SECTION 4

Operational Effectiveness and Maintenance Activities for the KCP Groundwater Corrective Action Program

4.0 Operational Effectiveness and Maintenance Activities for the KCP Groundwater Corrective Action Program

4.1 Introduction

This section provides a discussion of the operation and maintenance activities for the KCP groundwater corrective action program covering groundwater monitoring wells, groundwater pumping wells and groundwater treatment. The effectiveness and efficiency of the groundwater pumping system is also discussed. In addition, a discussion of groundwater and/or groundwater treatment studies performed in 2011 is provided. Actual copies of the reports are attached as appendices.

4.2 Compliance Point Wells

The point of compliance for each of the two KCP groundwater flow systems is defined as the location at and beyond which groundwater protection standards must be achieved. They are currently comprised of the following wells:

- Pumping wells 277 and 278 monitor groundwater passing the point of compliance for the Blue River Groundwater Flow System (BRGFS) (Plate 2).

- Point of compliance wells for the Indian Creek Groundwater Flow System (ICGFS) include monitoring well numbers 195U, 195L, 196U, 196L, 197U, 197L, 198U, 198L, 73U, 73L, 202U, and 202L located at the southern downgradient portion of the flow system (Plate 2).

Groundwater contamination at and beyond the point of compliance, which exceeds site clean-up standards, is subject to corrective action pursuant to 40 CFR 264.100.

No ICGFS compliance point wells detected contamination over site clean-up standards in 2011. Well 72L detected 1, 2-dichlorobenzene at 3 µg/L in the first semi-annual event, well below the 600 µg/L clean-up standard. No other ICGFS compliance point wells detected contamination.

BRGFS compliance point wells 277 and 278 detected vinyl chloride over site clean-up standards in 2011 up to 2.7 and 77.4 µg/L, respectively. Well 278 also detected 1, 2-DCE over site clean-up standards in the second semi-annual event at 242 µg/L. These wells marked the downgradient extent of contamination in groundwater over site standards.

The chosen corrective action to address the detection of compounds over site clean-up standards in both flow systems is continued extraction and treatment of contaminated groundwater by the groundwater pumping system.

4.3 Effectiveness and Perimeter Wells

Two subgroups of wells (which may include compliance point wells) are identified in the KCP's permit for semi-annual sampling. All others require only yearly sampling. The two subgroups are as follows:

Perimeter Wells – Wells monitored to ensure adequate delineation of the horizontal and vertical extent of groundwater contamination are referred to as perimeter wells and are listed in Table 4.1.

Effectiveness Wells – These are wells monitored to assess the effectiveness of the corrective action program. They are listed in Table 4.2

Table 4.1: Perimeter Wells at the DOE Kansas City Plant

BLUE RIVER GROUNDWATER FLOW SYSTEM	232, 121, 120, 105, 119, 269, 270, 133, 200, 79, 134, 267, 268, 194
INDIAN CREEK GROUNDWATER FLOW SYSTEM	73, 75, 195, 196, 44, 227, 228, 229, 230, 202

As in 2010 detectable levels of contaminants were present in BRGFS perimeter wells 121, 105, 119, 120, 267 and 200 during 2011. 1, 2-DCE was detected in BRGFS perimeter wells along the Blue River at concentrations ranging from 0.95 µg/L to 1.5 µg/L. 1, 1-DCA was detected in well 105 up to 1.6 µg/L in both sampling events, below the site clean-up standard of 5. This is the only well in the BRGFS to detect this compound. Well 200, north of the cattail area, detected vinyl chloride at 2.6 µg/L in the first semi-annual event. It was not detected in the second. Well 267 detected 1, 2-DCE at 0.85 µg/L in the second semi-annual event. Trend graphs for selected BRGFS perimeter wells are provided at the end of Section 2.

Perimeter wells in the ICGFS were all below detection limits in 2011 with the exception of well 73 that detected 1, 2-dichlorobenznene in the first semi-annual event at 3 µg/L.

The wells continue to effectively define the extent of groundwater contamination along the perimeter of the plume.

Table 4.2: Effectiveness Wells at the DOE Kansas City Plant

BLUE RIVER GROUNDWATER FLOW SYSTEM	272, 273, 274, 275, 277, 278, 212, 68, 83, 247, 248, 211
INDIAN CREEK GROUNDWATER FLOW SYSTEM	235, 236, 192, 165, 197,198, 271, 276, 69

Effectiveness wells for the BRGFS are broken into two groups. One group is comprised of groundwater pumping wells and monitoring wells near source areas of contamination. Another group consists of monitoring and pumping wells in and around the iron wall.

Of pumping wells installed in the Blue River flow system only wells 272 and 273 serve as source control wells with the remainder of pumping wells serving as groundwater containment wells. Consistent levels of contamination were noted in all wells except for monitoring wells 211, 212 and 248 located immediately upgradient of the iron wall. These wells are showing a decreasing trend over time. This is likely due to the action of pumping well 274 as it captures groundwater flowing through this area of the complex. Well 277 is showing a decreasing trend over time as was well 278 until the 2011 second semi-annual event when levels returned to that found in the well during the 2005/2006 timeframe.

Effectiveness wells in the ICGFS include groundwater monitoring and pumping wells at the limit of the plume and monitoring and pumping wells in significant source areas to ascertain whether solvent concentrations are decreasing.

Well 235 in the southeast parking lot assumed a dominant role (over companion pumping well 236) in the mass of contamination captured during the last year based on contaminant concentrations measured in the well over the last year. This well is upgradient and draws contamination toward it before reaching well 236.

Well 69 which monitors contamination from the former TCE Still Area has shown a steady decrease in contaminant level in the upper completion. TCE and 1,2-DCE levels in the lower completion are decreasing over time while vinyl chloride levels remain constant overall. This behavior suggests degradation of TCE and 1,2 DCE over time versus vinyl chloride.

Both completions of well 165 have shown decreases over time. This is likely due to the capture of contaminant source by pumping well 276.

4.4 Monitoring Well Inspection and Maintenance Conducted In 2011

Monitor well inspection activities performed in 2011 consisted of routine inspections by subcontract groundwater sampling personnel as a part of the semi-annual 2011 groundwater-sampling events. The routine well inspection performed by sampling subcontract personnel includes the completion of a well sampling field log data sheet, which incorporates a checklist to document information regarding the physical condition of each monitoring well. Also noted are items such as the depth to water and total depth of the well. Field log data sheets for the second semi-annual sampling event are provided in Volume 2 of this report. In addition, a table of constructed depths to total measured depths is provided at the end of this section.

KCP employees also perform an annual inspection of all wells. These inspections consist of a visual examination of all aspects of a properly maintained well. Deficiencies are logged by FM&T staff, corrective actions prepared, and maintenance scheduled. Included at the end of this section are results of the inspection along with records of the maintenance performed as a result.

In addition, twenty percent of groundwater monitoring wells were inspected with a down hole video camera for evaluation of subsurface integrity. Results of the inspection are attached as a table at the end of this section. Also included are records noting the dates of the inspections as well as dates of well redevelopment performed on those wells exhibiting excessive siltation and/or screen plugging.

Redevelopment with limited exception consisted of pumping and swabbing the well to remove material from the well screen and to remove silt that had accumulated in the bottom of the well. Some wells were simply pumped.

Sampling for the presence of non-aqueous phase liquid (NAPL) is required for all wells that exhibit contamination by individual compounds at levels greater than 10% of that compounds aqueous solubility. The following well again exhibited contamination meeting this criterion (for PCBs and TCE): Well 192L and U. The presence of a free phase component was monitored using an interface probe to detect a free phase throughout the water column. None was detected. No other well met this criteria.

4.5 Locations Exceeding Site Clean Up Standards

Tables 4.8 and 4.9 provide a listing of wells that exhibit contamination over site clean-up standards in the Indian Creek and Blue River Groundwater Flow Systems during the 2011 second semi-annual sampling event. Specifically, the well number and completion is provided along with the compound that exceeded the standard. Plates 3 and 4 visually show those areas where site cleanup standards are exceeded in upper and lower completion wells from the 2011 second semi-annual sampling.

ICGFS

The vast majority of compounds present in concentrations over site cleanup standards in the ICGFS coincide with the five compounds discussed in detail in Section 3 (TCE, 1,2-DCE, vinyl chloride, 1,1-DCE and 1,1-DCA). The overall aerial extent of groundwater contamination over site cleanup standards again changed little compared to the previous year. Contamination over site cleanup standards was not drawn in the upper completion plate for the Building 50 area as no upper completion wells exist. This differs from upper completion plates from 2008 and 2009 which inferred contamination in this area.

Four additional compounds were detected in this flow system above site cleanup standards (1,2- dichloroethane, tetrachloroethene, PCBs and benzene). Tetrachloroethene was present over site clean-up standards in monitoring wells 34L, 192 U and pumping well 276 all associated with the former Plating Building degreaser. Benzene was again present in well 187U located near the site of a former gasoline tank (Plate 2) and in pumping well 271 that extracts residual contamination from the former Underground Tank Farm. 1,2-dichloroethane was again noted in well 163L at 6.3 µg/L.

1,2-DCE over site clean-up standards was expressed in wells located downgradient of the former plating building degreaser (wells 276, 184L, 192 L&U), the TCE Still Area (well 69L), the Abandoned Sump (209L) and Abandoned Fuel lines (well 171L) and the former D/95 area (well 163).

ICGFS pumping well 235 marked the southern extent of contamination over site clean-up standards in 2011 second semi-annual sampling event with vinyl chloride, 1,2-DCE and TCE all detected over site clean-up standards. Wells 271 and 209L defined the eastern extent of groundwater contamination in the ICGFS.

PCBs over site clean-up standards were detected in wells 192U, 192L, and pumping well 276 in 2011 up to 3.1, 122, and 217 µg/L, respectively. The presence of PCBs in these wells is a result of historical releases of PCB containing Therminol fluid from the Department 26 area. PCBs were detected in pumping well 235 in the 2011 first semi-annual sampling event at 1.8 µg/L. This well last detected PCBs in 2003. The nature and cause for the detection in this well is unknown.

The western extent of contamination over site clean-up standards is found in the Building 50 area running westward toward the West Boilerhouse (Plate 2). TCE contamination over site clean-up standards is noted in wells 501, 502, 503, 505, and 509 with the highest value noted in well 505 at 28,800 µg/L. 1, 2-DCE over site clean-up standards was noted in wells 502, 503 and 508 that define the southern component of contamination in this area. Vinyl chloride contamination over site clean-up standards was also found in wells 502, 503 and 508. As discussed earlier, the majority of contamination in this area flows toward and into the West Boilerhouse footing tile drain system with the remaining component captured by the footing tile drain system within the MMB. This is based on the fact that wells 102 south of the West Boilerhouse and monitoring well 156 inside the western end of the MMB are free of contamination.

The northern component of contamination over site clean-up standards was found at well OW-1 exhibited by the detection of 1,2-DCE at 167µg/L and vinyl chloride at 14.0 µg/L. Well 115 at the north central edge of the MMB contained vinyl chloride over site cleanup standards in the upper and lower completions with the lower completion also exceeding standards for TCE and 1, 2–DCE . Contamination from well 115 is derived from the former Chip and Sales Buildings.

All compliance point wells in the ICGFS were again below clean-up standards in 2011.

BRGFS

Pumping/compliance point wells 277 and 278 marked the downgradient extent of contamination over clean-up standards in the BRGFS in 2011. No contamination above site clean-up standards was detected in wells downgradient of these wells during the second semi-annual event (Table 4.8). In January 2012 a number of wells at the south end of the iron wall were sampled in an attempt to explain the detection of 242 µg/L of 1,2 –DCE in well 278 These wells are provided in Table 4.8. Of the wells sampled, only wells 78L, 243L, 245L and 210L detected contamination over site clean-up standards (Table 4.10 Figure 4.3). However, these over limit detections were limited to vinyl chloride. 1,2-DCE was not detected over 2.3µg/L in all of the wells sampled in this special event. The cause of the elevated 1, 2-DCE detection in well 278 was never determined.

Pumping well 275 defines the northern extent of contamination above site clean-up standards for the northeast area near monitoring well 265. 1, 2-DCE was found at 242 μg/L from sampling conducted in the second semi-annual sampling event.

Summary
The KCP groundwater monitoring system continued to effectively define the extent and flow direction of contaminated groundwater in 2011. No ICGFS compliance point wells exceeded site clean-up standards while BRGFS compliance point wells 277 and 278 exhibited contamination by vinyl chloride over site cleanup standards with 278 also being over site standards for 1,2-DCE. This marked the downgradient extent of contamination over clean-up standards in this flow system.

An annual inspection by Honeywell FM&T revealed no surface integrity issues. No subsurface integrity problems were noted from a downhole camera survey of one-fifth of all KCP groundwater monitoring wells. A number of well completions did exhibit either dirty screens and/or excessive siltation sufficient to cover the bottom several inches of the well screen. These wells were redeveloped in 2011. Digital Video Discs (DVD's) of all camera surveys are stored in KCP files and are available for viewing.

4.6 Groundwater Pump and Treat System

4.6.1 Groundwater Pumping Well Operation and Maintenance

Pumping rate and water level are the primary tools used to determine whether an individual pumping well requires maintenance. Employees in charge of groundwater treatment system compliance and operation have real time access by computer to individual pumping well operation.

Maintenance activities continued on pumping wells with maintenance consisting of treatment for recurring iron bacteria problems and the replacement of pumps and/or motors. Table 4.3 provides a summary of groundwater pumping well maintenance in 2011. As can be seen in the table below, the two pumping wells downgradient of the iron wall (277, 278) frequently required treatment.

4.6.2 Groundwater Treatment System Operation and Maintenance

The groundwater treatment system at the KCP continues to utilize advanced oxidation Processes to destroy VOCs. Sixty kW of UV light and hydrogen peroxide (H_20_2) are used to treat contaminated groundwater. Two treatment units are in place, however, only one is operational at any given time. The units are rotated in and out of service as maintenance is performed on the idle unit. The treated wastewater is discharged to the sanitary sewer under the provisions of a pre-treatment permit. There are no air emissions associated with the treatment process.

Acidification of groundwater is performed to keep naturally occurring iron and manganese in solution during treatment. This commingling of flows reduces overall acid usage for water treatment at the KCP.

TABLE 4.3: Pumping Well Maintenance Performed in 2011

DATE	WORK PERFORMED
Mar-11	Well 277: Chemical Treatment, Remove and Replace Pump Motor
Mar-11	Well 278: Chemical Treatment
Apr-11	Well 278: Chemical Treatment
Apr-11	Well 275: Chemical Treatment
Apr-11	Well 272: Chemical Treatment
May-11	Well 235: Chemical Treatment
May-11	272, 275 and 278 Remove and Replace Pump
Jun-11	Well 235: Repair Pitless Adaptor
Jun-11	Well 271: Chemical Treatment
Jun-11	Well 273: Repair pump
Jun-11	Well 278 Chemical Treatment
Aug-11	Well 278 Chemical Treatment
Nov-11	Well 272: Chemical Treatment
Nov-11	Well 271 Install Transducer
Nov-11	Well 277 Chemical Treatment

The treatment system has built in, fail safe alarms that shut the system down should problems arise. These would include UV lamp failure, pH out of parameter, hydrogen peroxide addition failure, all of which are critical to the treatment process. Routine maintenance of the UV H_20_2 treatment units was performed as outlined in the Groundwater Treatment System Operation and Maintenance Plan (DOE, 2006a).

The groundwater pump and treat system at the KCP is designed so that all flows requiring treatment (groundwater pumping wells, 001 raceway groundwater collection system, building footing tile drains and 002 reroute reroute system) are routed to a 65,000 gallon equalization tank (Tank 3B) at Building 98 (IWPF). From Tank 3B, flows are pumped to the treatment unit in the groundwater treatment room on the second floor of the IWPF. Treated flows are directed to a companion 65,000 gallon tank (Tank 3A). The treated water, having an acidic pH, is stored and metered into the IWPF effluent where it serves to buffer the caustic nature of the IWPF effluent.

Flows to the Groundwater Treatment System (GTS)
Information related to groundwater extraction rates, installation and operation of the on-site groundwater treatment system and discharge of treated groundwater to the sanitary sewer are addressed below. The nature, location and effect that building footing tile drains have on groundwater flow and their intrinsic ability to collect contaminated groundwater has been discussed in previous annual reports (DOE 1995, 1996). In October 2007, the City of Kansas City, Missouri approved a request to allow footing tile drain flows to be rerouted to the sanitary sewer system. However, three sump locations would remain connected to the groundwater treatment system due to their elevated contaminant concentrations. These three locations are noted as sumps 4, 7 and 11 in Figure 4.1.

The combined annual average rate of all flows to the groundwater treatment system was 26.1 gpm in 2011 (Tables 4.5 - 4.7). Flow rates from various pumping wells varied in 2011 primarily due to a lack of water. A prime example is pumping well 278 contained within the interceptor trench in the northeast area. Well 278 averaged 1.7 gpm during the year while companion well 277 averaged almost 4 gpm. This difference was created by the elevation of pump intake of well 278. During dry months of the year (September, October, November and January) groundwater was often below the pump intake for this well but remained above the intake for well 277. A similar lack of water was noted in well 235 during the fall of 2011. As discussed in previous annual reports, pump placement in pumping wells at the KCP is usually near the top of the screened interval to prevent cascading of water into the well creating oxygenating water that may promote bacterial growth. As discussed earlier, wells 277 and 278 are the two most problematic wells in this regard.

Flows from remaining footing tile drains make up only a small part of total flow to the treatment system (~9%). Flow from the 002 groundwater collection sump provides approximately 15% of total flow to the system.

4.7 Effectiveness of Groundwater Pumping System

VOCs monitored under the KCP's sanitary sewer discharge permit for the Groundwater Treatment System incorporate groundwater sampling parameters of both the ICGFS and the BRGFS provided in Tables I and IA of the KCP’s Hazardous Waste Management Facility permit. Compliance monitoring from the treatment system is conducted monthly. All discharges were within permitted discharge limits.

4.7.1 Mass Removal

This section discusses the amount of contaminant mass removal that has occurred through the operation of the groundwater pumping system. The contaminant mass input is not known nor can it be estimated because of the historical nature of releases at the KCP. Figure 4.2 shows the amount of organics removed by the groundwater pumping system since its inception in 1988, along with total gallons pumped. To date, a total of 15,108.67 pounds of solvent have been removed by the interceptor system. In 2011, a

total of 13,715000 gallons of water were treated with a total of 84.3 pounds of solvent removed. Contaminant source area wells such as 272, 273 and 276 tend to extract greater concentrations of solvents than wells designed to hydraulically contain groundwater flow located in distal portions of the plume. Approximately 387 million gallons of groundwater have been pumped since the system began operation in 1988.

