Health, Safety, Environmental, Product Stewardship and Sustainability
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August 16, 2017

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

Re: Integrated Annual Groundwater Performance Report for 2016
Study Areas 5, 6, and 7
Jersey City, New Jersey

Dear Senator Torricelli:

Attached is 2016 Integrated Annual Groundwater Performance Monitoring Report prepared by Cornerstone Environmental Group, LLC on behalf of Honeywell.

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

Sincerely

William J. Hague
Global Director, Remediation
Design and Construction

Encl.: August 2017 Integrated Annual Groundwater Performance Report for 2016
(Study Areas 5, 6, and 7)

WJH:sgf

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INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT FOR 2016

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

Prepared for

HONEYWELL
Morristown, New Jersey

August 11, 2017

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

1.2 Purpose and Objectives

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

- Improve consistency and efficiency in field procedures including sample collection and scheduling.
- Provide a central database for monitoring well specifications and status.
- 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 2016

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 quarterly in available monitoring wells and piezometers and more frequently in selected locations 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 in 2016 is shown on **Table 1-2**.

1.4 Document Organization

In accordance with the approved outline for the Integrated Ground Water Performance Report (IGWPR), this report is organized in terms of its three primary elements; groundwater extraction (Section 3), groundwater elevations and flow direction (Section 4), and groundwater quality (Section 5). These sections are prefaced by a discussion of overall site conditions and events during the reporting period (Section 2). The status of the S-3 Sand Injection/Mass Removal program is summarized in Section 6, and conclusions and recommendations for modifications to the LTMP are provided in Section 7.

2 GENERAL CONDITIONS

Precipitation during the first half of 2016 was approximately 8 inches below long-term averages. The GWET system was operated at its total design rate of 54.5 gpm throughout the year with PW-3 taking the place of extraction well PW-2. The S-3 Injection/Mass Removal remedy continued with eight injection events in 2016. Subsurface remedial activities associated with the SA-6 Chromium Remedy continued with the completion of the soil containment barrier walls and caps at SA-6 South and SA-6 North. Groundwater dewatering pumping was conducted intermittently in SA-6 North only. The contingent groundwater dewatering system at NJCU was operated beginning in April 2016 using Sump B and four additional monitoring wells were installed.

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 7 inches below average for the first half of 2016 and one inch below the 30-year average for the second half. Total precipitation in 2016 was 38.42 inches or nearly 8 inches below the annual average of 46.25 inches.

2.2 Tidal Monitoring

Tidal fluctuations in the Hackensack River were monitored relative to the NGVD-1929 vertical datum. This datum is used for all reported groundwater elevation data in this report. The data logger is programmed to record river stage at 6-minute intervals. These data are used to correct groundwater levels for tidal impacts based on tidal lag and efficiency values previously determined for monitoring wells screened in the Intermediate, Deep, and Bedrock zones. There are no tidal influences in the Shallow Zone monitoring wells. The mean tidal elevation is approximately +1.2 feet (NGVD-1929).

2.3 Monitoring Well Inventory

A list of the groundwater monitoring wells in service within the Project Area during all or part of 2016 is provided on **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 2016 include piezometers PZ-1 through PZ-10 around the SA-6 North soil containment barrier and twelve shallow monitoring wells installed in the SA-6 South Development AOC in accordance with the SA-6 Chromium Remedy 100% Design. As indicated in **Table 2-2**, a number of monitoring wells were abandoned in 2016 in accordance with the SA-6 Monitoring Well Abandonment Plan. Since this is an on-going effort, the status of well abandonment changes frequently.

3 GROUNDWATER EXTRACTION

Pumping from the contingent pumping system at NJCU began in April 2016 and continued throughout the year. There was no pumping from the contingent pumping system on SA-6 South and only intermittent pumping of the dewatering system at SA-6 North during the first half of the year. Groundwater extraction for dewatering below Stratum D was not conducted in 2016.

3.1 GWET System Operation

The Deep Overburden Groundwater Extraction and Treatment (GWET) system was in operation throughout 2016. The GWET system consists of three extraction wells pumping at a combined rate of 54.5 gpm with discharge via independent force mains to the waste water treatment plant located on SA-6 North. Wells 087-PW-1 and 087-PW-3 are located on the Difeo property on the north side of SA-6 North and are screened in the Deep and Intermediate zones, respectively. Well 115-MW-215BR is located on the north side of Site 115 and pumps from the upper Bedrock zone. In December 2015, extraction well 087-PW-3 replaced wells 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 2016 were due to routine force main cleaning and activities related to the startup of PW-3.

3.1.2 Force Main Acid Flushing

The GWET force main from extraction well PW-3 to the treatment plant was acid flushed in early January 2016 to remove residual sediment from construction activities. No other force main cleanings were required in 2016.

3.1.3 Well Redevelopment

There were no extraction well redevelopment activities conducted in 2016.

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. Installation of the eastern portion of the drain was completed in 2015 and the western portion completed in 2016 as part of the SA-6 Chromium Remedy. The drain was used on an as-needed basis during the first half of 2016 for shallow soil dewatering until about the time the synthetic cap was completed in August. The pumping periods and rates were variable based on construction activities and precipitation events. The perimeter barrier wall was also completed in 2016.

3.3 SA-6 South Contingent Groundwater Pumping System

The SA-6 South contingent groundwater pumping system 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. The drain was last pumped on October 26, 2015 and was not used during 2016.

3.4 SA-5 NJCU Contingent Groundwater Pumping System

The contingent groundwater pumping system at the NJCU site was brought on line on April 20, 2016 and operated throughout 2016. Pumping was from extraction Sump B only (Sump A was not used in 2016) and cycled on and off based on a water level probe set to an elevation just below the drain line. When pumping, the discharge rate of the system is set at 5 gpm, however the steady-state, long-term net yield of the drain was approximately 0.3 gpm throughout 2016.

4 HYDRAULIC MONITORING

Hydraulic monitoring in 2016 consisted of four quarterly rounds of groundwater elevation measurements in available wells in March, June, September, and December. 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 December 2016 round, eight 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 above mean sea level (amsl) 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 13 feet amsl on Site 154 to less than 3 feet amsl near the Hackensack River. As a point of reference, the river has a mean tide elevation of approximately +1.2 feet 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, JCIA, 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 has begun with the recently installed perimeter piezometers. Data from 2016 indicate that heads inside the barrier walls do not respond to short-term rainfall events whereas groundwater elevations outside of the containment areas vary directly with the recharge from precipitation. These trends are evident in the hydrographs in Appendix C.

At the NJCU site in Study Area 5, groundwater flow is generally from east to west however the north-south oriented barrier walls 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 amsl in SA-5 to less than mean sea level in the vicinity of the GWET pumping wells. Groundwater is diverted around the SA-7 barrier wall but is not impacted by near-

surface features on SA-6 North to the same degree as in the Shallow zone. Groundwater elevations within the SA-7 barrier wall are relatively uniform in the range of 1.5 to 2.2 feet amsl. 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. **Figure 4-2** also illustrates that the combined groundwater depression in the vicinity of the GWET pumping wells fully encompasses the deep overburden plume and provides an effective capture zone in the upper lacustrine soils.

4.1.3 Deep Zone

Groundwater elevations in the Deep zone (**Figure 4-3**) are similar to those in the overlying Intermediate zone, although the influence of the SA-7 barrier wall is not as prominent. As noted in prior reports, groundwater flow in the Deep zone is, to a degree, able to move beneath the SA-7 barrier wall through gravel lenses in the underlying glacial till/ice contact deposits. At SA-5, the barrier wall does not extend down to the Deep zone and thus does not influence flow. The area of influence of the GWET pumping wells on groundwater flow in the Deep zone is also illustrated on **Figure 4-3**. 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. Observation well 087-OBS-7D, installed approximately 25 feet west of PW-3 and just below the Meadow Mat, was used to measure the drawdown. The results indicated a classic asymptotic drawdown curve and confirmed that pumping from PW-3 is capable of sourcing groundwater from both the S-2 Sand in which it is screened, and the overlying S-1 Sand. The tests also confirmed that pumping from PW-1, screened in the S-3 Sand at a depth of`60 to 70 feet, was able to create significant drawdown in the S-1 Sand some 300 feet away. Thus, although the primary component of flow to the wells is horizontal, there exists considerable vertical hydraulic connection within these lacustrine deposits.

Based on these results and data provided in both plan view on **Figures 4-2 and 4-3** and in cross section on **Figure 4-5,** the combined groundwater depression in the vicinity of the GWET pumping wells fully encompasses the deep overburden plume and provides an effective capture zone that meets its design objectives.

4.3 New Jersey City University

Quarterly groundwater elevation data for the NJCU property are compiled in **Table 4-2** and mapped on **Figures 4-6 through 4-9**. The results indicate a continuation of the generally lower groundwater elevations noted at the end of 2015. An evaluation of this decline was reported in a March 30, 2016 memorandum which indicated that the decline was primarily the result of reduced recharge from precipitation due to surface regrading and paving, lower than normal precipitation, and modifications to the adjacent storm sewer network.

Beginning with the second quarter in 2016, the groundwater elevation contour maps illustrate both the pumping of Sump B which began on April 20, 2016, and the installation of four new monitoring wells (MW-101 through MW-104). These maps indicate that groundwater flow is generally to the northwest as it moves onto Sites 90 and 184 from the east but then turns north as it is forced around the various barrier walls that block flow to the south and west. Strong downward vertical gradients continue to be present as documented by the reported head in the deep zone well 090-MW-09, located between MW-5 and Sump B in the Commercial AOC. These data suggest that groundwater naturally bypasses the capped portion of the Commercial AOC and/or moves vertically downward into the underlying zones; a scenario that is supported by groundwater quality data from the sentinel wells as further discussed in **Section 5-5**.

4.4 SA-7 Perimeter Pools

The LTMP program includes monitoring of the hydraulic gradients across the subsurface containment barrier (SCB) around the perimeter of SA-7. This is accomplished through monitoring of the head in each of the ten "perimeter pools" and comparing these data to groundwater elevations in various shallow piezometers located just outside of the SCB. The location of the perimeter pools, the design pool elevations, and water level trends are provided in **Appendix C.** The hydrographs illustrate the average ground surface elevation, the design pool elevation, the measured pool elevation, and the groundwater elevation in adjacent piezometers outside of the wall. Due to recent construction in SA-6 North and South, many of the former monitoring points have been abandoned in accordance with the approved SA-6 Chromium Remedy. Overall, the data indicate that water levels within the SA-7 pools are greater than those outside of the SCB and thus outward gradients are occurring relative to the SA-7 SCB.

4.5 SA-6 North Containment Cell

Shallow groundwater elevations within SA-6 North as measured in December 2016 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 four feet within the cell and with one exception, were lower than heads outside of the wall, indicating inward gradients. The exception is along the western wall at which gradients were slightly outward toward the river. However, cap installation was completed August 2016 and dewatering pumping continued on an intermittent basis throughout 2016. As a result, the heads shown on **Figure 4-1b** may not be representative of steady-state conditions. Beginning on January 1, 2017, data loggers will be used to construct hydrographs to assess hydraulic gradients across barrier walls relative to the applicable performance criteria.

4.6 SA-6 South Containment Cell

Shallow groundwater elevations within SA-6 South as measured in December 2016 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 3.5 to 3.8 feet within the cell and with one exception, were lower than heads outside of the wall, indicating inward gradients. The exception is along the western wall at which gradients were slightly outward toward the river. Beginning on January 1, 2017, data loggers will be used to construct hydrographs to assess hydraulic gradients across barrier walls relative to the applicable performance criteria.

4.7 SA-5 Site 117

Groundwater movement beneath Site 117 is generally from northeast to southwest as illustrated on **Figures 4-1** through **4-3**. In the Shallow zone, the sewers beneath Route 440 serve as a groundwater sink and limit the further movement of groundwater to the south and west. In both the Shallow and Intermediate zones, a component of groundwater in the northwestern corner of Site 117 is diverted to the northwest, passing between the SA-7 SCB and the NJCU sheet pile wall. The relatively low groundwater elevations in this area are caused by sewer systems that are actively dewatered by the Jersey City MUA.

4.8 Miscellaneous Events

4.8.1 Depressurization Pumping

There was no depressurization pumping from beneath the meadow mat in 2016.

5 GROUNDWATER QUALITY MONITORING

Groundwater quality monitoring within the project area was conducted in 2016 in accordance with the GWET Long-Term Monitoring Plan (LTMP) and the other applicable area-specific monitoring plans as discussed in **Section 1.3** and listed on **Table 1-2**.

5.1 Deep Overburden Regional Plume Monitoring

The frequency of regional monitoring of the Deep Overburden Plume is currently once every two years. The last sampling round was in November 2015 and thus sampling was not conducted in 2016. However, three of the wells (087-MW-W25D, 087-MW-W25T, and 124-MW-106T) were not physically accessible for sampling in 2015. These wells were therefore sampled on June 7 2016 after access was restored. Total and hexavalent chromium were non-detect in wells 087-MW-W25D and 087-MW-W25T. The results from 124-MW-106T indicated elevated concentrations of hexavalent chromium which is further discussed in Section 5.6 as this well is located within the plume diversion area.

5.2 GWET Extraction Wells

Groundwater from the three GWET pumping wells was sampled quarterly in 2016 as shown in **Table 5-1**. Samples were analyzed for total and hexavalent chromium and volatile organic chemicals (VOC). The results for hexavalent chromium are plotted on **Figure 5-1** and indicate that concentrations in the Deep zone (PW-1) have declined in an asymptotic fashion since 2009. The observed decline in concentration in PW-1 from 35 ppm in 2015 to 30 ppm in 2016 may be due to a slight shifting of the capture zone due the replacement of Intermediate Zone extraction well PW-2 with PW-3 in January 2016.

Concentrations in the Intermediate zone extraction well discharge increased significantly from 10 ppm to 90 ppm when PW-3 came on line approximately 120 feet east of PW-2. Hexavalent chromium concentrations in the bedrock have been generally stable at approximately 15 ppm. With the exception of carbon tetrachloride and chloroform, VOCs have not been detected in the bedrock pumping well. The Intermediate Zone pumping well PW-3 contains the highest VOC concentrations 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** following the same general trends as the other VOCs. As previously reported, the source of the VOCs in the groundwater is not related to Honeywell.

5.3 SA-6 South

Twelve shallow groundwater monitoring wells were installed in the SA-6 South Development AOC area in February, 2016 in accordance with the draft LTMP. These wells were sampled in April and again on September 2016 with the results provided in memos dated May 16 and September 1, 2016, respectively. Hexavalent chromium was not detected in any of the wells on either occasion.

Groundwater samples were also collected from the five perimeter piezometers located inside of the barrier walls at the SA-6 South soil containment area. Samples were collected in early September 2016 and the results indicated that only piezometers PZ-12 and 16 contained elevated hexavalent chromium concentrations above the New Jersey Groundwater Quality Standard (NJGWQS) of 70 ppb. The piezometer pair showing an outward gradient (PZ-19/20) and the pair next to it (PZ-17/PZ18) did not contain hexavalent chromium above the NJGWQS.

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

5.4 SA-6 North

Groundwater samples were collected from four of the five perimeter piezometers inside of the barrier walls at the SA-6 North soil containment area. Piezometer PZ-6 was not available for sampling due to construction activities in the area. Samples were collected in early September 2016 and the results indicated that none of the piezometers contained elevated hexavalent chromium concentrations above the NJGWQS of 70 ppb.

Groundwater monitoring wells were not sampled on SA-6 North in 2016, with the exception of S-3 Sand Mass Removal Injection program discussed in **Section 6.**

5.5 New Jersey City University

Groundwater samples were collected quarterly in 2016 from the three "sentinel" wells (184-MW-04, 184-MW-05, and 184-MW-06) at NJCU. In addition, monitoring wells 184-MW-101 through MW-104 were sampled during the second, third, and fourth quarterly rounds. The results are provided on **Figure 5-4** and indicate that hexavalent chromium was not detected above the reporting limit of 5.5 ppb in any of the 6 wells (20 samples) located down-gradient of the Commercial AOC cap area. Hexavalent chromium was detected above the reporting limit but below 70 ppb in 184-MW-06 at concentrations comparable to previous results; this well is located up-gradient of the cap area.

5.6 Plume Diversion Area Monitoring

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

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

Locations 124-MW-102T, 124-MW-103L, and 124-MW-107T are located within the open space area and were thus abandoned during excavation activities in 2014. In addition, well 124-MW-104T was damaged during construction and also abandoned in 2014. In accordance with the approved L-Well GWMP and subsequent agreements with Plaintiffs, the post-remedy sampling at these four locations was conducted using direct push methods after placement of excavated materials and installation of barrier walls but prior to the installation of the cap. This sampling took place in June 2015 using a GeoProbe® as provided in the L-Well GWMP. The post-remedy sampling event conducted in the six remaining wells was scheduled for April 2017.

In addition to the sampling conducted in accordance with the L-Well GWMP as discussed above, samples were collected from well 124-MW-106T on June 7, 2016 as part of the biennial GWET Long-Term Monitoring Plan. Since the results indicated Cr(VI) above the NJ Ground Water Quality Criterion of 70 µg/L, the well was resampled on August 11, 2016 to include major ions, and again on December 19, 2016. The results for well 124-MW-106T are summarized on **Table 5-2** and indicate that the hexavalent chromium concentration in the unfiltered sample was the highest in the June 2016 sampling event at 0.77 ppm but declined to 0.39 ppm in August 2016 and to 0.025 ppm in December 2016. Based on these results, confirmation sampling of this well was scheduled for April 2017 along with the post-remedy sampling of the remaining wells as noted above.

5.7 SA-5 Site 117

Groundwater sampling for water quality analysis was not conducted at Site 117 in 2016.

5.8 SA-5 Sites 079/153

Groundwater sampling for water quality analysis was not conducted at Sites 079/153 in 2016.

5.9 In-situ Sampling Beneath Riverbed Sediments

In accordance with Section 3.3 of the SA-7 Deep Overburden and Bedrock Groundwater Remedy Long-term Monitoring Plan, in-situ groundwater from within the lacustrine sand directly beneath the soft riverbed sediments in the Hackensack River are to be sampled every five years until the plume has been pulled back The most recent sampling was conducted in October 2014 and thus the next event is scheduled for October 2019.

6 S-3 INJECTION AND MASS REMOVAL PROGRAM

The S-3 Injection and Mass Removal program was initiated in 2012 and involves the injection of calcium polysulfide (CaSx) into the S-3 Sand beneath the project area in general accordance with the Operations Work Plan for In-Situ Chromium Mass Removal (Cornerstone, February 20, 2012). Changes to the plan, including both the location of the injection wells and the sequence of injection events, have taken place (in consultation with Plaintiffs' representatives) since the plan's inception. Currently three injection wells located on the former JCIA property are being used as further described below.

6.1 CaSx Injection Events in 2016

Eight CaSx injection events were conducted in 2016 as summarized on **Table 6-1**. Three injection wells (088-IW-01, 088-IW-02, and 088-IW-03) were used as shown on **Figure 6-1**. During each event approximately 3,800 to 4,400 gallons of CaSx was injected into the S-3 Sand formation during the first day. The actual volume varied from event to event and was based on the maximum volume that could be transported in a single tanker truck within DOT weight limitations. As shown on **Table 6-1**, a combination of gravity flow and slight pressurization of the tanker was used to off-load the material. During the second and third day of each event, clean water from an adjacent JCMUA hydrant was injected into the wells to aid flushing of the CaSx. The total volume of water used was approximately twice the volume of CaSx injected.

The injection rate ranged from approximately 9 to 11 gpm in 2016 with the exception of well 088-IW-01 which reported a yield of only 6 gpm in the June 2016 event. As a result, this well was redeveloped on September 21, 2016 which improved the yield to 10 gpm during the following Event #32. Additional re-development efforts will be conducted in 2017 on an as-needed basis.

6.2 Mass Removal Summary

In accordance with the Operations Work Plan, three replicate samples from each batch were used to determine the sulfide content of the material. The geometric mean of these data was then calculated as shown on **Table 6-2,** and used to estimate the mass of hexavalent chromium stochiometrically equivalent to the injected volume of CaSx. This calculation was conducted in accordance with the chemical reactions provided in Appendix C of the Operations Work Plan. As shown on **Table 6-3**, the stoichiometric equivalent mass reduced per event in 2016 ranged from 0.99 tons to 1.42 tons with an average of 1.25 tons per event. At the end of 2016, the stoichiometric equivalent of approximately 43 tons of hexavalent chromium had been treated leaving 7 tons remaining in the program. **Figure 6-2** provides a graph of the cumulative mass treated to date

For comparison, the mass of hexavalent chromium removed from the Deep Overburden Plume through historic pumping has also been calculated. As shown on **Figure 6-3**, historic pumping includes operation of the two depressurization wells, 115-DP-1 and 115-DP-2 during the SA-7 soil excavation remedy, and the GWET system pumping that has been ongoing since December 2008. The mass removed was calculated by multiplying the pumping rate of each well by the hexavalent chromium concentration of the discharge. The results indicate that over 85 tons of hexavalent chromium have been removed through groundwater extraction alone through the end of 2016.

6.3 Groundwater Quality Monitoring

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

6.3.1 Monitoring Well Sampling.

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

Well 088-MW-G19T: This well is located approximately 400 feet downgradient of injection well 088-IW-01 on the former JCIA property. Parameters used to indicate the presence of the CaSx reductant, such as ORP, calcium, and pH, were relatively consistent throughout the reporting period in this well. Hexavalent chromium concentrations were also relatively unchanged in 2016, ranging from 977 to 1,280 ppm.

Well 087-MW-29D: This well is located approximately 750 feet downgradient of injection well 088-IW-03 and is screened in the Intermediate Zone. Parameters used to indicate the presence of the CaSx reductant, such as ORP, calcium, and pH, were consistent throughout the reporting period in this well. Hexavalent chromium concentrations ranged from 149 ppm to 181 ppm with a possible downward trend.

Well 115-DP-1: This is a former depressurization well located approximately 25 feet upgradient from 115-PW-21. (Well 115-PW-21 was used as a temporary injection well on August 20, 2012.) Hexavalent chromium concentrations are shown on **Table A-2** and have historically fluctuated over a range of nearly two orders of magnitude. In 2016 concentrations ranged from 31 to 583 ppm. As noted in prior annual performance reports, these variable post-injection results are likely due to the fact that 115-DP-1 has a 25-foot long screen that extends approximately 20 feet above the top of the S-3 Sand into the S-2 Sand. Thus, during sampling, the well is likely influenced by both the remnants of the 2012 injection event and the elevated hexavalent chromium concentrations within the overlying S-2 formation.

GWET Wells: Hexavalent chromium concentrations in extraction wells 087-PW-1 were generally consistent with the long-term downward trend that is now approaching a quasi-steady state condition as shown on **Figure 5-1**. Concentrations in PW-3 began 2016 with concentrations of approximately 90 ppm or 10 times greater than that of PW-2 which it replaced. However, by the end of 2016, concentration declined to approximately 45 ppm. This is likely due to shifting of the plume as the new steady-state capture zone became established around the new well. Similar results were observed with respect to the constituents in the unrelated volatile organic plume as shown on **Figures 5-2 and 5-3**. Calcium concentrations in the GWET wells in 2016 were slightly higher compared to prior results and thus future trends will be monitored to determine if they reflect an impact from the CaSx injections.

6.3.2 Injection Well Sampling.

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

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

6.4 Planned Activities for 2017

In accordance with the Operations Work Plan, the goal for 2017 will be to inject sufficient reductant in the S-3 Sand to reduce the stoichiometric equivalent of approximately 7 tons of hexavalent chromium to reach the program target of 50 tons. Based on the results from 2016, this will require five injection events throughout the year.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Compliance with Monitoring Requirements

Hydraulic and groundwater quality monitoring conducted in 2016 have fulfilled the various monitoring plan requirements in accordance with **Tables 1-1 and 1-2**.

7.2 Status of Groundwater CEA Certifications

Groundwater Classification Exception Areas were approved by NJDEP on February 16, 2012 for the three principle water bearing zones in the Project Area (Shallow Zone, Deep Overburden, and Bedrock). In 2014, NJDEP notified Honeywell that CEA biennial certifications are not due until the applicable Groundwater Remediation Permits are issued.

7.3 Recommendations for Monitoring Well Network

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

7.4 Recommendations for Water Level Monitoring Frequency

Groundwater level monitoring will be conducted in accordance with the frequencies specified in the various hydraulic monitoring plans as summarized in **Table 1-1**. There are no recommended changes to these frequencies at this time.

7.5 Recommendations for Groundwater Quality Monitoring Frequency

The regional LTMP groundwater quality sampling event has been conducted six times since its inception in 2008. 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, with the exception of well 124-MW-106T, the horizontal limits of the plume are not expanding. Based on these data, it is recommended that, with the exception of well 124-MW-106T, the next round of sampling be conducted in 2018, which is three years after the last event in 2015 and 10 years after the initial round/startup of the GWET system. Sampling of well 124-MW-106T will be conducted in the spring of 2017 as discussed in Section 5.6. Recommendations regarding the frequency of LTMP events beyond 2018 will be considered based on those results.

The frequency of the other groundwater quality monitoring, well selection, and parameters for analysis are established in the monitoring plans for the various sub-areas. There are no proposed changes to these documents at this time.

7.6 Other Recommendations

There are no other recommendations regarding groundwater performance or monitoring in the Project Area at this time.

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*	2016 Activity or Estimated Start Date
Regional[1]	GWET Long Term Monitoring Plan June 10, 2008	Deep Overburden and Bedrock Groundwater Remedies Consent Order	All Zones	Quarterly	200	On-going
Study Area 7	SA-7 Perimeter Pools	Final Judgement, ICO v Honeywell	Shallow and Interm.	Monthly	22	On-going
SA-6 South	SA-6 LTMP[2]	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 South	Shallow	1st year - Monthly 2nd year - Quarterly	13	November 1, 2017
SA-6 North	SA-6 LTMP[2]	First Amended Consent Decree Regarding Remediation and Redevelopment of Study Area 6 North	Shallow	1st year - Monthly 2nd year - Quarterly	14	January 1, 2017
SA-5 (NJCU) Sites 90 & 184	Long Term Monitoring Plan[3] Remedial Action Permit for GW[4]	Consent Decree Regarding Remediation of the New Jersey City University Redevelopment Area	Shallow	Quarterly through 2017 future TBD[2]	12	On-going
SA-5: Site 079	"Long Term Monitoring Plan" (4/25/14)[3]	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	March 2014 then Annual	2	On-going per LTMP
SA-5: Site153 South	Remedial Action Permit for GW[4]	Consent Decree Regarding Sites 79 and 153 South	Shallow	Annual	2	On-going per Regional LTMP Future pending GW RAP
SA-5 Site 117	Remedial Action Permit for GW[4]	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	Annual	7	On-going per Regional LTMP Future pending GW RAP

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

[2] Draft SA-6 LTMP submitted to Parties in February 2017 with additional revisions submitted in April 2017. Future monitoring frequencies to be finalized.

