# **Kansas Geological Survey**

# **High Plains Aquifer Calibration Monitoring Well Program: Year 1 Progress Report on Well Installation and Aquifer Response**

by

D.P. Young, R.W. Buddemeier, D.O. Whittemore, and E. Reboulet



Kansas Geological Survey Open-file Report 2007-30 2007

GEOHYDROLOGY



The University of Kansas, Lawrence, KS 66047 (785) 864-3965; www.kgs.ku.edu

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## Introduction

The calibration monitoring (index) well program is a pilot study of an improved approach to measuring hydrologic responses at the local level. The study is being funded by the Kansas Water Office (KWO). It is being undertaken because of the KWO's interest in and responsibility for long-term planning of the Ogallala-High Plains aquifer in western Kansas. The program is expected to make a significant contribution to understanding the aquifer dynamics, and ultimately, improving the long-term management approach.

The Kansas Water Plan has outlined a goal for management of the Ogallala-High Plains aquifer by aquifer subunit. For the calibration monitoring well program, the KWO requested one well in each of the three western Kansas groundwater management districts (GMDs) to support their efforts to define aquifer subunits and long-term management approaches. The hypotheses to be tested by this program are that

- 1. Properly designed, sited, and measured wells can yield water-level measurements that, supported by supplemental measurements in other wells in the vicinity, are sufficiently accurate and representative of local water-table behavior to use in intensive management programs; and
- 2. Consistent deviations in water levels from the behavior of a calibration well indicate aquifer heterogeneity; such results can be interpreted to refine subunit definitions and characteristics or to inform the interpretation of water-table responses over larger/other areas.

One newly constructed well in each of the western Kansas GMDs will be monitored continuously over a period of ~5 years to address the following questions:

- Where, how, and at what level of confidence can high-quality measurements from a specifically designed, sited, and constructed monitoring well be combined with supplemental measurements of wells of opportunity to characterize water-level behavior over an area on the scale of an aquifer subunit?
- What can these measurements tell us about the results of the annual water-level program, and about possible opportunities for improvement?
- What can we learn about widely occurring but poorly characterized deviations from the "homogeneous aquifer" assumptions (e.g., fringe effects, confinement, recharge variation, variation in practical saturated thickness, etc.)?

A subsidiary goal is to directly examine issues and areas of particular interest to the GMDs and the Division of Water Resources, Kansas Department of Agriculture (DWR). A document describing the rationale and conceptual framework for the program in more detail is included in Appendix A.

The selected sites make the maximum use of additional data sources, local interest, and relevance to other goals and programs. They address a variety of ground-water settings

that are both individually and generally important, and will contribute to generalized knowledge as well as specific local information.

## Installations

Three index wells have been installed in the Ogallala-High Plains aquifer, one in each of the three western Kansas GMDs. The sites are located in Haskell (GMD3), Scott (GMD1), and Thomas (GMD4) counties (Figure 1). Each site is instrumented with a pressure transducer and telemetry system for real-time water-level data transfer. Figure 2 is a photograph of a typical installation. Elevations of the wells were surveyed by a licensed land surveyor, as were elevations of a number of wells in the annual water-level measurement network in the area of the index wells and 20 wells that the DWR is monitoring near the Haskell County index well (discussed in the results and discussion section).

A number of factors went into site selection. Considerations included: proximity to pumping wells and annual water-level monitoring wells, saturated thickness, decline rates, and general lithology and hydrogeology (degree of homogeneity, degree of confinement). See Appendix A for information regarding the rationale.

Figures 3 and 4 illustrate the High Plains aquifer 2005 saturated thickness and change in saturated thickness since predevelopment, respectively. As illustrated in Figure 3, the Haskell County site area has the most saturated thickness remaining of the three well locations, however, there is a transition to less saturated thickness from southwest to northeast at this site. The Scott County site is located in the northern portion of the Scott-Finney bedrock depression, the only area with substantial ground-water reserves remaining in the eastern portion of GMD1. Of the three locations, the Thomas County site has the least saturated thickness remaining (in the 60 ft range). Figure 4 shows that all sites are in areas of substantial water-level declines relative to their respective districts.

Prior to final site selection, the lithology surrounding each site was characterized based on drillers logs (WWC5 forms). Figure 5 illustrates the subsurface lithology along a cross section in the area of each of the three index well sites. The lithologic information listed on the well logs is represented as five color-coded categories of materials as indicated in the legend. Lighter colors indicate the more permeable sediments and darker colors indicate the less permeable materials. The predevelopment and winter 2007 water levels based on measurements for the area are represented on each cross section. The screened interval for each index well is indicated by the two short horizontal lines at the bottom of the well labeled with an "T" above and below the colored column. Figure 6 displays the locations of the different wells in each of the cross sections shown in Figure 5. The lithology is discussed in the results and discussion section.



Figure 1. Map of Kansas showing extent of the High Plains aquifer, GMD and county boundaries, and locations of index wells (red dots) in Thomas, Scott, and Haskell counties.



Figure 2. Haskell County site during telemetry installation.



Average 2004 - 2006 Saturated Thickness for the High Plains Aquifer in Kansas

Figure 3. 2005 saturated thickness for the High Plains aquifer. The red circles indicate the index well locations.



Change in Saturated Thickness for the High Plains Aquifer in Kansas, Predevelopment to 2005

Figure 4. Change in saturated thickness for the High Plains aquifer, predevelopment to 2005. The red circles indicate the index well locations.



Figure 5. Lithologic cross sections for each well site. The labels PRE and 2007 represent predevelopment and 2007 water levels.



Figure 6. Locations of well logs used to construct the lithologic cross sections shown in Figure 5. The red dot indicates the index well location.

## Haskell County Site (GMD3)

The Haskell County site is located in the SW/4 SE/4 NW/4 of Sec. 36, T.27S. R.31W (Figures 7 and 8). The location is in an area of local and district interest, characterized by high well and water-use density and large water-level declines, and concerns are high regarding these declines. This is also an area of intensive study by the DWR, which has installed pressure transducers in about 20 nearby wells and is monitoring meters on pumping wells. The site is at the center of a former impairment complaint, which was withdrawn before being resolved by the Chief Engineer. A major advantage of this site is the additional data available from the ongoing DWR investigation and the cooperative efforts of KGS and DWR.

The Haskell site is an area where there is a laterally extensive confining or semiconfining layer, with a relatively thin permeable layer consistently occurring just above bedrock. DWR has identified relatively shallow casings in the area that sample the water table above the confining layer, and deeper wells that are screened across both the shallow and deep zones. In addition to the general program objectives, this site will provide a test of how monitoring results and apparent depletion rates compare above, below, and across such a confining layer. This tests the applicability of regional indexing to a (semi-)confined water body.

The location is:

- In an area of water stresses and conflicts with high well and water-use density,
- In a hydrogeologically complex region (lithologic and bedrock topographic variability),
- Situated on a steep gradient in saturated thickness,
- Centered on an area where the main remaining water-bearing zone is deep, relatively thin, and semi-confined or confined.

#### Scott County Site (GMD1)

The location of the Scott County site is NE/4 NE/4 NE/4 of Sec. 1, T.18S. R.33W (Figure 9). The site is in the northern portion of the Scott-Finney bedrock depression. This is an area within the "region of interest" for municipal water supplies established as a GMD1 priority for ground-water management. There are no currently active monitoring wells in this part of the only major ground-water resource remaining in the area, so the study will provide an important addition to the annual network.

The ground-water body is the primary source of the municipal supply for Scott City, and there are active monitoring wells south of the city that will augment the study. The ground water in the depression is believed to be unconfined and hydraulically well-connected, which would facilitate indexing.



Haskell County Site with Surveyed Annual Water-Level (WIZARD) Wells and PDs

Figure 7. Haskell County site area with annual water-level (WIZARD) wells (yellow crosses) and points of diversion (black dots).



Haskell County Site with Surveyed DWR Wells (Yellow) and Points of Diversion (Black)

Figure 8. Haskell County site area showing wells that DWR is monitoring (yellow dots) and points of diversion (black dots).

Scott County Site with Annual Water-Level (WIZARD) Wells and PDs





The location is:

- Within a 5-mile radius of the Scott City municipal wells (consistent with GMD1 priorities on municipal supplies),
- In a major part of the local basin with adequate water supply remaining that is not monitored by existing program wells,
- A good test case for lateral extent of application of monitoring observations.

## Thomas County Site (GMD4)

The Thomas County site location is NW/4 NW/4 NW/4 Sec. 33, T.09S. R.33W (Figure 10). The site is within a region that has been identified as a high priority in the GMD4 management plan and was an EQIP "quick response area" for grants to transition irrigated cropland to dryland farming. There has been some local initiative toward aquifer management in this area and the KGS previously developed and presented a water budget based on existing data. The site is close to Colby (where the GMD4 office is located, simplifying GMD support) and near the edge of the aquifer (a location particularly problematic for interpreting network results and modeling). The earlier study identified a number of weaknesses and uncertainties in the available data, as well as providing a review of conditions in the area. The index well study will benefit from that existing work.

The location provides improved coverage relative to the annual program wells in the area, and will provide a check on an annual water-level measurement well that consistently shows a lower water level than would be extrapolated from other monitoring wells in the vicinity. Saturated thickness is relatively consistent for several miles in all directions and nearby annual wells show strongly correlated water-level changes, making the area a good candidate for index wells.

The location is:

- Near the aquifer fringe, with a probable lateral recharge component from the upgradient thinly-saturated area, and possible stream channel contributions to recharge,
- In the area of an initial attempt at self-organization for considering possible subunit management by the irrigation community,
- In a location of low, but not desperately low, ground-water resources,
- Relatively close to an annual well that consistently gives results that seem out of character with the other measuring points in the region.

Thomas County Site with Annual Water-Level (WIZARD) Wells and PDs



Figure 10. Thomas County site area with annual water-level (WIZARD) wells (yellow crosses) and points of diversion (black dots).

#### Well Construction and Data Transfer System

The index well casings are constructed of 2.5" PVC. Each well is screened in a 10-ft interval just above bedrock. Table 1 includes additional information on well construction. Water well completion records (WWC5 forms) containing well construction information and lithologic logs are in Appendix B, as are geophysical (natural gamma and resistivity) logs.

Initially, the Scott County well took longer to develop than expected and the static water level was lower than expected. It was determined that the well screen was probably plugged or partially plugged with grout and/or formation sediment. During discussions between the drilling contractor and the KGS, it was agreed that the contractor would return to the site to attempt to remove the blockage. On 20 August 2007, the contractor set up a top head drill rig with 1" pipe for drill string and a 2-1/4" bit. The crew ran drill string into the casing to 217 ft where the blockage was contacted, and drilled out blockage from 217 ft to total depth of 224.7 ft. The procedure was successful. The following day, the well developed normally and the water level rose to an expected elevation; continued monitoring of the water level indicates that it is responding to water-level changes in the aquifer.

Each site is equipped with a pressure transducer integrated with a data logger in the downhole sensor unit that collect data hourly. The sensors are vented to the surface and the transducers read the pressure or head of water above the sensors. The pressure readings are converted to feet of water above the sensors, and the readings are converted to water-level elevation during data processing.

Each site also is equipped with a telemetry system that transmits a pressure and a temperature reading to a database every 8 hours. These data are currently available in real time on a password-protected website, where the data may be viewed in tabular format, plotted, and downloaded. Figure 2 is a photograph of the Haskell site during telemetry installation, which is also typical of the other two sites.