As discussed earlier, the amount of contaminant mass that has been released in areas being addressed by DOE under RCRA corrective action is unknown. That is, one cannot use a beginning mass and calculate the total mass removed by the groundwater treatment system to arrive at the mass that remains in the subsurface. A good relative indicator to evaluate progress in contaminant removal at the KCP, however, is to calculate the dissolved contaminant mass that existed in the 2011 second semi-annual sampling event in comparison to the dissolved mass that existed at an earlier time. A decrease in contaminant mass over time may suggest a finite source of contamination. A steady state or growing dissolved mass would suggest continuing flux of contaminant mass into the aqueous environment indicative of a continuous source (e.g., NAPL). To accomplish the task of calculating dissolved contaminant mass, the dissolved contaminant mass that existed in the 2000 second semi-annual sampling event was compared to the dissolved mass calculated from the 2011 second semi-annual event. The following formula was used:

$$\mathbf{C_{avg} \ x \ V_{gw} \ x \ \rho_{gw} = Total\ Dissolved\ Contaminant\ mass}.$$

where:

- $\mathbf{C_{avg}}$ = average concentration of total VOCs expressed as xx μg_{voc} / L_{gw}
- $\mathbf{V_{gw}}$ = ft^3 of plume area (average saturated thickness = 25 ft) expressed as ft^3_{gw}
- $\boldsymbol{\rho_{gw}}$ = density of groundwater (L_{gw}/ft^3_{gw})

Specifically the area of plume segments (in ft^2) calculated by AutoCAD from Plates of lower completion groundwater solvent contamination provided in the 2000 and 2011 Annual Groundwater Corrective Action Reports were calculated along with the average concentration of all VOCs detected in lower completion wells from within each plume segment. An average saturated thickness of 25 feet was used in all calculations. The total dissolved mass calculated from the two sitewide VOC plumes from 2000 and 2011 were as follows:

Table 4.4: Dissolved Contaminant Mass 2000 versus 2011

2000	Mass of VOCs (in pounds)	2011	Mass of VOCs (in pounds)
ICGFS	9,846.67	ICGFS	5,977.38
BRGFS	1,277.34	BRGFS	2767.17
TOTAL	11,124.01		8744.55

The estimated overall mass of the sitewide dissolved VOC groundwater plume between 2000 and 2011 declined by a total of 3,275.64 pounds, a reduction of 21.4%. The mass of the ICGFS portion of the plume decreased by almost 40% (5,977.38 pounds in 2011

versus 9,846.67 pounds in 2000) while the dissolved mass of the BRGFS plume between 2000 and 2011 increased by almost 1489.8 pounds.

Historical investigations at the facility regarding Dense Non Aqueous Phase Liquids concluded that idealized pools of DNAPL do not exist and that DNAPL is not migrating as a separate phase. However, interpretation of site data was consistent with the hypothesis that DNAPL did exist at the facility but was trapped as discontinuous ganglia throughout several feet of soil at the base of the aquifer within the TCE Still Area release site and the former Plating Building degreaser area. In addition, DNAPL was visually observed by the author during the in-situ soil mixing project conducted in the area of the Old Ponds in the BRGFS. Previous studies have also concluded that groundwater pump and treat was unlikely to significantly alter groundwater contaminant concentrations for a long period of time (URS, 1999).

Specific calculations of plume mass conducted as a part of this exercise are included as an attachment to this section. The overall mass of dissolved solvent contamination in 2011 is 21% less than that calculated in 2000. This fact combined with a reduction in contamination in a number of monitoring wells suggests a reduction of mass in areas not directly impacted by DNAPL is occurring over time. As stated previously, evidence of contaminant attenuation is evident at the KCP based on the ubiquitous presence of TCE degradation products.

4.7.2 Effect of Pumping System on Contaminant Movement

The optimized (second generation) groundwater pumping system has been in full operation since March 2002**.** Upon analysis of groundwater potentiometric surfaces and contaminant distribution and overall mass, the pumping system continues to effectively limit the off-site movement of contaminated groundwater.

The current groundwater pumping system in the ICGFS which includes the significant benefits of building footing tile drains in removing groundwater effectively contains any contamination off-site. Nowhere are these drains more important than in the area of Building 50 where groundwater is captured under the West Boilerhouse. Groundwater flowing within the MMB is also captured by these drains which serve to inhibit southward flow toward Indian Creek. Pumping well 276 on the eastern edge of the MMB effectively contains solvent contamination from the former Plating Building degreaser. Solvent contamination from the area extends to the area of well 184 but is captured by footing tile drains before it reaches well 185 (Appendix A). The presence of a very low level detection of 1,2-DCE in well 158 L in the southeast quadrant of the MMB is unusual in that it resides within a mound of groundwater. Well 158 is a water level only well that was sampled in 2011 as a part of the second semi-annual sampling event. This well will be sampled in 2012 to determine if the presence of 1, 2 –DCE in this well is an enduring feature. Groundwater from this well flows directly toward compliance point well 202.

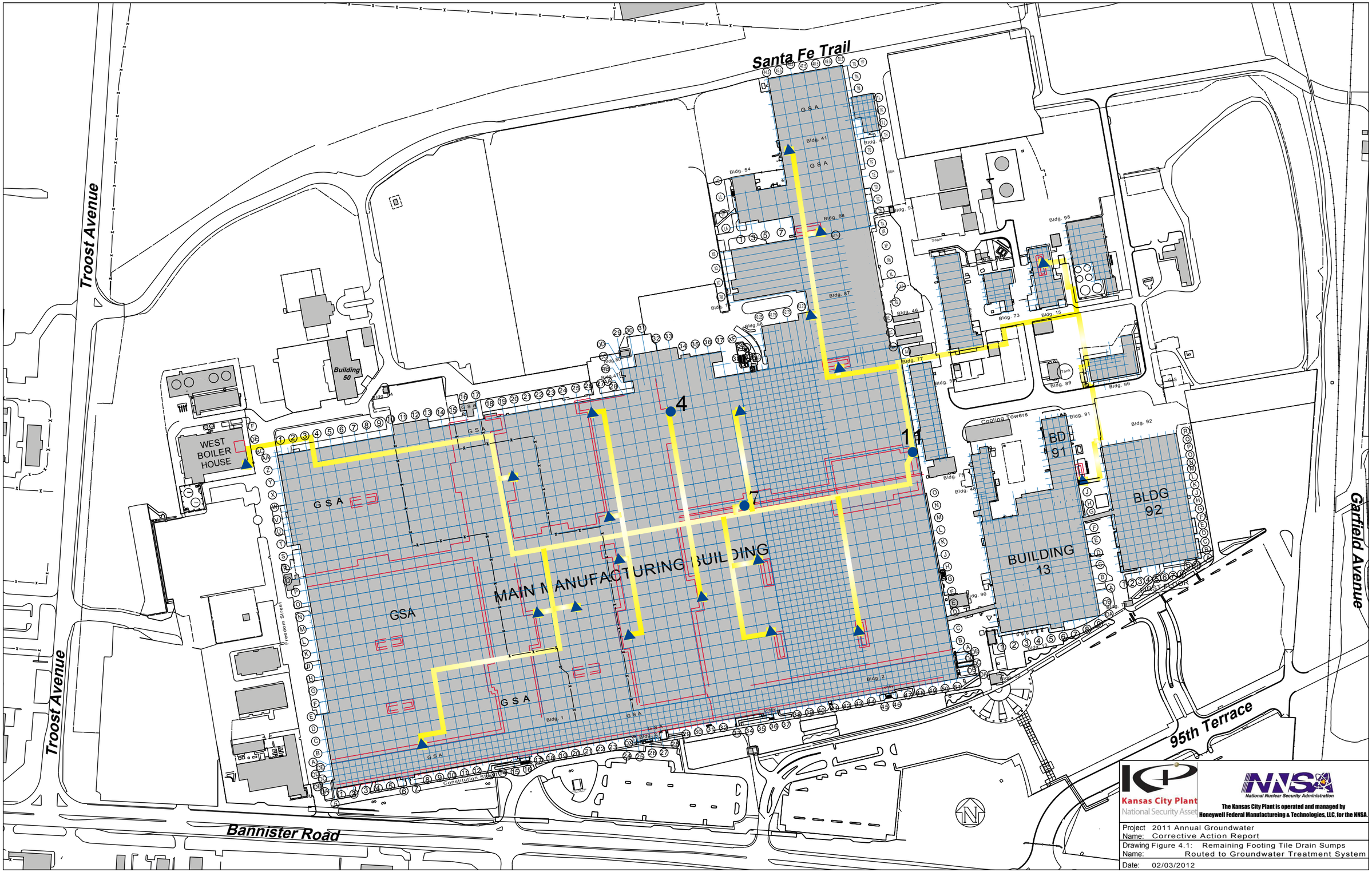
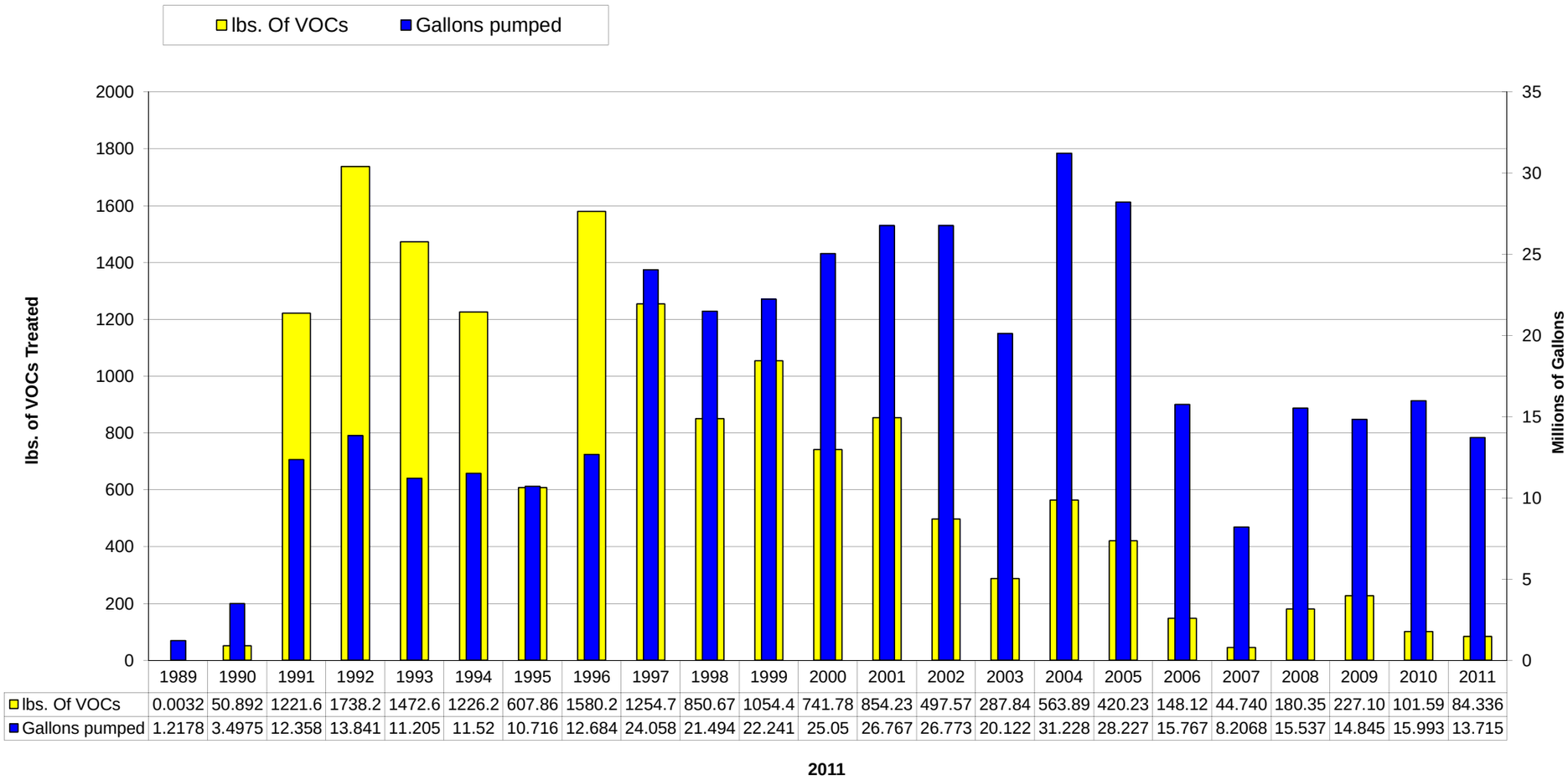

Santa Fe Trail
Troost Avenue
Garfield Avenue
95th Terrace
Bannister Road
Freedom Street
Constitution Street
WEST BOILER HOUSE
Building 50
MAIN MANUFACTURING BUILDING
GSA
BUILDING 13
BLDG 92
BD 91
Cooling Towers
4
7
11
Kansas City Plant
National Security Assets
NNSA
National Nuclear Security Administration
The Kansas City Plant is operated and managed by
Honeywell Federal Manufactureing & Technologies, LLC, for the NNSA.
Project 2011 Annual Groundwater
Name: Corrective Action Report
Drawing Figure 4.1: Remaining Footing Tile Drain Sumps
Name: Routed to Groundwater Treatment System
Date: 02/03/2012

Figure 4.2
GROUNDWATER TREATMENT SYSTEM
GALLONS PUMPED / VOCs REMOVED



	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
lbs. Of VOCs	0.0032	50.892	1221.6	1738.2	1472.6	1226.2	607.86	1580.2	1254.7	850.67	1054.4	741.78	854.23	497.57	287.84	563.89	420.23	148.12	44.740	180.35	227.10	101.59	84.336
Gallons pumped	1.2178	3.4975	12.358	13.841	11.205	11.52	10.716	12.684	24.058	21.494	22.241	25.05	26.767	26.773	20.122	31.228	28.227	15.767	8.2068	15.537	14.845	15.993	13.715

Pumping wells within the southeast parking lot effectively contain contamination. Water quality within the wells and lower completion plume shape in this area suggest the pumping wells draw dissolved contamination to the first pumping well 235.

Pumping well 271 captures contamination derived from the area near well OW-1 as well as possible residual contamination from the former Underground Tank Farm.

Contamination at the eastern edge of the flow system derived from the Abandoned sump (SWMU 37) monitored by well 209 flows toward the Building 91 drain as manifested by depressed water levels in monitoring well 72.

Groundwater flow to the northeast toward the cattail area is thwarted by hydraulic mounding created by this feature and enhanced biodegradation that likely occurs in this area. Well 275 effectively captures the small sliver of plume that exits on the north side of the cattail feature

Source area wells 272 and 273 extract groundwater from the area of the Former Ponds though mass removal is limited. Pumping well 274 serves as the primary groundwater extraction point for groundwater flowing toward the Blue River in the flow system. Groundwater quality at the south end of the iron wall near pumping wells 277 and 278 detected little or no contamination. Follow up sampling of wells in the area showed no evidence of contamination that would produce the levels noted in well 278. This compliance point well marks the downgradient extent of contamination over site standards in the BRGFS.

Conclusion

The KCP groundwater pumping system serves to contain groundwater contamination at the KCP and removes contaminant mass at a rate of tens to hundreds of pounds per year.

Table 4.5 Blue River Flow System Groundwater Pumping Well Flows (Gallons)
January 1 - December 31, 2011

Month	Well 272	Well 273	Well 274	Well 275	Well 277	Well 278	Total
January	55,291	116,743	111,600	68,770	191,699	0	544,103
February	50,996	72,449	105,228	76,366	172,561	5,605	483,205
March	87,872	97,013	192,425	81,699	130,856	127,505	717,370
April	71,435	106,833	157,686	48,234	204,755	132,486	721,429
May	83,091	88,354	173,666	85,719	205,786	174,396	811,012
June	81,695	23,494	144,334	84,574	185,869	154,347	674,313
July	59,267	71,172	144,254	69,153	157,722	93,630	595,198
August	45,485	37,197	86,484	37,621	165,975	31,356	404,118
September	52,978	67,879	180,082	235	177,012	6,213	484,399
October	55,701	89,708	137,093	1,717	184,201	0	468,420
November	34,577	142,205	116,330	3,351	160,670	62,401	519,534
December	62,683	119,117	133,877	1,545	125,513	110,129	552,864
Total	**741,071**	**1,032,164**	**1,683,059**	**558,984**	**2,062,619**	**898,068**	**6,975,965**

Table 4.6 Indian Creek Flow System Pumping Well Flows (Gallons)
January 1 - December 31, 2011

Month	Well 235	Well 236	Well 271	Well 276	Total
January	356	156,240	66,405	66,889	289,890
February	16,007	137,370	60,080	59,408	272,865
March	59,462	155,872	66,957	62,319	344,610
April	28,219	151,200	64,799	64,113	308,331
May	43,081	152,983	64,318	65,533	325,915
June	39,349	148,144	56,303	60,235	304,031
July	47,515	149,985	66,015	65,692	329,207
August	2,727	92,985	64,896	61,500	222,108
September	181	120,914	66,871	63,588	251,554
October	202	155,952	66,840	57,720	280,714
November	211	151,200	52,403	60,561	264,375
December	221	156,189	66,939	65,698	289,047
Total	**237,531**	**1,729,034**	**762,826**	**753,256**	**3,482,647**

Table 4.7 Groundwater Footing Tile Drain and Collection Sump Flows (Gallons)
January 1 - December 31, 2011

Month	2" Tile BD 15 Footing Tile Drain	3" Tile Outfall 001 Groundwater Collection Sump	4" Tile MMB Footing Tile Drains	002 Outfall	Total Footing Tiles
January	0	14,956	2,325	274,983	292,264
February	0	85,251	4,224	298,962	388,437
March	0	108,491	7,500	201,472	317,463
April	0	89,271	22,381	98,242	209,894
May	0	63,605	28,743	145,745	238,093
June	0	38,938	29,653	235,902	304,493
July	0	8,605	34,536	321,657	364,798
August	0	7,878	46,692	182,460	237,030
September	0	71,077	32,677	87,999	191,753
October	0	120,888	42,425	52,480	215,793
November	0	122,088	57,202	51,860	231,150
December	0	123,383	61,311	80,380	265,074
Total	**0**	**854,431**	**369,669**	**2,032,142**	**3,256,242**