[3] SA-5 NJCU LTMP dated November 2016; signed and transmitted to Parties on 2/3/17. Draft Shallow Groundwater Monitoring Document to be finalized after barrier wall extension is completed.

[4] Remedial Action Permit application in progress

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

Location	Monitoring Plan	Consent Decree	Depth	Frequency	# Wells*	2016 Activity or Estimated Start Date
Regional	GWET Long Term Monitoring Plan June 10, 2008	Deep Overburden and Bedrock Groundwater Remedies Consent Order	Shallow Intermediate Deep Bedrock Beneath River	Biennial TBD Biennial TBD Biennial TBD Biennial TBD Every 5 years	0 5 12 9 5	3 previously inaccessible wells sampled June 2016 Oct. 2019
Regional	S-3 Injection Mass Removal Final Operations Work Plan Feb. 28, 2012	Deep Overburden and Bedrock Groundwater Mass Removal Consent Decree, May 18, 2010	Deep	Every injection event Semi-annual Sampling	1 4	On-going (8 events in 2016)
SA-6 South	SA-6 South Development AOC Appendix D of SA-6 South 100% Design Report June 28, 2013	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 South	Shallow	Qtly first year[1]	12	Post Remedy 2016[4]
SA-6 South	L-zone Wells (Plume Diversion Area) Appendix E of SA-6 South 100% Design June 28, 2013	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 South	Deep	Post-remedy outside Capped Area	6	April 2017
SA-5 (NJCU) Sites 90 & 184	Long Term Monitoring Plan / Shallow Groundwater Monitoring Document[3]	Consent Decree Regarding Remediation of the New Jersey City University Redevelopment Area	Shallow	First Year Quarterly, then TBD	4 new wells	Beginning after barrier wall extension is completed
SA-5 Site 117	Remedial Action Permit for GW (in progress)	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	Biennial	7	Estimated 2019[5]
SA-5: Site 079	Long Term Monitoring Plan/ Post-Treatment Report[2]	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	2014 sampling	2	No further sampling
SA-5: Site153 South	Remedial Action Permit for GW (in progress)	Consent Decree Regarding Sites 79 and 153 South	Shallow	Biennial	2	Estimated 2019[5]

* Number and location of wells subject to field conditions during and after remedy construction.
Biennial = every two years
[1]Monitoring begins 12 months after construction is complete
[2]Site 79/153 updated LTMP issued 4/25/14; Post-Treatment Report for Site 79 approved by NJDEP 12/9/15.
[3]SA-5 NJCU Draft Shallow Groundwater Monitoring Document to be finalized after barrier wall extension is completed.
[4] Draft SA-6 LTMP submitted to Parties in February 2017 with additional revisions submitted in April 2017. Future monitoring frequencies to be finalized.
[5]Estimated timing for NJDEP issuance of a Remedial Action Groundwater Permit is during 2018.

Table 2-1
2016 Monthly Precipitation Data

Month	2016 Precipitation	Average Precipitation
January	4.01	3.98
February	4.04	2.96
March	1.38	4.21
April	1.12	3.92
May	3.85	4.46
June	2.40	3.4
July	6.08	4.68
August	0.93	4.02
September	2.17	4.01
October	3.00	3.16
November	6.52	3.88
December	2.91	3.57
Annual Total	38.42	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)	
073-MW-06	Shallow	9.01	20.0		
073-MW-07	Shallow	9.71	18.0		
073-MW-08	Shallow	7.47	17.0		
073-MW-10BR-1	Rock	6.67	155.0	10	
073-MW-10BR-2	Rock	6.67	170.0	10	
073-MW-10BR-3	Rock	6.67	195.0	15	
073-MW-10BR-4	Rock	6.67	227.0	15	
073-MW-10BR-5	Rock	6.67	327.0	15	
073-MW-1BR	Rock	25.25	144.0	15	
079-MW-01	Shallow	8.80	NA	NA	
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	
079-MW-A2	Shallow	8.10	13.0	10	
079-MW-C6	Shallow	11.00	13.0	10	
087-IW-01	Deep	11.51	67.0	10	
087-MW-01	Deep	12.80	60.0	10	
087-MW-08	Deep	12.98	99.0	10	
087-MW-101	Shallow	12.21	12.0	NA	Abandoned 2/2/2017
087-MW-102	Shallow	11.65	13.0	NA	
087-MW-119	Shallow	12.97	11.0	NA	Abandoned 10/27/16
087-MW-120	Shallow	12.30	11.0	NA	
087-MW-121	Shallow	11.76	12.0	NA	Abandoned 2/2/2017
087-MW-13	Intermediate	12.93	40.0	10	
087-MW-132	Shallow	14.56	NA	NA	
087-MW-133	Shallow	14.53	NA	NA	
087-MW-134	Shallow	14.67	NA	NA	
087-MW-14	Rock	10.68	97.0	10	Abandoned 4/20/16
087-MW-34	Deep	12.73	70.0	5	
087-MW-A26	Shallow	10.10	13.0	10	Abandoned 2/2/2017
087-MW-A26D	Intermediate	10.35	28.0	10	
087-MW-A26T	Deep	9.92	56.0	15	
087-MW-I30	Shallow	10.86	14.0	10	
087-MW-I30T	Rock	10.59	80.0	15	Abandoned 4/20/16
087-MW-O23	Shallow	11.79	13.0	10	
087-MW-O29	Shallow	10.08	14.0	10	Abandoned 2/2/2017
087-MW-O29D	Intermediate	10.32	56.0	NA	
087-MW-O29T	Rock	9.98	102.0	15	Abandoned 3/22/16
087-MW-W25D	Intermediate	18.17	66.0	10	
087-MW-W25T	Deep	18.19	91.0	15	
087-OBS-07	Intermediate	12.59	30.0	5	
087-OBS-1D	Intermediate	15.13	42.8	10	
087-OBS-1L	Deep	15.27	67.1	5	
087-OBS-1T	Deep	15.23	105.0	10	
087-OBS-2D	Intermediate	12.68	54.0	10	
087-OBS-3L	Deep	12.88	65.0	5	
087-OBS-4T	Deep	11.60	75.5	5	

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Comments
		(ft msl)	(ft)	(ft)	
087-OBS-5D	Intermediate	12.72	39.8	10	
087-OBS-5T	Deep	12.62	81.9	10	
087-OBS-6D	Intermediate	11.24	NA	NA	Abandoned 4/20/16
087-PW-1	Deep	12.66	69.0	10	
087-PW-2	Intermediate	13.02	48.0	20	
087-PW-3	Intermediate	TBD	50.0	20	
SA6N-PZ-1	Shallow	10.09	11.5	5	Installed June 2016
SA6N-PZ-2	Shallow	13.66	8.0	5	Installed June 2016
SA6N-PZ-3	Shallow	15.93	13.0	5	Installed June 2016
SA6N-PZ-4	Shallow	18.98	12.0	5	Installed June 2016
SA6N-PZ-5	Shallow	22.10	13.0	5	Installed June 2016
SA6N-PZ-6	Shallow	23.94	13.0	5	Installed June 2016
SA6N-PZ-7	Shallow	19.37	26.0	5	Installed June 2016
SA6N-PZ-8	Shallow	19.26	14.0	5	Installed June 2016
SA6N-PZ-9	Shallow	18.12	12.0	5	Installed June 2016
SA6N-PZ-10	Shallow	18.56	12.0	5	Installed June 2016
088-IW-01	Deep	11.75	59.0	10	
088-IW-02	Deep	13.64	64.0	10	
088-IW-03	Deep	19.96	74.0	10	
088-MW-002	Shallow	12.81	15.0	13	Abandoned
088-MW-111	Shallow	12.22	NA	NA	Abandoned 10/27/16
088-MW-112	Shallow	12.43	NA	NA	Abandoned 1/18/2017
088-MW-15R	Intermediate	14.59	35.0	10	
088-MW-G19	Shallow	NA	NA	NA	Abandoned
088-MW-G19T	Deep	12.42	93.0	15	
088-PZ-001	Shallow	10.67	12.0	5	Abandoned
088-PZ-002	Intermediate	10.56	25.0	5	Abandoned
088-PZ-003	Shallow	12.07	15.0	5	Abandoned
088-PZ-004	Intermediate	12.05	27.0	5	Abandoned
090-MW-07	Intermediate	16.79	40.0	10	
090-MW-09	Deep	10.70	75.0	5	
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	
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-E1-DI	Intermediate	16.72	44.9	NA	
115-E2-DI	Intermediate	13.82	41.2	NA	
115-E2-DO	Intermediate	10.24	35.0	NA	
115-E2-SO	Shallow	10.05	10.0	NA	
115-E3-DI	Intermediate	18.82	37.8	NA	
115-E3-DO	Intermediate	12.39	34.0	NA	
115-E3-SO	Shallow	12.57	NA	NA	
115-E4-DI	Intermediate	19.29	46.8	NA	
115-E4-DO	Intermediate	17.87	NA	NA	
115-E4-SO	Shallow	16.04	NA	NA	
115-E5-DO	Intermediate	15.72	NA	NA	
115-E5-SO	Shallow	18.49	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-E6-DI	Intermediate	19.89	48.4	NA	
115-E6-DO	Intermediate	19.74	51.1	NA	
115-MW-18	NA	13.04	NA	NA	
115-MW-20	Intermediate	14.19	NA	NA	
115-MW-203BR	Rock	8.70	162.0	20	
115-MW-211BR	Rock	17.41	NA	NA	
115-MW-215BR	Rock	8.82	143.0	20	
115-MW-216BR	Rock	18.02	131.0	20	
115-MW-A12T	Deep	15.55	NA	NA	
115-MW-E14D	Intermediate	18.05	35.0	10	
115-MW-E14T	Deep	21.33	71.0	15	
115-OMW-E08TR	Deep	16.82	NA	NA	
115-PW-21	Deep	15.13	71.0	10	
115-W1-DI	Intermediate	16.79	NA	NA	
115-W1-SO	Shallow	12.59	NA	NA	
115-W3-SO	Shallow	15.16	14.0	NA	
115-W4-DI	Intermediate	12.27	NA	NA	
115-W5-SO	Shallow	21.28	NA	NA	
115-W6-SO	Shallow	16.96	NA	NA	
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	
117-MW-A05	Shallow	18.48	16.0	NA	
117-MW-A14	Shallow	17.33	17.0	NA	
117-MW-A62	Shallow	18.32	15.0	NA	
117-MW-A85	Shallow	17.40	15.0	NA	
117-MW-A89	Shallow	13.17	16.0	NA	
117-MW-A99	Shallow	15.95	14.0	NA	
117-MW-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-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-I4	Deep	15.49	75.0	10	
117-MW-I4S	Shallow	15.49	NA	NA	
117-MW-I5	Intermediate	18.76	37.0	15	
119-MW-01T	Deep	10.78	62.0	10	
119-MW-02T	Deep	8.80	70.0	10	
119-MW-11BR	Rock	10.75	159.0	20	
119-MW-12BR	Rock	11.26	154.0	20	
119-MW-16BR-1	Rock	8.61	151.0	15	
119-MW-16BR-2	Rock	8.61	187.0	15	
119-MW-16BR-3	Rock	8.61	247.0	15	
119-MW-2BR-1	Rock	8.43	163.0	15	
119-MW-2BR-2	Rock	8.43	245.0	15	
119-MW-2BR-3	Rock	8.43	315.0	15	
119-MW-4BR-1	Rock	8.77	179.0	15	
119-MW-4BR-2	Rock	8.77	229.0	15	

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Comments
		(ft msl)	(ft)	(ft)	
119-MW-4BR-3	Rock	8.77	314.0	15	
124-MW-10	Shallow	10.06	11.0	8	
124-MW-104L	Deep	11.54	43.0	10	
124-MW-105T	Deep	10.90	62.0	10	
124-MW-106T	Deep	11.20	78.0	10	
124-MW-11	Shallow	9.05	8.0	6	
124-MW-12	Shallow	11.97	14.5	NA	
124-MW-13	Shallow	13.02	13.0	NA	
124-MW-17BR-1	Rock	9.56	153.0	15	
124-MW-17BR-2	Rock	9.56	337.0	15	
124-MW-8BR	Rock	9.71	NA	NA	
124-MW-G02D	Intermediate	9.59	28.0	10	
124-MW-G02T	Deep	9.50	69.0	10	
125-MW-02	Shallow	8.07	13.5	NA	
125-MW-03	Shallow	11.27	11.5	NA	
134-MW-03	Shallow	10.40	17.0	NA	
134-MW-04	Shallow	9.85	NA	NA	
134-MW-V09R	Shallow	11.11	17.5	NA	
134-PZ-002A	Intermediate	10.75	NA	NA	
140-MW-04	Shallow	7.18	NA	NA	
140-MW-08R	Shallow	9.63	NA	NA	
140-MW-09	Shallow	10.72	14.0	NA	
140-MW-10	Shallow	10.49	12.0	8	
140-MW-1R	Shallow	7.61	11.0	NA	
140-MW-9BR-1	Rock	7.32	153.0	15	
140-MW-9BR-2	Rock	7.32	222.0	15	
140-MW-9BR-3	Rock	7.32	272.0	15	
140-MW-P05D	Intermediate	9.89	30.0	10	
153-MW-02	Shallow	NA	NA	NA	Access Restricted
153-MW-05	Shallow	NA	NA	NA	Access Restricted
153-MW-A13	Shallow	9.62	10.0	6	
153-MW-A13T	Deep	9.34	58.0	15	
153-MW-A15	Shallow	11.00	12.2	10	
154-MW-A01	Shallow	18.06	14.6	NA	
154-MW-A06	Shallow	19.87	15.1	NA	
154-MW-A5A	Shallow	19.16	14.0	NA	
154-MW-B6A	Shallow	20.71	13.7	NA	
154-MW-C6A	Shallow	20.37	13.4	NA	
154-MW-D01	Shallow	18.78	14.3	NA	
154-MW-E08	Shallow	22.00	14.4	NA	
163-MW-01	Shallow	10.44	NA	NA	
163-MW-03	Shallow	10.24	NA	NA	
163-MW-2R	Shallow	10.94	NA	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	

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Comments
		(ft msl)	(ft)	(ft)	
184-MW-104	Shallow	16.46	13.0	5	
SA6-MW-14BR	Rock	9.99	85.0	10	
SA6-MW-15BR	Rock	8.08	103.0	20	
SA6-MW-5BR-1	Rock	17.06	106.0	15	
SA6-MW-5BR-2	Rock	17.06	154.0	15	
SA6-MW-5BR-3	Rock	17.06	204.0	13	
SA6-MW-5BR-4	Rock	17.06	236.0	15	
SA6-MW-5BR-5	Rock	17.06	281.0	15	
SA6-MW-AA1	Shallow	17.80	15.0	10	
SA6-MW-AA1D	Intermediate	19.36	32.0	10	
SA6-MW-AA1T	Deep	15.31	70.0	10	
SA6S-PZ-11	Shallow	15.89	9.5	5	(formerly PZ5-SO) Installed 2015
SA6S-PZ-12	Shallow	15.97	9.5	5	(formerly PZ5-SI) Installed 2015
SA6S-PZ-13	Shallow	16.04	9.5	5	(formerly PZ4-SO) Installed 2015
SA6S-PZ-14	Shallow	16.03	14.1	5	(formerly PZ4-SI) Installed 2015
SA6S-PZ-15	Shallow	14.16	10.1	5	(formerly PZ3-SO) Installed 2015
SA6S-PZ-16	Shallow	18.99	19.6	5	(formerly PZ3-SI) Installed 2015
SA6S-PZ-17	Shallow	18.07	12.0	5	(formerly PZ2-SO) Installed 2015
SA6S-PZ-18	Shallow	18.18	16.2	5	(formerly PZ2-SI) Installed 2015
SA6S-PZ-19	Shallow	17.91	10.4	5	(formerly PZ1-SO) Installed 2015
SA6S-PZ-20	Shallow	18.38	17.3	5	(formerly PZ1-SI) Installed 2015
Sump A	Shallow	15.98	NA	NA	
Sump B	Shallow	13.06	NA	NA	
TCE-1	Shallow	16.42	NA	NA	
TCE-2	Shallow	17.93	NA	NA	
TCE-3	Shallow	17.30	NA	NA	
TCE-4	Shallow	15.42	NA	NA	
TCE-5	Shallow	22.74	NA	NA	

Table 3-1

GWET Pumping Outages in 2016

Well ID	Start Date	End Date	Duration Days and	Hours	Comment
087-PW-1	13-Jan-16	14-Jan-16		22.50	Shut down for PW-3 HCL Acid line soak.
087-PW-3	13-Jan-16	14-Jan-16		22.50	Shut down for PW-3 HCL Acid line soak.
087-MW-215BR	13-Jan-16	14-Jan-16		22.50	Shut down for PW-3 HCL Acid line soak.
087-PW-1	24-Jan-16	25-Jan-16		18.50	Shut down due to 300A breaker trip.
087-PW-3	24-Jan-16	25-Jan-16		18.50	Shut down due to 300A breaker trip.
087-MW-215BR	24-Jan-16	25-Jan-16		18.50	Shut down due to 300A breaker trip.
087-PW-1	25-Jan-16	27-Jan-16	2	4.20	Shut down due to 300A breaker trip.
087-PW-3	25-Jan-16	27-Jan-16	2	4.20	Shut down due to 300A breaker trip.
087-MW-215BR	25-Jan-16	27-Jan-16	2	4.20	Shut down due to 300A breaker trip.
087-PW-3	14-Jul-16	15-Jul-16	1	0.83	Shut down for low flow dry running alarm. Pump Replaced.

TABLE 4-1
GROUNDWATER ELEVATION DATA FROM QUARTERLY ROUNDS IN 2016

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-16	Jun-16	Sep-16	Dec-16
		(ft msl)	(ft)	(ft)	(ft msl)	(ft msl)	(ft msl)	(ft msl)
087-IW-01	Deep	11.51	67	10	2.78	2.79	2.63	2.39
087-MW-01	Deep	12.8	60	10	3.72	3.68	3.50	NA
087-MW-08	Deep	12.98	99	10	0.84	1.58	1.52	0.28
087-MW-34	Deep	12.73	70	5	-0.59	1.52	-0.15	-1.20
087-MW-A26T	Deep	9.92	56	15	3.29	3.14	2.98	3.04
087-MW-W25T	Deep	18.19	91	15	NA	2.09	1.46	NA
087-OBS-1L	Deep	15.27	67	NA	2.45	1.73	2.62	1.35
087-OBS-1T	Deep	15.23	100	NA	1.03	2.56	1.58	0.38
087-OBS-3L	Deep	12.88	65	NA	1.13	0.69	1.49	0.19
087-OBS-4T	Deep	11.6	76	NA	0.89	1.55	1.08	0.29
087-OBS-5T	Deep	12.62	82	NA	-0.21	1.56	0.32	-0.78
087-PW-1	Deep	12.66	NA	NA	-25.65	1.38	-27.09	-28.85
088-IW-01	Deep	11.753	59	10	NA	8.87	3.06	3.05
088-IW-02	Deep	13.635	64	10	3.17	NA	2.63	2.85
088-IW-03	Deep	19.96	74	10	0.93	-0.08	2.59	2.19
088-MW-G19T	Deep	12.45	93	15	NA	2.82	NA	NA
090-MW-09	Deep	10.72	75	5	4.89	4.89	4.57	4.81
115-MW-A12T	Deep	15.55	NA	NA	1.11	1.17	1.23	1.27
115-MW-E14T	Deep	21.33	71	15	2.85	5.65	2.45	2.17
115-OMW-E08TR	Deep	16.82	NA	NA	3.08	2.95	2.92	2.81
115-PW-21	Deep	15.13	71	10	3.13	2.33	3.02	2.88
117-MW-D1	Deep	11.08	41	10	2.92	2.55	2.34	2.65
117-MW-D2	Deep	17.62	48	10	4.37	4.04	3.80	4.04
117-MW-D3	Deep	18.85	80	10	5.71	5.37	5.09	5.32
117-MW-I4	Deep	15.49	75	10	5.25	5.00	4.81	4.92
119-MW-01T	Deep	10.78	62	10	4.66	2.34	2.16	2.39
119-MW-02T	Deep	8.8	70	10	2.69	2.37	2.24	2.39
124-MW-104L	Deep	11.538	43	10	3.01	2.68	2.44	2.71
124-MW-105T	Deep	10.897	62	10	NA	NA	-0.43	0.12
124-MW-106T	Deep	11.203	78	10	-1.61	2.69	2.56	2.49
124-MW-G02T	Deep	9.5	69	10	2.74	2.52	2.48	2.75
153-MW-A13T	Deep	9.34	58	15	2.94	2.54	2.21	2.71
SA6-MW-AA1T	Deep	15.31	70	10	0.96	1.34	1.53	0.30
087-MW-13	Intermediate	12.93	40	10	1.80	0.98	1.46	NA
087-MW-A26D	Intermediate	10.35	28	10	3.33	3.15	2.98	3.05
087-MW-O29D	Intermediate	10.32	56	NA	1.54	1.51	1.65	0.98
087-MW-W25D	Intermediate	18.17	66	10	-6.48	2.30	1.81	NA
087-OBS-07	Intermediate	12.59	30	5	NA	0.83	-1.07	-1.40
087-OBS-1D	Intermediate	15.13	43	10	2.23	2.25	3.06	0.81
087-OBS-2D	Intermediate	12.68	NA	10	-1.86	1.37	-1.39	-2.45
087-OBS-5D	Intermediate	12.72	40	10	0.07	1.01	0.77	-0.80
087-PW-2	Intermediate	13.02	48	20	1.21	1.56	2.09	0.01
087-PW-3	Intermediate	12.4	50	20	NA	1.16	-4.68	-6.89
088-PZ-002	Intermediate	10.56	25	5	3.05	NA	NA	NA
090-MW-07	Intermediate	16.79	40	10	5.70	5.30	5.01	5.13
115-E1-DI	Intermediate	16.72	45	NA	-2.26	-2.29	-2.30	-2.45
115-E2-DI	Intermediate	13.815	41.2	NA	2.84	2.80	2.75	2.63
115-E2-DO	Intermediate	10.24	35	NA	4.06	3.76	3.45	3.71
115-E3-DI	Intermediate	18.818	37.82	NA	5.68	5.63	5.55	5.44
115-E3-DO	Intermediate	12.39	34	NA	4.74	4.40	4.11	4.38
115-E4-DI	Intermediate	19.292	46.82	NA	2.73	2.67	2.60	2.47
115-E5-DI	Intermediate	15.85	45.32	NA	-3.28	3.49	3.40	3.25
115-E5-DO	Intermediate	15.72	NA	NA	NA	3.60	NA	NA
115-E6-DI	Intermediate	19.89	48	NA	2.76	2.68	2.71	2.54
115-E6-DO	Intermediate	19.74	51	NA	2.58	2.61	2.75	2.43
115-MW-20	Intermediate	14.19	NA	NA	2.47	2.54	2.68	2.32
115-MW-E14D	Intermediate	18.05	35	10	2.42	-0.47	2.30	2.17
115-W1-DI	Intermediate	16.79	NA	NA	1.05	7.38	2.48	1.98
115-W4-DI	Intermediate	12.27	NA	NA	2.36	2.40	2.64	2.22
117-MW-I1	Intermediate	11.08	22	10	3.89	3.61	3.32	3.76
117-MW-I2	Intermediate	17.59	28	10	4.82	4.48	4.27	4.71
117-MW-I3	Intermediate	15.59	28	10	4.82	4.53	4.32	4.53
117-MW-I5	Intermediate	18.76	37	15	5.93	5.61	5.30	5.40
124-MW-G02D	Intermediate	9.59	28	10	2.64	2.27	2.29	2.45
134-PZ-002A	Intermediate	10.746	NA	NA	NA	NA	NA	1.72
140-MW-P05D	Intermediate	9.885	30	10	2.72	2.62	2.73	2.19
SA6-MW-AA1D	Intermediate	19.36	32	10	1.01	1.43	1.80	0.26
073-MW-10BR-1	Rock	6.67	155	10	4.41	6.22	NA	NA

