Department of Energy
Office of Legacy Management

DEC 2 3 2010

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Deputy Director
Mail Stop T8F5
Washington, DC 20555-0001

Subject: Transmittal of Groundwater Monitoring Assessment Report for the Falls City, Texas, Disposal Site, December 2010

To Whom It May Concern:

Enclosed is the *Groundwater Monitoring Assessment Report for the Falls City, Texas, Disposal Site, December 2010*. As you are aware, the *Long-Term Surveillance Plan for the U.S. Department of Energy, Falls City Uranium Mill Tailings Disposal Site, Falls City, Texas* (LTSP; DOE 2008), Section 3.7 requires a groundwater monitoring assessment be conducted after the 2010 monitoring event. The assessment will provide recommendations whether to continue, modify, or terminate the monitoring program.

In summary, the report recommends the DOE best management groundwater monitoring activities at the Falls City site be discontinued following the collection of samples in the spring of 2011. This recommendation is supported by the additional 5 years of monitoring results. Furthermore, the aquifer beneath the Falls City site has an Environmental Protection Agency "limited use" designation, and narrative supplemental standards for groundwater (40 *Code of Federal Regulations* 192.21 (g)) apply.

Upon the U.S. Nuclear Regulatory Commission's concurrence, DOE will then amend the Falls City LTSP using this approval to proceed with issuing the revision.

Please contact me at 970-248-6016 if you have any questions.

Sincerely,

Jalena Dayvault
Site Manager

Enclosure

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LMS/FCT/S07069

Groundwater Monitoring Assessment Falls City, Texas, Disposal Site

December 2010

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Groundwater Monitoring Assessment
Falls City, Texas, Disposal Site

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Executive Summary

Five years of additional groundwater monitoring data (2006 through 2010) at the Falls City, Texas, Disposal Site are compared to previous data (1996 through 2005). The comparison shows that hazardous constituent concentrations continue to fluctuate in the uppermost aquifer but the fluctuations in the past 5 years are within the historical range reported for the aquifer in the area of the site (DOE 1997b). The comparison also shows that there are no new unexpected water level changes.

Uranium concentrations at monitoring well MW-0891 have increased and are currently elevated when compared to the historical range for the well, but not for the historical range of the aquifer. The new maximum uranium concentration measured at monitoring well MW-0891 in 2010 (2.1 milligrams per liter [mg/L]) is below the maximum concentration reported for the aquifer (3.04 mg/L).

Because groundwater in the uppermost aquifer beneath the Falls City site meets the criteria for designation as "limited use", narrative supplemental standards for groundwater (40 *Code of Federal Regulations* 192.21 (g)) are applicable. The U.S. Nuclear Regulatory Commission does not require groundwater monitoring; it is conducted as a best management practice in accordance with the site's Long-Term Surveillance Plan (LTSP). Site-related contamination poses no risk to the uppermost aquifer at the Falls City site because the groundwater from this aquifer is not used for human consumption as a result of its designation as "limited use". Additionally, a 300-foot-thick aquitard isolates the uppermost aquifer from better quality groundwater that occurs in deeper aquifers.

The U.S. Department of Energy (DOE) recommends that following the collection of samples in the spring of 2011 that groundwater monitoring activities at the Falls City site be discontinued. DOE will maintain the 12 monitoring wells at the site until the nearby Title II Conquista site transfers to the Office of Legacy Management (LM), (which is projected to occur in 2017). The Conquista site is located just south of, and adjacent to the Falls City Site. Upon transfer of the Conquista site to LM, DOE will assess whether a joint site monitoring approach is warranted (either a one-time-event or some type of periodic monitoring). Once the recommended monitoring strategy for the Conquista site is approved by the NRC, wells no longer deemed necessary to a monitoring effort would be decommissioned following State of Texas guidelines for plugging and abandonment of groundwater monitoring wells.

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1.0 Introduction

Two aquifers of interest underlie the Falls City, Texas, Disposal Site: the shallow Deweesville/Conquista aquifer and the deeper Dilworth aquifer. Because the two aquifers are hydraulically connected, they constitute the uppermost aquifer for regulatory purposes. The Dilworth aquifer is underlain by the Manning Clay, a 300-foot-thick aquitard that isolates the uppermost aquifer from better quality groundwater in deeper aquifers. Groundwater quality in the uppermost aquifer varies by orders of magnitude because uranium mineralization is naturally present and redistributed in the area. The hydrogeology and quality of groundwater in the uppermost aquifer at the Falls City site is discussed in several plans and reports: (DOE 1995, DOE 1997a, DOE 1997b, DOE 1998, and DOE 2008).

Site-related contamination poses no risk to the uppermost aquifer at the Falls City site because there is no local use for the groundwater. Groundwater in the uppermost aquifer is designated "limited use" (per 40 *Code of Federal Regulations* 192.21(g)) because it has no current or potential groundwater use due to widespread ambient contamination that cannot be cleaned up using methods reasonably employed by public water systems. The U.S. Nuclear Regulatory Commission (NRC) does not require groundwater monitoring at the Falls City site; it is conducted as a best management practice in accordance with the Long-Term Surveillance Plan (LTSP) because narrative supplemental standards apply to the uppermost aquifer. Potable (domestic) water is produced locally from the Carrizo Sandstone that lies 2,000 feet below the surface near the disposal site.

The controlling document for groundwater monitoring at the Falls City Disposal Site is the *Long-Term Surveillance Plan for the U.S. Department of Energy Falls City Uranium Mill Tailings Disposal Site, Falls City, Texas* (DOE 2008). Two groundwater monitoring networks are defined for the site: the cell performance monitoring network and the groundwater compliance monitoring network. Twelve monitoring wells are sampled once a year for uranium and eight field parameters (alkalinity, dissolved oxygen, oxidation-reduction potential, pH, specific conductance, temperature, total dissolved solids, and turbidity).

The last groundwater monitoring assessment for the Falls City site included monitoring data collected from 1996 through 2005 (DOE 2008). As concluded in the last assessment, the U.S. Department of Energy (DOE) has fulfilled the environmental monitoring requirements for disposal cell performance and groundwater compliance monitoring. Specifically:

- There are no unexpected trends and no indication of unacceptable risk to human health and the environment resulting from historical processing of uranium ore at the site.
- Except for uranium, contaminant concentrations in groundwater are stable and no longer require monitoring. Uranium will continue to be present in groundwater in varying concentrations where geochemical conditions favor mobilization of this constituent as it is released from naturally occurring uranium minerals in the uppermost aquifer.
- Because of widespread, naturally occurring contaminants, groundwater in the uppermost aquifer will never by suitable for agricultural or domestic use.
- Groundwater in the uppermost aquifer in the vicinity of the Falls City site is of limited use and is unsuitable as a source of drinking water because of widespread ambient contamination (naturally occurring uranium mineralization) and degradation caused by associated human activities (uranium exploration and mining) not related to uranium-ore

processing. The disposal cell is located near former open-pit uranium mines in a geochemically active environment. Remnant uranium mineralization is being redistributed through recharge by oxidizing meteoric water at the formation outcrop immediately up dip of the site.

The last assessment (through 2005) recommended that water level monitoring and water quality sampling (uranium and field parameters) continue annually for an additional 5 years. Following the collection of samples in 2010, monitoring results were to be assessed again. This report fulfills that assessment requirement.

2.0 Groundwater Monitoring Overview (2006–2010)

Between 2006 and 2010, 2 years of groundwater monitoring were conducted under the original LTSP (DOE 1997a) and the Groundwater Compliance Action Plan (DOE 1998), and 3 years were conducted under the current LTSP (DOE 2008). The shift occurred in 2008, upon NRC concurrence with the current LTSP. Specifically:

- In 2006 and 2007, water levels were measured and groundwater samples were collected twice a year in cell performance wells and once a year in Groundwater Compliance wells. The groundwater samples were analyzed for 33 constituents (Table 1) and eight field parameters (alkalinity, dissolved oxygen, oxidation reduction potential, pH, specific conductance, temperature, total dissolved solids, and turbidity).
- In 2008, 2009, and 2010, water levels were measured and groundwater samples were collected once a year. The groundwater samples were analyzed for uranium and the same eight field parameters (alkalinity, dissolved oxygen, oxidation reduction potential, pH, specific conductance, temperature, total dissolved solids, and turbidity).

An exception to this monitoring scope involved the two monitoring wells completed in the Dilworth aquifer (monitoring wells MW-0862 and MW-0891). Fluctuating, and then increasing, uranium concentrations in monitoring well MW-0891 led to a decision by DOE to test for additional anions and cations in 2008 and again in 2010 at both of the Dilworth monitoring wells. The additional anions and cations were ammonia, calcium, chloride, iron, magnesium, nitrate, potassium, sodium, and sulfate.

The objective of the increased Dilworth monitoring was to provide additional insight into whether other cation and anion concentrations were also fluctuating and/or increasing along with the uranium.

3.0 Groundwater Monitoring Results

Groundwater monitoring data are available in the DOE Office of Legacy Management's Site Environmental Evaluation for Projects database. Constituent concentrations from the past 5 years (2006 through 2010) were compared to historical concentration ranges for individual monitoring wells and the aquifer. The individual well comparison is provided in Appendix A. New well-specific maximum hazardous constituent concentrations are discussed in Section 3.1 and Section 3.2.

Table 1. Thirty-Three Constituents Monitored in 2006 and 2007

Hazardous Constituents	Major Element Constituents	Field Parameters
Antimony	Aluminum	Alkalinity
Arsenic	Ammonia*	Dissolved Oxygen
Beryllium	Bromide	pH
Cadmium	Calcium*	Redox Potential
Chromium	Chloride*	Specific Conductance
Cobalt	Iron*	Temperature
Copper	Magnesium*	Total Dissolved Solids
Gross Alpha	Manganese	Turbidity
Gross Beta	Potassium*	
Lead	Sodium*	
Molybdenum	Sulfate*	
Nickel		
Nitrate + Nitrite as Nitrogen*		
Radium-226		
Radium-228		
Selenium		
Sulfide		
Thallium		
Tin		
Uranium		
Vanadium		
Zinc		

*Extra anions and cations sampled in Dilworth wells (MW-0862 and MW-0891) in 2008 and 2010.

3.1 Cell Performance Monitoring Results

Monitoring wells MW-0709, MW-0858, MW-0880, MW-0906, MW-0908, MW-0916, and MW-0921 are the seven monitoring wells assigned to cell performance monitoring (Figure 1). All of these monitoring wells are completed in the Conquista sandstone with the exception of monitoring well MW-0880, which is completed in the Deweesville Sandstone.

Two of these monitoring wells (MW-0908 and MW-0916) are used for water level measurement only, unless enough water is present to sample them. In the last 5 years (from 2006 through 2010) these wells were dry.

3.1.1 Cell Performance Water Levels

No unexpected water level trends were observed in the cell performance monitoring wells in the last 5 years (Figure 2). Water levels in monitoring wells MW-0709, MW-0858, MW-0880, and MW-0921 continue to show a slight decrease with minor fluctuations. Water levels in monitoring well MW-0906 continued to fluctuate within their historic range.

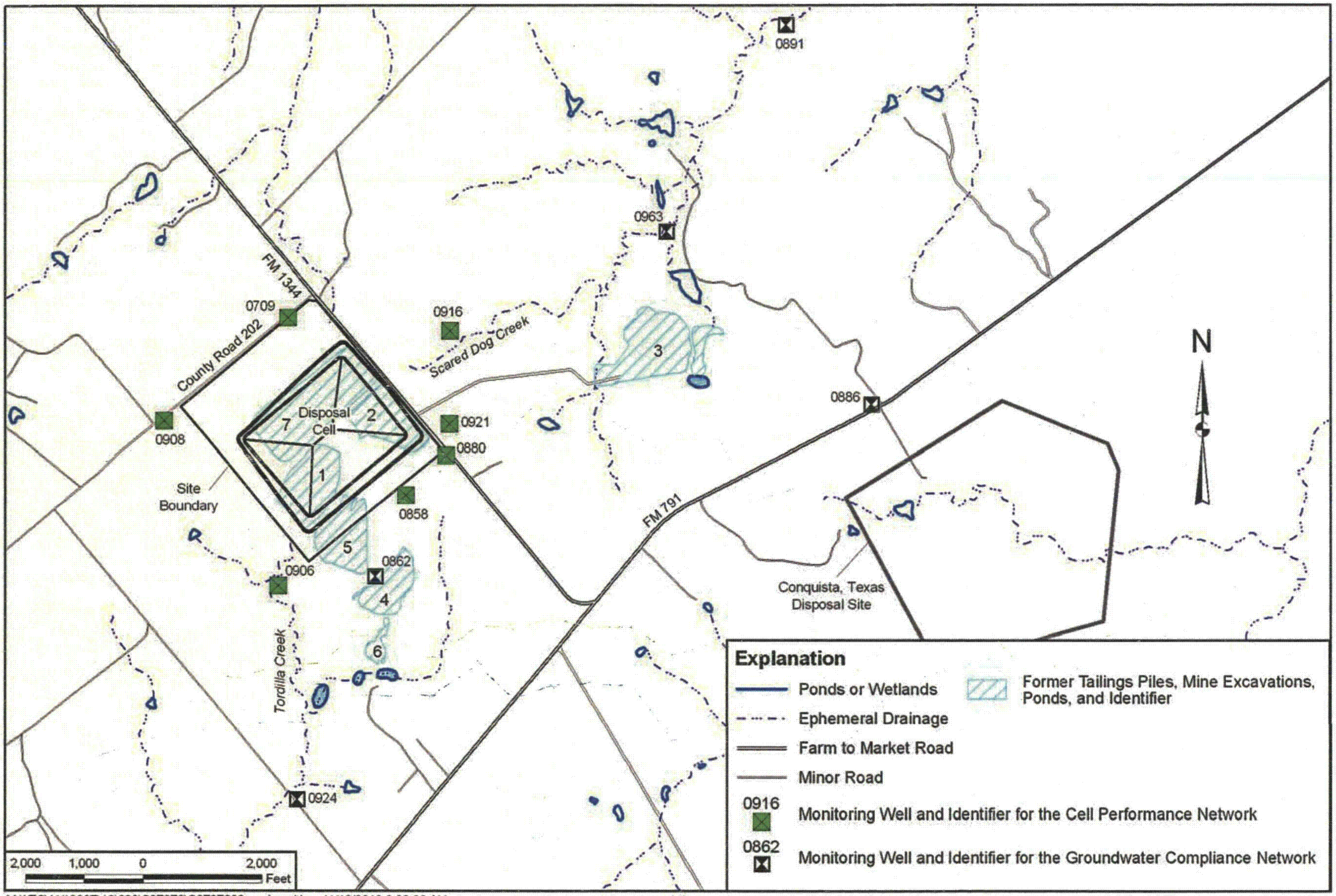

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Figure 1. Groundwater Monitoring Wells, Falls City, Texas, Disposal Site

