INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT FOR 2015

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

Prepared for

HONEYWELL
Morristown, New Jersey

June 17, 2016

Prepared by

cornerstone environmental

100 Crystal Run Road, Suite 101
Middletown, NY 10941

Project 150463

TABLE OF CONTENTS

LIST OF TABLES, FIGURES AND DRAWINGS iii

1 INTRODUCTION 1-1

1.1 GENERAL 1-1
1.2 PURPOSE AND OBJECTIVES 1-1
1.3 STATUS OF INTEGRATED MONITORING REQUIREMENTS FOR 2015 1-1
1.4 DOCUMENT ORGANIZATION 1-2

2 GENERAL CONDITIONS 2-1

2.1 ANNUAL PRECIPITATION 2-1
2.2 TIDAL MONITORING 2-1
2.3 MONITORING WELL INVENTORY 2-1

3 GROUNDWATER EXTRACTION 3-1

3.1 GWET SYSTEM OPERATION 3-1
3.1.1 Pumping Rates 3-1
3.1.2 Force Main Acid Flushing 3-1
3.1.3 Well Redevelopment 3-2
3.2 SA-6 NORTH CONTINGENT GROUNDWATER PUMPING SYSTEM 3-2
3.3 SA-6 SOUTH CONTINGENT GROUNDWATER PUMPING SYSTEM 3-2
3.4 SA-5 NJCU CONTINGENT GROUNDWATER PUMPING SYSTEM 3-2

4 HYDRAULIC MONITORING 4-3

4.1 REGIONAL GROUNDWATER FLOW 4-3
4.1.1 Shallow Zone 4-3
4.1.2 Intermediate Zone 4-3
4.1.3 Deep Zone 4-4
4.1.4 Bedrock Zone 4-4
4.2 GWET SYSTEM CAPTURE ZONE 4-4
4.3 NEW JERSEY CITY UNIVERSITY 4-4
4.4 SA-7 PERIMETER POOLS 4-5
4.5 SA-6 NORTH CONTAINMENT CELL 4-5
4.6 SA-6 SOUTH CONTAINMENT CELL 4-6
4.7 SA-5 SITE 117 4-6
4.8 MISCELLANEOUS EVENTS 4-6
4.8.1 Depressurization Pumping for Soil Excavation on SA-6 North 4-6

5 GROUNDWATER QUALITY MONITORING 5-1

5.1 DEEP OVERBURDEN REGIONAL PLUME MONITORING 5-1
5.1.1 Bedrock Zone 5-1
5.1.2 Intermediate Overburden Zone 5-2
5.1.3 Deep Overburden Zone 5-2
5.2 GWET EXTRACTION WELLS 5-2
5.3 SA-6 SOUTH 5-3
5.4 SA-6 NORTH 5-3
5.5 NEW JERSEY CITY UNIVERSITY 5-3

TABLE OF CONTENTS (Continued)

5.6 PLUME DIVERSION AREA MONITORING 5-4
5.7 SA-5 SITE 117 5-5
5.8 SA-5 SITES 079/153 5-5
5.9 IN-SITU SAMPLING BENEATH RIVERBED SEDIMENTS 5-5

6 S-3 INJECTION AND MASS REMOVAL PROGRAM 6-7

6.1 CASX INJECTION EVENTS IN 2015 6-7
6.2 MASS REMOVAL SUMMARY 6-7
6.3 GROUNDWATER QUALITY MONITORING 6-8
6.3.1 Monitoring Well Sampling. 6-8
6.3.2 Injection Well Sampling. 6-9
6.4 PLANNED ACTIVITIES FOR 2016 6-10

7 CONCLUSIONS AND RECOMMENDATIONS 7-1

7.1 COMPLIANCE WITH MONITORING REQUIREMENTS 7-1
7.2 STATUS OF GROUNDWATER CEA CERTIFICATIONS 7-1
7.3 RECOMMENDATIONS FOR MONITORING WELL NETWORK 7-1
7.4 RECOMMENDATIONS FOR WATER LEVEL MONITORING FREQUENCY 7-1
7.5 RECOMMENDATIONS FOR GROUNDWATER QUALITY MONITORING FREQUENCY 7-1
7.6 OTHER RECOMMENDATIONS 7-2

LIMITATIONS 1

TABLES 1

FIGURES 1

APPENDICES

APPENDIX A **RESULTS OF PRE-INJECTION MONITORING OF MONITORING WELLS IN 2015**

APPENDIX B **RESULTS OF PRE-INJECTION MONITORING OF INJECTION WELLS IN 2015**

APPENDIX C **SA-7 PERIMETER POOL HYDROGRAPHS**

LIST OF TABLES, FIGURES AND DRAWINGS

Tables

1-1 Summary of Groundwater Level Monitoring Requirements
1-2 Summary of Groundwater Quality Monitoring Requirements
2-1 2015 Monthly Precipitation Data
2-2 Groundwater Monitoring Well Inventory
3-1 GWET Pumping Outages in 2015
4-1 Groundwater Elevation Data from Quarterly Rounds in 2015
4-2 Summary of Groundwater Elevations Near NJCU
4-3 Summary of SA-6 North Depressurization Operations
5-1 List of Wells for December 2015 LTMP Sampling Event
5-2 Summary of Groundwater Quality Data from LTMP Events
5-3 Summary of Groundwater Quality Data from GWET Wells
5-4 Summary of Baseline and Interim L-well Groundwater Sampling Events
6-1 Summary of S-3 Sand Injection Events – Through 2015
6-2 Calculation of Percent Sulfide in CaSx Samples
6-3 Summary of Stoichiometrically Equivalent Cr(VI) Mass Reduced

Figures

2-1 2015 Monthly Precipitation
4-1 Groundwater Elevation Contours – Shallow Zone, September 2015
4-2 Groundwater Elevation Contours – Intermediate Zone, September 2015
4-3 Groundwater Elevation Contours – Deep Zone, September 2015
4-4 Groundwater Elevation Contours – Bedrock Zone, September 2015
4-5 Groundwater Elevations in Cross-Section, September, 2015
4-6 SA-5 NJCU Groundwater Elevation Contours – March 2015
4-7 SA-5 NJCU Groundwater Elevation Contours – June 2015
4-8 SA-5 NJCU Groundwater Elevation Contours – September 2015
4-9 SA-5 NJCU Groundwater Elevation Contours – December 2015
4-10 Location of Depressurization Wells on SA-6 North
5-1 Hexavalent Chromium Concentrations in Bedrock Groundwater
5-2 Total Chromium Concentrations in Bedrock Groundwater
5-3 Hexavalent Chromium Concentrations in Intermediate Zone Groundwater
5-4 Total Chromium Concentrations in Intermediate Zone Groundwater
5-5 Hexavalent Chromium Concentrations in Deep Groundwater
5-6 Total Chromium Concentrations in Deep Groundwater
5-7 Hexavalent Chromium Trends in GWET Extraction Wells
5-8 Trichloroethylene Trends in GWET Extraction Wells
5-9 Summary of Groundwater Quality Sampling Results – NJCU Sentinel Wells
6-1 Location of Injection Wells Used in 2015
6-2 Stoichiometrically Equivalent Cr(VI) Mass Reduced in S-3 Sand by Injection
6-3 Cumulative Mass Cr(VI) Removed from Groundwater by Pumping

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 seventh 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.
- Facilitate preparation of CEA biennial certifications.

1.3 Status of Integrated Monitoring Requirements for 2015

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. These data are used 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 2015 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 2015 was on par with long-term averages but was nearly 8 inches below normal during the third and fourth quarters. The GWET system was operated at its total design rate of 54.5 gpm despite a slow decline in the maximum available yield of extraction well PW-2. Well PW-2 was therefore replaced by PW-3 in late December 2015. The S-3 Injection/Mass Removal remedy continued with eight injection events in 2015. Subsurface remedial activities associated with the SA-6 Chromium Remedy continued with the installation of the soil containment barrier wall and cap at SA-6 South, and partial installation of the containment wall at SA-6 North. Groundwater dewatering and depressurization pumping was conducted locally and intermittently for soil excavation projects on SA-6. Groundwater levels on the NJCU portion of SA-5 declined in late 2015 as a result of below normal precipitation, a reduction in recharge due to site development, and modifications to nearby storm sewers.

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 on par with the 30-year average for the first half of 2015, but then fell nearly 8 inches below the average for the second half. Total precipitation in 2015 was 38.99 inches or more than 7 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 2015 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 2015 include observation well OBS-7 to monitor the drawdown in the new extraction well PW-3 and piezometers PZ-11 through PZ-19 around the SA-6 South soil containment barrier in accordance with the SA-6 South Groundwater Level Monitoring Plan. Depressurization wells DW-1 through DW-5 located on SA-6

South were abandoned in 2015 as were other monitoring wells in accordance with the SA-6 South Monitoring Well Abandonment Plan. Since this is an on-going effort, the status of well abandonment changes frequently.

3 GROUNDWATER EXTRACTION

The Deep Overburden Groundwater Extraction and Treatment (GWET) system was in operation throughout 2015. There was no pumping from the contingent pumping system at NJCU and the contingent pumping system on SA-6 North was not installed as of the end of 2015. The contingent pumping system at SA-6 South was operated in the latter portion of 2015. Groundwater extraction for dewatering below Stratum D was conducted in November and December 2015 on SA-6 North to facilitate soil excavation.

3.1 GWET System Operation

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 PW-1 and PW-2 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, well PW-2 was replaced with PW-3, located approximately 120 feet east of PW-2. PW-3 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-2 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** identifies the events that resulted in a shutdown of more than 8 hours. In general, system shutdowns in 2015 were due to routine force main cleaning and activities related to the startup of PW-3. Beginning in early March 2015, the maximum pumping rate of PW-2 began to decline below its target rate of 7.5 gpm. To compensate, the pumping rate of PW-1 was increased accordingly to maintain total system flow. By late December, PW-2 was producing approximately 3.5 gpm (and PW-1 was pumping at 44 gpm) when it was replaced by PW-3. During the shakedown period in late December 2015, the maximum pumping rate of PW-3 was approximately 6 gpm due to a partial restriction of flow in the force main. After force main cleaning in January 2016, the pumping rate of PW-3 was maintained at the design rate of 7.5 gpm and PW-1 was returned to its design rate of 40 gpm.

3.1.2 Force Main Acid Flushing

The GWET force main from extraction well PW-2 to the treatment plant is subject to fouling due to mineralization of groundwater from the Intermediate Zone. As a result, the

line was treated with hydrochloric acid and flushed out on February 2, 2015 to reduce the backpressure in the force main and increase the yield in PW-2. This line was modified in late 2015 to accept the discharge from well PW-3 and was again acid flushed in early January 2016 to remove residual sediment from construction activities.

3.1.3 Well Redevelopment

Routine groundwater level monitoring in the GWET extraction wells indicated that the pumping level in PW-2 was declining in December 2014. As a result, well PW-2 was redeveloped from February 2 to 4, 2015 along with the acid cleaning of its forcemain as discussed above. The results indicated little improvement in maximum yield of PW-2 and thus the Parties agreed to install a replacement well (PW-3) as noted above.

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 May 2015 as part of the SA-6 Chromium Remedy and used on an as-needed basis throughout 2015 for shallow soil dewatering. The pumping periods and rates were variable based on construction activities and precipitation events. The perimeter barrier wall was substantially completed in early August 2015 and the western portion of the contingent drain is scheduled for installation by the end of 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 pumped on an as-needed basis using a float switch to turn the pump on and off during the first three quarters of 2015. Groundwater levels within the shallow fill inside of the soil containment area declined steadily during this time and eventually approached the elevation of the drain. Due to the lack of flow into the drain, active dewatering operations were discontinued on October 26, 2015 and thus no dewatering took place during the fourth quarter.

3.4 SA-5 NJCU Contingent Groundwater Pumping System

The contingent groundwater pumping system at the NJCU site was not operated during 2015.

4 HYDRAULIC MONITORING

Hydraulic monitoring in 2015 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 September 2015 round, nearly seven 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

Groundwater elevations in the Shallow zone range from 12 feet above msl on Site 154 to less than 3 feet above msl 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 4-1**, shallow groundwater flow is generally from east to west across the region, but is locally impacted by subsurface features such as the completed SA-7, SA-6 South, and SA-5 barrier walls, the partially completed SA-6 North barrier wall, deep sewer lines that run beneath JCMUA, JCIA, and Route 440, and shallower storm sewers that run along most of the side streets. Groundwater elevations within the shallow soils in the SA-6 North and South soil containment areas generally declined during 2015 as a result of dewatering activities, and, in the case of SA-6 South, placement of the soil cap. These trends are evident in the hydrographs in Appendix C and will be discussed further in the 2016 annual report based on available data from the perimeter piezometer networks.

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. Further discussion regarding localized groundwater flow on the NJCU site is provided 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 above msl 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 above msl. Vertically, heads within the Intermediate zone are generally one to three feet lower than in the Shallow zone, which indicates a significant downward

vertical gradient across Stratum D. **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** and are relatively uniform compared to those in the overlying lacustrine units. 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-2 created a combined zone of influence causing groundwater to flow both laterally and vertically into the capture zone of the wells. The capture zone spans the various semi-confining layers but considering that the vertical anisotropy of the soil is likely on the order of 10:1, the primary component of flow to the wells is horizontal rather than vertical. It should be noted that the cross-section is drawn with a vertical exaggeration of 5X which tends to over-emphasize the vertical component of flow (i.e., the same cross-section drawn at true scale would more effectively illustrate that the majority of flow is horizontal). Based on the 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**. NJCU site development activities required that the casing of several monitoring wells be raised and thus the elevation of the new top of casing reference points were determined by revised survey as shown on **Table 4-2**. The

results indicate a general decline in groundwater elevations through the year, especially during the third and fourth quarters. A subsequent evaluation of the cause of this decline was therefore conducted. The results indicated that the decline was primarily caused by a combination of 1) reduced recharge from precipitation due to surface regrading, paving, 2) lower than normal precipitation during the second half of 2015, and 3) modifications to the storm sewer network along Motorano Way, Carbon Place, and within the north-central portion of the site during Building 5 construction.

The groundwater elevation contours shown on Figures **4-6 through 4-9** 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. A static zone is thus formed by the confluence of the two walls near the entrance to the Home Depot parking lot and the lack of recharge due to the overlying synthetic liner. Furthermore, 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. As a result, groundwater bypasses the static zone and also moves vertically downward into the underlying zones. This scenario 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. Other piezometers have been installed for soil surcharge monitoring and have been used to supplement the monitoring of head outside of the pools.

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. In prior years, the exceptions included areas outside of pools N-3 and N-4 on Site 087, and a small portion of SA-6 South near pool S-3. However, as shown on the hydrographs in **Appendix C,** heads outside of the wall in these areas have declined significantly.

4.5 SA-6 North Containment Cell

A groundwater elevation contour map specific to SA-6 North will be provided in future annual reports after the containment cell has been constructed and the perimeter piezometers installed. Hydraulic gradients across the wall(s) will be determined and compared to performance criteria.

4.6 SA-6 South Containment Cell

Piezometers on either side of the SA-6 South Containment Cell wall were installed late in 2015. Groundwater elevation data from these wells will be obtained and provided in the 2016 annual report. Hydrographs will be provided to document hydraulic gradients across the SA-7 SCB and the outside soil containment area walls relative to 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 for Soil Excavation on SA-6 North

To facilitate various soil excavations in 2015, groundwater pumping was conducted on SA-6 North to depressurize heads below Stratum D. Groundwater pumping from below Stratum D in 2015 was conducted using depressurization wells DW-6 and DW-7, screened in the Intermediate Zone. The locations of the wells are shown on **Figure 4-10** and the general periods of operation for each are summarized in **Table 4-3** below. Actual start/stop dates and daily flow rates were provided in monthly progress reports. Due to the relatively short duration and low pumping rates, the impact of these wells on regional groundwater flow direction and groundwater quality is minimal.

Table 4-3. Summary of SA-6 North Depressurization Operations

Well	Start Period	End Period	Total Days	Avg. Rate	Total Gal.
DW-6	12/6/15	1/5/16	31	6.9	284,000
DW-7	11/18/15	12/21/15	33	7.2	323,000

5 GROUNDWATER QUALITY MONITORING

Groundwater quality monitoring within the project area was conducted in 2015 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 December 2013 and thus sampling was conducted in November of 2015. The LTMP consists of 27 wells for sampling as shown on **Table 5-1**. Two of the upgradient wells (KP-MW-6BR and 090-MW-18BR) were removed from the program in 2014. Two of the wells (087-MW-W25D, 087-MW-W25T) were not physically accessible for sampling due to local construction activities. Finally, well 124-MW-106T suffered slight damage to the upper casing and is awaiting repair by a licensed driller. These wells will be sampled as soon as feasible in 2016. Finally, three wells in the "plume diversion area" (124-MW-102T, 124-MW-104T, and 124-MW-107T) were abandoned in 2014 but in-situ samples were collected at their prior locations in July 2015 as part of the "L-well" sampling work plan. Data from this in-situ sampling is further discussed in **Section 5.6**.

The monitoring wells are screened in the Intermediate, Deep, and Upper Bedrock zones. Monitoring of the Shallow zone is not within the scope of the LTMP. The wells are generally located on the perimeter of the chromium plume in each layer to assess if the plumes have expanded in a horizontal direction since the last sampling event. Since the GWET system is designed to provide downgradient containment, there is no expectation of significant changes in the extent of the plume, nor in the distribution of chromium concentrations within the plumes. Thus, groundwater monitoring within the plumes is not incorporated into the LTMP.

Groundwater quality data from this event are summarized in **Table 5-2** and are shown on **Figures 5-1 through 5-6**. Data from the previous rounds are shown on the figures for reference, as is the foot-print of the original plumes taken from the Final Groundwater Investigation Report (FGIR) [HydroQual, 2007].

5.1.1 Bedrock Zone

Hexavalent chromium and total chromium concentrations in unfiltered groundwater samples collected from the upper bedrock are shown on **Figures 5-1 and 5-2**, respectively. The data on **Figure 5-1** indicate that hexavalent chromium was not detected in any of the

wells on this, or any of the five previous sampling dates. The data on **Figure 5-2** indicate that total chromium was also non-detect in all but one of the bedrock wells sampled during this round. Well SA6-MW-15BR reported total chromium at 0.022 mg/L which is below the NJGWQS of 0.070 mg/L. As indicated on **Table 5-2**, the filtered sample from this well was non-detect for total chromium.

5.1.2 Intermediate Overburden Zone

Groundwater quality data from the Intermediate overburden water-bearing zone was monitored in four of the five wells as shown on **Figures 5-3 and 5-4**. Other than the sample from 117-MW-I5, located near the former source area, hexavalent chromium was not detected above the reporting limit in any of the wells. Similarly, with the exception of 117-MW-I5, total chromium concentrations were reported below the NJGWQS of 0.07 ppm in each of the wells during this monitoring event. Both hexavalent and total chromium concentrations in well 117-MW-15 continue to trend downward from initial sampling rounds. The minor detections of total chromium (below NJGWQC) during the previous events in well SA6-MW-AA1D were not repeated in 2015. The trace level of total chromium (0.013 ppm) detected in well 117-MW-I1 in 2013 was not detected in 2015.

5.1.3 Deep Overburden Zone

Groundwater quality data from the Deep overburden water-bearing zone is provided on **Figures 5-5 and 5-6**. Hexavalent chromium (**Figure 5-5**) was only detected in one well (115-MW-E08TR) which is located within the deep overburden plume. The reported concentration of 14.8 ppb is the same as that reported in 2013. The other two wells that reported a detection of hexavalent chromium in 2013 (124-MW-104T and 124-MW-102T) were abandoned in 2014 due to construction of the soil containment area cap. However, in-situ samples collected in July 2015 at these same locations were non-detect for hexavalent chromium. These results confirm that hexavalent chromium within the plume diversion area has not expanded due to the construction of the SA-7 SCB and the SA-6 South soil containment area perimeter wall.

Total chromium was reported above reporting limits in seven of the 12 wells as shown on F**igure 5-6.** Concentrations in the unfiltered samples from 124-MW-104T, 124-MW-102T, and 124-MW-107T (in-situ samples collected from the GeoProbe rig) were higher than the previously collected samples from the original monitoring well. This difference is likely due to the presence of trivalent chromium sorbed onto soil particles that become entrained in the sample during purging and impact the non-filtered sample. None of the three filtered samples from these wells reported total chromium above the NJGWQS.

5.2 GWET Extraction Wells

Groundwater from the three GWET pumping wells was sampled quarterly in 2015 as shown in **Table 5-3**. Samples were analyzed for total and hexavalent chromium and

volatile organic chemicals (VOC). The results for hexavalent chromium are plotted on **Figure 5-7** and indicate that concentrations in the Deep zone (PW-1) have declined in an asymptotic fashion to their current level of approximately 35 ppm. Concentrations in the Intermediate zone (PW-2) have declined to about one third of the initial concentration since 2009. The observed decline in concentration during the last two events in 2015 is likely due to the reduced pumping rate of PW-2 prior to its replacement with PW-3 in December 2015. Hexavalent chromium concentrations in the bedrock have been generally stable at approximately 15 ppm.

VOC data from the pumping wells are provided in **Table 5-3**. With the exception of carbon tetrachloride and chloroform, and on one occasion, cis-1,2-dichloroethene, VOCs have not been detected in the bedrock pumping well. Deep overburden pumping well PW-1 contains the highest VOC concentrations with the most prevalent compounds being chlorinated volatile organics such as trichloroethene (TCE) and its daughter products cis- and trans-dichloroethene and vinyl chloride. These same constituents were detected in the Intermediate zone pumping well PW-2 albeit at lower concentrations. Benzene was also detected in relatively low concentrations in PW-1 and PW-2 samples. The groundwater quality from PW-3 will be discussed in the 2016 annual groundwater performance report.

Figure 5-8 illustrates a time-series plot of TCE in each of the GWET pumping wells. The data indicate that concentrations in both PW-1 and PW-2 are in the 30 to 90 ppb range and are continuing to decline slowly. As previously reported, the source of the VOCs in the groundwater is not related to Honeywell.

5.3 SA-6 South

Other than the regional LTMP biennial sampling discussed in Section 5.1, and the in-situ sampling of selected L-well locations as discussed in Section 5.6, groundwater monitoring wells were not sampled on SA-6 South in 2015.

5.4 SA-6 North

Groundwater monitoring wells were not sampled on SA-6 North in 2015, 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 2015 from the three "sentinel" wells at NJCU. The objective of the monitoring program is to provide early warning of potential chromium migration in groundwater from the Commercial AOC (in the southwest corner of Site 90) to the Residential Area to the north. The results are provided on **Figure 5-9** and indicate that hexavalent chromium was not detected above the reporting limit of 5.5 ppb in any of the samples collected from 184-MW-04 and 184-MW-05, 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.

Total chromium was detected above 70 ppb in 184-MW-04 and 184-MW-05 during some sampling rounds in unfiltered samples; however, filtered sample results were either non-detect or well below 70 ppb. These variable results are likely due to differences in turbidity. In particular, field sampling logs for 184-MW-04 during December 2015 indicated turbidity readings higher than previous rounds (28 NTU compared to <1 NTU). The sentinel wells will be redeveloped prior to the next round of sampling in March 2016.

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 as discussed below. The remaining locations will be sampled one year after the SA-6 Chromium Remedy is complete in accordance with the L-Well GWMP. This sampling is expected to take place in 2017.

The analytical results for the unfiltered and filtered samples are summarized on the attached **Tables 5-4a and 5-4b**, respectively. The baseline sample results are also provided for comparison. Hexavalent chromium was not detected above 70 micrograms per liter (µg/L) in any of the samples collected during this interim sampling event. In the unfiltered samples, hexavalent chromium was detected above the laboratory reporting limit of 5.5 ppb at only one location (124-MW-102T) at 9.9 µg/L, which is lower than the baseline result of 32 µg/L. In the filtered samples, hexavalent chromium was again detected at the 124-MW-102T location at 12 µg/L, which is lower than the May 2013 result of 41 µg/L.

Hexavalent chromium was also detected in the filtered sample at the 124-MW-103L location at 12 µg/L. These results indicate that there has not been a meaningful change in the distribution of the hexavalent chromium plume in this area at these locations. Sampling of the six remaining L-wells, to be conducted following completion of the Chromium Remedy in accordance with the approved L-Well GWMP, will be used to further evaluate potential impacts of the remedy on the Plume Diversion Area.

Table 5-4a indicates that total chromium concentrations in the unfiltered interim samples exceeded the NJDEP Groundwater Quality Standard (GWQS) of 70 µg/L at each of the four interim locations. However, the filtered data on **Table 5-4b** indicates that none of the samples contained total chromium above this standard, with the highest reported concentration being 14.9 µg/L in 124-MW-102T. This comparison indicates that the elevated total chromium results in the unfiltered samples are due to the suspension of fines by the Geoprobe® sampling procedure and subsequent solubilization by the acid sample preservative.

Concentrations of the inorganic parameters from the four interim filtered samples on **Table 5-4b** are generally similar to the baseline results. The same is generally true of the major ion data shown on **Table 5-4a,** with the exception of the 124-MW-104T location. The interim sample results from this location are elevated compared to those from the sample collected from monitoring well 124-MW-104T in May 2013. Data from the resampling of the adjacent well 120-MW-104L will be reviewed to determine if this trend is present slightly higher up in the formation as well.

5.7 SA-5 Site 117

Groundwater sampling for water quality analysis was not conducted at Site 117 in 2015.

5.8 SA-5 Sites 079/153

Groundwater sampling was conducted on July 24, 2014 in existing monitoring wells 079-MW-001 and 079-MW-A02 in accordance with the Remedial Action Report and Confirmatory Sampling Work Plan (September 2011) for Site 079. The results were documented in the Post Treatment Sampling Results Report dated February 2015. Hexavalent chromium was not detected above the reporting limit of 5.5 ppb, and total chromium was reported at a maximum concentration of 5.7 ppb, well below the NJGWQC of 70 ppb. The report recommended that no further groundwater sampling be conducted and thus sampling was not conducted at Sites 079 or 153 in 2015.

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 2015

Eight CaSx injection events were conducted in 2015 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 4,000 to 4,300 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 (8,000 to 8,600 gallons).

The injection rate was approximately 10 to 12 gpm in wells 088-IW-02 and -03. Since the injection rate in well 088-IW-01 was relatively slow (3 to 4 gpm) during the last event in 2014, the well was redeveloped in early 2015 using mechanical brushing and surging. This improved the rate to 10 gpm in the March 2015 event, however the injection rate declined again to 6 gpm in July and 3.5 gpm in December 2015. Additional re-development efforts are planned for 2016 prior to the first injection in this well.

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 2015 ranged from 1.25 tons to 1.54 tons with an average of 1.34 tons per event. At the end of 2015, the stoichiometric equivalent of approximately 34 tons of hexavalent chromium had been treated leaving 16 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 81 tons of hexavalent chromium have been removed through groundwater extraction alone through the end of 2015.

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 2015, ranging from 1,100 to 1,110 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 were also generally consistent ranging from 185 ppm to 207 ppm without a 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 2015 concentrations ranged from 31 to 387 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 5-7**. Concentrations in PW-2 declined from approximately 13 ppm during the first half of 2015 to less than 6 ppm during the last quarter. This is likely due to the reduction in yield of the well as discussed in Section 3.3.1. Well PW-2 was replaced with extraction well PW-3 in 2016. Calcium concentrations in the GWET wells in 2015 were consistent with prior results indicating that impacts from the CaSx injections have not reached these wells.

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.

There was one exception to the above summary in 2015. Sampling of well 088-IW-01 in December 2015 occurred shortly after extensive redevelopment of the well. The redevelopment included pumping mechanical scrubbing of the screen, surge blocking, and pumping out the sump of sediment and residual CaSx. As a result, the pH at 6.85, and ORP at -30 were lower than historic values in this well during this pre-injection event.

6.4 Planned Activities for 2016

In accordance with the Operations Work Plan, the goal for 2016 will be to inject sufficient reductant in the S-3 Sand to reduce the stoichiometric equivalent of 10 tons of hexavalent chromium. Based on the results from 2015, this will require eight injection events throughout the year.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Compliance with Monitoring Requirements

Hydraulic and groundwater quality monitoring conducted in 2015 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 2013, 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 Monitoring Well Abandonment Plan for SA-6 North and South, the Groundwater Level Monitoring Plan for SA-6, and the L-Well Groundwater Monitoring Plan.

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 program to date have, without exception, shown that the horizontal limits of the plume is not expanding. Based on these data, it is recommended that 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. 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	2015 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	150	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 South GW Level Monitoring Plan Appendix J of SA-6 South 100% Design June 28, 2013	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 South	Shallow and Interm.	1st year - Monthly 2nd year - Quarterly 3rd year -Semi-Annual	13	Post Remedy (2016)
SA-6 North	SA-6 North GW Level Monitoring Plan Appendix J of SA-6 North 100% Design June 28, 2013	First Amended Consent Decree Regarding Remediation and Redevelopment of Study Area 6 North	Shallow and Interm.	1st year - Monthly 2nd year - Quarterly 3rd year -Semi-Annual	13	Post Remedy (2017)
Study Area 6 N&S	"Long Term Monitoring Plan" Draft Submitted October 1, 2015	Same Consent Decrees as Above for SA-6 South and SA-6 North	Shallow	Quarterly	12	Post Remedy (2016)
SA-5 (NJCU) Sites 90 & 184	Long Term Monitoring Plan (2/29/12)[2]	Consent Decree Regarding Remediation of the New Jersey City University Redevelopment Area	Shallow	Quarterly through 2013 future TBD[2]	7	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 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 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] Revisions to draft SA-6 LTMP plan in progress; future monitoring frequency TBD pending updated LTMP

[3]Updated LTMP issued

[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	2015 Activity or Estimated Start Date
Regional	GWET Long Term Monitoring Plan June 10, 2008	Deep Overburden and Bedrock Groundwater Remedies Consent Order	Shallow	Biennial TBD	0	
			Intermediate	Biennial TBD	5	November 2015 for all but 3 inaccessible wells that will be sampled asap 2016
			Deep	Biennial TBD	12	
			Bedrock	Biennial TBD	9	
			Beneath River	Every 5 years	5	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	1	On-going (8 events)
				Semi-annual Sampling	5	
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 within Capped Area (Direct Push)	4	Completed June 2015
				Post-remedy outside Capped Area	6	Post-remedy 2017
SA-5 (NJCU) Sites 90 & 184	Long Term Monitoring Plan (revisions in progress)	Consent Decree Regarding Remediation of the New Jersey City University Redevelopment Area	Shallow	Years 1 and 2 - Quarterly Year 3+ TBD[3]	3	On-going
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 2018[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 2018[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]LTMP plan revisons in progress; future monitoring frequency TBD pending updated LTMP
[4]Revisions to draft SA-6 LTMP in progress
[5]Etimated timing for NJDEP issuance of a Remedial Action Groundwater Permit is during 2017.

