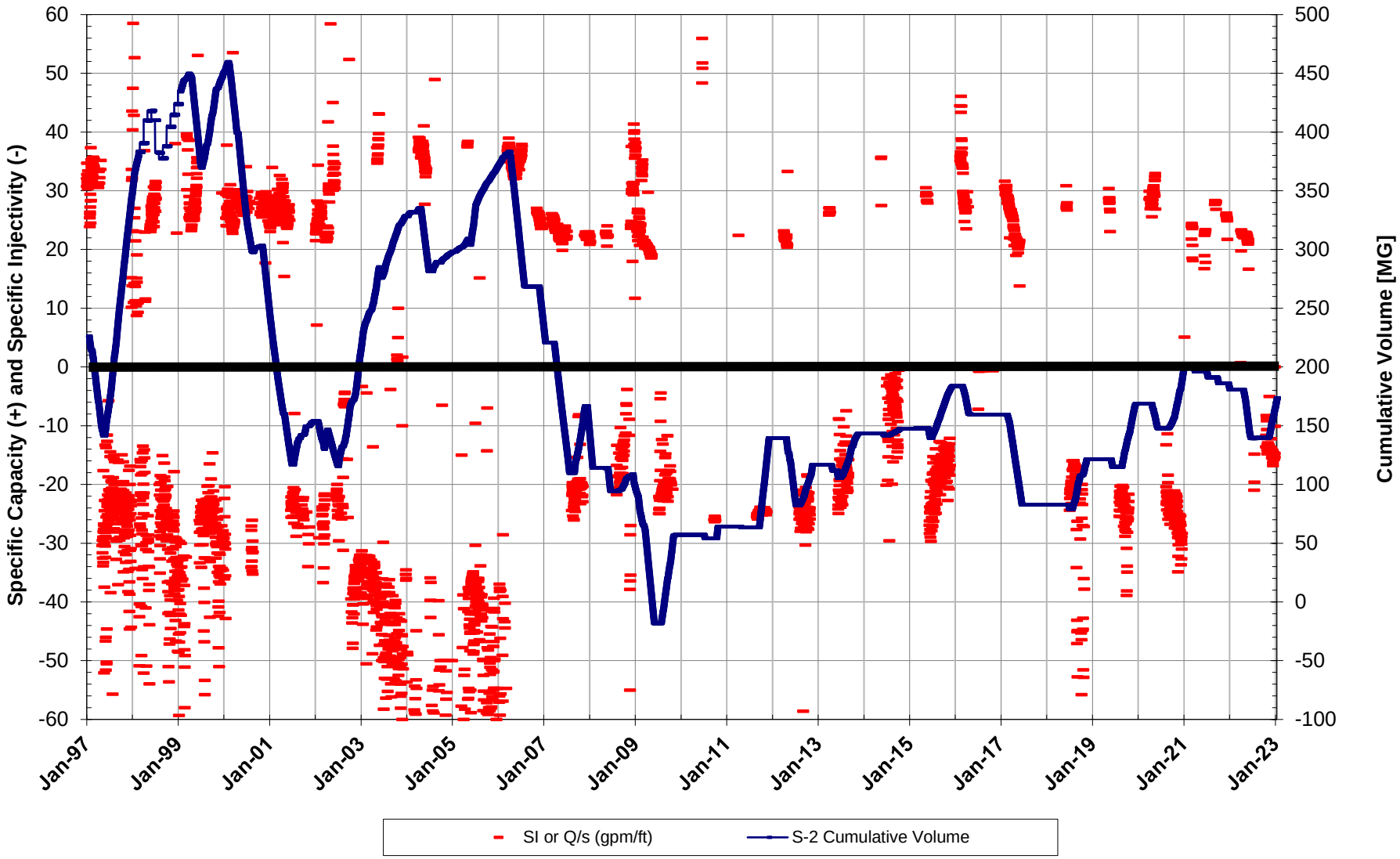


Figure B-3
WF1 S-2 Specific Capacity and Specific Injectivity

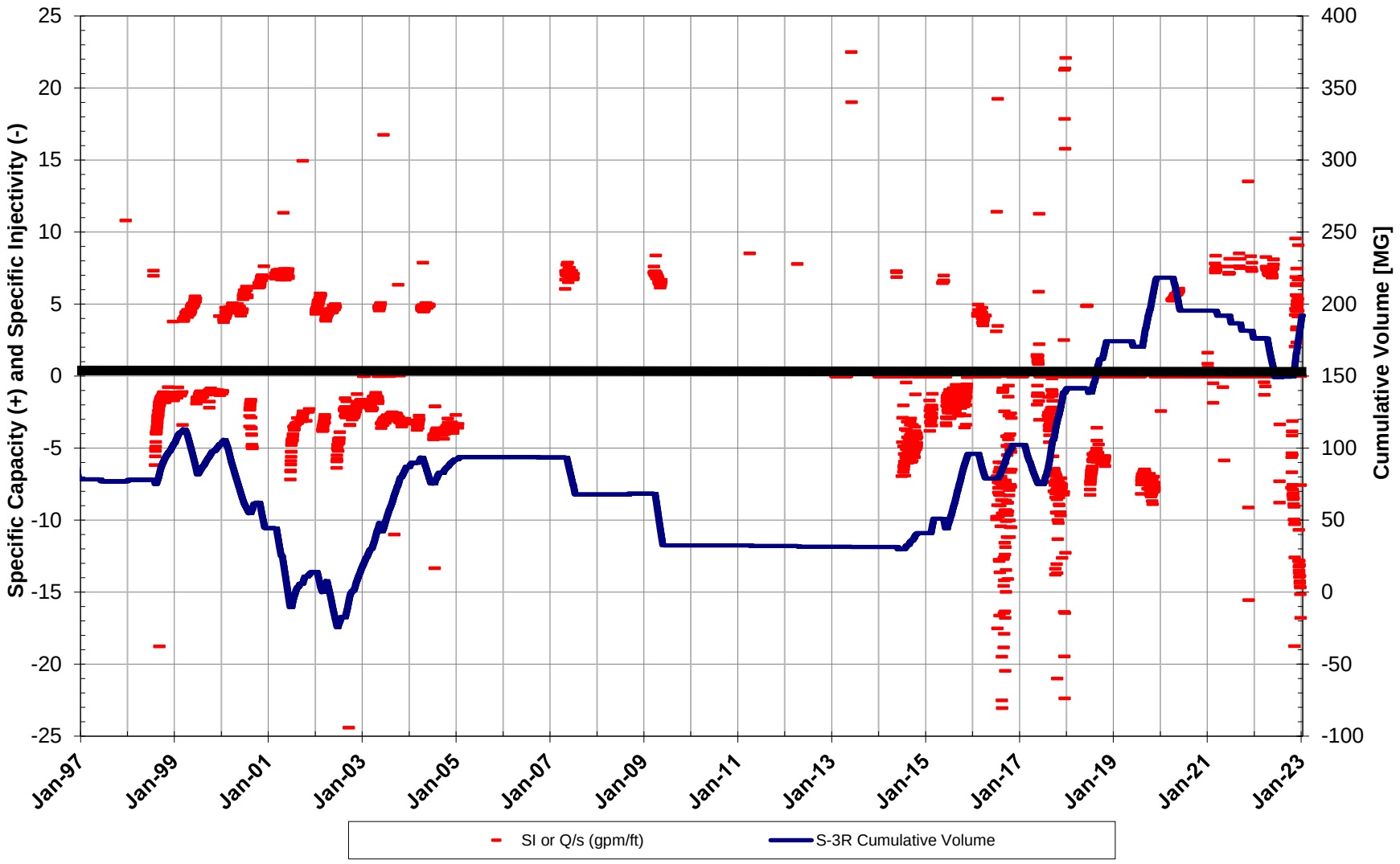


Figure B-4

WF1 S-3R Specific Capacity and Specific Injectiity

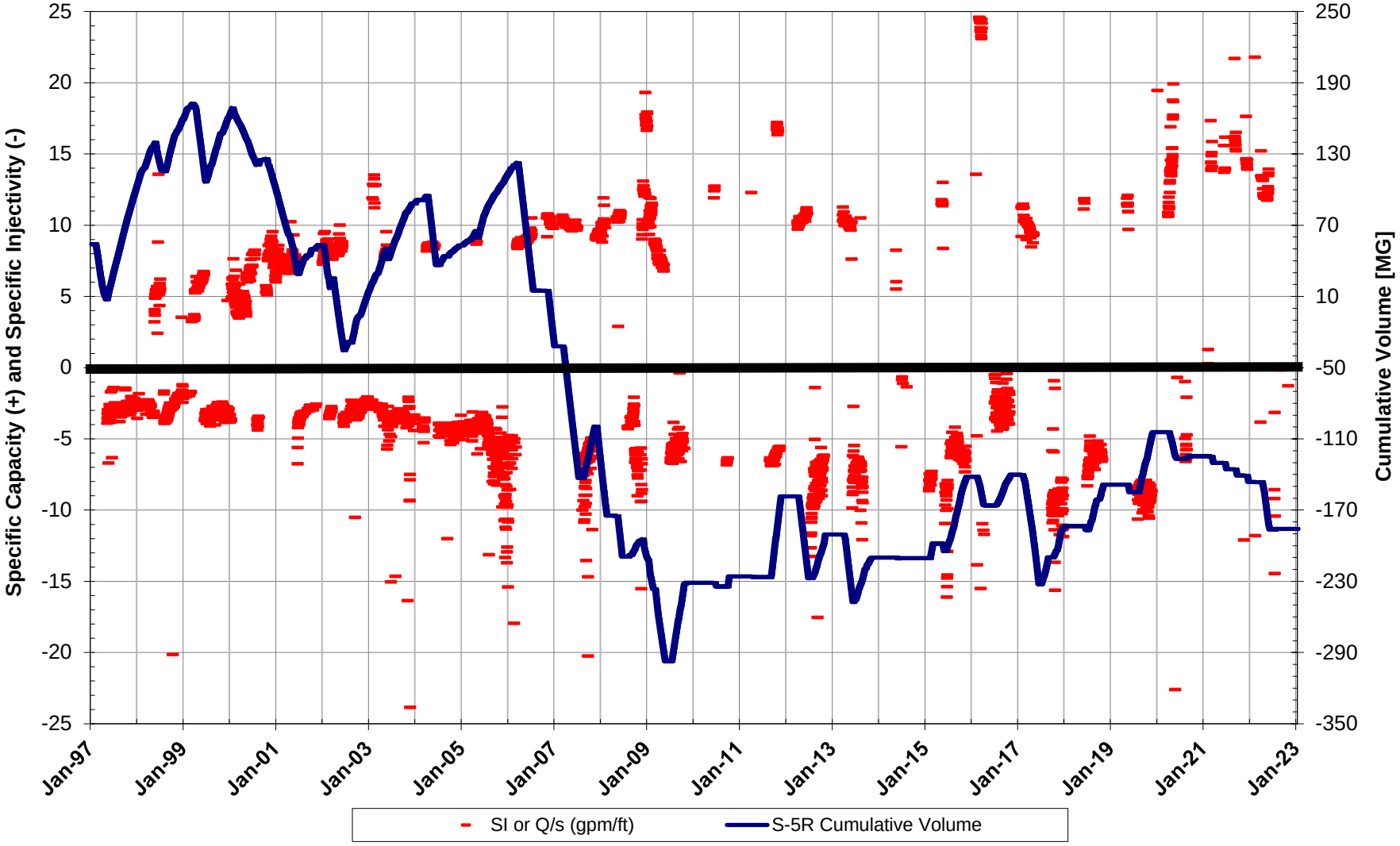


Figure B-5

WF1 S-5R Specific Capacity and Specific Injectivity

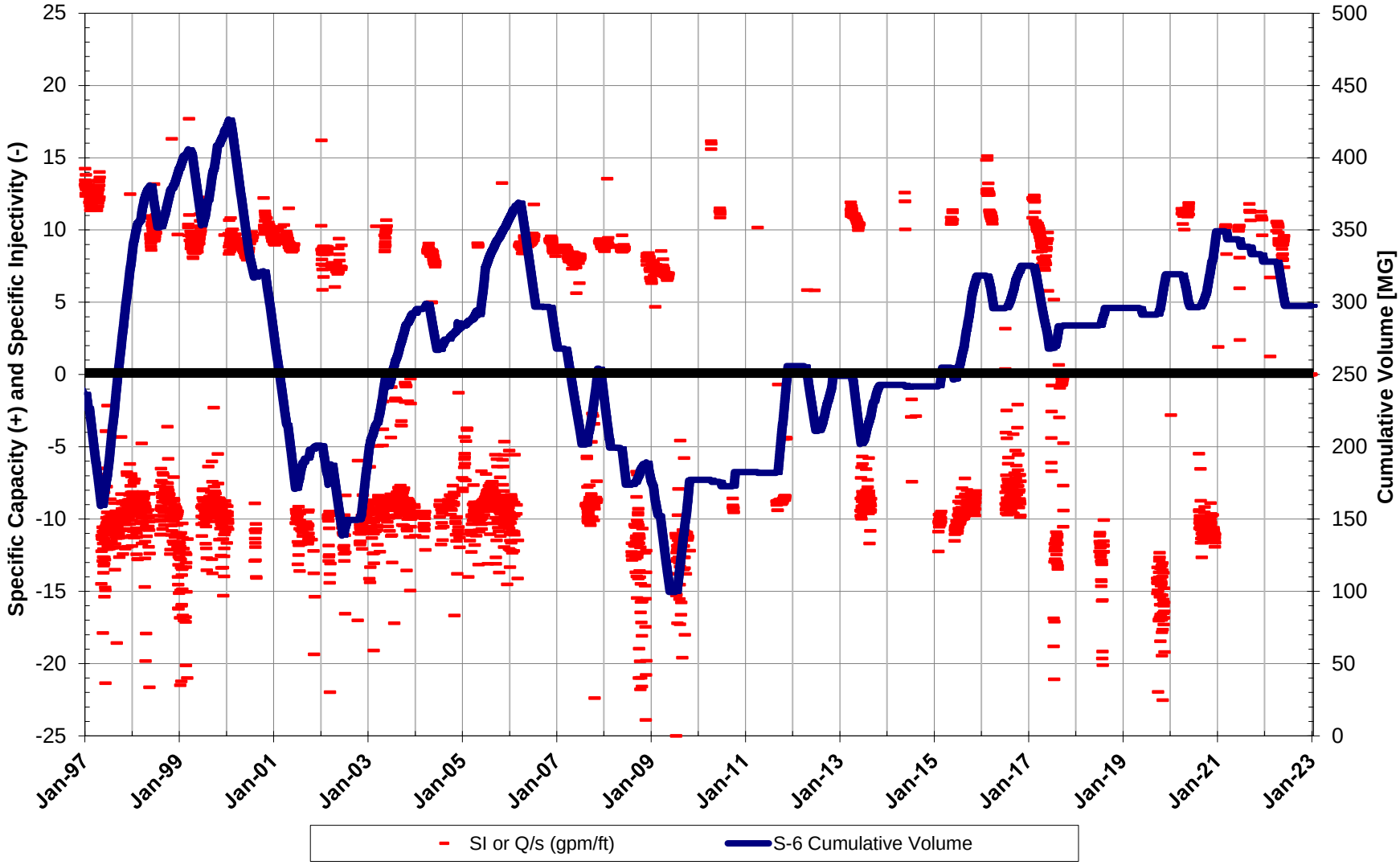


Figure B-6

WF1 S-6 Specific Capacity and Specific Injectivity

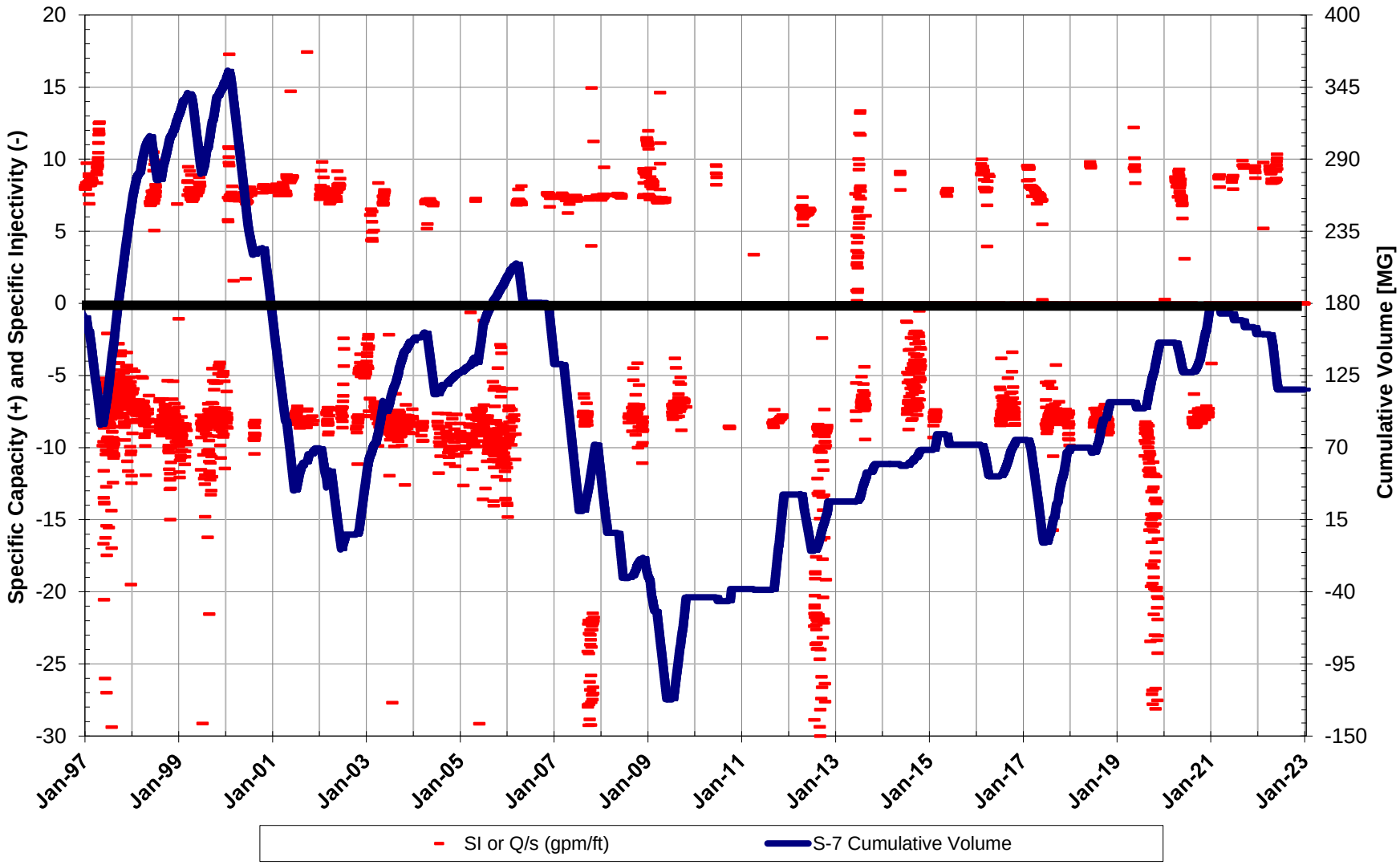


Figure B-7

WF1 S-7 Specific Capacity and Specific Injectivity

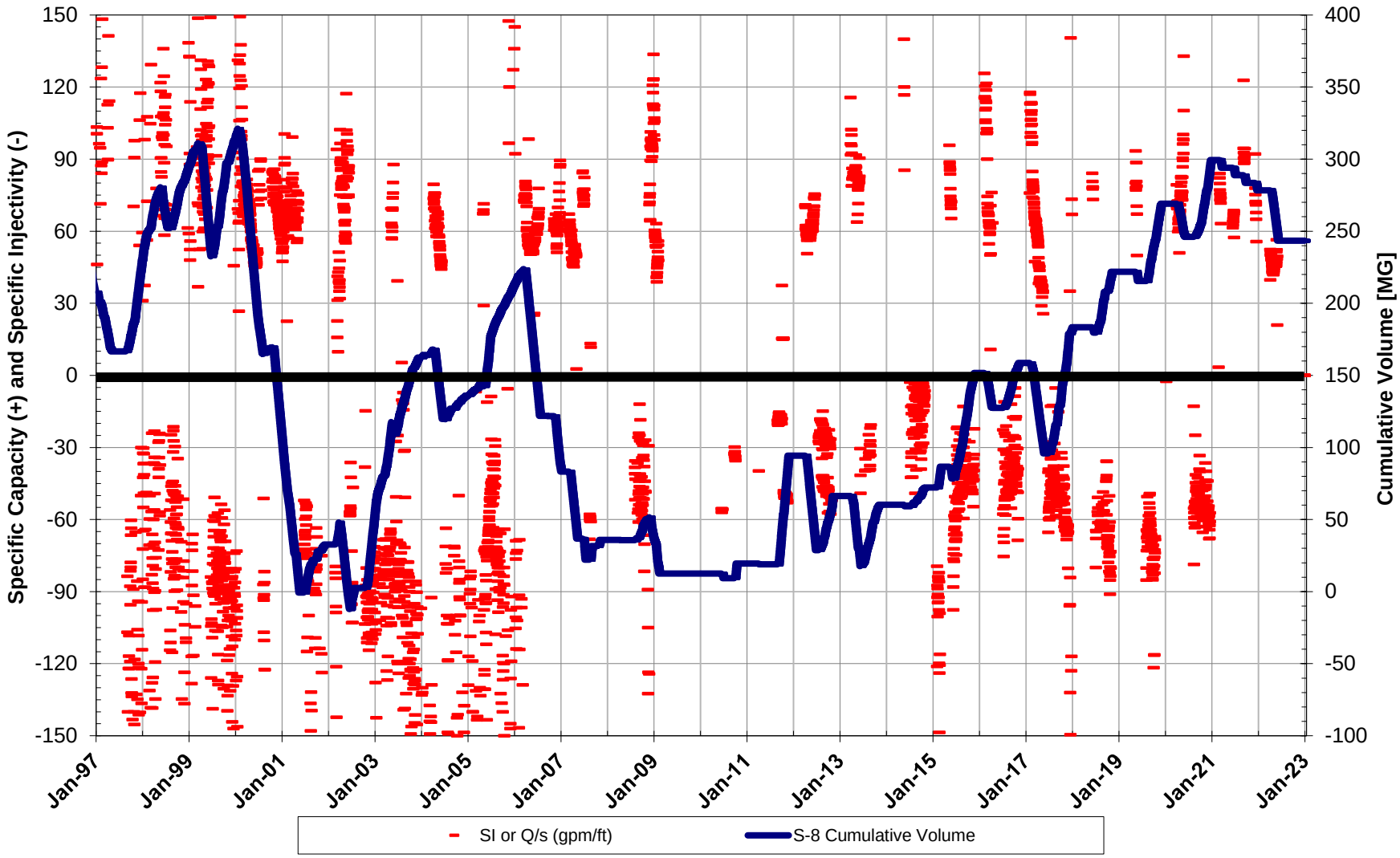


Figure B-8

WF1 S-8 Specific Capacity and Specific Injectivity

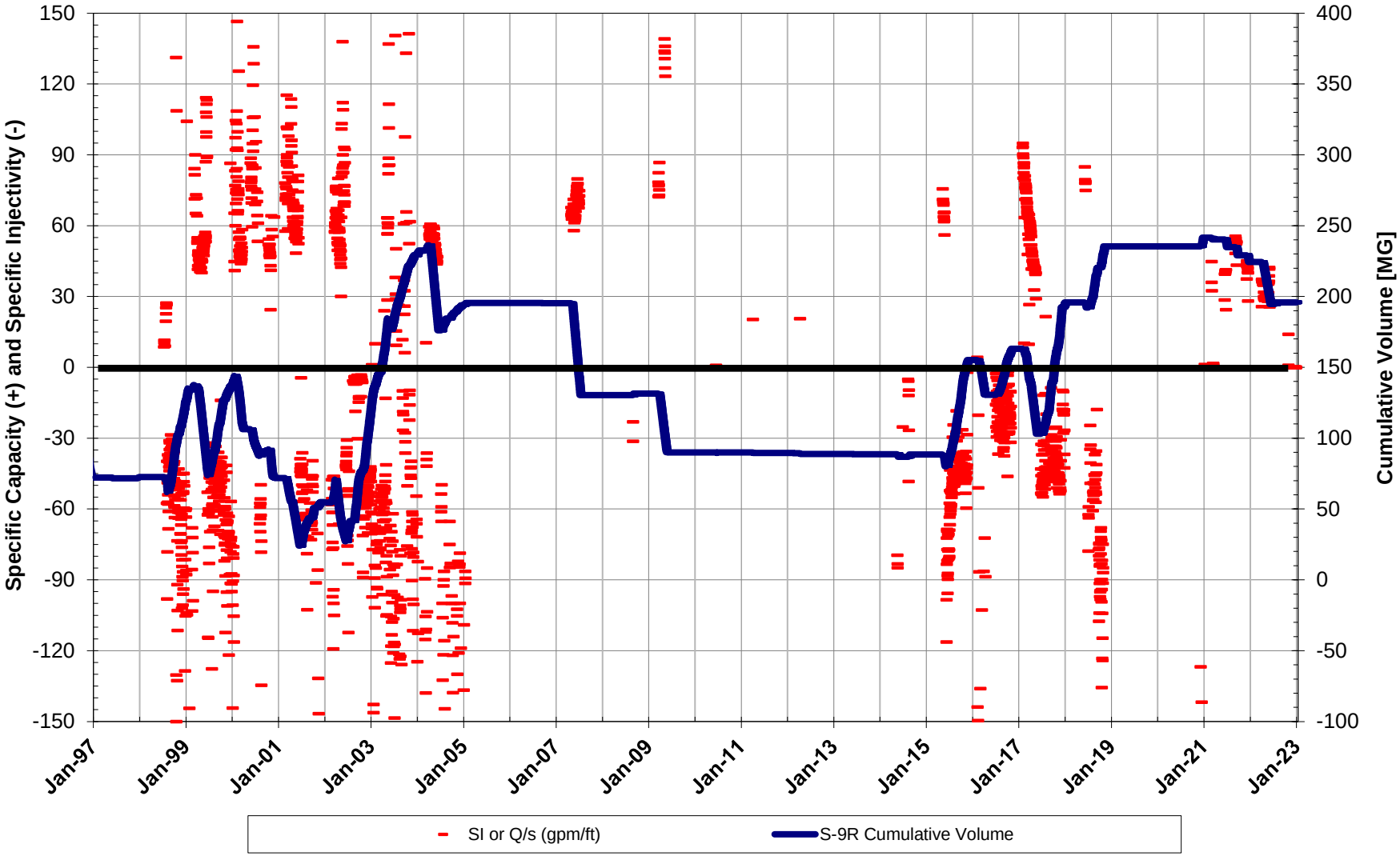


Figure B-9

WF1 S-9R Specific Capacity and Specific Injectivity

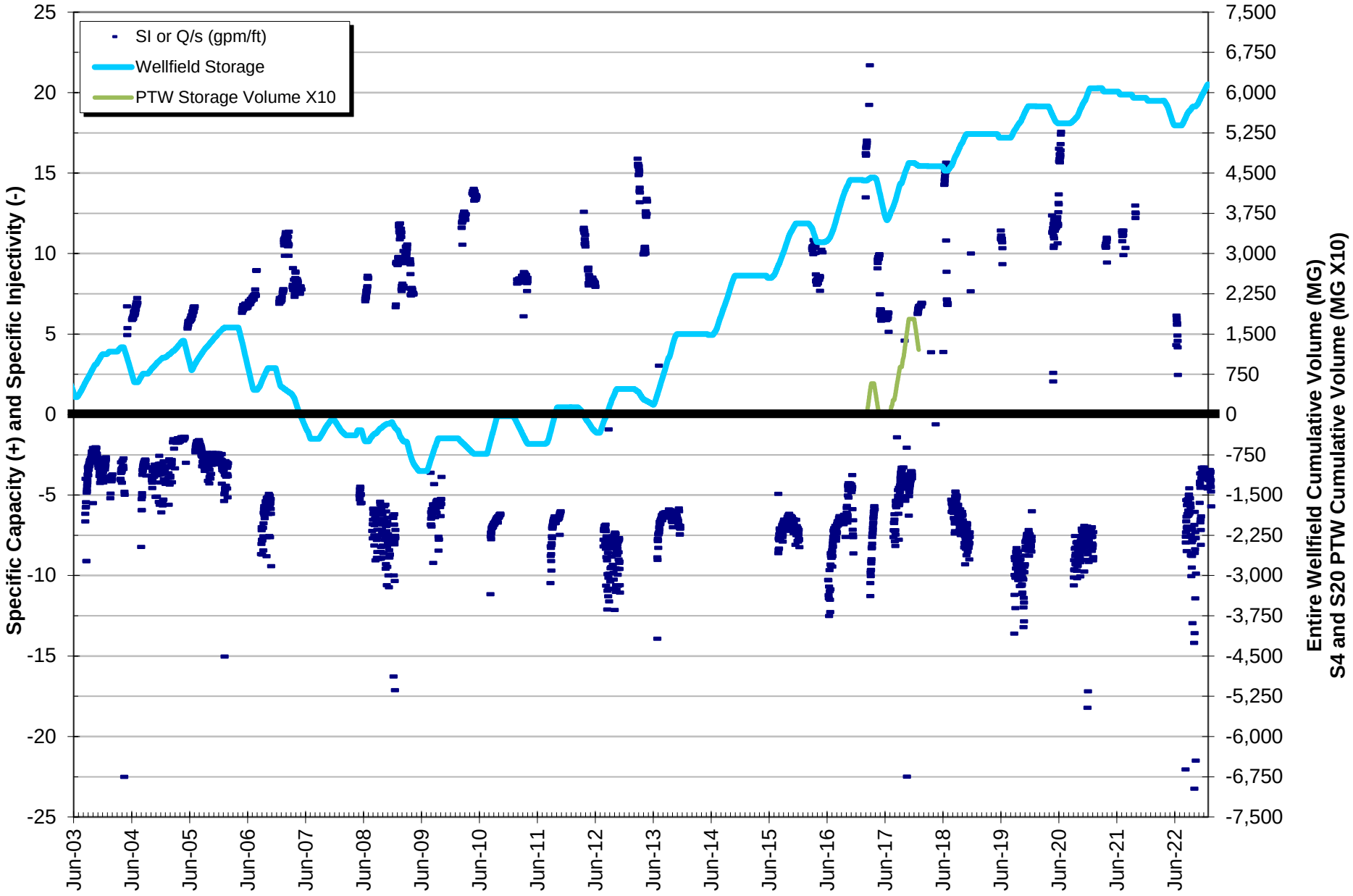


Figure B-10

WF2 S-4 Specific Capacity and Specific Injectivity

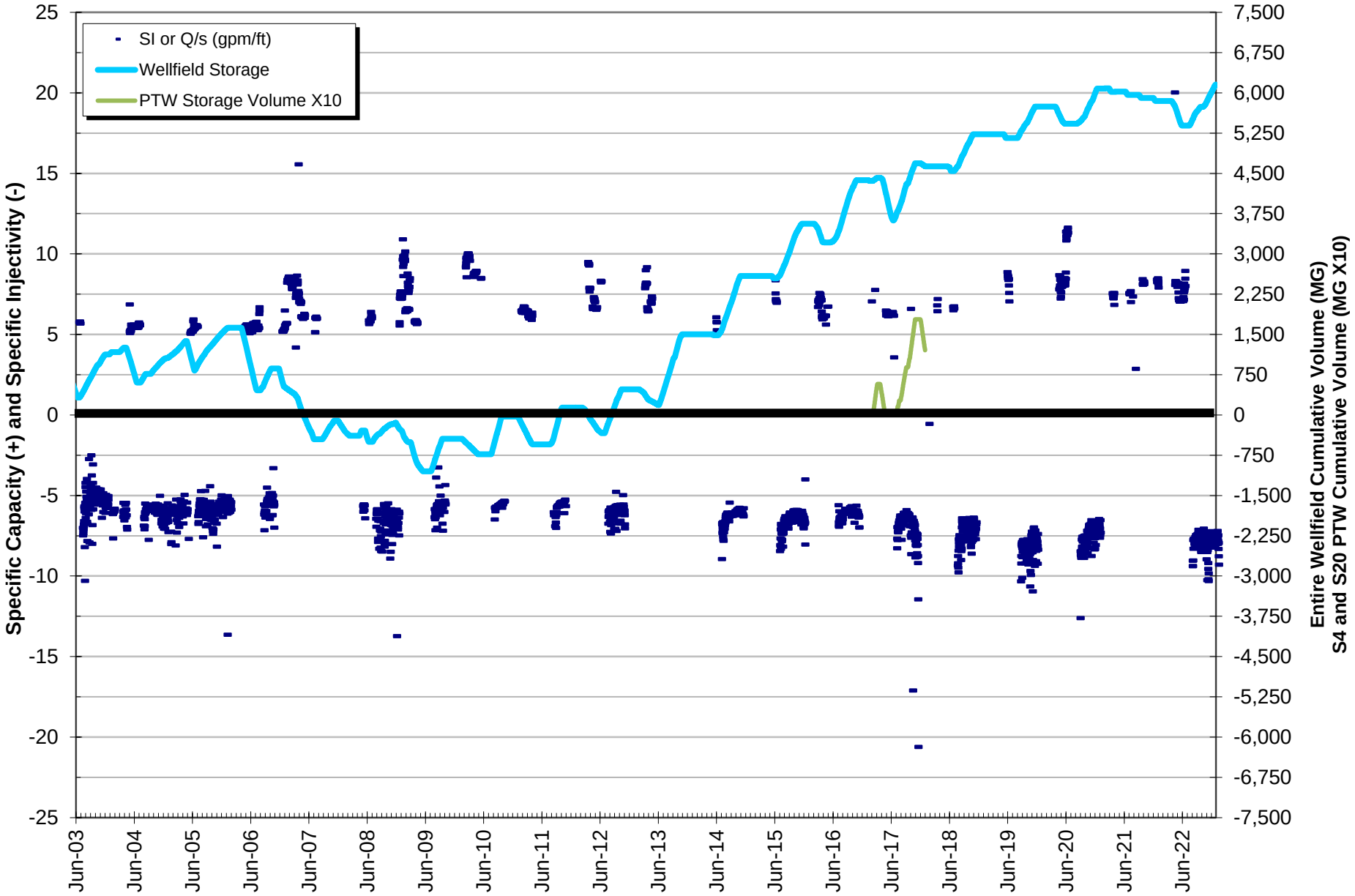


Figure B-11

WF2 S-10 Specific Capacity and Specific Injectivity

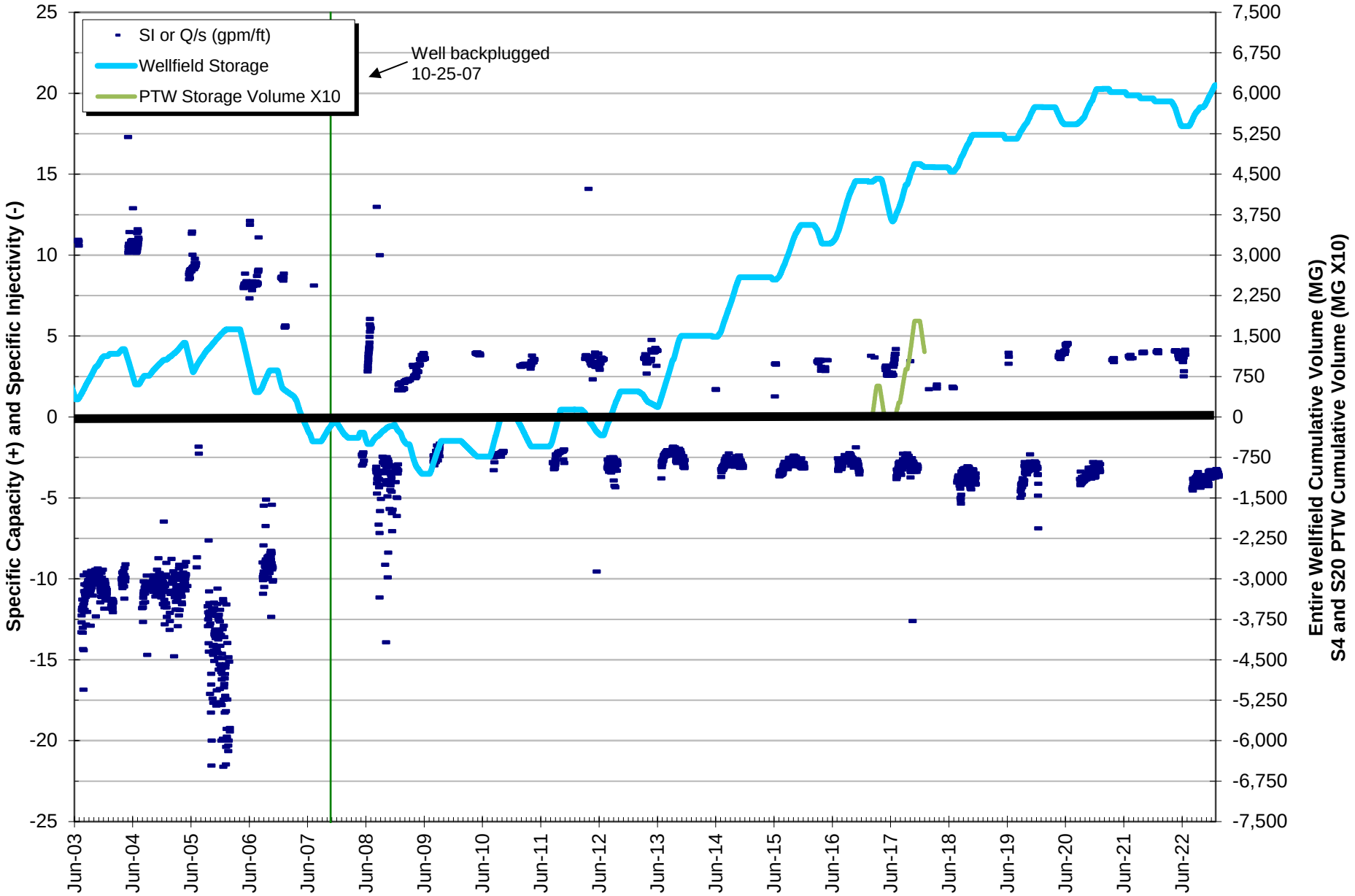


Figure B-12

WF2 S-11 Specific Capacity and Specific Injectivity

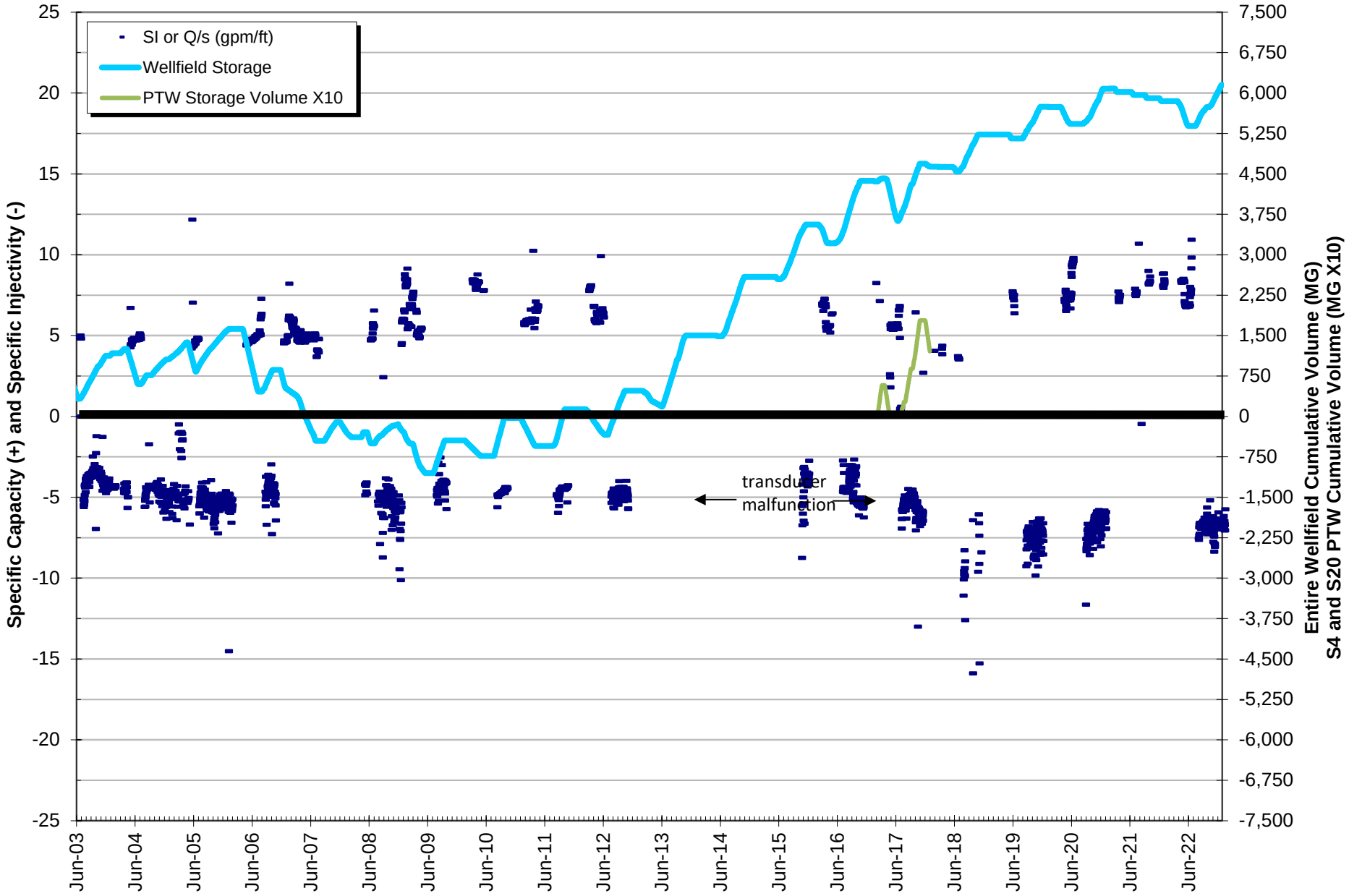


Figure B-13

WF2 S-12 Specific Capacity and Specific Injectivity

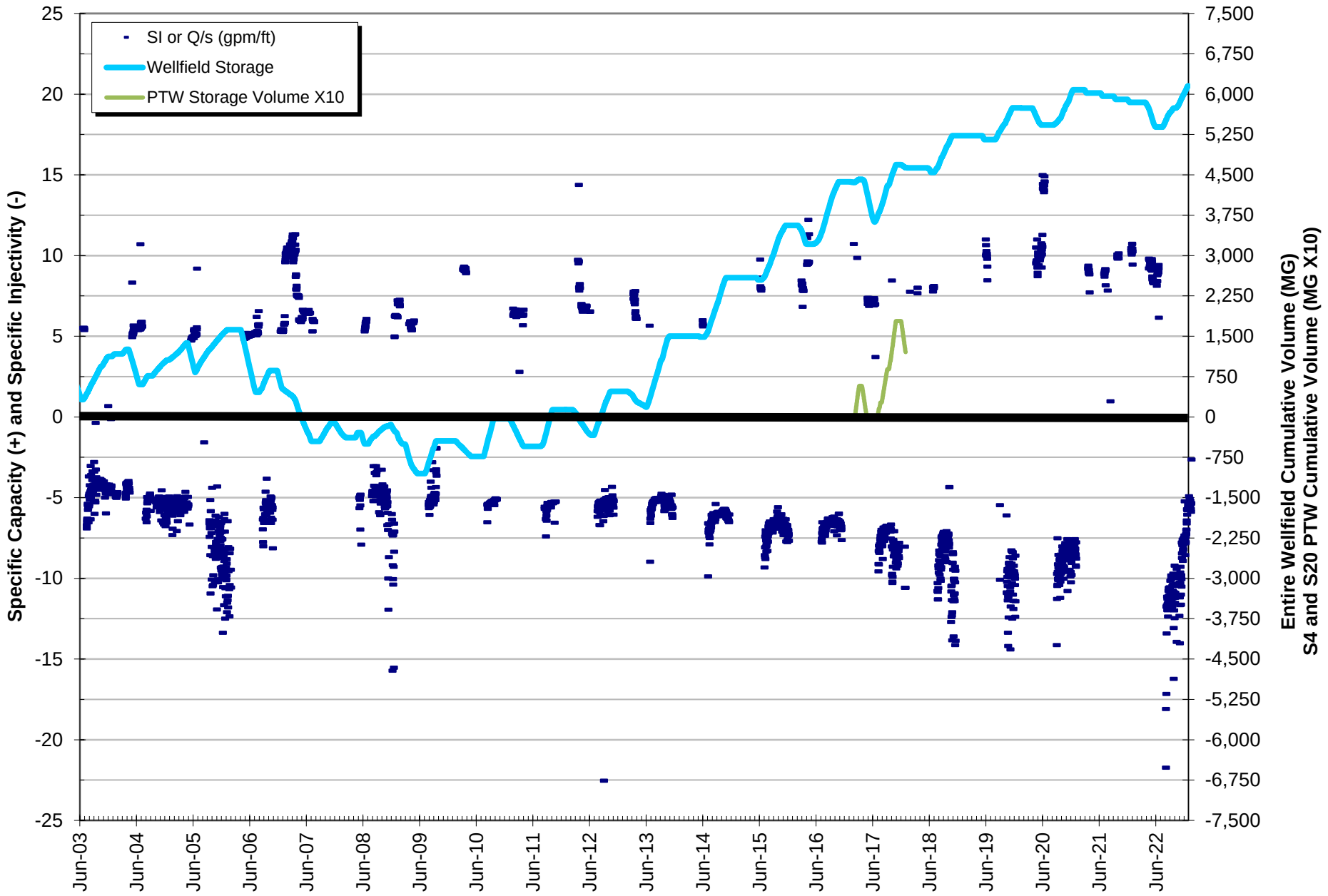


Figure B-14

WF2 S-13 Specific Capacity and Specific Injectivity

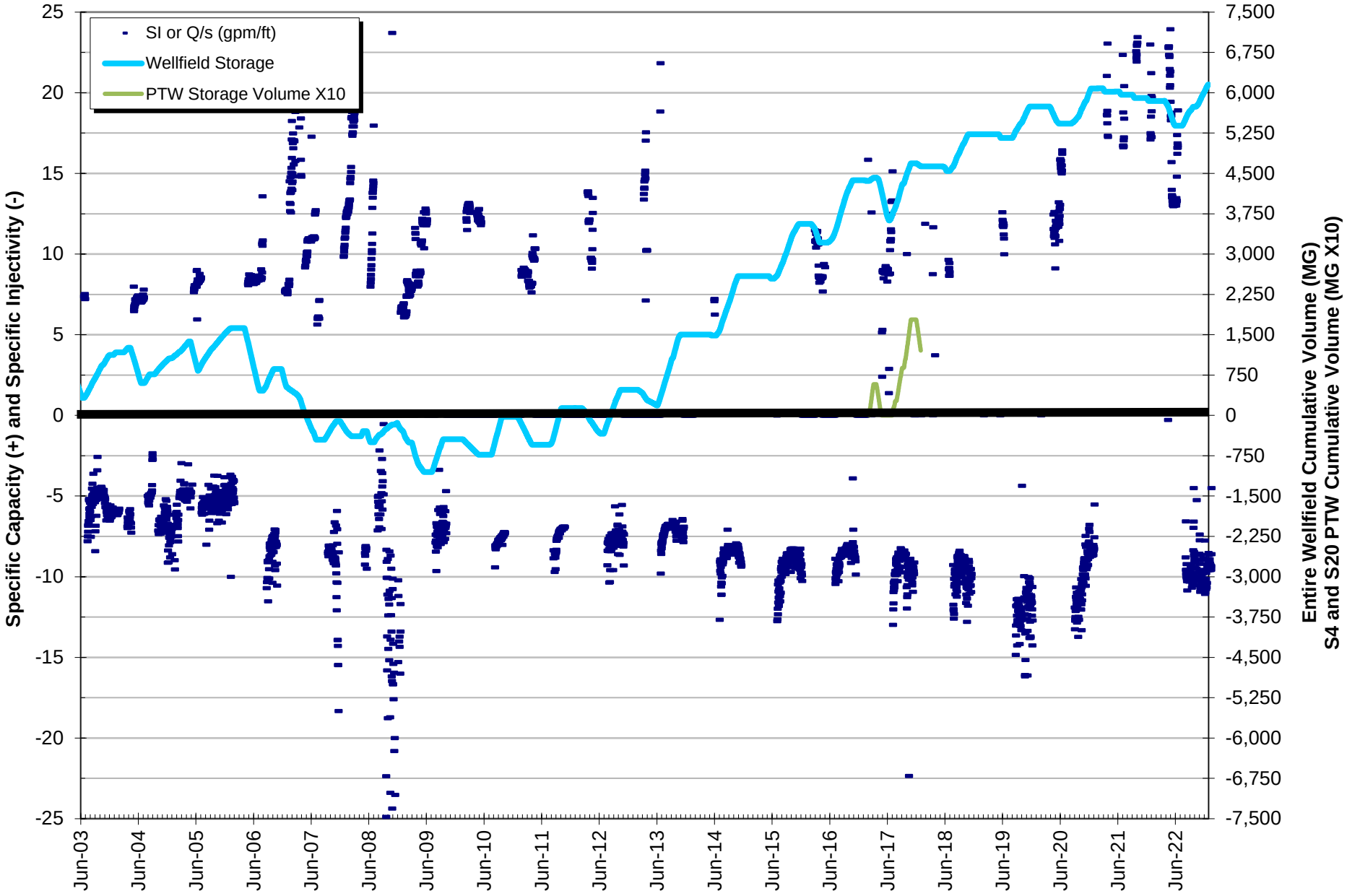


Figure B-15

WF2 S-14 Specific Capacity and Specific Injectivity

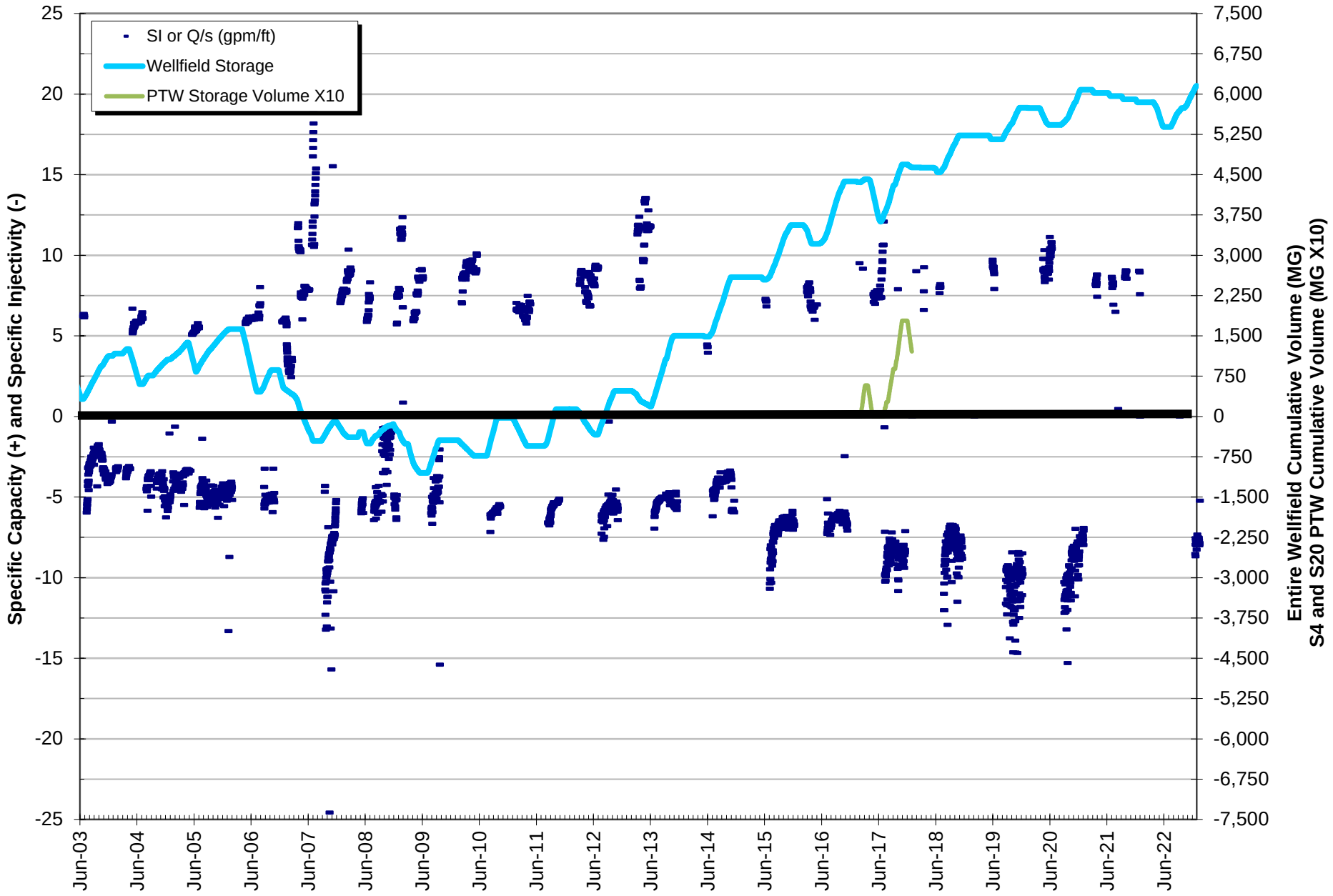


Figure B-16

WF2 S-15 Specific Capacity and Specific Injectivity

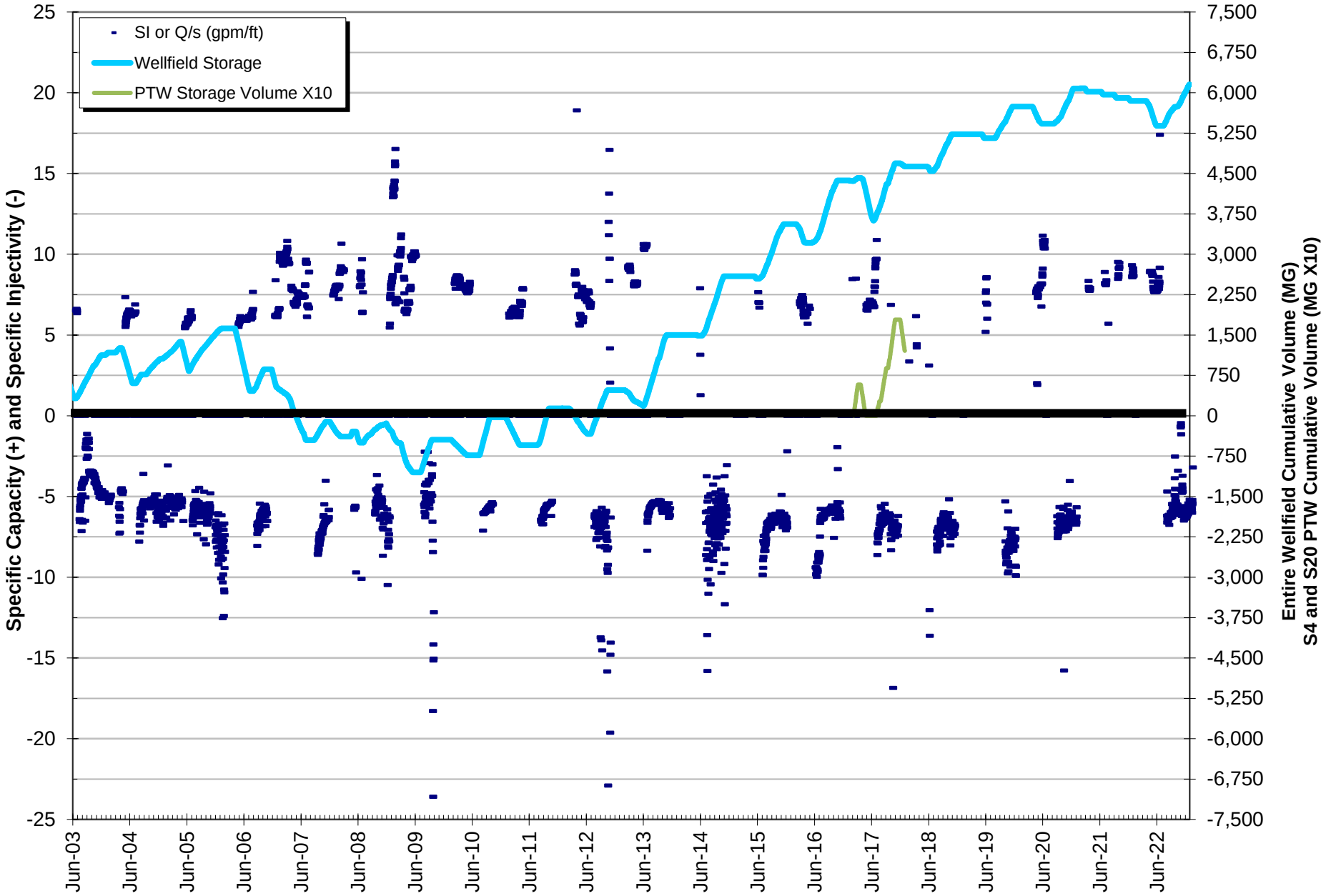


Figure B-17

WF2 S-16 Specific Capacity and Specific Injectivity

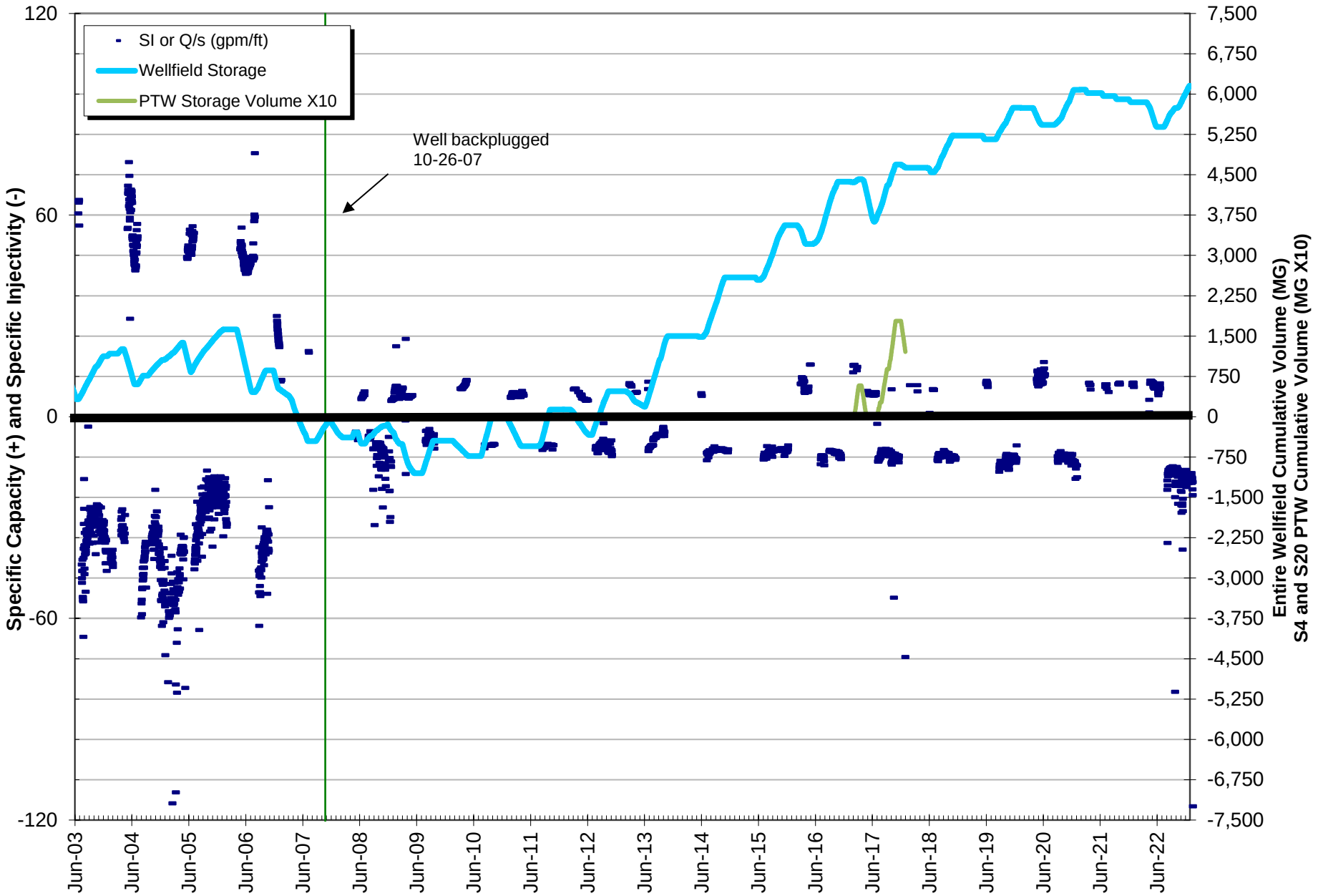


Figure B-18

WF2 S-17 Specific Capacity and Specific Injectivity

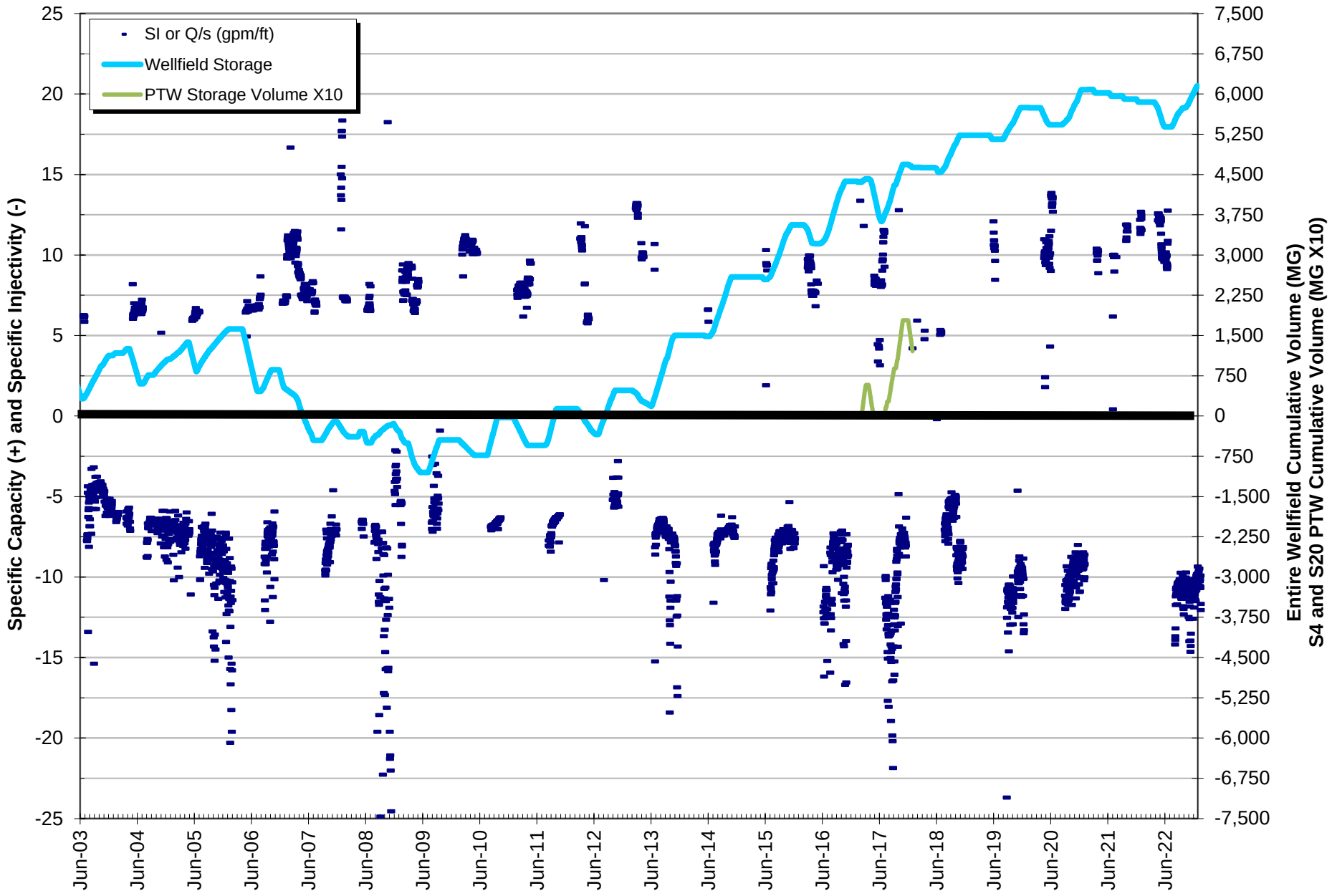


Figure B-19

WF2 S-18 Specific Capacity and Specific Injectivity

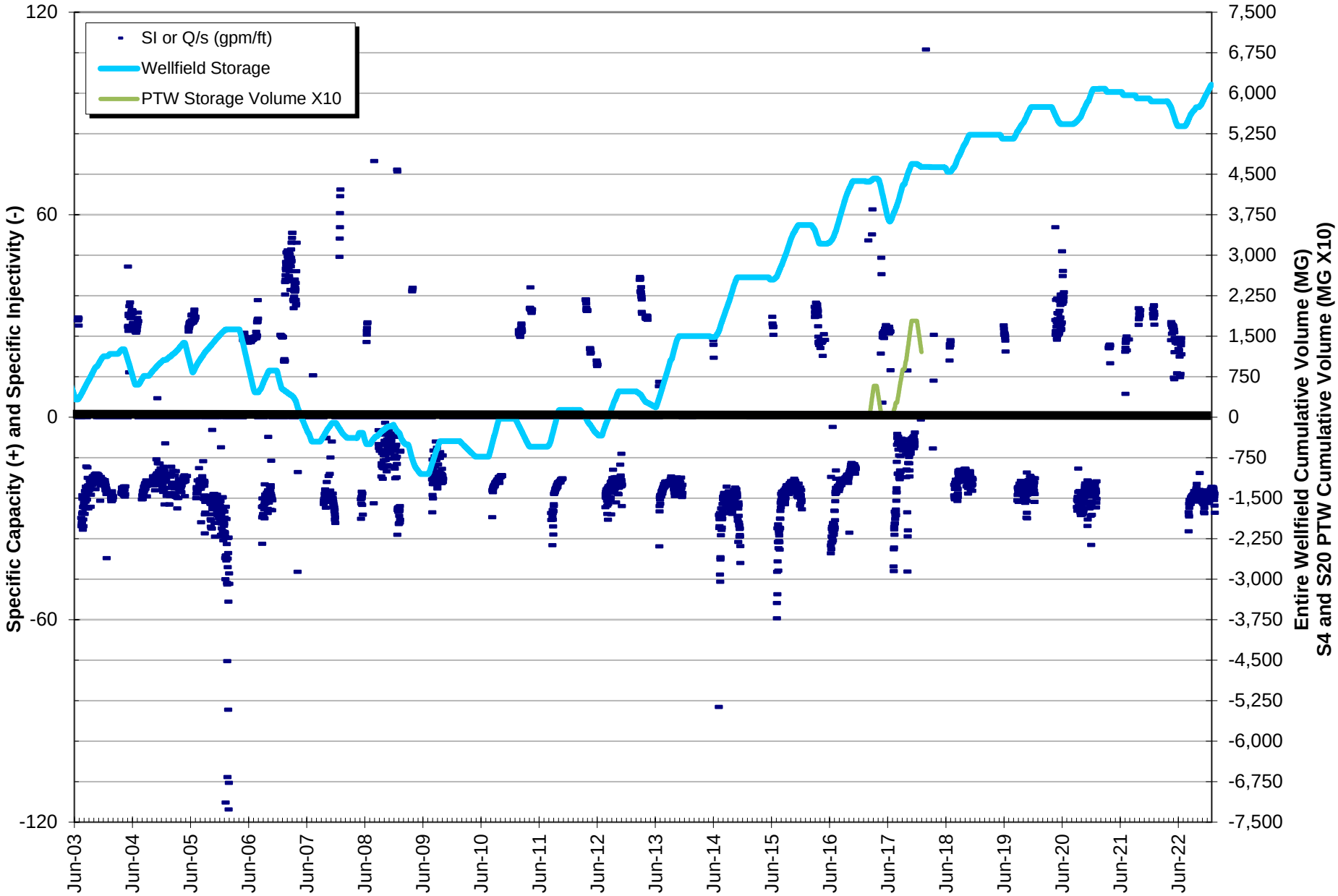


Figure B-20

WF2 S-19 Specific Capacity and Specific Injectivity

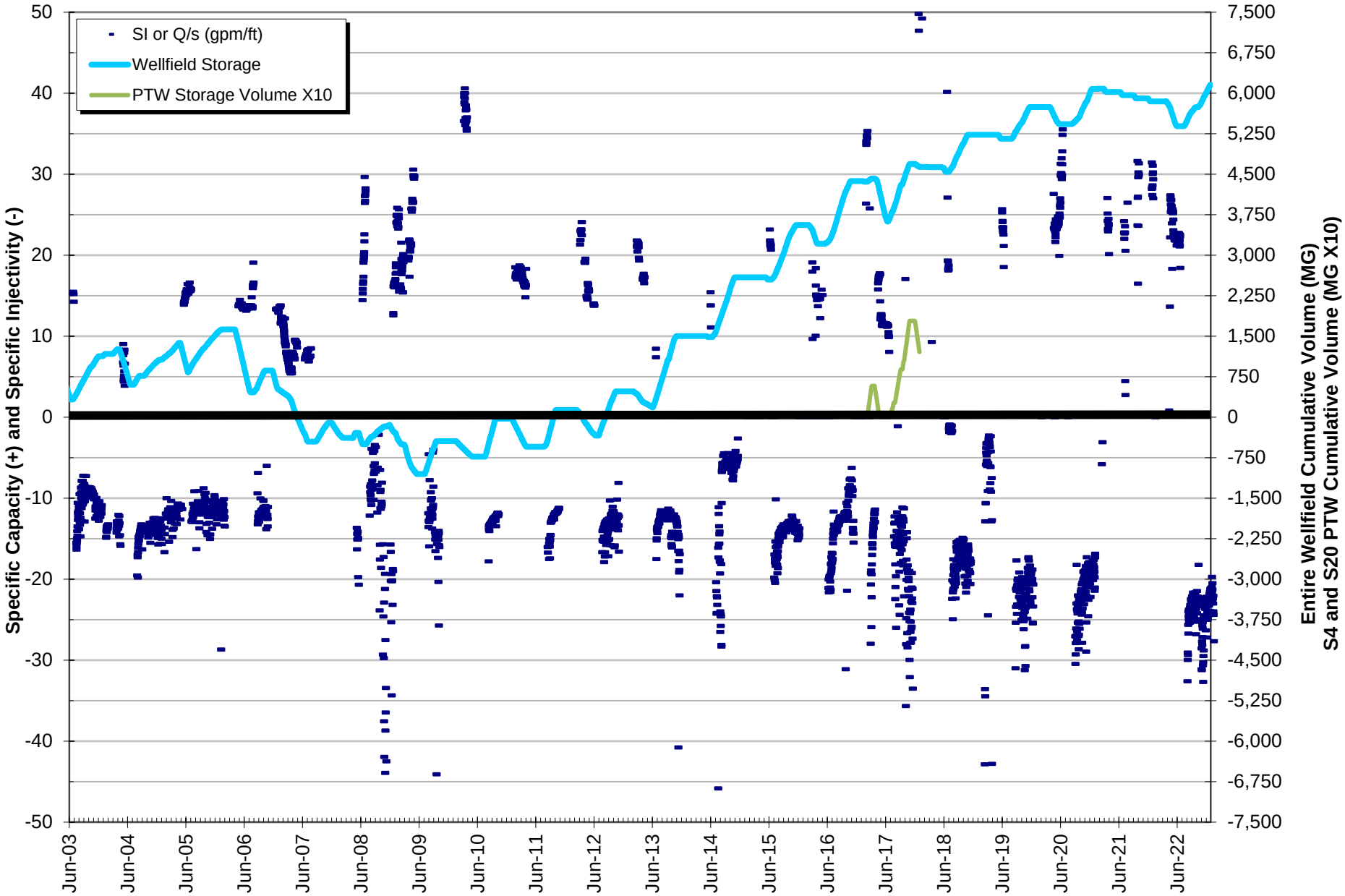


Figure B-21

WF2 S-20 Specific Capacity and Specific Injectivity

Appendix C
Table of Water Quality Data

Station_ID	Sample Date	pH Std Units	Temp °C	Specific Conductance umhos/cm	Oxidation Reduction Potential mV	Dissolved Oxygen mg/l	Turbidity NTU	Chloride mg/l	Sulfate mg/l	Total Dissolved Solids mg/l	Total Alkalinity mg/l Ca CO3	Total Iron ug/l	Dissolved Iron ug/l	Manganese mg/l	Nitrate mg/l	Sulfide mg/l	Total Organic Carbon mg/l	Arsenic ug/L		TTHMs ug/L		Gross Alpha pCi/L		Total Uranium ug/l	Calcium mg/L	Fluoride mg/L	Magnesium mg/L	Sodium mg/L	Total Suspended Solids mg/L	Bicarbonate Alkalinity mg/L	Carbonate Alkalinity mg/L	HAAs mg/L	RA 226 + 228 pCi/L
I-10	3/9/2022	7.57	25.0	824	-295.6	0.20	0.14	171.0	22.0	456.0								0.50	U														
I-10	4/19/2022	7.56	25.0	824	-260.8	0.16	0.11	164.0	20.7	438.0								0.50	U														
I-10	8/3/2022	7.61	25.0	824	-211.2	0.17	0.08	166.0	21.8	460.0								0.50	U														
I-10	11/28/2022	7.57	25.0	825	-240.6	0.19	0.06	170.0	22.2	442.0								0.50	U														
I-1E	1/19/2022	7.87	25.6	396	-209.2	0.28	0.45	58.7																									
I-1E	2/16/2022	7.88	25.6	396	-226.0	0.18	0.33	56.5																									
I-1E	3/9/2022	7.96	25.7	399	-220.1	0.31	0.82	58.4	3.5	216.0								0.50	U														
I-1E	4/19/2022	7.94	25.7	401	-238.0	0.38	1.78	56.8	3.6	204.0								0.50	U														
I-1E	5/11/2022	7.83	25.7	395	-323.4	0.13	0.52	57.3																									
I-1E	6/28/2022	7.84	25.8	395	-254.0	0.29	1.03	59.2																									
I-1E	7/19/2022	8.15	25.8	399	-248.0	0.31	0.29	60.2																									
I-1E	8/3/2022	7.94	25.8	398	-217.1	0.13	0.10	58.2	3.3	216.0								0.50	U														
I-1E	9/26/2022	7.87	25.8	401	-194.1	0.40	0.07	59.7																									
I-1E	10/18/2022	7.95	25.8	398	-247.9	0.15	0.14	58.3																									
I-1E	11/28/2022	7.92	25.7	398	-256.0	0.15	0.26	59.4	3.3	194.0								0.50	U														
I-7	3/9/2022	7.71	24.8	1139	-311.2	0.19	0.30	197.0	152.0	680.0								0.50	U														
I-7	4/19/2022	7.72	25.0	1138	-296.6	0.16	0.27	185.0	143.0	632.0								0.50	U														
I-7	8/3/2022	7.72	25.9	1128	-255.7	0.09	0.29	198.0	140.0	670.0								0.50	U														
I-7	11/28/2022	7.68	24.9	1141	-283.8	0.19	0.37	201.0	144.0	664.0								0.50	U														
I-7	12/27/2022	7.65	24.2	1153	-328.4	0.11	0.28	205.0																									
I-8	3/9/2022	8.10	24.3	420	-284.9	0.17	1.93	53.9	2.9	I 232.0								0.50	U														
I-8	4/19/2022	8.17	24.6	420	-294.4	0.30	0.81	51.4	3.2	218.0								0.50	U														
I-8	8/3/2022	8.27	25.1	406	-232.3	0.12	0.30	52.5	3.2	220.0								0.50	U														
I-8	11/28/2022	8.20	24.4	412	-274.6	0.15	0.72	54.1	3.5	218.0								0.50	U														
M-11	3/9/2022	7.86	24.9	562	-200.8	0.13	0.37	42.8	147.0	332.0								19.00															
M-11	4/19/2022	7.83	24.7	618	-186.0	0.13	3.72	50.7	152.0	368.0								13.90															
M-11	8/3/2022	7.94	25.0	603	-136.6	0.16	0.42	50.1	156.0	368.0								19.70															
M-11	11/28/2022	7.09	24.4	568	144.3	1.28	1.63	53.6	160.0	340.0								0.50	U														
M-12	3/9/2022	7.73	28.5	704	-163.0	0.33	0.38	71.2	181.0	426.0								12.80															
M-12	4/19/2022	7.85	29.1	673	-178.8	0.35	0.36	60.7	154.0	400.0								14.90															
M-12	8/3/2022	8.25	30.9	572	356.5	6.85	27.70	52.5	160.0	340.0								1.25	I														
M-12	11/28/2022	8.18	26.1	483	361.3	7.28	0.32	38.1	134.0	284.0								1.15	I														
M-13	3/9/2022	7.69	27.4	769	-255.7	0.14	0.26	70.7	202.0	486.0								0.50	U														
M-13	4/19/2022	7.70	27.8	772	-225.6	0.16	0.41	67.0	194.0	464.0								0.50	U														
M-13	8/3/2022	7.73	28.0	783	-189.1	0.15	0.30	73.6	203.0	506.0								0.50	U														
M-13	11/28/2022	7.71	27.5	766	-173.8	0.31	0.19	70.0	201.0	452.0								0.50	U														
M-14	1/19/2022	7.76	24.4	707	-171.2	0.13	0.24	70.0	180.0	444.0								11.90															
M-14	2/16/2022	7.79	24.4	711	-146.8	0.10	0.32	75.2	189.0	430.0								10.30				3.5											
M-14	3/22/2022	7.72	24.8	729	-156.6	0.12	0.26	74.2	184.0	452.0								11.50															
M-14	4/13/2022	7.76	24.6	727	-197.9	0.11	0.37	73.9	179.0	448.0								11.60															
M-14	5/11/2022	7.78	25.1	621	-197.2	0.11	0.12	52.9	154.0	372.0								8.36		0.4	U	2.7											
M-14	6/28/2022	7.68	25.6	906	-176.8	0.39	0.62	120.0	211.0	618.0								11.50															
M-14	7/19/2022	8.07	25.3	805	92.3	1.09	0.52	97.6	181.0	490.0								6.83				1.8											
M-14	8/29/2022	7.86	25.4	649	33.3	0.26	0.14	58.0	161.0	394.0								4.59															
M-14	9/26/2022	7.91	25.7	618	13.1	0.36	0.27	52.1	154.0	376.0								3.19															
M-14	10/18/2022	8.06	25.2	578	318.7	2.54	0.14	48.5	143.0	364.0								1.22	I														
M-14	11/15/2022	8.04	25.1	546	150.8	1.90	0.19	45.5	142.0	346.0								1.77	I														
M-14	12/28/2022	7.86	23.5	639	-25.3	0.16	0.10	56.2	165.0	382.0								4.71															
M-15	1/4/2022	7.78	24.3	637	-201.9	0.28	0.33	52.8	154.0	378.0								6.59															
M-15	1/11/2022	7.81	24.4	640	-209.8	0.22	0.21	51.9	151.0	402.0								6.80															