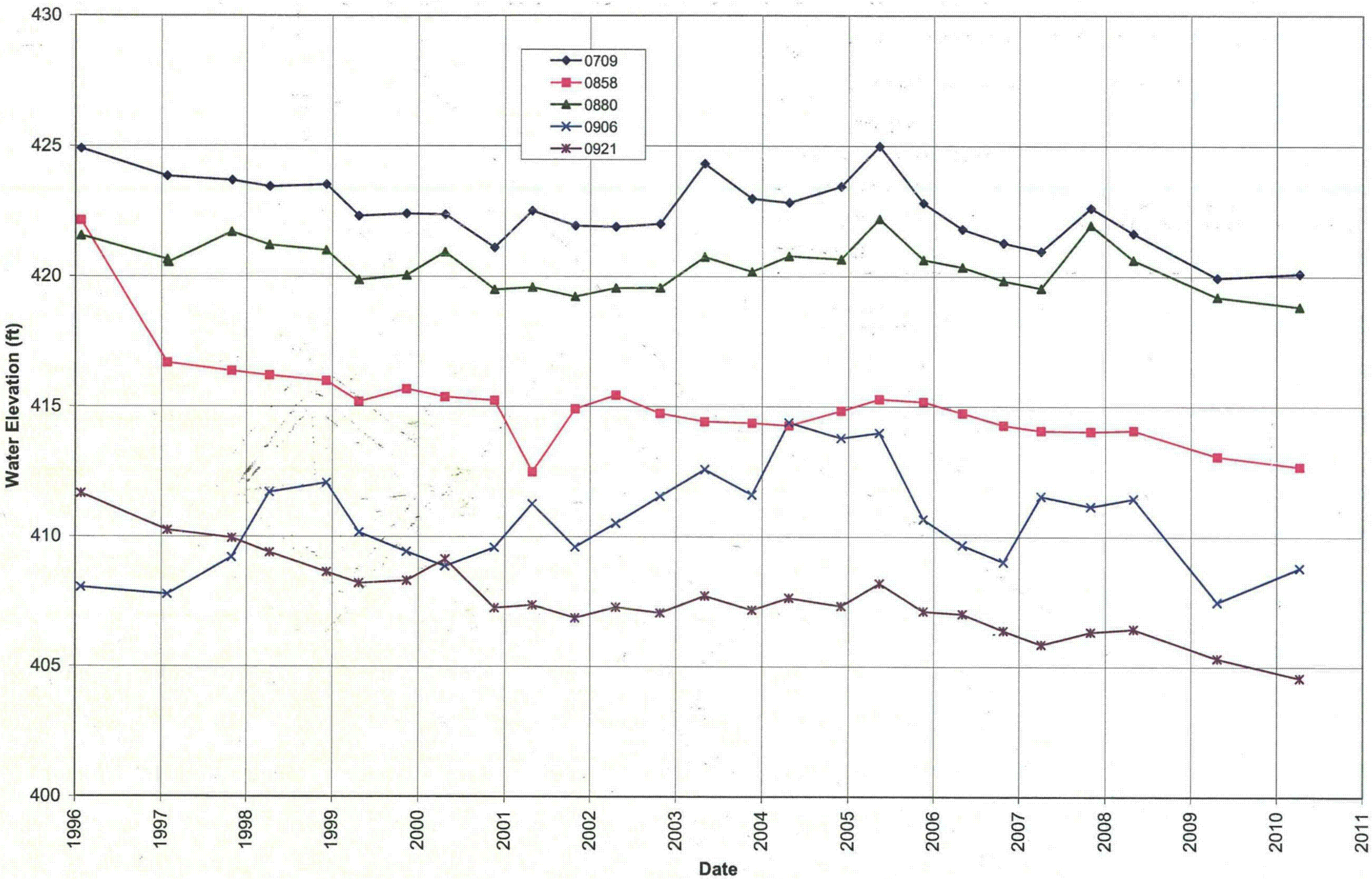

Figure 2. Cell Performance Wells Water Levels

Water level trends are consistent with the conceptual model presented in the Final Site Observational Work Plan (DOE 1997b). The conceptual model is that the Deweesville/Conquista Formations at the site were historically unsaturated. Milling and in situ leaching activities caused the formations to become saturated beneath the site. A groundwater mound was created under the site and groundwater from the mound moved radially outward and down dip. This mound is slowly dissipating over time.

3.1.2 Cell Performance Water Quality

Hazardous constituent concentrations (see Table 1) continue to fluctuate around the disposal cell and water quality continues to show significant local variation.

As shown in Appendix A, most of the hazardous constituent concentrations measured in the last 5 years at cell performance wells are below the maximum concentration previously reported for the wells. The few exceptions where a new well-specific maximum concentration was measured are presented in Table 2.

Table 2. Well-Specific Maximum Concentrations in Cell Performance Water Quality

Well ID	Aquifer	Constituent	Maximum Concentration at the Well Prior to 2006	Maximum Concentration at the Well Between 2006 and 2010	Maximum Aquifer Concentration*
0709	Conquista	Nitrate	10 mg/L	12 mg/L	73.9 mg/L
0858	Conquista	Radium-228	19.45 pCi/L	19.7 pCi/L	NR
0880	Deweesville	Chromium	0.0351 mg/L	0.047 mg/L	0.07 mg/L
		Gross Alpha	6772 pCi/L	8440 pCi/L	43,000 pCi/L
		Gross Beta	3714 pCi/L	3800 pCi/L	21,500 pCi/L
		Molybdenum	0.05 mg/L	0.058 mg/L	0.68 mg/L
		Nickel	1.58 mg/L	1.6 mg/L	1.3 mg/L
0906	Conquista	Radium-228	10.4 pCi/L	12.4 pCi/L	NR
		Tin	0.06 mg/L	0.13 mg/L	0.18 mg/L
0921	Conquista	Gross Beta	336 pCi/L	415 pCi/L	21,500 pCi/L
		Radium-228	5.53 pCi/L	12.3 pCi/L	NR
		Uranium	0.98 mg/L	1.2 mg/L	69.8 mg/L

* Maximum aquifer concentrations as reported in Table 4-2 of the Final Site Observational Work Plan (DOE 1997b).
NR = Not reported

The last column of the table provides the maximum reported aquifer concentrations from the Final Site Observational Work Plan (DOE 1997b). The maximum aquifer concentrations are from monitoring wells located across the site that were organized into four zones based on geographic location. Some of the data were collected from areas of the aquifer that were believed to be contaminated before remedial actions began. The concentration provided in the last column provides a reference to determine if any new maximum aquifer concentrations were measured in the last 5 years that would contradict the findings of the last groundwater evaluation which includes data collected through 2005.

With the exception of radium-228 and nickel, all of the new well-specific maximum concentrations measured in the last 5 years at cell performance wells were below the maximum concentration previously reported for the aquifer. Radium-228 concentrations in the Deweesville/Conquista Aquifer were not reported in the Final Site Observational Work Plan. The new maximum concentration for radium-228 (19.7 picocuries per liter [pCi/L] in monitoring well MW-0858) is slightly higher than the previous reported maximum for the cell performance wells (19.45 pCi/L in monitoring well MW-0858). The new maximum concentration measured for nickel in monitoring well MW-0880 (1.6 milligrams per liter [mg/L]) is essentially the same as the maximum reported prior to 2006 in monitoring well MW-0880 (1.58 mg/L).

Although constituent concentrations in the cell performance monitoring wells continue to fluctuate, pH continues to remain relatively stable (Figure 3). As shown in Figure 3, pH values measured in the past 5 years are consistent with previous trends.

With the exception of monitoring well MW-0880, uranium concentrations remain relatively stable (Figure 4). As shown in Figure 4, uranium concentrations at monitoring well MW-0880 have fluctuated in the past. The pH at monitoring well MW-0880 is lower than the pH in the other cell performance wells and has varied more than at other locations in the cell performance monitoring network..

3.1.3 Cell Performance Monitoring Conclusions

The last 5 years of cell performance monitoring data continue to indicate that there are no unexpected trends and no indication of unacceptable risk to human health and the environment from the disposal cell impacting the "limited use" upper aquifer.

Data suggest that the interaction between the disposal cell, the legacy groundwater mound, and processing plumes is still equilibrating at monitoring well MW-0880. However, monitoring results do not indicate that the disposal cell is resulting in degradation of the uppermost aquifer. Because the groundwater in the uppermost aquifer is not used as a potable water source near the Falls City site, the site remains protective.

Hazardous constituent fluctuations in the cell performance monitoring wells may be due to seepage from the disposal cell because some of the tailings material was not completely dry at the time of disposal (DOE 2008). However, it is also possible that the fluctuations may not be related to tailings seepage at all. "The distribution of other hazardous constituents ....shows isolated points of elevated concentrations... [that] are contributed by the natural redistribution of mineralization rather than tailings seepage." (DOE 2008).

Using groundwater chemistry as an indicator of disposal cell performance is problematic at the Falls City site (DOE 2008). A comparison of the chemistry of tailings pore water and site groundwater suggests that contamination that might leach from the disposal cell, either through transient drainage or by percolation of precipitation through the cover, would be chemically similar and most likely indistinguishable from site groundwater.

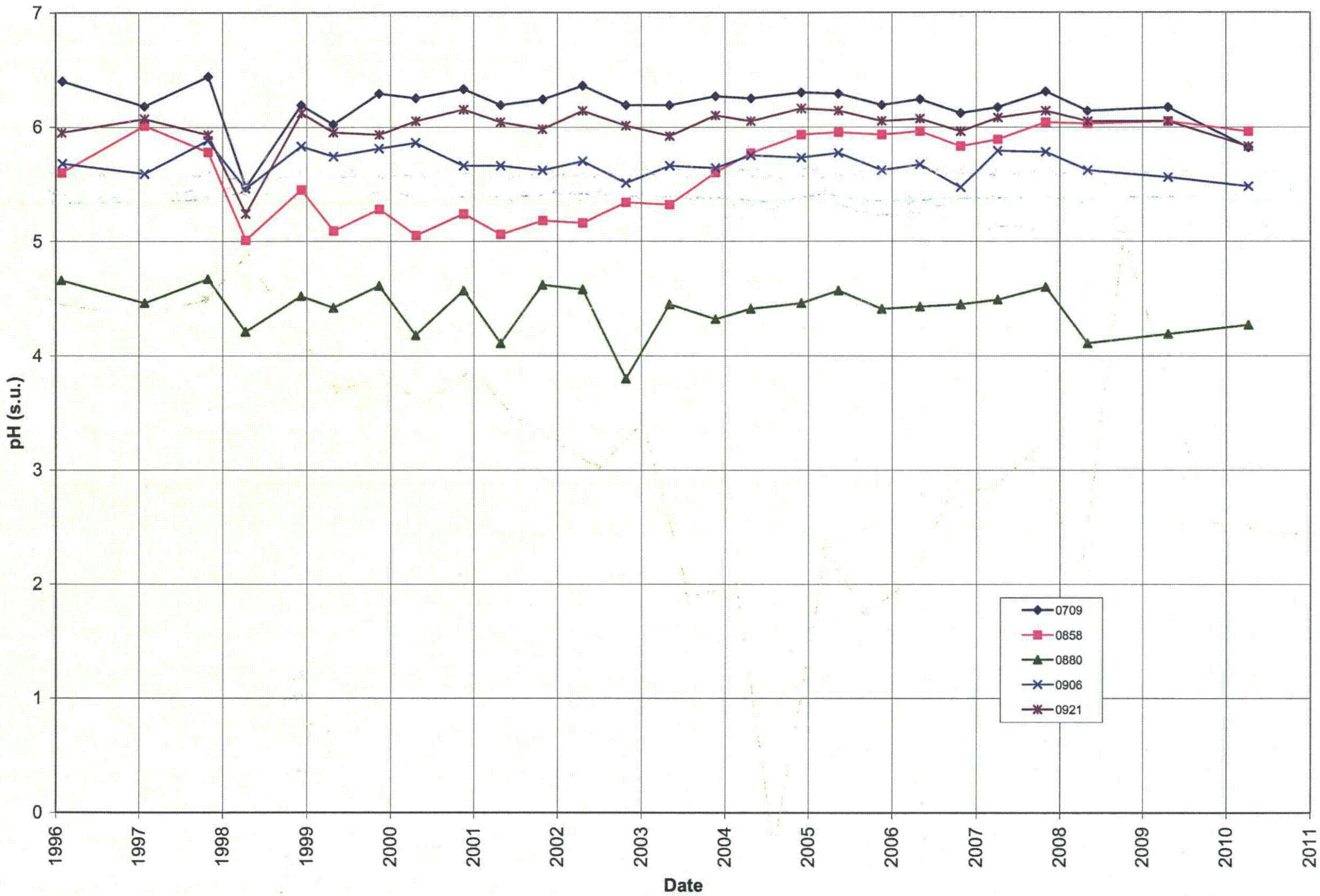

Figure 3. Cell Performance Wells pH

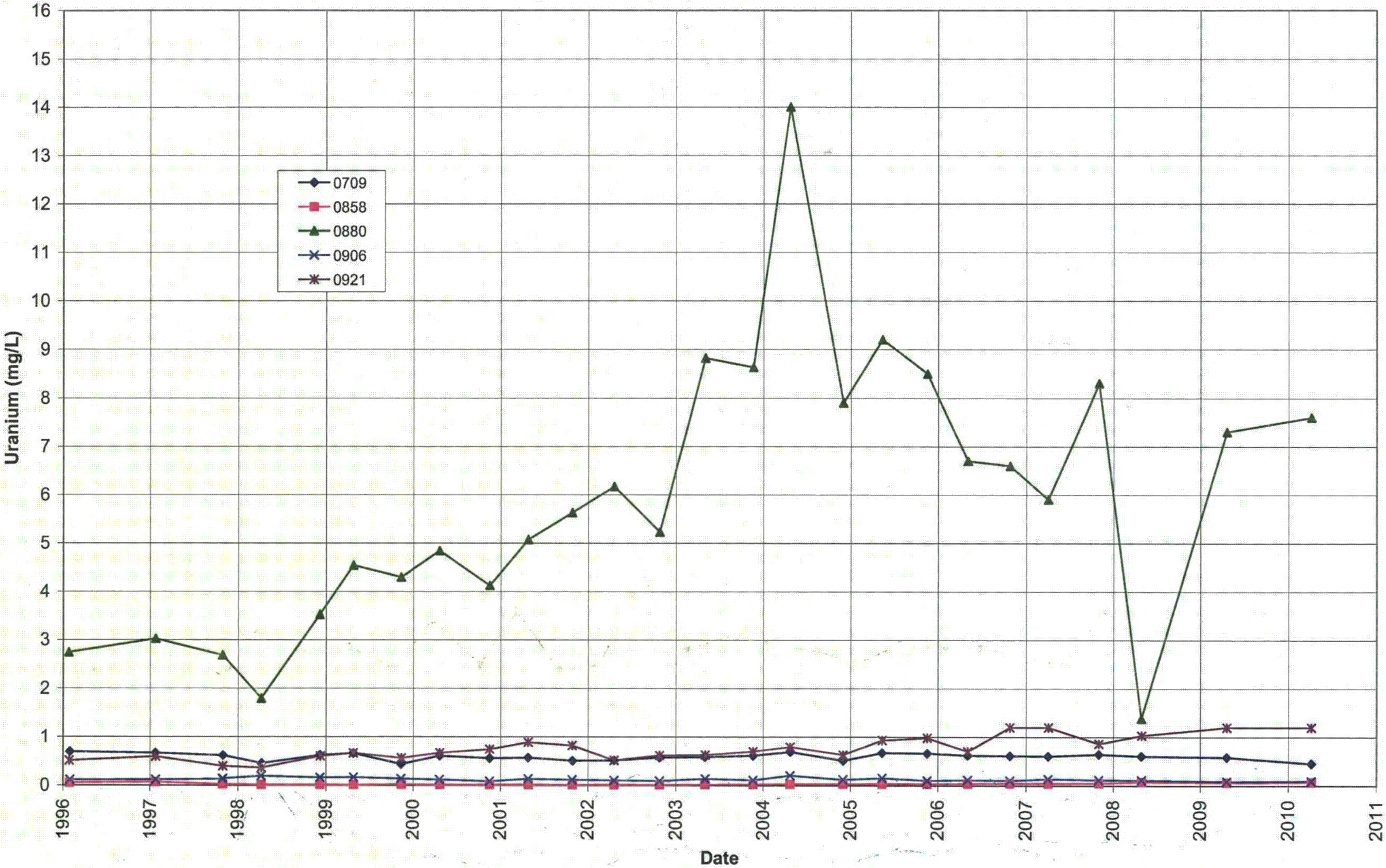

Figure 4. Cell Performance Wells Uranium

3.2 Compliance Monitoring

Monitoring wells MW-0862, MW-0886, MW-0891, MW-0924, and MW-0963 are the five monitoring wells in the compliance groundwater monitoring network (Figure 1). Two of the five monitoring wells are completed in the Dilworth aquifer (monitoring wells MW-0862 and MW-0891) and the remaining three are completed in the Deweesville/Conquista Aquifer.

