INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT FOR 2018

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

Prepared for

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VOLUME I – TEXT, TABLES, FIGURES

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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 tenth such annual performance report. In 2011, the GWET LTMP was expanded to integrate groundwater monitoring requirements for Study Areas 5, 6 and 7 (Project Area). Sampling and analysis within this integrated plan 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.

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

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

The draft LTMP for SA-5 Shallow Groundwater and updated LTMPs for SA-5 NJCU and SA-6 North and South are expected to be finalized during 2019.

The *Integrated SAP for SA-5/6/7* will be updated during 2019 to include modifications to the monitoring program based on remedial actions completed, monitoring data collected since 2008, and to incorporate requirements including any modifications agreed to by the parties or NJDEP from the RA Permits and site-specific LTMPs.

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 2018

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 2018 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). Conclusions and recommendations for modifications to the GWET LTMP are provided in Section 6.

2 GENERAL CONDITIONS

The GWET system was operated at its design rate throughout the year. Long term monitoring of the SA-6 Chromium Remedy continued at SA-6 South and SA-6 North in 2018. Groundwater pumping of the contingent groundwater extraction systems (CGWES) was conducted on an as-needed basis in SA-6 North and South Open Space Areas. At NJCU, the contingent groundwater pumping system was operated throughout 2018. Various wells throughout the area were abandoned following approval of an overall abandonment plan. The wells were no longer required as part of a monitoring program and were abandoned in an effort to decrease the overall number of wells on site during construction/redevelopment activities.

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 1 inch above average for the first half of 2018 and approximately 12.5 inches above the 30-year average for the second half. Total precipitation in 2018 was 59.48 inches or 13.23 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. With the exception of wells installed directly adjacent to the Hackensack River, there are no tidal influences in the Shallow Zone monitoring wells. Wells containing data loggers will not have the data tidally corrected. The mean tidal elevation is approximately +1.2 feet above mean sea level (msl) in the NGVD-1929 vertical datum.

2.3 Monitoring Well Inventory

A list of the groundwater monitoring wells in service within the Project Area during all or part of 2018 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 2018 include 087-MW-136D at SA6 North. A number of monitoring wells were abandoned in 2018 in accordance with the SA-6 Monitoring Well Abandonment Plan (MWAP). Honeywell updated the SA-6 MWAP in 2017 and 2018 and

submitted the revised MWAP to All Parties on March 16, 2018 via email from Mr. Jeremy Karpatkin of Arnold & Porter.

3 GROUNDWATER EXTRACTION

3.1 GWET System Operation

The Deep Overburden Groundwater Extraction and Treatment (GWET) system was in operation throughout 2018. 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 northwest side of Site 115 (SA-7) and pumps from the upper Bedrock zone. In December 2015, extraction well 087-PW-3 replaced well 087-PW-2. PW-3 is located approximately 120 feet east of PW-2 and is screened from 30 to 50 feet deep.

3.1.1 Pumping Rates

Flow rate monitoring was conducted on each of the three force mains using flow meters located within the treatment plant. The flow rates are controlled by a manually-operated valve and adjusted as necessary to maintain design rates of 40 gpm for PW-1, 7.5 gpm for PW-3 and 7 gpm for the bedrock extraction well 115-MW-215BR. The total system rate of 54.5 gpm was maintained throughout the period with the exception of occasional downtime for O&M activities. **Table 3-1** and **Figure 3-1** identify the events that resulted in a shutdown of more than 8 hours. In general, system shutdowns in 2018 were due to routine cleaning and maintenance activities, repair of the sulfuric acid tank, and storm-related power outages.

3.1.2 Force Main Acid Flushing

Force main cleanings for the GWET system were not required in 2018.

3.1.3 Well Redevelopment

GWET extraction well redevelopment activities were not required in 2018.

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. In 2018, the western portion of the contingent system was pumped periodically during the first quarter and during December, while the eastern portion was operated periodically from July to October. **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 (087-PZ-2, 087-PZ-4, and 087-PZ-6) responded to the pumping by declining to approximately 1.0 foot msl whereas the western piezometers PZ-8 and PZ-10 declined to approximately 2.0 feet msl.

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 April 9th to May 9th and from Spetember 26th to October 25th in 2018 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 6 gpm during both periods a rapid decline of groundwater levels was obervered especially within the western piezometers and to a lesser extent towards the east. After the cessation of pumping, groundwater levels rose to an average of 2.75 to 3.0 feet 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 2018. All pumping was conducted using extraction Sump B only; Sump A has not been operated. Due to Sump A discharge line relocation work as part of the NJCU redevelopment, Sump B was shut down from January 18 through February 8. 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 0.18 gpm from January 1 to 18, 2018 and 0.38 gpm from February 8 through the end of 2018.

4 HYDRAULIC MONITORING

Hydraulic monitoring in 2018 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 2018 round, ten 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 14.5 feet msl on Site 154 to less than 2.5 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 A**.

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

4.1.2 Intermediate Zone

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

4.1.3 Deep Zone

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

4.1.4 Bedrock Zone

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

4.2 GWET System Capture Zone

Figure 4-5 illustrates that pumping from PW-1 and PW-3 created a combined zone of influence causing groundwater to flow both laterally and vertically into the capture zone of the wells. The drawdown associated with both wells during the startup of PW-3 was documented in Cornerstone's technical memorandum dated February 23, 2016. Based on these results and data provided in both plan view on **Figures 4-2 and 4-3** and in cross section on **Figure 4-5,** the combined groundwater depression in the vicinity of the GWET pumping wells fully encompasses the deep overburden plume and provides effective capture that meets its design objectives.

4.3 New Jersey City University

Quarterly groundwater elevation data for the NJCU property are compiled in **Table 4-2** and mapped on **Figures 4-6 through 4-9**. A barrier wall extension, connecting the open-ended wing-wall west of Building 5 and the Building 6 sheet pile wall was constructed during May-June 2017. This wall completed the perimeter wall in the Shallow Zone around the capped portion of the Commercial AOC. This was followed by the installation of four monitoring wells (MW-105 through MW-108) that, along with the four existing wells MW-101 through MW-104, provide four well pairs along the barrier wall extension. Data loggers remained installed in the four well pairs as well as in Sumps A and B and wells 090-PZ-05 and 184-MW-05 throughout 2018 to monitor groundwater elevation trends on a 3-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 B** and indicate that groundwater elevations generally varied throughout the year in response to precipitation. A review of the hydrograph for well pair MW-101/105 shows that the outboard well (green line) is significantly greater than 0.1 foot above the inboard well (red line) indicating an inward gradient meeting the performance criteria of 0.1 foot for all but one to two weeks during each quarter. The well-pairs MW-103/107 and MW-104/108, while generally showing a gradient that was inward or close to zero for most of the year, did not consistently meet the performance criteria of a 0.1-foot head difference during 2018. As noted in pervious correspondence and reports, the future roadway and utility corridor forms a temporary depression that will be regraded and paved as part of NJCU's Phase 2 roadway and infrastructure project, which will improve stormwater drainage and reduce infiltration into the cap area. Honeywell expects that Shallow groundwater levels will more accurately reflect long term impact of these changes after final grading and construction of the roadways is completed (estimated during the latter part of 2020). In the meantime, it is premature to draw conclusions regarding shallow groundwater levels until the grading/paving work is completed.

At the MW-102/106 location, the head in the outside well MW-106 was generally lower than that of MW-102 and thus indicated an outward gradient. However, as noted in previous correspondence and reports, the screened interval in MW-106 is lower than that in MW-102 and thus is more representative of the lower regional heads beneath the level of the Meadow Mat. Well MW-106 is targeted for replacement during the latter part of 2020 and its screened interval will be raised to a similar elevation as MW-102 to allow a direct comparison of heads across the wall.

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

a scenario that is supported by groundwater quality data from the sentinel wells as further discussed in **Section 5-5**.

4.4 Eastern 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 the eastern perimeter pools E-1 and E-2 and comparing these data to groundwater elevations in the adjacent shallow piezometers E3-SO and E2-SO, respectively, located just outside of the SA-7 SCB. The location of the eastern perimeter pools, the design pool elevations, and water level trends are provided in **Appendix C.** Overall, the data indicate that water levels within the SA-7 eastern pools are greater than those outside of the SCB and thus outward gradients are occurring relative to the SA-7 SCB. 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 2018 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 5 feet msl within the cell. In addition, data from automatic loggers in each of the ten perimeter piezometers were used to construct the hydrographs provided in **Appendix A** to assess hydraulic gradient trends across the barrier walls through time and to calculate the monthly average head difference across the wall at each piezometer pair. The results are illustrated on **Figure 4-10** and indicate that with two exceptions, heads inside the cell were lower than heads outside of the wall, indicating inward gradients. The first exception is along the western wall at which gradients were slightly outward toward the river. The other exception was the eastern most piezometer pair when head differences in July were measured to be outward.

In accordance with the SA-6 LTMP, the quality of groundwater along the inside of the barrier wall at these locations was analyzed by the collection of groundwater samples from 087-PZ-2 in January and July, from 087-PZ-4 and 087-PZ-6 in January, and from 087-PZ-10 in January, April, July, and October. As discussed in **Section 5.4**, hexavalent chromium was not detected in any of these samples. Total chromium was detected above the NJDEP Groundwater Quality Standard (GWQS) of 70 ppb in 087-PZ-2 during the January 2018 round. Groundwater quality data from this sampling effort 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 2018 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 3-4 feet msl within the cell, 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 A** to assess hydraulic gradient trends across the barrier walls through time. These data were also used to calculate the monthly average head difference across the wall at each piezometer pair. These results are summarized on **Figure 4-11** and indicate that heads inside the cell were equal to or lower than heads outside of the wall throughout the year, indicating inward gradients. To assess the quality of groundwater along the inside of the barrier wall at the 124-PZ-20 location, groundwater samples were collected in April and October 2018 in accordance with the SA-6 LTMP. As discussed in **Section 5.3**, hexavalent chromium was not detected above the reporting limit in this well. These data were provided to the Parties in the applicable monthly progress reports.

4.7 SA-5 Sites 117 and 153

Groundwater movement beneath Sites 117 and 153 is generally from northeast to southwest as illustrated on **Figures 4-1** through **4-3**. In the Shallow zone, the 48-inch diameter combined sanitary/stormwater sewer beneath Route 440 serves as the primary groundwater sink and limits the further movement of groundwater to the south and west. Since the utilities beneath Route 440 were installed in close vertical proximity to the highly reducing conditions associated with the meadow mat, migration of hexavalent chromium into the pipe or along the bedding was, and is, not considered a viable transport mechanism. As noted in our December 7, 2018 Memorandum regarding Site 117 Discharge to Sewers, the JCMUA combined sewer is 48-inches in diameter with an invert elevation of approximately -5 feet (below sea level). Thus, the combined sewer pipe spans the interval between elevation -5 and -1 (ft., msl). By contrast, the storm sewers are 12 to 24 inches in diameter and much shallower, with inverts ranging from approximately +3.5' south of Kellogg St. to +7 feet near the entrance to the Home Depot parking lot. A comparison of these elevations with groundwater levels indicates that the storm sewers are, with rare exceptions, above the water table and thus rarely intercept groundwater flow from SA-5. By contrast, the combined sewer is well below the groundwater surface along its entire length and typically contains only a foot or so of water (December 19, 2018 verbal communication with JCMUA representatives). Given that the pipe is typically not full and therefore the resulting vertical head difference is large, it has the potential to induce groundwater into the pipe at its joints, etc. With an estimated base flow of 24 million gallons per day in the combined sewer, (December 19, 2018 verbal communication with JCMUA representatives), the estimated groundwater infiltration rate of 3 to 5 gpm (refer to Cornerstone's December 6, 2018 Memorandum) would not be discernable.

4.8 Miscellaneous Events

None

5 GROUNDWATER QUALITY MONITORING

Groundwater quality monitoring within the project area was conducted in 2018 in accordance with the GWET LTMP and the other applicable area-specific monitoring plans as discussed in **Section 1.3** and listed on **Table 1-2**.

5.1 Deep Overburden Regional Plume Monitoring

In accordance with the recommendations in Section 7.5 of the 2017 Integrated Groundwater Annual Report, the next round of regional monitoring of the Deep Overburden Plume was scheduled for the fall of 2018. However, at the request of Plaintiffs, this sampling event has been rescheduled for the spring of 2019 to coincide with sampling beneath the riverbed sediments. Thus, sampling was not conducted in 2018.

5.2 GWET Extraction Wells

Groundwater from the three GWET pumping wells was sampled quarterly in 2018 as shown in **Table 5-1**. The samples were unfiltered and analyzed for total and hexavalent chromium and volatile organic compounds (VOCs). The results for hexavalent chromium are plotted on **Figure 5-1** 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 2018 were approximately 19 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, and have also declined in an asymptotic fashion since then. Hexavalent chromium concentrations in the bedrock have been generally stable at approximately 15 ppm. The Intermediate Zone pumping well PW-3 contains the highest concentrations of VOCs with the most prevalent compounds being chlorinated volatile organics such as trichloroethene **(Figure 5-2)** 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 any Honeywell historic operations.

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 GWQS of 70 ppb.

During 2018, 140-MW-09 was the only well sampled. This well was sampled on March 23, June 7, and June 25. Total chromium was reported above the GWQS of 70 ppb during each sampling event. Every event consisted of an unfiltered sample, and two filtered samples, one using a 0.45 micron filter and the other a 0.1 micron filter. Results during the March 23 event were 102 ppb, 46.9 pbb, and 45.6 pbb, respectively. The June 7 results were 124 ppb, 117 ppb, and 86.3 ppb, respectively. Results during the June 25 event were 204 ppb, 102 pbb, and 156 pbb, respectively. Hexavalent chromium was not detected in any sample. Cumulatively, these results indicate that the total chromium concentrations are the result of trivalent chromium sorbed on soil particles in the sample. NJDEP agreed with this conclusion and allowed Honeywell to discontinue the shallow groundwater sampling program in the SA-6 South Development AOC and abandon all of the monitoring wells.

As discussed in **Section 4.6**, groundwater samples were also collected from piezometer PZ-20 located inside of the barrier wall of the SA-6 South soil containment area. Samples were collected in April and October with reported total chromium concentrations of 32.6 ppb and 31.1 ppb, respectively in the unfiltered samples. Total chromium concentrations were not detected in the filtered samples. Hexavalent chromium was not detected in any of the samples.

5.4 SA-6 North

As discussed in **Section 4.5**, groundwater samples were collected from four of the five perimeter piezometers located inside of the SA-6 North soil containment barrier wall during 2018. The sample from PZ-2 during the January event was the only 2018 result that contained a total chromium concentration in excess of 70 ppb. This detetion was in the unfiltered sample at 106 ppb, whereas, the filtered sample was non detect. Piezometer PZ-2 had a detection of 21.9 ppb for total chromium in the unfiltered sample during the July round, and piezometer PZ-6 had a detection at 13.5 ppb for total chromium in the unfiltered sample in the January round. Piezometer PZ-4 sampled in January had no detections of total chromium. Piezometer PZ-10 was sampled during each quarter in 2018 and had no detections of total chromium. Sample results indicated that none of the piezometers contained hexavalent chromium concentrations. Groundwater monitoring wells were not sampled at SA-6 North in 2018**.**

5.5 New Jersey City University

Groundwater samples were collected quarterly in 2018 from the three original sentinel wells (184-MW-04, 184-MW-05, and 184-MW-06) at NJCU. Total chromium was

detected above the GWQS in one of the unfiltered samples (184-MW-05 in the March event) at 91.3 ppb. The corresponding filtered sample result was non detect. Hexavalent chromium was only detected in well 184-MW-06 (during the March and June events) and at concentrations comparable with previous results. This well is located up-gradient of the capped area. Hexavalent chromium was not detected above the reporting limit (5.5 ppb) during the September and December sampling events. None of the samples contained filtered total chromium concentrations in excess of 70 ppb in 2018. Groundwater quality sampling of these wells has been discontinued as of the end of 2018 in favor of the four wells pairs along the barrier wall extension discussed below. This change is reflected in the current draft Shallow Groundwater Monitoring and Extraction System Operation Plan for the NJCU Commercial AOC.

Monitoring wells along the barrier wall extension (184-MW-101 through 184-MW-108), were sampled quarterly. The results are provided on **Figure 5-4** and indicate that hexavalent chromium was only detected above the reporting limit of 5.5 ppb in 184-MW-103 during two rounds of sampling (March and June) at concentrations ranging from 6.1 ppb to 21 ppb. Well 184-MW-103 is located outside (upgradient) of the barrier wall. Hexavalent chromium was not detected in this well during the September and December sampling events. Total chromium in the unfiltered samples was reported above the GWQS in two wells: 184-MW-107 at 108 ppb and 139 ppb in the September and December events, respectively; and in 184-MW-102 at 205 pbb during the March event. The corresponding filtered samples were 4.4 ppb and ND, respectively, for 184-MW-107 and 6.1 ppb in 184-MW-102.

5.6 Plume Diversion Area Monitoring

Based on the results of groundwater monitoring in 2017, no further groundwater samples were collected in the Plume Diversion Area in 2018, and the majority of the related monitoring wells were abandoned as shown in **Table 2-2**.

5.7 SA-5 Site 117

Groundwater sampling for water quality analysis was conducted at Site 117 in December 2018 at the following wells:

- 117-MW-A05
- 117-MW-A14
- 117-MW-A85
- 117-MW-A89
- 117-MW-A99
- 117-MW-14S

The samples were analyzed for total and and hexavalent chromium; both filtered and unfiltered. The total chromium GWQS of 70 ppb was exceeded at 117-MW-A85, 117-MW-A89, and 117-MW-I4S in both the filitered and unfiltered samples. Total chromium

was also detected in 117-MW-A14 and 117-MW-A99 but below 70 ppb. Hexavalent chromium was detected above 70 ppb in one well (117-MW-I4S) in both the filtered and unfiltered samples. Results are provided on **Figure 5-5** and were generally comparible to prior results.

Regarding well 117-MW-I4S, this well is located near the Site 117 boundary with NJCU and was originally installed to provide samples for treatability testing within the source area and not for long-term monitoring purposes. It is recommended that this well be temporarily maintained for a period of 6 months after the completion of the adjacent roadway construction, and used for water level monitoring only. Continued groundwater quality sampling is not necessary as the results will likely show similar order of magnitude concentrations in the future, and other monitoring wells provide data for evaluation of groundwater quality down-gradient of this location.

5.8 SA-5 Sites 079/153

Groundwater sampling for water quality analysis was conducted at Site 153 in December 2018. Wells 153-MW-A13 and 153-MW-A15 were sampled and analyzed for total chromium and hexavalent chromium. Total chromium was detected above the GWQS of 70 ppb in 153-MW-A15 at 128 ppb in the unfiltered sample and 73.6 ppb in the filtered sample, and in 153-MW-A13 at 103 ppb in the filtered sample. Hexavalent chromium was only detected in the unfiltered sample in 153-MW-A13 at 22 ppb. Results are presented on **Figure 5-5.**

Groundwater quality sampling at Site 079 was not conducted in 2018.

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 is to be sampled every five years or until the plume has been pulled back. The next in-situ groundwater sampling event beneath the riverbed sediments is scheduled for Spring 2019.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Compliance with Monitoring Requirements

Hydraulic and groundwater quality monitoring conducted in 2018 have fulfilled the various monitoring plan requirements in accordance with **Tables 1-1 and 1-2**.

6.2 Status of Groundwater CEA Certifications

Groundwater Classification Exception Areas were approved by NJDEP on February 16, 2012 for the three 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 Remedial Action (RA) Permit Applications to NJDEP in December 2017 and RA Permits were issued by the NJDEP in 2018. The RA Groundwater Permits include one permit for the Deep Overburden Zone, one permit for the Bedrock Zone, and five permits for the shallow zone as follows: SA-5 NJCU, Site 117, Site 153, SA-6 North and SA-6 South Open Space Cap areas. Biennial certification reports are due during July and August of 2020 and every 2 years thereafter.

6.3 Recommendations for Monitoring Well Network

In 2018 the abandonment of selected groundwater monitoring wells was conducted in accordance with the Updated Monitoring Well Abandonment Plan for SA-6 North and South submitted to All Parties on March 16, 2018. Currently, existing monitoring wells are part of monitoring programs indicated in either the RA Permits or LTMPs.

As indicated in Section 5.7, it is recommended that well 117-MW-I4S be temporarily retained for groudwater level monitoring only. This well was installed to provide samples for treatability testing within the source area and not for long-term monitoring purposes. Water level monitoring will be continued during and after roadway construction until hydraulic gradient issues have been resolved, at which time it will be abandoned and removed from the monitoring program.

6.4 Recommendations for Water Level Monitoring Frequency

It is recommended that the frequency of regional groundwater level monitoring be modified from quarterly to annually beginning January 2020. This modification will be included in the revised/updated SAP to be submitted to all Parties for review prior to implementation. 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 increased use of automated, telemetric water level data loggers in 2019 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**.

6.5 Recommendations for Groundwater Quality Monitoring Frequency

The regional GWET LTMP groundwater quality sampling event has been conducted six times since its inception in 2008, with the seventh event scheduled for the Spring of 2019. 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 2019 event, and in consideration that no further deep remedial actions are planned within the Project Area, it is recommended that the sampling frequency for deep overburden and bedrock wells be changed to every 5 years. Thus, after the 2019 round, the next round would be in 2024.

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

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

6.6 Other Recommendations

There are no further recommendations.

LIMITATIONS

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

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

TABLES

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

Location	Monitoring Plan	Consent Decree	Depth	Frequency	# Wells*
Regional[1]	GWET Long Term Monitoring Plan June 10, 2008	Deep Overburden and Bedrock Groundwater Remedies Consent Order	All Zones	Quarterly through 2019 Proposed annually thereafter	126
Study Area 7	SA-7 Perimeter Pools	Final Judgement, ICO v Honeywell	Shallow and Interm.	Monthly	4
SA-6 South	SA-6 LTMP (February 2018)	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 South	Shallow	Quarterly	13
SA-6 North	SA-6 LTMP (February 2018)	First Amended Consent Decree Regarding Remediation and Redevelopment of Study Area 6 North	Shallow	Quarterly	14
SA-5 (NJCU) Sites 90 & 184	SA-5 NJCU Long Term Monitoring Plan (March 2018)	Consent Decree Regarding Remediation of the New Jersey City University Redevelopment Area	Shallow	Quarterly through 2019 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[2]	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[2]	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 LTMP for SA-5 Shallow Groundwater includes monitoring at Sites 117 and 153 in progress; to be finalized in 2019.

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	6 5 2 1	April 2019 April 2019
SA-6 South	SA-6 LTMP (February 2018)	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 South	Shallow	As required by inward gradients across wall	5	on-going
SA-6 North	SA-6 LTMP (February 2018)	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 North	Shallow	As required by inward gradients across wall	5	on-going
SA-5 (NJCU) Sites 90 & 184	Long Term Monitoring Plan / Shallow Groundwater Monitoring Document[1]	Consent Decree Regarding Remediation of the New Jersey City University Redevelopment Area	Shallow	Quarterly through 2019; then TBD	8	on-going
SA-5 Site 117	Long Term Monitoring Plan for SA-5 Shallow GW[2]	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	Biennial***	6	Dec. 2018
SA-5 Site 153	Long Term Monitoring Plan for SA-5 Shallow GW[2]	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	Biennial***	2	Dec. 2018

[1]SA-5 NJCU Draft Shallow Groundwater Monitoring and Extraction System Operation Plan to be finalized in 2019 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 2019. Remedial Action Permits for Groundwater issued by NJDEP in 2018.
* Number and location of wells subject to periodic update.
** Beginning with April 2019 Event
*** Beginning with December 2018 Event
Biennial = every two years

Table 2-1
2018 Monthly Precipitation Data

Month	2018 Precipitation	Average Precipitation
January	2.06	3.98
February	5.74	2.96
March	4.48	4.21
April	5.85	3.92
May	3.80	4.46
June	1.87	3.4
July	6.30	4.68
August	5.87	4.02
September	5.64	4.01
October	2.82	3.16
November	7.95	3.88
December	7.09	3.57
Annual Total	59.48	46.25

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

Table 2-2
Groundwater Monitoring Well Inventory

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

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Comments
		(ft msl)	(ft)	(ft)	
073-MW-1BR	Rock	25.25	144.0	15	
079-MW-13BR-1	Rock	13.08	121.0	10	
079-MW-13BR-2	Rock	13.08	214.0	15	
079-MW-13BR-3	Rock	13.08	284.0	15	
090-MW-7BR-1	Rock	12.66	134.0	15	
090-MW-7BR-2	Rock	12.66	NA	NA	
090-MW-7BR-3	Rock	12.66	NA	NA	
115-MW-203BR	Rock	8.70	162.0	20	
115-MW-215BR	Rock	8.82	143.0	20	
117-MW-3BR-1	Rock	12.34	155.0	15	
117-MW-3BR-2	Rock	12.34	263.0	15	
117-MW-8BR	Rock	12.94	125.0	10	
119-MW-2BR-1	Rock	8.43	163.0	15	
119-MW-2BR-2	Rock	8.43	245.0	15	
119-MW-2BR-3	Rock	8.43	315.0	15	
119-MW-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	
124-MW-8BR	Rock	9.71	133.0	2	
SA6-MW-5BR-1	Rock	17.06	106.0	15	
SA6-MW-5BR-2	Rock	17.06	154.0	15	
SA6-MW-5BR-3	Rock	17.06	204.0	13	
SA6-MW-5BR-4	Rock	17.06	236.0	15	
SA6-MW-5BR-5	Rock	17.06	281.0	15	
SA6-MW-14BR	Rock	9.99	85.0	10	
SA6-MW-15BR	Rock	8.08	103.0	20	
079-MW-01	Shallow	8.80	NA	NA	
079-MW-A2	Shallow	8.10	13.0	10	
079-MW-C6	Shallow	11.00	13.0	10	
087-PZ-1	Shallow	10.09	11.5	5	Installed June 2016
087-PZ-2	Shallow	13.66	8.0	5	Installed June 2016
087-PZ-3	Shallow	15.93	13.0	5	Installed June 2016
087-PZ-4	Shallow	18.98	12.0	5	Installed June 2016
087-PZ-5	Shallow	22.10	13.0	5	Installed June 2016
087-PZ-6	Shallow	23.94	13.0	5	Installed June 2016
087-PZ-7	Shallow	19.37	26.0	5	Installed June 2016
087-PZ-8	Shallow	19.26	14.0	5	Installed June 2016
087-PZ-9	Shallow	18.12	12.0	5	Installed June 2016
087-PZ-10	Shallow	18.56	12.0	5	Installed June 2016
088-MW-15R	Shallow	12.82	NA	NA	
090-PZ-05	Shallow	17.24	NA	NA	
090-PZ-06	Shallow	17.15	NA	NA	
115-E1A-SO	Shallow	18.97	7.0	NA	Replaced 115-E1A-SO in 2015
115-E2-SO	Shallow	10.05	10.0	NA	
115-E3-SO	Shallow	12.57	NA	NA	
115-E4-SO	Shallow	16.04	NA	NA	

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Comments
		(ft msl)	(ft)	(ft)	
115-E5-SO	Shallow	18.49	19.8	2	
115-PZ-500	Shallow	6.68	NA	NA	
115-PZ-501	Shallow	14.47	NA	NA	
115-PZ-502	Shallow	14.51	16.0	NA	
115-PZ-503	Shallow	7.32	NA	NA	
115-W1-SO	Shallow	12.59	NA	NA	
115-W3-SO	Shallow	15.16	14.0	NA	
115-W5-SO	Shallow	21.28	16.0	2	
115-W6-SO	Shallow	16.96	NA	NA	
117-MW-A05	Shallow	18.48	16.0	NA	
117-MW-A14	Shallow	17.33	17.0	NA	
117-MW-I4S	Shallow	15.49	11.2	NA	
117-MW-A85	Shallow	17.40	15.0	NA	
117-MW-A89	Shallow	13.17	16.0	NA	
117-MW-A99	Shallow	15.95	14.0	NA	
124-MW-10	Shallow	10.06	11.0	8	
124-MW-11	Shallow	9.05	8.0	6	
124-PZ-11	Shallow	15.89	9.5	5	(formerly PZ5-SO) Installed 2015
124-PZ-12	Shallow	15.97	9.5	5	(formerly PZ5-SI) Installed 2015
124-PZ-13	Shallow	16.04	9.5	5	(formerly PZ4-SO) Installed 2015
124-PZ-14	Shallow	16.03	14.1	5	(formerly PZ4-SI) Installed 2015
124-PZ-15	Shallow	14.16	10.1	5	(formerly PZ3-SO) Installed 2015
124-PZ-16	Shallow	18.99	19.6	5	(formerly PZ3-SI) Installed 2015
124-PZ-17	Shallow	18.07	12.0	5	(formerly PZ2-SO) Installed 2015
124-PZ-18	Shallow	18.18	16.2	5	(formerly PZ2-SI) Installed 2015
124-PZ-19	Shallow	17.91	10.4	5	(formerly PZ1-SO) Installed 2015
124-PZ-20	Shallow	18.38	17.3	5	(formerly PZ1-SI) Installed 2015
153-MW-A13	Shallow	9.62	10.0	6	
153-MW-A15	Shallow	11.00	12.2	10	
154-MW-A06	Shallow	19.87	15.1	NA	
154-MW-A5A	Shallow	19.16	14.0	NA	
184-MW-04	Shallow	8.76	NA	NA	
184-MW-05	Shallow	14.79	NA	NA	
184-MW-06	Shallow	17.75	NA	NA	
184-MW-101	Shallow	14.95	13.0	5	
184-MW-102	Shallow	15.88	12.0	5	
184-MW-103	Shallow	15.96	14.0	5	
184-MW-104	Shallow	16.46	13.0	5	
184-MW-105	Shallow	15.10	NA	5	
184-MW-106	Shallow	15.47	NA	5	
184-MW-107	Shallow	15.90	NA	5	
184-MW-108	Shallow	16.61	NA	5	
Sump A	Shallow	15.98	NA	NA	
Sump B	Shallow	13.06	NA	NA	
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 2018

Well ID	Start Date	End Date	Duration Days and	Hours	Comment
087-PW-1	6-Jan-18	7-Jan-18		35.25	Shutdown due to storm
087-PW-1	7-Aug-18	7-Aug-18		10.17	Shutdown due to storm
087-PW-3	7-Aug-18	7-Aug-18		10.17	Shutdown due to storm
087-MW-215BR	7-Aug-18	7-Aug-18		10.17	Shutdown due to storm
087-PW-1	13-Aug-18	17-Aug-18		93.25	repairs of sulfuric acid tank
087-PW-3	13-Aug-18	17-Aug-18		93.25	repairs of sulfuric acid tank
087-MW-215BR	13-Aug-18	17-Aug-18		93.25	repairs of sulfuric acid tank
087-PW-3	11-Dec-18	11-Dec-18		8.75	clean discharge line

TABLE 4-1
GROUNDWATER ELEVATION DATA FROM QUARTERLY ROUNDS IN 2018

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-18	Jun-18	Sep-18	Nov-18
		(ft msl)	(ft)	(ft)	(ft msl)	(ft msl)	(ft msl)	(ft msl)
087-MW-08	Deep	12.98	99	10	1.24	0.84	1.43	1.43
087-MW-34	Deep	12.73	70	5	-0.37	-0.81	-0.76	-2.29
087-MW-A26T	Deep	9.92	56	15	3.62	2.91	N/A	3.77
087-MW-W25T	Deep	19.06	91	15	1.78	1.32	3.27	1.83
087-OBS-1L	Deep	15.27	67.05	5	1.43	1.44	1.41	N/A
087-OBS-1T	Deep	15.23	105	10	1.61	1.16	2.42	1.72
087-OBS-3L	Deep	12.88	65	5	0.71	0.29	0.29	1.00
087-OBS-4T	Deep	11.6	75.5	5	1.19	0.61	1.25	1.13
087-OBS-5T	Deep	12.62	81.9	10	0.25	-0.32	-0.06	0.05
087-PW-1	Deep	12.66	69	10	-29.45	-33.40	-32.14	-33.70
088-MW-G19T	Deep	15.085	93	15	3.16	2.55	3.26	3.19
090-MW-09	Deep	10.81	75	5	5.75	5.07	5.82	5.98
117-MW-D1	Deep	11.08	41	10	3.44	3.01	3.48	3.64
117-MW-D2	Deep	17.62	48	10	4.80	4.44	4.95	5.55
117-MW-D3	Deep	18.85	80	10	6.10	5.70	6.21	6.29
117-MW-I4	Deep	15.49	75	10	5.79	4.73	5.02	5.40
119-MW-01T	Deep	10.78	62	10	N/A	N/A	N/A	3.63
119-MW-02T	Deep	8.8	70	10	N/A	N/A	N/A	3.42
124-MW-106T	Deep	11.203	78	10	2.99	2.72	3.08	3.30
153-MW-A13T	Deep	9.34	58	15	3.36	3.10	3.33	3.79
SA6-MW-AA1T	Deep	15.31	70	10	1.38	0.86	0.45	1.41
087-MW-136D	Intermediate	13.19	36	10	N/A	N/A	N/A	N/A
087-MW-13	Intermediate	12.93	40	10	-0.19	0.74	0.15	2.16
087-MW-A26D	Intermediate	10.35	28	10	3.70	2.95	N/A	3.86
087-MW-O29D	Intermediate	10.32	56	N/A	1.62	-1.14	1.09	1.52
087-MW-W25D	Intermediate	16.98	66	10	2.14	1.69	3.91	1.85
087-OBS-07	Intermediate	12.59	30	5	0.39	-0.74	-0.53	-2.17
087-OBS-1D	Intermediate	15.13	42.8	10	2.11	1.84	1.87	2.20
087-OBS-2D	Intermediate	12.68	54	10	-29.53	-2.04	-2.01	-1.74
087-OBS-5D	Intermediate	12.72	39.83	10	-14.54	-0.42	-0.56	-0.59
087-PW-2	Intermediate	13.02	48	20	2.80	1.80	1.86	-0.08
087-PW-3	Intermediate	12.4	50	20	-8.45	-10.30	-9.69	-11.70
090-MW-07	Intermediate	16.79	40	10	6.68	5.91	6.35	6.49
117-MW-I1	Intermediate	11.08	22	10	4.16	3.86	4.54	4.78
117-MW-I2	Intermediate	17.59	28	10	4.79	4.94	5.41	4.97
117-MW-I3	Intermediate	15.59	28	10	5.49	4.82	5.39	2.16
117-MW-I5	Intermediate	18.76	37	15	6.32	6.22	6.41	6.59
124-MW-G02D	Intermediate	9.59	28	10	3.04	2.55	3.36	3.12
SA6-MW-AA1D	Intermediate	19.36	32	10	1.46	0.90	0.12	1.34
073-MW-1BR	Rock	25.27	144	15	-1.09	-0.77	0.04	-1.79
079-MW-13BR-1	Rock	13.08	121	10	N/A	N/A	7.96	7.87
079-MW-13BR-2	Rock	13.08	214	15	N/A	N/A	8.17	8.28
079-MW-13BR-3	Rock	13.08	284	15	N/A	N/A	7.89	8.06
090-MW-7BR-1	Rock	12.66	134	15	N/A	N/A	1.26	0.88
090-MW-7BR-2	Rock	12.66	N/A	N/A	N/A	N/A	1.36	1.08
090-MW-7BR-3	Rock	12.66	N/A	N/A	N/A	N/A	1.41	1.46
115-MW-203BR	Rock	8.7	162	20	1.13	-0.76	0.11	-1.65
115-MW-215BR	Rock	8.82	143	20	-3.65	-3.96	-3.72	-3.34
117-MW-3BR-1	Rock	12.34	155	15	N/A	N/A	N/A	6.19
117-MW-3BR-2	Rock	12.34	263	15	N/A	N/A	N/A	7.04
117-MW-8BR	Rock	12.94	125	10	N/A	N/A	5.88	6.30
119-MW-2BR-1	Rock	8.43	163	15	-0.85	-1.21	1.73	-0.64
119-MW-2BR-2	Rock	8.43	245	15	0.09	-0.70	1.97	-0.04
119-MW-2BR-3	Rock	8.43	315	15	0.05	-0.36	2.09	0.69
119-MW-11BR	Rock	10.75	159	20	N/A	N/A	N/A	4.53
119-MW-12BR	Rock	11.26	154	20	N/A	N/A	N/A	5.77
119-MW-16BR-1	Rock	8.61	151	15	N/A	N/A	N/A	6.13
119-MW-16BR-2	Rock	8.61	187	15	N/A	N/A	4.83	4.83
119-MW-16BR-3	Rock	8.61	247	15	N/A	N/A	N/A	4.85
124-MW-8BR	Rock	9.71	133	N/A	4.11	3.84	4.11	4.37
SA6-MW-5BR-1	Rock	17.06	106	15	N/A	N/A	N/A	2.72
SA6-MW-5BR-2	Rock	17.06	154	15	N/A	N/A	N/A	3.48
SA6-MW-5BR-3	Rock	17.06	204	13	N/A	N/A	N/A	3.94
SA6-MW-5BR-4	Rock	17.06	236	15	N/A	N/A	N/A	3.82
SA6-MW-5BR-5	Rock	17.06	281	15	N/A	N/A	N/A	4.01
SA6-MW-14BR	Rock	9.99	85	10	N/A	N/A	4.33	3.77
SA6-MW-15BR	Rock	8.08	103	20	1.95	1.57	2.37	1.46

TABLE 4-1
GROUNDWATER ELEVATION DATA FROM QUARTERLY ROUNDS IN 2018

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-18	Jun-18	Sep-18	Nov-18
079-MW-01	Shallow	8.8	N/A	N/A	4.66	3.78	4.29	4.56
079-MW-A2	Shallow	8.1	13	10	3.81	3.26	4.00	4.56
079-MW-C6	Shallow	11	13	10	5.41	5.16	5.51	3.92
087-PZ-1	Shallow	10.04	10.76	5	5.04	3.42	6.52	5.85
087-PZ-2	Shallow	10.35	11.88	5	3.61	3.91	4.08	4.77
087-PZ-3	Shallow	13.28	14.32	5	4.92	3.78	5.40	5.69
087-PZ-4	Shallow	13.65	14.89	5	3.60	3.68	3.70	4.05
087-PZ-5	Shallow	19.49	20.43	5	5.81	4.77	7.08	6.49
087-PZ-6	Shallow	21.04	22.28	5	3.04	3.55	3.27	3.63
087-PZ-7	Shallow	16.24	22	5	6.56	5.00	6.87	6.57
087-PZ-8	Shallow	16.54	17.58	5	2.51	2.94	3.37	3.72
087-PZ-9	Shallow	17.19	18.96	5	2.98	2.43	3.23	2.93
087-PZ-10	Shallow	17.06	18.58	5	2.99	3.06	4.33	4.52
088-MW-15R	Shallow	14.593	N/A	N/A	3.19	2.37	3.38	3.12
090-PZ-05	Shallow	17.26	N/A	N/A	8.98	7.71	7.88	3.13
090-PZ-06	Shallow	17.18	N/A	N/A	9.76	8.85	9.69	8.23
115-E1A-SO	Shallow	21.53	7	N/A	3.74	2.50	1.45	2.88
115-E2-SO	Shallow	10.05	10	N/A	6.69	6.70	7.18	6.85
115-E3-SO	Shallow	12.57	N/A	N/A	6.97	6.38	6.66	6.85
115-E4-SO	Shallow	16.04	13.17	N/A	3.65	1.87	1.66	4.09
115-E5-SO	Shallow	18.49	19.8	N/A	4.69	2.89	3.82	5.04
115-PZ-500	Shallow	6.68	N/A	N/A	4.89	4.49	4.80	5.05
115-PZ-501	Shallow	14.47	N/A	N/A	6.10	5.16	5.17	4.56
115-PZ-502	Shallow	14.51	16	N/A	5.41	4.83	4.78	5.45
115-PZ-503	Shallow	7.32	N/A	N/A	5.00	4.53	4.63	4.86
115-W1-SO	Shallow	23.08	N/A	N/A	2.36	-1.64	-1.20	3.34
115-W3-SO	Shallow	15.16	13.93	N/A	3.33	2.35	3.34	3.34
115-W5-SO	Shallow	24.45	16	N/A	3.73	-0.23	1.40	2.31
115-W6-SO	Shallow	16.96	N/A	N/A	2.76	0.89	1.47	1.77
117-MW-A05	Shallow	18.48	16	N/A	N/A	6.79	7.22	7.50
117-MW-A14	Shallow	17.33	17	N/A	5.16	4.96	5.50	5.49
117-MW-A85	Shallow	17.4	15	N/A	6.20	5.09	5.15	5.23
117-MW-A89	Shallow	13.17	16	N/A	4.80	4.21	5.25	4.91
117-MW-A99	Shallow	15.95	14	N/A	5.45	5.48	5.55	5.67
117-MW-I4S	Shallow	15.49	N/A	N/A	7.03	N/A	5.89	6.06
124-MW-10	Shallow	10.06	11	8	5.38	4.85	2.74	5.53
124-MW-11	Shallow	9.05	8	6	5.22	4.06	6.37	5.57
124-PZ-11	Shallow	9.69	9.02	5	5.64	5.39	7.93	6.69
124-PZ-12	Shallow	10.63	9.86	5	3.88	3.51	4.49	3.97
124-PZ-13	Shallow	10.62	9.76	5	7.75	6.08	8.12	7.97
124-PZ-14	Shallow	15.15	14.29	5	4.17	2.73	4.05	3.48
124-PZ-15	Shallow	13.34	14.43	5	6.88	5.51	7.06	6.84
124-PZ-16	Shallow	17.7	18.36	5	3.71	2.59	3.75	2.83
124-PZ-17	Shallow	15.15	17.02	5	5.54	4.44	5.77	5.62
124-PZ-18	Shallow	18.13	19.73	5	3.83	2.68	4.07	2.85
124-PZ-19	Shallow	15.38	17.22	5	3.33	3.29	4.50	2.98
124-PZ-20	Shallow	18.18	19.86	5	3.52	2.52	3.49	2.58
153-MW-A13	Shallow	9.62	10	6	3.87	3.84	4.50	5.57
153-MW-A15	Shallow	11	12.15	10	N/A	2.31	3.07	3.76
154-MW-A06	Shallow	19.87	15.12	N/A	12.92	11.61	15.08	14.24
154-MW-A5A	Shallow	19.16	14	N/A	11.75	11.17	12.19	12.12
184-MW-04	Shallow	8.76	N/A	N/A	3.78	3.55	4.03	3.76
184-MW-05	Shallow	14.71	N/A	N/A	6.10	5.31	6.06	6.18
184-MW-06	Shallow	17.69	N/A	N/A	7.69	7.19	7.84	7.85
184-MW-101	Shallow	14.85	13	5	6.89	5.37	7.09	6.84
184-MW-102	Shallow	15.66	12	5	6.89	6.44	6.77	6.93
184-MW-103	Shallow	15.85	14	5	6.92	6.28	6.90	7.06
184-MW-104	Shallow	16.35	13	5	7.21	6.79	7.31	7.34
184-MW-105	Shallow	15.1	12.12	5	6.07	5.71	5.99	5.85
184-MW-106	Shallow	15.47	13.9	5	6.61	5.71	6.40	6.57
184-MW-107	Shallow	15.89	11.22	5	6.95	6.17	6.73	6.88
184-MW-108	Shallow	16.61	14.78	5	7.45	6.71	7.24	7.38
SUMP A	Shallow	15.98	N/A	N/A	6.17	5.83	N/A	5.95
SUMP B	Shallow	13.08	N/A	N/A	4.89	4.88	2.16	4.47
TCE-1	Shallow	17.58	N/A	N/A	5.96	5.80	5.86	6.00
TCE-2	Shallow	19.15	N/A	N/A	10.06	9.17	9.53	9.67
TCE-3	Shallow	18.51	N/A	N/A	N/A	7.18	7.95	7.94
TCE-4	Shallow	16.71	N/A	N/A	11.17	10.10	11.07	11.07
TCE-5	Shallow	23.99	N/A	N/A	11.95	11.21	12.13	12.21

Table 4-2
Summary of Groundwater Elevations Near NJCU
2018

Ref. Point Survey Date	April 2018 Ref. pt.* ft, msl	September 2018 Ref. pt.* ft, msl	03/28/18		06/29/18		09/28/18		11/30/18	
			Depth to GW (ft,)	GW Elev. (ft., msl)	Depth to GW (ft,)	GW Elev. (ft., msl)	Depth to GW (ft,)	GW Elev. (ft., msl)	Depth to GW (ft,)	GW Elev. (ft., msl)
Location										
079-MW-A02	8.10	8.10	4.29	3.81	4.84	3.26	4.10	4.00	4.18	3.92
Sump A	15.98	15.98	9.81	6.17	10.15	5.83	NA	NA	10.03	5.95
Sump B	13.08	13.08	8.19	4.89	8.20	4.88	10.92	2.16	8.61	4.47
090-PZ-5	17.26	17.95	8.97	8.29	10.24	7.02	10.07	7.88	9.72	8.23
090-PZ-6	17.18	18.36	8.6	8.58	8.33	8.85	8.67	9.69	8.61	9.75
184-MW-4	8.76	8.76	4.98	3.78	5.21	3.55	4.73	4.03	5	3.76
184-MW-5	14.78	14.78	8.61	6.17	9.40	5.38	8.67	6.11	8.53	6.25
184-MW-6	17.76	17.76	10.00	7.76	10.50	7.26	9.85	7.91	11.78	5.98
090-MW-09	10.81	10.81	5.06	5.75	5.74	5.07	4.99	5.82	4.83	5.98
TCE-1	17.58	17.58	11.62	5.96	11.78	5.80	11.72	5.86	11.58	6.00
TCE-2	19.15	19.15	9.09	10.06	9.98	9.17	9.62	9.53	9.48	9.67
TCE-3	18.51	18.51	NA	NA	11.33	7.18	10.56	7.95	10.57	7.94
TCE-4	16.71	16.71	5.54	11.17	6.61	10.10	5.64	11.07	5.64	11.07
TCE-5	23.99	23.99	12.04	11.95	12.78	11.21	11.86	12.13	11.78	12.21
090-MW-07	16.79	17.46	10.78	6.01	11.55	5.24	11.11	6.35	10.97	6.49
117-MW-I4S	15.49	16.70	9.67	5.82	NA	NA	10.81	5.89	10.64	6.06
117-MW-I5	18.76	18.76	12.44	6.32	12.54	6.22	12.35	6.41	12.17	6.59
184-MW-101	14.95	14.95	7.96	6.99	9.58	5.37	7.86	7.09	8.11	6.84
184-MW-102	15.88	15.88	8.77	7.11	9.44	6.44	9.11	6.77	8.95	6.93
184-MW-103	15.96	15.96	8.93	7.03	9.68	6.28	9.06	6.90	8.90	7.06
184-MW-104	16.46	16.46	9.14	7.32	9.67	6.79	9.15	7.31	9.12	7.34
184-MW-105	15.10	15.10	9.03	6.07	9.36	5.74	9.11	5.99	9.25	5.85
184-MW-106	15.47	15.47	8.86	6.61	9.76	5.71	9.07	6.40	8.90	6.57
184-MW-107	15.90	15.90	8.94	6.96	9.73	6.17	9.17	6.73	9.02	6.88
184-MW-108	16.61	16.61	9.16	7.45	9.90	6.71	9.37	7.24	9.23	7.38

NA - Not available

* NGVD29 site datum

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

Parameter	28-Mar-18			29-Jun-18			28-Sep-18			30-Nov-18		
	PW-1 (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)	**PW-1** (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)	**PW-1** (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)	**PW-1** (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)
Benzene	1.9	19.5	ND	1.9	16.3	ND	1.9	13.5	ND	1.7	9.8	ND
Carbon Tetrachloride	4	11.3	2.8	3.8	11.5	2.8	4	11.1	3.3	3.6	6.6	2.4
Chloroform	17.2	102	0.28 J	17.9	92.1	0.31 J	16	64.4	ND	15.8	46.6	ND
1,1-Dichloroethene	ND	0.62 J	ND	ND	ND	ND	0.59 J	0.49 J	ND	ND	ND	ND
cis-1,2-Dichloroethene	86.5	185	ND	84.5	170	ND	77.2	134	ND	79.2	107	ND
trans-1,2-Dichloroethene	3.1	2.3	ND	3	2.3	ND	2.9	2.3	ND	2.9	1.8	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	62.4	193	ND	62.6	178	ND	61.9	149	ND	61.1	116	ND
1,1-Dichloroethane	0.78 J	0.32 J	ND	0.82 J	ND	ND	0.81 J	ND	ND	0.9 J	ND	ND
Methylene chloride	ND	2.7	ND	ND	2.2	ND	0.62 J	2	ND	0.51 J	1.4	ND
Vinyl chloride	11.5	48	ND	12.4	39	ND	12.9	30.6	ND	13.5	20.3	ND
1,2-Dichlorobenzene	0.64 J	ND	ND	0.52 J	ND	ND	0.56 J	ND	ND	0.52 J	ND	ND
Chlorobenzene	0.35 J	ND	ND	0.32 J	ND	ND	0.34 J	ND	ND	0.34 J	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	ND	0.28 J	ND	ND	0.27 J	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexavalent Chromium	23,400	32,400	14,400	24,000	32,800	16,500	20,400	26,900	14,100	19,100	28,200	11,700
Total Chromium	21,300	29,500	14,400	21,600	30,000	13,900	21,800	29,100	14,800	22,900	32,600	13,100

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

FIGURES

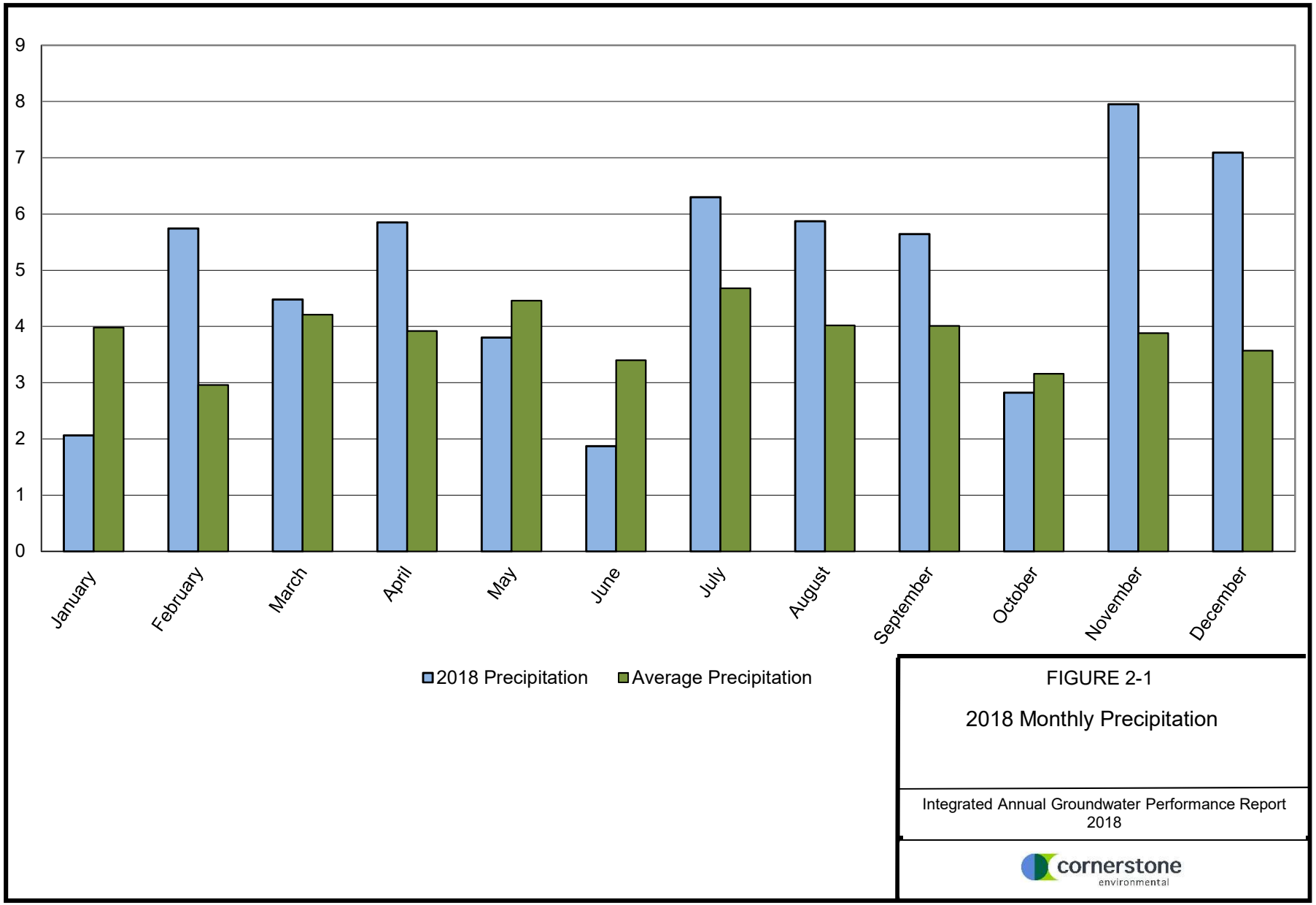

FIGURE 2-1

2018 Monthly Precipitation

Integrated Annual Groundwater Performance Report
2018

cornerstone environmental

Figure 3-1
GWET Pumping Rates and Downtimes in 2017

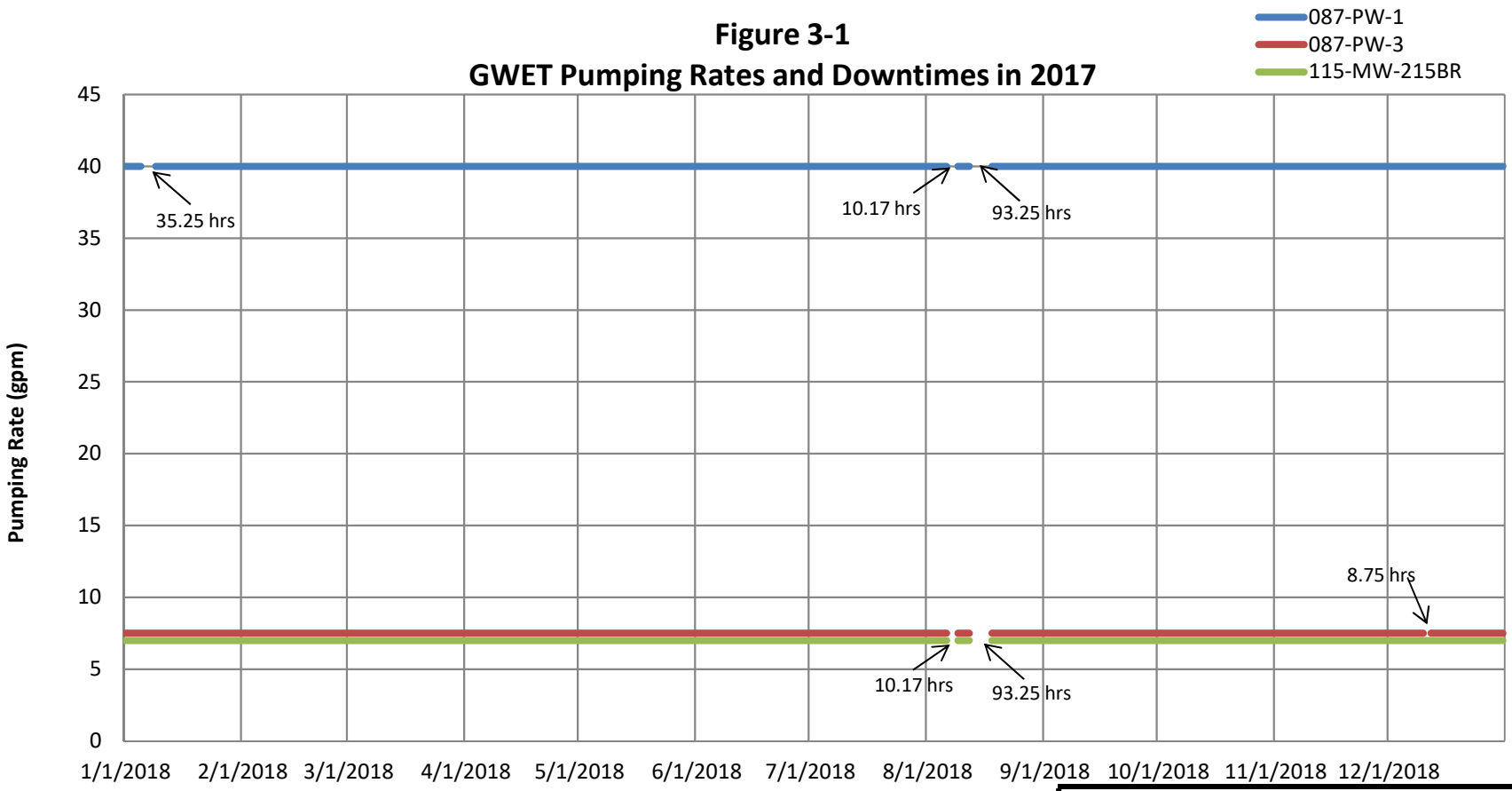

FIGURE 3-1

GWET Pumping Rates and Downtimes In 2018

Integrated Annual Groundwater Performance Report 2018

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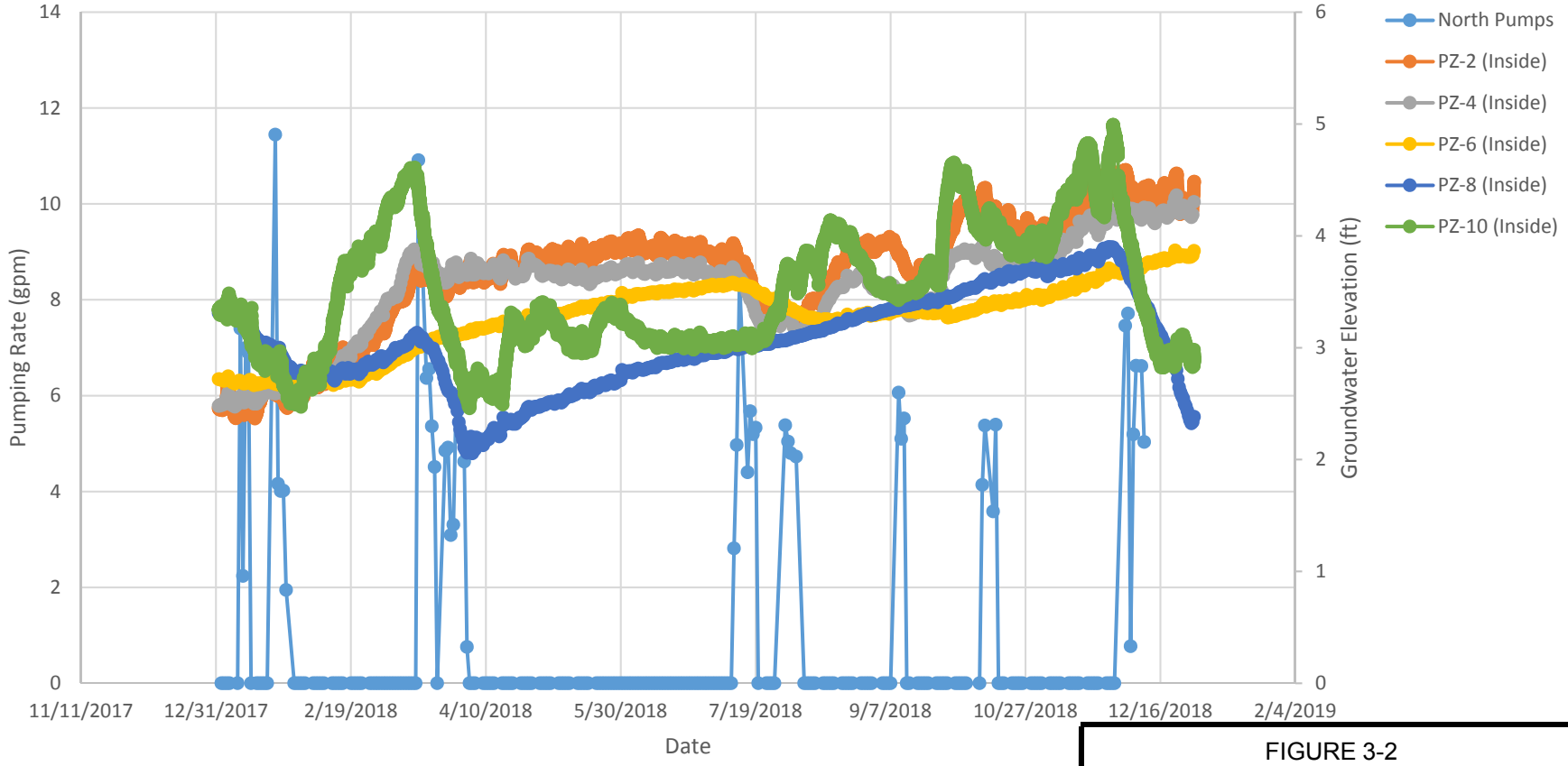

FIGURE 3-2

SA6-North Contingent Pumping
Average Daily Flow Rate

Integrated Annual Groundwater Performance Report
2018

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environmental

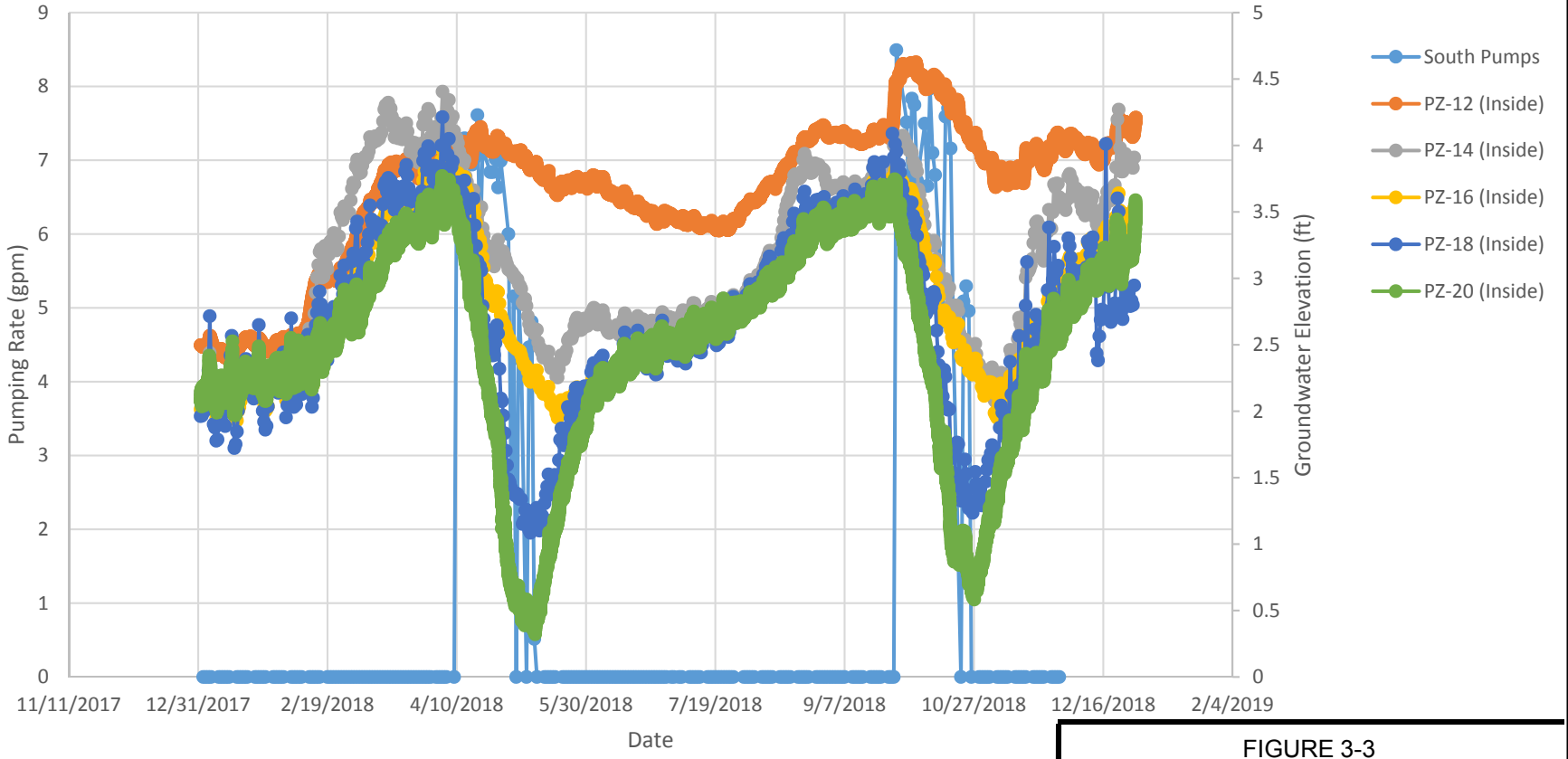
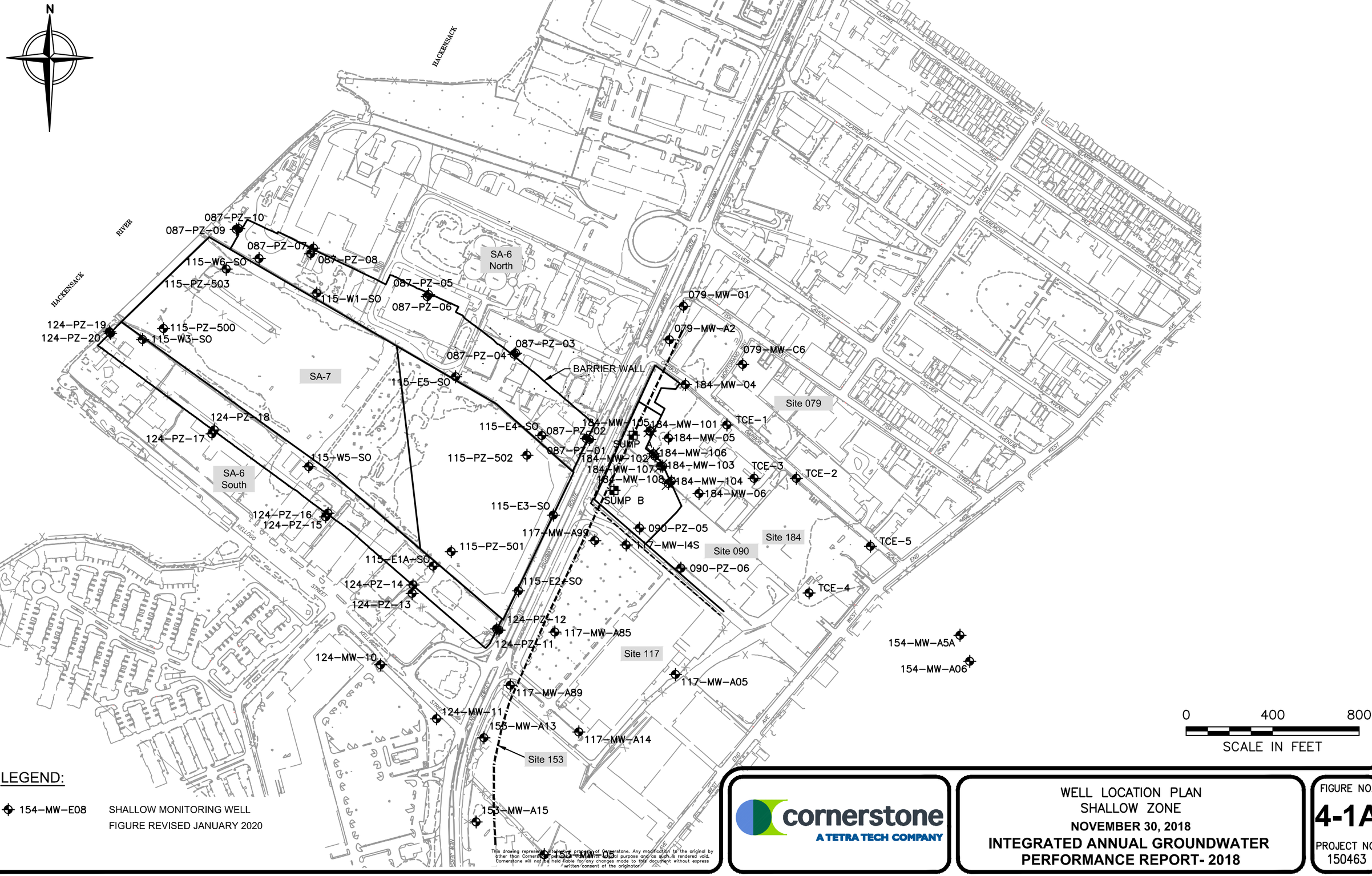


FIGURE 3-3

SA-6 South Contingent Pumping
Average Daily Flow Rate

Integrated Annual Groundwater Performance Report
2018

cornerstone
environmental



LEGEND:

154-MW-E08 SHALLOW MONITORING WELL

FIGURE REVISED JANUARY 2020

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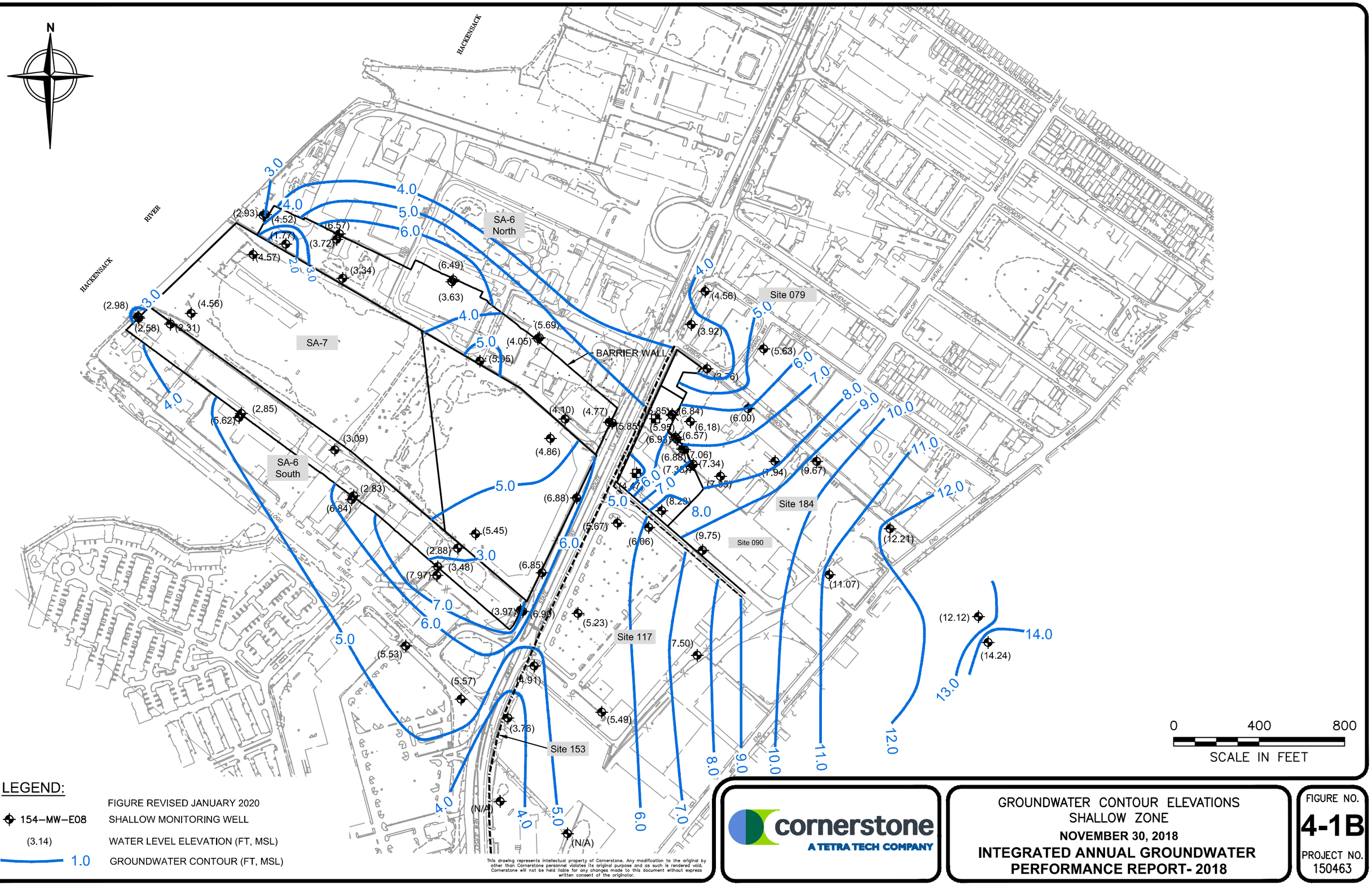
A TETRA TECH COMPANY

WELL LOCATION PLAN
SHALLOW ZONE
NOVEMBER 30, 2018
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2018

FIGURE NO.
4-1A
PROJECT NO.
150463

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2018-4Q ANNUAL FIGURES\H15WSF-S-SITE-4_1A.dwg Layout: FIGURE 4-1A User: john.giuliano Jan 21, 2020 - 10:07am



LEGEND:

FIGURE REVISED JANUARY 2020

154-MW-E08 SHALLOW MONITORING WELL

(3.14) WATER LEVEL ELEVATION (FT, MSL)

1.0 GROUNDWATER CONTOUR (FT, MSL)

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GROUNDWATER CONTOUR ELEVATIONS
SHALLOW ZONE
NOVEMBER 30, 2018
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2018

FIGURE NO.
4-1B
PROJECT NO.
150463

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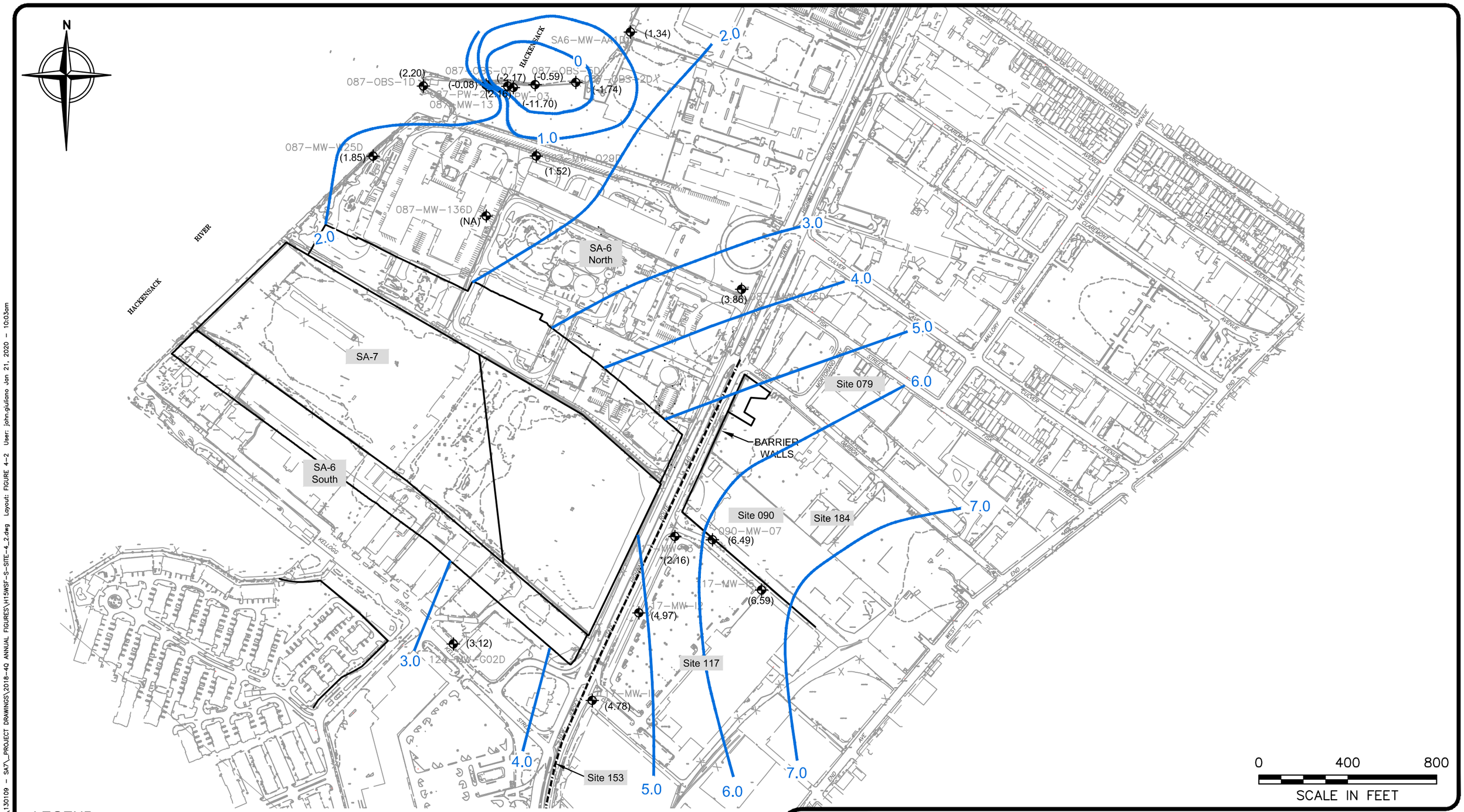

LEGEND:

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

FIGURE REVISED JANUARY 2020

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GROUNDWATER ELEVATION CONTOURS
INTERMEDIATE ZONE
NOVEMBER 30, 2018

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2018

FIGURE NO. **4-2**

PROJECT NO. 150463

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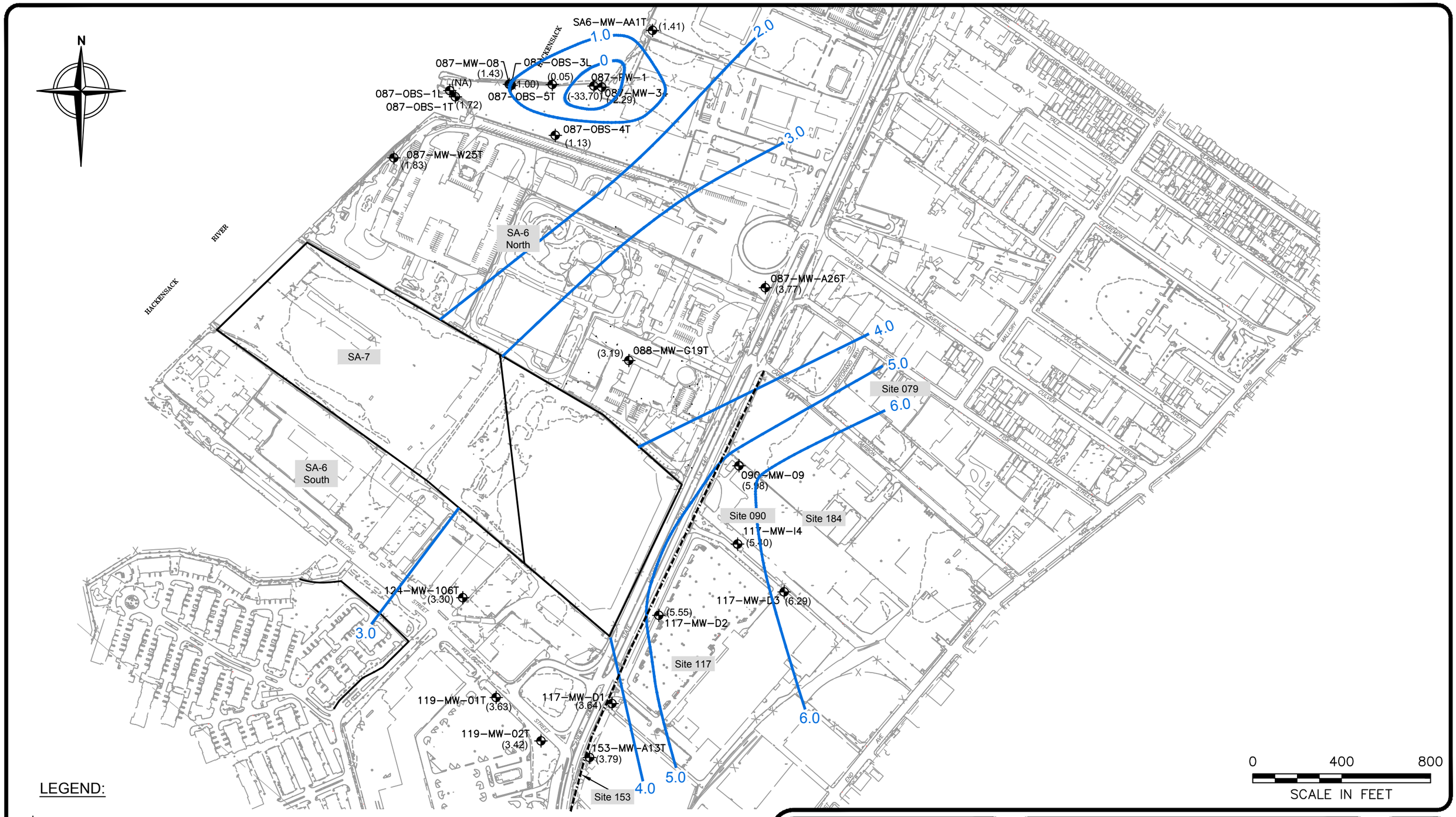

LEGEND:

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

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GROUNDWATER ELEVATION CONTOURS
DEEP ZONE
NOVEMBER 30, 2018
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2018

FIGURE NO.
4-3
PROJECT NO.
150463

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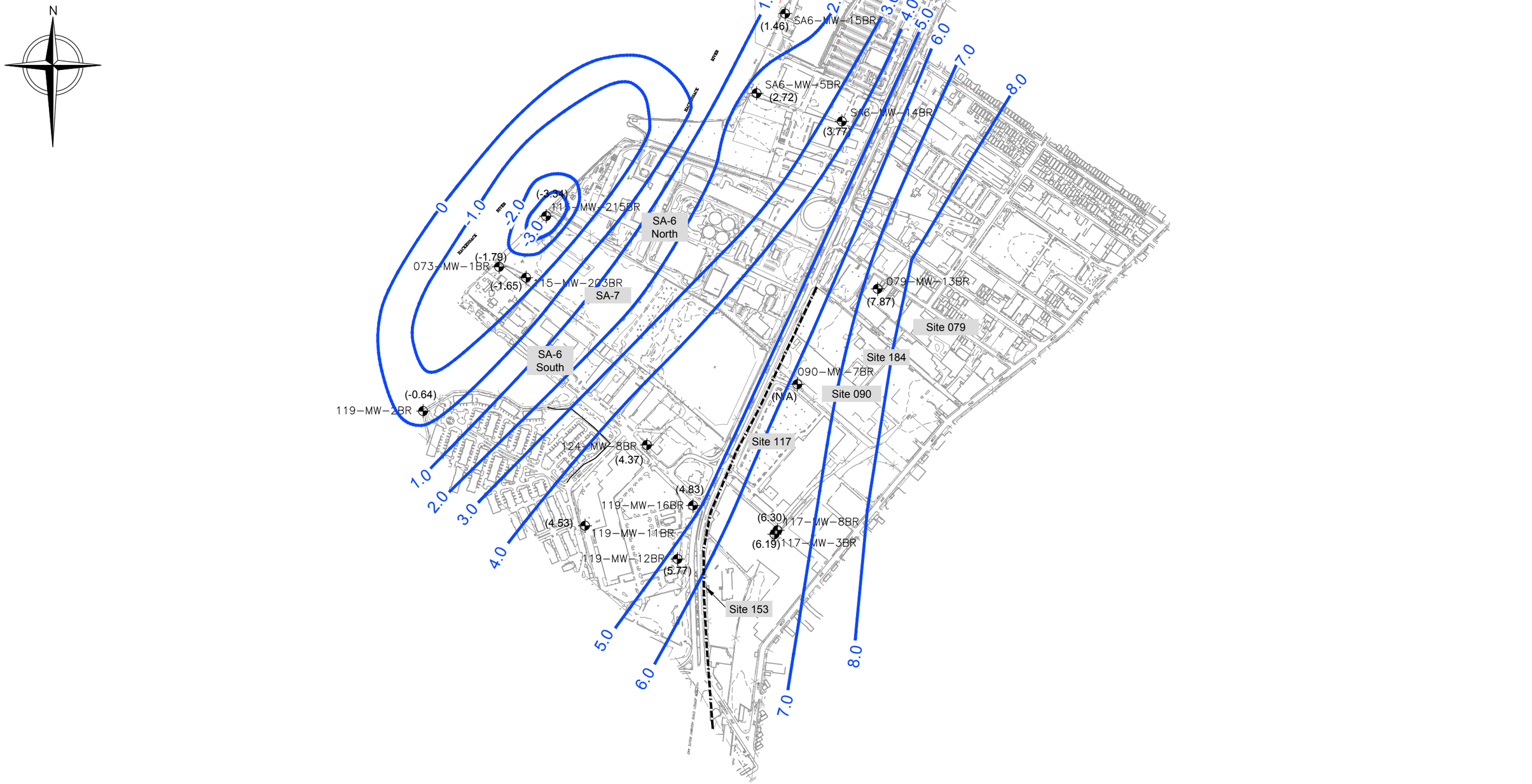

LEGEND:

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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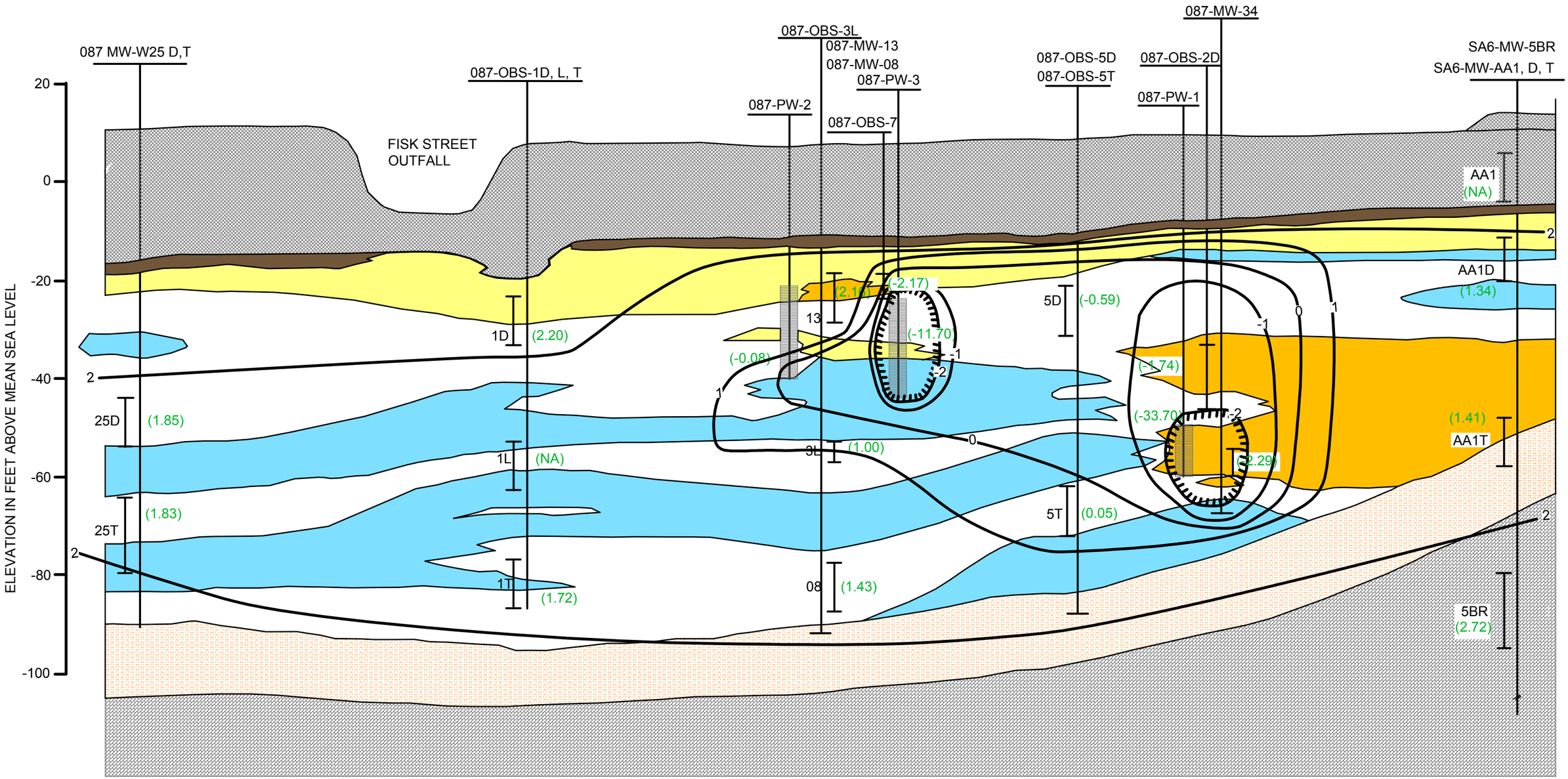
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS
BEDROCK ZONE
NOVEMBER 30, 2018
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2018

FIGURE NO.
4-4
PROJECT NO.
150463

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2018-4Q ANNUAL FIGURES\H15WSF-S-SITE-4_4.dwg Layout: FIGURE 4-4 User: john.giuliano Jan 03, 2019 - 4:04pm



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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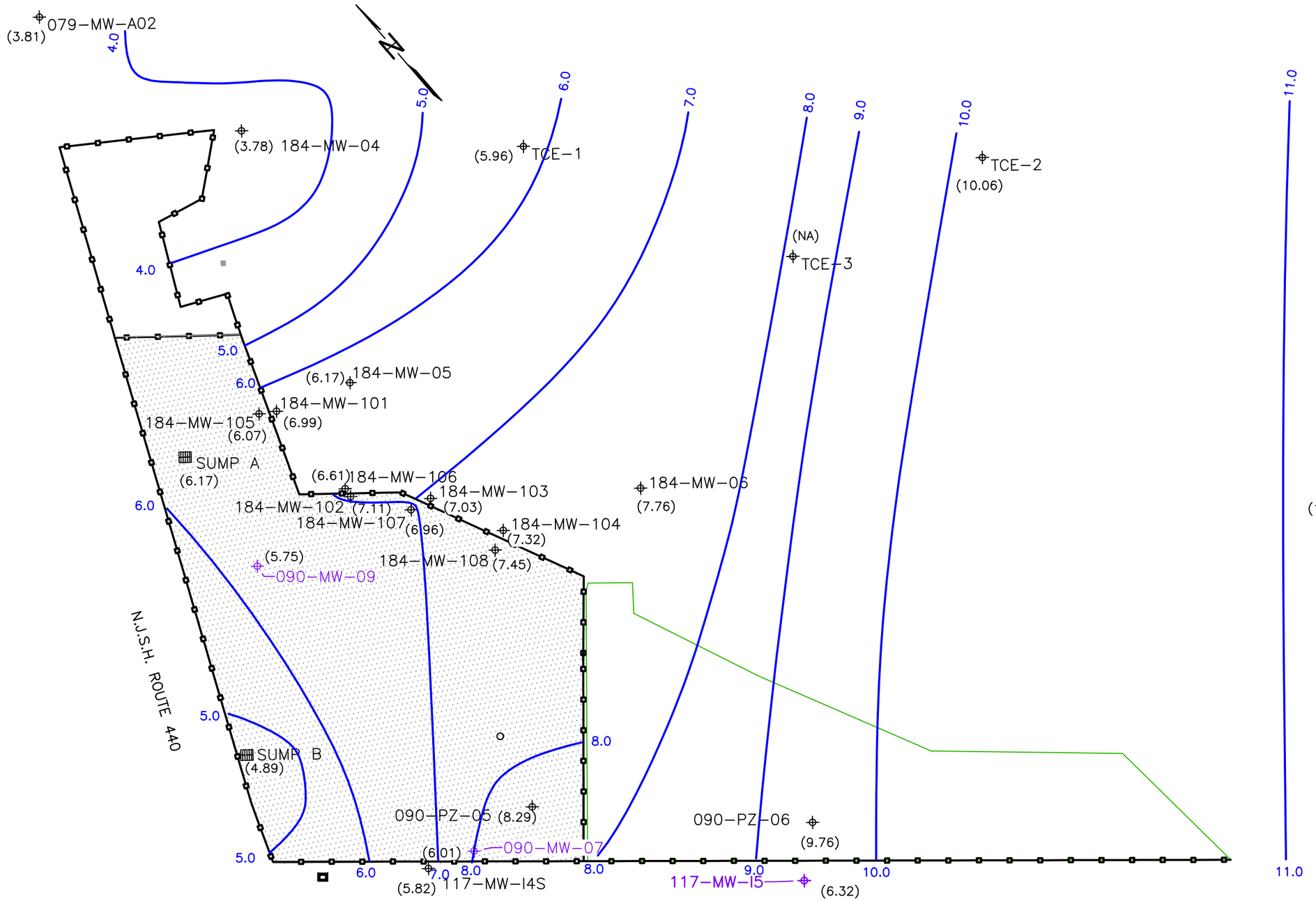
GROUNDWATER ELEVATIONS (FT, MSL)
IN CROSS-SECTION
NOVEMBER 30, 2018
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2018

FIGURE NO.
4-5
PROJECT NO.
150463



LEGEND

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

0 100 200

SCALE IN FEET

cornerstone
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS (ft.,msl)
MARCH 28, 2018
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2018

FIGURE NO.
4-6
PROJECT NO.
150463

079-MW-A02
(3.26)
4.0
N
5.0
(3.55) 184-MW-04
(5.80) TCE-1
6.0
7.0
8.0
9.0
TCE-2
(9.17)
(7.18)
TCE-3
10.0
11.0
(11.21)
TCE-5
4.0
5.0
(5.38) 184-MW-05
184-MW-101
184-MW-105
(5.71)
(5.37)
SUMP A
(5.83)
(5.71) 184-MW-106
184-MW-103
(6.28)
6.0
6.0
184-MW-102 (6.44)
184-MW-107 (6.17)
184-MW-104
(6.79)
184-MW-06
(7.26)
(10.10) TCE-4
(5.07)
090-MW-09
184-MW-108 (6.71)
7.0
7.0
N.J.S.H. ROUTE 440
5.0
SUMP B
(4.88)
090-PZ-05 (7.02)
090-PZ-06
(8.85)
(5.24) 090-MW-07
5.0
6.0
7.0
8.0
9.0
10.0
11.0
(NA
117-MW-I4S
117-MW-I5
(6.22)

LEGEND

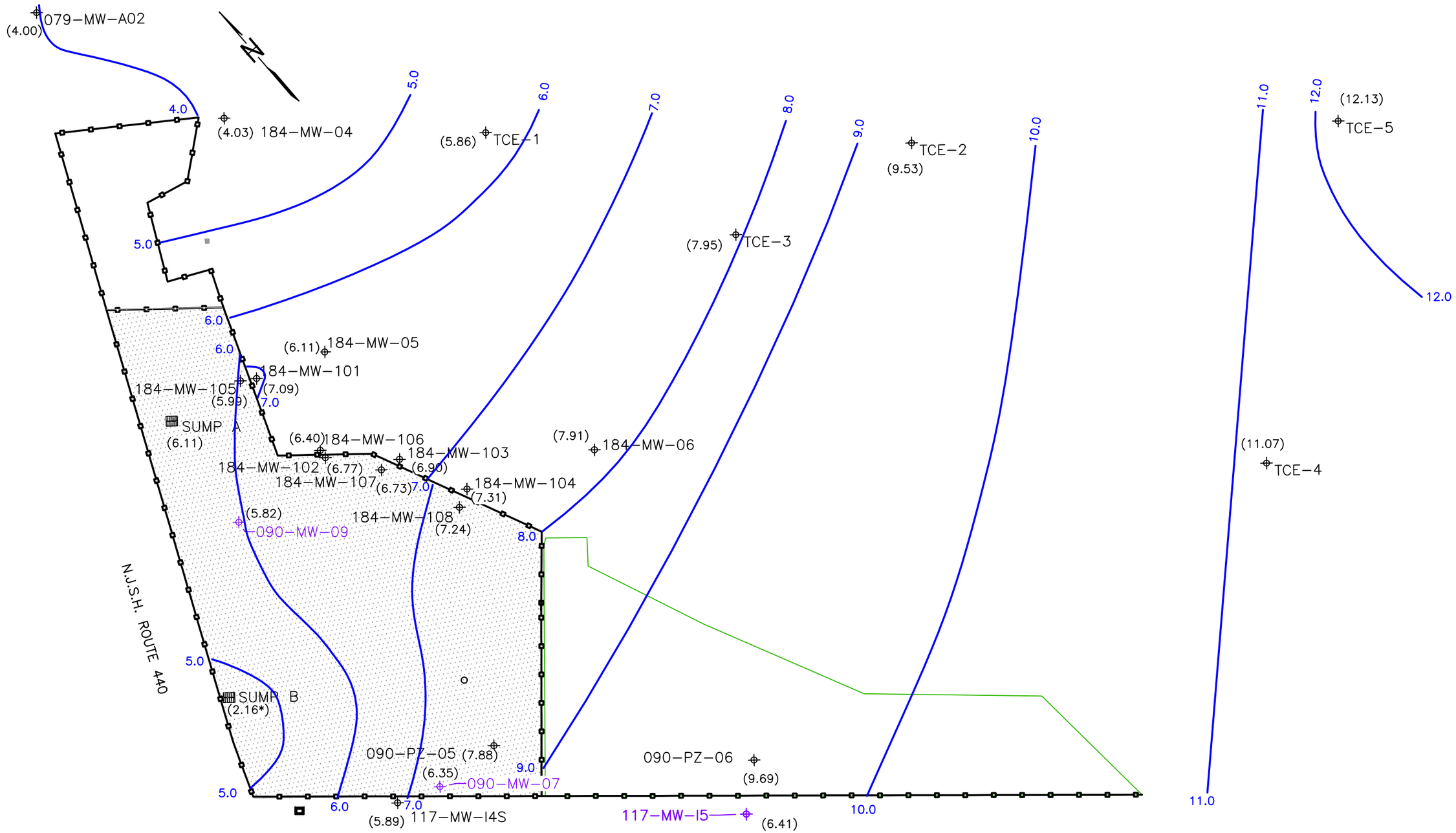
- MONITORING WELL
- PIEZOMETER
- SUMP
- SHEET PILE WALL
- CAP AREA

0 100 200
SCALE IN FEET

cornerstone
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS (ft.,msl)
June 29, 2018
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2018

FIGURE NO.
4-7
PROJECT NO.
150463



LEGEND

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

* SUMP B ELEVATION NOT USED IN CONTOURING. PUMP ON DURING MEASUREMENT.