Table 4.8: Blue River Flow System Contaminants Over Site Cleanup Standards

Printed: 02/03/2012 **CY-2011**

Location	Comp	Analyte	Date	Value	Date	Value	Limit	Units
KC00-265	L	Vinyl Chloride			10/24/2011	118.0	2.0	ug/L
KC01-272	L	1,1-Dichloroethene	05/10/2011	7.2	11/02/2011	11.5	7.0	ug/L
		1,2-Dichloroethene (Total)	05/10/2011	8,460.0	11/02/2011	14,900.0	70.0	ug/L
		Benzene	05/10/2011	17.7	11/02/2011	22.0	5.0	ug/L
		Trichloroethene	05/10/2011	74.6	11/02/2011	808.0	5.0	ug/L
		Vinyl Chloride	05/10/2011	1,420.0	11/02/2011	1,170.0	2.0	ug/L
KC01-273	L	1,1-Dichloroethene	05/10/2011	14.9	11/01/2011	13.8	7.0	ug/L
		1,2-Dichloroethene (Total)	05/10/2011	11,900.0	11/01/2011	9,550.0	70.0	ug/L
		Benzene	05/10/2011	51.2	11/01/2011	42.5	5.0	ug/L
		Trichloroethene	05/10/2011	126.0	11/01/2011	83.3	5.0	ug/L
		Vinyl Chloride	05/10/2011	2,990.0	11/01/2011	2,490.0	2.0	ug/L
KC01-274	L	1,2-Dichloroethene (Total)			11/02/2011	239.0	70.0	ug/L
		Vinyl Chloride	05/10/2011	54.7	11/02/2011	74.1	2.0	ug/L
KC01-275	L	1,2-Dichloroethene (Total)			11/02/2011	242.0	70.0	ug/L
		Vinyl Chloride	05/10/2011	44.8	11/02/2011	60.6	2.0	ug/L
KC01-277	L	Vinyl Chloride	05/10/2011	2.7	11/02/2011	2.6	2.0	ug/L
KC01-278	L	1,2-Dichloroethene (Total)			11/02/2011	242.0	70.0	ug/L
		Vinyl Chloride	05/10/2011	4.6	11/02/2011	77.4	2.0	ug/L
KC84-018	L	1,2-Dichloroethene (Total)	04/26/2011	1,250.0	10/20/2011	1,630.0	70.0	ug/L
		Benzene	04/26/2011	15.8	10/20/2011	27.1	5.0	ug/L
		Vinyl Chloride	04/26/2011	810.0	10/20/2011	1,200.0	2.0	ug/L
KC84-018	M	1,2-Dichloroethene (Total)	04/26/2011	330.0	10/20/2011	1,680.0	70.0	ug/L
		Vinyl Chloride			10/20/2011	199.0	2.0	ug/L
KC85-037	L	1,2-Dichloroethene (Total)			10/14/2011	3,180.0	70.0	ug/L
		Trichloroethene			10/14/2011	15.1	5.0	ug/L
		Vinyl Chloride			10/14/2011	111.0	2.0	ug/L
KC85-037	M	1,2-Dichloroethene (Total)			10/14/2011	1,840.0	70.0	ug/L
		Vinyl Chloride			10/14/2011	87.8	2.0	ug/L
KC85-037	U	1,1-Dichloroethene			10/14/2011	15.5	7.0	ug/L
		1,2-Dichloroethene (Total)	04/25/2011	19,000.0	10/14/2011	30,400.0	70.0	ug/L
		Benzene	04/25/2011	28.2	10/14/2011	43.9	5.0	ug/L

Table 4.8: Blue River Flow System Contaminants Over Site Cleanup Standards

Printed: 02/03/2012 **CY-2011**

Location	Comp	Analyte	Date	Value	Date	Value	Limit	Units
KC85-037		Trichloroethene			10/14/2011	10.3	5.0	ug/L
		Vinyl Chloride			10/14/2011	2,480.0	2.0	ug/L
KC85-039	L	Vinyl Chloride			10/20/2011	23.0	2.0	ug/L
KC85-039	M	Vinyl Chloride			10/20/2011	5.5	2.0	ug/L
KC85-045	L	1,2-Dichloroethene (Total)			10/21/2011	552.0	70.0	ug/L
KC85-045	U	1,2-Dichloroethene (Total)			10/21/2011	271.0	70.0	ug/L
KC87-067	L	1,1-Dichloroethene			10/20/2011	11.1	7.0	ug/L
		1,2-Dichloroethene (Total)			10/20/2011	10,900.0	70.0	ug/L
		Benzene			10/20/2011	14.4	5.0	ug/L
		Trichloroethene			10/20/2011	5.4	5.0	ug/L
		Vinyl Chloride			10/20/2011	645.0	2.0	ug/L
KC87-067	U	1,2-Dichlorobenzene			10/20/2011	637.0	600.0	ug/L
		Chlorobenzene			10/20/2011	916.0	100.0	ug/L
KC88-077	L	1,2-Dichloroethene (Total)	04/26/2011	170.0	10/21/2011	307.0	70.0	ug/L
		Vinyl Chloride	04/26/2011	45.1	10/21/2011	44.1	2.0	ug/L
KC91-182	L	1,2-Dichloroethene (Total)	04/26/2011	1,190.0	10/21/2011	1,050.0	70.0	ug/L
		Vinyl Chloride	04/26/2011	3.9	10/21/2011	45.9	2.0	ug/L
KC91-182	U	Trichloroethene	04/26/2011	58.5	10/21/2011	58.1	5.0	ug/L
KC95-200	L	Vinyl Chloride	04/29/2011	2.6			2.0	ug/L
KC98-212	L	Vinyl Chloride	04/26/2011	3.4			2.0	ug/L
OW-008	L	Vinyl Chloride			10/14/2011	2.1	2.0	ug/L

Table 4.9: Indian Creek Flow System Contaminants Over Site Cleanup Standards

Printed: 02/03/2012 **CY-2011**

Location	Comp	Analyte	Date	Value	Date	Value	Limit	Units
GS01-501	L	Trichloroethene			11/04/2011	607.0	5.0	ug/L
GS01-502	L	1,1-Dichloroethene			11/04/2011	23.9	7.0	ug/L
		1,2-Dichloroethene (Total)			11/04/2011	16,200.0	70.0	ug/L
		Trichloroethene			11/04/2011	9.8	5.0	ug/L
		Vinyl Chloride			11/04/2011	7,730.0	2.0	ug/L
GS02-503	L	1,2-Dichloroethene (Total)			11/04/2011	452.0	70.0	ug/L
		Trichloroethene			11/04/2011	1,980.0	5.0	ug/L
		Vinyl Chloride			11/04/2011	23.3	2.0	ug/L
GS06-505	L	Trichloroethene			11/04/2011	28,800.0	5.0	ug/L
GS06-508	L	1,2-Dichloroethene (Total)			11/04/2011	454.0	70.0	ug/L
		Vinyl Chloride			11/04/2011	16.2	2.0	ug/L
GS06-509	L	Trichloroethene			11/04/2011	2,750.0	5.0	ug/L
KC01-271	L	1,2-Dichloroethene (Total)	05/10/2011	103.0	11/02/2011	2,400.0	70.0	ug/L
		Benzene			11/02/2011	5.0	5.0	ug/L
		Trichloroethene	05/10/2011	5.9	11/02/2011	151.0	5.0	ug/L
		Vinyl Chloride	05/10/2011	24.6	11/02/2011	160.0	2.0	ug/L
KC01-276	L	1,1-Dichloroethene	05/10/2011	35.9	11/01/2011	39.4	7.0	ug/L
		1,2-Dichloroethene (Total)	05/10/2011	7,110.0	11/01/2011	3,150.0	70.0	ug/L
		PCB-1242 (Aroclor 1242)	05/10/2011	217.0	11/01/2011	88.8	0.5	ug/L
		Tetrachloroethene	05/10/2011	605.0	11/01/2011	259.0	5.0	ug/L
		Trichloroethene	05/10/2011	28,900.0	11/01/2011	11,700.0	5.0	ug/L
		Vinyl Chloride	05/10/2011	532.0			2.0	ug/L
KC84-006	M	Vinyl Chloride			10/14/2011	4.3	2.0	ug/L
KC85-033	L	1,2-Dichloroethene (Total)			10/31/2011	117.0	70.0	ug/L
		Trichloroethene			10/31/2011	171.0	5.0	ug/L
		Vinyl Chloride			10/31/2011	2.1	2.0	ug/L
KC85-034	L	Tetrachloroethene			10/31/2011	6.1	5.0	ug/L
		Trichloroethene			10/31/2011	33.3	5.0	ug/L
		Vinyl Chloride			10/31/2011	4.4	2.0	ug/L
KC85-034	M	Trichloroethene			10/31/2011	16.3	5.0	ug/L
		Vinyl Chloride			10/31/2011	11.4	2.0	ug/L

Table 4.9: Indian Creek Flow System Contaminants Over Site Cleanup Standards

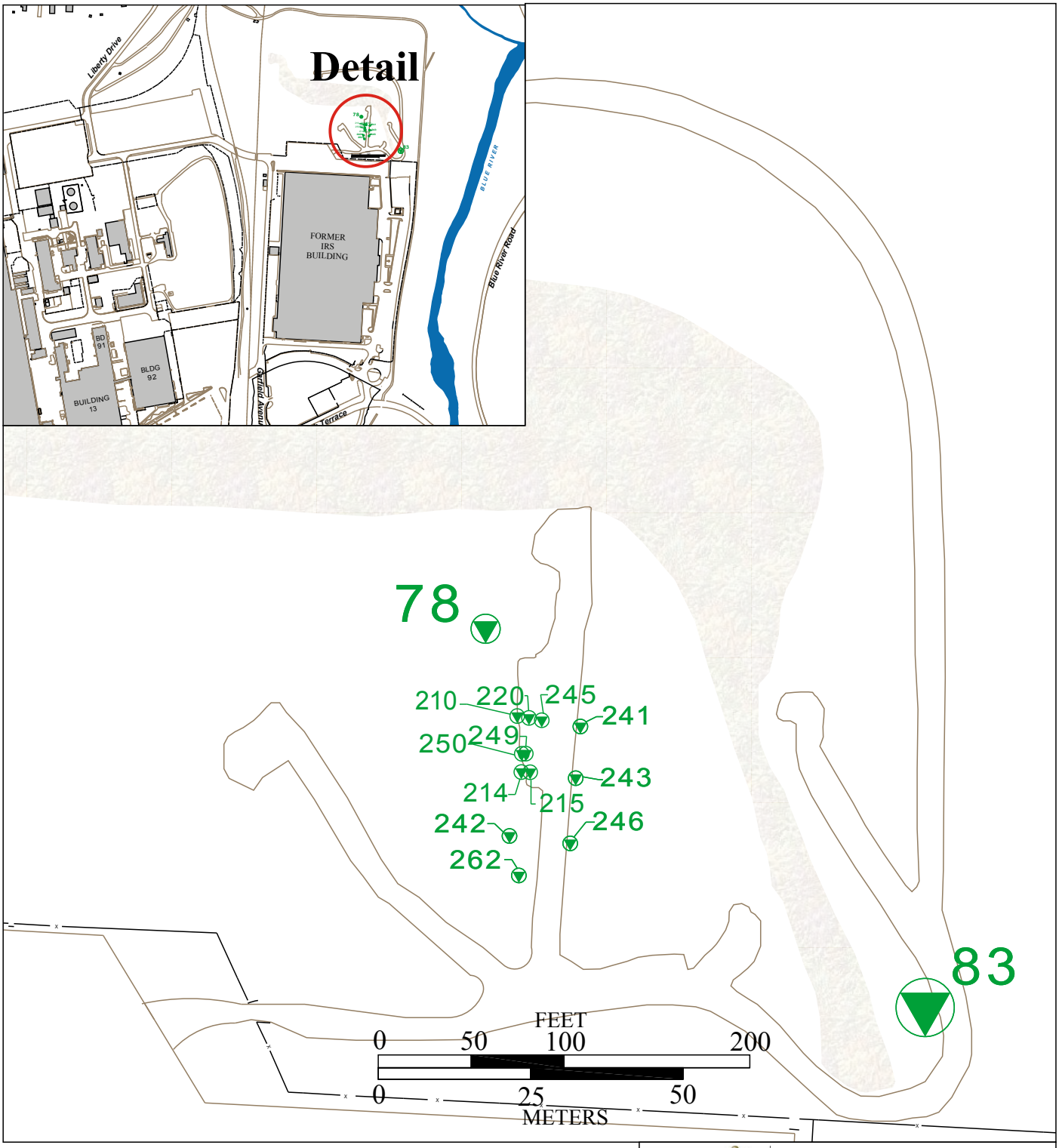
Printed: 02/03/2012 **CY-2011**

Location	Comp	Analyte	Date	Value	Date	Value	Limit	Units
KC87-069	L	1,1-Dichloroethene	04/25/2011	17.7	10/19/2011	26.4	7.0	ug/L
		1,2-Dichloroethene (Total)	04/25/2011	4,950.0	10/19/2011	7,670.0	70.0	ug/L
		Trichloroethene	04/25/2011	560.0	10/19/2011	34.6	5.0	ug/L
		Vinyl Chloride	04/25/2011	1,620.0	10/19/2011	1,140.0	2.0	ug/L
KC87-069	U	1,2-Dichloroethene (Total)			10/19/2011	74.2	70.0	ug/L
		Trichloroethene	04/25/2011	140.0	10/19/2011	76.2	5.0	ug/L
KC87-071	L	Vinyl Chloride	04/25/2011	155.0	10/24/2011	143.0	2.0	ug/L
KC87-071	U	Vinyl Chloride			10/24/2011	7.0	2.0	ug/L
KC87-072	L	Vinyl Chloride			10/24/2011	51.2	2.0	ug/L
KC89-115	L	1,2-Dichloroethene (Total)			10/18/2011	186.0	70.0	ug/L
		Trichloroethene			10/18/2011	14.8	5.0	ug/L
		Vinyl Chloride			10/18/2011	2.7	2.0	ug/L
KC89-115	U	Vinyl Chloride			10/18/2011	2.6	2.0	ug/L
KC89-125	L	Vinyl Chloride	05/10/2011	4.0	10/19/2011	8.7	2.0	ug/L
KC89-125	U	Vinyl Chloride			10/19/2011	7.8	2.0	ug/L
KC91-157	L	Vinyl Chloride			10/26/2011	2.7	2.0	ug/L
KC91-160	L	1,2-Dichloroethene (Total)			10/19/2011	1,620.0	70.0	ug/L
		Trichloroethene			10/19/2011	200.0	5.0	ug/L
		Vinyl Chloride			10/19/2011	5.2	2.0	ug/L
KC91-160	U	1,2-Dichloroethene (Total)			10/19/2011	362.0	70.0	ug/L
KC91-163	L	1,1-Dichloroethane			10/27/2011	2,370.0	810.0	ug/L
		1,1-Dichloroethene			10/27/2011	153.0	7.0	ug/L
		1,2-Dichloroethane			10/27/2011	6.3	5.0	ug/L
		1,2-Dichloroethene (Total)			10/27/2011	256.0	70.0	ug/L
		Trichloroethene			10/27/2011	16.3	5.0	ug/L
		Vinyl Chloride			10/27/2011	75.1	2.0	ug/L
KC91-163	U	1,2-Dichloroethene (Total)			10/27/2011	78.5	70.0	ug/L
		Vinyl Chloride			10/27/2011	7.5	2.0	ug/L
KC91-165	L	Vinyl Chloride	05/09/2011	128.0	11/01/2011	80.3	2.0	ug/L
KC91-168	L	1,2-Dichloroethene (Total)			10/25/2011	140.0	70.0	ug/L
KC91-176	L	Trichloroethene			10/18/2011	8.6	5.0	ug/L

Table 4.9: Indian Creek Flow System Contaminants Over Site Cleanup Standards

Printed: 02/03/2012 **CY-2011**

Location	Comp	Analyte	Date	Value	Date	Value	Limit	Units
KC92-184	L	1,1-Dichloroethene			10/19/2011	13.5	7.0	ug/L
		1,2-Dichloroethene (Total)			10/19/2011	2,790.0	70.0	ug/L
		Trichloroethene			10/19/2011	6,470.0	5.0	ug/L
		Vinyl Chloride			10/19/2011	14.0	2.0	ug/L
KC92-187	L	Vinyl Chloride			10/18/2011	20.3	2.0	ug/L
KC92-187	U	Benzene			10/18/2011	49.2	5.0	ug/L
KC94-192	L	1,1-Dichloroethene			11/01/2011	135.0	7.0	ug/L
		1,2-Dichloroethene (Total)			11/01/2011	18,100.0	70.0	ug/L
		PCB-1242 (Aroclor 1242)	05/06/2011	122.0	11/01/2011	18.7	0.5	ug/L
		Trichloroethene			11/01/2011	255,000.0	5.0	ug/L
KC94-192	U	1,1-Dichloroethene			11/01/2011	189.0	7.0	ug/L
		1,2-Dichloroethene (Total)	05/06/2011	91,200.0	11/01/2011	107,000.0	70.0	ug/L
		PCB-1242 (Aroclor 1242)	05/06/2011	2.4	11/01/2011	3.1	0.5	ug/L
		Tetrachloroethene	05/06/2011	2,460.0	11/01/2011	2,550.0	5.0	ug/L
		Trichloroethene	05/06/2011	69,600.0	11/01/2011	74,600.0	5.0	ug/L
		Vinyl Chloride	05/06/2011	115.0			2.0	ug/L
KC94-193	L	Vinyl Chloride			10/18/2011	47.9	2.0	ug/L
KC94-199	L	1,2-Dichloroethene (Total)			10/18/2011	75.0	70.0	ug/L
		Trichloroethene	04/27/2011	10.9	10/18/2011	44.2	5.0	ug/L
		Vinyl Chloride	04/27/2011	20.0			2.0	ug/L
KC97-209	L	1,1-Dichloroethene			10/25/2011	34.7	7.0	ug/L
		1,2-Dichloroethene (Total)			10/25/2011	1,770.0	70.0	ug/L
		Vinyl Chloride			10/25/2011	912.0	2.0	ug/L
KC97-209	U	1,2-Dichloroethene (Total)			10/25/2011	192.0	70.0	ug/L
		Vinyl Chloride			10/25/2011	171.0	2.0	ug/L
KC99-235	L	1,2-Dichloroethene (Total)	05/10/2011	305.0	11/02/2011	847.0	70.0	ug/L
		PCB-1242 (Aroclor 1242)	05/10/2011	1.8			0.5	ug/L
		Trichloroethene			11/02/2011	46.5	5.0	ug/L
		Vinyl Chloride	05/10/2011	84.3	11/02/2011	101.0	2.0	ug/L
OW-001	L	1,2-Dichloroethene (Total)			10/24/2011	167.0	70.0	ug/L
		Vinyl Chloride			10/24/2011	14.0	2.0	ug/L



Cattails

Kansas City Plant
National Security Asset

National Nuclear Security Administration

The Kansas City Plant is operated and managed by
Honeywell Federal Manufactureing & Technologies, LLC, for the NNSA.