M-15	2/15/2022	7.84	24.1	591	-53.7	0.21	0.52	56.2	161.0	384.0								6.38															
M-15	3/8/2022	7.92	25.2	624	-172.8	0.11	0.21	51.1	152.0	378.0								5.97				3.2											
M-15	4/5/2022	7.67	25.2	731	-207.6	0.12	0.23	71.6	175.0	446.0								10.80		0.5	U	3.1											
M-15	4/12/2022	7.71	25.2	749	-196.6	0.13	0.19	61.9	178.0	456.0								12.00															
M-15	4/20/2022	7.83	25.3	662	-269.6	0.09	0.27	59.3	157.0	388.0								4.74															
M-15	4/26/2022	7.81	25.4	655	-264.0	0.11	0.19	58.0	160.0	392.0								3.16															
M-15	5/3/2022	7.87	25.5	668	-267.8	0.10	0.27	60.1	156.0	400.0								2.59															
M-15	5/10/2022	7.86	24.9	675	-255.9	0.10	0.12	62.6	158.0	404.0								1.61	I														
M-15	5/18/2022	7.84	25.6	700	-235.5	0.13	0.21	65.7	160.0	458.0								2.15															
M-15	5/24/2022	7.70	25.5	926	-260.6	0.10	0.27	88.3	160.0	588.0								12.00															
M-15	6/1/2022	7.60	25.3	968	-236.9	0.10	0.28	132.0	207.0	642.0								9.90															
M-15	6/8/2022	7.68	25.0	825	-231.0	0.14	0.14	99.2	181.0	520.0								7.00															
M-15	6/14/2022	7.73	25.5	799	-247.7	0.11	0.17	98.1	176.0	505.0								6.02															
M-15	6/24/2022	7.90	25.5	793		1.21	5.66	82.1	175.0	476.0								6.08															
M-15	6/27/2022	7.82	25.8	766	-235.2	0.11	0.24	89.8	172.0	468.0								4.92															
M-15	7/18/2022	8.08	26.0	795	-231.4	0.13	0.18	92.4	172.0	476.0								7.04															
M-15	7/26/2022	8.35	25.5	606	388.3	5.49	0.19	56.4	157.0	356.0								1.44	I			1.8											
M-15	8/1/2022	7.97	25.9	686	0.6	0.13	0.04	66.6	160.0	416.0								2.32															
M-15	8/8/2022	8.17	25.9	603	309.7	3.28	0.20	52.7	154.0	344.0								1.32	I														
M-15	8/15/2022	7.97	25.6	642	-5.7	0.14	0.13	58.2	155.0	392.0								2.06															
M-15	8/26/2022	8.02	25.8	615	-23.1	0.24	0.09	55.7	157.0	380.0								1.78	I														
M-15	8/30/2022	7.98	25.6	616	-34.2	0.30	0.05	53.6	157.0	398.0								1.84	I														
M-15	9/6/2022	8.01	26.0	610	-20.0	0.22	0.18	51.2	152.0	372.0								2.26															
M-15	9/13/2022	8.06	25.4	595	-32.4	0.35	0.27	49.4	149.0	344.0								1.31	I														
M-15	9/22/2022	8.18	25.7	550	322.7	3.61	0.14	45.8	141.0	340.0								1.07	I														
M-15	9/26/2022	8.02	25.7	587	38.5	0.63	0.06	47.2	146.0	352.0								1.77	I														
M-15	10/7/2022	8.04	25.4	586	-13.0	0.11	0.15	49.8	149.0	342.0								1.05	I														
M-15	10/13/2022	8.09	25.2	587	-12.6	0.12	0.18	51.0	150.0	338.0								1.00	I														
M-15	10/17/2022	8.20	25.5	530	322.4	4.33	0.23	42.1	133.0	320.0								1.28	I														
M-15	10/24/2022	8.04	25.1	575	55.4	0.80	0.13	45.6	142.0	356.0								1.57	I														
M-15	11/1/2022	8.26	25.6	514	361.4	7.03	0.19	40.4	132.0	294.0								0.97	I														
M-15	11/10/2022	8.05	24.4	581	78.6	0.31	0.16	45.8	146.0	346.0								1.51	I														
M-15	11/14/2022	8.21	25.1	476	385.3	7.62	0.17	37.1	130.0	280.0								0.50	U														
M-15	11/22/2022	8.24	24.7	460	393.7	8.31	1.25	36.1	127.0	278.0								0.61	I														
M-15	11/29/2022	8.08	24.8	515	348.6	4.15	0.17	42.2	136.0	292.0								1.18	I			1.7	U										
M-15	12/6/2022	7.99	25.0	580	-73.8	0.13	0.12	45.9	150.0	358.0								3.00				3.3											
M-15	12/13/2022	8.18	25.1	484	403.1	7.57	0.18	36.0	126.0	298.0								1.02	I														
M-15	12/19/2022	7.97	24.4	595	-88.6	0.11	0.11	47.0	150.0	360.0								4.17															
M-15	12/27/2022	7.94	24.2	595	-117.6	0.11	0.20	49.1	154.0	360.0								3.68															
M-16	1/19/2022	7.73	28.6	670	-105.4	0.29	0.13	56.3	177.0	412.0								2.58															
M-16	2/16/2022	7.79	28.5	668	-163.9	0.21	0.23	60.5	187.0	406.0								2.42				2.5											
M-16	3/22/2022	7.68	28.6	677	-197.6	0.12	0.25	56.9	178.0	410.0								2.95															
M-16	4/13/2022	7.80	27.9	653	-174.5	0.16	0.39	51.3	171.0	404.0								3.97															
M-16	5/11/2022	7.87	26.7	654	-221.1	0.12	0.18	53.4	169.0	416.0								3.10		0.4	U	3.1											
M-16	6/28/2022	7.77	28.2	609	-159.8	0.20	0.54	48.0	165.0	396.0								4.97															
M-16	7/19/2022	8.14	28.5	617	-172.6	0.14	0.05	48.7	166.0	378.0								4.75				2.5											
M-16	8/29/2022	7.84	28.8	644	-151.2	0.15	0.16	52.8	172.0	384.0								3.21															
M-16	9/26/2022	7.82	29.2	666	-110.0	0.20	0.14	56.4	176.0	408.0								4.32															
M-16	10/18/2022	7.83	28.8	657	-142.7	0.14	0.16	54.8	170.0	414.0								3.46															
M-16	11/15/2022	7.78	28.9	663	-169.4	0.15	0.28	57.8	180.0	416.0								3.52															

Station_ID	Sample Date	pH Std Units	Temp °C	Specific Conductance umhos/cm	Oxidation Reduction Potential mV	Dissolved Oxygen mg/l	Turbidity NTU	Chloride mg/l	Sulfate mg/l	Total Dissolved Solids mg/l	Total Alkalinity mg/l Ca CO3	Total Iron ug/l	Dissolved Iron ug/l	Manganese mg/l	Nitrate mg/l	Sulfide mg/l	Total Organic Carbon mg/l	Arsenic ug/L	TTHMs ug/L	Gross Alpha pCi/L	Total Uranium ug/l	Calcium mg/L	Fluoride mg/L	Magnesium mg/L	Sodium mg/L	Total Suspended Solids mg/L	Bicarbonate Alkalinity mg/L	Carbonate Alkalinity mg/L	HAAs mg/L	RA 226 + 228 pCi/L
M-16	12/28/2022	7.80	28.5	688	-209.5	0.17	0.24	61.2	179.0	406.0								3.50													
M-17	1/19/2022	7.94	24.2	597	-170.0	0.14	0.26	49.1	156.0	364.0								4.57													
M-17	2/16/2022	7.95	24.0	594	-151.8	0.21	0.12	52.1	165.0	364.0								4.63		2.8											
M-17	3/22/2022	7.89	24.5	602	-159.9	0.12	0.29	48.9	157.0	366.0								6.31													
M-17	4/13/2022	7.63	24.6	843	-262.8	0.11	0.31	104.0	183.0	514.0								2.06													
M-17	5/11/2022	7.65	25.4	878	-316.5	0.11	0.09	112.0	187.0	538.0								0.80	I 0.4 U	6.5											
M-17	6/28/2022	7.84	25.2	638	-149.3	1.53	0.57	57.8	167.0	398.0								6.58													
M-17	7/19/2022	8.02	25.6	670	-198.2	0.13	0.40	60.7	168.0	410.0								6.99		2.8											
M-17	8/29/2022	8.02	25.7	611	-68.4	0.12	0.10	52.5	165.0	368.0								0.50	U												
M-17	9/26/2022	8.03	25.7	600	-10.2	0.15	0.19	50.1	161.0	374.0								1.22	I												
M-17	10/18/2022	8.11	25.2	592	-41.0	0.16	0.09	48.5	157.0	374.0								0.74	I												
M-17	11/15/2022	8.03	24.9	565	-54.5	0.15	0.34	46.0	157.0	352.0								1.07	I												
M-17	12/28/2022	8.05	24.3	558	-37.9	0.13	0.26	41.2	149.0	326.0								1.49	I												
M-18	1/4/2022	7.91	23.8	676	-242.6	0.26	0.11	56.1	174.0	412.0								0.76	I												
M-18	1/11/2022	7.91	23.9	682	-227.2	0.24	0.24	56.2	173.0	444.0								0.54	I												
M-18	2/15/2022	7.91	23.4	667	-95.4	0.21	0.35	61.1	183.0	438.0								0.50	U												
M-18	3/8/2022	7.99	24.6	679	-230.9	0.11	0.20	58.9	173.0	416.0								0.50	U	2.1 U											
M-18	4/5/2022	7.90	24.7	704	-258.9	0.12	0.25	62.5	181.0	432.0								0.54	I 0.5 U	6.2											
M-18	4/12/2022	7.97	24.7	704	-240.1	0.18	0.16	62.5	177.0	430.0								0.50	U												
M-18	4/20/2022	7.99	24.7	710	-299.2	0.10	0.27	63.3	178.0	434.0								0.63	I												
M-18	4/26/2022	8.09	25.1	739	-304.9	0.12	0.23	68.7	194.0	446.0								0.94	I												