TABLE 4-1
GROUNDWATER ELEVATION DATA FROM QUARTERLY ROUNDS IN 2016

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-16	Jun-16	Sep-16	Dec-16
073-MW-10BR-2	Rock	6.67	170	10	NA	6.42	NA	NA
073-MW-10BR-3	Rock	6.67	195	15	5.63	5.85	NA	NA
073-MW-10BR-4	Rock	6.67	227	15	0.39	0.39	NA	NA
073-MW-10BR-5	Rock	6.67	327	15	NA	NA	NA	NA
073-MW-1BR-1	Rock	25.25	144	15	-1.66	NA	NA	NA
079-MW-13BR-1	Rock	13.08	121	10	7.56	7.64	7.47	7.47
079-MW-13BR-2	Rock	13.08	214	15	8.03	7.59	7.40	7.49
079-MW-13BR-3	Rock	13.08	284	15	7.72	7.69	7.26	7.03
087-MW-14	Rock	10.68	97	10	2.45	NA	NA	NA
087-MW-O29T	Rock	9.98	102	15	1.82	NA	NA	NA
090-MW-7BR-1	Rock	12.66	134	15	4.91	4.64	4.39	4.52
090-MW-7BR-2	Rock	12.66	NA	NA	4.91	4.69	4.34	4.60
090-MW-7BR-3	Rock	12.66	NA	NA	7.35	12.21	7.50	5.29
115-MW-203BR	Rock	8.7	162	20	NA	1.57	1.27	-0.22
115-MW-211BR	Rock	17.41	NA	NA	3.77	3.59	3.38	3.47
115-MW-215BR	Rock	8.82	143	20	-4.20	-2.89	-3.23	-4.83
115-MW-216BR	Rock	18.02	131	20	3.91	3.69	3.49	3.60
117-MW-3BR-1	Rock	12.34	155	15	5.64	5.99	5.10	5.20
117-MW-3BR-2	Rock	12.34	263	15	6.39	6.32	6.05	5.99
117-MW-8BR	Rock	12.94	125	10	5.66	5.29	5.02	5.22
119-MW-11BR	Rock	10.75	159	20	3.90	3.50	3.42	4.45
119-MW-12BR	Rock	11.26	154	20	5.25	NA	4.68	4.82
119-MW-16BR-1	Rock	8.61	151	15	NA	4.15	NA	NA
119-MW-16BR-2	Rock	8.61	187	15	4.50	4.20	3.89	3.81
119-MW-16BR-3	Rock	8.61	247	15	5.11	4.51	4.26	3.86
119-MW-2BR-1	Rock	8.43	163	15	NA	-0.94	NA	NA
119-MW-2BR-2	Rock	8.43	245	15	-0.18	0.01	0.06	-1.31
119-MW-2BR-3	Rock	8.43	315	15	-0.07	0.14	0.28	-1.18
119-MW-4BR-1	Rock	8.77	179	15	3.72	4.12	3.64	3.03
119-MW-4BR-2	Rock	8.77	229	15	3.74	4.09	3.66	3.08
119-MW-4BR-3	Rock	8.77	314	15	3.97	4.07	3.65	3.33
124-MW-17BR-1	Rock	9.56	153	15	4.00	9.28	3.53	3.60
124-MW-17BR-2	Rock	9.56	337	15	4.03	3.83	3.58	3.47
124-MW-8BR	Rock	9.71	NA	NA	3.69	3.57	3.40	3.33
140-MW-9BR-1	Rock	7.32	153	15	2.07	1.87	1.78	3.26
140-MW-9BR-2	Rock	7.32	222	15	3.34	3.23	3.07	2.85
140-MW-9BR-3	Rock	7.32	272	15	3.32	3.22	3.04	1.29
SA6-MW-14BR	Rock	9.99	85	10	3.40	3.35	3.11	3.12
SA6-MW-15BR	Rock	8.08	103	20	1.38	1.83	1.36	0.99
SA6-MW-5BR-1	Rock	17.06	106	15	2.05	2.47	4.85	1.77
SA6-MW-5BR-2	Rock	17.06	154	15	2.77	3.04	2.58	2.60
SA6-MW-5BR-3	Rock	17.06	204	13	3.25	3.44	3.24	3.06
SA6-MW-5BR-4	Rock	17.06	236	15	3.34	3.36	2.91	3.16
SA6-MW-5BR-5	Rock	17.06	281	15	3.50	3.51	3.07	3.29
073-MW-06	Shallow	11.5	20	NA	NA	2.96	2.96	3.31
073-MW-07	Shallow	10.38	18	NA	NA	3.13	3.05	3.97
073-MW-08	Shallow	10.57	17	NA	NA	3.52	3.30	4.32
079-MW-01	Shallow	8.8	NA	NA	3.99	3.72	3.34	3.63
079-MW-A2	Shallow	8.1	13	10	NA	3.31	3.08	3.25
079-MW-C6	Shallow	11	13	10	5.62	4.56	4.93	4.72
087-MW-101	Shallow	12.21	12	NA	5.07	4.78	4.81	3.53
087-MW-102	Shallow	11.65	13	NA	NA	3.84	4.09	3.60
087-MW-119	Shallow	12.97	11	NA	4.83	4.69	4.44	NA
087-MW-120	Shallow	12.3	11	NA	3.23	4.42	4.31	NA
087-MW-121	Shallow	11.76	12	NA	NA	4.10	3.44	NA
087-MW-132	Shallow	14.564	NA	NA	NA	5.76	5.33	6.51
087-MW-133	Shallow	14.53	NA	NA	NA	5.75	5.31	6.55
087-MW-134	Shallow	14.665	NA	NA	NA	5.81	5.35	6.56
087-MW-A26	Shallow	10.1	13	10	3.46	3.23	3.60	3.15
087-MW-I30	Shallow	10.86	14	10	NA	4.43	4.10	4.31
087-MW-O29	Shallow	10.08	14	10	4.48	4.33	4.06	4.38
SA6S-PZ-11	Shallow	15.89	15.22	5	NA	4.81	3.70	5.96
SA6S-PZ-12	Shallow	15.97	15.2	5	NA	3.45	3.55	3.77
SA6S-PZ-13	Shallow	16.04	15.16	5	NA	5.59	4.53	6.28
SA6S-PZ-14	Shallow	16.03	15.17	5	NA	3.40	3.66	3.77
SA6S-PZ-15	Shallow	14.16	15.25	5	NA	4.52	4.05	5.33
SA6S-PZ-16	Shallow	18.99	19.66	5	NA	3.26	3.69	3.74
SA6S-PZ-17	Shallow	18.07	19.94	5	NA	3.78	3.54	4.59
SA6S-PZ-18	Shallow	22.89	19.8	5	NA	2.91	3.40	3.49
SA6S-PZ-19	Shallow	17.91	19.75	5	NA	3.29	3.21	2.68
SA6S-PZ-20	Shallow	18.38	20.06	5	NA	3.29	3.70	3.83
SA6N-PZ-1	Shallow	10.09	10.76	5	NA	NA	-1.10	4.26
SA6N-PZ-2	Shallow	13.661	11.88	5	NA	NA	3.34	3.57

TABLE 4-1
GROUNDWATER ELEVATION DATA FROM QUARTERLY ROUNDS IN 2016

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-16	Jun-16	Sep-16	Dec-16
SA6N-PZ-3	Shallow	15.933	13.28	5	NA	NA	2.96	3.47
SA6N-PZ-4	Shallow	18.984	14.89	5	NA	NA	3.33	3.44
SA6N-PZ-5	Shallow	22.098	20.43	5	NA	NA	NA	5.12
SA6N-PZ-6	Shallow	23.944	22.28	5	NA	NA	NA	3.38
SA6N-PZ-7	Shallow	19.37	22	5	NA	NA	5.05	6.13
SA6N-PZ-8	Shallow	19.26	17.58	5	NA	NA	1.51	2.86
SA6N-PZ-9	Shallow	18.124	18.96	5	NA	NA	2.25	1.98
SA6N-PZ-10	Shallow	18.56	18.58	5	NA	NA	1.53	3.08
088-MW-111	Shallow	12.223	NA	NA	NA	2.76	2.96	NA
088-MW-112	Shallow	12.43	NA	NA	NA	2.67	2.87	3.33
090-PZ-05	Shallow	17.24	15	NA	7.06	6.68	6.32	6.65
090-PZ-06	Shallow	17.15	17	NA	9.03	8.82	8.29	8.83
115-E1A-SO	Shallow	18.97	7	NA	2.73	3.22	3.64	8.86
115-E2-SO	Shallow	10.05	10	NA	5.92	5.62	5.14	5.30
115-E3-SO	Shallow	12.57	NA	NA	6.16	5.66	5.30	5.58
115-E4-SO	Shallow	16.04	NA	NA	0.64	-0.08	3.37	3.61
115-E5-SO	Shallow	18.49	NA	NA	3.62	NA	3.38	4.04
115-W1-SO	Shallow	12.59	NA	NA	NA	NA	2.03	2.62
115-W3-SO	Shallow	15.16	14	NA	2.57	3.07	3.51	3.71
115-W5-SO	Shallow	21.28	NA	NA	5.64	NA	3.60	3.71
115-W6-SO	Shallow	16.96	NA	NA	NA	1.86	1.72	3.06
117-MW-A05	Shallow	18.48	16	NA	6.62	5.93	5.42	5.93
117-MW-A14	Shallow	17.33	17	NA	4.85	4.28	3.98	4.31
117-MW-A85	Shallow	17.4	15	NA	4.72	4.50	4.19	4.28
117-MW-A89	Shallow	13.17	16	NA	4.19	3.53	3.34	3.78
117-MW-A99	Shallow	15.95	14	NA	5.10	4.97	4.72	4.72
117-MW-I4S	Shallow	15.49	NA	NA	5.31	5.04	DRY	4.80
124-MW-10	Shallow	10.06	11	8	4.87	4.53	4.24	4.78
124-MW-11	Shallow	9.05	8	6	5.10	4.47	3.96	5.05
124-MW-12	Shallow	11.97	14.5	NA	NA	4.86	4.26	5.45
124-MW-13	Shallow	13.02	13	NA	NA	6.57	5.26	7.55
125-MW-02	Shallow	8.07	13.5	NA	NA	4.06	3.89	4.82
125-MW-03	Shallow	11.27	11.5	NA	NA	4.84	4.39	6.10
134-MW-03	Shallow	10.4	17	NA	NA	3.71	3.48	4.52
134-MW-04	Shallow	9.85	NA	NA	NA	3.85	3.60	4.68
134-MW-V09R	Shallow	11.11	17.5	NA	NA	3.77	3.49	4.54
140-MW-04	Shallow	7.18	NA	NA	4.99	3.98	3.93	4.83
140-MW-08R	Shallow	9.63	NA	NA	NA	4.32	4.03	5.32
140-MW-09	Shallow	10.72	14	NA	NA	3.79	3.64	4.56
140-MW-10	Shallow	10.49	12	NA	NA	3.93	3.92	5.06
140-MW-1R	Shallow	7.61	11	NA	5.19	4.17	4.00	5.07
153-MW-A13	Shallow	9.62	10	6	3.44	3.41	2.31	3.78
153-MW-A15	Shallow	11	12	10	2.38	1.78	1.37	2.05
154-MW-A01	Shallow	18.06	15	NA	11.14	10.90	10.70	11.25
154-MW-A06	Shallow	19.87	15	NA	12.59	11.81	11.41	13.27
154-MW-A5A	Shallow	19.16	14	NA	11.32	11.13	10.85	11.40
154-MW-B6A	Shallow	20.71	14	NA	12.42	11.99	11.94	12.72
154-MW-C6A	Shallow	20.37	13	NA	12.09	11.90	11.70	12.21
154-MW-D01	Shallow	18.78	14	NA	12.26	NA	11.59	12.06
154-MW-E08	Shallow	22	14	NA	13.10	12.72	12.47	13.30
163-MW-01	Shallow	10.44	NA	NA	NA	NA	1.37	NA
163-MW-03	Shallow	10.24	NA	NA	NA	3.40	3.22	4.03
163-MW-2R	Shallow	10.94	NA	NA	3.16	2.72	2.74	2.76
184-MW-04	Shallow	8.76	NA	NA	3.57	3.51	3.46	3.61
184-MW-05	Shallow	14.79	NA	NA	5.63	5.11	4.91	5.35
184-MW-06	Shallow	17.75	NA	NA	7.57	7.19	6.85	7.16
184-MW-101	Shallow	14.95	13	5	NA	5.35	4.87	6.20
184-MW-102	Shallow	15.88	12	5	NA	5.78	5.45	6.24
184-MW-103	Shallow	15.96	14	5	NA	5.99	5.74	6.20
184-MW-104	Shallow	16.46	13	5	NA	6.52	6.26	6.65
SA6-MW-AA1	Shallow	17.8	15	10	4.14	3.68	3.60	4.01
SUMP A	Shallow	15.98	NA	NA	6.44	5.55	4.83	6.58
SUMP B	Shallow	13.06	NA	NA	6.68	4.88	4.94	4.94
TCE-1	Shallow	17.58	NA	NA	3.78	4.64	3.55	4.85
TCE-2	Shallow	19.15	NA	NA	NA	9.73	10.31	9.69
TCE-3	Shallow	18.51	NA	NA	NA	8.55	6.92	8.71
TCE-4	Shallow	16.71	NA	NA	10.41	10.18	NA	10.38
TCE-5	Shallow	23.99	NA	NA	NA	NA	13.32	11.30

Table 4-2
Summary of Groundwater Elevations Near NJCU
2016

Ref. Point Survey Date	April 2016 Ref. pt.* ft, msl	03/17/16		06/21/16		09/27/16		12/22/16	
		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	NA	NA	4.79	3.31	5.02	3.08	4.85	3.25
Sump A	15.98	9.54	6.44	10.47	5.55	11.15	4.83	9.4	6.58
Sump B	13.06	6.38	6.68	8.18	4.88	8.12	4.94	8.14	4.94
090-PZ-5	17.24	10.18	7.06	10.56	6.68	10.92	6.32	10.59	6.65
090-PZ-6	17.15	8.12	9.03	8.33	8.82	8.86	8.29	8.32	8.83
184-MW-4	8.76	5.19	3.57	5.25	3.51	5.3	3.46	5.15	3.61
184-MW-5	14.79	9.16	5.63	9.68	5.11	9.88	4.91	9.44	5.35
184-MW-6	17.75	10.18	7.57	10.56	7.19	10.9	6.85	10.59	7.16
090-MW-09	10.72	5.83	4.89	5.83	4.89	6.15	4.57	5.91	4.81
TCE-1	17.58	13.80	3.78	12.94	4.64	14.03	3.55	12.73	4.85
TCE-2	19.15	NA	NA	9.42	9.73	8.84	10.31	9.46	9.69
TCE-3	18.51	NA	NA	9.96	8.55	11.59	6.92	9.80	8.71
TCE-4	16.71	6.30	10.41	6.53	10.18	NA	NA	6.33	10.38
TCE-5	23.99	NA	NA	NA	NA	10.67	13.32	12.69	11.30
090-MW-07	16.79	11.09	5.70	11.49	5.30	11.78	5.01	11.66	5.13
117-MW-I4S	15.49	10.18	5.31	10.41	5.08	NA	DRY	10.09	5.40
117-MW-I5	18.76	12.83	5.93	13.14	5.62	13.46	5.30	13.96	4.80
184-MW-101	14.95	NA	NA	9.50	5.45	10.08	4.87	8.75	6.20
184-MW-102	15.88	NA	NA	10.06	5.82	10.43	5.45	9.64	6.24
184-MW-103	15.96	NA	NA	9.90	6.06	10.22	5.74	9.76	6.20
184-MW-104	16.46	NA	NA	9.89	6.57	10.20	6.26	9.81	6.65

NA - Not available

* NGVD29 site datum

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

	16-Mar-16			30-Jun-16		
Parameter	**PW-1** (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)	**PW-1** (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)
Benzene	2.7	24.9	ND	2.7	27.3	ND
Carbon Tetrachloride	4.5	18.9	2.7	4.1	14.6	2.1
Chloroform	21.0	121.0	0.23 J	24.2	111.0	0.25 J
1,1-Dichloroethene	0.44 J	0.32 J	ND	0.55 J	0.34 J	ND
cis-1,2-Dichloroethene	104	48.9	ND	125	59.9	ND
trans-1,2-Dichloroethene	2.9	0.37 J	ND	3.5	0.44 J	ND
Toluene	ND	ND	ND	ND	ND	ND
Trichloroethene	84	358.0	ND	86.8	347.0	ND
1,1-Dichloroethane	0.49 J	ND	ND	0.65 J	0.25 J	ND
Methylene chloride	ND	4.00	ND	0.75 J	3.70	ND
Vinyl chloride	14.0	14.2	ND	17.0	15.2	ND
1,2-Dichlorobenzene	0.54 J	ND	ND	0.54 J	0.19 J	ND
Chlorobenzene	0.31 J	ND	ND	0.35 J	ND	ND
Ethylbenzene	ND	ND	ND	ND	0.28 J	ND
Xylenes (total)	ND	ND	ND	ND	0.44 J	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND
Hexavalent Chromium	29,600	91,700	15,200	31,300	68,800	14,400
Total Chromium	30,400	84,300	14,800	31,700	37,100	12,900

ND = Not detected above reporting limit.

J = estimated value.

PW-3 replaced PW-2 in start of 2016

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

	19-Oct-16			19-Dec-16		
Parameter	**PW-1** (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)	**PW-1** (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)
Benzene	2.5	17.4	ND	2.7	25.0	ND
Carbon Tetrachloride	4.6	8.2	3.0	4.4	12.1	3.0
Chloroform	21.9	77.3	0.29 J	22.9	92.7	0.38 J
1,1-Dichloroethene	0.49 J	ND	ND	0.55 J	0.45 J	ND
cis-1,2-Dichloroethene	129	46.8	ND	107	71.7	ND
trans-1,2-Dichloroethene	3.4	0.32 J	ND	3.9	0.55 J	ND
Toluene	ND	ND	ND	ND	ND	ND
Trichloroethene	80.7	205.0	ND	83.9	308.0	ND
1,1-Dichloroethane	0.65 J	ND	ND	0.74 J	ND	ND
Methylene chloride	0.58 J	2.20	ND	0.83 J	2.70	ND
Vinyl chloride	13.2	6.9	ND	12.4	14.3	ND
1,2-Dichlorobenzene	0.52 J	ND	ND	0.59 J	ND	ND
Chlorobenzene	0.33 J	ND	ND	0.44 J	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND
Xylenes (total)	ND	ND	ND	ND	0.40 J	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND
Hexavalent Chromium	31,000	56,300	19,200	28,100	46,600	14,500
Total Chromium	30,200	58,500	17,800	27,600	38,000	14,800

ND = Not detected above reporting limit.

J = estimated value.

PW-3 replaced PW-2 in start of 2016

TABLE 5-2
SUMMARY OF GROUNDWATER QUALITY DATA FROM WELL 124-MW-106T

Date Sampled	Unfiltered Hex Cr. (mg/L)	Unfiltered Total Cr. (mg/L)	Filtered Hex Cr. (mg/L)	Filtered Total Cr. (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potasium (mg/L)	Sodium (mg/L)	Alkalinity Bi-carbonate (mg/L)	Alkalinity Total (mg/L)	Chloride (mg/L)	Sulfide (mg/L)	Sulfate (mg/L)	pH
Dec. 2008	ND	ND	ND	ND										
Dec. 2009	ND	0.013	ND	ND										
Dec. 2010	ND	0.011	ND	ND										
Dec. 2011	ND	0.024	ND	ND										
5/2/2013	ND	0.013	ND	ND	334	42.6	33.5	1040	20.3	22	2280	<2.0	319	9.42
6/7/2016	0.77	0.819	0.73	0.779										12.32
8/11/2016	0.39	0.489	0.2	0.33	104	<5	234	278	20.1	210	633	<2.0	224	11.2
12/19/2016	0.025	0.0581	0.012	0.0186	250	7.29	39.2	554	25.3	39	1280	<2.0	119	9.5

Table 6-1
Summary of S-3 Injection Events Through 2016

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

Table 6-2
Calculation of Percent Sulfide in CaSx Samples

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

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

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

Event #	Injection Date	Injection Well	Mass CaSx Delivered (tons)	Volume CaSx Injected[a] (gallons)	Geometric mean [b] Sulfide %	Stoichiometric Equivalent Mass Cr(VI) Reduced[c] (tons)	Cumulative Stoichiometric Equivalent Mass Cr(VI) Reduced (tons)
1	5/20/12	088-IW-01	22.53	4,291	5.01%	1.22	1.22
2	7/1/12	088-IW-02	22.40	4,267	5.29%	1.28	2.50
3	8/20/12	115-PW-21	22.84	4,350	5.21%	1.29	3.79
4	10/1/12	115-DP-2	22.79	4,340	5.45%	1.34	5.13
5	12/9/12	088-IW-02	22.42	4,230	6.51%	1.58	6.71
6	3/17/13	088-IW-01	22.60	4,305	4.31%	1.05	7.76
7	6/23/13	088-IW-03	22.68	4,320	3.91%	0.96	8.72
8	08/18/13	088-IW-02	22.13	4,171	5.33%	1.28	9.99
9	09/22/13	088-IW-01	22.27	4,242	4.96%	1.19	11.19
10	10/20/13	088-IW-03	20.76	3,954	5.15%	1.16	12.34
11	12/08/13	088-IW-02	21.43	4,080	5.14%	1.19	13.53
12	03/30/14	088-IW-01	22.57	4,300	5.26%	1.28	14.82
13	04/27/14	088-IW-03	21.68	4,130	5.21%	1.22	16.04
14	06/01/14	088-IW-02	22.05	4,200	5.93%	1.41	17.45
15	07/13/14	088-IW-01	22.26	4,240	5.06%	1.22	18.67
16	08/24/14	088-IW-03	22.10	4,210	6.15%	1.47	20.14
17	09/21/14	088-IW-02	22.31	4,250	6.04%	1.46	21.60
18	10/29/14	088-IW-03	20.18	3,844	6.31%	1.38	22.97
19	3/22/2015	088-IW-01	22.39	4,265	5.48%	1.33	24.30
20	4/26/2015	088-IW-03	21.34	4,065	5.43%	1.25	25.55
21	5/31/2015	088-IW-02	21.82	4,156	6.54%	1.54	27.09
22	7/6/2015	088-IW-01	22.52	4,290	5.28%	1.29	28.38
23	8/16/2015	088-IW-03	22.76	4,335	5.28%	1.30	29.68
24	9/27/2015	088-IW-02	22.78	4,339	5.24%	1.29	30.97
25	11/2/2015	088-IW-03	21.19	4,036	5.92%	1.36	32.33
26	12/06/15	088-IW-01	21.64	4,122	5.92%	1.38	33.71
27	03/20/16	088-IW-02	21.15	4,029	4.32%	0.99	34.70
28	04/25/16	088-IW-03	22.57	4,299	5.06%	1.23	35.93
29	06/05/16	088-IW-01	22.59	4,303	5.17%	1.26	37.19
30	07/11/16	088-IW-02	22.81	4,345	5.30%	1.31	38.50
31	08/07/16	088-IW-03	19.78	3,768	5.23%	1.12	39.62
32	10/03/16	088-IW-01	22.69	4,322	5.79%	1.42	41.04
33	10/24/16	088-IW-02	22.59	4,303	5.55%	1.36	42.39
34	11/29/16	088-IW-03	23.16	4,411	5.40%	1.35	43.75

Notes:
(a) Mass CaSx Delivered / CaSx density
(c) Mass CaSx Delivered × Sulfide% × (51.996/32.065) / 1.5;
The factor 1.5 represents the molar ratio of S(–II) to Cr(VI) in the balanced redox reaction:
$1.5CaS_{4.2} + CrO_4^{2-} + 5H^+ = Cr(OH)_3(s) + 6.3S(s) + 1.5Ca^{2+} + H_2O$
51.996 and 32.065 are the atomic masses of Cr and S, respectively