Project Name:	2011 Annual Groundwater Corrective Action Report
Drawing Name:	Figure 4.3: Wells Sampled January 2012
Date:	02/08/2012

Table 4.10 January 2012 Sampling Results

Well	Date	Parameter	Result	Units
KC00-262L	1/11/2012	1,1,1-Trichloroethane	< 0.5	ug/L
	1/11/2012	1,1,2-Trichloroethane	< 0.5	ug/L
	1/11/2012	1,1-Dichloroethane	< 0.7	ug/L
	1/11/2012	1,1-Dichloroethene	< 1.3	ug/L
	1/11/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/11/2012	1,2-Dichloroethane	< 0.5	ug/L
	1/11/2012	1,2-Dichloroethene (Total)	< 0.5	ug/L
	1/11/2012	2-Butanone	< 5	ug/L
	1/11/2012	4-Methyl-2-Pentanone	< 5	ug/L
	1/11/2012	Acetone	< 10	ug/L
	1/11/2012	Benzene	< 2	ug/L
	1/11/2012	Carbon Disulfide	< 5	ug/L
	1/11/2012	Chlorobenzene	< 0.7	ug/L
	1/11/2012	Chloroform	< 0.5	ug/L
	1/11/2012	Tetrachloroethene	< 0.5	ug/L
	1/11/2012	Toluene	< 2	ug/L
	1/11/2012	Trichloroethene	< 1.2	ug/L
	1/11/2012	Vinyl Chloride	< 1.8	ug/L
KC88-078L	1/26/2012	1,1,1-Trichloroethane	< 0.5	ug/L
	1/26/2012	1,1,2-Trichloroethane	< 0.5	ug/L
	1/26/2012	1,1-Dichloroethane	< 0.7	ug/L
	1/26/2012	1,1-Dichloroethene	< 1.3	ug/L
	1/26/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/26/2012	1,2-Dichloroethane	< 0.5	ug/L
	1/26/2012	1,2-Dichloroethene (Total)	0.91	ug/L
	1/26/2012	2-Butanone	< 5	ug/L
	1/26/2012	4-Methyl-2-Pentanone	< 5	ug/L
	1/26/2012	Acetone	< 10	ug/L
	1/26/2012	Benzene	< 2	ug/L
	1/26/2012	Carbon Disulfide	< 5	ug/L
	1/26/2012	Chlorobenzene	< 0.7	ug/L
	1/26/2012	Chloroform	< 0.5	ug/L
	1/26/2012	Tetrachloroethene	< 0.5	ug/L
	1/26/2012	Toluene	< 2	ug/L
	1/26/2012	Trichloroethene	< 1.2	ug/L
	1/26/2012	Vinyl Chloride	22	ug/L
KC88-078U	1/26/2012	1,1,1-Trichloroethane	< 0.5	ug/L
	1/26/2012	1,1,2-Trichloroethane	< 0.5	ug/L
	1/26/2012	1,1-Dichloroethane	< 0.7	ug/L
	1/26/2012	1,1-Dichloroethene	< 1.3	ug/L
	1/26/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/26/2012	1,2-Dichloroethane	< 0.5	ug/L
	1/26/2012	1,2-Dichloroethene (Total)	1.2	ug/L
	1/26/2012	2-Butanone	< 5	ug/L
	1/26/2012	4-Methyl-2-Pentanone	< 5	ug/L
	1/26/2012	Acetone	< 10	ug/L

Table 4.10 January 2012 Sampling Results

KC88-078U	1/26/2012	Benzene	< 2	ug/L
	1/26/2012	Carbon Disulfide	< 5	ug/L
	1/26/2012	Chlorobenzene	< 0.7	ug/L
	1/26/2012	Chloroform	< 0.5	ug/L
	1/26/2012	Tetrachloroethene	< 0.5	ug/L
	1/26/2012	Toluene	< 2	ug/L
	1/26/2012	Trichloroethene	< 1.2	ug/L
	1/26/2012	Vinyl Chloride	< 1.8	ug/L
KC88-083L	1/11/2012	1,1,1-Trichloroethane	< 1	ug/L
	1/11/2012	1,1,2-Trichloroethane	< 1	ug/L
	1/11/2012	1,1-Dichloroethane	< 1	ug/L
	1/11/2012	1,1-Dichloroethene	< 1	ug/L
	1/11/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/11/2012	1,2-Dichloroethane	< 1	ug/L
	1/11/2012	1,2-Dichloroethene (Total)	< 1	ug/L
	1/11/2012	2-Butanone	< 10	ug/L
	1/11/2012	4-Methyl-2-Pentanone	< 10	ug/L
	1/11/2012	Acetone	< 10	ug/L
	1/11/2012	Benzene	< 1	ug/L
	1/11/2012	Carbon Disulfide	< 5	ug/L
	1/11/2012	Chlorobenzene	< 1	ug/L
	1/11/2012	Chloroform	< 1	ug/L
	1/11/2012	Tetrachloroethene	< 1	ug/L
	1/11/2012	Toluene	< 1	ug/L
	1/11/2012	Trichloroethene	< 1	ug/L
	1/11/2012	Vinyl Chloride	< 1	ug/L
KC98-210L	1/25/2012	1,1,1-Trichloroethane	< 0.5	ug/L
	1/25/2012	1,1,2-Trichloroethane	< 0.5	ug/L
	1/25/2012	1,1-Dichloroethane	< 0.7	ug/L
	1/25/2012	1,1-Dichloroethene	< 1.3	ug/L
	1/25/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/25/2012	1,2-Dichloroethane	< 0.5	ug/L
	1/25/2012	1,2-Dichloroethene (Total)	< 0.5	ug/L
	1/25/2012	2-Butanone	< 5	ug/L
	1/25/2012	4-Methyl-2-Pentanone	< 5	ug/L
	1/25/2012	Acetone	< 10	ug/L
	1/25/2012	Benzene	< 2	ug/L
	1/25/2012	Carbon Disulfide	< 5	ug/L
	1/25/2012	Chlorobenzene	< 0.7	ug/L
	1/25/2012	Chloroform	< 0.5	ug/L
	1/25/2012	Tetrachloroethene	< 0.5	ug/L
	1/25/2012	Toluene	< 2	ug/L
	1/25/2012	Trichloroethene	< 1.2	ug/L
	1/25/2012	Vinyl Chloride	7.8	ug/L
KC98-214U	1/25/2012	1,1,1-Trichloroethane	< 0.5	ug/L
	1/25/2012	1,1,2-Trichloroethane	< 0.5	ug/L
	1/25/2012	1,1-Dichloroethane	< 0.7	ug/L

Table 4.10 January 2012 Sampling Results

KC98-214U	1/25/2012	1,1-Dichloroethene	< 1.3	ug/L
	1/25/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/25/2012	1,2-Dichloroethane	< 0.5	ug/L
	1/25/2012	1,2-Dichloroethene (Total)	2	ug/L
	1/25/2012	2-Butanone	< 5	ug/L
	1/25/2012	4-Methyl-2-Pentanone	< 5	ug/L
	1/25/2012	Acetone	< 10	ug/L
	1/25/2012	Benzene	< 2	ug/L
	1/25/2012	Carbon Disulfide	< 5	ug/L
	1/25/2012	Chlorobenzene	< 0.7	ug/L
	1/25/2012	Chloroform	< 0.5	ug/L
	1/25/2012	Tetrachloroethene	< 0.5	ug/L
	1/25/2012	Toluene	< 2	ug/L
	1/25/2012	Trichloroethene	< 1.2	ug/L
	1/25/2012	Vinyl Chloride	< 1.8	ug/L
KC98-215L	1/25/2012	1,1,1-Trichloroethane	< 1	ug/L
	1/25/2012	1,1,2-Trichloroethane	< 1	ug/L
	1/25/2012	1,1-Dichloroethane	< 1	ug/L
	1/25/2012	1,1-Dichloroethene	< 1	ug/L
	1/25/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/25/2012	1,2-Dichloroethane	< 1	ug/L
	1/25/2012	1,2-Dichloroethene (Total)	< 1	ug/L
	1/25/2012	2-Butanone	< 10	ug/L
	1/25/2012	4-Methyl-2-Pentanone	< 10	ug/L
	1/25/2012	Acetone	< 10	ug/L
	1/25/2012	Benzene	< 1	ug/L
	1/25/2012	Carbon Disulfide	< 5	ug/L
	1/25/2012	Chlorobenzene	< 1	ug/L
	1/25/2012	Chloroform	< 1	ug/L
	1/25/2012	Tetrachloroethene	< 1	ug/L
	1/25/2012	Toluene	< 1	ug/L
	1/25/2012	Trichloroethene	< 1	ug/L
	1/25/2012	Vinyl Chloride	2.5	ug/L
KC98-220L	1/25/2012	1,1,1-Trichloroethane	< 0.5	ug/L
	1/25/2012	1,1,2-Trichloroethane	< 0.5	ug/L
	1/25/2012	1,1-Dichloroethane	< 0.7	ug/L
	1/25/2012	1,1-Dichloroethene	< 1.3	ug/L
	1/25/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/25/2012	1,2-Dichloroethane	< 0.5	ug/L
	1/25/2012	1,2-Dichloroethene (Total)	< 0.5	ug/L
	1/25/2012	2-Butanone	< 5	ug/L
	1/25/2012	4-Methyl-2-Pentanone	< 5	ug/L
	1/25/2012	Acetone	< 10	ug/L
	1/25/2012	Benzene	< 2	ug/L
	1/25/2012	Carbon Disulfide	< 5	ug/L
	1/25/2012	Chlorobenzene	< 0.7	ug/L
	1/25/2012	Chloroform	< 0.5	ug/L

Table 4.10 January 2012 Sampling Results

KC98-220L	1/25/2012	Tetrachloroethene	< 0.5	ug/L
	1/25/2012	Toluene	2.3	ug/L
	1/25/2012	Trichloroethene	< 1.2	ug/L
	1/25/2012	Vinyl Chloride	< 1.8	ug/L
KC99-241L	1/26/2012	1,1,1-Trichloroethane	< 0.5	ug/L
	1/26/2012	1,1,2-Trichloroethane	< 0.5	ug/L
	1/26/2012	1,1-Dichloroethane	< 0.7	ug/L
	1/26/2012	1,1-Dichloroethene	< 1.3	ug/L
	1/26/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/26/2012	1,2-Dichloroethane	< 0.5	ug/L
	1/26/2012	1,2-Dichloroethene (Total)	0.54	ug/L
	1/26/2012	2-Butanone	< 5	ug/L
	1/26/2012	4-Methyl-2-Pentanone	< 5	ug/L
	1/26/2012	Acetone	< 10	ug/L
	1/26/2012	Benzene	< 2	ug/L
	1/26/2012	Carbon Disulfide	< 5	ug/L
	1/26/2012	Chlorobenzene	< 0.7	ug/L
	1/26/2012	Chloroform	< 0.5	ug/L
	1/26/2012	Tetrachloroethene	< 0.5	ug/L
	1/26/2012	Toluene	< 2	ug/L
	1/26/2012	Trichloroethene	< 1.2	ug/L
	1/26/2012	Vinyl Chloride	< 1.8	ug/L
KC99-241U	1/26/2012	1,1,1-Trichloroethane	< 0.5	ug/L
	1/26/2012	1,1,2-Trichloroethane	< 0.5	ug/L
	1/26/2012	1,1-Dichloroethane	< 0.7	ug/L
	1/26/2012	1,1-Dichloroethene	< 1.3	ug/L
	1/26/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/26/2012	1,2-Dichloroethane	< 0.5	ug/L
	1/26/2012	1,2-Dichloroethene (Total)	0.5	ug/L
	1/26/2012	2-Butanone	< 5	ug/L
	1/26/2012	4-Methyl-2-Pentanone	< 5	ug/L
	1/26/2012	Acetone	< 10	ug/L
	1/26/2012	Benzene	< 2	ug/L
	1/26/2012	Carbon Disulfide	< 5	ug/L
	1/26/2012	Chlorobenzene	< 0.7	ug/L
	1/26/2012	Chloroform	< 0.5	ug/L
	1/26/2012	Tetrachloroethene	< 0.5	ug/L
	1/26/2012	Toluene	< 2	ug/L
	1/26/2012	Trichloroethene	< 1.2	ug/L
	1/26/2012	Vinyl Chloride	< 1.8	ug/L
KC99-242L	1/11/2012	1,1,1-Trichloroethane	< 0.5	ug/L
	1/11/2012	1,1,2-Trichloroethane	< 0.5	ug/L
	1/11/2012	1,1-Dichloroethane	< 0.7	ug/L
	1/11/2012	1,1-Dichloroethene	< 1.3	ug/L
	1/11/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/11/2012	1,2-Dichloroethane	< 0.5	ug/L
	1/11/2012	1,2-Dichloroethene (Total)	< 0.5	ug/L

Table 4.10 January 2012 Sampling Results

KC99-242L	1/11/2012	2-Butanone	< 5	ug/L
	1/11/2012	4-Methyl-2-Pentanone	< 5	ug/L
	1/11/2012	Acetone	< 10	ug/L
	1/11/2012	Benzene	< 2	ug/L
	1/11/2012	Carbon Disulfide	< 5	ug/L
	1/11/2012	Chlorobenzene	< 0.7	ug/L
	1/11/2012	Chloroform	< 0.5	ug/L
	1/11/2012	Tetrachloroethene	< 0.5	ug/L
	1/11/2012	Toluene	< 2	ug/L
	1/11/2012	Trichloroethene	< 1.2	ug/L
	1/11/2012	Vinyl Chloride	< 1.8	ug/L
KC99-243L	1/11/2012	1,1,1-Trichloroethane	< 0.5	ug/L
	1/11/2012	1,1,2-Trichloroethane	< 0.5	ug/L
	1/11/2012	1,1-Dichloroethane	< 0.7	ug/L
	1/11/2012	1,1-Dichloroethene	< 1.3	ug/L
	1/11/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/11/2012	1,2-Dichloroethane	< 0.5	ug/L
	1/11/2012	1,2-Dichloroethene (Total)	< 0.5	ug/L
	1/11/2012	2-Butanone	< 5	ug/L
	1/11/2012	4-Methyl-2-Pentanone	< 5	ug/L
	1/11/2012	Acetone	< 10	ug/L
	1/11/2012	Benzene	< 2	ug/L
	1/11/2012	Carbon Disulfide	< 5	ug/L
	1/11/2012	Chlorobenzene	< 0.7	ug/L
	1/11/2012	Chloroform	< 0.5	ug/L
	1/11/2012	Tetrachloroethene	< 0.5	ug/L
	1/11/2012	Toluene	< 2	ug/L
	1/11/2012	Trichloroethene	< 1.2	ug/L
	1/11/2012	Vinyl Chloride	8.9	ug/L
	1/26/2012	1,1,1-Trichloroethane	< 0.5	ug/L
	1/26/2012	1,1,2-Trichloroethane	< 0.5	ug/L
	1/26/2012	1,1-Dichloroethane	< 0.7	ug/L
	1/26/2012	1,1-Dichloroethene	< 1.3	ug/L
	1/26/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/26/2012	1,2-Dichloroethane	< 0.5	ug/L
	1/26/2012	1,2-Dichloroethene (Total)	< 0.5	ug/L
	1/26/2012	2-Butanone	< 5	ug/L
	1/26/2012	4-Methyl-2-Pentanone	< 5	ug/L
	1/26/2012	Acetone	< 10	ug/L
	1/26/2012	Benzene	< 2	ug/L
	1/26/2012	Carbon Disulfide	< 5	ug/L
	1/26/2012	Chlorobenzene	< 0.7	ug/L
	1/26/2012	Chloroform	< 0.5	ug/L
	1/26/2012	Tetrachloroethene	< 0.5	ug/L
	1/26/2012	Toluene	< 2	ug/L
	1/26/2012	Trichloroethene	< 1.2	ug/L
	1/26/2012	Vinyl Chloride	17.5	ug/L

Table 4.10 January 2012 Sampling Results

KC99-243U	1/26/2012	1,1,1-Trichloroethane	< 0.5	ug/L
	1/26/2012	1,1,2-Trichloroethane	< 0.5	ug/L
	1/26/2012	1,1-Dichloroethane	< 0.7	ug/L
	1/26/2012	1,1-Dichloroethene	< 1.3	ug/L
	1/26/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/26/2012	1,2-Dichloroethane	< 0.5	ug/L
	1/26/2012	1,2-Dichloroethene (Total)	2.3	ug/L
	1/26/2012	2-Butanone	< 5	ug/L
	1/26/2012	4-Methyl-2-Pentanone	< 5	ug/L
	1/26/2012	Acetone	< 10	ug/L
	1/26/2012	Benzene	< 2	ug/L
	1/26/2012	Carbon Disulfide	< 5	ug/L
	1/26/2012	Chlorobenzene	< 0.7	ug/L
	1/26/2012	Chloroform	< 0.5	ug/L
	1/26/2012	Tetrachloroethene	< 0.5	ug/L
	1/26/2012	Toluene	< 2	ug/L
	1/26/2012	Trichloroethene	< 1.2	ug/L
	1/26/2012	Vinyl Chloride	< 1.8	ug/L
KC99-245L	1/26/2012	1,1,1-Trichloroethane	< 0.5	ug/L
	1/26/2012	1,1,2-Trichloroethane	< 0.5	ug/L
	1/26/2012	1,1-Dichloroethane	< 0.7	ug/L
	1/26/2012	1,1-Dichloroethene	< 1.3	ug/L
	1/26/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/26/2012	1,2-Dichloroethane	< 0.5	ug/L
	1/26/2012	1,2-Dichloroethene (Total)	< 0.5	ug/L
	1/26/2012	2-Butanone	< 5	ug/L
	1/26/2012	4-Methyl-2-Pentanone	< 5	ug/L
	1/26/2012	Acetone	< 10	ug/L
	1/26/2012	Benzene	< 2	ug/L
	1/26/2012	Carbon Disulfide	< 5	ug/L
	1/26/2012	Chlorobenzene	< 0.7	ug/L
	1/26/2012	Chloroform	< 0.5	ug/L
	1/26/2012	Tetrachloroethene	< 0.5	ug/L
	1/26/2012	Toluene	< 2	ug/L
	1/26/2012	Trichloroethene	< 1.2	ug/L
	1/26/2012	Vinyl Chloride	10.2	ug/L
KC99-246L	1/11/2012	1,1,1-Trichloroethane	< 0.5	ug/L
	1/11/2012	1,1,2-Trichloroethane	< 0.5	ug/L
	1/11/2012	1,1-Dichloroethane	< 0.7	ug/L
	1/11/2012	1,1-Dichloroethene	< 1.3	ug/L
	1/11/2012	1,2-Dichlorobenzene	< 1	ug/L
	1/11/2012	1,2-Dichloroethane	< 0.5	ug/L
	1/11/2012	1,2-Dichloroethene (Total)	< 0.5	ug/L
	1/11/2012	2-Butanone	< 5	ug/L
	1/11/2012	4-Methyl-2-Pentanone	< 5	ug/L
	1/11/2012	Acetone	< 10	ug/L
	1/11/2012	Benzene	< 2	ug/L

Table 4.10 January 2012 Sampling Results

KC99-246L	1/11/2012	Carbon Disulfide	< 5	ug/L
	1/11/2012	Chlorobenzene	< 0.7	ug/L
	1/11/2012	Chloroform	< 0.5	ug/L
	1/11/2012	Tetrachloroethene	< 0.5	ug/L
	1/11/2012	Toluene	< 2	ug/L
	1/11/2012	Trichloroethene	< 1.2	ug/L
	1/11/2012	Vinyl Chloride	< 1.8	ug/L

4.8 Work Performed in 2011

4.8.1 Groundwater Treatment Technology Evaluation

The current groundwater treatment system discussed in section 4.8.2 will be replaced in the future with a new system. As a part of initial efforts for system replacement, an evaluation of existing groundwater treatment and pre-treatment technologies with potential use at the KCP was conducted in 2010. From this study two new technologies were selected for further evaluation. Two separate one month pilot studies were conducted to determine if the technologies had the potential for use at the KCP. A brief description is provided below with the actual summary reports of the pilot tests provided as Appendices G and H to this report.