M-18	5/3/2022	8.15	25.2	740	-311.1	0.11	0.17	70.7	188.0	456.0								0.50	U												
M-18	5/10/2022	8.10	24.6	735	-265.1	0.12	0.18	70.2	187.0	448.0								0.50	U												
M-18	5/18/2022	8.08	25.3	756	-264.8	0.11	0.16	71.9	186.0	454.0								0.50	U												
M-18	5/24/2022	7.91	25.0	769	-308.9	0.12	0.27	52.3	145.0	452.0								2.00	I												
M-18	6/1/2022	7.73	24.9	766	-261.3	0.11	0.11	80.0	190.0	472.0								0.55	I												
M-18	6/7/2022	7.77	24.6	771	-299.9	0.10	0.18	80.0	188.0	482.0								0.57	I												
M-18	6/14/2022	7.80	25.3	758	-310.8	0.11	0.36	77.3	187.0	476.0								0.50	U												
M-18	6/24/2022	7.86	25.4	757		0.19	3.95	64.5	182.0	452.0								1.30	I												
M-18	6/27/2022	7.78	25.3	755	-307.7	0.10	0.20	74.8	182.0	458.0								0.84	I												
M-18	7/18/2022	8.19	25.5	751	-318.2	0.13	0.21	74.1	186.0	456.0								0.59	I												
M-18	7/26/2022	8.04	25.4	730	-290.8	0.12	0.29	69.1	186.0	456.0								0.69	I	2.6											
M-18	8/1/2022	7.95	25.5	768	-192.7	0.10	0.41	75.2	189.0	464.0								0.50	U												
M-18	8/8/2022	7.93	25.4	772	-184.3	0.11	0.11	77.1	191.0	462.0								0.50	U												
M-18	8/15/2022	7.91	25.3	770	-180.6	0.12	0.07	77.7	192.0	476.0								0.50	U												
M-18	8/26/2022	7.92	25.5	771	-252.9	0.12	0.04	78.7	196.0	498.0								0.50	U												
M-18	8/30/2022	7.89	25.3	774	-227.5	0.11	0.07	77.8	198.0	484.0								0.60	I												
M-18	9/6/2022	7.91	25.6	774	-221.1	0.11	0.27	76.0	194.0	478.0								0.50	U												
M-18	9/13/2022	7.93	25.0	761	-226.2	0.14	0.22	74.0	192.0	462.0								0.50	U												
M-18	9/22/2022	7.94	25.2	770	-231.6	0.12	0.12	75.8	195.0	502.0								0.50	U												
M-18	9/26/2022	7.89	25.6	774	-233.4	0.12	0.05	74.1	194.0	478.0								0.50	U												
M-18	10/7/2022	7.81	25.0	750	-210.9	0.12	0.15	71.6	192.0	454.0								0.50	U												
M-18	10/13/2022	7.98	24.9	738	-209.4	0.13	0.13	69.6	189.0	440.0								0.50	U												
M-18	10/17/2022	7.97	25.1	742	-224.0	0.12	0.21	69.1	185.0	448.0								0.80	I												
M-18	10/24/2022	7.89	24.6	754	-210.3	0.14	0.18	70.3	190.0	470.0								0.68	I												
M-18	11/1/2022	7.93	25.2	769	-257.3	0.16	0.22	72.1	191.0	472.0								0.65	I												
M-18	11/10/2022	7.93	24.2	777	-273.4	0.12	0.20	74.8	196.0	466.0								0.50	U												
M-18	11/14/2022	7.85	24.8	763	-261.5	0.12	0.13	76.9	200.0	460.0								0.50	U												
M-18	11/22/2022	7.91	24.5	764	-267.7	0.12	0.20	76.1	199.0	484.0								0.51	I												
M-18	11/29/2022	7.91	24.5	778	-274.5	0.11	0.11	78.3	206.0	490.0								0.50	U	2.1											
M-18	12/6/2022	7.90	24.5	778	-249.5	0.13	0.15	78.3	200.0	490.0								0.63	I	2.8											
M-18	12/13/2022	7.88	24.6	800	-276.5	0.13	0.13	79.7	202.0	496.0								0.50	U												
M-18	12/19/2022	7.89	23.9	804	-295.3	0.10	0.20	80.3	202.0	504.0								0.50	U												
M-18	12/27/2022	7.85	23.9	817	-301.5	0.10	0.23	82.9	206.0	502.0								0.50	U												
M-19	1/4/2022	7.80	24.2	621	-188.9	0.30	0.15	44.4	168.0	352.0								4.71													
M-19	1/11/2022	7.81	24.4	626	-206.0	0.24	0.18	44.4	166.0	400.0								5.31													
M-19	2/15/2022	8.02	24.0	608	-78.5	0.14	0.61	47.1	178.0	404.0								4.89													
M-19	3/8/2022	7.91	25.1	616	-222.2	0.10	0.23	44.0	166.0	378.0								5.22		4.0											
M-19	4/5/2022	7.83	24.8	603	-223.9	0.11	0.25	45.3	160.0	364.0								4.15	0.5 U	3.2											
M-19	4/12/2022	7.88	25.0	615	-222.9	0.12	0.14	45.4	163.0	356.0								4.36													
M-19	4/20/2022	7.91	25.4	625	-256.1	0.11	0.18	46.2	168.0	384.0								3.36													
M-19	4/26/2022	7.94	25.3	624	-235.5	0.13	0.28	45.6	173.0	388.0								2.76													
M-19	5/3/2022	7.95	25.1	627	-269.9	0.11	0.16	47.4	169.0	382.0								2.38													
M-19	5/10/2022	7.91	24.6	615	-210.3	0.14	0.15	46.7	169.0	372.0								2.72													
M-19	5/18/2022	7.94	25.2	630	-190.9	0.14	0.17	47.4	171.0	434.0								2.43													
M-19	5/24/2022	7.81	25.2	633	-278.1	0.11	0.23	39.6	164.0	352.0								4.00													
M-19	6/1/2022	7.78	24.9	627	-229.2	0.10	0.11	46.9	174.0	380.0								3.37													
M-19	6/7/2022	7.65	25.4	639	-231.8	0.12	0.17	47.7	174.0	406.0								4.27													
M-19	6/14/2022	7.83	25.5	632	-265.3	0.12	0.35	47.8	173.0	400.0								3.57													
M-19	6/24/2022	7.93	25.5	642		0.14	3.16	39.7	169.0	328.0								3.70													
M-19	6/27/2022	7.84	25.5	634	-264.9	0.13	0.22	48.5	177.0	392.0								3.21													
M-19	7/18/2022	7.81	25.6	640	-228.7	0.14	0.34	50.4	173.0	386.0								2.59													
M-19	7/26/2022	8.11	25.3	650	-226.0	0.15	0.27	61.9	162.0	400.0								1.79	I	2.8											
M-19	8/1/2022	7.99	25.7	650	-137.9	0.12	0.50	59.1	161.0	384.0								1.46	I												
M-19	8/8/2022	8.01	25.7	634	-75.3	0.12	0.24	57.2	162.0	384.0								0.77	I												
M-19	8/15/2022	7.97	25.4	625	-53.8	0.14	0.39	55.7	161.0	380.0								2.06													
M-19	8/26/2022	7.90	25.6	655	-207.7	0.16	0.13	54.6	179.0	410.0								1.78	I												
M-19	8/30/2022	7.91	25.5	654	-178.6	0.12	0.10	54.2	179.0	414.0								1.05	I												
M-19	9/6/2022	8.01	26.1	618	-89.8	0.12	0.18	51.6	161.0	376.0								1.78	I												
M-19	9/13/2022	8.00	25.5	616	-52.7	0.13	0.46	50.9	162.0	380.0								1.07	I												
M-19	9/22/2022	8.04	25.5	610	-82.1	0.12	0.24	50.4	162.0	380.0								1.31	I												
M-19	9/26/2022	7.86	26.2	672	-173.2	0.11	0.28	53.9	180.0	418.0								1.32	I												
M-19	10/7/2022	7.72	25.2	611	-114.8	0.12	0.30	50.3	163.0	382.0								2.08													
M-19	10/13/2022	8.06	25.1	599	-96.5	0.15	0.14	49.6	160.0	334.0								1.95	I												
M-19	10/17/2022	8.04	25.3	605	-112.3	0.14	0.18	49.4	156.0	398.0								1.71	I												
M-19	10/24/2022	7.84	24.6	666	-155.5	0.15	0.13	54.1	178.0	412.0								1.41	I												
M-19	11/1/2022	8.09	25.3	607	-100.9	0.16	0.24	47.7	157.0	364.0								1.34	I												
M-19	11/10/2022	7.92	24.4	672	-249.0	0.18	0.18	53.8	183.0	412.0								1.04	I												
M-19	11/14/2022	7.99	25.1	581	-152.2	0.13	0.31	47.3	159.0	350.0								0.58	I												
M-19	11/22/2022	8.04	24.7	572	-112.2	0.12	0.25	46.3	158.0	354.0								0.94	I												
M-19	11/29/2022	8.02	24.8	582	96.3	0.12	0.16	46.6	164.0	356.0								0.71	I	2.4											
M-19	12/6/2022	7.97	24.7	630	-196.2	0.11	0.11	50.8	172.0	394.0								0.50	U	4.4											
M-19	12/13/2022	8.05	24.7	574	-82.8	0.13	0.13	43.5	155.0	346.0								0.69	I												
M-19	12/19/2022	8.05	24.1	572	-123.7	0.11	0.17	43.8	154.0	346.0								0.90	I												
M-19	12/27/2022	8.00	24.1	576	-203.0	0.10	0.19	43.0	155.0	356.0								0.78	I												
M-2	1/4/2022	7.17	24.6	1220	-294.2	0.25	1.30	105.0	310.0	782.0								0.50	U												
M-2	1/11/2022	7.18	24.7	1198	-258.7	0.26	0.23	110.0	322.0	808.0								0.50	U												
M-2	2/15/2022	7.24	24.0	1162	-295.9	0.16	0.20	114.0	342.0	874.0								0.50	U												
M-2	3/8/2022	7.24	25.2	1170	-312.3	0.09	0.30	109.0	325.0	808.0								0.50	U	3.8											
M-2	4/5/2022	7.15	24.8	1191	-230.9	0.15	0.27	110.0	339.0	862.0								0.50	U 0.5 U	3.3											