0 100 200

SCALE IN FEET

cornerstone
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS (ft.,msl)
SEPTEMBER 28, 2018
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2018

FIGURE NO.
4-8
PROJECT NO.
150463

079-MW-A02
(3.92)
(3.76) 184-MW-04
(6.00) TCE-1
(7.94) TCE-3
TCE-2
(9.67)
(12.21)
TCE-5
(6.25) 184-MW-05
184-MW-101
184-MW-105
(6.84)
(5.85)
SUMP A
(5.95)
(6.57) 184-MW-106
184-MW-103
(7.06)
184-MW-102 (6.93)
184-MW-107
(6.88)
184-MW-104
(7.34)
(7.92) 184-MW-06
(5.98)
184-MW-108
(7.38.)
090-MW-09
(11.07)
TCE-4
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
N.J.S.H. ROUTE 440
SUMP B
(4.47)
090-PZ-05 (8.23)
(6.49)
090-MW-07
090-PZ-06
(9.75)
(6.06) 117-MW-I4S
117-MW-I5
(5.33)

LEGEND

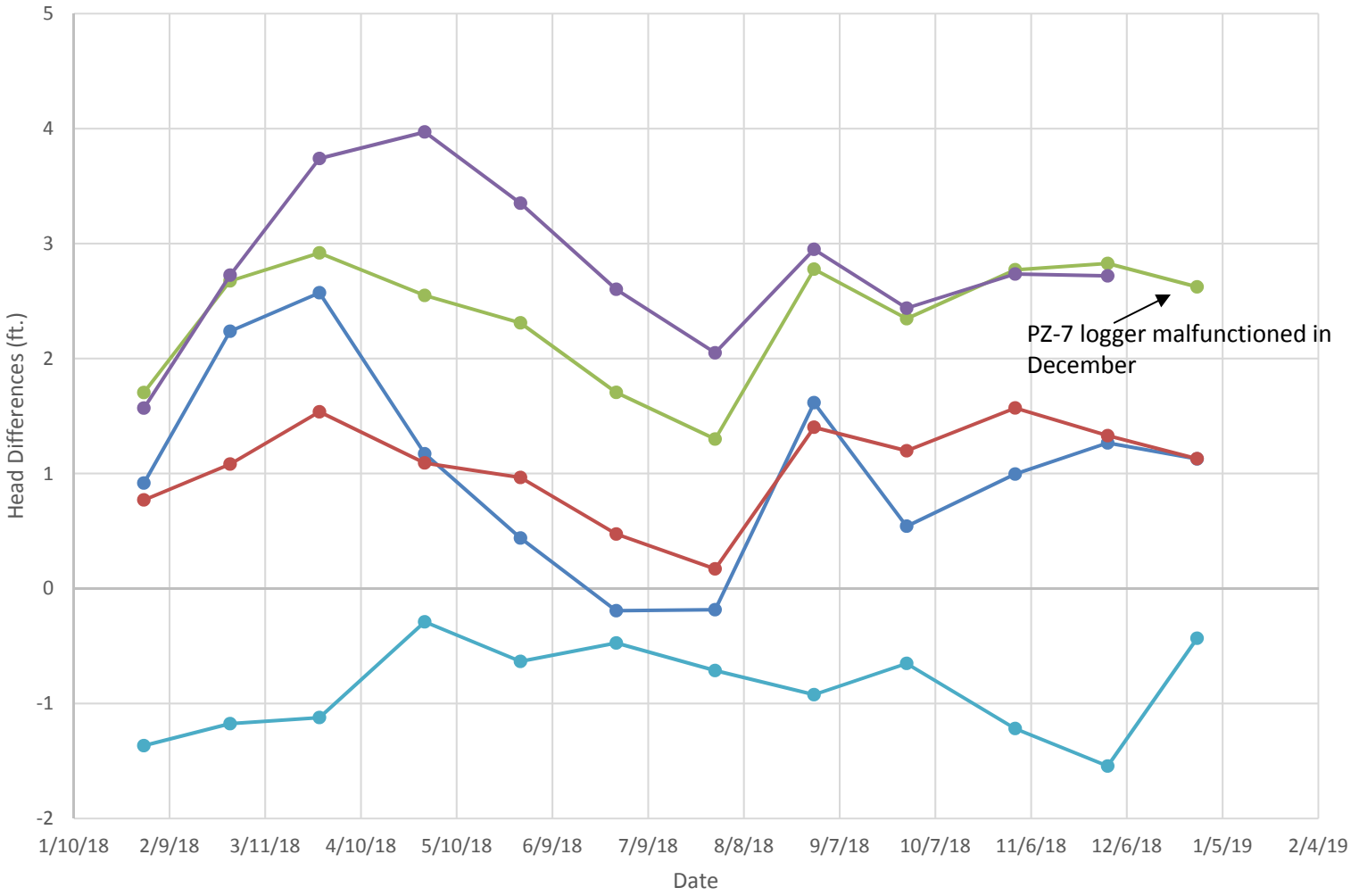
- MONITORING WELL
- PIEZOMETER
- SUMP
- SHEET PILE WALL
- CAP AREA

0 100 200
SCALE IN FEET

cornerstone
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS (ft.,msl)
NOVEMBER 30, 2018
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2018

FIGURE NO.
4-9
PROJECT NO.
150463



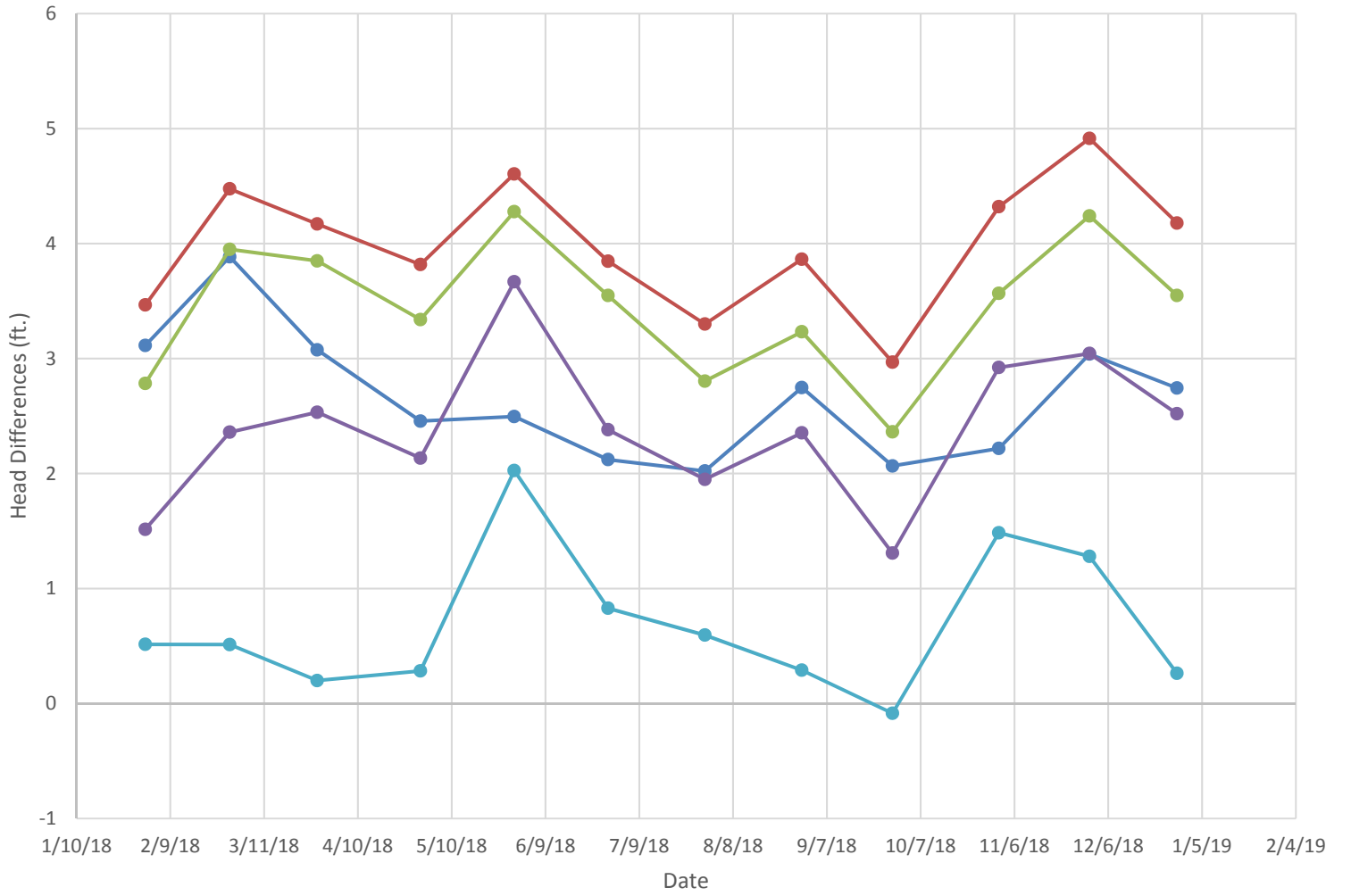
Note:
Positive head difference = inward gradient
Negative head difference = outward gradient

cornerstone
A TETRA TECH COMPANY

Integrated Annual Groundwater Performance Report 2018

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 2018

Monthly Average Head Differences Across SA-6 South Barrier Wall

Figure 4-11

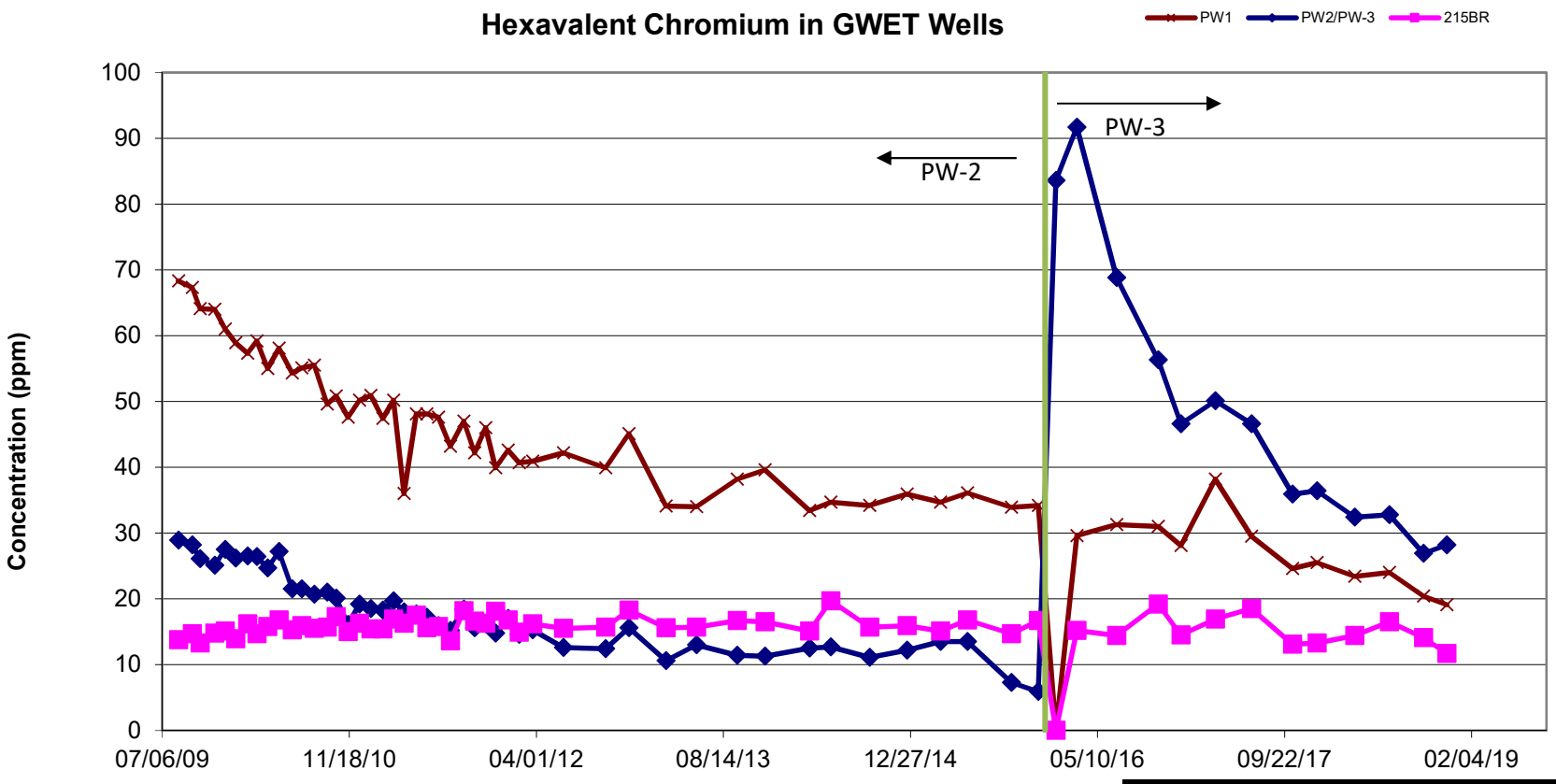


FIGURE 5-1

Hexavalent Chromium Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2018

cornerstone environmental

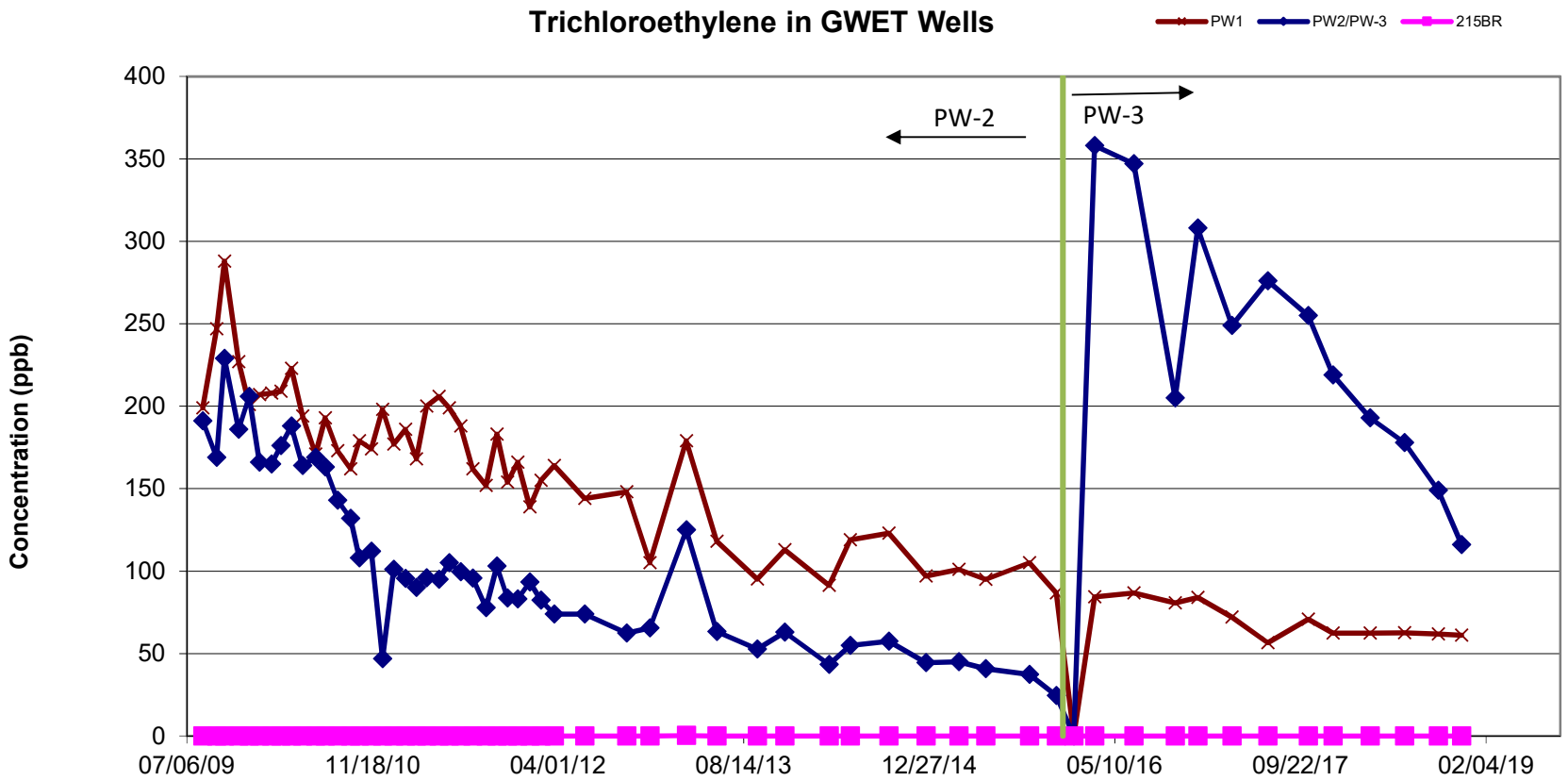


FIGURE 5-2

Trichloroethylene Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2018

cornerstone environmental

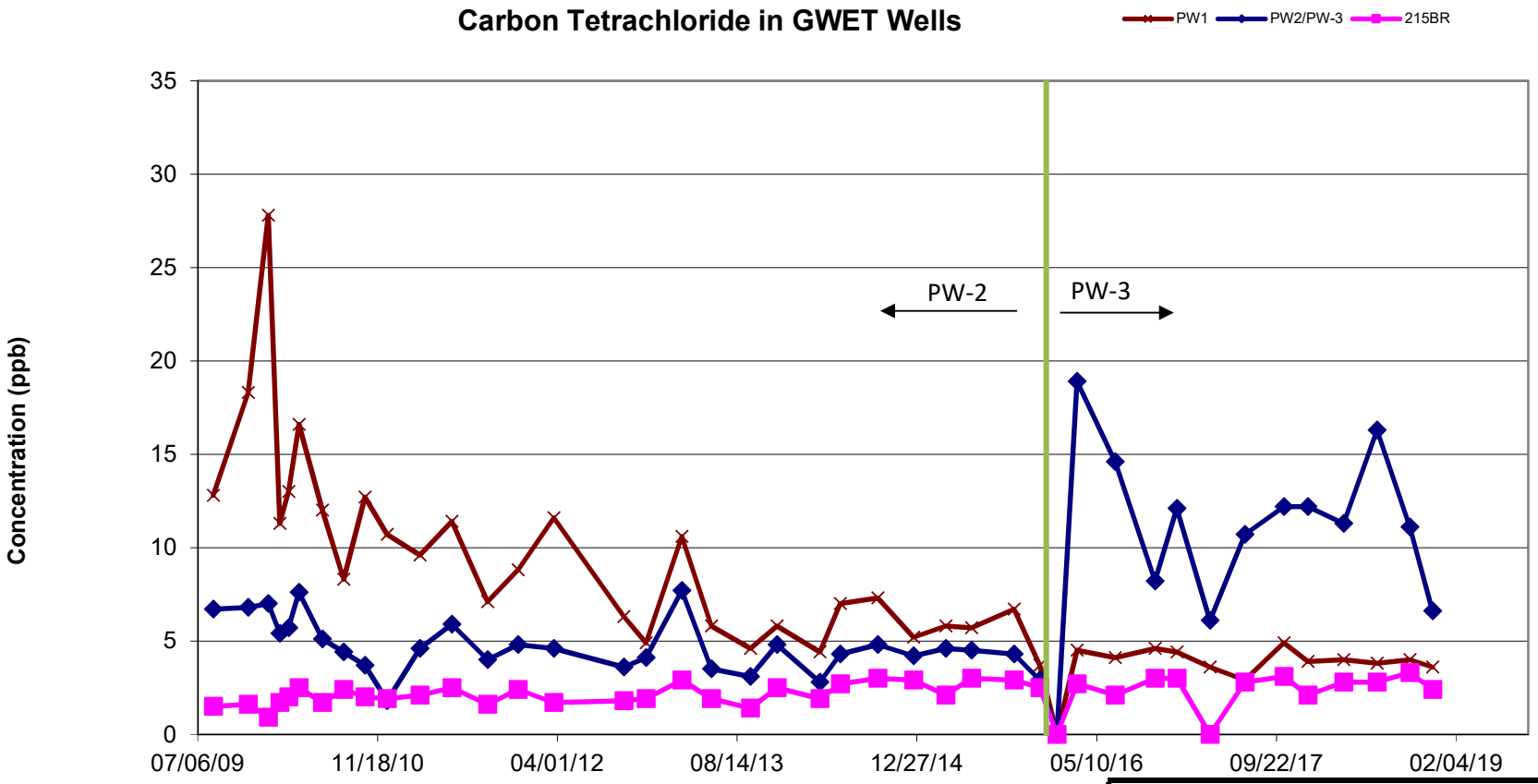
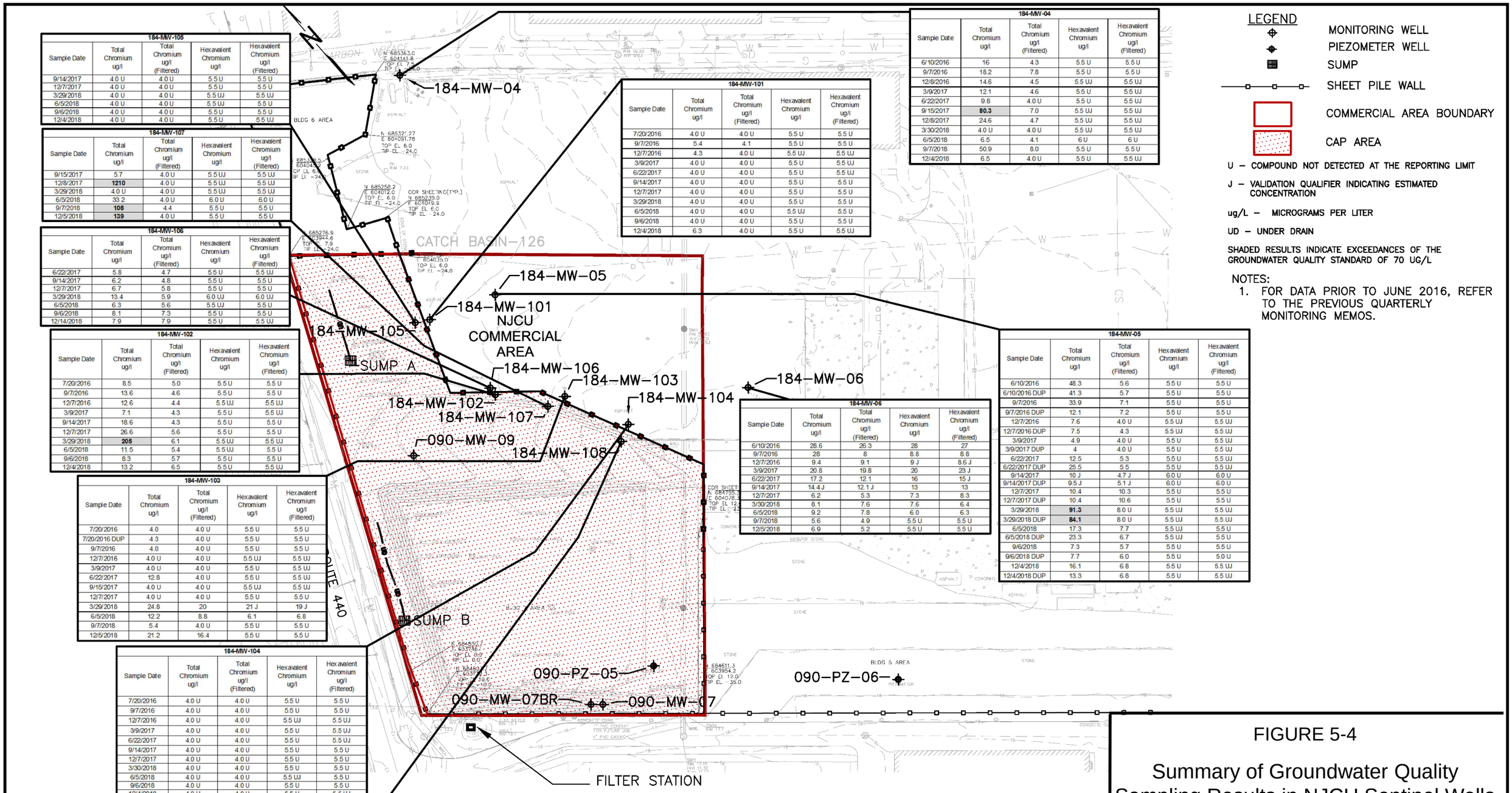


FIGURE 5-3

Carbon Tetrachloride Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2018

cornerstone environmental



184-MW-105

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
9/14/2017	4.0 U	4.0 U	5.5 U	5.5 U
12/7/2017	4.0 U	4.0 U	5.5 U	5.5 U
3/29/2018	4.0 U	4.0 U	5.5 UJ	5.5 UJ
6/5/2018	4.0 U	4.0 U	5.5 UJ	5.5 U
9/6/2018	4.0 U	4.0 U	5.5 U	5.5 U
12/4/2018	4.0 U	4.0 U	5.5 U	5.5 UJ

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 UJ	5.5 UJ
12/8/2017	**1210**	4.0 U	5.5 UJ	5.5 UJ
3/29/2018	4.0 U	4.0 U	5.5 UJ	5.5 UJ
6/5/2018	33.2	4.0 U	6.0 U	6.0 U
9/7/2018	**108**	4.4	5.5 U	5.5 U
12/5/2018	**139**	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 UJ
9/14/2017	6.2	4.8	5.5 U	5.5 U
12/7/2017	6.7	5.8	5.5 U	5.5 U
3/29/2018	13.4	5.9	6.0 UJ	6.0 UJ
6/5/2018	6.3	5.6	5.5 UJ	5.5 U
9/6/2018	8.1	7.3	5.5 U	5.5 U
12/14/2018	7.9	7.9	5.5 U	5.5 UJ

184-MW-102

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
7/20/2016	8.5	5.0	5.5 U	5.5 U
9/7/2016	13.6	4.6	5.5 U	5.5 U
12/7/2016	12.6	4.4	5.5 UJ	5.5 UJ
3/9/2017	7.1	4.3	5.5 U	5.5 UJ
9/14/2017	18.6	4.3	5.5 U	5.5 U
12/7/2017	26.6	5.6	5.5 U	5.5 U
3/29/2018	**205**	6.1	5.5 UJ	5.5 UJ
6/5/2018	11.5	5.4	5.5 UJ	5.5 U
9/6/2018	8.3	5.7	5.5 U	5.5 U
12/4/2018	13.2	6.5	5.5 U	5.5 UJ

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 UJ	5.5 UJ
3/9/2017	4.0 U	4.0 U	5.5 U	5.5 UJ
6/22/2017	12.8	4.0 U	5.5 U	5.5 UJ
9/15/2017	4.0 U	4.0 U	5.5 UJ	5.5 UJ
12/7/2017	4.0 U	4.0 U	5.5 U	5.5 U
3/29/2018	24.8	20	21 J	19 J
6/5/2018	12.2	8.8	6.1	6.8
9/7/2018	5.4	4.0 U	5.5 U	5.5 U
12/5/2018	21.2	16.4	5.5 U	5.5 U

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 UJ	5.5 UJ
3/9/2017	4.0 U	4.0 U	5.5 U	5.5 UJ
6/22/2017	4.0 U	4.0 U	5.5 U	5.5 UJ
9/14/2017	4.0 U	4.0 U	5.5 U	5.5 U
12/7/2017	4.0 U	4.0 U	5.5 U	5.5 U
3/30/2018	4.0 U	4.0 U	5.5 U	5.5 U
6/5/2018	4.0 U	4.0 U	5.5 UJ	5.5 U
9/6/2018	4.0 U	4.0 U	5.5 U	5.5 U
12/4/2018	4.0 U	4.0 U	5.5 U	5.5 UJ

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 UJ	4.0 UJ	5.5 U	5.5 U
12/8/2017	4.0 U	4.0 U	5.5 UJ	5.5 UJ
3/30/2018	4.0 U	4.0 U	5.5 U	5.5 U
6/5/2018	4.0 U	4.0 U	5.5 UJ	5.5 U
9/6/2018	4.0 U	4.0 U	5.5 U	5.5 U
12/5/2018	4.3	4.0 U	5.5 U	5.5 U

184-MW-101

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
7/20/2016	4.0 U	4.0 U	5.5 U	5.5 U
9/7/2016	5.4	4.1	5.5 U	5.5 U
12/7/2016	4.3	4.0 U	5.5 UJ	5.5 UJ
3/9/2017	4.0 U	4.0 U	5.5 U	5.5 UJ
6/22/2017	4.0 U	4.0 U	5.5 U	5.5 UJ
9/14/2017	4.0 U	4.0 U	5.5 U	5.5 U
12/7/2017	4.0 U	4.0 U	5.5 U	5.5 U
3/29/2018	4.0 U	4.0 U	5.5 U	5.5 U
6/5/2018	4.0 U	4.0 U	5.5 UJ	5.5 U
9/6/2018	4.0 U	4.0 U	5.5 U	5.5 U
12/4/2018	6.3	4.0 U	5.5 U	5.5 UJ

184-MW-04

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
6/10/2016	16	4.3	5.5 U	5.5 U
9/7/2016	18.2	7.8	5.5 U	5.5 U
12/8/2016	14.6	4.5	5.5 UJ	5.5 UJ
3/9/2017	12.1	4.6	5.5 U	5.5 UJ
6/22/2017	9.8	4.0 U	5.5 U	5.5 UJ
9/15/2017	**80.3**	7.0	5.5 UJ	5.5 UJ
12/8/2017	24.6	4.7	5.5 UJ	5.5 UJ
3/30/2018	4.0 U	4.0 U	5.5 UJ	5.5 UJ
6/5/2018	6.5	4.1	6 U	6 U
9/7/2018	50.9	8.0	5.5 U	5.5 U
12/4/2018	6.5	4.0 U	5.5 U	5.5 UJ

184-MW-06

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
6/10/2016	28.6	26.3	28	27
9/7/2016	28	8	8.8	8.8
12/7/2016	9.4	9.1	9 J	8.6 J
3/9/2017	20.8	19.8	20	23 J
6/22/2017	17.2	12.1	16	15 J
9/14/2017	14.4 J	12.1 J	13	13
12/7/2017	6.2	5.3	7.3	8.3
3/30/2018	8.1	7.6	7.6	6.4
6/5/2018	9.2	7.8	6.0	6.3
9/7/2018	5.6	4.9	5.5 U	5.5 U
12/5/2018	6.9	5.2	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)
6/10/2016	48.3	5.6	5.5 U	5.5 U
6/10/2016 DUP	41.3	5.7	5.5 U	5.5 U
9/7/2016	33.9	7.1	5.5 U	5.5 U
9/7/2016 DUP	12.1	7.2	5.5 U	5.5 U
12/7/2016	7.6	4.0 U	5.5 UJ	5.5 UJ
12/7/2016 DUP	7.5	4.3	5.5 UJ	5.5 UJ
3/9/2017	4.9	4.0 U	5.5 U	5.5 UJ
3/9/2017 DUP	4	4.0 U	5.5 U	5.5 UJ
6/22/2017	12.5	5.3	5.5 U	5.5 UJ
6/22/2017 DUP	25.5	5.5	5.5 U	5.5 UJ
9/14/2017	10 J	4.7 J	6.0 U	6.0 U
9/14/2017 DUP	9.5 J	5.1 J	6.0 U	6.0 U
12/7/2017	10.4	10.3	5.5 U	5.5 U
12/7/2017 DUP	10.4	10.6	5.5 U	5.5 U
3/29/2018	**91.3**	8.0 U	5.5 UJ	5.5 UJ
3/29/2018 DUP	**84.1**	8.0 U	5.5 UJ	5.5 UJ
6/5/2018	17.3	7.7	5.5 UJ	5.5 U
6/5/2018 DUP	23.3	6.7	5.5 UJ	5.5 U
9/6/2018	7.3	5.7	5.5 U	5.5 U
9/6/2018 DUP	7.7	6.0	5.5 U	5.0 U
12/4/2018	16.1	6.8	5.5 U	5.5 UJ
12/4/2018 DUP	13.3	6.8	5.5 U	5.5 UJ

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

UD – UNDER DRAIN

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

NOTES:

1. FOR DATA PRIOR TO JUNE 2016, REFER TO THE PREVIOUS QUARTERLY MONITORING MEMOS.

SOURCE MAP REFERNCE:

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

FIGURE 5-4

Summary of Groundwater Quality Sampling Results in NJCU Sentinel Wells

Integrated Annual Groundwater Performance Report
2018

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Location ID	153-MW-A013							
Sample Date	11/11/1997	8/21/1998	4/15/1999	4/17/2003	7/18/2006	9/9/2009	10/12/2009	12/17/2018
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
CHROMIUM	1870	122	31.7 J	457 J	784	176	30.5	121
HEXAVALENT CROMIUM	1750	11.6	10 U	416	550	10 UJ	10 UJ	63
DISSOLVED CHROMIUM	1790	52.6	11.3 J	401 J	189	10 U	10 U	83.6
DISSOLVED HEXAVALENT CHROMIUM	1720	10 U	10 U	416	310	10 UJ	10 UJ	51

Location ID	153-MW-A13							
Sample Date	1/6/1999	7/20/1999	4/14/2003	7/19/2006	10/19/2010	9/26/2011	12/18/2018	12/18/2018 DP
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
CHROMIUM	1830 J	459	1050	1090	763	666	65.6	103
HEXAVALENT CROMIUM	1830 J	22.2	1110	1300	19 J	530 J	22	6.5
DISSOLVED CHROMIUM	207 J	26	892	331	17.2 J	345	8.0	12.4
DISSOLVED HEXAVALENT CHROMIUM	571 J	10 U	772	53	10 UJ	230 J	5.5 U	5.5 U

Location ID	117-MW-A099							
Sample Date	11/11/1997	8/19/1998	4/15/1999	4/17/2003	7/26/2006	9/9/2009	10/12/2009	12/17/2018
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
CHROMIUM	504	130	215	78.4	84.3	42.6	10.9	7.2
HEXAVALENT CROMIUM	10 U	10 U	10 U	10 U	50 U	10 UJ	10 UJ	5.5 U
DISSOLVED CHROMIUM	NA	17.5	3 B	82.4	10	10 U	10 U	4.0 U
DISSOLVED HEXAVALENT CHROMIUM	NA	10 U	10 U	10 U	50 U	50 UJ	10 UJ	5.5 U

Location ID	117-MW-A099							
Sample Date	11/11/1997	8/20/1998	4/14/1999	4/18/2003	7/18/2006	9/9/2009	10/12/2009	12/17/2018	12/17/2018 DP
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
CHROMIUM	8970	14100	119000	3380 J	3640	186	89.9	204	293
HEXAVALENT CROMIUM	10 U	10 U	10 UJ	10 U	50 U	10 UJ	10 UJ	5.5 U	5.5 U
DISSOLVED CHROMIUM	1130	8720	29000	2760 J	1020	111	10 U	215	168
DISSOLVED HEXAVALENT CHROMIUM	20 U	10 U	10 UJ	10 U	50 U	10 UJ	10 UJ	5.5 U	5.5 U

Location ID	117-MW-145	
Sample Date	10/12/2009	12/17/2018
Units	ug/l	ug/l
CHROMIUM	334000	122000
HEXAVALENT CROMIUM	328000 J	121000
DISSOLVED CHROMIUM	353000	118000
DISSOLVED HEXAVALENT CHROMIUM	325000 J	171000

Location ID	117-MW-A062					
Sample Date	11/12/1997	8/19/1998	4/17/2003	7/19/2006	9/9/2009	10/12/2009
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
CHROMIUM	1810	108	401 J	96.3	36.5	1570
HEXAVALENT CROMIUM	10 UJ	10 U	10 U	50 UJ	10 UJ	10 UJ
DISSOLVED CHROMIUM	22.7	9.5 J	37.1 J	10 U	10 U	55.1
DISSOLVED HEXAVALENT CHROMIUM	10 UJ	10 U	10 U	50 UJ	10 UJ	10 UJ

Location ID	153-MW-5		
Sample Date	10/19/2010	4/26/2011	4/26/2011
Units	ug/l	ug/l	ug/l
CHROMIUM	4.0 U	4.0 U	4.0 U
HEXAVALENT CROMIUM	5.5 UJ	5.5 UJ	5.5 UJ
DISSOLVED CHROMIUM	4.0 U	4.0 U	4.0 U
DISSOLVED HEXAVALENT CHROMIUM	5.5 UJ	5.5 UJ	5.5 UJ

Location ID	153-MW-2	
Sample Date	10/19/2010	4/26/2011
Units	ug/l	ug/l
CHROMIUM	4.0 U	4.0 U
HEXAVALENT CROMIUM	5.5 UJ	5.5 UJ
DISSOLVED CHROMIUM	4.0 U	4.0 U
DISSOLVED HEXAVALENT CHROMIUM	5.5 UJ	5.5 UJ

Location ID	117-MW-A05					
Sample Date	11/12/1997	8/20/1998	4/17/2003	9/9/2009	10/12/2009	12/17/2018
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
CHROMIUM	164	36.2	NA	15.5	10 U	4.0 U
HEXAVALENT CROMIUM	151	32.4	10 U	10 UJ	10 UJ	5.5 U
DISSOLVED CHROMIUM	NA	39.5	NA	10 U	10 U	4.0 U
DISSOLVED HEXAVALENT CHROMIUM	NA	29.9	10 U	10 UJ	10 UJ	5.5 U

Location ID	153-MW-A15						
Sample Date	5/26/1999	7/14/1999	4/14/2003	7/18/2006	10/19/2010	9/23/2011	12/18/2018
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
CHROMIUM	20.2	24.9	14.1 J	60.7	161	71.4	128
HEXAVALENT CROMIUM	10 U	10 UJ	10 U	50 U	10 UJ	5.5 UJ	5.5 U
DISSOLVED CHROMIUM	13.6	11.8	5.0 J	10 U	10 UJ	10.2	73.6
DISSOLVED HEXAVALENT CHROMIUM	10 U	10 UJ	10 U	50 U	10 UJ	5.5 UJ	5.5 U

Location ID	117-MW-A014								
Sample Date	11/11/1997	8/20/1998	4/17/2003	7/19/2006	9/9/2009	10/12/2009	10/19/2010	4/26/2011	12/17/2018
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
CHROMIUM	131	95.6	NA	90.9	41.3	37.6	40.7	43.7	23.1
HEXAVALENT CROMIUM	131	88.7	10 U	65	14 J	28 J	31 J	40 J	9.9
DISSOLVED CHROMIUM	NA	90	NA	86	17.2	34.3	38.9	43.6	21.9
DISSOLVED HEXAVALENT CHROMIUM	NA	86.2	10 U	65	11 J	27 J	21 J	44 J	8.8

FIGURE 5-5

Summary of Groundwater Quality Sampling Results at Site 117 and Site 153

Integrated Annual Groundwater Performance Report
2018

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INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT FOR 2018

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

Prepared for

HONEYWELL
Morris Plains, New Jersey

VOLUME II - APPENDICES

May 2019

(revised July 2, 2020)

Prepared by

cornerstone
A TETRA TECH COMPANY

100 Crystal Run Road, Suite 101
Middletown, NY 10941

Project 150463

APPENDIX A

DATA LOGGER HYDROGRAPHS FROM SA-6 NORTH AND SOUTH

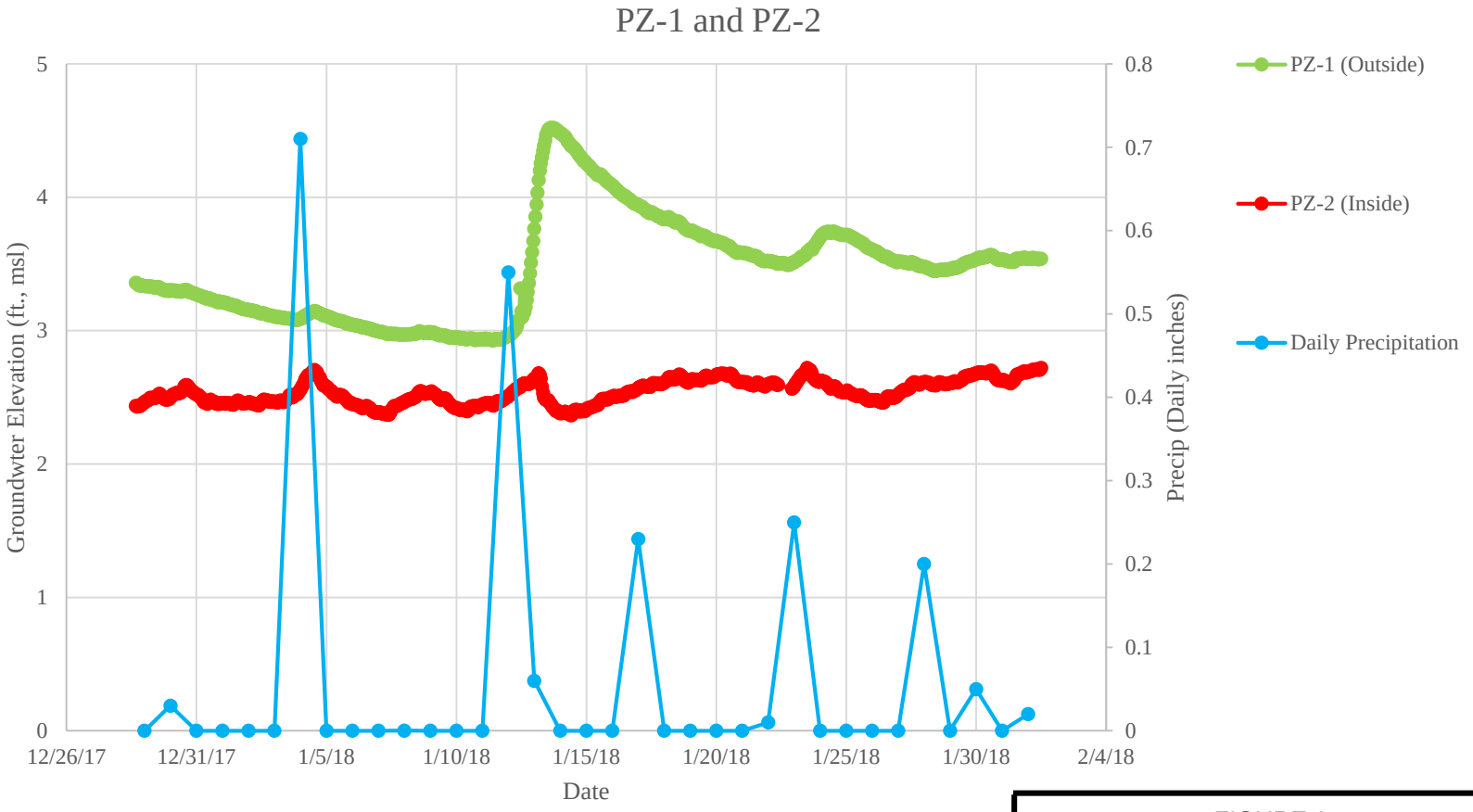

FIGURE 1

Hydrograph of PZ-1 and PZ-2
Data Logger Heads v. Precipitation
January 2018

Study Area 6, Jersey City, NJ

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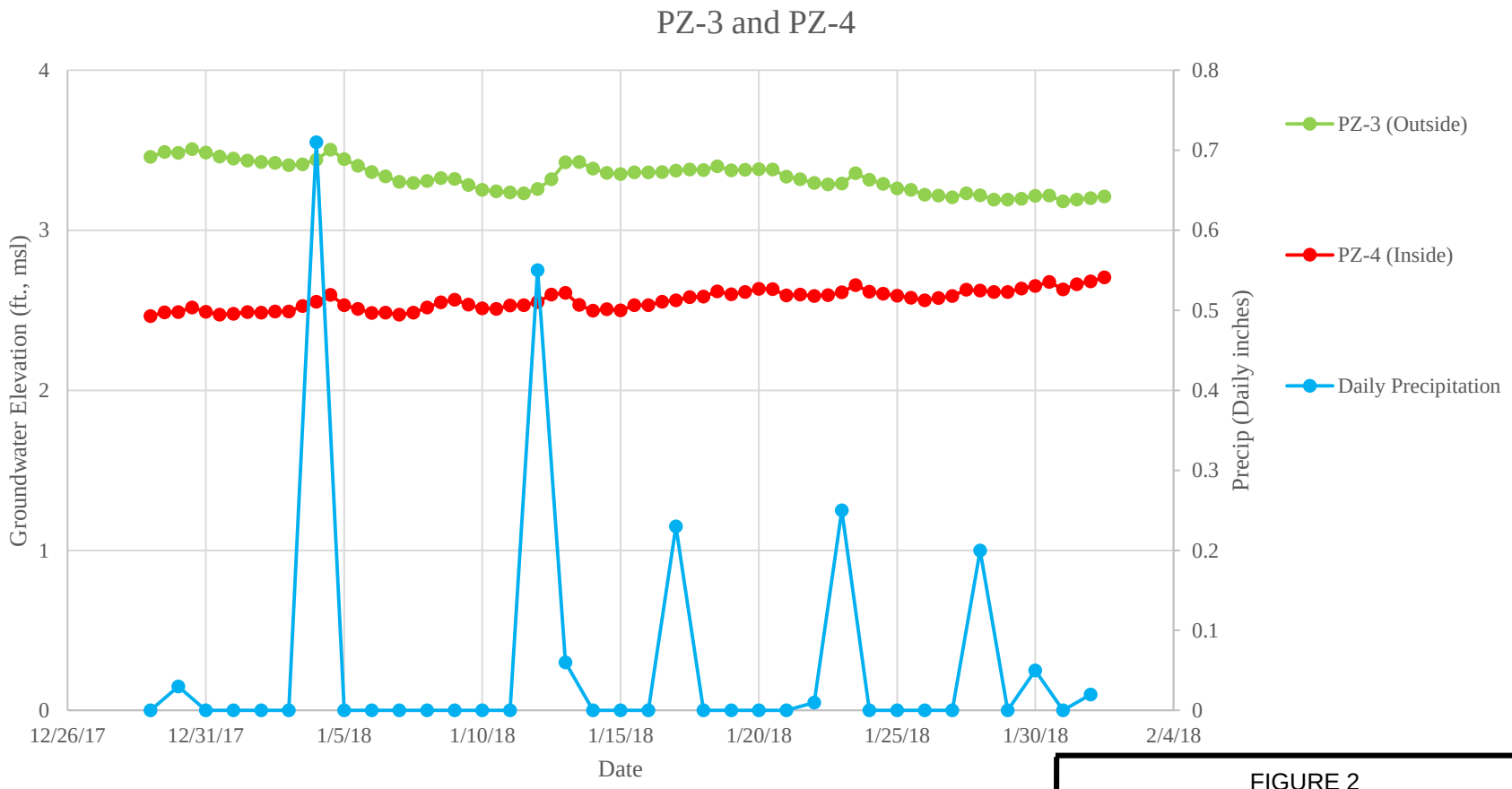
Notes:

1) Logger data recorded at one-hour intervals
2) Corrected for barometric fluctuation
3) Precipitation data from CRONOS database, Harrison, NJ



Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

FIGURE 2

Hydrograph of PZ-3 and PZ-4
Data Logger Heads v. Precipitation
January 2018

Study Area 6, Jersey City, NJ

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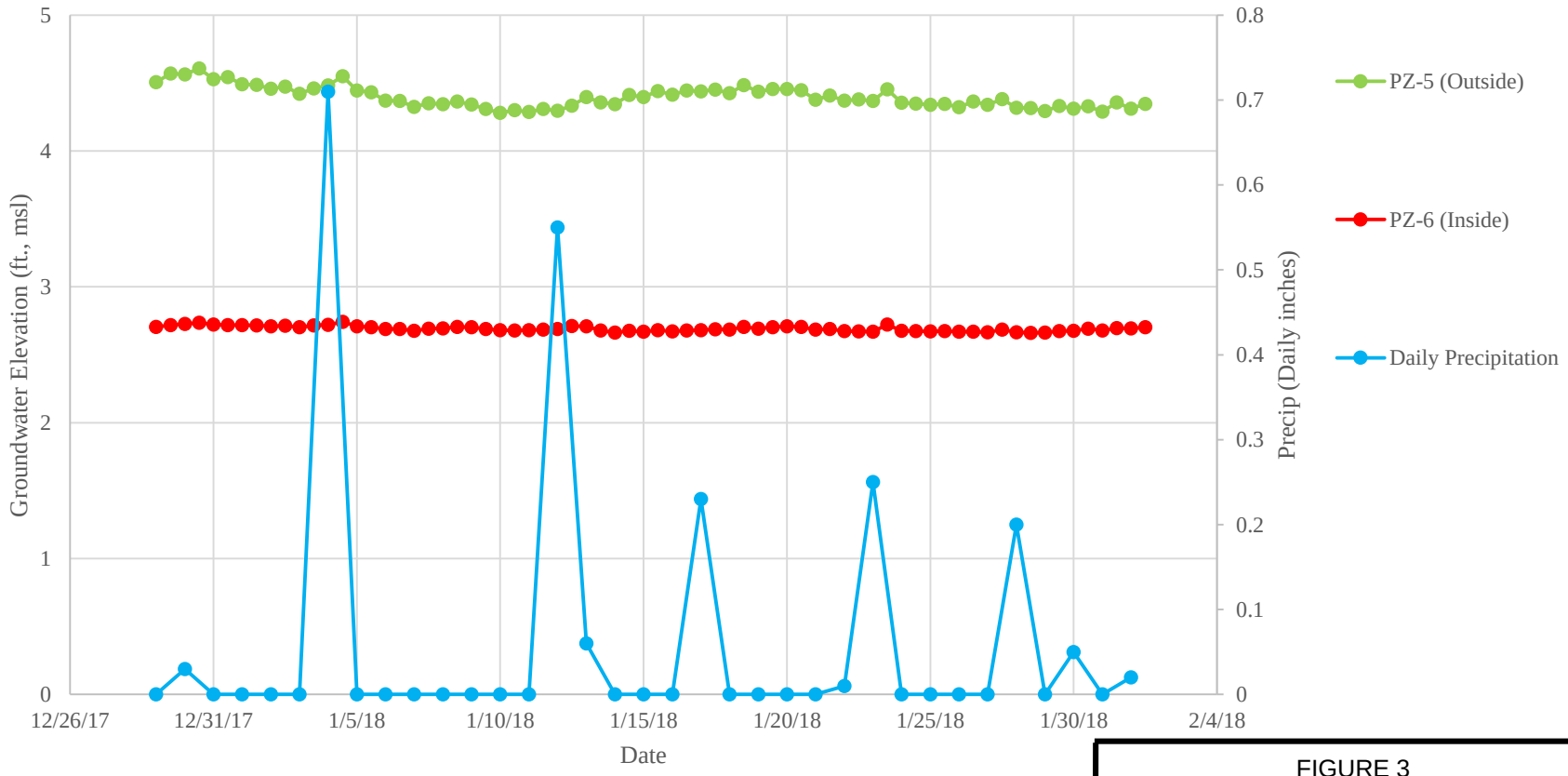

FIGURE 3

Hydrograph of PZ-5 and PZ-6
Data Logger Heads v. Precipitation
January 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

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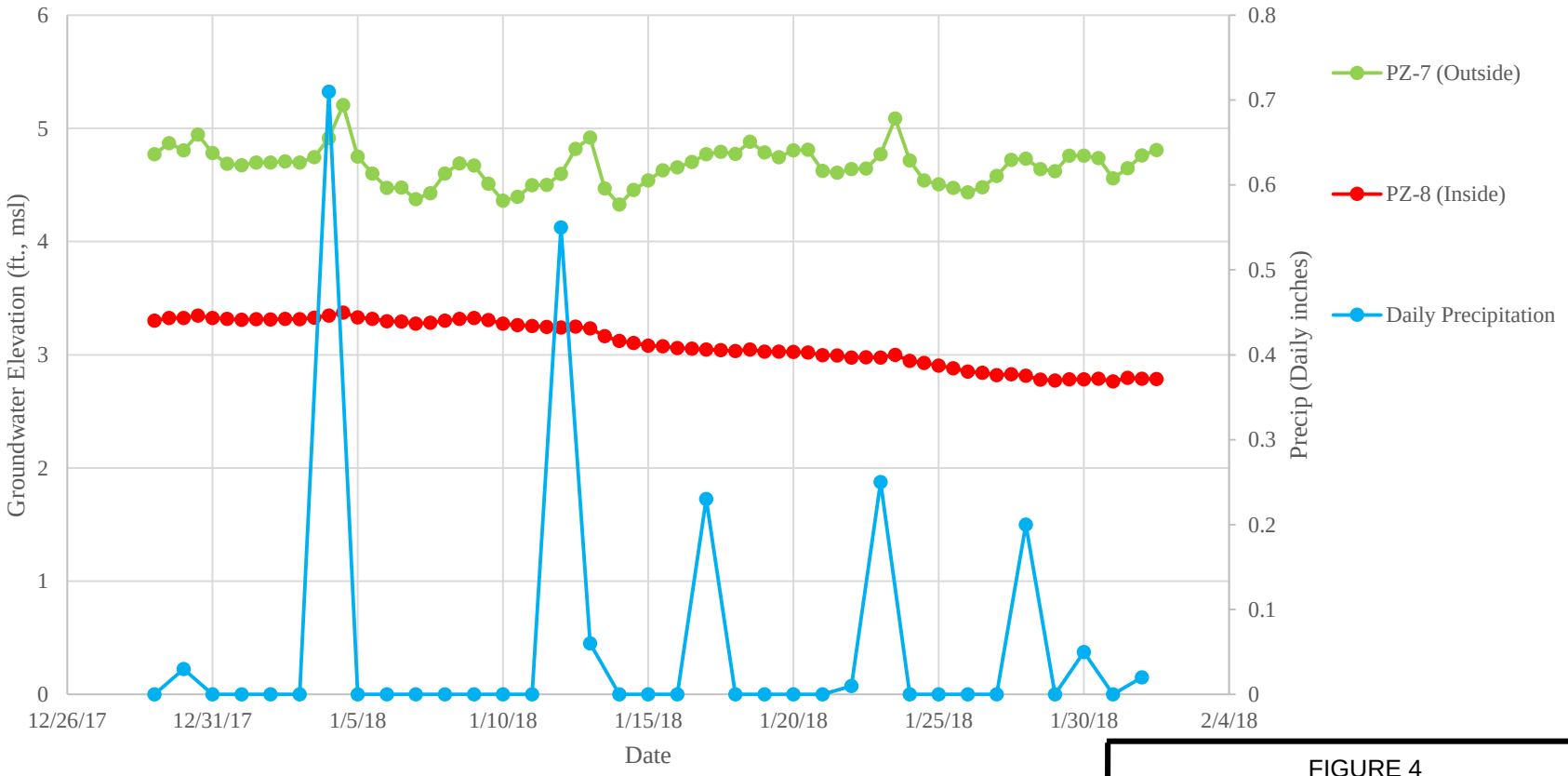

FIGURE 4

Hydrograph of PZ-7 and PZ-8
Data Logger Heads v. Precipitation
January 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

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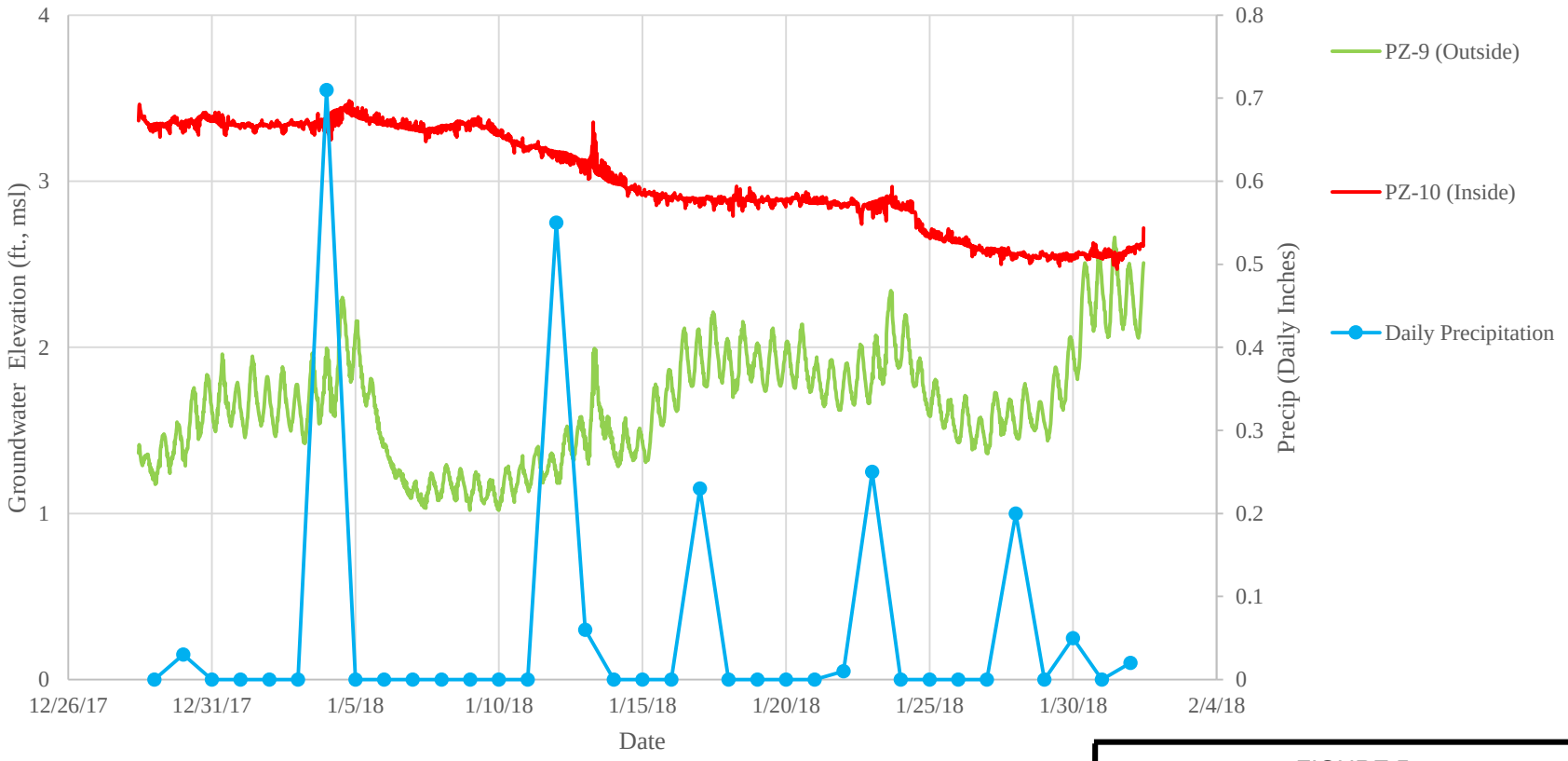

FIGURE 5

Hydrograph of PZ-9 and PZ-10
Data Logger Heads v. Precipitation
January 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 15-minute intervals
2) Precipitation data from CRONOS database, Harrison, NJ

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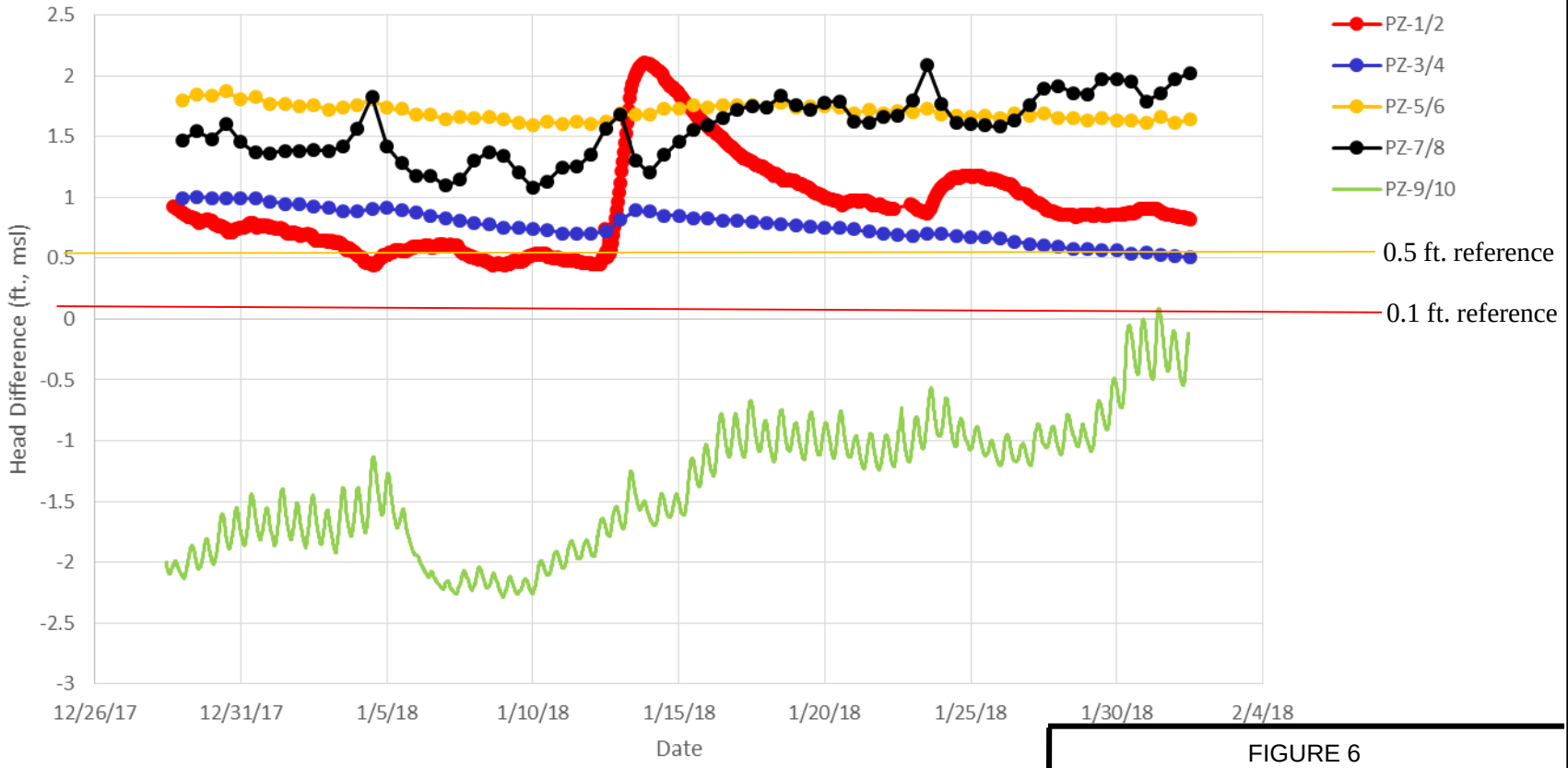

FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – January 2018

Study Area 6, Jersey City, NJ

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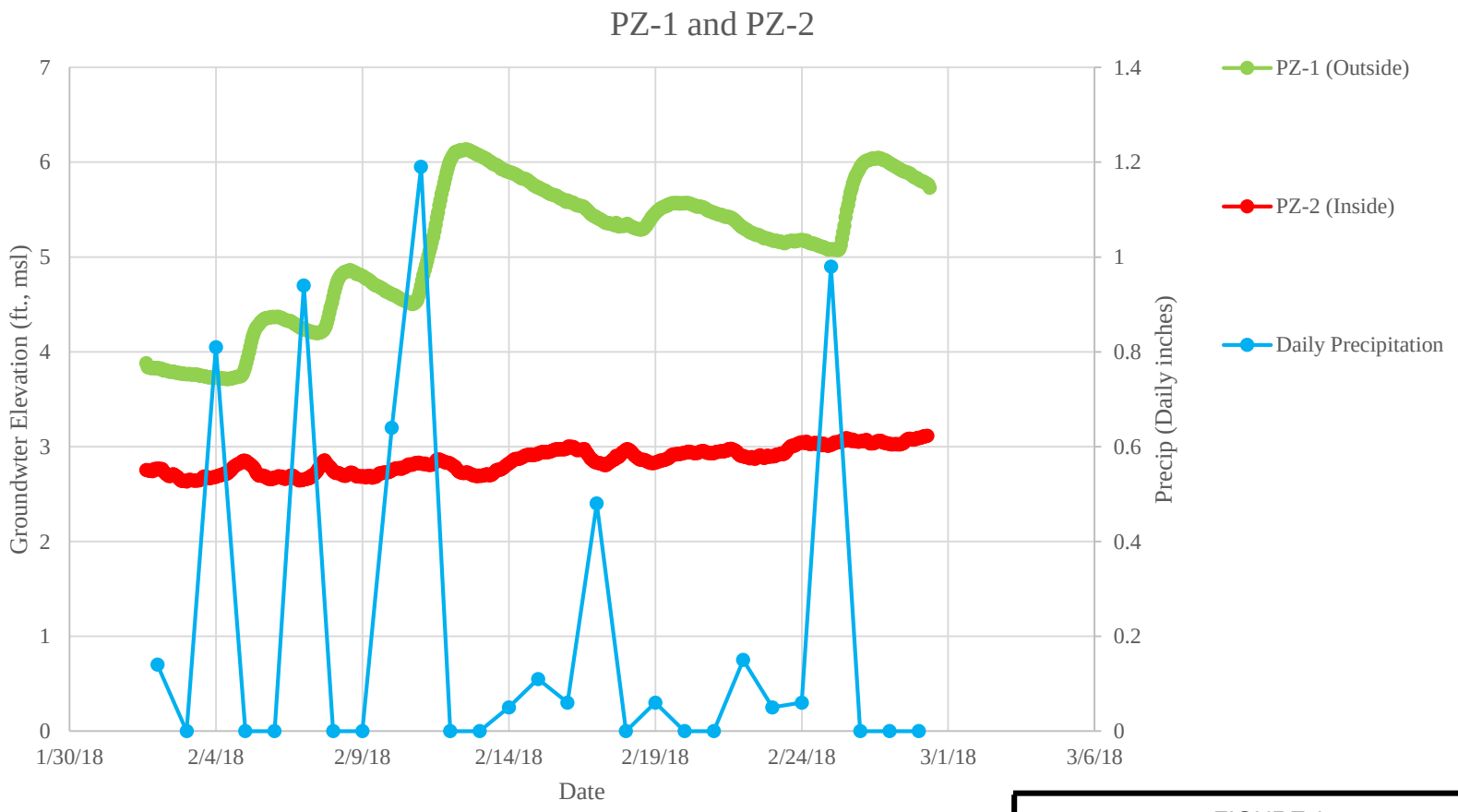

FIGURE 1

Hydrograph of PZ-1 and PZ-2
Data Logger Heads v. Precipitation
February 2018

Study Area 6, Jersey City, NJ

Notes:

1) Logger data recorded at one-hour intervals
2) Corrected for barometric fluctuation
3) Precipitation data from CRONOS database, Harrison, NJ

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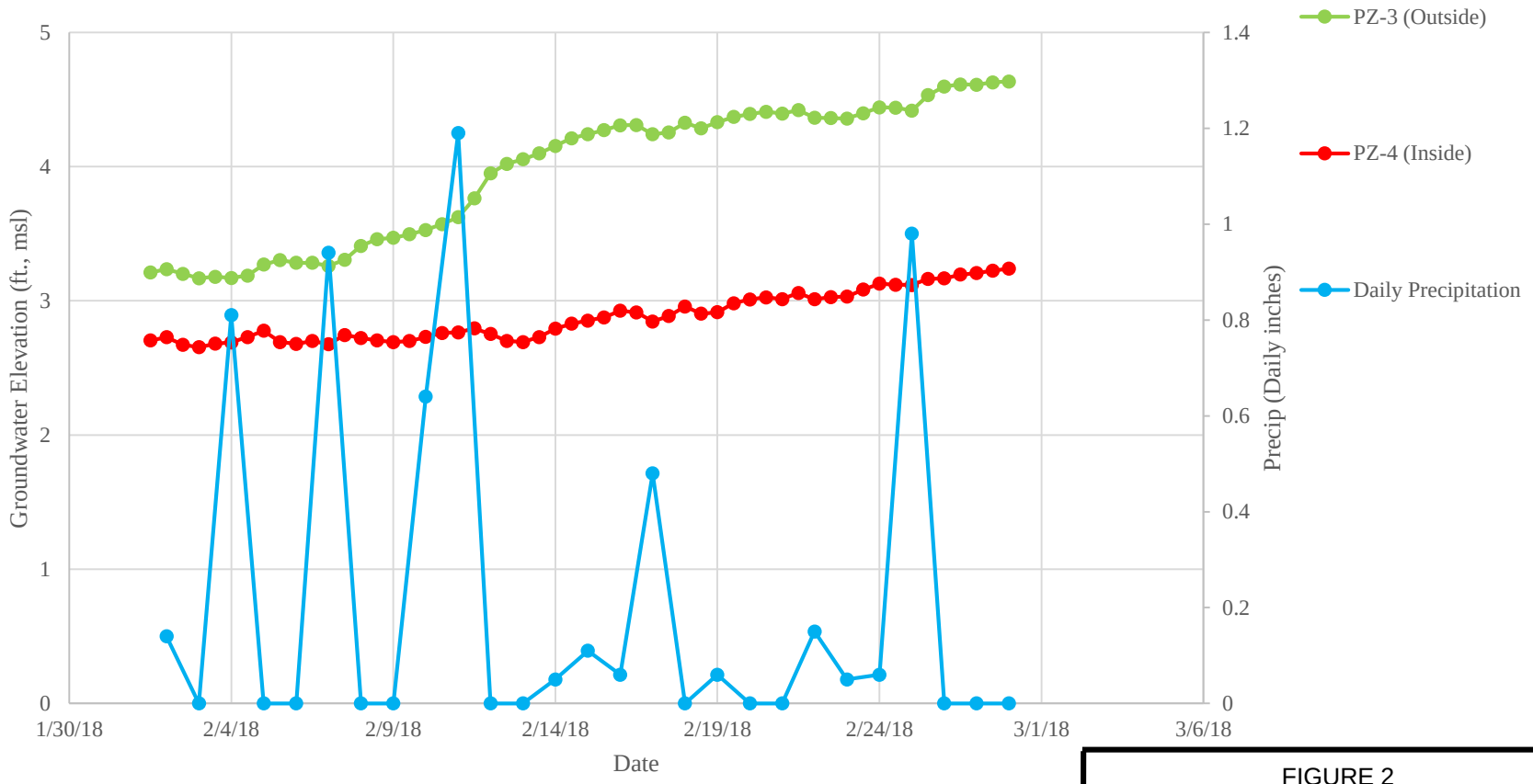

FIGURE 2

Hydrograph of PZ-3 and PZ-4
Data Logger Heads v. Precipitation
February 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

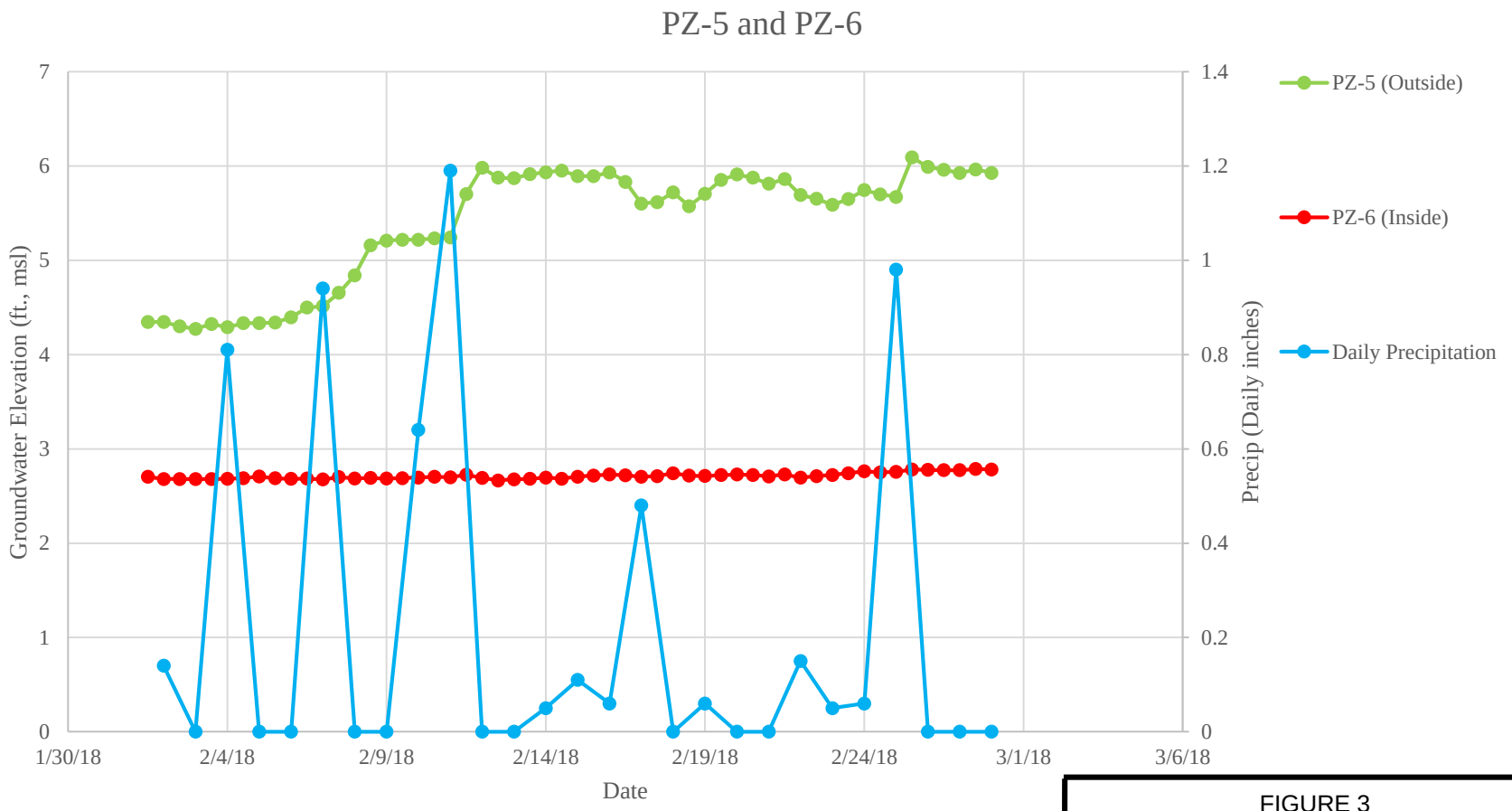

FIGURE 3

Hydrograph of PZ-5 and PZ-6
Data Logger Heads v. Precipitation
February 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

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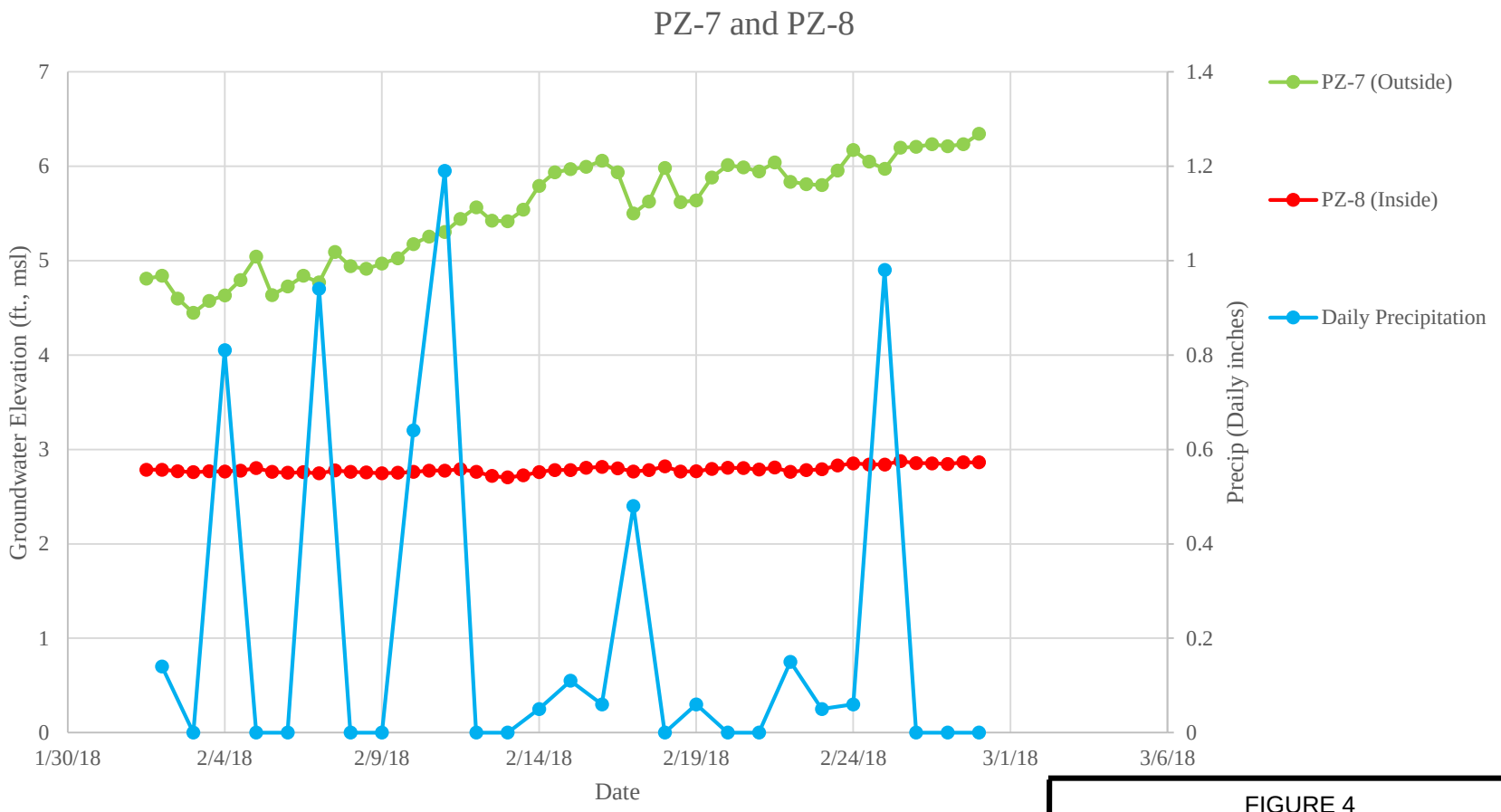

FIGURE 4

Hydrograph of PZ-7 and PZ-8
Data Logger Heads v. Precipitation
February 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

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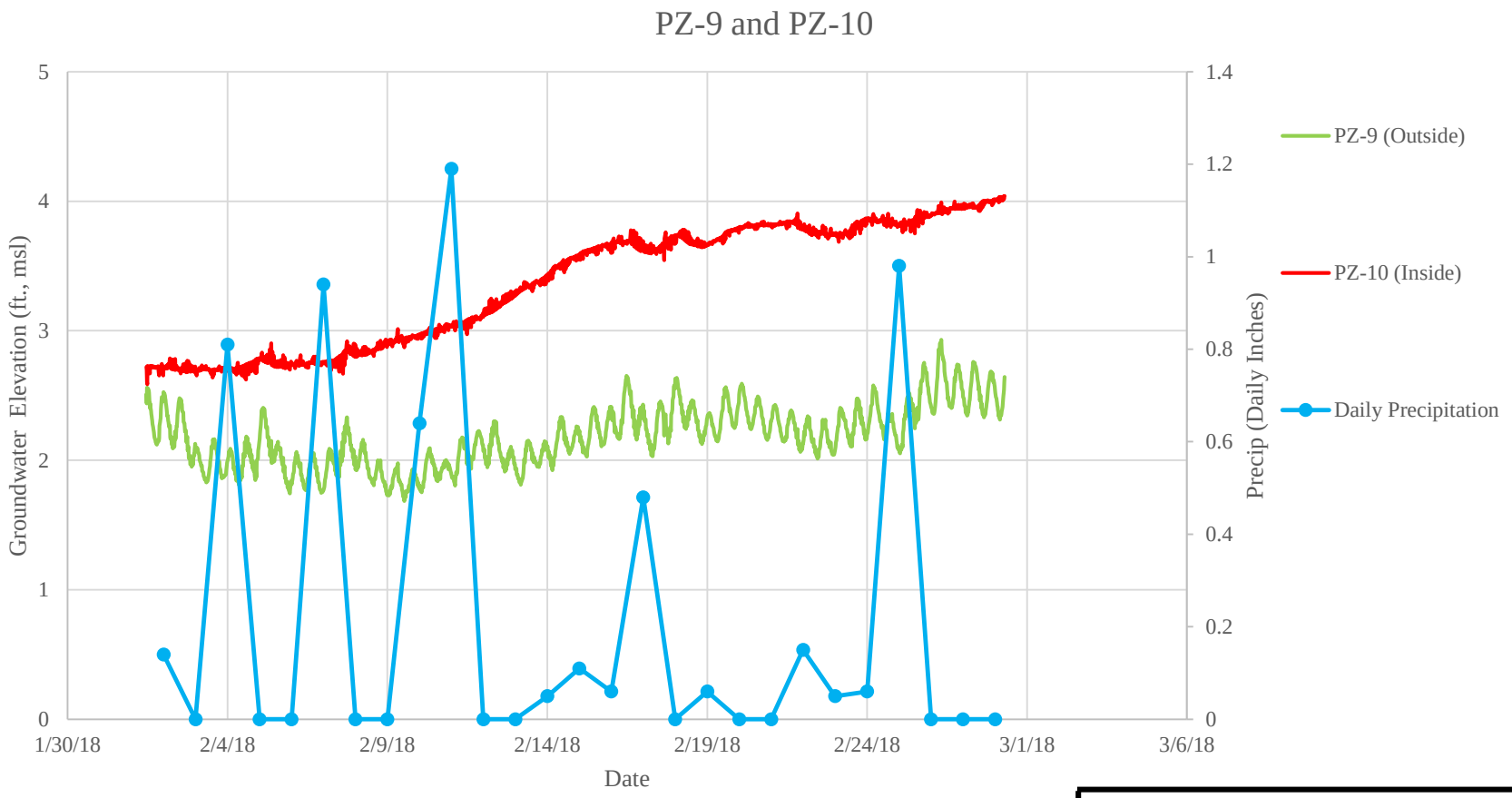

FIGURE 5

Hydrograph of PZ-9 and PZ-10
Data Logger Heads v. Precipitation
February 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 15-minute intervals
2) Precipitation data from CRONOS database, Harrison, NJ

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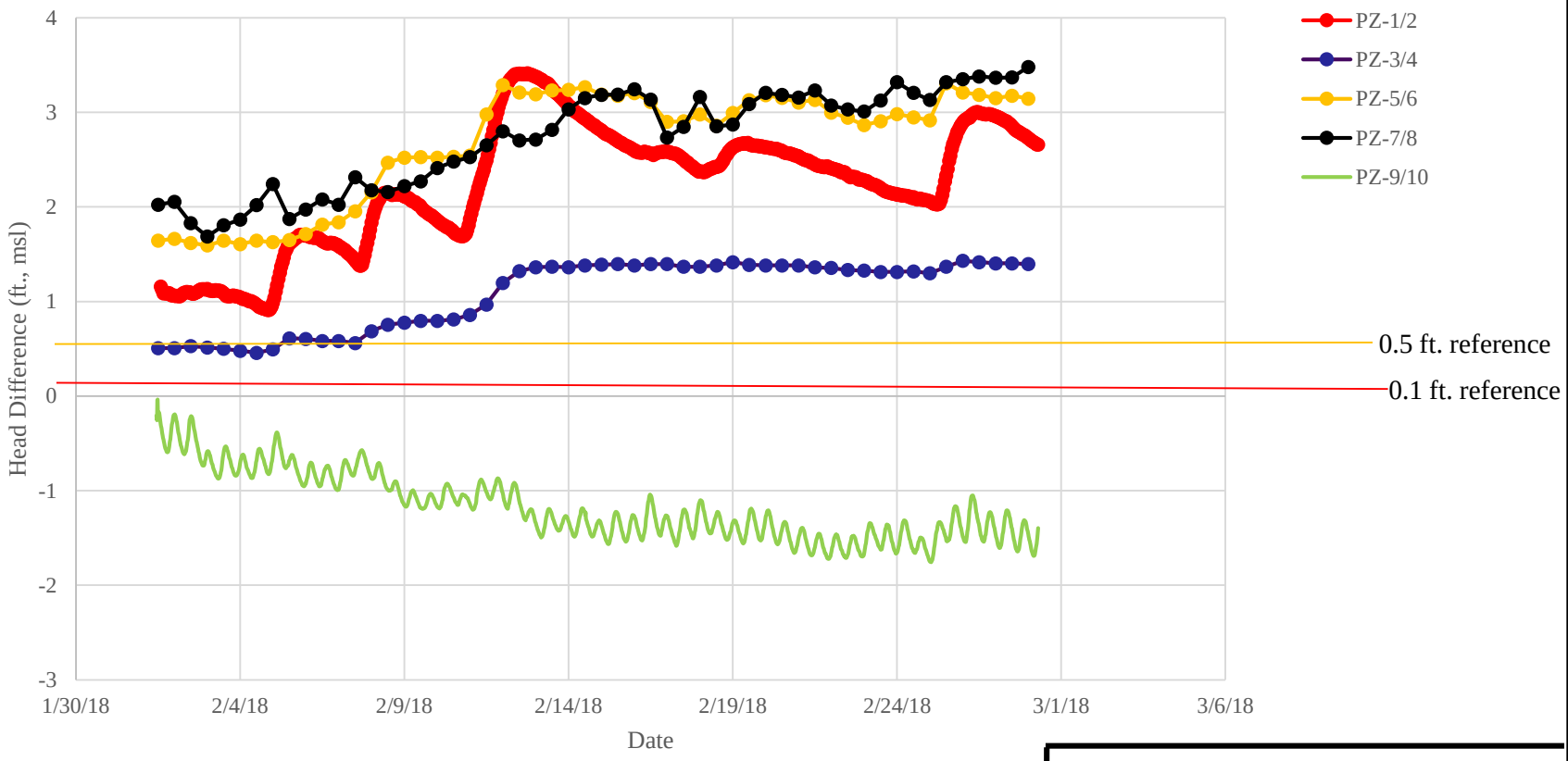

FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – February 2018

Study Area 6, Jersey City, NJ

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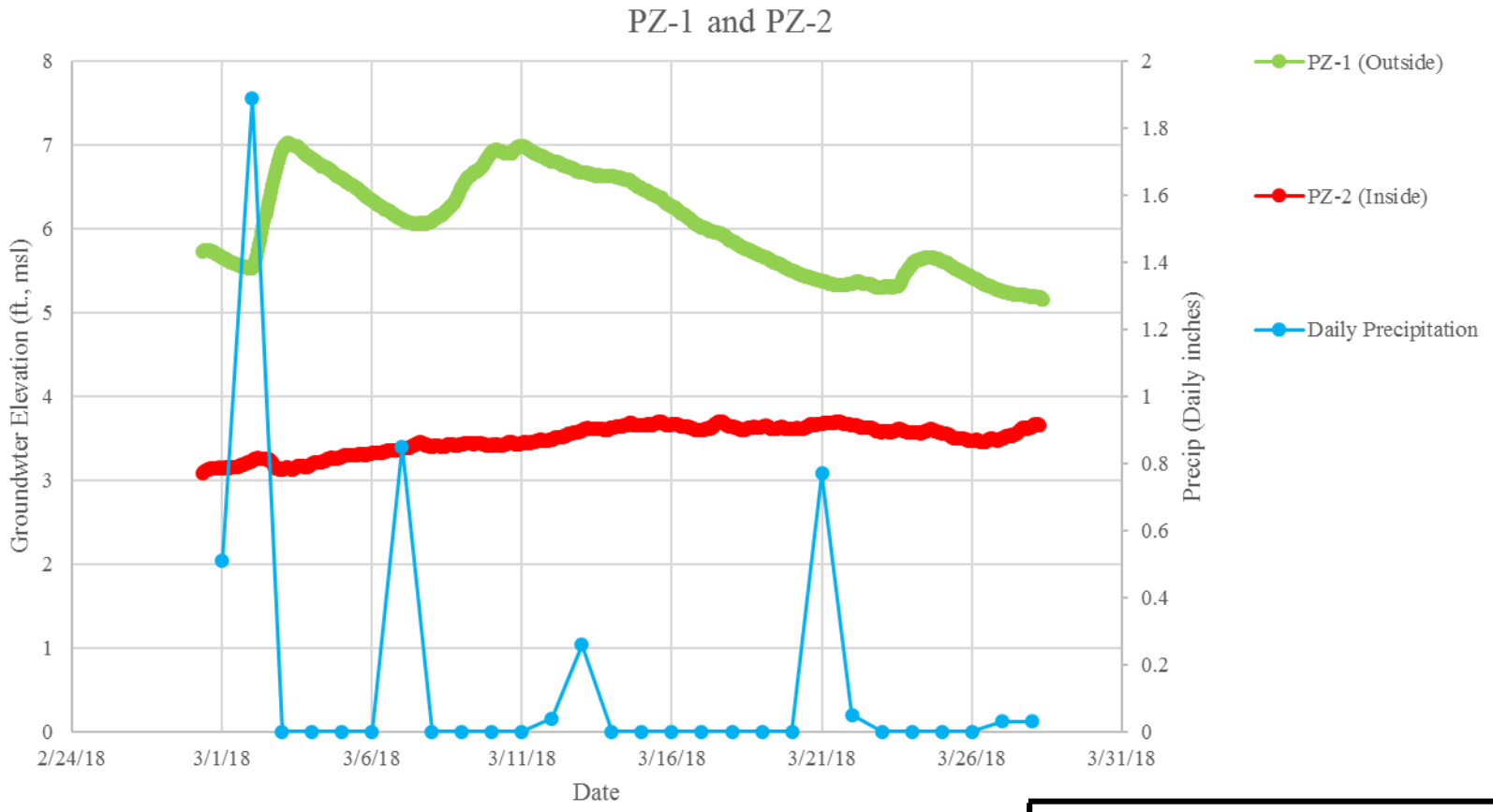

FIGURE 1

Hydrograph of PZ-1 and PZ-2
Data Logger Heads v. Precipitation
March 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:

1) Logger data recorded at one-hour intervals
2) Corrected for barometric fluctuation
3) Precipitation data from CRONOS database, Harrison, NJ

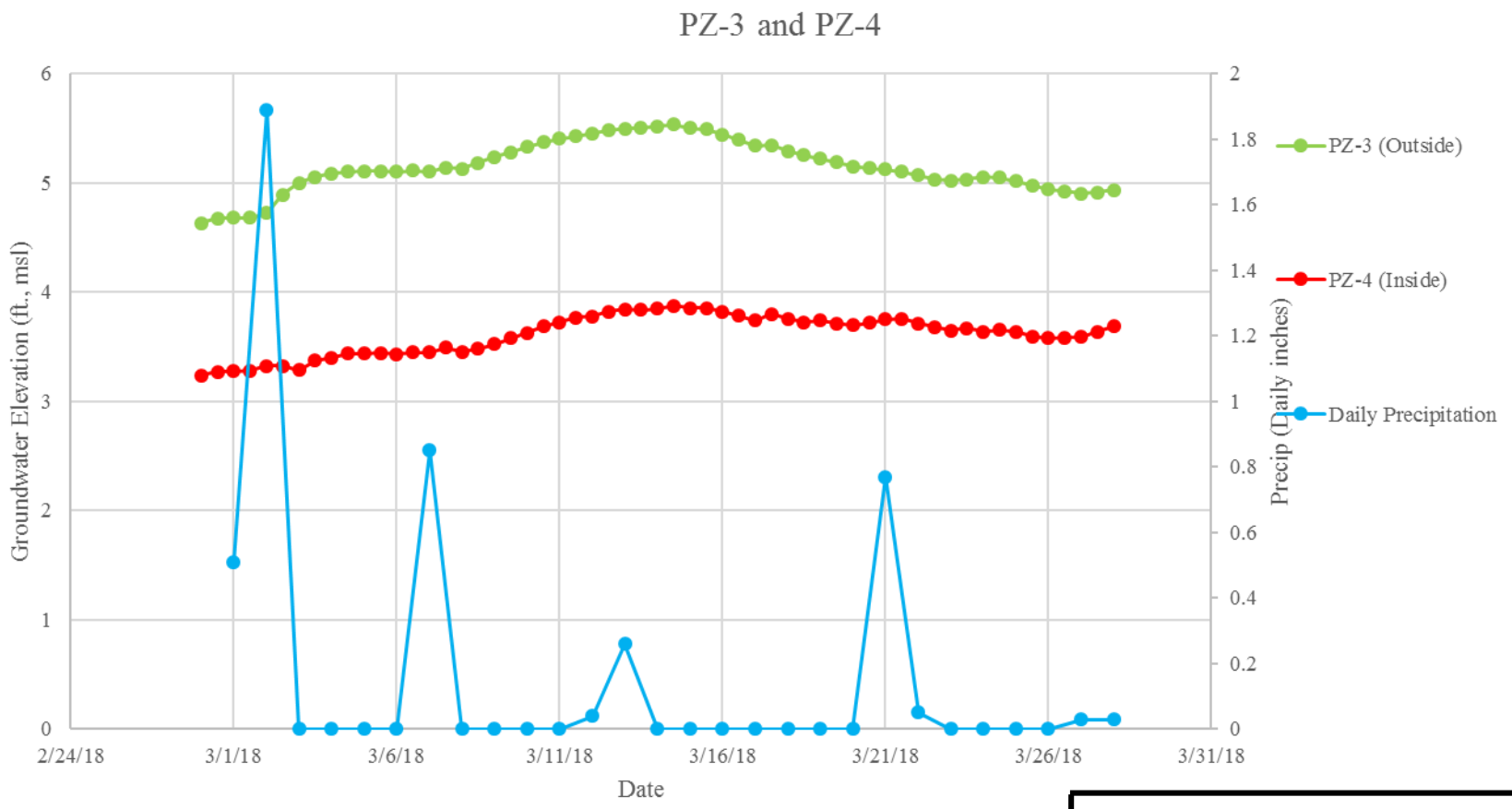

FIGURE 2

Hydrograph of PZ-3 and PZ-4
Data Logger Heads v. Precipitation
March 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

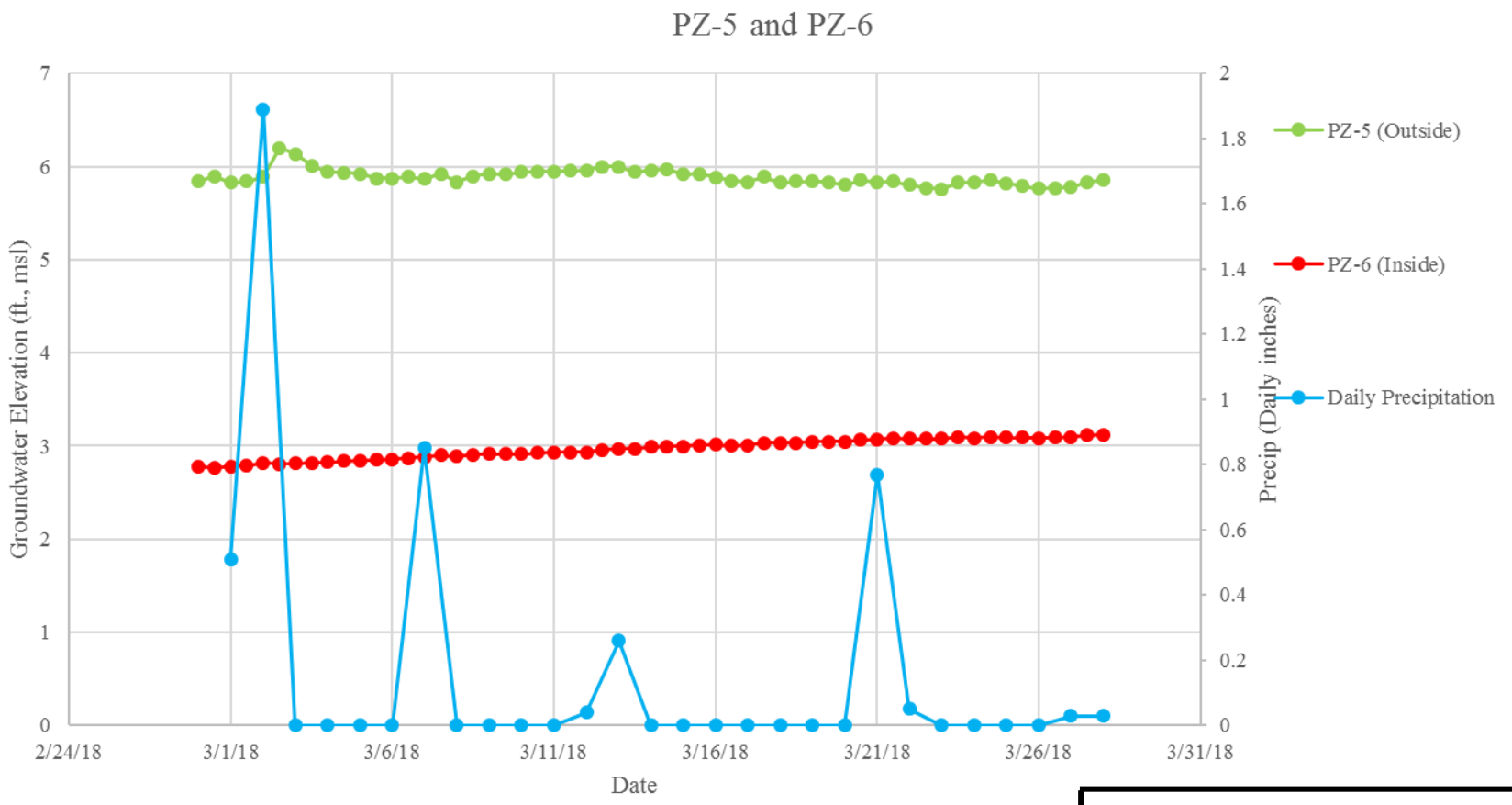

FIGURE 3

Hydrograph of PZ-5 and PZ-6
Data Logger Heads v. Precipitation
March 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

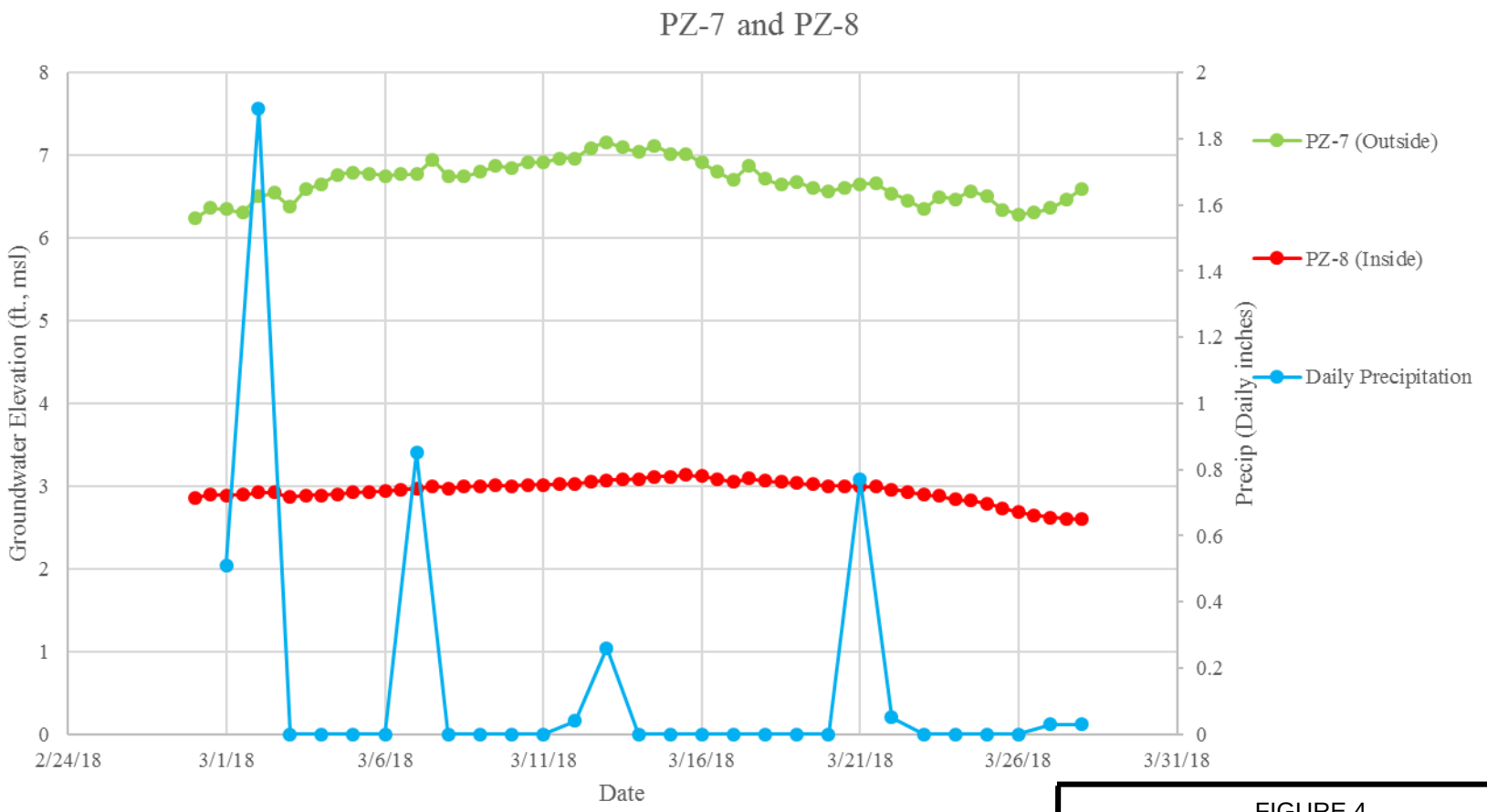

FIGURE 4

Hydrograph of PZ-7 and PZ-8
Data Logger Heads v. Precipitation
March 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