FIGURES

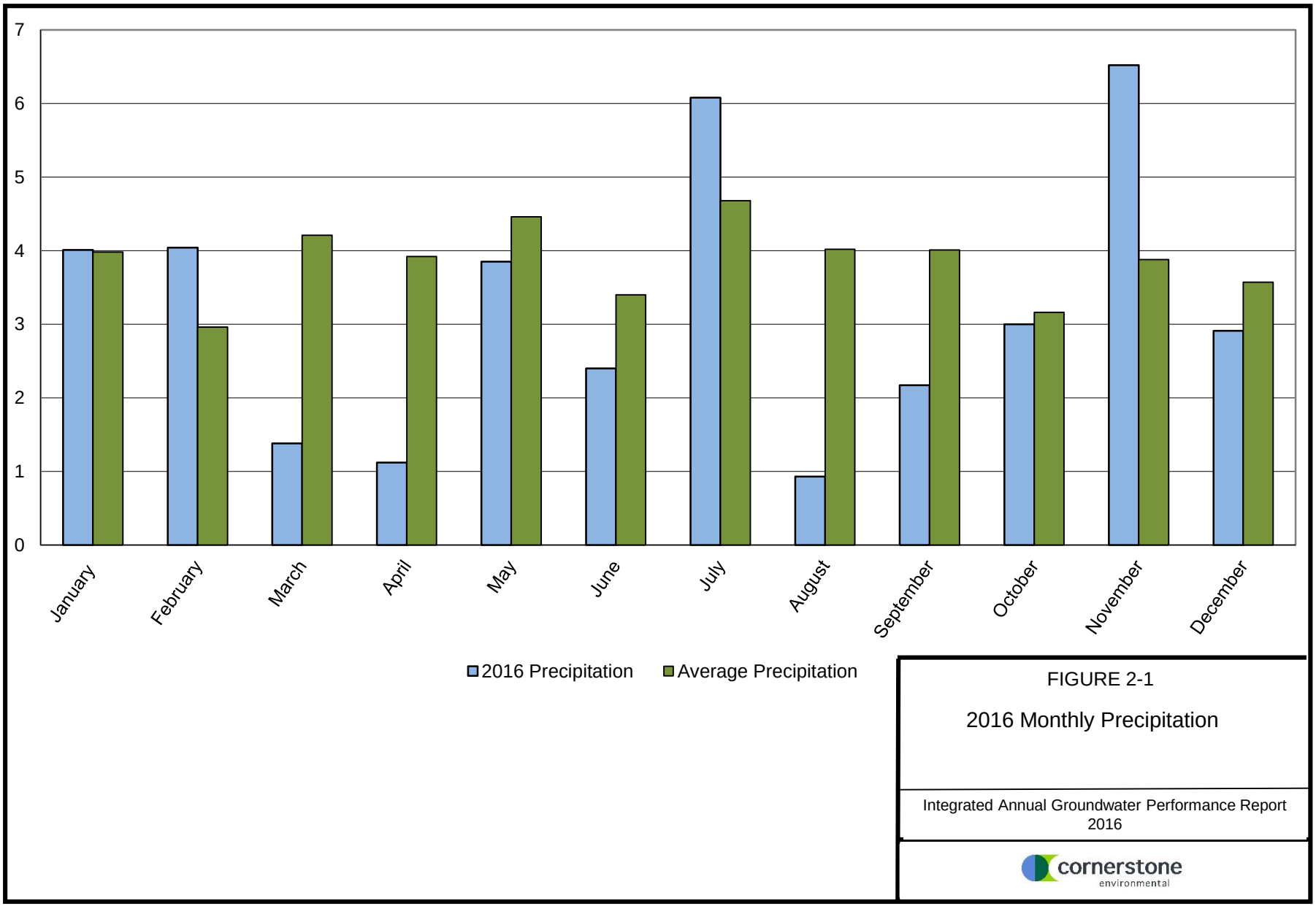

FIGURE 2-1

2016 Monthly Precipitation

Integrated Annual Groundwater Performance Report
2016

cornerstone
environmental

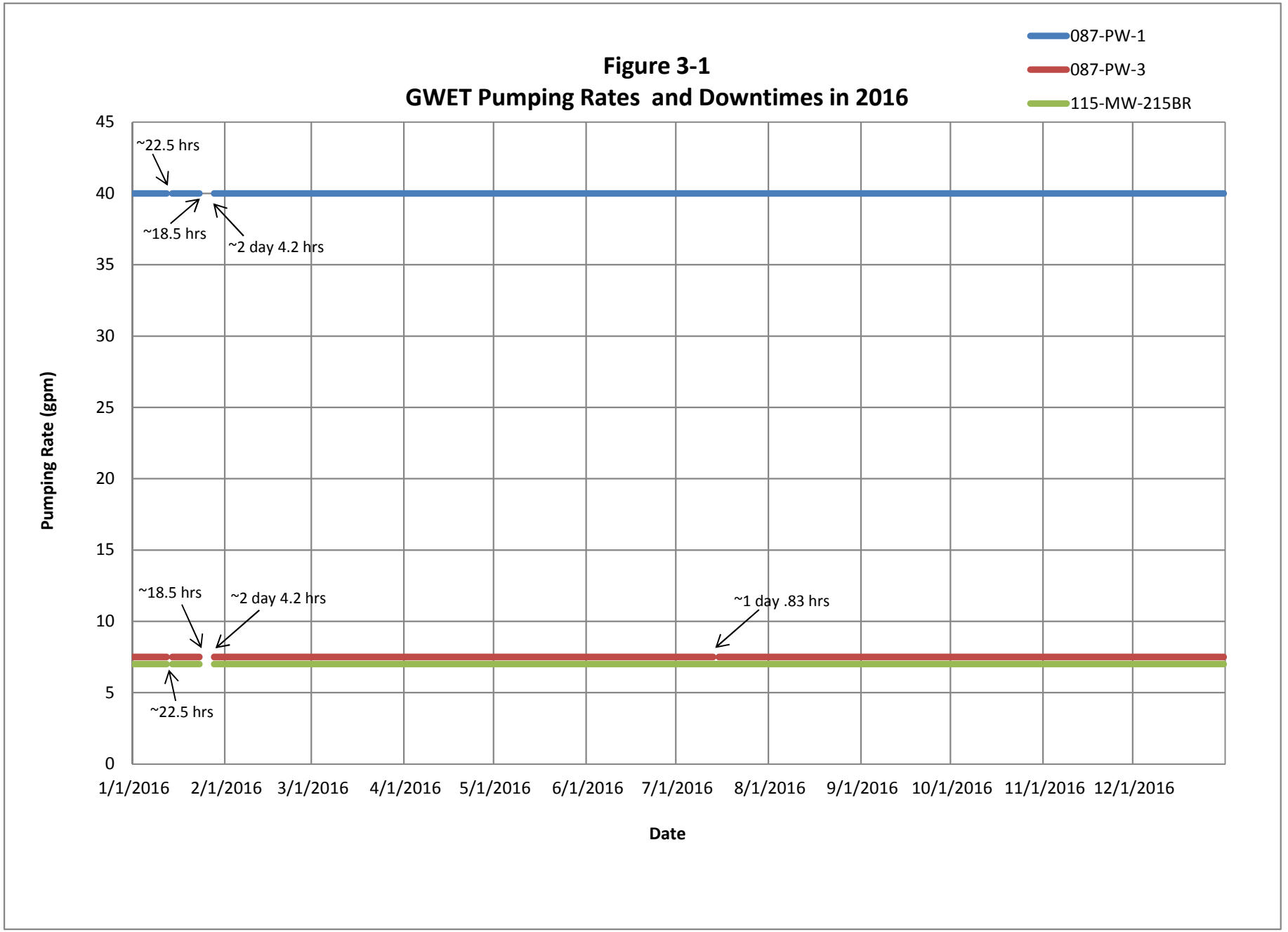
Figure 3-1
GWET Pumping Rates and Downtimes in 2016
087-PW-1
087-PW-3
115-MW-215BR
Pumping Rate (gpm)
45
40
35
30
25
20
15
10
5
0
~22.5 hrs
~18.5 hrs
~2 day 4.2 hrs
~18.5 hrs
~2 day 4.2 hrs
~1 day .83 hrs
~22.5 hrs
1/1/2016
2/1/2016
3/1/2016
4/1/2016
5/1/2016
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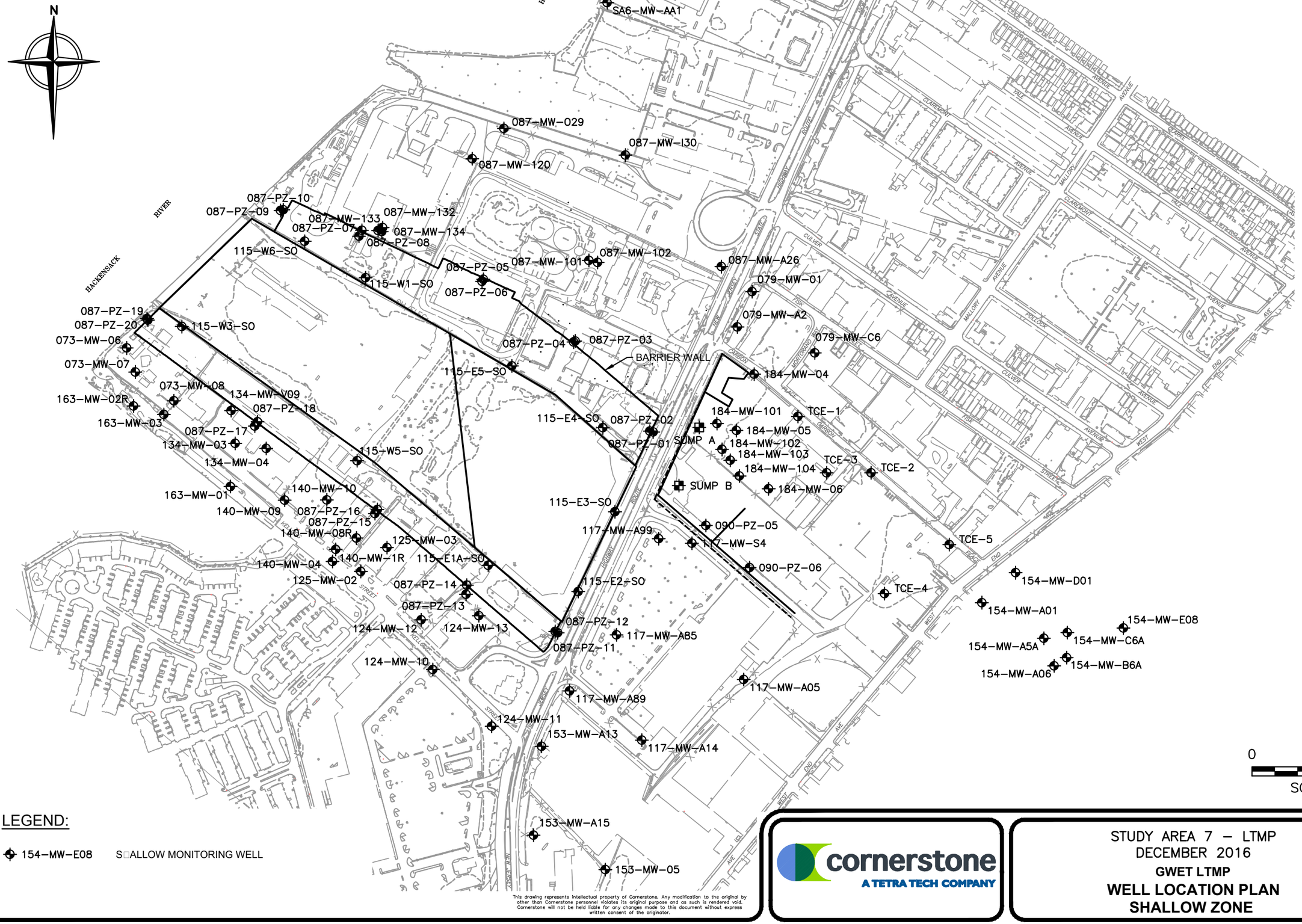
7/1/2016
8/1/2016
9/1/2016
10/1/2016
11/1/2016
12/1/2016
Date



LEGEND:

154-MW-E08 SHALLOW MONITORING WELL

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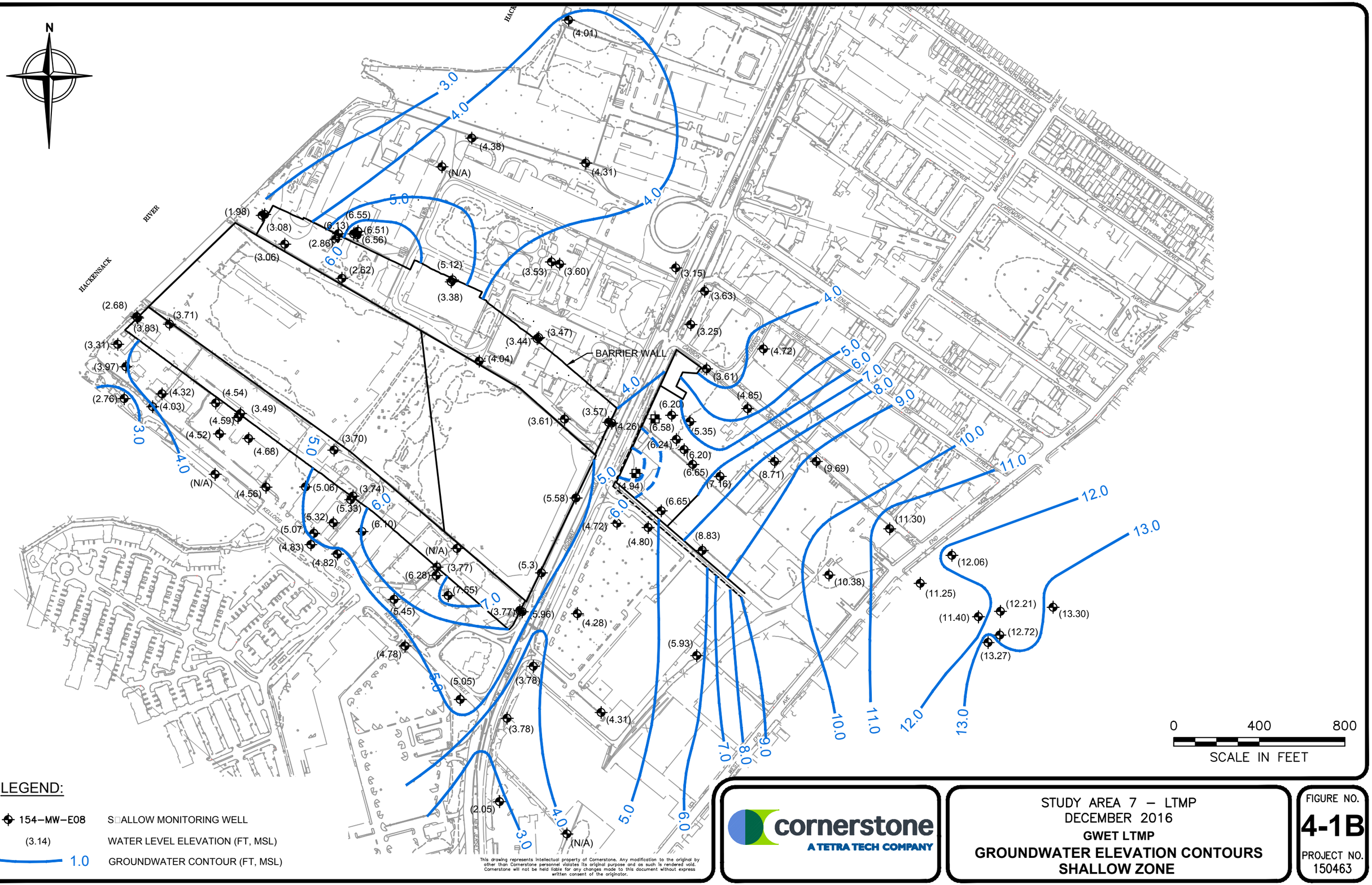
STUDY AREA 7 – LTMP
DECEMBER 2016
GWET LTMP
WELL LOCATION PLAN
SHALLOW ZONE

FIGURE NO.
4-1A
PROJECT NO.
150463

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2016 - 4Q - Annual Figures\2016 WELL SAMPLING FIGURES\H15WSF-S-SITE-4_1A.dwg Layout: FIGURE 4-1A User: bloyne.gibbons Apr 27, 2017 - 3:40pm



LEGEND:

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

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STUDY AREA 7 – LTMP
DECEMBER 2016
GWET LTMP
GROUNDWATER ELEVATION CONTOURS SHALLOW ZONE

FIGURE NO.
4-1B
PROJECT NO.
150463

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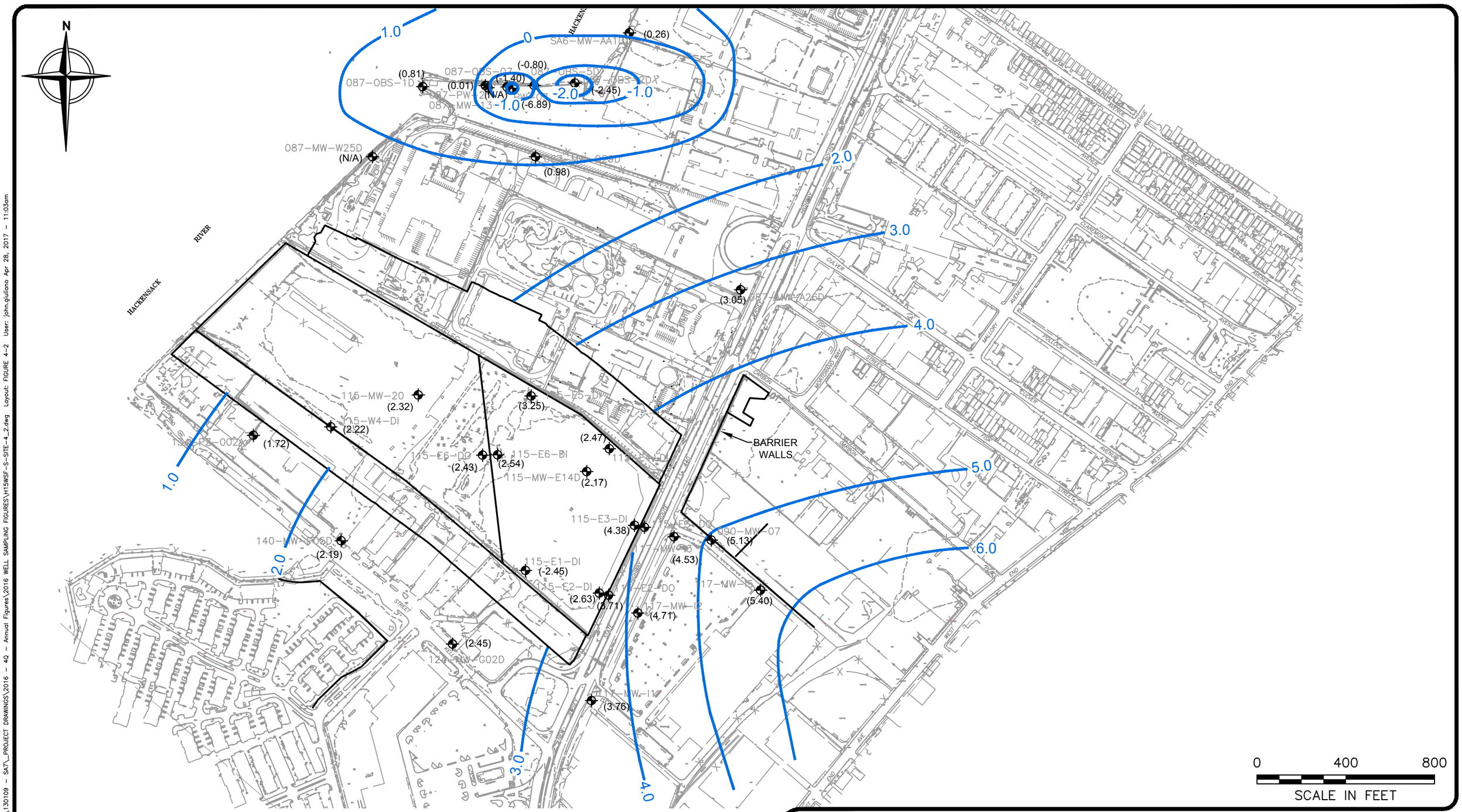


LEGEND:

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

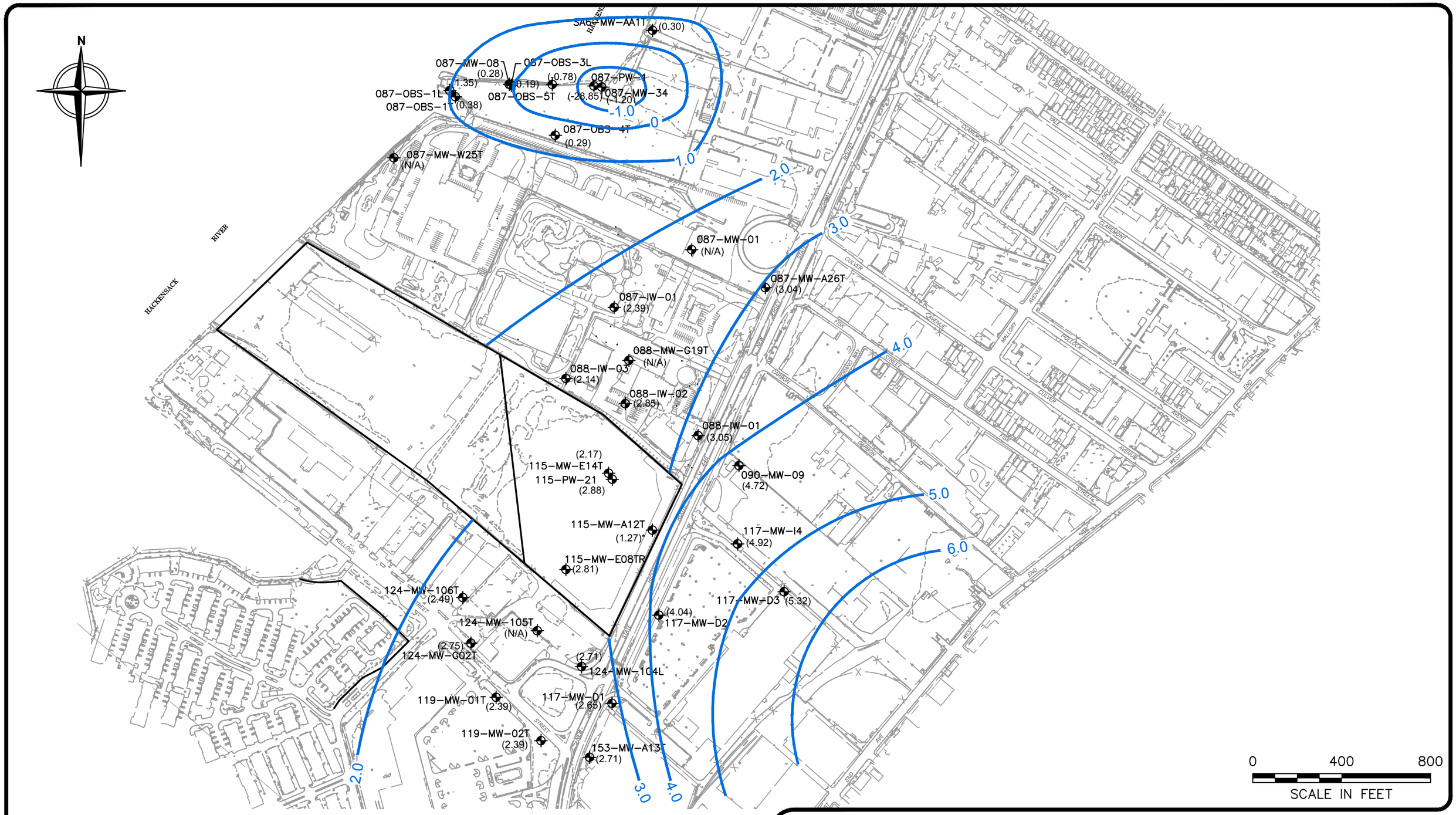
cornerstone
A TETRA TECH COMPANY

STUDY AREA 7 – LTMP
DECEMBER 2016

GWET LTMP
GROUNDWATER ELEVATION CONTOURS
INTERMEDIATE ZONE

FIGURE NO.
4-2
PROJECT NO.
150463

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2016 - 4Q - Annual Figures\2016 WELL SAMPLING FIGURES\H15WSF-S-SITE-4_2.dwg Layout: FIGURE 4-2 User: john.giuliano Apr 28, 2017 - 11:03am



LEGEND:

- 087-MW-029D — DEEP ZONE MONITORING WELL
- (2.25) — WATER LEVEL ELEVATION (FT, MSL)
- 1.0 — GROUNDWATER CONTOUR (FT, MSL)
- * REFERENCE POINT ELEVATION NOT ACCURATE
- ** SCREENED BETWEEN INTERMEDIATE AND DEEP ZONES

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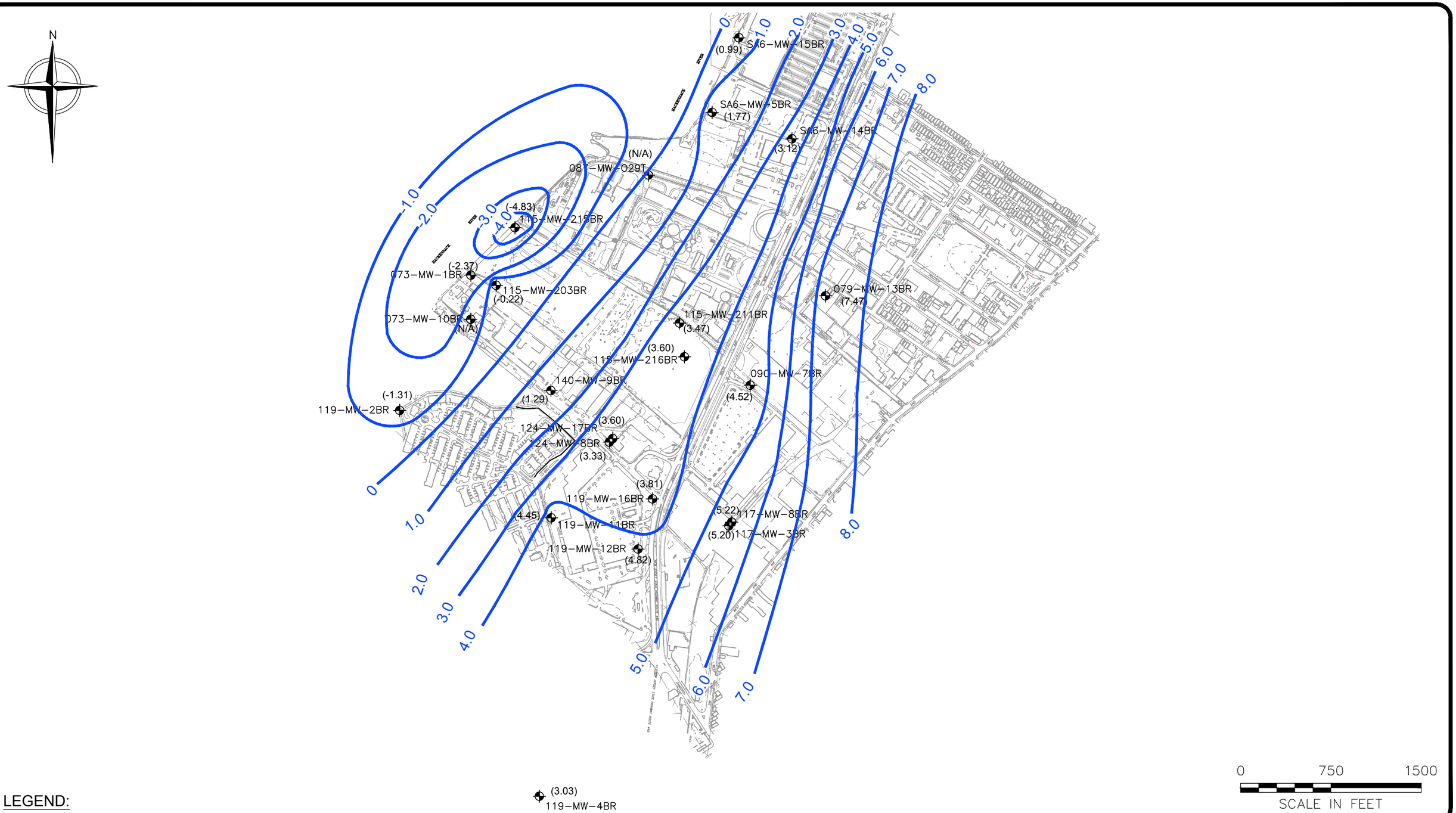
STUDY AREA 7 – LTMP
DECEMBER 2016

GWET LTMP
GROUNDWATER ELEVATION CONTOURS
DEEP ZONE

FIGURE NO.
4-3
PROJECT NO.
150463



LEGEND:

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

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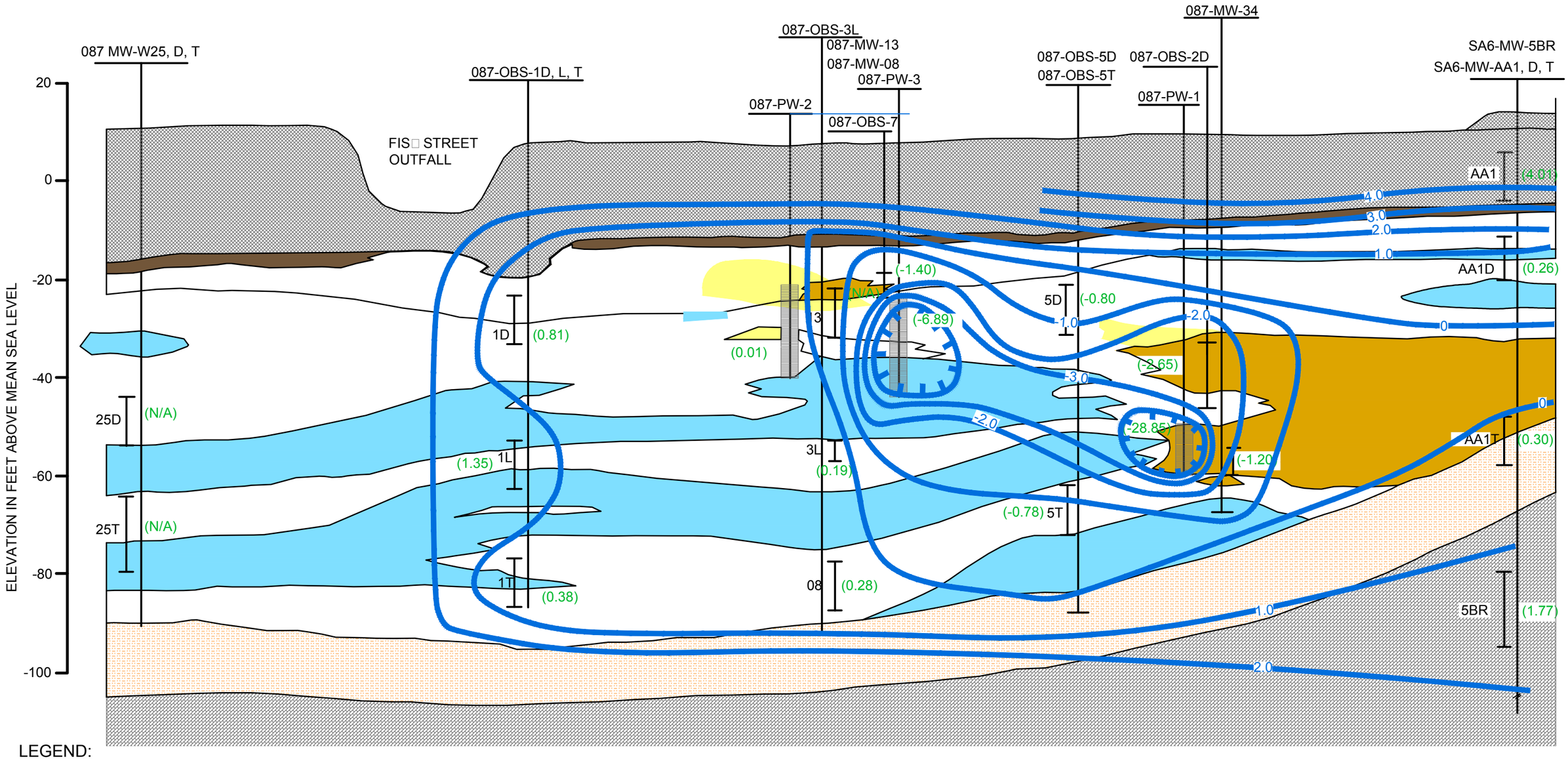
STUDY AREA 7 – LTMP
DECEMBER 2016