Table 1. Index well information.

| SITE_ID | Legal Location               | Elevation<br>(ft) | Screened Interval Depths<br>(ft) |
|---------|------------------------------|-------------------|----------------------------------|
| HASKELL | SW SE NW Sec. 36 T27S - R31W | 2837.85           | 420-430                          |
| SCOTT   | NE NE NE Sec. 01 T18S - R33W | 2967.47           | 215-225                          |
| THOMAS  | NW NW NW Sec. 33 T09S - R33W | 3187.44           | 274-284                          |

#### **Results and Discussion**

### Lithology

As discussed in the installations section, Figure 5 illustrates the subsurface lithology along a cross section in the area of each of the three index well sites. Lithologic characteristics at the Haskell County index well were as expected based on review of surrounding well logs. From the surface down, the Haskell site is characterized by roughly 100 ft of fine-grained, relatively impermeable sediments below the surface, an intermediate thick layer composed of mainly sand and gravel, another thick (confining) clay layer, and a relatively thin, permeable sand and gravel zone just above bedrock. Most of the thick intermediate permeable zone at the Haskell site was saturated before development of the aquifer but now has been mostly dewatered. All the lithologic layers are laterally extensive and slope from the north to the south, as does the bedrock surface.

The Haskell County well is screened in the relatively thin permeable zone just above bedrock. This thin confined or semi-confined zone at the base of the aquifer is currently the main water-producing zone in the area. The DWR monitoring efforts are providing data from above and below the confining layer, and from some wells that are screened in both intervals.

The lithology at the Scott County site is more heterogeneous, and is characterized by mostly fine-grained sediments in the top half of the columns, with more permeable materials below. The remaining saturated sediments are relatively permeable and appear to be mainly unconfined.

The sediments are the most heterogeneous, in terms of lateral continuity at the three well locations, at the Thomas County site. Individual layers and lenses are relatively thin and interspersed. The remaining saturated thickness is composed of relatively permeable sediments, and, like the Scott County site, appears to be mainly unconfined.

#### Water Levels/Water Use

The slope of the water-level surface (hydraulic gradient) is mostly from west to east at each site. Early results illustrate a range of aquifer conditions, including confined or semi-confined conditions near the base of the aquifer at the Haskell County site.

Figure 7 is an aerial photo showing locations of the index well, points of diversion, and annual water-level measurement wells surrounding the Haskell County site. The annual wells are measured in January and are also referred to as WIZARD wells, in reference to the WIZARD Water Well Levels Database:

http://www.kgs.ku.edu/Magellan/WaterLevels/index.html.

As Figure 7 suggests, the Haskell site area is characterized by high well and water-use density. Figure 8 is similar to Figure 7, but zoomed in to identify the wells that DWR is monitoring (discussed in more detail below).

As indicated in Figure 4, the water table has declined more than 100 ft in the Haskell site area. The decline rate has been 4 to 5 ft/yr in the last decade. The water-level data, hydrograph, and other information for the WIZARD well 1.5 miles north of the Haskell County well may be viewed at the following link:

http://hercules.kgs.ku.edu/geohydro/wizard/wizardwelldetail.cfm?usgs\_id=37404410039 5001.

The hydrograph for the Haskell County index well (Figure 11) shows that the water level responds rapidly to nearby pumping wells turning on and off (the small, sharp changes in level), and has a large overall decline during the pumping season, which are indicative of confined or semi-confined aquifer conditions. Of the three index well sites, the range of water-table variations from August through mid-October was by far the greatest -- over 100 ft -- at the Haskell site. This variation is over two orders of magnitude greater than the fluctuations observed at the other two sites.



Figure 11. Hydrograph of Haskell County index well.

Rapid recovery of the Haskell water level began in late August, when area pumping was greatly reduced. However, as of mid-October, some pumping was still occurring in the area, so the full "no-pumping" recovery had not yet begun at that time.

The area around the Scott County well has experienced water-level declines of 50-100 ft since predevelopment (Figure 4). The decline rate appears to have slowed and has been less than 1 ft/yr over the past 10 years. The following WIZARD link is for the annual measurement well about three miles west of the Scott County index well: <a href="http://hercules.kgs.ku.edu/geohydro/wizard/wizardwelldetail.cfm?usgs\_id=38305310057">http://hercules.kgs.ku.edu/geohydro/wizard/wizardwelldetail.cfm?usgs\_id=38305310057</a> 3701.

Since predevelopment, water-level declines in the 50-ft range have been observed in the vicinity of the Thomas County index well. Recent decline rates have been on the order of 1 ft/yr in the area. The link for the WIZARD well 3 miles east of the Thomas County index well is:

http://hercules.kgs.ku.edu/geohydro/wizard/wizardwelldetail.cfm?usgs\_id=39135510057 4901.

Both the Scott and Thomas County index wells show active fine-scale responses, but only a few feet of net change over the August through mid-October period (Figures 12 and 13). The full vertical (elevation) scale on Figures 12 and 13 is only 3 ft, whereas the full vertical scale on Figure 11 (Haskell County) is 160 ft.

After the summer irrigation season ended, pumping continued near all the sites as winter wheat was planted so the full "no pumping" recovery had not yet begun by the end of the hydrographs in Figures 12 and 13. We will closely examine the hydrographs from all three sites and obtain additional measurements from annual wells during the recovery period to determine how representative the annual/January measurements are.



Figure 12. Hydrograph of Scott County index well.



Figure 13. Hydrograph of Thomas County index well.

## **DWR** Monitoring Efforts

The DWR has installed pressure transducers in approximately 20 wells in the vicinity of the Haskell County index well as part of monitoring activities regarding a former impairment complaint that has since been withdrawn. Locations of the wells are shown in Figure 8. DWR also is collecting metered water-use data from surrounding irrigation wells. Substantial efforts will go into the workup of these data, beginning with sorting out the respective elevations and depths.

It will be valuable to observe and important to understand what differences in water-level responses occur in different wells that are sampling different portions of the aquifer. For example, the Haskell County index well is screened in only the lower (semi-)confined portion of the aquifer. DWR is monitoring some wells that are only screened in the upper permeable portion of the aquifer and some wells that are screened over multiple intervals, which is common in many of the annual network wells and most irrigation wells.

Analysis of preliminary data indicates that the water levels in the shallow wells show relatively little response, whereas water levels in some deeper and/or pumping wells show relatively large responses. In fact, the hydrograph from a deep pumping well onehalf mile north of the Haskell index well is very similar to the hydrograph from the index well in both shape and magnitude of water-level change. It is not known how laterally extensive the confined zone is, but it appears to be the primary source of water remaining for irrigation well production, particularly to the north.

## Elevation Surveys (Provisional)

Elevations at six WIZARD wells surrounding each of the index wells were surveyed by a licensed land surveyor (Table 2). These data should be considered provisional. Datums will have to be verified using site photos, and possibly field inspections for some of the sites. These provisional elevation data are compared with the elevations in the WIZARD database in Table 2. The apparent difference between the surveyed elevations and WIZARD elevations is less than 2 ft at most of the 18 sites. However, the difference is greater than 5 ft at one site. If changes are made in a local network of measuring points, uncertainties of just a foot or two can obscure annual decline trends, which are less than a foot per year in Scott and Thomas counties.

## **Future Work**

Year 2 of the program will be data intensive. In coordination and cooperation with the DWR, we will conduct a full work-up and calibration of the numerous data being collected around the Haskell County site. These data include the newly-surveyed elevation data, well depths and screened interval information, water-level changes and pumping meter data.

The index wells are being added into the annual measurement program, and the elevation survey data for the annual wells will be verified and entered into the WIZARD database. Thus, the annual measurement program will be improved with better elevation accuracy and higher (high-quality) data density.

It is clear from previous studies that recovery continues after the January water-level measurements in some wells. We will watch the recovery period very carefully to gain a better understanding of when full recovery occurs in the different wells/regions and how representative and spatially consistent the annual/January measurements are. With the assistance of the DWR and the GMDs, we will collect additional measurements from annual wells surrounding the index wells, particularly during the recovery period.

We will continue to collect and analyze data from the index wells, coordinating with the DWR monitoring program for the wells surrounding the Haskell site. We will compare pumping records with well hydrographs and assess interactions between pumping patterns and water-level changes. In addition to the general program objectives, the Haskell site will provide a test of how monitoring results and apparent depletion rates compare above, below, and across a (semi-)confining layer. This tests the applicability of regional indexing to a (semi-)confined water body. As a part of the Haskell site investigations, we will examine the lithologic logs of neighboring wells and other wells in an outward direction from the index well location to map the lateral extent of the (semi-)confined zone.

Table 2. Comparison of surveyed elevations (provisional) and elevations in the WIZARD database for annual wells.

| HASKELL | COUNTY VICINITY   |                 |               |             |                 |
|---------|-------------------|-----------------|---------------|-------------|-----------------|
| SITE_ID | LOCATION          | USGS_ID         | ELEV_SURVEYED | ELEV_WIZARD | DIFFERENCE (FT) |
| HS21    | SW SE SW 24 27-31 | 374044100395001 | 2821.67       | 2816        | 5.67            |
| HS22    | SW SW NW 31 27-31 | 373929100453601 | 2893.22       | 2895        | -1.78           |
| HS23    | NE NW NW 08 27-30 | 374319100375801 | 2789.93       | 2791        | -1.07           |
| HS24    | NW NW NW 08 27-30 | 374317100375501 | 2792.27       | 2790        | 2.27            |
| HS25    | SW NW NW 23 27-30 | 374125100344101 | 2771.18       | 2773        | -1.82           |
| HS26    | NE NW NW 17 28-30 | 373709100374701 | 2818.32       | 2817        | 1.32            |
| SCOTT C | OUNTY VICINITY    |                 |               |             |                 |
| SITE_ID | LOCATION          | USGS_ID         | ELEV_SURVEYED | ELEV_WIZARD | DIFFERENCE      |
| SC2     | NW SW SW 03 18-33 | 383053100573701 | 3009.10       | 3008        | 1.10            |
| SC3     | NW NW NW 25 18-33 | 382803100552301 | 2974.82       | 2972        | 2.82            |
| SC4     | NW SW NE 14 17-33 | 383448100555801 | 3016.81       | 3014        | 2.81            |
| SC5     | NW NW NW 16 17-32 | 383501100520601 | 2980.82       | 2980        | 0.82            |
| SC6     | NW NW NW 27 17-32 | 383316100505801 | 2989.24       | 2990        | -0.76           |
| SC7     | NE NW NE 17 18-32 | 382947100522902 | 2974.56       | 2973        | 1.56            |
| THOMAS  | COUNTY VICINITY   |                 |               |             |                 |
| SITE_ID | LOCATION          | USGS_ID         | ELEV_SURVEYED | ELEV_WIZARD | DIFFERENCE      |
| TH2     | SE NE NE 35 09-33 | 391355100574901 | 3145.31       | 3145        | 0.31            |
| TH3     | SW NW NW 06 10-33 | 391303101031701 | 3191.91       | 3191        | 0.91            |
| TH4     | NW NE NW 11 10-33 | 391217100583201 | 3139.87       | 3140        | -0.13           |
| TH5     | SE SW NW 12 10-34 | 391200101041601 | 3220.55       | 3220        | 0.55            |
| TH6     | SW SW SW 11 09-34 | 391646101052901 | 3179.13       | 3180        | -0.87           |
| TH7     | NE SE NE 12 09-34 | 391718101032301 | 3202.16       | 3199        | 3.16            |
|         |                   |                 |               |             |                 |

We will continue to compare and contrast the characteristics of the locales (in terms of potential subunits). For example, the potential approach for an aquifer subunit in the Scott City area is a set of five-mile circles around each of the municipal water rights, which appear as the single circle-shaped red line in Figure 14. The Scott County index well is located approximately in the center of the northern half of the large red circle. We will assess how representative the index wells are of the water-level changes within potential subunits such as this circled-shaped area in Figure 14, as well as how the index wells can be used to calibrate WIZARD wells and other water-level measurements within subunits.