Station_ID	Sample Date	pH Std Units	Temp °C	Specific Conductance umhos/cm	Oxidation Reduction Potential mV	Dissolved Oxygen mg/l	Turbidity NTU	Chloride mg/l	Sulfate mg/l	Total Dissolved Solids mg/l	Total Alkalinity mg/l Ca CO3	Total Iron ug/l	Dissolved Iron ug/l	Manganese mg/l	Nitrate mg/l	Sulfide mg/l	Total Organic Carbon mg/l	Arsenic ug/L	TTHMs ug/L	Gross Alpha pCi/L	Total Uranium ug/l	Calcium mg/L	Fluoride mg/L	Magnesium mg/L	Sodium mg/L	Total Suspended Solids mg/L	Bicarbonate Alkalinity mg/L	Carbonate Alkalinity mg/L	HAAs mg/L	RA 226 + 228 pCi/L
M-2	4/12/2022	7.16	24.9	1182	-245.9	0.10	0.32	111.0	326.0	802.0								0.50 U												
M-2	4/20/2022	7.22	25.8	1187	-308.5	0.11	0.22	111.0	327.0	842.0								0.50 U												
M-2	4/26/2022	7.23	25.3	1179	-266.9	0.13	0.23	113.0	335.0	824.0								0.50 U												
M-2	5/3/2022	7.27	25.1	1183	-247.1	0.12	0.27	113.0	323.0	814.0								0.50 U												
M-2	5/10/2022	7.20	25.2	1175	-281.7	0.11	0.24	112.0	322.0	810.0								0.50 U												
M-2	5/18/2022	7.24	26.0	1200	-322.5	0.11	0.19	111.0	325.0	826.0								0.50 U												
M-2	5/24/2022	7.10	25.7	1182	-311.4	0.13	0.23	84.0	279.0	916.0								4.00												
M-2	6/1/2022	7.14	25.7	1177	-319.2	0.12	0.27	115.0	327.0	824.0								0.50 U												
M-2	6/7/2022	7.18	26.1	1193	-330.8	0.12	0.29	117.0	320.0	846.0								0.50 U												
M-2	6/14/2022	7.15	26.1	1178	-339.3	0.13	0.34	118.0	312.0	812.0								0.50 U												
M-2	6/24/2022	7.36	25.7	1189		0.71	3.88	83.9	260.0	728.0								0.81 I												
M-2	6/27/2022	7.22	25.8	1167	-332.1	0.13	0.21	118.0	307.0	818.0								0.50 U												
M-2	7/18/2022	7.72	26.1	1174	-341.5	0.13	0.33	119.0	303.0	788.0								0.50 U												
M-2	7/26/2022	7.51	26.1	1172	-342.7	0.13	0.17	115.0	318.0	798.0								0.50 I		6.0										
M-2	8/1/2022	7.35	26.3	1189	-266.5	0.12	0.34	114.0	315.0	790.0								0.50 U												
M-2	8/8/2022	7.34	26.1	1172	-268.4	0.10	0.20	115.0	318.0	794.0								0.50 U												
M-2	8/15/2022	7.34	25.6	1175	-258.2	0.11	0.06	113.0	314.0	866.0								0.50 U												
M-2	8/26/2022	7.35	26.3	1166	-288.0	0.12	0.14	115.0	320.0	778.0								0.50 U												
M-2	8/30/2022	7.32	25.6	1181	-273.8	0.13	0.06	117.0	326.0	810.0								0.50 U												
M-2	9/6/2022	7.34	26.2	1185	-271.1	0.12	0.17	114.0	318.0	796.0								0.50 U												
M-2	9/13/2022	7.35	25.8	1176	-284.3	0.13	0.18	113.0	318.0	792.0								0.50 U												
M-2	9/22/2022	7.32	25.9	1184	-280.3	0.12	0.26	117.0	330.0	814.0								0.50 U												
M-2	9/26/2022	7.31	25.5	1189	-278.6	0.13	0.17	113.0	319.0	808.0								0.50 U												
M-2	10/7/2022	7.38	26.1	1181	-293.1	0.12	0.16	115.0	319.0	814.0								0.50 U												
M-2	10/13/2022	7.39	25.4	1177	-280.2	0.13	0.18	115.0	319.0	780.0								0.50 U												
M-2	10/17/2022	7.37	25.9	1179	-287.6	0.13	0.26	110.0	310.0	982.0								0.50 U												
M-2	10/24/2022	7.39	25.5	1155	-279.5	0.14	0.24	107.0	300.0	814.0								0.50 U												
M-2	11/1/2022	7.29	25.2	1204	-307.5	0.13	0.12	114.0	322.0	832.0								0.52 I												
M-2	11/10/2022	7.29	24.5	1205	-295.5	0.12	0.24	114.0	330.0	806.0								0.50 U												
M-2	11/14/2022	7.20	25.3	1184	-285.0	0.14	0.43	116.0	342.0	792.0								0.50 U												
M-2	11/22/2022	7.27	24.9	1171	-292.9	0.13	0.27	115.0	343.0	814.0								0.50 U												
M-2	11/29/2022	7.29	25.0	1193	-302.2	0.12	0.09	116.0	346.0	814.0								0.50 U		3.6										
M-2	12/6/2022	7.30	25.3	1182	-303.2	0.12	0.12	114.0	334.0	872.0								0.50 U		4.0										
M-2	12/13/2022	7.27	25.1	1200	-297.3	0.13	0.13	113.0	333.0	832.0								0.50 U												
M-2	12/19/2022	7.26	24.5	1200	-303.8	0.12	0.10	111.0	333.0	868.0								0.50 U												
M-2	12/27/2022	7.22	24.2	1205	-304.6	0.14	0.14	114.0	341.0	826.0								0.50 U												
M-20	1/19/2022	7.42	24.1	987	-260.3	0.15	0.18	98.3	247.0	652.0								0.50 U												
M-20	2/16/2022	7.42	24.4	986	-286.8	0.09	0.32	102.0	254.0	648.0								0.50 U		2.6										
M-20	3/22/2022	7.38	24.9	997	-295.8	0.09	0.19	98.1	245.0	646.0								0.50 U												
M-20	4/13/2022	7.35	25.1	1010	-275.5	0.08	0.28	104.0	260.0	672.0								0.50 U												
M-20	5/11/2022	7.43	25.1	1009	-324.1	0.12	0.33	99.5	251.0	676.0								0.50 U	0.4 U	5.4										
M-20	6/28/2022	7.39	25.3	1013	-326.3	0.13	0.33	103.0	269.0	696.0								0.55 I												
M-20	7/19/2022	7.66	25.7	1025	-334.0	0.12	0.12	103.0	259.0	682.0								0.50 U		3.0										
M-20	8/29/2022	7.43	25.7	1015	-256.3	0.13	0.24	103.0	256.0	664.0								0.50 U												
M-20	9/26/2022	7.44	25.5	1024	-265.1	0.12	0.13	102.0	257.0	704.0								0.50 U												
M-20	10/18/2022	7.50	25.4	1013	-263.3	0.14	0.13	101.0	247.0	690.0								0.50 U												
M-20	11/15/2022	7.40	25.2	1016	-288.1	0.13	0.22	109.0	253.0	678.0								0.50 U												
M-20	12/28/2022	7.43	24.4	1028	-300.9	0.10	0.12	106.0	247.0	658.0								0.50 U												
M-21	1/4/2022	7.38	23.8	999	-264.6	0.26	0.22	106.0	253.0	616.0								0.53 I												
M-21	1/11/2022	7.44	24.0	1011	-258.8	0.23	0.23	100.0	238.0	658.0								0.50 U												
M-21	2/15/2022	7.50	23.7	980	-290.7	0.10	0.14	110.0	257.0	672.0								0.50 U												
M-21	3/8/2022	7.46	24.4	988	-271.6	0.14	0.27	104.0	243.0	634.0								0.50 U		6.1										
M-21	4/5/2022	7.47	24.6	998	-275.7	0.11	0.38	94.6	264.0	636.0								0.50 U	0.5 U	2.8										
M-21	4/12/2022	7.55	24.3	990	-218.2	0.16	0.24	88.6	268.0	640.0								0.50 U												
M-21	4/20/2022	7.67	24.9	993	-300.7	0.17	0.27	84.9	266.0	640.0								0.50 U												
M-21	4/26/2022	7.61	24.9	991	-327.5	0.09	0.31	87.3	277.0	628.0								0.81 I												
M-21	5/3/2022	7.63	24.7	993	-326.2	0.09	0.19	90.2	268.0	642.0								0.50 U												
M-21	5/10/2022	7.59	24.8	991	-329.3	0.10	0.09	91.1	259.0	632.0								0.50 U												
M-21	5/18/2022	7.60	25.5	1014	-288.7	0.12	0.19	101.0	251.0	658.0								0.50 U												
M-21	5/24/2022	7.43	25.4	1010	-324.5	0.13	0.25	76.3	206.0	800.0								2.00 I												
M-21	6/1/2022	7.37	25.1	1011	-259.4	0.11	0.23	110.0	250.0	658.0								0.50 U												
M-21	6/8/2022	7.44	24.6	1017	-312.1	0.13	0.22	110.0	244.0	670.0								0.67 I												
M-21	6/14/2022	7.47	25.6	1007	-332.4	0.12	0.36	109.0	244.0	666.0								0.50 U												
M-21	6/24/2022	7.54	25.3	1013		0.15	2.87	99.3	252.0	536.0								0.80 I												
M-21	6/27/2022	7.47	25.3	1001	-332.0	0.10	0.18	110.0	244.0	640.0								0.50 I												
M-21	7/18/2022	7.88	25.7	1006	-336.6	0.12	0.27	107.0	242.0	646.0								0.50 U												
M-21	7/26/2022	7.77	25.6	1000	-331.3	0.11	0.20	107.0	247.0	658.0								0.50 U		7.0										
M-21	8/1/2022	7.59	25.8	1020	-251.1	0.10	0.28	107.0	241.0	654.0								0.50 U												
M-21	8/8/2022	7.58	25.3	1013	-220.9	0.12	0.33	109.0	243.0	640.0								0.50 U												
M-21	8/15/2022	7.57	25.0	1004	-212.2	0.13	0.13	108.0	239.0	654.0								0.50 U												
M-21	8/26/2022	7.57	25.7	1004	-286.4	0.12	0.11	112.0	244.0	658.0								0.50 U												
M-21	8/30/2022	7.53	25.2	1012	-254.1	0.13	0.11	113.0	248.0	662.0								0.50 U												
M-21	9/6/2022	7.45	25.5	1007	-223.5	0.15	0.14	109.0	240.0	650.0								0.56 I												
M-21	9/13/2022	7.56	25.4	996	-268.8	0.10	0.08	109.0	236.0	634.0								0.50 U												
M-21	9/22/2022	7.59	25.2	998	-261.6	0.13	0.29	107.0	237.0	656.0								0.50 U												
M-21	9/26/2022	7.53	25.4	999	-250.0	0.14	0.22	107.0	235.0	662.0								0.50 U												
M-21	10/7/2022	7.60	25.1	993	-258.1	0.13	0.15	107.0	237.0	634.0								0.63 I												
M-21	10/13/2022	7.60	24.8	990	-268.4	0.14	0.12	108.0	240.0	632.0								0.50 U												
M-21	10/17/2022	7.59	25.0	993	-252.3	0.14	0.08	104.0	232.0	672.0								0.50 U												
M-21	10/24/2022	7.53	25.0	999	-253.6	0.13	0.26	105.0	234.0	664.0								0.51 I												
M-21	11/1/2022	7.57	24.8	1004	-306.1	0.10	0.13	108.0	236.0	642.0								0.59 I												
M-21	11/10/2022	7.56	24.3	1004	-290.8	0.12	0.22	108.0	238.0	646.0								0.50 U												
M-21	11/14/2022	7.50	24.6	987	-277.5	0.14	0.29	110.0	244.0	630.0								0.50 U												
M-21	11/22/2022	7.54	24.4	980	-280.5	0.15	0.15	109.0	242.0	640.0								0.51 I												
M-21	11/29/2022	7.55	24.2	999	-275.2	0.16	0.15	111.0	251.0	644.0								0.50 U		4.3										
M-21	12/6/2022	7.54	24.5	991	-265.6	0.13	0.14	108.0	241.0	646.0								0.50 U		2.1 U										
M-21	12/13/2022	7.48	24.2	1012	-262.1	0.16	0.09	109.0	240.0	636.0								0.50 U												
M-21	12/19/2022	7.52	23.9	1011	-304.5	0.10	0.13	109.0	241.0	642.0								0.50 U												
M-21	12/27/2022	7.50	24.1	1016	-309.3	0.12	0.06	109.0	241.0	642.0								0.50 U												
M-22	1/19/2022	7.90	27.7	534	-11.6	0.13	0.37	40.5	140.0	312.0								5.43												
M-22	2/16/2022	7.95	27.5	537	-59.7	0.21	0.74	42.8	145.0	320.0								4.60		3.4										
M-22	3/22/2022	7.70	27.8	542	59.8	0.24	0.22	41.6	142.0	324.0								5.16												
M-22	4/13/2022	7.87	27.8	551	-102.8	0.19	0.39	40.5	137.0	328.0								4.76												
M-22	5/11/2022	7.95	28.2	548	-83.4	0.29	0.10	42.9	142.0	328.0								4.47	1.5	3.3										
M-22	6/28/2022	7.74	27.8	636	-77.6	0.13	0.80	65.9	156.0	372.0								7.50												
M-22	7/19/2022	8.04	27.8	646	-78.7	0.14	0.40	68.5	156.0	386.0								9.41		3.2										
M-22	8/29/2022	7.81	27.8	644	-48.3	0.36	0.43	69.3	154.0	386.0								9.63												
M-22	9/26/2022	7.79	27.8	641	-88.7	0.29	1.62	67.2	152.0	390.0								12.40												
M-22	10/18/2022	7.85	27.8	646	-76.9	0.31	0.23	69.2	149.0	388.0								12.00												
M-22	11/15/2022	7.96	27.1	560	106.5	1.58	0.21	47.3	147.0	336.0								3.69												

Station_ID	Sample Date	pH Std Units	Temp °C	Specific Conductance umhos/cm	Oxidation Reduction Potential mV	Dissolved Oxygen mg/l	Turbidity NTU	Chloride mg/l	Sulfate mg/l	Total Dissolved Solids mg/l	Total Alkalinity mg/l Ca CO3	Total Iron ug/l	Dissolved Iron ug/l	Manganese mg/l	Nitrate mg/l	Sulfide mg/l	Total Organic Carbon mg/l	Arsenic ug/L	TTHMs ug/L	Gross Alpha pCi/L	Total Uranium ug/l	Calcium mg/L	Fluoride mg/L	Magnesium mg/L	Sodium mg/L	Total Suspended Solids mg/L	Bicarbonate Alkalinity mg/L	Carbonate Alkalinity mg/L	HAAs mg/L	RA 226 + 228 pCi/L
M-22	12/28/2022	8.06	24.8	408	1.5	2.13	0.19	41.4	138.0	334.0								3.75													
M-6	3/9/2022	7.58	28.3	1480	-253.4	0.49	0.08	254.0	257.0	992.0								0.50 U													
M-6	4/19/2022	7.25	28.3	1483	-245.0	0.23	0.08	241.0	235.0	904.0								0.50 U													
M-6	8/3/2022	7.25	28.8	1482	-177.8	1.41	0.05	257.0	248.0	942.0								0.50 U													
M-6	11/28/2022	7.24	28.3	1471	-237.3	0.52	1.43	261.0	254.0	948.0								0.50 U													
M-7	1/19/2022	7.90	23.9	676	-180.5	0.17	0.21	58.2	179.0	410.0								0.50 U													
M-7	2/16/2022	7.89	24.7	678	-203.5	0.16	0.26	61.6	188.0	412.0								0.50 U		3.1											
M-7	3/22/2022	7.86	25.2	690	-232.9	0.11	0.19	59.7	182.0	434.0								0.50 U													
M-7	4/13/2022	7.82	25.1	693	-209.3	0.12	0.41	58.1	180.0	450.0								0.50 U													
M-7	5/11/2022	7.87	25.0	705	-286.5	0.12	0.27	62.5	182.0	444.0								0.50 U	0.4 U	2.1											
M-7	6/28/2022	7.86	25.3	704	-265.1	0.15	0.28	64.1	187.0	428.0								0.50 U													
M-7	7/19/2022	8.10	25.8	712	-290.2	0.12	0.37	63.6	188.0	436.0								0.50 U		1.5											
M-7	8/29/2022	7.91	25.7	711	-178.8	0.14	0.21	64.7	187.0	430.0								0.50 U													
M-7	9/26/2022	7.91	25.6	721	-203.4	0.13	0.24	65.0	187.0	444.0								0.62 I													
M-7	10/18/2022	7.98	25.1	710	-185.1	0.15	0.15	63.6	181.0	452.0								0.50 U													
M-7	11/15/2022	7.86	25.3	710	-228.2	0.13	0.12	66.1	190.0	462.0								0.50 U													
M-7	12/28/2022	7.87	24.4	726	-260.5	0.11	0.18	64.8	188.0	450.0								0.50 U													
M-8	1/19/2022	7.91	23.7	782	-237.8	0.15	0.38	85.7	160.0	486.0								0.50 U													
M-8	2/16/2022	7.93	23.3	771	-229.8	0.17	0.56	92.3	166.0	482.0								0.50 U		2.0											
M-8	3/22/2022	7.87	23.8	778	-244.0	0.12	0.41	89.1	159.0	480.0								0.50 U													
M-8	4/13/2022	7.87	24.4	791	-262.9	0.10	0.87	86.6	157.0	508.0								0.50 U													
M-8	5/11/2022	7.90	24.5	796	-326.1	0.11	0.47	88.3	162.0	506.0								0.50 U	0.4 U	2.5											
M-8	6/28/2022	7.89	25.4	788	-246.1	0.12	0.54	90.4	160.0	496.0								0.50 U													
M-8	7/19/2022	8.25	25.3	785	-300.0	0.13	0.35	91.3	158.0	486.0								0.52 I		2.0											
M-8	8/29/2022	7.93	25.4	803	-236.7	0.13	0.08	90.7	164.0	500.0								0.50 U													
M-8	9/26/2022	7.91	25.6	804	-235.7	0.14	0.12	90.0	165.0	530.0								0.50 U													
M-8	10/18/2022	8.02	25.1	783	-238.6	0.13	0.14	87.4	155.0	512.0								0.50 U													
M-8	11/15/2022	7.88	24.7	780	-266.1	0.12	0.23	87.4	162.0	512.0								0.72 I													
M-8	12/28/2022	7.98	22.8	811	-276.8	0.15	0.27	91.2	172.0	482.0								0.68 I													
S-1	4/4/2022	7.78	28.2	574	-203.5	0.44	0.24	45.3	139.0	334.0								3.27	0.5 U	1.9 U											
S-1	4/11/2022	7.48	28.1	573	-51.3	0.30	0.46	45.8	139.0	344.0								4.02													
S-1	4/18/2022	8.18	28.8	582	-97.5	0.50	0.45	48.3	141.0	336.0								4.21													
S-1	4/25/2022	7.58	28.5	590	-99.9	0.30	0.24	50.4	142.0	370.0								3.92													
S-1	5/2/2022	7.93	29.7	601	-140.0	0.36	0.21	52.5	145.0	359.0								4.26													
S-1	5/9/2022	7.40	28.5	604	-86.0	0.25	0.33	54.0	146.0	358.0								3.84													
S-1	5/17/2022	7.86	28.9	625	-162.1	0.31	1.97	54.7	148.0	456.0								5.36													
S-1	5/23/2022	6.93	29.1	635	-15.0	0.29	0.27	58.5	145.0	382.0								5.40													
S-1	5/31/2022	7.75	29.7	636	-155.7	0.29	0.26	62.7	147.0	376.0								5.30													
S-10	4/4/2022	7.63	28.3	623	-101.5	0.41	0.28	53.5	152.0	376.0								9.11	0.5 U	2.9 U											
S-10	4/11/2022	7.89	28.7	633	-138.4	0.26	0.32	55.4	155.0	374.0								8.85													
S-10	4/18/2022	7.56	28.8	633	-122.1	0.28	0.29	55.4	156.0	374.0								8.81													
S-10	4/25/2022	7.94	28.9	624	-144.1	0.30	0.34	55.3	155.0	388.0								10.20													
S-10	5/2/2022	7.07	29.0	656	-139.8	0.23	0.32	63.1	158.0	388.0								9.33													
S-10	5/9/2022	7.92	29.6	695	-155.4	0.24	0.16	74.2	164.0	430.0								9.03													
S-10	5/17/2022	7.63	29.1	754	-159.1	0.20	0.15	89.4	170.0	442.0								10.60													
S-10	5/23/2022	7.83	29.5	793	-155.2	0.37	0.38	102.0	173.0	448.0								10.90													
S-10	5/31/2022	7.29	30.0	927	-180.1	0.20	0.25	138.0	185.0	604.0								12.30													
S-11	4/4/2022	7.75	28.0	524	-3.7	0.26	0.33	35.4	135.0	308.0								11.00	4.4	1.6 U											
S-11	4/11/2022	7.93	28.3	529	-6.8	0.27	0.33	36.7	136.0	310.0								13.40													
S-11	4/18/2022	7.82	28.6	530	18.7	0.26	0.26	37.5	138.0	324.0								14.10													
S-11	4/25/2022	7.86	29.0	530	58.6	0.36	0.23	37.2	138.0	332.0								14.10													
S-11	5/2/2022	7.44	28.8	533	81.5	0.28	0.25	38.2	140.0	308.0								12.60													
S-11	5/9/2022	7.99	29.5	538	-9.6	0.21	0.16	38.8	137.0	328.0								14.60													
S-11	5/17/2022	7.84	28.8	555	1.7	0.26	0.20	40.0	142.0	342.0								17.50													
S-11	5/23/2022	7.93	29.3	557	-25.6	0.22	0.24	40.6	142.0	316.0								19.20													
S-11	5/31/2022	7.59	29.7	558	-9.8	0.22	0.26	42.0	144.0	352.0								19.40													
S-12	4/4/2022	7.71	28.3	633	-137.7	0.23	0.37	53.0	155.0	376.0								10.70	2.0 I	2.6											
S-12	4/11/2022	7.82	28.6	638	-152.2	0.31	0.22	55.7	157.0	380.0								10.50													
S-12	4/18/2022	7.79	28.7	638	-141.3	0.28	0.27	55.8	158.0	384.0								9.54													
S-12	4/25/2022	7.87	29.4	632	-126.3	0.36	0.24	54.8	156.0	398.0								10.10													
S-12	5/2/2022	7.61	28.9	643	-154.9	0.26	0.22	58.7	159.0	390.0								8.87													
S-12	5/9/2022	7.92	29.4	657	-168.5	0.20	0.64	62.1	161.0	408.0								8.28													
S-12	5/17/2022	7.72	29.1	690	-150.3	0.29	0.23	67.9	164.0	460.0								9.98													
S-12	5/23/2022	7.92	29.7	703	-168.3	0.28	0.19	73.1	167.0	416.0								10.90													
S-12	5/31/2022	7.55	30.3	804	-177.8	0.25	0.28	97.9	181.0	506.0								12.80													
S-13	4/4/2022	7.66	28.5	725	-152.1	0.57	0.36	69.7	176.0	430.0								13.00	1.1 I	2.4 U											
S-13	4/11/2022	7.76	28.9	741	-172.6	0.23	0.20	74.6	182.0	446.0								12.10													
S-13	4/18/2022	7.74	28.9	741	-165.8	0.33	0.29	75.3	180.0	446.0								11.00													
S-13	4/25/2022	7.81	29.3	740	-168.8	0.34	0.23	75.8	180.0	464.0								11.10													
S-13	5/2/2022	7.67	29.3	759	-177.5	0.26	0.21	80.9	183.0	462.0								10.40													
S-13	5/9/2022	7.85	29.5	780	-188.8	0.21	0.37	86.2	185.0	482.0								9.91													
S-13	5/17/2022	7.65	29.2	825	-174.7	0.25	0.18	96.4	191.0	512.0								10.20													
S-13	5/23/2022	7.79	29.8	845	-183.8	0.29	0.31	103.0	193.0	490.0								10.50													
S-13	5/31/2022	7.54	30.2	953	-193.9	0.22	0.30	124.0	206.0	626.0								13.20													
S-14	4/4/2022	7.69	28.6	656	-154.7	0.38	0.24	58.0	162.0	390.0								8.76	2.5	3.4											
S-14	4/11/2022	7.82	28.9	662	-171.9	0.37	0.42	59.6	163.0	402.0								8.50													
S-14	4/18/2022	7.77	29.0	673	-166.4	0.28	0.23	62.6	165.0	378.0								9.16													
S-14	4/25/2022	7.82	29.1	662	-187.3	0.20	0.28	60.2	162.0	410.0								8.25													
S-14	5/2/2022	7.80	29.2	671	-180.0	0.20	0.26	61.8	162.0	396.0								6.28													
S-14	5/9/2022	7.93	29.6	683	-178.5	0.39	0.18	66.0	166.0	404.0								5.26													
S-14	5/17/2022	7.72	29.2	711	-165.3	0.29	0.19	70.6	169.0	446.0								8.22													
S-14	5/23/2022	7.82	29.7	720	-181.2	0.25	0.34	74.8	171.0	424.0								9.57													
S-14	5/31/2022	7.62	30.1	797	-193.0	0.21	0.26	94.4	187.0	500.0								10.90													
S-16	4/4/2022	7.76	27.9	558	-77.7	0.28	0.34	42.1	141.0	324.0								5.22	5.6	2.3											
S-16	4/11/2022	7.89	28.2	561	-112.9	0.23	0.20	42.1	143.0	342.0								4.66													
S-16	4/18/2022	7.87	28.4	566	-114.7	0.23	0.22	43.4	143.0	324.0								5.08													
S-16	4/25/2022	7.93	28.7	559	-91.9	0.31	0.29	42.5	143.0	364.0								4.82													
S-16	5/2/2022	7.94	28.9	580	-103.0	0.28	0.20	47.1	147.0	334.0								5.16													
S-16	5/9/2022	7.99	29.0	595	-120.8	0.37	0.88	51.0	148.0	346.0								4.65													
S-16	5/17/2022	7.77	28.9	626	-133.3	0.25	0.19	56.9	151.0	384.0								6.64													
S-16	5/23/2022	7.89	29.2	637	-132.3	0.34	0.22	60.9	153.0	364.0								7.41													
S-16	5/31/2022	7.67	29.8	720	-184.8	0.18	0.23	85.9	164.0	446.0								8.96													
S-17	4/4/2022	7.70	29.1	655	-143.4	0.56	0.32	58.7	161.0	392.0								11.00	1.2 I	4.6											
S-17	4/11/2022	7.81	29.2	661	-172.7	0.18	0.22	60.8	162.0	402.0								11.00													
S-17	4/18/2022	7.80	29.4	662	-167.0	0.22	0.21	61.6	163.0	386.0								10.20													
S-17	4/25/2022	7.85	29.7	652	-158.4	0.22	0.19	59.1	161.0	408.0								10.40													
S-17	5/2/2022	7.88	29.5	679	-153.5	0.27	0.21	66.7	166.0	400.0								10.40													
S-17	5/9/2022	7.93	29.5	708	-155.0	0.33	0.24	75.8	170.0	422.0								10.50													
S-17	5/17/2022	7.71	29.5	764	-161.7	0.23	0.19	89.3	174.0	496.0								12.80													
S-17	5/31/2022	7.58	30.1	941	-183.2	0.19	0.25	137.0	187.0	612.0								11.80													

Station_ID	Sample Date	pH Std Units	Temp °C	Specific Conductance umhos/cm	Oxidation Reduction Potential mV	Dissolved Oxygen mg/l	Turbidity NTU	Chloride mg/l	Sulfate mg/l	Total Dissolved Solids mg/l	Total Alkalinity mg/l Ca CO3	Total Iron ug/l	Dissolved Iron ug/l	Manganese mg/l	Nitrate mg/l	Sulfide mg/l	Total Organic Carbon mg/l	Arsenic ug/L	TTHMs ug/L	Gross Alpha pCi/L	Total Uranium ug/l	Calcium mg/L	Fluoride mg/L	Magnesium mg/L	Sodium mg/L	Total Suspended Solids mg/L	Bicarbonate Alkalinity mg/L	Carbonate Alkalinity mg/L	HAAs mg/L	RA 226 + 228 pCi/L
S-18	4/4/2022	7.71	28.3	609	-146.5	0.25	0.36	49.5	152.0	356.0								6.95	1.3 I	3.0 U										
S-18	4/11/2022	7.82	28.5	618	-144.9	0.29	0.22	52.2	152.0	384.0								6.76												
S-18	4/18/2022	7.81	28.6	622	-151.7	0.20	0.32	53.1	154.0	362.0								7.10												
S-18	4/25/2022	7.86	28.8	617	-115.8	0.39	0.48	53.3	154.0	388.0								6.32												
S-18	5/2/2022	7.89	28.8	634	-154.6	0.20	0.24	57.3	157.0	370.0								6.82												
S-18	5/9/2022	7.95	28.9	652	-144.2	0.29	0.30	62.6	159.0	382.0								7.53												
S-18	5/17/2022	7.76	28.8	690	-149.4	0.24	0.19	69.4	162.0	426.0								8.62												
S-18	5/23/2022	7.80	29.1	710	-161.6	0.22	0.20	76.7	165.0	412.0								8.61												
S-18	5/31/2022	7.66	29.5	725	-139.6	0.28	0.25	82.7	166.0	456.0								9.43												
S-19	4/4/2022	7.68	28.7	740	-185.9	0.35	0.34	73.9	181.0	452.0								13.60	0.5 U	2.6										
S-19	4/11/2022	7.73	28.9	754	-193.9	0.24	0.48	78.5	183.0	458.0								11.90												
S-19	4/18/2022	7.76	29.1	766	-193.2	0.29	0.27	81.1	185.0	462.0								11.00												
S-19	4/25/2022	7.76	29.1	782	-206.3	0.27	0.41	86.4	188.0	494.0								9.95												
S-19	5/2/2022	7.79	29.4	813	-200.9	0.21	0.26	94.5	193.0	492.0								8.88												
S-19	5/9/2022	7.82	29.4	845	-206.2	0.22	0.38	105.0	197.0	528.0								7.22												
S-19	5/17/2022	7.68	29.3	904	-184.8	0.36	0.41	109.0	202.0	588.0								9.45												
S-19	5/23/2022	7.76	29.8	945	-199.9	0.33	0.20	122.0	198.0	592.0								8.93												
S-19	5/31/2022	7.58	30.1	982	-204.4	0.22	0.20	137.0	206.0	654.0								9.72												
S-2	4/4/2022	7.69	27.9	692	-190.6	0.25	0.45	69.4	163.0	418.0								6.93	0.5 U	3.1										
S-2	4/11/2022	7.62	28.1	788	-170.6	0.22	0.39	92.7	175.0	478.0								4.80												
S-2	4/18/2022	7.84	28.8	813	-175.7	0.37	0.25	99.5	177.0	480.0								4.64												
S-2	4/25/2022	7.26	28.7	836	-152.5	0.31	0.57	109.0	178.0	526.0								4.35												
S-2	5/2/2022	7.76	29.1	865	-178.6	0.30	0.37	108.0	176.0	538.0								3.76												
S-2	5/9/2022	7.57	29.1	881	-175.1	0.23	0.37	113.0	177.0	524.0								3.84												
S-2	5/17/2022	7.68	29.2	941	-179.4	0.32	0.29	131.0	185.0	582.0								4.57												
S-2	5/23/2022	7.38	29.1	940	-175.7	0.27	0.98	132.0	185.0	560.0								4.34												
S-2	5/31/2022	7.53	29.7	1016	-201.4	0.27	0.17	151.0	192.0	612.0								4.26												
S-20	4/4/2022	7.68	28.5	702	-190.7	0.42	0.35	65.1	169.0	430.0								13.20	0.5 U	2.4										
S-20	4/11/2022	7.75	28.8	715	-191.5	0.34	0.31	69.1	173.0	454.0								12.40												
S-20	4/18/2022	7.80	28.9	727	-191.2	0.32	0.20	72.3	175.0	432.0								13.00												
S-20	4/25/2022	7.74	28.9	736	-187.5	0.41	0.32	76.7	179.0	470.0								11.90												
S-20	5/2/2022	7.83	29.1	759	-198.7	0.20	0.26	81.3	180.0	466.0								10.40												
S-20	5/9/2022	7.85	29.6	786	-188.6	0.30	0.36	89.5	185.0	494.0								8.49												
S-20	5/17/2022	7.77	29.3	836	-207.2	0.16	0.26	99.3	191.0	534.0								13.30												
S-20	5/23/2022	7.76	29.6	865	-199.9	0.22	0.29	110.0	195.0	543.0								12.60												
S-20	5/31/2022	7.59	29.7	923	-199.7	0.24	0.25	122.0	197.0	616.0								12.10												
S-3	4/4/2022	7.52	29.1	924	-197.4	0.23	0.66	123.0	191.0	572.0								24.60	0.5 U	4.8										
S-3	4/11/2022	7.53	29.0	904	-170.7	0.20	0.38	116.0	181.0	558.0								21.30												
S-3	4/18/2022	7.66	29.2	925	-198.3	0.20	0.30	125.0	188.0	554.0								21.30												
S-3	4/25/2022	7.43	29.1	944	-166.3	0.26	0.22	129.0	184.0	588.0								21.90												
S-3	5/2/2022	7.61	29.3	970	-226.4	0.15	0.26	135.0	188.0	598.0								16.50												
S-3	5/9/2022	7.53	29.3	988	-191.8	0.22	0.15	142.0	188.0	588.0								13.20												
S-3	5/17/2022	7.61	29.4	1029	-200.8	0.26	0.24	147.0	191.0	632.0								18.70												
S-3	5/23/2022	7.43	29.3	1027	-200.1	0.19	0.25	148.0	191.0	616.0								20.60												
S-3	5/31/2022	7.47	29.8	1051	-223.9	0.25	0.81	160.0	195.0	638.0								20.40												
S-4	5/31/2022	7.63	29.5	829	-206.4	0.23	0.29	108.0	185.0	522.0								12.70												
S-5	4/4/2022	7.65	28.8	631	-216.2	0.25	0.42	54.3	156.0	386.0								8.04	0.6 I	1.7										
S-5	4/11/2022	7.80	28.6	640	-172.4	0.18	0.26	56.6	157.0	374.0								8.55												
S-5	4/18/2022	7.73	28.7	647	-157.6	0.25	0.22	57.7	158.0	382.0								8.89												
S-5	4/25/2022	7.73	28.5	652	-132.5	0.30	0.24	58.2	159.0	416.0								9.88												
S-5	5/2/2022	7.79	28.7	666	-147.6	0.21	0.31	61.0	162.0	398.0								8.47												
S-5	5/9/2022	7.74	28.6	674	-153.8	0.18	0.09	63.5	164.0	408.0								5.80												
S-5	5/17/2022	7.76	28.5	699	-170.7	0.11	0.32	66.0	166.0	422.0								10.00												
S-5	5/23/2022	7.65	28.5	704	-125.5	0.26	0.23	68.4	167.0	420.0								10.30												
S-5	5/31/2022	7.75	29.1	712	-161.2	0.24	0.28	71.7	169.0	452.0								11.80												
S-6	4/4/2022	7.92	26.9	529	-162.2	0.28	0.38	37.2	136.0	328.0								1.44 I	5.3	1.2										
S-6	4/11/2022	7.90	27.2	533	-109.9	0.23	0.29	36.7	136.0	324.0								1.27 I												
S-6	4/18/2022	8.00	27.6	541	-72.0	0.24	0.18	37.6	138.0	292.0								1.28 I												
S-6	4/25/2022	7.93	27.7	545	-96.0	0.24	0.19	38.6	139.0	330.0								1.43 I												
S-6	5/2/2022	8.03	28.1	551	-61.0	0.28	0.21	40.5	142.0	322.0								1.24 I												
S-6	5/9/2022	8.12	28.0	554	-29.5	0.38	0.12	41.3	143.0	328.0								0.77 I												
S-6	5/17/2022	7.82	27.9	566	-52.7	0.25	0.17	42.3	145.0	356.0								1.89 I												
S-6	5/23/2022	7.86	28.2	573	-101.5	0.20	0.46	43.1	146.0	346.0								2.27												
S-6	5/31/2022	7.83	28.5	576	-64.0	0.25	0.21	44.6	148.0	346.0								2.62												
S-7	4/4/2022	7.74	27.2	589	-201.0	0.30	0.59	51.5	144.0	360.0								7.50	5.7	2.3 U										
S-7	4/11/2022	7.81	27.7	644	-150.1	0.27	0.41	62.3	149.0	382.0								5.76												
S-7	4/18/2022	7.85	28.0	653	-165.8	0.24	0.36	64.1	150.0	376.0								5.03												
S-7	4/25/2022	7.79	28.2	639	-153.2	0.29	0.56	63.3	150.0	386.0								4.72												
S-7	5/2/2022	7.87	28.5	654	-159.1	0.23	0.60	66.3	152.0	400.0								4.54												
S-7	5/9/2022	7.91	28.4	660	-132.5	0.31	0.33	66.4	149.0	396.0								3.37												
S-7	5/17/2022	7.73	28.4	683	-154.9	0.16	0.45	70.8	153.0	424.0								4.81												
S-7	5/23/2022	7.76	28.5	686	-157.9	0.24	0.55	72.5	156.0	412.0								4.93												
S-7	5/31/2022	7.65	29.2	756	-172.6	0.28	0.34	92.1	165.0	475.0								5.66												
S-8	4/4/2022	7.54	28.0	709	-166.9	0.23	0.30	78.5	161.0	422.0								1.87 I	0.5 U	1.7 U										
S-8	4/11/2022	7.77	27.9	706	-132.5	0.26	0.21	75.6	157.0	416.0								2.26												
S-8	4/18/2022	7.74	27.9	722	-147.7	0.32	0.26	82.4	161.0	426.0								2.48												
S-8	4/25/2022	7.79	28.3	747	-145.5	0.24	0.19	88.3	163.0	464.0								1.99 I												
S-8	5/2/2022	7.80	28.3	780	-135.9	0.33	0.23	98.1	169.0	407.0								2.44												
S-8	5/9/2022	7.70	28.2	807	-148.4	0.18	0.62	106.0	171.0	484.0								2.05												
S-8	5/17/2022	7.70	28.4	857	-132.8	0.30	0.18	112.0	175.0	524.0								2.56												
S-8	5/23/2022	7.66	28.5	878	-159.3	0.19	0.21	126.0	177.0	528.0								2.53												
S-9	4/4/2022	7.38	28.8	1030	-185.6	0.17	2.36	150.0	202.0	666.0								4.85	0.5 U	4.7										
S-9	4/11/2022	7.51	28.8	1037	-176.1	0.27	0.40	149.0	199.0	638.0								4.27												
S-9	4/18/2022	7.54	29.2	1060	-208.2	0.24	0.19	155.0	200.0	660.0								3.50												
S-9	4/25/2022	7.50	29.2	1073	-196.0	0.31	0.27	160.0	201.0	670.0								3.48												
S-9	5/2/2022	7.58	29.5	1096	-215.5	0.34	0.33	167.0	205.0	702.0								2.90												
S-9	5/9/2022	7.54	29.3	1107	-236.8	0.18	0.12	170.0	203.0	672.0								2.37												
S-9	5/17/2022	7.52	29.4	1144	-213.6	0.24	0.21	176.0	205.0	716.0								2.83												
S-9	5/23/2022	7.44	29.4	1148	-240.4	0.19	0.23	181.0	207.0	724.0								2.59												
S-9	5/31/2022	7.45	29.8	1160	-236.4	0.21	0.22	187.0	208.0	744.0								2.60												
T-1	4/4/2022	7.82	27.2	570	-195.0	0.29	0.29	44.2	143.0	340.0								2.47	0.5 U	2.9 U										
T-1	4/11/2022	7.66	27.4	563	-96.9	0.32	0.31	40.5	142.0	330.0								3.14												
T-1	4/18/2022	8.10	27.8	572	-103.8	0.64	0.36	42.5	143.0	340.0								3.94												
T-1	4/25/2022	6.97	27.8	576	-72.1	0.25	0.19	44.7	146.0	357.0								3.87												
T-1	5/2/2022	7.94	28.3	595	-160.2	0.23	0.20	47.2	150.0	348.0								3.47												
T-1	5/9/2022	7.65	28.0	594	-116.6	0.22	0.86	48.1	148.0	354.0								3.40												
T-1	5/17/2022	7.76	28.1	620	-147.3	0.24	0.29	49.4	148.0	386.0								4.95												
T-1	5/23/2022	7.37	28.0	622	-100.0	0.23	0.23	51.3	151.0	374.0								4.62												
T-1	5/31/2022	7.74	28.7	626	-148.5	0.31	0.20	54.1	155.0	386.0								4.88												
T-11	1/4/2022	7.70	23.8	849	-289.2	0.46	0.27	101.0	135.0	471.0								0.50 U												

