Health, Safety, Environmental, Product Stewardship and Sustainability
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July 20, 2018
via electronic tranmsmittal

Honorable Robert G. Torricelli
Office of the Special Master
c/o Sean Jackson
7 So. Lanning Ave.
Hopewell, NJ 08525

Re: Integrated Annual Groundwater Performance Report for 2017
Study Areas 5, 6, and 7
Jersey City, New Jersey

Dear Senator Torricelli:

Attached is 2017 Integrated Annual Groundwater Performance Monitoring Report prepared by Cornerstone Environmental Group, LLC on behalf of Honeywell.

Please note that in Section 7 of this report we have made have several recommendations with respect to future monitoring frequency for groundwater level and quality measurements which are built on the program's extensive data and results to date. Once we have agreement from the parties on these recommendations Honeywell will submit an updated Sampling and Analysis Plan (SAP).

Please contact the undersigned should you have any questions or comments on the attachment.

Sincerely

William J. Hague
Global Director, Remediation
Design and Construction

Encl.: July 2017 Integrated Annual Groundwater Performance Report for 2017
(Study Areas 5, 6, and 7)

WJH:sgf

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INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT FOR 2017

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

Prepared for

HONEYWELL
Morris Plains, New Jersey

July 2018

Prepared by

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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 ninth such annual performance report. In 2011, the LTMP was expanded to integrate groundwater monitoring requirements for Study Areas 5, 6 and 7 (Project Area). Sampling and analysis within this integrated plan was performed consistent with the requirements set forth in the *Integrated Groundwater Sampling and Analysis Plan* (SAP) *for Study Areas 5, 6 and 7* dated April 29, 2014.

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 2017

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 2017 is shown on **Table 1-2**.

1.4 Document Organization

In accordance with the approved 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). The status of the S-3 Sand Injection/Mass Removal program is summarized in Section 6, and conclusions and recommendations for modifications to the LTMP are provided in Section 7.

2 GENERAL CONDITIONS

The GWET system was operated at its design rate throughout the year and the S-3 Injection/Mass Removal remedy was completed with five injection events in 2017. Long term monitoring of the SA-6 Chromium Remedy continued at SA-6 South and SA-6 North in 2017. Groundwater dewatering pumping was conducted on an as-needed basis in SA-6 South and intermittently in SA-6 North. At NJCU, the contingent groundwater dewatering system was operated continuously through 2017, the barrier wall extension was completed, and four additional monitoring wells were installed to monitor hydraulic gradients across the wall.

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 5 inches above average for the first half of 2017 and approximately 3.5 inches below the 30-year average for the second half. Total precipitation in 2017 was 47.50 inches or 1.25 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 data logger 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. There are no tidal influences in the Shallow Zone monitoring wells. 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

A list of the groundwater monitoring wells in service within the Project Area during all or part of 2017 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. Wells installed during 2017 include piezometers 115-PZ-500 through 115-PZ-503 within the interior pool of SA-7 and four shallow wells along the barrier wall extension within NJCU. As indicated in **Table 2-2**, a number of monitoring wells were abandoned in 2017 in accordance with the SA-6 Monitoring Well Abandonment Plan (MWAP). Honeywell updated the SA-6 MWAP in March and April 2017 and submitted the revised documents to All Parties.

3 GROUNDWATER EXTRACTION

3.1 GWET System Operation

The Deep Overburden Groundwater Extraction and Treatment (GWET) system was in operation throughout 2017. 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 waste water treatment plant located on SA-6 North. Wells 087-PW-1 and 087-PW-3 are located on the Difeo property on the north side of SA-6 North and are screened in the Deep and Intermediate zones, respectively. Well 115-MW-215BR is located on the north 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 2017 were due to routine cleaning and maintenance activities and storm-related power outages.

3.1.2 Force Main Acid Flushing

Force main cleanings were not required in 2017.

3.1.3 Well Redevelopment

There were no extraction well redevelopment activities conducted in 2017.

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 and extending from near Route 440 to the western barrier wall in two separate sections. Installation of the eastern section of the drain was completed in 2015 and the western section was completed in 2016 as part of the SA-6 Chromium Remedy. In 2017, the eastern portion of the contingent system was operated from mid-August through December to lower the groundwater level within the containment area. **Figure 3-2** compares the average daily flow rate of the contingent pumping system to interior groundwater levels at SA-6 North. Groundwater elevations at the eastern piezometers (PZ-2, PZ-4, and PZ-6) responded to the pumping by declining to approximately 2.5’ msl whereas the western piezometers PZ-

8 and PZ-10 declined to approximately 3.25' msl. Pumping from the western drain was not conducted in a significant manner due to equipment issues, however the equipment issues have been resolved and its operation is planned to begin in early 2018.

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 that extends from near Route 440 to the western barrier wall in a continuous length. The drain was pumped from June through October 2017 to lower the groundwater level 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 1.5 gpm (from June through August) groundwater levels declined relatively slowly to an elevation of 3.5' msl. A more rapid decline of groundwater levels to below elevation 2.0' msl occurred during September and October when the pumping rate was increased to approximately 6 gpm. After the cessation of pumping, groundwater levels rose quickly to 1.75' msl as that is the approximate head in the underlying Intermediate Zone.

3.4 SA-5 NJCU Contingent Groundwater Pumping System

With one exception, the contingent groundwater pumping system at the NJCU site was operated continuously throughout 2017. All pumping was conducted using extraction Sump B only (Sump A has not been operated). During installation of the hydraulic barrier wall extension, Sump B was temporarily deactivated to allow for dewatering of the disturbed area and discharge of the construction water through the groundwater treatment system. The temporary shutdown lasted from May 4 through June 9, 2017. 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 0.42 gpm from January 1 to May 14, 2017 and 0.36 gpm from June 9 through the end of 2017.

Hydraulic monitoring in 2017 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 2017 round, nine 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 12.5 feet msl on Site 154 to less than 2 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, deep sewer lines that run beneath JCMUA and Route 440, and shallower storm sewers that run along most of the side streets.

Monitoring of groundwater elevations within the SA-6 North and South soil containment areas indicate that heads inside the barrier walls do not respond to short-term rainfall events, now that these areas are capped, whereas groundwater elevations outside of the containment areas vary directly with the recharge from precipitation. These trends are evident in the hydrographs provided in **Appendix C**.

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 5 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. Groundwater elevations within the SA-7 barrier wall are relatively uniform in the range of 2.3 to 3.3 feet msl. 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 an effective capture zone 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 an effective capture zone 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**. Groundwater elevations declined approximately one foot during 2017 as a result of reduced recharge from precipitation due to surface

regrading and paving, continued pumping of Sump B, and lower than normal precipitation toward the end of the year.

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. In July 2017, data loggers were installed in the four well pairs to monitor groundwater elevation trends on a 6-hour interval. Hydrographs developed from these data were used to assess the direction and magnitude of hydraulic gradients across the barrier wall through time.

Data from the loggers are provided in **Appendix D** and indicate that a slight outward gradient was often present at the two northern well pairs (MW-101/105 and MW-106/102) whereas an inward gradient was typical at the two southern pairs (MW-103/107 and MW-104/108). Quarterly water level data from on-site wells are provided on **Figures 4-6 through 4-9**. These maps 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-5 and Sump B in the Commercial AOC. These data suggest that groundwater naturally 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**.

4.4 SA-7 Perimeter Pools

The LTMP program includes monitoring of the hydraulic gradients across the subsurface containment barrier (SCB) around the perimeter of SA-7. This is accomplished through monitoring of the head in each of the ten "perimeter pools" and comparing these data to groundwater elevations in various shallow piezometers located just outside of the SA-7 SCB. The location of the perimeter pools, the design pool elevations, and water level trends are provided in **Appendix E.** The hydrographs illustrate the average ground surface elevation, the design pool elevation, the measured pool elevation, and the groundwater elevation in adjacent piezometers outside of the SCB. Overall, the data indicate that water levels within the SA-7 pools are greater than those outside of the SCB and thus outward gradients are occurring relative to the SA-7 SCB.

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.

4.5 SA-6 North Containment Cell

Shallow groundwater elevations within the SA-6 North containment cell as measured in November 2017 are illustrated on **Figure 4-1b** and include data from the ten piezometers installed around the perimeter of the soil containment cell. Groundwater elevations ranged from approximately 3 to 4 feet msl within the cell. In addition, data loggers were installed in each of the ten perimeter piezometers in January 2017 and used to construct the hydrographs provided in **Appendix C** to assess hydraulic gradient trends across the barrier walls through time. These data were used to calculate the monthly average head difference across the wall at each piezometer pair. These results are illustrated on **Figure 4-10,** and with one exception, indicate that heads inside the cell were lower than heads outside of the wall, indicating inward gradients. The exception is along the western wall at which gradients were slightly outward toward the river. Two of the other piezometer pairs, one along the eastern side and one along northern side, were measured to be outward sporadically in 2017. To assess the quality of groundwater along the inside of the barrier wall at these locations, groundwater samples were collected from PZ-10 in April, July, and October 2017 and from PZ-2 in October and PZ-4 in April in accordance with the SA-6 LTMP. As discussed in Section 5.4, hexavalent chromium was not detected above the reporting limit in any of these piezometers. Groundwater quality data from these piezometers data were provided to the Parties in the applicable monthly progress reports.

4.6 SA-6 South Containment Cell

Shallow groundwater elevations within the SA-6 South containment area as measured in November 2017 are illustrated on **Figure 4-1b** and include data from the ten piezometers installed around the perimeter of the soil containment cell. Groundwater elevations were approximately 4 feet msl within the cell during the early part of the year, and then declined to approximately 2 feet msl as a result of pumping from the contingent drain system as discussed in **Section 3.3**. In addition, data loggers in each of the piezometers were used to construct the hydrographs provided in **Appendix C** to assess hydraulic gradient trends across the barrier walls through time. These data were used to calculate the monthly average head difference across the wall at each piezometer pair. These results are summarized on **Figure 4-11,** and with the exception of the PZ-19/20 pair during the first two thirds of 2017, indicate that heads inside the cell were lower than heads outside of the wall, indicating inward gradients. To assess the quality of groundwater along the inside of the barrier wall at this location, groundwater samples were collected from PZ-20 in April, July, and October 2017. As discussed in **Section 5.3**, hexavalent chromium was not detected above the reporting limit in this well. All piezometer data were provided to the Parties in the applicable monthly progress reports.

4.7 SA-5 Site 117

Groundwater movement beneath Site 117 is generally from northeast to southwest as illustrated on **Figures 4-1** through **4-3**. In the Shallow zone, the sewers beneath Route 440 serve as a groundwater sink and limit the further movement of groundwater to the south and west. In both the Shallow and Intermediate zones, a component of groundwater in the

northwestern corner of Site 117 is diverted to the northwest, passing between the SA-7 SCB and the NJCU sheet pile wall. The relatively low groundwater elevations in this area are caused by sewer systems that are actively dewatered by the Jersey City MUA.

4.8 Miscellaneous Events

4.8.1 Depressurization Pumping

There was no depressurization pumping from beneath the meadow mat in 2017.

5 GROUNDWATER QUALITY MONITORING

Groundwater quality monitoring within the project area was conducted in 2017 in accordance with the GWET Long-Term Monitoring Plan (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 2016 Integrated Groundwater Annual Report, the next round of regional monitoring of the Deep Overburden Plume will be in 2018. Thus, sampling was not conducted in 2017. The results from 124-MW-106T confirmatory samples indicated elevated concentrations of both total and hexavalent chromium in the March 2017 sample and then a decrease in the April 2017 sample, which is further discussed in Section 5.6 as this well is located within the plume diversion area.

5.2 GWET Extraction Wells

Groundwater from the three GWET pumping wells was sampled quarterly in 2017 as shown in **Table 5-1**. The samples were unfiltered and analyzed for total and hexavalent chromium and volatile organic chemicals (VOC). The results for hexavalent chromium are plotted on **Figure 5-1** 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 2017 were approximately 25 ppm.

Concentrations in the Intermediate zone extraction well discharge increased significantly from 10 ppm to 90 ppm when PW-3 came on line in January 2016. 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 5-2)** and its daughter products cis-dichloroethene and vinyl chloride. Carbon Tetrachloride was also detected as shown in **Figure 5-3** 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 Honeywell.

5.3 SA-6 South

The twelve shallow groundwater monitoring wells that were installed in the SA-6 South Development AOC area during the Spring of 2016 were sampled quarterly during 2017. In consultation with NJDEP, Honeywell also collected a round of samples in late December 2017 (which was considered to be representative of the 1st Quarter 2018). Hexavalent chromium was only detected above the reporting limit in one sample, that being 5.5 ppb in well 140-MW-10 during the January event This result is well below the NJGWQS of 70 ppb.

Total chromium was reported above the NJGWQS in two wells during 2017. In the January event, total chromium was detected in well 125-MW-02 at a concentration of 3,260 ppb in the unfiltered sample, and at 14.3 ppb in the filtered sample; well below the NJGWQS of 70 ppb. During the October sampling event, total chromium was detected in well 140-MW-09 at a concentration of 227 ppb in the unfiltered sample and at 178 ppb and 104 ppb in filtered samples using a 0.45 micron filter and a 0.1 micron filter, respectively. The remainder of the analytical results for total chromium in 2017 were either not detected or were below the NJGWQS.

As discussed in Section 4.6, groundwater samples were also collected from piezometer PZ-20 located inside of the barrier wall at the SA-6 South soil containment area. Samples were collected in April, July, and October with reported total chromium concentrations of 68.2 ppb, 7.4 ppb, and <10 ppb, respectively in the unfiltered samples. Hexavalent chromium was not detected in any of the samples.

Groundwater sampling of selected L-well locations is discussed in Section 5.6.

5.4 SA-6 North

As discussed in Section 4.5, groundwater samples were collected from three of the five perimeter piezometers located inside of the SA-6 North soil containment barrier wall during 2017. None of the samples contained total chromium concentrations in excess of 70 ppb. Piezometer PZ-2 had a detection of 37.4 ppb for total chromium in the unfiltered sample during the October round, and piezometer PZ-4 had a detection at 28 ppb for total chromium in the unfiltered sample in the April round. Piezometer PZ-10 was sampled in April, July, and October and had detections of total chromium in the unfiltered sampled of 52.7 ppb, 5.8 ppb, and 20.3 ppb, respectively. Sample results indicated that none of the piezometers contained hexavalent chromium concentrations.

With the exception of the S-3 Sand Mass Removal Injection program discussed in **Section 6**, groundwater monitoring wells were not sampled in SA-6 North in 2017**.**

5.5 New Jersey City University

Groundwater samples were collected quarterly in 2017 from the three "sentinel" wells (184-MW-04, 184-MW-05, and 184-MW-06) at NJCU. Of these, total chromium was detected above the NJGWQS in only one of the unfiltered samples (MW-184-04 in the September round) at 80.3 ppb. The corresponding filtered sample result was 7.0 ppb. Hexavalent chromium was detected only in well 184-MW-06, and at concentrations below 70 ppb and comparable with previous results. This well is located up-gradient of the capped area. None of the samples contained filtered total chromium concentrations in excess of 70 ppb in 2017.

Monitoring wells along the barrier wall extension (184-MW-101, MW-103, and MW-104) were sampled quarterly with monitoring wells 184-MW-105, MW-107, and MW-108 sampled during the third and fourth quarterly rounds. Well 184-MW-102 was sampled during the first, second and fourth quarterly rounds due to access limitations during construction of the barrier wall extension. 184-MW-106 was sampled during the second, third, and fourth quarterly rounds. The results are provided on **Figure 5-5** and indicate that hexavalent chromium was not detected above the reporting limit of 5.5 ppb in any of the samples. Total chromium in the unfiltered samples was reported above the NJGWQS in only one well; 184-MW-107 at 1,210 ppb in December 2017. The corresponding filtered sample did not report total chromium above the detection limit of 5.5 ppb.

5.6 Plume Diversion Area Monitoring

In accordance with the approved L-Well Groundwater Monitoring Plan (L-Well GWMP) which was part of the 100% SA-6 Chromium Remedy Design, the following wells in the Plume Diversion Area of SA-6 South were sampled in May 2013 to provide a pre-remedy baseline and were sampled once more after the remedy was complete to evaluate if the deep plume in this area has shifted position due to the installation of the soil containment cell.

124-MW-106T	124-MW-103L
124-MW-107T	124-MW-104T
124-MW-G02T	124-MW-104L
119-MW-01T	124-MW-105T
119-MW-02T	124-MW-102T

Locations 124-MW-102T, 124-MW-103L, and 124-MW-107T were located within the open space area and were thus abandoned during excavation activities in 2014. In addition, well 124-MW-104T was damaged during construction and was also abandoned in 2014. In accordance with the approved L-Well GWMP and subsequent agreements with Plaintiffs, the post-remedy sampling at these four locations was conducted in June 2015 using direct push methods after placement of excavated materials and installation of barrier walls but prior to the installation of the cap.

In addition to the sampling conducted in accordance with the L-Well GWMP as discussed above, samples were collected from well 124-MW-106T on June 7, 2016 as part of the biennial GWET Long-Term Monitoring Plan. Since the results indicated Cr(VI) above the NJ Ground Water Quality Criterion of 70 µg/L, the well was resampled on August 11, 2016 to include major ions, and again on December 19, 2016. The results indicated declining chromium concentrations in this well.

Based on these results, the remaining 6 wells listed above were sampled in March 2017 to assess post remedy conditions. Confirmatory sampling of well 124-MW-106T was included in this event. The results indicated that with the exception of well 124-MW-106T, hexavalent chromium was not detected above the reporting limit in any of these locations. However, hexavalent chromium concentrations in well 124-MW-106T continued to be elevated, ranging from 470 ppb in March to 160 ppb in April 2017.

Based on these results, a plume delineation sampling program was conducted in accordance with Cornerstone's April 25, 2017 memorandum "Summary of Post-Remedy L-Well Groundwater Sampling" submitted to all Parties on April 26, 2017. The field work was conducted from June 26 to 29, 2017 by B&B Drilling under the observation of Cornerstone Environmental personnel. In-situ groundwater samples were collected at four locations (GP-1 through GP-4) downgradient of well 124-MW-106T as shown on **Figure 5-6**. At each location, boreholes were drilled and temporary wells were installed to obtain in-situ samples of the groundwater. Groundwater samples were collected from two depths; 40 feet and 65 feet below grade at each of the four locations and analyzed for total and hexavalent chromium, field parameters and major ions. These depth correlate to the "L-well" and "Deep well" screened intervals of adjacent monitoring wells, respectively.

Hexavalent chromium was not detected above the reporting limit of 5.5 ppb in any of the eight downgradient delineation samples and thus confirmed that the L-well Area plume of hexavalent chromium has not expanded downgradient of monitoring well 124-MW-106T. As discussed in Cornerstone's Technical Memorandum dated July 25, 2017, submitted by Honeywell to All Parties on July 27, 2017, the data also show that reducing conditions prevail downgradient of well 124-MW-106T and thus future migration is not likely. Since none of the eight downgradient Geoprobe samples detected hexavalent chromium and the elevated detection of hexavalent chromium in 124-MW-106T was attributed to the temporary pumping of depressurization well DW-2 during implementation of the Chromium Remedy at SA-6 South, the memo concluded that further investigative or remedial efforts in this area are not warranted.

5.7 SA-5 Site 117

Groundwater sampling for water quality analysis was not conducted at Site 117 in 2017.

5.8 SA-5 Sites 079/153

Groundwater sampling for water quality analysis was not conducted at Sites 079/153 in 2017.

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 sand directly beneath the soft riverbed sediments in the Hackensack River are to be sampled every five years until the plume has been pulled back. The most recent sampling was conducted in October 2014 and thus the next event is scheduled for October 2019.

6 S-3 INJECTION AND MASS REMOVAL PROGRAM

The S-3 Injection and Mass Removal program was initiated in May of 2012 and completed in September 2017. The objective of the injection program was to inject an amount of reductant (calcium polysulfide) into groundwater within the S-3 Sand formation that is stoichiometrically sufficient to reduce 50 tons of hexavalent chromium. This goal was achieved through a total of 39 injection events conducted during the five year program. The results of the program were documented in the *Five Year Summary Report for In-Situ Mass Removal From the S-3 Sand* (Cornerstone, November 13, 2017). The portion of the program conducted during 2017 is described in the following sections.

6.1 CaSx Injection Events in 2017

Five CaSx injection events were conducted in 2017 as summarized on **Table 6-1**. Three injection wells (088-IW-01, 088-IW-02, and 088-IW-03) were used as shown on **Figure 6-1**. During each event approximately 3,800 to 4,400 gallons of CaSx was injected into the S-3 Sand formation during the first day. The actual volume varied from event to event and was based on the maximum volume that could be transported in a single tanker truck within DOT weight limitations. As shown on **Table 6-1**, a combination of gravity flow and pressurization of the tanker was used to off-load the material. During the second and third day of each event, clean water from an adjacent JCMUA hydrant was injected into the wells to aid flushing of the CaSx into the formation. The total volume of water used was approximately twice the volume of CaSx injected.

The injection rates ranged from approximately 8 to 11 gpm in 2017 with the exception of the injection well 088-IW-01 at which a rate of only 1.2 gpm could be obtained during the August 2017 event. After 3 hours and the injection of 229 gallons, the well became clogged. In accordance with the Operations Work Plan for In-Situ Chromium Mass Removal (Cornerstone, February 20, 2012), operations were then moved to well 088-IW-02 into which the remainder of the CaSx was successfully injected.

6.2 Mass Removal Summary

In accordance with the Operations Work Plan, three replicate samples from each batch were used to determine the sulfide content of the material. The geometric mean of these data was then calculated as shown on **Table 6-2,** and used to estimate the mass of hexavalent chromium stoichiometrically equivalent to the injected volume of CaSx. This calculation was conducted in accordance with the chemical reactions provided in Appendix C of the Operations Work Plan. As shown on **Table 6-3**, the stoichiometric equivalent mass reduced per event in 2017 ranged from 1.20 tons to 1.44 tons with an average of 1.33 tons per event. At the end of 2017, the stoichiometric equivalent of approximately 50.38 tons of hexavalent chromium had been treated, meeting the overall program goal of 50 tons. **Figure 6-2** provides a graph of the cumulative mass treated.

For comparison, the mass of hexavalent chromium removed from the Deep Overburden Plume through historic pumping has also been calculated. As shown on **Figure 6-3**, 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 88 tons of hexavalent chromium have been removed through groundwater extraction alone through the end of 2017.

6.3 Groundwater Quality Monitoring

Groundwater monitoring of injection wells and monitoring wells was conducted in accordance with the Operations Work Plan. Injection wells were sampled several days prior to each injection event, whereas monitoring wells were sampled semi-annually.

6.3.1 Monitoring Well Sampling.

Data from sampling of monitoring wells associated with the S-3 Sand Injection program are provided on **Tables A-1 through A-10** in **Appendix A** and further discussed below.

Well 088-MW-G19T: This well is located approximately 400 feet downgradient of injection well 088-IW-01 on the former JCIA property. Parameters used to indicate the presence of the CaSx reductant, such as ORP, calcium, and pH, were relatively consistent throughout the reporting period in this well. Hexavalent chromium concentrations increased from 977 ppb in 2016 to 1,390 ppm in the June 2017 sample, whereas calcium concentrations remained relatively unchanged at 293 ppm.

Well 087-MW-29D: This well is located approximately 750 feet downgradient of injection well 088-IW-03 and is screened in the Intermediate Zone. Parameters used to indicate the presence of the CaSx reductant, such as ORP, calcium, and pH, were consistent throughout the reporting period in this well. Hexavalent chromium concentrations remained unchanged in 2017 at 149 ppm, and calcium concentrations rose slightly from 38.1 in 2016 to 44 in 2017.

Well 115-DP-1: This is a former depressurization well located approximately 25 feet upgradient from 115-PW-21. (Well 115-PW-21 was used as a temporary injection well on August 20, 2012.) Hexavalent chromium concentrations are shown on **Table A-2** and have historically fluctuated over a range of nearly two orders of magnitude. As noted in prior annual performance reports, these variable post-injection results are likely due to the fact that 115-DP-1 has a 25-foot long screen that extends approximately 20 feet above the top of the S-3 Sand into the S-2 Sand.

GWET Wells: Hexavalent chromium concentrations in extraction well 087-PW-1 were consistent with the long-term downward trend that is now approaching a quasi-steady state condition as shown on **Figure 5-1**. Concentrations in extraction well 087-PW-3 began 2016 with concentrations of approximately 90 ppm or 10 times greater than that of 087-PW-2 which it replaced. However, by the end of 2017, concentration declined to approximately 36 ppm. This is likely due to shifting of the plume as the new steady-state capture zone became established around the new well. Calcium concentrations in the GWET wells in 2017 remained relatively unchanged.

6.3.2 Injection Well Sampling.

Sampling of the injection wells was conducted to assess how long the reductant remains in the groundwater at the point of contact. Injection wells were sampled once prior to the first injection event and then just prior to each injection event as shown on **Tables B-1 through B-10** in **Appendix B**. The scope of this portion of the sampling plan has been reduced due to the consistent nature of the results. The fact that hexavalent chromium concentrations have not rebounded between injections is likely due to the establishment of a reductive zone around the well. This zone is capable of treating hexavalent chromium in groundwater that moves into the area from upgradient.

Indicator parameters measured in the field include pH, specific conductivity, dissolved oxygen, ORP, and turbidity. These data are shown on **Tables B-6 through B-10**. Of these, ORP has been the most reliable indicator of the presence of CaSx (reducing conditions) in groundwater. ORP values initially declined from several hundred mV to less than (minus) -400 mV and have been consistently in the -450 to -500 mV range. Groundwater pH has also been a reasonably good indicator since the injected calcium polysulfide has a pH of between 11 and 12. Thus, an increase in pH provides a qualitative indication of calcium polysulfide influence at a specific location. Both ORP and pH indicate that reducing conditions have been established around each of the injection wells and that these conditions will persist for some time, facilitating the reduction of additional hexavalent chromium in groundwater moving into the region from upgradient.

6.4 Planned Activities for 2018

As discussed in the Five Year Summary Report, the S-3 Injection and Mass Removal program was completed in 2017 and has met its objective of chromium mass reduction. As a result, no further activities are planned.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Compliance with Monitoring Requirements

Hydraulic and groundwater quality monitoring conducted in 2017 have fulfilled the various monitoring plan requirements in accordance with **Tables 1-1 and 1-2**.

7.2 Status of Groundwater CEA Certifications

Groundwater Classification Exception Areas were approved by NJDEP on February 16, 2012 for the three principle 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 Remediation Permit Applications to NJDEP in December 2017. The issuance of the permits is expected in 2018.

7.3 Recommendations for Monitoring Well Network

It is recommended that the abandonment of selected groundwater monitoring wells be conducted in accordance with the Updated Monitoring Well Abandonment Plan for SA-6 North and South.

7.4 Recommendations for Water Level Monitoring Frequency

It is recommended that the frequency of regional groundwater level monitoring be extended from quarterly to annually beginning January 2019. The following considerations support this proposed change:

- A review of the more than 40 rounds of quarterly groundwater level data collected since 2008 show little change in regional groundwater flow direction or the GWET capture zone.

- There are no further planned remedial actions (e.g. barrier walls, caps, new pumping wells, etc.) that would have the potential to impact groundwater elevations or flow direction in the Project Area.

- The number of monitoring wells will be significantly reduced in 2018 in accordance with the approved Groundwater Monitoring Well Abandonment Plan.

- The increased use of automated, telemetric water level data loggers will provide real-time data in focused areas such as along the SA-6 and NJCU barrier walls.

Groundwater level monitoring at specific sites will continue to be conducted in accordance with the frequencies specified in the various site-specific LTMPs as summarized in **Table 1-1**.

7.5 Recommendations for Groundwater Quality Monitoring Frequency

The regional LTMP groundwater quality sampling event has been conducted six times since its inception in 2008, with the seventh event scheduled for the fall of 2018. The objective of the program was to confirm that the deep overburden plume did not expanded 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. Assuming this is confirmed with the 2018 event, and in consideration that no further deep remedial actions are planned within the Project Area, it is recommended that the sampling frequency be changed to every 5 years. Thus, after the 2018 round, the next round would be in 2023.

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

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 2018 Proposed annually thereafter	200
Study Area 7	SA-7 Perimeter Pools	Final Judgement, ICO v Honeywell	Shallow and Interm.	Monthly	22
SA-6 South	SA-6 LTMP[2]	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 South	Shallow and Interm.	Quarterly	13
SA-6 North	SA-6 LTMP[2]	First Amended Consent Decree Regarding Remediation and Redevelopment of Study Area 6 North	Shallow	1st year - Monthly 2nd year - Quarterly	14
SA-5 (NJCU) Sites 90 & 184	Long Term Monitoring Plan[3]	Consent Decree Regarding Remediation of the New Jersey City University Redevelopment Area	Shallow	Quarterly through 2018 future TBD	15
SA-5: Site 079	Long Term Monitoring Plan for Sites 079 and 153	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[4]	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[4]	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and	Shallow	Quarterly	6

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

[2] Draft SA-6 LTMP submitted to Parties in February 2017 with additional revisions submitted in April 2017. SA-6 LTMP finalized Feb. 2018.

[3] SA-5 NJCU LTMP dated November 2016; to be updated 2018. Draft Shallow Groundwater Monitoring and Extraction System Operations Plan for NJCU Commercial AOC to be finalized 2018.

[4] Draft LTMP for SA-5 Shallow Groundwater includes monitoring at Sites 117 and 153 in progress; to be finalized in 2018. Remedial Action Permit for Groundwater application submitted to NJDEP Dec. 5, 2017.

* Prior to implementation of groundwater Monitoring Well Abaondonment Plan in 2018.

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

Location	Monitoring Plan	Consent Decree	Depth	Frequency	# Wells*	Estimated Start Date
Regional	GWET Long Term Monitoring Plan June 10, 2008	Deep Overburden and Bedrock Groundwater Remedies Consent Order	Intermediate Deep Bedrock Beneath River	Every 5 years** Every 5 years** Every 5 years** Every 5 years	5 12 9 1	Oct. 2018 Oct. 2019
SA-6 South	SA-6 South Development AOC Appendix D of SA-6 South 100% Design Report June 28, 2013	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 South	Shallow	Quarterly with one round in December 2017	12	January 2017
SA-6 South	L-zone Wells (Plume Diversion Area) Appendix E of SA-6 South 100% Design June 28, 2013	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 South	Deep	March and April 2017	6	Completed
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 2018 then TBD	11	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	7	Estimated 2020[2]

[1]SA-5 NJCU Draft Shallow Groundwater Monitoring Document to be finalized in 2018 as part of updated LTMP.
[2]Draft LTMP for SA-5 Shallow Groundwater includes monitoring at Sites 117 and 153 in progress; to be finalized in 2018. Remedial Action Permit for Groundwater application submitted to NJDEP Dec. 5, 2017.
* Number and location of wells subject to field conditions during and after remedy construction.
** Currently every 3 years, proposed every 5 years pending 2018 results.
Biennial = every two years

Table 2-1
2017 Monthly Precipitation Data

Month	2017 Precipitation	Average Precipitation
January	4.65	3.98
February	2.09	2.96
March	5.07	4.21
April	3.49	3.92
May	7.24	4.46
June	5.29	3.4
July	4.36	4.68
August	5.49	4.02
September	1.72	4.01
October	4.94	3.16
November	1.51	3.88
December	1.64	3.57
Annual Total	47.50	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. (ft msl)	Well Depth (ft)	Screen Length (ft)	Comments
087-IW-01	Deep	11.51	67.0	10	
087-MW-01	Deep	12.80	60.0	10	
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-IW-01	Deep	11.75	59.0	10	
088-IW-02	Deep	13.64	64.0	10	
088-IW-03	Deep	19.96	74.0	10	
088-MW-G19T	Deep	15.09	93.0	15	
090-MW-09	Deep	10.70	75.0	5	
115-MW-A12T	Deep	12.44	50.0	2	
115-MW-E14T	Deep	21.33	71.0	15	
115-OMW-E08TR	Deep	16.82	NA	NA	
115-PW-21	Deep	15.13	71.0	10	
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-104L	Deep	11.54	43.0	10	
124-MW-105T	Deep	10.92	62.0	10	
124-MW-106T	Deep	11.20	78.0	10	
124-MW-G02T	Deep	9.50	69.0	10	
153-MW-A13T	Deep	9.34	58.0	15	
SA6-MW-AA1T	Deep	15.31	70.0	10	
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-OBS-6D	Intermediate	11.24	30.0	2	Abandoned 4/20/16
087-PW-2	Intermediate	13.02	48.0	20	
087-PW-3	Intermediate	TBD	50.0	20	
088-MW-15R	Intermediate	14.59	35.0	10	
088-PZ-002	Intermediate	10.56	25.0	5	Abandoned 8/10/2015
088-PZ-004	Intermediate	12.05	27.0	5	Abandoned 3/24/2015
090-MW-07	Intermediate	16.79	40.0	10	
115-E1-DI	Intermediate	21.71	44.9	NA	
115-E2-DI	Intermediate	13.82	41.2	NA	
115-E2-DO	Intermediate	10.24	35.0	NA	
115-E3-DI	Intermediate	18.82	37.8	NA	
115-E3-DO	Intermediate	12.39	34.0	NA	

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev. (ft msl)	Well Depth (ft)	Screen Length (ft)	Comments
115-E4-DI	Intermediate	19.29	46.8	NA	
115-E4-DO	Intermediate	17.87	NA	NA	Abandoned 8/10/2015
115-E5-DO	Intermediate	15.72	46.9	4	Abandoned 8/10/2015
115-E5-DI	Intermediate	15.85	45.3	NA	
115-E6-DI	Intermediate	19.89	48.4	NA	
115-E6-DO	Intermediate	19.74	51.1	NA	
115-MW-18	Intermediate	13.04	NA	NA	
115-MW-20	Intermediate	14.19	40.0	2	
115-MW-E14D	Intermediate	18.05	35.0	10	
115-W1-DI	Intermediate	16.79	NA	NA	
115-W4-DI	Intermediate	12.27	46.3	4	
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	
134-PZ-002A	Intermediate	10.75	NA	NA	
140-MW-P05D	Intermediate	9.89	30.0	10	
SA6-MW-AA1D	Intermediate	19.36	32.0	10	
073-MW-10BR-1	Rock	6.67	155.0	10	
073-MW-10BR-2	Rock	6.67	170.0	10	
073-MW-10BR-3	Rock	6.67	195.0	15	
073-MW-10BR-4	Rock	6.67	227.0	15	
073-MW-10BR-5	Rock	6.67	327.0	15	
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	
087-MW-14	Rock	10.68	97.0	10	Abandoned 4/20/16
087-MW-I30T	Rock	10.59	80.0	15	Abandoned 4/20/16
087-MW-O29T	Rock	9.98	102.0	15	Abandoned 3/22/16
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-211BR	Rock	17.41	124.0	4	
115-MW-215BR	Rock	8.82	143.0	20	
115-MW-216BR	Rock	18.02	131.0	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-11BR	Rock	10.75	159.0	20	
119-MW-12BR	Rock	11.26	154.0	20	
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	
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-4BR-1	Rock	8.77	179.0	15	
119-MW-4BR-2	Rock	8.77	229.0	15	
119-MW-4BR-3	Rock	8.77	314.0	15	
124-MW-17BR-1	Rock	9.56	153.0	15	
124-MW-17BR-2	Rock	9.56	337.0	15	
124-MW-8BR	Rock	9.71	133.0	2	

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev. (ft msl)	Well Depth (ft)	Screen Length (ft)	Comments
140-MW-9BR-1	Rock	7.32	153.0	15	
140-MW-9BR-2	Rock	7.32	222.0	15	
140-MW-9BR-3	Rock	7.32	272.0	15	
SA6-MW-14BR	Rock	9.99	85.0	10	
SA6-MW-15BR	Rock	8.08	103.0	20	
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	
073-MW-06	Shallow	9.01	20.0	NA	
073-MW-07	Shallow	9.71	18.0	NA	
073-MW-08	Shallow	7.47	17.0	NA	
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-MW-101	Shallow	12.21	12.0	NA	Abandoned 2/2/2017
087-MW-102	Shallow	11.65	13.0	NA	
087-MW-114R	Shallow	10.42	10.0	NA	
087-MW-118R	Shallow	15.41	16.5	NA	
087-MW-119R	Shallow	14.03	16.5	NA	
087-MW-119	Shallow	12.97	11.0	NA	Abandoned 10/27/16
087-MW-120	Shallow	12.30	11.0	NA	
087-MW-121	Shallow	11.76	12.0	NA	Abandoned 2/2/2017
087-MW-132	Shallow	14.56	16	2	
087-MW-133	Shallow	14.53	16	2	
087-MW-134	Shallow	14.67	16	2	
087-MW-135	Shallow	10.29	9	NA	
087-MW-A26	Shallow	10.10	13.0	10	Abandoned 2/2/2017
087-MW-I30	Shallow	10.86	14.0	10	
087-MW-O23	Shallow	11.79	13.0	10	
087-MW-O29	Shallow	10.08	14.0	10	Abandoned 2/2/2017
SA6N-PZ-1	Shallow	10.09	11.5	5	Installed June 2016
SA6N-PZ-2	Shallow	13.66	8.0	5	Installed June 2016
SA6N-PZ-3	Shallow	15.93	13.0	5	Installed June 2016
SA6N-PZ-4	Shallow	18.98	12.0	5	Installed June 2016
SA6N-PZ-5	Shallow	22.10	13.0	5	Installed June 2016
SA6N-PZ-6	Shallow	23.94	13.0	5	Installed June 2016
SA6N-PZ-7	Shallow	19.37	26.0	5	Installed June 2016
SA6N-PZ-8	Shallow	19.26	14.0	5	Installed June 2016
SA6N-PZ-9	Shallow	18.12	12.0	5	Installed June 2016
SA6N-PZ-10	Shallow	18.56	12.0	5	Installed June 2016
088-MW-002	Shallow	12.81	15.0	13	Abandoned 8/10/2015
088-MW-111	Shallow	12.22	NA	NA	Abandoned 10/27/2016
088-MW-112	Shallow	12.43	NA	NA	Abandoned 1/18/2017
088-MW-112R	Shallow	12.36	15.0	NA	
088-MW-116	Shallow	12.52	14.0	NA	
088-MW-117	Shallow	12.86	14.0	NA	
088-MW-G19	Shallow	NA	12.7	2	Abandoned 3/24/2015
088-PZ-001	Shallow	10.67	12.0	5	Abandoned 8/10/2015
088-PZ-003	Shallow	12.07	15.0	5	Abandoned 3/24/2015
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	

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev. (ft msl)	Well Depth (ft)	Screen Length (ft)	Comments
115-E3-SO	Shallow	12.57	NA	NA	
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-A62	Shallow	18.32	15.0	NA	Paved Over
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	
117-MW-I4S	Shallow	15.49	NA	NA	
124-MW-10	Shallow	10.06	11.0	8	
124-MW-11	Shallow	9.05	8.0	6	
124-MW-12	Shallow	11.97	14.5	NA	
124-MW-13	Shallow	13.02	13.0	NA	
125-MW-02	Shallow	8.07	13.5	NA	
125-MW-03	Shallow	11.27	11.5	NA	
134-MW-03	Shallow	10.40	17.0	NA	
134-MW-04	Shallow	9.85	16	2	
134-MW-V09R	Shallow	11.11	17.5	NA	
140-MW-04	Shallow	7.18	11.7	4	
140-MW-08R	Shallow	9.63	NA	NA	
140-MW-09	Shallow	10.72	14.0	NA	
140-MW-10	Shallow	10.49	12.0	8	
140-MW-1R	Shallow	7.61	11.0	NA	
153-MW-02	Shallow	NA	NA	NA	Access Restricted
153-MW-05	Shallow	NA	NA	NA	Access Restricted
153-MW-A13	Shallow	9.62	10.0	6	
153-MW-A15	Shallow	11.00	12.2	10	
154-MW-A01	Shallow	18.06	14.6	NA	
154-MW-A06	Shallow	19.87	15.1	NA	
154-MW-A5A	Shallow	19.16	14.0	NA	
154-MW-B6A	Shallow	20.71	13.7	NA	
154-MW-C6A	Shallow	20.37	13.4	NA	
154-MW-D01	Shallow	18.78	14.3	NA	
154-MW-E08	Shallow	22.00	14.4	NA	
163-MW-01	Shallow	10.44	NA	NA	
163-MW-03	Shallow	10.24	NA	NA	
163-MW-2R	Shallow	10.94	17.2	2	
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	

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Comments
		(ft msl)	(ft)	(ft)	
SA6-MW-AA1	Shallow	17.80	15.0	10	
SA6S-PZ-11	Shallow	15.89	9.5	5	(formerly PZ5-SO) Installed 2015
SA6S-PZ-12	Shallow	15.97	9.5	5	(formerly PZ5-SI) Installed 2015
SA6S-PZ-13	Shallow	16.04	9.5	5	(formerly PZ4-SO) Installed 2015
SA6S-PZ-14	Shallow	16.03	14.1	5	(formerly PZ4-SI) Installed 2015
SA6S-PZ-15	Shallow	14.16	10.1	5	(formerly PZ3-SO) Installed 2015
SA6S-PZ-16	Shallow	18.99	19.6	5	(formerly PZ3-SI) Installed 2015
SA6S-PZ-17	Shallow	18.07	12.0	5	(formerly PZ2-SO) Installed 2015
SA6S-PZ-18	Shallow	18.18	16.2	5	(formerly PZ2-SI) Installed 2015
SA6S-PZ-19	Shallow	17.91	10.4	5	(formerly PZ1-SO) Installed 2015
SA6S-PZ-20	Shallow	18.38	17.3	5	(formerly PZ1-SI) Installed 2015
Sump A	Shallow	15.98	NA	NA	
Sump B	Shallow	13.06	NA	NA	
TCE-1	Shallow	16.42	NA	NA	
TCE-2	Shallow	17.93	NA	NA	
TCE-3	Shallow	17.30	NA	NA	
TCE-4	Shallow	15.42	NA	NA	
TCE-5	Shallow	22.74	NA	NA	

Table 3-1

GWET Pumping Outages in 2017

Well ID	Start Date	End Date	Duration Days and	Hours	Comment
087-PW-1	25-Feb-17	25-Feb-17		13.83	Shutdown due to lightening storm
087-PW-3	25-Feb-17	25-Feb-17		13.83	Shutdown due to lightening storm
087-MW-215BR	25-Feb-17	25-Feb-17		13.83	Shutdown due to lightening storm
087-PW-1	29-Jun-17	29-Jun-17		11.25	Pumps shutdown to drain and clean out the T -202 tank
087-MW-215BR	29-Jun-17	29-Jun-17		11.25	Pumps shutdown to drain and clean out the T -202 tank

TABLE 4-1
GROUNDWATER ELEVATION DATA FROM QUARTERLY ROUNDS IN 2017

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-17	Jun-17	Sep-17	Nov-17
		(ft msl)	(ft)	(ft)	(ft msl)	(ft msl)	(ft msl)	(ft msl)
087-IW-01	Deep	11.51	67	10	2.76	1.43	3.04	2.50
087-MW-01	Deep	12.8	60	10	3.65	4.36	3.87	3.47
087-MW-08	Deep	12.98	99	10	1.70	1.35	0.46	0.64
087-MW-34	Deep	12.73	70	5	-0.25	-0.02	-0.91	-0.76
087-MW-A26T	Deep	9.92	56	15	N/A	3.91	3.48	3.03
087-MW-W25T	Deep	19.06	91	15	5.08	0.99	1.30	0.61
087-OBS-1L	Deep	15.27	67.05	5	1.82	2.33	1.32	1.98
087-OBS-1T	Deep	15.23	105	10	2.61	1.32	0.48	0.76
087-OBS-3L	Deep	12.88	65	5	0.81	1.23	0.12	0.57
087-OBS-4T	Deep	11.6	75.5	5	0.99	1.43	0.66	0.69
087-OBS-5T	Deep	12.62	81.9	10	0.41	0.31	-0.60	-0.38
087-PW-1	Deep	12.66	69	10	-28.14	-28.27	-28.71	-29.74
088-IW-01	Deep	11.753	59	10	3.76	4.70	4.40	3.60
088-IW-02	Deep	13.635	64	10	3.28	3.89	2.84	2.19
088-IW-03	Deep	19.96	74	10	2.63	3.19	3.08	1.66
088-MW-G19T	Deep	15.085	93	15	3.08	3.34	2.88	2.45
090-MW-09	Deep	10.81	75	5	5.08	5.58	5.61	4.97
115-MW-A12T	Deep	12.435	50	N/A	-1.79	-1.74	-1.67	-1.66
115-MW-E14T	Deep	21.33	71	15	2.84	3.47	3.21	2.59
115-OMW-E08TR	Deep	16.82	N/A	N/A	3.05	3.70	3.42	2.82
115-PW-21	Deep	15.13	71	10	2.55	1.33	2.95	2.32
117-MW-D1	Deep	11.08	41	10	2.97	3.26	3.06	2.68
117-MW-D2	Deep	17.62	48	10	4.44	4.75	4.50	4.09
117-MW-D3	Deep	18.85	80	10	5.79	6.07	5.77	5.33
117-MW-I4	Deep	15.49	75	10	5.34	5.14	5.51	5.07
119-MW-01T	Deep	10.78	62	10	2.69	2.96	2.63	2.43
119-MW-02T	Deep	8.8	70	10	2.81	2.98	2.65	2.42
124-MW-104L	Deep	11.538	43	10	3.05	3.29	2.96	2.59
124-MW-105T	Deep	10.922	62	10	7.61	7.75	7.09	6.69
124-MW-106T	Deep	11.203	78	10	2.81	3.23	2.92	2.46
124-MW-G02T	Deep	9.5	69	10	2.64	2.60	2.75	2.65
153-MW-A13T	Deep	9.34	58	15	3.09	3.28	2.91	2.64
SA6-MW-AA1T	Deep	15.31	70	10	1.38	1.56	0.56	-0.18
087-MW-13	Intermediate	12.93	40	10	1.03	1.56	1.01	1.04
087-MW-A26D	Intermediate	10.35	28	10	3.42	3.95	3.55	3.10
087-MW-O29D	Intermediate	10.32	56	N/A	1.62	1.73	1.11	1.10
087-MW-W25D	Intermediate	16.98	66	10	0.46	0.64	1.17	0.61
087-OBS-07	Intermediate	12.59	30	5	-0.26	-0.45	-1.81	-1.20
087-OBS-1D	Intermediate	15.13	42.8	10	2.33	2.09	0.24	1.79
087-OBS-2D	Intermediate	12.68	54	10	-1.50	-1.31	-2.21	-2.02
087-OBS-5D	Intermediate	12.72	39.83	10	0.42	0.23	-0.99	-0.45
087-PW-2	Intermediate	13.02	48	20	1.57	1.14	-0.40	0.80
087-PW-3	Intermediate	12.4	50	20	-6.35	-7.29	-9.10	-9.51
090-MW-07	Intermediate	16.79	40	10	5.37	5.99	5.76	5.21
115-E1-DI	Intermediate	21.713	44.85	N/A	2.67	3.42	3.15	2.51
115-E2-DI	Intermediate	13.815	41.2	N/A	2.78	3.51	3.26	2.59
115-E2-DO	Intermediate	10.24	35	N/A	4.16	4.42	4.17	3.76
115-E3-DI	Intermediate	18.818	37.82	N/A	6.64	6.37	6.09	5.43
115-E3-DO	Intermediate	12.39	34	N/A	4.80	5.14	4.86	4.39
115-E4-DI	Intermediate	19.292	46.82	N/A	2.65	3.38	3.09	2.47
115-E5-DI	Intermediate	15.85	45.32	N/A	3.49	4.47	3.85	3.30
115-E6-DI	Intermediate	19.89	48.35	N/A	2.71	3.44	3.17	2.56
115-E6-DO	Intermediate	19.74	51.1	N/A	2.41	3.12	2.98	2.46
115-MW-18	intermediate	13.043	N/A	N/A	2.26	2.96	2.84	2.40
115-MW-20	Intermediate	14.19	40	N/A	2.24	2.96	2.86	2.40
115-MW-E14D	Intermediate	18.05	35	10	2.39	3.09	2.80	2.19
115-W1-DI	Intermediate	16.79	N/A	N/A	1.89	2.56	2.52	2.06
115-W4-DI	Intermediate	12.27	46.3	N/A	2.08	4.83	2.75	2.29
117-MW-I1	Intermediate	11.08	22	10	4.29	4.37	3.95	3.59
117-MW-I2	Intermediate	17.59	28	10	5.19	5.24	5.01	4.55
117-MW-I3	Intermediate	15.59	28	10	4.94	5.27	5.04	4.55
117-MW-I5	Intermediate	18.76	37	15	5.93	6.34	5.12	5.71
124-MW-G02D	Intermediate	9.59	28	10	2.61	2.89	2.75	2.39
134-PZ-002A	Intermediate	10.746	N/A	N/A	NA	2.19	1.97	1.82
140-MW-P05D	Intermediate	9.885	30	10	2.43	2.68	2.46	2.19
SA6-MW-AA1D	Intermediate	19.36	32	10	1.65	1.51	-0.62	0.78
073-MW-1BR	Rock	25.27	144	15	-1.40	-0.92	-1.31	-1.60
079-MW-13BR-1	Rock	13.08	121	10	7.70	8.28	7.59	7.28

TABLE 4-1
GROUNDWATER ELEVATION DATA FROM QUARTERLY ROUNDS IN 2017

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-17	Jun-17	Sep-17	Nov-17
079-MW-13BR-2	Rock	13.08	214	15	7.70	8.28	7.88	7.28
079-MW-13BR-3	Rock	13.08	284	15	6.79	8.20	7.74	7.20
090-MW-7BR-1	Rock	12.66	134	15	4.93	5.21	4.82	4.48
090-MW-7BR-2	Rock	12.66	N/A	N/A	4.93	5.09	4.81	4.48
090-MW-7BR-3	Rock	12.66	N/A	N/A	4.95	9.48	4.91	4.59
115-MW-203BR	Rock	8.7	162	20	1.18	1.28	0.71	0.62
115-MW-211BR	Rock	17.41	124	N/A	3.73	4.20	3.71	3.38
115-MW-215BR	Rock	8.82	143	20	-3.30	-3.48	-3.96	-4.14
115-MW-216BR	Rock	18.02	131	20	3.81	4.31	3.81	3.47
117-MW-3BR-1	Rock	12.34	155	15	5.21	5.90	5.45	5.05
117-MW-3BR-2	Rock	12.34	263	15	6.21	6.57	6.29	5.75
117-MW-8BR	Rock	12.94	125	10	5.45	5.92	5.62	5.17
119-MW-11BR	Rock	10.75	159	20	4.99	6.05	3.80	3.27
119-MW-12BR	Rock	11.26	154	20	5.11	5.57	5.09	4.74
119-MW-16BR-1	Rock	8.61	151	15	N/A	5.37	4.86	4.22
119-MW-16BR-2	Rock	8.61	187	15	4.05	4.71	4.16	3.81
119-MW-16BR-3	Rock	8.61	247	15	4.23	4.98	4.31	4.23
119-MW-2BR-1	Rock	8.43	163	15	-1.64	-0.37	N/A	-0.98
119-MW-2BR-2	Rock	8.43	245	15	-0.79	0.08	-1.07	-0.39
119-MW-2BR-3	Rock	8.43	315	15	-0.32	0.42	-0.86	-0.35
119-MW-4BR-1	Rock	8.77	179	15	4.03	3.76	3.62	3.05
119-MW-4BR-2	Rock	8.77	229	15	4.17	3.80	3.71	3.08
119-MW-4BR-3	Rock	8.77	314	15	4.19	4.07	3.77	3.32
124-MW-17BR-1	Rock	9.56	153	15	8.01	4.23	3.85	3.51
124-MW-8BR	Rock	9.71	133	N/A	3.58	5.03	3.54	3.36
140-MW-9BR-1	Rock	7.32	153	15	1.78	2.11	3.15	1.39
140-MW-9BR-2	Rock	7.32	222	15	3.23	3.61	3.21	2.88
140-MW-9BR-3	Rock	7.32	272	15	3.27	3.63	1.54	2.93
SA6-MW-14BR	Rock	9.99	85	10	3.36	3.79	3.45	3.09
SA6-MW-15BR	Rock	8.08	103	20	1.70	1.68	1.55	1.11
SA6-MW-5BR-1	Rock	17.06	106	15	2.63	2.31	2.56	1.69
SA6-MW-5BR-2	Rock	17.06	154	15	3.16	3.17	3.26	2.54
SA6-MW-5BR-3	Rock	17.06	204	13	3.68	3.77	3.67	3.04
SA6-MW-5BR-4	Rock	17.06	236	15	3.54	3.51	3.58	3.02
SA6-MW-5BR-5	Rock	17.06	281	15	3.77	3.71	3.76	3.14
073-MW-06	Shallow	11.5	20	N/A	3.74	3.99	3.48	2.88
073-MW-07	Shallow	10.38	18	N/A	4.73	5.19	3.87	3.17
073-MW-08	Shallow	10.57	17	N/A	4.55	4.92	4.48	3.69
079-MW-01	Shallow	8.8	N/A	N/A	4.24	4.37	4.08	3.46
079-MW-A2	Shallow	8.1	13	10	3.67	4.01	3.64	3.18
079-MW-C6	Shallow	11	13	10	5.38	5.18	4.78	4.39
087-MW-102	Shallow	11.65	13	N/A	5.40	6.26	5.49	5.24
087-MW-114R	Shallow	10.42	10	N/A	4.85	5.35	4.83	4.52
087-MW-118R	Shallow	15.41	16.5	N/A	5.16	4.93	4.79	4.51
087-MW-120	Shallow	12.3	11	N/A	4.62	4.57	4.50	4.28
087-MW-132	Shallow	14.564	16	N/A	6.81	6.16	5.84	5.32
087-MW-133	Shallow	14.53	16	N/A	7.02	6.31	5.88	5.35
087-MW-134	Shallow	14.665	16	N/A	7.01	6.30	5.93	5.39
087-MW-135	Shallow	10.29	9	N/A	4.84	5.35	4.90	4.53
087-MW-I30	Shallow	10.86	14	10	4.61	4.92	4.60	4.15
087-MW-O23	Shallow	11.79	13	10	6.17	5.78	5.45	5.39
087-PZ-1	Shallow	10.04	10.76	5	5.33	5.16	4.19	3.49
087-PZ-10	Shallow	17.06	18.58	5	3.87	3.93	4.11	3.33
087-PZ-11	Shallow	9.69	9.02	5	7.20	6.45	5.70	4.95
087-PZ-12	Shallow	10.63	9.86	5	4.17	4.69	4.05	2.76
087-PZ-13	Shallow	10.62	9.76	5	7.14	6.69	6.10	5.67
087-PZ-14	Shallow	15.15	14.29	5	4.06	4.16	3.41	1.95
087-PZ-15	Shallow	13.34	14.43	5	6.09	5.94	5.37	4.98
087-PZ-16	Shallow	17.7	18.36	5	3.82	4.11	3.40	1.87
087-PZ-17	Shallow	15.15	17.02	5	5.04	5.17	4.69	3.95
087-PZ-18	Shallow	18.13	19.73	5	3.77	4.08	3.43	1.86
087-PZ-19	Shallow	15.38	17.22	5	3.44	2.95	2.86	2.68
087-PZ-2	Shallow	10.35	11.88	5	3.78	4.20	4.36	2.92
087-PZ-20	Shallow	18.18	19.86	5	3.84	3.98	3.37	1.79
087-PZ-3	Shallow	13.28	14.32	5	3.43	4.94	4.66	3.75
087-PZ-4	Shallow	13.65	14.89	5	3.68	4.05	4.25	2.84
087-PZ-5	Shallow	19.49	20.43	5	2.93	6.33	5.41	4.51
087-PZ-6	Shallow	21.04	22.28	5	0.77	3.99	4.28	3.28
087-PZ-7	Shallow	16.24	22	5	6.33	5.86	5.48	4.89
087-PZ-8	Shallow	16.54	17.58	5	3.41	3.63	3.93	3.27
087-PZ-9	Shallow	17.19	18.96	5	2.82	2.65	2.36	1.98
088-MW-112R	Shallow	12.36	15	N/A	3.45	5.05	4.73	3.79
088-MW-116	Shallow	12.52	14	N/A	3.25	4.84	4.53	3.65
088-MW-117	Shallow	12.86	14	N/A	3.39	4.92	4.61	3.72