In addition, we will examine the regional/broader aquifer conditions of subunit areas and what further information is needed to assess the utility of the index well approach. We will maintain close liaison with the GMDs to develop the program and interpretation of results in ways that will address management implications.

Finally, we will make the data promptly and easily available to the KWO, DWR, GMDs, and the landowners who have allowed the use of their property for well installation.

### Acknowledgments

We are grateful for the support, assistance, and cooperation of the staffs of the Kansas Water Office, the Division of Water Resources of the Kansas Department of Agriculture, the managers and staffs of Groundwater Management Districts 1, 3 and 4, and especially for the cooperation of Jarvis Garetson (the Garetson Brothers), KBUF Inc., and Steve and Marilyn Friesen in making their properties available for installation of the wells.

This report was reviewed by other members of the KGS Geohydrology Section. Susan Stover of the Kansas Water Office provided instructive comments on an earlier draft of this report. Mark Schoneweis assisted with graphics and ShyAnne Mailen assisted with the final production of this report.



Figure 14. A possible subunit approach in GMD1 based on a five-mile radius around the municipal water rights of Scott City.

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# Appendix A.

# Calibration Monitoring (a.k.a. "Index") Well Program Rationale

(updated and modified from a KGS draft document of 16 November 2006)

## Background and Issues:

Effective management of priority aquifer subunits (i.e., areas in which prompt, active intervention may be required to maintain or extend access to ground-water resources) must be supported by hydrologic data that:

- Are technically and scientifically defensible;
- Can be accepted both by government agencies and members of the affected community;
- Have the accuracy and precision to adequately detect and quantify changes (e.g., in water in storage or saturated thickness) on time scales of a few years and spatial scales of townships or smaller, and to relate these changes to changes in water use or specific management-related actions.

Data must be usable to enforce or implement measures (incentives or restrictions) that will have profound economic effects on individuals and the community. It is essential that the basis for these measures be acceptable to stakeholders, and that the effects of management measures be subject to quantitative evaluation. The adequacy of any specific dataset or approach is ultimately determined by the governing body (e.g., GMD Board of Directors, or Chief Engineer) in the context of specific local conditions and management objectives, and cannot be rigorously specified in terms of universal, exclusively technical, criteria. However, general guidelines can be provided for developing and evaluating the monitoring program used to support enhanced management of localized areas.

The existing annual monitoring program and the data it provides have been effectively used to identify areas deserving priority for enhanced management – regions with high rates of water-level decline and/or remaining ground-water resources so limited that usage of appropriated quantities is no longer possible. However, this information lacks the accuracy and precision needed to permit reliable interpretation of annual or near-annual changes. The problems have been reviewed extensively in KGS OFR 2002-25 (http://www.kgs.ku.edu/HighPlains/OHP/index.htm; see especially parts D and F). To summarize briefly:

- 1. Annual program wells are measured at the same time in early January. This is often far in advance of full water-table recovery from the pumping stresses of the previous season, and the deviation from recovery differs from well to well and from year to year. This variability in recovery introduces substantial year-to-year uncertainty.
- 2. Program wells are distributed geometrically (very approximately one/township), based on assumed values of acceptable uncertainty for regional, multi-year estimates of water-table elevation, and to provide a network that is a reasonable statistical sample of water levels with a number of wells that is within cost considerations of the joint DWR-KGS program.
- 3. The aquifer is treated as a uniform, varying hydrologic surface, which does not account for the spatially abrupt changes observed in the cross-validation of the annual monitoring results.

- 4. Elevation control is based on topographic maps rather than surveys, so a change in the well measured can cause a water-table elevation change uncertainty of up to several feet.
- 5. Historic well selection did not consider proximity to other pumping wells, including those that may be in use at the time of measurement.
- 6. Most of the wells measured are irrigation wells, which means that they are constructed to maximize yield rather than quality of measurement, and which exacerbates the problem identified in point 1.
- 7. The statistical analysis used is based on assumptions about the magnitude and distribution of uncertainty that are considered reasonable, but which have not been calibrated against field observations or well tested theory.

There are no systematic, universally accepted approaches to overcoming the deficiencies of the annual monitoring program in order provide the quantity and quality of data desired for subunit management – that is, to move from a system that can evaluate large-scale change over time periods of 5-10 years to one that can characterize smaller areas on near-annual time scales. Since the needs for accuracy, precision, and spatial and temporal density of measurements will depend on both local hydrogeology and the specific management objectives, detailed data and monitoring needs for priority areas are best considered on a case-by-case basis. However, many issues can be resolved at a general level, which greatly simplifies case-by-case decisions. This project, which will combine high-quality continuous water-level monitoring in individual wells with additional well measurements in the same general vicinity at greater frequencies and spatial densities than used in the annual management program, will provide quantitative case studies that can be used as quantitative examples of possible monitoring strategies.

Simply measuring more wells more often in a priority area is a straightforward option requiring little investment, but it is an inefficient, labor-intensive approach that still does not address some of the problems listed above (3, 4, and 6, and possibly all or part of 2, 5, and 7). An expanded hand measurement program is a logical way to establish better local baseline data and experimentally assess the utility of that approach, but longer-term monitoring should be designed for ease and consistency of application. Modeling is attractive at larger scales, but at the local level the quality of output is controlled by the quality of the input data. The calibration well project, however, takes a general step forward in addressing a number of relevant issues. Specifically, from the list above, items 1, 3, 4, 5 and 6 are not issues in the present study, and item 7 will be addressed in the analysis. At least for the areas in question, the results will therefore provide information on the accuracy and precision of data needed and available at local scales, and on the issues involved in expanding these scales to cover larger areas. Between them, the study sites should represent enough hydrogeologic variety to provide some sense of the range of monitoring approaches needed.

#### Program description:

The monitoring calibration (index) well program is a pilot study of an improved approach to measuring hydrologic responses at the local level. The hypotheses to be tested are that

- 1. Properly designed, sited, and measured wells can yield measurements that, supported by supplemental measurement of other wells in the vicinity, are sufficiently accurate and representative of local water-table behavior to use in intensive management programs; and
- 2. Consistent deviations from the behavior of a calibration well indicate aquifer heterogeneity; such results can be interpreted to refine subunit definitions and characteristics or to inform the interpretation of water table responses over larger/other areas.

There are two primary aspects to the program: well and measurement design, and siting. By using carefully installed monitoring wells of proven design, combined with continuous pressure transducer measurements of water level, points 1 and 6 above are addressed, and the results can serve to either test or augment the analyses (point 7). Since a limited number of wells are being tested, vertical surveys to establish network "hydrobenchmarks" are feasible (point 4).

Points 2-5 are addressed by the well siting (discussed in more detail below). It is important to note, however, that the siting and local purpose of the well are also key factors in generating local interest in and acceptance of the measurement approach, and thereby of the feasibility of management subunits. To this end, site selection that addresses local needs, interests, and perceptions becomes an important factor along with the hydrogeologic considerations. This is particularly true because of the practical need to rely on GMD assistance for local supplemental measurements, information, and maintenance support and possibly for financial supplementation.

## Siting criteria:

The technology of installation and measurement is generally well understood and feasible, so the major issues are related to well location. The general technical criteria considered are that the location chosen addresses one or more of the concerns noted above. Two major issues can be identified: homogeneous vs. heterogeneous aquifer regions, and confined vs. unconfined aquifers. In order to obtain the most useful results (and potentially to provide an installation of continuing utility), selection needs to focus on:

- 1. Regions where there is good reason to believe that the aquifer is locally relatively homogeneous, whether confined or unconfined.
- 2. In the case of a confined system, it should be possible to obtain data from above and below the confining layer (note that annual program wells are often screened or gravel-packed across multiple layers).
- 3. In all cases, it is essential to have enough remaining saturated thickness to ensure hydraulic connection over a reasonable area, and if possible, enough so that the

aquifer lifetime in the region is long enough to use the installation in development and implementation of an actual management program.

- 4. In addition to the technical considerations, it is desirable to have the installations in a region that could qualify as a priority subunit, and especially to work in locations where local and/or district interest and concern are high.
- 5. Also a consideration, in addition to tests of the hypotheses and possible practical application of the results, is augmentation or correction of the annual program network, as a first step toward comparison and intercalibration.
- 6. Distance from and relationship to both pumping wells and network wells.

### Review of site selections:

Initial screening for all three GMDs consisted of two concurrent processes -reviewing the estimated lifetime and saturated thickness maps (criteria 3 and 4), and other data where available (e.g. the PST data in GMD3 – criterion 1), and, discussing with the GMD managers options and priorities relevant to hydrologic and political situations within each GMD (criterion 4). Based on these efforts, we focused on one or a few general areas in each GMD, and considered criteria 1, 2, 5, and 6, as well as questions of access, landowner permission, etc. In each case, it was possible to identify possible sites.

<u>GMD4</u>: The south Thomas county region where there has been some local initiative toward aquifer management and where KGS developed and presented a water budget based on existing data in 2006, was selected as the area of interest. In addition to fitting the selection criteria, it is close to Colby (simplifying GMD support) and on the edge of the aquifer (a location particularly problematic for interpreting network results and modeling). The selected site is 9S 33W N1/2 of sec 33 (NW corner). Considerations – location south of the South Fork Solomon River provides improved coverage relative to the annual program wells in the area, and will provide a check on well 10S 33W 06BBC, which consistently shows a lower water level than would be extrapolated from other monitoring wells in the vicinity. Saturated thickness is relatively consistent for several miles in all directions and the well hydrographs for 9S 33W 35AAD and 9S 34W 12ADA show strongly correlated water-level changes, making the area a good candidate for index wells. Landowner permission has been obtained.

<u>GMD3</u>: The vicinity of the Garetson impairment action was selected as an initial target (Criteria 3 and 4, plus the major advantage of the additional data available from the ongoing DWR investigation). Following discussions and an intensive review of well logs for the area, a location in the SE1/4 of the NW 1/4 Section 36, 27S 31W has been identified (depending on access it may be moved slightly).

Considerations – this is an area where there is a laterally extensive confining or semiconfining layer, with a deep sandy layer consistently occurring just above bedrock. Further, DWR has identified shallow casings in the area that sample the water table above the confining layer (criteria 1 and 2). In addition to the general program objectives, this site will provide a test of how monitoring results and apparent depletion rates compare above, below, and across such a layer. This tests the applicability of regional indexing to a (semi)confined water body. In addition to providing enhanced local monitoring, DWR has identified landowners willing to cooperate with test well installation.