<u>STiR Filter</u>

The first pilot test evaluated a groundwater pretreatment technology to remove suspended solids before treatment occurred. The current system utilizes a filter bank and acidification of groundwater before it is filtered to remove suspended material. The piloted technology called the STiR system utilizes walnut shell media exclusively from Missouri sources. The media traps 95-99% of suspended solids and 90-99% of insoluble hydrocarbons. During the twenty five day test suspended solids removal was frequently 100% with no solids being detected in the filtered effluent. Utilization of this technology would eliminate the need for the large bank of filters and the acidification of groundwater. Results of the pilot are being evaluated internally to determine how the technology might be installed as a permanent feature of the BFC groundwater pump and treat systems. The most significant questions that remain include the actual amount of backwash solids that must be managed and their method of management.

<u>VOCEater</u>

The second pilot tested ABS Materials' catalytic chlorinated solvent scrubbing system called the VOCEater which uses metallic particles of palladium entrapped within a glass matrix called Osorb^{TM}. Osorb is a newly discovered glass that has the unique property of swelling over 8 times its volume when contacting organic solutes, but does not swell in water.

The Osorb swelling process is reversible and delivers high capture affinity for chlorinated organics such as TCE, 1,2-DCE and vinyl chloride. Other organics, such as benzene, are also absorbed but are not degraded. Encapsulating palladium with an Osorb matrix is advantageous for the following reasons:

1. The glass matrix extracts and concentrates organic solvents causing them to have close contact with the palladium catalyst.
2. Salts and other inorganic species are excluded from the Osorb matrix. This serves to protect the palladium from being poisoned by dissolved ions or minerals.
3. The glass is inert and water resistant preventing palladium from entering the water stream.

The ABS Materials system requires the addition of a hydrogen source (hydrogen gas) at the

inlet of a column filled with Osorb-Pd. Within the column, the Osorb rapidly absorbs the dissolved chlorinated organic (e.g. TCE) and hydrogen gas from solution. Inside the Osorb glass, the TCE and hydrogen rapidly react in a reduction reaction via palladium catalysis to yield ethane, ethene, and chloride.

Results of the testing suggest that the technology works but as discussed in Section 9 of the report a number of unresolved issues remain before the technology can ever be considered as a viable candidate to replace the current groundwater treatment system.

Results of 2011 Groundwater Monitoring Well Surface Integrity Inspection

WELL INSPECTION REPORT

Well Number:	Inspection Date:	Paint:	Stencil	Grout	Well Caps	Locks	Pad Loose	Tags:	Weep Hole
KC00-261	9/23/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC00-262	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC00-265	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC00-267	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC00-268	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC00-269	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC00-270	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC01-271	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC01-272	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								

WELL INSPECTION REPORT

Well Number:	Inspection Date:	Paint:	Stencil	Grout	Well Caps	Locks	Pad Loose	Tags:	Weep Hole
KC01-273	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC01-274	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC01-275	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC01-276	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC01-277	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC01-278	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC84-006	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC84-010	9/28/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	0								
KC84-012	9/28/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	seal around base of well on asphalt								

WELL INSPECTION REPORT

Well Number:	Inspection Date:	Paint:	Stencil	Grout	Well Caps	Locks	Pad Loose	Tags:	Weep Hole
KC84-018	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC84-024	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC85-030	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC85-032	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC85-033	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK (all pumps)								
KC85-034	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK (all pumps)								
KC85-035	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC85-037	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC85-038	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	small crack on pad. Needs sealing								

WELL INSPECTION REPORT

Well Number:	Inspection Date:	Paint:	Stencil	Grout	Well Caps	Locks	Pad Loose	Tags:	Weep Hole
KC85-039	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC85-040	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC85-041	9/27/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	seal cracks in pad								
KC85-043	9/27/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	0								
KC85-044	9/29/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	0								
KC85-045	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC86-051	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC87-060	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC87-067	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								

WELL INSPECTION REPORT

Well Number:	Inspection Date:	Paint:	Stencil	Grout	Well Caps	Locks	Pad Loose	Tags:	Weep Hole
KC87-068	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC87-069	9/27/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC87-071	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC87-072	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC87-073	10/1/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC87-074	9/27/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC87-075	9/27/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	Seal cracks on pad								
KC87-076	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC88-077	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	Lid Broke off Repair								

WELL INSPECTION REPORT

Well Number:	Inspection Date:	Paint:	Stencil	Grout	Well Caps	Locks	Pad Loose	Tags:	Weep Hole
KC88-079	9/23/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	0								
KC88-083	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC88-084	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC89-102	9/27/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	Broke bolt off. Drill out. New bolt								
KC89-104	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC89-105	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC89-115	9/27/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	Bolts wil not seat								
KC89-119	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	Clean mud off pad. Reem weep hole.								
KC89-120	9/23/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	0								

WELL INSPECTION REPORT

Well Number:	Inspection Date:	Paint:	Stencil	Grout	Well Caps	Locks	Pad Loose	Tags:	Weep Hole
KC89-121	9/23/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	0								
KC89-122	9/27/2011	Repaint	Restencil	OK	OK	OK	Cracked/Replac	OK	OK
Insp Remarks:	0								
KC89-123	9/27/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	Need longer bolts. Will not seat.								
KC89-125	10/1/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC89-126	10/1/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC89-129	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC89-130	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC90-133	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC90-134	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	Reem out weep hole								

WELL INSPECTION REPORT

Well Number:	Inspection Date:	Paint:	Stencil	Grout	Well Caps	Locks	Pad Loose	Tags:	Weep Hole
KC90-135	9/28/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	Check weep hole								
KC90-137	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC90-140	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC90-143	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC91-149	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC91-152	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC91-153	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC91-154	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC91-155	9/28/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								

WELL INSPECTION REPORT

Well Number:	Inspection Date:	Paint:	Stencil	Grout	Well Caps	Locks	Pad Loose	Tags:	Weep Hole
KC91-156	10/1/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC91-157	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC91-158	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC91-160	10/1/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC91-163	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC91-165	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC91-168	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC91-171	9/28/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC91-175	9/28/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	seal around perimeter of pad								

WELL INSPECTION REPORT

Well Number:	Inspection Date:	Paint:	Stencil	Grout	Well Caps	Locks	Pad Loose	Tags:	Weep Hole
KC91-176	9/28/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC91-179	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	pad floats								
KC91-182	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	check weep hole. Fill in rock/soil around perimeter of pad.								
KC91-183	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC92-184	10/1/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC92-185	10/1/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	Replace Housing. Bolt eyes broken								
KC92-187	10/1/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	0								
KC92-194	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC94-191	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK.								

WELL INSPECTION REPORT

Well Number:	Inspection Date:	Paint:	Stencil	Grout	Well Caps	Locks	Pad Loose	Tags:	Weep Hole
KC94-192	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK.								
KC94-193	10/1/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK.								
KC94-195	10/1/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC94-196	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC94-197	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC94-198	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC94-199	10/1/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC95-200	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC95-201	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								

WELL INSPECTION REPORT

Well Number:	Inspection Date:	Paint:	Stencil	Grout	Well Caps	Locks	Pad Loose	Tags:	Weep Hole
KC95-202	10/1/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC97-209	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC98-211	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC98-212	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC98-227	10/1/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	needs locks								
KC98-228	10/1/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	Can remove lid								
KC98-229	10/1/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	0								
KC98-230	10/1/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	Bolt broke off								
KC98-231	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								

WELL INSPECTION REPORT

Well Number:	Inspection Date:	Paint:	Stencil	Grout	Well Caps	Locks	Pad Loose	Tags:	Weep Hole
KC98-232	9/20/2011	Repaint	Restencil	OK	OK	OK	OK	OK	OK
Insp Remarks:	0								
KC98-233	10/17/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC98-234	9/20/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC99-235	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC99-236	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC99-239	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC99-247	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
KC99-248	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								
OW-001	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK
Insp Remarks:	OK								

WELL INSPECTION REPORT

Well Number:	Inspection Date:	Paint:	Stencil	Grout	Well Caps	Locks	Pad Loose	Tags:	Weep Hole	
OW-008	9/23/2011	OK	OK	OK	OK	OK	OK	OK	OK	
Insp Remarks:	OK									

2011 KCP Monitoring Well Redevelopment

	Well Number	Total Well Depth (TIC)	Water Level (TIC)	Date Redevelopment Completed	Volume (Gallons)	Casing Diameter (inches)	Screen Length (feet)	Flush Mount Well	Comments
1	KC85-41U	27.5	17.9	9/4/2011	15	2	10	N	Pumped dry multiple events until clear
2	KC85-41L	47	18.2	9/4/2011	40	2	5	N	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
3	KC89-105	29.4	22.1	9/5/2011	85	2	15	N	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
4	KC89-119	27.5	19.6	9/4/2011	100	2	5	N	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
5	KC89-120	29.5	21	9/5/2011	50	2	5	N	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
6	KC89-121	26.5	18.6	9/5/2011	70	2	5	N	Very Black water when we started pumping off. Pumped till clear by moving the pump up and down at a rate of 1 in/sec
7	KC89-122	58.5	9.2	9/6/2011	85	2	10	Y	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
8	KC89-123	59.5	7.9	9/4/2011	25	2	10	Y	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
9	KC89-125U	25.5	15.1	8/31/2011	20	2	10	Y	The well and water was not too bad at all. It was brushed and pumped off until water was clear
10	KC89-125L	39	15.1	8/31/2011	0	2	5	Y	This well and water was very clean. Did not redeveloped.
11	KC90-133	26.5	18.1	9/4/2011	20	2	5	N	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
12	KC90-134	28	19.2	9/5/2011	70	2	5	N	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
13	KC91-149U	18.5	10.4	8/31/2011	15	2	10	Y	The well and water was not too bad at all. It was brushed and pumped off until water was clear
14	KC91-149L	40	9.1	8/31/2011	30	2	5	Y	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
15	KC91-152U	20	12.8	9/1/2011	10	2	10	Y	The well and water was not too bad at all. It was brushed and pumped off until water was clear
16	KC91-152L	42	13	9/1/2011	35	2	5	Y	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
17	KC91-153U	20	11.1	9/1/2011	10	2	10	Y	The well and water was not too bad at all. It was brushed and pumped off until water was clear
18	KC91-153L	42	13.8	9/1/2011	40	2	5	Y	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
19	KC91-154U	20	7.5	9/5/2011	20	2	10	Y	Pumped dry multiple events until clear
20	KC91-154L	36.2	7.1	9/5 & 9/6/2011	110	2	5	Y	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
21	KC91-156U	20	13.8	9/1/2011	15	2	10	Y	Pumped dry multiple events until clear
22	KC91-156L	39	13.9	9/1/2011	10	2	5	Y	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
23	KC91-157U	20	11.1	9/1/2011	10	2	10	Y	Pumped dry multiple events until clear
24	KC91-157L	38.5	13.8	9/1/2011	30	2	5	Y	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
25	KC91-158U	20.5	9.9	8/31/2011	15	2	10	Y	Pumped dry multiple events until clear
26	KC91-158L	40.5	9.6	8/31/2011	35	2	5	Y	Pumped till clear by moving the pump up and down at a rate of 1 in/sec

2011 KCP Monitoring Well Redevelopment

	Well Number	Total Well Depth (TIC)	Water Level (TIC)	Date Redevelopment Completed	Volume (Gallons)	Casing Diameter (inches)	Screen Length (feet)	Flush Mount Well	Comments
27	KC94-195U	16	8	9/5/2011	15	2	10	Y	Pumped dry multiple events until clear
28	KC94-195L	40.5	14.2	9/5/2011	75	2	5	Y	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
29	KC98-230U	21	19.8	9/5/2011	1	2	10	Y	Well had only a couple of feet of water. It was brushed & pumped out.
30	KC98-230L	44	23.5	9/5/2011	40	2	5	Y	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
31	KC00-261U	17	16.8	9/4/2011	10	2	5	N	Pumped dry multiple events until clear
32	KC00-261L	29	21.3	9/4/2011	27	2	5	N	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
33	KC00-262U	21	18.2	9/4/2011	0	2	5	N	Did not redeveloped
34	KC00-262L	29	21.5	9/4/2011	55	2	5	N	Pumped until clear by moving the pump up and down at a rate of 1 in/sec.
35	KC00-267U	16	15.1	9/4/2011	10	2	5	N	Well had only a couple of feet of water. It was brushed & pumped out 4 times
36	KC00-267L	25	15.6	9/4/2011	75	2	5	N	Pumped till clear by moving the pump up and down at a rate of 1 in/sec
37	GS06-501	32.7	9.4	12/15/2011	75	2	15	Y	Pumped until clear by moving the pump up and down at a rate of 1 in/sec. Did not brush.
38	GS06-502	33.5	8.9	12/15/2011	10	2	15	Y	Never really cleared, pumped dry too fast. Did not brush.
39	GS06-503	20.8	6.7	12/15/2011	175	2	10	Y	Pumped until clear by moving the pump up and down at a rate of 1 in/sec. Did not brush.
40	GS06-504	27.1	8.6	12/15/2011	125	2	10	Y	Pumped until dry/clear by moving the pump up and down at a rate of 1 in/sec. Did not brush.
41	GS06-505	26.8	7.6	12/15/2011	125	2	10	Y	Pumped until dry/clear by moving the pump up and down at a rate of 1 in/sec. Did not brush.
42	GS06-506	26.3	5.3	12/15/2011	130	2	10	Y	Pumped until clear by moving the pump up and down at a rate of 1 in/sec. Did not brush.
43	GS06-507	26.3	6.2	12/15/2011	120	2	5	Y	Pumped until clear by moving the pump up and down at a rate of 1 in/sec. Did not brush.
44	GS06-508	28.8	9.1	12/15/2011	120	2	5	Y	Pumped until dry by moving the pump up and down at a rate of 1 in/sec. Relatively clear. Did not brush.
45	GS06-509	26.8	5.7	12/15/2011	175	2	10	Y	Pumped until clear by moving the pump up and down at a rate of 1 in/sec. Did not brush.
46	GS06-510	21.6	16.1	12/15/2011	30	2	15	Y	Pumped until dry by moving the pump up and down at a rate of 1 in/sec. Relatively clear. Did not brush.
47	GS06-511	19.6	5.5	12/15/2011	65	2	10	Y	Pumped until dry by moving the pump up and down at a rate of 1 in/sec. Relatively clear. Did not brush.
48	GS06-512	20	16.8	12/15/2011	10	2	10	Y	Pumped until dry. Made very little water. Did not brush.

Note: All Monitoring Wells were brushed using a Stainless Steel brush before any pumping started.

2011 Well Pad Replacement

	Well Number	Date Pad Removed	Date Pad Replaced	Painting Dates		Stenciling Date	Comments
				1st Coat	2nd Coat		
1	KC89-102	10/14/2011	10/14/2011	10/15/2011	10/15/2011	10/15/2011	We used the new all aluminum well casing on this well.
2	KC89-122	10/14/2011	14/14/11	10/15/2011	10/15/2011	10/15/2011	We used the new all aluminum well casing on this well.
3	KC84-012	10/15/2011	10/15/2011	10/15/2011	10/15/2011	NA	This well had been ran over by a vehicle damaging the well, post and asphalt around the base. We made the necessary repairs.
4	KC92-185						Not being replaced at this time per Joe's request
5	KC91-154	12/14/2011	12/14/2011	12/15/2011	12/16/2011	12/16/2011	KC91-154U TOC lowered
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							

2011 Miscellaneous Well Maintenance			
	Well Number	**Date Completed**	**Comments**
1	KC89-109	8/30/2011	This Interceptor Pumping Well was abandon using 10 - 50 lbs. bags of Bentonite 3/8" Pellets and toped off with 1 - 80 lbs. bag of Commercial Grade Quikrete. The pump and all associated equipment was removed before the well was abandoned.
2	KC85-39	10/11/2011	Removed and replaced asphalt around base of well
3	KC87-075	10/11/2011	Epoxy/sealed cracks and repainted and stenciled. Please see the well painting and stenciling list.
4	KC88-77	10/12/2011	Removed the broken hinge and replaced it with a new one. Touch up paint afterwards.
5	KC89-123	10-12011	Tapped and replaced with new bolts.
6	KC89-115	10/11/2011	Tapped and replaced with new bolts. repainted and stenciled. Please see the well painting and stenciling list.
7	KC89-119	10/12/2011	Removed mud off pad and reamed out weep hole
8	KC90-134	10/12/2011	Reamed out weep hole
9	KC90-135	10/12/2011	Reamed out weep hole
10	KC91-182	10/12/2011	Reamed out weep hole
11	KC98-230	10/13/2011	Tapped and replaced with new bolts.
12	KC91-175	10/11/2011	Epoxy/sealed cracks and repainted and stenciled. Please see the well painting and stenciling list.
13			
14			
15			
16			

2011 Monitoring Well Sanding, Painting, and Stenciling

	Well Number	Sanding Date	Painting Date		Stenciling Date	Comments
			1st Coat	2nd Coat		
1	KC84-10	10/14/2011	10/14/2011	10/14/2011	10/15/2011	
2	KC85-41	10/11/2011	10/13/2011	10/13/2011	10/15/2011	
3	KC85-43	10/15/2011	10/15/2011	10/15/2011	10/15/2011	
4	KC87-75	10/11/2011	10/15/2011	10/15/2011	10/16/2011	Epoxy/sealed cracks and repainted and stenciled.
5	KC88-79	11/19/2011	11/19/2011	11/20/2011	11/21/2011	
6	KC89-102	NA	10/15/2011	10/15/2011	10/15/2011	New pad
7	KC89-115	10/11/2011	10/13/2011	10/13/2011	10/15/2011	
8	KC89-120	10/11/2011	10/11/2011	10/13/2011	10/16/2011	
9	KC89-121	10/11/2011	10/11/2011	10/13/2011	10/16/2011	
10	KC89-122	NA	10/15/2011	10/15/2011	10/16/2011	New pad
11	KC92-187	10/13/2011	10/13/2011	10/13/2011	10/16/2011	
12	KC94-199	10/13/2011	10/13/2011	10/13/2011	10/16/2011	
13	KC95-202	10/13/2011	10/13/2011	10/13/2011	10/15/2011	
14	KC98-227	10/13/2011	10/13/2011	10/13/2011	10/15/2011	
15	KC98-228	10/13/2011	10/13/2011	10/13/2011	10/15/2011	
16	KC98-229	10/13/2011	10/13/2011	10/13/2011	10/15/2011	
17	KC98-230	10/13/2011	10/13/2011	10/13/2011	10/15/2011	
18	KC98-232	10/13/2011	10/13/2011	10/13/2011	10/16/2011	
19	KC99-244	10/12/2011	10/13/2011	10/13/2011	10/16/2011	
20	KC99-252	10/13/2011	10/13/2011	10/13/2011	10/16/2011	
21	KC00-260	10/13/2011	10/13/2011	10/13/2011	10/16/2011	
22	KC00-261	10/13/2011	10/13/2011	10/13/2011	10/16/2011	
23	KC91-154	10/14/2011	10/15/2011	10/15/2011	10/16/2011	Epoxy/sealed cracks and repainted and stenciled. The well needs to be lowered and pad replaced. Will check with Todd on notifications with the state.
24	KC91-175	10/11/2011	10/13/2011	10/13/2011	10/16/2011	Epoxy/sealed cracks and repainted and stenciled.
25	KC91-154	NA	12/15/2011	12/16/2011	12/16/2011	New pad - lowered