Station_ID	Sample Date	pH Std Units	Temp °C	Specific Conductance umhos/cm	Oxidation Reduction Potential mV	Dissolved Oxygen mg/l	Turbidity NTU	Chloride mg/l	Sulfate mg/l	Total Dissolved Solids mg/l	Total Alkalinity mg/l Ca CO3	Total Iron ug/l	Dissolved Iron ug/l	Manganese mg/l	Nitrate mg/l	Sulfide mg/l	Total Organic Carbon mg/l	Arsenic ug/L		TTHMs ug/L		Gross Alpha pCi/L	Total Uranium ug/l	Calcium mg/L	Fluoride mg/L	Magnesium mg/L	Sodium mg/L	Total Suspended Solids mg/L	Bicarbonate Alkalinity mg/L	Carbonate Alkalinity mg/L	HAAs mg/L	RA 226 + 228 pCi/L
T-11	1/11/2022	7.74	24.2	853	-278.5	0.39	0.25	96.5	138.0	500.0								0.50	U													
T-11	2/15/2022	7.53	23.8	831	-143.5	0.22	0.41	102.0	141.0	496.0								0.50	U													
T-11	3/8/2022	7.87	24.6	844	-307.2	0.11	0.23	95.8	143.0	480.0								0.50	U			1.5										
T-11	4/5/2022	7.70	24.5	855	-302.2	0.14	0.34	102.0	137.0	490.0								0.50	U	0.5	U	1.7										
T-11	4/12/2022	7.78	24.3	852	-320.6	0.08	0.28	101.0	134.0	487.0								0.50	U													
T-11	4/20/2022	7.86	24.4	853	-312.0	0.24	0.31	107.0	132.0	478.0								0.50	U													
T-11	4/26/2022	7.71	25.0	860	-328.2	0.11	0.28	112.0	128.0	496.0								0.50	U													
T-11	5/3/2022	7.83	24.8	862	-339.1	0.12	0.18	113.0	123.0	502.0								0.50	U													
T-11	5/10/2022	7.80	24.4	845	-278.7	0.10	0.25	107.0	123.0	485.0								0.50	U													
T-11	5/18/2022	7.85	25.1	855	-271.7	0.15	0.26	106.0	123.0	508.0								0.50	U													
T-11	5/24/2022	7.74	25.0	846	-338.3	0.15	0.18	98.3	122.0	528.0								2.00	I													
T-11	6/1/2022	7.64	24.6	837	-267.2	0.09	0.25	108.0	125.0	498.0								0.50	U													
T-11	6/7/2022	7.66	25.1	852	-313.8	0.13	0.24	112.0	124.0	500.0								0.58	I													
T-11	6/14/2022	7.79	25.3	846	-333.2	0.17	0.31	111.0	120.0	492.0								0.50	U													
T-11	6/24/2022	7.85	25.1	855		0.08	3.46	78.0	91.3	552.0								0.69	U													
T-11	6/27/2022	7.72	25.3	853	-345.4	0.11	0.22	123.0	116.0	487.0								0.50	U													
T-11	7/18/2022	7.70	25.2	857	-296.0	0.16	0.33	123.0	113.0	498.0								0.50	U													
T-11	7/26/2022	8.01	25.7	859	-315.6	0.15	0.52	119.0	115.0	500.0								0.50	U			4.1										
T-11	8/1/2022	7.86	26.2	876	-251.0	0.12	0.90	115.0	122.0	499.0								0.50	U													
T-11	8/8/2022	7.87	25.5	862	-238.9	0.12	0.41	109.0	128.0	507.0								0.50	U													
T-11	8/15/2022	7.88	25.0	849	-230.4	0.13	0.67	102.0	133.0	496.0								0.50	U													
T-11	8/26/2022	7.90	25.7	838	-274.2	0.14	0.08	97.3	145.0	495.0								0.50	U													
T-11	8/30/2022	7.87	25.2	843	-259.3	0.14	0.43	96.7	147.0	504.0								0.50	U													
T-11	9/6/2022	7.91	25.3	843	-252.0	0.13	0.21	92.9	144.0	497.0								0.50	U													
T-11	9/13/2022	7.90	25.3	840	-277.7	0.10	0.30	94.0	144.0	494.0								0.50	U													
T-11	9/22/2022	7.92	25.3	843	-256.3	0.15	0.14	92.8	146.0	496.0								0.50	U													
T-11	9/26/2022	7.87	25.5	848	-262.9	0.15	0.25	91.2	149.0	498.0								0.50	U													
T-11	10/7/2022	7.90	24.9	842	-259.2	0.13	0.13	95.5	151.0	492.0								0.50	U													
T-11	10/13/2022	7.92	24.8	840	-259.2	0.12	0.12	95.2	145.0	478.0								0.50	U													
T-11	10/17/2022	7.91	25.0	842	-263.4	0.13	0.14	92.1	140.0	497.0								0.50	U													
T-11	10/24/2022	7.86	24.7	846	-256.4	0.13	0.18	89.9	144.0	496.0								0.50	U													
T-11	11/1/2022	7.89	25.0	857	-294.7	0.14	0.21	91.0	148.0	493.0								0.50	U													
T-11	11/10/2022	7.92	24.0	846	-289.9	0.13	0.38	87.9	155.0	478.0								0.50	U													
T-11	11/14/2022	7.84	24.8	830	-282.5	0.14	0.16	90.4	156.0	491.0								0.50	U													
T-11	11/22/2022	7.91	24.5	820	-294.6	0.14	0.17	87.1	158.0	488.0								0.50	U													
T-11	11/29/2022	7.91	24.5	835	-303.9	0.10	0.18	88.7	161.0	480.0								0.50	U			4.5										
T-11	12/6/2022	7.87	24.5	827	-251.4	0.15	0.15	86.9	154.0	486.0								0.50	U			4.8										
T-11	12/13/2022	7.89	24.6	837	-305.3	0.12	0.15	86.8	155.0	500.0								0.50	U													
T-11	12/19/2022	7.90	24.3	835	-306.9	0.12	0.15	83.6	158.0	488.0								0.50	U													
T-11	12/27/2022	7.87	23.8	841	-314.4	0.11	0.06	85.2	155.0	474.0								0.50	U													
T-2	1/4/2022	7.69	24.6	937	-290.8	0.24	0.67	120.0	159.0	556.0								0.50	U													
T-2	1/11/2022	7.69	24.5	945	-273.6	0.23	0.22	121.0	158.0	576.0								0.50	U													
T-2	2/15/2022	7.61	23.8	991	-298.7	0.14	0.12	131.0	208.0	676.0								0.50	U													
T-2	3/8/2022	7.76	25.0	932	-317.0	0.15	0.28	124.0	166.0	572.0								0.50	U			4.6										
T-2	4/5/2022	7.74	24.7	919	-303.6	0.13	0.39	123.0	154.0	532.0								0.50	U	0.5	U	4.2										
T-2	4/12/2022	7.73	24.8	907	-311.9	0.09	0.28	125.0	147.0	540.0								0.50	U													
T-2	4/20/2022	7.77	25.6	908	-339.0	0.10	0.25	121.0	140.0	534.0								0.50	U													
T-2	4/26/2022	7.76	25.4	899	-328.2	0.11	0.21	119.0	140.0	514.0								0.77	I													
T-2	5/3/2022	7.79	25.1	898	-315.8	0.10	0.23	121.0	134.0	534.0								0.50	U													
T-2	5/10/2022	7.74	25.3	891	-335.8	0.09	0.26	119.0	133.0	528.0								0.50	U													
T-2	5/18/2022	7.78	26.2	907	-350.3	0.10	0.33	118.0	132.0	540.0								0.50	U													
T-2	5/24/2022	7.65	25.6	894	-350.7	0.12	0.21	87.6	105.0	528.0								1.00	I													
T-2	6/1/2022	7.68	25.6	893	-351.1	0.10	0.31	121.0	137.0	548.0								0.50	U													
T-2	6/7/2022	7.71	25.8	907	-347.3	0.11	0.53	122.0	140.0	552.0								0.50	U													
T-2	6/14/2022	7.73	25.8	923	-355.9	0.11	0.45	126.0	167.0	614.0								0.50	U													
T-2	6/24/2022	7.72	25.0	981		0.51	1.67	110.0	173.0	504.0								0.69	U													
T-2	6/27/2022	7.63	25.6	994	-341.7	0.11	0.17	127.0	190.0	630.0								0.50	U													
T-2	7/18/2022	8.19	26.1	928	-358.2	0.11	0.34	124.0	152.0	572.0								0.50	U													
T-2	7/26/2022	7.96	26.0	921	-353.7	0.11	0.19	123.0	154.0	588.0								0.50	U			3.7										
T-2	8/1/2022	7.87	26.2	927	-270.3	0.11	0.37	121.0	149.0	550.0								0.50	U													
T-2	8/8/2022	7.87	26.3	906	-277.8	0.09	0.25	122.0	145.0	542.0								0.50	U													
T-2	8/15/2022	7.88	25.5	903	-263.6	0.10	0.10	119.0	142.0	558.0								0.50	U													
T-2	8/26/2022	7.88	26.2	892	-307.3	0.10	0.07	120.0	142.0	542.0								0.50	U													
T-2	8/30/2022	7.84	25.5	901	-278.1	0.13	0.09	122.0	142.0	558.0								0.50	U													
T-2	9/6/2022	7.86	26.2	903	-276.5	0.11	0.15	121.0	140.0	514.0								0.50	U													
T-2	9/13/2022	7.86	25.8	896	-283.0	0.11	0.25	121.0	139.0	534.0								0.50	U													
T-2	9/22/2022	7.86	26.0	902	-289.4	0.12	0.31	120.0	138.0	546.0								0.50	U													
T-2	9/26/2022	7.85	25.5	904	-272.0	0.15	0.11	119.0	139.0	554.0								0.50	U													
T-2	10/7/2022	7.92	25.8	898	-296.9	0.12	0.13	121.0	140.0	542.0								0.50	U													
T-2	10/13/2022	8.02	25.3	895	-302.8	0.11	0.14	122.0	143.0	520.0								0.50	U													
T-2	10/17/2022	7.67	25.9	999	-297.4	0.11	0.18	121.0	182.0	660.0								0.50	U													
T-2	10/24/2022	7.72	25.4	1015	-284.3	0.12	0.15	125.0	192.0	668.0								0.51	I													
T-2	11/1/2022	7.76	25.1	1027	-319.6	0.12	0.13	127.0	201.0	670.0								0.50	U													
T-2	11/10/2022	7.71	24.4	1009	-304.3	0.11	0.20	124.0	194.0	630.0								0.50	U													
T-2	11/14/2022	7.63	25.2	968	-294.9	0.13	0.46	125.0	182.0	614.0								0.50	U													
T-2	11/22/2022	7.73	24.8	928	-305.1	0.12	0.25	124.0	163.0	576.0								0.50	U													
T-2	11/29/2022	7.76	24.9	926	-316.2	0.11	0.15	127.0	159.0	564.0								0.79	I			2.9										
T-2	12/6/2022	7.85	25.4	901	-370.7	0.11	0.11	123.0	148.0	544.0								0.50	U			6.4										
T-2	12/13/2022	7.88	24.9	907	-317.5	0.12	0.13	121.0	145.0	540.0								0.50	U													
T-2	12/19/2022	7.83	24.3	907	-316.6	0.11	0.16	120.0	143.0	562.0								0.50	U													
T-2	12/27/2022	7.83	24.0	906	-328.0	0.12	0.17	120.0	143.0	532.0								0.50	U													
T-7	1/4/2022	7.36	24.1	1160	-268.9	0.31	0.23	192.0	147.0	658.0								0.54	I													
T-7	1/11/2022	7.39	24.2	1170	-250.6	0.33	0.20	188.0	146.0	676.0								0.50	U													
T-7	2/15/2022	7.53	24.2	1139	-302.5	0.15	0.47	200.0	152.0	744.0								0.50	U													
T-7	3/8/2022	7.46	24.7	1147	-305.9	0.11	0.23	189.0	147.0	674.0								0.50	U			6.7										
T-7	4/5/2022	7.47	25.3	1163	-301.8	0.14	0.28	190.0	147.0	664.0								0.50	U	0.5	U	4.5										
T-7	4/12/2022	7.52	24.7	1154	-309.2	0.09	0.20	190.0	145.0	686.0								0.50	U													
T-7	4/20/2022	7.61	25.1	1155	-310.4	0.15	0.37	188.0	145.0	736.0								0.50	U													
T-7	4/26/2022	7.58	25.2	1150	-329.9	0.10	0.16	191.0	149.0	660.0								0.50	U													
T-7	5/3/2022	7.60	25.1	1152	-323.1	0.08	0.31	190.0	147.0	680.0								0.50	U													
T-7	5/10/2022	7.58	25.0	1145	-337.5	0.08	0.19	193.0	148.0	714.0								0.50	U													
T-7	5/18/2022	7.58	25.7	1163	-279.9	0.13	0.21	186.0	145.0	718.0								0.50	U													
T-7	5/24/2022	7.46	25.7	1153	-340.3	0.13	0.21	185.0	146.0	696.0								2.00	I													
T-7	6/1/2022	7.44	25.6	1147	-304.7	0.12	0.26	205.0	147.0	712.0								0.50	U													
T-7	6/8/2022	7.50	25.0	1161	-342.8	0.12	0.19	208.0	147.0	714.0								0.50	U													
T-7	6/14/2022	7.49	25.9	1159	-346.5	0.14	0.36	207.0	147.0	730.0								0.50	U													
T-7	6/24/2022	7.59	25.6	1169		0.11	3.43	148.0	116.0	604.0								0.75	I													
T-7	6/27/2022	7.43	25.2	1149	-316.7	0.15	0.19	198.0	149.0	664.0								0.56	I													
T-7	7/18/2022	7.92	25.9	1164	-360.4	0.12	0.40	198.0	145.0	674.0								0.50	U													
T-7	7/26/2022	7.78	25.9	1148	-353.4	0.12	0.23	199.0	151.0	720.0								0.61	I			6.0										

Station_ID	Sample Date	pH Std Units	Temp °C	Specific Conductance umhos/cm	Oxidation Reduction Potential mV	Dissolved Oxygen mg/l	Turbidity NTU	Chloride mg/l	Sulfate mg/l	Total Dissolved Solids mg/l	Total Alkalinity mg/l Ca CO3	Total Iron ug/l	Dissolved Iron ug/l	Manganese mg/l	Nitrate mg/l	Sulfide mg/l	Total Organic Carbon mg/l	Arsenic ug/L	TTHMs ug/L	Gross Alpha pCi/L	Total Uranium ug/l	Calcium mg/L	Fluoride mg/L	Magnesium mg/L	Sodium mg/L	Total Suspended Solids mg/L	Bicarbonate Alkalinity mg/L	Carbonate Alkalinity mg/L	HAAs mg/L	RA 226 + 228 pCi/L
T-7	8/1/2022	7.57	26.1	1167	-257.7	0.14	0.28	189.0	148.0	680.0								0.50 U												
T-7	8/8/2022	7.61	25.5	1152	-244.2	0.14	0.39	191.0	148.0	672.0								0.50 U												
T-7	8/15/2022	7.62	25.3	1151	-264.8	0.11	0.09	196.0	149.0	678.0								0.50 U												
T-7	8/26/2022	7.62	26.1	1148	-289.4	0.14	0.33	197.0	151.0	672.0								0.50 U												
T-7	8/30/2022	7.57	25.3	1155	-262.4	0.18	0.12	196.0	152.0	778.0								0.50 U												
T-7	9/6/2022	7.58	26.0	1161	-263.2	0.14	0.13	191.0	148.0	678.0								0.50 U												
T-7	9/13/2022	7.58	25.3	1148	-269.4	0.15	0.18	196.0	148.0	678.0								0.50 U												
T-7	9/22/2022	7.62	25.6	1161	-286.4	0.13	0.13	196.0	151.0	690.0								0.50 U												
T-7	9/26/2022	7.56	25.4	1167	-280.3	0.15	0.17	197.0	150.0	752.0								0.50 U												
T-7	10/7/2022	7.61	25.4	1160	-278.9	0.14	0.17	205.0	146.0	684.0								0.50 U												
T-7	10/13/2022	7.63	25.1	1156	-288.2	0.15	0.22	199.0	149.0	656.0								0.50 U												
T-7	10/17/2022	7.62	25.2	1156	-269.3	0.17	0.07	188.0	145.0	704.0								0.50 U												
T-7	10/24/2022	7.57	25.2	1171	-295.0	0.11	0.11	193.0	147.0	736.0								0.50 U												
T-7	11/1/2022	7.59	25.2	1177	-324.6	0.13	0.19	197.0	148.0	694.0								0.50 U												
T-7	11/10/2022	7.59	24.5	1171	-311.3	0.12	0.14	194.0	150.0	676.0								0.50 U												
T-7	11/14/2022	7.52	25.2	1150	-303.5	0.13	0.24	197.0	152.0	678.0								0.50 U												
T-7	11/22/2022	7.55	24.6	1139	-293.5	0.15	0.13	200.0	151.0	704.0								0.50 U												
T-7	11/29/2022	7.58	24.5	1156	-303.4	0.15	0.13	198.0	153.0	748.0								0.50 U		5.9										
T-7	12/6/2022	7.58	25.0	1147	-302.5	0.13	0.12	201.0	150.0	696.0								0.50 U		6.7										
T-7	12/13/2022	7.54	24.7	1163	-302.6	0.13	0.14	194.0	146.0	684.0								0.50 U												
T-7	12/19/2022	7.53	23.9	1166	-282.7	0.15	0.08	192.0	147.0	676.0								0.50 U												
T-7	12/27/2022	7.56	24.1	1166	-324.5	0.13	0.21	198.0	148.0	678.0								0.50 U												
T-8	3/9/2022	7.96	24.5	592	-299.3	0.14	0.37	94.6	24.5	326.0								0.50 U												
T-8	4/19/2022	8.01	24.7	591	-305.1	0.14	0.22	90.7	23.3	306.0								0.50 U												
T-8	8/3/2022	7.96	25.3	588	-247.3	0.10	0.30	94.4	22.9	326.0								0.50 U												
T-8	11/28/2022	7.85	24.6	596	-292.2	0.12	0.66	92.7	22.6	319.0								0.50 U												