TABLE 4-1
GROUNDWATER ELEVATION DATA FROM QUARTERLY ROUNDS IN 2017

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-17	Jun-17	Sep-17	Nov-17
088-MW-15R	Shallow	14.593	N/A	N/A	4.34	3.57	3.18	2.67
090-PZ-05	Shallow	17.26	N/A	N/A	7.20	7.26	6.87	6.40
090-PZ-06	Shallow	17.18	N/A	N/A	9.53	9.44	9.36	N/A
115-E1A-SO	Shallow	21.53	7	N/A	4.00	4.14	3.38	1.87
115-E2-SO	Shallow	10.05	10	N/A	6.20	6.36	5.49	5.43
115-E3-SO	Shallow	12.57	N/A	N/A	6.66	6.50	6.50	5.81
115-E4-SO	Shallow	16.04	13.17	N/A	3.83	4.12	4.38	N/A
115-E5-SO	Shallow	18.49	19.8	N/A	4.61	4.63	4.68	3.37
115-PZ-500	Shallow	6.68	N/A	N/A	4.83	4.75	4.50	4.12
115-PZ-501	Shallow	14.47	N/A	N/A	5.41	5.44	5.15	4.49
115-PZ-502	Shallow	14.51	16	N/A	5.07	5.11	4.61	4.25
115-PZ-503	Shallow	7.32	N/A	N/A	4.91	4.94	5.20	4.12
115-W1-SO	Shallow	23.08	N/A	N/A	3.11	3.29	3.67	2.97
115-W3-SO	Shallow	15.16	13.93	N/A	3.82	4.20	3.72	1.99
115-W5-SO	Shallow	24.45	16	N/A	3.95	4.16	3.41	1.88
115-W6-SO	Shallow	16.96	N/A	N/A	3.59	3.86	4.06	3.38
117-MW-A05	Shallow	18.48	16	N/A	6.55	6.97	6.49	6.02
117-MW-A14	Shallow	17.33	17	N/A	4.85	5.23	4.80	4.36
117-MW-A85	Shallow	17.4	15	N/A	4.64	5.06	4.92	4.51
117-MW-A89	Shallow	13.17	16	N/A	5.04	4.60	4.07	3.64
117-MW-A99	Shallow	15.95	14	N/A	5.09	5.59	5.46	5.03
117-MW-I4S	Shallow	15.49	N/A	N/A	5.26	5.74	N/A	5.06
124-MW-10	Shallow	10.06	11	8	5.11	4.84	4.86	4.71
124-MW-11	Shallow	9.05	8	6	5.30	4.74	3.75	4.03
124-MW-12	Shallow	11.97	14.5	N/A	6.49	5.98	5.25	4.96
124-MW-13	Shallow	13.02	13	N/A	6.43	7.79	7.04	6.67
125-MW-02	Shallow	8.07	13.5	N/A	5.83	5.30	4.68	4.27
125-MW-03	Shallow	11.27	11.5	N/A	7.03	6.47	5.88	5.51
134-MW-03	Shallow	10.4	17	N/A	4.92	5.07	4.64	3.92
134-MW-04	Shallow	9.85	16	N/A	5.20	5.26	4.77	4.06
134-MW-V09R	Shallow	11.11	17.5	10	N/A	5.10	4.68	3.95
140-MW-04	Shallow	7.18	11.7	N/A	5.69	5.32	4.74	4.28
140-MW-08R	Shallow	9.63	N/A	N/A	6.26	5.85	4.92	4.70
140-MW-09	Shallow	10.72	14	N/A	5.86	5.32	4.61	3.98
140-MW-10	Shallow	10.49	12	8	5.66	5.83	5.10	4.46
140-MW-1R	Shallow	7.61	11	N/A	5.96	5.56	4.96	4.49
153-MW-A13	Shallow	9.62	10	6	4.30	4.09	3.40	3.04
153-MW-A15	Shallow	11	12.15	10	2.62	2.66	2.16	2.00
154-MW-A01	Shallow	18.06	14.61	N/A	N/A	11.56	11.02	10.75
154-MW-A06	Shallow	19.87	15.12	N/A	14.44	13.99	12.02	11.72
154-MW-A5A	Shallow	19.16	14	N/A	11.90	11.98	11.23	10.87
154-MW-B6A	Shallow	20.71	13.68	N/A	13.86	13.23	12.10	11.71
154-MW-C6A	Shallow	20.37	13.41	N/A	12.85	12.86	11.98	11.60
154-MW-D01	Shallow	18.78	14.28	N/A	13.09	N/A	N/A	11.58
154-MW-E08	Shallow	22	14.4	N/A	14.15	14.02	12.88	12.44
163-MW-01	Shallow	10.44	N/A	N/A	4.51	4.57	4.17	3.66
163-MW-03	Shallow	10.24	N/A	N/A	4.40	4.68	4.25	3.55
163-MW-2R	Shallow	10.94	17.2	N/A	3.55	4.08	2.80	2.39
184-MW-04	Shallow	8.7	N/A	N/A	4.26	3.88	3.54	3.41
184-MW-05	Shallow	14.71	N/A	N/A	6.04	5.92	5.49	4.93
184-MW-06	Shallow	17.69	N/A	N/A	7.93	7.84	7.42	7.07
184-MW-101	Shallow	14.85	13	5	7.02	6.67	5.80	5.03
184-MW-102	Shallow	15.66	12	5	6.83	6.69	6.31	5.85
184-MW-103	Shallow	15.85	14	5	6.87	6.62	6.26	5.82
184-MW-104	Shallow	16.35	13	5	7.46	7.09	6.74	6.38
184-MW-105	Shallow	15.1	12.12	5	N/A	6.68	6.08	5.57
184-MW-106	Shallow	15.47	13.9	5	N/A	6.26	5.90	5.41
184-MW-107	Shallow	15.89	11.22	5	N/A	6.65	6.26	5.78
184-MW-108	Shallow	16.61	14.78	5	N/A	7.07	6.68	6.25
SA6-MW-AA1	Shallow	17.8	15	10	5.03	4.38	3.85	3.35
SUMP A	Shallow	15.98	N/A	N/A	7.44	6.75	6.16	5.65
SUMP B	Shallow	13.08	N/A	N/A	4.48	5.03	5.00	5.03
TCE-1	Shallow	17.58	N/A	N/A	5.84	5.66	5.02	4.53
TCE-2	Shallow	19.15	N/A	N/A	10.44	10.43	9.99	9.65
TCE-3	Shallow	18.51	N/A	N/A	9.74	9.31	8.79	8.45
TCE-4	Shallow	16.71	N/A	N/A	11.48	10.91	10.46	10.05
TCE-5	Shallow	23.99	N/A	N/A	N/A	12.02	11.21	10.84

Table 4-2
Summary of Groundwater Elevations Near NJCU
2017

Ref. Point Survey Date	Dec. 2014 Ref. pt.* ft, msl	June 2015 Ref. pt.* ft, msl	April 2016 Ref. pt.* ft, msl	April 2017 Ref. pt.* ft, msl	03/29/17 Depth to GW (ft,)	03/29/17 GW Elev. (ft., msl)	06/19/17 Depth to GW (ft,)	06/19/17 GW Elev. (ft., msl)	09/12/17 Depth to GW (ft,)	09/12/17 GW Elev. (ft., msl)	11/29/17 Depth to GW (ft,)	11/29/17 GW Elev. (ft., msl)
Location												
079-MW-A02	8.10	8.10	8.10	8.10	4.43	3.67	4.09	4.01	4.46	3.64	4.92	3.18
Sump A	15.98	15.98	15.98	15.98	8.54	7.44	9.23	6.75	9.82	6.16	10.33	5.65
Sump B	13.06	13.06	13.06	13.08	8.6	4.46	8.05	5.03	8.08	5.00	8.05	5.03
090-PZ-5	17.24	17.24	17.24	17.26	10.06	7.18	10.00	7.26	10.39	6.87	10.86	6.40
090-PZ-6	17.15	17.15	17.15	17.18	7.65	9.50	7.74	9.44	7.82	9.36	N/A	N/A
184-MW-4	8.76	8.76	8.76	8.76	4.44	4.32	4.82	3.94	5.16	3.60	5.29	3.47
184-MW-5	14.79	14.79	14.79	14.78	8.67	6.12	8.79	5.99	9.22	5.56	9.78	5.00
184-MW-6	15.90	17.75	17.75	17.76	9.76	7.99	9.85	7.91	10.27	7.49	10.62	7.14
090-MW-09	10.72	10.72	10.72	10.81	5.73	4.99	5.23	5.58	5.20	5.61	5.84	4.97
TCE-1	NA	NA	17.58	17.58	11.74	5.84	11.92	5.66	12.56	5.02	13.05	4.53
TCE-2	NA	NA	19.15	19.15	8.71	10.44	8.72	10.43	9.16	9.99	9.50	9.65
TCE-3	NA	NA	18.51	18.51	8.77	9.74	9.20	9.31	9.72	8.79	10.06	8.45
TCE-4	NA	NA	16.71	16.71	5.23	11.48	5.80	10.91	6.25	10.46	6.66	10.05
TCE-5	NA	NA	23.99	23.99	NA	NA	11.97	12.02	12.78	11.21	13.15	10.84
090-MW-07	16.79	16.79	16.79	16.79	11.42	5.37	10.80	5.99	11.03	5.76	11.58	5.21
117-MW-I4S	15.49	15.49	15.49	15.49	10.23	5.26	9.75	5.74	DRY	DRY	10.43	5.06
117-MW-I5	18.76	18.76	18.76	18.76	12.83	5.93	12.42	6.34	12.64	6.12	13.05	5.71
184-MW-101	NA	NA	14.95	14.95	7.83	7.12	8.18	6.77	9.05	5.90	9.82	5.13
184-MW-102	NA	NA	15.88	15.88	8.83	7.05	8.97	6.91	9.35	6.53	9.81	6.07
184-MW-103	NA	NA	15.96	15.96	8.98	6.98	9.23	6.73	9.59	6.37	10.03	5.93
184-MW-104	NA	NA	16.46	16.46	8.89	7.57	9.26	7.20	9.61	6.85	9.97	6.49
184-MW-105	NA	NA	NA	15.10	NA	NA	8.42	6.68	9.02	6.08	9.53	5.57
184-MW-106	NA	NA	NA	15.47	NA	NA	9.21	6.26	9.57	5.90	10.06	5.41
184-MW-107	NA	NA	NA	15.90	NA	NA	9.24	6.66	9.63	6.27	10.11	5.79
184-MW-108	NA	NA	NA	16.61	NA	NA	9.54	7.07	9.93	6.68	13.36	3.25

NA - Not available

* NGVD29 site datum

Table 5-1
Summary of Groundwater Quality Data from GWET Wells

Parameter	21-Mar-17			26-Jun-17			13-Oct-17			18-Dec-17		
	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	2.3	19.8	ND	1.9	26.3	ND	2.1	24.7	ND	2.1	25.5	ND
Carbon Tetrachloride	3.6	6.1	ND	2.9	10.7	2.8	4.9	12.2	3.1	3.9	12.2	2.1
Chloroform	19	70	0.28 J	16.6	120	0.27	20.1	129	0.24	19.7	132	0.25 J
1,1-Dichloroethene	0.47 J	0.22 J	ND	ND	ND	ND	ND	ND	ND	0.61 J	0.91 J	ND
cis-1,2-Dichloroethene	96.8	73.8	ND	81.3	119	ND	81.6	134	ND	86.4	168	ND
trans-1,2-Dichloroethene	3	0.33 J	ND	2.6	0.53 J	ND	3	0.87	ND	3.3	1.7	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	72	249	ND	56.5	276	ND	70.9	255	ND	62.3	219	ND
1,1-Dichloroethane	0.57 J	ND	ND	0.62 J	ND	ND	0.65	ND	ND	0.92 J	0.33 J	ND
Methylene chloride	0.58 J	2.1	ND	ND	3.3	ND	ND	2.9	ND	0.58 J	3.8	ND
Vinyl chloride	10.2	7.8	ND	7.2	22.5	ND	9.5	32	ND	13.4	62.5	ND
1,2-Dichlorobenzene	0.58 J	ND	ND	0.57 J	ND	ND	0.6	ND	ND	0.59 J	ND	ND
Chlorobenzene	0.38 J	ND	ND	0.32 J	ND	ND	ND	ND	ND	0.35 J	ND	ND
Ethylbenzene	ND	ND	ND	ND	0.21 J	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	ND	0.28 J	ND	ND	0.35 J	ND	ND	0.34	ND	ND	0.36 J	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexavalent Chromium	38,200	50,100	16,900	29,500	46,600	18,500	24,600	35,900	13,100	25,500	36,400	13,300
Total Chromium	23,800	46,500	17,900	26,700	38,500	15,900	25,500	39,300	13,900	20,600	31,400	10,800

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

Table 6-1
Summary of S-3 Injection Events Through 2017

Event #	Injection Dates	Injection Well	Injection History	Volume Calmet Injected (gallons)	Volume Water Injected (gallons)	Average Injection Rate (gpm)	Pressurization Required (psi)
1	05/20/12	088-IW-01	First	4,291	9,135	9.0 to 10.9	0
2	07/01/12	088-IW-02	First	4,267	9,000	10.0	0
3	08/20/12	115-PW-21	First	4,350	9,440	12.0	0
4	10/01/12	115-DP-2	First	4,340	9,022	10-11.5	3 to 5
5	12/09/12	088-IW-02	Second	4,230	9,006	11-12.5	0 to 2
6	03/17/13	088-IW-01	Second	4,305	9,027	5.0 to 10.0	0
7	06/23/13	088-IW-03	First	4,320	9,007	7.0 to 11.5	0 to 4
8	08/18/13	088-IW-02	Third	4,171	8,400	10 to 12	0
9	09/22/13	088-IW-01	Third	4,242	8,500	7 to 10	0
10	10/20/13	088-IW-03	Second	3,954	7,950	6 to 9	4 to 7
11	12/08/13	088-IW-02	Fourth	4,080	8,200	10.0	2 to 7
12	03/30/14	088-IW-01	Fourth	4,300	8,400	12 to 14	3 to 8
13	04/27/14	088-IW-03	Third	4,130	8,250	7 to 9	4 to 8
14	06/01/14	088-IW-02	Fifth	4,200	8,400	11.0	0
15	07/13/14	088-IW-01	Fifth	4,240	8,500	3 to 4	12 to 15
16	08/24/14	088-IW-03	Fourth	4,210	8,400	9.0	5 to 7
17	09/21/14	088-IW-02	Sixth	4,250	8,500	13.0	3 to 5
18	10/29/14	088-IW-03	Fifth	3,844	7,700	11.0	8 to 10
19	3/22/2015	088-IW-01	Sixth	4,265	8,600	10.0	12 to 15
20	4/26/2015	088-IW-03	Sixth	4,065	8,160	11.0	10
21	5/31/2015	088-IW-02	Seventh	4,156	8,385	11.5	2 to 6
22	7/6/2015	088-IW-01	Seventh	4,290	8,699	6.0	15 to 17
23	8/16/2015	088-IW-03	Seventh	4,335	8,690	10.0	8 to 10
24	9/27/2015	088-IW-02	Eighth	4,339	8,700	12.0	8 to 10
25	11/2/2015	088-IW-03	Eighth	4,036	8,120	10.0	10 to 13
26	12/06/15	088-IW-01	Eighth	4,122	8,290	3.5	15
27	03/20/16	088-IW-02	Ninth	4,029	8,221	10.0	9.5 to 14.5
28	04/25/16	088-IW-03	Ninth	4,299	8,737	9.0	9.5 to 17.5
29	06/05/16	088-IW-01	Ninth	4,303	8,742	6.0	5 to 18.5
30	07/11/16	088-IW-02	Tenth	4,345	8,686	9.0	7.5 to 17.5
31	08/07/16	088-IW-03	Tenth	3,768	7,652	9.0	13.5 to 15.5
32	10/03/16	088-IW-01	Tenth	4,322	8,512	10.0	2 to 11
33	10/24/16	088-IW-02	Eleventh	4,303	8,468	10.0	2.5 to 10
34	11/29/16	088-IW-03	Eleventh	4,411	8,867	11.0	7 to 10
35	5/8/2017	088-IW-01	Eleventh	4,215	8,490	8.0	13
36	6/12/2017	088-IW-02	Twelfth	4,309	8,645	10.0	5
37	7/17/2017	088-IW-03	Twelfth	3,885	7,780	8.5	17
38a	8/28/2017	088-IW-01	Thirteenth	229	300	1.2	17
38b	8/28/2017	088-IW-02	Thirteenth	4,102	8,400	9.0	17
39	9/18/2017	088-IW-03	Thirteenth	4,262	8,550	10.5	18

Table 6-2
Calculation of Percent Sulfide in CaSx Samples

Event	Product Name	CaSx Manufacturer	Sulfide % T-1	Sulfide % T-2	Sulfide % T-3	Sulfide % Geometric Mean
1	Calmet	TKI	5.10	4.91	5.01	5.01
2	Calmet	TKI	5.31	5.12	5.44	5.29
3	Calmet	TKI	5.19	5.25	5.19	5.21
4	Calmet	TKI	5.48	5.41	5.45	5.45
5	Calcium Polysulfide	Graus	6.48	6.48	6.56	6.51
6	Calcium Polysulfide	Graus	4.30	4.31	4.33	4.31
7	Calcium Polysulfide	Graus	3.84	3.84	4.06	3.91
8	Calcium Polysulfide	Graus	5.12	5.48	5.40	5.33
9	Calcium Polysulfide	Graus	5.08	4.88	4.92	4.96
10	Calcium Polysulfide	Graus	5.17	5.13	5.16	5.15
11	Calcium Polysulfide	Graus	5.18	5.13	5.11	5.14
12	Calcium Polysulfide	Graus	5.44	5.12	5.22	5.26
13	Calcium Polysulfide	Graus	5.07	5.06	5.50	5.21
14	REMOTOX	Graus	5.98	5.97	5.83	5.93
15	REMOTOX	Graus	4.98	5.06	5.14	5.06
16	REMOTOX	Graus	6.23	6.20	6.02	6.15
17	REMOTOX	Graus	6.21	6.13	5.80	6.04
18	REMOTOX	Graus	6.14	6.39	6.42	6.31
19	REMOTOX	Graus	5.42	5.59	5.42	5.48
20	REMOTOX	Graus	5.56	5.36	5.36	5.43
21	REMOTOX	Graus	6.47	6.66	6.47	6.54
22	REMOTOX	Graus	5.18	5.31	5.35	5.28
23	REMOTOX	Graus	5.31	5.30	5.23	5.28
24	REMOTOX	Graus	5.24	5.19	5.29	5.24
25	REMOTOX	Graus	5.95	5.90	5.91	5.92
26	REMOTOX	Graus	5.88	5.90	5.97	5.92
27	Calcium Polysulfide	Thatcher	4.32	4.32	4.32	4.32
28	Calcium Polysulfide	Thatcher	5.06	5.05	5.06	5.06
29	Calcium Polysulfide	Thatcher	5.17	5.19	5.16	5.17
30	Calcium Polysulfide	Thatcher	5.29	5.31	5.30	5.30
31	Calcium Polysulfide	Thatcher	5.32	5.17	5.20	5.23
32	Calcium Polysulfide	Thatcher	5.79	5.79	5.78	5.79
33	Calcium Polysulfide	Thatcher	5.55	5.55	5.55	5.55
34	Calcium Polysulfide	Thatcher	5.40	5.40	5.40	5.40
35	Calcium Polysulfide	Thatcher	5.38	5.45	5.47	5.43
36	Calcium Polysulfide	Thatcher	5.37	5.50	5.44	5.44
37	Calcium Polysulfide	Thatcher	5.33	5.38	5.38	5.36
38	Calcium Polysulfide	Thatcher	5.72	5.78	5.76	5.75
39	Calcium Polysulfide	Thatcher	5.33	5.37	5.36	5.35

TKI = Tessenderlo Kerley, Inc.
Graus = Graus Chemicals
T- Triplicate #

Table 6-3
Summary of Stoichiometriclly Equivalent Cr(VI) Mass Reduced
S-3 Injection/Mass Removal Program

Event #	Injection Date	Injection Well	Mass CaSx Delivered (tons)	Volume CaSx Injected[(a)] (gallons)	Geometric mean [(b)] Sulfide %	Stoichiometric Equivalent Mass Cr(VI) Reduced[(c)] (tons)	Cumulative Stoichiometric Equivalent Mass Cr(VI) Reduced (tons)
1	5/20/12	088-IW-01	22.53	4,291	5.01%	1.22	1.22
2	7/1/12	088-IW-02	22.40	4,267	5.29%	1.28	2.50
3	8/20/12	115-PW-21	22.84	4,350	5.21%	1.29	3.79
4	10/1/12	115-DP-2	22.79	4,340	5.45%	1.34	5.13
5	12/9/12	088-IW-02	22.42	4,230	6.51%	1.58	6.71
6	3/17/13	088-IW-01	22.60	4,305	4.31%	1.05	7.76
7	6/23/13	088-IW-03	22.68	4,320	3.91%	0.96	8.72
8	08/18/13	088-IW-02	22.13	4,171	5.33%	1.28	9.99
9	09/22/13	088-IW-01	22.27	4,242	4.96%	1.19	11.19
10	10/20/13	088-IW-03	20.76	3,954	5.15%	1.16	12.34
11	12/08/13	088-IW-02	21.43	4,080	5.14%	1.19	13.53
12	03/30/14	088-IW-01	22.57	4,300	5.26%	1.28	14.82
13	04/27/14	088-IW-03	21.68	4,130	5.21%	1.22	16.04
14	06/01/14	088-IW-02	22.05	4,200	5.93%	1.41	17.45
15	07/13/14	088-IW-01	22.26	4,240	5.06%	1.22	18.67
16	08/24/14	088-IW-03	22.10	4,210	6.15%	1.47	20.14
17	09/21/14	088-IW-02	22.31	4,250	6.04%	1.46	21.60
18	10/29/14	088-IW-03	20.18	3,844	6.31%	1.38	22.97
19	3/22/2015	088-IW-01	22.39	4,265	5.48%	1.33	24.30
20	4/26/2015	088-IW-03	21.34	3,996	5.43%	1.25	25.55
21	5/31/2015	088-IW-02	21.82	4,086	6.54%	1.54	27.09
22	7/6/2015	088-IW-01	22.52	4,217	5.28%	1.29	28.38
23	8/16/2015	088-IW-03	22.76	4,262	5.28%	1.30	29.68
24	9/27/2015	088-IW-02	22.78	4,266	5.24%	1.29	30.97
25	11/2/2015	088-IW-03	21.19	3,968	5.92%	1.36	32.33
26	12/06/15	088-IW-01	21.64	4,052	5.92%	1.38	33.71
27	03/20/16	088-IW-02	21.15	3,961	4.32%	0.99	34.70
28	04/25/16	088-IW-03	22.57	4,227	5.06%	1.23	35.93
29	06/05/16	088-IW-01	22.59	4,230	5.17%	1.26	37.19
30	07/11/16	088-IW-02	22.81	4,272	5.30%	1.31	38.50
31	08/07/16	088-IW-03	19.78	3,704	5.23%	1.12	39.62
32	10/03/16	088-IW-01	22.69	4,249	5.79%	1.42	41.04
33	10/24/16	088-IW-02	22.59	4,230	5.55%	1.36	42.39
34	11/29/16	088-IW-03	23.16	4,337	5.40%	1.35	43.75
35	5/8/2017	088-IW-01	22.51	4,215	5.43%	1.32	45.07
36	6/12/2017	088-IW-02	23.01	4,309	5.44%	1.35	46.42
37	7/17/2017	088-IW-03	20.75	3,886	5.36%	1.20	47.62
38	8/28/2017	088-IW-02	23.13	4,331	5.75%	1.44	49.06
39	9/18/2017	088-IW-03	22.76	4,262	5.35%	1.32	50.38

Notes:

(a) Mass CaSx Delivered / CaSx density

(c) Mass CaSx Delivered × Sulfide% × (51.996/32.065) / 1.5;

The factor 1.5 represents the molar ratio of S(−II) to Cr(VI) in the balanced redox reaction:

$1.5CaS_{4.2} + CrO_4^{2-} + 5H^+ = Cr(OH)_3(s) + 6.3S(s) + 1.5Ca^{2+} + H_2O$

51.996 and 32.065 are the atomic masses of Cr and S, respectively

FIGURES

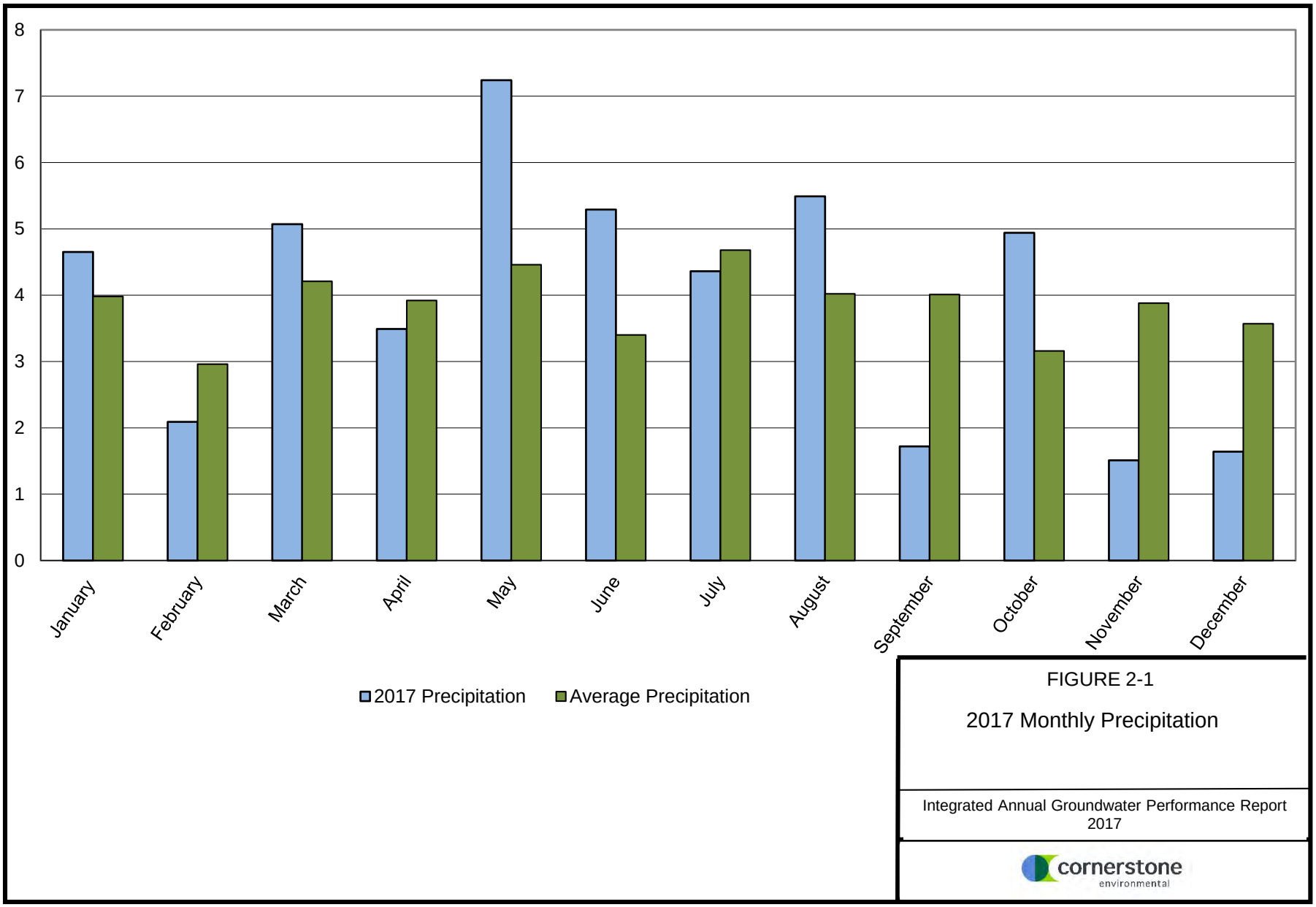


FIGURE 2-1

2017 Monthly Precipitation

Integrated Annual Groundwater Performance Report
2017

cornerstone
environmental

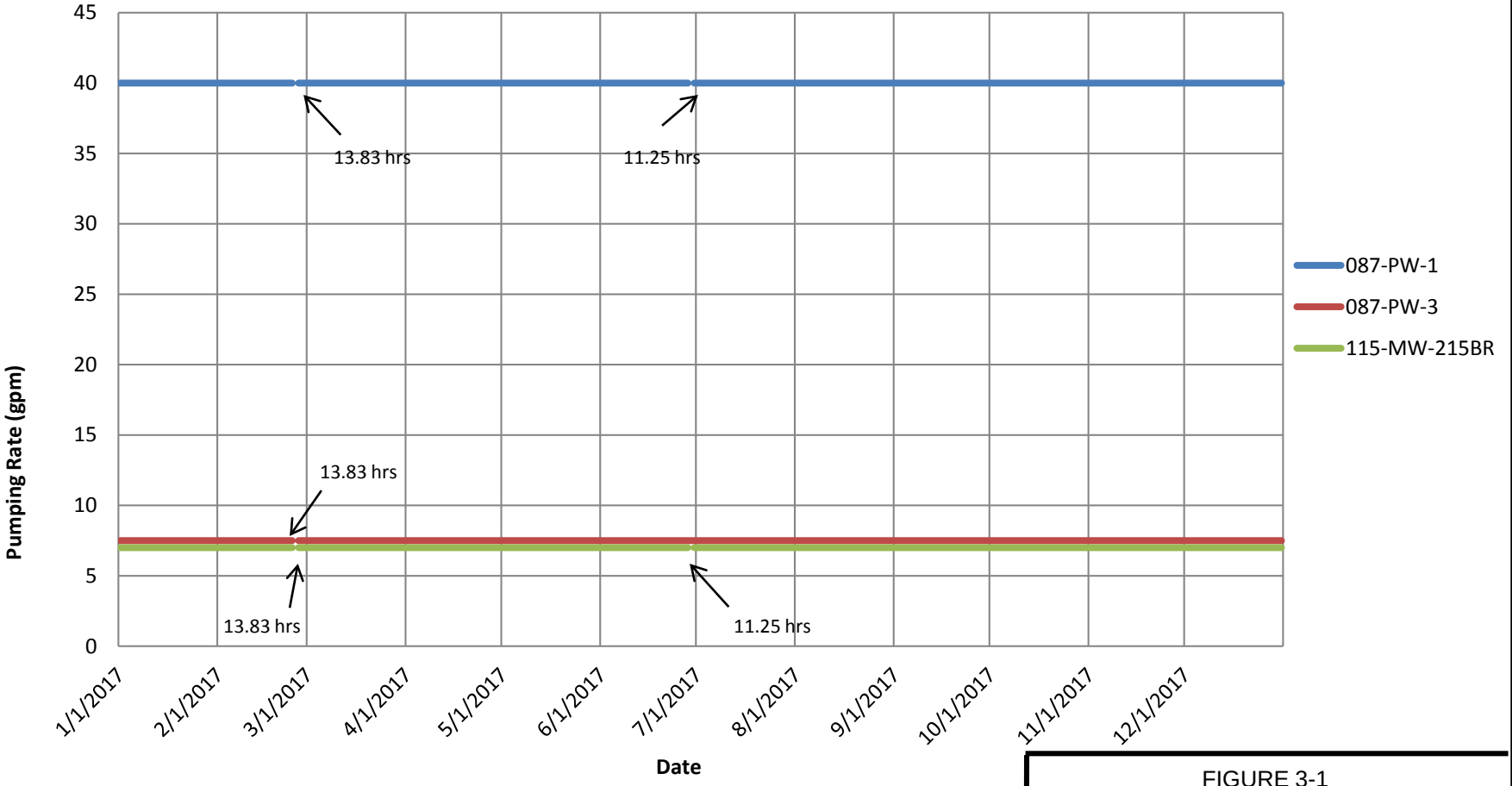


FIGURE 3-1

GWET Pumping Rates and Downtimes In 2017

Integrated Annual Groundwater Performance Report 2017

cornerstone environmental

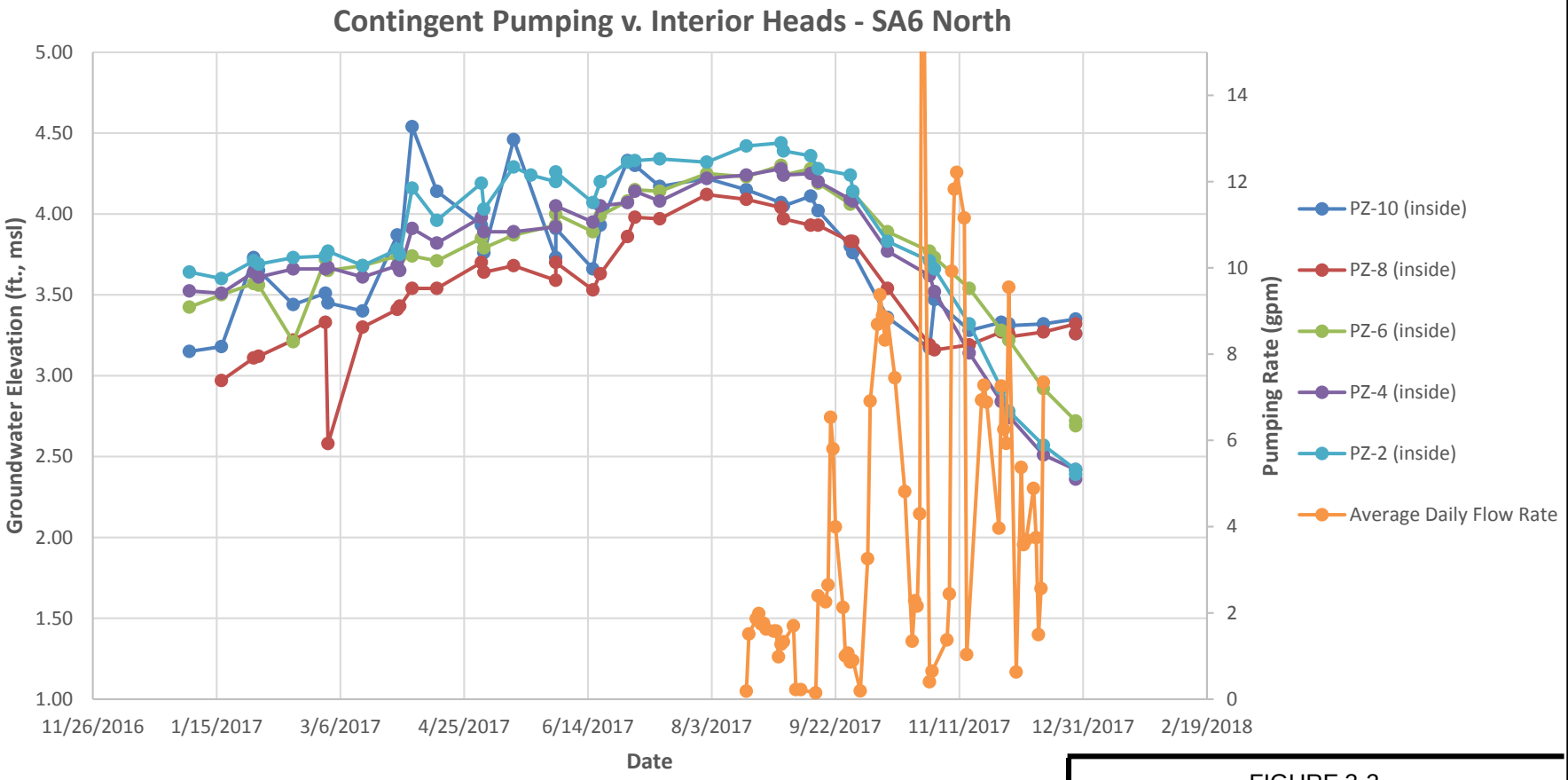


FIGURE 3-2

SA6-North Contingent Pumping

Integrated Annual Groundwater Performance Report
2017

cornerstone
environmental

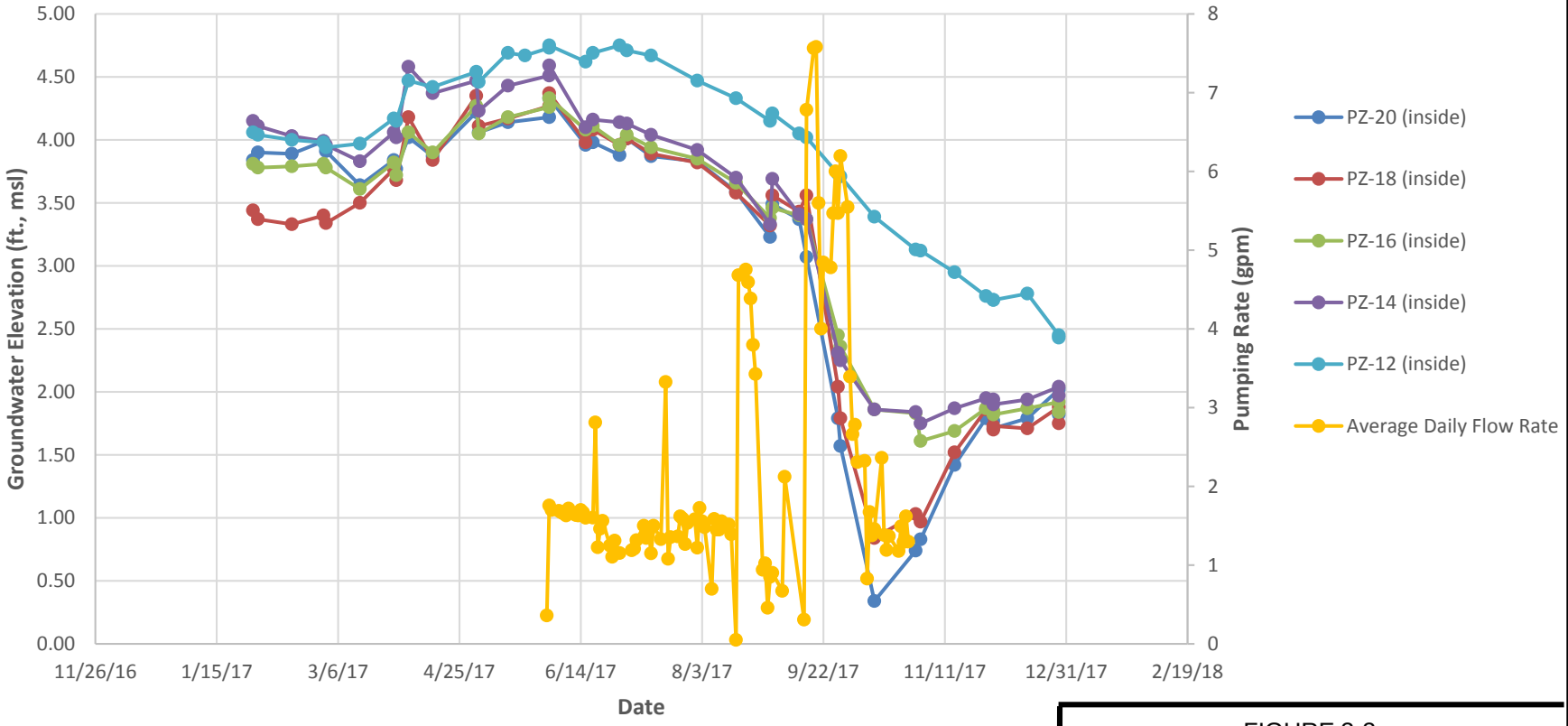
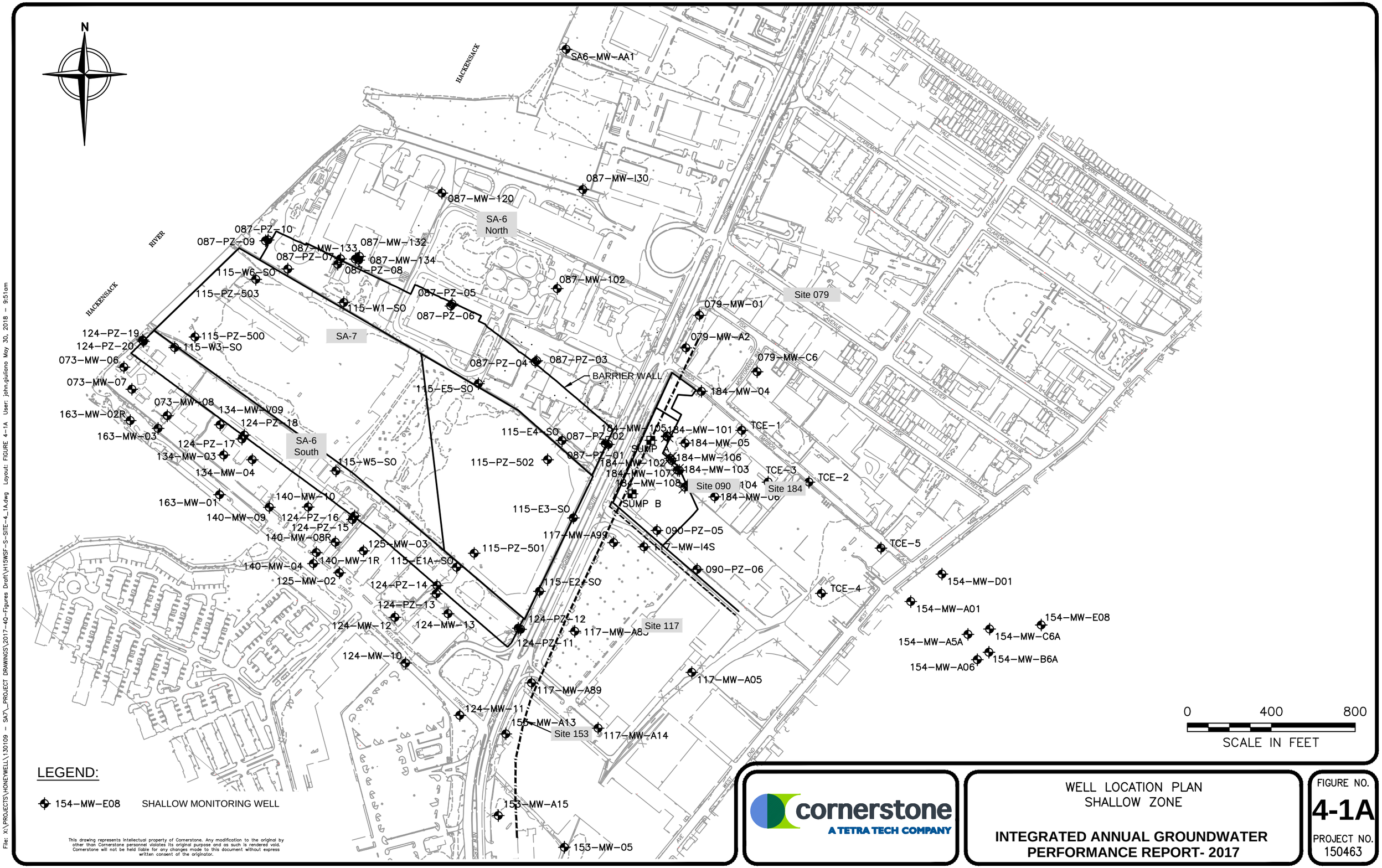


FIGURE 3-3

SA-6 South Contingent Pumping

Integrated Annual Groundwater Performance Report
2017

cornerstone
environmental



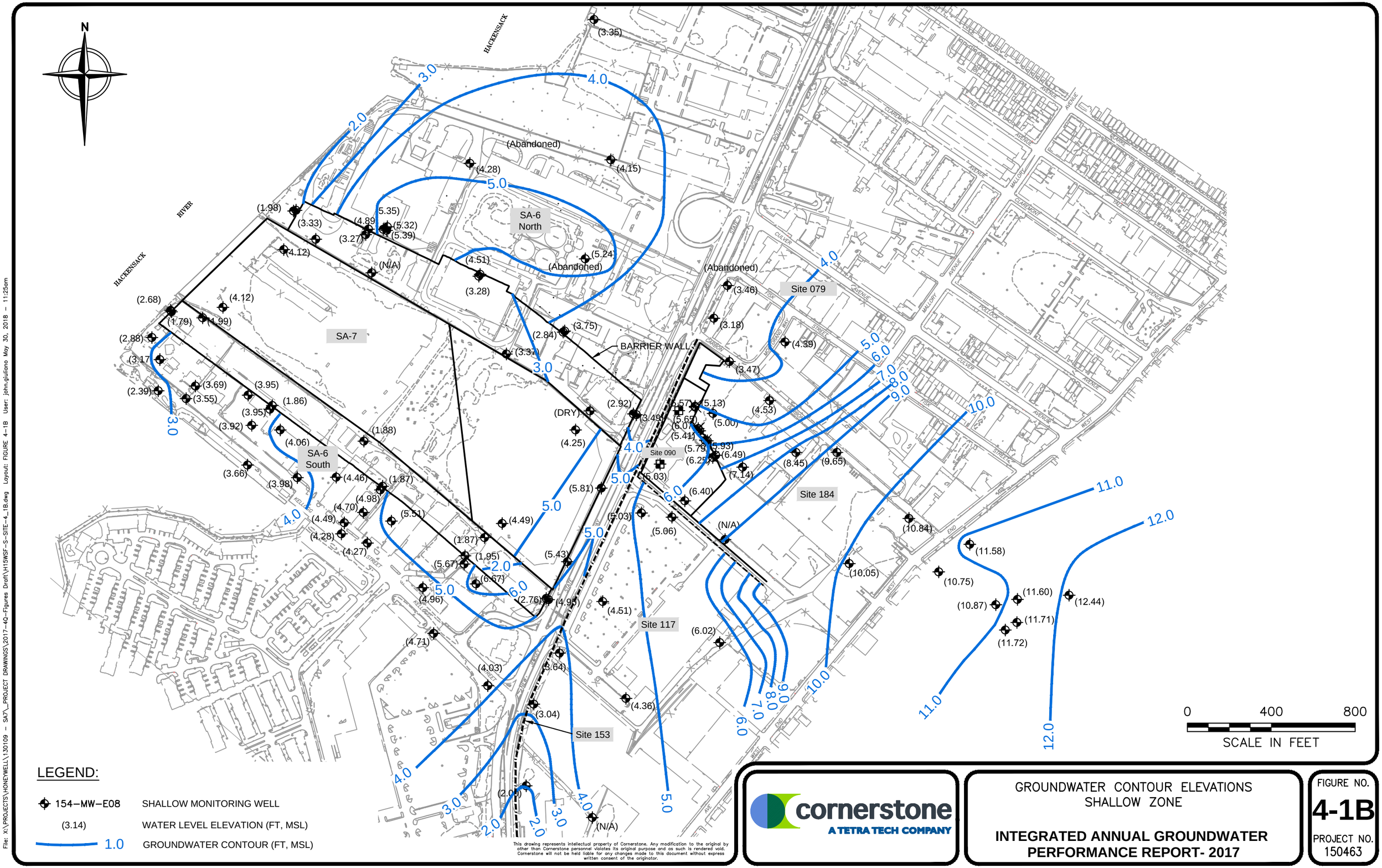
cornerstone
A TETRA TECH COMPANY

WELL LOCATION PLAN
SHALLOW ZONE

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2017

FIGURE NO.
4-1A
PROJECT NO.
150463

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2017-40-Figures Draft\H15WSF-S-SITE-4_1A.dwg Layout: FIGURE 4-1A User: john.giuliano May 30, 2018 - 9:51am



LEGEND:

- 154-MW-E08 — SHALLOW MONITORING WELL
- (3.14) — WATER LEVEL ELEVATION (FT, MSL)
- 1.0 — GROUNDWATER CONTOUR (FT, MSL)

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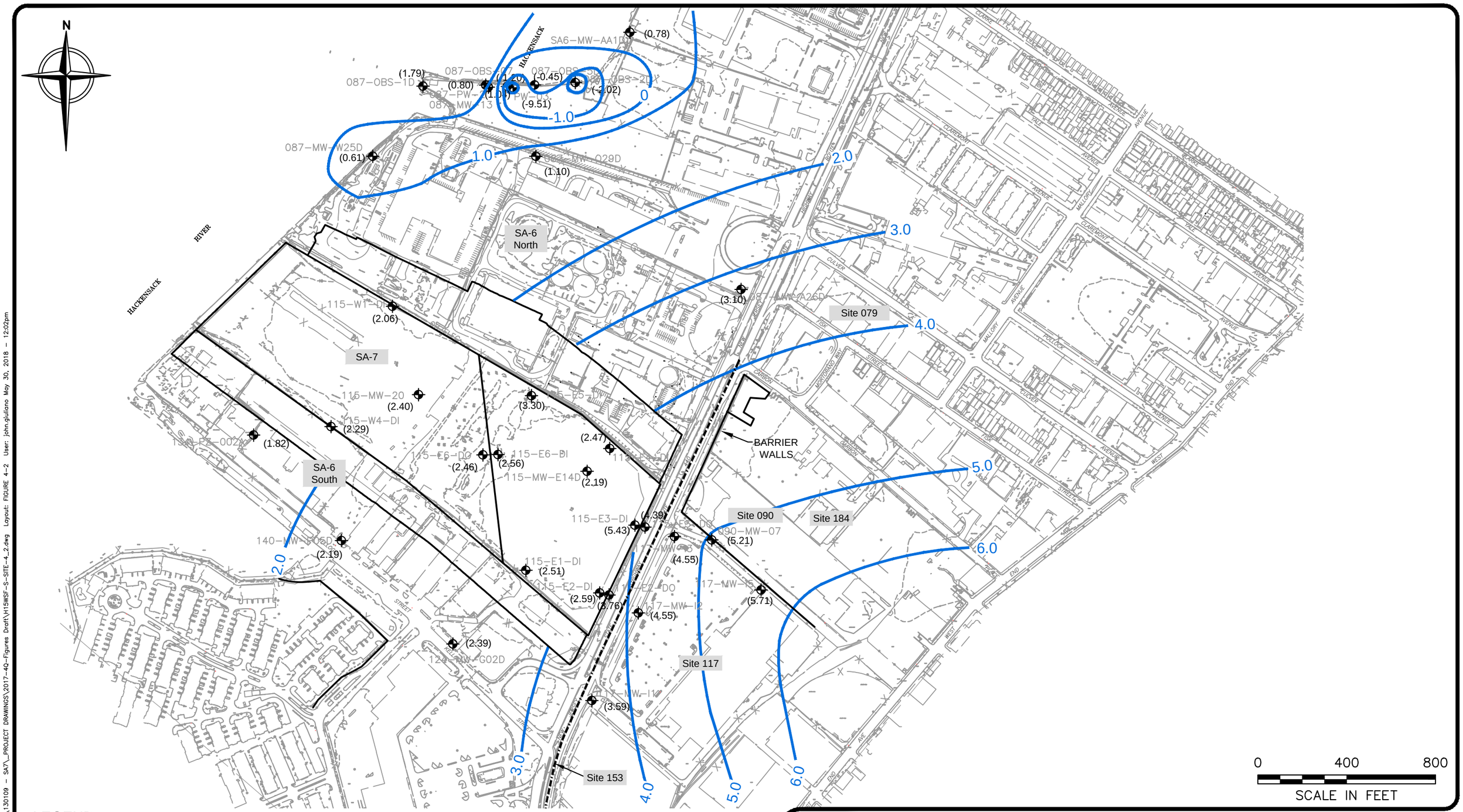
A TETRA TECH COMPANY

GROUNDWATER CONTOUR ELEVATIONS
SHALLOW ZONE

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2017

FIGURE NO.
4-1B
PROJECT NO.
150463

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2017-4Q-Figures Draft\H15WSF-S-SITE-4_1B.dwg Layout: FIGURE 4-1B User: john.giuliano May 30, 2018 - 11:25am



LEGEND:

087-MW-029D	INTERMEDIATE ZONE MONITORING WELL
(3.45)	WATER LEVEL ELEVATION (FT, MSL)
1.0	GROUNDWATER CONTOUR (FT, MSL)

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GROUNDWATER ELEVATION CONTOURS
INTERMEDIATE ZONE

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2017

FIGURE NO.
4-2
PROJECT NO.
150463

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2017-4Q-Figures Draft\H15WSF-S-SITE-4_2.dwg Layout: FIGURE 4-2 User: john.giuliano May 30, 2018 - 12:02pm

N

SA6- MW-AA1T (-0.18)
087-MW-08 (0.64)
087-OBS-3L (0.38)
087-PW-1 (0.57)
087-OBS-1L (1.98)
087-OBS-1T (0.76)
087-OBS-5T (-29.74)
087-MW-34 (-0.76)
087-OBS-4T (0.69)
087-MW-W25T (0.61)
1.0
0
-1.0
1.0
2.0
3.0
4.0
5.0
6.0
HACKENSACK RIVER
SA-6 North
SA-7
SA-6 South
087-MW-01 (3.47)
087-MW-A26T (3.03)
087-IW-01 (2.50)
088-MW-G19T (2.45)
088-IW-03 (1.66)
088-IW-02 (2.19)
088-IW-01 (3.60)
Site 079
115-MW-E14T (2.59)
115-PW-21 (2.32)
090-MW-09 (4.97)
Site 090
Site 184
115-MW-A12T (-1.66)*
117-MW-I4 (5.07)
115-MW-E08TR (2.82)
124-MW-106T (2.46)
117-MW-D3 (5.33)
(4.09)
117-MW-D2
124-MW-105T (6.69**)
(2.65)
124-MW-G02T
(2.59)
124-MW-104L
Site 117
119-MW-01T (2.43)
117-MW-D1 (2.68)
119-MW-02T (2.42)
153-MW-A13T (2.64)
Site 153

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)

* ELEVATION QUESTIONABLE, NOT USED IN CONTOURING

** SCREENED BETWEEN INTERMEDIATE AND DEEP ZONES

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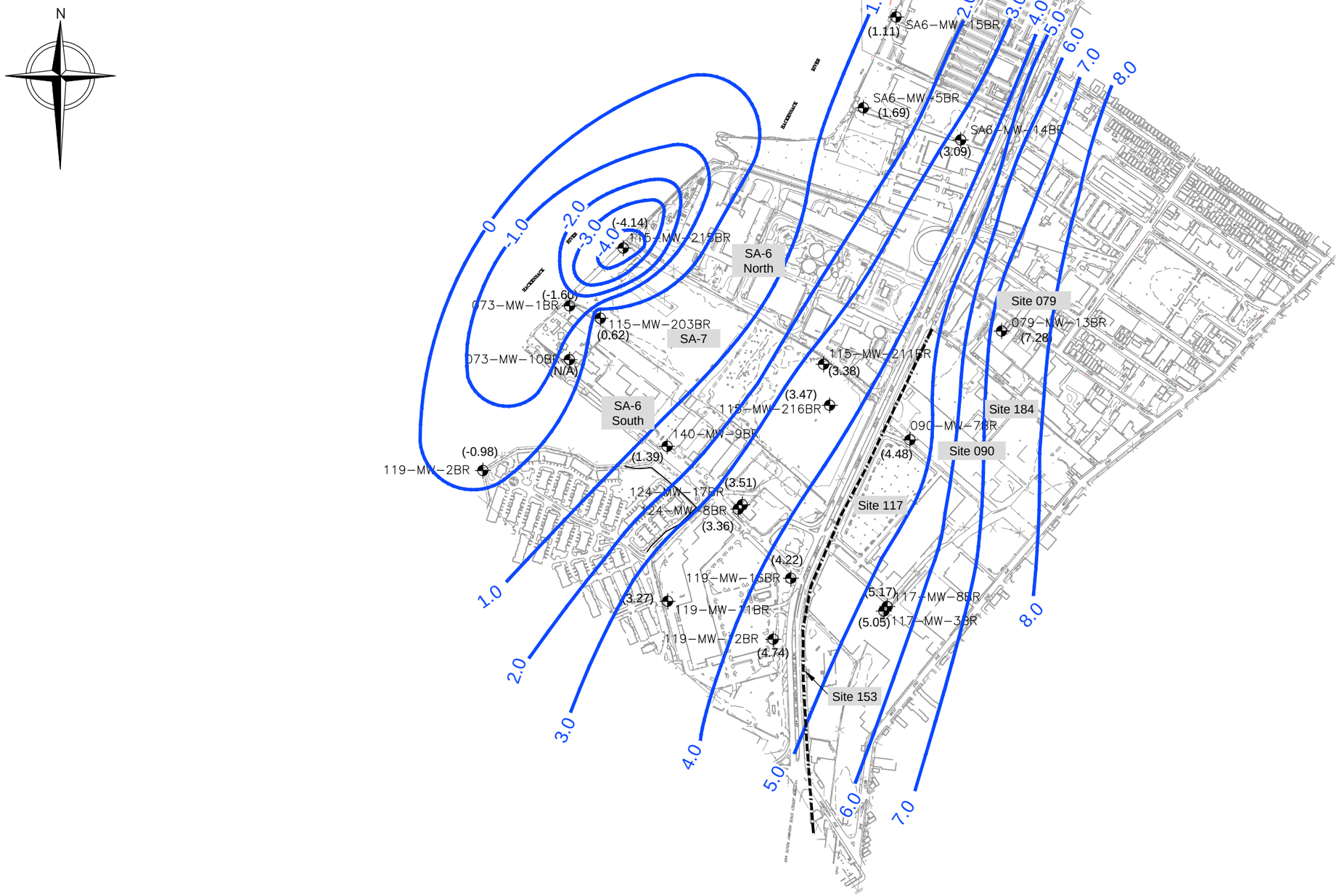
GROUNDWATER ELEVATION CONTOURS
DEEP ZONE

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2017

FIGURE NO.
4-3
PROJECT NO.
150463



LEGEND:

119–MW–11BR	BEDROCK ZONE MONITORING WELL
*	INOPERATIVE IN 2013: STATUS UNDER EVALUATION
(5.04)	WATER LEVEL ELEVATION (FT, MSL)
1.0	GROUNDWATER CONTOUR (FT, MSL)

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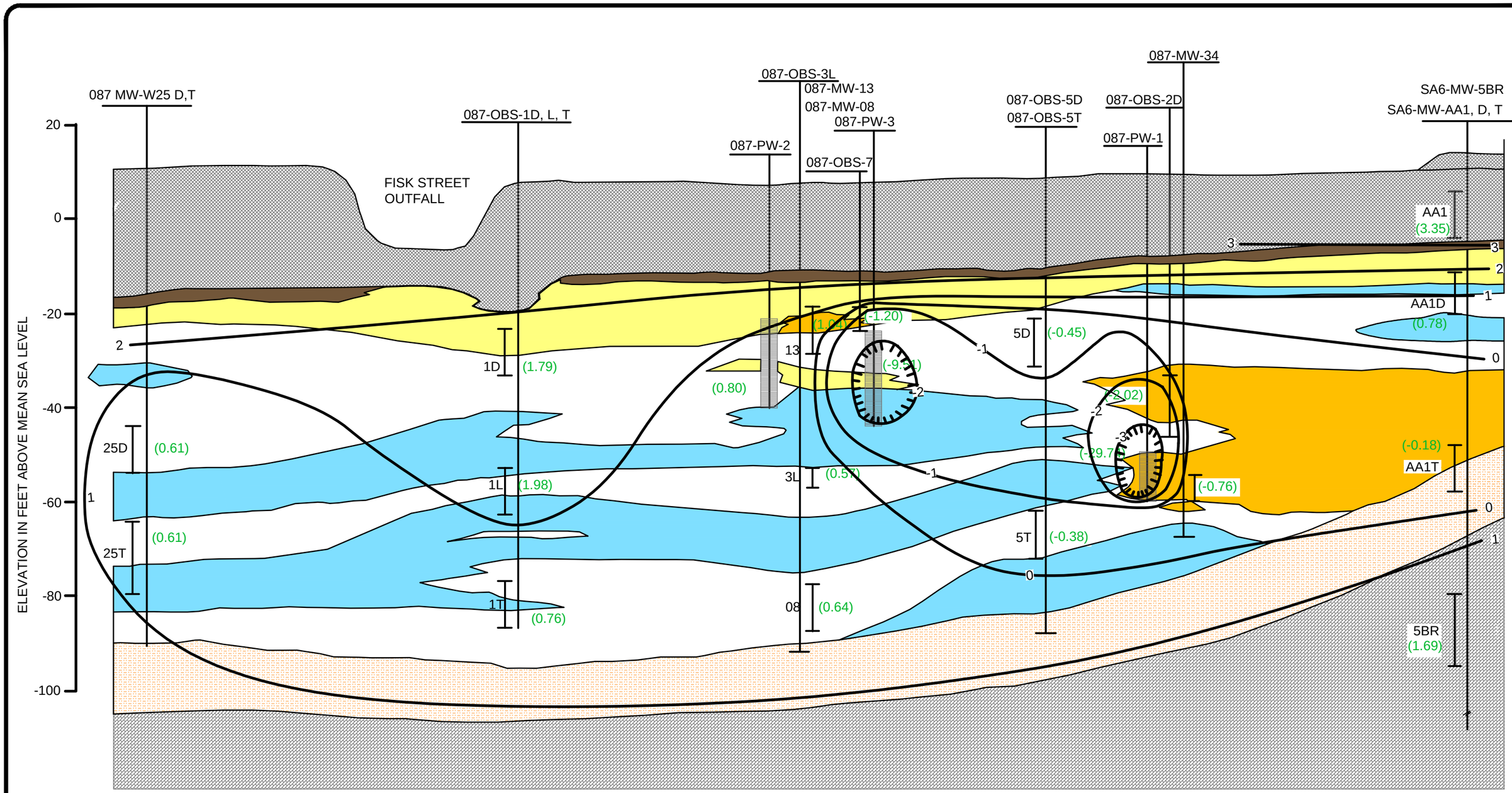
GROUNDWATER ELEVATION CONTOURS
BEDROCK ZONE