GWET LTMP
GROUNDWATER ELEVATION CONTOURS
BEDROCK ZONE

FIGURE NO.
4-4
PROJECT NO.
150463

File: X:\PROJECTS\HONEYWELL\130109 – SA7_PROJECT DRAWINGS\2016 – 4Q – Annual Figures\2016 WELL SAMPLING FIGURES\H15WSF–S–SITE–4_4.dwg Layout: FIGURE 4–4 User: john.giuliano Apr 28, 2017 – 10:48am



LEGEND:

- FILL
- MEADOW MAT
- FINE TO MEDIUM SAND
- FINE, MEDIUM TO COARSE SAND
- INTERBED SILTS AND CLA□S
- GLACIAL TILL
- PASSAIC FORMATION
- FINE TO VER□ FINE SAND

087-MW-W25T — WELL DESIGNATION

GROUND SURFACE

25T — SCREENED INTERVAL

4.0 — GROUNDWATER CONTOUR

0 100 200

SCALE IN FEET

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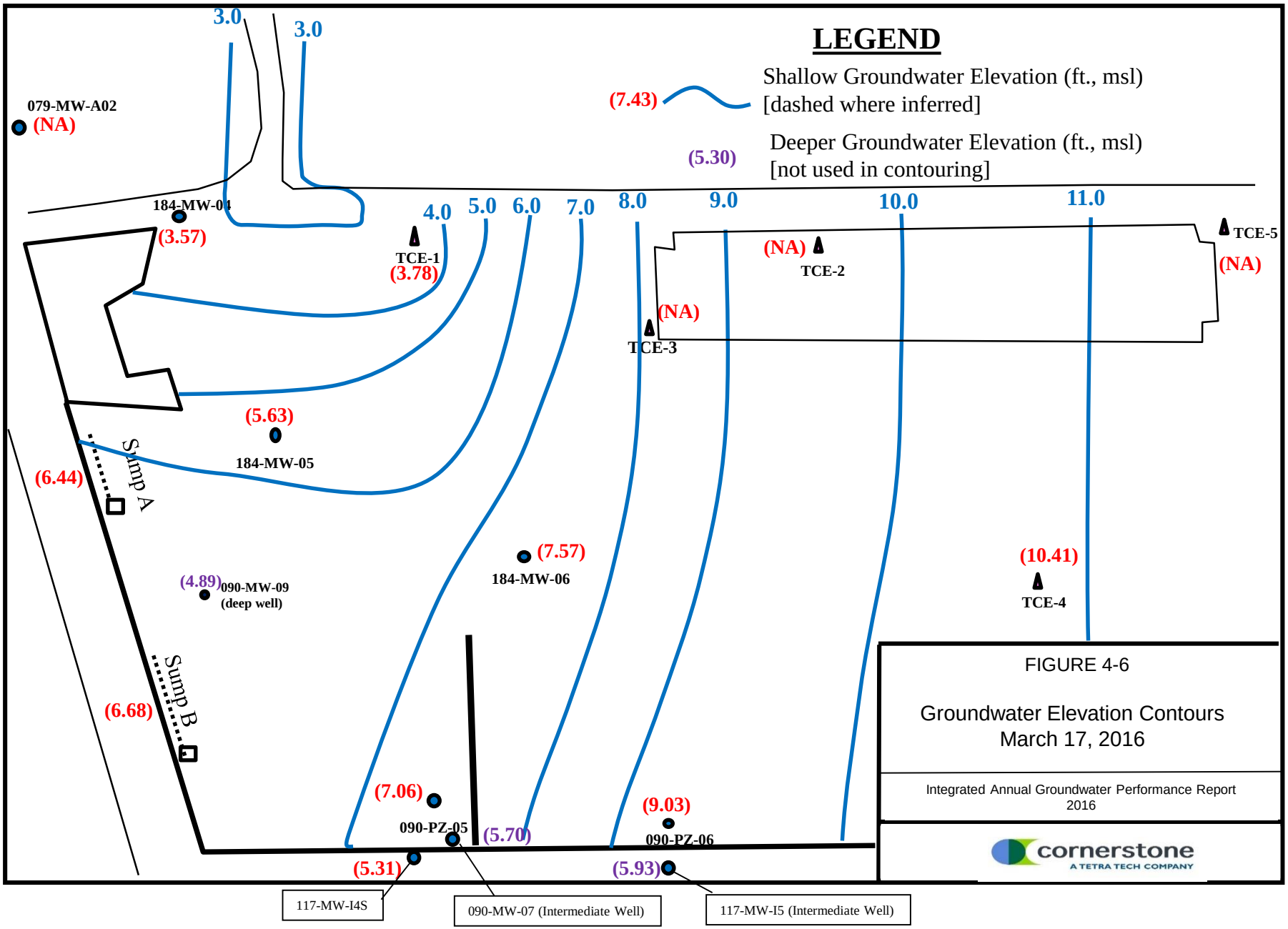
STUDY AREA 7 – LTMP
DECEMBER 2016
GROUNDWATER ELEVATIONS IN CROSS-SECTION DECEMBER 2016

FIGURE NO.
4-5
PROJECT NO.
150463

File: X:\PROJECTS\HONEYWELL\130109 – SA7_PROJECT DRAWINGS\2016 – 4Q – Annual Figures\2016 WELL SAMPLING FIGURES\H15WSF-S-SECT-4_5.dwg Layout: FIGURE 4-5 User: john.giuliano Apr 28, 2017 – 10:34am


LEGEND
Shallow Groundwater Elevation (ft., msl)
[dashed where inferred]
Deeper Groundwater Elevation (ft., msl)
[not used in contouring]
(7.43)
(5.30)
3.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
079-MW-A02
(NA)
184-MW-01
(3.57)
TCE-1
(3.78)
TCE-2
(NA)
TCE-3
(NA)
TCE-5
(NA)
(5.63)
184-MW-05
(6.44)
Symp A
(4.89)
090-MW-09
(deep well)
(7.57)
184-MW-06
(10.41)
TCE-4
Sump B
(6.68)
(7.06)
090-PZ-05
(5.70)
(9.03)
090-PZ-06
(5.31)
(5.93)
117-MW-I4S
090-MW-07 (Intermediate Well)
117-MW-I5 (Intermediate Well)
FIGURE 4-6
Groundwater Elevation Contours
March 17, 2016
Integrated Annual Groundwater Performance Report
2016
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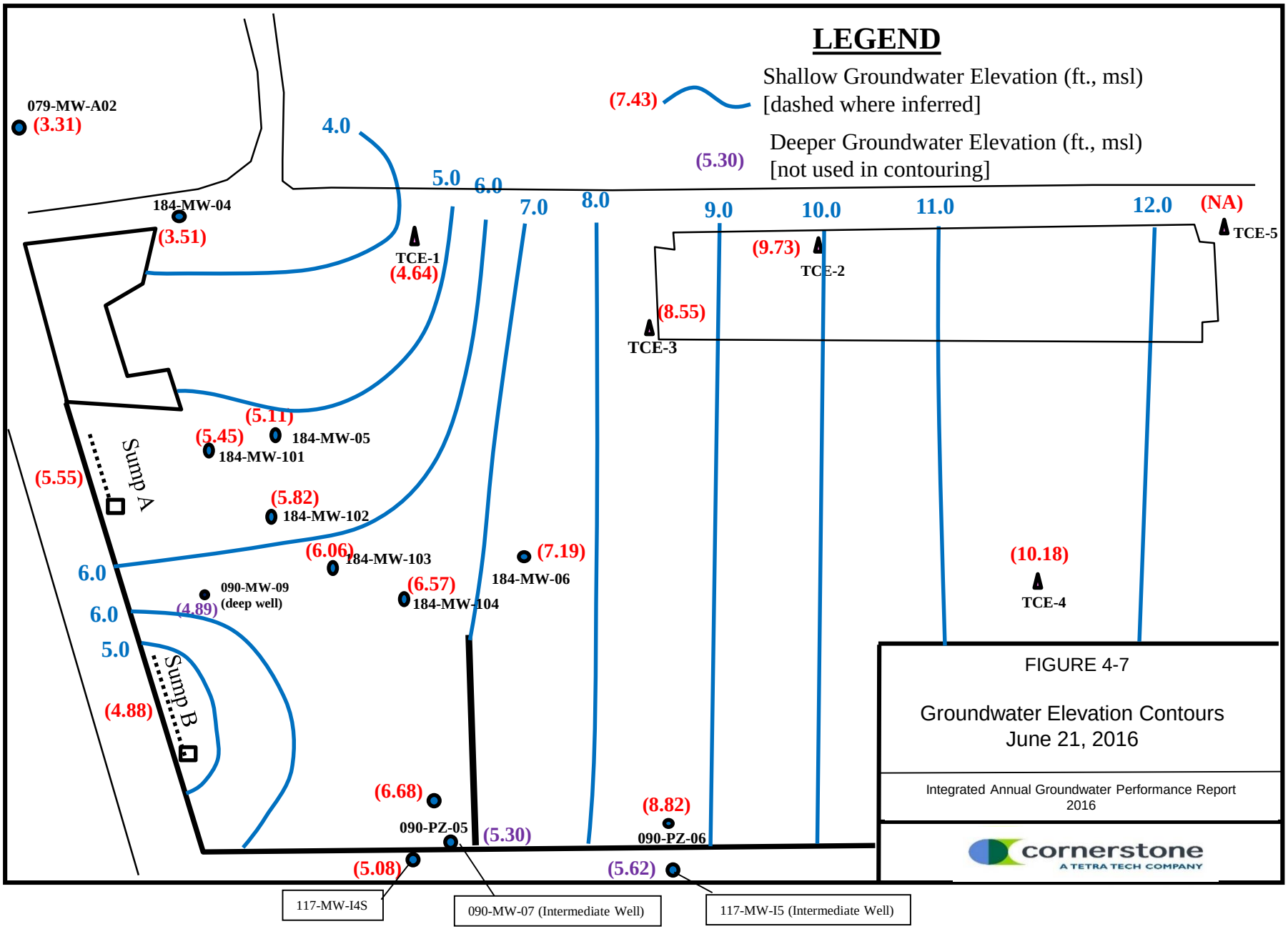
LEGEND
Shallow Groundwater Elevation (ft., msl)
[dashed where inferred]
Deeper Groundwater Elevation (ft., msl)
[not used in contouring]
(7.43)
(5.30)
079-MW-A02
(3.31)
184-MW-04
(3.51)
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
(NA)
TCE-1
(4.64)
TCE-2
(9.73)
TCE-3
(8.55)
TCE-4
(10.18)
TCE-5
(5.11)
(5.45)
184-MW-05
184-MW-101
(5.55)
Sump A
(5.82)
184-MW-102
(6.06)
184-MW-103
(7.19)
184-MW-06
(6.57)
184-MW-104
090-MW-09
(deep well)
(4.89)
6.0
6.0
5.0
Sump B
(4.88)
(6.68)
090-PZ-05
(5.30)
(8.82)
090-PZ-06
(5.08)
(5.62)
117-MW-I4S
090-MW-07 (Intermediate Well)
117-MW-I5 (Intermediate Well)
FIGURE 4-7
Groundwater Elevation Contours
June 21, 2016
Integrated Annual Groundwater Performance Report
2016
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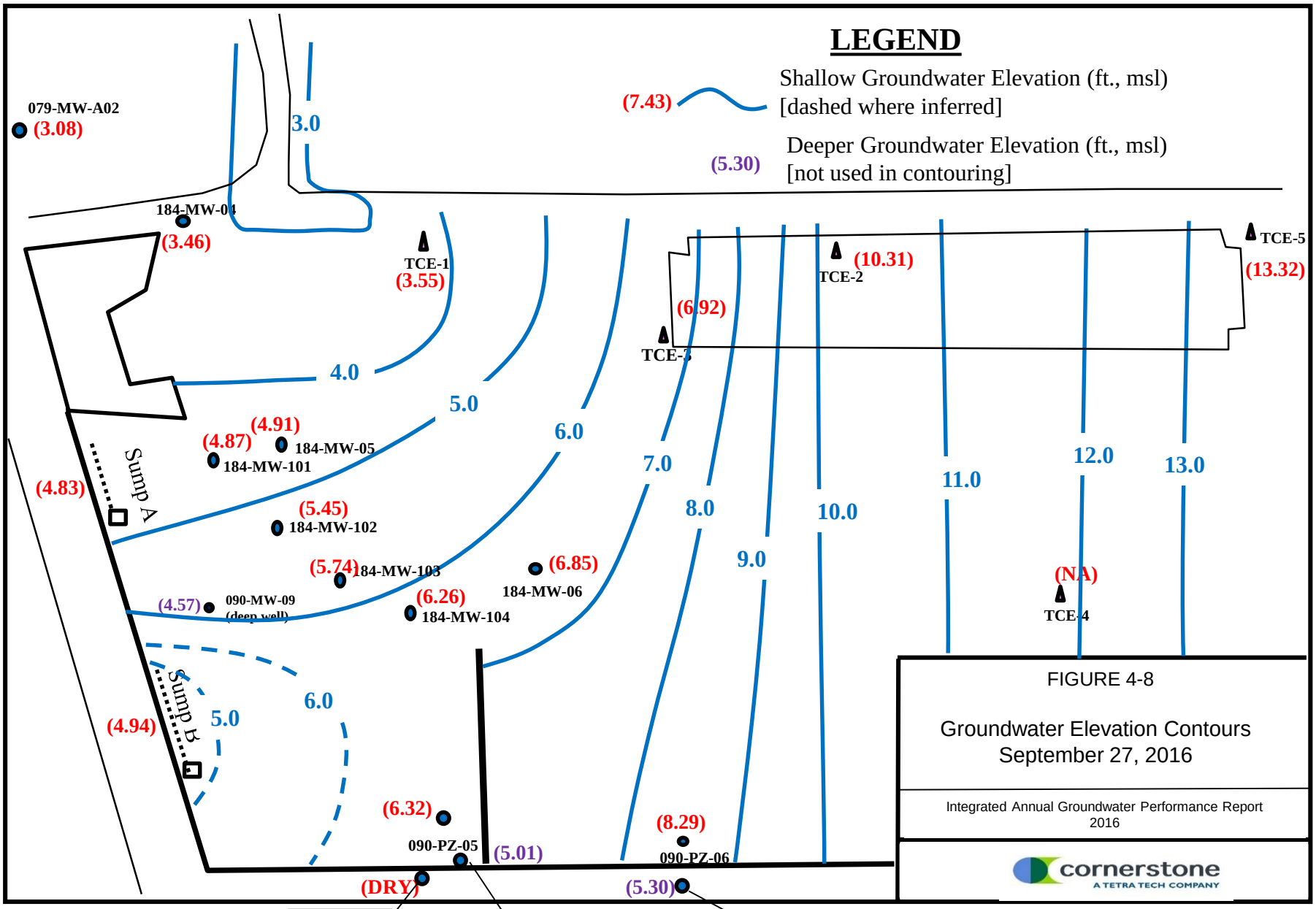

FIGURE 4-8

Groundwater Elevation Contours
September 27, 2016

Integrated Annual Groundwater Performance Report
2016

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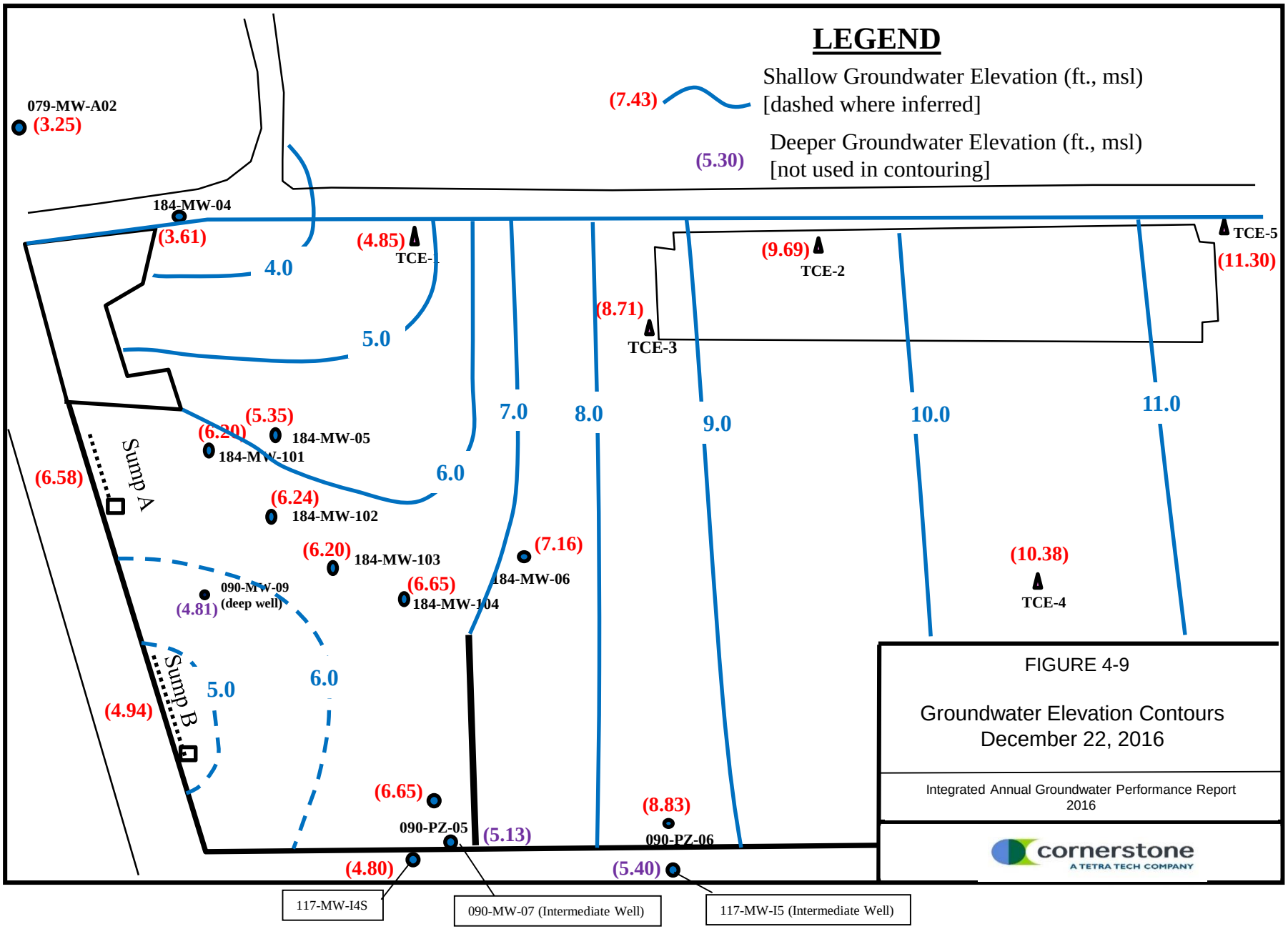
LEGEND
(7.43)
Shallow Groundwater Elevation (ft., msl)
[dashed where inferred]
(5.30)
Deeper Groundwater Elevation (ft., msl)
[not used in contouring]
079-MW-A02
(3.25)
184-MW-04
(3.61)
(4.85)
TCE-
(9.69)
TCE-2
TCE-5
(11.30)
(8.71)
TCE-3
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
(5.35)
(6.20)
184-MW-05
184-MW-101
(6.58)
Sump A
(6.24)
184-MW-102
(6.20)
184-MW-103
(7.16)
184-MW-06
(6.65)
184-MW-104
090-MW-09
(deep well)
(4.81)
(10.38)
TCE-4
Sump B
5.0
6.0
(4.94)
(6.65)
090-PZ-05
(5.13)
(8.83)
090-PZ-06
(4.80)
(5.40)
117-MW-I4S
090-MW-07 (Intermediate Well)
117-MW-I5 (Intermediate Well)
FIGURE 4-9
Groundwater Elevation Contours
December 22, 2016
Integrated Annual Groundwater Performance Report
2016
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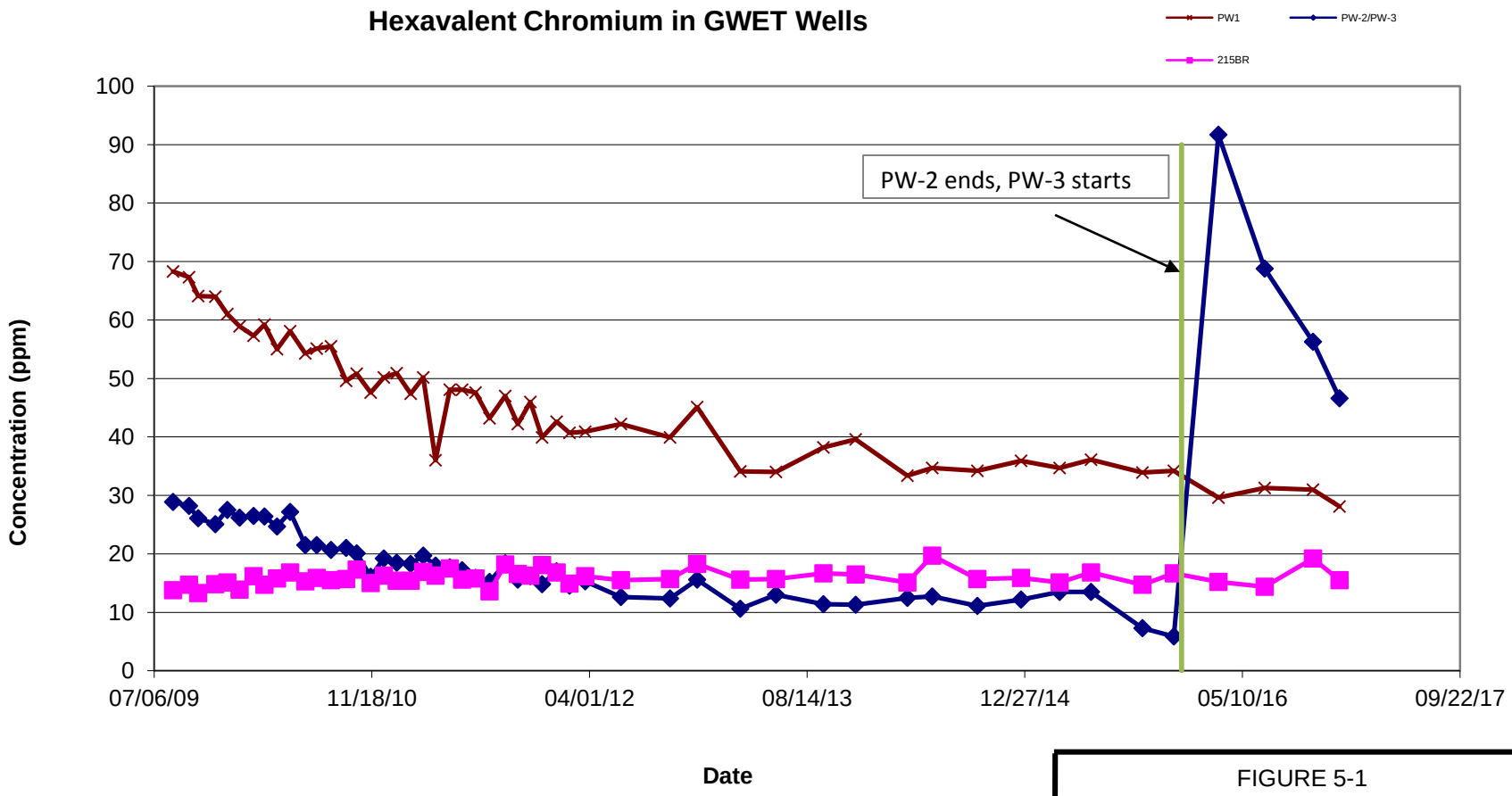