Appendix D
Water Quality Charts for Monitoring Wells

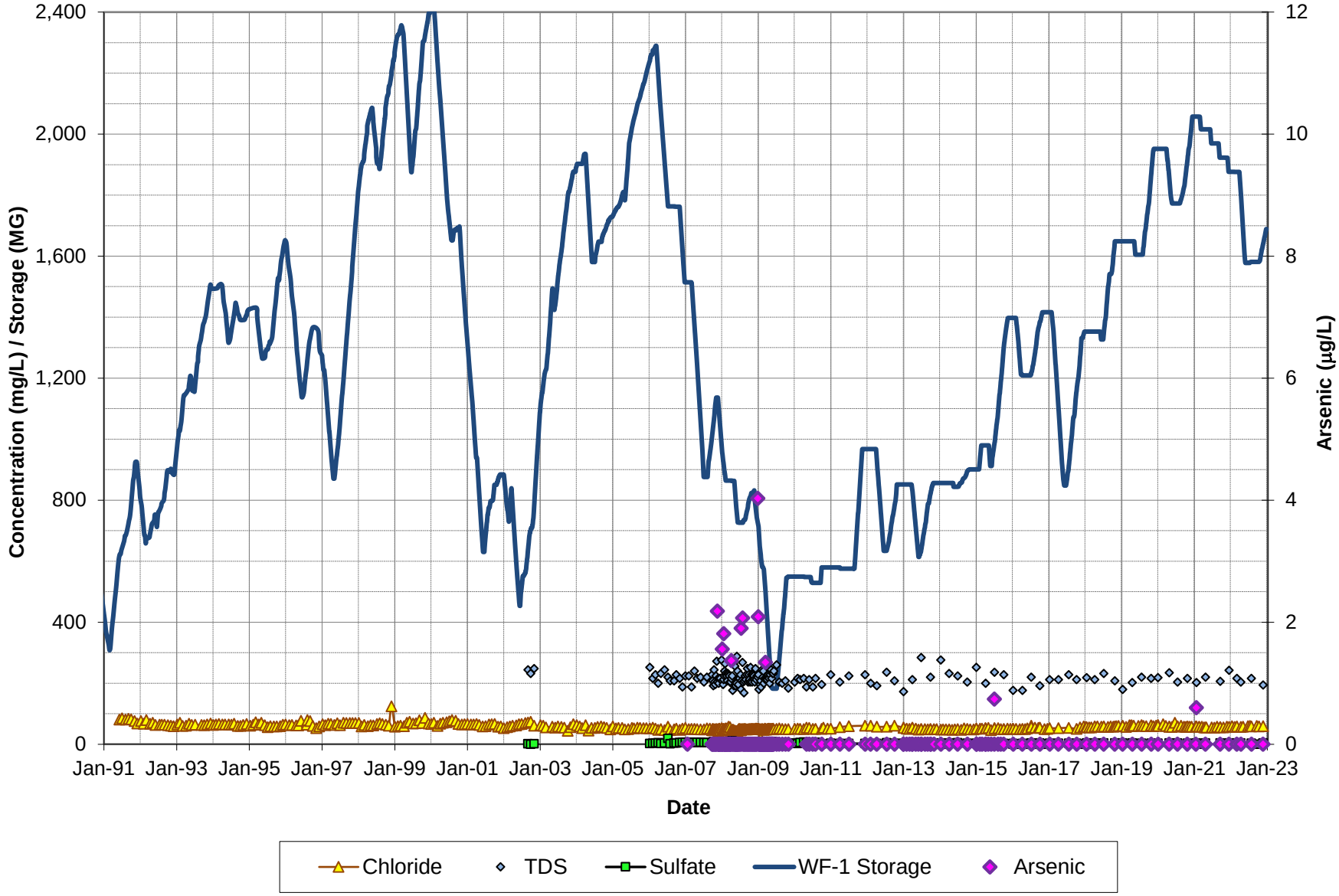


Figure D-1
WF-1 Monitoring Well "E" Water Quality

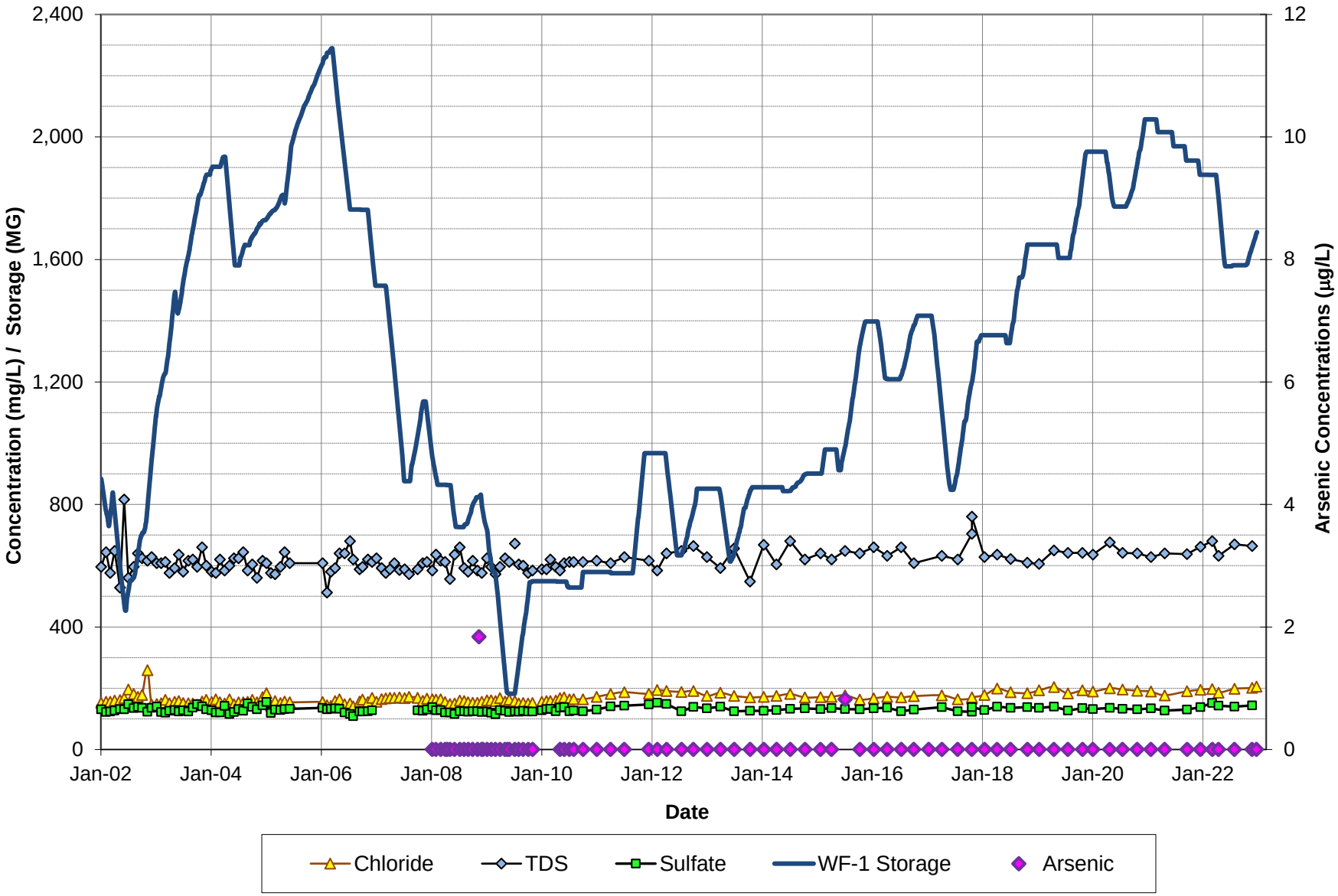


Figure D-2
W-1 Monitoring Well I-7 Water Quality

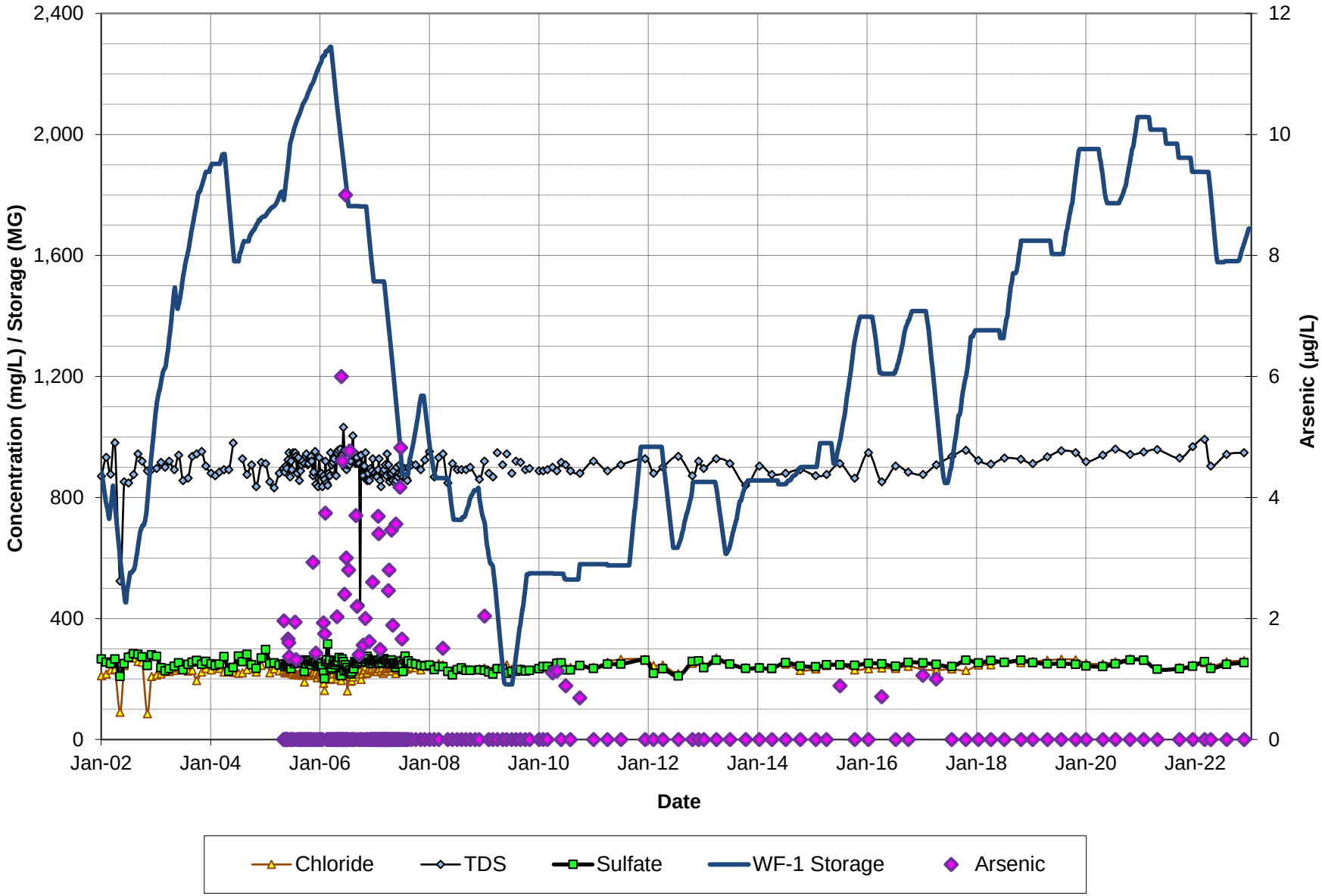


Figure D-3
WF-1 Monitoring Well M-6 Water Quality

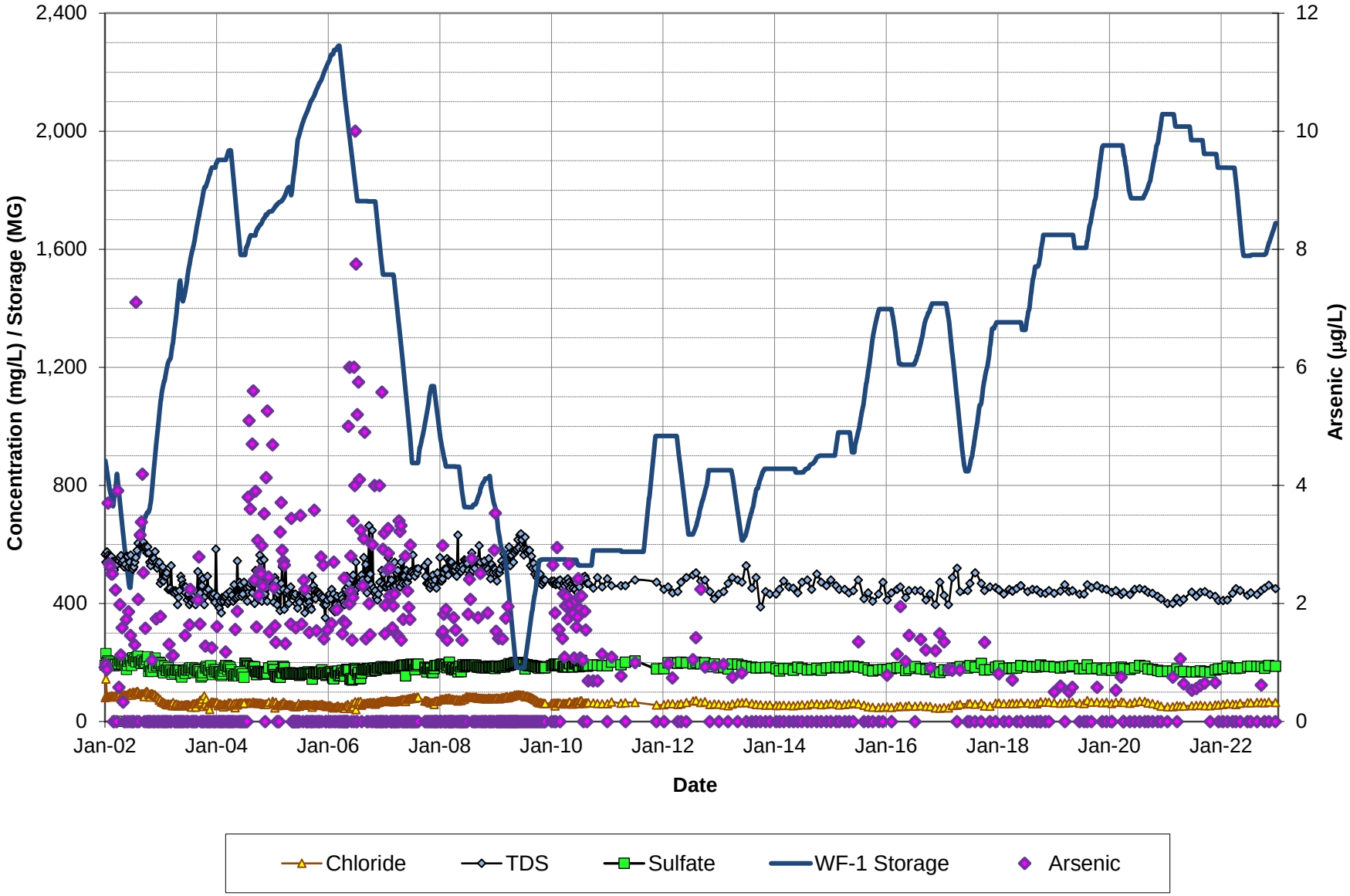


Figure D-4
WF-1 Monitoring Well M-7 Water Quality

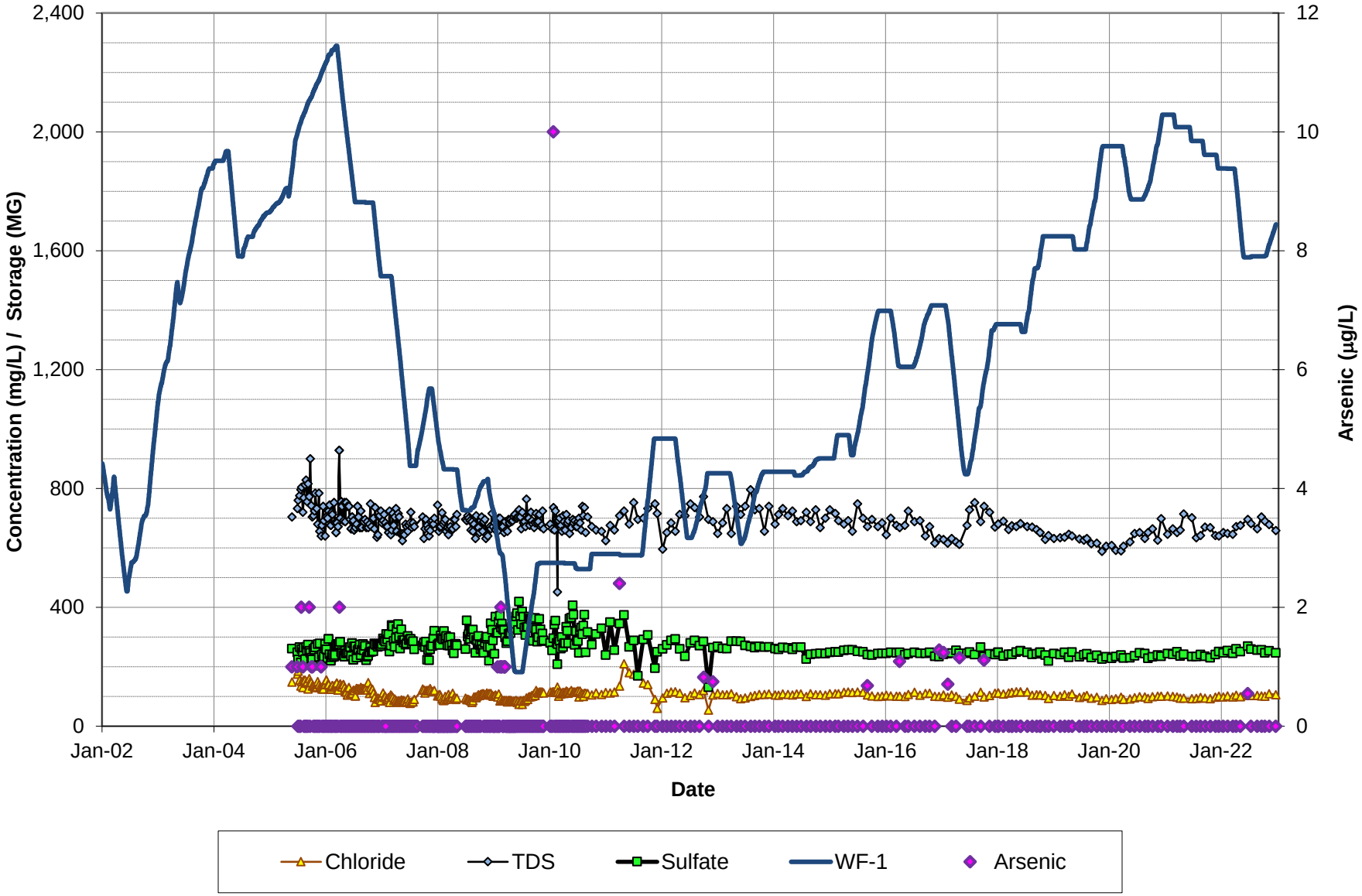


Figure D-5
WF-1 Monitoring Well M-20 Water Quality

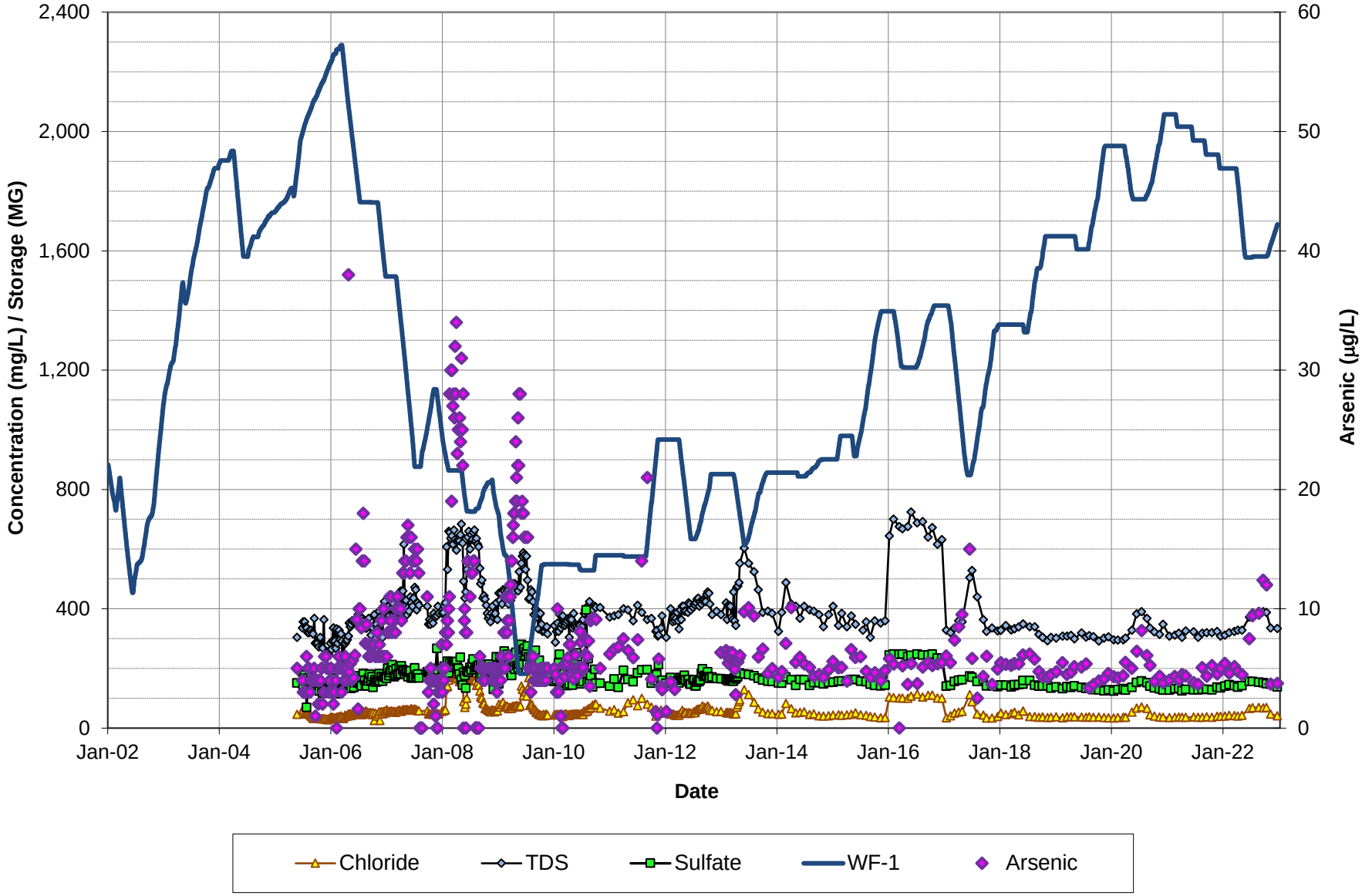


Figure D-6
WF-1 Monitoring Well M-22 Water Quality

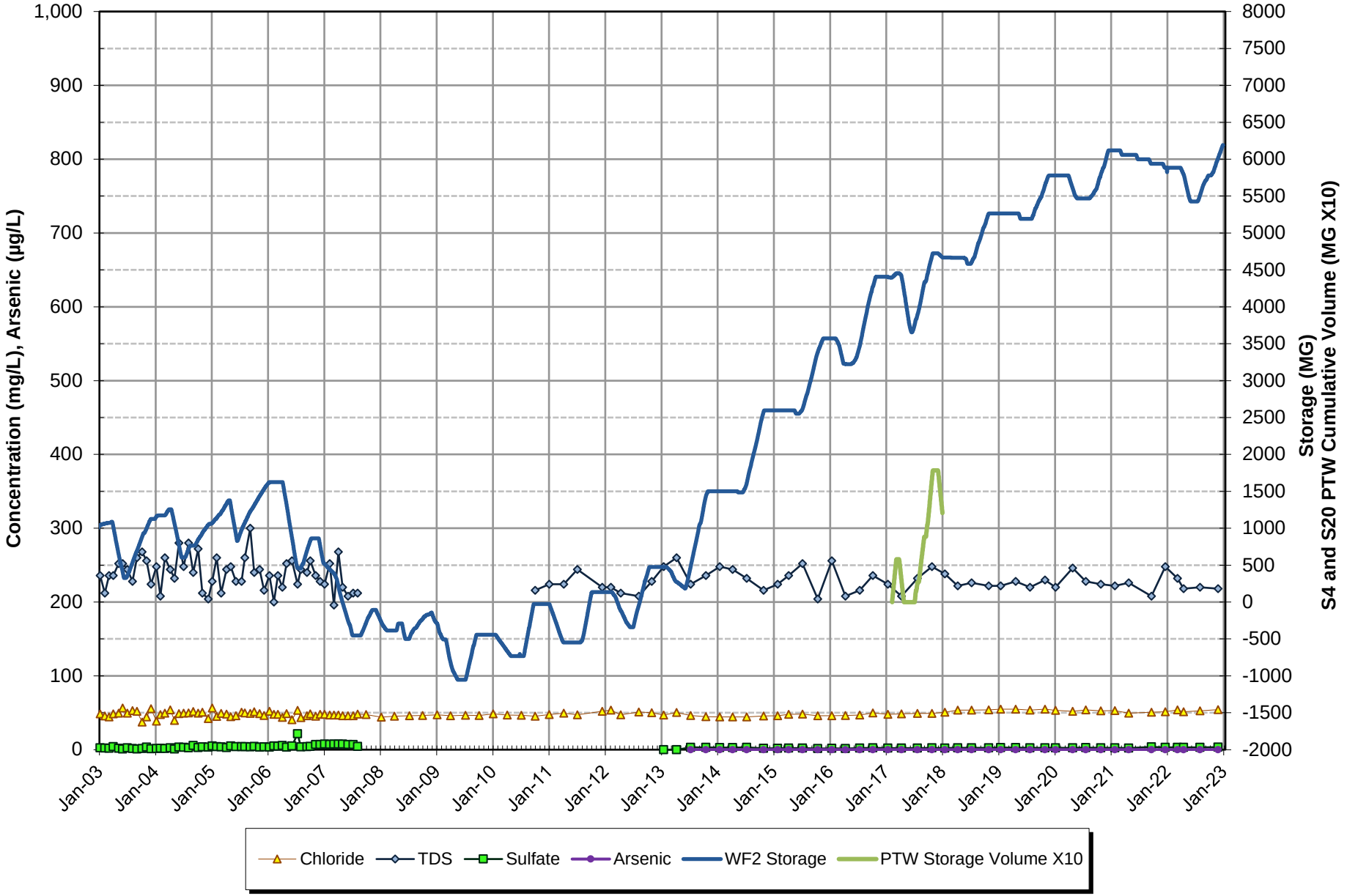


Figure D-7
WF2 Monitoring Well I-8 Water Quality

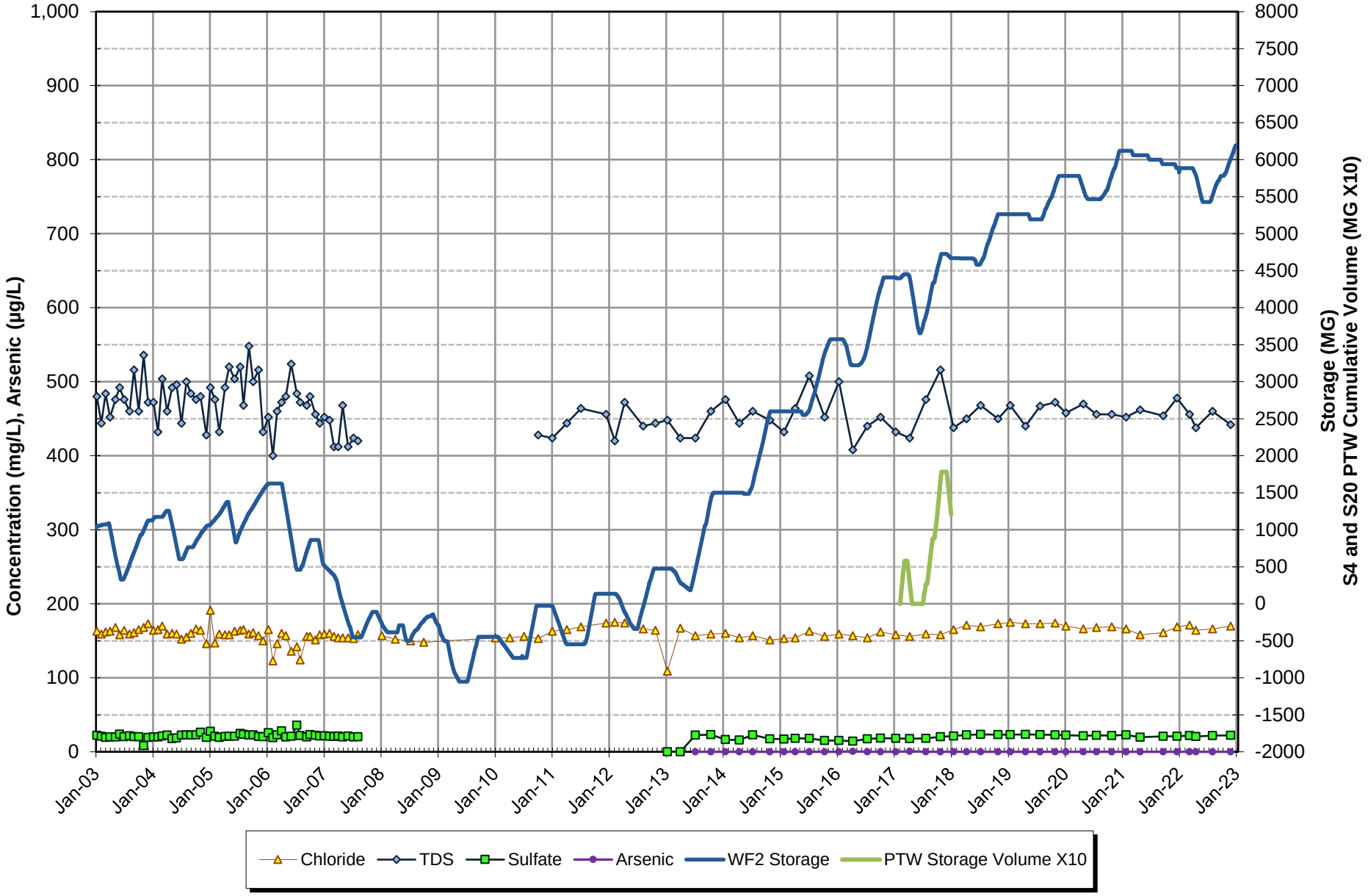


Figure D-8
WF2 Monitoring Well I-10 Water Quality

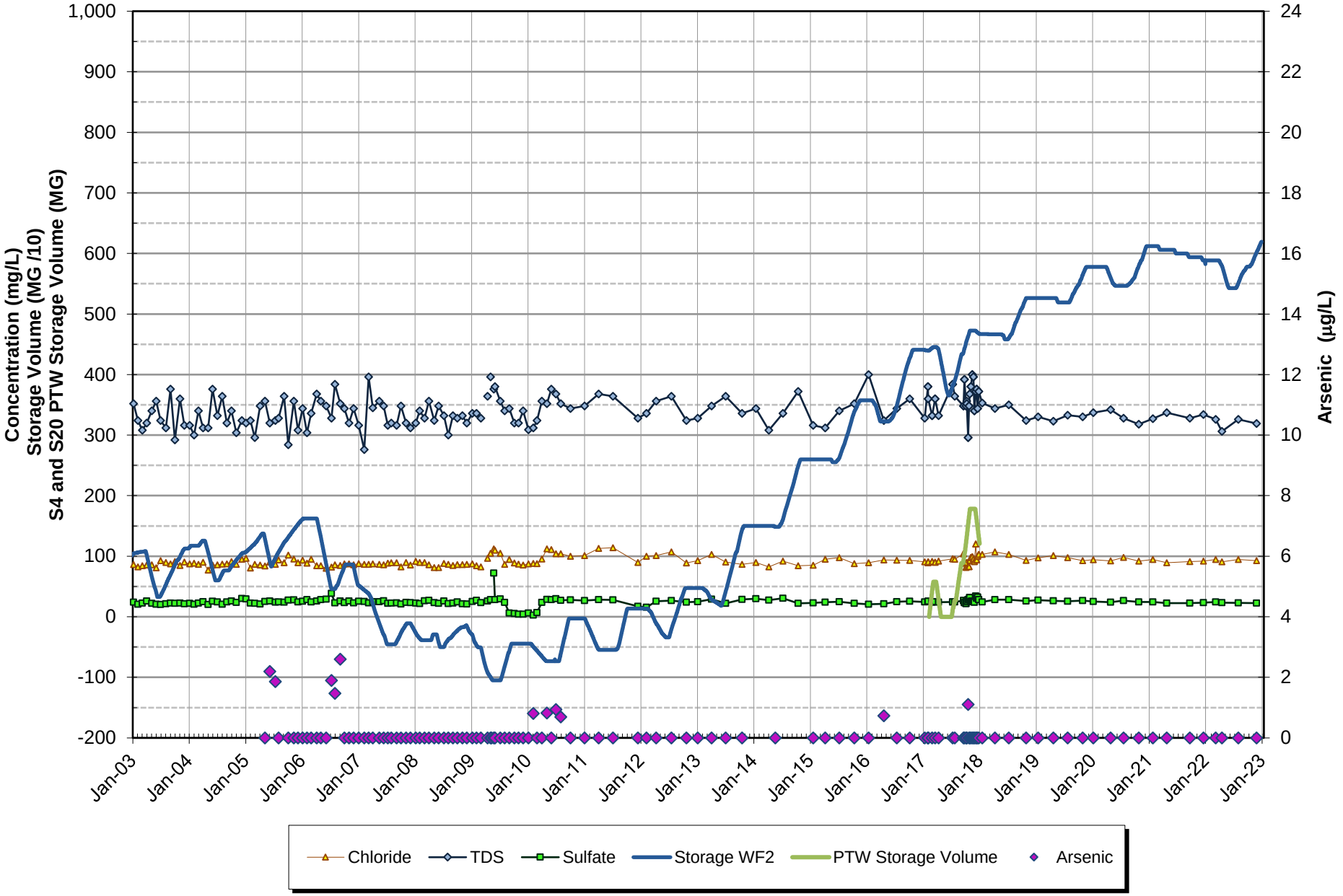


Figure D-9
WF2 Monitoring Well T-8 Water Quality

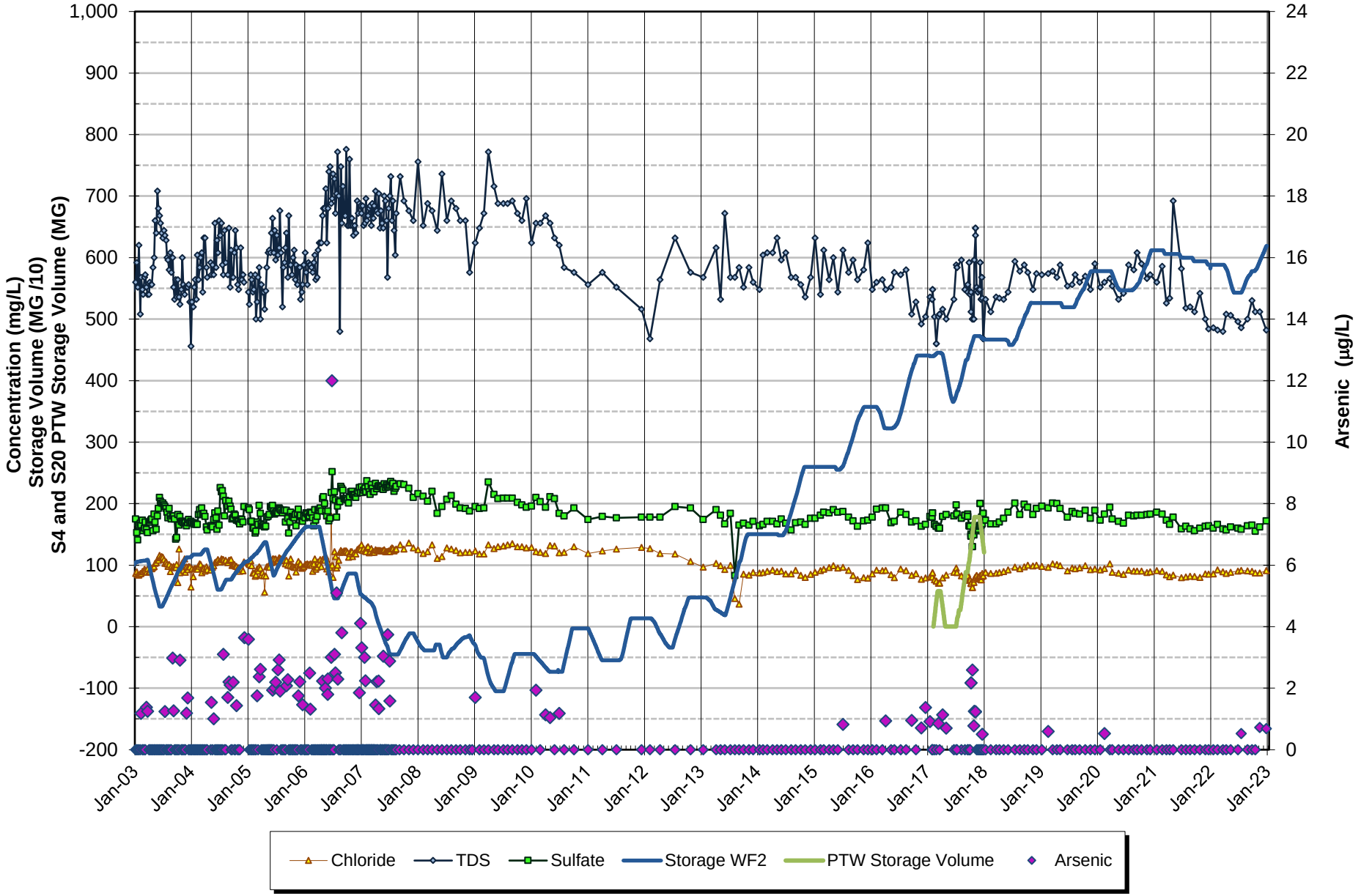
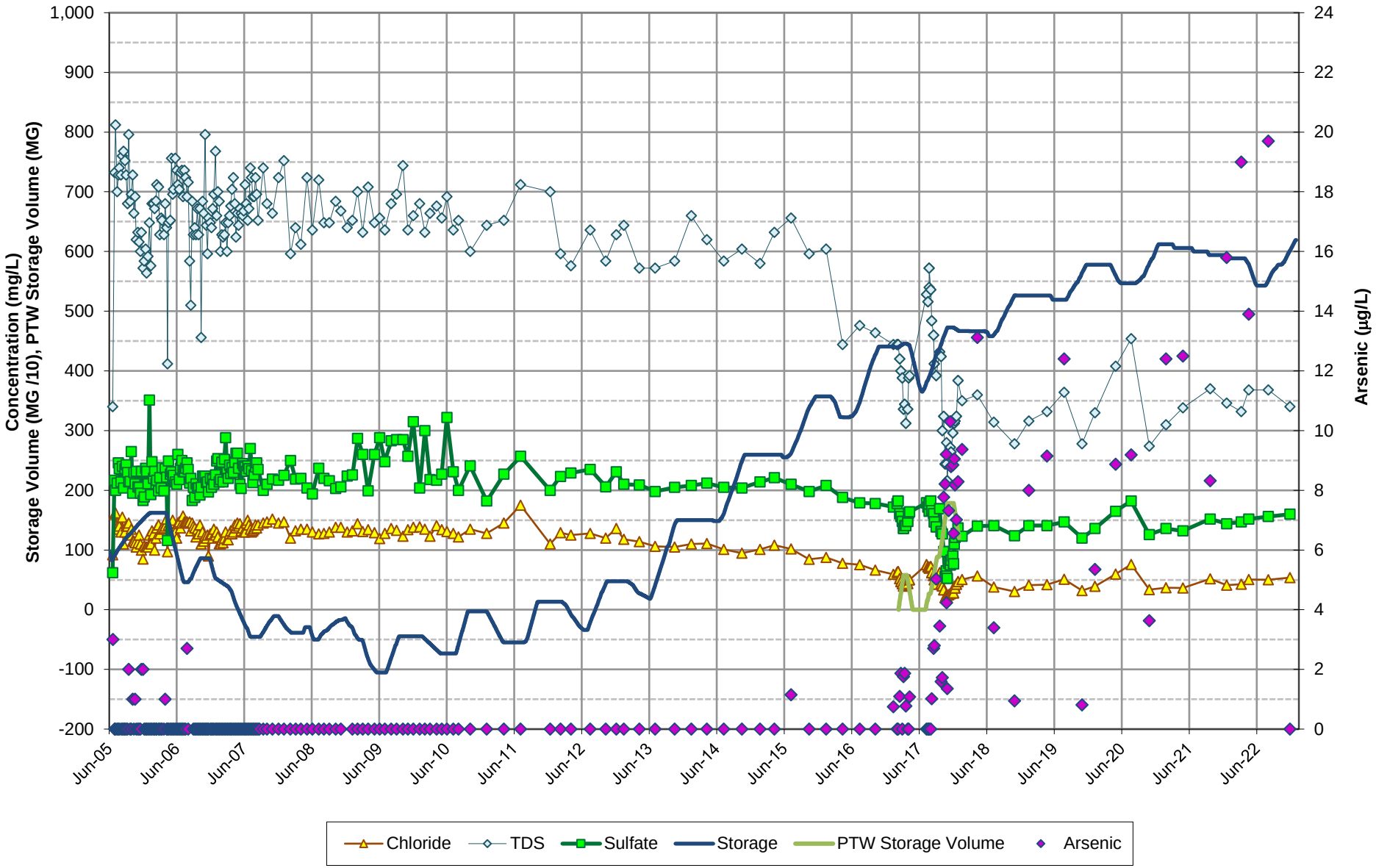
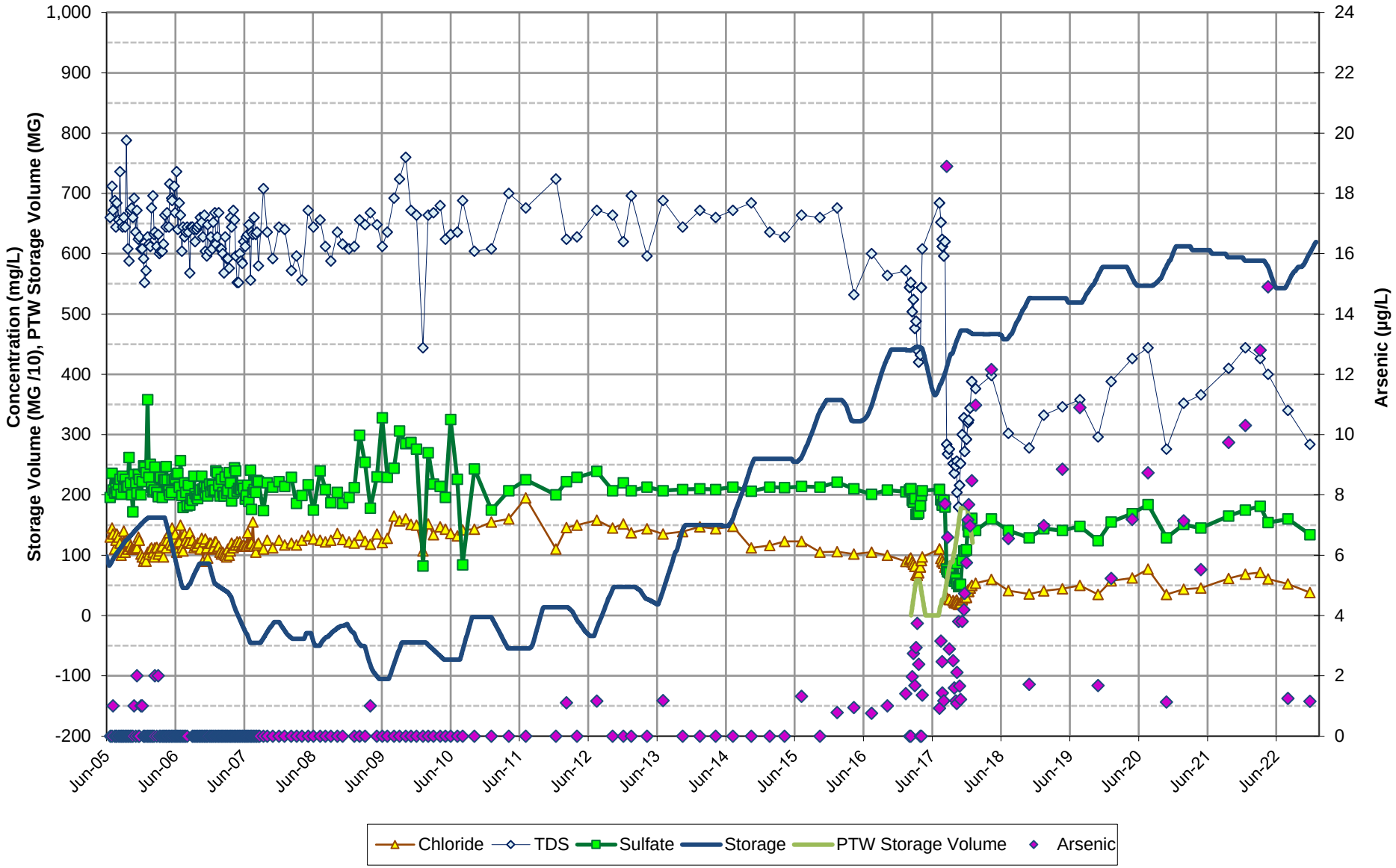