Table 2-1
2015 Monthly Precipitation Data

Month	2015 Precipitation	Average Precipitation
January	4.42	3.98
February	2.06	2.96
March	4.63	4.21
April	1.67	3.92
May	4.83	4.46
June	5.90	3.4
July	2.69	4.68
August	1.40	4.02
September	2.33	4.01
October	3.35	3.16
November	1.30	3.88
December	4.40	3.57
Annual Total	38.99	46.25

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

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev. (ft msl)	Well Depth (ft)	Screen Length (ft)	Comments
079-MW-01	Shallow	8.80	NA	NA	
079-MW-A2	Shallow	8.10	13	10	
079-MW-C6	Shallow	11.00	13	10	
087-MW-101	Shallow	12.21	12	NA	
087-MW-102	Shallow	11.65	13	NA	
087-MW-119	Shallow	12.97	11	NA	
087-MW-120	Shallow	12.30	11	NA	
087-MW-121	Shallow	11.76	12	NA	
087-MW-A26	Shallow	10.10	13	10	
087-MW-I30	Shallow	10.86	14	10	
087-MW-O23	Shallow	11.79	13	10	Abandoned in 2015 for soil excavation
087-MW-O29	Shallow	10.08	14	10	
087-MW-U28	Shallow	14.08	16	10	Abandoned in 2015 for soil excavation
087-MW-W25	Shallow	18.26	18	10	Abandoned in 2015 for soil excavation
087-PZ-003	Shallow	13.10	18	5	Abandoned in 2015 for soil excavation
088-MW-002	Shallow	12.81	15	13	
088-MW-101	Shallow	11.56	12	NA	Abandoned in 2015 for soil excavation
088-MW-102	Shallow	17.54	19	NA	Abandoned in 2015 for soil excavation
088-MW-103	Shallow	11.44	35	NA	Abandoned in 2015 for soil excavation
088-PZ-001	Shallow	10.67	12	5	
088-PZ-003	Shallow	12.07	15	5	Abandoned in 2015 for soil excavation
090-PZ-05	Shallow	17.24	NA	NA	
090-PZ-06	Shallow	17.15	NA	NA	
115-E1A-SO	Shallow	18.97	7	NA	Replaced 115-E1A-SO in 2015
115-E2-SO	Shallow	10.05	10	NA	
115-E3-SO	Shallow	12.57	NA	NA	
115-E4-SO	Shallow	NA	NA	NA	
115-E5-SO	Shallow	NA	NA	NA	
115-W1-SO	Shallow	12.59	NA	NA	
115-W3-SO	Shallow	15.16	14	NA	
115-W5-SO	Shallow	21.28	NA	NA	
115-W6-SO	Shallow	NA	NA	NA	
117-MW-A05	Shallow	18.48	16	NA	
117-MW-A14	Shallow	17.33	17	NA	
117-MW-A62	Shallow	18.32	15	NA	
117-MW-A85	Shallow	17.40	15	NA	
117-MW-A89	Shallow	13.17	16	NA	
117-MW-A99	Shallow	15.95	14	NA	
117-MW-I4S	Shallow	15.49	NA	NA	
124-MW-10	Shallow	10.06	11	8	
124-MW-11	Shallow	9.05	8	6	
134-MW-V09	Shallow	7.98	13	10	
140-MW-04	Shallow	7.18	NA	NA	
140-MW-08	Shallow	8.13	10	8	
140-MW-1R	Shallow	7.61	11	NA	
153-MW-02	Shallow	NA	NA	NA	Access Restricted
153-MW-05	Shallow	NA	NA	NA	Access Restricted
153-MW-A13	Shallow	9.62	10	6	

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Comments
		(ft msl)	(ft)	(ft)	
153-MW-A15	Shallow	11.00	12	10	
154-MW-A01	Shallow	18.06	15	NA	
154-MW-A06	Shallow	19.87	15	NA	
154-MW-A5A	Shallow	19.16	14	NA	
154-MW-B6A	Shallow	20.71	14	NA	
154-MW-C6A	Shallow	20.37	13	NA	
154-MW-D01	Shallow	18.78	14	NA	
154-MW-E08	Shallow	22.00	14	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	
SA6-MW-AA1	Shallow	17.80	15	10	
Sump A	Shallow	15.98	NA	NA	
Sump B	Shallow	13.06	NA	NA	
SA6S-PZ-11	Shallow	15.89	TBD	10	(aka PZ5-SO) Installed 2015
SA6S-PZ-12	Shallow	15.97	TBD	10	(aka PZ5-SI) Installed 2015
SA6S-PZ-13	Shallow	16.04	TBD	10	(aka PZ4-SO) Installed 2015
SA6S-PZ-14	Shallow	16.03	TBD	10	(aka PZ4-SI) Installed 2015
SA6S-PZ-15	Shallow	14.16	TBD	10	(aka PZ3-SO) Installed 2015
SA6S-PZ-16	Shallow	18.99	TBD	10	(aka PZ3-SI) Installed 2015
SA6S-PZ-17	Shallow	18.07	TBD	10	(aka PZ2-SO) Installed 2015
SA6S-PZ-18	Shallow	18.18	TBD	10	(aka PZ2-SI) Installed 2015
SA6S-PZ-19	Shallow	17.91	TBD	10	(aka PZ1-SO) Installed 2015
SA6S-PZ-20	Shallow	18.38	TBD	10	(aka PZ1-SI) Installed 2015
073-MW-10BR-1	Rock	6.67	155	10	
073-MW-10BR-2	Rock	6.67	170	10	
073-MW-10BR-3	Rock	6.67	195	15	
073-MW-10BR-4	Rock	6.67	227	15	
073-MW-10BR-5	Rock	6.67	327	15	
073-MW-1BR	Rock	25.25	144	15	
079-MW-13BR-1	Rock	13.08	121	10	
079-MW-13BR-2	Rock	13.08	214	15	
079-MW-13BR-3	Rock	13.08	284	15	
087-MW-14	Rock	10.68	97	10	
087-MW-I30T	Rock	10.59	80	15	
087-MW-O29T	Rock	9.98	102	15	
090-MW-7BR-1	Rock	12.66	134	15	
090-MW-7BR-2	Rock	12.66	NA	NA	
090-MW-7BR-3	Rock	12.66	NA	NA	
115-MW-203BR	Rock	8.70	162	20	
115-MW-211BR	Rock	17.41	NA	NA	
115-MW-215BR	Rock	8.82	143	20	
115-MW-216BR	Rock	18.02	131	20	
117-MW-3BR-1	Rock	12.34	155	15	
117-MW-3BR-2	Rock	12.34	263	15	
117-MW-8BR	Rock	12.94	125	10	
119-MW-11BR	Rock	10.75	159	20	
119-MW-12BR	Rock	11.26	154	20	
119-MW-16BR-1	Rock	8.61	151	15	
119-MW-16BR-2	Rock	8.61	187	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-16BR-3	Rock	8.61	247	15	
119-MW-2BR-1	Rock	8.43	163	15	
119-MW-2BR-2	Rock	8.43	245	15	
119-MW-2BR-3	Rock	8.43	315	15	
119-MW-4BR-1	Rock	8.77	179	15	
119-MW-4BR-2	Rock	8.77	229	15	
119-MW-4BR-3	Rock	8.77	314	15	
124-MW-17BR-1	Rock	9.56	153	15	
124-MW-17BR-2	Rock	9.56	337	15	
124-MW-8BR	Rock	9.71	NA	NA	
140-MW-9BR-1	Rock	7.32	153	15	
140-MW-9BR-2	Rock	7.32	222	15	
140-MW-9BR-3	Rock	7.32	272	15	
SA6-MW-14BR	Rock	9.99	85	10	
SA6-MW-15BR	Rock	8.08	103	20	
SA6-MW-5BR-1	Rock	17.06	106	15	
SA6-MW-5BR-2	Rock	17.06	154	15	
SA6-MW-5BR-3	Rock	17.06	204	13	
SA6-MW-5BR-4	Rock	17.06	236	15	
SA6-MW-5BR-5	Rock	17.06	281	15	
087-MW-13	Intermediate	12.93	40	10	
087-MW-35	Intermediate	18.29	40	10	Abandoned in 2015 for soil excavation
087-MW-A26D	Intermediate	10.35	28	10	
087-MW-O29D	Intermediate	10.32	56	NA	
087-MW-W25D	Intermediate	18.17	66	10	
087-OBS-07	Intermediate	TBD	30	5	
087-OBS-1D	Intermediate	15.13	43	10	
087-OBS-2D	Intermediate	12.68	54	10	
087-OBS-5D	Intermediate	12.72	40	10	
087-OBS-6D	Intermediate	11.24	NA	NA	
087-PW-2	Intermediate	13.02	48	20	
087-PW-3	Intermediate	TBD	50	20	
087-PZ-004	Intermediate	13.18	29	5	Abandoned in 2015 for soil excavation
088-MW-15	Intermediate	12.09	35	10	
088-PZ-002	Intermediate	10.56	25	5	
088-PZ-004	Intermediate	12.05	27	5	Abandoned in 2015 for soil excavation
090-MW-07	Intermediate	14.00	40	10	
115-E1-DI	Intermediate	TBD	45	NA	
115-E1-DO	Intermediate	9.21	37	NA	Abandoned in 2015 for soil excavation
115-E2-DO	Intermediate	10.24	35	NA	
115-E3-DO	Intermediate	12.39	34	NA	
115-E4-DO	Intermediate	17.87	NA	NA	
115-E5-DO	Intermediate	15.72	NA	NA	
115-E6-DI	Intermediate	19.89	48	NA	
115-E6-DO	Intermediate	19.74	51	NA	
115-MW-20	Intermediate	14.19	NA	NA	
115-MW-E14D	Intermediate	18.05	35	10	
117-MW-I1	Intermediate	11.08	22	10	
117-MW-I2	Intermediate	17.59	28	10	
117-MW-I3	Intermediate	15.59	28	10	

Table 2-2
Groundwater Monitoring Well Inventory

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Comments
		(ft msl)	(ft)	(ft)	
117-MW-I5	Intermediate	18.76	37	15	
124-MW-G02D	Intermediate	9.59	28	10	
134-PZ-002	Intermediate	7.81	27	5	Abandoned in 2015 for soil excavation
140-MW-P05D	Intermediate	7.44	30	10	
SA6-MW-AA1D	Intermediate	19.36	32	10	
087-IW-01	Deep	11.51	67	10	
087-MW-01	Deep	12.80	60	10	
087-MW-08	Deep	12.98	99	10	
087-MW-34	Deep	12.73	70	5	
087-MW-A26T	Deep	9.92	56	15	
087-MW-W25T	Deep	18.19	91	15	
087-OBS-1L	Deep	15.27	67	5	
087-OBS-1T	Deep	15.23	105	10	
087-OBS-3L	Deep	12.88	65	5	
087-OBS-4T	Deep	11.60	76	5	
087-OBS-5T	Deep	12.62	82	10	
087-PW-1	Deep	12.66	69	10	
088-IW-01	Deep	11.57	59	10	
088-IW-02	Deep	16.32	64	10	
088-IW-03	Deep	12.56	74	10	
088-MW-G19T	Deep	12.45	93	15	
090-MW-09	Deep	10.70	75	5	
115-MW-A12T	Deep	15.55	NA	NA	
115-MW-E14T	Deep	21.33	71	15	
115-OMW-E08TR	Deep	16.82	NA	NA	
115-PW-21	Deep	15.13	71	10	
117-MW-D1	Deep	11.08	41	10	
117-MW-D2	Deep	17.62	48	10	
117-MW-D3	Deep	18.85	80	10	
117-MW-I4	Deep	15.49	75	10	
119-MW-01T	Deep	10.78	62	10	
119-MW-02T	Deep	8.80	70	10	
124-MW-104L	Deep	9.22	43	10	
124-MW-105T	Deep	9.33	62	10	
124-MW-106T	Deep	TBD	78	10	
124-MW-G02T	Deep	9.50	69	10	
153-MW-A13T	Deep	9.34	58	15	
SA6-MW-AA1T	Deep	15.31	70	10	

Table 3-1

GWET Pumping Outages in 2015

Well ID	Start Date	End Date	Duration Days and	Hours	Comment
087-PW-1	2-Feb-15	3-Feb-15	1	2.8	Shut down for forcemain acid cleaning.
087-PW-2	2-Feb-15	4-Feb-15	1	21.7	Shut down for forcemain acid cleaning.
115-MW-215BR	2-Feb-15	3-Feb-15	0	22.4	Shut down for forcemain acid cleaning.
115-MW-215BR	3-Oct-15	4-Oct-15	1	7.0	Shut down due to multiple outfall structure high alarm events.
115-MW-215BR	28-Oct-15	29-Oct-15	0	13.5	Shut down due to multiple outfall structure high alarm events.
087-PW-1	10-Dec-15	10-Dec-15	0	7.8	Shut down for trenching activities (for PW-3 forcemain).
087-PW-2	10-Dec-15	10-Dec-15	0	8.1	Shut down for trenching activities (for PW-3 forcemain).
087-PW-2	10-Dec-15	11-Dec-15	*	*	Well replaced by PW-3.
087-PW-1	14-Dec-15	15-Dec-15	0	16.0	Shut down to allow drip leak repairs.
087-PW-1	23-Dec-15	28-Dec-15	4	16.2	Shut down due to plant PLC communication problem.
087-PW-3	24-Dec-15	28-Dec-15	3	22.8	Shut down due to plant PLC communication problem.
115-MW-215BR	24-Dec-15	28-Dec-15	3	22.8	Shut down due to plant PLC communication problem.

* PW-2 taken out of service during construction of force main for PW-3 replacement

Table 4-1
Groundwater Elevation Data from Quarterly Rounds in 2015

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-15	Jun-15	Sep-15	Dec-15
		(ft msl)	(ft)	(ft)	(ft msl)	(ft msl)	(ft msl)	(ft msl)
SA6-MW-AA1T	Deep	15.31	70	10	0.84	0.96	0.75	0.39
153-MW-A13T	Deep	9.34	58	15	2.79	3.03	2.56	2.37
124-MW-G02T	Deep	9.5	69	10	1.61	2.46	1.65	1.28
124-MW-106T	Deep	TBD	78	10	N/A	N/A	N/A	N/A
124-MW-105T	Deep	9.33	62	10	3.22	N/A	N/A	N/A
124-MW-104L	Deep	9.22	43	10	2.78	3.01	2.50	2.32
119-MW-02T	Deep	8.8	70	10	2.94	2.83	2.32	2.12
119-MW-01T	Deep	10.78	62	10	N/A	2.34	2.18	2.26
117-MW-I4	Deep	15.49	75	10	5.36	5.49	4.89	4.45
117-MW-D3	Deep	18.85	80	10	5.60	5.80	5.18	4.78
117-MW-D2	Deep	17.62	48	10	4.23	4.41	3.97	3.55
117-MW-D1	Deep	11.08	41	10	2.80	2.95	2.42	2.17
115-PW-21	Deep	15.13	71	10	2.60	2.45	1.34	1.15
115-OMW-E08TR	Deep	16.82	NA	NA	2.58	2.99	2.30	1.72
115-MW-E14T	Deep	21.33	71	15	2.32	2.71	2.00	1.44
115-MW-A12T	Deep	15.55	NA	NA	0.98	1.03	1.07	1.11
090-MW-09	Deep	10.72	75	5	4.65	4.90	5.43	4.37
088-MW-G19T	Deep	12.45	93	15	N/A	N/A	N/A	N/A
088-IW-03	Deep	12.56	74	10	1.93	N/A	N/A	N/A
088-IW-02	Deep	16.34	64	10	2.91	2.91	N/A	N/A
088-IW-01	Deep	11.58	59	10	3.69	3.06	N/A	N/A
087-PW-1	Deep	12.66	NA	NA	-23.99	-24.90	-26.89	-27.59
087-OBS-5T	Deep	12.62	82	NA	-0.31	-0.25	-0.74	-0.68
087-OBS-4T	Deep	11.6	76	NA	N/A	0.75	0.12	-0.14
087-OBS-3L	Deep	12.88	65	NA	N/A	0.65	-0.19	1.16
087-OBS-1T	Deep	15.23	100	NA	1.82	1.28	1.07	0.99
087-OBS-1L	Deep	15.27	67	NA	1.99	2.70	1.02	1.40
087-MW-W25T	Deep	18.19	91	15	0.95	0.94	N/A	N/A
087-MW-A26T	Deep	9.92	56	15	N/A	3.00	2.25	1.46
087-MW-34	Deep	12.73	70	5	-0.77	-0.66	-1.33	-1.52
087-MW-08	Deep	12.98	99	10	1.47	0.99	0.43	0.47
087-MW-01	Deep	12.8	60	10	3.03	3.30	2.59	1.93
087-IW-01	Deep	11.51	67	10	2.21	2.43	1.77	1.19
SA6-MW-AA1D	Intermediate	19.36	32	10	0.97	1.04	0.62	0.83
140-MW-P05D	Intermediate	7.44	30	10	N/A	N/A	2.45	N/A
124-MW-G02D	Intermediate	9.59	28	10	2.38	2.52	2.26	2.35
117-MW-I5	Intermediate	18.76	37	15	N/A	6.09	5.68	5.34
117-MW-I3	Intermediate	15.59	28	10	4.65	4.84	4.32	3.72
117-MW-I2	Intermediate	17.59	28	10	5.04	4.97	4.66	4.21
117-MW-I1	Intermediate	11.08	22	10	3.77	4.23	3.45	3.02
115-MW-E14D	Intermediate	18.05	35	10	-0.13	2.29	1.58	1.01

Table 4-1
Groundwater Elevation Data from Quarterly Rounds in 2015

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-15	Jun-15	Sep-15	Dec-15
		(ft msl)	(ft)	(ft)	(ft msl)	(ft msl)	(ft msl)	(ft msl)
115-MW-20	Intermediate	14.19	NA	NA	1.91	2.60	2.27	1.94
115-E6-DO	Intermediate	19.74	51	NA	1.98	2.76	2.22	1.93
115-E6-DI	Intermediate	19.89	48	NA	2.18	2.77	1.98	1.42
115-E5-DO	Intermediate	15.72	NA	NA	2.21	N/A	N/A	N/A
115-E4-DO	Intermediate	17.87	45	NA	3.24	3.40	N/A	N/A
115-E3-DO	Intermediate	12.39	34	NA	4.61	4.65	4.14	3.55
115-E2-DO	Intermediate	10.24	35	NA	3.89	4.02	3.56	3.29
115-E1-DI	Intermediate	TBD	45	NA	NA	NA	NA	NA
090-MW-07	Intermediate	14	40	10	2.78	2.93	2.37	1.76
088-PZ-002	Intermediate	10.56	25	5	3.54	3.66	N/A	N/A
088-MW-15	Intermediate	12.09	35	10	N/A	N/A	N/A	N/A
087-PW-3	Intermediate	TBD	50	20	NA	NA	NA	NA
087-PW-2	Intermediate	13.02	48	20	-18.20	-18.38	-15.33	2.54
087-OBS-6D	Intermediate	11.24			2.68	2.53	2.59	0.91
087-OBS-5D	Intermediate	12.72	40	10	0.33	0.65	0.58	1.18
087-OBS-2D	Intermediate	12.68	NA	10	-2.00	-1.99	-2.65	-2.67
087-OBS-1D	Intermediate	15.13	43	10	1.69	1.80	1.40	2.31
087-OBS-07	Intermediate	TBD	30	5	NA	NA	NA	NA
087-MW-W25D	Intermediate	18.17	66	10	1.06	1.04	N/A	N/A
087-MW-O29D	Intermediate	10.32	56	NA	1.27	1.49	1.09	1.08
087-MW-A26D	Intermediate	10.35	28	10	N/A	3.05	2.30	1.48
087-MW-13	Intermediate	12.93	40	10	0.81	1.56	-0.32	0.58
SA6-MW-5BR-5	Rock	17.06	281	15	3.45	3.54	2.89	2.96
SA6-MW-5BR-4	Rock	17.06	236	15	3.36	3.40	2.85	2.92
SA6-MW-5BR-3	Rock	17.06	204	13	3.51	3.15	2.66	2.72
SA6-MW-5BR-2	Rock	17.06	154	15	2.10	2.74	2.29	2.51
SA6-MW-5BR-1	Rock	17.06	106	15	2.07	2.07	1.68	2.06
SA6-MW-15BR	Rock	8.08	103	20	1.70	1.32	1.22	1.91
SA6-MW-14BR	Rock	9.99	85	10	3.36	3.34	2.84	3.08
140-MW-9BR-3	Rock	7.32	272	15	3.03	2.94	2.77	2.98
140-MW-9BR-2	Rock	7.32	222	15	1.53	3.01	2.76	2.93
140-MW-9BR-1	Rock	7.32	153	15	3.03	1.42	1.31	1.58
124-MW-8BR	Rock	9.71	NA	NA	3.34	3.54	2.96	3.15
124-MW-17BR-2	Rock	9.56	337	15	3.73	3.75	3.41	3.59
124-MW-17BR-1	Rock	9.56	153	15	3.61	3.77	3.36	3.47
119-MW-4BR-3	Rock	8.77	314	15	4.07	3.94	3.25	3.72
119-MW-4BR-2	Rock	8.77	229	15	4.16	3.85	2.41	3.67
119-MW-4BR-1	Rock	8.77	179	15	4.20	3.94	2.58	3.59
119-MW-2BR-3	Rock	8.43	315	15	-0.19	-0.34	-1.11	0.21
119-MW-2BR-2	Rock	8.43	245	15	-0.47	-0.53	-0.93	-0.37
119-MW-2BR-1	Rock	8.43	163	15	-1.27	-1.28	-1.68	N/A

Table 4-1
Groundwater Elevation Data from Quarterly Rounds in 2015

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-15	Jun-15	Sep-15	Dec-15
		(ft msl)	(ft)	(ft)	(ft msl)	(ft msl)	(ft msl)	(ft msl)
119-MW-16BR-3	Rock	8.61	247	15	4.50	4.80	3.63	4.36
119-MW-16BR-2	Rock	8.61	187	15	4.19	4.28	3.76	3.88
119-MW-16BR-1	Rock	8.61	151	15	8.59	5.50	4.88	N/A
119-MW-12BR	Rock	11.26	154	20	4.99	5.06	4.55	4.53
119-MW-11BR	Rock	10.75	159	20	7.68	3.64	3.17	3.21
117-MW-8BR	Rock	12.94	125	10	5.71	5.52	4.92	4.87
117-MW-3BR-2	Rock	12.34	263	15	6.19	6.29	5.76	5.70
117-MW-3BR-1	Rock	12.34	155	15	5.40	5.53	5.04	4.93
115-MW-216BR	Rock	18.02	131	20	3.69	3.77	3.16	3.14
115-MW-215BR	Rock	8.82	143	20	-3.63	-3.83	-4.06	-3.59
115-MW-211BR	Rock	17.41	NA	NA	3.60	3.67	3.05	3.06
115-MW-203BR	Rock	8.7	162	20	N/A	0.42	1.27	N/A
090-MW-7BR-3	Rock	12.66	NA	NA	4.85	N/A	6.52	N/A
090-MW-7BR-2	Rock	12.66	NA	NA	4.71	4.83	4.26	4.12
090-MW-7BR-1	Rock	12.66	134	15	4.47	4.70	4.16	4.07
087-MW-O29T	Rock	9.98	102	15	1.63	1.80	1.22	1.10
087-MW-I30T	Rock	10.59	80	15	2.73	3.68	1.64	1.03
087-MW-14	Rock	10.68	97	10	3.28	4.43	2.01	1.86
079-MW-13BR-3	Rock	13.08	284	15	7.77	7.87	8.23	6.95
079-MW-13BR-2	Rock	13.08	214	15	7.72	7.80	7.19	7.14
079-MW-13BR-1	Rock	13.08	121	10	7.57	7.67	6.79	7.07
073-MW-1BR	Rock	25.25	144	15	N/A	-1.43	-1.54	-1.02
073-MW-10BR-5	Rock	6.67	327	15	N/A	N/A	N/A	N/A
073-MW-10BR-4	Rock	6.67	227	15	-3.25	N/A	-0.03	0.69
073-MW-10BR-3	Rock	6.67	195	15	-1.55	N/A	-0.81	4.63
073-MW-10BR-2	Rock	6.67	170	10	-0.79	N/A	-1.55	2.63
073-MW-10BR-1	Rock	6.67	155	10	-6.51	N/A	N/A	-5.57
Sump B	Shallow	13.06	NA	NA	7.03	6.97	6.53	6.20
Sump A	Shallow	15.98	NA	NA	7.28	6.60	4.80	4.76
SA6-MW-AA1	Shallow	17.8	15	10	3.95	3.86	3.28	3.56
184-MW-06	Shallow	17.75*	NA	NA	7.90*	7.78	6.89	6.58
184-MW-05	Shallow	14.79	NA	NA	5.67	5.72	4.72	4.21
184-MW-04	Shallow	8.76	NA	NA	N/A	3.73	3.47	3.35
154-MW-E08	Shallow	22	14	NA	13.31	13.11	12.21	12.92
154-MW-D01	Shallow	18.78	14	NA	12.12	12.17	N/A	N/A
154-MW-C6A	Shallow	20.37	13	NA	12.20	12.06	11.46	11.28
154-MW-B6A	Shallow	20.71	14	NA	12.74	12.41	11.42	11.43
154-MW-A5A	Shallow	19.16	14	NA	11.42	11.28	10.69	10.56
154-MW-A06	Shallow	19.87	15	NA	14.82	12.59	11.06	11.31
154-MW-A01	Shallow	18.06	15	NA	N/A	11.07	10.61	10.50
153-MW-A15	Shallow	11	12	10	N/A	2.29	1.75	1.43

Table 4-1
Groundwater Elevation Data from Quarterly Rounds in 2015

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-15	Jun-15	Sep-15	Dec-15
		(ft msl)	(ft)	(ft)	(ft msl)	(ft msl)	(ft msl)	(ft msl)
153-MW-A13	Shallow	9.62	10	6	4.52	4.20	3.14	2.96
140-MW-1R	Shallow	7.61	11	NA	3.69	5.06	3.80	4.00
140-MW-08	Shallow	8.13	10	8	N/A	N/A	3.77	N/A
140-MW-04	Shallow	7.18	NA	NA	3.84	4.47	3.60	3.78
134-MW-V09	Shallow	7.98	13	10	N/A	N/A	N/A	N/A
124-MW-11	Shallow	9.05	8	6	4.48	N/A	3.60	4.33
124-MW-10	Shallow	10.06	11	8	4.86	N/A	4.31	4.46
117-MW-I4S	Shallow	15.49	NA	NA	N/A	N/A	N/A	N/A
117-MW-A99	Shallow	15.95	14	NA	N/A	5.35	5.02	4.58
117-MW-A89	Shallow	13.17	16	NA	4.02	4.50	3.54	3.25
117-MW-A85	Shallow	17.4	15	NA	4.72	5.00	4.64	4.22
117-MW-A62	Shallow	18.32	15	NA	N/A	N/A	N/A	N/A
117-MW-A14	Shallow	17.33	17	NA	4.84	5.01	4.36	4.10
117-MW-A05	Shallow	18.48	16	NA	N/A	6.61	5.96	5.61
115-W6-SO	Shallow	NA	NA	NA	NA	NA	NA	NA
115-W5-SO	Shallow	21.28	NA	NA	NA	NA	1.58	1.78
115-W3-SO	Shallow	15.16	14	NA	NA	NA	1.26	1.86
115-W1-SO	Shallow	12.59	NA	NA	NA	NA	NA	NA
115-E5-SO	Shallow	NA	NA	NA	N/A	N/A	N/A	N/A
115-E4-SO	Shallow	NA	NA	NA	NA	NA	NA	NA
115-E3-SO	Shallow	12.57	NA	NA	6.17	5.86	5.22	4.82
115-E2-SO	Shallow	10.05	10	NA	5.42	5.44	4.77	4.50
115-E1A-SO	Shallow	18.97	7	NA	NA	NA	0.93	1.78
090-PZ-06	Shallow	17.15	17	NA	9.33	9.22	8.19	7.85
090-PZ-05	Shallow	17.24	15	NA	7.20	7.27	6.40	5.99
088-PZ-001	Shallow	10.67	12	5	5.86	4.13	N/A	N/A
088-MW-002	Shallow	12.81	15	13	N/A	5.33	N/A	N/A
088-MW-001	Shallow	9.34	15	13	5.85	4.10	N/A	N/A
087-MW-O29	Shallow	10.08	14	10	4.66	4.32	3.50	3.50
087-MW-I30	Shallow	10.86	14	10	4.20	4.22	3.58	3.37
087-MW-A26	Shallow	10.1	13	10	N/A	3.25	2.43	1.73
087-MW-121	Shallow	11.76	12	NA	2.58	2.84	2.01	N/A
087-MW-120	Shallow	12.3	11	NA	6.27	4.57	4.23	4.28
087-MW-119	Shallow	12.97	11	NA	N/A	4.88	4.32	4.42
087-MW-102	Shallow	11.65	13	NA	2.97	3.18	2.24	N/A
087-MW-101	Shallow	12.21	12	NA	2.93	3.17	2.22	1.63
079-MW-C6	Shallow	11	13	10	4.97	4.94	4.04	N/A
079-MW-A2	Shallow	8.1	13	10	N/A	N/A	N/A	N/A
079-MW-01	Shallow	8.8	NA	NA	4.01	3.87	3.28	N/A
SA6S-PZ-11	Shallow	15.89	TBD	10	N/A	N/A	N/A	3.06
SA6S-PZ-12	Shallow	15.97	TBD	10	N/A	N/A	N/A	2.09

Table 4-1
Groundwater Elevation Data from Quarterly Rounds in 2015

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					Mar-15	Jun-15	Sep-15	Dec-15
		(ft msl)	(ft)	(ft)	(ft msl)	(ft msl)	(ft msl)	(ft msl)
SA6S-PZ-13	Shallow	16.04	TBD	10	N/A	N/A	N/A	4.47
SA6S-PZ-14	Shallow	16.03	TBD	10	N/A	N/A	N/A	1.82
SA6S-PZ-15	Shallow	14.16	TBD	10	N/A	N/A	N/A	3.96
SA6S-PZ-16	Shallow	18.99	TBD	10	N/A	N/A	N/A	1.82
SA6S-PZ-17	Shallow	18.07	TBD	10	N/A	N/A	N/A	3.48
SA6S-PZ-18	Shallow	18.18	TBD	10	N/A	N/A	N/A	1.83
SA6S-PZ-19	Shallow	17.91	TBD	10	N/A	N/A	N/A	3.70
SA6S-PZ-20	Shallow	18.38	TBD	10	N/A	N/A	N/A	1.90

* - See Table 4-2 for Reference Point Elevations near NJCU.

