



K-Area Burning/Rubble Pit and Rubble Pile (131-K and 631-20G) (KBRP) and P-Area Burning/Rubble Pit (131-P) (PBRP) Operable Units Detailed Combined Groundwater Monitoring Report (U)

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LIST OF ABBREVIATIONS AND ACRONYMS

4Q21	fourth quarter 2021
~	approximate, approximately
BRP	Burning/Rubble Pit
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	CERCLA list
CMCOC	contaminant migration constituent of concern
COC	constituent of concern
cm	centimeter
CPT	cone penetrometer technology
DCE	dichloroethylene
FFA	Federal Facility Agreement
ft	feet
GAU	Gordon aquifer unit
GCU	Gordon confining unit
GWMZ	groundwater mixing zone
GWPS	Groundwater Protection Standard
IC	institutional control
in.	inch, inches
KBRP	K-Area Burning Rubble Pit
KP	K and P Area
KRP	K-Area Rubble Pile
LAZ	lower aquifer zone
m	meter
µg/L	microgram per liter
MCL	maximum contaminant level
MNA	Monitored Natural Attenuation
msl	mean sea level
MZCL	mixing zone contamination limit
OU	operable unit
PAGW	P-Area groundwater
PBRP	P-Area Burning/Rubble Pit
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene
ppmv	parts per million by volume
PTSM	principal threat source material
RA	remedial action
RCRA	Resource Conservation and Recovery Act
RFI/RI	RCRA Facility Investigation/Remedial Investigation
ROD	Record of Decision
RP	rubble pile
RSL	regional screening level

LIST OF ACRONYMS AND ABBREVIATIONS *(Continued/End)*

SCDHEC	South Carolina Department of Health and Environmental Control
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
TCA	trichloroethane
TCCZ	Tan Clay Confining Zone
TCE	trichloroethylene
TSP	time-series plots
TZ	transmissive zone
UAZ	upper aquifer zone
USEPA	U.S. Environmental Protection Agency
UTRAU	Upper Three Runs aquifer unit
VOC	volatile organic compound
WSRC	Westinghouse Savannah River Company LLC (before October 2005)
WSRC	Washington Savannah River Company LLC (October 2005-July 2008)

1.0 INTRODUCTION

The K- and P-Area (KP) Burning/Rubble Pits (BRPs) were each shallow (≤ 3.35 meters [m] [11 feet {ft}] deep) pits of similar dimensions (approximately [\sim] 70.10 m [230 ft] long by 9.14 m [30 ft] wide) used to dispose of and burn various combustible wastes from the 1950s through 1973. These wastes included wood, cardboard, paper, plastics, rubber, rags, oils, degreasers, solvents, and organic liquids of unknown use and origins. The K-Area Burning/Rubble Pit (KBRP) had adjacent rubble piles (RPs) where construction wastes/soils were dumped on the surface. Figure 1 shows the locations of these two operable units (OUs).

In 1973, the Savannah River Site (SRS) discontinued waste burning in open pits and placed a layer of soil over each pit. Inert debris such as construction rubble, and in some cases batteries, continued to be disposed of at the pits until they became full. In 1978, P-Area Burning Rubble Pit (PBRP) was backfilled with clean soil to grade; similar work followed at KBRP in 1981.

Each of the BRP OUs is listed as a Resource Conservation and Recovery Act (RCRA)/Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) unit in Appendix C of the Federal Facility Agreement (FFA) for SRS (FFA 1993). SRS has remediated the source units that have contaminated the groundwater at each unit, but groundwater remains contaminated with low concentrations of volatile organic compounds (VOCs).

This Combined Groundwater Monitoring Report addresses the effectiveness of the Groundwater Mixing Zones (GWMZs) at the KBRP OU and verifies that a discernible plume has not developed at the PBRP OU. In 2008, reporting for the OUs was combined into a single abbreviated annual groundwater monitoring data letter because of the similarities in the OUs, small size of contaminant plumes, and stable or decreasing contaminant concentrations (WSRC 2008). The L-Area BRP OU was originally included as part of these combined documents until 2020 when the OU achieved its remedial goal. Because of successive years without an exceedance above maximum contaminant levels (MCLs) for the recognized constituents of concern (COCs) at the LBRP OU, the groundwater remedy was considered complete and monitoring and reporting was

discontinued. Full detailed reports, such as those contained in this report, will be provided every five years. SRS will submit the next full report on or before June 30, 2027. The abbreviated groundwater data summary letters will be submitted annually on the years the full 5-year detailed reports are not issued.

This report comprises two sections, which cover each of the BRP OUs.

2.0 SITE HYDROGEOLOGY

A detailed description of the hydrostratigraphic units relevant to each of the BRP OUs can be found in the RCRA Facility Investigation/Remedial Investigation (RFI/RI) documents (K Area: WSRC 1998; P Area: WSRC 2001).

In general, the Floridan aquifer system is the aquifer system of concern within the KP BRP OU areas. The system consists of two aquifer units separated by a confining unit. From top to bottom, they are the Upper Three Runs aquifer unit (UTRAU), the Gordon confining unit (GCU), and the Gordon aquifer unit (GAU).

The UTRAU occurs between the water table surface and the GCU. A semicontinuous clay layer, the “tan clay,” divides the UTRAU into two aquifer zones. From top to bottom they are the upper aquifer zone (UAZ) and the lower aquifer zone (LAZ).

The UAZ sediments include moderately sorted, coarse- to medium-grained silty sand, sandy and silty clay layers, and some locally confined pebble layers. The UAZ is often further separated into layers informally referred to as surface soils: “A”-Horizon, “AA”-Horizon, and the basal “transmissive zone” (TZ). The A-Horizon consists of various layers of silty and clayed sands. Pebble layers are common, as are clay laminae and beds. The AA-Horizon contains moderately to poorly sorted quartz sands with interlaminated and locally abundant interbedded clay. Pebble layers and clay clast-rich zones are common. The AA-Horizon is coarser than the A-Horizon and highly variable. The TZ is characterized by various layers of interbedded clayed and silty sands with some pebble layers and is highly permeable. The water table aquifer is in the A-/AA-Horizon. Groundwater flow at both BRP OUs is to the west or southwest (Figures 2 and 3).

The tan clay is a semicontinuous confining clay layer that separates the UAZ and LAZ. It varies between a thick clay layer to clay lenses interbedded with sands, silty sands, clayey sands, and sandy clays. It can range in thickness from 0.61 m (2 ft) to 4.57 m (15 ft).

The LAZ sediments include moderately to poorly sorted medium- to fine-grained silty clayey sand; calcareous and fossiliferous limestone; clay and silt; and moderately sorted coarse- to medium-grained sand with minor amounts of silt and clay matrix.

The GCU separates the UTRAU from the GAU and consists of an interval of clayey sand and clay. This confining unit is laterally continuous and significantly inhibits the flow of water between the UTRAU and GAU. The GAU consists of unconsolidated sands with several pebbly zones. Clay lenses are present; however, they are thin and discontinuous.

3.0 RECHARGE AND PRECIPITATION MEASUREMENTS

Recharge to the groundwater is estimated from precipitation data. The amount of precipitation entering the groundwater as recharge is typically one-third of total precipitation. This varies, based on land cover, such as parking lots vs. pine stands, or the degree of topographic slope vs. steeper hillsides.

Daily precipitation measurements are made at meteorological stations at multiple locations around SRS. The precipitation data for this report is gathered from a single location in L Area, rain gauge 100-L, which is halfway between K and P Areas. Figure 4 provides a summary of the last 20 years of measurements. Annual precipitation ranges from 81.56 centimeters (cm) (32.11 inches [in.]) in 2011 to 160.30 cm [63.11 in.] in 2003. Over the last five years (2017-2021), precipitation has fluctuated above and below the 20-year average of 122.22 cm [48.12 in.].

The affects in precipitation can be seen in water table aquifers beneath the KP BRP OUs when compared to the water elevations collected during previous years (Appendix A and Figure 4). Water elevations at the KP BRPs have decreased between 0.2 m (0.8 ft) and 0.7 m (2.4 ft) since 2020, due to less precipitation occurring in 2021 after seven years of significantly more than average precipitation.

3.1 KBRP OU

3.1.1 KBRP OU Background

The KBRP is in the south-central part of SRS, northeast of K Area (Figure 1). The elevation in the vicinity of the KBRP is ~81 m (262 ft) mean sea level (msl). The water table aquifer is ~17 m (55 ft) below ground surface (or ~64 m [210 ft] msl). Groundwater flow is to the southwest.

The RFI/RI used seven groundwater monitoring wells installed from 1983 to 1997 and groundwater samples collected by cone penetrometer technology (CPT) for groundwater analysis (WSRC 1998). Groundwater was determined to be contaminated with tetrachloroethylene (PCE) and trichloroethylene (TCE) above MCLs only in the upper portion of the water table aquifer. No final Contaminant Migration Constituents of Concern (CMCOCs) were identified for the soil at the KBRP/RP that would impact groundwater. Groundwater monitoring and soil sampling have shown that the source for PCE and TCE is depleted.

The Record of Decision (ROD) was signed in 2001, selecting Monitored Natural Attenuation (MNA) as the remedy, which includes institutional controls (ICs) and a GWMZ (WSRC 2000). SRS has not performed removal actions at the unit; however, it has consolidated contaminated soil and placed a low permeable soil cover over KBRP to protect future industrial workers from exposure to the contaminated soil. ICs at the KBRP OU consist of groundwater-use restrictions and site use/site clearance restrictions, including signage, to protect human health and the environment.

Per the ROD, the remedial objectives for groundwater are to decrease the constituent of concern (COC) concentrations in groundwater below MCLs and to protect future industrial workers from unacceptable exposures to PCE and TCE in groundwater. Long-term groundwater monitoring using a GWMZ ensures maximum mixing zone contamination limits (MZCLs) are not exceeded.

3.1.2 KBRP OU Groundwater Mixing Zone Application Elements

The remedial objective for the groundwater is to allow for PCE and TCE concentrations in the groundwater to naturally decrease to levels below MCLs. A GWMZ with ICs was the selected remedy to achieve this goal. The modeling performed as part of the GWMZ Application (WSRC

1999a) predicted that the groundwater contaminant concentrations would decrease through natural attenuation to levels at or below MCLs by 2005 through advective-dispersive processes.

The GWMZ Application established a monitoring well network to include plume, intermediate, and compliance boundary wells. The objective of the network is to demonstrate compliance with MCLs at the compliance boundary and with the MZCLs at the plume and intermediate wells. Groundwater flow and transport modeling of KBRP (WSRC 1999b) established MZCLs at the location of the compliance boundary. Installing deeper screen zones at each of the GWMZ monitoring well cluster locations was contingent upon the analytical results from the shallow aquifer. The current wells included in the monitoring plan for the GWMZ Application are listed in Table 1, shown on Figure 2, and are also described below.

3.1.2.1 Plume Wells

The approved GWMZ Application requires monitoring plume wells (KRP 4, KRP 5, KRP 6, and KRP 8) screened in the AA-Horizon. Although not identified in the GWMZ Application as a plume well, KRP 9 has also been monitored because it is the only other well in the vicinity of the initial plume to be above MCLs. Table 1 categorizes this well as an auxiliary plume well. The trigger levels for these plume wells are 43 µg/L for PCE and 61 µg/L for TCE.

3.1.2.2 Intermediate Wells

SRS constructed intermediate wells in 2002 after the approval of the GWMZ Application. Two well clusters, KRP 10 and KRP 11, were installed as intermediate wells with screens in the TZ (D wells) and LAZ (C wells) of the UTRAU per the GWMZ Application. The trigger levels for these wells are the same as the MCL: 5.0 µg/L for both PCE and TCE.

3.1.2.3 Compliance Boundary Wells

There are six compliance boundary wells in either the TZ or LAZ for the GWMZ at KBRP. Compliance boundary wells were installed in 2002 and 2003 at locations southwest of KBRP within possible groundwater flow, as indicated in Figure 2.

As of 2005, well KRP 7 (AA aquifer) was designated a compliance boundary well. The core team agreed that wells KRP 14C and KRP 14D are no longer part of the GWMZ monitoring network (WSRC 2005).

No wells have been installed in the GAU because contaminant concentrations have not exceeded MCLs in the LAZ.

3.1.2.4 Sampling Frequency

Initially, the GWMZ Application called for sampling to be quarterly the first year, then semiannually thereafter. To satisfy the corrective action agreement and with concurrence from the core team, the GWMZ monitoring wells would continue to be sampled quarterly. Sampling frequency was reduced to semiannually starting in 2007, when contaminant levels were determined to be steady or decreasing. In accordance with the 2012 Combined Groundwater Monitoring Report (SRNS 2012), the sampling frequency was further reduced to annually.

Beginning in 2007, per core team agreement, samples are required to be analyzed for PCE, TCE, and their degradation products (cis-1,2-dichloroethylene [cis-1,2-DCE], trans-1,2-dichloroethylene [trans-1,2-DCE], 1,1-dichloroethylene [1,1-DCE], and vinyl chloride). The remaining analytes listed in USEPA analytical method 8260 are no longer required.

In 2012, SRS suspended sampling for all LAZ wells (KRP 10C, KRP 11C, KRP 12C, and KRP 15C) and three TZ wells (KRP 12D, KRP 13D, and KRP 15D), due to continuous non-detect observations in each well (SRNS 2012). The core team agreed that sampling would resume if an exceedance of MCLs was observed in any of the intermediate wells (KRP 10D and KRP 11D). During the next sampling event, compliance boundary wells KRP 12C and KRP 12D and intermediate wells KRP 10C and KRP 11C will restart with annual sampling, and one sample from each of the other wells (KRP 13D, KRP 15C, and KRP 15D) will be collected to confirm contamination has not spread to the northwest and south. If concentrations are found in any of these wells (KRP 13D, KRP 15C, and KRP 15D) as detectable and not estimated values, sampling will continue annually for those specific wells. Table 2 presents the monitoring network and

conditional sampling approach for the KBRP OU. Figure 2 identifies the wells with suspended sampling, as indicated by the “SS” designation.

With agreement from USEPA and SCDHEC on a comment response on the 2020 Combined Groundwater Monitoring Report (Sampling Summary), the project team has initiated an increase in sampling frequency at well KRP 9, based on PCE and TCE exceeding the MCLs in 2018 (SRNS, 2020a). Sampling frequency at well KRP 9 was increased from annually to semiannually starting in the second quarter of 2021, to facilitate the team’s understanding of the need for continued monitoring at this unit. The USEPA’s groundwater monitoring guidance recommends a minimum number of data points to evaluate each phase of groundwater monitoring (USEPA 2014). Consistent with this guidance, four data points from each currently monitored well are required for the remediation monitoring phase, and eight data points are needed for the attainment monitoring phase. Because KRP 9 is the only well that has had an exceedance since 2008, the eight data points required to reach unit closure will be obtained at a faster rate by the increase in the sampling frequency from annually to semiannually.

For future sampling events in the GWMZ monitoring wells, if the trigger levels for PCE or TCE are exceeded, the affected well(s) will be resampled within 30 days of receipt of a validated data report to confirm this exceedance. If daughter products exceed their MCL, SRS will report the results. However, there are no plans to resample if daughter products exceed their MCL. If the trigger level is exceeded in the validated confirmation sample(s), SRS will submit a plan for corrective action to the USEPA and SCDHEC. Jointly, SRS, USEPA, and SCDHEC will evaluate a range of corrective action options that are commensurate with the exceedance (WSRC 1999a).

3.1.3 Observed Hydrology at the KBRP OU

Water-level measurements from 2021 are listed in Appendix B, Table B-1. Water-level data has been used to prepare hydrographs for each of the currently sampled GWMZ monitoring wells (Appendix A). Potentiometric surfaces have been created for each of the aquifer zones monitored (AA and TZ) using fourth quarter 2021 (4Q21) data (Figure 2). Groundwater flow within the UTRAU is to the southwest. Water levels in all wells have decreased an average of 0.5 m (1.8 ft) since the last measurements taken in the fourth quarter of 2020. Recharge is estimated at 38 cm

(15 in.), based on 2021 data (a third of the total rainfall as shown in Figure 4). This is below the recharge rate of 43 cm (17 in.) per year used in the model (WSRC 1999a). However, 2021 potentiometric surfaces do not show any unusual pattern of flow from previous measurements or from the modeled surfaces.

There is very little difference in hydraulic heads between the TZ and LAZ aquifers (across the Tan Clay Conforming Zone [TCCZ]) as shown by well clusters on the potentiometric surfaces (Figure 2) and hydrographs (Appendix A). There is a very slight, consistent downward head gradient from shallow to deeper aquifer zones. This is a typical condition for shallow aquifers at SRS.