Figure D-10
WF2 Monitoring Well M-8 Water Quality



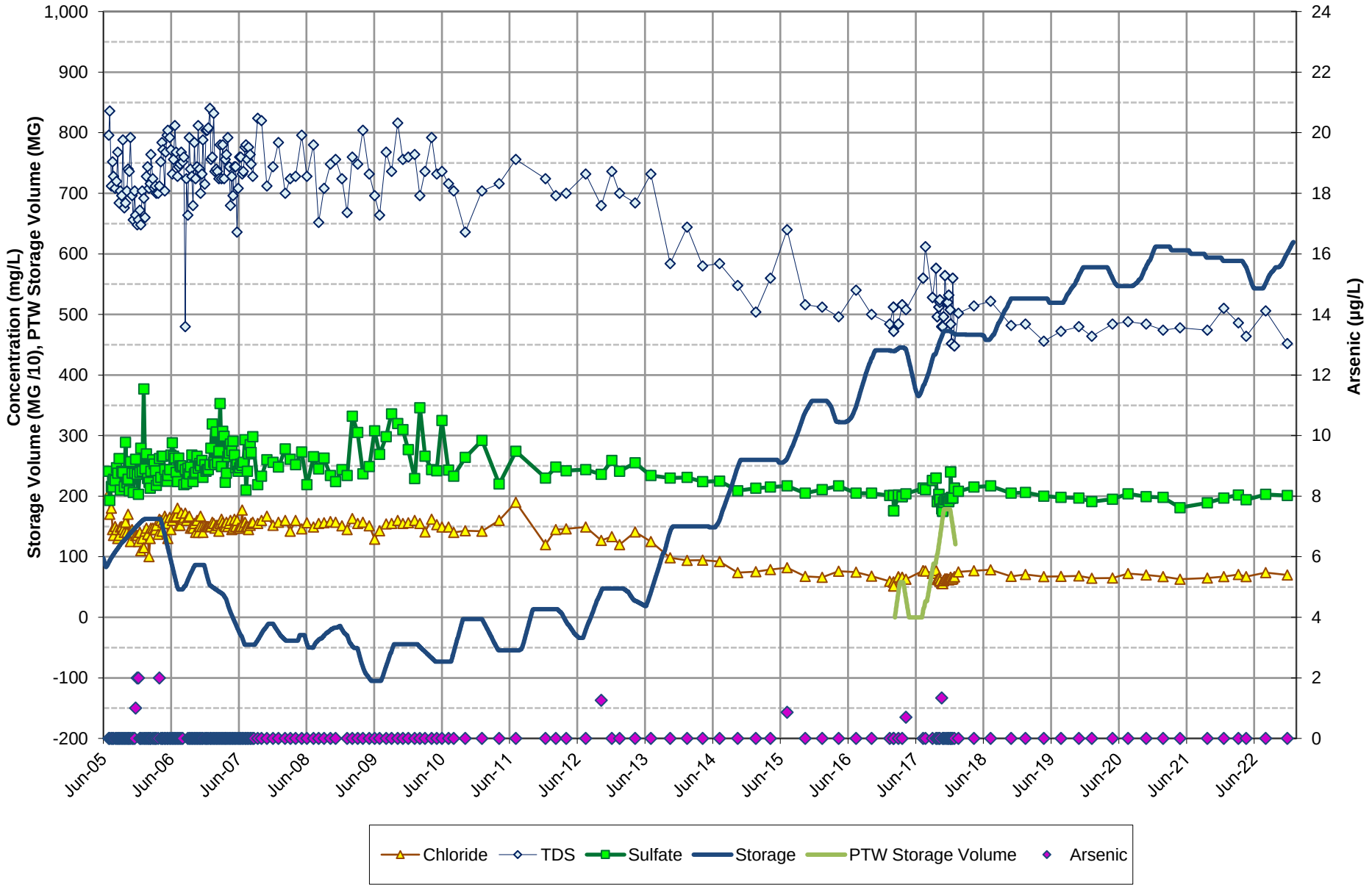
Notes:
For the purpose of this graphic any readings below the laboratory method detection limit were assigned zero
Sampling events for the PTSW testing occasionally resulted in duplicate samples on the same day, in that instance the result with the higher concentration of the two samples was used

Figure D-11
WF2 Monitoring Well M-11 Water Quality



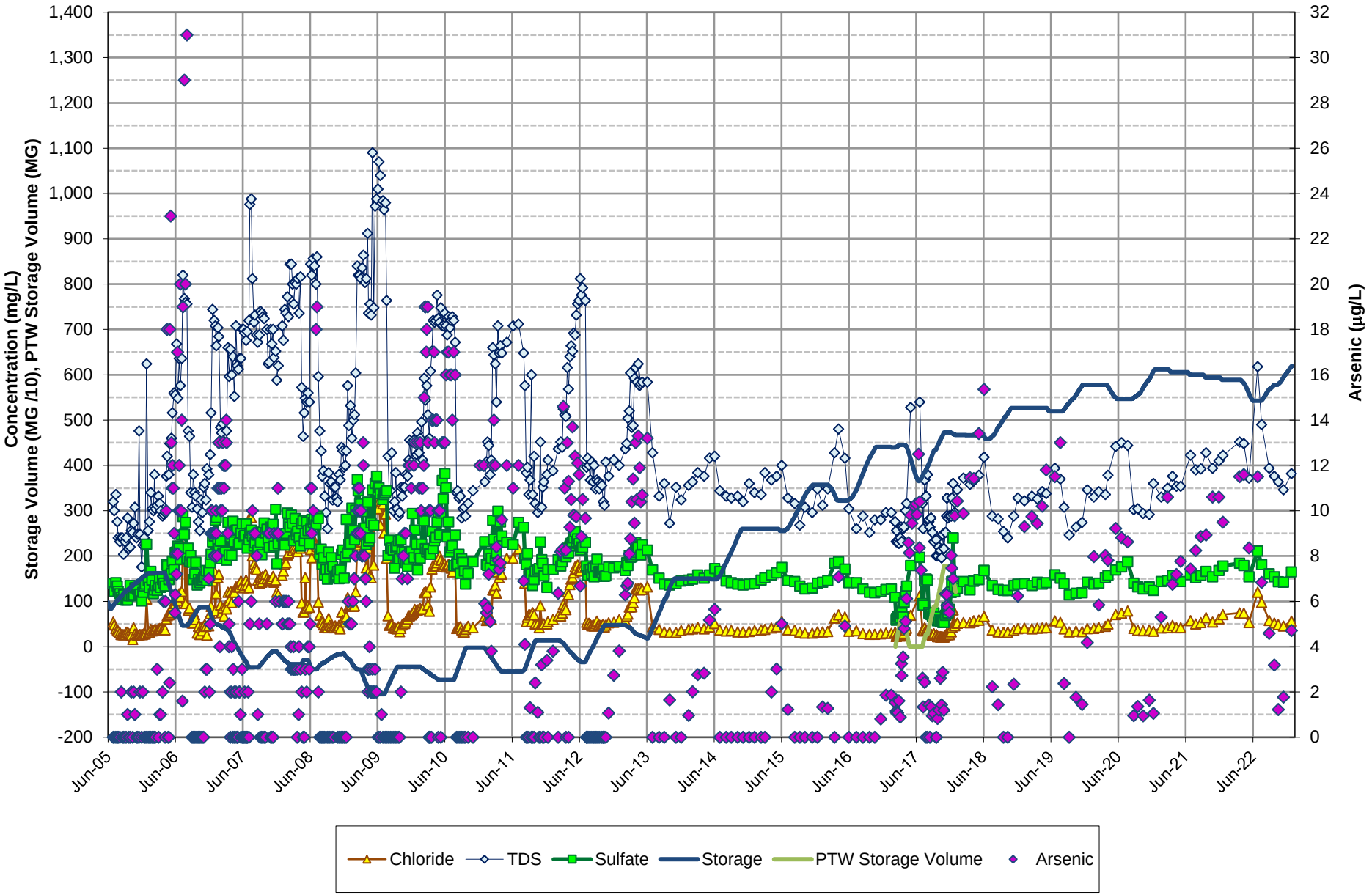
Notes:
For the purpose of this graphic any readings below the laboratory method detection limit were assigned zero
Sampling events for the PTSW testing occasionally resulted in duplicate samples on the same day, in that instance the result with the higher concentration of the two samples was used

Figure D-12
WF2 Monitoring Well M-12 Water Quality



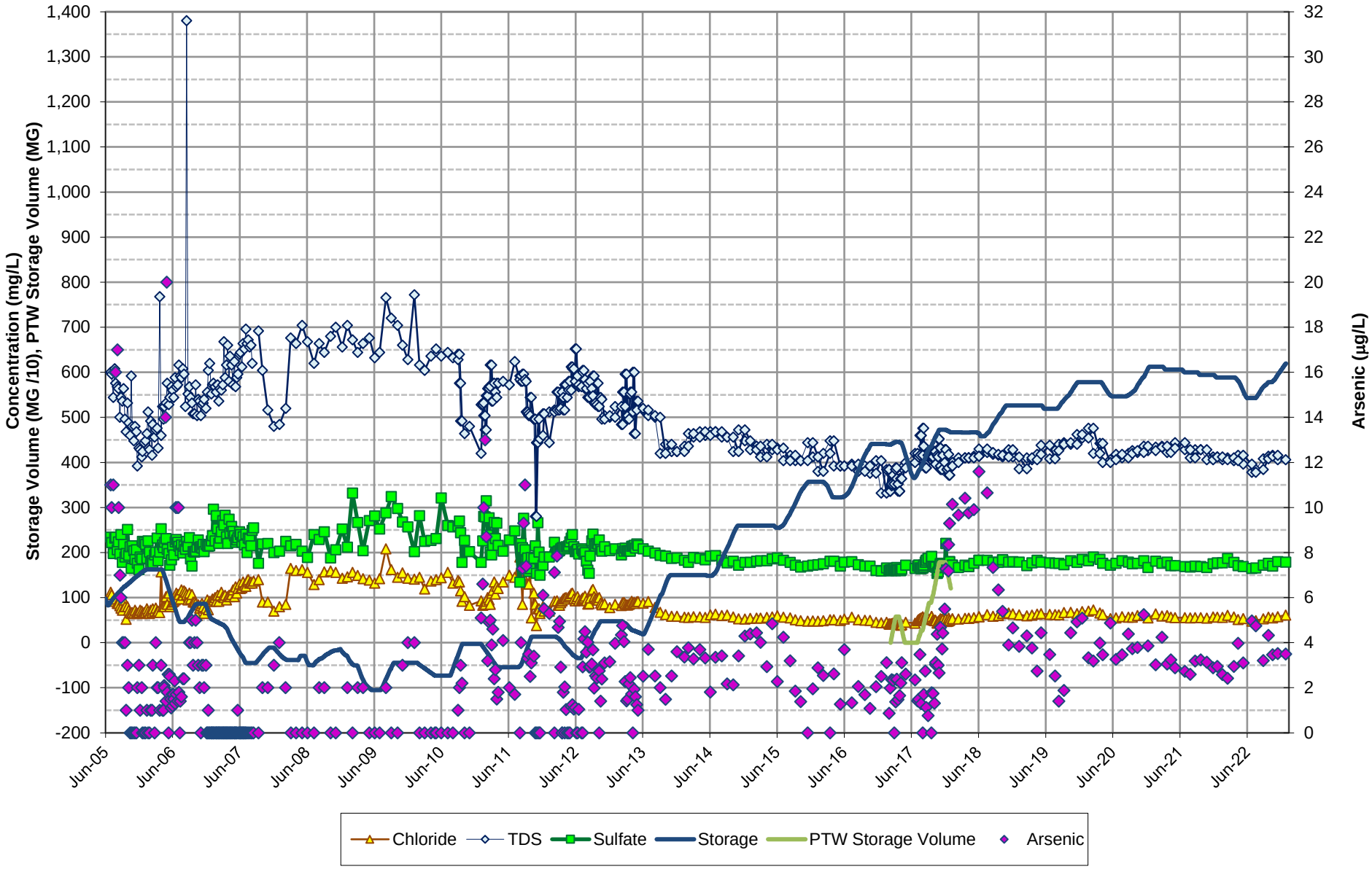
Notes:
For the purpose of this graphic any readings below the laboratory method detection limit were assigned zero
Sampling events for the PTSW testing occasionally resulted in duplicate samples on the same day, in that instance the result with the higher concentration of the two samples was used

Figure D-13
WF2 Monitoring Well M-13 Water Quality



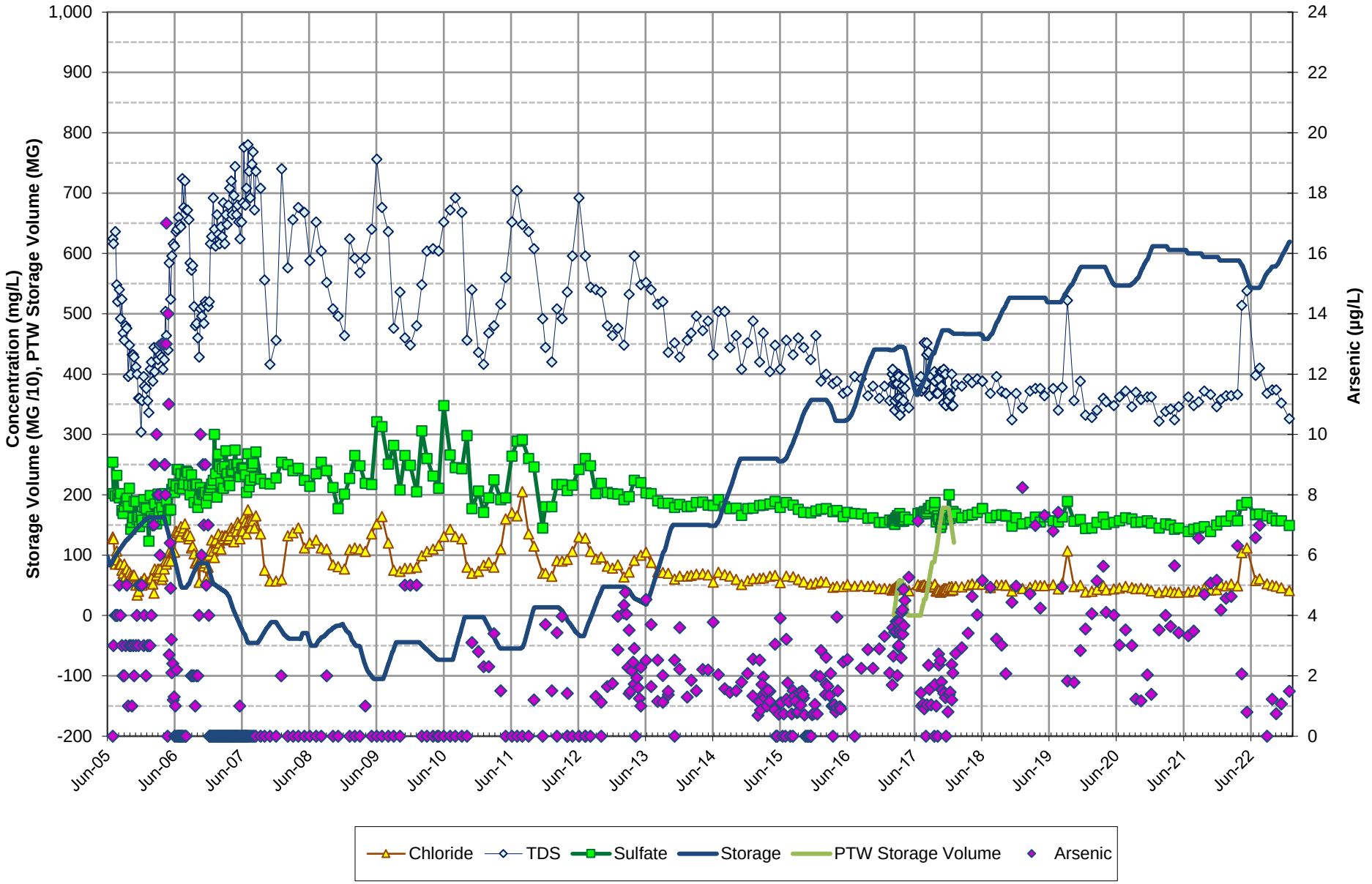
Notes:
For the purpose of this graphic any readings below the laboratory method detection limit were assigned zero
Sampling events for the PTSW testing occasionally resulted in duplicate samples on the same day, in that instance the result with the higher concentration of the two samples was used

Figure D-14
WF2 Monitoring Well M-14 Water Quality



Notes:
For the purpose of this graphic any readings below the laboratory method detection limit were assigned zero
Sampling events for the PTSW testing occasionally resulted in duplicate samples on the same day, in that instance the result with the higher concentration of the two samples was used

Figure D-15
WF2 Monitoring Well M-16 Water Quality



Notes:
For the purpose of this graphic any readings below the laboratory method detection limit were assigned zero
Sampling events for the PTSW testing occasionally resulted in duplicate samples on the same day, in that instance the result with the higher concentration of the two samples was used

