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August 17, 2020

Honorable Robert G. Torricelli
Office of the Special Master
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Subject: 2019 Integrated Groundwater Monitoring Report (IGWMR)
Study Area 5, 6 & 7

Dear Senator Torricelli:

We are submitting on behalf of Honeywell the 2019 Integrated Groundwater Monitoring Report (IGWMR) for Study Areas 5, 6 & 7 prepared by our groundwater consultant, Cornerstone. Please note that this report includes all applicable conforming edits which plaintiffs provided on the 2018 version of the report.

Please contact the undersigned at 973-896-9366 should you have any questions or comments on this submittal.

Sincerely,

Wood Environment & Infrastructure Solutions, Inc.
sent on behalf of Honeywell

William Hague
Principal Consultant

Enclosures: 2019 Integrated Groundwater Monitoring Report (IGWMR)

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INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT FOR 2019

STUDY AREAS 5, 6, AND 7 JERSEY CITY, NEW JERSEY

Prepared for

HONEYWELL
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August 2020

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1 INTRODUCTION

1.1 General

The Long Term Monitoring Plan (LTMP) for the Study Area 7 (SA-7) deep overburden and bedrock groundwater remedy was originally developed in 2008 to monitor groundwater conditions relative to the Groundwater Extraction and Treatment (GWET) system. Annual progress reports have been prepared in accordance with this plan since the startup of the GWET system in December 2008 and thus this document represents the eleventh such annual performance report. In 2011, the GWET LTMP was expanded to integrate groundwater monitoring requirements for Study Areas 5, 6 and 7 (Project Area). Sampling and analysis within this integrated plan were performed consistent with the requirements set forth in the *Integrated Groundwater Sampling and Analysis Plan* (SAP) *for Study Areas 5, 6 and 7* currently under revision.

Groundwater monitoring in the Project Area is also governed by Remedial Action (RA) Permits issued by the NJDEP in 2018 for the shallow, deep overburden, and bedrock groundwater zones, and site-specific LTMPs applicable to SA-5 and SA-6 sites. RA Groundwater Permits are discussed further in Section 6.2. Site-specific LTMPs include:

- LTMP for SA-5 New Jersey City University (NJCU) (Sites 090 and 184) November 2016, updated May 2019 and Shallow Groundwater Monitoring and Extraction System Operation Plan (Appendix L of the LMTP)
- Draft LTMP for SA-5 Shallow Groundwater, June 2018; review in progress
- LTMP for SA-6 North and SA-6 South, recently updated June 2020; review in progress.

1.2 Purpose and Objectives

The purpose of this document is to provide an integrated annual reporting format that characterizes regional groundwater conditions and documents compliance with area-specific remedial objectives. The specific objectives of this approach are to:

- Improve consistency and efficiency in field procedures including sample collection and scheduling.
- Provide a central database for monitoring well specifications and status.
- Compile groundwater data in one annual report.

- Provide regional groundwater flow interpretations that consider the impact of features such as subsurface barrier walls, drains, caps, and drawdown from pumping.
- Provide localized groundwater flow maps consistent with the regional contour maps.

1.3 Status of Integrated Monitoring Requirements for 2019

The two primary elements of groundwater monitoring within the Project Area are water level measurements and water quality sampling and analysis. Groundwater level monitoring is conducted in available monitoring wells and piezometers to fulfill various reporting requirements as shown on **Table 1-1**. Groundwater quality sampling is conducted in a subset of wells at various times in accordance with the requirements of the various monitoring plans. The status of groundwater sample collection for laboratory analysis in 2019 is shown on **Table 1-2**.

1.4 Document Organization

In accordance with the SAP, this report is organized in terms of its three primary elements: groundwater extraction (Section 3), groundwater elevations and flow direction (Section 4), and groundwater quality (Section 5). These sections are prefaced by a discussion of overall site conditions and events during the reporting period (Section 2). Conclusions and recommendations for modifications to the GWET LTMP are provided in Section 6.

2 GENERAL CONDITIONS

The GWET system was operated at its design rate throughout the year. Long term monitoring of the SA-6 Chromium Remedy continued at SA-6 South and SA-6 North in 2019. Groundwater pumping of the contingent groundwater extraction systems (CGWES) was conducted on an as-needed basis in SA-6 North and South Open Space Areas. At NJCU, the contingent groundwater pumping system was operated throughout 2019.

2.1 Annual Precipitation

Monthly precipitation data recorded at Newark Airport, approximately 2.5 miles southwest of SA-7 are provided in **Table 2-1** and shown on **Figure 2-1**. Precipitation was approximately 6.0 inches above the 30-year average for the first half of 2019 and approximately 6.3 inches above the 30-year average for the second half. Total precipitation in 2019 was 58.56 inches or 12.31 inches above the annual average of 46.25 inches.

2.2 Tidal Monitoring

Tidal fluctuations in the Hackensack River were monitored relative to the NGVD-1929 vertical datum. This datum is used for all reported groundwater elevation data in this report. The datalogger is programmed to record river stage at 6-minute intervals. These data are used to correct groundwater levels for tidal impacts based on tidal lag and efficiency values previously determined for monitoring wells screened in the Intermediate, Deep, and Bedrock zones. With the exception of wells installed directly adjacent to the Hackensack River, there are no tidal influences in the Shallow Zone monitoring wells. Wells containing dataloggers will not have the data tidally corrected. The mean tidal elevation is approximately +1.2 feet above mean sea level (msl) in the NGVD-1929 vertical datum.

2.3 Monitoring Well Inventory

Honeywell updated the SA-6 Monitoring Well Abandonment Plan (MWAP) in 2017 and 2018 and submitted the revised MWAP to All Parties on March 16, 2018 via email from Mr. Jeremy Karpatkin of Arnold & Porter. A number of monitoring wells were abandoned in 2018 in accordance with this plan. There were no wells abandoned in 2019. A list of the groundwater monitoring wells in service within the Project Area during 2019 is provided in **Table 2-2**. The wells are organized by hydrogeologic zone. Information regarding the total depth, screen interval, and reference point elevation are also provided.

3 GROUNDWATER EXTRACTION

3.1 GWET System Operation

The Deep Overburden Groundwater Extraction and Treatment (GWET) system was in operation throughout 2019. The GWET system consists of three extraction wells pumping at a combined rate of 54.5 gpm with discharge via independent force mains to the wastewater treatment plant located on SA-6 North. Wells 087-PW-1 and 087-PW-3 are located on the Difeo property to the north of SA-6 North and are screened in the Deep and Intermediate zones, respectively. Well 115-MW-215BR is located on the northwest side of Site 115 (SA-7) and pumps from the upper Bedrock zone. In December 2015, extraction well 087-PW-3 replaced well 087-PW-2. PW-3 is located approximately 120 feet east of PW-2 and is screened from 30 to 50 feet deep.

3.1.1 Pumping Rates

Flow rate monitoring was conducted on each of the three force mains using flow meters located within the treatment plant. The flow rates are controlled by a manually-operated valve and adjusted as necessary to maintain design rates of 40 gpm for PW-1, 7.5 gpm for PW-3 and 7 gpm for the bedrock extraction well 115-MW-215BR. The total system rate of 54.5 gpm was maintained throughout the period with the exception of occasional downtime for O&M activities. **Table 3-1** and **Figure 3-1** identify the events that resulted in a shutdown of more than 8 hours. In general, system shutdowns in 2019 were due to repair of the sulfuric acid tank and pump.

3.1.2 Force Main Acid Flushing

Force main cleanings for the GWET system were not required in 2019.

3.1.3 Well Redevelopment

GWET extraction well redevelopment activities were not required in 2019.

3.2 SA-6 North Contingent Groundwater Pumping System

The SA-6 North contingent groundwater pumping system design consists of a horizontal perforated drain located close to the centerline of the soil containment area. The drain consists of two sections extending from near Route 440 to the western barrier wall. In 2019, the western portion of the contingent system was pumped from August 12 through 23, whereas the eastern portion was operated during the following periods; January 4 to February 12, May 20 to July 13, September 9 to October 4, and from October 16 to November 19. **Figure 3-2** compares the average daily flow rate of the contingent pumping

system to interior groundwater levels at SA-6 North. During active pumping, the average pumping rate for the eastern pumping system was approximately 4 gpm. During the pumping cycles that took place in 2019, heads within the soil containment cell declined approximately 1 to 2 feet, which is a typical response to pumping.

3.3 SA-6 South Contingent Groundwater Pumping System

The SA-6 South contingent groundwater pumping system consists of a single horizontal perforated drain located close to the centerline of the soil containment area, which extends from near Route 440 to the western barrier wall in a continuous length. Three pumping cycles were conducted during 2019. These were from February 19 to April 8, August 23 to September 9, and from November 19 to December 31 to lower heads within the containment area. **Figure 3-3** compares the pumping rate of the contingent drain to interior groundwater levels at SA-6 South. At an average pumping rate of 6.5 gpm during each period, a rapid decline of groundwater levels was observed, especially within the western piezometers and to a lesser extent within the eastern piezometers. After the cessation of pumping, heads within the soil containment cell rose to an average elevation of approximately 4.0 feet msl before the pumps were restarted as discussed in Section 4.6.

3.4 SA-5 NJCU Contingent Groundwater Pumping System

The contingent groundwater pumping system at the NJCU site was operated continuously throughout 2019. All pumping was conducted using extraction Sump B only; Sump A has not been operated. The Sump B pump cycles on and off based on a water level probe set to an elevation of approximately 4.5 feet msl just below the drain line. When pumping, the discharge rate of the pump is 5 gpm; however, the average steady-state, long-term net yield of the drain was 0.36 gpm in 2019.

4 HYDRAULIC MONITORING

Hydraulic monitoring in 2019 consisted of four quarterly rounds of groundwater elevation measurements in available wells in March, June, September, and November. The measured depth to groundwater was subtracted from the reference point elevation to determine the elevation of the groundwater surface. For those wells that are tidally influenced, the measured values were adjusted using a time-series method developed by the U.S. Geological Survey (Halford, 2006). The results for the four quarterly rounds are provided in **Table 4-1**. Groundwater elevations from the November 2019 round, eleven years after startup of the GWET system, are plotted for the Shallow, Intermediate, Deep, and Bedrock zones on **Figures 4-1** through **4-4**, respectively and on **Figure 4-5** in cross section. Groundwater elevation data are reported in units of feet of water relative to mean sea level in the NGVD-29 vertical datum.

4.1 Regional Groundwater Flow

4.1.1 Shallow Zone

Due to the close spacing of monitoring wells and piezometers screened in the Shallow Zone, well location IDs are shown separately on **Figure 4-1A** to improve the readability of the groundwater elevations and contours provided on **Figure 4-1B**. Groundwater elevations in the Shallow zone range from approximately 13 feet msl on Site 154 to less than 3 feet msl near the Hackensack River. As a point of reference, the river has a mean tide elevation of approximately +1.2 feet msl relative to the NGVD-29 datum. As shown on **Figure 4-1B**, shallow groundwater flow is generally from east to west across the region, but is locally impacted by subsurface features such as the barrier walls installed at SA-5, SA-6, and SA-7, and deep sewer lines that run beneath JCMUA and Route 440.

A telemetry system was installed in the piezometers along the barrier walls of SA-6 North, SA-6 South, and the four monitoring wells within SA-7 in late January 2019. The telemetry units are connected to dataloggers that record the water level within each well at 6-hour intervals. Monitoring of groundwater elevations within the SA-6 North and South soil containment areas indicates that with the occasional exception of PZ-10, heads inside the barrier are generally stable and do not react to short-term rainfall events. In the case of PZ-10, it was noted that in late December 2019, the head in the piezometer remained relatively high, likely as a result of build-up of rain water on the cap due to heavy rainfall during a short period of time. It was concluded that the build-up of water on the cap could be caused by slow drainage of the water to the west (the direction in slope of the cap). The associated weight of the built-up water on the cap could create localized, short-duration hydrostatic pressure in the subsurface resulting in a rise in head in PZ-10. When precipitation decreased in January 2020, water on the cap gradually drained and the head in PZ-10 decreased to a more typical elevation. Groundwater elevations outside of the containment

areas vary directly with the recharge from precipitation. These trends are evident in the hydrographs provided in the quarterly reports.

At the NJCU site in Study Area 5, groundwater flow is generally from east to west; however, the north-south oriented barrier walls, including the barrier wall extension installed in 2017, cause groundwater to be diverted to the north. The depression around the active groundwater extraction Sump B is also evident and further discussed in Section 4.3.

4.1.2 Intermediate Zone

Groundwater elevations in the Intermediate zone are shown on **Figure 4-2** and range from over 6 feet msl in SA-5 to less than mean sea level near the GWET pumping wells. Groundwater is diverted around the SA-7 barrier wall but is not impacted by near-surface features on SA-6 North to the same degree as in the Shallow zone. Vertically, heads within the Intermediate zone are generally one to three feet lower than in the Shallow zone, which indicates a significant downward vertical gradient across Stratum D. **Figures 4-2 and 4-5** also illustrate that the combined groundwater depression in the vicinity of the GWET pumping wells fully encompasses the deep overburden plume and provides effective capture in the upper lacustrine soils.

4.1.3 Deep Zone

Groundwater elevations in the Deep zone (**Figure 4-3**) are similar to those in the overlying Intermediate zone, although the influence of the SA-7 barrier wall is not as prominent. As noted in prior reports, groundwater flow in the Deep zone is, to a degree, able to move beneath the SA-7 barrier wall through gravel lenses in the underlying glacial till/ice contact deposits. At SA-5, the barrier wall does not extend down to the Deep zone and thus does not influence flow. The area of influence of the GWET pumping wells on groundwater flow in the Deep zone is also illustrated on **Figures 4-3 and 4-5**. The resulting combined groundwater depression in the vicinity of the GWET pumping wells fully encompasses the deep overburden plume and provides effective capture in this deeper flow zone.

4.1.4 Bedrock Zone

Groundwater elevation contours in the Upper Bedrock zone are shown on **Figure 4-4.** The impact of the GWET pumping well 115-MW-215BR on groundwater flow is evident from the closely-spaced closed contours along the western border of SA-7. This area is characterized by the southwest-northeast trending high-permeability fracture zone which aids in the propagation of the capture zone parallel to the bulkhead as shown on **Figure 4-4**.

4.2 GWET System Capture Zone

Figure 4-5 illustrates that pumping from PW-1 and PW-3 created a combined zone of influence causing groundwater to flow both laterally and vertically into the capture zone of the wells. The drawdown associated with both wells during the startup of PW-3 was

documented in Cornerstone's technical memorandum dated February 23, 2016. Based on these results and data provided in both plan view on **Figures 4-2 and 4-3** and in cross section on **Figure 4-5,** the combined groundwater depression in the vicinity of the GWET pumping wells fully encompasses the deep overburden plume and provides effective capture that meets its design objectives.

4.3 New Jersey City University

Quarterly groundwater elevation data for the NJCU property are compiled in **Table 4-2** and mapped on **Figures 4-6 through 4-9**. A barrier wall extension, connecting the open-ended wing-wall west of Building 5 and the Building 6 sheet pile wall, was constructed during May-June 2017. This wall completed the perimeter wall in the Shallow Zone around the capped portion of the Commercial AOC. This was followed by the installation of four monitoring wells (MW-105 through MW-108) that, along with the four existing wells MW-101 through MW-104, provide four well pairs along the barrier wall extension. Data loggers were present throughout 2019 in the four well pairs as well as in Sumps A and B and wells 090-PZ-05 and 184-MW-05 to monitor groundwater elevation trends on a 3-hour interval. Hydrographs developed from these data were provided in the quarterly reports and indicate that groundwater elevations generally varied throughout the year in response to precipitation.

For each piezometer equipped with an automatic datalogger, the arithmetic mean of the recorded values was calculated over a nominal one-month period and are plotted for 2019 in **Appendix A**. These averages were then used to determine if the head gradient across the barrier wall meets the performance standard of an inward gradient of 0.1 foot or greater as defined in Appendix L of the LTMP. These comparisons are provided in **Table 4-3** and graphed for the year on **Figure 4-10**.

A review of the monthly average gradients indicates that outside heads at the MW-101/105 well pair were higher than inside heads in 9 of the 12 months, but met the 0.1 foot criteria during 7 out of 12 months. At the MW-103/107 well pair, average heads outside of the barrier wall were higher than those inside the wall for 4 of the 12 months, but only met the 0.1 foot criteria in July. At the MW-104/108 well pair, average heads outside of the barrier wall were higher than those inside for 5 of the 12 months, but met the 0.1 foot criteria in only 3 months.

At the MW-102/106 location, the head in the outside well MW-106 was consistently lower than that of MW-102 and thus indicated an outward gradient. As noted in previous reports, the screened interval in MW-106 is lower than that in MW-102 and thus is more representative of the lower regional heads beneath the level of the Meadow Mat. Well MW-106 is planned for replacement after the construction activities in the immediate area have been completed. The screened interval will be raised to a similar elevation as MW-102 to allow a direct comparison of heads across the wall.

Finally, as noted in previous correspondence and reports, the future roadway and utility corridor forms a temporary depression which will be regraded and paved as part of NJCU's Phase 2 roadway and infrastructure project, thereby improving stormwater drainage and reducing infiltration into the cap area. Honeywell expects that shallow groundwater levels will more accurately reflect the long term impact of these changes after final grading and construction of the roadways is completed. It is premature to draw conclusions regarding shallow groundwater levels at this time; these levels should be evaluated after the grading/paving work is completed. For further details regarding groundwater levels, including monthly average head differences from logger data, refer to the quarterly reports.

Groundwater elevation maps are provided on **Figures 4-6 through 4-9** and indicate that groundwater flow is generally to the northwest as it moves onto Sites 90 and 184 from the east, but then turns north as it is forced around the barrier walls that block flow to the south and west. In addition, downward vertical gradients continue to be present as documented by the reported head in the deep zone well 090-MW-09, located between MW-05 and Sump B in the Commercial AOC. These data suggest that groundwater bypasses the capped portion of the Commercial AOC and moves vertically downward into the underlying zones; a scenario that is supported by groundwater quality data from the sentinel wells as further discussed in Section 5.5.

A field investigation was conducted during the first half of 2019 to assess the response of groundwater levels within the NJCU capped area to precipitation events. Results of the investigation are provided in the Quarterly Monitoring for Q2-2019 Study Area 5 – Sites 090/184 and 153 North memorandum, dated July 31, 2019. Specifically, the objective of the investigation was to respond to Plaintiff's assertion that periodic spikes in the head in 090-PZ-05 may be due to a leak in the NJCU liner. The investigation was conducted in accordance with the proposed scope provided in Wood's September 26, 2018 memorandum. The investigation consisted of the following activities:

1. Inspect the overall integrity of the surface completion (road box, PVC riser, etc.) at 090-PZ-05.
2. Hand excavate cover soils around 090-PZ-05 to visually inspect the integrity of the liner boot around the riser.
3. Determine surface grades of the adjacent NJCU parking lot to assess the potential for stormwater to runoff and pool in the vegetated area around 090-PZ-05.
4. Assess the potential for head buildup above the cap liner by installing a shallow piezometer above the cap adjacent to 090-PZ-05 and monitoring with a datalogger.
5. Assess the potential for flooding within nearby storm and sanitary sewers using dataloggers to monitor liquid levels during rainfall events.

The results of these activities were discussed in the Q2-2019 monitoring report (Wood memorandum dated July 31, 2019) and are summarized as follows:

- Visual inspection of the liner has confirmed the lack of any tears or gaps in the boot around 090-PZ-05.
- Liquid level rises in the local storm and sanitary sewers following rainfall events in the range of approximately 1.5 to 2.5 inches are unlikely to impact heads beneath the NJCU liner.
- Runoff from the parking lot onto the unpaved corner containing 090-PZ-05 is the most likely cause of the occasional spikes in head in piezometer 090-PZ-05. Approximately 10,000 square feet of parking lot area is directed to this corner during a rain event, which could then generate over approximately 10,000 gallons of stormwater runoff during a 2-inch rainfall event.
- In the past, stormwater runoff from the parking lot has also flooded the road-box of 090-PZ-05 and directly entered the well casing. An extended well casing and upgraded seals have been installed to reduce such leakage.

4.4 Eastern SA-7 Perimeter Pools

The LTMP program includes monitoring of the hydraulic gradients across the soil-cement bentonite (SCB) barrier around the perimeter of SA-7. On May 4, 2017, Honeywell submitted to All Parties a "Study Area 7 (SA-7) Perimeter Pool Termination" letter to document Honeywell's intention to terminate the functional operation of the Perimeter Pools on SA-7 along the northern and southern edges of SA-7. Therefore, Honeywell is no longer routinely operating the northern and southern perimeter pools, but is still operating the eastern perimeter pool. This is accomplished through monitoring of the head in the eastern perimeter pools E-1 and E-2, and comparing these data to groundwater elevations in adjacent shallow piezometers E3-SO and E2-SO, respectively, located just outside of the SA-7 SCB. The location of the eastern pools, the design pool elevations, and water level trends are provided in **Appendix B**. Overall, the data indicate that water levels within the SA-7 eastern pools are greater than those outside of the SCB and thus outward gradients are occurring relative to the SA-7 SCB.

4.5 SA-6 North Containment Cell

Shallow groundwater elevations within the SA-6 North containment cell, as measured in November 2019, are illustrated on **Figure 4-1b** and include data from the ten piezometers installed around the perimeter of the soil containment cell and the six wells on the border of SA-7 and SA-6 North. At the time of the measurements, groundwater elevations within the cell ranged from approximately 3 to 5 feet above msl, but varied during the year with pumping from the contingent drain system. Data from automatic loggers placed in each of the wells were used to construct the hydrographs provided in monthly data submittals and quarterly reports to assess the impact of precipitation events on heads in the short term. The logger data were also used to calculate monthly average heads for the longer-term assessment of hydraulic gradients across the barrier walls. The monthly average heads are provided on **Table 4-4** and plotted in **Appendix C** for the year. Head differences across the barrier walls for these well pairs are also provided in **Table 4-4** and plotted on **Figure**

4-11. Gradient determinations include the 5 piezometer pairs around the east, north, and west soil containment cell wall, and four well pairs that have been identified along the SA-7 SCB using wells 115-MW-502 and 115-MW-503. It is noted that the dataloggers in these two wells were only recording data since the end of June 2019 and thus only 6 months of average monthly head differences are available.

A review of these data indicates that the performance standard requiring at least 0.1 foot of inward gradient, as defined by the SA-6 LTMP, was met at all but a few well pairs/months. An outward gradient was present throughout the year along the western SA-6 North soil containment cell wall due to the tidal influence of the Hackensack River. At the eastern-most piezometer pair (087-PZ-01/02), the average monthly head difference failed to meet the performance standard for two months in the early fall when lower than average rainfall caused heads outside the cell to decline. Finally, gradients at the 115-MW-502/E5-SO pair failed to meet the 0.1 foot criteria during August and December, although in August the average head inside the wall was below that outside of the barrier wall.

In accordance with the SA-6 LTMP, the quality of groundwater along the inside of the barrier wall at these locations was analyzed by the collection of groundwater samples from 087-PZ-2 in September and October, 087-PZ-4 and 087-PZ-6 in January, and from 087-PZ-10 in January, February, April, July, and October. As discussed in Section 5.4, hexavalent chromium was not detected in any of these samples. Total chromium was detected below the NJDEP Groundwater Quality Standard (GWQS) of 70 ppb in 087-PZ-2 in the unfiltered sample, but was not detected in the filtered sample.

4.6 SA-6 South Containment Cell

Shallow groundwater elevations within the SA-6 South containment area, as measured in November 2019, are illustrated on **Figure 4-1b** and include data from the ten piezometers installed around the perimeter of the soil containment cell and the five wells on the border of SA-7 and SA-6 South. At the time of measurement, groundwater elevations were approximately 3 to 5 feet above msl within the cell, but varied throughout the year in response to pumping of the contingent drain system as discussed in Section 3.3.

Data from automatic loggers placed in each of the wells were used to construct the hydrographs provided in monthly data submittals and quarterly reports and to assess the impact of precipitation events on heads in the short term. The logger data were also used to calculate monthly average heads for the longer-term assessment of hydraulic gradients across the barrier walls. The monthly average heads are provided on **Table 4-4** and plotted in **Appendix C** for the year. Head differences across the barrier walls for these well pairs are also provided in **Table 4-4** and plotted on **Figure 4-12**. Gradient determinations include the 5 piezometer pairs around the east, south, and west soil containment cell wall, and three well pairs that have been identified along the SA-7 SCB using wells 115-MW-500 and 115-MW-501. It is noted that dataloggers in these two wells were only recording data since the end of June 2019 and thus only 6 months of average monthly head differences are available.

A review of these data indicates that the performance standard requiring at least 0.1 foot of inward gradient, as defined by the SA-6 LTMP, was met at all but a few well pairs/months. The exceptions include along the western soil containment cell wall where gradients were outward toward the river for 8 months during the year due to the tidal influence of the Hackensack River. The other exception was at the 115-MW-500/W3-SO pair which failed to meet the 0.1 foot criteria for only the month of August, although the average outside head was slightly above the average inside head for the month.

To assess the quality of groundwater along the inside of the barrier wall at the 124-PZ-20 location, groundwater samples were collected in February, April, July, and October 2019 in accordance with the SA-6 LTMP. As discussed in Section 5.4, hexavalent chromium was not detected above the reporting limit in this well. Total chromium was detected below the NJDEP GWQS of 70 ppb in 124-PZ-20 in the unfiltered sample during the October event only, and was not detected in the filtered sample.

4.7 SA-5 Sites 117 and 153

Groundwater movement beneath Sites 117 and 153 is generally from northeast to southwest as illustrated on **Figures 4-1 through 4-3**. In the Shallow zone, the 48-inch diameter combined sanitary/stormwater sewer beneath Route 440 serves as a groundwater sink and limits the further movement of groundwater to the south and west. In addition, this sewer was installed in close vertical proximity to the highly reducing conditions associated with the meadow mat and thus the migration of hexavalent chromium into the pipe or along the bedding is not considered a viable transport mechanism. Additional detail regarding Honeywell's position on the impact of this sewer was provided in our December 7, 2018 and January 23, 2019 memoranda and is the subject of continuing technical discussions with Plaintiffs.

4.8 Miscellaneous Events

None

5 GROUNDWATER QUALITY MONITORING

Groundwater quality monitoring within the project area was conducted in 2019 in accordance with the GWET LTMP and the other applicable area-specific monitoring plans as discussed in Section 1.3 and listed on **Table 1-2**.

5.1 Deep Overburden Regional Plume Monitoring

In accordance with the recommendations in Section 7.5 of the 2017 Integrated Groundwater Annual Report, the round of regional monitoring of the Deep Overburden Plume was scheduled for the fall of 2018. However, at the request of Plaintiffs, this sampling event was rescheduled for the spring of 2019 to coincide with sampling beneath the riverbed sediments.

The regional LTMP groundwater quality sampling event had been conducted six times prior to this event with the last round in December 2015. This seventh event was conducted between April 29 and May 2, 2019. Sampling of bedrock monitoring well 115-MW-203BR was postponed until June 6, 2019 to allow the groundwater extraction equipment to be removed by the drilling contractor. Groundwater sampling procedures were in accordance with EPA low-flow sampling protocol as documented in the SAP. Both filtered and unfiltered samples were collected from each well for the analysis of total and hexavalent chromium. Results of this investigation were provided in the July 23, 2019 memorandum "Results of the 2019 Sampling of SA-7 LTMP Wells and In-Site Porewater Beneath Riverbed Sediments." The analytical results are also summarized on **Table 5-1.**

The objective of the sampling program is to determine if the deep overburden chromium plume in each of the three water-bearing zones has expanded beyond the horizontal extent documented in the Final Groundwater Investigation Report (FGIR) [HydroQual 2007]. During this sampling event, a total of 25 monitoring wells were sampled. These included six wells which were added to the program in accordance with NJDEP Groundwater Permits for the site. Monitoring wells 090-MW-09, 117-MW-I4, and 117-MW-D2 are screened in the Deep Zone; well 087-MW-136D is screened in the Intermediate Zone as a replacement for well 087-MW-O19D at SA-6 North; and wells 115-MW-203BR and 090-MW-7BR, screened in the Upper Bedrock, are located within the central portions of the chromium plume as originally delineated in the FGIR. Well 115-MW-203BR served as the original Upper Bedrock extraction well prior to being replaced by the current extraction well 115-MW-215BR in 2012.

5.1.1 Bedrock Zone

Figure 5-1 provides hexavalent chromium results for both the May 2019 sampling event as well as those from the six prior events in the Bedrock Zone. Iso-concentration contours from the 2006 FGIR are shown in green for reference and are overlain by revised contours in red based on the May 2019 data. The March 2019 analytical result from a discharge sample of the current GWET bedrock extraction well 115-MW-215BR has been added to the map and is used in the contouring. The results indicate that groundwater around the east and south edges of the plume remains non-detect for both hexavalent and total chromium. Exceptions are in wells SA6-MW-15BR to the north and 124-MW-8BR to the south where total chromium was detected in the unfiltered samples, but is below the NJDEP GWQS of 70 ppb (or 0.07 ppm). Both associated filtered samples are non-detect for total chromium.

Well 090-MW-7BR, located in the central portion of the bedrock plume, had a reported hexavalent chromium concentration of 139 ppm, which is in line with the 2006 plume contours from the FGIR. Former groundwater GWET extraction well 115-MW-203BR was non-detect for hexavalent chromium and total chromium was reported in the unfiltered sample from this well at 0.3 ppm. Yield testing during the evaluation of well 115-MW-215BR as a replacement extraction well confirmed that MW-203BR is screened within the same highly-transmissive fracture zone as well MW-215BR. Thus, this non-detect result suggests that pumping over the past seven years from extraction well MW-215BR has been successful at pulling the bedrock plume back from its former southern extent as shown by the revised contours on **Figure 5-1**.

5.1.2 Deep Overburden Zone

Figure 5-2 provides hexavalent chromium results for both the May 2019 sampling event as well as those from the six prior events in the Deep Overburden Zone. Iso-concentration contours from the 2006 FGIR are shown in green for reference and are overlain by revised contours in red based on the May 2019 data. March 2019 analytical results from sampling of the discharge of the Deep GWET extraction well PW-1 have been added to the map and used in the contouring. The results indicate that groundwater quality around the east and west edges of the plume remain non-detect for hexavalent chromium. Wells 090-MW-09 and 117-MW-I4, located in the central portion of the Deep Zone plume, reported hexavalent chromium concentrations of 1,940 ppm and 6,080 ppm, respectively, which are in line with the 2006 plume contours in the FGIR.

Groundwater sampling in the Plume Diversion or “L-well” area has been conducted on a number of occasions since the last regional LTMP event in 2015. This sampling was conducted to investigate the detection of hexavalent chromium in downgradient well 124-MW-106T and consisted of a delineation program in which 4 in-situ (GeoProbe) groundwater samples were collected in June 2017. As noted on **Figure 5-2**, well 124-MW-106T was re-sampled three times in 2016 and once in 2017. The results were summarized in a July 26, 2017 Memorandum to Plaintiffs that indicated non-detect results in all four downgradient (westerly) in-situ samples and a reduced hexavalent chromium concentration

of 0.16 ppm in 124-MW-106T. The May 2019 sampling event result of non-detect in well 124-MW-106T supports these delineation findings that the plume is not expanding to the west.

Hexavalent chromium was detected in two adjacent monitoring wells in the L-well area, but at concentrations below the GWQS for total chromium. As shown on **Figure 5-2**, these are 119-MW-01T and 119-MW-02T located to the south of Kellogg St. Total chromium concentrations were 0.14 ppm in the unfiltered samples and 0.026 and 0.062 ppm in the filtered samples, respectively. Total chromium has been detected in each of these wells in the past at trace levels.

5.1.3 Intermediate Overburden Zone

Figure 5-3 provides hexavalent chromium results for both the May 2019 sampling event as well as those from the six prior events in the Intermediate Overburden Zone. Iso-concentration contours from the 2006 FGIR are shown in green for reference and are overlain by revised contours in red based on the May 2019 data. March 2019 analytical results from sampling of the discharge of the GWET Intermediate Zone extraction well PW-3 have been added to the map and used in the contouring. The results indicate that groundwater quality is similar to previous events and below the GWQS in five of the six wells including the replacement well 087-MW-136D at SA-6. Well 117-MW-I5 had elevated total and hexavalent chromium concentrations, as expected based on its location within the Intermediate Zone plume. The reported concentration of 0.14 ppm is similar to results from prior years. The next round of sampling is scheduled to take place in May 2024 in accordance with the SAP.

5.2 GWET Extraction Wells

Groundwater from the three GWET pumping wells was sampled quarterly in 2019 as shown in **Table 5-2**. The samples were unfiltered and analyzed for total and hexavalent chromium and volatile organic compounds (VOCs). The results for hexavalent chromium are plotted on **Figure 5-4** and indicate that concentrations in the Deep zone (PW-1) have declined in an asymptotic fashion since 2009. Hexavalent chromium concentrations at the end of 2019 were approximately 18 ppm.

Concentrations in the Intermediate zone extraction well discharge initially increased significantly from 10 ppm to 90 ppm when PW-3 came online in January 2016, but have also declined in an asymptotic fashion since then. Hexavalent chromium concentrations in the bedrock have been generally stable at approximately 15 ppm. The Intermediate Zone pumping well PW-3 contains the highest concentrations of VOCs with the most prevalent compounds being chlorinated volatile organics such as trichloroethene **(Figure 5-5)** and its daughter products cis-dichloroethene and vinyl chloride. Carbon Tetrachloride was also detected as shown in **Figure 5-6** and follows the same general asymptotic trend as the other VOCs. With the exception of carbon tetrachloride and chloroform, VOCs have not been detected in the bedrock pumping well. As previously reported, the source of the VOCs in the groundwater is not related to any Honeywell historic operations.

5.3 SA-6 North

As discussed in Section 4.5, and shown on **Table 5-3**, shallow groundwater samples were collected from four of the five perimeter piezometers located inside of the SA-6 North soil containment area during 2019. Hexavalent chromium was not detected in any of the samples, nor was total chromium detected in the filtered samples. The unfiltered sample from PZ-2 during October was the only sample to have a detection of total chromium (11.8 ppb) which is below the GWQS of 70 ppb.

5.4 SA-6 South

As discussed in Section 4.6, and shown on **Table 5-3**, shallow groundwater samples were collected from piezometer PZ-20 located inside of the barrier wall of the SA-6 South soil containment area during each quarter of 2019. Hexavalent chromium was not detected above the reporting limit in any of the samples, nor was total chromium detected in the filtered samples. Total chromium was detected in the unfiltered samples in February and October at concentrations of 16.1 and 29.6 ppb, respectively. Both results are below the GWQS of 70 ppb.

5.5 New Jersey City University

Groundwater samples were not collected from the three original shallow groundwater sentinel wells (184-MW-04, 184-MW-05, and 184-MW-06) at NJCU during 2019. As shown on **Table 5-4**, Groundwater quality sampling of these wells was discontinued as of the end of 2018 in favor of the four wells pairs along the barrier wall extension discussed below. This change is reflected in the current Shallow Groundwater Monitoring and Extraction System Operation Plan for the NJCU Commercial AOC.

Monitoring wells along the barrier wall extension (184-MW-101 through 184-MW-108) were sampled quarterly. The results are provided on **Table 5-4** and plotted on **Figure 5-7**. The results indicate that hexavalent chromium was only detected above the reporting limit of 5.5 ppb in 184-MW-103 during two rounds of sampling (March and June) at concentrations ranging from 27 ppb to 35 ppb. Well 184-MW-103 is located outside (upgradient) of the barrier wall. Hexavalent chromium was not detected in this well during the September and December sampling events. Total chromium in the unfiltered samples was reported above the GWQS in one well, 184-MW-107 at 136 ppb and 95.7 ppb in the June and September events, respectively. The corresponding filtered samples and hexavalent chromium results were non-detect for both events.

5.6 Plume Diversion Area Monitoring

Based on the results of groundwater monitoring in 2017, no further groundwater samples were required to be collected in the Plume Diversion Area.

5.7 SA-5 Site 117

Results of the SA-7 Regional LTMP Groundwater sampling event for the intermediate, deep overburden and bedrock wells are summarized on **Table 5-1**. Results of this investigation were provided in the July 23, 2019 memorandum "Results of the 2019 Sampling of SA-7 LTMP Wells and In-Site Porewater Beneath Riverbed Sediments." These wells will be sampled again in 2024 in accordance with the SAP.

Groundwater sampling for water quality analysis was conducted at one shallow monitoring well (117-MW-A89) in November 2019 to provide current data for the southernmost (sentinel) well at Site 117 and to supplement previous data collected at all shallow wells in December 2018. Total chromium was detected in unfiltered samples below 70 ppb. Hexavalent chromium was detected below 70 ppb in the unfiltered sample and filtered sample (using 0.45-micron filter) but was not detected in the filtered sample using the 0.10-micron filter. These data are presented on **Table 5-5** and plotted on **Figure 5-8**.

5.8 SA-5 Sites 079/153

Groundwater Quality sampling of the shallow groundwater wells is not required at Site 079. In accordance with the SAP, groundwater quality monitoring of the bedrock monitoring well 079-MW-13BR is required every five years. Sampling took place in May 2019. Results were non-detect for both hexavalent chromium and total chromium as summarized on **Table 5-1**.

Groundwater quality sampling was conducted at shallow monitoring wells 153-MW-A13 and 153-MW-A15 in November 2019 at Site 153. Sampling included collection of unfiltered samples and two filtered samples, one sample using a 0.45-micron filter and one sample using a 0.10-micron filter to provide additional data for evaluation of dissolved chromium. Results for the southernmost monitoring well (153-MW-A15) indicate that hexavalent chromium was not detected, consistent with historical results. Total chromium was detected in the unfiltered sample (85 ppb); however, filtered results were non-detect or less than 70 ppb. Results for well 153-MW-A13 indicate hexavalent chromium was detected at concentrations less than 70 ppb. At 153-MW-A13, elevated total chromium (>1,000 ppb) was detected in unfiltered samples, filtered total chromium results showed a variable range of concentrations (<10 to 520 ppb), hexavalent chromium was detected in filtered samples (up to 46 ppb) but was not detected in unfiltered samples. Results are shown on **Table 5-5**.

5.9 In-Situ Sampling Beneath Riverbed Sediments

In accordance with Section 3.3 of the SA-7 Deep Overburden and Bedrock Groundwater Remedy Long-term Monitoring Plan, in-situ groundwater from within the lacustrine deposits directly beneath the soft riverbed sediments in the Hackensack River is to be sampled every five years until chromium concentrations are below the GWQS of 70 ppb or 0.07 ppm. The last sampling event took place in 2014 during which the original five

locations were re-sampled. Of the five locations, PW-09-450 was the only sample that had a detection of hexavalent chromium and was therefore resampled in 2019. Results of this investigation were provided in the July 23, 2019 memorandum "Results of the 2019 Sampling of SA-7 LTMP Wells and In-Site Porewater Beneath Riverbed Sediments."

Sample collection was conducted on May 9, 2019 in the same manner as was implemented in the prior investigations. The sampling boat was positioned over the location using an on-board GPS navigation system. A GeoProbe sampling tool was then lowered through approximately 6 feet of water to the top of the riverbed sediments. From there, it was pushed by hand through 19 feet of soft organic muds to the top of the native lacustrine sand. The probe was then driven four additional feet into the underlying lacustrine deposit using a pneumatic hammer. A small diameter solid rod was inserted though the hollow drive rods and used to hold the bottom of the sampler in position while the outer sheath was pulled back approximately 18 inches, exposing the stainless-steel screen. A peristaltic pump was then attached to flexible polypropylene tubing placed down the temporary well to a position across from the well screen.

During the first attempt at collecting a groundwater sample, the water level inside of the casing was quickly pumped dry and did not recover to allow sample collection. The GeoProbe casing was removed and the well screen was observed to be clogged with silt from the formation. A second attempt was then made approximately 10 feet from the initial location using the same procedure. The yield at this location, although still poor, was sufficient to provide a representative sample of the groundwater beneath the riverbed sediments as the discharge eventually ran clear and field parameter values stabilized. Groundwater samples were then directed from the sample tubing into appropriate sample containers for shipment to the lab.