3.1.4 Groundwater Sampling Results at the KBRP OU

Groundwater samples were collected from the eight active mixing zone wells at the KBRP OU. Appendix B provides the groundwater monitoring results from 2021.

In 2021, PCE and TCE contamination was detected in three plume wells, KRP 4, KRP 8, and KRP 9. The detections at KRP 4 were estimated quantities, less than the practical quantitation limit. KRP 8 has not had an exceedance for PCE or TCE since 2008, and detections during 2021 were either estimated quantities or well below the MCL. PCE and TCE concentrations at KRP 9 have not exceeded the MCL since 2018. In 2021, concentrations of PCE in KRP 9 were down to 3.09 µg/L during the second and fourth quarters. TCE concentrations have decreased to 2.15 µg/L in the second quarter and 2.12 µg/L in the fourth quarter. Appendix C provides time-series plots (TSP) for these wells.

All boundary and intermediate wells were non-detect during the 2021 sampling event. Wells KRP 7, KRP 12C, and KRP 12D, which are downgradient of KRP 9, have had detections of 2 µg/L or less throughout their history, indicating that the plume is migrating with groundwater flow but is sufficiently dispersing closer to the KBRP.

Figure 5 depicts plume trends showing the change in the PCE plume from 1996 to 2003 and to 2011. The PCE plume has since diminished with 2021 concentrations below the MCL in all wells.

Biodegradation of PCE and TCE has not been shown to be occurring at KBRP. All PCE/TCE degradation products were non-detect in 2021. Historically, wells KRP 8 and KRP 9 have shown detections of cis-1,2-DCE at concentrations less than 1.5 µg/L, well below the MCL of 70 µg/L. All other degradation products (trans-1,2-DCE, 1,1-DCE, and vinyl chloride) have always been non-detect.

3.1.5 Contaminant Concentration Comparison to Model Predictions at the KBRP OU

PCE and TCE concentrations have not decreased as rapidly as predicted by the groundwater flow and contaminant transport modeling in two of the five plume wells (KRP 8 and KRP 9). Modeling predicted that contaminant levels would be below MCLs by 2005 due to the processes of advection and dispersion (WSRC 1999b). 2016 was the first year all plume wells were below the MCL of 5.0 µg/L for both PCE and TCE. A slight increase in concentrations at well KRP 9, just above the MCL for PCE and TCE was observed in 2018 but have since decreased and remained below the MCL. The model predicted that the plume would not migrate further from directly downgradient of the KBRP and would not migrate into the GAU. Both predictions have been shown to be correct as the highest concentration is still near well KRP 9 and seen only in the AA aquifer.

A reduction in dispersion due to heterogeneity of the sediments within the aquifers; previous years of reduced groundwater recharge; and, to some degree, sorption are suspected of slowing the movement and reducing contamination at KBRP. Even though the plume has persisted longer than expected, core concentrations continue to decrease, and a GWMZ is still reasonable for monitoring. Additionally, contaminated groundwater is nowhere near surface-water discharge locations, and it is 945 m (3,100 ft) from the nearest downgradient surface-water body.

3.1.6 KBRP OU Summary and Conclusions

The GWMZ monitoring well network continues to provide sufficient data to assess the progress of natural attenuation within the groundwater. Consistent with the groundwater modeling predictions, the VOC plume has not increased in areal size or migrated below the uppermost aquifer zone. With an agreement from USEPA and SCDHEC on a comment response on the 2020 Combined Groundwater Monitoring Report (Sampling Summary), the project team has initiated

an increase in sampling frequency from annually to semiannually at well KRP 9, based on PCE and TCE exceeding the MCLs in 2018. In 2021, PCE and TCE concentrations were below MCLs in all wells. MNA, including the GWMZ, continues to be an effective remedial action (RA). SRS will continue to sample and monitor the eight active mixing zone wells to ensure that concentrations remain below MCLs, until it is agreed upon that the RA objective has been met, and monitoring is no longer necessary.

3.2 PBRP OU

3.2.1 PBRP OU Background

The PBRP is in the south-central portion of the SRS, west of P Area (Figure 1). Data collected from seven groundwater monitoring wells installed between 1983 and 1999, as well as 26 CPT pushes and 18 surface-water stations where samples were collected in 1997 and 1998, were used for the RFI/RI analysis of groundwater (WSRC 2001). Groundwater was determined to be contaminated with 1,1-DCE and TCE only in the area adjacent to the south side of the PBRP and not farther south towards Steel Creek. CMCOCs include antimony, chromium, copper, nickel, zinc, dibenzofuran, PCE, TCE, and polychlorinated biphenyl-1242 (PCB-1242). Modeling identified these constituents from the PBRP to become a potential threat to groundwater within 1,000 years.

The ROD was signed in 2003 and selected a remedy of Continued Monitoring and Reporting to verify that a discernible plume above MCLs does not develop (WSRC 2002). The chosen remedy for the PBRP OU was a low permeable soil cover over PBRP with colocated BaroBalls™, natural biodegradation, and ICs. No removal actions have been performed at the unit, and miscellaneous inert debris remains in place at depth. Soil sampling confirmed there is no principal threat source material (PTSM) present.

Per the ROD, the remedial objectives for groundwater are to prevent human exposure to 1,1-DCE and TCE above the MCLs of 7.0 µg/L and 5.0 µg/L, respectively, and to protect groundwater resources from the CMCOCs listed above. ICs will maintain the integrity of the soil cover, which in turn will maintain the effectiveness of the cover to mitigate leaching. Long-term

groundwater monitoring ensures CMCO concentration limits are not exceeded and allows a comparison of actual concentrations to predicted model concentrations over time.

In 2000, eight BaroBall™ wells were installed in and around the PBRP. The wells were located in the area with the highest soil contamination (north of well PRP 6) to remove volatile contaminants in the vadose zone. These wells, in addition to one groundwater well, were abandoned in 2003 when the low-permeability soil cover was installed. Four new BaroBall™ wells were installed in 2004 through the soil cover in the same general location (Figure 3). Vapor phase monitoring of the BaroBall™ wells was discontinued in 2006 as concentrations dropped to below 10 parts per million by volume (ppmv), the remedial goal. Although these wells are no longer being used for vapor monitoring, the BaroBall™ wells were left in place to continue operating until groundwater objectives are met.

3.2.2 PBRP OU Monitoring Requirements

The ROD requires quarterly groundwater monitoring (started in 2003) for 1,1-DCE and TCE in groundwater monitoring wells PRP 5, PRP 6, and PRP 7. Monitoring was planned to continue until contaminant levels were below MCLs for four consecutive quarters, after which sampling frequency would be reduced to semiannually (WSRC 2002). If concentrations did not exceed MCLs for three consecutive years after semiannual sampling began, SRS would propose to terminate monitoring and abandon the groundwater monitoring wells and the BaroBall™ wells.

When the BRP OU reports were combined, an agreement was reached to reduce the sampling frequency of the PBRP groundwater monitoring wells from quarterly to annually due to the small low-concentration plume and relatively constant decreasing concentrations (WSRC 2008). Additionally, analysis of the CMCOs, including antimony, chromium, copper, nickel, zinc, dibenzofuran, PCB-1242, and PCE, was reduced to every five years.

Vinyl chloride, cis-1,2-DCE, 1,1,1-trichloroethane (1,1,1-TCA), and 1,4-dioxane have also been added to the analyses. Vinyl chloride and cis-1,2-DCE are degradation products of TCE, and 1,1,1-TCA is a possible parent compound of 1,1-DCE, which was previously used as a degreaser at SRS. 1,4-dioxane was added based on a recommendation in the *Fourth Five-Year Remedy*

Review Report for the SRS (SRNS 2013). Details of the monitoring stations and passive BaroBall™ wells are listed in Table 3 and shown on Figure 3.

In response to comments on the 2020 Combined Groundwater Monitoring Report (Sampling Summary) SRS is making improvements to the monitoring network as detailed below (SRNS 2020a). To better define the extent of contamination at the PBRP OU and to ensure that concentrations sourced from the unit are not adversely affecting Steel Creek, SRS has agreed to sample two new surface-water stations, SC-02 and SC-03, for 1-4 dioxane (Figure 6). The additional sampling will be conducted in the first quarter of the year during the P Area Groundwater (PAGW) sampling event. To address concerns regarding triangulation within the current groundwater monitoring network and to better define the groundwater flow direction beneath the PBRP OU, seven wells, including four additional wells from within the PAGW OU monitoring network (Table 4 and Figure 6) will be used to help evaluate the potentiometric surface in the area. All water elevations will be collected in the third quarter of the year during the PAGW sampling event.

3.2.3 Observed Hydrology at the PBRP OU

Water-level measurements are listed in Appendix B, Table B-2. Hydrographs have been prepared for each of the PBRP groundwater monitoring wells (Appendix A). Potentiometric surfaces of the water table aquifer have been created using 4Q21 data (Figure 3).

Water levels from the 4Q21 sampling event have fallen an average of 0.5 m (1.5 ft) since the fourth quarter of 2020 due to the decrease in precipitation. Recharge is estimated at 38 cm (15 in.), based on 2021 data (a third of the total annual rainfall as shown in Figure 4). This is below the recharge rate of 43 cm (17 in.) per year used in the model (WSRC 1999a).

3.2.4 Groundwater Sampling Results at the PBRP OU

Groundwater samples were collected from all three groundwater monitoring wells at the PBRP OU during 4Q21. Appendix B provides the groundwater monitoring results from 2021.

In 2021, 1,1-DCE and TCE contamination was detected above their respective MCLs of 7.0 µg/L and 5 µg/L in plume well PRP 6. The 1,1-DCE concentration decreased to 15 µg/L from the 2020 value of 19 µg/L. The TCE concentration decreased to 32 µg/L from the 2020 value of 44 µg/L. Appendix C provides TSPs for these constituents. The significant increase in 1,1-DCE and TCE concentrations in the last two sampling events may be related to the increased water levels over the last few years. Figure 7 shows a water level versus concentration trend plot. A similar increase in 1,1-DCE and TCE occurred in 2003 when water levels increased to historically high levels. The more recent increase in water elevations near historic levels may have mobilized some residual contamination within the capillary fringe into the water table. If 1,1-DCE or TCE exceed the recent 2020 maximums at well PRP 6 during the fourth quarter 2022 sampling event, the sampling frequency will be increased to semi-annual at PRP 6 and PRP 7.

1,4-Dioxane was detected in the plume wells PRP 6 and PRP 7 in exceedance of the regional screening level (RSL) of 0.46 µg/L. 1,4-Dioxane does not have an MCL; therefore, the USEPA tap water RSL has been applied. The currently approved method (EPA8260SIM) for analyzing 1,4-dioxane is not capable of achieving a quantitation limit low enough to effectively quantify detections of 1,4-dioxane; therefore, SRS chose to also analyze by method EPA522, which can achieve a quantitation limit below the RSL. This method is for information only; the approved method was also run. The long-term trend for 1,4-dioxane continues to decrease (Appendix C).

All other analytes were non-detect or were detected well below their respective MCLs during the 2021 sampling event.

Beginning in 2007, groundwater samples were analyzed for the remaining CMCOCs at a frequency of once every five years to ensure the integrity of the cover at the PBRP. In 2021, all samples were analyzed for the CMCOCs: metals (antimony, chromium, copper, nickel, and zinc), PCB-1242, and the pesticide dibenzofuran. All 2021 results were either non-detect or substantially below MCLs (Appendix B). These results confirm that the cover at PBRP is performing as expected.

3.2.5 Lateral and Vertical Extent of Contamination at the PBRP OU

In 2021, well PRP 6 exceeded the MCL for 1,1-DCE and TCE. In addition, 1,4-dioxane exceeded the tapwater RSL at both PRP 6 and PRP 7. The water table aquifer beneath the PBRP OU represents the “upper” aquifer zone of the UTRAU. The top of the upper aquifer zone is ~7 m (23 ft) below ground surface and ~17 m (57 ft) thick down to a locally continuous tan clay. The water table aquifer discharges to Steel Creek, 76 m (250 ft) south of the PBRP OU. Therefore, Steel Creek defines the lateral extent of the groundwater contamination at the PBRP OU, and the local confining layer (tan clay) likely bounds the vertical extent of contamination.

SRS believes that any impact to Steel Creek from the PBRP OU is insignificant, as evidenced by years of no detections of 1,1-DCE within Steel Creek (Table 5). Surface-water station SC-03 has traditionally exhibited elevated levels of TCE and is currently the primary area where the PAGW OU VOC plume is discharging based on previous concentrations as well as data from shallow wells installed near Steel Creek (SRNS 2020b).

3.2.6 PBRP OU Summary and Conclusions

Improvements to the groundwater monitoring network at the PBRP OU are being made to address concerns regarding the triangulation and extent of contamination within the OU. To better define the groundwater flow direction beneath the PBRP OU, seven wells, including four additional wells from within the PAGW OU monitoring network will be used to help evaluate the potentiometric surface/groundwater flow in the area (Table 4 and Figure 6). To better define the extent of contamination at the PBRP OU and to ensure that concentrations sourced from the unit are not adversely affecting Steel Creek, additional surface-water sampling for 1,4-dioxane will be conducted at surface-water stations SC-02 and SC-03 (Figure 6). The additional wells will be sampled during the PAGW OU sampling events. Surface-water sampling at the PAGW OU is conducted during the first quarter of the year and synchronous water elevations are collected during the third quarter of the year. SRS will continue to sample and monitor the wells within the PBRP monitoring network, and the additional wells identified above, to ensure that a discernable plume above MCLs does not develop and until it is agreed upon that the RA objectives has been met and monitoring is no longer necessary.

4.0 RECOMMENDATIONS

No recommendations are proposed for the KBRP OU or PBRP OU and sampling will continue as outlined in this combined document until conditions for discontinuing the monitoring are met.

5.0 REFERENCES

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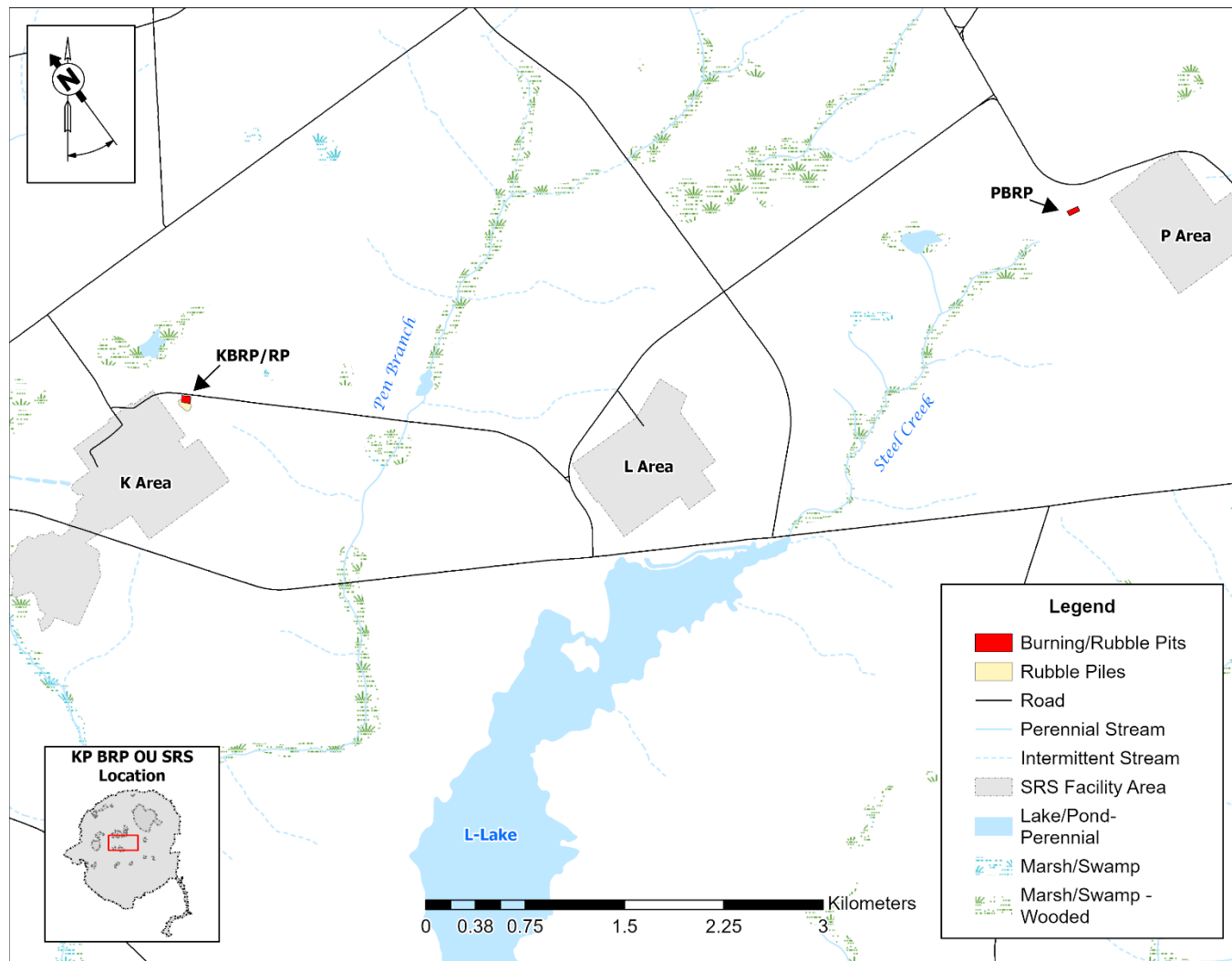