3.2.1 Compliance Water Levels

No unexpected water level trends were observed in the compliance monitoring wells in the last 5 years (Figure 5). Two water level trends are indicated: one defined by the three shallow monitoring wells located next to two ephemeral drainages: Tordillo and Scared Dog Creeks (monitoring wells MW-0924, MW-0963, and MW-0891) and the other defined by the two deeper monitoring wells located away from the ephemeral drainages (monitoring wells MW-0886 and MW-0862). Water levels in the shallower wells fluctuate more than the water levels in the deeper wells. Water level measurements for the last 5 years continue to show a slight regional water level rise.

3.2.2 Compliance Water Quality

Water quality data collected at compliance monitoring wells for the last 5 years (2006 through 2010) were compared to the historical data from the sampled well, and to historical data for the aquifer. Constituent concentrations continue to fluctuate and groundwater quality continues to show significant local variation across the site.

As shown in Appendix A, most of the hazardous constituent concentrations measured at compliance monitoring wells between 2006 and 2010 fell below the maximum concentration previously measured for that well. The few exceptions where a new well-specific maximum hazardous constituent concentration was measured are provided in Table 3.

With the exception of gross alpha, gross beta, and radium-228 in monitoring well MW-0891, the last column of Table 3 shows that all of the new well-specific maximum hazardous constituent concentrations measured at compliance monitoring wells between 2006 and 2010 were below the maximum concentrations previously reported for the aquifer. A comparison for gross alpha and gross beta for the Dilworth aquifer in monitoring well MW-0891 could not be made because the historical ranges are reported in mg/L (DOE 1997b) and the current data is reported in picocuries per liter. A value for radium-228 in the Dilworth is not reported. Monitoring results at monitoring well MW-0891 are further discussed below.

Although constituent concentrations in the compliance monitoring wells continue to fluctuate, pH continues to remain relatively stable (Figure 6). As shown in Figure 6, pH values measured in the past 5 years in the compliance wells are consistent with previous trends.

With the exception of monitoring well MW-0891, uranium concentrations in the compliance wells have remained relatively stable over the last 5 years (Figure 7). As shown in Figure 7, uranium concentrations at monitoring well MW-0891 have increased over the past 2 years, to a new maximum concentration for the well of 2.1 mg/L. However, the new maximum concentration is still within the historical range of the aquifer.

Table 3. Well-Specific Maximum Concentrations in Compliance Water Quality

Well ID	Aquifer	Constituent	Maximum Concentration at the Well Prior to 2006	Maximum Concentration at the Well Between 2006 and 2010	Maximum Aquifer Concentration *
0886	Deweesville/Conquista	Molybdenum	0.0291 mg/L	0.042 mg/L	0.68 mg/L
		Nitrate	0.019 mg/L	0.35 mg/L	73.9 mg/L
0891	Dilworth	Beryllium	0.00045 mg/L	0.00052 mg/L	0.005 mg/L
		Chromium	0.005 mg/L	0.0053 mg/L	0.02 mg/L
		Gross Alpha	205.85 pCi/L	217 pCi/L	1,400 mg/L **
		Gross Beta	163.43 pCi/L	175 pCi/L	650 mg/L **
		Molybdenum	0.0115 mg/L	0.019 mg/L	0.07 mg/L
		Nitrate	0.048 mg/L	0.05 mg/L	12.8 mg/L
		Radium-228	1.49 pCi/L	2.43 pCi/L	NR
		Thallium	0.0004 mg/L	0.00064 mg/L	0.1 mg/L
		Uranium	0.358 mg/L	2.1 mg/L	3.04 mg/L
0924	Deweesville/Conquista	Gross Alpha	193 pCi/L	264 pCi/L	43,000 pCi/L
		Gross Beta	200 pCi/L	231 pCi/L	21,500 pCi/L
		Radium-226	1.6 pCi/L	2.54 pCi/L	654 pCi/L
		Uranium	0.54 mg/L	0.58 mg/L	69.8 mg/L
0963	Deweesville/Conquista	Nickel	0.19 mg/L	0.2 mg/L	1.3 mg/L

* Maximum aquifer concentrations as reported in Table 4−2 and 4−3 of the Final Site Observational Work Plan (DOE 1997b) for the Deweesville/Conquista Aquifer and Dilworth Aquifer respectively.
** Table 4−3 (DOE 1997b) has units of mg/L for Gross Alpha and Gross Beta for the Dilworth Aquifer.
NR = Not reported

Uranium Concentrations in Monitoring Well MW-0891

Prior to 2006, the maximum uranium concentration reported for monitoring well MW-0891 was 0.358 mg/L. In 2010, the uranium concentration was 2.1 mg/L. It is unclear if the increase in uranium in the Dilworth aquifer at monitoring well MW-0891 is due to the redistribution of natural uranium mineralization in the aquifer or due to legacy contamination from ore processing activities. As discussed below, the pH range for the well indicates that legacy contamination is probably not the cause. However, new maximum concentration measurements for several hazardous constituents at monitoring well MW-0891 in the last 5 years, coupled with the concentration trend of several anions and cations, indicate that legacy contamination could be the cause.

As shown in Figure 8, monitoring well MW-0891 is located on the edge of an identified area of the Dilworth aquifer (based on pH values) where tailings-related contaminants associated with the former tailings pile 3 are present. The pH delineated area of contamination is based on a statistical, geochemical, and hydrological analysis of Falls City water quality data (1989 through 1997) that indicates that the extent of tailings-related contamination in the aquifer can be inferred by pH measurements. A bimodal distribution of pH values at the Falls City site indicates that tailings-related contamination in the groundwater has a pH value less than 4.75 to 5.5 standard units (SU) (DOE 1997b). The study also reports that dissolution of aluminosilicates present in the ore matrix by sulfuric acid solutions used in the acid leaching process buffer the pH of tailings solutions to about 3 or 4 SU The bimodal pH distribution indicates the presence of two

