# Results of the In Situ Reduction Pilot Test, Garfield Groundwater Contamination Superfund Site, New Jersey

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CH2M HILL prepared this technical memorandum for the U.S. Environmental Protection Agency (USEPA) Region 2 and the U.S. Army Corps of Engineers (USACE) Kansas City District to present the results of an in situ reduction (ISR) pilot test and associated groundwater performance monitoring completed at the Garfield Groundwater Contamination Superfund site in the city of Garfield, Bergen County, New Jersey (site). This memorandum has been prepared under Contract W912DQ-11-D-3005, Task Order 0003, for the USACE Kansas City District.

The ISR pilot test was conducted to obtain information regarding the practicability of the following: (1) injecting reagents into the overburden using direct-push injections, (2) achievably reducing hexavalent chromium [Cr(VI)] in overburden groundwater, and (3) creating reducing zone barriers as a component of the full-scale remedy. The ISR pilot test study was carried out in accordance with the *Final Work Plan for Aquifer Test, Pilot Test and Groundwater Modeling, Garfield Groundwater Contamination Superfund Site* (work plan) (CH2M HILL 2013a). Deviations from the work plan are summarized at the end of the Field and Analytical Methods section of this technical memorandum. The results of the ISR pilot test will support development of full-scale remedy alternatives, allowing the feasibility study to be completed with a greater degree of certainty. The pilot test was performed in two separate areas within the boundaries of the E.C. Electroplating (ECE) property, including within the vicinity of the former chromic acid tank storage tank (source area) and on the downgradient (western) side of ECE property along Lincoln Place (barrier area). The location of the ECE property is shown in Figure 1.

# Field and Analytical Methods

# Overburden Monitoring Well Installation

Four monitoring wells were installed between June 2 and 4, 2014, as performance monitoring wells to evaluate the effectiveness of the ISR pilot test. Three new monitoring wells were installed within the overburden material on the ECE property, and the fourth was installed along the eastern side of Lincoln Place, just west of the ECE property. One previously installed monitoring well, EPA-13-OB, located along the eastern side of Lincoln Place, was also used to monitor the pilot system. The locations of the wells are shown in Figure 2, and well screen interval information is provided in Table 1.

Drilling, construction, and development of the four new overburden monitoring wells (EPA-29-OB through EPA-32-OB) were performed by Parratt Wolff, the drilling contractor. Well borings were drilled using a Central Mine Equipment Company 55 hollow-stem auger drill rig with continuous split-spoon core sampling for observation of soil cores. The borings were continuously logged using the Unified Soil Classification System in accordance with ASTM International Method 422-D from the ground surface to the bottom of the borehole. Lithology within the ECE property indicates fill across the site from ground surface to a depth of up to 10 feet. Below the fill layer is reddish-brown silty sand to approximately 20 feet below ground surface (bgs), where weathered bedrock is encountered. The saturated zone exists at approximately 12 feet bgs within the ECE property. No problems were encountered during the drilling activities.

With the exception of EPA-30-OB, monitoring wells were installed above the contact between the overburden and weathered bedrock zone, as determined from observations of rock fragments in soil cores

and changes in auger drilling characteristics. EPA-30-OB was installed at a shallower depth (17 to 22 feet bgs) near EPA-13-OB, which is screened to a deeper depth (22 to 32 feet bgs) at the top of weathered bedrock, to provide monitoring data at different depths across the overburden. All wells were constructed following New Jersey Department of Environmental Protection (NJDEP) guidelines. The overburden wells were completed with a 2-inch-diameter, Schedule 40 polyvinyl chloride (PVC) casing, with 5- or 10-foot, 10-slot (0.01-inch) machine-slotted PVC well screen. The annular space between the well screen and borehole of each monitoring well was filled with NJ #0 sand to 2 feet above the top of the well screen and space between the bottom of the borehole and well screen. An annular seal of fine, NJ #00–type sand was installed to fill 2 feet of annular space above the filter sand. The remaining annular space was grouted to the surface using a slurry mixture of Portland cement and bentonite. The wells were then finished with a locking cap, outer steel protective casing, and a flush-mounted concrete pad at the surface.

The monitoring wells were developed using a combination surge and purge method over the entire well screen to remove fines from the filter pack and clear debris that settled at the bottom of the well during installation. Water quality parameters, consisting of conductivity, pH, turbidity, dissolved oxygen (DO), oxidation-reduction potential (ORP), and temperature, were recorded throughout development of each well. A total of five well volumes was removed from each well, ranging anywhere from 25 to 45 gallons. All parameters were fairly stable after removing five well volumes from each of the newly installed wells.

The four newly installed wells were registered with the NJDEP, and copies of the completed well permits are included in Attachment 1. Following installation, a New Jersey-licensed surveyor surveyed the monitoring wells using global positioning system (GPS) technology, and the survey report is provided in Attachment 2. Lithologic logs, well completion diagrams, and development forms are provided in Attachment 3, including the boring log for the previously installed monitoring well EPA-13-OB for reference.

# **Baseline Groundwater Monitoring**

Before the pilot test was initiated, a groundwater sampling event was conducted at the five monitoring wells (EPA-13-OB and EPA-29-OB through EPA-32-OB) to establish baseline Cr(VI) concentrations and geochemical conditions in the overburden aquifer.

The baseline groundwater sampling event was conducted on June 19, 2014, 2 weeks after the monitoring wells were installed, and 4 days before initiating injections. Before collecting groundwater samples, synoptic water level measurements were collected. An electronic water interface probe was used to record the depth to water at each well within an accuracy of  $\pm$  0.01 foot. Results of the baseline depth to water measurements are included in Table 2.

Groundwater samples were collected using USEPA-approved low-flow purging and sampling techniques. During purging of each well, field parameters were collected, including pH, temperature, conductivity, ORP, DO, and turbidity. Once field parameters had stabilized (depth to water, pH, conductivity, ORP, DO, and turbidity), samples were collected and sent to Australian Laboratory Services Group (ALS) in Rochester, New York, for Cr(VI) analysis, and USEPA's Contract Laboratory Program (CLP) and the Division of Environmental Science and Assessment (DESA) laboratory system for other analyses, as detailed in Table 3. Cr(VI) data were validated by the project chemist following the receipt of results and a Data Quality Evaluation Report is included in Attachment 4. Final field parameter readings for each well are included in Table 2, and groundwater monitoring forms are included in Attachment 5.

# Injections

Pilot test injections were carried out within the ECE property boundaries by Vironex between June 23 and July 2, 2014. Injections were carried out at 40 locations between two areas: 12 locations within an approximately 45-foot by 60-foot area situated over the former chromic acid tank storage area (IP-17B, IP-18, IP-19, IP-20A, IP-21, IP-22, IP-23, IP-24A, IP-25, IP-28, IP-29, and IP-30) and 28 locations along a 120-foot barrier downgradient of the source area near the western property boundary (IP-1, IP-1A, IP-2, IP-3, IP-4, IP-4A, IP-5B, IP-6A, IP-7, IP-7A, IP-7B, IP-8B, IP-8C, IP-9, IP-10, IP-10A, IP-11, IP-12, IP-12A,

IP-13, IP-14, IP-14A, IP-15, IP-15A, IP-16A, IP-26, and IP-27D) (Figure 2). Attempts were made to space the injection points 15 feet from each other; however, because of refusal during implementation, some locations needed to be moved, so distances between each injection point varied. The initial work plan called for 25 injection points within the ECE property; however, because of refusal at shallower depths than anticipated, step-out injection points and additional injection point locations were drilled to deliver the total reagent mass and volume, as designed.

Injections were carried out using direct-push technology (DPT) drilling and, where possible, a top down injection approach in which injections are initiated at the water table and advanced in conjunction with the drive rods to the top of bedrock or refusal. At some locations, a bottom-up injection approach was used in order to guarantee delivery of injection fluids to deeper depth intervals. A 1.5-inch top-down injection tool with a 2-foot screen and injection cap was used to evenly distribute the reagent solution across each interval. Refusal within the barrier area was encountered at depths varying from 11 to 28 feet bgs, and from 15 to 20 feet bgs within the source area. Injection interval details for each injection location, including refusal depths, are included in the *Vironex Injections Services Report* included in Attachment 6.

A total of 28,701 gallons of reagent solution composed of emulsified vegetable oil (EVO), magnesium sulfate (MgSO<sub>4</sub>·7H<sub>2</sub>O), and water was injected at the ECE property. During injections, 3,448 gallons of 60 percent Terra Systems SRS-SD EVO product, 1,374 pounds of MgSO<sub>4</sub>·7H<sub>2</sub>O, and 25,254 gallons of potable water were injected. Within the source area, a total volume of 4,800 gallons was injected at an average pressure of 14.8 pounds per square inch and an average flow rate of 2.9 gallons per minute. A total volume of 23,901 gallons was injected within the barrier area at an average flow rate of 2.6 gallons per minute and average pressure of 15.7 pounds per square inch. Injection parameter details for each injection location are included in the *Vironex Injections Services Report* included in Attachment 6.

Upon completion of each injection point, the injection rods were withdrawn, and the resulting voids were sealed with a cement-bentonite group mixture. The injection points were surveyed by a New Jersey-licensed surveyor following injections using GPS technology, and the final survey report is included in Attachment 1.

Water levels and grab groundwater field parameters (DO, conductivity, ORP, pH, temperature, turbidity, and water color) were collected as part of the injection events to monitor groundwater mounding and indicators of reagent arrival and distribution. Before starting injections and following completion of injections (within 24 hours), the five overburden monitoring wells were monitored. Additionally, during the injection activities, monitoring wells EPA-29-OB and EPA-31-OB were monitored at the beginning of each day, every half hour during injections, and at the end of each day of injection activities conducted adjacent to the two wells. Field monitoring results from the injections are included in Attachment 6.

# Post-injection Grab Groundwater Sampling

Following the injection activities, grab groundwater samples were collected at 10 locations (GW-A through GW-J, see Figure 2) between July 29 and 31, 2014, approximately 4 weeks after the injection event. The grab groundwater samples were performed to evaluate the radius of influence (ROI) and distribution of EVO and sulfate achieved during injection, and post-injection adjective transport. The 10 grab groundwater locations were determined based on observations during the injection activities. Grab groundwater locations GW-F, GW-G, and GW-H were installed around injection points IP-9 and IP-11, where larger injection volumes were achieved (1,300 to 1,400 gallons per point). The locations of GW-F, GW-G, and GW-H were selected to provide more information on the injection ROI in an area where larger injection volumes more representative of an optimized full-scale injection were achieved.

Grab groundwater samples were collected using DPT. Two sample depth intervals were targeted at each location—one at the bottom 2 feet of overburden and a second near the water table. However, at two of the locations (GW-A and GW-B), depth to water was within 3 feet of refusal, and only one grab groundwater sample was collected. At each grab groundwater location, the DPT was advanced to the target depth, and a 2-foot screen was deployed at the targeted depth. At three of the grab groundwater locations (GW-C,

GW-D, and GW-I), step-out borings (designated with an "a" suffix on Figure 2) were advanced to collect the deeper sample because of refusal in the initial boring. A peristaltic pump was deployed at each screened interval, and a grab groundwater sample was collected. Upon completion of each grab groundwater sample, the DPT rods were withdrawn, and the resulting voids were sealed with a cement-bentonite group mixture. The grab groundwater points were surveyed using a handheld GPS Trimble unit.

Water levels and field parameters (DO, conductivity, ORP, pH, temperature, turbidity, and water color) were collected at each grab groundwater. Additionally, field kits were used to analyze the grab groundwater samples for Cr(VI) and ferrous iron. Samples were collected and sent for total organic carbon (TOC) and sulfate analysis through the USEPA CLP/DESA laboratory system, as detailed in Table 3. Cr(VI) data were validated following the receipt of results, as included in the Data Validation Report (Attachment 4). Water level, field parameter readings, and analytical results for the grab samples are summarized in Table 4, and groundwater monitoring forms are included in Attachment 5.

# pH Titration Tests

Based on low pH values observed during the initial baseline groundwater sampling, a soil pH titration test was carried out following the EVO injection event. A soil sample was collected from SO-B (Figure 2) during the grab groundwater sampling event and sent to ALS Laboratories in Corvallis, Oregon, for titration testing. Titrations were carried out using sodium hydroxide (NaOH) on a 1 to 1 soil to deionized water slurry. NaOH was added in increments of 50 micrograms per liter ( $\mu$ g/L) (0.1 millimole hydroxide) until a pH of 7 was reached. The sample was then sealed and allowed to sit for 122 hours. During the 122 hours of the test, the pH was checked incrementally to ensure it had not drifted by more than 0.5 pH units. If the pH had drifted, NaOH was added in 50  $\mu$ g/L increments until a pH of 7 was reestablished. Details on the pH titration test are included in Attachment 7.

Results of the pH titration tests indicate that to neutralize the soil within the ECE property, NaOH or a similar base would need to be added at a dosing of 0.0161 micromoles per gram of dry soil, or approximately two pounds of NaOH per cubic yard of soil.

# Performance Monitoring

Following the injections, five rounds of groundwater sampling at the five monitoring wells (EPA-13-OB and EPA-29-OB through EPA-32-OB) were carried out over 7 months after the injection event to monitor the performance on the EVO injections. Performance monitoring events were carried out as follows:

- July 29–30, 2014 (Event 1)
- September 3–4, 2014 (Event 2)
- October 20–21, 2014 (Event 3)
- December 17–18, 2014 (Event 4)
- February 5–6, 2015 (Event 5)

Before collecting groundwater samples, synoptic water-level measurements were collected. An electronic water interface probe was used to record the depth to water level at each well within an accuracy of  $\pm$  0.01 foot. Results of the depth to water measurements are included in Table 2.

During performance monitoring, groundwater samples were collected using USEPA-approved low-flow purging and sampling techniques. During purging of each well, field parameters were collected including pH, temperature, conductivity, ORP, DO, and turbidity. Once field parameters had stabilized (depth to water, pH, conductivity, ORP, DO, and turbidity), samples were collected and sent to ALS in Rochester, New York, for Cr(VI) analysis, and USEPA's CLP/DESA laboratory for analyses as detailed in Table 3. Data were validated following the receipt of results, as included in the Data Validation Report (Attachment 4). Final field parameter readings for each well are included in Table 2, and groundwater monitoring forms are included in Attachment 5.

# **Investigation-Derived Waste Management**

Investigation-derived waste (IDW) created throughout the pilot study was stored within the ECE property. IDW soil and water produced during the installation and subsequent sampling of each borehole and monitoring well was transferred to 55-gallon Department of Transportation-regulated drums. Copies of IDW disposal waste manifests and bills of lading are included in Attachment 8.

Three IDW samples were collected for various laboratory analyses, based on the media to be disposed of and the requirements of each disposal facility. In general, IDW samples were analyzed by a subcontracted laboratory (ALS) for the following:

- IDW water: Cr(VI), volatile organic carbons (VOCs), semivolatile organic carbons (SVOCs), polychlorinated biphenyls (PCBs), pesticides, metals (including mercury and cyanide), total petroleum hydrocarbons–gasoline and diesel ranges, corrosivity, and ignitability
- IDW soils cuttings: Cr(VI), toxicity characteristic leaching procedure VOCs, SVOCs, pesticides, herbicides; PCBs, corrosivity, and ignitability

Wastewater from the pilot study activities were classified as hazardous based on analytical results of the IDW samples collected, and waste solids were classified as nonhazardous. Capitol Environmental managed disposal of the hazardous wastewater and nonhazardous waste solids. During the pilot study, approximately 730 gallons of hazardous wastewater and 3,000 pounds of nonhazardous waste solids were disposed of at the EQ Detroit facility in Detroit, Michigan.

# Work Plan Deviations

The ISR pilot test study was carried out in accordance with the work plan (CH2M HILL 2013a). Deviations from the work plan are summarized as follows:

- Three of the four monitoring wells installed (not including EPA-30-OB) were installed at depths shallower than anticipated in the work plan, due to refusal at a shallower depth. Additionally, EPA-29-OB was installed with a 5-foot screen, instead of a 10-foot screen as detailed in the work plan.
- During injections, 40 locations were advanced, including 12 within an approximately 45-foot by 60-foot area (source), and 28 along the 120 foot barrier. The 15 additional boring locations, above the 25 prescribed in the work plan, were advanced in order to deliver the design dosage of EVO substrate, after refusal was encountered at multiple injection locations. Additionally, due to refusal, not all locations were pushed on 15-foot centers, as established in the work plan.
- A bottom-up injection approach was used at some of the injection locations, in order to ensure that the substrate was delivered to deeper depths. The bottom-up approach was used most often when a top-down approach hit refusal at a shallow depth and a step out boring was advanced.
- Due to shallow refusal, not all borings received the proper dosage over a 10-foot (source) or 17-foot (barrier) interval, as prescribed in the work plan. However, additional step-out locations were drilled, and the overall dosing of EVO substrate to the subsurface was in accordance with the work plan.
- Grab groundwater samples were collected approximately 4 weeks after the completion of injections, 1 week longer than the prescribed 3-week timeframe in the work plan.
- A soil pH titration test was carried out to determine the buffering capacity of the soil after low pH was encountered in the source area.

# Health and Safety

The ISR pilot test study was carried out in compliance with the *Final-Accident Prevention Plan, Garfield Groundwater Contamination Superfund Site Remedial Investigation, Revision 1* (CH2M HILL 2013b). Prior to starting fieldwork, an Operational Readiness Review call was held in order to address possible health and safety issues that could be encountered during field activities. Additionally, prior to starting each task, an Activity Hazard Analysis was performed and reviewed with the field team. Each morning, prior to starting work, the team reviewed the tasks to be performed for the day and discussed possible health and safety issues that may be encountered. If change conditions were encountered, work was stopped, and the situation and its risks were discussed within the field team prior to resuming work. The ISR pilot study was performed with no health and safety incidents. Similar risks would be involved with a full-scale implementation, with an additional risk of working outside of the ECE property boundaries within public streets, and traffic-control planning would be necessary.

# Results

# Analysis of Pilot Study Performance

This section provides a summary and assessment of the pilot study performance monitoring data. Overall, the pilot study demonstrated that EVO can be injected and distributed at sufficient concentrations to stimulate the reduction of Cr(VI).

Several challenges were encountered during the pilot study that affected the effectiveness of Cr(VI) reduction. Heterogeneity in the overburden resulted in non-uniform distribution of injected solutions laterally across the site. However, at most injection locations, the distribution of injected solutions did not appear to be significantly affected by vertical short-circuiting up toward the water table or down toward the weathered bedrock. At injection points where surfacing was observed, minor amounts of injection solutions were observed, and in most cases reducing flow rates proved effective for reducing surfacing.

At the source area onsite, historical releases of chromic acid have affected groundwater conditions to the point of impacting the ability to treat Cr(VI) in situ. Low pH and elevated Cr(VI) concentrations impacted microbial growth, which effectively shut down the biogeochemical processes required to reduce Cr(VI) to trivalent chromium [Cr(III)]. Downgradient of the site where pH is neutral and Cr(VI) concentrations are lower, Cr(VI) treatment was most successful, as demonstrated by indicators of microbial activity and overall Cr(VI) concentrations.

Pilot study performance monitoring data are summarized in Table 2, and grab groundwater monitoring data are summarized in Table 4. Figures 3 and 4 summarize results from the grab groundwater monitoring and performance monitoring. Additional discussion and interpretation of the pilot study performance monitoring data is presented in the following subsections.

# TOC Concentrations and Substrate Distribution

- Refusal was encountered in many injection borings requiring step-out injection locations. In IP-4, IP-7, and IP-8, multiple step-out borings were required to complete injection of the approximate target reagent solution volume.
- At most locations, surfacing of injected reagents was not observed in the injection borings or adjacent borings and monitoring wells. In IP-4 and IP-8, surfacing was observed in the boring being injected, while in IP-7 surfacing was observed in the step-out injection boring and the adjacent original boring. Surfacing was easily mitigated by lowering the injection rates and volumes of surfaced material were minimal (less than 5 gallons). Additional grouting activities were also performed in the original IP-7 injection boring to ensure no further surfacing occurred through adjacent borings. Surfacing is an indicator of low permeability at a given location due to lithology, or smearing of the DPT boring wall causing reduction in permeability. These issues can be resolved for the most part by using properly

screened and developed permanent injection wells rather than DPT injection points. Groundwater mounding observed during injections ranged from approximately 1 foot in EPA-29-OB to 3 feet in EPA-31-OB.

- During the grab groundwater sampling event, TOC in grab groundwater samples was collected to assess substrate distribution 4 weeks after injection. The substrate used was a mixture of EVO and 4 percent lactate. The EVO itself is expected to mostly sorb to the soil particles; therefore, it is not measurable in groundwater. The lactate is soluble and can be measured in groundwater as TOC. In addition, as EVO ferments, it releases volatile fatty acids that are soluble and therefore can be measured as TOC in groundwater.
  - Baseline TOC concentrations at the site were less than 3 milligrams per liter (mg/L). Across the majority of the treatment area, TOC concentrations in grab groundwater samples were greater than 10 mg/L, but not uniformly greater than 20 mg/L (Figure 3). This suggests that substrate was distributed to most locations; however, it was not uniformly distributed to meet design concentrations at all locations. At two grab groundwater locations near the center of the barrier (GW-G and GW-H), TOC concentrations exceeded 200 mg/L. The high concentrations of TOC may be because of the presence of EVO droplets in the groundwater samples.
  - The overall TOC concentrations suggest that the distribution of the EVO was not ideally uniform, and at some locations, preferential lateral flow during injections may have carried the substrate further from the injection points. Across most of the site, vertical distribution of solutions during injection did not appear to be affected by short-circuiting up toward the water table or down toward the weathered bedrock. This was evidenced by similarities or limited differentiation between TOC and sulfate concentrations in grab samples collected near the water table versus near the weathered bedrock. The exceptions were near IP-9 and IP-11, where grab groundwater samples (GW-G and GW-H) collected near the water table contained much higher TOC concentrations than the deeper samples collected near the weathered bedrock. This could indicate localized heterogeneities that cause uneven reagent distribution during injection, and/or after injection during the first month of advective transport.
  - Due to overburden heterogeneities resulting in uneven lateral reagent distribution, a well-defined injection ROI could not be inferred from the monitoring data. On average, the estimated radius of influence achieved using DPT injection points was on the order of 5 to 10 feet, as confirmed in injection point/grab groundwater sample pairs IP-5B/GW-E, IP-9/GW-G, IP-17B/GW-A, IP-20A/GW-B and IP-23/GW-C(a).
  - Long-term TOC data were collected from monitoring wells over 8 months to evaluate the steadystate flux of organic carbon from the breakdown of the oil-based fraction of the EVO, as shown in Figure 5. Onsite TOC concentrations increased to as high as 18 mg/L in the source area and 20 mg/L inside the barrier. Downgradient of the barrier, TOC concentrations increased to as high as 38 mg/L in offsite monitoring well EPA-13-OB. Higher long-term TOC concentrations in this well suggests a greater level of microbial activity breaking down the long-chain fatty acids of the EVO.
  - The pilot test design target steady-state TOC concentration in groundwater was 60 mg/L, which is within the typical steady-state TOC range observed at other EVO injection sites (20 to 100 mg/L). Measured TOC concentrations in monitoring wells were all lower than 60 mg/L, indicating either non-uniform EVO distribution because of overburden heterogeneity, or limited microbial activity breaking down the long-chain fatty acids of the EVO.
  - TOC concentration trends over time appear to be decreasing or stable, with the exception of downgradient monitoring well EPA-13-OB, where TOC concentrations were still increasing as of the fifth performance monitoring event. The trends provide additional evidence of higher microbial activity breaking down the long-chain fatty acids of the EVO.

# Sulfate Concentrations and Distribution

- As discussed in the work plan, sulfate was added to stimulate the formation of iron sulfide minerals, which can abiotically reduce Cr(VI) to Cr(III), which then precipitates out with ferric oxide [Fe(III)] to form insoluble hydroxides and oxyhydroxides. Iron sulfide minerals will re-oxidize once EVO is depleted and aerobic conditions re-establish. The Cr(VI) that has already been reduced by the iron sulfide will not reoxidize.
- Baseline sulfate concentrations ranged from 33 mg/L downgradient of the site to 200 mg/L near the source area. Background overburden sulfate concentrations in the vicinity of the ECE property, as reported in the remedial investigation report, were approximately 30 mg/L. Elevated sulfate near the source area is likely because of sulfuric acid in historically released chrome plating solutions. Following the MgSO<sub>4</sub>·7H<sub>2</sub>O injections, sulfate concentrations in grab groundwater samples collected during the first performance monitoring event were as high at 710 mg/L and averaged approximately 300 mg/L across the rest of the site (Figure 3), which is greater than the design target sulfate concentration of 250 mg/L. The application of the sulfate data as an indicator of distribution of the injected fluids is difficult because of the presence of elevated sulfate concentrations in the source area.
- Long-term sulfate data collected from monitoring wells over 8 months showed sulfate concentrations
  dropping back down to near baseline concentrations, as shown in Figure 6. Sulfide (resulting from the
  reduction of sulfate) was not detected in any onsite monitoring well, which suggests the decrease in
  sulfate onsite was most likely because of advective flushing and dilution. Sulfide was detected in
  downgradient monitoring well EPA-13-OB, which indicates that sulfate reducing conditions were
  achieved downgradient of the ECE property. Both iron and manganese concentrations also increased in
  this well because of reducing conditions, although dissolved iron did not increase to the same
  magnitude as manganese. The lower dissolved iron combined with the presence of sulfide indicates a
  higher likelihood that iron sulfide minerals were likely formed.

# Cr(VI) Concentration Trends

- Baseline Cr(VI) ranged from 224,000 to 275,000 μg/L onsite, and from 18,400 to 125,000 μg/L downgradient of the site (Figure 4). Cr(VI) concentrations decreased by more than 97 percent in offsite downgradient monitoring wells EPA-13-OB and EPA-30-OB (Figure 8). No appreciable Cr(VI) concentration decreases were observed onsite, as shown in Figure 7.
- The lack of Cr(VI) reduction onsite appears to be associated with low pH conditions inhibiting microbial activity, which requires neutral pH. Onsite, pH ranged from 3.1 to 6.1, whereas pH ranged from 6.2 to 7.7 offsite. Alkalinity also provides another indication of microbial activity since carbon dioxide (CO<sub>2</sub>) is produced from microbial activity as organic carbon (naturally occurring or from the EVO injections) is consumed and the CO<sub>2</sub> converts to alkalinity. Alkalinity was lowest onsite closer to the source area (EPA-29-OB) and upgradient of the barrier (EPA-32-OB), and elevated within, offsite and downgradient of the barrier (greater than 250 mg/L), indicating increased microbial activity where pH was 6 or higher.
- The lack of Cr(VI) reduction also could be associated with toxic effects of high Cr(VI) concentrations on microbial growth. Studies have shown that Cr(VI) concentration greater than approximately 160,000 to 200,000 μg/L are inhibitive for Cr(VI)-reducing bacteria (Farag and Zaki 2010). Cr(VI) concentrations onsite are above this threshold, whereas offsite concentrations are below this threshold.
- Dissolved total chromium also was analyzed to evaluate the potential for organic acids resulting from the breakdown of EVO to form soluble complexes with Cr(III). The complexation of Cr(III) by organic acids occurs after Cr(VI) is reduced either biologically or abiotically, so the presence of organic acids does not have a bearing on biotic or abiotic Cr(VI) reduction. The complexes, while stable and not likely to re-oxidize to Cr(VI), would allow Cr(III) to remain in solution at higher pH levels where Cr(III) is expected to precipitate. In most of the monitoring wells, Cr(VI) composed a majority of the dissolved chromium. In downgradient monitoring well EPA-13-OB, Cr(III) made up approximately 70 to 80 percent

of the dissolved chromium, an indication that Cr(III) had complexed with organic acids. However, the concentration of dissolved chromium in this well was still below the NJDEP Groundwater Quality Standard (GWQS) of 70  $\mu$ g/L. Compared to the greater than two-orders-of magnitude reduction of total chromium and Cr(VI) concentrations in this well, the magnitude of Cr(III) complexation is not significant.

### **Geochemical Parameter Trends**

- Typical ORP in the environment ranges from hundreds of millivolts (mv) for very oxidizing conditions, to negative hundreds of mV for methanogenic conditions. Baseline groundwater ORP ranged from 103 to 530 mV, indicating oxidizing conditions. The high ORP was likely because of the high Cr(VI) concentrations in the source area. The ORP observed at the end of the performance monitoring period (greater than 400 mV at the source area to less than -200 mV at the furthest downgradient wells) is indicative of more reducing conditions downgradient of the barrier, which also corroborates the overall Cr(VI) reduction patterns observed.
- The terminal electron acceptors evaluated included nitrate, which reduces to nitrogen gas (with nitrite as a short-lived intermediate), manganese(IV) which reduces to dissolved manganese(II); Fe(III), which reduces to dissolved Fe(II); and CO<sub>2</sub>, which reduces to methane. Overall trends in groundwater electron acceptor concentrations also mirror the same general Cr(VI) reduction patterns, in that Cr(VI) reduction occurred where consistent reducing conditions resulting from the stimulation of microbial activity were observed downgradient of the site. Due mainly to low pH and elevated Cr(VI) concentrations, impacts to microbial activity, redox conditions observed during the pilot study ranged from oxidizing onsite to nitrate-reducing and methanogenic downgradient, as follows:
  - Background nitrate concentrations range from approximately 10 to 40 mg/L. Nitrate concentrations in all monitoring wells, except EPA-29-OB, decreased over time. The greatest nitrate decreases (decreased to less than 1 mg/L) were observed in downgradient monitoring wells EPA-13-OB and EPA-30-OB. Nitrate concentration decreases were caused by nitrate-reducing bacteria using it as a terminal electron acceptor, reducing it to nitrogen gas.
  - Iron and manganese concentration trends were difficult to interpret because of elevated background concentrations in the acidic onsite groundwater. The most significant increases in iron and manganese were observed in downgradient wells EPA-13-OB and EPA-30-OB. Iron and manganese concentrations in these wells were elevated above the NJDEP GWQSs during the fifth performance monitoring event. Concentrations are expected to drop back below maximum contaminant levels as the EVO is depleted over time and redox conditions return to background.
  - Background methane concentrations were predominately nondetect. Methane concentration increases were noted in most of the monitoring wells; however, the most significant increases were observed in downgradient monitoring wells EPA-13-OB and EPA-30-OB (1,360 and 427 μg/L, respectively). The increase of methane is a result of methanogenic bacteria using CO<sub>2</sub> as a terminal electron acceptor, reducing it to methane. Certain strains of methanogens are known to be tolerant of lower pH conditions, possibly explaining the slight increase in methane in EPA-29-OB. Methanogenic conditions can also exist in localized microenvironments near the EVO injections that are not representative of the overall surrounding aquifer conditions.

# Recommendations for Full-scale Application of In Situ Reduction

The overall results of the pilot study show that because of microbe-inhibitory low pH and elevated Cr(VI) concentrations at the source area, biological in situ reduction should not be considered for application in the overburden at the ECE property. Either chemical in situ reduction, or a combination of chemical with pH neutralization and biological reduction, should be considered.

In situ biological reduction has the potential to be a successful component of a full-scale remedy for the Cr(VI) plume downgradient of the ECE property. For example, in situ biological reduction could be used to create reducing barriers by injecting EVO in a line of wells parallel to the groundwater flow direction.

Uneven lateral distribution of injected solution was observed during the pilot study. Greater uniformity and injection ROI can likely be achieved by using permanent injection wells rather than DPT injection points, and increasing the total injection volume. Using injection wells and larger injection volumes would be beneficial for treatment barrier applications, where uniformity of treatment is important. For full-scale application, volatile fatty acids analysis would be performed periodically to confirm the distribution of EVO and TOC concentrations.

The dosage of EVO used during the pilot study resulted in sufficient TOC concentrations to support Cr(VI) reduction (at least 20 mg/L) where microbial activity was not inhibited. However, it is uncertain at this time how long reducing conditions will persist with a single injection at the pilot study dosage. For full-scale application, increasing the EVO dosage would be recommended to maximize the longevity of the reduction barriers and to provide contingency against non-uniform EVO distribution. Based on the pH data collected from the downgradient offsite monitoring wells, adding a buffer does not appear to be necessary in the downgradient plume area to maintain neutral pH levels.

For full-scale application, it is not anticipated that the addition of sulfate would be necessary for Cr(VI) reduction to occur. However, sulfate injections may extend the effectiveness (in areal extent and longevity) of full-scale in situ reduction barriers and reduce the EVO reinjection frequency. Additional monitoring data from EPA-13-OB collected after TOC has been depleted may provide additional insight into the benefits of sulfate amendment. If sulfate is injected along with the EVO during full-scale application, amendment of iron also is recommended to supplement the low naturally occurring iron in the aquifer.

# References

CH2M HILL. 2013a. Final Work Plan for Aquifer Test, Pilot Test and Groundwater Modeling, Garfield Groundwater Contamination Superfund Site, Remedial Investigation/Feasibility Study, City of Garfield, Bergen Country, New Jersey. September

CH2M HILL. 2013b. Final- Accident Prevention Plan, Garfield Groundwater Contamination Superfund Site, Remedial Investigation, Garfield, New Jersey. July.

Farag, Soha, and Sahar Zaki. 2010. "Identification of bacterial strains from tannery effluent and reduction of hexavalent chromium." *Journal of Environmental Biology*. September.

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- 3 Pilot Test Monitoring Analysis
- 4 Pilot Test Grab Groundwater Results

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- 3 Grab Groundwater Sample Results
- 4 Total/Hexavalent Chromium Results Performance Monitoring
- 5 Total Organic Carbon Concentration Trends in Groundwater
- 6 Sulfate Concentration Trends in Groundwater
- 7 Hexavalent Chromium Concentration Trends in Groundwater Source Area and within Treatment Barrier
- 8 Hexavalent Chromium Concentration Trends in Groundwater Downgradient of Treatment Barrier

### ATTACHMENTS

- 1 Well Permits
- 2 Survey Data
- 3 Boring Logs, Well Completion Diagrams, and Development Forms
- 4 Data Quality Evaluation Report
- 5 Groundwater Field Logs
- 6 Vironex Injection Services Report
- 7 pH Titration Results
- 8 IDW Manifest and Bill of Lading

# Tables

### Pilot Test Monitoring Wells

Results of In Situ Reduction Pilot Test

Garfield Groundwater Contamination Superfund Site, New Jersey

Monitoring Well	Depth Interval	TOC Elevation	Total Depth	Screen Interval	TOS Elevation	<b>BOS Elevation</b>	Pilot Study Location
ID	Depth interval	ft amsl	ft bgs	ft bgs	ft amsl	ft amsl	
EPA-13-OB	Overburden	55.54	32	22 to 32	33.54	23.54	Downgradient of Injection Barrier
EPA-29-OB	Overburden	58.23	20	15 to 20	43.23	38.23	Within Source Area
EPA-30-OB	Overburden	55.50	22	17 to 22	38.50	33.50	Downgradient of Injection Barrier
EPA-31-OB	Overburden	56.31	26	16 to 26	40.31	30.31	Within Injection Barrier
	Overburden	F0 20	20 5	10 F to 20 F	47.70	27 70	Upgradient of Injection Barrier, Downgradient
EPA-32-OB	Overburden	58.29	20.5	10.5 to 20.5	47.79	37.79	of Source Area

Notes:

BOS = bottom of screen

ft amsl = ft above mean sea level

ft bgs = feet below ground surface

TOC = top of casing

TOS = top of screen

### Pilot Test Groundwater Analytical Results

Results of In Situ Reduction Pilot Test Garfield Groundwater Contamination Superfund Site. New Jersev

Garfield Groundwater Contamination Superfund S	Site, New Jersey																	
		Well					EPA-13-OB								EPA-29-OB			
		Date Collected	6/19/2014	6/19/2014	7/29/2014	9/3/2014	10/20/2014	10/20/2014	12/18/2014	12/18/2014	2/5/2015	6/19/2014	7/30/2014	9/4/2014	9/4/2014	10/21/2014	12/17/2014	2/6/2015
		Event	Baseline	Event 1	Event 1 - Dup	Event 2	Event 3	Event 3 - Dup	Event 4	Event 4 - Dup	Event 5	Baseline	Event 1	Event 2	Event 2 - Dup	Event 3	Event 4	Event 5
			EPA-13-OB-	D-06192014-	EPA-13-OB-	EPA-13-OB-	EPA-13-OB-		GCGC-EPA-13-		EPA-13-OB-	EPA-29-OB-	EPA-29-OB-	EPA-29-OB-		EPA-29-OB-	GCGC-EPA-29-	EPA-29-OB-
		Sample ID	061914	01	072914	090314	102014	D-01-102014	OB-05	01	020515	061914	072914	090414	D-01-090414	102114	OB-05	020615
Analyte	Unit	NJDEP GWQS																
Chromium , dissolved	μg/L	70	19,000	18,000	2,850	350	56.8		32.1		41	310,000	316,000	410,000	400,000	332,000	220,000	220,000
Chromium	μg/L	70	18,000	18,000	2,730	740	187		49.5		83 L	300,000	421,000	410,000	430,000	380,000	267,000	240,000
Chromium, Hexavalent (CrVI) , dissolved	μg/L	70	18,400	18,900	2,400	310	13.2 J	147 J	9	9	9	275,000	292,000	379,000	379,000	298,000	213,000	207,000
ron , dissolved	μg/L	300	50 U	50 U	100 U	50 U	200 U		354		220	2,800	2,200	4,900	4,400	115,000	200 U	1,600
Iron	μg/L	300	50 U	50 U	100 U	50 U	200 U		395		290	3,300	6,510	4,700	5,000	128,000	1,820	1,800
Manganese , dissolved	μg/L	50	4.5	11			2,800		1,910		4,500	770				995		950
Manganese	μg/L	50	5.4	5.2			2,880				4,500	790				1,480		920
Methane , dissolved	μg/L						1									1.6		
Methane	μg/L		2 U								1,360	2 U						47.8
Ethane	μg/L		2 U								2 U	2 U						2 U
Ethene	μg/L		2 U								2 U	2 U						2 U
ALKALINITY, TOTAL (AS CaCO3)	mg/L		210				262				280	1 U				2 U		1 U
Chloride (Cl)	mg/L		140		160	180	150		160		160	240	240	260		211	210	180
NITRATE-NITRITE (as Nitrogen)	mg/L		8.5		0.13		0.016 J		0.05 U		0.05 U	9.8	6.2			9.58		7.9
Sulfate	mg/L		33		56	57	13.5		12		3.2	160	200	190		214	92	110
Sulfide, Acid-Soluble	mg/L		0.01 U		0.01 UL	0.01 U	1.6		1.3		0.012	0.01 U	0.01 U	0.01 U		1 U	0.02 UL	0.01 UL
Total Organic Carbon	mg/L		1 U	1 U	13	5.2	17.3	10.6	7.4		38	2.6	18	10	9.9	14.3	6.3 J	7.5
Field Parameters	Unit																	
pH	s.u.		7.74		7.74	7.57	7.44		7.53		7.18	4.15	3.64	3.23		3.20	3.28	3.13
Temperature	°C		16.91		19.01	17.44	19.00		17.67		14.95	13.49	17.70	19.00		17.96	17.43	15.29
Conductivity	mS/cm		0.806		0.956	1.00	0.108		1.00		1.01	1.52	1.69	1.84		0.187	1.40	1.49
Oxidation-Reduction Potential	mV		149		17	-94	251		-229		-228	530	470	523		535	459	427
Dissolved Oxygen <sup>a</sup>	mg/L		1.12		0.00	0.00	0.00		1.98		0.00	2.95	0.00	0.51		0.40	0.00	0.00
Turbidity	NTU		2.85		191	40.5	6.03		7.07		9.3	98.3	339	93.1		48.4	7.09	19.6
Depth to Water	ft bgs		11.98		12.42	13.64	14.50		12.20		12.97	10.37	10.67	11.77		12.65	10.78	11.08
Water Elevation	ft amsl		43.56		43.12	41.90	41.04		43.34		42.57	47.86	47.56	46.46		45.58	47.45	47.15
			Yellow, Green		Clear, Slightly milky	Clear	Clear		Clear		Clear	Dark Yellow	Yellow, milky	Yellow		Yellow	Yellow, green	Yellow
Observations <sup>b</sup>					тшку													
Notes:																		

Notes:

Shading indicates concentrations in exceedance of NJDEP GWQS

-- Analyte was not sampled for at that location

NJDEP GWQS - New Jersey Department of Environmental Protection Groundwater

Quality Standard CaCO3 - Calcium Carbonate

Dup - Duplicate

μg/L - microgram per liter

mg/L - milligram per liter

s.u. - standard pH units

°C - degrees Celsius

mS/cm - millisiemens per centimeter

mV - millivolts

NTU - Nephelometric Turbidity Units

ft bgs - feet below ground surface

ft amsl - feet above mean sea level

<sup>a</sup> Due to equipment limitations in the field during the six sampling events , dissolved oxygen measurements are inaccurate and were not used in the assessment of the Pilot Study.

<sup>b</sup> Yellow to orange coloring is indicative of elevated concentrations of hexavalent chromium. Green coloring is indicative of elevated concentrations of trivalent chromium. Brown to red color may be indicative of elevated precipitation of iron as a result of EVO injections.

J- The identification of the analyte is acceptable; the reported value is an estimate.

K- The identification of the analyte is acceptable; the reported value may be biased high.

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U- The analyte was not detected at or above the Reporting Limit.

### Pilot Test Groundwater Analytical Results

Results of In Situ Reduction Pilot Test Garfield Groundwater Contamination Superfund Site. New Jersev

Garfield Groundwater Contamination Superfund Si	te, New Jersey														
		Well			EPA-3	80-OB						EPA-31-OB			
		Date Collected	6/19/2014	7/29/2014	9/3/2014	10/20/2014	12/18/2014	2/5/2015	6/19/2014	7/30/2014	9/3/2014	10/20/2014	12/18/2014	2/6/2015	2/6/2015
		Event	Baseline	Event 1	Event 2	Event 3	Event 4	Event 5	Baseline	Event 1	Event 2	Event 3	Event 4	Event 5	Event 5 - Dup
			EPA-30-OB-	EPA-30-OB-	EPA-30-OB-	EPA-30-OB-	GCGC-EPA-30-	EPA-30-OB-	EPA-31-OB-	EPA-31-OB-	EPA-31-OB-	EPA-31-OB-	GCGC-EPA-31-	EPA-31-OB-	D-02062015-
		Sample ID	061914	072914	090314	102014	OB-05	020515	061914	073014	090314	102014	OB-05	020615	01
Analyte	Unit	NJDEP GWQS													
Chromium, dissolved	μg/L	70	130,000	76,800	25,000	8,400	6,940	2,300	250,000	264,000	250,000	275,000 J	211,000	250,000	250,000
Chromium	μg/L	70	130,000	75,700	22,000	9,600	9,150	5,600	250,000	251,000	240,000	267,000	270,000	250,000	250,000
Chromium, Hexavalent (CrVI), dissolved	μg/L	70	125,000	68,100	25,300	10,000	9,880	2,880	241,000	237,000	246,000	288,000	241,000	249,000	253,000
Iron , dissolved	μg/L	300	50 U	1,000 U	50 U	2,630	447	50 U	50 U	3,500 U	50 U	87,000 J	1,210	50 U	50 U
Iron	μg/L	300	240	1,000 U	50 U	3,140	893	3,000	120	3,000 U	440	90,900	1,070	190	150
Manganese, dissolved	μg/L	50	410			1,640		2,700	1,200			1,270 J		1,100	1,100
Manganese	μg/L	50	420			1,830		2,800	1,200			772		1,200	1,100
Methane , dissolved	μg/L					2.4						0.89 J			
Methane	μg/L		2.38					427	2 U					4.42	
Ethane	μg/L		2 U					2 U	2 U					2 U	
Ethene	μg/L		2 U					2 U	2 U					2 U	
ALKALINITY, TOTAL (AS CaCO3)	mg/L		250			273		290	210			265		150	
Chloride (Cl)	mg/L		160	160	180	163	160	170	190	190		170	180	170	
NITRATE-NITRITE (as Nitrogen)	mg/L		16	2.8		0.024 J		0.1	28	22		14.1		13	
Sulfate	mg/L		76	89	71	57.2	68	40	100	140	130	111	130	140	
Sulfide, Acid-Soluble	mg/L		0.01 U	0.01 U	0.01 U	1 U	0.02 U	0.01 U	0.01 U	0.01 U	0.01 U	1 U	0.02 U	0.01 U	
Total Organic Carbon	mg/L		1.7	12	3.6	3.5	3.7	6.4	2.3	20	11	12.6	8.6	6.9	7
Field Parameters	Unit														
рН	s.u.		6.77	6.73	7.25	7.30	7.04	6.21	6.11	6.02	5.76	6.00	5.81	5.36	
Temperature	°C		18.35	16.91	20.16	21.30	18.72	13.24	16.90	17.98	20.50	18.32	16.91	15.29	
Conductivity	mS/cm		1.29	1.24	1.17	0.115	1.19	1.09	1.75	1.74	1.56	0.193	1.74	1.61	
Oxidation-Reduction Potential	mV		103	151	20	-84	-3	-49	202	259	206	290	331	350	
Dissolved Oxygen <sup>a</sup>	mg/L		0.83	0.00	0.75	0.73	2.17	0.00	1.49	0.00	0.00	0.41	0.00	0.00	
Turbidity	NTU		13.6	258	10.9	6.91	7.03	78	20.9	256	137	53.4	36.9	18.3	
Depth to Water	ft bgs		11.95	12.65	13.97	14.54	12.55	12.74	11.98	12.90	14.13		12.46	13.18	
Water Elevation	ft amsl		43.55	42.85	41.53	40.96	42.95	42.76	44.33	43.41	42.18		43.85	43.13	
			Yellow, green	Yellow	Yellow, green	Clear	Clear	Light brown	Dark Yellow	Yellow	Yellow	Yellow	Yellow	Yellow, green	
Observations <sup>b</sup>															

#### Notes:

Shading indicates concentrations in exceedance of NJDEP GWQS

-- Analyte was not sampled for at that location

NJDEP GWQS - New Jersey Department of Environmental Protection Groundwater

Quality Standard CaCO3 - Calcium Carbonate

Dup - Duplicate

µg/L - microgram per liter

mg/L - milligram per liter

s.u. - standard pH units

°C - degrees Celsius

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mV - millivolts

NTU - Nephelometric Turbidity Units ft bgs - feet below ground surface

ft amsl - feet above mean sea level

<sup>a</sup> Due to equipment limitations in the field during the six sampling events , dissolved oxygen measurements are inaccurate and were not used in the assessment of the Pilot Study.