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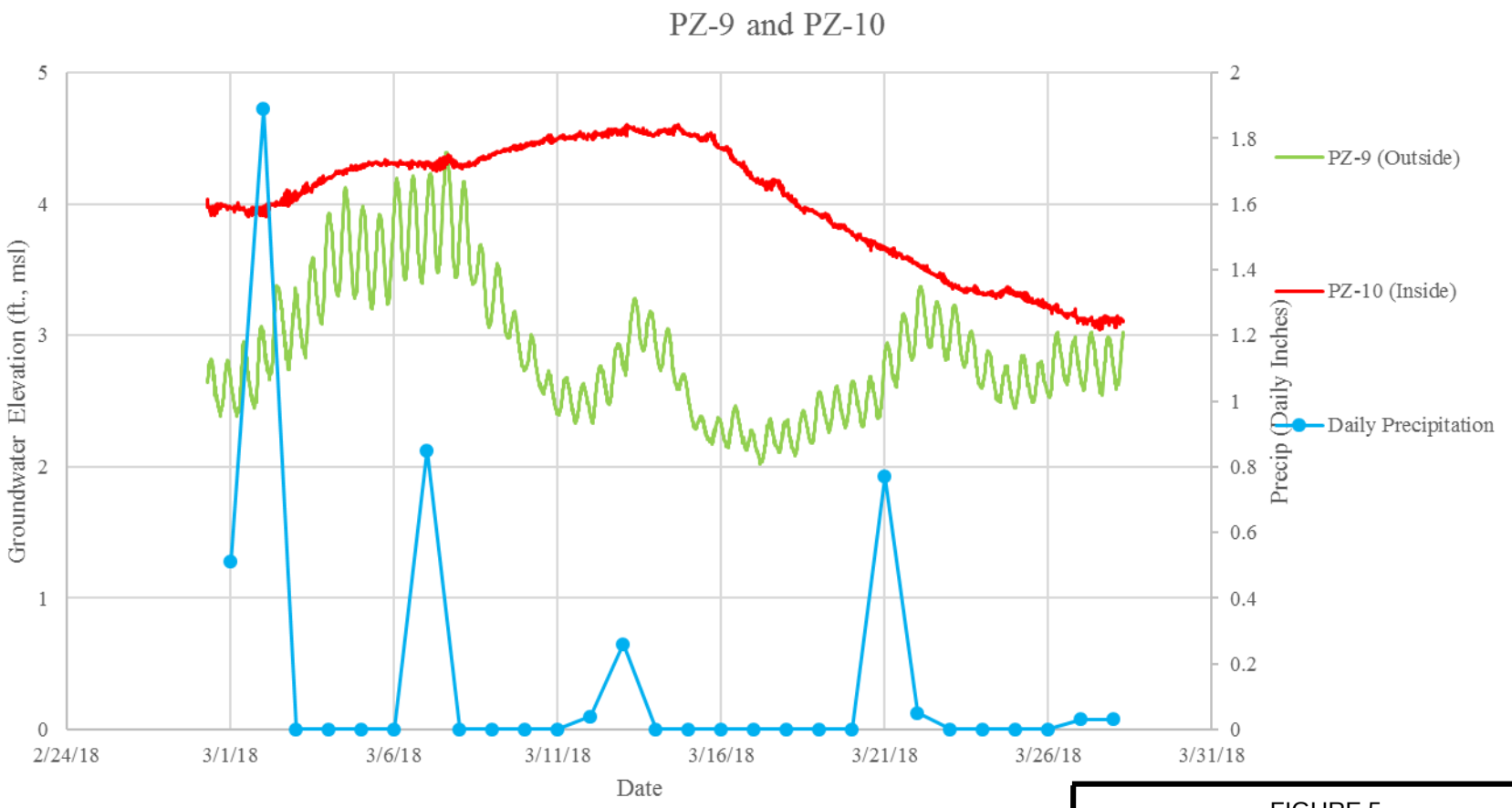

FIGURE 5

Hydrograph of PZ-9 and PZ-10
Data Logger Heads v. Precipitation
March 2018

Study Area 6, Jersey City, NJ

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Notes:
1) Logger data recorded at 15-minute intervals
2) Precipitation data from CRONOS database, Harrison, NJ

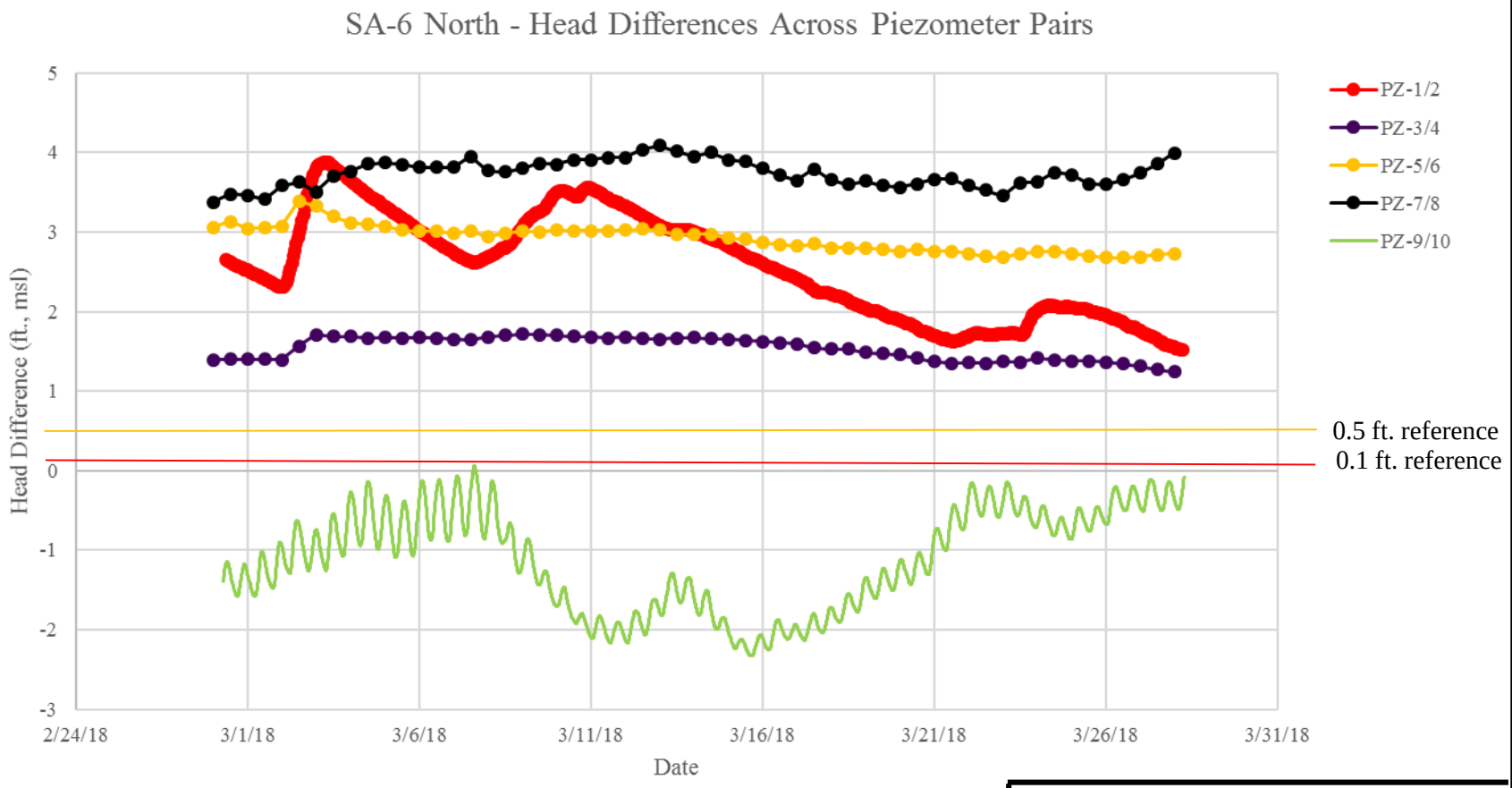

FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – March 2018

Study Area 6, Jersey City, NJ

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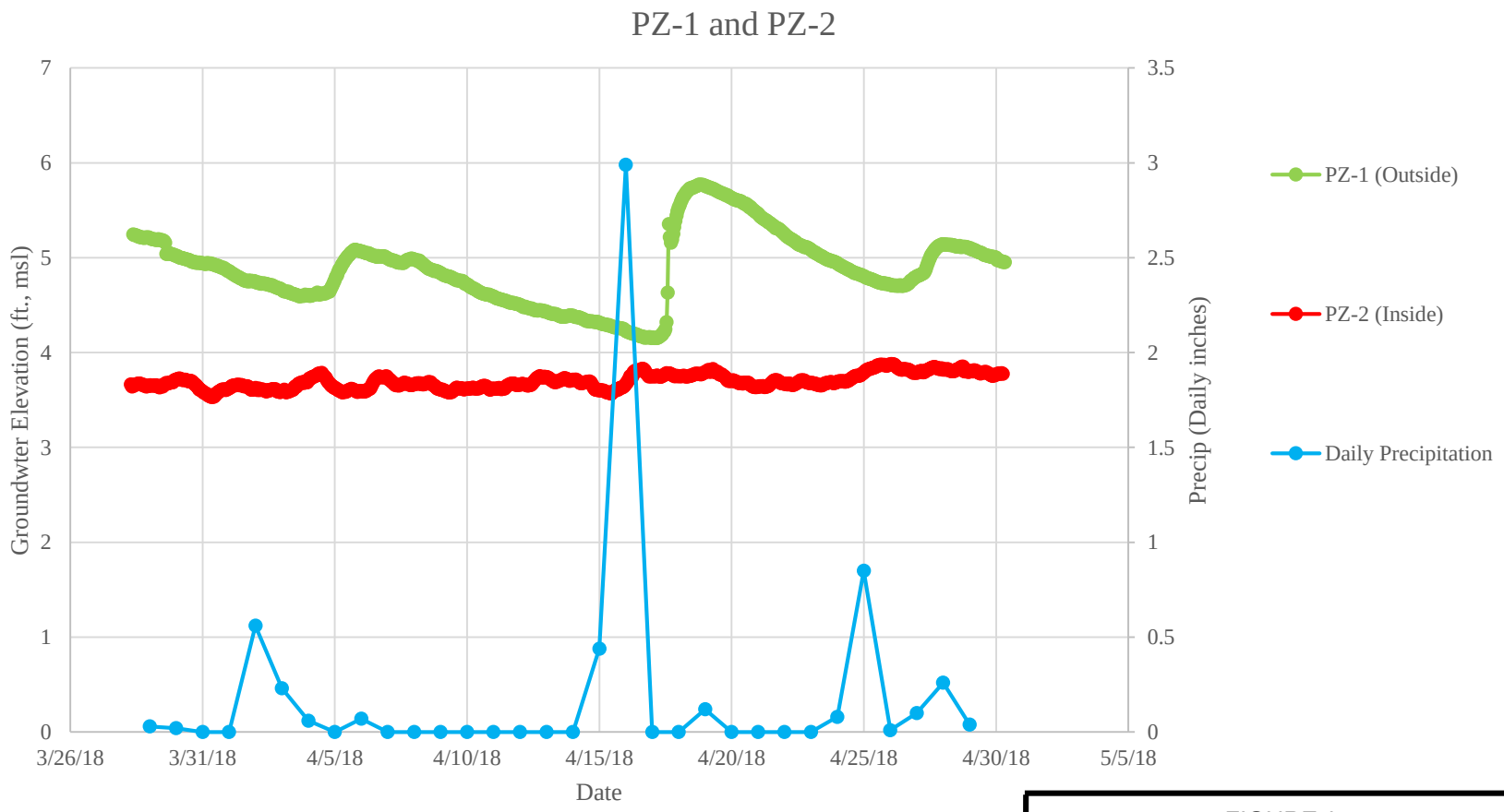

Notes:

1) Logger data recorded at one-hour intervals
2) Corrected for barometric fluctuation
3) Precipitation data from CRONOS database, Harrison, NJ

FIGURE 1

Hydrograph of PZ-1 and PZ-2
Data Logger Heads v. Precipitation
April 2018

Study Area 6, Jersey City, NJ

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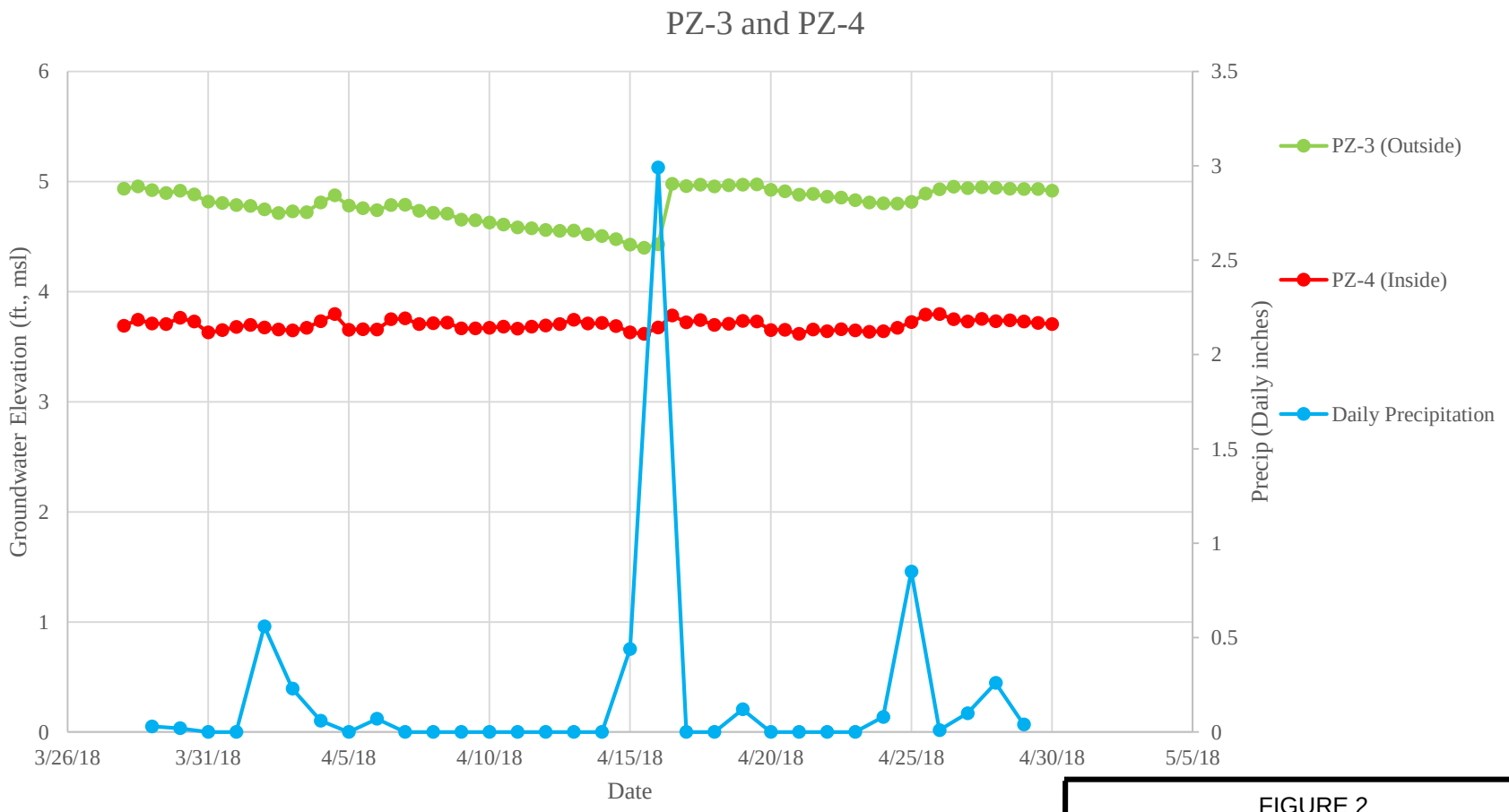

FIGURE 2

Hydrograph of PZ-3 and PZ-4
Data Logger Heads v. Precipitation
April 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

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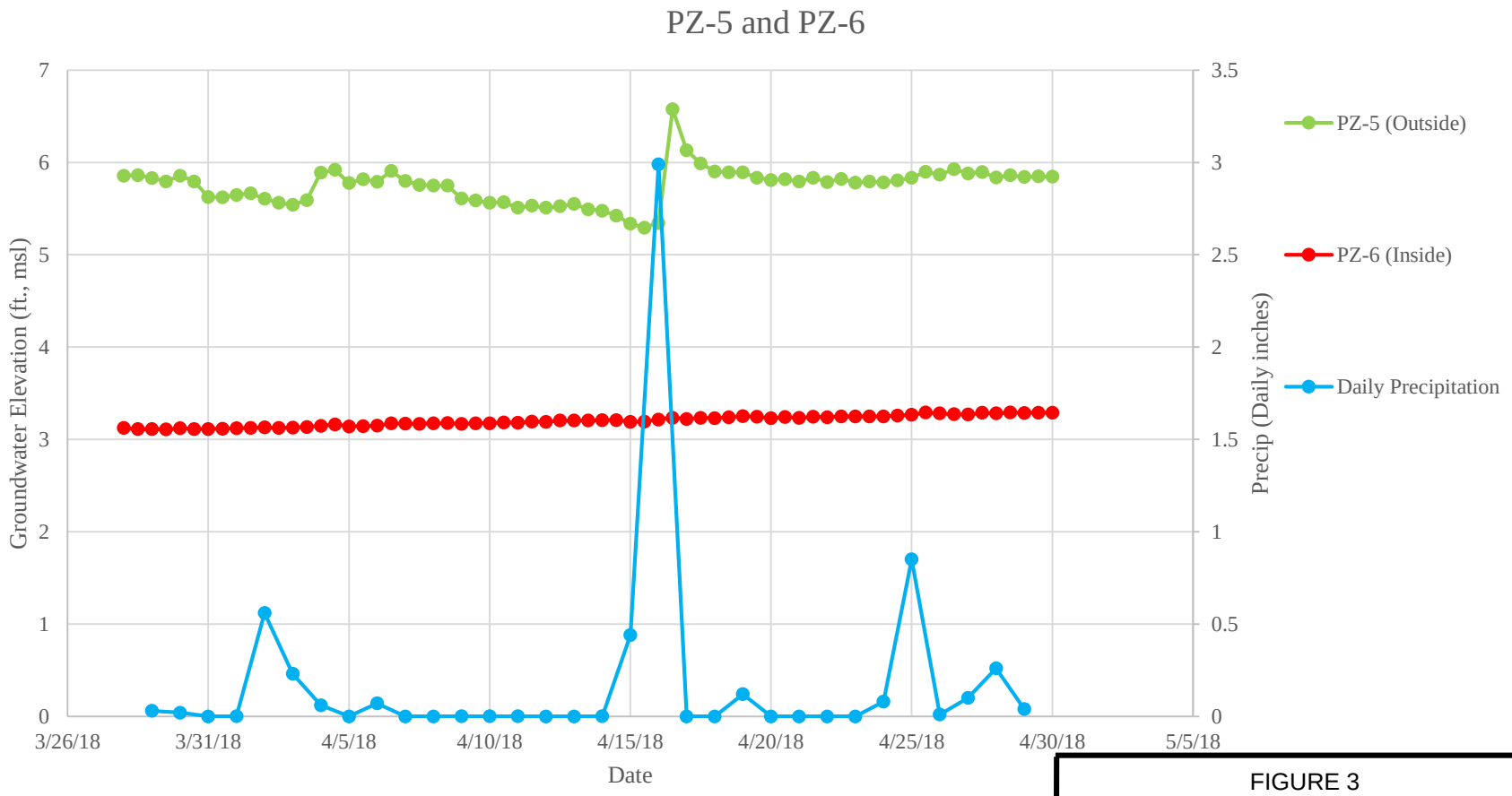

FIGURE 3

Hydrograph of PZ-5 and PZ-6
Data Logger Heads v. Precipitation
April 2018

Study Area 6, Jersey City, NJ

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Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

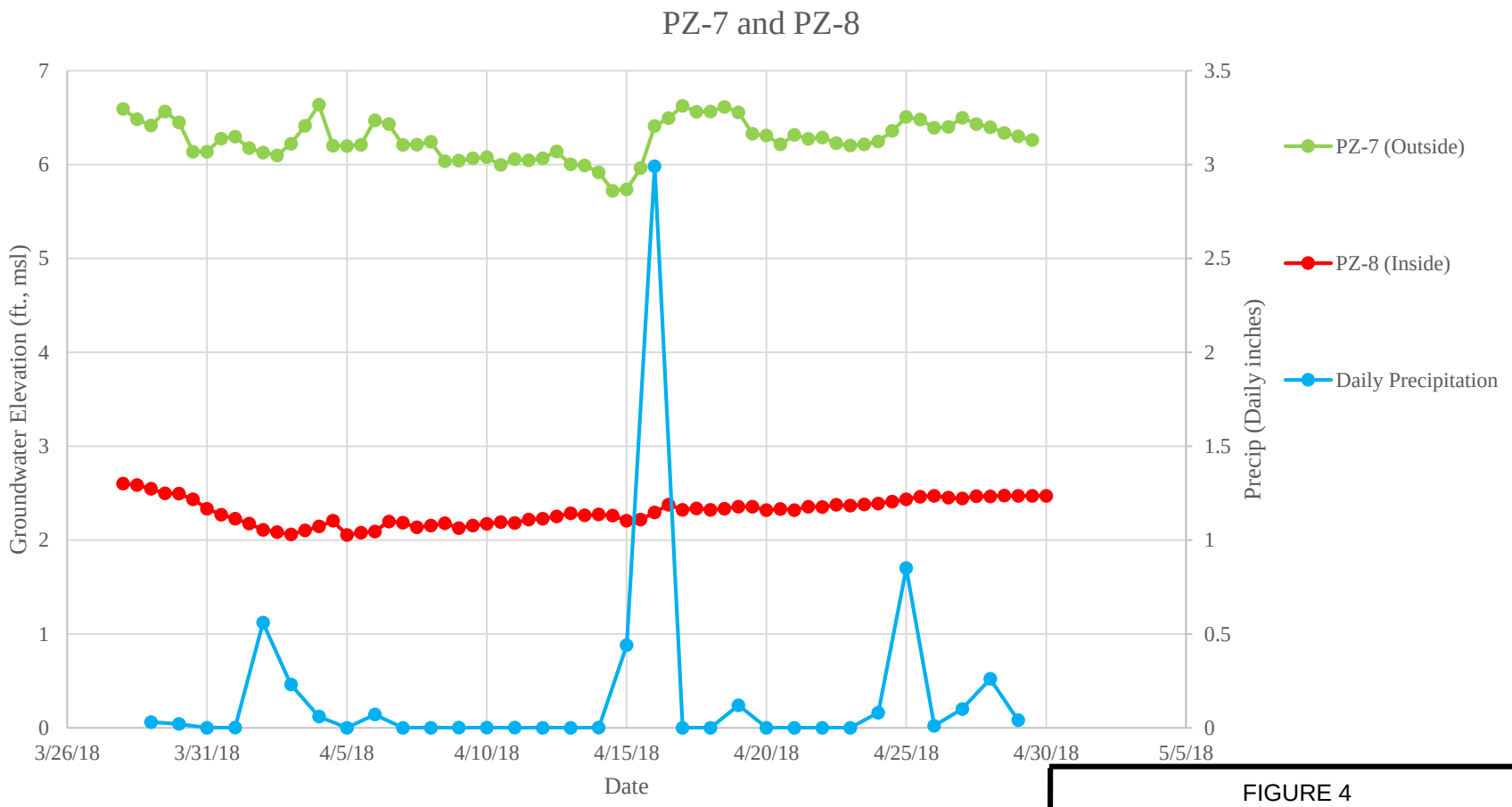

FIGURE 4

Hydrograph of PZ-7 and PZ-8
Data Logger Heads v. Precipitation
April 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

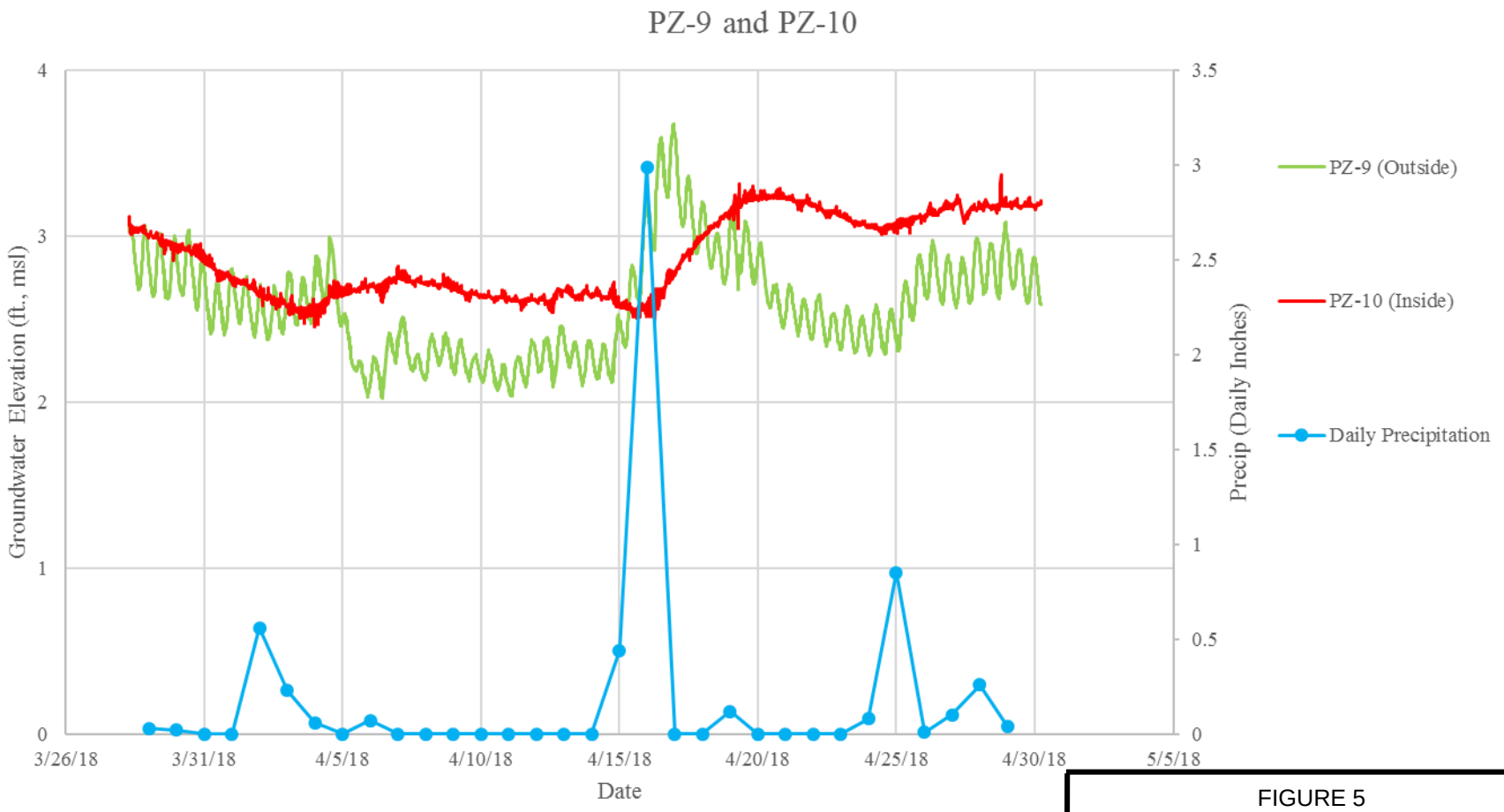

FIGURE 5

Hydrograph of PZ-9 and PZ-10
Data Logger Heads v. Precipitation
April 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 15-minute intervals
2) Precipitation data from CRONOS database, Harrison, NJ

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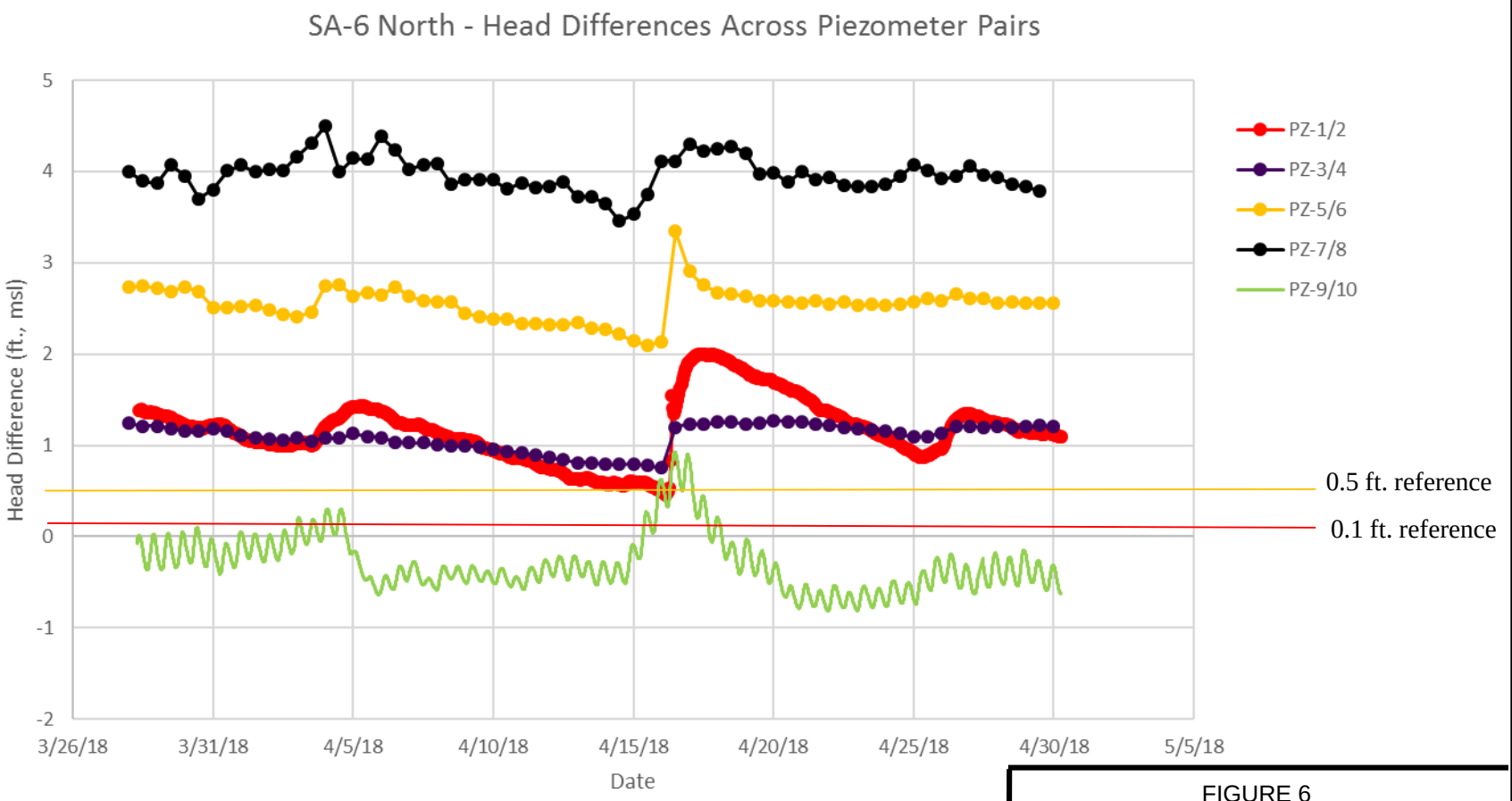

FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – April 2018

Study Area 6, Jersey City, NJ

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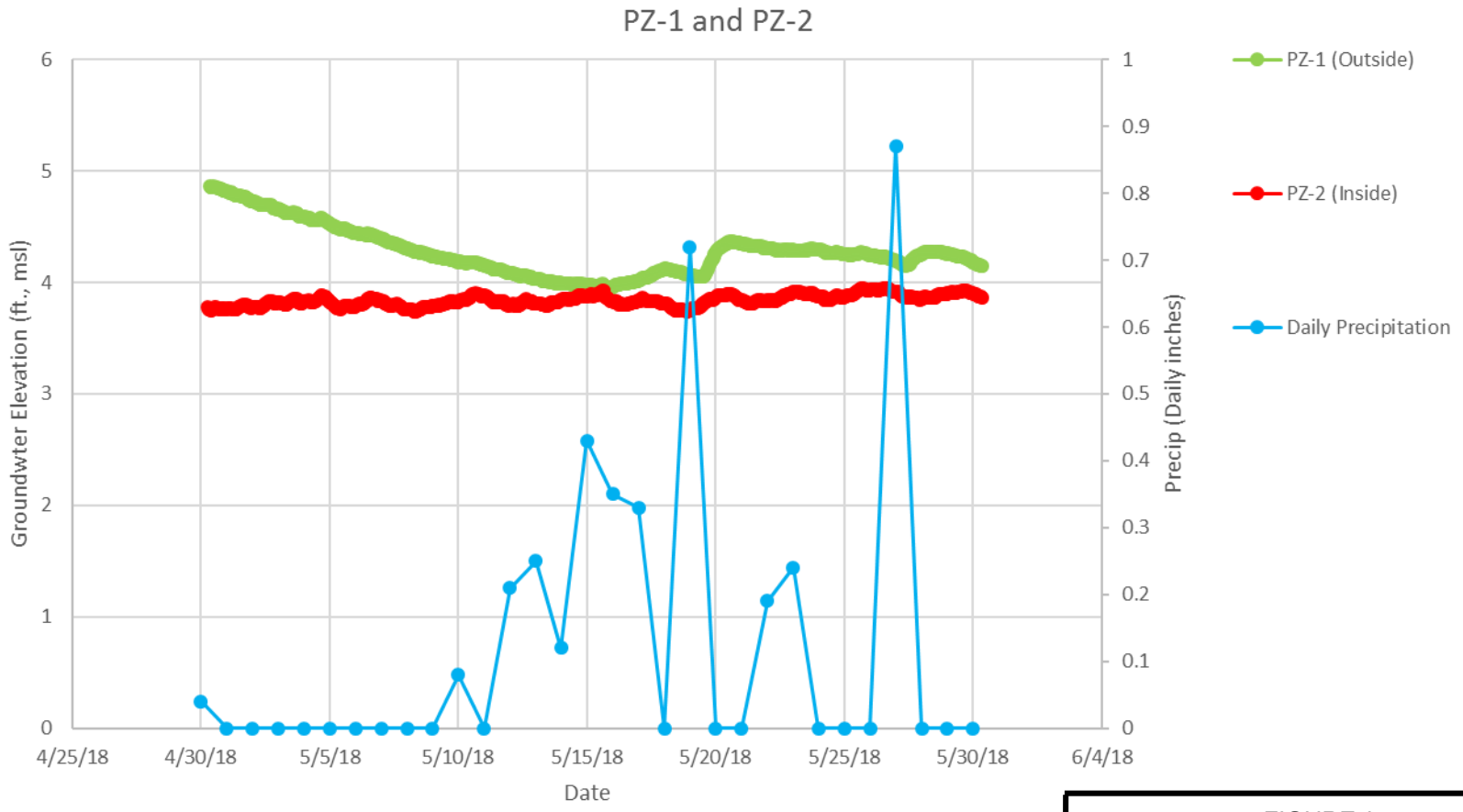

FIGURE 1

Hydrograph of PZ-1 and PZ-2
Data Logger Heads v. Precipitation
May 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at one-hour intervals
2) Corrected for barometric fluctuation
3) Precipitation data from CRONOS database, Harrison, NJ

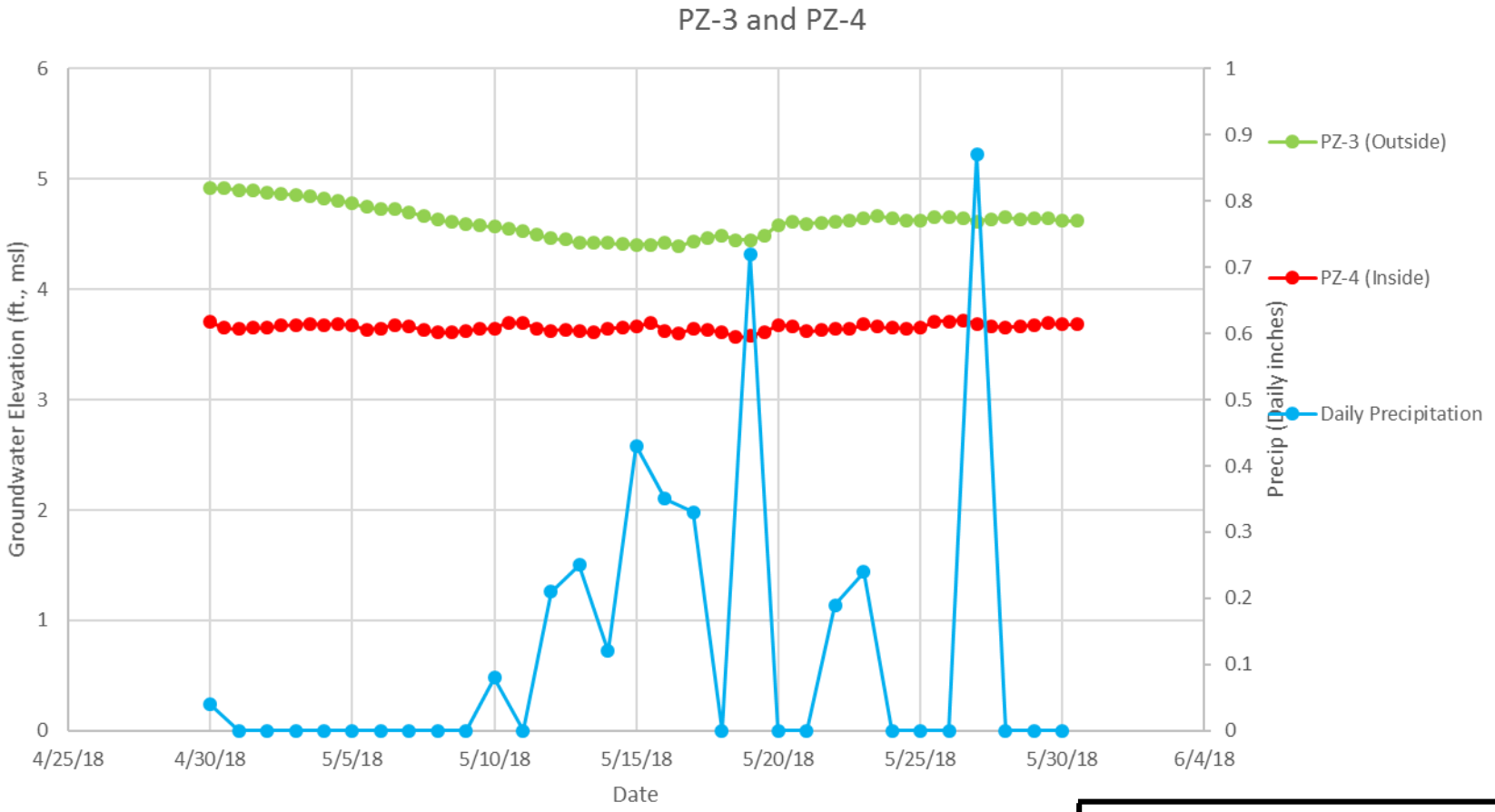

FIGURE 2

Hydrograph of PZ-3 and PZ-4
Data Logger Heads v. Precipitation
May 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

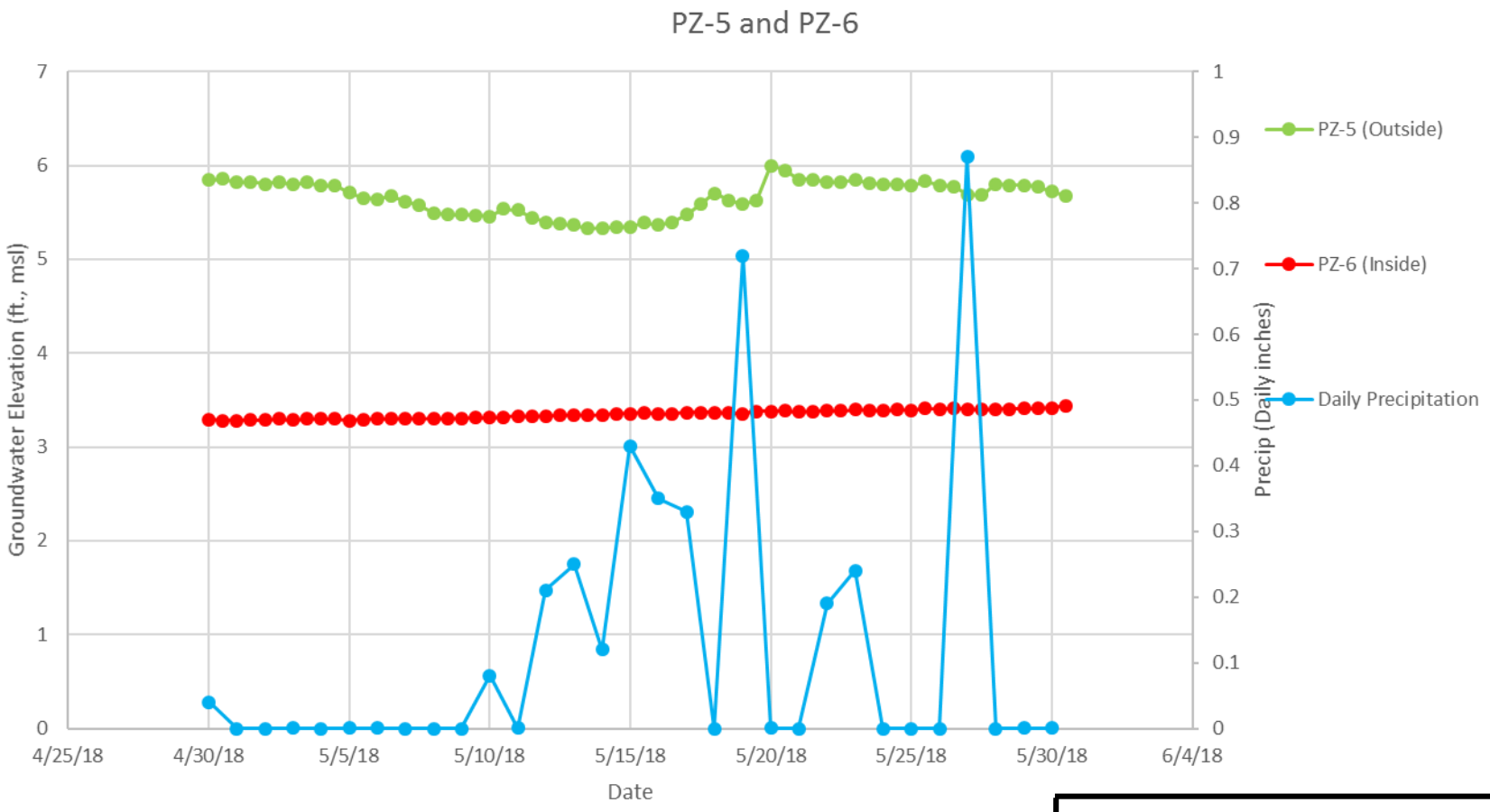

FIGURE 3

Hydrograph of PZ-5 and PZ-6
Data Logger Heads v. Precipitation
May 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

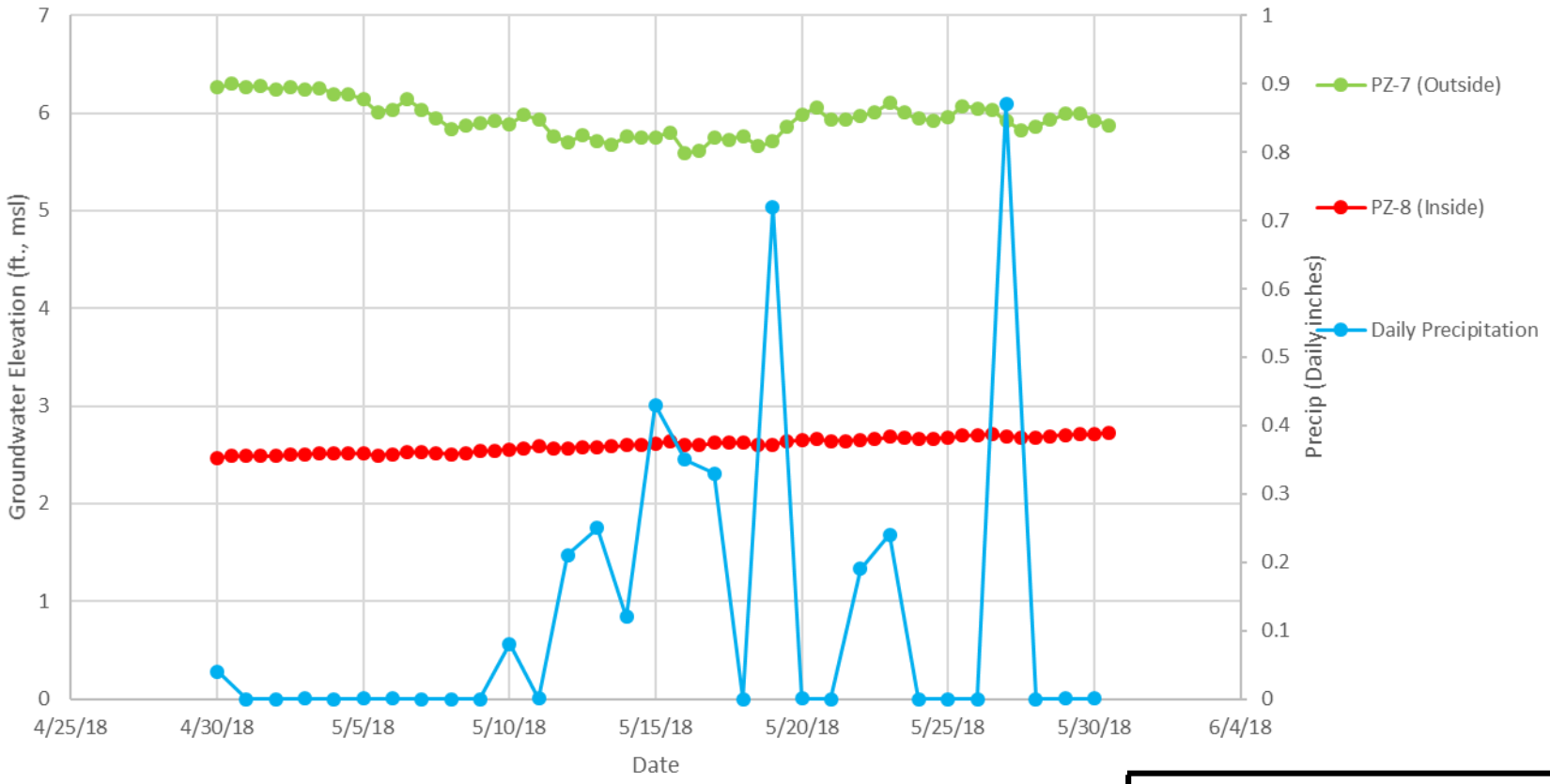

FIGURE 4

Hydrograph of PZ-7 and PZ-8
Data Logger Heads v. Precipitation
May 2018

Study Area 6, Jersey City, NJ

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Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

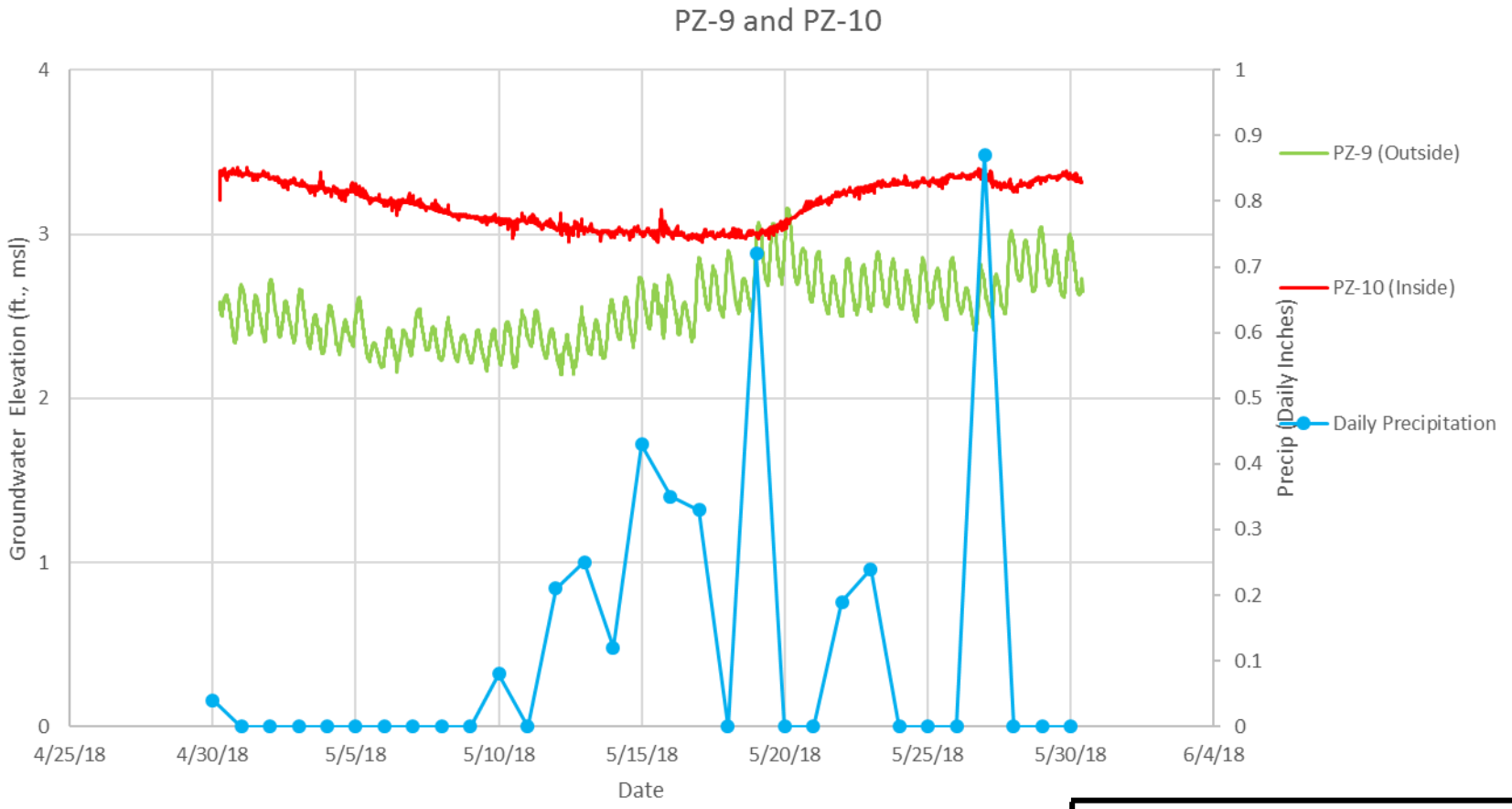

FIGURE 5

Hydrograph of PZ-9 and PZ-10
Data Logger Heads v. Precipitation
May 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 15-minute intervals
2) Precipitation data from CRONOS database, Harrison, NJ

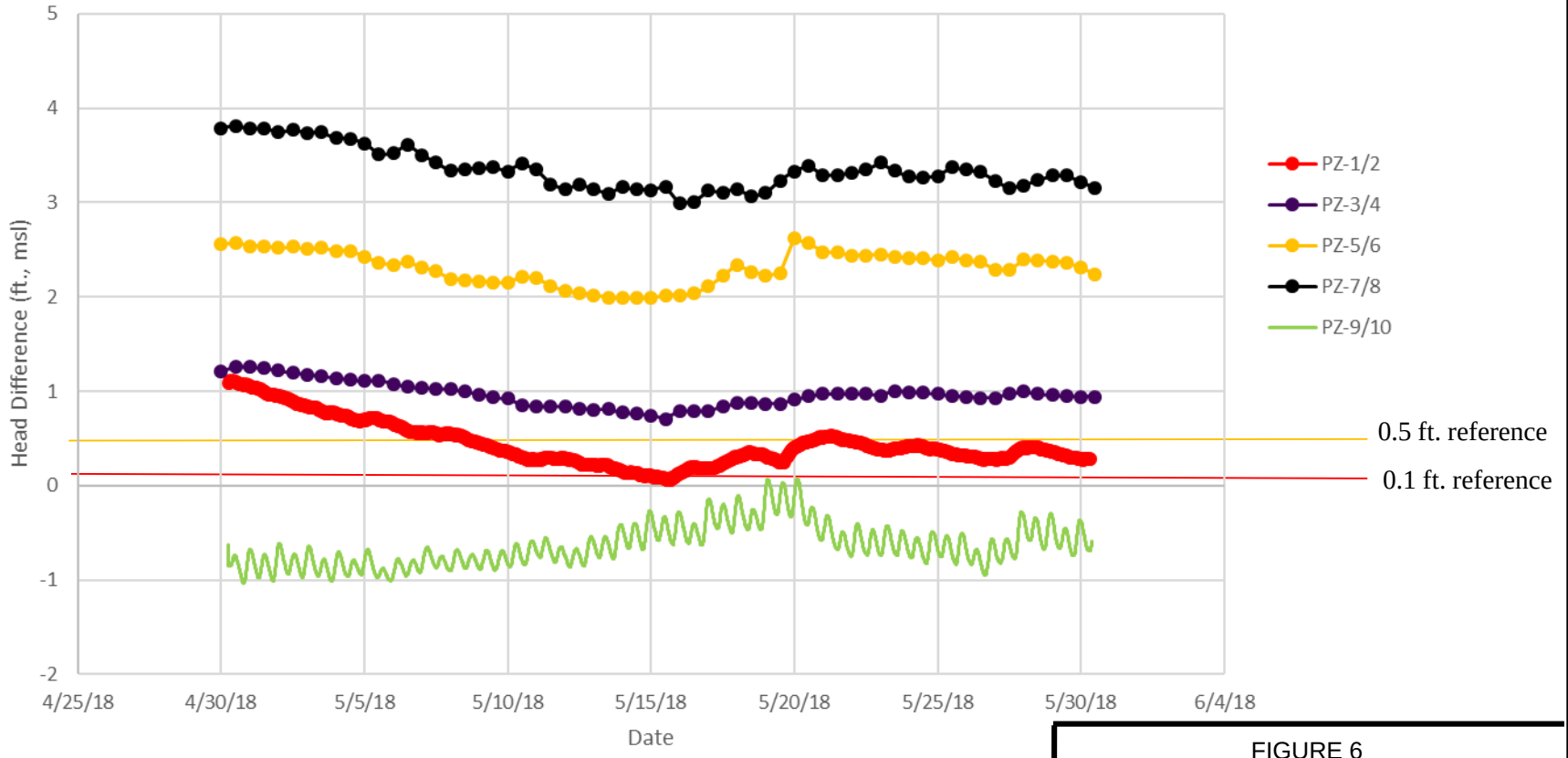

FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – May 2018

Study Area 6, Jersey City, NJ

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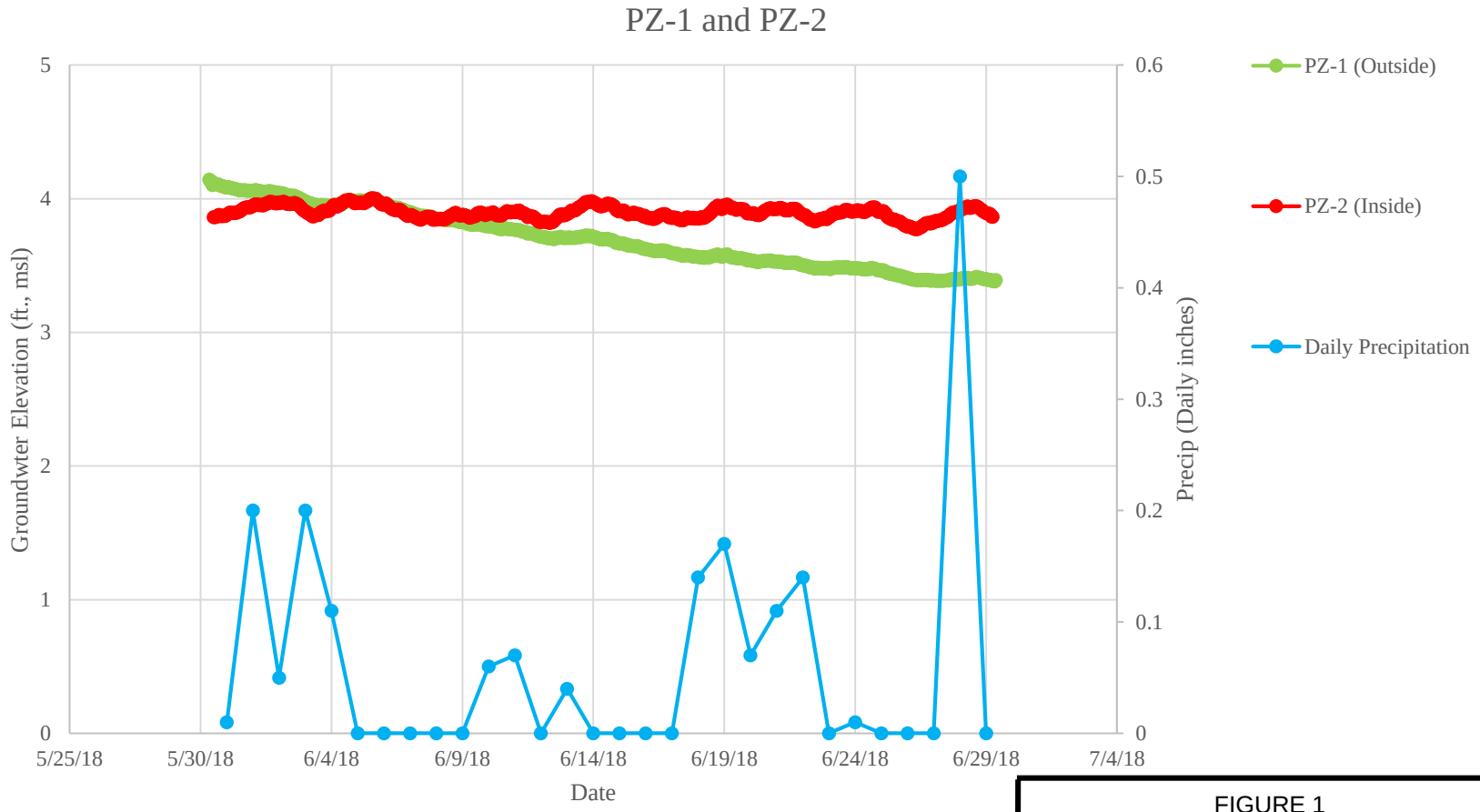

Notes:

1) Logger data recorded at one-hour intervals
2) Corrected for barometric fluctuation
3) Precipitation data from CRONOS database, Harrison, NJ

FIGURE 1

Hydrograph of PZ-1 and PZ-2
Data Logger Heads v. Precipitation
June 2018

Study Area 6, Jersey City, NJ

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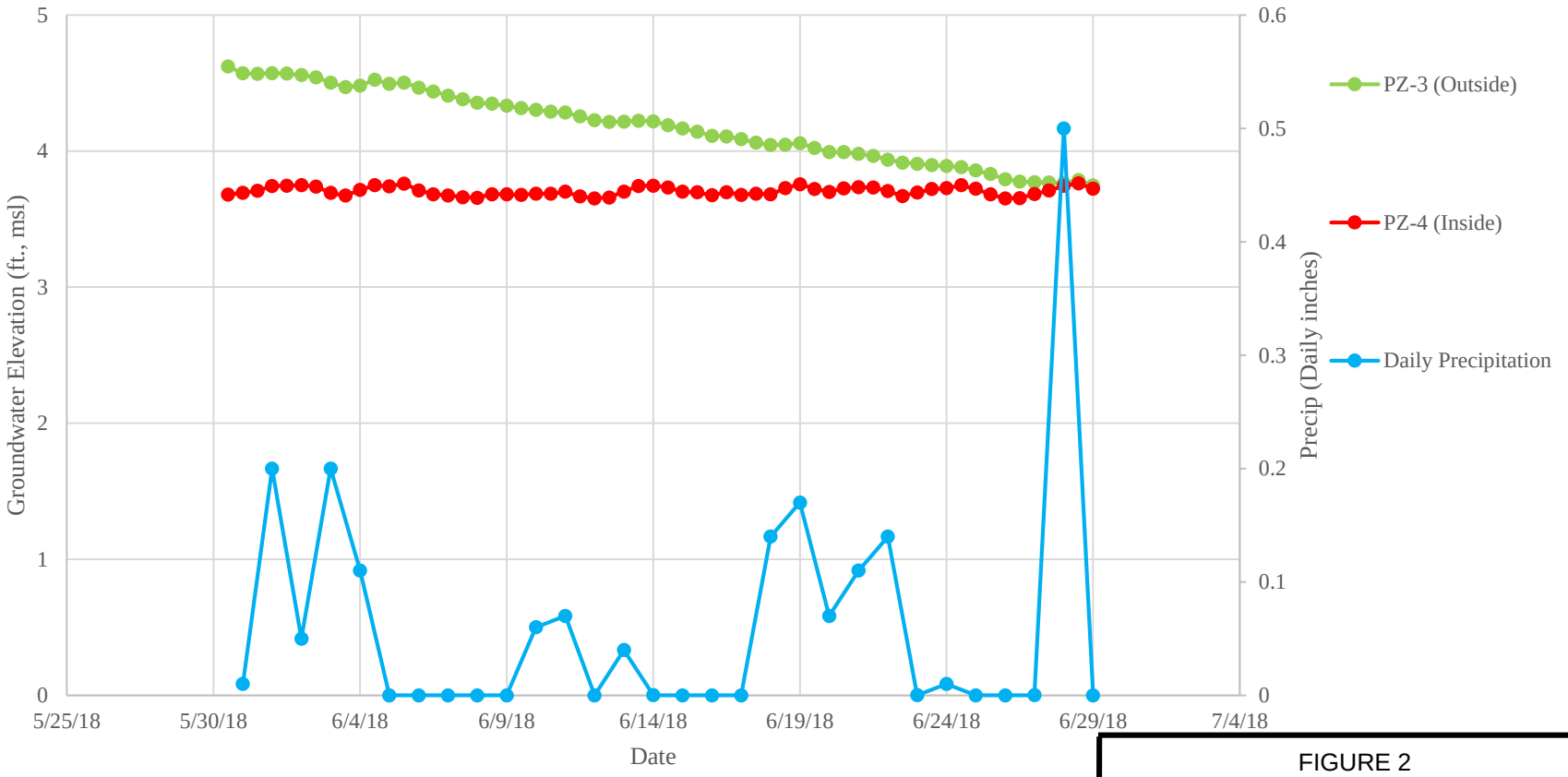

FIGURE 2

Hydrograph of PZ-3 and PZ-4
Data Logger Heads v. Precipitation
June 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

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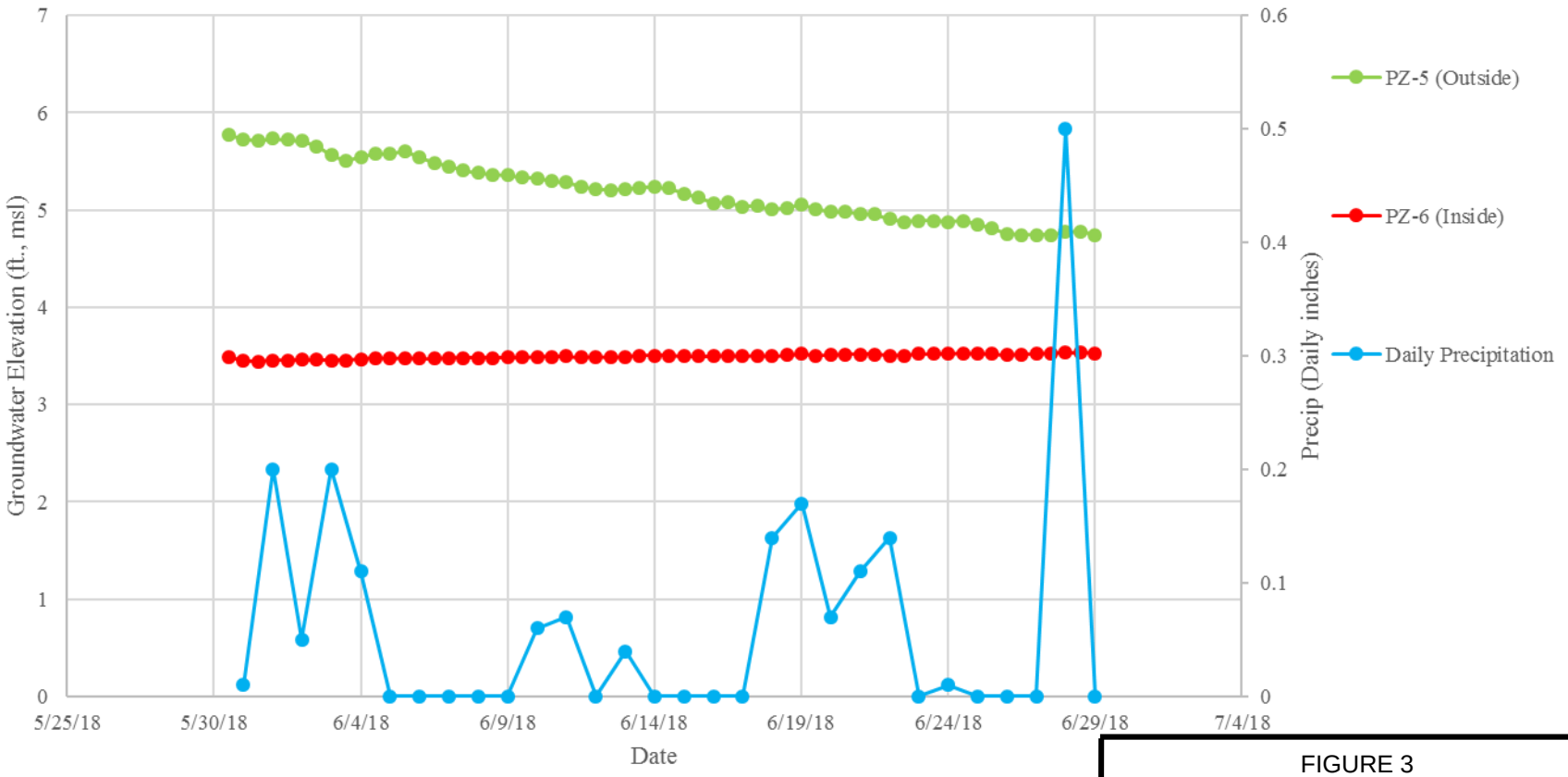

FIGURE 3

Hydrograph of PZ-5 and PZ-6
Data Logger Heads v. Precipitation
June 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

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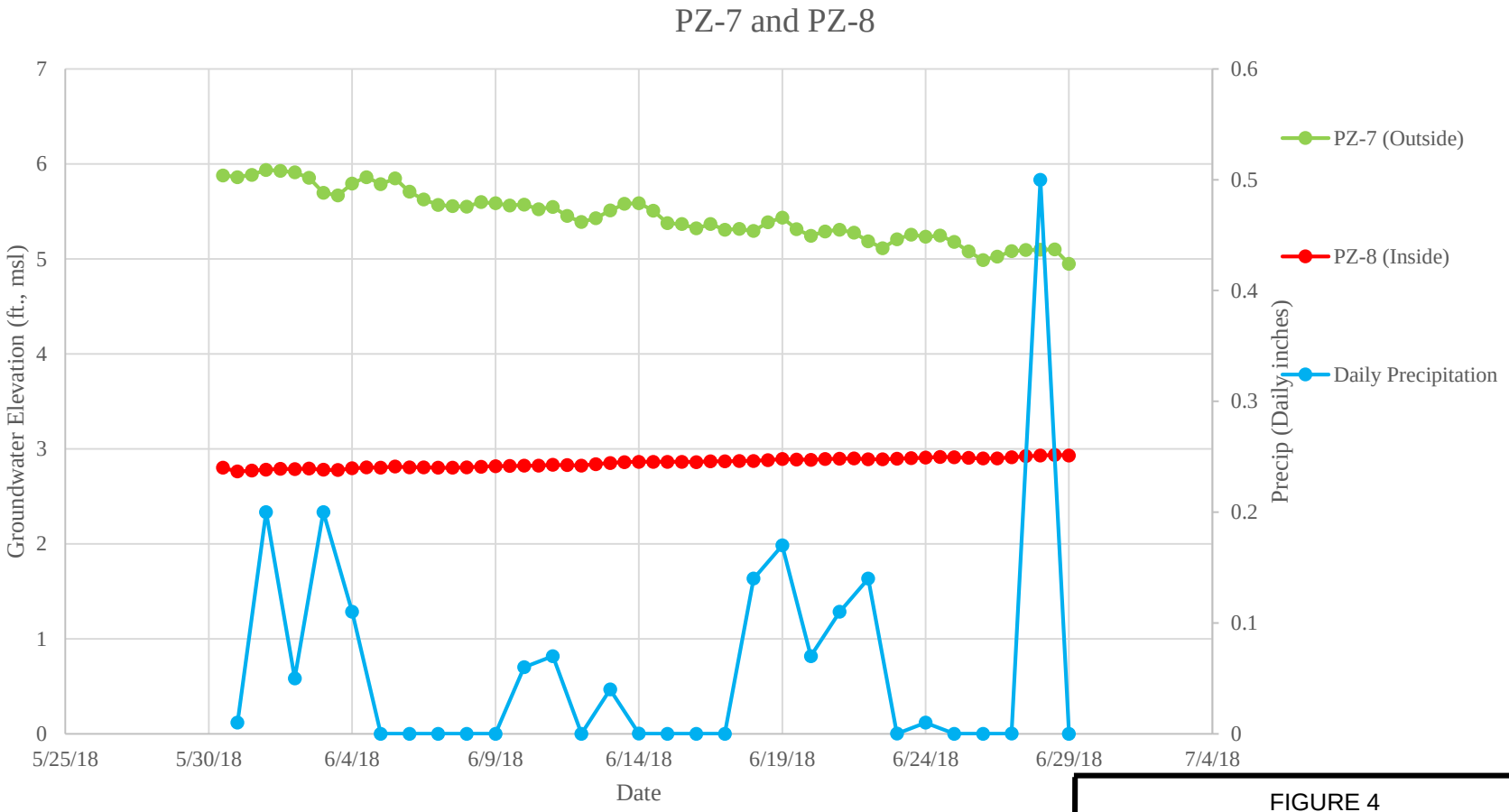

FIGURE 4

Hydrograph of PZ-7 and PZ-8
Data Logger Heads v. Precipitation
June 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

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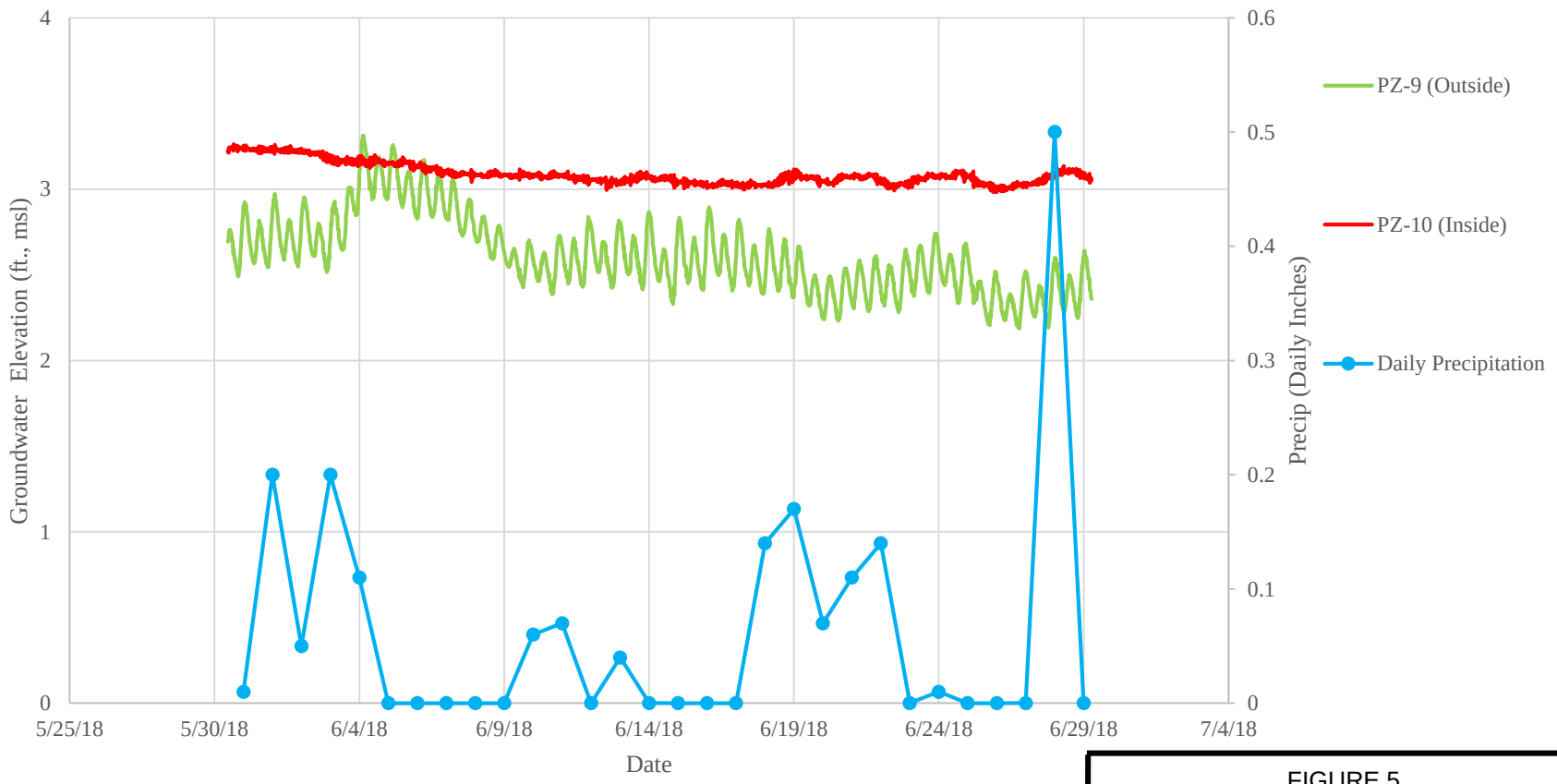

FIGURE 5

Hydrograph of PZ-9 and PZ-10
Data Logger Heads v. Precipitation
June 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 15-minute intervals
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

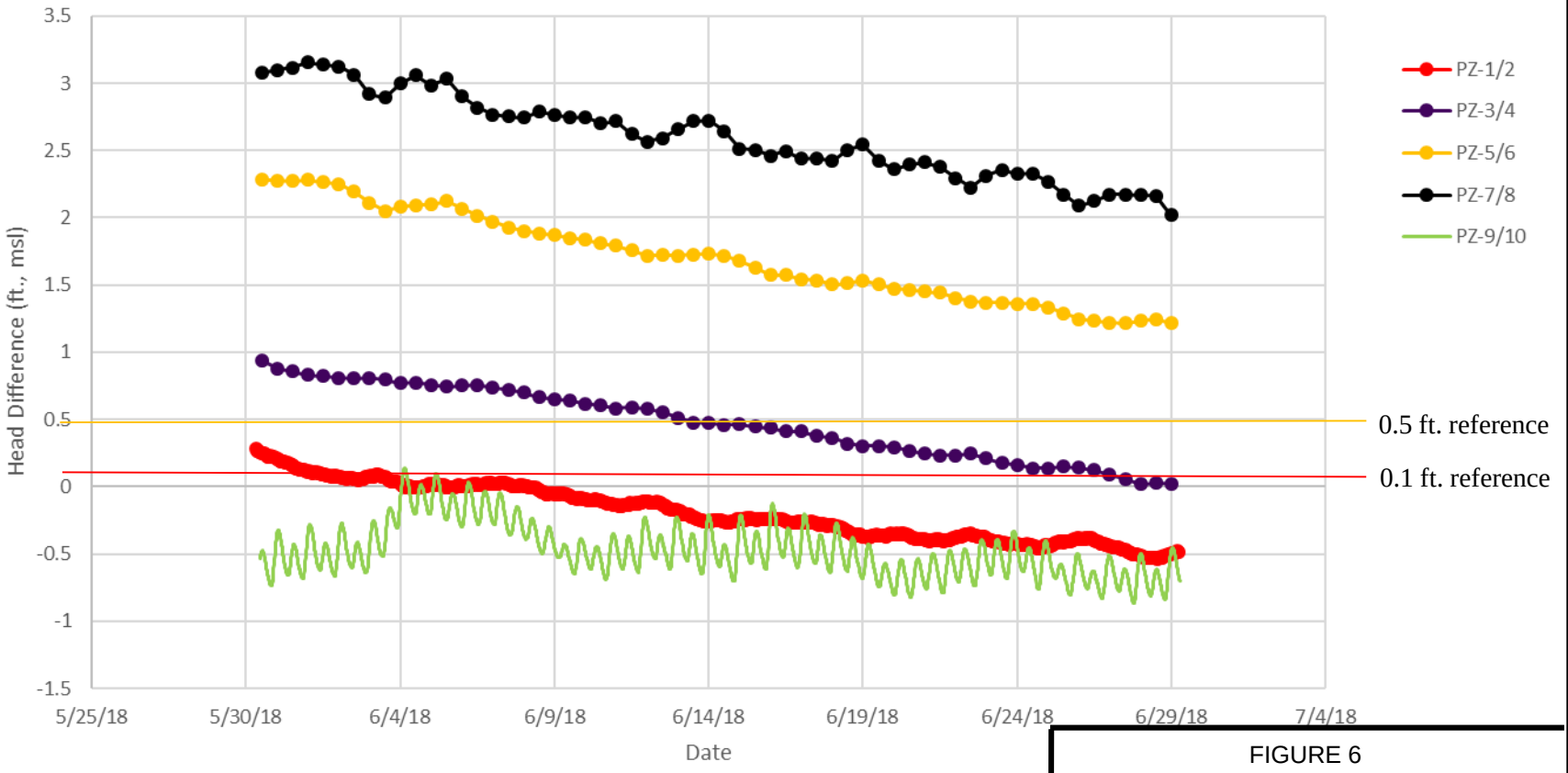

FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – June 2018

Study Area 6, Jersey City, NJ

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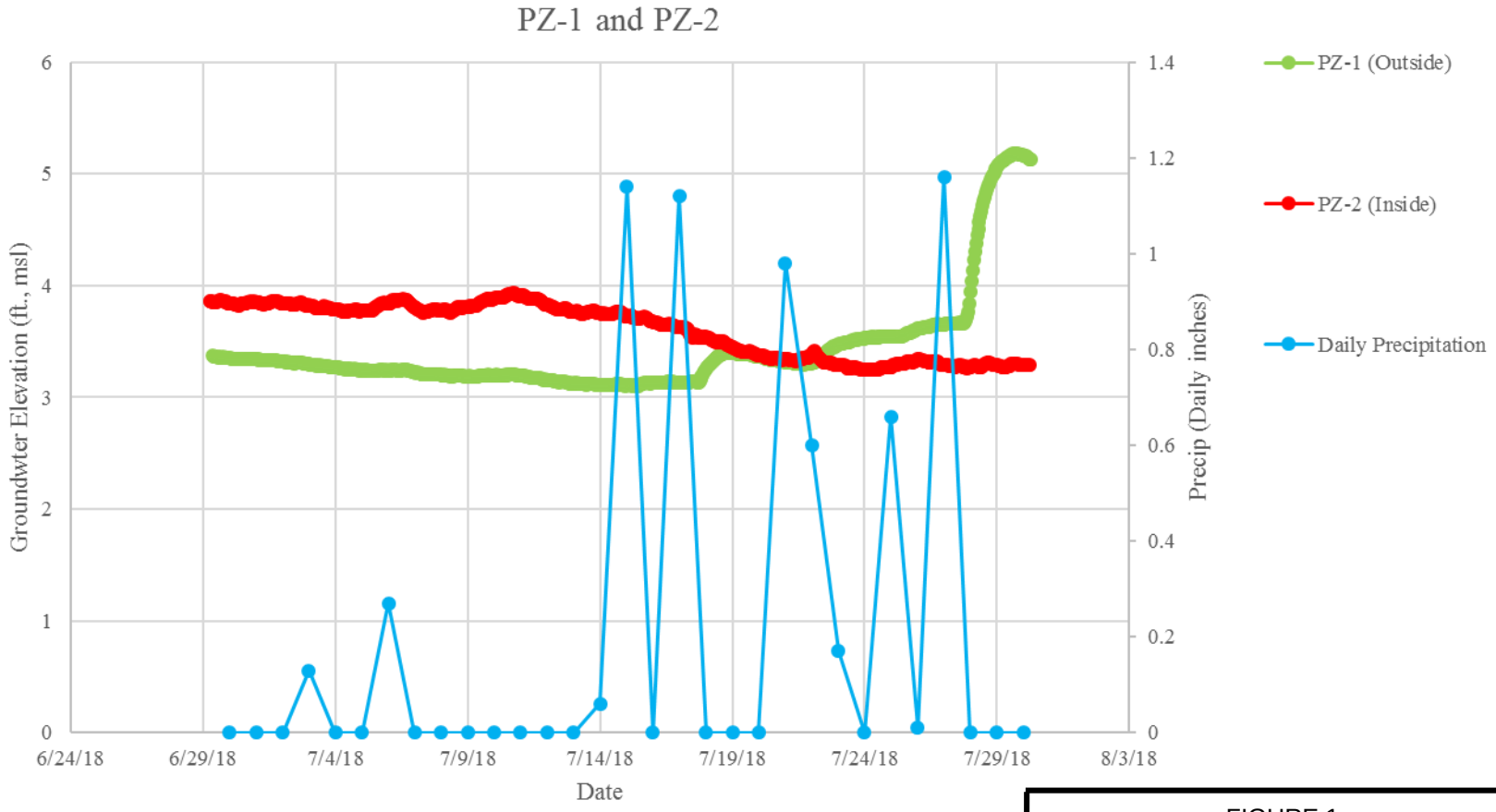

FIGURE 1

Hydrograph of PZ-1 and PZ-2
Data Logger Heads v. Precipitation
July 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:

1) Logger data recorded at one-hour intervals
2) Corrected for barometric fluctuation
3) Precipitation data from CRONOS database, Harrison, NJ

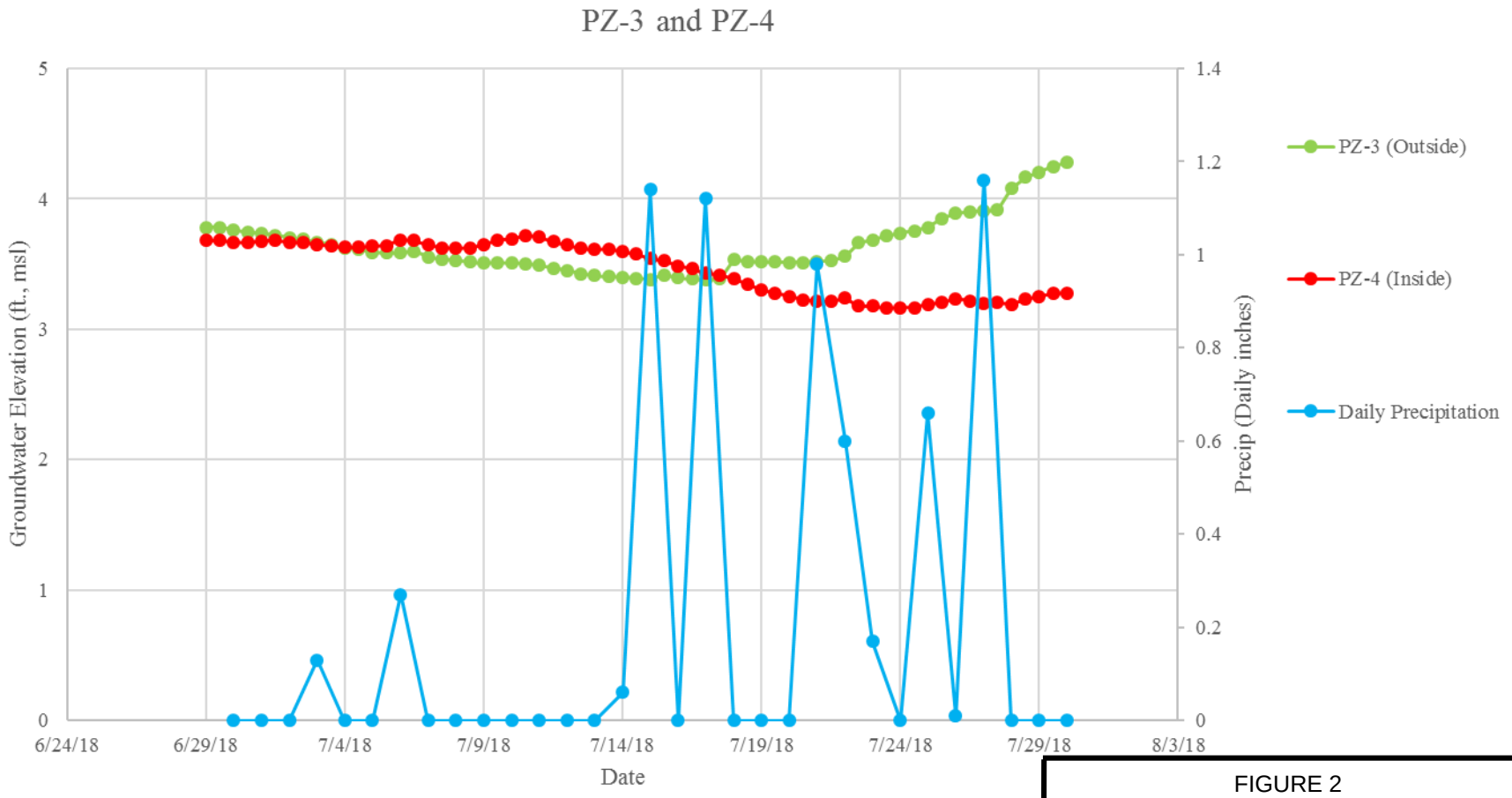

FIGURE 2

Hydrograph of PZ-3 and PZ-4
Data Logger Heads v. Precipitation
July 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

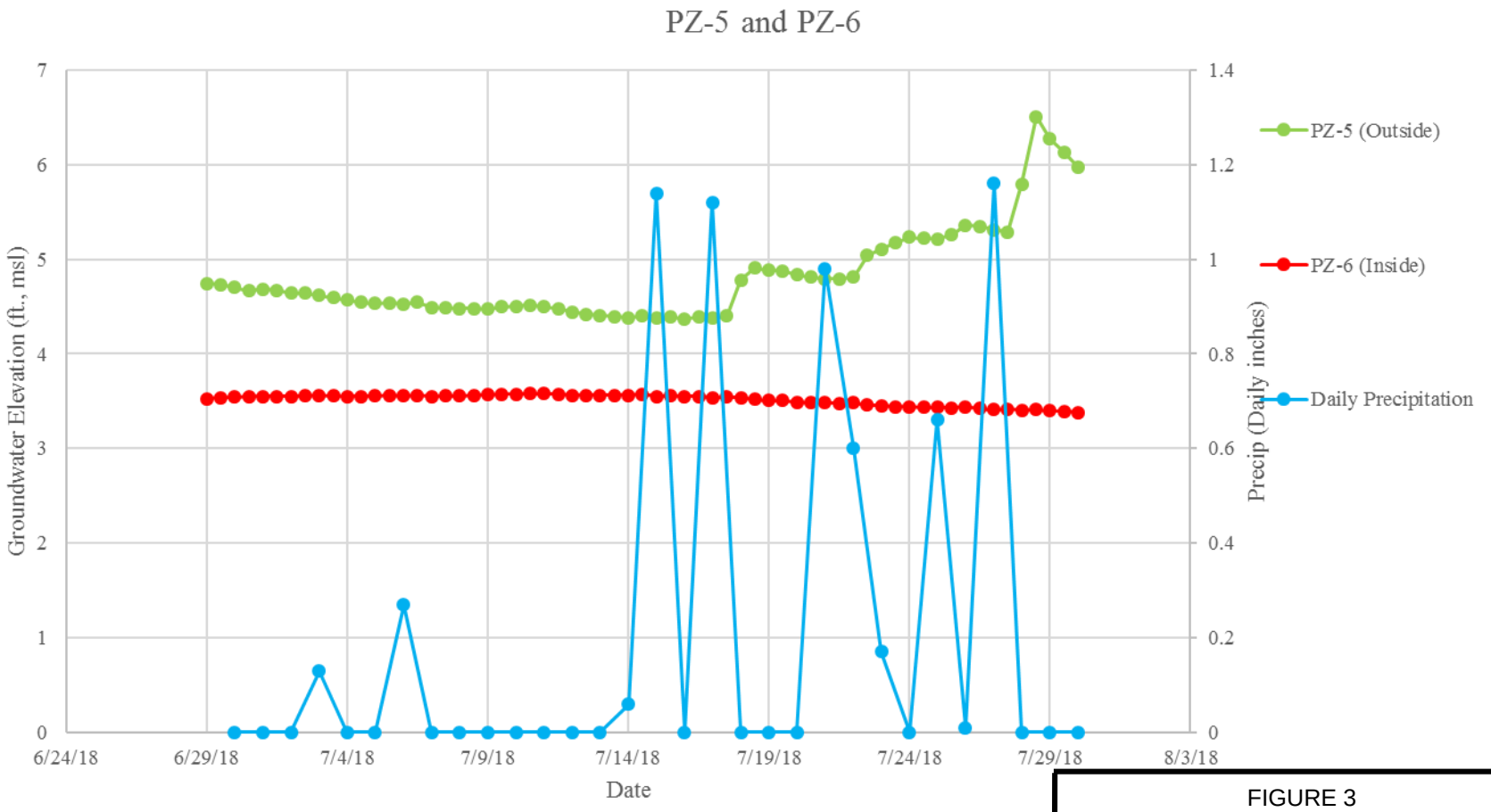

FIGURE 3

Hydrograph of PZ-5 and PZ-6
Data Logger Heads v. Precipitation
July 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

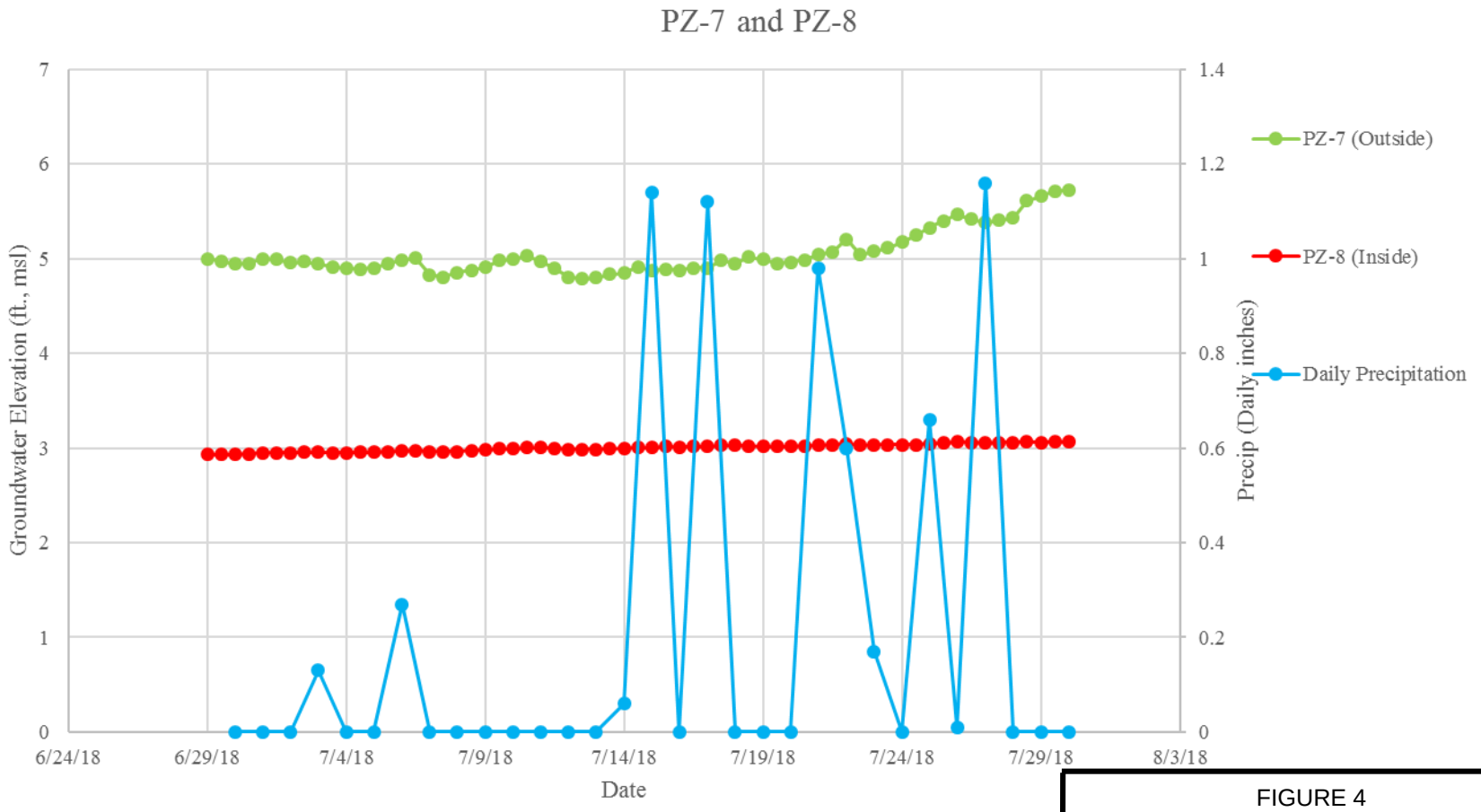

FIGURE 4

Hydrograph of PZ-7 and PZ-8
Data Logger Heads v. Precipitation
July 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

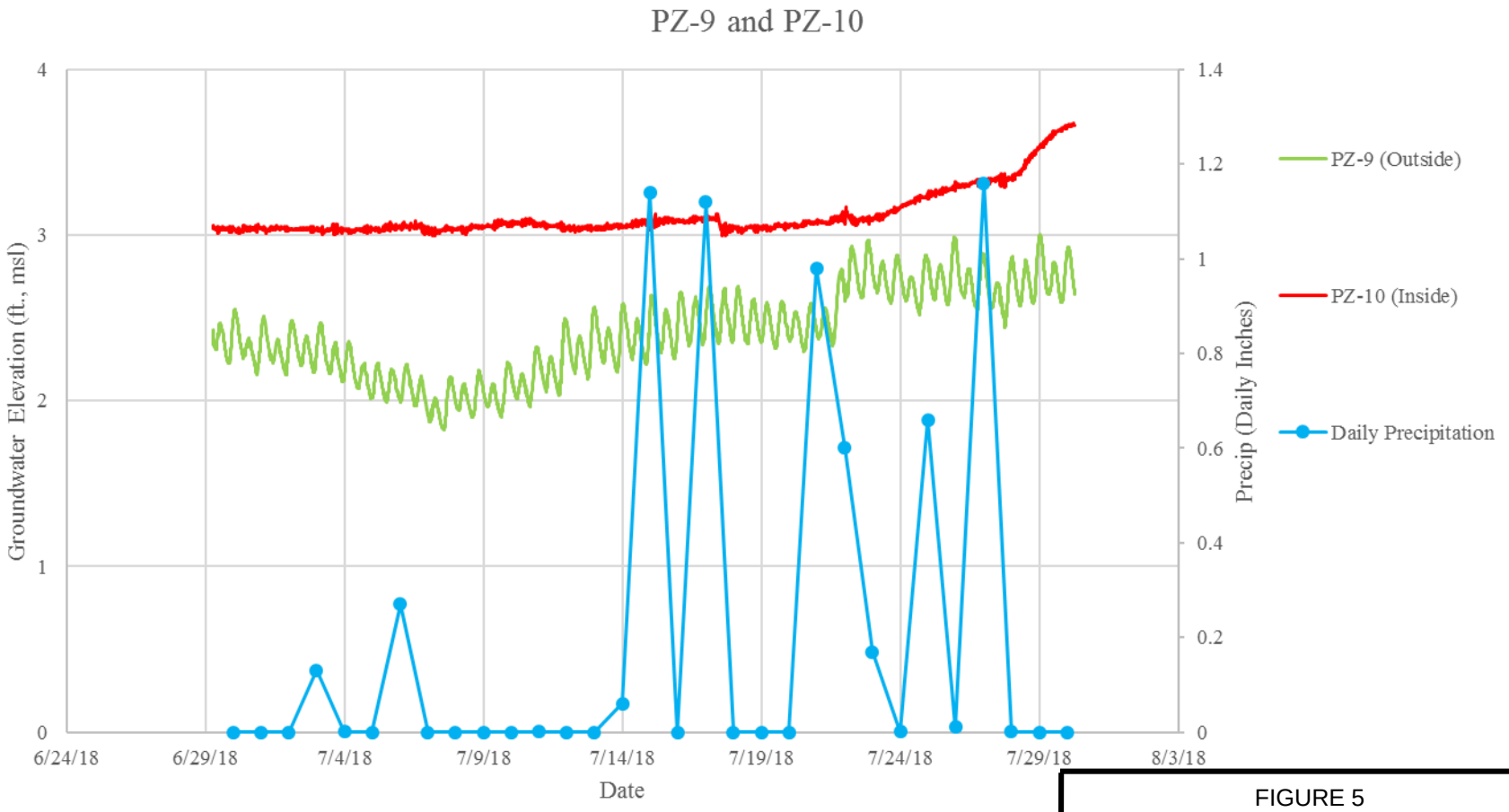

FIGURE 5

Hydrograph of PZ-9 and PZ-10
Data Logger Heads v. Precipitation
July 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 15-minute intervals
2) Precipitation data from CRONOS database, Harrison, NJ

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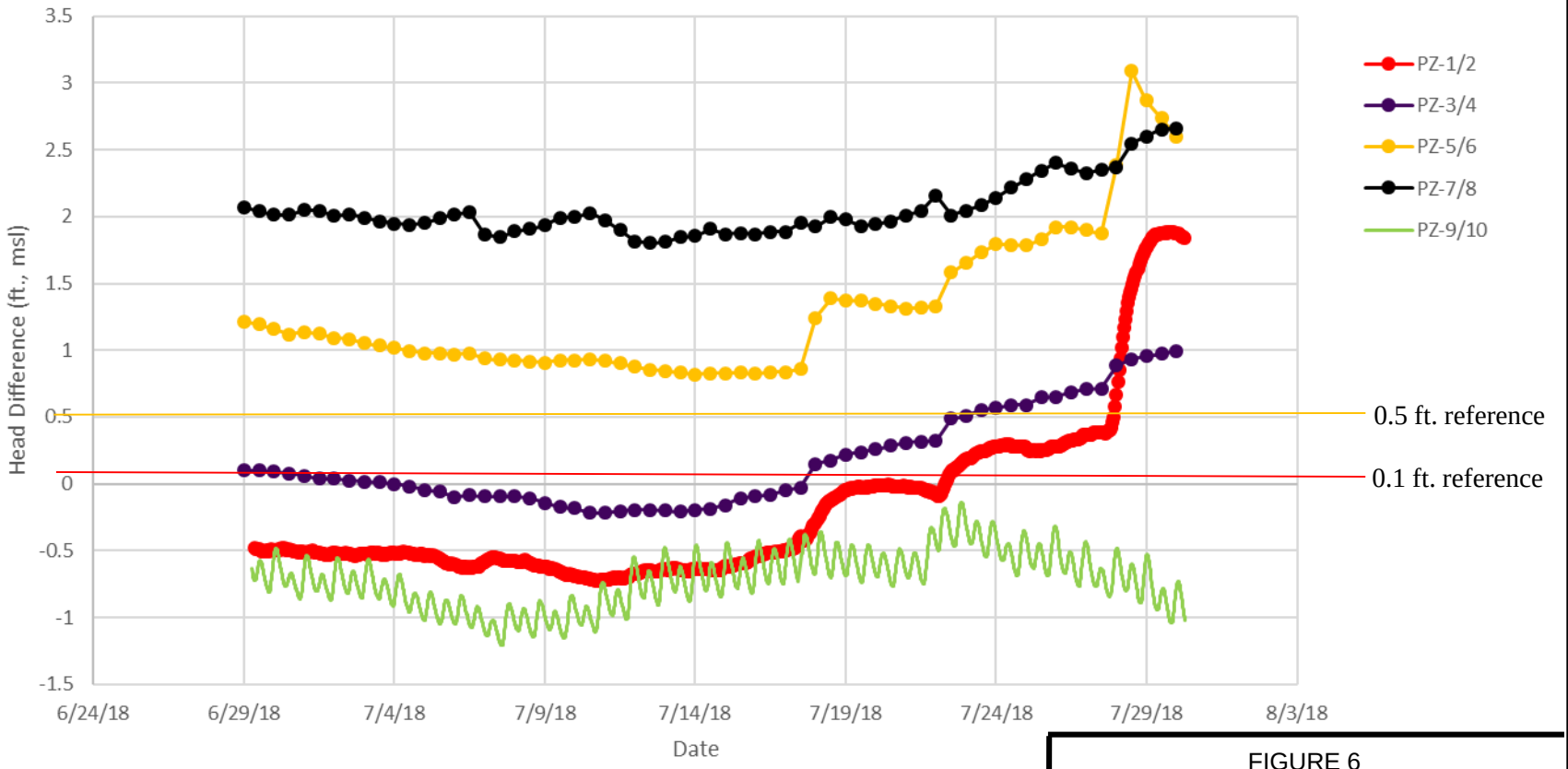

FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – July 2018

Study Area 6, Jersey City, NJ

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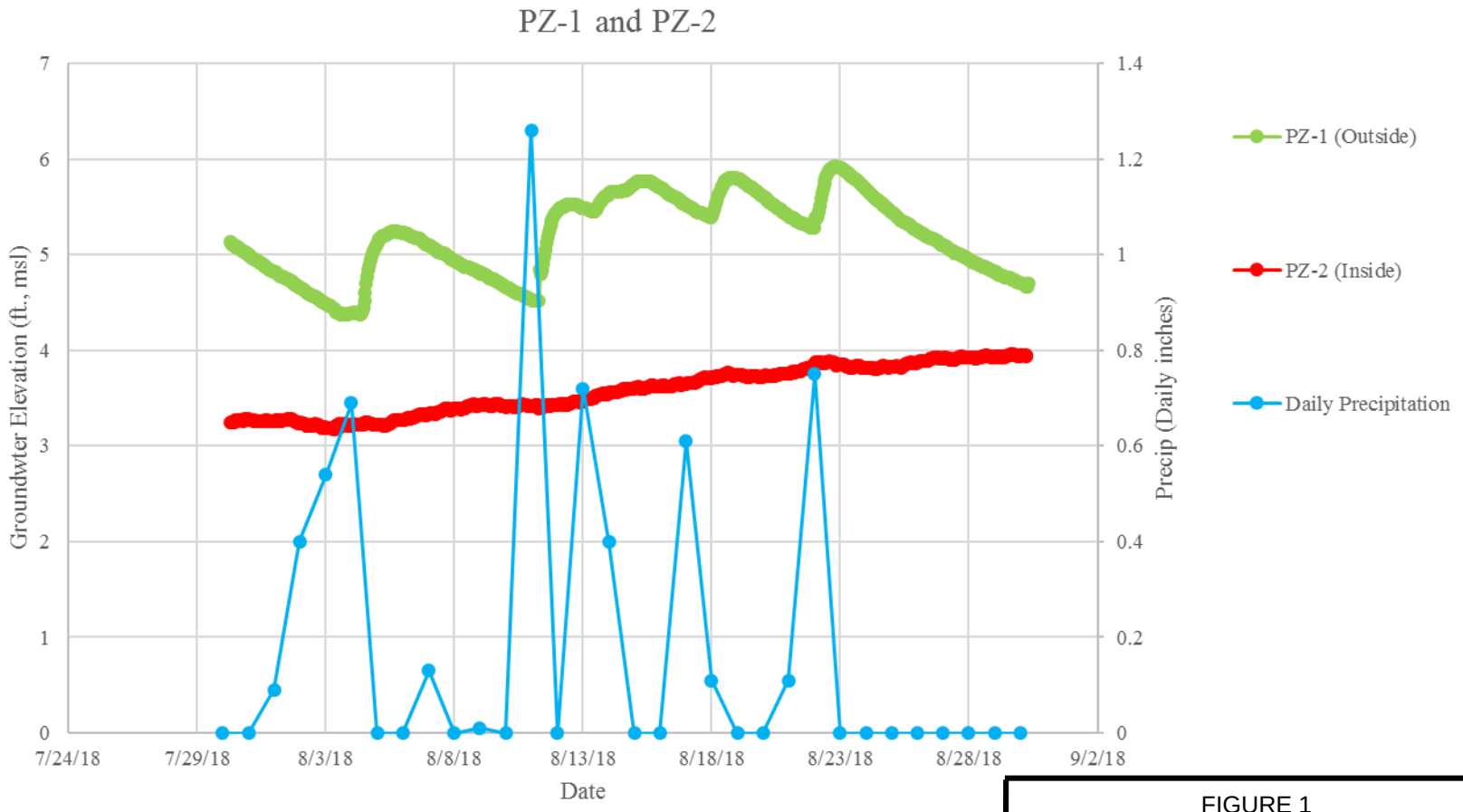

Notes:

1) Logger data recorded at one-hour intervals
2) Corrected for barometric fluctuation
3) Precipitation data from CRONOS database, Harrison, NJ

FIGURE 1

Hydrograph of PZ-1 and PZ-2
Data Logger Heads v. Precipitation
August 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

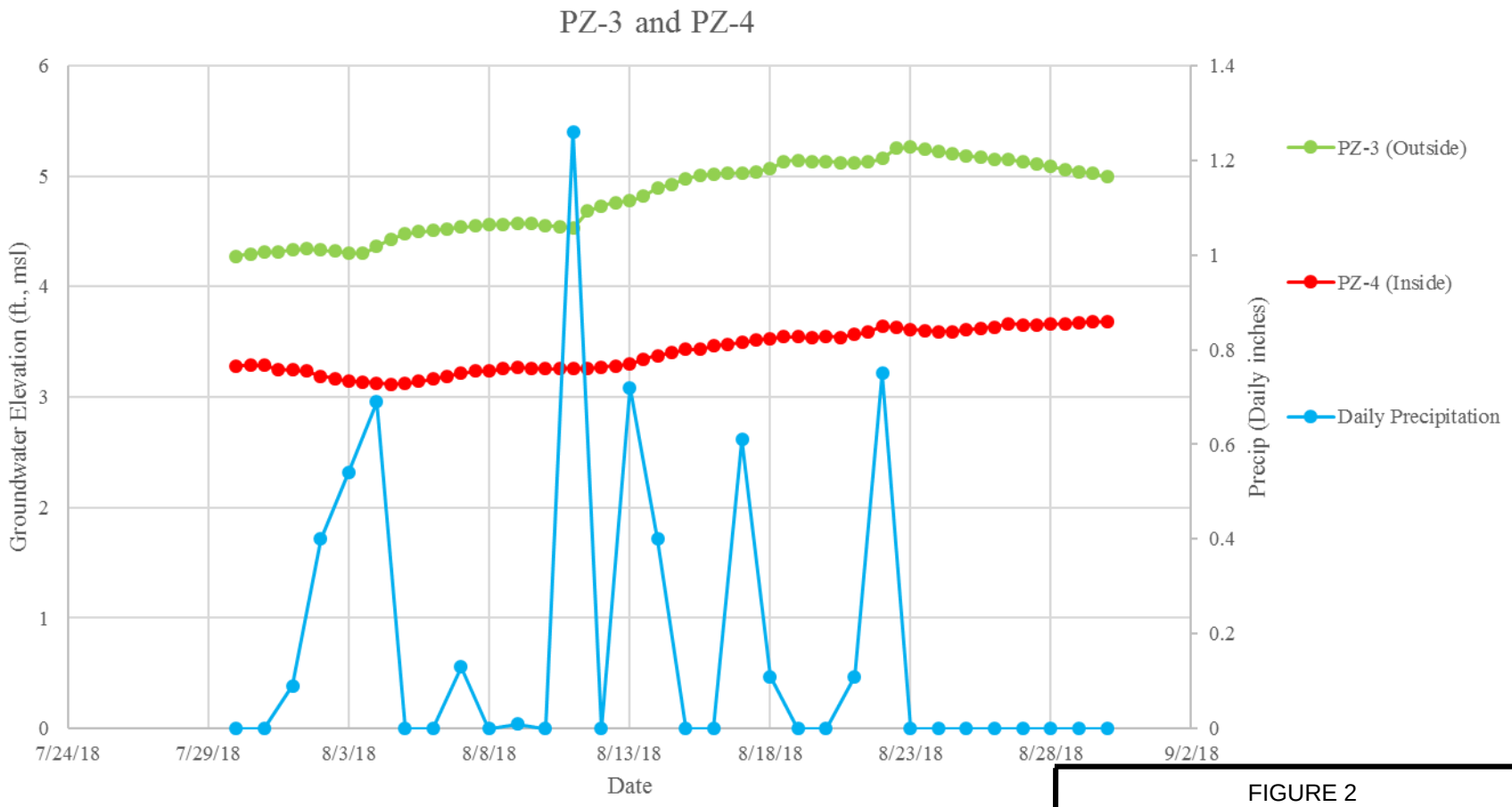

FIGURE 2

Hydrograph of PZ-3 and PZ-4
Data Logger Heads v. Precipitation
August 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

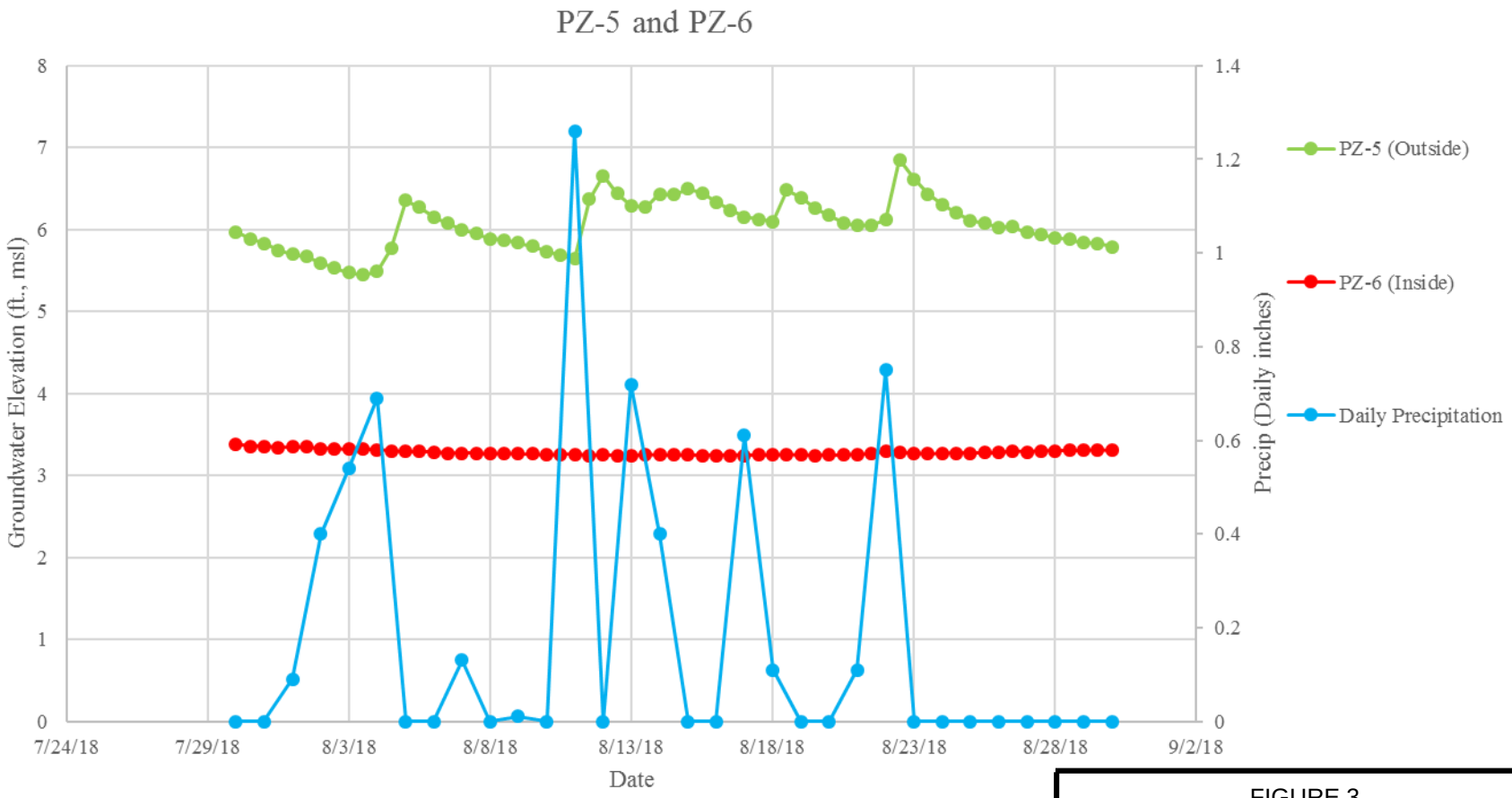

FIGURE 3

Hydrograph of PZ-5 and PZ-6
Data Logger Heads v. Precipitation
August 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

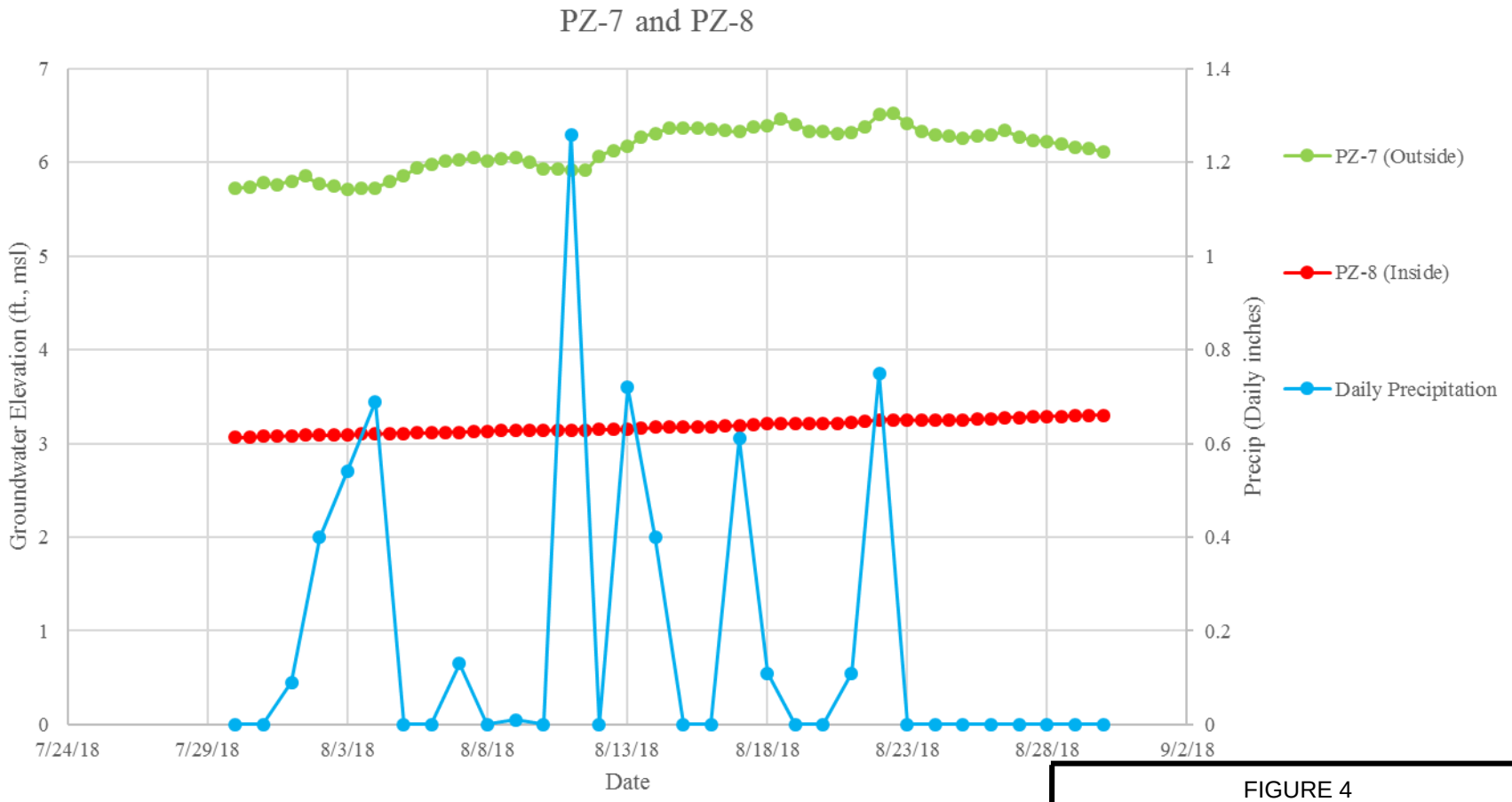

FIGURE 4

Hydrograph of PZ-7 and PZ-8
Data Logger Heads v. Precipitation
August 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

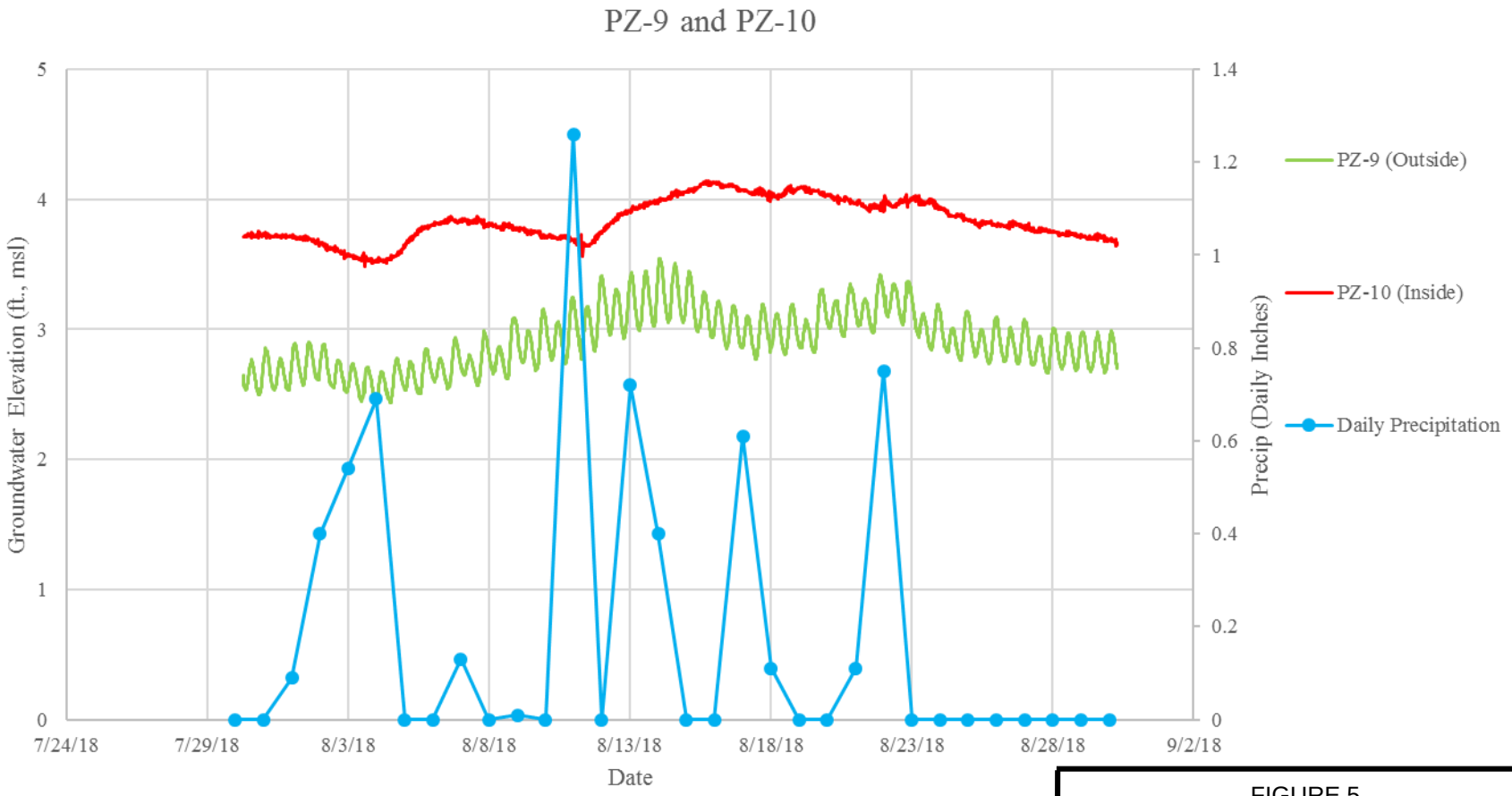

FIGURE 5

Hydrograph of PZ-9 and PZ-10
Data Logger Heads v. Precipitation
August 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 15-minute intervals
2) Precipitation data from CRONOS database, Harrison, NJ

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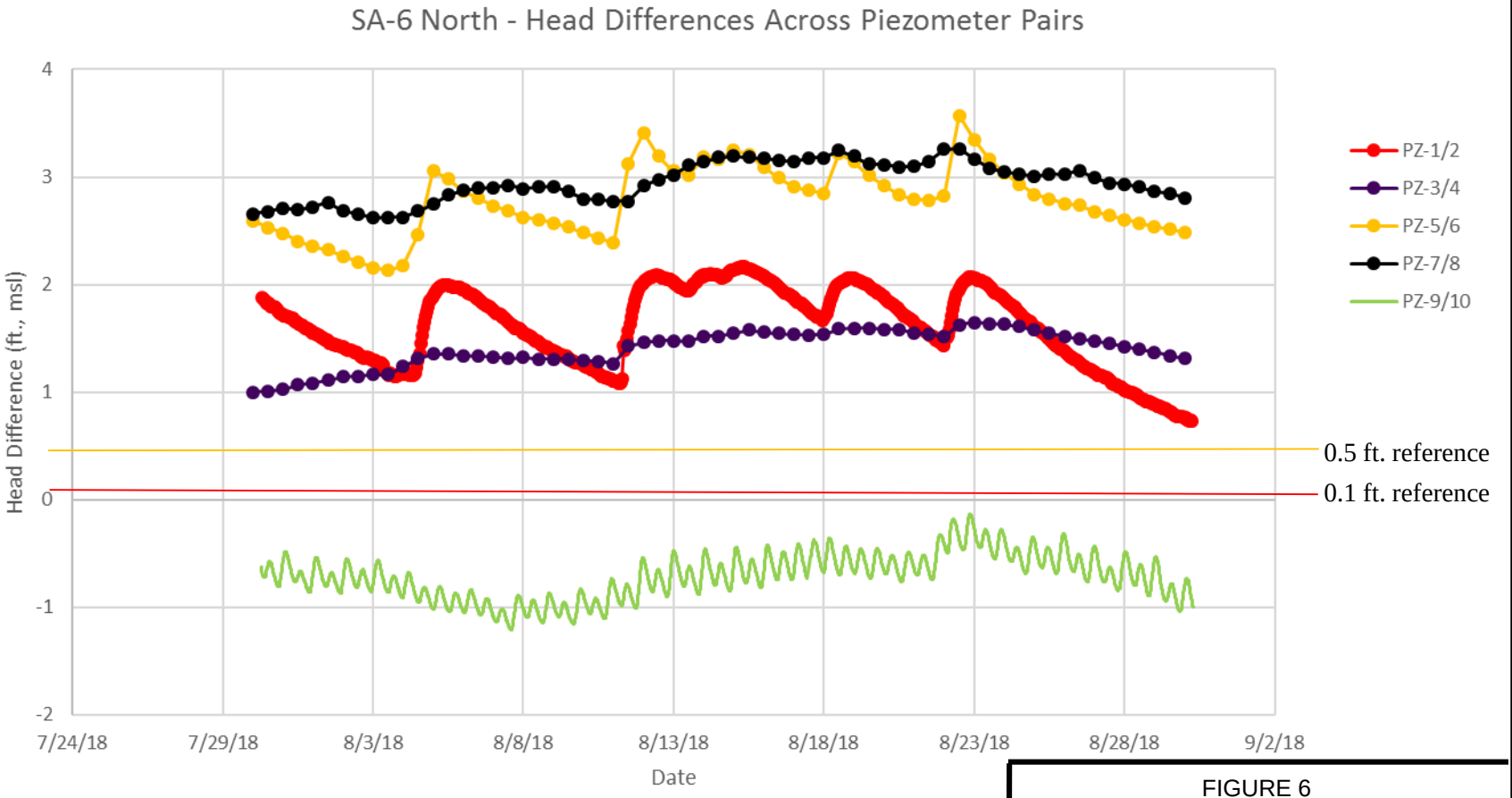

FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – August 2018

Study Area 6, Jersey City, NJ

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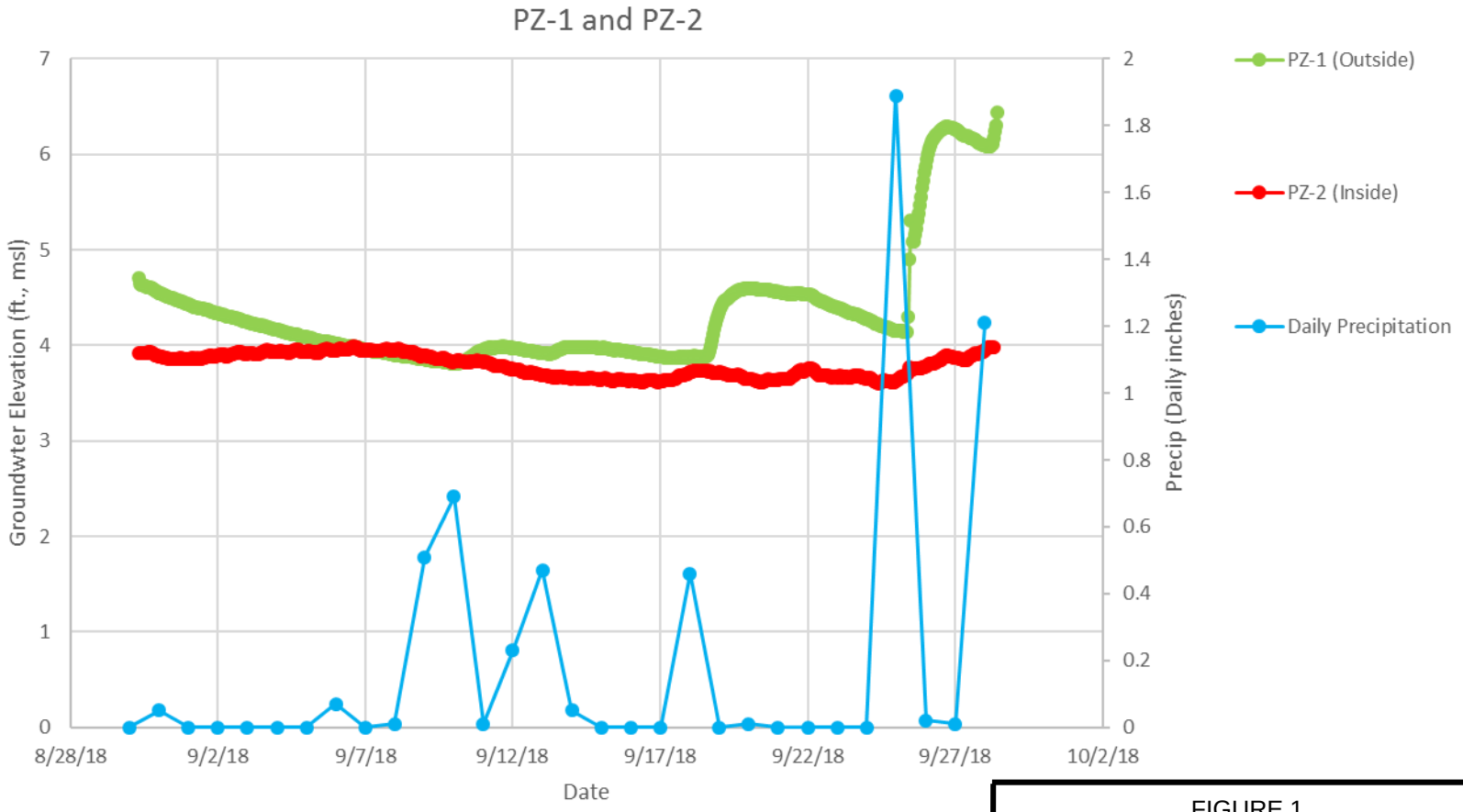

FIGURE 1

Hydrograph of PZ-1 and PZ-2
Data Logger Heads v. Precipitation
September 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:

1) Logger data recorded at one-hour intervals
2) Corrected for barometric fluctuation
3) Precipitation data from CRONOS database, Harrison, NJ

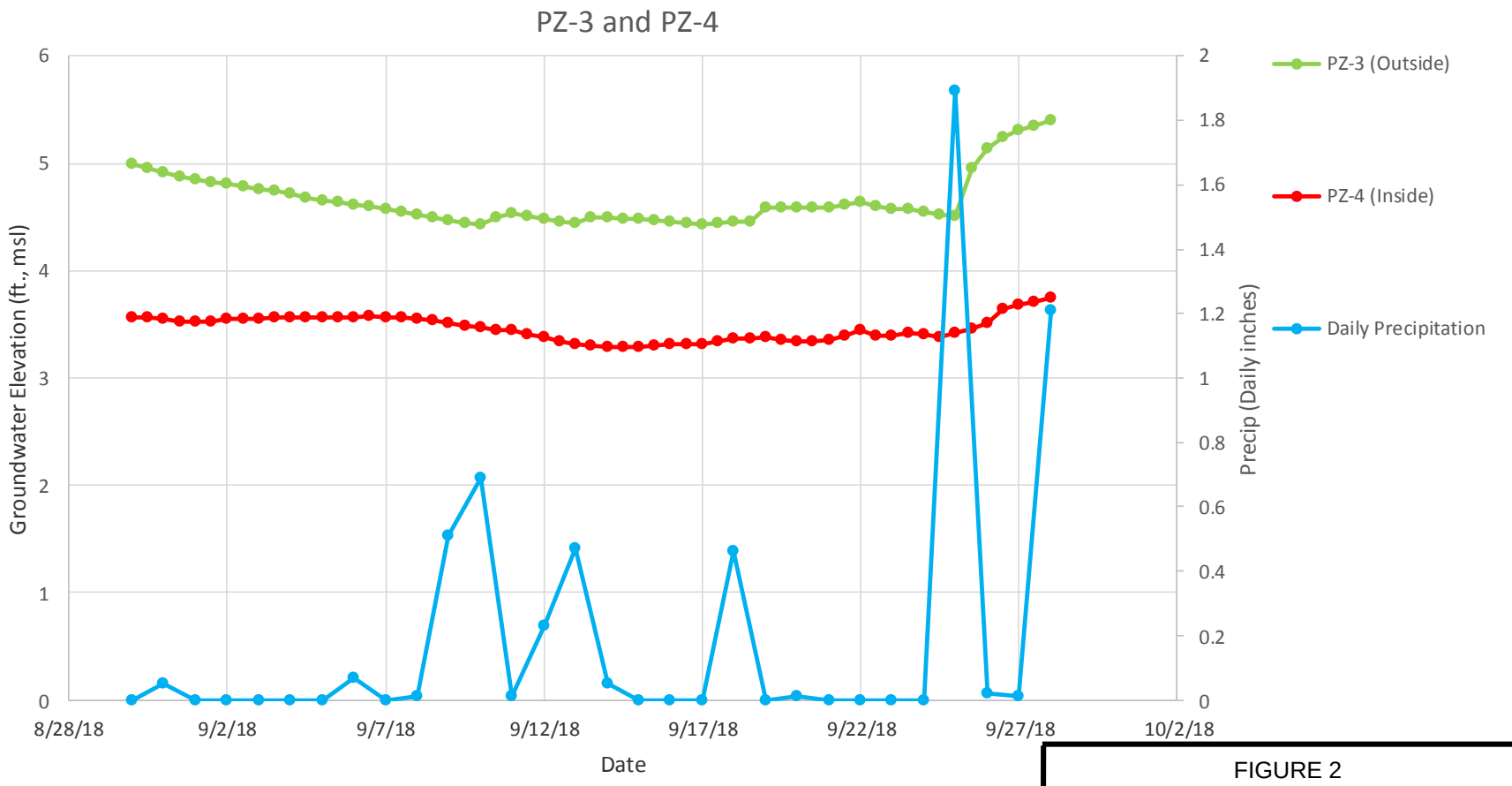

FIGURE 2

Hydrograph of PZ-3 and PZ-4
Data Logger Heads v. Precipitation
September 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

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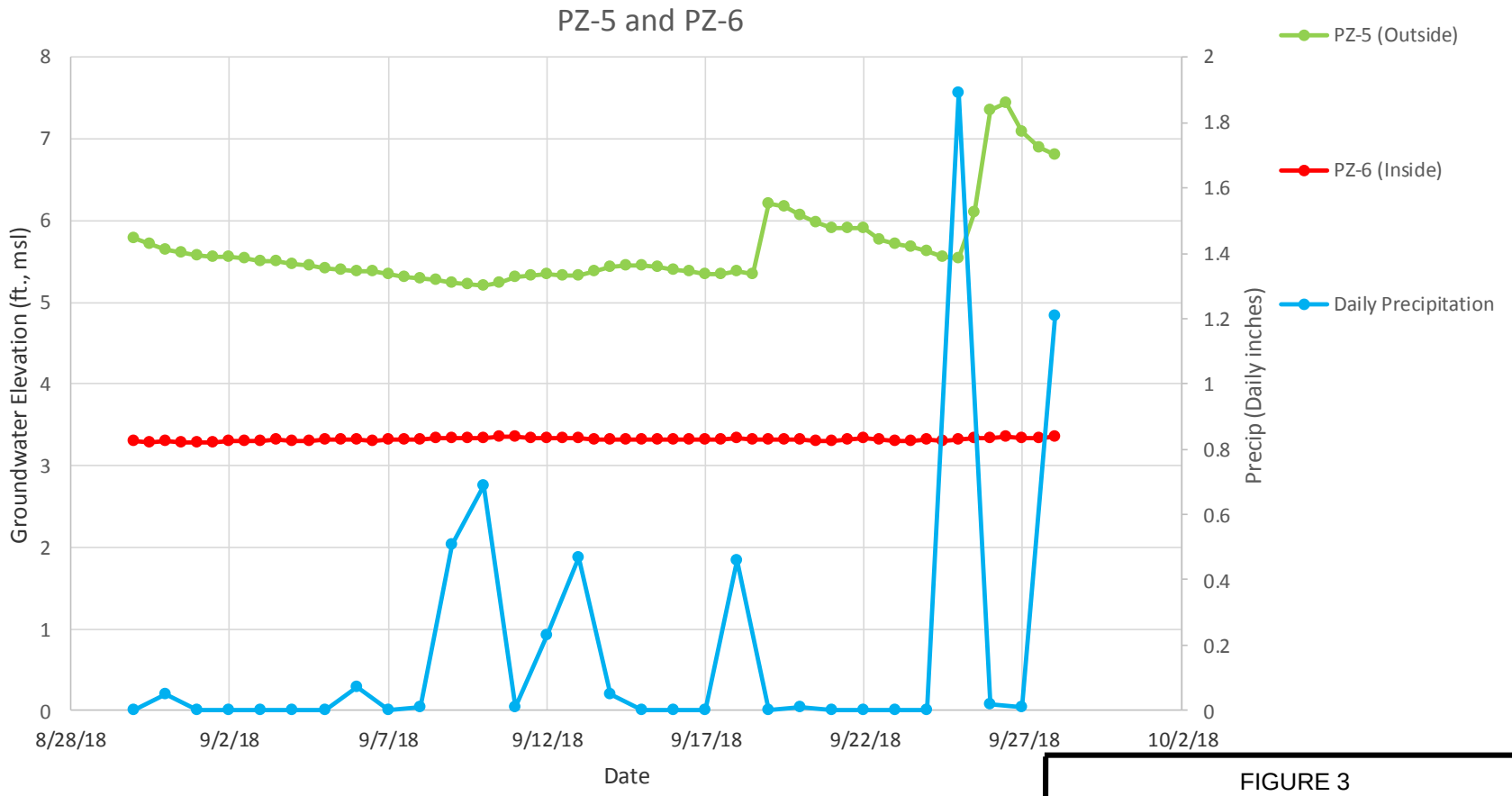

FIGURE 3

Hydrograph of PZ-5 and PZ-6
Data Logger Heads v. Precipitation
September 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

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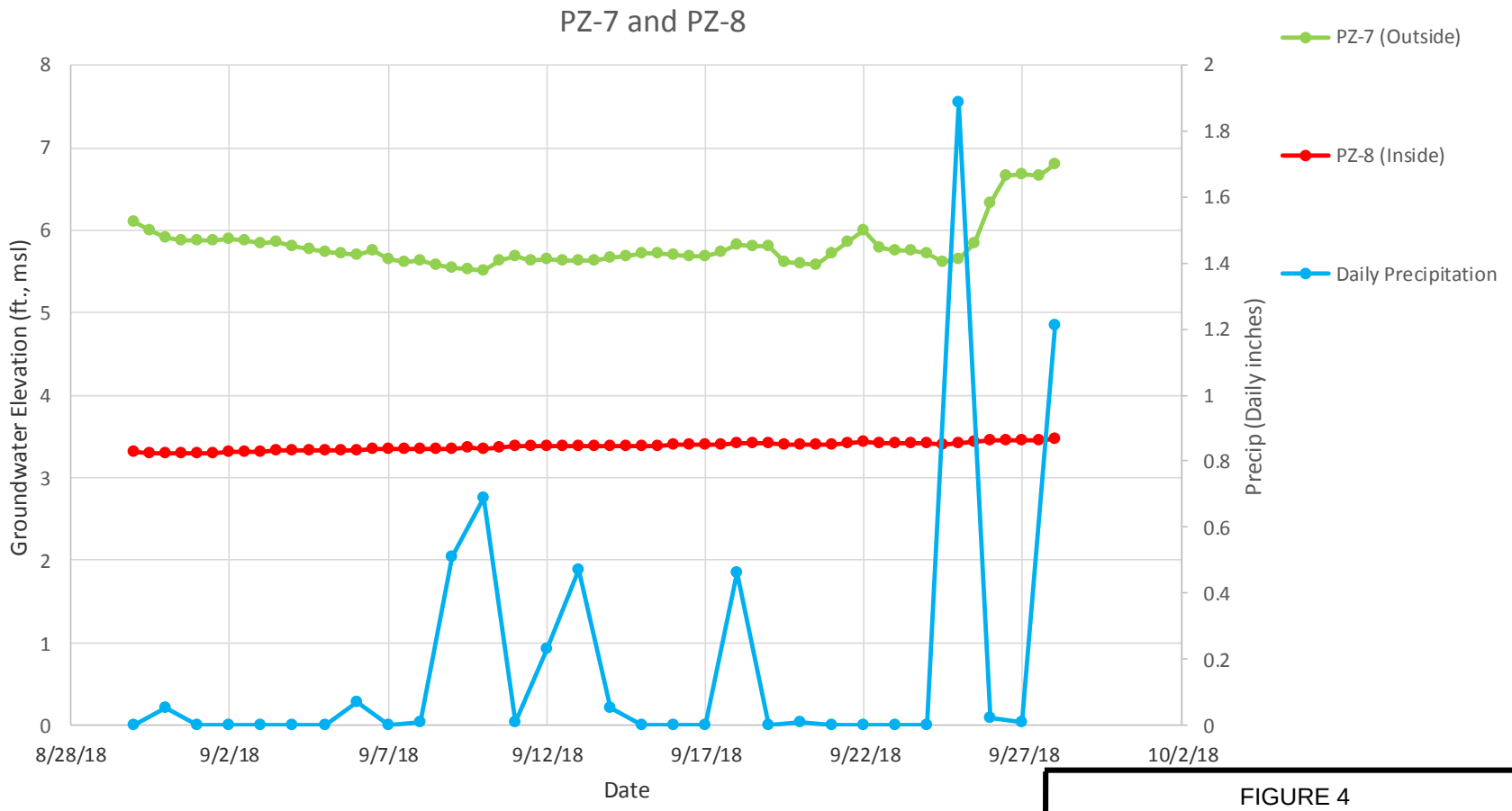

FIGURE 4

Hydrograph of PZ-7 and PZ-8
Data Logger Heads v. Precipitation
September 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

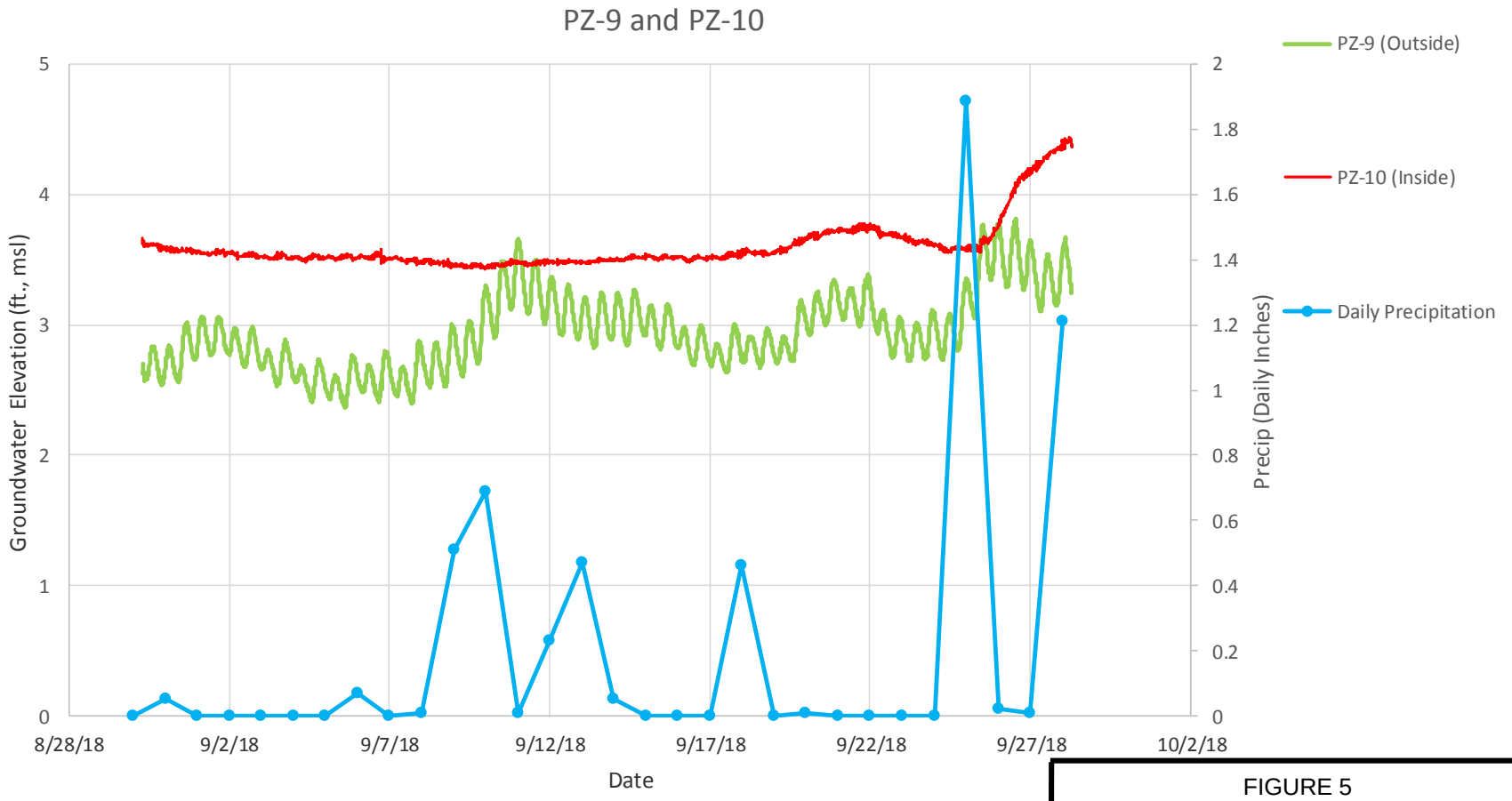

FIGURE 5

Hydrograph of PZ-9 and PZ-10
Data Logger Heads v. Precipitation
September 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 15-minute intervals
2) Precipitation data from CRONOS database, Harrison, NJ

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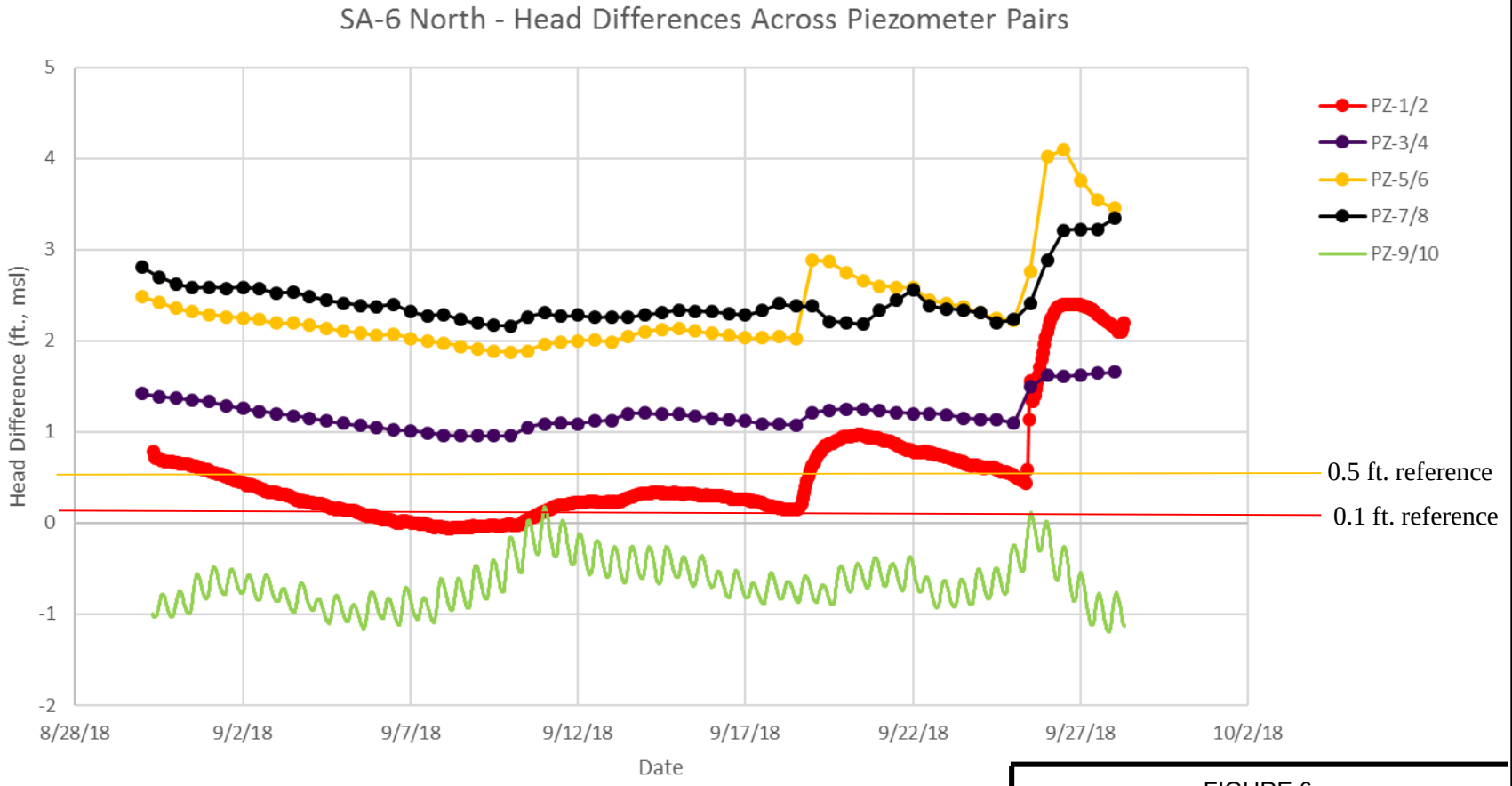
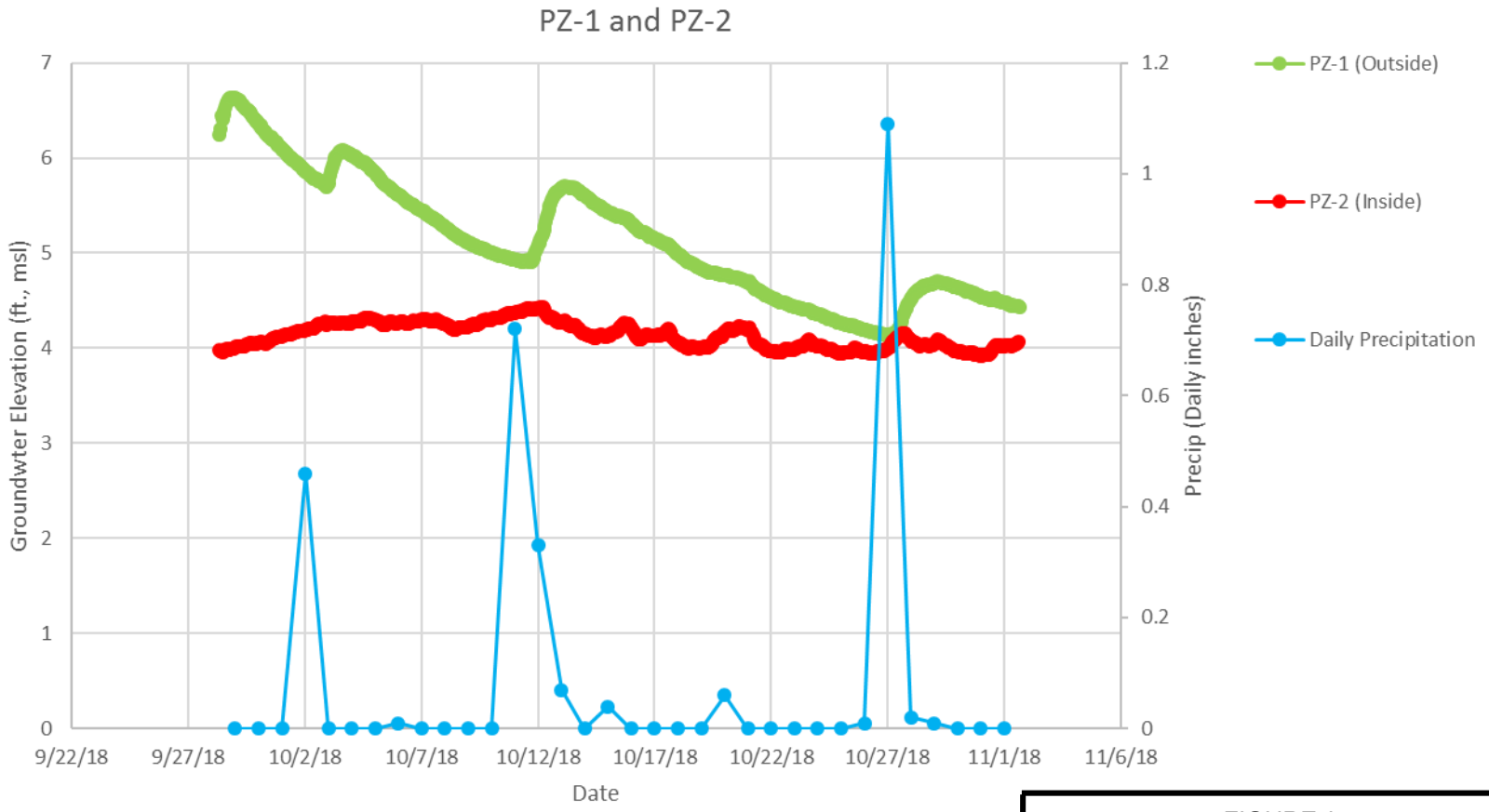


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – September 2018

Study Area 6, Jersey City, NJ

cornerstone environmental



Notes:

1) Logger data recorded at one-hour intervals
2) Corrected for barometric fluctuation
3) Precipitation data from CRONOS database, Harrison, NJ

FIGURE 1

Hydrograph of PZ-1 and PZ-2
Data Logger Heads v. Precipitation
October 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

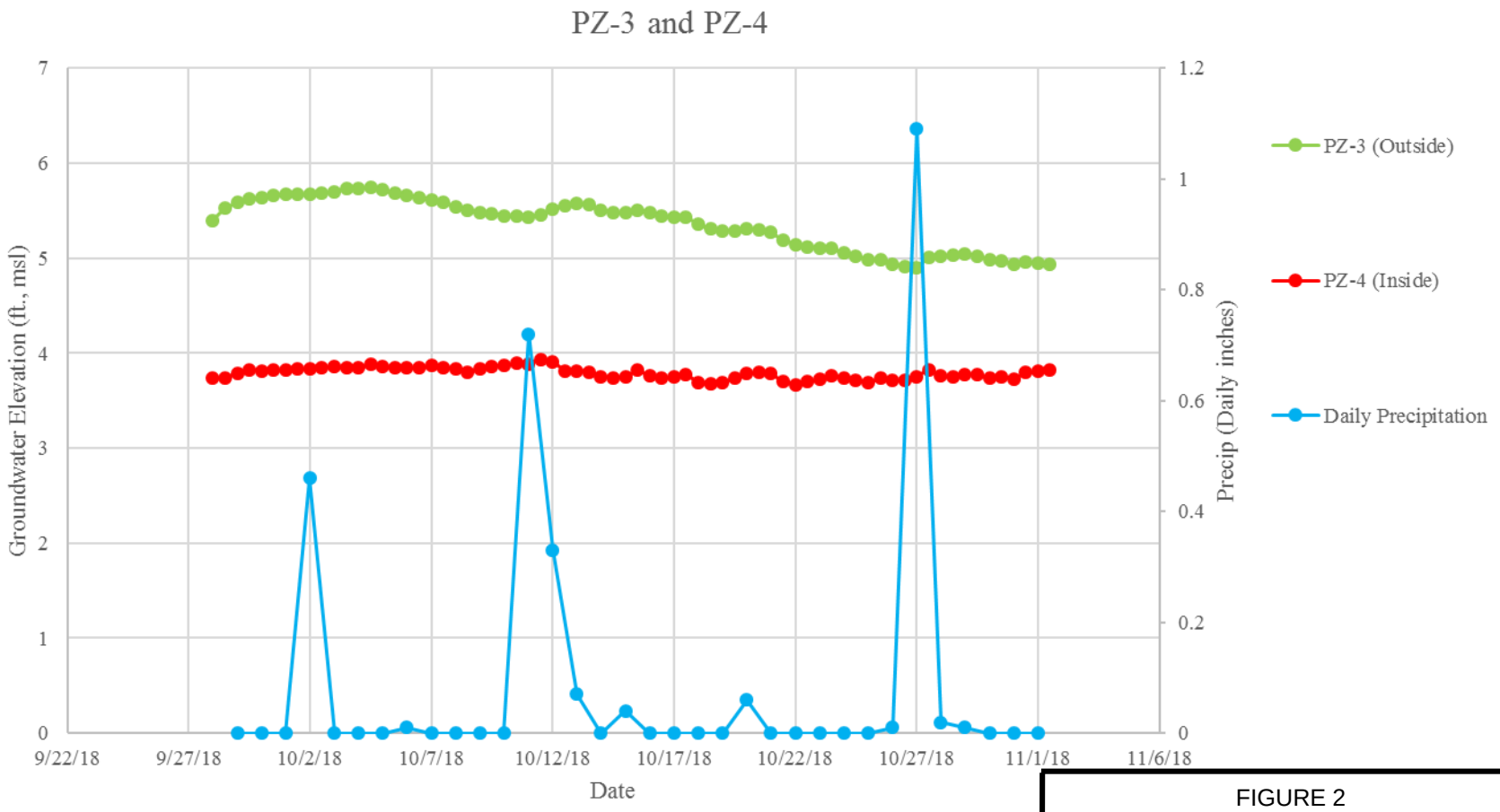


FIGURE 2

Hydrograph of PZ-3 and PZ-4
Data Logger Heads v. Precipitation
October 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

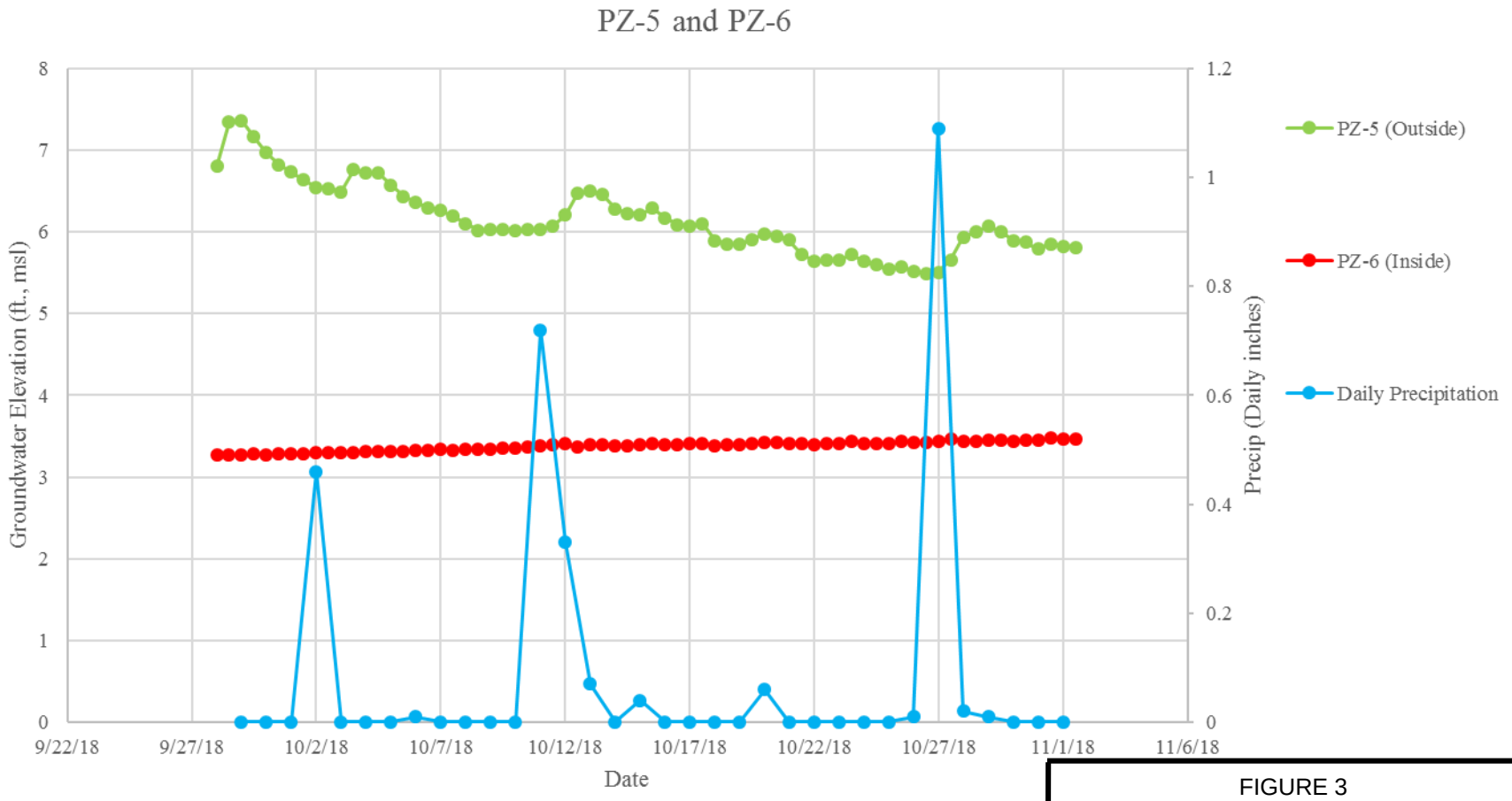


FIGURE 3

Hydrograph of PZ-5 and PZ-6
Data Logger Heads v. Precipitation
October 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

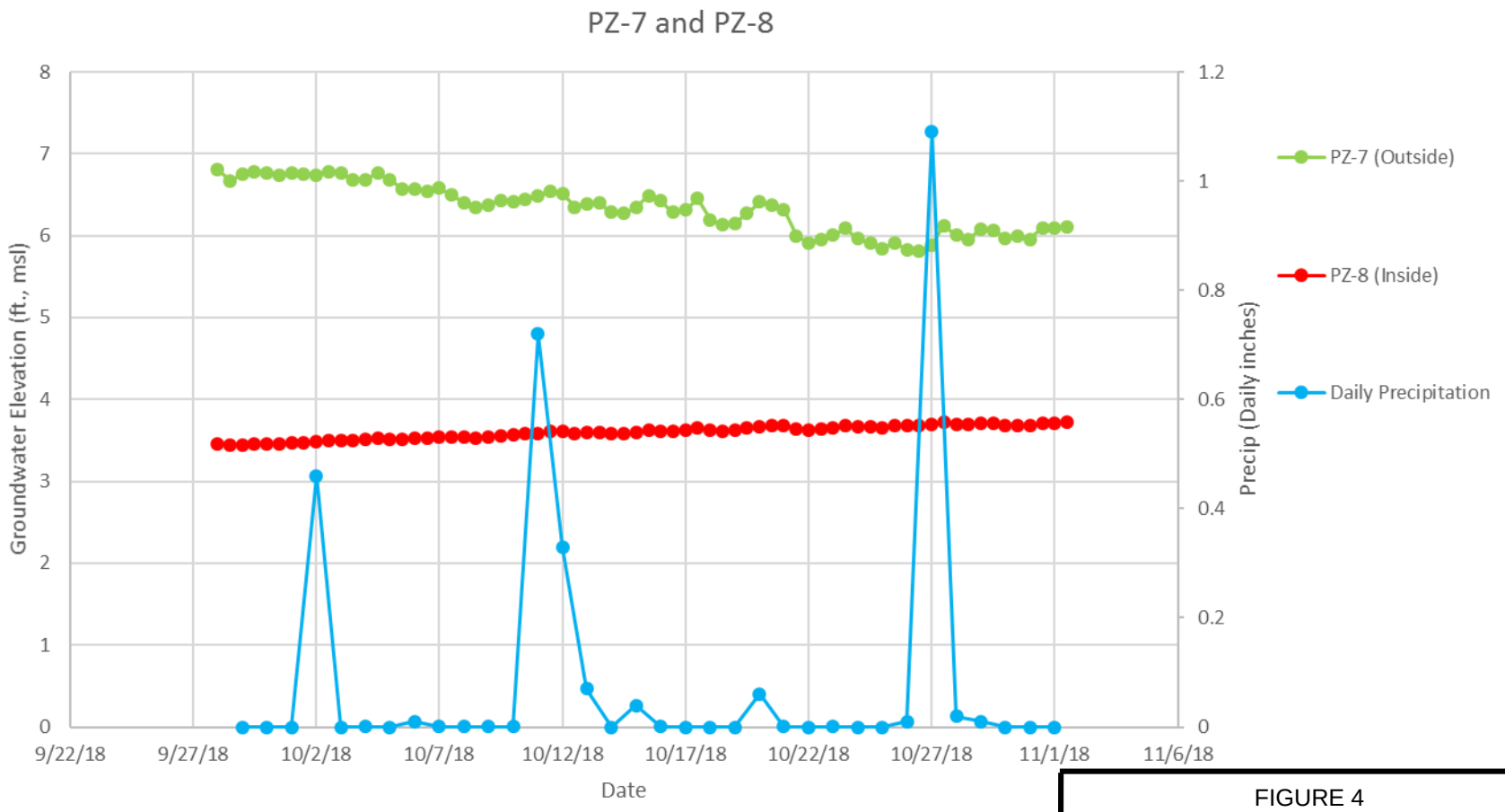


FIGURE 4

Hydrograph of PZ-7 and PZ-8
Data Logger Heads v. Precipitation
October 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

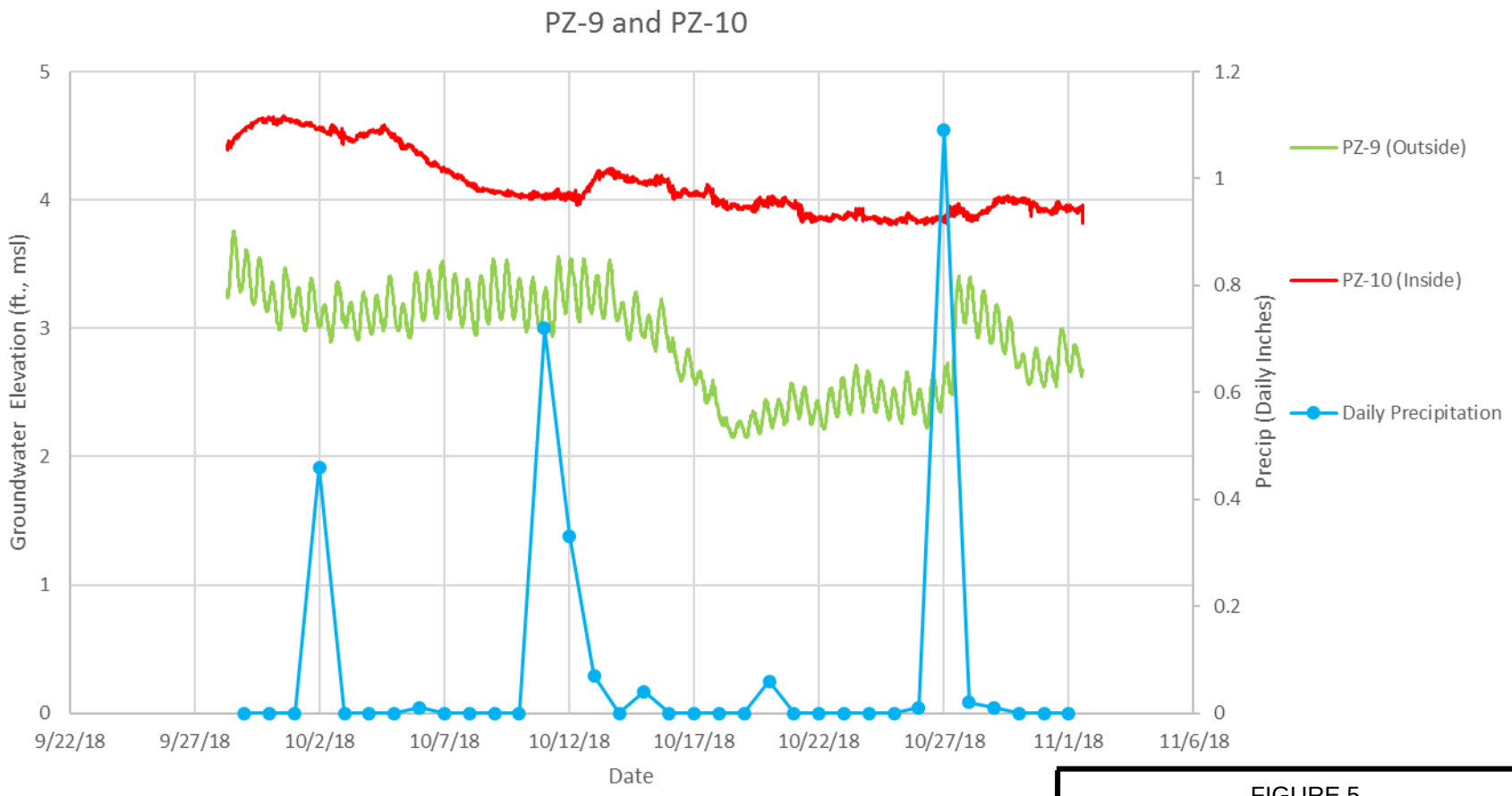


FIGURE 5

Hydrograph of PZ-9 and PZ-10
Data Logger Heads v. Precipitation
October 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 15-minute intervals
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

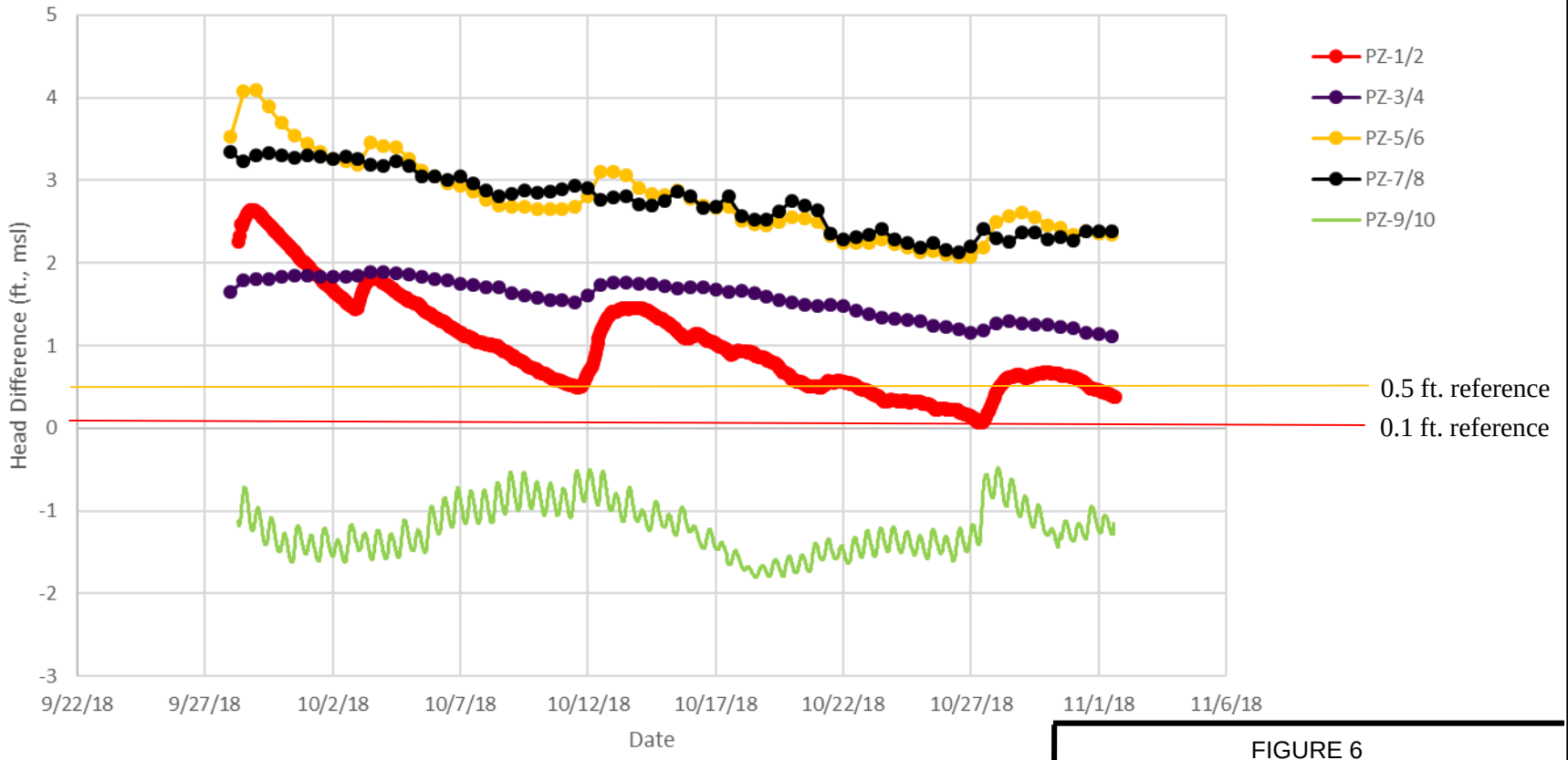


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – October 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

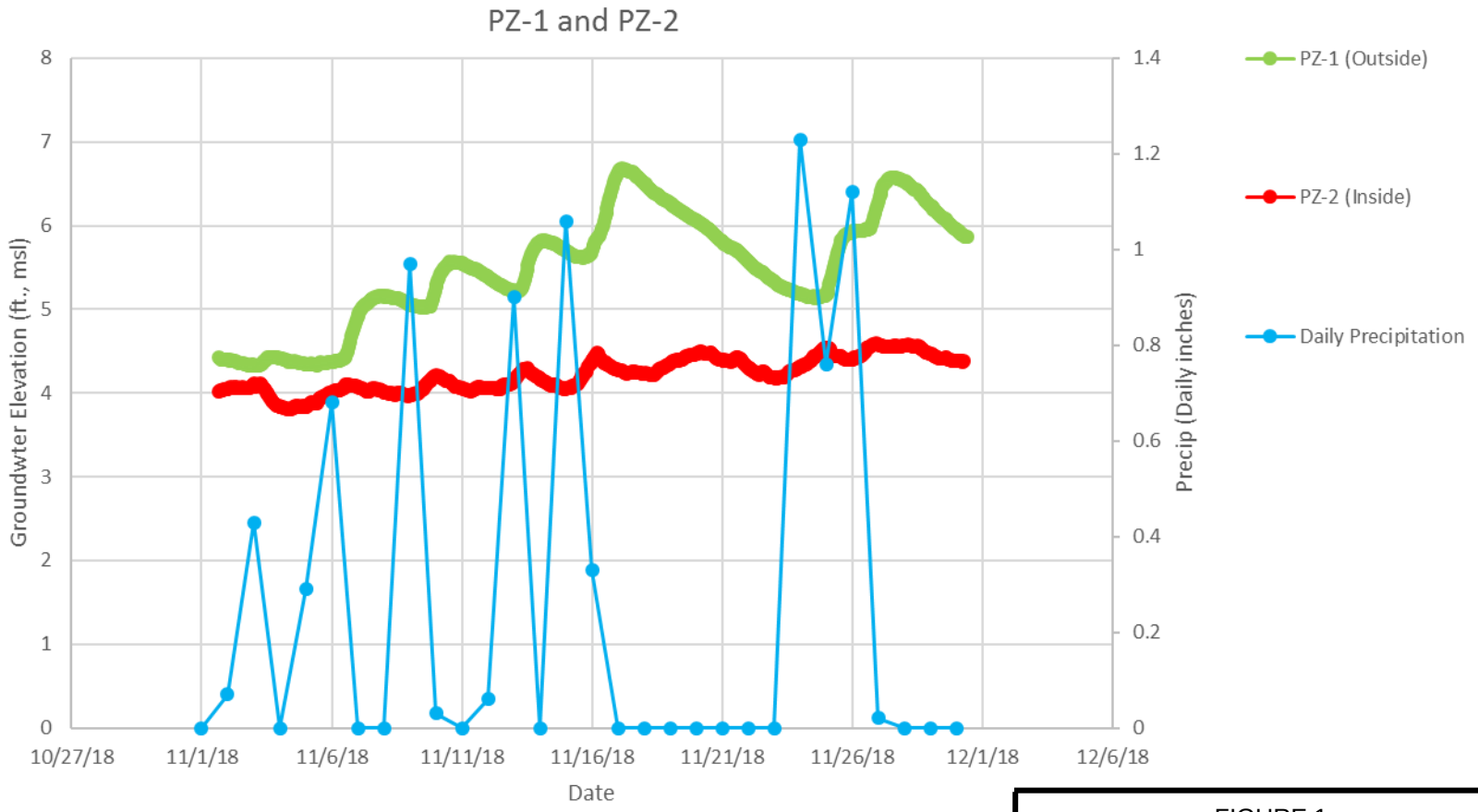


FIGURE 1

Hydrograph of PZ-1 and PZ-2
Data Logger Heads v. Precipitation
November 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:

1) Logger data recorded at one-hour intervals
2) Corrected for barometric fluctuation
3) Precipitation data from CRONOS database, Harrison, NJ

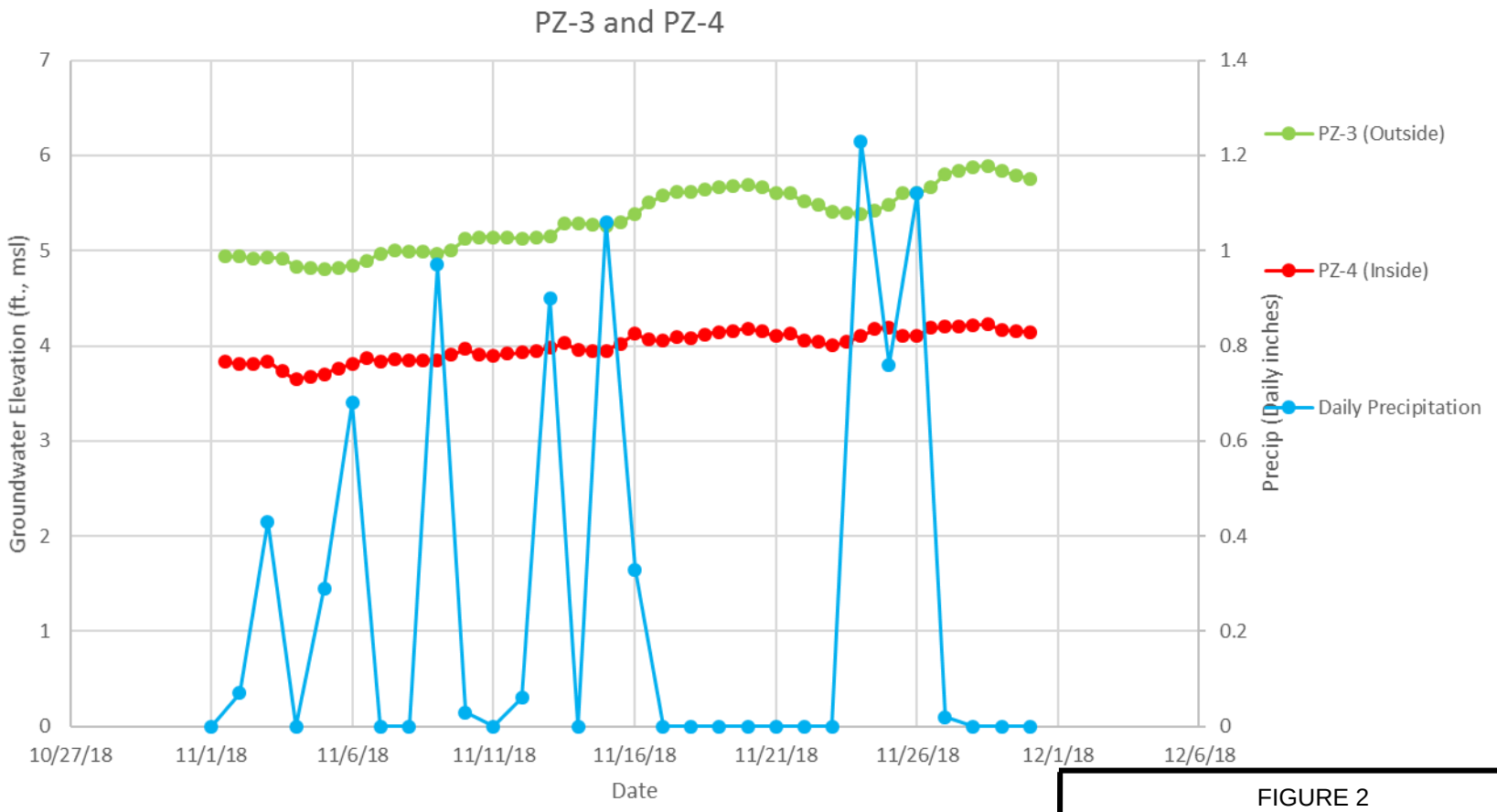


FIGURE 2

Hydrograph of PZ-3 and PZ-4
Data Logger Heads v. Precipitation
November 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

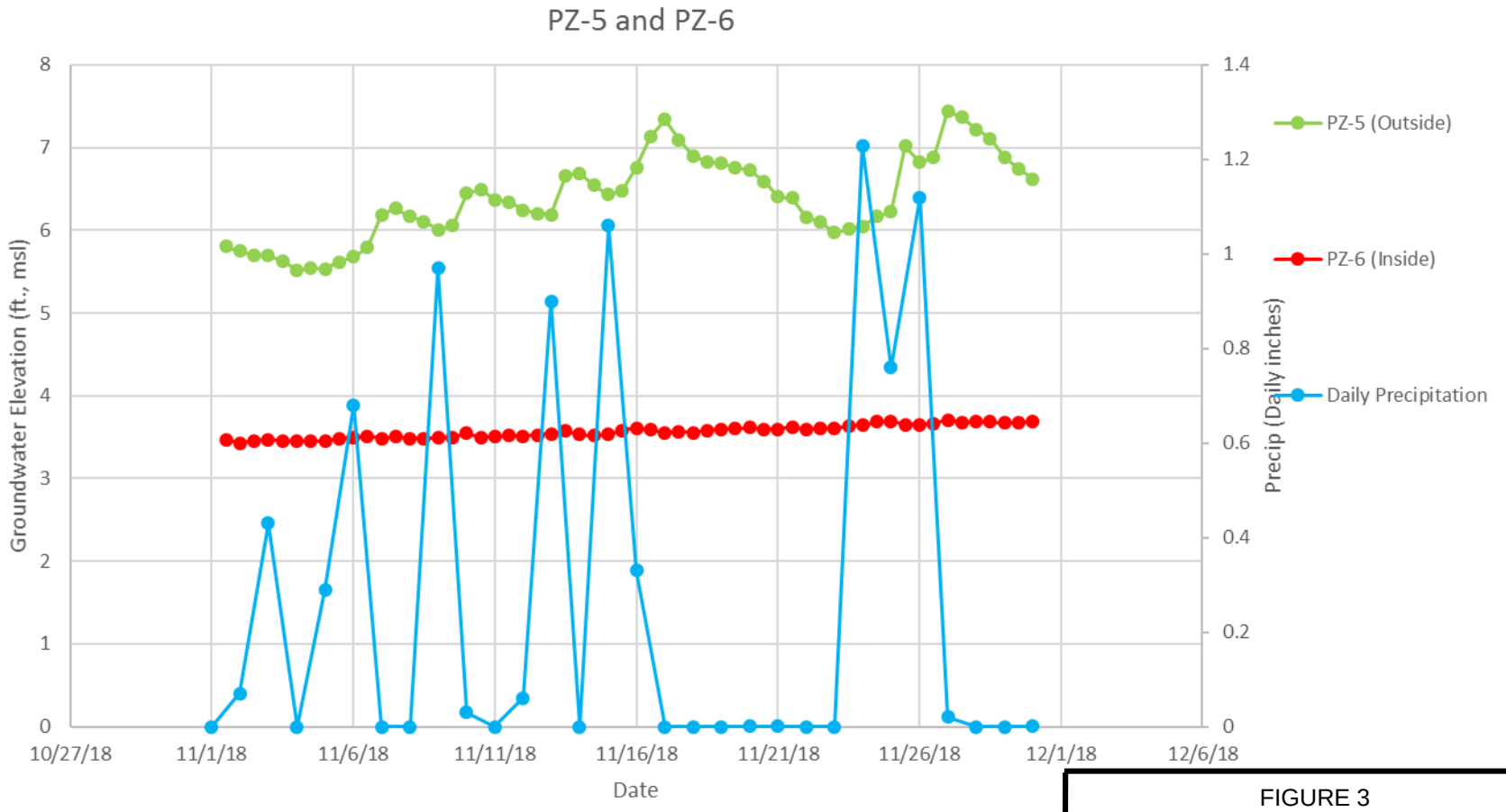


FIGURE 3

Hydrograph of PZ-5 and PZ-6
Data Logger Heads v. Precipitation
November 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

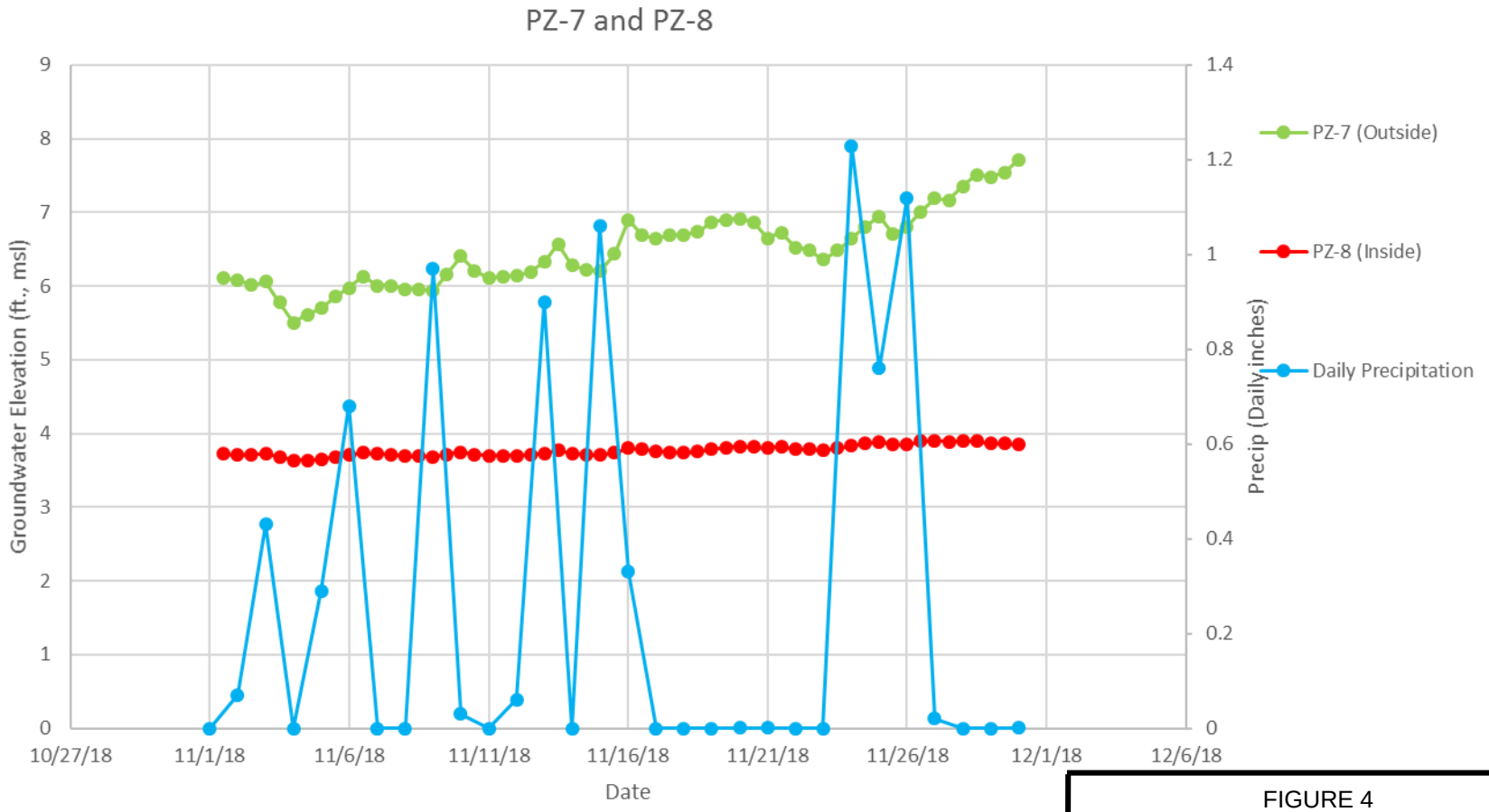


FIGURE 4

Hydrograph of PZ-7 and PZ-8
Data Logger Heads v. Precipitation
November 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

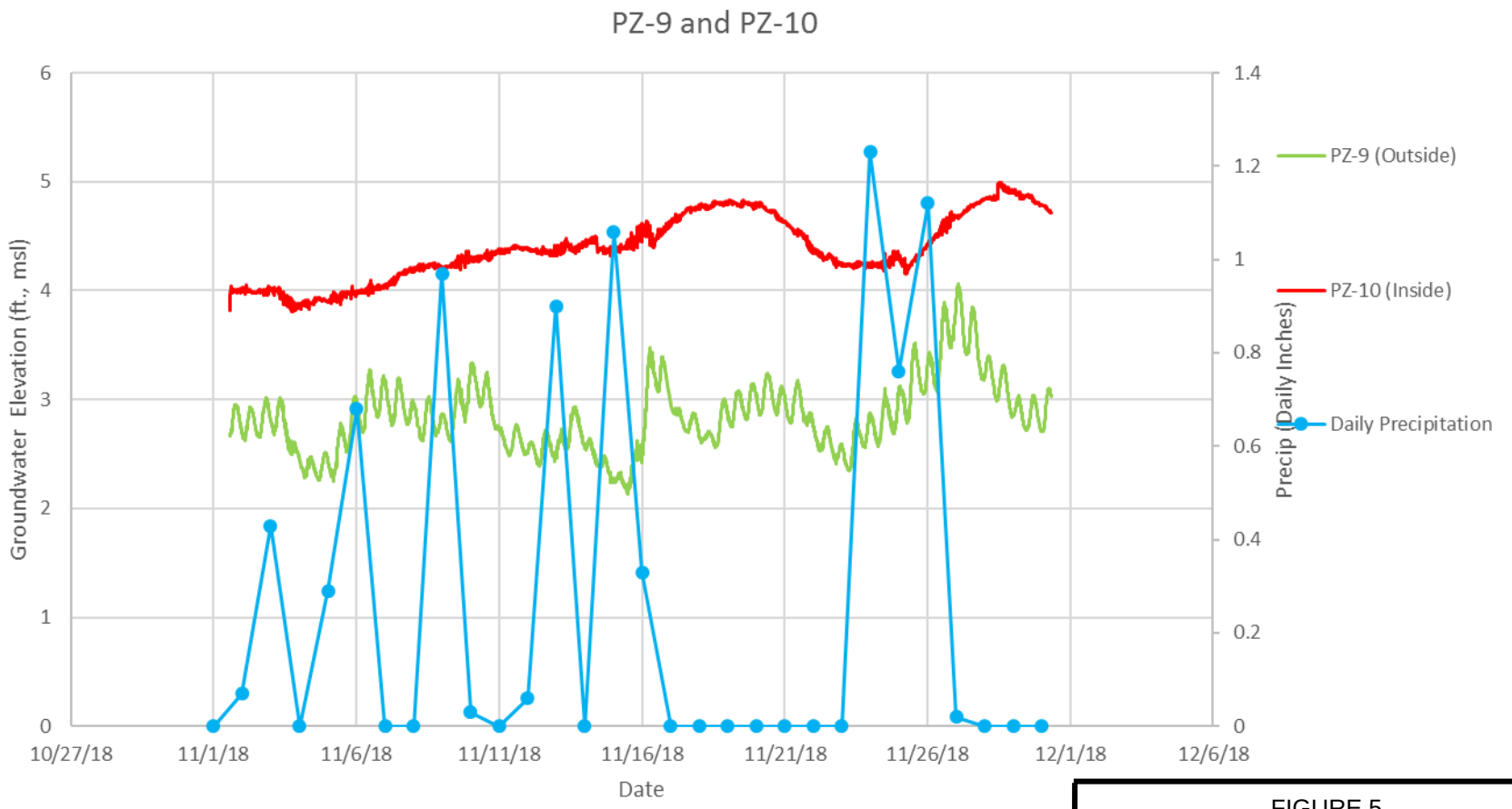


FIGURE 5

Hydrograph of PZ-9 and PZ-10
Data Logger Heads v. Precipitation
November 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 15-minute intervals
2) Precipitation data from CRONOS database, Harrison, NJ

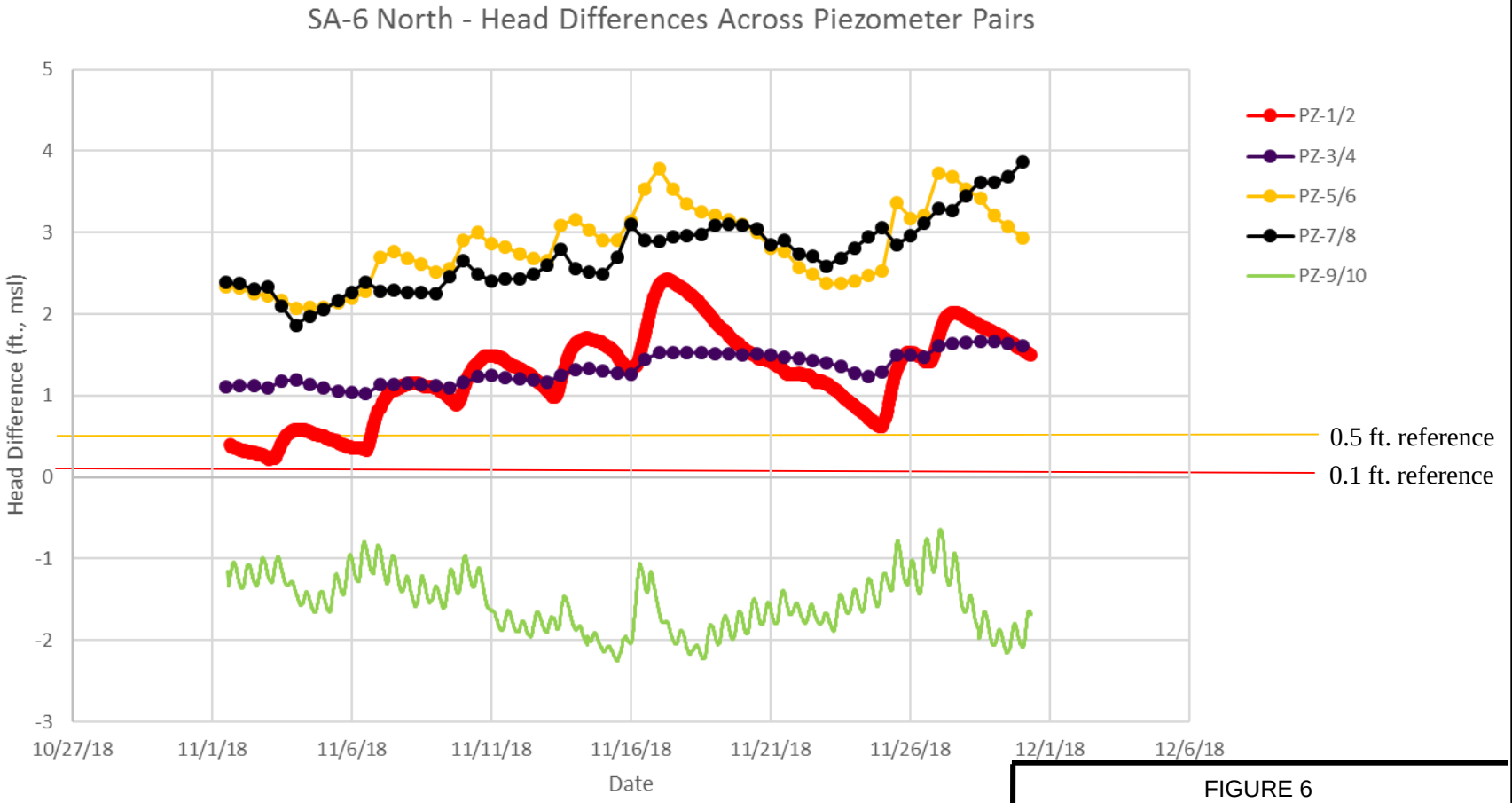


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – November 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

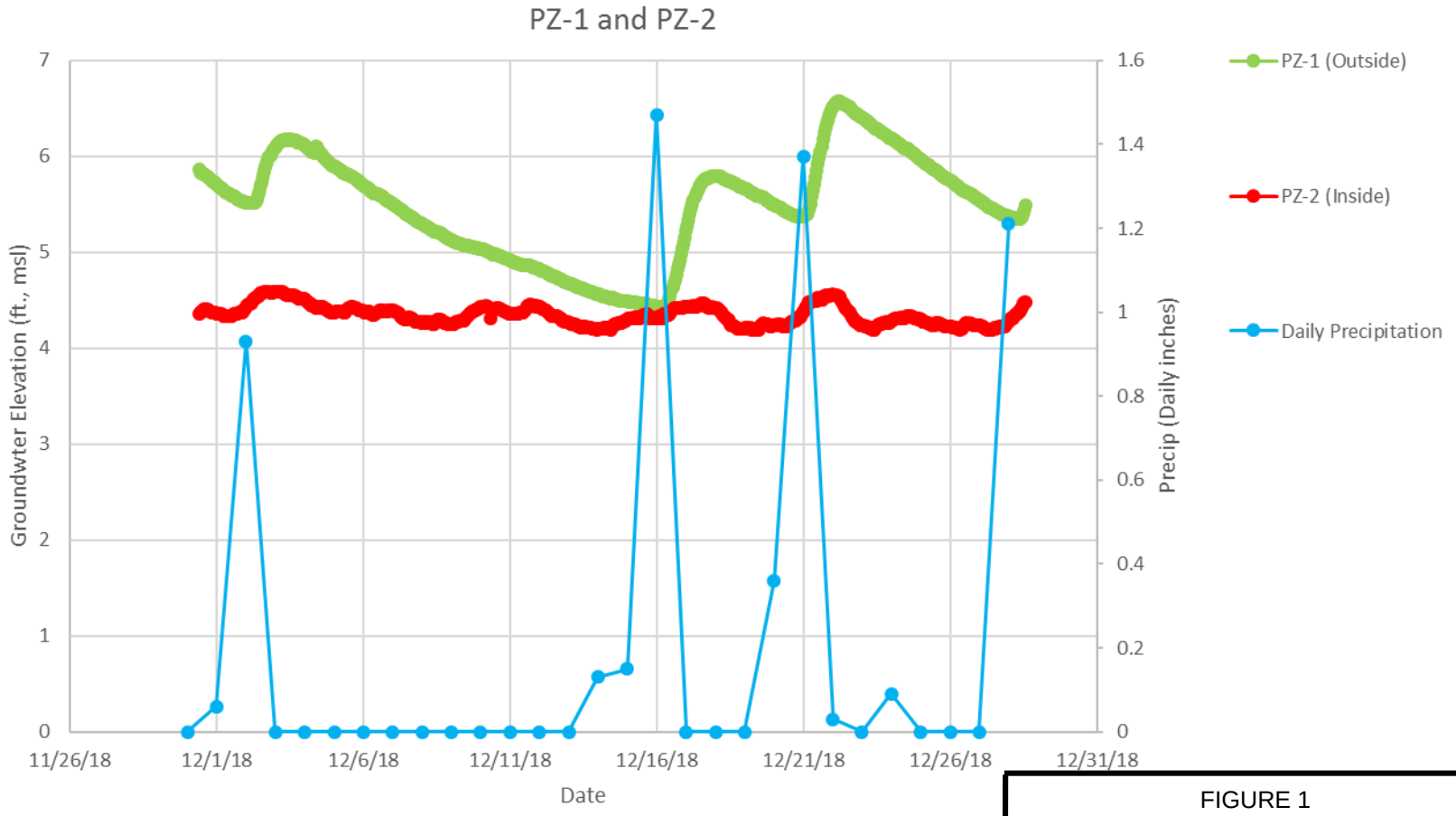


FIGURE 1

Hydrograph of PZ-1 and PZ-2
Data Logger Heads v. Precipitation
December 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at one-hour intervals
2) Corrected for barometric fluctuation
3) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

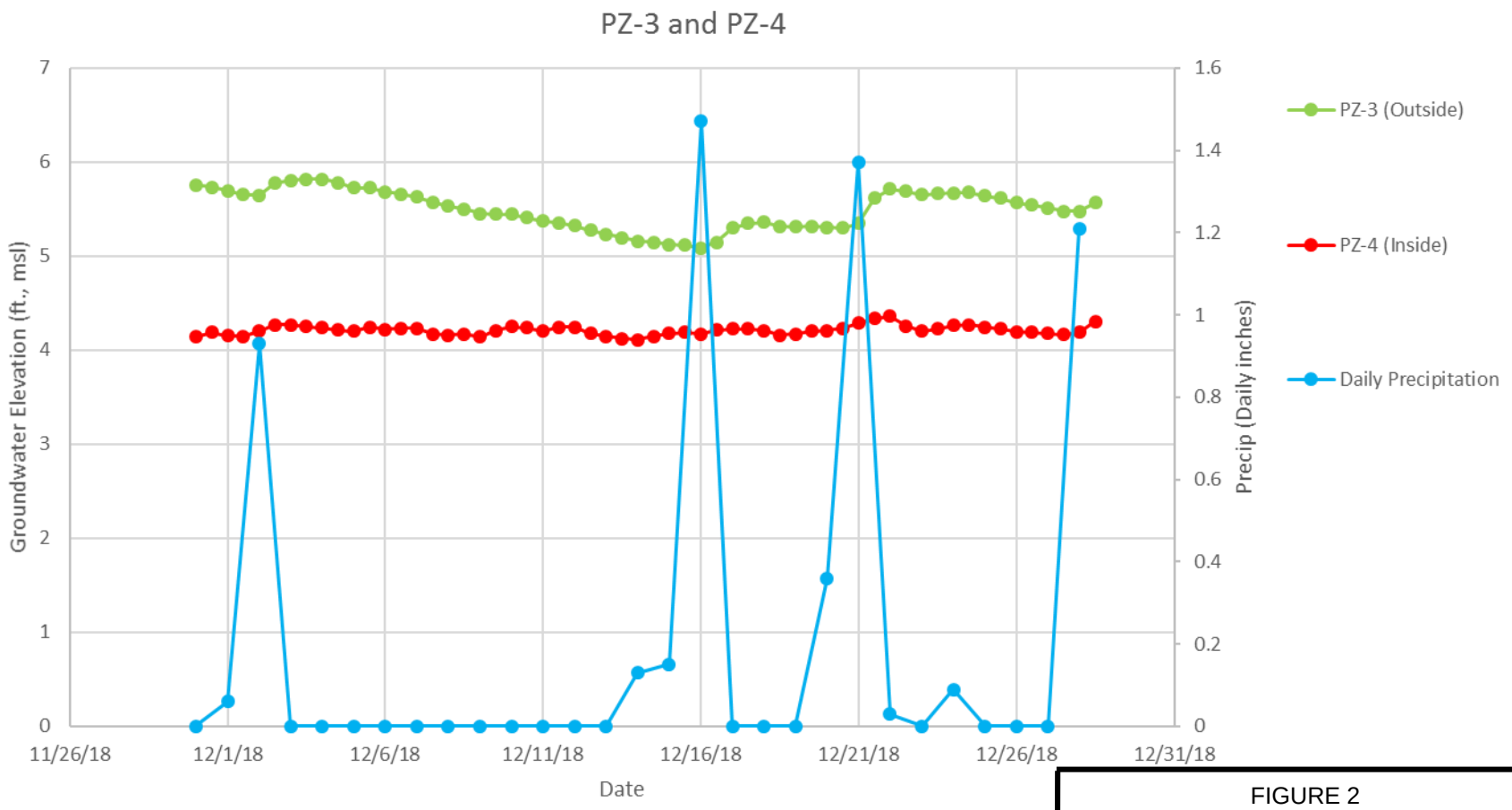


FIGURE 2

Hydrograph of PZ-3 and PZ-4
Data Logger Heads v. Precipitation
December 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