<u>GMD1</u>: The GMD has adopted protection of municipal water supplies as a priority; all of the areas surrounding municipalities (and their water rights) were reviewed with the Manager for suitability. Scott City and Sharon Springs were identified as best meeting the initial criteria, and Scott City was identified as a preferred target. There was agreement that the priority area is the Scott-Finney depression north of Scott City. There are no currently active monitoring wells in this part of the only major remaining ground water resource in the area, so the study would provide an important addition to the annual network (criteria 3, 5). The water body is the primary source of the municipal supply (criterion 4), and there are active monitoring wells south of the city that will augment the study. The ground water in the depression is believed to be unconfined and hydraulically well-connected (criterion 1), which would facilitate indexing. On an initial review, the preferred location would be along the south or west border of sec 31, 17S 32 W. The west boundary is the highway right-of-way, which means that drilling might not require landowner cooperation, and elevation surveys would be easier.

Taken together, the selected sites make the maximum use of additional data sources, local interest, and relevance to other goals and programs. They address a variety of ground-water settings that are both individually and generally important, and will contribute generalizable knowledge as well as specific local benefit.

## Implementation:

The wells will be installed under contract to KGS specifications for monitoring wells. Following installation and development, the wells will be equipped with recording pressure transducers, and water levels will be measured with a tape initially and at intervals throughout the project to calibrate the transducer readings. Also, we are looking into deploying telemetry capability for remotely accessing data and monitoring for possible problems and/or malfunctions.

We anticipate that the loggers will be set to acquire data every hour (with data transmission via telemetry every 8 hours), which should be adequate to observe responses to nearby pumping and barometric changes (if any); however, frequency of measurement can be adjusted over a very wide range.

It will be very desirable to obtain surveyed elevation data for the wells early in the program period; similar surveys of the nearby wells (especially annual program wells) would further enhance the results.

#### Analysis and dissemination of data

Transducer records will be data-based and linked to the WIZARD well listing to be viewable and retrievable. Hand measurements will be uploaded to WIZARD via the remote entry capability. Additional websites presenting comparisons and analysis results can be made available; but this needs concurrence of the GMDs and other agencies as to access and conclusions presented.

Well records will be analyzed by standard curve-fitting and extrapolation techniques to project the time and elevation of complete recovery. The consistency of the other measured wells with the calibration well will be assessed both visually and statistically to determine the level of confidence with which the calibration well results can be applied to water-table behavior in adjacent areas. The measured "subunit" behavior will be compared to inferences based on the annual measurement program (both with and without the calibration well included in the network) to estimate present network reliability and the degree of improvement resulting from inclusion of the calibration well.

In addition to making the data generally available and distributing appropriately the resource- and management-oriented conclusions, we anticipate that the results will be publishable as scientific articles or technical reports, which can serve as an information resource in addressing similar issues elsewhere.

### Duration and requirements of program

It is anticipated that two full years after completed well installation will be required to carry out formal subunit-level comparisons and analyses, although substantial amounts of useful information and preliminary analyses will occur within the first year and expand progressively.

An estimated 5-year period is the probable duration of the main phase of the program. That period will extend into the time by which aquifer subunits are expected to be designated and operating as management entities, and will provide adequate time for analysis of the monitoring well implications for the annual program network as well as for the characterization and management of the immediate (subunit-scale) vicinity.

It is expected that these wells will become an important part of the annual program network in addition to any possible role in local subunit management; thus their existence and use could extend into the indefinite future. This raises the question of the source of support for long-term maintenance and measurement.

Since this relates closely to overall KGS support for and involvement in Ogallala efforts, the exact sources and amounts of resources required (personnel, funding) cannot realistically be spelled out, other than to say that (a) some additional resources will be needed, and (b) they will be less than the present total devoted to Ogallala support.

#### Expected outcomes and criteria for success

Success can be measured by:

- 1. Acquisition of the desired data (continuous calibration well records and supporting measurements from other wells in the vicinity);
- 2. Completion of the specified analyses and interpretations; and,
- 3. Application of the results to improved management and/or monitoring programs.

The first two of those can be promised with confidence by the KGS Geohydrology section; the third depends on responses and reactions by others. In the outcomes description below, **bold type** indicates the products or results the completion of which will be a criterion for success of the overall effort.

We will obtain detailed data on maximum drawdown and water-table recovery characteristics, and relate these to observations made in pumping wells and annual program wells in the vicinity. From this we will evaluate the year-to-year accuracy and precision of point estimates made from annual program results, and produce specific recommendations for modifying the program and/or interpreting the results to make improvements in the utility of the annual program data.

The correlation between the calibration well and nearby wells will determine the extent (in both time and space) to which the calibration well can be used as an index or proxy for local water-table behavior. In areas where the extent is large we will have achieved a major improvement in ongoing data for management purposes; if there are locations near boundaries where the relationship breaks down, we will be able to identify the reasons (e.g, lithology, topography, etc.). The extent of applicability will provide important inputs for the design and monitoring of subunit areas.

We expect that the wells will be included in the annual measurement program, as well as adopted by the GMDs for management support, although these decisions will be made by others. Incorporation of continuously monitored, non-pumping wells plus a high density of local measurements into the network will precipitate a reassessment of the methods of determining confidence level at the local scale. Whether improved confidence at the local level (a certain result) leads immediately to improved confidence in the overall network results will depend on the findings, but the results of this calibration well program will certainly make it possible to improve overall network confidence on a scale of years.

# Appendix B.

Water Well Completion Forms and Geophysical Log Plots for the Index Wells

| 157 8726  | Site 3 OBGMD-3  | Corrected Co  | opy                                   | Division of                                   | f Water P    |                         |              |  |
|---|---|---|---------------------------------------|---|--------------|-------------------------|--------------|--|
| VATER WELL RE   | CORD  | Form wwe  | -3                                    | Division of                                   | - water is   | The sources, 7          |              | In white                               |
| LOCATION OF W/<br>County: Haskell   | ATER WELL:  | SW 1/4 SE 1/4   | NW_1/4                                | Section Nut<br>36                             | mber         | T 27                    | Number       | R 31 E W                               |
| Distance and direction  | ocated  | Global Posi   | tioning S                             | ystems (d                                     | cimal deg    | rees, min. of 4 digits) |              |  |
| within city? Approximately 11 1/2 miles west and 4 miles north of           |   |   |                                       |   | 37.657       | 017                     |              |  |
| Aontezuma   | MALE PLAN AND A MARK                                      | Vagene Geologia   | of Surney                             | Longitude:                                    | -100.        | 664848                  |              | ······································ |
| 2 WATER WELL OF   | Center To Repeat  | ch. Inc. 1930 Constant A                                | we.                                   | Elevation:                                    | Unkn         | own                     |              |  |
| City State 710 Cod  | 2385 Iping Hill Re  | Lawrence, KS 6  | 66045                                 | Datum:  | NAD83        |                         |              |  |
| City, State, ZIF Cou  | Lawrence KS 66  | 045-7562  |                                       | Data Colle                                    | ction M      | ethod: W                | AAS GP       | S Unit                                 |
| <b>3 LOCATE WELL'S</b>  | 4 DEPTH OF COMP   | LETED WELL  | 43                                    | 2   | ft.          |                         |              |  |
| LOCATION  | Depth(s) Groundwater                                      | Encountered (1)   |                                       | ft. (2  | 2)           | ft                      | (3)          | ft.                                    |
| WITH AN "X" IN  | WELL'S STATIC WA  | TER LEVEL 317   | 7.65 n                                | helow land                                    | eneface i    | manneed                 | in malda.    | 06-20-07                               |
| SECTION BOX:  | Pump test dat   | a Well water was N                                      | lot checked                           | ft after                                      | suitace      | hours r                 | umning       | //yi                                   |
|   | Est. Yield Unknown gpr                                    | n: Well water was                                       |                                       | ft. after                                     |              | hours i                 | umping       | epm                                    |
|   | WELL WATER TO I   | BE USED AS: 5 Pt  | ublic water s                         | woolv   | 8 Air co     | nditionine              | 11 1         | niection well                          |
| w L. I S  | L Domestic 3  | Feedlat 6 Oil 6   | iald water re                         | malu (  |              | aring                   | Ö            | When (Specify holow)                   |
| " - - - -   | I Domestic 5  | reculor o Ontr  | ICIG Watter St                        | dobrà.  | > Dewar      |                         | 600          | Aller (Specify below)                  |
| SWSE  | 2 Irrigation 4  | Industrial 7 Dom  | testic (lawn                          | & garden)                                     | 0 Monite     | oring well              | ,            | Observation                            |
|   | Was a chemical/bacte                                      | riological sample sub                                   | printed to I                          | Department                                    | ? Yes        | No                      | . <b>V</b>   | lf yes, mo/day/yrs                     |
|   | Sample was submitted                                      | 1   | Water                                 | well disinfe                                  | cted? Y      | es                      | No 🗸         | /                                      |
| 3   | Weanah  | tiene & Co  | ncrete tile                           | C   | ASING        |                         | lund a       | / Clamped                              |
| 5 TYPE OF CASING  | (D/SED: 5 wrough  | c Cement 9 Of   | her (enecify                          | v helow)                                      | ASING        | 01113.0                 | Welded       | Clamped                                |
|   | nr (ak) 0 Asocaio   | s-Octificiti 7 Ou                                       | ner (speen)                           | y below)                                      |              |                         | Threaded     |  |
| 2) PVC 4 A  | 35 / Floetgia   | 0 Diameter  |                                       | 10  | 0.0          | liameter                | 1 III Carloo | in to fi                               |
| Casing beight above lar   | d surface 24  | in weight   | 145 1                                 | hs/ft Wal                                     | ll thickn    | ess or ear              | iee No       | 276                                    |
| TYPE OF SCREEN OF   | PERFORATION MATI  | RIAL  |                                       |   | i unenn      | con or par              | Be 110.      |  |
| Steel 3 Steel 3   | Stainless Steel 5 Fib                                     | erglass (7) PVC   | 9                                     | ABS   | 1            | 1 Other (S              | pecify)      |  |
| 2 Brass 4 C   | alvanized Steel 6 Co                                      | ncrete tile 8 RM  | (SR) 10                               | Asbestos-C                                    | ement 1      | 2 None us               | ed (open h   | ole)                                   |
| CREEN OR PERFOR   | ATION OPENINGS ARE  | E:  |                                       |   |              |                         |              | -                                      |
| Continuous slo  | t 3 Mill slot 5   | Gauzed wrapped 7  | Torch cut                             | 9 Drill                                       | led holes    | 11 Non                  | e (open hol  | e)                                     |
| 2 Louvered shutt  | er 4 Key punched 6  | Wire wrapped 8  | Saw Cut                               | 10 Othe                                       | r (Specify   | n                       |              |  |
| SCREEN-PERFORAT   | ED INTERVALS: From  | 420 ft. to  | 430                                   | ) ft., F                                      | rom          |                         | ft. to       | fi.                                    |
|   | From  | ft. to  |                                       | ft., F  | rom          |                         | fL to        | fi.                                    |
| GRAVEL PAC  | CK INTERVALS: From  | 325 ft. to  | 435                                   | 5 fL, F                                       | rom          |                         | ft. to       | . ft.                                  |
|   | From  | 435 IL 10   | 460                                   | ) IL., F                                      | rom          |                         | IL to        | 11.                                    |
| 6 GROUT MATERI/   | L: (1) Neat Cement 2                                      | Cement grout 3 Be                                       | entonite (                            | Other   |              | Bento                   | nite Hole    | plug                                   |
| Grout Intervals:  | From 4 ft. to   | 325 ft. From  |                                       | ft. to  | ft.          | From                    | 0            | ft to 4 ft                             |
| What is the nearest source  | e of possible contamination:                              | Diterior  | 10 Linetton                           | k nene  | 13 Incest    | icida Store             |              | C Other (marily                        |
| Septic tank   | 4 Lateral lines 7   | Pit privy   | 10 Envision                           | a pens  | 13 maccu     | doned wate              | ge v         | below)                                 |
| 2 Sewer lines   | 5 Cess poor 8   | Sewage tagoon   | 12 Feetiling                          | age<br>Channe                                 |              | ell/gas well            | i wen        | None known                             |
| 3 Watertight sewer line   | s 6 Seepage pin 9   | Feedyard  | How man                               | r Storage                                     | 15 011 4     | en gas wei              |              |  |
| Direction from well?  | LITHOLOGIC L  | YG.   | FROM                                  | TO  |              | PLUGO                   | ING INTE     | PVALS                                  |
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| 2 28 0  | av tan sitty some cali                                    | che   | 107                                   | 115   | Clay ta      | n white                 | sandy w      | aith some caliche                      |
| 2 20 0  | and fine to coarse  |   | 115                                   | 130   | Sand c       | ravel fin               | e to med     | ium                                    |
| 34 45 0   | av fan white silv   |   | 130                                   | 145   | Sand o       | aravel, fin             | e to coar    | se with clay                           |
| 45 56 0   | ay, red, brown, with cal                                  | liche   |                                       |   | streaks      | thin ve                 | low          | as, maroley                            |
| 56 63 5   | and, fine to very fine                                    |   | 145                                   | 245   | Sand, e      | ravel fin               | e to coar    | se                                     |
| 63 68 C   | ay, tan, white, with stre                                 | aks of caliche and                                      | 245                                   | 250   | Sand, o      | ravel, fin              | e to coar    | se, with clay, gray                    |
|   | mented sand, thin   |   | 250                                   | 280   | Sand, o      | ravel, fin              | e to coar    | se, with clay                          |
| 68 80 S   | and, fine to very fine, si                                | lty   |                                       |   | streaks      | , thin, ye              | low          |  |
| 80 95 C   | emented sand, soft, wit                                   | h clay, brown, and                                      | 280                                   | 296   | Sand, g      | gravel, fin             | e to med     | ium, with clay                         |
| C   | aliche streaks  |   |                                       |   | streaks      | , thin, ye              | low          |  |
| CONTRACTOR'S  | OR LANDOWNER'S CH   | ERTIFICATION:   | This water                            | well was (1)                                  | Constru      | icted (2)               | reconstru    | acted (3) plugged                      |
| under my jurisdiction an  | the second second day                                     | (Juner) 06-20-  | 07 an                                 | d this record                                 | is true to   | the best of             | my knowle    | dge and belief.                        |
| anges my jangarenon an  | a was completed on (movday                                | (year)  |                                       |   |              | are ocat or             | ing more in  | effe and conter.                       |
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| Kansas Water Well Cont<br>Under the business name                           | of Clarke Well & Equip                                    | 185 This Wate<br>oment, Inc.                            | er Well Reco<br>by (                  | ed was comp<br>signature)                     | leted on (   | mo/day/ye               | "Che         | 6,26-07                                |
| Kansas Water Well Cont<br>Under the business name<br>INSTRUCTIONS: Use type | of Clarke Well & Equip<br>writer or ball point pen. ELEAS | 185 This Wate<br>oment, Inc.<br>E PRESS FIRMLY and PRIM | er Well Reco<br>by (<br>Tolearly, Ple | ed was comp<br>signature)<br>ase fill in blan | ks, underlig | mo/day/ye               | ar)          | 6-26-07                                |