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### Pilot Test Groundwater Analytical Results

Results of In Situ Reduction Pilot Test Garfield Groundwater Contamination Superfund Site. New Jersev

		Well				EPA-32-OB			
		Date Collected	6/19/2014	7/29/2014	7/29/2014	9/3/2014	10/20/2014	12/17/2014	2/5/2015
		Event	Baseline	Event 1	Event 1 - Dup	Event 2	Event 3	Event 4	Event 5
			EPA-32-OB-	EPA-32-OB-	D-07292014-	EPA-32-OB-	EPA-32-OB-	GCGC-EPA-32-	EPA-32-OB
		Sample ID	061914	072914	01	090314	102014	OB-05	020515
Analyte	Unit	NJDEP GWQS							
Chromium , dissolved	μg/L	70	250,000	184,000		240,000	274,000	301,000	250,00
Chromium	μg/L	70	240,000	159,000		240,000	389,000	312,000	250,00
Chromium, Hexavalent (CrVI) , dissolved	μg/L	70	224,000	160,000		232,000	285,000	269,000	235,00
ron , dissolved	μg/L	300	540	632		560	88,900	731	680
ron	μg/L	300	690	2,040		1,100	105,000	2,250	2,30
Manganese , dissolved	μg/L	50	1,500				1,410		1,60
Vanganese	μg/L	50	1,500				1,760		1,60
Vethane, dissolved	μg/L						0.92 J		
/lethane	μg/L		2 U						2 U
thane	μg/L		2 U						2 U
thene	μg/L		2 U						2 U
ALKALINITY, TOTAL (AS CaCO3)	mg/L		1 U				4.4		1 U
Chloride (Cl)	mg/L		150	160		190	185	200	170
NITRATE-NITRITE (as Nitrogen)	mg/L		35	36			9.22		8.9
Sulfate	mg/L		200	260		200	169	150	200
Sulfide, Acid-Soluble	mg/L		0.01 U	0.01 U		0.01 U	1 U	0.02 U	0.01 U
Fotal Organic Carbon	mg/L		2.1	3.8	3.9	6.8	14.1	5.2	5.7
Field Parameters	Unit								
ЪН	s.u.		4.75	4.35		4.44	4.71	3.25	5.02
emperature	°C		15.43	19.56		21.47	21.50	17.87	20.33
Conductivity	mS/cm		1.41	1.45		1.46	0.185	1.68	1.54
Dxidation-Reduction Potential	mV		474	406		462	375	488	419
Dissolved Oxygen <sup>a</sup>	mg/L		2.14	0.00		1.20	0.00	0.14	0.00
Furbidity	NTU		9.73	39.2		46.4	> 1,000	4.39	232
Depth to Water	ft bgs		12.40	13.01		14.35	15.20	12.79	13.40
Water Elevation	ft amsl		45.89	45.28		43.94	43.09	45.50	44.89
			Dark Yellow	Yellow		Yellow	Yellow-brown	Yellow - brown	Yellow, gre
Observations <sup>b</sup>									. 0

### Notes:

Shading indicates concentrations in exceedance of NJDEP GWQS

-- Analyte was not sampled for at that location

NJDEP GWQS - New Jersey Department of Environmental Protection Groundwater Quality Standard CaCO3 - Calcium Carbonate

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### TABLE 3 Pilot Test Monitoring Analysis

Results of In Situ Reduction Pilot Test

		Post-Injection					
	Baseline	Grab	Performance	Performance	Performance	Performance	Performance
	Groundwater	Groundwater	Monitoring Event	<b>Monitoring Event</b>	<b>Monitoring Event</b>	Monitoring Event	<b>Monitoring Event</b>
Analysis	Sampling	Sampling	1	2	3	4	5
Chromium, Hexavalent (CrVI), dissolved	Х		Х	Х	Х	Х	Х
Dissolved total chromium	Х		Х	Х	Х	Х	Х
Total chromium	Х		Х	Х	Х	Х	Х
Total Organic Carbon	Х	Х	Х	Х	Х	Х	Х
Sulfide	Х		Х	Х	Х	Х	Х
Chloride	Х		Х	Х	Х	Х	Х
Sulfate	Х	х	Х	Х	Х	Х	Х
Nitrate	Х		Х		Х		Х
Dissolved Iron	Х		Х	Х	Х	Х	Х
Total Iron	Х		Х	Х	Х	Х	Х
Alkalinity	Х				Х		Х
Methane	Х				Х		Х
Dissolved Manganese	Х				Х		Х
Total Manganese	Х				Х		Х
Field test kits:							
Cr(VI)		Х					
Ferrous Iron							
Field measurements: pH, temperature, dissolved							
oxygen, turbidity, conductivity, oxidation-	Х	х	Х	х	Х	Х	Х
reduction potential							

Pilot Test Grab Groundwater Results

Results of In Situ Reduction Pilot Test

	Well	GW-A	GW-B	GW-C(a)	GW-C	GW-D(a)	GW-D	G	N-E	G	W-F	GV	N-G	G	W-H	GW-I(a)	GW-I	G\	W-J
	Date Collected	7/30/2014	7/29/2014	7/30/2014	7/29/2014	7/30/2014	7/30/2014	7/29/2014	7/29/2014	7/30/2014	7/31/2014	7/30/2014	7/30/2014	7/31/2014	7/31/2014	7/31/2014	7/30/2014	7/31/2014	7/31/2014
	Sample ID	GW-A-14-16	GW-B-12-14	GW-C(A)-17.5-19.5	GW-C-10.5-12.5	GW-D(A)-16-18	GW-D-13-15	GW-E-13-15	GW-E-16.5-18.5	GW-F-15-17	GW-F-21.5-23.5	GW-G-15-17	GW-G-24-26	GW-H-21-23	GW-H-26-28	GW-I(A)-21.5-23.5	GW-I-19-21	GW-J-15-17	GW-J-20-22
Analyte	Unit																		
ulfate	mg/L	270	710	94	530	120	190	590	190	270	240	360	550	480	310	160	95	160	120
otal Organic Carbon	mg/L	9.2	14	25	5.1	12	13	26	16	36	65	250	18	200	59	21	12	17	23
Field Parameter	Unit																		
н	s.u.	3.79	*	5.72	6.82	4.79	4.25	4.34	5.81	7.18	4.69	6.27	7.19	6.95	7.93	6.76	7.15	8.02	7.68
emperature <sup>a</sup>	°C	18.45	*	21.88	27.15	22.30	19.43	28.01	25.64	35.03	19.90	26.44	21.98	21.25	27.01	18.34	25.98	27.73	24.74
onductivity	mS/cm	2.02	*	1.18	1.62	1.56	1.30	1.45	1.49	1.36	0.670	1.48	2.08	1.56	1.04	0.957	0.75	0.654	1.25
xidation-Reduction Potential	mV	435	*	176	322	345	385	376	343	113	360	34	-210	-22	-9	-172	192	125	-300
issolved Oxygen <sup>b</sup>	mg/L	2.13	*	0.43	3.98	0.19			4.05	2.21	2.00	0.87	1.29	3.30	0.63	73	2.95	0.42	0.00
urbidity <sup>c</sup>	NTU	586	*	> 1,000		> 1,000	> 1,000	>1,000	> 1,000		246	> 1,000	> 1,000	> 1,000	> 1,000	604		> 1,000	> 1,000
errous Iron (field test)	mg/L	0.35	*	> 3.30	2.63	> 3.30	0	0	0.05	0	0.51	1.62	0	0.35	2.13		0	1.13	0
exavalent Chromium (field test) <sup>d</sup>	mg/L	> 0.70	*	> 0.70	> 0.70	> 0.70	> 0.70	> 0.70	> 0.70	> 0.70	> 0.70	0.1	0.35	0.17	> 0.70		> 0.70	> 0.70	0.12
epth to Water	ft bgs	12.5	*	11.20	10.90	11.60	12.70	13.10	13.12	15.21	22.01	15.40	15.20	18.05	24.80	13.40	19.85	13.20	17.85
bservations <sup>e</sup>		Yellow	Yellow	Reddish/Yellow	White, milky	Red/Yellow	Reddish/Brown	Yellowish/Red	Reddish Brown	Light Brown	Clear/light brown	Red	Brown	Light Brown	Reddish brown	Cloudy/White	Brown	Reddish/brown	Light Brown

-- Field parameter was not recorded at the location

mg/L - milligram per liter

s.u. - standard pH units

°C - degrees Celsius

mS/cm - millisiemens per centimeter

mV - millivolts

NTU - Nephelometric Turbidity Units

ft bgs - feet below ground surface \* - unable to collect field parameters due to lack of water

<sup>a</sup> Increased temperatures may be due to field methodology and may not be representative of aquifer conditions, due to the grab nature in which the field parameters were collected.

<sup>b</sup> Due to equipment error in the field, dissolved oxygen measurements are inaccurate and were not used in the assessment of the Pilot Study. <sup>c</sup> "> 1,000" indicates turbidity measurements exceeded the limits of the

field equipment. <sup>d</sup> "> 0.70" indicates field tested hexavalent chromium measurements

exceeded the limits of the field testing kit.

<sup>e</sup> Yellow to orange coloring is indicative of elevated concentrations of hexavalent chromium. Green coloring is indicative of elevated concentrations of trivalent chromium. Brown to red color may be indicative of elevated precipitation of iron as a result of EVO injections.

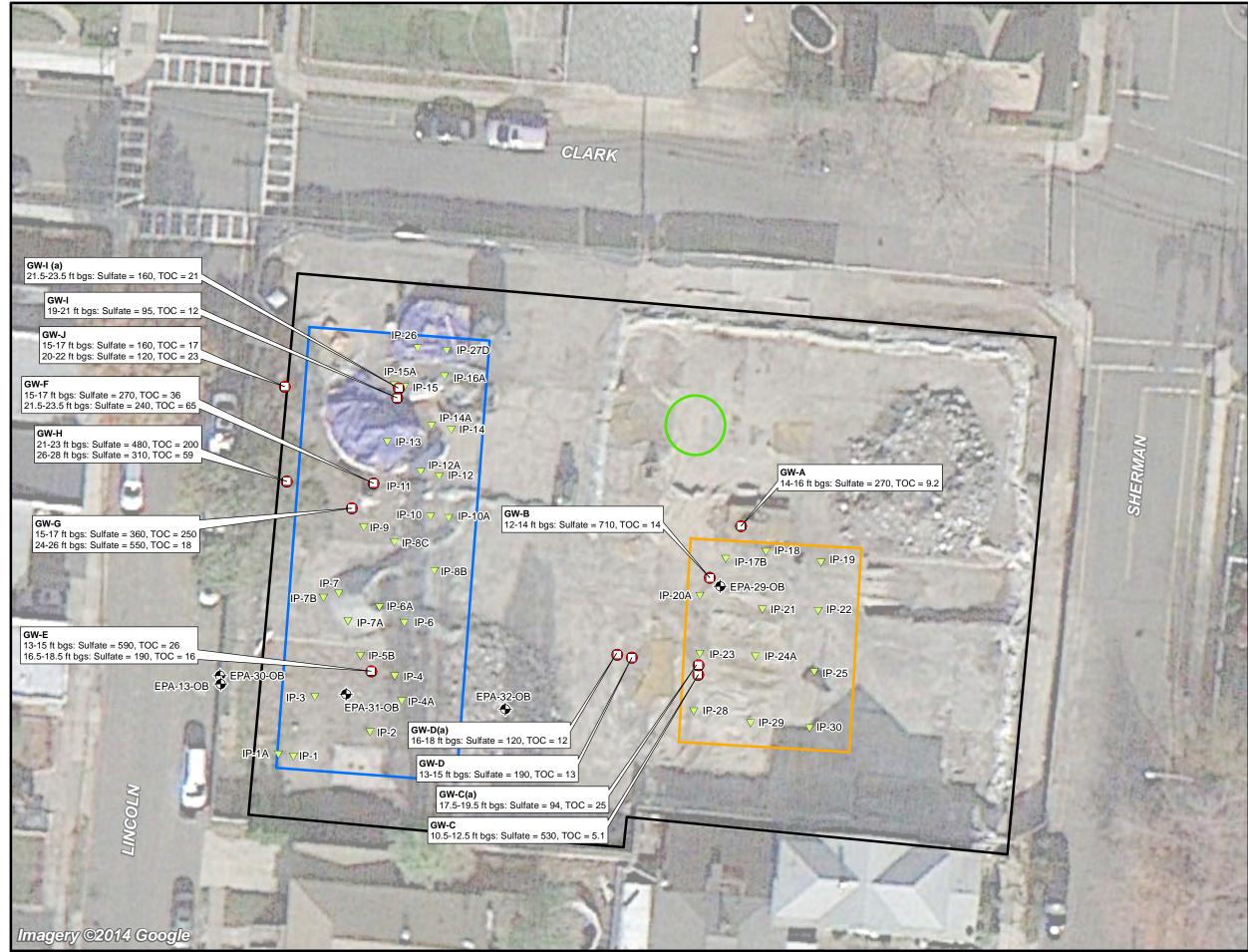
# Figures



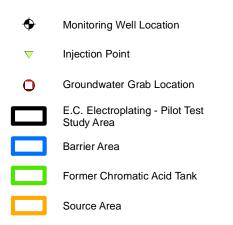


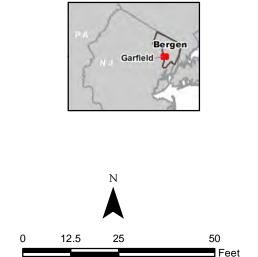


SLC C:\Work\NJO\Garfield\2015\InSituRedux\GIS\Garfield\_InSitu\_Fig03.mxd CH mcotterb 8/12/2015 12:47:48



### Legend





### Notes:

Grab Groundwater Samples were collected on July 29 – 31, 2014, four weeks after injections were completed. mg/L = milligrams per liter. ft gbs = feet below ground surface. TOC = Total Organic Carbon. TOC and Sulphate measured in mg/L. New Jersey State Plane Coordinate System, Horizontal Datum NAD83, US Survey Feet. Imagery Source: Google Earth, 2014.

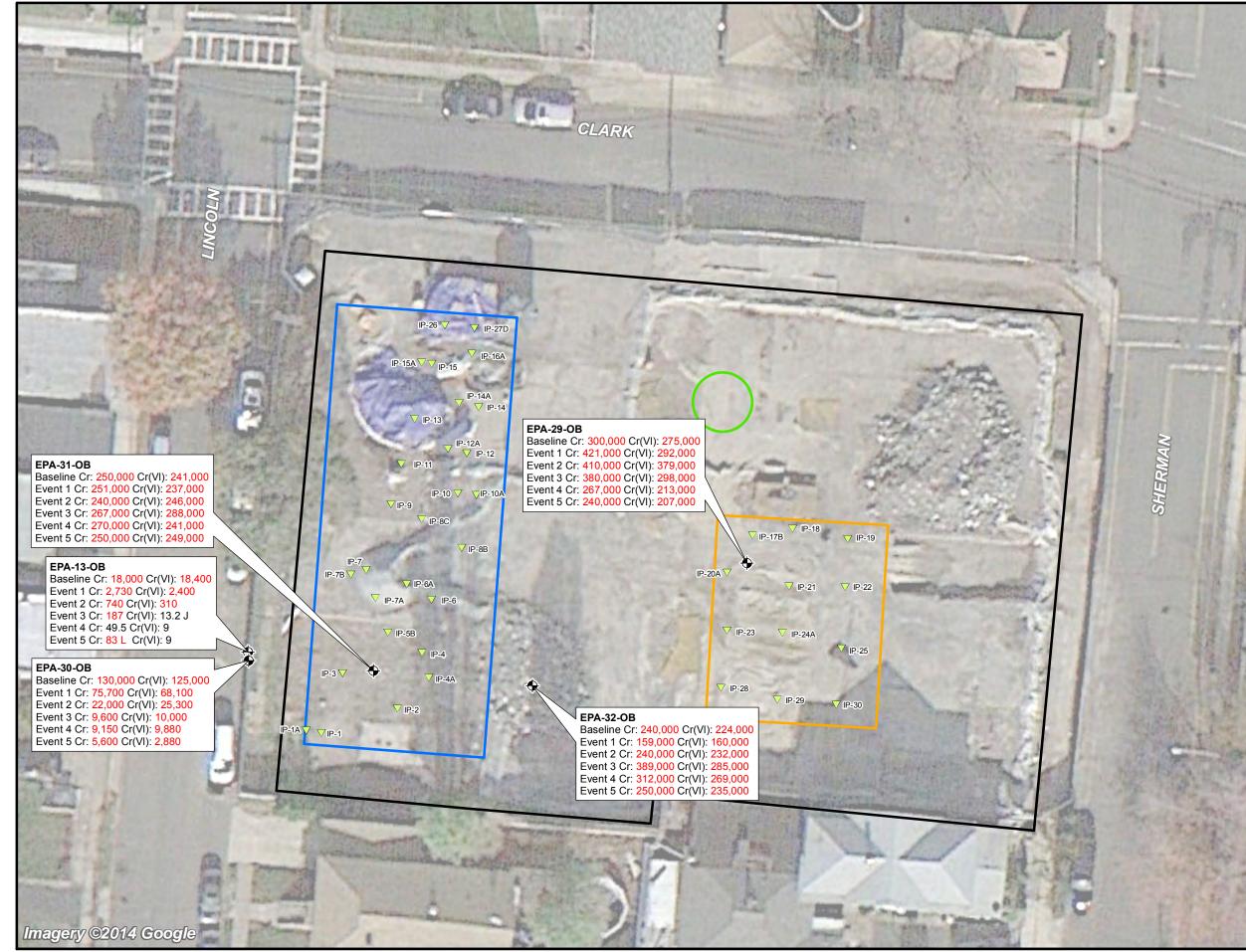
# Figure 3

Grab Groundwater Sample Results

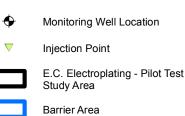
CH2MHILL

In situ Reduction Pilot Test Garfield Groundwater Contamination Superfund Site, Garfield NJ, 07026





### Legend



Former Chromatic Acid Tank

Source Area

### Sampling Schedule:

Baseline – June 19, 2014 Event 1 – July 29-30, 2014 Event 2 – September 3-4, 2014 Event 3 – October 20-21, 2014 Event 4 – December 17-18, 2014

Event 5 – February 5-6, 2015





#### Notes:

Cr = Total Chromium. Cr(VI) = Hexavalent Chromium. J = The identification of the analyte is acceptable; the reported value is an estimate. NJDEP GWQS = New Jersey Department of Environmental Protection Groundwater Quality Standards. Hexavalent/Total Chromium concentrations given in micrograms per liter (µg/L) Concentrations shown in red are exceedances of the NJDEP GWQS for Total Cr = 70 µg/L and Hexavalent Cr =70 µg/L. New Jersey State Plane Coordinate System, Horizontal Datum NAD83, US Survey Feet Imagery Source: Google Earth, 2014.

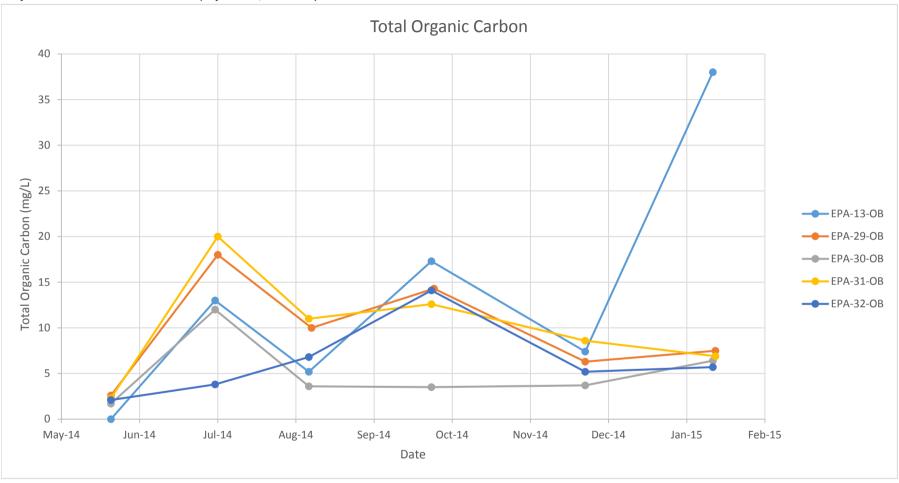
### Figure 4

Total/Hexavalent Chromium Results – Performance Monitoring

CH2MHILL,

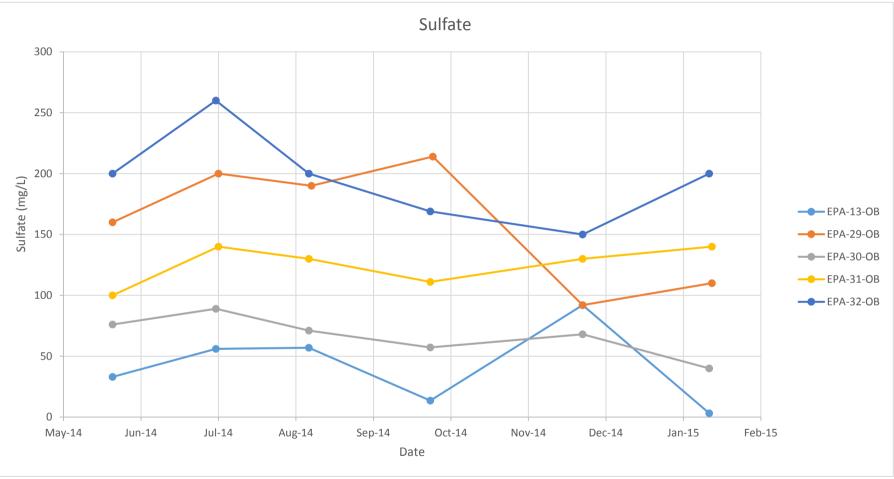
In situ Reduction Pilot Test Garfield Groundwater Contamination Superfund Site, Garfield NJ, 07026

### FIGURE 5 Total Organic Carbon Concentration Trends in Groundwater Results of In Situ Reduction Pilot Test



# FIGURE 6 Sulfate Concentration Trends in Groundwater

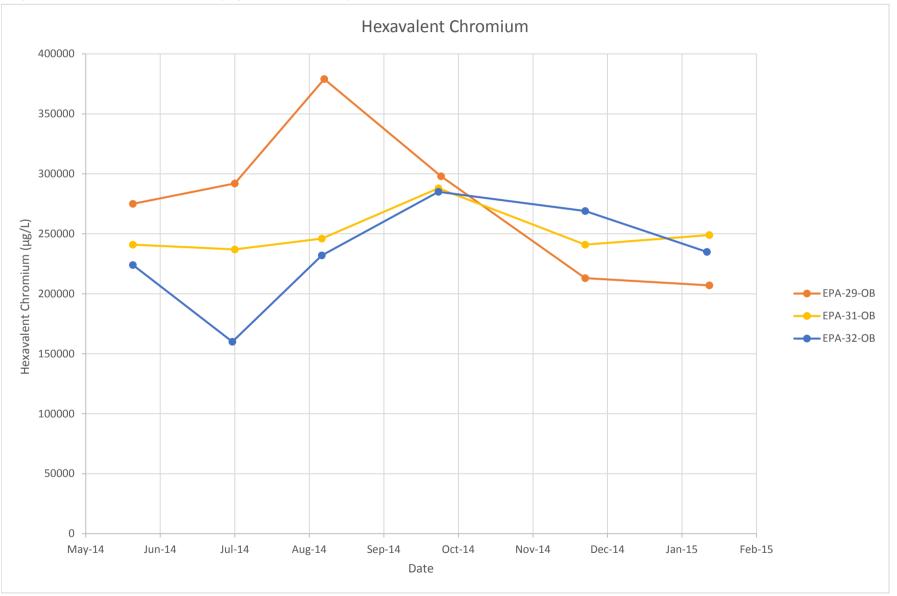
Results of In Situ Reduction Pilot Test



### FIGURE 7

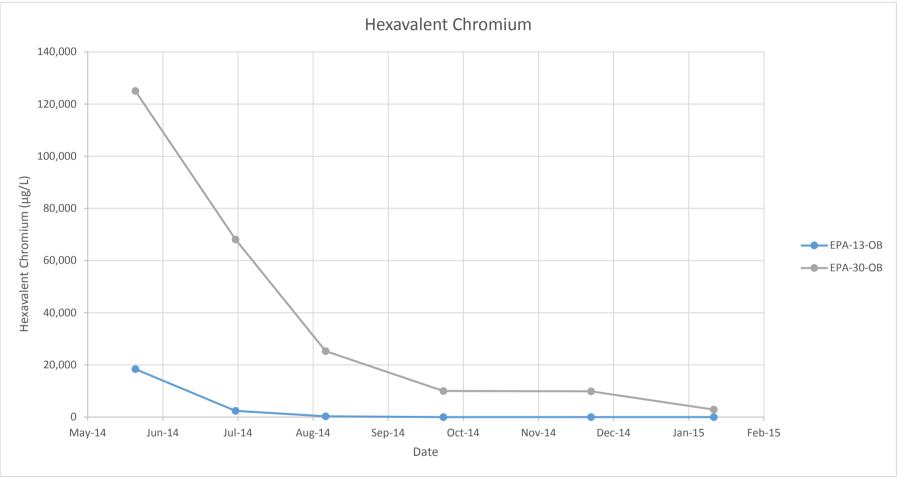
### Hexavalent Chromium Concentration Trends in Groundwater - Source Area and within Treatment Barrier

Results of In Situ Reduction Pilot Test



# FIGURE 8 Hexavalent Chromium Concentration Trends in Groundwater - Downgradient of Treatment Barrier

Results of In Situ Reduction Pilot Test



# Attachment 1 Well Permits

New Jersey State Department of Environmental Protection Bureau of Water Allocation and Well Permitting Mail Code 401-03 PO BOX 420 Trenton, NJ 08625-0420 Tel: 609-984-6831

Well Permit Number **E201405957** 

# WELL PERMIT

The New Jersey Department of Environmental Protection grants t accompanying same application, and applicable laws and regulation enumerated in the supporting documents which are agreed to by the	ons. This permit is also subject to further conditions and stipulations										
Certifying Driller: MICHAEL ELLINGWORTH, JOUR	NEYMAN LICENSE # 0002725										
Permit Issued to: PARRATT-WOLFF INC											
Company Address: PO BOX 56 5879 FISHER RD EAST	SYRACUSE, NY 13057										
PROPERTY OWNER											
Name: ANDREW PAVLICA											
Organization: _City of Garfield											
Address: 111 Outwater Lane											
City: Garfield City State: New Jerse	y Zip Code: 07026										
PROPOSED WELL LOCATION Facility Name: <u>Garfield Groundwater Contamination Superfund</u> Address: Lincoln Place	Site										
County: Bergen Municipality: Garfield City	Lot: ROW Block: ROW										
Easting (X): 601872 Northing (Y): 742961 Coordinate System: NJ State Plane (NAD83) - USFEET	Local ID: EPA-30-OB										
SITE CHARACTERISTICS											
PROPOSED CONSTRUCTION											
WELL USE: MONITORING	Other Use(s):										
Diameter (in.): 2	Regulatory Program Requiring Wells/Borings:										
Depth (ft.): 27	Case ID Number:										
Pump Capacity (gpm): 0	Deviation Requested: N										
Drilling Method: Hollow Stem Augers											
Attachments:											
SPECIFIC CONDITIONS/REQUIREMENTS											

 Approval Date:
 May 15, 2014

 Expiration Date:
 May 15, 2015

Approved by the authority of: Bob Martin Commissioner

Well Permit -- Page 1 of 2

Jerry D. P. Tawski

Terry Pilawski, Chief Bureau of Water Allocation and Well Permitting

# WELL PERMIT

EVIATION INFORMATION	
Purpose:	
Unusual Conditions:	
Reason for Deviation:	
Proposed Well Construction	
ENERAL CONDITIONS/REQUIREMENTS	
. copy of this permit shall be kept at the worksite / on the property and shall be exhibited upon request. [N.J.A.C. 7:9D-1]	
well record must be submitted by the well driller to the Bureau of Water Systems and Well Permitting. Unless prior written approval is basis from the Bureau of Water Systems and Well Permitting the well record shall be submitted electronically through the New Jerse pertment of Environmental Protection's Regulatory Services Portal Submit Well Record: within ninety (90) days after the well is completed.[N.J.A.C. 7:9D-1]	
ll well drilling/pump installation activities shall comply with N.J.A.C. 7:9D-1 et seq. [N.J.A.C. 7:9D-1]	
or this permit to remain valid, the well approved in this permit shall be constructed within one year of the effective date of the permit. N.J.A.C. 7:9D-1]	
The pump capacity applied for is less than 70 gpm, no subsequent increase to 70 gpm or more shall be made without prior approval of the Bureau of Water Systems and Well Permitting. [N.J.A.C. 7:9D-1]	
the use of the well is to be changed a well permit for the proposed use of the well shall be submitted for review and approval. [N.J.A.C.	r
·9D-1]	
you or a future property owner intend to redesignate this well as a Category 1 well (domestic, non-public, community water supply or ublic non-community water supply wells), the well must be constructed as a Category 1 well per the Well Construction and	
bandonment Regulations at N.J.A.C. 7:0D-1.1 et seq. In addition, if the current or future property owner intends to have this well edesignated as a community water supply well, the well must be constructed by a Master well driller, which would include having a faster well driller on-site at all times during construction of the well, as specified in the Well Construction and Abandonment egulations. Otherwise, the New Jersey Department of Environmental Protection will not allow the well to be redesignated, and a new rell would have to be installed. [N.J.A.C. 7:9D-1.7((a))1i]	
a accepting this permit the Property Owner and Driller agree to abide by the following terms and conditions [N.J.A.C. 7:9D-1]	
the event that this well is not constructed the well driller shall notify the Bureau of Water Systems and Well Permitting of the permit ancellation. Unless prior written approval is obtained from the Bureau of Water Systems and Well Permitting the Cancellation otification shall be submitted electronically through the New Jersey Department of Environmental Protection's Regulatory Services Pon ubmit Well Permit Cancellation : by the expiration date of this permit.[N.J.A.C. 7:9D-1]	rtal
the event this well is abandoned, the Owner or Well driller shall assume full responsibility for having the well decommissioned in a nanner satisfactory to the New Jersey Department of Environmental Protection in accordance with the provisions of N.J.A.C. 7:9D-1 et eq. [N.J.A.C. 7:9D-1]	
he granting of this permit shall not be construed in any way to affect the title or ownership of property, and shall not make the New ersey Department of Environmental Protection or the State a party in any suit or question of ownership of property. [N.J.A.C. 7:9D-1] he issuance of this permit shall not be deemed to affect in any way action by the New Jersey Department of Environmental Protection of	on
ny future application. [N.J.A.C. 7:9D-1]	
his permit conveys no rights, either expressed, or implied to divert water. [N.J.A.C. 7:9D-1]	
his permit does not waive the obtaining of Federal or other State or local Government consent when necessary. This permit is not valid	
nd no work shall be undertaken until such time as all other required approvals and permits have been obtained. [N.J.A.C. 7:9D-1]	
his permit is NONTRANSFERABLE [N.J.A.C. 7:9D]	
his well shall not be used for the supply of potable / drinking water. [N.J.A.C. 7:9D-1]	

New Jersey State Department of Environmental Protection Bureau of Water Allocation and Well Permitting Mail Code 401-03 PO BOX 420 Trenton, NJ 08625-0420 Tel: 609-984-6831

Well Permit Number **E201405959** 

# WELL PERMIT

The New Jersey Department of Environmental Protection grants accompanying same application, and applicable laws and regulation enumerated in the supporting documents which are agreed to by the	ions. This permit is also subject to further conditions and stipulations										
Certifying Driller: MICHAEL ELLINGWORTH, JOUR	NEYMAN LICENSE # 0002725										
Permit Issued to: PARRATT-WOLFF INC											
Company Address: PO BOX 56 5879 FISHER RD EAS	T SYRACUSE, NY 13057										
PROPERTY OWNER											
Name: MARY PETTIT (CALDERIO)											
Organization: Property Owner											
Address: 115 Sherman Place											
City: Garfield City State: New Jerse	zip Code: <u>07026</u>										
PROPOSED WELL LOCATION         Facility Name:       Garfield Groundwater Contamination Superfunct         Address:       97 Sherman Place	1 Site										
County: Bergen Municipality: Garfield City	Lot: 15 Block: 38.01										
Easting (X):601986Northing (Y):743001Coordinate System: NJ State Plane (NAD83) - USFEET	Local ID: EPA-29-OB										
SITE CHARACTERISTICS											
PROPOSED CONSTRUCTION											
WELL USE: MONITORING	Other Use(s):										
Diameter (in.): 2	Regulatory Program Requiring Wells/Borings:										
Depth (ft.): 27	Case ID Number:										
Pump Capacity (gpm): 0	Deviation Requested: N										
Drilling Method: Hollow Stem Augers											
Attachments:											
SPECIFIC CONDITIONS/REQUIREMENTS											

Approved by the authority of: Bob Martin Commissioner

Well Permit -- Page 1 of 2

Jerry D. P. Tawski

Terry Pilawski, Chief Bureau of Water Allocation and Well Permitting

# WELL PERMIT

<b>DEVIATION INFORMATION</b>	N		
Purpose:			
Unusual Conditions:			
Reason for Deviation:			
Proposed Well Construction			
GENERAL CONDITIONS/RE			
	pt at the worksite / on the property and shall be exhibited upon request. [N.J.A.C. 7:9D-1]		
A well record must be submitted by the well driller to the Bureau of Water Systems and Well Permitting. Unless prior written approval is obtained from the Bureau of Water Systems and Well Permitting the well record shall be submitted electronically through the New Jersey Department of Environmental Protection's Regulatory Services Portal Submit Well Record: within ninety (90) days after the well is completed.[N.J.A.C. 7:9D-1]			
All well drilling/pump installation	on activities shall comply with N.J.A.C. 7:9D-1 et seq. [N.J.A.C. 7:9D-1]		
For this permit to remain valid, the well approved in this permit shall be constructed within one year of the effective date of the permit. [N.J.A.C. 7:9D-1]			
If the pump capacity applied for is less than 70 gpm, no subsequent increase to 70 gpm or more shall be made without prior approval of the Bureau of Water Systems and Well Permitting. [N.J.A.C. 7:9D-1]			
	nged a well permit for the proposed use of the well shall be submitted for review and approval. [N.J.A.C.		
public non-community water sup Abandonment Regulations at N redesignated as a community wa Master well driller on-site at all	r intend to redesignate this well as a Category 1 well (domestic, non-public, community water supply or oply wells), the well must be constructed as a Category 1 well per the Well Construction and J.A.C. 7:0D-1.1 et seq. In addition, if the current or future property owner intends to have this well ter supply well, the well must be constructed by a Master well driller, which would include having a times during construction of the well, as specified in the Well Construction and Abandonment w Jersey Department of Environmental Protection will not allow the well to be redesignated, and a new [N.J.A.C. 7:9D-1.7((a))1i]		
In accepting this permit the Prop	erty Owner and Driller agree to abide by the following terms and conditions [N.J.A.C. 7:9D-1]		
cancellation. Unless prior written notification shall be submitted el Submit Well Permit Cancellation	constructed the well driller shall notify the Bureau of Water Systems and Well Permitting of the permit in approval is obtained from the Bureau of Water Systems and Well Permitting the Cancellation lectronically through the New Jersey Department of Environmental Protection's Regulatory Services Portal in : by the expiration date of this permit.[N.J.A.C. 7:9D-1] ed, the Owner or Well driller shall assume full responsibility for having the well decommissioned in a		
manner satisfactory to the New Jersey Department of Environmental Protection in accordance with the provisions of N.J.A.C. 7:9D-1 et seq. [N.J.A.C. 7:9D-1]			
The granting of this permit shall not be construed in any way to affect the title or ownership of property, and shall not make the New Jersey Department of Environmental Protection or the State a party in any suit or question of ownership of property. [N.J.A.C. 7:9D-1] The issuance of this permit shall not be deemed to affect in any way action by the New Jersey Department of Environmental Protection on any future application. [N.J.A.C. 7:9D-1]			
This permit conveys no rights, either expressed, or implied to divert water. [N.J.A.C. 7:9D-1]			
This permit does not waive the obtaining of Federal or other State or local Government consent when necessary. This permit is not valid			
and no work shall be undertaken until such time as all other required approvals and permits have been obtained. [N.J.A.C. 7:9D-1]			
This permit is NONTRANSFERABLE [N.J.A.C. 7:9D] This well shall not be used for the supply of potable / drinking water. [N.J.A.C. 7:9D-1]			
This well shall not be used for th	This wen shan not be used for the suppry of potable / utniking water. [N.J.A.C. /:9D-1]		

New Jersey State Department of Environmental Protection Bureau of Water Allocation and Well Permitting Mail Code 401-03 PO BOX 420 Trenton, NJ 08625-0420 Tel: 609-984-6831

Well Permit Number **E201405960** 

# WELL PERMIT

The New Jersey Department of Environmental Protection grants this permit in accordance with your application, attachments accompanying same application, and applicable laws and regulations. This permit is also subject to further conditions and stipulations enumerated in the supporting documents which are agreed to by the permittee upon acceptance of the permit				
Certifying Driller: MICHAEL ELLINGWORTH, JOUR	RNEYMAN LICENSE # 0002725			
Permit Issued to: PARRATT-WOLFF INC				
Company Address: PO BOX 56 5879 FISHER RD EAS	T SYRACUSE, NY 13057			
PROPERTY OWNER				
Name: MARY PETTIT (CALDERIO)				
Organization: Property Owner				
Address: 115 Sherman Place				
City: Garfield City State: New Jerse	ey Zip Code: <u>07026</u>			
PROPOSED WELL LOCATION Facility Name:Garfield Groundwater Contamination Superfund Address:194 Lincoln Place	d Site			
County: Bergen Municipality: Garfield City	Lot: 8 Block: 38.01			
Easting (X):       601905       Northing (Y):       742957       Local ID:       EPA-31-OB         Coordinate System: NJ State Plane (NAD83) - USFEET       EVA-31-OB       EVA-31-OB				
SITE CHARACTERISTICS				
PROPOSED CONSTRUCTION				
WELL USE: MONITORING	Other Use(s):			
Diameter (in.): 2	Regulatory Program Requiring Wells/Borings:			
Depth (ft.): 27	Case ID Number:			
Pump Capacity (gpm): 0	Deviation Requested: N			
Drilling Method: Hollow Stem Augers				
Attachments:				
SPECIFIC CONDITIONS/REQUIREMENTS				

Approved by the authority of: Bob Martin Commissioner

Well Permit -- Page 1 of 2

Jerry D. P. Tawski

Terry Pilawski, Chief Bureau of Water Allocation and Well Permitting

# WELL PERMIT

<b>DEVIATION INFORMATION</b>	N		
Purpose:			
Unusual Conditions:			
Reason for Deviation:			
Proposed Well Construction			
GENERAL CONDITIONS/RE			
	pt at the worksite / on the property and shall be exhibited upon request. [N.J.A.C. 7:9D-1]		
A well record must be submitted by the well driller to the Bureau of Water Systems and Well Permitting. Unless prior written approval is obtained from the Bureau of Water Systems and Well Permitting the well record shall be submitted electronically through the New Jersey Department of Environmental Protection's Regulatory Services Portal Submit Well Record: within ninety (90) days after the well is completed.[N.J.A.C. 7:9D-1]			
All well drilling/pump installation	on activities shall comply with N.J.A.C. 7:9D-1 et seq. [N.J.A.C. 7:9D-1]		
For this permit to remain valid, the well approved in this permit shall be constructed within one year of the effective date of the permit. [N.J.A.C. 7:9D-1]			
If the pump capacity applied for is less than 70 gpm, no subsequent increase to 70 gpm or more shall be made without prior approval of the Bureau of Water Systems and Well Permitting. [N.J.A.C. 7:9D-1]			
	nged a well permit for the proposed use of the well shall be submitted for review and approval. [N.J.A.C.		
public non-community water sup Abandonment Regulations at N redesignated as a community wa Master well driller on-site at all	r intend to redesignate this well as a Category 1 well (domestic, non-public, community water supply or oply wells), the well must be constructed as a Category 1 well per the Well Construction and J.A.C. 7:0D-1.1 et seq. In addition, if the current or future property owner intends to have this well ter supply well, the well must be constructed by a Master well driller, which would include having a times during construction of the well, as specified in the Well Construction and Abandonment w Jersey Department of Environmental Protection will not allow the well to be redesignated, and a new [N.J.A.C. 7:9D-1.7((a))1i]		
In accepting this permit the Prop	erty Owner and Driller agree to abide by the following terms and conditions [N.J.A.C. 7:9D-1]		
cancellation. Unless prior written notification shall be submitted el Submit Well Permit Cancellation	constructed the well driller shall notify the Bureau of Water Systems and Well Permitting of the permit in approval is obtained from the Bureau of Water Systems and Well Permitting the Cancellation lectronically through the New Jersey Department of Environmental Protection's Regulatory Services Portal in : by the expiration date of this permit.[N.J.A.C. 7:9D-1] ed, the Owner or Well driller shall assume full responsibility for having the well decommissioned in a		
manner satisfactory to the New Jersey Department of Environmental Protection in accordance with the provisions of N.J.A.C. 7:9D-1 et seq. [N.J.A.C. 7:9D-1]			
The granting of this permit shall not be construed in any way to affect the title or ownership of property, and shall not make the New Jersey Department of Environmental Protection or the State a party in any suit or question of ownership of property. [N.J.A.C. 7:9D-1] The issuance of this permit shall not be deemed to affect in any way action by the New Jersey Department of Environmental Protection on any future application. [N.J.A.C. 7:9D-1]			
This permit conveys no rights, either expressed, or implied to divert water. [N.J.A.C. 7:9D-1]			
This permit does not waive the obtaining of Federal or other State or local Government consent when necessary. This permit is not valid			
and no work shall be undertaken until such time as all other required approvals and permits have been obtained. [N.J.A.C. 7:9D-1]			
This permit is NONTRANSFERABLE [N.J.A.C. 7:9D] This well shall not be used for the supply of potable / drinking water. [N.J.A.C. 7:9D-1]			
This well shall not be used for th	This wen shan not be used for the suppry of potable / utniking water. [N.J.A.C. /:9D-1]		

New Jersey State Department of Environmental Protection Bureau of Water Allocation and Well Permitting Mail Code 401-03 PO BOX 420 Trenton, NJ 08625-0420 Tel: 609-984-6831

Well Permit Number **E201405962** 

# WELL PERMIT

The New Jersey Department of Environmental Protection grants this permit in accordance with your application, attachments accompanying same application, and applicable laws and regulations. This permit is also subject to further conditions and stipulations enumerated in the supporting documents which are agreed to by the permittee upon acceptance of the permit					
Certifying Driller: MICHAEL ELLINGWORTH, JOUR	NEYMAN LICENSE # 0002725				
Permit Issued to: PARRATT-WOLFF INC	ermit Issued to: PARRATT-WOLFF INC				
Company Address: PO BOX 56 5879 FISHER RD EAST SYRACUSE, NY 13057					
PROPERTY OWNER					
Name: MARY PETTIT (CALDERIO)					
Organization: Property Owner					
Address: 115 Sherman Place					
City: Garfield City State: New Jersey Zip Code: 07026					
PROPOSED WELL LOCATION Facility Name: <u>Garfield Groundwater Contamination Superfunc</u> Address: 97 Sherman Place	1 Site				
	Lot: 9 Block: 38.01				
County:       Bergen       Municipality:       Garfield City       Lot:       9       Block:       38.01         Easting (X):       601954       Northing (Y):       742955       Local ID:       EPA-32-OB         Coordinate System: NJ State Plane (NAD83) - USFEET       Local ID:       EPA-32-OB					
SITE CHARACTERISTICS					
PROPOSED CONSTRUCTION					
WELL USE: MONITORING	Other Use(s):				
Diameter (in.): 2	Regulatory Program Requiring Wells/Borings:				
Depth (ft.): 27	Case ID Number:				
Pump Capacity (gpm): 0	Deviation Requested: N				
Drilling Method: Hollow Stem Augers					
Attachments:					
SPECIFIC CONDITIONS/REQUIREMENTS					

Approved by the authority of: Bob Martin Commissioner

Well Permit -- Page 1 of 2

Jerry D. P. Tawski

Terry Pilawski, Chief Bureau of Water Allocation and Well Permitting

# WELL PERMIT

<b>DEVIATION INFORMATION</b>	N		
Purpose:			
Unusual Conditions:			
Reason for Deviation:			
Proposed Well Construction			
GENERAL CONDITIONS/RE			
	pt at the worksite / on the property and shall be exhibited upon request. [N.J.A.C. 7:9D-1]		
A well record must be submitted by the well driller to the Bureau of Water Systems and Well Permitting. Unless prior written approval is obtained from the Bureau of Water Systems and Well Permitting the well record shall be submitted electronically through the New Jersey Department of Environmental Protection's Regulatory Services Portal Submit Well Record: within ninety (90) days after the well is completed.[N.J.A.C. 7:9D-1]			
All well drilling/pump installation	on activities shall comply with N.J.A.C. 7:9D-1 et seq. [N.J.A.C. 7:9D-1]		
For this permit to remain valid, the well approved in this permit shall be constructed within one year of the effective date of the permit. [N.J.A.C. 7:9D-1]			
If the pump capacity applied for is less than 70 gpm, no subsequent increase to 70 gpm or more shall be made without prior approval of the Bureau of Water Systems and Well Permitting. [N.J.A.C. 7:9D-1]			
	nged a well permit for the proposed use of the well shall be submitted for review and approval. [N.J.A.C.		
public non-community water sup Abandonment Regulations at N redesignated as a community wa Master well driller on-site at all	r intend to redesignate this well as a Category 1 well (domestic, non-public, community water supply or oply wells), the well must be constructed as a Category 1 well per the Well Construction and J.A.C. 7:0D-1.1 et seq. In addition, if the current or future property owner intends to have this well ter supply well, the well must be constructed by a Master well driller, which would include having a times during construction of the well, as specified in the Well Construction and Abandonment w Jersey Department of Environmental Protection will not allow the well to be redesignated, and a new [N.J.A.C. 7:9D-1.7((a))1i]		
In accepting this permit the Prop	erty Owner and Driller agree to abide by the following terms and conditions [N.J.A.C. 7:9D-1]		
cancellation. Unless prior written notification shall be submitted el Submit Well Permit Cancellation	constructed the well driller shall notify the Bureau of Water Systems and Well Permitting of the permit in approval is obtained from the Bureau of Water Systems and Well Permitting the Cancellation lectronically through the New Jersey Department of Environmental Protection's Regulatory Services Portal in : by the expiration date of this permit.[N.J.A.C. 7:9D-1] ed, the Owner or Well driller shall assume full responsibility for having the well decommissioned in a		
manner satisfactory to the New Jersey Department of Environmental Protection in accordance with the provisions of N.J.A.C. 7:9D-1 et seq. [N.J.A.C. 7:9D-1]			
The granting of this permit shall not be construed in any way to affect the title or ownership of property, and shall not make the New Jersey Department of Environmental Protection or the State a party in any suit or question of ownership of property. [N.J.A.C. 7:9D-1] The issuance of this permit shall not be deemed to affect in any way action by the New Jersey Department of Environmental Protection on any future application. [N.J.A.C. 7:9D-1]			
This permit conveys no rights, either expressed, or implied to divert water. [N.J.A.C. 7:9D-1]			
This permit does not waive the obtaining of Federal or other State or local Government consent when necessary. This permit is not valid			
and no work shall be undertaken until such time as all other required approvals and permits have been obtained. [N.J.A.C. 7:9D-1]			
This permit is NONTRANSFERABLE [N.J.A.C. 7:9D] This well shall not be used for the supply of potable / drinking water. [N.J.A.C. 7:9D-1]			
This well shall not be used for th	This wen shan not be used for the suppry of potable / utniking water. [N.J.A.C. 7:9D-1]		

## Attachment 2 Survey Data

## **Borbas Surveying & Mapping, LLC**

402 Main Street, Boonton, New Jersey 07005 Phone (973) 316-8743 Fax (973) 402-6627 www.borbas.com

### MONITORING WELL CHART

Garfield Groundwater Contamination Superfund Site

125 Clark Street

Garfield, New Jersey 07026

July 15, 2014

			0 minut	Newthing	Easting	Latitude North	Longitude West	Survey Date
Monitor Well ID	Grade Elev	Outer Casing	Inner Casing	Northing				7/15/2014
EPA-29-OB	58.6	58.56	58.23	742985.6	602009.5	40°52'20.89"		
EPA-30-OB	55.9	55.86	55.50	742960.1	601879.0	40°52'20.65"		7/15/2014
EPA-31-OB	56.7	56.71	56.31	742957.4	601911.7	40°52'20.62"		7/15/2014
EPA-32-OB	58.7	58.67	58.29	742953.5	601953.3			7/15/2014
IP-1	56.0	-	-	742941.1	601898.0			7/15/2014
IP-1A	55.8	-	-	742941.7	601894.1	40°52'20.46"		7/15/2014
IP-2	56.4	-	-	742947.5	601918.0	40°52'20.52"	74°06'10.70"	7/15/2014
IP-3	56.5	-	-	742956.7	601903.6	40°52'20.61"	74°06'10.89"	7/15/2014
IP-4	57.0	-	-	742962.1	601924.4	40°52'20.66"	74°06'10.62"	7/15/2014
IP-4A	56.7	-	_	742955.6	601926.2	40°52'20.60"	74°06'10.60"	7/15/2014
IP-5B	56.8			742967.4	601915.5	40°52'20.72"	74°06'10.73"	7/15/2014
IP-6	58.7		_	742976.0	601926.9		74°06'10.59"	7/15/2014
IP-6A	58.8			742980.1	601920.4		74°06'10.67"	7/15/2014
IP-0A IP-7	58.8			742983.7	601909.8			7/15/2014
	58.8		_	742976.4	601912.2			7/15/2014
IP-7A				742982.6	601905.8			7/15/2014
IP-7B	58.8			742989.6				7/15/2014
IP-8B	58.6			742903.0	601924.3			7/15/2014
IP-8C	58.5		-	742997.1				7/15/2014
IP-9	58.4				601933.8			7/15/2014
IP-10	58.5			743003.8				7/15/2014
IP-10A	58.4		-	743003.4	601938.6			7/15/2014
IP-11	58.3		-	743011.5	601919.0			
IP-12	58.3	-	-	743014.3				7/15/2014
IP-12A	58.3	-		743015.5				7/15/2014
IP-13	58.1	-	-	743023.3	601922.5	40°52'21.27'	' 74°06'10.64"	7/15/2014

Monitor Well ID	Grade Elev	Outer Casing	Inner Casing	Northing	Easting	Latitude North	Longitude West	Survey Date
IP-14	58.1	-		743026.4	601939.2	40°52'21.30"	74°06'10.42"	7/15/2014
IP-14A	58.1	-	_	743027.5	601934.1	40°52'21.31"	74°06'10.49"	7/15/2014
IP-15	58.1	-	-	743037.7	601927.0	40°52'21.41"	74°06'10.58"	7/15/2014
IP-15A	58.1		-	743038.1	601924.3	40°52'21.42"	74°06'10.62"	7/15/2014
IP-16A	58.1	_	_	743040.4	601937.5	40°52'21.44"	74°06'10.44"	7/15/2014
IP-17B	58.5		-	742992.8	602010.9	40°52'20.96"	74°06'09.49"	7/15/2014
IP-18	58.5	-	1	742994.6	602021.4	40°52'20.98"		7/15/2014
IP-19	58.6		_	742991.8	602035.8	40°52'20.95"	74°06'09.17"	7/15/2014
IP-20A	58.6		-	742983.1	602004.2	40°52'20.87"	74°06'09.58"	7/15/2014
IP-21	58.6	-	_	742979.5	602020.5	40°52'20.83"	74°06'09.37"	7/15/2014
IP-22	58.7	-	-	742979.2	602035.1	40°52'20.83"		7/15/2014
IP-23	58.7	-		742967.9	602004.2	40°52'20.72"	74°06'09.58"	7/15/2014
IP-24A	58.7	-	-	742967.3	602018.7	40°52'20.71"	74°06'09.39"	7/15/2014
IP-25	58.8	-	-	742963.2	602034.1	40°52'20.67"	74°06'09.19"	7/15/2014
IP-26	58.1	-	-	743047.8	601930.4	40°52'21.51"	74°06'10.54"	7/15/2014
IP-27D	58.1	-	-	743047.1	601938.1	40°52'21.50"	74°06'10.44"	7/15/2014
IP-28	58.8		-	742952.9	602002.6	40°52'20.57"	' 74°06'09.60"	7/15/2014
IP-29	58.7		-	742949.8	602017.4	40°52'20.54'	' 74°06'09.41"	7/15/2014
IP-30	58.8	-	-	742948.5	602032.8	40°52'20.53'	' 74°06'09.21"	7/15/2014

Notes:

1. The horizontal datum is the New Jersey State Plane Coordinate System NAD83 determined by differential GPS observations from the NGS CORS Network on July 25, 2012. Reference Stations: NJI2, NJTP, NYVH.

2. The vertical datum is the North American Vertical Datum of 1988 (NAVD88) GEOID09 verified by differential GPS observation from the NGS CORS Network on July 25, 2012. New Jersey Geodetic Control Survey Monument # 9818 (NAVD88 Elevation = 28.7372') was held. NJGCS monument elevation was converted using US Army Corps of Engineers Corpscon Software version 6.0.1.