Figure 1. Location of the KP BRPs at SRS

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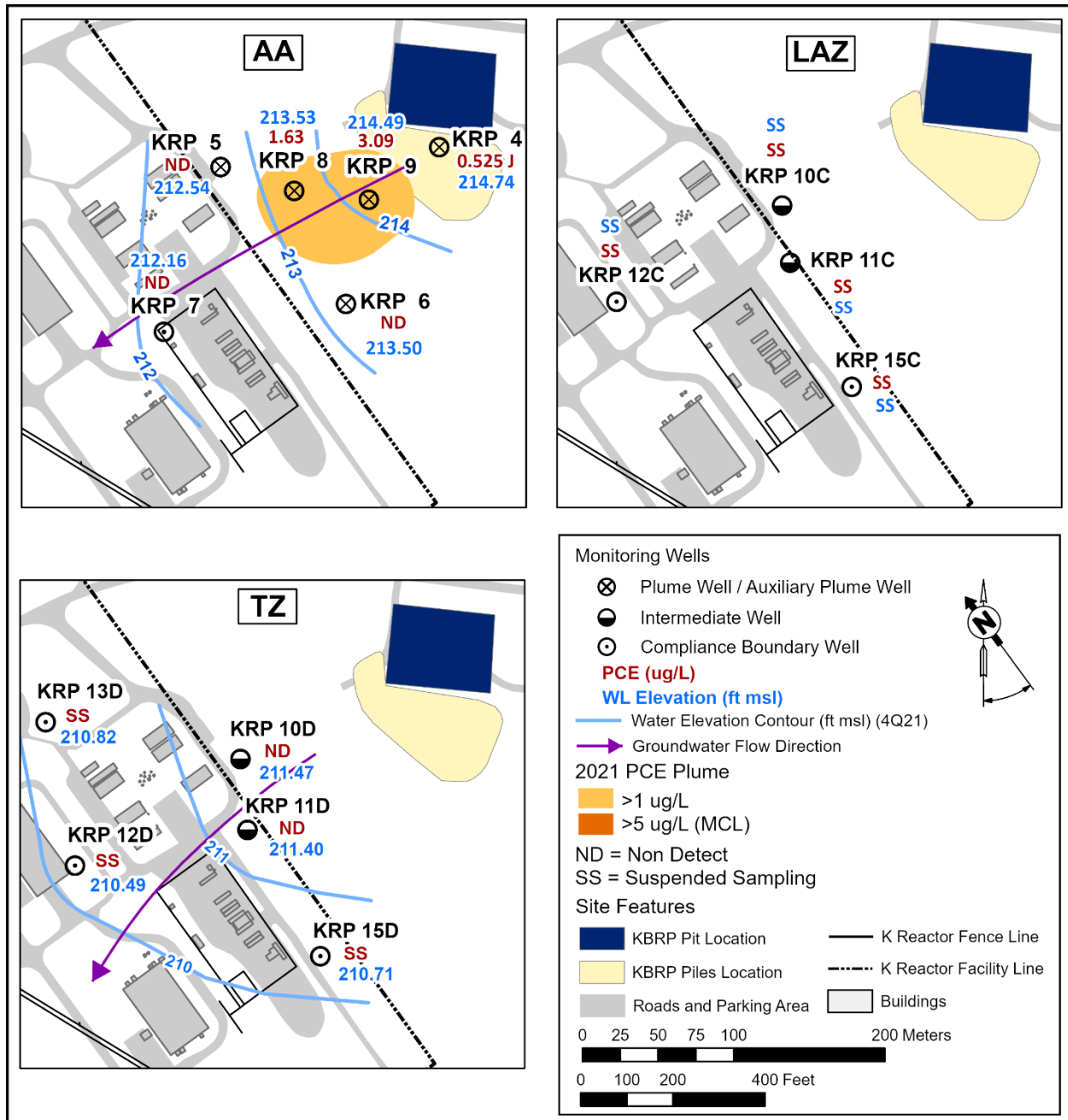


Figure 2. KBRP OU GWMZ Monitoring Network, Potentiometric Surface and PCE Plume (4Q21)

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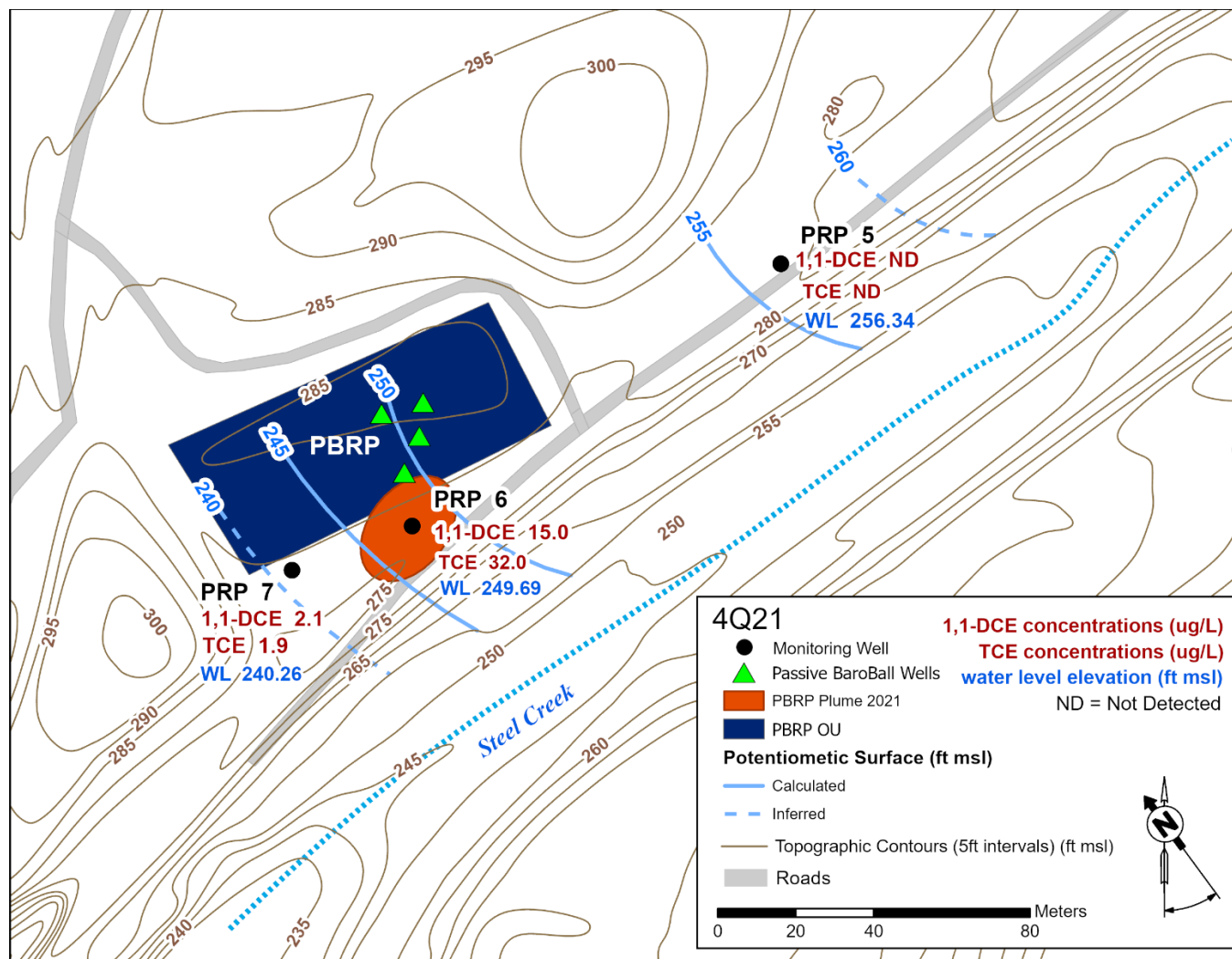


Figure 3. PBRP OU Monitoring Network, Potentiometric Surface and 1,1-DCE Plume (4Q21)