Table 4-2
Summary of Groundwater Elevations Near NJCU
2015

Ref. Point Survey Date	Dec. 2014 Ref. pt.* ft, msl	June 2015 Ref. pt.* ft, msl		03/10/15 Depth to GW (ft,)	03/10/15 GW Elev. (ft., msl)	06/10/15 Depth to GW (ft,)	06/10/15 GW Elev. (ft., msl)	09/18/15 Depth to GW (ft,)	09/18/15 GW Elev. (ft., msl)	12/14/15 Depth to GW (ft,)	12/14/15 GW Elev. (ft., msl)
Location											
079-MW-A02	8.10	8.10		NA	NA	NA	NA	NA	NA	NA	NA
Sump A	15.98	15.98		8.70	7.28	9.38	6.60	11.18	4.80	11.22	4.76
Sump B	13.06	13.06		6.03	7.03	6.09	6.97	6.53	6.53	6.86	6.20
090-PZ-5	17.24	17.24		10.04	7.20	9.97	7.27	10.84	6.40	11.25	5.99
090-PZ-6	17.15	17.15		7.82	9.33	7.93	9.22	8.96	8.19	9.30	7.85
184-MW-4	8.76	8.76		NA*	NA*	5.03	3.73	5.29	3.47	5.41	3.35
184-MW-5	14.79	14.79		9.12	5.67	9.07	5.72	10.07	4.72	10.58	4.21
184-MW-6	15.90	17.75		8.00	7.90	9.97	7.78	10.86	6.89	11.17	6.58
090-MW-09	10.72	10.72		6.07	4.65	5.82	4.90	5.29	5.43	6.35	4.37
TCE-1	NA	NA	**	NA	NA	NA	NA	NA	NA	NA	NA
TCE-2	NA	NA	**	NA	NA	NA	NA	NA	NA	NA	NA
TCE-3	NA	NA	**	NA	NA	NA	NA	NA	NA	NA	NA
TCE-4	NA	NA	**	NA	NA	NA	NA	NA	NA	NA	NA

NA - Not available

* NGVD29 site datum

Table 5-1

List of Wells for December 2015 LTMP Groundwater Quality Sampling Event

Wells Sampled 2013 LTMP Biennial Event	Wells Sampled 2015 LTMP Biennial Event	Comments
079-MW-13BR-2	079-MW-13BR-2	
087-MW-A26D	087-MW-A26D	
087-MW-A26T	087-MW-A26T	
087-MW-W25D	Temporarily Obstructed	Rescheduled for 2016
087-MW-W25T	Temporarily Obstructed	Rescheduled for 2016
090-MW-18BR	Not Sampled	Removed from LTMP 2014
117-MW-8BR	117-MW-8BR	
117-MW-D3	117-MW-D3	
117-MW-I1	117-MW-I1	
117-MW-I5	117-MW-I5	
119-MW-01T	119-MW-01T	
119-MW-02T	119-MW-02T	
119-MW-16BR-2	119-MW-16BR-2	
119-MW-2BR-2	119-MW-2BR-2	
124-MW-102T	124-MW-102T*	Well was abandoned 2014
124-MW-104T	124-MW-104T*	Well was abandoned 2014
124-MW-106T	Temporarily Obstructed	Rescheduled for 2016
124-MW-107T	124-MW-107T*	Well was abandoned 2014
124-MW-8BR	124-MW-8BR	
124-MW-G02T	124-MW-G02T	
140-MW-9BR-1	140-MW-9BR-1	
KP-MW-6BR-1	Not Sampled	Removed from LTMP 2014
SA6-MW-14BR	SA6-MW-14BR	
SA6-MW-15BR-1	SA6-MW-15BR-1	
SA6-MW-AA1D	SA6-MW-AA1D	
SA6-MW-AA1T	SA6-MW-AA1T	
115-MW-E08TR	115-MW-E08TR	

*Location sampled via GeoProbe June 2015 as part of L-Well Sampling Plan

Table 5-2
Summary of Ground Water Quality Data
from Long Term Monitoring Well Sampling Rounds

Unfiltered

Well Sample Date	Total Cr (mg/L) 2006	Total Cr (mg/L) Dec-08	Total Cr (mg/L) Dec-09	Total Cr (mg/L) Dec-10	Total Cr (mg/L) Dec-11	Total Cr (mg/L) Dec-13	Total Cr (mg/L) Nov-15	Hex Cr. (mg/L) 2006	Hex Cr. (mg/L) Dec-08	Hex Cr. (mg/L) Dec-09	Hex Cr. (mg/L) Dec-10	Hex Cr. (mg/L) Dec-11	Hex Cr. (mg/L) Dec-13	Hex Cr. (mg/L) Nov-15
079-MW-13BR	0.034	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
087-MW-A26D	0.059	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
087-MW-A26T	0.162	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
087-MW-W25D	0.005	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA
087-MW-W25T	0.015	ND	ND	0.026	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA
090-MW-18BR	0.367	0.039	0.011	0.030	0.017	NS	NR	0.230	ND	ND	ND	ND	NS	NR
117-MW-8BR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
117-MW-D3	0.011	ND	ND	0.014	0.014	0.010	0.024	ND	ND	ND	ND	ND	ND	ND
117-MW-I1	ND	ND	0.023	ND	ND	0.013	ND	ND	ND	ND	ND	ND	ND	ND
117-MW-I5	0.840	0.529	0.401	0.605	0.232	0.209	0.192	0.770	0.510	0.370	0.540	0.24	0.16	0.14
119-MW-01T	0.137	0.033	0.033	0.020	ND	0.020*	0.040	ND	ND	ND	ND	ND	ND*	ND
119-MW-02T	ND	ND	ND	0.014	ND	ND*	0.0229	ND	ND	ND	ND	ND	ND*	ND
119-MW-16BR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
119-MW-2BR	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
124-MW-102T	0.020	ND	ND	0.014	0.019	0.028*	0.557**	0.012	ND	ND	ND	0.012	0.03*	0.01**
124-MW-104T	0.020	0.015	0.047	0.062	0.066	0.062*	0.382**	0.138	ND	0.046	0.029	0.060	0.07*	ND**
124-MW-106T	0.105	ND	0.013	0.011	0.024	0.013*	NA	ND	ND	ND	ND	ND	ND*	NA
124-MW-107T	0.067	ND	0.191	0.021	ND	0.026*	0.450**	ND	ND	ND	ND	ND	ND*	ND
124-MW-8BR	0.060	N/A	ND	ND	ND	ND	ND	ND	N/A	ND	ND	ND	ND	ND
124-MW-G02T	0.024	ND	ND	ND	ND	ND*	ND	ND	ND	ND	ND	ND	ND*	ND
140-MW-9BR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
KP-MW-6BR	ND	ND	ND	ND	ND	NA	NR	ND	ND	ND	ND	ND	NA	NR
SA6-MW-14BR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SA6-MW-15BR	ND	ND	ND	ND	ND	ND	0.022	ND	ND	ND	ND	ND	ND	ND
SA6-MW-AA1D	0.005	0.018	ND	0.020	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SA6-MW-AA1T	0.015	0.021	ND	0.013	0.014	0.035	ND	ND	ND	ND	ND	ND	ND	ND
115-MW-E08TR	38.900	NS	NS	11.600	11.900	12.80	14.00	41.200	NS	NS	12.100	13.0	14.8	14.8

Notes: NA. Not Available NR. Not Required
* Sampled in May 2013 ** Sampled in June 2015

Table 5-2
Summary of Ground Water Quality Data
from Long Term Monitoring Well Sampling Rounds

Filtered

Well Sample Date	Total Cr (mg/L) 2006	Total Cr (mg/L) Dec-08	Total Cr (mg/L) Dec-09	Total Cr (mg/L) Dec-10	Total Cr (mg/L) Dec-11	Total Cr (mg/L) Dec-13	Total Cr (mg/L) Nov-15	Hex Cr. (mg/L) 2006	Hex Cr. (mg/L) Dec-08	Hex Cr. (mg/L) Dec-09	Hex Cr. (mg/L) Dec-10	Hex Cr. (mg/L) Dec-11	Hex Cr. (mg/L) Dec-13	Hex Cr. (mg/L) Nov-15
079-MW-13BR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
087-MW-A26D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
087-MW-A26T	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
087-MW-W25D	0.006	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA
087-MW-W25T	NA	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA
090-MW-18BR	0.345	ND	ND	ND	ND	NS	NR	0.220	ND	ND	ND	ND	NS	NR
117-MW-8BR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
117-MW-D3	ND	ND	0.034	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
117-MW-I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
117-MW-I5	0.758	0.593	0.392	0.618	0.259	0.164	0.178	0.740	0.520	0.360	0.560	0.24	0.16	0.16
119-MW-01T	0.013	ND	ND	ND	ND	ND*	ND	ND	ND	ND	ND	ND	ND*	ND
119-MW-02T	ND	ND	ND	ND	ND	ND*	ND	ND	ND	ND	ND	ND	ND*	ND
119-MW-16BR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
119-MW-2BR	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
124-MW-102T	NA	ND	ND	ND	0.021	0.036*	0.015**	0.012	ND	ND	ND	0.012	0.04*	0.012**
124-MW-104T	NA	ND	0.053	0.050	0.057	0.092*	ND	0.141	ND	0.050	0.038	0.056	0.08*	ND
124-MW-106T	0.077	ND	ND	ND	ND	ND*	NA	ND	ND	ND	ND	ND	ND*	NA
124-MW-107T	0.041	ND	ND	ND	ND	ND*	ND	ND	ND	ND	ND	ND	ND*	ND
124-MW-8BR	ND	N/A	ND	ND	ND	0.174	ND	ND	N/A	ND	ND	ND	ND	ND
124-MW-G02T	NA	ND	ND	ND	ND	ND*	ND	ND	ND	ND	ND	ND	ND*	ND
140-MW-9BR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
KP-MW-6BR	ND	ND	ND	ND	ND	NA	NR	ND	ND	ND	ND	ND	NA	NR
SA6-MW-14BR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SA6-MW-15BR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SA6-MW-AA1D	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SA6-MW-AA1T	0.011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
115-MW-E08TR	37.700	NS	NS	11.300	12.200	14.10	15.00	39.100	NS	NS	11.600	12.0	14.6	13.8

Notes: NA. Not Available NR. Not Required
* Sampled in May 2013 ** Sampled in June 2015

Table 5-3
Summary of Groundwater Quality Data from GWET Wells

	17-Mar-15			28-May-15		
Parameter	**PW-1** (ug/L)	**PW-2** (ug/L)	**115-MW-215BR** (ug/L)	**PW-1** (ug/L)	**PW-2** (ug/L)	**115-MW-215BR** (ug/L)
Benzene	3.1	3.9	ND	3.1	3.8	ND
Carbon Tetrachloride	5.8	4.6	2.1	5.7	4.5	3.0
Chloroform	23.1	7.8	0.21	23.5	7.8	0.24J
1,1-Dichloroethene	0.63	ND	ND	0.61J	ND	ND
cis-1,2-Dichloroethene	111	8.1	ND	131	9.6	ND
trans-1,2-Dichloroethene	3.8	ND	ND	3.9	ND	ND
Toluene	ND	ND	ND	ND	ND	ND
Trichloroethene	101	45.0	ND	94.9	40.7	ND
1,1-Dichloroethane	0.51	ND	ND	0.56J	ND	ND
Methylene chloride	0.71	ND	ND	0.73J	ND	ND
Vinyl chloride	16.9	2.5	ND	18.1	3.0	ND
1,2-Dichlorobenzene	0.70	ND	ND	0.67J	ND	ND
Chlorobenzene	0.41	ND	ND	0.38J	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND
Xylenes (total)	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND
Hexavalent Chromium	34,700	13,500	15,100	36,100	13,500	16,800
Total Chromium	34,700	15,100	14,800	32,600	15,600	16,700

ND = Not detected above reporting limit.

J = estimated value.

Table 5-3 (continued)
Summary of Groundwater Quality Data from GWET Wells

	23-Sep-15			4-Dec-15		
Parameter	**PW-1** (ug/L)	**PW-2** (ug/L)	**115-MW-215BR** (ug/L)	**PW-1** (ug/L)	**PW-2** (ug/L)	**115-MW-215BR** (ug/L)
Benzene	3.8	3.6	ND	3.2	2.2	ND
Carbon Tetrachloride	6.7	4.3	2.9	3.7	2.9	2.5
Chloroform	27.4	6.8	0.27	24.4	4.8	ND
1,1-Dichloroethene	0.63	ND	ND	0.43	ND	ND
cis-1,2-Dichloroethene	129	8.7	0.24	104	5.3	ND
trans-1,2-Dichloroethene	3.9	ND	ND	3.2	ND	ND
Toluene	ND	ND	ND	ND	ND	ND
Trichloroethene	105.0	37.3	ND	86.8	24.5	ND
1,1-Dichloroethane	0.64	ND	ND	0.51	ND	ND
Methylene chloride	0.71	ND	ND	ND	ND	ND
Vinyl chloride	17.4	2.0	ND	11.3	1.4	ND
1,2-Dichlorobenzene	0.61	ND	ND	0.55	ND	ND
Chlorobenzene	0.35	ND	ND	0.29	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND
Xylenes (total)	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND
Hexavalent Chromium	33,900	7,300	14,700	34,200	5,900	16,700
Total Chromium	33,800	8,480	14,000	34,200	8,430	16,600

ND = Not detected above re

J = estimated value.

TABLE 5-4A

SUMMARY OF BASELINE AND INTERIM L-WELL GROUNDWATER ANALYTICAL RESULTS

UNFILTERED SAMPLES

Well	Sample Date	Total Chromium	Hexavalent Chromium	Calcium	Magnesium	Potassium	Sodium	Alkalinity, Bicarbonate	Alkalinity, Total as CaCO3	Chloride	Sulfide	Sulfate	pH
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L	mg/L	mg/L	su
124-MW-103L	5/2/2013	11.2	<5.5	99,400	50,600	20,000	575,000	156	159	870	<2.0	437	8.58
124-MW-103L	6/4/2015	834	<5.5	740,000	185,000	<100,000	<100,000	234	234	42.5	<2.0	226	8.1
124-MW-102T	5/2/2013	27.7	32	184,000	27,300	<10,000	105,000	159	160	203	<2.0	385	8.23
124-MW-102T	6/5/2015	557	9.9	480,000	79,100	<50,000	116,000	160	160	179	<2.0	467	7.75
124-MW-105T	5/2/2013	553	470	168,000	6,310	<10,000	213,000	29.1	77.1	497	<2.0	124	11.14
124-MW-106T	5/2/2013	13.3	<5.5	334,000	42,600	33,500	1,040,000	20.3	22	2,280	<2.0	319	9.42
124-MW-107T	5/2/2013	25.9	<5.5	475,000	217,000	46,800	2,350,000	49.8	50.4	4,760	<2.0	454	8.93
124-MW-107T	6/3/2015	450	<5.5	1,080,000	309,000	<50,000	1,890,000	139	139	4,880	<2.0	482	7.6
124-MW-G02T	5/1/2013	<10	<5.5	454,000	191,000	13,600	1,910,000	138	137	4,230	<2.0	335	7.24
119-MW-02T	5/1/2013	<10	<5.5	56,700	10,400	<10,000	178,000	58.5	62.4	314	<2.0	54.2	8.48
119-MW-01T	5/1/2013	20.3	<5.5	20,000	10,700	16,900	369,000	24.4	56.6	991	<2.0	64.8	10.45
124-MW-104T	5/1/2013	61.7	66	79,500	9,540	<10,000	34,700	62.3	64	93	<2.0	138	8.86
124-MW-104T	6/4/2015	382	<5.5	2,960,000	103,000	<100,000	<100,000	116	116	129	376	377	7.95
124-MW-104L	5/1/2013	56.8	40	47,300	22,300	13,000	69,900	222	NT	55.8	<2.0	121	9.25

Notes:

Shaded well and results indicate post-remediation samples collected prior to cap installation.

Prepared By: DEN 6/30/15

Checked By: JLD 7/1/15

TABLE 5-4B

SUMMARY OF BASELINE AND INTERIM L-WELL GROUNDWATER ANALYTICAL RESULTS

FILTERED SAMPLES

Well	Sample Date	Total Chromium	Hexavalent Chromium	Calcium	Magnesium	Potassium	Sodium	pH
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	su
124-MW-103L	5/2/2013	<10	<5.5	98,600	49,200	19,700	562,000	NT
124-MW-103L	6/4/2015	13	12	63,400	52,300	16,100	60,600	8.10
124-MW-102T	5/2/2013	35.5	41	185,000	27,800	<10,000	106,000	NT
124-MW-102T	6/5/2015	14.9	12	220,000	31,200	<10,000	122,000	7.75
124-MW-105T	5/2/2013	474	510	166,000	<5,000	<10,000	212,000	NT
124-MW-106T	5/2/2013	<10	<5.5	332,000	45,100	34,900	1,020,000	NT
124-MW-107T	5/2/2013	<10	<5.5	484,000	233,000	46,500	2,340,000	NT
124-MW-107T	6/3/2015	<10	<5.5	652,000	224,000	15,900	1,860,000	7.60
124-MW-G02T	5/1/2013	<10	<5.5	425,000	171,000	13,000	1,800,000	NT
119-MW-02T	5/1/2013	<10	<5.5	45,000	7,290	<10,000	151,000	NT
119-MW-01T	5/1/2013	<10	<5.5	230,000	<5000	15,900	400,000	NT
124-MW-104T	5/1/2013	92	78	114,000	13,700	<10,000	35,100	NT
124-MW-104T	6/4/2015	<10	<5.5	162,000	23,000	<10,000	58,800	7.95
124-MW-104L	5/1/2013	39.8	38	51,400	24,200	12,100	73,500	NT

Notes:

Shaded well and results indicate post-remediation samples collected prior to cap installation.

Prepared By: DEN 6/30/15

Checked By: JLD 7/1/15

Table 6-1
Summary of S-3 Injection Events Through 2015

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

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

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

(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

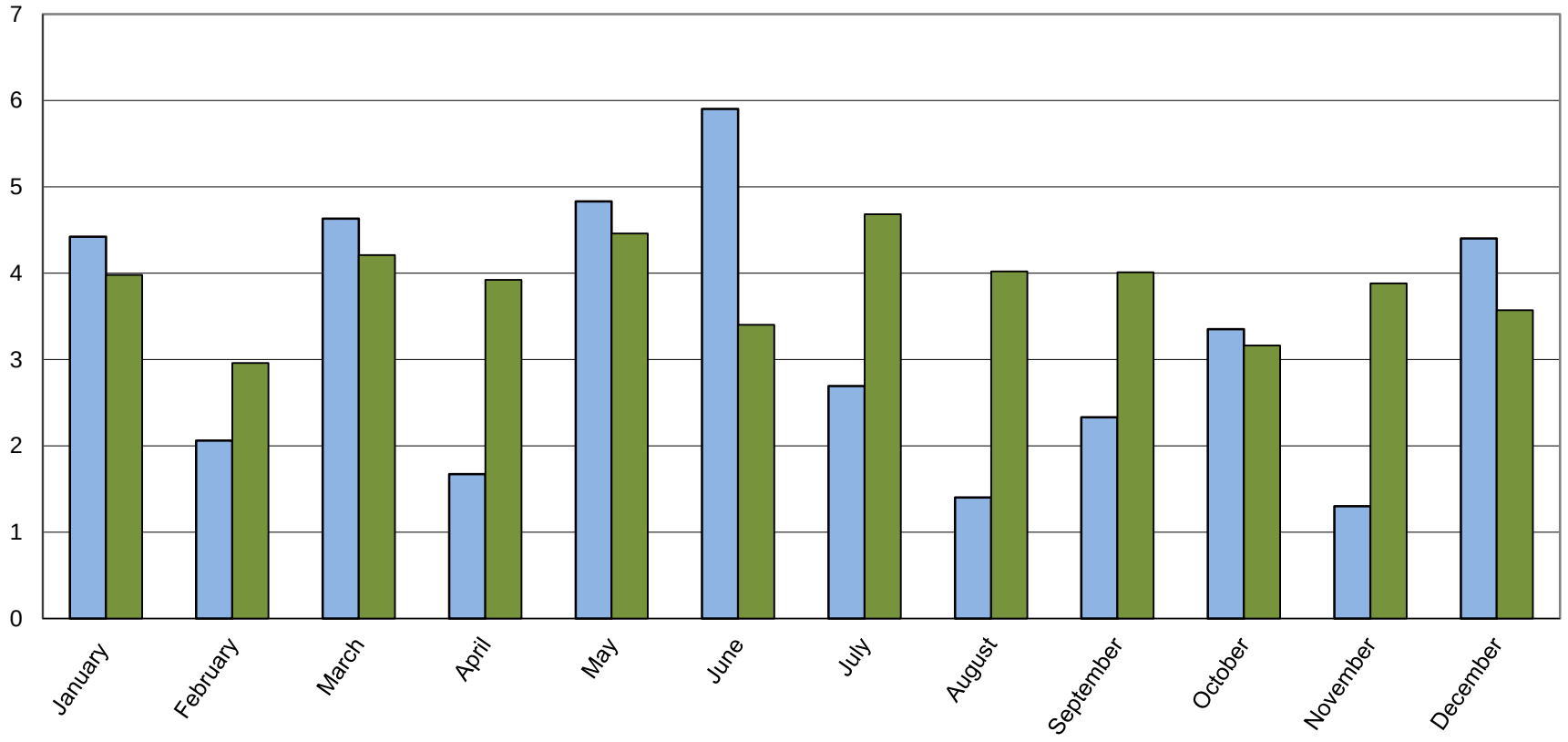
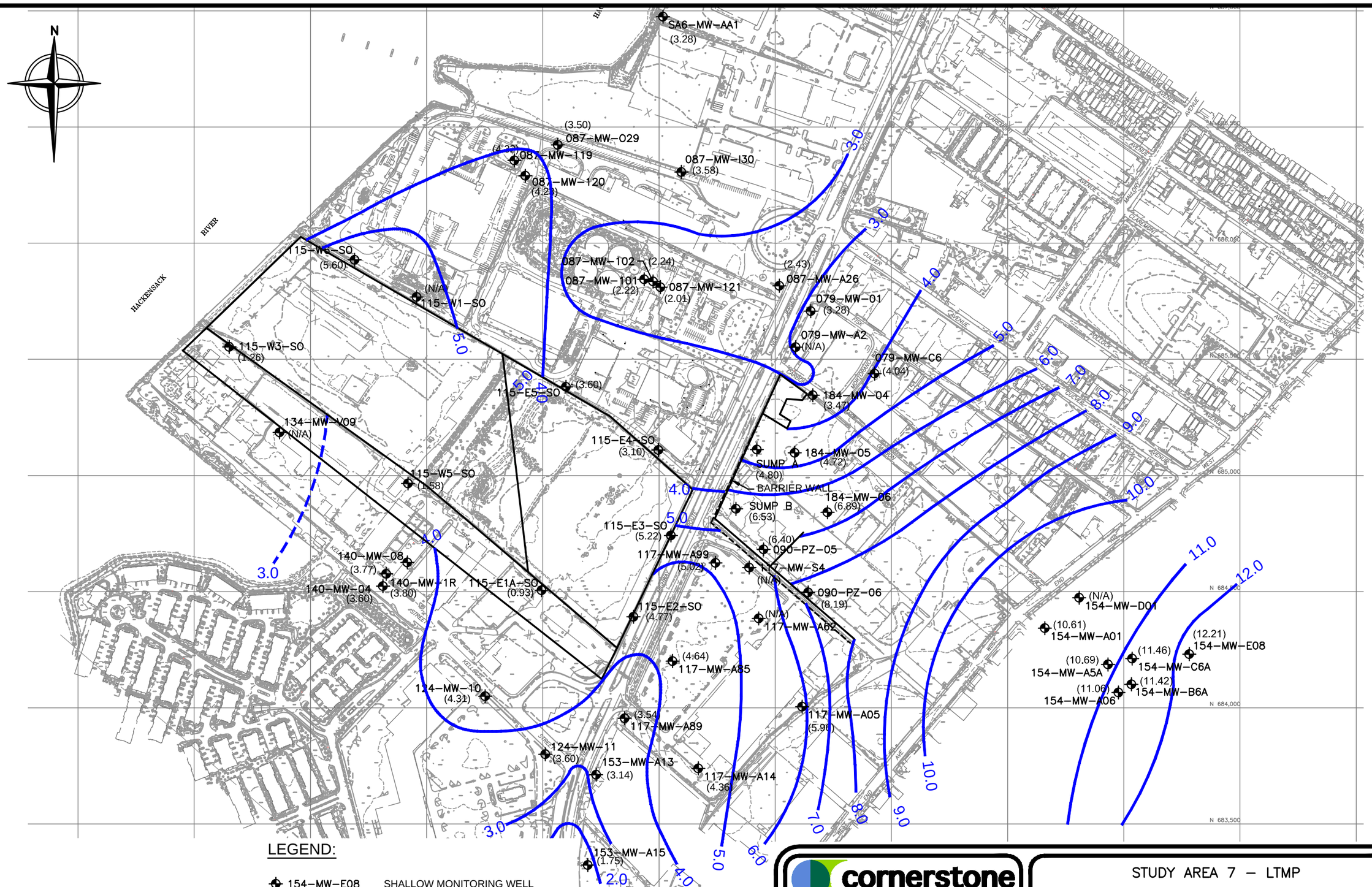


FIGURE 2-1

2015 Monthly Precipitation

Integrated Annual Groundwater Performance Report
2015

cornerstone
environmental



LEGEND:

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

0 400 800

SCALE IN FEET

cornerstone environmental

PREPARED BY:
CORNERSTONE ENVIRONMENTAL GROUP, LLC

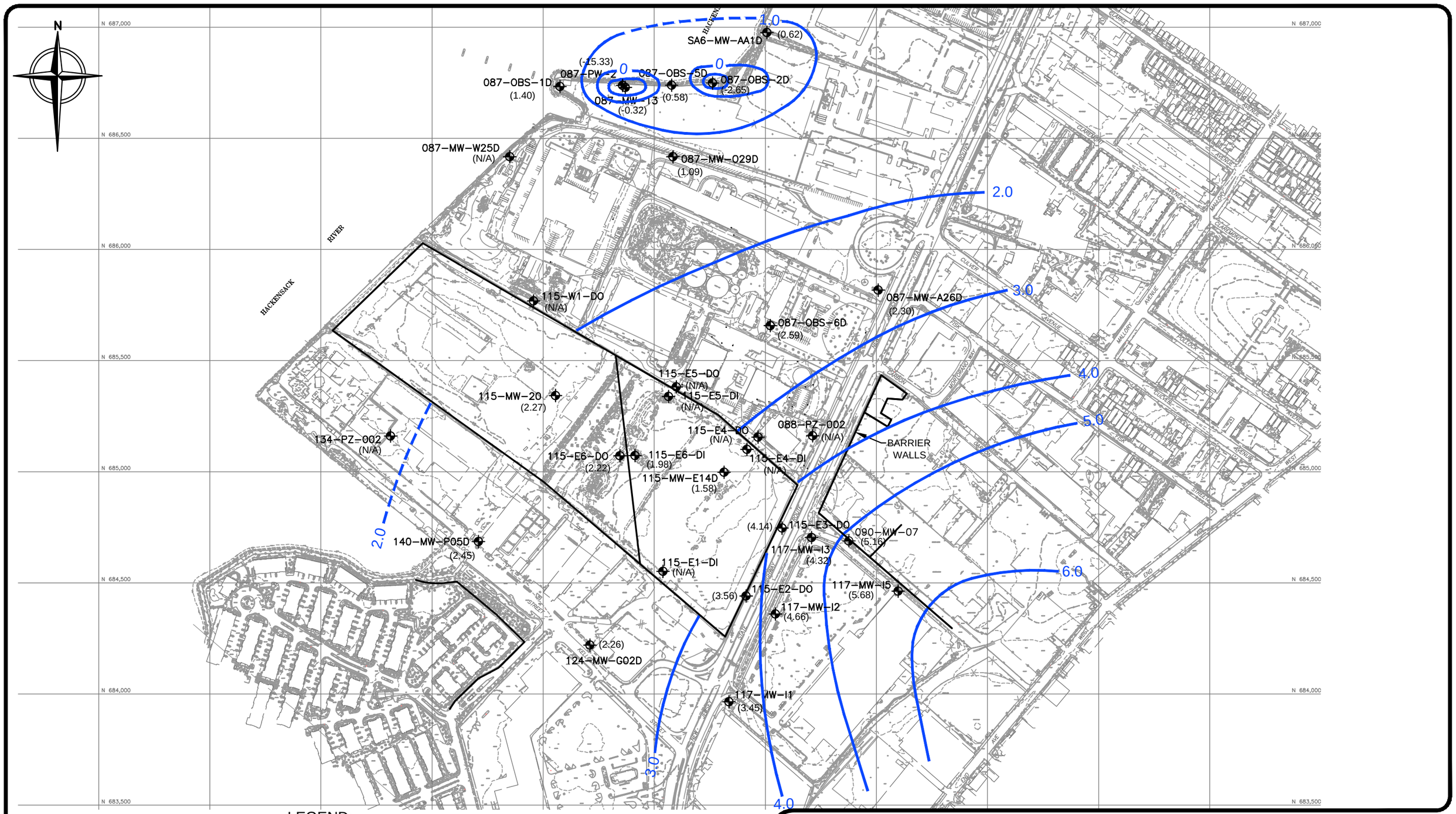
STUDY AREA 7 – LTMP

SEPTEMBER 2015

GROUNDWATER ELEVATION CONTOURS SHALLOW ZONE

FIGURE NO. **4-1**

PROJECT NO. 150463



LEGEND:

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

0 400 800

SCALE IN FEET

cornerstone environmental

PREPARED BY:
CORNERSTONE ENVIRONMENTAL GROUP, LLC

STUDY AREA 7 – LTMP

SEPTEMBER 2015

GWET LTMP
GROUNDWATER ELEVATION CONTOURS
INTERMEDIATE ZONE

FIGURE NO. **4-2**

PROJECT NO. 150463

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2015- 4Q - Annual Figures\2015 WELL SAMPLING FIGURES\H15WSF-S-SITE-4_2.dwg Layout: FIGURE 4-2 INTERMEDIATE ZONE User: magdalen

N

N 687,000
N 686,500
N 686,000
N 685,500
N 685,000
N 684,500
N 684,000
N 683,500

SA6-MW-AA1T (0.75)
087-MW-08 (0.43)
087-OBS-3L (-0.19)
(-26.89)
087-PW-1
(1.02)**
087-OBS-1L
087-OBS-1T (1.07)
087-OBS-5T (-0.74)
087-MW-34 (-1.33)
087-OBS-4T (0.12)
087-MW-W25T (N/A)
087-MW-01 (2.59)
087-MW-A26T (2.25)
087-IW-01 (1.77)
088-MW-G19T (NA)
088-IW-03 (NA)
088-IW-02 (NA)
088-IW-01 (NA)
(2.00)
115-MW-E14T
115-PW-21 (1.34)
090-MW-09 (5.43)
115-MW-A12T (1.07)*
117-MW-I4 (4.89)
115-MW-E08TR (2.30)
124-MW-106T (N/A)
117-MW-D3 (5.18)
(3.97)
117-MW-D2
124-MW-105T (N/A)
124-MW-G02T (1.65)
(N/A)
(2.50)**
124-MW-104L
124-MW-104T
119-MW-01T (2.18)
117-MW-D1 (2.42)
119-MW-02T (2.32)
153-MW-A13T (2.56)

1.0
2.0
3.0
4.0
5.0

RIVER
HACKENSACK

0 400 800
SCALE IN FEET

LEGEND:

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

* REFERENCE POINT ELEVATION NOT ACCURATE

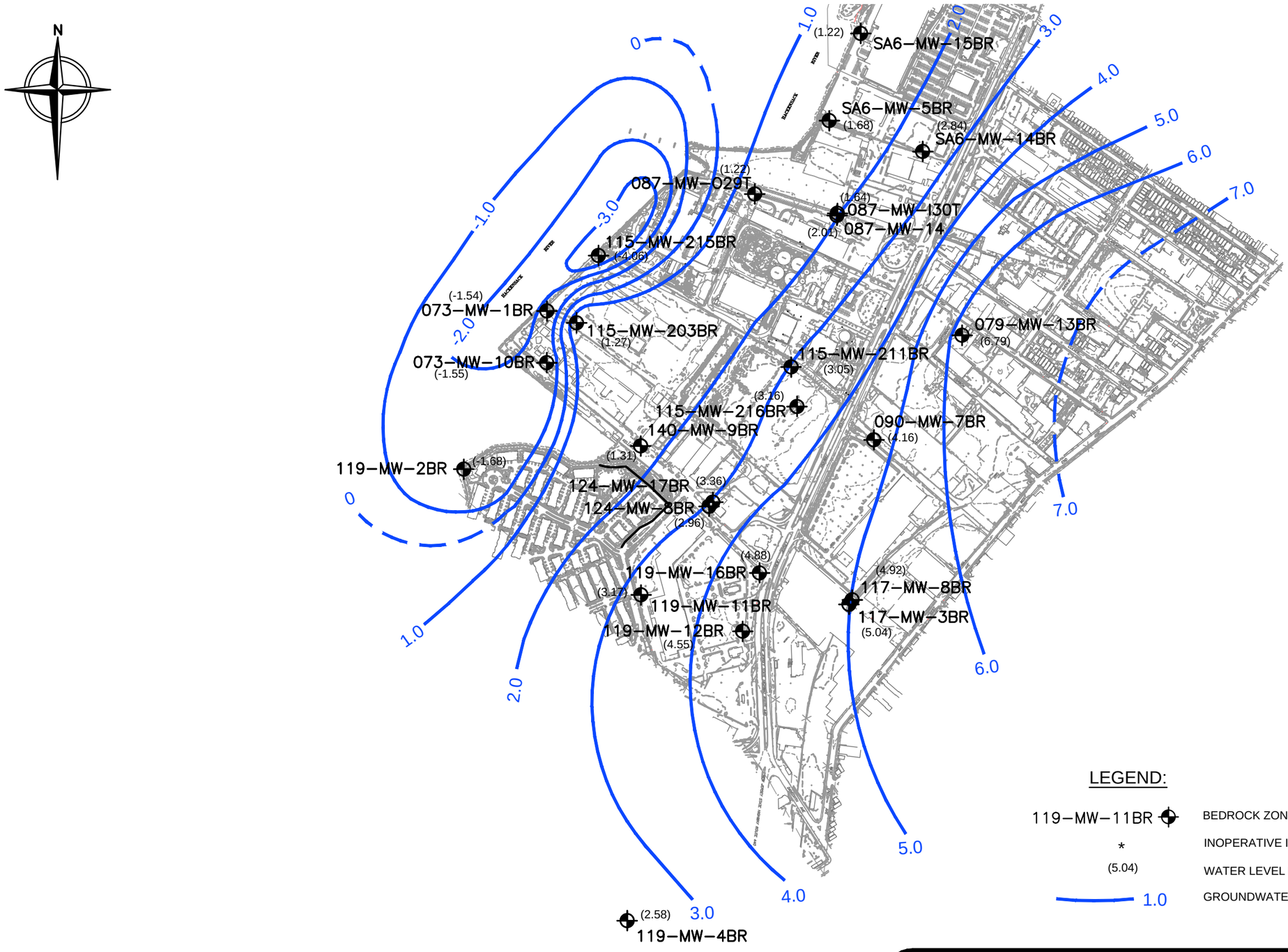
** SCREENED BETWEEN INTERMEDIATE AND DEEP ZONES

cornerstone environmental

PREPARED BY:
CORNERSTONE ENVIRONMENTAL GROUP, LLC

STUDY AREA 7 – LTMP
SEPTEMBER 2015
GWET LTMP
GROUNDWATER ELEVATION CONTOURS
DEEP ZONE

FIGURE NO.
4-3
PROJECT NO.
150469



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)