FIGURE 5-1

Hexavalent Chromium Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2016

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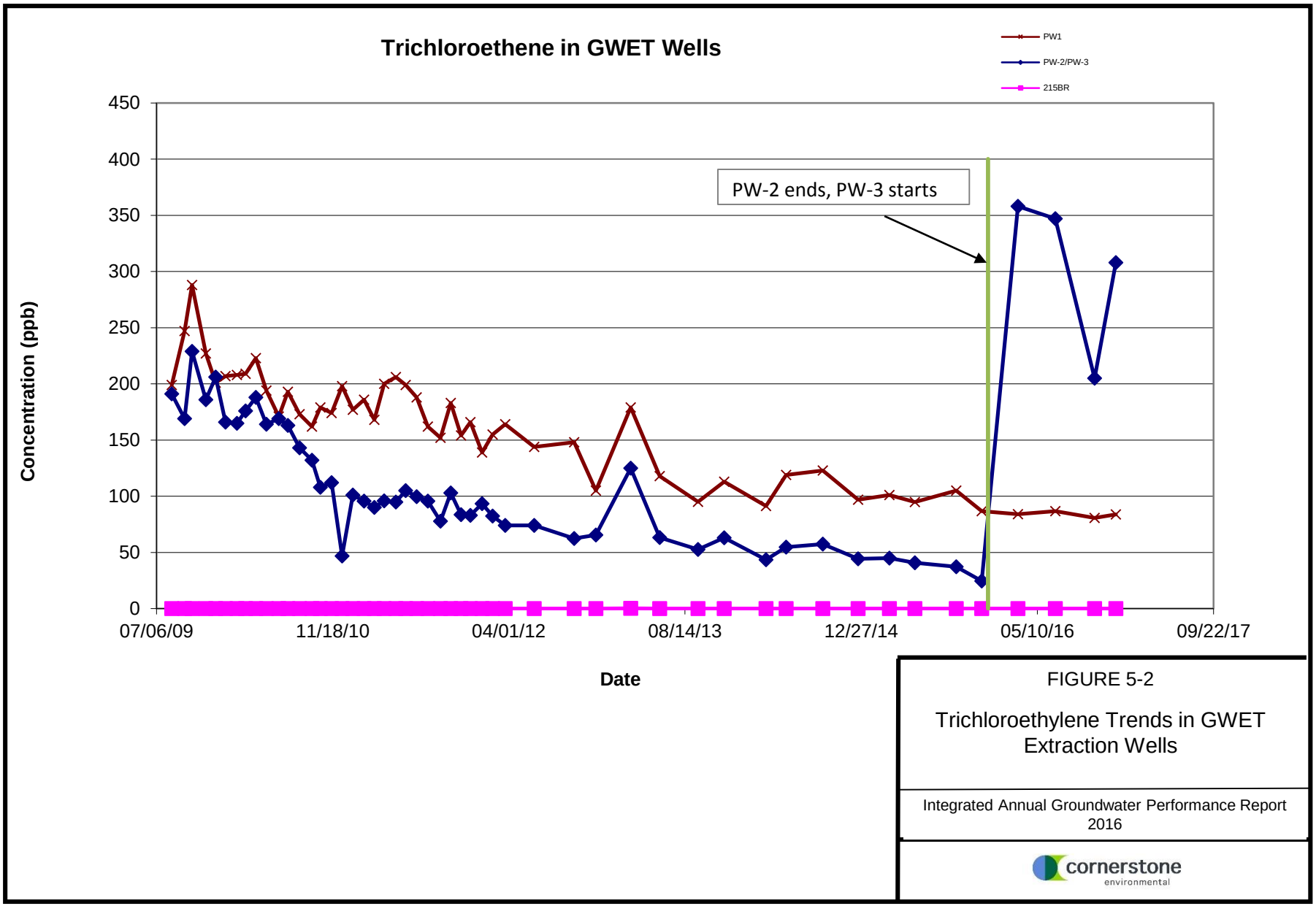

FIGURE 5-2

Trichloroethylene Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2016

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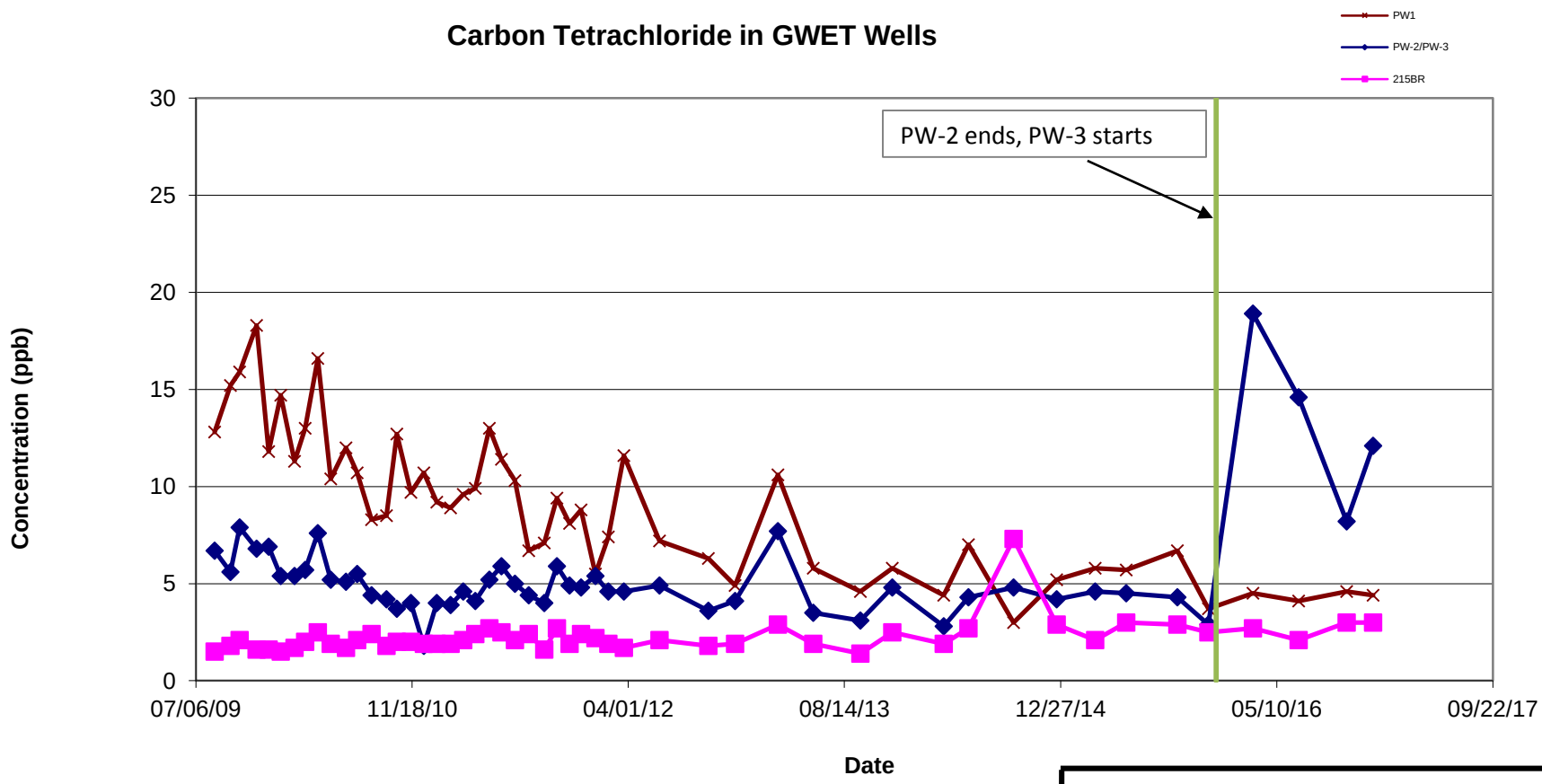

FIGURE 5-3

Carbon Tetrachloride Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2016

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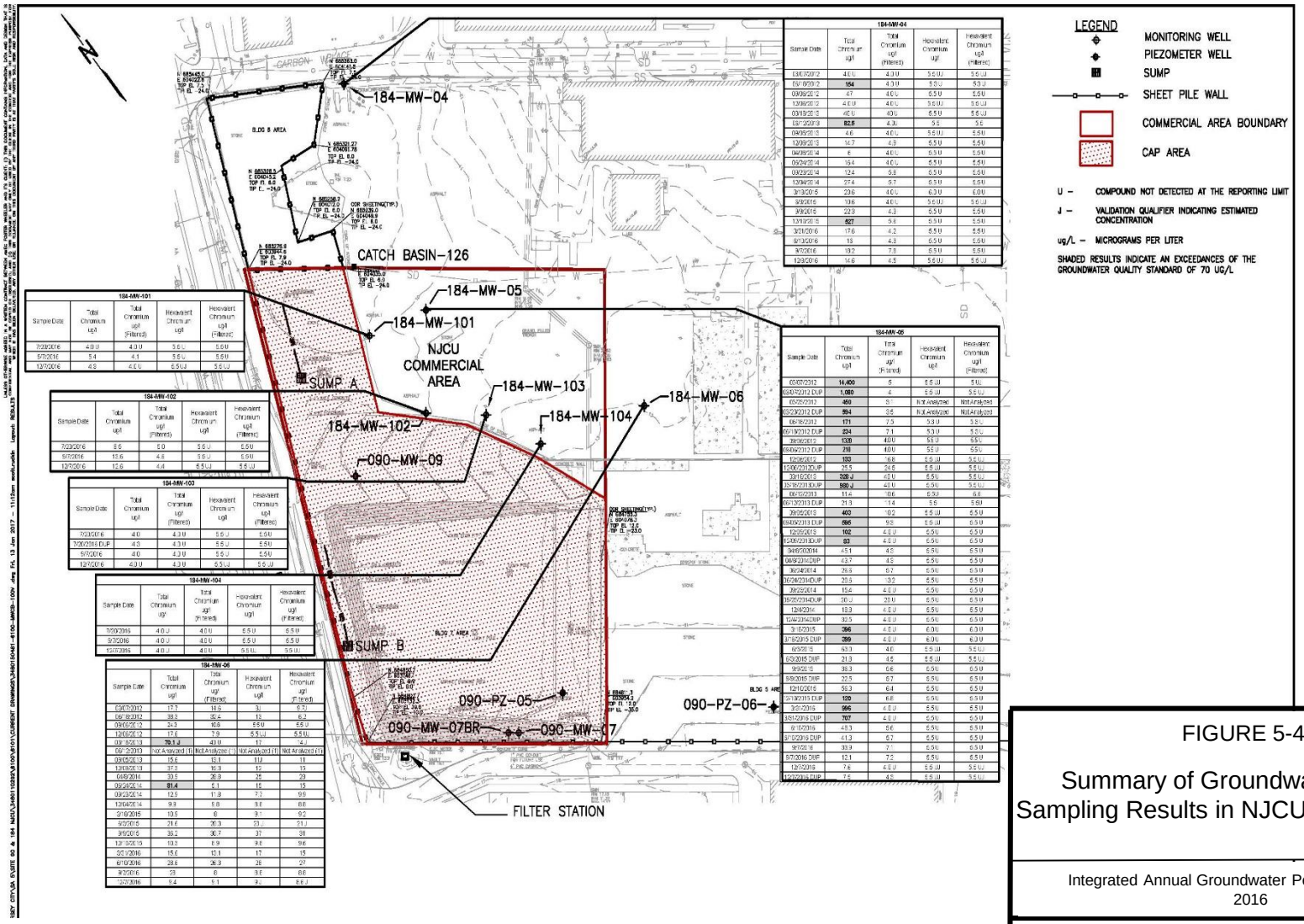

184-MW-04

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
03/07/2012	4.0 U	4.0 U	5.5 U	5.5 U
09/19/2012	154	4.3 U	5.5 U	5.5 U
09/26/2012	47	4.0 U	5.5 U	5.5 U
12/06/2012	4.0 U	4.0 U	5.5 U	5.5 U
03/13/2013	4.0 U	4.0 U	5.5 U	5.5 U
09/17/2013	82.5	4.3 U	5.5	5.5
09/09/2013	4.6	4.0 U	5.5 U	5.5 U
12/09/2013	14.7	4.3	5.5 U	5.5 U
03/26/2014	4	4.0 U	5.5 U	5.5 U
09/24/2014	16.4	4.0 U	5.5 U	5.5 U
03/23/2014	12.4	5.8	5.5 U	5.5 U
12/04/2014	27.4	5.7	5.5 U	5.5 U
3/13/2015	23.6	4.0 U	6.3 U	6.0 U
9/3/2015	13.6	4.0 U	5.5 U	5.5 U
3/9/2016	22.9	4.3	5.5 U	5.5 U
12/10/2015	827	5.6	5.5 U	5.5 U
3/21/2016	17.6	4.2	5.5 U	5.5 U
9/13/2016	16	4.3	5.5 U	5.5 U
3/7/2016	19.2	7.8	5.5 U	5.5 U
12/9/2016	14.6	4.5	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	4.8	4.0 U	5.5 U	5.5 U

184-MW-102

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
7/20/2016	8.6	5.0	5.5 U	5.5 U
9/7/2016	13.6	4.8	5.5 U	5.5 U
12/7/2016	12.6	4.4	5.5 U	5.5 U

184-MW-103

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
7/20/2016	4.0	4.3 U	5.5 U	5.5 U
7/20/2016 DUP	4.0	4.3 U	5.5 U	5.5 U
9/7/2016	4.0	4.3 U	5.5 U	5.5 U
12/7/2016	4.0 U	4.3 U	5.5 U	5.5 U

184-MW-104

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
7/20/2016	4.0 U	4.0 U	5.5 U	5.5 U
9/7/2016	4.0 U	4.0 U	5.5 U	5.5 U
12/7/2016	4.0 U	4.0 U	5.5 U	5.5 U

184-MW-06

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
03/07/2012	17.2	11.5	11	6.7 J
09/19/2012	38.2	42.4	13	6.2
09/09/2012	24.3	10.8	5.5 U	5.5 U
12/06/2012	17.5	7.9	5.5 U	5.5 U
03/13/2013	78.1 J	40 U	17	14 J
09/17/2013	Not Analyzed (1)	Not Analyzed (1)	Not Analyzed (1)	Not Analyzed (1)
09/09/2013	15.6	16.1	11	11
12/09/2013	37.5	16.3	12	15
03/26/2014	30.5	26.9	25	23
09/24/2014	81.4	5.1	15	15
09/23/2014	12.9	11.3	7.2	9.9
12/04/2014	9.8	5.8	3.8	6.8
3/10/2015	10.8	6	3.1	9.2
9/3/2015	31.6	20.3	23 J	21 J
9/9/2015	39.1	30.7	37	31
12/10/2015	10.3	8.9	9.8	9.6
3/21/2016	15.6	10.1	17	15
6/13/2016	28.8	26.3	28	27
9/7/2016	28	6	3.8	6.8
12/7/2016	9.4	6.1	9.1	8.6 J

184-MW-05

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
03/07/2012	14,400	5	5.5 U	5 U
03/07/2012 DUP	1,080	4	5.5 U	5.5 U
03/25/2012	460	5.1	Not Analyzed	Not Analyzed
03/23/2012 DUP	894	0.5	Not Analyzed	Not Analyzed
06/18/2012	171	7.5	5.3 U	5.3 U
06/19/2012 DUP	224	7.1	5.3 U	5.3 U
09/06/2012	1320	4.0 U	5.5 U	5.5 U
09/06/2012 DUP	218	4.0 U	5.5 U	5.5 U
12/05/2012	153	9.8	5.5 U	5.5 U
12/06/2012DUP	25.5	24.6	5.5 U	5.5 U
03/13/2013	328 J	4.0 U	6.5 U	5.5 U
03/18/2013 DUP	980 J	4.0 U	6.5 U	5.5 U
06/18/2013	11.4	0.6	6.5 U	6.6
06/19/2013 DUP	21.3	11.4	5.5	5.9 U
09/05/2013	400	10.2	5.5 U	6.5 U
09/09/2013 DUP	696	9.8	5.5 U	6.5 U
12/05/2013	102	4.0 U	6.5 U	6.5 U
12/06/2013 DUP	83	4.0 U	6.5 U	6.5 U
03/05/2014	45.1	4.5	6.5 U	6.5 U
03/6/2014 DUP	43.7	4.5	6.5 U	6.5 U
06/24/2014	26.5	6.7	6.5 U	6.5 U
06/24/2014 DUP	20.5	10.2	6.5 U	6.5 U
09/25/2014	15.4	4.0 U	6.5 U	6.5 U
09/25/2014 DUP	20.2	20.0	6.5 U	6.5 U
12/4/2014	13.3	4.0 U	6.5 U	6.5 U
12/4/2014 DUP	32.5	4.0 U	6.5 U	6.5 U
3/10/2015	396	4.0 U	6.0 U	6.0 U
3/10/2015 DUP	399	4.0 U	6.0 U	6.0 U
6/3/2015	53.0	4.6	5.5 U	5.5 U
6/3/2015 DUP	21.3	4.5	5.5 U	5.5 U
9/3/2015	38.3	6.6	6.5 U	6.5 U
9/8/2015 DUP	22.5	5.7	6.5 U	6.5 U
12/10/2015	56.3	6.4	6.5 U	6.5 U
12/10/2015 DUP	120	6.8	6.5 U	6.5 U
3/21/2016	696	4.0 U	6.5 U	6.5 U
3/21/2016 DUP	707	4.0 U	6.5 U	6.5 U
6/13/2016	48.3	6.6	6.5 U	6.5 U
6/13/2016 DUP	41.3	5.7	6.5 U	6.5 U
9/7/2016	33.9	7.1	6.5 U	6.5 U
9/7/2016 DUP	12.1	7.2	6.5 U	6.5 U
12/7/2016	7.6	4.6 U	5.5 U	5.5 U
12/7/2016 DUP	7.6	4.6	5.5 U	5.5 U

FIGURE 5-4

Summary of Groundwater Quality Sampling Results in NJCU Sentinel Wells

Integrated Annual Groundwater Performance Report
2016

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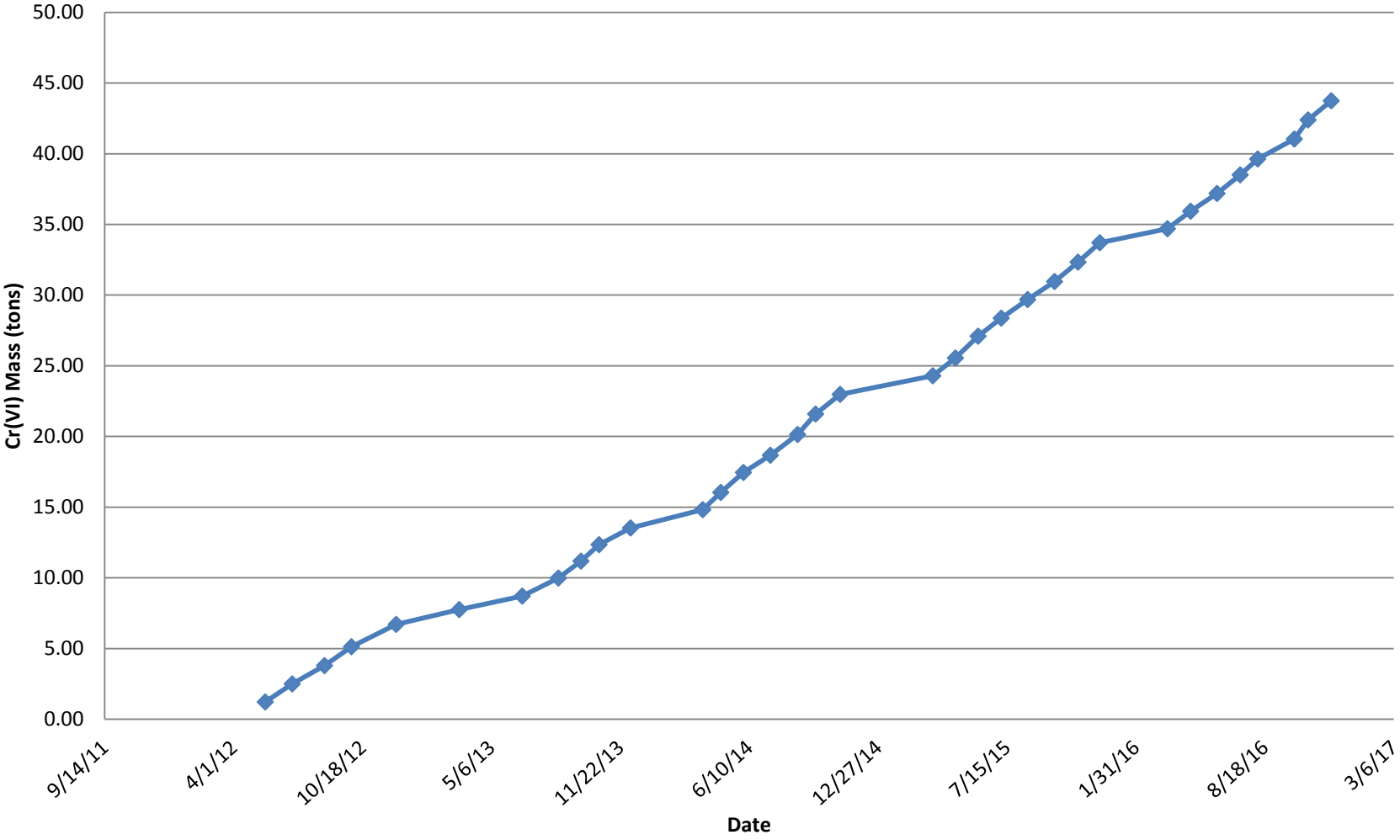
Location of S-3 Injection Wells
Used in 2016

Figure
6-1



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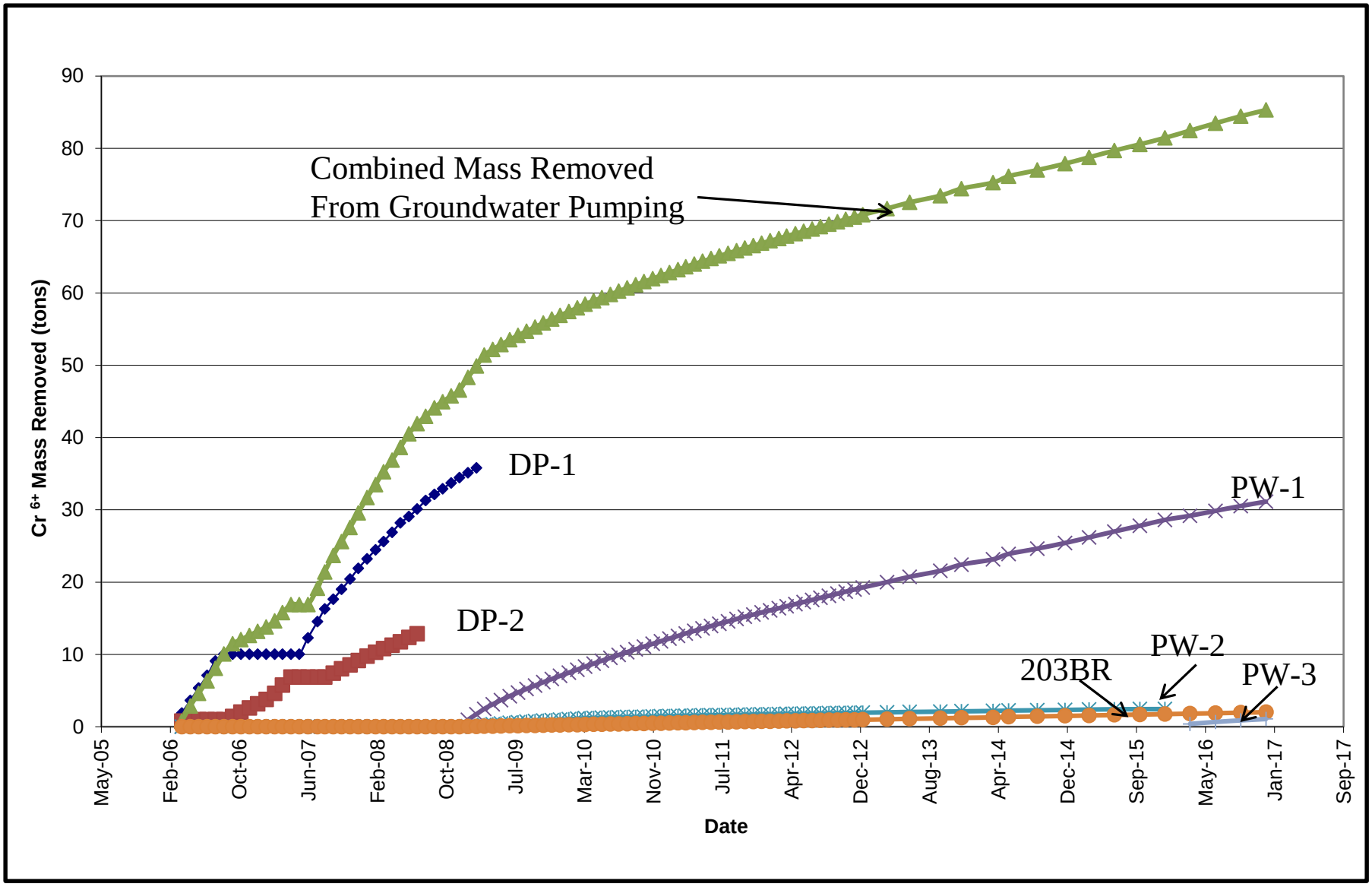
Stoichiometrically Equivalent Cr(VI) Mass Reduced in S-3 Sand by Injection

Figure 6-2



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Cumulative Cr(VI) Mass Removed From Groundwater by Pumping

Figure 6-3

APPENDIX A

RESULTS OF PRE-INJECTION MONITORING IN MONITORING WELLS

Table A1
Results of Pre-injection Monitoring of Monitoring Wells

		Total Chromium in Unfiltered Samples (ppm)					
Event #	Sample Date	087-PW-1	087-PW-2	115-DP-1	088-MW-G19T	087-MW-O29D	087-PW-3
1	5/16/2012	46.9	16.2	307	762	180	---
2	6/28/2012	NR	NR	NR	889	NR	---
3	7/31/2012	NR	NR	NR	989	NR	---
5	12/9/2012	37.9	14.8	359	985	171	---
6	3/17/2013	39.8	13.5	NR	NR	NR	---
7	6/3/2013	48.5	28.0	1,670	967	233	---
9	9/22/2013	39.9	13.5	NR	NR	NR	---
11	12/8/2013	34.2	10.6	20.8	1,150	182	---
12	3/30/2014	36.9	16.4	NR	NR	NR	---
14	6/1/2014	35.5	14.5	15.5	982	188	---
17	9/21/2014	37.6	19.3	NR	NR	NR	---
18A	12/20/2014	341	127.0	1,230	927	175	---
19	3/22/2015	347	15.1	NR	NR	NR	---
21	5/31/2015	32.6	15.6	31.5	1,010	173	---
24	9/27/2015	33.8	8.5	NR	NR	NR	---
26	12/3/2015	34.2	8.4	515	974	166	---
26a	1/20/2016	NR	---	NR	NR	NR	83.8
27	3/20/2016	30.4	---	NR	NR	NR	84.3
30	6/30/2016	31.7	---	26.1	1,180	182	37.1
33	10/19/2016	30.2	---	NR	NR	NR	58.5
34	11/29/2016	27.6	---	659	890	127	38.0

---- well not in service

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

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

Table A2
Results of Pre-injection Monitoring of Monitoring Wells

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

---- well not in service

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

* additional sampling at request of Plaintiffs

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

Table A3
Results of Pre-injection Monitoring of Monitoring Wells

		Sulfate in Unfiltered Samples (ppm)					
Event #	Sample Date	087-PW-1	087-PW-2	115-DP-1	088-MW-G19T	087-MW-O29D	087-PW-3
1	5/16/2012	320	613	749	843	604	---
2	6/28/2012	NR	NR	NR	1,030	NR	---
3	7/31/2012	NR	NR	NR	1,020	NR	---
5	12/9/2012	307	671	202	1,020	688	---
7	6/3/2013	268	654	2,130	1,090	662	---
9	9/22/2013	292	664	NR	NR	NR	---
11	12/8/2013	291	701	137	1,140	614	---
12	3/30/2014	283	205	NR	NR	NR	---
26	12/3/2015	NR	1,040	NR	NR	NR	---
26a	1/20/2016	NR	---	NR	NR	NR	344
27	3/20/2016	NR	---	NR	NR	NR	NR
30	6/30/2016	NR	---	NR	NR	NR	NR
33	10/19/2016	NR	---	NR	NR	NR	NR
34	11/29/2016	NR	---	NR	NR	NR	NR