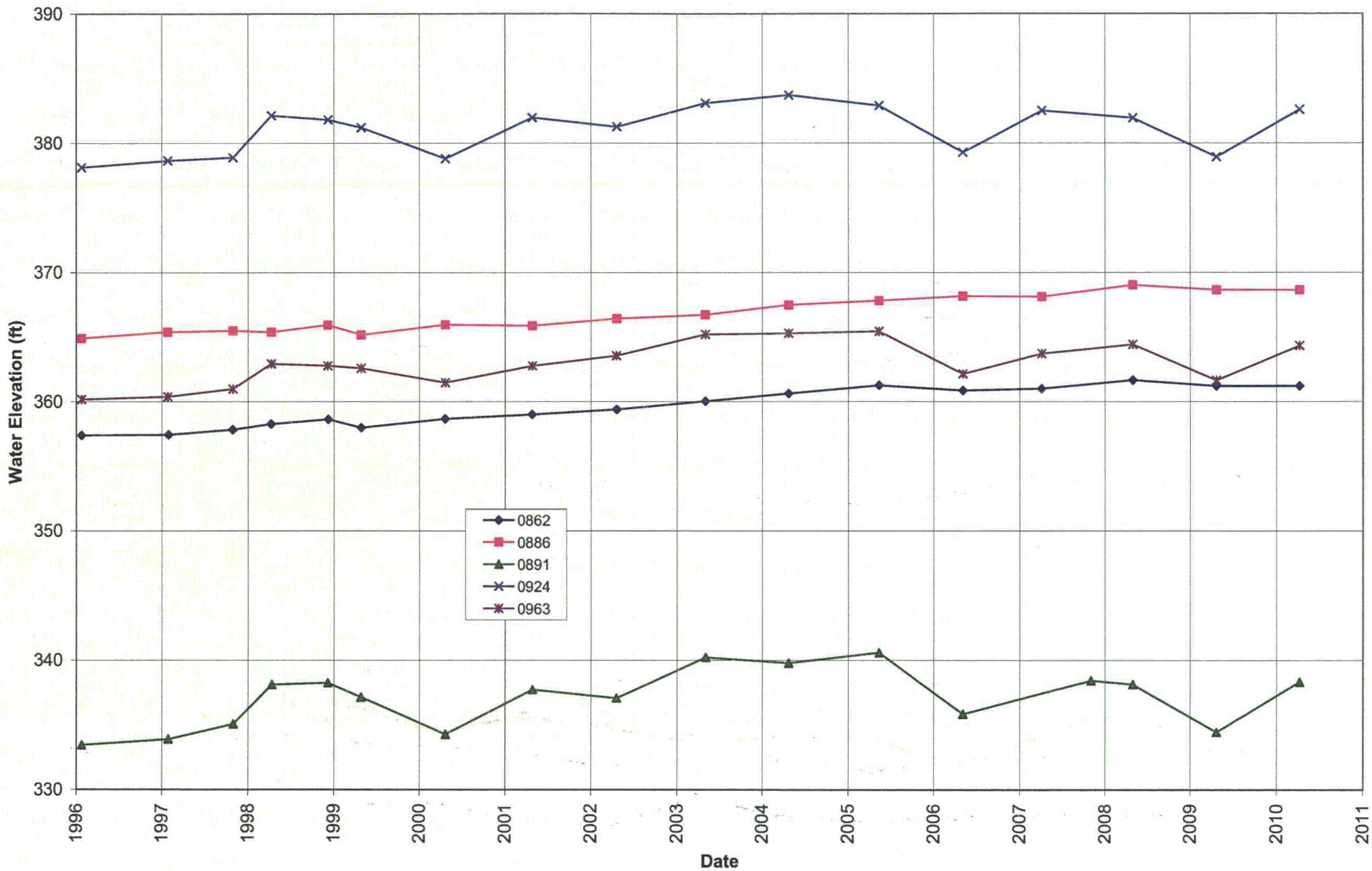

Figure 5. Compliance Monitoring Wells Water Levels

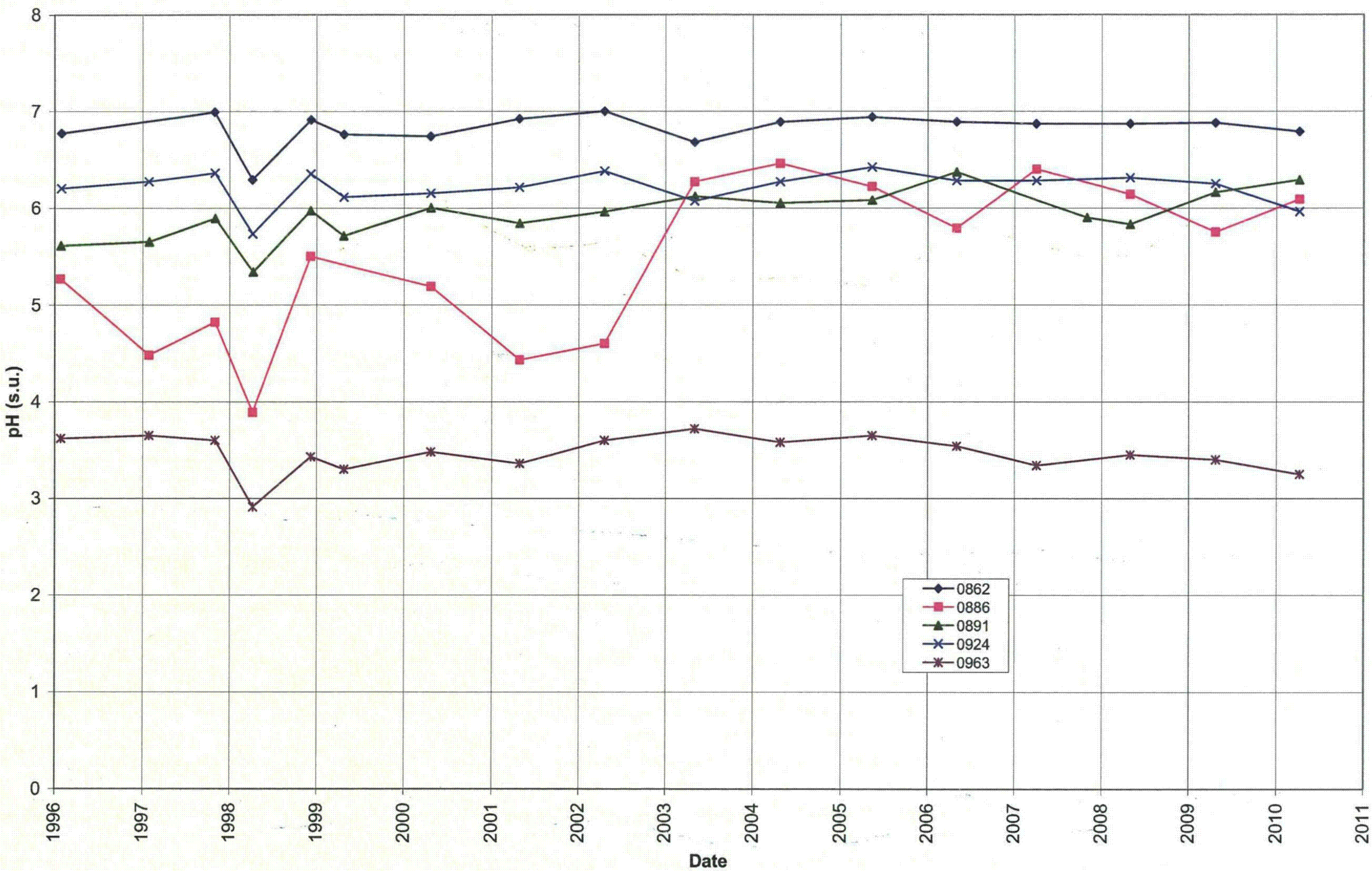

Figure 6. Compliance Monitoring Wells pH

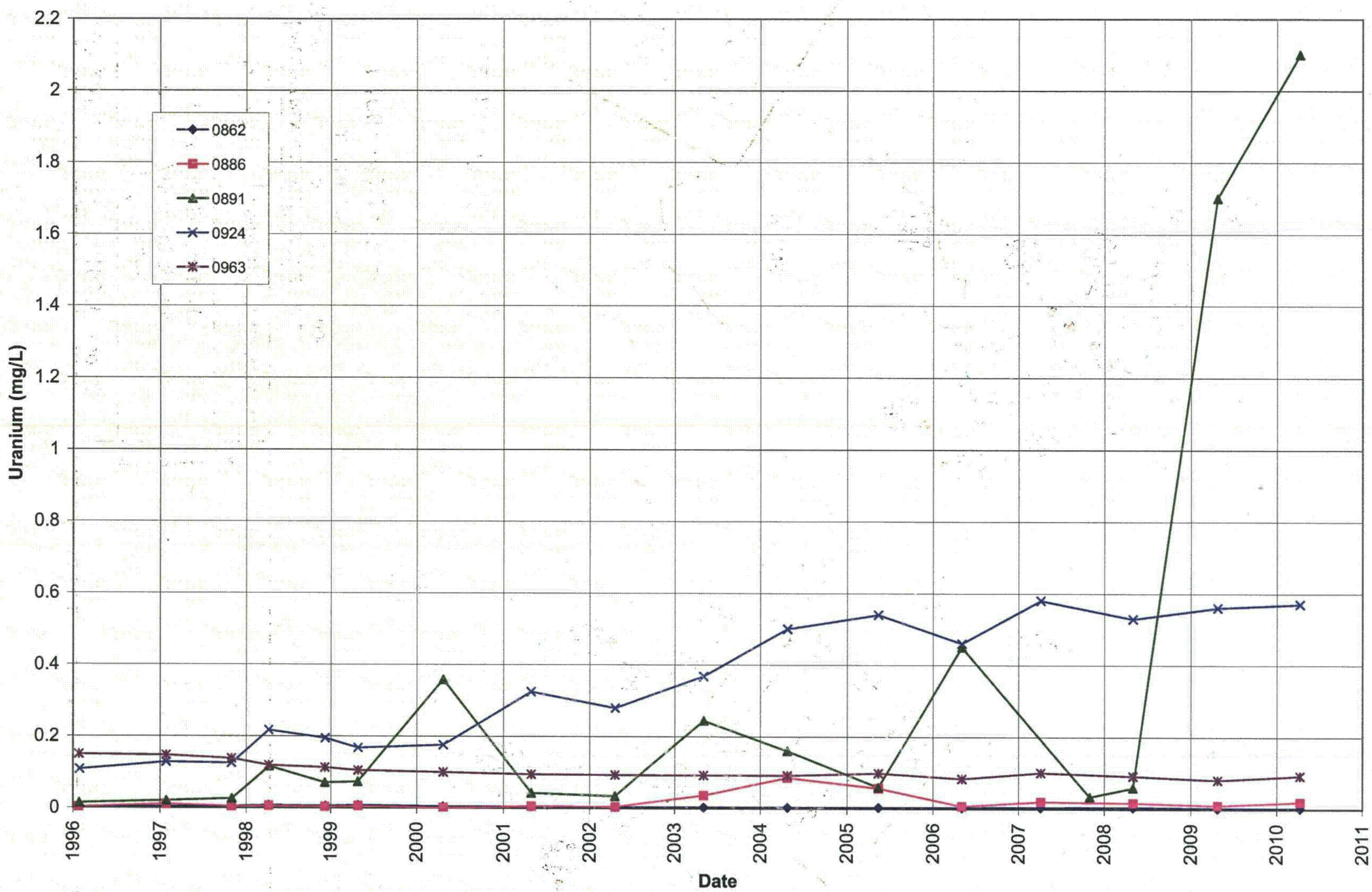

Figure 7. Compliance Monitoring Wells Uranium

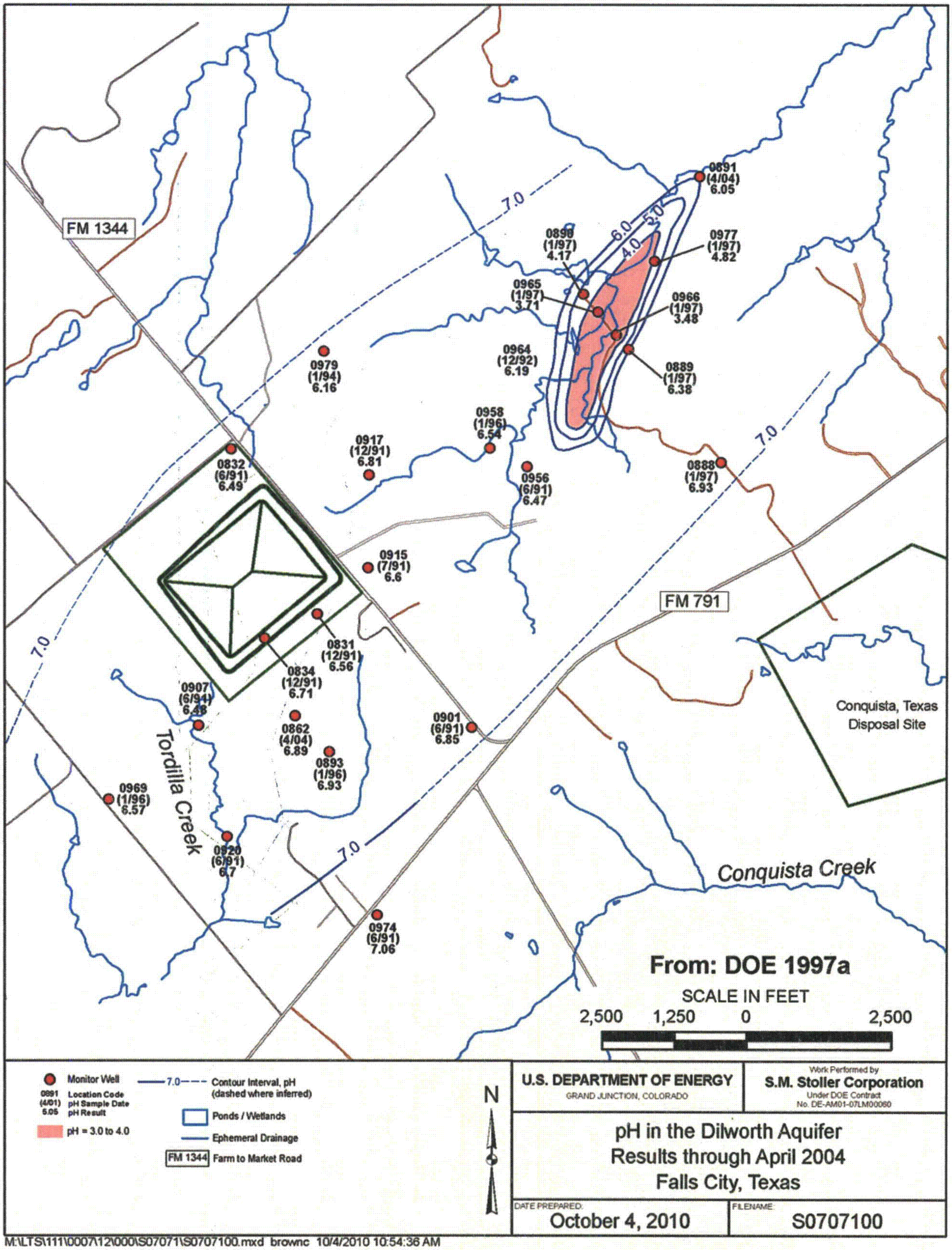

Figure 8. Groundwater pH in the Dilworth Aquifer

different pH buffers. The dominate source of acidity in the contaminated groundwater is aluminum sulfate pH buffer associated with the relatively low pH ranging from 2.75 to 4.5. Bicarbonate is the high pH buffer having a pH that reflects background water quality with values ranging from 5.25 to 7.0.

Contaminant mobility generally increases as pH decreases, implying that an increase in uranium concentrations at monitoring well MW-0891 should be accompanied by a decrease in pH. Movement of the pH delineated plume in the Dilworth to monitoring well MW-0891 should also be accompanied by a decrease in pH values. As shown in Figure 9, in the last 5 years pH values at monitoring well MW-0891 have fluctuated between 5.83 SU and 6.37 SU. Prior to 2006, pH fluctuated between 5.34 SU and 6.12 SU. So pH has slightly increased, not decreased.

A redistribution of uranium mineralization in the Dilworth aquifer due to the movement of oxidized water would probably not result in the corresponding increase of other hazardous constituents in the groundwater. In the last 5 years, though, several other new well-specific maximum hazardous constituent concentrations have been measured at monitoring well MW-0891 (beryllium, chromium, gross alpha, gross beta, molybdenum, nitrate, radium-228, and thallium).

Additional cations and anions (ammonia, calcium, chloride, iron, magnesium, nitrate, sodium, sulfate, and potassium) were measured in 2008 and 2010 in monitoring well MW-0891 and monitoring well MW-0862 (the two monitoring wells completed in the Dilworth aquifer). Concentration versus time graphs for these additional cations and anions are provided in Appendix B.

The figures in Appendix B show that cations and anions were relatively stable in monitoring well MW-0862 over the past 5 years compared to cations and anions at monitoring well MW-0891 (calcium, chloride, iron, magnesium, sodium, and sulfate). The data shows that the increase in uranium at monitoring well MW-0891 was accompanied by an increase in calcium, chloride, iron, magnesium, potassium, sodium, and sulfate.

The increase in additional hazardous constituents and major cations and anions at monitoring well MW-0891 implies that contamination from legacy uranium production activities could be the cause for the increase in uranium concentrations.

Monitoring well MW-0891 is a shallow monitoring well (approximately 13 feet deep) located next to Scared Dog Creek, which is an ephemeral drainage. The Dilworth outcrops just north of Scared Dog Creek. The formation dips gradually to the south-southeast where it becomes a confined aquifer.

Precipitation data collected by the National Oceanic and Atmospheric Administration at the Falls City 7 WSW station (located approximately 2 miles from monitoring well MW-0891) does not indicate that there is a correlation between precipitation amounts and uranium concentrations at monitoring well MW-0891 (Figure 10). Figure 10 reports the cumulative inches of rain that fell between sampling events. In 2007, a large amount of rainfall between sampling events (55.79 inches) coincides with a relatively low uranium concentration (0.33 mg/L), and in 2010, a relatively large amount of rainfall between sampling events (33.08 inches) coincides with a relatively large uranium concentration (2.1 mg/L).