Figures 5-9 and 5-10 illustrate that both hexavalent and total chromium were again detected at the PW-09-450 sample location in 2019, but at reduced concentrations relative to the two prior events. Data are also presented on **Table 5-6**. The reported hexavalent chromium concentration of 15.8 ppm for example, represents a fourfold decrease relative to the 2014 result of 64.2 ppm. The continued presence of chromium at this location is likely due to the slow flushing of groundwater from a localized, low-permeability silt lens in the lacustrine deposits in the area. This scenario is supported by the non-detect results (2014) from the four adjacent sample locations, some closer and some further from shore than PW-09-450. Clearly, if these locations were within the capture zone of the GWET extraction wells, so too is the PW-09-450 location. pH and total dissolved solids data further support a low permeability zone as they have remained relatively unchanged at this location compared with the varied results at the adjacent locations that have been flushed clean. Based on these results, and in accordance with the SAP, location PW-09-450 will be resampled in 5 years, during the spring of 2024.

5.10 Miscellaneous Groundwater Quality

The mass of hexavalent chromium removed from the Deep Overburden Plume through pumping has been calculated for reference. As shown on **Figure 5-11**, historic pumping includes operation of the two depressurization wells, 115-DP-1 and 115-DP-2, during the SA-7 soil excavation remedy, and the GWET system pumping that has been ongoing since December 2008. The mass removed was calculated by multiplying the pumping rate of each well by the hexavalent chromium concentration of the discharge. The results indicate that over 93 tons of hexavalent chromium have been removed through groundwater extraction alone through the end of 2019 and does not include the 50 tons of chromium treated during the mass removal injection program conducted from 2011 to 2016.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Compliance with Monitoring Requirements

Hydraulic and groundwater quality monitoring conducted in 2019 have fulfilled the various monitoring plan requirements in accordance with **Tables 1-1 and 1-2**.

6.2 Status of Groundwater CEA Certifications

Groundwater Classification Exception Areas were approved by NJDEP on February 16, 2012 for the three principal water bearing zones in the Project Area (Shallow Zone, Deep Overburden, and Bedrock). In 2014, NJDEP notified Honeywell that CEA biennial certifications are not due until the applicable Groundwater Remediation Permits are issued. Honeywell submitted Groundwater Remedial Action (RA) Permit Applications to NJDEP in December 2017 and RA Permits were issued by the NJDEP in 2018. The RA Groundwater Permits include one permit for the Deep Overburden Zone, one permit for the Bedrock Zone, and five permits for the shallow zone as follows: SA-5 NJCU, Site 117, Site 153, SA-6 North and SA-6 South Open Space Cap areas. Biennial certification reports are due during July and August of 2020 and every 2 years thereafter.

6.3 Recommendations for Monitoring Well Network

Well 117-MW-I4S will be temporarily retained for groundwater level monitoring only. This well was installed to provide samples for treatability testing within the source area and not for long-term monitoring purposes. Water level monitoring will be conducted during and after roadway construction until such time that hydraulic gradient issues are resolved by the Parties, at which time it will be abandoned and removed from the monitoring program.

6.4 Recommendations for Water Level Monitoring Frequency

The frequency of regional groundwater level monitoring will be annually beginning January 2020 in accordance with the SAP. However, groundwater level monitoring at specific sites will continue to be conducted in accordance with frequencies specified in the various site-specific LTMPs as indicated in **Table 1-1**.

6.5 Recommendations for Groundwater Quality Monitoring Frequency

The regional GWET LTMP groundwater quality sampling events have now been conducted seven times since the plan's inception in 2008, with the seventh event occurring in the spring of 2019. The objective of the program is to confirm that the deep overburden plume did not expand beyond its horizontal extent as documented in the Final Groundwater

Investigation Report (HydroQual 2007). The results of the program to date have shown that the horizontal limits of the plume are not expanding, as confirmed with the 2019 event. In consideration that no further deep remedial actions are planned within the Project Area, the sampling frequency for deep overburden and bedrock wells has been changed to every 5 years. This change in sampling frequency was approved by the Plaintiffs in November 2019, on the condition that the intermediate well 087-MW-136D installed in July 2018 is sampled. This well was sampled in May 2019.Results are discussed in Section 5.1 and were reported in the July 23, 2019 Technical Memorandum re: Results of the 2019 Sampling of the LTMP Wells and In-situ Porewater Beneath Riverbed Sediments. The next round of groundwater quality monitoring is scheduled for 2024.

As indicated in previous correspondence, it is recommended that water quality sampling at shallow well 117-MW-I4S be discontinued (Wood memoranda dated February 25, 2019 and March 2, 2020). This well was originally installed in the source area to provide samples for treatability testing and not for long-term monitoring purposes. It is proposed that this well be eliminated from future monitoring since results will likely show similar order of magnitude concentrations in the future, and down-gradient monitoring wells provide data for evaluation of potential migration and protectiveness of the shallow groundwater remedy. The well will remain for water level monitoring until such time that hydraulic gradient issues have been resolved by the Parties.

The frequency of the other groundwater quality monitoring, well selection, and parameters for analysis are established in the site-specific LTMPs and the NJDEP RA Groundwater Permits for the various sub-areas.

Any changes to the monitoring program that differ from the requirements of RA Groundwater Permits will require approval from the NJDEP via permit modification prior to implementation. Following review and approval of the above recommendations by the Parties, Honeywell will submit required permit modifications to the NJDEP for approval prior to proceeding with implementation.

6.6 Other Recommendations

There are no further recommendations.

LIMITATIONS

The work product included in the attached was undertaken in full conformity with generally accepted professional consulting principles and practices and to the fullest extent as allowed by law we expressly disclaim all warranties, express or implied, including warranties of merchantability or fitness for a particular purpose. The work product was completed in full conformity with the contract with our client and this document is solely for the use and reliance of our client (unless previously agreed upon that a third party could rely on the work product) and any reliance on this work product by an unapproved outside party is at such party's risk.

The work product herein (including opinions, conclusions, suggestions, etc.) was prepared based on the situations and circumstances as found at the time, location, scope and goal of our performance and thus should be relied upon and used by our client recognizing these considerations and limitations. Cornerstone shall not be liable for the consequences of any change in environmental standards, practices, or regulations following the completion of our work and there is no warrant to the veracity of information provided by third parties, or the partial utilization of this work product.

TABLES

TABLE 1-1
GROUNDWATER LEVEL MONITORING REQUIREMENTS
for Integrated Groundwater Monitoring Plan

Location	Monitoring Plan	Consent Decree	Depth	Frequency	# Wells
Regional[1]	GWET Long Term Monitoring Plan June 10, 2008	Deep Overburden and Bedrock Groundwater Remedies Consent Order	All Zones	Quarterly through 2019; Annually thereafter	115
Study Area 7	SA-7 Perimeter Pools	Final Judgement, ICO v Honeywell	Shallow	Monthly	2
Study Area 7 - Site 115	SA-6 Long Term Monitoring Plan[4] (February 2018)	Not Applicable	Shallow	Monthly manual readings; logger readings every 6 hours-averaged monthly	6
SA-6 South	SA-6 Long Term Monitoring Plan[4] (February 2018)	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 South	Shallow	Annual manual readings; logger readings every 6 hours-averaged monthly	13
SA-6 North	SA-6 Long Term Monitoring Plan[4] (February 2018)	First Amended Consent Decree Regarding Remediation and Redevelopment of Study Area 6 North	Shallow	Annual manual readings; logger readings every 6 hours-averaged monthly	14
SA-5 (NJCU) Sites 90 & 184	Long Term Monitoring Plan[2] (November 2016)	Consent Decree Regarding Remediation of the New Jersey City University Redevelopment Area	Shallow	Quarterly manual readings; logger readings every 6 hours-averaged monthly	13 wells and 2 sumps
SA-5: Site 079	Long Term Monitoring Plan for Sites 079 and 153 South	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	Quarterly	3
SA-5: Site153	Long Term Monitoring Plan for SA-5 Shallow GW[3]	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	Quarterly	2
SA-5 Site 117	Long Term Monitoring Plan for SA-5 Shallow GW[3]	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	Quarterly	5

[1] Includes available wells on SA-5, SA-6, SA-7, and surrounding areas historically considered part of the Deep Overburden Plume investigation..

[2]SA-5 NJCU LTMP (November 2016; updated May 2019); Shallow Groundwater Monitoring and Extraction System Operation Plan (Appendix L of the LTMP).

[3]Draft LTMP for SA-5 Shallow Groundwater includes Sites 117 and 153 submitted to the Parties for review in 2018; estimated to be finalized 2020.

[4] Recently Honeywell and the Parties have been working to update and revise the SA-6 LTMP. Honeywell anticipates finalizing the LTMP in 2020.

[5]Remedial Action Groundwater Permits were issued in 2018 for the Deep Overbuden; Bedrock; and Shallow groundwater zones at SA-5 Sites 90/184, 117, 153, SA-6 North and South Open Space Cap Areas

TABLE 1-2
GROUNDWATER QUALITY MONITORING REQUIREMENTS
for Integrated Groundwater Monitoring Plan

Location	Monitoring Plan	Consent Decree	Depth	Frequency	# Wells	Estimated Start Date
Regional	Integrated Sampling and Analysis Plan; April 2014, revised October 2019	Deep Overburden and Bedrock Groundwater Remedies Consent Order	Intermediate Deep Bedrock Beneath River	Every 5 years[5] Every 5 years[5] Every 5 years[5] Every 5 years	6 10 9 1	On-going future events TBD
SA-5 (NJCU) Sites 90 & 184	Long Term Monitoring Plan / Shallow Groundwater Monitoring Document[1]	Consent Decree Regarding Remediation of the New Jersey City University Redevelopment Area	Shallow	Quarterly through 2019 Future TBD	8	On-going
SA-5 Site 117	Long Term Monitoring Plan for SA-5 Shallow GW[2]	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	Biennial[2]	5	On-going
SA-5: Site153	Long Term Monitoring Plan for SA-5 Shallow GW[2]	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	Biennial[2]	2	On-going
SA-6 South	SA-6 LTMP (February 2018)[3]	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 South	Shallow	As required by inward gradients across wall	5	On-going
SA-6 North	SA-6 LTMP (February 2018)[3]	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 North	Shallow	As required by inward gradients across wall	5	On-going

Biennial = every two years

[1]SA-5 NJCU LTMP (November 2016, updated May 2019); Shallow Groundwater Monitoring and Extraction System Operation Plan (Appendix L of the LTMP).

[2]Draft LTMP for SA-5 Shallow Groundwater includes Sites 117 and 153 submitted to the Parties for review in 2018; estimated to be finalized in 2020.

[3]Recently Honeywell and the Parties have been working to update and revise the SA-6 LTMP. Honeywell anticipates finalizing the LTMP in 2020.

[4]Remedial Action Groundwater Permits were issued in 2018 for the Deep Overbuden and Bedrock groundwater zones at SA-5 Sites 90/184, 117, 153, SA-6 North and South Open Space Cap Areas

[5]The current frequency in the Remedial Action Groundwater Permits issued in 2018 for the Deep Overbuden and Bedrock groundwater zones is every 2 years, thus a reduced frequency to every 5 years is subject to NJDEP approval via RA GW permit modification.

Table 2-1
2019 Monthly Precipitation Data

Month	2019 Precipitation	Average Precipitation
January	3.79	3.98
February	3.89	2.96
March	4.20	4.21
April	3.77	3.92
May	7.31	4.46
June	6.00	3.4
July	6.82	4.68
August	5.94	4.02
September	1.60	4.01
October	7.26	3.16
November	1.49	3.88
December	6.49	3.57
Annual Total	58.56	46.25

Data Source: http://www.nc-climate.ncsu.edu/cronos/?station=286026&temporal=monthly
Station name: Newark International Airport
Station ID: 286026

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Comments
		(ft msl)	(ft)	(ft)	
087-MW-08	Deep	12.98	99.0	10	
087-MW-34	Deep	12.73	70.0	5	
087-MW-A26T	Deep	9.92	56.0	15	
087-MW-W25T	Deep	18.19	91.0	15	
087-OBS-1L	Deep	15.27	67.1	5	
087-OBS-1T	Deep	15.23	105.0	10	
087-OBS-3L	Deep	12.88	65.0	5	
087-OBS-4T	Deep	11.60	75.5	5	
087-OBS-5T	Deep	12.62	81.9	10	
087-PW-1	Deep	12.66	69.0	10	
088-MW-G19T	Deep	15.09	93.0	15	
090-MW-09	Deep	10.70	75.0	5	
117-MW-D1	Deep	11.08	41.0	10	
117-MW-D2	Deep	17.62	48.0	10	
117-MW-D3	Deep	18.85	80.0	10	
117-MW-I4	Deep	15.49	75.0	10	
119-MW-01T	Deep	10.78	62.0	10	
119-MW-02T	Deep	8.80	70.0	10	
124-MW-106T	Deep	11.20	78.0	10	
153-MW-A13T	Deep	9.34	58.0	15	
SA6-MW-AA1T	Deep	15.31	70.0	10	
087-MW-136D	Intermediate	13.19	36.0	10	Installed July 2018
087-MW-13	Intermediate	12.93	40.0	10	
087-MW-A26D	Intermediate	10.35	28.0	10	
087-MW-O29D	Intermediate	10.32	56.0	NA	
087-MW-W25D	Intermediate	18.17	66.0	10	
087-OBS-07	Intermediate	12.59	30.0	5	
087-OBS-1D	Intermediate	15.13	42.8	10	
087-OBS-2D	Intermediate	12.68	54.0	10	
087-OBS-5D	Intermediate	12.72	39.8	10	
087-PW-2	Intermediate	13.02	48.0	20	
087-PW-3	Intermediate	12.40	50.0	20	
088-MW-15R	Intermediate	14.59	35.0	10	
090-MW-07	Intermediate	16.79	40.0	10	
117-MW-I1	Intermediate	11.08	22.0	10	
117-MW-I2	Intermediate	17.59	28.0	10	
117-MW-I3	Intermediate	15.59	28.0	10	
117-MW-I5	Intermediate	18.76	37.0	15	
124-MW-G02D	Intermediate	9.59	28.0	10	
SA6-MW-AA1D	Intermediate	19.36	32.0	10	

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Comments
		(ft msl)	(ft)	(ft)	
073-MW-1BR	Rock	25.25	144.0	15	
079-MW-13BR-1	Rock	13.08	121.0	10	
079-MW-13BR-2	Rock	13.08	214.0	15	
079-MW-13BR-3	Rock	13.08	284.0	15	
090-MW-7BR-1	Rock	12.66	134.0	15	
090-MW-7BR-2	Rock	12.66	NA	NA	
090-MW-7BR-3	Rock	12.66	NA	NA	
115-MW-203BR	Rock	8.70	162.0	20	
115-MW-215BR	Rock	8.82	143.0	20	
117-MW-3BR-1	Rock	12.34	155.0	15	
117-MW-3BR-2	Rock	12.34	263.0	15	
117-MW-8BR	Rock	12.94	125.0	10	
119-MW-2BR-1	Rock	8.43	163.0	15	
119-MW-2BR-2	Rock	8.43	245.0	15	
119-MW-2BR-3	Rock	8.43	315.0	15	
119-MW-16BR-1	Rock	8.61	151.0	15	
119-MW-16BR-2	Rock	8.61	187.0	15	
119-MW-16BR-3	Rock	8.61	247.0	15	
124-MW-8BR	Rock	9.71	133.0	2	
SA6-MW-5BR-1	Rock	17.06	106.0	15	
SA6-MW-5BR-2	Rock	17.06	154.0	15	
SA6-MW-5BR-3	Rock	17.06	204.0	13	
SA6-MW-5BR-4	Rock	17.06	236.0	15	
SA6-MW-5BR-5	Rock	17.06	281.0	15	
SA6-MW-14BR	Rock	9.99	85.0	10	
SA6-MW-15BR	Rock	8.08	103.0	20	
079-MW-01	Shallow	8.80	NA	NA	
079-MW-A2	Shallow	8.10	13.0	10	
079-MW-C6	Shallow	11.00	13.0	10	
087-PZ-1	Shallow	10.09	11.5	5	Installed June 2016
087-PZ-2	Shallow	13.66	8.0	5	Installed June 2016
087-PZ-3	Shallow	15.93	13.0	5	Installed June 2016
087-PZ-4	Shallow	18.98	12.0	5	Installed June 2016
087-PZ-5	Shallow	22.10	13.0	5	Installed June 2016
087-PZ-6	Shallow	23.94	13.0	5	Installed June 2016
087-PZ-7	Shallow	19.37	26.0	5	Installed June 2016
087-PZ-8	Shallow	19.26	14.0	5	Installed June 2016
087-PZ-9	Shallow	18.12	12.0	5	Installed June 2016
087-PZ-10	Shallow	18.56	12.0	5	Installed June 2016
090-PZ-05	Shallow	17.24	NA	NA	
090-PZ-06	Shallow	17.15	NA	NA	
115-E1A-SO	Shallow	18.97	7.0	NA	Replaced 115-E1A-SO in 2015
115-E2-SO	Shallow	10.05	10.0	NA	
115-E3-SO	Shallow	12.57	NA	NA	

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Comments
		(ft msl)	(ft)	(ft)	
115-E4-SO	Shallow	16.04	NA	NA	
115-E5-SO	Shallow	18.49	19.8	2	
115-PZ-500	Shallow	6.68	NA	NA	
115-PZ-501	Shallow	14.47	NA	NA	
115-PZ-502	Shallow	14.51	16.0	NA	
115-PZ-503	Shallow	7.32	NA	NA	
115-W1-SO	Shallow	12.59	NA	NA	
115-W3-SO	Shallow	15.16	14.0	NA	
115-W5-SO	Shallow	21.28	16.0	2	
115-W6-SO	Shallow	16.96	NA	NA	
117-MW-A05	Shallow	18.48	16.0	NA	
117-MW-A14	Shallow	17.33	17.0	NA	
117-MW-I4S	Shallow	15.49	11.2	NA	
117-MW-A85	Shallow	17.40	15.0	NA	
117-MW-A89	Shallow	13.17	16.0	NA	
117-MW-A99	Shallow	15.95	14.0	NA	
124-MW-10	Shallow	10.06	11.0	8	
124-MW-11	Shallow	9.05	8.0	6	
124-PZ-11	Shallow	15.89	9.5	5	(formerly PZ5-SO) Installed 2015
124-PZ-12	Shallow	15.97	9.5	5	(formerly PZ5-SI) Installed 2015
124-PZ-13	Shallow	16.04	9.5	5	(formerly PZ4-SO) Installed 2015
124-PZ-14	Shallow	16.03	14.1	5	(formerly PZ4-SI) Installed 2015
124-PZ-15	Shallow	14.16	10.1	5	(formerly PZ3-SO) Installed 2015
124-PZ-16	Shallow	18.99	19.6	5	(formerly PZ3-SI) Installed 2015
124-PZ-17	Shallow	18.07	12.0	5	(formerly PZ2-SO) Installed 2015
124-PZ-18	Shallow	18.18	16.2	5	(formerly PZ2-SI) Installed 2015
124-PZ-19	Shallow	17.91	10.4	5	(formerly PZ1-SO) Installed 2015
124-PZ-20	Shallow	18.38	17.3	5	(formerly PZ1-SI) Installed 2015
153-MW-A13	Shallow	9.62	10.0	6	
153-MW-A15	Shallow	11.00	12.2	10	
154-MW-A06	Shallow	19.87	15.1	NA	
154-MW-A5A	Shallow	19.16	14.0	NA	
184-MW-04	Shallow	8.76	NA	NA	
184-MW-05	Shallow	14.79	NA	NA	
184-MW-06	Shallow	17.75	NA	NA	
184-MW-101	Shallow	14.95	13.0	5	
184-MW-102	Shallow	15.88	12.0	5	
184-MW-103	Shallow	15.96	14.0	5	
184-MW-104	Shallow	16.46	13.0	5	
184-MW-105	Shallow	15.10	NA	5	
184-MW-106	Shallow	15.47	NA	5	
184-MW-107	Shallow	15.90	NA	5	
184-MW-108	Shallow	16.61	NA	5	
Sump A	Shallow	15.98	NA	NA	
Sump B	Shallow	13.06	NA	NA	

Table 3-1

GWET Pumping Outages in 2019

Well ID	Start Date	End Date	Duration Days and	Hours	Comment
087-PW-1	21-Feb-19	21-Feb-19		8.00	Sulfuric acid pump failure
087-MW-215BR	21-Feb-19	21-Feb-19		8.00	Sulfuric acid pump failure
087-PW-3	21-Feb-19	21-Feb-19		8.00	Sulfuric acid pump failure
087-PW-1	26-Feb-19	27-Feb-19		8.00	High tank sulfic acid pump issues
087-MW-215BR	26-Feb-19	27-Feb-19		8.00	High tank sulfic acid pump issues
087-PW-3	26-Feb-19	27-Feb-19		8.00	High tank sulfic acid pump issues

TABLE 4-1
GROUNDWATER ELEVATION DATA FROM QUARTERLY ROUNDS IN 2019

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-19	Jun-19	Sep-19	Nov-19
		(ft msl)	(ft)	(ft)	(ft msl)	(ft msl)	(ft msl)	(ft msl)
087-MW-08	Deep	12.98	99	10	1.09	1.50	1.11	0.80
087-MW-34	Deep	12.73	70	5	-0.44	-0.02	-0.54	-0.75
087-MW-A26T	Deep	9.92	56	15	3.54	4.03	2.86	2.95
087-MW-W25T	Deep	19.06	91	15	1.61	1.86	1.51	1.42
087-OBS-1L	Deep	15.27	67.05	5	2.37	1.77	1.93	1.10
087-OBS-1T	Deep	15.23	105	10	1.40	1.81	1.77	1.25
087-OBS-3L	Deep	12.88	65	5	1.02	1.26	0.44	0.02
087-OBS-4T	Deep	11.6	75.5	5	1.05	1.46	0.67	0.54
087-OBS-5T	Deep	12.62	81.9	10	-0.07	0.39	-0.08	-0.26
087-PW-1	Deep	12.66	69	10	-33.56	-33.43	-35.63	-35.13
088-MW-G19T	Deep	15.085	93	15	3.02	2.80	3.04	2.67
090-MW-09	Deep	10.81	75	5	6.20	5.30	5.20	5.35
117-MW-D1	Deep	11.08	41	10	3.58	3.70	3.19	3.08
117-MW-D2	Deep	17.62	48	10	5.20	5.25	4.75	4.42
117-MW-D3	Deep	18.85	80	10	6.30	6.47	5.58	5.57
117-MW-I4	Deep	15.49	75	10	4.61	4.81	4.57	4.66
119-MW-01T	Deep	10.78	62	10	3.55	3.33	2.57	2.77
119-MW-02T	Deep	8.8	70	10	3.28	3.41	2.50	2.80
124-MW-106T	Deep	11.203	78	10	3.05	2.90	3.36	3.23
153-MW-A13T	Deep	9.34	58	15	4.63	1.67	2.74	2.84
SA6-MW-AA1T	Deep	15.31	70	10	1.17	4.15	0.86	0.95
087-MW-136D	Intermediate	13.19	36	10	NA	2.05	1.29	NA
087-MW-13	Intermediate	12.93	40	10	1.42	1.33	0.60	-0.95
087-MW-A26D	Intermediate	10.35	28	10	3.63	4.11	2.89	3.97
087-MW-O29D	Intermediate	10.32	56	N/A	1.52	1.89	1.42	1.14
087-MW-W25D	Intermediate	16.98	66	10	1.78	1.87	1.91	1.68
087-OBS-07	Intermediate	12.59	30	5	-0.65	0.17	-0.38	0.94
087-OBS-1D	Intermediate	15.13	42.8	10	2.05	2.19	1.69	1.59
087-OBS-2D	Intermediate	12.68	54	10	-1.80	-1.41	-1.75	-1.97
087-OBS-5D	Intermediate	12.72	39.83	10	0.00	0.48	0.19	0.36
087-PW-2	Intermediate	13.02	48	20	0.86	1.80	1.20	3.06
087-PW-3	Intermediate	12.4	50	20	-6.75	-6.00	-6.59	-5.40
088-MW-15R	intermediate	14.593	35	10	3.09	3.42	2.37	2.42
090-MW-07	Intermediate	16.79	40	10	6.52	6.67	5.87	5.78
117-MW-I1	Intermediate	11.08	22	10	4.93	4.57	4.46	4.49
117-MW-I2	Intermediate	17.59	28	10	6.03	5.72	4.85	4.61
117-MW-I3	Intermediate	15.59	28	10	5.67	5.67	4.74	4.66
117-MW-I5	Intermediate	18.76	37	15	6.86	6.92	6.26	6.04
124-MW-G02D	Intermediate	9.59	28	10	3.00	3.16	2.53	2.54
SA6-MW-AA1D	Intermediate	19.36	32	10	1.15	1.70	0.98	1.07
073-MW-1BR	Rock	25.27	144	15	-1.93	-1.77	-0.34	-0.12
079-MW-13BR-1	Rock	13.08	121	10	7.81	7.97	7.09	7.31
079-MW-13BR-2	Rock	13.08	214	15	8.14	8.35	7.14	7.74
079-MW-13BR-3	Rock	13.08	284	15	8.16	8.36	7.09	7.62
090-MW-7BR-1	Rock	12.66	134	15	1.12	1.07	0.27	0.41
090-MW-7BR-2	Rock	12.66	N/A	N/A	1.25	1.34	0.59	0.65
090-MW-7BR-3	Rock	12.66	N/A	N/A	1.36	1.50	0.70	0.74
115-MW-203BR	Rock	8.7	162	20	-1.88	-1.60	-0.42	-0.12
115-MW-215BR	Rock	8.82	143	20	-2.65	-3.54	-3.78	-3.99
117-MW-3BR-1	Rock	12.34	155	15	6.03	6.25	5.42	5.39
117-MW-3BR-2	Rock	12.34	263	15	6.86	6.84	6.07	6.17
117-MW-8BR	Rock	12.94	125	10	6.02	6.24	5.55	5.57
119-MW-2BR-1	Rock	8.43	163	15	-1.34	-0.61	-1.50	-1.00
119-MW-2BR-2	Rock	8.43	245	15	-0.21	-0.41	-0.40	-0.84
119-MW-2BR-3	Rock	8.43	315	15	0.06	0.33	-0.03	-0.16
119-MW-16BR-1	Rock	8.61	151	15	4.92	5.30	4.64	4.80
119-MW-16BR-2	Rock	8.61	187	15	4.81	5.08	4.44	4.32
119-MW-16BR-3	Rock	8.61	247	15	5.16	5.56	4.56	5.47
124-MW-8BR	Rock	9.71	133	N/A	4.12	4.22	4.18	3.84
SA6-MW-5BR-1	Rock	17.06	106	15	2.20	2.70	1.99	2.07
SA6-MW-5BR-2	Rock	17.06	154	15	3.08	3.45	2.72	2.72
SA6-MW-5BR-3	Rock	17.06	204	13	3.51	3.86	3.26	3.29
SA6-MW-5BR-4	Rock	17.06	236	15	3.65	3.86	3.14	3.15
SA6-MW-5BR-5	Rock	17.06	281	15	3.66	3.99	3.16	3.34
SA6-MW-14BR	Rock	9.99	85	10	3.52	3.95	3.18	3.32
SA6-MW-15BR	Rock	8.08	103	20	1.08	1.99	1.22	1.27

TABLE 4-1
GROUNDWATER ELEVATION DATA FROM QUARTERLY ROUNDS IN 2019

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-19	Jun-19	Sep-19	Nov-19
079-MW-01	Shallow	8.8	N/A	N/A	4.31	4.80	3.47	3.28
079-MW-A2	Shallow	8.1	13	10	3.71	4.12	2.97	3.00
079-MW-C6	Shallow	11	13	10	5.47	5.39	4.08	4.93
087-PZ-1	Shallow	10.04	10.76	5	4.83	5.83	3.09	3.81
087-PZ-2	Shallow	10.35	11.88	5	4.04	4.71	3.78	3.54
087-PZ-3	Shallow	13.28	14.32	5	5.48	6.03	3.87	4.21
087-PZ-4	Shallow	13.65	14.89	5	4.08	4.18	3.55	3.45
087-PZ-5	Shallow	19.49	20.43	5	6.05	6.86	4.47	5.10
087-PZ-6	Shallow	21.04	22.28	5	3.56	3.89	3.81	3.50
087-PZ-7	Shallow	16.24	22	5	6.35	6.87	4.97	5.69
087-PZ-8	Shallow	16.54	17.58	5	3.35	3.82	3.70	3.94
087-PZ-9	Shallow	17.19	18.96	5	2.68	3.11	2.38	2.69*
087-PZ-10	Shallow	17.06	18.58	5	3.70	4.58	3.80	4.16
090-PZ-05	Shallow	17.26	N/A	N/A	7.81	7.73	6.37	6.53
090-PZ-06	Shallow	17.18	N/A	N/A	9.68	9.41	9.38	8.85
115-E1A-SO	Shallow	21.53	7	N/A	2.47	4.34	3.47	3.46
115-E2-SO	Shallow	10.05	10	N/A	6.79	7.20	6.30	6.05
115-E3-SO	Shallow	12.57	N/A	N/A	7.08	7.09	6.55	6.36
115-E4-SO	Shallow	16.04	13.17	N/A	4.12	3.95	3.40	3.21
115-E5-SO	Shallow	18.49	19.8	N/A	4.71	5.18	3.71	4.12
115-PZ-500	Shallow	6.68	N/A	N/A	4.85	4.94	4.29	4.82
115-PZ-501	Shallow	14.47	N/A	N/A	6.26	6.35	4.48	4.73
115-PZ-502	Shallow	14.51	16	N/A	5.63	5.58	4.30	4.48
115-PZ-503	Shallow	7.32	N/A	N/A	4.89	4.91	4.21	4.71
115-W1-SO	Shallow	23.08	N/A	N/A	3.10	3.73	3.70	3.91
115-W3-SO	Shallow	15.16	13.93	N/A	2.77	3.49	3.66	3.70
115-W5-SO	Shallow	24.45	16	N/A	2.44	4.39	3.50	3.64
115-W6-SO	Shallow	16.96	N/A	N/A	6.02	4.00	3.71	3.95
117-MW-A05	Shallow	18.48	16	N/A	7.67	7.75	NA	6.54
117-MW-A14	Shallow	17.33	17	N/A	5.68	5.82	4.94	4.82
117-MW-A85	Shallow	17.4	15	N/A	5.30	5.59	5.10	NA
117-MW-A89	Shallow	13.17	16	N/A	4.97	5.12	4.08	4.24
117-MW-A99	Shallow	15.95	14	N/A	6.05	6.15	5.64	5.33
117-MW-I4S	Shallow	15.49	N/A	N/A	6.35	6.37	5.69	5.53
124-MW-10	Shallow	10.06	11	8	5.27	5.18	4.81	4.93
124-MW-11	Shallow	9.05	8	6	5.16	5.05	4.11	4.50
124-PZ-11	Shallow	9.69	9.02	5	6.75	7.11	5.52	6.53
124-PZ-12	Shallow	10.63	9.86	5	4.66	5.07	4.60	4.35
124-PZ-13	Shallow	10.62	9.76	5	7.83	7.94	5.50	6.38
124-PZ-14	Shallow	15.15	14.29	5	3.00	4.64	3.51	3.52
124-PZ-15	Shallow	13.34	14.43	5	6.90	5.85	4.80	5.40
124-PZ-16	Shallow	17.7	18.36	5	2.81	4.23	3.60	3.75
124-PZ-17	Shallow	15.15	17.02	5	5.50	5.81	3.81	4.30
124-PZ-18	Shallow	18.13	19.73	5	1.92	4.19	3.43	3.47
124-PZ-19	Shallow	15.38	17.22	5	2.70	2.84	4.29	3.29*
124-PZ-20	Shallow	18.18	19.86	5	1.28	4.05	3.66	3.39
153-MW-A13	Shallow	9.62	10	6	4.16	4.11	4.23	3.38
153-MW-A15	Shallow	11	12.15	10	N/A	3.12	N/A	N/A
154-MW-A06	Shallow	19.87	15.12	N/A	13.52	13.84	11.56	12.99
154-MW-A5A	Shallow	19.16	14	N/A	12.13	12.39	11.29	11.53
184-MW-04	Shallow	8.76	N/A	N/A	3.67	3.74	3.51	3.57
184-MW-05	Shallow	14.71	N/A	N/A	6.20	5.33	5.09	5.40
184-MW-06	Shallow	17.69	N/A	N/A	8.76	8.97	8.11	7.62
184-MW-101	Shallow	14.85	13	5	6.47	6.94	49.80	5.89
184-MW-102	Shallow	15.66	12	5	6.80	6.90	5.88	6.17
184-MW-103	Shallow	15.85	14	5	6.88	7.07	5.89	6.14
184-MW-104	Shallow	16.35	13	5	7.16	7.35	6.47	6.63
184-MW-105	Shallow	15.1	12.12	5	6.01	6.30	5.59	5.56
184-MW-106	Shallow	15.47	13.9	5	6.51	6.77	5.46	5.68
184-MW-107	Shallow	15.89	11.22	5	6.91	7.06	5.89	6.17
184-MW-108	Shallow	16.61	14.78	5	7.35	7.46	6.37	6.61
SUMP A	Shallow	15.98	N/A	N/A	6.13	6.28	5.67	N/A
SUMP B	Shallow	13.08	N/A	N/A	4.88	4.98	4.75	4.97

* 24-Hour average value used from data loggers for 087-PZ-9 and 124-PZ-19

Table 4-2
Summary of Groundwater Elevations Near NJCU
2019

Ref. Point Survey Date	As of Jan. 2019 Ref. pt.* ft, msl	03/29/19		06/27/19		09/30/19		11/26/19	
		Depth to GW (ft,)	GW Elev. (ft., msl)	Depth to GW (ft,)	GW Elev. (ft., msl)	Depth to GW (ft,)	GW Elev. (ft., msl)	Depth to GW (ft,)	GW Elev. (ft., msl)
Location									
079-MW-A02	8.10	4.39	3.71	3.98	4.12	5.13	2.97	5.10	3.00
Sump A	15.98	9.85	6.13	9.7	6.28	10.31	5.67	NA	NA
Sump B	13.08	8.2	4.88	8.10	4.98	8.33	4.75	8.11	4.97
090-PZ-5	18.08	10.14	7.94	10.22	7.86	11.58	6.50	11.42	6.66
090-PZ-6	18.20	8.68	9.52	8.95	9.25	8.98	9.22	9.51	8.69
184-MW-4	8.70	5.09	3.61	5.02	3.68	5.25	3.45	5.19	3.51
184-MW-5	14.71	8.51	6.20	8.38	6.33	9.62	5.09	9.31	5.40
184-MW-6	18.75	9.99	8.76	9.78	8.97	10.64	8.11	11.13	7.62
090-MW-09	10.81	4.61	6.20	5.51	5.30	5.61	5.20	5.46	5.35
090-MW-07	17.20	10.94	6.26	10.79	6.41	11.59	5.61	11.68	5.52
117-MW-I4S	16.70	10.35	6.35	10.33	6.37	11.01	5.69	11.17	5.53
117-MW-I5	18.76	11.90	6.86	11.84	6.92	12.50	6.26	12.72	6.04
184-MW-101	14.85	8.38	6.47	8.01	6.84	9.87	4.98	8.96	5.89
184-MW-102	15.66	8.86	6.80	8.76	6.90	9.78	5.88	9.49	6.17
184-MW-103	15.85	8.97	6.88	8.78	7.07	9.96	5.89	9.71	6.14
184-MW-104	16.35	9.19	7.16	9.00	7.35	9.88	6.47	9.72	6.63
184-MW-105	15.10	9.09	6.01	8.80	6.30	9.51	5.59	9.54	5.56
184-MW-106	15.47	8.96	6.51	8.70	6.77	10.01	5.46	9.79	5.68
184-MW-107	15.89	8.98	6.91	8.83	7.06	10.01	5.88	9.72	6.17
184-MW-108	16.61	9.26	7.35	9.15	7.46	10.24	6.37	10	6.61

NA - Not available

* NGVD29 site datum

Table 4-3
Monthly Average Heads and Gradients Across Barrier Walls - NJCU

	184-MW-101/184-MW-105			184-MW-106/184-MW-102		
	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)
Month	184-MW-101	184-MW-105		184-MW-106	184-MW-102	
January	6.61	5.89	0.72	6.38	6.73	**-0.35**
February	6.53	5.78	0.75	6.21	6.63	**-0.42**
March	6.84	5.95	0.89	6.58	6.94	**-0.36**
April	6.34	5.96	0.38	6.21	6.65	**-0.44**
May	6.81	6.17	0.64	6.53	6.92	**-0.39**
June	6.96	6.32	0.64	6.68	7.02	**-0.34**
July	6.23	6.22	**0.01**	6.44	6.70	**-0.26**
August	6.18	6.20	**-0.02**	6.33	6.55	**-0.22**
September	5.28	5.87	**-0.59**	5.78	6.17	**-0.39**
October	5.51	5.57	**-0.06**	5.65	6.00	**-0.35**
November	5.67	5.59	**0.08**	5.80	6.12	**-0.32**
December	6.30	5.58	0.72	6.13	6.36	**-0.23**

1. Average monthly head from data logger
2. Average monthy gradient across barrier wall. Bold values do not meet the LTMP definition of inward gradient (>0.1 ft)

Table 4-3
Monthly Average Heads and Gradients Across Barrier Walls - NJCU

	184-MW-103/184-MW-107			184-MW-104/184-MW-108		
	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)
Month	184-MW-103	184-MW-107		184-MW-104	184-MW-108	
January	6.84	6.80	**0.04**	7.12	7.17	**-0.05**
February	6.71	6.72	**-0.01**	7.00	7.05	**-0.05**
March	7.11	7.14	**-0.03**	7.33	7.45	**-0.12**
April	6.61	6.67	**-0.06**	6.93	7.13	**-0.20**
May	6.92	7.05	**-0.13**	7.22	7.37	**-0.15**
June	7.04	7.13	**-0.09**	7.32	7.45	**-0.13**
July	6.79	6.65	0.14	7.15	7.02	0.13
August	6.71	6.75	**-0.04**	7.07	7.12	**-0.05**
September	6.18	6.17	**0.01**	6.72	6.61	0.11
October	6.08	6.01	**0.07**	6.63	6.53	0.10
November	6.20	6.22	**-0.02**	6.65	6.64	**0.01**
December	6.55	6.61	**-0.06**	6.97	6.94	**0.03**

1. Average monthly head from data logger
2. Average monthy gradient across barrier wall. Bold values do not meet the LTMP definition of inward gradient (>0.1 ft)

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA6

	087-PZ-1/087-PZ-2			087-PZ-3/087-PZ-4		
	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)
Month	PZ-1	PZ-2		PZ-3	PZ-4	
January	5.51	4.33	1.18	5.26	3.75	1.51
February	4.99	3.23	1.76	5.09	3.70	1.39
March	5.53	3.88	1.65	5.48	4.25	1.23
April	4.51	4.10	0.41	4.75	3.92	0.83
May	5.16	4.59	0.57	5.33	4.22	1.11
June	5.48	4.47	1.01	5.77	3.99	1.78
July	5.01	4.55	0.46	5.70	4.00	1.70
August	4.73	4.81	**-0.08**	5.52	4.18	1.34
September	3.71	4.11	**-0.40**	4.66	4.03	0.63
October	3.70	3.49	0.21	3.85	3.60	0.25
November	4.27	3.62	0.65	4.39	3.58	0.81
December	5.32	3.94	1.38	4.87	4.08	0.79

1. Average monthly head from data logger
2. Average monthy gradient across barrier wall. Bold values do not meet the LTMP definition of inward gradient (>0.1 ft)

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA6

	087-PZ-5/087-PZ-6			087-PZ-7/087-PZ-8		
	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)
Month	PZ-5	PZ-6		PZ-7	PZ-8	
January	6.57	4.22	2.35	6.27	2.48	3.79
February	6.36	3.59	2.77	6.19	2.76	3.43
March	6.44	3.68	2.76	6.39	2.98	3.41
April	5.77	3.67	2.10	5.96	3.15	2.81
May	6.53	3.91	2.62	6.61	3.37	3.24
June	6.50	3.91	2.59	6.62	3.73	2.89
July	6.09	3.96	2.13	5.67	3.95	1.72
August	5.87	4.22	1.65	5.64	3.81	1.83
September	4.87	4.13	0.74	5.51	3.45	2.06
October	4.72	3.68	1.04	5.36	3.74	1.62
November	5.30	3.43	1.87	6.05	3.56	2.49
December	5.87	3.51	2.36	6.77	3.68	3.09

1. Average monthly head from data logger
2. Average monthy gradient across barrier wall. Bold values do not meet the LTMP definition of inward gradient (>0.1 ft)

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA6

	087-PZ-9/087-PZ-10			124-PZ-11/124-PZ-12		
	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)
Month	PZ-9	PZ-10		PZ-11	PZ-12	
January	2.74	2.99	**-0.25**	6.59	4.40	2.19
February	2.44	3.24	**-0.80**	6.93	5.11	1.82
March	2.80	3.74	**-0.94**	7.08	5.13	1.95
April	2.63	3.56	**-0.93**	6.81	4.30	2.51
May	3.09	4.25	**-1.16**	7.14	4.48	2.66
June	3.09	4.34	**-1.25**	7.09	4.86	2.23
July	3.01	4.32	**-1.31**	6.90	5.20	1.70
August	3.14	4.09	**-0.95**	7.04	5.51	1.53
September	2.71	3.83	**-1.12**	6.35	4.97	1.38
October	2.57	3.90	**-1.33**	5.94	4.11	1.83
November	2.68	4.38	**-1.70**	6.91	4.38	2.53
December	2.74	4.88	**-2.14**	7.47	4.41	3.06

1. Average monthly head from data logger
2. Average monthy gradient across barrier wall. Bold values do not meet the LTMP definition of inward gradient (>0.1 ft)

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA6

	124-PZ-13/124-PZ-14			124-PZ-15/124-PZ-16		
	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)
Month	PZ-13	PZ-14		PZ-15	PZ-16	
January	8.05	4.39	3.66	6.74	4.07	2.67
February	8.56	4.48	4.08	6.55	4.20	2.35
March	8.44	3.74	4.70	6.90	3.52	3.38
April	7.41	2.96	4.45	6.57	2.50	4.07
May	7.90	3.73	4.17	6.96	3.14	3.82
June	7.78	4.30	3.48	6.75	3.99	2.76
July	7.12	4.76	2.36	6.26	4.58	1.68
August	7.20	5.04	2.16	6.21	4.93	1.28
September	6.22	3.60	2.62	5.41	3.81	1.60
October	5.80	3.60	2.20	5.01	3.66	1.35
November	6.75	4.08	2.67	5.73	4.08	1.65
December	7.73	3.07	4.66	6.45	2.96	3.49

1. Average monthly head from data logger
2. Average monthy gradient across barrier wall. Bold values do not meet the LTMP definition of inward gradient (>0.1 ft)

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA6

	124-PZ-17/124-PZ-18			124-PZ-19/124-PZ-20		
	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)
Month	PZ-17	PZ-18		PZ-19	PZ-20	
January	5.37	3.96	1.41	3.20	3.61	**-0.41**
February	5.20	4.43	0.77	2.89	4.18	**-1.29**
March	5.49	1.83	3.66	3.18	2.97	0.21
April	5.13	1.94	3.19	2.88	1.46	1.42
May	5.74	3.14	2.60	3.09	2.87	0.22
June	5.66	3.99	1.67	3.24	3.89	**-0.65**
July	5.16	4.59	0.57	3.25	4.60	**-1.35**
August	5.16	4.96	0.20	3.33	4.97	**-1.64**
September	4.35	3.69	0.66	3.25	3.73	**-0.48**
October	4.10	3.70	0.40	3.55	3.74	**-0.19**
November	4.48	4.00	0.48	3.22	3.96	**-0.74**
December	5.05	2.24	2.81	3.32	1.86	1.46

1. Average monthly head from data logger
2. Average monthy gradient across barrier wall. Bold values do not meet the LTMP definition of inward gradient (>0.1 ft)

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA6

	115-PZ-500/115-W3-SO			115-PZ-501/115-E1A-SO		
	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)
Month	115-PZ-500	115-W3-SO		115-PZ-501	115-E1A-SO	
January	NA	NA	NA	NA	NA	NA
February	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA
June	4.83	3.60	1.23	6.38	4.38	2.00
July	4.71	4.04	0.67	5.80	4.57	1.23
August	4.62	4.56	**0.06**	5.49	4.69	0.80
September	4.36	3.95	0.41	4.88	3.43	1.45
October	4.38	3.65	0.73	4.61	3.63	0.98
November	4.39	3.78	0.61	4.98	3.87	1.11
December	4.64	2.87	1.77	5.46	2.97	2.49

1. Average monthly head from data logger
2. Average monthy gradient across barrier wall. Bold values do not meet the LTMP definition of inward gradient (>0.1 ft)
3. NA - Data not available, loggers not recording until June.