0 750 1500

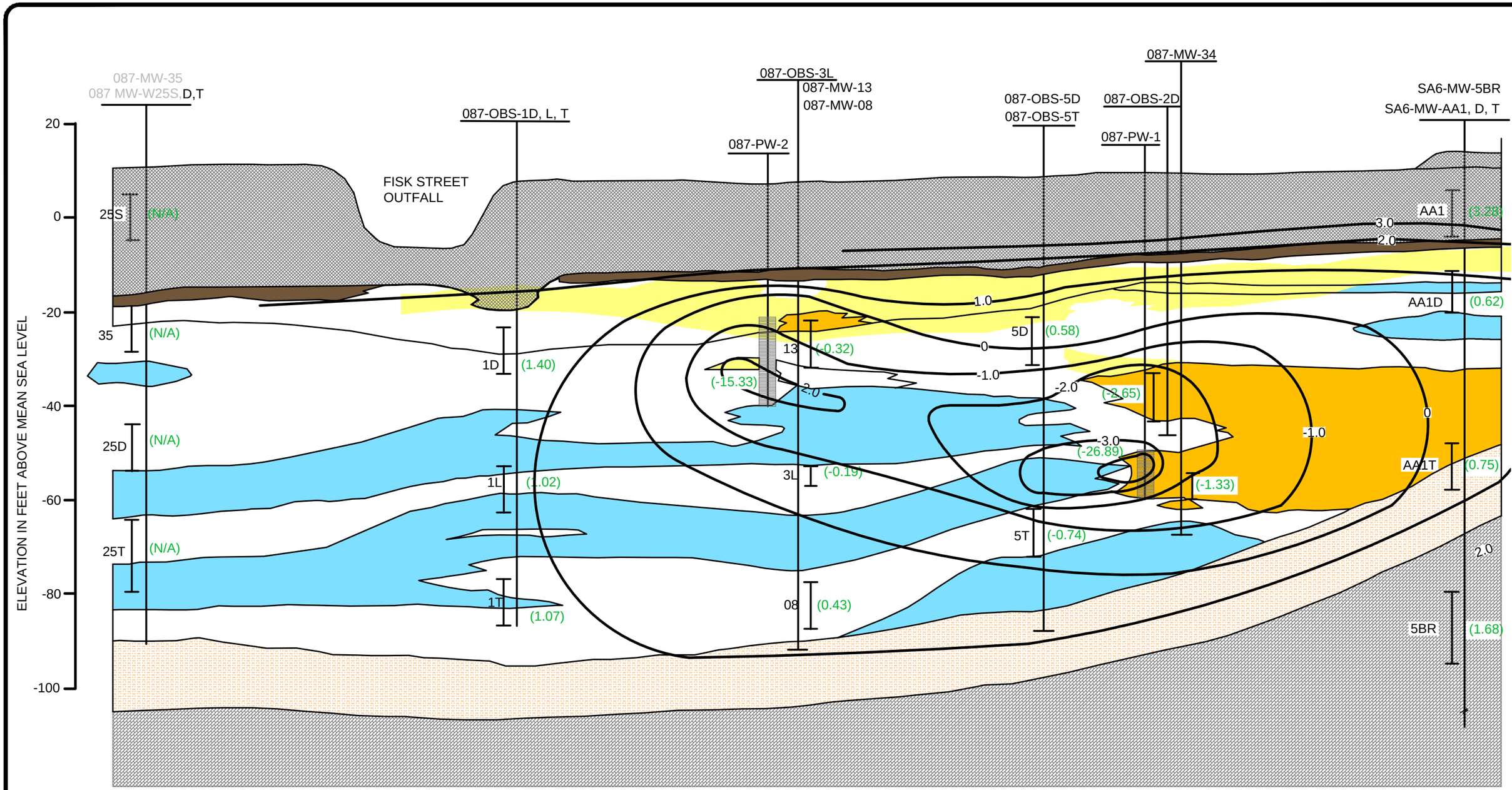
SCALE IN FEET

cornerstone environmental

PREPARED BY:
CORNERSTONE ENVIRONMENTAL GROUP, LLC

STUDY AREA 7 – LTMP
SEPTEMBER 2015
GWET LTMP
GROUNDWATER ELEVATION CONTOURS
BEDROCK ZONE

FIGURE NO.
4-4
PROJECT NO.
150409



LEGEND:

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

087-MW-W25T — WELL DESIGNATION

GROUND SURFACE

25T — SCREENED INTERVAL

cornerstone environmental

PREPARED BY:
CORNERSTONE ENVIRONMENTAL GROUP, LLC

STUDY AREA 7 – LTMP

GROUNDWATER ELEVATIONS IN CROSS-SECTION SEPTEMBER 2015

FIGURE NO.
4-5
PROJECT NO.
150463

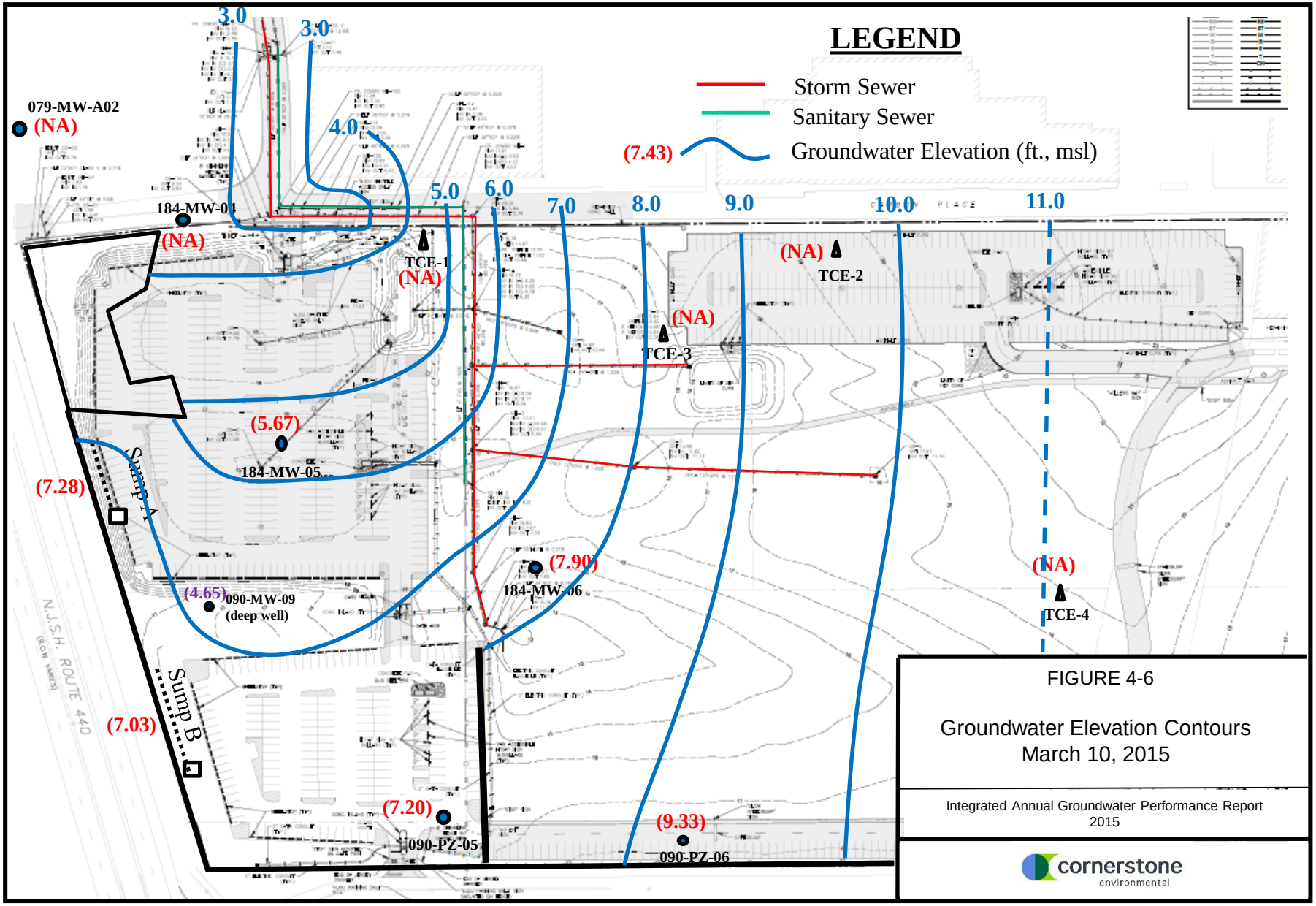


FIGURE 4-6

Groundwater Elevation Contours
March 10, 2015

Integrated Annual Groundwater Performance Report
2015

cornerstone environmental

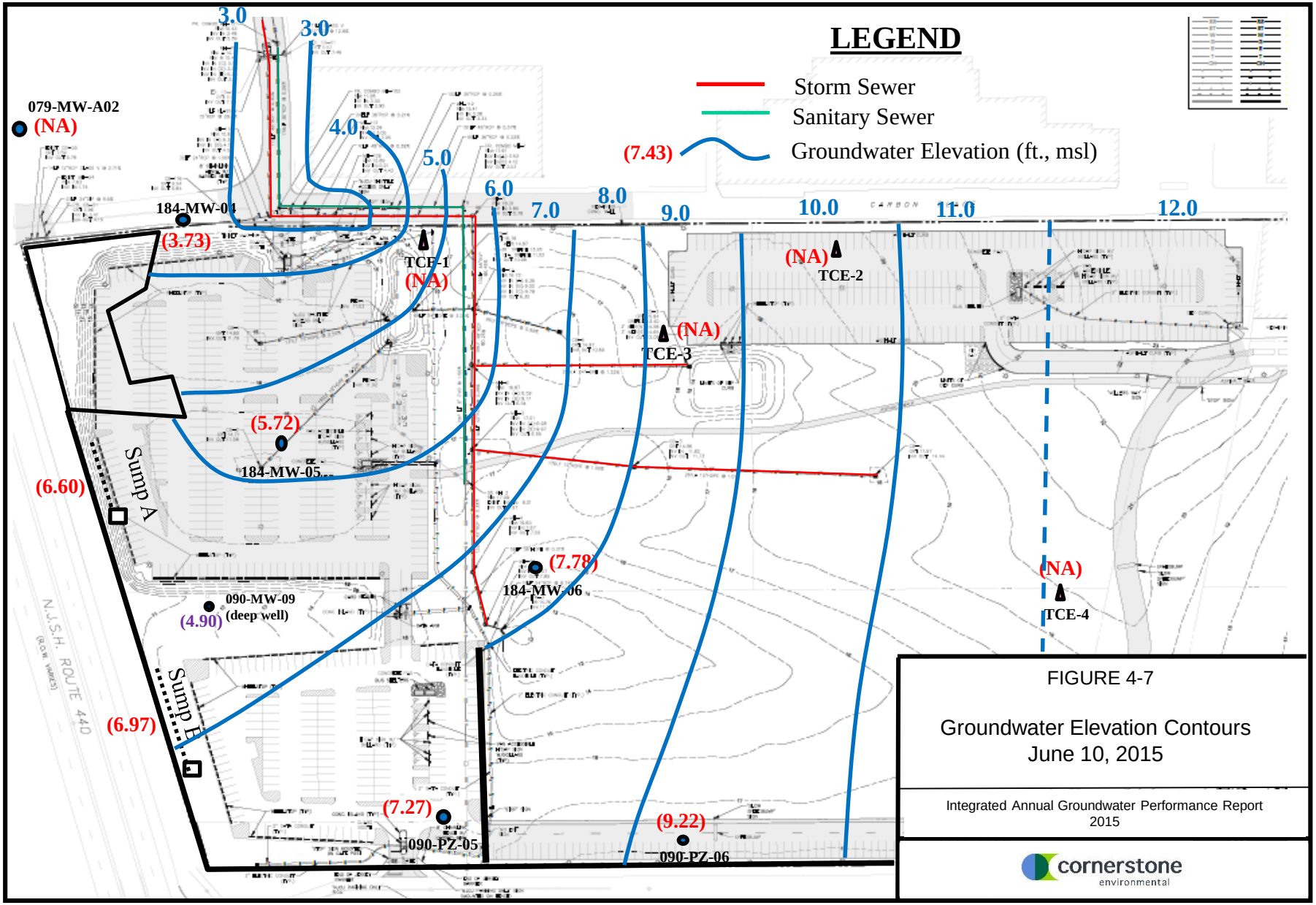


FIGURE 4-7

Groundwater Elevation Contours
June 10, 2015

Integrated Annual Groundwater Performance Report
2015

cornerstone environmental

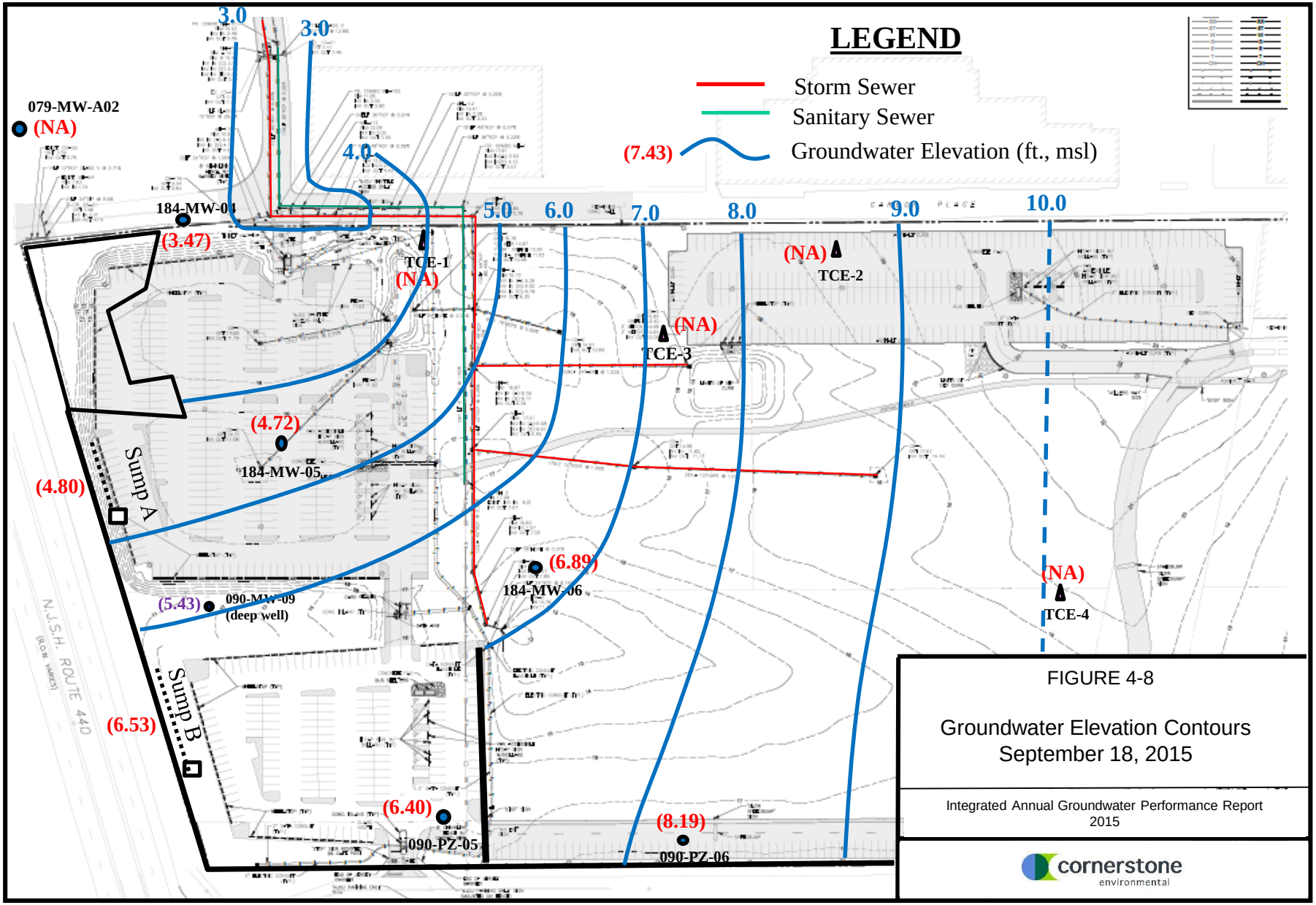


FIGURE 4-8

Groundwater Elevation Contours
September 18, 2015

Integrated Annual Groundwater Performance Report
2015

cornerstone
environmental

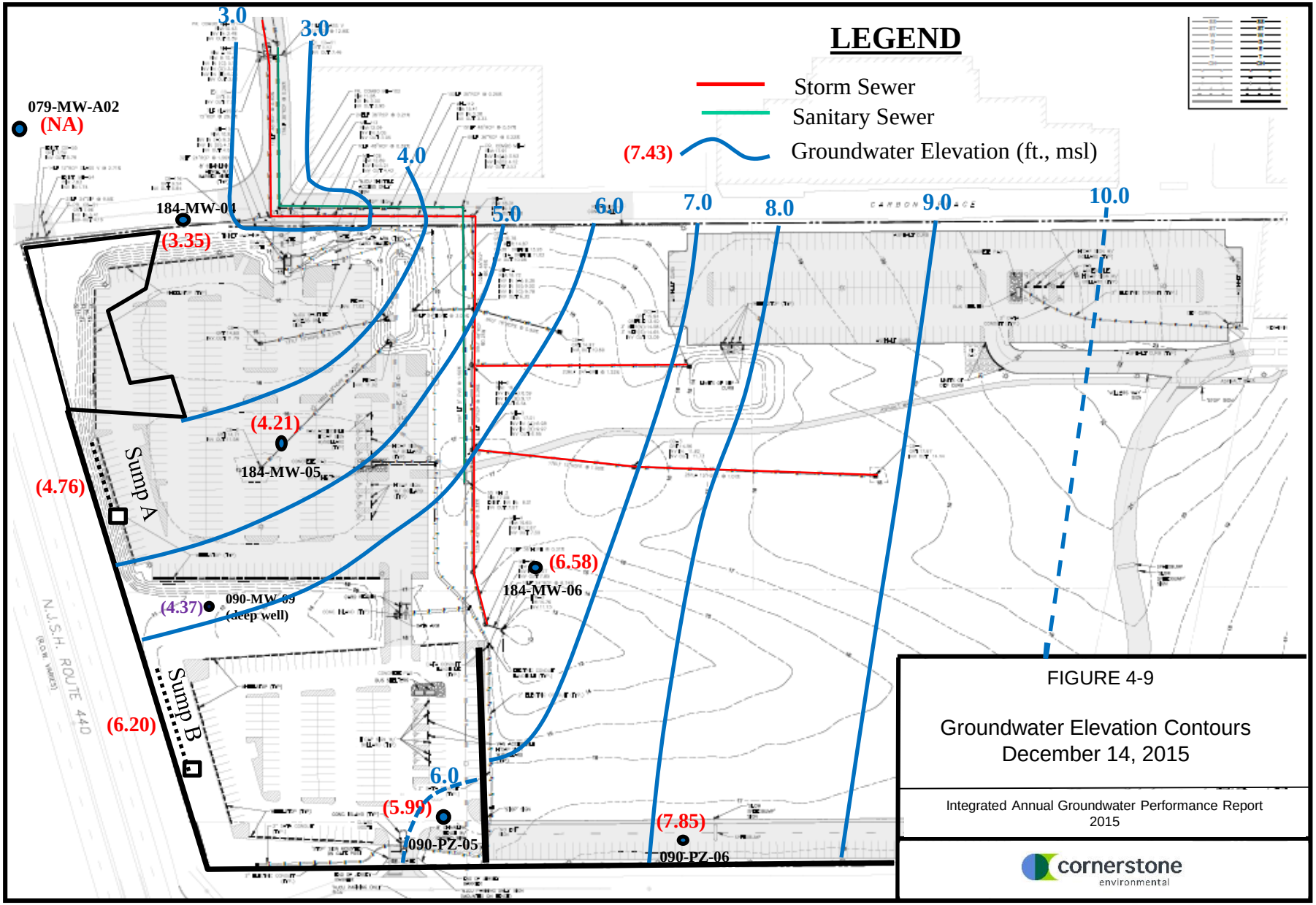


FIGURE 4-9

Groundwater Elevation Contours
December 14, 2015

Integrated Annual Groundwater Performance Report
2015

cornerstone
environmental

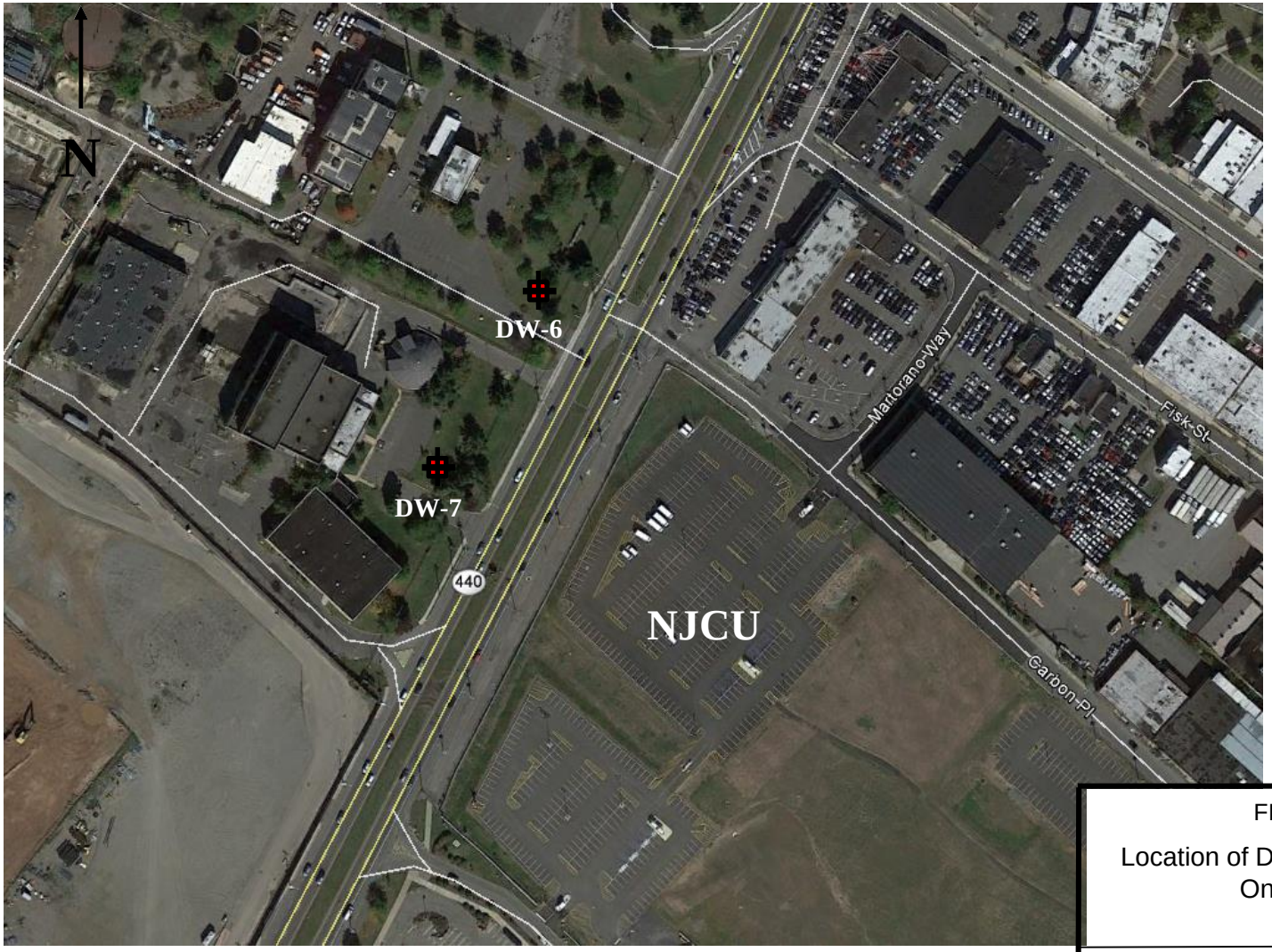


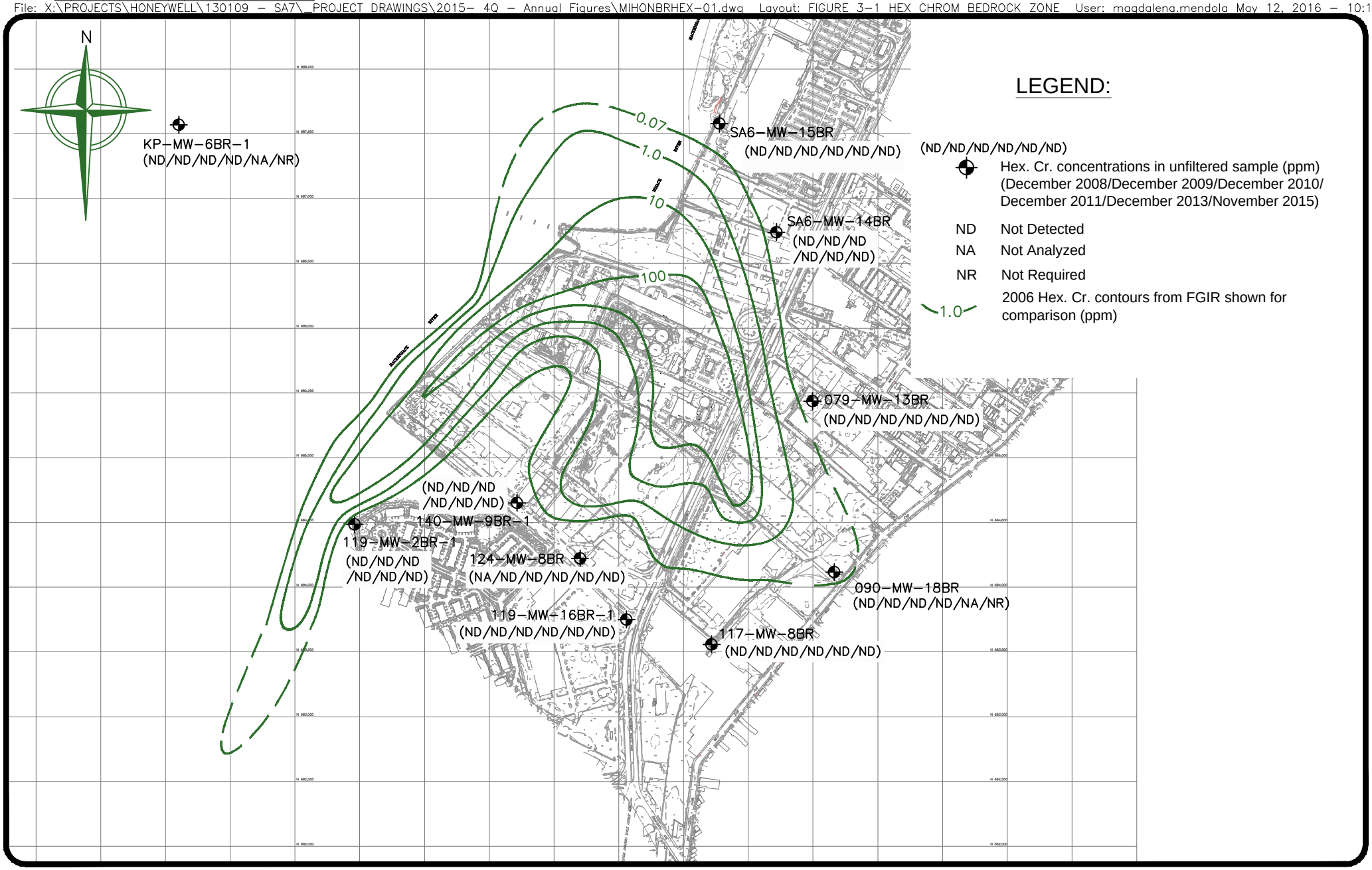
FIGURE 4-10

Location of Depressurization Wells
On SA6-North

Integrated Annual Groundwater Performance Report
2015

Depressurization Well

cornerstone
environmental



0 1000 2000

SCALE IN FEET

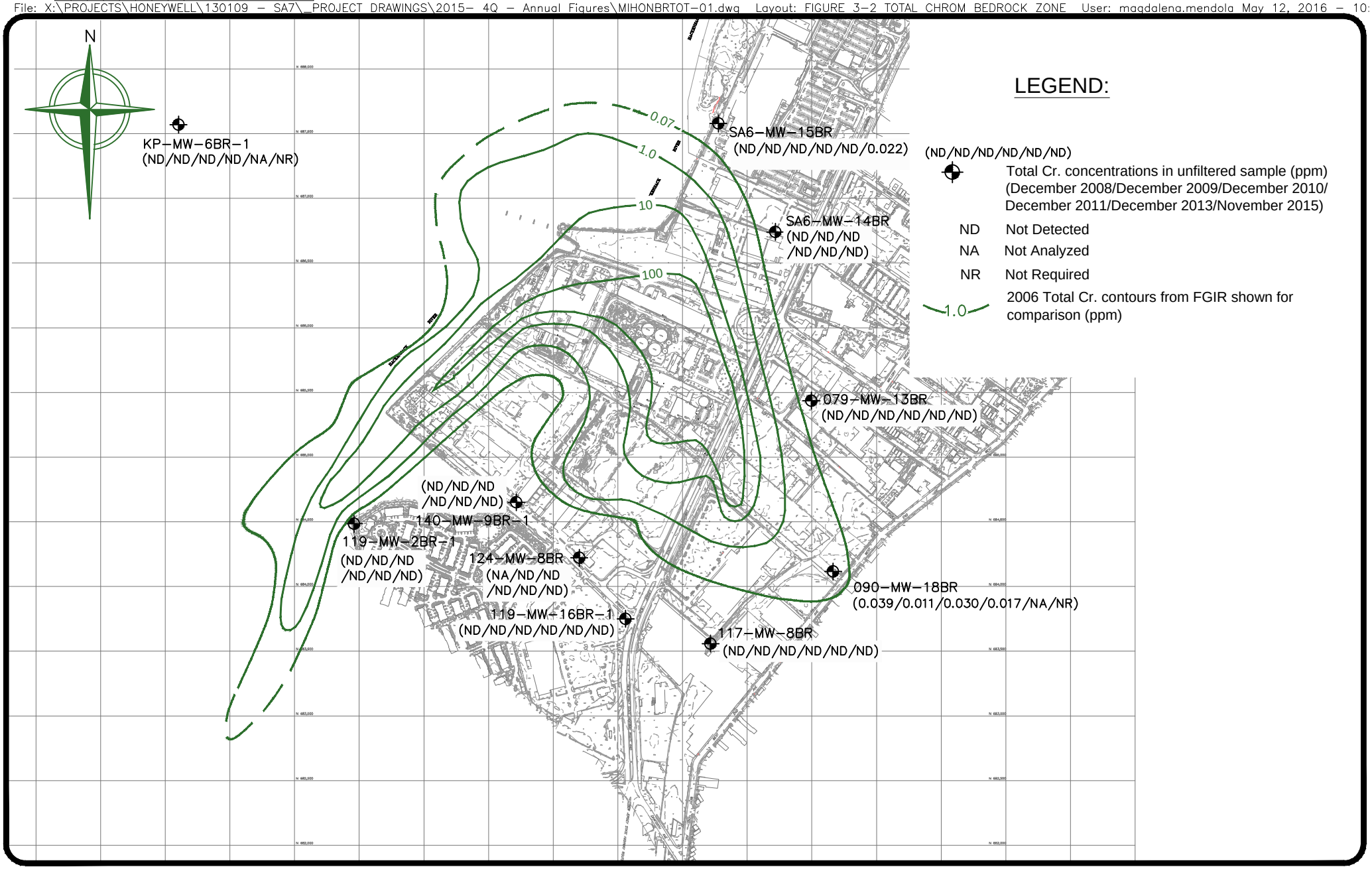
cornerstone environmental

PREPARED BY:
CORNERSTONE ENVIRONMENTAL GROUP, LLC

STUDY AREA 7 - LTMP

Hexavalent Chromium Concentrations in Bedrock Groundwater

FIGURE NO.
5-1
PROJECT NO.
150463



0 1000 2000

SCALE IN FEET

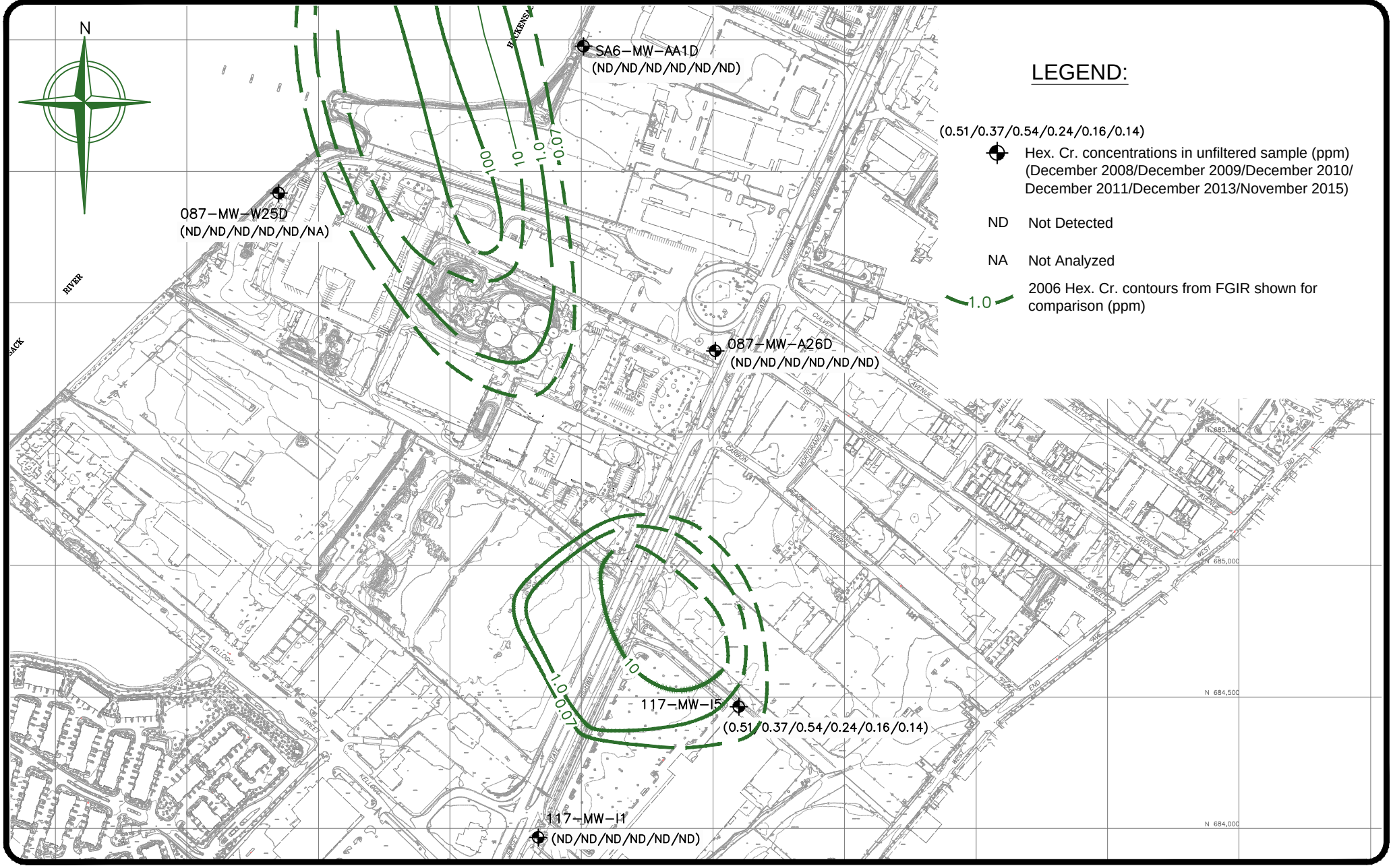
cornerstone environmental

PREPARED BY:
CORNERSTONE ENVIRONMENTAL GROUP, LLC

STUDY AREA 7 - LTMP

Total Chromium Concentrations in Bedrock Groundwater

FIGURE NO.
5-2
PROJECT NO.
150463



0 500 1000

SCALE IN FEET

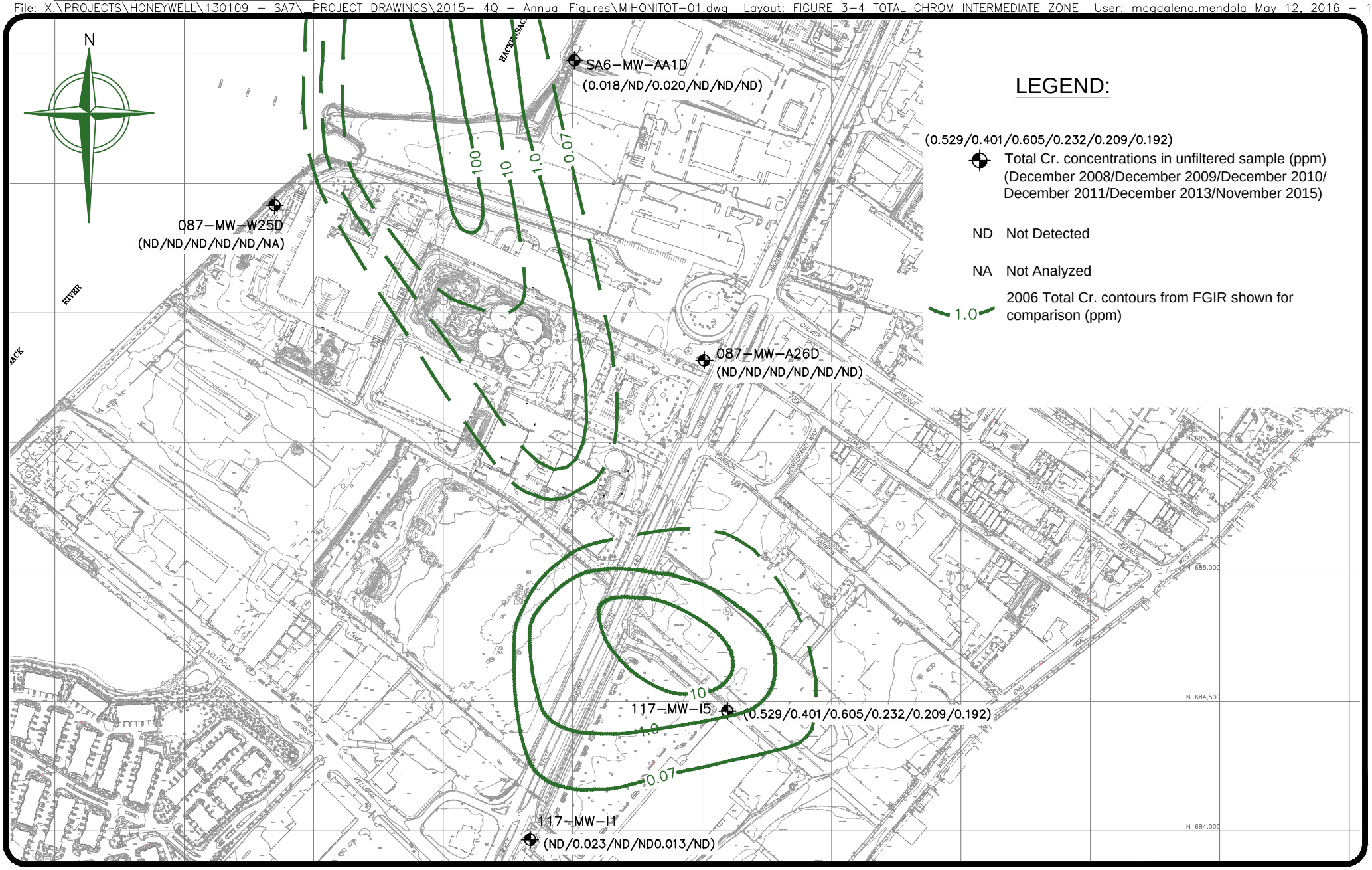
cornerstone environmental

PREPARED BY:
CORNERSTONE ENVIRONMENTAL GROUP, LLC

STUDY AREA 7 - LTMP

Hexavalent Chromium Concentrations in Intermediate Zone Groundwater

FIGURE NO.
5-3
PROJECT NO.
150463



0 500 1000

SCALE IN FEET

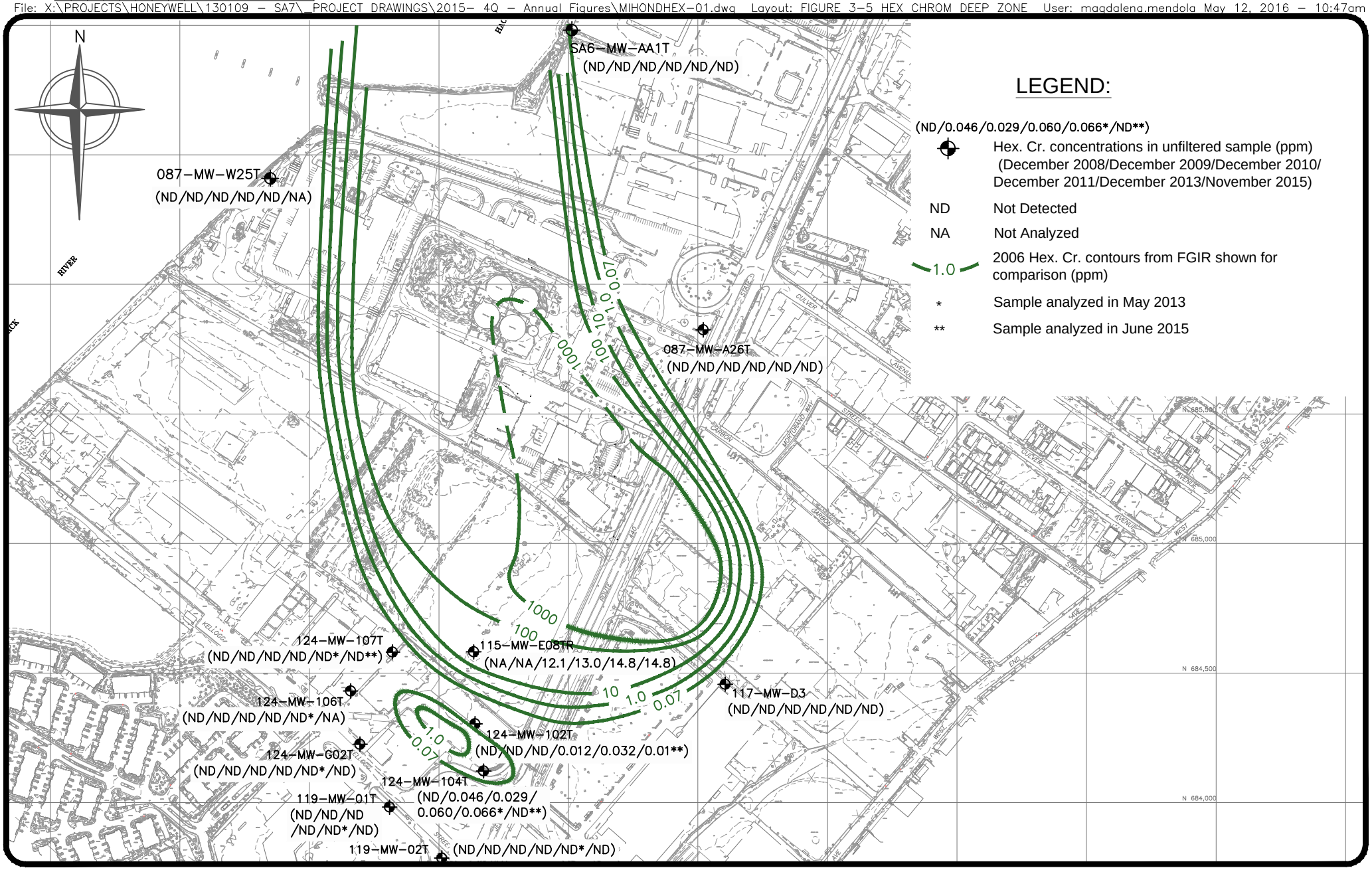
cornerstone environmental

PREPARED BY:
CORNERSTONE ENVIRONMENTAL GROUP, LLC

STUDY AREA 7 - LTMP

Total Chromium Concentrations in Intermediate Zone Groundwater

FIGURE NO.
5-4
PROJECT NO.
150463



LEGEND:

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

ND — Not Detected

NA — Not Analyzed

1.0 — 2006 Hex. Cr. contours from FGIR shown for comparison (ppm)

* — Sample analyzed in May 2013

** — Sample analyzed in June 2015

0 500 1000

SCALE IN FEET

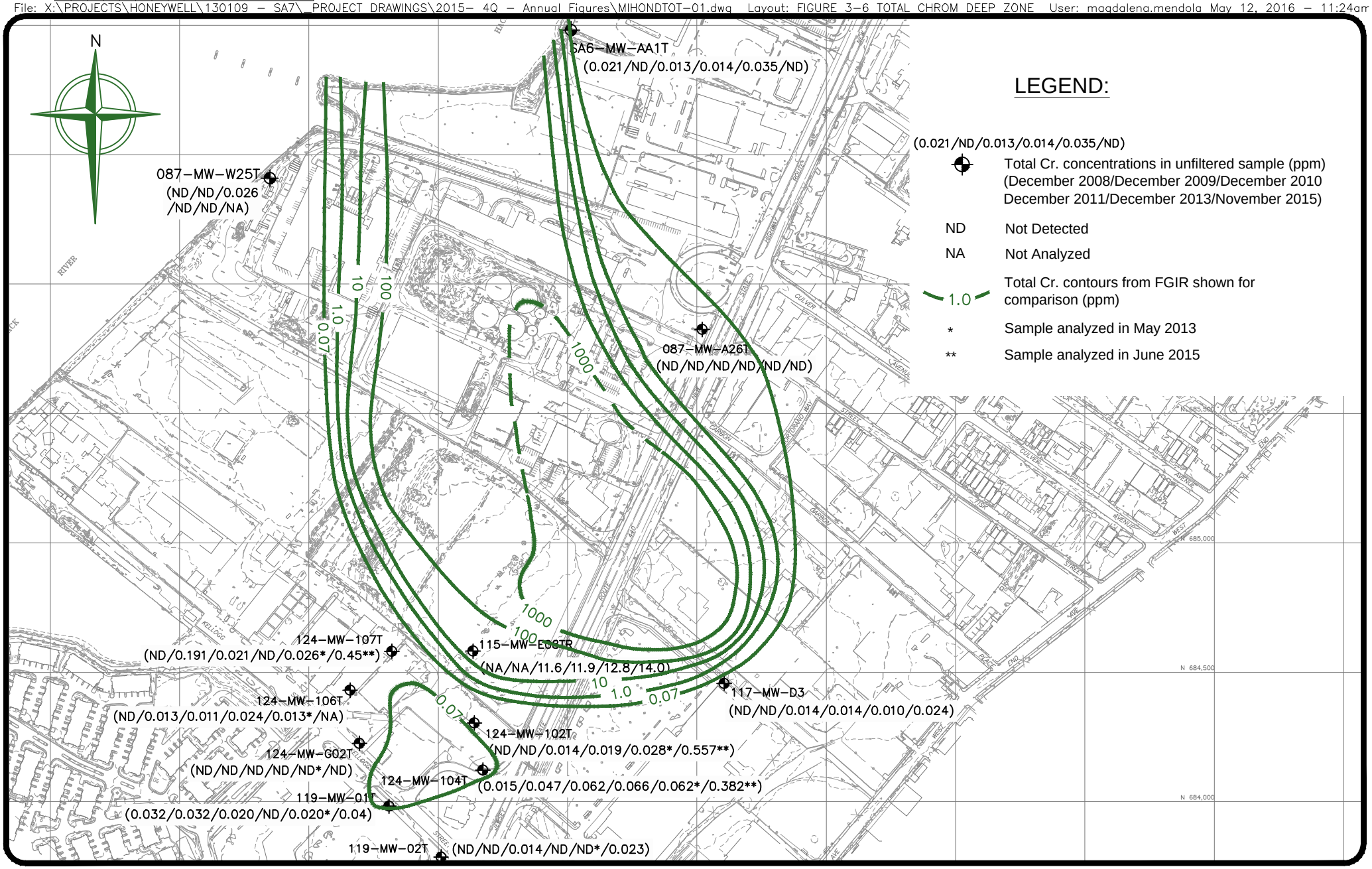
cornerstone environmental

PREPARED BY:
CORNERSTONE ENVIRONMENTAL GROUP, LLC

STUDY AREA 7 - LTMP

Hexavalent Chromium Concentrations in Deep Groundwater

FIGURE NO.
5-5
PROJECT NO.
150463



LEGEND:

(0.021/ND/0.013/0.014/0.035/ND) — Total Cr. concentrations in unfiltered sample (ppm) (December 2008/December 2009/December 2010 December 2011/December 2013/November 2015)

ND — Not Detected

NA — Not Analyzed

1.0 — Total Cr. contours from FGIR shown for comparison (ppm)

* — Sample analyzed in May 2013

** — Sample analyzed in June 2015

0 500 1000

SCALE IN FEET

cornerstone environmental

PREPARED BY:
CORNERSTONE ENVIRONMENTAL GROUP, LLC

STUDY AREA 7 - LTMP

Total Chromium Concentrations in Deep Groundwater

FIGURE NO.
5-6
PROJECT NO.
150463

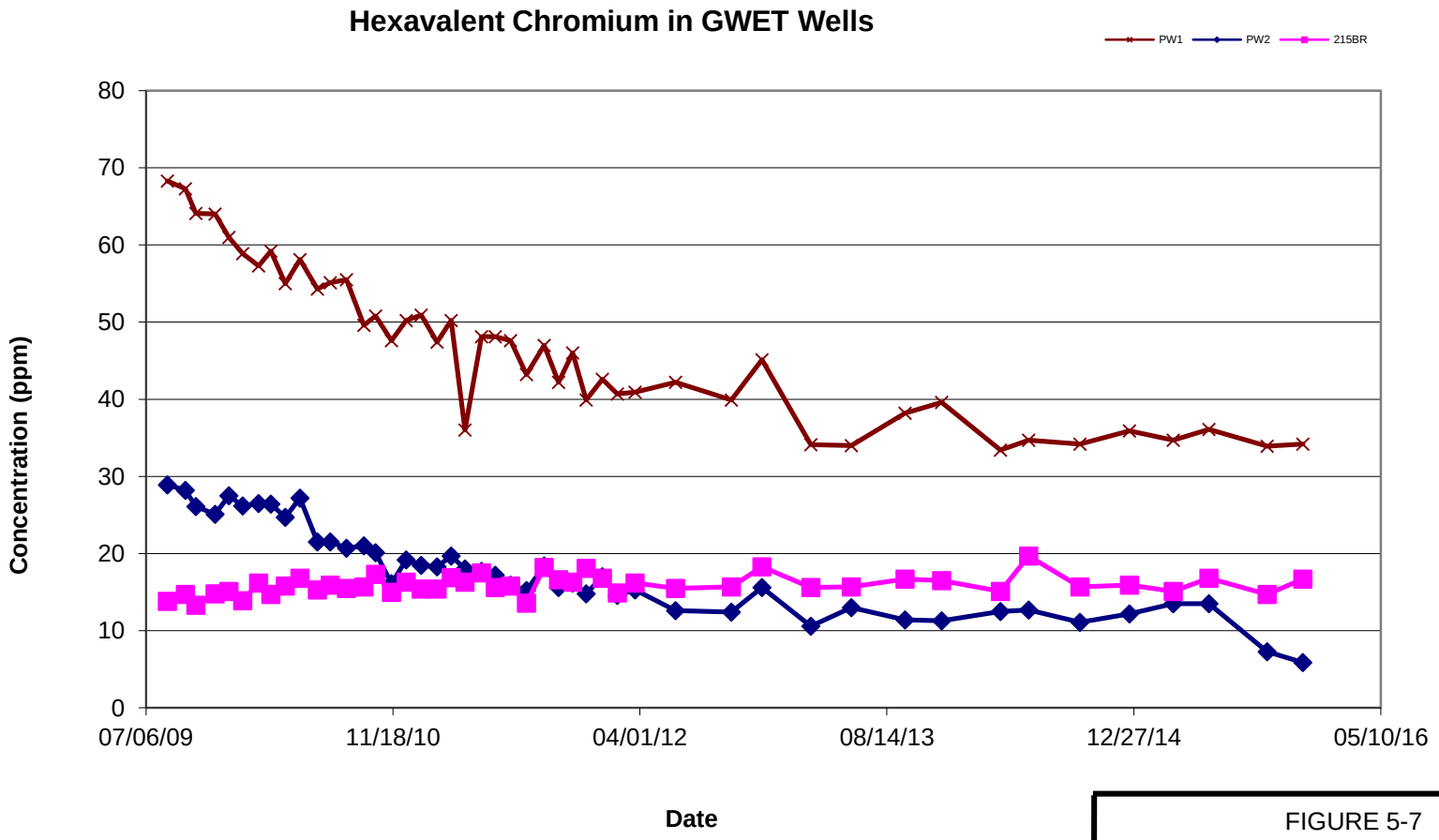


FIGURE 5-7

Hexavalent Chromium Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2015

cornerstone environmental

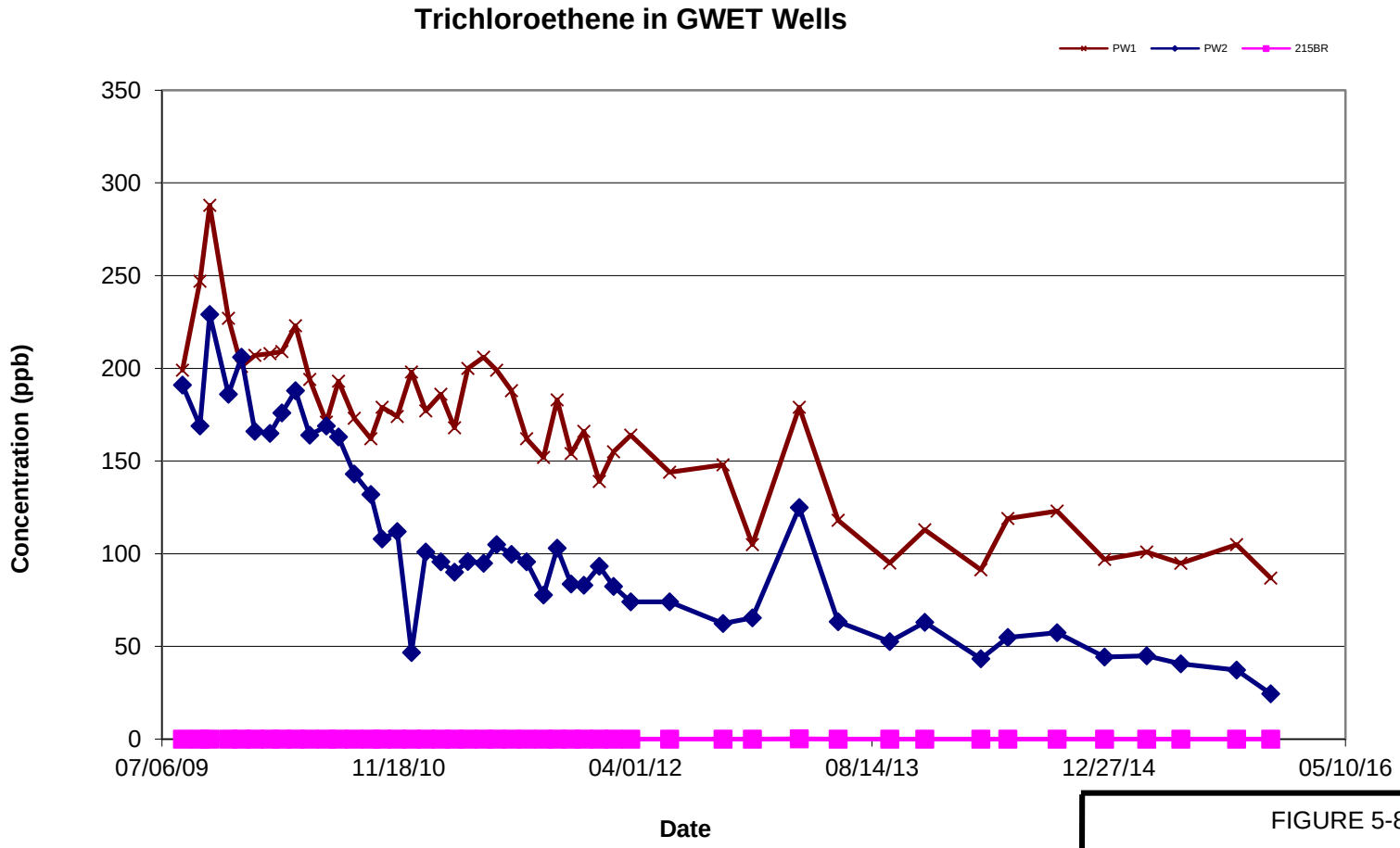
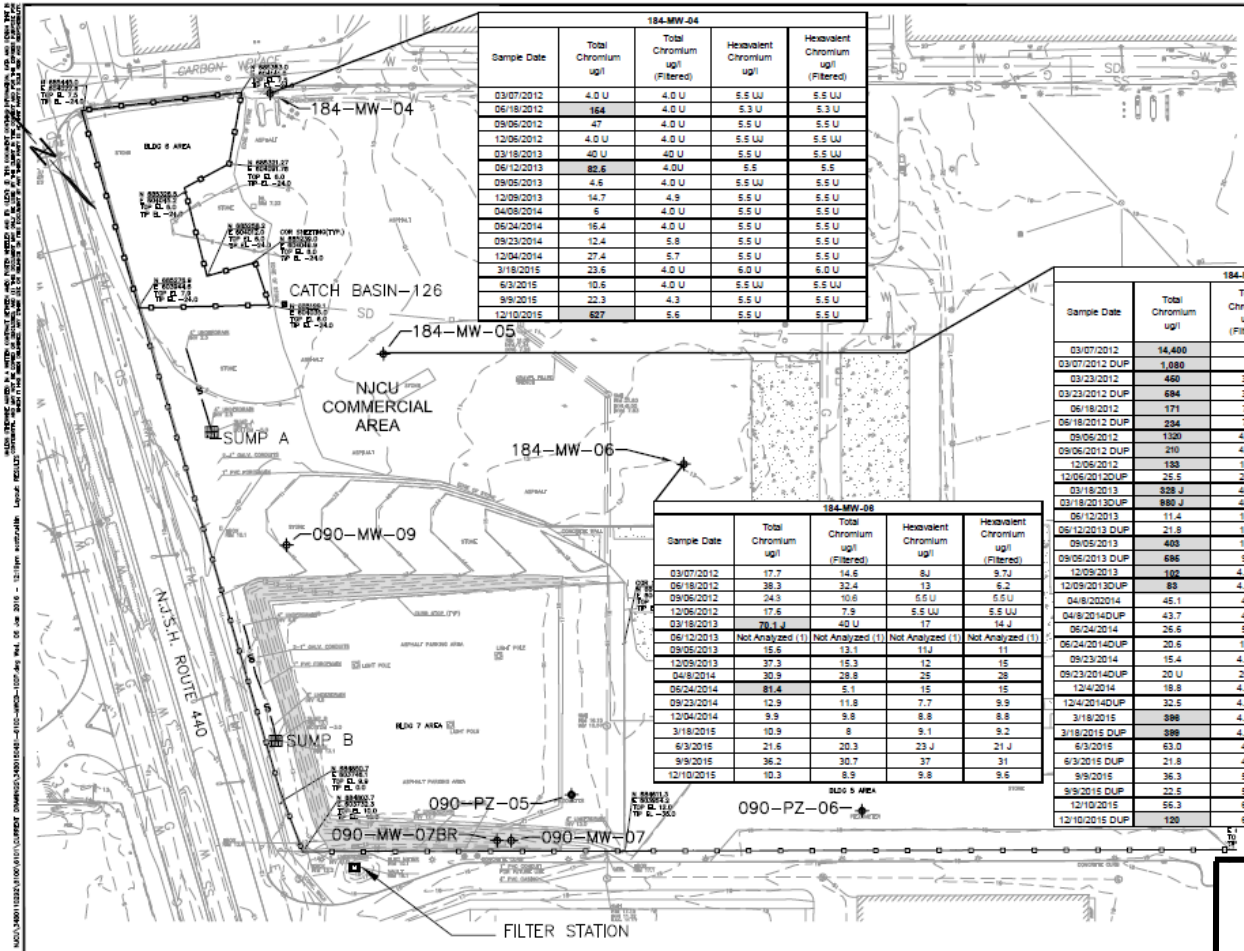


FIGURE 5-8

Trichloroethylene Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2015

cornerstone environmental



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 UJ	5.5 UJ
06/18/2012	164	4.0 U	5.3 U	5.3 U
09/06/2012	47	4.0 U	5.5 U	5.5 U
12/06/2012	4.0 U	4.0 U	5.5 UJ	5.5 UJ
03/18/2013	40 U	40 U	5.5 U	5.5 UJ
06/12/2013	82.6	4.0U	5.5	5.5
09/05/2013	4.6	4.0 U	5.5 UJ	5.5 U
12/09/2013	14.7	4.9	5.5 U	5.5 U
04/08/2014	6	4.0 U	5.5 U	5.5 U
06/24/2014	16.4	4.0 U	5.5 U	5.5 U
09/23/2014	12.4	5.8	5.5 U	5.5 U
12/04/2014	27.4	5.7	5.5 U	5.5 U
3/18/2015	23.6	4.0 U	6.0 U	6.0 U
6/3/2015	10.6	4.0 U	5.5 UJ	5.5 UJ
9/9/2015	22.3	4.3	5.5 U	5.5 U
12/10/2015	627	5.6	5.5 U	5.5 U

184-MW-08

Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
03/07/2012	17.7	14.6	8J	9.7J
06/18/2012	38.3	32.4	13	6.2
09/06/2012	24.3	10.6	5.5 U	5.5 U
12/06/2012	17.6	7.9	5.5 UJ	5.5 UJ
03/18/2013	70.1 J	40 U	17	14 J
06/12/2013	Not Analyzed (1)	Not Analyzed (1)	Not Analyzed (1)	Not Analyzed (1)
09/05/2013	15.6	13.1	11J	11
12/09/2013	37.3	15.3	12	15
04/8/2014	30.9	28.8	25	28
06/24/2014	81.4	5.1	15	15
09/23/2014	12.9	11.8	7.7	9.9
12/04/2014	9.9	9.8	8.8	8.8
3/18/2015	10.9	8	9.1	9.2
6/3/2015	21.6	20.3	23 J	21 J
9/9/2015	36.2	30.7	37	31
12/10/2015	10.3	8.9	9.8	9.6