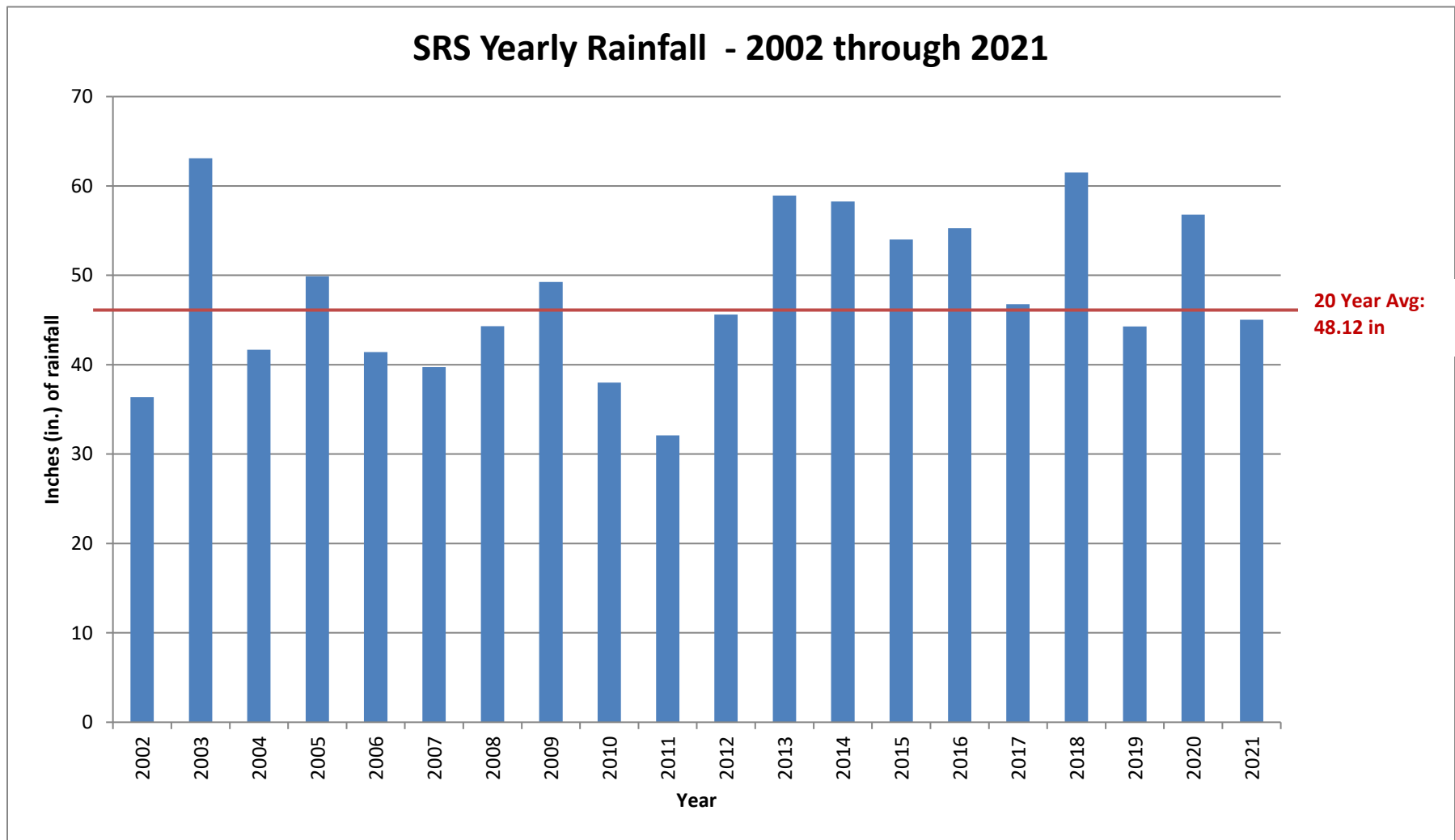


Figure 4. SRS Yearly Rainfall over the Last 20 Years

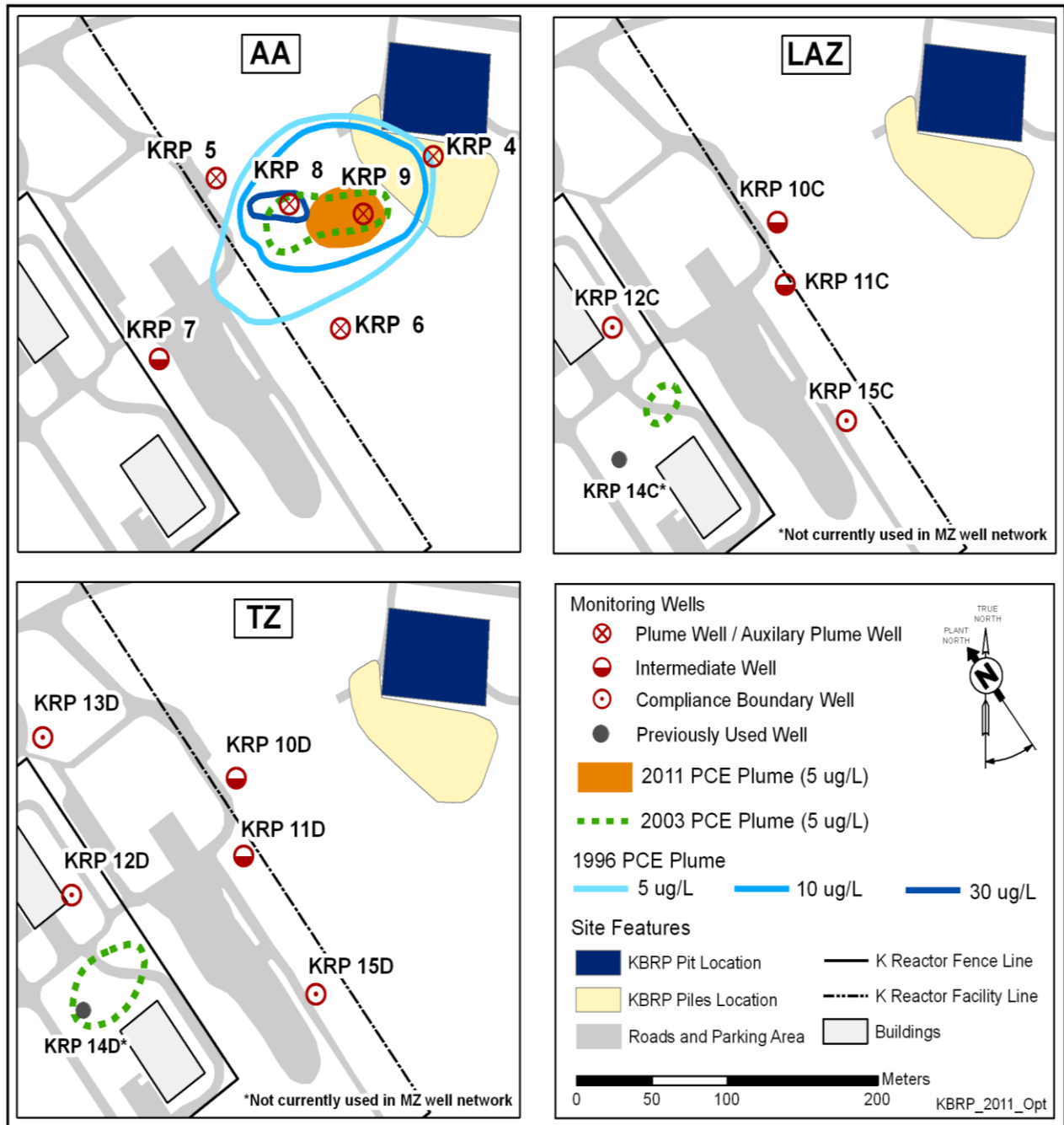


Figure 5. Historical PCE Plume Comparison at KBRP

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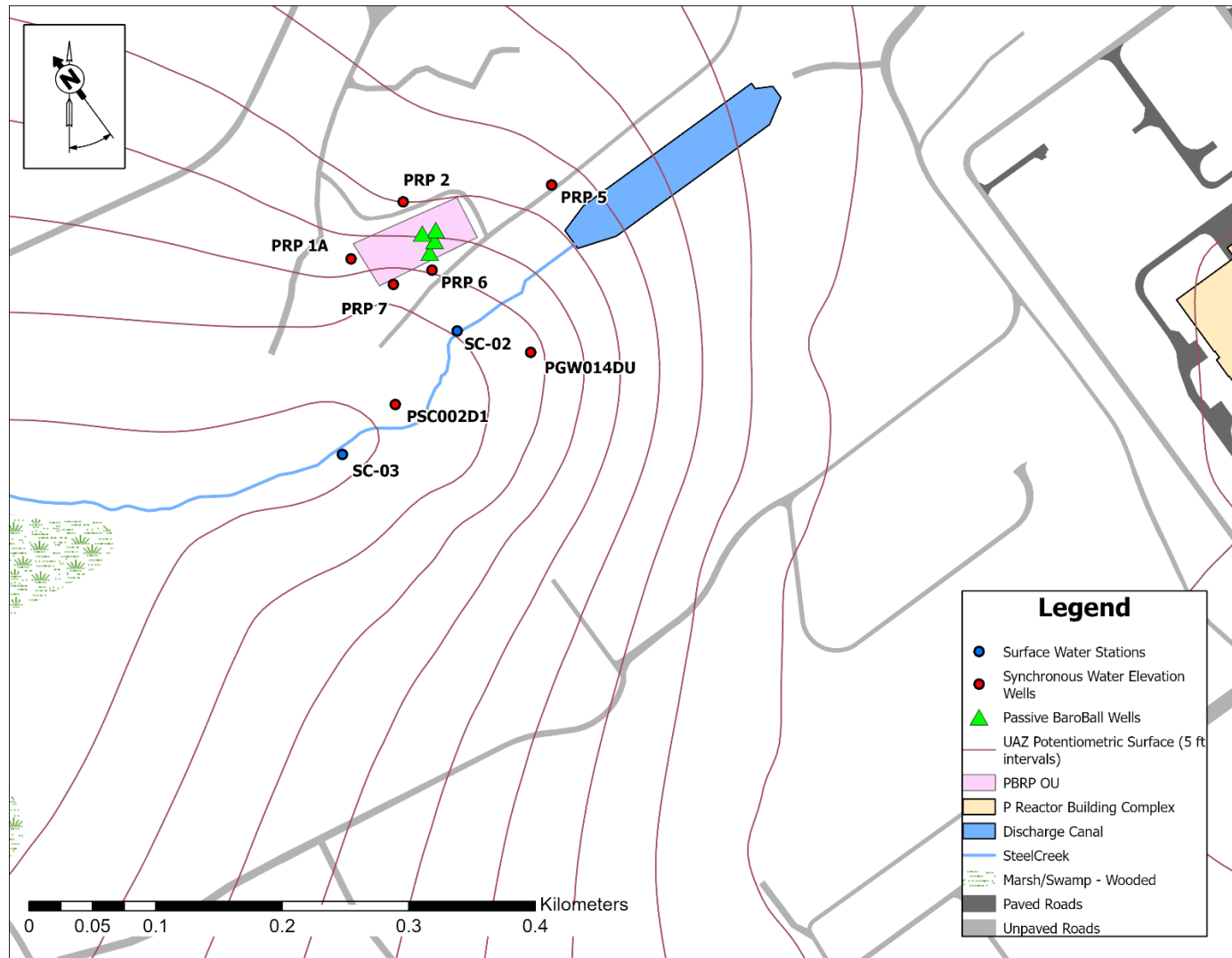


Figure 6. 2022 PBRP OU Optimized Monitoring Network

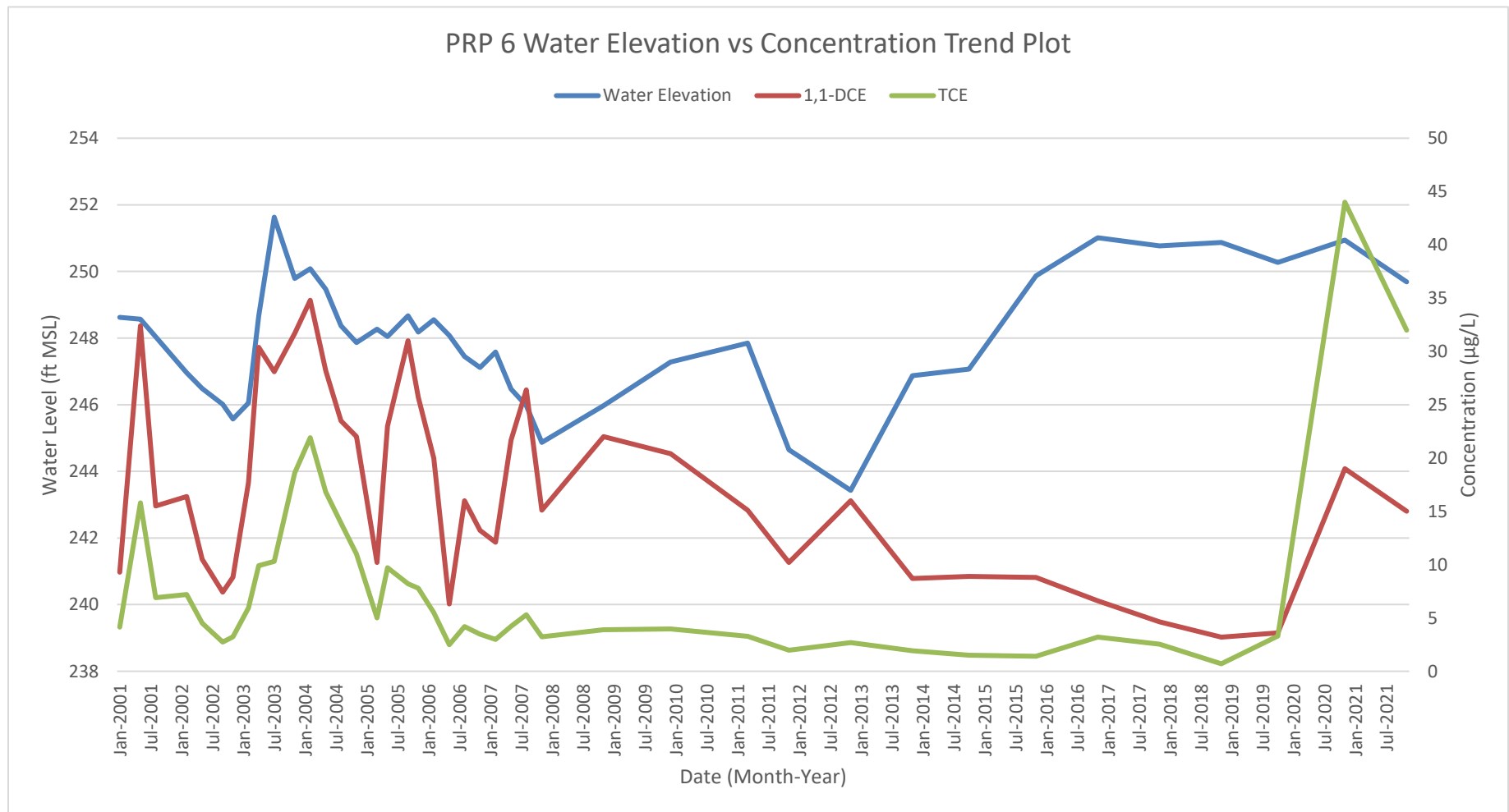


Figure 7. PRP 6 Water Elevation vs Concentration Trend Plot

Table 1. KBRP GWMZ Monitoring Network

Station ID	Aquifer	Well Use	Screen Zone (ft msl)		Screen Length (ft)	Ground Elevation (ft msl)	UTM (27) GPS Coordinates	
			Top	Bottom			Easting	Northing
KRP 4	AA	Plume Well	225.07	195.07	30	260.07	438470.81	3675179.73
KRP 5	AA	Plume Well	210.85	200.84	10.01	265.50	438326.24	3675166.67
KRP 6	AA	Plume Well	213.12	203.12	10	267.90	438409.06	3675076.24
KRP 7	AA	Boundary Compliance	213.20	203.16	10.04	267.90	438288.63	3675057.77
KRP 8	AA	Plume Well	210.09	200.09	10	265.09	438374.90	3675150.88
KRP 9	AA	Auxiliary Plume Well	210.83	200.83	10	265.83	438424.20	3675145.08
KRP 10C	LAZ	Intermediate	155.40	145.40	10	266.40	438343.49	3675141.17
KRP 10D	TZ	Intermediate	183.80	173.80	10	265.80	438340.28	3675146.12
KRP 11C	LAZ	Intermediate	152.20	142.20	10	268.20	438348.74	3675103.45
KRP 11D	TZ	Intermediate	180.80	170.80	10	267.80	438345.04	3675099.30
KRP 12C	LAZ	Boundary Compliance	151.90	141.90	10	266.90	438233.85	3675077.67
KRP 12D	TZ	Boundary Compliance	179.40	169.40	10	267.40	438230.82	3675075.74
KRP 13D	TZ	Boundary Compliance	172.20	162.20	10	266.20	438211.42	3675170.38
KRP 15C	LAZ	Boundary Compliance	147.75	137.75	10	267.75	438389.51	3675021.46
KRP 15D	TZ	Boundary Compliance	177.56	167.56	10	267.56	438393.14	3675015.85
KRP 14C*	LAZ	Former Boundary Compliance	146.70	136.70	10	266.70	438243.64	3674998.15
KRP 14D*	TZ	Former Boundary Compliance	175.70	165.70	10	266.70	438238.56	3675005.98

* This well is no longer included in the monitoring network

Table 2. KBRP GWMZ Monitoring Network and Sampling Conditions

Station ID	Data Collected	Sampling Frequency	Conditions
KRP 4	Samples and Water Levels	Annual	
KRP 5	Samples and Water Levels	Annual	
KRP 6	Samples and Water Levels	Annual	
KRP 7	Samples and Water Levels	Annual	
KRP 8	Samples and Water Levels	Annual	
KRP 9	Samples and Water Levels	Semiannual	
KRP 10C	All Suspended	Suspended	Restart annual sampling if concentrations in wells KRP 10D or KRP 11D exceed an MCL.
KRP 10D	Samples and Water Levels	Annual	Restart annual sampling at wells KRP 10C, KRP 11C, KRP 12C, and KRP 12D if detected above an MCL. Sample once at wells KRP 13D, KRP 15C, and KRP 15D to confirm extent of contamination.
KRP 11C	All Suspended	Suspended	Restart annual sampling if concentrations in wells KRP 10D or KRP 11D exceed an MCL.
KRP 11D	Samples and Water Levels	Annual	Restart annual sampling at wells KRP 10C, KRP 11C, KRP 12C, and KRP 12D if detected above an MCL. Sample once at wells KRP 13D, KRP 15C, and KRP 15D to confirm extent of contamination.
KRP 12C	All Suspended	Suspended	Restart annual sampling if concentrations in wells KRP 10D or KRP 11D exceed an MCL.
KRP 12D	Water Levels Only	Annual	Restart annual sampling if concentrations in wells KRP 10D or KRP 11D exceed an MCL.
KRP 13D	Water Levels Only	Annual	Sample once if wells KRP 10D or KRP 11D exceed an MCL. If concentrations are detected at nonestimated values, sample annually.
KRP 15C	All Suspended	Suspended	Sample once if wells KRP 10D or KRP 11D exceed an MCL. If concentrations are detected at nonestimated values, sample annually.
KRP 15D	Water Levels Only	Annual	Sample once if wells KRP 10D or KRP 11D exceed an MCL. If concentrations are detected at nonestimated values, sample annually.
KRP 14C*	All Suspended	Suspended	
KRP 14D*	All Suspended	Suspended	

* This well is no longer included in the monitoring network

Table 3. PBRP Monitoring Network and Passive BaroBall™ Vapor Extraction Wells

Station ID	Aquifer	Well Use	Screen Zone (ft msl)		Screen Length (ft)	Ground Elevation (ft msl)	UTM (27) GPS Coordinates	
			Top	Bottom			Easting	Northing
PRP 5	AA	Background Well	210.29	200.31	9.98	285.29	445281.37	3676683.92
PRP 6	AA	Plume Well	249.32	234.32	15	279.32	445186.93	3676616.71
PRP 7	AA	Plume Well	244.15	229.15	15	279.15	445156.17	3676605.45
PSV-10	Vadose Zone	BaroBall™ Vapor Extraction Well	263.00	253.00	10	284.70	445184.94	3676630.41
PSV-11	Vadose Zone	BaroBall™ Vapor Extraction Well	270.00	260.00	10	285.40	445188.80	3676639.81
PSV-12	Vadose Zone	BaroBall™ Vapor Extraction Well	275.00	265.00	10	285.20	445189.74	3676648.41
PSV-13	Vadose Zone	BaroBall™ Vapor Extraction Well	280.00	270.00	10	286.00	445179.05	3676645.54

Table 4. PBRP Synchronous Water Level Monitoring Network

Station	Aquifer	Well Use	Water Elevation Reference	Easting (UTM NAD 27)	Northing (UTM NAD 27)
PGW014DU	AA	Synchronous Water Elevation	277.8	445264.8	3676551.7
PRP 1A	AA	Synchronous Water Elevation	284.7	445122.9	3676625.5
PRP 2	AA	Synchronous Water Elevation	286.6	445164.1	3676670.5
PRP 5	AA	Synchronous Water Elevation	287.8	445281.4	3676683.9
PRP 6	AA	Synchronous Water Elevation	281.9	445186.9	3676616.7
PRP 7	AA	Synchronous Water Elevation	282.0	445156.2	3676605.5
PSC002D1	AA	Synchronous Water Elevation	239.0	445157.9	3676510.7

Table 5. Steel Creek Surface-Water Station Data

Station	Date	Analyte	MDL	PQL	EPA Storet Code	Qualifier	Result	Unit
SC-02	8/19/2002	1,1-DICHLOROETHYLENE	0.17	1		U	1	µg/L
SC-02	11/20/2002	1,1-DICHLOROETHYLENE	0.17	1		U	1	µg/L
SC-02	3/11/2003	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-02	5/29/2003	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-02	8/21/2003	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-02	11/18/2003	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-02	3/9/2004	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-02	6/2/2004	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-02	9/13/2004	1,1-DICHLOROETHYLENE	1	2		U	2	µg/L
SC-02	3/3/2005	1,1-DICHLOROETHYLENE	1	2		U	2	µg/L
SC-02	12/10/2008	1,1-DICHLOROETHYLENE	0.79	2		U	2	µg/L
SC-02	6/16/2009	1,1-DICHLOROETHYLENE	0.79	2		U	2	µg/L
SC-02	12/1/2010	1,1-DICHLOROETHYLENE	0.083	0.5		U	0.5	µg/L
SC-02	6/17/2013	1,1-DICHLOROETHYLENE	0.3	1		U	1	µg/L
SC-02	4/3/2019	1,1-DICHLOROETHYLENE	0.333	1		U	1	µg/L
SC-02	2/5/2020	1,1-DICHLOROETHYLENE	0.333	1		U	1	µg/L
SC-02	2/8/2021	1,1-DICHLOROETHYLENE	0.333	1		U	1	µg/L
SC-02	2/10/2022	1,1-DICHLOROETHYLENE	0.333	1		U	1	µg/L
SC-03	8/19/2002	1,1-DICHLOROETHYLENE	0.17	1		U	1	µg/L
SC-03	11/20/2002	1,1-DICHLOROETHYLENE	0.17	1		U	1	µg/L
SC-03	3/11/2003	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L

Table 5. Steel Creek Surface-Water Station Data (Continued)