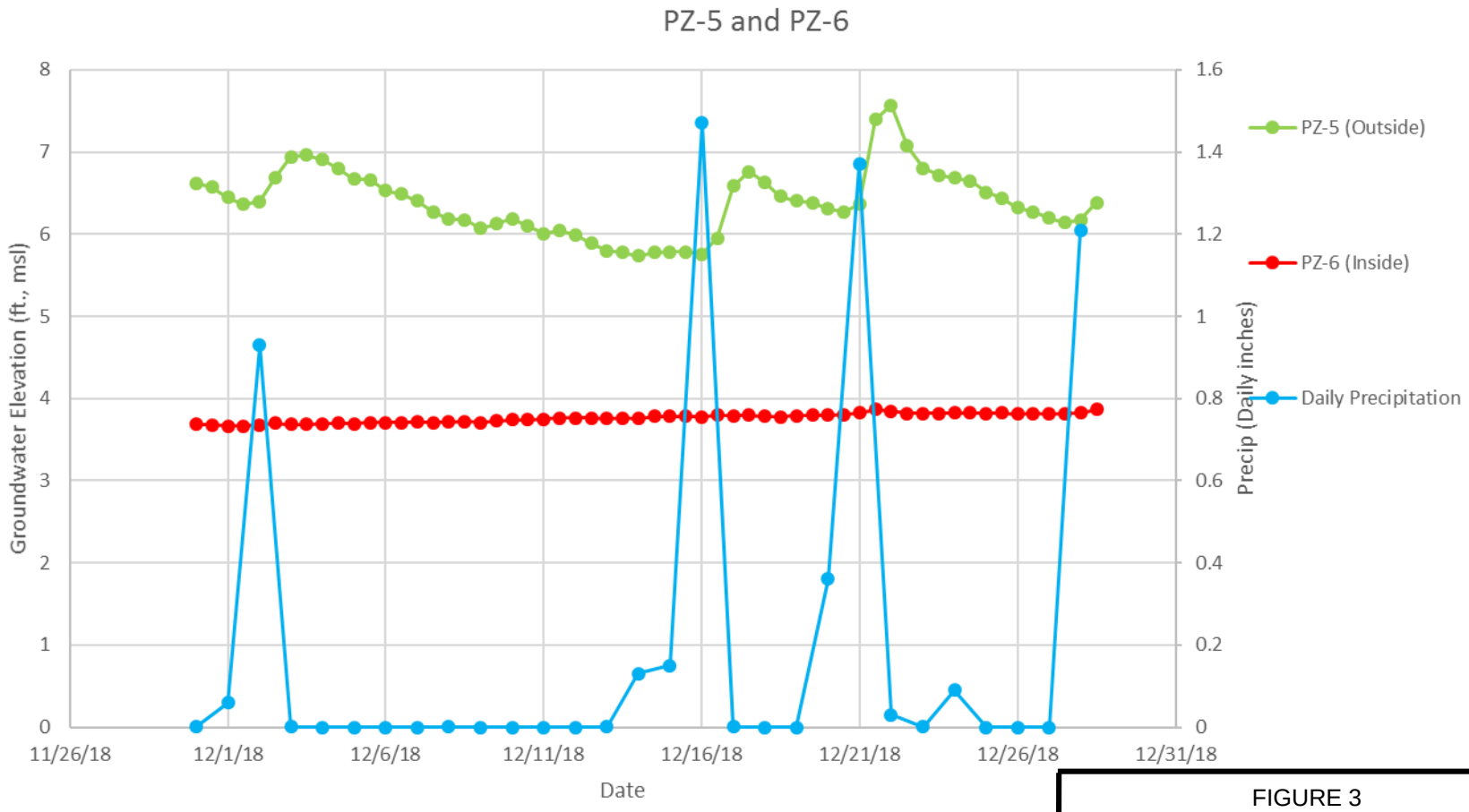


FIGURE 3

Hydrograph of PZ-5 and PZ-6
Data Logger Heads v. Precipitation
December 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

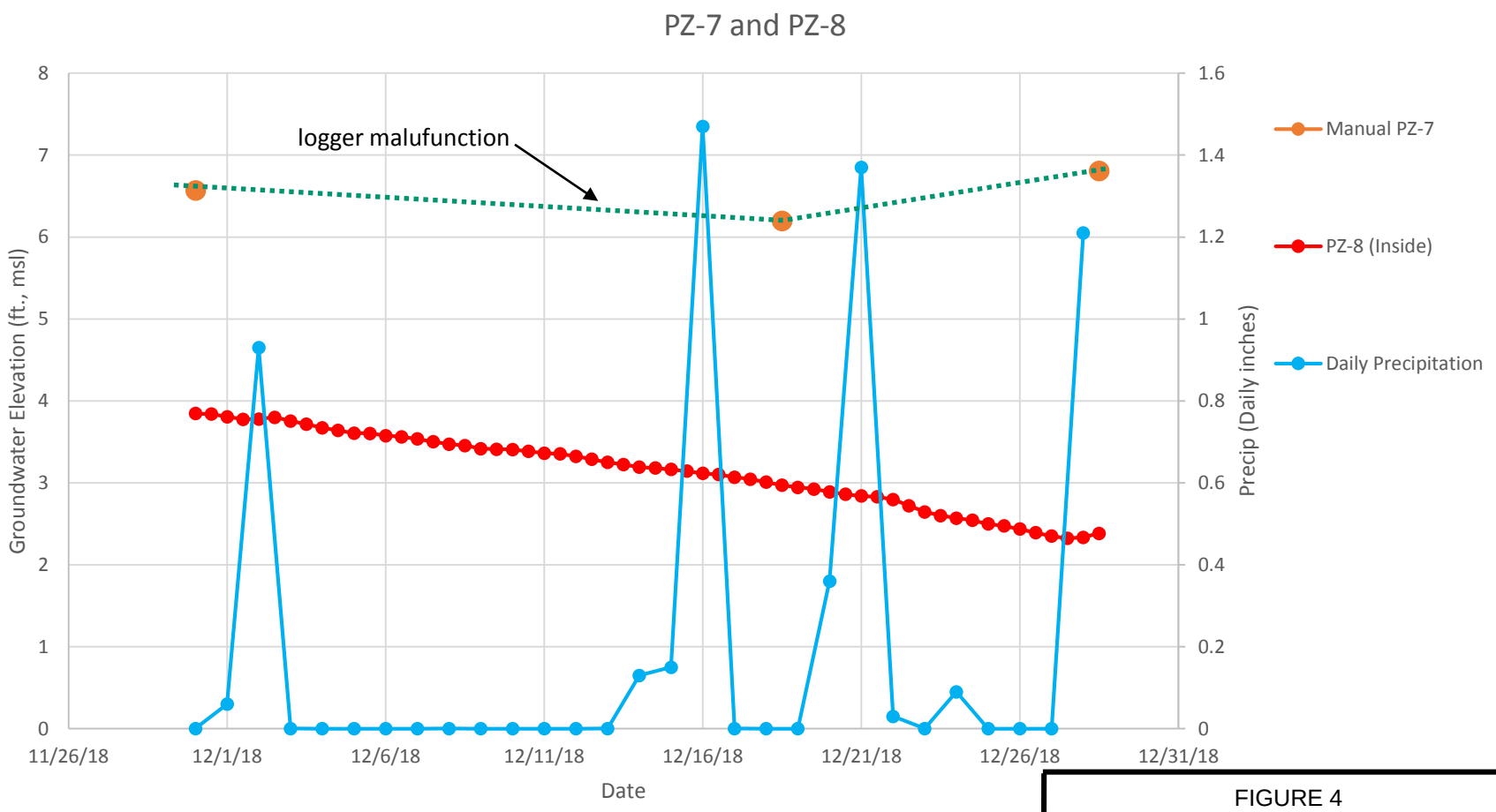


FIGURE 4

Hydrograph of PZ-7 and PZ-8
Data Logger Heads v. Precipitation
December 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hour intervals; corrected for barometric fluctuation
2) Precipitation data from CRONOS database, Harrison, NJ

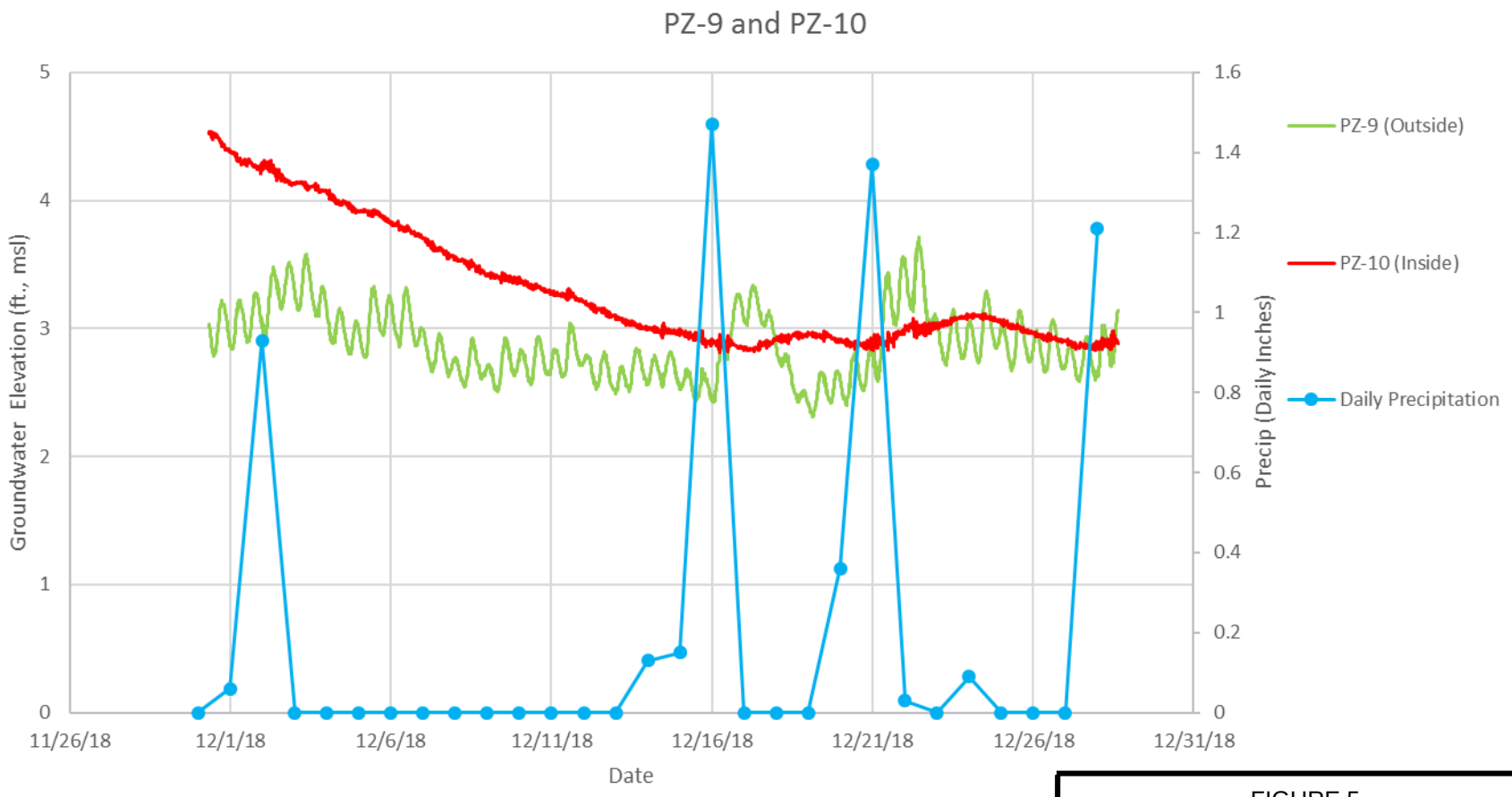


FIGURE 5

Hydrograph of PZ-9 and PZ-10
Data Logger Heads v. Precipitation
December 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 15-minute intervals
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

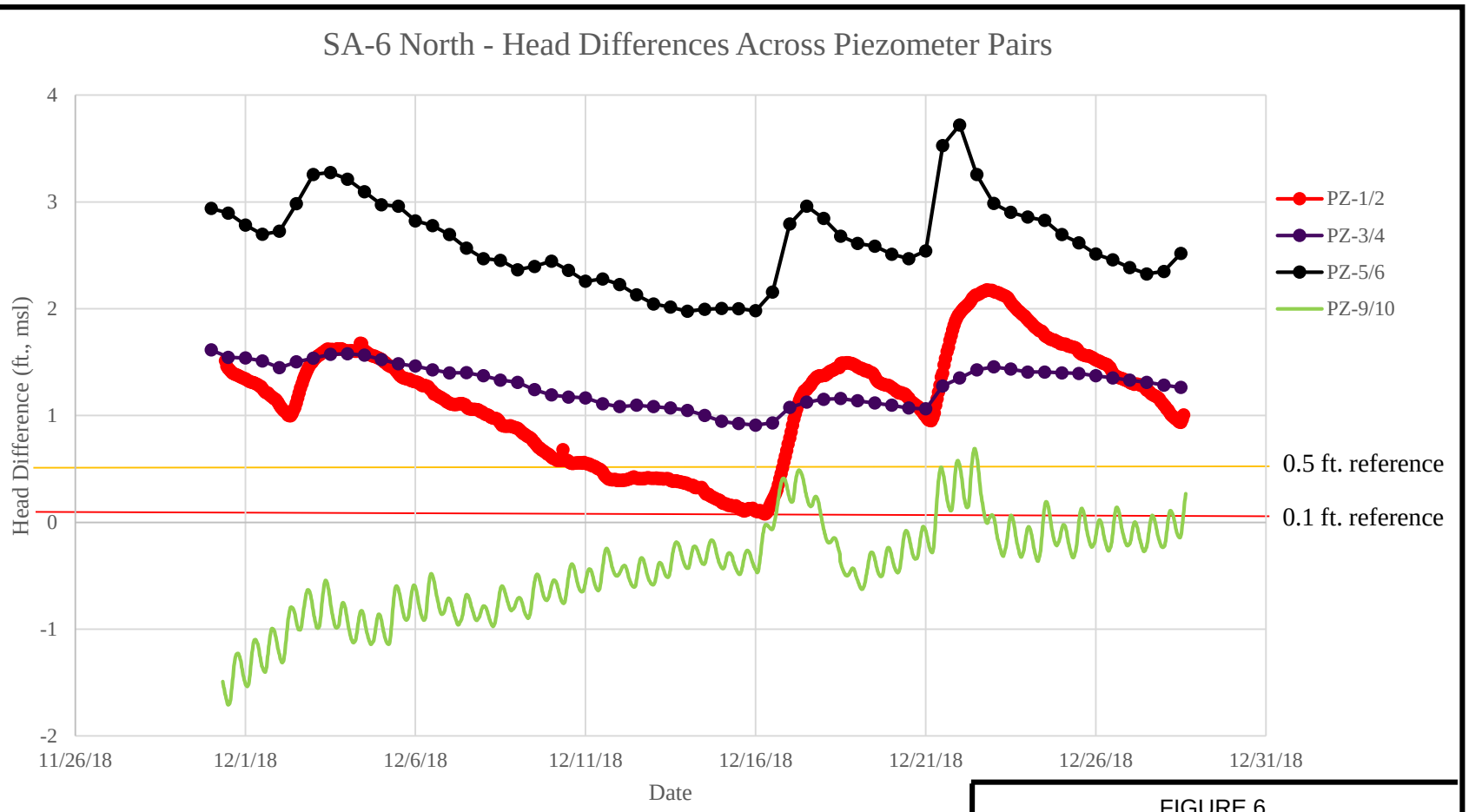


FIGURE 6

Hydrograph of Head Differences Across Piezometer Pairs – December 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

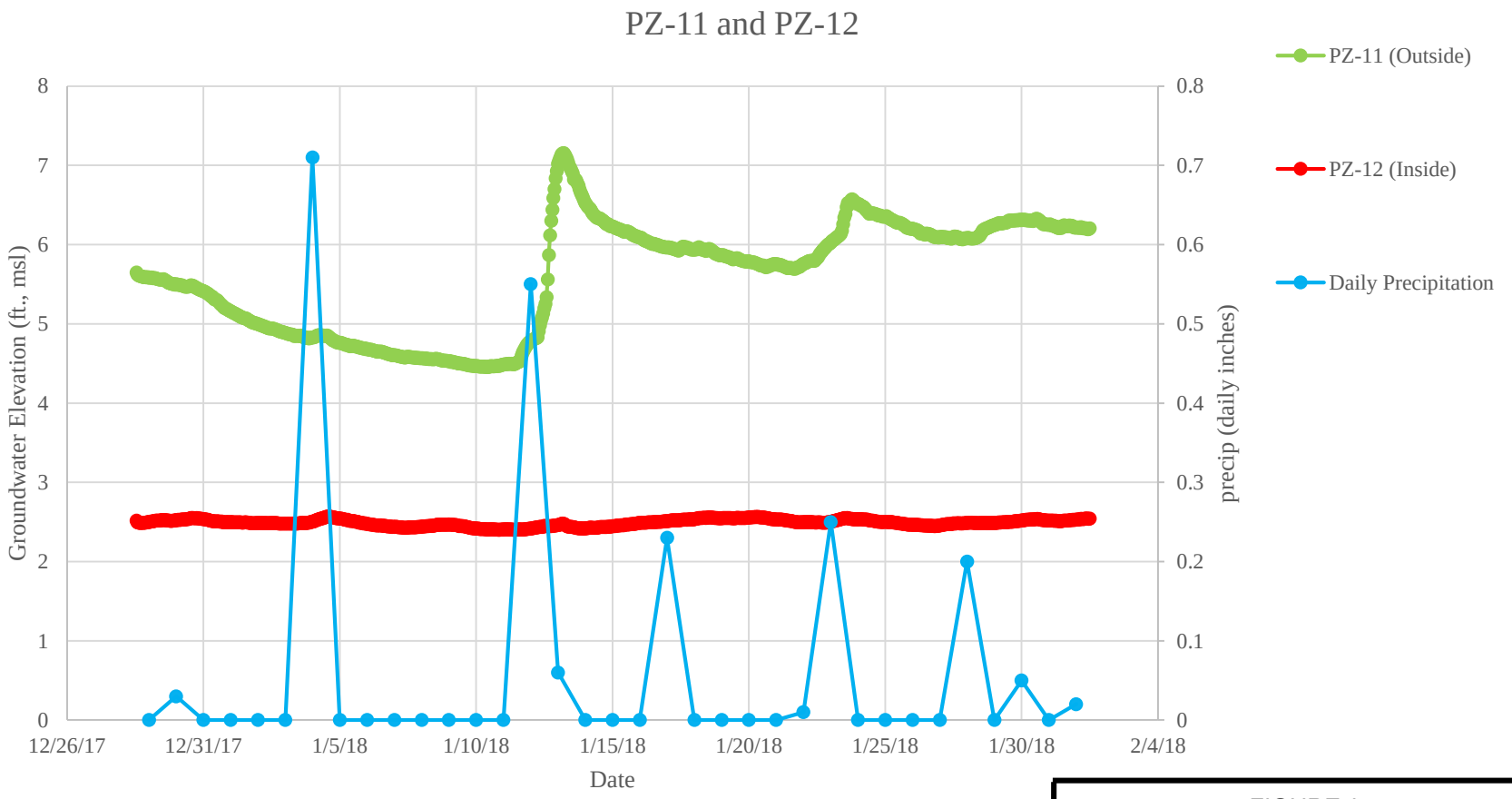


FIGURE 1

Hydrograph of PZ-11 and PZ-12
Data Logger Heads v. Precipitation
January 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at one-hour intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

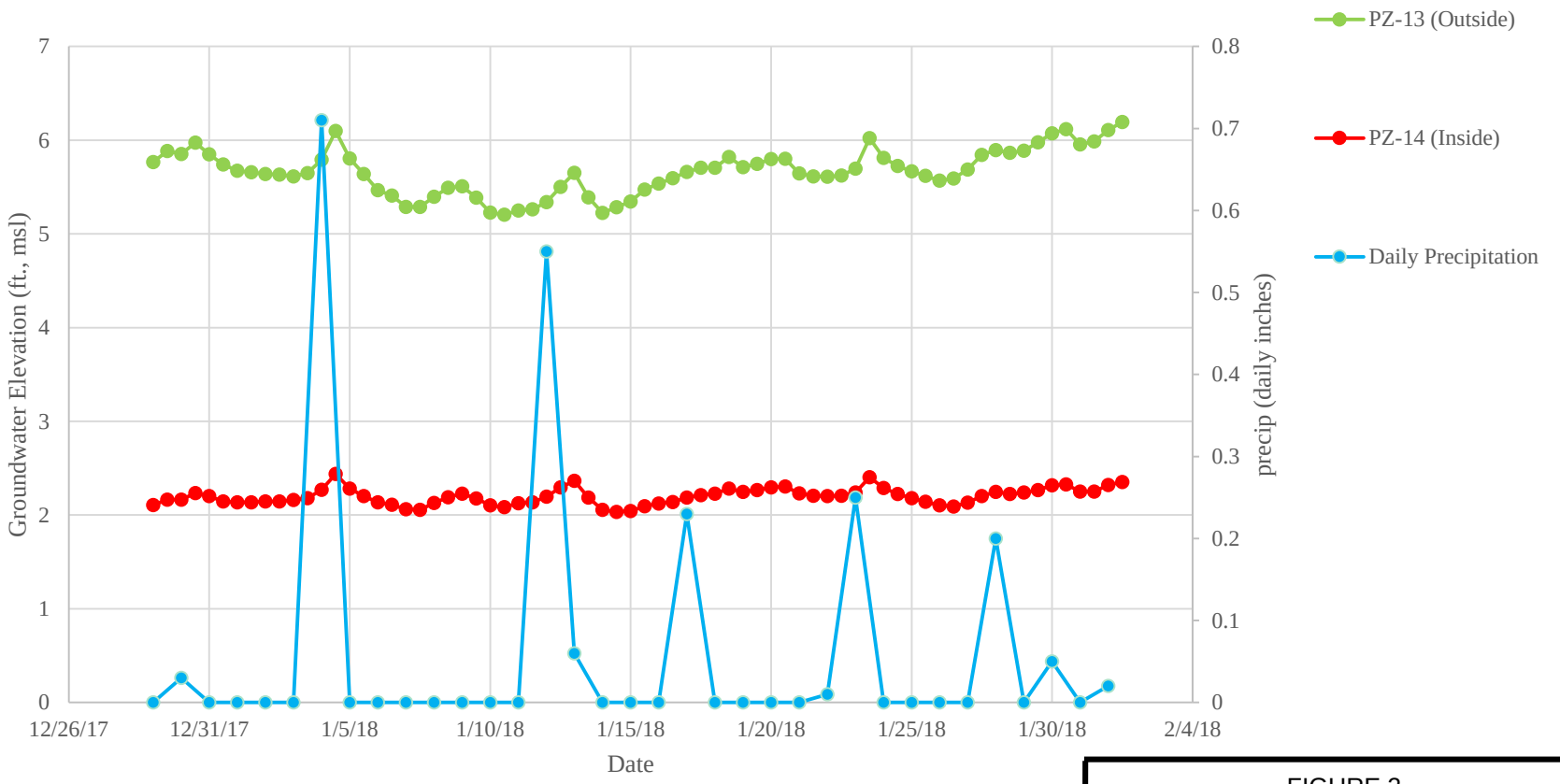


FIGURE 2

Hydrograph of PZ-13 and PZ-14
Data Logger Heads v. Precipitation
January 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

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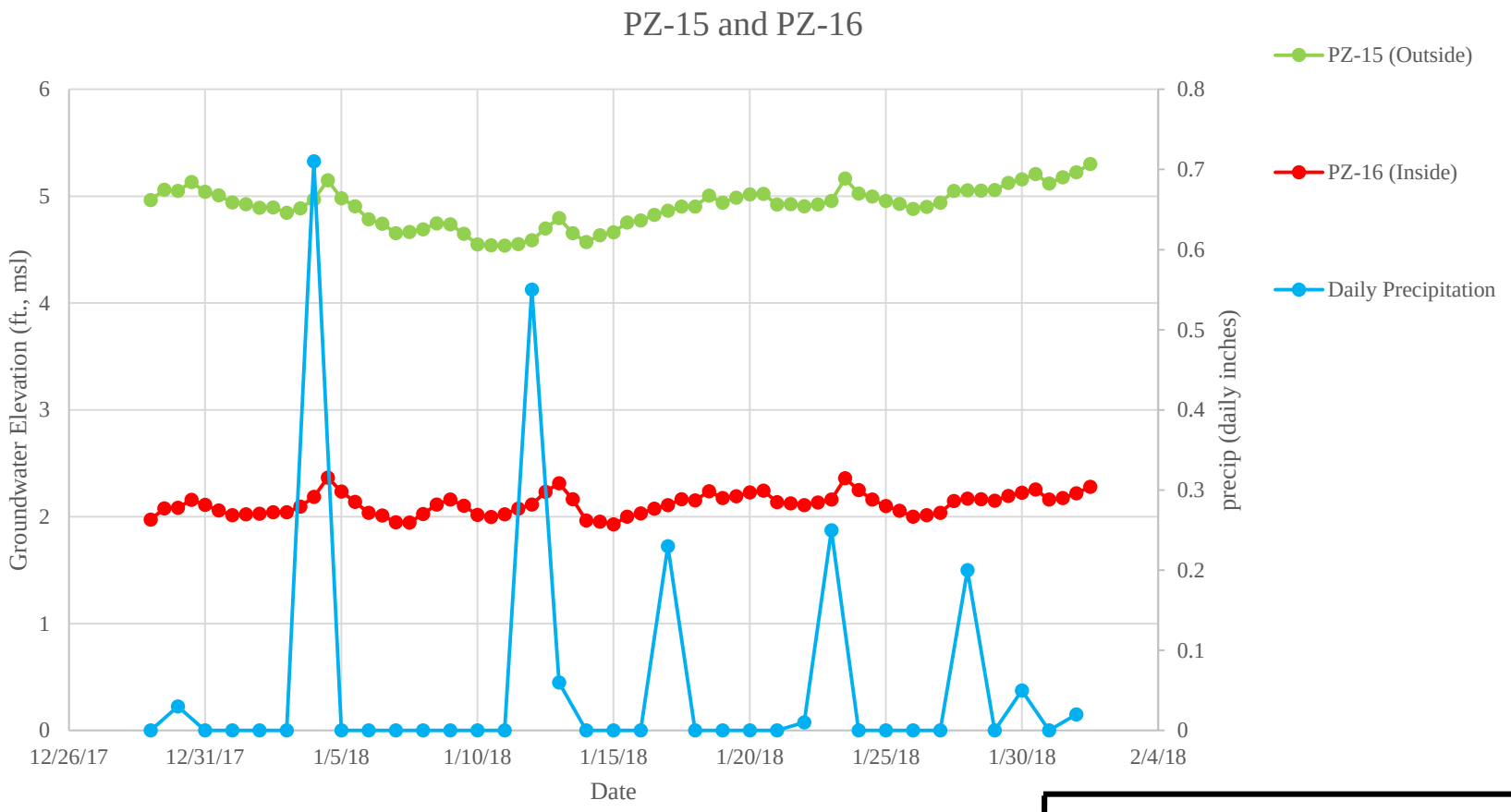

FIGURE 3

Hydrograph of PZ-15 and PZ-16
Data Logger Heads v. Precipitation
January 2018

Study Area 6, Jersey City, NJ

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Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

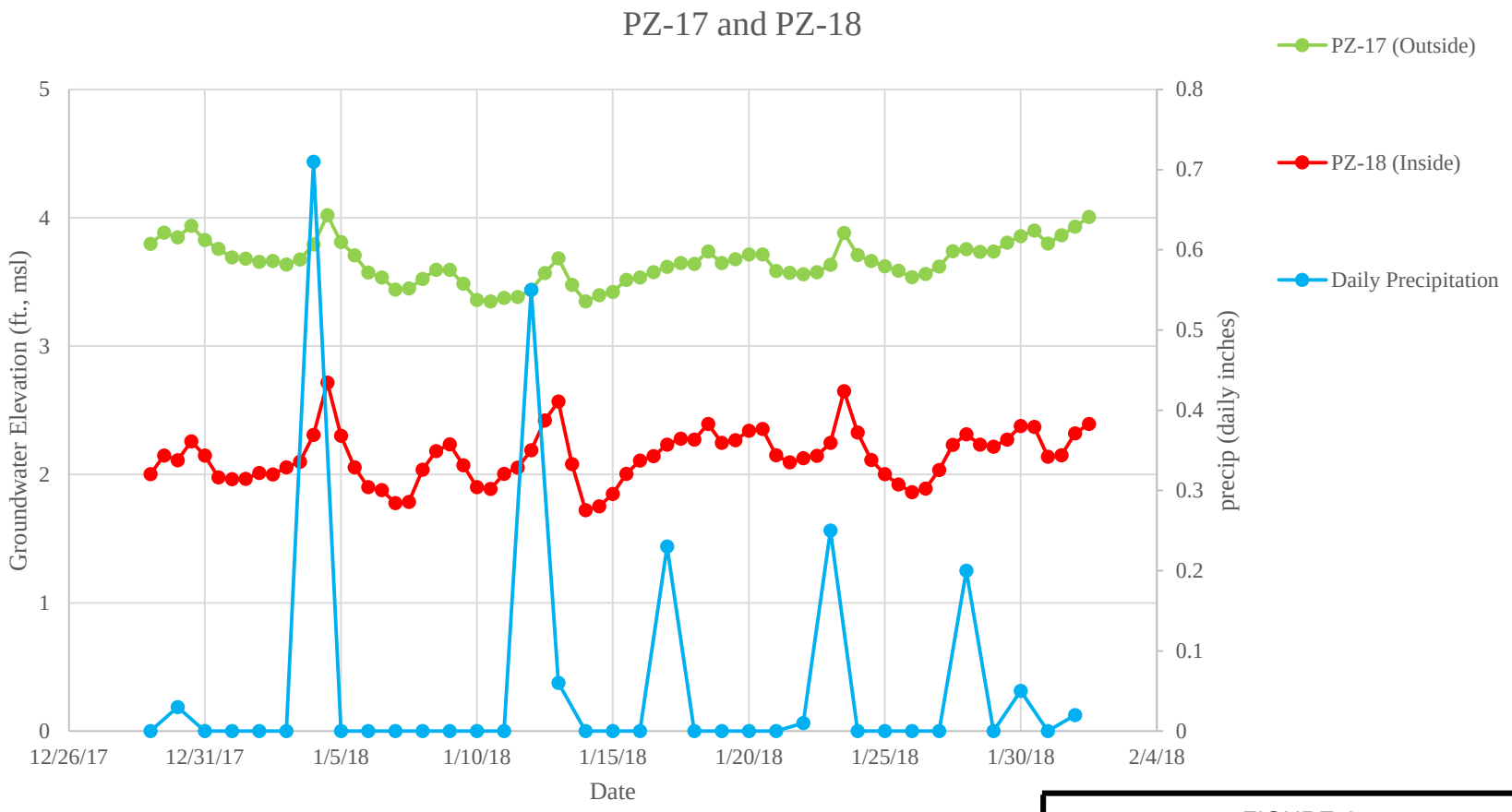

FIGURE 4

Hydrograph of PZ-17 and PZ-18
Data Logger Heads v. Precipitation
January 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

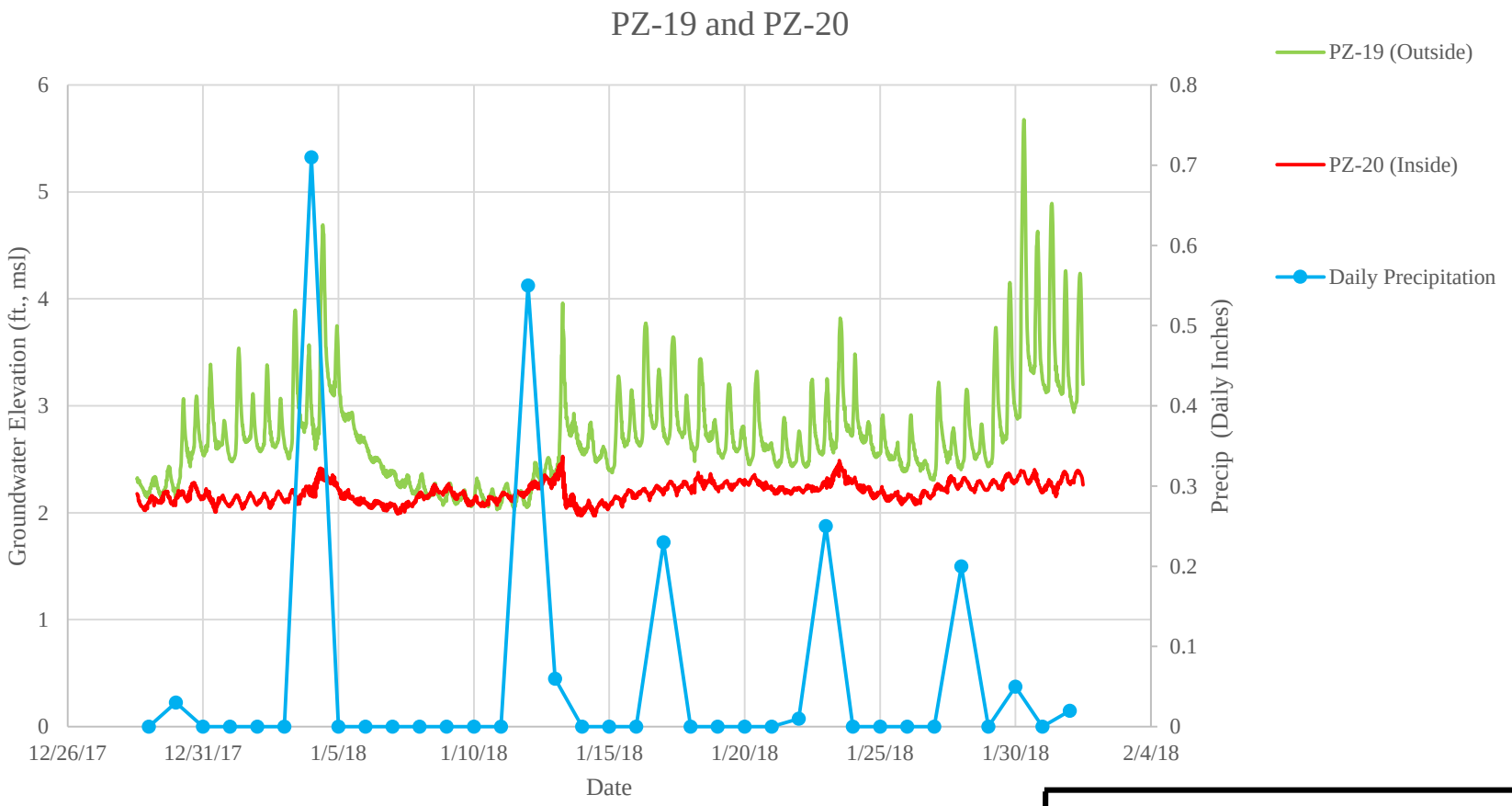

FIGURE 5

Hydrograph of PZ-19 and PZ-20
Data Logger Heads v. Precipitation
January 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 15-minute intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

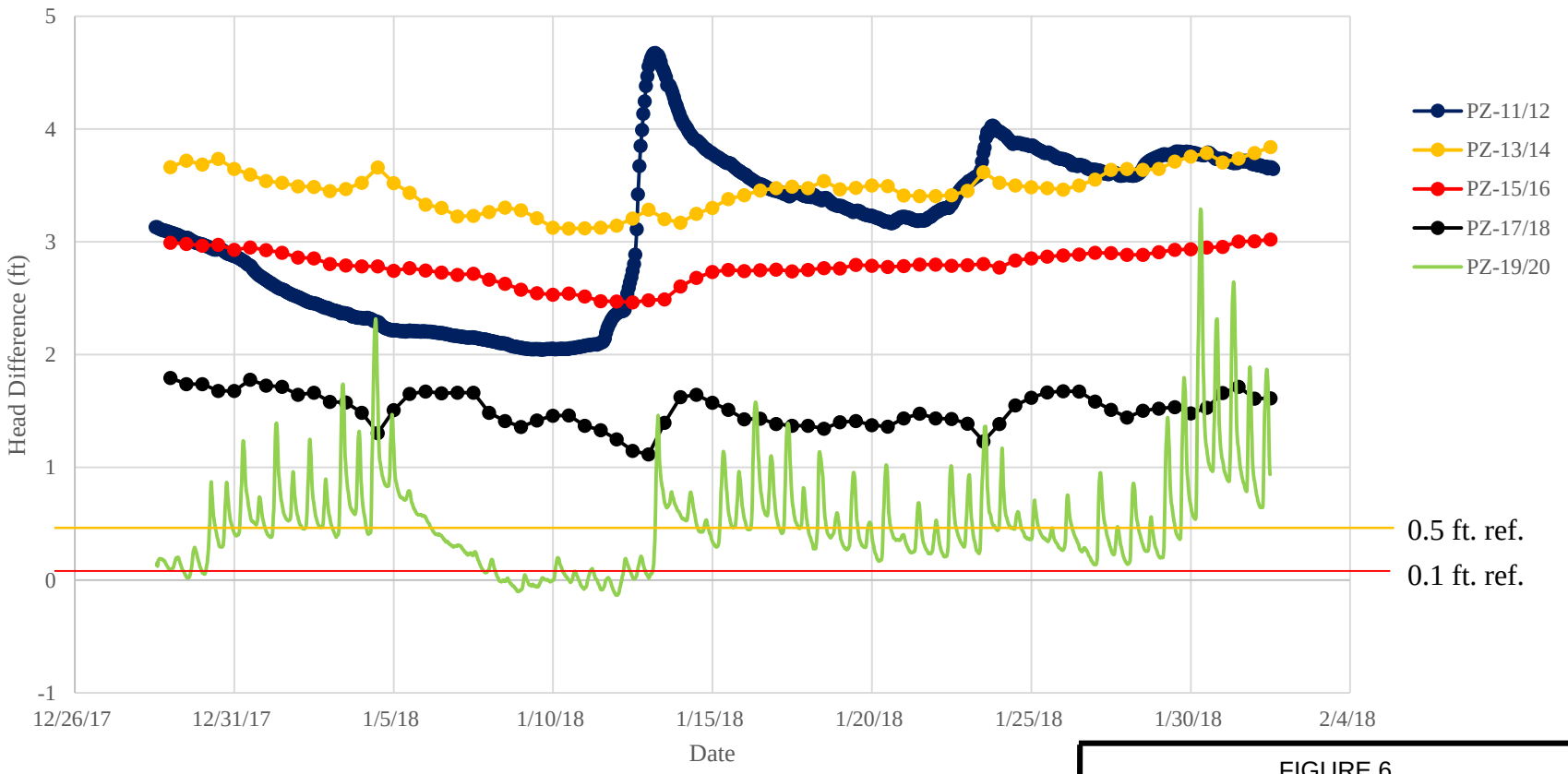

FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – January 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

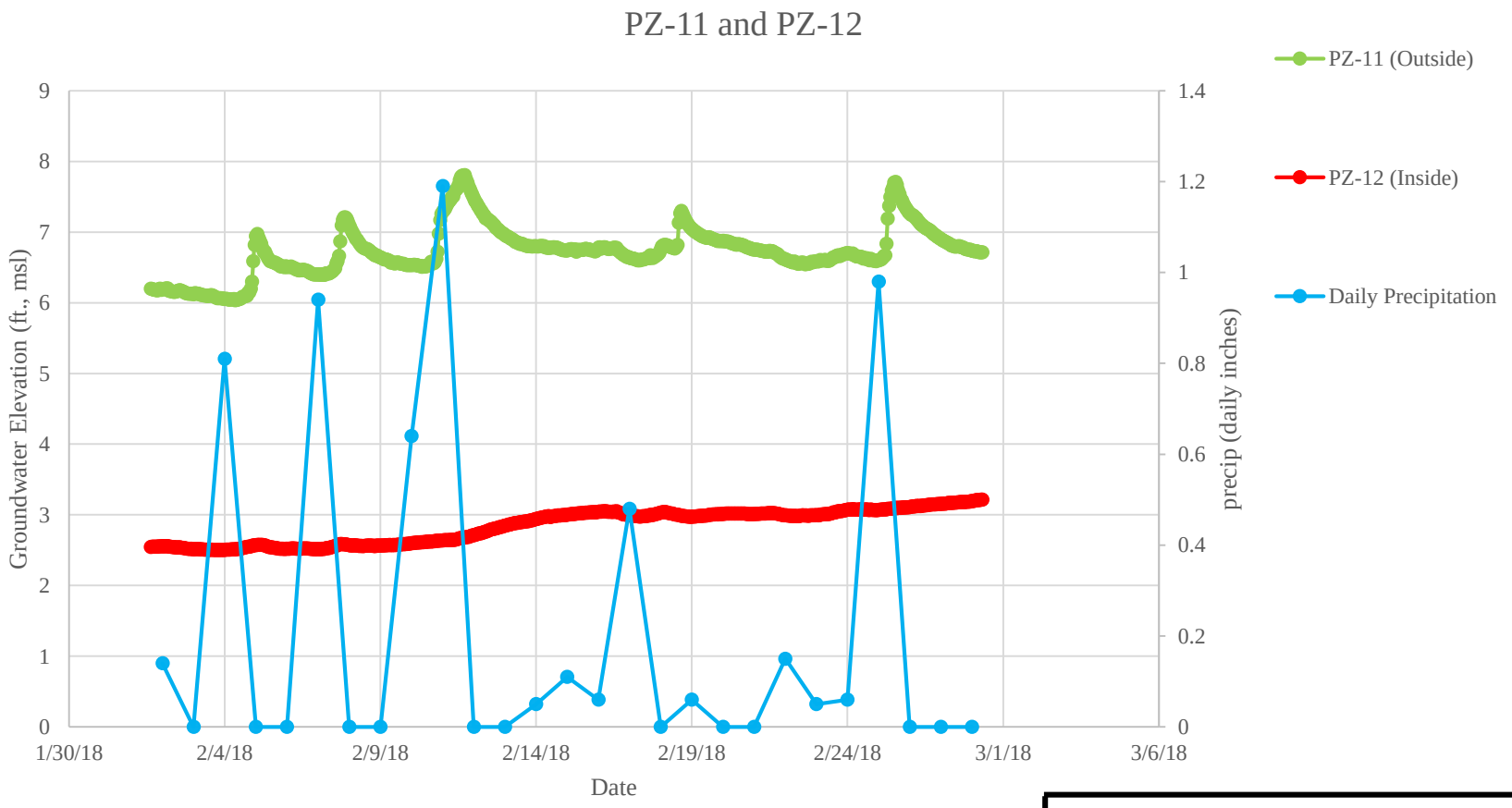

FIGURE 1

Hydrograph of PZ-11 and PZ-12
Data Logger Heads v. Precipitation
February 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at one-hour intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

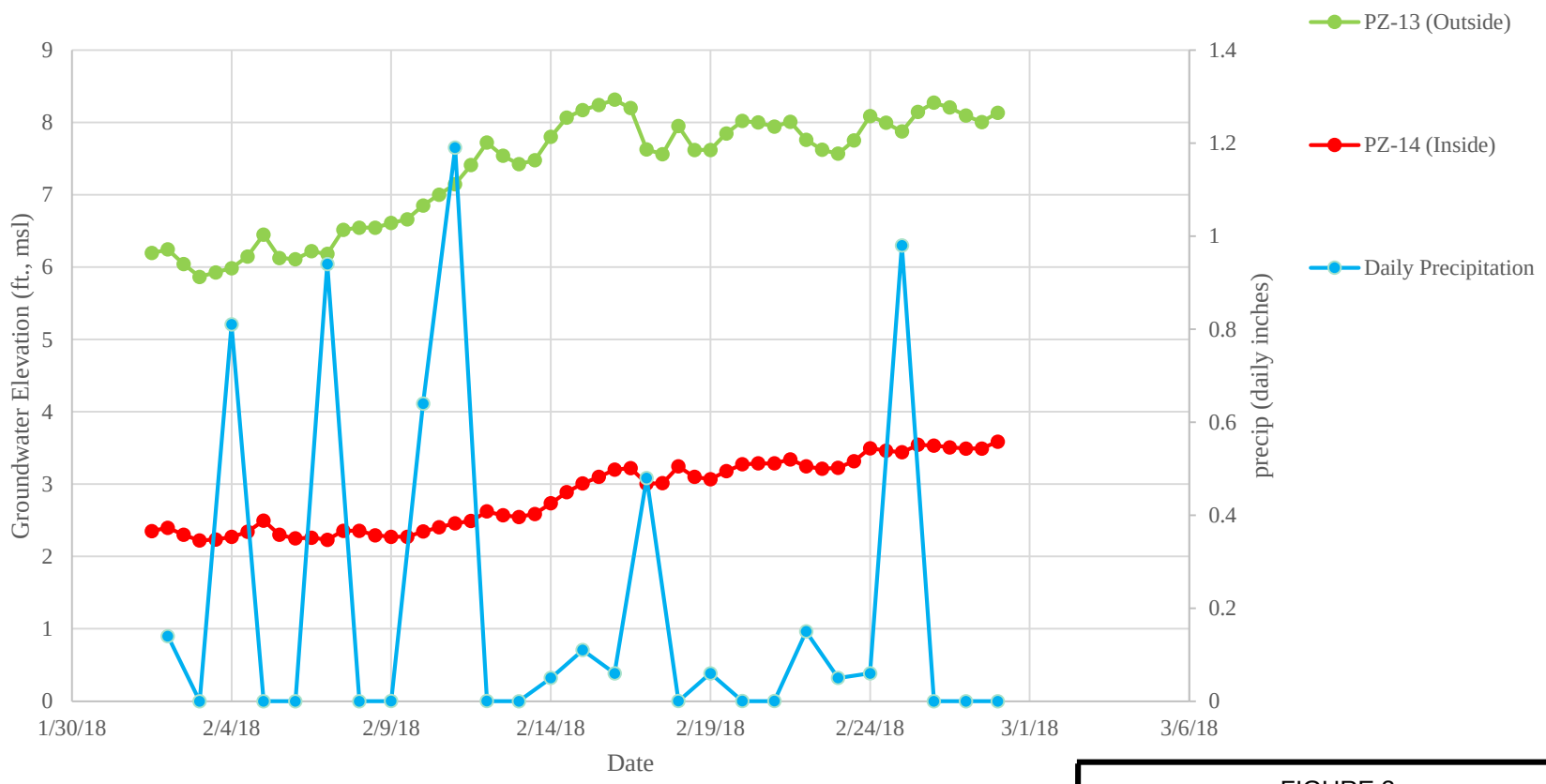

FIGURE 2

Hydrograph of PZ-13 and PZ-14
Data Logger Heads v. Precipitation
February 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

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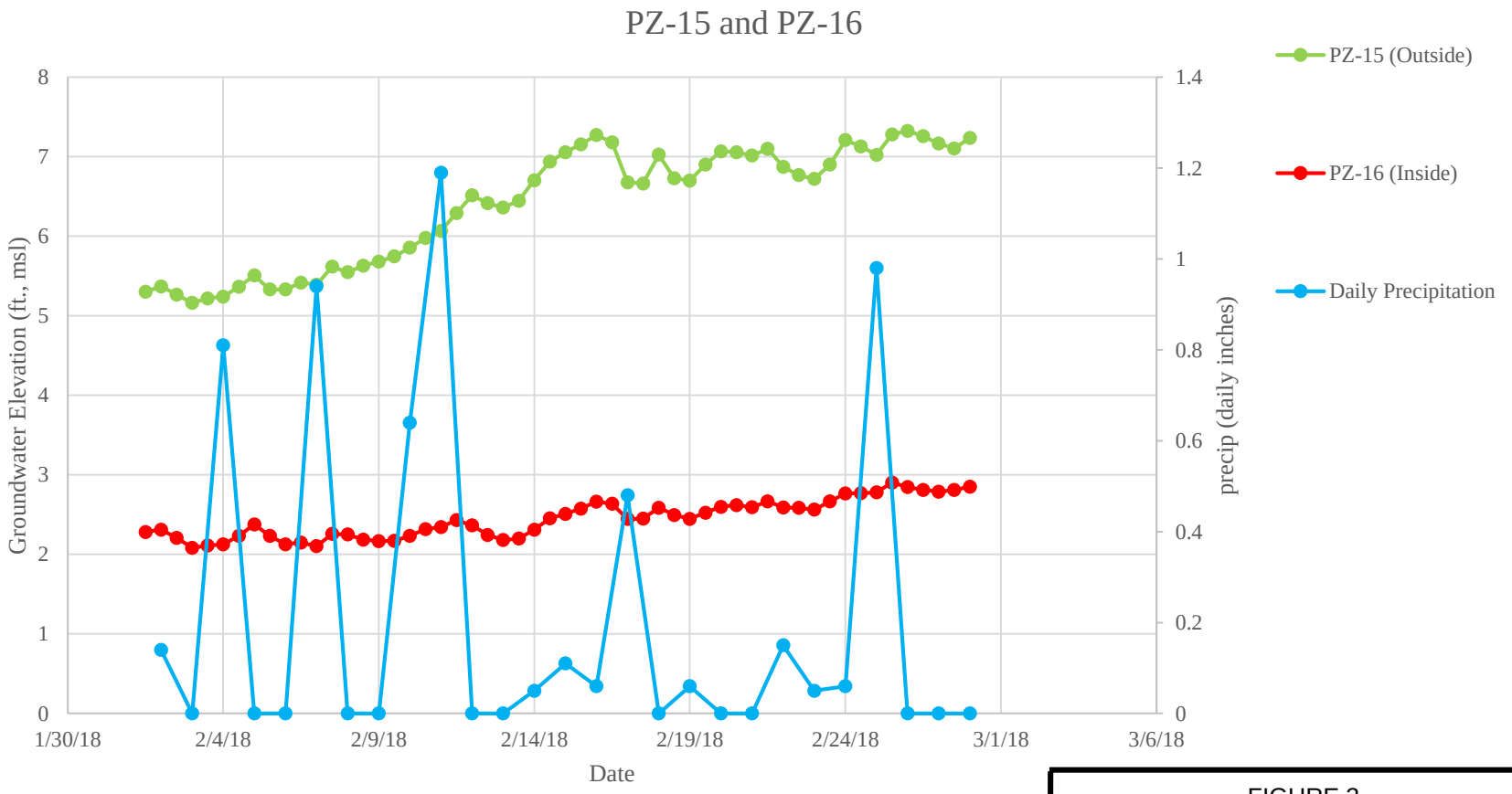

FIGURE 3

Hydrograph of PZ-15 and PZ-16
Data Logger Heads v. Precipitation
February 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

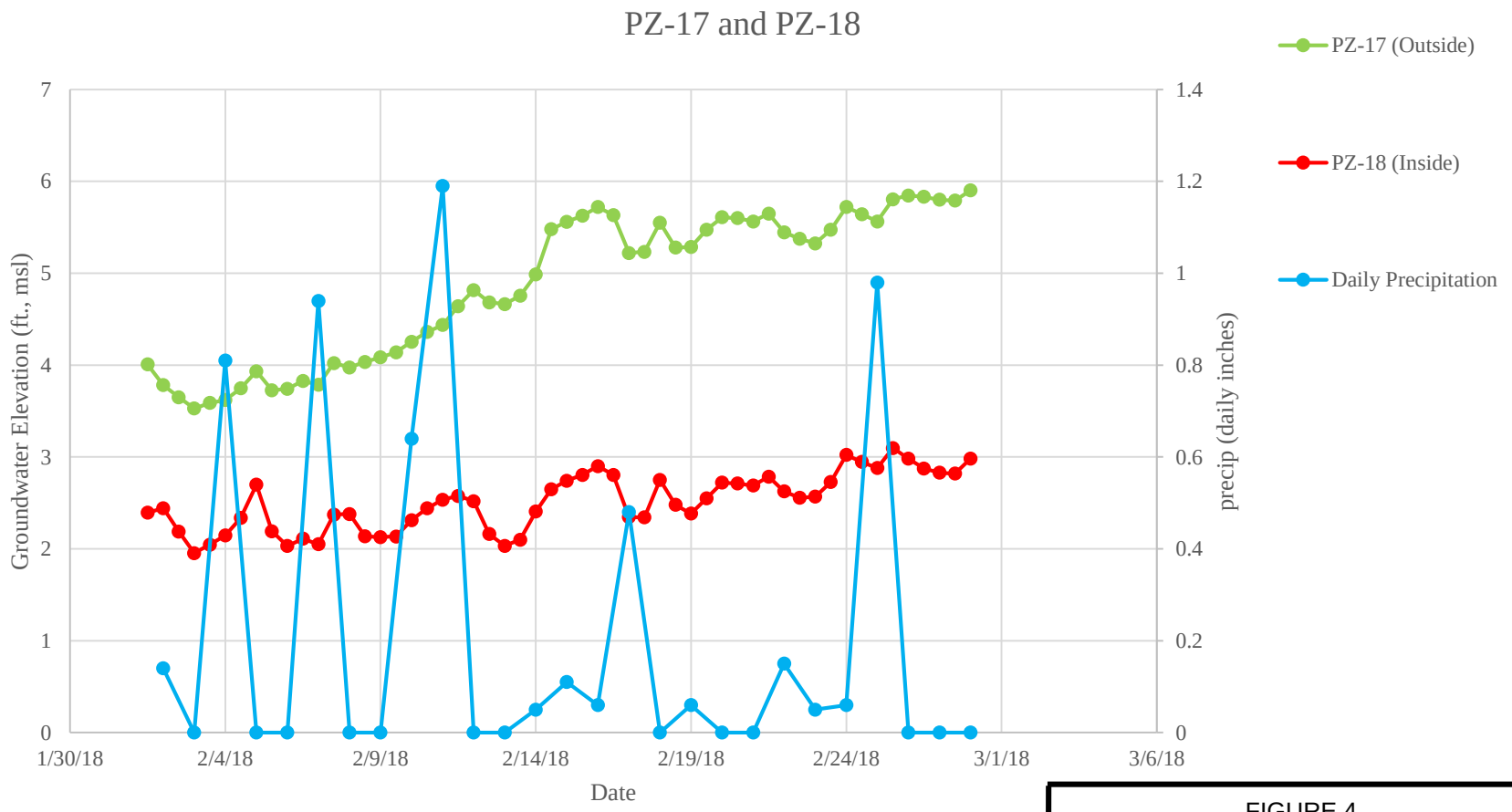

FIGURE 4

Hydrograph of PZ-17 and PZ-18
Data Logger Heads v. Precipitation
February 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

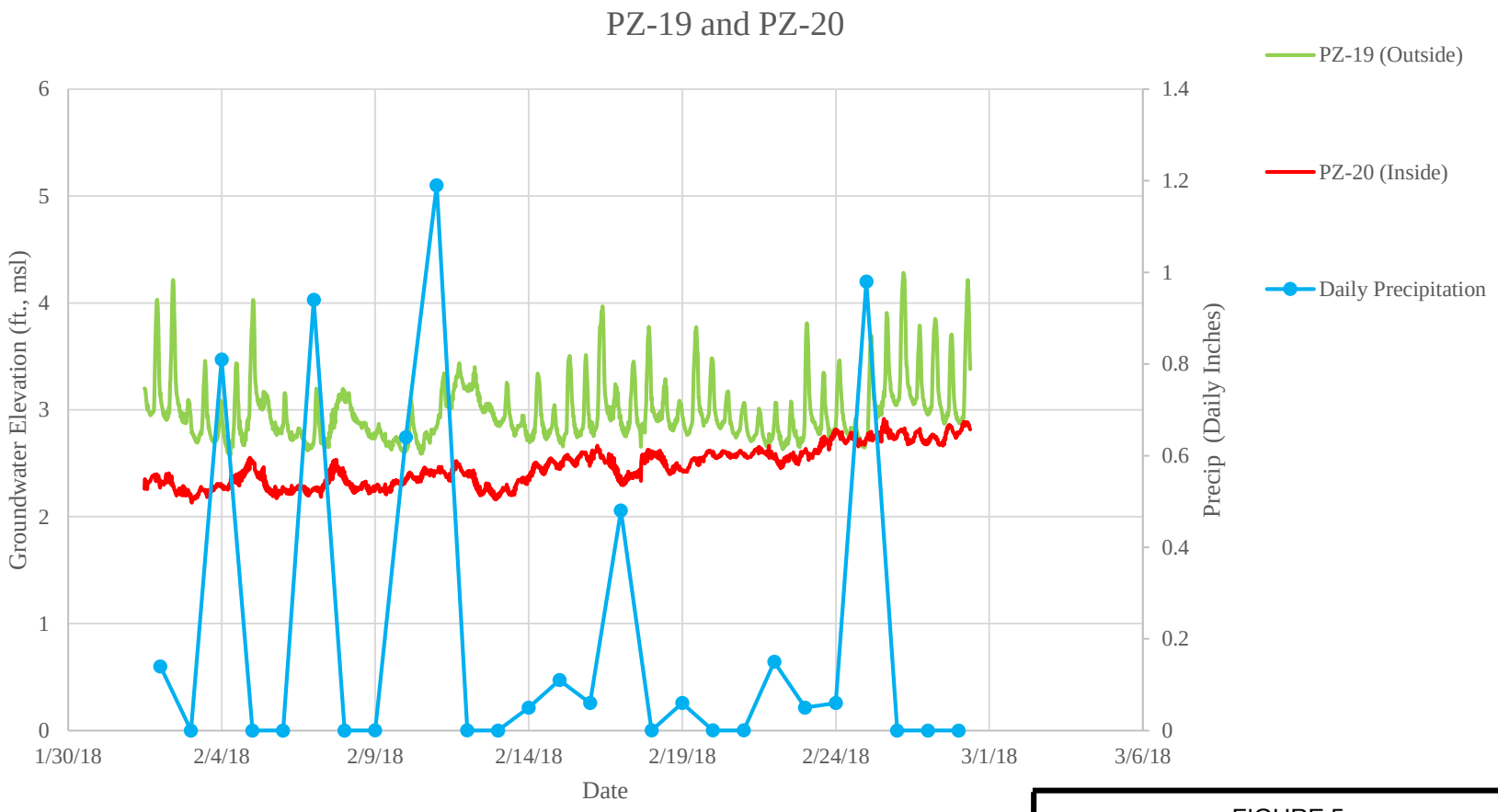

FIGURE 5

Hydrograph of PZ-19 and PZ-20
Data Logger Heads v. Precipitation
February 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 15-minute intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

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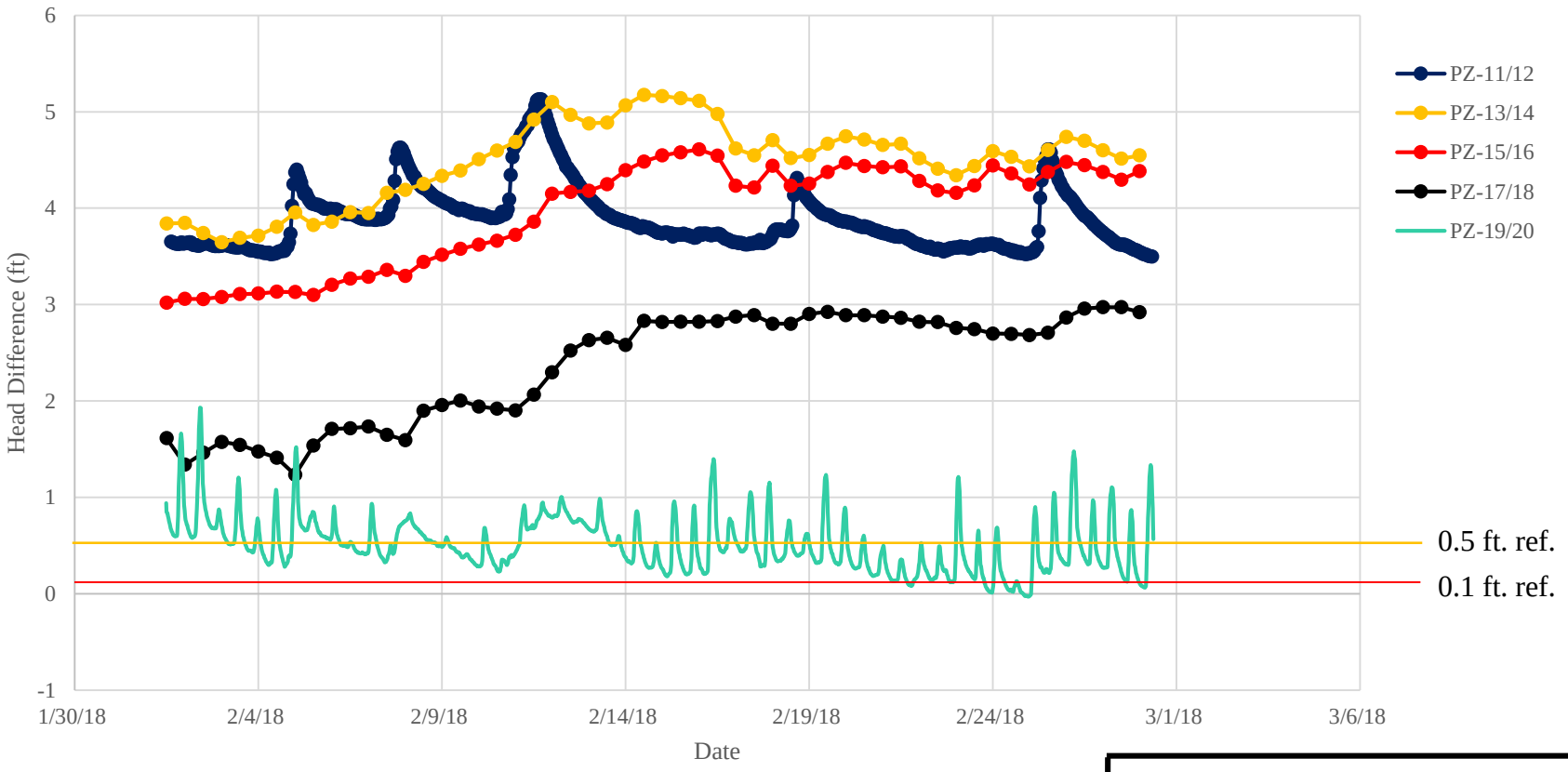

FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – February 2018

Study Area 6, Jersey City, NJ

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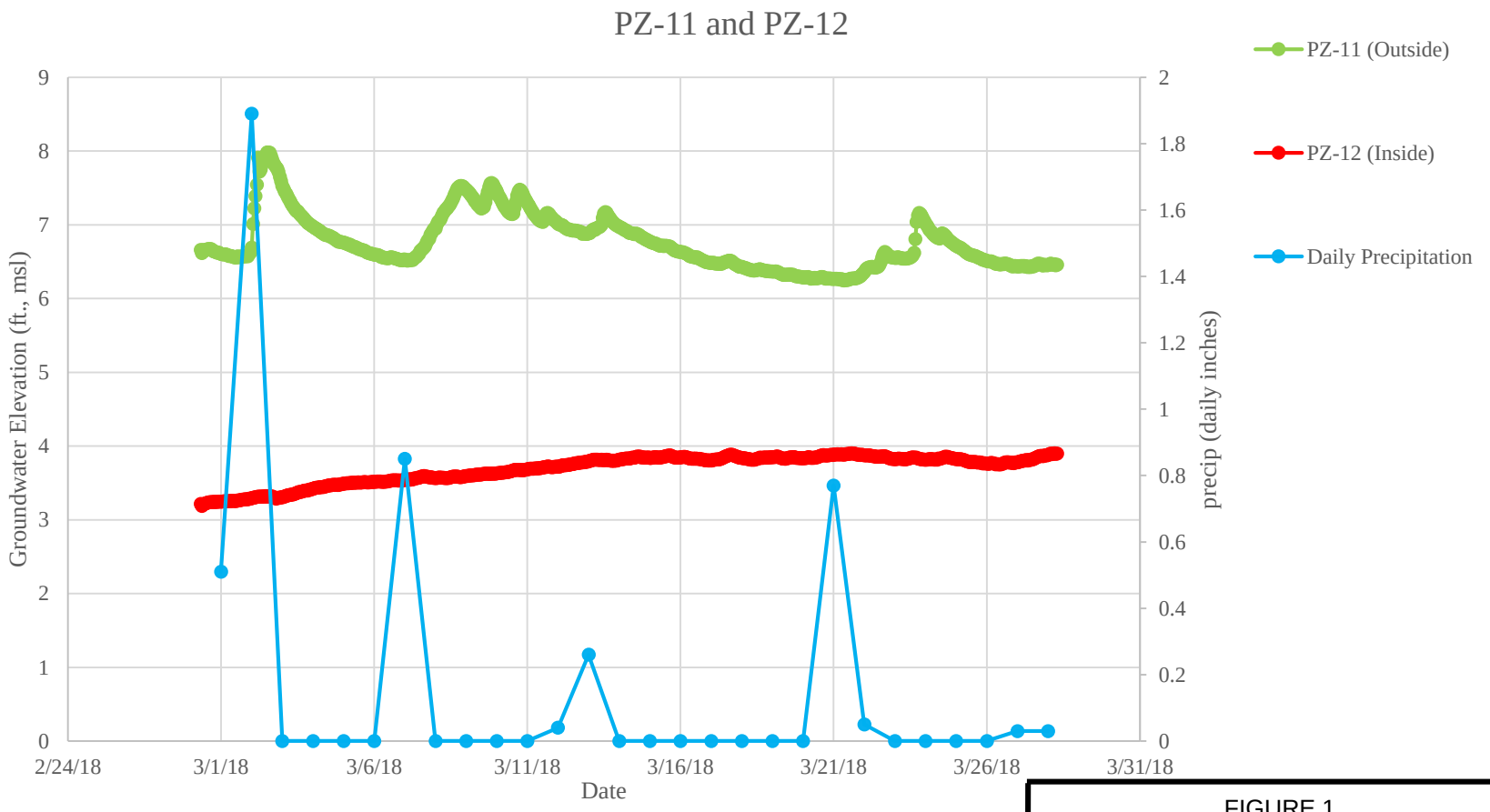

FIGURE 1

Hydrograph of PZ-11 and PZ-12
Data Logger Heads v. Precipitation
March 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at one-hour intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

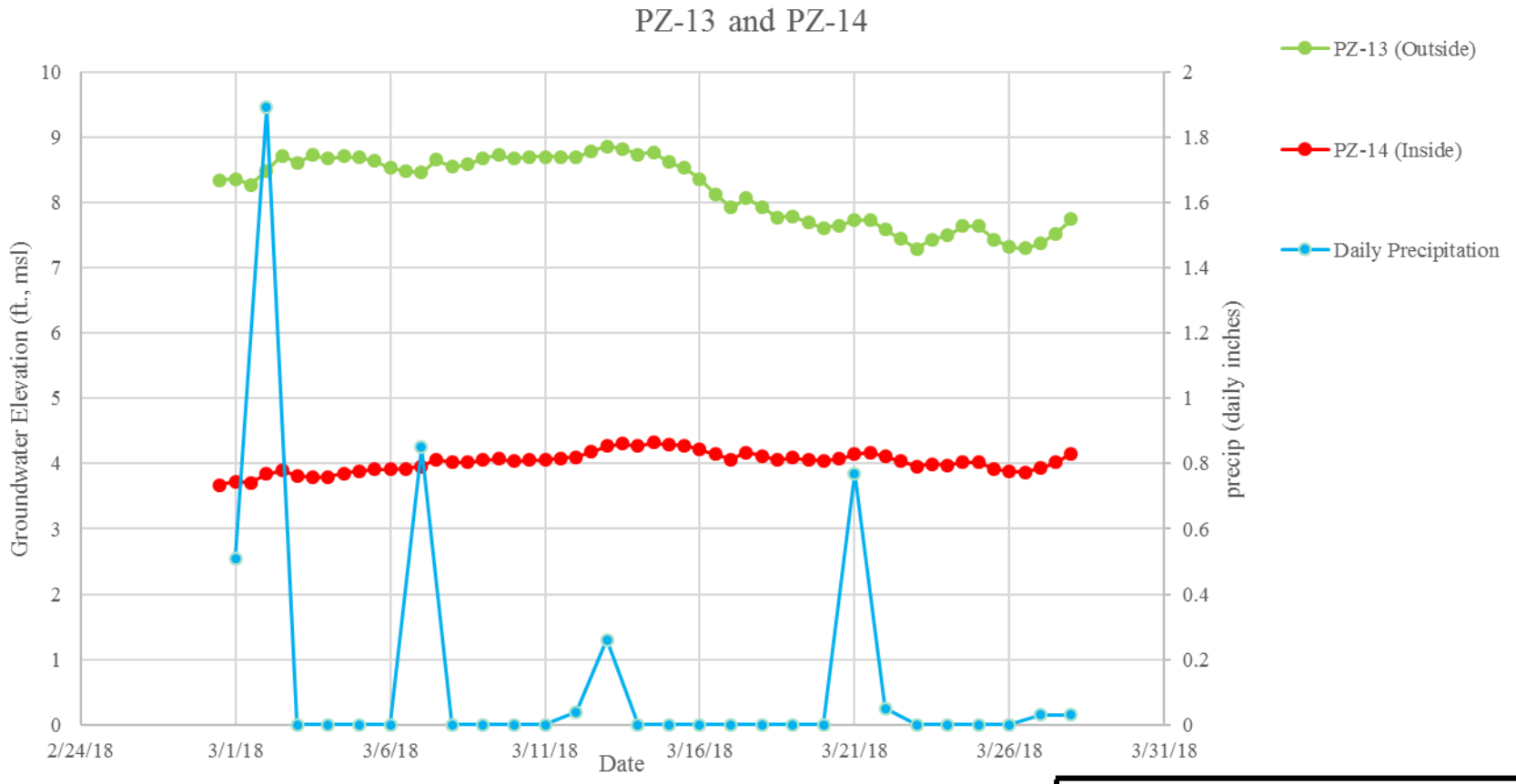

FIGURE 2

Hydrograph of PZ-13 and PZ-14
Data Logger Heads v. Precipitation
March 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

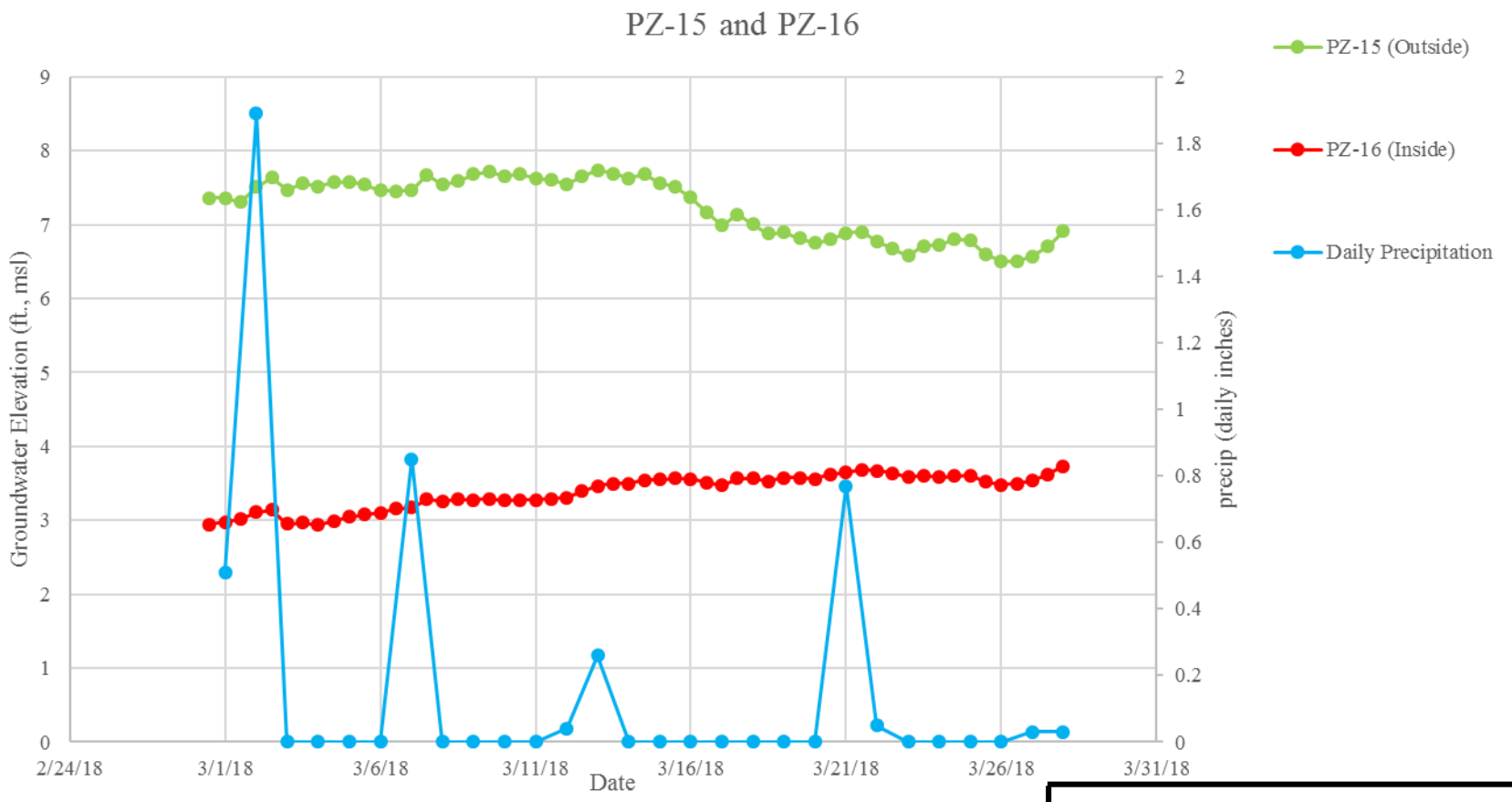

FIGURE 3

Hydrograph of PZ-15 and PZ-16
Data Logger Heads v. Precipitation
March 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

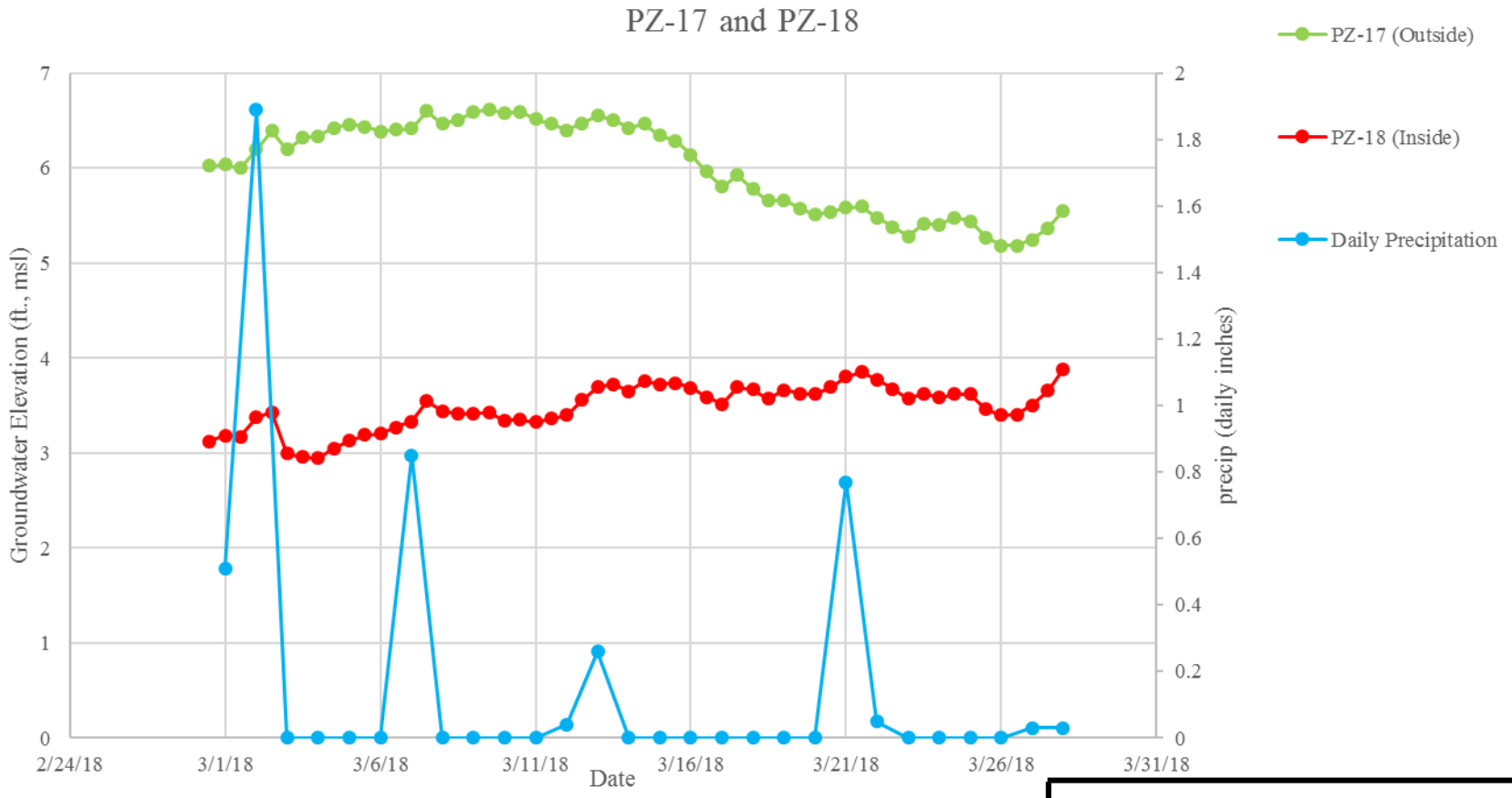

FIGURE 4

Hydrograph of PZ-17 and PZ-18
Data Logger Heads v. Precipitation
March 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

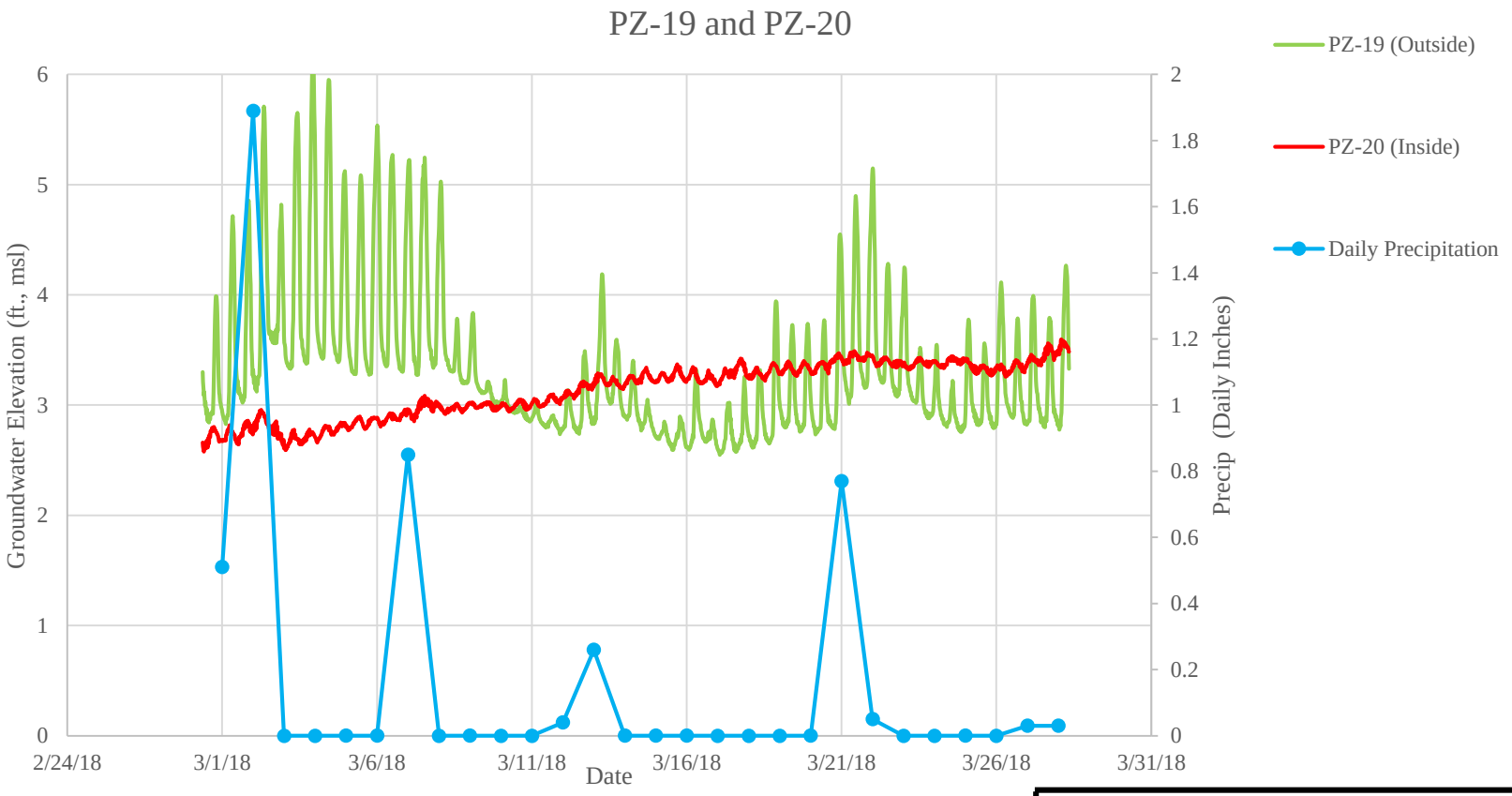

FIGURE 5

Hydrograph of PZ-19 and PZ-20
Data Logger Heads v. Precipitation
March 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 15-minute intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

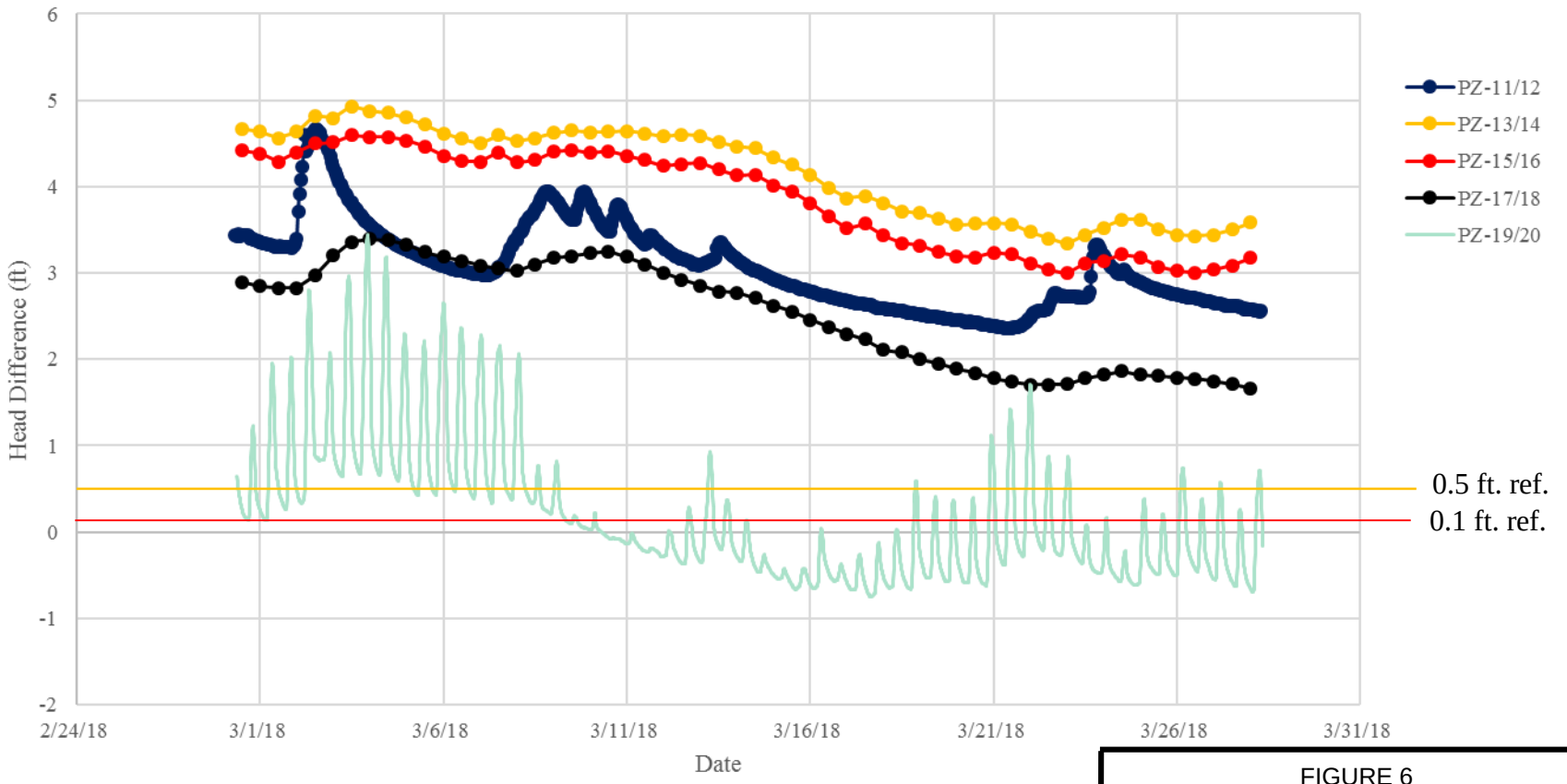

FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – March 2018

Study Area 6, Jersey City, NJ

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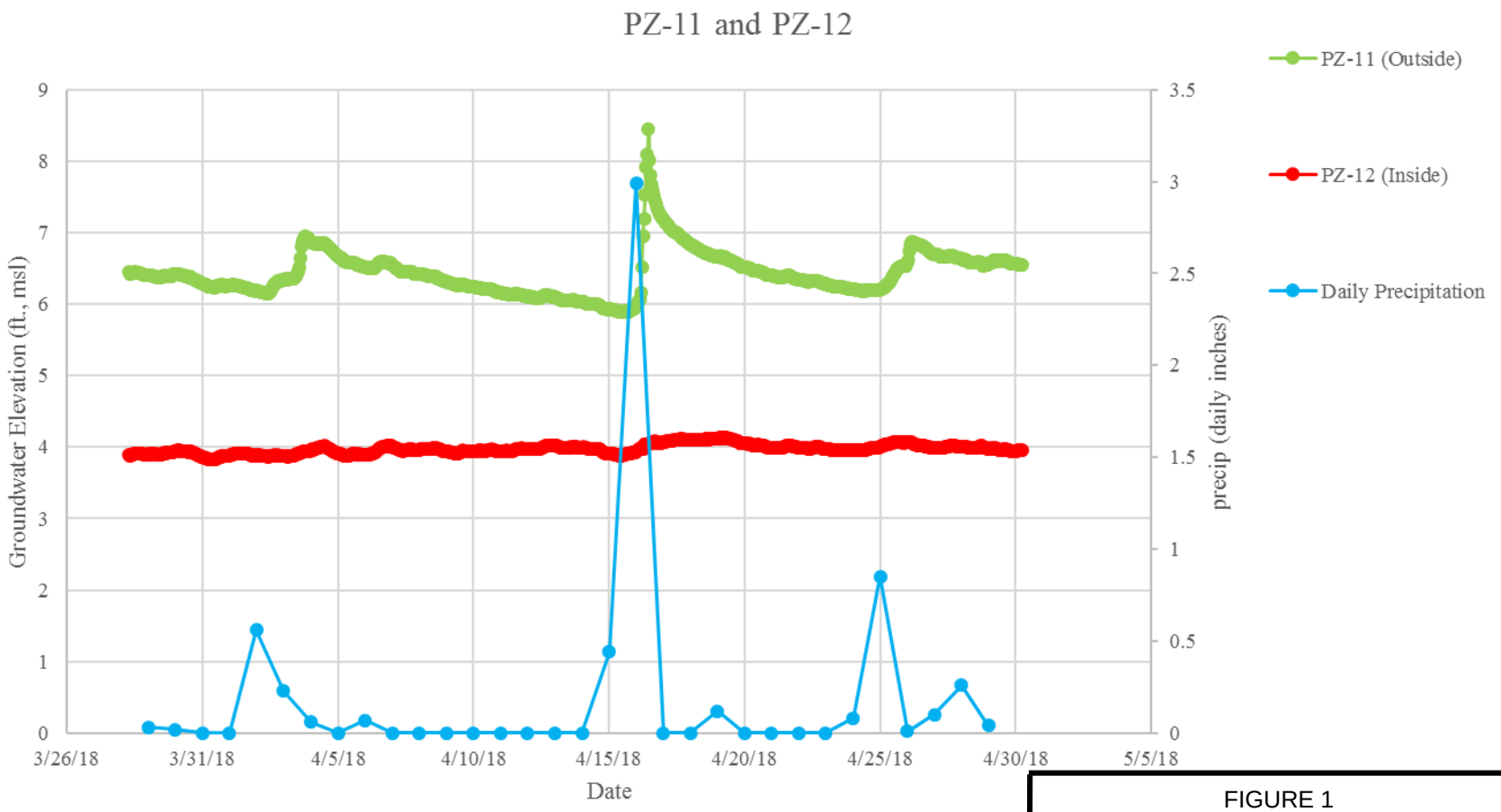

FIGURE 1

Hydrograph of PZ-11 and PZ-12
Data Logger Heads v. Precipitation
April 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at one-hour intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

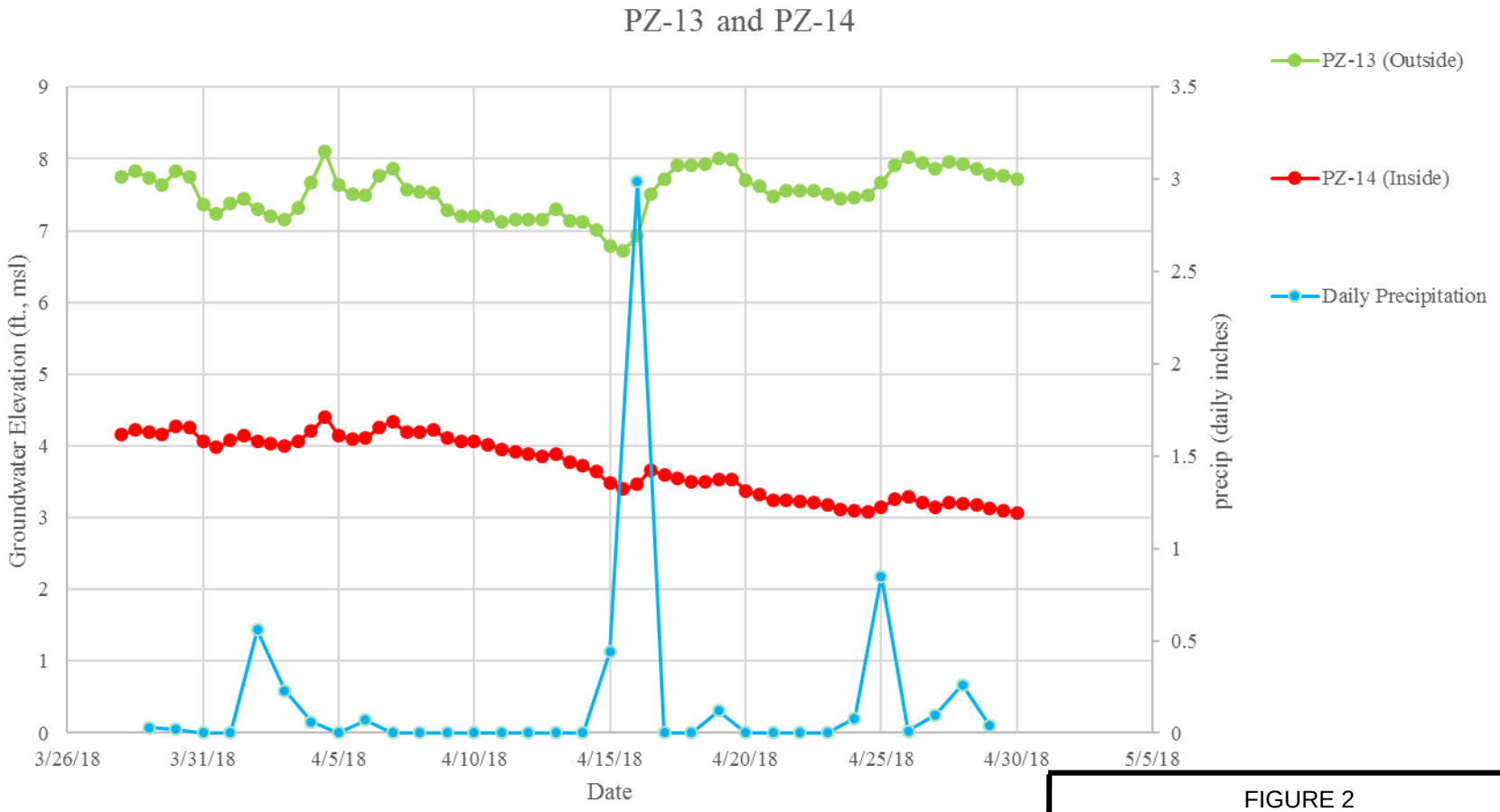

FIGURE 2

Hydrograph of PZ-13 and PZ-14
Data Logger Heads v. Precipitation
April 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

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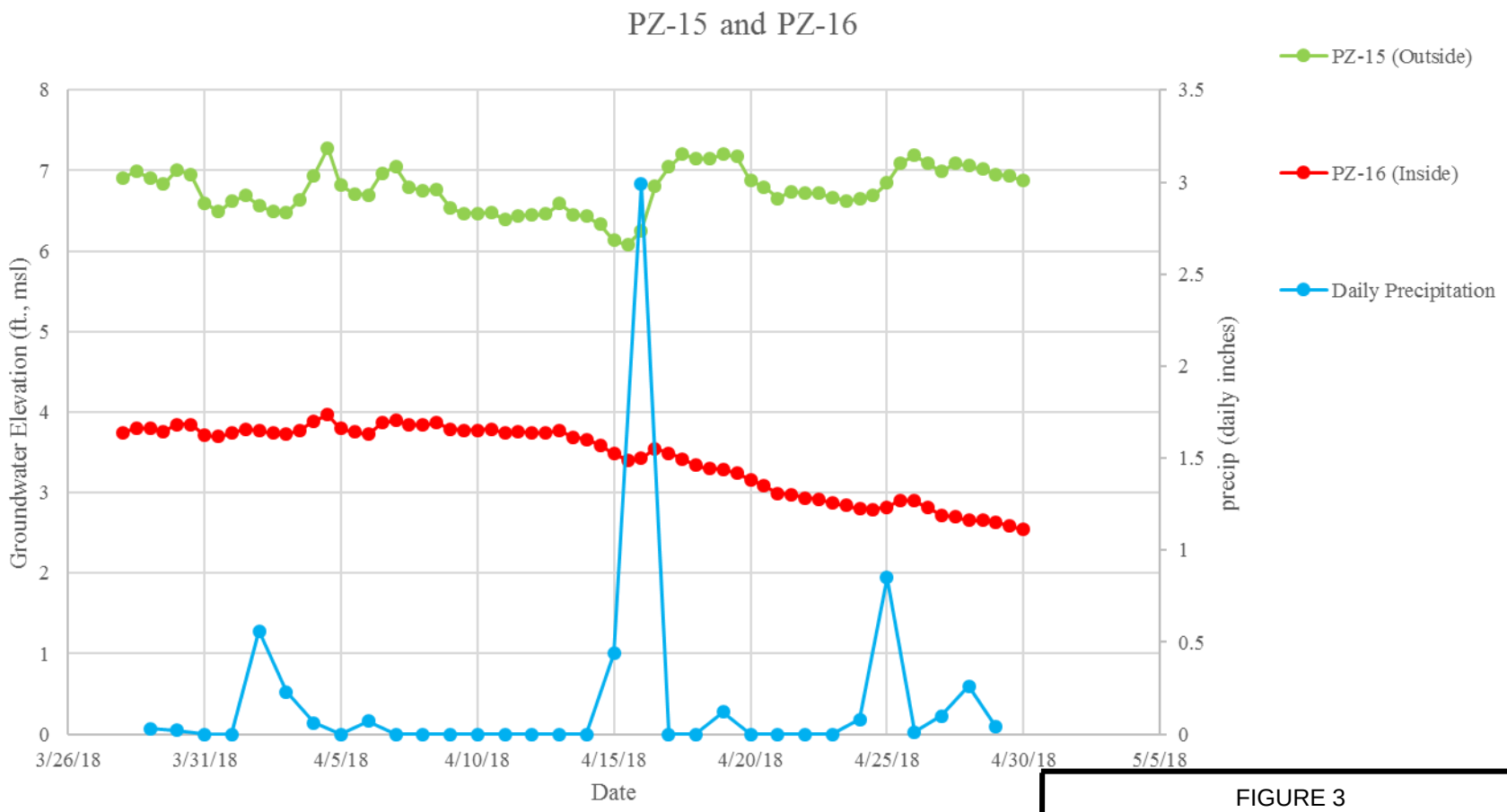

FIGURE 3

Hydrograph of PZ-15 and PZ-16
Data Logger Heads v. Precipitation
April 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