| 158<br>WATER   | 8726   | Site 3 OBGMD-3 (<br>RECORD   | Cont'd) Corrected<br>Form WWC-5   | Copy   | Division of Water   | Resources; App. No.  |  |
|--|--|--|---|--|---|--|--|
| 1 LOCA   | TION OF  | WATER WELL:  | Fraction  |  | Section Number  | Township Number  | Range Number   |
| Count<br>Distan<br>within<br>Aont  | ty: Haske<br>ce and direc<br>city? App<br>ezuma  | ell<br>ction from nearest town or city st<br>roximately 11 1/2 miles we  | treet address of well if locates 1 and 4 miles north  | ated<br>of   | Global Positioning<br>Latitude: 37.65<br>Longitude: -100  | 57017<br>5664848   | rees, min. of 4 digits)  |
| 2 WATH<br>RR#.<br>City.  | ER WELI<br>St. Addres<br>State, ZIP  | Code Lawrence, KS 6  | Kanşas Geollogical<br>ich, inc. 1930 Constant Ave<br>ad Lawrence, KS 666<br>5045-7582   | Survey<br>5.<br>045                                      | Elevation: Unk<br>Datum: NAD83<br>Data Collection 1   | Method: WAAS GP  | S Unit   |
| 3 LOCA<br>LOC/<br>WITH<br>SECT   | ATE WEL<br>ATION<br>I AN "X"<br>TION BOJ<br>N<br>/NE<br>   | L'S 4 DEPTH OF COMP<br>IN Depth(s) Groundwate<br>WELL'S STATIC W.<br>Pump test da<br>Est. Yieldgp<br>WELL WATER TO<br>E 1 Domestic 3<br>2 Irrigation 4<br>Was a chemical/bacte<br>Sample was submitter                     | LETED WELL<br>r Encountered (1)<br>ATER LEVEL<br>ta: Well water was<br>m: Well water was<br>BE USED AS: 5 Publ<br>Feedlot 6 Oil field<br>Industrial 7 Domes<br>priological sample subm<br>d | fic water<br>d water :<br>tic (lawr<br>itted to<br>Water | ft. (2)<br>ft. (2)<br>ft. below land surface.<br>ft. after<br>supply 8 Air of<br>supply 9 Dew<br>ft. garden) 10 Mon<br>Department? Yes<br>r well disinfected? | ft. (3)<br>é méásured on mo/day<br>hours pumping<br>conditioning 11 fr<br>atering 12 C<br>itoring well<br>No 1<br>Yes No                       | ft,<br>gpm<br>gpm<br>njection well<br>bther (Specify below)<br>If yes, mo/clay/yrs |
| 5 TYP<br>1 S<br>2 F<br>Blank ca<br>Casing b<br>TYPE O<br>1<br>2<br>STREEN<br>1 | E OF CAS<br>Steel 3<br>PVC 4<br>sing diame<br>eight abov<br>F SCREEN<br>Steel<br>Brass<br>V OR PERI<br>Continuou | SING USED: 5 Wrough<br>RMP (SR) 6 Asbesto<br>ABS 7 Fibergla<br>tter in. to<br>e land surface<br>4 OR PERFORATION MAT<br>3 Stainless Steel 5 Fib<br>4 Galvanized Steel 6 Co<br>FORATION OPENINGS AR<br>s slot 3 Mill slot 5 | tt Iron 8 Conc<br>ss-Cement 9 Othe<br>ass<br>ft., Diameter<br>in., weight<br>ERIAL:<br>erglass 7 PVC<br>ncrete tile 8 RM (SI<br>E:<br>Gauzed wrapped 7 T                                    | rete tile<br>r (speci<br>9<br>R) 10<br>forch cut         | e CASING<br>fy below)<br>in. to ft.,<br>lbs./ft. Wall thick<br>ABS<br>) Asbestos-Cement<br>9 Drilled hole   | i JOINTS: Glued<br>Weldled<br>Threaded<br>Diameter<br>ness or gauge No.<br>11 Other (Specify)<br>12 None used (open hol<br>s 11 None (open hol | Clampe-d<br>in. to ft.<br>ole)   |
| 2<br>SCREEN  | Louvered :<br>N-PERFOR   | shutter 4 Key punched 6<br>ATED INTERVALS: From<br>From  | Wire wrapped & S  | Saw Cut  | 10 Other (Speci<br>ft., From<br>ft., From   | fy)<br>fi. to<br>fi. to  | ñ.   |
|  | GRAVEL   | PACK INTERVALS: From<br>From   | ft. to<br>ft. to  |  | ft., From<br>ft., From  | ft. to<br>ft. to   | ft.<br>ft.   |
| 6 GROU<br>Grout In<br>What is t<br>1 Septi<br>2 Sewe<br>3 Wate                 | JT MATE<br>tervals:<br>the nearest s<br>c tank<br>r lines<br>rtight sewer<br>a from wel                          | RIAL: 1 Neat Cement 2<br>From ft. to<br>ource of possible contamination<br>4 Lateral lines 7<br>5 Cess pool 8<br>lines 6 Seepage pit 9<br>12   | Cement grout 3 Bent<br>   | Livesto<br>Fuel sto<br>Fertiliz                          | 4 Other   | t., From<br>cticide Storage<br>indoned water well<br>well/gas well   | ft. toft.<br>16 Other (specify<br>below)   |
| FROM   | TO   | LITHOLOGIC L   | 0G  | FROM   | то  | PLUGGING INTE  | RVALS  |
| 296  | 370  | camented sand, shale pi  | eces, and caliche   |  |   |  |  |
| 370  | 413  | Clay, tan, brown, sandy,   | with caliche streaks  |  |   |  |  |
| 413  | 433  | Sand, gravel, fine to med<br>Weathered shale vellow  | black   |  |   |  |  |
| 435  | 445  | Clay, red, gray, white   | , CIOCK   |  | +   |  |  |
|  |  |  |   |  |   |  |  |
|  |  |  |   |  |   |  |  |
|  |  |  |   |  |   |  |  |
| CONT<br>ander my<br>Kansas V<br>Under th                                       | FRACTOR<br>y jurisdictio<br>Water Well<br>e business r   | R'S OR LAND OWNER'S Cl<br>n and was completed on (mo/day<br>Contractor's License No.   | ERTIFICATION: 77<br>(vycar) 06-20-07<br>185 This Water V<br>pment, Inc.   | vis water<br>au<br>Well Rec<br>by                        | well was (1) <u>const</u><br>and this record is true to<br>cord was completed or<br>(signature)   | nucted (2) reconstru-<br>o the best of my knowle<br>(mo/day/year) 0  | dge and belie f.<br>6-26-07  |
| INSTRUC  | TIONS: Us  | typewriter or ball point pen. PLEAS  | E PRESS FIRMLY and PRINT el   | learly. Pl   | ease fill in blanks, under  | line or circle the correct an  | swers. Send top three  |

copies to Kansas Department of Health and Environment, Bureau of Water, Geology Section, 1000 SW Jackson St., Suite 420, Topeka, Kansas 66612-1367. Teleph 785-296-5522. Send one to WATER WELL OWNER and retain one for your records. Fee of \$5.00 for each constructed well.