3. All coordinates and elevations shown hereon are in U.S. Survey Feet.

John D. Beattie, P.L.S. NJGS 24GS04331900 July 15, 2014

P:\LP\2012\06\120601\Documents\120601\_2014-07-15\_Monitoring Well and Boring Chart

Attachment 3 Boring Logs, Well Completion Diagrams, and Development Forms Project No: WA-120

Project: EC Electroplating

Client: EPA/ERT

Location: Lincoln Place/Clark Street, Garfield, NJ

Log of Well: EPA-13-OB

Northing (ft): 742962.30 Elevation (ft AMSL): 55.54 Easting (ft): 601878.85 Logged By: J. Bolduc

	SUB	SURFACE PROFILE		SA	MPL	E	FID/PID Concentration	
	Symbol	Description	Elev.	Number	Type	Recovery	ppmv     m       3     9     15     21     27     33       1     1     1     1     1     1     1       VOC Concentration       •     ug/L       5     15     25     35     45     55       1     1     1     1     1     1     1	Well Completion Details
m 0		Ground Surface Drilex cleared borehole of	55.74					
m 		underground utilities to a depth of 7 feet. Cuttings not logged during utility clearance.						#0 Filpro Sand
- 2		CLAX (CL)	48.74					Bentonite Grout
-		CLAY (CL) Weak red, some fine to coarse sand, little coarse angular gravel, moist.						4
3		GRAVEL (GW)	45.74					Casing
4		Weak red, fine to coarse angular sandstone gravel, some fine to coarse sand, some silt and clay, sandstone cobble at 14 feet, moist to damp.	40.74					2-inch ID Schedule 40 PVC Casing
5		SAND (SW) Weak red, fine to coarse grained, and fine to coarse subangular sandstone gravel, trace sandstone cobbles, wet at 16 feet.						
6								#000 Filpro Sand
7								#0 Filpro Sand

Start Date: 2/28/11

Hole Size: 6-inch

Lockheed Martin/SERAS 2890 Woodbridge Avenue Building 209 Annex Edison, NJ 08837

End Date: 2/28/11

Sheet: 1 of 2

Project No: WA-120

Project: EC Electroplating

Client: EPA/ERT

Location: Lincoln Place/Clark Street, Garfield, NJ

Log of Well: EPA-13-OB

 Northing (ft): 742962.30
 Elevation (ft AMSL): 55.54

 Easting (ft): 601878.85
 Logged By: J. Bolduc

S	UB	SURFACE PROFILE		SA	MPL	E	FID/PID Concentration	
Depth	Symbol	Description	Elev.	Number	Type	Recovery	ppmv       ppmv         3       9       15       21       27       33         1       1       1       1       1       1       1       1         VOC Concentration       ug/L       -       -       -       -       -         5       15       25       35       45       55       -       -       -	Well Completion Details
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		BEDROCK (MUDSTONE) Grayish red, clayey, highly weathered, pulverized zone, dry to wet at 30.5 to 31.5 feet. BEDROCK (SANDSTONE) Grayish red, fine grained, micaceous, massive, dry. End of Borehole	28.74					Bentonie Grout

Drill Method: Rotary Sonic

Start Date: 2/28/11

Hole Size: 6-inch

Lockheed Martin/SERAS 2890 Woodbridge Avenue Building 209 Annex Edison, NJ 08837 Drill Company: Boart Longyear

End Date: 2/28/11

Sheet: 2 of 2



PROJECT NUMBER 431007.06.06.02 WELL NUMBER

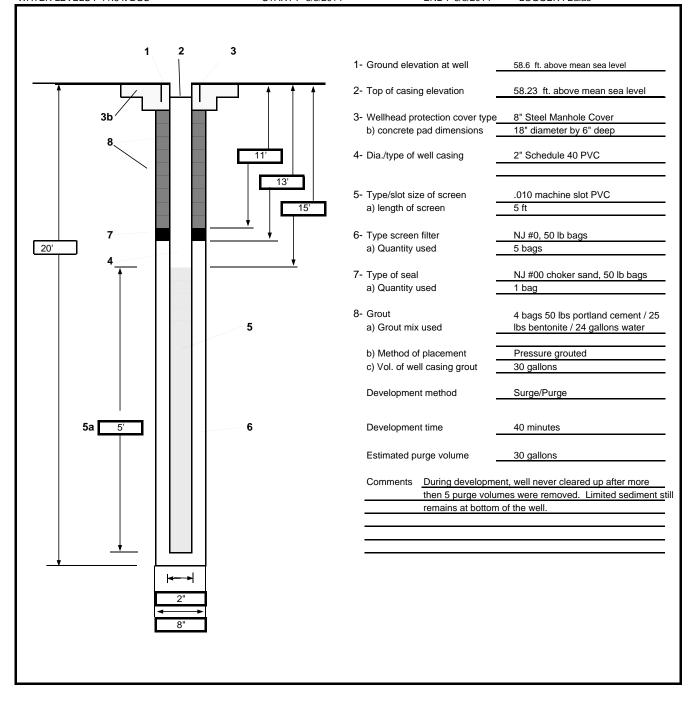
SHEET 1 OF 1

### WELL COMPLETION DIAGRAM

PROJECT : Garfield Groundwater Contamination Superfund Site LOCATION : Garfield, NJ DRILLING CONTRACTOR : Parratt Wolff

 DRILLING METHOD AND EQUIPMENT USED CME 55 Drill Rig - 8" Hollow Stem Auger - 2" Stainless Steel Split Spoons

 WATER LEVELS : 11.8 ft BGS
 START : 6/3/2014
 END : 6/3/2014
 LOGGER : Balas





PROJECT NUMBER: 431007

BORING NUMBER: EPA-29-OB

SHEET 1 OF 1

**ORIENTATION :** 

### SOIL BORING LOG

PROJECT : Garfield Groundwater Contamination Superfund Site

LOCATION : Garfield, NJ DRILLING CONTRACTOR : Parratt Wolff/Cushing & Sons

ELEVATION :

DRILLING EQUIPMENT AND METHOD : CME Hollow Stem Auger Rig

WATER LEVELS 2 12.8 ft bgs					START : 6/3/14 13:50 END : 6/3/14 16:15 LOGGER : J. Balas
DEPTH B	BELOW EX	(ISTING G	RADE (ft)	STANDARD	SOIL DESCRIPTION COMMENTS
	INTERV	AL (ft)	ERY (in)	PENETRATION TEST RESULTS 6"-6"-6"-6"	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY
	0.0		#111 E	(N)	
-	0.0 2.0	10.8	SS-1	7-9-2 (11)	Asphalt       BZ: H2S = 0, VOC = 0, CO = 0, LEL = 0, O2         0-0.5'       = 20.5, Dust = 0.006         Gravel (GW-GM)       PID = 0.0 ppm         0.5-10.4' - gray, dry, medium dense, little silt, fine       PID = 0.0 ppm
-	4.0	24.0	SS-2	6-6-5-5 (11)	grained, angular, FILL 2' - Same as above except FILL, trace medium to coarse gravel
5_	6.0	18.0	SS-3	3-3-1-2 (4)	4' - Same as above
-	8.0	13.2	SS-4	1-3-2-1 (5)	6' - Same as above except 6.7'-6.9' red colored brick
	10.0	14.4	SS-5	3-1-1-1 (2)	8' - Same as above except moist
-	12.0	12.0	SS-6	1-1-1-9 (2)	10' - wet         PID = 0.0 ppm           Sandy Silt (ML)         10.4-12.4' - dark reddish brown, (5YR 3/3), moist to
-	14.0	16.8	SS-7	7-9-20-19 (29)	wet, medium stiff, non-cohesive, trace fine to medium gravel Silt (ML) 12.4-14' - dark yellowish brown, (10YR 4/4), moist, IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII
15_ <sup>_</sup>	16.0	18.0	SS-8	10-16-16-20 (32)	stiff, non-cohesive, few mottling reddish brown (5YR 5/3), increasing medium to fine gravel with depth 13.2' - 1" diameter sandstone piece noted at bottom of recovery
-	18.0		SS-9	26-31-35-50 (66)	Silty Sand (SW-SM) 14-14.5' - dark reddish brown, (2.5YR 3/3), moist, medium dense, fine to very fine sand, SANDSTONE pieces 1/4"-1" diameter noted throughout BZ: H2S = 0, VOC = 0, CO = 0, LEL = 0, O2 = 20, Dust = 0.016 = 0.0 ppm
20	20.0	13.2	SS-10	14-30-50/4 (80/10")	Sandy Silt(ML) 14.5-16' - dark reddish brown, (2.5YR 3/3), moist, very stiff, non-cohesive, trace coarse to medium gravel, subrounded
-	22.0		SS-11	50/4 (50/4")	Silty Sand (SW-SM) 16-19.1' - dark reddish brown, (2.5YR 3/3), wet, very dense, trace gravel, angular, increased gravel at bottom, SANDSTONE noted throughout, 1" diameter
-					18' - Same as above except larger SANDSTONE       -         pieces, weathered bedrock 18.9'-19.1'       -         No Recovery       -         19.1-20.3'       -
25					Bottom of Boring at 20.3 ft bgs on 6/3/14 16:15
-					
-					
30					



PROJECT NUMBER 431007.06.06.02 WELL NUMBER

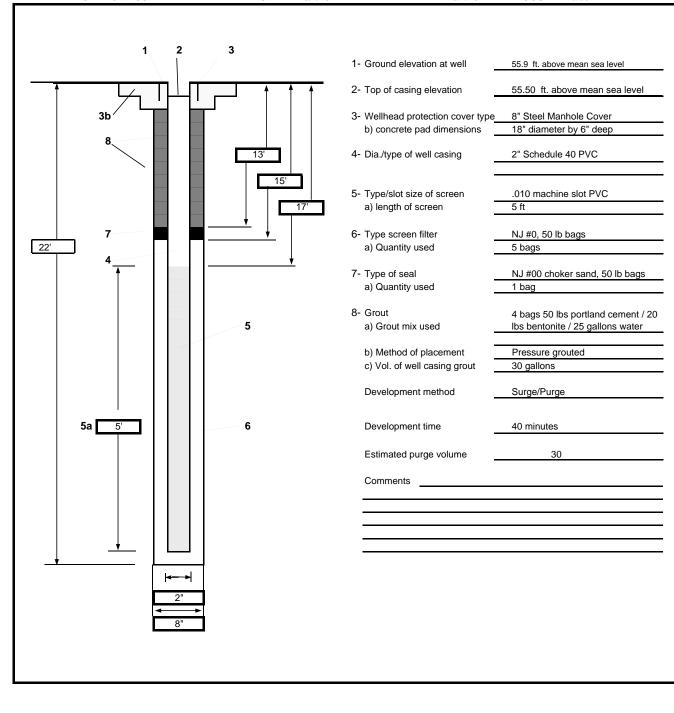
SHEET 1 OF 1

### WELL COMPLETION DIAGRAM

PROJECT : Garfield Groundwater Contamination Superfund Site LOCATION : Garfield, NJ DRILLING CONTRACTOR : Parratt Wolff

 DRILLING METHOD AND EQUIPMENT USED CME 55 Drill Rig - 8" Hollow Stem Auger - 2" Stainless Steel Split Spoons

 WATER LEVELS : 12.8 ft BGS
 START : 6/4/2014
 END : 6/4/2014
 LOGGER : Balas





PROJECT NUMBER: 431007

BORING NUMBER: EPA-30-OB

SHEET 1 OF 1

**ORIENTATION :** 

### SOIL BORING LOG

PROJECT : Garfield Groundwater Contamination Superfund Site

LOCATION : Garfield, NJ DRILLING CONTRACTOR : Parratt Wolff/Cushing & Sons

ELEVATION :

DRILLING EQUIPMENT AND METHOD : CME Hollow Stem Auger Rig

RECOVERY (III)     MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY     DRILL       -     0.0     -     14.4     SS-1     3-4-3-2 (7)     Silty Sand(SW-SM) 0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     - <th>LOGGER : J. Balas COMMENTS H OF CASING, DRILLING RATE, ING FLUID LOSS, TESTS, AND</th>	LOGGER : J. Balas COMMENTS H OF CASING, DRILLING RATE, ING FLUID LOSS, TESTS, AND
INTERVAL (ft)       PENETRATION TEST RESULTS         RECOVERY (in)       SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY         -       0.0         14.4       SS-1         2.0       3-4-3-2 (7)         (7)       gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material	H OF CASING, DRILLING RATE, ING FLUID LOSS, TESTS, AND
0.0     14.4     SS-1     3-4-3-2 (7)     Silty Sand(SW-SM) 0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks n	ING FLUID LOSS, TESTS, AND
0.0     14.4     SS-1     3-4-3-2 (7)     Silty Sand(SW-SM) 0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     10-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks n	ING FLUID LOSS, TESTS, AND
0.0     14.4     SS-1     3-4-3-2 (7)     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at gravel 1/2" diameter, concrete/bricks noted at     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at	
0.0     14.4     SS-1     3-4-3-2 (7)     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at gravel 1/2" diameter, concrete/bricks noted at     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at     0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at	INSTRUMENTATION
14.4SS-13-4-3-2 (7)0-2' - dark brown, (7.5YR 3/3), fine sand, round gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material0.2' + 3 + 3 + 19.9, D (7)	
2.0     14.4     SS-1     (7)     gravel 1/2" diameter, concrete/bricks noted at 0.3'-0.5' bgs, organic material     0.0' 1 0 0.0'	= 0, VOC = 0, CO = 0, LEL = 0, O2
$\begin{array}{c c} (7) & \text{graver 1/2 diameter, concrete/bricks noted at} \\ \hline 2.0 & 0.3'-0.5' \text{ bgs, organic material} \end{array}$	
	) ppm _
Sand (SW-SM)	) nnm
- $        -$	
$10.0$ $30.2$ (11) \some silt, fine to very fine sand, well graded $/$	
4.0 Sand And Silt(SW-SM)	-
$2.6-8'$ - dark reddish brown, (5YR 3/4), moist, loose, $-\frac{9}{5}$ PID = 0.0	ppm –
5 $-$ 19.2 SS-3 $\begin{pmatrix} 5-5-6-5 \\ (11) \end{pmatrix}$ fine to very fine sand, trace fine gravel (mica), well $ \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$	
6.0 graded, pieces of sandstone in dameter noted at the pieces of sandstone in dameter not be pieces of sandstone in dameter noted at the pieces of sandst	-
4' - Same as above except slighty cohesive, trace	) ppm
- 20.4 SS-4 $7-11-11-7$ gravel and sandstone noted $-$	-
$\begin{bmatrix} 20.4 \\ 8.0 \end{bmatrix}$ (22) $\hat{6}$ ' - Same as above except increase silt/clay content $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ with depth	=
	= 0, VOC = 0, CO = 0, LEL = 0, O2
$\begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\$	oust = 0.036
(58) Sand Silt (ML)	) ppm
8.4-12' - dark reddish brown, (5YR 3/4), dry to moist,	) nom
	, bbu
8.4 SS-6 (18) throughout, very fine to fine sand	-
	-
Silty Sand (SW-SM)	) ppm
6.0 SS-7 4-5-5-7 12-14.7' - dark reddish brown, (5YR 3/4), moist to	-
	-
14' - Same as above	) ppm -
$15 - 14.4$ SS-8 $11-6-9-5$ Sand Some Silt(SW-SM) $- \frac{36}{6} \frac{1}{6} \frac{1}{6}$	
$(15)$ 14 7-16' - dark reddish brown (5YR 3/4) wet loose $-10^{10}$	-
16.0 Little very fine gravel, fine to medium sand	) nom
$\neg \neg                                    $	- ppin _
19.2 SS-9 (16) 16-18.5' - dark reddish brown, (5YR 3/4), wet, loose, $-\frac{1}{2} \begin{bmatrix} r \\ r$	
10.0 1/4"-1/2" diameter condetene pieces throughout	
-   $  -  $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $	= 0, VOC = 0, CO = 0, LEL = 0, O2
-7 10.8 SS-10 (50/5") 1 18 - dark reddish brown, (SYR 3/4), wet, dense, $-7$ [D] $-0.0$	oust = 0.011
20 7 20 0 V V V VIACE gravel, higher sit content at top of recovery, 7 4	
Variational Conditions	) ppm
10-20-20-15 Weathered Sandstone	_
$-22.0$ (40) hard, pulverized $-\frac{1}{4}$	-
Weathered Sandstone	
-    20' - dark reddish brown, (5YR 3/4), wet, hard,	-
-	_
20.4-22' - dark reddish brown, (5YR 3/4), wet, dense,	-
25 - few gravel (gravel is 1/2" sandstone pieces)	-
20.9 <sup>°</sup> - Same as above	—
Bottom of Boring at 22.0 ft bgs on 6/4/2014	-
	-
	-
	-
	-
	-
	-
30	



PROJECT NUMBER 431007.06.06.02 WELL NUMBER

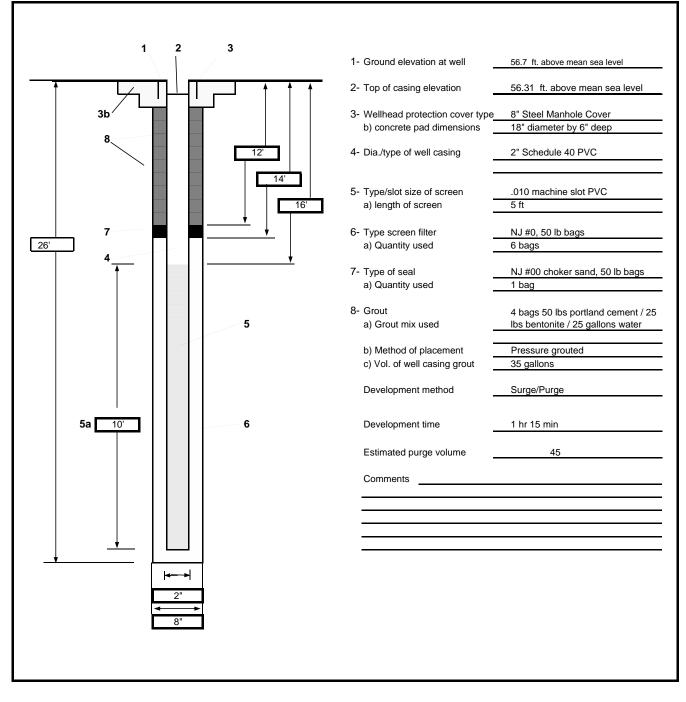
SHEET 1 OF 1

### WELL COMPLETION DIAGRAM

PROJECT : Garfield Groundwater Contamination Superfund Site LOCATION : Garfield, NJ DRILLING CONTRACTOR : Parratt Wolff

 DRILLING METHOD AND EQUIPMENT USED CME 55 Drill Rig - 8" Hollow Stem Auger - 2" Stainless Steel Split Spoons

 WATER LEVELS : ###
 START : 6/4/2014
 END : 6/4/2014
 LOGGER : Balas





PROJECT NUMBER:

431007

BORING NUMBER: EPA-31-OB

SHEET 1 OF 2

**ORIENTATION :** 

### SOIL BORING LOG

PROJECT : Garfield Groundwater Contamination Superfund Site

LOCATION : Garfield, NJ DRILLING CONTRACTOR : Parratt Wolff/Cushing & Sons

ELEVATION :

DRILLING EQUIPMENT AND METHOD : CME Hollow Stem Auger Rig

WATER	LEVELS	· <b>V</b>			START : 6/4/2014 END : 6/4/2014 LOGGER : J. Balas
DEPTH E	BELOW EX	ISTING G	RADE (ft)	STANDARD	SOIL DESCRIPTION COMMENTS
	INTERVA	AL (ft)		PENETRATION TEST RESULTS	
		RECOVE	RY (in)		SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR DRILLING FLUID LOSS, TESTS, AND
			#TYPE	6"-6"-6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY
<u> </u>	0.0				$\sqrt{\frac{1}{2}}$ BZ: H2S = 0, VOC = 0, CO = 0, LEL = 0, O2
		16.8	SS-1	4-7-7-7 (14)	#2 Gravel $\neg ( \downarrow \downarrow \downarrow \downarrow )$ BZ: H2S = 0, VOC = 0, CO = 0, LEL = 0, O2         0-0.2' $\neg ( \downarrow \downarrow \downarrow \downarrow )$ = 20.4, Dust = 0.011         Silty Sand (SW-SM) $\neg ( \downarrow \downarrow \downarrow \downarrow )$ PID = 0.0 ppm
	2.0			(1.)	0.2-1.4' - dark brown, (7.5YR 3/3), dry, loose, few
-				50/2	fine to medium gravel, organic material noted, some / _ PID = 0.0 ppm
		2.4	SS-2	(50/2")	brick fragments noted throughout
	4.0				1.4-4' - concrete below 2.4' bas
5 -				7-9-11-11	Sand And Silt(SW-SM) 4-6' - dark reddish brown, (5YR 3/4), dry, dense,
_		9.6	SS-3	(20)	trace gravel $-6^{\circ}$
	6.0				$\nabla$ Sandstone / $PID = 0.0 \text{ ppm}$
		10.8	SS-4	9-11-13-16	∖ 6-6.3' - dark reddish brown, (5YR 3/4), pulverized / ] ki ki
-	8.0	10.0	00 1	(24)	boulder
	0.0				6.3-8' - dark reddish brown, (5YR 3/4), dry, medium $/$
		0.0	SS-5	50/2 (50/2")	\dense, trace gravel
10_	10.0			(00/2)	No Recovery
				21-28-13-14	Sandstone
		9.6	SS-6	(41)	\10-10.4' - dark reddish brown, (5YR 3/4), pulverized / -0.4**
	12.0				Silty Sand (SW-SM) $10.4 \ 12.7 \ dork raddish brown (SVR 2/4) \ dry = 0, VOC = 0, CO = 0, LEL = 0, O2$
		24.0	SS-8	13-10-13-16	10.4 - 10.7 - 0.012
-	110	24.0	55-8	(23)	dense, trace gravel
	14.0				12' - dark reddish brown, (5YR 3/4), moist to wet, $\left(-\frac{1}{2}\right)$ PID = 0.0 ppm
15_		8.4	SS-9	10-20-27-20	Vioose, trace gravel, fine sand, well graded     Image: A state of the sand sector
	16.0			(47)	13.7-18.6' - dark reddish brown, (5YR 3/4), moist to -
_				44.40.05.00	wet, loose, little silt, few gravel, fine to medium sand, poorly graded
-		24.0	SS-10	14-16-25-22 (41)	Sand (ŠW-SM)
_	18.0			(,	14' - dark reddish brown, (7YR 4/4), moist to wet, loose, some silt, trace fine gravel, fine to medium
				38-20-12-29	sand, well graded, some pulverized sandstone at
		21.6	SS-11	(32)	bottom of recovery
20	20.0				14.7′ - dark reddish brown, (5YR 3/4), wet, dense, Hit file o o ppm —
		21.6	SS-12	5-4-19-15	some silt, trace gravel, fine to very fine sand, 1"
-	22.0		50 IL	(23)	18' - Same as above
					Silty Sand (SW-SM) 18.6-20.5' - dark reddish brown, (5YR 3/4), wet,
-		9.6	SS-13	15-50/3 (50/3")	dense, few gravel 1/4"-1" diameter, some is
	24.0				20' - Same as above
25				23-50/4	Sand
			SS-14	(50/4")	20.5-22' - very dusky red, (2.5YR 2.5/2), moist to
	26.0				wet, very dense, little silt, trace gravel, gravel is
					Sandy Silt(ML)
					22-22.4' - dark reddish brown, (5YR 4/3), wet, trace
					Silt (ML)
					22.4-24 <sup>′</sup> - dark reddish brown, (5YR 4/3), moist, very
30 -					



PROJECT NUMBER: 431007

BORING NUMBER: **EPA-31-OB** 

SHEET 2 OF 2

### SOIL BORING LOG

DRILLING CONTRACTOR : Parratt Wolff/Cushing & Sons

PROJECT : Garfield Groundwater Contamination Superfund Site

LOCATION : Garfield, NJ

ELEVATION :

				HOD : CME Holl	ow Stem Auger Rig			ORIENTATION :
WATER	LEVELS	· · · · ·			START : 6/4/2014	END : 6/4/	2014	
DEPTH E	BELOW EX	ISTING G	RADE (ft)	STANDARD	SOIL DESCRIPTION		g	COMMENTS
	INTERV			PENETRATION TEST RESULTS			SYMBOLIC LOG	
		RECOVE	ERY (in)		SOIL NAME, USCS GROUP SYMBOL, MOISTURE CONTENT, RELATIVE DEN	ISITY OR	30LI	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND
			#TYPE	6"-6"-6"-6"	CONSISTENCY, SOIL STRUCTURE, MIN	IERALOGY	зYME	INSTRUMENTATION
<b> </b>				(N)	Sandstone	1	0)	
-					24-26' - dark reddish brown, (5YR 4/3)	-		
-					Bottom of Boring at 26.0 ft bgs on 6/4/20	14 _		
						-		
	-					-		
						-		
35 -						-		
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	-					-		
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PROJECT NUMBER 431007.06.06.02 WELL NUMBER

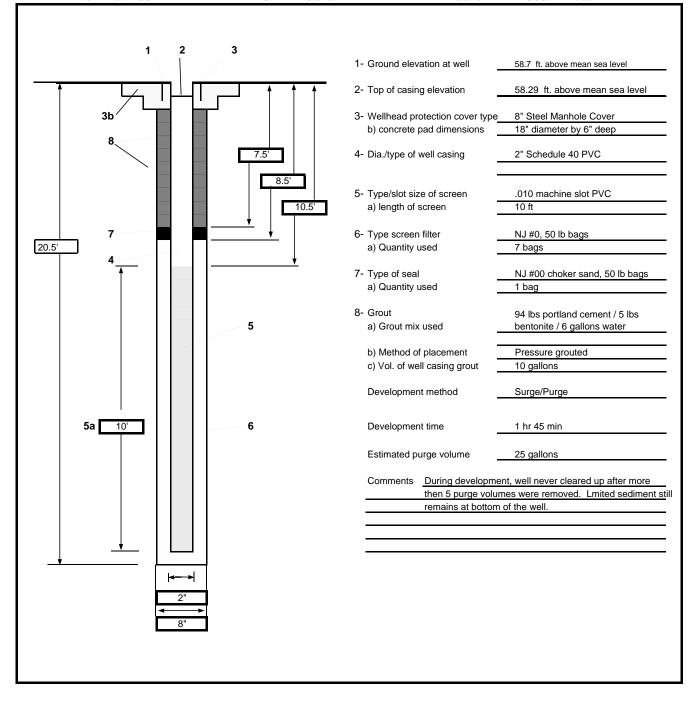
SHEET 1 OF 1

### WELL COMPLETION DIAGRAM

PROJECT : Garfield Groundwater Contamination Superfund Site LOCATION : Garfield, NJ DRILLING CONTRACTOR : Parratt Wolff

 DRILLING METHOD AND EQUIPMENT USED CME 55 Drill Rig - 8" Hollow Stem Auger - 2" Stainless Steel Split Spoons

 WATER LEVELS : 12.5 ft BGS
 START : 6/3/2014
 END : 6/3/2014
 LOGGER : Balas





PROJECT NUMBER: 431007

BORING NUMBER: EPA-32-OB

SHEET 1 OF 1

**ORIENTATION :** 

### SOIL BORING LOG

DRILLING CONTRACTOR : Parratt Wolff/Cushing & Sons

PROJECT : Garfield Groundwater Contamination Superfund Site

LOCATION : Garfield, NJ

ELEVATION :

DRILLING EQUIPMENT AND METHOD : CME Hollow Stem Auger Rig

WATER					START : 6/2/2014	END : 6/3/2	2014	
DEPTH B	BELOW E	(ISTING G	RADE (ft)	STANDARD	SOIL DESCRIPTION		ŋ	COMMENTS
	INTERV	AL (ft)	ERY (in)	PENETRATION TEST RESULTS	SOIL NAME, USCS GROUP SYMBOL, (		SYMBOLIC LOG	DEPTH OF CASING, DRILLING RATE,
			#TYPE	6"-6"-6"-6" (N)	MOISTURE CONTENT, RELATIVE DEN CONSISTENCY, SOIL STRUCTURE, MIN		SYMBC	DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
-	2.0				Reinforced Concrete 0-2'	-		BZ: H2S = 0, VOC = 0, CO = 0, LEL = 0, O2 = 20, Dust = 0.075 Refusal at 8" bgs, move north 10', resume
-	4.0	8.4	SS-1	2-3-3-2 (6)	Fill, Silty Sand(SM) 2-4' - dark brown, (7.5YR 3/2), dry, loose, gravel, fine sand and gravel, black slag no			PID = 0.0 ppm
5	6.0	12.0	SS-2	2-1-3-4 (4)	Sand (SW-SM) 4-8' - dark yellowish brown, (10YR 4/6), dr dense, little silt, trace subangular gravel, fi some of the gravel is red sandstone well g	ne sand,		BZ: H2S = 0, VOC = 0, CO = 0, LEL = 0, O2 = 20.5, Dust = 0.008 PID = 0.0 ppm
-	8.0	14.4	SS-3	5-5-5-7 (10)	6' - dark reddish brown, (2.5YR 3/4), dry, i dense, some silt, fine sand, trace round qu noted, well graded		**************************************	PID = 0.0 ppm 
- - 10	10.0	14.4	SS-4	5-9-5-4 (14)	Sandy Silt (ML) 8-10' - dark reddish brown, (2.5YR 3/4), m dense, non-cohesive, trace cobbles of 1" o sandstone, trace quartz and mica noted th	diameter ]		PID = 0.0 ppm
-	12.0	18.0	SS-5	5-8-9-10 (17)	fine sand Silty Sand(SW-SM) 10-20.5' - dark reddish brown, (2.5YR 3/4) medium dense, fine sand, well graded, tra	ce		PID = 0.0 ppm 
-	14.0	20.4	SS-6	9-10-11-13 (21)	sandstone 1" diameter, trace quartz and n Silty Sand (SW-SM) 12' - dark reddish brown, (2.5YR 4/3), moi medium dense, well graded, trace gravel,			BZ: H2S = 0, VOC = 0, CO = 0, LEL = 0, O2 = 20.9, Dust = 0.011 PID = 0.0 ppm
15_ <sup>_</sup>	16.0	14.4	SS-7	18-23-18-25 (41)	subangular to rounded, trace sandstone 1 trace quartz and mica 14' - dark reddish brown, (2.5YR 3/3), moi fine sand, weathered bedrock-sandstone	st, dense,	<u></u>	PID = 0.0 ppm
-	18.0	15.6	SS-8	26-28-11-8 (39)	bgs, 14.9'-15' bgs), trace mica, 1" diameter sandstone chunks throughout 16' - dark reddish brown, (2.5YR 3/3), wet dense, fine sand, weathered/incompetent	, very		PID = 0.0 ppm 
20	20.0	6.0	SS-9	6-8-50/4 (58/10")	1" diameter pieces of sandstone througho quartz 1/4" diameter 18' - dark reddish brown, (2.5YR 3/3), wet dense, fine to very fine sand, 2" diameter	, very	••••••••••••••••••••••••••••••••••••••	PID = 0.0 ppm 
-	22.0		SS-10	29-50/1 (50/1")	sandstone in shoe 20' - dark reddish brown, (2.5YR 3/3), wet dense, fine to very fine sand, weathered p diameter sandstone, trace quartz	ieces 1"-2" / -		PID = 0.0 ppm
-					Bottom of Boring at 20.5 ft bgs on 6/3/201	4		-
 25								
-						-		
-						-		
30								
		L						

		NUMBER 431007	A.		PA-	39-0P	SHEET 1	OF 1	]			
CH2MHILL		WELL DEVELOPMENT LOG										
PROJECT : Garfield Superfun	d Site		LOCATION:	Garfield, NJ								
Development Contractor: Pa	an a three		~									
START Time: 0910	E	ND Time :	1000		LOGGER :	Balas			-			
Diameter of Well (inches) & Typ	e: 2" 2V	c		Development	Method: Surg	e/Purge						
Depth of Well (feet): 19, 7				Surge Block								
Depth to Water (feet)				Screen Interval Surged: 15-20								
Water Column Height (feet): 5	23											
Gallons per Foot: ,103	+ - 1	2.5Y	44	Water Quality	y Meter (Manufa	acturer/Mode	I/Serial #):					
One Well Volume (gallons): 1	3 1 8	gingul	ST.	F	foribg. U	-52			18.5			
	0.5.54	dego	llons		sec cal	She	if	-	-			
Maximum Drawdown During Pu	Imping	5	S	Dia. (in)	Gal./Ft.	Dia. (in)	Gal./Ft.	1				
Average Discharge Rate & Ran		23		1"	0.041	5"	1.02	**				
Total Quantity of Water Dischar				2"	0.163	6"	1.469	2				
Disposition of Discharge Water		CIOR.	15	3"	0.367	8"	2.611	1				
Disposition of Disorial go Water		- Harr		4"	0.653	10"	4.08					
•												
Water Volume Discharged Time (gal)	Water Level	Turbidity (NTU)	Temperature (°C)	pH (Std. Units)	Conductivity (µmhos/cm)	(color od	Remarks	diment, etc.)	00	lar,		

Time	Discharged (gal)	(ft BTIC)	(NTU)	(°C)	(Std. Units)	(µmhos/cm)	(color, odor, sheen, sediment, etc.)		CRP
0910	6	DN	OR	14.75	5.99	2.40	dart brann	King !	203
0917		day	OR	13.01	5.54	1.98	Lat bran	4.57	1250
0925	16	dni	OR	12:83	4.80	193	Lak brain	7:13	335
0932	21	15.71	OR	12.20	4.27	1,58	Jark brenn	6.32	. 400
0937	24	15.63	or	1217	4.09	1.93	Lak brown	4.67	243
0942	845	15.73	or	Fi.9.8	3:82	1.86	Los brown	7.80	7 47
			1.1724	F. 250		1			
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		-1 -1		Real Providence	1000		ric	_	

NJDEP Well Permit #

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PROJECT NUMBER 431007	- 55		r 4-30-	oB	SHEET . 1	- <u>1</u>
CH2MHILL	WEL	L DEVE		ENT LO	G	
	LOCATION:	Garfield, NJ				
Development Contractor: Pa		1.04				a.
START Time: 12/0 END Time :	1213	1245	LOGGER :	Balas	3	
Diameter of Well (inches) & Type: 2"		Development	Method: Sur	je/Purge		1 10 °
Depth of Well (feet): 21.21		Surge Block L	Jsed: Yes	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -		÷
Depth to Water (feet) 11, 38		Screen Interv	al Surged: / ;	132		1
Water Column Height (feet): 9.38						
Gallons per Foot: 9 ¥. 163 + 1.5 + 1.5		Water Quality	Meter (Manu	facturer/Mode	I/Serial #):	
One Well Volume (gallons):			Horvhe	V-55		
Five Well Volumes (gallons): 15					-	14.411/
Maximum Drawdown During Pumping: 2 7		Dia. (in)	Gal./Ft.	Dia. (in)	Gal./Ft.	
Average Discharge Rate & Range: 8 6/2m		1"	0.041	5"	1.02	
Total Quantity of Water Discharged:		2"	0.163	6"	1.469	
Disposition of Discharge Water: Greensh tint		3"	0.367	8"	2.611	
mie fortigit (covers		4"	0.653	10"	4.08	

Time	Water Volume Discharged (gal)	Water Level (ft BTIC)	Turbidity (NTU)	Temperature (°C)	pH (Std. Units)	Conductivity (µmhos/cm)	Remarks (color, odor, sheen, sediment, etc.)	00	prp
1219	3	19.23	al	16126	6.41	160g	Very silty Jorneen Ant	1.61	121
1217	6	14.75	ar	14.91	6.47	1465	Ni ri	R-4	ISI SI
1.222	Ĩ.	17.02	oR	14.43	6.48	H+15	NI Le	1.77	121
(227	15	17.02	va	14.41	6.42	1.12	N	ングチ	1124
1232	19	17.31	cR	14.17	6.39	1,13	velter larten	2.01	152
1237	23	17.22	54Z	14:31	6,40	1:13	yet las greep	2.20	143
SUR	e scent	8 wil	1 jet	nnc	Lear		1 2		1
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<b>A</b> -			CT NUMBER 431007		WELL NUMBE	R EPA-3	1-0B	SHEET 1 OF 1	
	H2MHIL	- <b>L</b> -	141	WEL	L DEVE			G	
PROJECT :	Garfielld Superfi	und Site		LOCATION:	Garfield, NJ				
Development	t Contractor: Pa								
START Time	: 0756		END Time	:0913		LOGGER :	Balas		
Diameter of	Well (inches) & 1	Гуре:		_	Development	Method: Surg	e/Purge		
Depth of We	ll (feet): 그곳.				Surge Block				
Depth to Wat				2	Screen Interv	al Surged: 14	-25	e	
	n Height (feet):			_			<b>// /</b>	10	
	-oot: ,/63 x			- 8	Water Quality	Meter (Manuf			
	lume (gallons):		, B	~	<b>U</b>	or 150 L	/->		
Five Well Vo	lumes (gallons):	\$5	•	-				-	
Maximum Dr	awdown During	Pumping: 7			Dia. (in)	Gal./Ft.	Dia. (in)	Gal./Ft.	
	charge Rate & R		1	-	1"	0.041	5"	1.02	
	y of Water Disch		1	_	2"	0.163	6"	1.469	
	f Discharge Wat		w	_	3"	0.367	8"	2.611	
			12		4"	0.653	10"	4.08	
						<			
Time	Water Volume Discharged (gal)	Water Level (ft BTIC)	Turbidity (NTU)	Temperature (°C)	pH (Std. Units)	Conductivity (µmhos/cm)	(color, od	Remarks or, sheen, sediment, e	tc.) Dolore
0400	4	19:50	OR	14.93	4.05	1:90	dart	reddige brown	5.21/221
08007	11	18.91	OR	14.27	4.36	1.90		redith /yell ~	

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	UMBER 31007	WELL NUMBE	R 32-C	B	SHEET 1 (	OF 1	
CH2MHILL	W	ELL DEVE	LL DEVELOPMENT LOG				
PROJECT : Garfielld Superfund Site	LOCATIC	N: Garfield, NJ	2.				
Development Contractor: Pa							
	D Time : 21	5	LOGGER :	Balas			
Diameter of Well (inches) & Type: 2 1		Development Surge Block	Method: Sur	ge/Purge			
		Screen Interv		5-20			
Depth to Water (feet) 11,28		Screen milery	al Sulyeu. 7	7-20			
Water Column Height (feet):       8.07         Gallons per Foot:       1/2 3 + 4.5			/ Meter (Manu		/Serial #):		
One Well Volume (gallons): 4; 7		1-	tachen U	-57	٠		
Five Well Volumes (gallons): 23.5				18 C			
	4						
Maximum Drawdown During Pumping:	Y	Dia. (in)	Gal./Ft.	Dia. (in)	Gal./Ft.		
Average Discharge Rate & Range: VGr	il L	1"	0.041	5"	1.02		
Total Quantity of Water Discharged: 23		2"	0.163	6"	1.469	0	
Disposition of Discharge Water: newro	Ver. rec	3"	0.367	8"	2.611		
	101	4"	0.653	10"	4.08		

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Time	Water Volume Discharged (gal)	Water Level (ft BTIC)	Turbidity (NTU)	Temperature (°C)	pH (Std. Units)	Conductivity (µmhos/cm)		Der app
1030	5	day	or	17.74	5.47	2.33	durk red-sheeryous	29 378
1102	9	dny	OR	15.06	6.53	2.22	dark red-sheen	5,23/50
1120	14	day	OR	19.97	6.43	1,95		7.28 147
1192	18.5	dry	OR	14.87	6.33	1.88	Jak Relyelow	2.76 194
12/3	25	dry	OR	14.82	6.07	1.43	yellow trut	3.375
	cloare d	wat	very	Phdo	Proce		*	
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Attachment 4 Data Validation Report Data Quality Evaluation Report

# 2014/2015 Garfield Groundwater Pilot Test

## Garfield Groundwater Contamination Superfund Site City of Garfield, Bergen County, New Jersey

Prepared for

## U.S. Army Corps of Engineers

Contract No. W912DQ-11-D-3005, Task Order 0003

May 2015 Revised July 2015

Prepared by



119 Cherry Hill Road Suite 300 Parsippany, NJ 07054

### DATA QUALITY EVALUATION REPORT 2014/2015 GARFIELD GROUNDWATER PILOT TEST GARFIELD GROUNDWATER CONTAMINATION SUPERFUND SITE

### CITY OF GARFIELD BERGEN COUNTY, NEW JERSEY

### USACE Contract No. W912DQ-11-D-3005 Task Order No. 0003

### May 2015 Revised July 2015

### NONDISCLOSURE STATEMENT

This document has been prepared for the U.S. Army Corps of Engineers under Contract No. W912DQ-11-D-3005. The material contained herein is not to be disclosed to, discussed with, or made available to any persons for any reason without the prior expressed approval of a responsible official of the U.S. Army Corps of Engineers.

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# Acronyms and Abbreviations

ALS	Australian Laboratory Services
DESA	Division of Environmental Science and Assessment (USEPA)
FD	field duplicate
IDW	investigation-derived waste
LCS	laboratory control sample
MS	matrix spike
MSD	matrix spike duplicate
QAPP	quality assurance project plan
QC	quality control
RL	reporting limit
SDG	sample delivery group
USEPA	U.S. Environmental Protection Agency

### section 1 Introduction

This data quality evaluation report contains an assessment of the quality and usability of analytical data from environmental groundwater samples collected during the 2014 and 2015 U.S. Environmental Protection Agency (USEPA) pilot testing sampling events at the Garfield Groundwater Contamination Superfund Site in Garfield, Bergen County, New Jersey, by CH2M HILL, on behalf of the U.S. Army Corps of Engineers.

The analytical work was conducted in accordance with the Remedial Investigation Uniform Federal Policy for Quality Assurance Project Plan, Garfield Groundwater Contamination Superfund Site, Aquifer Test and Pilot Test, Garfield, Bergen County, New Jersey (project QAPP; CH2M HILL 2012).

This report discusses the details of groundwater sample results that were collected and validated during the 2014 and 2015 sampling events and were analyzed outside of the USEPA Division of Environmental Science and Assessment (DESA) and Contract Laboratory Program laboratory systems. USEPA data validation reports are not provided by the DESA laboratory. Samples collected as part of the investigation-derived waste (IDW) samples are not included in this data quality discussion because the data were not validated in accordance with the project QAPP.

## 1.1 Analytical Laboratories and Analytical Methods

Australian Laboratory Services (ALS), (formerly Columbia Analytical Services) of Rochester, New York, performed all sample analyses. After collection, the samples were delivered to the ALS laboratories by overnight courier for analysis. The analytical methods used were as follows:

• USEPA Method EPA 218.6 Hexavalent Chromium

# Field Sample Collection

Six sample delivery groups (SDGs) of analytical data were evaluated for data quality. Table 1 lists the SDGs, sample identifications, and collection and analysis chronology associated with the project samples.

Thirty groundwater samples were collected between June 19, 2014 and February 6, 2015. Field duplicate (FD) collection goals were met with four groundwater FDs completed. Other quality control (QC) samples including matrix spike (MS)/matrix spike duplicates (MSDs) and field blanks were collected and analyzed in accordance with the project QAPP (CH2M HILL 2012). Table 2 summarizes the field samples collected by date.

## 3.1 Data Validation Definition

All analytical data from this investigation were evaluated as described in the project QAPP (CH2M HILL 2012). All (100 percent) of the hexavalent chromium analytical results were validated, except for IDW samples not included in this report. The data assessment included reviewing the following laboratory summary forms:

- Chain-of-custody documentation
- Holding time
- QC sample frequencies
- Method blanks
- Laboratory control samples (LCSs)
- Surrogate spikes
- MS/MSDs
- Initial and continuing calibration information
- FD precision
- Case narrative review and other method-specific criteria

Data flags (if applicable) were assigned using the QC acceptance limits and procedures defined in the project QAPP (CH2M HILL 2012). Data flags, and the reason for each flag, were entered into an electronic database and are available to the data users. Multiple flags can be routinely applied to a specific sample method/matrix/analyte combination, but only one final flag is applied to the data according to the most conservative of the validation flags.

## 3.2 Overall Data Validation Findings

Table 3 presents an overall summary of definitive data sample results and the reasons each sample was flagged. The information in Table 3 is presented so that each flag applied to a method, matrix, and analyte is shown. In addition, a statistical evaluation of the results is provided so the percentage of results affected by a specific data quality condition or flag, with respect to the total results available for any target analyte/matrix, is shown. Only out-of-control conditions noted during the data validation are discussed in Table 3 and in the following subsections.

### 3.3 Results Detected between the Method Detection Limit and Reporting Limit

Analytes that were detected at concentrations greater than the method detection limit, but less than the reporting limit (RL), were qualified as "J" and are considered to be qualitative concentrations.

## 3.4 Field Duplicates

FDs were submitted at a minimum frequency of 1 per 20 project samples. Four FDs were submitted for the effort in a manner such that the duplicate association was "blind" to the laboratory. FD precision for hexavalent chromium in groundwater was out of control for the duplicate pair EPA-13-OB-102014 and D-01-102014. Out-of-control detected results from the FD were qualified as estimated concentrations, flagged "J", and are believed to be caused by sample heterogeneity or matrix interference in the analytical process. Table 4 presents results that were qualified because of out-of-control FD precision.

# Summary of Precision, Accuracy, Representativeness, Comparability, and Completeness

The quality of the field sampling efforts and laboratory results were evaluated for compliance with project data quality objectives by reviewing overall precision, accuracy, representativeness, comparability, and completeness. Procedures used to assess these criteria were in accordance with the respective analytical methods and the project QAPP (CH2M HILL 2012) and QAPP addendum (CH2M HILL 2013) requirements.

## 4.1 Precision

Matrix precision from MS/MSDs was in control. Matrix precision also was evaluated through the results of FD samples. The results of the FD sample were out of control. The FD sample was within the oxidizing sample group and may indicate the other oxidizing samples have similar amounts of imprecision or uncertainty. Laboratory precision was acceptable as shown by the repeated in-control performance (accuracy) of the LCSs.

## 4.2 Accuracy

Matrix accuracy from MS/MSDs was in control. The laboratory accuracy of LCSs and calibrations was in control. The accuracy of blanks was in control overall and contamination was not significant to the sample concentrations. Both laboratory and matrix accuracy were acceptable.

## 4.3 Representativeness

Sample data were representative of the site conditions at the time of sample collection. All samples were properly stored and preserved. Analytical data were reported from an analysis conducted within the project-specified hold time. Blank contamination was not an issue with this data set.

## 4.4 Appropriateness of Reporting Limits

This project was designed to allow risk-based decisions to be made based on the results of common USEPA-approved analytical methodologies. Sample dilutions required from matrix interference and/or high target analyte concentrations resulted in elevated RLs for sample data. The RLs achieved were the best possible based on sample variables.

## 4.5 Comparability

All samples were reported in industry standard units. Analytical protocols for the methods were followed. Results obtained were comparable to industry standards in that collection and analytical techniques followed approved, documented procedures.

## 4.6 Completeness

Project completeness for hexavalent chromium is 100 percent. No results were qualified as unusable for project objectives. Table 5 presents the completeness results.

## 4.7 Conclusions

The data generated from groundwater sample analyses were of sufficient quality and quantity necessary for accomplishing the project objectives. Sample results indicate the presence and/or absence of target analyte

contamination at sampled locations when considering the accuracy and precision bias as discussed in this report.

Samples were collected and analyzed as specified in the project QAPP (CH2M HILL 2012). Sample results are believed to be representative of site conditions at the time of collection. Results obtained are comparable to industry standards in that collection, and analytical techniques followed approved, documented procedures. All results were reported in industry standard units. Although field blank contamination from equipment blanks did occur, it was not significant to the sample data. The results obtained for sample analyses reflect the best achievable data for the site-specific conditions.

# Reference

CH2M HILL. 2012. *Remedial Investigation Sampling Uniform Federal Policy for Quality Assurance Project Plan, Garfield Groundwater Contamination Superfund Site, Garfield, Bergen County, New Jersey.* March.

CH2M HILL. 2013. *Remedial Investigation - Uniform Federal Policy for Quality Assurance Project Plan, Aquifer Test and Pilot Test, Garfield Groundwater Contamination Superfund Site, Garfield, Bergen County, New Jersey.* September.