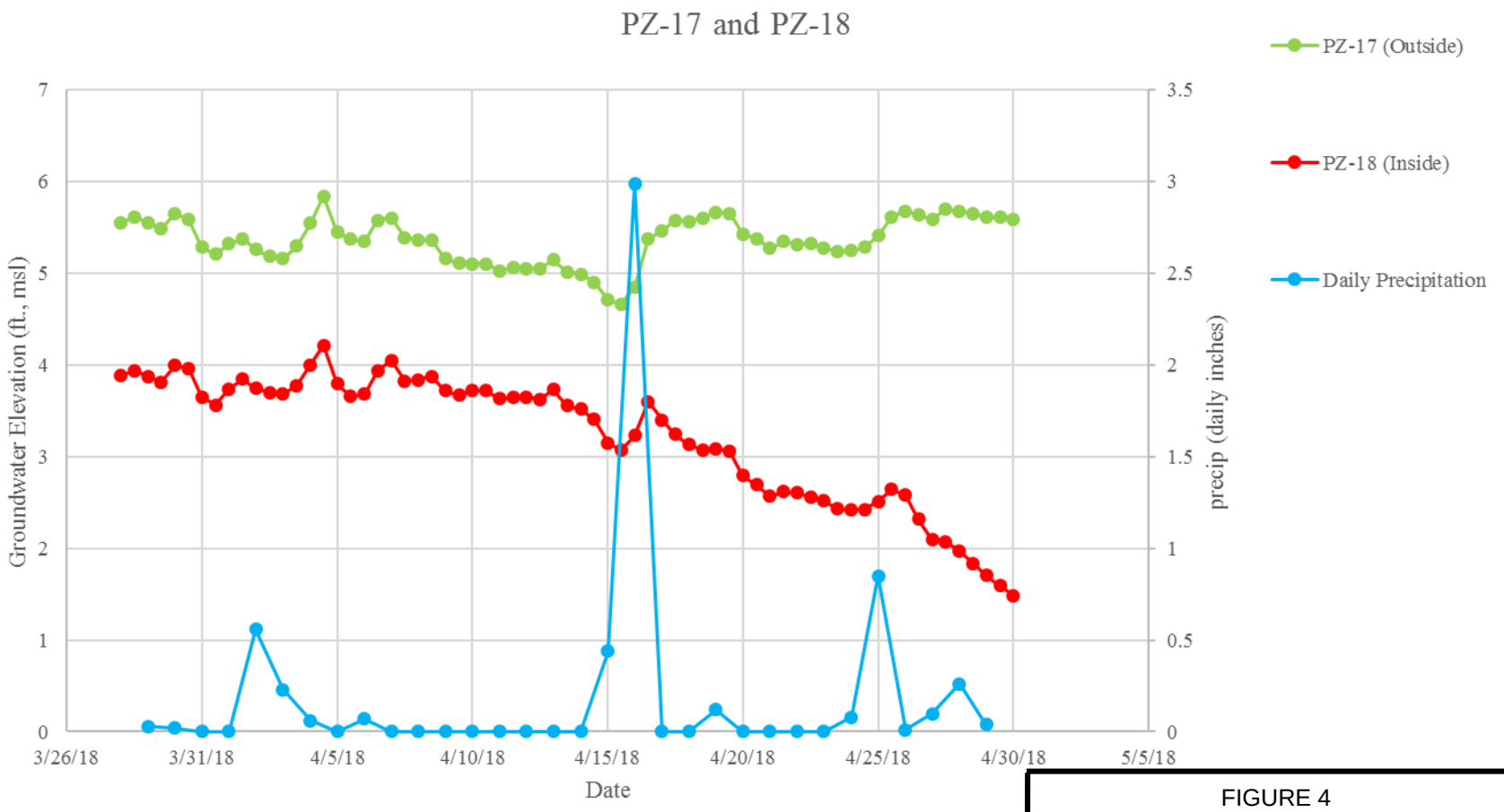

FIGURE 4

Hydrograph of PZ-17 and PZ-18
Data Logger Heads v. Precipitation
April 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

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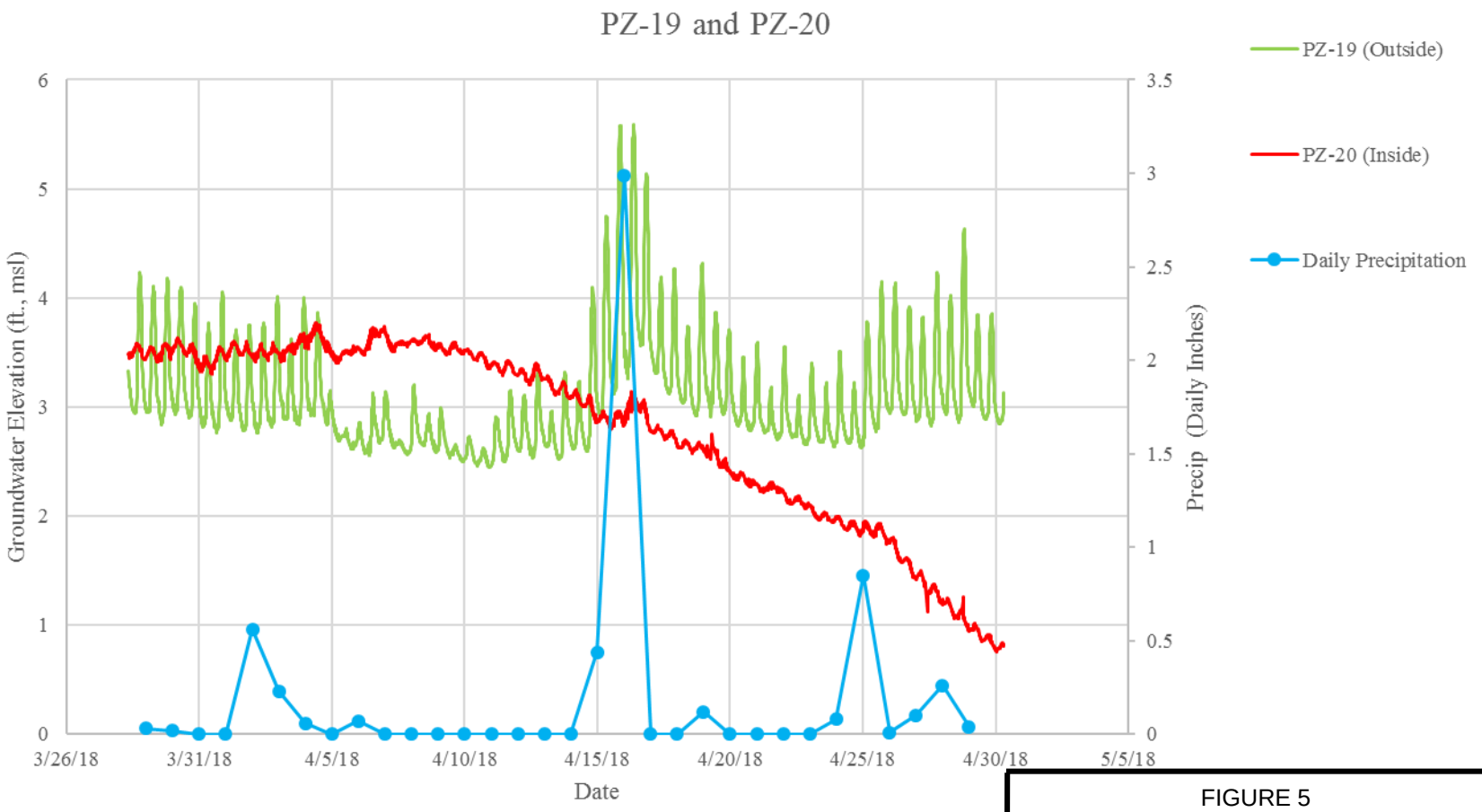

FIGURE 5

Hydrograph of PZ-19 and PZ-20
Data Logger Heads v. Precipitation
April 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 15-minute intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

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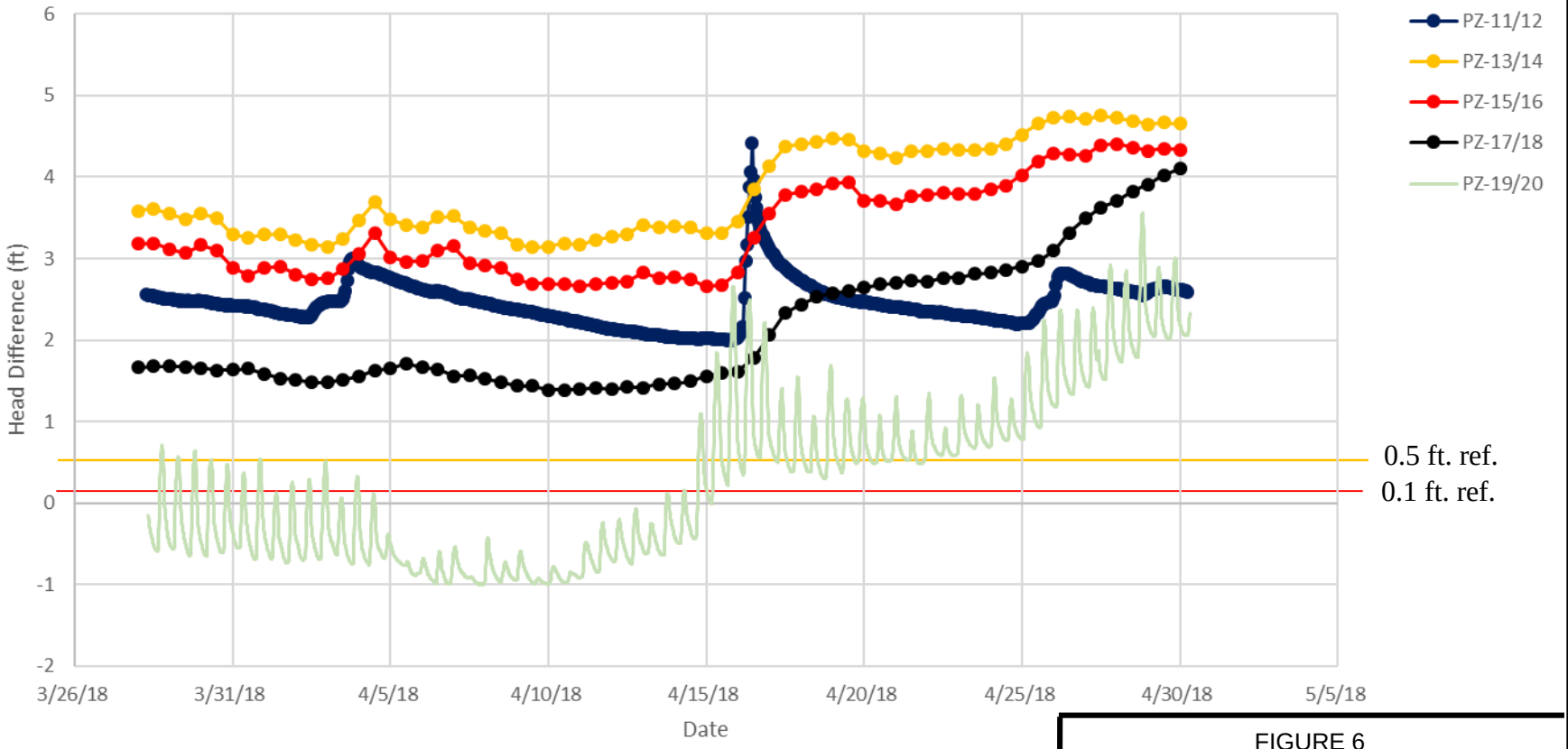

FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – April 2018

Study Area 6, Jersey City, NJ

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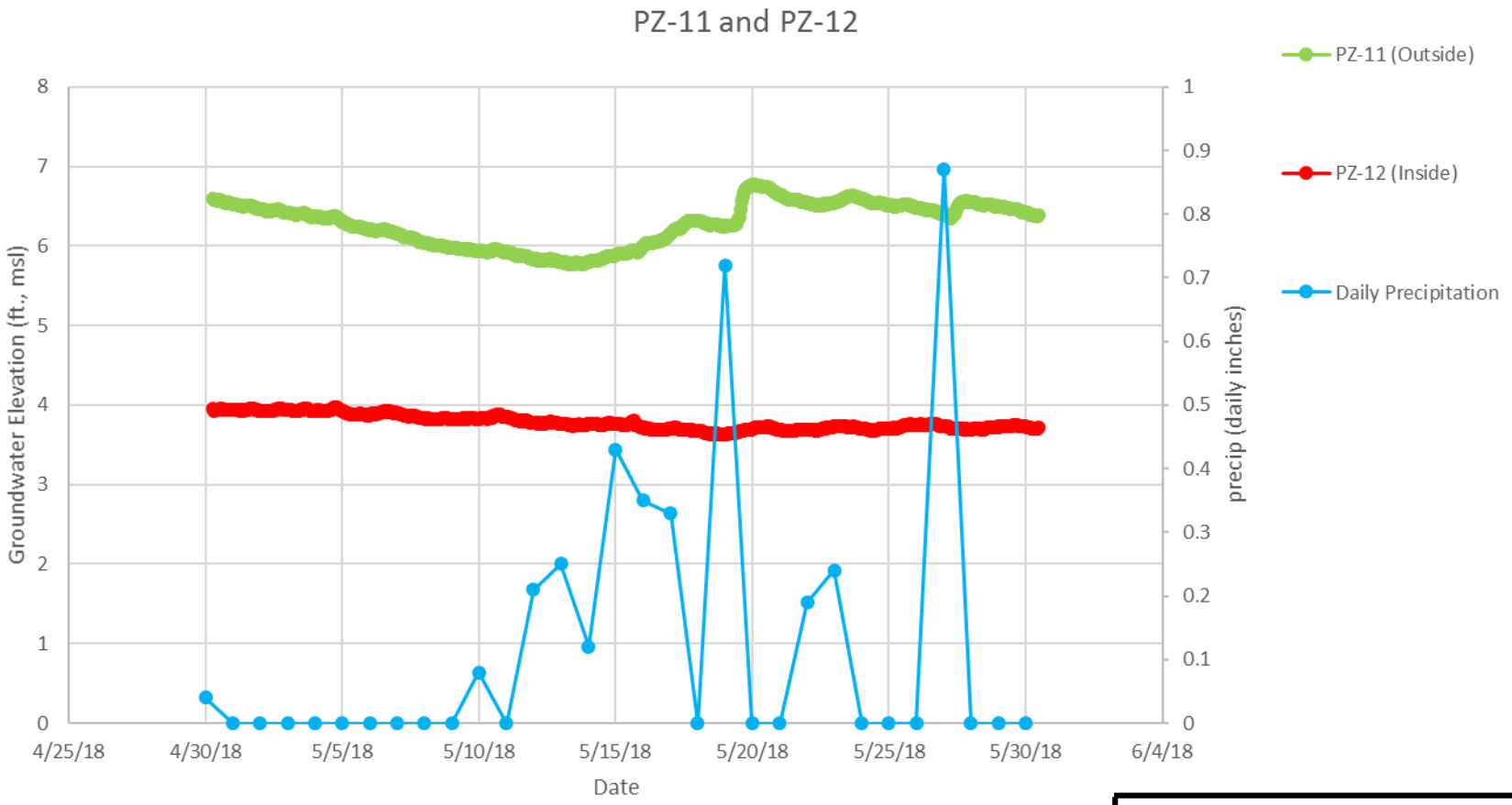


FIGURE 1

Hydrograph of PZ-11 and PZ-12
Data Logger Heads v. Precipitation
May 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at one-hour intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

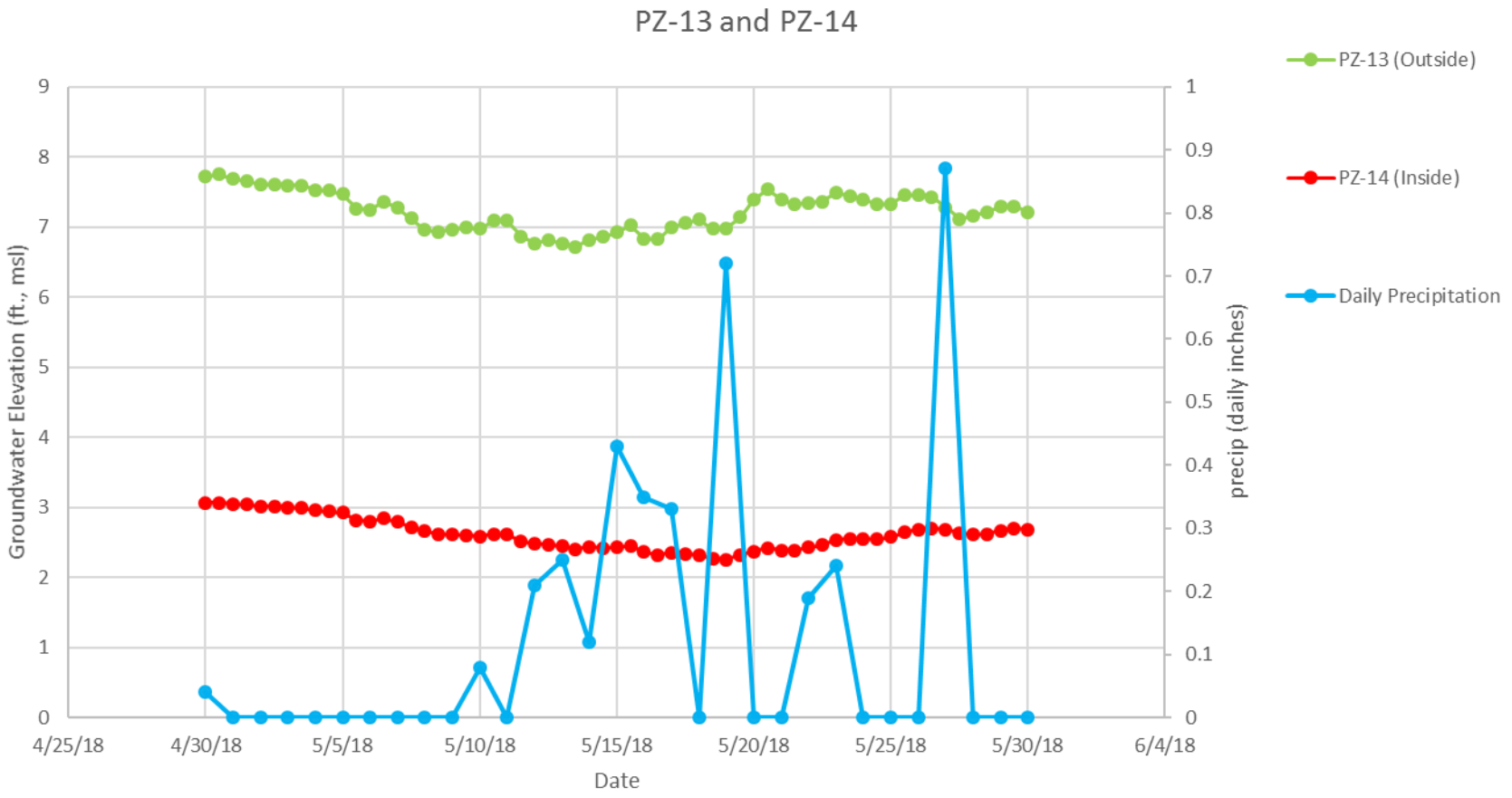


FIGURE 2

Hydrograph of PZ-13 and PZ-14
Data Logger Heads v. Precipitation
May 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

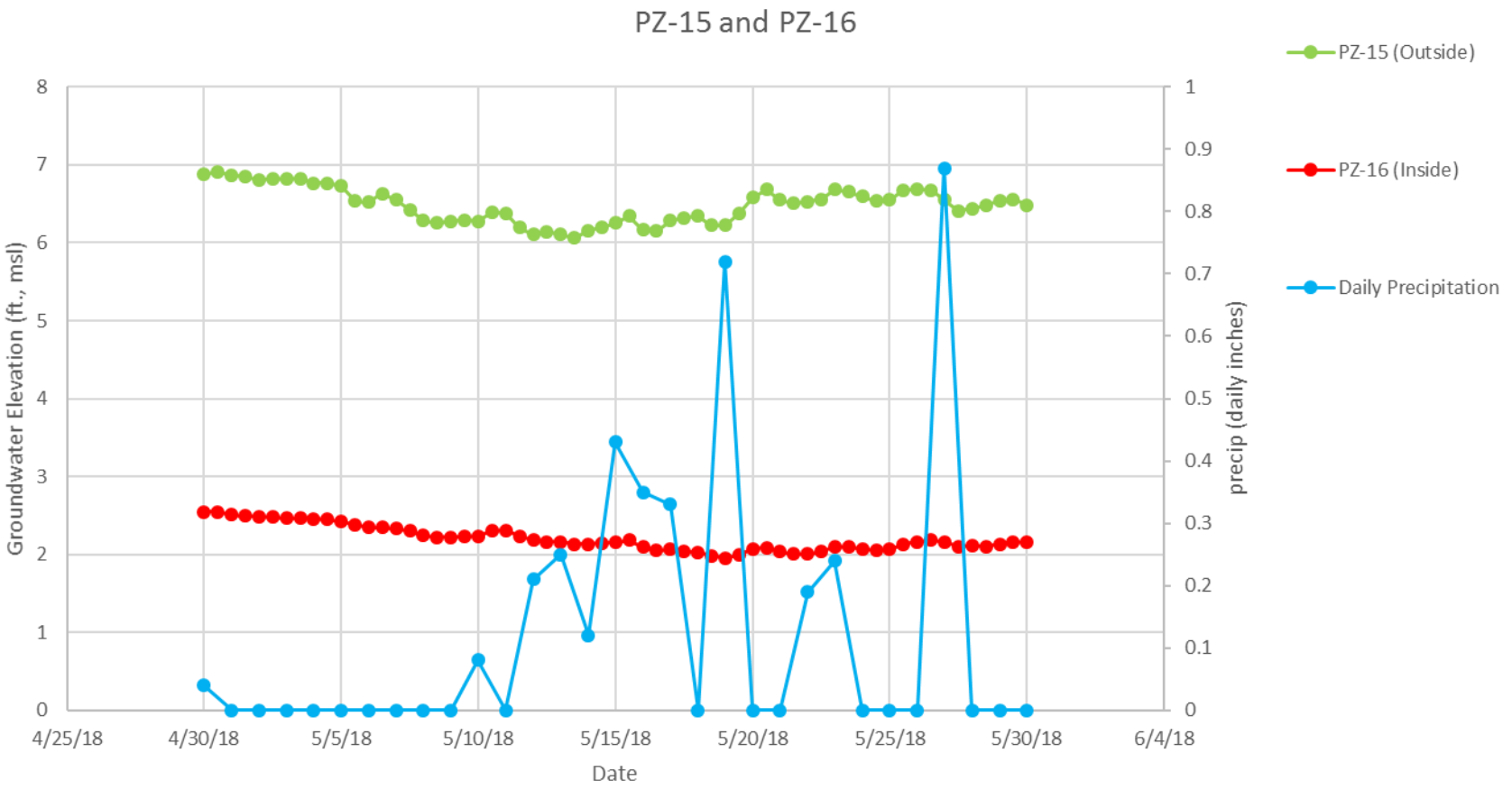


FIGURE 3

Hydrograph of PZ-15 and PZ-16
Data Logger Heads v. Precipitation
May 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

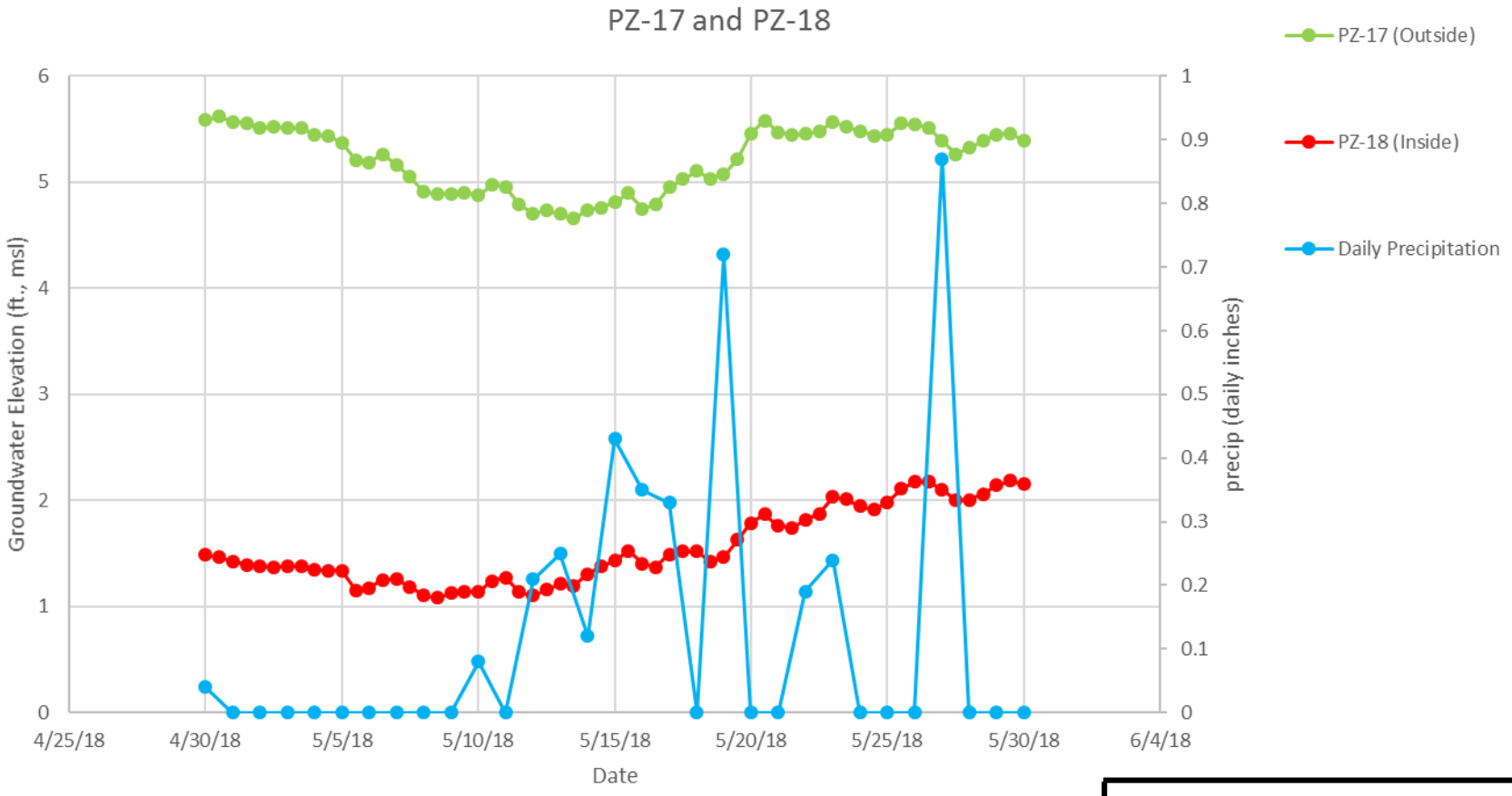


FIGURE 4

Hydrograph of PZ-17 and PZ-18
Data Logger Heads v. Precipitation
May 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

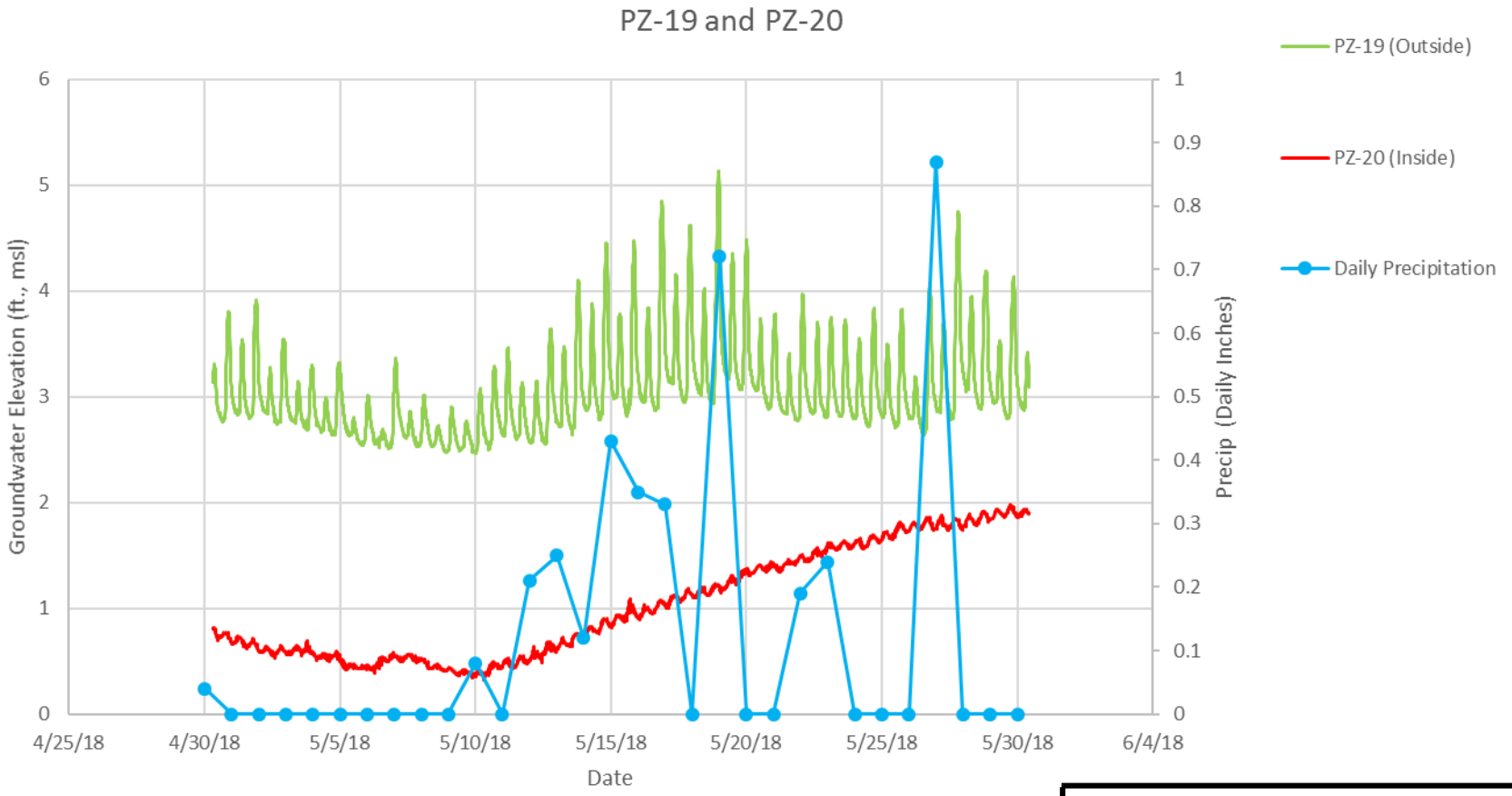


FIGURE 5

Hydrograph of PZ-19 and PZ-20
Data Logger Heads v. Precipitation
May 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 15-minute intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

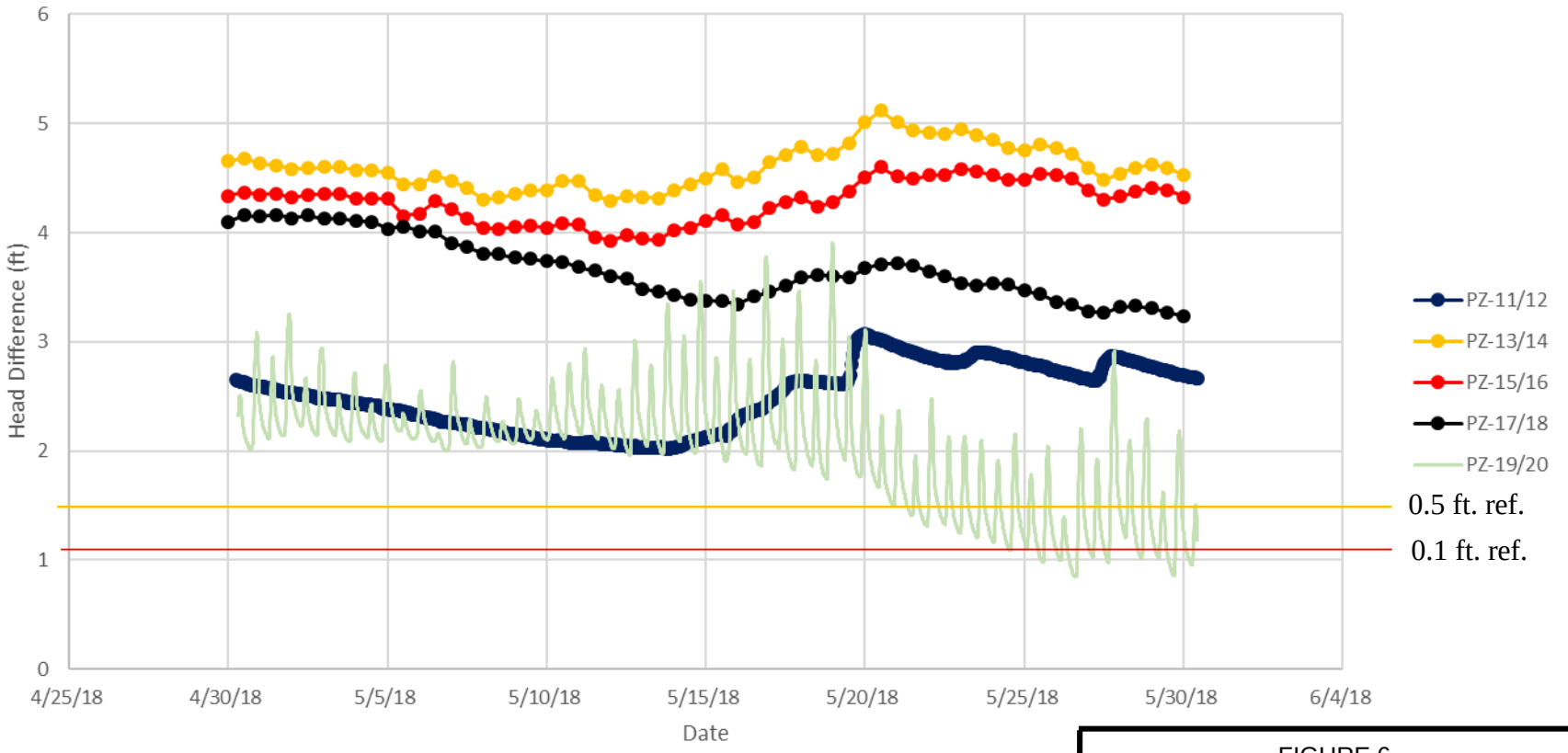


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – May 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

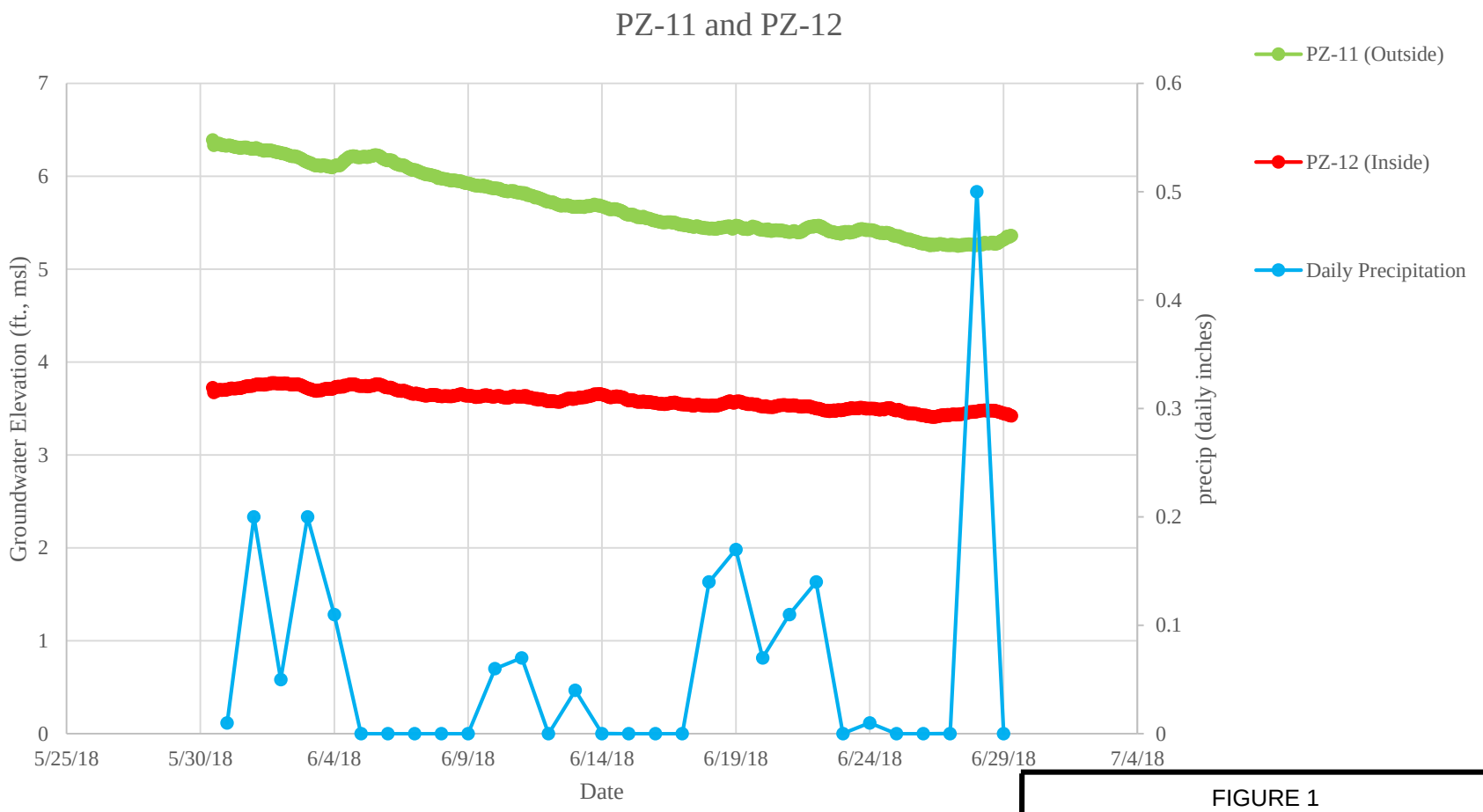


FIGURE 1

Hydrograph of PZ-11 and PZ-12
Data Logger Heads v. Precipitation
June 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at one-hour intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

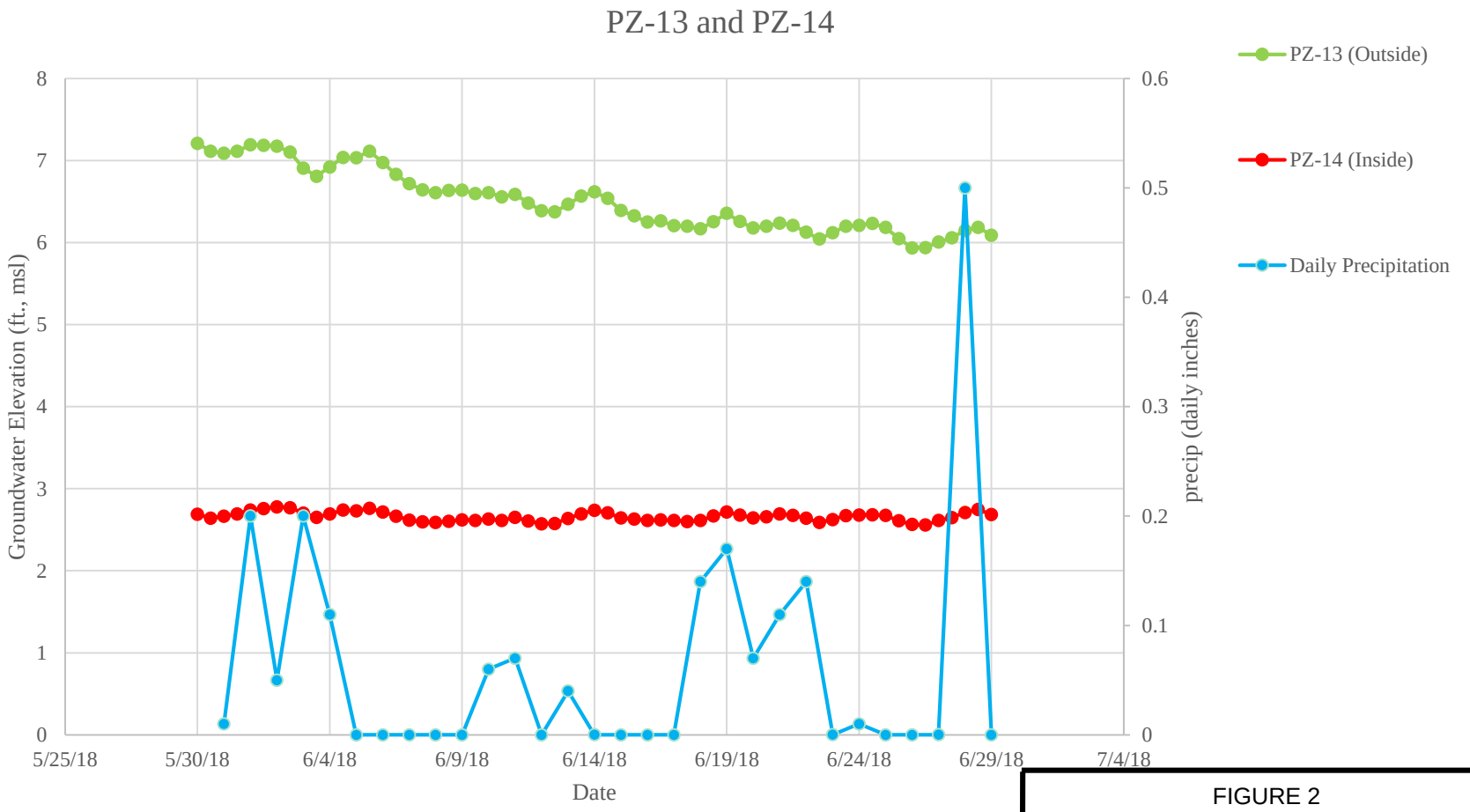


FIGURE 2

Hydrograph of PZ-13 and PZ-14
Data Logger Heads v. Precipitation
June 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

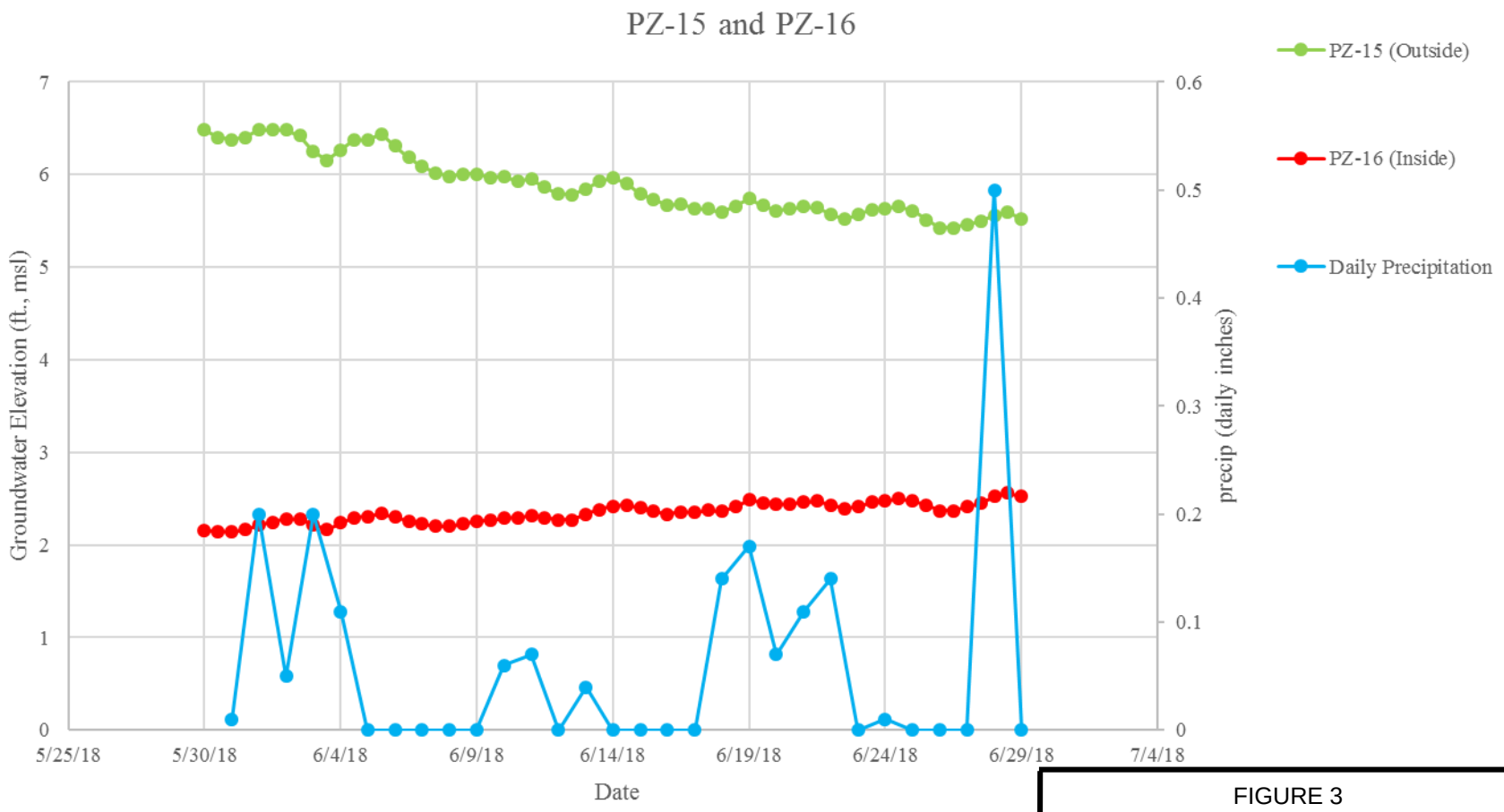


FIGURE 3

Hydrograph of PZ-15 and PZ-16
Data Logger Heads v. Precipitation
June 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

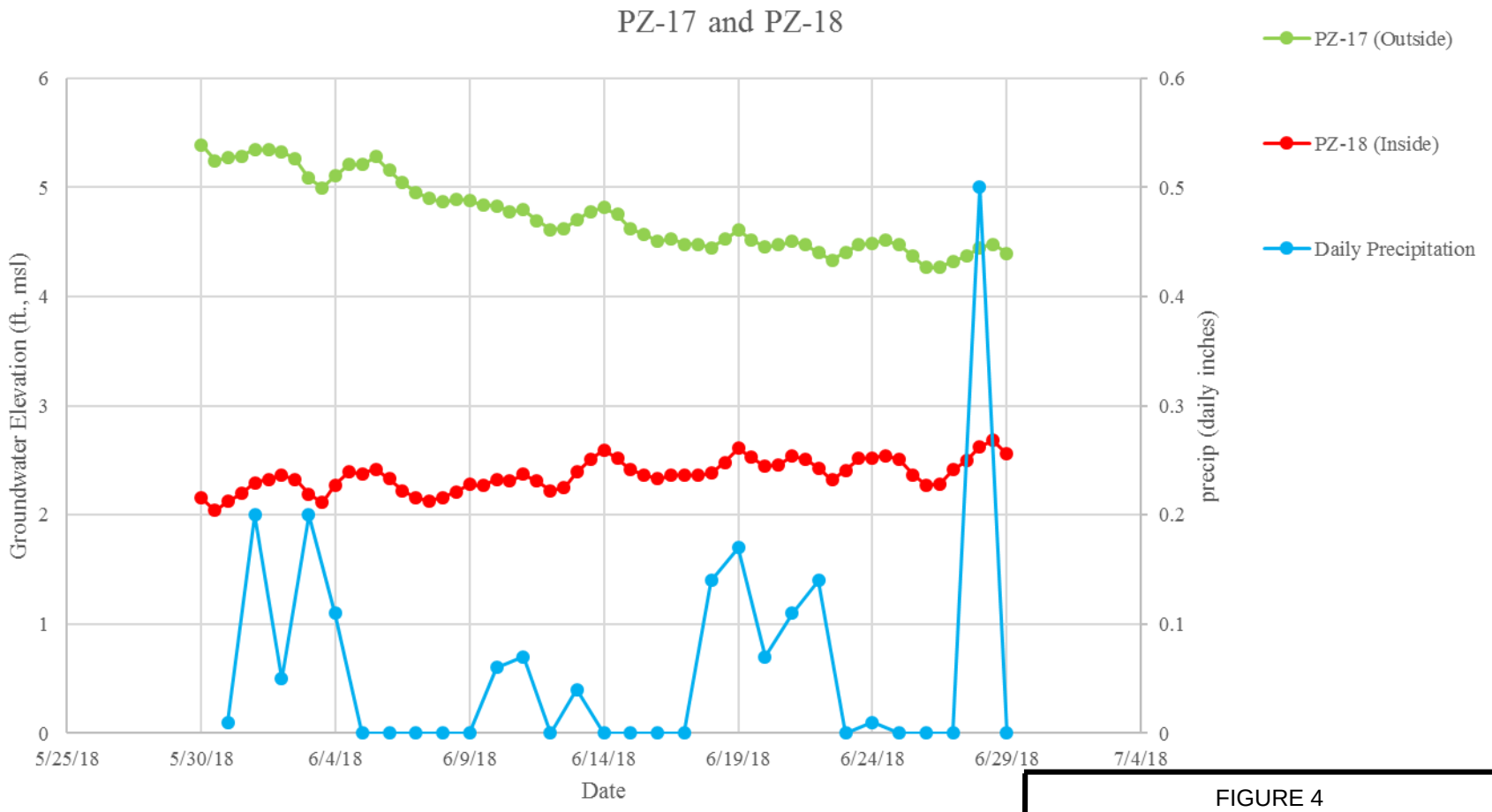


FIGURE 4

Hydrograph of PZ-17 and PZ-18
Data Logger Heads v. Precipitation
June 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

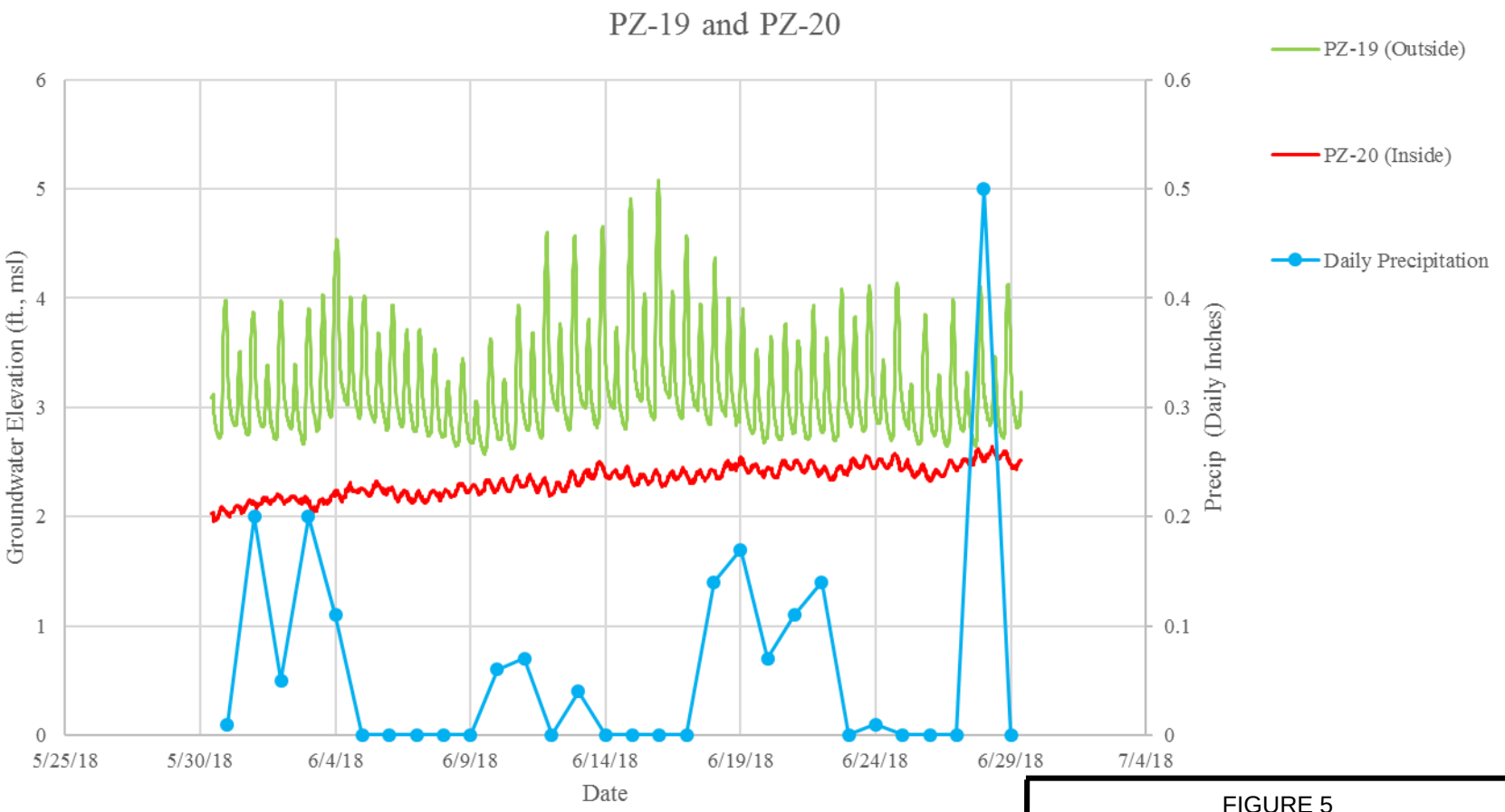


FIGURE 5

Hydrograph of PZ-19 and PZ-20
Data Logger Heads v. Precipitation
June 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 15-minute intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

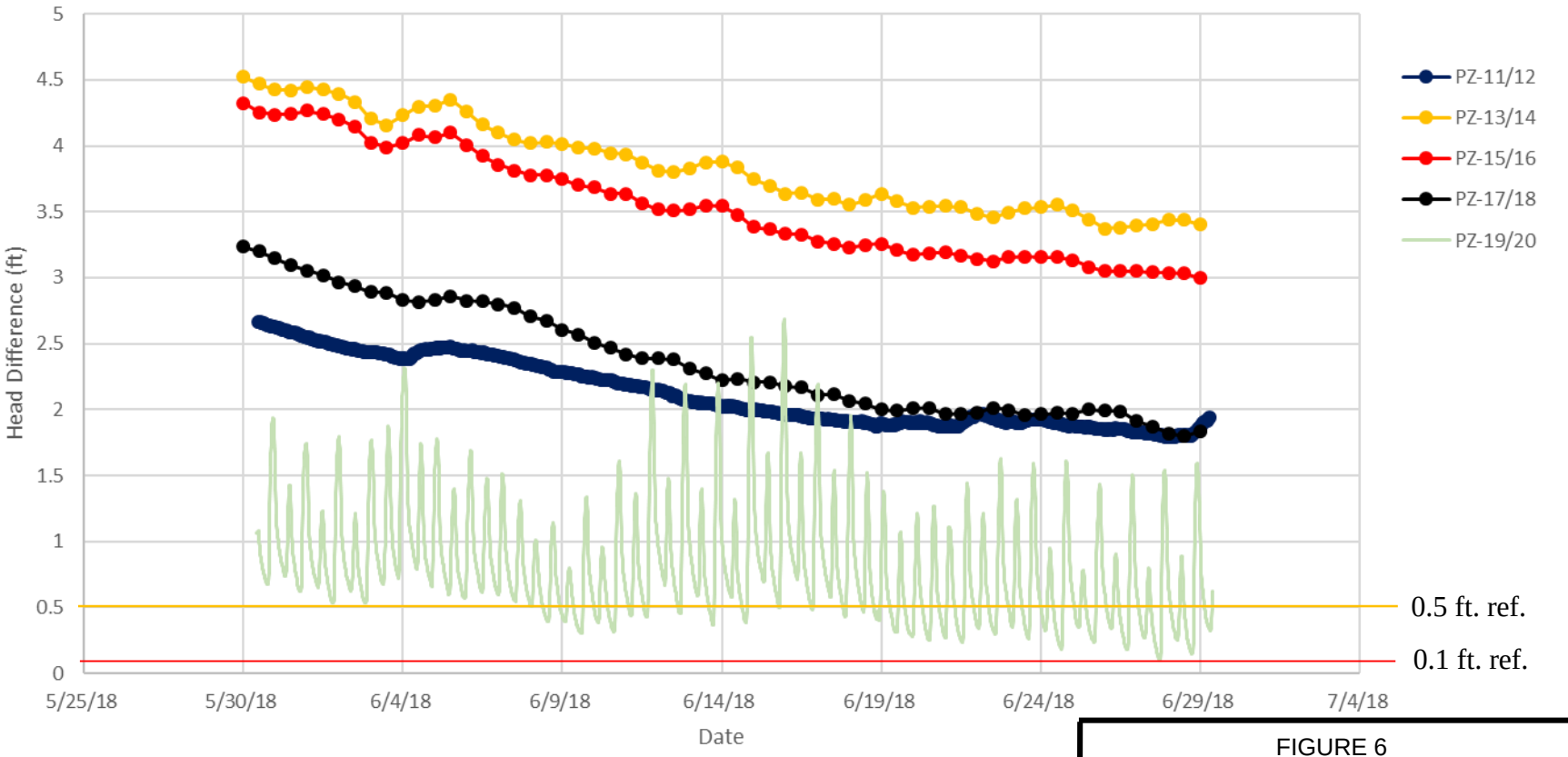


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – June 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

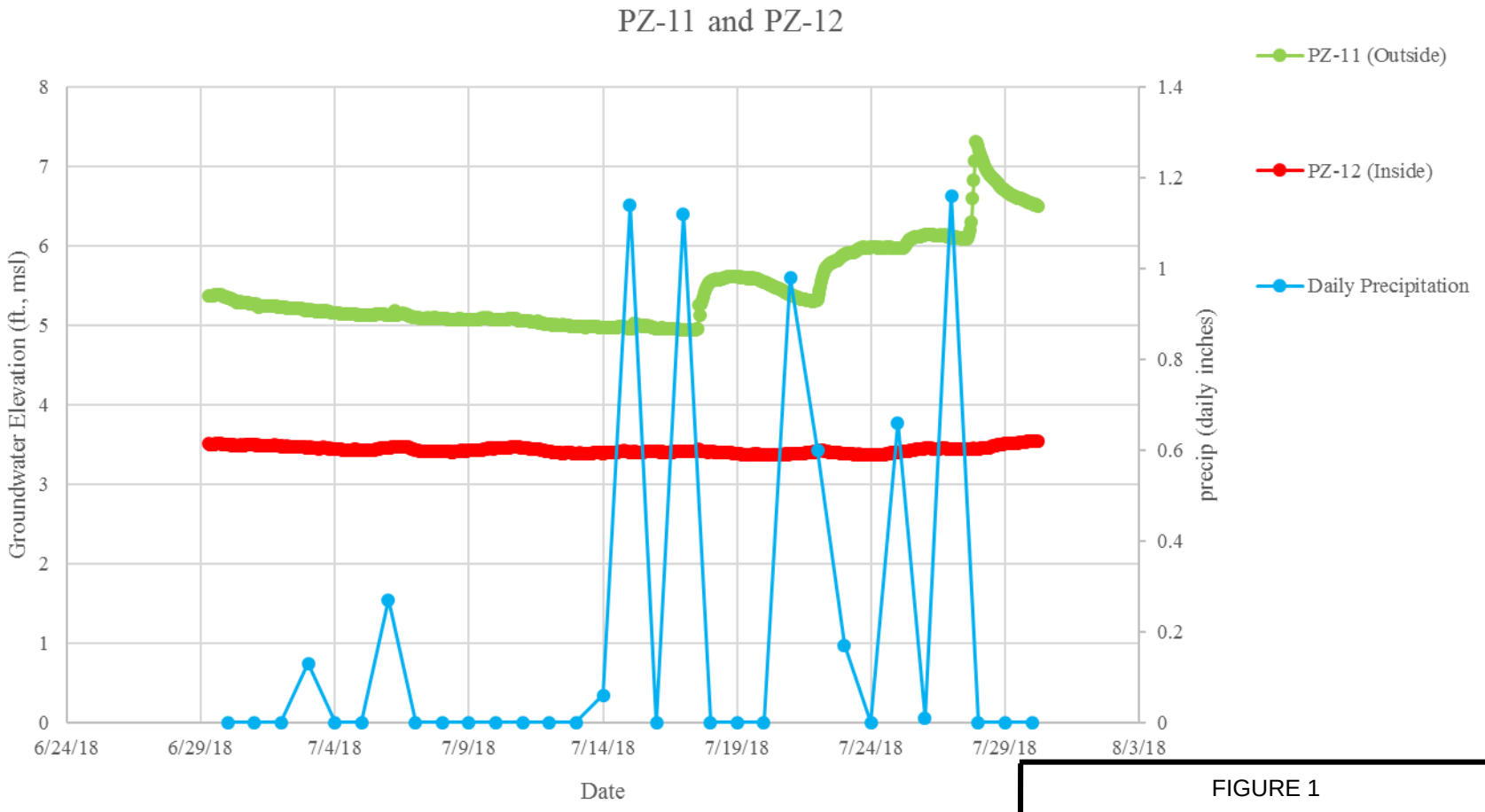


FIGURE 1

Hydrograph of PZ-11 and PZ-12
Data Logger Heads v. Precipitation
July 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at one-hour intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

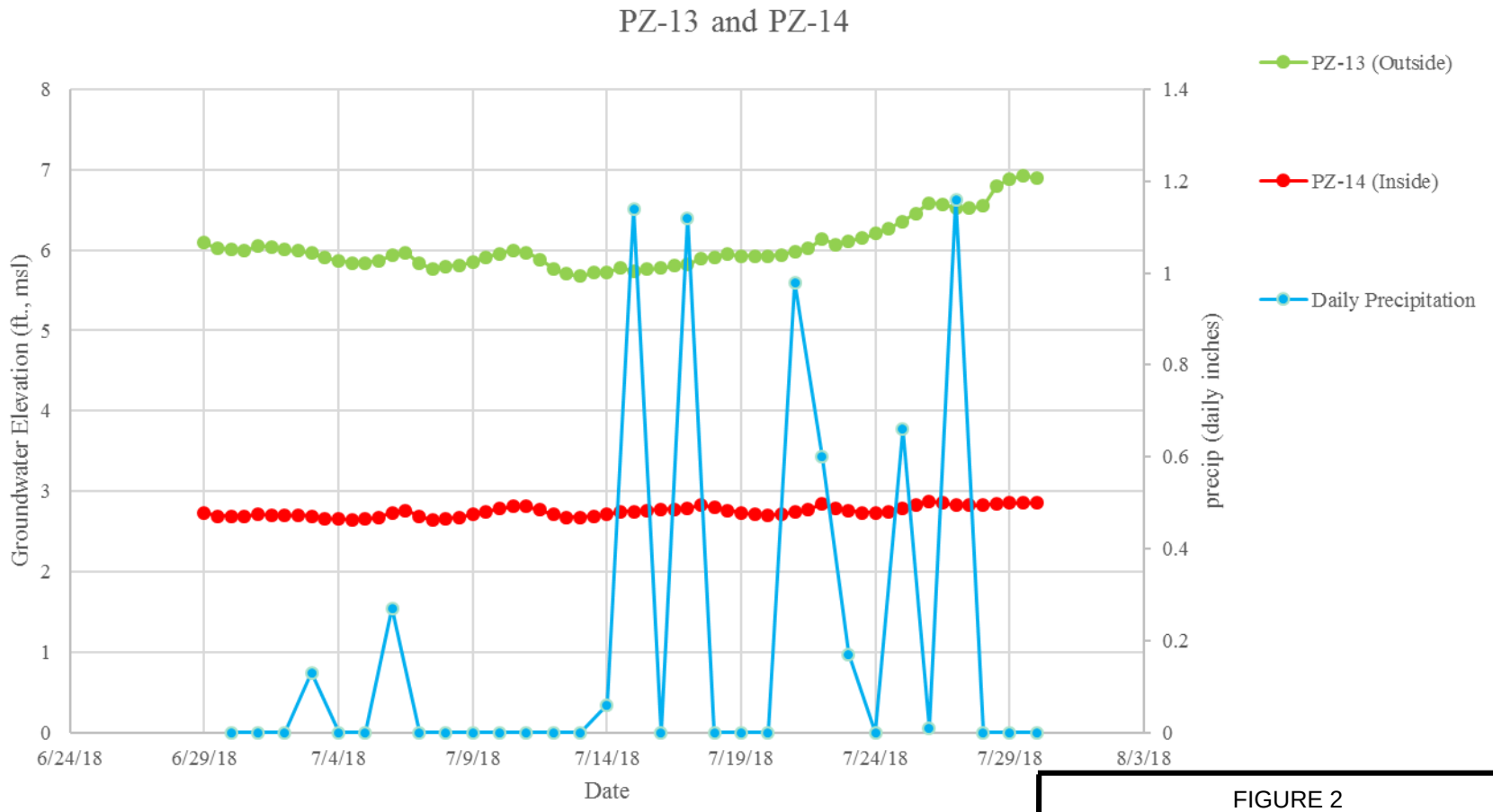


FIGURE 2

Hydrograph of PZ-13 and PZ-14
Data Logger Heads v. Precipitation
July 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

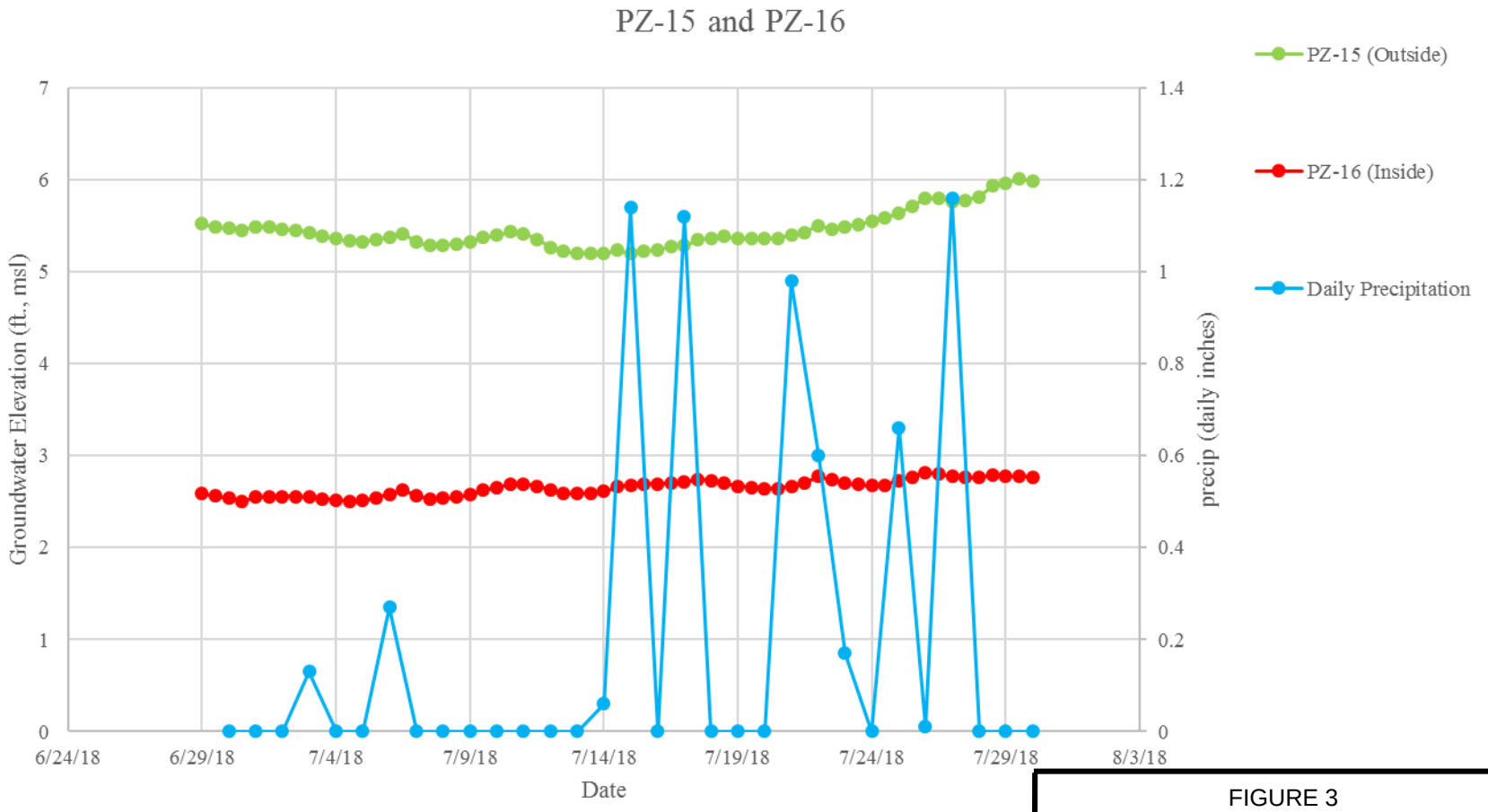


FIGURE 3

Hydrograph of PZ-15 and PZ-16
Data Logger Heads v. Precipitation
July 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

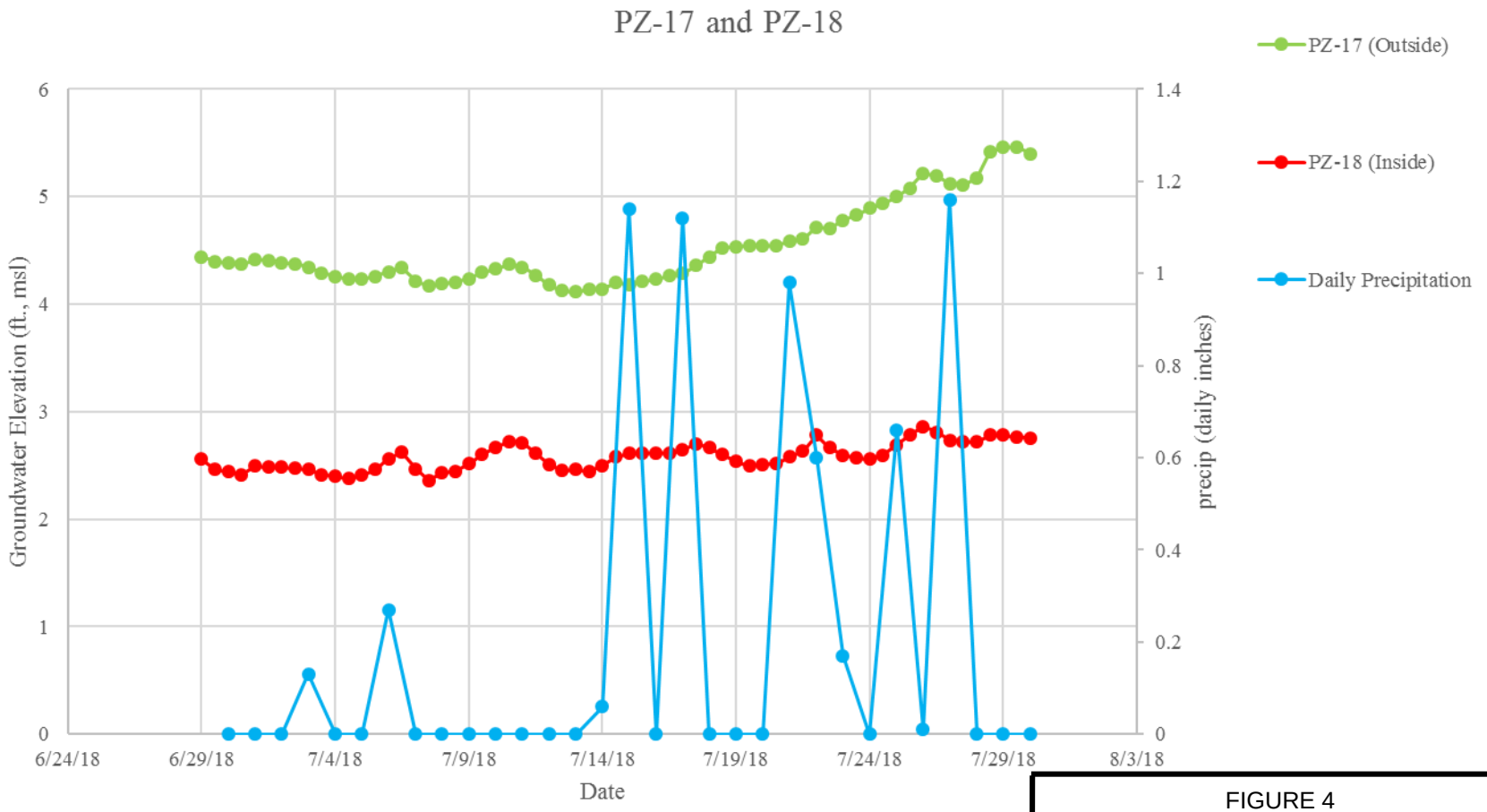


FIGURE 4

Hydrograph of PZ-17 and PZ-18
Data Logger Heads v. Precipitation
July 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

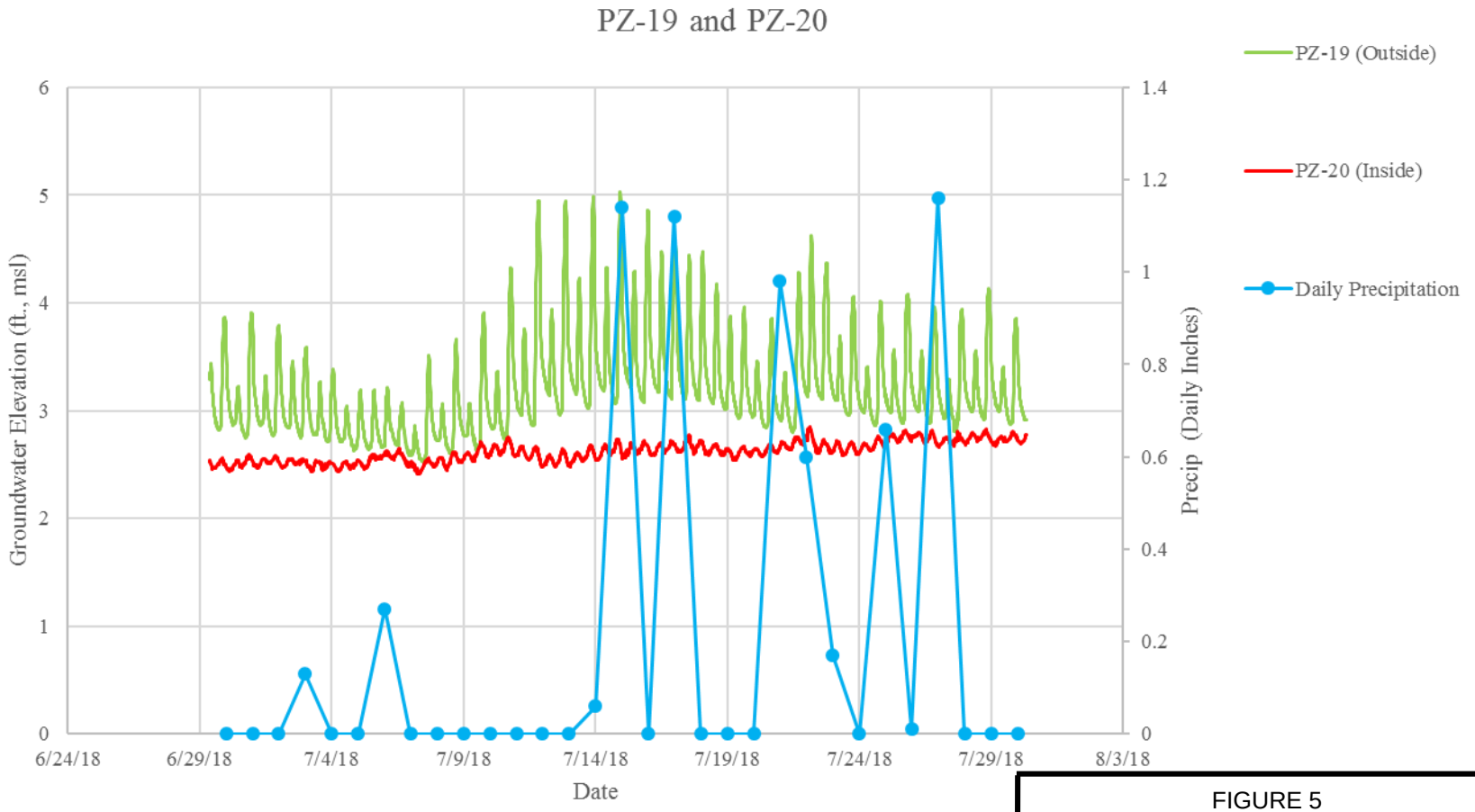


FIGURE 5

Hydrograph of PZ-19 and PZ-20
Data Logger Heads v. Precipitation
July 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 15-minute intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

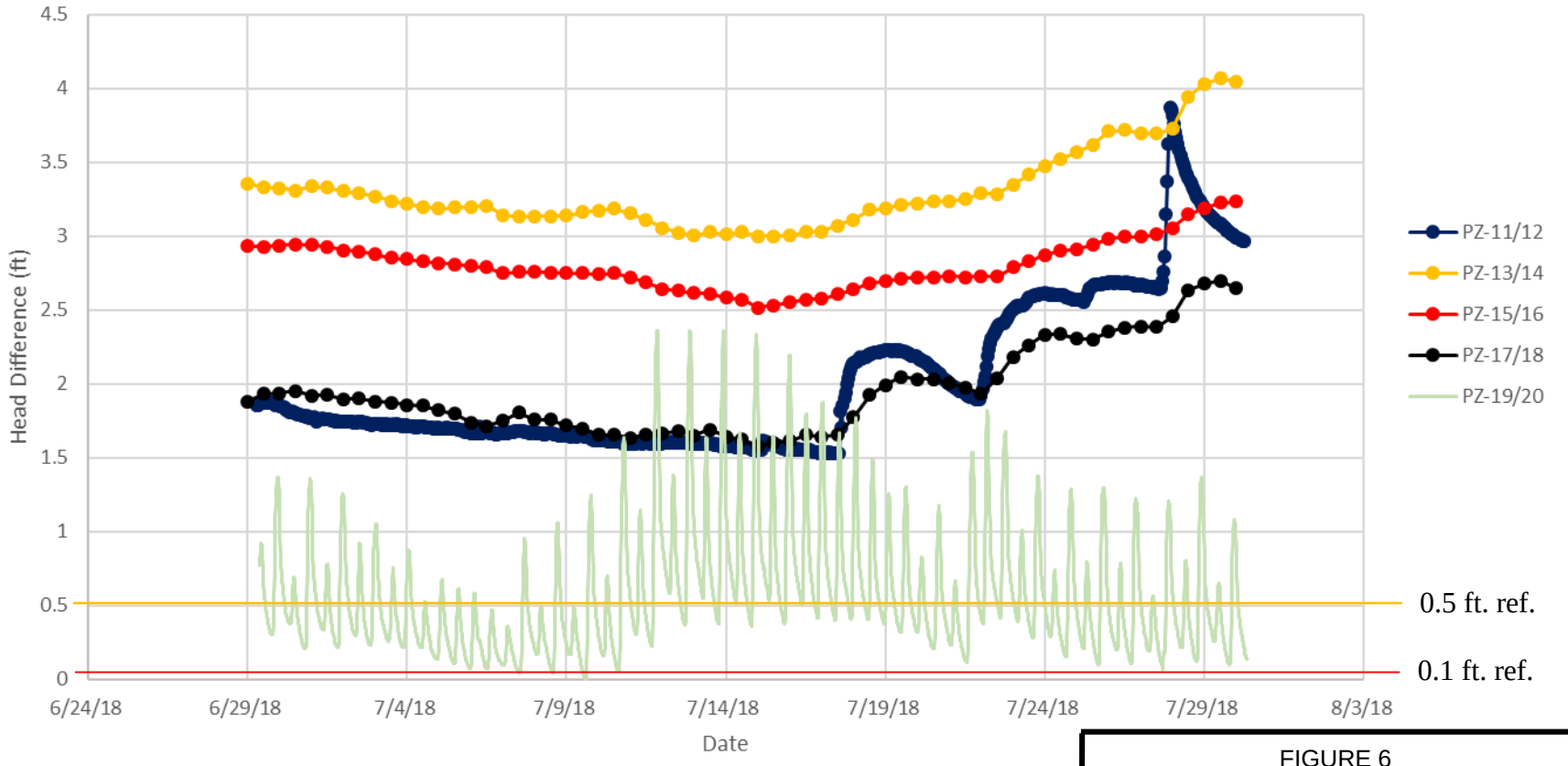


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – July 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

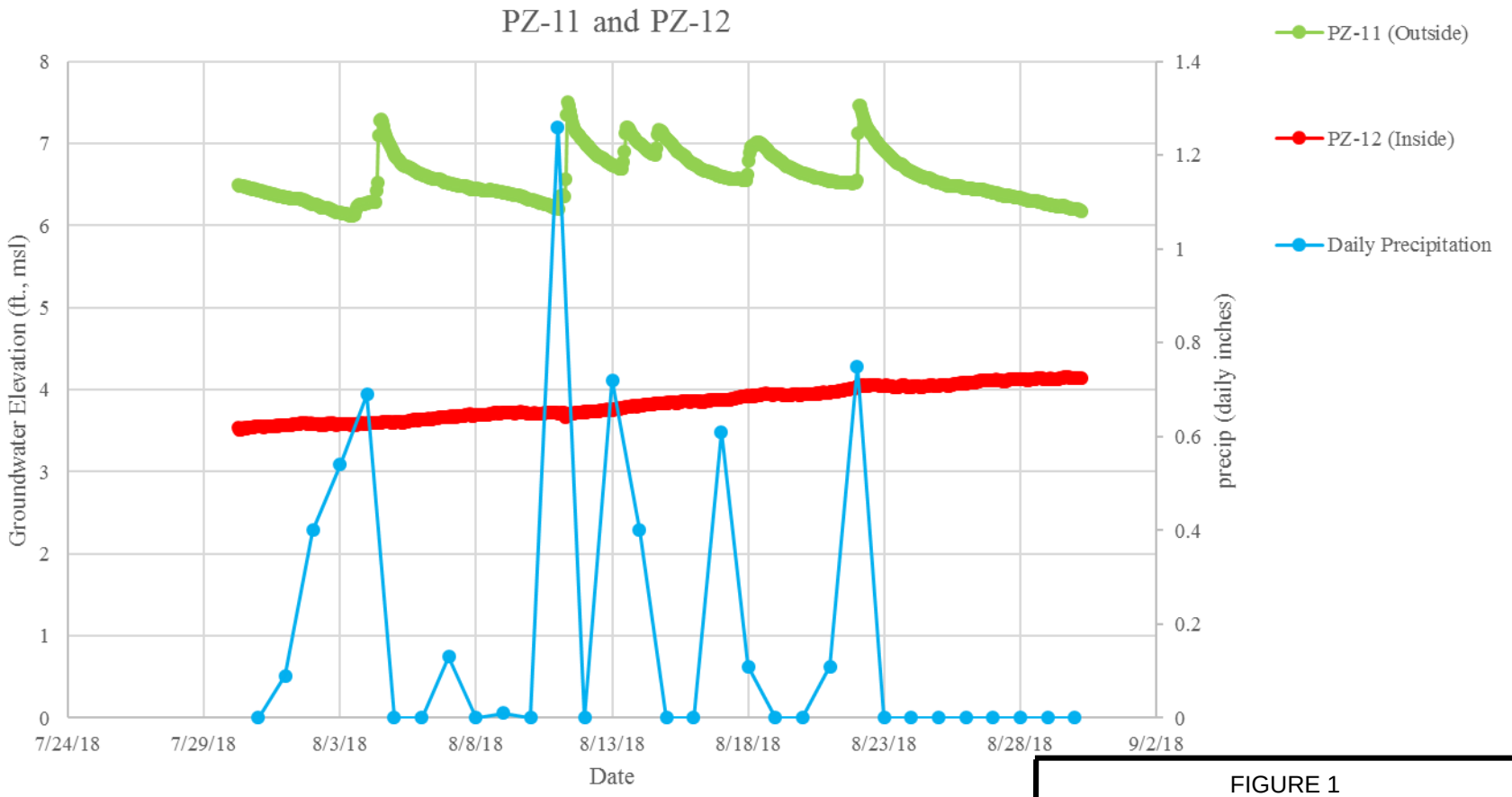


FIGURE 1

Hydrograph of PZ-11 and PZ-12
Data Logger Heads v. Precipitation
August 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at one-hour intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

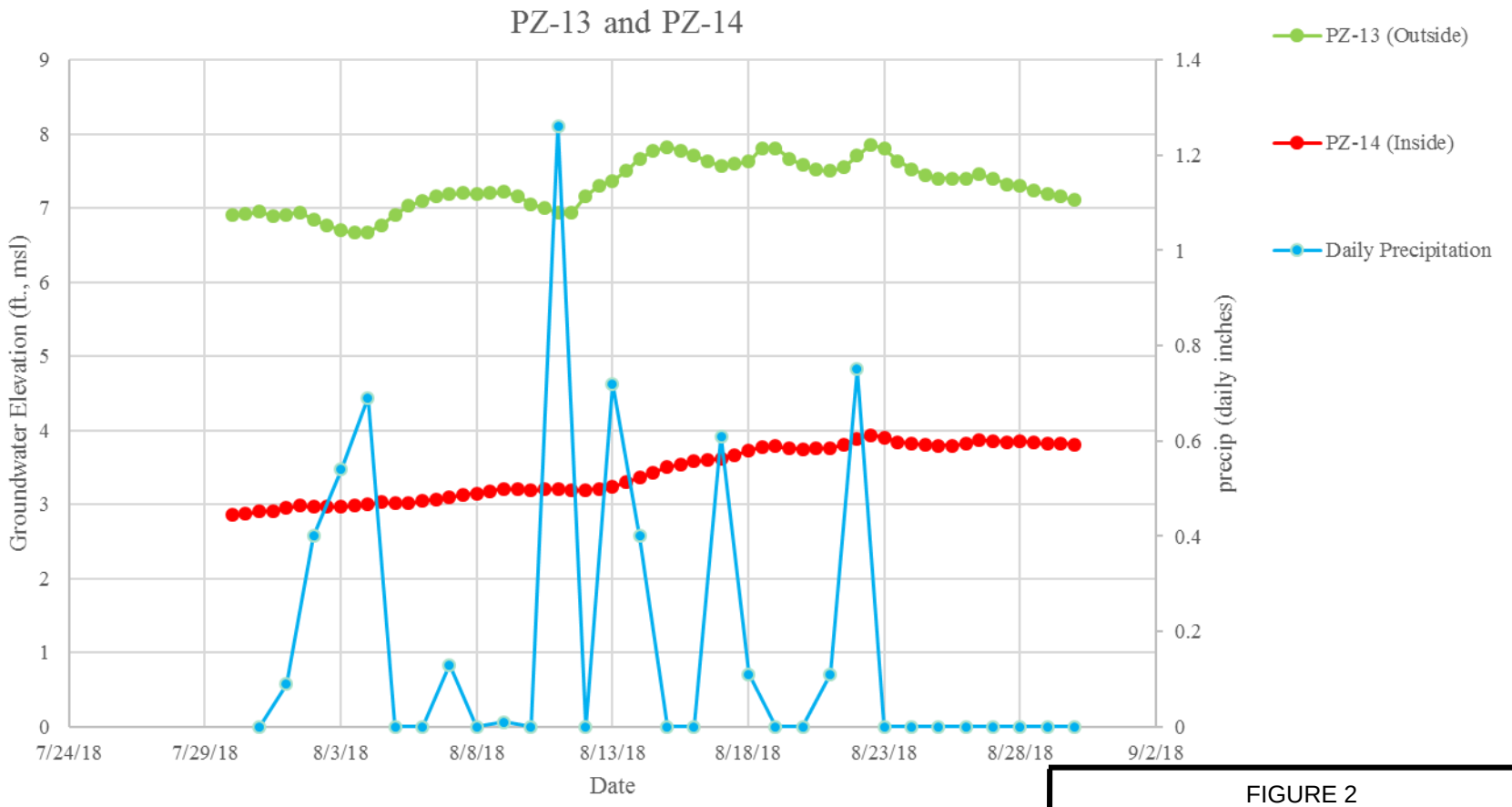


FIGURE 2

Hydrograph of PZ-13 and PZ-14
Data Logger Heads v. Precipitation
August 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

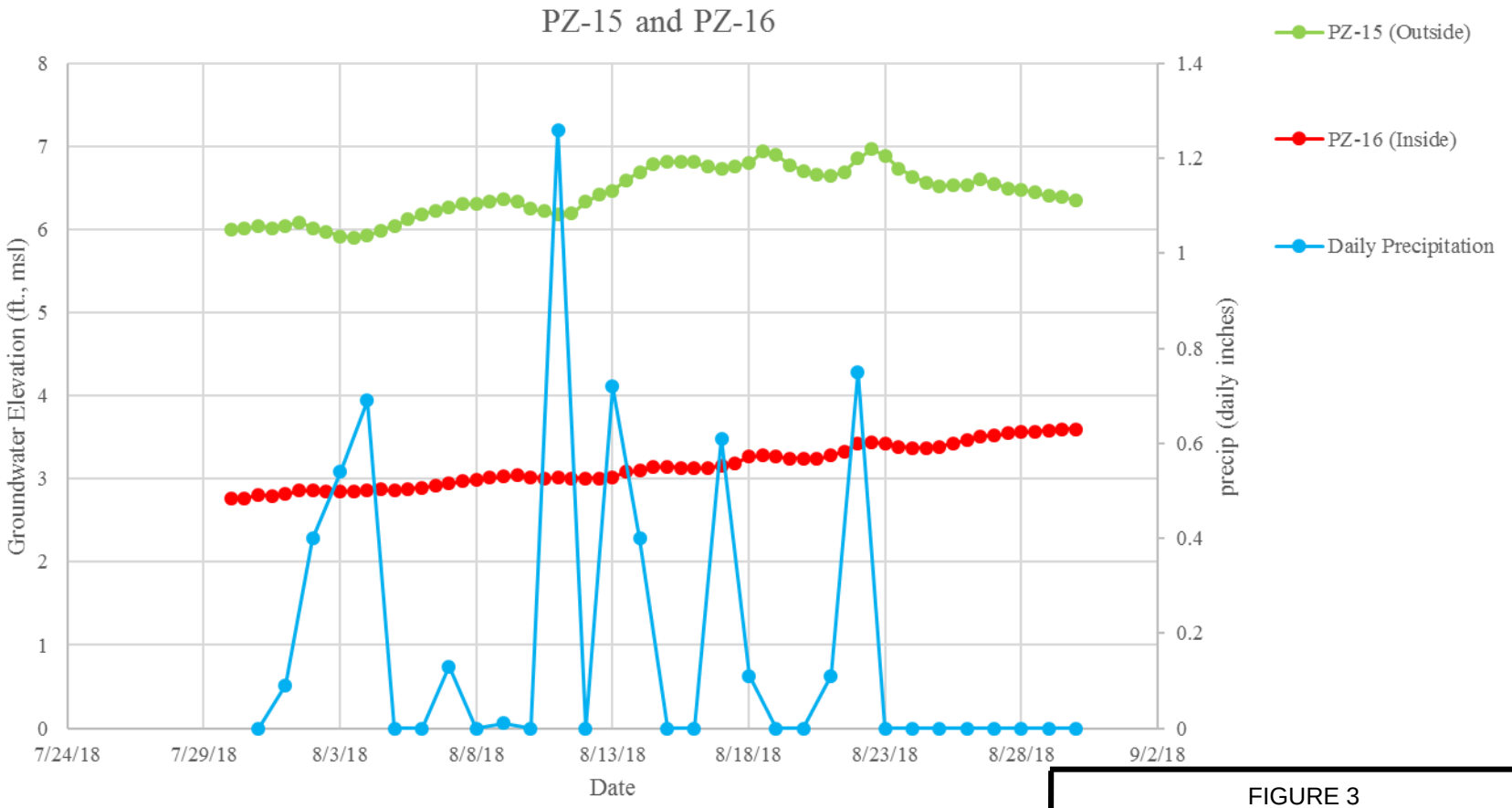


FIGURE 3

Hydrograph of PZ-15 and PZ-16
Data Logger Heads v. Precipitation
August 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

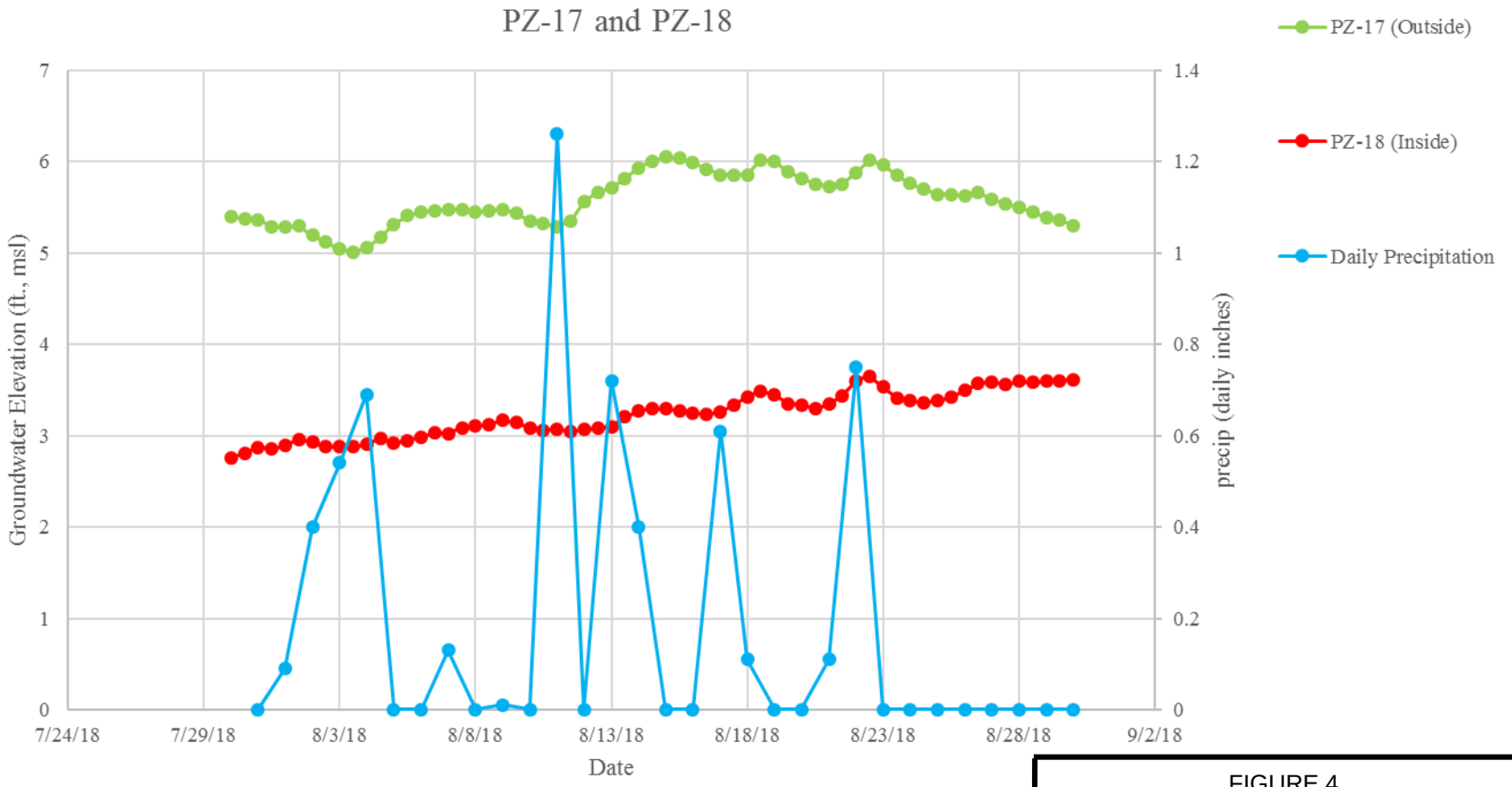


FIGURE 4

Hydrograph of PZ-17 and PZ-18
Data Logger Heads v. Precipitation
August 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

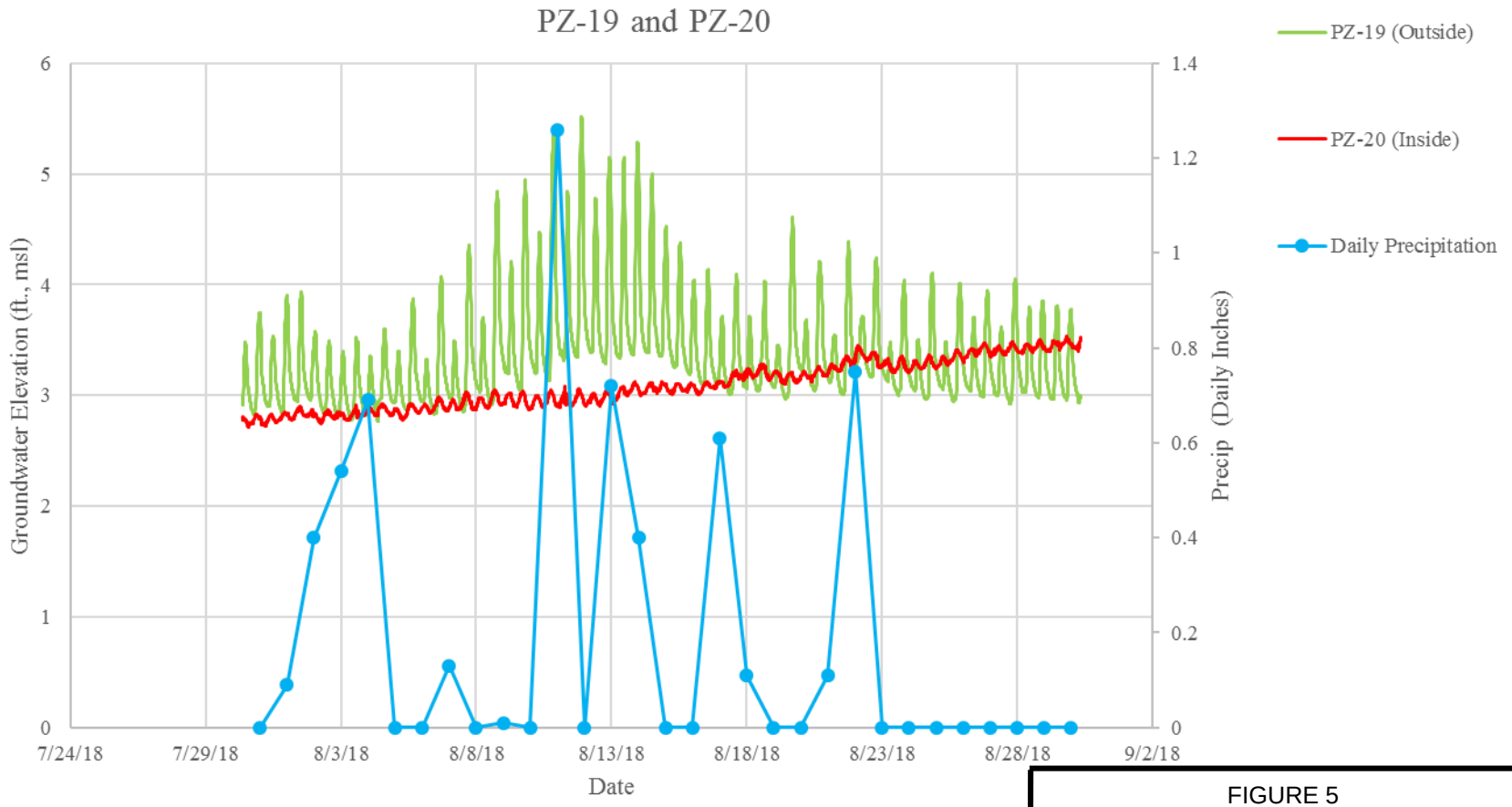


FIGURE 5

Hydrograph of PZ-19 and PZ-20
Data Logger Heads v. Precipitation
August 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 15-minute intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