2011 Monitoring Well Video			
	Well Number	**Date Completed**	**Comments**
1	**KC85-41U**	**8/30/2011**	Clear with some SSs
2	**KC85-41L**	**8/30/2011**	Clear with some SSs. A jellyfish like material on the walls of the well. There also was gas bubbling taking place.
3	**KC89-105**	**8/29/2011**	Water was clear with some SSs. The first joint do not look good.
4	**KC89-119**	**8/29/2011**	Moderate to heavy plugging, water full of SSs
5	**KC89-120**	**8/29/2011**	There was a spot that did not look good at approximately 13.7 feet. There were bugs swimming around on the surface of the water and what appeared to be a very small worm at the bottom.
6	**KC89-121**	**8/29/2011**	Clear with some SSs
7	**KC89-122**	**9/3/2011**	Clear with some SSs
8	**KC89-123**	**9/2/2011**	Water cloudy and some SSs
9	**KC89-125U**	**8/31/2011**	Used Joe's camera system to video well. Clear with some SSs
10	**KC89-125L**	**8/31/2011**	Used Joe's camera system to video well. Clear water and well
11	**KC90-133**		Camera became lodged in well near top - no video evaluation
12	**KC90-134**		Mild to moderate plugging, water full of SSs
13	**KC91-149U**	**8/31/2011**	Used Joe's camera system to video well. Clear well and water with some SSs
14	**KC91-149L**	**8/31/2011**	Used Joe's camera system to video well. Clear well and water with some SSs
15	**KC91-152U**	**9/1/2011**	Used Joe's camera system and GEO's 2" camera to video well. Clear with some SSs
16	**KC91-152L**	**9/1/2011**	Used Joe's camera system and GEO's 2" camera to video well. Clear with some SSs
17	**KC91-153U**	**9/1/2011**	Used Joe's camera system and GEO's 2" camera to video well. Clear water with some SSs. Well walls had a little fouling
18	**KC91-153L**	**9/1/2011**	Used Joe's camera system and GEO's 2" camera to video well. Clear water with some SSs. Well walls had a little fouling
19	**KC91-154U**	**9/3/2011**	Mild to moderate fouling & plugging
20	**KC91-154L**	**9/3/2011**	Mild to moderate fouling & plugging
21	**KC91-156U**	**9/1/2011**	Used Joe's camera system and GEO's 2" camera to video well. Clear well and water with some SSs
22	**KC91-156L**	**9/1/2011**	Used Joe's camera system and GEO's 2" camera to video well. Clear well and water with some SSs
23	**KC91-157U**	**9/1/2011**	Used Joe's camera system and GEO's 2" camera to video well. Walls of the well has some black on it and water had some SSs
24	**KC91-157L**	**9/1/2011**	Used Joe's camera system and GEO's 2" camera to video well. Walls of the well has some black on it and water had some SSs
25	**KC91-158U**	**8/31/2011**	Used Joe's camera system to video well. Walls of the well has some black on it and water had some SSs
26	**KC91-158L**	**9-31-2011**	Used Joe's camera system to video well. Clear well and water with some SSs
27	**KC94-195U**	**9/3/2011**	Clear well and water with some SSs. This will also had bugs in it.
28	**KC94-195L**	**9/3/2011**	Clear well. Water was cloudy with some SSs
29	**KC98-230U**	**9/3/2011**	This well was essentially dry with some screen plugging.
30	**KC98-230L**	**9/3/2011**	There was what appeared to be a clear disk floating on the surface of the water and it traveled all the way to the bottom of the well as it was being video
31	**KC00-261U**	**9/2/2011**	Clear well. Water was cloudy
32	**KC00-261L**	**9/2/2011**	Well was essentially dry with white bugs in it
33	**KC00-262U**	**8/30/2011**	Clear
34	**KC00-262L**	**8/30/2011**	Black on the walls of the well and water with some SSs
35	**KC00-267U**	**9/2/2011**	White Bugs in the bottom of the well.
36	**KC00-267L**	**9/2/2011**	Bugs swimming around on the water surface.

2011 Monitoring Well Video			
	Well Number	**Date Completed**	**Comments**
37	**KC85-41L**	**9/6/2011**	**Post Redevelopment**: gas bubbles was noticed escaping in two locationsin the top portion of the screen. Also a bailer was identified in the bottom of the well.
38	**KC89-105**	**9/6/2011**	**Post Redevelopment:** well casing and screen was very clean along with the sump. Water was somewhat cloudy.
39	**GS06-501**	**12/12/2011**	Biofouling began at WL and worsened to TOS. TOS moderately fouled and plugged, but clears with depth. Begins to worsen at joint at 28.5'.
40	**GS06-502**	**12/12/2011**	Walls covered in black biofouling over entire length of screen. Screens appeared relatively free of plugging though. Water was very turbid. Heavy bio accumulation on well bottom.
41	**GS06-503**	**12/12/2011**	Black biofouling on walls below WL. Mild plugging in the screen. Biofouling decreased significantly after first 1-2' below WL. After that, screens generally clean w/ only some spotting and no plugging. Moderate bio accum on bottom. Water turbid near top, cleared with depth.
42	**GS06-504**	**12/12/2011**	Clean well at top. Hit turbidity in water at ~17', reduced visibility in camera. Screens appeared generally clean, became more plugged with depth. Moderate bio accum on bottom.
43	**GS06-505**	**12/12/2011**	Consistent black staining on casing below WL. Cleared some with depth. Some observable mild plugging of screens. Some turbidity in water, likely generated from camera rubbing the walls. Visibility was affected.
44	**GS06-506**	**12/12/2011**	Mild biofouling observed. Casing was black/brown below the WL, but very little plugging was observed. Heavy turbidity affected downhole view of camera, some was attributed to the camera rubbing. Heavy bio accum on the bottom.
45	**GS06-507**	**12/12/2011**	Generally clean well with some mild light brown biofouling on the well casing. Very little to no plugging was observed.
46	**GS06-508**	**12/13/2011**	Some biofouling on casing observed above screen. Screen was generally very clean and free of plugging. Some bio accum on bottom.
47	**GS06-509**	**12/12/2011**	Walls covered in biofouling throughout the entire screen. Plugging of screens generally very mild, however. Low turbidity in water, with very little bio accum on well bottom.
48	**GS06-510**	**12/13/2011**	Clean well until ~15'. Entire casing below WL was covered in brown biofouling. Plugging and biofouling worsened with depth. Some bio accum on bottom.
49	**GS06-511**	**12/14/2011**	Walls of casing generally clean with mild brown biofouling. Some plugging was observed in screens with the worst near TOS. Cleared some with depth, but worsened again. Lots of floating biomass in water. Visibility was poor. Light brown bio accum on well bottom.
50	**GS06-512**	**12/13/2011**	Very clean well. Some streaks of biofouling and some turbidity were observed. Minor bio accum on well bottom.
51			

Note: Well fouling and screen plugging were assessed on a scale of clear, mild, moderate, heavy, severe
SS = Suspended Solids

Results of 2011 Groundwater Monitoring Well Subsurface Integrity Inspection

GROUNDWATER MONITORING WELL DOWNHOLE VIDEO INSPECTION

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC89-120	L	8/29/2011	No	Yes	~2"	Yes

Anomaly Remarks:
Screen overall is clean. Good integrity. However, silt is slightly over the bottom of the screen. REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC90-133	L	8/29/2011	No	N/A	unknown	Yes

Anomaly Remarks:
Could not go deep in the well with long camera. Well was hit by lawn trctor several years ago and repaired. By default REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC89-119	L	8/29/2011	No	Yes	~3"	Yes

Anomaly Remarks:
Screen is partially obstructed with bacterial slime and flaky material. This material is present over the bottom the screen. REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC89-105	L	8/29/2011	No	No	~1.5"	Yes

Anomaly Remarks:
Screen is partially plugged by bacterial slime and flakey material. Good integrity. REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC89-121	L	8/29/2011	No	Yes	3+ "	Yes

Anomaly Remarks:
Screen is obstructed with sediment and slimey material.. Material is over the base of the well screen. Good integrity. REDEVELOP

GROUNDWATER MONITORING WELL DOWNHOLE VIDEO INSPECTION

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC90-134	L	8/29/2011	No	Yes	3"	Yes

Anomaly Remarks:
Screen is dirty and aprtially plugged with slimey, flakey material. Material is present over the base of the well screen. REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC85-041	U	8/30/2011	No	No	~1"	Yes

Anomaly Remarks:
Good integrity. Screen dirty. Limited silt. REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC85-041	L	8/30/2011	No	No	~1"	Yes

Anomaly Remarks:
Good integrity. Screen is coated with a gelatinous material. Bubbles are pervasive in video from first contact with water at 39.1 feet to 40.8 feet, then disappear. Some silt in bottom but not over screen. REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC00-262	U	8/30/2011	No	No	~1/2 "	Yes

Anomaly Remarks:
Good integrity. Clean well. Limited silt.

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC00-262	L	8/30/2011	No	Yes	3.5"	Yes

Anomaly Remarks:
Screen is dirty. Slimey/flakey material is over base of screen. Good integrity.

GROUNDWATER MONITORING WELL DOWNHOLE VIDEO INSPECTION

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC89-123	L	9/2/2011	No	Yes	~4"	Yes

Anomaly Remarks:
Good integrity. Screen somewhat dirty. Slight plugging. Significant sediment in bottom of well over the base of the screen. REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC00-261	U	9/2/2011	No	No	~1"	Yes

Anomaly Remarks:
Good integrity. Screen dirty, partially plugged. Limited silt at bottom. REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC00-261	L	9/2/2011	No	No	~1"	Yes

Anomaly Remarks:
Good integrity. Limited silt. Screen is soemwhat dirty though not plugged. Nevertheless, REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC00-267	U	9/2/2011	No	No	~1/2"	Yes

Anomaly Remarks:
Good integrity. Limited Silt. Clean screen. Did have some bugs floating on the surface of the water. For this reason REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC00-267	L	9/2/2011	No	No	~1/2"	Yes

Anomaly Remarks:
Good integrity. Screen is dirty and partially plugged. Limited silt. REDEVELOP

GROUNDWATER MONITORING WELL DOWNHOLE VIDEO INSPECTION

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC94-195	U	9/2/2011	No	Yes	~3"	Yes

Anomaly Remarks:
Clean screen. Good integrity. Sediment slightly over base of well screen. REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC94-195	L	9/3/2011	No	Yes	~3"	Yes

Anomaly Remarks:
Good integrity. Clean screen Sediment over base of well screen. REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC98-230	U	9/3/2011	No	No	<1/2"	Yes

Anomaly Remarks:
Good integrity. Clean screen. No sediment.

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC98-230	L	9/3/2011	No	No	<1/2 "	Yes

Anomaly Remarks:
Good integrity. Clean screen. No sediment

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC91-154	U	9/3/2011	No	Yes	3"	Yes

Anomaly Remarks:
Good integrity. Extensive bacterial flakely slime. Material over the base of the well screen. REDEVELOP

GROUNDWATER MONITORING WELL DOWNHOLE VIDEO INSPECTION

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC91-154	L	9/3/2011	No	Yes	~3"	Yes

Anomaly Remarks:
Good integrity. Bacterial slime partially clogging screen. This material is slightly over the base of the well screen. REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC89-122	L	9/3/2011	No	No	~1/2"	Yes

Anomaly Remarks:
Clean screen . Good integrity. Limited silt.

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC89-125	U	8/30/2011	No	No	~1/4"	Yes

Anomaly Remarks:
Screen slighly dirty. Limited Silt. Good integrity. Redevelop while here due to accessability

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC89-125	L	8/30/2011	No	No	~1/4"	Yes

Anomaly Remarks:
Screen slightly dirty. Limited Silt. Good integrity. Redevelop while at site due to limited accessabilty.

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC91-149	U	8/30/2011	No	No	~1/4"	Yes

Anomaly Remarks:
Screen slightly dirty. Limited silt. Good integrity. Redevelop since area is indoors and limited access.

GROUNDWATER MONITORING WELL DOWNHOLE VIDEO INSPECTION

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC91-149	L	8/30/2011	No	No	~1/4"	Yes

Anomaly Remarks:
Screen slightly dirty. Good integrity. Limited Silt. Redevelop since indoors and limited accessability.

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC91-158	U	8/30/2011	No	No	~1/4"	Yes

Anomaly Remarks:
Screen slightly dirty. Good integrity. Limited Silt. Redevelop since well is indoors with limited accessability.

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC91-158	L	8/30/2011	No	No	~1/4"	Yes

Anomaly Remarks:
Screen slightly dirty. Limited silt. Good integrity. Redevelop since indoors with limited accessibility

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC91-157	U	8/30/2011	No	No	~1/2"	Yes

Anomaly Remarks:
Screen dirty and partially plugged. Limited Silt. Good integrity. REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC91-157	L	8/31/2011	No	No	~1/4"	Yes

Anomaly Remarks:
Clean screen limited silt. Good integrity. Redevelop since indoors in limited access area.

GROUNDWATER MONITORING WELL DOWNHOLE VIDEO INSPECTION

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC91-156	U	8/31/2011	No	No	~1/4"	Yes

Anomaly Remarks:
Screen clean. Limited silt. Good integrity. Redevelop since in an indoor area with limited access.

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC91-156	L	8/31/2011	No	No	~1/4"	Yes

Anomaly Remarks:
Clean screen. Limited silt. Good integrity. Redevelop since in an indoor area with limited access.

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC91-152	U	8/31/2011	No	No	~1/2"	Yes

Anomaly Remarks:
Screen partially plugged. Limited silt. Good integrity. REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC91-152	L	8/30/2011	No	No	~1/2"	Yes

Anomaly Remarks:
Screen partially plugged. Limited silt.
Good integrity. REDEVELOP

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC91-153	U	8/31/2011	No	No	~1/2"	Yes

Anomaly Remarks:
Screen partially plugged. Limited silt. Good integrity. REDEVELOP

GROUNDWATER MONITORING WELL DOWNHOLE VIDEO INSPECTION

Well Number:		Inspection Date:	Surface Anomalies:	Silt:	Silt Amount:	Video:
KC91-153	L	8/31/2011	No	No	~1/4"	Yes

Anomaly Remarks:
Clean screen. Limited silt. Good integrity. Redevelop since indoors in a limited access area.

State of Missouri Well Abandonment Registration and Reconstruction Registration Records

WIMS
Bi-Monthly Well and Pump Report

Report Date: 10/31/2011 **From - 09/01/2011 to - 10/31/2011**

The table below lists the well and/or pump reports that the Wellhead Protection Section received from your company during the time period identified above. Compare these reports with your record of reports submitted. If you have turned in reports during this time period that are not on the list, please call us at (573) 368-2165.

GEO CONSULTANTS INC
325 KENTUCKY AVE
KEVIL, KY 42053

Ref Num	Rec Type	Date Rcvd	Owner	City	Contractor	Permit #	Cert #
00457925	Abandoned	09/19/2011	NNSA KANSAS CITY PLANT-HONEYWELL FM&T	KANSAS CITY	GEO CONSULTANTS	003872	B34154

RECEIVED
NOV 3 2011
BY:

STATE OF MISSOURI
Jeremiah W. (Jay) Nixon, Governor • Sara Parker Pauley, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov
P.O. Box 250, Rolla, MO 65402-0250
(573) 368-2165
FAX(573) 368-2317

file(PCD3)
October 11, 2011

NNSA KANSAS CITY PLANT-HONEYWELL FM&T
20000 E 95TH STREET
KANSAS CITY, MO 64131

Re: 00457925

OFFICIAL DOCUMENT

Congratulations! This confirms that your well abandonment information has been reviewed and registered by the Missouri Department of Natural Resources in Rolla, Missouri.

This letter should be filed with the Abandonment Registration Record received from your permitted well driller or pump installer.

This letter may be needed in the future as proof of Registration, verifying that your well was plugged in accordance with the Missouri Well Construction rules.