# Tables

# TABLE 1Sample Chronology – Data Summary

Laboratory	SDG	Sample ID	Method	Sample Date	Receive Date	Extract Date	Analysis Date
CASR	R1404720	D-06192014-01	E218.6	6/19/2014	6/20/2014		6/23/2014
		EPA-13-OB-061914	E218.6	6/19/2014	6/20/2014		6/23/2014
		EPA-29-OB-061914	E218.6	6/19/2014	6/20/2014		6/23/2014
		EPA-30-OB-061914	E218.6	6/19/2014	6/20/2014		6/23/2014
		EPA-31-OB-061914	E218.6	6/19/2014	6/20/2014		6/23/2014
		EPA-32-OB-061914	E218.6	6/19/2014	6/20/2014		6/23/2014
	R1405819	EPA-13-OB-072914	E218.6	7/29/2014	7/30/2014		7/30/2014
		EPA-29-OB-072914	E218.6	7/30/2014	7/31/2014		7/31/2014
		EPA-30-OB-072914	E218.6	7/29/2014	7/30/2014		7/30/2014
		EPA-30-OB-072914MS	E218.6	7/29/2014	7/30/2014		7/30/2014
		EPA-30-OB-072914SD	E218.6	7/29/2014	7/30/2014		7/30/2014
		EPA-31-OB-073014	E218.6	7/30/2014	7/31/2014		7/31/2014
		EPA-31-OB-073014MS	E218.6	7/30/2014	7/31/2014		7/31/2014
		EPA-31-OB-073014SD	E218.6	7/30/2014	7/31/2014		7/31/2014
		EPA-32-OB-072914	E218.6	7/29/2014	7/30/2014		7/30/2014
	R1406953	D-01-090414	E218.6	9/4/2014	9/5/2014		9/10/2014
		EPA-13-OB-090314	E218.6	9/3/2014	9/5/2014		9/5/2014
		EPA-29-OB-090414	E218.6	9/4/2014	9/5/2014		9/10/2014
		EPA-30-OB-090314	E218.6	9/3/2014	9/5/2014		9/5/2014
		EPA-31-OB-090314	E218.6	9/3/2014	9/5/2014		9/10/2014
		EPA-32-OB-090314	E218.6	9/3/2014	9/5/2014		9/10/2014
	R1408420	D-01-102014	E218.6	10/20/2014	10/23/2014		11/3/2014
		EPA-13-OB-102014	E218.6	10/20/2014	10/23/2014		11/4/2014
		EPA-29-OB-102114	E218.6	10/21/2014	10/23/2014		11/3/2014
		EPA-30-OB-102014	E218.6	10/20/2014	10/23/2014		11/3/2014
		EPA-31-OB-102014	E218.6	10/20/2014	10/23/2014		11/3/2014
		EPA-32-OB-102014	E218.6	10/20/2014	10/23/2014		11/3/2014
LSR	R1410146	GCGC-EPA-13-OB-05	E218.6	12/18/2014	12/19/2014		12/29/2014
		GCGC-EPA-13-OB-05MS	E218.6	12/18/2014	12/19/2014		12/29/2014
		GCGC-EPA-13-OB-05SD	E218.6	12/18/2014	12/19/2014		12/29/2014
		GCGC-EPA-29-OB-05	E218.6	12/17/2014	12/18/2014		12/29/2014
		GCGC-EPA-30-OB-05	E218.6	12/18/2014	12/19/2014		12/29/2014
		GCGC-EPA-31-OB-05	E218.6	12/18/2014	12/19/2014		12/29/2014
		GCGC-EPA-32-OB-05	E218.6	12/17/2014	12/18/2014		12/29/2014
	R1500842	D-02062015-01	E218.6	2/6/2015	2/7/2015		2/10/2015

### TABLE 1 Sample Chronology – Data Summary

Laboratory	SDG	Sample ID	Method	Sample Date	Receive Date	Extract Date	Analysis Date
ALSR	R1500842	EPA-13-OB-020515	E218.6	2/5/2015	2/6/2015		2/10/2015
		EPA-29-OB-020615	E218.6	2/6/2015	2/7/2015		2/10/2015
		EPA-30-OB-020515	E218.6	2/5/2015	2/6/2015		2/10/2015
		EPA-31-OB-020615	E218.6	2/6/2015	2/7/2015		2/10/2015
		EPA-32-OB-020515	E218.6	2/5/2015	2/6/2015		2/10/2015

# TABLE 2Sample Summary by Chain of Custody – Data Summary

CoC Number	Sample Date	Matrix	Sample ID / QAQC Type	SDG	Laboratory	
R1404720						
	19-Jun-14	WATER	D-06192014-01 / FD	R1404720	CASR	
			EPA-13-OB-061914 / N	R1404720	CASR	
			EPA-29-OB-061914 / N	R1404720	CASR	
			EPA-30-OB-061914 / N	R1404720	CASR	
			EPA-31-OB-061914 / N	R1404720	CASR	
			EPA-32-OB-061914 / N	R1404720	CASR	
R1405819						
	29-Jul-14	WATER	EPA-13-OB-072914 / N	R1405819	CASR	
	30-Jul-14		EPA-29-OB-072914 / N	R1405819	CASR	
	29-Jul-14		EPA-30-OB-072914 / N	R1405819	CASR	
			EPA-30-OB-072914MS / MS	R1405819	CASR	
			EPA-30-OB-072914SD / SD	R1405819	CASR	
	30-Jul-14		EPA-31-OB-073014 / N	R1405819	CASR	
			EPA-31-OB-073014MS / MS	R1405819	CASR	
			EPA-31-OB-073014SD / SD	R1405819	CASR	
	29-Jul-14		EPA-32-OB-072914 / N	R1405819	CASR	
R1406953						
	04-Sep-14	WATER	D-01-090414 / FD	R1406953	CASR	
	03-Sep-14		EPA-13-OB-090314 / N	R1406953	CASR	
	04-Sep-14		EPA-29-OB-090414 / N	R1406953	CASR	
	03-Sep-14		EPA-30-OB-090314 / N	R1406953	CASR	
			EPA-31-OB-090314 / N	R1406953	CASR	
			EPA-32-OB-090314 / N	R1406953	CASR	
R1408420						
	20-Oct-14	WATER	D-01-102014 / FD	R1408420	CASR	
			EPA-13-OB-102014 / N	R1408420	CASR	
	21-Oct-14		EPA-29-OB-102114 / N	R1408420	CASR	
	20-Oct-14		EPA-30-OB-102014 / N	R1408420	CASR	
			EPA-31-OB-102014 / N	R1408420	CASR	
			EPA-32-OB-102014 / N	R1408420	CASR	
R1410146						
	18-Dec-14	WATER	GCGC-EPA-13-OB-05 / N	R1410146	ALSR	
1 0015			Table 0			

June 2015

### TABLE 2 Sample Summary by Chain of Custody – Data Summary

CoC Number	Sample Date	Matrix	Sample ID / QAQC Type	SDG	Laboratory	
R1410146						
	18-Dec-14	WATER	GCGC-EPA-13-OB-05MS / MS	R1410146	ALSR	
			GCGC-EPA-13-OB-05SD / SD	R1410146	ALSR	
	17-Dec-14		GCGC-EPA-29-OB-05 / N	R1410146	ALSR	
	18-Dec-14		GCGC-EPA-30-OB-05 / N	R1410146	ALSR	
			GCGC-EPA-31-OB-05 / N	R1410146	ALSR	
	17-Dec-14		GCGC-EPA-32-OB-05 / N	R1410146	ALSR	
R1500842						
	06-Feb-15	WATER	D-02062015-01 / FD	R1500842	ALSR	
	05-Feb-15		EPA-13-OB-020515 / N	R1500842	ALSR	
	06-Feb-15		EPA-29-OB-020615 / N	R1500842	ALSR	
	05-Feb-15		EPA-30-OB-020515 / N	R1500842	ALSR	
	06-Feb-15		EPA-31-OB-020615 / N	R1500842	ALSR	
	05-Feb-15		EPA-32-OB-020515 / N	R1500842	ALSR	

#### QAQC Type

N = normal environmental sample FD = field duplicate MS = matrix spike SD = spike duplicate TB = trip blank EB = equipment blank AB = ambient blank FB = field blank

### TABLE 3 Site Completeness by Analyte – Flagging Statistics

Matrix	Method	Analyte			Number of San	ples
WATER						
	E218.6					
		Chromium, Hexavalent, Dissolved			34	
Validat	ion Flag Ca	tegory: FieldDuplicate	2	J	Flags (5.88%)	for Field duplicate exceeds RPD criteria

Note: The total number of validation flags may exceed the actual number of samples if multiple flags were applied to the same sample. Consequently, the percentage of total flags (flags applied/number of samples) may exceed 100 percent.

\* The most severe flag for each analyte becomes the final validation flag.

#### **Qualifier Description:**

J = The analyte was positively identified, the quantitation is an estimate.

## TABLE 4 Field Duplicate Precision – Qualified Data

Method	Matrix			Result	Field Duplicate Qualifier*	Criteria
E218.6	WATER		Chromium, Hexavalent,	Dissolved		
		D-01-102014		147 UG/L	J	FD>RPD
		EPA-13-OB-102014		13.2 UG/L	J	FD>RPD

\* The most severe flag for each analyte becomes the final validation flag.

#### **Qualifier Description:**

J = The analyte was positively identified, the quantitation is an estimate.

#### Criteria:

FD>RPD = Field duplicate exceeds RPD criteria

# TABLE 5 Site Completeness by Analyte – Qualified Data

					Number	of Occu	rrences		_	
Method	Analyte	Units	Analyses	Detects	Non- detects	Blank Flags	J-Flags	<u>Contractor</u> <u>Total</u> R-Flags	Contractor Complete	<u>Overall</u> ness (%)
E218.6	Chromium, Hexavalent, Dissolved	MG/L	28	28			2		100	100
E218.6	Chromium, Hexavalent, Dissolved	UG/L	6	6			2		100	100

Attachment 5 Groundwater Field Logs

Well Number:				-		Site: Garfield			adon Superior		
Field Crew:	J. Ba	165 +	$\cdot p, \tau$	Reamer Purge		Date: 6//	9/14	Project #:	431007		
Well Depth (ft.):	19.65	5		Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Foot	
DTW (ft.): /	0.37			USEPA - Low	Flow	6.	.163	>	5"	1.020	
Water Column	(ft.): 9, Z	8		Sampling Proc	edures	3*	.367		6"	1.469	
Well Diameter (	(in.): Z			with submersit	te pump	4"	.653	2	8"	2.611	
Gal. per ft.: 🧷				Water Quality	Meter:						
Well Volume (g Depth of Scree	al.): 1,51	5-20	'Rrs	Horiba U-52							
Depth of Scree	n (tt.): /	5 20	000			Field Parame	tore		·····		
251		Flow Rate	Total		Tomp		ORP	D.O.	Turbidity	Salinity <sup>1</sup>	
Time	DTW (tic)	(ml/min)	Volume (gai)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	(mV)	[Surface] (mg/l)	(NTU)	(PPT)	Color/Odor
120		Purge at							1 40%		
Stabilization	< 0.3	200-500	10	+/- 0.1	10 100	+/-3%	+/- 10 mV	+/- 10%	+/- 10%		5k ./ /
1454	10.92		1.5	4.06	13,58		535	<u> </u>	254	0.8	Sellow Ino
1500	10,96	460	2.4	4.10	13,57	1.57	533	2.74	185	0.8	Dark Yellow
	10.98	460	3.0	4.14	13.48	1.55	530	2.82	108	6.8	11/11
1510	10.99	400	3,5	4.15	1	1	530	2.90			ajn
									1111		
1515	11.00	400	3.1	4,15	13,49	1.52	530	2.95	98,3	0.8	11/11
				3.	13.66	(F)					
		n <sup>2</sup>									
2				о. <sup>20</sup>							
						2					0
								P			
14110	11.27	Upp	21	3.96	13.96	1,58	FUD	3.57	46.2	0.5	11
1540				4 cmp 10	· · · · · ·		570	5.57	L indiana in the second		· · ·
Remarks:	Pump Intake	Depth:	0107	Junpre	Control Box Se			3		ample at 100-250	ml/min)
	the for	\$' B7	IC		N	A	56			200	
	17	,5'			FI-	a a D	,				
					10 -	0.07	mg/c				1
-							0				
						SAMPLIN	6				2
Depth to Wate	r Before Sam	aling: //	,00			SAMP LIV	<u> </u>				
			w Samplin	g Procedures w	ith submersible p	oump					
Sample Name	roa	-	-OB			QC Sample:	NA		2	6.4	<u>.</u>
Sample Date/	Time: Cel	19/14	<u>e15</u>	20			*	- 21			
Sampler / Sigr		Ke	ane	- Un	he						
Filtered Metals		Y/ COM		Jer							
Sample Obser		1		ired prior to coll	acting comple						C 16:07
INOTES: 7 = STR	UNIZATION OF D	s paramete	13 HOLLEQU	neo prior to coll	ocarig sample				oc/N		

and the second sec

Well Number: EPA - 30 - 013 Site: Garfield Groundwater Contamination Superfund Site Field Crew: Balas 6/19/14 Date: Project #: 431007 Purge Well Depth (ft.): 21, 40 Gal. Per Foot Gal. Per Foot Methodology: Diameter Diameter USEPA - Low Flow 1.020 2" .163 5" DTW (A.): 11, 95 Water Column (ft.): 10.45 Sampling Procedures 3" .367 6" 1.469 2.611 Weil Diameter (in.): 2 " with submersible pump 4" .653 8" Gal. per ft.: , /6 3 Water Quality Meter: Well Volume (gal.): [+7 Horiba U-52 Depth of Screen (ft.): 17-22 Field Parameters D.O. Total Volume Turbidity (NTU) Salinity<sup>1</sup> (PPT) Flow Rate pH (Std. Units) Temp Cond. ORP [Surface] Color/Odor (ml/min) (C) (mS/cm) (mV) (mg/l) DTW (tic) (gai) Time Purge at 200-500 +/- 3 % +/- 10% +/- 10% < 0.3' +/- 0.1 +/- 10 mV Stabilization 19.36 3.44 R bran yeller 6.72 1,25 350 16 12.98 112 1007 Initial 85,5 18.16 6.25 07 R1 107 .94 7 IUZ1 2.7 300 0 .7 1.31 56,2 12.73 6.33 18.01 103 . 89 300 5 121 1026 1.30 101 18,00 40,8 6.35 1,8 ,87 R.H 300 1031 95 16,9 100 6.38 300 2.5 18:10 79 1041 4.80 300 218 8.12 185 12,5 29 6 6.41 104 1046 103 ,29 083 10 300 6.46 18.21 R.6 マオ 7.7 105 103 .83 13.6 29 6 77 1056 300 6. samo e 1100 CO C.50 16-82 1054 7 57 55.5 111 12.75 200 -1130 Post-Purge Sampling: (Sample at 100-250 ml/min) Control Box Setting (Hz): Remarks: Pump Intake Depth: Cr IT-OR Ferrors Iron - Owing/2 ~ 20 SAMPLING 12:69 Depth to Water Before Sampling: pling Procedures with submersible pump Sample Methodology: USEPA EPA-30-03-061914 QC Sample: 1000 Sample Name: 1100 114 10 Sample Date/Time: Sampler / Signature 45 Filtered Metals Collected: N Filter Size: Sample Observations: Notes: 1 = stabilization of this parameter is not required prior to collecting sample Parameters: Select pultals (1350/24) anion 9, CH4; NOD. TOC cr II 5 105 163 300

Well Number:	EPA	-15-	00			Site: Garfield		r Contamin	ation Superfun	d Site	
Field Crew:	T.Balas	T+ P	Rear	m		Date: 6-19	7-14	Project #:	431007	T T	
Well Depth (ft.):	220	22	3710	Purge Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Foo	t
DTW (ft.):				USEPA - Low F	low	2"	.163		5"	1.020	)
Water Column	(11): 77			Sampling Proc		3"	.367		6"	1.469	9
Well Diameter (		,,,,		with submersib	e pump	4"	.653		8"	2.611	I
A				Water Quality I	Aeter:						
Gal. per ft.: 🧷 Well Volume (g Depth of Scree	, 16 5 al.): 73 al.): 72	2.3 -32		Horiba U-52		· .					
Departor Scree	n (n.). •					Field Parame	ters				
Time	DTW (tic)	Flow Rate (ml/min)	Totai Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	D.O. [Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		
1016	12.60	300	0.7	7.84	16.77	0,789	150	1.42	9.94	0.4	Yellowish Green
1021	12.62	300	1.2			0.791			6.42		Yellowish green
1026	12.64	300	1			0.794		1	5.62		11/11
1031	12.64		2.1			0.796		1.05			11/11
	12.65		2.4		<u> </u>	6.800			3.10	0,4	11/11
1041	12.65					0.803					1. /1.
1046	12.65	300	3.2	1.77	16,91	0.806	149	1.12	2.45	6.4	
	+2.9-	(PR)	ļ								
								1	<u> </u>		
1131	12.90	250	3.2	7.74	17.40	0,820	158	1.17	4.06	04	11/11
Remarks:	Pump intake				Control Box Se					ample at 100-25	0 ml/min)
	27'		pirs Sague		11/					250	
					Fe	· .' 0.	00m	g/c			
				ale pr		SAMPLIN	G				
Depth to Wate			<u>6.65</u>	12							<u> </u>
	C 20	PA-Low Fk - 13- C		g Procedures wi	th submersible		Dal	D - A	6192010	1-01	<u> </u>
Sample Name		-19-1		1050		QC Sample:	Jup !	0-01	5172010	7-01	
Sample Date/	~	Rea		~~~	12-					-	
Sampler / Sign Filtered Metals	/		Filter Size:	0.45			· · · · · · · · · · · · · · · · · · ·			2	
Sample Obse		ollowi		<u></u>	0/01						
	/			lired prior to coll			· · · ·	·······			
						ate Ini					

(Jai)

Well Number:	ETA	-31	- <u>013</u>	0		Site: Garffeld	- F			id Site	
Field Crew:	J. B	alas	ID.	Ream	- 260	Date: 6/1	qliy	Project #:	431007		
Well Depth (ft.):	24.91	1.		Purge Methodology:	382	₿ Diameter	Gal. Per Foot		Diameter	Gal. Per Foot	×
	1.98			USEPA - Low F	low	2"			5"	1.020	
Water Column (	•			Sampling Proce	dures	3"	.367		6"	1.469	
Well Diameter (				with submersib	e pump	4"	.653		8"	2.611	
Gal. per ft.: ()	163			Water Quality N	leter:		Q.				<b>1</b> 0
Well Volume (g	al.):			Horiba U-52	14	340	$\mathbf{X}$				
Depth of Screen	n (ft.): 15	-25					7				
					= 74	Field Parame	ters	D.O.			
		Flow Rate	Total Volume	pН	Temp	Cond.	ORP	[Surface]	Turbidity	Salinity <sup>1</sup>	
Time	DTW (tic)	(ml/min)	(gal)	(Std. Units)	(C)	(mS/cm)	(mV)	(mg/l)	(NTU)	(PPT)	Color/Odor
Stabilization	< 0.3'	Purge at 200-500		+/- 0.1	-	+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		
	20 00	300	150	See and	perto	·L			2	() ×	1 .4 .01
1327	1290	200	1.25	lotdy	16.62	1.68	184	2.60	975	+8	derkyel
1334	12,95	300	1.6	6.23	16.45	1.67	187	2.24	189	O.K	t e
134/9	12,98	300	3.0	6.22	16,19	169	194	2:09	69.6	09	
12/0	12 99	300	3.7	1 22		+ 00	195	1.78	229	19.9	~ ~ ~
1557	12010		1.1.1	6.22	16.14	1,90			32 ~	A ()	<sup>w</sup>
1907	1278	300	410	6.2	16,05	1,72	196	1.64	dis	0.9	M
1409	12.98	300	9.4	6:16	16.72	1.73	199	1.51	21.4	0,9	10
1414	12.98	300	4.8	6.12	14.97	1,74	202	1,47	22,6	0,9	se, 1
1419	12.98	300	51	Gill	14:90	1.75	202	1.79	20,9	8,9	N 3
6.6.1	parti	11	P		2/2	111-	-	1		1	
1725	· (V	llec		sam	112						
	1.00			12 <b>F</b> O				S	•		
											- S -
1745	12.98	200	-	6.22	16.24	1.77	207	1.86	47.9	0.9	yellor
2			1	4.4	Control Box Se		0.01	11.0-		ample at 100-250	
Remarks:	Pump Intake	200 AU 4			COLLICI DOX 3				Samping. (S	ampie al 100-200	*10/11007
	~ 20	,5 R	TIC	_	<b></b>	4	~~~	0 0	- 1		
	rented				tere	vs Ir	<i>5</i> 77	0,0	m5/=		
59	erpe	<b>G</b> τ	1516		e		9 11	18	$\sim$		#]
					Cr V	I le	ick.	- 0r	2		
1.1								i i			
							-			¥2.7	2
			3.9	,	6	SAMPLIN	G				
Depth to Wate			K ( )	L.	the actions						
	T D		W Sampling	Procedures wi	a IU	QC Sample:	None				
Sample Name		10/14	1 10	175		QU Sample:	100ML				
Sample Date/ Sampler / Sign		10		(#)	<u> </u>	·					1
Filtered Metal	1000	Y 70)	Filter Size:			2					
Sample Obser	2								-	-	
	1. But 1	is paramete	r is not reau	ired prior to colle	acting sample						
		- met								, SUIGA	

	EPA			2		Site: Garfield	Groundwate	r Contamina	ation Superfun	d Site	
	J, 13		11	D, Rear Purce	~	Date:		Project #:	431007	al na	
Well Depth (ft.):	19.9	Z		Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Foo	t
DTW (ft.): 12	. 40			USEPA - Low F	low	2"	.163	5	5"	1.020	)
Water Column (		Z		Sampling Proce	adures	3"	.367	-	6"	1.469	9
Well Diameter (	in.): 2			with submersib	le pump	<b>4</b> "	.653		8"	2.61	1
Gal. per ft.: <i>(</i> ) Well Volume (ga	163			Water Quality N	Aeter:						
Well Volume (g	al.):	1.2	811	Horiba U-52		8					
Depth of Screer	n (ft.): /	0-20	1565						S		5 1 - 7 1
			Total			Field Parame		D.O.			
Time	DTW (tic)	Flow Rate (ml/min)	Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	[Surface] (mg/l)	Turbidity (NTU)	Salinity' (PPT)	Color/Odor
Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		
1330	12.77	300	0.9		15.77		454	2.41	over	0.7	Yellowish Grown
1343	12.86	300	2.0		15.11		1		38.3		Yellowish Growny Brownish gellow
	12,90	300	2.6			1.37		1	16.1	0.7	Dark yellow
	12.92	300	3,0			1,38	+	2.17		0.7	
		300				1.39	4.72		10.5	0.7	114
	12.94				15.36		474	2.15		6.7	11/11
1408	0		4.3	4.75	15.43	1.41	474	2.14	9.73	0.7	11/11
14/2 6	R)(UR)	250	-								-
- 61 <sup></sup>							а — — — — — — — — — — — — — — — — — — —				
				- 14 (						<i>a</i> *	
1428	13,15	250	4.3	4.70	15,30	1.46	469	3.44	36.5	0.7	11/4
Remarks:	Pump Intake	Depth:	pius	Sangoli	Control Box Se	etting (Hz):				ample at 100-25	i0 ml/min)
	~ 17	"BT.	IC		49	199				250	
			-		01	. , .					
						100 F					
					/	Errou	3 I/	'Un	= 0, c	10 min	1 e
										J	1 5
							St				
			6.1			SAMPLIN	G				
Depth to Wate		Para Mi	.96				<b>3</b> .				
				Procedures wi			11				.65
Sample Name		1 1		<u>06/9/</u> 1410	/	QC Sample:	None	-			
Sample Date/		$ \sum_{i=1}^{n} $	1 7	-		7					
Sampler / Sign		MDN 1	Tilter Size:	earer AUSC	- a	<i>we</i>					
Filtered Metals			ow /		10-	9.57					
	vau013.	70.11	/								

$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	-		OB				- 20 / / /		ation Superfun	d Olto	
Weil Dep N1::         Cl. MO         Methodology         Diameter         Gal Per Foot           OTW (b):         12::         USER-L-WP Por         2:::         ::         3:::         :	1. 5:40	513-12	a /0		15	Date: 7/2	9/19	Project #:	431007		
OTW (11): 12.1.4.5.1.5.1.7.5.1.5.1.5.1.5.1.5.1.5.1.5.1.5	21.40					Diameter	Gal. Per Foot		Diameter	Gal. Per Foot	
Water Column (D):         2/7         Sampling Procedures         3°         367         6°         1.469           Well Diameter (n):         9         2.811         4'         .653         8°         2.811           Sampling (n):         9         1.469         8'         .853         8°         2.811           Sampling Science (n):         1         Horiba U-32         Field Parameters         1         .653         8°         2.811           Time         DTW (de)         (field minimine)         (field		7		USEPA - Low F	low	2"	.163		1.		
Weil Damber (M. 2)         Water Challty Meter:           Opph of Screen (R):         Term         Value Challty Meter:           True         DTW (6)         Field Parameters           1259         15,17         0.55         0.5         (a. 0.11)           1259         15,17         0.55         0.5         (a. 0.12)         1.53         0.40         7.55         0.6         420,00           1259         15,17         0.55         0.5         (a. 0.2)         1.53         0.40         7.53         0.6         7.6         420,00           1301         14,55         5.00         1.7         (a. 7.1         (a. 1.50         1.53         0.40         7.6         420,00           1304         14,60         450         (a. 7.1         (a. 1.50         1.53         0.10         420,00         7.6         420,00           1319         14,60         450         (a. 7.1<		i									
Oak part         Child Parameters         Dio         Tendel Parameters           Time         DTW (ttel)         Pow Rate         Volume         PH         Tency         Cond.         ORP         Rundees         Tencidity         Salingston           Stabilization         <0.3         200.500         H+ 0.1         H- 2.3%         H- 10%         H- 10%         Feld Parameters           Stabilization         <0.3         200.500         H+ 0.1         H- 2.3%         H- 10%	1.): 21	/				4"	.653		8"	2.611	
Teled Parameters         Field Parameters         Tane       Different Volum         Tane       Total       Properties         Tane       Different Volum       Samber Volum         Tane       Different Volum       Samber Volum	0.103	7		Contraction of the second s	Aeter:						
Deprint South M.         Field Parameters         D.0.           Time         DTW (US)         Few Res         Volume         GC         Cond.         (MV         Sample')         Color/Dec           Subtration         c.0.3         DD0 500         +4.0.1         +4.3%         +4.10mV         +1.0%         Feedback           Subtration         c.0.3         DD0 500         +4.0.1         +4.3%         +4.10mV         +1.0%         Feedback		1-22		Horiba U-52							
Time         DTW (c)         Flow Rate         Volume         pH         Temp         Cond.         ORP         Biordeel         Turchsty         Satinty1         Colorder           Subtration         < 0.3         Puppe at         +6.0.1         +7.3 %         +1.0 mV         +1.10%	(ft.):			-		Field Paramet	ters				
subtration       -0.3       200-500       +1.0.1       +1.3.%       +1.0.1 +1.0.%       11.0%       11.0%         1259       15.77       0.50       0.5       11.0%       1.3.0       15.33       2.4.7       40.8       0.0       12.5%       12.5%       0.0       12.5%       0.0       12.5%       12.5%       0.0       12.5%       0.0       12.5%       0.0       12.5%       12.5%       0.0       12.5%       0.0       12.5%       0.0<	DTW (tic)		Volume			Cond.	ORP	[Surface]			Color/Odor
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	< 0.3'			+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		
1304       1455       500       141       14.74       14.42       125       144       0.00       273       3.6       42000         1314       14.60       450       2.0       6.74       16.40       1.24       150       6.60       764       0.00       4800         1319       1458       450       2.0       6.74       16.41       150       6.60       764       0.00       4800         1324       1457       50       3.3       6.73       16.91       1.24       150       6.60       766       4800         1324       1457       50       3.3       6.73       16.91       1.24       151       0.60       758       6.60       4800         1324       1457       50       3.3       6.73       16.91       1.24       151       0.60       758       6.60       4800	15.17	650	0.5	6.63	17.11	1.30	158	2.47	408	0.6	YELLON - B
1314       14.60       450       2.0       6.74       16.90       1.24       150       6.60       7.64       0.60       4.64	14.00	600	0,8	6.71	16.00	1.20	153	0.00	235	0.6	YEuce
1319       1453       450       C.G.C.G.T.T. 16.91       1.2.4       150       0.00       2.55       0.10       4.6.00         1324       1457       550       3.3       6.73       16.91       1.2.4       161       0.00       2.58       0.10       4.6.00         1329       1.2.4       161       0.00       2.58       0.10       4.6.00       4.6.00         1329       1.2.4       161       0.00       2.58       0.10       4.6.00         1329       1.2.4       1.61       0.00       2.58       0.10       4.6.00         1329       1.2.5       1.51       0.00       7.60       4.6.00       4.6.00         1329       1.460       5.60       5.6.014       1.7.50       1.7.3       1.51       0.00       4.6.00       4.6.00         1310       1.460       5.60       5.6.014       1.7.50       1.7.3       1.51       0.00       4.6.00	14.55	500	1.4	4.74	16.92	125	149	0.00	273	3.6	YELLOU
1324       Correct Suptration and the set of the	1460	450	20	6.74	110.90	1.24	150	6,00	Zien	0.0	YELLOU
1329       1457       500       3,3       673       1691       124       161       0.00       258       0.00       420.00         1329       100       100       100       151       0.00       258       0.00       420.00         1329       100       100       100       100       151       0.00       258       0.00       420.00         1329       100       1460       500       5       6.74       17.50       1.73       151       0.00       167       0.00       460.00         1400       1460       500       5       6.74       17.50       1.73       151       0.00       167       0.00       460.00         1400       1460       500       5       6.74       17.50       1.73       151       0.00       167       0.00       460.00         1500       1420       17.50       1.73       151       0.00       167       0.00       460.00       160.00       460.00       160.00       160.00       160.00       160.00       160.00       160.00       160.00       160.00       160.00       160.00       160.00       160.00       160.00       160.00       160.00       150.00<	1453	450	2.6	Le.74	16-91	124	150	0,00	255	0,0	YELLOU
1329       Control Schlipher         1329       Control Schlipher         1329       Control Box Setting (Hz):         1300       1460         1400       500         1300       1460         1400       500         1400       500         1400       1750				COLLE	T 517	MPil.					
1329       Contract Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image: Sch14/h 2         Image: Sch14/h 2       Image: Sch14/h 2       Image:	1457	500	3.3	673	16.91	1.24	151	0.00	258	0,0	YELLOS
Image: Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump         Sample Date/Time:         Sample Date/Time:         Sample Date/Time:         Sample Attace Collected:         Y / N				Cou	eer	S14141	12				
ge       Control Box Setting (Hz):       Sampling: (Sample at 100-250 ml/min)         Image: Control Box Setting (Hz):       Sampling:       Sampling: (Sample at 100-250 ml/min)         Image: Control Box Setting (Hz):       Image: Control Box Setting (Hz):       Sampling:         Image: Control Box Setting (Hz):       Sampling:       Sampling:         Image: Control Box Setting (Hz):       Sampling:       Sampling:         Image: Control Box Setting (Hz):       Sample Before Sampling:       Sample Name:         Sample Date/Time:       13:12.9       7/2.9/Tm/         Sample Date/Time:       13:12.9       7/2.9/Tm/         Filtered Metals Collected:       Y / N       Filter Size:											
Remarks:       Pump Intake Depth:       Control Box Setting (H2):       Sampling: (Sample at 100-250 ml/min)         FC 201301911       IO 0112 013591       IO 0112 013591         FOR 20170       IO 01112 013591       IO 0112 013591         FOR 20170       IO 01112 013591       IO 0112 013591         FOR 20170       IO 01112 013591       IO 0110110         Sample Norma       Sample Name:       OC Sample:         Sample Date/Time:       T/2.9/111       IO 0112 01200         Sample Date/Time:       T/2.9/111       IO 0112 01200         Filtered Metals Collected:       Y / N       Filter Size:	1450	500	5	670	1 17.50	1.23	151	0,00	207	0.0	YELLO
Free of Sorvey it     9612 E1309       Y DID NOT LOLLELT SHITTLE DUE TO TURBIDITY EISCHILOLULETEISCH       Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump       Sample Name:     OC Sample:       Sample Date/Time:     13:229       Filtered Metals Collected:     Y / N	Val. of a	e Depth:			Control Box S	and the second s			and a most of	Sample at 100-25	0 ml/min)
Image: Contract Setting     Image: Contract Setting       Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump       Sample Name: OC Sample:       Sample Date/Time:       13::29       7/29/14       Sample Date/Time:       Filtered Metals Collected:       Y / N		70	2			100	71+2	6125	-4		
SAMPLING         Depth to Water Before Sampling:         Sample Methodology: USEPA- Low Flow Sampling Procedures with submersible pump         Sample Name:       QC Sample:         Sample Date/Time:       13:224         Filtered Metals Collected:       Y / N	30	501	ugiz			76	2112 1	0 130	-1		
A DAD NOT LOLLELT SHMPPLA DUE TO TURBIDITY CIBERTICOLLET CIBER         SAMPLING         Depth to Water Before Sampling:         Sample Methodology: USEPA-Low Flow Sampling Procedures with submersible pump         Sample Name:         QC Sample:         Sample Date/Time:         TO TURBIDITY CIBERTIC CIBERTIC         Filtered Metals Collected:         Y / N	10 3	5-5-	no c	INIT		4 2	5142	013	DEY		
SAMPLING         Depth to Water Before Sampling:         Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump         Sample Name:       QC Sample:         Sample Date/Trime:       7/24/144         Sampler / Signature:       7/24/144         Filtered Metals Collected:       Y / N         Filter Size:       Filter Size:	X				Dur						6 137 4
Depth to Water Before Sampling:         Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump         Sample Name:       QC Sample:         Sample Date/Time:       7/24/144         Sampler / Signature:       Filtered Metals Collected:         Y / N       Filter Size:	2 MC7	620	ect.	SMMMM	DUE 7	ic file	DIDIT T	ens	52 9 . 10	statel	e ist
Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump         Sample Name:       QC Sample:         Sample Date/Time:       7/24/144         Sampler / Signature:       7/24/144         Filtered Metals Collected:       Y / N         Filter Size:       7/24/144						SAMPLIN	IG				_
Sample Name:     QC Sample:       Sample Date/Time:     7/24/14       Sampler / Signature:     7/24/14       Filtered Metals Collected:     Y / N			low Samolir	n Procedures v	vith submersible	pump					
Sample Date/Time: 13:224 7/29/129 Sampler / Signature: Filtered Metals Collected: Y / N Filter Size:		LFA-LOWF	ow oampin								
Sampler / Signature: Filtered Metals Collected: Y / N Filter Size:		3:20	(	7/29/1	1.1						
Filtered Metals Collected: Y / N Filter Size:									_		
	nature:										
		Y/N	Filter Size:	1							
Sampler / Sig Filtered Metal		L. (65 L.): S. 77 n.): 2 (14.77 (14.60 14.55 14.60 14.55 14.60 14.55 14.60 14.55 14.60 14.55 14.60 14.57 14.57 14.60 14.57 14.60 14.57 14.60 14.57 14.60 14.57 14.60 14.57 14.60 14.57 14.60 14.57 14.60 14.57 14.60 14.57 14.60 14.57 14.60 14.55 14.60 14.55 14.60 14.57 14.60 14.57 14.60 14.55 14.60 14.55 14.60 14.57 14.57 14.60 14.57 14.60 14.57 14.60 14.57 14.60 14.57 14.60 14.57 14.60 14.57 14.60 14.57 14.60 14.57 14.57 14.57 14.60 14.57 14.57 14.60 14.57 14.57 14.60 14.57 14.57 14.60 14.57 14.57 14.60 14.57	1.1:       SI 75         n.1:       SI 75         n.1:       Flow Rate         DTW (tic)       Flow Rate         DTW (tic)       Flow Rate         DTW (tic)       Purge at         200-500       15,17         15,17       0500         14,00       0,00         14,55       500         14,60       450         14,60       450         14,60       500         14,60       500         14,60       500         14,60       500         Pump Intake Depth:       100,000         -0,000,000       100,000         -0,000,000       100,000         -0,000,000       100,000         -0,000,000       100,000         -0,000,000       100,000         -0,000,000       100,000         -0,000,000       100,000         -0,000,000       100,000         -0,000,000       100,000         -0,000,000       100,000         -0,000,000       100,000         -0,000,000       100,000         -0,000,000       100,000         -0,000,000       100,000         -	a)       b)       b)       b)         a)       b)       b)       b)         b)       b)       b)       b)         b)       b)       b)       b)         b)       b)       b)       b)         b)       b)       b)       b)         c)       b)       b)       c)         c)       b)       b)       c)         c)       b)       b)       c)         c)       c)       c)       c)       c)         c)       c)       c)       c)       c)         c)       c)       c)       c)       c)         c)       c)       c)       c)       c)         c)       c)	USEPA - Low Flow Sampling Procedures v Sampling Proce with submersibil Water Quality M Water Quality M Water Quality M Water Quality M Horiba U-52 (ft.): Total Water Quality M Horiba U-52 (ft.): Total DTW (tic) Flow Rate Volume (gal) PH (Std. Units) Purge at 200-500 0.8 (0.71) 15.17 (050 0.5 (0.02) (4.00 (000 0.8 (0.71) 14.55 500 1.4 (0.74) 14.60 450 2.0 (0.74) 14.60 500 5 (0.02) 14.60 500 5 (0.02) Pump Intake Depth: Solo 1.4 (0.02) Pump Intake D	USEPA - Low Flow Sampling Procedures with submersible pump Water Quality Meter: Horiba U-52 (R.): Total DTW (tic) Flow Rate Volume (gal) PH Temp (G) DTW (tic) Flow Rate Volume (gal) PH (Std. Units) (C) < 0.3' 200-500 ++-0.1 15,177 050 0.5 (a. (2.3) 17,11) (g. 00 0.00 0.8 (a. 711 16. 0.0.6 14.00 0.00 0.00 0.8 (a. 711 16. 0.0.6 14.00 0.00 0.8 (a. 711 16. 0.0.6 14.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	USEPA - Low Flow       2°         3°       3°         ampling Procedures       3°         ampling Procedures       4°         With submersible pump       4°         Water Quality Meter:       Horiba U-52         (R):       Total       pH         Temp       Cond.         DTW (tic)       Flow Rate       Volume         (R):       Total       pH         Temp       Cond.       (mScm)         <0.3	USEPA-Low Flow       22°       .163         Sampling Procedures       3°       .367         Water Quality Meter:       Horba U-52         Maint Mater:       Maint Mater:         DTW (ile)       Total         DTW (ile)       Market Volume         Quarket Mater:       Purge at the Maint Mater:         Quarket Mater:       Ide Grad Grad Mater:         Maint Grad Grad Mater:       Ide Grad Grad Mater:         Market Mater:       Ide Grad Grad Mater:         Market Mater:       Ide Grad Mater:         <	USEPA - Low Flow         22°         .183           Sampling Procedures         3°         .367           with submersible pump         4°         .653           Al: I AT         Water Cuality Meter:         .653           Al: I AT         Yotal         PH         Temp           OTW (tio)         Flow Rate         Yolume         PH         Cond.           OTW (tio)         Flow Rate         Yolume         PH         Temp         Cond.           OTW (tio)         Flow Rate         Yolume         PH         Temp         Cond.         ORP         Sumpto           (n):         Total         PH         Temp         Cond.         ORP         Sumpto           (n):         Total         PH         Temp         Cond.         ORP         Sumpto           (n):         Total         PH         Temp         Cond.         ORP         Sumpto           (a):         Sumpto         Sumpto         Sumpto         Sumpto         Sumpto         Sumpto           (a):         Sumpto         Sumpto         Sumpto         Sumpto         Sumpto         Sumpto           (b):         Sumpto         Sumpto         Sumpto         Sumpto	21: 5: 5: 5: 5: 5: 5: 5: 5: 5: 5: 5: 5: 5:	21: STA         USERA - Low Flow         22*         .163.3         5*         1.020           0: 1: STA         Sampling Procedures         3*         387         6*         1.469           0: 1: StA         Writer Quality. Meter:         Horba U-52         6*         2.611           Writer Quality. Meter:         Horba U-52         6*         2.611           DTW (tc)         Flow Pate         DO.         (Writer)         Gene         2.611           DTW (tc)         Flow Pate         DO.         (Writer)         (Writer)         (Writer)         Salinity'           co.3         Purge at         -4.0.1         -4.3 %         +4.10 mV         +10%         +10%           c.3.         Purge at         -4.0.1         -4.3 %         +4.10 mV         +10%         -10%           c.4.0         0.30         0.8         (a.7.1.1         (J.3.0         1.5 %         2.47         9.6         00           c.4.5         0.6         1.4.6         1.7.4         1.50         1.6.2         0.00         0.6         0.6         0.00         0.6         0.00         0.6         0.00         0.6         0.00         0.6         0.00         0.00         0.00         0.00

Well Number:	EAP	-13-	OB			Site: Garfield	Groundwater	Contamina	tion Superfun	d Site		
Field Crew:	I SIA	ISBUR	5/12	T BIALI	B	Date: 7/2	4/14	Project #:	431007			
Vell Depth (ft.):	21.90	32	.10	Purge Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Foot		_
DTW (ft.):				USEPA - Low F	Flow	-2"	.163 )		5"	1.020		
Vater Column (i		8		Sampling Proce		3"	.367		6"	1.469		
Vell Diameter (i		2		with submersib		4 <sup>n</sup>	.653		8"	2.611		
Gal. per ft.: Well Volume (ga		20	6	Water Quality M Horiba U-52	<u>Meter:</u>							
Depth of Screer	(11.): 1		Tatal	_	-	Field Paramet	ers	D.O.				
Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	[Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/	Odor
Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%			
NOY	14.60	400	1.5	7.43	16,76	0.886	75	0.18	55.1	0.4	MILKY	wHI
1109	14.67	900	2,5	7.54	16.36	0.938	34	0,00	124	0.5	. Pa.	
1114	14,67	650	3,25	7.64	16,29	0,954	23	0,00	167	0.5	1	
1119	13:41	500	3.9	7.72	17.82	0,945	15	0,00	161	0.5	LLEAM	ZING
1124	(3,1)	450	4.4	7.72	148158	0,958	16	0,00	192	05	CLEIAR	5-37
1/2 a	13.11	450	4.9	7.7	18,86	0,957	17	0.00	194	0.5	14	1
1134	13:10	450	5.4	7.74	19.01	0.954	17	0,00	191	0.5		2
1139	1.10			SILILI	RE (	CLLECT	ED					
1121				0.117		George						
						-						
1155	1			7.74	13,99	10.954	19	0.00	212	0.5	CEENTE, SC	16/11/10
Remarks:	Pump Intak	e Depth:			Control Box		- 01	1.1.	Sampling: (	Sample at 100-25	0 ml/min)	
	1	27'					SH2@1					
							Hz@ 11					
FP	2	0,00	0.09	1c		10	Bitz 6	2 1114				
				LLI	YIT							
CIL	1	2.1	- 'J/	L								
Depth to Wat	or Before Cor	nolina: 1	3.10			SAMPLIN	G					
			21	ng Procedures v	with submersibl	e pump	_					
Sample Nam	1	:39	7/	Talili		QC Sample:						
Sample Date Sampler / Si		54	and	ready								
	Is Collected:	YIN	Filter Size:									
Sample Obs		Lain		uired prior to co		179 PEULOCU	11462					

Vell Number: Field Crew:	T. 8.4.	SRIK	510	Bitch	5	Date: 7/2	9/14	Project #:	431007		
Well Depth (ft.):	19.9	-		Purge Methodology:		Diameter	Gal. Per Foot	( )	Diameter	Gal. Per Foot	
DTW (ft.):	3 ~	-	- 1	USEPA - Low F	low c	2"	.163		5"	1.020	
Water Column (	R.): ()	0,91		Sampling Proce	dures	3"	.367		6"	1.469	
Vell Diameter (i		4		with submersible	e pump	4"	.653		8"	2.611	
Gal. per ft.:	01	123		Water Quality N	leter:						
Well Volume (g	al.):	3	19,97	Horiba U-52							
Depth of Screer	(ft.): 10	i C	1772			Field Paramet	ters				
Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	D.O. [Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		
1451	13.96	300	0.2	5,77	19,26	1:35	265	2.50	757	0.7	Year -
1450	1410	300	0.7	4.97	19.43	1,28	329	0,20	434	O.Le	12
1501	14.02	300	@1.1	4.80	19.89	1.30	343	Cill	331	O.Le	1.6
1506	14,07	300	1.6	4.78	20,29	1.31	343	0.00	569	0.7	YELCON
1511	14.19	300	21	4,68	19,86	1.33	355	0.00	241	0.7	15
1514	14,25	300	2.10	4.59	14,52	1.38	370	cicle	116	0.7	481000
1521	1428	300	3.2	9152	19.44	1.39	380	0.09	640	0.7	YELLO
1526	14.29	300	3.8	9,47	19.49	641	387	0.06	51.00	0.7	TELCO
1531	14.30	300	44	41415	19.40	0 1.42	390	Ciuz		0.7	TELLO
153Ce	14,29	300	5.0	4.43	19.45	1.43	394	0.00	Sle.5	0.7	42000
1541	14,31	300	510	4.40	19.41	1.44	399	0.00	3019	0.7	TELLO
1540	14,30	300	612	239	19.41	1.45	401	C.OC	29,2	09	YELLON
Remarks:	Pump Intak	e Depth:			Control Box S	Setting (Hz):			Sampling: (S	ample at 100-25	0 mi/min)
	1	7'-				SSHA	e C	1449		+-	
		Fe	7	0.01	19/L	9011	2 6	1450	>		
		Cre	2 - 2	0.701	rig/L	LITHT			F	2.10	VER
		-				SAMPLIN	IG		-1	ens	
Depth to Wa	er Before San	npling:				SAMPLIN					
Sample Meth	odology: USI	EPA - Low F	low Samplin	ng Procedures w	ith submersible	e pump	~	120			
Sample Nam				1		QC Sample:	1)=1	109	2014	-01	
Sample Date		0.000	7/2	9/14					C	XOD	
Sampler / Si		Egft:	Append	1							
	is Collected:	Y/N	Filter Size:								
lo unis Ohe	ervations:										

CONT. ON BACK

723 TINE 320 1551 31.2 1550	DTW Flaw Vol 14,30 300 0.7 14,30 300 7.2 14,30 300 7.7	438	19.36	1145	403	0.00	53,0	0. (
38.3 16000 88.3 05T-2 1622	14.30 2001 11 (OZCECT 14.00 300 Bis	Sitti	ΫÉ				16) 221	- )

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Well Number:	- Dif ~	29-	OB			Site: Garfield	Groundwater	Contamina	ation Superfund	Site		
Field Crew:	T 5 140	51301	Ech			Date: 7/	30/14	Project #:	431007			
Well Depth (ft.):	19.100	~		Purge Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Foot		
DTW (ft.):		2		USEPA - Low F	low	2"	.163		5"	1.020		
Water Column (i		78		Sampling Proce	edures	3"	.367		6"	1.469		
Well Diameter (i	7.	10		with submersibl	le pump	4"	.653		8"	2.611		
Gal. per ft.: Well Volume (ga Depth of Screer	+163 al.): 1+4	6200		Water Quality N Horiba U-52	Aeter:					r		
Deput of Coroor						Field Paramet	ers		r			
Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	D.O. [Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/	Odor
Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%			
1150	12.15	400	0.2	302	15,10	1.95	470	4.62	OVER	1.0	Yellow-C	REAM
1155	11.23	400	0.9	3,65	17:05	171	404	0.00	788	0.9	Le	
1200	11.22	450	1.7	3.58	17.77	1.69	472	0.00	637	0.9	10	- 1
1205	11.23	450	2.4	3.58	18.02	171	.473	5.00	677	0:9	1 X.	
1210	11:21	400	3.0	3.62	18.40	1.70	475	0.00	559	5:2		c
1215	(1.2L	400	3.7	3.102	17,49	171	470	0.51	434	0.9	107	7
1220	11.35	400	4.2	3.05	17.70	1.69	403	0.27	402	0.9	11	1
1225	11.32	400	4.9	325	17.21	1.69	409	0.00	354	3.8	-tx	I
1730	11.31	400	5,5	360	17.54	1.08	469	0.00	346	0-8	1.4	
1235	11,32	400	61	3.64	17.70	1.69	470	0.00	2 339	019	- ( )	
1240				COLL	ect	SUALAPC	5	-				_
e1304	11.28	2		3,53	17.13	1.74	480	0.00	436	019		
Remarks:	Pump Intak	e Depth:			Control Box S					ample at 100-250	0 ml/min)	
	17	5				120 19						
	110	2				10011	20	1152	-			
	Fe	>	0,07	LIMI		90 1	h të	115	7			
	CS	56-	- Ulli	O MICH	c1							
		14-20	11.32			SAMPLIN	G					
	er Before Sar	uping.	1.1.1.	na Proceduree w	with submersible	oumo						
Sample Meth Sample Nam	- 1	A-29	- OB	-073C		QC Sample:						_
Sample Date	/Time:	240		7/30/10	1							
Sampler / Sig				_								_
	als Collected:	Y/N	Filter Size:			_						
Sample Obs				Transie and the second								
Notes: 1 = st	for the strange on some of the											

Nell Number:	É 9:4 -		113			Site: Garfield				d Site		
Field Crew:	T. 514	LS:SUR	6n	Purge		Date: 7/3	0/14	Project #:	431007			_
Well Depth (ft.):	24.9	1		Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Foot		
DTW (ft.): 12	190			USEPA - Low F	Flow	2"	.163		5"	1.020		
Water Column (	ft.): 12 -	01		Sampling Proc		3"	.367		6"	1.469		
Well Diameter (i	n.): Z			with submersib		4"	.653		8"	2.611		-
Gal. per ft.: Well Volume (ga		5722		Water Quality I Horiba U-52	<u>Vleter:</u>							
Depth of Screer	n (n.).	- 0				Field Parame	ters	A				
Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	D.O. [Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/O	dor
Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%			
0923	14.54	900	0.4	5.15	15.93	140	247	10.3	OVER	0.7	YEllow	1.
6919	13,65	600	1.3	5,75	110,49	1.60	247	6.64	697	OB	YEller	
0933	13.107	400	2.0	5.78	16.84	1.63	250	6.08	524	0.3	YEuca	5
0938	13.40	400	2.7	5.80	16.86	164	250	5.54	467	0.8	48660	62
0943	13,82	400	3,4	5.8Le	16.41	1.67	248	4,73	5459	0,8	YEnon	1
0448	13,430	400	4.1	5.90	16.82	1.69	249	3.95	427	0.9	48000	~
0453	13:78	450	4.8	5.92	17.92	- 1.09	251	343	395	0:9	YEuro	w
0453	13.77	450	5,5	5.93	18.18	1.69	252	2.95	351	Org	YELLO	
1003	1335	400	6.1	5,94	18.17	1.70	252	2.70	338	0.9	e.1	C
1008	13,30	400	le le	5194	15,42	170	253	2:30	320	019	14	_
1013	13.30	400	7.1	5.94	18.56	1.70	254	2.06	697	619	- X - Y	_
e 1018	13.29	400	7.7	5.98	17.34	1.72	256	1254	1	0.9		1
Remarks:	Pump Intak				Control Box	Setting (Hz):		0 . 000		Sample at 100-25	0 ml/min)	
	3	0.5				9	142 6	096	0			
	Fe-	3 14				8	7112 6	090	50			
	te-	701	2		T	3				16 Bal	D, 1405724	00
-	Crie	-> 0	01/0	LIMI	1 .		48	ucin	Court	1 Jul	21 1 10310-1	- 40
-						SAMPLI	NG					
Depth to Wat	er Before Sar	mpling:	21	0								
Sample Meth	odology: US	EPA - Low F	low Sampli	ng Procedures v	with submersibl							-
Sample Nam		A-3	1-01	7/30/1	014	QC Sample:						
Sample Date Sampler / Sig		0-17		11 10/1	-1							
	als Collected:	Y/N	Filter Size:									
Sample Obs								-				_
				quired prior to co								

TINE DATE FLOW WEL PH TRINP (OND CH? DO TRANS SHE (OLOR 1023 13:41 400 8:3 5:48 17:20 1.73 250 1.04 281 0.9 48000 128 13:40 400 8:9 5:48 17:74 1:73 257 0.64 278 0.9 48000 1033 13:43 400 9:60 6:00 17:77 1:74 258 0.35 709 0.9 48000 1038 13:49 400 10:3 3:01 17:41 1:74 259 0:02 200 0.19 48000 1038 13:49 400 10:9 6:52 17:46 1:74 259 0:0 256 0.19 48000 1049 13:40 9:00 10:9 6:52 17:46 1:74 259 0:0 256 0:9 48000 1079 SATURE 1079 SATURE