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2017

FIGURE NO.
4-4
PROJECT NO.
150463

File: X:\PROJECTS\HONEYWELL\130109 – SA7_PROJECT DRAWINGS\2017-4Q-Figures Draft\H15WSF-S-SITE-4_4.dwg Layout: FIGURE 4-4 User: john.giuliano May 30, 2018 – 12:06pm



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

087-MW-W25T — WELL DESIGNATION

GROUND SURFACE

25T — SCREENED INTERVAL

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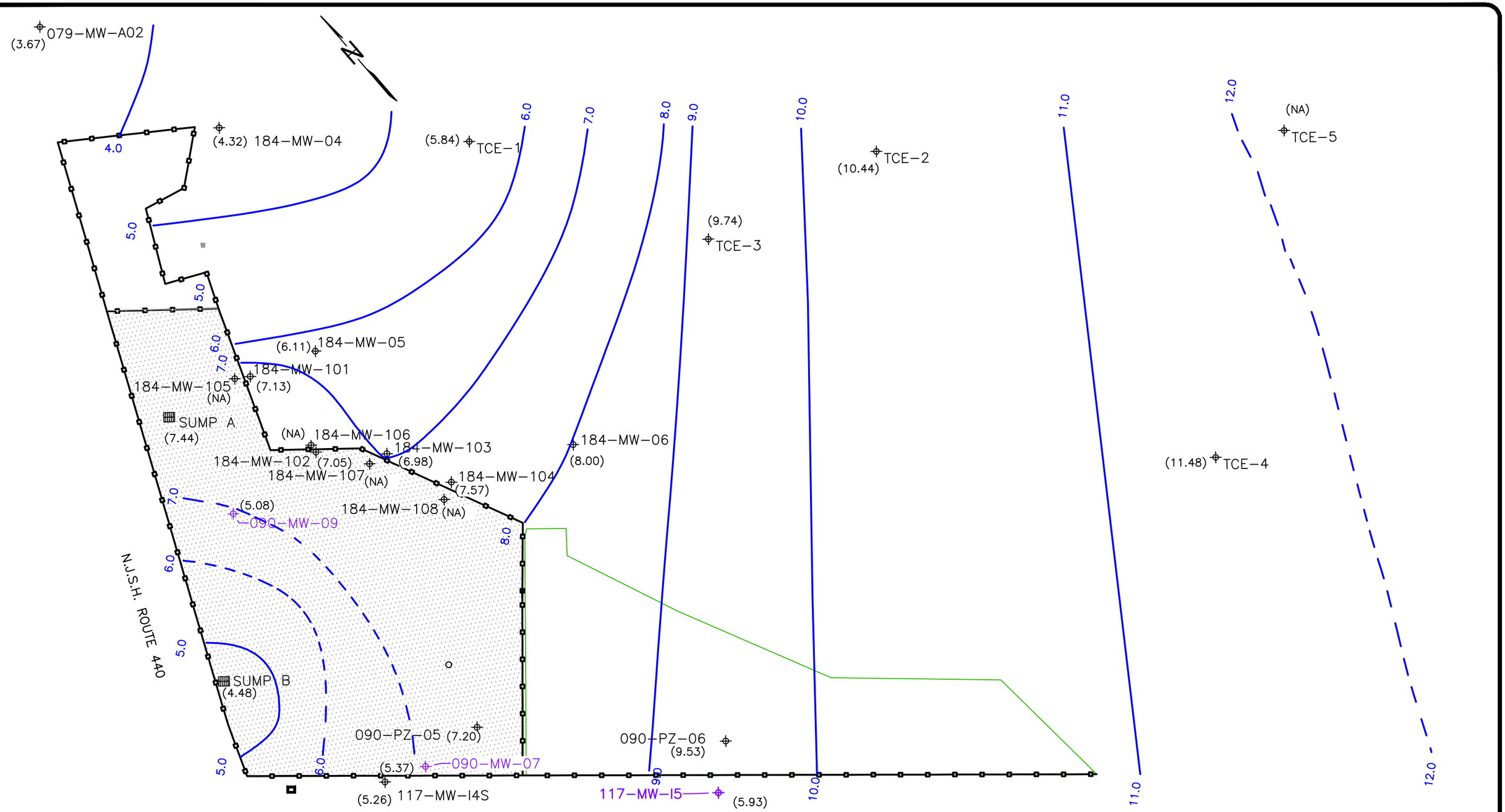
GROUNDWATER ELEVATIONS (FT, MSL)
IN CROSS-SECTION

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2017

FIGURE NO.
4-5
PROJECT NO.
150463



LEGEND

- MONITORING WELL
- PIEZOMETER
- SUMP
- SHEET PILE WALL
- CAP AREA

0 100 200

SCALE IN FEET

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GROUNDWATER ELEVATION CONTOURS (ft.,msl)
MARCH 29, 2017
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2017

FIGURE NO.
4-6
PROJECT NO.
150463

079-MW-A02
(4.01)
(3.94) 184-MW-04
TCE-1
(5.66)
TCE-2
(10.43)
(9.31)
TCE-3
(12.02)
TCE-5
184-MW-05
(5.99)
184-MW-101
184-MW-105
(6.68)
(6.77)
SUMP A
(6.75)
(6.26) 184-MW-106
184-MW-103
(6.73)
184-MW-102 (6.91)
184-MW-107
(6.66)
184-MW-104
(7.20)
184-MW-06
(7.91)
(10.91) TCE-4
(5.58)
090-MW-09
184-MW-108 (7.07)
N.J.S.H. ROUTE 440
SUMP B
(5.03)
090-PZ-05 (7.26)
090-PZ-06
(9.44)
(5.99) 090-MW-07
(5.74) 117-MW-I4S
117-MW-I5
(6.34)
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0

LEGEND

- MONITORING WELL
- PIEZOMETER
- SUMP
- SHEET PILE WALL
- CAP AREA

0 100 200
SCALE IN FEET

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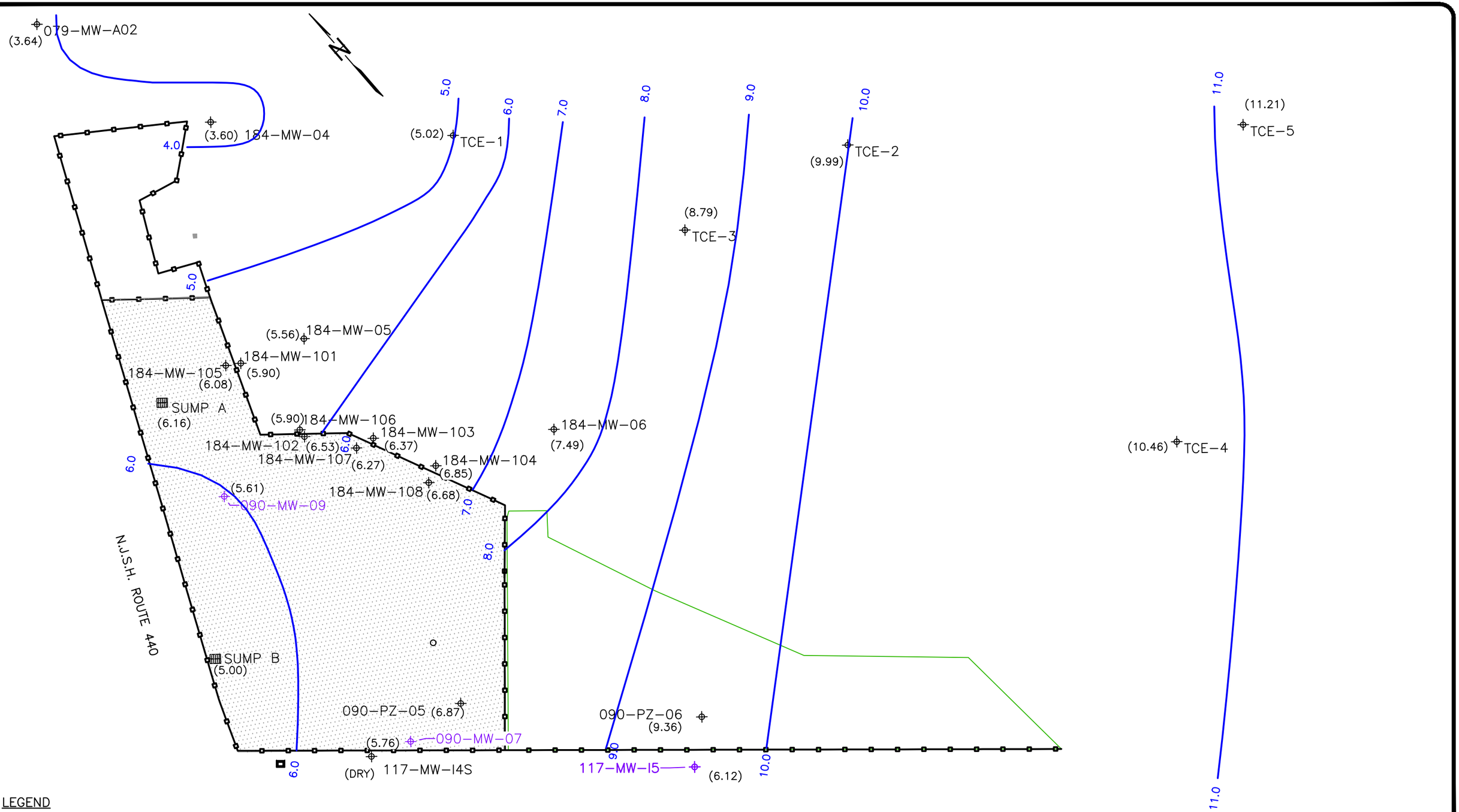
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS (ft.,msl)
JUNE 19, 2017
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2017

FIGURE NO.
4-7
PROJECT NO.
150463



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GROUNDWATER ELEVATION CONTOURS (ft.,msl)
SEPTEMBER 12, 2017
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2017

FIGURE NO.
4-8
PROJECT NO.
150463

079-MW-A02
(3.18)
(3.47) 184-MW-04
(4.53) TCE-1
TCE-2
(9.65)
(8.45)
TCE-3
(10.84)
TCE-5
4.0
5.0
6.0
7.0
8.0
9.0
10.0
(5.00) 184-MW-05
184-MW-101
184-MW-105
(5.57)
(5.13)
SUMP A
(5.65)
(5.41) 184-MW-106
184-MW-103
(5.93)
184-MW-102 (6.07)
184-MW-107
(5.79)
184-MW-104
(6.49)
184-MW-06
(7.14)
(10.05) TCE-4
(4.97)
090-MW-09
184-MW-108 (6.25)
7.0
N.J.S.H. ROUTE 440
SUMP B
(5.03)
090-PZ-05 (6.40)
090-PZ-06
(NA)
(5.21) 090-MW-07
6.0
8.0
9.0
10.0
(5.06) 117-MW-I4S
117-MW-I5
(5.71)

LEGEND

- MONITORING WELL
- PIEZOMETER
- SUMP
- SHEET PILE WALL
- CAP AREA

0 100 200
SCALE IN FEET

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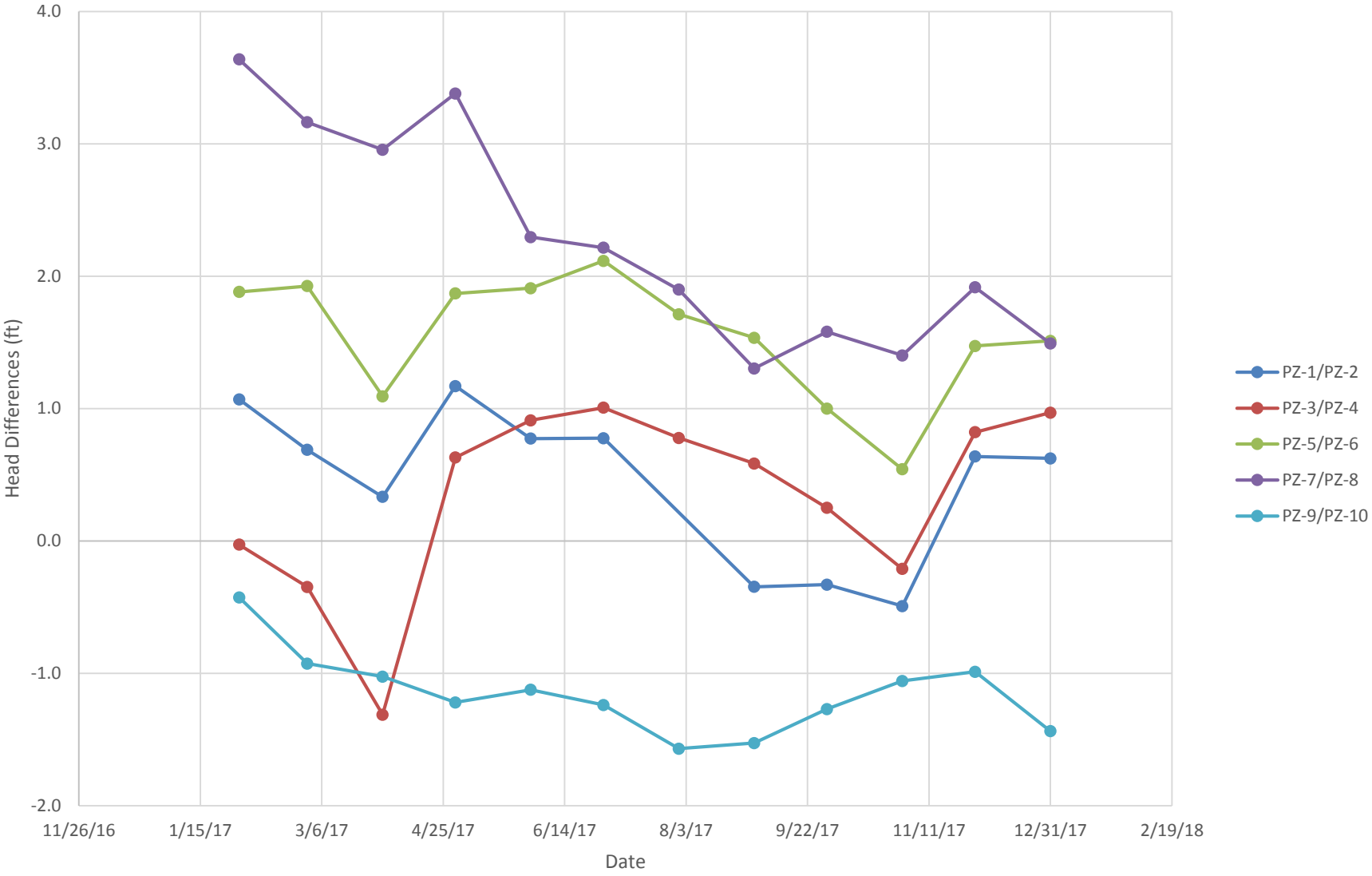
GROUNDWATER ELEVATION CONTOURS (ft.,msl)
NOVEMBER 29, 2017
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2017

FIGURE NO.
4-9
PROJECT NO.
150463



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

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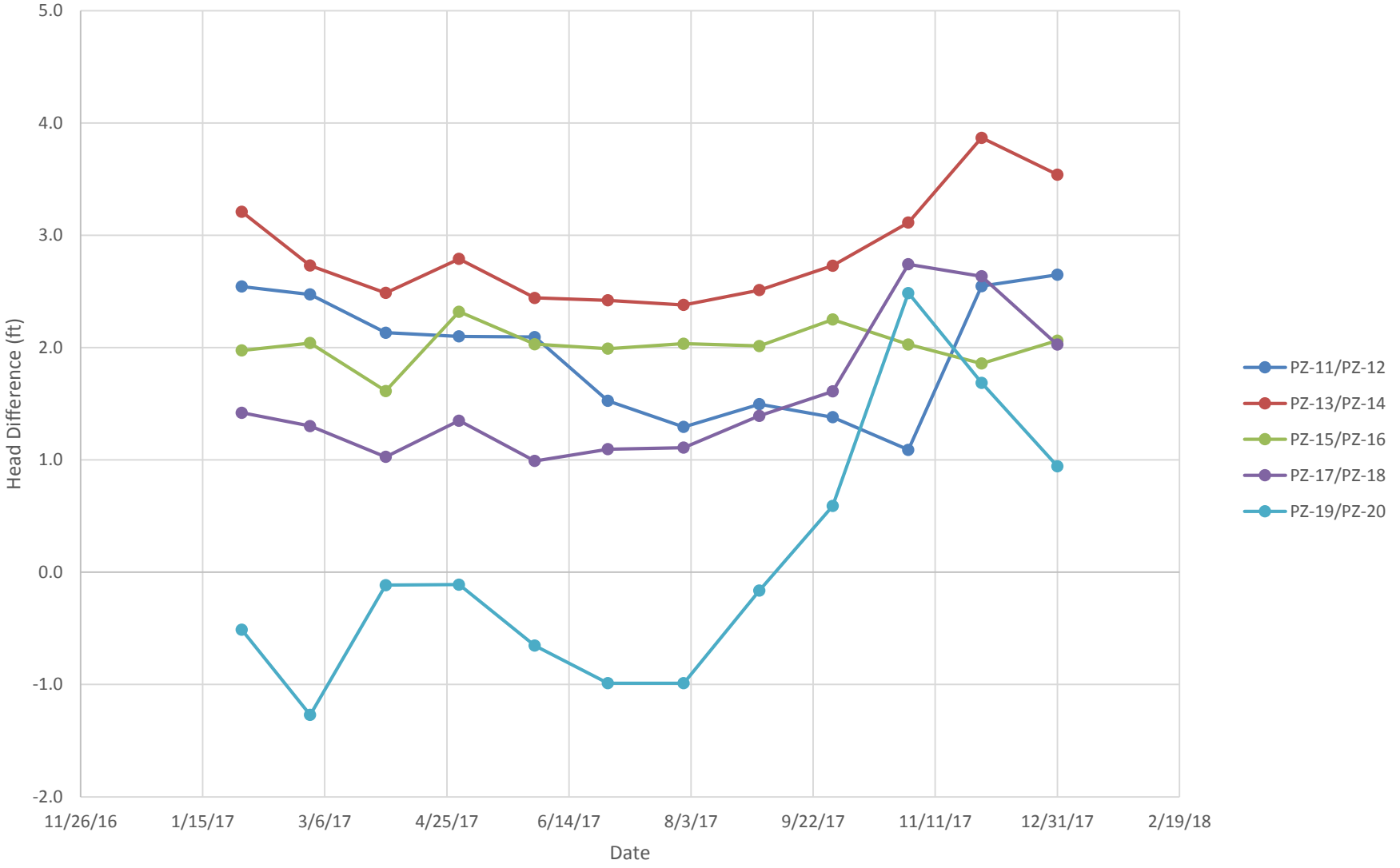
A TETRA TECH COMPANY

Integrated Annual Groundwater Performance Report 2017

Monthly Average Head Differences Across SA-6 North 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 2017

Monthly Average Head Differences Across SA-6 South Barrier Wall

Figure 4-11

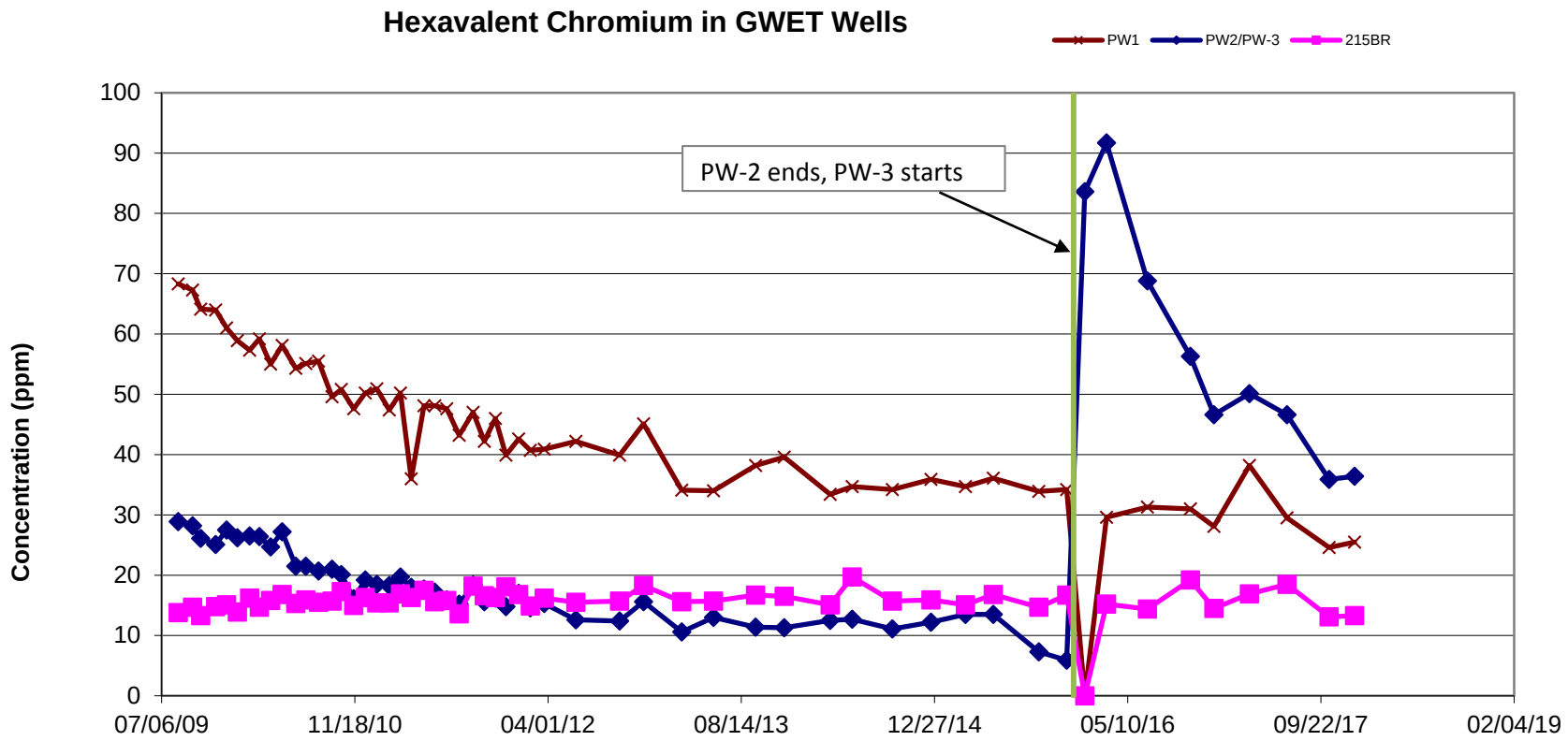


FIGURE 5-1

Hexavalent Chromium Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2017

cornerstone environmental

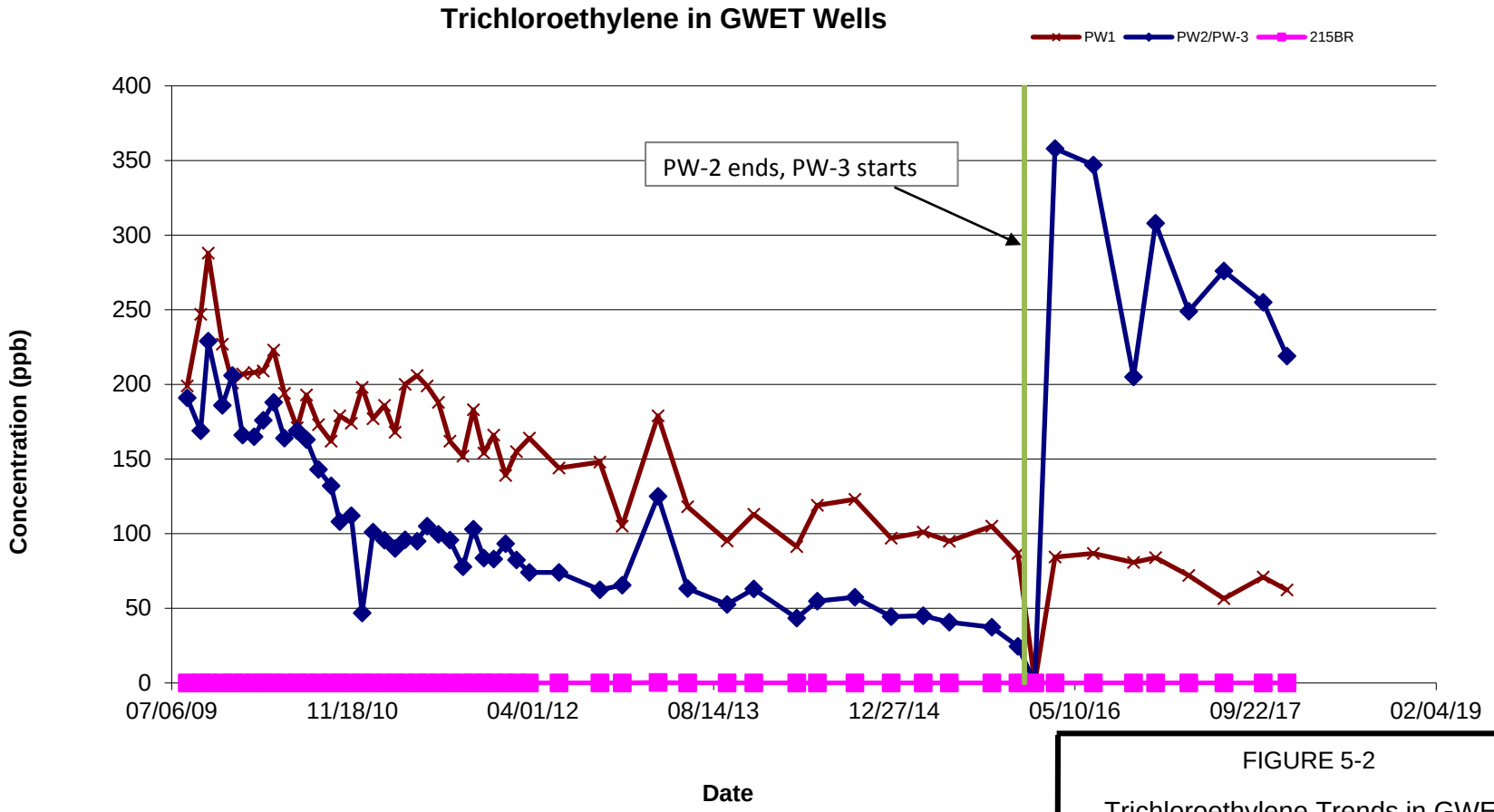


FIGURE 5-2

Trichloroethylene Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2017

cornerstone environmental

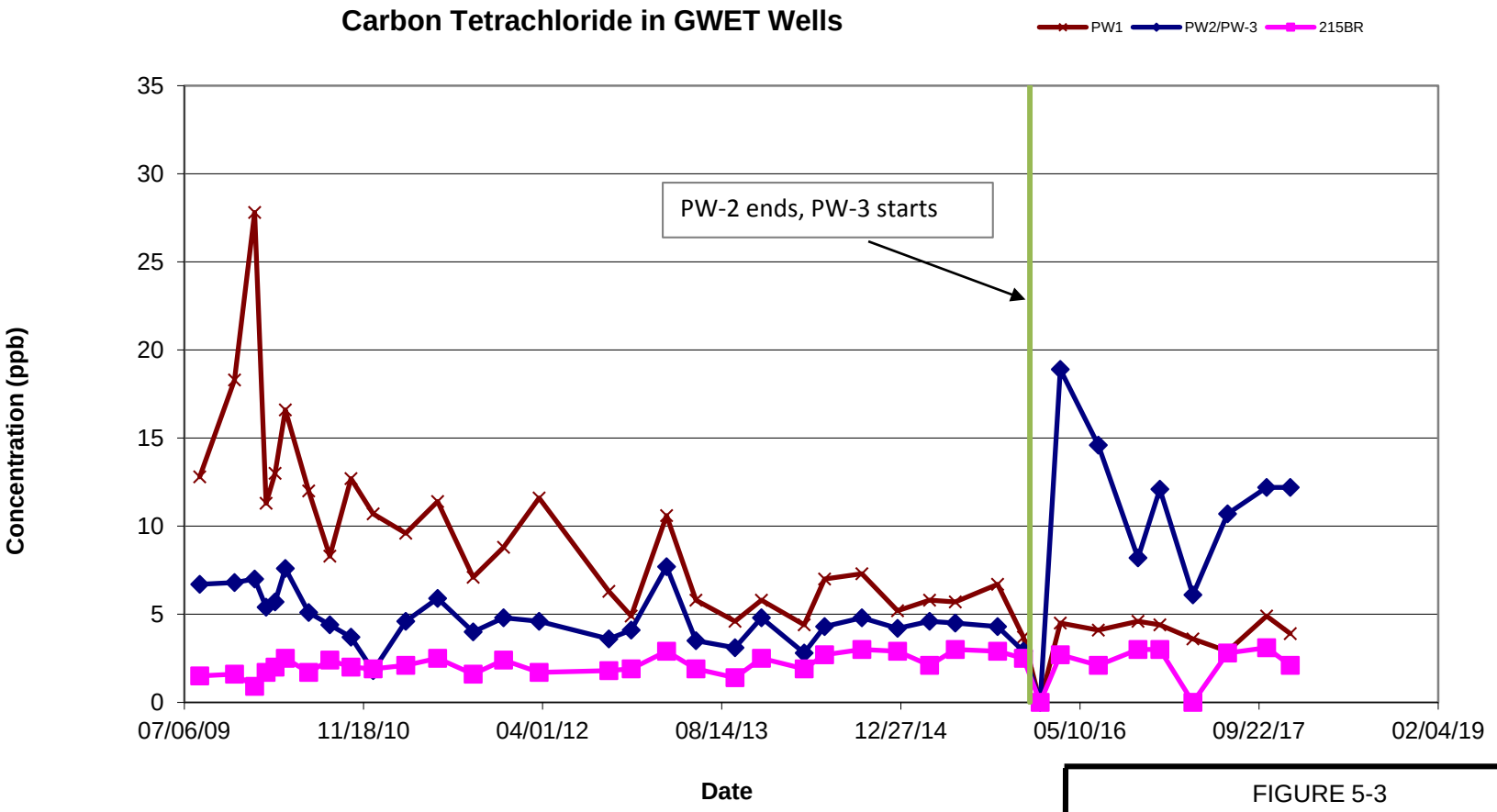


FIGURE 5-3

Carbon Tetrachloride Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2017

cornerstone environmental

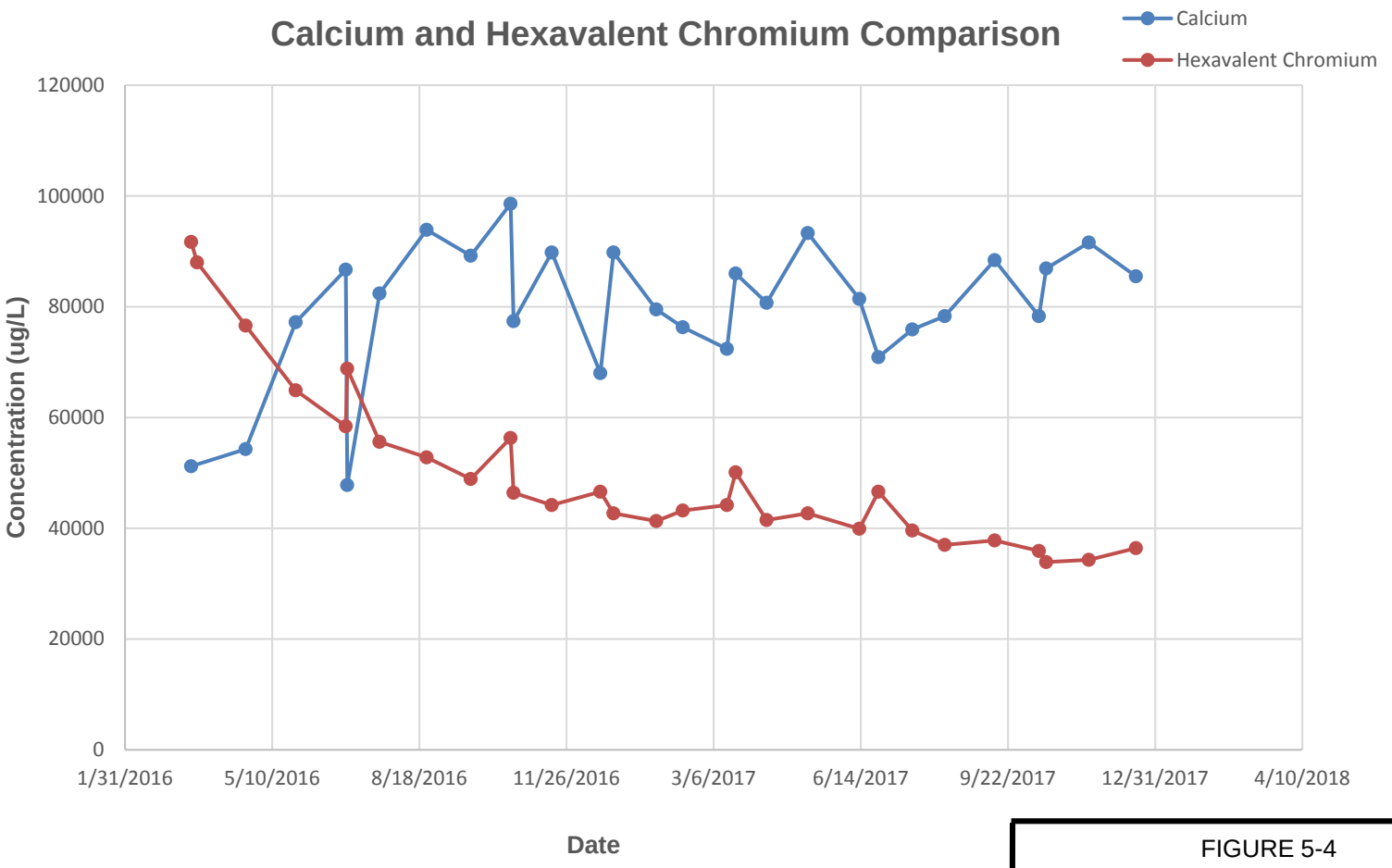
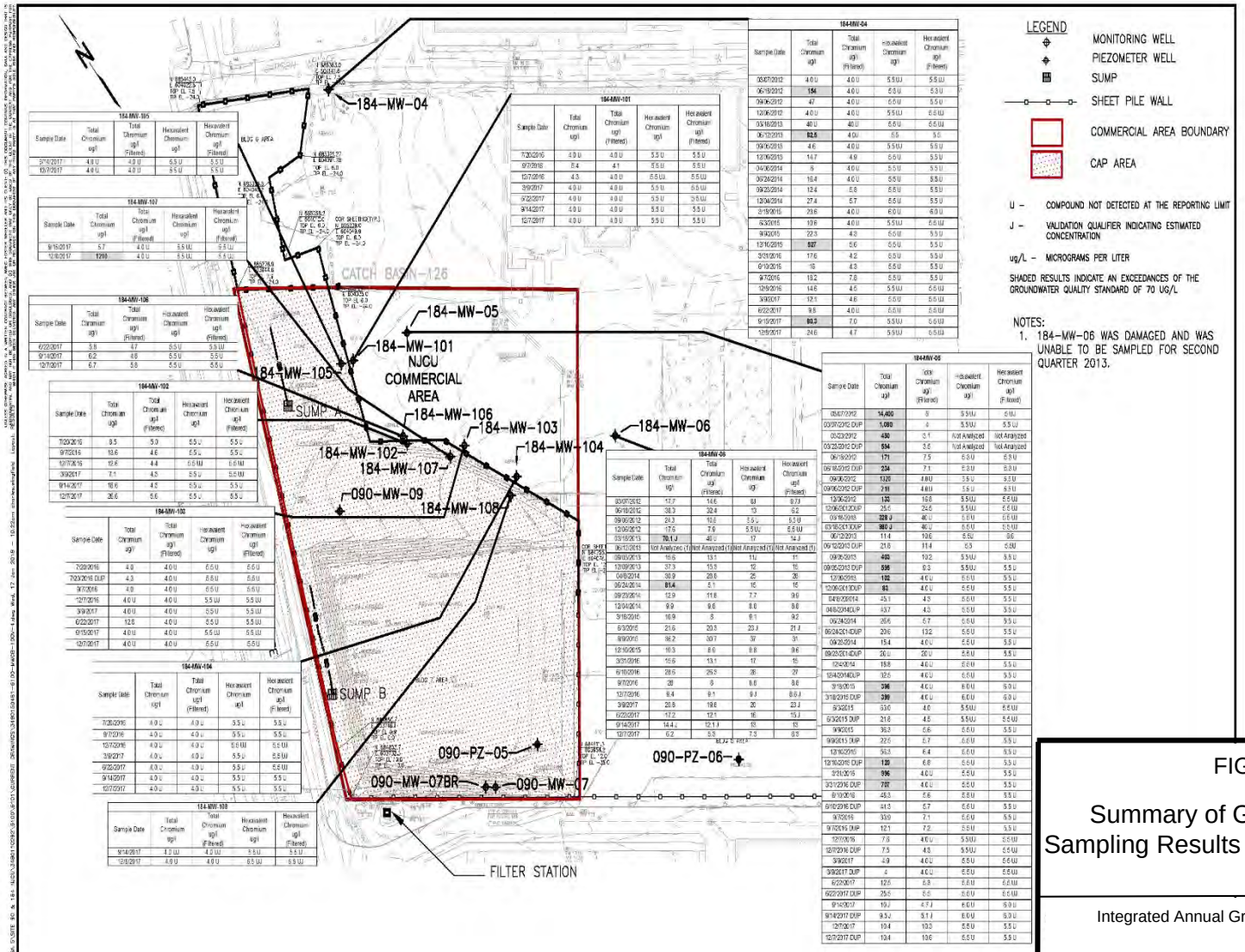


FIGURE 5-4

Hexavalent vs Calcium Trends in PW-3

Integrated Annual Groundwater Performance Report 2017

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

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 U	5.5 U
12/6/2017	1200	4.0 U	5.5 U	5.5 U

184-MW-106

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
6/22/2017	5.8	4.7	5.5 U	5.5 U
9/14/2017	6.2	4.6	5.5 U	5.5 U
12/7/2017	6.7	5.6	5.5 U	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	9.5	5.9	5.5 U	5.5 U
9/7/2016	10.6	4.6	5.5 U	5.5 U
12/7/2016	10.6	4.4	5.5 U	5.5 U
3/9/2017	7.1	4.5	5.5 U	5.5 U
9/14/2017	10.6	4.5	5.5 U	5.5 U
12/7/2017	30.6	5.6	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	4.0 U	4.0 U	5.5 U	5.5 U
3/9/2017	4.0 U	4.0 U	5.5 U	5.5 U
6/22/2017	12.6	4.0 U	5.5 U	5.5 U
9/15/2017	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

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 U	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

184-MW-108

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 U	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	4.9 U	4.9 U	5.5 U	5.5 U
9/7/2016	8.4	4.1	5.5 U	5.5 U
12/7/2016	4.3	4.0 U	5.5 U	5.5 U
3/9/2017	4.9 U	4.9 U	5.5 U	5.5 U
9/22/2017	4.9 U	4.9 U	5.5 U	5.5 U
9/14/2017	4.9 U	4.9 U	5.5 U	5.5 U
12/7/2017	4.9 U	4.9 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)
05/07/2012	4.0 U	4.0 U	5.5 U	5.5 U
06/19/2012	154	4.0 U	5.5 U	5.5 U
09/06/2012	47	4.0 U	5.5 U	5.5 U
12/06/2012	4.0 U	4.0 U	5.5 U	5.5 U
03/18/2013	40 U	40 U	5.5 U	5.5 U
06/12/2013	82.5	4.0 U	5.5	5.5
09/06/2013	4.6	4.0 U	5.5 U	5.5 U
12/06/2013	14.7	4.9	5.5 U	5.5 U
04/06/2014	6	4.0 U	5.5 U	5.5 U
06/24/2014	16.4	4.0 U	5.5 U	5.5 U
09/23/2014	12.4	5.8	5.5 U	5.5 U
12/04/2014	27.4	5.7	5.5 U	5.5 U
3/19/2015	29.6	4.0 U	5.5 U	5.5 U
6/3/2015	10.9	4.0 U	5.5 U	5.5 U
9/9/2015	22.3	4.2	5.5 U	5.5 U
12/16/2015	527	5.6	5.5 U	5.5 U
3/31/2016	17.6	4.2	5.5 U	5.5 U
6/10/2016	16	4.3	5.5 U	5.5 U
9/7/2016	19.2	7.8	5.5 U	5.5 U
12/8/2016	14.6	4.5	5.5 U	5.5 U
3/9/2017	12.1	4.6	5.5 U	5.5 U
6/22/2017	9.5	4.0 U	5.5 U	5.5 U
9/15/2017	80.3	7.0	5.5 U	5.5 U
12/6/2017	24.6	4.7	5.5 U	5.5 U

184-MW-05

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
05/07/2012	14,400	5	5.5 U	5.5 U
05/07/2012 DUP	1,080	4	5.5 U	5.5 U
05/23/2012	430	3.1	Not Analyzed	Not Analyzed
05/23/2012 DUP	594	3.6	Not Analyzed	Not Analyzed
06/19/2012	171	7.5	5.5 U	5.5 U
06/19/2012 DUP	234	7.1	5.5 U	5.5 U
09/06/2012	1320	4.8 U	5.5 U	5.5 U
09/06/2012 DUP	711	4.8 U	5.5 U	5.5 U
12/06/2012	132	19.8	5.5 U	5.5 U
12/06/2012 DUP	25.6	24.6	5.5 U	5.5 U
03/18/2013	228 J	40 U	5.5 U	5.5 U
03/18/2013 DUP	880 J	40 U	5.5 U	5.5 U
06/12/2013	114	19.6	5.5	5.5
06/12/2013 DUP	21.9	11.4	5.5	5.5
09/6/2013	403	19.2	5.5 U	5.5 U
09/06/2013 DUP	556	9.3	5.5 U	5.5 U
12/06/2013	102	4.0 U	5.5 U	5.5 U
12/06/2013 DUP	93	4.0 U	5.5 U	5.5 U
04/6/2014	45.1	4.3	5.5 U	5.5 U
04/6/2014 DUP	43.7	4.3	5.5 U	5.5 U
06/24/2014	26.6	5.7	5.5 U	5.5 U
06/24/2014 DUP	20.6	13.2	5.5 U	5.5 U
09/23/2014	15.4	4.0 U	5.5 U	5.5 U
09/23/2014 DUP	20.4	20 U	5.5 U	5.5 U
12/4/2014	18.8	4.0 U	5.5 U	5.5 U
12/4/2014 DUP	12.6	4.0 U	5.5 U	5.5 U
3/19/2015	396	4.0 U	6.0 U	6.0 U
3/19/2015 DUP	390	4.0 U	6.0 U	6.0 U
6/3/2015	53.0	4.0	5.5 U	5.5 U
6/3/2015 DUP	21.8	4.5	5.5 U	5.5 U
9/9/2015	96.3	5.6	5.5 U	5.5 U
9/9/2015 DUP	22.6	5.7	5.5 U	5.5 U
12/16/2015	55.3	6.4	5.5 U	5.5 U
12/16/2015 DUP	120	6.8	5.5 U	5.5 U
3/31/2016	996	4.0 U	5.5 U	5.5 U
3/31/2016 DUP	707	4.0 U	5.5 U	5.5 U
6/10/2016	48.3	5.6	5.5 U	5.5 U
6/10/2016 DUP	44.3	5.7	5.5 U	5.5 U
9/7/2016	33.0	7.1	5.5 U	5.5 U
9/7/2016 DUP	12.1	7.3	5.5 U	5.5 U
12/7/2016	7.8	4.0 U	5.5 U	5.5 U
12/7/2016 DUP	7.5	4.3	5.5 U	5.5 U
3/9/2017	4.9	4.0 U	5.5 U	5.5 U
3/9/2017 DUP	6	4.0 U	5.5 U	5.5 U
6/22/2017	12.5	5.8	5.5 U	5.5 U
6/22/2017 DUP	25.5	5.5	5.5 U	5.5 U
9/14/2017	19.2	6.7 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	19.4	10.3	5.5 U	5.5 U
12/7/2017 DUP	19.4	13.6	5.5 U	5.5 U

184-MW-06

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
05/07/2012	17.7	14.6	9.9	9.73
06/19/2012	38.3	32.4	13	9.2
09/06/2012	21.3	10.6	5.5 U	5.5 U
12/06/2012	17.6	7.9	5.5 U	5.5 U
03/18/2013	70.1 J	46 U	17	14 J
06/12/2013	Not Analyzed (1)	Not Analyzed (1)	Not Analyzed (1)	Not Analyzed (1)
09/06/2013	19.6	13.1	11	11
12/06/2013	37.3	15.5	12	15
04/6/2014	30.9	20.6	25	26
06/24/2014	61.4	5.1	15	15
09/23/2014	12.9	11.6	7.7	9.6
12/04/2014	9.9	9.6	8.6	9.6
3/19/2015	16.9	8	8.1	9.2
6/3/2015	21.6	20.3	23 J	21 J
9/9/2015	36.2	30.7	37	31
12/16/2015	16.3	8.9	8.8	9.6
3/31/2016	15.6	13.1	17	15
6/10/2016	28.5	25.5	26	27
9/7/2016	28	8	8.8	8.6
12/7/2016	8.4	9.1	9.3	8.6 J
3/9/2017	20.8	19.6	20	23 J
6/22/2017	17.2	12.1	16	15 J
9/14/2017	14.4 J	12.1 J	16	15
12/7/2017	6.2	5.9	7.3	8.5

090-MW-07BR

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 U	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

090-MW-07

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 U	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

LEGEND

- MONITORING WELL
- PIEZOMETER WELL
- SUMP
- SHEET PILE WALL
- COMMERCIAL AREA BOUNDARY
- CAP AREA

U – COMPOUND NOT DETECTED AT THE REPORTING LIMIT

J – VALIDATION QUALIFIER INDICATING ESTIMATED CONCENTRATION

ug/L – MICROGRAMS PER LITER

SHADED RESULTS INDICATE AN EXCEEDANCES OF THE GROUNDWATER QUALITY STANDARD OF 70 UG/L

NOTES:
1. 184-MW-06 WAS DAMAGED AND WAS UNABLE TO BE SAMPLED FOR SECOND QUARTER 2013.

FIGURE 5-5

Summary of Groundwater Quality Sampling Results in NJCU Sentinel Wells

Integrated Annual Groundwater Performance Report
2017

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LEGEND

Hex Cr. in ppm
March 2017 (unfiltered)

[ND]

*Hex Cr. in ppm
June 2015 (unfiltered)

**Hex Cr. in ppm
April 2017 (unfiltered)

GP-1 {ND}
June 2017 In-situ GW Sample Location and Hex Cr. concentration (ppm, unfiltered)

FIGURE 5-6
In-situ Groundwater Sample Results
L-Well Delineation
(June 26 to 29, 2017)

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FIGURE 6-1

Location of S-3 Injection Wells
Used in 2017

Integrated Annual Groundwater Performance Report
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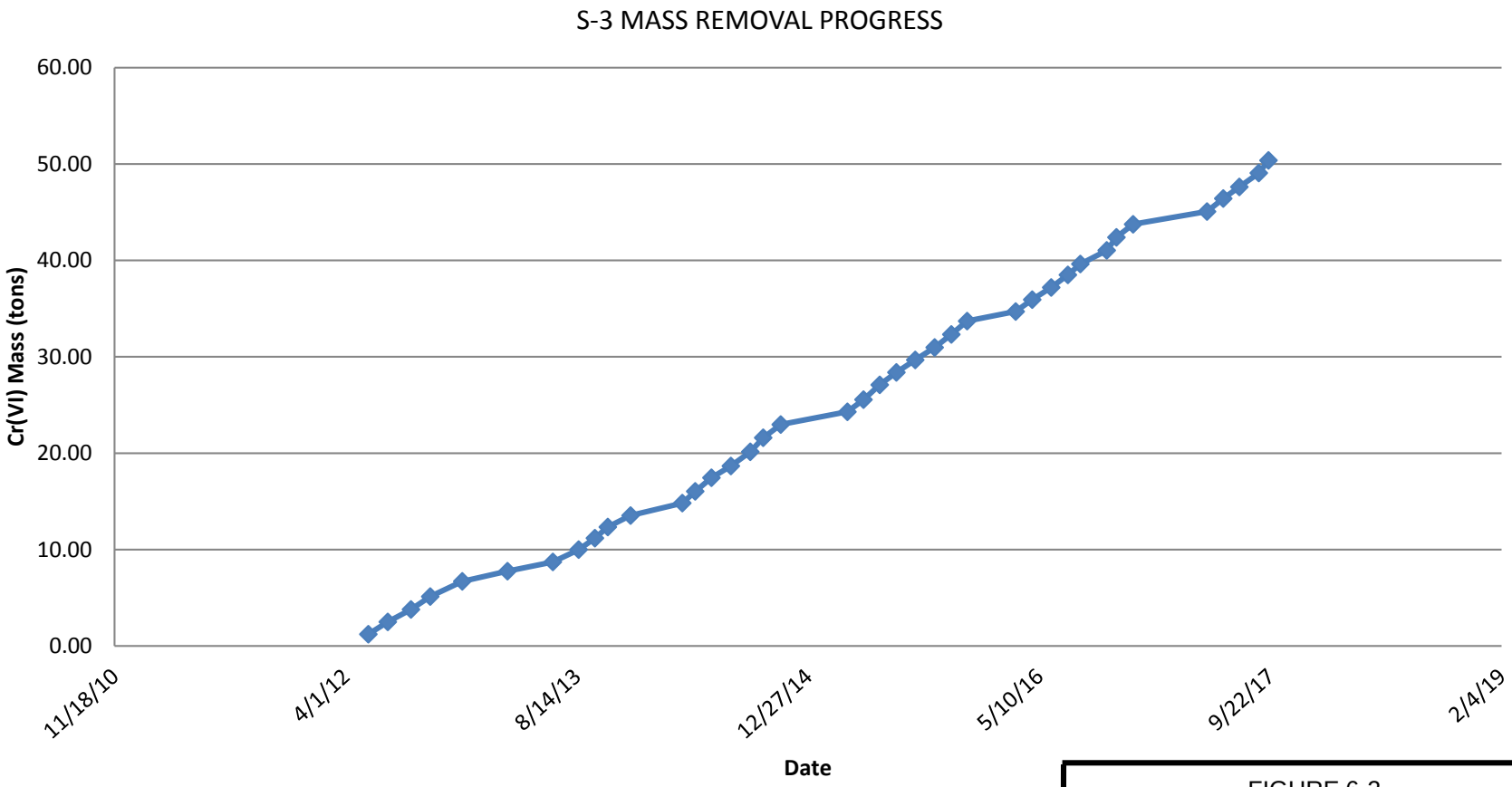

FIGURE 6-2

Stoichiometrically Equivalent Cr(VI) Mass Reduced in S-3 Sand by Injection

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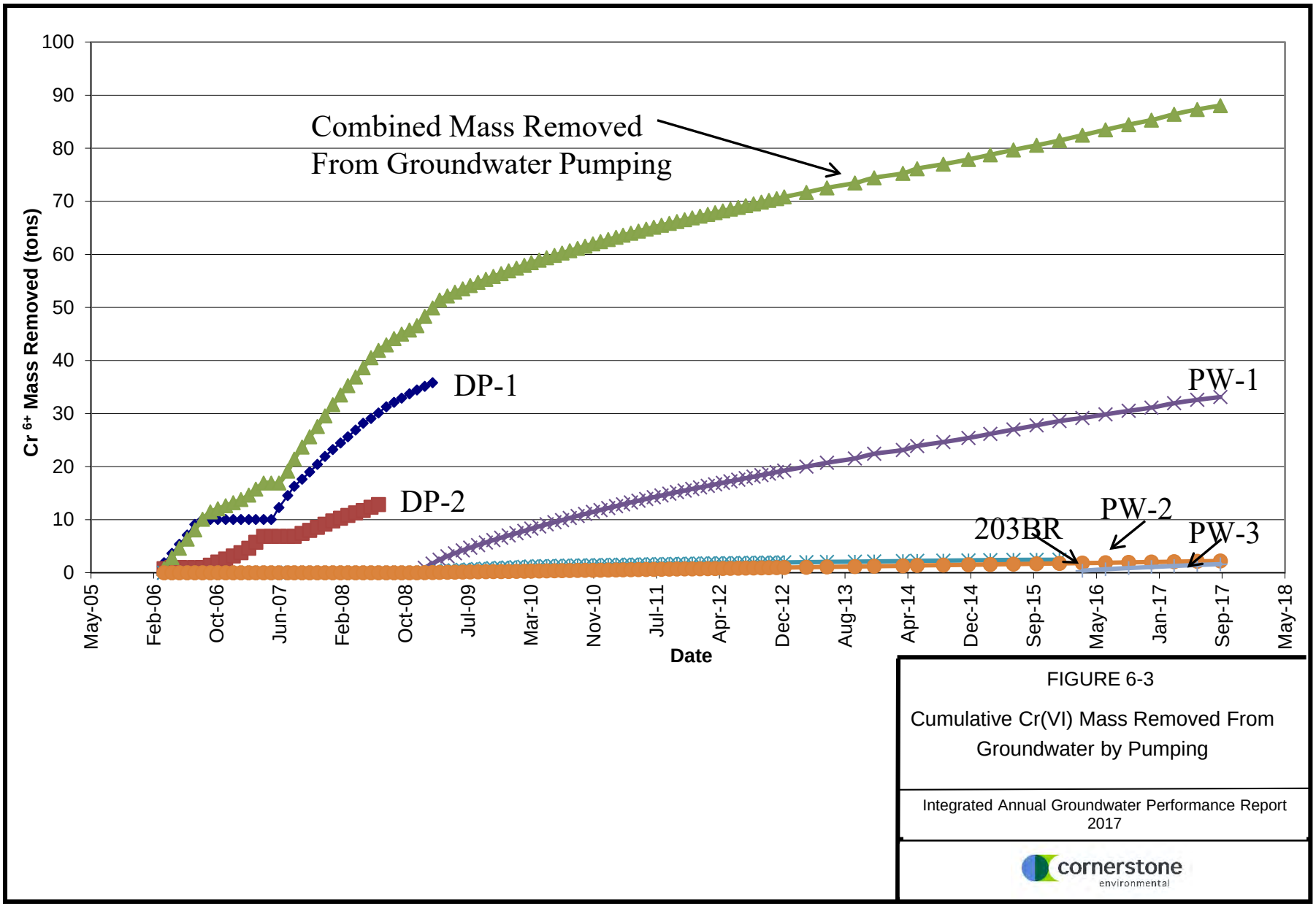

FIGURE 6-3

Cumulative Cr(VI) Mass Removed From Groundwater by Pumping

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APPENDIX A

RESULTS OF PRE-INJECTION MONITORING IN MONITORING WELLS

Table A1
Results of Pre-injection Monitoring of Monitoring Wells

Total Chromium in Unfiltered Samples (ppm)

Event #	Sample Date	087-PW-1	087-PW-2	115-DP-1	088-MW-G19T	087-MW-O29D	087-PW-3
1	5/16/2012	46.9	16.2	307	762	180	---
2	6/28/2012	NR	NR	NR	889	NR	---
3	7/31/2012	NR	NR	NR	989	NR	---
5	12/9/2012	37.9	14.8	359	985	171	---
6	3/17/2013	39.8	13.5	NR	NR	NR	---
7	6/3/2013	48.5	28.0	1,670	967	233	---
9	9/22/2013	39.9	13.5	NR	NR	NR	---
11	12/8/2013	34.2	10.6	20.8	1,150	182	---
12	3/30/2014	36.9	16.4	NR	NR	NR	---
14	6/1/2014	35.5	14.5	15.5	982	188	---
17	9/21/2014	37.6	19.3	NR	NR	NR	---
18A	12/20/2014	341	127.0	1,230	927	175	---
19	3/22/2015	347	15.1	NR	NR	NR	---
21	5/31/2015	32.6	15.6	31.5	1,010	173	---
24	9/27/2015	33.8	8.5	NR	NR	NR	---
26	12/3/2015	34.2	8.4	515	974	166	---
26a	1/20/2016	NR	---	NR	NR	NR	83.8
27	3/20/2016	30.4	---	NR	NR	NR	84.3
30	6/30/2016	31.7	---	26.1	1,180	182	37.1
33	10/19/2016	30.2	---	NR	NR	NR	58.5
34	12/19/2016	27.6	---	659	890	127	38.0
36	6/12/2017	26.7	---	28.3	1,120	142	38.5
39	10/13/2017	25.5	---	NR	NR	NR	39.3

---- well not in service

NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .

Note: only event dates with at least one sample result shown

Table A2
Results of Pre-injection Monitoring of Monitoring Wells

		Hexavalent Chromium in Unfiltered Samples (ppm)					
Event #	Sample Date	087-PW-1	087-PW-2	115-DP-1	088-MW-G19T	087-MW-O29D	087-PW-3
1	5/16/2012	43.9	15.1	389.0	777	189	---
2	6/28/2012	NR	NR	NR	933	NR	---
3	7/31/2012	NR	NR	NR	897	NR	---
5	12/9/2012	45.1	15.6	39.3	1,150	235	---
6	3/13/2013	34.1	10.6	NR	NR	NR	---
7	6/3/2013	34.0	13.0	1,470	1,050	177	---
9	9/22/2013	38.2	11.4	NR	NR	NR	---
11	12/8/2013	39.6	11.3	19.0	1,230	192	---
12	3/30/2014	33.4	12.5	NR	NR	NR	---
14	6/1/2014	34.7	12.7	14.9	1,070	188	---
17	9/21/2014	34.2	11.1	NR	NR	NR	---
18A	12/20/2014	35.9	12.2	1,300	1,080	190	---
19	3/22/2015	34.7	13.5	NR	NR	NR	---
21	5/31/2015	36.1	13.5	31.1	1,110	207	---
24	9/27/2015	33.9	7.30	NR	NR	NR	---
26	12/3/2015	34.2	5.90	387	1,100	185	---
26a	1/20/2016	NR	---	NR	NR	NR	83.6
27	3/20/2016	29.6	---	NR	NR	NR	91.7
request*	4/11/2016	NR	---	NR	NR	NR	76.6
request*	5/26/2016	NR	---	NR	NR	NR	64.9
request*	6/29/2016	NR	---	NR	NR	NR	58.4
30	6/30/2016	31.3	---	30.6	1,280	181	68.8
33	10/19/2016	31.0	---	NR	NR	NR	56.3
34	12/19/2016	28.1	---	583	977	149	46.6
36	6/12/2017	29.5	---	31.9	1,390	149	46.6
39	10/13/2017	24.6	---	NR	NR	NR	35.9

---- well not in service

NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .