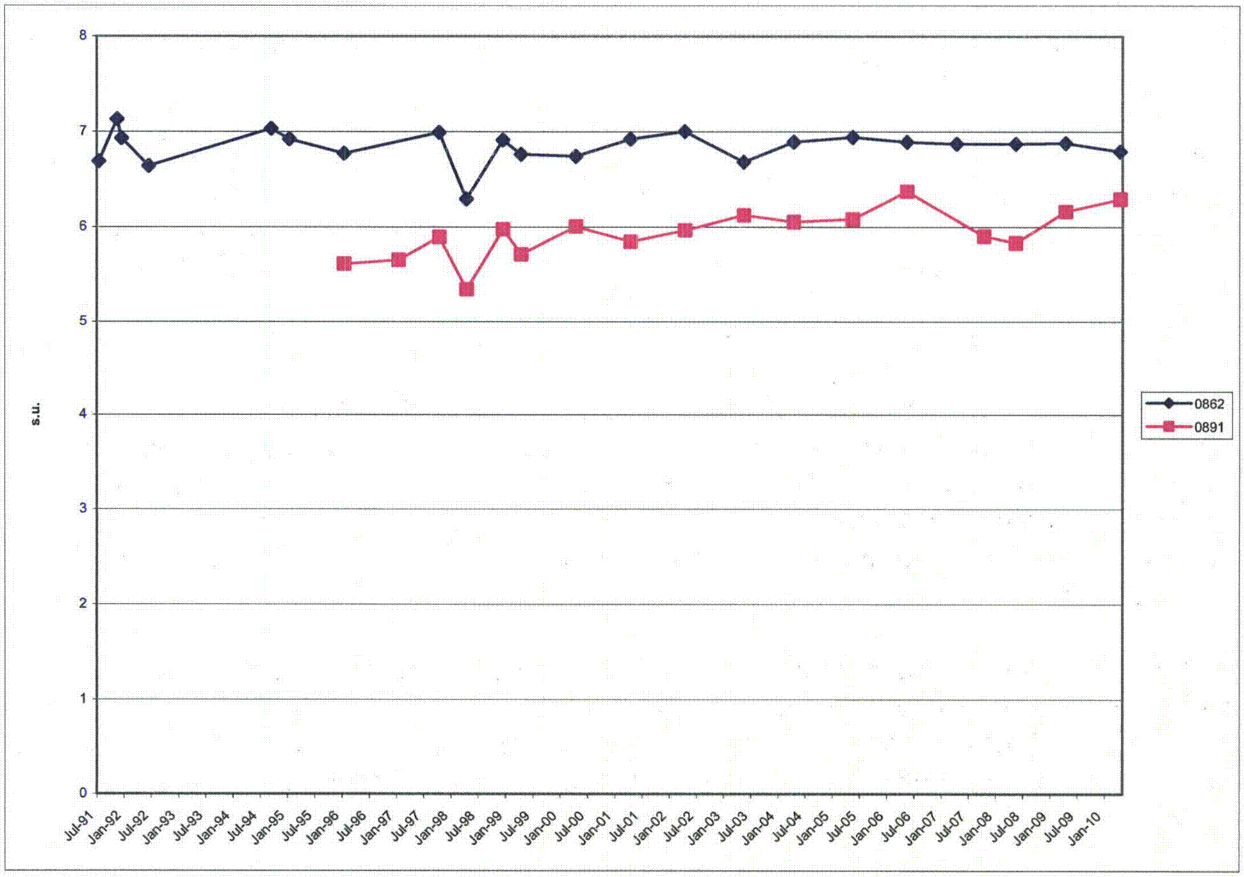

Figure 9. pH in Dilworth Monitoring Wells MW-0862 and MW-0891

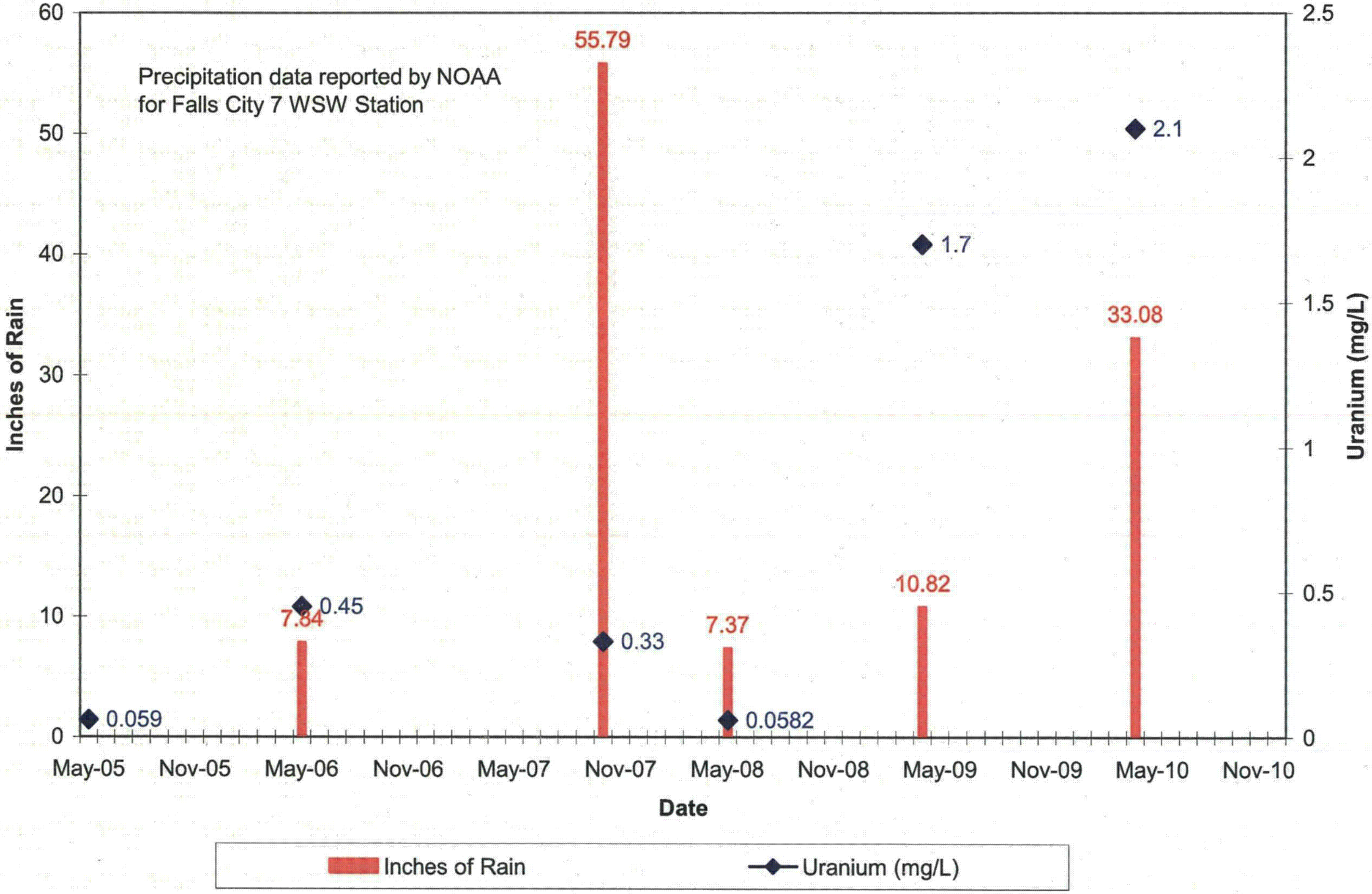

Figure 10. Cumulative Yearly Precipitation Recorded at National Oceanic and Atmospheric Administration Station-Falls City 7 WSW, Texas, Inches of Rain (2004 through May 2010)

3.2.3 Compliance Monitoring Conclusions

No unexpected water level trends were observed in the compliance monitoring wells in the last 5 years. Constituent concentrations measured in the last 5 years in the compliance monitoring wells continue to fluctuate and groundwater quality continues to show significant local variation across the site. Most of the hazardous constituent concentrations measured at compliance monitoring wells between 2006 and 2010 fell below the maximum concentrations previously measured for those wells. With the exception of gross alpha, gross beta, and radium-228 in monitoring well MW-0891, all of the new well-specific maximum hazardous constituent concentrations measured at compliance monitoring wells between 2006 and 2010 were below the maximum concentrations reported for the aquifer. A comparison for gross alpha and gross beta for the Dilworth aquifer in monitoring well MW-0891 could not be made because the historical ranges are reported in mg/L and the current data is reported in pCi/L. A value for radium-228 in the Dilworth is not reported for the aquifer.

Uranium concentrations at monitoring well MW-0891 have increased and are currently elevated when compared to the historical range for the well, but not for the aquifer. The cause for the increase has not been determined. New well-specific maximum concentrations were also measured in the last 5 years at monitoring well MW-0891 for several other hazardous constituents (beryllium, chromium, gross alpha, gross beta, molybdenum, nitrate, radium-228, and thallium). Increases in other hazardous constituents and major anions and cations along with uranium indicate that legacy contamination could be the cause for the increased uranium concentrations. However, the range and trend of pH values indicates that legacy contamination is probably not the cause for the increased uranium concentrations.

4.0 Monitoring Recommendation

The U.S. Department of Energy (DOE) recommends that following the collection of samples in the spring of 2011 that groundwater monitoring activities at the Falls City site be discontinued. DOE will maintain the 12 monitoring wells at the site until the nearby Title II Conquista site transfers to the Office of Legacy Management (LM) (which is projected to occur in 2017). The Conquista site is located just south of, and adjacent to the Falls City Site. Upon transfer of the Conquista site to LM, DOE will assess whether a joint site monitoring approach is warranted (either a one-time-event or some type of periodic monitoring). Once the recommended monitoring strategy for the Conquista site is approved by the NRC, wells no longer deemed necessary to a monitoring effort would be decommissioned following State of Texas guidelines for plugging and abandonment of groundwater monitoring wells.

5.0 References

DOE (U.S. Department of Energy), 1995. *Baseline Risk Assessment of Ground Water Contamination at the Uranium Mill Tailings Site Near Falls City, Texas*, Environmental Restoration Division, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1997a. *Long-Term Surveillance Plan for the Falls City Disposal Site, Falls City, Texas*, Environmental Restoration Division, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1997b. *Final Site Observational Work Plan for the UMTRA Project Site at Falls City, Texas*, Grand Junction Projects Office, Grand Junction, Colorado.

DOE (U.S. Department of Energy), 1998. *Groundwater Compliance Action Plan*, Grand Junction Projects Office, Grand Junction, Colorado

DOE (U.S. Department of Energy), 2008. *Long-Term Surveillance Plan for the U.S. Department of Energy Falls City Uranium Mill Tailings Disposal Site, Falls City, Texas*, Office of Legacy Management, Grand Junction, Colorado, March.

Appendix A

Summary of Monitoring Results
Falls City, Texas

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Well ID	Constituents	Units	# of Samples	# of Detects	Maximum Through 2005	Maximum 2006 to 2010
Hazardous Constituents						
0709	Antimony	mg/L	27	6	0.05	0.00016
0709	Arsenic	mg/L	29	18	0.05	0.0015
0709	Beryllium	mg/L	28	2	0.01	0.00052
0709	Cadmium	mg/L	29	12	0.026	0.00023
0709	Chromium	mg/L	28	5	0.0227	0.0053
0709	Cobalt	mg/L	28	4	0.05	0.004
0709	Copper	mg/L	27	6	0.04	0.0035
0709	Gross Alpha	pCi/L	27	27	438.32	322
0709	Gross Beta	pCi/L	27	26	307	243
0709	Lead	mg/L	28	4	0.1	0.000058
0709	Molybdenum	mg/L	29	29	0.17	0.034
0709	Nickel	mg/L	28	5	0.04	0.0066
0709	**Nitrate + Nitrite as Nitrogen***	mg/L	12	12	10	**12**
0709	Radium-226	pCi/L	29	29	5.6	5.38
0709	Radium-228	pCi/L	28	28	4.4	3.18
0709	Selenium	mg/L	29	28	0.097	0.037
0709	Sulfide	mg/L	29	0	5	2
0709	Thallium	mg/L	28	10	0.1	0.00027
0709	Tin	mg/L	28	6	0.05	0.05
0709	Uranium	mg/L	32	32	0.9	0.64
0709	Vanadium	mg/L	29	6	0.55	0.00032
0709	Zinc	mg/L	27	20	0.0983	0.021
Major Elements						
0709	Aluminum	mg/L	28	5	0.5	0.07
0709	Ammonia Total as N	mg/L	28	13	1.31	0.1
0709	Bromide	mg/L	27	27	8.6	6.3
0709	Calcium	mg/L	29	29	1340	1100
0709	Chloride	mg/L	29	29	3200	2600
0709	Iron	mg/L	27	10	0.56	0.041
0709	Magnesium	mg/L	29	29	108	88
0709	Manganese	mg/L	29	18	0.17	0.00082
0709	Potassium	mg/L	29	29	60	61
0709	Sodium	mg/L	29	29	1280	970
0709	Sulfate	mg/L	29	29	1720	1700
Field Parameters						
0709	Alkalinity, Total (As CaCO3)	mg/L	38	38	202	148
0709	Dissolved Oxygen	mg/L	3	3	4.38	3.38
0709	Oxidation Reduction Potential	umhos/cm	27	27	498.2	263.8
0709	pH	SU	32	32	6.49	6.31
0709	Specific Conductance	mg/L	32	32	10000	9303
0709	Temperature	celcius	32	32	25.1	25.3
0709	Total Dissolved Solids	mg/L	28	28	8710	7000
0709	Turbidity	NTU	25	25	1000	1.87

* and red font identifies a new well specific maximum hazardous constituent concentration between 2006 and 2010.

Well ID	Constituents	Units	# of Samples	# of Detects	Maximum Through 2005	Maximum 2006 to 2010
Hazardous Constituents						
0858	Antimony	mg/L	27	6	0.03	0.00022
0858	Arsenic	mg/L	30	17	0.1	0.0051
0858	Beryllium	mg/L	29	25	0.05	0.0064
0858	Cadmium	mg/L	30	29	0.037	0.0062
0858	Chromium	mg/L	30	5	0.05	0.0095
0858	Cobalt	mg/L	28	16	0.117	0.021
0858	Copper	mg/L	26	6	0.05	0.0042
0858	Gross Alpha	pCi/L	29	17	151.94	42.5
0858	Gross Beta	pCi/L	29	27	170	128
0858	Lead	mg/L	30	18	0.016	0.0017
0858	Molybdenum	mg/L	30	13	0.05	0.0065
0858	Nickel	mg/L	30	28	0.08	0.029
0858	Nitrate + Nitrite as Nitrogen	mg/L	9	7	16.8	0.32
0858	Radium-226	pCi/L	29	29	13	9.83
0858	**Radium-228***	pCi/L	29	29	19.45	**19.7**
0858	Selenium	mg/L	30	27	0.116	0.0099
0858	Sulfide	mg/L	24	1	5	2
0858	Thallium	mg/L	28	15	0.1	0.00065
0858	Tin	mg/L	28	7	0.05	0.039
0858	Uranium	mg/L	34	34	0.224	0.0746
0858	Vanadium	mg/L	30	3	0.05	0.00038
0858	Zinc	mg/L	30	27	0.143	0.064
Major Elements						
0858	Aluminum	mg/L	30	19	2.91	0.07
0858	Ammonia Total as N	mg/L	29	22	10.7	0.34
0858	Bromide	mg/L	28	28	16.8	10
0858	Calcium	mg/L	29	29	1300	1300
0858	Chloride	mg/L	28	28	4010	3600
0858	Iron	mg/L	26	10	0.739	0.18
0858	Magnesium	mg/L	29	29	233	190
0858	Manganese	mg/L	29	29	4.97	3.2
0858	Potassium	mg/L	29	29	133	120
0858	Sodium	mg/L	29	29	1350	1000
0858	Sulfate	mg/L	28	28	2020	1800
Field Parameters						
0858	Alkalinity, Total (As CaCO3)	mg/L	37	37	160	134
0858	Dissolved Oxygen	mg/L	3	3	1.39	2.65
0858	Oxidation Reduction Potential	umhos/cm	28	28	449	241.4
0858	pH	SU	33	33	6.08	6.05
0858	Specific Conductance	mg/L	33	33	12530	11538
0858	Temperature	celcius	33	33	25.2	23.86
0858	Total Dissolved Solids	mg/L	27	27	9500	8600
0858	Turbidity	NTU	25	25	17.5	4.34

* and red font identifies a new well specific maximum hazardous constituent concentration between 2006 and 2010.

Well ID	Constituents	Units	# of Samples	# of Detects	Maximum Through 2005	Maximum 2006 to 2010
Hazardous Constituents						
862	Antimony	mg/L	11	2	0.003	0.000036
0862	Arsenic	mg/L	11	7	0.01	0.0011
0862	Beryllium	mg/L	11	0	0.01	0.00013
0862	Cadmium	mg/L	15	0	0.001	0.00004
0862	Chromium	mg/L	16	0	0.01	0.0036
0862	Cobalt	mg/L	16	2	0.03	0.0015
0862	Copper	mg/L	11	1	0.01	0.0013
0862	Gross Alpha	pCi/L	16	4	28.45	8.96
0862	Gross Beta	pCi/L	16	15	89	50.9
0862	Lead	mg/L	16	2	0.005	0.000026
0862	Molybdenum	mg/L	19	10	0.02	0.0019
0862	Nickel	mg/L	16	2	0.04	0.003
0862	Nitrate + Nitrite as Nitrogen	mg/L	8	4	0.81	0.17
0862	Radium-226	pCi/L	11	9	2	0.564
0862	Radium-228	pCi/L	11	8	1.6	1.33
0862	Selenium	mg/L	17	3	0.05	0.00004
0862	Sulfide	mg/L	8	1	5	2
0862	Thallium	mg/L	11	1	0.01	0.000044
0862	Tin	mg/L	11	4	0.1	0.043
0862	Uranium	mg/L	22	21	0.016	0.0038
0862	Vanadium	mg/L	11	3	0.01	0.00014
0862	Zinc	mg/L	12	7	0.453	0.0036
Major Elements						
0862	Aluminum	mg/L	14	0	0.05	0.028
0862	Ammonia Total as N	mg/L	17	15	0.8	0.26
0862	Bromide	mg/L	14	14	2.5	1.8
0862	Calcium	mg/L	22	22	405	430
0862	Chloride	mg/L	22	22	658	620
0862	Iron	mg/L	16	6	0.05	0.046
0862	Magnesium	mg/L	22	22	27	25
0862	Manganese	mg/L	14	14	0.77	0.47
0862	Potassium	mg/L	22	22	64	68
0862	Sodium	mg/L	22	22	632	620
0862	Sulfate	mg/L	22	22	1330	1300
Field Parameters						
0862	Alkalinity, Total (As CaCO3)	mg/L	23	23	348	292
0862	Dissolved Oxygen	mg/L	3	3	0.14	3.02
0862	Oxidation Reduction Potential	umhos/cm	21	21	435	36.8
0862	pH	SU	22	22	7.13	6.89
0862	Specific Conductance	mg/L	22	22	4495	4401
0862	Temperature	celcius	22	22	27.5	25.22
0862	Total Dissolved Solids	mg/L	16	16	3300	3300
0862	Turbidity	NTU	16	16	864	5.2

* and red font identifies a new well specific maximum hazardous constituent concentration between 2006 and 2010.