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	14,400	5	5.5 UJ	5 UJ
03/07/2012 DUP	1,080	4	5.5 UJ	5.5 UJ
03/23/2012	460	3.1	Not Analyzed	Not Analyzed
03/23/2012 DUP	694	3.5	Not Analyzed	Not Analyzed
06/18/2012	171	7.5	5.3 U	5.3 U
06/18/2012 DUP	234	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	210	4.0 U	5.5 U	5.5 U
12/06/2012	133	16.8	5.5 UJ	5.5 UJ
12/06/2012DUP	25.5	24.5	5.5 UJ	5.5 UJ
03/18/2013	328 J	40 U	5.5 U	5.5 UJ
03/18/2013DUP	980 J	40 U	5.5 U	5.5 UJ
06/12/2013	11.4	10.6	5.5U	6.6
06/12/2013 DUP	21.8	11.4	5.5	5.5U
09/05/2013	403	10.2	5.5 UJ	5.5 U
09/05/2013 DUP	686	9.3	5.5 UJ	5.5 U
12/09/2013	102	4.0 U	5.5 U	5.5 U
12/09/2013DUP	83	4.0 U	5.5 U	5.5 U
04/8/202014	45.1	4.3	5.5 U	5.5 U
04/8/2014DUP	43.7	4.3	5.5 U	5.5 U
06/24/2014	26.6	5.7	5.5 U	5.5 U
06/24/2014DUP	20.6	13.2	5.5 U	5.5 U
09/23/2014	15.4	4.0 U	5.5 U	5.5 U
09/23/2014DUP	20 U	20 U	5.5 U	5.5 U
12/4/2014	18.8	4.0 U	5.5 U	5.5 U
12/4/2014DUP	32.5	4.0 U	5.5 U	5.5 U
3/18/2015	396	4.0 U	6.0 U	6.0 U
3/18/2015 DUP	399	4.0 U	6.0 U	6.0 U
6/3/2015	63.0	4.0	5.5 UJ	5.5 UJ
6/3/2015 DUP	21.8	4.5	5.5 UJ	5.5 UJ
9/9/2015	36.3	5.6	5.5 U	5.5 U
9/9/2015 DUP	22.5	5.7	5.5 U	5.5 U
12/10/2015	56.3	6.4	5.5 U	5.5 U
12/10/2015 DUP	120	6.8	5.5 U	5.5 U

LEGEND

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

U – COMPOUND NOT DETECTED AT THE REPORTING LIMIT

J – VALIDATION QUALIFIER INDICATING ESTIMATED CONCENTRATION

ug/L – MICROGRAMS PER LITER

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

FIGURE 5-9

Summary of Groundwater Quality Sampling Results in NJCU Sentinel Wells

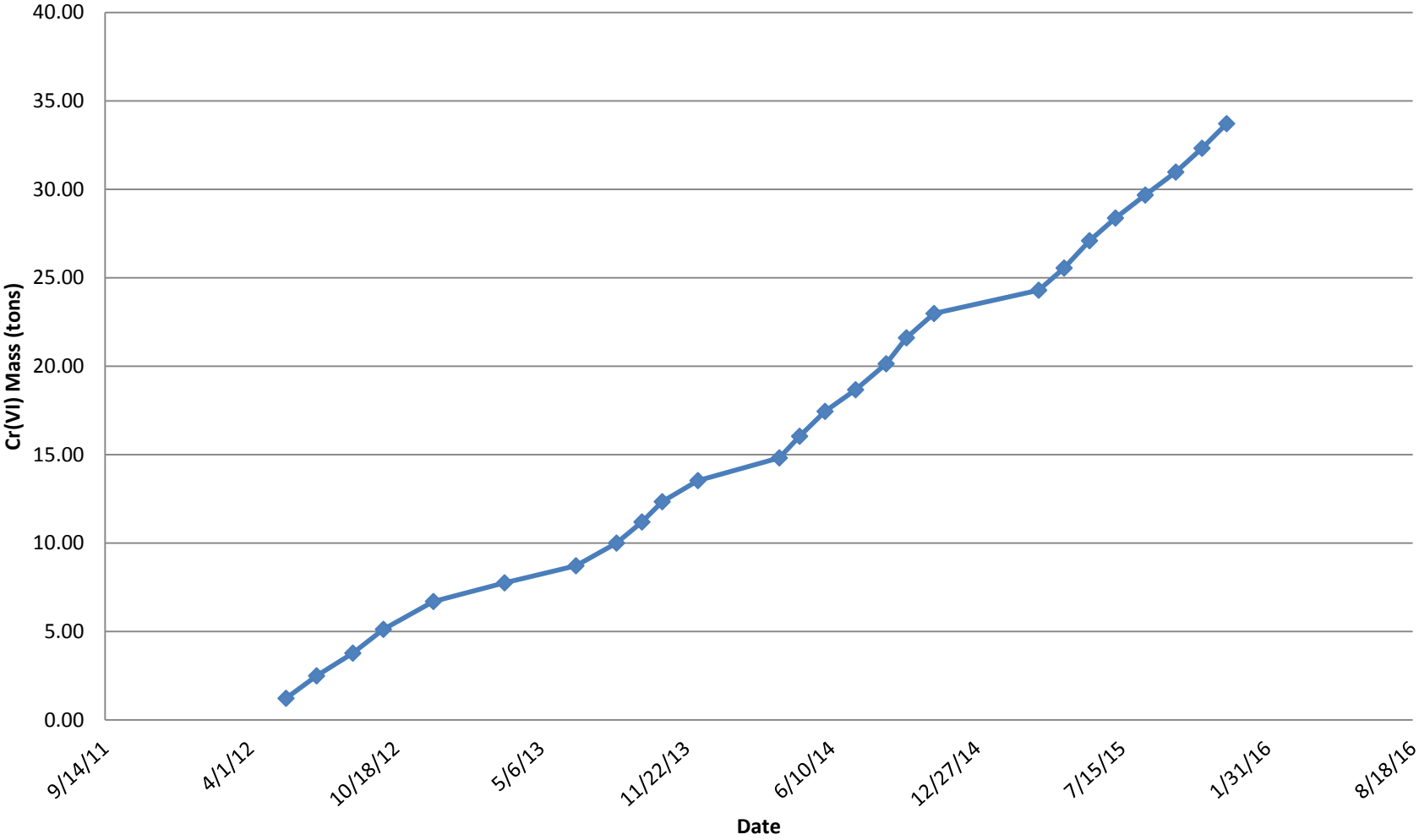
Integrated Annual Groundwater Performance Report
2015

cornerstone environmental

cornerstone environmental

Location of S-3 Injection Wells Used in 2015

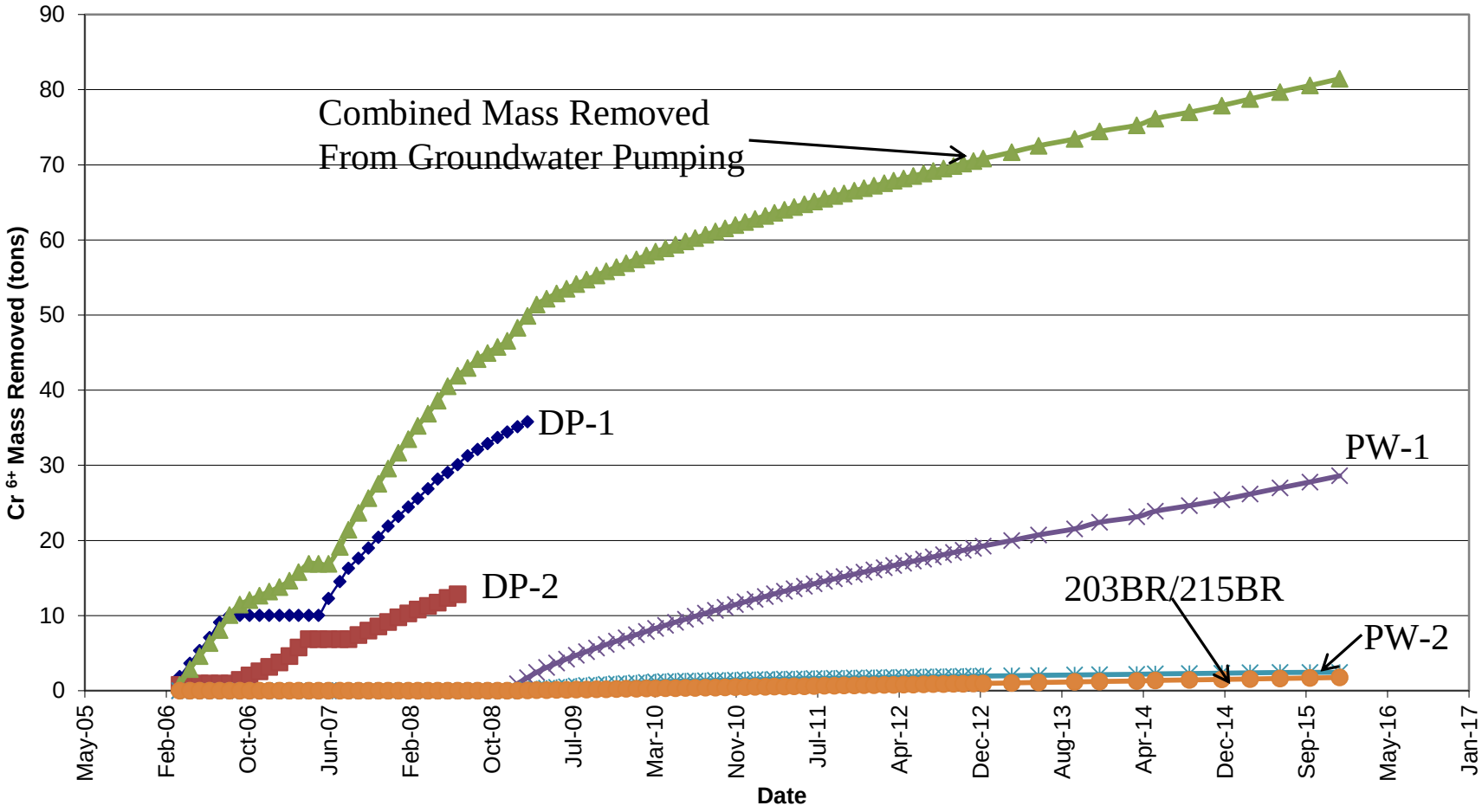
Figure 6-1



cornerstone environmental

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

Figure 6-2



cornerstone environmental

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	090-MW-09	115-DP-1	088-MW-G19T	087-MW-O29D	087-MW-03*
1	5/16/2012	46.9	16.2	1,680	307	762	180	NR
2	6/28/2012	NR	NR	NR	NR	889	NR	NR
3	7/31/2012	NR	NR	NR	NR	989	NR	155
3A	8/16/2012	NR	NR	NR	NR	NR	NR	NR
4	10/1/2012	NR	NR	NR	NR	NR	NR	NR
5	12/9/2012	37.9	14.8	2,220	359	985	171	NR
6	3/17/2013	39.8	13.5	NR	NR	NR	NR	NR
7	6/3/2013	48.5	28.0	2,930	1,670	967	233	NR
8	8/18/2013	NR	NR	NR	NR	NR	NR	NR
9	9/22/2013	39.9	13.5	NR	NR	NR	NR	NR
10	10/20/2013	NR	NR	NR	NR	NR	NR	NR
11	12/8/2013	34.2	10.6	2,990	20.8	1,150	182	NR
12	3/30/2014	36.9	16.4	NR	NR	NR	NR	NR
13	4/27/2014	NR	NR	NR	NR	NR	NR	NR
14	6/1/2014	35.5	14.5	NR	15.5	982	188	NR
15	7/13/2014	NR	NR	NR	NR	NR	NR	NR
16	8/24/2014	NR	NR	NR	NR	NR	NR	NR
17	9/21/2014	37.6	19.3	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	NR
18A	12/20/2014	341.0	127.0	NR	1,230	927	175	NR
19	3/22/2015	347.0	15.1	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR	NR	NR
21	5/31/2015	32.6	15.6	NR	31.5	1,010	173	NR
24	9/27/2015	33.8	8.48	NR	NR	NR	NR	NR
26	12/3/2015	34.2	8.43	NR	515	974	166	NR

NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .
NA: Not Analyzed; the collection of filtered samples from the GWET pumping wells is not required.
* Well 087-MW-03 was sampled on a one-time basis at the request of Plaintiffs and is not part of the monitoring plan.

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	090-MW-09	115-DP-1	088-MW-G19T	087-MW-O29D	087-MW-03*
1	5/16/2012	43.9	15.1	2,600	389.0	777	189	NR
2	6/28/2012	NR	NR	NR	NR	933	NR	NR
3	7/31/2012	NR	NR	NR	NR	897	NR	195
3A	8/16/2012	NR	NR	NR	NR	NR	NR	NR
4	10/1/2012	NR	NR	NR	NR	NR	NR	NR
5	12/9/2012	45.1	15.6	2,690	39.3	1,150	235	NR
6	3/13/2013	34.1	10.6	NR	NR	NR	NR	NR
7	6/3/2013	34.0	13.0	2,110	1,470	1,050	177	NR
8	8/18/2013	NR	NR	NR	NR	NR	NR	NR
9	9/22/2013	38.2	11.4	NR	NR	NR	NR	NR
10	10/20/2013	NR	NR	NR	NR	NR	NR	NR
11	12/8/2013	39.6	11.3	3,060	19.0	1,230	192	NR
12	3/30/2014	33.4	12.5	NR	NR	NR	NR	NR
13	4/27/2014	NR	NR	NR	NR	NR	NR	NR
14	6/1/2014	34.7	12.7	NR	14.9	1,070	188	NR
15	7/13/2014	NR	NR	NR	NR	NR	NR	NR
16	8/24/2014	NR	NR	NR	NR	NR	NR	NR
17	9/21/2014	34.2	11.1	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	NR
18A	12/20/2014	35.9	12.2	NR	1,300	1,080	190	NR
19	3/22/2015	34.7	13.5	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR	NR	NR
21	5/31/2015	36.1	13.5	NR	31.1	1,110	207	NR
24	9/27/2015	33.9	7.30	NR	NR	NR	NR	NR
26	12/3/2015	34.2	5.90	NR	387	1,100	185	NR

NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .
NA: Not Analyzed; the collection of filtered samples from the GWET pumping wells is not required.
* Well 087-MW-03 was sampled on a one-time basis at the request of Plaintiffs and is not part of the monitoring plan.

Table A3
Results of Pre-injection Monitoring of Monitoring Wells

		Sulfate in Unfiltered Samples (ppm)						
Event #	Sample Date	087-PW-1	087-PW-2	090-MW-09	115-DP-1	088-MW-G19T	087-MW-O29D	087-MW-03*
1	5/16/2012	320	613	1,000	749	843	604	NR
2	6/28/2012	NR	NR	NR	NR	1,030	NR	NR
3	7/31/2012	NR	NR	NR	NR	1,020	NR	850
3A	8/16/2012	NR	NR	NR	NR	NR	NR	NR
4	10/1/2012	NR	NR	NR	NR	NR	NR	NR
5	12/9/2012	307	671	1,110	202	1,020	688	NR
6	3/13/2013	NR	NR	NR	NR	NR	NR	NR
7	6/3/2013	268	654	1,080	2,130	1,090	662	NR
8	8/18/2013	NR	NR	NR	NR	NR	NR	NR
9	9/22/2013	292	664	NR	NR	NR	NR	NR
10	10/20/2013	NR	NR	NR	NR	NR	NR	NR
11	12/8/2013	291	701	1,270	137	1,140	614	NR
12	3/30/2014	283	205	NR	NR	NR	NR	NR
13	4/27/2014	NR	NR	NR	NR	NR	NR	NR
14	6/1/2014	NR	NR	NR	NR	NR	NR	NR
15	7/13/2014	NR	NR	NR	NR	NR	NR	NR
16	8/24/2014	NR	NR	NR	NR	NR	NR	NR
17	9/21/2014	NR	NR	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	NR
18A	12/20/2014	NR	NR	NR	NR	NR	NR	NR
19	3/22/2015	NR	NR	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR	NR	NR
21	5/31/2015	NR	NR	NR	NR	NR	NR	NR
24	9/27/2015	NR	NR	NR	NR	NR	NR	NR
26	12/3/2015	NR	NR	NR	NR	NR	NR	NR

NA: Not Analyzed; the collection of filtered samples from the GWET pumping wells is not required.
* Well 087-MW-03 was sampled on a one-time basis at the request of Plaintiffs and is not part of the monitoring plan.

Table A4
Results of Pre-injection Monitoring of Monitoring Wells

		Calcium in Unfiltered Samples (ppm)						
Event #	Sample Date	087-PW-1	087-PW-2	090-MW-09	115-DP-1	088-MW-G19T	087-MW-O29D	087-MW-03*
1	5/16/2012	97.7	169	547	112	287	48.2	NR
2	6/28/2012	NR	NR	NR	NR	293	NR	NR
3	7/31/2012	NR	NR	NR	NR	284	NR	207
3A	8/16/2012	NR	NR	NR	NR	NR	NR	NR
4	10/1/2012	NR	NR	NR	NR	NR	NR	NR
5	12/9/2012	88.4	146	492	370	336	52.1	NR
6	3/13/2013	NR	NR	NR	NR	NR	NR	NR
7	6/3/2013	99.6	158	446	473	317	53.1	NR
8	8/18/2013	NR	NR	NR	NR	NR	NR	NR
9	9/22/2013	99.7	168	NR	NR	NR	NR	NR
10	10/20/2013	NR	NR	NR	NR	NR	NR	NR
11	12/8/2013	86.7	145	560	37.3	307	52.4	NR
12	3/30/2014	95.7	154	NR	NR	NR	NR	NR
13	4/27/2014	NR	NR	NR	NR	NR	NR	NR
14	6/1/2014	94.3	149	NR	30.9	287	56.2	NR
15	7/13/2014	NR	NR	NR	NR	NR	NR	NR
16	8/24/2014	NR	NR	NR	NR	NR	NR	NR
17	9/21/2014	97.9	164	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	NR
18A	12/20/2014	105	160	NR	506	331	49.8	NR
19	3/22/2015	101	153	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR	NR	NR
21	5/31/2015	99	171	NR	39.1	311	44.2	NR
24	9/27/2015	101	154	NR	NR	NR	NR	NR
26	12/3/2015	112	172	NR	275	318	44.2	NR

NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .
NA: Not Analyzed; the collection of filtered samples from the GWET pumping wells is not required.
* Well 087-MW-03 was sampled on a one-time basis at the request of Plaintiffs and is not part of the monitoring plan.

Table A5
Results of Pre-injection Monitoring of Monitoring Wells

		Iron in Unfiltered Samples (ppm)						
Event #	Sample Date	087-PW-1	087-PW-2	090-MW-09	115-DP-1	088-MW-G19T	087-MW-O29D	087-MW-03*
1	5/16/2012	<.5	< .5	< 25	0.764	<2	1.12	NR
2	6/28/2012	NR	NR	NR	NR	<10	NR	NR
3	7/31/2012	NR	NR	NR	NR	4.79	NR	1.62
3A	8/16/2012	NR	NR	NR	NR	NR	NR	NR
4	10/1/2012	NR	NR	NR	NR	NR	NR	NR
5	12/9/2012	<0.1	<0.1	NR	0.954	NR	<0.5	NR
6	3/13/2013	NR	NR	NR	NR	NR	NR	NR
7	6/3/2013	0.709	1.21	<5.0	<5.0	<5.0	1.19	NR
8	8/18/2013	NR	NR	NR	NR	NR	NR	NR
9	9/22/2013	0.345	<0.1	NR	NR	NR	NR	NR
10	10/20/2013	NR	NR	NR	NR	NR	NR	NR
11	12/8/2013	<0.1	<0.1	<10.0	0.535	<2.0	<1.0	NR
12	3/30/2014	<0.1	0.165	NR	NR	NR	NR	NR
13	4/27/2014	NR	NR	NR	NR	NR	NR	NR
14	6/1/2014	NR	NR	NR	NR	NR	NR	NR
15	7/13/2014	NR	NR	NR	NR	NR	NR	NR
16	8/24/2014	NR	NR	NR	NR	NR	NR	NR
17	9/21/2014	NR	NR	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	NR
18A	12/20/2014	NR	NR	NR	NR	NR	NR	NR
19	3/22/2015	NR	NR	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR	NR	NR
21	5/31/2015	NR	NR	NR	NR	NR	NR	NR
24	9/27/2015	NR	NR	NR	NR	NR	NR	NR
26	12/3/2015	NR	NR	NR	NR	NR	NR	NR

NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .
NA: Not Analyzed; the collection of filtered samples from the GWET pumping wells is not required.
* Well 087-MW-03 was sampled on a one-time basis at the request of Plaintiffs and is not part of the monitoring plan.

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	087-MW-03*
1	5/16/2012	6.84	7.29	7.72	7.73	NR
2	5/28/2012	NR	NR	7.83	NR	NR
3	7/31/2012	NR	NR	7.41	NR	7.15
3A	8/16/2012	NR	NR	NR	NR	NR
4	10/1/2012	NR	NR	NR	NR	NR
5	12/9/2012	7.36	7.97	7.47	7.35	NR
6	3/13/2013	NR	NR	NR	NR	NR
7	6/3/2013	6.94	6.99	7.74	7.75	NR
8	8/18/2013	NR	NR	NR	NR	NR
9	9/22/2013	NR	NR	NR	NR	NR
10	10/20/2013	NR	NR	NR	NR	NR
11	12/8/2013	6.82	8.00	7.83	7.78	NR
12	3/30/2014	NR	NR	NR	NR	NR
13	4/27/2014	NR	NR	NR	NR	NR
14	6/1/2014	NR	8.76	8.02	8.22	NR
15	7/13/2014	NR	NR	NR	NR	NR
16	8/24/2014	NR	NR	NR	NR	NR
17	9/21/2014	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR
18A	12/20/2014	NR	6.85	7.61	7.68	NR
19	3/22/2015	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR
21	5/31/2015	NR	8.20	7.80	7.91	NR
24	9/27/2015	NR	NR	NR	NR	NR
26	12/3/2015	NR	7.04	7.4	7.46	NR

NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .
* Well 087-MW-03 was sampled on a one-time basis at the request of Plaintiffs and is not part of the monitoring plan.

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	087-MW-03*
1	5/16/2012	12.2	5.45	7.56	5.09	NR
2	6/28/2012	NR	NR	7.21	NR	NR
3	7/31/2012	NR	NR	7.66	NR	15.8
3A	8/16/2012	NR	NR	NR	NR	NR
4	10/1/2012	NR	NR	NR	NR	NR
5	12/9/2012	11.7	3.03	8.10	4.85	NR
6	3/13/2013	NR	NR	NR	NR	NR
7	6/3/2013	10.9	11.1	8.29	4.91	NR
8	8/18/2013	NR	NR	NR	NR	NR
9	9/22/2013	NR	NR	NR	NR	NR
10	10/20/2013	NR	NR	NR	NR	NR
11	12/8/2013	13.9	3.03	8.53	4.73	NR
12	3/30/2014	NR	NR	NR	NR	NR
13	4/27/2014	NR	NR	NR	NR	NR
14	6/1/2014	NR	3.44	9.47	5.29	NR
15	7/13/2014	NR	NR	NR	NR	NR
16	8/24/2014	NR	NR	NR	NR	NR
17	9/21/2014	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR
18A	12/20/2014	NR	13.0	10.7	5.73	NR
19	3/22/2015	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR
21	5/31/2015	NR	3.03	8.09	4.20	NR
24	9/27/2015	NR	NR	NR	NR	NR
26	12/3/2015	NR	5.40	9.6	5	NR

NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .
* Well 087-MW-03 was sampled on a one-time basis at the request of Plaintiffs and is not part of the monitoring plan.

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	087-MW-03*
1	5/16/2012	347	276	251	244	NR
2	6/28/2012	NR	NR	184	NR	NR
3	7/31/2012	NR	NR	187	NR	173
3A	8/16/2012	NR	NR	NR	NR	NR
4	10/1/2012	NR	NR	NR	NR	NR
5	12/9/2012	300	-153	104	-7.0	NR
6	3/13/2013	NR	NR	NR	NR	NR
7	6/3/2013	343	340	255	242	NR
8	8/18/2013	NR	NR	NR	NR	NR
9	9/22/2013	NR	NR	NR	NR	NR
10	10/20/2013	NR	NR	NR	NR	NR
11	12/8/2013	289	181	244	199	NR
12	3/30/2014	NR	NR	NR	NR	NR
13	4/27/2014	NR	NR	NR	NR	NR
14	6/1/2014	NR	242	231	237	NR
15	7/13/2014	NR	NR	NR	NR	NR
16	8/24/2014	NR	NR	NR	NR	NR
17	9/21/2014	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR
18A	12/20/2014	NR	300	248	215	NR
19	3/22/2015	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR
21	5/31/2015	NR	260	237	209	NR
24	9/27/2015	NR	NR	NR	NR	NR
26	12/3/2015	NR	145.00	148.0	144	NR

NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .
* Well 087-MW-03 was sampled on a one-time basis at the request of Plaintiffs and is not part of the monitoring plan.

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	087-MW-03*
1	5/16/2012	0.46	2.25	0.43	0.67	NR
2	6/28/2012	NR	NR	0.00	NR	NR
3	7/31/2012	NR	NR	0.00	NR	0.00
3A	8/16/2012	NR	NR	NR	NR	NR
4	10/1/2012	NR	NR	NR	NR	NR
5	12/9/2012	0.99	1.22	1.02	1.07	NR
6	3/13/2013	NR	NR	NR	NR	NR
7	6/3/2013	0.36	5.05	1.31	0.36	NR
8	8/18/2013	NR	NR	NR	NR	NR
9	9/22/2013	NR	NR	NR	NR	NR
10	10/20/2013	NR	NR	NR	NR	NR
11	12/8/2013	0.85	0.00	0.33	0.33	NR
12	3/30/2014	NR	NR	NR	NR	NR
13	4/27/2014	NR	NR	NR	NR	NR
14	6/1/2014	NR	3.96	0.00	0.00	NR
15	7/13/2014	NR	NR	NR	NR	NR
16	8/24/2014	NR	NR	NR	NR	NR
17	9/21/2014	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR
18A	12/20/2014	NR	0.00	0.00	0.00	NR
19	3/22/2015	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR
21	5/31/2015	NR	15.85**	10.88**	5.73	NR
24	9/27/2015	NR	NR	NR	NR	NR
26	12/3/2015	NR	0.00	0.00	0.00	NR

NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .
* Well 087-MW-03 was sampled on a one-time basis at the request of Plaintiffs and is not part of the monitoring plan.
** Instrument error suspected.

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	087-MW-03*
1	5/16/2012	0.0	0.0	74.3	0.0	NR
2	6/28/2012	NR	NR	64.0	NR	NR
3	7/31/2012	NR	NR	157	NR	19.0
3A	8/16/2012	NR	NR	NR	NR	NR
4	10/1/2012	NR	NR	NR	NR	NR
5	12/9/2012	177	0.0	650	708	NR
6	3/13/2013	NR	NR	NR	NR	NR
7	6/3/2013	52.7	0.0	47.8	11.5	NR
8	8/18/2013	NR	NR	NR	NR	NR
9	9/22/2013	NR	NR	NR	NR	NR
10	10/20/2013	NR	NR	NR	NR	NR
11	12/8/2013	10.0	19.6	0.0	12.1	NR
12	3/30/2014	NR	NR	NR	NR	NR
13	4/27/2014	NR	NR	NR	NR	NR
14	6/1/2014	NR	7.8	128	230	NR
15	7/13/2014	NR	NR	NR	NR	NR
16	8/24/2014	NR	NR	NR	NR	NR
17	9/21/2014	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR
18A	12/20/2014	NR	0.0	185	55	NR
19	3/22/2015	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR
21	5/31/2015	NR	0.0	138	8.1	NR
24	9/27/2015	NR	NR	NR	NR	NR
26	12/3/2015	NR	2.90	0.0	80	NR

NR: Not Required; the sampling frequency for monitoiring wells in the S-3 Mass Removal Program is semi-annual .
* Well 087-MW-03 was sampled on a one-time basis at the request of Plaintiffs and is not part of the monitoring plan.