---- well not in service

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

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

Table A4
Results of Pre-injection Monitoring of Monitoring Wells

Calcium in Unfiltered Samples (ppm)

Event #	Sample Date	087-PW-1	087-PW-2	115-DP-1	088-MW-G19T	087-MW-O29D	087-PW-3
1	5/16/2012	97.7	169	112	287	48.2	---
2	6/28/2012	NR	NR	NR	293	NR	---
3	7/31/2012	NR	NR	NR	284	NR	---
5	12/9/2012	88.4	146	370	336	52.1	---
7	6/3/2013	99.6	158	473	317	53.1	---
9	9/22/2013	99.7	168	NR	NR	NR	---
11	12/8/2013	86.7	145	37.3	307	52.4	---
12	3/30/2014	95.7	154	NR	NR	NR	---
13	4/27/2014	NR	NR	NR	NR	NR	---
14	6/1/2014	94.3	149	30.9	287	56.2	---
17	9/21/2014	97.9	164	NR	NR	NR	---
18A	12/20/2014	105	160	506	331	49.8	---
19	3/22/2015	101	153	NR	NR	NR	---
21	5/31/2015	99	171	39.1	311	44.2	---
24	9/27/2015	101	154	NR	NR	NR	---
26	12/3/2015	112	172	275	318	44.2	---
26a	1/20/2016	NR	---	NR	NR	NR	35.2
27	3/20/2016	110	---	NR	NR	NR	51.2
request*	4/11/2016	NR	---	NR	NR	NR	54.3
request*	5/26/2016	NR	---	NR	NR	NR	77.2
request*	6/29/2016	NR	---	NR	NR	NR	86.7
30	6/30/2016	117.0	---	40	414	51	47.8
33	10/19/2016	118.0	---	NR	NR	NR	196.0
34	11/29/2016	114	---	333	273	38.1	68.0

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

Table A5
Results of Pre-injection Monitoring of Monitoring Wells

		Iron in Unfiltered Samples (ppm)						
Event #	Sample Date	087-PW-1	087-PW-2		115-DP-1	088-MW-G19T	087-MW-O29D	087-PW-3
1	5/16/2012	<.5	< .5		0.764	<2	1.12	---
2	6/28/2012	NR	NR		NR	<10	NR	---
3	7/31/2012	NR	NR		NR	4.79	NR	---
5	12/9/2012	<0.1	<0.1		0.954	NR	<0.5	---
7	6/3/2013	0.709	1.21		<5.0	<5.0	1.19	---
9	9/22/2013	0.345	<0.1		NR	NR	NR	---
11	12/8/2013	<0.1	<0.1		0.535	<2.0	<1.0	---
12	3/30/2014	<0.1	0.165		NR	NR	NR	---
26	12/3/2015	NR	NR	J	NR	NR	NR	NR
26a	1/20/2016	NR	NR	J	NR	NR	NR	NR
27	3/20/2016	NR	NR	J	NR	NR	NR	NR
30	6/30/2016	NR	NR	J	NR	NR	NR	NR
33	10/19/2016	NR	NR	J	NR	NR	NR	NR
34	11/29/2016	NR	NR	J	NR	NR	NR	NR

---- well not in service
NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .
Note: only event dates with at least one sample result shown

Table A6
Results of Pre-injection Monitoring of Monitoring Wells

Field pH (pH units)

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

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

Table A7
Results of Pre-injection Monitoring of Monitoring Wells

Field Specific Conductivity (ms/cm)

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

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

Table A8
Results of Pre-injection Monitoring of Monitoring Wells

Field Redox Potential (mv)

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

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

Table A9
Results of Pre-injection Monitoring of Monitoring Wells

Field Dissolved Oxygen (mg/L)

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

** Instrument error suspected.

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

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

* additional sampling at request of Plaintiffs

Table A10
Results of Pre-injection Monitoring of Monitoring Wells

Field Turbidity (NTU)

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

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

APPENDIX B

RESULTS OF PRE-INJECTION MONITORING IN INJECTION WELLS

Table B1
Results of Pre-injection Monitoring of Injection Wells

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

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

First	Second	Third	Fourth	Sixth	Fifth	Seventh
Eights	Ninth	Tenth	Eleventh			

Table B2
Results of Pre-injection Monitoring of Injection Wells

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

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

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eights	Ninth	Tenth	Eleventh			

Table B3
Results of Pre-injection Monitoring of Injection Wells

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

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

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eights	Ninth	Tenth	Eleventh			

Table B4
Results of Pre-injection Monitoring of Injection Wells

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

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

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eights	Ninth	Tenth	Eleventh			

Table B5
Results of Pre-injection Monitoring of Injection Wells

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

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

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eights	Ninth	Tenth	Eleventh			

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

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

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

First	Second	Third	Fourth	Fifth	Sixth	event
Eights	Ninth	Tenth	Eleventh			

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

Event #	Sample Date	088-IW-01	088-IW-02	087-IW-01	088-IW-03
1	5/16/2012	1.78	1.7	2.81	NR
2	6/28/2012	32.7	1.4	2.11	NR
3	7/31/2012	14.2	47.0	2.33	NR
3A	8/16/2012	NR	NR	NR	NR
4	10/1/2012	7.1	10.0	NR	NR
5	12/9/2012	37.6	5.9	NR	NR
6	3/13/2013	5.47	9.8	NR	NR
7	6/3/2013	3.15	17.0	NR	3.0
8	8/18/2013	7.06	2.6	NR	16.9
9	9/22/2013	7.22	25.9	NR	8.1
10	10/20/2013	20.5	6.1	NR	6.9
11	12/8/2013	22.7	6.1	NR	27.1
12	3/30/2014	12.2	15.1	NR	9.3
13	4/27/2014	14.2	8.9	NR	7.3
14	6/1/2014	6.70	9.5	2.39	12.4
15	7/13/2014	22.3	31.4	NR	8.0
16	8/24/2014	17.0	21.0	NR	5.8
17	9/21/2014	NR	16.0	NR	NR
18	10/26/2014	NR	NR	NR	28.7
18A	12/20/2014	NR	NR	2.75	NR
19	3/22/2015	0.62	6.1	NR	14.1
20	4/26/2015	27.0	5.9	NR	11.1
21	5/31/2015	NR	NR	2.30	NR
22	7/6/2015	29.7	NR	NR	NR
23	8/18/2015	NR	NR	NR	23.5
24	9/27/2015	NR	20.3	NR	NR
25	11/2/2015	NR	NR	NR	2.45
26	12/7/2015	3.04	NR	NR	NR
27	3/20/2016	NR	14.5	NR	NR
28	4/25/2016	NR	NR	NR	24.2
29	6/5/2016	7.94	NR	NR	NR
30	7/11/2016	NR	31.28	NR	NR
31	8/7/2016	NR	NR	NR	23.0
32	10/3/2016	10.4	NR	NR	NR
33	10/24/2016	NR	15.20	NR	NR
34	11/29/2016	NR	NR	NR	21.50

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

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eights	Ninth	Tenth	Eleventh			

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

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

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

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eights	Ninth	Tenth	Eleventh			

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

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

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

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eights	Ninth	Tenth	Eleventh			

Table B10
Results of Pre-injection Monitoring of Injection Wells

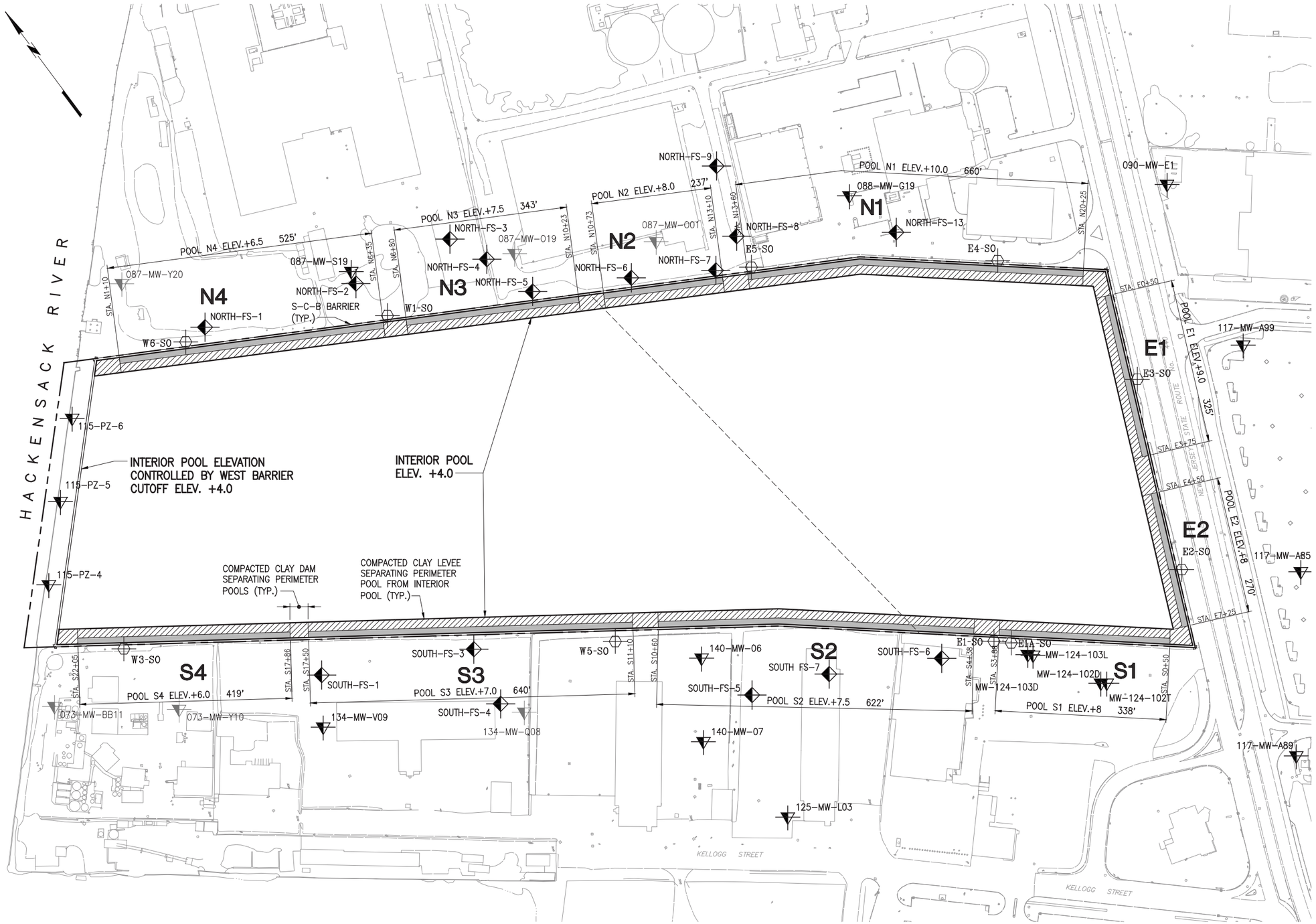
		Field Turbidity (NTU)			
Event #	Sample Date	088-IW-01	088-IW-02	087-IW-01	088-IW-03
1	5/16/2012	15.2	39.4	0.0	NR
2	6/28/2012	>800	24.1	8.5	NR
3	7/31/2012	13.0	113.0	18.1	NR
3A	8/16/2012	NR	NR	NR	NR
4	10/1/2012	0.0	34.1	NR	NR
5	12/9/2012	0.0	0.0	NR	NR
6	3/13/2013	3.7	8.8	NR	NR
7	6/3/2013	545	1.0	NR	8.4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

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

First	Second	Third	Fourth	Fifth	Sixth	Seventh
Eights	Ninth	Tenth	Eleventh			

APPENDIX C

SA-7 PERIMETER POOL HYDROGRAPHS



LEGEND

- FILL TYPE A CLAY
- FILL TYPE B GRANULAR FILL
- SHALLOW WELL INSTALLED BY OTHERS
- SHALLOW WELL ABANDONED IN 2014 IN ACCORDANCE WITH STUDY AREA 6 100% DESIGN
- SHALLOW WELL INSTALLED FOR STUDY AREA 7 REMEDIATION
- SURCHARGE MONITORING STANDPIPE INSTALLED IN 2014 OR 2015 IN ACCORDANCE WITH STUDY AREA 6 100% DESIGN

GRAPHIC SCALE

100' 50' 0 100' 200'

IN PROGRESS
06-10-2015

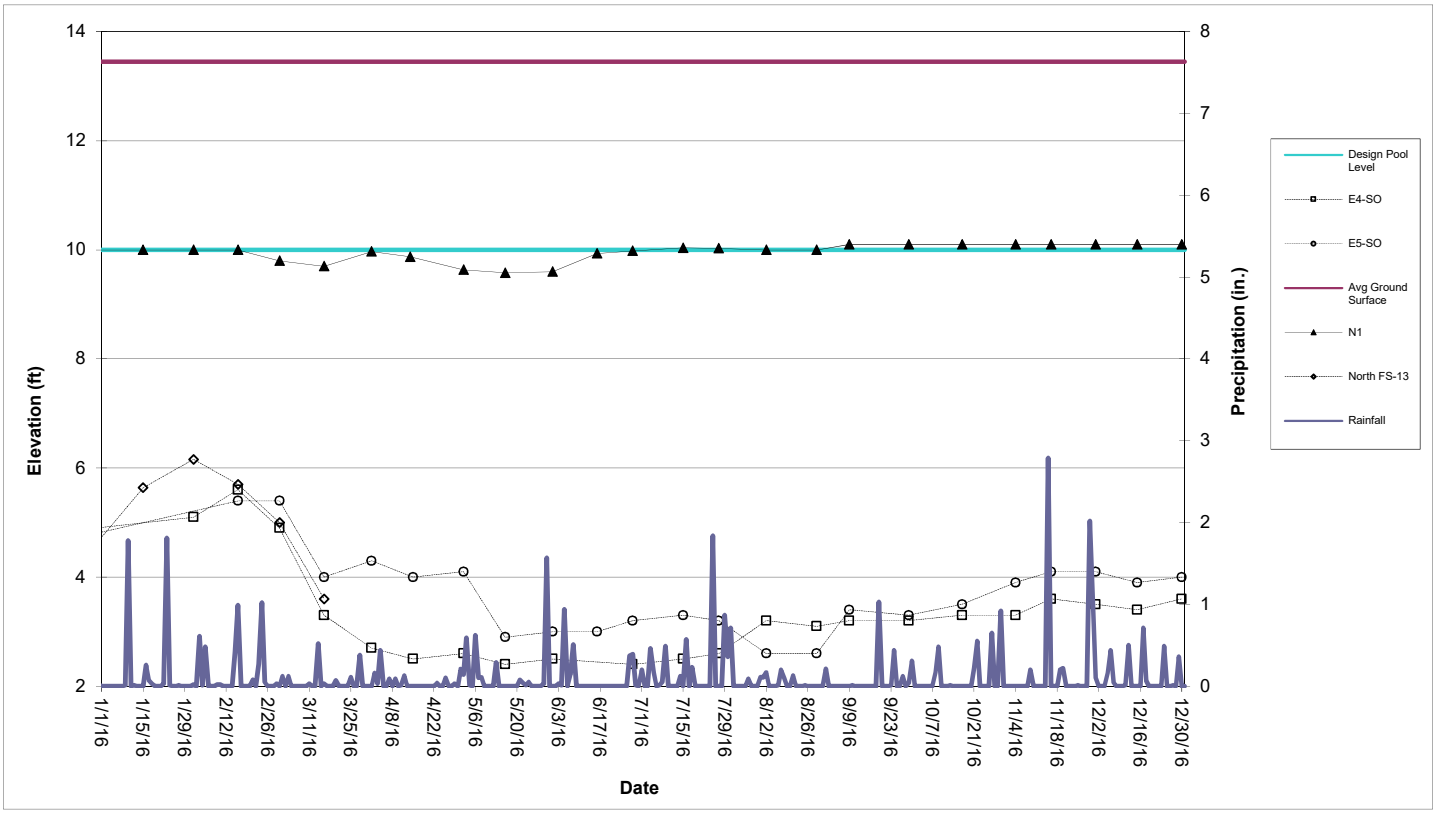
STUDY AREA 7
PERIMETER POOL DESIGN ELEVATIONS

NEW JERSEY

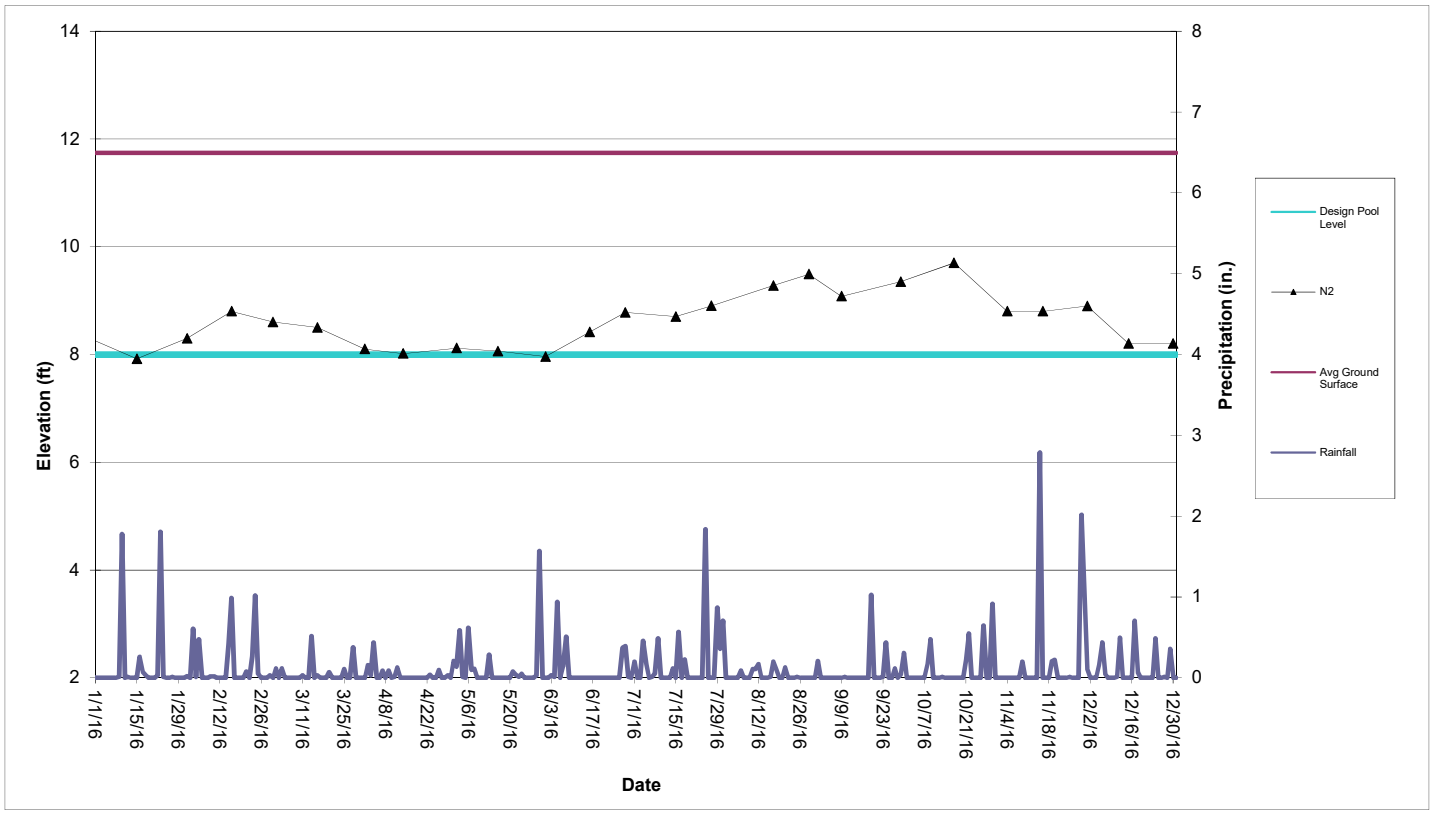
MUESER RUTLEDGE CONSULTING ENGINEERS
14 PENN PLAZA – 225 WEST 34th STREET

FILE NO. 10210
DRAWING NO. PP-1

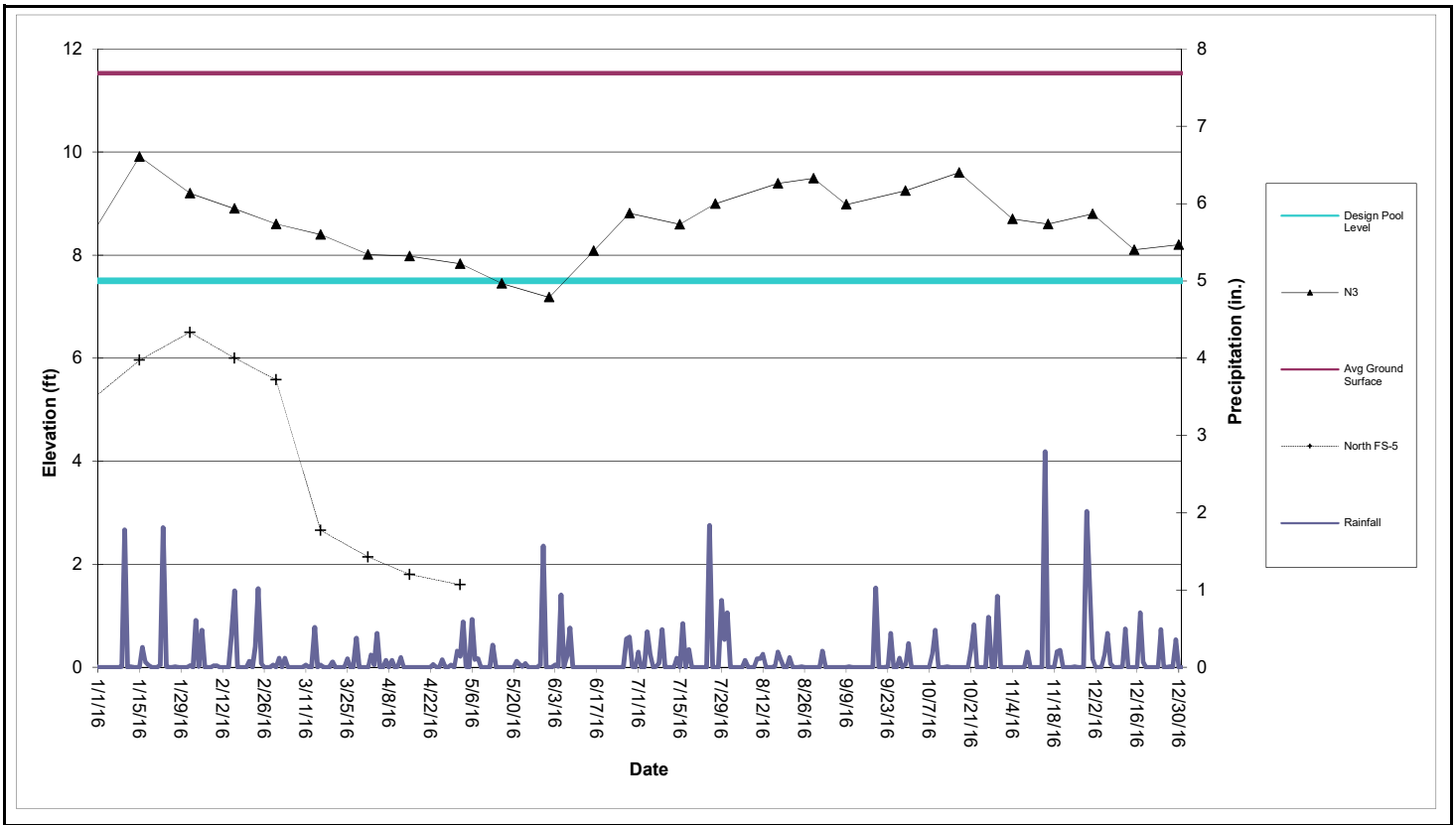
Jul 09, 2015 at 3:14pm
G:\DWGS\102\10210\Dewatering\PP-1.dwg
bboscaino



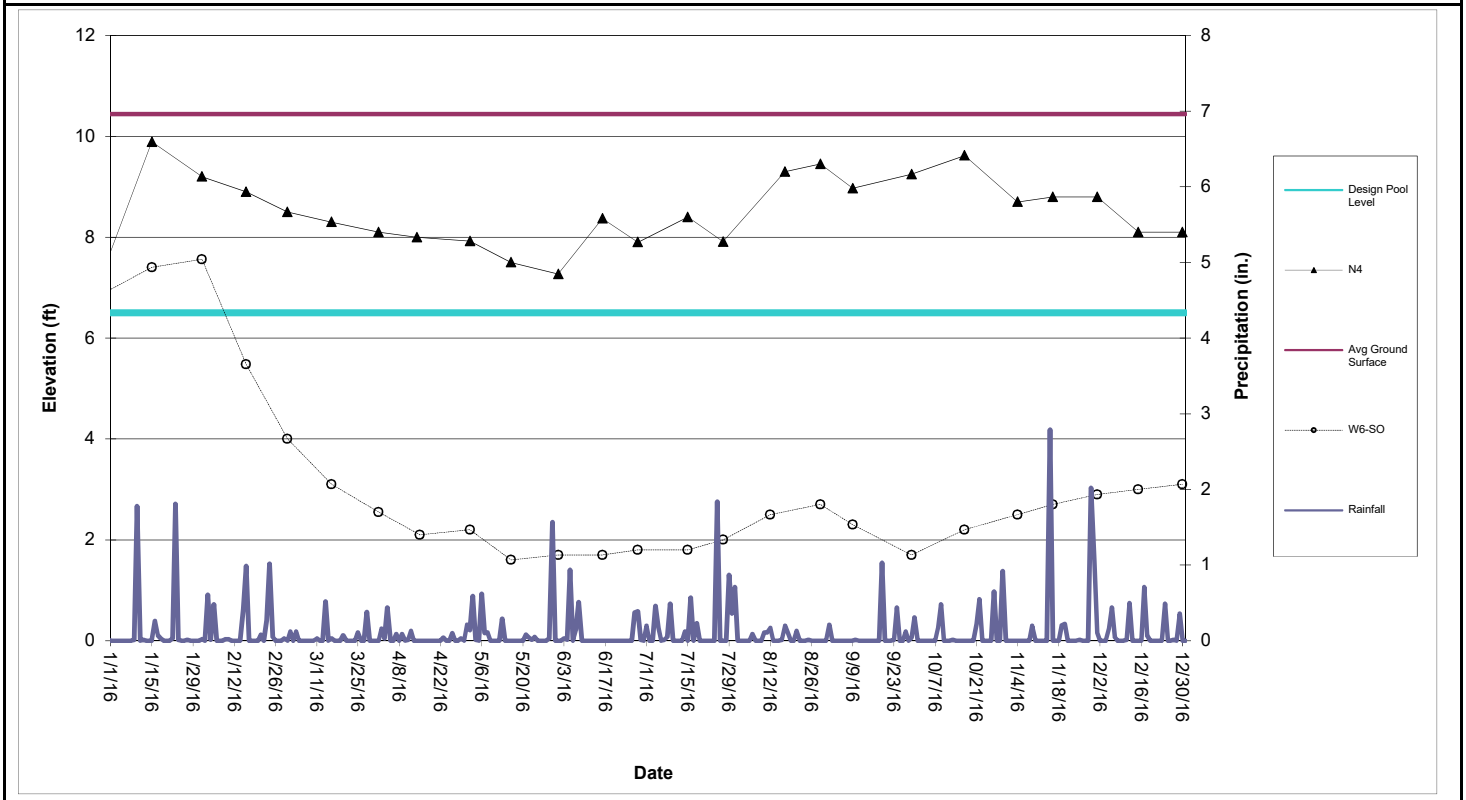
Perimeter Pool N1 (Sta. N13+60 to N20+25)