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Well Number:	E -	16.5-	10.2	,		Site: Cal	ليو الا	•		
Field Crew:	Bal		1.7			Date: Pa	4/14	Project #:	43/00	7.06.06.02
Well Depth (ft.);	DTU	1	-	Purge Methodology:		Diameter	Gal, Per Fool	b	Diameter	Gal. Per Foot
DTW (ft.):	13.1	-		perist	itic	2"	.163		5"	1.020
Water Column (f				זרייסן		3"	.367		6"	1.469
Well Diameter (ir	n.):	5-18.	5			4"	.653		8"	2.611
Gal, per ft.	10	5-10		Water Quality	Meter:					
Well Volume (ga	l.):									
Depth of Screen	(fl.):									
r			Total	r	I	Field Paramete		D.O.	···	T
Time	DTW (tic)	Flow Rate (ml/min)	Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	[Surface] (mg/l)	Turbidity (NTU)	Color/Odor
Stabilization	< 0.3'	300 - 500	(84.)	+/- 0.1	(07	+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%	
1212	11/1	ALA	NA	5,18	25.64	1.49	343	4.05	ol	Reddrah brown
ia in	$M\pi$	10/24	n pr	1110	7.01					Interest Advin
							- C-	Pi		
		K								
/1		$\mathbf{h}$				1	<u> </u>			
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N					1		ł			
				2	$   \land$			/		
f					16					·····
	1									
	/									
-A							<b> </b>			
							[			
ļ l										
Remarks: F	Pump intake	Depth:			Control Box	Setting (Hz):			-	Λ
		1 1	<u></u>	1 -	-A.1.C	0~~	ca ti	had	cf1	low of
11	Hervo	c	cesr	10+ P	10200	4	Confin	A 1	5 11	
	1.001		16.	Gray I	Pad D	n t	San	K k		
	Worr	Cr ·		9.	1-10-	2	(	/		
						SAMPLING				
Depth to Water E	Before Samp	ling:								
Sample Methodo										
Sample Name: (				<u>8.5</u>		QC Sample:	nonl			
Sample Date/Tim	ne: 7/2º	1/13_!	220	·						
Sampler / Signat		$\swarrow$								
Filtered Metals C		T / N	iter Cize.							
Sample Observa			10				······			·····
Parameters:	Toc 1	gel for	<u>*</u>							
	•		~			)				
		F	P. I	ion =	,05	ng/ mg/L	$\langle$			*
		,	~	2		1	_			
		C	~切	- 7	, 70	mglL	~0r	e~	An.	0
		Ļ		()	• •				· ··(C	L'

Well Number:	R-12	-14				Site: Gar	field			G
Field Crew:	Balac	)				Date: 7/20	114	Project #:	731007	.06.04.22
Well Depth (ft.	» 14.1			Purge Methodology:		Diameter	Gal. Per Fool		Diameter	Gal. Per Foot
DTW (ft.):	スイン	Sec. N		Penzite	ite	2"	.163		5"	1.020
Water Column	(ft.): 17-	17		1 .		3"	.367		6"	1.469
Well Diameter	(in.): 10					4"	.653		8"	2.611
Gal, per ft.;				Water Quality I	Neter:					
Well Volume (		.14		NA	/					
Depth of Scree	en (n.): 🐧 🕰 🤊	-, [		. 11		Field Paramete		_		
	T	Flow Rate	Total Volume	На	Temp	Cond.	ORP	D.O. [Surface]	Turbidity	
Time	DTW (tic)	(ml/min)	(gal)	pri (Std. Units)	(C)	(mS/cm)	(mV)	(mg/l)	(NTU)	Color/Odor
Stabilization	< 0.3'	300 - 500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%	
		2								
							1			$\sim$
				<u> </u>			-+		-/	
		1//								
	$\mathbf{k}$	$\mathbb{K}$				$  \cap$	K			
	$\uparrow$	$\mathbb{K}$				$\sqrt{1}$				•
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				$\square$	$\square$	· •	$\sim$			
V		$ \Lambda^{+} $			ł					
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	1									· · · · · · · · · · · · · · · · · · ·
-	Dumo intolo	D			Rev.	]				
Remarks:	Pump intake	Deptn:	_		Control Box	Setting (Hz):			<i>.</i>	c A
l r	) nes e	of 1	2volu	te m	uch	walk	- 01	ny	enorg	h fer has <u>VI</u>
1 '	,, I	·-·	``			ſ		. <b>(</b> )	wel.	. 1
	San	le c	wfe	ently	s. P	inge 1	scm	re	wy	has
	Noll		-	1	(	· · ·	v	1.	1	
	4. Y.	enst	n (d	lonno	i ir d	rit'	n d	f hi	95 ( <i>1</i>	$(\mathcal{V})$
	·	-		-	/	SAMPLING		-	/	
Depth to Water	r Before Same	aling:				Grant Clive				
Sample Metho		istalt	7	Gw-1	3-12-12	1				
Sample Name:	-B-12	-14.	Gto-	12-10		QC Sample:	some			
Sample Date/T	'ime: 11	29/14-	-	<u> </u>						
Sampler / Sign			20							
Filtered Metals		Y / N Fil	ter Size:							·········
Sample Obser										
Parameters:	NO K	V Her H	(J							

Well Number:	- Œ -	13-15			Site: ( SG	frid	-		
Field Course Bar Inc					Date: 7/	XG	Project #:	43100	07.06.06.02
Well Depth (ft.): 5 - 1 DTW (ft.): 3.0		1	Purge Methodology:		Diameter	Gal. Per Foot	t	Diameter	Gal. Per Foot
DTW (ft.): 13.01	5-15	In	val,		2"	.163		5"	1.020
Water Column (ft.):			peritie	the	3"	.367		6"	1.469
Well Diameter (in.):	-		, ,	•	4"	.653		8"	2.611
Gal. per ft.:	$\langle$		Water Quality M	Aeter:					
			Hanha U						
Depth of Screen (ft.):	5-15		in na v	~72					
					Field Paramete	115			
	Flow Rate	Total Volume	рH	Temp	Cond.	ORP	D.O. [Surface]	Turbidity	
Time DTW (tid		(gal)	(Std. Units)	(C)	(mS/cm)	(mV)	(mg/i)	(NTU)	Color/Odor
Stabilization < 0.3'	300 - 500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%	
1525 NA	MA	NA	4,34	28.01	1.45	376		OR	Yellowith Res non
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	$  \rangle$								
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		l	L				L		
Remarks: Pump Inta	ke Depth:			Control Box	Setting (Hz):				
Peristal	to 0	m	_			1.			
Perigiai		ſ	F	e - 1	0.0 mg	j IL			
				-	- 7.7 01	1.)	. 11		
			(r	- U -	- /.7	10 mg	15		
					٤v	ier Ra	nae		
					•		17-		
		. 1			SAMPLING				
Depth to Water Before Sa	mpling:	UA							
	ensk lt								
Sample Name: 10 (	WTE	-13 -	-15		QC Sample:	none			
Sample Date/Time: 7/2	29/14	18 Y	0						
Sampler / Signature		È							
Filtered Metals Collected:	Y (N) F	ilter Size:							
Sample Observations:									
Parameters: CC	SA fas	و							



Weil Number: C-10, 5-12, 5     Site: Carfit 16       Field Crew: Balas     Date: B7/25/114       Weil Depth (R.): 12, 8     Purge Methodology:   Diameter Gal. Per Foot Diameter Gal. Per Foot	6.02
Well Depth (ft.): 2 8 Purge Well Depth (ft.): 2 8 Methodology: Diameter Gal. Per Foot Diameter Gal. Per Foot	
DTW (ft.): 10,9	1.020
Water Column (ft.): 3" .367 6"	1.469
Water Column (ft.):         ID: 5 - D: 5         3"         .367         6"           Well Diameter (in.):         ID: 5 - D: 5         4"         .653         8"	2.611
Gal. per ft.: Water Quality Meter:	
Well Volume (gal.):	
Depth of Screen (ft.):	
Field Parameters	
Flow Rate Volume pH Temp Cond. ORP [Surface] Turbidity	
Time         DTW (tic)         (m/min)         (gal)         (Std. Units)         (C)         (mS/cm)         (mV)         (mg/l)         (NTU)           Stabilization         < 0.3'	Color/Odor
	. 14.1
1650 NA NA NA 6.82 27,15 1.62 32-398 NA white	milky/noe
	<i>,</i> .
	,
	/
	/
	/
Remarks: Pump Intake Depth: Control Box Setting (Hz):	
To -7/7 unly	
re-2005 mg/2	
- T b to mell	
Fe-2.63 mg/L Cr II - J. 70 ng/L	
Over range	
	990 <u>-</u>
SAMPLING	
Depth to Water Before Sampling:	
Sample Methodology Proston 171C	· · · · · ·
Sample Name: GUV-C-10.5-12.5 QC Sample: NUNL Sample Date/Time: B129 L4 (J (555	
Sample Date/Ime	
Filtered Metals Collegetto: Y N Filter Size:	
Sample Obsegations:	
Parameters: DOC SULFE 4	

.

Well Number:	A-14	-16				Site: 6-C+	reld			1.000	
Field Crew:						Date: 7 30	14	Project #:	4310	50.00.00.00	
Well Depth (ft.)	15.8			Purge Methodology:		Diameter	Gal. Per Fool	t	Diameter	Gal. Per Foot	
	2.5			penste	the	2*	.163		5"	1.020	
Water Column				1		3"	.367		6"	1.469	
Well Diameter						4"	.653		8"	2.611	
Gal. per ft.:				Water Quality M	leter:						
Well Volume (g Depth of Scree		$\overline{\ }$	i	Honbal	1-52						
		Ì	M			Field Paramete	78				
		Flow Rate	Total Volume	pН	Temp	Cond.	ORP	D.O. [Surface]	Turbidity		
Time	DTW (tic)	(ml/min)	(gal)	(Std. Units)	(C)	(mS/cm)	(mV)	(mg/i)	(NTU)	Color/Odor	
Stabilization	< 0.3'	300 - 500	1	+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%	1-11	-
0740	MA	NA	NA	3.79	18.45	202	435	2.13	586	YR law	
							,				
8											
		·					120			•	
											-
	$\vdash$ /						1				
					$h^{\prime}$		r				X
					7	$\Lambda$					
					5	(Ar	<i>t</i>				-
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	1										
	/										
	/										-
/											_
Remarks:	Pump Intake	Depth:			Control Box	Setting (Hz):					
			Fe	- ,35 IJ-	mg	K					
			<u> </u>	TT	~ '	Ic) in	all				
			Cr	<u> </u>	/ •	A non -	·/· a.c.s				
5							ing				
						SAMPLING					
Depth to Water	~		1								-
Sample Method		inst.					<b>6</b>				-
Sample Name:	- / -	51-17	-16 073			QC Sample:	none				
Sample Date/Ti		13	<u> </u>	/							
Sampler / Signa		Y / N F	ter Size:								
Sample Observ			ILUI DIZU:								
Parameters:	UC,	SUI	fak								

Low-Flow Groundwater Sampling: Field Data Sheet

/ell Number:	<u>(A) 17</u>	5-	19.4	5		Site: Gar	67 4		471	1
ield Crew: /ell Depth (ft.):	19.5	•		Purge Methodology:	· · · · ·	Date: 73	Gal. Per Foo		7 5) 60 - Diameter	4.06-06-02 Gal. Per Foot
	(n.):	IA		penzi	ka   HK	2" 3" 4"	.163 .367 .653		5" 6" 8"	, 1.020 1.469 2.611
al. per ft.: /ell Volume (gi epth of Screer		5-19.9	5	Water Quality I						
			Total			Field Paramete	rs	D.O.		1
Time Stabilization	DTW (tic) < 0.3'	Flow Rate (ml/min) 300 - 500	Volume (gai)	pH (Std. Units) +/- 0.1	Temp (C)	Cond. (mS/cm) +/- 3 %	ORP (mV) +/- 10 mV	[Surface] (mg/l) +/- 10%	Turbidity (NTU) +/- 10%	Color/Odor
1015	NA	NA	N/A	5172	21.88	1.18	176	: 4/3	R	reddish yellow
		*.								
					1			1 1 1 1		
				1-	$\int C $		( )	***		
	/			$\neg \lor$			g			
$ \rightarrow $										
emarks:	Pump Intake	Depth:			Control Box 8	Setting (Hz):				
	C F	r I e In	I - m-	711	to me	s/L s/L	ne nge	van (	e	
opth to Water	Refere Com	line.	-			SAMPLING	0	L.	- 5-	
imple Method imple Name: imple Date/Til	C(C)	1201	142	19.5		QC Sample:	0-0=	120.	2014-	01 6 0 800
ampler / Signa Itered Meters	ature:	20	itter Size:	U au				E.,		7
ample Observa		fusa	19+	19.51						

Well Number:	D1	3-10	5			Site: Gar	he lo	Super	ford	
Field Crew:	Balas	,	Û.	7		Date: 7/3	0/14	Project #:	631	007.06.06.02
Weil Depth (ft.	13-	15		Purge Methodology:		Diameter	Gal. Per Foot	t	Diameter	Gal, Per Foot
DTW (ft.):				penzta	ltr	2"	.163		5"	1.020
Water Column		11	_	perista	(AC	3"	.367		6"	1.469
Well Diameter	(in.):	MA				4"	.653		8"	2.611
Gal. per ft.:	/	$\land l_i$		Water Quality M	Aeter:					
Well Volume (		-15	h	intro U	-92					
						Field Paramete	15			
		Flow Rate	Total Volume	рН	Temp	Cond.	ORP	D.O. [Surface]	Turbidity	
Time	DTW (tic)	(ml/min)	(gai)	(Std. Units)	(C)	(mS/cm)	(mV)	(mg/l)	(NTU)	Color/Odor
Stabilization	< 0.3'	300 - 500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%	
1120	NA	NA	NA	4.25	19,43	1,30	385		OR	reddish/brun
		/	-							
						~				<u> </u>
		$\frown$						ļ		//
								$\frown$		
							<u> </u>		Ν	
	<b>├</b> ── <del> </del>		$\rightarrow$				/		<u> </u>	
			1			$\Delta c /$				
						A				
			$\square$	$\cap$	(A)	$f \rightarrow \sim$				
	<b>↓</b> /		$\vdash$		7.0.4					
	1/			V	)					
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ļ'										
Remarks:	Pump Intake	Depth:			Control Box	Setting (Hz):	ano 2	water	er cli	ecro I un
			~			(	10172	w l		and of
	С	~V	I -	8.3	70 r	nsll	over	\$One	5-0	ecred y
	T	P	~	0	mal	L				
	(	<u> </u>		<b>~</b>	1					
<b>—</b>						SAMPLING				
Depth to Wate							· · · ·			
Sample Metho	~ ~ ~	instal	the							
Sample Name:	Gw-	-Q-1	3-15			QC Sample:	Jose			
Sample Date/T	ime: 7/30	2/14	11ãs	n 					2	
Sampler / Sign	ature:		é	· ·				_		
Filtered Metals	Collected	N FI	lter Size:							
Sample Obser										
Parameters:	FOC 1	516	an.							

Well Number:	DAT	6-18				Site: CC.A	hell !	Sipe	ronz	
Field Crew:	20.00					Date: 7/3	0/14	Project #:	4319	0706:0602
Well Depth (ft.)	17.9	5		Purge Methodology:		Diameter	Gal. Per Foot	ł	Diameter	Gal. Per Foot
				Penst	ally	2"	.163		5"	1.020
DTW (ft.): Water Column	(ft.):			Penji	Cpc	3"	.367		6"	1.469
Well Diameter						4"	.653		8"	2.611
Gal. per ft.:				Water Quality M	Neter:					
Well Volume (	gal.):	15		Horiza	U-57					
Depth of Scree	in (ft.):	-10		140.						
	r		Total			Field Paramete		D.O.		
Time	DTW (tic)	Flow Rate (ml/min)	Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	[Surface] (mg/l)	Turbidity (NTU)	Color/Odor
Stabilization	< 0,3'	300 - 500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%	
/318	MA	NA	MA	4.7g	22.30	1.56	345	<u>, 19</u>	or	Red Yella
						-57-5				
	1	$\overline{\ }$			· · · ·		7	6		
	1		v						$\left( \right)$	
		~		$\cap$		In K	·	~		
	$\square$			()						
					$\bigcap$					
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	1									
Remarks:	Pump Intake	Depth:			Control Box	Setting (Hz):	•			· · · · · · · · · · · · · · · · · · ·
	Ċ	ìr4Ă	-	3.70	) m	5/K C	ver v	ong	حد ا	
		FP		75.3	d or	15/L	OR	2 ₹		
						SAMPLING				
Depth to Wate			4				Ť.			<u></u>
Sample Metho	dology Ply	<u>zzfel'.</u>	he					.737-		King a
Sample Name	-	w-	ga) I	6-18		QC Sample:	non	~~** <sub>3</sub>		
Sample Date/T		712	1104	1520						
Sampler / Sign						ç				
Filtered Metals Sample Obser	2	<u>Y/N</u> Fi	lter Size:							
Parameters:	JO C	Isn	Cente				The second			
		/								

Well Number:	Gala	1-17				Site: (ic.	reld	Sper.	Inc	
Field Crew:	Balas			Burn		Date: 73		Project #:	43100	7.06.04.03
Well Depth (ft.	17			Purge Methodology:	11-	Diameter	Gal. Per Foot		Diameter	Gal. Per Foot
DTW (ft.):	5.4			Nethodology:	altic	2"	.163		5"	1.020
Water Column	(ft.):	A		here		3"	.367		6"	1.469
Well Diameter	(in.): 18	VT				4"	.653		8"	2.611
Gal. per ft.:	14	-		Water Quality N	Aeter:					
Well Volume (	gal.):	.~		Honto U	- 52					
Depth of Scree	en (ft.): 15-	1+								
		r	Total	Т	r	Field Paramete	rs	D.O.	r	
Time	DTW (tic)	Flow Rate (ml/min)	Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	[Surface] (mg/l)	Turbidity (NTU)	Color/Odor
Stabilization	< 0.3'	300 - 500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%	
1410	N/A	NA	NA	627	26.47	1.48	ЗY	187	cr	ne /none
							1			
		/			<u> </u>	ļ	6		L/	
			/		$\square \rho$					
		5		14	10		, L			1
						<u> </u>			/	
L	+					ļ			$\square$	
		1								
						<u> </u>				
Remarks:	Pump Intake	Depth:			Control Box	Setting (Hz):				
Dept	1 6	water	Fe (r rot	- / ( VI - \$tab	.2 M 	ng/L mg/	$\mathcal{L}$			
		to an				SAMPLING				· · · · ·
Depth to Wate Sample Metho			h'e							
Sample Metho		n-16	8-1	Fix) - is	-15-17	QC Sample:	hore			
Sample Date/	41	30/11	í 14	15	12.11	Le sample,				
Sampler / Sign			*	-						
Filtered Metals		YON F	Iter Size:							
Sample Obser	92.	1								-
Parameters:	TUC	ISUT	ta 7	4	1	§				(IICE)
	1	1								

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Well Number:	F-F	5-17				Site:				
Field Crew:	TISUAC	SBUR	67			Date: 7/3	0/14	Project #:		
Well Depth (ft.)	141	7'	·	Purge Methodology:		Diameter	Gal. Per Foo	t	Diameter	Gal. Per Foot
DTW (ft.): 1 4	5.21	<i>.</i> .		.0		2"	.163		5"	1.020
Water Column		. 11	Λ	per	1	3"	.367		6"	1.469
Well Diameter	(in.):	$\Lambda \Lambda^{\prime}$	14			4"	.653		8"	2.611
Gal. per ft.:		$\int $		Water Quality	Meter:					
Well Volume (g		,~		Horba	1-52					
Depth of Scree	n (ft.):	-(1		[[011]]		Field Parameter			-	
		Flow Rate	Total Volume	рН	Temp	Cond.	ORP	D.O. [Surface]	Turbidity	
Time	DTW (tic)	(ml/min)	(gal)	(Std. Units)	(C)	(mS/cm)	(mV)	(mg/l)	(NTU)	Color/Odor
Stabilization	< 0.3'	300 - 500		· +/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%	
1605	-	-	/	7.18	35,03	1.36	113	2,21		LT BROWIN
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					MC	lan	F		/	/
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		/								
Remarks:	Pump Intake	Depth:		<b></b>	Control Box	Setting (Hz):		••		•
		FP	-20	2.0						
		10	5	2.0 UN1	T					
	(	40	2-0		1					
_						SAMPLING				
Depth to Water	Before Samp	ling: Dra₂	24-							
Sample Method	iology:	PEP-15	INUT	17			10.00			
Sample Name:		600	- 19	130/10		QC Sample:	none.			
Sample Date/Ti		600	/	100/10	ļ		· · · · · · · · · · · · · · · · · · ·			
Sampler / Signa		× / N	in Circu	-						
Filtered Metals		<u>Y/N</u> Fi	ter Size:							
Sample Observ Parameters:	auons:	Th	-10	RENTS						
r aldilleters;			- 1 31							· · · · · · · · · · · · · · · · · · ·

Low-Flow Groundwater Sampling: Field Data Sheet

# SOP No-24b: Pilot Test Direct-Push Groundwater sampling

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Well Number:	2-24-	-26				Site: G.C.I	5-014			
Field Crew:	Bala	5 50	s b	<del>ට උද</del> Peirge		Date: 7/3		Project #:	43100	7.06.06.03
Well Depth (ft )	201			Perge Methodology:		l Diameter	Gal. Per Foot		Diameter	Gal. Per Foot
Well Depth (ft.): DTW (ft.): 乙	gig ,				1hr	2"	.163		5"	1.020
Water Column			0	ewiste	אורן	3"	.367		6*	1.469
Well Diameter (	in.):		ľ	eni).		4"	.653		8"	2.611
Gal. per ft.:				Water Quality I	Meter:					
141-01-14-1	ał.):	-								
Depth of Screet	n (ft.): 21	-26	14							
		·,	Total			Field Paramete	rs	D.O.	· · · · ·	· · · · · · · · · · · · · · · · · · ·
_		Flow Rate	Volume	pН	Temp	Cond.	ORP	[Surface]	Turbidity	
Time Stabilization	DTW (tic)	(ml/min) 300 - 500	(gal)	(Std. Units) +/- 0.1	(C)	(mS/cm) +/- 3 %	(mV) +/- 10 mV	(mg/l) +/- 10%	(NTU) +/- 10%	Color/Odor
1640	< 0.3'	300 - 300			7100					20 1
1090	1	. ^		7.19	21,98	2.08	-210	1,29	OVER	BRWIT
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Remarks:	Pump Intake	Depth:			Control Box \$	Setting (Hz):				
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		1510	->	2.35	Mall					
	0	21	100	יייי איג	$\pi \circ \overline{\mathcal{Q}}$	Lecifited	99. WI	TEM	PWE	ic i
	D	$\omega \rightarrow$	1012	UNT	124 P		ic w	141		
ļ			_			SAMPLING				
Depth to Water		ling:	Sill	)	·					
Sample Method			nc .	7			A .07	7 . 14		
Sample Name:		6-3	1-2	6		QC Sample:	v - 0 t	SOM	4-02 10 C	@ 0900
Sample Date/Ti		50/14		6:35					NO C	<u>cny</u>
Sampler / Signa		22					······			• ·
Filtered Metale		Y / 🗭 Fil	ter Size:							
Sample Observi Parameters:		CITC	10							······································
rarameters:		an late	V.X.							

## Low-Flow Groundwater Sampling: Field Data Sheet

Time         Total         Total         Organ         Organ <tho< th=""><th></th></tho<>	
Veil Depth (ft.):         Z / . 06         Methodology:         Diameter         Gal. Per Foot         Diameter         Gal. Per Foot           DTW (ft.):         / 9 , 85         Vater Column (ft.):         Vater Column (ft.):         Vater Column (ft.):         Vater Column (ft.):         Vater Quality Meter:         2"         163         5"         1.020           Vater Column (ft.):         Vater Quality Meter:         Vater Quality Meter:         Vater Quality Meter:         4"         653         8"         2.611           Vell Volume (gal.):         Vater Quality Meter:         Vater Quality Meter:         Field Parameters         0.0.         1.020           Time         DTW (tic)         Flow Rate         Volume (gal.):         0.0.         (mVmin)         Color/Odor           Time         DTW (tic)         Flow Rate         Volume (gal.)         Cond.         ORP         [Surface]         Turbidity         Color/Odor           Stabilization         < 0.3'	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
Vell Diameter (in.):         Value         Value         4"         653         8"         2.611           Sal. per ft.:         Water Quality Meter:         Water Quality Meter:         How Could Vision         8"         2.611           Vell Volume (gal.):         Image: Amount of Screen (ft.):         Image: Amoun	
Vell Diameter (in.):         Value         Value         4"         653         8"         2.611           Sal. per ft.:         Water Quality Meter:         Water Quality Meter:         How Could Vision         8"         2.611           Vell Volume (gal.):         Image: Amount of Screen (ft.):         Image: Amoun	
Water Quality Meter:         Water Quality Meter:         Well Volume (gal.):         Field Parameters         Total         Time       DTW (tic)       Flow Rate       O.O.         (Std. Units)       Cond.       ORP       Color/Odor         Stabilization       < 0.3'       300 - 500       +/- 0.1       +/- 3 %       +/- 10 mV       +/- 10%	
Vell Volume (gal.):           Field Parameters           Total         Field Parameters           Time         DTW (tic)         Flow Rate         Volume         pH         Temp         Cond.         ORP         Turbidity         Color/Odor           Time         DTW (tic)         (mi/min)         (Std. Units)         (C)         (mS/cm)         (mV)         (mg/l)         (NTU)         Color/Odor           Stabilization         < 0.3'	
Field Parameters           Field Parameters           Time         Flow Rate         Volume         pH         Temp         Cond.         ORP         [Surface]         Turbidity           Time         DTW (tic)         (ml/min)         (gal)         (Std. Units)         (C)         (mS/cm)         (mV)         (mg/l)         (NTU)         Color/Odor           Stabilization         < 0.3'	
Field Parameters           Field Parameters           Time         Flow Rate         Volume         pH         Temp         Cond.         ORP         [Surface]         Turbidity           Time         DTW (tic)         (ml/min)         (gal)         (Std. Units)         (C)         (mS/cm)         (mV)         (mg/l)         (NTU)         Color/Odor           Stabilization         < 0.3'	
Time         DTW (tic)         Total Volume         pH (std. Units)         Temp (C)         Cond. (mS/cm)         ORP (mV)         D.O. (mg/l)         Turbidity (NTU)           Stabilization         < 0.3'	
Time         DTW (tic)         (ml/min)         (gal)         (Std. Units)         (C)         (mS/cm)         (mV)         (mg/l)         (NTU)         Color/Odor           Stabilization         < 0.3'	
710 7.15 2598 0.749 192 2.95 BRavid	
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emarks: Pump Intake Depth. Control Box Setting (Hz):	1.000
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Fe -> 0.0 (Fle -> 0.70 CINIT	
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SAMPLING	
epth to Water Before Sampling:	
ample Methodology. PERISTO LHZ	-
ampler / Signature:	-
iltered Metals Concred: Y / N Filter Size	
ample Observations. Parameters: TPC / 5JI FGHC	_
arameters: DC / SJIFak	

Well Number:	F-2	1.5-	23,5			Site: Gar	6-10			
Field Crew:	Ba	195				Date: 7	3)	Project #:	4310	07.06.06.02
Well Depth (ft.)	73.	5		Purge Methodology:		Diameter	Gal. Per Foot	1	Diameter	Gal. Per Foot
DTW (ft.):	12.0			Pen		2"	.163		5"	1.020
Water Column	(ft.):			pari		3"	.367		6"	1.469
Weil Diameter	(in.):					4"	.653		8"	2.611
Gal. per ft.:				Water Quality N	Meter:					
Well Volume (g	al.):		27	- 1tm	hora					
Depth of Scree	n (ft.): C	-1.5	-631	5 1tm	114					•
			Total			Field Paramete	ns I	D.O.		
Time	DTW (tic)	Flow Rate (ml/min)	Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	[Surface] (mg/l)	Turbidity (NTU)	Color/Odor
Stabilization	< 0.3'	300 - 500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%	
0745				9,09	19,90	0 070	360	2.00	246	CLENTR/LT BRUG
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	$\checkmark$				I.					
Remarks:	Pump Intake	Depth:			Control Box	setting (Hz)	1			L
Ste	AL	Can a	7/z	x						
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			F	e - 1	51	mgll				
				- VI				(h)	D	
				<u>V</u>		< / ·	710			
		17		-		SAMPLING				
Depth to Water			,55							
Sample Method	ology:	20	21.5	-77-		00.0	0.0.47			
Sample Name; Sample Date/Ti	6-W-	52		157	114	QC Sample:	None	d		
Sampler / Signa		K		1317	+					
Filtered Metals		Y/N Fil	ter Size:							· · · · · · · · · · · · · · · · · · ·
Sample Observa										
Parameters:	TU(	151	fa k							······

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Low-Flow Groundwater Sampling: Field Data Sheet

# SOP No-24b: Pilot Test Direct-Push Groundwater sampling

$\lambda [15-23.5]$ Weil Number: $J = 22.6-23-6$ Site: $L_16-23-6$ Date: $7/31$ Project #: $Y_3/0^{10} J.C02.02$ Well Depth (ft.): $23.5$ DiameterGal. Per FootDiameterDTW (ft.): $I_3$ $I_1020$	
Field Crew:         Actacl & Cl & Cl & burg         Date:         7/31         Project #:         Y31007.ct	
Well Depth (ft.):     US_5     Methodology:     Diameter     Gal. Per Foot       DTW (ft.):     Image: State	_
DTW (A.): 13 1020	
Water Column (ft.): 3" .367 6" 1.469	
Well Diameter (in.): 4" 653 8" ' 2.611	
Gal. per ft.: Water Quality Meter:	1
Well Volume (gal.): Depth of Screen (ft.): 21.5-23.5 Hon 2052	
Field Parameters	-
Flow Rate         Volume         pH         Temp         Cond.         ORP         [Surface]         Turbidity           Time         DTW (tic)         (ml/min)         (gal)         (Std. Units)         (C)         (mS/cm)         (mV)         (mg/l)         (NTU)         Color/Odor	
Imme         DTW (uc)         (mmm)         (gain)         (dath mas)         (c)         (modify)         (mgy)         (cross)         Constant           Stabilization         < 0.3'	
0975 6.76 18.34 .957 -172 73 604 cloudy white	
	-
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	-
	_
Remarks: Pump Intake Depth: Control Box Setting (Hz):	
ATTERIAT TO REPRUSE STREET I' INSTEAD OF Z TO HITTERAPT TO	
CAPTURE THE PROPOSED (NTERMAC, LET SIT OVER NOMET TO REC	HARG
Curriche Inc III	
SAMPLING	1
Depth to Water Before Sampling:	
Sample Methodology:	
Sample Name: UW - IAD - ALIS-23.5 QC Sample: NONE	
Sample Date/Time: 73174 040 0500	1
Sampler / Signature:	_
Filtered Metals Collected: Y (N) Filter Size:	_
Sample Observations:	4
Parameters: TOC SUIFAR	
	1

Low-Flow Groundwater Sampling: Field Data Sheet

Well Number:	11-2	11-23	5			Site:	Freid	1				1
Field Crew:	130.10.	5 5	K sh	Nrg		Date: 7	31	Project #:	4/310	ut. Ob.ok	.22	]
Well Depth (ft.	): 23	, t ,		Pylfge Methodology:		Diameter	Gal. Per Foo	t	Diameter	Gal. Per Foot		
DTW (ft.):	18.0			0		2"	.163		5"	1.020	)	1
Water Column	(ft.):			per	1	3"	.367		6*	, 1.469	)	
Well Diameter	(in.):			v		4"	.653		8"	2.61		
Gal. per ft.:				Water Quality								
Well Volume (	gal.): en (ft.): <b>2 (</b> -	-23		Hanha	N -52							
Depth of Scree	en (ft.): 🔑 [	0/		VIP 11		I Field Paramete	3 <b>rs</b>					1
	T	Flow Rate	Total Volume	рН	Temp	Cond.	ORP	D.O. [Surface]	Turbidity			1
Time	DTW (tic)	(ml/min)	(gal)	(Std. Units)	(C)	(mS/cm)	(mV)	(mg/l)	(NTU)	Color/O	dor	
Stabilization	< 0.3'	300 - 500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%			12 \tt
1035	18.05	-	-	10.95	21,25	1.5°Ce	-22	3,30	OVER	UT ISRa	NTA	MAN PARTY
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		$\uparrow$				<u> </u>		<i>{</i>				
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<u> </u> '						<u> </u>						1
Remarks:	Pump Intake	Depth:		L	Control Box	Setting (Hz):		1	10.000			
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				·) - ·								
		C	. <b>r</b> (	11 =	.17	loc/L						
						)						
						SAMPLING				and the Constant		1
Depth to Wate	r Before Sam	oling:			(ersads)							1
Sample Metho		en	37.0	7		- 440 - 60 - 44	1000					4
Sample Name	1 0		21/2	7		QC Sample:	Vien					1
Sample Date/T Sampler / Sign			7	21/14								1
Filtered Metals		TTN F	ilter Size:						291 h		mere la lad	
Sample Obser												14 - (S.S. 14)
Parameters:	TOL	150	fate									]

Revision No.: 1 Date: September July 2013

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Well Number:	H-2	6-2	8		-	Site: CTL	ARFIEL	0	5	
Field Crew:	Tisite	SAM	1/50	BALLA	5	Date: 7	31/14	Project #:	431	007.06.06.02
Nell Depth (ft.)	22		-	Purge Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Foot
DTW (ft.): Nater Column	4.8	0		PERIST	ACTIC	2" 3"	163 367	1	5" 6"	1.020 1.469
Vell Diameter	(in.):					4"	.653		8"	2,611
Sal. per ft.:				Water Quality I						
Vell Volume (g Depth of Scree	al.): n (ft.): 'Z	Ce-2	8	ita	434					
			Total			Field Paramete	1	D.O.		
Time Stabilization	DTW (tic) < 0.3'	Flow Rate (ml/min) 300 - 500	Volume (gal)	pH (Std. Units) +/- 0.1	Temp (C)	Cond. (mS/cm) +/- 3 %	ORP (mV) +/- 10 mV	[Surface] (mg/l) +/- 10%	Turbidity (NTU) +/- 10%	Color/Odor
1210	< 0.3	-		7.93	270	1.04	-9	.63	or	reloch from
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						1.0	1	-7		<u> </u> ]
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	$\sim$									
emarks:	Pump Intake	Depth:			Control Box	Setting (Hz):				
0	2,13	~F	e n	y/L						
	CrV	- 7	.7	ons/0	1 0	R				
				3 <b>1 2 3 1 2</b> 1		SAMPLING				
lepth to Water	Before Samp	ling:								
ample Method		11-2		a			1000			ana da
Sample Name: Sample Date/Ti		<u> +-2</u> 21/14	114	3		QC Sample:	nou			
ampler / Signa		2º								•
iltered Metals		Y/N Fi	ter Size:							
ample Observ										
arameters:	The	ISN1	ill							

Revision No.: 1 Date: September July 2013 2

Well Number:	1-10	5-17				Site: (rer	fred				
Field Crew:	Bala	5 9	5191	10:-5		Date:		Project #:	451	007.06.00.02	
Well Depth (ft.)	17	,,,,		Purge Methodology:		Diameter	Gal. Per Foot	t	Diameter	Gai. Per Foot	
DTW (ft.):						2"	.163		5"	1,020	
Water Column						3"	.367		6"	1.469	
Well Diameter (						4*	.653		8"	* 2.611	
Gal. per ft.:				Water Quality I	Meter:						
Well Volume (g	al.): 🔒 🧹	1-1-									
Depth of Scree	n (ft.):   🤈	-17									_
			Total			Field Paramete	rs	D.O. 1			_
		Flow Rate	Volume	рН	Temp	Cond.	ORP	-[Surface]	Turbidity		
Time	DTW (tic)	(ml/min) 300 - 500	(gal)	(Std. Units)	(C)	(mS/cm) +/- 3 %	(mV) +/- 10 mV	(mg/l) +/- 10%	(NTU) +/- 10%	Color/Odor	
Stabilization	< 0.3'	300 - 300		+/- 0.1	in the second	1-578	47- 10 miv		-	ald - 2 (	
1205				8,02	2775	<u> 2077</u>	105	:72	OR	receish brow	4
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Remarks:	Pump Intake					Setting (Hz):				•	
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						•					
						SAMPLING					
Depth to Water	Before Samp	ling:									
Sample Method	dology: 🖊	4ñ_		,			• .				
Sample Name:	Gui-	7-1	5-17	<u>t</u>		QC Sample:	none				_
Sample Date/T	ime: 7/3	1115	1200	, 							
Sampler / Sign			2							مىنىپور - يور بار بار بار بار بار بار بار بار بار با	
Filtered Metals	Collected.	Y/N F	ilter Size:								-
Sample Observ	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-	<u>, ,</u>								-
Parameters:	ACC		4	<u> </u>							

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# Low-Flow Groundwater Sampling: Field Data Sheet

20-22

Revision No.: 1 Date: September July 2013

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Well Number:	5-2	0-22	2			Site: Gu	trene			
Field Crew: 🕇	T SAL	SBUTE	10	Butter	3	Date: 7/ 3	1/17_	Project #:	<u>43/03</u>	1.04.06.07
Well Depth (ft.)	:22	-		Purge Methodology:		Diameter	Gal. Per Foot	t	Diameter	Gal. Per Foot
DTW (ft.):				penil	-lb>	2"	,163	-	5"	1.020
Vater Column	(A).			ירחשי	SUC	3"	.367		6"	1.469
Vell Diameter	(in.): /	VIA				4"	.653		8"	2.611
Sal. per ft.:	<u> </u>	V (('		Water Quality	Meter:					
Vell Volume (g	aal.):			Water Quality I	67					
epth of Scree		20	ゥーて	2 1-1	52					
						Field Paramete	ins .			
		Flow Rate	Total Volume	рН	Temp	Cond.	ORP	D.O. [Surface]	Turbidity	
Time	DTW (tic)	(ml/min)	(gal)	(Std. Units)	(C)	(mS/cm)	(mV)	(mg/l)	(NTU)	Color/Odor
Stabilization	< 0.3'	300 - 500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%	
1235	17.90		-	7.08	24,72	1.25	-300	0.00	OVER	- LF BROW IY
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emarks:	Pump Intake	Depth:			Control Box	Setting (Hz):		L		
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ample Name:		75	-dl	131/10	1	QC Sample:	UTU			
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iltered Metals	800	Y CV Fi	iter Size:					-		
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Revision No.: 1 Date: September July 2013

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$\frac{5iAUSIN}{2}$ 2 2 3 - 162	3.3 (e 7 Total Volume (gal) 0.1 Z 1.1	Purge Methodology: USEPA - Low I Sampling Proc with submersib Water Quality I Horiba U-52 pH (Std. Units) +/- 0.1 7, 1 4 7, 3 3	Flow cedures ble pump	Diameter 2" 3" 4" Field Paramet Cond. (mS/cm) +/- 3 %	Gal_Per Foo 163 .653 ters ORP (mV) +/- 10 mV	Project #: t D.O. [Surface] (mg/l) +/- 10%	431007 Diameter 5" 6" 8" Turbidity (NTU)	Gal. Per Foo 1.020 1.469 2.611 Salinity <sup>1</sup> (PPT)	9
2 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 -	Total Volume (gal) 012	Methodology: USEPA - Low I Sampling Proc with submersib Water Quality I Horiba U-52 pH (Std. Units) +/- 0.1 7,1 4	Flow cedures ble pump Meter: Temp (C)	2" 3" 4" Field Paramet Cond. (mS/cm) +/- 3 %	.163 .367 .653 ters ORP (mV)	D.O. [Surface] (mg/l)	5" 6" 8" Turbidity (NTU)	1.020 1.469 2.611 Salinity <sup>1</sup>	D 9 1
2 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 -	Total Volume (gal) 012	USEPA - Low I Sampling Proc with submersib <u>Water Quality I</u> Horiba U-52 pH (Std. Units) +/- 0.1 7,1 Y	Flow cedures ble pump Meter: Temp (C)	3" 4" Field Paramet Cond. (mS/cm) +/- 3 %	.163 .367 .653 ters ORP (mV)	D.O. [Surface] (mg/l)	5" 6" 8" Turbidity (NTU)	1.020 1.469 2.611 Salinity <sup>1</sup>	D 9 1
$\begin{array}{c} 11 \\ 11 \\ 12 \\ 12 \\ 13 \\ 12 \\ 13 \\ 12 \\ 13 \\ 12 \\ 13 \\ 12 \\ 13 \\ 12 \\ 13 \\ 12 \\ 13 \\ 12 \\ 13 \\ 12 \\ 13 \\ 13 \\ 13 \\ 13 \\ 13 \\ 13 \\ 13 \\ 13$	Total Volume (gal) 012	with submersib Water Quality I Horiba U-52 pH (Std. Units) +/- 0.1 7,1 4	Die pump Meter: Temp (C)	4" Field Paramet Cond. (mS/cm) +/- 3 %	.653 ters ORP (mV)	[Surface] (mg/l)	8" Turbidity (NTU)	2.61 <sup>1</sup> Salinity <sup>1</sup>	1
$\begin{array}{c} .1 \ (\ 2 \ 3 \ 2 \ - \$	Total Volume (gal) 0/2	Water Quality I Horiba U-52 PH (Std. Units) +/- 0.1 7,1 4	Temp (C)	Field Paramer Cond. (mS/cm) +/- 3 %	ters ORP (mV)	[Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup>	
$\begin{array}{c}     2 & 9 \\     \hline     2 & 2 \\     \hline     \hline     2 & 2 \\     \hline      \hline     \hline     \hline     \hline     \hline     \hline      \hline       $	Total Volume (gal) 0/2	Horiba U-52 pH (Std. Units) +/- 0.1 7,1 4	Temp (C)	Cond. (mS/cm) +/- 3 %	ORP (mV)	[Surface] (mg/l)	(NTU)		Color/Odor
$\begin{array}{c} 22 - 3 \\ \hline \\ (iic) \\ 3' \\ 200-500 \\ \hline \\ 3' \\ 3' \\ 200-500 \\ \hline \\ 3' \\ 3' \\ 3' \\ 3' \\ 3' \\ 3' \\ 3' $	Total Volume (gal) 0/2	pH (Std. Units) +/- 0.1 7,1 4	(C)	Cond. (mS/cm) +/- 3 %	ORP (mV)	[Surface] (mg/l)	(NTU)		Color/Odor
$\begin{array}{c} (iic) \\ (iiic) \\ 3' \\ 200-500 \\ \hline 3 \\ 200-500 \\ \hline 3 \\ 600 \\ \hline 5 \\ 600 \\$	Total Volume (gal) 0/2	(Std. Units) +/- 0.1 7,1 Y	(C)	Cond. (mS/cm) +/- 3 %	ORP (mV)	[Surface] (mg/l)	(NTU)		Color/Odor
(tic) (ml/min) 3' Purge at 200-500 3 (200-500 0 1 500 0 2 180	Volume (gal) 0/2 1/	(Std. Units) +/- 0.1 7,1 Y	(C)	Cond. (mS/cm) +/- 3 %	ORP (mV)	[Surface] (mg/l)	(NTU)		Color/Odor
3' 200-500 3 600 0 1 500 0 2 1 80	0,2	7,14	17,88		+/- 10 mV	+/- 10%			
01500	1.1	7,14	17,88	0 0 0		1	+/- 10%		
2480	1.1	7.33	1	0,870	-75	0.00	69.2	0,4	CLENR, LITTLE 1412
110-	21	1	17.00	0.905	-79	0.00	50.3	0.4	K 47
1 480	01	7,39	17,58	0,938	-86	0.00	24.8	0.5	11 11
·	3.0	7.40	17,47	0.958	-89	0.00	38-29	205	14 11
1 480	40	7,40	17.40	0,961	-89		32.6	015	LEARING
1 480	4.8	7.40	17.41			0.00	8-348	0.5	11 11
	-	7.58	17.46	0,999			35.5	0.5	CLEATE
				0.997				0.5	CLEAR_
0440	1.2	1.57			-94	0.00	40.5	0.5	CLEAR
7		Court	CT S	ANRE		2.0			
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			32 			34 C	- a		
ntake Depth:			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-			Sampling: (Sa	mple at 100-250	) ml/min)
771				89.31	177			Squ	
	6 486 0 480 0 480 >	0 480 5.6 0 480 6.4 0 480 7.2 ≥	0 480 5.6 7.58 0 480 6.4 7.57 0 480 7.2 7.57 ≥ Cours	0       186       5.6       7.58       17.46         0       180       6.4       7.57       17.47         0       180       7.2       7.57       17.47         0       180       7.2       7.57       17.47         0       180       7.2       7.57       17.47         0       180       7.2       7.57       17.47         0       180       7.2       7.57       17.47         0       180       7.2       7.57       17.47         0       180       1.2       5.6       1.5         10       190       1.2       1.5       1.5         11       1.2       1.5       1.5       1.5         12       1.5       1.5       1.5       1.5         13       1.5       1.5       1.5       1.5         14       1.5       1.5       1.5       1.5         14       1.5       1.5       1.5       1.5         14       1.5       1.5       1.5       1.5         15       1.5       1.5       1.5       1.5         15       1.5       1.5       1.5       1.5<	0       186       5.6       7.58       17.46       0.999         0       180       6.4       7.57       17.47       0.997         0       180       7.2       7.57       17.47       0.997         0       180       7.2       7.57       17.44       1.00         0       0       0       0.999       1.00         0       0       0       0.997       1.00         0       0       0       0.997       1.00         0       0       0       0.997       1.00         0       0       0       0       0.997         0       0       0       0.997       1.00         0       0       0       0       0.997         0       0       0       0       0.997         0       0       0       0       0         0       0       0       0       0         0       0       0       0       0         0       0       0       0       0         0       0       0       0       0         0       0       0       0       0 <td>0 480 5.6 7.58 17.46 0.999 - 99 0 480 6.4 7.57 17.47 0.997 -97 0 480 7.2 7.57 17.47 1.00 -94 &gt; COLLECT SALARE</td> <td>0       1980       5.6       7.58       17.46       0.999       - 99       0.00         0       180       6.4       7.57       17.47       0.997       - 97       0.00         0       180       7.2       7.57       17.47       1.00       - 94       0.00         0       180       7.2       7.57       17.44       1.00       - 94       0.00         2       0       0       0       - 94       0.00         2       0       0       - 94       0.00         3       0       0       - 94       0.00         4       0       0       - 94       0.00         3       0       0       - 94       0.00         4       0       0       - 94       0.00         3       0       0       - 94       0.00         4       0       0       0       - 94       0.00         4       0       0       0       0       - 94       0.00         4       0       0       0       0       0       0       - 94         4       0       0       0       0       0</td> <td>0       1980       5.6       7.58       17.46       0.999       - 99       0.00       35.5         0       180       6.4       7.57       17.47       0.997       - 97       0.00       38.4         0       1980       7.2       7.57       17.47       1.00       - 94       0.00       10.5         2       0       0       0       17.44       1.00       - 94       0.00       40.5         2       0       0       0       - 94       0.00       40.5       -         2       0       0       0       - 94       0.00       40.5       -         3       0       0       0       0       - 94       0.00       40.5         4       0       0       0       - 94       0.00       40.5         3       0       0       0       0       - 94       0.00       40.5         4       0       0       0       0       - 94       0.00       40.5         4       0       0       0       0       0       0       0         4       0       0       0       0       0       0       &lt;</td> <td>•           Y88           S.6           7.58           I7.46           0.999           -         99           S.5           0.5             0         480         [6.4         7.57         17.47         0.997         -         97         0.00         38.4         0.5         0.5           0.5</td>	0 480 5.6 7.58 17.46 0.999 - 99 0 480 6.4 7.57 17.47 0.997 -97 0 480 7.2 7.57 17.47 1.00 -94 > COLLECT SALARE	0       1980       5.6       7.58       17.46       0.999       - 99       0.00         0       180       6.4       7.57       17.47       0.997       - 97       0.00         0       180       7.2       7.57       17.47       1.00       - 94       0.00         0       180       7.2       7.57       17.44       1.00       - 94       0.00         2       0       0       0       - 94       0.00         2       0       0       - 94       0.00         3       0       0       - 94       0.00         4       0       0       - 94       0.00         3       0       0       - 94       0.00         4       0       0       - 94       0.00         3       0       0       - 94       0.00         4       0       0       0       - 94       0.00         4       0       0       0       0       - 94       0.00         4       0       0       0       0       0       0       - 94         4       0       0       0       0       0	0       1980       5.6       7.58       17.46       0.999       - 99       0.00       35.5         0       180       6.4       7.57       17.47       0.997       - 97       0.00       38.4         0       1980       7.2       7.57       17.47       1.00       - 94       0.00       10.5         2       0       0       0       17.44       1.00       - 94       0.00       40.5         2       0       0       0       - 94       0.00       40.5       -         2       0       0       0       - 94       0.00       40.5       -         3       0       0       0       0       - 94       0.00       40.5         4       0       0       0       - 94       0.00       40.5         3       0       0       0       0       - 94       0.00       40.5         4       0       0       0       0       - 94       0.00       40.5         4       0       0       0       0       0       0       0         4       0       0       0       0       0       0       <	•           Y88           S.6           7.58           I7.46           0.999           -         99           S.5           0.5             0         480         [6.4         7.57         17.47         0.997         -         97         0.00         38.4         0.5         0.5           0.5