Station	Date	Analyte	MDL	PQL	EPA Storet Code	Qualifier	Result	Unit
SC-03	5/29/2003	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-03	8/21/2003	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-03	11/18/2003	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-03	3/9/2004	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-03	6/2/2004	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-03	9/13/2004	1,1-DICHLOROETHYLENE	1	2		U	2	µg/L
SC-03	11/5/2007	1,1-DICHLOROETHYLENE	1	2		U	2	µg/L
SC-03	6/11/2008	1,1-DICHLOROETHYLENE	0.79	2		U	2	µg/L
SC-03	12/10/2008	1,1-DICHLOROETHYLENE	0.79	2		U	2	µg/L
SC-03	6/16/2009	1,1-DICHLOROETHYLENE	0.79	2		U	2	µg/L
SC-03	12/1/2010	1,1-DICHLOROETHYLENE	0.083	0.5		U	0.5	µg/L
SC-03	6/22/2011	1,1-DICHLOROETHYLENE	0.12	2		U	2	µg/L
SC-03	6/26/2012	1,1-DICHLOROETHYLENE	0.083	0.5		U	0.5	µg/L
SC-03	12/11/2012	1,1-DICHLOROETHYLENE	0.083	0.5	21	J	0.13	µg/L
SC-03	6/17/2013	1,1-DICHLOROETHYLENE	0.3	1		U	1	µg/L
SC-03	11/13/2013	1,1-DICHLOROETHYLENE	0.08	1		U	1	µg/L
SC-03	11/3/2014	1,1-DICHLOROETHYLENE	0.08	1		U	1	µg/L
SC-03	11/17/2015	1,1-DICHLOROETHYLENE	0.08	1		U	1	µg/L
SC-03	4/3/2019	1,1-DICHLOROETHYLENE	0.333	1		U	1	µg/L
SC-03	2/5/2020	1,1-DICHLOROETHYLENE	0.333	1		U	1	µg/L
SC-03	2/8/2021	1,1-DICHLOROETHYLENE	0.333	1		U	1	µg/L
SC-03	2/10/2022	1,1-DICHLOROETHYLENE	0.333	1		U	1	µg/L
SC-04	8/19/2002	1,1-DICHLOROETHYLENE	0.17	1		U	1	µg/L

Table 5. Steel Creek Surface-Water Station Data (Continued/End)

Station	Date	Analyte	MDL	PQL	EPA Storet Code	Qualifier	Result	Unit
SC-04	11/20/2002	1,1-DICHLOROETHYLENE	0.17	1		U	1	µg/L
SC-04	3/11/2003	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-04	5/29/2003	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-04	8/21/2003	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-04	11/18/2003	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-04	3/9/2004	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-04	6/2/2004	1,1-DICHLOROETHYLENE	0.11	1		U	1	µg/L
SC-04	9/13/2004	1,1-DICHLOROETHYLENE	1	2		U	2	µg/L
SC-04	12/1/2010	1,1-DICHLOROETHYLENE	0.083	0.5		U	0.5	µg/L
SC-04	6/22/2011	1,1-DICHLOROETHYLENE	0.12	2		U	2	µg/L
SC-04	6/26/2012	1,1-DICHLOROETHYLENE	0.083	0.5		U	0.5	µg/L
SC-04	12/11/2012	1,1-DICHLOROETHYLENE	0.083	0.5		U	0.5	µg/L
SC-04	6/17/2013	1,1-DICHLOROETHYLENE	0.3	1		U	1	µg/L
SC-04	11/13/2013	1,1-DICHLOROETHYLENE	0.08	1		U	1	µg/L
SC-04	11/4/2014	1,1-DICHLOROETHYLENE	0.08	1		U	1	µg/L
SC-04	11/17/2015	1,1-DICHLOROETHYLENE	0.08	1		U	1	µg/L
SC-04	4/3/2019	1,1-DICHLOROETHYLENE	0.333	1		U	1	µg/L
SC-04	2/5/2020	1,1-DICHLOROETHYLENE	0.333	1		U	1	µg/L
SC-04	2/8/2021	1,1-DICHLOROETHYLENE	0.333	1		U	1	µg/L
SC-04	2/10/2022	1,1-DICHLOROETHYLENE	0.333	1		U	1	µg/L

J estimated quantity
MDL method detection limit
PQL practical quantitation limit
U non-detect value
21 result above detection limit and cannot be accurately quantified

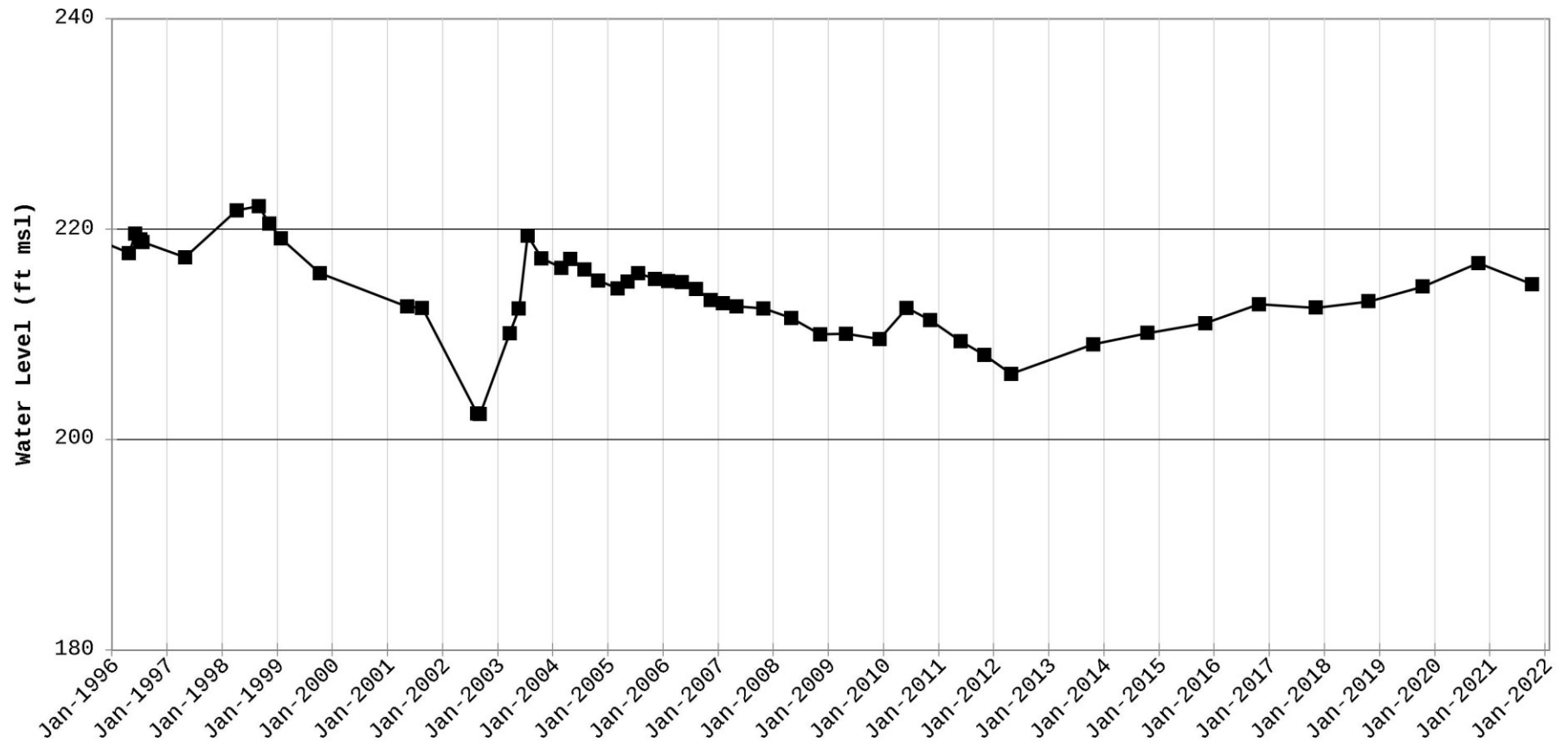
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APPENDIX A

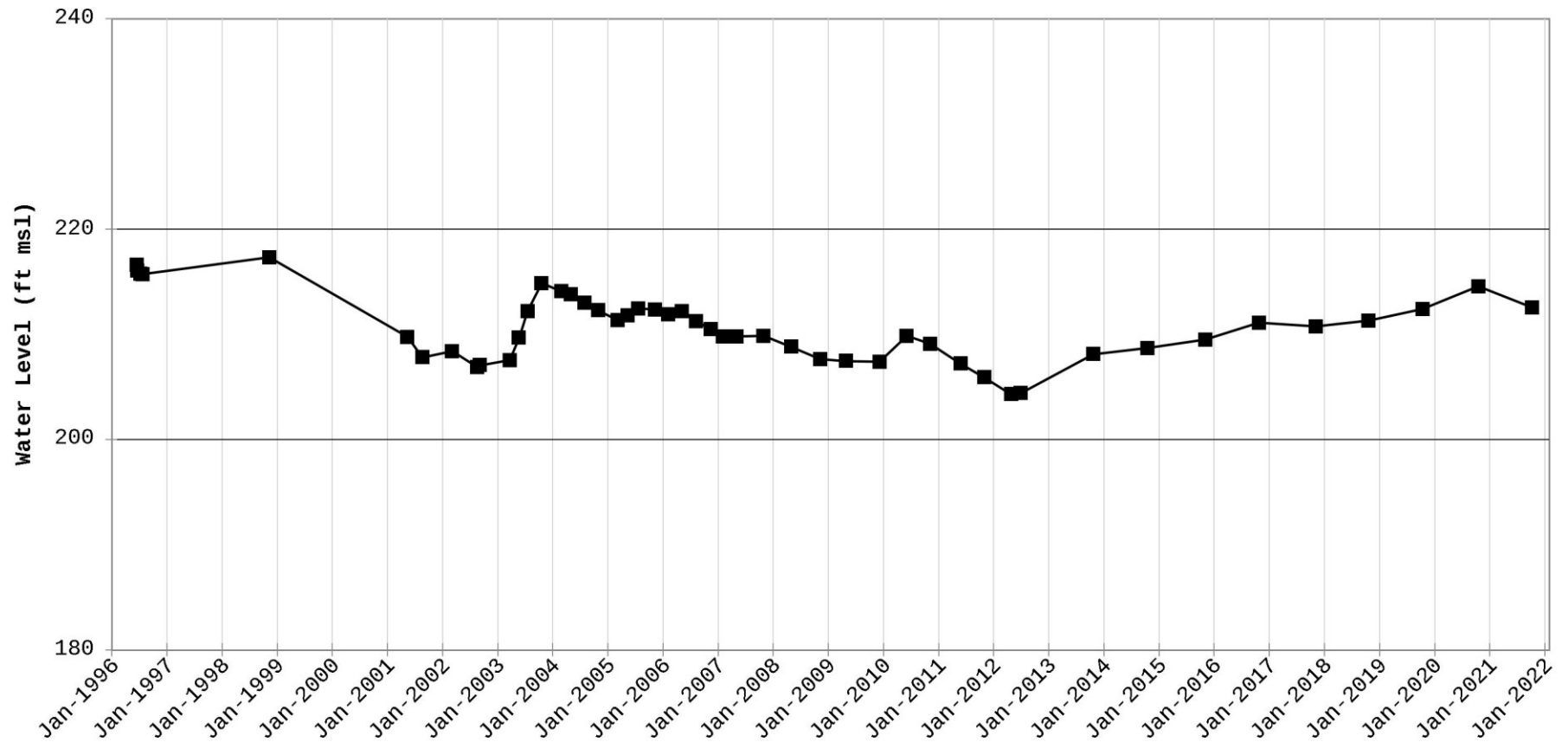
Hydrographs

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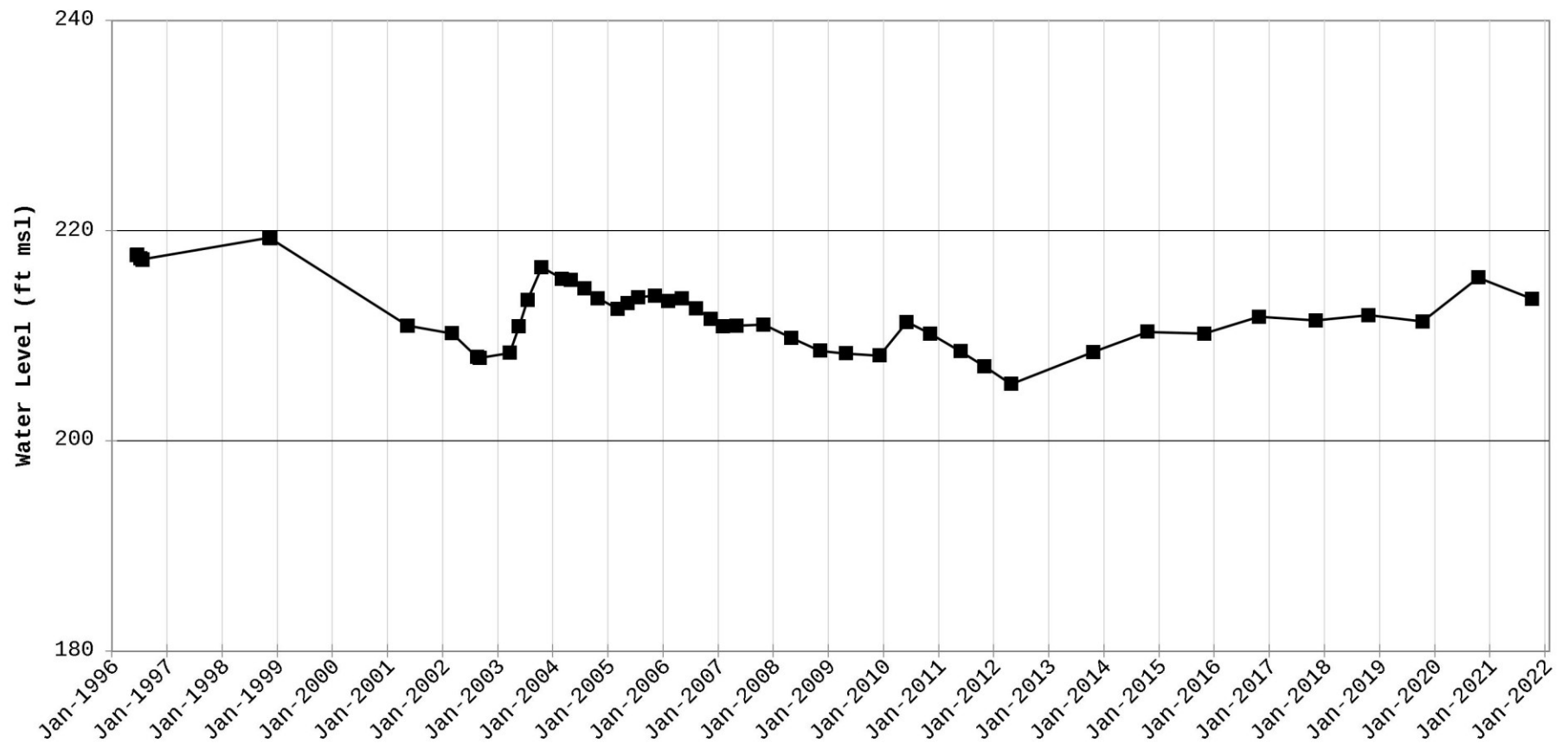
Hydrograph for Station KRP 4