* additional sampling at request of Plaintiffs

Note: only event dates with at least one sample result shown

Table A3
Results of Pre-injection Monitoring of Monitoring Wells

		Sulfate in Unfiltered Samples (ppm)					
Event #	Sample Date	087-PW-1	087-PW-2	115-DP-1	088-MW-G19T	087-MW-O29D	087-PW-3
1	5/16/2012	320	613	749	843	604	---
2	6/28/2012	NR	NR	NR	1,030	NR	---
3	7/31/2012	NR	NR	NR	1,020	NR	---
5	12/9/2012	307	671	202	1,020	688	---
7	6/3/2013	268	654	2,130	1,090	662	---
9	9/22/2013	292	664	NR	NR	NR	---
11	12/8/2013	291	701	137	1,140	614	---
12	3/30/2014	283	205	NR	NR	NR	---
26	12/3/2015	NR	1,040	NR	NR	NR	---
26a	1/20/2016	NR	---	NR	NR	NR	344
27	3/20/2016	NR	---	NR	NR	NR	NR
30	6/30/2016	NR	---	NR	NR	NR	NR
33	10/19/2016	NR	---	NR	NR	NR	NR
34	12/19/2016	NR	---	NR	NR	NR	NR
36	6/12/2017	NR	---	NR	NR	NR	NR
39	10/13/2017	NR	---	NR	NR	NR	NR

---- well not in service

NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .

Note: only event dates with at least one sample result shown

Table A4
Results of Pre-injection Monitoring of Monitoring Wells

Calcium in Unfiltered Samples (ppm)

Event #	Sample Date	087-PW-1	087-PW-2	115-DP-1	088-MW-G19T	087-MW-O29D	087-PW-3
1	5/16/2012	97.7	169	112	287	48.2	---
2	6/28/2012	NR	NR	NR	293	NR	---
3	7/31/2012	NR	NR	NR	284	NR	---
5	12/9/2012	88.4	146	370	336	52.1	---
7	6/3/2013	99.6	158	473	317	53.1	---
9	9/22/2013	99.7	168	NR	NR	NR	---
11	12/8/2013	86.7	145	37.3	307	52.4	---
12	3/30/2014	95.7	154	NR	NR	NR	---
13	4/27/2014	NR	NR	NR	NR	NR	---
14	6/1/2014	94.3	149	30.9	287	56.2	---
17	9/21/2014	97.9	164	NR	NR	NR	---
18A	12/20/2014	105	160	506	331	49.8	---
19	3/22/2015	101	153	NR	NR	NR	---
21	5/31/2015	99	171	39.1	311	44.2	---
24	9/27/2015	101	154	NR	NR	NR	---
26	12/3/2015	112	172	275	318	44.2	---
26a	1/20/2016	NR	---	NR	NR	NR	35.2
27	3/20/2016	110	---	NR	NR	NR	51.2
request*	4/11/2016	NR	---	NR	NR	NR	54.3
request*	5/26/2016	NR	---	NR	NR	NR	77.2
request*	6/29/2016	NR	---	NR	NR	NR	86.7
30	6/30/2016	117	---	40	414	51	47.8
33	10/19/2016	118	---	NR	NR	NR	196.0
34	12/19/2016	114	---	333	273	38.1	68.0
36	6/12/2017	111	---	39.9	293	44.0	70.9
39	10/13/2017	108	---	NR	NR	NR	78.3

---- well not in service

NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .

* additional sampling at request of Plaintiffs

Note: only event dates with at least one sample result shown

Table A5
Results of Pre-injection Monitoring of Monitoring Wells

		Iron in Unfiltered Samples (ppm)					
Event #	Sample Date	087-PW-1	087-PW-2	115-DP-1	088-MW-G19T	087-MW-O29D	087-PW-3
1	5/16/2012	<.5	< .5	0.764	<2	1.12	---
2	6/28/2012	NR	NR	NR	<10	NR	---
3	7/31/2012	NR	NR	NR	4.79	NR	---
5	12/9/2012	<0.1	<0.1	0.954	NR	<0.5	---
7	6/3/2013	0.709	1.21	<5.0	<5.0	1.19	---
9	9/22/2013	0.345	<0.1	NR	NR	NR	---
11	12/8/2013	<0.1	<0.1	0.535	<2.0	<1.0	---
12	3/30/2014	<0.1	0.165	NR	NR	NR	---
26	12/3/2015	NR	NR	NR	NR	NR	---
26a	1/20/2016	NR	---	NR	NR	NR	NR
27	3/20/2016	NR	---	NR	NR	NR	NR
30	6/30/2016	NR	---	NR	NR	NR	NR
33	10/19/2016	NR	---	NR	NR	NR	NR
34	12/19/2016	NR	---	NR	NR	NR	NR
36	6/12/2017	NR	---	NR	NR	NR	NR
39	10/13/2017	NR	NR	NR	NR	NR	NR

---- well not in service

NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .

Note: only event dates with at least one sample result shown

Table A6
Results of Pre-injection Monitoring of Monitoring Wells

Field pH (pH units)

Event #	Sample Date	090-MW-09	115-DP-1	088-MW-G19T	087-MW-O29D
1	5/16/2012	6.84	7.29	7.72	7.73
2	5/28/2012	NR	NR	7.83	NR
3	7/31/2012	NR	NR	7.41	NR
5	12/9/2012	7.36	7.97	7.47	7.35
7	6/3/2013	6.94	6.99	7.74	7.75
11	12/8/2013	6.82	8.00	7.83	7.78
14	6/1/2014	NR	8.76	8.02	8.22
18A	12/20/2014	NR	6.85	7.61	7.68
21	5/31/2015	NR	8.20	7.80	7.91
26	12/3/2015	NR	7.04	7.44	7.46
30	6/30/2016	NR	8.5	8.7	8.50
request*	9/29/2016	NR	NR	7.7	7.79
34	12/19/2016	NR	6.8	7.6	7.75
36	6/12/2017	NR	7.63	7.44	7.56
39	10/13/2017	NR	NR	NR	NR

NR: Not Required; the sampling frequency in the S-3 Mass Removal Program is semi-annual .
Note: only event dates with at least one sample result shown
* additional sampling at request of Plaintiffs

Table A7
Results of Pre-injection Monitoring of Monitoring Wells

Field Specific Conductivity (ms/cm)

Event #	Sample Date	090-MW-09	115-DP-1	088-MW-G19T	087-MW-O29D
1	5/16/2012	12.2	5.45	7.56	5.09
2	6/28/2012	NR	NR	7.21	NR
3	7/31/2012	NR	NR	7.66	NR
5	12/9/2012	11.7	3.03	8.10	4.85
6	3/13/2013	NR	NR	NR	NR
7	6/3/2013	10.9	11.1	8.29	4.91
11	12/8/2013	13.9	3.03	8.53	4.73
14	6/1/2014	NR	3.44	9.47	5.29
18A	12/20/2014	NR	13.0	10.7	5.73
21	5/31/2015	NR	3.03	8.09	4.20
26	12/3/2015	NR	5.40	9.6	4.99
30	6/30/2016	NR	4.0	11.4	5.15
request*	9/29/2016	NR	NR	9.4	4.39
34	12/19/2016	NR	4.51	4.82	2.41
36	6/12/2017	NR	3.47	9.40	4.47
39	10/13/2017	NR	NR	NR	NR

NR: Not Required; the sampling frequency in the S-3 Mass Removal Program is semi-annual .
Note: only event dates with at least one sample result shown
* additional sampling at request of Plaintiffs

Table A8
Results of Pre-injection Monitoring of Monitoring Wells

Field Redox Potential (mv)

Event #	Sample Date	090-MW-09	115-DP-1	088-MW-G19T	087-MW-O29D
1	5/16/2012	347	276	251	244
2	6/28/2012	NR	NR	184	NR
3	7/31/2012	NR	NR	187	NR
5	12/9/2012	300	-153	104	-7.0
7	6/3/2013	343	340	255	242
11	12/8/2013	289	181	244	199
14	6/1/2014	NR	242	231	237
18A	12/20/2014	NR	300	248	215
21	5/31/2015	NR	260	237	209
26	12/3/2015	NR	145	148	144
30	6/30/2016	NR	202.0	-55.0	0.0
request*	9/29/2016	NR	NR	162.0	201
34	12/19/2016	NR	309	224	227
36	6/12/2017	NR	208	233	211
39	10/13/2017	NR	NR	NR	NR

NR: Not Required; the sampling frequency in the S-3 Mass Removal Program is semi-annual .
Note: only event dates with at least one sample result shown
* additional sampling at request of Plaintiffs

Table A9
Results of Pre-injection Monitoring of Monitoring Wells

Field Dissolved Oxygen (mg/L)

Event #	Sample Date	090-MW-09	115-DP-1	088-MW-G19T	087-MW-O29D
1	5/16/2012	0.46	2.25	0.43	0.67
2	6/28/2012	NR	NR	0.00	NR
3	7/31/2012	NR	NR	0.00	NR
5	12/9/2012	0.99	1.22	1.02	1.07
7	6/3/2013	0.36	5.05	1.31	0.36
11	12/8/2013	0.85	0.00	0.33	0.33
14	6/1/2014	NR	3.96	0.00	0.00
18A	12/20/2014	NR	0.00	0.00	0.00
21	5/31/2015	NR	15.85**	10.88**	5.73
26	12/3/2015	NR	0.00	0.00	0.00
30	6/30/2016	NR	0.00	0.00	0.00
request*	9/29/2016	NR	NR	0.00	0.00
34	12/19/2016	NR	4.48	5.15	0.00
36	6/12/2017	NR	0.00	0.00	0.00
39	10/13/2017	NR	NR	NR	NR

** Instrument error suspected.

NR: Not Required; the sampling frequency in the S-3 Mass Removal Program is semi-annual .

Note: only event dates with at least one sample result shown

* additional sampling at request of Plaintiffs

Table A10
Results of Pre-injection Monitoring of Monitoring Wells

Field Turbidity (NTU)

Event #	Date	090-MW-09	115-DP-1	088-MW-G19T	087-MW-O29D
1	5/16/2012	0	0	74	0
2	6/28/2012	NR	NR	64	NR
3	7/31/2012	NR	NR	157	NR
5	12/9/2012	177	0	650	708
7	6/3/2013	53	0	48	12
11	12/8/2013	10	20	0	12
14	6/1/2014	NR	8	128	230
18A	12/20/2014	NR	0	185	55
21	5/31/2015	NR	0	138	8
26	12/3/2015	NR	3	0	80
30	6/30/2016	NR	1	0	49
request*	9/29/2016	NR	NR	79	21
34	12/19/2016	NR	0	66	43
36	6/12/2017	NR	3	53	4
39	10/13/2017	NR	NR	NR	NR

NR: Not Required; the sampling frequency in the S-3 Mass Removal Program is semi-annual .
Note: only event dates with at least one sample result shown
* additional sampling at request of Plaintiffs

APPENDIX B

RESULTS OF PRE-INJECTION MONITORING IN INJECTION WELLS

Table B1
Results of Pre-injection Monitoring of Injection Wells

		Total Chromium in Unfiltered Samples (ppm)			
Event #	Sample Date	088-IW-01	088-IW-02	087-IW-01	088-IW-03
1	5/16/2012	72.40	255.0	0.047	NR
2	6/28/2012	0.52	111.0	0.026	NR
3	7/31/2012	0.14	4.33	0.019	NR
3A	8/16/2012	NR	NR	NR	NR
4	10/1/2012	0.155	4.19	NR	NR
5	12/9/2012	0.059	2.82	NR	NR
6	3/13/2013	1.36	4.18	NR	NR
7	6/3/2013	<0.050	36.2	NR	98.6
8	8/18/2013	<10	5.4	NR	0.114
9	9/22/2013	<.01	<.01	NR	<.01
10	10/20/2013	<.1	0.198	NR	<.02
11	12/8/2013	<.1	1.61	NR	<.01
12	3/30/2014	<.02	<.02	NR	<.02
13	4/27/2014	<.01	0.300	NR	<.01
14	6/1/2014	<.01	0.174	0.0225	<.01
15	7/13/2014	<.01	<.01	NR	<.01
16	8/24/2014	<0.050	0.03	NR	<.02
17	9/21/2014	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR
18A	12/20/2014	0.0397	NR	NR	NR
19	3/22/2015	0.251	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR
21	5/31/2015	NR	NR	0.0666	NR
22	7/6/2015	NR	NR	NR	NR
23	8/16/2015	NR	NR	NR	NR
24	9/27/2015	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR
26	12/7/2015	0.068	NR	NR	NR
27	3/20/2016	NR	NR	NR	NR
28	4/25/2016	NR	NR	NR	NR
29	6/5/2016	NR	NR	NR	NR
30	7/11/2016	NR	0.073	NR	NR
31	8/7/2016	NR	NR	NR	NR
32	10/3/2016	NR	NR	NR	NR
33	10/24/2016	NR	NR	NR	NR
34	11/29/2016	NR	NR	NR	NR
35	5/8/2017	NR	NR	NR	NR
36	6/12/2017	NR	NR	NR	NR
37	7/17/2017	NR	NR	NR	NR
38	8/28/2017	NR	NR	NR	NR
39	9/18/2017	NR	NR	NR	NR

NR-Not Required; The selection of injection wells for sampling prior to each event was coordinated with Plaintiffs.
Sample collected just prior to following injection events in indicated well:

First	Second	Third	Fourth	Sixth	Fifth	Seventh
Eighth	Ninth	Tenth	Eleventh	Twelfth	Thirteenth	

Table B2
Results of Pre-injection Monitoring of Injection Wells

		Hexavalent Chromium in Unfiltered Samples (ppm)			
Event #	Sample Date	088-IW-01	088-IW-02	087-IW-01	088-IW-03
1	5/16/2012	48.8	94.2	<0.010	NR
2	6/28/2012	<0.55	130.0	<0.005	NR
3	7/31/2012	<.55	<.55	<0.0055	NR
3A	8/16/2012	NR	NR	NR	NR
4	10/1/2012	<0.55	<0.55	NR	NR
5	12/9/2012	<0.14	<0.14	NR	NR
6	3/13/2013	<0.28	<0.55	NR	NR
7	6/3/2013	<2.2	<0.5	NR	116
8	8/18/2013	<.0055	<.0055	NR	<.0055
9	9/22/2013	<.0055	<.0055	NR	<.0055
10	10/20/2013	<.0055	<.0055	NR	<.0055
11	12/8/2013	<.025	<.025	NR	<.025
12	3/30/2014	<.028	<.028	NR	<.028
13	4/27/2014	<.028	<.028	NR	<.028
14	6/1/2014	<.0055	<.0055	<0.0055	<.0055
15	7/13/2014	<.028	<.0055	NR	<.0055
16	8/24/2014	<.028	<.028	NR	<.028
17	9/21/2014	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR
18A	12/20/2014	<0.0055	NR	NR	NR
19	3/22/2015	<0.020	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR
21	5/31/2015	NR	NR	<0.0055	NR
22	7/6/2015	NR	NR	NR	NR
23	8/16/2015	NR	NR	NR	NR
24	9/27/2015	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR
26	12/7/2015	<0.0055	NR	NR	NR
27	3/20/2016	NR	NR	NR	NR
28	4/25/2016	NR	NR	NR	NR
29	6/5/2016	NR	NR	NR	NR
30	7/11/2016	NR	<0.55	NR	NR
31	8/7/2016	NR	NR	NR	NR
32	10/3/2016	NR	NR	NR	NR
33	10/24/2016	NR	NR	NR	NR
34	11/29/2016	NR	NR	NR	NR
35	5/8/2017	NR	NR	NR	NR
36	6/12/2017	NR	NR	NR	NR
37	7/17/2017	NR	NR	NR	NR
38	8/28/2017	NR	NR	NR	NR
39	9/18/2017	NR	NR	NR	NR

NR-Not Required; The selection of injection wells for sampling prior to each event was coordinated with Plaintiffs.
* reported concentration questionable due to matrix interference
Sample collected just prior to following injection events in indicated well:

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eighth	Ninth	Tenth	Eleventh	Twelfth	Thirteenth	

Table B3
Results of Pre-injection Monitoring of Injection Wells

		Sulfate in Unfiltered Samples (ppm)			
Event #	Sample Date	088-IW-01	088-IW-02	087-IW-01	088-IW-03
1	5/16/2012	147	95.7	49.6	NR
2	6/28/2012	861	315	50.6	NR
3	7/31/2012	474	1,390	40.3	NR
3A	8/16/2012	NR	NR	NR	NR
4	10/1/2012	<400	479	NR	NR
5	12/9/2012	244	227	NR	NR
6	3/13/2013	224	290	NR	NR
7	6/3/2013	108	341	NR	259
8	8/18/2013	138	275	NR	152
9	9/22/2013	149	155	NR	251
10	10/20/2013	<100	344	NR	317
11	12/8/2013	<100	403	NR	<160
12	3/30/2014	<500	<500	NR	<500
13	4/27/2014	<100	357	NR	469
14	6/1/2014	<50	358	NR	<50
15	7/13/2014	<100	<100	NR	188
16	8/24/2014	<100	461	NR	804
17	9/21/2014	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR
18A	12/20/2014	NR	NR	NR	NR
19	3/22/2015	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR
21	5/31/2015	NR	NR	NR	NR
22	7/6/2015	NR	NR	NR	NR
23	8/16/2015	NR	NR	NR	NR
24	9/27/2015	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR
26	12/7/2015	NR	NR	NR	NR
27	3/20/2016	NR	NR	NR	NR
28	4/25/2016	NR	NR	NR	NR
29	6/5/2016	NR	NR	NR	NR
30	7/11/2016	NR	NR	NR	NR
31	8/7/2016	NR	NR	NR	NR
32	10/3/2016	NR	NR	NR	NR
33	10/24/2016	NR	NR	NR	NR
34	11/29/2016	NR	NR	NR	NR
35	5/8/2017	NR	NR	NR	NR
36	6/12/2017	NR	NR	NR	NR
37	7/17/2017	NR	NR	NR	NR
38	8/28/2017	NR	NR	NR	NR
39	9/18/2017	NR	NR	NR	NR

NR-Not Required; The selection of injection wells for sampling prior to each event was coordinated with Plaintiffs.
Sample collected just prior to following injection events in indicated well:

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eighth	Ninth	Tenth	Eleventh	Twelfth	Thirteenth	

Table B4
Results of Pre-injection Monitoring of Injection Wells

		Calcium in Unfiltered Samples (ppm)			
Event #	Sample Date	088-IW-01	088-IW-02	087-IW-01	088-IW-03
1	5/16/2012	34.7	51.2	73.0	NR
2	6/28/2012	7,760	<50	69.3	NR
3	7/31/2012	2,900	14,300	603	NR
3A	8/16/2012	#N/A	NR	NR	NR
4	10/1/2012	1,400	1,800	NR	NR
5	12/9/2012	827	970	NR	NR
6	3/13/2013	586	2,060	NR	NR
7	6/3/2013	3,320	432	NR	61.5
8	8/18/2013	1,490	250	NR	3,010
9	9/22/2013	1,650	6,680	NR	1,550
10	10/20/2013	6,220	1,210	NR	1,150
11	12/8/2013	6,060	1,100	NR	7,670
12	3/30/2014	2,490	3,260	NR	1,580
13	4/27/2014	2,390	1,600	NR	1,160
14	6/1/2014	978	750	76.6	896
15	7/13/2014	5,500	5,230	NR	1,270
16	8/24/2014	4,620	1,030	NR	1,000
17	9/21/2014	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR
18A	12/20/2014	100.0	NR	NR	NR
19	3/22/2015	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR
21	5/31/2015	NR	NR	94.4	NR
22	7/6/2015	NR	NR	NR	NR
23	8/16/2015	NR	NR	NR	NR
24	9/27/2015	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR
26	12/7/2015	88.7	NR	NR	NR
27	3/20/2016	NR	NR	NR	NR
28	4/25/2016	NR	NR	NR	NR
29	6/5/2016	NR	NR	NR	NR
30	7/11/2016	NR	4,220	NR	NR
31	8/7/2016	NR	NR	NR	NR
32	10/3/2016	NR	NR	NR	NR
33	10/24/2016	NR	NR	NR	NR
34	11/29/2016	NR	NR	NR	NR
35	5/8/2017	NR	NR	NR	NR
36	6/12/2017	NR	NR	NR	NR
37	7/17/2017	NR	NR	NR	NR
38	8/28/2017	NR	NR	NR	NR
39	9/18/2017	NR	NR	NR	NR

NR-Not Required; The selection of injection wells for sampling prior to each event was coordinated with Plaintiffs
Sample collected just prior to following injection events in indicated well:

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eighth	Ninth	Tenth	Eleventh	Twelfth	Thirteenth	

Table B5
Results of Pre-injection Monitoring of Injection Wells

		Iron in Unfiltered Samples (ppm)			
Event #	Sample Date	088-IW-01	088-IW-02	087-IW-01	088-IW-03
1	5/16/2012	5.060	4.070	0.516	NR
2	6/28/2012	<5.0	1.900	0.502	NR
3	7/31/2012	4.68	<0.5	NR	NR
3A	8/16/2012	NR	NR	NR	NR
4	10/1/2012	0.835	0.255	NR	NR
5	12/9/2012	0.504	0.517	NR	NR
6	3/13/2013	0.854	0.277	NR	NR
7	6/3/2013	<0.5	0.478	NR	0.509
8	8/18/2013	0.126	<0.1	NR	<0.1
9	9/22/2013	<0.1	<0.1	NR	0.114
10	10/20/2013	<0.5	<0.1	NR	0.126
11	12/8/2013	<0.2	0.268	NR	<0.2
12	3/30/2014	<0.2	<0.2	NR	<0.2
13	4/27/2014	NR	NR	NR	NR
14	6/1/2014	NR	NR	NR	NR
15	7/13/2014	NR	NR	NR	NR
16	8/24/2014	NR	NR	NR	NR
17	9/21/2014	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR
18A	12/20/2014	NR	NR	NR	NR
19	3/22/2015	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR
21	5/31/2015	NR	NR	NR	NR
22	7/6/2015	NR	NR	NR	NR
23	8/16/2015	NR	NR	NR	NR
24	9/27/2015	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR
26	12/7/2015	NR	NR	NR	NR
27	3/20/2016	NR	NR	NR	NR
28	4/25/2016	NR	NR	NR	NR
29	6/5/2016	NR	NR	NR	NR
30	7/11/2016	NR	NR	NR	NR
31	8/7/2016	NR	NR	NR	NR
32	10/3/2016	NR	NR	NR	NR
33	10/24/2016	NR	NR	NR	NR
34	11/29/2016	NR	NR	NR	NR
35	5/8/2017	NR	NR	NR	NR
36	6/12/2017	NR	NR	NR	NR
37	7/17/2017	NR	NR	NR	NR
38	8/28/2017	NR	NR	NR	NR
39	9/18/2017	NR	NR	NR	NR

NR-Not Required; The selection of injection wells for sampling prior to each event was coordinated with Plaintiffs.
Sample collected just prior to following injection events in indicated well:

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eighth	Ninth	Tenth	Eleventh	Twelfth	Thirteenth	

Table B6
Results of Pre-injection Monitoring of Injection Wells
Field pH (pH units)

Event #	Sample Date	088-IW-01	088-IW-02	087-IW-01	088-IW-03
1	5/16/2012	8.08	7.46	7.21	NR
2	5/28/2012	10.98	7.53	7.42	NR
3	7/31/2012	10.56	10.38	6.96	NR
3A	8/16/2012	NR	NR	NR	NR
4	10/1/2012	10.95	11.19	NR	NR
5	12/9/2012	8.27	9.46	NR	NR
6	3/13/2013	10.81	11.35	NR	NR
7	6/3/2013	11.43	10.29	NR	7.66
8	8/18/2013	10.70	11.52	NR	10.90
9	9/22/2013	11.44	11.99	NR	11.66
10	10/20/2013	10.71	11.20	NR	10.74
11	12/8/2013	11.01	11.50	NR	10.94
12	3/30/2014	10.45	11.95	NR	10.90
13	4/27/2014	10.80	11.60	NR	10.90
14	6/1/2014	11.30	11.88	7.74	11.46
15	7/13/2014	9.42	9.90	NR	10.11
16	8/24/2014	10.60	11.05	NR	11.09
17	9/21/2014	NR	11.20	NR	NR
18	10/26/2014	NR	NR	NR	10.63
18A	12/20/2014	NR	NR	7.13	NR
19	3/22/2015	9.59	11.48	NR	10.94
20	4/26/2015	10.99	11.59	NR	10.63
21	5/31/2015	NR	NR	7.31	NR
22	7/6/2015	11.30	NR	NR	NR
23	8/18/2015	NR	NR	NR	11.69
24	9/27/2015	NR	11.15	NR	NR
25	11/2/2015	NR	NR	NR	11.19
26	12/7/2015	6.85	NR	NR	NR
27	3/20/2016	NR	13.17	NR	NR
28	4/25/2016	NR	NR	NR	12.50
29	6/5/2016	10.88	NR	NR	NR
30	7/11/2016	NR	12.19	NR	NR
31	8/7/2016	NR	NR	NR	11.04
32	10/3/2016	11.45	NR	NR	NR
33	10/24/2016	NR	11.21	NR	NR
34	11/29/2016	NR	NR	NR	11.33
35	5/8/2017	12.7	NR	NR	NR
36	6/12/2017	NR	12.68	NR	NR
37	7/17/2017	NR	NR	NR	10.5
38	8/28/2017	11.96	NR	NR	NR
39	9/18/2017	NR	NR	NR	12.51

NR-Not Required; The selection of injection wells for sampling prior to each event was coordinated with Plaintiff

Sample collected just prior to following injection events in indicated well:

First	Second	Third	Fourth	Fifth	Sixth	event
Eighth	Ninth	Tenth	Eleventh	Twelfth	Thirteenth	

Table B7
Results of Pre-injection Monitoring of Injection Wells
Field Specific Conductivity (ms/cm)

Event #	Sample Date	088-IW-01	088-IW-02	087-IW-01	088-IW-03
1	5/16/2012	1.78	1.7	2.81	NR
2	6/28/2012	32.7	1.4	2.11	NR
3	7/31/2012	14.2	47.0	2.33	NR
3A	8/16/2012	NR	NR	NR	NR
4	10/1/2012	7.1	10.0	NR	NR
5	12/9/2012	37.6	5.9	NR	NR
6	3/13/2013	5.47	9.8	NR	NR
7	6/3/2013	3.15	17.0	NR	3.0
8	8/18/2013	7.06	2.6	NR	16.9
9	9/22/2013	7.22	25.9	NR	8.1
10	10/20/2013	20.5	6.1	NR	6.9
11	12/8/2013	22.7	6.1	NR	27.1
12	3/30/2014	12.2	15.1	NR	9.3
13	4/27/2014	14.2	8.9	NR	7.3
14	6/1/2014	6.70	9.5	2.39	12.4
15	7/13/2014	22.3	31.4	NR	8.0
16	8/24/2014	17.0	21.0	NR	5.8
17	9/21/2014	NR	16.0	NR	NR
18	10/26/2014	NR	NR	NR	28.7
18A	12/20/2014	NR	NR	2.75	NR
19	3/22/2015	0.62	6.1	NR	14.1
20	4/26/2015	27.0	5.9	NR	11.1
21	5/31/2015	NR	NR	2.30	NR
22	7/6/2015	29.7	NR	NR	NR
23	8/18/2015	NR	NR	NR	23.5
24	9/27/2015	NR	20.3	NR	NR
25	11/2/2015	NR	NR	NR	2.45
26	12/7/2015	3.04	NR	NR	NR
27	3/20/2016	NR	14.5	NR	NR
28	4/25/2016	NR	NR	NR	24.2
29	6/5/2016	7.9	NR	NR	NR
30	7/11/2016	NR	31.3	NR	NR
31	8/7/2016	NR	NR	NR	23.0
32	10/3/2016	10.4	NR	NR	NR
33	10/24/2016	NR	15.2	NR	NR
34	11/29/2016	NR	NR	NR	21.5
35	5/8/2017	17.7	NR	NR	NR
36	6/12/2017	NR	8.3	NR	NR
37	7/17/2017	NR	NR	NR	21.7
38	8/28/2017	30.4	NR	NR	NR
39	9/18/2017	NR	NR	NR	28.9

NR-Not Required; The selection of injection wells for sampling prior to each event was coordinated with Plaintiffs.
Sample collected just prior to following injection events in indicated well:

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eighth	Ninth	Tenth	Eleventh	Twelfth	Thirteenth	

Table B8
Results of Pre-injection Monitoring of Injection Wells
Field Redox Potential (mv)

Event #	Sample Date	088-IW-01	088-IW-02	087-IW-01	088-IW-03
1	5/16/2012	93	230	-38	NR
2	6/28/2012	-533	140	-128	NR
3	7/31/2012	-498	-507	-49	NR
3A	8/16/2012	NR	NR	NR	NR
4	10/1/2012	-508	-510	NR	NR
5	12/9/2012	-497	-497	NR	NR
6	3/13/2013	-483	-505	NR	NR
7	6/3/2013	-478	-509	NR	245
8	8/18/2013	-500	-466	NR	-500
9	9/22/2013	-516	-536	NR	-516
10	10/20/2013	-509	-512	NR	-496
11	12/8/2013	-524	-514	NR	-521
12	3/30/2014	-462	-482	NR	-450
13	4/27/2014	-505	-515	NR	-505
14	6/1/2014	-505	-516	-81	-509
15	7/13/2014	-519	-519	NR	-500
16	8/24/2014	-502	-517	NR	-498
17	9/21/2014	NR	-500	NR	NR
18	10/26/2014	NR	NR	NR	-503
18A	12/20/2014	NR	NR	-75	NR
19	3/22/2015	-452	-504	NR	-501
20	4/26/2015	-511	-506	NR	-506
21	5/31/2015	NR	NR	-37	NR
22	7/6/2015	-498	NR	NR	NR
23	8/18/2015	NR	NR	NR	-506
24	9/27/2015	NR	-517	NR	NR
25	11/2/2015	NR	NR	NR	-489
26	12/7/2015	-30	NR	NR	NR
27	3/20/2016	NR	-474	NR	NR
28	4/25/2016	NR	NR	NR	-490
29	6/5/2016	-444	NR	NR	NR
30	7/11/2016	NR	31	NR	NR
31	8/7/2016	NR	NR	NR	-513
32	10/3/2016	-496	NR	NR	NR
33	10/24/2016	NR	-512	NR	NR
34	11/29/2016	NR	NR	NR	-522
35	5/8/2017	-514	NR	NR	NR
36	6/12/2017	NR	-456	NR	NR
37	7/17/2017	NR	NR	NR	-513
38	8/28/2017	-519	NR	NR	NR
39	9/18/2017	NR	NR	NR	-505

NR-Not Required; The selection of injection wells for sampling prior to each event was coordinated with Plaintiffs.
Sample collected just prior to following injection events in indicated well:

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eighth	Ninth	Tenth	Eleventh	Twelfth	Thirteenth	

Table B9
Results of Pre-injection Monitoring of Injection Wells
Field Dissolved Oxygen (mg/L)

Event #	Sample Date	088-IW-01	088-IW-02	087-IW-01	088-IW-03
1	5/16/2012	0.38	0.51	1.02	NR
2	6/28/2012	0.00	0.00	0.00	NR
3	7/31/2012	0.52	4.73	0.00	NR
3A	8/16/2012	NR	NR	NR	NR
4	10/1/2012	2.70	5.88	NR	NR
5	12/9/2012	5.16	0.43	NR	NR
6	3/13/2013	8.56	5.37	NR	NR
7	6/3/2013	0.24	0.42	NR	5.22
8	8/18/2013	0.38	0.28	NR	0.27
9	9/22/2013	2.19	2.29	NR	3.20
10	10/20/2013	0.48	0.96	NR	2.90
11	12/8/2013	1.95	1.36	NR	1.45
12	3/30/2014	NA	2.61	NR	2.95
13	4/27/2014	4.50	3.10	NR	2.80
14	6/1/2014	0.00	0.00	0.00	0.00
15	7/13/2014	0.48	0.38	NR	0.36
16	8/24/2014	0.86	0.52	NR	0.62
17	9/21/2014	NR	4.42	NR	NR
18	10/26/2014	NR	NR	NR	0.45
18A	12/20/2014	NR	NR	0.00	NR
19	3/22/2015	2.91	1.38	NR	1.19
20	4/26/2015	2.58	2.02	NR	2.84
21	5/31/2015	NR	NR	5.64	NR
22	7/6/2015	0.00	NR	NR	NR
23	8/18/2015	NR	NR	NR	3.35
24	9/27/2015	NR	0.00	NR	NR
25	11/2/2015	NR	NR	NR	0.00
26	12/7/2015	0.00	NR	NR	NR
27	3/20/2016	NR	0.0	NR	NR
28	4/25/2016	NR	NR	NR	0.00
29	6/5/2016	0.00	NR	NR	NR
30	7/11/2016	NR	0.00	NR	NR
31	8/7/2016	NR	NR	NR	3.8
32	10/3/2016	1.07	NR	NR	NR
33	10/24/2016	NR	0.00	NR	NR
34	11/29/2016	NR	NR	NR	0.00
35	5/8/2017	0.00	NR	NR	NR
36	6/12/2017	NR	0.00	NR	NR
37	7/17/2017	NR	NR	NR	0.00
38	8/28/2017	0.00	NR	NR	NR
39	9/18/2017	NR	NR	NR	0.00

NR-Not Required; The selection of injection wells for sampling prior to each event was coordinated with Plaintiffs.
Sample collected just prior to following injection events in indicated well:

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eighth	Ninth	Tenth	Eleventh	Twelfth	Thirteenth	

Table B10
Results of Pre-injection Monitoring of Injection Wells

		Field Turbidity (NTU)			
Event #	Sample Date	088-IW-01	088-IW-02	087-IW-01	088-IW-03
1	5/16/2012	15.2	39.4	0.0	NR
2	6/28/2012	>800	24.1	8.5	NR
3	7/31/2012	13.0	113.0	18.1	NR
3A	8/16/2012	NR	NR	NR	NR
4	10/1/2012	0.0	34.1	NR	NR
5	12/9/2012	0.0	0.0	NR	NR
6	3/13/2013	3.7	8.8	NR	NR
7	6/3/2013	545	1.0	NR	8.4
8	8/18/2013	0.0	3.2	NR	0.0
9	9/22/2013	2.4	8.4	NR	15.2
10	10/20/2013	0.0	0.0	NR	0.0
11	12/8/2013	0.0	42.2	NR	8.0
12	3/30/2014	1.4	16.3	NR	2.1
13	4/27/2014	0.0	1.2	NR	0.0
14	6/1/2014	7.8	38.0	4.4	4.6
15	7/13/2014	0	0.0	NR	0.0
16	8/24/2014	1.50	2.8	NR	0.0
17	9/21/2014	NR	0.0	NR	NR
18	10/26/2014	NR	NR	NR	0.0
18A	12/20/2014	NR	NR	4.800	NR
19	3/22/2015	120	50.0	NR	60.0
20	4/26/2015	0.0	69.0	NR	0.0
21	5/31/2015	NR	NR	0.00	NR
22	7/6/2015	0.0	NR	NR	NR
23	8/18/2015	NR	NR	NR	13.3
24	9/27/2015	NR	3.3	NR	NR
25	11/2/2015	NR	NR	NR	4.10
26	12/7/2015	4.90	NR	NR	NR
27	3/20/2016	NR	64.8	NR	NR
28	4/25/2016	NR	NR	NR	26.5
29	6/5/2016	7.20	NR	NR	NR
30	7/11/2016	NR	4.8	NR	NR
31	8/7/2016	NR	NR	NR	26.0
32	10/3/2016	4.40	NR	NR	NR
33	10/24/2016	NR	8.6	NR	NR
34	11/29/2016	NR	NR	NR	57.0
35	5/8/2017	0.0	NR	NR	NR
36	6/12/2017	NR	3.00	NR	NR
37	7/17/2017	NR	NR	NR	2.70
38	8/28/2017	0.00	NR	NR	NR
39	9/18/2017	NR	NR	NR	4.90

NR-Not Required; The selection of injection wells for sampling prior to each event was coordinated with Plaintiffs.
Sample collected just prior to following injection events in indicated well:

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eights	Ninth	Tenth	Eleventh	Twelfth	Thirteenth	

APPENDIX C

DATA LOGGER HYDROGRAPHS FROM SA-6 NORTH AND SOUTH

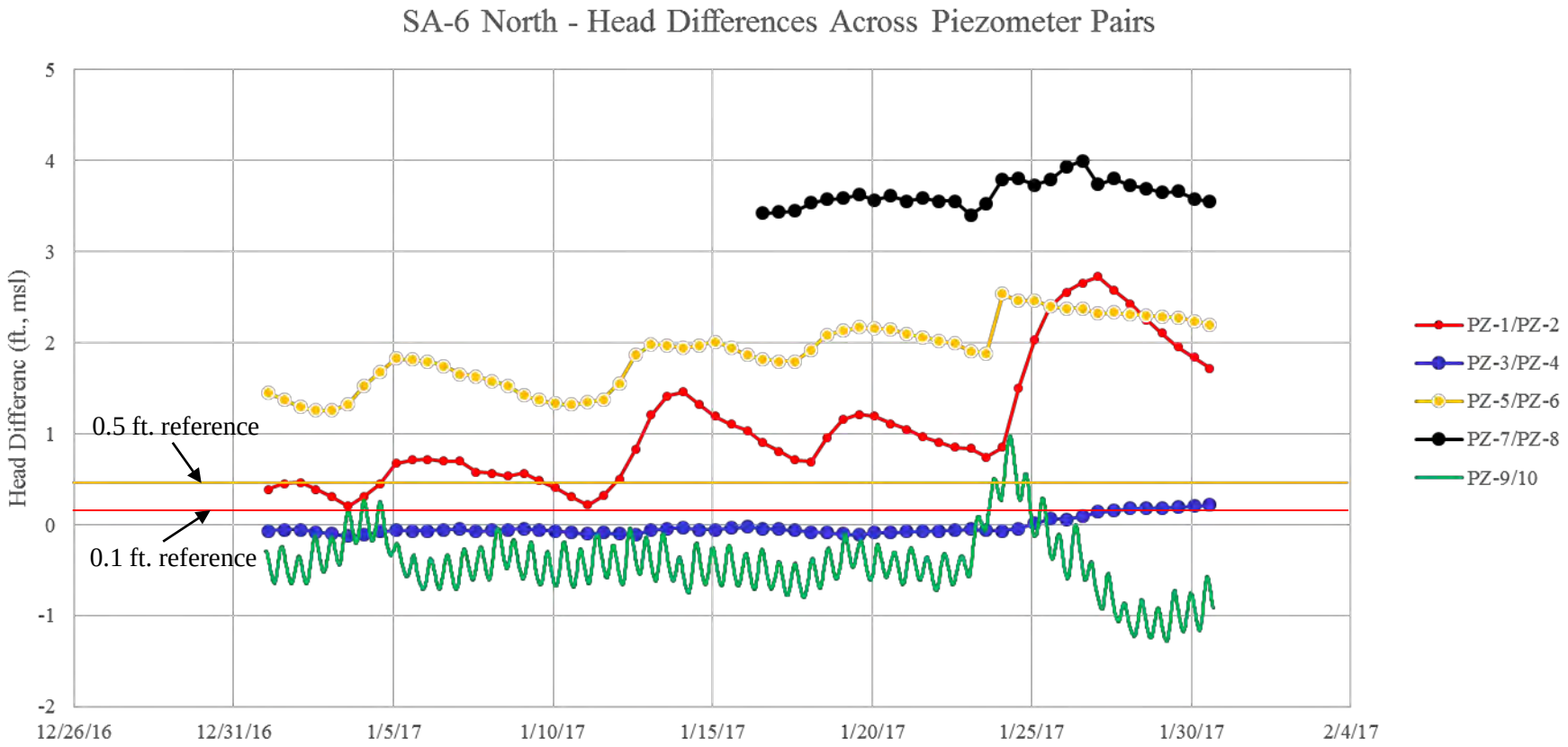


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs - January 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

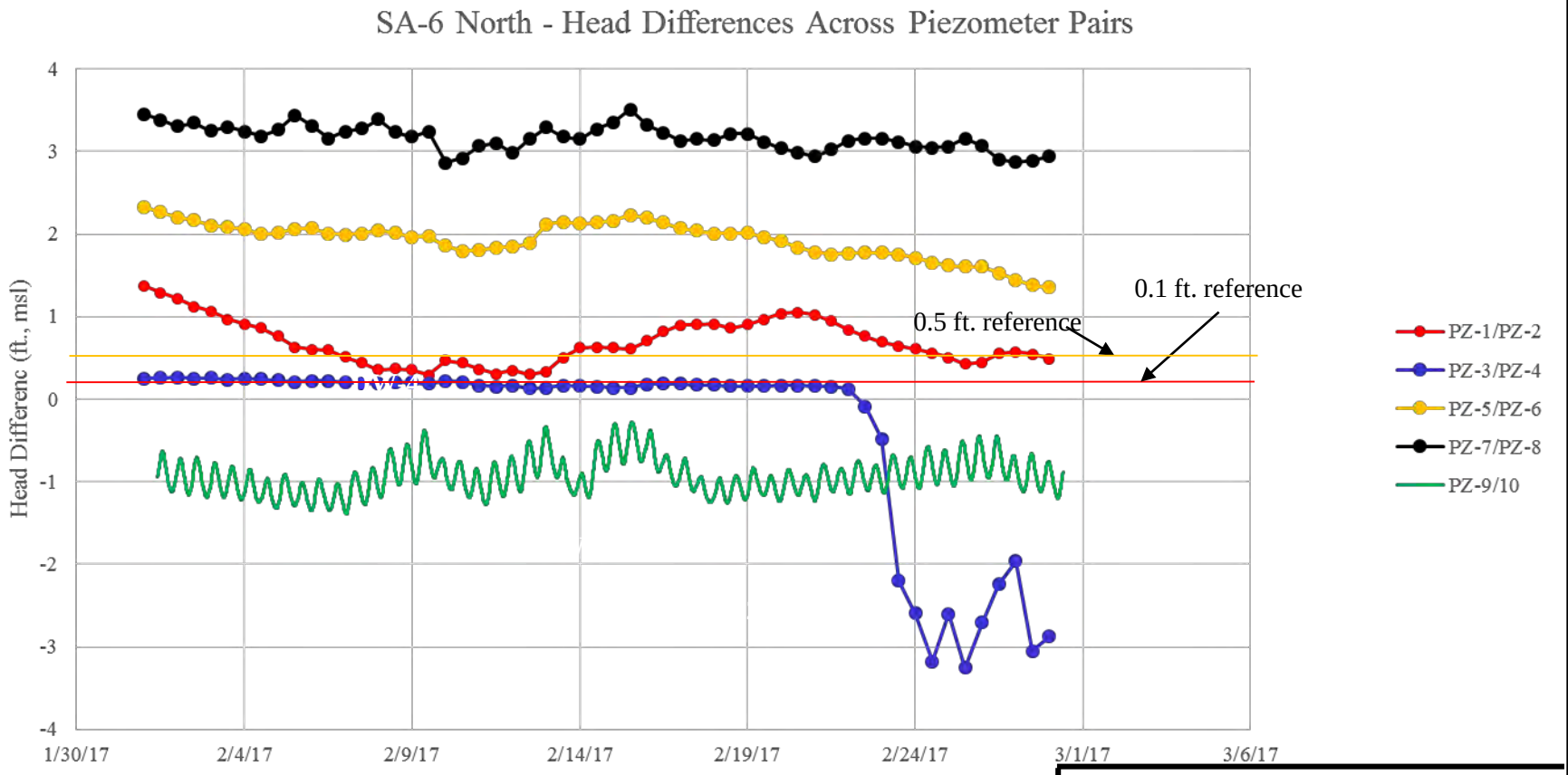


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs - February 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

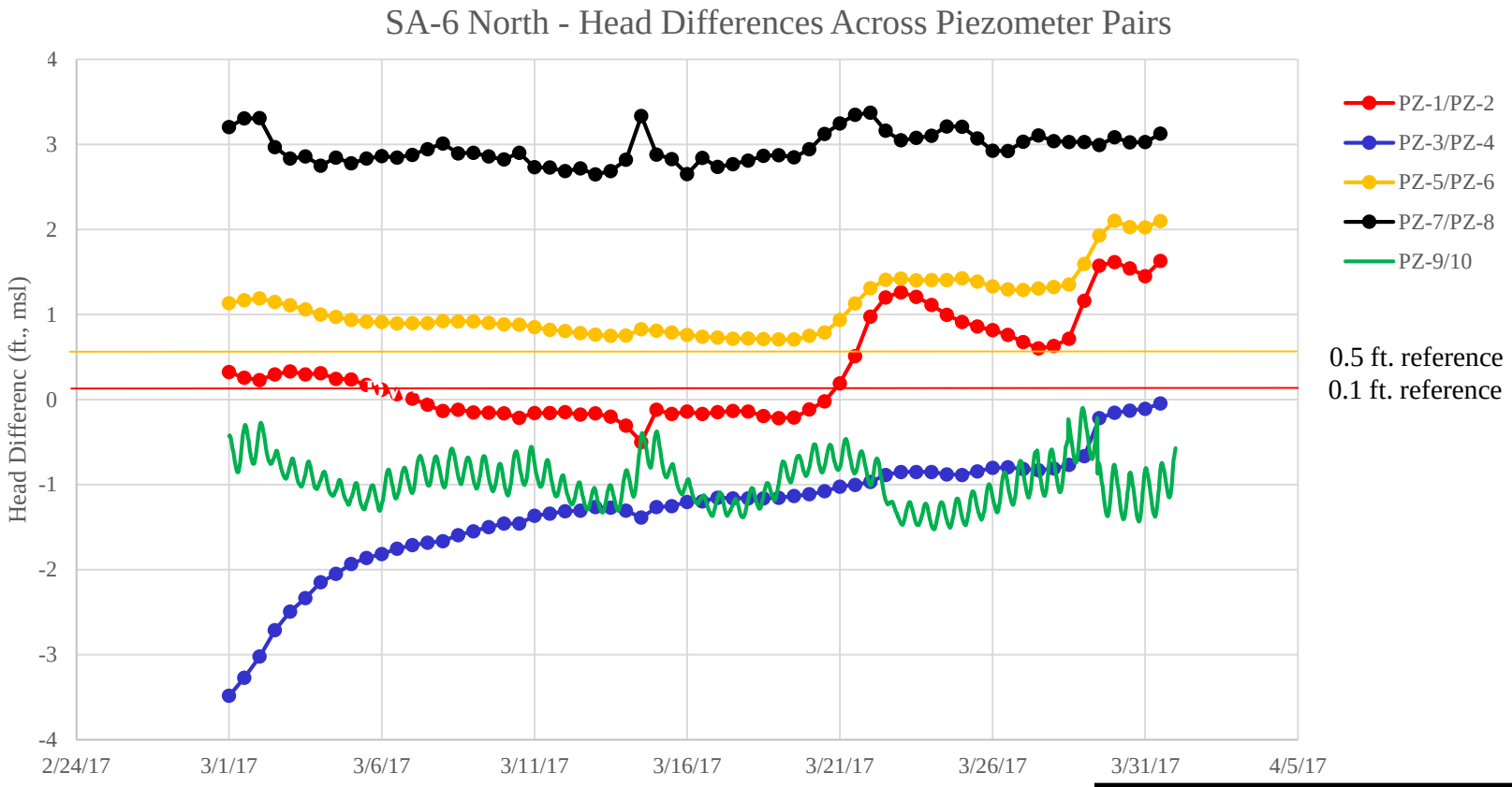


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – March 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

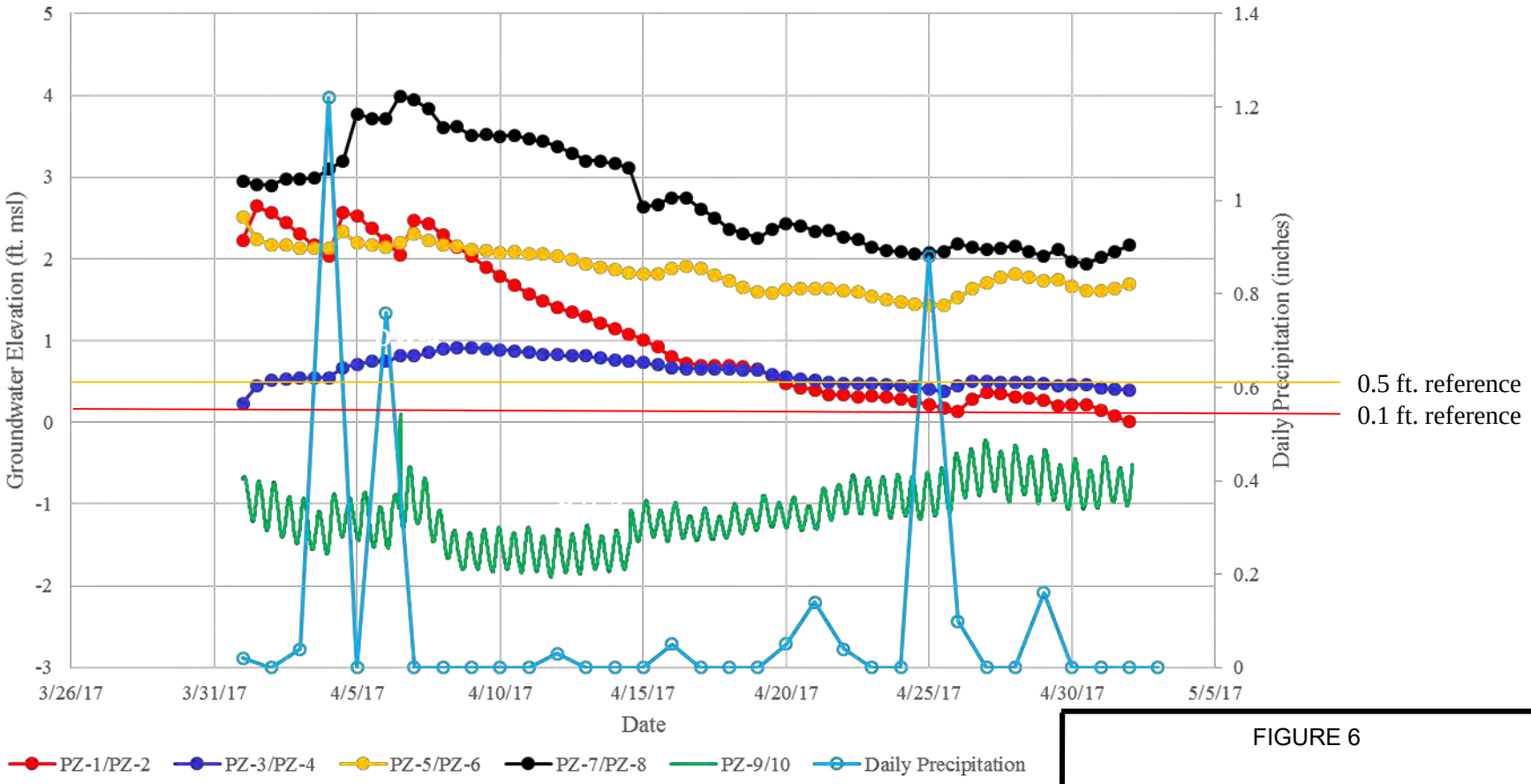


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs –April 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

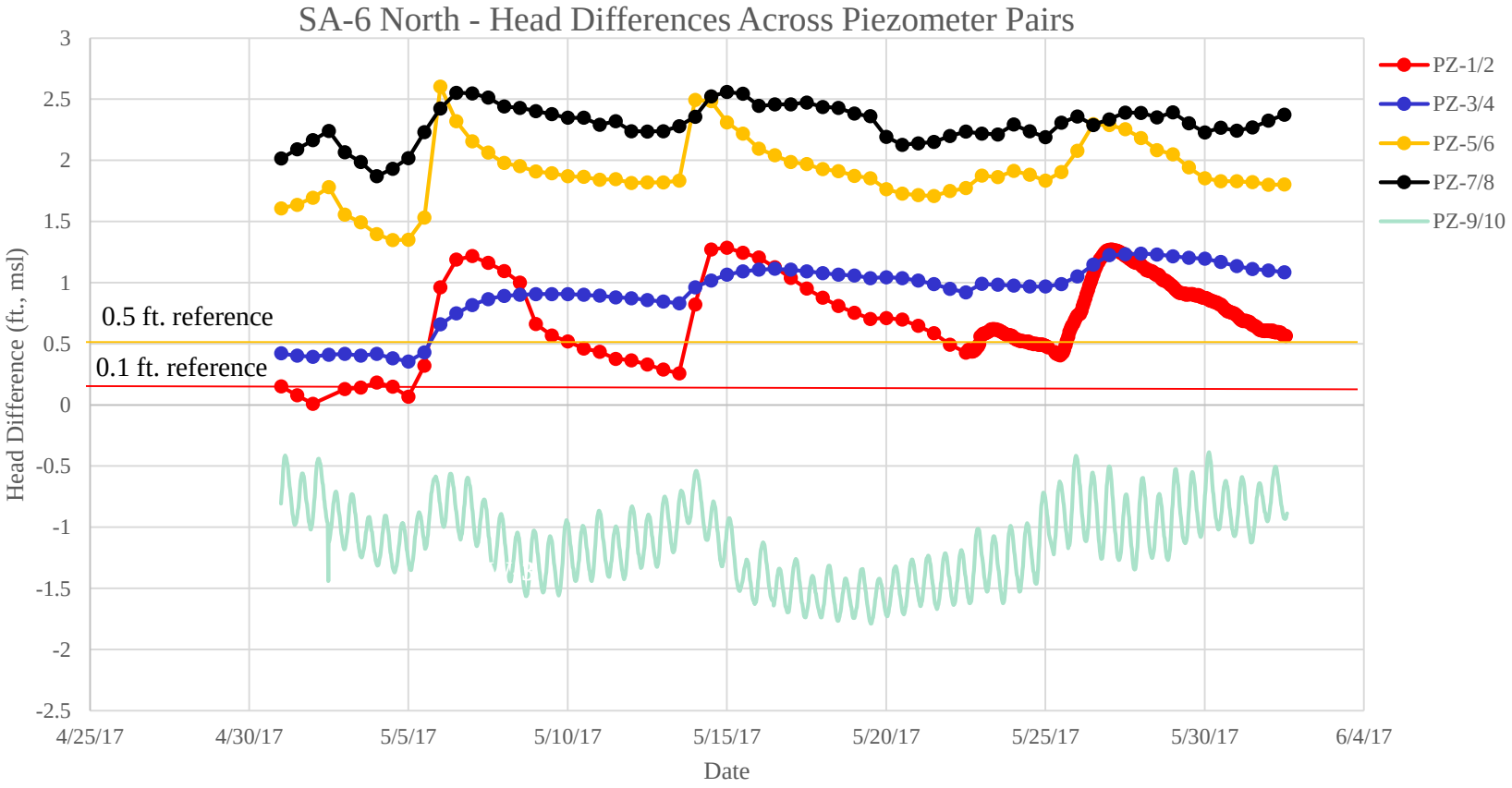


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs –May 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

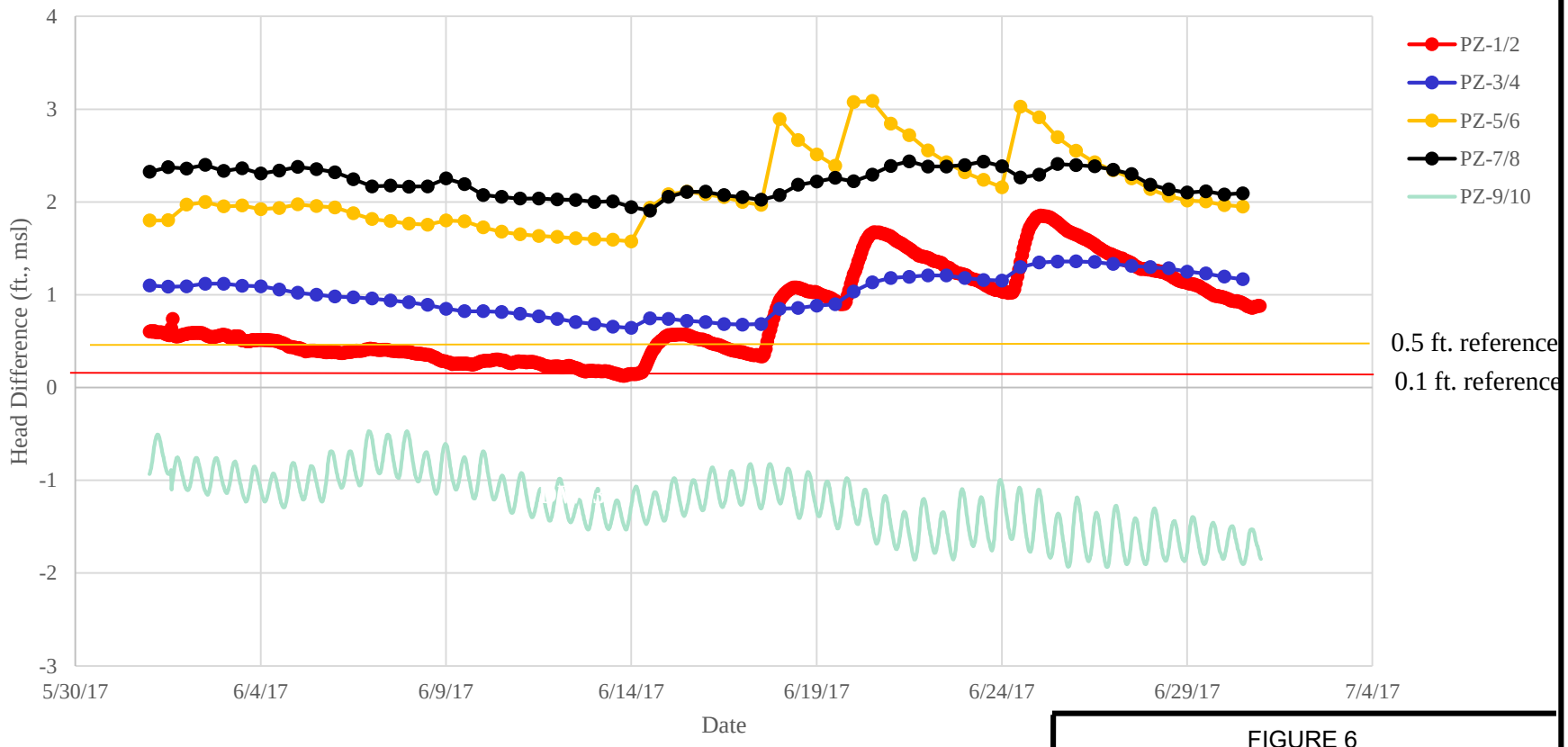


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs –June 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