Field Crew:       T.       SIACS SURGS       Date: $f/1/1/1/2$ Project #:       431007         Well Dopit (N::       Z       Methodkoz:       USEPA - Low Flow       Z       .183       S'       1.020         DTW (N::       N::       J. D'S       Semigling Procedures       3'       .367       6'       1.600         Well Doamnete (n):       Z'       .183       S'       1.020         Well Doamnete (n):       Z'       .183       S'       1.020         Well Doamnete (n):       Z'       .163       S'       1.020         Well Doamnete (n):       Z'       .163       S'       1.020         Well Doamnete (n):       Z'       .163       S'       1.020         Well Obarnet (a):       I:       S       Well Doamneter       3'       .60         Date:       Flow Parameters       Do       Salinky'       Color/Oder       Salinky'       Color/Oder         Salinitizedon       -0.3       20000       -3'.10       17.93       1.90       S23       1.00       Vel C       0.9       Clercht/17       1'         Salinitizedon       -0.3       20000       -3'.10       1.98       S25'.0       0.07       Q	Well Number:		9-0B						r Contamin	ation Superfu	nd Site	
Weil Depth (1): 11.77       Methodologic:       Diameter       Gal. Per Foot       Diameter       Gal. Per Foot         DTW (1): 11.77       USEPA - Low Flow       3"       367       6"       1.020         Weil Diameter (n.): Z <sup>-1</sup> USEPA - Low Flow       3"       367       6"       1.469         Weil Diameter (n.): Z <sup>-1</sup> With submensible pump       4"       .653       8"       2.611         Gal. per F.:       / 10.3       Weil Volume (gal.): 1.5       7.70       Yoluatin Meter:       8"       2.611         Time       DTW (tic)       Flow Rate       Cold.       0.8       0.7       1.469         Time       DTW (tic)       Flow Rate       Cold.       0.8       0.7       1.0       1.0         Stabilization       <0.3"       20-500       +/-0.1       +/-3 %       +/-10 mV       +/-10%       -/-10%         Stabilization       <0.3"       20-500       +/-0.1       +/-3 %       +/-10 mV       +/-10%       -/-10%       -/-10%         Stabilization       <0.3"       20-500       +/-0.1       1.7.9       1.90       52.3       1.00       0.40 FC       1.0       1.1         Stabilization       <0.3"       3.10       17.92       <	Field Crew:	T. SH	KSBL	NG	=		Date: 9/4	114	Project #:	431007	<u> </u>	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Well Depth (ft.)	20				10 A	Diameter	Gal. Per Foo	t	Diameter	Gal. Per Foot	
Weit Column (ft.): 2, 3, 3, 3       Sampling Procedures with submersible pump       3°       367       6°       1.469         Weit Diameter (n.): 2, 4°       With submersible pump       .653       8°       2.811         Sal, per 1:: $0, 10, 3$ Water County (the call): 1, 3.47       Horba U.S2       8°       2.811         Depth of Screen (ft.): 1, 5       Total       pH       Temp       Cond.       ORP       100, 100, 100, 100, 100, 100, 100, 100,	DTW (ft.): }]	77			USEPA - Low	Flow	2"	.163		5"	1.020	
Well Diameter (in.): $\mathbb{Z}^{34}$ with submersible pump       4"       .653       8"       2.611         Gal. per ft:       , 1 (D 3)       Water Quality Meter:       Horiba U-S2       Perfect of Screen (ft):       1, 5 - 7, 6'       Saling ft       Perfect of Screen (ft):       1, 5 - 7, 6'       Perfect of Screen (ft):       1, 5 - 7, 6'       Perfect of Screen (ft):       1, 5 - 7, 6'       Perfect of Screen (ft):       1, 5 - 7, 6'       Perfect of Screen (ft):       1, 5 - 7, 6'       Perfect of Screen (ft):       1, 5 - 7, 6'       Perfect of Screen (ft):       1, 5 - 7, 6'       Perfect of Screen (ft):       1, 5 - 7, 6'       Perfect of Screen (ft):       1, 5 - 7, 6'       Perfect of Screen (ft):       1, 5 - 7, 6'       Perfect of Screen (ft):       Salinity'       Color/Odor         Time       DTW (fte)       Flow Rate       Volume       pH       Temp       Cond.       ORP       (Subilization       (NTU)       Salinity'       Color/Odor         Stabilization       <0.3'		(ft.): 8	33		Sampling Proc	edures	3"	.367		6"	1.469	
Well Volume (gal.): $1.5^{-7.0^{\circ}}$ Field Parameters         D.0.         Time DTW (tic) Flow Rate Volume (gal.): $1.5^{-7.0^{\circ}}$ Time DTW (tic) Flow Rate Volume (gal.): $1.5^{-7.0^{\circ}}$ Time DTW (tic) Flow Rate Volume (gal.): $1.5^{-7.0^{\circ}}$ DTW (tic) Flow Rate Volume (gal.): $1.5^{-7.0^{\circ}}$ Purge at 200-500         +/-0.1         +/-0.1         +/-0.0         D.0.         ORC (m/min) (gal.)         ORC (m/min) (gal.)         Stabilization <0.3"         -0.1         +/-0.1         +/-0.1         +/-0.1         -0.0         OX (true 1.00         OX (true 1.00         OX (true 1.00         -0.1         -0.1         -0.2         OX (true 1.00         -0.1         -0.2         -0.2         -0.2         -0.2         -0.2		in.): Z <sup>u</sup>			with submersit	ble pump	4"	.653		8"	2.611	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $						Meter:						
Field Parameters           Time         DTW (tic)         Flow Rate         Volume (gal)         pH (std. Units)         Temp (C)         Cond. (mS/cm)         ORP (my)         Turbidity (mg/n)         Salinity' (NTU)         Color/Odor           stabilization         < 0.3					Horiba U-52							
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Depart of Scree	<u>n (m.): 15</u>					Field Param	otore		- 2015 - V		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		·····	Elow Date			Tomo				Tuichidity	Salinity <sup>1</sup>	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Time	DTW (tic)										Color/Odor
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Stabilization	< 0.3'			+6.0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		1
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2017			/		17.93					0.9	IRGANY YY
6827 12,90 440 2.5 3,23 17,70 1,899 5230,72 OVER 1.0 " 0837 12,81 440 3,9 3,19 17,96 1.88 525 0,68 OVER 0.9 (VEAR 4EU 0837 12,78 440 4.2 3,21 18,19 1.88 523 0,65 200 1.0 4EU 00 0842 2,78 440 4.8 3,25 18,27 1.90 521 0,64 35 1.0 4EU 00 0847 2,75 440 5,5 3,18 17,87 1.92 527 0,59 423 1.0 4EU 00 0852 12,78 425 6,2 3,21 18,31 1.81 520 0,57 67303 0,9 4EU 00 0857 12,73 425 6,9 3,22 18,75 1.82 520 0,55 173 0,9 4EU 00 0857 12,73 425 6,9 3,22 18,75 1.82 520 0,55 173 0,9 4EU 00 0902 12,68 425 7.6 3,26 18,94 1.81 517 0,54 125 0,9 4EU 00 0907 12,67 425 8,3 3,28 19,24 1.81 517 0,54 125 0,9 4EU 00 0912 12,80 425 9.0 3,21 18,80 1.90 527 0,52 91,2 1.0 11 0912 12,90 425 9.0 3,21 18,80 1.90 527 0,52 91,2 1.0 11 Remarks: Pump Intake Dept: Control Box Setting (Hz): Sampling: (Sample at 100-250 ml/min)	UNIT	101				1117				1945 - C		
0832 12,81 440 3,9 3,19 17,96 1.88 525 0,68 OVER 0.9 (VEAR 460 0837 12,78 440 4.2 3,21 18,19 1.88 523 0,65 2000 1.00 460 00 0847 2,78 440 4.8 3,25 18,27 1.90 521 0.641 35 1.00 460 00 0847 2,75 440 5,5 3.18 17.87 1.92 527 0.59 423 1.00 460 00 0852 12.78 425 6.7 3,21 18,31 1.81 520 0.57 6703 0.9 46000 0857 12,73 425 6.9 3,22 18,75 1.82 520 0.55 173 0.9 46000 0857 12,73 425 6.9 3,22 18,75 1.82 520 0.55 173 0.9 46000 0902 12,68 425 7.6 3.26 18,94 1.81 517 0.54 125 0.9 46000 0907 12,67 425 8.3 3,28 19,24 1.81 517 0.54 125 0.9 46000 0907 12,67 425 8.3 3,28 19,24 1.81 577 0.55 115 0.9 46000 0907 12,69 425 9.0 3,21 18,80 1.90 527 0.52 91,2 1.0 11 0912 12,80 425 9.0 3,2 1 18,80 1.90 527 0.52 91,2 1.0 11 Remarks: Pump Intake Dept: Control Box Setting (Hz): Sampling: (Sample at 100-250 mJ/min)	0822	16.89	480	1.5	3.25	11.52	1.89			over	1.0	•••
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	6827	12,90	440	2.5	3.23	17,70	#89	523	0.72	OVER	1.0	( <u>)</u>
0837 12.78 440 4.2 3.21 18.19 1.88 523 0.05 120 1.0 46600 0842 2.73 440 4.8 3.25 18.27 1.90 521 0.641 35 1.0 46600 0847 2.75 440 5.5 3.18 17.87 1.92 527 0.59 423 1.0 46000 0852 12.78 425 6.2 3.21 18.31 1.81 520 0.57 67303 0.9 46000 0857 12.73 465 6.9 3.22 18.75 1.82 520 0.55 173 0.9 46000 0902 12.68 425 7.6 3.26 18.44 1.81 517 0.54 125 0.9 46000 0907 12.67 425 8.3 3.28 19.24 1.81 517 0.54 125 0.9 46000 0907 12.67 425 8.3 3.28 19.24 1.81 577 0.52 115 0.9 46000 0912 12.80 425 9.0 3.21 18.80 1.90 527 0.52 91.2 1.0 11	0832	12,81	440	3.9	3,19	17.96	1.88	525	0,68	OVER	0.9	LVEAR YEL
2842 2.73 440 4.8 3.25 18.27 1.90 521 0.64135 1.0 4ELLOU 0847 2.75 440 5.5 3.18 17.87 1.92 527 0.59 423 1.0 4ELLOU 0852 12.78 425 6.2 3.21 18.31 1.81 520 0.57 6.203 0.9 4ELLOU 0857 12.73 425 6.9 3.22 18.75 1.82 520 0.55 173 0.9 4ELLOU 0902 12.68 425 7.6 3.26 18.94 1.81 517 0.54 125 0.9 4ELLOU 0907 12.67 425 8.3 3.28 19.24 1.81 517 0.54 125 0.9 4ELLOU 0912 12.80 425 9.0 3.21 18.80 1.90 527 0.52 91.2 1.0 11 0912 12.80 425 9.0 3.21 18.80 1.90 527 0.52 91.2 1.0 11	0837	12.78	440	4.2	3.21			523	0.05	1200		1.0
0847 2.75 440 5.5 3.18 17.87 1.92 527 0.59 423 1.0 4ELLOW 0852 12.78 425 6.2 3.21 18.31 1.81 520 0.57 0.203 0.9 YELLOW 0857 12.73 425 6.9 3.22 18.75 1.82 520 0.55 173 0.9 YELLOW 0902 12.68 425 7.6 3.26 18.94 1.81 517 0.54 125 0.9 YELLOW 0907 12.67 425 8.3 3.28 19.24 1.81 517 0.54 125 0.9 YELLOW 0912 12.80 425 9.0 3.21 18.80 1.90 527 0.52 91.2 1.0 11 Remarks: Pump Intake Depth: Control Box Setting (Hz): Sampling: (Sample at 100-250 ml/min)	17247	17.70		4.2	215	-	1	+	0.104	135		
0852 12.73 425 6.2 3.21 18:31 1.81 520 0.57 6.303 0.9 Yellow 0857 12.73 425 6.9 3.22 18:75 1.82 520 0.55 173 0.9 Yellow 090212.68 425 7.6 3.26 18:44 1.81 517 0.54 125 0.9 Yellow 0907 12:67 425 8.3 3.28 19:24 1.81 517 0.54 125 0.9 Yellow 0907 12:67 425 8.3 3.28 19:24 1.81 577 0.53 115 0.9 Yellow 0912 12:80 425 9.0 3.21 18:80 1.90 527 0.52 91.2 1.0 11 Remarks: Pump Intake Depth: Control Box Setting (Hz): Sampling: (Sample at 100-250 ml/min)	1610	010		51					n ca	Una		Jacou
0857 12,73 425 6,9 3,22 18,75 1,82 520 0,55 173 0,9 4Eccon 090212,68 425 7.6 3,26 18,94 1,81 517 0,54 125 0,9 4Eccon 0907 12,67 425 8.3 3,28 19,24 1,81 577 0,54 125 0,9 4Eccon 0907 12,67 425 8.3 3,28 19,24 1,81 577 0,55 115 0,9 4Eccon 0912 12,80 425 9,0 3,21 18,80 1,90 527 0,52 91,2 1,0 1 Remarks: Pump Intake Depth: Control Box Setting (Hz): Sampling: (Sample at 100-250 ml/min)	0897	6.15	<u> </u>	1,5		1.				(67)7	· · ·	Jeccon
090212,68 425 7.6 3,26 18,94 1.81 517 0,54 125 0,9 4 4000 0907 12,67 425 8.3 3,28 19,24 1.81 577 0,53 115 0,9 4 4000 0912 12,80 425 9.0 3,21 18,80 1.90 527 0,52 91,2 1.0 11 Remarks: Pump Intake Depth: Control Box Setting (Hz): Sampling: (Sample at 100-250 ml/min)	- 0/	12.18	425			18:51	181			07505		Jelion
0907 12167 425 8.3 3.28 19124 1.81 577. 0.53 115 019 4 2000 0912 12.80 425 9.0 3.21 18.80 1.90 527 0.52 91.2 1.0 11 Remarks: Pump Intake Depth: Control Box Setting (Hz): Sampling: (Sample at 100-250 ml/min)	0857	12,73	425	6.9	3,22	18.75	1.82	520	0.55	173	0,9	YEur
Oq12         12.80         9.0         3.21         18.80         1.90         527         9.52         91.2         1.0         1           Remarks:         Pump Intake Depth:         Control Box Setting (Hz):         Sampling: (Sample at 100-250 mil/min)	0902	12,68	425	7.6	3.26	18,94	1.81	517	0.54	125	0.9	YELLON
Remarks:         Pump Intake Depth;         Control Box Setting (Hz):         Sampling: (Sample at 100-250 ml/min)	0907	12,67	425	8.3	3.28	19,24	1.81	577.	0.53	115	019	YEno
Remarks:         Pump Intake Depth;         Control Box Setting (Hz):         Sampling: (Sample at 100-250 ml/min)	0912	12,80	425	9.0	3.21	18,80	1.90	527	0.52	91.2	1.0	11
17.5 87.1		Pump Intake	Depth:			Control Box Se	etting (Hz):			Sampling: (S	ample at 100-250	ml/min)
071		1-	7-	1			071					
		1	175				0/11					
				2.1								
					12							
							SAMPLIN	G	Ч.			
SAMPLING						· ··						
Depth to Water Before Sampling:		ology: USEP	A - Low Flor	w Sampling	Procedures wit	th submersible p		000			*******	
Depth to Water Before Sampling: Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump							QC Sample:	VVY				
Depth to Water Before Sampling: Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump Sample Name: QC Sample: DV P												
Depth to Water Before Sampling: Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump Sample Name: QC Sample: DV P Sample Date/Time:			Y/N F	iter Size:						g kil		951
Depth to Water Before Sampling: Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump Sample Name: QC Sample: DV P												
Depth to Water Before Sampling: Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump Sample Name: QC Sample: DV P Sample Date/Time: Sample Date/Time: Sampler / Signature:			parameter		ed prior to colle	ation annuals						

# CONTINUED

Well Number:	EP19 -	29top	o (l	DNTINU	ED	Site: Garfield	Groundwate	r Contamin	ation Superfur	nd Site	
Field Crew:						Date: 9/4	1/14	Project #:	431007		
Well Depth (ft.)	:			Purge Methodology:		Diameter	Gal. Per Fool	t	Diameter	Gal. Per Foot	
DTW (ft.):				USEPA - Low I	Flow	2"	.163		5"	1.020	
Water Column	(ft.):			Sampling Proc		3"	.367		6"	1.469	
Well Diameter				with submersib		4"	.653		8"	2.611	
Gal. per ft.:				Water Quality							
Well Volume (g	al.):			Horiba U-52							
Depth of Scree					<b>6</b> 70)						
8						Field Parame	ters				
ö		Flow Rate	Total Volume	рН	Temp	Cond.	ORP	D.O. [Surface]	Turbidity	Salinity <sup>1</sup>	
Time	DTW (tic)	(ml/min)	(gal)	(Std. Units)	(C)	(mS/cm)	(mV)	(mg/l)	(NTU)	(PPT)	Color/Odor
1. E		Purge at									
Stabilization	< 0.3'	200-500		+/- 0.1	0	+/-3%	+/- 10 mV	+/- 10%	+/- 10%		
a 0917	12.79	410	9,6	3.22	18.94	1.85	524	53	95.0	0.9	YELLON
0927	17.78	420	10,3	3:23	19.00	1.84	523	0.51	93,1	0.9	Ullia
	10.18	no	10, 1		<u> </u>	1			-1771		- Jeren
0927				Corre	CT S	AMPLE	+				
· · ·			-								
			e								
9							-				
				-							
				2010	2						
	•										
/				Let a series and series							
0954	12.70	YLD	/	3.21	18.40	1.87	528	1.26	79,3	0,9	YELLOW
Remarks:	Pump Intake			2101	Control Box Se			111-0-		ample at 100-250	
rtoniarka.					CONTROL DOX.50				Samping. (Sa	ample at 100-200	
		17.	$\varsigma'$		•	87.1r	+7.				
		( ( ·	~								
						SAMPLIN	3				
Depth to Water	Refore Samo	ing: 17	1.78			Uran En	-				
				Procedures with	h submersible n						
	1 - 1						DUP	>			
		uliu	00-	0977	1 (	ao oampie.	RV1				
		$\overline{\mathcal{T}}_{\mu}$	P	1101							
		Then T	Har Sizai	and the	-	·····		1			
								. 2		=	
								2			
Sample Merror Sample Name: Sample Date/TI Sampler / Signe Filtered Metals Sample Observ Notes: 1 = stab Parameters:	LPA me: 9/ ature: 0 Collected: ( ations: lization of this	29 <u>Y/19</u> <del>Y/20</del> <del>N</del> Fi <del>YEM</del> parameter	-OB- Je Iter Size:	- 0904 0927 		QC Sample:		> 	6		

Field Crew:	D. Re	amer				Date: 9/	3/14	Project #:	431007		
Well Depth (ft.)	- 22	BGS		Purge Methodology:		Diameter	Gal. Per Foo	L	Diameter	Gal. Per Foo	ot
DTW (ft.): /				USEPA - Low	Flow	2	.163	>	5"	1.02	20
Water Column	(ft.): 5	3		Sampling Proc	edures	3"	.367		6"	1.46	9
Well Diameter				with submersit	ole pump	4"	.653		8"	2.61	1
Gal. per ft.: 🧷	,163			Water Quality	Meter:						
Well Volume (	gal.): / 35		- 1	Horiba U-52							
Depth of Scree	en (ft.):	7-2	U								
8	I	r	Total		1	Field Parame	oters	D.O.	1		1
Time	DTW (tic)	Flow Rate (ml/min)	Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	[Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
Time		Purge at	(3)	÷ .							
Stabilization	< 0.3'	200-500		+/- 0.1		+/-3%	+/- 10 mV	+/- 10%	+/- 10%		
1040	15.28		0	7.10	19.45	1.14	93	1,69	NM	0.6	Pinkish / no odi
1045	14.6C	15,30 (1	1.5	7.23	19.66	1.13	12	0.99	64.9	0.6	Clear / no ado.
1050	15.29	450	2.25	7.25	19.89	1.13	14	0.89	41.4	0.6	11/11
1050	15.28	450	2.75	7.25	20.03	1.14	16	0.81	18.1	0.6	alu
1100	15.28			7.24	19.96	1.14	18	0.75	12.7	0,6	slightly acle
1105	15.28		T	7,24	20.05	1.15	17	0.70		a.	
1110	15.28				20.17	1.17		<u>+</u>		- 16	yellowish greens
			T	7.24		1	19		1.4	0.6	
1115	15.28	450	5,15	7.25	20.16	1.17	20	0.75	10,9	0.6	de cifn
1			•					ļ			
affi											
Remarks:	Pump Intake	Depth:			Control Box Se	etting (Hz):			Sampling: (Si	ample at 100-25	i0 ml/min)
	~ 20	or Be	55		91.7	б			15	0	
					-	Turbia: ty	5 HAO	=H		Horiba	052-
						2100	Q =			5N A	NUKY25M8
NM-N	of me	sured				SIN I	3040	2 27	57.7	Pine	E.
								UZL	116	· inte	UNV,
Depth to Water	Before Same	lina: 15	.28		ч.,	SAMPLIN	×				
				Procedures wi	th submersible p	oump					
Sample Name:	and the second distance of the second distanc	the second s			and the second se	QC Sample:	None				
Sample Date/T	ïme: 9/:	3/14	1120								1
Sampler / Sign		David	Rean		1- an	lan					
Filtered Metals	C				- 19 Car -		1 -				a
Sample Obser				-	sh ga	ion wa					7 - 24-34
Notes: 1 = stat	Select			- / /	netals	1.	+ chr	•	1 1 10	atete	-11 - 1 -

	Well Number:	EPA	31-0	3			Site: Garfield	Groundwate	r Contamin	ation Superfu	nd Site	
	Field Crew: <		LSBN				Date: 9/	3/14	Project #:	431007		
	Well Depth (ft.)	25'			Purge Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Foot	
	DTW (ft.):				USEPA - Low	Flow	2"	.163		5"	1.020	
	Water Column				Sampling Proc	edures	3"	.367		6"	1.469	
	Well Diameter	-			with submersib	le pump	4"	.653		8"	2.611	
	Gal. per ft.:	0,10	3		Water Quality I	<u>Meter:</u>						
	Well Volume (g Depth of Scree		-25	•	Horiba U-52		1					
	Departor Screek	n (n.). 13	, ,				Field Parame	ters				
	Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	D.O. [Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
	Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		
Initial	1357	14.60	300	/	5,50	23.05	1.20	214	1.32	632	0:6	YELLOW
	1356	14.65	350	0.6	5,38	20.58	1.38	230	0.00	717	617	YELLOW
	1901	14,64	350	1.6	5,39	20,32	1.42	209	0:00	552	0.7	YELLOW
	1406	14,05	380	2.0	5.42	20,24	1:45	197	0.00	381	0.7	YENOW
	1411	14,09	300	2.4	5.47	20,19	1.46	205	0,00	308	0.7	YELLOW
	1416	14.64	300	2.8	5,50	20.15	1.49	197	0.00	254	0.7	YEccon
	1421	14.64	300	3.3	5.63	20.01	1:52	183	0.00	53192	-0.8	YELLOW
	1426	14.64	300	31.8	5.69	1997	1.54	202	0.00	161	0,8	YEwond
	1431	14,64	/	4.3	5.74	20,29	1.56		0,00	149	0.8	Yanow
	1430	14,05	500	9,4	5.70	20,50	1.50	206,	0.00	157	6.8	17 /)
	1440		0 7		Cong	C( SVII	tpue			1 - 0		
Purge	1510	14.05	500		5.82	21.70	1.5 5	222	0.00	129	0.8	year
	Remarks:	Pump Intake				Control Box Set				Sampling: (Sa	ample at 100-250 r	nl/min)
		Z	0 '				91.1					
				×								
5												
		E.										
							SAMPLING	; ;				
	Depth to Water	Before Sampl	ing:	1,65	-							
						h submersible p						
	Sample Name:	CI (.		15-1	040314	1	QC Sample:	/				
	Sample Date/Ti Sampler / Signa		ry le	he	1º10							
	Filtered Metals		28	Iter Size:				V		<u>.</u>		
	Sample Observ		Yell		•••	14 au						
	Notes: 1 = stabi	-	_									
	Parameters: C	I FE	2 1	DC	HEX	C CF	SULFI	2				

Post

Field Crew: Well Depth (ft	): 19.87	carr		<u>Sa</u> <u>J</u> s <u>6</u> <u>Purge</u> <u>Methodology:</u> USEPA - Low I	9	Diameter	Gal. Per Foo	Project #:	431007 Diameter 5"	Gal. Per Foo	States -
Water Colum Well Diamete Gal. per ft.: උ	n (ft.): 55 r (in.): 2	2		Sampling Proc with submersib Water Quality I Horiba U-52	edures le pump	3"	.367	>	6" 8"	1.46 2.61	9
Depth of Scre	en (ft.):	10-2	0			Field Parame	tor				
Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	D.O. [Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
Stabilization	< 0.3'	Purge at 200-500	-	+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%	15	
1410	16.23	350	1.25	the state of the second st	21.3.2			2.67	780	0.8	Yellowish bro
1415	16.27	350	1.75	4.52	21:20	1.48	440	1,30	385	0.7	Yellansh 1
142.5	16.25	400	3.0	4.41	21.13	1.47	463	1,20	24.9	0.7	11/1
1430	16.10	460	3.5	4.39	21.26	1.46	465	1.15	20,4	0.7	11/11
1435	15,92	200	3.6	4.40	22.11	1.4.6	460	1.25	50,4	6.7	up u
1440	15,58	300	4.2	4.42	21.63	1.46	463	1,21	48.3	6.7	11/11
14 95	15.62	400	4.7	4.44	21.47.	1.46	462	1,20	46.4	0.7	11/11
1450	- Scn	pte:	Colle	ed 4.20	21.70	ER)					
- seeder	· · ·										
1500	16,32	110	50	412	21.22	1.4-	Man		(())	0.7	
Remarks:	Pump Intake		50	4.20	21.20 Control Box Se	1,47	784	4.96		ample at 100-250	
		'B6:		НАСН 5л 13	95	,20	_	oriba SN M			
				2		SAMPLIN	G				
- 2017-01-01-01-01-2010	EPA-	PA-Low Flor		90314	h submersible p	ump QC Sample:	None				
Sampler / Sigr	/	Car'o		amer /	T-	a		8995 			* /// 
litered Metals Sample Obser		Y)N FI		lor							

Well Number: Field Crew:				NUBLE		Site: Garfield Date: / 0/2		Project #:	431007		
			100	Purge		· · · · ·	_			Gal. Per Foot	
Well Depth (ft.)			ł	Methodology: USEPA - Low I	Flow	Diameter	Gal. Per Foot		Diameter 5"	Gai. Per Foot 1.020	
DTW (ft.): ) Water Column				Sampling Proc		2 3"	.367		6"	1.469	
Well Diameter				with submersib		4"	.653		8"	2.611	
	0,103			Water Quality !							
Well Volume (g	gal.): 1.10	8 21.3	541	Horiba U-52							
Departer du de						Field Parame	ters				
Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	D.O. [Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		
1153	15,00	350	/	7.4	18,29	0.119	-5	2,45	OVER	0.1	CLEOTE LIBRAN 14
1158	15.64	350	0,4	7,4	20.38	0.093	-79	1.60	33,2	0.1	(LEAR/CHEM
1203	15.65	350	0.75	7.4	20,84	0.112	-115	1.36	14.0	011	CLENTZ
1208	15.72	300	1.1	7,4	21,02	0119	-128	1.25	10-1	0.1	CLENTZ
1213	15.71	300	1.9	7.4	21.18	0.119	-129	1.14	9,62	0,1	CLEAR
1218	15.70	300	1.7	7,4	21,46	0.116	-119	1.06	8137	0.1	CLEATZ
1223	15.68	300	2.0	7.3	21,69	0,120	-103	1.00	7.91	0.0	CLEAR2
1228	15,68	300	22	7.3	21.87	0,120	-87	0.99	7,80	011	-)
1233	15,00	300	2,4	7.3	21.78	0.121	-87	0.70	7.33	0.1	
1238	15.56	300	7.5	7,3	21,37	0.118	-85	0.72	7,20	0.1	V
1243	15.54	300	3,0	7.3	21,30	0.115	-34	0.73		0.1	e .
1330	15.67	300	/	7.3	22,04	0112	- lece	3,71	5.36	01)	CLENT
Remarks:	Pump Intake	Depth:			Control Box Se	etting (Hz):			Sampling: (S	ample at 100-25	0 ml/min)
	l	8.6	١			95				200	
	•					SAMPLIN	G				
	er Before Sam		.54	an) Maria							
	10.				/ith submersible		~				
Sample Name		7 1	<u>-00-</u> 9	102014	·	QC Sample:	<u> </u>				
Sample Date/	17	11	fren	1							
Sampler / Sig Filtered Metal		5	Filter Size:								
Sample Obse	~	LEVTR							· · · · · · · · · · · · · · · · · · ·		
	Construction C										

4

Well Number:	EPA-	29-01	3			Site: Garfield		r Contamir	ation Superfu	nd Site	
Field Crew: -	T. SALSI	3re				Date: 10/2	1/14	Project #:	431007		
Well Depth (ft.)	:			Purge Methodology:		Diameter	Gal. Per Fool	t i	Diameter	Gal. Per Foot	
DTW (R.): 12				USEPA - Low	Flow	2"	.163		5"	1.020	
Water Column	(ft.):			Sampling Proc	edures	3"	.367		6"	1.469	
Well Diameter	(in.):			with submersib	le pump	-4"	.653		8"	2.611	
Gal. per ft.:				Water Quality I	Meter:	and the second					
Well Volume (g	gal.):	~		Horiba U-52							
Depth of Scree	n (ft.): 15	- 60				<u> </u>			¥.		····
	r		Total			Field Parame	ters	D.O.	<del>X</del>		-
Time	DTW (tic)	Flow Rate (ml/min)	Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	[Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		
0915	13.30	500		4.3	16.25	0.134	412	2.41	245	0.1	YELLOU
0920	13,50	500	· · · ·	3.2	17.34	0.176		0.86	175	0,(	YELLOW
0925	13,54	500	1.9	3.1		0,186		0.61		011	YELLOW
0930	1358	500	29	3.1	1	01187	540	1	58.4		YELLOU YELLOU YELLOU YELLOU YELLOU YELLOU
6935	13,60		3.9	3.2	17,93		535	0.41		8.1	YEnow
0940	13.61	500	4.8	3.2	17,96	01187	535	0.00	48.4	0.1	YELLOL
	ļ					<b>_</b>					
.0.63				3,0	17.86	01199	571	2.68		0.1	
10:03		L	I	270			1311	10.00	1		
Remarks:	Pump Intake	1 <u>.5</u>	ł		Control Box Se	87				ample at 100-250	i mi/min)
			*								
	э					SAMPLIN	G				· · · · · · · · · · · · · · · · · · ·
Depth to Wate	er Before Sam	pling:	3.41								
Sample Metho	dology: USE	PA - Low Flo			ith submersible				·····		
Sample Name	<u>: EPI</u>	4- (9	1-015	-10211	1	QC Sample:	۷				
Sample Date/		21/14	P	9:45							
Sampler / Sig		gla -	de-	7						<u> </u>	
Filtered Metal			Filter Size:								
Sample Obser		YEU									
Notes: 1 = sta Parameters:	bilization of th /+ミェー C(		- Muttik	ired prior to col	4	RR ()	/SJLFA	TESUL	FIDE T	BC, ALK	METHOMME,
Falanteters.		/ 10,0			- / / (11 - 1		/	, .,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			NITHTEL

MITHTE/NITRUFA

Well		FUF I	3-0	B			Site: Garfield	Groundwate	r Contamin	nation Superfu	nd Site	
DTV	d Crew:	Levini	ULDic /	Taylo		14	Date: 10-	20-14	Project #:	431007		
DTV	ll Depth (ft.):	32.1	/		Purge Methodology:		Diameter	Gal. Per Fool		Diameter	Gal. Per Foo	t
\A/at	N (ft.): 14				USEPA - Low I	Flow	Ð	(163)		5"	1.020	)
a activ	ter Column (	ft.): [7.6			Sampling Proc	edures	3"	.367	- 7	6"	1.46	9
	II Diameter (i				with submersib	le pump	4"	.653		8"	2.61	1
	. per ft.: c				Water Quality	Meter:	1.1					
	II Volume (ga oth of Screen				Horiba U-52		-					
	2						Field Parame	ters		-		1
L	Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	D.O. [Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
St	tabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		1
nitiat 12	115	1575	250	-	7.57	17.4	0,104	242	0.0	120	000	CICAR
12	1:20	15.75	200	0%	750	19.3	0,105	246	0:0	9011	0.0	CICAR
12	35	15.75	200	1.50	7.49	185	0.105	244	00	7.19	O.C	alcas
12	2.20	1575	250	29	7.44	14.0	0107	247	00	575	00	CIPER
12	2:35	15.75	252	2.5	7.46	19.1	0:107	250	0.0	5.51	0.0	CHAR
12	240	15.75	150	39	7.46	19.0	0,107	249	0.0	6,12	0.0	CHAR
1	2,45	15.75	250	3.5	7.46	190	0.10%	250	0-0	6.14	0.0	dear
12	1:50	1375	25c	49	7.94		0.100	251	0.0	6.03	00	CLAR
1	2:55	ce	llec)-		Sum	ph.		1				
17	3:15	15.75	-		7.48		0109	252	00	6.14	0.0	CHAR
15												
Purge	marks:	Pump Intake	Depth:			Control Box Se 9 1.0	etting (Hz):				iample at 100-25 ເດັດທະ/ທະ	

TAOR MORE AND	EPA -	32 OF	3	_	-	Site: Garfield	Groundwate	er Contamir	ation Superf	und Site	
Field Crew:						Date:		Project #:	431007		
Well Depth (ft.):	20'			Purge Methodology:		Diameter	Gal. Per Foo	t	Diameter	Gal. Per Foo	ot
DTW (ft.): 15				USEPA - Low	Flow	2"	.163	>	5"	1.02	0
Water Column (		,		Sampling Proc	edures	3"	.367		6"	1.46	9
Well Diameter (i	in.): 🧝 🖊			with submersib	ole pump	4"	.653		8*	- 2.61	1
Gal. per ft.: Well Volume (ga Depth of Screer	al.): 0.7	661		Water Quality   Horiba U-52	Meter;						
						Field Parame	ters				-
Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	D.O. [Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		
15:15	15.8	200		5.66	19.4	0.199	294	0.0	IK	0.1	BROWNINENE
15.20	158	ace	0.25	5.48	19.5	0.198	306	0.0	IK	0.1	BEAUN/ADN
15:25	154	200	. 59	5.05	19.5	0.195	339	0-0	IK	0.1	STOWN INON
15.30	158	200	c 75	505	22.1	6.198	358	0.0	110	0.1	
15:35	15.8	2.00	19	4.15	214	0.180	416	0.0	18	0.1	
15:40	17.8	200	15	4.12	21.2	0.139	409	0.0	IX	0.)	
15:45	17.8	200	1.75	4.11	215	0.185	375	0.0	11	0.)	
15:50	17.5	200	29	4.71	21.5	0.155	374	00	11C	0.1	
15:55	17.5	200	235	471	dis	0.199	377	0.0	114	01	+
16:00	17.5	20.)	34	(1,7)	215	0.185	375	00	inc	0)	
16:30	Ce	VIECI		ompi	٢						
	1		L				1	12.2		1	
Remarks:	Pump Intake	e Depth:			Control Box S	etting (Hz):			Sampling: (	Sample at 100-2	50 ml/min)
	18'				111Hz						
WATER L Off we	cill Clay	entine es Will	todrog ei &c	e hours x	drow for h	down Is All nou	surs Di R isa	iciel P mpic	ump de	un. 16:0	OPUMP
						SAMPLIN	G				
Depth to Water	Before Sam	ipling: 1	68	Atte	Reth	se -					
		PA-Low Fi		Procedures w	vith submersible	QC Sample:	NONE				
Sample Name:	10	20-14	42-7	6:30		go sample.	MONE.				
Sample Date/T		1 /	1							_	
Sample Date/T Sampler / Sign	ature:	-	A COLORING COLORING								
		(Y) N	Filter Size:								

iz <sup>U</sup>G

V	Vell Number: /						Site: Garfield	Groundwate	r Contamir	ation Superfu	nd Site		
F	ield Crew:	SURSB	Ren/K	NUB	12		Date: 10/20	>/14	Project #:	431007			
	Vell Depth (ft.):				Purge Methodology:	1	Diameter	Gal. Per Foot		Diameter	Gal. Per Foot		
	)TW (ft.):				USEPA - Low F	iow	2"	.163	-	5"	1.020		
- L	Nater Column (	ft.):			Sampling Proce	edures	3"	.367		6"	1.469		
V	Vell Diameter (i	n.):			with submersib	le pump	4"	.653		8"	2.611		
6	Gal. per ft.:				Water Quality N	Aeter;							
V	Vell Volume (ga	al.):			Horiba U-52								
4	Depth of Screen	<u>(ft.): 15</u>	25										
╞			· · · ·	Total			Field Parame	ters	D.O.			ľ	
	Time	DTW (tic)	Flow Rate (ml/min)	Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	[Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/C	Odor
	Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%			
tiat	1532	15,70	400		6.0	18.14	0.176	254	3.21	OVER	ON	YELLOW BI	2001
	1537	15,82	500	0,9	5.9	18:51	0,183	265	1.32	OVER	0,1	i v	1.1
ŀ	1542	15,91	500	1.8	10.0	16,28	0,183	273	0.88	957	0,1	11	r f
ł	1547	15,93	500	2.8	(a, D	18,12	01141	279	1	OVER	0.1		U.
ł	1552	15.95	500	3.8	10.0	18:15	0.194	285	0.51	OVER	011	n	7-1
ł	1557	15.97	500	4.8	(e.D	18,17	0.185	286	0,49	77.9	0,1	XX	7.1
ł	1602	15,96	500	5.2	6.0	13:00	0.179	233	045	102.5	011		1
ł	11.07	15.95	500	6.8	10.0	18.48	0.143	289	0.42	58.1	0.1	<b>1</b> ±	4.1
Ì	1612	15.95	500	7,8	6.0	18.32	0,193	290	OY	53.4	0,1	11	1
												-	
	10 10 1	12-71	200			Rale	0.100	777	2,45	140 7		9ELLOL	
rge	1641	15.75	300		le.1	18,36	0.198	272	6.0		0.1		<u> </u>
	Remarks:	Pump Intake	Depth:	-		Control Box Se	etting (Hz):			Sampling: (S	Sample at 100-25		
		7	0.5			9	5				250	• •	
		-											
		•					SAMPLIN	G					
	Depth to Water			.95									
					g Procedures w	ith submersible						-	
	Sample Name:	E PA -		B-10			QC Sample:	/					
	Sample Date/T	ime: 10/	120/14	1	16:	10							
	Sampler / Sign		glese -	fee	4						č.		
	Filtered Metals			Filter Size:								·····	
1	Sample Obser		YELLOU										
	Notes: 1 = stat				A A A A	In all and a second							

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Head Crew:         12. Holongs         Desc:         12/18/14         Project #: 431007.04.03.05           Well Dept R1: 52.         Madicadocar.         Descritur         Call, Per Foot         9         1.000           Well Dept R1: 52.         Madicadocar.         Descritur         Call, Per Foot         9         1.000           Well Dept R1: 52.         Madicadocar.         USERA - Low Flow         Sarry         e         1.400           Well Dept R1: 52.         Well Dept R1: 52.         Well Dept R1: 52.         E         2.811           Gal, per T: 0, 16.3         Well Dept R1: 62.         Well Dept R1: 62.         E         2.811           Gard Sciene (1), 72 3.2         Horde U.S2         Feel Prematers         0.00         E         2.811           Gard Sciene (1), 72 3.2         Horde U.S2         Feel Prematers         0.00         E         2.811           Well Dept R1:         3.73.40         Molon 0.6         7.55         1.02         1.02         1.02         1.02         1.11           1128         13.40         Molo 0.6         7.55         1.02         9.97         2.00         1.01         1.11           1128         13.40         Molo 0.1         7.55         1.72         0.97	W	ell Number:	EPA-1		5			Site: Garfield	Groundwate	r Contamir	ation Superfu	nd Site			
Web Depth (1): 3, 2, 3, 2, 3, 2, 3, 2, 3, 2, 3, 3, 2, 3, 2, 3, 2, 3, 2, 3, 2, 3, 3, 2, 3, 3, 2, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,	Fi	ield Crew:	D. Halc	nez		-		Date: 12/1/2	3/14	Project #:	431007.04.0	3.05			
DTW (r): [2, 2.         USEA-Low Flow         JSEA         JSEA <thjsea< th=""> <thj< th=""><th>w</th><th>/ell Depth (ft.)</th><th></th><th>-0</th><th></th><th></th><th></th><th>Diameter</th><th>Gal. Per Foo</th><th>t</th><th>Diameter</th><th>Gal. Per Foo</th><th>ot</th><th></th><th></th></thj<></thjsea<>	w	/ell Depth (ft.)		-0				Diameter	Gal. Per Foo	t	Diameter	Gal. Per Foo	ot		
Web Deriver (n): 2         with submemble purp         4*         953         9*         2.91           Sail per fin: (): 16.3         With submemble purp         4*         953         9*         2.91           Sail per fin: (): 16.3         With submemble purp         4*         953         9*         2.91           Sail per fin: (): 16.3         With submemble purp         4*         953         9*         2.91           Sail per fin: (): 16.3         With submemble purp         Honke Use         1								Zer		>					
Gal per 1:: 0, 16.3       Yate: Could Mater.         Wel Volume (art. 3, 2:3, 2       Field Parameters         Tene       DTW (pt Plow Rate       Volume (art. 3, 2:3, 2         Tene       DTW (pt Plow Rate       Volume (art. 3, 2:3, 2         Tene       DTW (pt Plow Rate       Volume (art. 3, 2:3, 2         Tene       DTW (pt Plow Rate       Volume (art. 3, 2:3, 2         Tene       DTW (pt Plow Rate       Volume (art. 3, 2:3, 2         Tene       DTW (pt Plow Rate       Volume (art. 3, 2:3, 2         Battoreton       c.0.3       Volume (art. 3, 2:3, 2         Battoreton       c.0.3       Volume (art. 3, 2:4, 2         I112       I.3.40       Volume (art. 3, 2:4, 1       4:3%         J123       I3.40       Volume (art. 1, 2       7.55         J133       I.4.40       I.5.5       I.7.55       I.7.25         J133       I.4.40       Volume (art. 1, 2       T.55       I.7.55       I.7.25       I.97         J1132       I.3.40       Volume (art. 1, 2       T.55       I.7.53       I.7.63       I.00       -212       I.94       S.2.5       I.1       I.1         J1133       I.3.40       Volume (art. 1, 2       T.5.5       I.7.53       I.7.63       I.00						Sampling Proc	edures	3"	.367		6"	1.46	9		
Work the space of the spac	w	ell Diameter (	(in.): 2			with submersib	le pump	4"	.653		8"	2.61	1		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	G	al. per ft.: ()	163			Water Quality	Meter:								
Field Parameters           Time         D.0           D.0         OPT (col)         (Colspan="2">OPT         D.0           Sublitation         Color Colspan="2">Color Colspan="2"           Sublitation         Color Colspan="2"           III Colspan="2"         Colspan="2"         Colspan="2"         Colspan="2"         Colspan="2"         Colspan="2"         Colspan="2"         Colspan="2"           Colspan="2"          Colspan="2"             <				20		Horiba U-52									
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	D	epth of Scree	n (ft.): 7.Z~	-34											
Time         DTW (to)         (think)         (to)	$\vdash$				Total		1	Field Parame	ters	D.O.	[		1		_
swaltzeon       -0.02       20500       ++0.1       ++3%       ++10mV       ++10%       ++10%         an [118]       13.30       500       0.0       7.59       16.17       0.981       -155       2.19       12.7       0.5       Clearfs.ubr-like         1123       13.40       400       0.6       7.55       17.25       0.997       -200       1.97       7.52       0.5       11       11         1123       13.40       400       1.2       7.55       17.25       0.997       -200       1.97       7.52       0.5       11       11         1133       13.40       400       1.2       7.54       17.25       0.977       -200       1.97       7.52       0.5       11       11         1133       13.40       400       2.5       7.54       17.43       1.00       -218       1.97       5.29       0.5       11       11         1143       13.40       400       3.6       7.63       17.67       1.00       -229       1.98       7.67       0.5       11       11         1143       13.40       400       5.5       7.54       17.63       1.00       -229       1.98		Time	DTW (tic)					1						Color/Odor	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		Stabilization	< 0.3'			+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%			,	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	ial	1113		500	0.0		16.17	0.987		2.19	12.7	0.5	Cleas	Suth	c-like
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		1123	13.40		0.6	7.55		0.994	-185	2.02	11.04	U.S		11	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		1128	13.40		1.2	7.55	17.25			1.97			-{I	11	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		133	13.40	400	1.8	7.54	17.32	1.00	-212	1.94	5.53	0.5	11	11	
$\frac{1143}{1148} \frac{13.40}{900} \frac{400}{3.6} \frac{1.53}{7.63} \frac{17.65}{1.00} \frac{1.00}{-229} \frac{1.98}{1.98} \frac{7.67}{7.67} \frac{0.5}{0.5} \frac{11}{11} \frac{11}{11}$ $\frac{1155}{1155} \frac{1155}{1155} \frac{1155}{1$		1138	13.40	400	2.5	7.54	17.40	1.00)	-213	1.92	5.29	0.5	<u>U</u>		
IIISS         Collect Soumple         Collect Soumple         Collect Soumple         Collect Soumple         IIISS         Collect Soumple         IIISS         Collect Soumple         Collect Soumple         Colspan="2">Colspan="2"         Colspan="2"         Colspan="2"         Colspan="2"         Colspan="2"         Colspan="2"         Colspan="2"         Colspan="2"         Colspan="2"         Colspan="2" <td>Ĺ</td> <td>143</td> <td>13.40</td> <td>400</td> <td>3.1</td> <td>7.53</td> <td>17.63</td> <td>1.00</td> <td>-224</td> <td>2.04</td> <td>5.15</td> <td>0.5</td> <td>1/</td> <td>Л</td> <td></td>	Ĺ	143	13.40	400	3.1	7.53	17.63	1.00	-224	2.04	5.15	0.5	1/	Л	
e 12.17 13.58 400 5.5 7.54 17.95 1.02 -172 1.79 8.74 0.5 11 11 Remerke: Punp Intake Depth: Z7 Control Box Setting (Hz): 85 4 Sampling: (Sample at 100-250 mVmin) FETOUS IFON: 0.0C mg/L Sampling: J3.40 Sample Methodology: USEPA-Low Flow Sampling Procedures with submersible pump Sample Name: 566-F29A-13-08-03 oc Sample: Field Dup For Hex Oscian and Total Order Sample: Figurature: 0.45 Manual United With Stamples 2014 Sample Stamples 2015 Samples 2015 Samples 2015 Samples 2015 Samples 2015 Sample Stamples 2015 Sample Stamples 2015 Samples 2015 Sample Stamples 2015 Sample Stamples 2015 Sample Stamples 2015 Sample Stamples 2015 Samples 2015 Samples 2015 Sample Stamples 2015 Samples 2015 Sample Stamples 2015 Samples 2015 Samples 2015 Sample Stamples 2015 Samples 2015 Sample Stamples 2015 Samples 2015 Samples 2015 Samples 2015 Sample Stamples 2015 Samples 2015 S		1148	13.40	400	3.6	7.63	17.67	1.00	-229	1.98	7.07	0.5	11	31	
PIZIT 13.58 400 5.5 7.54 17.95 1.02 -172 1.79 8.74 0.5 11 11 Remerks: Pump Intake Depth: Z7 Control Box Setting (Hz): 85 4 Sampling: (Sample at 100-250 mVmin) FETOUS IFON: 0.0C Mg/L SAMPLING Depth to Water Before Sampling: 13.40 Sample Methodology: USEPA-Low Flow Sampling Procedures with submersible pump Sample Name: 5.66 - EPR-13 - 05 - 03 oc Sample: Field Dip For Hex Oscient and Total Ordern Sample Name: 5.66 - FPR-13 - 05 - 03 oc Sample: Field Dip For Hex Oscient and Total Ordern Sample: Figurature: 0.45 Maint Uthurth Filtered Metals Collected: (3/ N Filter Size: 0.45 MM Sample Observations: No 1531/65		1155				Collect	- Sama	$d \rho -$							
Remarks: Pump Intake Depth: Z7' Control Box Setting (Hz): GS. Y Sampling: (Sample at 100-250 mV/min) FETROUS IFCM: 0.0C Mg/L SAMPLING Depth to Water Before Sampling: J3. 40 Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump Sample Marne: GCSC - EPR - 13 - 08 - 03 QC Sample: Field Dip for Hex Chronn and Total Chrum Sample Date/Time: [2/13/14 Sample Date/Time: [2/13/14 Sample Collected: (G/N Filter Size: 0.45 MM Sample Observations: No 1551/LS	ľ							P.C.					-	-	
Remarks: Pump Intake Depth: Z7' Control Box Setting (Hz): GS. Y Sampling: (Sample at 100-250 mV/min) FETROUS IFCM: 0.0C Mg/L SAMPLING Depth to Water Before Sampling: J3. 40 Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump Sample Marne: GCSC - EPR - 13 - 08 - 03 QC Sample: Field Dip for Hex Chronn and Total Chrum Sample Date/Time: [2/13/14 Sample Date/Time: [2/13/14 Sample Collected: (G/N Filter Size: 0.45 MM Sample Observations: No 1551/LS	$\vdash$														
Remarks: Pump Intake Depth: Z7' Control Box Setting (Hz): GS. Y Sampling: (Sample at 100-250 mV/min) FETROUS IFCM: 0.0C Mg/L SAMPLING Depth to Water Before Sampling: J3. 40 Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump Sample Marne: GCSC - EPR - 13 - 08 - 03 QC Sample: Field Dip for Hex Chronn and Total Chrum Sample Date/Time: [2/13/14 Sample Date/Time: [2/13/14 Sample Collected: (G/N Filter Size: 0.45 MM Sample Observations: No 1551/LS															
Remarks: Pump Intake Depth: Z7' Control Box Setting (Hz): GS. Y Sampling: (Sample at 100-250 mV/min) FETROUS IFCM: 0.0C Mg/L SAMPLING Depth to Water Before Sampling: J3. 40 Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump Sample Marne: GCSC - EPR - 13 - 08 - 03 QC Sample: Field Dip for Hex Chronn and Total Chrum Sample Date/Time: [2/13/14 Sample Date/Time: [2/13/14 Sample Collected: (G/N Filter Size: 0.45 MM Sample Observations: No 1551/LS															
Remarks: Pump Intake Depth: Z7' Control Box Setting (Hz): GS. Y Sampling: (Sample at 100-250 mV/min) FETROUS IFCM: 0.0C Mg/L SAMPLING Depth to Water Before Sampling: J3. 40 Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump Sample Marne: GCSC - EPR - 13 - 08 - 03 QC Sample: Field Dip for Hex Chronn and Total Chrum Sample Date/Time: [2/13/14 Sample Date/Time: [2/13/14 Sample Collected: (G/N Filter Size: 0.45 MM Sample Observations: No 1551/LS		217	13.58	400	5.5	7.54	17.85	1.07	-177	1.79	9.74	65	h	D	
ECTOUS ISON: 0.00 mg/L SAMPLING Depth to Water Before Sampling: 13.40 Sample Methodology: USEPA-Low Flow Sampling Procedures with submersible pump Sample Name: 5(5(-EPA-13-0B-03) ac Sample: Field Dip for Hex Choin and Total Chrum Sample Date/Time: 12/13/14 Sampler / Signature: D. Holmes / David Udmuk Filtered Metals Collected: (P/N Filter Size: 0.45 MM Sample Observations: No 1551/LS													) ml/min)		
Depth to Water Before Sampling: 13.40 Sample Methodology: USEPA-Low Flow Sampling Procedures with submersible pump Sample Name: 5(5(-EPA-13-0B-03) QC Sample: Field Dip for Hex Chrown and Tata) Chrom- Sample Date/Time: 12/13/14 Sampler / Signature: D. Holmes / Daniel Collected: (A/N Filter Size: 0.45 MM Sample Observations: No 1551/05						Ferrous	s Iror	5:0.00	3 mg/	2					
Sample Methodology: USEPA - Low Flow Sampling Procedures with submersible pump Sample Name: 5(5(-FPA-13-08-03) QC Sample: Field Dip for Hex (how and Tata) Chrum Sample Date/Time: 12/13/14 Sampler / Signature: D. Holmes / Daniel Unimer Filtered Metals Collected: (P/N Filter Size: 0.45 MM Sample Observations: No 1551, es	$\mathbb{F}$							SAMPLING							
Sample Methodology: USEPA-Low Flow Sampling Procedures with submersible pump Sample Name: GLGL-EPA-13-08-03 QC Sample: Field Dip for Hex Chosen and Tatal Chrum Sample Date/Time: 12/13/14 Sampler / Signature: D. Holmes / Daniel Unimer Filtered Metals Collected: (P) / N Filter Size: 0.45 MM Sample Observations: No 1551 PCS	De	opth to Water	Before Sampl	ing: 人.	40										
Sample Date/Time: 12/13/14 Sample / Signature: D. Holmes / Danuel Unimer Filtered Metals Collected: (9) / N Filter Size: D. 4 S MM Sample Observations: No 155125											11 -1	·			
Sampler / Signature: D. Holmes / Danuel Unimer Filtered Metals Collected: (?) / N Filter Size: C. 4 S MM Sample Observations: No 1551 RS					13-01	5-05		QC Sample: F	ied Dup	o tor	Hex Choo	m and T	Ctal C	hrom	
Filtered Metals Collected: (9) / N Filter Size: 0.4 S MM Sample Observations: No 1551,45					11.	: 111	1								
Sample Observations: No 155125			ture: 11-1-	ioines											
						<u>, , , , , , , , , , , , , , , , , , , </u>	1								
		-				red prior to collo	cting earnlo							2	

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	Well Number:	EPA-	29-0	13			Site: Garfield	d Groundwate	r Contamin	ation Superfu	nd Site	
	Field Crew:		deroit				1	4		431007.04.0		
. 1	Well Depth (ft.)			7	Purge Methodology:		Diameter	Gal. Per Foo	ł	Diameter	Gal. Per Foot	<b>F</b> 22
	DTW (ft.): 10				USEPA - Low	Flow	(2")	.163		5"	1.020	
	Water Column				Sampling Proc	édures	3	.367		6*	1.469	3
	Well Diameter	(in.): 🔍	•		with submersib	le pump	4"	.653		8"	2.611	
	Gal. per ft.: D Well Volume (g	al.): 1.4			Water Quality I Horiba U-52	<u>Meter:</u>	PAGE	10	f c			N
- 2	Depth of Scree	n (ft.): 15 –	1.0				Field Parame		· 4			2.
	Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	D.O. [Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
-	Stabilization	< 0.3'	Purge at 200-500	(300)	+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		
Initial	9:10	11.44	320		5.11	16.01	1.17	266	0.57	30.j	0.6	yellow, no odor
	9:15	11.48	330	0.7	4.45	16.44	1.17	268	0.24	21.7	0.6	greenish yellow no
а С	9:20	No in	esswe	nent	- pho	e call	from	Janu				
	9.25	11.50	340	3.1	4.68	16.86	1.20	296	0.00	13.15	0.6	Same as a base Sth
	9:30	11.50	330	2.5	4.58	16.89	1.21	3/3	0.00	11,47	0.6	SAA
	9:35	11.48	330	3.0	4.43	16.93	1.24	333	0.00	9.58	0.6	SAA
	9:40	11.49	330	3.7	4.30	17.01	1.26	355	0.00	8,36	0.6	SAA
	9:45	11.49	330	4.2	4.20	17.10	1.29	372	0.00	8.65	0.6	SAA
9	9:50	11.49	340	5.0	4.00	17.08	1.3/	394	0.00	7.39	0.7	SAA
	9:55	11.46	1	5.4	384	17.05	1.32	4//	0.00	7.05	0.7	SAA
	10:00	11.47		5.8	3.73	17.17	1.34	421	0.00	6.71	0.7	SAA
t-Purge	10:57	11.48	350	89	3-12	17.33	1.44	478	0.00	6.95	0.7	SAA
	Remarks: - Ferrev	Pump Intake S 1009			ut: 0		etting (Hz): <b>7</b> 9 1 L	70		Sampling: (S	ample at 100-250	ml/min)
	20 20											
-												
		а. С	1. 18.				SAMPLIN	6				
	Depth to Water	Before Samp		8								
	Sample Methor Sample Name:				Procedures with		QC Sample:	Maria				
-	Sample Name: Sample Date/T		7/14/	10 35		·	GO Gample: 4	vane				
	Sampler / Sign		arclerz	rk / 4/2	The de	1						
	Filtered Metals Sample Observ			ilter Size:	0.45 um	lan ad	or obsi	0 5.0				
	Notes: 1 = stab					•	er seda				72	N.
		6			in tot		n 5 a .	1	1		and tak	liren suffice.