.

| LOCATION OF WATER WELL:       Fraction       Fraction       Number       Township Number       Range Number         Obstance and discuss from ensents tows or city strets address of well if Coattal within city? Approximately 21/2 miles north of Scott City       Image Number       Township Number       Range Number         Well of WATER WELL       NE with neight of Number       State State       State State       Image Number         City, State, 21/0       Coll and State       State State       State State       Image Number       Township Number       Townshi  | 161 8726<br>WATER WELL                  | Site #2 OBGMD-1<br>RECORD  | Corrected Cop<br>Form WWC-5     | y<br>S                  | Division                   | of Water Res          | ources; App. No.      |                            |
|--|---|--|---------------------------------|-------------------------|----------------------------|-----------------------|-----------------------|----------------------------|
| Country: Soot         INE         INE         INE         INE         Int         To         To <td>1 LOCATION OF</td> <td>WATER WELL:</td> <td>Fraction</td> <td>S</td> <td>ection N</td> <td>amber To</td> <td>ownship Number</td> <td>Range Number</td>  | 1 LOCATION OF                           | WATER WELL:  | Fraction                        | S                       | ection N                   | amber To              | ownship Number        | Range Number               |
| Durance and direction from marget lower or pather ballies to over in octate<br>whine city? Approximately 21 Provides month of a digits)         Durance 2010   | County: Scott                           |  | NE 1/4 NE 1/4 N                 | IE 1/4                  | 1<br>Hohel Per             | T Itianing Sur        | 18 S                  | R 33 F. W                  |
| Longstinde   | Distance and direct<br>within city? ADD | Distance and direction from nearest town or city street address of well it located<br>within sing. Approximately 2 1/2 miles north of Scott City |                                 |                         |                            |                       | stems (decimal deg    | rees, min. or 4 aigits)    |
| INATE RU WELL OWNER: Sequency of Margue Acass Geological Survey         Elevations         Directions         Directions           RAM, SL Address, Box #         2020 Jerrig HTTPack         Lawrence, KS 0605-5984         Datass   | annar cuj ++-                           | whith city. • + p  |                                 |                         |                            | -100.90               | 08705                 |                            |
| RRM, Si: Address, Box #       Control To Sequence (S) 6005 "Deal Action (S) 6005 "Deal Collection Method: WAAS GPS Unit Data Collection Method: WAAS GPS Unit Depth(s) Groundwater Encountered (1) 124.74", ft. (2) ft. (3) 68.21-07 ft. Depth(s) Groundwater Encountered (1) 124.74", ft. (2) ft. (3) 68.21-07 ft. WELL'S LOCATE WELL'S LOCATEWELL'S          | 2 WATER WELL                            | OWNER: University of Kans  | Ae Kansas Geological            | Survey E                | levation                   | Unknow                | MU                    |                            |
| City, State, 2/P Code       : interface, its, is geode-7984       Data Collection Method: WAAS GPS Unit         S LOCATE WELL'S       4 DEPTH OF COMPLETED WELL       227       ft.         WITH AN '''.       Depth() Groundwater face incountered       (1) 124.34:       ft. (2)       ft. (3)       (82-107 ft.)         WITH AN '''.       Depth() Groundwater face incountered       (1) 124.34:       ft. (2)       ft. (3)       (82-107 ft.)         N       Tomp fot data: Well water was.       ft. ft. (2)       ft. (3)       (82-107 ft.)         N       Tomp fot data: Well water was.       ft. ft. (2)       ft. (3)       (92-107 ft.)         SW-       SE       ''''''''''''''''''''''''''''''''''''  | RR#, St. Addres                         | s, B ox # Center for Recear<br>2385 Junto Hill St  | ch. Inc. 1930 Constant Ave      | 6.<br>045 D             | atum:                      | NAD83                 |                       |                            |
| 1 IOCATE WELL'S       4 DEPTH OF COMPLETED WELL       227       ft.         DOCATON       WELL'S CATCOMPLETED WELL       227       ft.         SECTION BOX:       WELL'S STATIC WATER LEVEL       243.07       ft. below land surface messured on mod/styre.         No       WELL'S STATIC WATER LEVEL       243.07       ft. below land surface messured on mod/styre.       90.01         No       WELL WATER TO BE USED AS: 5 Public water supply       8 Air conditioning will work water.       10 Insertion well       0 Device(specify below)         Section       1 Dimestic       3 Feedloi 6 Oil field water supply       9 Dewatering       0 Device(specify below)         Supple was submitted       0 Device 10 Department? Yes       No       1 Supple was submitted         Supple was submitted       0 Device 10 Department? Yes       No       1 Supple was submitted         OPVC 4 ABS       7 Fiberglass       Threaded       0 Device 10 Department? Yes       No       203         IPTPE OF SCLEND 08 EELFORATION MATERIAL       0 PVC 9 ABS       11 Obter (Specify)       203       203         1 Steel       1 RMP (SR)       6 Concrete life       KM (SR)       10 Absesso-Cemeet 12 None used (open hole)         2 VEE OF SCLEEND REELFORATION MATERIAL       0 PVC       9 ABS       11 Obter (Specify)         2 Bastat   | City, State, ZIP                        | Code Lawrence, KS 66   | 045-7562                        | ~~ _ c                  | Data Coll                  | ection Met            | hod: WAAS GP          | S Unit                     |
| LOCATION       Depth(s) Groundwater Encountered       (1)       194.72       ft.       (2)       ft.       (3)       08-31407       ft.         SECTION BOX:       N       WELL'S STATIC WATER LEVEL       245-357       ft. below land surface measured on modslay/r.       057-067-067       057   | <b>3 LOCATE WEL</b>                     | L'S 4 DEPTH OF COMP  | LETED WELL                      | 227                     |                            | ft.                   |                       |                            |
| WITH AN "X" IN<br>SECTION BOLTS STATIC WATER LEVEL.       243.95"       the low land surface measured on modify/r.       40.400         N       N       Pump test data: Well water was NCI Chocked ft. Alter.       hours pumping.       gpm         N       EX. Well water was  | LOCATION                                | Depth(s) Groundwater   | Encountered (1)                 | 134 742                 | ft.                        | 2)                    | ft. (3)               | 08.21.07 (1                |
| SECTION BOX:       Pump test dat: Well water was NOI Chickled ft after       hours pumping       gpm         -NWe       -NE       Filed Minore gam: Well water was       ft after       hours pumping       gpm         -SW-       -SE       Filed Minore gam: Well water was       ft after       hours pumping       gpm         -SW-       -SE       Filed Minore gam: Well water was       ft after ft hours pumping       gpm         -SW-       -SE       Filed Minore gam: Well water was       ft after ft hours pumping       gpm         -SW-       -SE       Filed Minore gam: Status       ft after ft hours pumping       gpm         -SW-       SE       Forder ft after ft   | WITH AN "X"                             | WELL'S STATIC W  | TER LEVEL 243                   | 97 n. F                 | clow lan                   | d surface me          | asured on molday      | Jur -07-10-07              |
| Ext. Vield Universe game: Well water was       f. after       hours pumping       gm         Well. WATER TO BE USED AS: 5 Public water supply       8 Ar conditioning       11 lejection well         SW-SH       5       Feedot       6 Oil field water supply       9 Dewatering       (i) Obter (Specify below)         SW-SH       5       Feedot       6 Oil field water supply       9 Dewatering       (i) Obter (Specify below)         Stripe of the supply of the  | SECTION BOX                             | Pump test dat  | a: Well water was NO            | t checked               | ft. after                  | a surrace me          | hours pumping         | gom                        |
| AW       NUL.       WELL WATER TO BE USED AS: 5 Public water supply       8 Air conditioning       11 lipection well         SW       S       Domestic       3 Feedlot       6 Oil field water supply       9 Dewatering       (2) Other (Specify below)         S       Sample was submitted       Domestic (law a garden) 10 Monitoring well       (2) Other (Specify below)       Viet result of the submitted       Desarting and the submitted       No       (2) Other (Specify below)         S TYPE OF CASING USED:       5 Wought Iron       8 Concrete tile       CASING JOINTS: Glued       (2) Clamped         (3) PVC       4 ABS       7 Fiberglass       Diameter       1.10       Ibs./ft. Wall thickness or gauge No.       203         TYPE OF CASING USED:       5 Fiberglass       (2) PVC       9 ABS       11 Oher (Specify)       203         Blank casing diameter       21 (2) in to 215 ft., Diameter       in. to       ft. Diameter       in. to       ft.         1 Destroy Barries       3 Sainles Steel       5 Fiberglass       (2) PVC       9 ABS       11 Oher (Specify)       203         2 Brank casing diameter       4 (2) All Steel (2) Concrete tile       8 KM (SR) 10 Asbestor-Crement 12 None used (spen hole)       2         2 Lowered shutter       4 Key punched (6 Wire wapped 7 Torch cut 9 Diilde holes 11 None (spen hole)       2   |   | Est. Yield Unknown gpr   | n: Well water was               |                         | ft. after                  |                       | hours pumping         | gpm                        |
| sum       1       Domestic       3       Feedlot       6       Oil field water supply       9       Dewatering       (12)       Observation         2       Irrigation       4       Industrial       7       Domestic (lawn & garden)       10       Menioring well       Observation         5       Sample was submitted       Water well disinfected?       Yes       No       If yes, mo/day/yrs         5       TYPE OF CASING USED:       5       Wrought from       8       Concrete tile       CASING JOINTS: Claud       Clamped         1       Steel       3       RMP (SR)       6       Asbestos-Cement       9       Other (specify below)       Welded        n <td>-NWNE-</td> <td>WELL WATER TO</td> <td>BE USED AS: 5 Pub</td> <td>lic water su</td> <td>ipply</td> <td>8 Air cond</td> <td>itioning 11 b</td> <td>njection well</td>   | -NWNE-                                  | WELL WATER TO  | BE USED AS: 5 Pub               | lic water su            | ipply                      | 8 Air cond            | itioning 11 b         | njection well              |
| _SWSE       2 Irrigation       4 Industrial       7 Domestic (lawn & garden)       10 Monitoring well       Obsorvation         _S       Sample was submitted       Water well disinfected?       No       If yes, mor/day/yrs         _S       Sample was submitted       Water well disinfected?       No       If yes, mor/day/yrs         _S       STYPE OF CASING USED:       S Wought Iron       8 Concrete tile       CASING JOINTS: Clied       Clamped         (3)       PVC       4 AbS       7 Fiberglass       In to       16 to       In to       16 to       16 to       16 to       Clamped       Threaded         Blank casing diameter       21 in to       215 ft., Diameter       in to       16 to       ft.       16 to       ft.       ft. <t< td=""><td>*      </td><td>E I Domestic 3</td><td>Feedlot 6 Oil fiel</td><td>d water sup</td><td>ply</td><td>9 Dewateri</td><td>ing (12) (</td><td>Other (Specify below)</td></t<>   | *                                       | E I Domestic 3   | Feedlot 6 Oil fiel              | d water sup             | ply                        | 9 Dewateri            | ing (12) (            | Other (Specify below)      |
| -SU-<br>3       Series a chemical/bacteriological sample submitted to Department? Yes       No       ✓ If yes, mordiay/yrs         Sample was submitted       Water well disinfected? Yes       No       ✓         5 TYPE OF CASING USED:       5 Wrought Iron       8 Concrete tile       CASING JOINTS: Clated       ✓ Clamped         0       PVC       4 ABS       7 Fiberglass       Threaded       Threaded         1       Steel 3       Stankassing dimeter       212;       in. 0       ft. Diameter       203       203       203       203       203       203       203       203       203       203       203       203       203       204       204       204       204       204       204       204       204       204       204       204       204       204   |   | 2 Irrigation 4   | Industrial 7 Domes              | tic (lawn &             | garden)                    | 10 Monitori           | ing well              | Observation                |