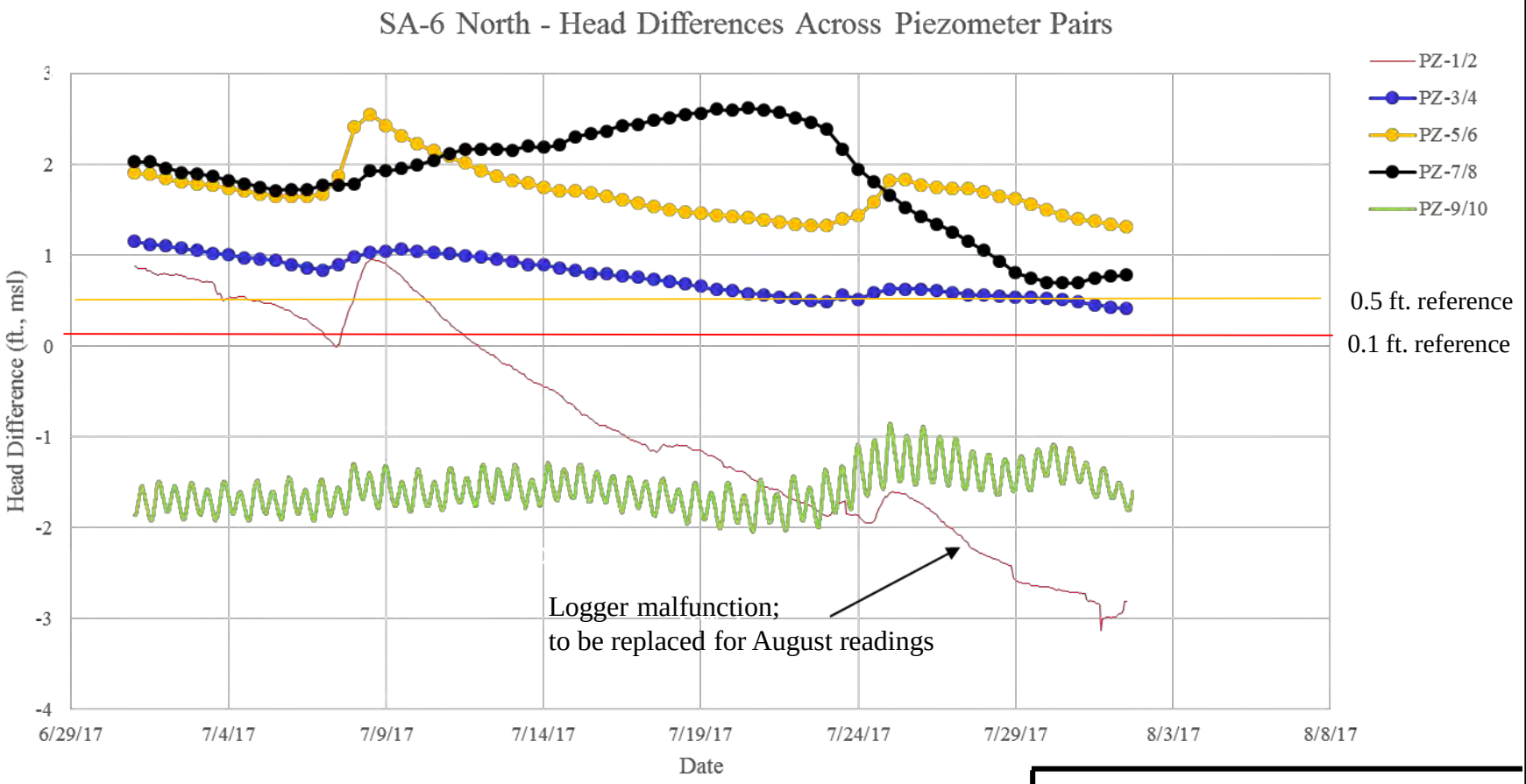


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs –July 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

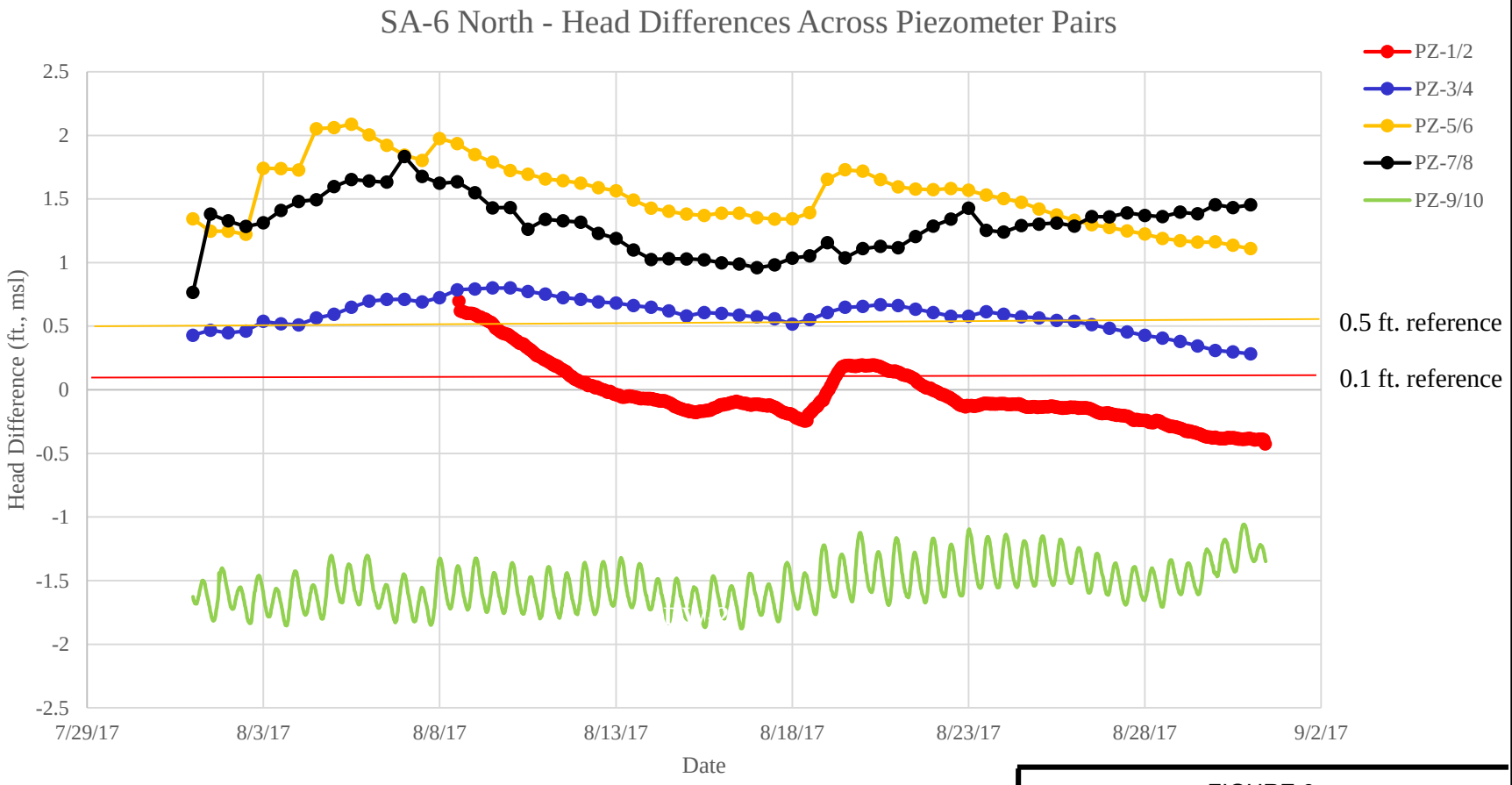


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs –August 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

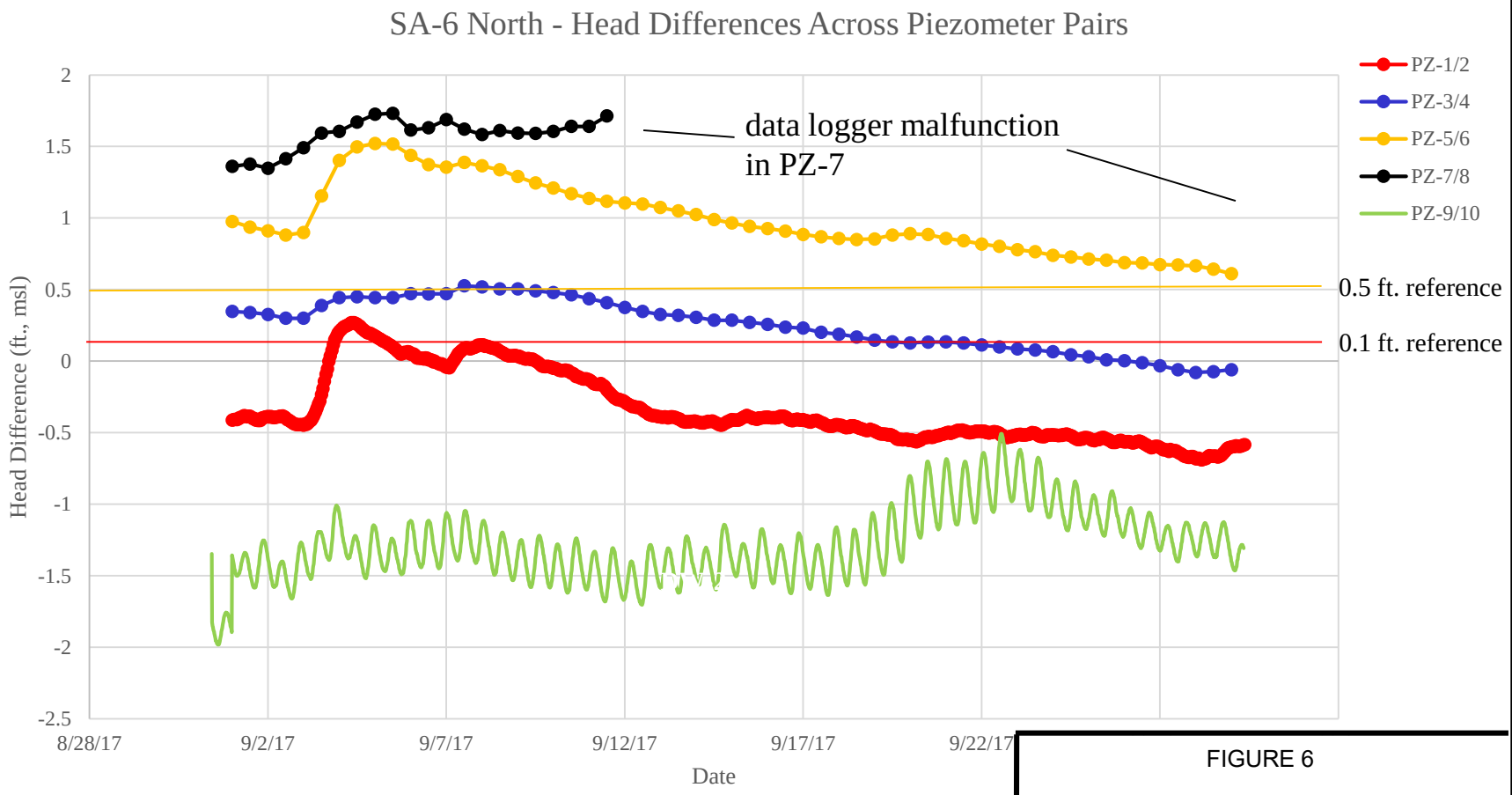


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – September 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

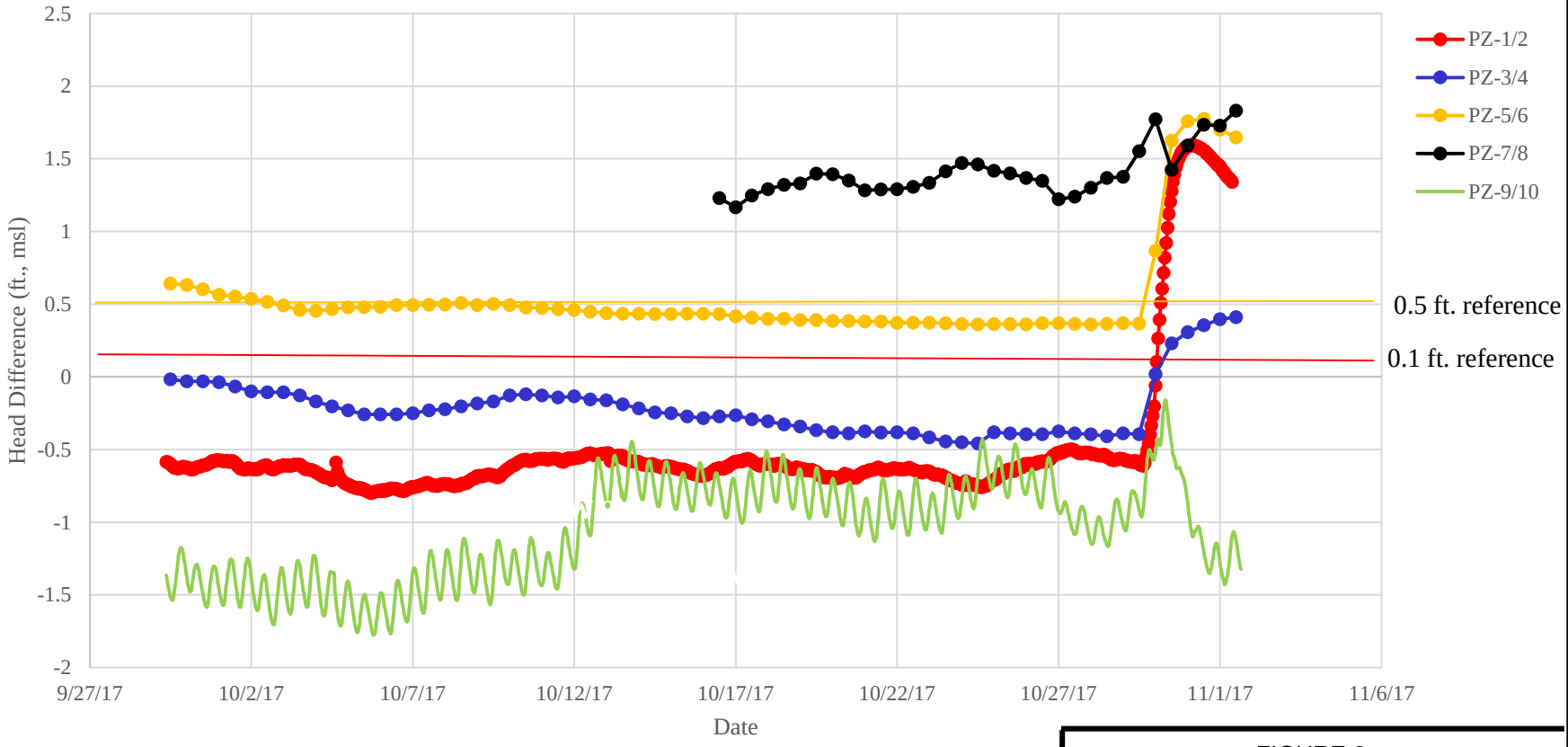


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – October 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

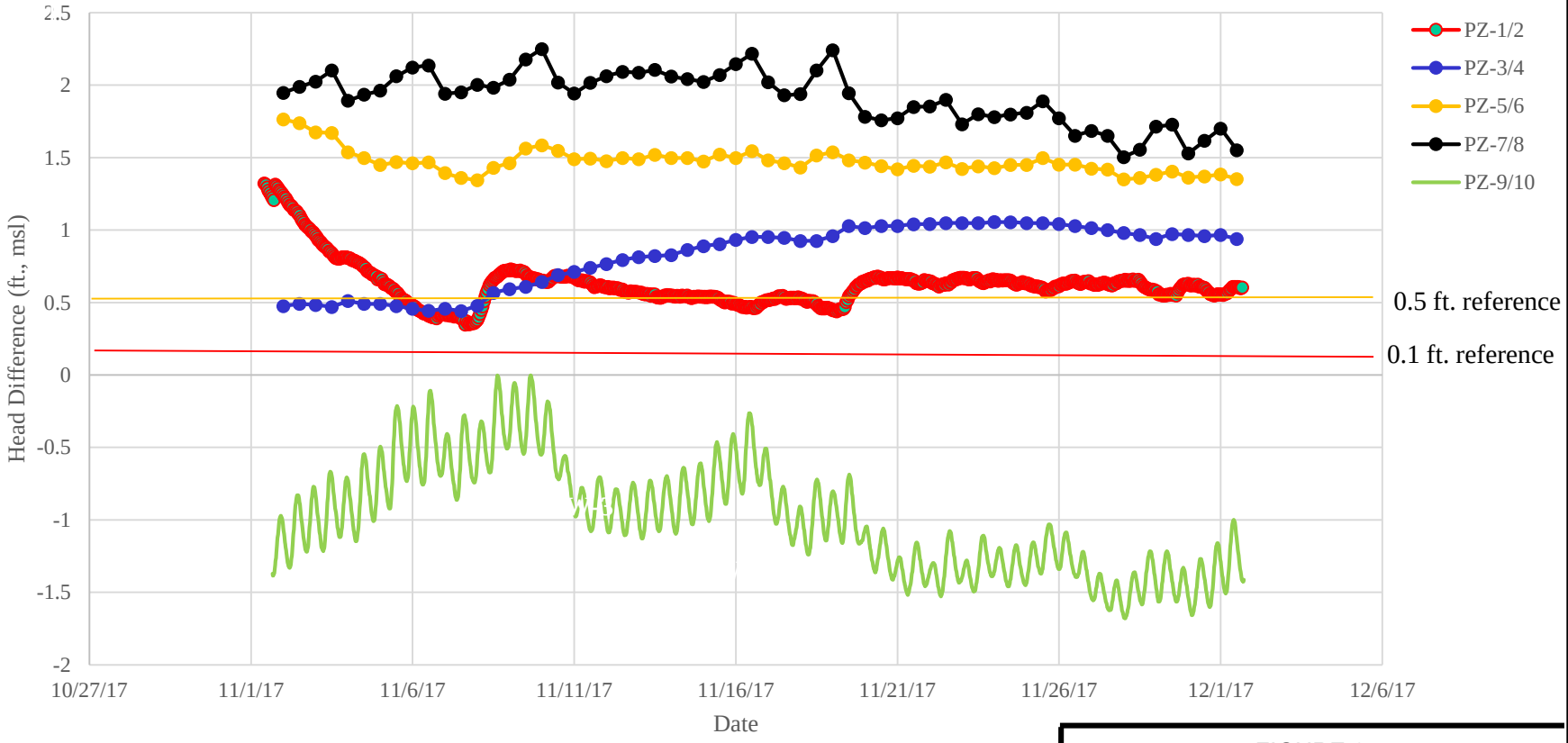


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – November 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

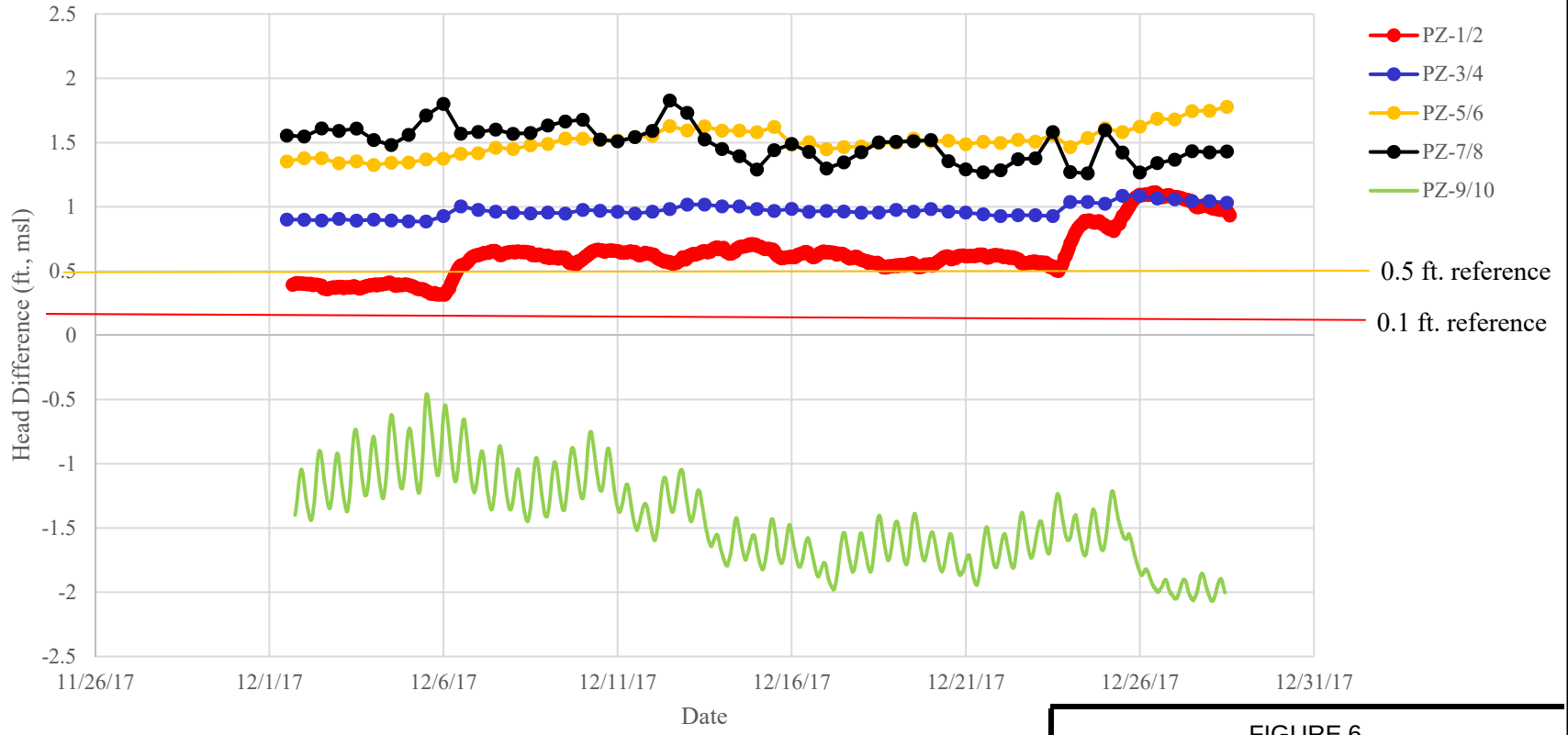


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – December 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

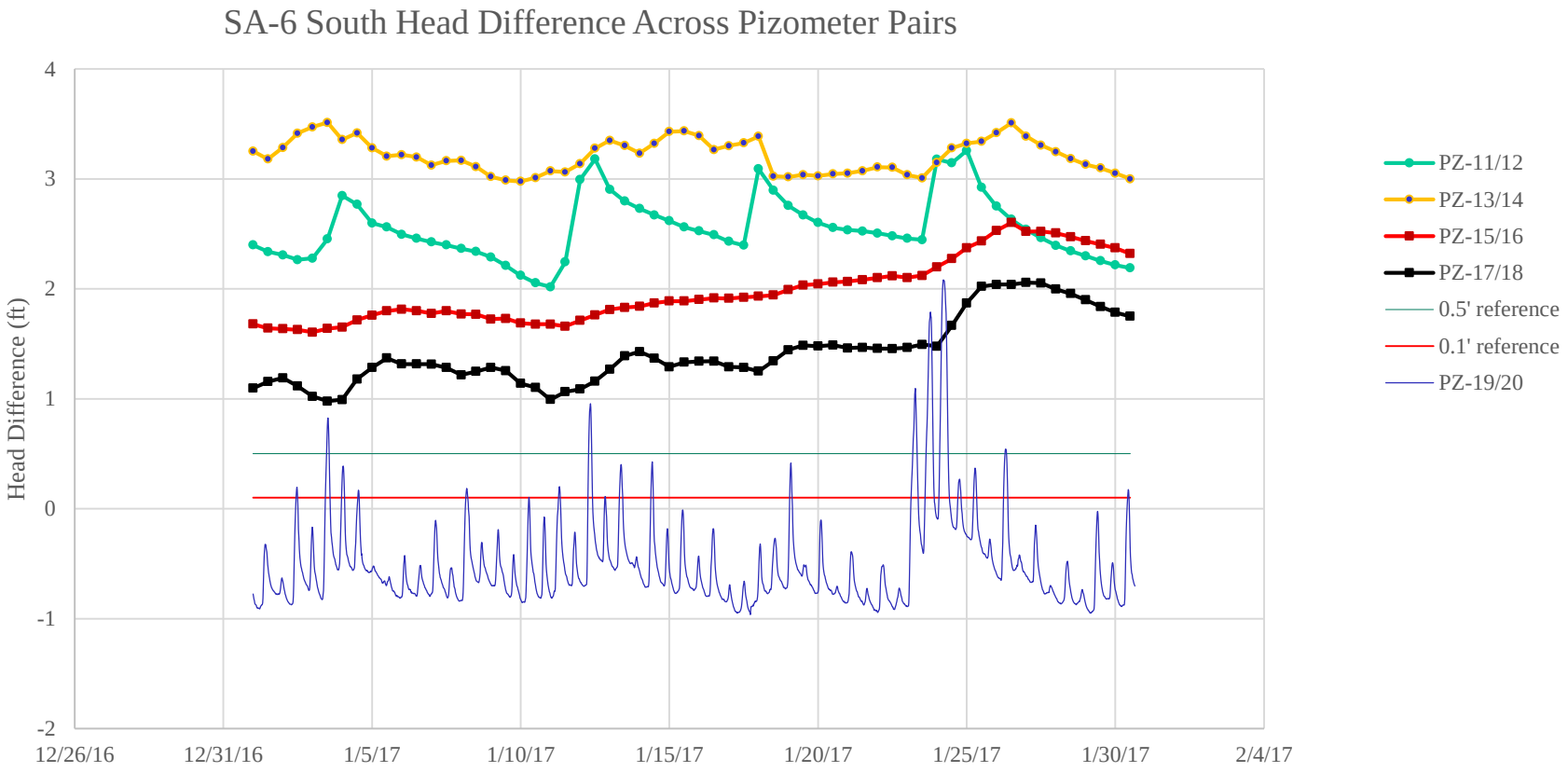


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs - January 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

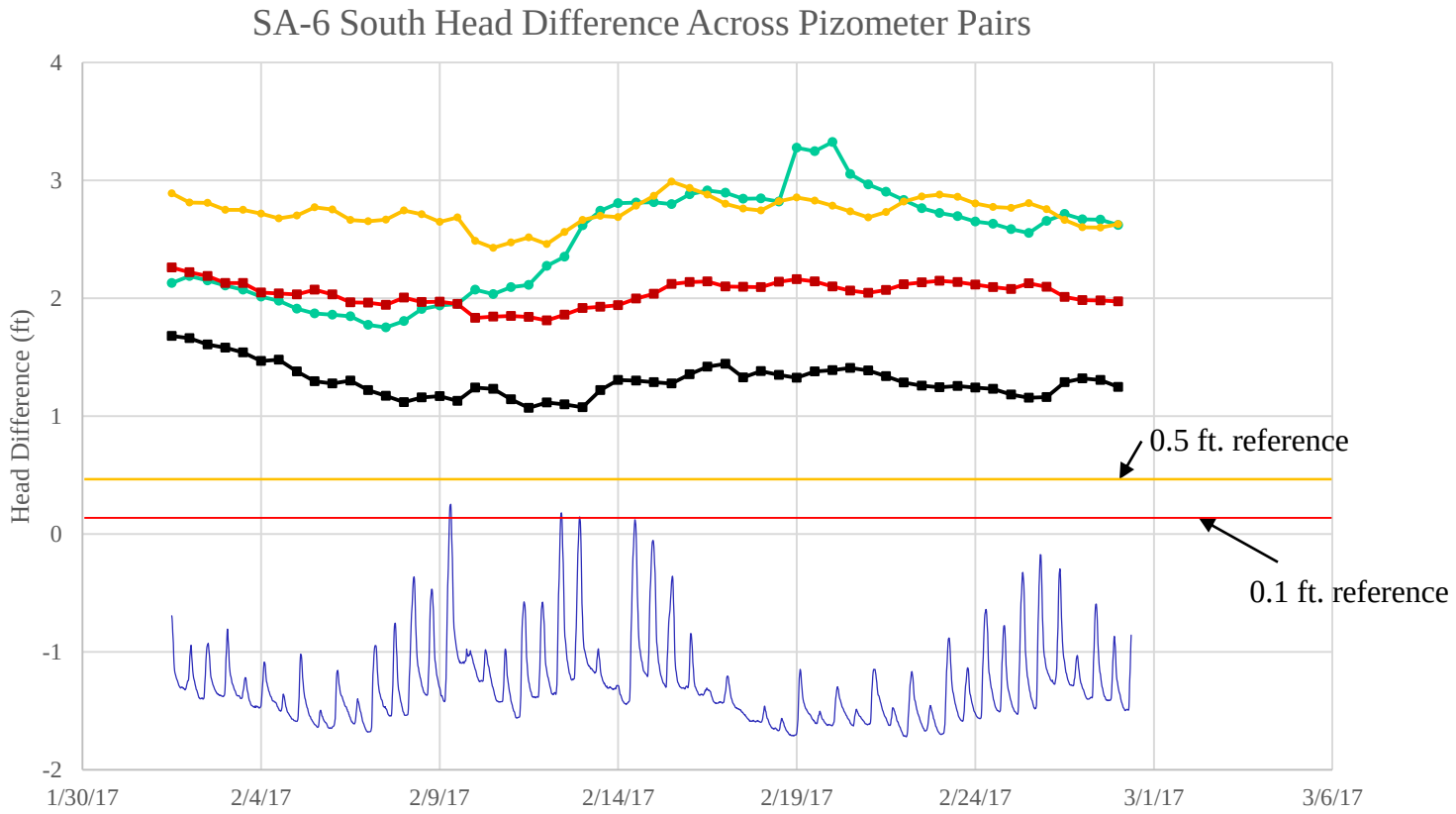


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs - February 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

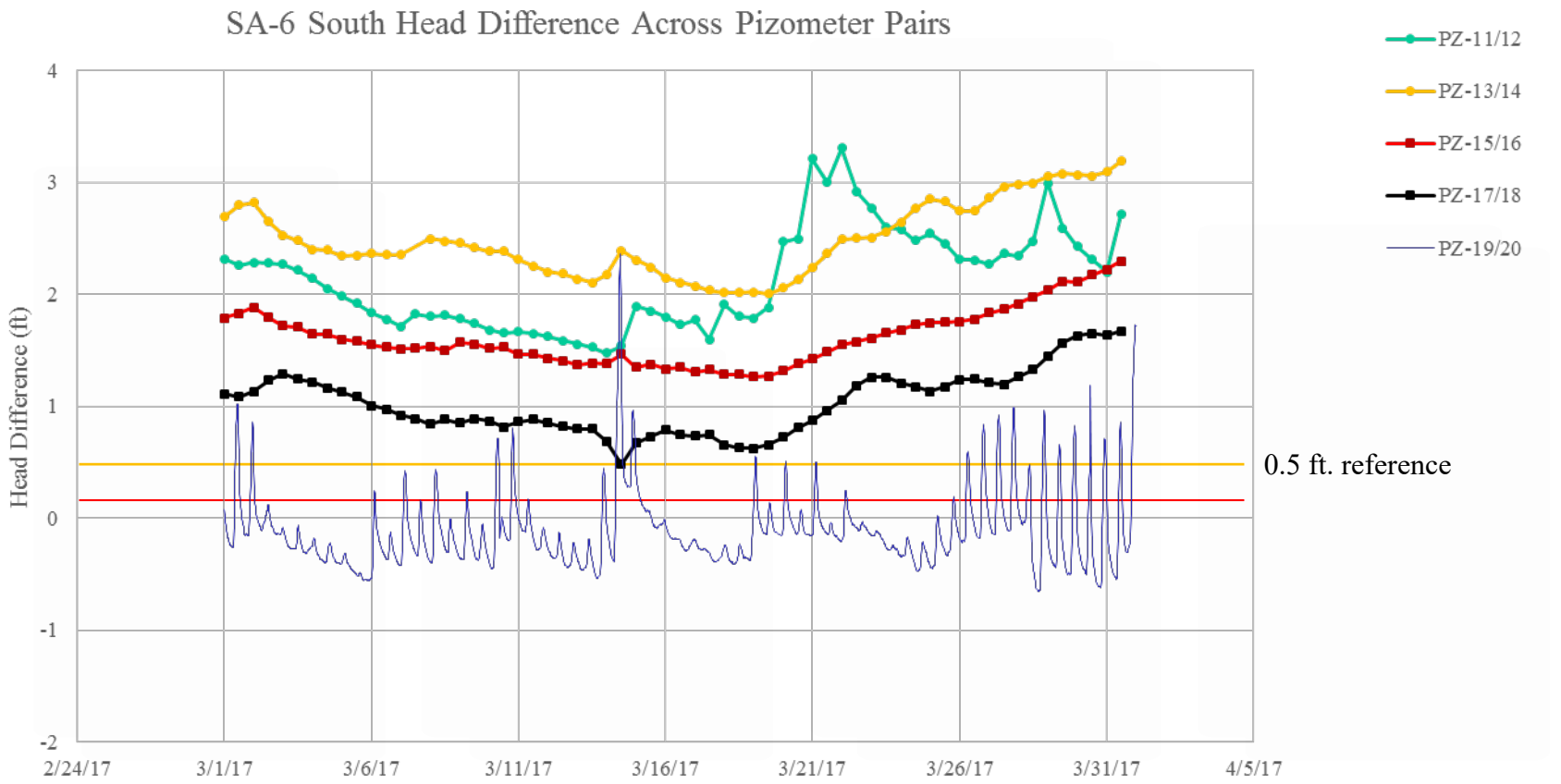


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs - March 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

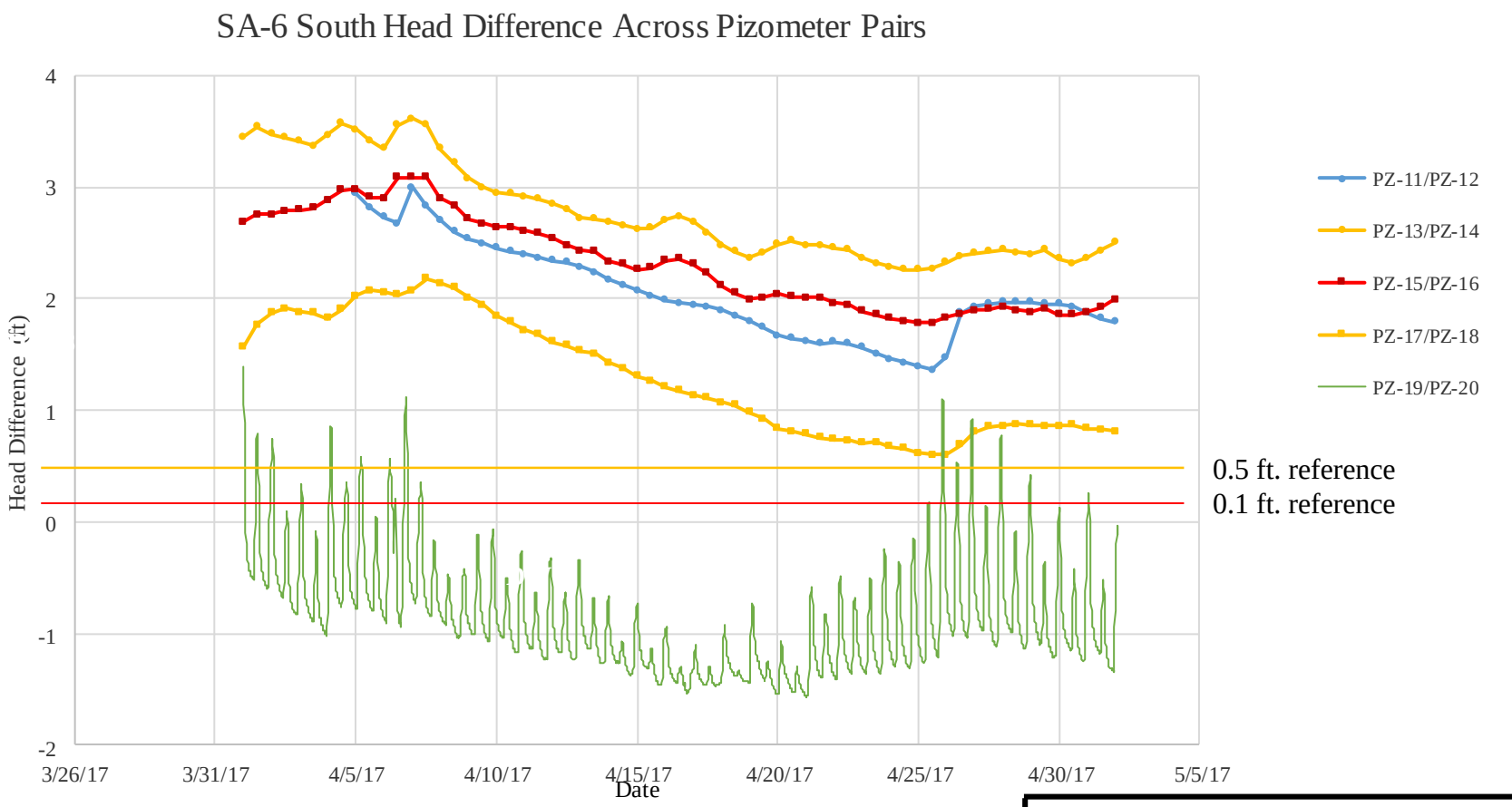


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs - April 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

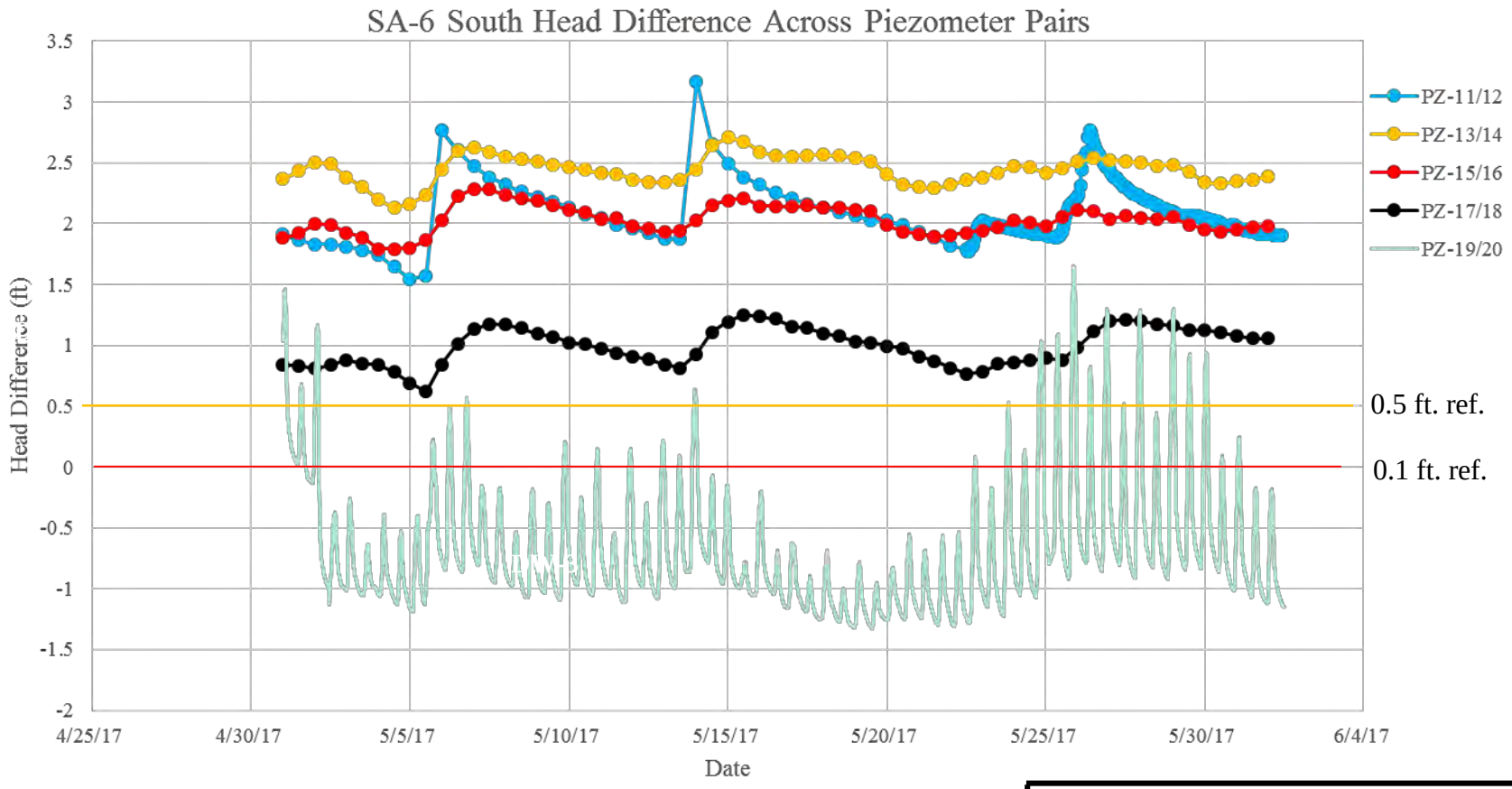


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – May 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

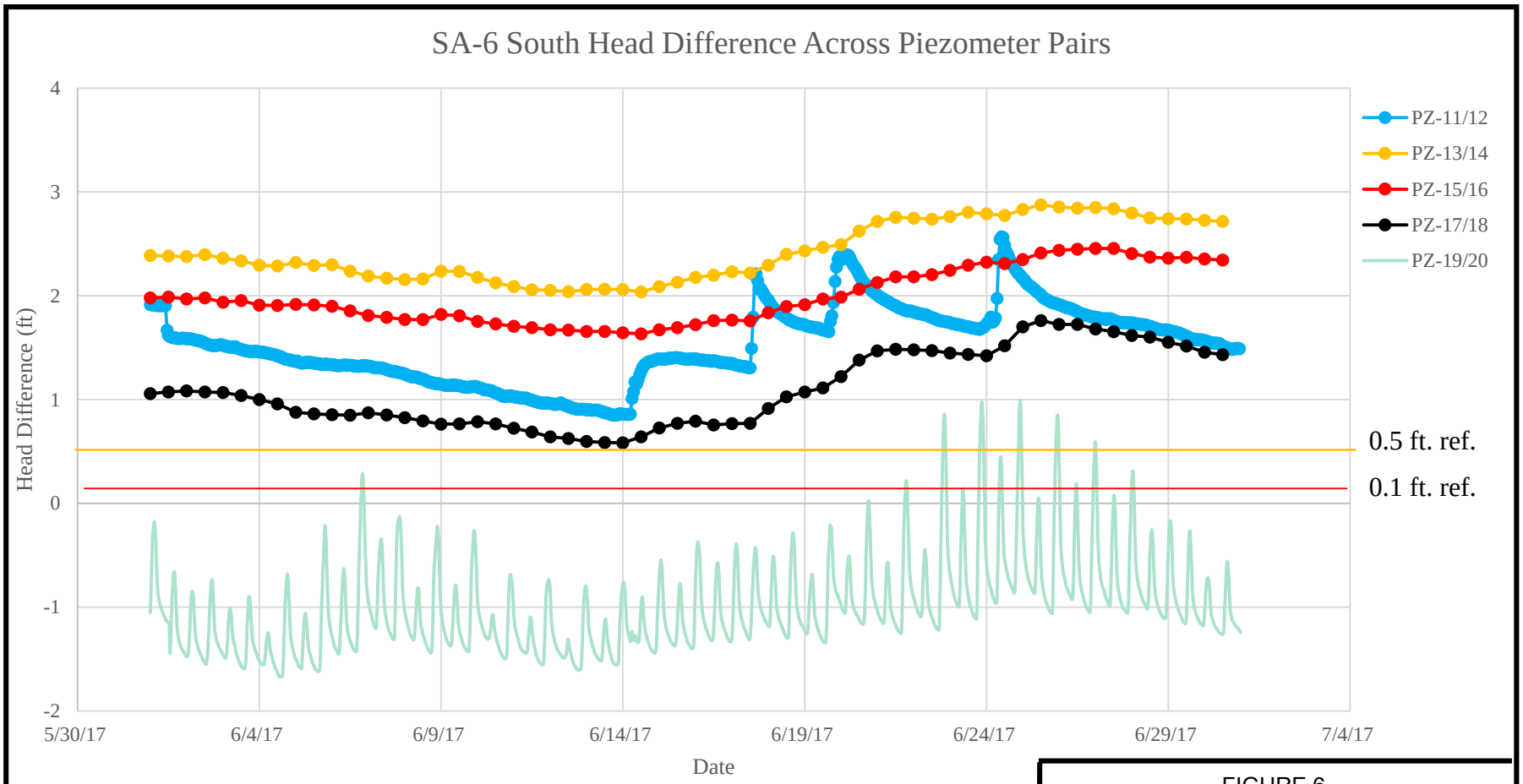


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – June 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

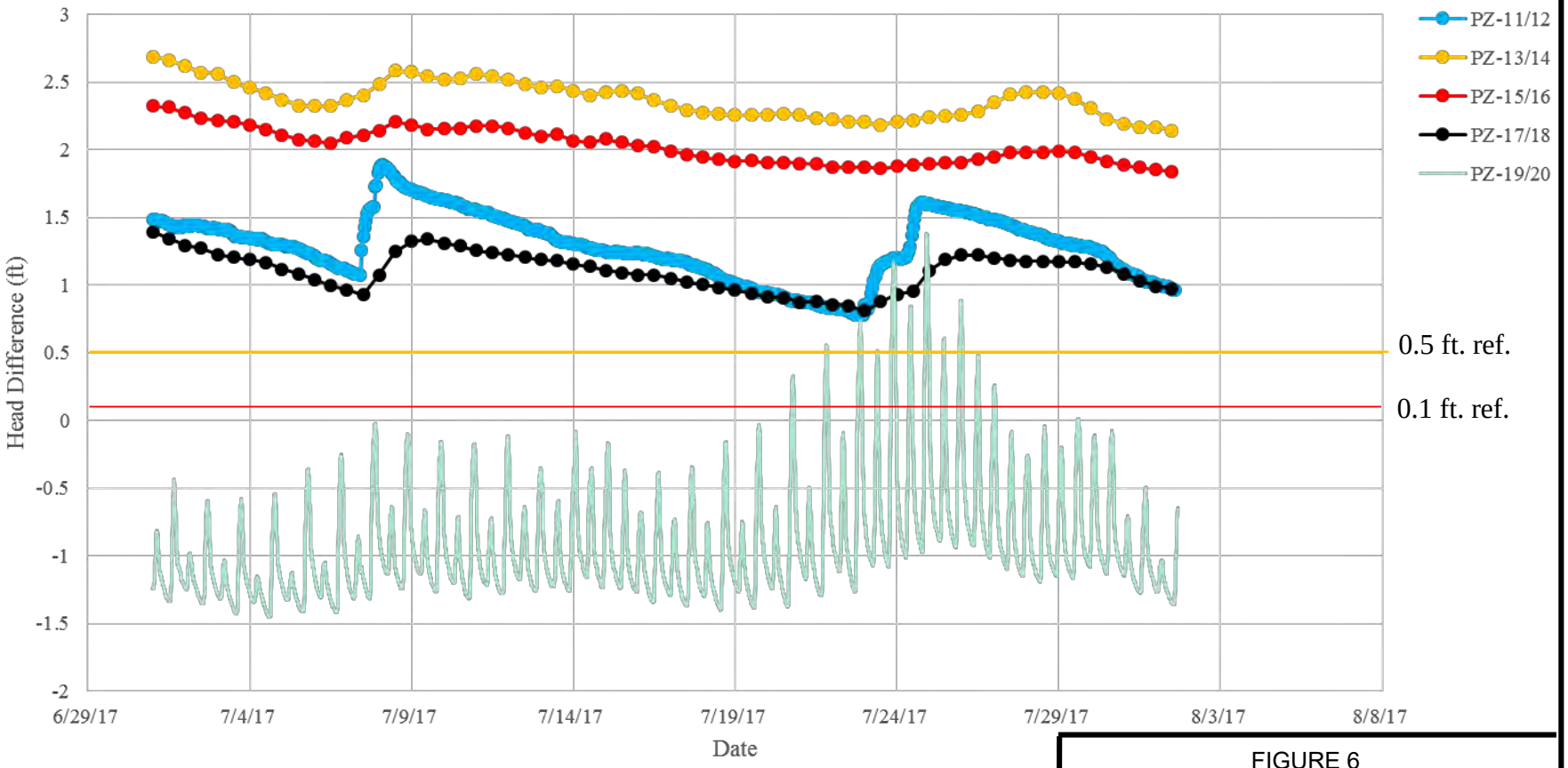


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – July 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

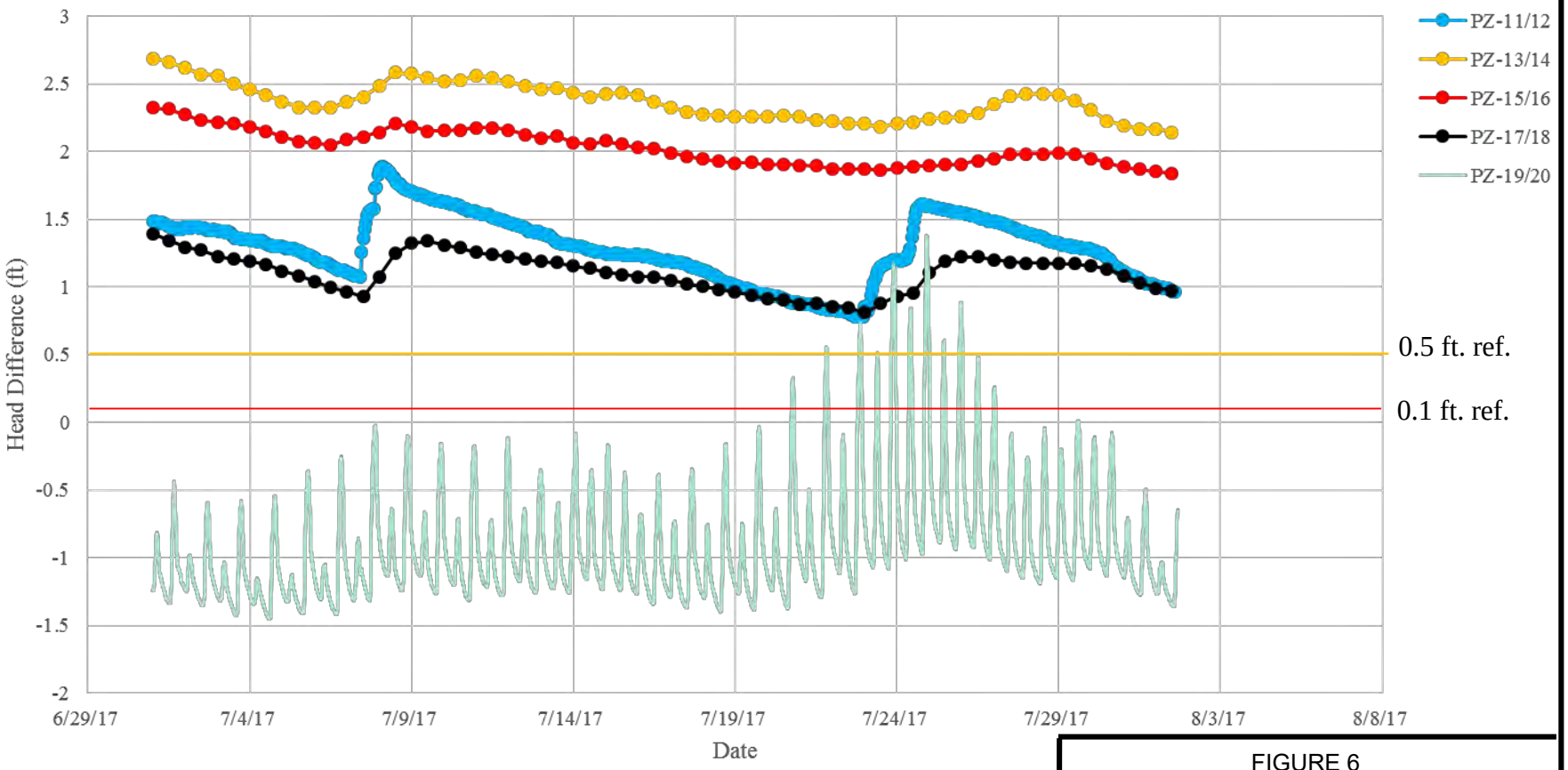


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – August 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

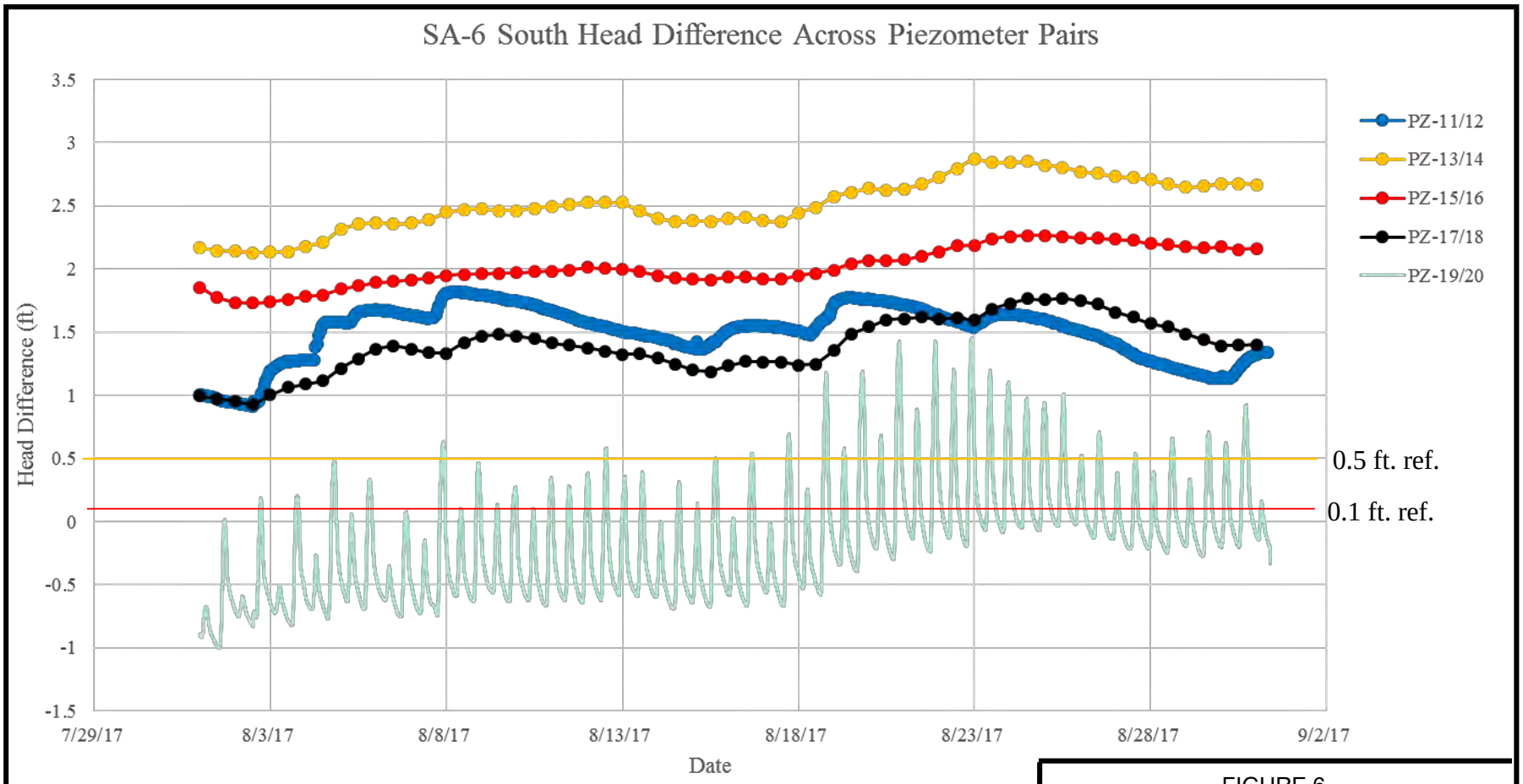


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – August 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