Well Number:	EPA-2	1-0B				Site: Garfield	Groundwate	r Contarnin	ation Superfu	nd Site	
Field Crew:		clevol	le			Date: 12/17	114	Project #:	431007.04.0	3.05	
				Purge Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Foo	f
Well Depth (ft.)	See	page	1	USEPA - Low I	Flow	2"	.163	·	5"	1.020	
DTW (ft.):	ļ	ų –		Sampling Proc		3"	.367		6"	1.469	
Water Column	· · · · · ·			with submersib		4"	.653		8"	2.61	
Well Diameter	(in.):	8					<u></u>				
Gai. per ft.: Well Volume (g Depth of Scree				Water Quality I Horiba U-52	vieter.	PAG	E2	e f	ີ 2		
						Field Parame	ters	D.O.	·····	· · · · · · · · · · · · · · · · · · ·	1
Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	[Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		
10:05	11.47	330	6.3	3.57	17.15	1.35	435	0.00	6.99	0:7	greenish yolas! 10
10:10 -	11.46	330	6.7	3.50	17.25	1.37	443	0.00	6.53	0.7	Greenish yelow 100 Sume as above (S
10:15	11.41	320	7.1	3.48	17.24	1.37	446	0.00	7.13	0.7	SAA
10:20	11.41	330	7.5	3.36	17.35	1.38	450	0.00	6.84	0.7	SAA
10:25	11.38	320	80	331	17.59	1.37	462	0.00	6.82	0.7	SAA
10:31	11:48	350	8.6	3.28	17.43	1.40	459	0.00	7.09	0.7	SAA
10:35	Coll	ect	Sa	nple							₽
				ļ '							
6	0	, ,		 							
<u>See</u>	1952										
Remarks:	Pump Intake	<u>Depth:</u>	<i>C</i> .		<u>Control Box Se</u>				Samping. (S	ample at 100-25	
			Jee	Pase	. 1 ,	$\langle \rangle$					
K						SAMPLIN	G				
Depth to Wate									······		
Sample Metho	dology: USEI	PA - Low Flo	w Sampling	g Procedures wi	ith submersible					<u></u>	
Sample Name	:					QC Sample:					
Sample Date/	Time:										· · · · · · · · · · · · · · · · · · ·
Sampler / Sigr	nature:										
Filtered Metals		Y/N F	ilter Size:								11
Sample Obser											
Notes: 1 = sta	bilization of thi	s parameter	is not requ	ired prior to colle	ecting sample						
Parameters:											

Page 1 of 2

h	Vell Number:	FPA-	30-0	1B			Site: Garfield	Groundwate	r Contamin	ation Superfun	d Site		
	Field Crew: 1						Date: 17/1	8/14	Project #:	431007.04.03	.05		
r	Well Depth (ft.):				Purge Methodology:		/ Diameter	Gal. Per Foot		Diameter	Gal. Per Foot		
	DTW (ft.): 12.				USEPA - Low F	low	, 2"	.183		5"	1.020		
	Water Column (				Sampling Proce		3"	.367		6"	1,469		
	Well Diameter (				with submersibl	e pump	4"	.653		8"	2.611		
	Gal. per ft.: ()	163			Water Quality N	Aeter:							
	Well Volume (g				Horiba U-52								
4	Depth of Screer	1 (ft.): 17 -	72										
-				Total			Field Parame		D.O.		1		
	Time	DTW (tic)	Flow Rate (ml/min)	Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	[Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)		Color/Odor
	Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	· +/- 10%	-		. 1
tial	0844	1320	320	0.0	7.39	17.27	1,30	73	9.43	38	0.6		nish, Jaud
	6849	13.29	320	0.3	6.93	13.96	1.27	26	5.14	63	0.6	41	<u> </u>
	0854	13,53	320	0.6	7.00	15.28	1.27	-12	4.16	23.6	0.6	41	M
	0859	13.53	300	0.9	7.02	15.62	1.26	-20_	3.72	12.9	0.6		5/ Nh odor
	0904	13.43	200	1.2	7.02	15.89	1.26	-72	3.43	11.64	0.6	11	<u> </u>
	0909	13.45	300	1.5	7.62	15.93	1.26	-19	3.31	10.02	0.6		· · · · · · · · · · · · · · · · · · ·
	0914	13,25	150	1.8	7.04	15.48	1.26	-17	3.24	19.Z	0.6	1(	
	0919	13.20	150	2.1	7.06	15.97	1.27	-14	3.12	11.5	0.6	11	 
	0924	13.95	500	2.6	7.05	16.57	1.25	-13	3.09	14.68	0.6		ų .
	0929	13.05	100	2.8	7.06	15.79	1.26	-12	3.02	14.08	0.6	<u>3</u> 1	h
	0934	12.96	150	30	7.06	15.64	1.25	-9	2.93	11.54	0.6	11	1
rge	0939	12.95	150	3.2	7.01	16.26	1.25	-5.	2.83		0.6	6	N
	Remarks:	Pump Intake	Depth:	15'		Control Box S	etting (Hz): 9	1.30		Sampling: (S	ample at 100-250	) ml/min)	
	-Issu	es geth	ing coi	nsister	+ flaw	rate	yn 10	58.40					
1													
					-								
							SAMPLIN	<u>G</u>	_				<u></u>
	Depth to Water Sample Metho			w Samplin	g Procedures wi	th submersible	pump						
	Sample Name:		-				QC Sample:						<u>(</u> )
	Sample Date/T												
	Sampler / Sign	ature:			3.								
	Filtered Metals	Collected:	Y/N F	ilter Size:						_			
	Sample Obser												·····
	Notes: 1 = stat	vilization of thi	s parameter	is not requ	ired prior to coll	ecting sample							

Page Zof Z

Stabilization         0944         0949         0954         0959         1004         1009         1015         1035	.): .):	Flow Rate (ml/min) Purge at 200-500 5(10 400 350 350 350 350	Total	Purge Methodology: USEPA - Low F Sampling Proce with submersib Water Quality M Horiba U-52 PH (Std. Units) +/- 0.1 7.03 7.03 7.03 7.03 7.03 7.03	Flow edures le pump	Date: Diameter 2" 3" 4" Field Parame Cond. (mS/cm) +/- 3 % 1.25 1.25 1.21 (.19	Gal. Per Foot .163 .367 .653 .653 		431007.04.03 Diameter 5" 6" 8" Turbidity (NTU) +/- 10% <u>74.4</u> [5.1] [1.53]	Gal. Per Foot 1.020 1.469 2.611 Salinity <sup>1</sup> (PPT)	Color/Od Clear/No
DTW (ft.): Water Column (ft.): Well Diameter (in.): Gal. per ft.: Well Volume (gal.): Depth of Screen (ft. Time D Stabilization 0949 I 0959 I 1009 I 1009 I 1009 I 1015	.): .): DTW (tic) <0.3' 14.4% 14.10 13.70 13.84 13.95	(ml/min) Purge at 200-500 5()0 400 350 350 350		Methodology: USEPA - Low F Sampling Proce with submersile Water Quality M Horiba U-52 pH (Std. Units) +/- 0.1 7.03 7.03 7.03 7.03	edures ie pump <u>Meter:</u> Temp (C) 19.48 19.15 19.66 18.00	2" 3" 4" Field Parame Cond. (mS/cm) +/- 3 % 1, 2, 3 1, 2, 3	.163 .367 .653 .653 	D.O. [Surface] (mg/l) +/- 10% 5.54	5" 6" 8" Turbidity (NTU) +/- 10% 24.4 [5.]	1.020 1.469 2.611 Salinity <sup>1</sup> (PPT)	Clear/N
Water Column (ft.):           Well Diameter (in.):           Gal. per ft.:           Well Volume (gal.):           Depth of Screen (ft.)           Time         D           Stabilization           0944           0954           0954           1009           1009           1015           1035	.): .): DTW (tic) <0.3' 14.4% 14.10 13.70 13.84 13.95	(ml/min) Purge at 200-500 5()0 400 350 350 350		Sampling Proce with submersib Water Quality M Horiba U-52 PH (Std. Units) +/- 0.1 7.(59 7.07 7.03 7.08 7.08 7.05	edures ie pump <u>Meter:</u> Temp (C) 19.48 19.15 19.66 18.00	3" 4" Field Parame Cond. (mS/cm) +/- 3 % 1.25 1.23	.367 .653 ORP (mV) +/-10 mV - 9 - 7 - 7	[Surface] (mg/l) +/- 10% 5.54	6" 8" Turbidity (NTU) +/- 10% 24.4 [5.]	1.469 2.611 Salinity <sup>1</sup> (PPT) O. 6 O. 6	Clear/N
Well Diameter (in.):           Gal. per ft.:           Well Volume (gal.):           Depth of Screen (ft.           Time         D           Stabilization           0949         14           0949         14           0959         11           1009         14           1009         14           1015         -           1035         1	.): .): DTW (tic) <0.3' 14.4% 14.10 13.70 13.84 13.95	(ml/min) Purge at 200-500 5()0 400 350 350 350	Total Volume (gal) 3, 7 4, 1 4, 1 4, 4 4, 9 5, 5	with submersib <u>Water Quality M</u> Horiba U-52 PH (Std. Units) +/- 0.1 7.(\9 7.07 7.07 7.03 7.03 7.05 7.05	IP.48 19.15 19.66 19.00	4" Field Parame Cond. (mS/cm) +/- 3 % 1.25 1.23	.653 ORP (mV) +/-10 mV 7 7	[Surface] (mg/l) +/- 10% 5.54	8" Turbidity (NTU) +/- 10% <u>74.4</u> [5.(	2.611 Salinity <sup>1</sup> (PPT) O. 6 O. 6	Clear/N
Gal, per ft.:         Well Volume (gal.):         Depth of Screen (ft.         Time       D         Stabilization       0         0949       14         0949       14         0959       11         1009       14         1009       14         1015       -         1035       1	.): (ft.): <0.3' 14.46 14.10 13.70 13.84 13.95	(ml/min) Purge at 200-500 5()0 400 350 350 350	Total Volume (gal) 3 7 4,1 4,1 4,4 4,5,5	Water Quality M Horiba U-52 pH (Std. Units) +/- 0.1 7.07 7.07 7.07 7.03 7.03 7.05	Temp (C) 19.48 19.15 19.66 18.00	Field Parame Cond. (mS/cm) +/- 3 % 1.25 1.23	ters ORP (mV) +/-10 mV 7 7	[Surface] (mg/l) +/- 10% 5.54	Turbidity (NTU) +/- 10% <u>74.4</u> [5.1	Salinity <sup>1</sup> (PPT)	Clear/N
Well Volume (gal.):           Depth of Screen (ft.           Time         D           Stabilization         D           0949         14           0959         11           1009         14           1015         -           1015         -           1035         1	(ft.):	(ml/min) Purge at 200-500 5()0 400 350 350 350	Total Volume (gal) 3 7 4,1 4,1 4,4 4,5,5	Horiba U-52 pH (Std. Units) +/- 0.1 7.(59 7.07 7.03 7.03 7.05 7.05 7.05	Temp (C) 19.48 19.15 19.66 18.00	Cond. (mS/cm) +/- 3 % 1.25 1.23	ORP (mV) +/-10 mV - 9 - 7 - 7	[Surface] (mg/l) +/- 10% 5.54	(NTU) +/- 10% <u>74.4</u> [5.(	(PPT) 0.6 0.6	Clear/N
Depth of Screen (ft.           Time         D           Stabilization         0           0949         14           0959         1           0959         1           1009         14           1009         14           1015         -           1035         1	(ft.):	(ml/min) Purge at 200-500 5()0 400 350 350 350	Total Volume (gal) 3 7 4,1 4,1 4,4 4,4 4,5,5	pH (Std. Units) +/- 0.1 7.(59 7.07 7.03 7.03 7.05 7.05	(c) 19.48 19.15 19.66 18.00	Cond. (mS/cm) +/- 3 % 1.25 1.23	ORP (mV) +/- 10 mV - 9 - 7 - 7	[Surface] (mg/l) +/- 10% 5.54	(NTU) +/- 10% <u>74.4</u> [5.(	(PPT) 0.6 0.6	Clear/N
Time D Stabilization 0949 14 0949 14 0959 11 1009 14 1009 14 1009 14 1015	DTW (tic) <0.3' 14.48 14.10 13.70 13.84 13.95	(ml/min) Purge at 200-500 5()0 400 350 350 350		(std. Units) +/- 0.1 7.(59 7.07 7.03 7.03 7.05 7.05	(c) 19.48 19.15 19.66 18.00	Cond. (mS/cm) +/- 3 % 1.25 1.23	ORP (mV) +/- 10 mV - 9 - 7 - 7	[Surface] (mg/l) +/- 10% 5.54	(NTU) +/- 10% <u>74.4</u> [5.(	(PPT) 0.6 0.6	Clear/N
Stabilization         0944         0949         0954         0959         1004         1009         1015         1015         1035	<0.3 14.48 14.10 13.70 13.84 13.95	(ml/min) Purge at 200-500 5()0 400 350 350 350		(std. Units) +/- 0.1 7.(59 7.07 7.03 7.03 7.05 7.05	(c) 19.48 19.15 19.66 18.00	Cond. (mS/cm) +/- 3 % 1.25 1.23	ORP (mV) +/- 10 mV - 9 - 7 - 7	[Surface] (mg/l) +/- 10% 5.54	(NTU) +/- 10% <u>74.4</u> [5.(	(PPT) 0.6 0.6	Clear/N
Stabilization         0944         0949         0954         0959         1004         1009         1015         1015         1035	<0.3 14.48 14.10 13.70 13.84 13.95	Purge at 200-500 500 400 350 350 350	37 4.1 4.4 4.9 5.5	++.0.1 7.69 7.07 7.03 7.08 7.08 7.09	19.48 19.15 19.66 18.00	+1-3% 1.25 1.23	+/-10 mV 9 7 3	+/- 10%	+/- 10% <u>74.4</u> [5.1	0.6	Clear/N
0944 14 0949 14 0954 1 1004 13 1009 14 1015 -	14.10 14.10 13.70 13.84 13.95	200-500 500 400 350 350 350	4.1 4.4 4.9 5.5	7.69 7.07 7.03 7.08 7.09	19.15 19.66 18.00	1.25	-9 -7 3	5.54	24.4 15.1	0.6	
0949 1 <sup>4</sup> 0954 1 1004 1 1009 1 1015 -	14.10 13.70 13.84 13.95	400 350 350 350	4.1 4.4 4.9 5.5	7.07 7.03 7.08 7.09	19.15 19.66 18.00	1.23	-7		15.1	0.6	
0954 1 0959 1 1004 1 1009 10 1015 -	13.70 13.84 13.95	350 350 350	4.9	7.03 7.08 7.01	19.66		3	5.07			(1)
0959 11 1004 11 1009 10 1015	13.84	350 350	4.9	7.08	18.00	1.21		2.26	1163		
1004 11 1009 10 1015	13.95		5.5	7.07	10.00	1.19	-16			0.6	H F
1009 10 1015	i sace i la		222		18.82		+	2.29	9.36	0.6	1/ )
1015 -	14.10	350	5.9	7111		1.19	-10	2.17	8.28	0.6	<u>Ц</u>
1035 1				104	18.72	1.19	-3	2.17	7.03	0.6	11 1
1035 1			+	Colle	1 So	male					
						rfie					
	15.0		0.9	7.06	19.14	1.21	8	209	51.5	2,6	
-	ump Intake	Depth:	· · · · · · · · · · · · · · · · · · ·	· · · · ·	Control Box Se	etting (Hz):	•		Sampling: (Sa	ample at 100-250	ml/min)
				Ferro	us I	ron:	0.15	mg/L	•		
					<del>.</del>						-
Depth to Water Bef	Before Samp	aling: 1식 .	1			SAMPLIN					
Sample Methodolog	logy: USEF	A - Low Flo		g Procedures wi	th submersible					34	
Sample Name: 6			- P	15		QC Sample:	None			19 A.B. 18.9	
Sample Date/Time	ne: 12/	18/14	1019	5						209	
Sampler / Signature		Holme			mer				11. 121		
Filtered Metals Col	ollected:		ilter Size:	0.45 M	<u>n</u>			r			
Sample Observatio				ired prior to cell	ecting sample	24				A. M.	
Parameters:		> naromolor	is not requi	1 Chrin	PIA	Study F	arranote	275	West and		
	itions: N ization of this		TAM					0	Sec. Same	₩ .*	

Page 1 AD

	•											
	Well Number:	EPA-	- 31 -	0B			Site: Garfie	d Groundwate				
G 11	Field Crew:	Balas			0		Date: /2 /	(8	Project #:	431007.04.0	3.05	
	Well Depth (ft.)	25.1	7		Purge Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Foot	
~		1.46			USEPA - Low I	low	2"	.163		5"	1.020	
	Water Column		4		Sampling Proce		3"	.367		6"	1.469	
	Well Diameter	(in.): 2 · · · ·	1		with submersib		. 4"	.653		8"	2.611	
		163			Water Quality I Horiba U-52	<u>Meter:</u>	~					
	Well Volume (g Depth of Scree		25									
	Departer Corec						Field Paran	neters			84 - S. A.	
	Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	D.O. [Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
	Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		· D 7
Initial	6848	13.25	425	<u> </u>	7.49	12-81	1.50	-1	3.15	488	O.K	yellow non.
	0853	13,02	350	"6	5.44	14.43	1.60	347	1.02	270	0,8	yellow/none
	0858	13,05	350	1.1	5.34	15.93	1.61	347	,72	202	0.8	ye low/nor
	0903	13,00	350	116	5136	16.24	1,63	347	.57	186	0,8	yellow/none
	0908	13.02	340	2,0	5,40	16.44	1164	346	. 44	146	0.8	yellen more
	0918	13.0)	340	3.0	5.50	16.73	1.66	343	.24	89.3	0.0	yel autra
	0928	13,00	350	3.8	5.95	14.85	1,68	370	.10	64.6	08	Tellaspore
•	0{73	13.00	350	43	5.62	16:89	1,69		0.00	56.7	0.9	you apper
	0938	13,00	350	4.8	5.74	16.77	1.70	337	0,0	52.0		yella In
	0943	13 1	340 350			16:88	$\frac{1.72}{1.72}$	334	0.00	47 N	0.9	ye within
	0948	12.00	340	5.8 G.3	5.77	16 188	1.73	333	0.00	38:7	0.8	yellas/non
Post-Purge		Pump Intake		<u><u><u>9</u>,7</u></u>	11.10	Control Box Se	1 C. J.		10 : 0		Sample at 100-250	1
	Remarks:					<u>Quinter Dex es</u>		•			250	
		Ö	20				86.4	0			270	
						1-1	erren	is Im-	Erro	r lim	t-ya	1102
								watt	cel i	in in t	v pr, ~ c	ie/
		d'						7040	unj_			
							SAMPL	ING				
	Depth to Wate											
	Sample Metho	dology: USE	$\frac{PA - Low Flow}{2}$	- Zi-0	g Procedures wi 冯 - <i>ひ 5</i>	th submersible	QC Sample	none		<u> </u>		······································
	Sample Name	2	- <u> </u>	10	10	· · · · · · · · · · · · · · · · · · ·	QC Sample					- 1
	Sampler / Sigr	· · · · ·		200								
	Filtered Metals		(Ŷ) N F	Filter Size:	.45							
	Sample Obser										·	
	Notes: 1 = sta		s parameter	r is not requ	ired prior to coll	ecting sample						
	Parameters:	0.76	<u>/                                    </u>	107 ;	study			<u> </u>				
					12-5							
					163							
				Z	375							
				, <u>r</u>	-							

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1	Well Number:	EPA-	31-013				Site: Garfield	Groundwate	Contamin	ation Superfu	nd Site	
		Balac					Date: /2 []	liv	Project #:	431007.04.0	3.05	
	Well Depth (ft.):	, ,			Purge Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Foot	
	DTW (ft.):	500	,		USEPA - Low F	low	2"	.163		5"	1.020	
	Water Column	(A) Je		~	Sampling Proce		3"	.367		6"	1.469	
	Well Diameter (	• •		2	with submersibl		4"	.653		8"	2.611	
	Gal. per ft.:	per la companya de la	ĊΥ	_	Water Quality N				3			
	-	-1	A		Horiba U-52							
	Well Volume (g Depth of Scree						(@)					
	Deput of Screek	n (n.).					Field Parame	ters				
1			Flow Rate	Total Volume	рН	Temp	Cond.	ORP	D.O. [Surface]	Turbidity	Salinity <sup>1</sup>	
	Time	DTW (tic)	(ml/min)	(gal)	(Std. Units)	(C)	(mS/cm)	(mV)	(mg/l)	(NTU)	(PPT)	Color/Odor
	Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%	-	
	0958	NUU	350	1 1	F.80	14,94	124	331	12,00	35,2	09	. ella for
Initial		1					1, 77			369	0.9	921092
	1003	13,00	340	7.3	5,81	16,97	1,74	331	O.W	269	07	y.e / ca/lin
	10/0	colle	ct	SGr	nple							
					<b>U</b>		94 - C					
	•				· · · ·							
			Γl									
		1				Fla	n".					
0		· /	<u></u>	}		- 47						
۹L -	/	ľ	L	$\lambda$								
1												
	-/											
		17	- Cid		C 0.0	11 18	1.79	22/	<u>^</u>	201	0.9	yellastone
Post-Purge	1029	13,00	250		5.90	14108		326	0.4		<b>v</b> 1 /	
	Remarks:	Pump Intake	Depth:			Control Box Se	etting (Hz):			Sampling: (S	Sample at 100-250	ml/min)
	A											
	с.									Δ		
				- /			$\mathcal{O}\mathcal{O}$	$\sim$		/		
	1			(	2	1 - 1	VQ	- 4	$\leq \geq$	C		
				- /				0				
							SAMPLIN	3				
	Depth to Water	Before Samp	ling:									
	Sample Metho	dology: USEF	A - Low Flo	w Sampling	Procedures wit	h submersible j	oump					
	Sample Name:						QC Sample:					
	Sample Date/T	ime:			-			<u> </u>		1		
	Sampler / Sign	ature:				$Q \leftarrow$	> 4	$\angle Q$	l-	[		
	Filtered Metals	Collected:	Y/N F	ilter Size:	) (	t	(/	/				
	Sample Obser	vations:					V	/				
	Notes: 1 = stat	bilization of this	s parameter	is not requ	red prior to colle	cting sample						
	Parameters:											

Г		FRA	212 6	2			Site: Garfield	Constants	Contomin	ation Suporfur	d Site	
	Well Number:	EPA-					Date: JZ//			431007.04.03		
ł	Field Crew:		erone		Purge			-				
	Well Depth (ft.):	•			Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Foot	
	DTW (ft.): 12				USEPA - Low F		27	.163		5"	1.020	
	Water Column				Sampling Proce		3"	.367 .653		6" 8"	1.469 2.611	
	Well Diameter (				with submersib			.055		0	2.011	
	Gal. per ft.: <i>(</i> ), Well Volume (g				Water Quality N Horiba U-52	vieter.					22	
	Depth of Screet		20		TOTIDE O'OL							
							Field Parame	ters				
	Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	рН (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	D.O. [Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
	Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%	이 이 가지 않는	
Initial	11:40	13.30	400	-	3.5]	16.22	1.73	462	0.76	50.7	0.9	brownish yellow, m
	11:45	13:77	390	1.0	3.75	17.62	1.71	440	0.00	33.8	0.9	Same asabove (
	11:50	14.06	410	1.6	3.74	18.01	1.71	439	0.00		0.9	SAA
	11:55	Non	245 6	even	ts-pi	mpra	te inc	onsiste	VICY		I	
	12:00	14.01	310	2.5	3.60	18.62	1.67	451	0.00	35.3	0.8	SAA
	12:10	16.90	420	4.0	3.46	18.07	1.70.	466	0.00	34.1	D.g	SAA
	12:15	16.35	400	4.5	3.26	17.79	1.68	485	0.19	13.9	0.8	SAA
	12:20	16.18	410	5.1	3.25	17.91	1.68	487	0.17	9.81	0.8	SAA
	12:25	15.90	420	5.6	3.25	17.91	1.67	488	0.14	6.86	0.8	SAA
	12:30	15.95	400	6.0	3.25	17.87	1.68	488	0.14	4.39	0.8	SAA
× ***	12:35	Colle	ct s	Samp	12 -							→
ost-Purge	12:45	15.05	330	6.2	3.37	17.28	1.68	476	0.59	4.05	0.8	SAA
-	Remarks:	Pump Intake	Depth:	5' bło	<u>c</u> -	Control Box S	etting (Hz): 90	.80 -9	1.50		ample at 100-250	) ml/min)
				verso	-			1		9	0,50	
	•			.8' t								l
. 9	63 S.				issues							~
	11 <sup>12</sup>			. <b>r</b> -5	119003							а. 
-		-		10	ذ ب		;					·
8	terrow	s fron	Had	Re	sult:	0.21	ing/L	- î				
	000				9		SAMPLIN	G				
	Depth to Water	Before Samp	ling:			-	- 10 10					
				w Sampling	Procedures wi	th submersible	pump					
					1-0B-1		QC Sample:	Novie				
	Sample Date/T			1235	-		Ŋ		040		5. 1	<u>.</u>
	Sampler / Sign											×
					0.45 MI							-
	Sample Observ					001			0			
	Notes: 1 = stat	ilization of this	s parameter	is not requi	red prior to colle	ecting sample	iclued ch		1.000	10 Min		
	Parameters:	IEXGVG LE	M4 CM	remiti	NI, IUIMI	4N/) (15)	OLDER CA	NOVM UV	Tano I	<u>1 67 L j</u>	9	· · · · · · · · · · · · · · · · · · ·

M	Veil Number:		5 <u>7-0</u> 8				Site: Garneid	Groundwate	r Contamin	ation Superfur	nd Site	
E	ield Crew:	2. 1-101	nes				Date: 2/5	15	Project #:	431007.06.00	3.02	
v	Vell Depth (ft.):	Za	-		Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Fo	ot
	DTW (ft.): 13	-			USEPA - Low I	Flow	2"	.163		5"	1.02	0
	Vater Column (		2		Sampling Proc	edures	3"	.367		6"	1.46	39
V	Vell Diameter (	in.): Z			with submersib	le pump	4"	.653		8"	2.61	11
	Gai. per ft.: () ,				Water Quality I	<u>Meter:</u>						
	Veli Volume (g				Horiba U-52							
F	Depth of Screen	n (ft.): <b>[0-</b>	/0	· · · · · · · · · · · · · · · · · · ·								
$\mathbf{F}$				Total			Field Parame		D.O.	<u> </u>		<u> </u>
	Time	DTW (tic)	Flow Rate (mi/min)	Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	[Sunface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
t			Purge at									
	Stabilization	< 0.3'	200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		
at	1352	13.70	200	0.0	5.81	(1.77	1.64	38	0.93	121	0.9	Yellow/Green,
	1357	13.69	200	0.4	5.31	13.05	1.57	414	6.00	74.6	0.8	r( ((
ŀ	1221	12.00					1		1.			-
Ļ	1402	13.55	200	0.6	5.20	13.30	1.58	422	0.00	48.7	0.8	(1 1)
	1407	13.60	150	0.7	5.14	12.70	(10)	427	0.00	375	0.8	1 1
F					5.17.	14.32	1.56	428		48.9	0.8	11 11
ł	1412	13.60	100	1.0		· · · · ·				48.7		
	1417	13.64	100	1.2	5.09	15.76	1.56	434	0.00	57.6	0,8	(· //
	1422	13.67	100	2.1	505	15.55	1.58	435	0.00	73.7	0.8	M 11
F		13.62		1.7	5.04				1		0.9	(c) (1
┢	1427	13.00	100	1.1	····	17.51	1.55	420	0.00	170		
	1432	15.65	150	2.0	5.05	9.19	1.54	418	0.00	265	0.8	<u> </u>
	1437	13.64	100	2.2	5.07	20.53	1.54	419	0.00	232	0.8	11 11
1			1.00									
ŀ	1445				pllect	Sanp	le –					
ge	1525	13.65	150	3.2	5.05	17.03	1.56	444	0.20	102	0.8	(i (i
1	Remarks:	Pump Intake	Depth:	5		Control Box Se	etting (Hz): (2	3		Sampling: (S	ample at 100-2	50 ml/min)
	- 7			۱.	ſ,	1 .						
	- T:	5062	mant	ani ng	-riow i	ste , Ed	ulpment	issue				
							•					
ł	J.	/					SAMPLIN	G				
ł	Depth to Water	r Before Same	alina: 13	.(5	~				*e		····	
- 6				w Sampling	Procedures wi	th submersible	pump	,		4		
- 8	Sample Name:						QC Sample:	Nane				
- 1	Sample Date/T	- 11	115	1449	j							
	Sampler / Sign	ature: D.	tome	5/1/	min Ut	m						
	Filtered Metals	Collected:	() / N F	ilter Size:	0.45 M	<u>^</u>						
- 1	Sample Obser		UN CO		sues			<u></u> .				
	Notes: 1 = stat	bilization of thi	s parameter	is not requ	ired prior to colle	ecting sample			·	<del>_</del>		
	Parameters:											

Well Number:	QA-30	-0B				Site: Garfield	Groundwater	Contamir	ation Superfu	nd Site			
Field Crew:		SBA	len			Date: 2/5	115	Project #:	431007.06.0	8.02			
Well Depth (ft.)				Purge Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Foot			
DTW (ft.): 2				USEPA - Low	Flow	2"	.163		5"	1.020			
Water Column				Sampling Proc	edures	3"	.367		6"	1.469			
Well Diameter	(in.): Z "			with submersit		4"	.653		8"	2.611	-		
Gai. per ft.:				Water Quality	Meter:								
Well Volume (	oal.):			Horiba U-52									
Depth of Scree		-22		_								_	
						Field Parame	ters		1				
Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	D.O. [Surface] (mg/l)	Turbidity (NTU)	Satinity <sup>1</sup> (PPT)	Color	r/Odor	
Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%				
1316	13.30	300	~	6.90	10.90	1.10	-Q27	0.30	210	0.5	LTBRO	word	
1321	13.89	300	0.3	6.67	12.42	1.09	-53	0.00	44.5	0.5	11		
1326	13.85	300	0,6	6.44	12.79	1.09	-65	0.00	78.3	0.5	37.7	NR	
1331	13.81	300	0.9	6.37	13.01	1.09	-43	0.00	90.9	0.5	(LEAT		
1336	13.83	300	1,2	6.31	13.16	1.09	-63	0.00	180	0.5	49/17	BROL	
1341	13.84	300	1.6	6.25	13.31	1.09	-40	0.00	159	0.0	CIGHT	BRO	
1346		300	1.9	6.22	13,23	1.09	-57	0.00		0.5			
1351	13.83		23	6.21	13.27	1.09	-51	0.00	79	0.5	1 \	' 7	
1356	17.82	300	2.6	6.21	1324	1.09	-49	0.00	78	0.5	1(	• \	
1405	6	ciec	T SI	AMRE			1						
e 1415	13.78	300	/	6.35	13.85	1.08	-78	0.00	2520	0.5	LTB	rer	
Remarks:	Pump Intake				Control Box S		1911 C			ample at 100-250			
		9.5				55							
											_		
Denth to Wet	er Before Sam	olina:		<u></u>		SAMPLIN	G		and Same	101-0 U			
			w Sampling	Procedures wi	th submersible	pump							
Sample Name	1.1			-0B-0		QC Sample:	×						
Sample Date/	010	1405		215/1	5								
Sampler / Sig		92les	Ina	6									
Filtered Metal		DIN F	ilter Size										
Sample Obse			ROWH							and the second second			
				ired prior to coll	ecting sample	and the second se							
Parameters:	SUL												

		58A-1	3-05	2		-	Rites Confield	Crownshurster	Cantonia	etion Suportur	d Site	
	Weil Number: Field Crew: 1	. SALS		D			Site: Garfield Date: 7/5/			431007.06.06		
ł					Purge							······································
	Well Depth (ft.):				Methodology: USEPA - Low I	low	Diameter	Gal. Per Foot		Diameter 5"	Gal. Per Foot 1.020	
	DTW (ft.): 12 Water Column (				Sampling Proce		3"	.163		6"	1.469	12
	Well Diameter (				with submersib		4"	.653		8"	2.611	
	Gal. per ft.: (				Water Quality N	Aeter:						
		al \·			Horiba U-52							
	Depth of Screer	n (ft.): 22	-32									
				Total	1		Field Parame	ters	D.O.		1	
	Time	DTW (tic)	Flow Rate (ml/min)	Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	[Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Color/Odor
	Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%		
Initial	1142	14.40	400	/	7.35	13.35	0.961	-188	0.70	63.3	0.5	LEAR
	1147	13.95	300	0.4	7.17	13.01	0.945		0.05	12.1	0.5	CLEAR
	1152	13.86	250	0.6	6.85	14.05	0.975		0.00	121	0.5	LEAR
	11:57	13.82	250	0.4	6.63	14.45	0.983	-192	0.00	10.5	0.5	
	1202	13,82		1.0	6.60	14.52	1	-192	0.00	9,3	0.5	crean
	1207	13.83	250	1.2	6.59	14.69	0.996	-194	0.00	10.9	0.5	1x (1
	1212	13.83	250	1.4	6.77	14.68	1.01	-207	0.00	10.4	0.5	11 4
	1217	13.82	250	1.6	7.07	14.75	1.01	-223	0.00	9.2	0.5	t t
	1222	13.82		1.9	7.18	14.97	1.01	-229 -228	0.00	9.6	0.5	15 17
	1227	13.81	250	22	7.18	14.95	1.01	-29	0.00	9.3	0.5	· · · ·
	1236	COL	ices	54	14AR					07		
Post-Purge	1246	3.8/	250	/	7,23	14.01	1.07	-218	0.00	8.3	0.5	CLEAR
	Remarks:	Pump Intake	Depth:			Control Box Se	ettina (Hz):			Sampling: (S	ample at 100-250 i	ml/min)
		2-	7			6	87					
							SAMPLIN	3	~			
	Depth to Water								<i>×</i>		<u></u>	
		1.1	1		Procedures with			$\overline{\mathbf{x}}$				······································
	Sample Name: Sample Date/T	- 1-			30		wo sample:					
	Sampler / Sign	•	Tyla	de	in							3 <b>3</b> 0 823
	Filtered Metals		ON F	ilter Size:							2	
	Sample Observ	vations:	(Lea	C							2	
	Notes: 1 = stat		s parameter	is not requ	ired prior to colle	cting sample		-, -, -,	<u></u>			
	Parameters:	au	<b>.</b>									11 A

Well Number:	EIA -	29				Site: Garfield	Groundwate	r Contamin	ation Superfun	d Site		
	T.SUM		2			Date: Z/U	115	Project #:	431007.06.06	.02		
Well Depth (ft.):	20-	20		Purge Methodology:		Diameter	Gal. Per Foot		Diameter	Gal. Per Foot		
DTW (ft.): 1		CO		USEPA - Low I	Flow	2"	.163		5"	1.020		
Water Column				Sampling Proc		3"	.367		6"	1.469		
Well Diameter (	(n): 7 ×			with submersib		4"	.653		8"	2.611		
	a llazz			Water Quality I	• •							
Gal. per ft.:				Horiba U-52	WOUGI.							
Well Volume (g Depth of Scree	all.): 	200 15	-70	Horiba 0-52		1-2-2						
Deptil of Screek	1 (It.).					Field Parame	tors					
			Total		-			D.O.	Turkida	Option		
Time	DTW (tic)	Flow Rate (ml/min)	Votume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	[Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Co	lor/Odor
		Purge at										
Stabilization	< 0.3'	200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%			
11.110	11.50	300	//	3.11	12.40	1.57	449	0.00	39.2	0.8	1/211	ow
			.2	1	i					0-7	YELL	,
1121	<u>[1.5Le</u>	300	0.3	3.13	14.37	1.50	435	0.00	98.7		Tu	$\omega$
1/210	11.58	300	0.6	3.13	14.75	1.49	432	0.00	117	0.1	ч	e j
1121	11 / 1				1010		470		100	0.7		c ;
1151	11.61	1	6.9	3.14	15.06	1.48	428	0.00	109			
1136	11.01	300	1.2	3.15	15.17	1.47	427	5.00	24,7	0.7	L.	v
	1117	300	1.5	3.15	15.25	1.47	425	0.00	77.0	0.7		-
1141	11.62		115	-	1	497						
1446	11.03	300	1.8	3.13	15.29	1.49	427	0.00	19.6	0.7	IN .	1
1150		Car	LEU	CA	IPIE							
1130		100	20	- Jul	ma							
			1									
<u> </u>	<u> </u>	+				+			1			
				L								
1216	11.64	200	1	3.10	15.40	lin	447	0.00	29.6	0.8	480	
Remarks:	Pump intake			1 2010	Control Box S					ample at 100-250		
Reinarks.	-				Consol Don D	<u>A contractores</u>			eenikungi (e		,	
	17.	5				81						
						0						
1												
						SAMPLIN	G					
Depth to Wate	r Before Sam	pling: 11	103									
-			w Samplin	g Procedures wi	th submersible	pump						_
Sample Name	1 11	L ERA		8-020		QC Sample:	X					
Sample Date/	1	16/15	1150	5	SILVEN.				0.00			
Sampler / Sign	6	Tylen	en	N								
Filtered Metals		ON F	ilter Size:	-								
Sample Obser		44000										
	and the second se			ired prior to coll	ecting sample							
	FUL		R									

P	ell Number:	EPA-3	1-00				1	Groundwate					
F	ield Crew: 1	2. Halm	<b>e</b> 5		Burne		Date: Z/6	15	Project #:	431007.06.00	3.02		
W	/ell Depth (ft.):	25	V		Purge Methodology:		Diameter	Gal. Per Foot	t	Diameter	Gal. Per Foo	t	
	TW (ft.): 13				USEPA - Low F	low		.163	)	5"	1.020	)	
	Vater Column (				Sampling Proce	edures	3"	.367		6"	1.469	)	
W	Vell Diameter (	in.): <b>2</b>	•		with submersib	le pump	4"	.653		8"	2.611		
v	ai. per ft.: <b>()</b> Vell Volume (g Vepth of Scree	al.): <b>1.93</b>	25		<u>Water Quality N</u> Horiba U-52	<u>Aeter:</u>							
E							Field Parame	ters					
	Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Temp (C)	Cond. (mS/cm)	ORP (mV)	D.O. [Surface] (mg/l)	Turbidity (NTU)	Salinity <sup>1</sup> (PPT)	Colo	r/Odor
	Stabilization	< 0.3'	Purge at 200-500		+/- 0.1		+/- 3 %	+/- 10 mV	+/- 10%	+/- 10%			
	1031	13.60	400	0.0	4.69	10.97	1.50	387	2.05	113	0.7	Yellow/c	reen
	10.36	13.68	480	0.6	4.83	14.76	1.49	378	0.00	92.8	0.7	"	N
ſ	1041	13.68	480	1.2	4.89	14.79	1.50	314	0.00	75.2	0.8	(1	٨
	1046	13.70	480	1.8	4.95	15.00	1.52	371	0.00	55.6	8.0	6	11
	1051	13.70	480	2.4	5.02	15.11	1.54	367	0.00	39.9	8.0	N	н
	1056	13.70	480	3.0	5.09	15.14	1.56	364	0.00	32.0	0.8	le	0
ŀ	1101	13.70	480	3.6	5.17	15.21	1.58	359	0.00	23.3	0,8	£¢	//
	(106	13.70	480	4.Z	5.23	15.23	1.59	356	0.00	20,3	0.8	31	ĸ
	1111	13.70	480	4.8	5.28	(5.32	1.60	354	0.00	19.7	0,8	q	11
L	1116	13.70	480	5.4	5.36	15.29	1.61	350	0.00	18.3	8,0	11	1/
	1120		<u> </u>	llee	Sam	ole -							
e	1150	13.80	480	8.0	5.46	12.74	1.72	341	2.82		P.0	h	h.
	Remarks:	<u>Pump Intake</u>	<u>Depth:</u> 2				ettina (Hz): 8°				ample at 100-25		
ł							SAMPLIN	G		and and a second se			
	Depth to Wate			10	Dread	lh automatiki-							
	Sample Metho Sample Name				Procedures wi		QC Sample:	Field D	(10)				
- 1	Sample Name Sample Date/I			1170	1		do Semple:	muy D	-				
- 6	Sample Date/1 Sampler / Sign		Holone	1h	min Holan	M					and and a second		
r	Filtered Metals		V/N F										
- 11	Sample Obser		~			-							- Annia
					ired prior to colle								

Attachment 6 Vironex Injection Services Report

# **Injection Services Report**

Prepared for:



Prepared by:



Garfield Groundwater Contamination Superfund Site

Garfield, NJ

June 23, 2014 – July 2, 2014

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# Project Summary

Project Name: Garfield Superfund Site

Project Dates: June 23, 2014 – July 2, 2014

Manpower: Brendan Gerber (Regional Manager); Robert Jones (Technician); Mat Bacher (Technician)

Equipment: DC5 (Truck Platform) equipped with two stainless steel batch mixing tanks, integrated secondary containment, safety shower and eye wash, Air Diaphragm Pump for distribution.

Tooling: 1.5 inch top down injection tools with a 2 foot screen length and equipped with injection caps

Rental Equipment: Forklift (chemical management) Conex Box (chemical management)

Water Source: Fire Hydrant

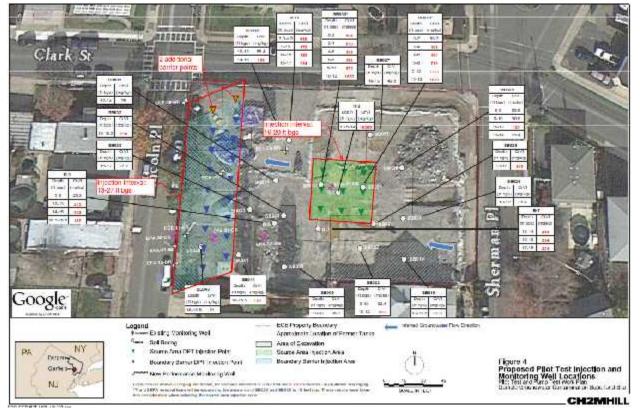
Proposed Scope of Work: Vironex proposed to prepare, batch, mix and inject a total of 36,200 gallons of a 60% solution of EVO, Magnesium Sulfate and Water under low pressure and low flow conditions into 25 total locations across the site. Vironex was to provide 3,453 gallons of 60% SRS-SD and 1,347 pounds of Magnesium Sulfate. Vironex proposed to use a 2 foot, top down injection tool for distribution. While injecting at the Reactive Barrier, Vironex proposed a 10 foot to 27 foot injection zone, injecting 1,700 gallons per point at 18 locations. While in the Source Area Vironex proposed a 10 foot to 20 foot injection zone, 1,000 gallons per point at 9 locations.

Project Summary: While injecting into the Reactive Barrier, Vironex encountered difficult drilling; refusal was met between 17 feet and 24 feet causing the injection zones to be adjusted. Vironex switched from a top down 2.25 inch injection tool with pre strung tooling to a 1.5 inch injection tool with an injection cap. Certain locations specified in the injection field logs were offset in the event there was surfacing or refusal was met before an acceptable zone was achieved to start injections.

While injecting into the Source Area, Vironex continued with the 1.5 inch injection tooling. The injection zones again were adjusted due to shallow refusal. Due to the difficult drilling encountered throughout this site, there were a total of 7 injection tools that were lost or broken.