Your Well Registration Number: B34154
Well Number: KC89-109
Reference Number: 00457925
Site Address:

Estimated Dissolved Contaminant Mass in Groundwater at the DOE Kansas City Plant 2000 vs. 2011

2000 Indian Creek MDL 1,000 µg/L plume area

AREA			
1	2055526	ft2	
2	9088.66	ft2	
3	6550.55	ft2	
4	3563.8	ft2	
	2074729	ft2	Total Area
	512125	ft2	minus the plume area of 1,00 - 10,000 mdl
	1562604	ft2	TOTAL PLUME AREA WHERE MDL > 1,000 µg/L
	25	ft	x ft saturated thickness
=	**39065100**		**ft^3 TOTAL PLUME VOLUME WHERE MDL > 1,000 µg/L**

2000 Indian Creek MDL = 1,000 - 10,000 µg/L plume area

AREA			
	512125	ft2	Total Area
	98178	ft2	minus the plume area >10,000 µg/L
	413947	ft2	ft2 TOTAL PLUME AREA WHERE MDL = 1,000 - 10,000 µg/L
	25	ft	x ft saturated thickness
=	**10348675**		**ft^3 TOTAL PLUME VOLUME WHERE MDL 1,000 - 10,000 µg/L**

2000 Indian Creek MDL > 10,000 µg/L plume area

AREA			
	98178	ft2	TOTAL PLUME AREA WHERE MDL >10,000 µg/L
	25	x ft saturated thickness	
=	**2454450**		**ft^3 TOTAL PLUME VOLUME WHERE MDL > 1,000 µg/L**

2000 INDIAN CREEK FLOW SYSTEM TOTAL DISSOLVED VOC MASS ESTIMATE

To calculate contaminant mass - C_{avg} x V_{gw} x ρ_{gw}

where C_{avg} = average concentration of total VOCs expressed as xx μg_{voc} / L_{gw}
V_{gw} = ft^3 of plume area (average saturated thickness = 25 ft) expressed as ft^3_{gw}
ρ_{gw} = constant of 28.32 L_{gw}/ft^3_{gw} (density conversion factor from metric to english units)

Average Concentration Within Plume			Plume area	
Cavg for MDL > 1,000 ug/L =	**144.60**	**µg/L**	**39065100**	**ft3**
Cavg for MDL 1,000 - 10,000 ug/L =	**3425.94**	**µg/L**	**10348675**	**ft3**
Cavg for MDL > 10,000 ug/L =	**47512.50**	**µg/L**	**2454450**	**ft3**

Mass of total VOC > 1,000 µg/L

	C_{avg}		x	V_{gw}		x	ρ_{gw}	
=	144.60	μg_{voc} / L_{gw}	x	39065100	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
=	1.59974E+11	μg_{voc}	x	0.0000010	or ($1g/10^6$ µg)	x	0.002205	or (1lb/453.6 g)
=	**352.66**	**lb_{voc}**						

Mass of total VOC 1,000 - 10,000 µg/L

	C_{avg}		x	V_{gw}		x	ρ_{gw}	
=	3425.94	μg_{voc} / L_{gw}	x	10348675	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
=	1.00406E+12	μg_{voc}	x	0.0000010	or ($1g/10^6$ µg)	x	0.002205	or (1lb/453.6 g)
=	**2213.44**	**lb_{voc}**						

Mass of total VOC > 10,000 µg/L

	C_{avg}		x	V_{gw}		x	ρ_{gw}	
=	47512.50	μg_{voc} / L_{gw}	x	2454450	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
=	3.3026E+12	μg_{voc}	x	0.0000010	or ($1g/10^6$ µg)	x	0.002205	or (1lb/453.6 g)
=	**7280.57**	**lb_{voc}**						

Total ~ lbs Indian Creek Flow System dissolved phase = 9846.67

2000 Blue River MDL 1,000 µg/L plume area

AREA			
1	1126860	ft2	
2	54103.5	ft2	
3		ft2	
4		ft2	
	1180963	ft2	Total Area
	219485.9	ft2	minus the plume area of 1,00 - 10,000 mdl
	961477.4	ft2	TOTAL PLUME AREA WHERE MDL > 1,000 µg/L
	25	ft	x ft saturated thickness
=	**24036935**		**ft^3 TOTAL PLUME VOLUME WHERE MDL > 1,000 µg/L**

2000 Blue River MDL = 1,000 - 10,000 µg/L plume area

AREA			
	219485.9	ft2	Total Area
	5920	ft2	minus the plume area >10,000 µg/L
	213565.9	ft2	ft2 TOTAL PLUME AREA WHERE MDL = 1,000 - 10,000 µg/L
	25	ft	x ft saturated thickness
=	**5339148**		**ft^3 TOTAL PLUME VOLUME WHERE MDL 1,000 - 10,000 µg/L**

2000 Blue River MDL > 10,000 µg/L plume area

AREA			
	5920	ft2	TOTAL PLUME AREA WHERE MDL >10,000 µg/L
	25	x ft saturated thickness	
=	**148000**		**ft^3 TOTAL PLUME VOLUME WHERE MDL > 1,000 µg/L**

2000 BLUE RIVER FLOW SYSTEM TOTAL DISSOLVED VOC MASS ESTIMATE

To calculate contaminant mass - C_{avg} x V_{gw} x ρ_{gw}

where C_{avg} = average concentration of total VOCs expressed as xx μg_{voc} / L_{gw}
V_{gw} = ft^3 of plume area (average saturated thickness = 25 ft) expressed as ft^3_{gw}
ρ_{gw} = constant of 28.32 L_{gw}/ft^3_{gw} (density conversion factor from metric to english units)

Average Concentration Within Plume			Plume area	
Cavg for MDL > 1,000 ug/L =	**146.61**	**µg/L**	**24036935**	**ft3**
Cavg for MDL 1,000 - 10,000 ug/L =	**2830.60**	**µg/L**	**5339148**	**ft3**
Cavg for MDL > 10,000 ug/L =	**12316.00**	**µg/L**	**148000**	**ft3**

Mass of total VOC > 1,000 µg/L

	C_{avg}		x	V_{gw}		x	ρ_{gw}	
=	146.61	μg_{voc} / L_{gw}	x	24036935	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
=	99801239781	μg_{voc}	x	0.0000010	or ($1g/10^6$ µg)	x	0.002205	or (1lb/453.6 g)
=	**220.01**	**lb_{voc}**						

Mass of total VOC 1,000 - 10,000 µg/L

	C_{avg}		x	V_{gw}		x	ρ_{gw}	
=	2830.60	μg_{voc} / L_{gw}	x	5339148	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
=	4.28E+11	μg_{voc}	x	0.0000010	or ($1g/10^6$ µg)	x	0.002205	or (1lb/453.6 g)
=	**943.53**	**lb_{voc}**						

Mass of total VOC > 10,000 µg/L

	C_{avg}		x	V_{gw}		x	ρ_{gw}	
=	12316.00	μg_{voc} / L_{gw}	x	148000	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
=	51620789760	μg_{voc}	x	0.0000010	or ($1g/10^6$ µg)	x	0.002205	or (1lb/453.6 g)
=	**113.80**	**lb_{voc}**						

Total ~ lbs Indian Creek Flow System dissolved phase = 1277.34

2011 Indian Creek MDL - 50 µg/L plume area

AREA

2529018	ft2	Total Area
1168546	ft2	minus the plume area of >50 µg/L
1360472	ft2	TOTAL PLUME AREA WHERE MDL -50 µg/L
25	ft	x ft saturated thickness
= **34011808**		**ft^3 TOTAL PLUME VOLUME WHERE MDL - 50 µg/L**

2010 Indian Creek 50 - 1,000 µg/L plume area

AREA

1168546	ft2	Total Area
546959	ft2	minus the plume area > 1,000 µg/L
621587	ft2	ft2 TOTAL PLUME AREA WHERE MDL = 50 - 1000
25	ft	x ft saturated thickness
= **15539675**		**ft^3 TOTAL PLUME VOLUME WHERE MDL 50 - 1000 µg/L**

2010 Indian Creek MDL1,000 -10,000 µg/L plume area

AREA

546959	ft2	Total Area
33220.15	ft2	minus the plume area >10,000 µg/L
513738.9	ft2	TOTAL PLUME AREA WHERE MDL 1,000 - 10,000 µg/L
25	x ft saturated thickness	
= **12843471**		**ft^3 TOTAL PLUME VOLUME WHERE MDL 1,000 - 10,000 µg/L**

2010 Indian Creek MDL 10,000-100,000 µg/L plume area

AREA

33220.15	ft2	TOTAL PLUME AREA L 10,000-100,000 µg/L
7315.94	minus the plume area >100,000 ug/L	
25904.21		
25	x ft saturated thickness	
= **647605.3**		**ft^3 TOTAL PLUME VOLUME WHERE MDL 10,000-100,000 µg/L**

2010 Indian Creek > 100,000 µg/L plume area

AREA

7315.94	ft2	Total PLUME AREA >100,000
25	x ft saturated thickness	
= **182898.5**		**ft^3 TOTAL PLUME VOLUME WHERE MDL > 100,000 µg/L**

2011 INDIAN CREEK FLOW SYSTEM TOTAL DISSOLVED VOC MASS ESTIMATE

To calculate contaminant mass - C_{avg} x V_{gw} x ρ_{gw}

where C_{avg} = average concentration of total VOCs expressed as xx μg_{voc} / L_{gw}
V_{gw} = ft^3 of plume area (average saturated thickness = 25 ft) expressed as ft^3_{gw}
ρ_{gw} = constant of 28.32 L_{gw}/ft^3_{gw} (density conversion factor from metric to english units)

Average Concentration Within Plume			plume area	
Cavg for MDL -50 ug/L =	**15.60**	**µg/L**	**34011808**	**ft3**
Cavg for MDL 50 - 1,000 ug/L =	**213.79**	**µg/L**	**15539675**	**ft3**
Cavg for MDL 1,000 - 10,000 ug/L	**3851.88**	**µg/L**	**12843471**	**ft3**
Cavg for MDL 10,000-100,000 ug/	**22685.76**	**µg/L**	**647605**	**ft3**
Cavg for >100,000 ug/L	**273261.90**		**182898.5**	**ft3**

Mass of total VOC MDL - 50 µg/L

	C_{avg}		x	V_{gw}		x	ρ_{gw}	
=	15.60	μg_{voc} / L_{gw}	x	34011808	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
=	15026144459	μg_{voc}	x	0.0000010	or ($1g/10^6$ µg)	x	0.002205	or (1lb/453.6 g)
=	**33.13**	**lb_{voc}**						

Mass of total VOC 50 - 1,000 µg/L

	C_{avg}		x	V_{gw}		x	ρ_{gw}	
=	213.79	μg_{voc} / L_{gw}	x	15539675	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
=	94085473502	μg_{voc}	x	0.0000010	or ($1g/10^6$ µg)	x	0.002205	or (1lb/453.6 g)
=	**207.41**	**lb_{voc}**						

Mass of total VOC 1,000 - 10,000 µg/L

	C_{avg}		x	V_{gw}		x	ρ_{gw}	
=	3851.88	μg_{voc} / L_{gw}	x	12843471	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
=	1.40103E+12	μg_{voc}	x	0.0000010	or ($1g/10^6$ µg)	x	0.002205	or (1lb/453.6 g)
=	**3088.58**	**lb_{voc}**						

Mass of total VOC 10,000-100,000 µg/L

	C_{avg}		x	V_{gw}		x	ρ_{gw}	
=	22685.76	μg_{voc} / L_{gw}	x	647605	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
=	4.16061E+11	μg_{voc}	x	0.0000010	or ($1g/10^6$ µg)	x	0.002205	or (1lb/453.6 g)
=	**917.21**	**lb_{voc}**						

Mass of total VOC >100,000 µg/L

C_{avg}		x	V_{gw}		x	ρ_{gw}	
265575.00	μg_{voc} / L_{gw}	x	104405	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
785238775020.00	μg_{voc}	x	0.0000010	or ($1g/10^o$ µg)	x	0.002205	L_{gw}/ft^3_{gw}
1731.06	**lb_{voc}**						

Total ~ lbs Indian Creek Flow System dissolved phase = 5977.38

2011 Blue River MDL - 50 µg/L plume area

AREA

980015.6	ft2	Total Area
21203		Small additional plume
447414.5	ft2	minus the plume area of >50 µg/L
553804.2	ft2	TOTAL PLUME AREA WHERE MDL -50 µg/L
25	ft	x ft saturated thickness
= **13845104**		**ft^3 TOTAL PLUME VOLUME WHERE MDL - 50 µg/L**

2010 Blue River 50 - 1,000 µg/L plume area

AREA

447414.5	ft2	Total Area
192348.3	ft2	minus the plume area > 1,000 µg/L
255066.2	ft2	ft2 TOTAL PLUME AREA WHERE MDL = 50 - 1000
25	ft	x ft saturated thickness
= **6376655**		**ft^3 TOTAL PLUME VOLUME WHERE MDL 50 - 1000 µg/L**

2010 Blue River MDL1,000 -10,000 µg/L plume area

AREA

192348.3	ft2	Total Area
75589.53	ft2	minus the plume area >10,000 µg/L
116758.8	ft2	TOTAL PLUME AREA WHERE MDL 1,000 - 10,000 µg/L
25	x ft saturated thickness	
= **2918970**		**ft^3 TOTAL PLUME VOLUME WHERE MDL 1,000 - 10,000 µg/L**

2010 Blue River MDL 1,000-10,000ug/L plume area

AREA

75589.53	ft2	TOTAL PLUME AREA WHERE MDL >10,000 µg/L
25	x ft saturated thickness	
= **1889738**		**ft^3 TOTAL PLUME VOLUME WHERE MDL > 10,000 µg/L**

2011 BLUE RIVER FLOW SYSTEM TOTAL DISSOLVED VOC MASS ESTIMATE

To calculate contaminant mass - C_{avg} x V_{gw} x ρ_{gw}

where C_{avg} = average concentration of total VOCs expressed as xx μg_{voc} / L_{gw}
V_{gw} = ft^3 of plume area (average saturated thickness = 25 ft) expressed as ft^3_{gw}
ρ_{gw} = constant of 28.32 L_{gw}/ft^3_{gw} (density conversion factor from metric to english units)

Average Concentration Within Plume		plume area	
Cavg for MDL -50 ug/L =	**8.87 µg/L**	**13845104**	**ft3**
Cavg for MDL 50 - 1,000 ug/L =	**240.37 µg/L**	**6376655**	**ft3**
Cavg for MDL 1,000 - 10,000 ug/L	**3546.50 µg/L**	**2918970**	**ft3**
Cavg for MDL > 10,000 ug/L =	**11788.00 µg/L**	**1889738**	**ft3**

Mass of total VOC MDL - 50 µg/L

	C_{avg}		x	V_{gw}		x	ρ_{gw}	
=	4.36	μg_{voc} / L_{gw}	x	14451085	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
=	1784350611	μg_{voc}	x	0.0000010	or ($1g/10^6$ µg)	x	0.002205	or (1lb/453.6 g)
=	**3.93**	**lb_{voc}**						

Mass of total VOC 50 - 1,000 µg/L

	C_{avg}		x	V_{gw}		x	ρ_{gw}	
=	266.70	μg_{voc} / L_{gw}	x	6376655	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
=	48162518122	μg_{voc}	x	0.0000010	or ($1g/10^6$ µg)	x	0.002205	or (1lb/453.6 g)
=	**106.17**	**lb_{voc}**						

Mass of total VOC 1,000 - 10,000 µg/L

	C_{avg}		x	V_{gw}		x	ρ_{gw}	
=	2082.30	μg_{voc} / L_{gw}	x	2918970	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
=	1.72134E+11	μg_{voc}	x	0.0000010	or ($1g/10^6$ µg)	x	0.002205	or (1lb/453.6 g)
=	**379.47**	**lb_{voc}**						

Mass of total VOC > 10,000 µg/L

	C_{avg}		x	V_{gw}		x	ρ_{gw}	
=	19305.10	μg_{voc} / L_{gw}	x	1889738	ft^3_{gw}	x	28.32	L_{gw}/ft^3_{gw}
=	1.03316E+12	μg_{voc}	x	0.0000010	or ($1g/10^6$ µg)	x	0.002205	or (1lb/453.6 g)
=	**2277.60**	**lb_{voc}**						

Total ~ lbs Indian Creek Flow System dissolved phase = 2767.17

Constructed Depth Versus Measured Total Depth 2011 Second Semi-Annual Sampling Event

Constructed Depth Versus Meassured Total Depth 2011 Second Semi-Annual Sampling Event

		Ground	Casing	Casing	CONSTRUCTION INFORMATION						
Well Name		Elevation	Elevation	Height	Total Depth (Borehole)	Depth to Bedrock From TOG	Casing Depth From TOG	Screen Interval From TOG	2011 Measured Depth from TOC	Measured Depth TOG	Difference Between Measured and Constructed
OW-001	L	797.200	799.630	2.430	41	40	39.7	24.5 to 39.5	42.1	39.670	-0.030
OW-008	L	796.400	799.240	2.840	49.8	47	48.8	38.3 to 48.3	48.91	46.070	-2.730
KC84-006	L	797.020	799.110	2.090	39	39	39	34.5 to 38.5	42.33	40.240	1.240
	M		799.210	2.190	39	39	27.5	23.0 to 27.0	30.87	28.680	1.180
	U		799.210	2.190	39	39	12	7.5 to 11.5	14.31	12.120	0.120
KC84-010	L	799.350	798.840	-0.510	27.65	27.65	27.65	23.15 to 27.15	23.81	24.320	-3.330
	U		798.820	-0.530	27.65	27.65	20.65	16.15 to 20.15	19.81	20.340	-0.310
KC84-012	L	800.700	803.270	2.570	37.6	37	37.6	33.1 to 37.1	40.19	37.620	0.020
	U		803.530	2.830	37.6	37	21.1	16.6 to 20.6	24.41	21.580	0.480
KC84-018	L	795.600	798.410	2.810	44	44	44	39.5 to 43.5	47.03	44.220	0.220
	M		798.370	2.770	44	44	31	26.5 to 30.5	33.83	31.060	0.060
	U		798.400	2.800	44	44	20	15.5 to 19.5	23.14	20.340	0.340
KC84-024	L	772.500	775.640	3.140	24.1	24	24.1	19.6 to 23.6	26.89	23.750	-0.350
KC85-030	L	798.300	800.890	2.590	29.5	26.5	26.5	22.0 to 26.0	29.12	26.530	0.030
KC85-032	L	796.990	799.880	2.890	39.89	39.8	39.8	34.4 to 39.4	41.79	38.900	-0.900
	M		799.890	2.900	39.89	39.8	27.76	23.29 to 27.29	30.56	27.660	-0.100
	U		799.870	2.880	39.89	39.8	18	7.59 to 17.59	21.25	18.370	0.370
KC85-033	L	796.900	800.950	4.050	40	40	39.5	35.0 to 39.0	*		
	M		800.930	4.030	40	40	29.5	25.0 to 29.0	*		
	U		800.920	4.020	40	40	14.5	5.0 to 14.0	*		
KC85-034	L	796.500	799.460	2.960	39	39	39	34.5 to 38.5	*		
	M		799.460	2.960	39	39	26	21.5 to 25.5	*		
	U		799.460	2.960	39	39	10	5.5 to 9.5	12.89	9.930	-0.070
KC85-035	L	796.800	800.800	4.000	39.5	39.5	39.5	35.0 to 39.0	43.76	39.760	0.260
	U		800.790	3.990	39.5	39.5	19	4.5 to 18.5	23.29	19.300	0.300
KC85-037	L	799.200	801.090	1.890	47.8	47.3	47.6	43.3 to 47.3	49.27	47.380	-0.220
	M		801.080	1.880	47.8	47.3	27	22.7 to 26.7	29.91	28.030	1.030
	U		801.100	1.900	47.8	47.3	14	9.7 to 13.7	16.95	15.050	1.050
KC85-038	L	796.800	798.860	2.060	40.5	40.5	40.5	36.0 to 40.0	42.63	40.570	0.070
	M		798.860	2.060	40.5	40.5	26	21.5 to 25.5	28.49	26.430	0.430
	U		798.010	1.210	40.5	40.5	18	12.5 to 17.5	20.23	19.020	1.020
KC85-039	L	798.500	800.520	2.020	42.5	42	42	37.5 to 41.5	44.31	42.290	0.290
	M		800.530	2.030	42.5	42	29	24.5 to 28.5	31.03	29.000	0.000
	U		800.500	2.000	42.5	42	19	8.5 to 18.0	20.8	18.800	-0.200
KC85-040	L	797.900	800.850	2.950	45.6	44.5	45	40.5 to 44.5	48.01	45.060	0.060
	M		800.820	2.920	45.6	44.5	27.5	23.0 to 27.0	30.24	27.320	-0.180
	U		800.830	2.930	45.6	44.5	17	7.0 to 16.5	19.79	16.860	-0.140
KC85-041	L	795.600	798.190	2.590	47.4	47	47	42.5 to 46.5	46	43.410	-3.590
	U		798.180	2.580	47.4	47	27.5	17.0 to 27.0	30.19	27.610	0.110
KC85-043	L	798.930	798.960	0.030	49.03	48.5	49	44.3 to 48.3	46.97	46.940	-2.060
	M		798.770	-0.160	49.03	48.5	39.8	35.3 to 39.3	37.86	38.020	-1.780
	U		798.770	-0.160	49.03	48.5	21.8	11.8 to 21.3	19.33	19.490	-2.310
KC85-044	L	797.700	799.520	1.820	43.5	43.5	43.5	33.0 to 43.0	*	*	*
KC85-045	L	773.900	776.170	2.270	28.2	28	28	23.5 to 27.5	30.06	27.790	-0.210
	U		776.310	2.410	28.2	28	16	11.5 to 15.5	18.94	16.530	0.530
KC86-051	L	795.800	797.710	1.910	47	47	46.5	42.0 to 46.0	48.39	46.480	-0.020
	U		797.870	2.070	47	47	22.5	17.0 to 22.0	25.16	23.090	0.590
KC87-060	L	798.600	800.980	2.380	39.4	39.4	39.4	33.9 to 38.9	42.89	40.510	1.110
	U		800.960	2.360	39.4	39.4	20	9.5 to 19.5	22.83	20.470	0.470
KC87-067	L	799.900	802.320	2.420	47.9	47.5	47.5	42.0 to 47.0	49.23	46.810	-0.690
	U		802.310	2.410	47.9	47.5	19.5	9.0 to 19.0	21.06	18.650	-0.850
KC87-068	L	773.800	776.300	2.500	26.3	26.3	26.3	20.8 to 25.8	27.87	25.370	-0.930
	U		776.330	2.530	26.3	26.3	16.3	5.8 to 15.8	18.29	15.760	-0.540
KC87-069	L	796.650	796.390	-0.260	37.5	37.5	37.5	33.0 to 37.0	36.47	36.730	-0.770
	U		796.370	-0.280	37.5	37.5	18.23	7.7 to 17.7	17.43	17.710	-0.520
KC87-071	L	798.220	800.940	2.720	40	40	40	34.5 to 39.5	42.55	39.830	-0.170
	U		801.010	2.790	40	40	18	8.0 to 17.5	20.18	17.390	-0.610
KC87-072	L	797.700	800.910	3.210	41.43	41.4	41.4	35.9 to 40.9	44.41	41.200	-0.200
	U		800.900	3.200	41.43	41.4	15.9	7.4 to 15.4	18.99	15.790	-0.110
KC87-073	L	799.130	801.910	2.780	44.5	44.5	44	39.5 to 43.5	47.43	44.650	0.650
	U		801.910	2.780	44.5	44.5	18	7.5 to 17.5	19.63	16.850	-1.150
KC87-074	L	800.020	803.030	3.010	46.4	46.4	46.4	40.9 to 45.9	49.39	46.380	-0.020
	U		803.010	2.990	46.4	46.4	17.5	8.0 to 17.0	20.17	17.180	-0.320
KC87-075	L	796.240	796.070	-0.170	44	44	44	39.5 to 43.5	43.34	43.510	-0.490
	U		796.060	-0.180	44	44	17.5	8.0 to 17.0	16.9	17.080	-0.420
KC87-076	L	797.630	800.810	3.180	45	45	45	39.5 to 44.5	47.67	44.490	-0.510
	U		800.820	3.190	45	45	17.5	8.0 to 17.0	20.06	16.870	-0.630
KC88-077	L	775.290	777.700	2.410	27.5	27	27.5	22.0 to 27.0	29.59	27.180	-0.320
	U		777.670	2.380	27.5	27	18	7.5 to 17.5	20.19	17.810	-0.190