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA6

	115-PZ-501/115-W5-SO			115-PZ-502/115-E4-SO		
	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)
Month	115-PZ-501	115-W5-SO		115-PZ-502	115-E4-SO	
January	NA	NA	NA	NA	NA	NA
February	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA
June	6.38	5.12	1.26	5.63	NA	NA
July	5.80	5.25	0.55	5.34	NA	NA
August	5.49	4.96	0.53	4.92	NA	NA
September	4.88	3.58	1.30	4.42	3.63	0.79
October	4.61	3.69	0.92	4.47	3.35	1.12
November	4.98	3.98	1.00	4.64	3.23	1.41
December	5.46	3.06	2.40	5.05	3.76	1.29

1. Average monthly head from data logger
2. Average monthy gradient across barrier wall. Bold values do not meet the LTMP definition of inward gradient (>0.1 ft)
3. NA - Data not available, loggers not recording until June.

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA6

	115-PZ-502/115-E5-SO			115-PZ-503/115-W6-SO		
	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)
Month	115-PZ-502	115-E5-SO		115-PZ-503	115-W6-SO	
January	NA	NA	NA	NA	NA	NA
February	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA
June	5.63	NA	NA	4.97	4.06	0.91
July	5.34	4.61	0.73	4.78	4.06	0.72
August	4.92	4.87	**0.05**	4.62	3.95	0.67
September	4.42	NA	NA	4.34	3.83	0.51
October	4.47	3.85	0.62	4.25	3.79	0.46
November	4.64	4.48	0.16	4.34	3.96	0.38
December	5.05	5.18	**-0.13**	4.62	4.17	0.45

1. Average monthly head from data logger
2. Average monthy gradient across barrier wall. Bold values do not meet the LTMP definition of inward gradient (>0.1 ft)
3. NA - Data not available, loggers not recording until June.

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA6

	115-PZ-503/115-W1-SO		
	Exterior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Interior Piezometer/Monitoring Well Average Head Groundwater Elevation (ft. msl)	Average Gradient (ft)
Month	115-PZ-503	115-W1-SO	
January	NA	NA	NA
February	NA	NA	NA
March	NA	NA	NA
April	NA	NA	NA
May	NA	NA	NA
June	4.97	3.83	1.14
July	4.78	3.95	0.83
August	4.62	3.96	0.66
September	4.34	3.55	0.79
October	4.25	3.66	0.59
November	4.34	3.85	0.49
December	4.62	3.98	0.64

1. Average monthly head from data logger
2. Average monthy gradient across barrier wall. Bold values do not meet the LTMP definition of inward gradient (>0.1 ft)
3. NA - Data not available, loggers not recording until June.

Table 5-1
Summary of Groundwater Quality Data From Regional LTMP Sampling

Well ID	Date Sampled	Hexavalent Chromium (PPM)	Total Chromium (PPM)	Hexavalent Chromium (PPM)	Total Chromium (PPM)
		unfiltered		filtered	
Intermediate Zone					
087-MW-W25D	5/2/2019	0.0055 U	0.0491	0.0055 U	0.01 U
087-MW-A26D	5/1/2019	0.0055 U	0.0189	0.0055 U	0.01 U
117-MW-I1	5/1/2019	0.0055 U	0.021	0.0055 U	0.014
117-MW-I5	4/30/2019	0.14	0.16	0.12	0.147
SA6-MW-AA1D	4/29/2019	0.0055 U	0.01 U	0.0055 U	0.01 U
087-MW-136D	5/2/2019	0.0055 U	0.0413	0.0055 U	0.035
6					
Deep Zone					
087-MW-W25T	5/2/2019	0.0055 U	0.0314	0.0055 U	0.0104
087-MW-A26T	5/1/2019	0.0055 U	0.0233	0.0055 U	0.01 U
117-MW-D3	4/29/2019	0.0055 U	0.0662	0.0055 U	0.01 U
119-MW-01T	5/1/2019	0.026	0.14	0.028	0.0347
119-MW-02T	5/1/2019	0.062	0.141	0.057	0.0867
124-MW-106T	5/2/2019	0.0055 U	0.11	0.0055 U	0.0149
SA6-MW-AA1T	5/2/2019	0.0055 U	0.01 U	0.0055 U	0.01 U
090-MW-09	4/30/2019	1,940.00	2,240.00	2,240.00	2,520.00
117-MW-I4	4/30/2019	6,080.00	6,550.00	6,010.00	6,340.00
117-MW-D2	4/30/2019	0.0055 U	0.0122	0.0055 U	0.01 U
10					
Upper Bedrock Zone					
079-MW-13BR	5/1/2019	0.0055 U	0.01 U	0.0055 U	0.01 U
117-MW-8BR	4/30/2019	0.0055 U	0.01 U	0.0055 U	0.01 U
119-MW-2BR-1	4/30/2019	0.0055 U	0.01 U	0.0055 U	0.01 U
119-MW-16BR-2	5/1/2019	0.0055 U	0.01 U	0.0055 U	0.01 U
124-MW-8BR	5/2/2019	0.0055 U	0.0257	0.0055 U	0.01 U
SA6-MW-14BR	4/29/2019	0.0055 U	0.01 U	0.0055 U	0.01 U
SA6-MW-15BR	4/29/2019	0.0055 U	0.0188	0.0055 U	0.01 U
115-MW-203BR	6/6/2019	0.0055 U	0.304	0.0055 U	0.01 U
090-MW-7BR	5/1/2019	139	106	122	891
9					

U=Not detected

Table 5-2
Summary of Groundwater Quality Data from GWET Extraction Wells

Parameter	29-Mar-19			27-Jun-19			30-Sep-19			11-Dec-19		
	PW-1 (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)	**PW-1** (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)	**PW-1** (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)	**PW-1** (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)
Benzene	1.6	7.8	ND	1.5	8.7	ND	1.6	7.3	ND	1.4	5	ND
Carbon Tetrachloride	2.9	5.1	2.1	2.6	9.9	2.4	3.2	8.9	3.5	2.9	5.2	1.9
Chloroform	11.8	25.8	ND	12.4	28.7	ND	12.4	18.5	ND	10.7	12.3	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	63.1	68.2	ND	59.8	75.5	ND	65.4	68.8	ND	61.1	50.6	ND
trans-1,2-Dichloroethene	2.1	1.1	ND	2	1.6	ND	2.1	1.5	ND	2.2	1	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	50.1	78.3	ND	44.8	98.8	ND	48.1	81.1	ND	45.1	54.5	ND
1,1-Dichloroethane	0.82	ND	ND	0.91	ND	ND	1.4	ND	ND	1.1	ND	ND
Methylene chloride	ND	0.72	ND	ND	0.78	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	12.3	13.2	ND	9.9	21.2	ND	14.7	18.9	ND	12.4	8.7	ND
1,2-Dichlorobenzene	0.52	ND	ND	0.44	ND	ND	0.51	ND	ND	0.47	ND	ND
Chlorobenzene	0.32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexavalent Chromium	19,800	26,400	11,200	19,000	24,300	12,500	19,400	24,500	14,800	17,800	21,600	10,000
Total Chromium	18,900	24,000	12,100	20,400	27,400	12,800	20,700	27,300	15,600	20,500	25,500	11,700

ND = Not detected above reporting limit.
J = Estimated Value
PW-3 replaced PW-2 in start of 2016

Table 5-3
Summary of Groundwater Quality Monitoring Result - SA-6 and SA-7

Sample Location	Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
087-PZ-02	9/10/2019	10 U	10 U	5.5 UJ	5.5 UJ
	10/24/2019	11.8	10 U	5.5 UJ	5.5 U
087-PZ-04	1/28/2019	10 U	10 U	5.5 UJ	5.5 UJ
087-PZ-06	1/28/2019	10 U	10 U	5.5 UJ	5.5 UJ
087-PZ-10	1/28/2019	10 U	10 U	5.5 UJ	5.5 UJ
	2/28/2019	10 U	10 U	5.5 U	5.5 UJ
	4/18/2019	10 U	10 U	5.5 U	5.5 U
	7/24/2019	10 U	10 U	5.5 U	5.5 UJ
	10/24/2019	10 U	10 U	5.5 UJ	5.5 U
124-PZ-20	2/28/2019	16.1	10 U	5.5 U	5.5 UJ
	4/18/2019	10 U	10 U	5.5 U	5.5 U
	7/24/2019	10 U	5.5 UJ	10 U	5.5 U
	10/24/2019	29.6	10 U	5.5 UJ	5.5 U

BOLD Exceeds Groundwater Quality Standard 70 ug/l

U - Not detected above reporting limit

J - Estimated value

Table 5-4
Summary of Groundwater Quality Monitoring Results - NJCU

Sample Location	Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
184-MW-101	3/4/2019	4.5	4.0 U	5.5 U	5.5 U
	6/14/2019	4.0 U	4.0 U	5.5 U	5.5 U
	9/5/2019	4.0 U	4.0 U	5.5 UJ	5.5 UJ
	12/5/2019	4.7	4.0 U	5.5 U	5.5 UJ
184-MW-102	3/4/2019	45.1	6.4	5.5 U	5.5 U
	6/13/2019	26.7	5.2	5.5 U	5.5 U
	9/4/2019	15.9	5.1	5.5 UJ	5.5 UJ
	12/5/2019	13.8	5.7	5.5 U	5.5 UJ
184-MW-103	3/4/2019	34.2	28.9	35 J	34 J
	6/13/2019	34.7	28.1	29	27
	9/4/2019	11.3	4.0 U	5.5 UJ	5.5 UJ
	12/4/2019	20.2	4.0 U	5.5 UJ	5.5 UJ
184-MW-104	3/5/2019	4.0 U	4.0 U	5.5 U	5.5 U
	6/14/2019	4.0 U	4.0 U	5.5 U	5.5 U
	9/4/2019	4.0 U	4.0 U	5.5 UJ	5.5 UJ
	12/4/2019	4.0 U	4.0 U	5.5 UJ	5.5 UJ
184-MW-105	3/4/2019	4.0 U	4.0 U	5.5 U	5.5 U
	6/14/2019	4.0 U	4.0 U	5.5 U	5.5 U
	9/5/2019	4.0 U	4.0 U	5.5 UJ	5.5 UJ
	12/5/2019	4.0 U	4.0 U	5.5 U	5.5 UJ
184-MW-106	3/4/2019	7.2	5.1	5.5 U	5.5 U
	6/13/2019	5.7	5	5.5 U	5.5 U
	9/4/209	6.5	6	5.5 UJ	5.5 UJ
	12/4/2019	6.8	6.5	5.5 UJ	5.5 UJ
184-MW-107	3/5/2019	40.7	4.0 U	5.5 U	5.5 U
	3/5/2019 DUP	36	4.0 U	5.5 U	5.5 U
	6/13/2019	**136**	4.0 U	5.5 U	5.5 U
	6/13/2019 DUP	**715**	4.0 U	5.5 U	5.5 U
	9/4/2019	**95.7**	4.0 U	5.5 UJ	5.5 UJ
	9/4/2019 DUP	**76.3 J**	8.0 UJ	5.5 UJ	5.5 UJ
	12/4/2019	49	4 U	5.5 UJ	5.5 UJ
	12/4/2019 DUP	34.5	4 U	5.5 UJ	5.5 UJ
184-MW-108	3/5/2019	4.5	4.0 U	5.5 U	5.5 U
	6/14/2019	16.9	4.0 U	5.5 U	5.5 U
	9/4/2019	8.0 UJ	8.0 UJ	5.5 UJ	5.5 UJ
	12/4/2019	5.3	4.0 U	5.5 UJ	5.5 UJ

BOLD Exceeds Groundwater Quality Standard

U - Value not detected above reporting limit

J- Estimated value

Table 5-5
Summary of Groundwater Quality Monitoring Results - Sites 117 and 153

Sample Location	Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
117-MW-A89	11/21/2019	66.2	55.7	32 J	25 J
	11/21/2019*	NA	36.7	NA	5.5 U
	11/21/2019DP	63.3	49.2	29 J	11 J
	11/21/2019DP*	NA	43.9	NA	5.5 U
153-MW-A15	11/21/2019	**85**	10 U	5.5 UJ	5.5 UJ
	11/21/2019*	NA	12.7	NA	5.5 UJ
153-MW-A13	11/21/2019	**1090**	10 U	5.5 UJ	46 J
	11/21/2019*	NA	67.2	NA	10 J
	11/21/2019DP	**1640**	10 U	5.5 UJ	32 J
	11/21/2019DP*	NA	**520**	NA	39

Bold - sample exceeds the GWQS OF 70 ug/l for Total Chromium
U - compound was not detected
J - approximate value
NA - not analyzed
ug/l - mircorgrams per liter
DP - field duplicate
* - Field filtered with 0.1 micron filter. Other filitered samples were field filtered with a 0.45 micron filter.

Table 5-6
Miscellaneous Groundwater Quality Data
Porewater Sampling April 2019

	Hexavalent Chromium (ppm)	Total Chromium (ppm)
PW09-450	15.8	16.6

FIGURES

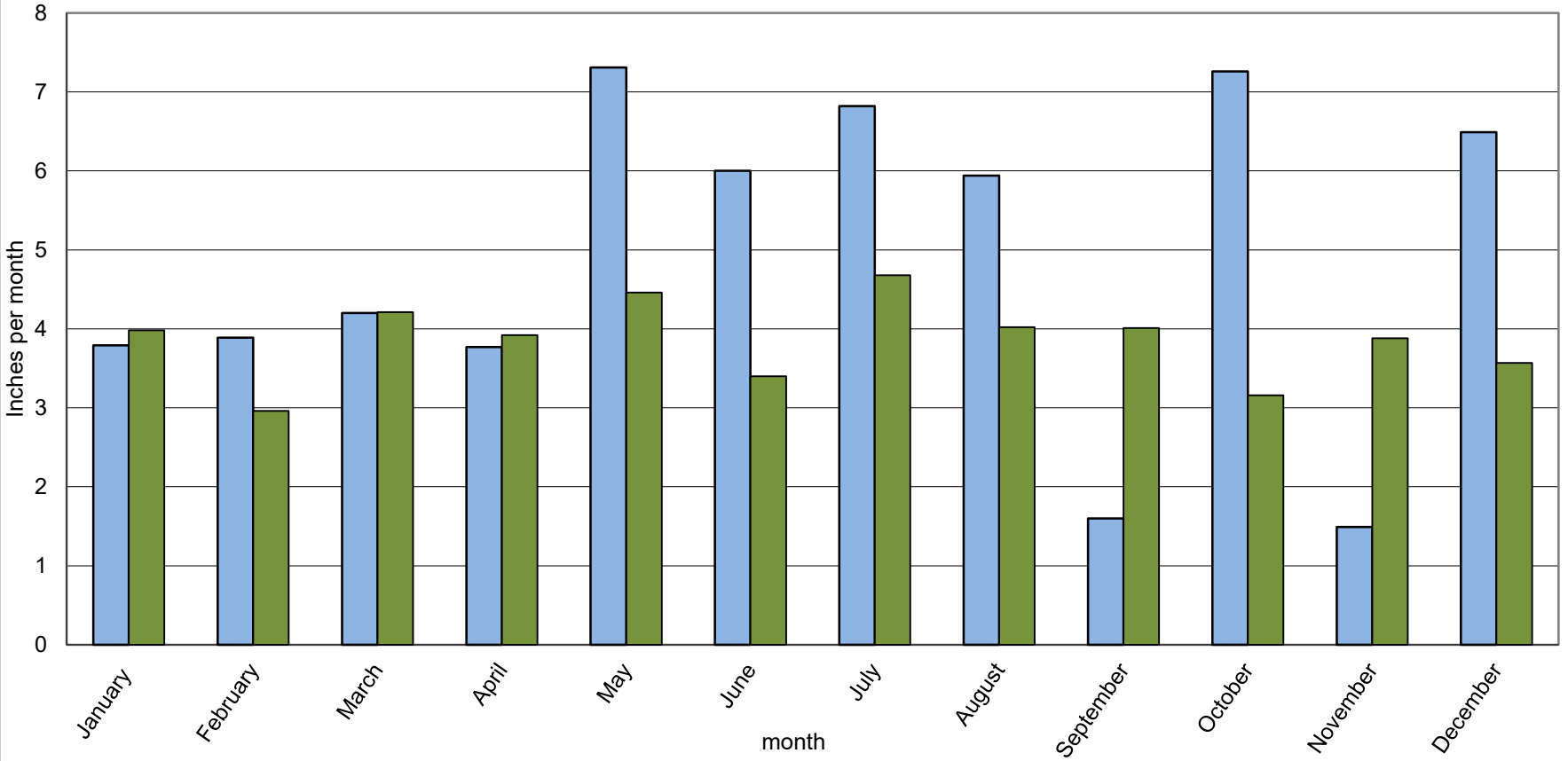


FIGURE 2-1

2019 Monthly Precipitation

Integrated Annual Groundwater Performance Report
2019

cornerstone
environmental

Figure 3-1
GWET Pumping Rates and Downtimes in 2019

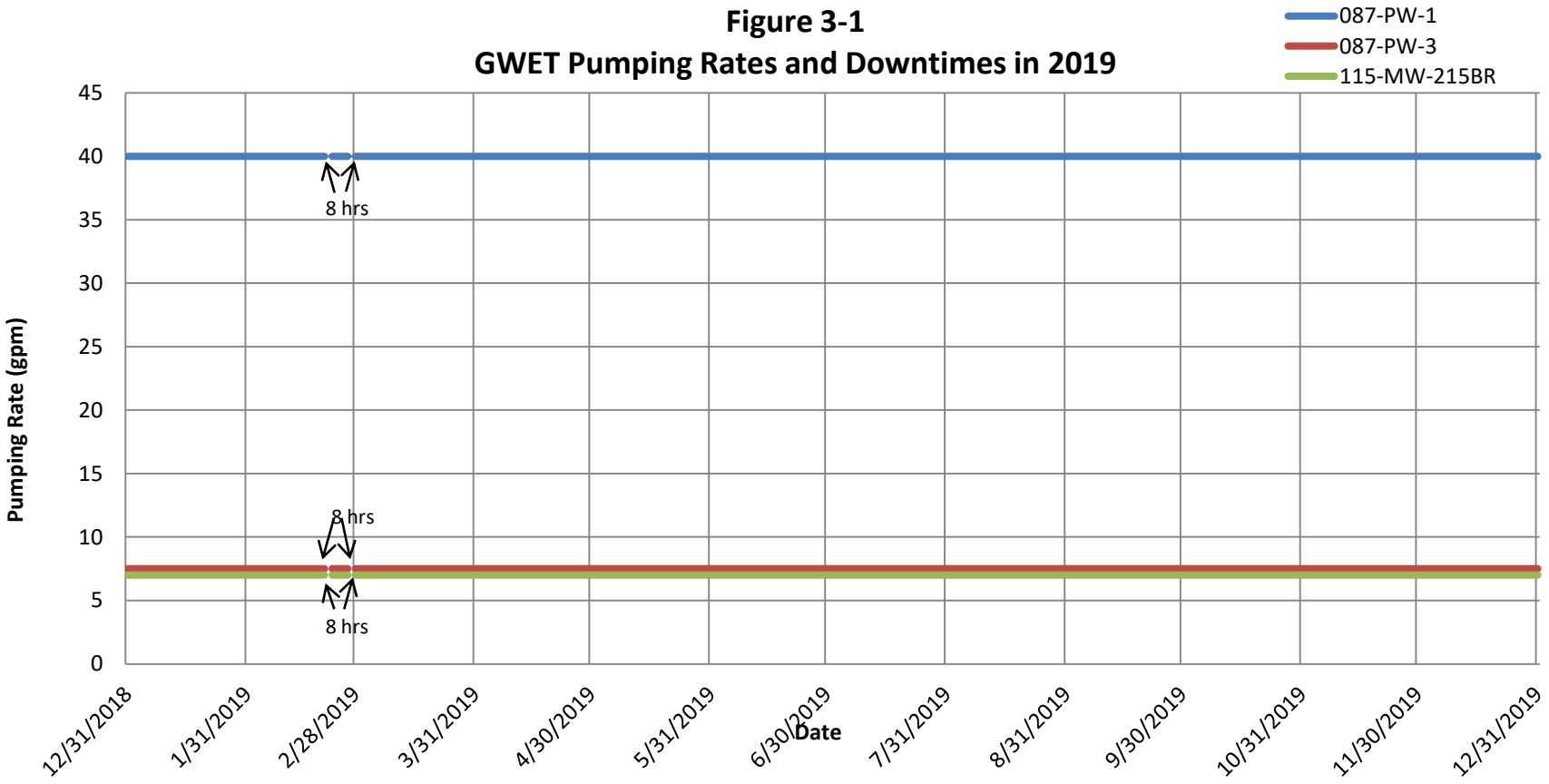


FIGURE 3-1

GWET Pumping Rates and Downtimes In 2019

Integrated Annual Groundwater Performance Report 2019

cornerstone environmental

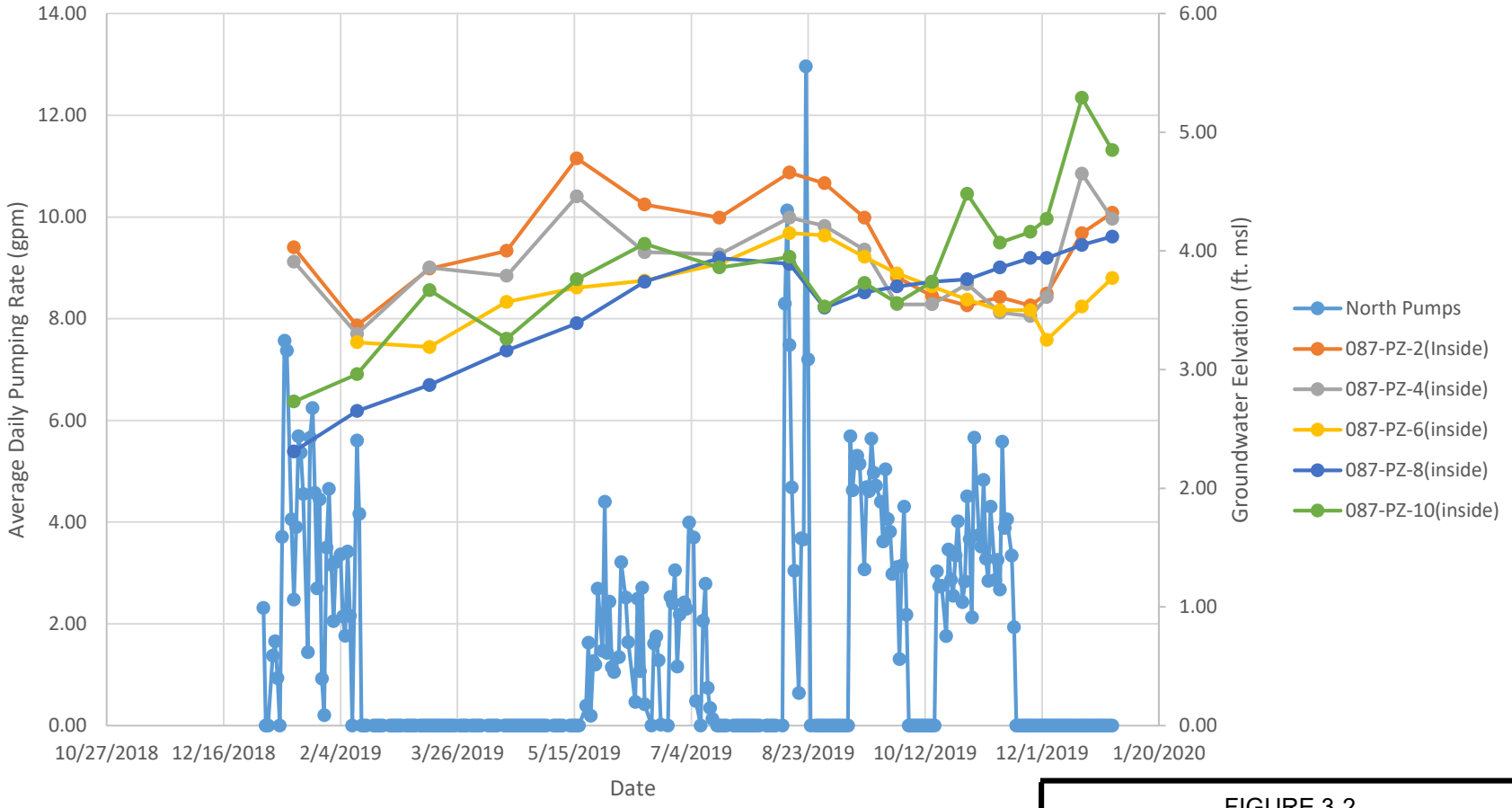


FIGURE 3-2

Contingent Pumping vs.
Interior Heads – SA6 North

Integrated Annual Groundwater Performance Report
2019

cornerstone
environmental

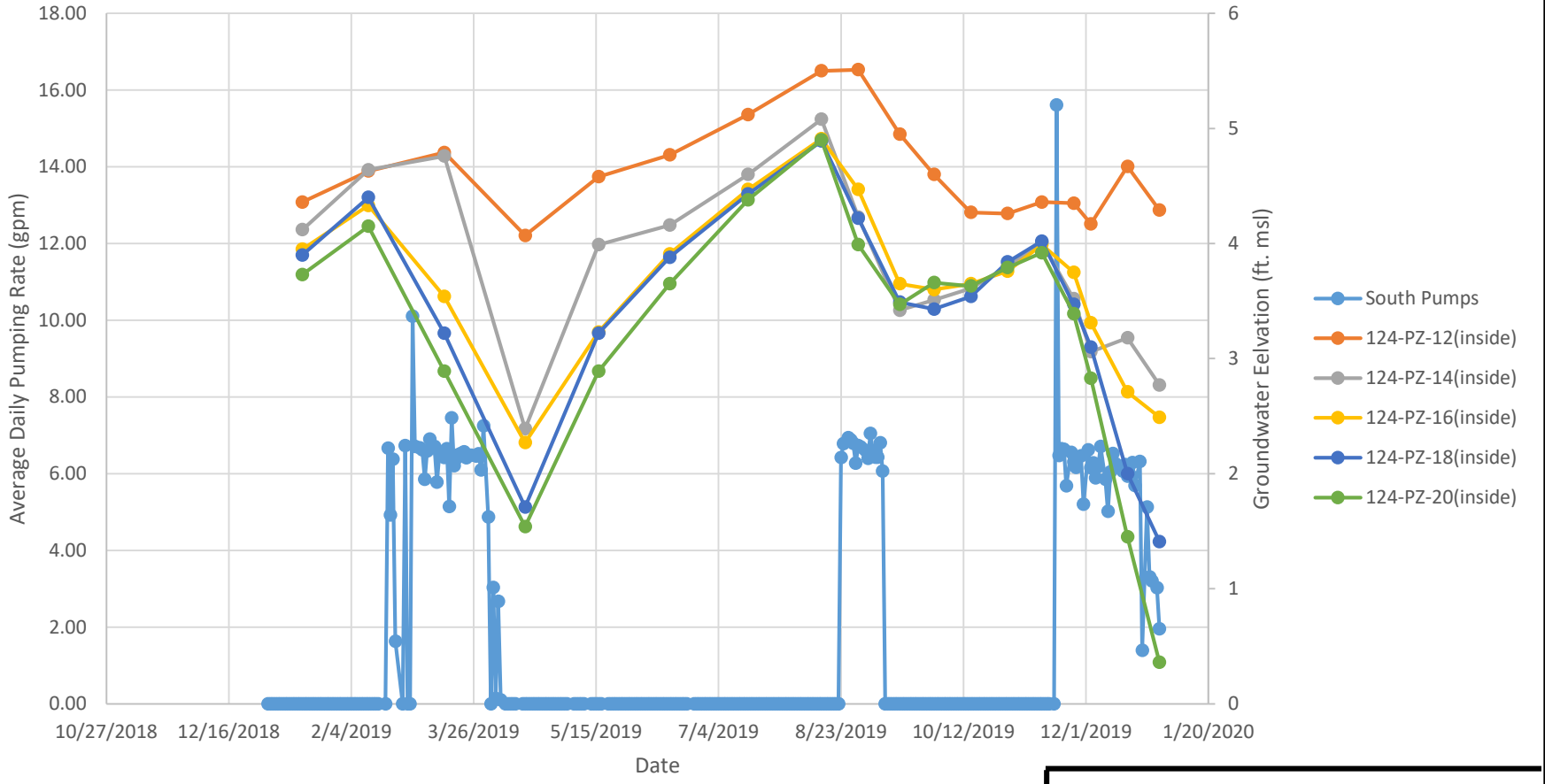
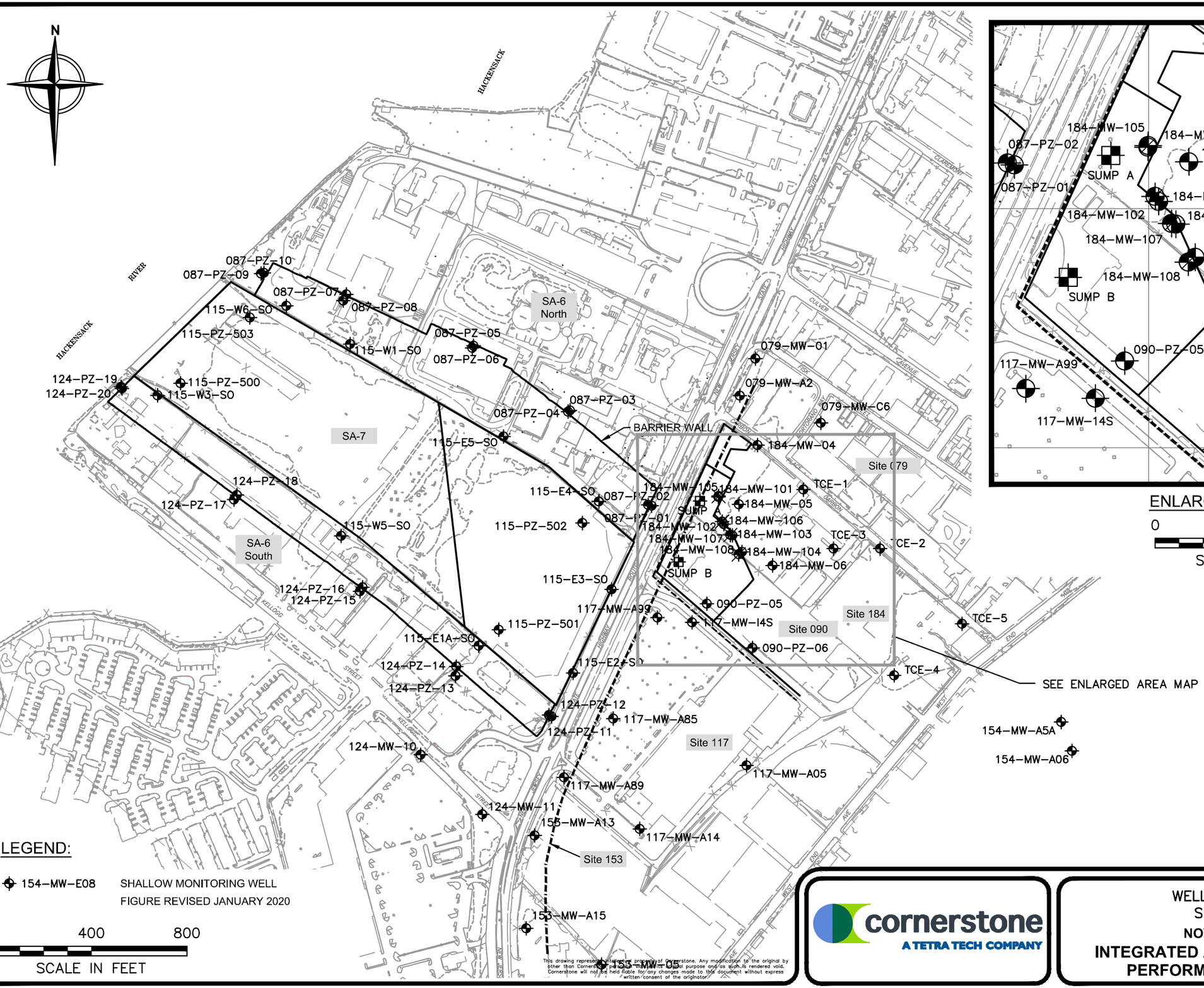


FIGURE 3-3

Contingent Pumping vs.
Interior Heads - SA6 South

Integrated Annual Groundwater Performance Report
2019

cornerstone
environmental

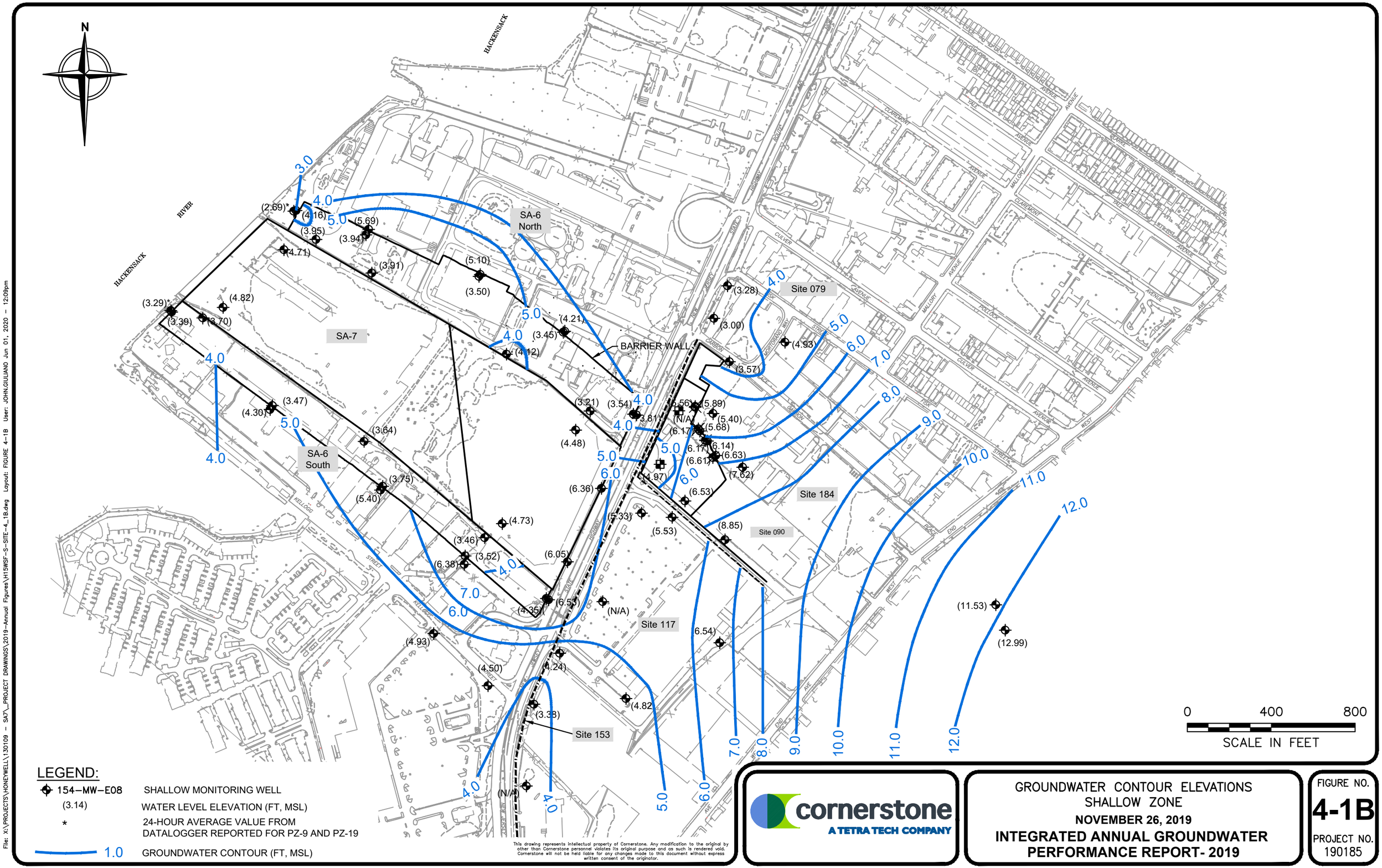


cornerstone
A TETRA TECH COMPANY

WELL LOCATION PLAN
SHALLOW ZONE
NOVEMBER 26, 2019
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT - 2019

FIGURE NO.
4-1A
PROJECT NO.
190485

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2018-4Q ANNUAL FIGURES\H15WSF-S-SITE-4_1A.dwg Layout: FIGURE 4-1A User: SAM.WAIZENEGGER Jun 04, 2020 - 10:44am