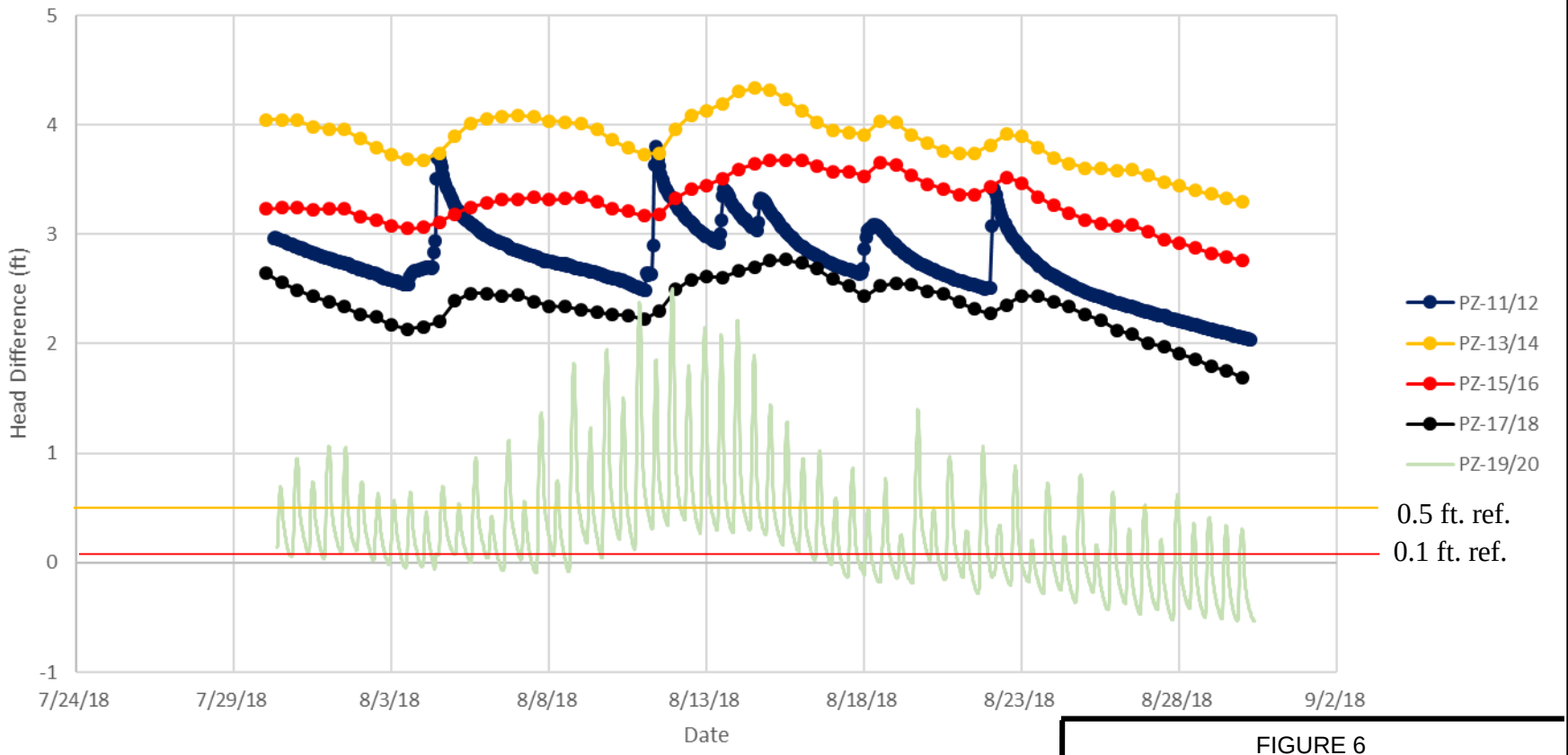


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – August 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

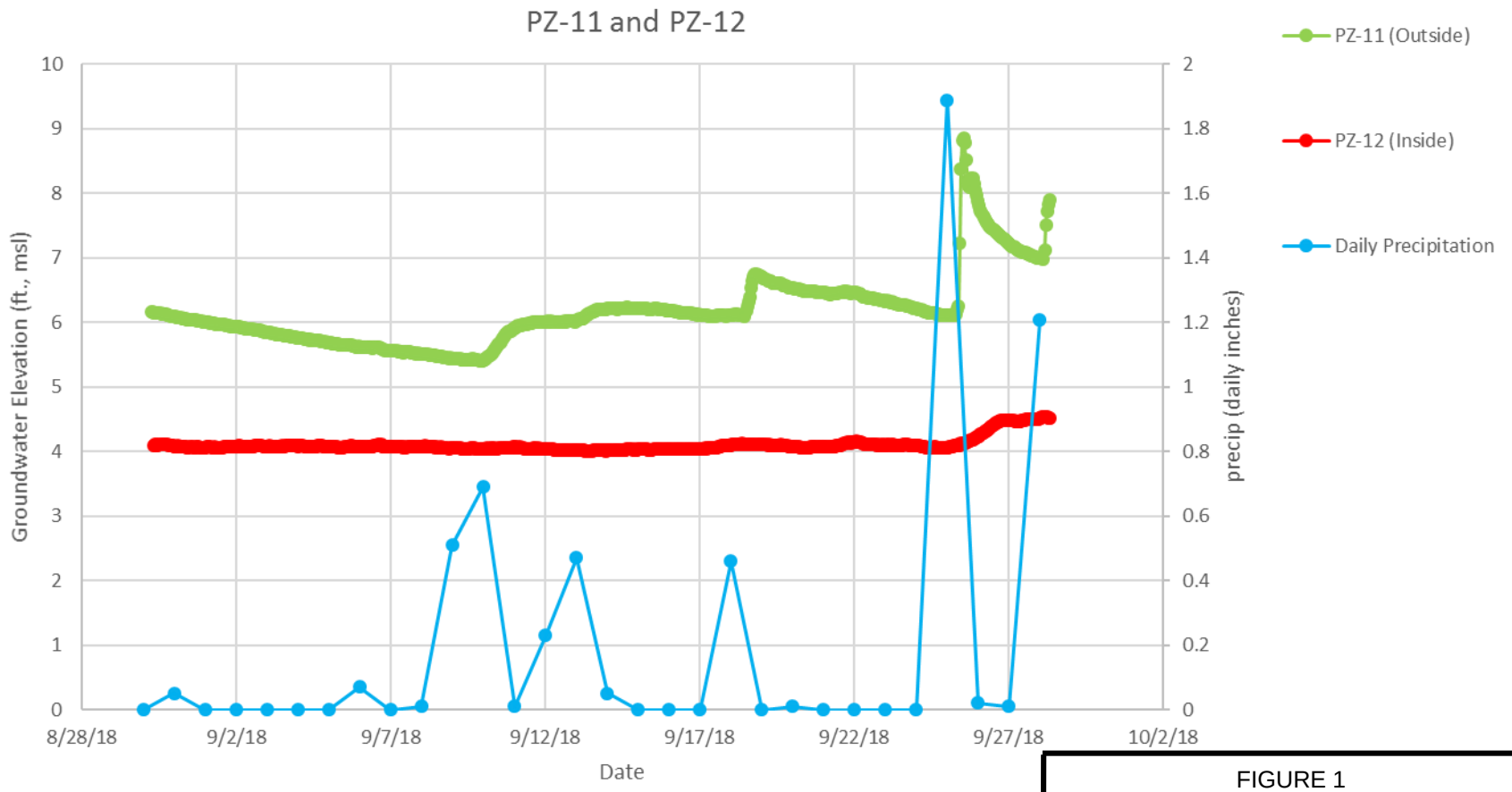


FIGURE 1

Hydrograph of PZ-11 and PZ-12
Data Logger Heads v. Precipitation
September 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at one-hour intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

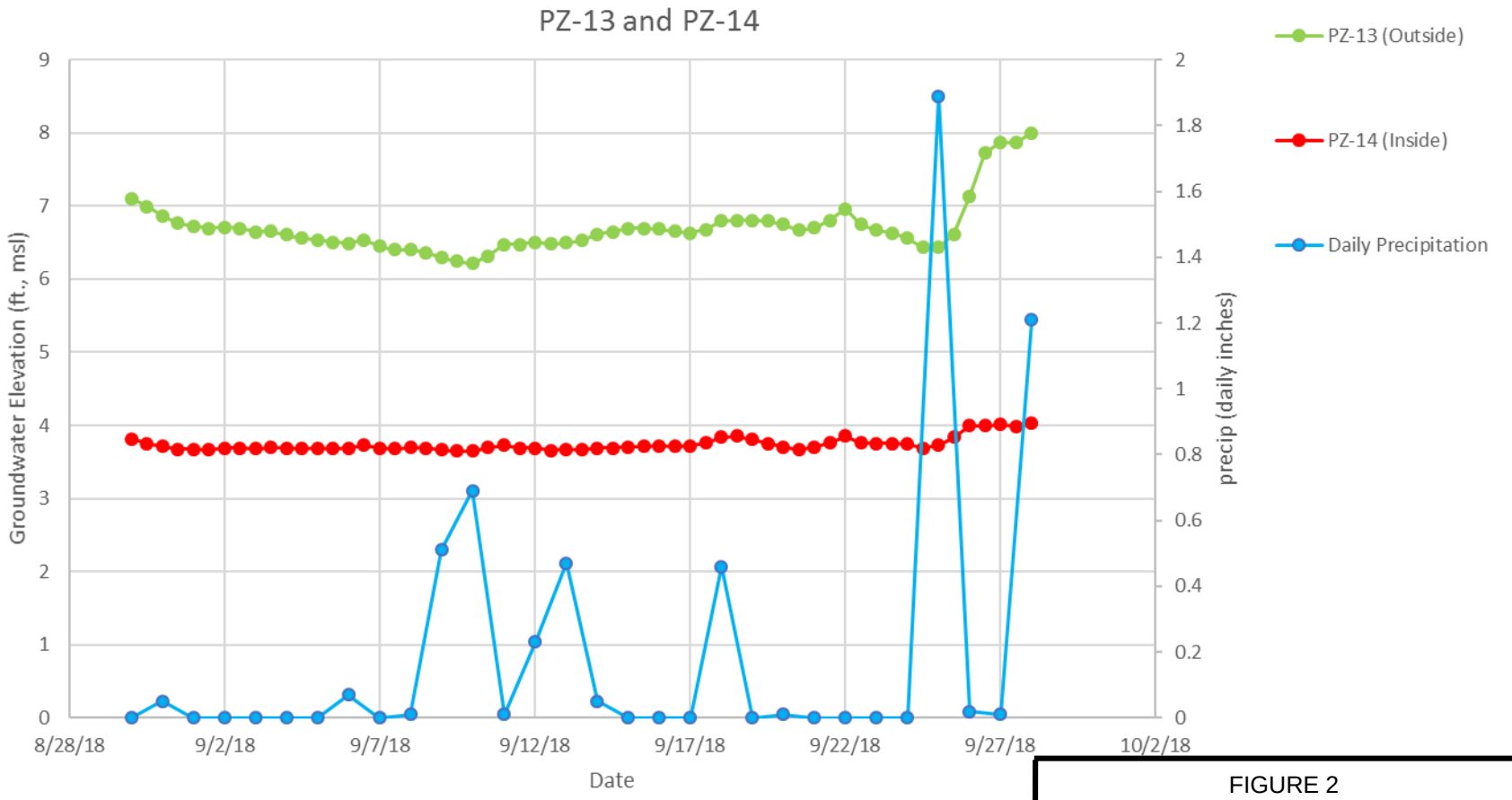


FIGURE 2

Hydrograph of PZ-13 and PZ-14
Data Logger Heads v. Precipitation
September 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

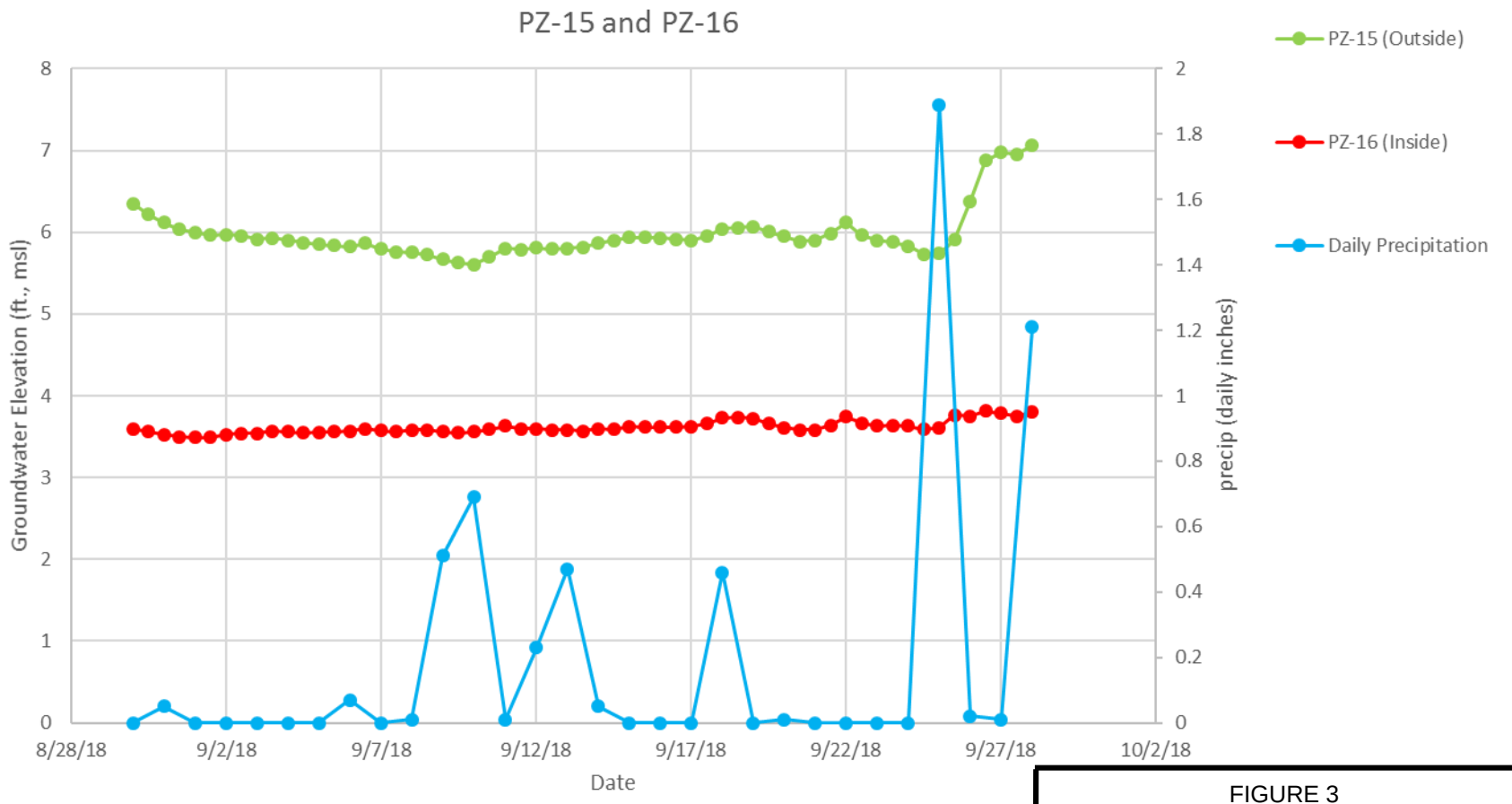


FIGURE 3

Hydrograph of PZ-15 and PZ-16
Data Logger Heads v. Precipitation
September 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

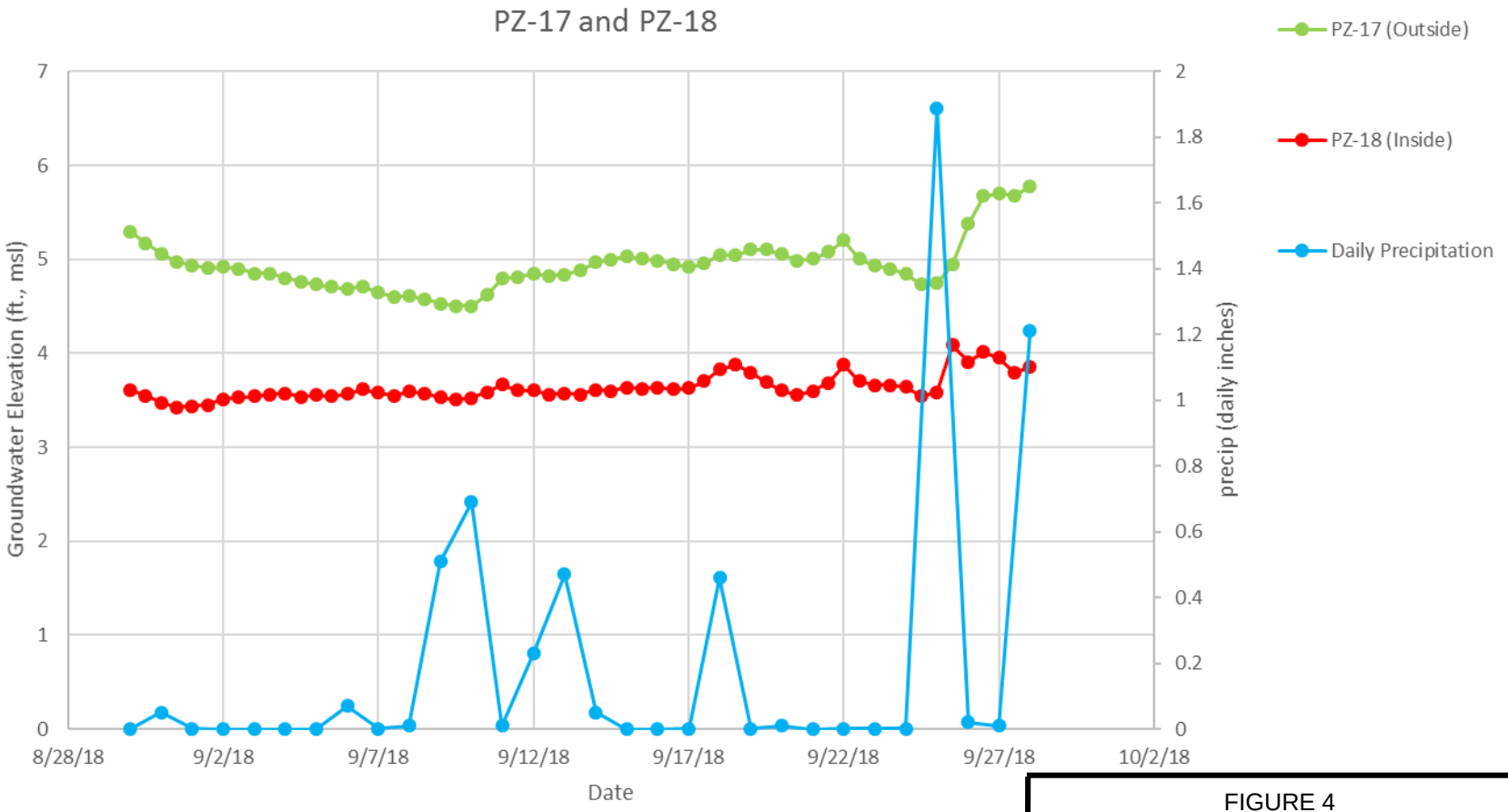


FIGURE 4

Hydrograph of PZ-17 and PZ-18
Data Logger Heads v. Precipitation
September 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

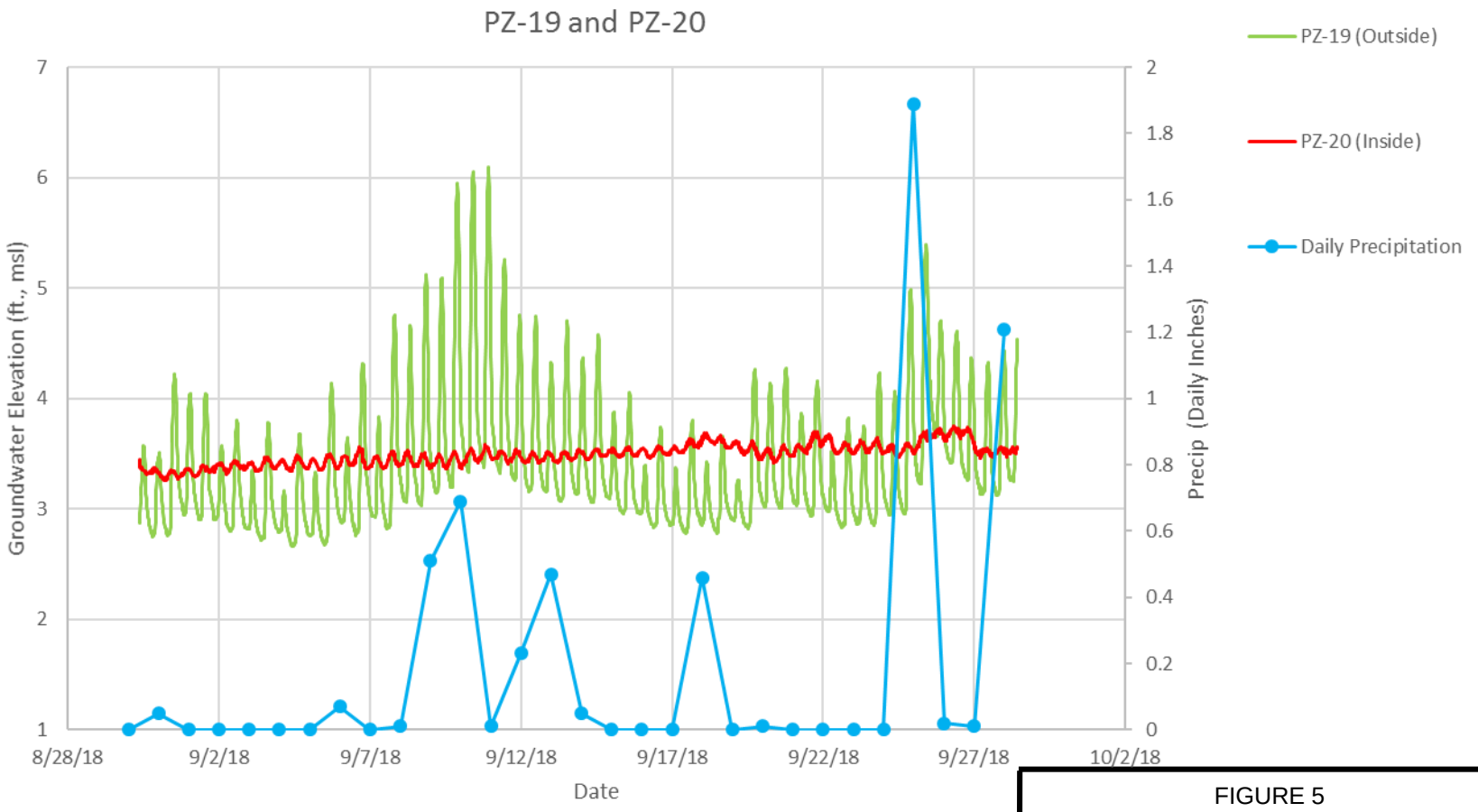


FIGURE 5

Hydrograph of PZ-19 and PZ-20
Data Logger Heads v. Precipitation
September 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 15-minute intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

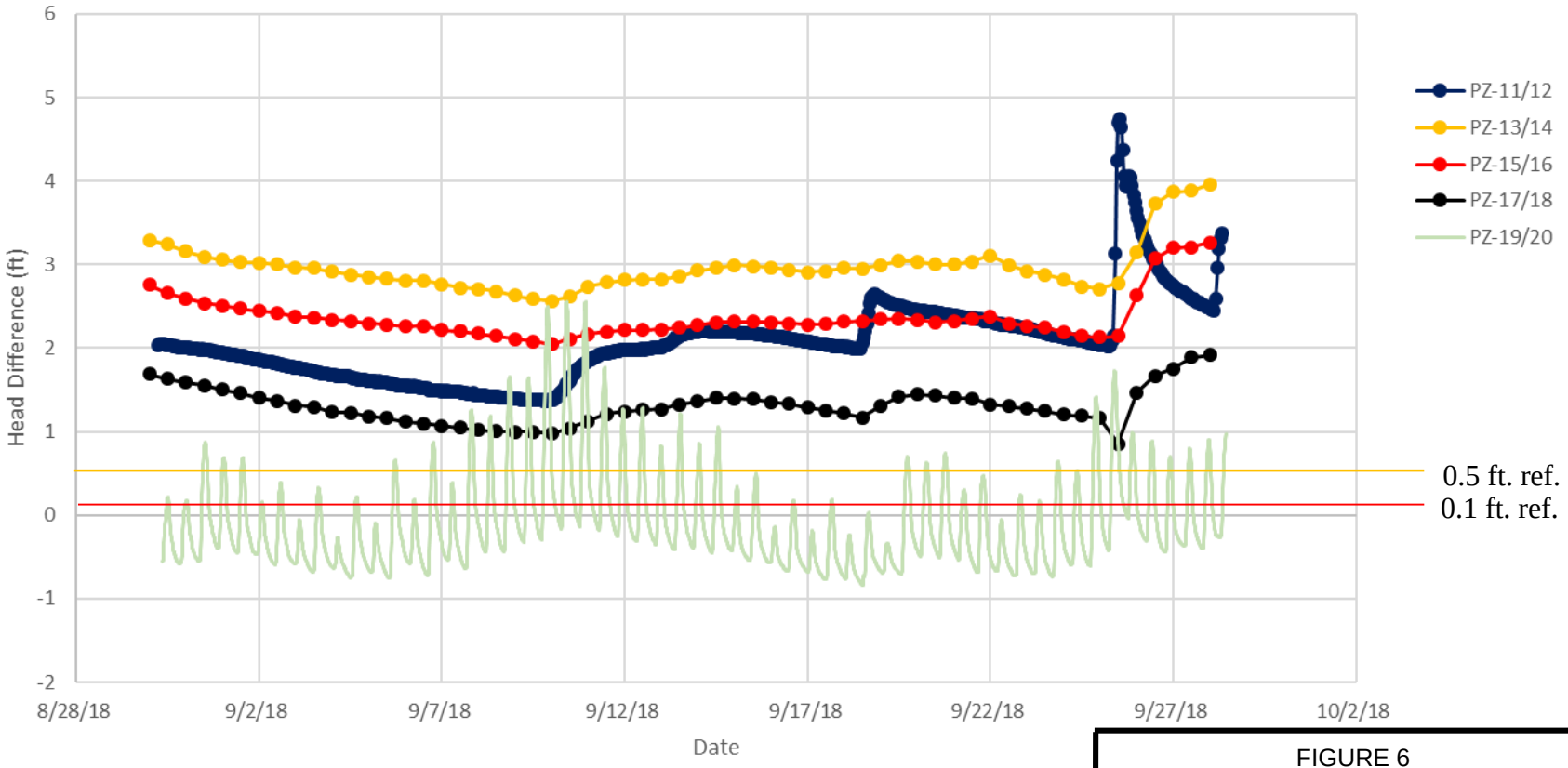


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – September 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

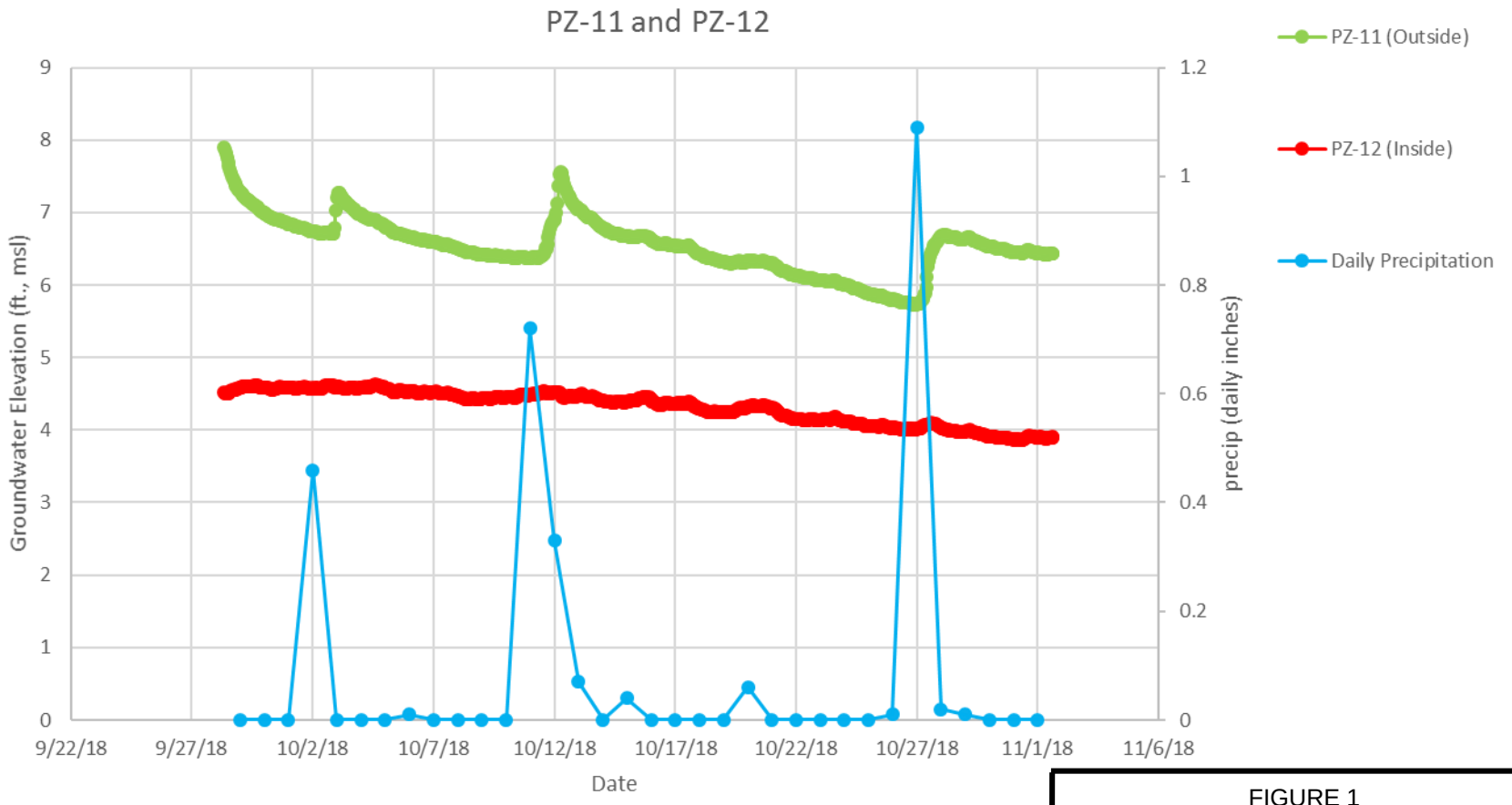


FIGURE 1

Hydrograph of PZ-11 and PZ-12
Data Logger Heads v. Precipitation
October 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at one-hour intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

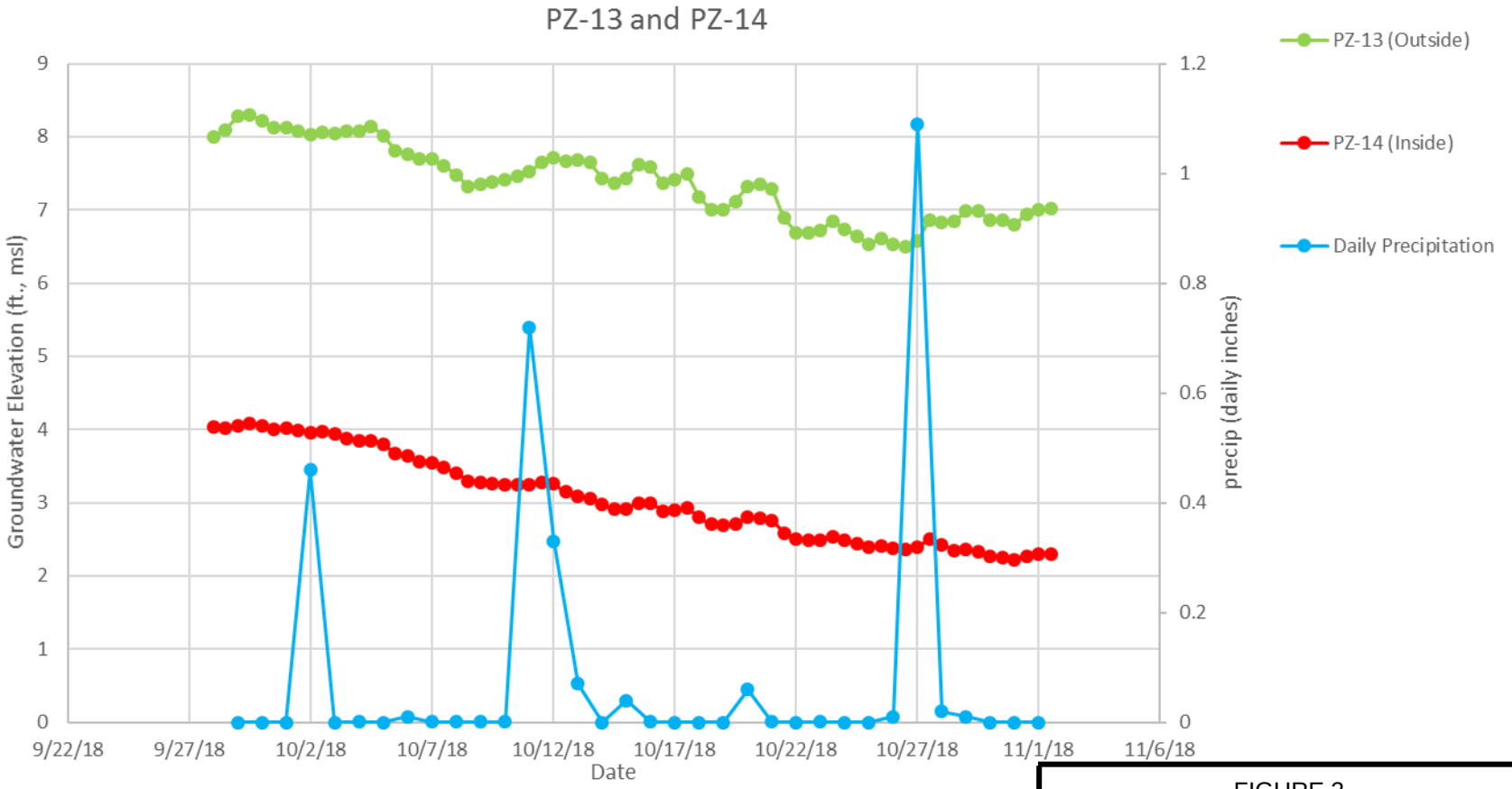


FIGURE 2

Hydrograph of PZ-13 and PZ-14
Data Logger Heads v. Precipitation
October 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

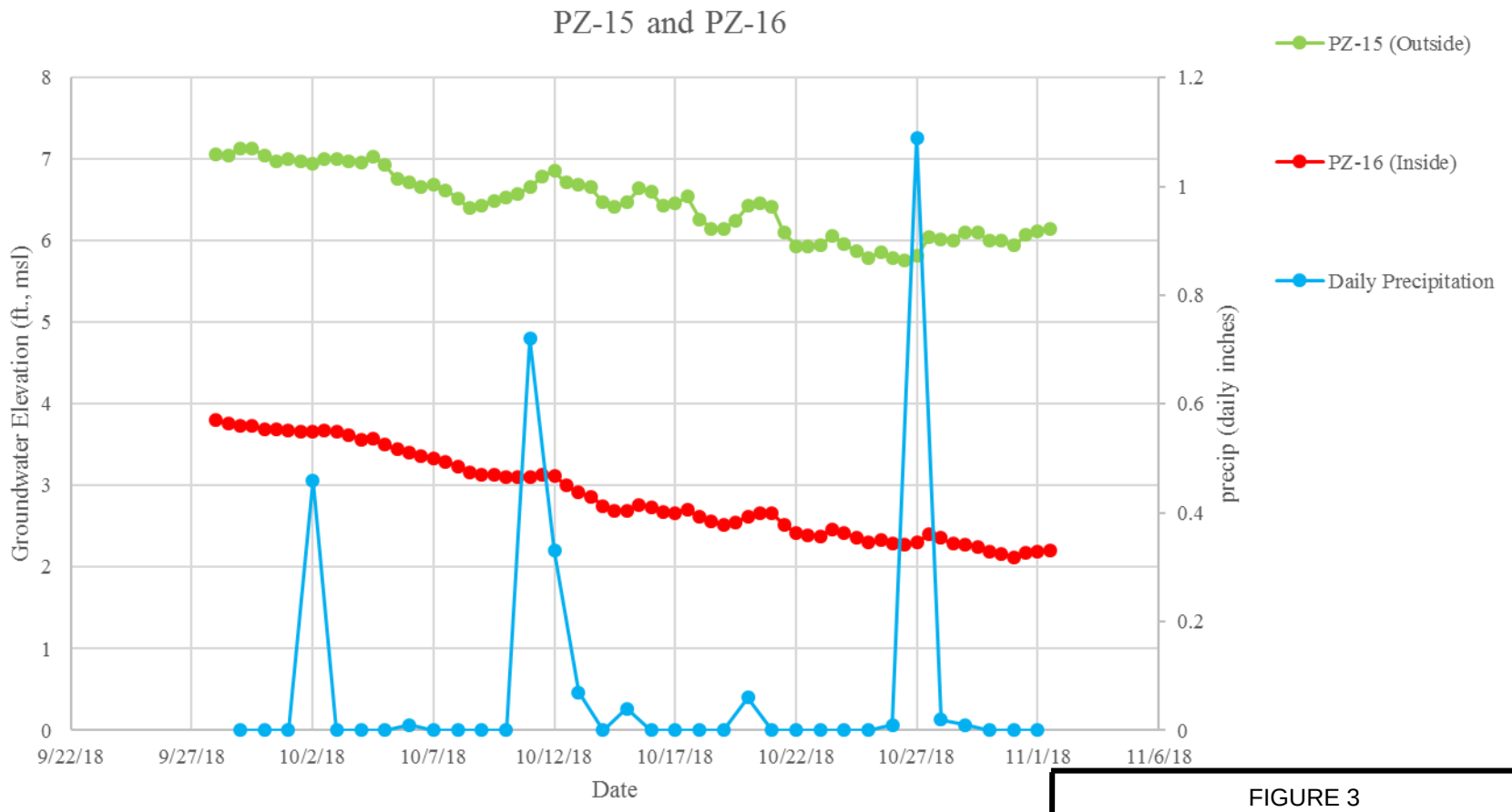


FIGURE 3

Hydrograph of PZ-15 and PZ-16
Data Logger Heads v. Precipitation
October 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

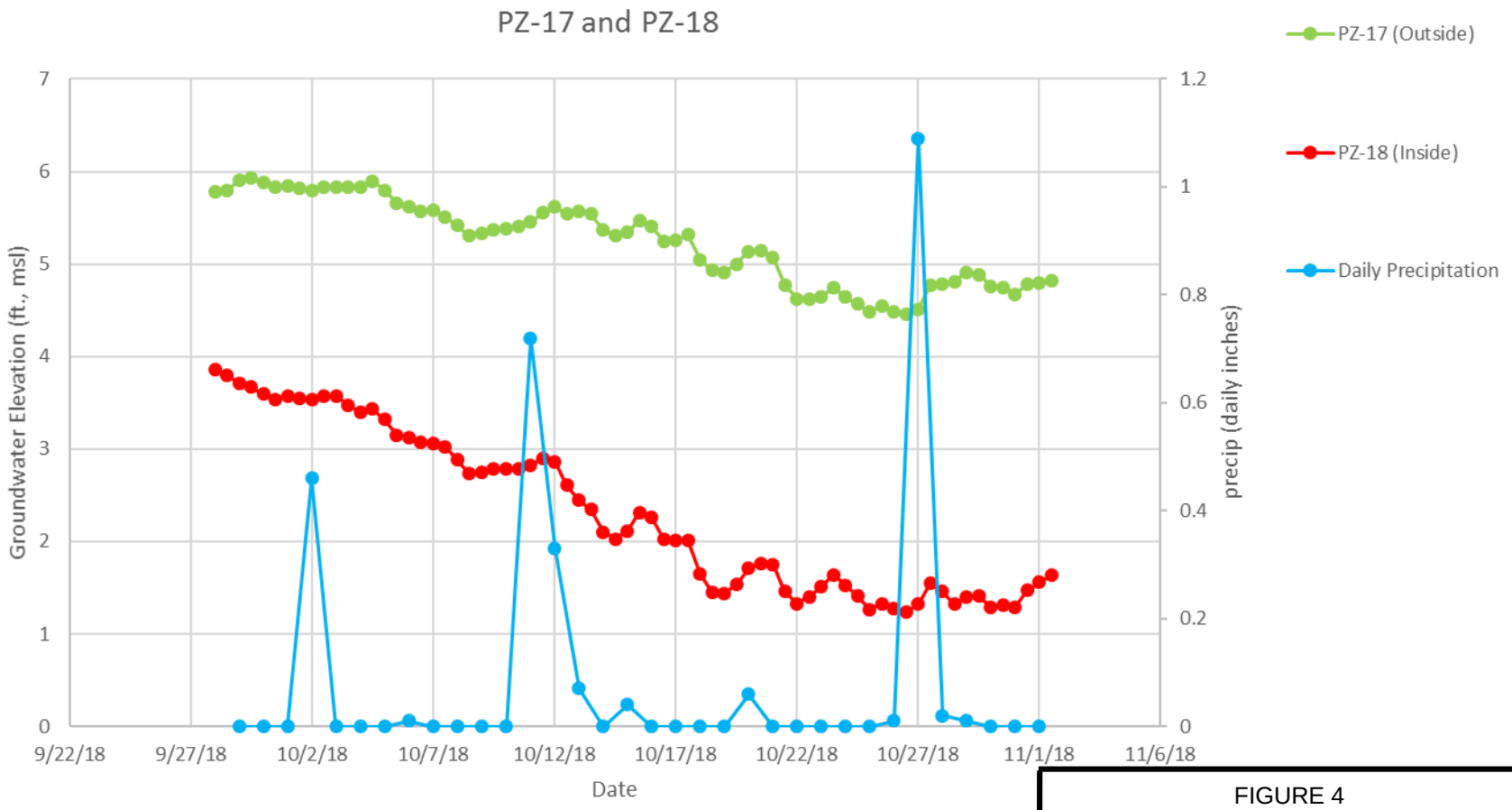


FIGURE 4

Hydrograph of PZ-17 and PZ-18
Data Logger Heads v. Precipitation
October 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

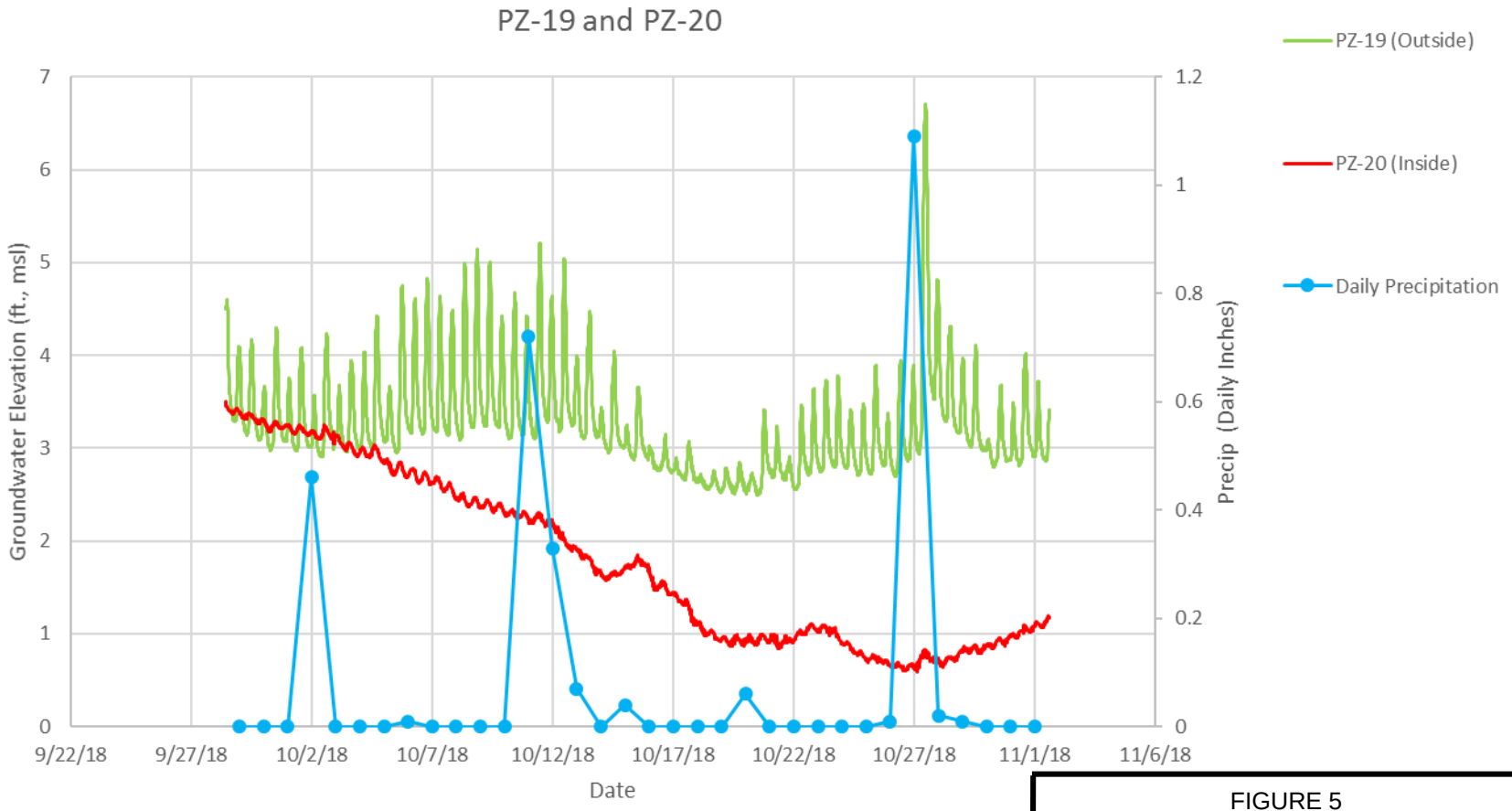


FIGURE 5

Hydrograph of PZ-19 and PZ-20
Data Logger Heads v. Precipitation
October 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 15-minute intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

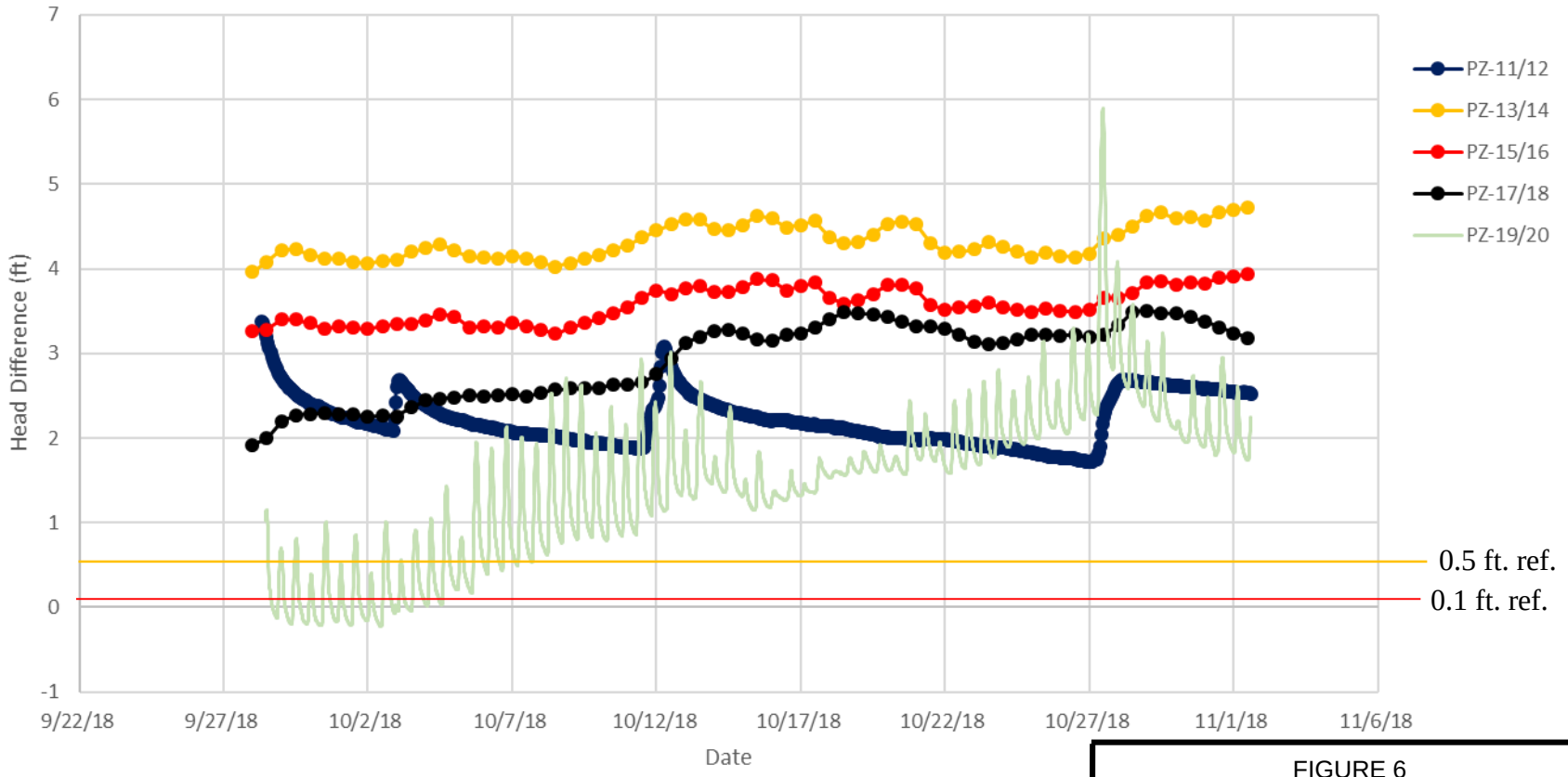


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – October 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

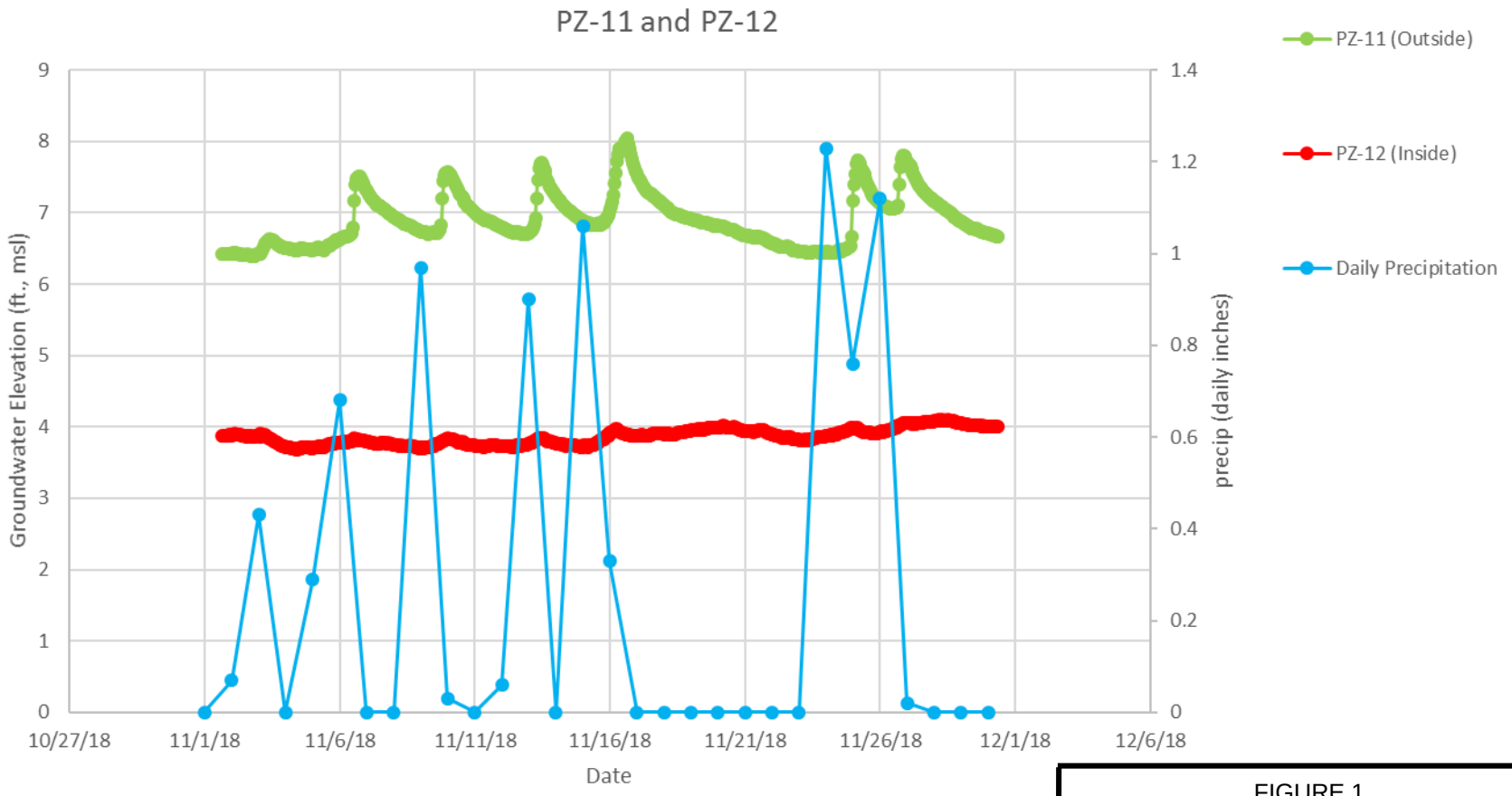


FIGURE 1

Hydrograph of PZ-11 and PZ-12
Data Logger Heads v. Precipitation
November 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at one-hour intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

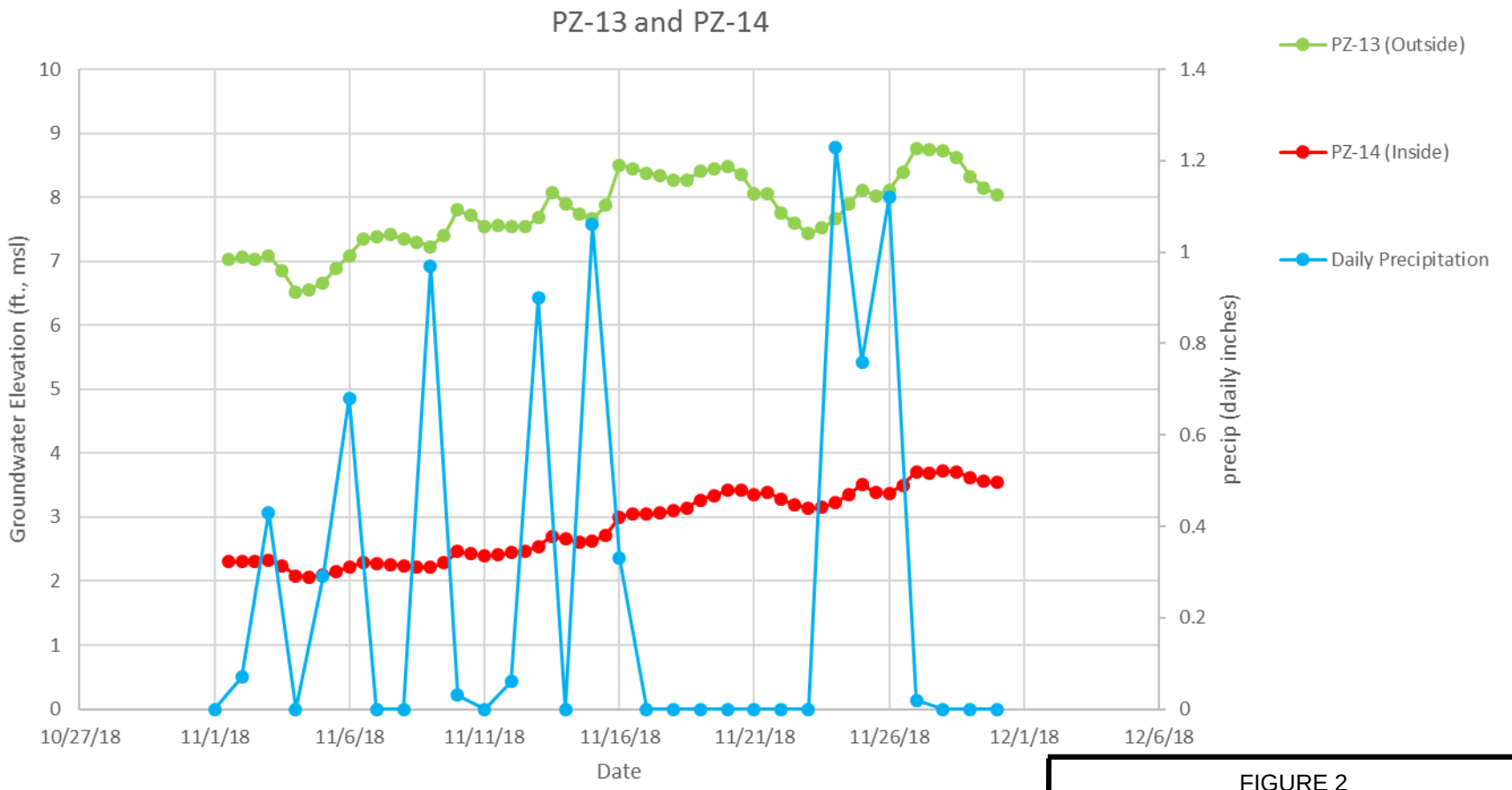


FIGURE 2

Hydrograph of PZ-13 and PZ-14
Data Logger Heads v. Precipitation
November 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

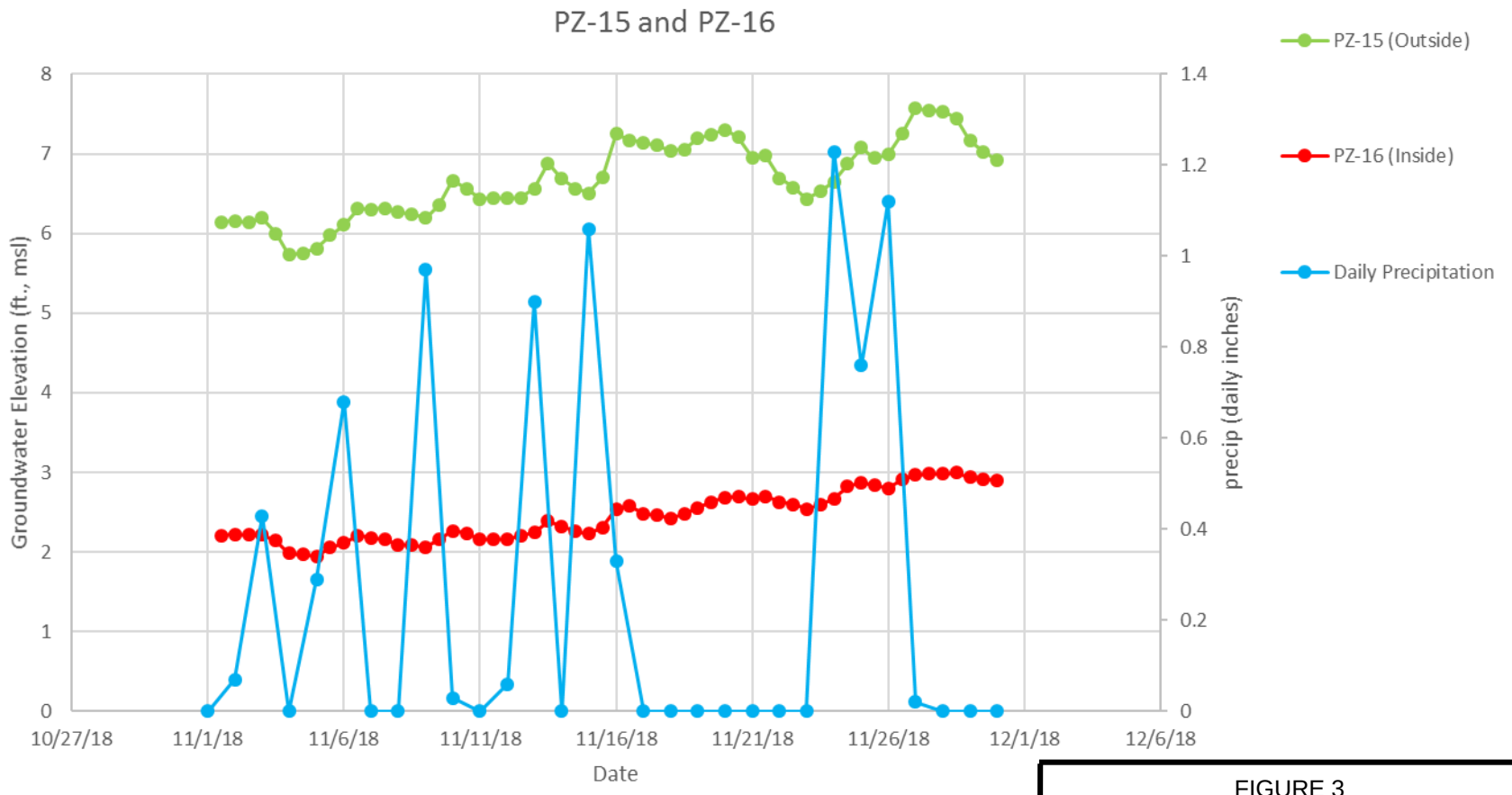


FIGURE 3

Hydrograph of PZ-15 and PZ-16
Data Logger Heads v. Precipitation
November 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

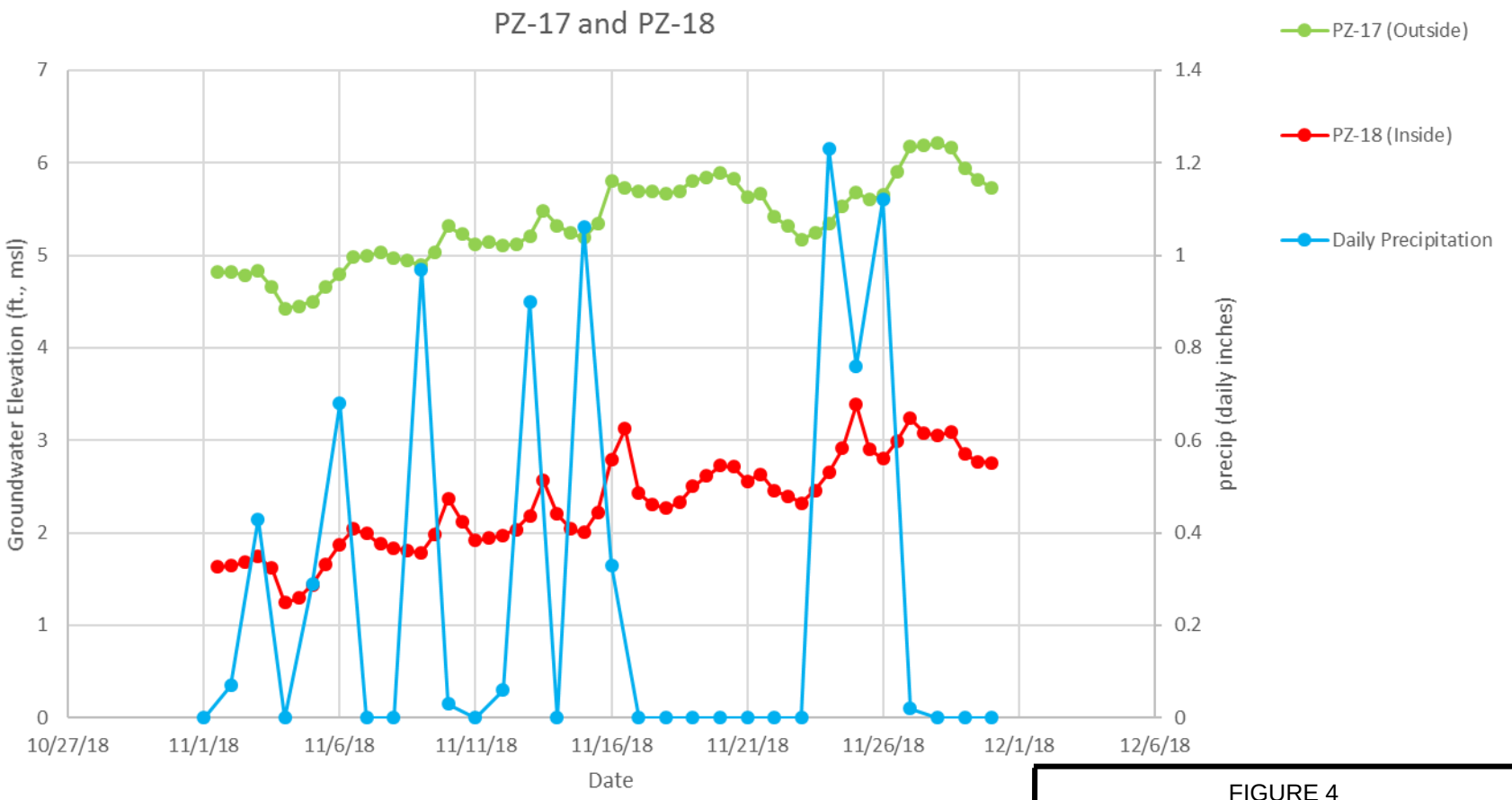


FIGURE 4

Hydrograph of PZ-17 and PZ-18
Data Logger Heads v. Precipitation
November 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

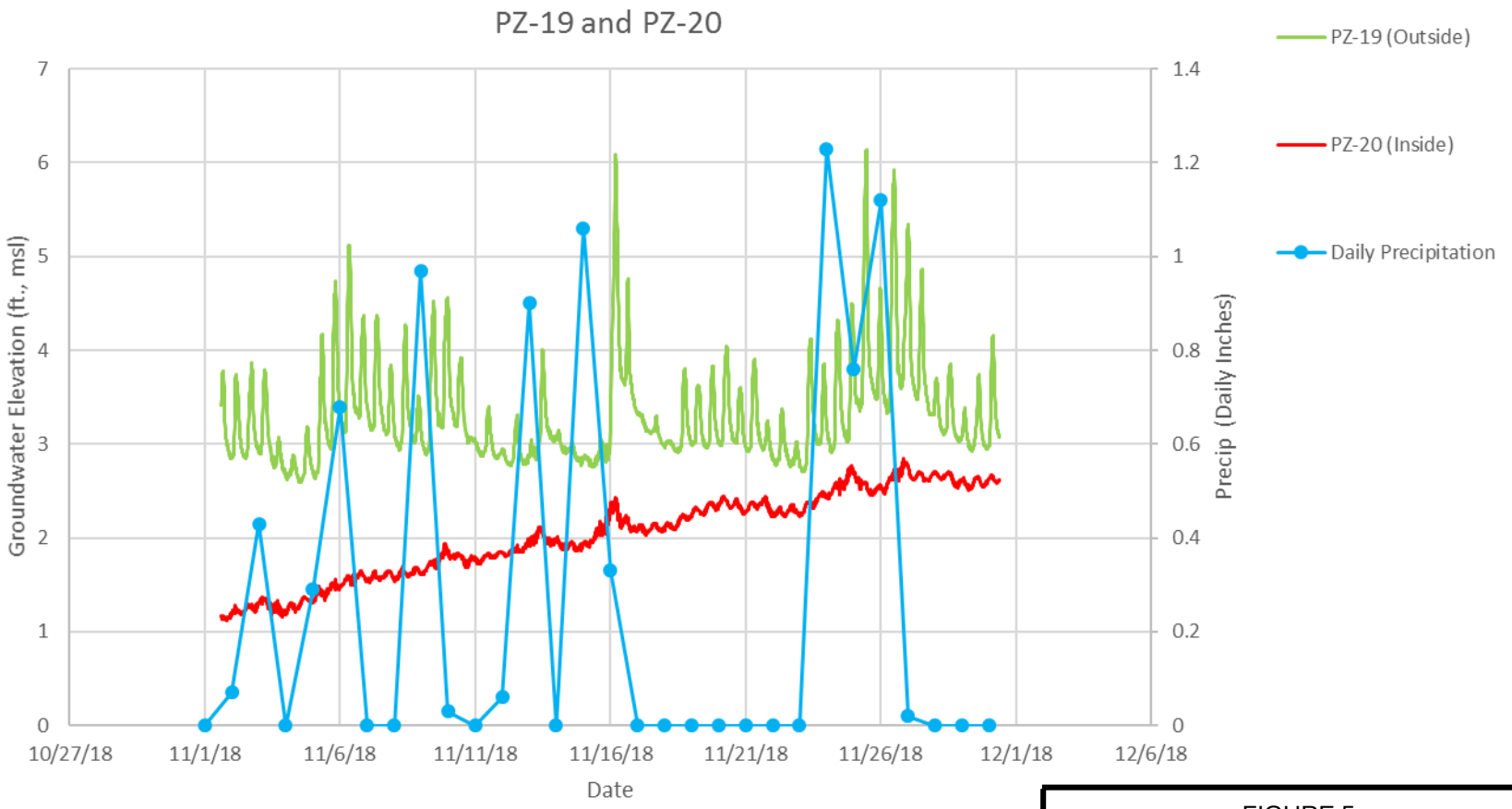


FIGURE 5

Hydrograph of PZ-19 and PZ-20
Data Logger Heads v. Precipitation
November 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 15-minute intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

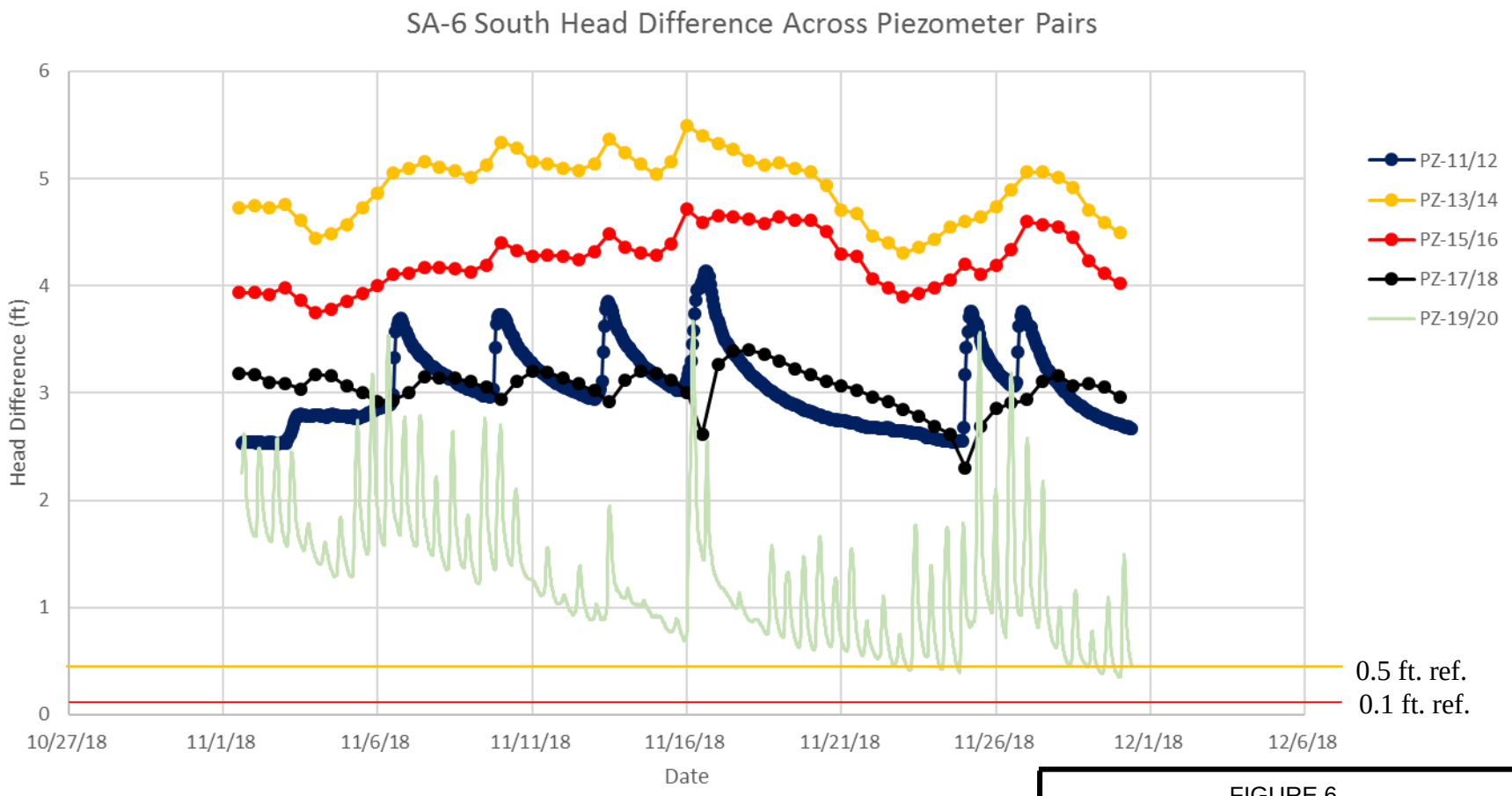


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – November 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

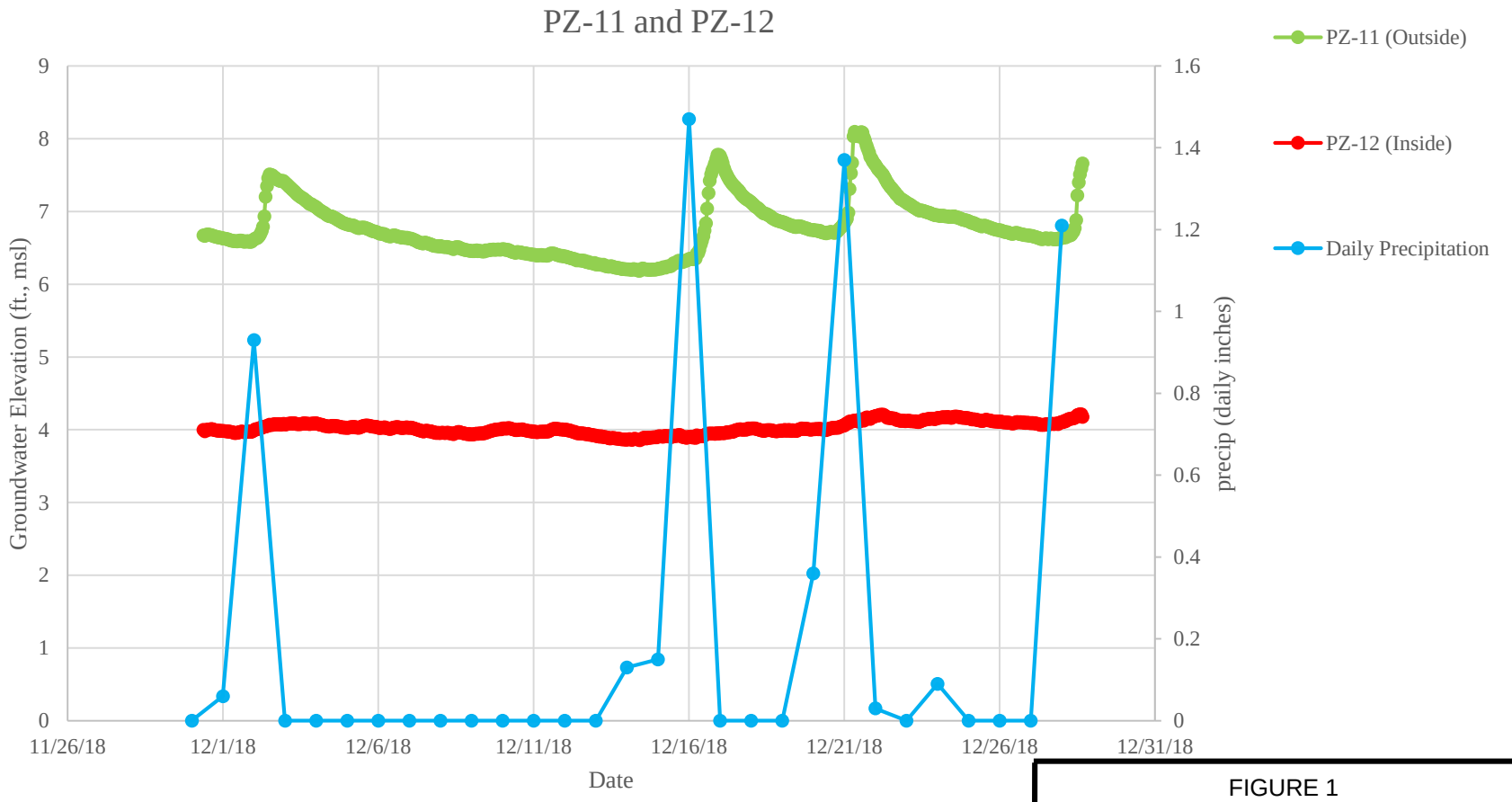


FIGURE 1

Hydrograph of PZ-11 and PZ-12
Data Logger Heads v. Precipitation
December 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at one-hour intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

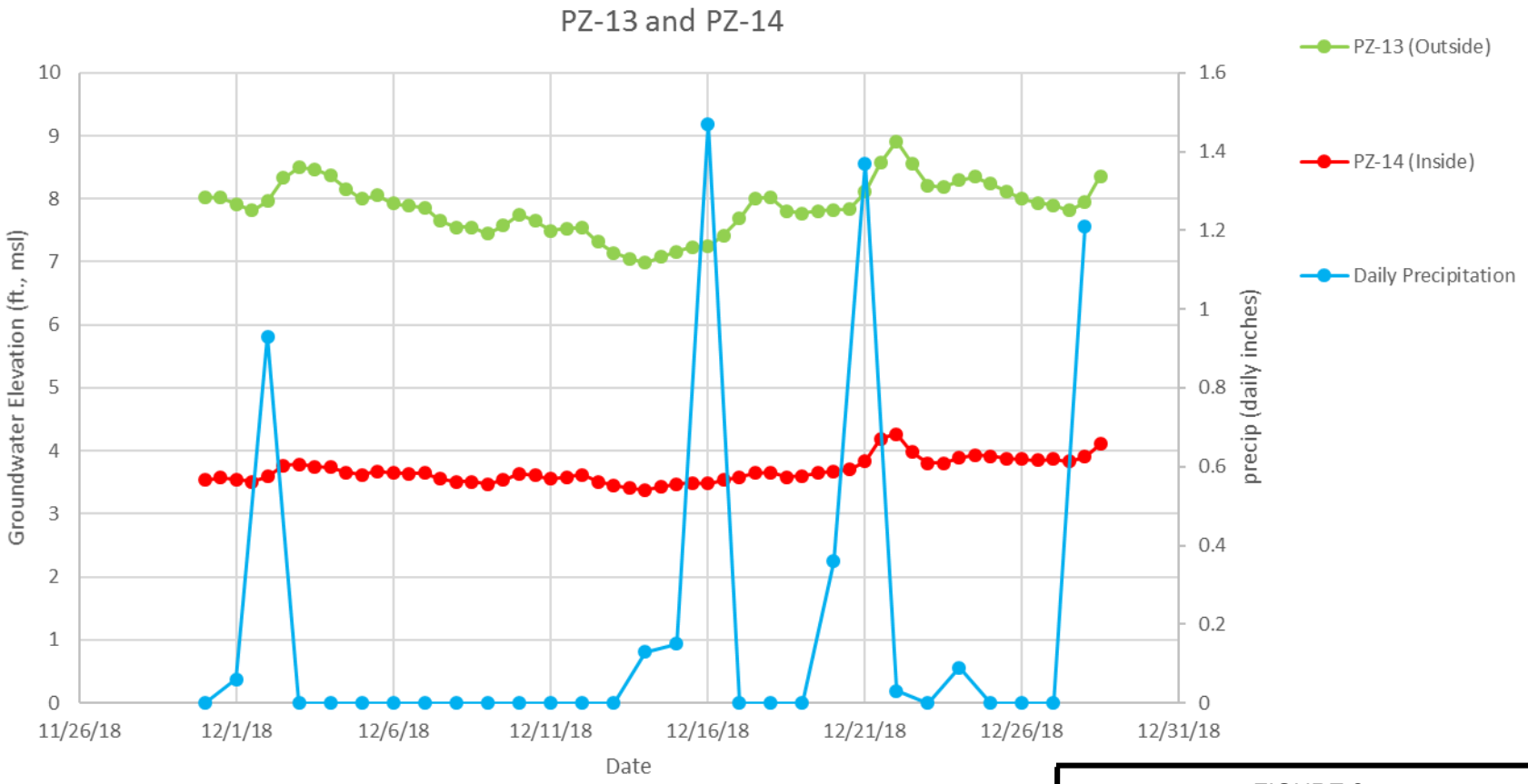


FIGURE 2

Hydrograph of PZ-13 and PZ-14
Data Logger Heads v. Precipitation
December 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

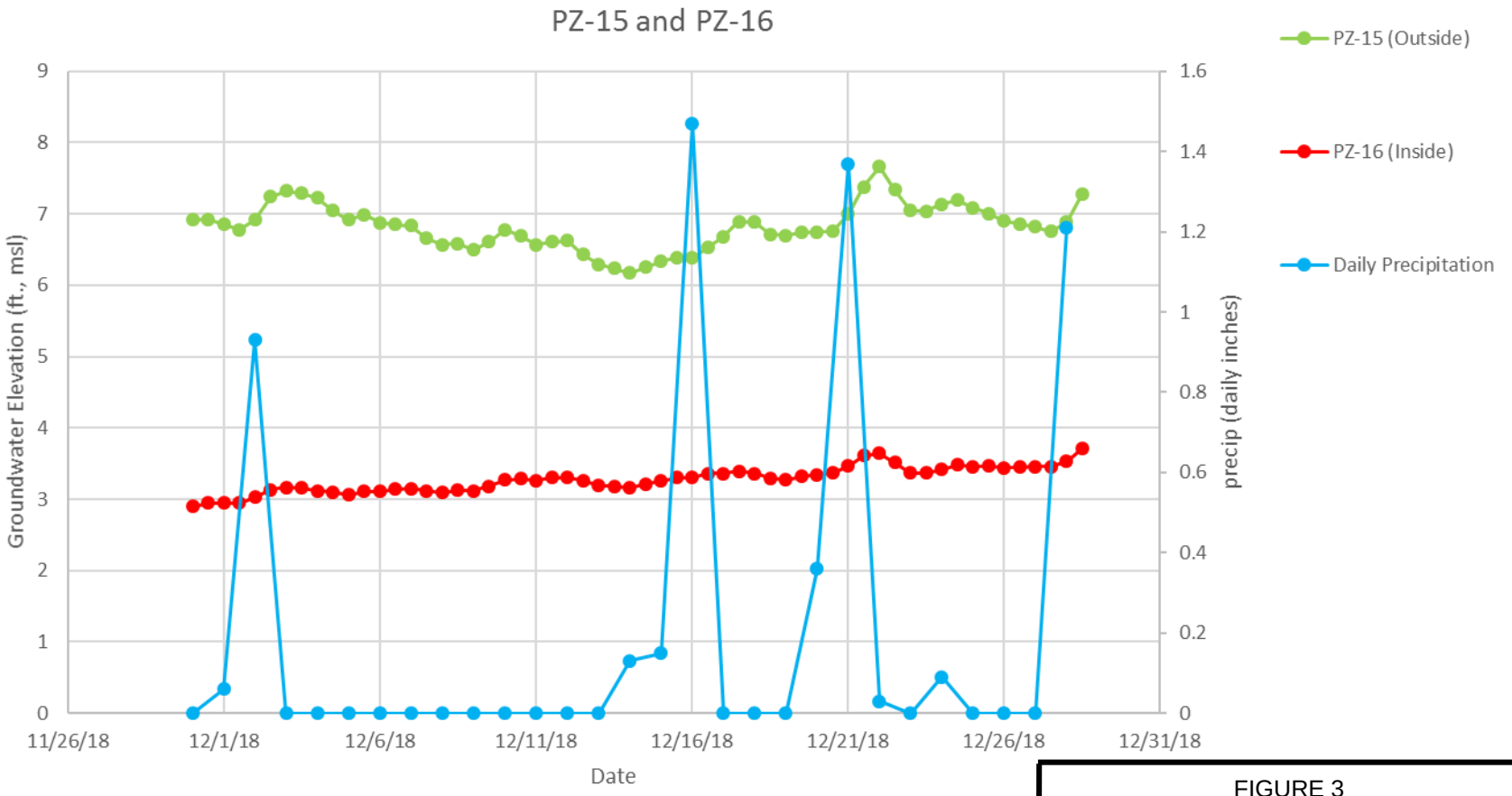


FIGURE 3

Hydrograph of PZ-15 and PZ-16
Data Logger Heads v. Precipitation
December 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

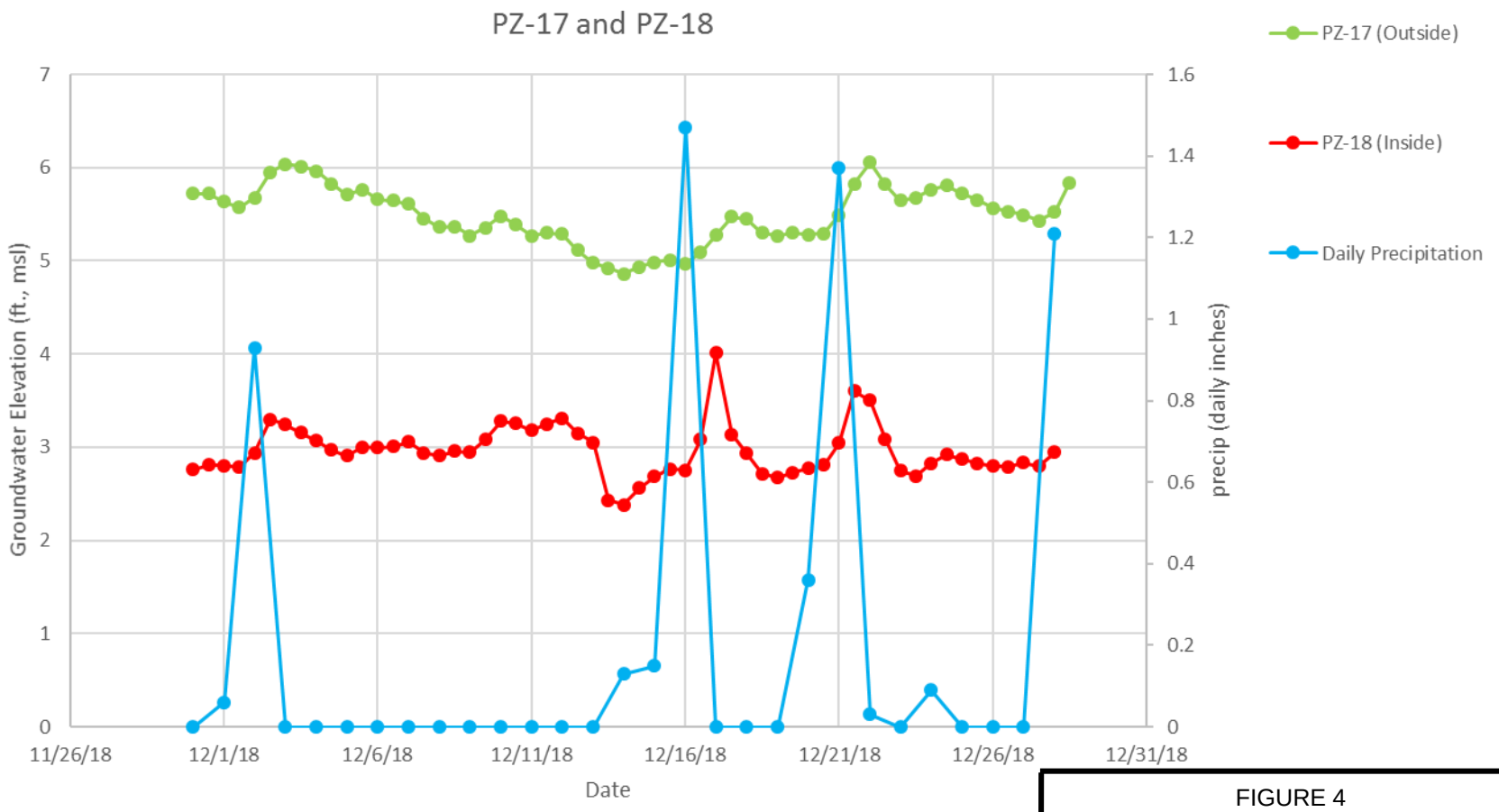


FIGURE 4

Hydrograph of PZ-17 and PZ-18
Data Logger Heads v. Precipitation
December 2018

Study Area 6, Jersey City, NJ

Notes:
1) Logger data recorded at 12-hours intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

cornerstone environmental

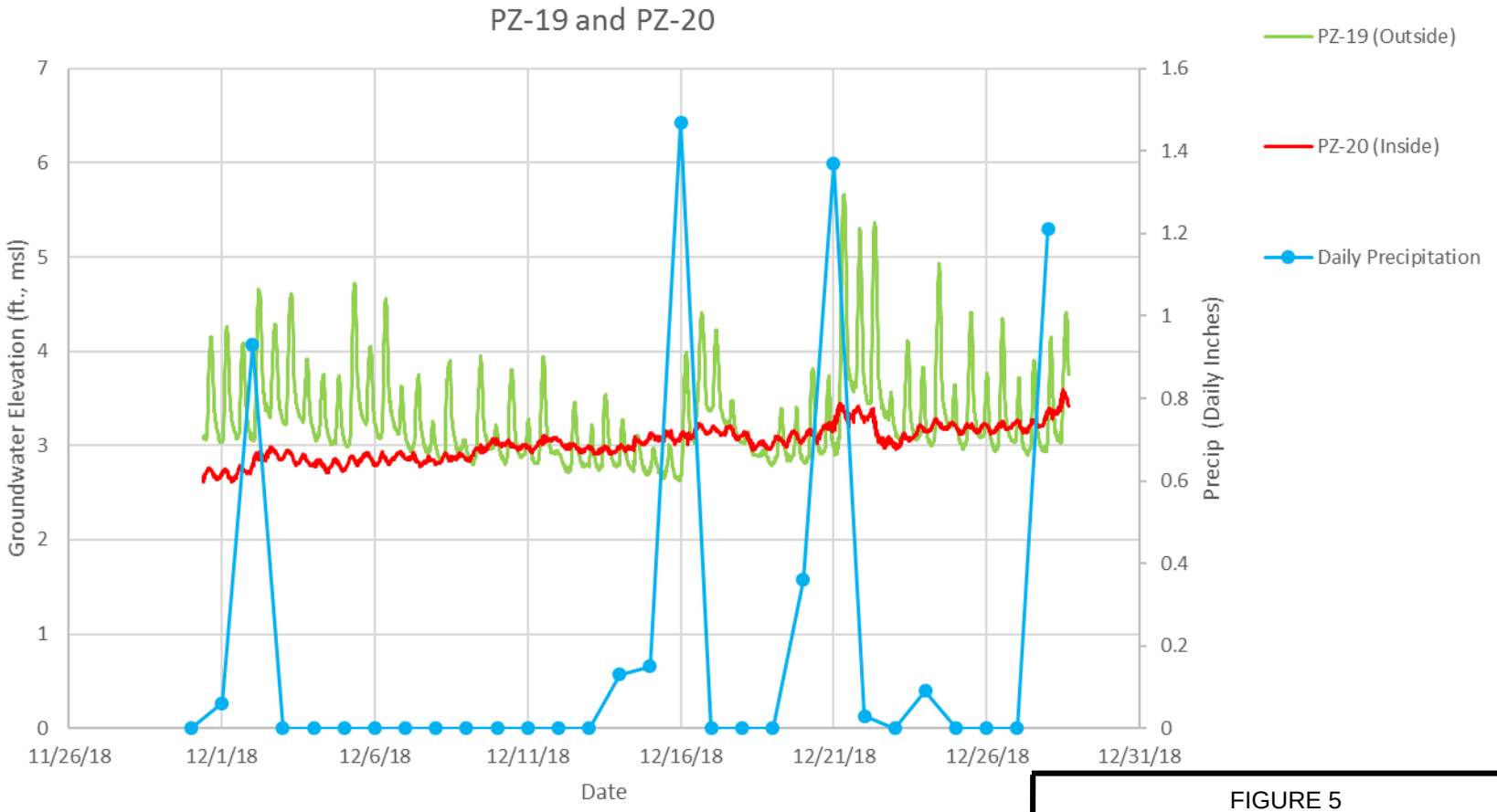


FIGURE 5

Hydrograph of PZ-19 and PZ-20
Data Logger Heads v. Precipitation
December 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

Notes:
1) Logger data recorded at 15-minute intervals; corrected for barometric fluctuations
2) Precipitation data from CRONOS database, Harrison, NJ

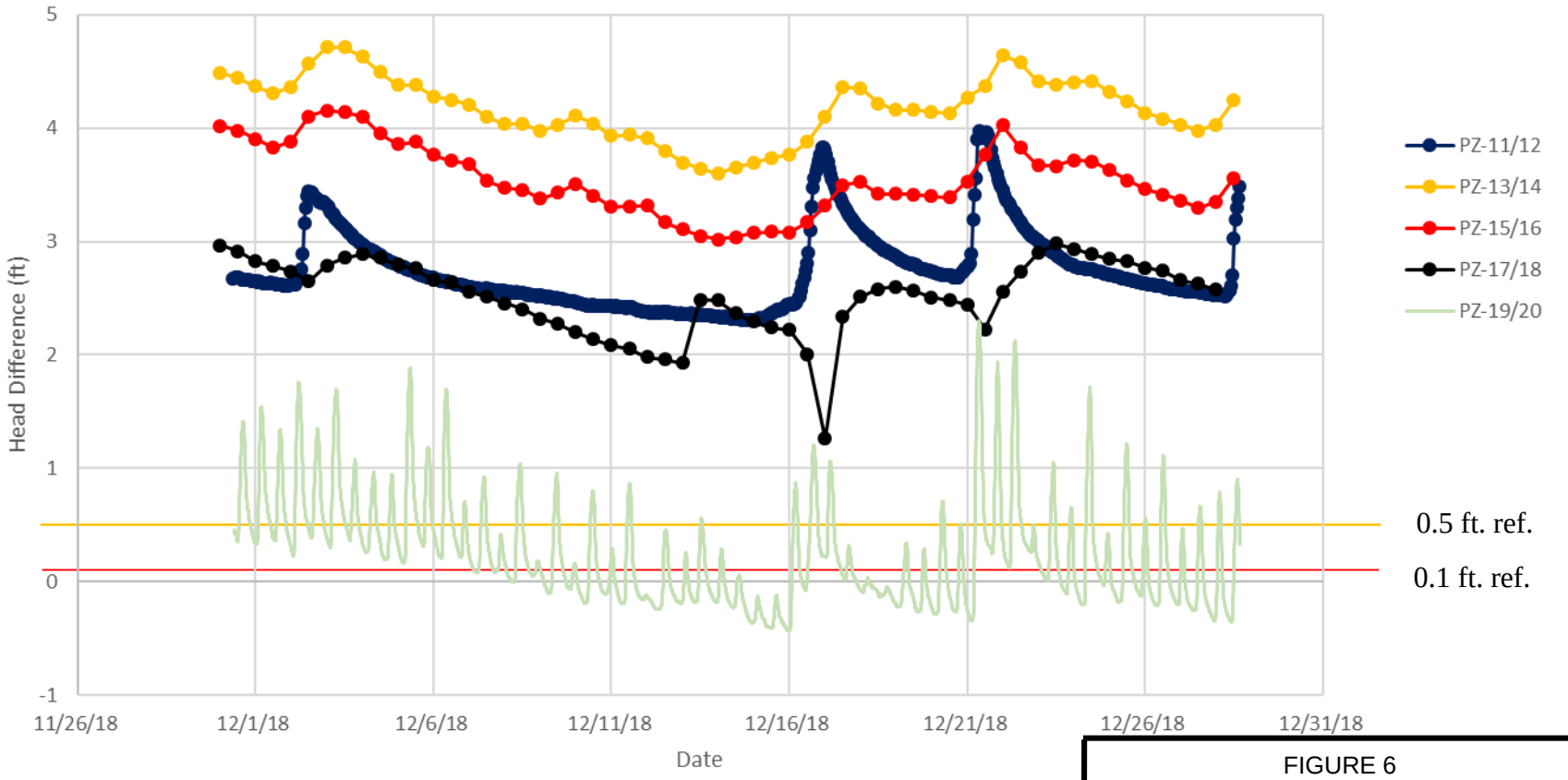


FIGURE 6

Hydrograph of Head Difference Across Piezometer Pairs – December 2018

Study Area 6, Jersey City, NJ

cornerstone environmental

APPENDIX B

DATA LOGGER HYDRGRAPHS FROM SA-5 NJCU

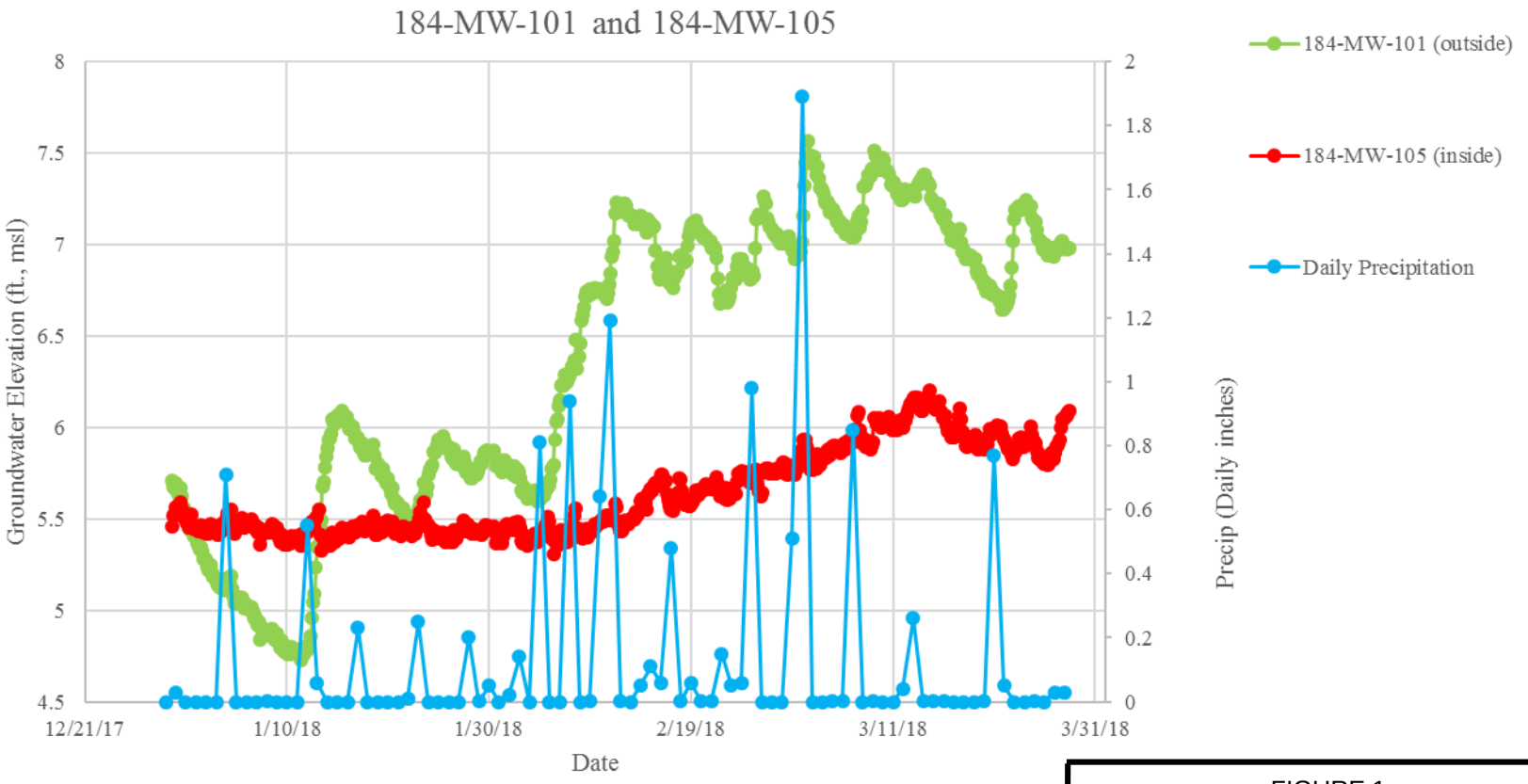


FIGURE 1

Hydrograph of Piezometer Pair
MW-101 and MW-105
First Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