| Sample was submitted         Water well disinfected? Yes         No           5 TYPE OF CASING USED:         5 Wrought Iron         8 Concrete tile         CASING JOINTS: Glasd         Clamped           1 Steel         3 RMP (SR)         6 Asbestos-Cement         9 Other (specify below)         Welded         Threaded           0 PVC         4 ABS         7 Fiberglass         Threaded         In. to         ft. Diameter         in. to         ft. O           Casing height above land purface         24         in., weight         1.10         Ibs/ft. Wall thickness or gavge No.         203           1 PPE OF SCREEN OR PERFORATION MATERIAL:         0 PVC         9 ABS         11 Other (Specify)         203           2 Brias         Galvanida Steel         6 Concret tile         8 RM (SR)         10 Abestos-Cement         12 None (open hole)           2 Lowered shuter         4 Key punched         6 Wire wrapped         8 Sw Cut <sup>+</sup> 10 Other (Specify)           3 Standard Steel         6 Concret tile         8 RM (SR)         10 Abestos-Cement         1 None (open hole)           2 Lowered shuter         4 Key punched         6 Wire wrapped         7 Torch cut         9 Drilled holes         1 None (open hole)           3 Converted shuter         4 Key punched         6 Wire wrapped         1 Savd   | SWSE                                    | Was a chemical/bacte   | riological sample subm          | nitted to D             | epartmer                   | t? Yes                | No 🗸                  | If yes, mo/day/yrs         |
| 3       Simple was positive.       4       Construct use of the second                           |   | Sample was submitted   |                                 | Water w                 | ell disinf                 | ected? Yes            | No -                  | /                          |
| STYPE OF CASING USED:       5       Wrought from       8       Concrete tile       CASING JOINTS: Gladed       Clamped         1       Steel       3       RMP (SR)       6       Absotos-Cement       9       Other (specify below)       Welded       Threaded         2       PVC       4       ABS       7       Fiberglass       in. to       17       Display       Displ  | <u> </u>                                | Sample was submittee   |                                 | The second re-          |                            |                       |                       |                            |
| 1 Steel     3 RMP (SR)     6 Asbestos-Cernent     9 Other (specify below)     Weided       Ø PVC     4 ABS     7 Fiberglass     ft, Diameter     in. to     ft, Diameter     in. to     ft, Diameter       Blank casing diameter     2 12     in. to     2 15     ft, Diameter     in. to     ft, Diameter     in. to     ft, Diameter       I Steel     3 Stainless Steel     5 Fiberglass     Ø PVC     9 ABS     II Other (Specify)       2 Brass     4 Galvanized Steel     6 Concrete tile     R M(SR)     10 Asbestos-Cernent     12 None used (open hole)       7 REEN OR FERFORATION OPENINGS ARE:     1     1 Continuous slot     10 Mill slot     5 Gazed wrapped 7 Torch cut     9 Drilled holes     11 None (open hole)       2 Lowered shutter     4 Key pusched     6 Wize wrapped 7 Torch cut     9 Drilled holes     11 None (open hole)       2 Converted in the rest of the form     ft to     2 ft, From     ft. to     ft. ft.       GRAVEL PACK INTERVALS: From     215     ft. to     232     ft. From     ft. to     ft.       Grout Intervals:     From     ft. to     232     ft. From     ft. to     ft.     ft.       1 Septic tank     4 Lateral lines     7 Fibry 10 Livestock pres     13 Insecticid Storage     fib Other (specify       2 Severe lines   | 5 TYPE OF CAS                           | ING USED: 5 Wrough   | t Iron 8 Com                    | crete tile              |                            | CASING JO             | INTS: Glued           | Clamped                    |
| (1) PVC       4 ABS       7       Fibreglass         (2) Blank casing diameter       in. to       ft., Diameter       in. to       ft., Diameter       in. to       ft.         (2) Casing height above land surface       24       in., weight       1.10       Ibs:/ft. Wall thickness or gauge No.       203         (1) Statistical Stell       5       Fiberglass       (2) PVC       9       ABS       11       Other (Specify)         2       Brass       4       Galvanized Stell       6       Construct Et & RM (SR)       10       Asbestore-Centent       12       None used (open hole)         7. REEN OR PERFORATED INTERVALS: From       215       ft. to       225       ft. From       ft. to       ft. ft.         (2) Lowered shutter       4       Key punched       6       Wite wrapped       7       Torch cut       9       Dilled holes       11       None (open hole)         2       Lowered shutter       4       Key punched       6       Wite wrapped       7       Torch cut       9       Dilled holes       11       None (open hole)         2       Lowered shutter       14       Key punched       6       Wite wrapped       12       ft. ft.       ft.       ft.       ft.       ft.  | 1 Steel 3                               | RMP (SR) 6 Asbesto   | s-Cement 9 Othe                 | r (specafy              | below)                     |                       |                       |                            |
| Bink casing diameter 2 12 in, 10 215 fr. Diameter 10 0bc/ft. Wall thickness or gauge No. 203         TYPE OF SCREEN OR PERFORATION MATERIAL:         1 Seed 3 Stainless Steel 5 Fibergias         2 Brass 4 Galvanized Steel 6 Concrete tile 8 RM (SR) 10 Asbestos-Cement 12 None used (open hole)         ?REEN OR PERFORATION OPENINGS ARE:         1 Continuous side (3) Mill stot 5 Gauzed wrapped 7 Torch cut 9 Drilled holes 11 None (open hole)         ?REEN OR PERFORATION OPENINGS ARE:         1 Continuous side (3) Mill stot 5 Gauzed wrapped 7 Torch cut 9 Drilled holes 11 None (open hole)         ?ScreEn-PERFORATED INTERVALS: From 215 ft. to 225 ft., From ft. to ft.         From ft. to ft.         From ft. to ft.         GRAVEL PACK INTERVALS: From 185 ft. to 232 ft., From ft. to ft.         From ft. to ft.         From ft. to ft.         GROUT MATERIAL:         () Next Cement 2 Coment grout 3 Beatonite Other Bentonite Hotleplug         Grout Intervals:       From ft. to ft. prom ft. to ft. below)         1 Septic tank 4 Lateral finant 7 Pit privy       10 Livestock pens 13 Insecticide Storage (below)         1 Severe times 6 Seepage pit 9 Feedyard       12 Fertilizes Storage 15 Oil well/gas well         1 Settion from well?       LittholoCiC Loo       FROM 10 PLUGCING INTERVALS         1 Settion from well?       Sand and gravel, medium to fine       131 Insecticide Storage         1 Setion f   | (2) PVC 4                               | ABS 7 Fibergla   | SS ft Diameter                  |                         | to                         | 6 D.                  | Inteadiod             | in to 0                    |
| Caring, insight work intervalues for the second | Casing height above                     | land surface 24  | in weight 1.                    | 10 Ib                   | s./ft. Wa                  | II thicknes           | s or gauge No.        | 203                        |
| 1 Steel       3 Stainless Steel       5 Fibergiass       (7) PVC       9 ABS       11 Other (Specify)         2 Brass       4 Galvarized Steel       6 Concrete tile       8 RM (SR)       10 Asbestos-Cement       12 None used (open hole)         ?REEN OR PERFORATION OPENINGS ARE:       1 Continuous slot       1 Mill slot       5 Gauzed wrapped       7 Torch cut       9 Drilled holes       11 None (open hole)         2 Lowered shutter       4 Key punched       6 Wire wrapped       8 Saw Cut <sup>2</sup> 10 Other (Specify)         SCREEEN.PERFORATED INTERVALS: From       215 ft. to       223 ft., From       ft. to       ft.         GRAVEL PACK INTERVALS: From       185 ft. to       232 ft., From       ft. to       ft.         From       ft. to       ft., From       ft. to       ft.       ft.         GROUT MATERIAL:       (1) Next Cement       2 Cement grout       3 Bentonite       Other       Bentonite Hotleplug         Grout Intervals:       From       4 ft. to       185 ft., From       ft. to  | TYPE OF SCREEN                          | OR PERFORATION MAT   | RIAL:                           | 1                       |                            |                       | a an Banda russ '     | 10.00                      |
| 2       Brass       4 Galvanized Steel       6       Concrete tile       8       RM (SR)       10       Asbestos-Cement       12       None used (open hole)         'TREEN OR PERFORATION OPENINGS ARE::       1       Concrete tile       5       Saw Cut*       10       Other (Specify)         2       Louvered shutter       4       Key pusched       6       Wite wrapped       8       Saw Cut*       10       Other (Specify)         SCREEN-PERFORATED INTERVALS: From       215       ft. to       223       ft., From       ft. to       ft.         GRAVEL PACK INTERVALS: From       185       ft. to       232       ft., From       ft. to       ft.       ft.         Grout Intervals:       From       4       ft. 0       185       ft., From       ft. to       ft. to       ft. ft.         1 Septie tank       4       Lateral lines       7 Prip rivy       10       Livestock pens       13       Inscricide Storage       (B) Other (specify below)         2 Sewer lines       - 5       Cess pool       3       Sevage lagoon       11       Fuel storage       15       Oilder (specify below)         3       What is the nearest source of possible containination:       12       Fertilizer Storage       15  | 1 Steel                                 | Stainless Steel 5 Fib  | ergiass 7 PVC                   | 9 /                     | ABS                        | - 11                  | Other (Specify)       |                            |
| "CREEN OR PERFORATION OPENINGS ARE:<br>1 Continuous slot (1) Mill slot 5 Gauzed wrapped 7 Torch cut 9 Drilled holes 11 None (open hole)         2 Louvered shutter 4 Key punched 6 Wire wrapped 8 Saw Cut <sup>7</sup> 10 Other (Specify)         SCREEN-PERFORATED INTERVALS: From 215 ft to 7, From 1, to 1, 10 ft, From 1, to 1, 11 ft, 10 ft, From 1, to 1, 10 ft, From 0, ft, to 4, ft, What is the nearest source of possible confamination:         GROUT MATERIAL: (1) Neat Cement 2 Cement grout 3 Bentonite (4) Other Bentonite Holiophug         Grout Intervals: From 4 ft to 185 ft, From 1, From 0, ft, from 0, ft, to 4, ft, What is the nearest source of possible confamination:         Yeas the nearest source of possible confamination:         1 Septie tank 4 Lateral lines 7 Pit privy       10 Livestock pens 1 3 Insecticide Storage 160 Other (specify below many feet?         PROM       TO       LITHOLOGIC LOG         1 Storage pit 9 Feedyard       12 Ferdilizer Storage 15 Oil well/gas well         1 Storage 1 3 Topsoil       107 122       Sand and gravel, medium to fine         3 15 Clay, brown, silty, hard       122 Fillizer Storage 13 Oil well/gas well       None known         3 15 Clay, brown, silty, hard       122 Sand and gravel, medium to fin  | 2 Brass                                 | 4 Galvanized Steel 6 Co  | ncrete tile 🛛 🖇 RM (S           | R) 10                   | Asbestos-4                 | Cernent 12            | None used (open h     | ole)                       |
| 1       Continuous stot       (1) Mill stot       5       Gaubes wrapped       8       Saw Cut <sup>2</sup> 10       Other (Specify)         SCREEN-PERFORATED INTERVALS: From       215       ft. to       225       ft., From       ft. to       ft.         GRAVEL PACK INTERVALS: From       185       ft. to       225       ft., From       ft. to       ft.         GRAVEL PACK INTERVALS: From       ft. to       232       ft., From       ft. to       ft.         Grout Intervals:       From       ft. to       ft.       ft.       ft.       ft.         Grout Intervals:       From       4       ft.  | CREEN OR PERF                           | ORATION OPENINGS AR  | 6:<br>Communication of the test | Courts and              | 6 D.                       |                       |                       |                            |