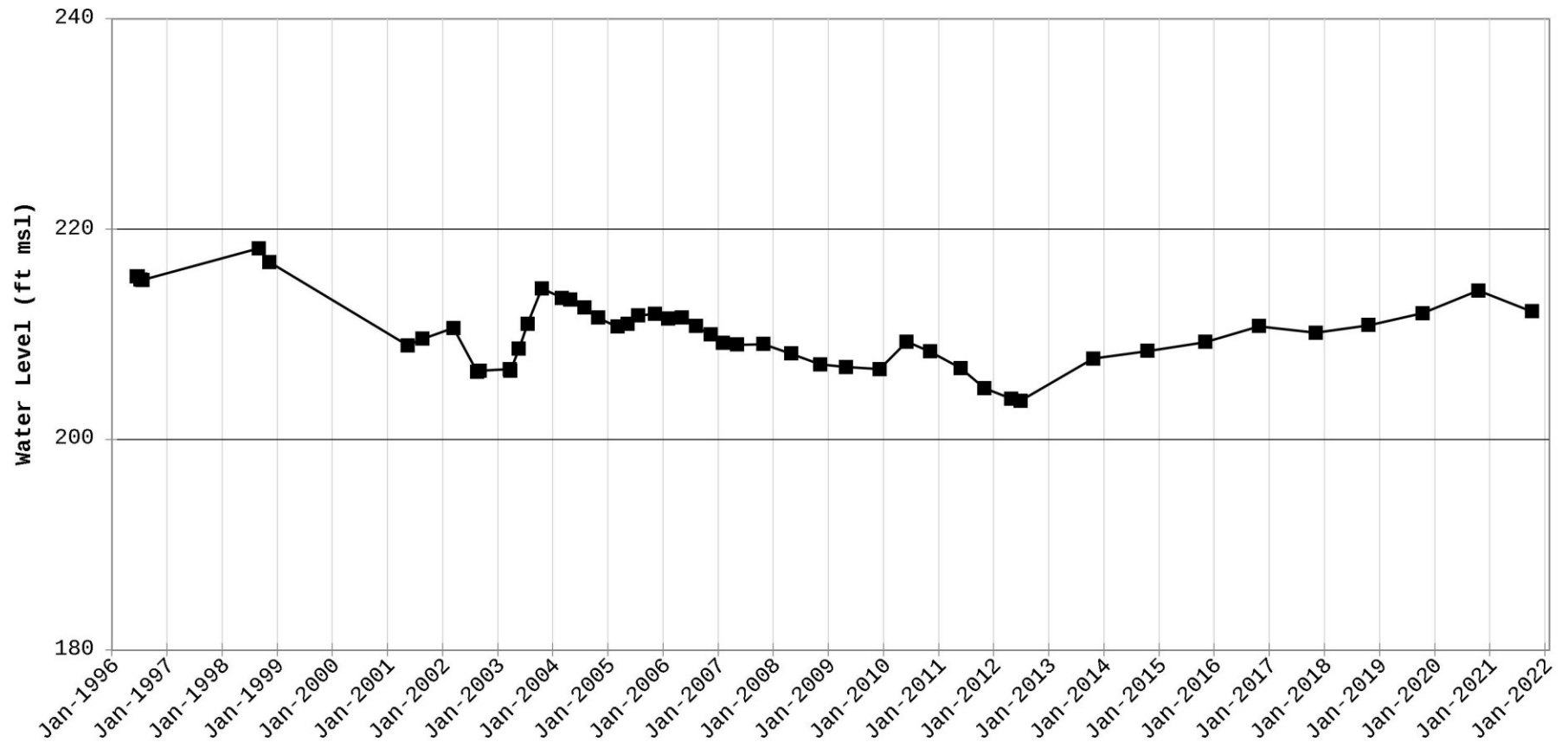
Hydrograph for Station KRP 5



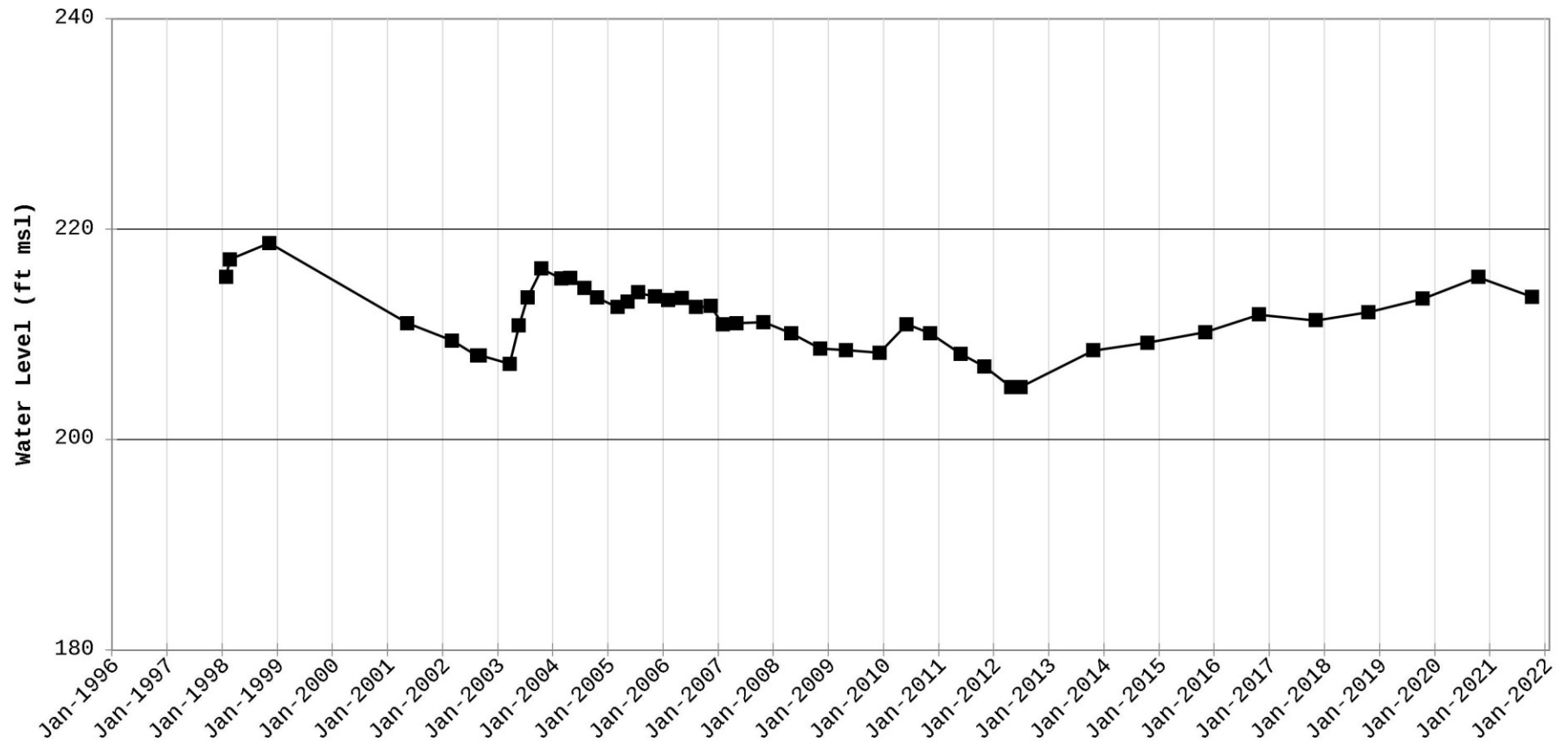
Hydrograph for Station KRP 6



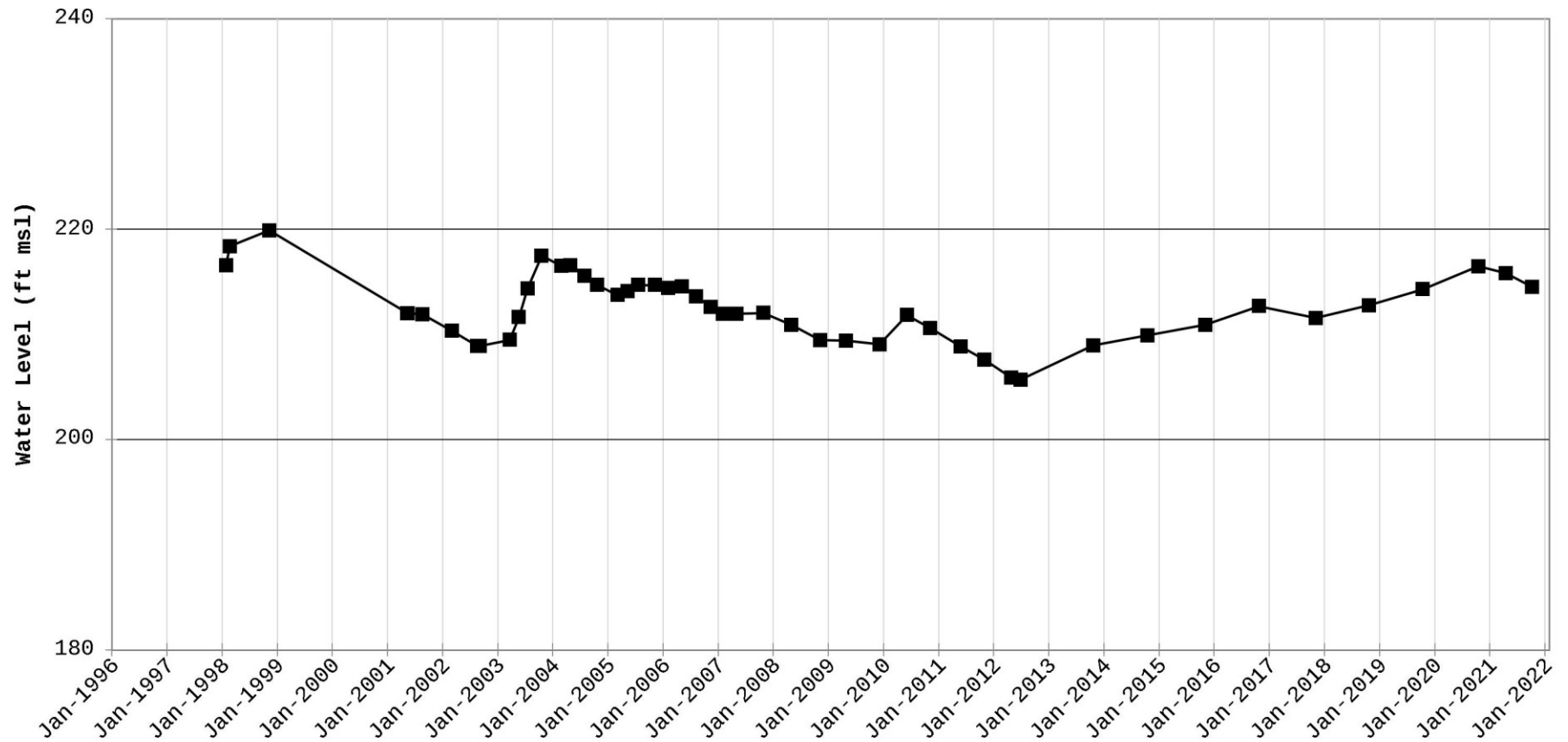
Hydrograph for Station KRP 7



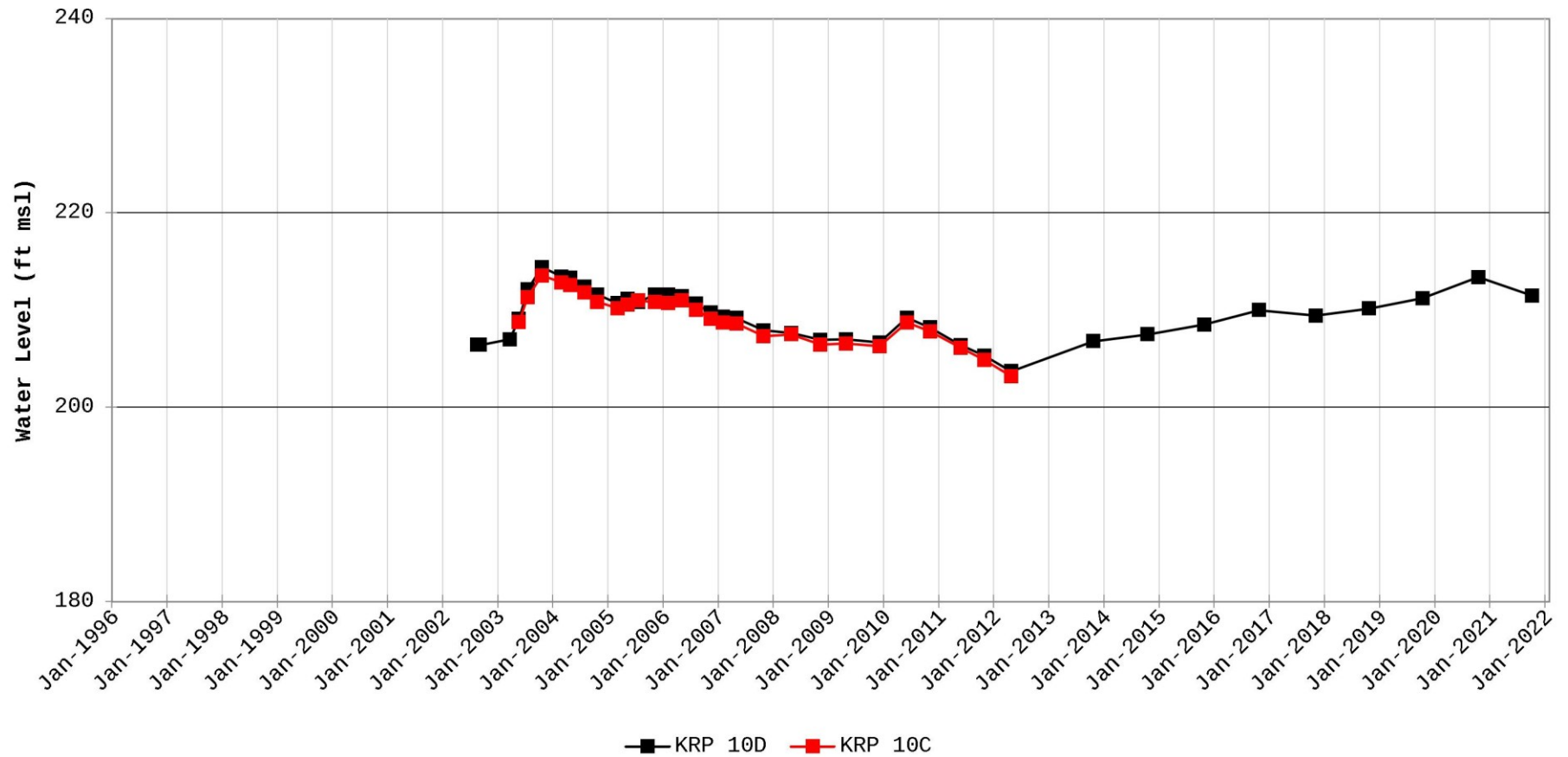