* Total Depth Not Measured (Pump in Well Completion) TOG = Top of Ground TOC = Top of Casing

Constructed Depth Versus Meassured Total Depth 2011 Second Semi-Annual Sampling Event

		Ground	Casing	Casing	CONSTRUCTION INFORMATION						
Well Name		Elevation	Elevation	Height	Total Depth (Borehole)	Depth to Bedrock From TOG	Casing Depth From TOG	Screen Interval From TOG	2011 Measured Depth from TOC	Measured Depth TOG	Difference Between Measured and Constructed
KC88-079	L	770.840	773.400	2.560	26.39	25.9	26.4	15.9 to 25.9	28.33	25.770	-0.630
KC88-083	L	780.600	782.240	1.640	33.5	33	33.5	28.0 to 33.0	35.22	33.580	0.080
	U		782.210	1.610	33.5	33	20.5	10.0 to 20.0	22.73	21.120	0.620
KC88-084	L	791.930	793.990	2.060	48.53	43.2	48.5	43.0 to 48.0	50.24	48.180	-0.320
	U		793.730	1.800	48.53	43.2	38.2	27.7 to 37.7	40.16	38.360	0.160
KC89-102	L	797.470	797.250	-0.220	32	32	32	26.5 to 31.5	31.26	31.480	-0.520
	U		797.240	-0.230	32	32	19.5	9.0 to 19.0	18.64	18.870	-0.630
KC89-104	L	786.070	788.840	2.770	37.8	37.8	37.8	32.3 to 37.3	40.13	37.360	-0.440
	U		788.880	2.810	37.8	37.8	27.5	17.0 to 27.0	30.21	27.400	-0.100
KC89-105	L	776.300	779.370	3.070	30	30	29.4	13.9 to 28.9	32.07	29.000	-0.400
KC89-115	L	798.090	797.790	-0.300	37.06	37.1	36.2	30.7 to 35.7	35.08	35.380	-0.820
	U		797.960	-0.130	37.06	37.1	18.6	8.1 to 18.1	18.84	18.970	0.370
KC89-119	L	774.780	776.630	1.850	28	27.5	27.5	22.0 to 27.0	29.09	27.240	-0.260
KC89-120	L	776.480	778.040	1.560	30	29.5	29.5	24.0 to 29.0	31.31	29.750	0.250
KC89-121	L	773.480	775.420	1.940	28	27.5	26.5	21.0 to 26.0	28.91	26.970	0.470
KC89-122	L	798.670	798.550	-0.120	71	36.8	58.5	49.5 to 58.0	58.96	59.080	0.580
KC89-123	L	800.210	800.020	-0.190	62	39	59.5	49.5 to 59.0	59.31	59.500	0.000
KC89-125	L	800.390	800.130	-0.260	39.75	Unknown	39	33.5 to 38.5	38.64	38.900	-0.100
	U		800.180	-0.210	39.75	Unknown	25.5	15.0 to 25.0	25.53	25.740	0.240
KC89-126	L	800.410	800.210	-0.200	40	Unknown	40	34.5 to 39.5	38.13	38.330	-1.670
	U		800.150	-0.260	40	Unknown	23.5	13.5 to 23.0	23.54	23.800	0.300
KC90-133	L	776.290	778.380	2.090	26.5	26.5	26.5	20.5 to 25.5	27.52	25.430	-1.070
KC90-134	L	773.500	776.180	2.680	29	28	28	22.5 to 27.5	30.35	27.670	-0.330
KC90-135	L	804.100	806.650	2.550	30.5	30.1	30.5	25.0 to 30.0	32.62	30.070	-0.430
KC90-137	L	798.410	801.040	2.630	48.5	46	46.5	41.0 to 46.0	49.42	46.790	0.290
	U		801.060	2.650	48.5	46	17.5	7.0 to 17.0	20.12	17.470	-0.030
KC90-140	L	797.200	799.680	2.480	48.5	45.3	45.3	40.0 to 45.0	48.06	45.580	0.280
	U		799.660	2.460	48.5	45.3	17.5	7.0 to 17.0	19.53	17.070	-0.430
KC90-143	L	793.440	793.250	-0.190	47.5	47	47.3	42.5 to 47.5	46.76	46.950	-0.350
	U		793.160	-0.280	47.5	47	22.3	12.0 to 22.0	21.99	22.270	-0.030
KC91-149	L	799.950	799.610	-0.340	40	40	40	34.5 to 39.5	39.23	39.570	-0.430
	U		799.720	-0.230	40	40	18.5	8.0 to 18.0	18.36	18.590	0.090
KC91-152	L	800.490	800.260	-0.230	42	42	42	36.5 to 41.5	41.29	41.520	-0.480
	U		800.240	-0.250	42	42	20	9.5 to 19.5	20.1	20.350	0.350
KC91-153	L	800.490	800.190	-0.300	42.2	40	42	36-5. to 41.5	42.11	42.410	0.410
	U		800.180	-0.310	42.2	40	20	9.5 to 19.5	20.11	20.420	0.420
KC91-154	L	798.620	798.360	-0.260	36.2	36	36.2	30.7 to 35.7	35.88	36.140	-0.060
	U		798.380	-0.240	36.2	36	20	9.5 to 19.5	20.11	20.350	0.350
KC91-155	L	799.050	798.660	-0.390	40	39	39.5	34.0 to 39.0	38.36	38.750	-0.750
	U		798.770	-0.280	40	39	20	9.5 to 19.5	19.81	20.090	0.090
KC91-156	L	800.510	800.150	-0.360	39	38.8	39	33.5 to 38.5	38.15	38.510	-0.490
	U		800.130	-0.380	39	38.8	20	9.5 to 19.5	20.11	20.490	0.490
KC91-157	L	800.550	800.070	-0.480	38.5	38	38.5	33.0 to 38.0	37.34	37.820	-0.680
	U		800.010	-0.540	38.5	38	20	9.5 to 19.5	20.11	20.650	0.650
KC91-158	L	800.380	799.990	-0.390	40.5	40.5	40.5	35.0 to 40.0	39.96	40.350	-0.150
	U		800.000	-0.380	40.5	40.5	20.5	10.0 to 20.0	20.11	20.490	-0.010
KC91-160	L	800.360	800.110	-0.250	39.5	39.5	39.5	35.0 to 39.0	39.08	39.330	-0.170
	U		800.090	-0.270	39.5	39.5	20.5	10.0 to 20.0	20	20.270	-0.230
KC91-163	L	800.310	800.070	-0.240	40	40	38.8	33.3 to 38.3	38.29	38.530	-0.270
	U		800.030	-0.280	40	40	20	9.5 to 19.5	20.18	20.460	0.460
KC91-165	L	796.660	796.430	-0.230	39.2	39	39.2	33.7 to 38.7	38.98	39.210	0.010
	U		796.320	-0.340	39.2	39	19	8.5 to 18.5	19.81	20.150	1.150
KC91-168	L	797.770	797.310	-0.460	40.5	40	40.5	35.0 to 40.0	39.29	39.750	-0.750
	U		797.330	-0.440	40.5	40	19.5	9.0 to 19.0	18.56	19.000	-0.500
KC91-171	L	797.040	796.610	-0.430	38.5	38	38.5	33.0 to 38.0	38.07	38.500	0.000
	U		796.640	-0.400	38.5	38	18.5	8.0 to 18.0	18.15	18.550	0.050
KC91-175	L	801.050	800.720	-0.330	29.5	28	29.5	24.2 to 29.2	28.78	29.110	-0.390
	U		800.730	-0.320	29.5	28	17.8	7.5 to 17.5	17.87	18.190	0.390
KC91-176	L	799.770	800.690	0.920	40.5	40	39.48	34.1 to 39.1	40.08	39.160	-0.320
	U		802.010	2.240	40.5	40	18.3	8.0 to 18.0	20.27	18.030	-0.270
KC91-179	L	791.600	793.650	2.050	40	39.5	40	34.5 to 39.5	41.64	39.590	-0.410
	U		793.720	2.120	40	39.5	20.5	10.0 to 20.0	22.5	20.380	-0.120
KC91-182	L	789.200	791.430	2.230	41	41	41	35.7 to 40.7	43.31	41.080	0.080
	U		791.540	2.340	41	41	19.3	9.0 to 19.0	21.36	19.020	-0.280
KC91-183	L	796.700	798.110	1.410	41	41	41	35.5 to 40.5	42.65	41.240	0.240
	U		798.190	1.490	41	41	20	9.5 to 19.5	22.24	20.750	0.750
KC92-184	L	800.020	799.910	-0.110	41	40.8	40.3	35.0 to 40.0	40.22	40.330	0.030
	U		800.010	-0.010	41	40.8	20	10.7 to 19.7	20.19	20.200	0.200
KC92-185	L	800.200	799.910	-0.290	41	40.5	41	35.7 to 40.7	39.83	40.120	-0.880

* Total Depth Not Measured (Pump in Well Completion) TOG = Top of Ground TOC = Top of Casing

Constructed Depth Versus Meassured Total Depth 2011 Second Semi-Annual Sampling Event

		Ground	Casing	Casing	CONSTRUCTION INFORMATION						
Well Name		Elevation	Elevation	Height	Total Depth (Borehole)	Depth to Bedrock From TOG	Casing Depth From TOG	Screen Interval From TOG	2011 Measured Depth from TOC	Measured Depth TOG	Difference Between Measured and Constructed
KC92-185	U		800.010	-0.190	41	40.5	20	9.7 to 19.7	20.19	20.380	0.380
KC92-187	L	797.240	797.070	-0.170	41	41	41	35.7 to 40.7	40.42	40.590	-0.410
	U		797.070	-0.170	41	41	17.5	7.2 to 17.2	18.33	18.500	1.000
KC94-193	L	798.010	797.640	-0.370	40	Unknown	40	34.7 to 39.7	39.7	40.070	0.070
	U		797.720	-0.290	40	Unknown	19.3	9.0 to 19.0	18.75	19.040	-0.260
KC92-194	L	792.020	791.780	-0.240	39	38.5	39	33.7 to 38.7	39.35	39.590	0.590
KC94-195	L	797.640	797.100	-0.540	40.5	40.5	40.5	35.3 to 40.3	39.45	39.990	-0.510
	U		797.170	-0.470	40.5	40.5	16	5.7 to 15.7	15.62	16.090	0.090
KC94-196	L	800.140	799.880	-0.260	45.7	45.7	45.7	40.4 to 45.4	44.98	45.240	-0.460
	U		799.810	-0.330	45.7	45.7	22	9.2 to 22.2	21.23	21.560	-0.440
KC94-197	L	800.510	800.290	-0.220	45	45	45	39.7 to 44.7	44.12	44.340	-0.660
	U		800.320	-0.190	45	45	21	10.7 to 20.7	20.31	20.500	-0.500
KC94-198	L	800.490	799.740	-0.750	47	47	46	40.7 to 45.7	44.97	45.720	-0.280
	U		799.680	-0.810	47	47	22	11.7 to 21.7	21.1	21.910	-0.090
KC94-199	L	798.310	798.080	-0.230	42	42	42	36.7 to 41.7	41.89	42.120	0.120
	U		797.750	-0.560	42	42	16	5.5 to 15.5	15.3	15.860	-0.140
KC95-200	L	773.440	775.980	2.540	27	27	27	16.8 to 26.8	29.57	27.030	0.030
KC95-201	L	798.290	801.040	2.750	41	41	41	30.8 to 40.8	*	*	*
KC95-202	L	800.300	799.800	-0.500	43.17	43	43	37.7 to 42.7	42.31	42.810	-0.190
	U		800.070	-0.230	43.17	43	22	16.7 to 21.7	22.31	22.540	0.540
KC97-209	L	797.760	797.540	-0.220	41.5	41.5	41.5	35.7 to 40.7	41.05	41.270	-0.230
	U		797.480	-0.280	41.5	41.5	20	9.5 to 19.5	20.04	20.320	0.320
KC98-211	U	774.500	777.075	2.575	21.6	NA	19.6	14.1 to 19.1	21.81	19.235	-0.365
KC98-212	L	774.000	776.435	2.435	28.4	28	28	22.5 to 27.5	29.94	27.505	-0.495
KC98-227	L	799.780	799.310	-0.470	45.5	45	44	38.7 to 43.7	44.21	44.680	0.680
	U		799.290	-0.490	45.5	45	24	13.5 to 23.5	23.41	23.900	-0.100
KC98-228	L	801.590	801.330	-0.260	45	NA	44	38.7 to 43.7	44.87	45.130	1.130
	U		801.160	-0.430	45	NA	24	13.7 to 23.7	23.7	24.130	0.130
KC98-229	L	801.240	800.910	-0.330	50	47	46	40.7 to 45.7	46.49	46.820	0.820
	U		800.990	-0.250	50	47	24	13.7 to 23.7	24.73	24.980	0.980
KC98-230	L	800.650	800.420	-0.230	45	43	44	38.7 to 43.7	44.47	44.700	0.700
	U		800.430	-0.220	45	43	21	13.7 to 23.7	24.61	24.830	3.830
KC98-231	L	795.780	797.810	2.030	41	38	39	33.7 to 38.7	41.87	39.840	0.840
	U		797.840	2.060	41	38	24	13.7 to 23.7	26.08	24.020	0.020
KC98-232	L	793.600	795.990	2.390	28.5	28	27	21.7 to 26.7	30.09	27.700	0.700
	U		795.490	1.890	28.5	28	17	11.7 to 16.7	19.87	17.980	0.980
KC98-233	L	779.430	782.020	2.590	25	23.8	23.5	18.2 to 23.2	27.12	24.530	1.030
KC98-234	L	797.080	799.290	2.210	22.5	20.5	19	13.7 to 18.7	22.81	20.600	1.600
KC99-239	L	767.800	769.613	1.813	22	21	21	15.7 to 20.7	23.01	21.197	0.197
KC99-247	L	776.100	777.850	1.750	29	NA	29	23.5 to 28.5	30.43	28.680	-0.320
KC99-248	L	776.100	777.880	1.780	29	NA	29	23.5 to 28.5	30.4	28.620	-0.380
KC00-261	L	775.110	777.480	2.370	29	28.75	29	23.7 to 28.7	30.79	28.420	-0.580
	U		777.500	2.390	29	28.75	17	11.7 to 16.7	19.48	17.090	0.090
KC00-262	L	775.670	778.565	2.895	29	29	29	23.7 to 28.7	31.8	28.905	-0.095
	U		778.550	2.880	29	29	21	15.7 to 20.7	23.26	20.380	-0.620
KC00-265	L	767.680		2.820	22.5	22.5	22.5	20.3 to 22.3	25.18	22.360	-0.140
	U			2.925	22.5	22.5	12	6.7 to 11.7	15.25	12.325	0.325
KC00-267	L	772.460	775.670	3.210	25.5	25.25	25	19.7 to 24.7	28.85	25.640	0.640
	U		775.720	3.260	25.5	25.25	16	11.7 to 15.7	18.79	15.530	-0.470
KC00-268	L	771.980	775.210	3.230	25.7	25.5	25.7	20.4 to 25.4	28.81	25.580	-0.120
	U		775.360	3.380	25.7	25.5	16.5	11.2 to 16.2	19.26	15.880	-0.620
KC00-269	L	776.140	779.115	2.975	30	30	29.5	25.2 to 29.2	32.44	29.465	-0.035
KC00-270	L	774.840	778.090	3.250	29	29	27.5	22.2 to 27.2	31.57	28.320	0.820
KC94-191	U	797.120	799.540	2.420	22	NA	22	11.8 to 21.8	*	*	*
KC94-192	U	796.830	799.590	2.760	41.5	41.5	41.3	36.0 to 41.0	*	*	*
	L		799.510	2.680	41.5	41.5	22	9.75 to 21.8	*	*	*

* Total Depth Not Measured (Pump in Well Completion) TOG = Top of Ground TOC = Top of Casing