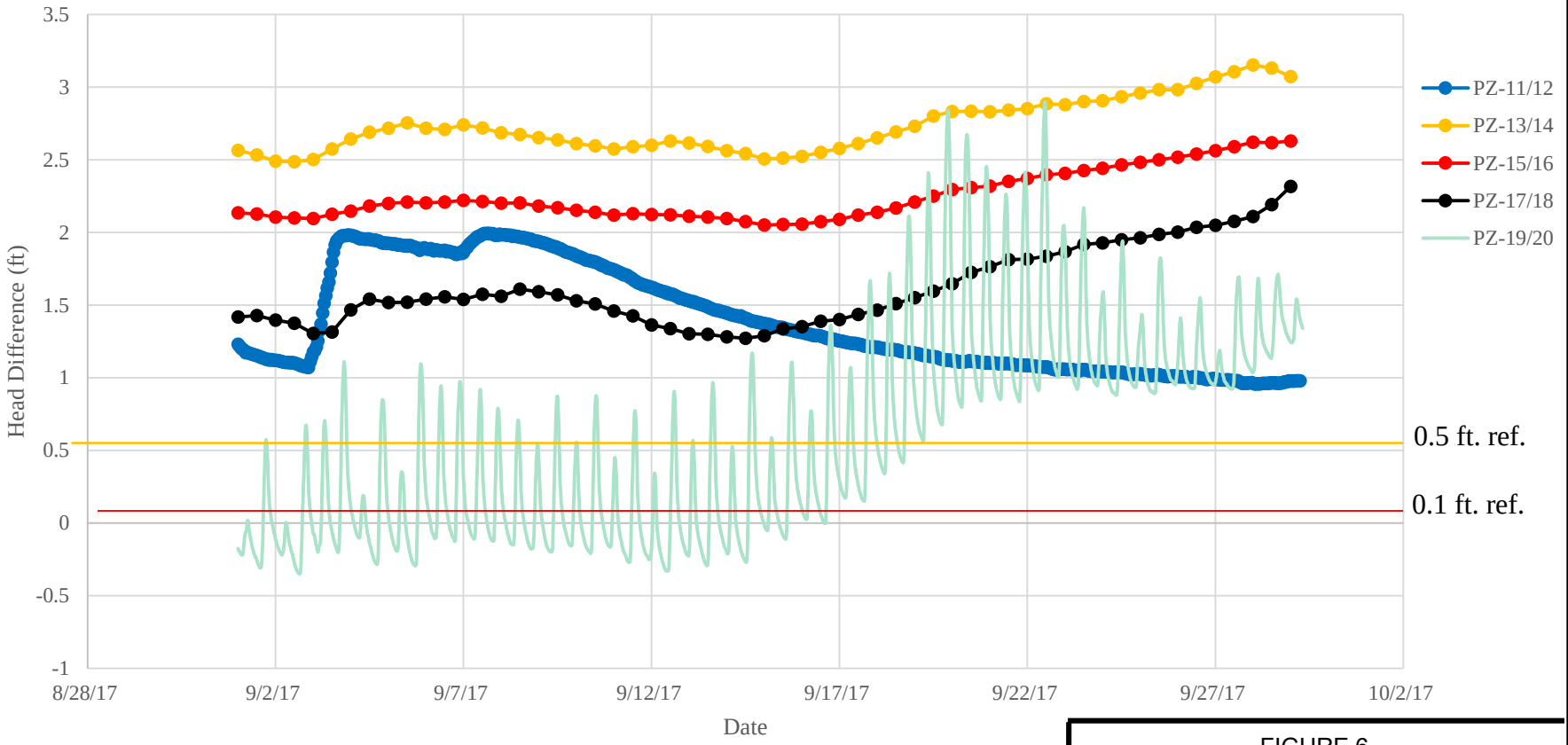


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – September 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

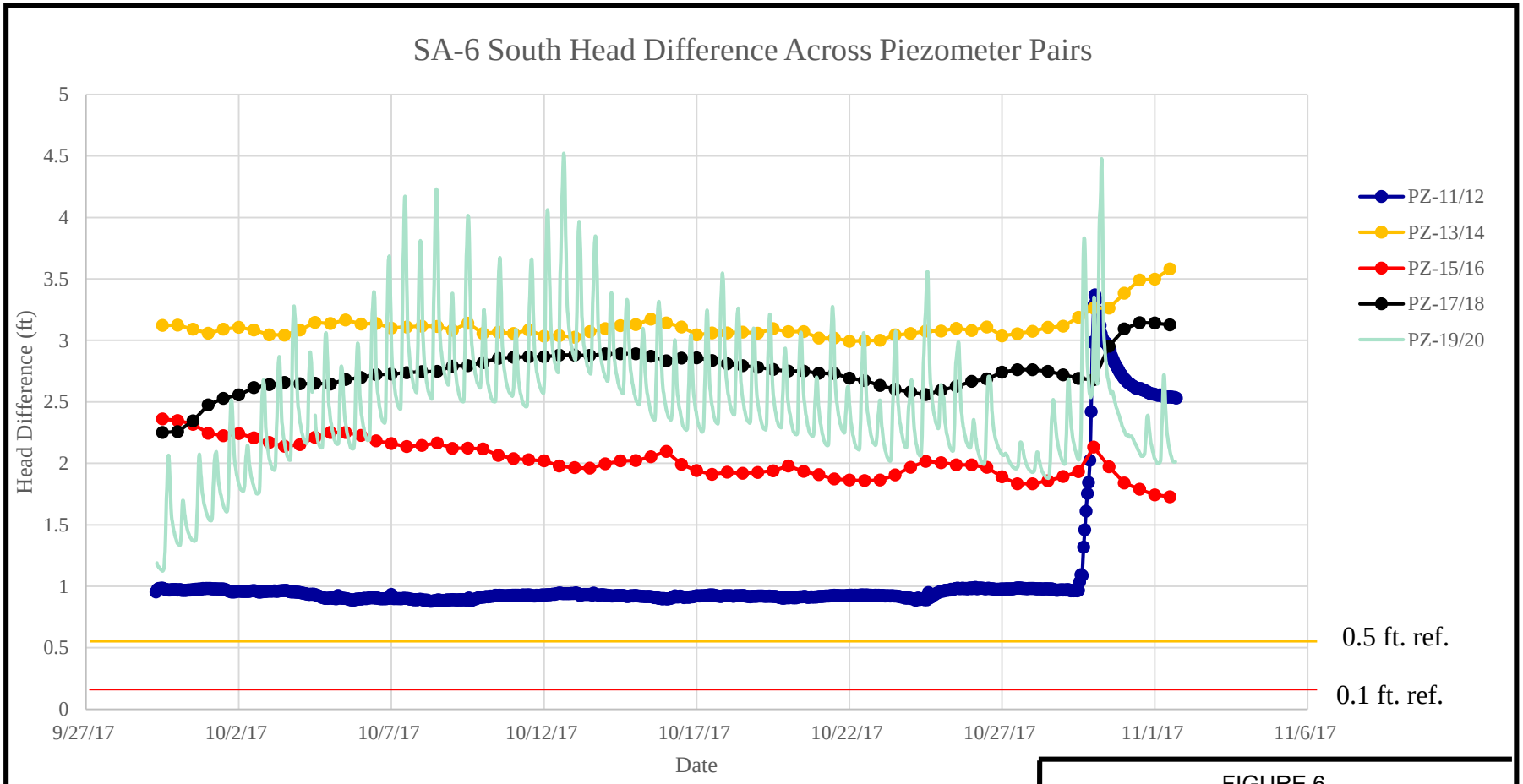


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – October 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

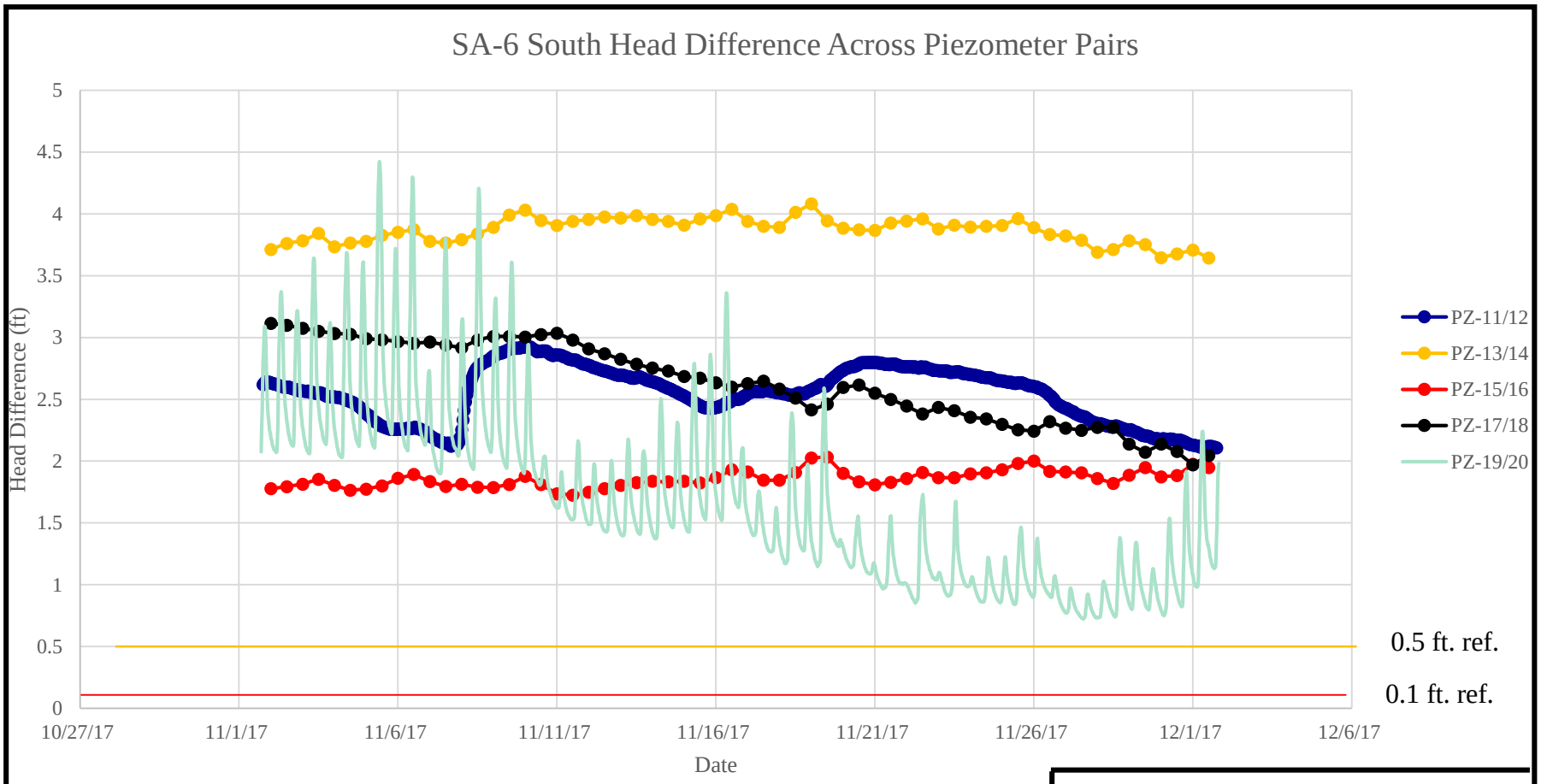


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – November 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