Hydrograph for Station KRP 8



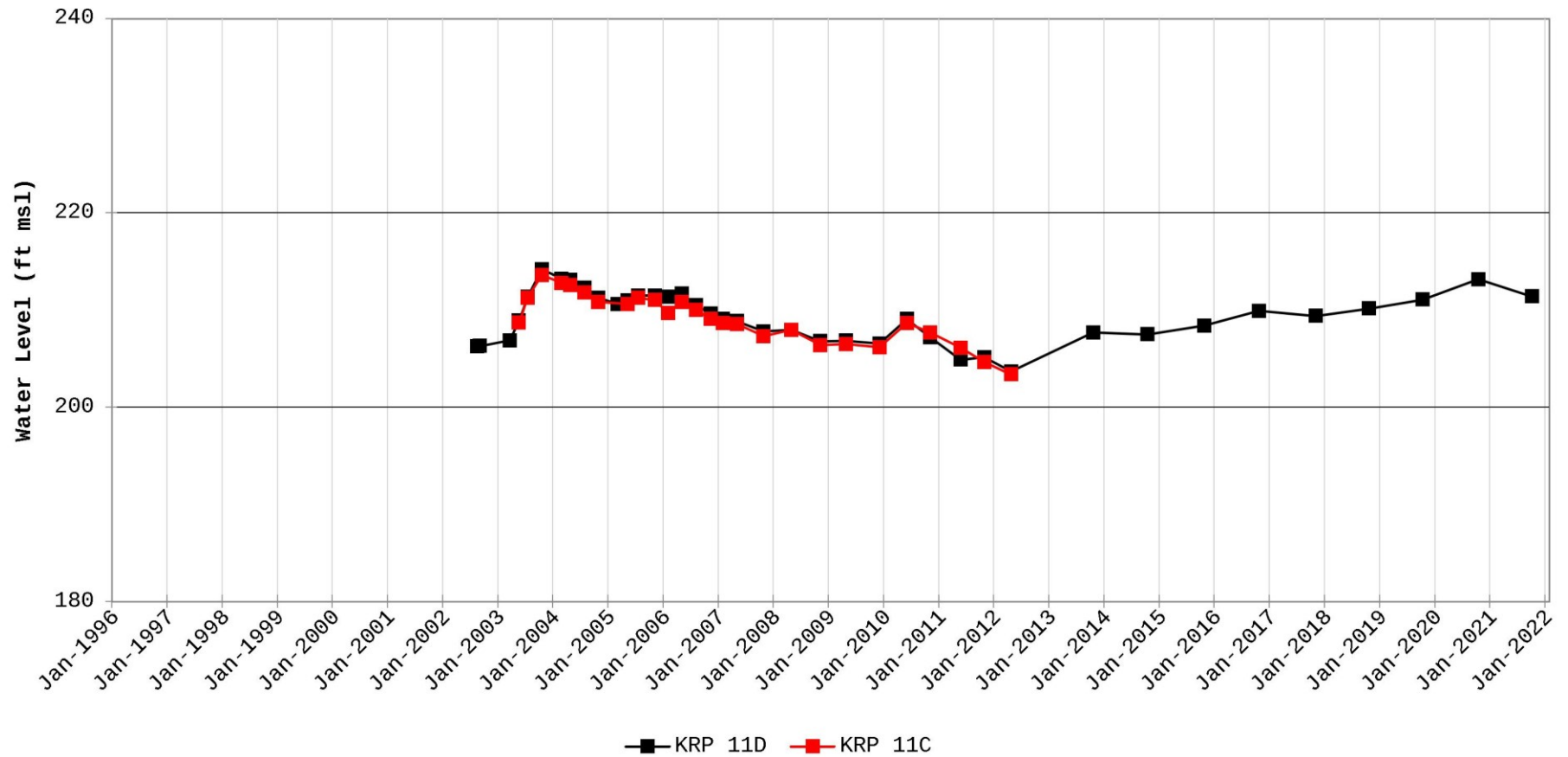
Hydrograph for Station KRP 9



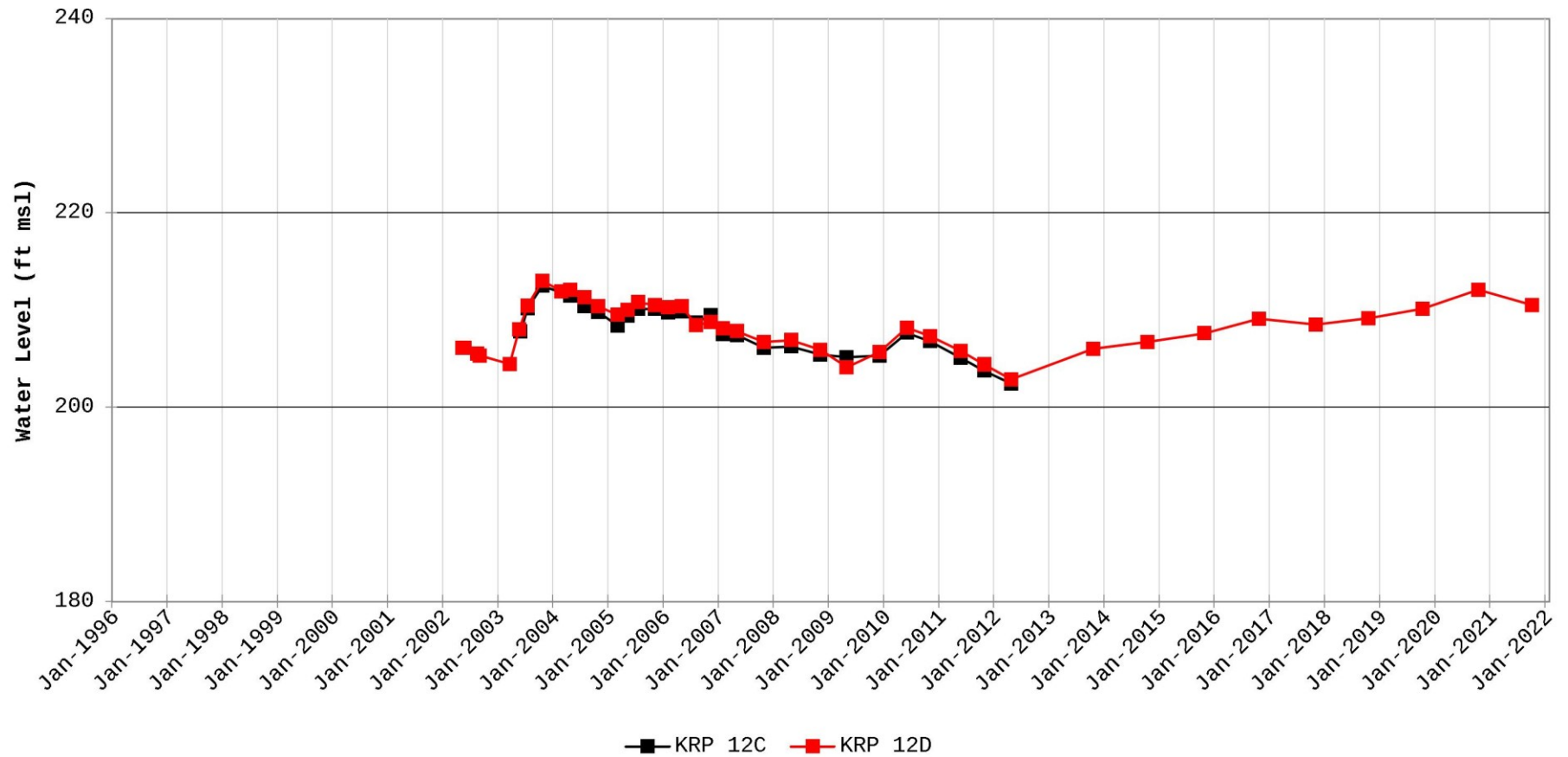
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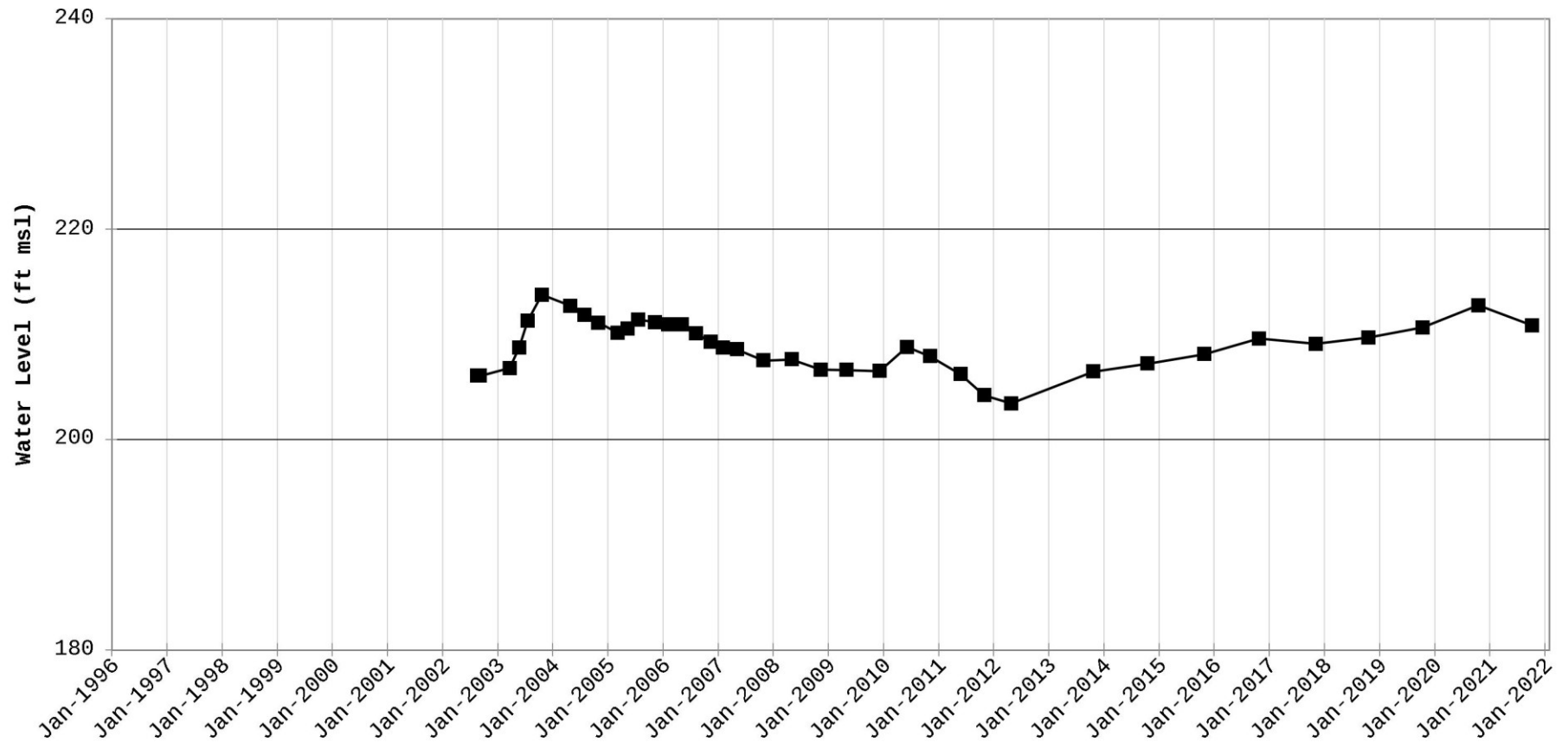
Hydrograph for Station KRP 11