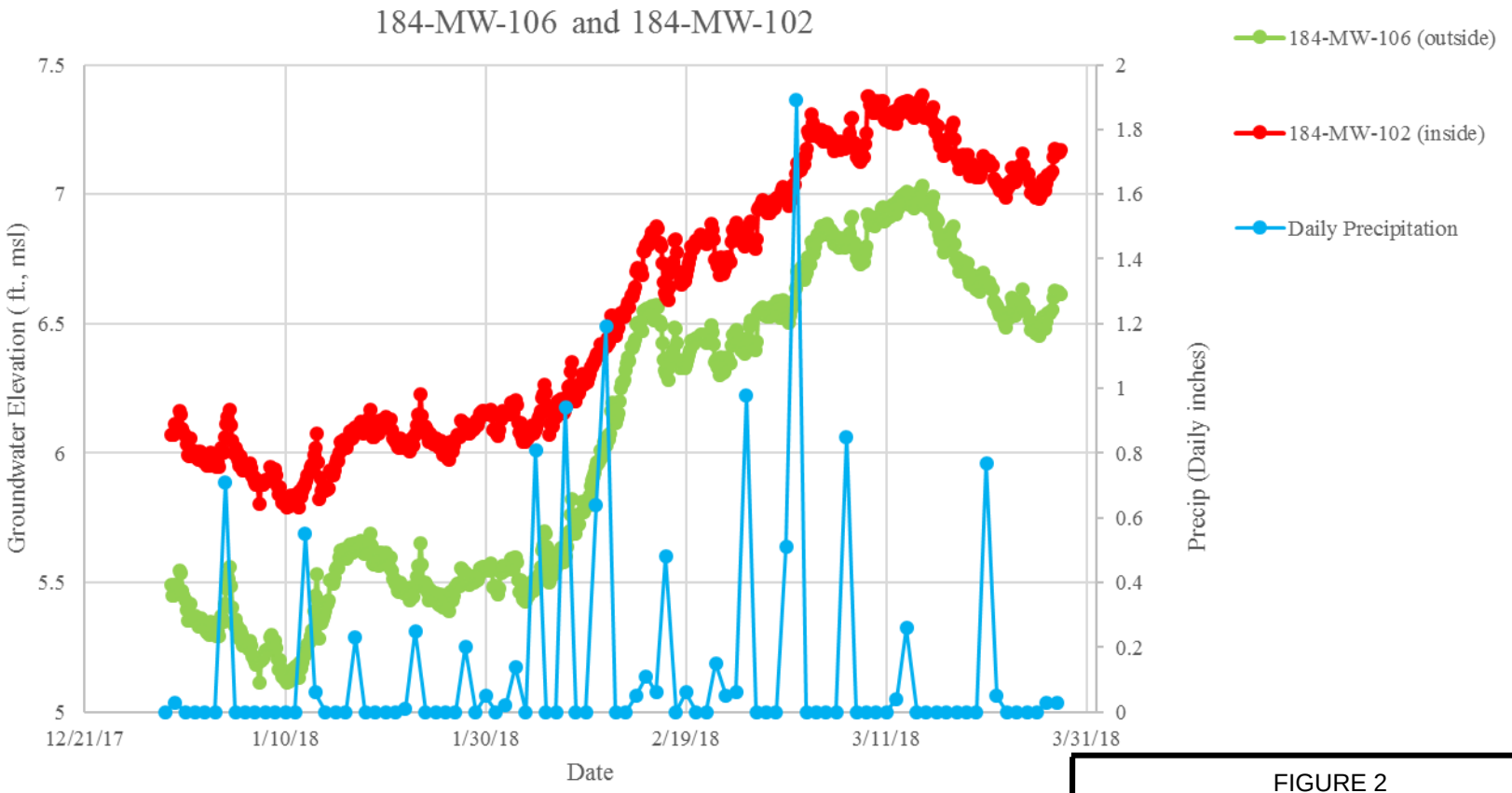


FIGURE 2

Hydrograph of Piezometer Pair
MW-102 and MW-106
First Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

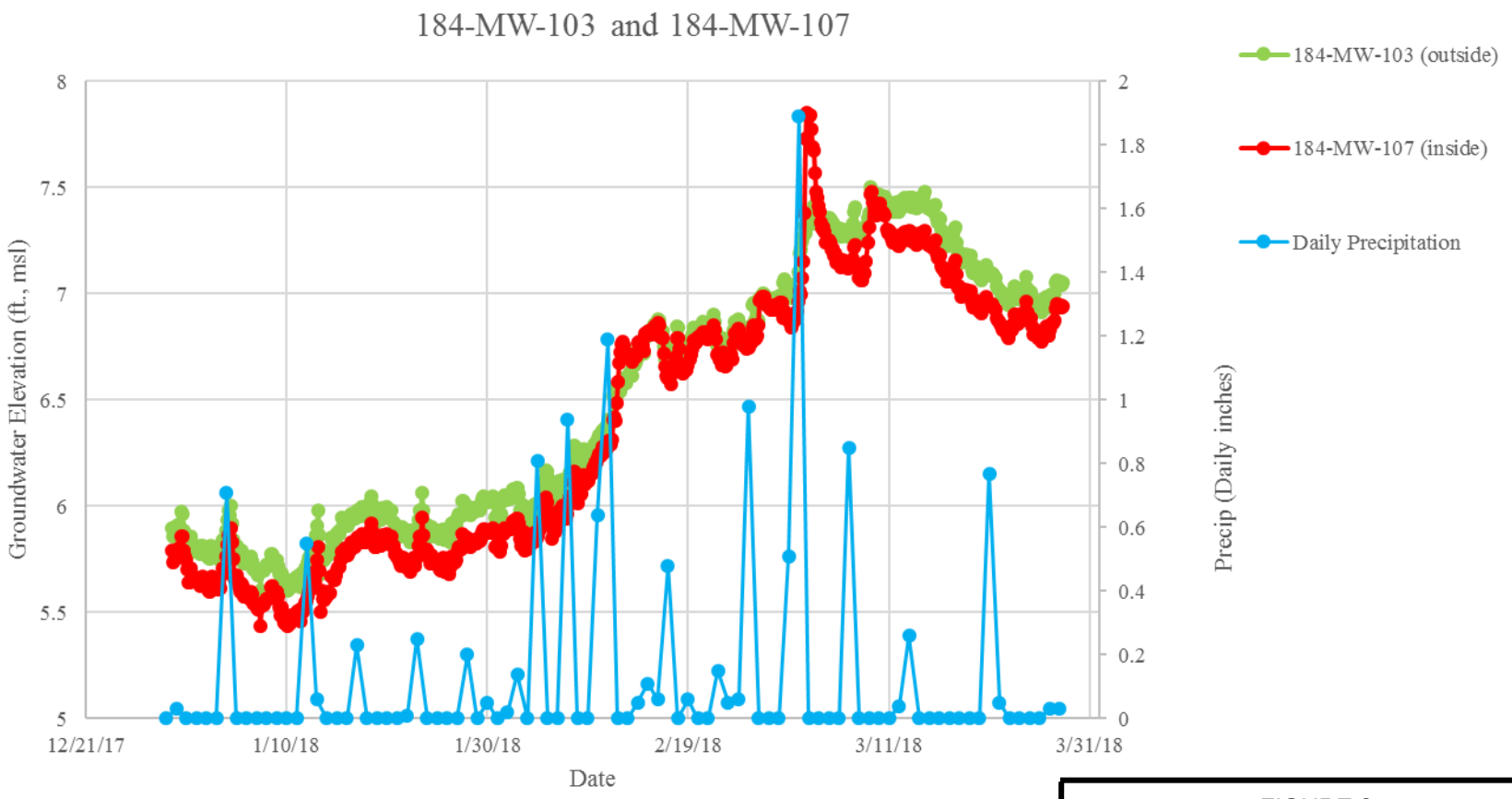


FIGURE 3

Hydrograph of Piezometer Pair
MW-103 and MW-107
First Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

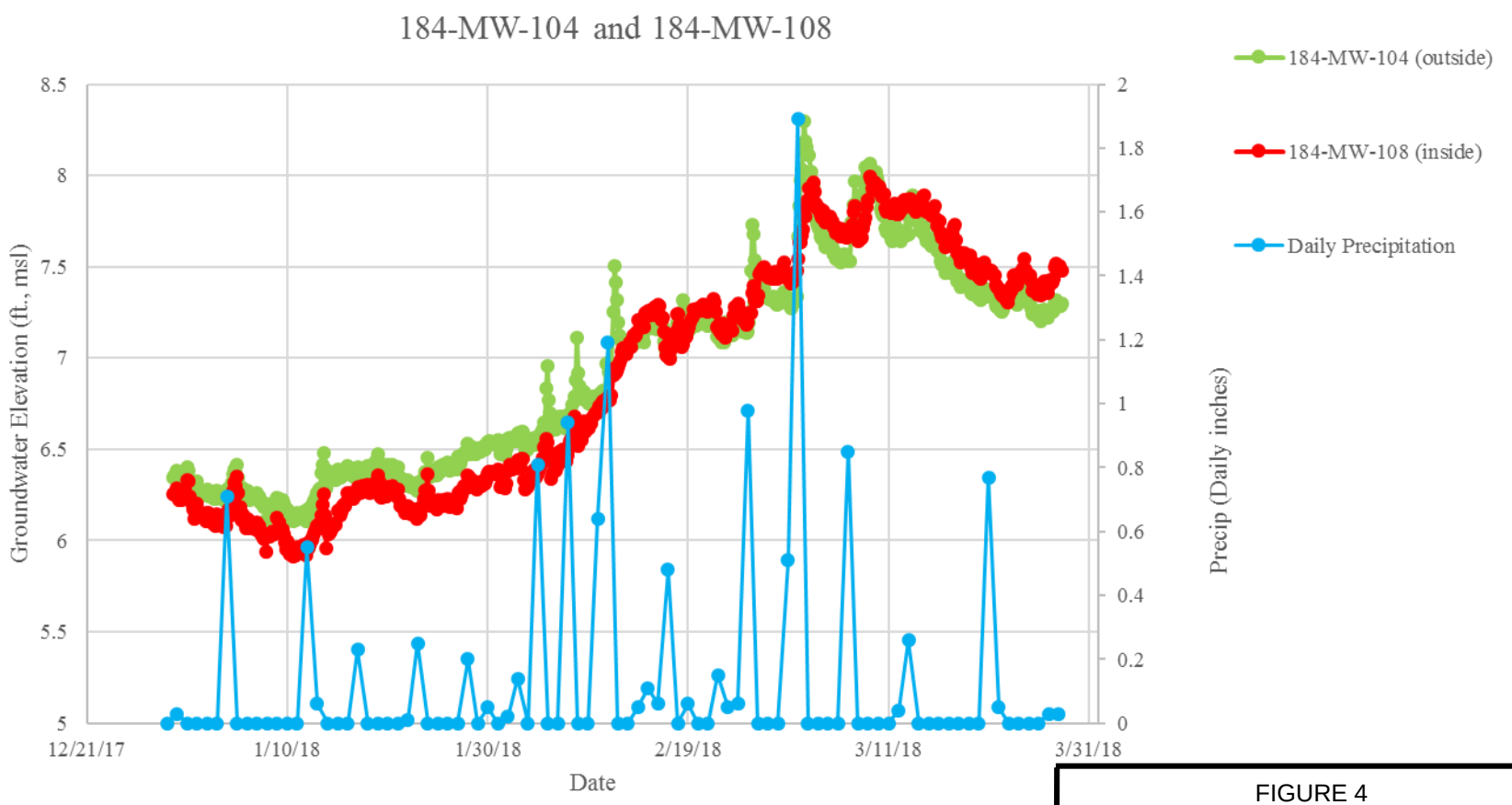


FIGURE 4

Hydrograph of Piezometer Pair
MW-104 and MW-108
First Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

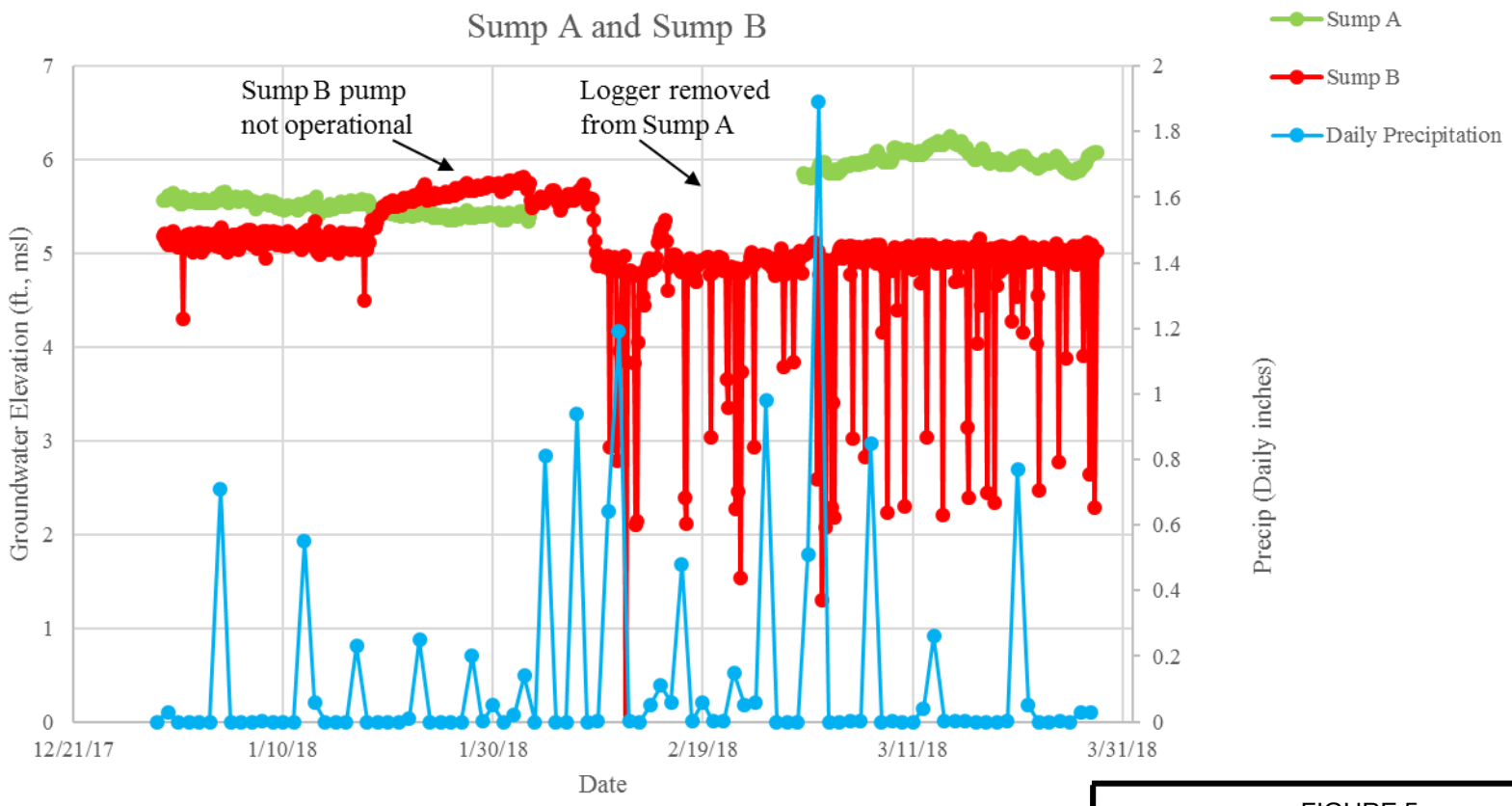


FIGURE 5

Hydrograph of Sump A and Sump B
First Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

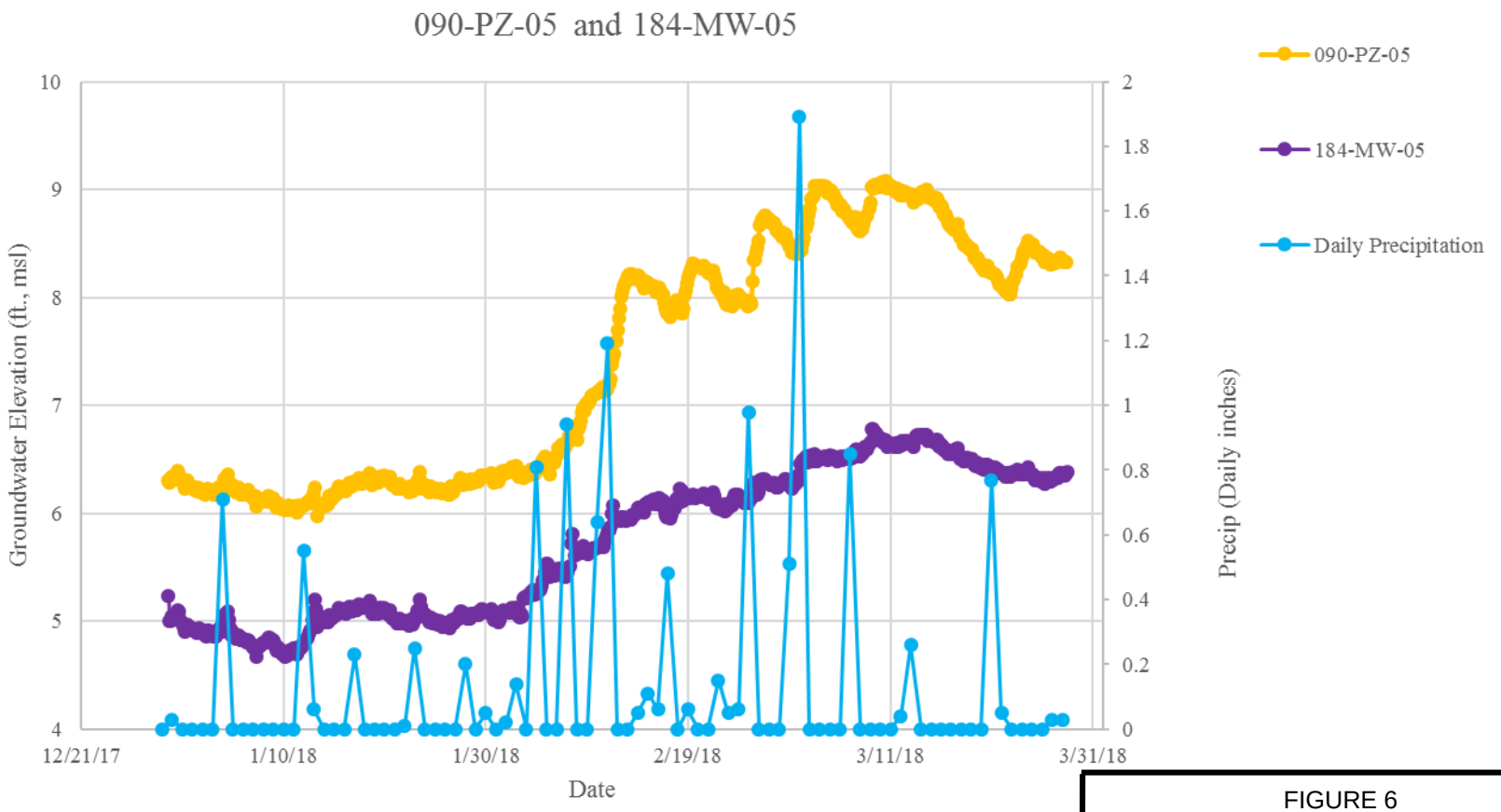


FIGURE 6

Hydrograph of Wells
PZ-05 and MW-05
First Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

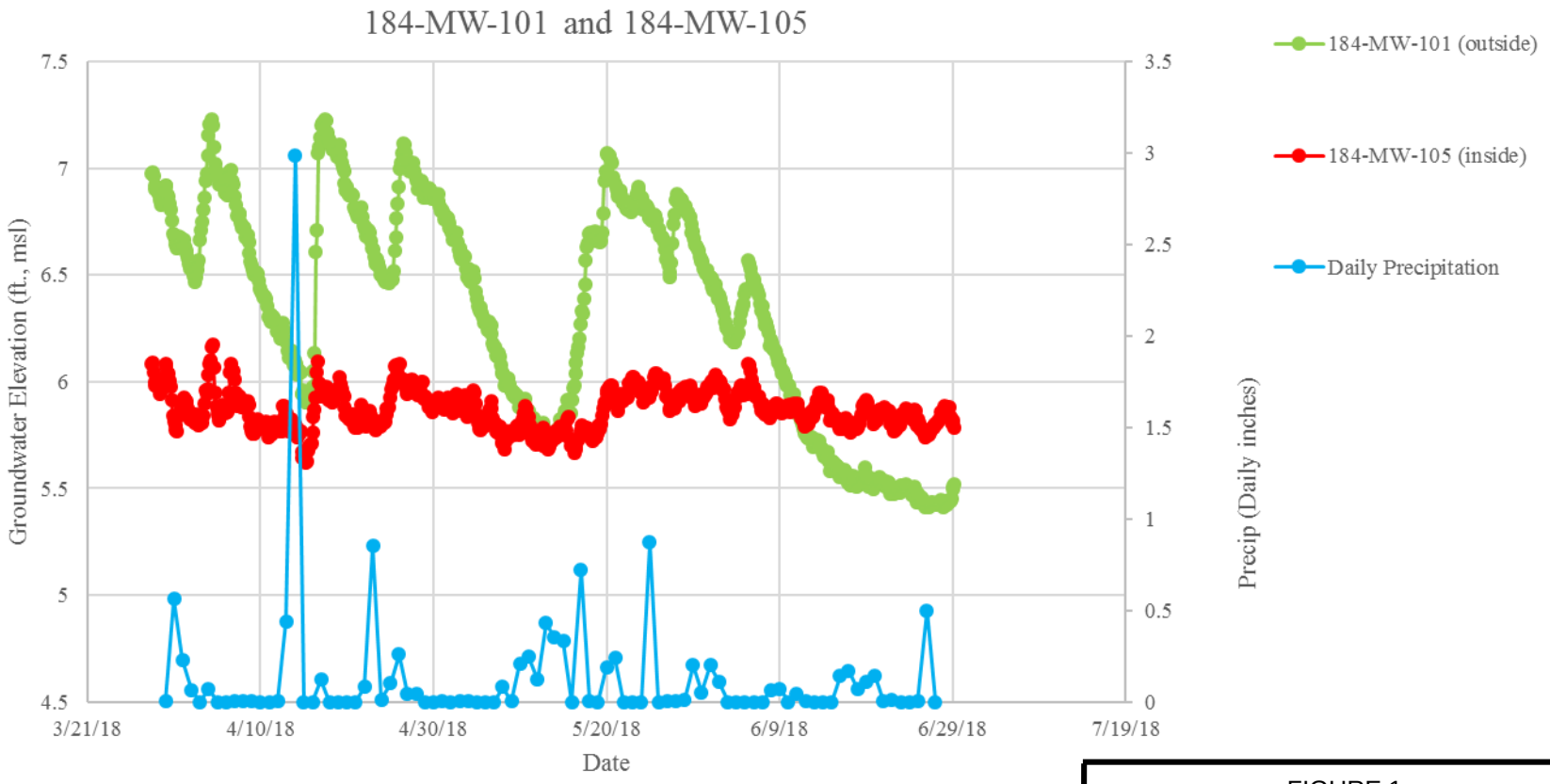


FIGURE 1

Hydrograph of Piezometer Pair
MW-101 and MW-105
Second Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

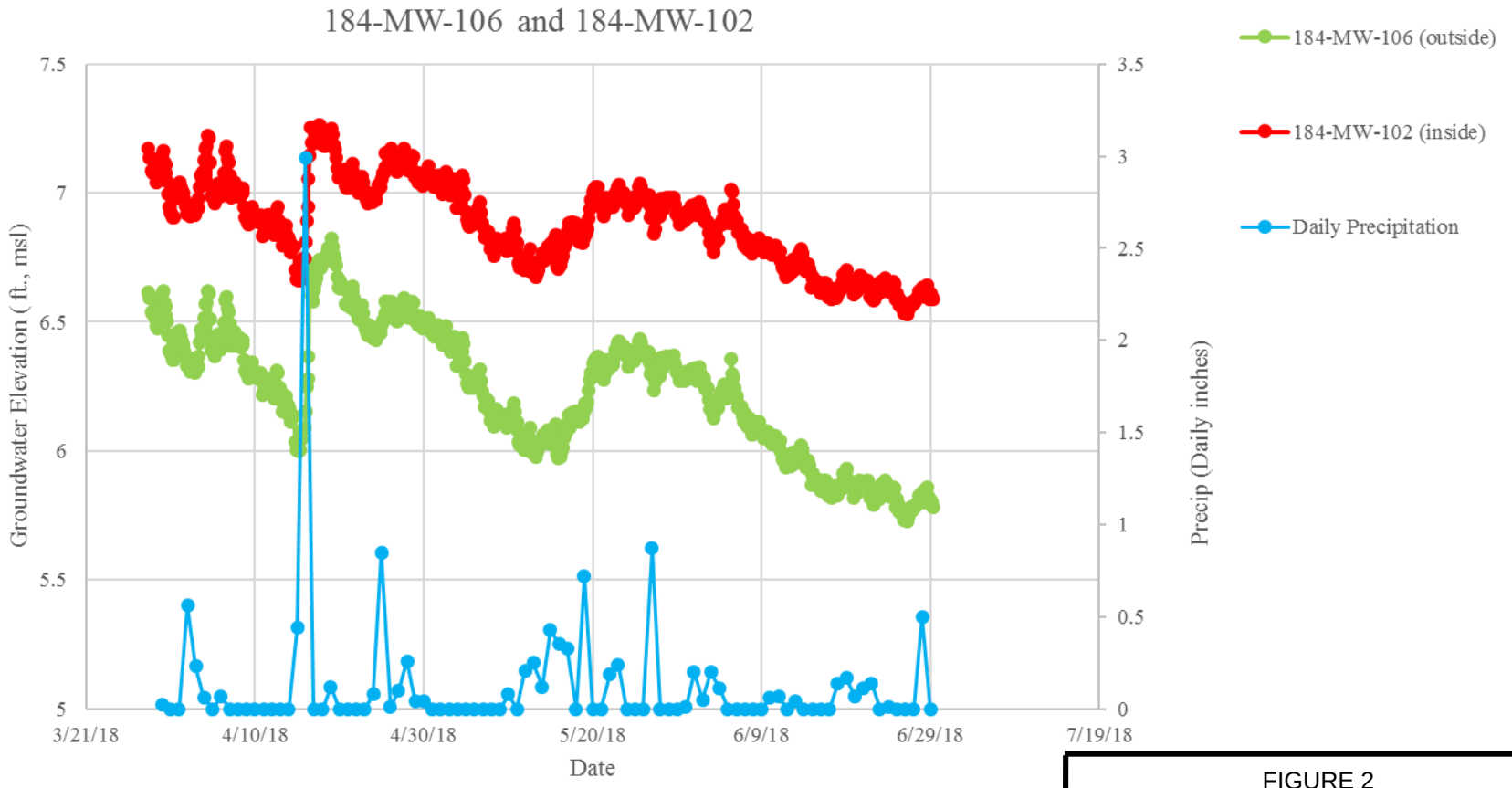


FIGURE 2

Hydrograph of Piezometer Pair
MW-102 and MW-106
Second Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

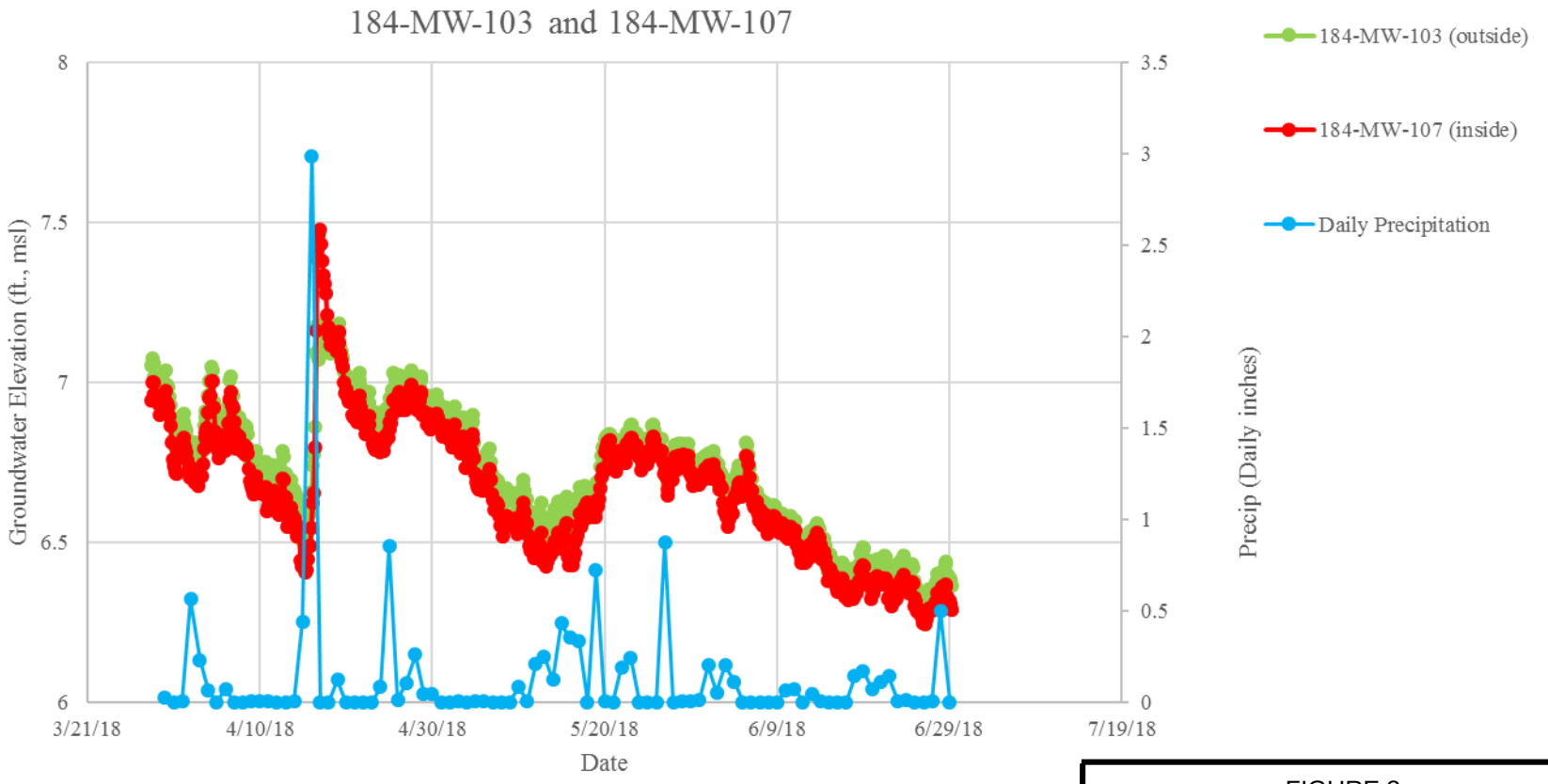


FIGURE 3

Hydrograph of Piezometer Pair
MW-103 and MW-107
Second Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

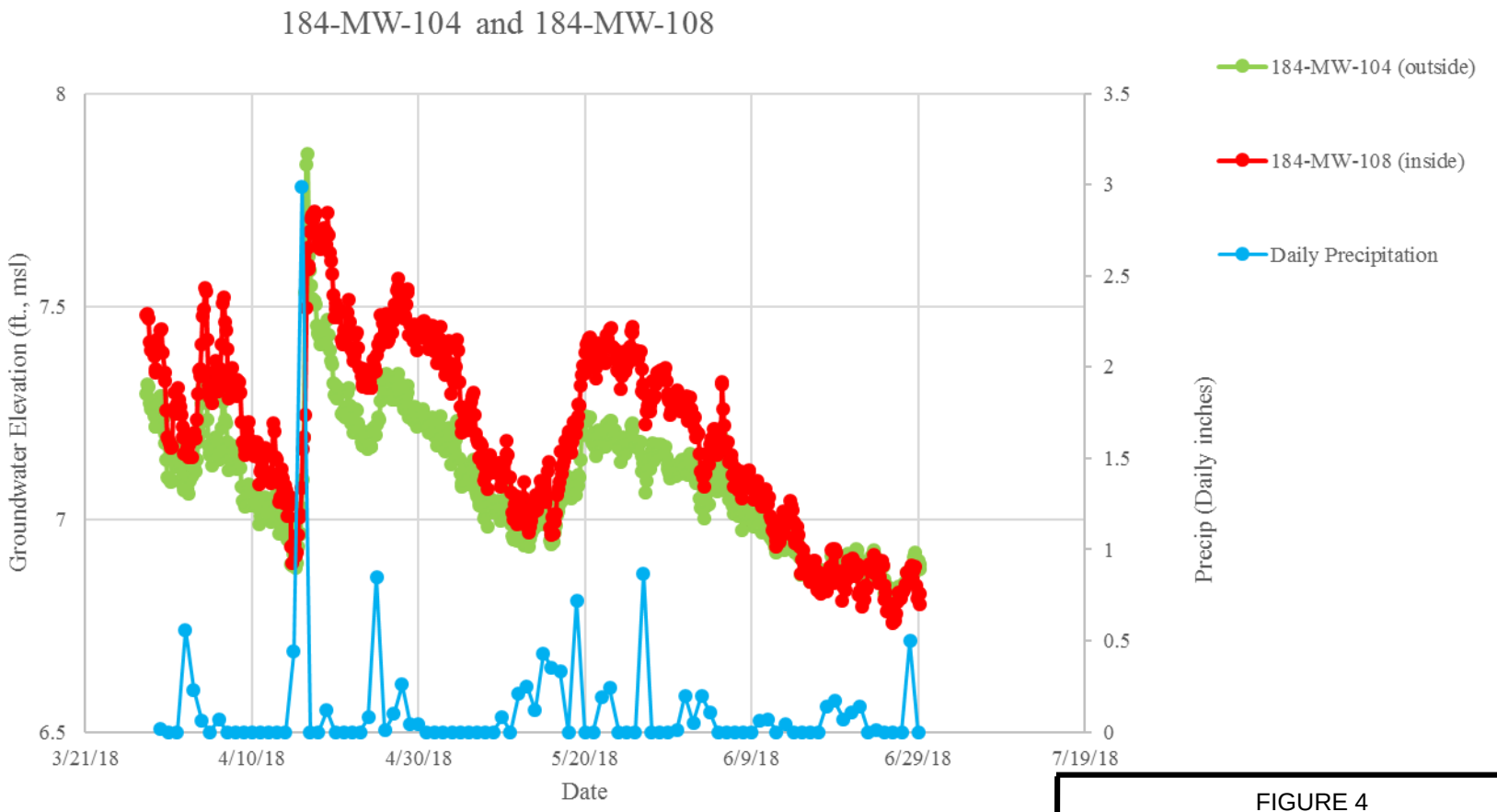


FIGURE 4

Hydrograph of Piezometer Pair
MW-104 and MW-108
Second Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

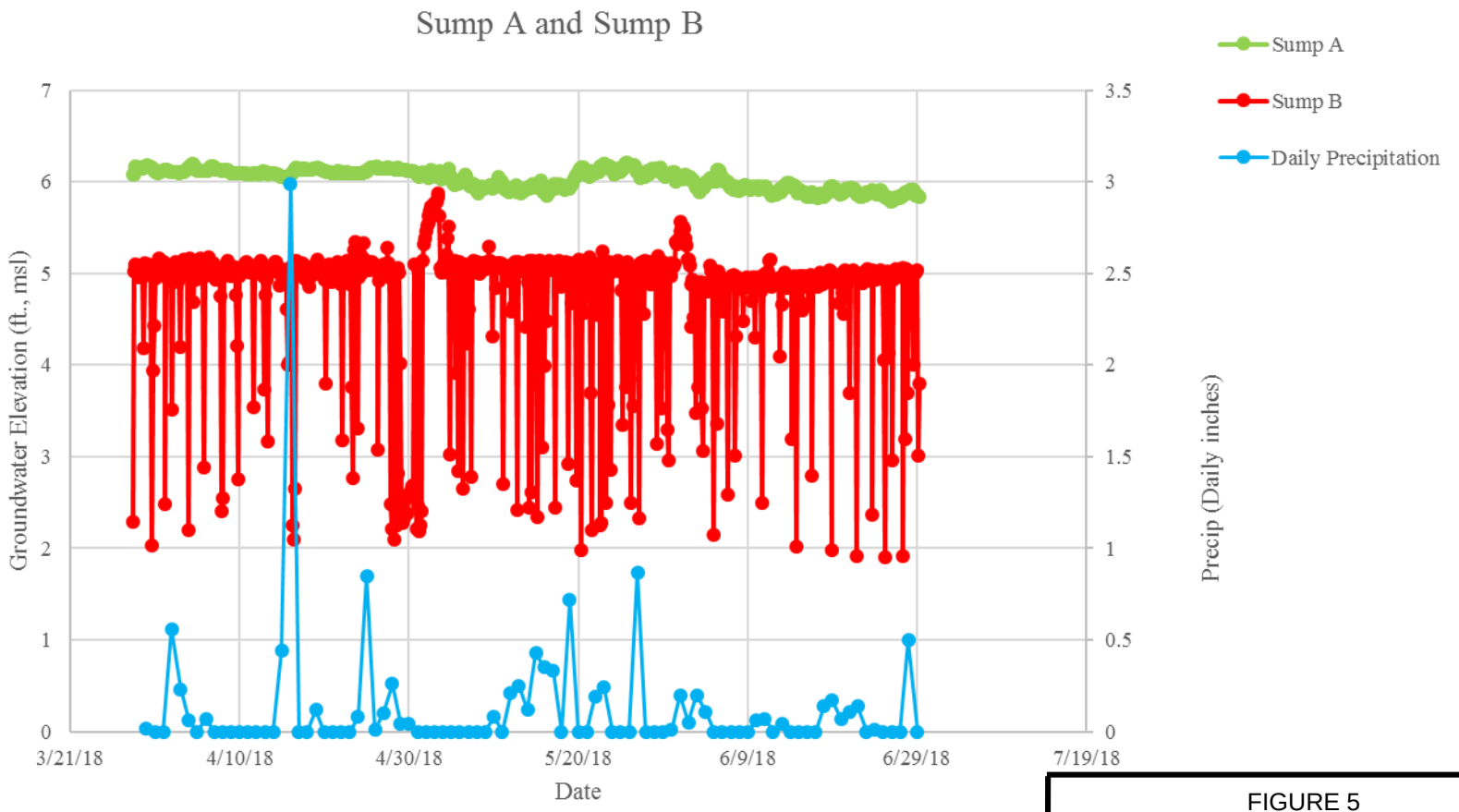


FIGURE 5

Hydrograph of Sump A and Sump B
Second Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

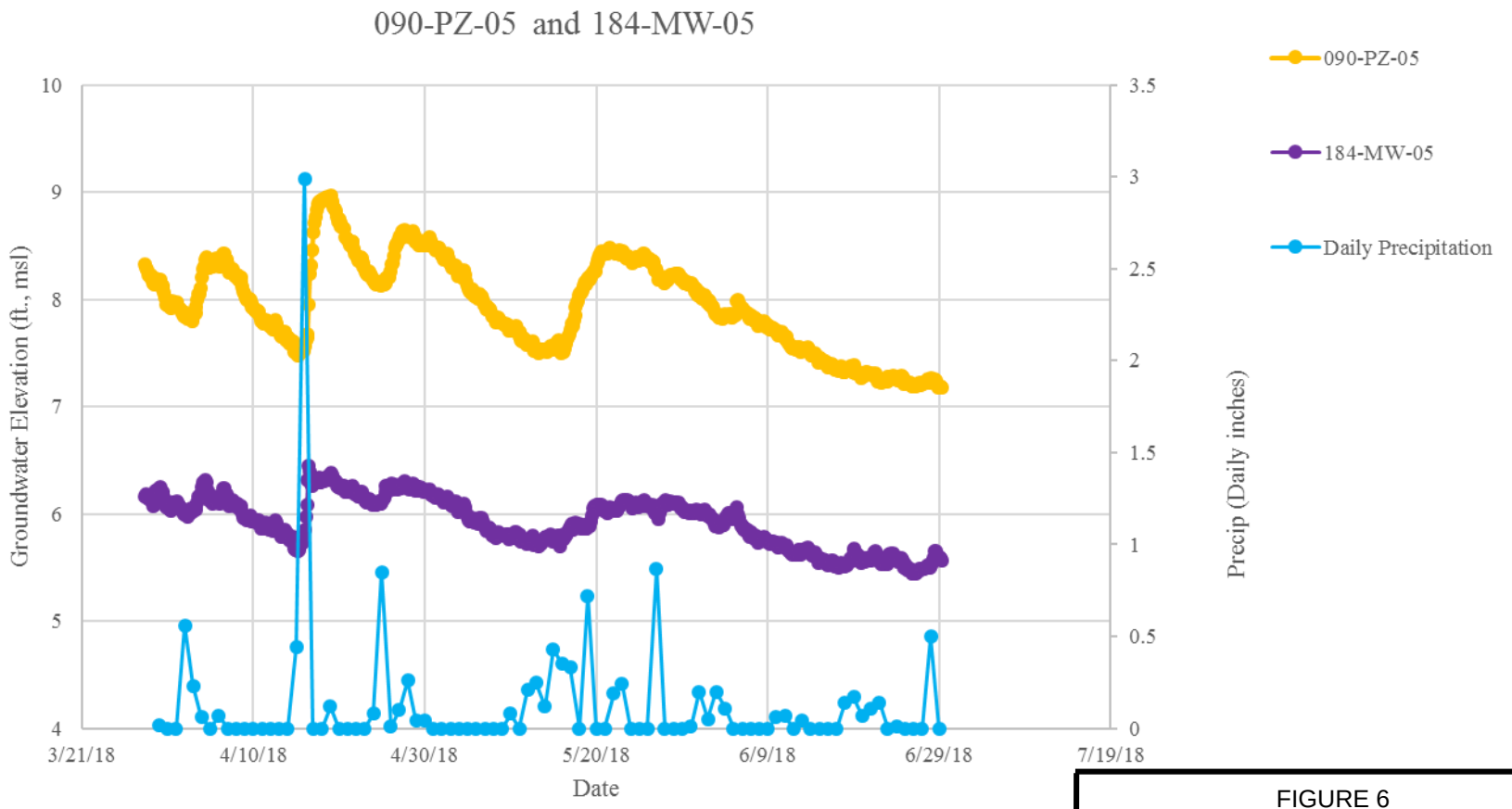


FIGURE 6

Hydrograph of Wells
PZ-05 and MW-05
Second Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

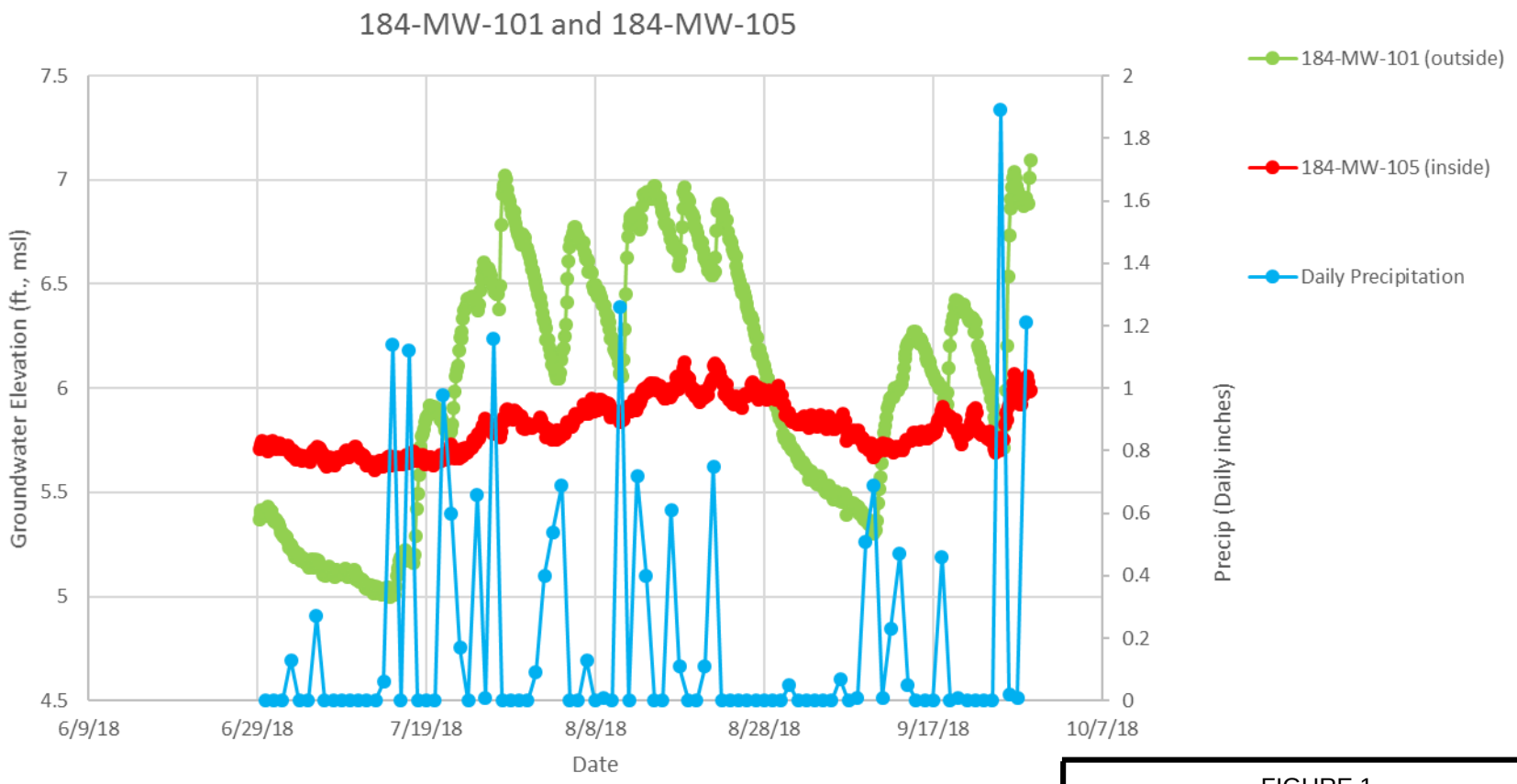


FIGURE 1

Hydrograph of Piezometer Pair
MW-101 and MW-105
Third Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

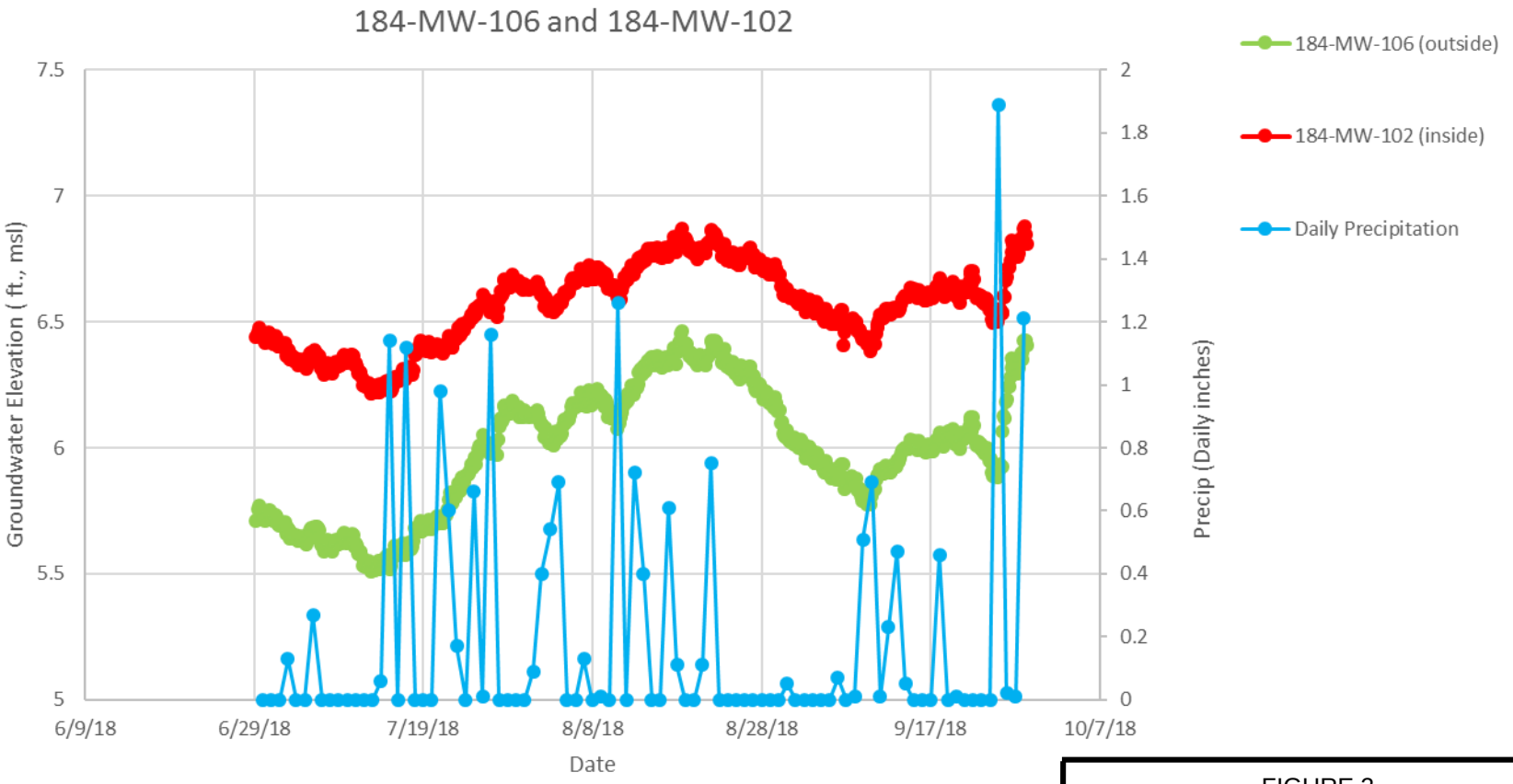


FIGURE 2

Hydrograph of Piezometer Pair
MW-102 and MW-106
Third Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

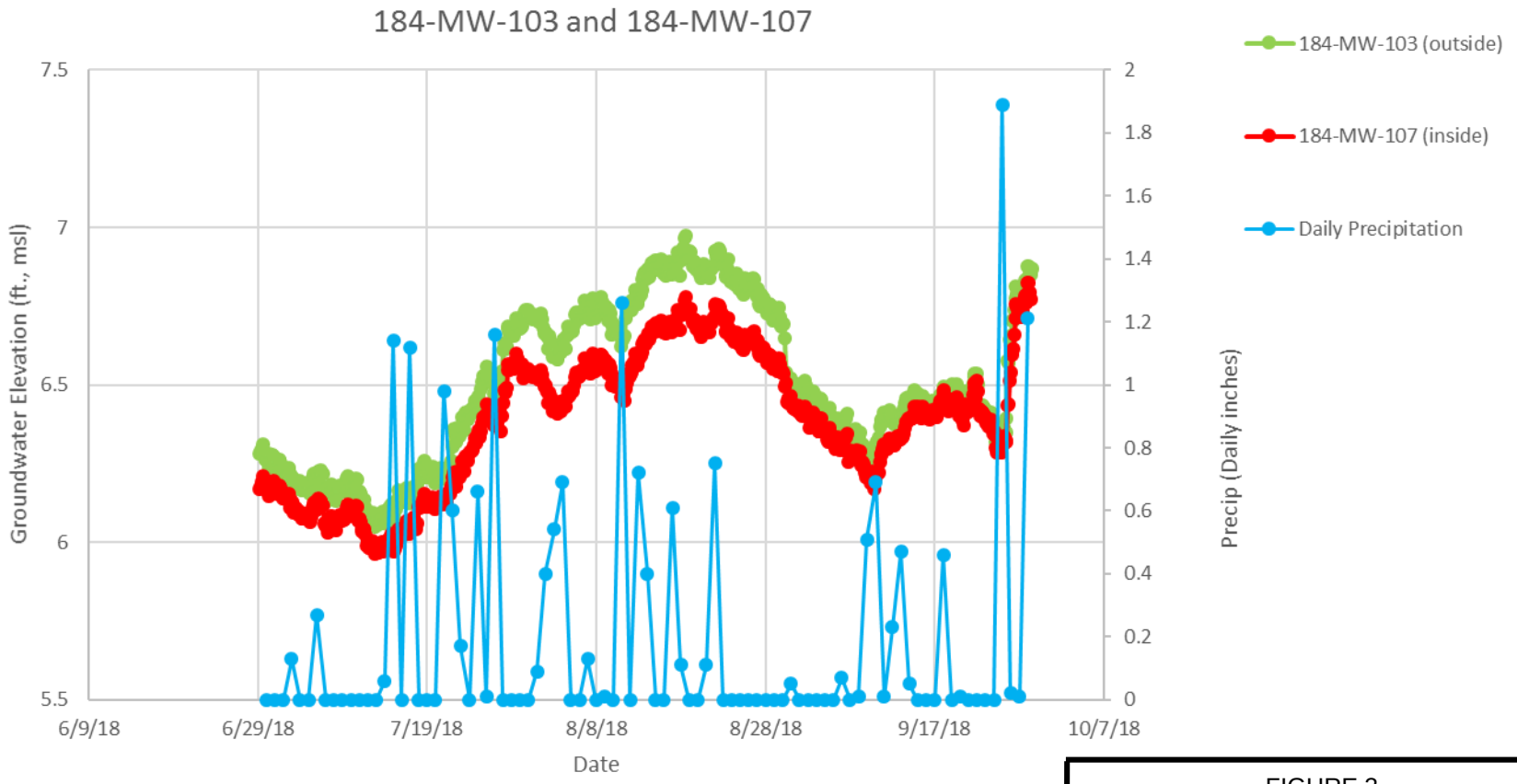


FIGURE 3

Hydrograph of Piezometer Pair
MW-103 and MW-107
Third Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

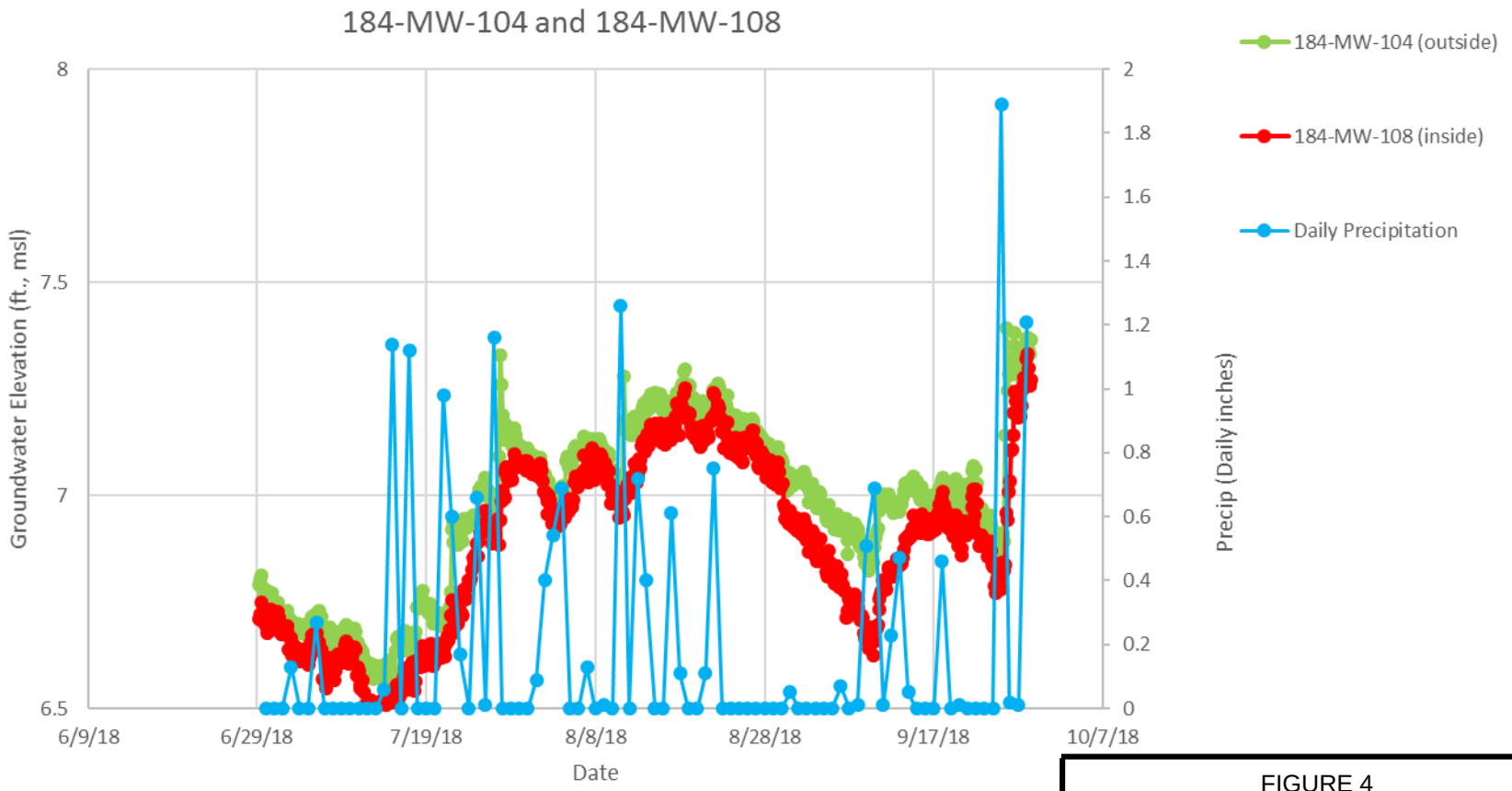


FIGURE 4

Hydrograph of Piezometer Pair
MW-104 and MW-108
Third Quarter 2018

NJCU, Jersey City, NJ

cornerstone
environmental

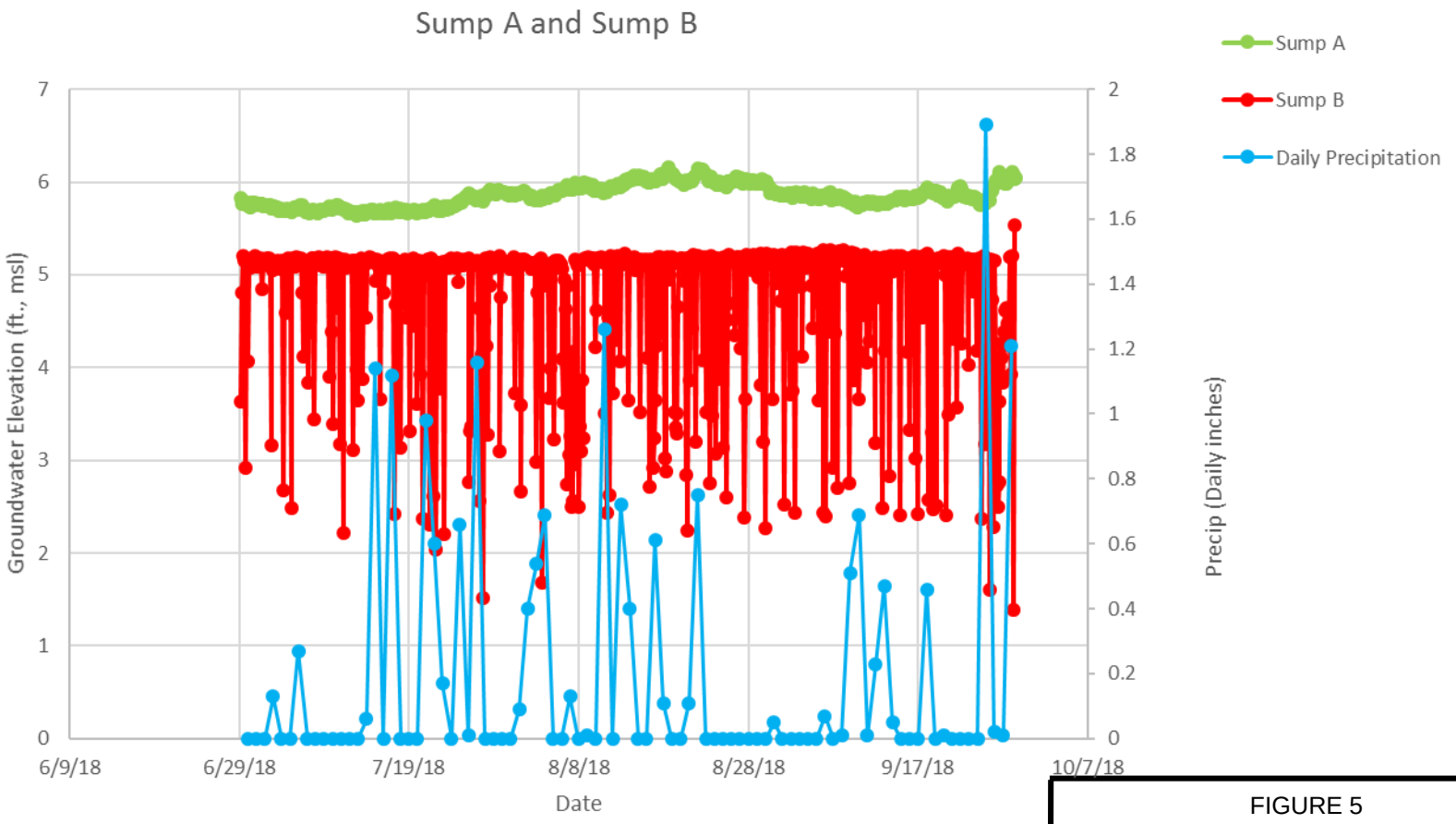


FIGURE 5

Hydrograph of Sump A and Sump B
Third Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

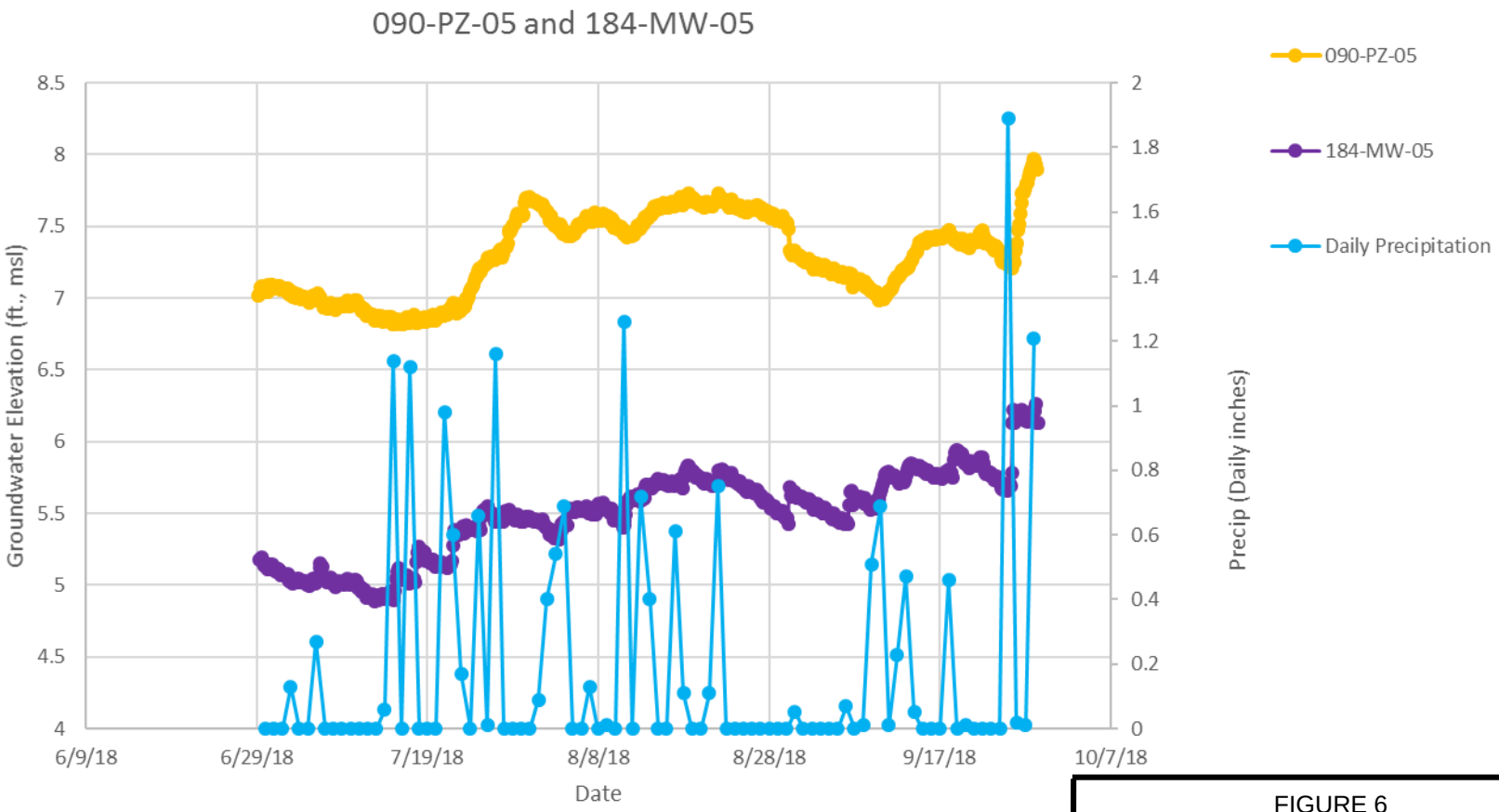


FIGURE 6

Hydrograph of Wells
PZ-05 and MW-05
Third Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

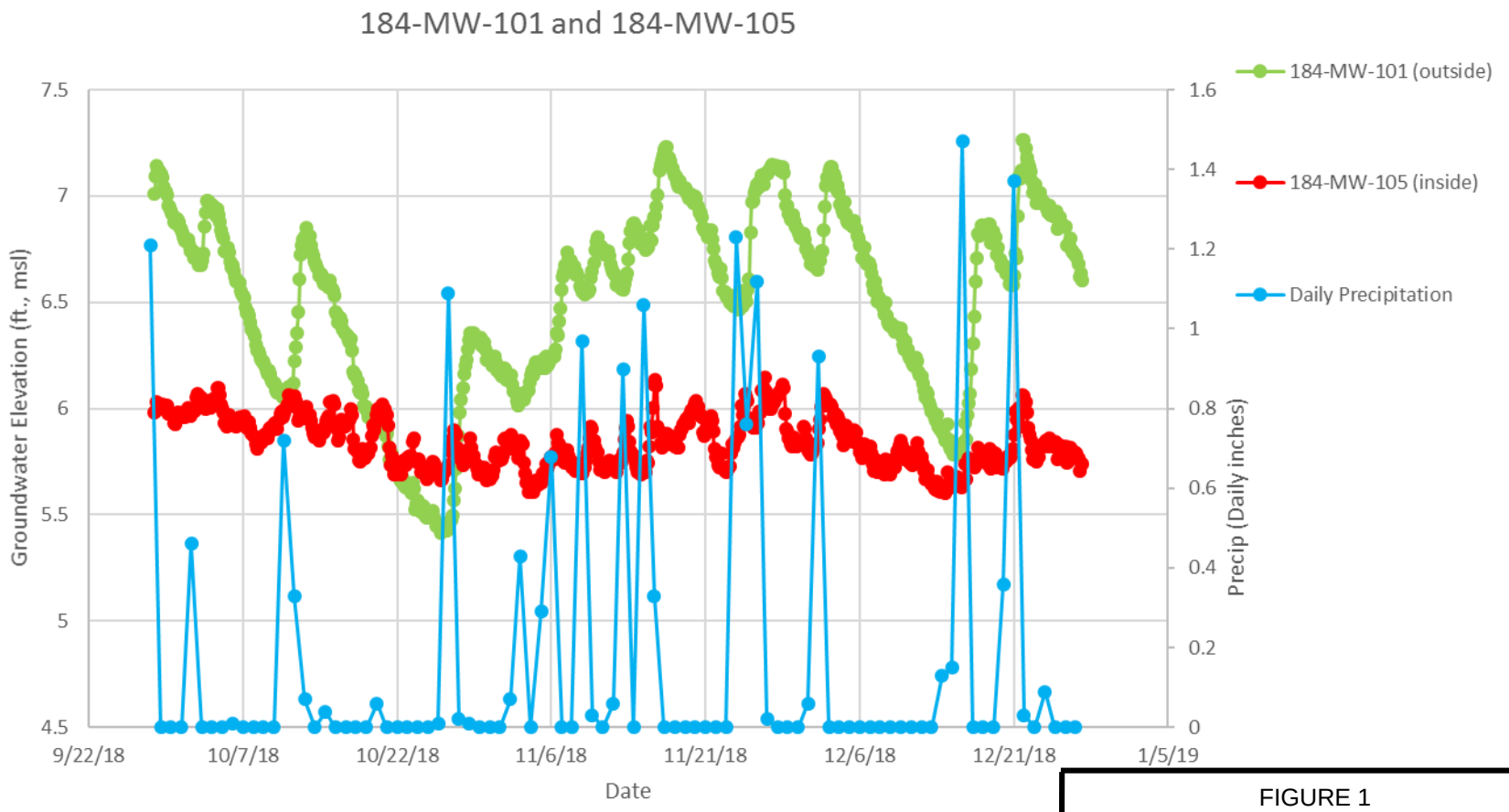


FIGURE 1

Hydrograph of Piezometer Pair
MW-101 and MW-105
Fourth Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

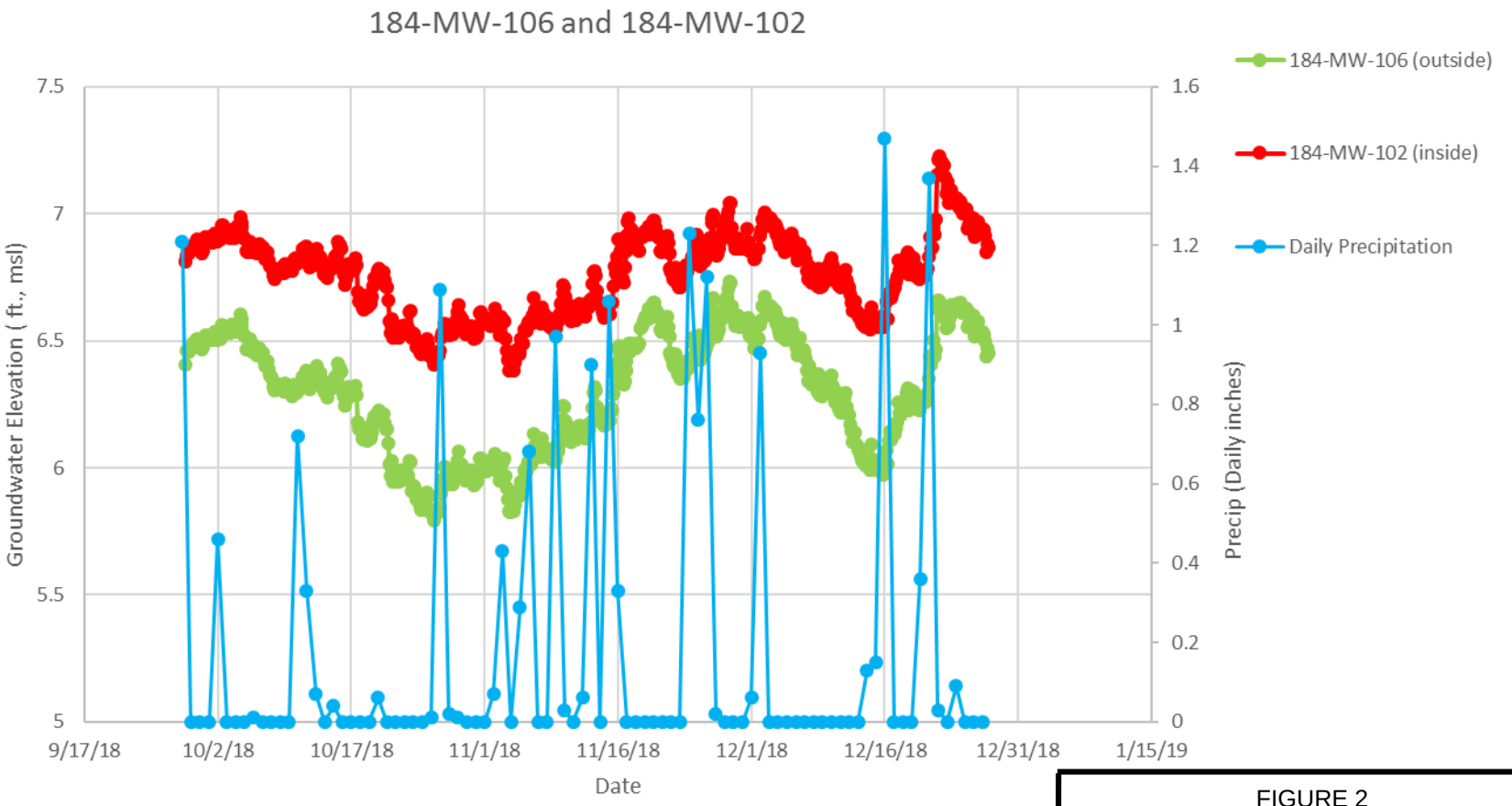


FIGURE 2

Hydrograph of Piezometer Pair
MW-102 and MW-106
Fourth Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

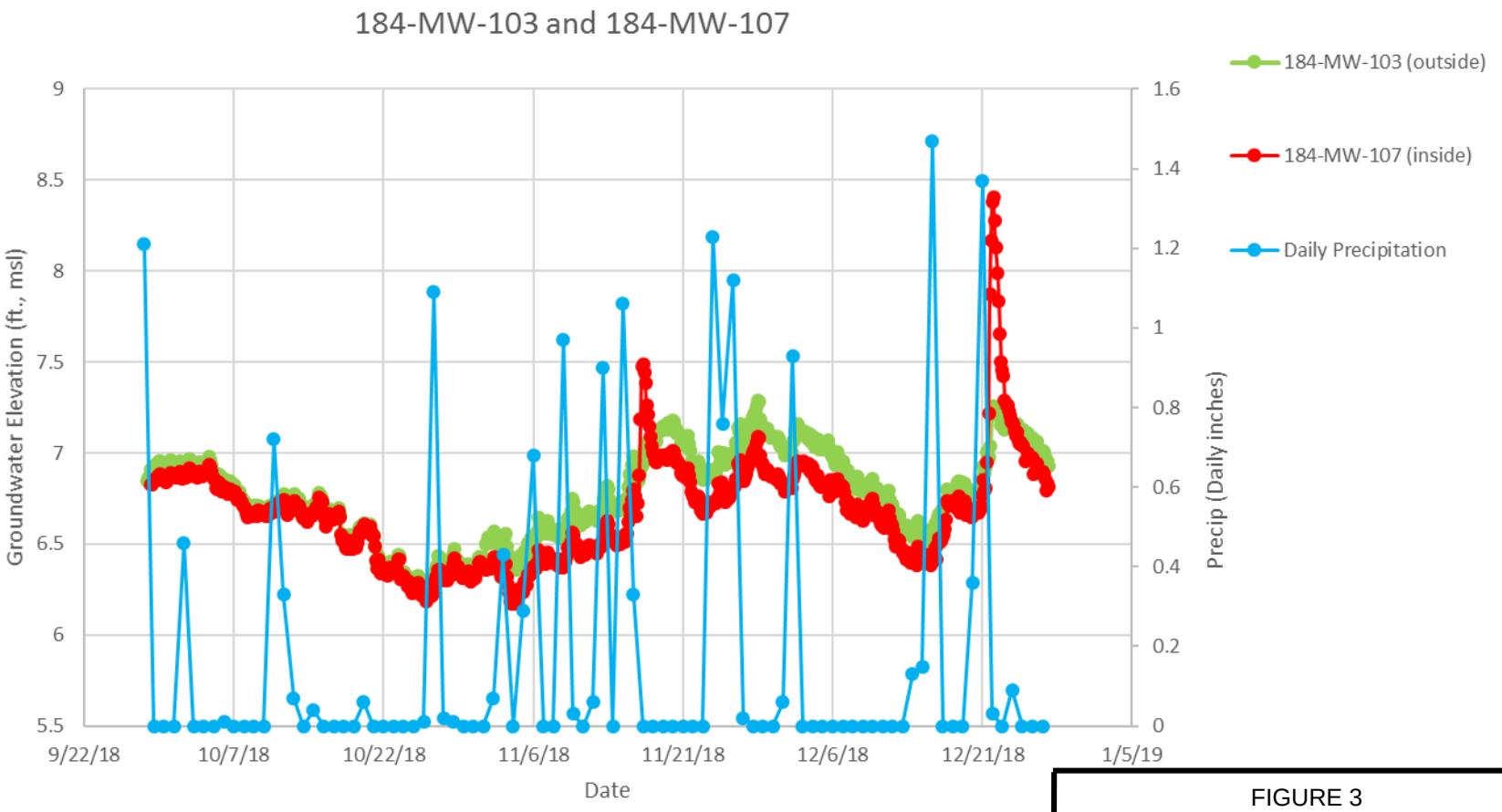


FIGURE 3

Hydrograph of Piezometer Pair
MW-103 and MW-107
Fourth Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

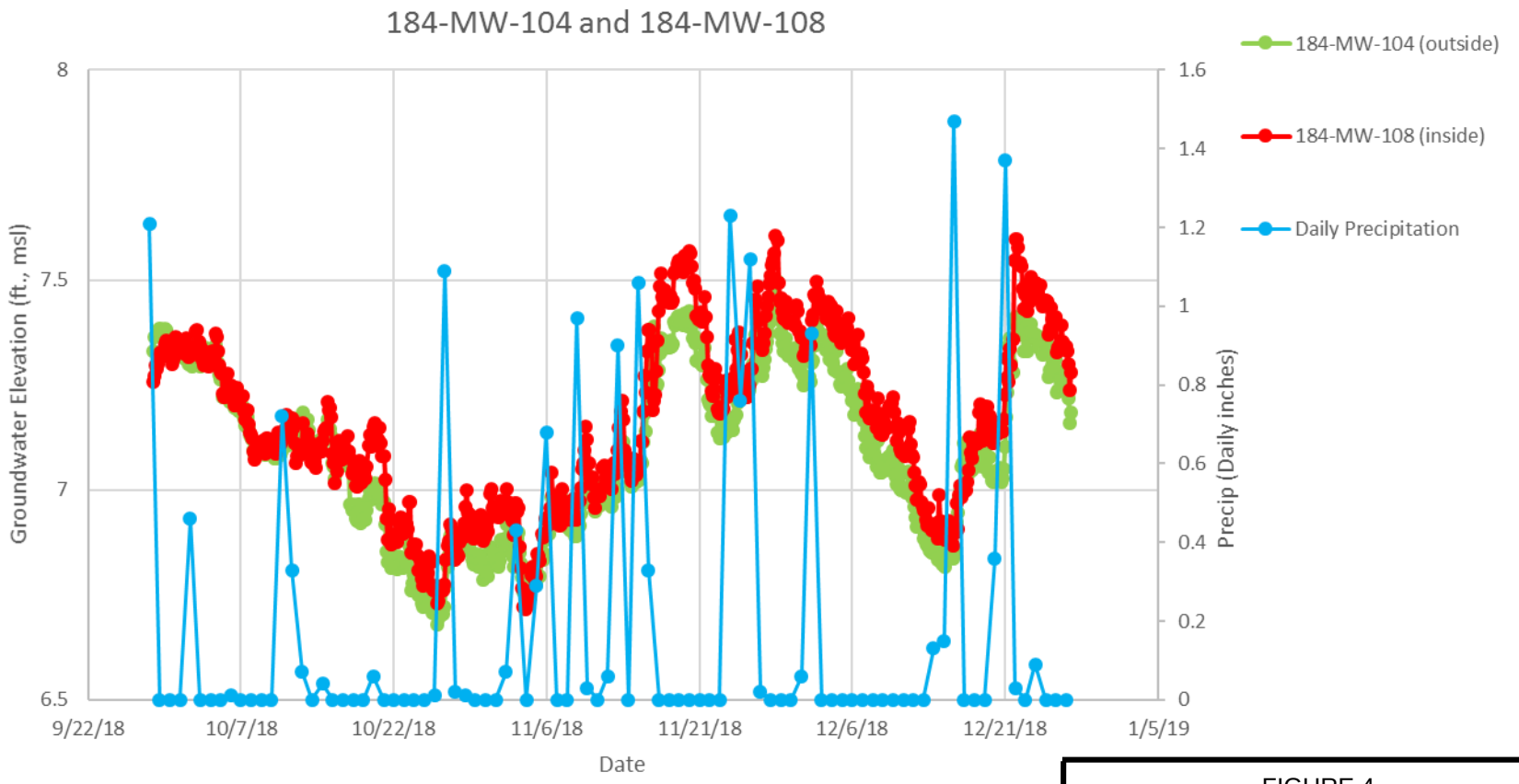


FIGURE 4

Hydrograph of Piezometer Pair
MW-104 and MW-108
Fourth Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

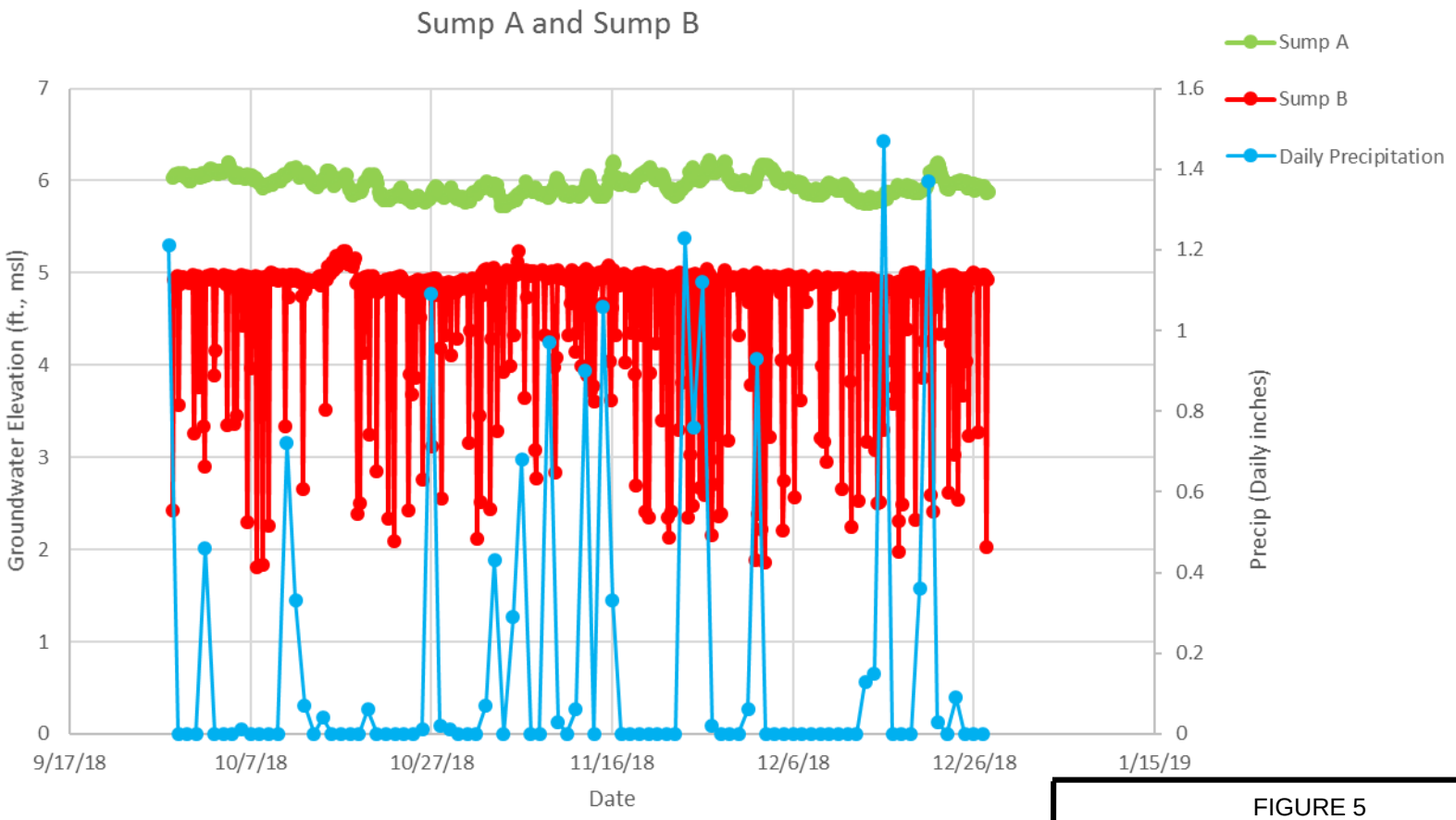


FIGURE 5

Hydrograph of Sump A and Sump B
Fourth Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

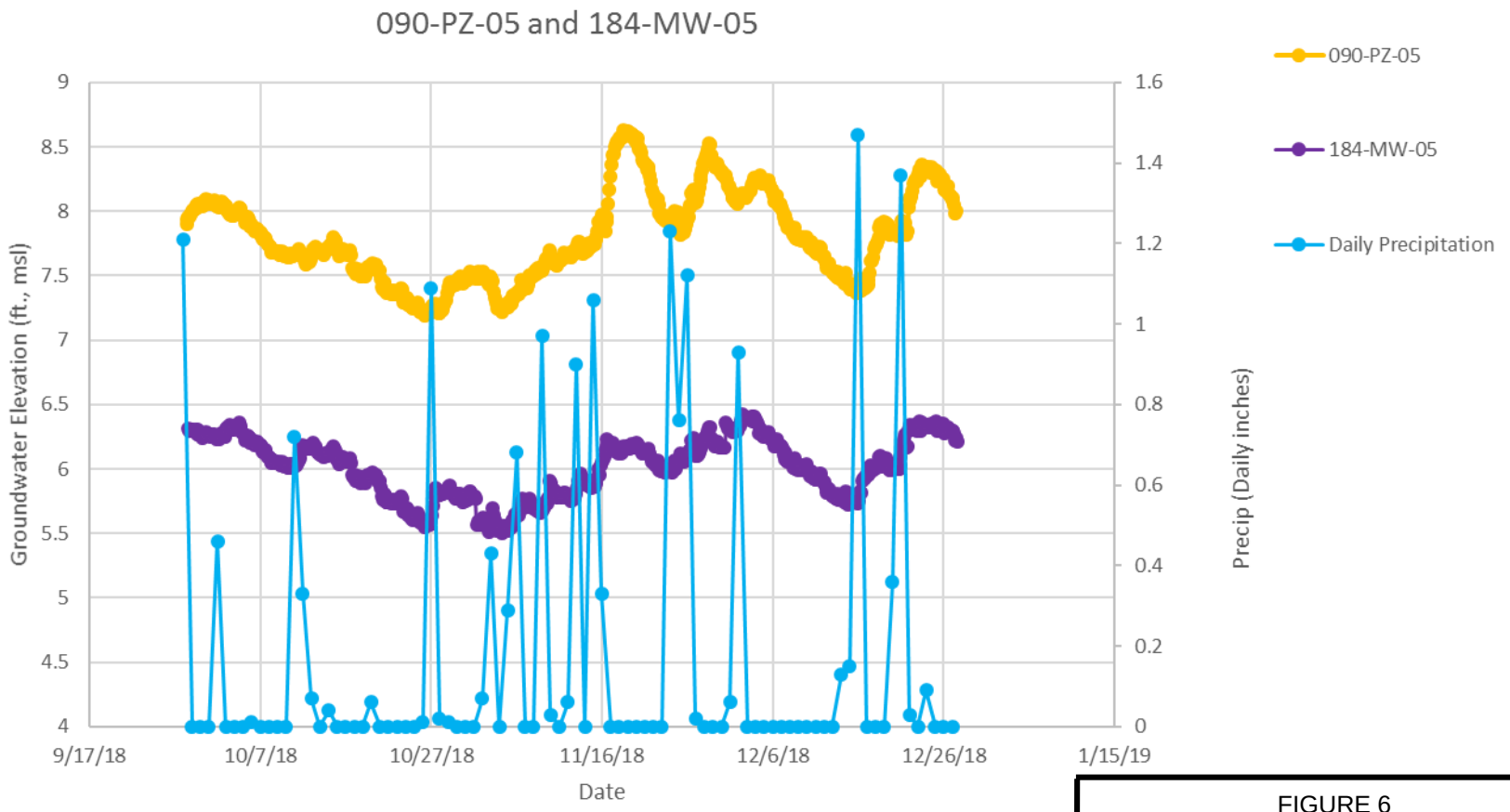


FIGURE 6

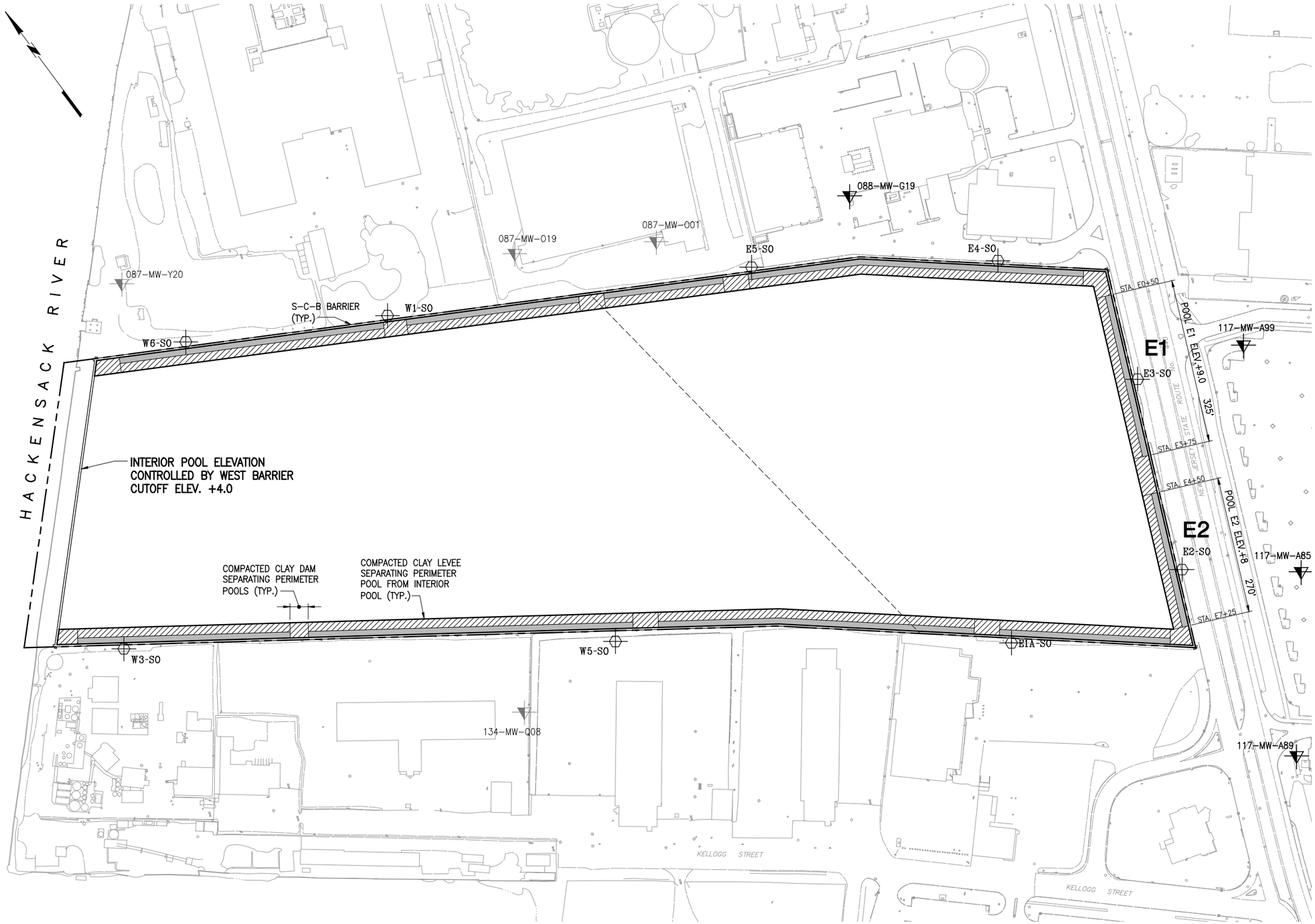
Hydrograph of Wells
PZ-05 and MW-05
Fourth Quarter 2018

NJCU, Jersey City, NJ

cornerstone environmental

APPENDIX C

SA-7 PERIMETER POOL HYDROGRAPHS



NOTES:

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

   WELLS NORTH FS-1, NORTH FS-2, NORTH FS-3, NORTH FS-4, NORTH FS-5, NORTH FS-6, NORTH FS-7, NORTH FS-8, NORTH FS-9, NORTH FS-13, 087-MW-S19, 088-MW-G19, 090-MW-E1, 115-PZ-4, 115-PZ-5, 115-PZ-6, 073-MW-BB11, 073-MW-Y10, SOUTH-FS-1, SOUTH-FS-3, SOUTH-FS-4, SOUTH FS-5, SOUTH-FS-6, SOUTH FS-7, 134-MW-V09, 140-MW-06, 140-MW-07, 125-MW-L03, E1-S0, MW-124-103L, MW-124-103D, MW-124-103, MW-102D, MW-124-102T,

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

LEGEND

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

GRAPHIC SCALE

100' 50' 0 100' 200'

IN PROGRESS
10-16-2018

STUDY AREA 7
PERIMETER POOL DESIGN ELEVATIONS

NEW JERSEY

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

FILE NO. 10210
DRAWING NO. PP-1

Oct 16, 2018 at 11:22am
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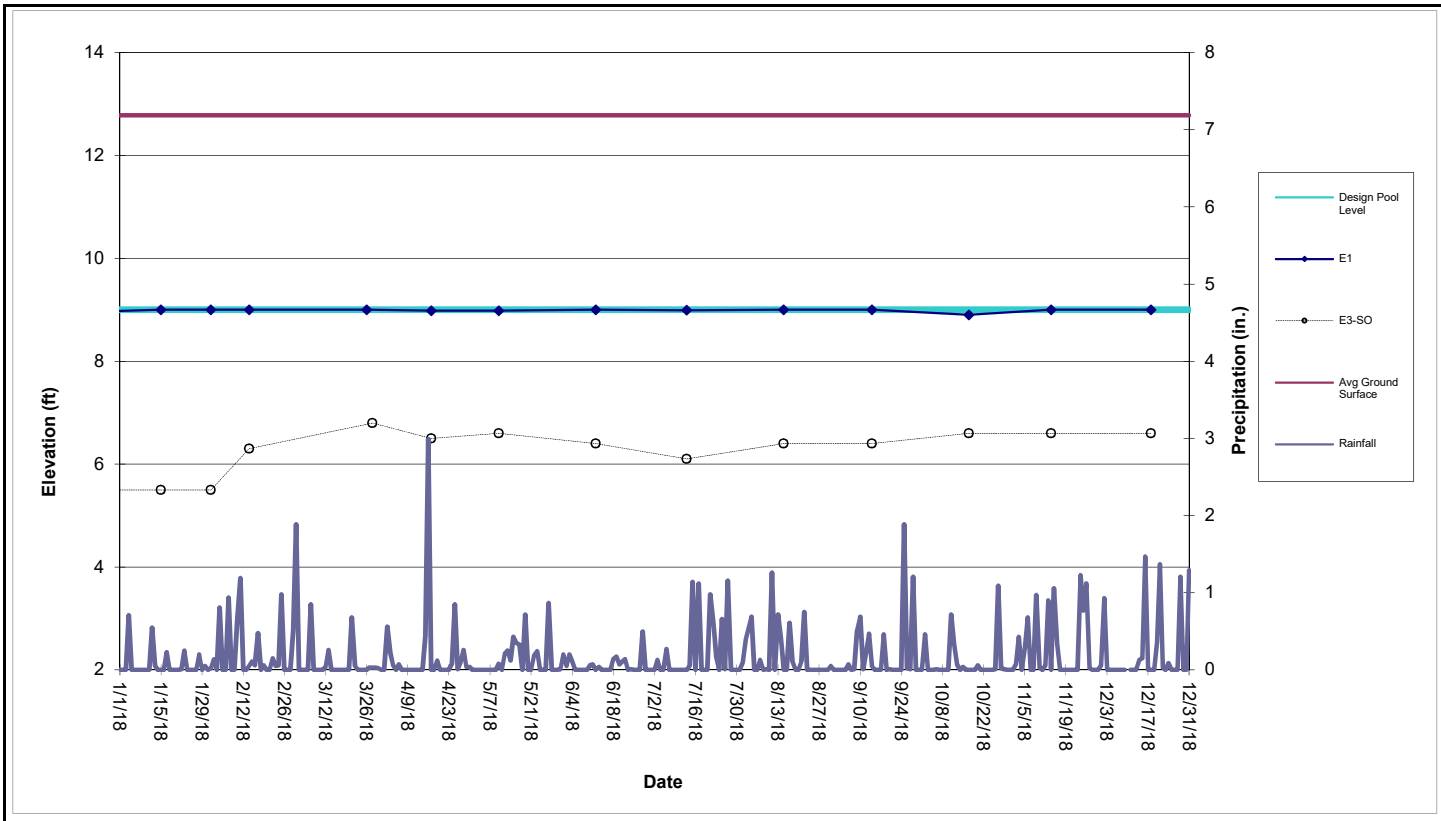
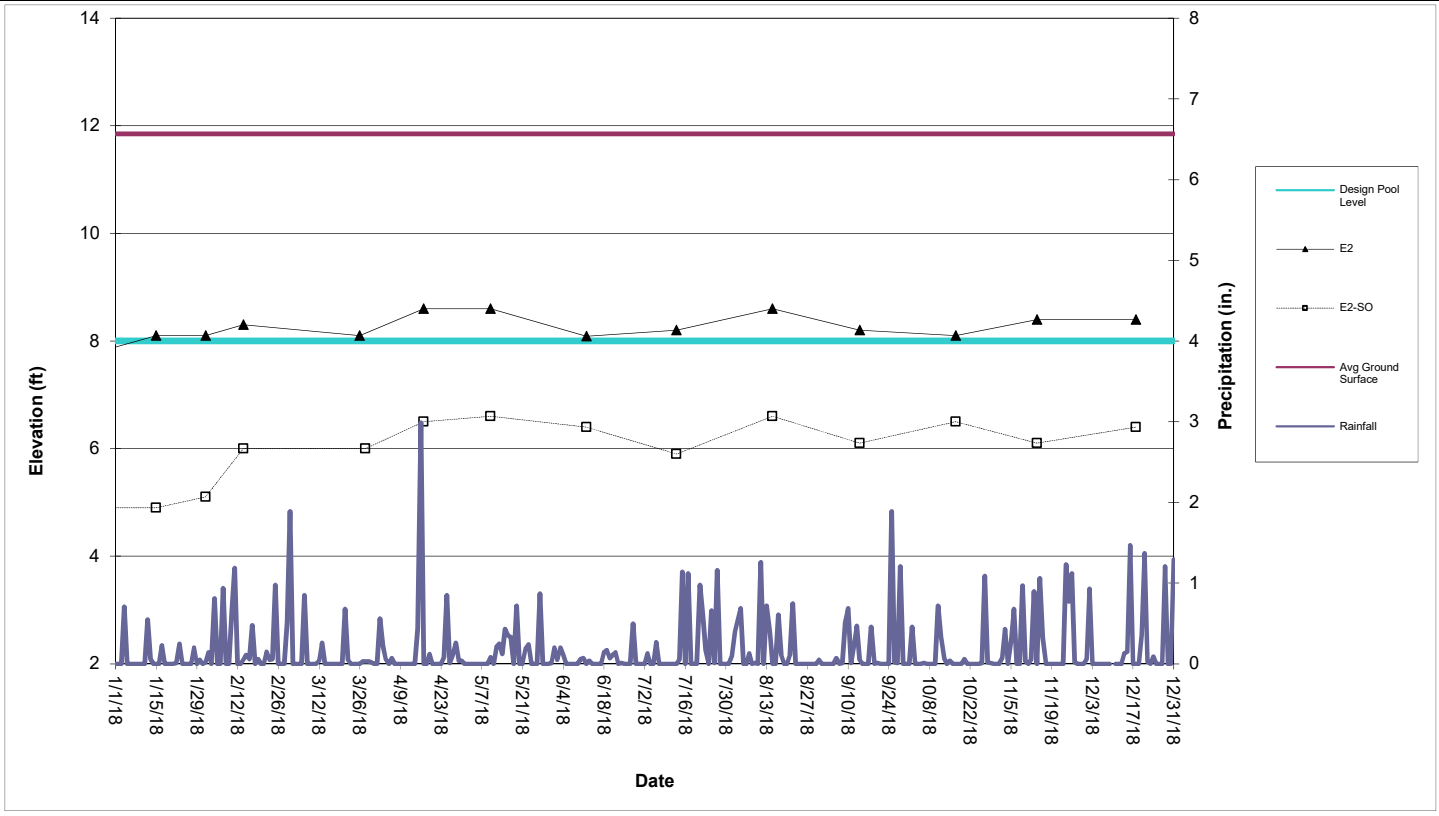
bboscaino



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



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

Table 1

Shallow Groundwater Data

	E2-SO	E3-SO
Date		
1/15/2018	4.9	5.5
2/1/2018	5.1	5.5
2/14/2018	6.0	6.3
3/28/2018	6.0	6.8
4/17/2018	6.5	6.5
5/10/2018	6.6	6.6
6/12/2018	6.4	6.4
7/13/2018	5.9	6.1
8/15/2018	6.6	6.4
9/14/2018	6.1	6.4
10/17/2018	6.5	6.6
11/14/2018	6.1	6.6
12/18/2018	6.4	6.6