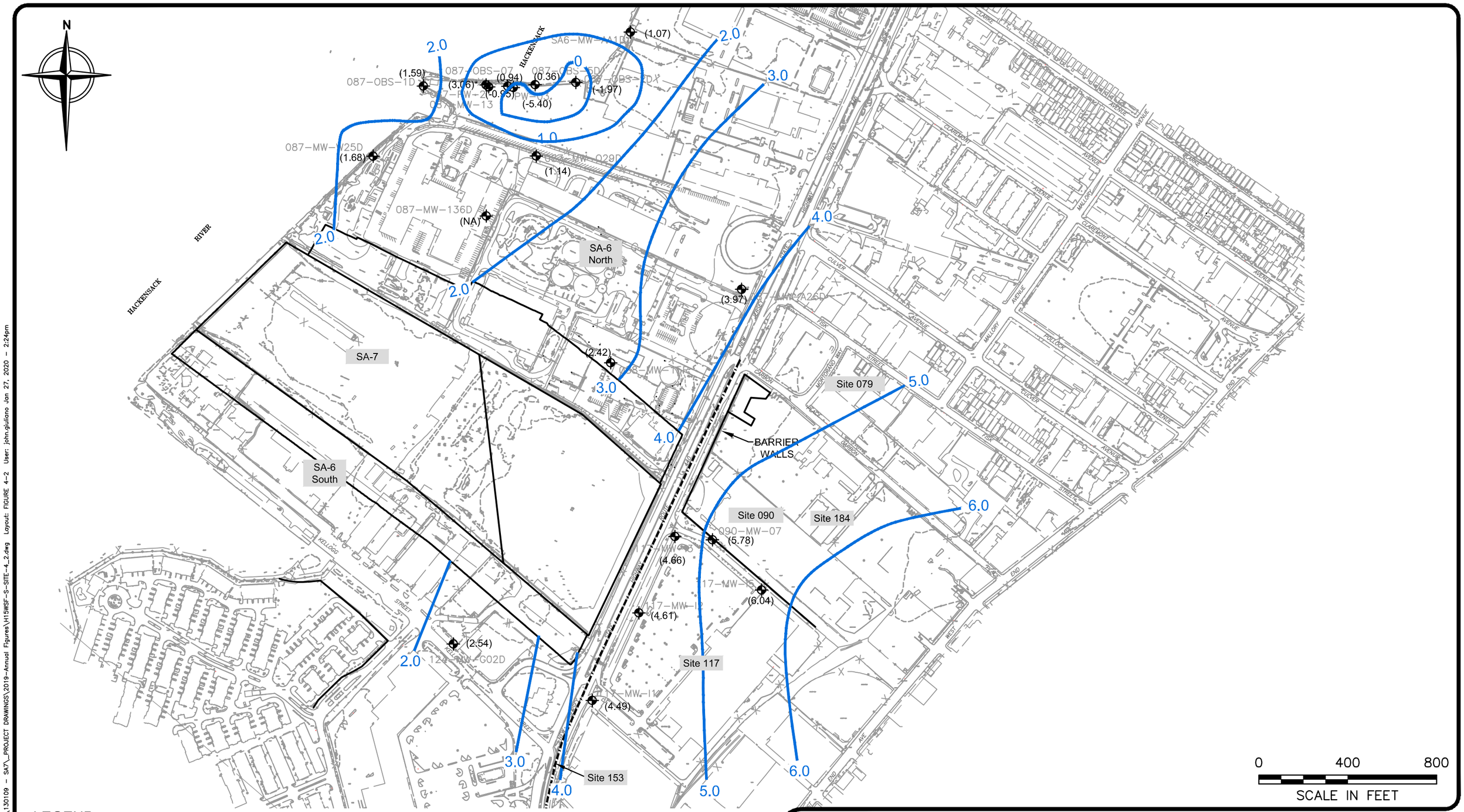
LEGEND:

154-MW-E08	SHALLOW MONITORING WELL
(3.14)	WATER LEVEL ELEVATION (FT, MSL)
*	24-HOUR AVERAGE VALUE FROM DATALOGGER REPORTED FOR PZ-9 AND PZ-19
1.0	GROUNDWATER CONTOUR (FT, MSL)

cornerstone
A TETRA TECH COMPANY

GROUNDWATER CONTOUR ELEVATIONS
SHALLOW ZONE
NOVEMBER 26, 2019
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2019

FIGURE NO.
4-1B
PROJECT NO.
190185



LEGEND:

- 087-MW-029D — INTERMEDIATE ZONE MONITORING WELL
- (3.45) — WATER LEVEL ELEVATION (FT, MSL)
- 1.0 — GROUNDWATER CONTOUR (FT, MSL)
- * ELEVATION NOT USED IN CONTOURING

FIGURE REVISED JANUARY 2020

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GROUNDWATER ELEVATION CONTOURS
INTERMEDIATE ZONE
NOVEMBER 26, 2019

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2019

FIGURE NO. **4-2**

PROJECT NO. 190185

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2019-Annual Figures\H15WSF-S-SITE-4_2.dwg Layout: FIGURE 4-2 User: john.giuliano Jan 27, 2020 - 2:24pm

N

SA6-MW-AA1T (0.95)
1.0
0
087-MW-08 (0.80)
087-OBS-3L (0.26)
087-PW-1 (-35.13)
087-MW-34 (-0.75)
087-OBS-1L (1.10)
087-OBS-5T (0.02)
087-OBS-1T (1.25)
087-OBS-4T (0.54)
087-MW-W25T (1.42)
2.0
3.0
4.0
5.0
087-MW-A26T (2.95)
088-MW-G19T (2.67)
090-MW-09 (5.35)
117-MW-I4 (4.66)
124-MW-106T (3.23)
117-MW-D3 (5.57)
117-MW-D2 (4.42)
119-MW-01T (2.77)
117-MW-D1 (3.08)
119-MW-02T (2.80)
153-MW-A13T (2.84)

SA-6 North
SA-7
SA-6 South
Site 079
Site 090
Site 184
Site 117
Site 153

HACKENSACK RIVER

0 400 800
SCALE IN FEET

LEGEND:

087-MW-029D — DEEP ZONE MONITORING WELL
(2.25) — WATER LEVEL ELEVATION (FT, MSL)
1.0 — GROUNDWATER CONTOUR (FT, MSL)

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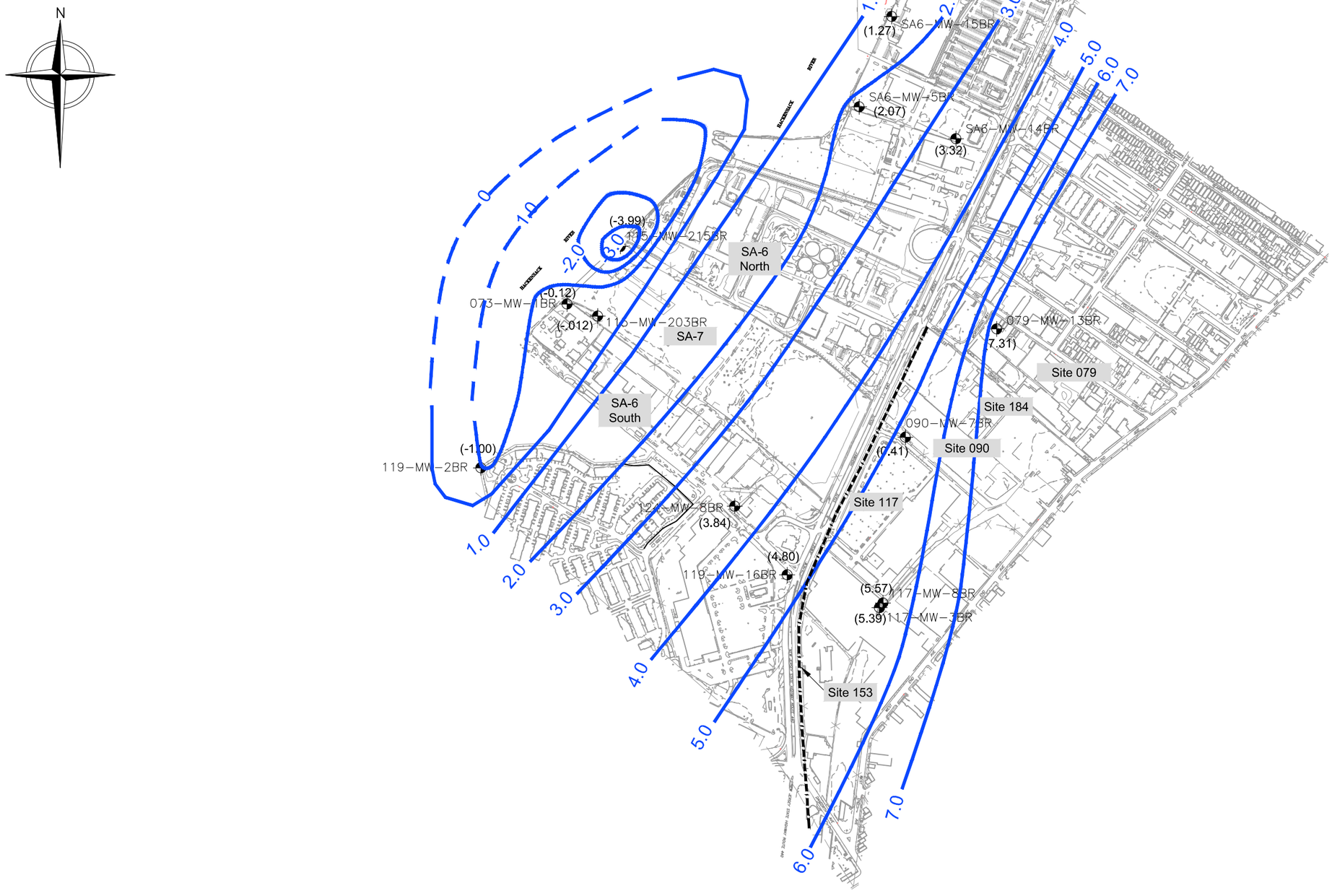
GROUNDWATER ELEVATION CONTOURS
DEEP ZONE
NOVEMBER 26, 2019
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2019

FIGURE NO.
4-3
PROJECT NO.
190185

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2019-Annual Figures\H15WSF-S-SITE-4_3.dwg Layout: FIGURE 4-3 User: john.giuliano Jan 27, 2020 - 2:35pm



LEGEND:

119-MW-11BR	BEDROCK ZONE MONITORING WELL
(5.04)	WATER LEVEL ELEVATION (FT, MSL)
1.0	GROUNDWATER CONTOUR (FT, MSL)

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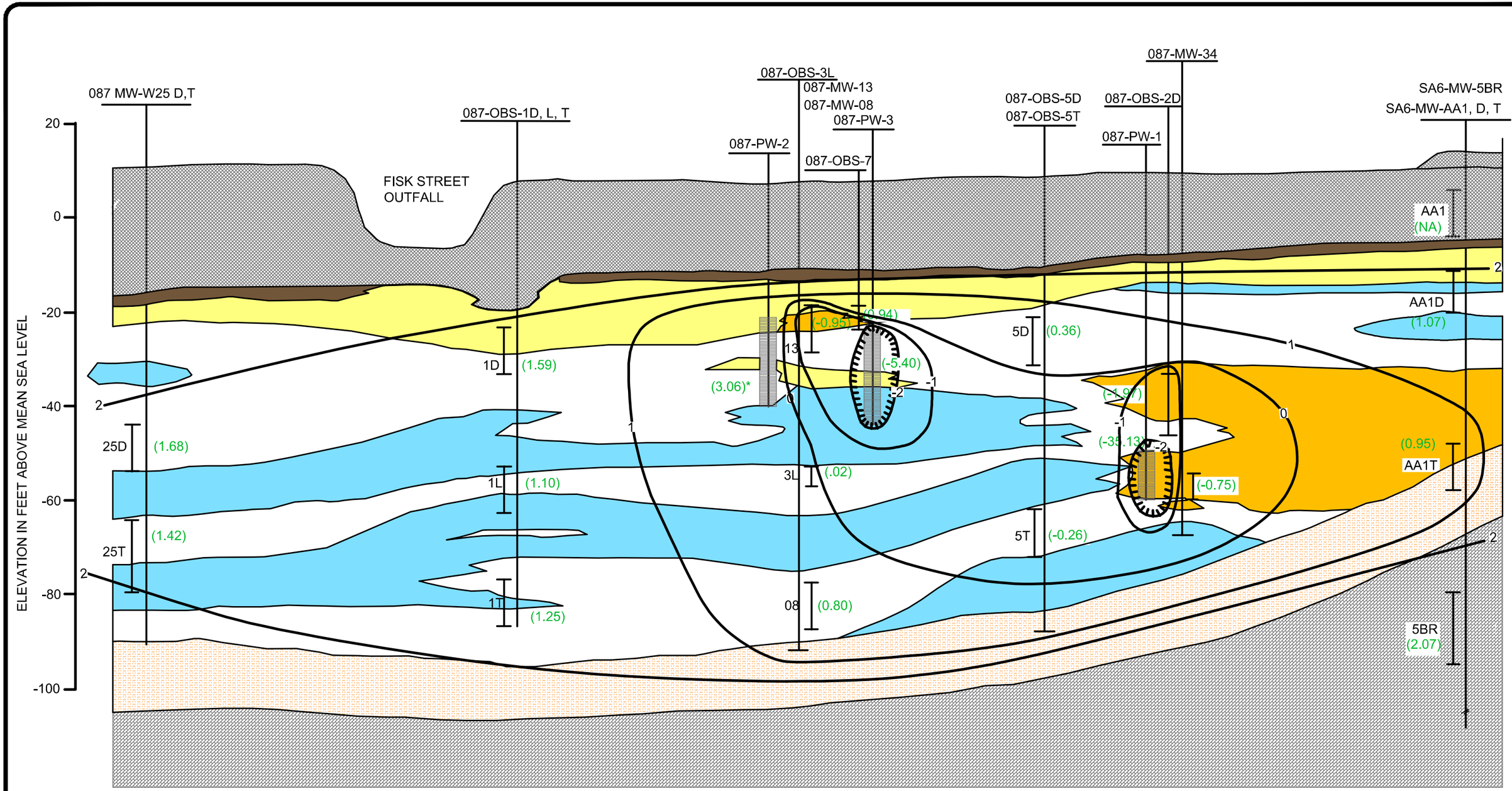
GROUNDWATER ELEVATION CONTOURS
BEDROCK ZONE
NOVEMBER 26, 2019
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2019

FIGURE NO.
4-4
PROJECT NO.
190185

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2019-Annual Figures\H15WSF-S-SITE-4_4.dwg Layout: FIGURE 4-4 User: john.giuliano Jan 27, 2020 - 2:51pm



0 100 200

SCALE IN FEET

LEGEND:

- FILL
- MEADOW MAT
- FINE TO MEDIUM SAND
- FINE, MEDIUM TO COARSE SAND
- INTERBED SILTS AND CLAYS
- GLACIAL TILL
- PASSAIC FORMATION
- FINE TO VERY FINE SAND

* VALUE NOT USED IN CONTOURING

087-MW-W25T — WELL DESIGNATION

GROUND SURFACE

25T — SCREENED INTERVAL

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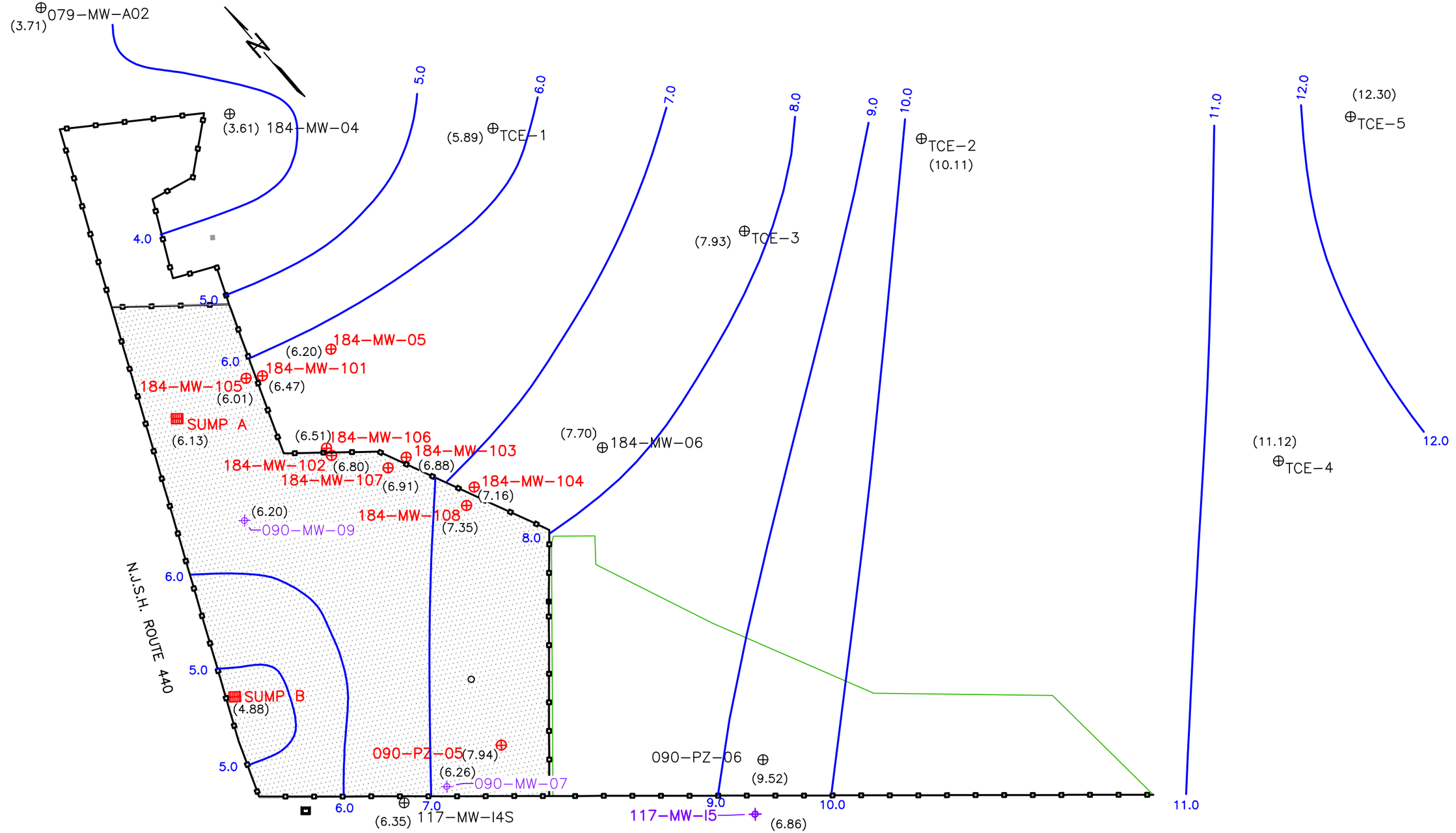
A TETRA TECH COMPANY

GROUNDWATER ELEVATIONS (FT, MSL)
IN CROSS-SECTION
NOVEMBER 26, 2019
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2019

FIGURE NO.
4-5
PROJECT NO.
190185



LEGEND

- MONITORING WELL
- PIEZOMETER
- SUMP
- SHEET PILE WALL
- CAP AREA
- DATA LOGGER INSTALLED AT THIS LOCATION
- GROUNDWATER ELEVATION CONTOUR

0 100 200

SCALE IN FEET

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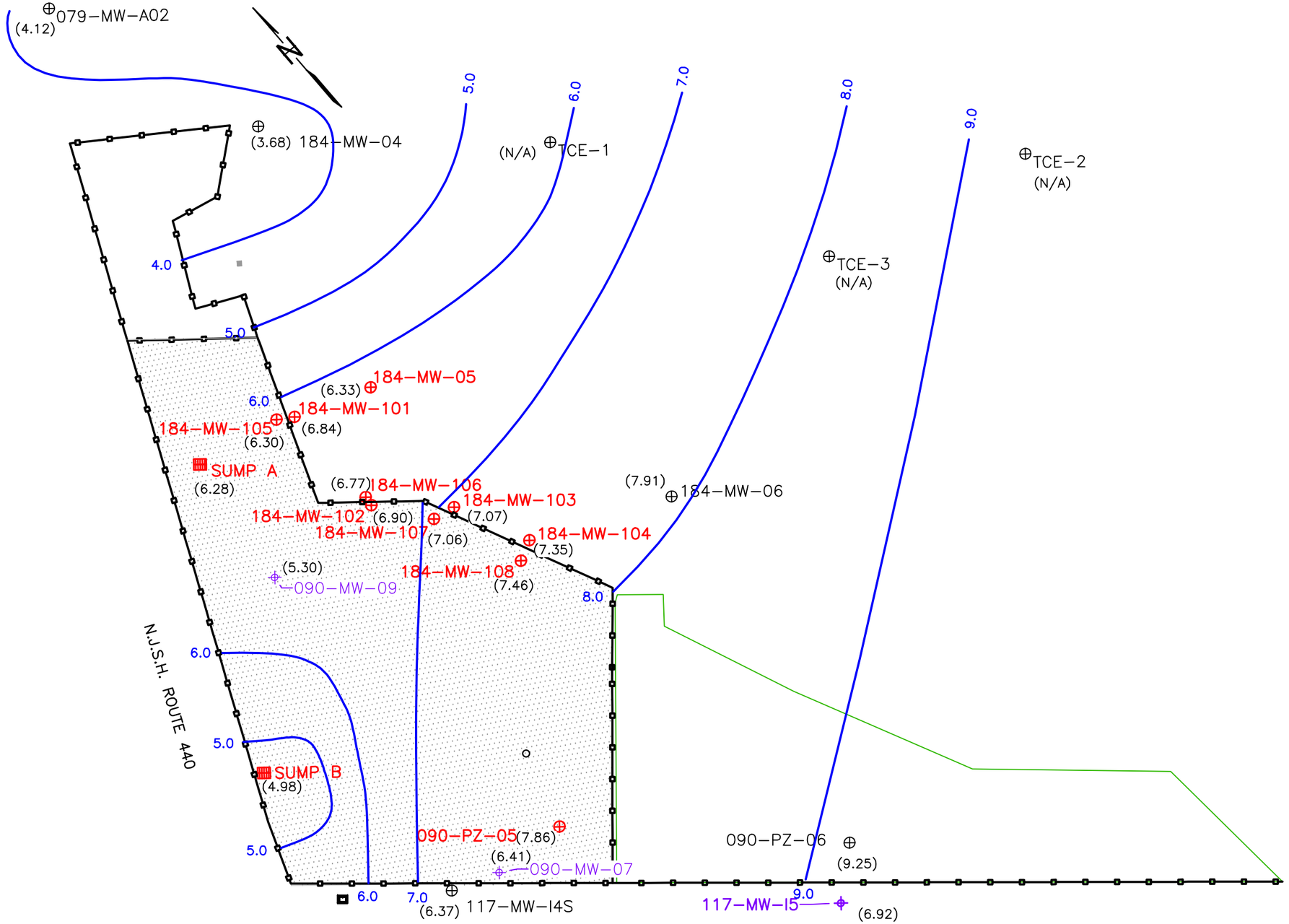
GROUNDWATER ELEVATION CONTOURS (ft.,msl)
MARCH 28, 2019
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2019

FIGURE NO.
4-6
PROJECT NO.
190185



LEGEND

- MONITORING WELL
- PIEZOMETER
- SUMP
- SHEET PILE WALL
- CAP AREA
- DATA LOGGER INSTALLED AT THIS LOCATION
- GROUNDWATER ELEVATION CONTOUR

TCE WELLS AS OF MAY 2019 ARE NO LONGER MEASURED

0 100 200

SCALE IN FEET

cornerstone
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS (ft.,msl)

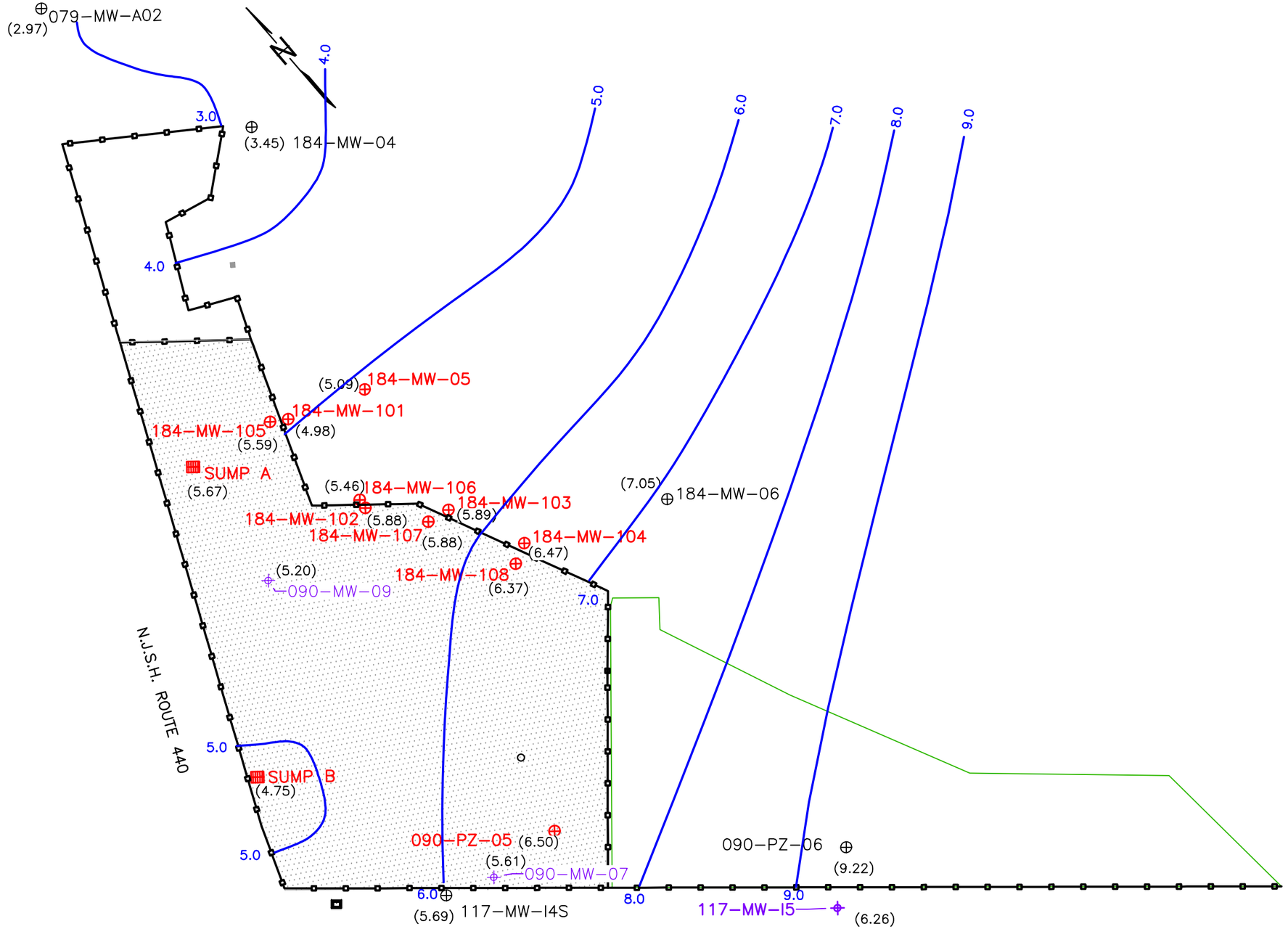
JUNE 27, 2019

STUDY AREA 5 - NJCU

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2019

FIGURE NO.
4-7

PROJECT NO.
190185



LEGEND

- MONITORING WELL
- PIEZOMETER
- SUMP
- SHEET PILE WALL
- CAP AREA
- DATA LOGGER INSTALLED AT THIS LOCATION
- GROUNDWATER ELEVATION CONTOUR

TCE WELLS AS OF MAY 2019 ARE NO LONGER MEASURED

0 100 200

SCALE IN FEET

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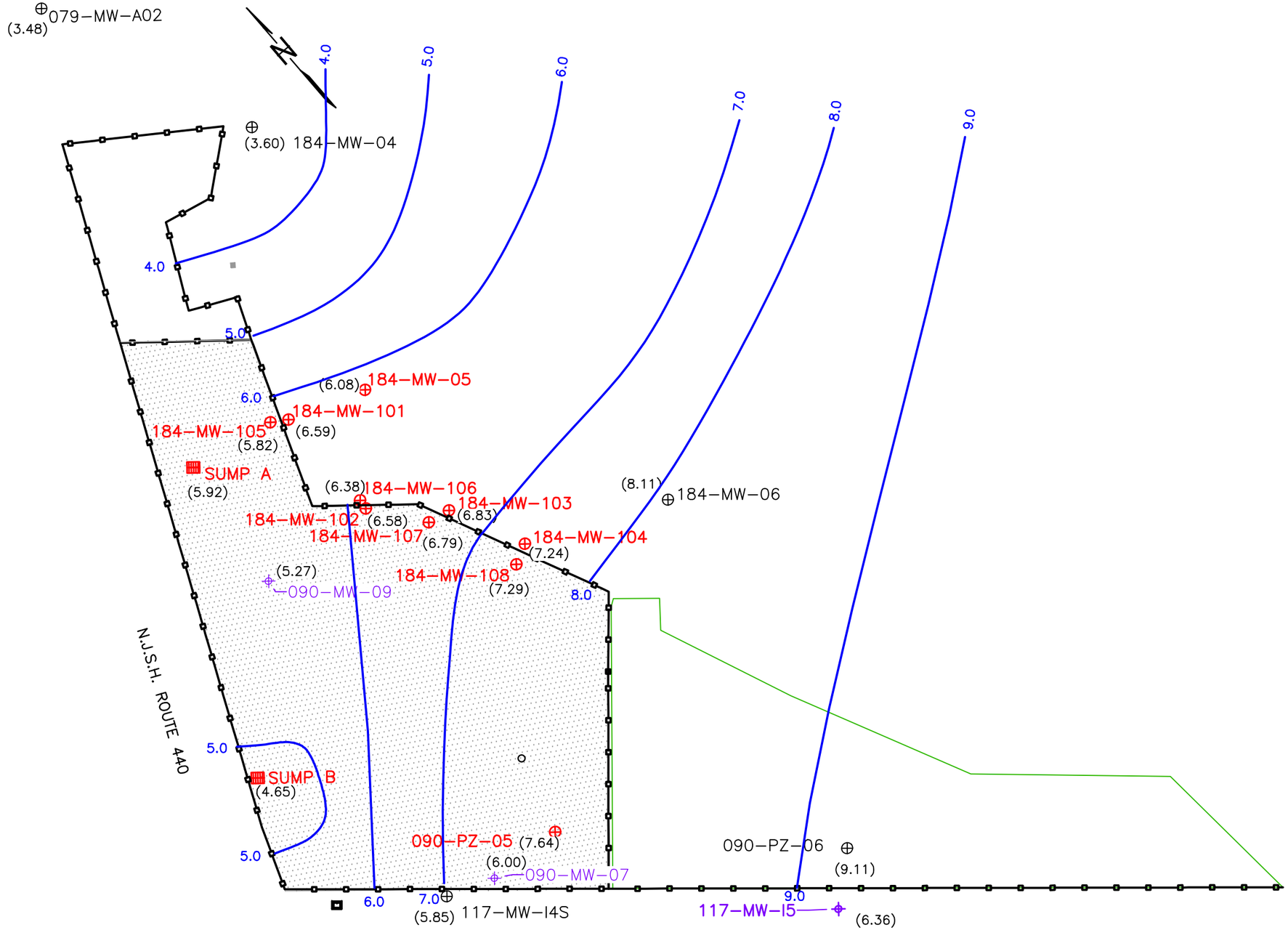
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS (ft.,msl)
SEPTEMBER 30, 2019
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2019

FIGURE NO.
4-8
PROJECT NO.
190185



LEGEND

- MONITORING WELL
- PIEZOMETER
- SUMP
- SHEET PILE WALL
- CAP AREA
- DATA LOGGER INSTALLED AT THIS LOCATION
- GROUNDWATER ELEVATION CONTOUR
- TCE WELLS AS OF MAY 2019 ARE NO LONGER MEASURED

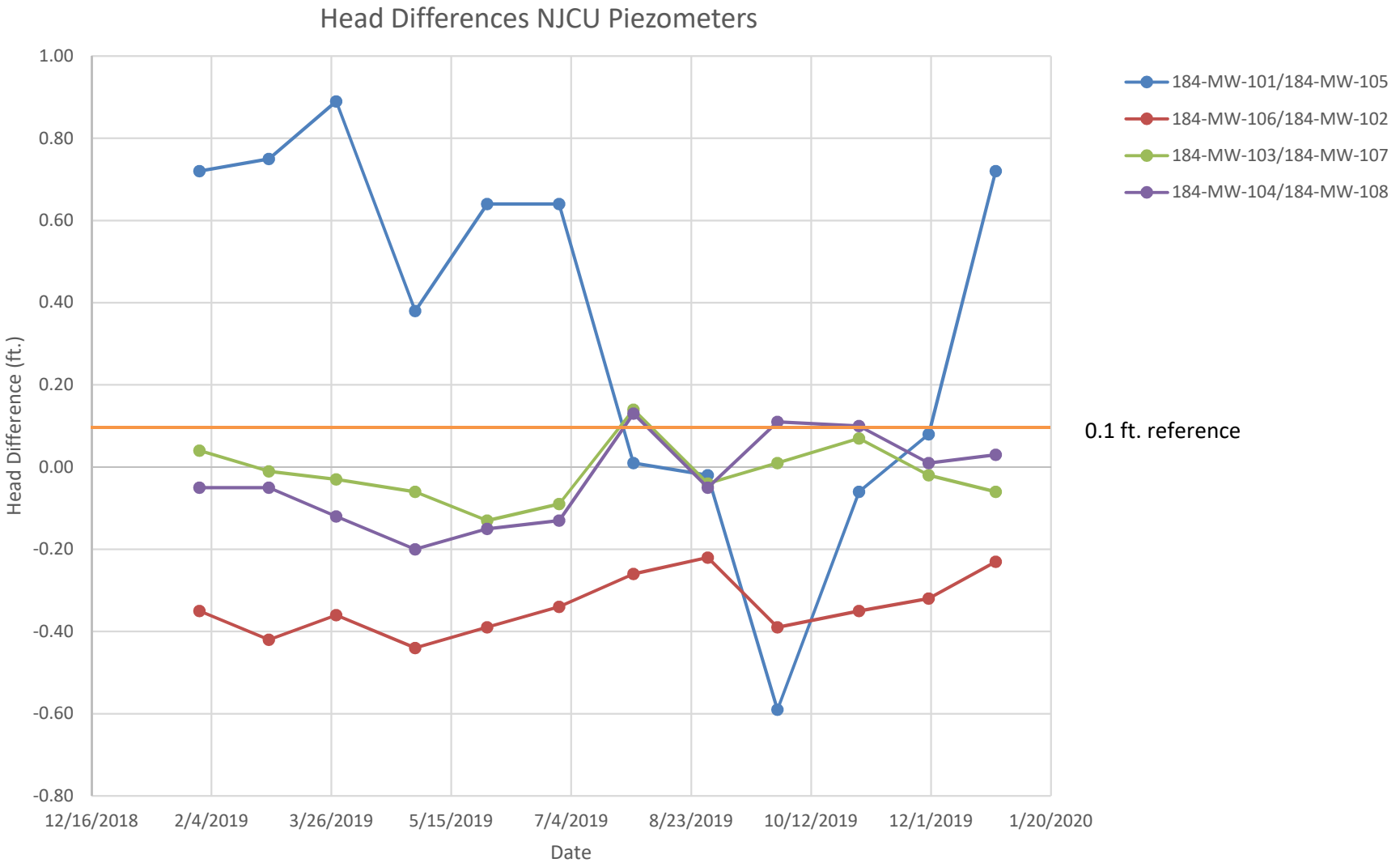
0 100 200

SCALE IN FEET

cornerstone
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS (ft.,msl)
JANUARY 2, 2020
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2019

FIGURE NO.
4-9
PROJECT NO.
190185



Note:
Positive head difference = inward gradient
Negative head difference = outward gradient

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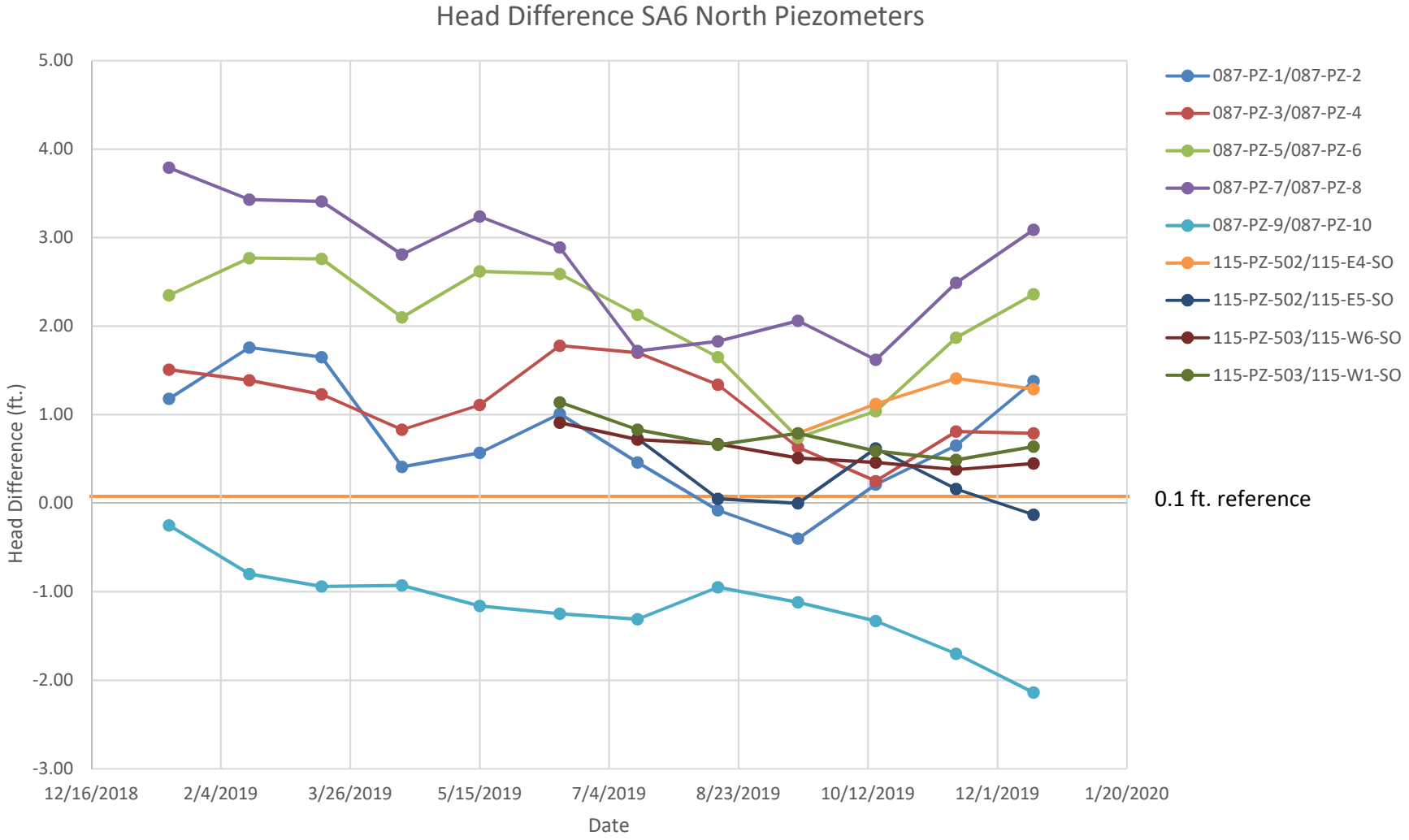
Integrated Annual Groundwater Performance Report 2019