Well ID	Constituents	Units	# of Samples	# of Detects	Maximum Through 2005	Maximum 2006 to 2010
			Hazardous Constituents			
0880	Antimony	mg/L	24	6	0.06	0.0018
0880	Arsenic	mg/L	28	28	0.08	0.048
0880	Beryllium	mg/L	27	27	0.45	0.4
0880	Cadmium	mg/L	28	28	1.2	0.58
0880	**Chromium***	mg/L	28	13	0.0351	**0.047**
0880	Cobalt	mg/L	27	27	1.15	1.1
0880	Copper	mg/L	25	7	0.0358	0.007
0880	**Gross Alpha***	pCi/L	26	26	6772	**8440**
0880	**Gross Beta***	pCi/L	26	26	3714	**3800**
0880	Lead	mg/L	28	22	0.0075	0.0038
0880	**Molybdenum***	mg/L	30	17	0.05	**0.058**
0880	**Nickel***	mg/L	28	28	1.58	**1.6**
0880	Nitrate + Nitrite as Nitrogen	mg/L	9	3	2	0.1
0880	Radium-226	pCi/L	28	28	29.6	13.9
0880	Radium-228	pCi/L	28	28	12.4	8.72
0880	Selenium	mg/L	28	27	0.095	0.0071
0880	Sulfide	mg/L	25	5	5	2
0880	Thallium	mg/L	25	23	0.1	0.0077
0880	Tin	mg/L	25	12	0.23	0.11
0880	Uranium	mg/L	35	35	14	8.3
0880	Vanadium	mg/L	28	25	2.9	1.7
0880	Zinc	mg/L	28	28	2.3	1.9
			Major Elements			
0880	Aluminum	mg/L	31	31	140	140
0880	Ammonia Total as N	mg/L	30	25	5.23	0.2
0880	Bromide	mg/L	30	16	4	4
0880	Calcium	mg/L	31	31	548	470
0880	Chloride	mg/L	31	31	1800	1700
0880	Iron	mg/L	31	31	350	290
0880	Magnesium	mg/L	31	31	1860	1900
0880	Manganese	mg/L	31	31	104	100
0880	Potassium	mg/L	31	31	180	180
0880	Sodium	mg/L	31	31	4430	3800
0880	Sulfate	mg/L	31	31	16400	16000
			Field Parameters			
0880	Alkalinity, Total (As CaCO3)	mg/L	36	36	102	0
0880	Dissolved Oxygen	mg/L	5	5	2	3.65
0880	Oxidation Reduction Potential	umhos/cm	28	28	365	202
0880	pH	SU	31	31	5.23	4.6
0880	Specific Conductance	mg/L	31	31	21996	21780
0880	Temperature	celcius	31	31	24.4	25
0880	Total Dissolved Solids	mg/L	25	25	28300	27000
0880	Turbidity	NTU	27	27	1000	12.5

* and red font identifies a new well specific maximum hazardous constituent concentration between 2006 and 2010.

Well ID	Constituents	Units	# of Samples	# of Detects	Maximum Through 2005	Maximum 2006 to 2010
Hazardous Constituents						
0886	Antimony	mg/L	7	1	0.0003	0.000036
0886	Arsenic	mg/L	7	7	0.037	0.0059
0886	Beryllium	mg/L	7	3	0.0118	0.000067
0886	Cadmium	mg/L	13	9	0.0232	0.00004
0886	Chromium	mg/L	13	1	0.0127	0.0018
0886	Cobalt	mg/L	13	11	0.038	0.0017
0886	Copper	mg/L	7	3	0.0173	0.00087
0886	Gross Alpha	pCi/L	13	7	94.68	11.2
0886	Gross Beta	pCi/L	13	11	97.46	28.2
0886	Lead	mg/L	13	5	0.0016	0.000026
0886	**Molybdenum***	mg/L	14	12	0.0291	**0.042**
0886	Nickel	mg/L	13	13	0.0464	0.004
0886	**Nitrate + Nitrite as Nitrogen***	mg/L	4	3	0.019	**0.35**
0886	Radium-226	pCi/L	7	7	10.06	9.16
0886	Radium-228	pCi/L	7	6	14.14	1.4
0886	Selenium	mg/L	14	14	0.0513	0.0028
0886	Sulfide	mg/L	7	1	5	2
0886	Thallium	mg/L	7	7	0.0029	0.00037
0886	Tin	mg/L	7	3	0.023	0.017
0886	Uranium	mg/L	17	16	0.085	0.019
0886	Vanadium	mg/L	7	4	0.0041	0.0037
0886	Zinc	mg/L	8	7	0.242	0.0058
Major Elements						
0886	Aluminum	mg/L	8	5	0.5	0.014
0886	Ammonia Total as N	mg/L	9	5	0.803	0.1
0886	Bromide	mg/L	8	5	5.91	1.2
0886	Calcium	mg/L	14	14	816	140
0886	Chloride	mg/L	14	14	1910	440
0886	Iron	mg/L	14	12	4.2	0.052
0886	Magnesium	mg/L	14	14	78.9	11
0886	Manganese	mg/L	8	8	2.8	0.16
0886	Potassium	mg/L	14	14	85.6	35
0886	Sodium	mg/L	14	14	643	140
0886	Sulfate	mg/L	14	14	1180	190
Field Parameters						
0886	Alkalinity, Total (As CaCO3)	mg/L	20	19	56	67
0886	Dissolved Oxygen	mg/L	3	3	1.9	4.37
0886	Oxidation Reduction Potential	umhos/cm	17	17	474	90
0886	pH	SU	16	16	6.46	6.4
0886	Specific Conductance	mg/L	17	17	6950	3285
0886	Temperature	celcius	17	17	26.4	26.87
0886	Total Dissolved Solids	mg/L	13	13	4920	1100
0886	Turbidity	NTU	17	17	248	69.5

* and red font identifies a new well specific maximum hazardous constituent concentration between 2006 and 2010.

Well ID	Constituents	Units	# of Samples	# of Detects	Maximum Through 2005	Maximum 2006 to 2010
Hazardous Constituents						
0891	Antimony	mg/L	8	2	0.0003	0.000084
0891	Arsenic	mg/L	8	8	0.0062	0.0054
0891	**Beryllium***	mg/L	8	3	0.00045	**0.00052**
0891	Cadmium	mg/L	16	3	0.006	0.00089
0891	**Chromium***	mg/L	16	3	0.005	**0.0053**
0891	Cobalt	mg/L	17	6	0.05	0.0077
0891	Copper	mg/L	8	3	0.0092	0.0035
0891	**Gross Alpha***	pCi/L	16	8	205.85	**217**
0891	**Gross Beta***	pCi/L	16	11	163.43	**175**
0891	Lead	mg/L	16	2	0.0016	0.000054
0891	**Molybdenum***	mg/L	16	13	0.0115	**0.019**
0891	Nickel	mg/L	17	9	0.04	0.0066
0891	**Nitrate + Nitrite as Nitrogen***	mg/L	7	5	0.048	**0.05**
0891	Radium-226	pCi/L	8	2	1.33	0.676
0891	**Radium-228***	pCi/L	8	6	1.49	**2.43**
0891	Selenium	mg/L	17	6	0.005	0.00038
0891	Sulfide	mg/L	8	0	5	2
0891	**Thallium***	mg/L	8	5	0.0004	**0.00064**
0891	Tin	mg/L	8	2	0.046	0.03
0891	**Uranium***	mg/L	22	22	0.358	**2.1**
0891	Vanadium	mg/L	8	2	0.0016	0.00032
0891	Zinc	mg/L	9	9	0.103	0.042
Major Elements						
0891	Aluminum	mg/L	9	1	0.05	0.061
0891	Ammonia Total as N	mg/L	13	11	0.369	0.24
0891	Bromide	mg/L	9	9	11.2	13
0891	Calcium	mg/L	20	20	1420	2500
0891	Chloride	mg/L	20	20	4380	10000
0891	Iron	mg/L	19	18	0.9	0.64
0891	Magnesium	mg/L	20	20	124	250
0891	Manganese	mg/L	9	9	4.28	4.5
0891	Potassium	mg/L	20	20	82	110
0891	Sodium	mg/L	20	20	1560	2800
0891	Sulfate	mg/L	20	20	1500	1900
Field Parameters						
0891	Alkalinity, Total (As CaCO3)	mg/L	20	20	240	382
0891	Dissolved Oxygen	mg/L	3	3	0.9	3.58
0891	Oxidation Reduction Potential	umhos/cm	17	17	390	183.4
0891	pH	SU	17	17	6.12	6.37
0891	Specific Conductance	mg/L	17	17	11890	23160
0891	Temperature	celcius	17	17	26.4	25.7
0891	Total Dissolved Solids	mg/L	16	16	8950	8400
0891	Turbidity	NTU	17	17	30.7	9.96

* and red font identifies a new well specific maximum hazardous constituent concentration between 2006 and 2010.

Well ID	Constituents	Units	# of Samples	# of Detects	Maximum Through 2005	Maximum 2006 to 2010
Hazardous Constituents						
0906	Antimony	mg/L	34	10	0.05	0.00013
0906	Arsenic	mg/L	39	24	0.1	0.0012
0906	Beryllium	mg/L	36	9	0.05	0.0032
0906	Cadmium	mg/L	39	34	0.024	0.018
0906	Chromium	mg/L	38	6	0.06	0.0089
0906	Cobalt	mg/L	38	10	0.11	0.004
0906	Copper	mg/L	36	14	0.187	0.0042
0906	Gross Alpha	pCi/L	35	27	290	67.7
0906	Gross Beta	pCi/L	35	32	250	112
0906	Lead	mg/L	38	11	0.1	0.000058
0906	Molybdenum	mg/L	40	24	0.14	0.0047
0906	Nickel	mg/L	37	22	0.06	0.014
0906	Nitrate + Nitrite as Nitrogen	mg/L	13	8	1	0.059
0906	Radium-226	pCi/L	39	39	9.5	5.7
0906	**Radium-228***	pCi/L	37	37	10.4	**12.4**
0906	Selenium	mg/L	39	29	0.039	0.002
0906	Sulfide	mg/L	34	2	5	2
0906	Thallium	mg/L	35	27	0.1	0.0024
0906	**Tin***	mg/L	36	11	0.06	**0.13**
0906	Uranium	mg/L	43	43	0.395	0.13
0906	Vanadium	mg/L	39	9	0.42	0.0013
0906	Zinc	mg/L	37	32	0.119	0.038
Major Elements						
0906	Aluminum	mg/L	39	7	1	0.07
0906	Ammonia Total as N	mg/L	37	21	2.68	0.1
0906	Bromide	mg/L	36	35	26.5	7.7
0906	Calcium	mg/L	39	39	2090	1600
0906	Chloride	mg/L	39	39	5650	3600
0906	Iron	mg/L	36	21	0.35	0.068
0906	Magnesium	mg/L	39	39	206	120
0906	Manganese	mg/L	39	39	3.48	3.5
0906	Potassium	mg/L	39	39	92	90
0906	Sodium	mg/L	39	39	1510	920
0906	Sulfate	mg/L	39	39	1740	1800
Field Parameters						
0906	Alkalinity, Total (As CaCO3)	mg/L	45	45	206	126
0906	Dissolved Oxygen	mg/L	4	4	2.04	5.53
0906	Oxidation Reduction Potential	umhos/cm	28	28	449.3	228.5
0906	pH	SU	39	39	6.56	5.79
0906	Specific Conductance	mg/L	39	39	15240	11312
0906	Temperature	celcius	39	39	25	25.8
0906	Total Dissolved Solids	mg/L	37	37	13882	8500
0906	Turbidity	NTU	26	26	359	4.16

* and red font identifies a new well specific maximum hazardous constituent concentration between 2006 and 2010.

Well ID	Constituents	Units	# of Samples	# of Detects	Maximum Through 2005	Maximum 2006 to 2010
Hazardous Constituents						
0921	Antimony	mg/L	41	12	0.05	0.00024
0921	Arsenic	mg/L	44	35	0.05	0.0072
0921	Beryllium	mg/L	42	26	0.05	0.0031
0921	Cadmium	mg/L	44	41	0.033	0.018
0921	Chromium	mg/L	43	9	0.05	0.0089
0921	Cobalt	mg/L	42	18	0.0504	0.0044
0921	Copper	mg/L	40	12	0.07	0.0042
0921	Gross Alpha	pCi/L	41	41	534	483
0921	**Gross Beta***	pCi/L	41	41	336	**415**
0921	Lead	mg/L	43	10	0.1	0.000058
0921	Molybdenum	mg/L	50	47	0.13	0.048
0921	Nickel	mg/L	43	35	0.094	0.041
0921	Nitrate + Nitrite as Nitrogen	mg/L	16	16	7.41	3.9
0921	Radium-226	pCi/L	44	43	7.6	2.75
0921	**Radium-228***	pCi/L	43	37	5.53	**12.3**
0921	Selenium	mg/L	44	43	0.236	0.15
0921	Sulfide	mg/L	39	1	5	2
0921	Thallium	mg/L	41	30	0.3	0.002
0921	Tin	mg/L	42	11	0.1	0.086
0921	**Uranium***	mg/L	53	53	0.98	**1.2**
0921	Vanadium	mg/L	44	12	0.3	0.0049
0921	Zinc	mg/L	43	39	0.826	0.027
Major Elements						
0921	Aluminum	mg/L	48	15	0.8	0.07
0921	Ammonia Total as N	mg/L	47	20	1.48	0.1
0921	Bromide	mg/L	47	46	18.9	8.1
0921	Calcium	mg/L	49	49	1760	1400
0921	Chloride	mg/L	49	49	3830	3400
0921	Iron	mg/L	46	8	0.17	0.068
0921	Magnesium	mg/L	49	49	224	170
0921	Manganese	mg/L	49	49	2.51	2
0921	Potassium	mg/L	49	49	120	110
0921	Sodium	mg/L	49	49	1190	890
0921	Sulfate	mg/L	49	49	1680	1700
Field Parameters						
0921	Alkalinity, Total (As CaCO3)	mg/L	46	46	621	441
0921	Dissolved Oxygen	mg/L	8	8	2.1	4.26
0921	Oxidation Reduction Potential	umhos/cm	34	34	466.2	205
0921	pH	SU	40	40	6.34	6.14
0921	Specific Conductance	mg/L	40	40	11690	11075
0921	Temperature	celcius	40	40	25.3	25.15
0921	Total Dissolved Solids	mg/L	42	42	9650	8600
0921	Turbidity	NTU	30	29	5.72	1.65

* and red font identifies a new well specific maximum hazardous constituent concentration between 2006 and 2010.