Figure D-16
WF2 Monitoring Well M-17 Water Quality

Appendix E
Water Level Charts for Monitoring Wells

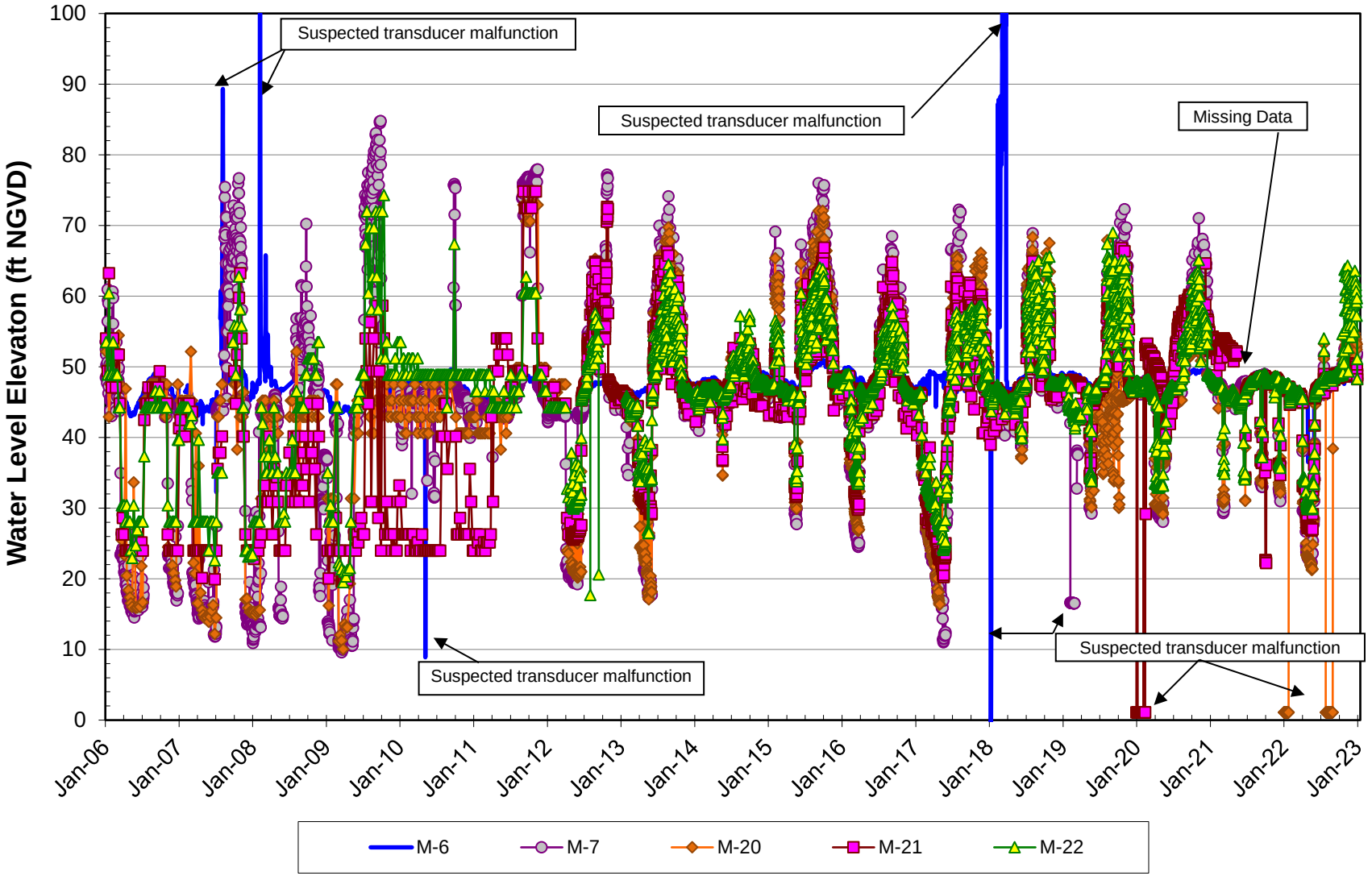


Figure E-1
WF-1 Suwannee Zone Monitoring Well Hydrographs

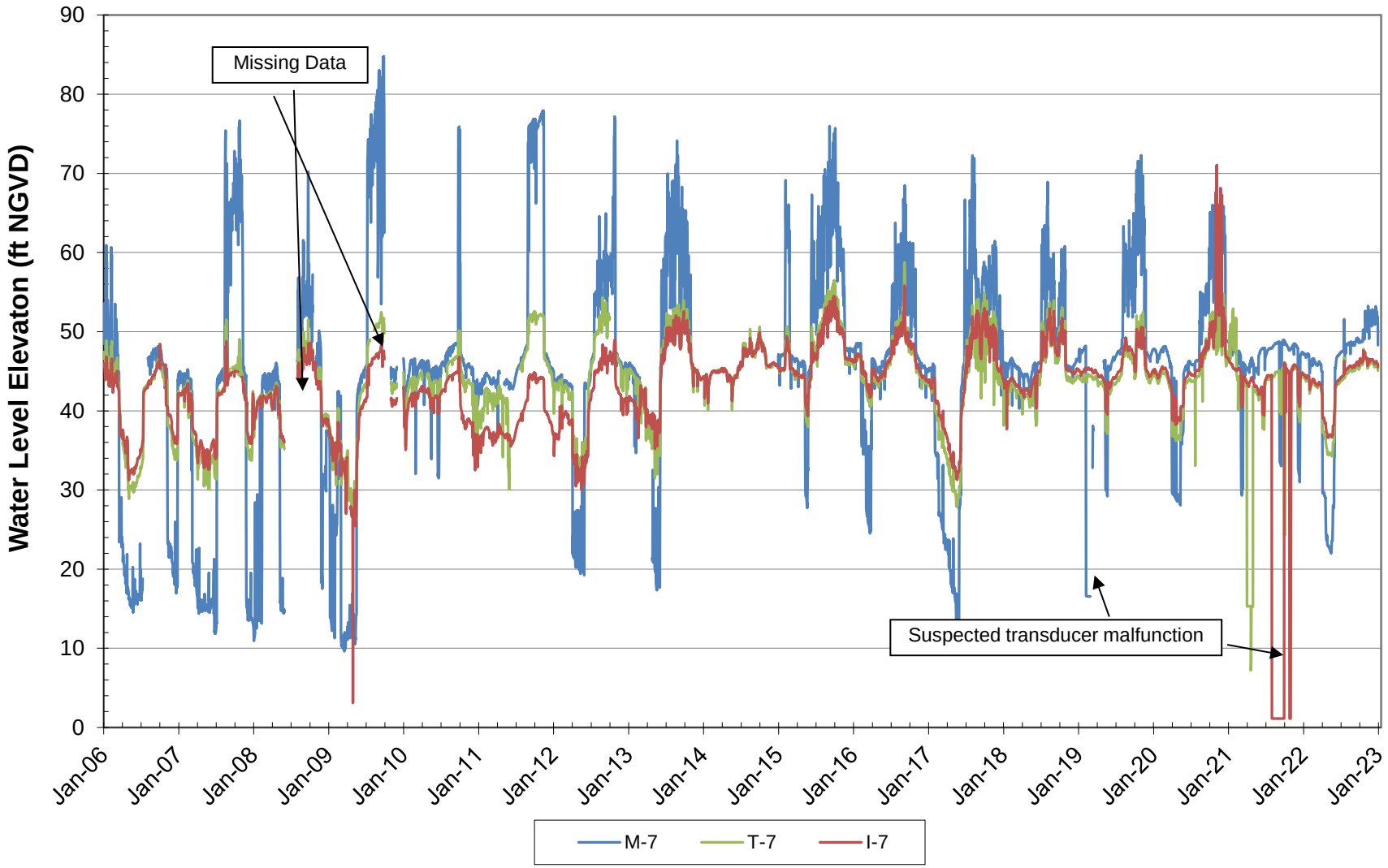


Figure E-2
WF-1 Site 7 Monitoring Well Hydrographs

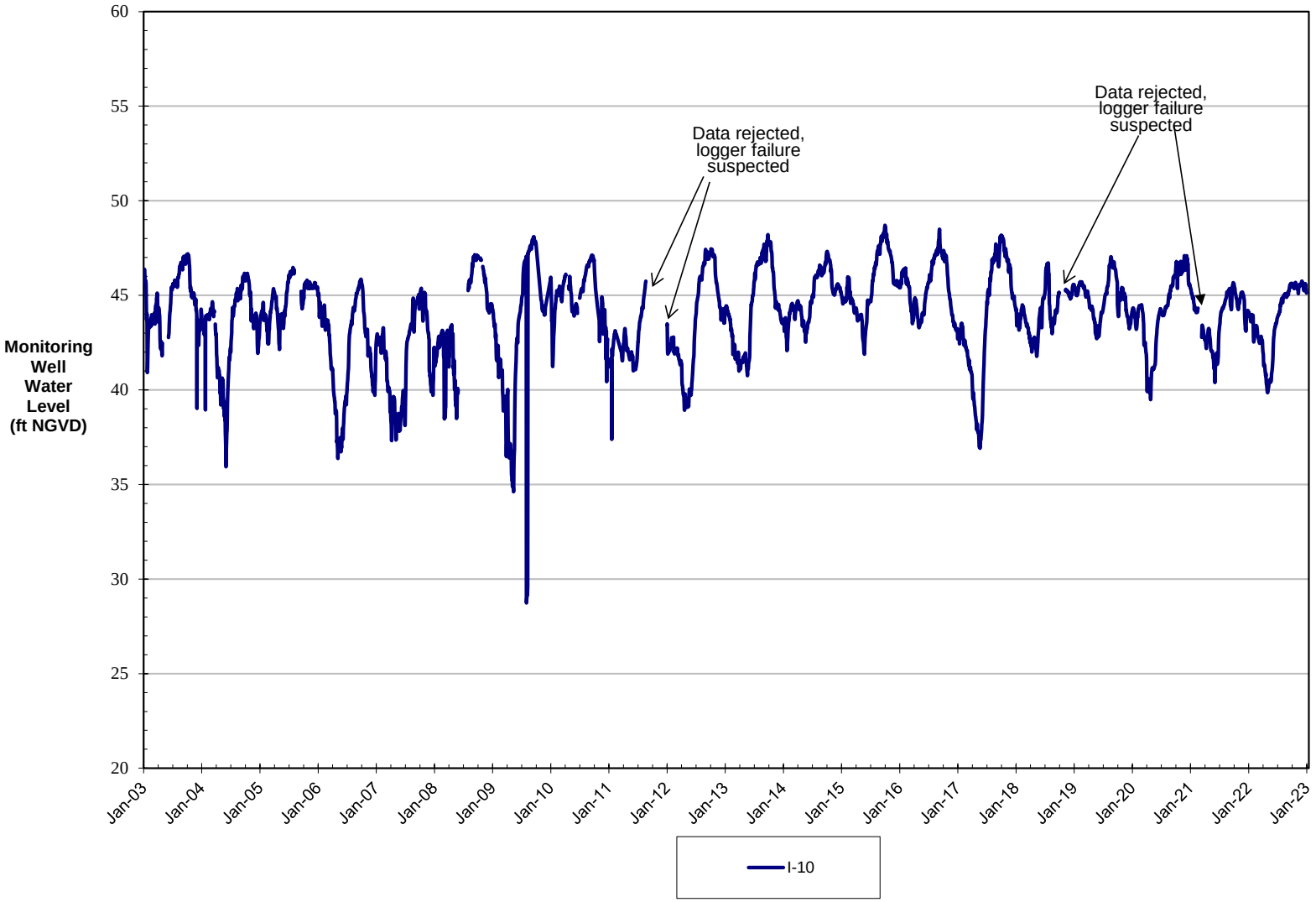


Figure E-3
WF2 I-10 Average Daily Water Levels

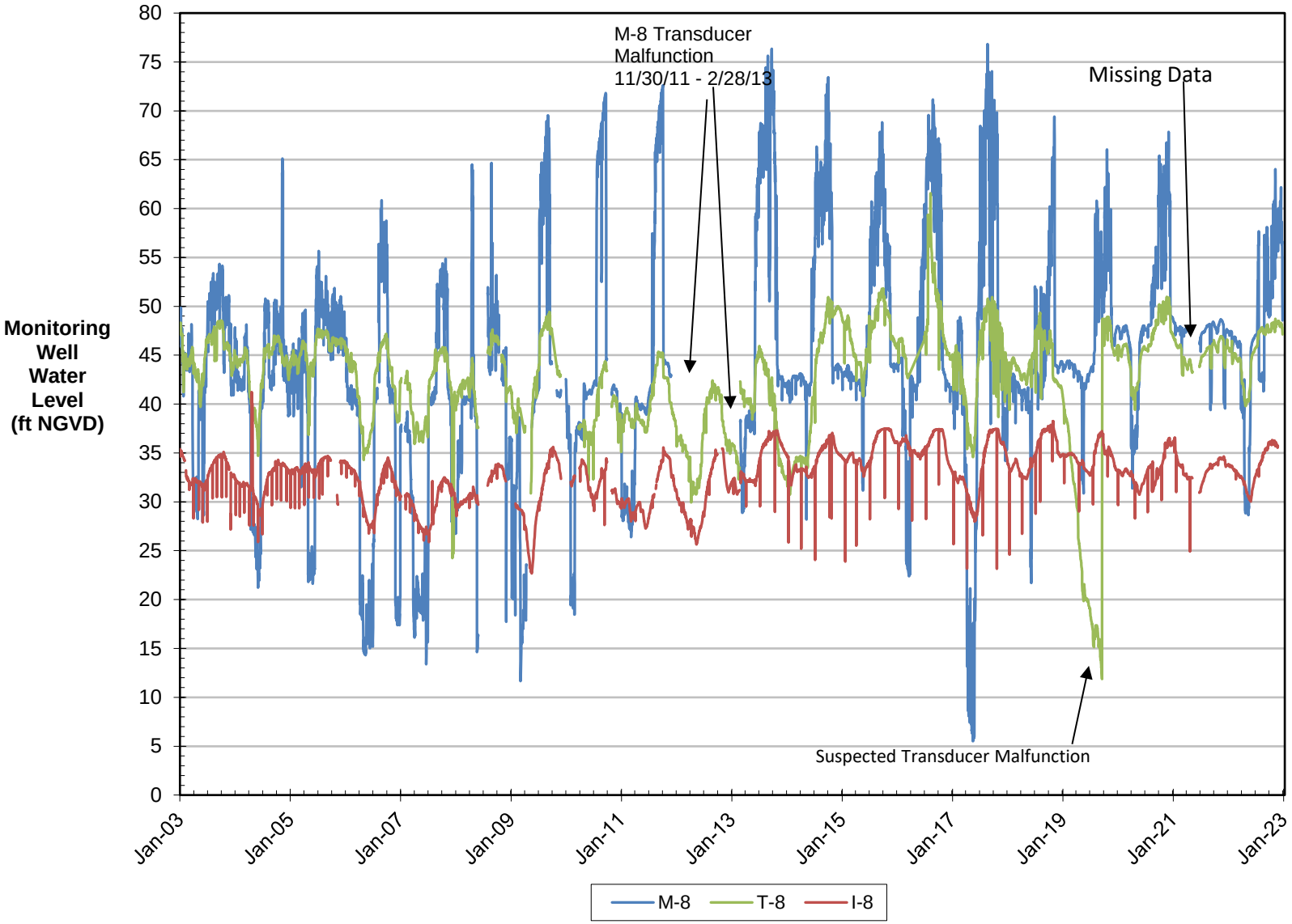


Figure E-4
WF2 I-8, T-8, M-8 Average Daily Water Levels

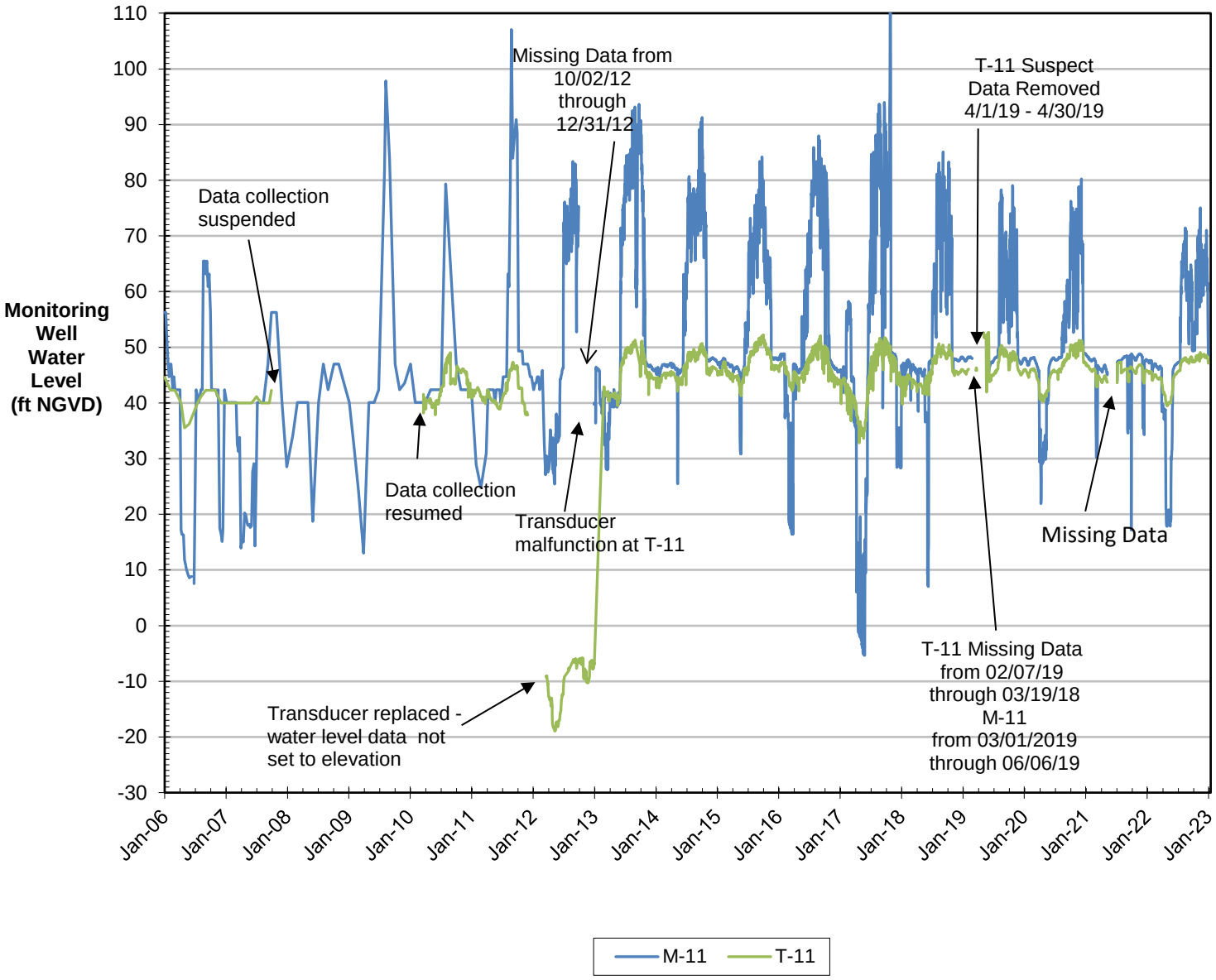


Figure E-5
WF2 T-11 and M-11 Average Daily Water Levels

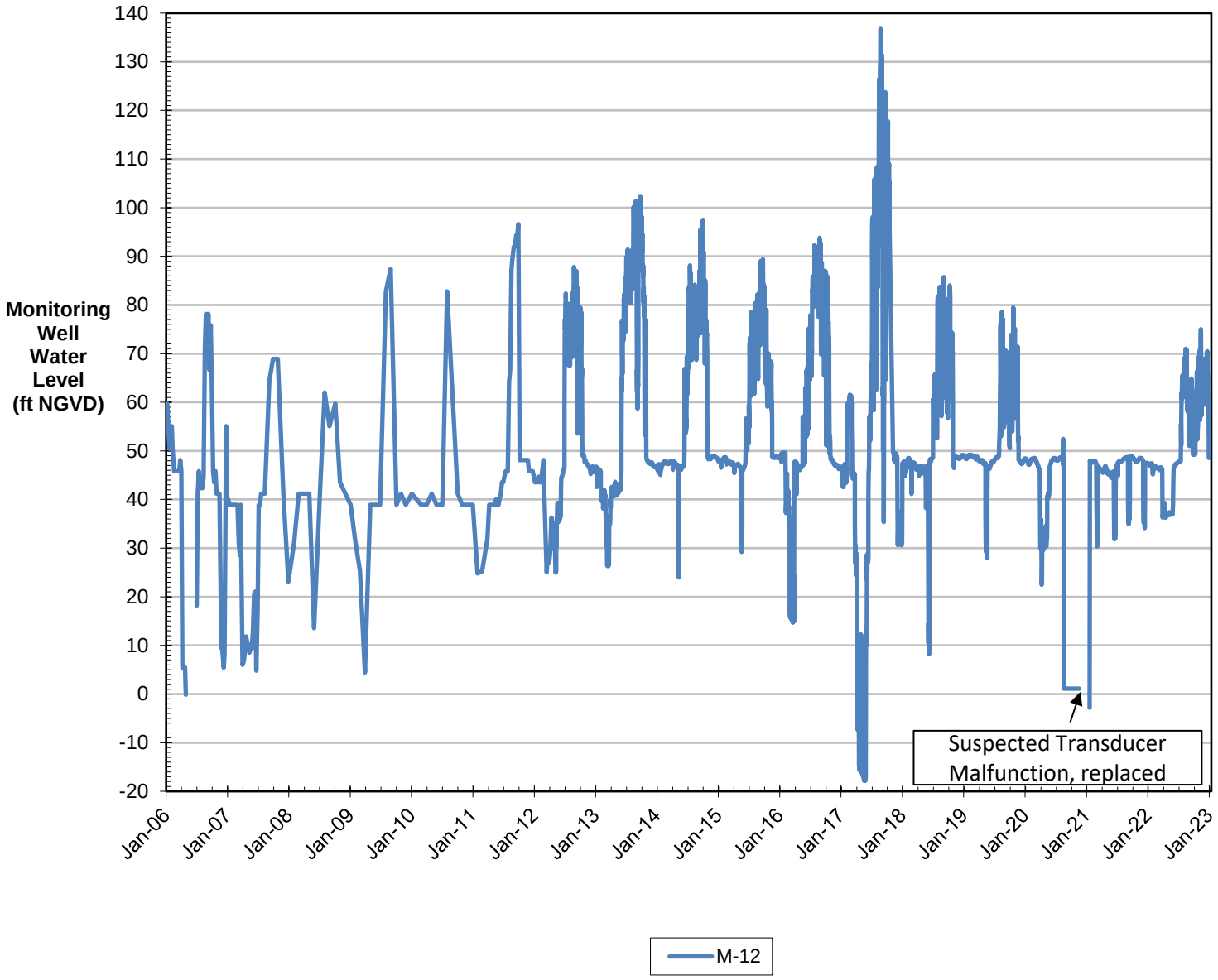


Figure E-6
WF2 M-12 Average Daily Water Levels

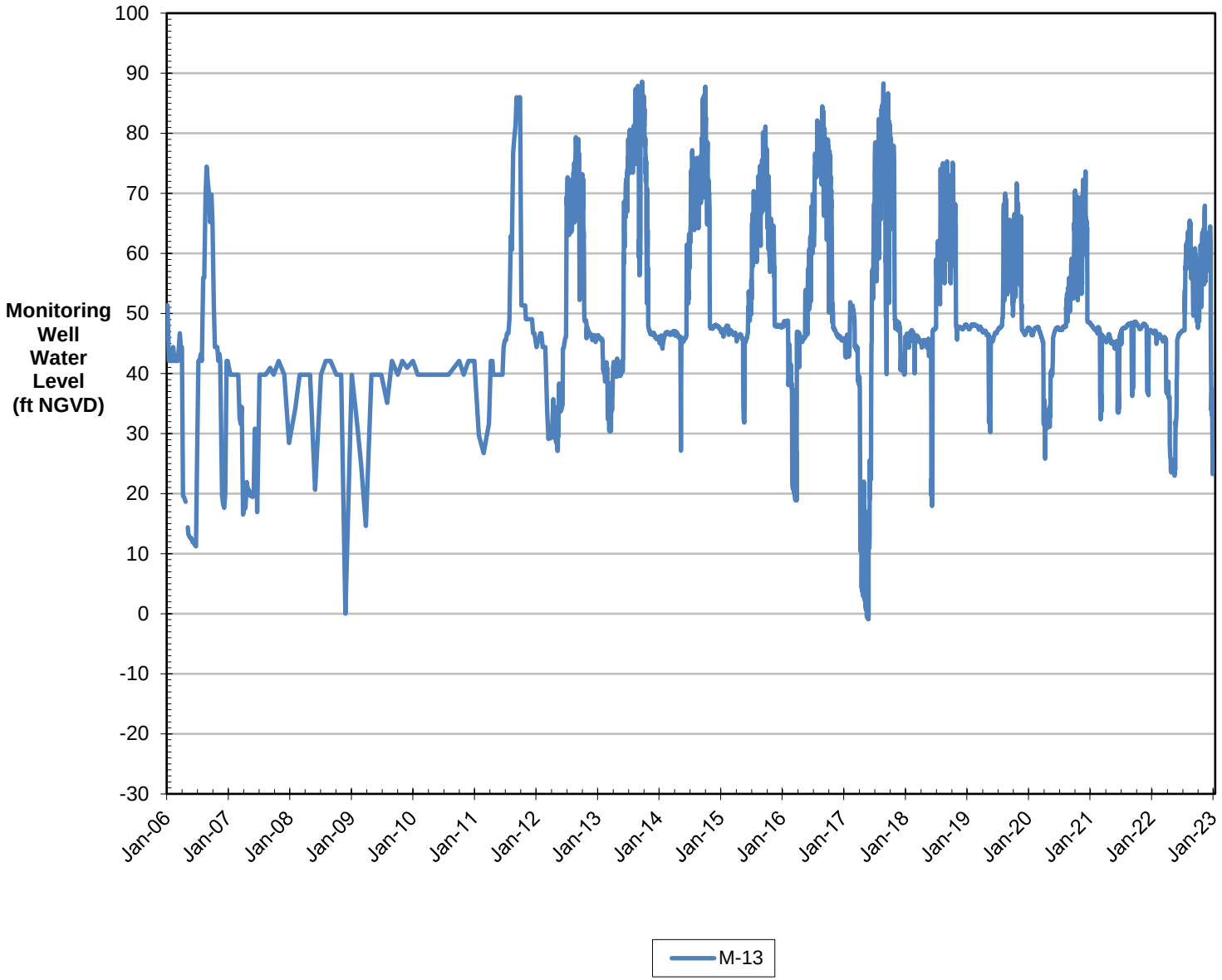


Figure E-7
WF2 M-13 Average Daily Water Levels

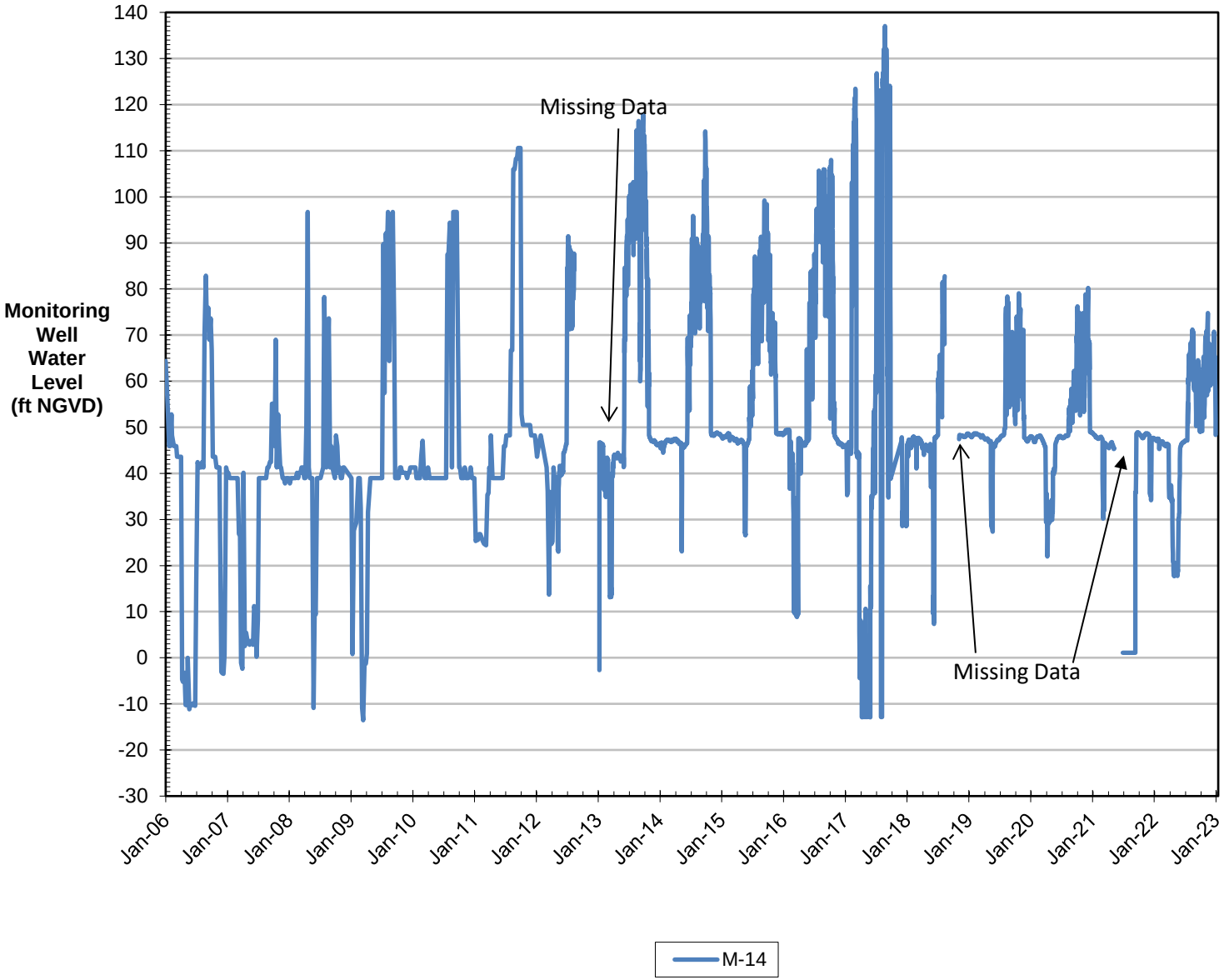


Figure E-8
WF2 M-14 Average Daily Water Levels

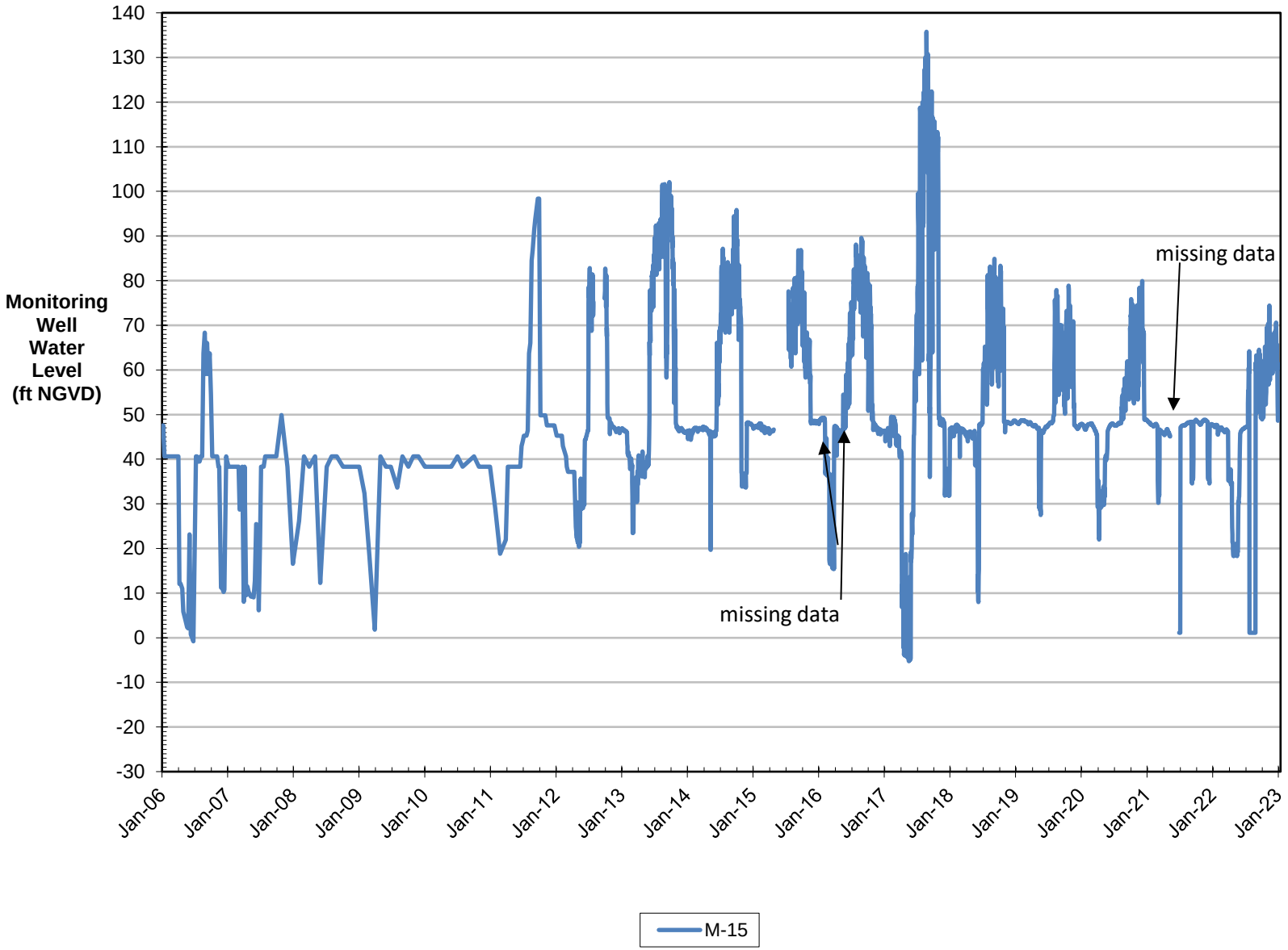


Figure E-9
WF2 M-15 Average Daily Water Levels

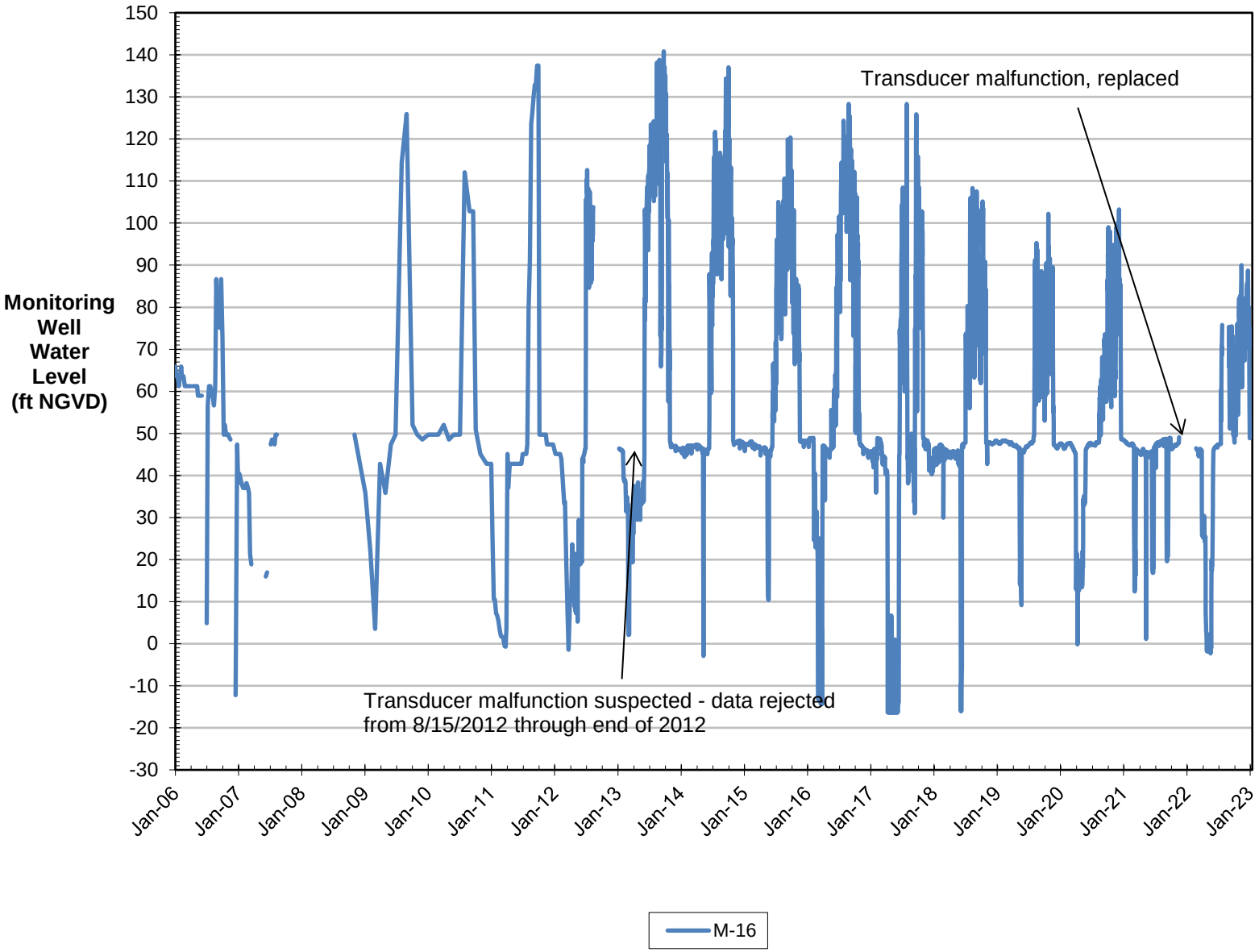


Figure E-10
WF-2 M-16 Average Daily Water Levels

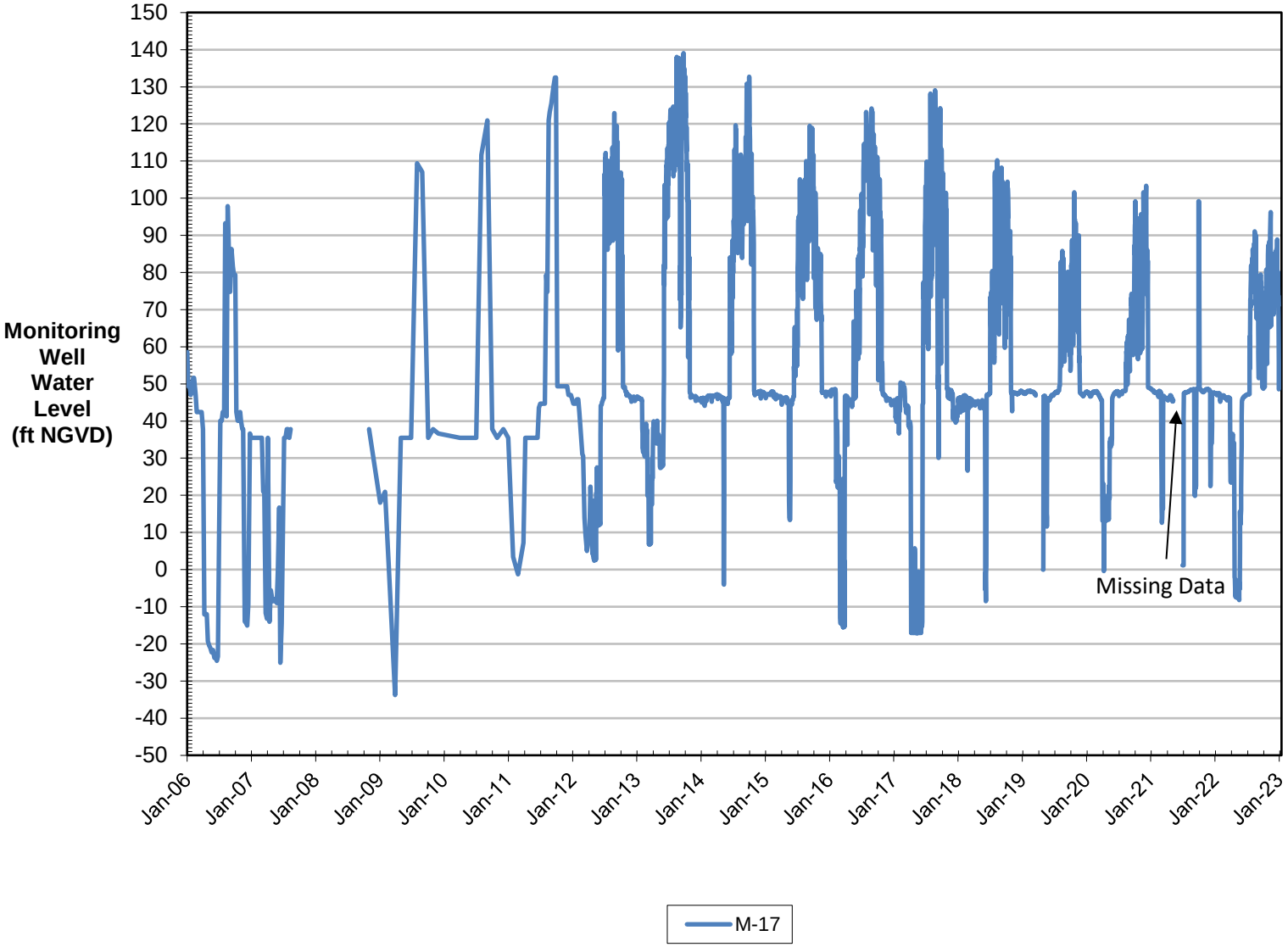


Figure E-11
WF2 M-17 Average Daily Water Levels

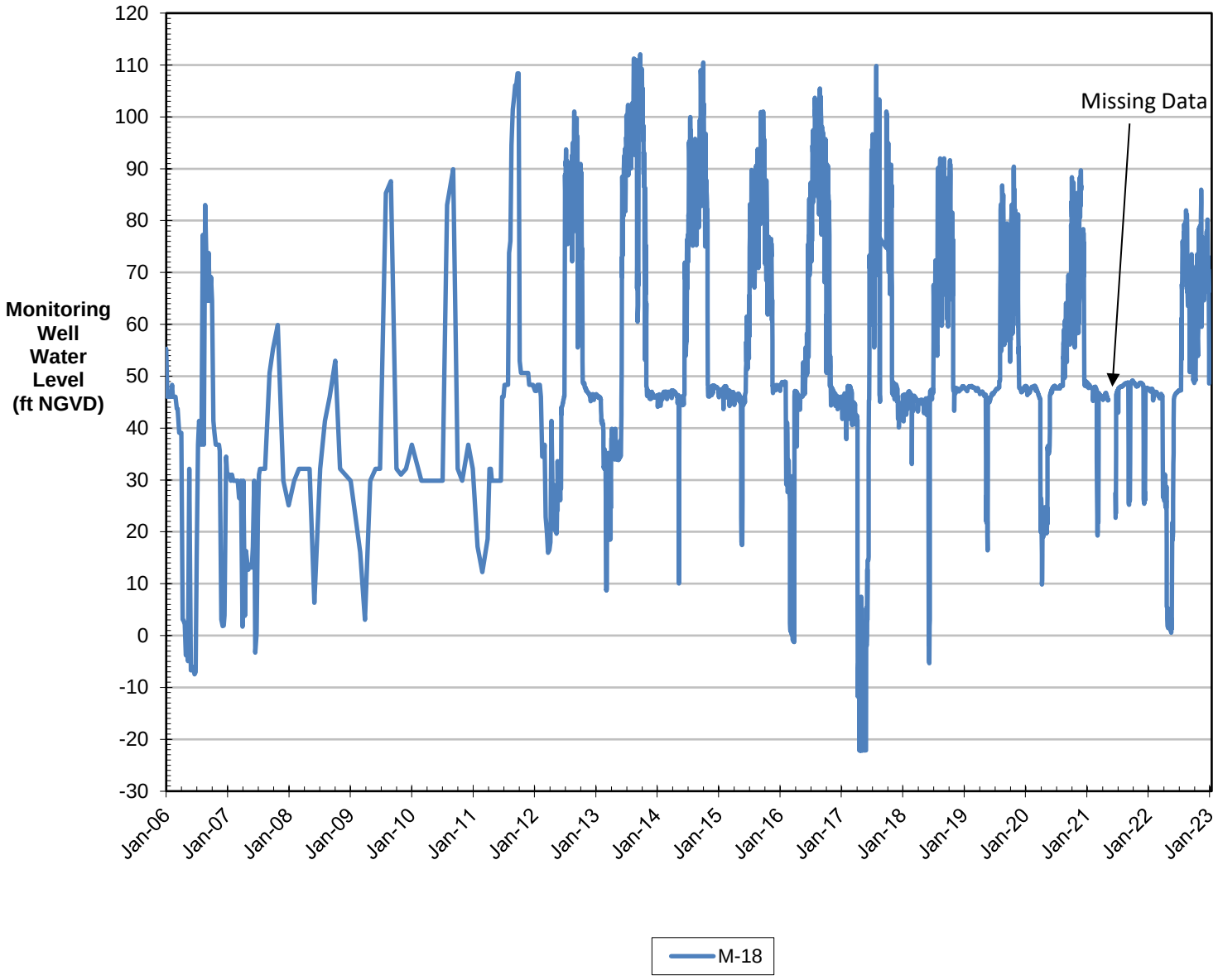


Figure E-12
WF2 M-18 Average Daily Water Levels

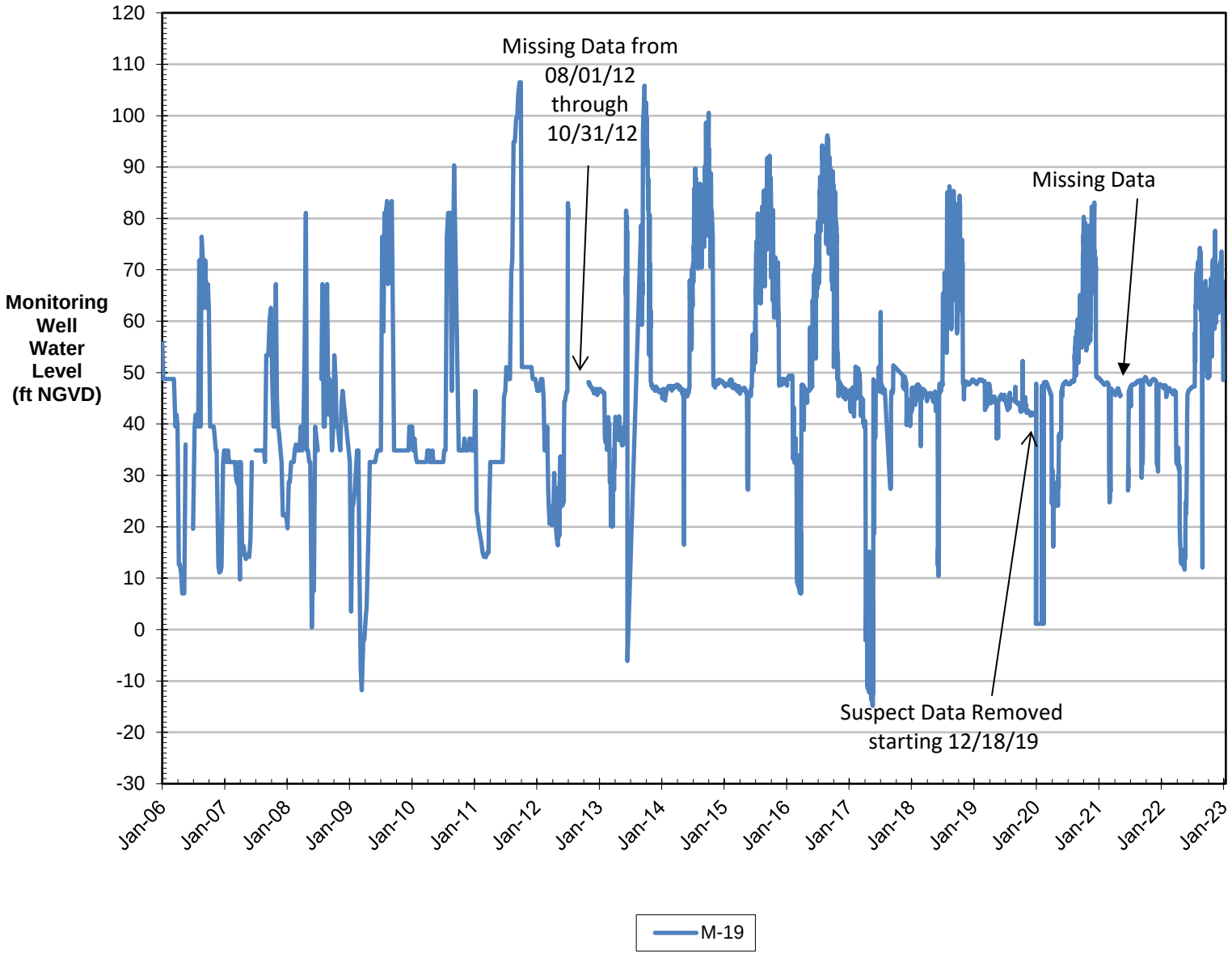


Figure E-13
WF2 M-19 Average Daily Water Levels