Monthly Average Head Differences Across NJCU Barrier Wall

Figure 4-10



Note:
Positive head difference = inward gradient
Negative head difference = outward gradient

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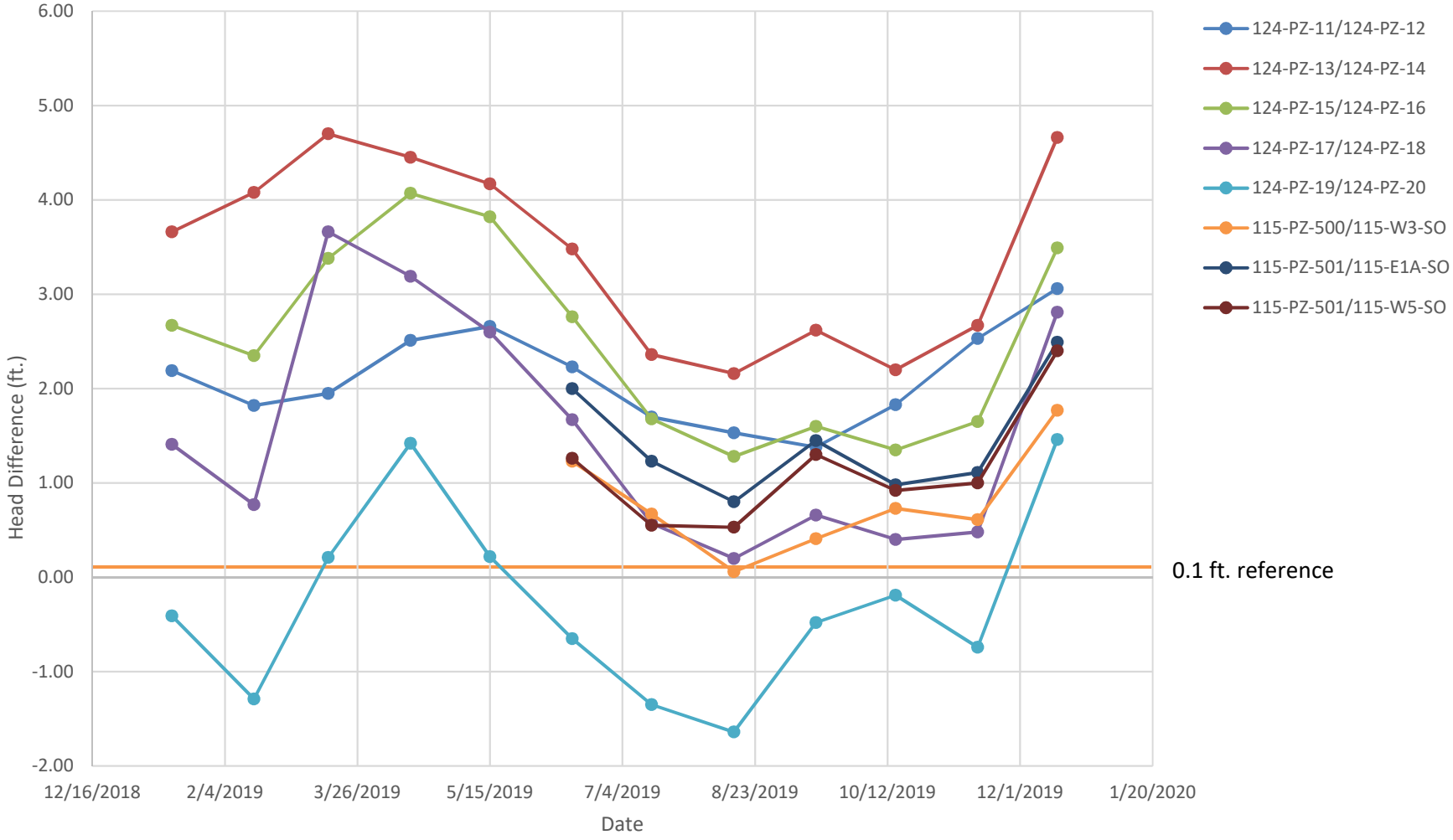
A TETRA TECH COMPANY

Integrated Annual Groundwater Performance Report 2019

Monthly Average Head Differences Across SA-6 North Barrier Wall

Figure 4-11



Note:
Positive head difference = inward gradient
Negative head difference = outward gradient

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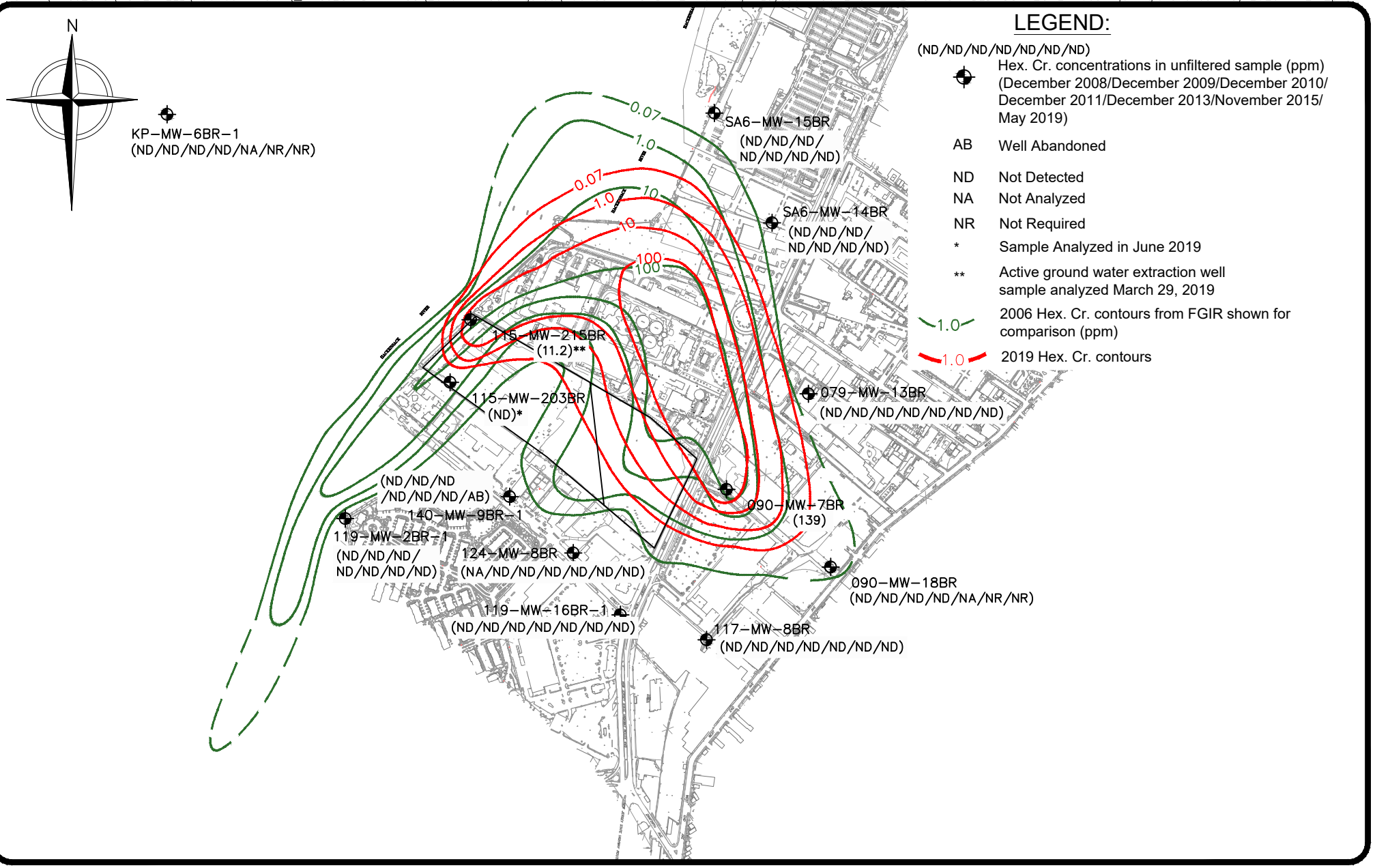
A TETRA TECH COMPANY

Integrated Annual Groundwater Performance Report 2019

Monthly Average Head Differences Across SA-6 South Barrier Wall

Figure 4-12



0 1000 2000

SCALE IN FEET

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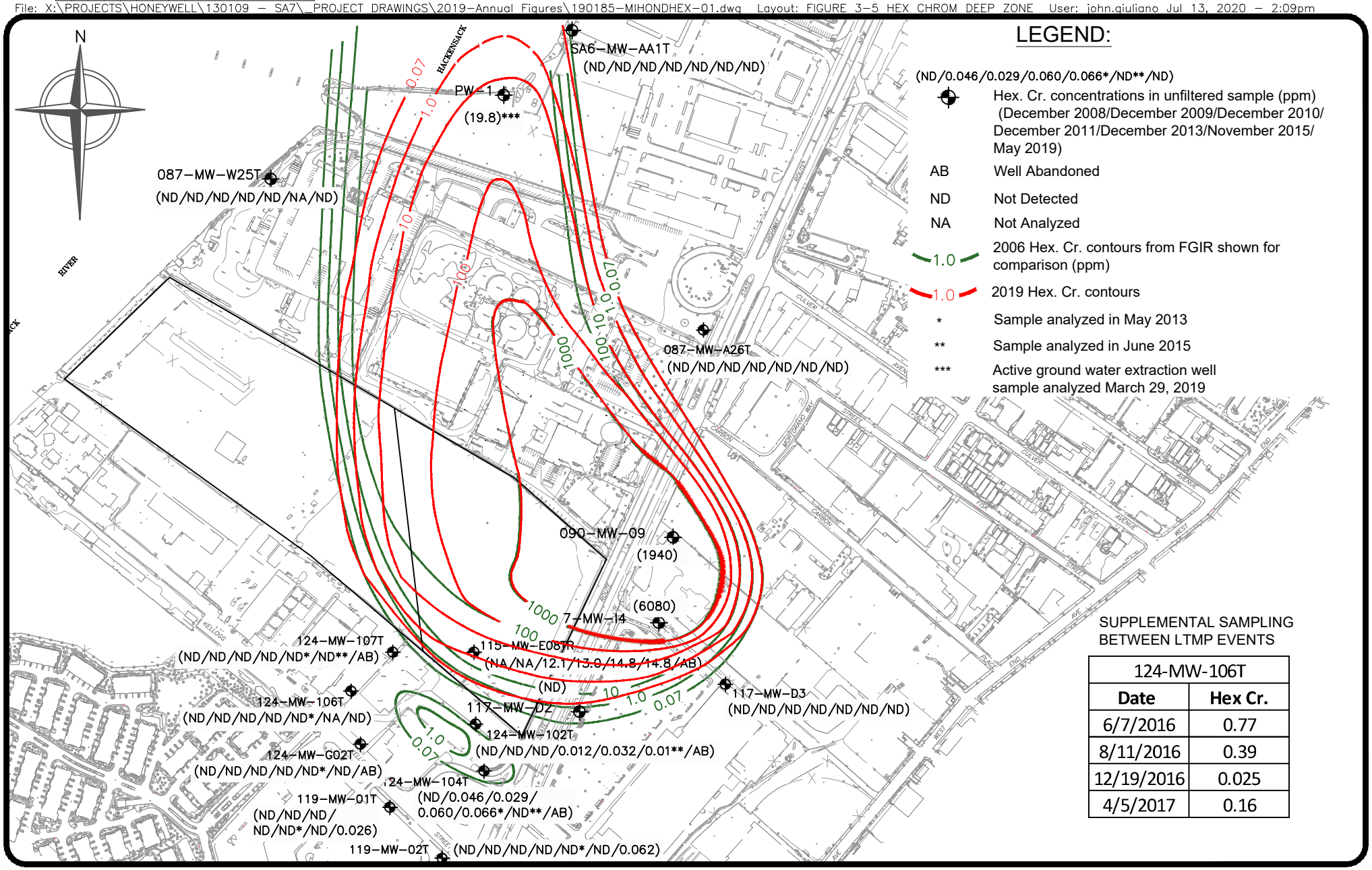
PREPARED BY:
CORNERSTONE ENVIRONMENTAL GROUP, LLC

Hexavalent Chromium Concentrations in Bedrock Groundwater

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT-2019

FIGURE NO.
5-1
PROJECT NO.
190185



LEGEND:

(ND/0.046/0.029/0.060/0.066*/ND**/ND)
Hex. Cr. concentrations in unfiltered sample (ppm) (December 2008/December 2009/December 2010/ December 2011/December 2013/November 2015/ May 2019)

AB	Well Abandoned
ND	Not Detected
NA	Not Analyzed
1.0	2006 Hex. Cr. contours from FGIR shown for comparison (ppm)
1.0	2019 Hex. Cr. contours
*	Sample analyzed in May 2013
**	Sample analyzed in June 2015
***	Active ground water extraction well sample analyzed March 29, 2019

SUPPLEMENTAL SAMPLING BETWEEN LTMP EVENTS

124-MW-106T	
Date	**Hex Cr.**
6/7/2016	0.77
8/11/2016	0.39
12/19/2016	0.025
4/5/2017	0.16

0 500 1000
SCALE IN FEET

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A TETRA TECH COMPANY

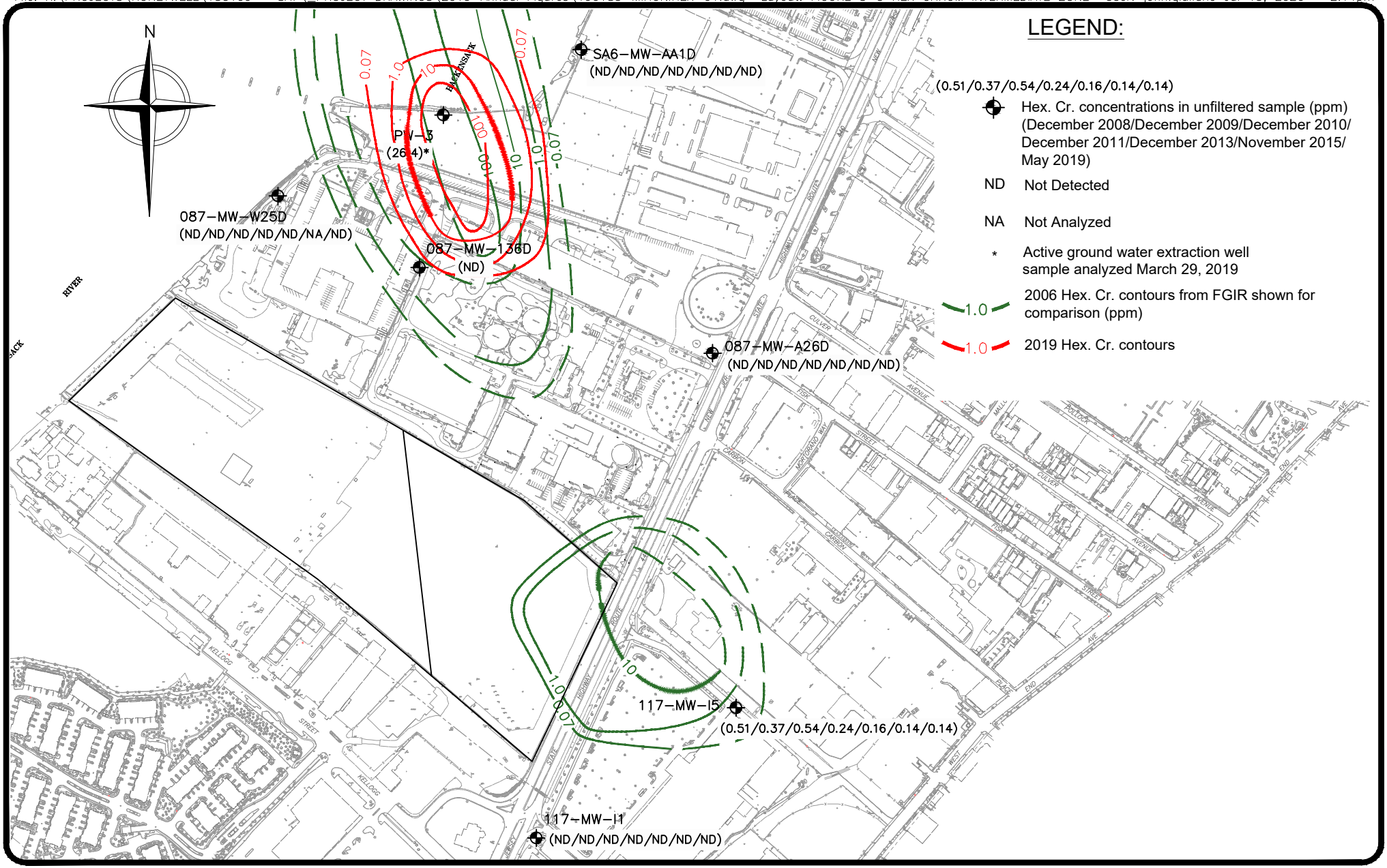
PREPARED BY:
CORNERSTONE ENVIRONMENTAL GROUP, LLC

Hexavalent Chromium Concentrations in Deep Groundwater

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT-2019

FIGURE NO.
5-2
PROJECT NO.
190185

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2019-Annual Figures\190185-MIHONIHEX-01.dwg Layout: FIGURE 3-3 HEX CHROM INTERMEDIATE ZONE User: john.giuliano Jul 13, 2020 - 2:14pm



0 500 1000

SCALE IN FEET

cornerstone
A TETRA TECH COMPANY

PREPARED BY:
CORNERSTONE ENVIRONMENTAL GROUP, LLC

Hexavalent Chromium Concentrations in Intermediate Zone Groundwater

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT-2019

FIGURE NO.
5-3
PROJECT NO.
190185

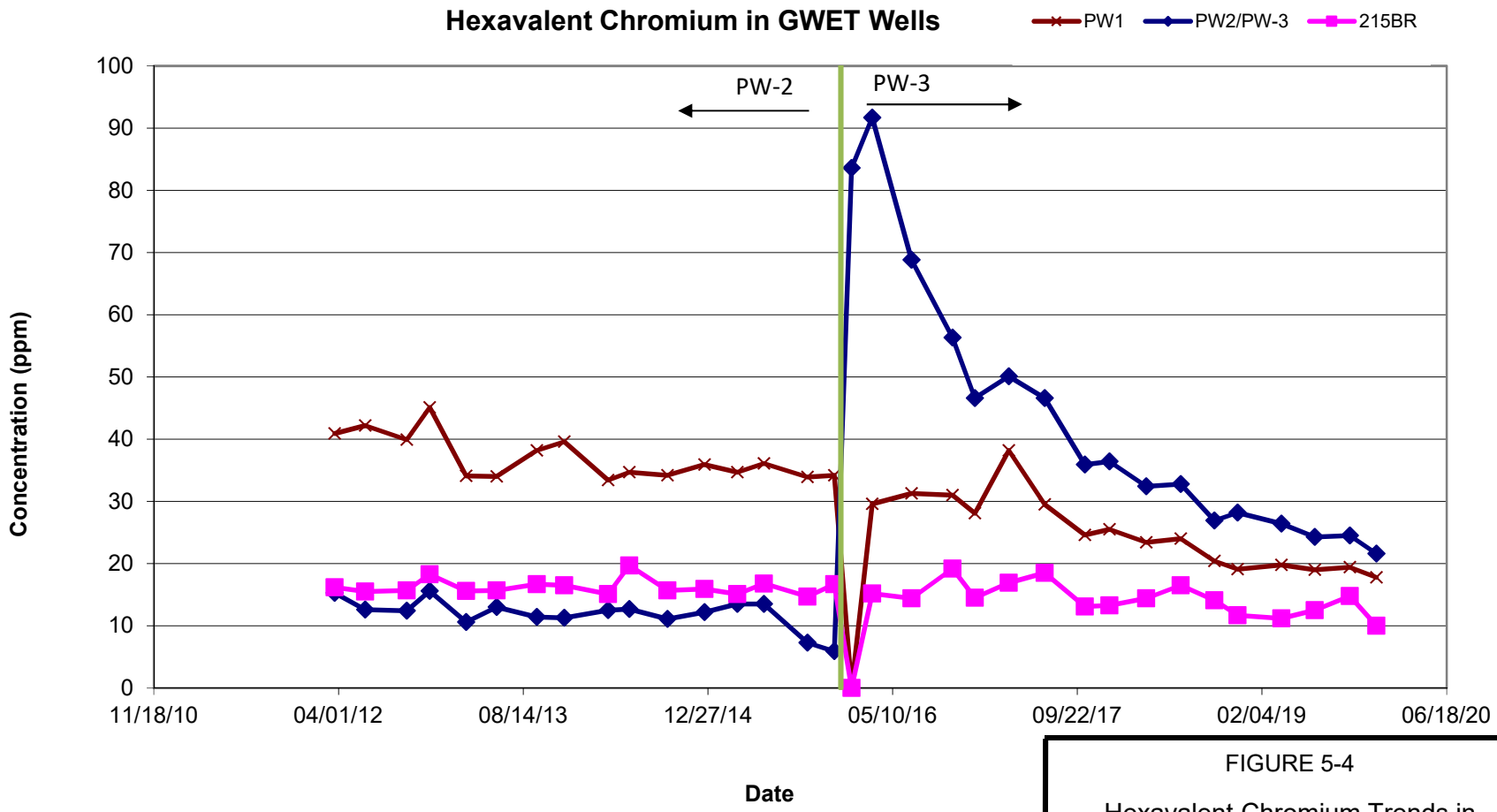


FIGURE 5-4

Hexavalent Chromium Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2019

cornerstone environmental

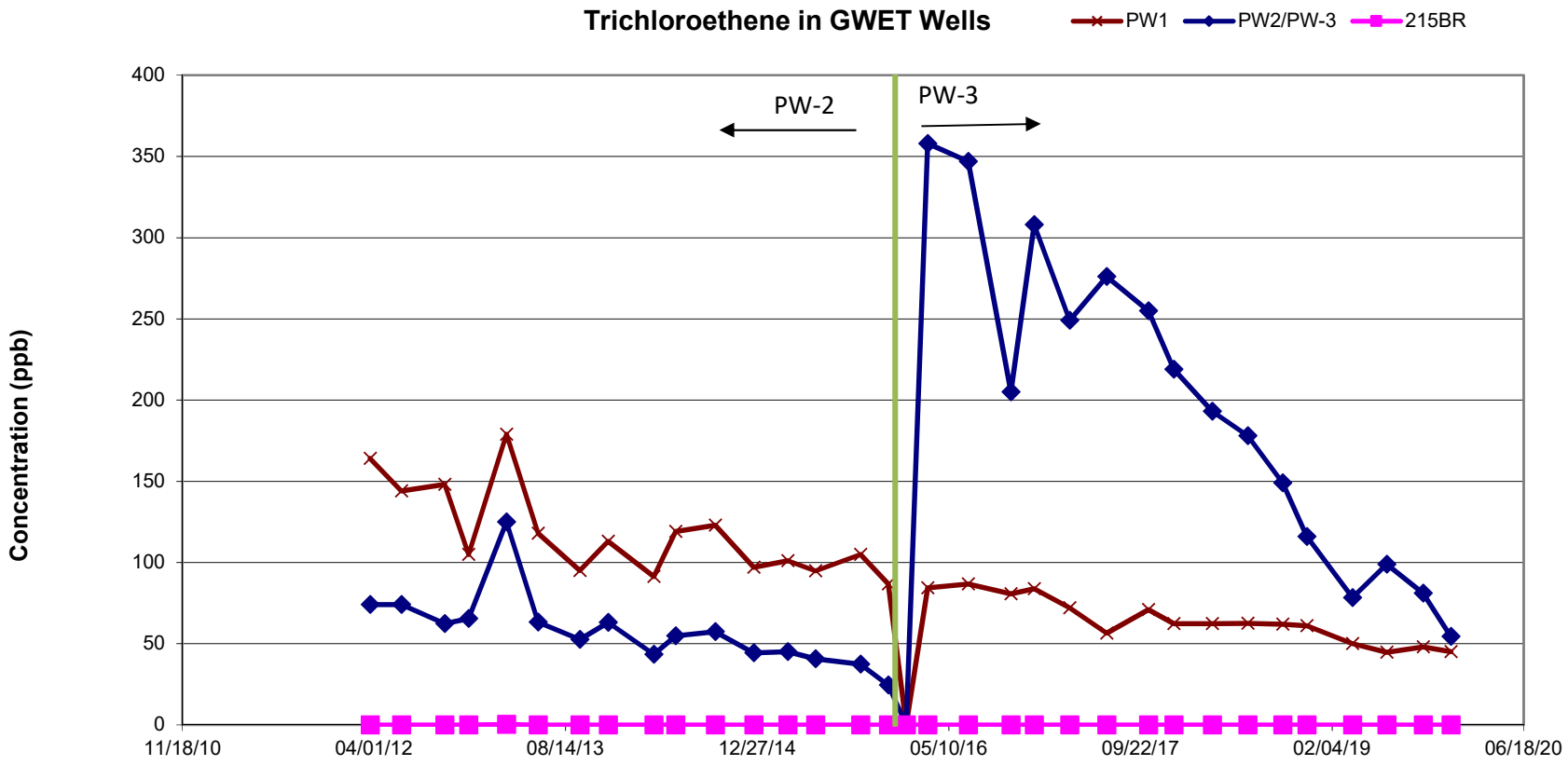


FIGURE 5-5

Trichloroethylene Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2019

cornerstone environmental

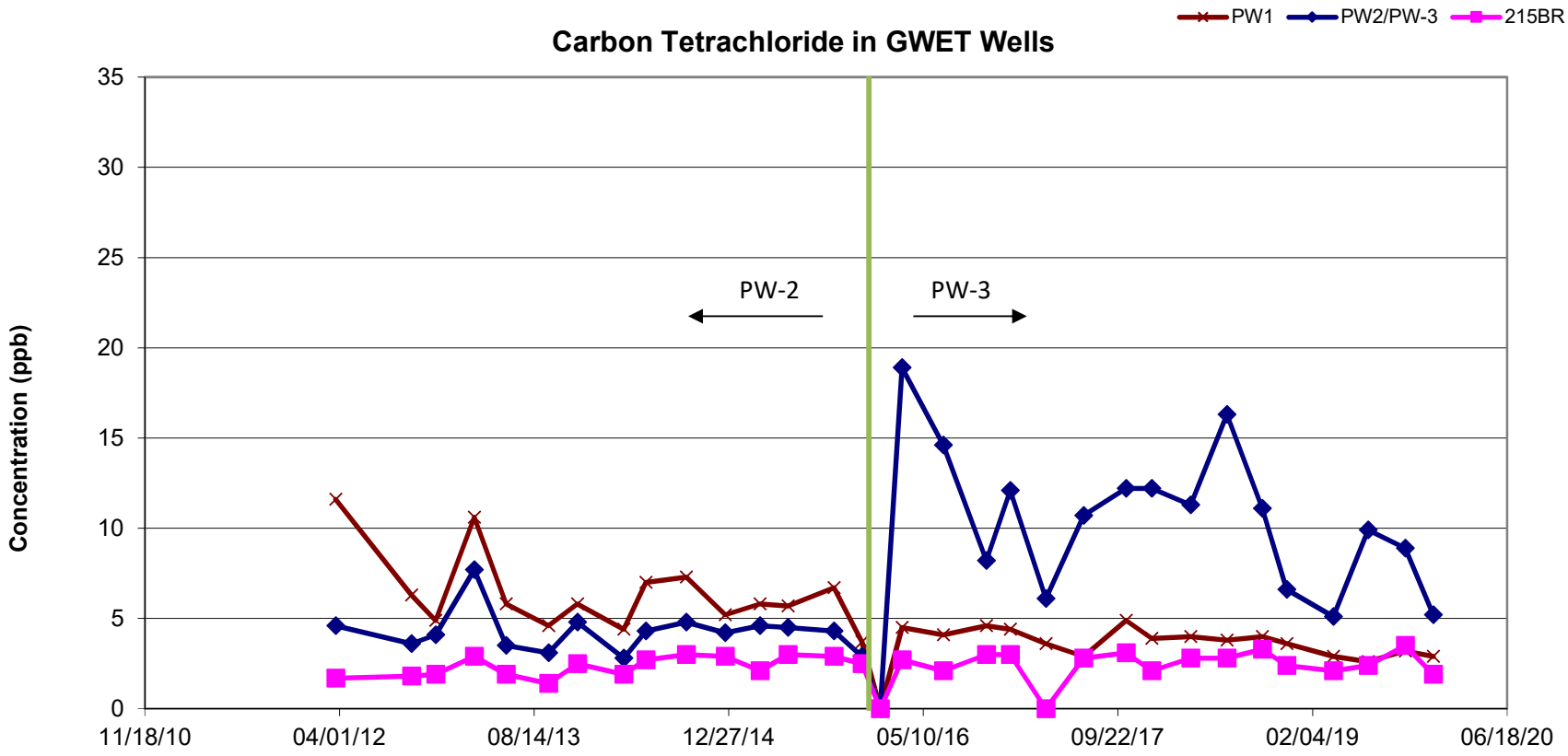
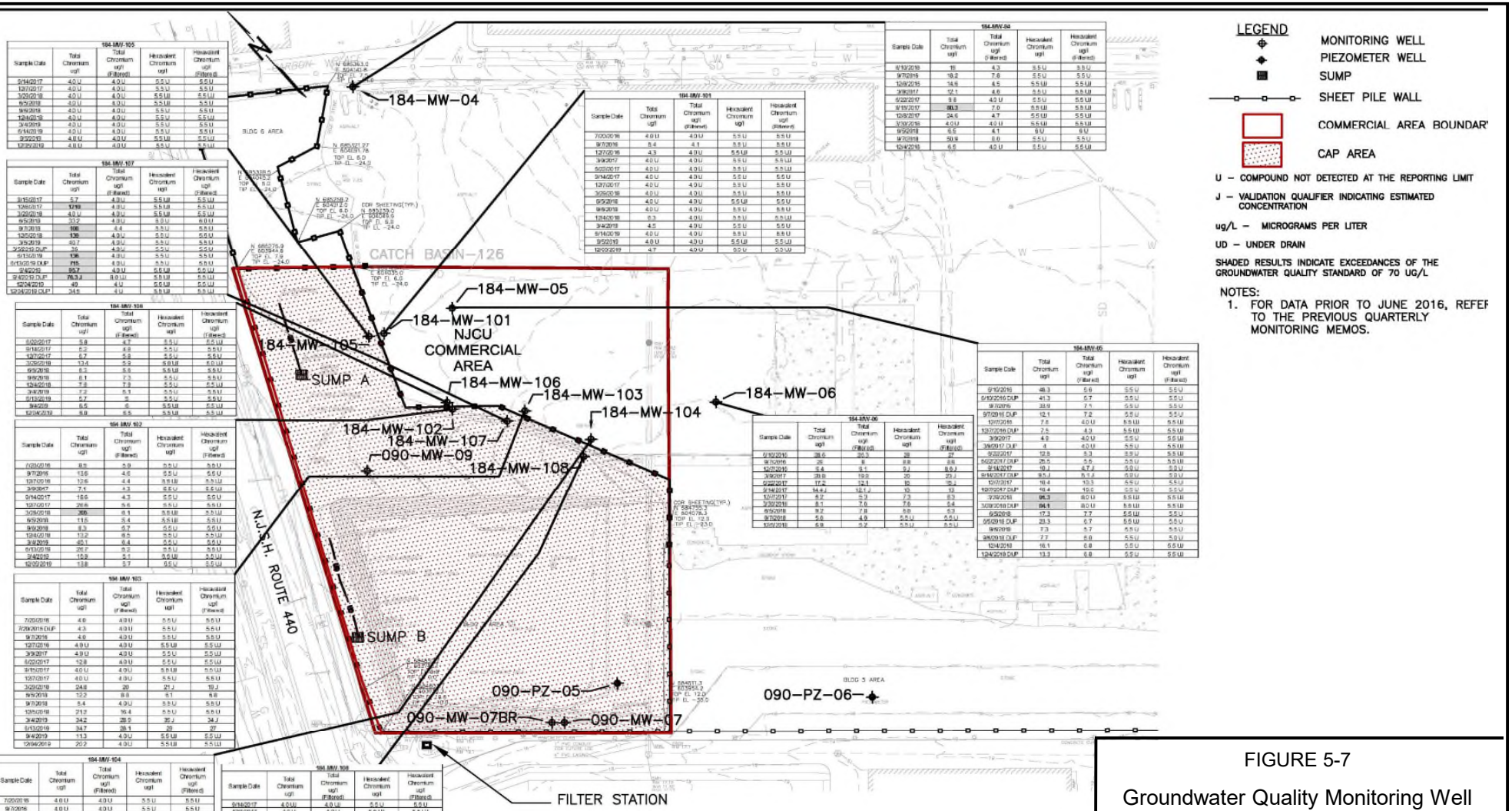


FIGURE 5-6

Carbon Tetrachloride Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2019

cornerstone environmental



184-MW-105

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
9/14/2017	4.0 U	4.0 U	5.5 U	5.5 U
12/7/2017	4.0 U	4.0 U	5.5 U	5.5 U
3/20/2018	4.0 U	4.0 U	5.5 UI	5.5 U
6/5/2018	4.0 U	4.0 U	5.5 UI	5.5 U
9/6/2018	4.0 U	4.0 U	5.5 U	5.5 U
12/4/2018	4.0 U	4.0 U	5.5 U	5.5 U
3/4/2019	4.0 U	4.0 U	5.5 U	5.5 U
6/14/2019	4.0 U	4.0 U	5.5 U	5.5 U
9/20/2019	4.0 U	4.0 U	5.5 UI	5.5 U
12/26/2019	4.0 U	4.0 U	5.5 U	5.5 U

184-MW-107

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
9/15/2017	5.7	4.0 U	5.5 UI	5.5 U
12/6/2017	12.6	4.0 U	5.5 UI	5.5 U
3/20/2018	4.0 U	4.0 U	5.5 UI	5.5 U
6/5/2018	33.2	4.0 U	6.0 U	6.0 U
9/7/2018	100	4.4	5.5 U	5.5 U
12/5/2018	130	4.0 U	5.5 U	5.5 U
3/5/2019	40.7	4.0 U	5.5 U	5.5 U
3/5/2019 DUP	39	4.0 U	5.5 U	5.5 U
6/13/2019	136	4.0 U	5.5 U	5.5 U
6/13/2019 DUP	115	4.0 U	5.5 U	5.5 U
9/4/2019	55.7	4.0 U	5.6 UI	5.6 U
9/4/2019 DUP	76.3 J	8.0 UI	5.5 UI	5.5 U
12/4/2019	40	4 U	5.6 UI	5.5 U
12/04/2019 DUP	34.5	4 U	5.5 UI	5.5 U

184-MW-108

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
3/22/2017	5.8	4.7	5.5 U	5.5 U
9/14/2017	6.2	4.8	5.5 U	5.5 U
12/7/2017	6.7	5.8	5.5 U	5.5 U
3/29/2018	13.4	5.9	5.8 UI	5.8 U
6/5/2018	8.3	5.9	5.5 UI	5.5 U
9/6/2018	8.1	7.3	5.5 U	5.5 U
12/4/2018	7.8	7.9	5.5 U	5.5 U
3/4/2019	7.2	6.1	5.5 U	5.5 U
6/13/2019	5.7	6	5.5 U	5.5 U
9/4/2019	6.5	6	5.5 UI	5.5 U
12/04/2019	8.8	6.5	5.5 UI	5.5 U

184-MW-102

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
7/20/2016	8.5	5.9	5.5 U	5.5 U
9/7/2016	13.6	4.6	5.5 U	5.5 U
12/7/2016	12.6	4.4	5.5 UI	5.5 U
3/9/2017	7.1	4.3	5.5 U	5.5 U
9/14/2017	18.6	4.3	5.5 U	5.5 U
12/7/2017	28.6	5.6	5.5 U	5.5 U
3/29/2018	306	6.1	5.5 UI	5.5 U
6/5/2018	115	5.4	5.5 UI	5.5 U
9/6/2018	8.3	5.7	5.5 U	5.5 U
12/4/2018	13.2	6.5	5.5 U	5.5 U
3/4/2019	45.1	6.4	5.5 U	5.5 U
6/13/2019	26.7	6.2	5.5 U	5.5 U
9/4/2019	10.9	5.1	5.6 UI	5.5 U
12/05/2019	13.8	5.7	5.5 U	5.5 U

184-MW-103

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
7/20/2016	4.0	4.0 U	5.5 U	5.5 U
7/20/2016 DUP	4.3	4.0 U	5.5 U	5.5 U
9/7/2016	4.0	4.0 U	5.5 U	5.5 U
12/7/2016	4.9 U	4.0 U	5.5 UI	5.5 U
3/9/2017	4.9 U	4.0 U	5.5 U	5.5 U
6/22/2017	12.8	4.0 U	5.5 U	5.5 U
9/15/2017	4.0 U	4.0 U	5.5 UI	5.5 U
12/7/2017	4.0 U	4.0 U	5.5 U	5.5 U
3/29/2018	24.8	20	21 J	19 J
6/5/2018	12.2	8.8	6.1	6.8
9/7/2018	5.4	4.0 U	5.5 U	5.5 U
12/5/2018	21.2	16.4	5.5 U	5.5 U
3/4/2019	34.2	28.9	35 J	34 J
6/13/2019	34.7	28.1	28	27
9/4/2019	11.3	4.0 U	5.5 UI	5.5 U
12/04/2019	20.2	4.0 U	5.5 UI	5.5 U

184-MW-104

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
7/20/2016	4.0 U	4.0 U	5.5 U	5.5 U
9/7/2016	4.0 U	4.0 U	5.5 U	5.5 U
12/7/2016	4.0 U	4.0 U	5.5 UI	5.5 U
3/9/2017	4.0 U	4.0 U	5.5 U	5.5 U
6/22/2017	4.0 U	4.0 U	5.5 U	5.5 U
9/14/2017	4.0 U	4.0 U	5.5 U	5.5 U
12/7/2017	4.0 U	4.0 U	5.5 U	5.5 U
3/30/2018	4.0 U	4.0 U	5.5 UI	5.5 U
6/5/2018	4.0 U	4.0 U	5.5 UI	5.5 U
9/6/2018	4.0 U	4.0 U	5.5 U	5.5 U
12/4/2018	4.0 U	4.0 U	5.5 U	5.5 U
3/5/2019	4.0 U	4.0 U	5.5 U	5.5 U
6/14/2019	4.0 U	4.0 U	5.5 U	5.5 U
9/4/2019	4.0 U	4.0 U	5.5 UI	5.5 U
12/04/2019	4.0 U	4.0 U	5.6 UI	5.6 U

184-MW-109

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
9/14/2017	4.0 U	4.0 U	5.5 U	5.5 U
12/6/2017	4.0 U	4.0 U	5.5 UI	5.5 U
3/20/2018	4.0 U	4.0 U	5.5 U	5.5 U
6/5/2018	4.0 U	4.0 U	5.5 UI	5.5 U
9/6/2018	4.0 U	4.0 U	5.5 U	5.5 U
12/5/2018	4.3	4.0 U	5.5 U	5.5 U
3/5/2019	4.5	4.0 U	5.5 U	5.5 U
6/14/2019	10.9	4.0 U	5.5 U	5.5 U
9/4/2019	8.0 UJ	8.9 UJ	5.5 UI	5.5 U
12/04/2019	5.3	4.0 U	5.5 UI	5.5 U

184-MW-101

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
7/20/2016	4.0 U	4.0 U	5.5 U	5.5 U
9/7/2016	5.4	4.1	5.5 U	5.5 U
12/7/2016	4.3	4.0 U	5.5 UI	5.5 U
3/9/2017	4.0 U	4.0 U	5.5 U	5.5 UI
5/22/2017	4.0 U	4.0 U	5.5 U	5.5 U
9/14/2017	4.0 U	4.0 U	5.5 U	5.5 U
12/7/2017	4.0 U	4.0 U	5.5 U	5.5 U
3/29/2018	4.0 U	4.0 U	5.5 U	5.5 U
9/5/2018	4.0 U	4.0 U	5.5 UI	5.5 U
9/6/2018	4.0 U	4.0 U	5.5 U	5.5 U
12/4/2018	5.3	4.0 U	5.5 U	5.5 U
3/4/2019	4.5	4.0 U	5.5 U	5.5 U
6/14/2019	4.0 U	4.0 U	5.5 U	5.5 U
9/5/2019	4.7	4.0 U	5.5 U	5.5 U