# Site Map





	Date	Time On- Site	Time Off- Site	Lunch Break (hrs)	Total EVO Injected (gal)	Total Magnesium Sulfate Injected (Ibs)	Total Water Injected (gal)	Total Solution Volume Injected (gal)	DPT Injection Points Completed
			Run	ning Iotal >	3,448	1,374	25,254	28,701	29.1
Monday	6/23/2014	10:15 AM	5:00 PM	0.75	-	-	-	-	-
Tuesday	6/24/2014	7:00 AM	5:15 PM	0	115	42	802	916	0.7
Wednesday	6/25/2014	7:00 AM	5:15 PM	0	359	131	2,515	2,875	2.0
Thursday	6/26/2014	7:00 AM	6:00 PM	0	367	135	2,573	2,940	2.1
Friday	6/27/2014	7:00 AM	6:15 PM	0	445	162	2,604	3,049	2.2
Saturday	6/28/2014	7:00 AM	6:30 PM	0	490	179	3,429	3,919	2.8
Sunday	6/29/2014	7:00 AM	5:40 PM	0	503	184	3,520	4,023	2.9
Monday	6/30/2014	7:00 AM	6:10 PM	0	441	162	3,088	3,529	2.5
Tuesday	7/1/2014	7:00 AM	6:00 PM	0	467	209	3,821	4,288	6.0
Wednesday	7/2/2014	7:00 AM	3:00 PM	0	261	170	2,902	3,162	7.9
I				Injected	3,448	1,374	25,254	28,701	29

# Injection Summary



# Project Photographs



Vironex Injection Platform



Vironex Direct Push Rig



Injection Manifold



Safety Shower & Eyewash Station

# Search and Destroy®





EVO in Secondary Containment





Magnesium Sulphate



Field Computer for Data Entry

**Completed Injection Locations** 



Appendix – Injection Logs

								Vironex Fiel	ld Data She				
Injection Point ID	Start Date	Start Time	End Date	End Time	Depth	Start Up Pressure (psi)	Average Pressure (psi)	Average Flow Rate (gpm)	EVO Injected (gal)	Epsom Salt Injected (lbs)	H <sub>2</sub> O Injected (gal)	Amended Total Gal	Notes
IP-01	6/25/14	1:42 PM	6/25/14	2:58 PM	15' - 17'	25	7	3.0	25	9.1	175	200	
	6/25/14	3:10 PM	6/25/14	4:08 PM	13' - 15'	8	7	3.5	25	9.1	175	200	
IP-01a	6/29/14	10:18 AM	6/29/14	1:15 PM	13' - 15'	30	20	2.0	38	13.7	263	300	
	6/29/14	1:27 PM	6/29/14	5:26 PM	15' - 17'	25	10	3.5	63	22.9	438	500	
	6/30/14	7:41 AM	6/30/14	8:15 AM	15' - 17'	15	15	4.5	19	6.9	131	150	Location complete.
Total H₂0 1181	Total EVO 169	Total Epsom Salt 62	Total Solution 1350	Additional No	tes: Hit refusa	al at 17'. Offs	et location. I	Put extra volu	ume into IP-0	4 due to shal	low refusal c	on IP-01.	
IP-02	6/27/14	7:55 AM	6/27/14	8:40 AM	21' - 19'	25	20	2.5	9	3.4	66	75	
	6/27/14	9:36 AM	6/27/14	11:05 AM	21' - 19'	20	19	2.3	42	15.3	125	167	
	6/27/14	11:29 AM	6/27/14	11:48 AM	19' - 17'	10	7	1.0	5	1.9	16	21	
	6/27/14	12:26 PM	6/27/14	3:26 PM	19' - 17'	16	10	2.0	38	13.7	263	300	
	6/27/14	3:35 PM	6/27/14	5:48 PM	17' - 15'	16	14	3.0	32	11.7	224	256	
	6/28/14	8:10 AM	6/28/14	8:24 AM	17' - 15'	15	15	3.0	6	2.0	39	44	
_	6/28/14	8:42 AM	6/28/14	12:04 PM	15' - 13'	2	2	2.0	43	15.8	302	345	Location complete.
Total H <sub>2</sub> 0 1034 IP-03	Total EVO 175 6/27/14	Total Epsom Salt 64 2:00 PM	Total Solution 1208	Additional No									
IP-03			6/27/14	4:25 PM	13' - 15'	35	25	2.5	38	13.7	263	300	
	6/27/14	4:34 PM	6/27/14	5:48 PM	15' - 17'	25	20	3.0	26	9.6	185	211	
	6/28/14 6/28/14	8:10 AM 8:30 AM	6/28/14 6/28/14	8:24 AM	15' - 17' 17' - 19'	20	20	3.0	6	2.2	43	49	
	6/28/14	10:47 AM	6/28/14	10:44 AM	17 - 19	15	15	3.0	35	12.8	245	280	
	6/28/14	1:45 PM	6/28/14	1:38 PM 3:27 PM	21' - 23'	35 45	20 20	2.5	35 35	12.8	245	280 280	Defined at 221 Location complete
Total H <sub>2</sub> 0 1225	Total EVO 175	Total Epsom Salt 64	Total Solution 1400	Additional No		45	20	3.5	35	12.8	245	280	Refusal at 23'. Location complete.
IP-04	6/26/14	8:15 AM	6/26/14	11:56 AM	13' - 15'	5	5	2.0	25	9.1	175	200	Surfacing through the annulus.
	6/26/14	12:04 PM	6/26/14	1:49 PM	15' - 17'	28	16	2.0	25	9.1	175	200	
	6/26/14	2:18 PM	6/26/14	3:36 PM	17' - 19'	25	12	2.5	25	9.1	175	200	
	6/26/14	3:43 PM	6/26/14	5:13 PM	19' - 21'	40	20	2.5	25	9.1	175	200	
	6/26/14	5:30 PM	6/26/14	5:48 PM	20' - 22'	28	20	2.8	5	2.0	38	43	
	6/27/14	7:50 AM	6/27/14	8:40 AM	20' - 22'	30	25	2.5	20	7.2	137	157	
	6/27/14	9:36 AM	6/27/14	9:56 AM	20' - 22'	27	24	2.5	13	4.6	38	50	
	6/27/14	10:43 AM	6/27/14	11:48 AM	19' - 21'	7	7	2.0	18	6.6	54	72	Surfacing through the annulus. Lowered flow rate.
15.01	6/27/14	12:26 PM	6/27/14	1:16 PM	19' - 21'	16	15	2.0	9	3.1	60	68	Surfacing through the annulus. Abandoned location.
IP-04a	6/29/14	4:28 PM	6/29/14	5:27 PM	19' - 21'	30	25	3.0	17	6.4	122	139	Refusal at 21'. Location complete.
Total H <sub>2</sub> 0 1148	Total EVO 181	Total Epsom Salt 66	Total Solution 1329	Additional No	tes: Extra vol	ume into this	location due	e to shallow r	retusal on IP-	01.			

Injection Point ID	Start Date	Start Time	End Date	End Time	Depth	Start Up Pressure (psi)	Average Pressure (psi)	Average Flow Rate (gpm)	EVO Injected (gal)	Epsom Salt Injected (lbs)	H <sub>2</sub> O Injected (gal)	Amended Total Gal	Notes
IP-05b	6/28/14	4:15 PM	6/28/14	6:01 PM	13' - 15'	25	20	2.0	27	9.9	190	217	
	6/29/14	7:46 AM	6/29/14	8:11 AM	13' - 15'	22	22	2.5	8	2.9	55	63	
	6/29/14	8:17 AM	6/29/14	10:27 AM	15' - 17'	25	20	3.0	35	12.8	245	280	
	6/29/14	10:38 AM	6/29/14	12:18 PM	17' - 19'	7	7	2.8	35	12.8	245	280	
	6/29/14	12:28 PM	6/29/14	2:34 PM	18' - 20'	7	7	2.8	38	13.7	263	300	Refusal at 20'.
	6/29/14	2:38 PM	6/29/14	3:37 PM	16' - 18'	5	5	3.0	28	10.1	193	220	
	6/29/14	3:40 PM	6/29/14	3:56 PM	16' - 14'	10	10	3.5	5	1.8	35	40	Location complete.
Total H₂0 1225	Total EVO 175	Total Epsom Salt 64	Total Solution 1400	Additional No	tes: Hit refusa	al at 5' on IP-	05 and IP-0	5a.					
IP-06	6/25/14	8:53 AM	6/25/14	10:38 AM	15' - 17'		15	2.5	25	9.1	175	200	
	6/25/14	10:50 AM	6/25/14	12:07 PM	17' - 19'		20	2.8	25	9.1	175	200	
	6/25/14	12:15 PM	6/25/14	12:58 PM	18' - 20'		13	3.0	13	4.6	88	100	Hit refusal at 20'. 100 gal into this interval per client request.
IP-06a	6/30/14	8:21 AM	6/30/14	10:23 AM	15' - 17'	15	15	3.0	38	13.7	263	300	
	6/30/14	10:28 AM	6/30/14	1:04 PM	17' - 19'	25	15	3.0	50	18.3	350	400	
	6/30/14	1:15 PM	6/30/14	3:30 PM	19' - 21'	40	20	2.0	25	9.1	175	200	Location complete.
Total H₂0 1225	Total EVO 175	Total Epsom Salt 64	Total Solution 1400	Additional No	tes:								
IP-07	6/24/14	1:19 PM	6/24/14	2:00 PM	15' - 17'		25	0.5	2	0.7	14	16	Clogged injection tool. Ceased pumping and removed tooling.
	6/26/14	2:42 PM	6/26/14	3:05 PM	21' - 19'	5	4	1.5	5	1.8	35	40	Bottom up injection. Surfacing from annulus.
IP-07a	6/26/14	4:00 PM	6/26/14	5:12 PM	21' - 19'	20	10	2.0	18	6.6	126	144	
	6/26/14	5:28 PM	6/26/14	5:44 PM	19' - 17'	10	3	1.0	2	0.8	16	18	Surfacing through the annulus.
	6/27/14	8:05 AM	6/27/14	8:37 AM	19' - 17'	3	3	1.5	5	1.8	35	40	Surfaced from annulus again.
	6/27/14	9:36 AM	6/27/14	11:22 AM	19' - 17'	2	2	1.0	22	8.0	66	88	Surfaced from annulus again. Abandoned location.
IP-07b	6/30/14	8:45 AM	6/30/14	11:00 AM	24' - 22'	45	40	1.5	25	9.1	175	200	
	6/30/14	11:06 AM	6/30/14	2:00 PM	22' - 20'	40	40	1.5	25	9.1	175	200	
	6/30/14	2:08 PM	6/30/14	3:30 PM	20' - 18'	35	35	1.5	13	4.6	88	100	
	6/30/14	3:40 PM	6/30/14	4:07 PM	18' - 16'	20	15	1.5	7	2.5	47	54	Surfacing from annulus. Remaining volume into IP-08c.
Total H₂0 777	Total EVO 124	Total Epsom Salt 45	Total Solution 900	Additional No injected into I		flow rate to .	5 GPM, how	vever surfacii	ng continued	through the a	innulus. Mul	tiple offsets a	at this location due to refusal and surfacing. Remaining 500 gallons
IP-08b	6/28/14	1:08 PM	6/28/14	5:35 PM	15' - 17'	15	15	1.8	35	12.8	245	280	
	6/29/14	7:48 AM	6/29/14	8:47 AM	15' - 17'	5	5	1.5	9	3.4	66	75	Refusal at 17'. Surfacing from annulus.
IP-08c	6/30/14	4:03 PM	6/30/14	6:01 PM	17' - 19'	10	10	3.0	37	13.5	258	295	
	7/1/14	7:40 AM	7/1/14	8:21 AM	17' - 19'	15	15	4.0	31	11.4	219	250	
	7/1/14	8:23 AM	7/1/14	10:58 AM	19' - 21'	17	15	3.5	63	22.9	438	500	
	7/1/14	11:02 AM	7/1/14	1:10 PM	20' - 22'	20	20	4.0	63	22.9	438	500	Refusal at 22'. Location complete.
Total H₂0 1663	Total EVO 238	Total Epsom Salt 87	Total Solution 1900	Additional No	tes: Hit refusa	al 3 times at	3'. Refusal c	on IP-08 at 3'	and IP-08a a	at 5'. Additiona	al 500 gallor	is injected fro	om IP-07.

								-					
Injection Point ID	Start Date	Start Time	End Date	End Time	Depth	Start Up Pressure (psi)	Average Pressure (psi)	Average Flow Rate (gpm)	EVO Injected (gal)	Epsom Salt Injected (lbs)	H <sub>2</sub> O Injected (gal)	Amended Total Gal	Notes
IP-09	6/24/14	3:35 PM	6/24/14	4:35 PM	15' - 17'		5	1.5	13	4.6	88	100	
	6/25/14	8:00 AM	6/25/14	8:45 AM	15' - 17'		13	2.8	13	4.6	88	100	
	6/25/14	9:00 AM	6/25/14	11:10 AM	17' - 19'		10	2.5	25	9.1	175	200	
	6/25/14	11:15 AM	6/25/14	12:30 PM	19' - 21'	40	20	2.8	25	9.1	175	200	Minor surfacing around point. Reduced flow and continued.
	6/25/14	12:43 PM	6/25/14	2:20 PM	21' - 23'		15	2.8	25	9.1	175	200	
	6/25/14	2:33 PM	6/25/14	3:46 PM	23' - 25'	35	10	3.8	25	9.1	175	200	
	6/25/14	3:52 PM	6/25/14	4:52 PM	25' - 27'	30	10	3.5	22	8.0	153	175	
	6/26/14	8:12 AM	6/26/14	8:20 AM	25' - 27'	15	12	3.5	3	1.1	22	25	
	6/26/14	9:00 AM	6/26/14	9:52 AM	26' - 28'	35	35	4.0	25	9.1	175	200	Refusal at 28'. Location complete.
Total H <sub>2</sub> 0 1225	Total EVO 175	Total Epsom Salt 64	Total Solution 1400	Additional No	otes: Injection	point comple	ete.		<u>.</u>	•			· · · · ·
IP-10	6/24/14	1:03 PM	6/24/14	3:16 PM	15' - 17'		10	2.0	25	9.1	175	200	
	6/24/14	3:35 PM	6/24/14	4:40 PM	17' - 19'		10	2.5	25	9.1	175	200	Refusal at 19'.
IP-10a	6/30/14	5:30 PM	6/30/14	6:01 PM	22' - 20'	45	25	3.0	13	4.6	88	100	
	7/1/14	7:50 AM	7/1/14	9:40 AM	22' - 20'	25	25	3.0	38	13.7	263	300	
	7/1/14	9:45 AM	7/1/14	11:15 AM	20' - 18'	20	20	3.5	38	13.7	263	300	
	7/1/14	11:19 AM	7/1/14	12:53 PM	18' - 16'	20	20	3.5	38	13.7	263	300	Location complete.
Total H <sub>2</sub> 0 1225	Total EVO 175	Total Epsom Salt 64	Total Solution 1400	Additional No	otes:								
IP-11	6/26/14	10:55 AM	6/26/14	11:35 AM	15' - 17'	28	28	2.0	9	3.4	66	75	
	6/26/14	12:28 PM	6/26/14	1:32 PM	15' - 17'	20	22	2.0	16	5.7	109	125	
	6/26/14	1:36 PM	6/26/14	3:09 PM	17' - 19'	30	15	2.0	25	9.1	175	200	
	6/26/14	3:27 PM	6/26/14	5:10 PM	19' - 21'	15	10	2.0	25	9.1	175	200	
	6/26/14	5:18 PM	6/26/14	5:48 PM	21' - 23'	25	15	2.5	9	3.2	61	70	
	6/27/14	8:04 AM	6/27/14	8:40 AM	21' - 23'	12	12	2.5	10	3.5	67	76	
	6/27/14	9:36 AM	6/27/14	10:32 AM	21' - 23'	25	24	2.5	25	9.1	75	100	
	6/27/14	11:40 AM	6/27/14	11:48 AM	22' - 24'	25	25	2.5	3	1.2	10	13	
	6/27/14	12:26 PM	6/27/14	2:17 PM	22' - 24'	30	22	2.5	29	10.5	201	230	
	6/27/14	2:25 PM	6/27/14	4:29 PM	20' - 22'	20	17	2.5	28	10.3	197	225	Location complete.
Total H <sub>2</sub> 0 1136	Total EVO 178	Total Epsom Salt 65	Total Solution 1314	-	otes: Refusal a	-		210		1010			
IP-12	6/28/14	8:10 AM	6/28/14	8:40 AM	15' - 17'	50	50	0.2	1	0.2	4	5	Clogged injection tool. Ceased pumping and removed tooling.
IP-12a	6/28/14	9:17 AM	6/28/14	11:16 AM	25' - 23'	10	10	3.0	34	12.6	241	275	
	6/28/14	11:20 AM	6/28/14	1:34 PM	23' - 21'	10	10	3.0	35	12.8	245	280	
	6/28/14	1:37 PM	6/28/14	4:25 PM	21' - 19'	7	7	2.0	40	14.6	280	320	Surfacing from annulus. Reduced flow rate.
	6/28/14	4:31 PM	6/28/14	6:01 PM	19' - 17'	15	15	2.5	17	6.3	120	137	
	6/29/14	7:46 AM	6/29/14	8:54 AM	19' - 17'	10	10	2.5	15	5.6	108	123	
	6/29/14	8:58 AM	6/29/14	11:30 AM	17' - 15'	5	5	1.5	33	11.9	228	260	Location complete.
Total	Total	Total	Total	Additional No		5	5	1.0		11.5	220	200	Leoganer, completer
$H_20$	EVO	Epsom Salt	Solution										

Injection Point ID	Start Date	Start Time	End Date	End Time	Depth	Start Up Pressure (psi)	Average Pressure (psi)	Average Flow Rate (gpm)	EVO Injected (gal)	Epsom Salt Injected (lbs)	H <sub>2</sub> O Injected (gal)	Amended Total Gal	Notes
IP-13	6/25/14	9:23 AM	6/25/14	11:01 AM	15' - 17'		7	2.5	25	9.1	175	200	
	6/25/14	11:10 AM	6/25/14	12:40 PM	17' - 19'		10	3.0	25	9.1	175	200	
	6/25/14	12:53 PM	6/25/14	1:47 PM	19' - 21'		12	3.5	25	9.1	175	200	
	6/25/14	2:00 PM	6/25/14	2:57 PM	21' - 23'		10	3.5	25	9.1	175	200	
	6/25/14	3:05 PM	6/25/14	3:42 PM	22' - 24'	15	12	3.0	13	4.6	88	100	Refusal at 24'. 100 gal into this interval per client request.
Total H₂0 788	Total EVO 113	Total Epsom Salt 41	Total Solution 900	Additional No	ites: Extra vol	ume injected	into IP-14a.	Remaining	olume will b	e injected in t	he source ar	ea.	
IP-14	6/24/14	11:40 AM	6/24/14	1:52 PM	15' - 17'		20	1.5	25	9.1	175	200	
	6/24/14	2:18 PM	6/24/14	3:43 PM	17' - 19'		17	2.8	25	9.1	175	200	Hit refusal at 19'. Pulled tooling and abandoned location.
IP-14a	6/30/14	1:58 PM	6/30/14	4:10 PM	22' - 20'	25	22	3.0	50	18.3	350	400	
	6/30/14	4:17 PM	6/30/14	6:01 PM	20' - 18'	17	17	3.0	38	13.7	263	300	
	7/1/14	7:40 AM	7/1/14	9:55 AM	20' - 18'	20	20	3.8	63	22.9	438	500	Location complete. Additional 200 gallons injected from IP-13.
Total H <sub>2</sub> 0 1400	Total EVO 200	Total Epsom Salt 73	Total Solution 1600	Additional No	tes: Hit refusa	al when trying	g to advance	e to the 19'-21	' zone. Pulle	ed tooling and	abandoned	location. Lo	cation will be offset. Additional 200 gallons injected from IP-13.
IP-15	6/26/14	10:15 AM	6/26/14	11:33 AM	15' - 17'	45	30	3.0	25	9.1	175	200	
	6/26/14	11:45 AM	6/26/14	1:49 PM	17' - 19'	45	25	3.0	25	9.1	175	200	
	6/26/14	1:56 PM	6/26/14	2:17 PM	19' - 21'	30	20	3.0	25	9.1	175	200	
	6/26/14	2:28 PM	6/26/14	3:53 PM	21' - 23'	35	18	3.0	25	9.1	175	200	Began surfacing around annulus. Reduced flow to 2 GPM.
	6/26/14	4:11 PM	6/26/14	5:34 PM	23' - 25'	15	15	3.0	25	9.1	175	200	Refusal at 25'.
IP-15a	6/30/14	12:10 PM	6/30/14	1:28 PM	22' - 20'	15	15	3.0	25	9.1	175	200	
Total H₂0 1050	Total EVO 150	Total Epsom Salt 55	Total Solution 1200	Additional No	tes: Refusal a	it 25'. Remai	ning 200 ga	llons will be i	njected in the	e source area			-
IP-16a	6/28/14	3:47 PM	6/28/14	6:01 PM	22' - 20'	40	25	3.5	41	14.9	286	327	
	6/29/14	7:46 AM	6/29/14	7:56 AM	22' - 20'	20	20	3.0	3	1.1	20	23	
	6/29/14	8:10 AM	6/29/14	10:27 AM	21' - 19'	10	10	3.5	44	16.0	306	350	
	6/29/14	10:40 AM	6/29/14	2:58 PM	19' - 17'	10	10	3.0	84	30.6	586	670	
	6/29/14	3:00 PM	6/29/14	5:27 PM	17' - 15'	10	10	3.0	50	18.3	350	400	
	6/30/14	7:41 AM	6/30/14	9:17 AM	17' - 15'	10	10	4.0	41	15.1	289	330	Location complete.
Total H <sub>2</sub> 0 1838	Total EVO 263	Total Epsom Salt 96	Total Solution 2100	Additional No	tes: Hit refusa	al on first atte	empt with 2.2	25" inner hos	e tooling. Sw	itched to 1.5"	tooling. Inje	cting extra v	olume into this location due to multiple refusals at IP-27.

Injection Point ID	Start Date	Start Time	End Date	End Time	Depth	Start Up Pressure (psi)	U	Average Flow Rate (gpm)	EVO Injected (gal)	Epsom Salt Injected (lbs)	H <sub>2</sub> O Injected (gal)	Amended Total Gal	Notes
IP-26	6/27/14	12:42 PM	6/27/14	3:17 PM	24' - 22'	30	20	2.5	38	13.7	263	300	
	6/27/14	3:26 PM	6/27/14	5:37 PM	22' - 20'	15	12	3.0	38	13.7	263	300	
	6/28/14	8:35 AM	6/28/14	10:43 AM	20' - 18'	15	12	3.0	33	12.1	232	265	
	6/28/14	10:38 AM	6/28/14	1:13 PM	18' - 16'	8	8	3.0	33	12.1	232	265	
	6/28/14	1:22 PM	6/28/14	3:05 PM	17' - 15'	10	10	3.0	34	12.3	236	270	Location complete.
Total H₂0 1225	Total EVO 175	Total Epsom Salt 64	Total Solution 1400	Additional No	tes: Refusal a	at 24'.							
IP-27d	6/30/14	9:42 AM	6/30/14	11:05 AM	22' - 20'	17	13	3.0	25	9.1	175	200	
	6/30/14	11:09 AM	6/30/14	11:34 AM	20' - 18'	11	11	3.0	6	2.3	44	50	
	6/30/14	11:38 AM	6/30/14	11:54 AM	18' - 16'	10	10	3.5	6	2.3	44	50	
Total H <sub>2</sub> 0 263	Total EVO 38	Total Epsom Salt 14	Total Solution 300	Additional No	tes: Hit refusa	al at 11' on fi	rst attempt. I	Refusal at 11	' on IP-27a.	Refusal at 10'	on IP-27b.	Refusal at 15	on IP27c and broke injection tool.
						Average Pressure (psi) 20.8	Average Pressure (psi) 15.7	Average Flow Rate 2.6	EVO Injected (gal) 3,051.5	Epsom Salt Injected (lbs) 1,115.6	H <sub>2</sub> O Injected (gal) 20,850	Amended Total (gal) 23,901	Points Complete (based on volume of 1400/point)

	Garriero Site, No													
								Vironex Fiel	d Data She	eet				
Injection Point ID	Start Date	Start Time	End Date	End Time	Depth	Start Up Pressure (psi)	Average Pressure (psi)	Average Flow Rate (gpm)	EVO Injected (gal)	Epsom Salt Injected (lbs)	H <sub>2</sub> O Injected (gal)	Amended Total Gal	Notes	
IP-17b	7/1/14	4:31 PM	7/1/14	5:50 PM	14' - 16'	10	5	2.5	15.84	10.32	176	192	Refusal at 16'.	
	7/2/14	7:39 AM	7/2/14	8:59 AM	14' - 16'	6	6	3.0	17.16	11.18	191	208	Location complete.	
Total H₂0 176	Total EVO 16	Total Epsom Salt 10.3	Total Solution 192	Additional No	tes:									
IP-18	7/1/14	3:43 PM	7/1/14	5:19 PM	20' - 18'	30	30	2.0	17	10.8	184	200		
	7/1/14	5:40 PM	7/1/14	5:50 PM	18' - 16'	20	18	2.5	1	0.8	14	15		
	7/2/14	7:39 AM	7/2/14	9:32 AM	18' - 16'	30	30	2.0	15	9.9	170	185	Location complete.	
Total H <sub>2</sub> 0 367	Total EVO 33	Total Epsom Salt 21.5	Total Solution 400	Additional No										
IP-19	7/1/14	1:45 PM	7/1/14	2:35 PM	13' - 15'	25	20	3.0	17	10.8	184	200		
	7/1/14	3:40 PM	7/1/14	5:04 PM	14' - 16'	22	15	3.0	17	10.8	184	200	Refusal at 16'. Location complete.	
Total H₂0 367	Total EVO 33	Total Epsom Salt 21.5	Total Solution 400											
IP-20a	7/1/14	5:37 PM	7/1/14	5:50 PM	15' - 13'	10	8	2.5	3	1.7	28	31	Refusal at 15'.	
	7/2/14	7:39 AM	7/2/14	10:10 AM	15' - 13'	17	15	3.0	30	19.8	339	369	Location complete.	
Total H <sub>2</sub> 0 367	Total EVO 33	Total Epsom Salt 21.5	Total Solution 400	Additional No	tes:									
IP-21	7/1/14	10:25 AM	7/1/14	2:40 PM	15' - 13'	25	15	2.0	33	21.5	367	400	Refusal at 15'. Minor surfacing from annulus. Lowered flow rate.	
Total H <sub>2</sub> 0 367	Total EVO 33	Total Epsom Salt 21.5	Total Solution 400	Additional No		at 15'.								
IP-22	7/2/14	8:01 AM	7/2/14	10:28 AM	16' - 14'	22	20	3.0	33	21.5	367	400	Refusal at 16'. Location complete.	
Total H₂0 367	Total EVO 33	Total Epsom Salt 21.5	Total Solution 400	Additional No										
IP-23	7/1/14	2:15 PM	7/1/14	4:46 PM	14' - 16'	10	5	2.5	33	21.5	367	400	Refusal at 16'. Location complete.	
Total H <sub>2</sub> 0 367	Total EVO 33	Total Epsom Salt 21.5	Total Solution 400	Additional No	tes:									
IP-24a	7/2/14	9:47 AM	7/2/14	12:03 PM	16' - 14'	15	12	3.5	33	21.5	367	400	Refusal at 16'. Location complete.	
Total H <sub>2</sub> 0 367	Total EVO 33	Total Epsom Salt 21.5	Total Solution 400	Additional No	tes:									

## CH2M HILL EVO Injections Garfield Superfund Site, NJ

Injection Point ID	Start Date	Start Time	End Date	End Time	Depth	Start Up Pressure (psi)	Average Pressure (psi)	Average Flow Rate (gpm)	EVO Injected (gal)	Epsom Salt Injected (lbs)	H <sub>2</sub> O Injected (gal)	Amended Total Gal	Notes
IP-25	7/2/14	10:15 AM	7/2/14	12:22 PM	16' - 14'	22	20	3.0	33	21.5	367	400	Location complete.
Total	Total	Total	Total	Additional No	tes:								· · · · · · · · · · · · · · · · · · ·
H <sub>2</sub> 0	EVO	Epsom Salt	Solution										
367	33	21.5	400							1			
IP-28	7/2/14	11:31 AM	7/2/14	12:40 PM	18' - 16'	10	10	3.0	17	10.8	184	200	Refusal at 18'.
	7/2/14	12:44 PM	7/2/14	1:43 PM	16' - 14'	15	15	3.0	17	10.8	184	200	Location complete.
Total	Total	Total	Total	Additional No	tes:								
H <sub>2</sub> 0 367	EVO 33	Epsom Salt 21.5	Solution 400										
IP-29	7/2/14	11:31 AM	7/2/14	4:40 DM	20' - 18'	40	40	0.0	47	40.0	184	000	Refusal at 18'.
11-23		-		1:13 PM		10	10	3.8	17	10.8	-		
Total	7/2/14	1:16 PM	7/2/14	2:05 PM	18' - 16'	10	10	4.0	17	10.8	184	200	Location complete.
$H_20$	Total EVO	Total Epsom Salt	Total Solution	Additional No	tes:								
367	33	21.5	400										
IP-30	7/2/14	12:32 PM	7/2/14	1:25 PM	14' - 16'	25	17	2.8	17	10.8	184	200	
	7/2/14	1:30 PM	7/2/14	2:18 PM	16' - 18'	15	15	4.0	17	10.8	184	200	Location complete.
Total	Total	Total	Total	Additional No	tes:								
H <sub>2</sub> 0	EVO	Epsom Salt	Solution										
367	33	21.5	400										
						Average Pressure (psi)	Average Pressure (psi)	Average Flow Rate	EVO Injected (gal)	Epsom Salt Injected (lbs)	H <sub>2</sub> O Injected (gal)	Amended Total (gal)	Points Complete (based on volume of 400/point)
						17.5	14.8	2.9	396.0	258.0	4,404	4,800	12.0

**Pilot Test Injection Field Parameters** 

	vater Contaminat		-	1						
Vell ID	Date	Time	DTW (ft BTIC)	Temp (°C)	Cond. (us/cm)	DO (mg/L)	рН	ORP (eV)	Observations	Injection Point
A-13-OB	6/24/2014	8:33	12.47	14.35	593	5.09	7.38	72.6	yellow	Pre-Injection
	7/2/2014	10:40	12.27	14.29	668	0.60	6.81	273.0	slight yellow, milky color	Post-Injection
4-29-OB	6/24/2014	8:44	10.58	11.85	602	11.85	5.06	365.3		Pre-Injection
	7/1/2014	10:30	10.52	12.26	1212	NR	3.35	416.20		IP-21
	7/1/2014	11:00	10.62	11.71	1397	NR	3.18	490.40		IP-21
	7/1/2014	11:30	10.64	11.62	1509	NR	3.01	508.00		IP-21
	7/1/2014	12:00	10.62	11.57	1541	NR	3.02	511.50		IP-21
	7/1/2014	12:30	10.62	11.82	1595	NR	2.98	516.00		IP-21
	7/1/2014	13:00	10.61	11.69	1633	2.43	2.92	524.70		IP-21
	7/1/2014	13:30	10.58	11.64	1668	2.34	2.89	526.70		IP-21
	7/1/2014	14:00	10.62	11.60	1696	2.09	2.87	528.80		IP-21, IP-19
	7/1/2014	14:30	10.61	11.58	1733	2.06	2.84	532.90		IP-21, IP-19, IP-23
	7/1/2014	15:00	10.58	11.56	1788	1.90	2.80	535.50		IP-23
	7/1/2014	15:30	10.56	11.55	1830	1.82	2.78	534.10		IP-23
	7/1/2014	16:00	9.73	11.61	885	5.03	4.40	433.00		IP-18, IP-19, IP-23
	7/1/2014	16:30	9.63	11.64	2472	4.85	6.13	312.70		IP-17B, IP-18, IP-19, IP-23
	7/1/2014	17:00	9.73	11.66	3552	4.10	6.35	242.90		IP-17B, IP-18, IP-19
	7/1/2014	17:30	10.20	11.64	3408	4.37	6.37	210.40		IP-17B, IP-18
	7/1/2014	18:00	10.16	11.63	3353	4.37	6.35	204.40		IP-17B, IP-18, IP-20A
	7/2/2014	11:00	10.57	12.34	1495	1.17	3.29	391.00		IP-24A, IP-25
	7/2/2014	11:30	10.05	11.90	1557	0.79	3.15	458.80		IP-24A, IP-25, IP-28, IP-29
	7/2/2014	12:00	10.17	NR	NR	NR	NR	NR		IP-24A, IP-25, IP-28, IP-29
	7/2/2014	12:30	9.77	11.63	2078	1.04	4.62	317.60		IP-28, IP-29, IP-30
	7/2/2014	13:00	9.18	11.64	2529	1.24	5.12	257.30		IP-28, IP-29, IP-30
	7/2/2014	13:30	9.22	11.65	2516	1.26	5.19	230.00		IP-28, IP-29, IP-30
	7/2/2014	14:00	9.38	11.64	2474	1.30	5.29	218.80		IP-29, IP-30
	7/2/2014	14:30	10.10	11.60	2432	1.32	5.25	216.30		
	7/2/2014	14:30	10.10	11.60	2432	1.32	5.25	216.30		Post-Injection
A-30-OB	6/24/2014	8:36	12.36	13.99	887	5.77	6.48	182.3		Pre-Injection
	7/2/2014	10:20	12.15	15.43	1023	3.04	5.60	297.2		Post-Injection
A-31-OB	6/24/2014	9:00	12.75	13.38	1174	8.36	6.23	353.4		Pre-Injection
	6/24/2014	12:30	12.75	13.17	1009	4.02	6.06	321.3	Dark yellow color	IP-14
	6/24/2014	13:45	12.78	13.21	1012	1.83	6.06	327.8	,	IP-07, IP-10, I P-14
	6/24/2014	14:35	12.80	13.20	1035	1.58	6.07	328.9		IP-10
	6/24/2014	16:20	12.79	13.21	1010	1.24	6.04	327.7		IP-09, IP-10
	6/24/2014	16:50	12.78	13.21	1009	1.17	6.04	326.9		
	6/25/2014	8:32	12.81	13.90	1232	2.68	5.95	302.1		IP-09
	6/25/2014	12:12	12.65	13.30	1249	2.56	5.86	339.8		IP-07, IP-09, IP-13
	6/25/2014	13:50	12.64	13.30	1235	2.58	5.89	342.6		IP-07, IP-09, IP-13
	6/25/2014	14:30	12.63	13.30	1236	2.43	5.92	342.8		IP-07, IP-09, IP-13
	6/25/2014	15:00	12.61	13.30	1239	2.56	5.91	343.7		IP-07, IP-09, IP-13
	6/25/2014	15:30	12.56	13.29	1251	2.57	5.93	343.8		IP-07, IP-09, IP-13
	6/25/2014	16:00	12.57	13.30	1240	2.58	5.93	341.5		IP-01, IP-09
	6/25/2014	16:30	12.56	13.30	1249	2.55	5.92	345.0	Heavy rain at night	IP-09
	6/26/2014	8:00	12.57	13.93	1283	3.59	6.02	296.4		IP-04
	6/26/2014	8:30	12.56	13.56	1271	3.55	5.99	324.0		IP-04, IP-09
	6/26/2014	9:00	12.52	13.37	1273	2.79	6.00	335.9		IP-04, IP-09
	6/26/2014	9:30	12.52	13.38	1273	2.51	6.01	334.9		IP-04, IP-09
	6/26/2014	10:00	12.55	13.35	1242	2.36	5.95	342.3		IP-04
	6/26/2014	10:30	12.55	13.34	1237	2.27	5.95	343.8		IP-04, IP-15
	6/26/2014	11:00	12.56	13.34	1244	2.23	5.97	343.6		IP-04, IP-11, IP-15
	6/26/2014	11:30	12.56	13.35	1247	2.28	5.98	342.9		IP-04, IP-11, IP-15
	6/26/2014	12:00	12.56	13.34	1245	2.28	5.99	341.9		IP-04, IP-15
	6/26/2014	12:30	12.56	13.34	1252	2.25	6.00	345.1		IP-04, IP-11, IP-15
	6/26/2014	13:00	12.56	13.35	1245	2.24	5.98	343.9		IP-04, IP-11, IP-15
	6/26/2014	13:30	12.56	13.35	1246	2.25	5.98	343.7		IP-04, IP-11, IP-15
	6/26/2014	14:00	12.55	13.34	1244	2.23	5.98	347.1		IP-04, IP-11, IP-15
	6/26/2014	14:30	12.53	13.35	1244	2.31	5.98	346.5		IP-04, IP-11, IP-15
	6/26/2014	15:00	12.53	13.35	1235	2.36	5.95	350.0		IP-04, IP-07, IP-11, IP-15
	6/26/2014	15:30	12.52	13.35	1228	2.19	5.96	347.6		IP-04, IP-11, IP-15
	6/26/2014	16:00	12.46	13.34	1224	2.13	5.94	350.0		IP-04, IP-07A, IP-11, IP-15
	6/26/2014	16:30	12.42	13.35	1227	2.27	5.95	348.0		IP-04, IP-07A, IP-11, IP-15
	6/26/2014	17:00	12.41	13.35	1228	2.23	5.95	349.1		IP-04, IP-07A, IP-11, IP-15
	6/26/2014	17:30	12.41	13.35	1228	2.16	5.94	349.1		IP-04, IP-07A, IP-11, IP-15
	6/26/2014	18:00	12.42	13.36	1244	2.27	5.99	347.2		IP-04
	6/27/2014	8:30	11.97	13.86	1197	2.85	5.61	291.2		IP-02, IP-04, IP-07, IP-11
	6/27/2014	9:00	12.42	13.45	1300	4.59	5.80	321.9	DO begins to increase then dropping later	IP-02, IP-04
	6/27/2014	9:30	12.23	13.35	1177	4.01	5.72	333.5		IP-02, IP-04, IP-07A, IP-11
	6/27/2014	10:00	12.24	13.33	1181	3.30	5.61	335.6		IP-02, IP-04, IP-07A, IP-11
	6/27/2014	10:30	12.38	13.34	1223	4.04	5.70	334.3		IP-02, IP-04, IP-07A, IP-11
	6/27/2014	11:00	Color changed to n						Color Change and conductivity changing more significantly	IP-02, IP-04, IP-07A, IP-11
	6/27/2014	11:30	12.35	13.29	1390	4.03	5.89	342.3		IP-02, IP-04
	6/27/2014	12:00	12.35	13.29	1390	4.03	5.89	342.3	1	IP-02, IP-04 IP-02, IP-04
	6/27/2014 6/27/2014	12:00	12.43	13.32	1401 1383	4.10	5.84	345.4		IP-02, IP-04 IP-02, IP-04, IP-11, IP-26
	6/27/2014	13:00	12.28	13.31	1370	3.86	5.85	348.1		IP-02, IP-04, IP-11, IP-26
	6/27/2014	13:30	12.27	13.32	1408	3.98	5.87	349.6		IP-02, IP-11, IP-26
	6/27/2014	14:00	12.28	13.32	1433	4.15	5.90	351.0		IP-02, IP-03, IP-11, IP-26
	6/27/2014	14:30	12.25	13.34	1457	4.49	5.93	353.0		IP-02, IP-03, IP-11, IP-26
	6/27/2014	15:00	12.26	13.34	1474	4.54	5.95	353.5		IP-02, IP-03, IP-11, IP-26
	6/27/2014	15:30	12.23	13.34	1466	4.60	5.96	354.5		IP-02, IP-03, IP-11, IP-26
	6/27/2014	16:00	12.25	13.35	1468	4.39	5.96	354.7		IP-02, IP-03, IP-11, IP-26
	6/27/2014	16:30	12.25	13.35	1470	4.27	5.96	354.4		IP-02, IP-03, IP-11, IP-26
	6/27/2014	17:00	12.25	13.35	1482	4.43	5.97	355.0		IP-02, IP-03, IP-26
	6/28/2014	8:40	12.35	13.87	1485	3.73	6.03	304.1		IP-02, IP-03, IP-12, IP-26
	6/28/2014	9:00	12.35	13.66	1562	4.90	6.06	318.4		IP-02, IP-03, IP-26
	6/28/2014	9:30	12.25	13.42	1554	4.65	6.03	330.1		IP-02, IP-03, IP-12A, IP-26

Attachment 6: Table 1

**Pilot Test Injection Field Parameters** 

0/20/2011		12100	10107	Ĩ	5175	0105	100		11 OE) 11 OS) 11 IE) 11 EO
6/28/2014	9:00	12.35	13.66	1562	4.90	6.06	318.4		IP-02, IP-03, IP-26
6/28/2014	9:30	12.25	13.42	1554	4.65	6.03	330.1		IP-02, IP-03, IP-12A, IP-26
6/28/2014	10:00	12.25	13.40	1534	4.59	5.99	341.2		IP-02, IP-03, IP-12A, IP-26
6/28/2014	10:30	12.25	13.40	1517	3.98	5.99	344.9		IP-02, IP-03, IP-12A, IP-26
6/28/2014	11:00	12.09	13.40	1539	4.16	6.01	348.0		IP-02, IP-03, IP-12A, IP-26
6/28/2014	11:30	12.03	13.41	1563	4.88	6.09	348.5		IP-02, IP-03, IP-12A, IP-26
6/28/2014	12:00	12.00	13.41	1549	4.24	6.10	347.6		IP-02, IP-03, IP-12A, IP-26
6/28/2014	12:30	12.20	13.42	1534	4.58	6.09	346.8		IP-03, IP-12, IP-26
6/28/2014	13:00	12.18	13.40	1570	4.63	6.04	348.6		IP-03, IP-12, IP-26
6/28/2014	13:30	12.11	13.40	1555	4.28	6.05	350.0		IP-03, IP-08, IP-12, IP-26
6/28/2014	14:00	11.88	13.41	1566	4.50	6.06	352.5		IP-03, IP-08, IP-12, IP-26
6/28/2014	14:30	12.01	13.42	1622	4.99	6.13	351.0		IP-03, IP-08, IP-12, IP-26
6/28/2014	15:00	11.89	13.43	1627	4.41	6.12	348.7		IP-03, IP-08, IP-12, IP-26
6/28/2014	15:30	12.03	13.43	1619	4.36	6.13	350.3		IP-08B, IP-12
6/28/2014	16:00	12.00	13.42	1625	4.14	6.10	348.1		IP-08B, IP-12, IP-16A
6/28/2014	16:30	12.00	13.41	1541	4.28	6.11	348.9		IP-05, IP-08B, IP-12, IP-16A
6/28/2014	17:00	12.00	13.41	1543	4.02	6.12	348.7		IP-05, IP-08B, IP-12, IP-16A
6/28/2014	17:30	12.08	13.42	1558	4.14	6.10	350.9		IP-05, IP-08B, IP-12, IP-16A
6/29/2014	7:40	12.30	13.84	1365	4.83	6.06	298.3		IP-05, IP-08B, IP-12, IP-16A
6/29/2014	8:00	12.26	13.53	1359	4.97	6.03	326.6		IP-05, IP-08B, IP-12, IP-16A
6/29/2014	8:30	12.25	13.60	1370	3.61	6.05	335.6		IP-05, IP-08B, IP-12, IP-16A
6/29/2014	9:00	12.25	13.47	1374	3.51	6.05	338.9		IP-05, IP-12, IP-16A
6/29/2014	9:30	12.22	13.47	1378	3.44	6.08	340.7		IP-05, IP-12, IP-16A
6/29/2014	10:00	12.20	13.47	1384	3.43	6.08	342.7		IP-05, IP-12, IP-16A
6/29/2014	10:30	12.18	13.47	1384	3.50	6.07	345.2		IP-01, IP-05B, IP-12, IP-16A
6/29/2014	11:00	12.16	13.47	1384	3.46	6.07	345.7		IP-01, IP-05B, IP-12, IP-16A
6/29/2014	11:30	12.12	13.46	1383	3.54	6.04	355.8	ORP showing more of a significant change	IP-01A, IP-05B, IP-12, IP-16A
6/29/2014	12:00	12.09	13.46	1353	3.38	6.08	360.3		IP-01A, IP-05B, IP-16A
6/29/2014	12:30	12.03	13.46	1348	3.25	6.08	365.7		IP-01A, IP-05B, IP-16A

Attachment 6: Table 1
Pilot Test Injection Field Parameters
Pecults of In Situ Peduction Pilot Test

Results of In Situ Reduction Pilot Test Garfield Groundwater Contamination Superfund Site, New Jersey

Well ID	Date	Time	DTW (ft BTIC)	Temp (°C)	Cond. (us/cm)	DO (mg/L)	рН	ORP (eV)	Observations	Injection Point
	6/29/2014	13:00	12.04	13.46	1347	3.56	6.09	367.7		IP-01A, IP-05B, IP-16A
	6/29/2014	13:30	12.04	13.46	1348	3.42	6.08	368.6		IP-01A, IP-05B, IP-16A
	6/29/2014	14:00	12.04	13.46	1347	3.27	6.08	368.0		IP-01A, IP-05B, IP-16A
	6/29/2014	14:30	12.00	13.46	1345	3.23	6.09	365.4		IP-01A, IP-05B, IP-16A
	6/29/2014	15:00	11.98	13.47	1341	3.21	6.06	368.6		IP-01A, IP-05B, IP-16A
	6/29/2014	15:30	11.95	13.47	1346	3.00	6.09	369.3		IP-01A, IP-05B, IP-16A
	6/29/2014	16:00	11.96	13.47	1345	2.90	6.09	369.5		IP-01A, IP-05B, IP-16A
	6/29/2014	16:30	11.15	13.42	1379	2.76	6.11	363.8		IP-01A, IP-04A, IP-16A
	6/29/2014	16:45	9.80	13.37	1302	2.42	6.07	358.9	rapid water table increase	IP-01A, IP-04A, IP-16A
	6/29/2014	17:00	9.32	13.41	1435	2.44	6.09	345.1		IP-01A, IP-04A, IP-16A
	6/29/2014	17:30	11.20	13.60	1427	2.51	6.07	352.5		IP-04A, IP-16A
	6/30/2014	7:40	12.15	14.00	1211	6.90	5.86	341.2		IP-01A, IP-07B, IP-16A
	6/30/2014	8:00	12.05	14.00	1211	6.10	5.87	346.1		IP-01A, IP-07B, IP-16A
	6/30/2014	8:30	12.03	13.57	1211	4.66	5.87	364.2		IP-01A, IP-07B, IP-16A
	6/30/2014	9:00	11.96	13.50	1199	4.35	5.89	376.2		IP-01A, IP-07B, IP-16A
	6/30/2014	10:15	11.92	13.49	1192	4.36	5.91	380.3		IP-06A, IP-07B, IP-27D
	6/30/2014	10:45	11.91	13.50	1197	4.34	5.91	381.1		IP-06A, IP-07B, IP-27D
	6/30/2014	11:00	11.91	13.49	1199	4.35	5.92	380.4		IP-06A, IP-07B, IP-27D
	6/30/2014	11:30	11.91	13.49	1210	4.33	5.90	381.5		IP-06A, IP-07B, IP-27D
	6/30/2014	12:00	11.91	13.49	1198	4.19	5.91	381.8		IP-06A, IP-07B, IP-27D
	6/30/2014	12:30	11.92	13.49	1208	4.25	5.90	382.9		IP-06A, IP-07B, IP-15A
	6/30/2014	13:00	11.92	13.49	1210	4.27	5.90	383.2		IP-06A, IP-07B, IP-15A
	6/30/2014	13:30	11.93	13.50	1217	4.17	5.91	383.9		IP-06A, IP-07B, IP-15A
	6/30/2014	14:00	11.91	13.50	1215	4.10	5.90	348.1		IP-06A, IP-07B, IP-14A
	6/30/2014	14:30	11.90	13.50	1201	4.00	5.91	385.1		IP-06A, IP-07B, IP-14A
	6/30/2014	15:00	11.88	13.50	1211	3.97	5.90	385.6		IP-06A, IP-07B, IP-14A
	6/30/2014	15:30	11.87	13.50	1198	3.88	5.92	386.2		IP-06A, IP-07B, IP-14A
	6/30/2014	16:00	11.86	13.51	1207	3.82	5.90	385.3		IP-07, IP-08, IP-14
	6/30/2014	16:30	11.84	13.51	1206	3.69	5.90	386.4		IP-08C, IP-14
	6/30/2014	17:00	11.83	13.51	1206	3.63	5.90	386.0		IP-08C, IP-14
	6/30/2014	17:30	11.86	13.51	1208	3.62	5.90	385.7		IP-08C, IP-10A, IP-14
	7/2/2014	9:20	12.42	14.16	1122	2.99	5.86	244.9		Post-Injection
EPA-32-OB	6/24/2014	8:57	12.74	13.16	924	7.17	5.28	381.2		Pre-Injection
	7/2/2014	9:40	12.43	13.86	891	2.72	5.11	289.0		Post-Injection

Attachment 7 pH Titration Results

## Benchsheet Soil Buffering Capacity Garfield, NJ Superfund Site

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**Date/Time:** 7/31/14 @ 15:20

## Moisture Content

				MC	MC
Sample	Tin Tare	$Tin + Soil_{wet}$	Tin + Soil <sub>dry</sub>	(% <sub>wet</sub> basis)	(% <sub>dry</sub> basis)
SO-B-14-16	1.2846	14.4717	13.1614	10%	11%

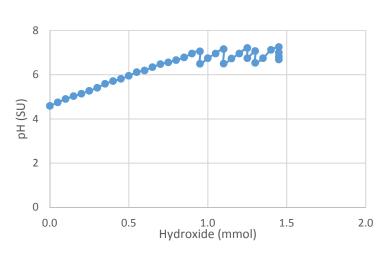
## **Base Titration Test**

Soil Sample:	SO-B-14-16	
Water Sample:	DI Water	
Base:	NaOH	

Wet Mass (g):	100
Volume (mL):	100
Strength (N):	1
-	

Dry Mass (g): 90.06 Base ID: 3-OR-19-04

Time	NaOH	OH-	- II
(hrs)	(µL)	mmol	рН
-	0	0.0	4.59
-	50	0.1	4.75
-	100	0.1	4.90
-	150	0.2	5.03
-	200	0.2	5.14
-	250	0.3	5.27
-	300	0.3	5.41
-	350	0.4	5.59
-	400	0.4	5.71
-	450	0.5	5.81
-	500	0.5	5.95
-	550	0.6	6.12
-	600	0.6	6.19
-	650	0.7	6.34
-	700	0.7	6.48
-	750	0.8	6.56
-	800	0.8	6.66
-	850	0.9	6.78
-	900	0.9	6.96
0	950	1.0	7.06
4	950	1.0	6.49
-	1000	1.0	6.75
-	1050	1.1	6.96
-	1100	1.1	7.16
16	1100	1.1	6.50
-	1150	1.2	6.73
-	1200	1.2	6.96
-	1250	1.3	7.21
23	1250	1.3	6.75
-	1300	1.3	7.07
51	1300	1.3	6.54
-	1350	1.4	6.75
-	1400	1.4	7.12
-	1450	1.5	7.25
74	1450	1.5	7.00
97	1450	1.5	6.82
122	1450	1.5	6.69



Target pH: 7	
Needed Base:	0.0161 mmol/g dry soil

	Soil Borin	33
CT : Garfield Ground	vater Contamination Superfund Site LOCATION: Garfield, NJ DRILLING CONTRACTOR: Parratt Wolff	
IG METHOD AND EC	UIPMENT USED: Geoprope	
LEVELS : 12,5		LOGGER: 13a / G C
INTERVAL (FT) RECOVERY (FT)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm): Breathing Zone Above Hole
	0-14 - discrete Sample- no' recovery -targeted	-
	14-16' BGS	
14 2'	Silty SAND, (M) trace f-gravel, dark veddish brown (2.54/R313), wet at 14.5; stiff/hard	- 0 pi2 - 50-B-14-16- required 2 Tuns to fi71
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Attachment 8 IDW Manifest and Bill of Lading

ECD			. BOX	5010 • FREE 462-1001 • FA	HOLD, N	IJ 0772	8-5010			EPA ID NO S 41		2616
350 Pigeon Point Road New Castle, DE 19720 Phone: (302) 658-2005 Fax: (302) 658-6229	175 Bartow M Bartow, FL 33 Phone: (863) 5 Fax: (863) 533	830 533-4599			ghts, OH 44 0) 835-3473			Dunme Phone:	onahan Avenue ore, PA 18512 (570) 342-7232 70) 342-7367	Sumter, S Phone: (8	le Beach Hwy. C 29153 03) 773-2611 ) 773-2942	
SHIPPER NAME/ADDRESS			PHON	31 21 23 64 24						1 + 1	1 1 1	I
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5. GENERATOR'S/OFFEROF marked and labeled/placard	XET chromium contaminated R'S CERTIFICATION: I hereby declare that the conten ded, and are in all respects in proper condition for trans	ts of this consignment are for port according to applicable	ully and accurately de	scribed above	by the proper sh	nipping name	e, and are clas	ssified, pack	aged,
GENERATOR'S/OFFEROP marked and labeled/placarc Exporter, I certify that the ca	XET chromium contaminated	ts of this consignment are fu port according to applicable attached EPA Acknowledgr	ully and accurately de e international and nati ment of Consent.	scribed above onal governm	by the proper sh ental regulations	nipping name	e, and are clas	ssified, pack	aged,
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