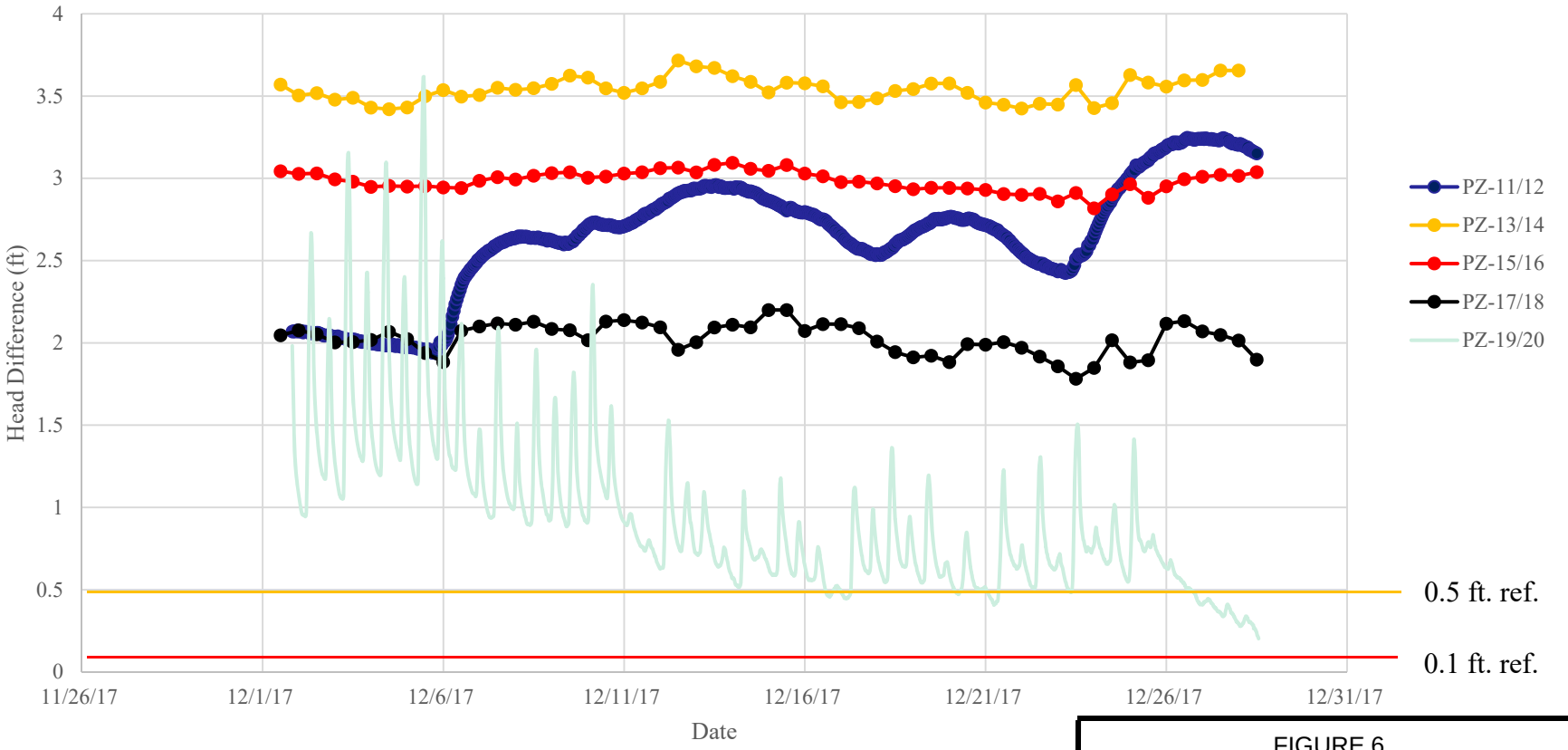


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – December 2017

Study Area 6, Jersey City, NJ

cornerstone environmental

APPENDIX D

DATA LOGGER HYDRGRAPHS FROM SA-5 NJCU

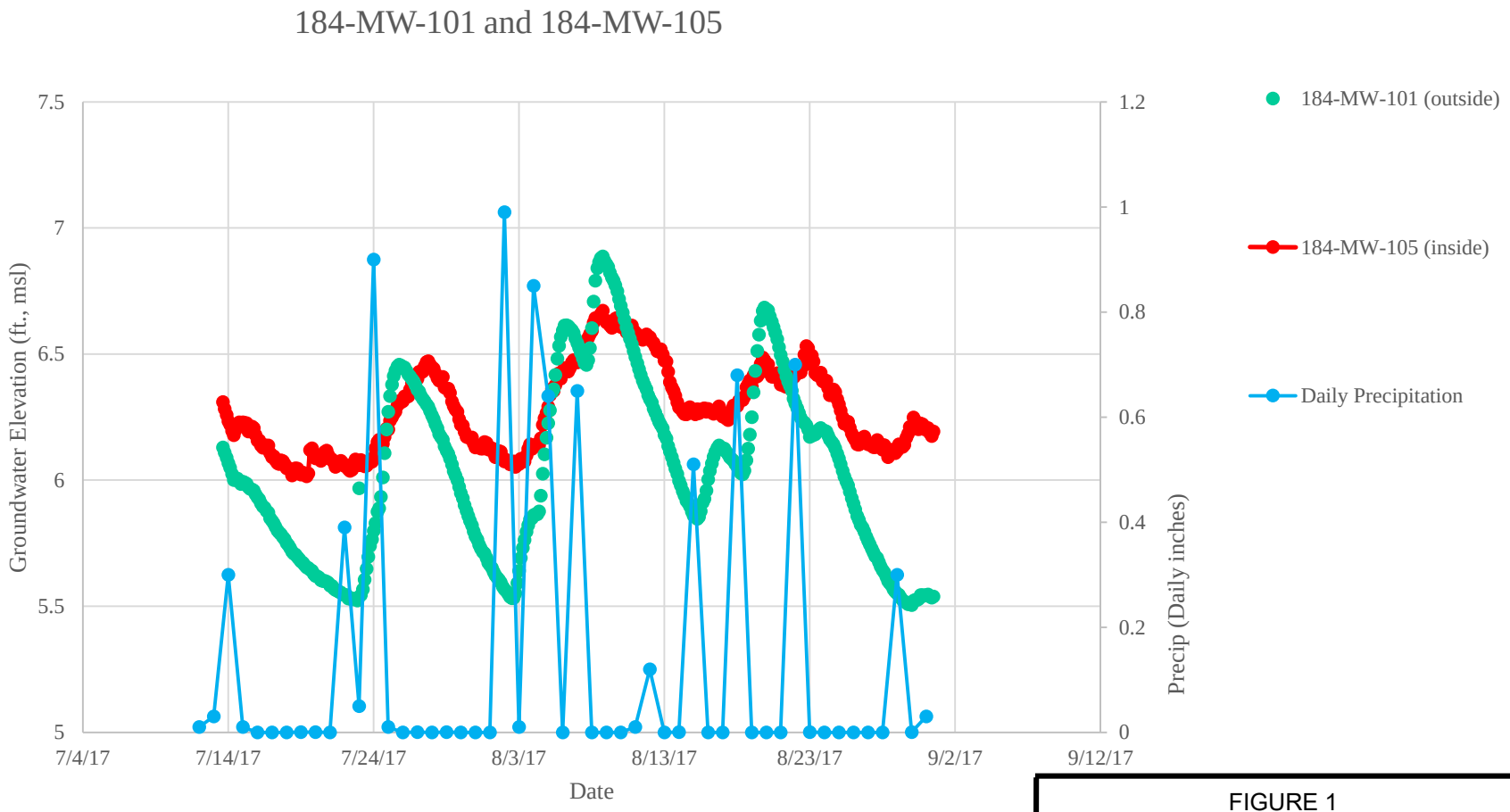


FIGURE 1

Hydrograph of Piezometer Pair
MW-101 and MW-105
August 2017

NJCU, Jersey City, NJ

cornerstone environmental

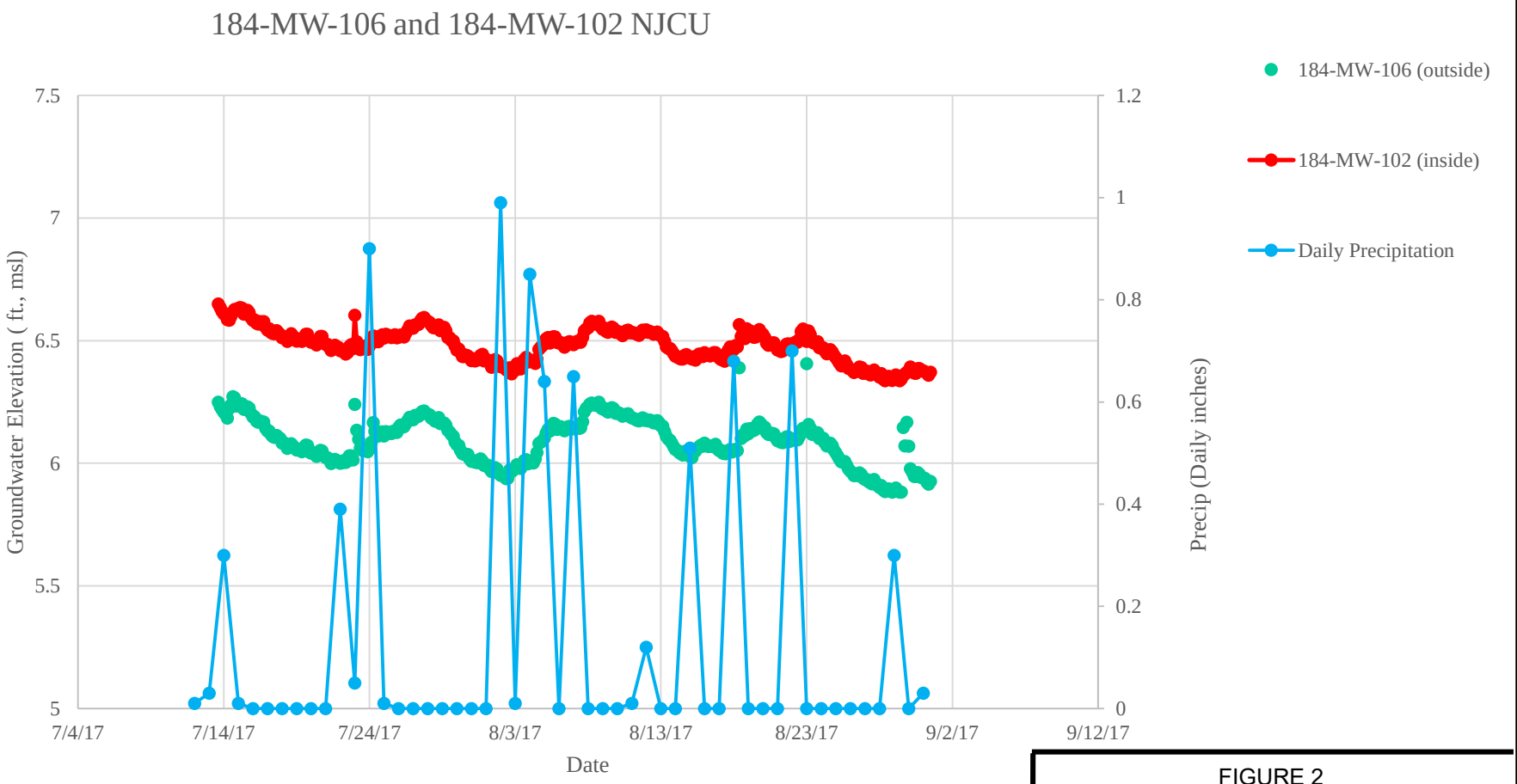


FIGURE 2

Hydrograph of Piezometer Pair
MW-102 and MW-106
August 2017

NJCU, Jersey City, NJ

cornerstone environmental

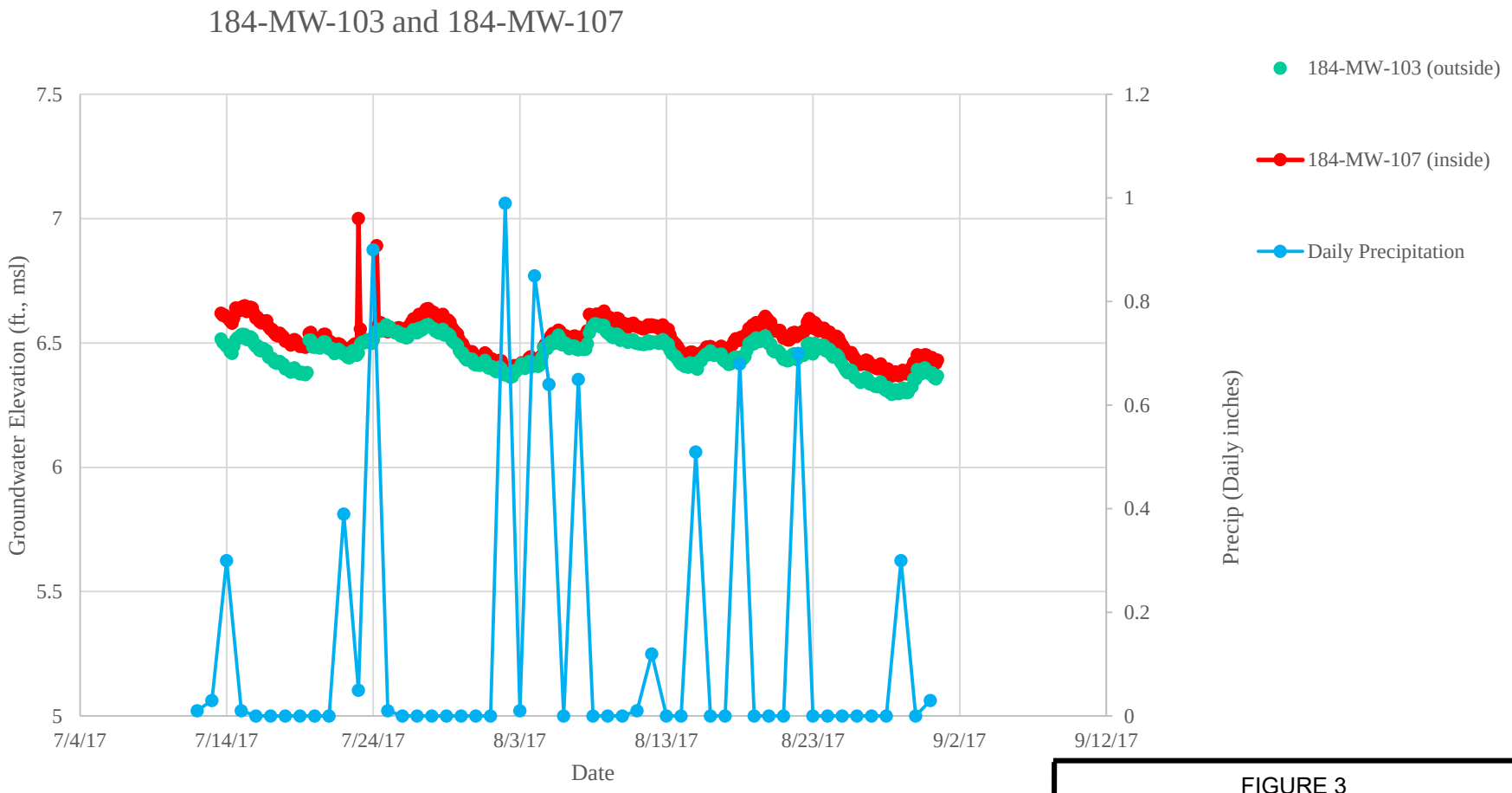


FIGURE 3

Hydrograph of Piezometer Pair
MW-103 and MW-107
August 2017

NJCU, Jersey City, NJ

cornerstone environmental

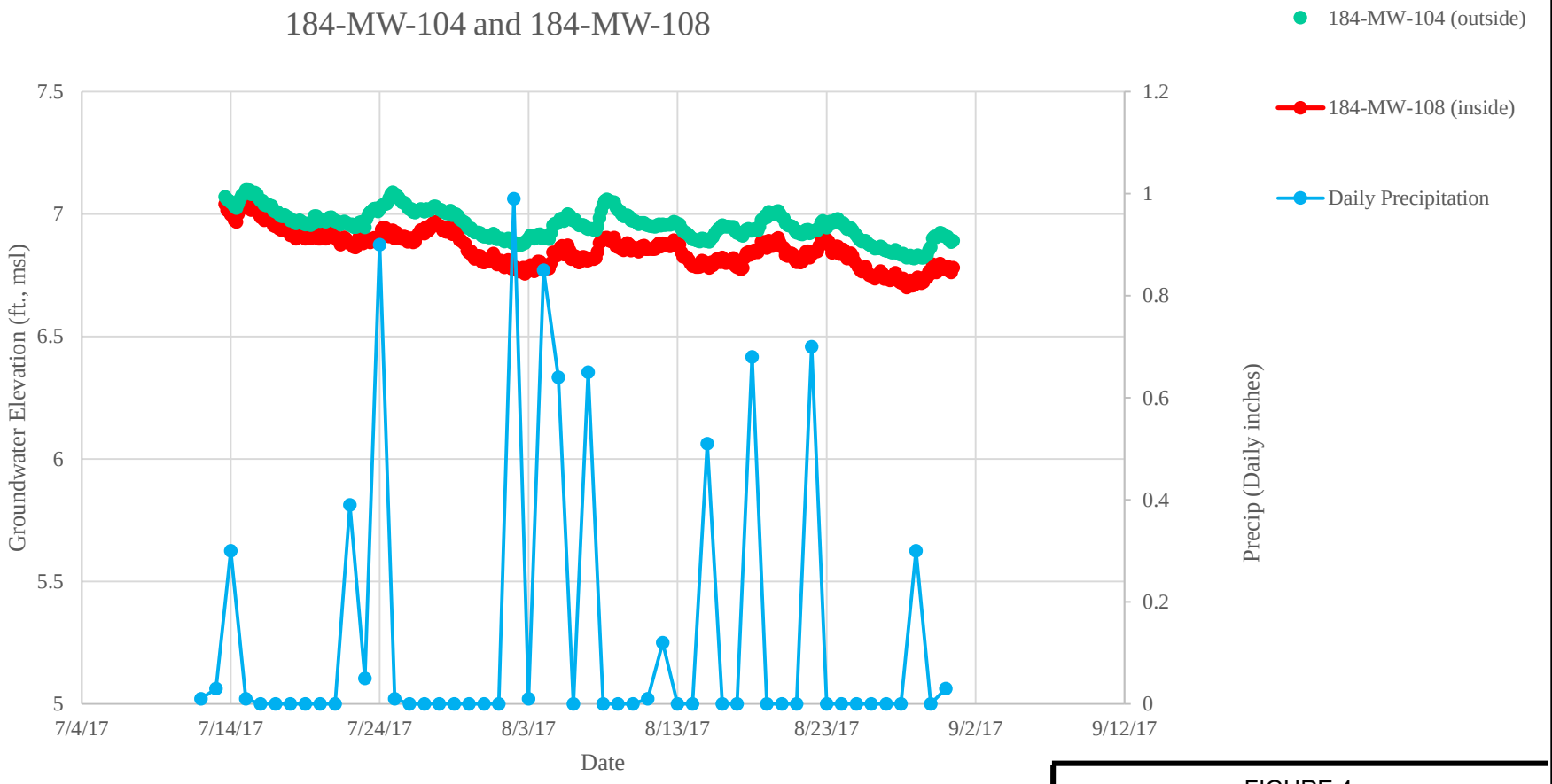


FIGURE 4

Hydrograph of Piezometer Pair
MW-104 and MW-108
August 2017

NJCU, Jersey City, NJ

cornerstone environmental

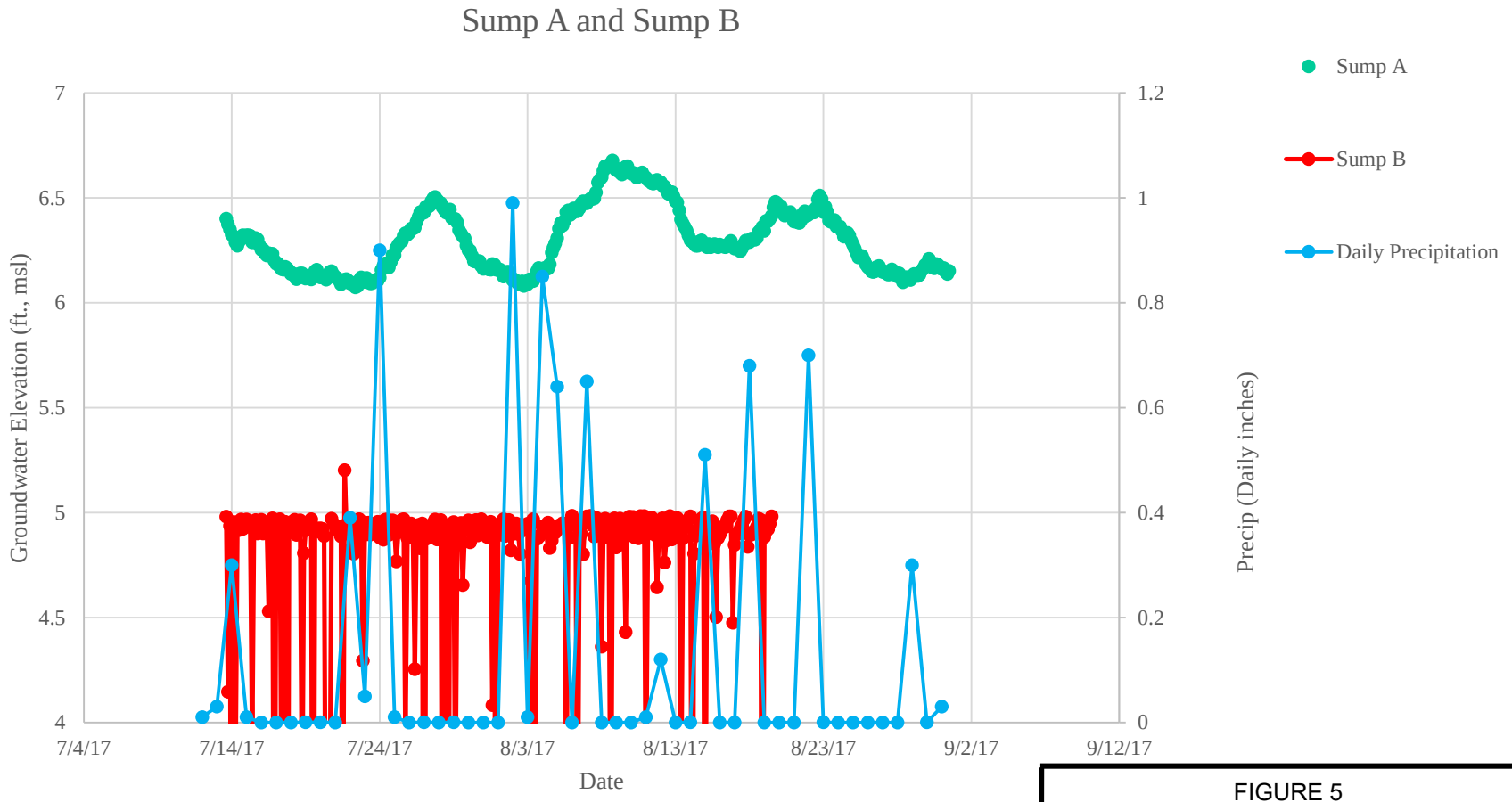


FIGURE 5

Hydrograph of Sump A and Sump B
August 2017

NJCU, Jersey City, NJ

cornerstone environmental

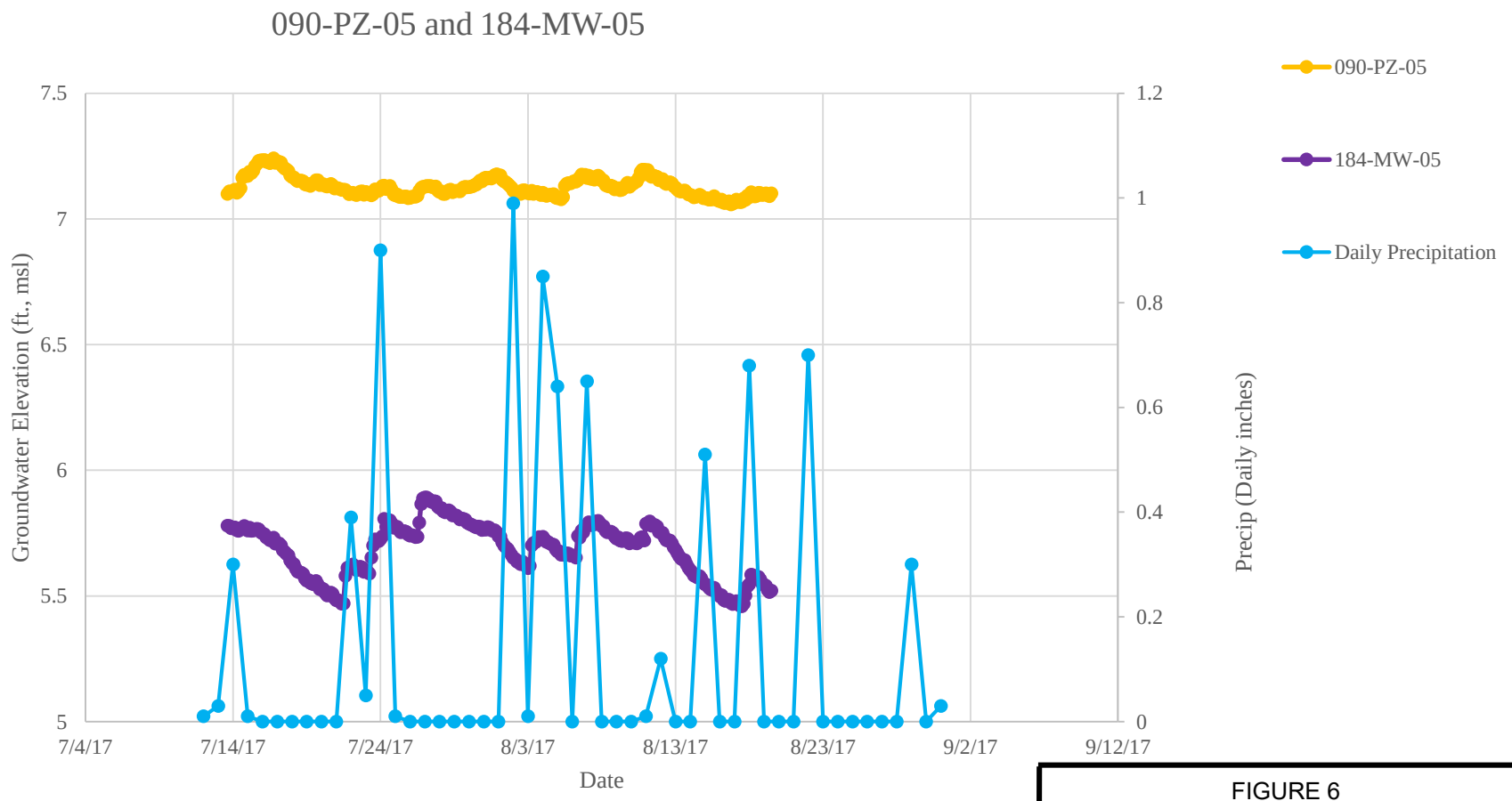


FIGURE 6

Hydrograph of Wells
PZ-05 and MW-05
August 2017

NJCU, Jersey City, NJ

cornerstone environmental

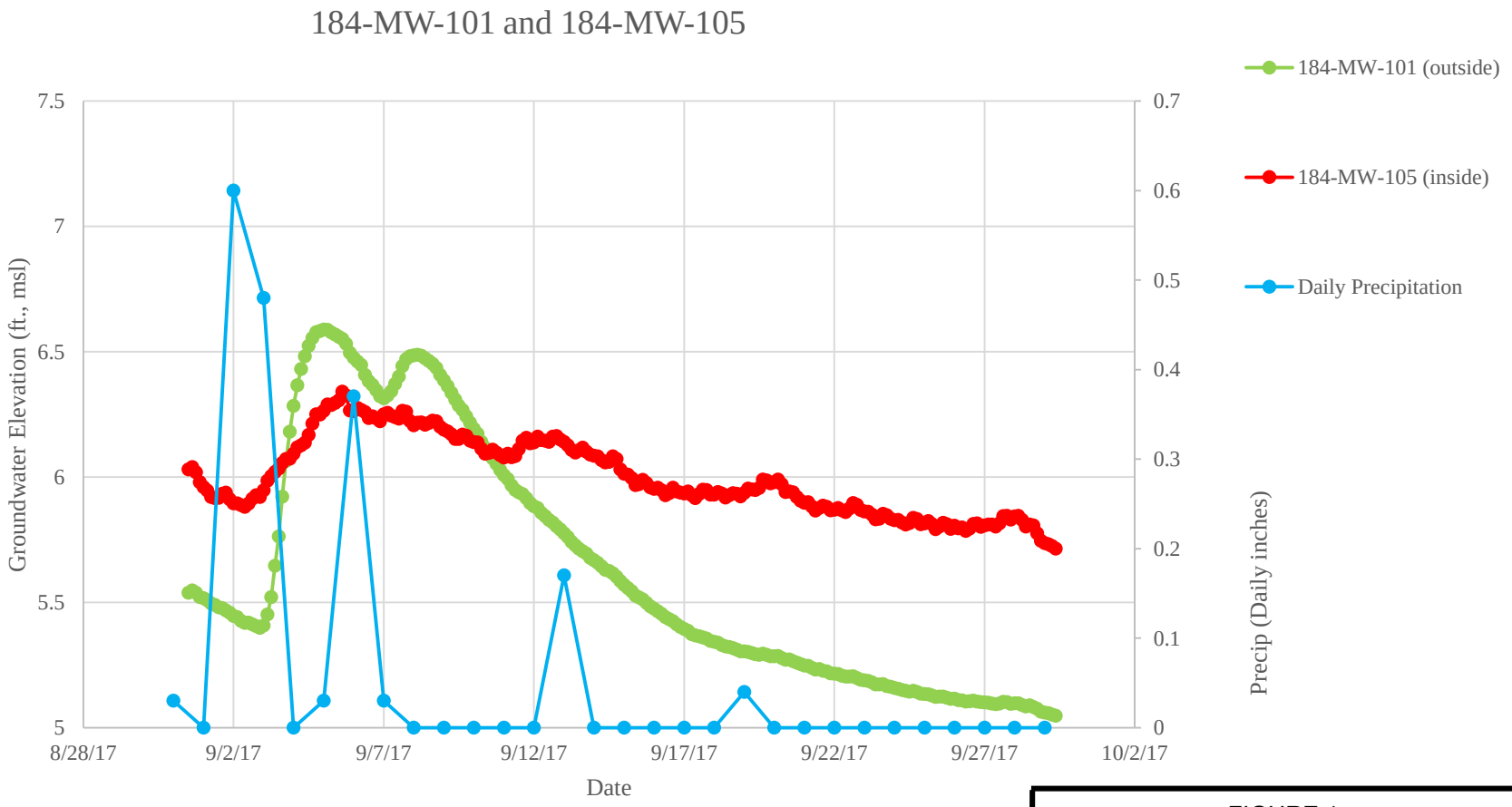


FIGURE 1

Hydrograph of Piezometer Pair
MW-101 and MW-105
September 2017

NJCU, Jersey City, NJ

cornerstone environmental

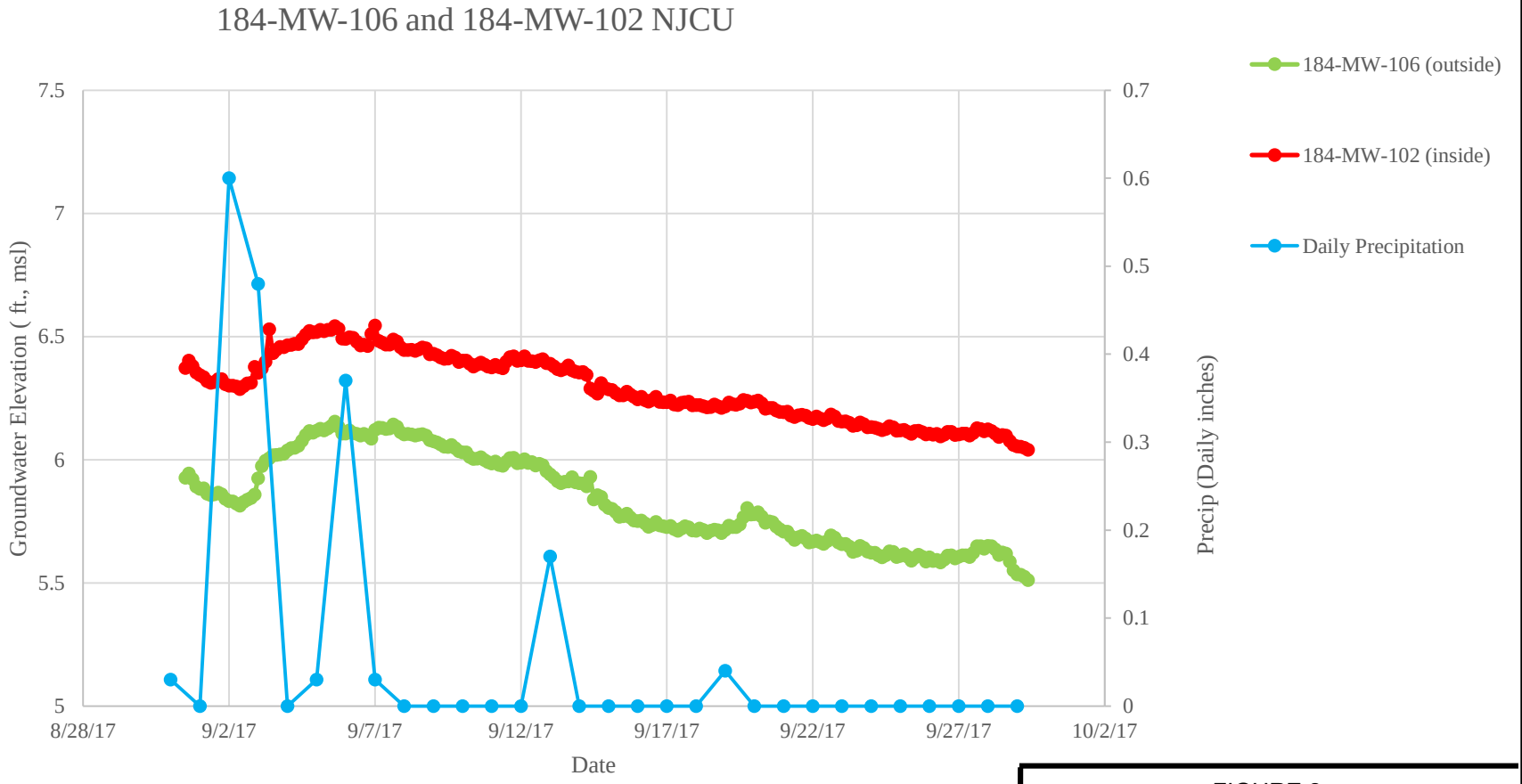


FIGURE 2

Hydrograph of Piezometer Pair
MW-102 and MW-106
September 2017

NJCU, Jersey City, NJ

cornerstone environmental

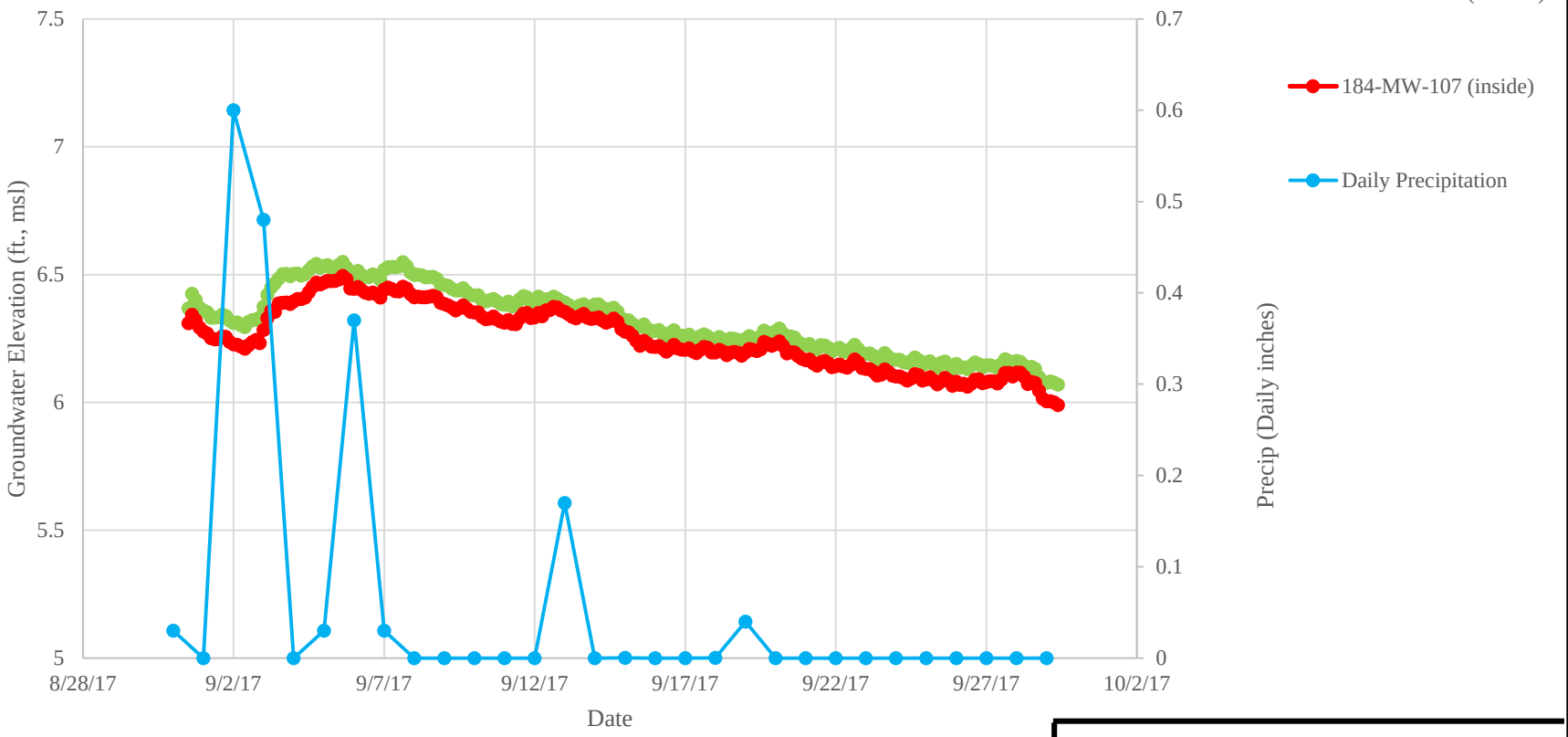


FIGURE 3

Hydrograph of Piezometer Pair
MW-103 and MW-107
September 2017

NJCU, Jersey City, NJ

cornerstone environmental

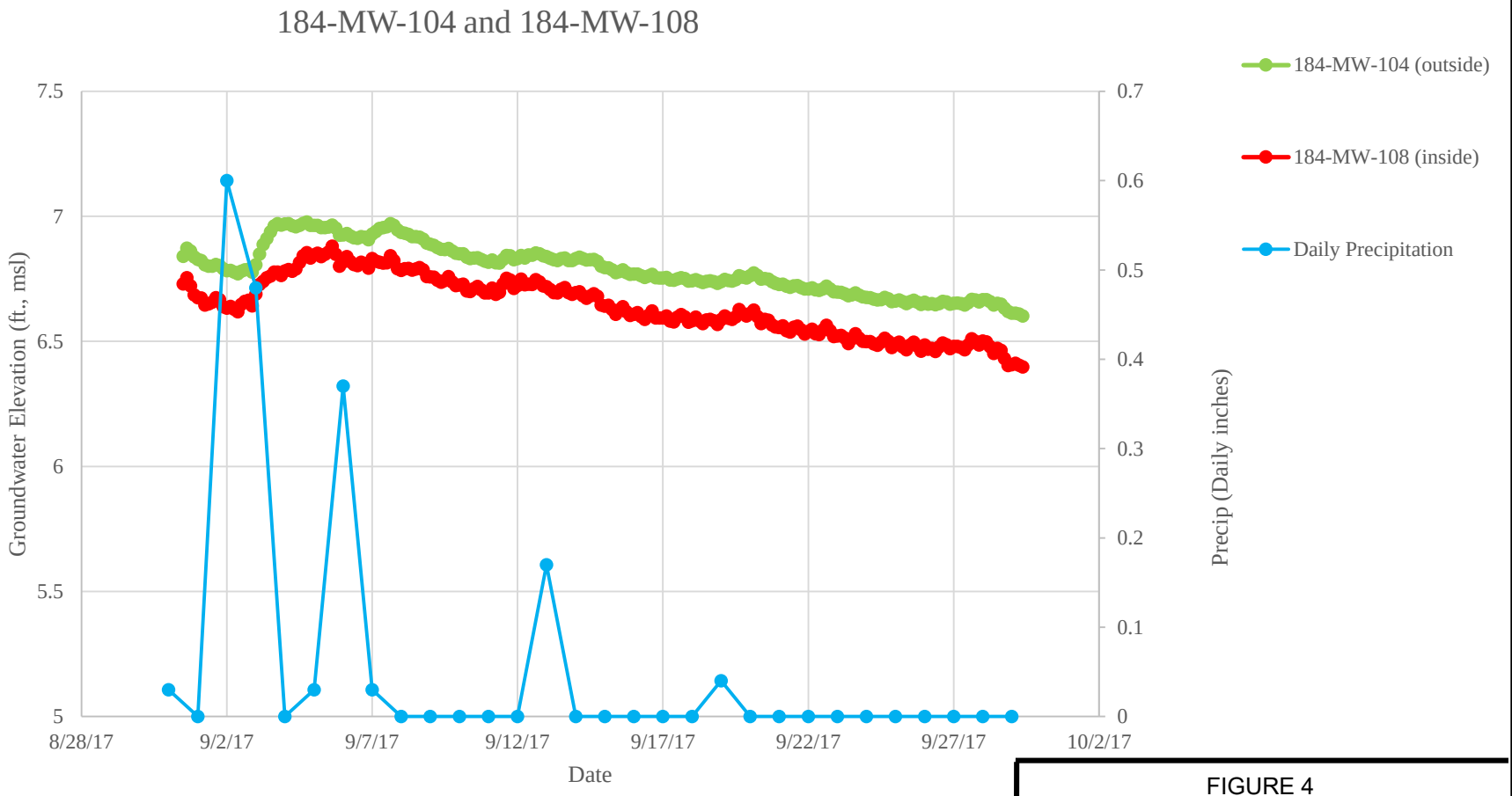


FIGURE 4

Hydrograph of Piezometer Pair
MW-104 and MW-108
September 2017

NJCU, Jersey City, NJ

cornerstone environmental

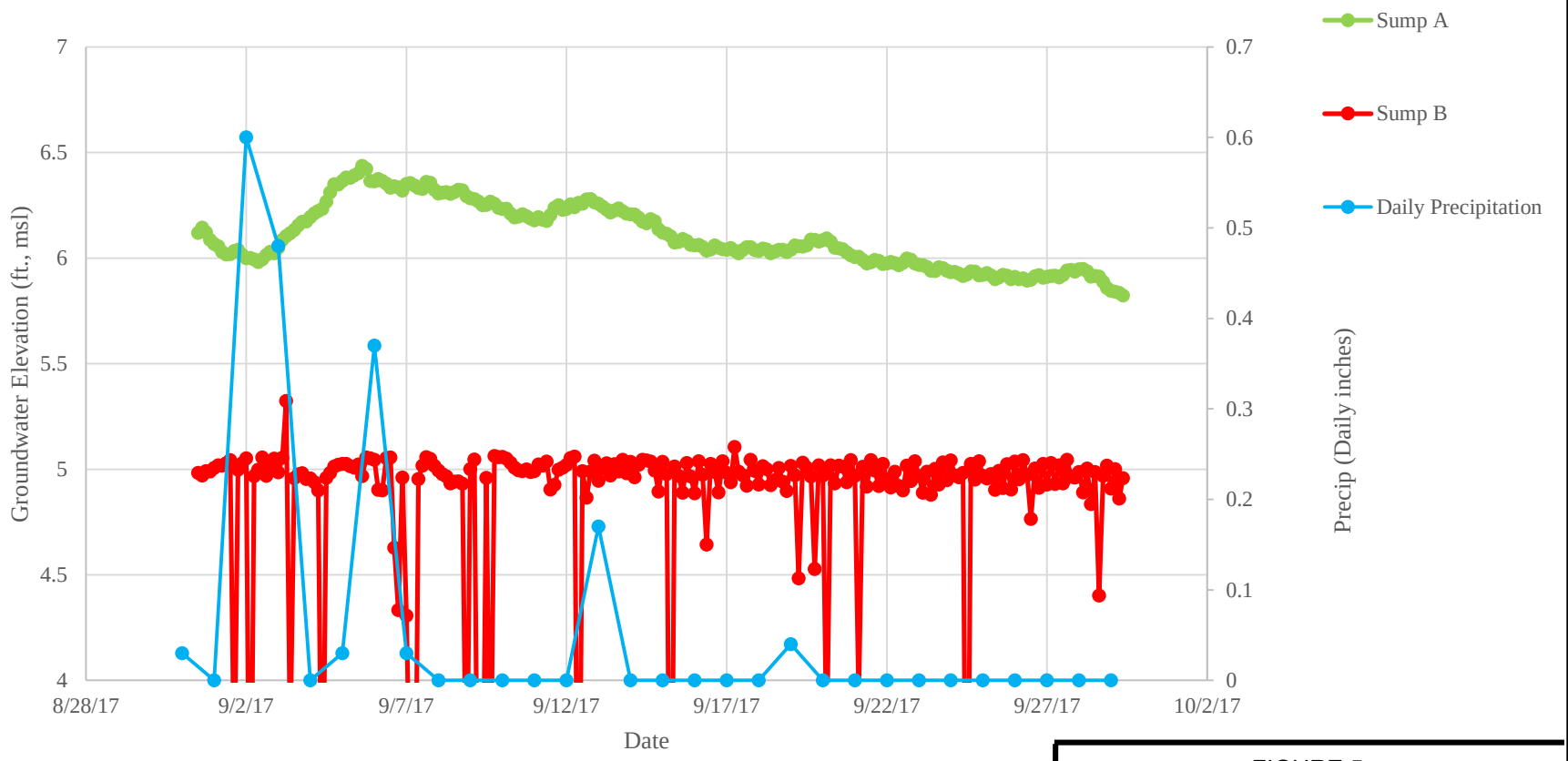


FIGURE 5

Hydrograph of Sump A and Sump B
September 2017

NJCU, Jersey City, NJ

cornerstone environmental

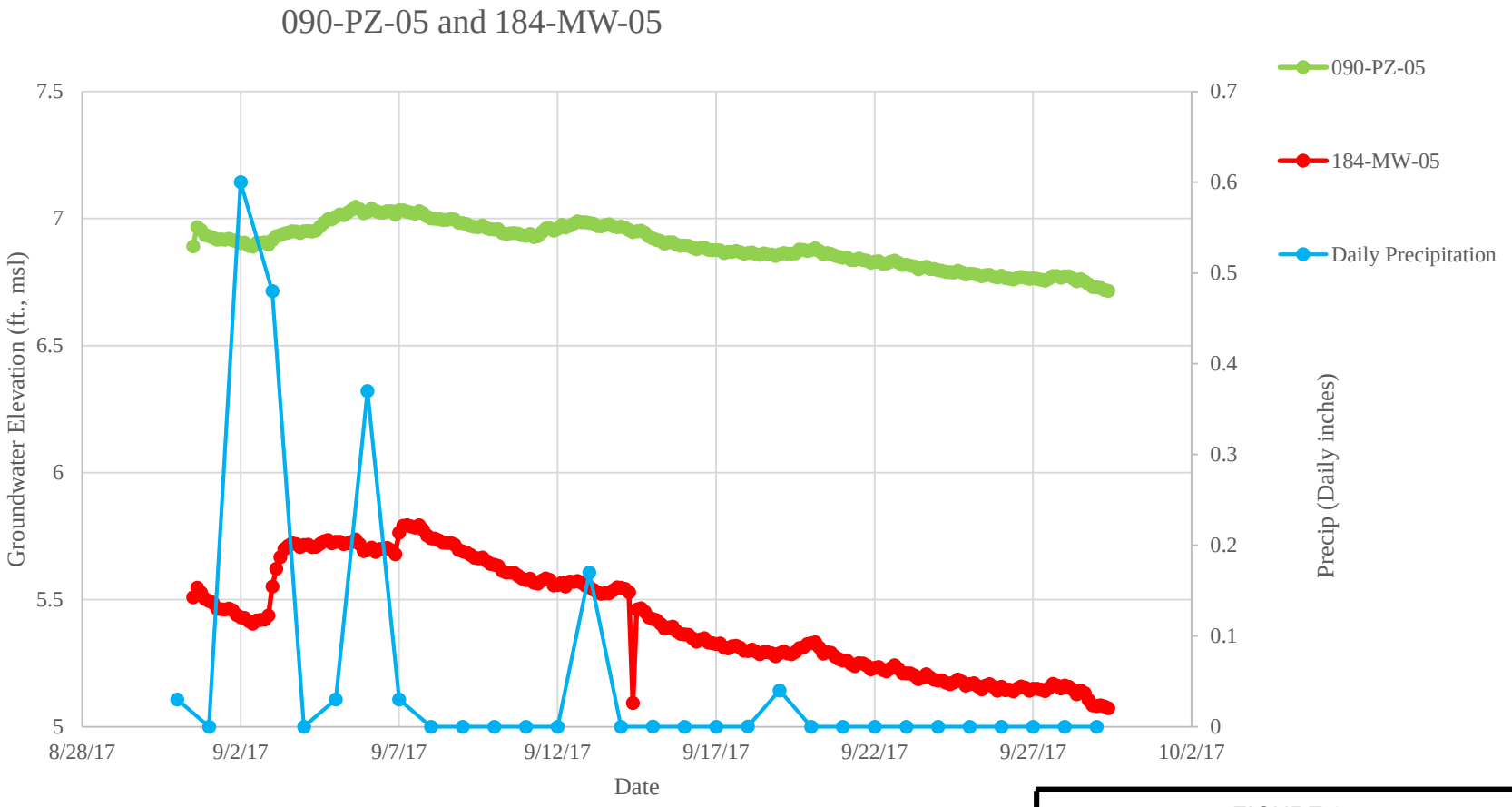


FIGURE 6

Hydrograph of Wells
PZ-05 and MW-05
September 2017

NJCU, Jersey City, NJ

cornerstone environmental

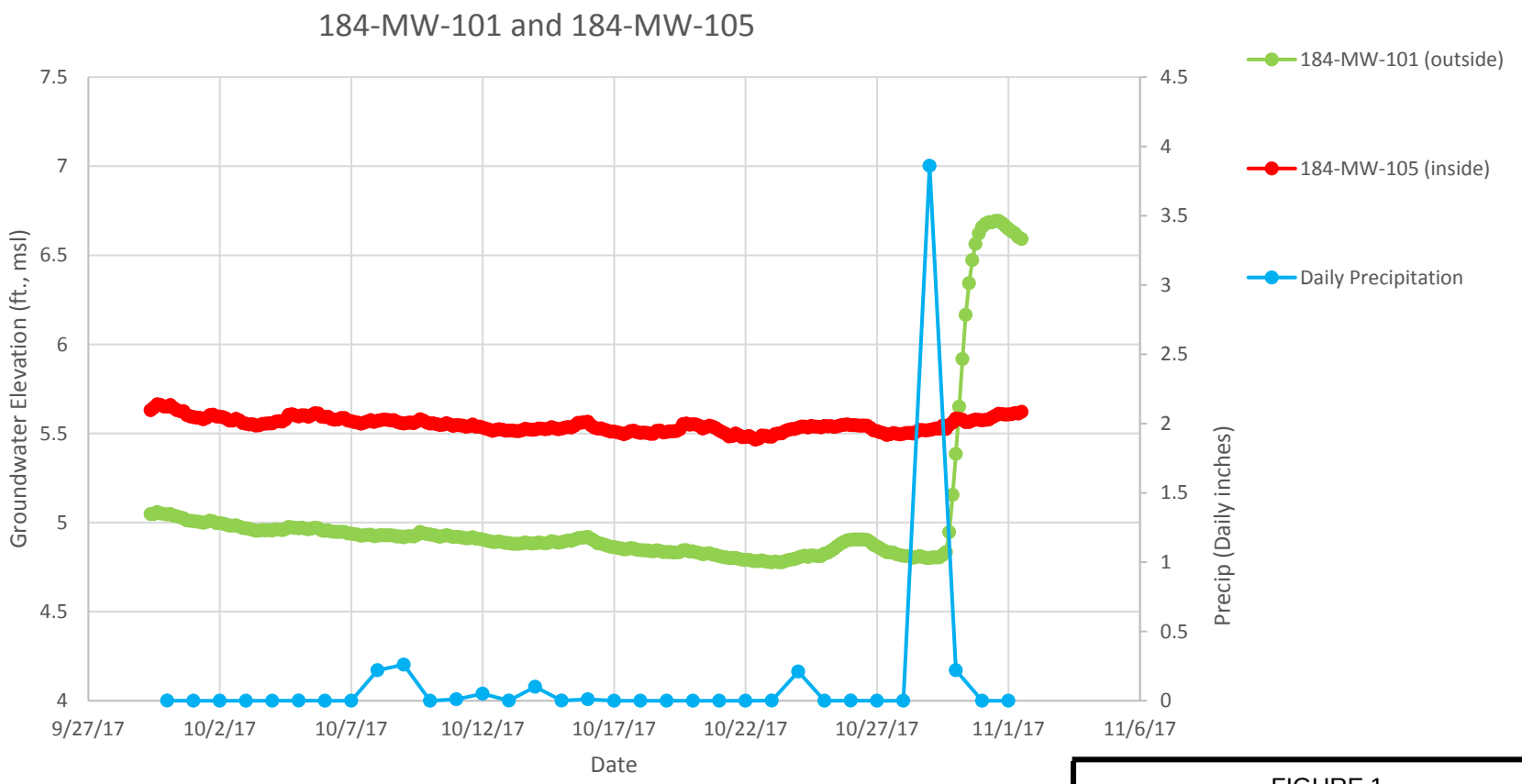


FIGURE 1

Hydrograph of Piezometer Pair
MW-101 and MW-105
October 2017

NJCU, Jersey City, NJ

cornerstone environmental

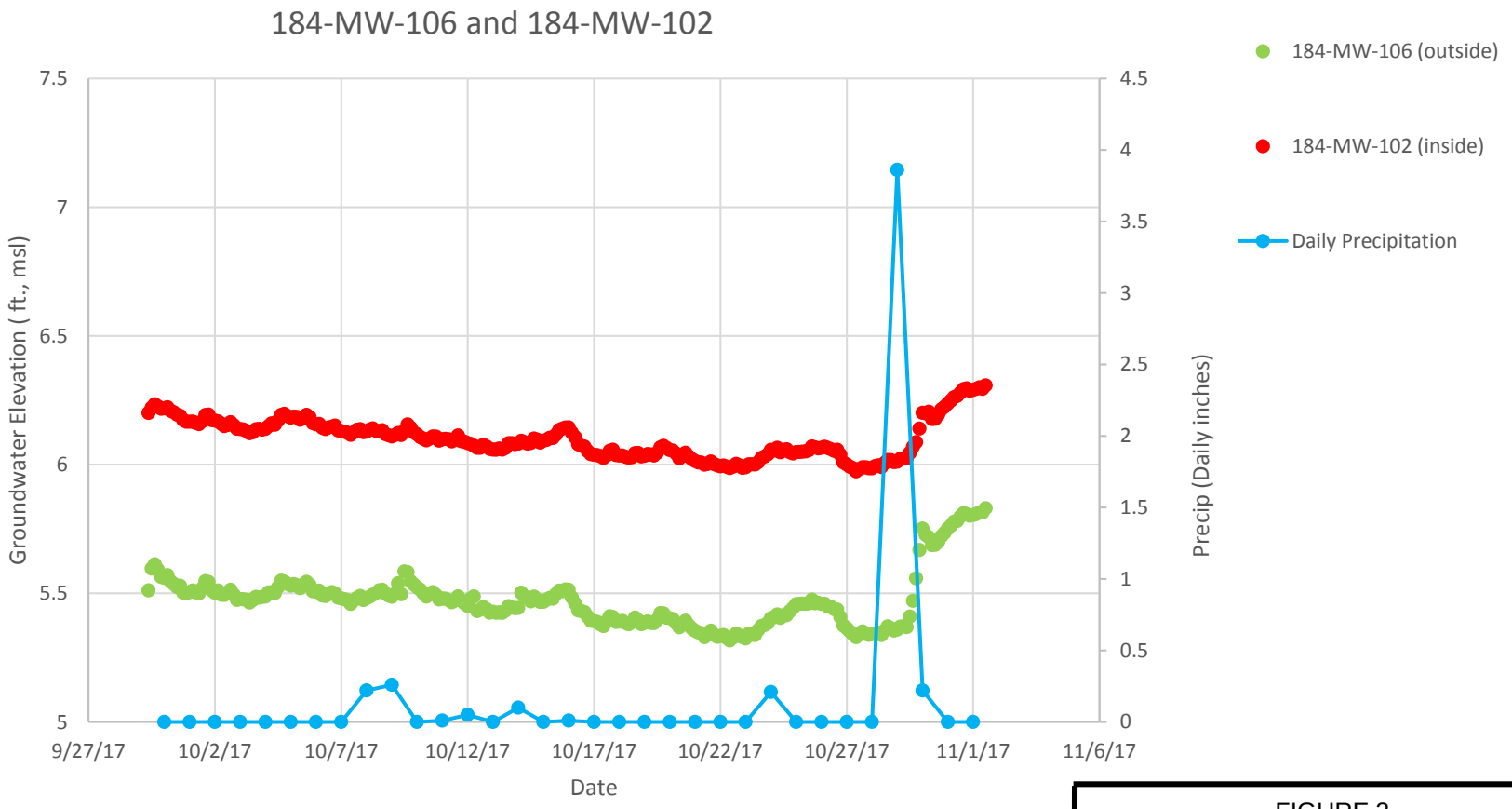


FIGURE 2

Hydrograph of Piezometer Pair
MW-102 and MW-106
October 2017

NJCU, Jersey City, NJ

cornerstone environmental

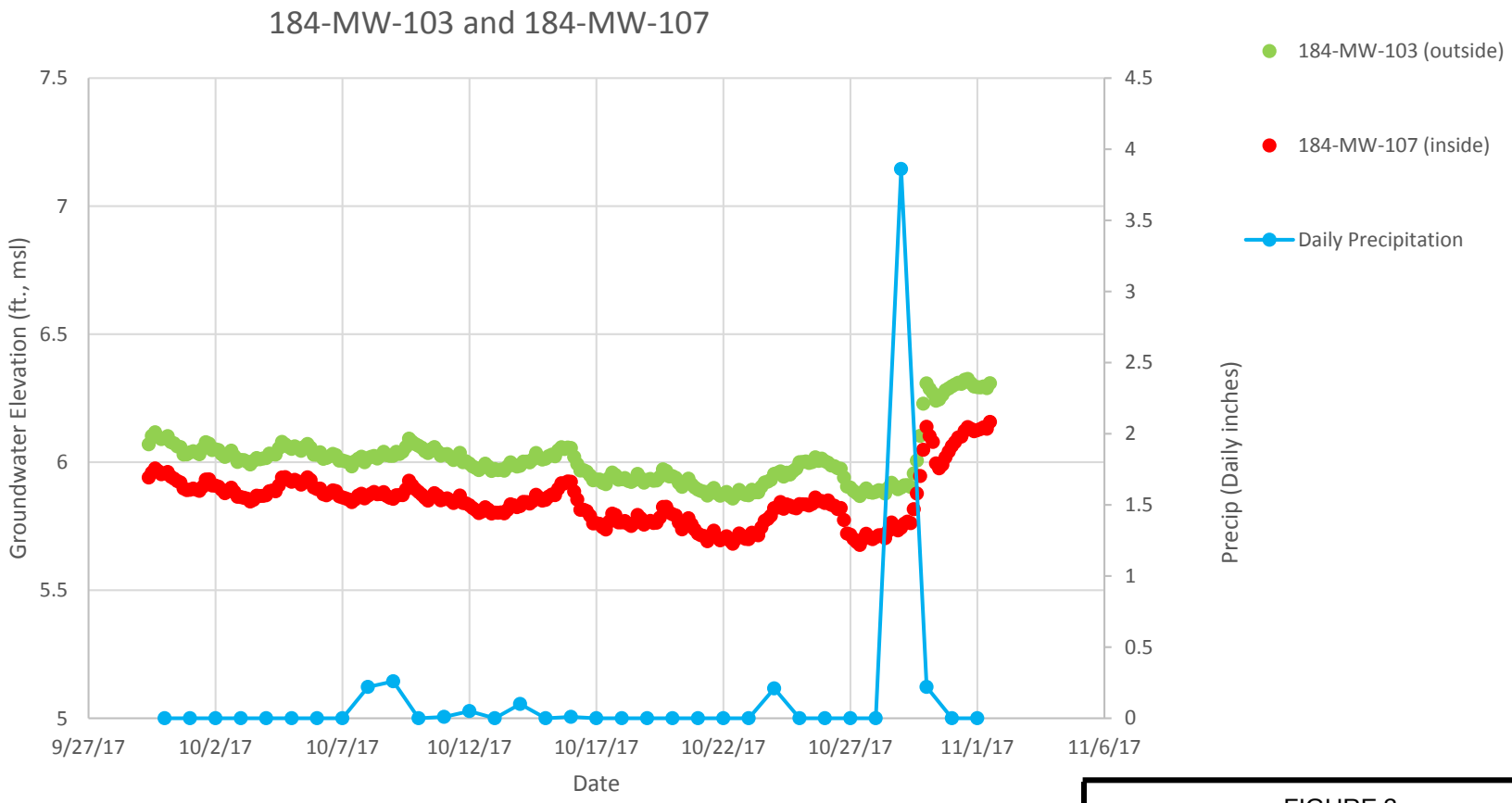


FIGURE 3

Hydrograph of Piezometer Pair
MW-103 and MW-107
October 2017

NJCU, Jersey City, NJ

cornerstone
environmental

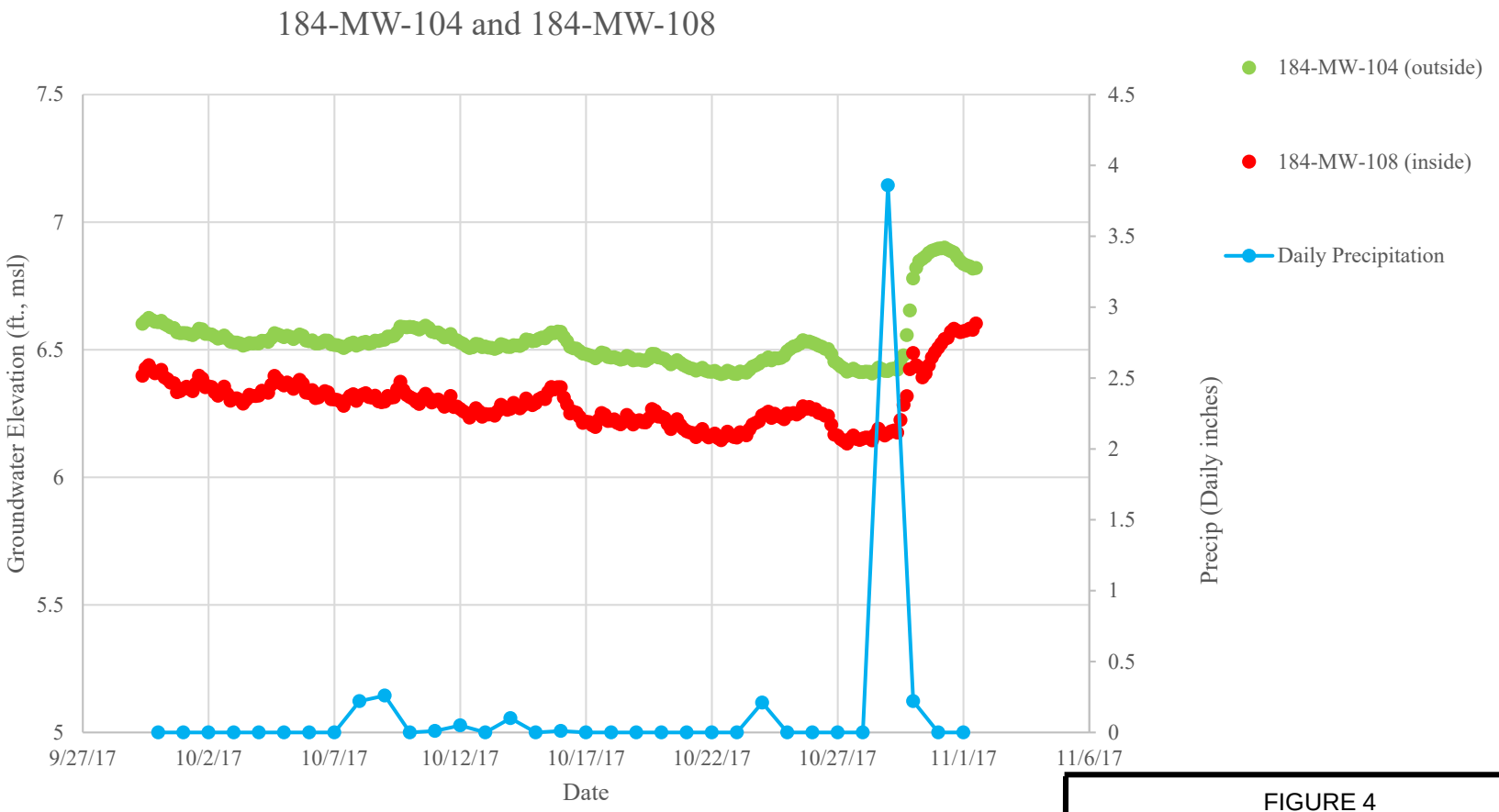


FIGURE 4

Hydrograph of Piezometer Pair
MW-104 and MW-108
October 2017

NJCU, Jersey City, NJ

cornerstone environmental

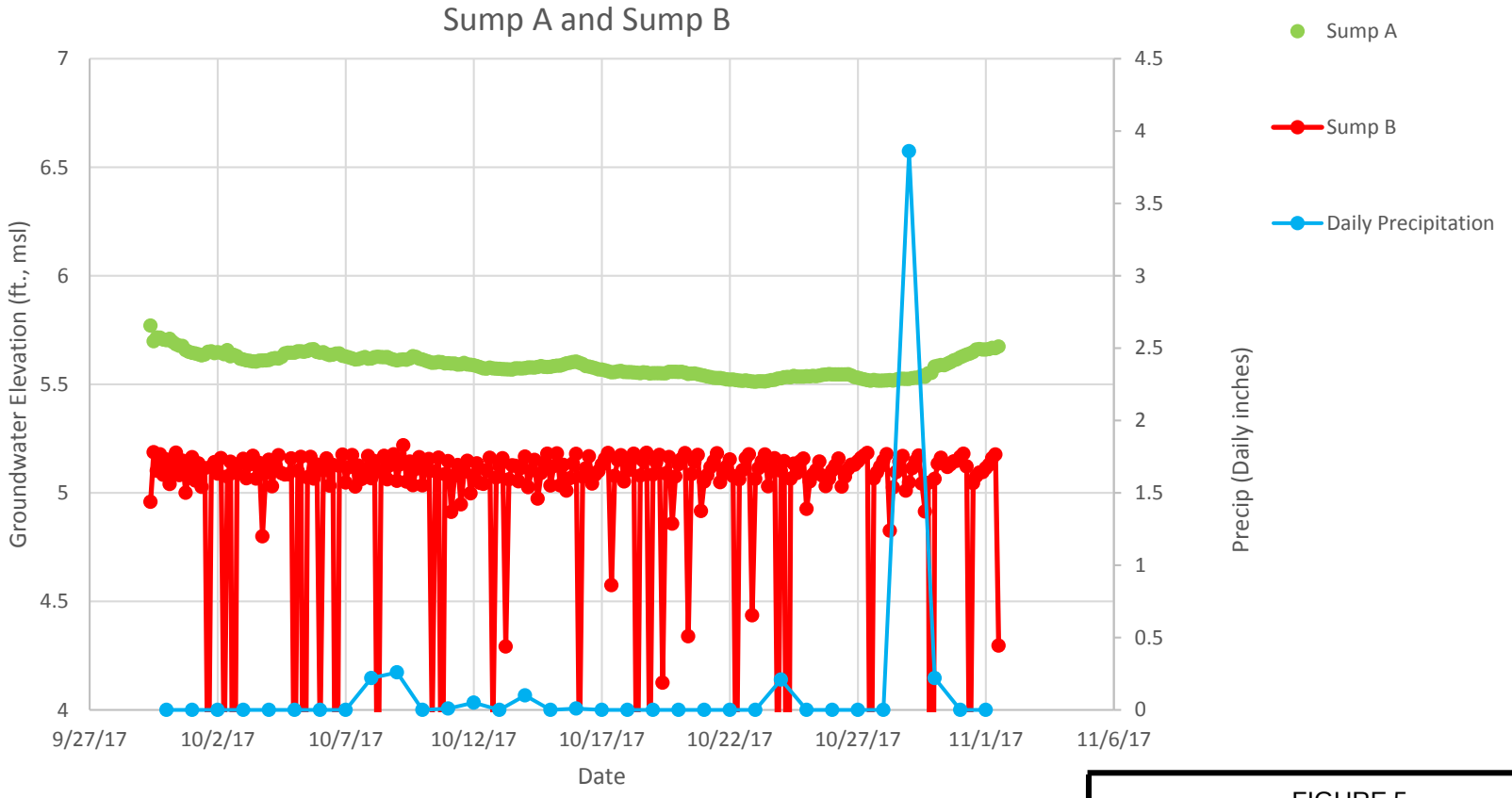


FIGURE 5

Hydrograph of Sump A and Sump B
October 2017

NJCU, Jersey City, NJ

cornerstone environmental

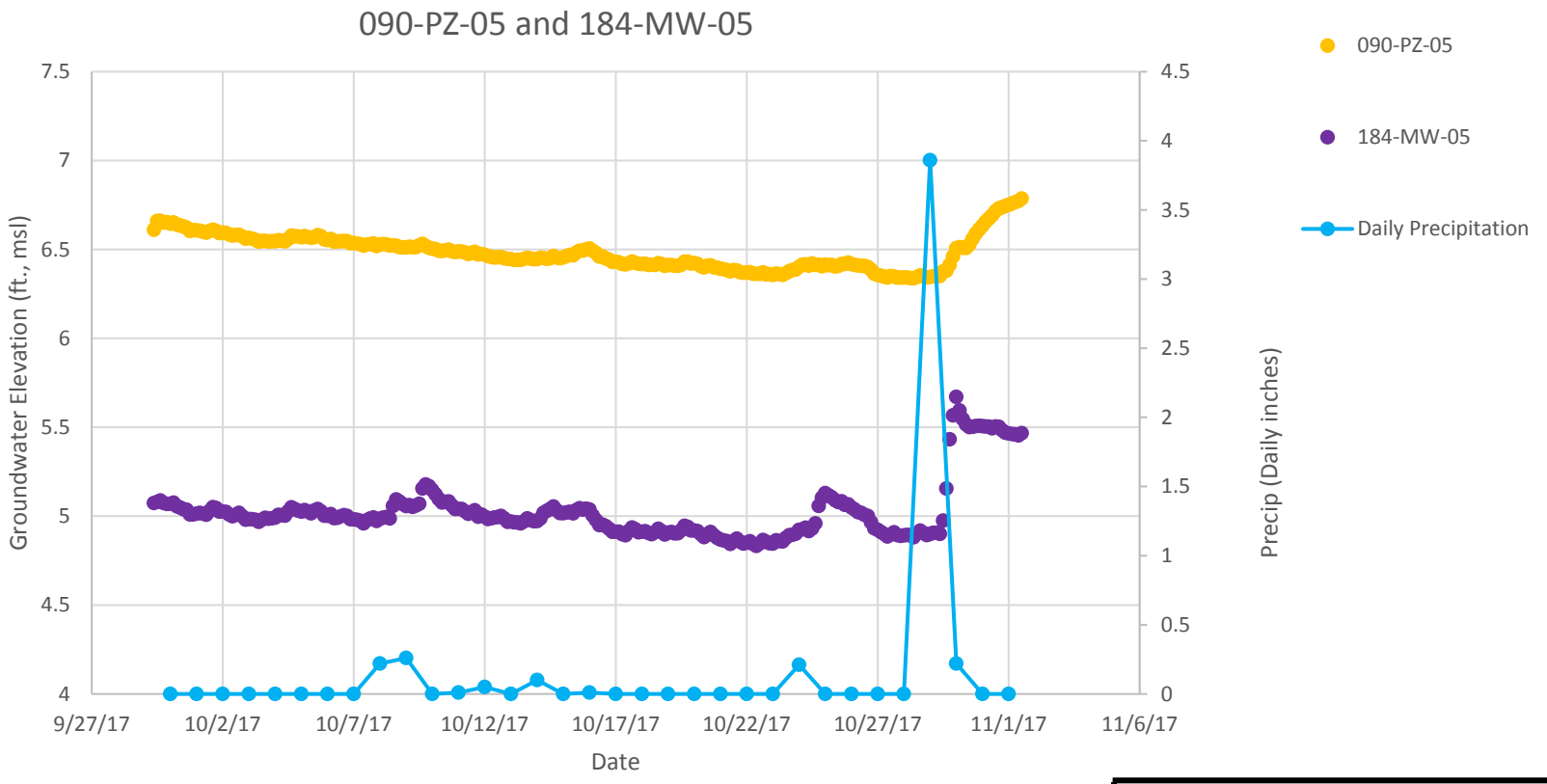


FIGURE 6

Hydrograph of Wells
PZ-05 and MW-05
October 2017

NJCU, Jersey City, NJ

cornerstone
environmental

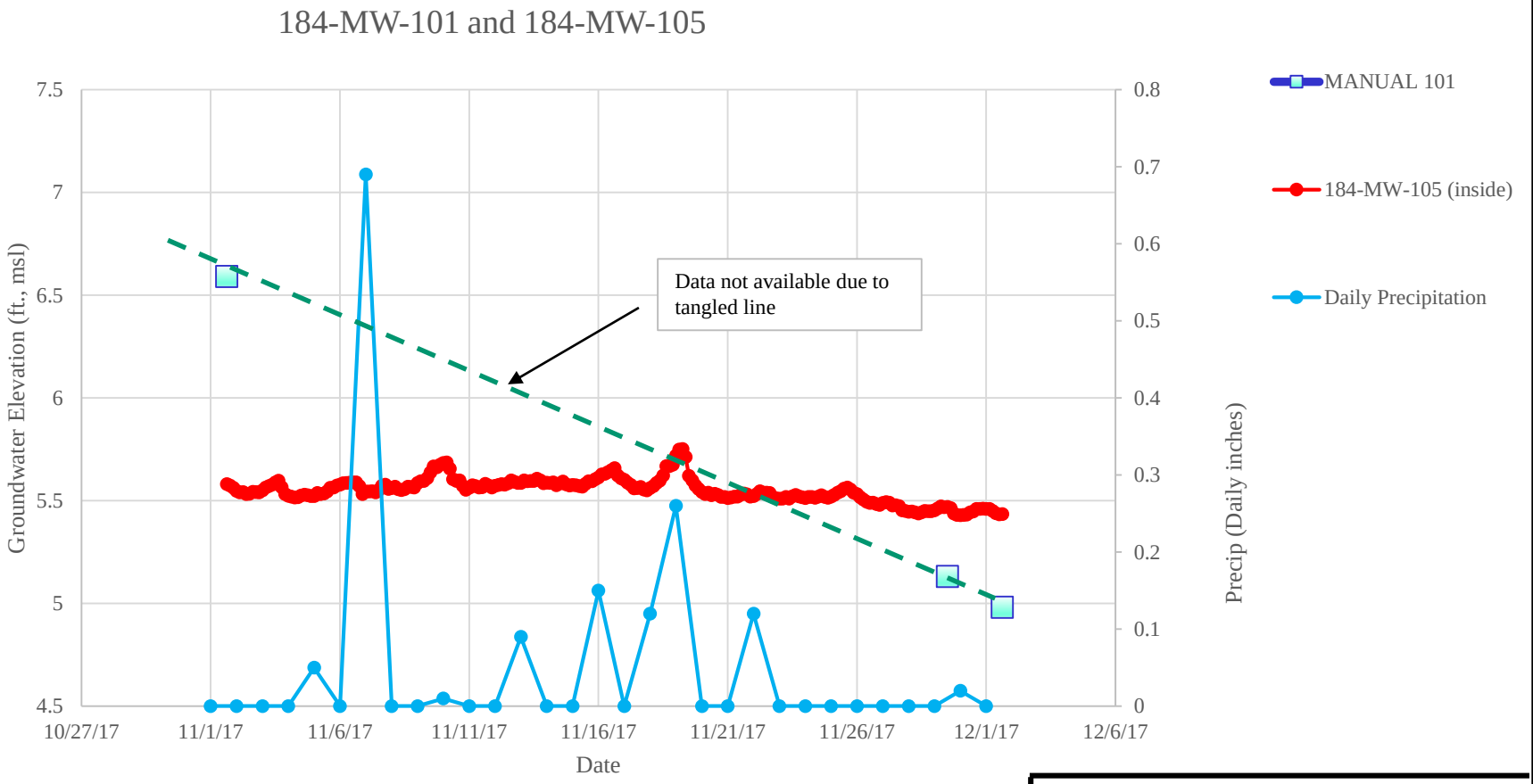


FIGURE 1

Hydrograph of Piezometer Pair
MW-101 and MW-105
November 2017

NJCU, Jersey City, NJ

cornerstone environmental

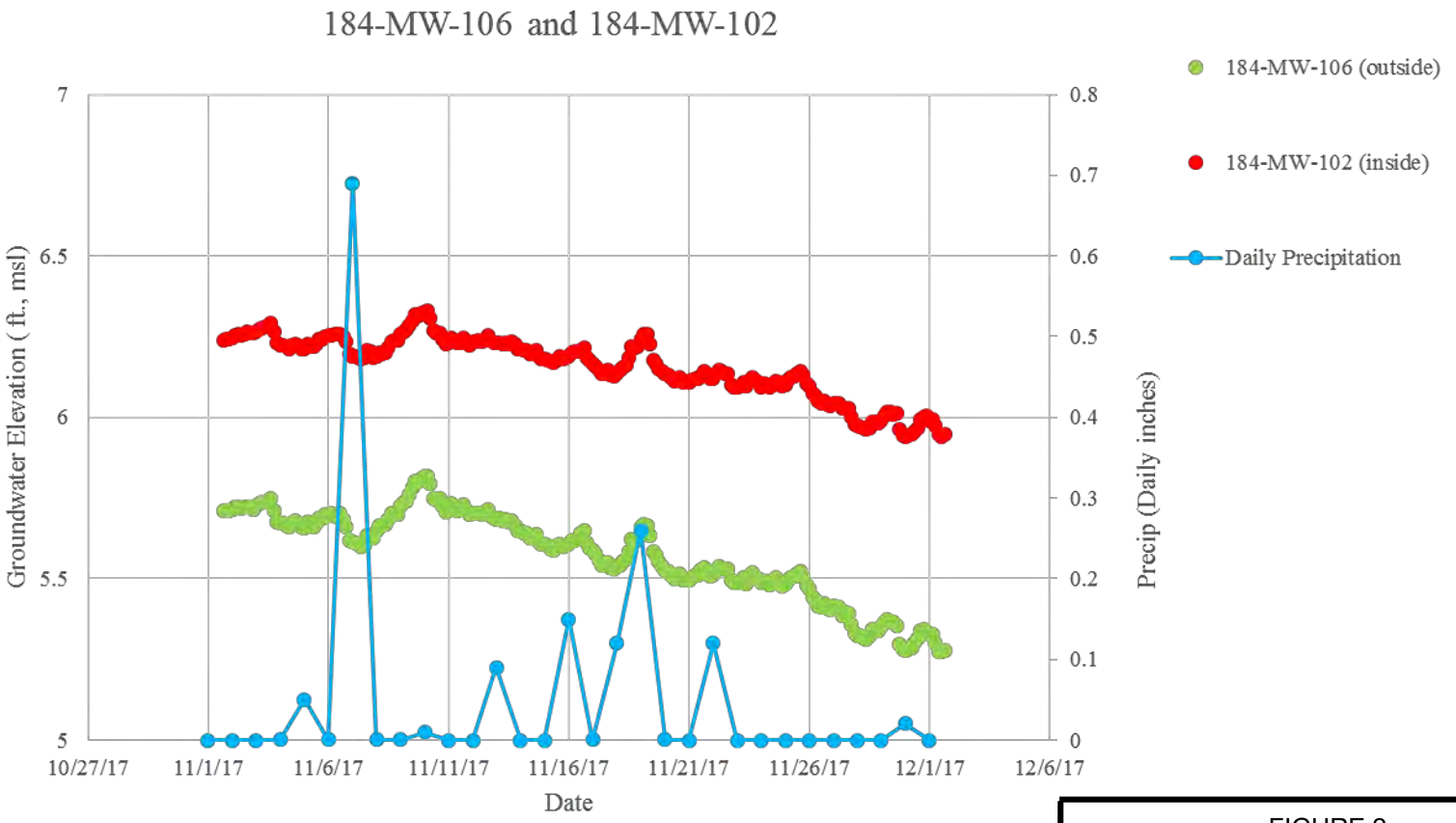


FIGURE 2

Hydrograph of Piezometer Pair
MW-102 and MW-106
November 2017

NJCU, Jersey City, NJ

cornerstone environmental

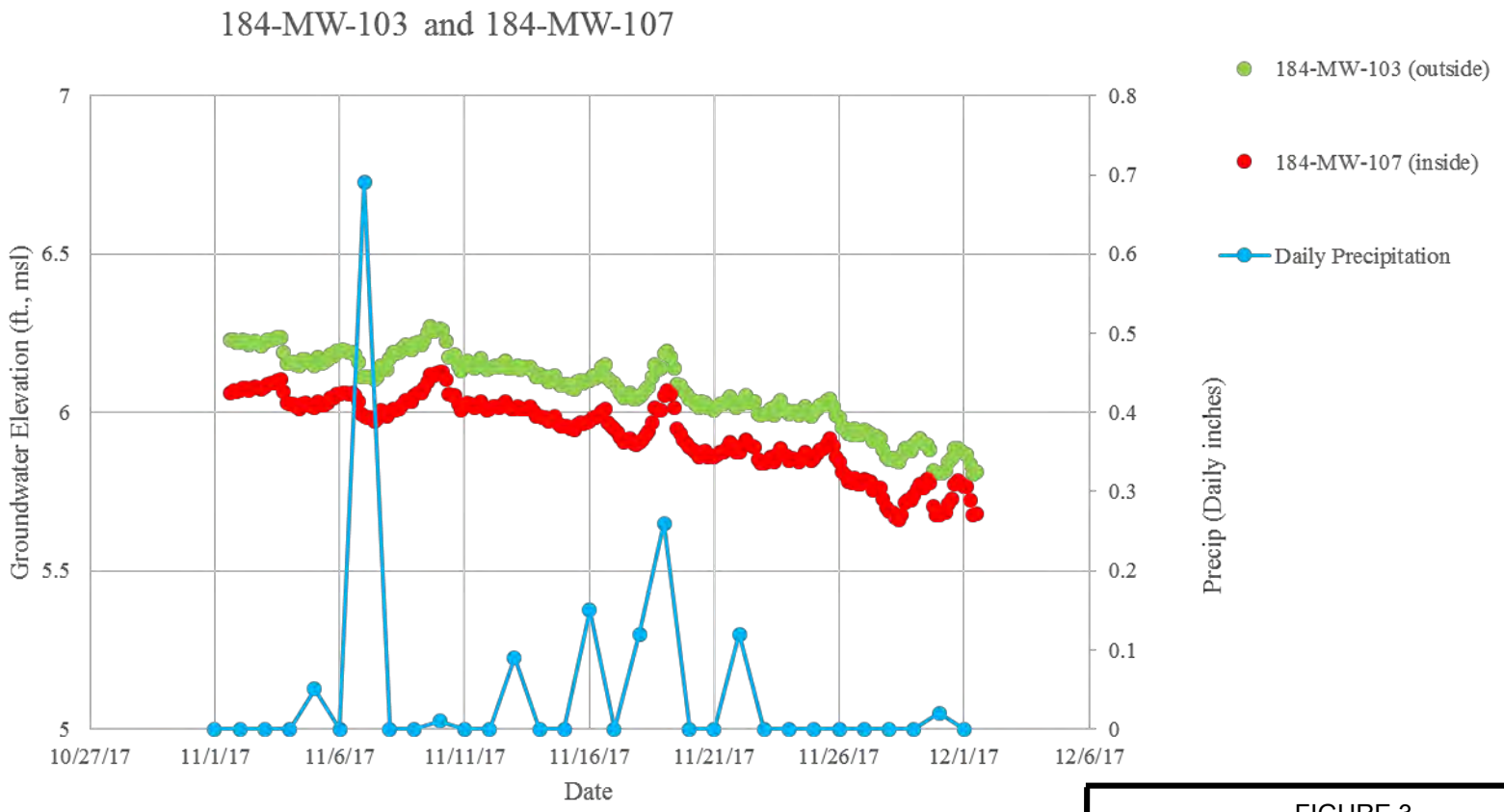


FIGURE 3

Hydrograph of Piezometer Pair
MW-103 and MW-107
November 2017

NJCU, Jersey City, NJ

cornerstone environmental

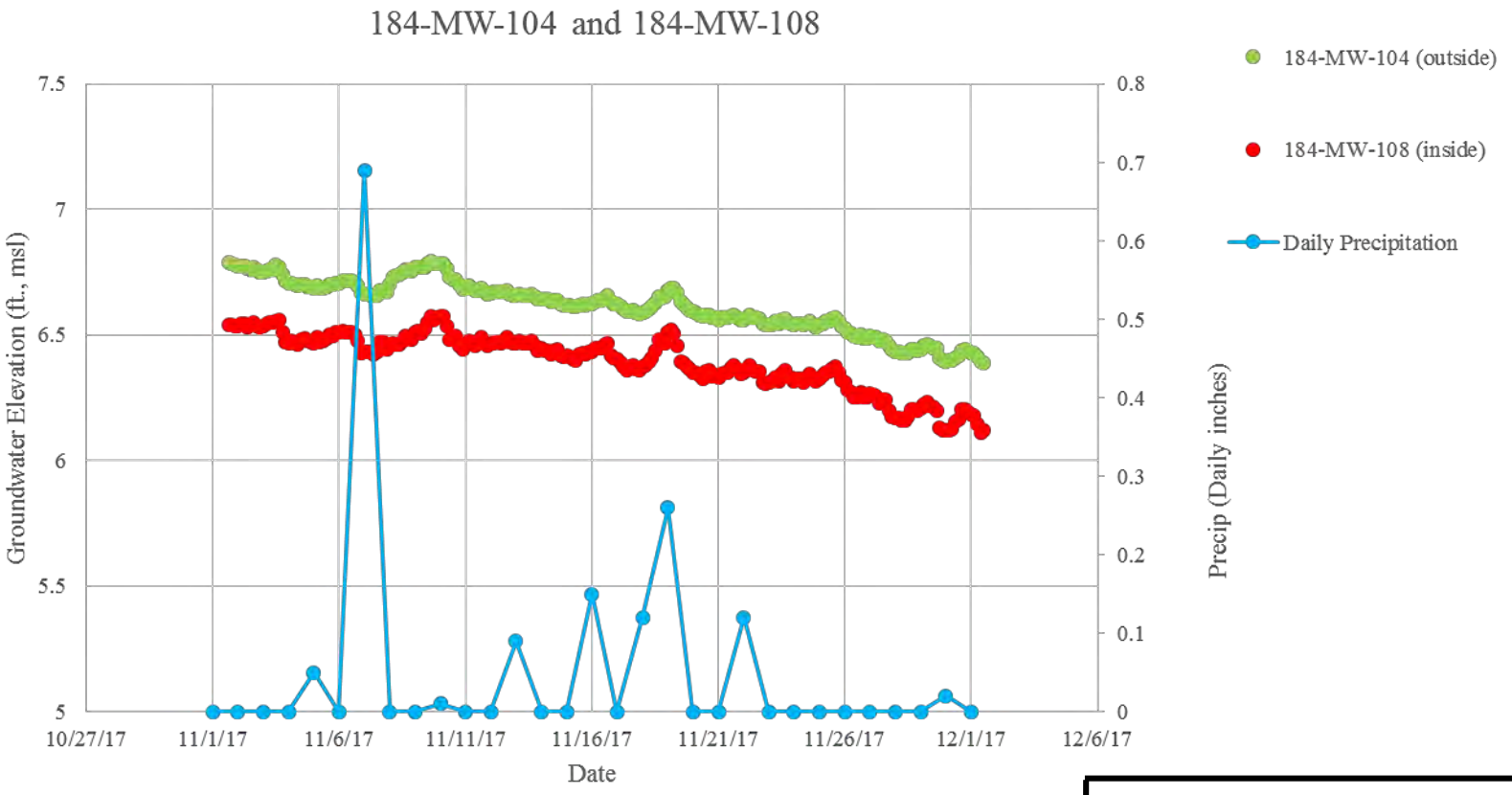


FIGURE 4

Hydrograph of Piezometer Pair
MW-104 and MW-108
November 2017

NJCU, Jersey City, NJ

cornerstone environmental

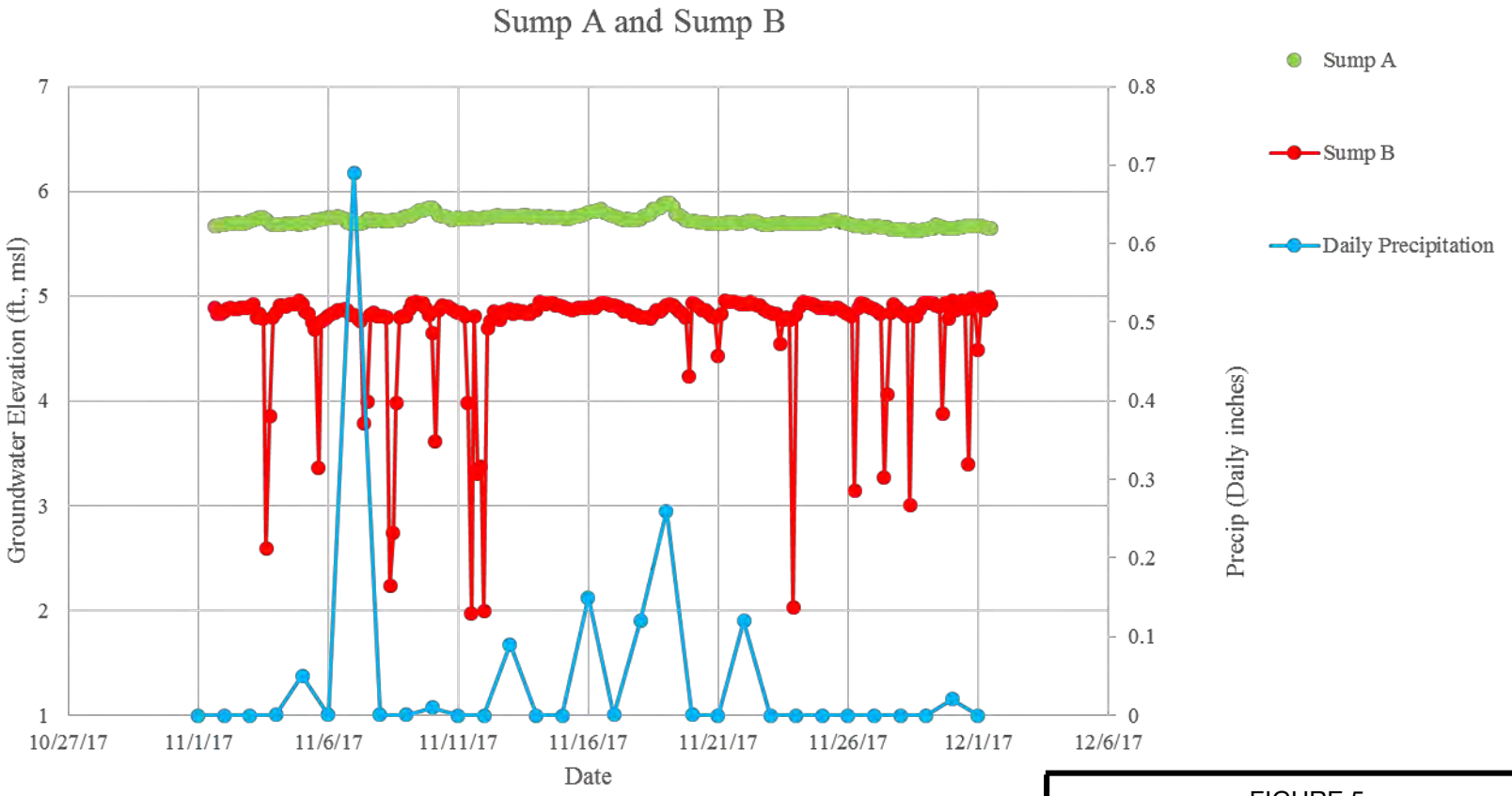


FIGURE 5

Hydrograph of Sump A and Sump B
November 2017

NJCU, Jersey City, NJ

cornerstone environmental

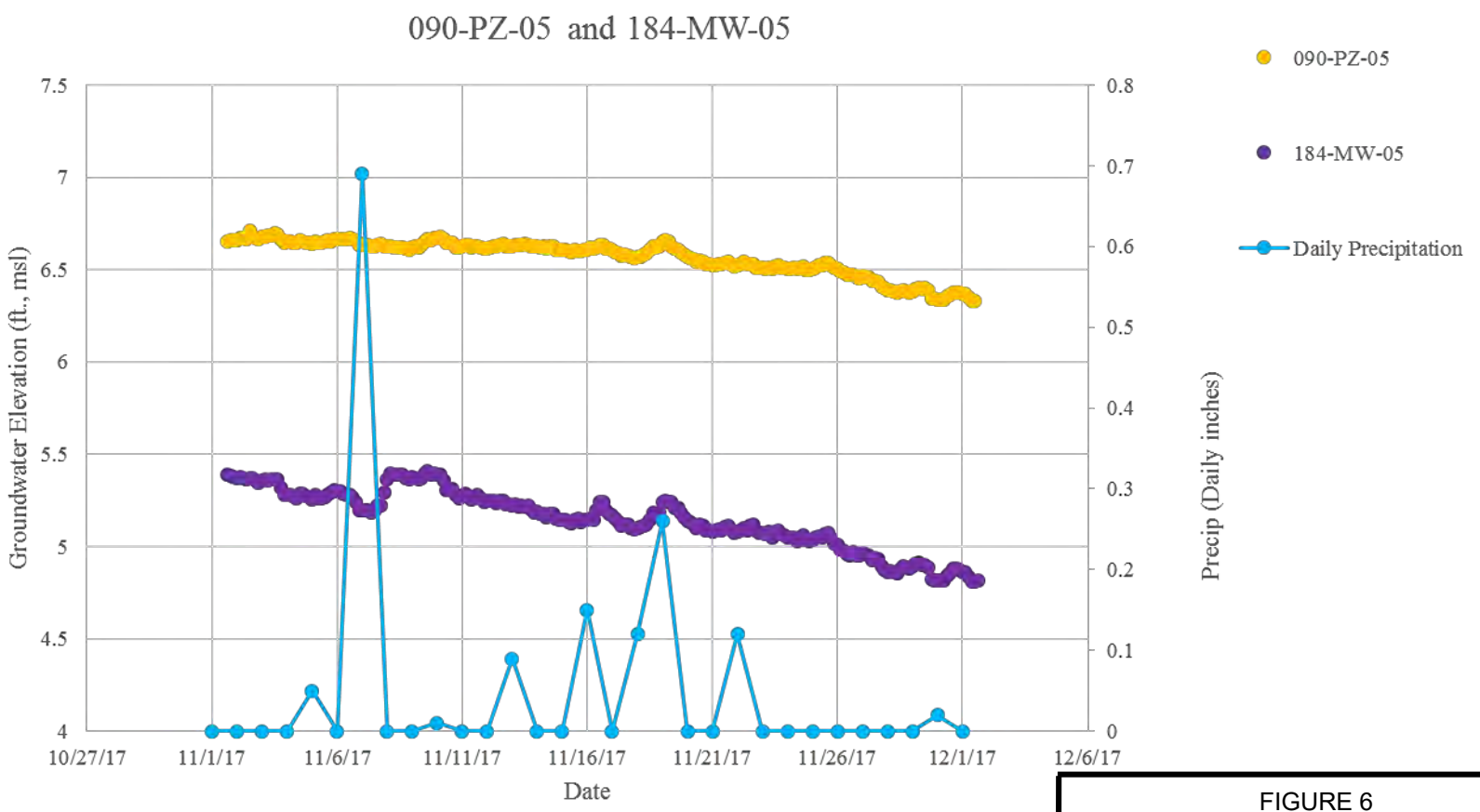


FIGURE 6

Hydrograph of Wells