184-MW-04

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
6/10/2016	16	4.3	5.5 U	5.5 U
9/7/2016	19.2	7.6	5.5 U	5.5 U
12/8/2016	14.6	8.5	5.5 UI	5.5 UI
3/9/2017	12.1	8.6	5.5 U	5.5 UI
5/22/2017	9.8	4.0 U	5.5 U	5.5 UI
9/15/2017	81.3	7.0	5.5 UI	5.5 UI
12/8/2017	24.6	4.7	5.5 UI	5.5 UI
3/30/2018	4.0 U	4.0 U	5.5 UI	5.5 UI
9/5/2018	6.5	4.1	5.5 U	5.5 U
9/7/2018	50.9	8.0	5.5 U	5.5 U
12/4/2018	6.5	4.0 U	5.5 U	5.5 UI

184-MW-05

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
6/10/2016	48.3	5.6	5.5 U	5.5 U
6/10/2016 DUP	41.3	5.7	5.5 U	5.5 U
9/7/2016	33.9	7.1	5.5 U	5.5 U
9/7/2016 DUP	12.1	7.2	5.5 U	5.5 U
12/7/2016	7.6	4.0 U	5.5 UI	5.5 UI
12/7/2016 DUP	7.5	4.3	5.5 UI	5.5 UI
3/9/2017	4.9	4.0 U	5.5 U	5.5 UI
3/9/2017 DUP	4	4.0 U	5.5 U	5.5 UI
5/22/2017	12.8	5.3	5.5 U	5.5 UI
5/22/2017 DUP	25.5	5.5	5.5 U	5.5 UI
9/14/2017	10 J	4.7 J	5.5 U	5.5 U
9/14/2017 DUP	9.5 J	5.1 J	5.5 U	5.5 U
12/7/2017	10.4	13.3	5.5 U	5.5 U
12/7/2017 DUP	10.4	10.6	5.5 U	5.5 U
3/29/2018	96.3	8.0 U	5.5 UI	5.5 UI
3/29/2018 DUP	84.1	8.0 U	5.5 UI	5.5 UI
6/5/2018	17.3	7.7	5.5 UI	5.5 U
6/5/2018 DUP	23.3	6.7	5.5 U	5.5 U
9/6/2018	7.3	5.7	5.5 U	5.5 U
9/6/2018 DUP	7.7	6.8	5.5 U	5.5 U
12/4/2018	16.1	6.8	5.5 U	5.5 UI
12/4/2018 DUP	13.3	6.8	5.5 U	5.5 UI

184-MW-06

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
9/15/2016	28.6	30.3	28	27
9/15/2016	28	8	8.8	8.6
12/7/2016	9.4	9.1	5.5	5.6 J
3/9/2017	39.8	19.8	20	23 J
5/22/2017	17.2	12.1	10	10 J
9/14/2017	14.4 J	12.1 J	10	10
12/7/2017	8.2	5.3	7.3	8.3
3/30/2018	8.1	7.6	7.6	8.4
6/5/2018	9.2	7.8	8.8	9.3
9/7/2018	5.6	4.8	5.5 U	5.5 U
12/5/2018	6.8	5.7	5.5 U	5.5 U

SOURCE MAP REFERNCE:
AS-BUILT SURVEY FINAL EXISTING CONDITIONS" BLOCK 1286.5, LOT 1 & BLOCK 1286, LOT 5 JERSEY CITY, NEW JERSEY HONEYWELL SITE ID 37288, 37811 & 37460 KENNON SURVEYING SERVICES INC. WARREN, NEW JERSEY SHEET 1 OF 2, PROJECT NUMBER 2201, DATED 01-13-12

FIGURE 5-7

Groundwater Quality Monitoring Well Results - NJCU

Integrated Annual Groundwater Performance Report 2019

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153-MW-A13

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
1/6/1999	**1830**	J	**207**	J	**1330**	J	**571**	J
7/20/1999	**459**		26		22.2		10	U
4/14/2003	**1050**		**892**		**1110**		772	
7/19/2006	**1090**		**133**		**1100**		53	
10/19/2010	**761**		17.2	J	19	J	10	UJ
9/26/2011	**666**		**345**		**530**	J	**230**	J
12/18/2018	65.6		8.6		72		5.5	U
11/21/2019	**1090**		10	U	5.5	UJ	46	J
11/21/2019*	NA		87.2		NA		18	J
11/21/2019DP	**1640**		10	U	5.5	UJ	32	J
11/21/2019DP*	NA		**520**		NA		39	

117-MW-A089

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
11/11/1997	**1870**		**1790**		**1750**		**1720**	
8/21/1998	**122**		52.6		11.6		10	U
6/15/1999	31.7	J	11.3	J	10	U	10	U
4/17/2003	**457**	J	**401**	J	**416**		**416**	
7/18/2006	**784**		**189**		**550**		**310**	
9/9/2009	**176**		10	U	10	UJ	10	UJ
10/12/2009	30.5		10	U	10	UJ	10	UJ
12/12/2018	**121**		**83.6**		63		51	
11/21/2019	66.2		59.7		32	J	25	J
11/21/2019*	NA		36.7		NA		5.5	U
11/21/2019DP	69.5		49.2		39	J	11	J
11/21/2019DP*	NA		43.9		NA		5.5	U

117-MW-A085

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
11/11/1997	**8970**		**1130**		10	U	20	U
8/20/1998	**14100**		**8720**		10	U	10	U
6/14/1999	**119000**		**29000**		10	UJ	10	UJ
4/18/2003	**1940**	J	**2760**	J	10	U	10	U
7/18/2006	**3640**		**1020**		50	U	50	U
9/9/2009	**186**		**111**		10	UJ	10	UJ
10/12/2009	**89.9**		10	U	10	UJ	10	UJ
12/12/2018	**704**		**215**	UJ	5.5	U	5.5	U

117-MW-A099

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
11/11/1997	**504**		NA		10	U	NA	
8/19/1998	**130**		17.5		10	U	10	U
4/15/1999	**215**		3	B	10	U	10	U
4/17/2003	**78.4**		**82.4**		10	U	10	U
7/26/2006	**84.9**		10		50	U	50	U
9/9/2009	42.6		10	U	10	UJ	50	UJ
10/12/2009	30.9		10	U	10	UJ	10	UJ
12/12/2018	7.2		4.0	U	5.5	U	5.5	U

117-MW-I4S

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
10/13/2009	**334000**		**353000**		**328000**	J	**325000**	J
12/12/2018	**122000**		**118000**		**121000**		**173000**	J

153-MW-A15

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
5/26/1999	20.2		13.5		10	U	10	U
7/14/1999	24.9		11.8		10	UJ	10	UJ
4/14/2003	14.1	J	5.6	J	10	U	10	U
7/18/2006	68.7		10	U	50	U	50	U
10/19/2010	**161**		10	UJ	10	UJ	10	UJ
9/23/2011	**71.4**		10.2		5.5	UJ	5.5	UJ
12/18/2018	**128**		**73.6**		5.5	U	5.5	U
11/21/2019	**85**		10	U	5.5	UJ	5.5	UJ
11/21/2019*	NA		12.7		NA		5.5	UJ

153-MW-2

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
10/19/2010	4.0	U	4.0	U	5.5	UJ	5.5	UJ
4/28/2011	4.0	U	4.0	U	5.5	UJ	5.5	UJ

153-MW-5

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
10/19/2010	4.0	U	4.0	U	5.5	UJ	5.5	UJ
4/26/2011	4.0	U	4.0	U	5.5	UJ	5.5	UJ
4/26/2011	4.0	U	4.0	U	5.5	UJ	5.5	UJ

117-MW-A014

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
11/11/1997	**333**		NA		**131**		NA	
8/20/1998	**95.6**		**90**		**83.7**		**86.2**	
4/17/2003	NA		NA		10	U	10	U
7/19/2006	**90.9**		**86**		65		65	
9/9/2009	41.3		17.2		14	J	11	J
10/12/2009	37.6		34.3		28	J	27	J
10/19/2010	40.7		38.9		33	J	23	J
4/26/2011	43.7		43.6		40	J	44	J
12/17/2018	23.1		21.9		9.9		8.8	

117-MW-A05

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
11/12/1997	**164**		NA		**151**		NA	
8/20/1998	36.7		35.5		32.4		29.9	
4/17/2003	NA		NA		10	U	10	U
9/9/2009	15.5		10	U	10	UJ	10	UJ
10/12/2009	10	U	10	U	10	UJ	10	UJ
12/12/2018	4.0	U	4.0	U	5.5	U	5.5	U

117-MW-A062

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
11/12/1997	**1810**		22.7		10	U	10	U
8/19/1998	**108**		9.5	J	10	U	10	U
4/17/2003	**401**	J	37.1	J	10	U	10	U
7/19/2006	**96.3**		10	U	50	U	50	U
9/9/2009	36.5		10	U	10	U	10	U
10/12/2009	**1570**		55.1		10	U	10	U

FIGURE 5-8

Groundwater Quality Monitoring Results - Site 117 and Site 153

Integrated Annual Groundwater Performance Report 2019

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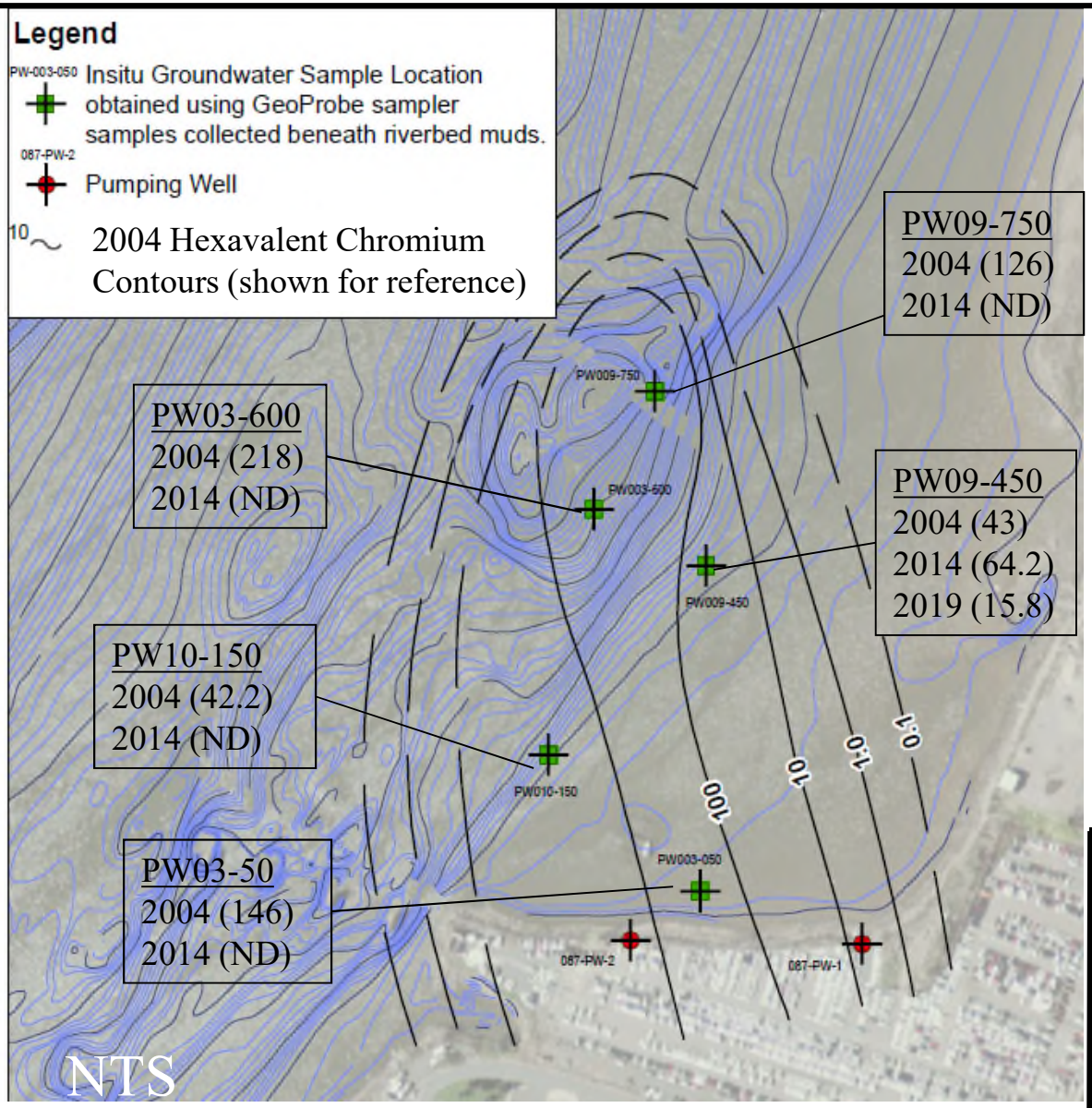


Figure 5-9
Hexavalent Chromium
In Groundwater Beneath
Riverbed Sediments (ppm)

Integrated Annual Groundwater
Performance Report - 2019

cornerstone
environmental

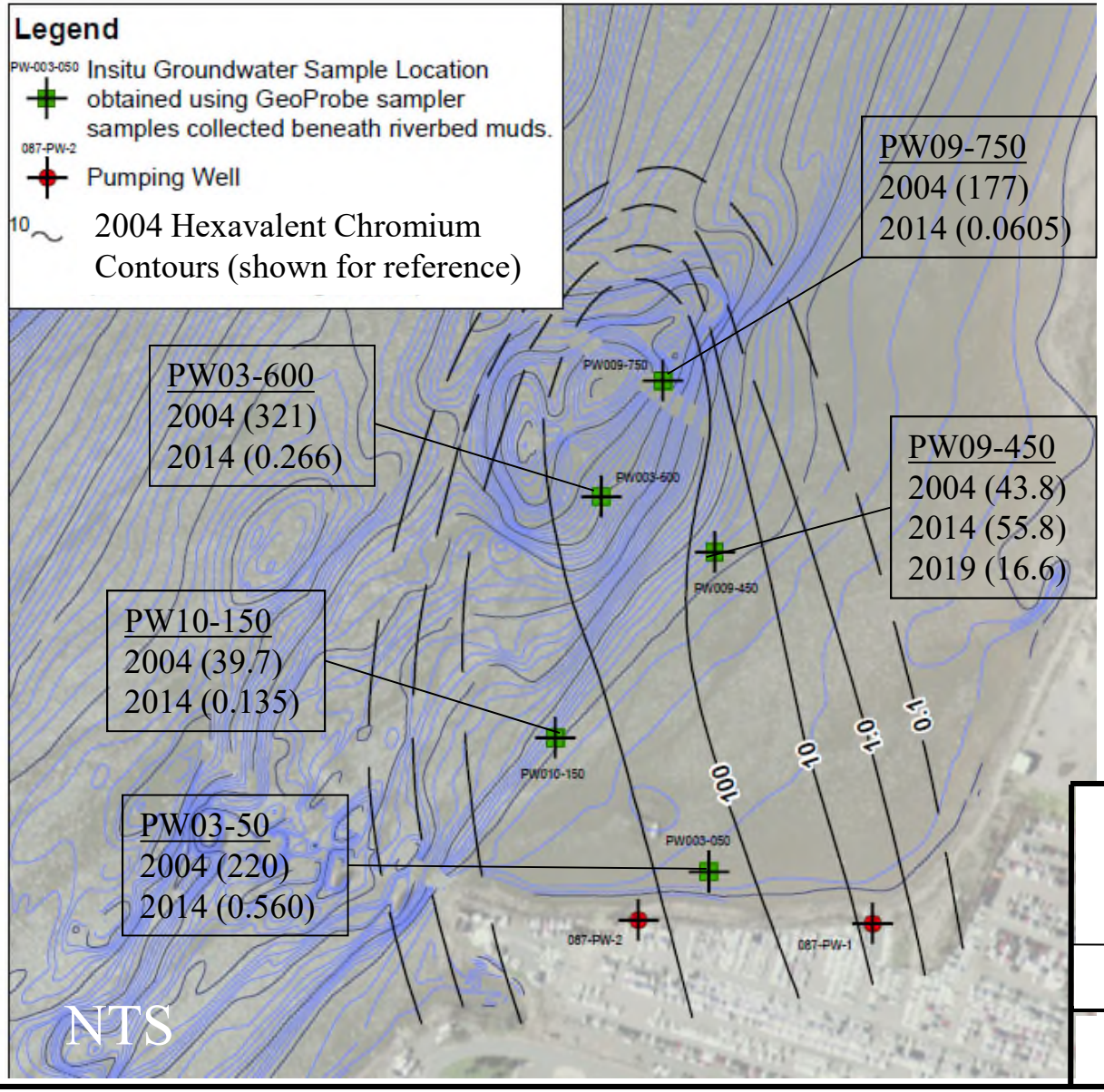


Figure 5-10
Total Chromium
In Groundwater Beneath
Riverbed Sediments (ppm)

Integrated Annual Groundwater
Performance Report - 2019

cornerstone environmental

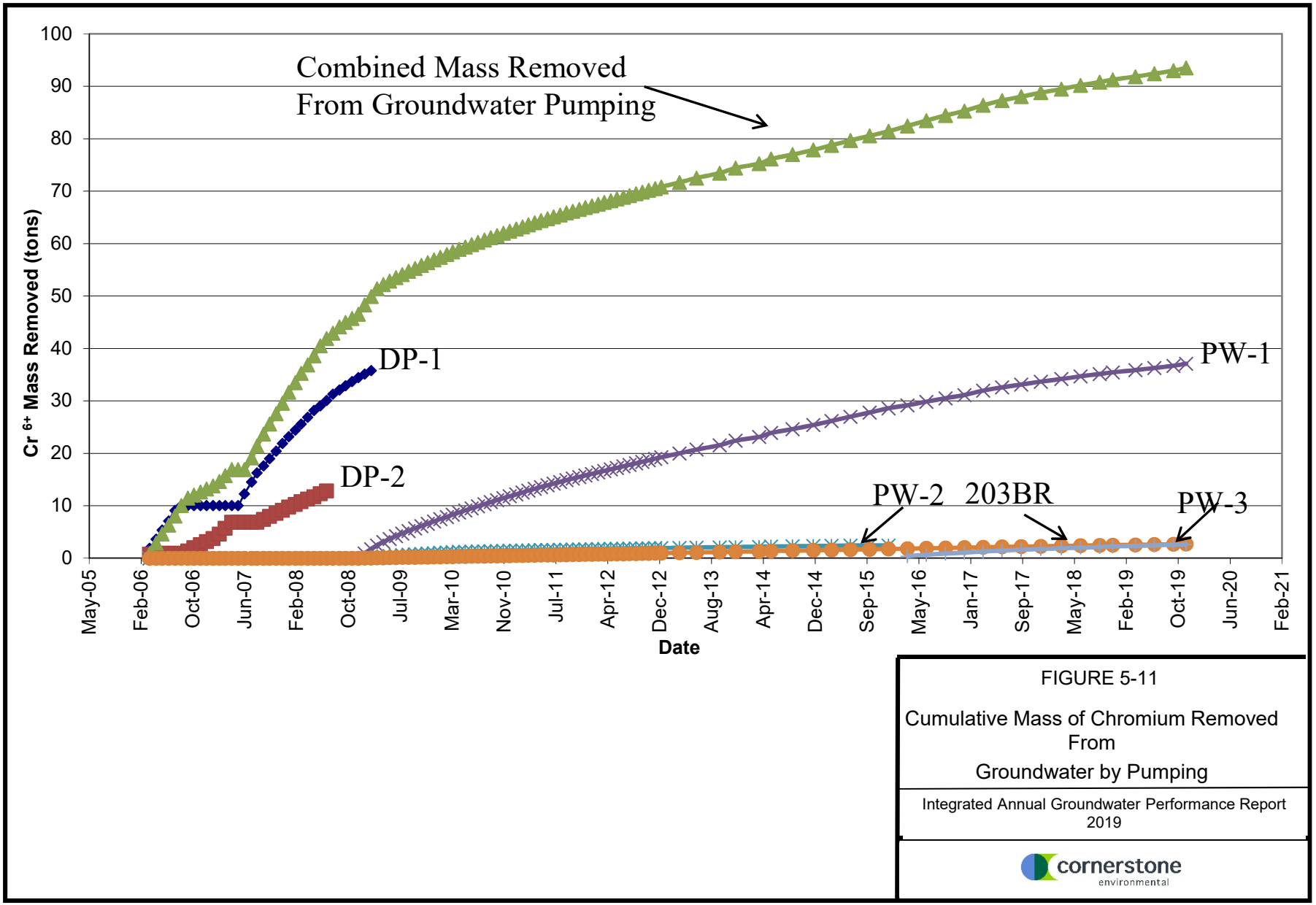


FIGURE 5-11

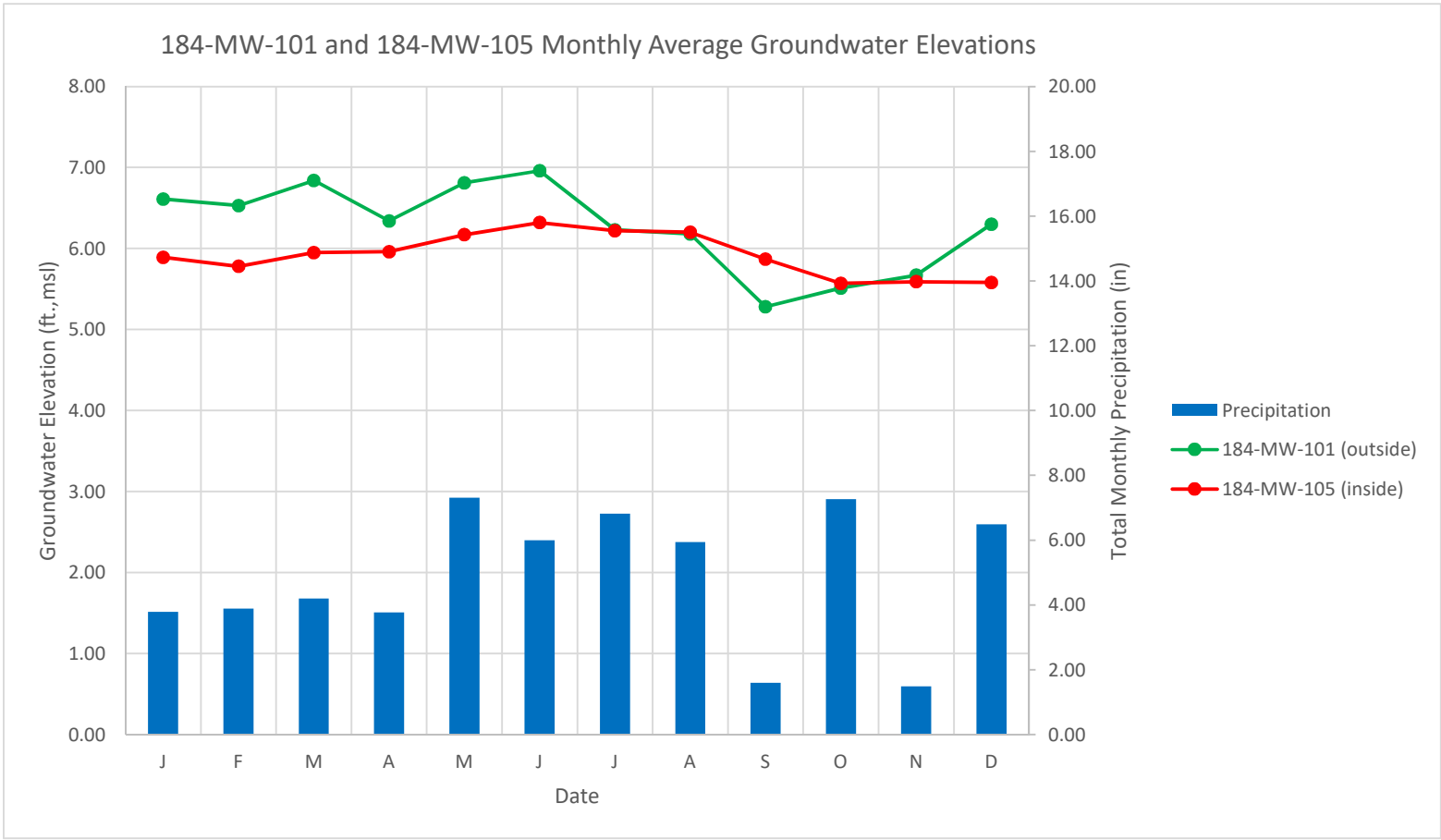
Cumulative Mass of Chromium Removed From Groundwater by Pumping

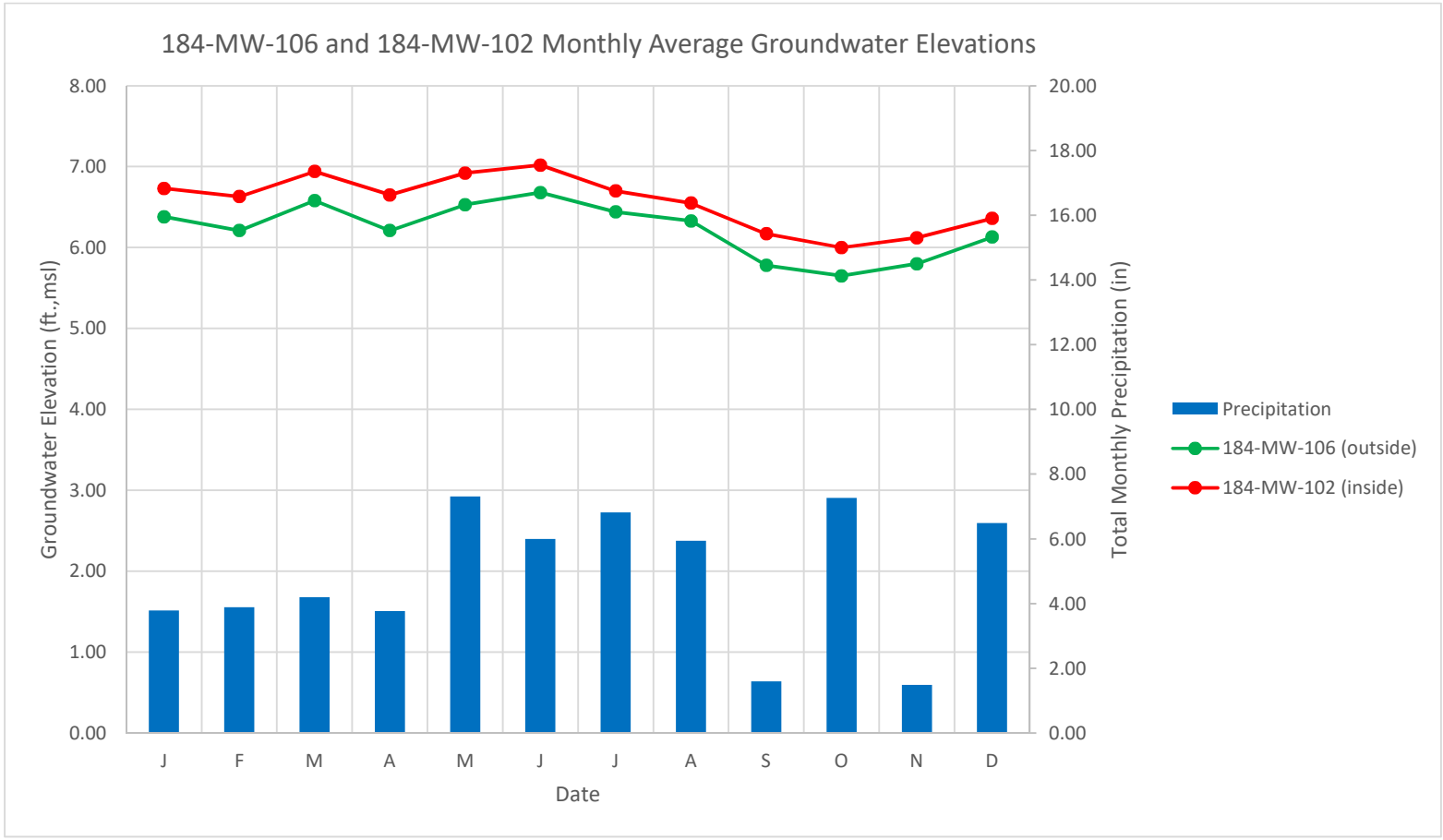
Integrated Annual Groundwater Performance Report 2019

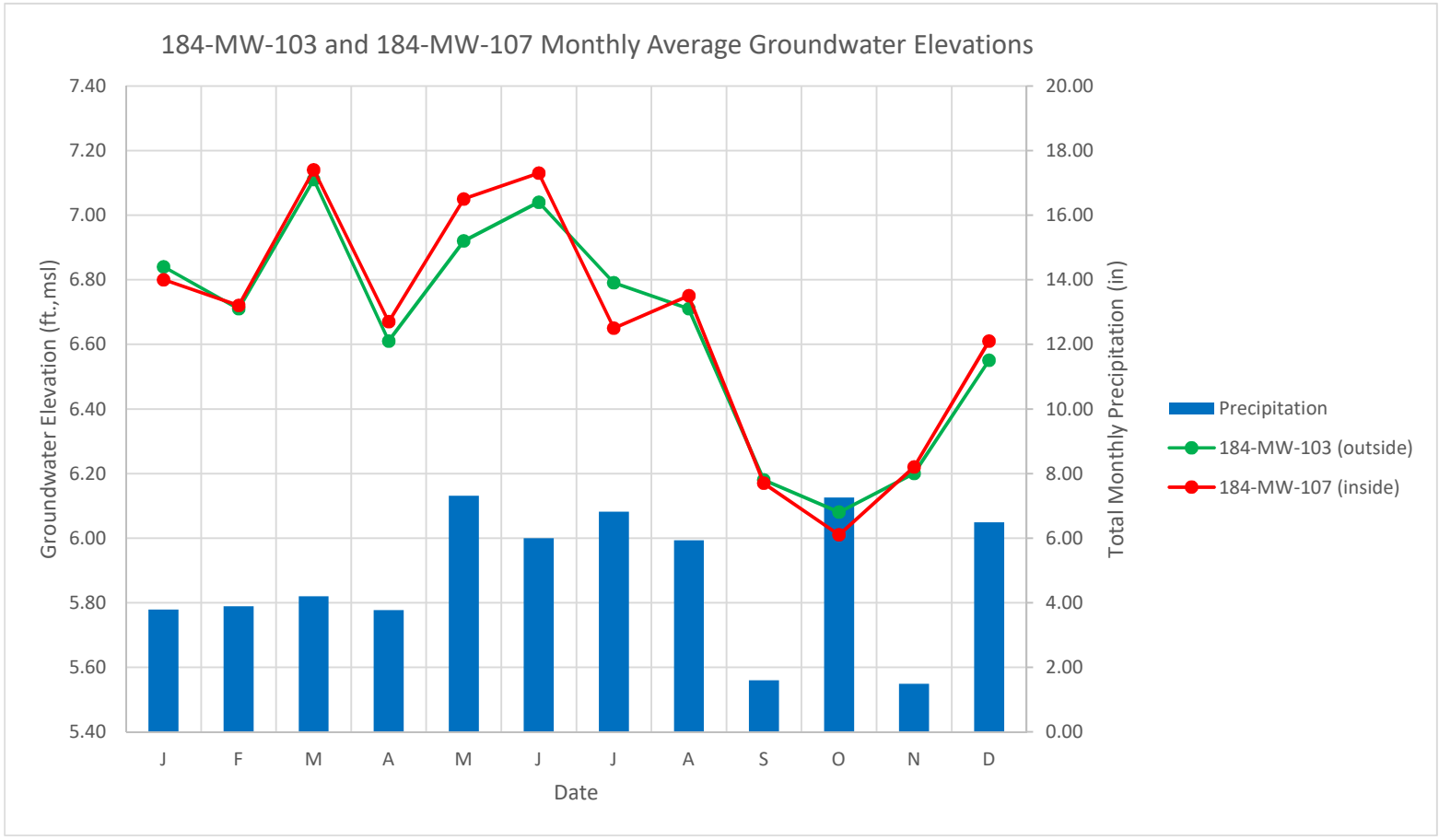
cornerstone environmental

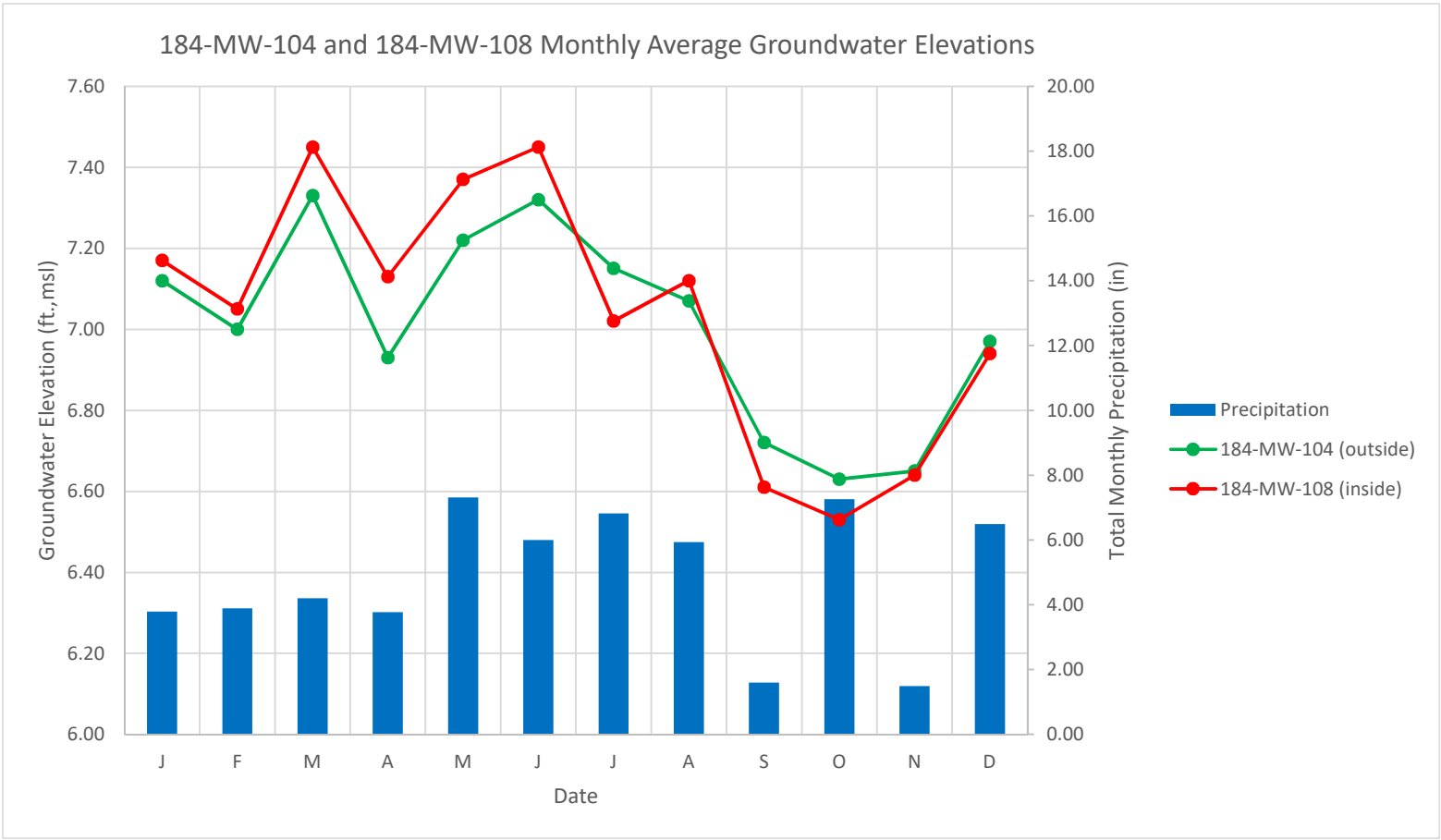
APPENDIX A

HYDROGRAPHS OF AVERAGE MONTHLY HEADS FROM SA-5 NJCU


184-MW-101 and 184-MW-105 Monthly Average Groundwater Elevations
Groundwater Elevation (ft.,msl)
Total Monthly Precipitation (in)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
J
F
M
A
M
J
J
A
S
O
N
D
Date
Precipitation
184-MW-101 (outside)
184-MW-105 (inside)

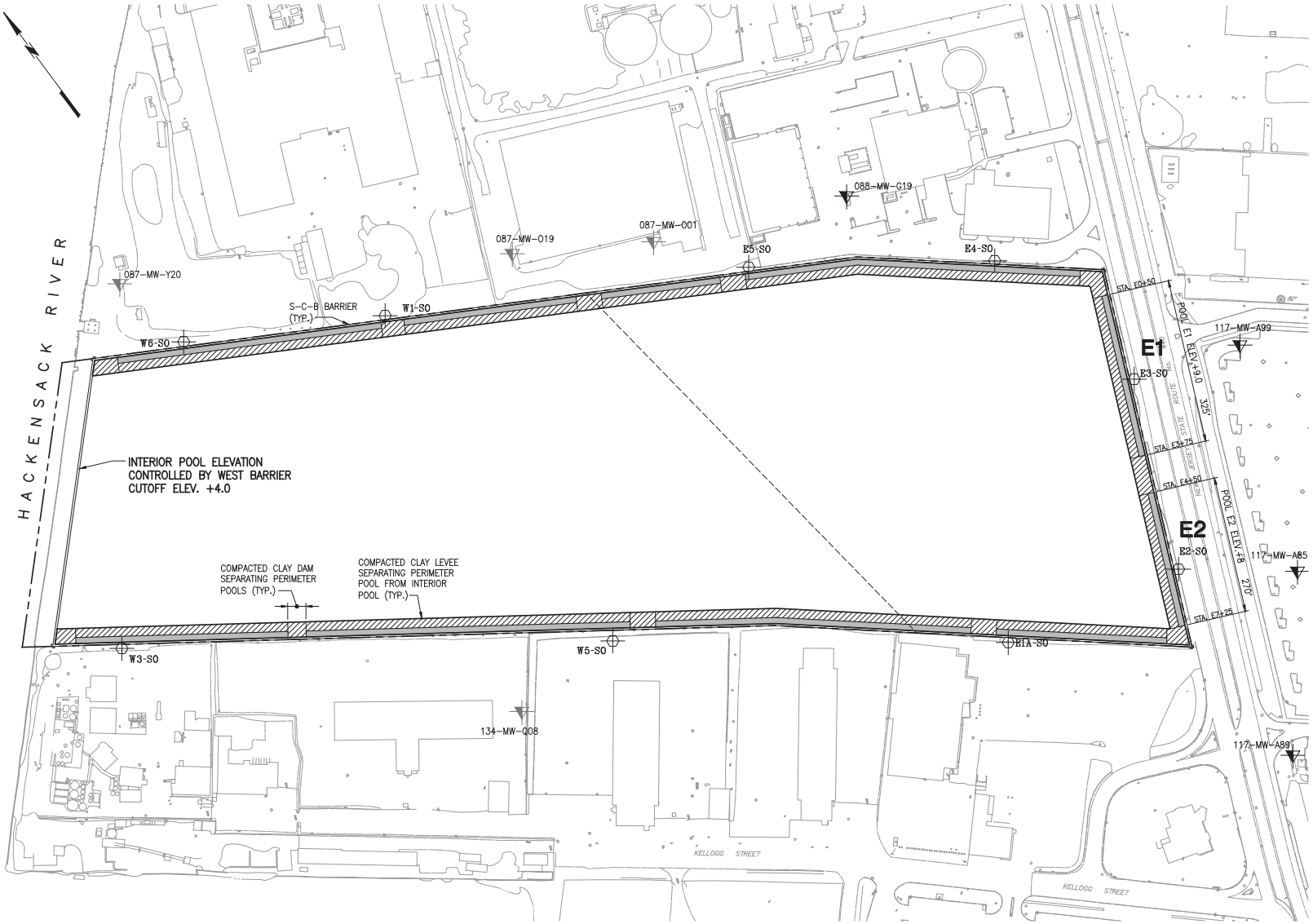

184-MW-106 and 184-MW-102 Monthly Average Groundwater Elevations
Groundwater Elevation (ft.,msl)
Total Monthly Precipitation (in)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
J
F
M
A
M
J
J
A
S
O
N
D
Date
Precipitation
184-MW-106 (outside)
184-MW-102 (inside)


184-MW-103 and 184-MW-107 Monthly Average Groundwater Elevations
Groundwater Elevation (ft.,msl)
7.40
7.20
7.00
6.80
6.60
6.40
6.20
6.00
5.80
5.60
5.40
Total Monthly Precipitation (in)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
J
F
M
A
M
J
J
A
S
O
N
D
Date
Precipitation
184-MW-103 (outside)
184-MW-107 (inside)


184-MW-104 and 184-MW-108 Monthly Average Groundwater Elevations
Groundwater Elevation (ft.,msl)
7.60
7.40
7.20
7.00
6.80
6.60
6.40
6.20
6.00
Total Monthly Precipitation (in)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
J
F
M
A
M
J
J
A
S
O
N
D
Date
Precipitation
184-MW-104 (outside)
184-MW-108 (inside)

APPENDIX B

EASTERN SA-7 PERIMETER POOL HYDROGRAPHS



NOTES:

1. THE FOLLOWING WERE REMOVED FROM THIS DRAWING ON OCTOBER 15, 2018, AT THE REQUEST OF HONEYWELL:

   WELLS NORTH FS-1, NORTH FS-2, NORTH FS-3, NORTH FS-4, NORTH FS-5, NORTH FS-6, NORTH FS-7, NORTH FS-8, NORTH FS-9, NORTH FS-13, 087-MW-S19, 088-MW-G19, 090-MW-E1, 115-PZ-4, 115-PZ-5, 115-PZ-6, 073-MW-BB11, 073-MW-Y10, SOUTH-FS-1, SOUTH-FS-3, SOUTH-FS-4, SOUTH FS-5, SOUTH-FS-6, SOUTH FS-7, 134-MW-V09, 140-MW-06, 140-MW-07, 125-MW-L03, E1-SO, MW-124-103L, MW-124-103D, MW-124-103, MW-102D, MW-124-102T,

   PERIMETER POOL CALLOUTS N1, N2, N3, N4, S1, S2, S3, S4.