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	115-PW-21	115-DP-2	087-IW-01	117-MW-I4	088-IW-03
1	5/16/2012	72.40	255.0	NR	NR	0.047	6,980	NR
2	6/28/2012	0.52	111.0	NR	NR	0.026	8,900	NR
3	7/31/2012	0.14	4.33	NR	NR	0.019	NR	NR
3A	8/16/2012	NR	NR	536	NR	NR	NR	NR
4	10/1/2012	0.155	4.19	<0.020	40.4	NR	NR	NR
5	12/9/2012	0.059	2.82	<0.050	NR	NR	NR	NR
6	3/13/2013	1.36	4.18	NR	NR	NR	NR	NR
7	6/3/2013	<0.050	36.2	NR	NR	NR	NR	98.6
8	8/18/2013	<10	5.4	NR	NR	NR	NR	0.114
9	9/22/2013	<.01	<.01	NR	NR	NR	NR	<.01
10	10/20/2013	<.1	0.198	NR	NR	NR	NR	<.02
11	12/8/2013	<.1	1.61	NR	NR	NR	NR	<.01
12	3/30/2014	<.02	<.02	NR	NR	NR	NR	<.02
13	4/27/2014	<.01	0.300	NR	NR	NR	NR	<.01
14	6/1/2014	<.01	0.174	NR	NR	0.0225	NR	<.01
15	7/13/2014	<.01	<.01	NR	NR	NR	NR	<.01
16	8/24/2014	<0.050	0.03	NR	NR	NR	NR	<.02
17	9/21/2014	NR	NR	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	NR
18A	12/20/2014	0.0397	NR	NR	NR	NR	NR	NR
19	3/22/2015	0.251	NR	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR	NR	NR
21	5/31/2015	NR	NR	NR	NR	0.0666	NR	NR
22	7/6/2015	NR	NR	NR	NR	NR	NR	NR
23	8/16/2015	NR	NR	NR	NR	NR	NR	NR
24	9/27/2015	NR	NR	NR	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR	NR	NR	NR
26	12/7/2015	0.068	NR	NR	NR	NR	NR	NR

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

First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth

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	115-PW-21	115-DP-2	087-IW-01	117-MW-I4	088-IW-03
1	5/16/2012	48.8	94.2	NR	NR	<0.010	7,250	NR
2	6/28/2012	<0.55	130.0	NR	NR	<0.005	9,130	NR
3	7/31/2012	<.55	<.55	NR	NR	<0.0055	NR	NR
3A	8/16/2012	NR	NR	594	NR	NR	NR	NR
4	10/1/2012	<0.55	<0.55	<0.50	40.9	NR	NR	NR
5	12/9/2012	<0.14	<0.14	<0.14	NR	NR	NR	NR
6	3/13/2013	<0.28	<0.55	NR	NR	NR	NR	NR
7	6/3/2013	<2.2	<0.5	NR	NR	NR	NR	116
8	8/18/2013	<.0055	<.0055	NR	NR	NR	NR	<.0055
9	9/22/2013	<.0055	<.0055	NR	NR	NR	NR	<.0055
10	10/20/2013	<.0055	<.0055	NR	NR	NR	NR	<.0055
11	12/8/2013	<.025	<.025	NR	NR	NR	NR	<.025
12	3/30/2014	<.028	<.028	NR	NR	NR	NR	<.028
13	4/27/2014	<.028	<.028	NR	NR	NR	NR	<.028
14	6/1/2014	<.0055	<.0055	NR	NR	<0.0055	NR	<.0055
15	7/13/2014	<.028	<.0055	NR	NR	NR	NR	<.0055
16	8/24/2014	<.028	<.028	NR	NR	NR	NR	<.028
17	9/21/2014	NR	NR	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	NR
18A	12/20/2014	<0.0055	NR	NR	NR	NR	NR	NR
19	3/22/2015	<0.020	NR	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR	NR	NR
21	5/31/2015	NR	NR	NR	NR	<0.0055	NR	NR
22	7/6/2015	NR	NR	NR	NR	NR	NR	NR
23	8/16/2015	NR	NR	NR	NR	NR	NR	NR
24	9/27/2015	NR	NR	NR	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR	NR	NR	NR
26	12/7/2015	<0.0055	NR	NR	NR	NR	NR	NR

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

First Second Third Fourth Fifth Sixth Seventh Eighth

Table B3
Results of Pre-injection Monitoring of Injection Wells

		Sulfate in Unfiltered Samples (ppm)						
Event #	Sample Date	088-IW-01	088-IW-02	115-PW-21	115-DP-2	087-IW-01	117-MW-I4	088-IW-03
1	5/16/2012	147	95.7	NR	NR	49.6	3,160	NR
2	6/28/2012	861	315	NR	NR	50.6	4,640	NR
3	7/31/2012	474	1,390	NR	NR	40.3	NR	NR
3A	8/16/2012	NR	NR	1,290	NR	NR	NR	NR
4	10/1/2012	<400	479	740	395	NR	NR	NR
5	12/9/2012	244	227	830	NR	NR	NR	NR
6	3/13/2013	224	290	NR	NR	NR	NR	NR
7	6/3/2013	108	341	NR	NR	NR	NR	259
8	8/18/2013	138	275	NR	NR	NR	NR	152
9	9/22/2013	149	155	NR	NR	NR	NR	251
10	10/20/2013	<100	344	NR	NR	NR	NR	317
11	12/8/2013	<100	403	NR	NR	NR	NR	<160
12	3/30/2014	<500	<500	NR	NR	NR	NR	<500
13	4/27/2014	<100	357	NR	NR	NR	NR	469
14	6/1/2014	<50	358	NR	NR	NR	NR	<50
15	7/13/2014	<100	<100	NR	NR	NR	NR	188
16	8/24/2014	<100	461	NR	NR	NR	NR	804
17	9/21/2014	NR	NR	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	NR
18A	12/20/2014	NR	NR	NR	NR	NR	NR	NR
19	3/22/2015	NR	NR	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR	NR	NR
21	5/31/2015	NR	NR	NR	NR	NR	NR	NR
22	7/6/2015	NR	NR	NR	NR	NR	NR	NR
23	8/16/2015	NR	NR	NR	NR	NR	NR	NR
24	9/27/2015	NR	NR	NR	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR	NR	NR	NR
26	12/7/2015	NR	NR	NR	NR	NR	NR	NR

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

First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth

Table B4
Results of Pre-injection Monitoring of Injection Wells

		Calcium in Unfiltered Samples (ppm)						
Event #	Sample Date	088-IW-01	088-IW-02	115-PW-21	115-DP-2	087-IW-01	117-MW-I4	088-IW-03
1	5/16/2012	34.7	51.2	NR	NR	73.0	1,590	NR
2	6/28/2012	7,760	<50	NR	NR	69.3	1,370	NR
3	7/31/2012	2,900	14,300	NR	NR	603	NR	NR
3A	8/16/2012	#N/A	NR	370	NR	NR	NR	NR
4	10/1/2012	1,400	1,800	3,900	97.4	NR	NR	NR
5	12/9/2012	827	970	2,280	NR	NR	NR	NR
6	3/13/2013	586	2,060	NR	NR	NR	NR	NR
7	6/3/2013	3,320	432	NR	NR	NR	NR	61.5
8	8/18/2013	1,490	250	NR	NR	NR	NR	3,010
9	9/22/2013	1,650	6,680	NR	NR	NR	NR	1,550
10	10/20/2013	6,220	1,210	NR	NR	NR	NR	1,150
11	12/8/2013	6,060	1,100	NR	NR	NR	NR	7,670
12	3/30/2014	2,490	3,260	NR	NR	NR	NR	1,580
13	4/27/2014	2,390	1,600	NR	NR	NR	NR	1,160
14	6/1/2014	978	750	NR	NR	76.6	NR	896
15	7/13/2014	5,500	5,230	NR	NR	NR	NR	1,270
16	8/24/2014	4,620	1,030	NR	NR	NR	NR	1,000
17	9/21/2014	NR	NR	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	NR
18A	12/20/2014	100.0	NR	NR	NR	NR	NR	NR
19	3/22/2015	NR	NR	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR	NR	NR
21	5/31/2015	NR	NR	NR	NR	94.4	NR	NR
22	7/6/2015	NR	NR	NR	NR	NR	NR	NR
23	8/16/2015	NR	NR	NR	NR	NR	NR	NR
24	9/27/2015	NR	NR	NR	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR	NR	NR	NR
26	12/7/2015	88.7	NR	NR	NR	NR	NR	NR

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

First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth

Table B5
Results of Pre-injection Monitoring of Injection Wells

		Iron in Unfiltered Samples (ppm)						
Event #	Sample Date	088-IW-01	088-IW-02	115-PW-21	115-DP-2	087-IW-01	117-MW-I4	088-IW-03
1	5/16/2012	5.060	4.070	NR	NR	0.516	<50	NR
2	6/28/2012	<5.0	1.900	NR	NR	0.502	<20	NR
3	7/31/2012	4.68	<0.5	NR	NR	NR	NR	NR
3A	8/16/2012	NR	NR	0.861	NR	NR	NR	NR
4	10/1/2012	0.835	0.255	0.464	<0.1	NR	NR	NR
5	12/9/2012	0.504	0.517	<0.5	NR	NR	NR	NR
6	3/13/2013	0.854	0.277	NR	NR	NR	NR	NR
7	6/3/2013	<0.5	0.478	NR	NR	NR	NR	0.509
8	8/18/2013	0.126	<0.1	NR	NR	NR	NR	<0.1
9	9/22/2013	<0.1	<0.1	NR	NR	NR	NR	0.114
10	10/20/2013	<0.5	<0.1	NR	NR	NR	NR	0.126
11	12/8/2013	<0.2	0.268	NR	NR	NR	NR	<0.2
12	3/30/2014	<0.2	<0.2	NR	NR	NR	NR	<0.2
13	4/27/2014	NR	NR	NR	NR	NR	NR	NR
14	6/1/2014	NR	NR	NR	NR	NR	NR	NR
15	7/13/2014	NR	NR	NR	NR	NR	NR	NR
16	8/24/2014	NR	NR	NR	NR	NR	NR	NR
17	9/21/2014	NR	NR	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	NR
18A	12/20/2014	NR	NR	NR	NR	NR	NR	NR
19	3/22/2015	NR	NR	NR	NR	NR	NR	NR
20	4/26/2015	NR	NR	NR	NR	NR	NR	NR
21	5/31/2015	NR	NR	NR	NR	NR	NR	NR
22	7/6/2015	NR	NR	NR	NR	NR	NR	NR
23	8/16/2015	NR	NR	NR	NR	NR	NR	NR
24	9/27/2015	NR	NR	NR	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR	NR	NR	NR
26	12/7/2015	NR	NR	NR	NR	NR	NR	NR

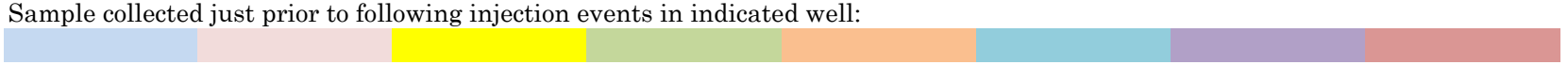
NR-Not Required; The selection of injection wells for sampling prior to each event was coordinated with Plaintiffs.
Sample collected just prior to following injection events in indicated well:

First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth

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

Event #	Sample Date	088-IW-01	088-IW-02	115-PW-21	115-DP-2	087-IW-01	117-MW-I4	088-IW-03
1	5/16/2012	8.08	7.46	NR	NR	7.21	6.91	NR
2	5/28/2012	10.98	7.53	NR	NR	7.42	7.13	NR
3	7/31/2012	10.56	10.38	NR	NR	6.96	NR	NR
3A	8/16/2012	NR	NR	6.56	NR	NR	NR	NR
4	10/1/2012	10.95	11.19	11.52	7.65	NR	NR	NR
5	12/9/2012	8.27	9.46	10.74	NR	NR	NR	NR
6	3/13/2013	10.81	11.35	NR	NR	NR	NR	NR
7	6/3/2013	11.43	10.29	NR	NR	NR	NR	7.66
8	8/18/2013	10.70	11.52	NR	NR	NR	NR	11
9	9/22/2013	11.44	11.99	NR	NR	NR	NR	12
10	10/20/2013	10.71	11.20	NR	NR	NR	NR	10.74
11	12/8/2013	11.01	11.50	NR	NR	NR	NR	10.94
12	3/30/2014	10.45	11.95	NR	NR	NR	NR	10.90
13	4/27/2014	10.80	11.60	NR	NR	NR	NR	10.90
14	6/1/2014	11.30	11.88	NR	NR	7.74	NR	11.46
15	7/13/2014	9.42	9.90	NR	NR	NR	NR	10.11
16	8/24/2014	10.60	11.05	NR	NR	NR	NR	11.09
17	9/21/2014	NR	11.20	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	10.63
18A	12/20/2014	NR	NR	NR	NR	7.13	NR	NR
19	3/22/2015	9.59	11.48	NR	NR	NR	NR	10.94
20	4/26/2015	10.99	11.59	NR	NR	NR	NR	10.63
21	5/31/2015	NR	NR	NR	NR	7.31	NR	NR
22	7/6/2015	11.30	NR	NR	NR	NR	NR	NR
23	8/18/2015	NR	NR	NR	NR	NR	NR	11.69
24	9/27/2015	NR	11.15	NR	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR	NR	NR	11.19
26	12/7/2015	6.85	NR	NR	NR	NR	NR	NR

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



First Second Third Fourth Fifth Sixth Seventh Eighth

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

Event #	Sample Date	088-IW-01	088-IW-02	115-PW-21	115-DP-2	087-IW-01	117-MW-I4	088-IW-03
1	5/16/2012	1.78	1.7	NR	NR	2.81	6.27	NR
2	6/28/2012	32.7	1.4	NR	NR	2.11	30.3	NR
3	7/31/2012	14.2	47.0	NR	NR	2.33	NR	NR
3A	8/16/2012	NR	NR	5.16	NR	NR	NR	NR
4	10/1/2012	7.1	10.0	17.7	1.8	NR	NR	NR
5	12/9/2012	37.6	5.9	13.0	NR	NR	NR	NR
6	3/13/2013	5.47	9.8	NR	NR	NR	NR	NR
7	6/3/2013	3.15	17.0	NR	NR	NR	NR	3.0
8	8/18/2013	7.06	2.6	NR	NR	NR	NR	16.9
9	9/22/2013	7.22	25.9	NR	NR	NR	NR	8.1
10	10/20/2013	20.5	6.1	NR	NR	NR	NR	6.9
11	12/8/2013	22.7	6.1	NR	NR	NR	NR	27.1
12	3/30/2014	12.2	15.1	NR	NR	NR	NR	9.3
13	4/27/2014	14.2	8.9	NR	NR	NR	NR	7.3
14	6/1/2014	6.70	9.5	NR	NR	2.39	NR	12.4
15	7/13/2014	22.3	31.4	NR	NR	NR	NR	8.0
16	8/24/2014	17.0	21.0	NR	NR	NR	NR	5.8
17	9/21/2014	NR	16.0	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	28.7
18A	12/20/2014	NR	NR	NR	NR	2.75	NR	NR
19	3/22/2015	0.62	6.1	NR	NR	NR	NR	14.1
20	4/26/2015	27.0	5.9	NR	NR	NR	NR	11.1
21	5/31/2015	NR	NR	NR	NR	2.30	NR	NR
22	7/6/2015	29.7	NR	NR	NR	NR	NR	NR
23	8/18/2015	NR	NR	NR	NR	NR	NR	23.5
24	9/27/2015	NR	20.3	NR	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR	NR	NR	2.45
26	12/7/2015	3.04	NR	NR	NR	NR	NR	NR

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

First, Second, Third, Fourth, Fifth, Sixth, Seventh, Eighth

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

Event #	Sample Date	088-IW-01	088-IW-02	115-PW-21	115-DP-2	087-IW-01	117-MW-I4	088-IW-03
1	5/16/2012	93	230	NR	NR	-38	362	NR
2	6/28/2012	-533	140	NR	NR	-128	298	NR
3	7/31/2012	-498	-507	NR	NR	-49	NR	NR
3A	8/16/2012	NR	NR	263	NR	NR	NR	NR
4	10/1/2012	-508	-510	-498	170	NR	NR	NR
5	12/9/2012	-497	-497	-493	NR	NR	NR	NR
6	3/13/2013	-483	-505	NR	NR	NR	NR	NR
7	6/3/2013	-478	-509	NR	NR	NR	NR	245
8	8/18/2013	-500	-466	NR	NR	NR	NR	-500
9	9/22/2013	-516	-536	NR	NR	NR	NR	-516
10	10/20/2013	-509	-512	NR	NR	NR	NR	-496
11	12/8/2013	-524	-514	NR	NR	NR	NR	-521
12	3/30/2014	-462	-482	NR	NR	NR	NR	-450
13	4/27/2014	-505	-515	NR	NR	NR	NR	-505
14	6/1/2014	-505	-516	NR	NR	-81	NR	-509
15	7/13/2014	-519	-519	NR	NR	NR	NR	-500
16	8/24/2014	-502	-517	NR	NR	NR	NR	-498
17	9/21/2014	NR	-500	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	-503
18A	12/20/2014	NR	NR	NR	NR	-75	NR	NR
19	3/22/2015	-452	-504	NR	NR	NR	NR	-501
20	4/26/2015	-511	-506	NR	NR	NR	NR	-506
21	5/31/2015	NR	NR	NR	NR	-37	NR	NR
22	7/6/2015	-498	NR	NR	NR	NR	NR	NR
23	8/18/2015	NR	NR	NR	NR	NR	NR	-506
24	9/27/2015	NR	-517	NR	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR	NR	NR	-489.00
26	12/7/2015	-30.00	NR	NR	NR	NR	NR	NR

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

First Second Third Fourth Fifth Sixth Seventh Eighth

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

Event #	Sample Date	088-IW-01	088-IW-02	115-PW-21	115-DP-2	087-IW-01	117-MW-I4	088-IW-03
1	5/16/2012	0.38	0.51	NR	NR	1.02	0.37	NR
2	6/28/2012	0.00	0.00	NR	NR	0.00	0.10	NR
3	7/31/2012	0.52	4.73	NR	NR	0.00	NR	NR
3A	8/16/2012	NR	NR	0.00	NR	NR	NR	NR
4	10/1/2012	2.70	5.88	5.00	1.02	NR	NR	NR
5	12/9/2012	5.16	0.43	1.49	NR	NR	NR	NR
6	3/13/2013	8.56	5.37	NR	NR	NR	NR	NR
7	6/3/2013	0.24	0.42	NR	NR	NR	NR	5.22
8	8/18/2013	0.38	0.28	NR	NR	NR	NR	0.27
9	9/22/2013	2.19	2.29	NR	NR	NR	NR	3.20
10	10/20/2013	0.48	0.96	NR	NR	NR	NR	2.90
11	12/8/2013	1.95	1.36	NR	NR	NR	NR	1.45
12	3/30/2014	NA	2.61	NR	NR	NR	NR	2.95
13	4/27/2014	4.50	3.10	NR	NR	NR	NR	2.80
14	6/1/2014	0.00	0.00	NR	NR	0.00	NR	0.00
15	7/13/2014	0.48	0.38	NR	NR	NR	NR	0.36
16	8/24/2014	0.86	0.52	NR	NR	NR	NR	0.62
17	9/21/2014	NR	4.42	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	0.45
18A	12/20/2014	NR	NR	NR	NR	0.00	NR	NR
19	3/22/2015	2.91	1.38	NR	NR	NR	NR	1.19
20	4/26/2015	2.58	2.02	NR	NR	NR	NR	2.84
21	5/31/2015	NR	NR	NR	NR	5.64	NR	NR
22	7/6/2015	0.00	NR	NR	NR	NR	NR	NR
23	8/18/2015	NR	NR	NR	NR	NR	NR	3.35
24	9/27/2015	NR	0.00	NR	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR	NR	NR	0.00
26	12/7/2015	0.00	NR	NR	NR	NR	NR	NR

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

First Second Third Fourth Fifth Sixth Seventh Eighth

Table B10
Results of Pre-injection Monitoring of Injection Wells

Field Turbidity (NTU)

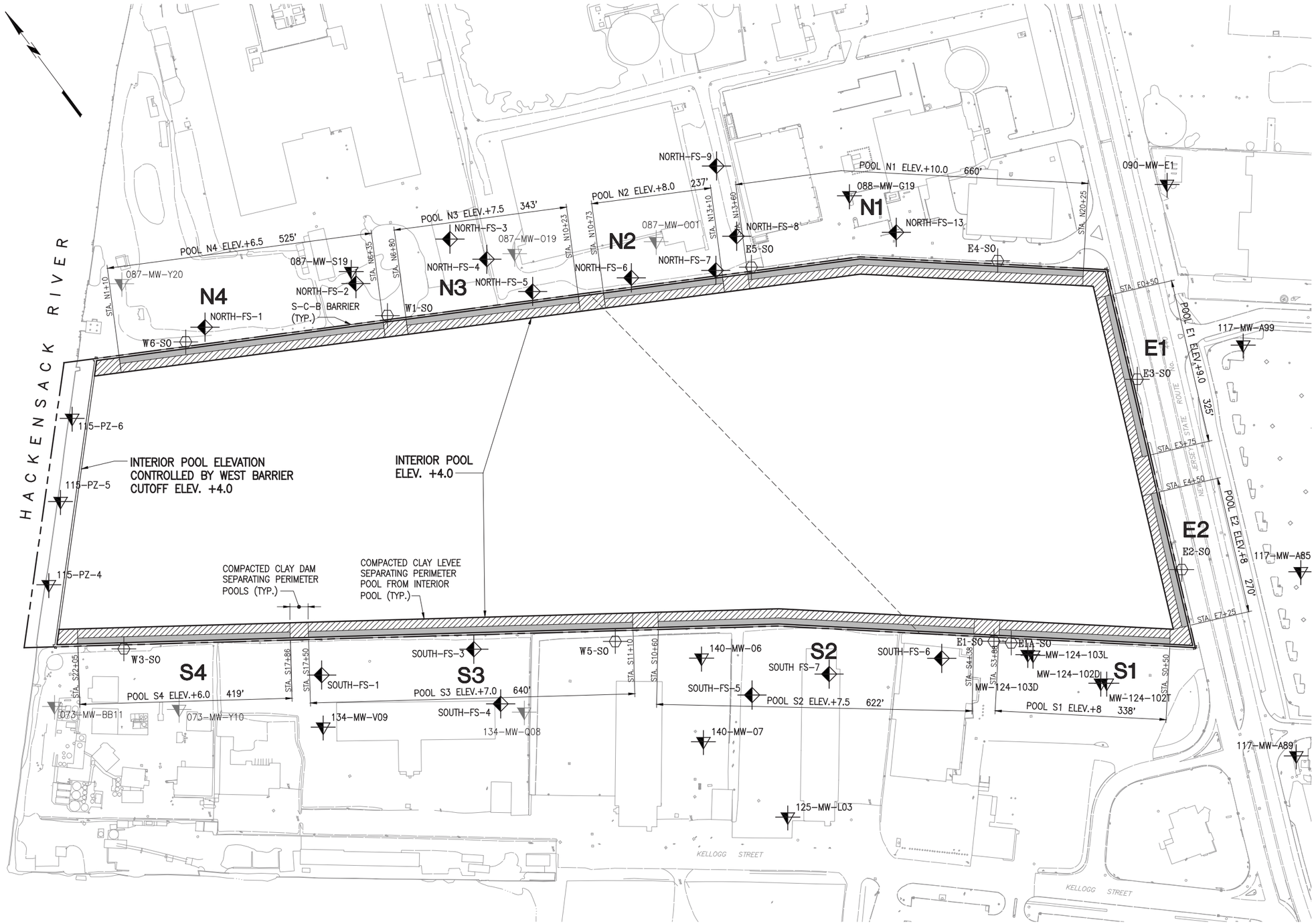
Event #	Sample Date	088-IW-01	088-IW-02	115-PW-21	115-DP-2	087-IW-01	117-MW-I4	088-IW-03
1	5/16/2012	15.2	39.4	NR	NR	0.0	3.6	NR
2	6/28/2012	>800	24.1	NR	NR	8.5	609	NR
3	7/31/2012	13.0	113.0	NR	NR	18.1	NR	NR
3A	8/16/2012	NR	NR	12.5	NR	NR	NR	NR
4	10/1/2012	0.0	34.1	0.0	0.0	NR	NR	NR
5	12/9/2012	0.0	0.0	0.0	NR	NR	NR	NR
6	3/13/2013	3.7	8.8	NR	NR	NR	NR	NR
7	6/3/2013	545	1.0	NR	NR	NR	NR	8.4
8	8/18/2013	0.0	3.2	NR	NR	NR	NR	0.0
9	9/22/2013	2.4	8.4	NR	NR	NR	NR	15.2
10	10/20/2013	0.0	0.0	NR	NR	NR	NR	0.0
11	12/8/2013	0.0	42.2	NR	NR	NR	NR	8.0
12	3/30/2014	1.4	16.3	NR	NR	NR	NR	2.1
13	4/27/2014	0.0	1.2	NR	NR	NR	NR	0.0
14	6/1/2014	7.8	38.0	NR	NR	4.4	NR	4.6
15	7/13/2014	0	0.0	NR	NR	NR	NR	0.0
16	8/24/2014	1.50	2.8	NR	NR	NR	NR	0.0
17	9/21/2014	NR	0.0	NR	NR	NR	NR	NR
18	10/26/2014	NR	NR	NR	NR	NR	NR	0.0
18A	12/20/2014	NR	NR	NR	NR	4.800	NR	NR
19	3/22/2015	120	50.0	NR	NR	NR	NR	60.0
20	4/26/2015	0.0	69.0	NR	NR	NR	NR	0.0
21	5/31/2015	NR	NR	NR	NR	0.00	NR	NR
22	7/6/2015	0.0	NR	NR	NR	NR	NR	NR
23	8/18/2015	NR	NR	NR	NR	NR	NR	13.3
24	9/27/2015	NR	3.3	NR	NR	NR	NR	NR
25	11/2/2015	NR	NR	NR	NR	NR	NR	4.10
26	12/7/2015	4.90	NR	NR	NR	NR	NR	NR

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

First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth

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

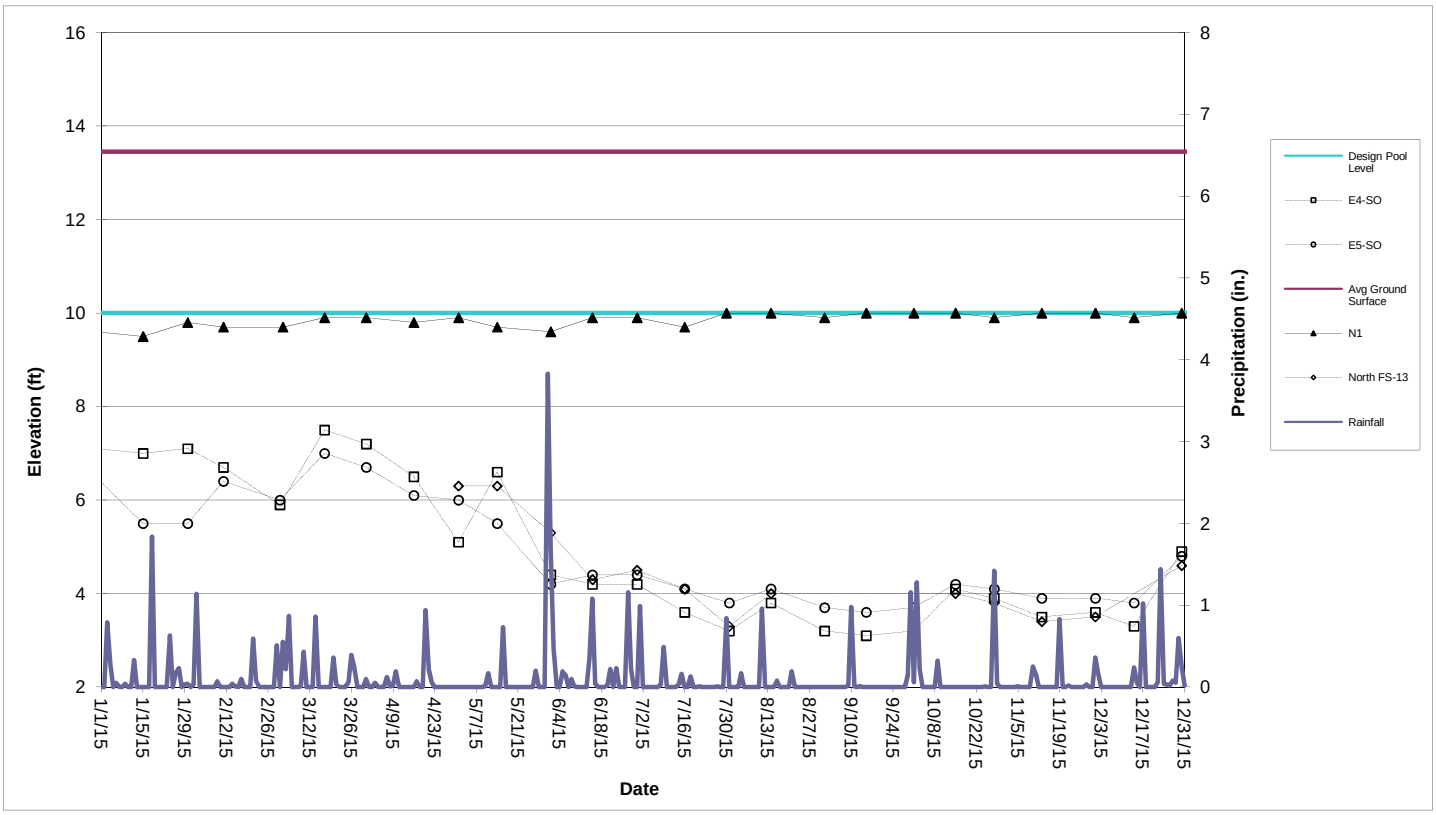
STUDY AREA 7
PERIMETER POOL DESIGN ELEVATIONS

NEW JERSEY

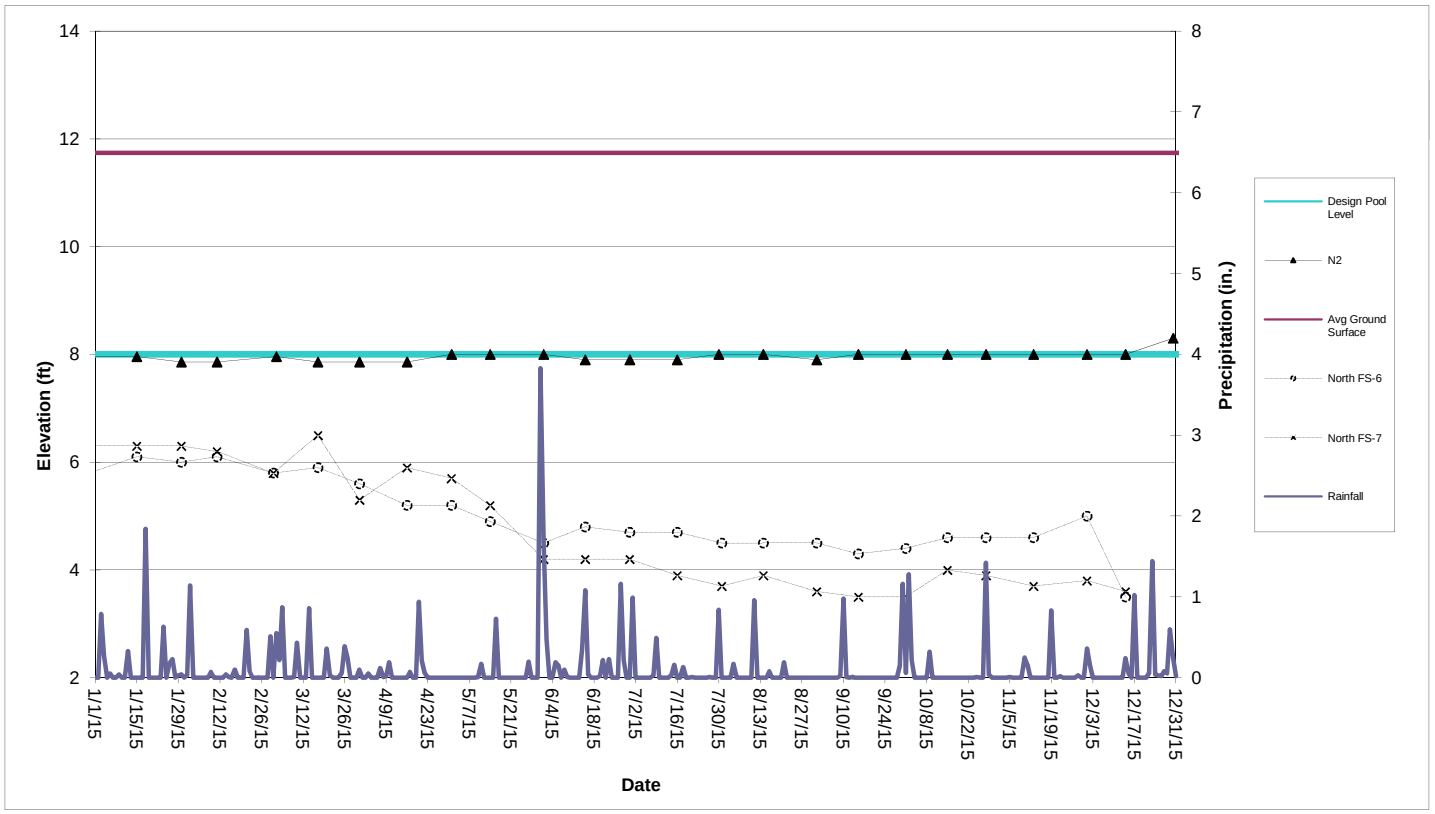
MUESER RUTLEDGE CONSULTING ENGINEERS
14 PENN PLAZA – 225 WEST 34th STREET

FILE NO. 10210
DRAWING NO. PP-1

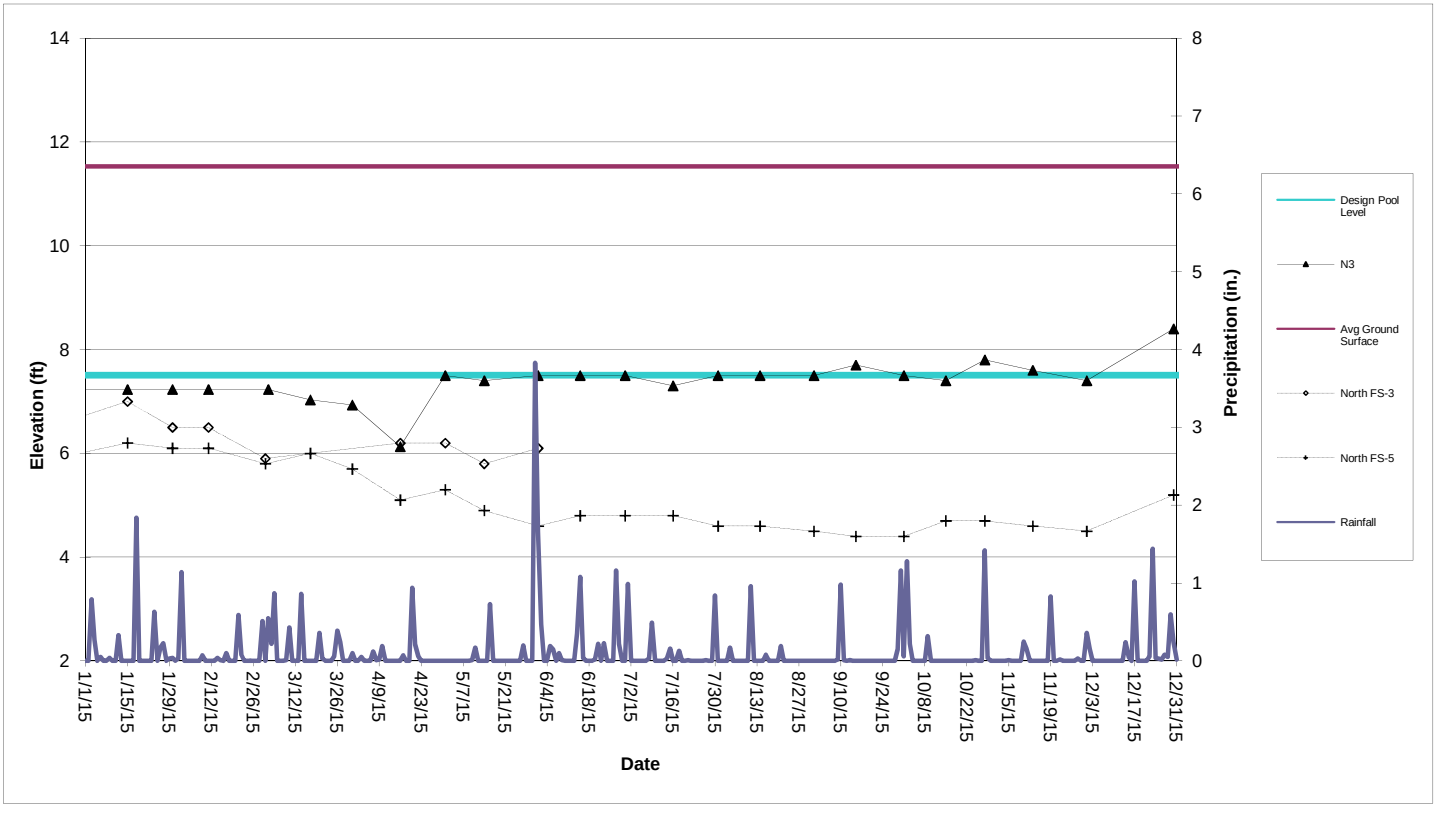
Jul 09, 2015 at 3:14pm
G:\DWGS\102\10210\Dewatering\PP-1.dwg
bboscaino