Well ID	Constituents	Units	# of Samples	# of Detects	Maximum Through 2005	Maximum 2006 to 2010
Hazardous Constituents						
0924	Antimony	mg/L	22	9	0.05	0.000036
0924	Arsenic	mg/L	28	14	0.05	0.0056
0924	Beryllium	mg/L	18	1	0.01	0.00034
0924	Cadmium	mg/L	34	11	0.02	0.00064
0924	Chromium	mg/L	35	7	0.04	0.0089
0924	Cobalt	mg/L	35	10	0.1	0.0037
0924	Copper	mg/L	27	8	0.03	0.0034
0924	**Gross Alpha***	pCi/L	25	24	193	**264**
0924	**Gross Beta***	pCi/L	25	23	200	**231**
0924	Lead	mg/L	34	8	0.1	0.000026
0924	Molybdenum	mg/L	39	34	0.16	0.017
0924	Nickel	mg/L	30	18	0.04	0.031
0924	Nitrate + Nitrite as Nitrogen	mg/L	10	7	1.5	0.039
0924	**Radium-226***	pCi/L	28	27	1.6	**2.54**
0924	Radium-228	pCi/L	23	18	4.9	1.13
0924	Selenium	mg/L	36	18	0.045	0.0062
0924	Sulfide	mg/L	14	1	5	2
0924	Thallium	mg/L	17	9	0.1	0.0016
0924	Tin	mg/L	22	12	0.1	0.05
0924	**Uranium***	mg/L	42	42	0.54	**0.58**
0924	Vanadium	mg/L	28	13	0.34	0.0027
0924	Zinc	mg/L	29	21	0.0588	0.0099
Major Elements						
0924	Aluminum	mg/L	31	14	0.39	0.07
0924	Ammonia Total as N	mg/L	27	7	1.2	0.1
0924	Bromide	mg/L	21	19	7.6	6.1
0924	Calcium	mg/L	38	38	970	1100
0924	Chloride	mg/L	38	38	3000	3400
0924	Iron	mg/L	37	18	0.2	0.068
0924	Magnesium	mg/L	38	38	170	200
0924	Manganese	mg/L	31	31	1.05	0.93
0924	Potassium	mg/L	38	38	120	140
0924	Sodium	mg/L	38	38	1220	1400
0924	Sulfate	mg/L	38	38	2970	2100
Field Parameters						
0924	Alkalinity, Total (As CaCO3)	mg/L	42	42	380	389
0924	Dissolved Oxygen	mg/L	8	7	0.21	3.29
0924	Oxidation Reduction Potential	umhos/cm	25	25	444.7	305.1
0924	pH	SU	39	39	6.53	6.31
0924	Specific Conductance	mg/L	39	39	11495	12514
0924	Temperature	celcius	39	39	26	26.1
0924	Total Dissolved Solids	mg/L	33	33	24714	9200
0924	Turbidity	NTU	19	18	3.16	1.29

* and red font identifies a new well specific maximum hazardous constituent concentration between 2006 and 2010.

Well ID	Constituents	Units	# of Samples	# of Detects	Maximum Through 2005	Maximum 2006 to 2010
Hazardous Constituents						
0963	Antimony	mg/L	16	1	0.05	0.000036
0963	Arsenic	mg/L	17	12	0.09	0.03
0963	Beryllium	mg/L	16	15	0.07	0.051
0963	Cadmium	mg/L	23	21	0.048	0.036
0963	Chromium	mg/L	22	6	0.01	0.0089
0963	Cobalt	mg/L	22	22	0.21	0.21
0963	Copper	mg/L	16	5	0.046	0.0034
0963	Gross Alpha	pCi/L	22	22	295	56.4
0963	Gross Beta	pCi/L	22	19	407	105
0963	Lead	mg/L	22	16	0.1	0.0054
0963	Molybdenum	mg/L	27	5	0.05	0.00021
0963	**Nickel***	mg/L	22	22	0.19	**0.2**
0963	Nitrate + Nitrite as Nitrogen	mg/L	8	5	1	0.16
0963	Radium-226	pCi/L	17	16	12.7	1.28
0963	Radium-228	pCi/L	16	16	3	2.58
0963	Selenium	mg/L	24	13	0.083	0.0023
0963	Sulfide	mg/L	13	2	5	2
0963	Thallium	mg/L	16	8	0.2	0.0031
0963	Tin	mg/L	16	3	0.13	0.05
0963	Uranium	mg/L	30	30	0.367	0.1
0963	Vanadium	mg/L	17	13	0.43	0.0086
0963	Zinc	mg/L	17	17	1.7	1.6
Major Elements						
0963	Aluminum	mg/L	20	20	97.5	79
0963	Ammonia Total as N	mg/L	20	20	3.9	1.5
0963	Bromide	mg/L	19	17	4.9	3.5
0963	Calcium	mg/L	26	26	634	620
0963	Chloride	mg/L	26	25	1400	1400
0963	Iron	mg/L	26	26	170	180
0963	Magnesium	mg/L	26	26	120	120
0963	Manganese	mg/L	20	20	8.4	9
0963	Potassium	mg/L	26	26	80	78
0963	Sodium	mg/L	26	26	1040	840
0963	Sulfate	mg/L	26	26	3730	3000
Field Parameters						
0963	Alkalinity, Total (As CaCO3)	mg/L	20	19	71	0
0963	Dissolved Oxygen	mg/L	7	5	0.1	4.15
0963	Oxidation Reduction Potential	umhos/cm	24	24	507	394
0963	pH	SU	29	29	5.5	3.54
0963	Specific Conductance	mg/L	29	29	7416	8209
0963	Temperature	celcius	29	29	26	23.98
0963	Total Dissolved Solids	mg/L	23	23	6800	6600
0963	Turbidity	NTU	20	20	55	33

* and red font identifies a new well specific maximum hazardous constituent concentration between 2006 and 2010.

Appendix B

Time-Concentration Graphs
Dilworth Wells MW-0862 and MW-0891

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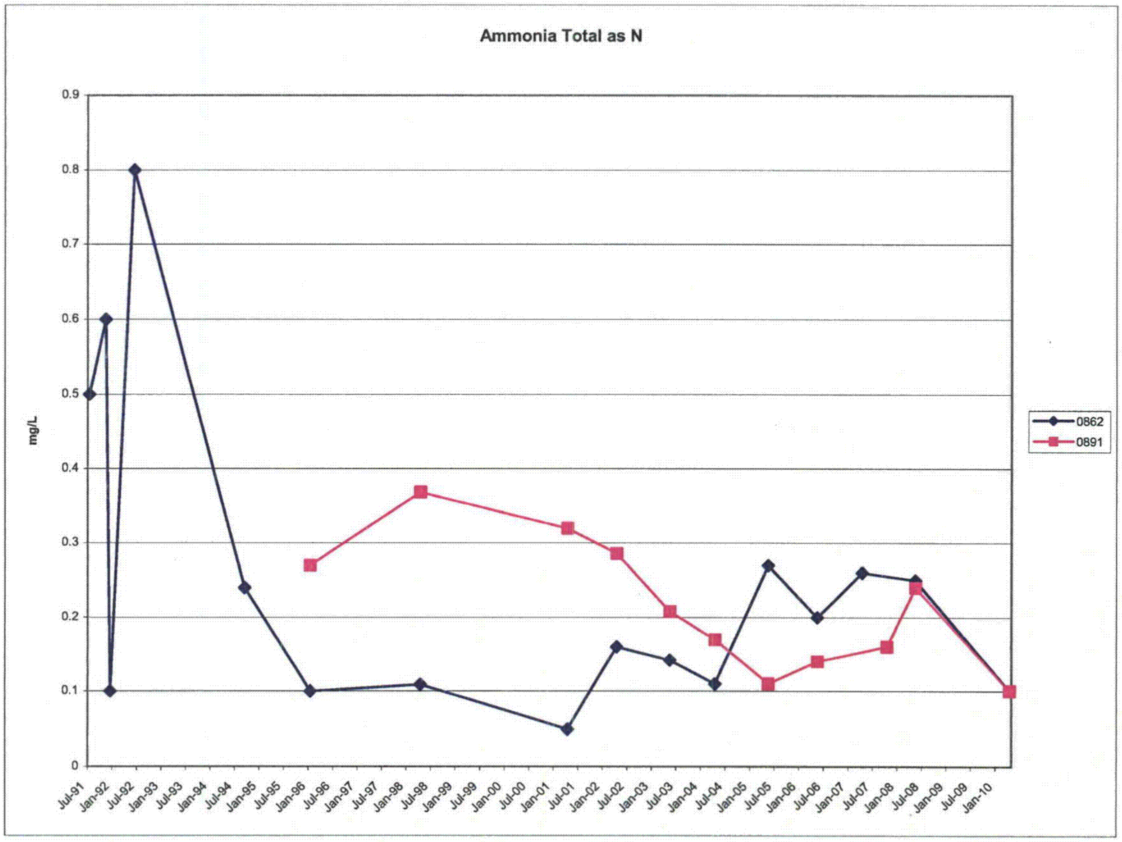
Ammonia Total as N
mg/L
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0862
0891
Jul-91
Jan-92
Jul-92
Jan-93
Jul-93
Jan-94
Jul-94
Jan-95
Jul-95
Jan-96
Jul-96
Jan-97
Jul-97
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00
Jan-01
Jul-01
Jan-02
Jul-02
Jan-03
Jul-03
Jan-04
Jul-04
Jan-05
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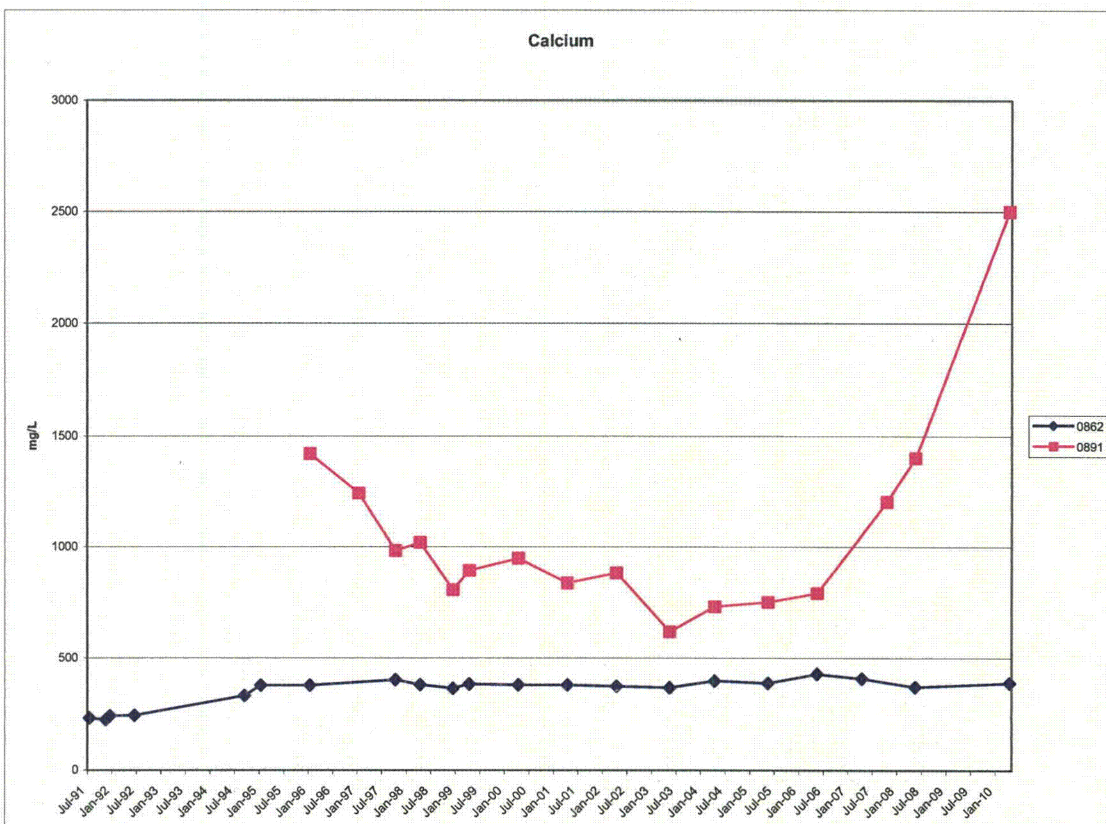
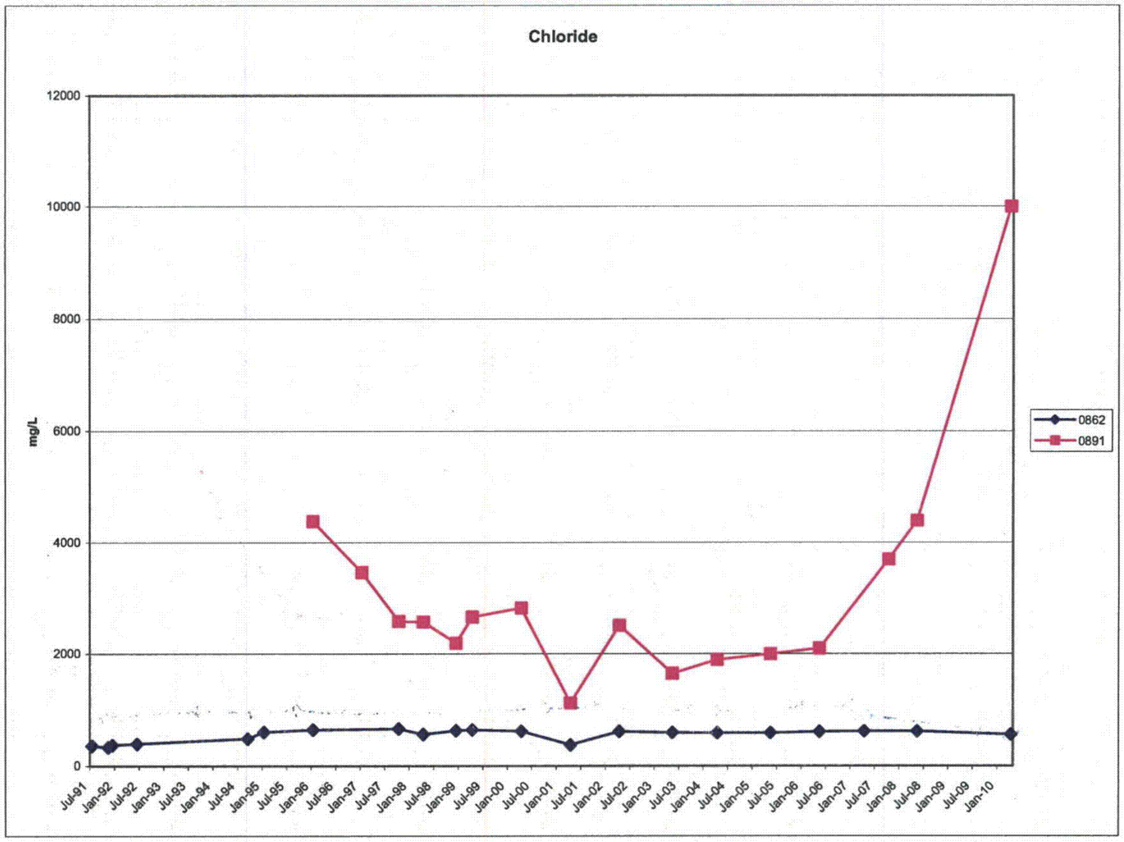
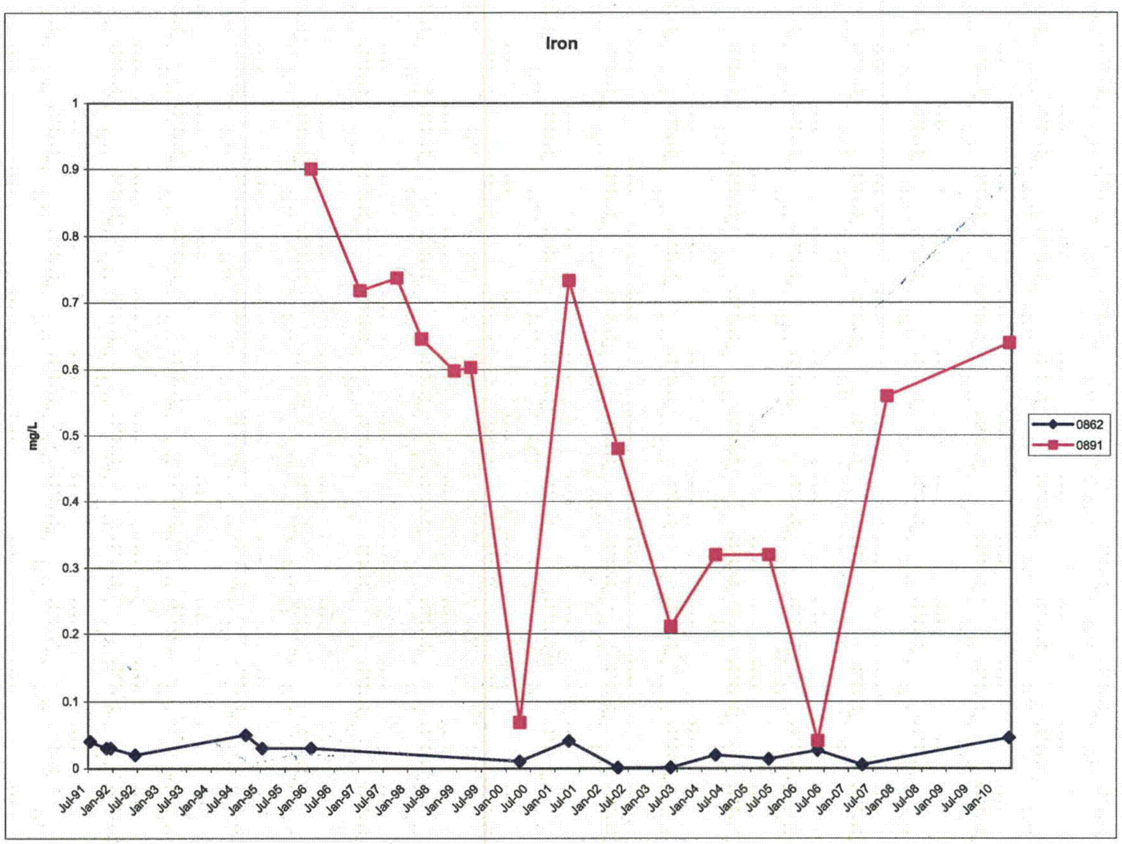
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10