LEGEND

- FILL TYPE A CLAY
- FILL TYPE B GRANULAR FILL
- SHALLOW WELL INSTALLED BY OTHERS
- SHALLOW WELL ABANDONED IN 2014 IN ACCORDANCE WITH STUDY AREA 6 100% DESIGN
- SHALLOW WELL INSTALLED FOR STUDY AREA 7 REMEDIATION

GRAPHIC SCALE

100' 50' 0 100' 200'

NOTE: BEGINNING MARCH 1, 2018, PERIMETER POOLS DESIGNATED N1, N2, N3, N4, S1, S2, S3 AND S4 ARE NO LONGER MONITORED. PERIMETER POOLS E1 AND E2 WILL CONTINUE TO BE MONITORED AND WATER LEVEL DATA FOR THE REPORTING PERIOD IS ATTACHED.

IN PROGRESS
10-16-2018

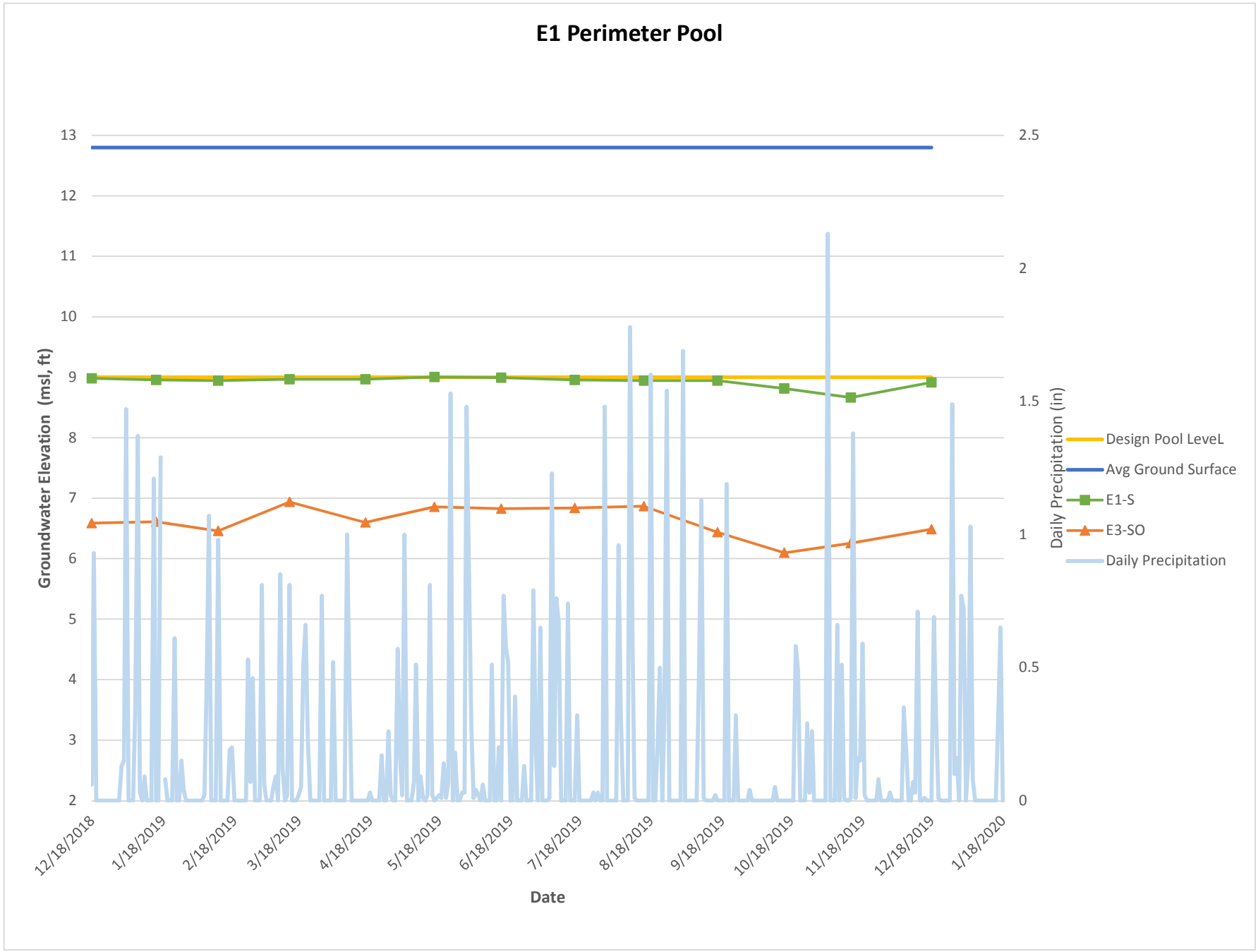
STUDY AREA 7
PERIMETER POOL DESIGN ELEVATIONS

NEW JERSEY

MUESER RUTLEDGE CONSULTING ENGINEERS
14 PENN PLAZA – 225 WEST 34th STREET

FILE NO. 10210
DRAWING NO. PP-1

Oct. 16, 2018 at 11:22am
G:\DWGS\102\10210\Dewatering\PP-1.dwg
bbascaino


E1 Perimeter Pool
Groundwater Elevation (msl, ft)
Daily Precipitation (in)
Date
13
12
11
10
9
8
7
6
5
4
3
2
2.5
2
1.5
1
0.5
0
12/18/2018
1/18/2019
2/18/2019
3/18/2019
4/18/2019
5/18/2019
6/18/2019
7/18/2019
8/18/2019
9/18/2019
10/18/2019
11/18/2019
12/18/2019
1/18/2020
Design Pool LeveL
Avg Ground Surface
E1-S
E3-SO
Daily Precipitation

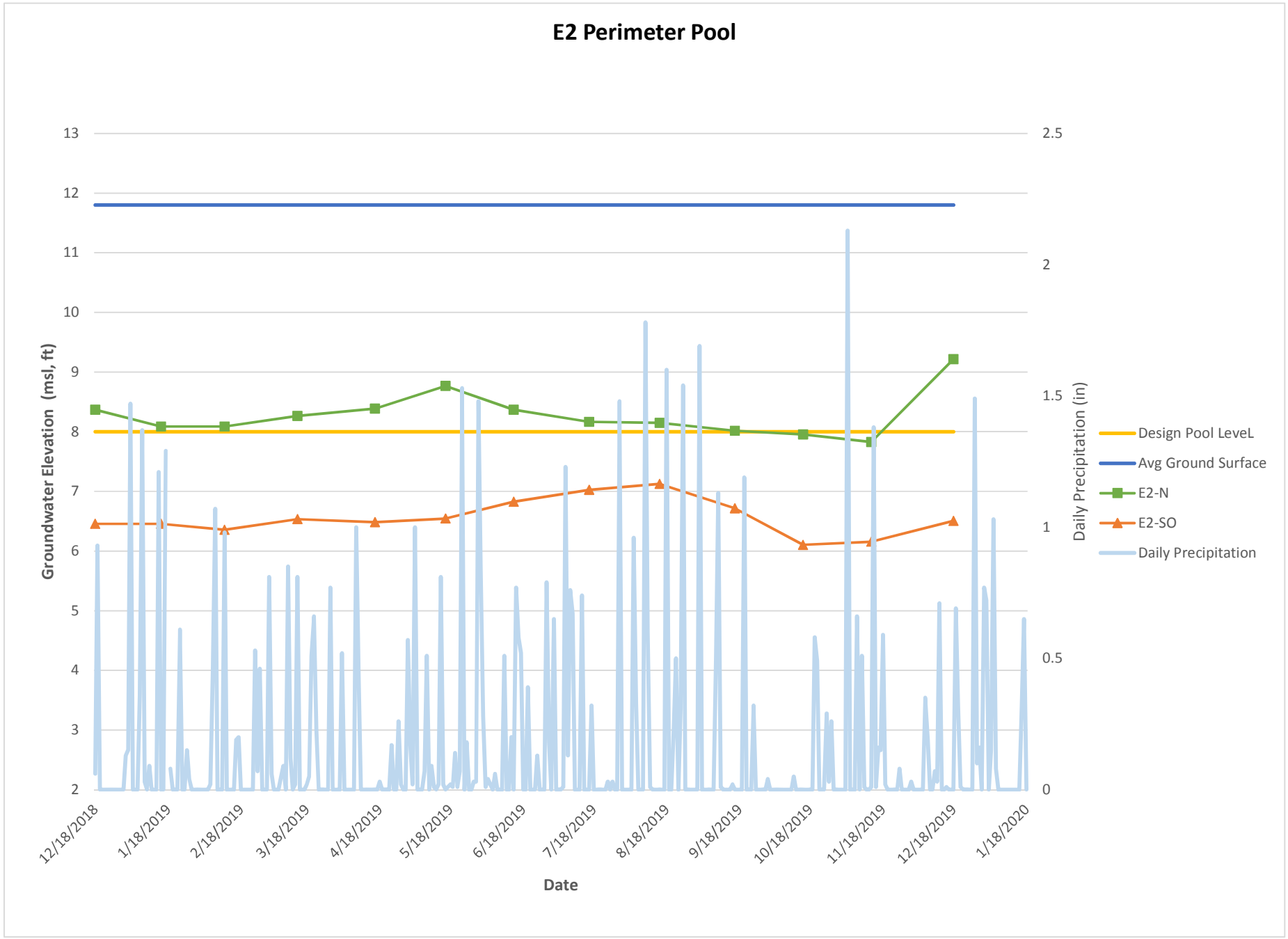
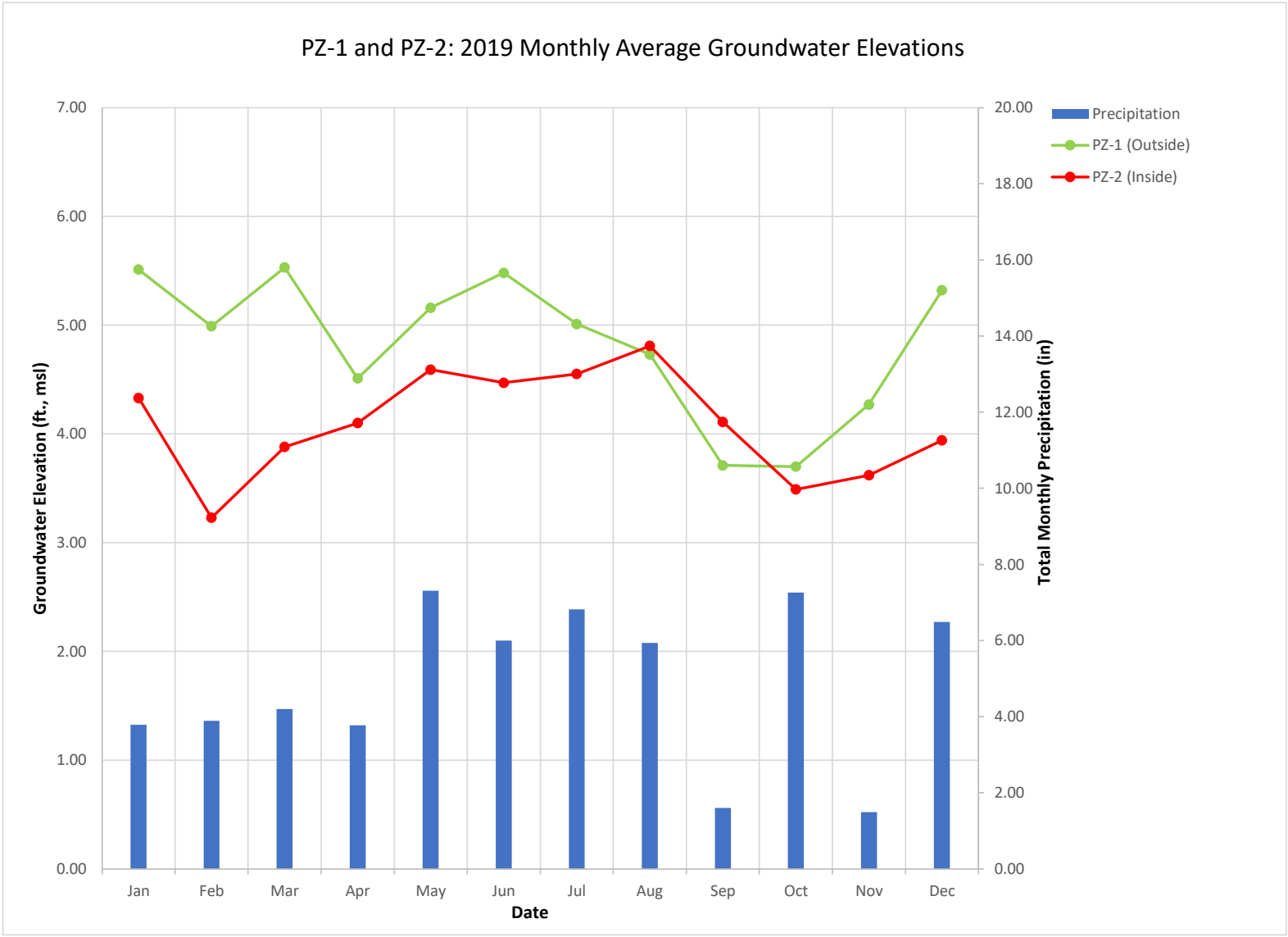
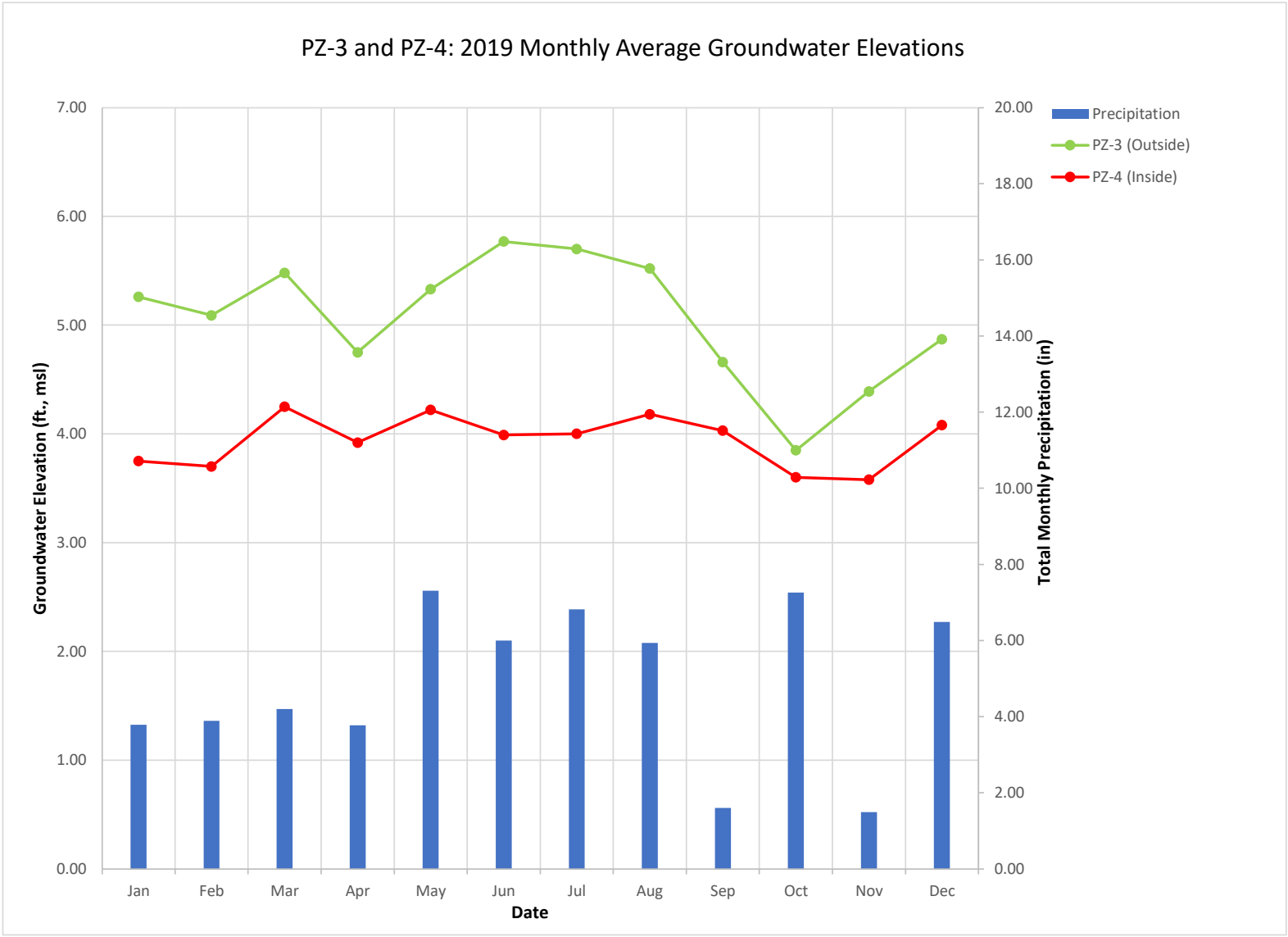

E2 Perimeter Pool
Groundwater Elevation (msl, ft)
Daily Precipitation (in)
Date
13
12
11
10
9
8
7
6
5
4
3
2
2.5
2
1.5
1
0.5
0
12/18/2018
1/18/2019
2/18/2019
3/18/2019
4/18/2019
5/18/2019
6/18/2019
7/18/2019
8/18/2019
9/18/2019
10/18/2019
11/18/2019
12/18/2019
1/18/2020
Design Pool LeveL
Avg Ground Surface
E2-N
E2-SO
Daily Precipitation

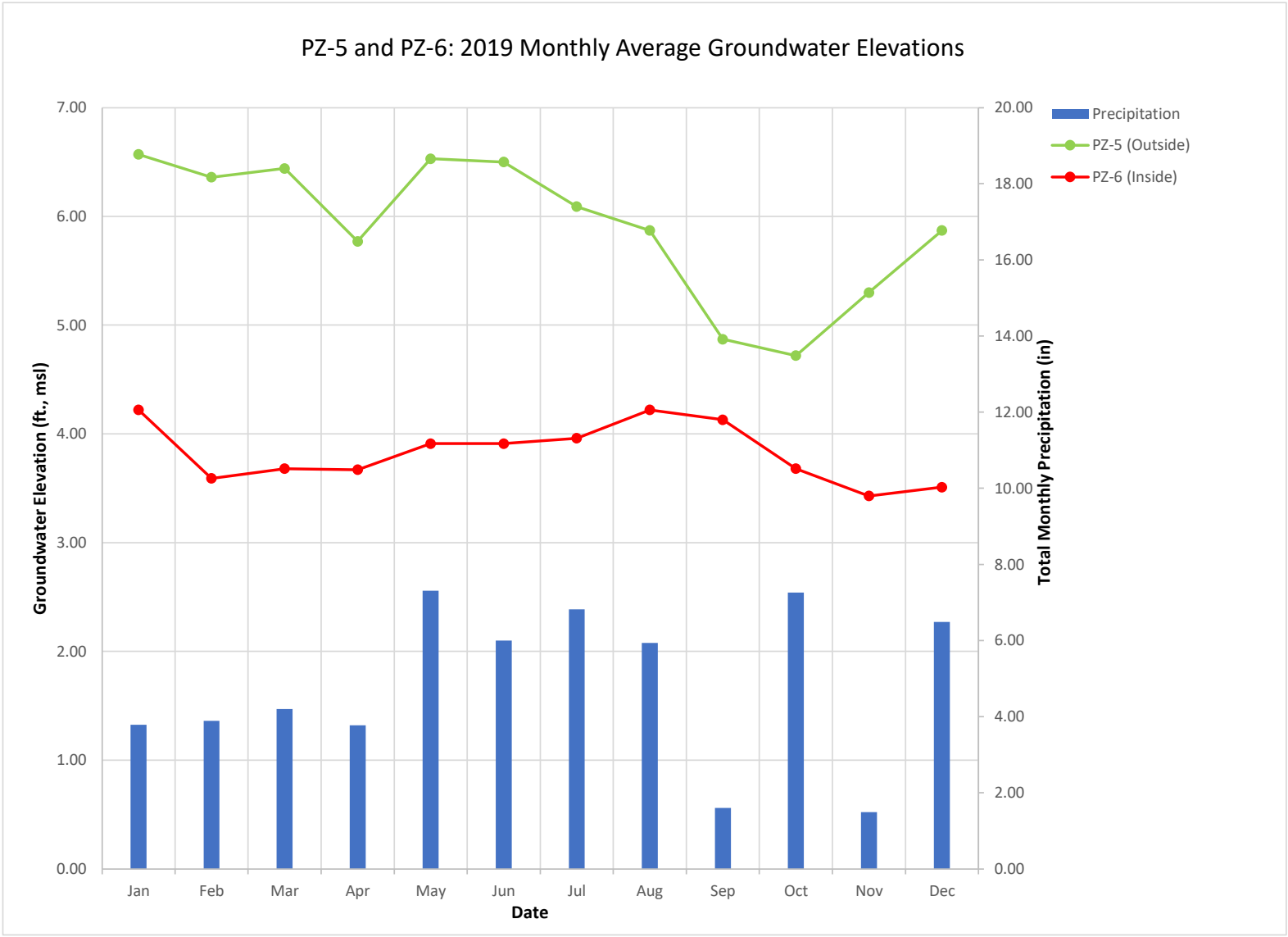
Table 1 Shallow Groundwater Data		
Date	**E2-SO**	**E3-SO**
12/18/2018	6.45	6.59
1/15/2019	6.45	6.61
2/11/2019	6.35	6.46
3/14/2019	6.53	6.94
4/16/2019	6.48	6.60
5/16/2019	6.54	6.86
6/14/2019	6.82	6.83
7/16/2019	7.02	6.84
8/15/2019	7.12	6.87
9/16/2019	6.71	6.44
10/15/2019	6.10	6.10
11/13/2019	6.15	6.26
12/18/2019	6.50	6.49

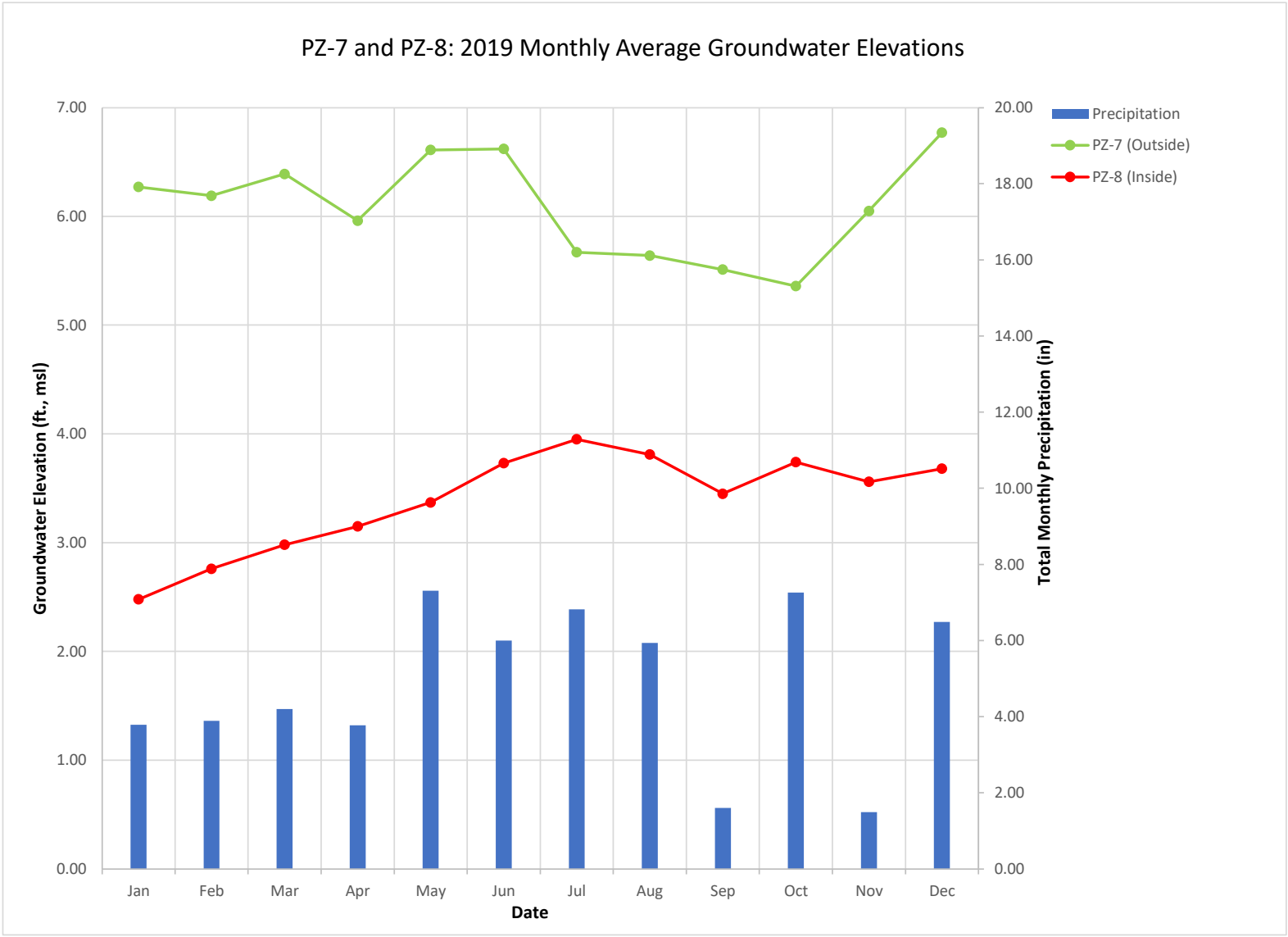
APPENDIX C

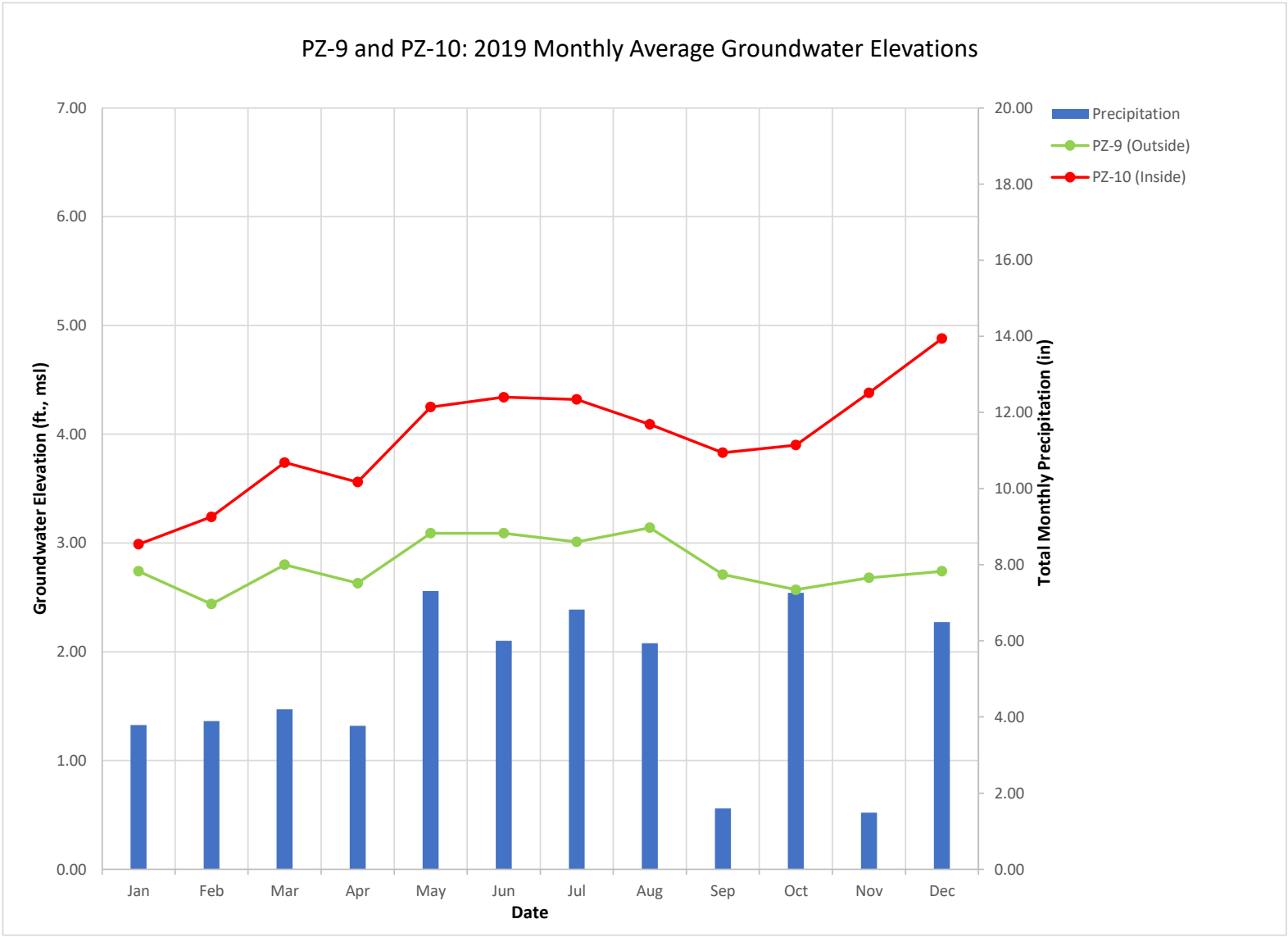
HYDROGRAPHS OF AVERAGE MONTHLY HEADS FROM SA-6 AND SA-7

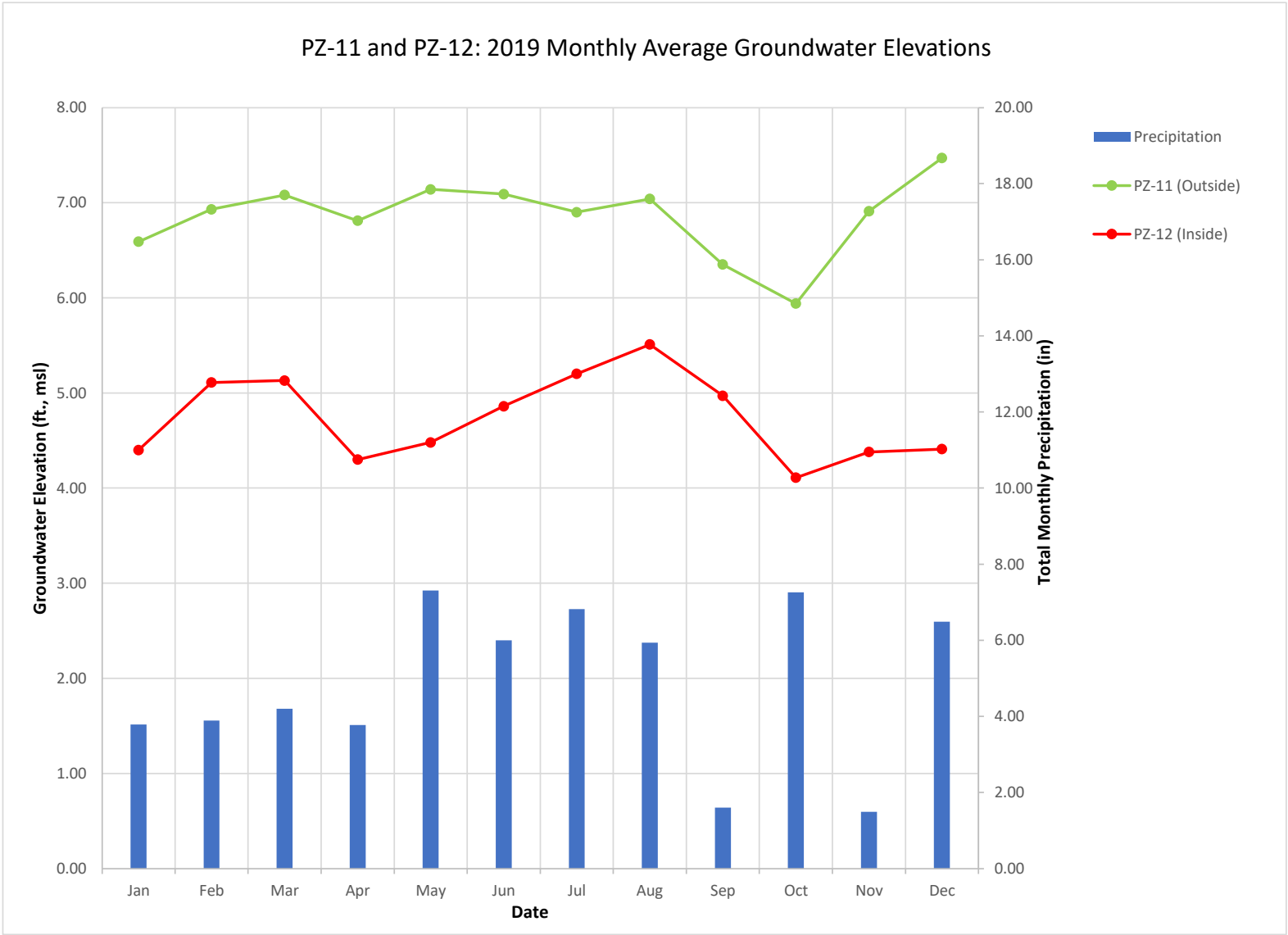

PZ-1 and PZ-2: 2019 Monthly Average Groundwater Elevations
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
PZ-1 (Outside)
PZ-2 (Inside)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

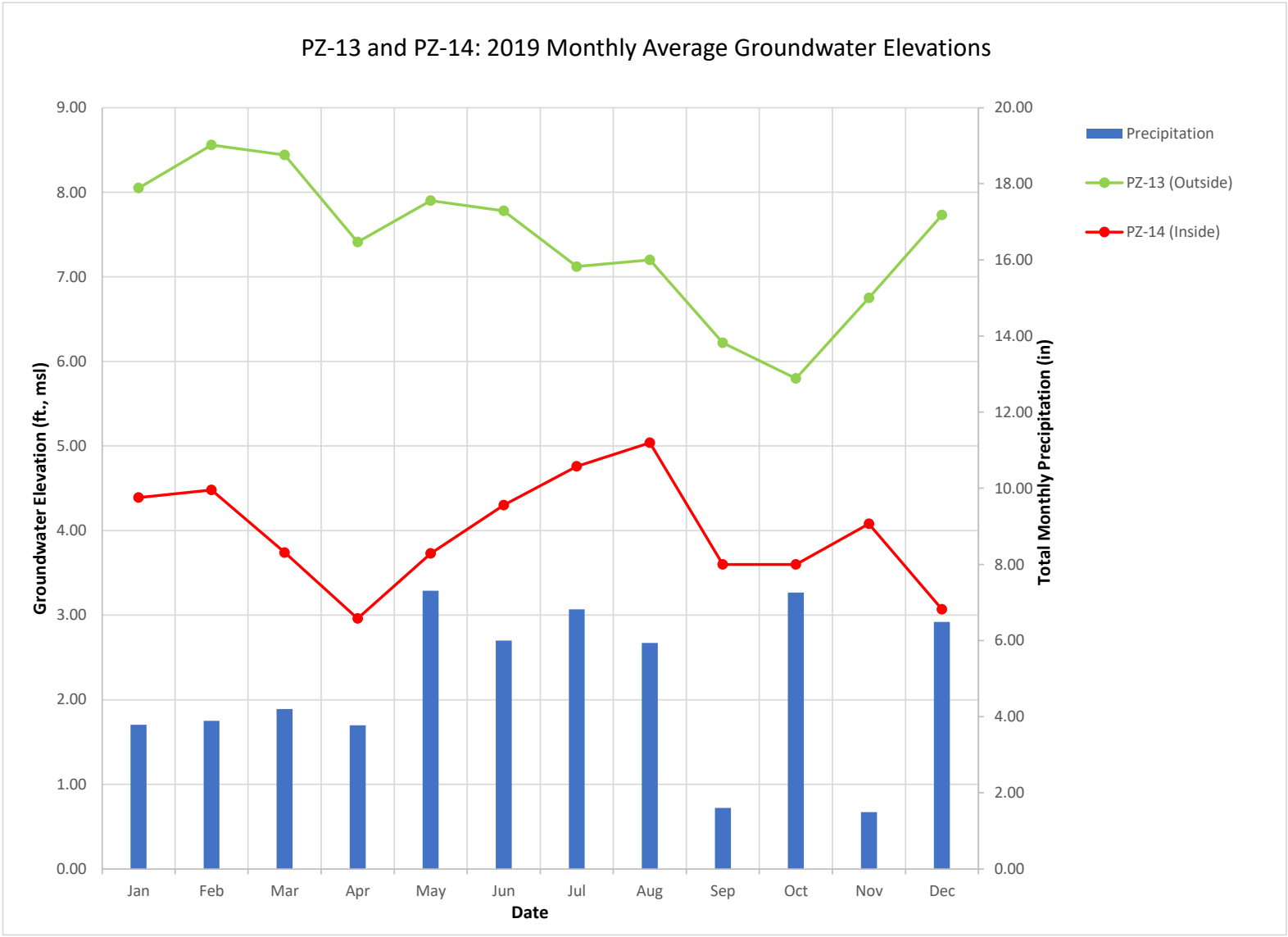

PZ-3 and PZ-4: 2019 Monthly Average Groundwater Elevations
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
PZ-3 (Outside)
PZ-4 (Inside)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