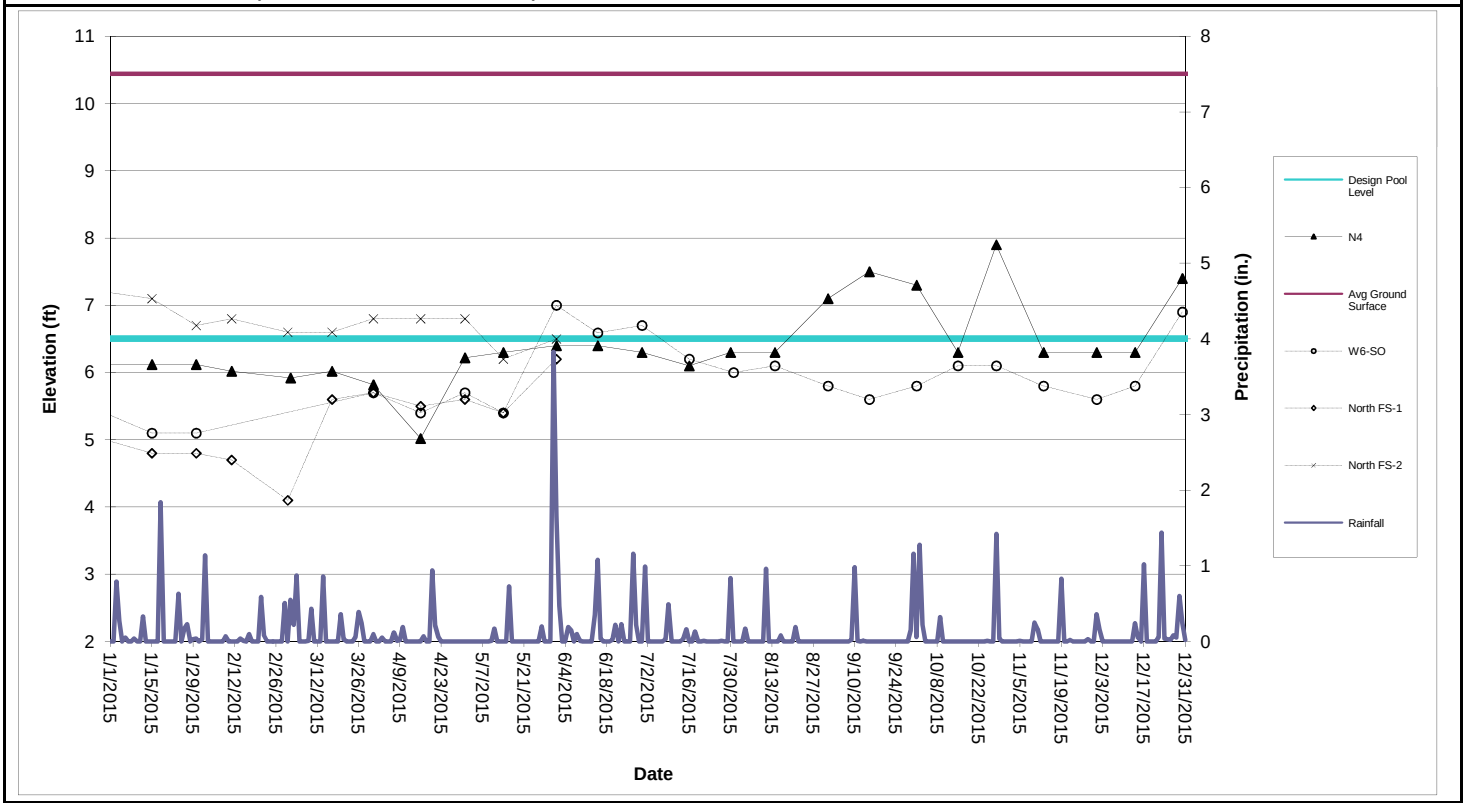
Perimeter Pool N1 (Sta. N13+60 to N20+25)



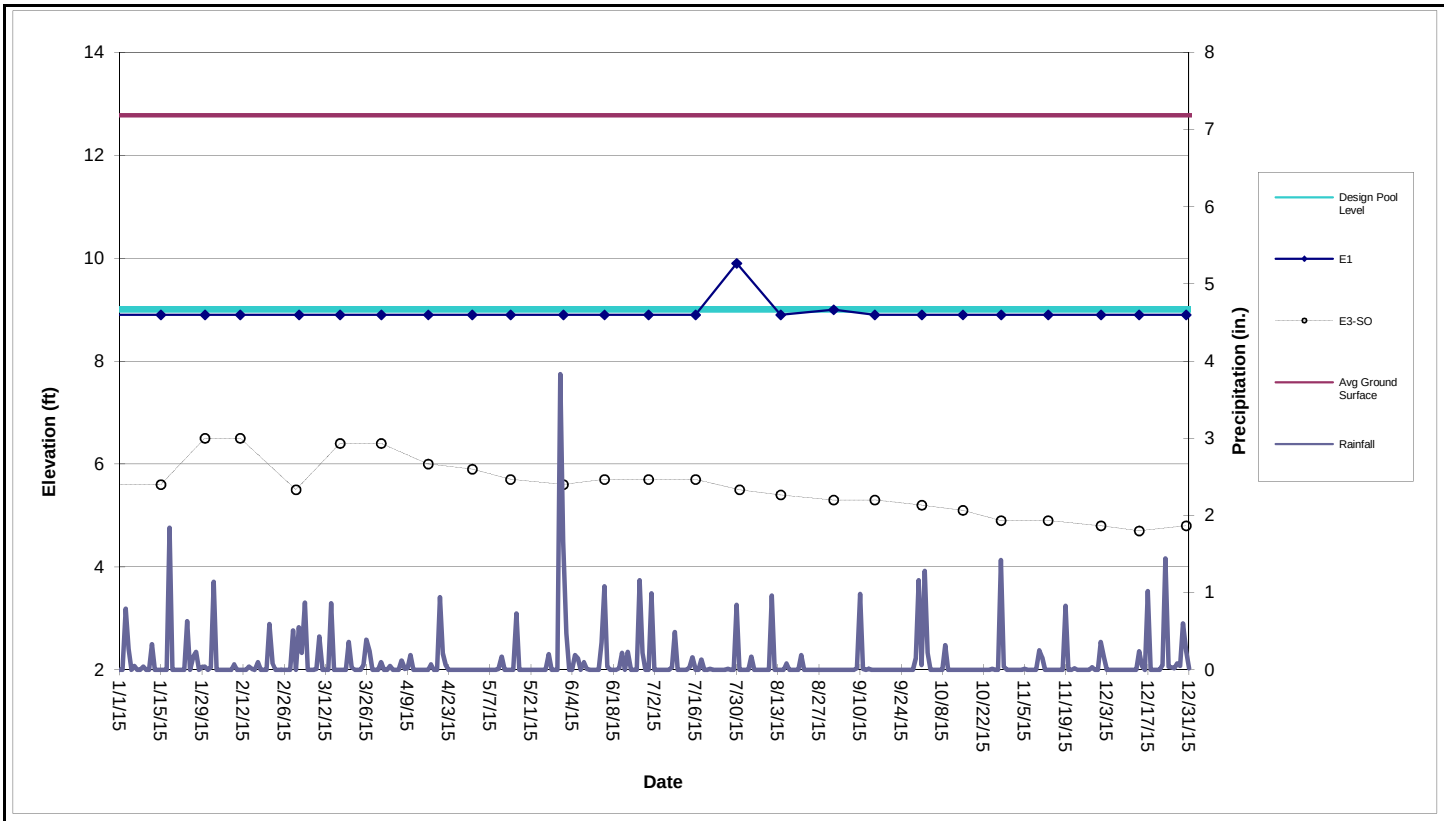
Perimeter Pool N2 (Sta. N10+73 to N13+10)



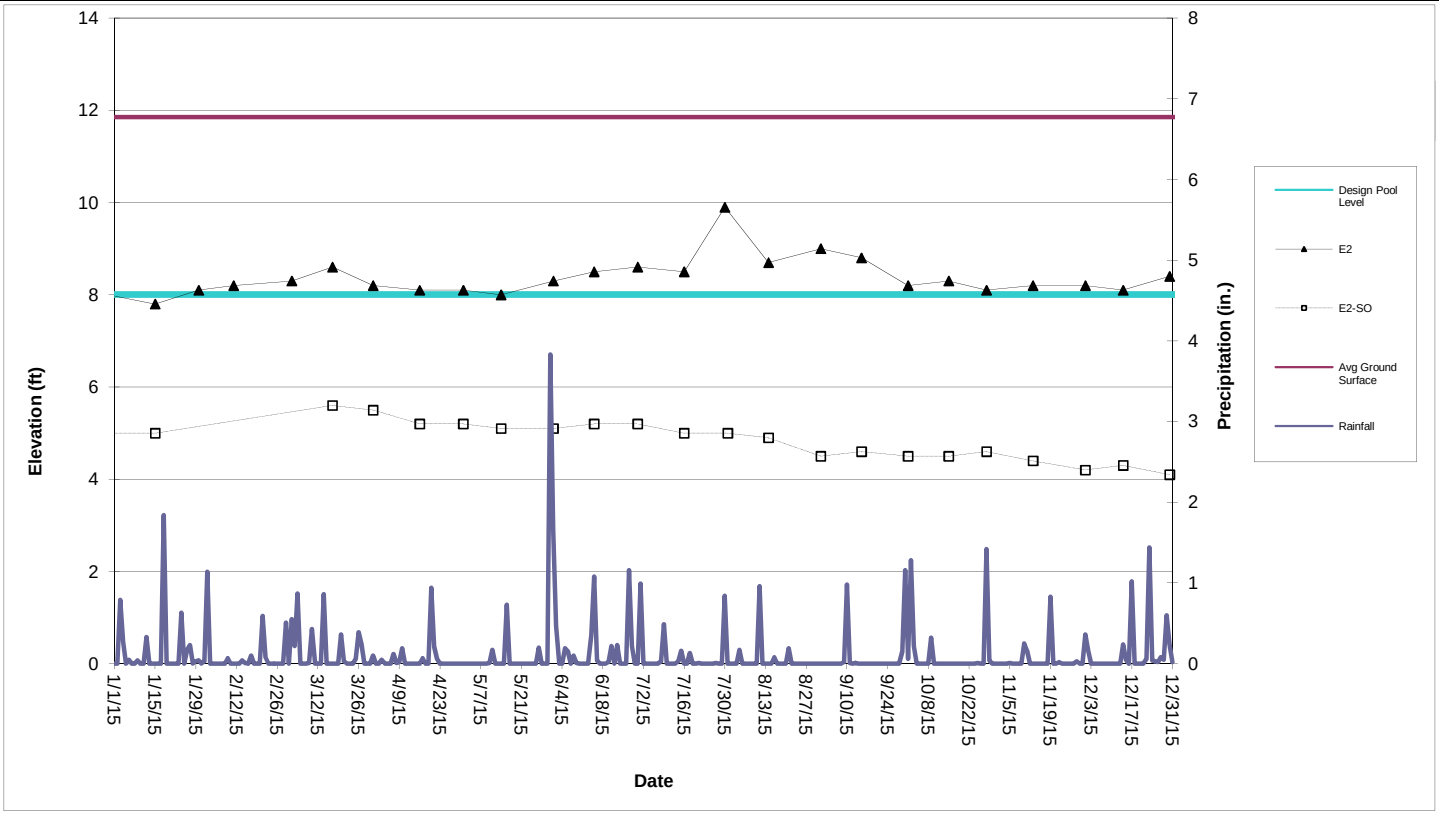
Perimeter Pool N3 (Sta. N6+80 to N10+23)



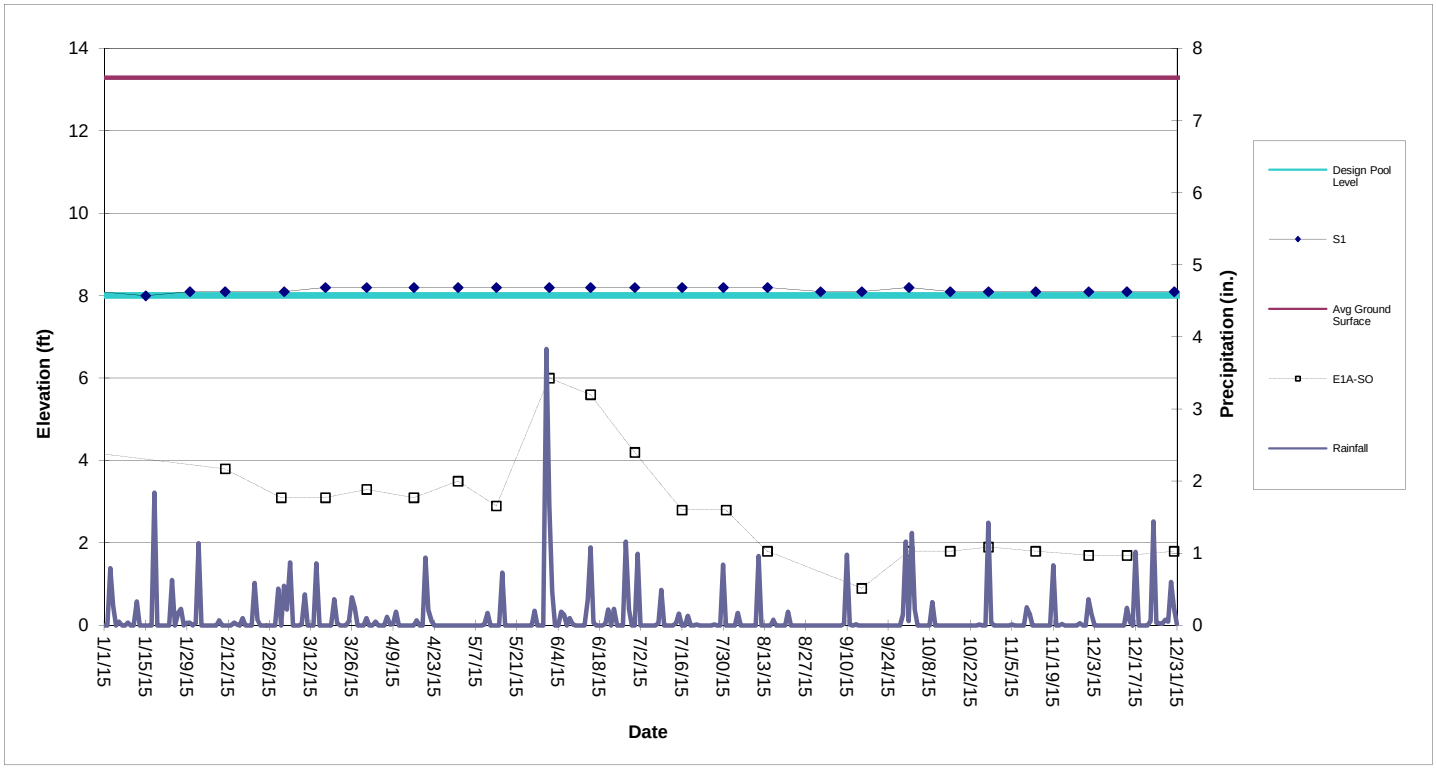
Perimeter Pool N4 (Sta. N6+80 to N10+23)



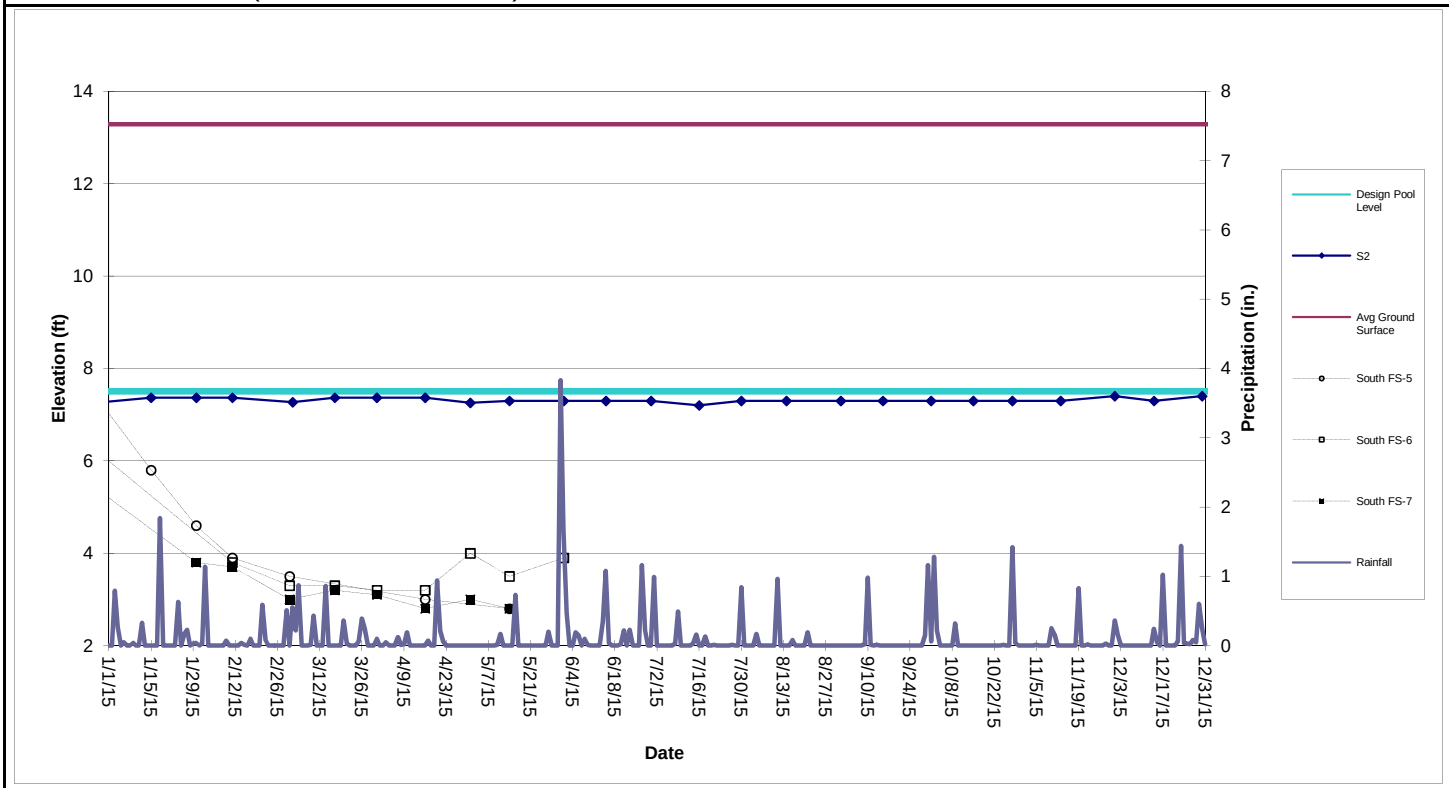
Perimeter Pool E1 (Sta. E0+50 to E3+75)



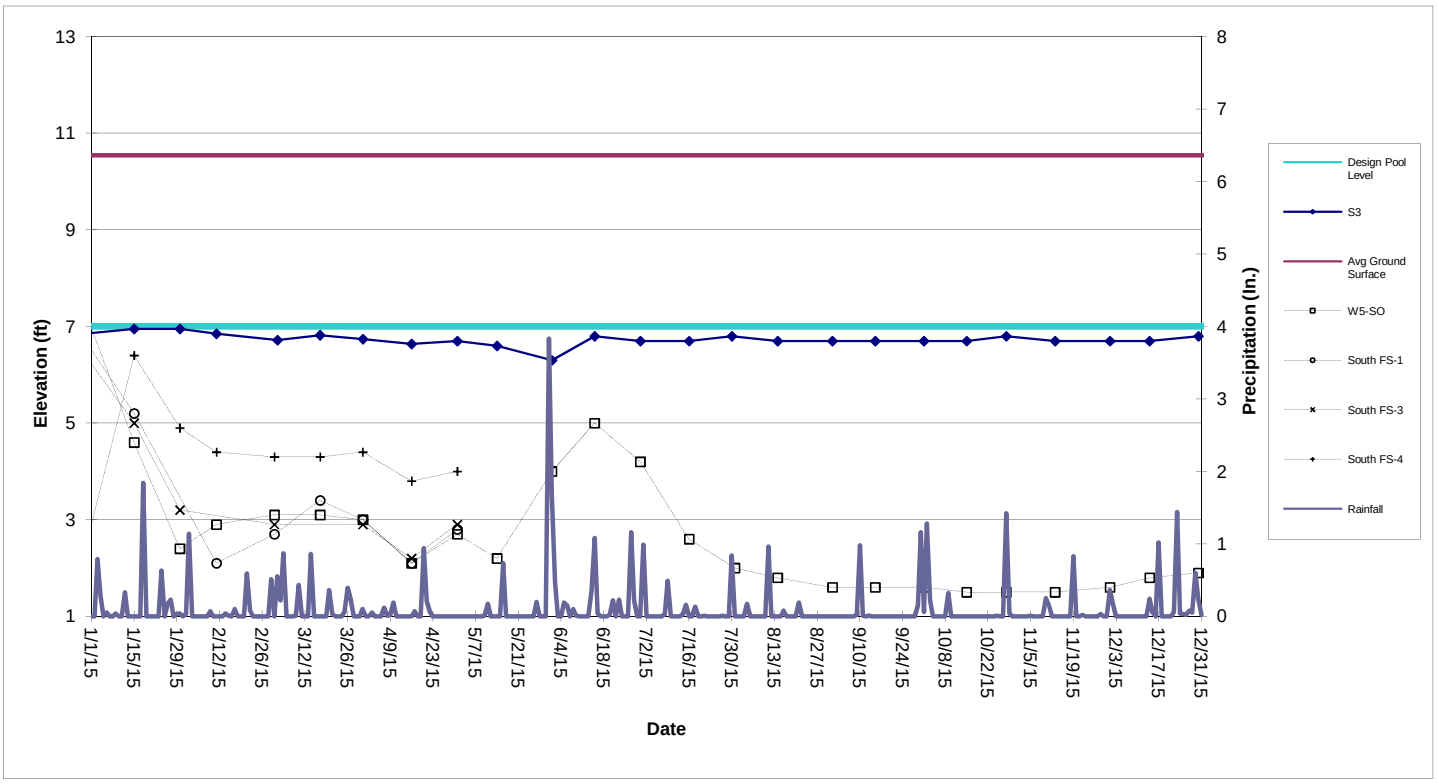
Perimeter Pool E2 (Sta. E4+50 to E7+25)



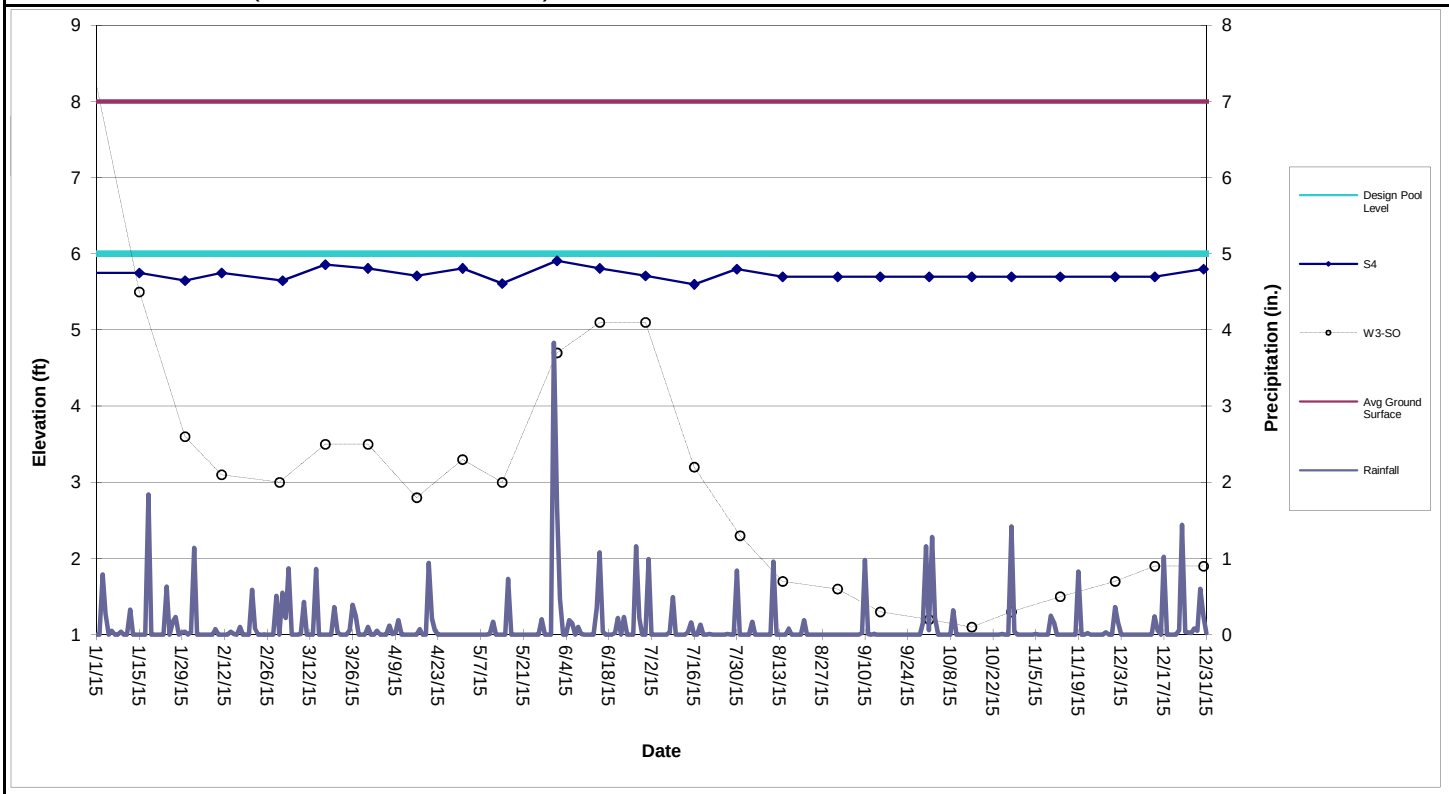
Perimeter Pool S1 (Sta. S0+50 to S3+88)



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							South					
	E1A-SO	E2-SO	E3-SO	E4-SO	E5-SO	W1-SO	W3-SO	W5-SO	W6-SO	FS-1	FS-2	FS-3	FS-5	FS-6	FS-7	FS-13	FS-1	FS-3	FS-4	FS-5	FS-6	FS-7
Date																						
1/15/2015		5.0	5.6	7.0	5.5		5.5	4.6	5.1	4.8	7.1	7.0	6.2	6.1	6.3		5.2	5.0	6.4	5.8		
1/30/2015			6.5	7.1	5.5		3.6	2.4	5.1	4.8	6.7	6.5	6.1	6.0	6.3			3.2	4.9	4.6		3.8
2/11/2015	3.8		6.5	6.7	6.4		3.1	2.9		4.7	6.8	6.5	6.1	6.1	6.2		2.1		4.4	3.9	3.8	3.7
3/2/2015	3.1		5.5	5.9	6.0		3.0	3.1		4.1	6.6	5.9	5.8	5.8	5.8		2.7	2.9	4.3	3.5	3.3	3.0
3/17/2015	3.1	5.6	6.4	7.5	7.0		3.5	3.1		5.6	6.6		6.0	5.9	6.5		3.4		4.3		3.3	3.2
3/31/2015	3.3	5.5	6.4	7.2	6.7		3.5	3.0	5.7	5.7	6.8		5.7	5.6	5.3		3.0	2.9	4.4		3.2	3.1
4/16/2015	3.1	5.2	6.0	6.5	6.1		2.8	2.1	5.4	5.5	6.8	6.2	5.1	5.2	5.9		2.1	2.2	3.8	3.0	3.2	2.8
5/1/2015	3.5	5.2	5.9	5.1	6.0		3.3	2.7	5.7	5.6	6.8	6.2	5.3	5.2	5.7	6.3	2.8	2.9	4.0		4.0	3.0
5/14/2015	2.9	5.1	5.7	6.6	5.5		3.0	2.2	5.4	5.4	6.2	5.8	4.9	4.9	5.2	6.3				2.8	3.5	2.8
6/1/2015	6.0	5.1	5.6	4.4	4.2		4.7	4.0	7.0	6.2	6.5	6.1	4.6	4.5	4.2	5.3					3.9	
6/15/2015	5.6	5.2	5.7	4.2	4.4		5.1	5.0	6.6				4.8	4.8	4.2	4.3						
6/30/2015	4.2	5.2	5.7	4.2	4.4		5.1	4.2	6.7				4.8	4.7	4.2	4.5						
7/16/2015	2.8	5.0	5.7	3.6	4.1		3.2	2.6	6.2				4.8	4.7	3.9	4.1						
7/31/2015	2.8	5.0	5.5	3.2	3.8		2.3	2.0	6.0				4.6	4.5	3.7	3.3						
8/14/2015	1.8	4.9	5.4	3.8	4.1		1.7	1.8	6.1				4.6	4.5	3.9	4.0						
9/1/2015		4.5	5.3	3.2	3.7		1.6	1.6	5.8				4.5	4.5	3.6							
9/15/2015	0.9	4.6	5.3	3.1	3.6		1.3	1.6	5.6				4.4	4.3	3.5							
10/1/2015	1.8	4.5	5.2	3.2	3.7		1.2	1.6	5.8				4.4	4.4	3.5							
10/15/2015	1.8	4.5	5.1	4.1	4.2		1.1	1.5	6.1				4.7	4.6	4.0	4.0						
10/28/2015	1.9	4.6	4.9	3.9	4.1	6.9	1.3	1.5	6.1				4.7	4.6	3.9	3.8						
11/13/2015	1.8	4.4	4.9	3.5	3.9	6.4	1.5	1.5	5.8				4.6	4.6	3.7	3.4						
12/1/2015	1.7	4.2	4.8	3.6	3.9	6.2	1.7	1.6	5.6				4.5	5.0	3.8	3.5						
12/14/2015	1.7	4.3	4.7	3.3	3.8	6.2	1.9	1.8	5.8					3.5	3.6							
12/30/2015	1.8	4.1	4.8	4.9	4.8	7.5	1.9	1.9	6.9				5.2			4.6						

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
South FS-1, FS-3, FS-4, FS-5, FS-6, FS-7

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