Calcium
mg/L
3000
2500
2000
1500
1000
500
0
0862
0891
Jul-91
Jan-92
Jul-92
Jan-93
Jul-93
Jan-94
Jul-94
Jan-95
Jul-95
Jan-96
Jul-96
Jan-97
Jul-97
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00
Jan-01
Jul-01
Jan-02
Jul-02
Jan-03
Jul-03
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10


Chloride
mg/L
12000
10000
8000
6000
4000
2000
0
0862
0891
Jul-91
Jan-92
Jul-92
Jan-93
Jul-93
Jan-94
Jul-94
Jan-95
Jul-95
Jan-96
Jul-96
Jan-97
Jul-97
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00
Jan-01
Jul-01
Jan-02
Jul-02
Jan-03
Jul-03
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10


Iron
mg/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0862
0891
Jul-91
Jan-92
Jul-92
Jan-93
Jul-93
Jan-94
Jul-94
Jan-95
Jul-95
Jan-96
Jul-96
Jan-97
Jul-97
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00
Jan-01
Jul-01
Jan-02
Jul-02
Jan-03
Jul-03
Jan-04
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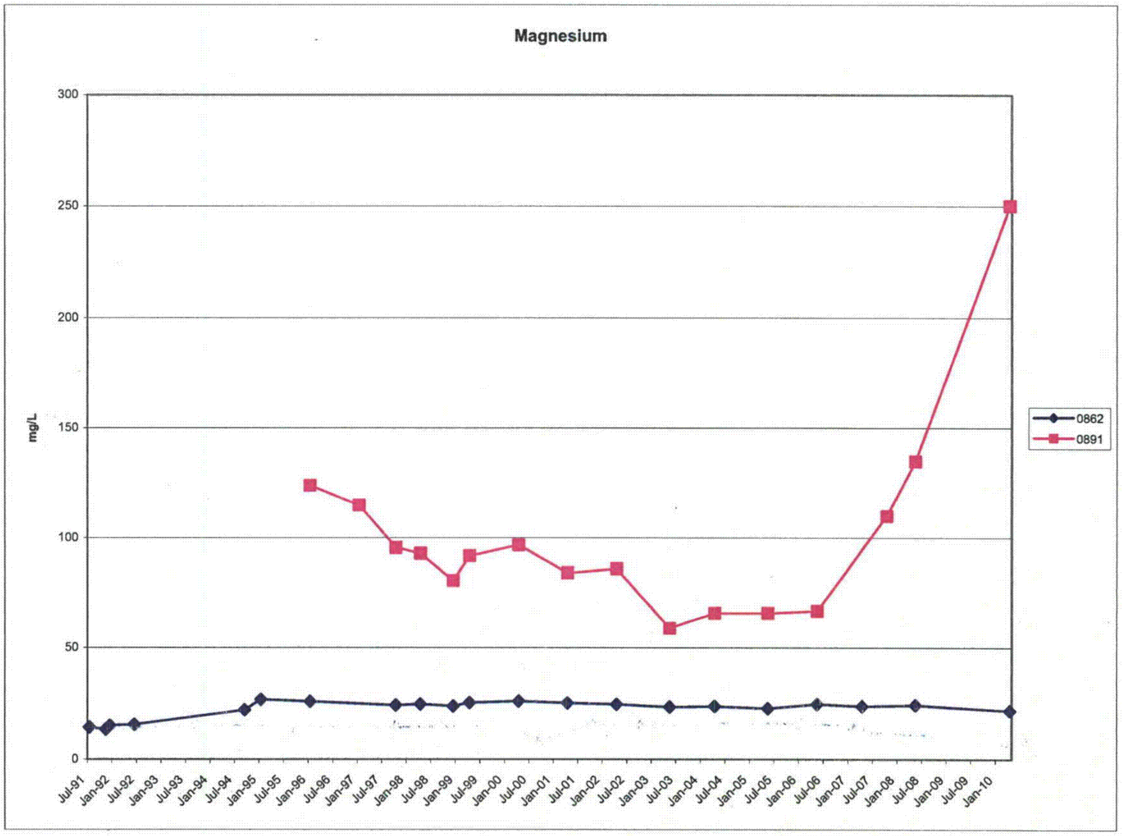
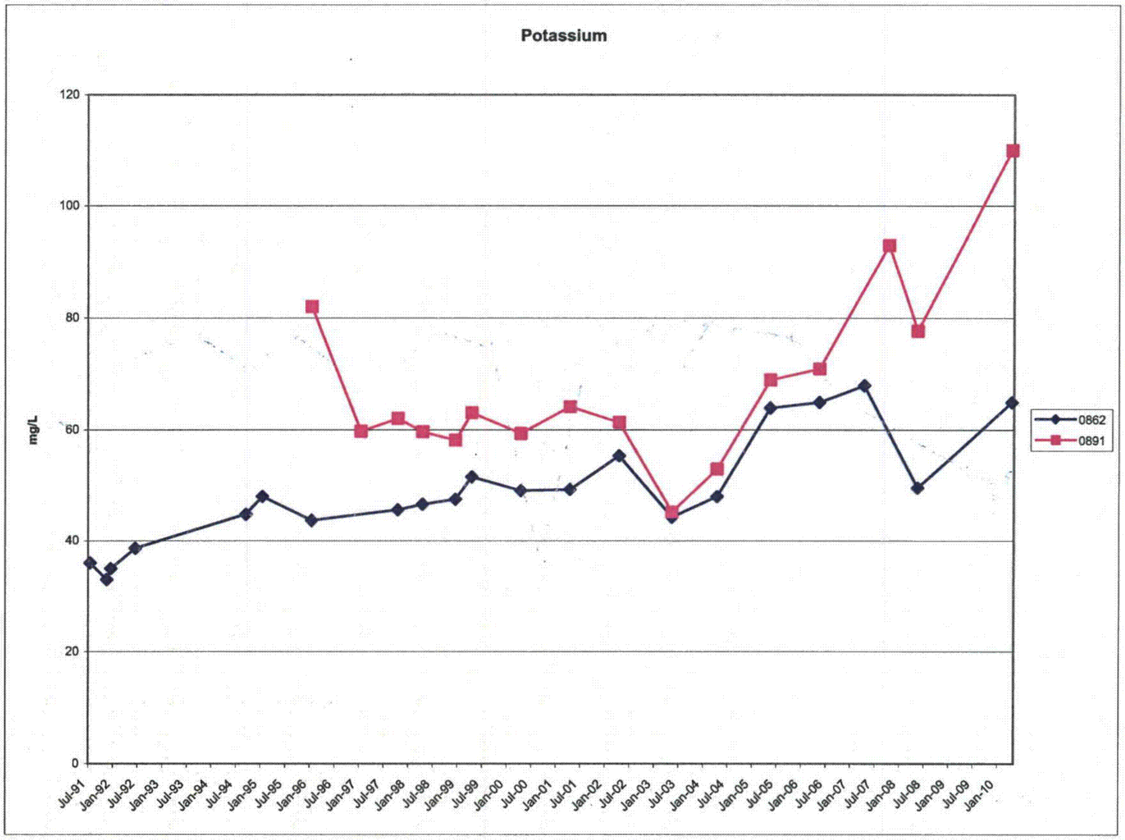
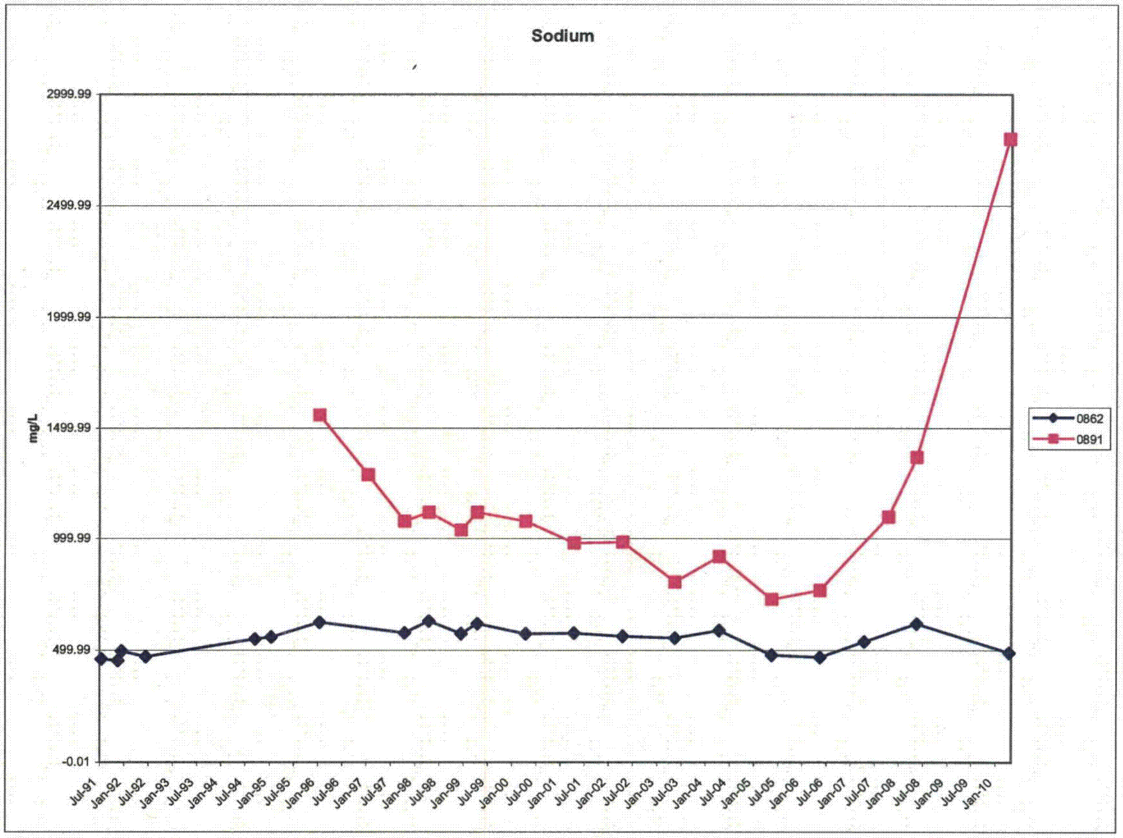
Jan-09
Jul-09
Jan-10



Magnesium
mg/L
0862
0891

Nitrate + Nitrite as Nitrogen
mg/L
0862
0891


Potassium
mg/L
120
100
80
60
40
20
0
0862
0891
Jul-91
Jan-92
Jul-92
Jan-93
Jul-93
Jan-94
Jul-94
Jan-95
Jul-95
Jan-96
Jul-96
Jan-97
Jul-97
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00
Jan-01
Jul-01
Jan-02
Jul-02
Jan-03
Jul-03
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10


Sodium
mg/L
2999.99
2499.99
1999.99
1499.99
999.99
499.99
-0.01
0862
0891
Jul-91
Jan-92
Jul-92
Jan-93
Jul-93
Jan-94
Jul-94
Jan-95
Jul-95
Jan-96
Jul-96
Jan-97
Jul-97
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00
Jan-01
Jul-01
Jan-02
Jul-02
Jan-03
Jul-03
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10


Sulfate
1999.99
1799.99
1599.99
1399.99
1199.99
999.99
799.99
599.99
399.99
199.99
-0.01
mg/L
Jul-91
Jan-92
Jul-92
Jan-93
Jul-93
Jan-94
Jul-94
Jan-95
Jul-95
Jan-96
Jul-96
Jan-97
Jul-97
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00
Jan-01
Jul-01
Jan-02
Jul-02
Jan-03
Jul-03
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
0862
0891

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