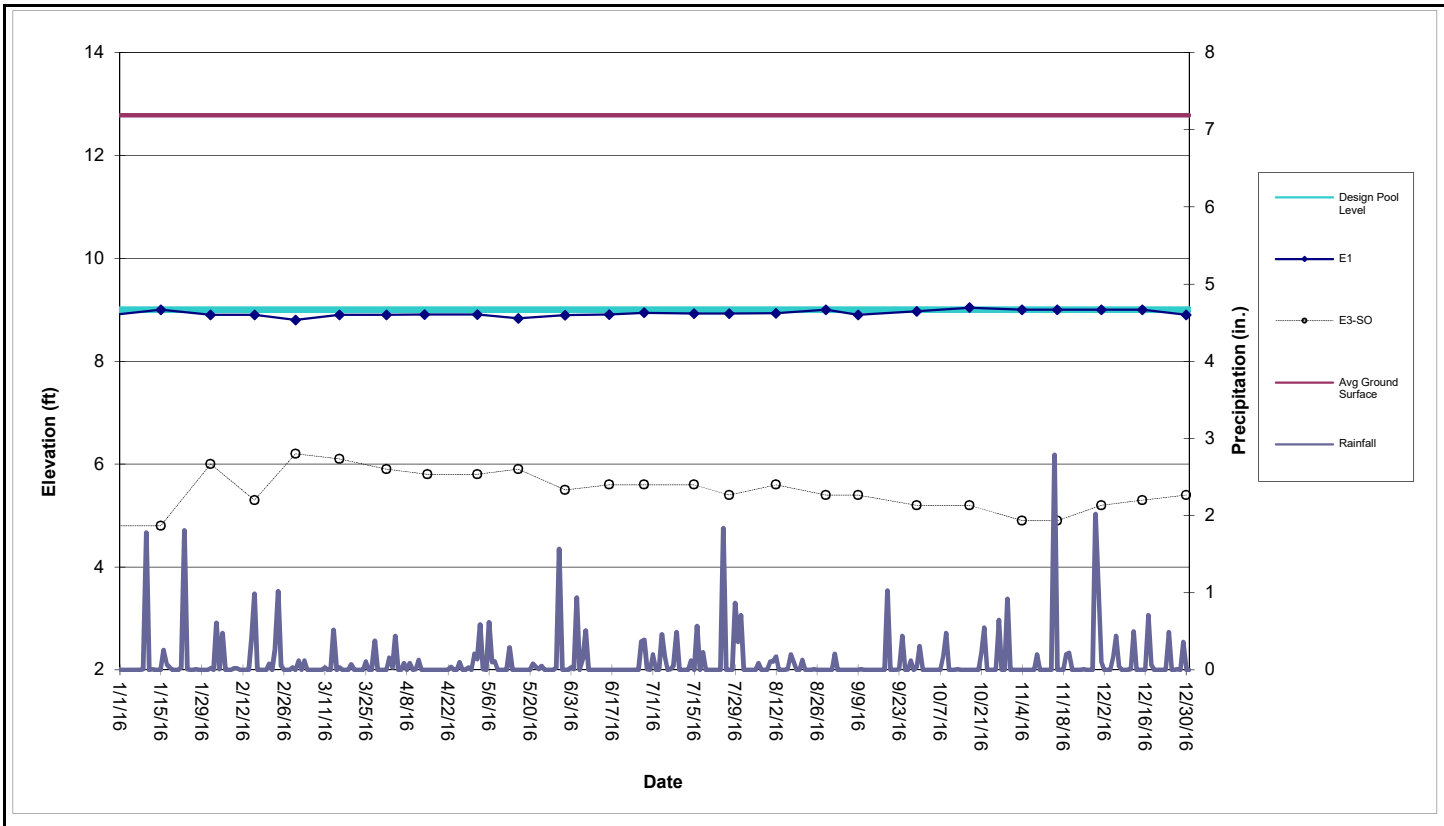
Perimeter Pool N2 (Sta. N10+73 to N13+10)



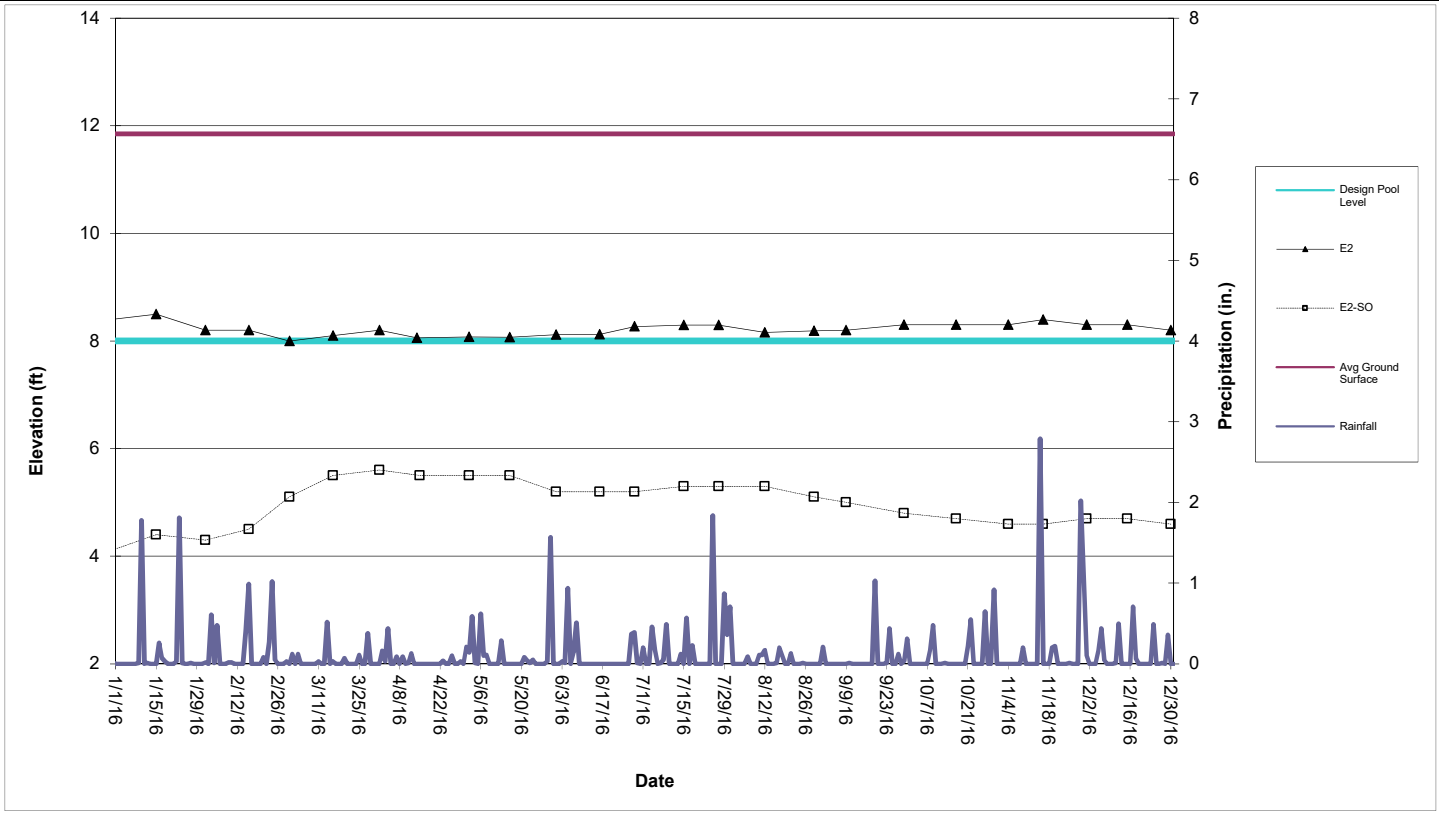
Perimeter Pool N3 (Sta. N6+80 to N10+23)



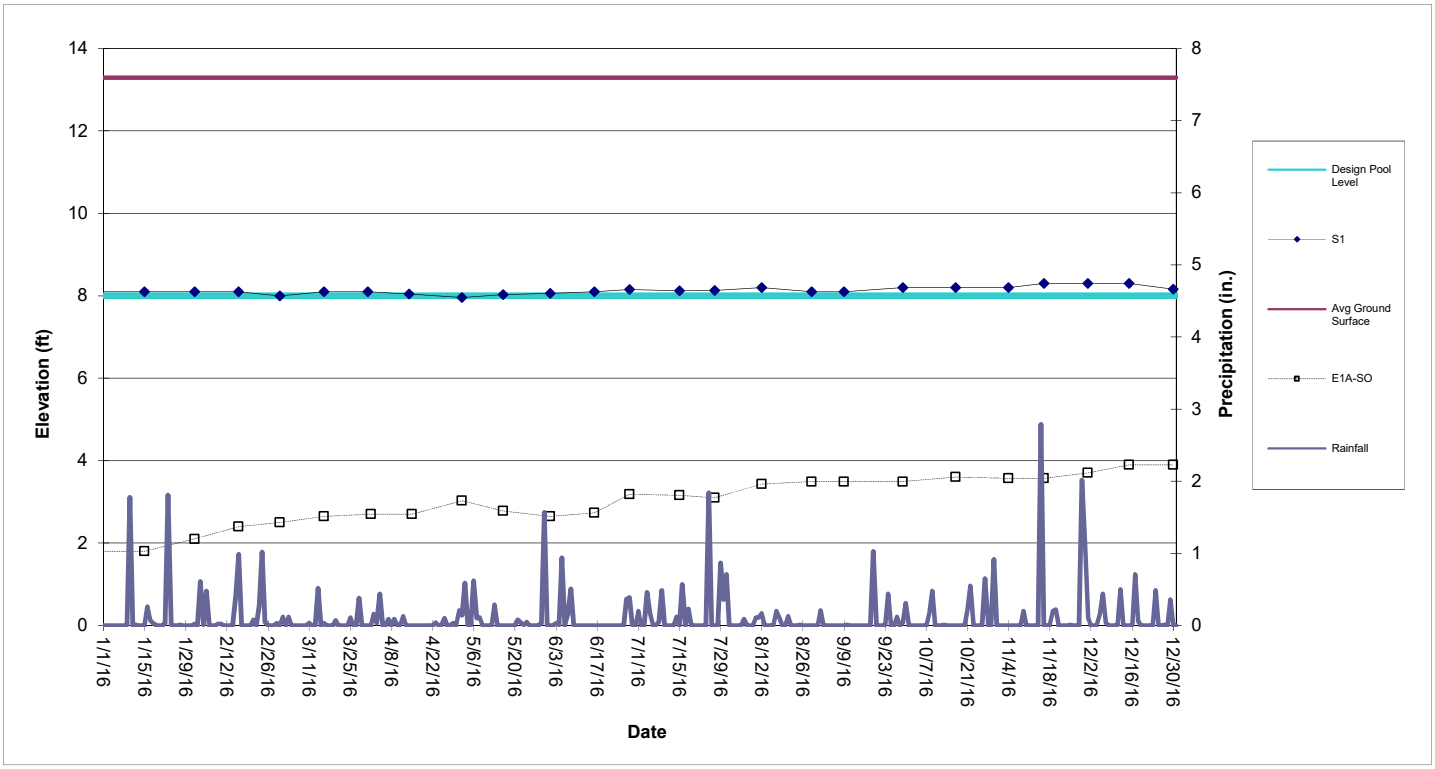
Perimeter Pool N4 (Sta. N6+80 to N10+23)



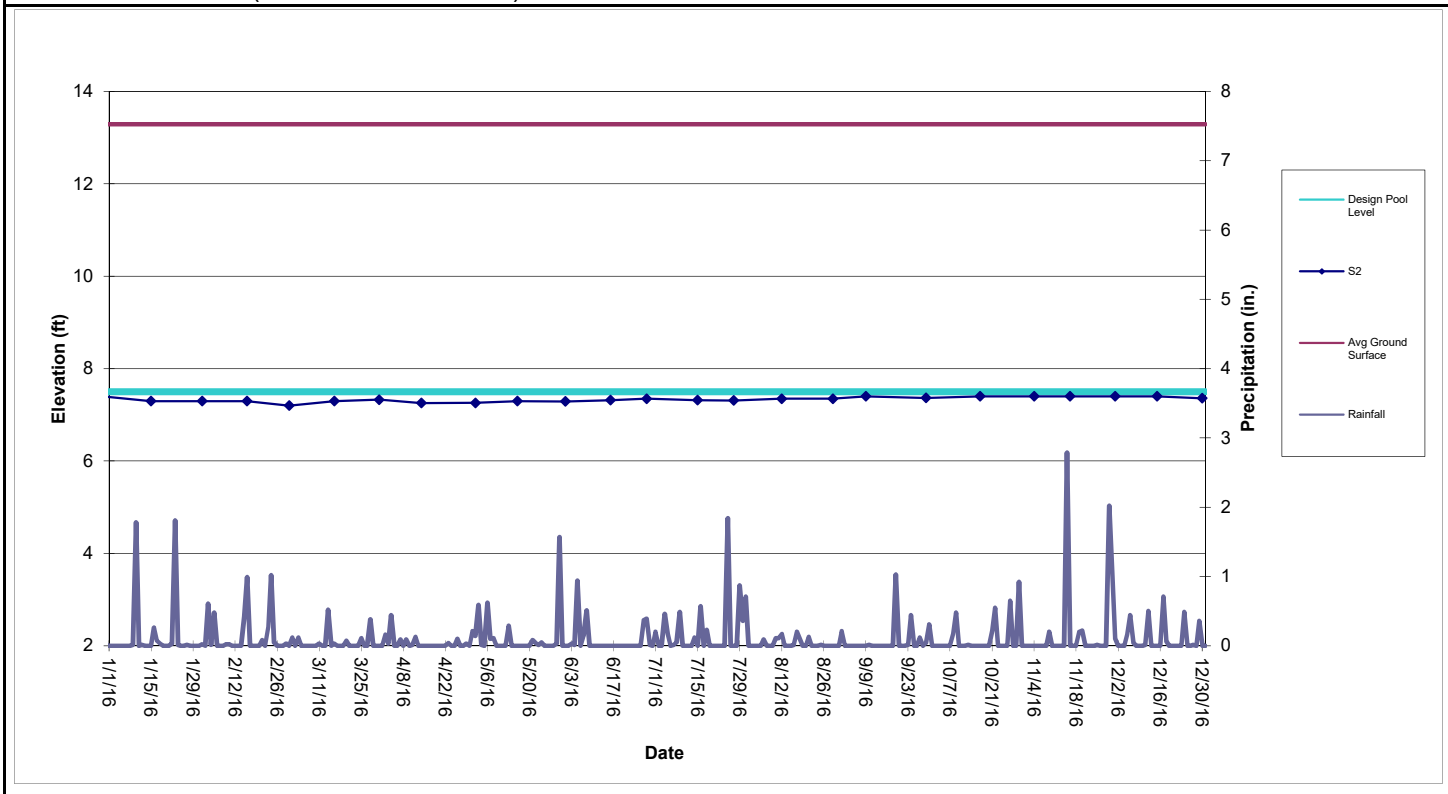
Perimeter Pool E1 (Sta. E0+50 to E3+75)



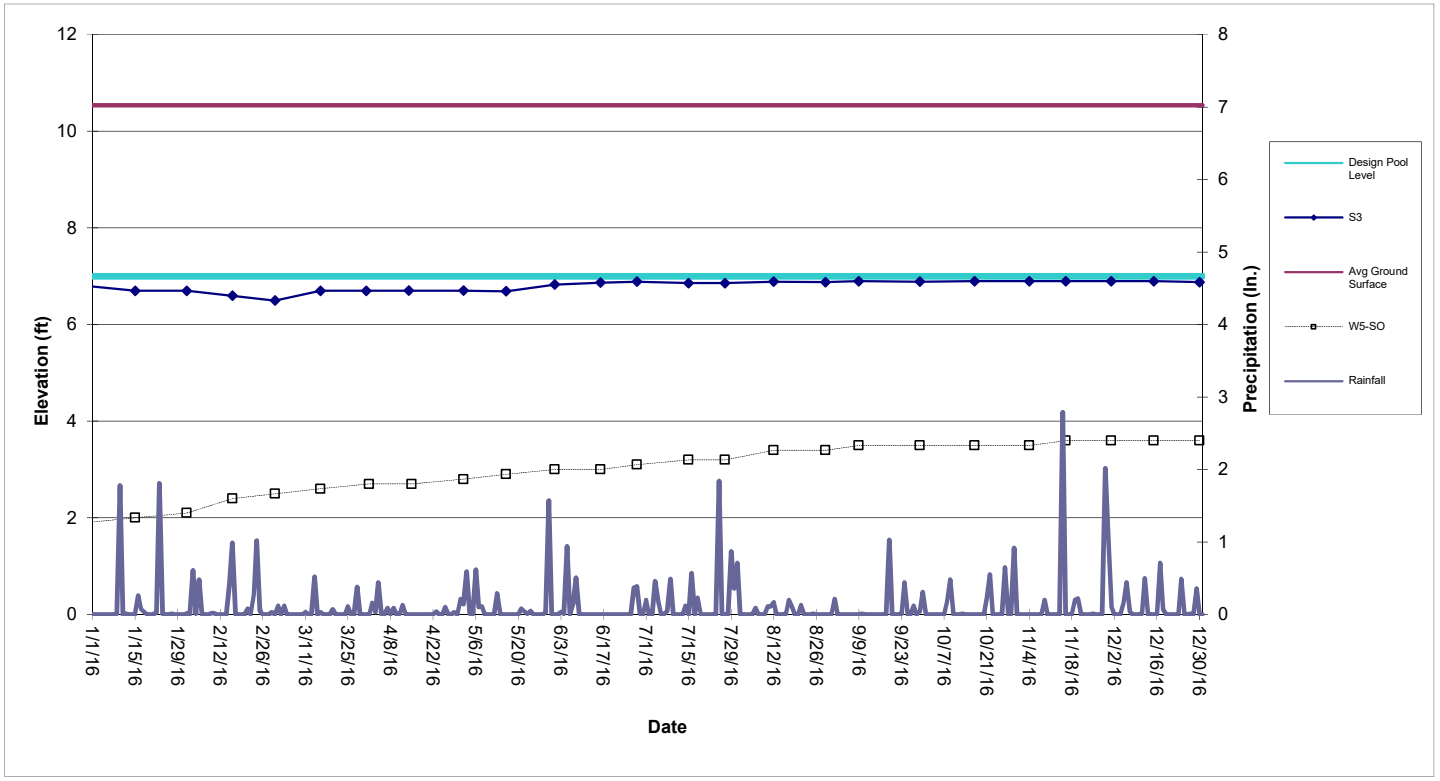
Perimeter Pool E2 (Sta. E4+50 to E7+25)



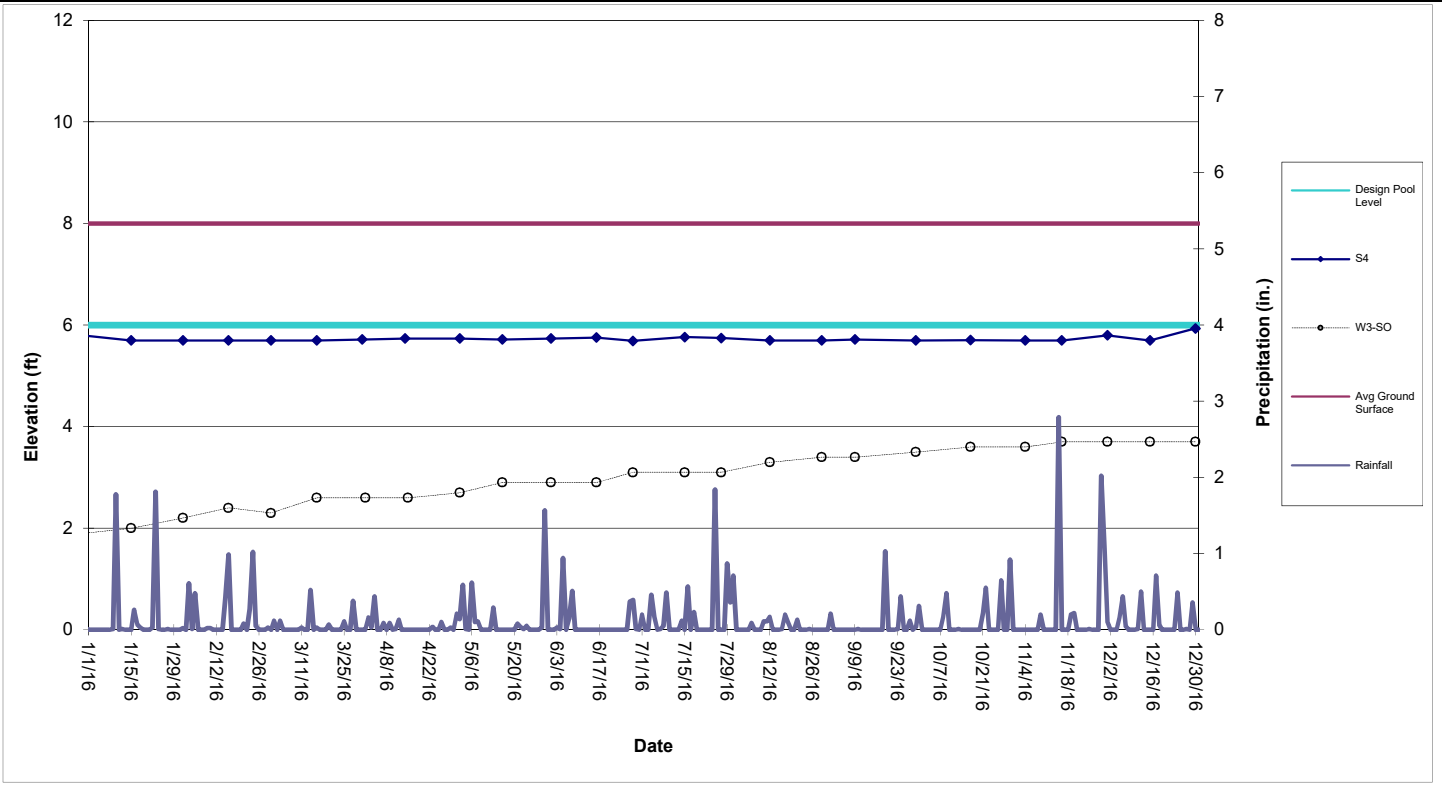
Perimeter Pool S1 (Sta. S0+50 to S3+88)



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



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



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

Table 1

Shallow Groundwater Data

										North	
	E1A-SO	E2-SO	E3-SO	E4-SO	E5-SO	W1-SO	W3-SO	W5-SO	W6-SO	FS-5	FS-13
Date											
1/15/2016	1.8	4.4	4.8			7.9	2.0	2.0	7.4	6.0	5.6
2/1/2016	2.1	4.3	6.0	5.1		7.7	2.2	2.1	7.6	6.5	6.2
2/16/2016	2.4	4.5	5.3	5.6	5.4	6.7	2.4	2.4	5.5	6.0	5.7
3/1/2016	2.5	5.1	6.2	4.9	5.4	5.1	2.3	2.5	4.0	5.6	5.0
3/16/2016	2.7	5.5	6.1	3.3	4.0	4.2	2.6	2.6	3.1	2.7	3.6
4/1/2016	2.7	5.6	5.9	2.7	4.3	3.5	2.6	2.7	2.6	2.1	
4/15/2016	2.7	5.5	5.8	2.5	4.0	2.9	2.6	2.7	2.1	1.8	
5/2/2016	3.0	5.5	5.8	2.6	4.1		2.7	2.8	2.2	1.6	
5/16/2016	2.8	5.5	5.9	2.4	2.9	2.4	2.9	2.9	1.6		
6/1/2016	2.7	5.2	5.5	2.5	3.0	2.5	2.9	3.0	1.7		
6/16/2016	2.7	5.2	5.6		3.0	2.5	2.9	3.0	1.7		
6/28/2016	3.2	5.2	5.6	2.4	3.2	2.3	3.1	3.1	1.8		
7/15/2016	3.2	5.3	5.6	2.5	3.3	2.4	3.1	3.2	1.8		
7/27/2016	3.1	5.3	5.4	2.6	3.2	2.3	3.1	3.2	2.0		
8/12/2016	3.4	5.3	5.6	3.2	2.6	2.8	3.3	3.4	2.5		
8/29/2016	3.5	5.1	5.4	3.1	2.6	2.8	3.4	3.4	2.7		
9/9/2016	3.5	5.0	5.4	3.2	3.4	2.6	3.4	3.5	2.3		
9/29/2016	3.5	4.8	5.2	3.2	3.3	3.1	3.5	3.5	1.7		
10/17/2016	3.6	4.7	5.2	3.3	3.5	2.3	3.6	3.5	2.2		
11/4/2016	3.6	4.6	4.9	3.3	3.9	2.5	3.6	3.5	2.5		
11/16/2016	3.6	4.6	4.9	3.6	4.1	2.7	3.7	3.6	2.7		
12/1/2016	3.7	4.7	5.2	3.5	4.1	2.6	3.7	3.6	2.9		
12/15/2016	3.9	4.7	5.3	3.4	3.9	2.7	3.7	3.6	3.0		
12/30/2016	3.9	4.6	5.4	3.6	4.0	2.8	3.7	3.6	3.1		

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

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

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