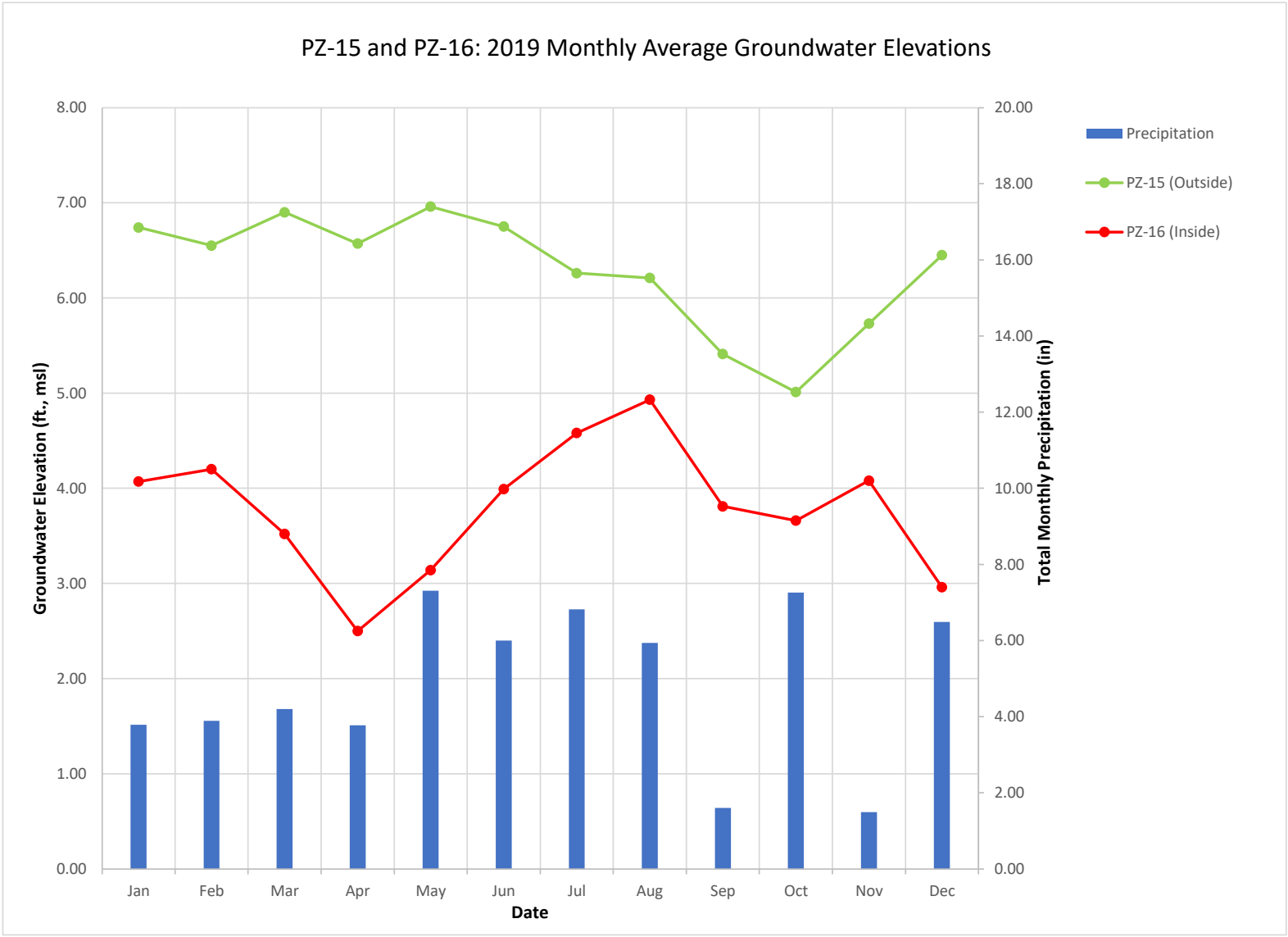

PZ-5 and PZ-6: 2019 Monthly Average Groundwater Elevations
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
PZ-5 (Outside)
PZ-6 (Inside)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

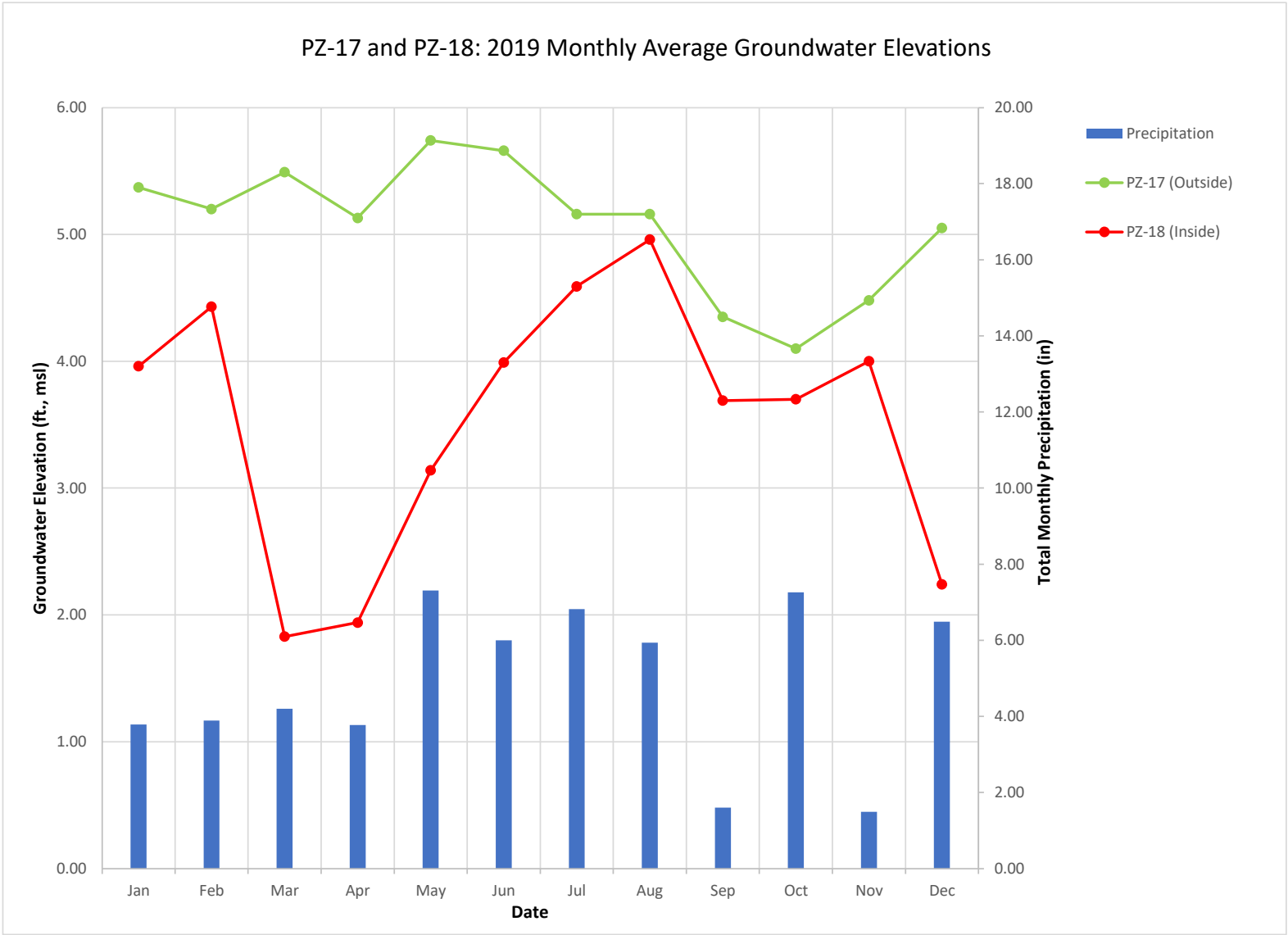

PZ-7 and PZ-8: 2019 Monthly Average Groundwater Elevations
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
PZ-7 (Outside)
PZ-8 (Inside)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

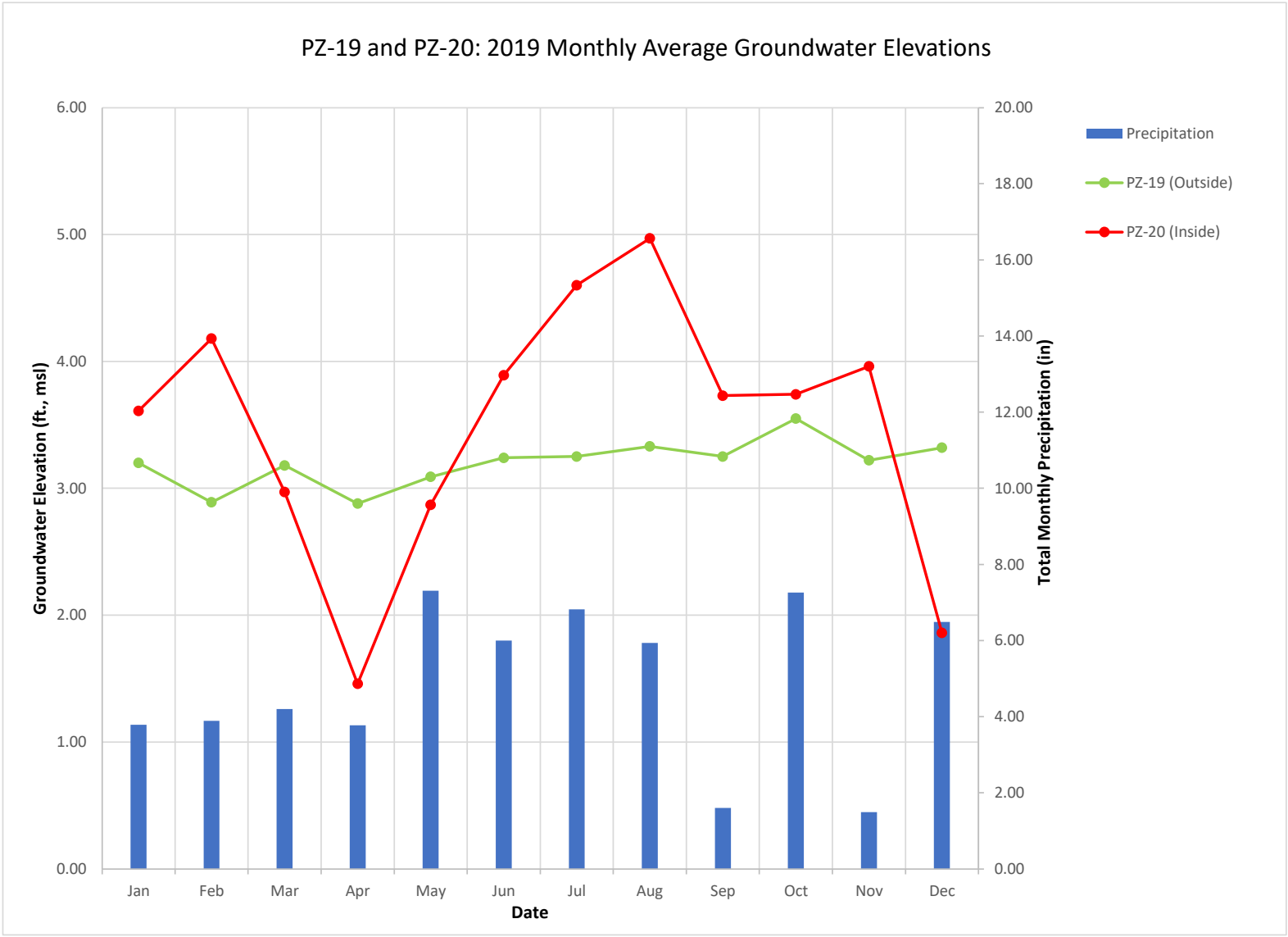

PZ-9 and PZ-10: 2019 Monthly Average Groundwater Elevations
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
PZ-9 (Outside)
PZ-10 (Inside)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

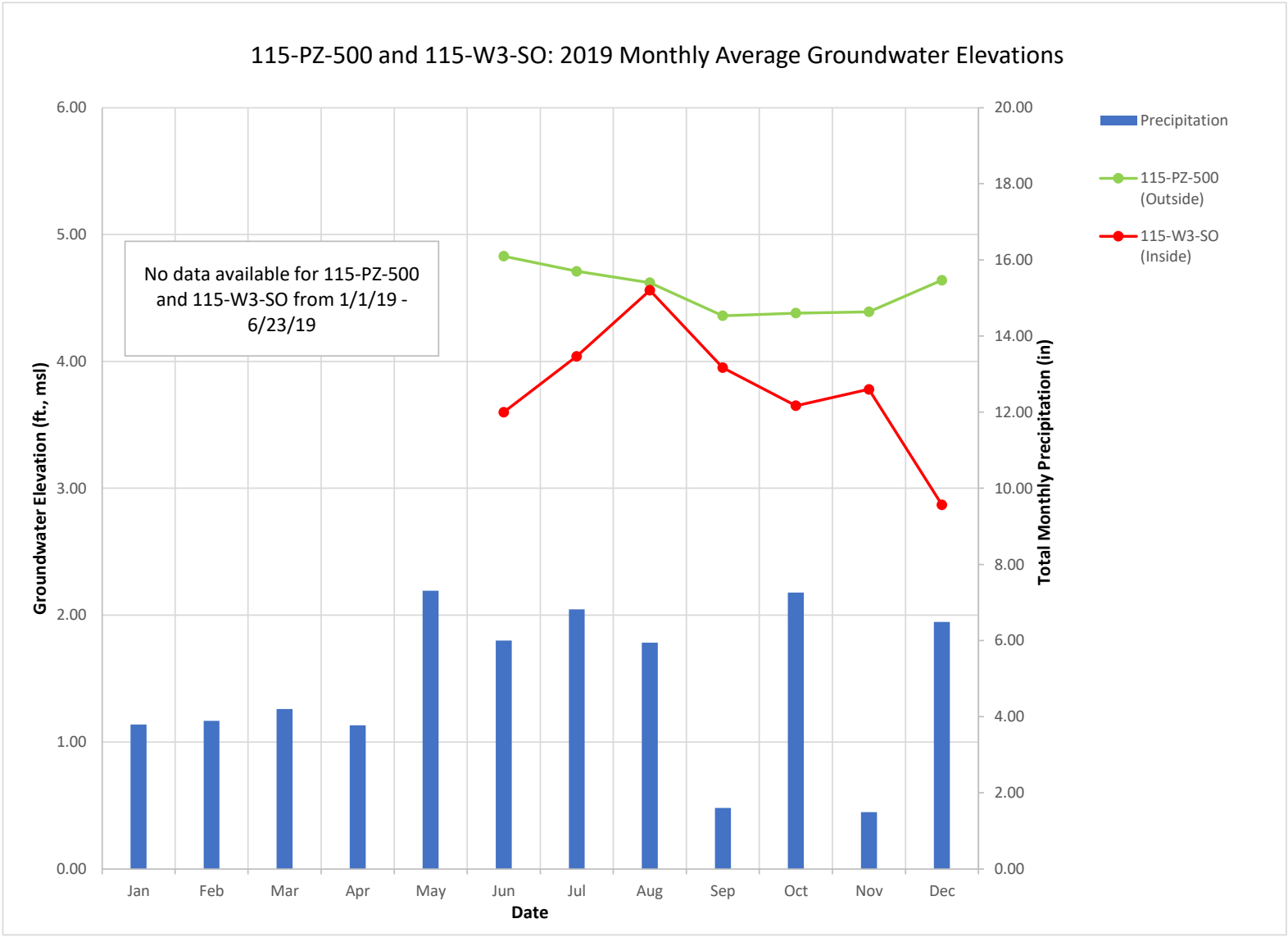

PZ-11 and PZ-12: 2019 Monthly Average Groundwater Elevations
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Groundwater Elevation (ft., msl)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Total Monthly Precipitation (in)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Date
Precipitation
PZ-11 (Outside)
PZ-12 (Inside)

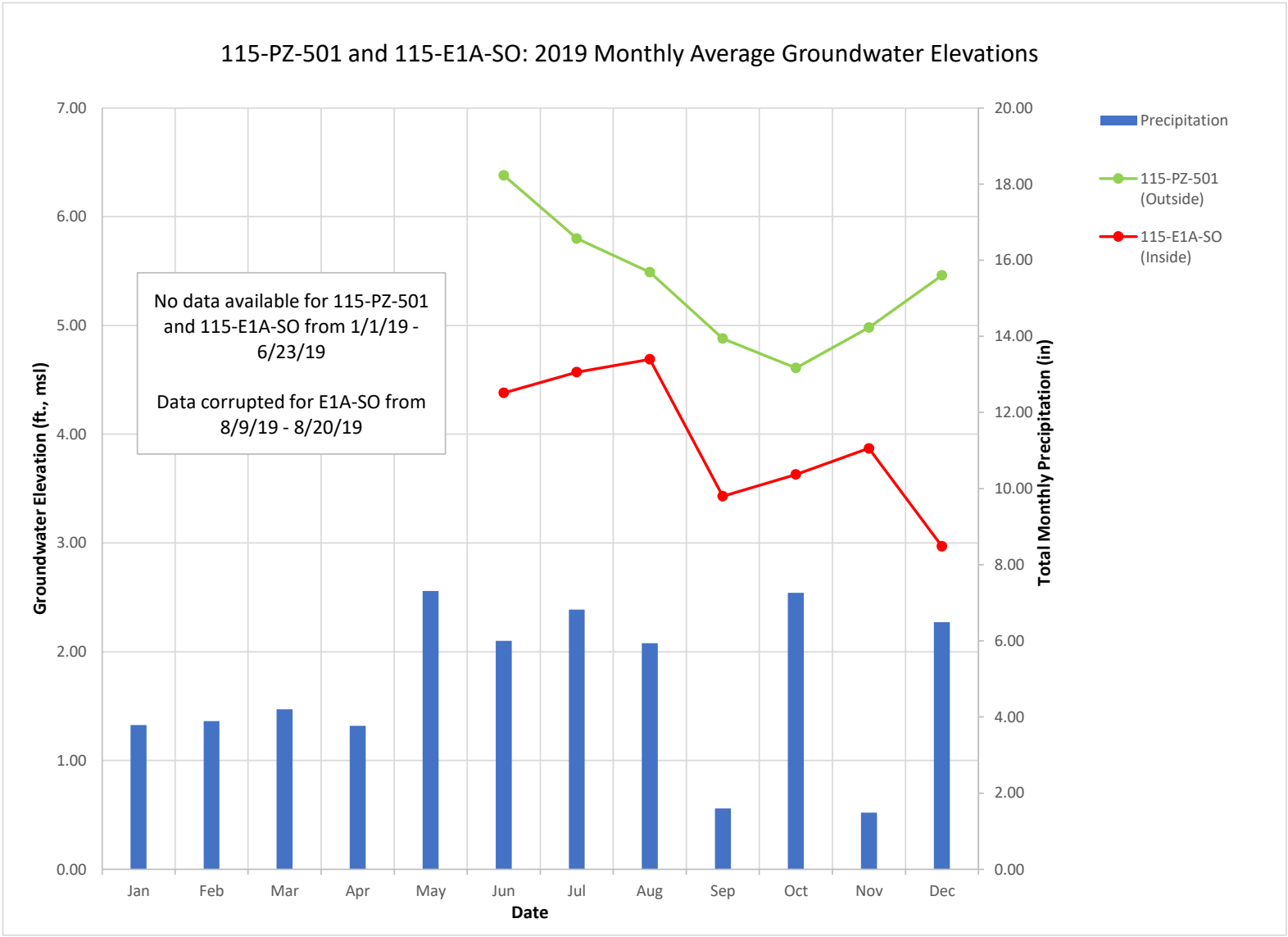

PZ-13 and PZ-14: 2019 Monthly Average Groundwater Elevations
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
PZ-13 (Outside)
PZ-14 (Inside)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

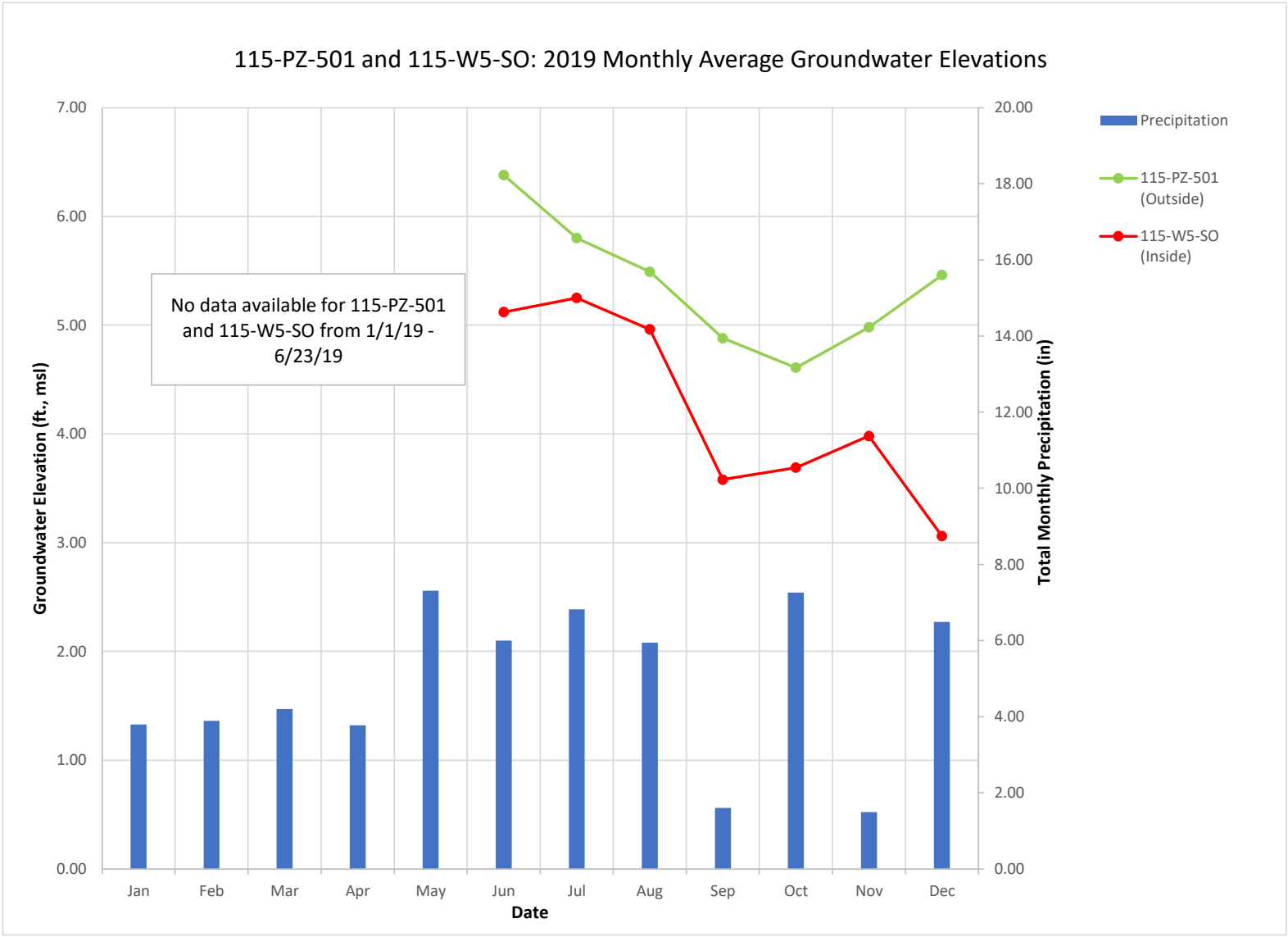

PZ-15 and PZ-16: 2019 Monthly Average Groundwater Elevations
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
PZ-15 (Outside)
PZ-16 (Inside)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

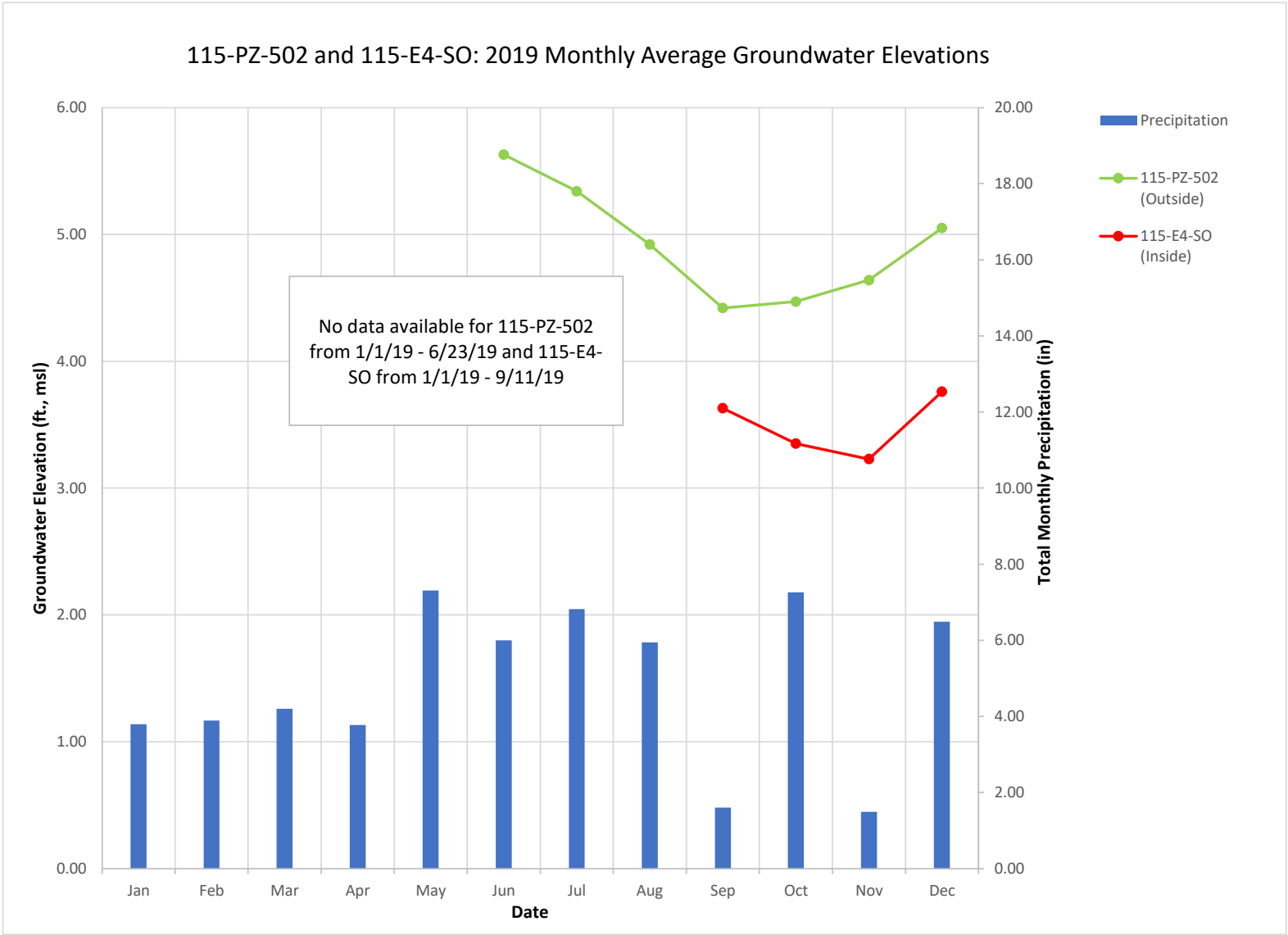

PZ-17 and PZ-18: 2019 Monthly Average Groundwater Elevations
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
PZ-17 (Outside)
PZ-18 (Inside)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

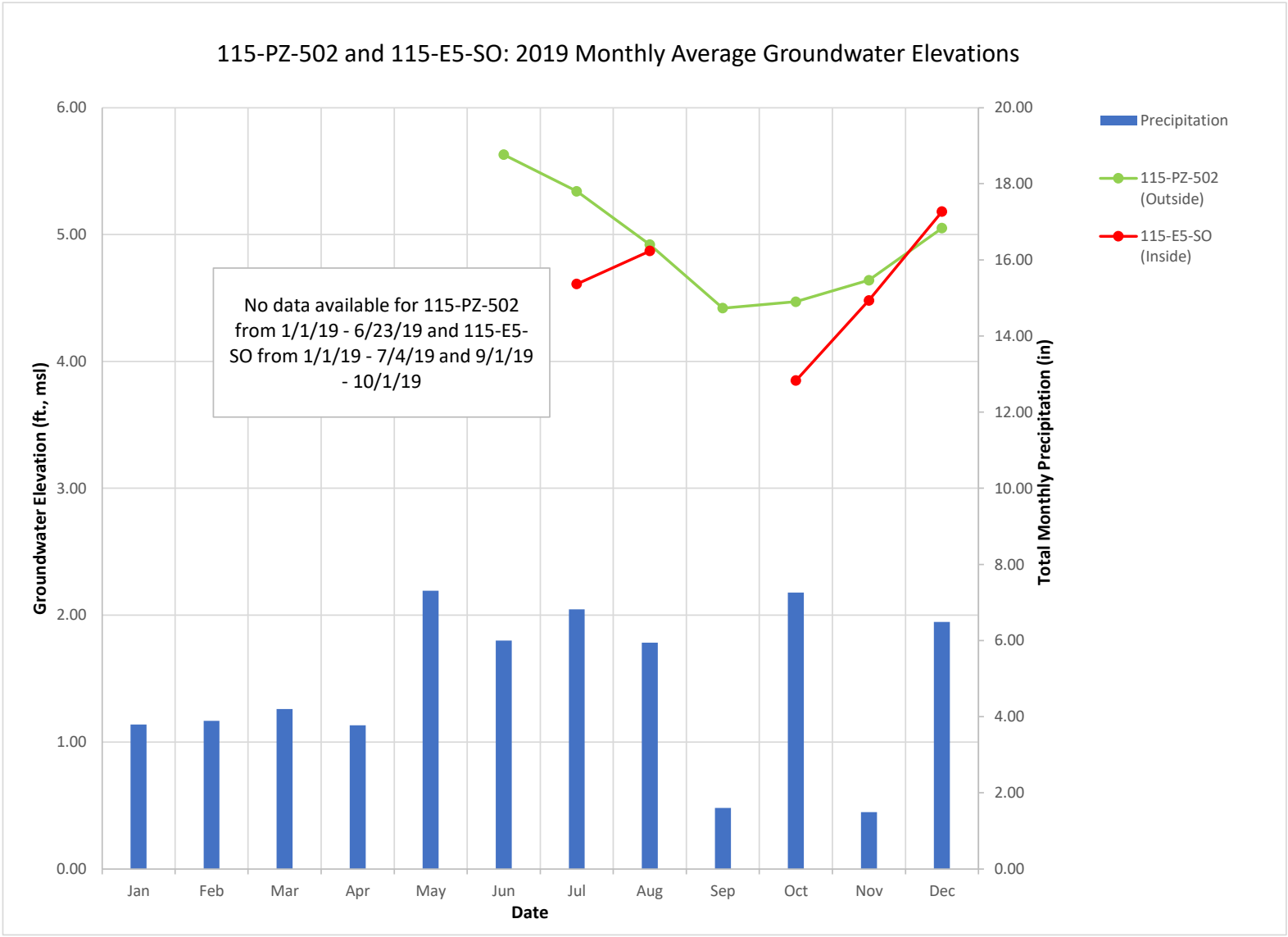

PZ-19 and PZ-20: 2019 Monthly Average Groundwater Elevations
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
PZ-19 (Outside)
PZ-20 (Inside)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

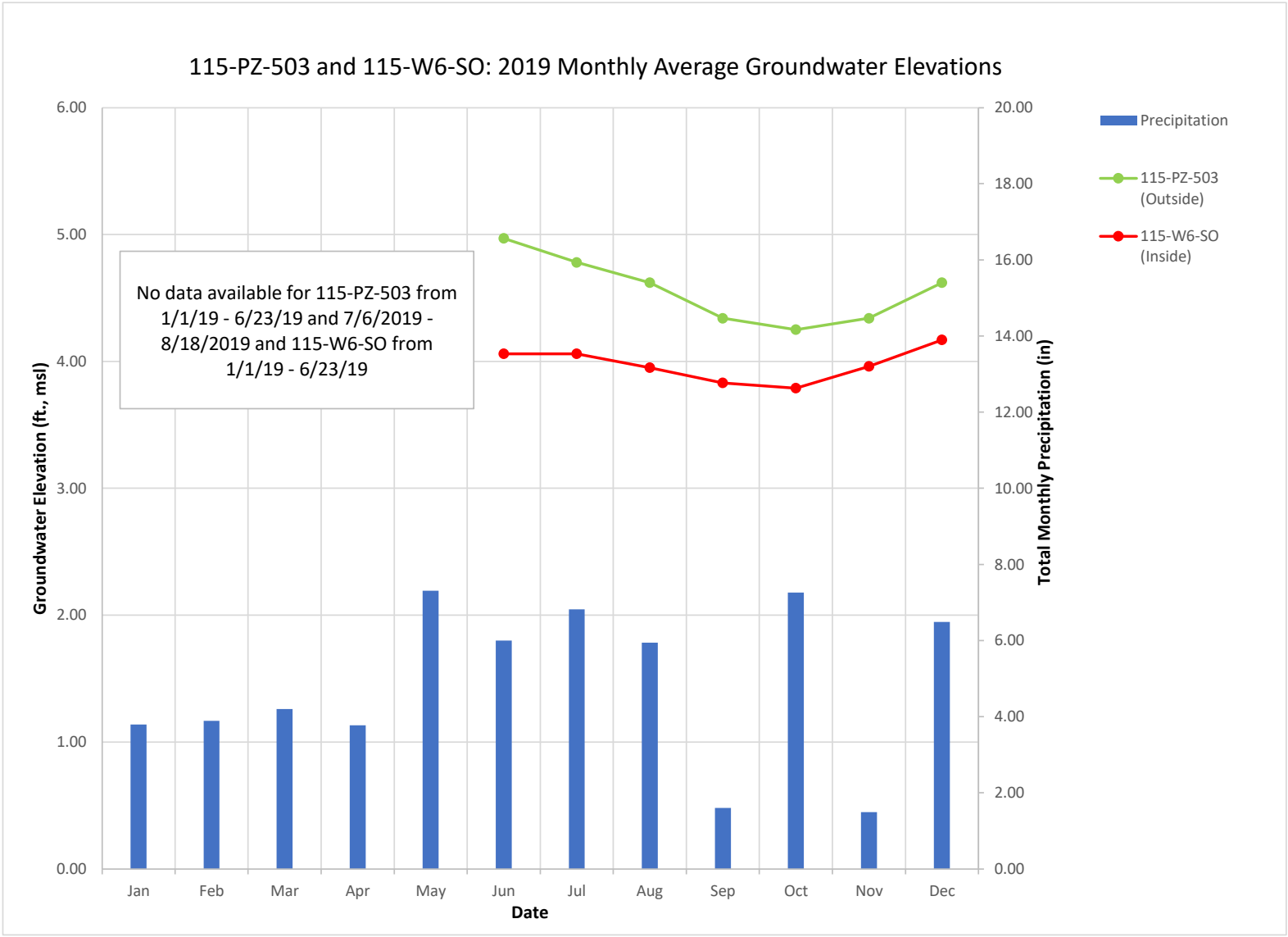

115-PZ-500 and 115-W3-SO: 2019 Monthly Average Groundwater Elevations
No data available for 115-PZ-500 and 115-W3-SO from 1/1/19 - 6/23/19
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Precipitation
115-PZ-500 (Outside)
115-W3-SO (Inside)

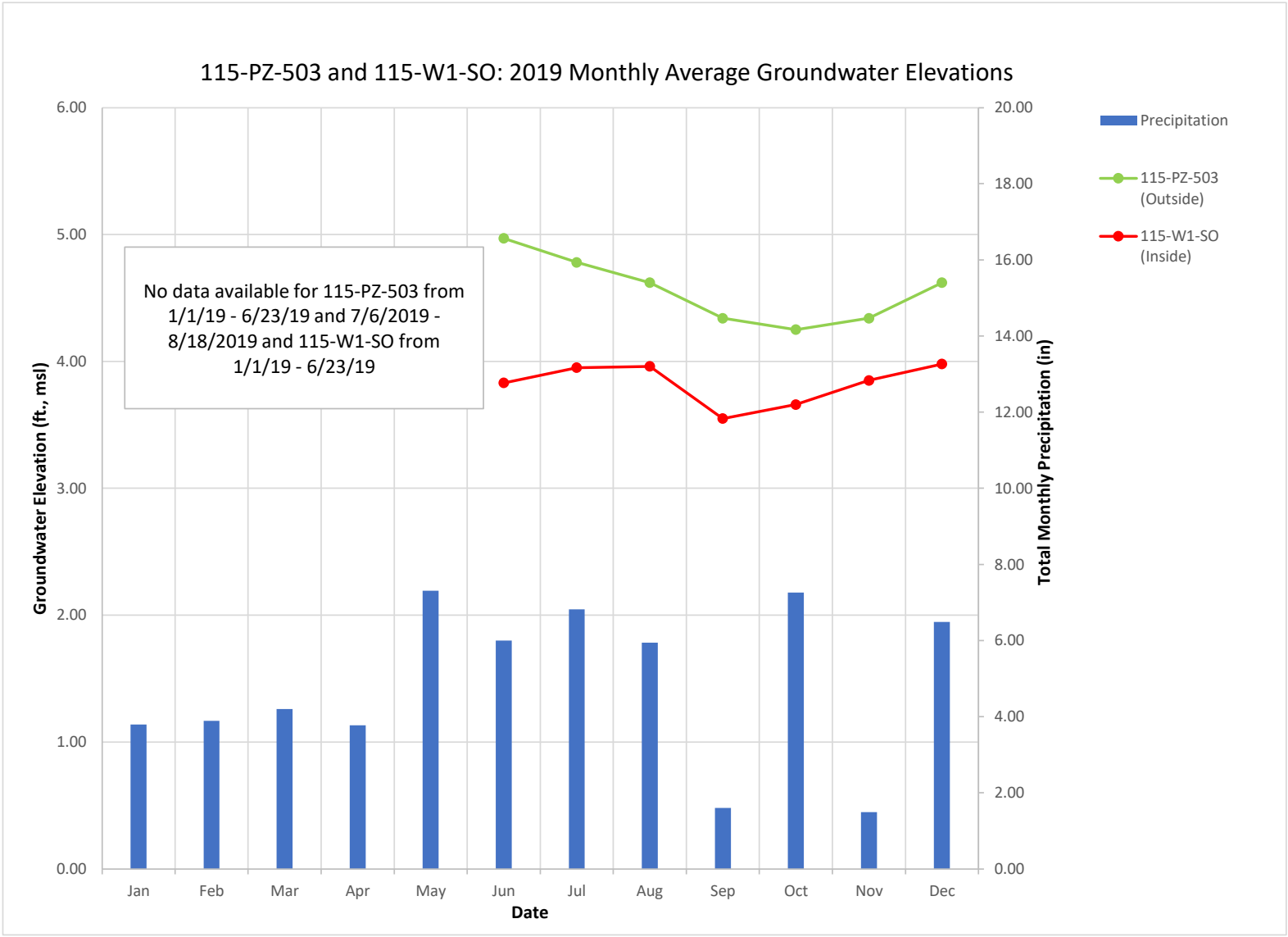

115-PZ-501 and 115-E1A-SO: 2019 Monthly Average Groundwater Elevations
No data available for 115-PZ-501 and 115-E1A-SO from 1/1/19 - 6/23/19
Data corrupted for E1A-SO from 8/9/19 - 8/20/19
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Precipitation
115-PZ-501 (Outside)
115-E1A-SO (Inside)


115-PZ-501 and 115-W5-SO: 2019 Monthly Average Groundwater Elevations
No data available for 115-PZ-501 and 115-W5-SO from 1/1/19 - 6/23/19
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Precipitation
115-PZ-501 (Outside)
115-W5-SO (Inside)


115-PZ-502 and 115-E4-SO: 2019 Monthly Average Groundwater Elevations
No data available for 115-PZ-502 from 1/1/19 - 6/23/19 and 115-E4-SO from 1/1/19 - 9/11/19
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Precipitation
115-PZ-502 (Outside)
115-E4-SO (Inside)


115-PZ-502 and 115-E5-SO: 2019 Monthly Average Groundwater Elevations
No data available for 115-PZ-502 from 1/1/19 - 6/23/19 and 115-E5-SO from 1/1/19 - 7/4/19 and 9/1/19 - 10/1/19
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0.00
1.00
2.00
3.00
4.00
5.00
6.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Precipitation
115-PZ-502 (Outside)
115-E5-SO (Inside)


115-PZ-503 and 115-W6-SO: 2019 Monthly Average Groundwater Elevations
No data available for 115-PZ-503 from 1/1/19 - 6/23/19 and 7/6/2019 - 8/18/2019 and 115-W6-SO from 1/1/19 - 6/23/19
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0.00
1.00
2.00
3.00
4.00
5.00
6.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Precipitation
115-PZ-503 (Outside)
115-W6-SO (Inside)


115-PZ-503 and 115-W1-SO: 2019 Monthly Average Groundwater Elevations
No data available for 115-PZ-503 from 1/1/19 - 6/23/19 and 7/6/2019 - 8/18/2019 and 115-W1-SO from 1/1/19 - 6/23/19
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0.00
1.00
2.00
3.00
4.00
5.00
6.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Precipitation
115-PZ-503 (Outside)
115-W1-SO (Inside)