PZ-05 and MW-05
November 2017

NJCU, Jersey City, NJ

cornerstone environmental

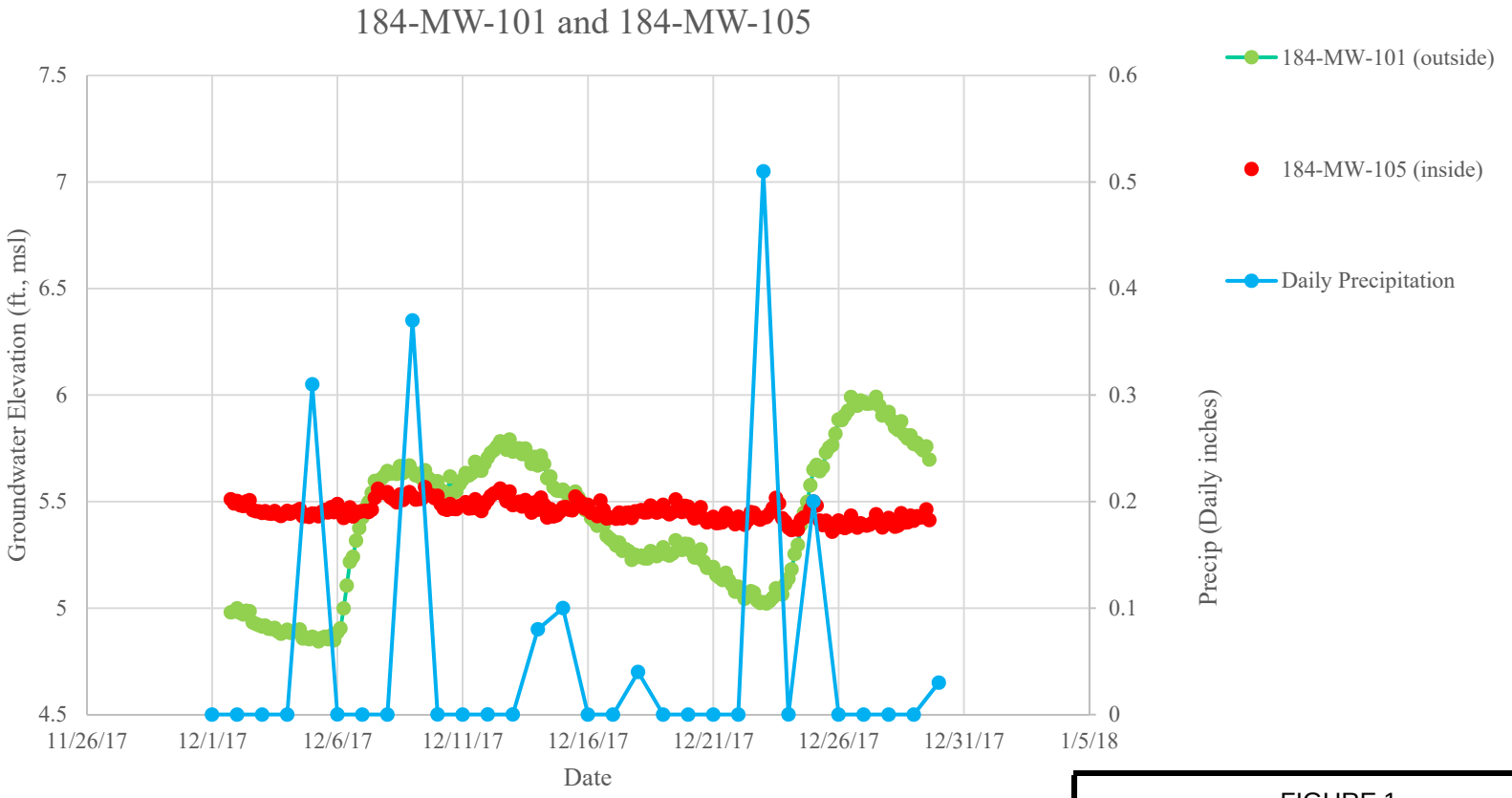


FIGURE 1

Hydrograph of Piezometer Pair
MW-101 and MW-105
December 2017

NJCU, Jersey City, NJ

cornerstone environmental

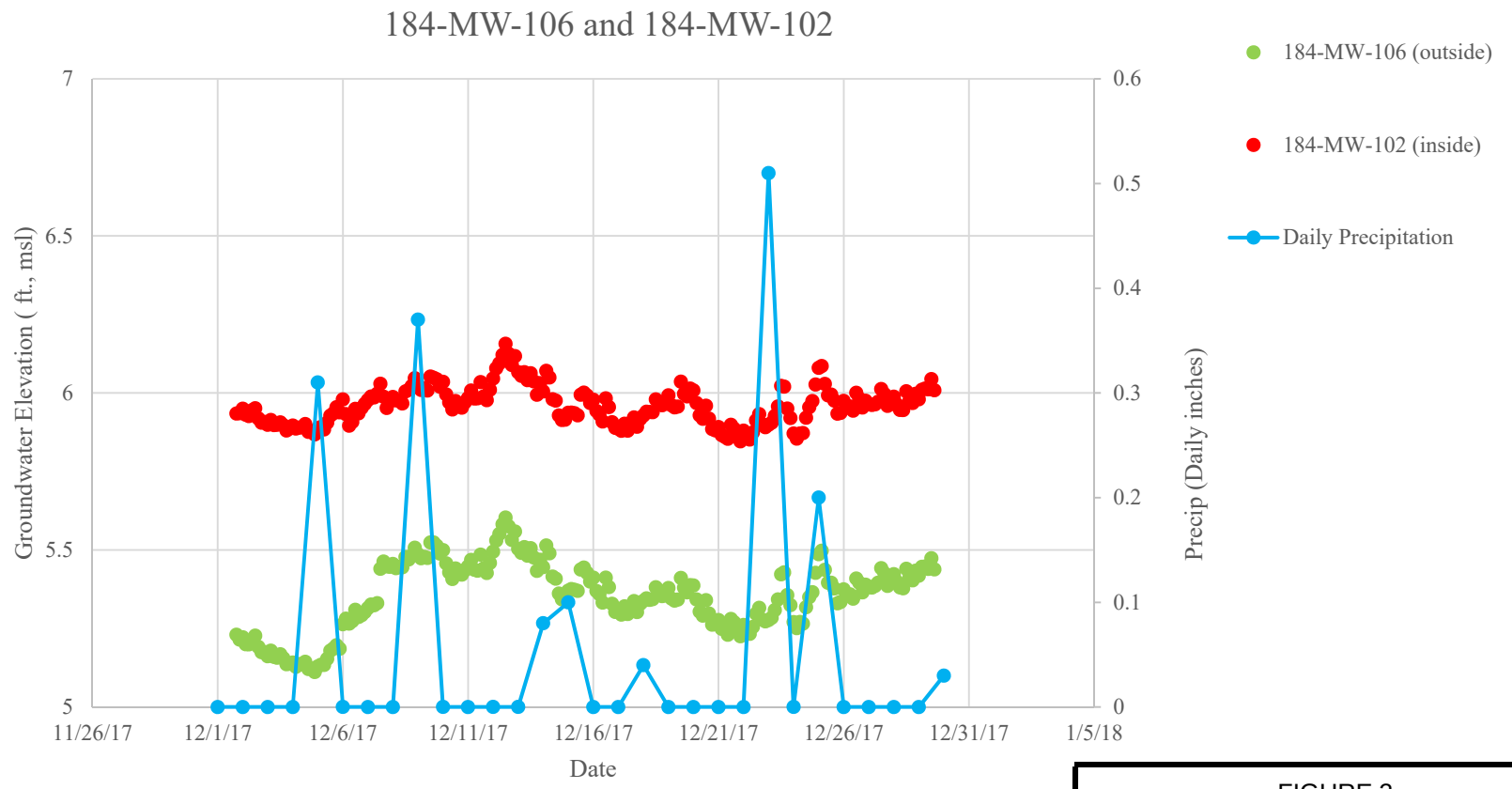


FIGURE 2

Hydrograph of Piezometer Pair
MW-102 and MW-106
December 2017

NJCU, Jersey City, NJ

cornerstone environmental

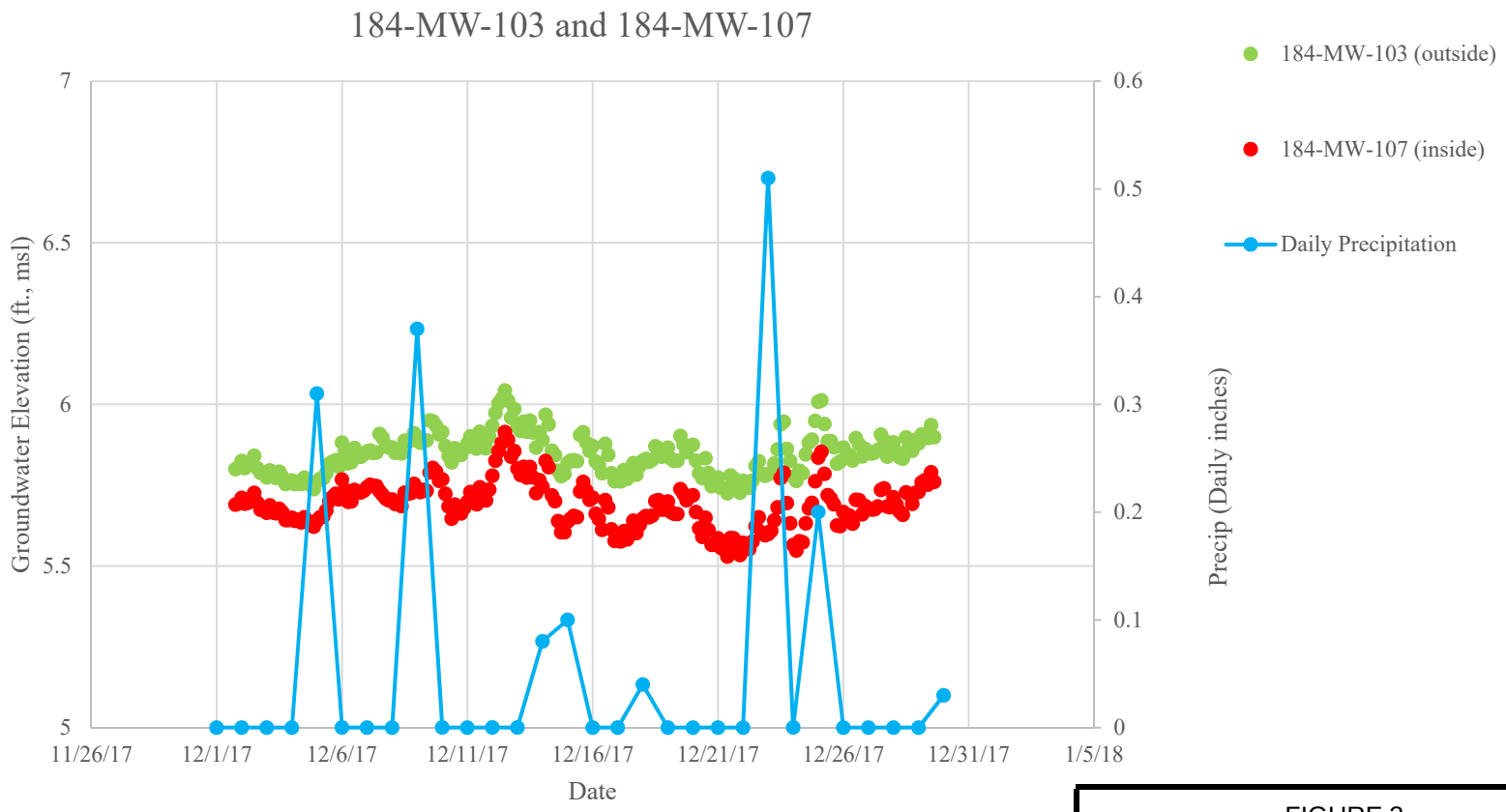


FIGURE 3

Hydrograph of Piezometer Pair
MW-103 and MW-107
December 2017

NJCU, Jersey City, NJ

cornerstone environmental

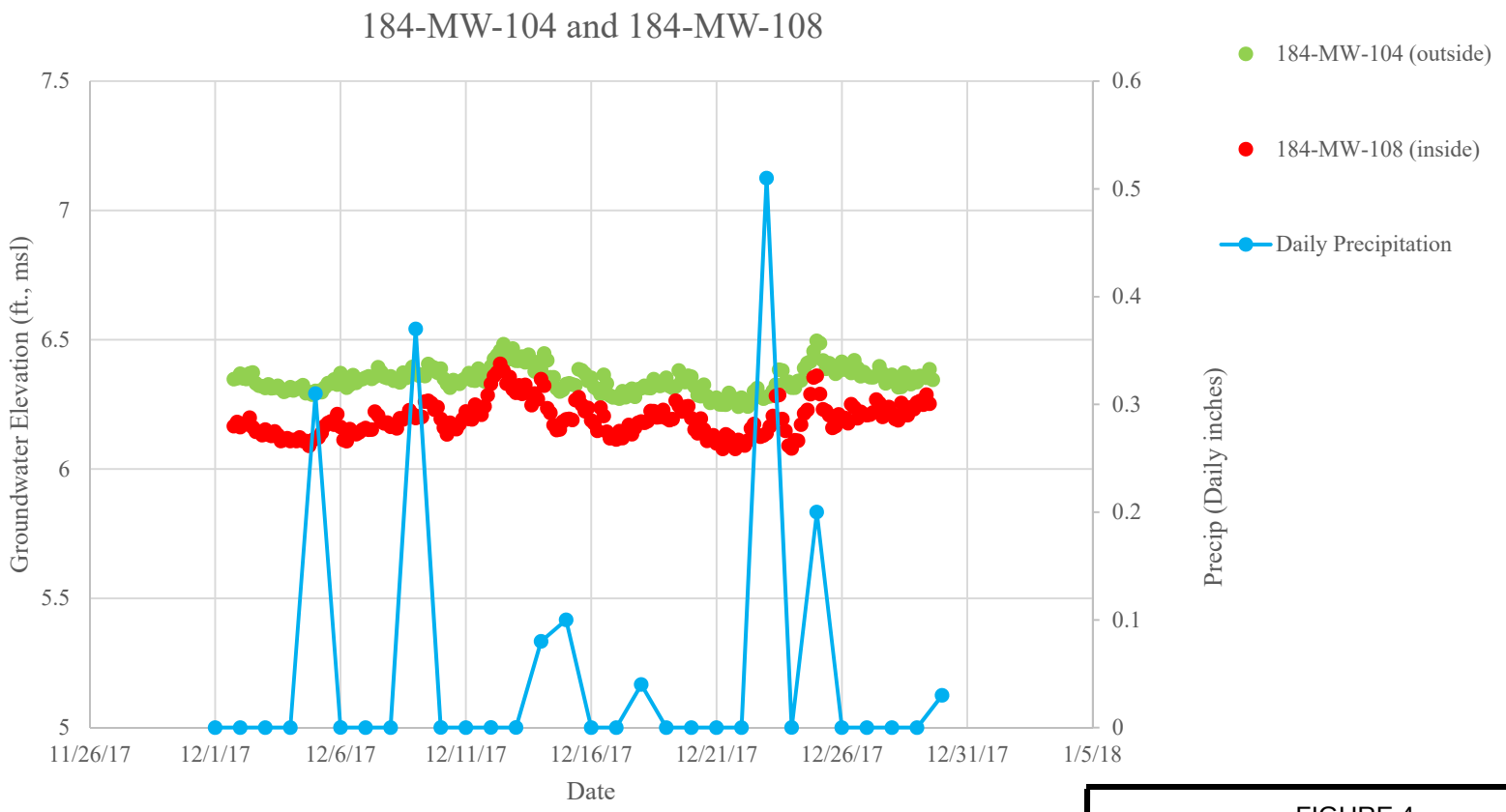


FIGURE 4

Hydrograph of Piezometer Pair
MW-104 and MW-108
December 2017

NJCU, Jersey City, NJ

cornerstone environmental

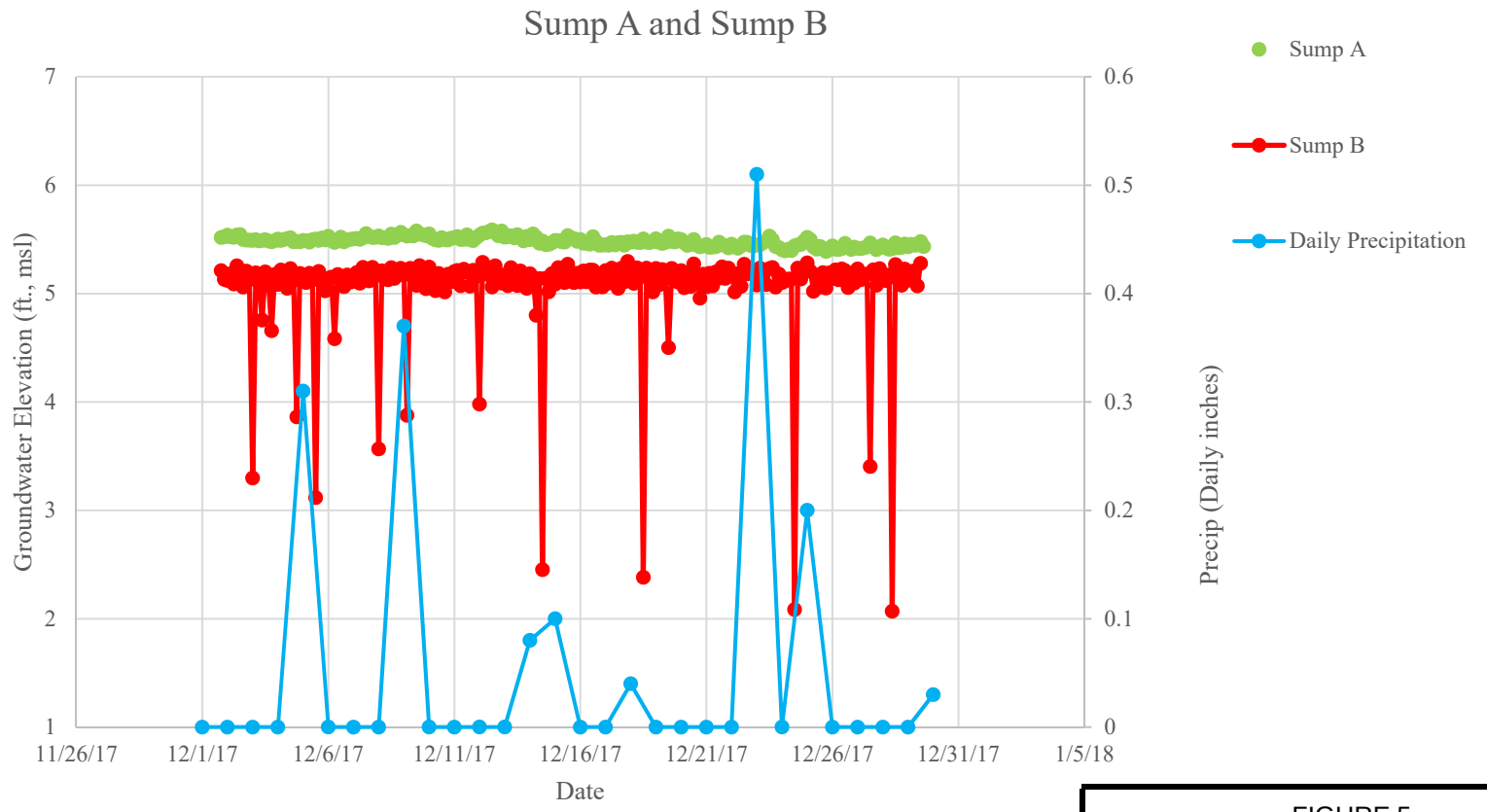


FIGURE 5

Hydrograph of Sump A and Sump B
December 2017

NJCU, Jersey City, NJ

cornerstone environmental

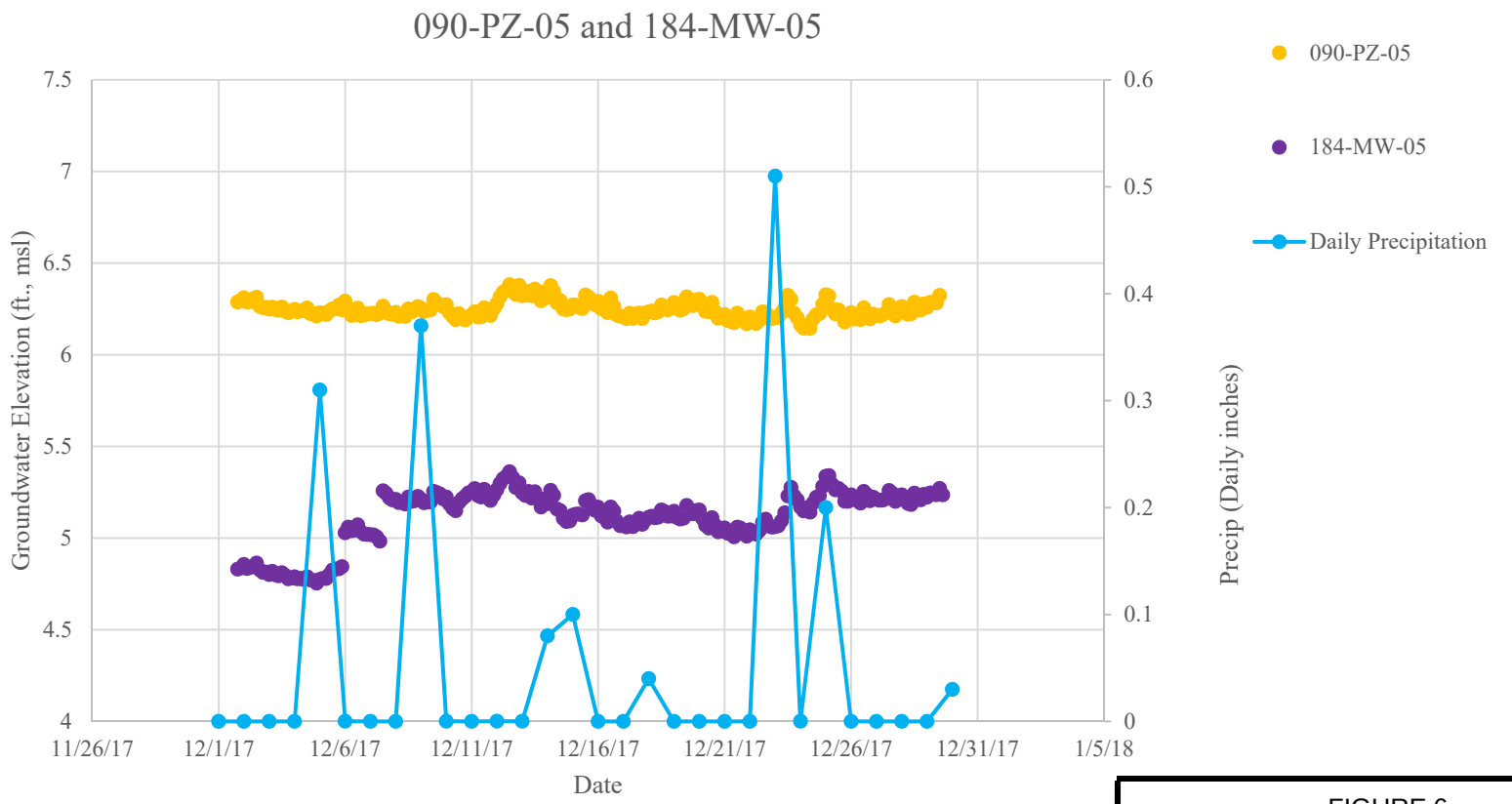


FIGURE 6

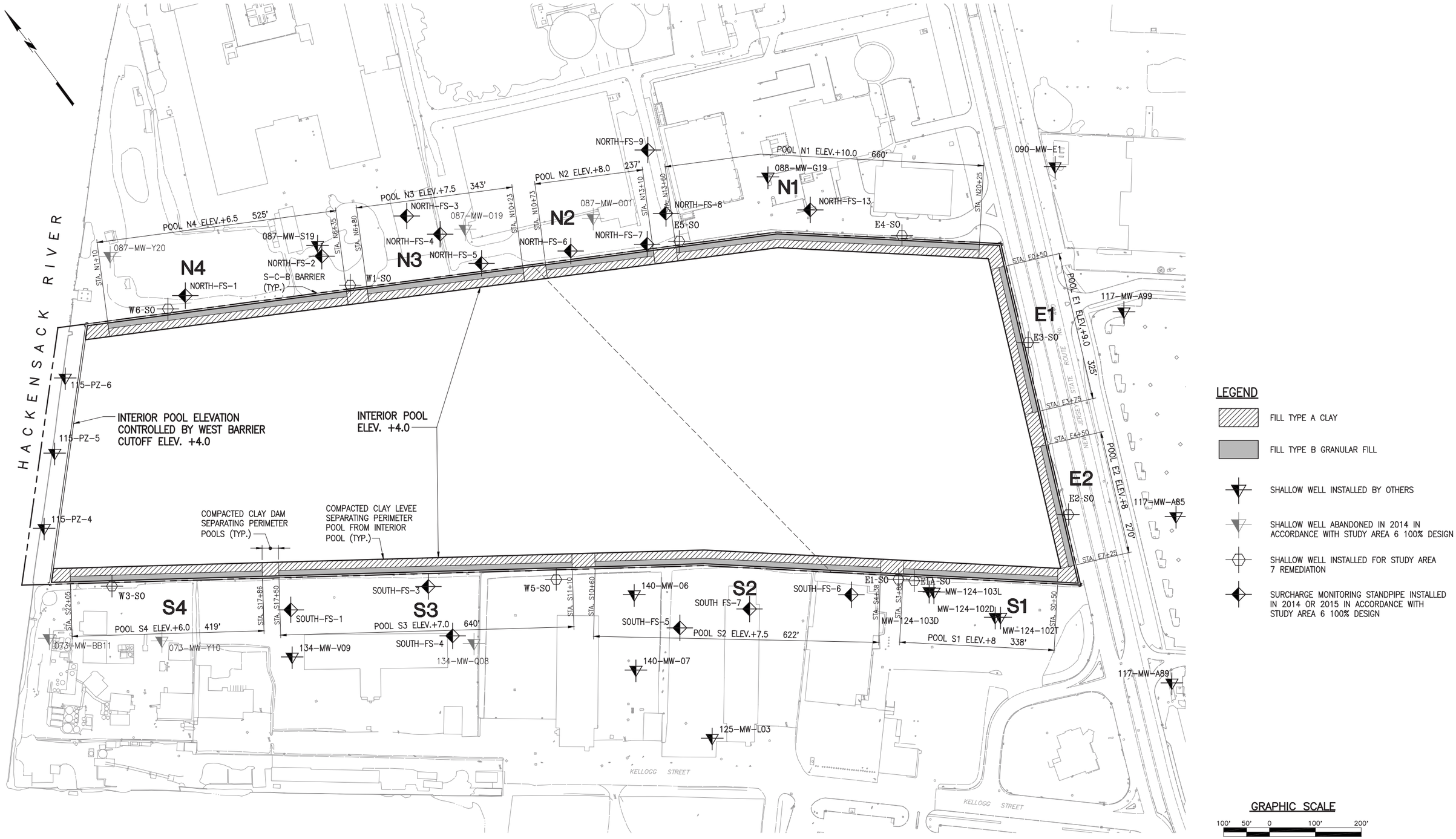
Hydrograph of Wells
PZ-05 and MW-05
December 2017

NJCU, Jersey City, NJ

cornerstone environmental

APPENDIX E

SA-7 PERIMETER POOL HYDROGRAPHS



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
- SURCHARGE MONITORING STANDPIPE INSTALLED IN 2014 OR 2015 IN ACCORDANCE WITH STUDY AREA 6 100% DESIGN

GRAPHIC SCALE

100' 50' 0 100' 200'

IN PROGRESS
06-10-2015

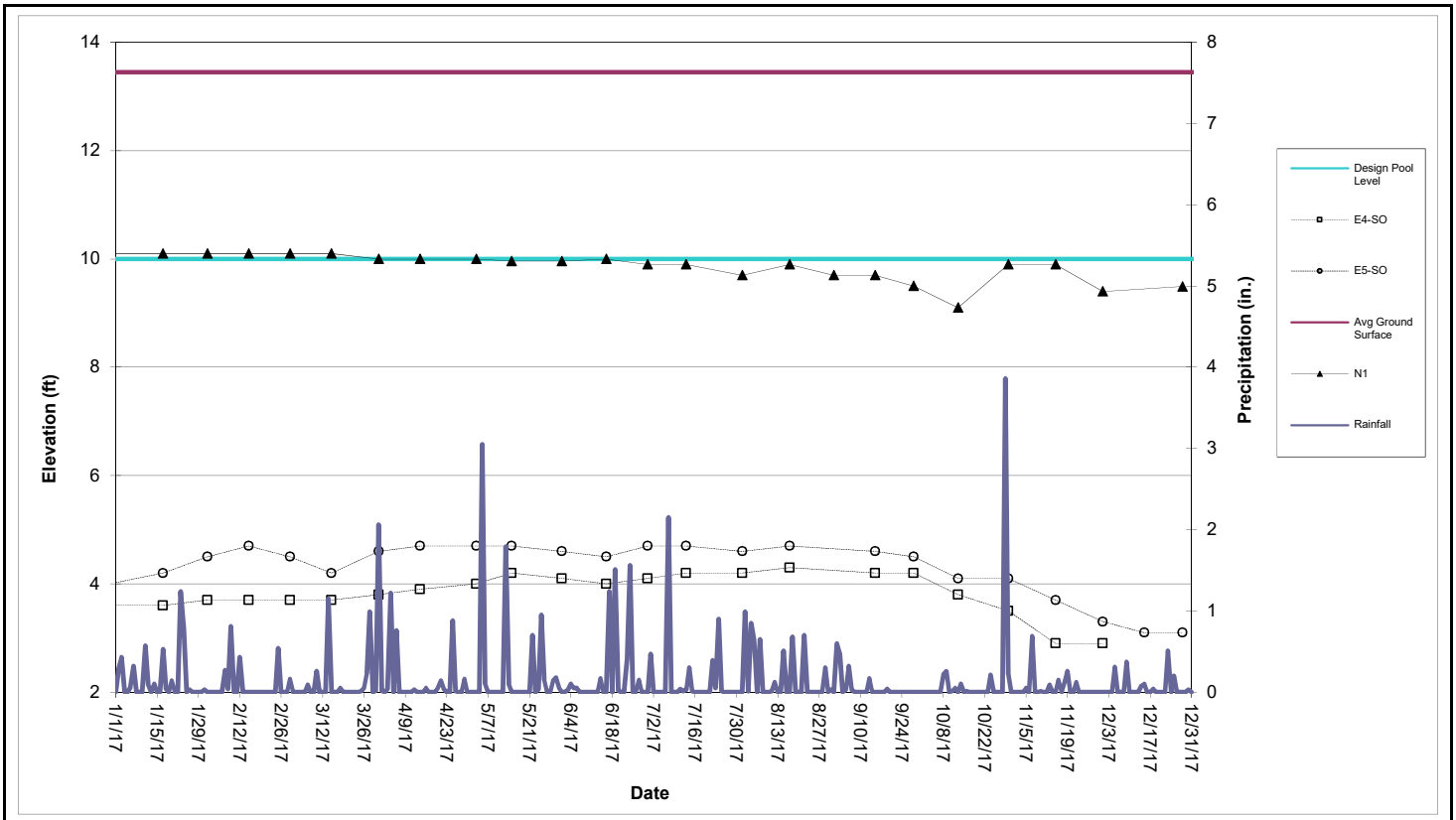
STUDY AREA 7
PERIMETER POOL DESIGN ELEVATIONS

NEW JERSEY

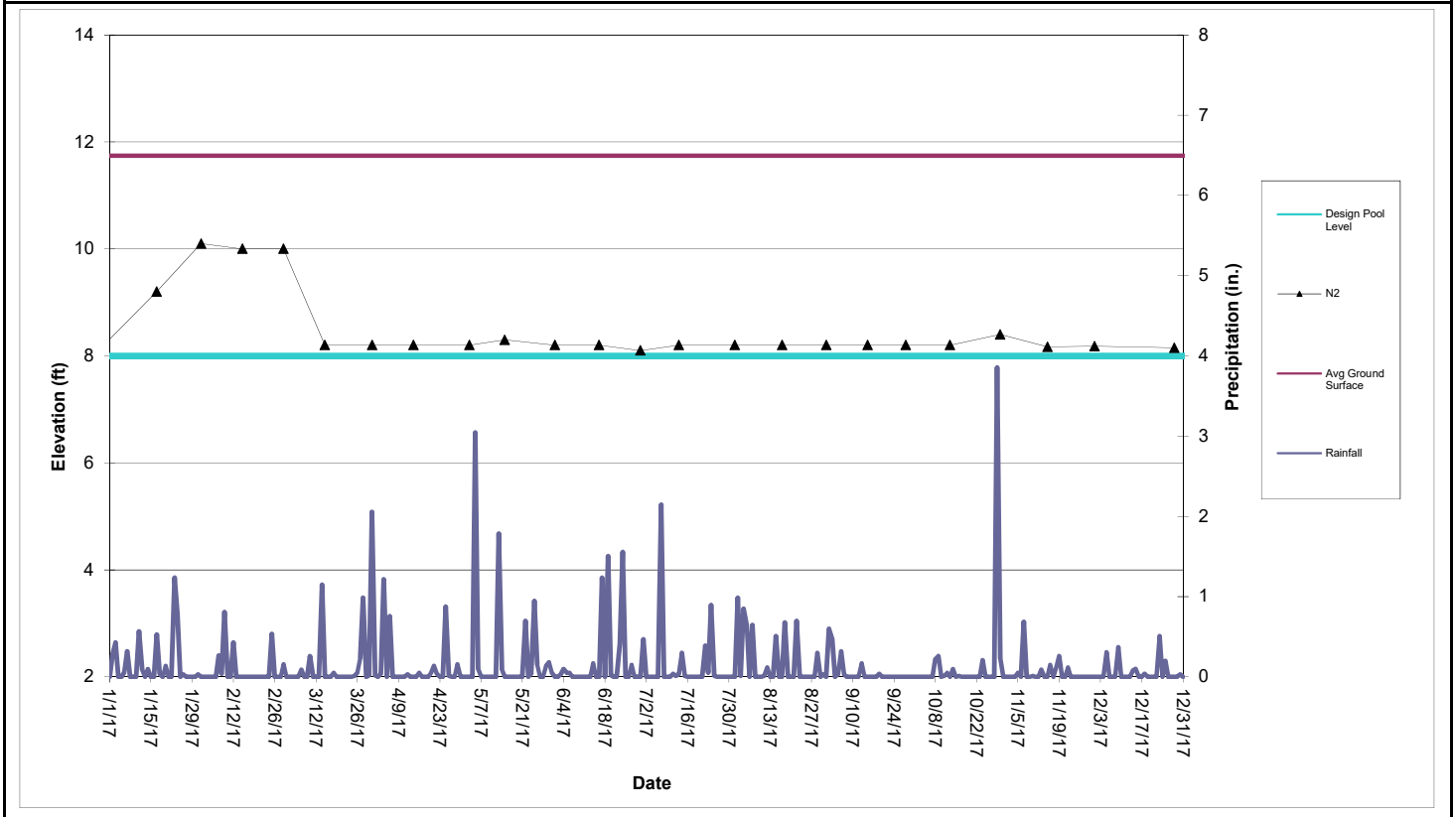
MUESER RUTLEDGE CONSULTING ENGINEERS
14 PENN PLAZA – 225 WEST 34th STREET

FILE NO. 10210
DRAWING NO. PP-1

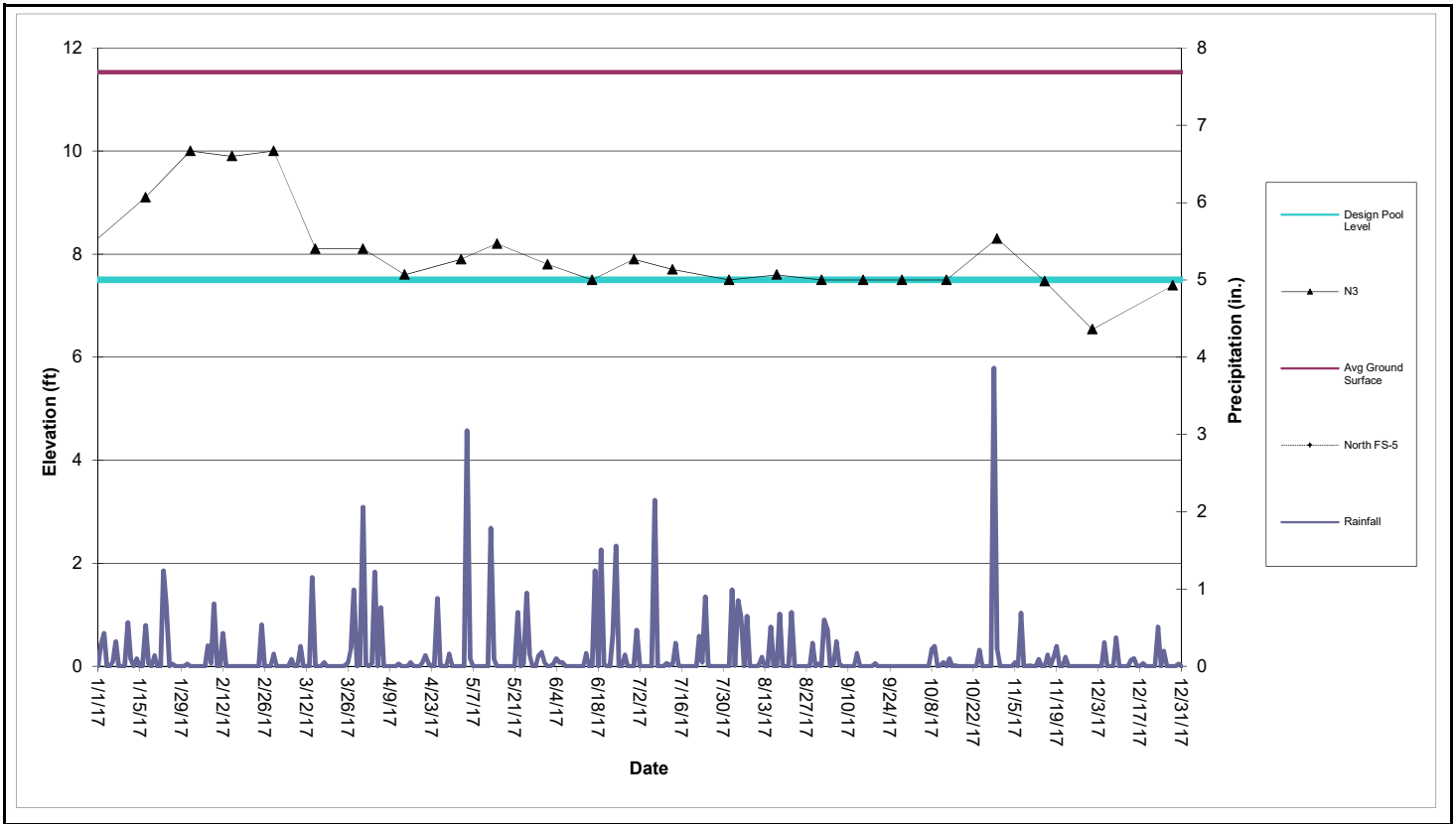
Jul 09, 2015 at 3:14pm
G:\DWGS\102\10210\Dewatering\PP-1.dwg
bboscaino



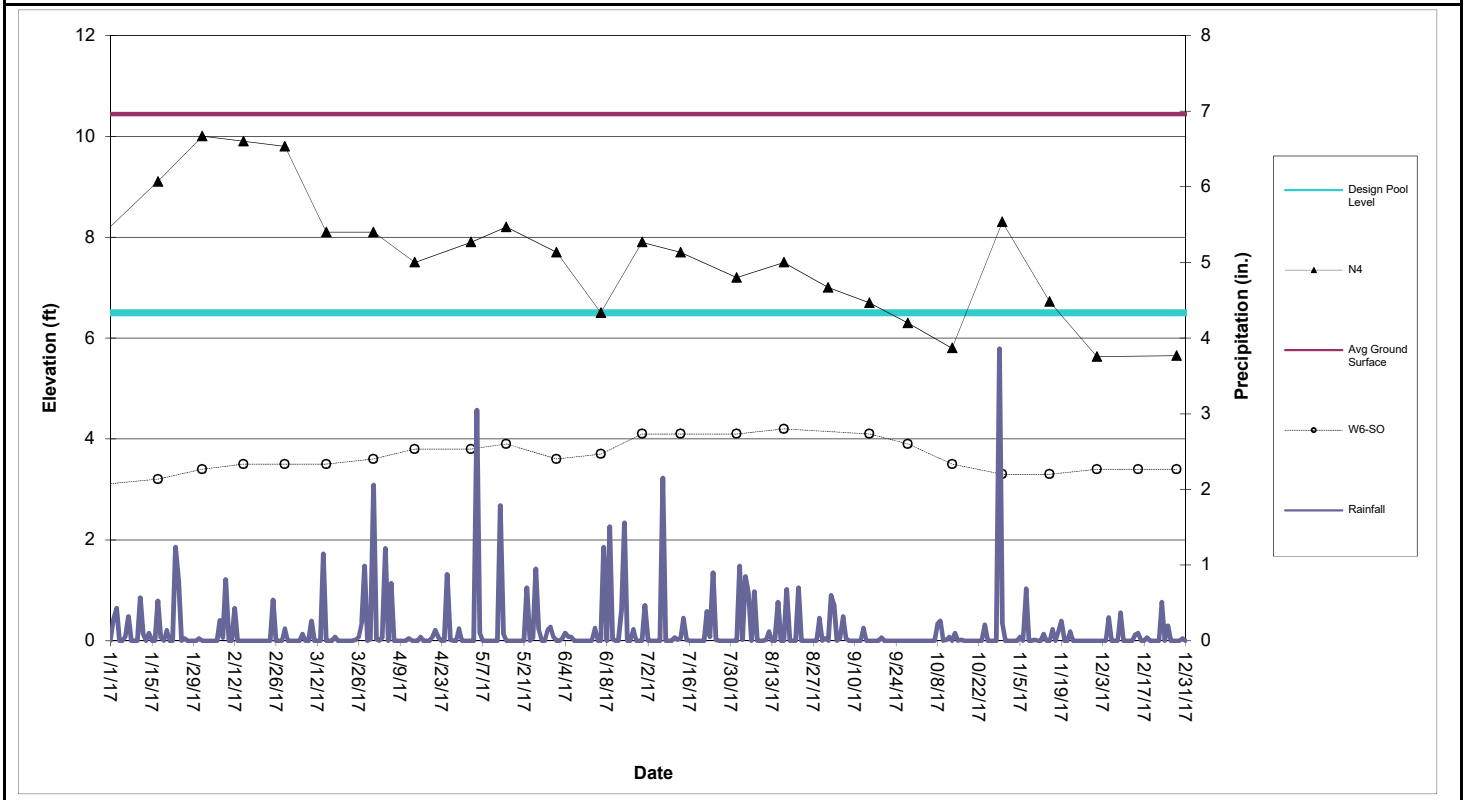
Perimeter Pool N1 (Sta. N13+60 to N20+25)



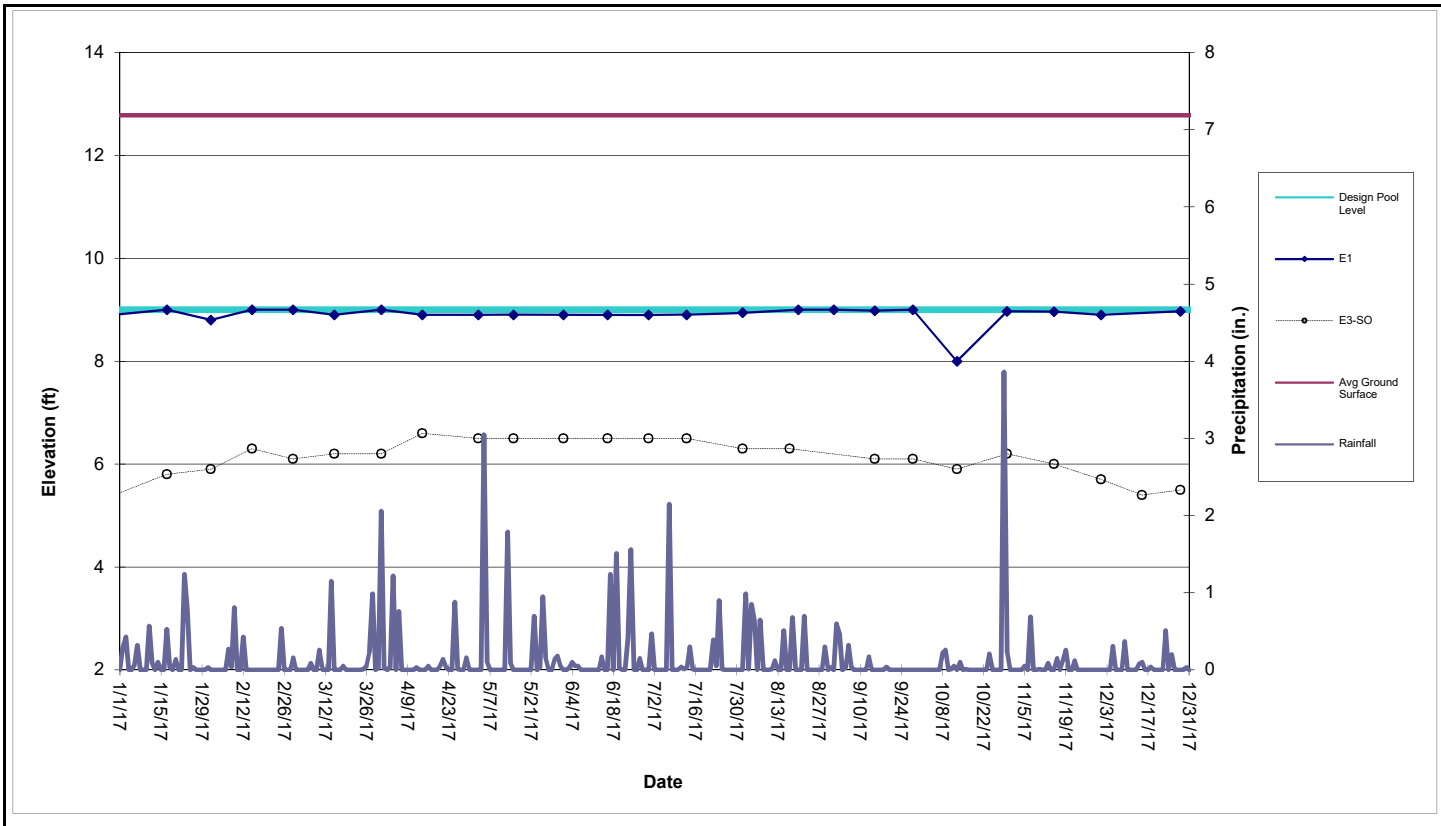
Perimeter Pool N2 (Sta. N10+73 to N13+10)



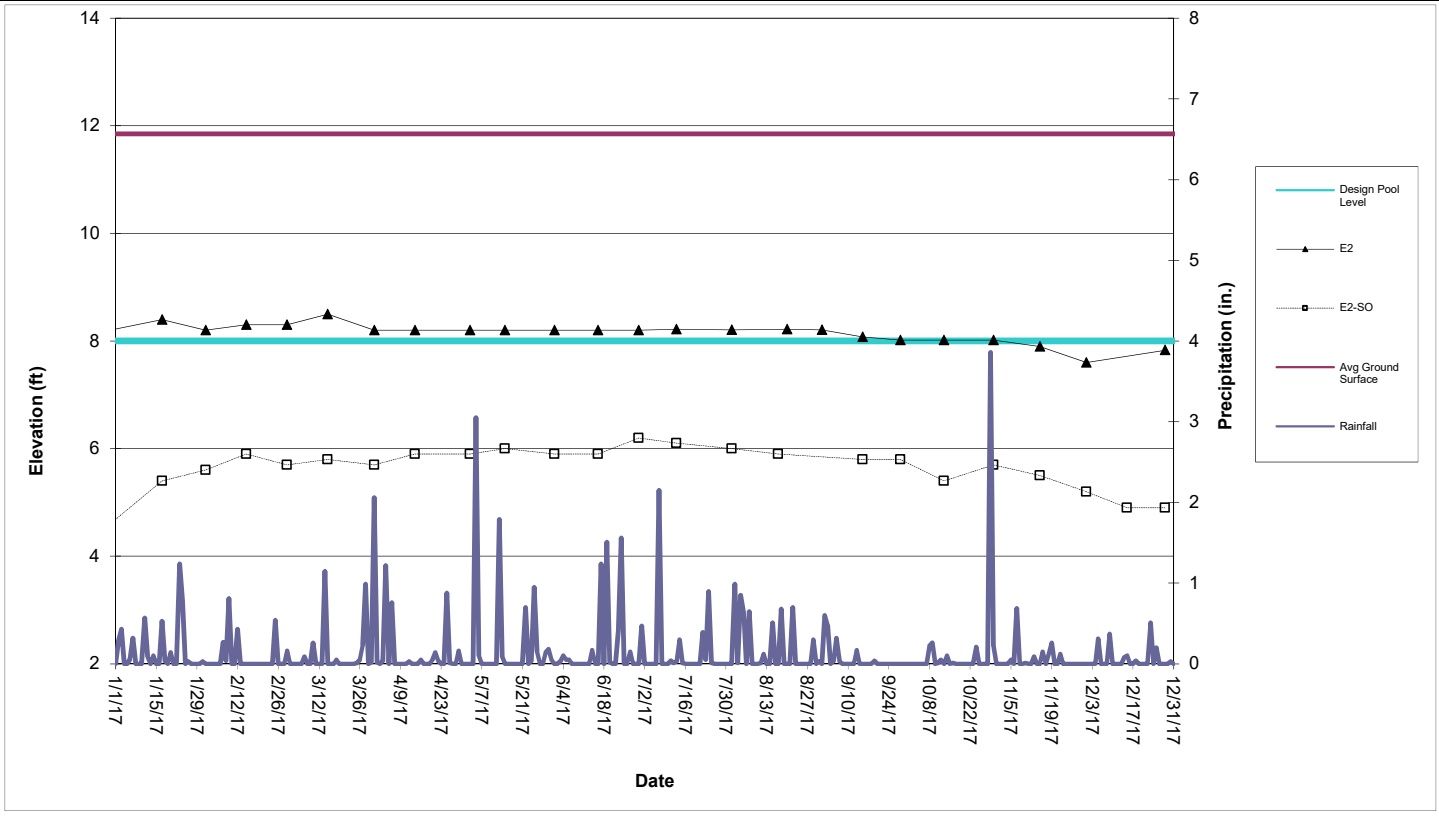
Perimeter Pool N3 (Sta. N6+80 to N10+23)



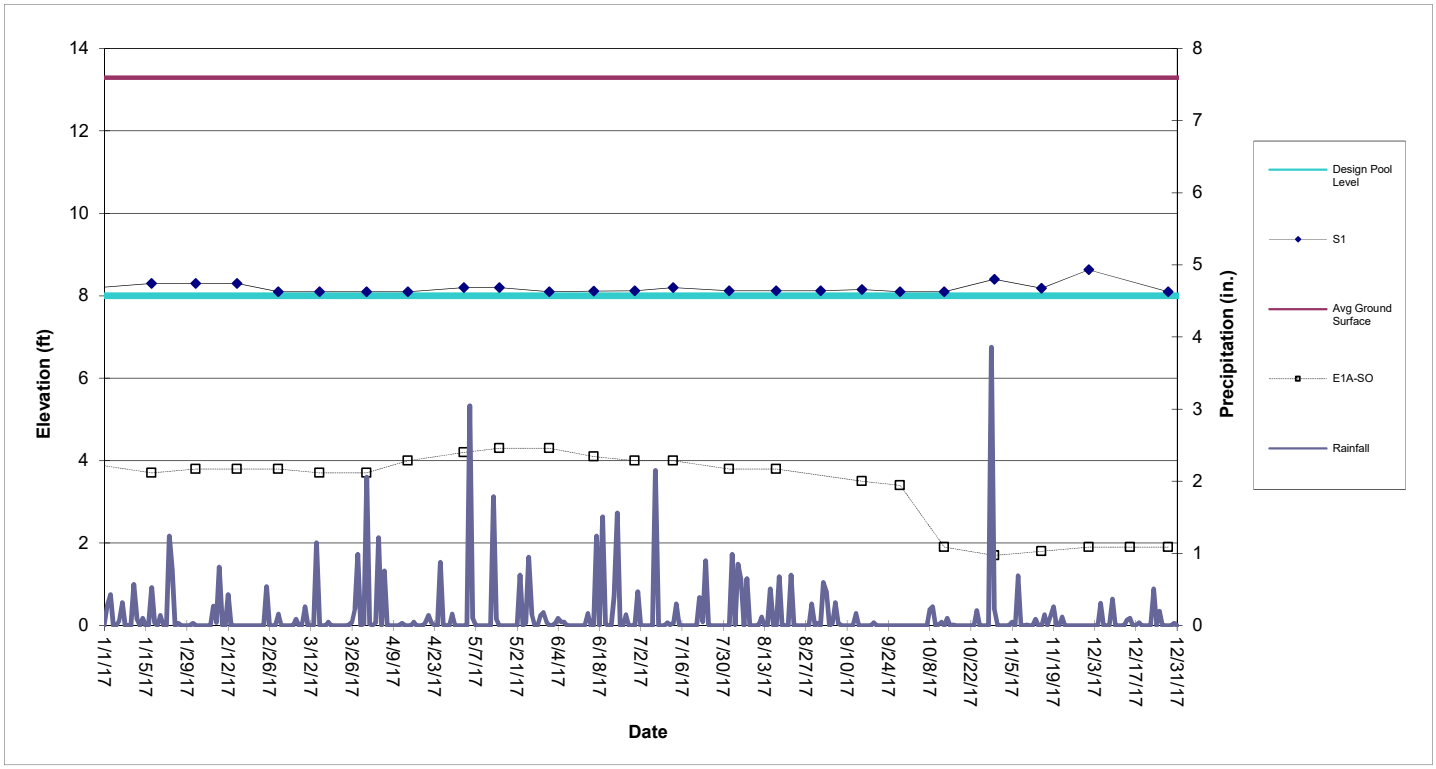
Perimeter Pool N4 (Sta. N6+80 to N10+23)



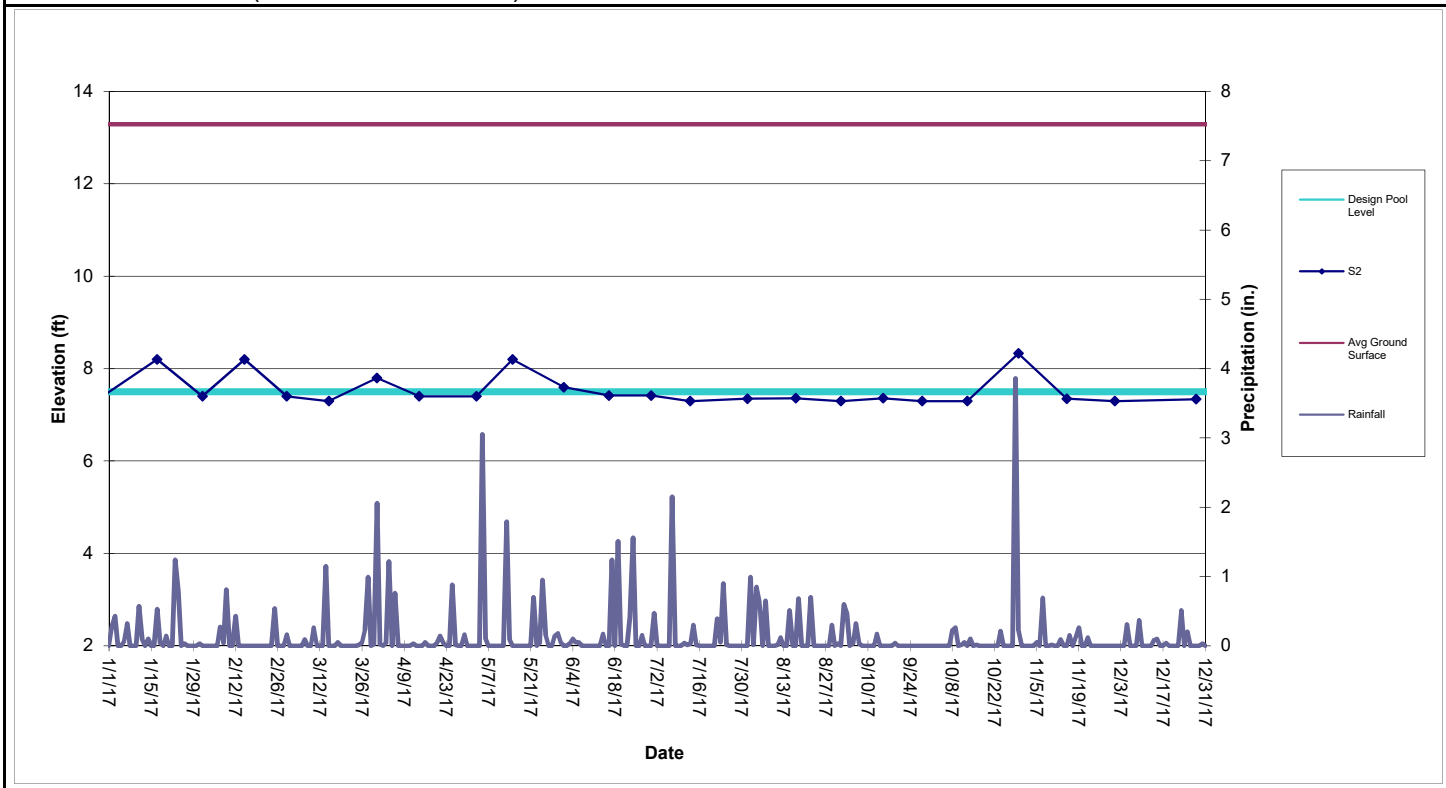
Perimeter Pool E1 (Sta. E0+50 to E3+75)



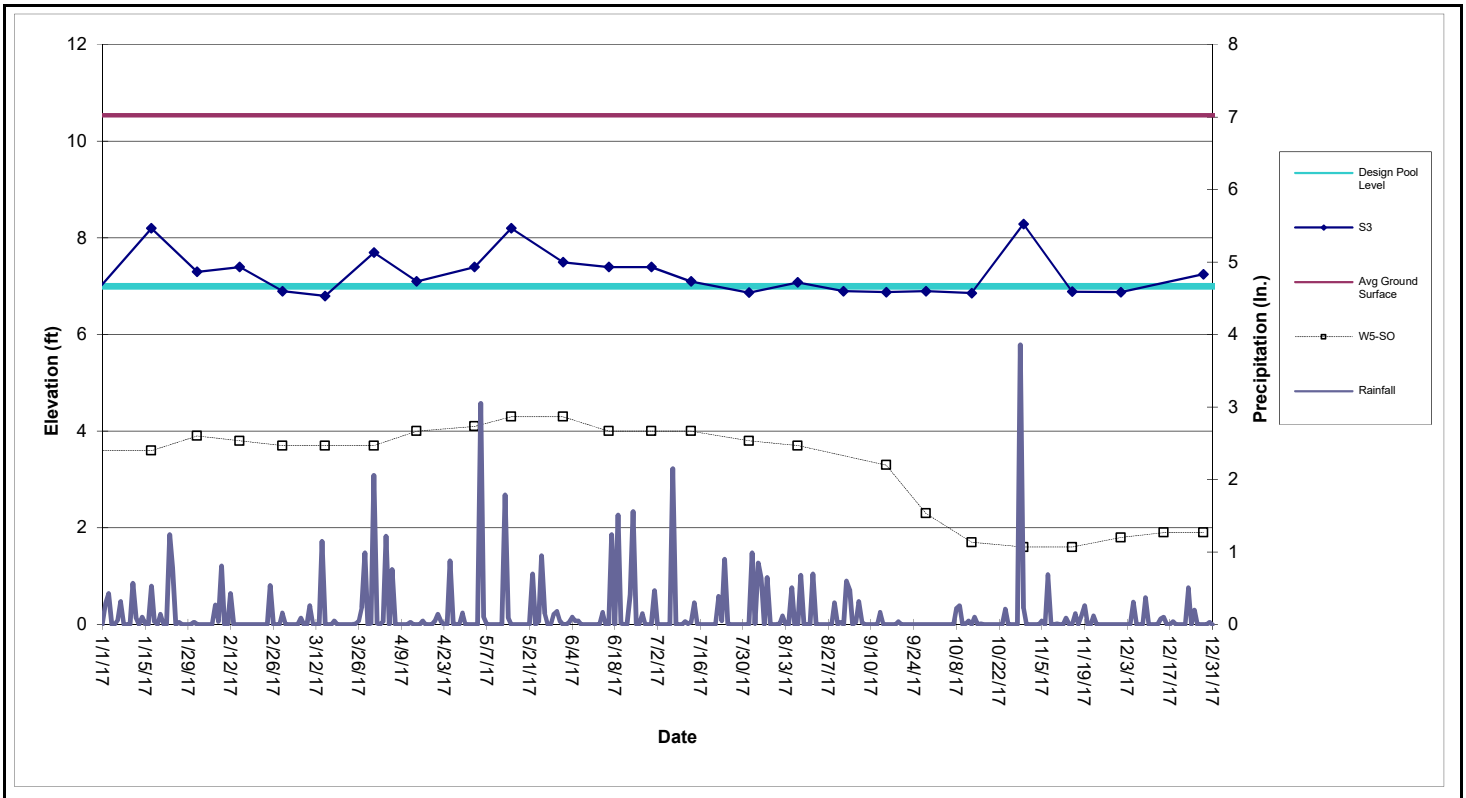
Perimeter Pool E2 (Sta. E4+50 to E7+25)



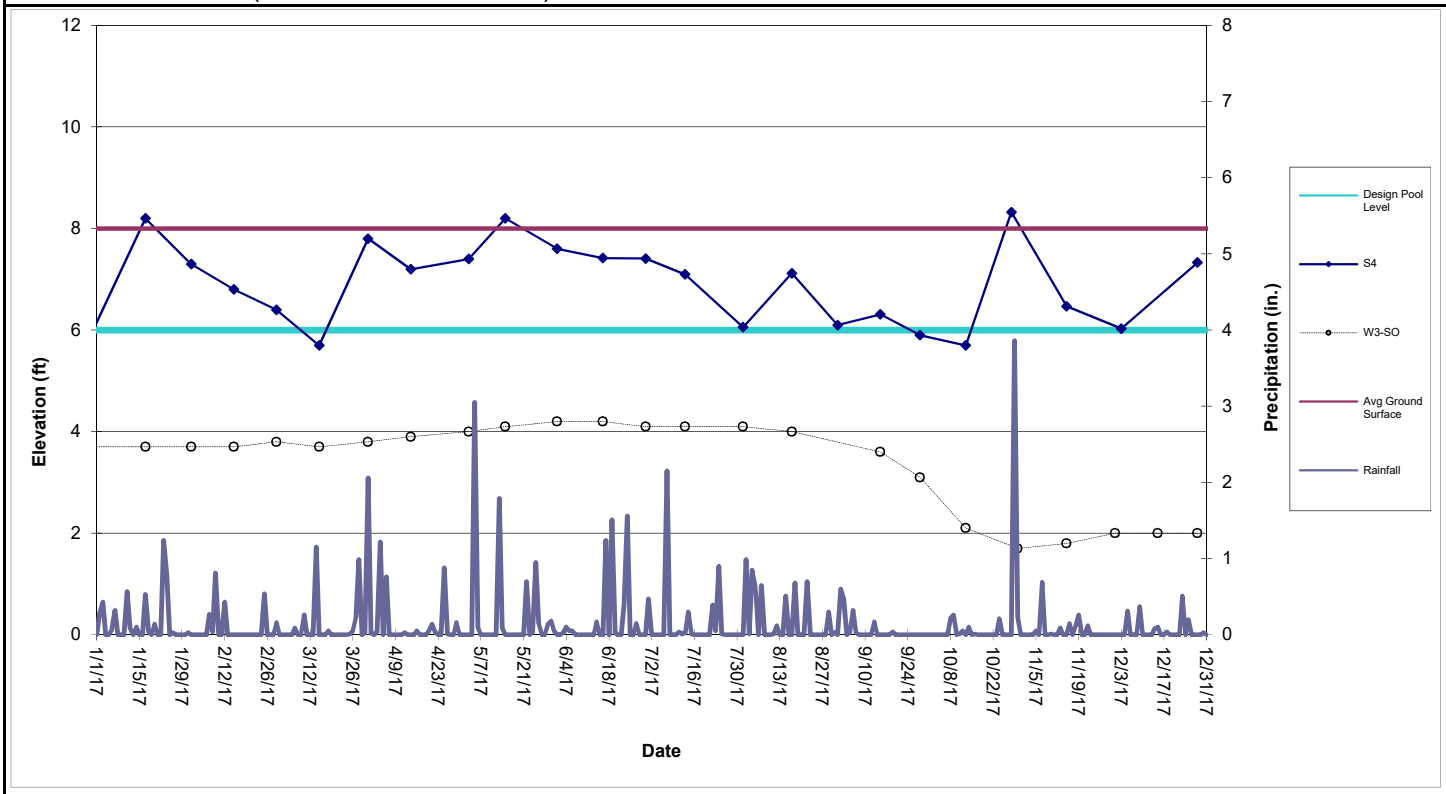
Perimeter Pool S1 (Sta. S0+50 to S3+88)



Perimeter Pool S2 (Sta. S4+38 to S10+60)



Perimeter Pool S3 (Sta. S11+10 to S17+50)



Perimeter Pool S4 (Sta. S17+86 to S22+05)

Table 1

Shallow Groundwater Data

	E1A-SO	E2-SO	E3-SO	E4-SO	E5-SO	W1-SO	W3-SO	W5-SO	W6-SO
Date									
1/17/2017	3.7	5.4	5.8	3.6	4.2	2.9	3.7	3.6	3.2
2/1/2017	3.8	5.6	5.9	3.7	4.5	3.0	3.7	3.9	3.4
2/15/2017	3.8	5.9	6.3	3.7	4.7	3.1	3.7	3.8	3.5
3/1/2017	3.8	5.7	6.1	3.7	4.5	3.1	3.8	3.7	3.5
3/15/2017	3.7	5.8	6.2	3.7	4.2	3.1	3.7	3.7	3.5
3/31/2017	3.7	5.7	6.2	3.8	4.6	3.2	3.8	3.7	3.6
4/14/2017	4.0	5.9	6.6	3.9	4.7	3.3	3.9	4.0	3.8
5/3/2017	4.2	5.9	6.5	4.0	4.7	3.4	4.0	4.1	3.8
5/15/2017	4.3	6.0	6.5	4.2	4.7	3.4	4.1	4.3	3.9
6/1/2017	4.3	5.9	6.5	4.1	4.6	3.4	4.2	4.3	3.6
6/16/2017	4.1	5.9	6.5	4.0	4.5	3.3	4.2	4.0	3.7
6/30/2017	4.0	6.2	6.5	4.1	4.7	3.6	4.1	4.0	4.1
7/13/2017	4.0	6.1	6.5	4.2	4.7	3.7	4.1	4.0	4.1
8/1/2017	3.8	6.0	6.3	4.2	4.6	3.8	4.1	3.8	4.1
8/17/2017	3.8	5.9	6.3	4.3	4.7	3.8	4.0	3.7	4.2
9/15/2017	3.5	5.8	6.1	4.2	4.6	3.7	3.6	3.3	4.1
9/28/2017	3.4	5.8	6.1	4.2	4.5	3.5	3.1	2.3	3.9
10/13/2017	1.9	5.4	5.9	3.8	4.1	3.4	2.1	1.7	3.5
10/30/2017	1.7	5.7	6.2	3.5	4.1	3.1	1.7	1.6	3.3
11/15/2017	1.8	5.5	6.0	2.9	3.7	3.0	1.8	1.6	3.3
12/1/2017	1.9	5.2	5.7	2.9	3.3	3.0	2.0	1.8	3.4
12/15/2017	1.9	4.9	5.4		3.1	3.1	2.0	1.9	3.4
12/28/2017	1.9	4.9	5.5		3.1	3.0	2.0	1.9	3.4

The following wells have been abandoned in accordance with the SA-6 100% Design:
134-W4-DO, 087-MW-001, 087-MW-019, 087-MW-Y20, 115-E1-DO, 115-E1-SO, 125-MW-01, 073-MW-BB-11, 073-MW-Y10, 134-MW-Q08.

The following wells have been abandoned:
North FS-1, FS-2, FS-3, FS-4, FS-5, FS-6, FS-7, FS-13
South FS-1, FS-3, FS-4, FS-5, FS-6, FS-7

The following wells are temporarily inaccessible:
134-MW-V09,