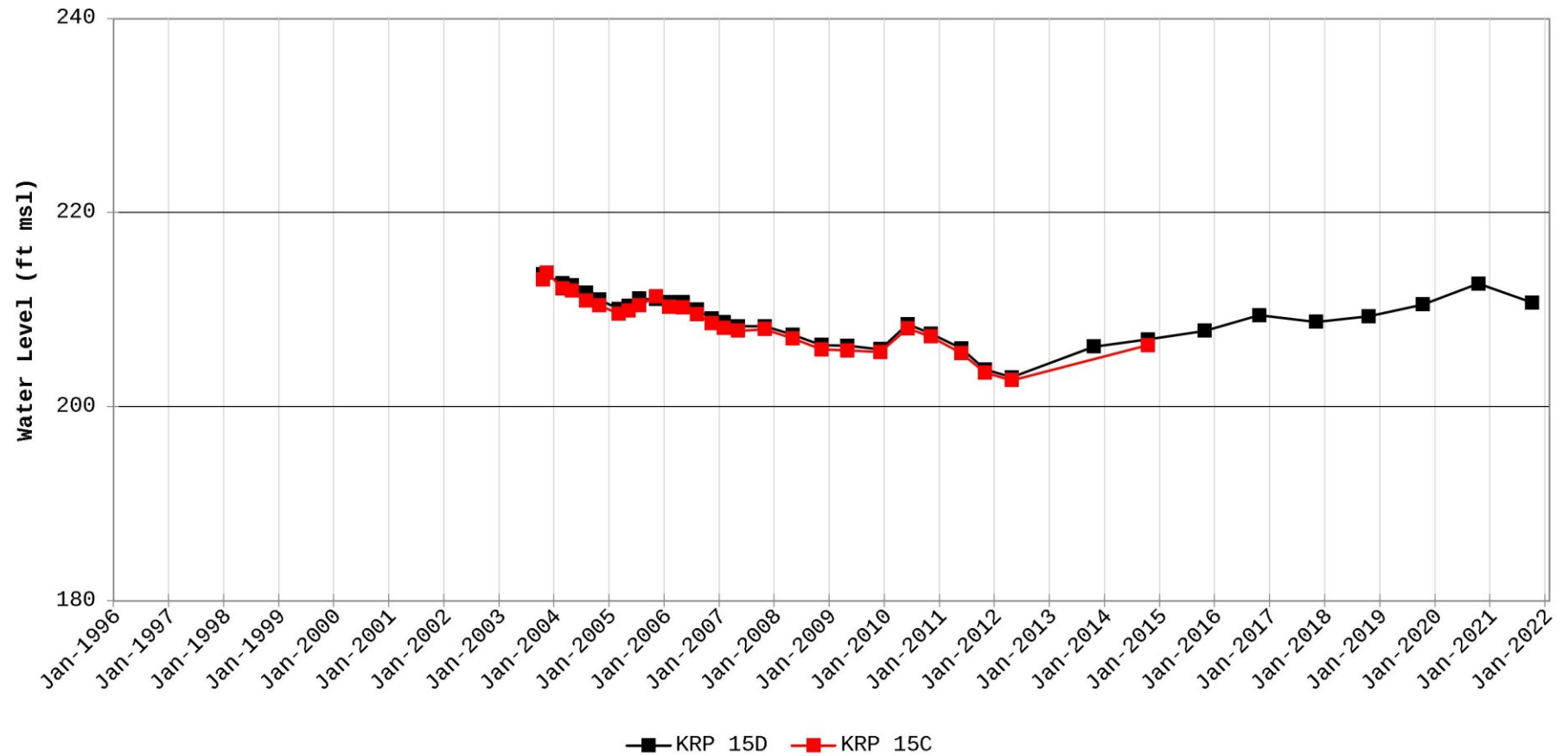
Hydrograph for Station KRP 12



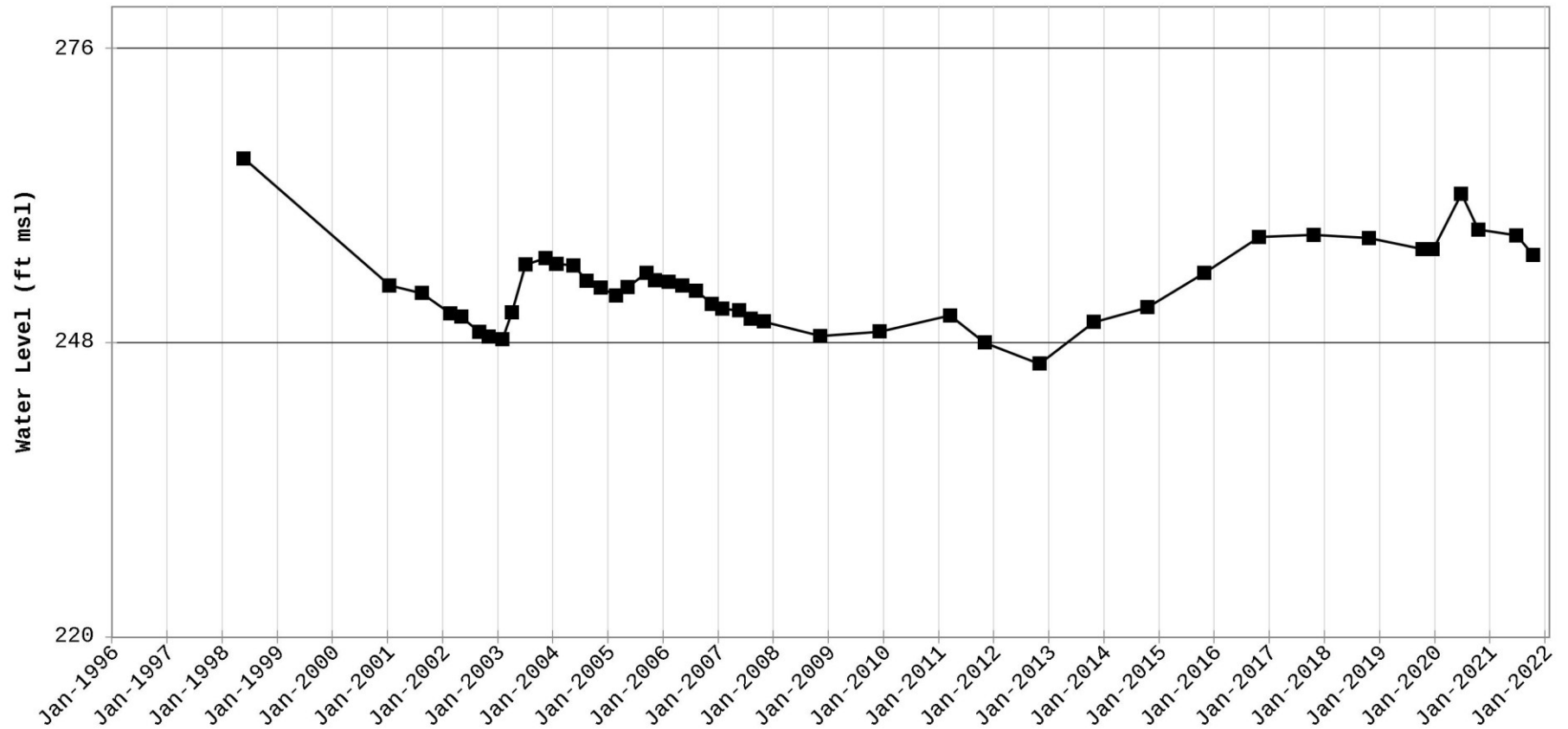
Hydrograph for Station KRP 13D



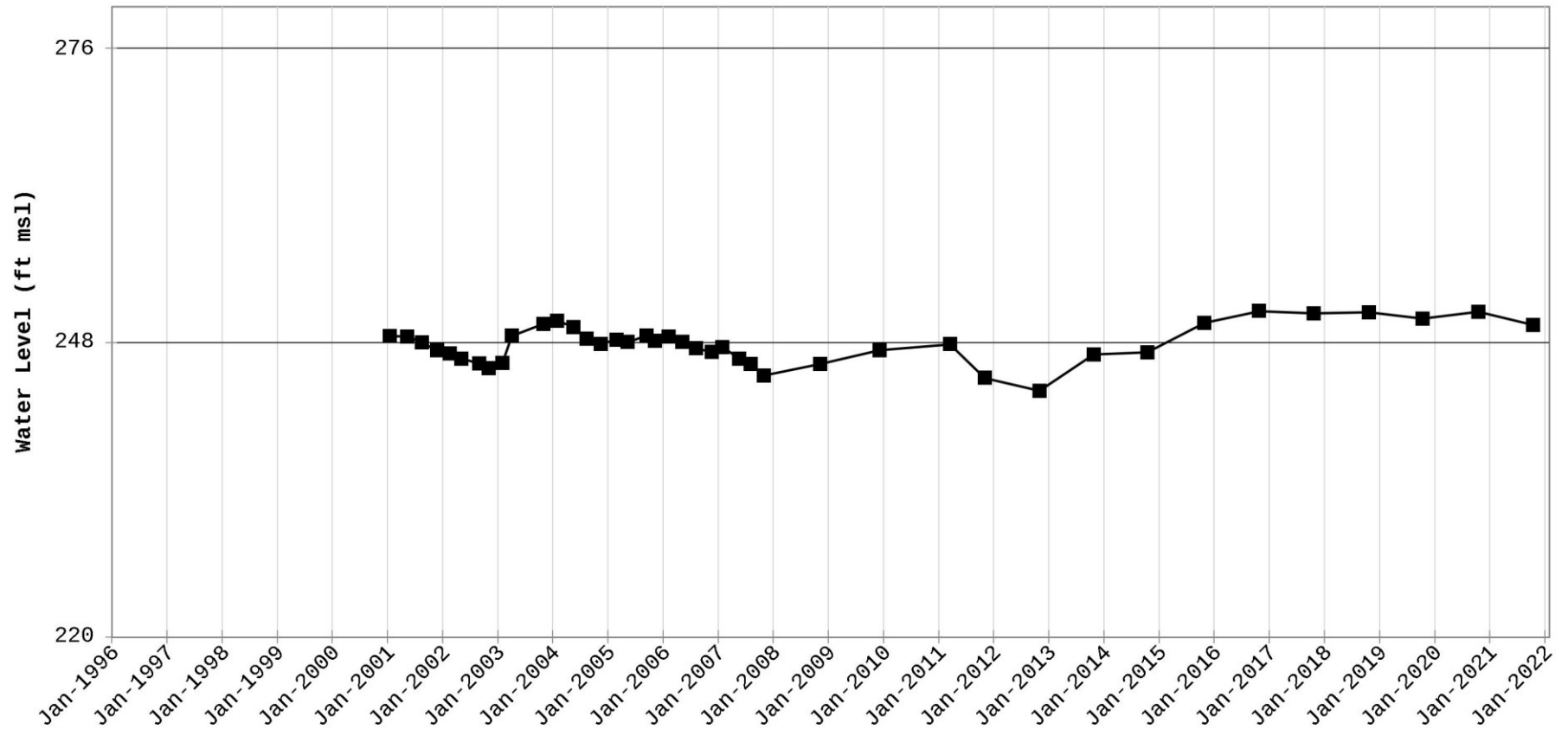
Hydrograph for Station KRP 15



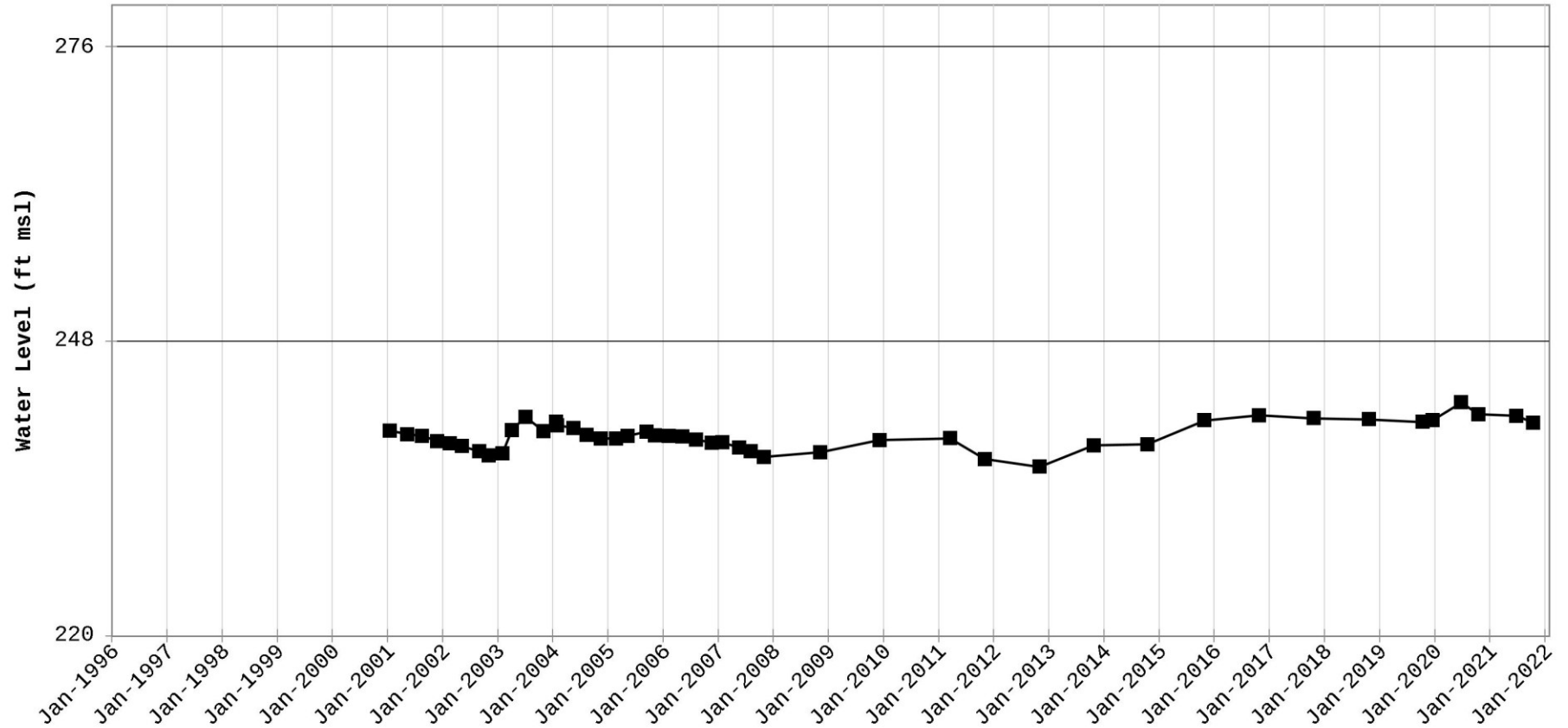
Hydrograph for Station PRP 5



Hydrograph for Station PRP 6



Hydrograph for Station PRP 7



APPENDIX B

Groundwater and Surface-Water Monitoring Results (2021)

Key to Reading the Tables

The following abbreviations may appear in the data tables:

Laboratories Available for Use

EBL	Environmental Bioassay Lab
GEL	General Engineering Lab
PACE	Pace Analytical Services

Nomenclature

EQL	sample-specific estimated quantitation limit
GAU	Gordon aquifer unit
KSZ	Key Source Zone
KSZCL	Key Source Zone Concentration Limit
LAZ	lower aquifer zone
MAZ	middle aquifer zone
MCL	maximum contaminant level
TC	tan clay
UAZ	upper aquifer zone
UTRAU	Upper Three Runs aquifer unit

Units

deg. C	degrees Celsius
gal	gallons
ft	feet
mg/L	milligrams per liter
msl	mean sea level
NTU	nephelometric turbidity unit
pCi/mL	picocuries per milliliter
pH	pH unit
µg/L	micrograms per liter

Field Conditions

A	pump is surging excessively; aerated
B	blank sample was collected
C	well is continuously pumping
D	well is dry-no sample or field data collected
E	equipment blank was collected
I	well went dry during sampling; field data collected but insufficient water to collect all samples
L	well went dry before sampling began; only depth to water can be determined
N	well was not stabilized before sampling began
P	inaccessibility or mechanical failure prevented sample collection and field analysis of the water
S	no water in standpipe; for water level events only
T	samples were collected, but some samples were not sent to the laboratory due to high turbidity
W	unable to sample well because of stabilization or sampling equipment failure; water-level measurements were obtained
X	well went dry during purging; samples collected after well recovered measurements obtained
0	OK
1	pump dry
2	sampled after recovery
3	gallons purged through sample port
4	DI water taken from 772-7B
5	high turbidity
6	flow meter leaking
7	pump failure
8	flow meter not operating
9	# gallons added
10	well is inaccessible, well cannot be sampled
11	well abandoned
12	no water to surface
13	field measurements only
14	not all samples were collected
15	equipment failure
16	no water in standpipe
17	bailed well
18	water level tape not long enough
19	well not sampled, maintenance required
20	well sampled, maintenance required
21	measurement exceeded criteria

Table App B-1. KBRP OU 2021 Data

See insert on the following page.

Station		Well Use	Aquifer Zone	Field Data													KBRP Constituents of Concern							
				SAMPLE COLLECTION DATE	AIR TEMPERATURE	WATER TEMPERATURE	FLOW RATE	TOTAL ALKALINITY (AS CaCO3)	PH	SPECIFIC CONDUCTANCE	TURBIDITY	VOLUME PURGED	DEPTH TO WATER	SAMPLING EVENT WATER ELEVATION	SYNCHRONOUS MEASUREMENT DATE	SYNCHRONOUS WATER ELEVATION	FIELD CONDITIONS	Constituent	VOC					
																			1,1-DICHLOROETHYLENE	CHLOROETHENE (VINYL CHLORIDE)	CIS-1,2-DICHLOROETHYLENE	TETRACHLOROETHYLENE (PCE)	TRANS-1,2-DICHLOROETHYLENE	TRICHLOROETHYLENE (TCE)
day-month-year	degC	degC	gal/min	mg/L	pH	uS/cm	NTU	gal	ft	ft	day-month-year	ft		Unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L				
							15							GWPS	7	2	70	5	100	5				
KRP 4	Plume Definition Well	AA_UAZ_UTRAU	26-Oct-2021	14.8	20.2	1	0	4.6	49	1.5	25	48.1	214.74	NS	NS	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	[0.525]	<EQL (1)	[0.21]		
KRP 5	Plume Definition Well	AA_UAZ_UTRAU	26-Oct-2021	16.3	19.4	0.1	70	6.1	114	0.7	1	55.56	212.54	NS	NS	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)		
KRP 6	Plume Definition Well	AA_UAZ_UTRAU	26-Oct-2021	17.2	18.1	NS	0	5.3	95	7.6	0	56.8	213.5	NS	NS	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)		
KRP 7	Boundary Compliance	AA_UAZ_UTRAU	26-Oct-2021	22.4	20.5	0.1	0	4.9	33	0.7	1	58.4	212.16	NS	NS	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)		
KRP 8	Plume Definition Well	AA_UAZ_UTRAU	26-Oct-2021	13.9	18.2	0.1	0	4.5	28	1.4	2	54.04	213.53	NS	NS	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	1.63	<EQL (1)	[0.724]		
KRP 9	Auxiliary Plume Definition Well	AA_UAZ_UTRAU	04-May-2021	20.6	19.9	0.1	33	6.1	141	0.3	2	52.56	215.81	NS	NS	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	3.09	<EQL (1)	2.15		
			26-Oct-2021	13.9	18.1	0.1	13	5.9	98	0.9	2	53.88	214.49	NS	NS	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	3.09	<EQL (1)	2.12		
KRP 10C	Intermediate	LAZ_UTRAU	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No Comments	NS	NS	NS	NS	NS	NS		
KRP 10D	Intermediate	TZ_UAZ_UTRAU	26-Oct-2021	17.8	19.8	1	4	5.3	21	1.2	14	56.93	211.47	NS	NS	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)		
KRP 11C	Intermediate	LAZ_UTRAU	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No Comments	NS	NS	NS	NS	NS	NS		
KRP 11D	Intermediate	TZ_UAZ_UTRAU	26-Oct-2021	15.6	19.7	0.5	7	5.4	18	0.5	15	59	211.4	NS	NS	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)		
KRP 12C	Boundary Compliance	LAZ_UTRAU	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No Comments	NS	NS	NS	NS	NS	NS		
KRP 12D	Boundary Compliance	TZ_UAZ_UTRAU	26-Oct-2021	NS	NS	NS	NS	NS	NS	NS	NS	59.31	NS	26-Oct-2021	210.49	No Comments	NS	NS	NS	NS	NS	NS		
KRP 13D	Boundary Compliance	TZ_UAZ_UTRAU	26-Oct-2021	NS	NS	NS	NS	NS	NS	NS	NS	58.08	NS	26-Oct-2021	210.82	No Comments	NS	NS	NS	NS	NS	NS		
KRP 15C	Boundary Compliance	LAZ_UTRAU	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No Comments	NS	NS	NS	NS	NS	NS		
KRP 15D	Boundary Compliance	TZ_UAZ_UTRAU	26-Oct-2021	NS	NS	NS	NS	NS	NS	NS	NS	59.52	NS	26-Oct-2021	210.71	No Comments	NS	NS	NS	NS	NS	NS		

Explanation

- [##] EPA Functional Guideline Code of 'J' was applied to the result, indicating an estimated quantity.
- <EQL(##) Constituent was below detection. The sample-specific Estimated Quantitation Limit is in parentheses.
- Result exceeds applicable limit.
- REJ Result Rejected.
- Result is less than the applicable limit and without EPA Functional Guideline qualifiers.
- NS Requested to be sampled but was not. See comments as to why not.
- Blue Text Not a required sample analysis.

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Table App B-2. PBRP OU 2021 Data

See insert on the following page.

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Table B-2. 2021 PBRP Monitoring Data			Field Data												PBRP Constituents of Concern							Contaminant Migration Constituents of Concern								
			SAMPLE COLLECTION DATE	AIR TEMPERATURE	WATER TEMPERATURE	FLOW RATE	OXIDATION/REDUCTION POTENTIAL	PH	SPECIFIC CONDUCTANCE	TOTAL ALKALINITY (AS CaCO3)	TURBIDITY	VOLUME PURGED	DEPTH TO WATER	SAMPLING EVENT WATER ELEVATION	FIELD CONDITIONS	Constituent	VOCs							Inorganics			PCBs	Pesticides		
																	1,1,1-TRICHLOROETHANE	1,1-DICHLOROETHYLENE	1,4-DIOXANE	CHLOROETHENE (VINYL CHLORIDE)	CIS-1,2-DICHLOROETHYLENE	TETRACHLOROETHYLENE (PCE)	TRICHLOROETHYLENE (TCE)	ANTIMONY	CHROMIUM	COPPER	NICKEL	ZINC	AROCOLOR 1242	DIBENZOFURAN
day-month-year	degC	degC	gal/min	mV	pH	uS/cm	mg/L	NTU	gal	ft	ft		Unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L				
Station	Well Use	Aquifer Zone											GWPS																	
PRP 5	Background Well	UAZ UTRAU	03-Nov-2021	17	19.1	0.5	228	5	29	0	3.5	19	31.42	256.34	No Comments		200	7	0.46	2	70	5	5	6	100	1300	1800	11000	0.034	
																<EQL (1)	<EQL (1)	<EQL (1.4)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (3)	<EQL (10)	0.706	0.603	<EQL (20)	<EQL (0.103)	<EQL (10)
PRP 6	Plume Definition Well	AA UAZ UTRAU	03-Nov-2021	10.7	20.2	0.5	199	4.9	60	0	0.7	6	32.18	249.69	No Comments		3.2	15	5.1	<EQL (1)	3.9	0.85	32	<EQL (3)	<EQL (10)	11.9	4.57	15	<EQL (0.1)	<EQL (10)
																		3.93												
PRP 7	Plume Definition Well	UAZ UTRAU	03-Nov-2021	13.3	19.7	0.5	266	5	40	0	6.7	5	41.73	240.26	No Comments		<EQL (1)	2.1	4.1	<EQL (1)	1.3	1.9	1.9	<EQL (3)	<EQL (10)	1.85	4.04	11.6	<EQL (0.1)	<EQL (10)
																		3.5												

Explanation

- [##] EPA Functional Guideline Code of 'J' was applied to the result, indicating an estimated quantity.
- <EQL(##) Constituent was below detection. The sample-specific Estimated Quantitation Limit is in parentheses.
- Result exceeds applicable limit.
- REJ Result Rejected.
- Result is less than the applicable limit and without EPA Functional Guideline qualifiers.
- NS Requested to be sampled but was not. See comments as to why not.
- Blue Text Not a required sample analysis.

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APPENDIX C

Time-Series Plots

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