| 2       Louvered shutter       4       Key pulsched       6       wite wrapped       8       Saw Cut       100 ther (specify)         SCREEN-PERFORATED INTERVALS: From       1215       ft to       2225       ft, From       ft to       ft.         GRAVEL PACK INTERVALS: From       185       ft to       232       ft, From       ft to       ft.         6       GROUT MATERIAL:       ()       Neat Cement 2       Cement grout       3 Bentonite       (4) Other       Bentonite Holeplug         Grout Intervals:       From       4       ft, ft, from       ft, ft, from       ft, ft, from       ft, to       ft,   | 1 Continuous                            | slot (3) Milli slot 5  | Gauzeo wrappeo 7 1              | Foren cut               | 9 Dn                       | lied holes            | 11 None (open hol     | e)                         |
| Scheener BRFORM 1201 Intervals:       From       1:0   | Z LOUVERED S                            | ATED DITERVALS: From   | 215 ft to                       | 225                     | 0.00                       | er (-specity)<br>Erom | <b>B</b> to           | 6                          |
| GRAVEL PACK INTERVALS: From       105       11. to   | SCREEN-FERFOR                           | From   |                                 | 220                     | ····· 6                    | From                  | ft 10                 | n.<br>()                   |
| From       ft. to       ft. to       ft. from       ft. to  | GRAVEL                                  | PACK INTERVALS: From   | 185 ft to                       | 232                     |                            | From                  | ft. to -              | £.                         |
| 6 GROUT MATERIAL:       (1) Neat Cement       2 Cement grout       3 Bentonite       (4) Other       Bentonite Holeplug         Grout Intervals:       From       4       ft to       185       ft, From       ft to       ft, From       0       ft to       ft t   |   | From   | ft. to                          |                         | ft.,                       | From                  | ft. to                | ft.                        |
| Grout Intervals:       From.       4       ft to       185       ft, From       ft to       ft, From       0       ft to       4       ft to         1 Septic tank       4 Lateral lines       7 Pit privy       10 Livestock pens       13 Insecticide Storage       16 Other (specify below)         2 Sewer lines       5 Cess pool       3 Sewage lagoon       11 Fuel storage       14 Abandoned water well       below)         0       3 Waterlight sewer lines       6 Seepage pit       9 Feedyard       12 Fertilizer Storage       15 Oil well/gas well       NOne known         0       3 Topsoil       107       122 Sand and gravel, medium to fine       131       Clay, tan and white, hard, silty, with streaks,         15       29       Clay, brown, silty, hard       122       133       Clay, tan and white, hard, and clay, white         29       38       Sand and gravel, medium to fine       131       133       135       Clay, tan and white, hard, and clay, white         71       Sand and gravel, medium to fine       133       135       Clay, tan and white, hard, and clay, white         71       Sand and gravel, medium to fine, with clay       151       153       Cernented sand, hard         79       86       Sand and gravel, medium to fine, with clay       151       153   | 6 GROUT MATE                            | RIAL: (1) Neat Cement 2  | Cement grout 3 Ben              | tonite (4)              | )Other                     |                       | <b>Bentonite Hole</b> | plug                       |
| Order Intervals       From the nearest source of possible contamination:       1 Service of possible contamination:       10 Livestock pens       13 Insecticide Storage       16 Other (specify below)         1 Service tank       4 Lateral lines       7 Pit privy       10 Livestock pens       13 Insecticide Storage       10 Other (specify below)         2 Sewer lines       • 5 Cess pool       8 Sewage lagoon       11 Fuel storage       14 Abandoned water well       None known         3 Watertight sewer lines       6 Seepage pit       9 Feedyard       12 Fertilizer Storage       15 Oil well/gas well       None known         0       3 Topsoil       107       122       Sand and gravel, medium to fine       13 Issecticide Storage       None known         3 15       Clay, brown, silty, hard       122       131       Clay, tan and white, hard, silty, with streaks, 15       29       Clay, light gray, hard       13 Issecticide Storage       None known         29       38       Sand and gravel, medium to fine       131       133       Sand and gravel, medium to fine         30       47       Clay, gray, hard       142       151       Sand and gravel, medium to fine         79       86       Sand and gravel, medium to fine, with clay       151       153       Cemented sand, hard, and clay, white         71       79  | Grout Intervale:                        | E 4 0.10   | 185 0 Emm                       | Ň                       |                            | 0 5                   |                       | A 4 A                      |
| 1 Septic tank       4 Lateral lines       7 Pit privy       10 Livestock pens       13 insecticade Storage       (16) Other (specify below)         2 Sewer lines       • 5 Cess pool       3 Sewage lagoon       11 Fuel storage       14 Abandoned water well       below)         3 Watertight sewer lines       6 Seepage pit       9 Feedyard       12 Fertilizer Storage       15 Oil well/gas well       NONe known         Direction from well?       How many feet?       FROM       TO       PLUGGING INTERVALS         0       3 Topsoil       107       122       Sand and gravel, medium to fine         3 15       Clay, brown, silty, hard       122       131       Clay, tan and white, hard, silty, with streaks,         15       29       Clay, light gray, hard       133       135       Clay, brown, hard         47       71       Sand and gravel, medium to fine       131       153       142       Cemented sand, hard, and clay, white         71       79       Clay, tan and white, hard       142       151       Sand and gravel, medium to fine         79       86       Sand and gravel, medium to fine, with clay       153       154       Sand and gravel, medium to fine, with clay         79       86       103       Clay, tan and white, hard, silty       154       161   | What is the nearest so                  | purce of possible contamination  |                                 |                         |                            | IL., F                | Tom                   |                            |
| 2 Sewer lines       * 5 Cess pool       3 Sewage lagoon       11 Fuel storage       14 Adaptate with the fuel is to age       14 Adaptate with the fuel is to age         3 Watertight sewer lines       6 Seepage pit       9 Feedyard       12 Fertilizer Storage       15 Oil well/gas well       None known         Direction from well?       ITHOLOGIC LOG       From TO       LTTHOLOGIC LOG       From TO       PLUGGING INTERVALS         0       3 Topsoil       107       122       Sand and gravel, medium to fine       131         15       29       Clay, light gray, hard       122       131       Clay, tan and white, hard, silty, with streaks, cemented sand         29       38       Sand and gravel, medium to fine       131       133       Sand and gravel, medium to fine         31       71       Sand and gravel, coarse to fine       135       142       Cemented sand, hard, and clay, white         71       79       Clay, tan and white, hard       142       151       Sand and gravel, medium to fine         78       86       Sand and gravel, medium to fine, with clay       151       153       Cemented sand, hard         103       107       Clay, tan and white, hard, silty       07       153       154       Sand and gravel, medium to fine, with clay         86       103  | 1 Septic tank                           | 4 Lateral lines 7  | Pit privy 10                    | ) Livestock             | pens                       | 13 Insectici          | de Storage            | (16) Other (specify below) |
| 3 Watertight sever lines       6 Seepage pit       9 Feedyard       11 Pertilizer Storage       15 Sonage       15 Sonage       16 Sonage         Direction from well?       To       LITHOLOGIC LOG       FROM       TO       PLUGGING INTERVALS         0       3 Topsoil       107       122       Sand and gravel, medium to fine         3 15       Clay, brown, silty, hard       122       131       Clay, tan and white, hard, silty, with streaks,         15       29       Clay, light gray, hard       133       133       Sand and gravel, medium to fine         38       47       Clay, gray, hard       133       135       Clay, brown, hard         47       71       Sand and gravel, coarse to fine       135       142       Cemented sand, hard, and clay, white         71       9       Clay, tan and white, hard       142       151       S and and gravel, medium to fine         79       86       Sand and gravel, medium to fine, with clay       151       153       Cemented sand, hard         103       107       Clay, tan and white, hard, silty       154       161       Clay, brown, hard, with gravel streaks, torwal, medium to fine, with clay         103       107       Clay, tan and white, hard, silty       07       153       154       S and and gravel, m   | 2 Sewer lines                           | S Cess pool 8  | Sewage lagoon 1                 | Fuel stora              | ige<br>Gwenner             | 14 Adando             | lieu water weil       | None known                 |
| Direction from wear       Total and gravel       LITHOLOGIC LOG       FROM       TO       PLUGGING INTERVALS         0       3       Topsoil       107       122       Sand and gravel, medium to fine         3       15       Clay, brown, silty, hard       122       131       Clay, tan and white, hard, silty, with streaks,         15       29       Clay, light gray, hard       122       131       Clay, tan and white, hard, silty, with streaks,         29       38       Sand and gravel, medium to fine       131       133       Sand and gravel, medium to fine         38       47       Clay, gray, hard       133       135       Clay, brown, hard         47       71       Sand and gravel, coarse to fine       135       142       Cemented sand, hard, and clay, white         71       79       Clay, tan and white, hard       142       151       Sand and gravel, medium to fine         79       86       Sand and gravel, medium to fine, with clay       151       153       Cemented sand, hard         103       107       Clay, tan and white, hard, silty       154       161       Clay, brown, hard, with gravel streaks         CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:       This water well was (1)       Ccenstructed)       (2)       reconstructed)       (   | 3 Watertight sewer                      | lines 6 Seepage pit 9  | Feedyard L                      | ow many                 | Storage<br>feet?           | 15 OII Well           | Bes well              |                            |
| 0       3       Topsoil       107       122       Sand and gravel, medium to fine         3       15       Clay, brown, silty, hard       122       131       Clay, tan and white, hard, silty, with streaks,         15       29       Clay, light gray, hard       122       131       Clay, tan and white, hard, silty, with streaks,         29       38       Sand and gravel, medium to fine       131       133       Sand and gravel, medium to fine         38       47       Clay, gray, hard       133       135       Clay, brown, hard         47       71       Sand and gravel, coarse to fine       135       142       Cemented sand, hard, and clay, white         71       79       Clay, tan and white, hard       142       151       Sand and gravel, medium to fine         79       86       Sand and gravel, medium to fine, with clay       151       153       Cemented sand, hard         103       107       Clay, tan and white, hard, silty       154       161       Clay, brown, hard, with gravel streaks         CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:       This water well was (1)       Ccenstructed)       (2)       reconstructed (3)       plugged         under my jurisdiction and was completed on (mo/day/year)       07-10-07       and this record is true to the best of my knowle  | FROM TO                                 | LITHOLOGIC L   | DG                              | FROM                    | TO                         |                       | PLUGGING INTE         | RVALS                      |
| 3       15       Clay, brown, silty, hard       122       131       Clay, tan and white, hard, silty, with streaks,         15       29       Clay, light gray, hard       131       133       Sand and gravel, medium to fine         38       47       Clay, gray, hard       133       135       Clay, brown, hard         47       71       Sand and gravel, coarse to fine       135       142       Cemented sand, hard, and clay, white         71       79       Clay, tan and white, hard       142       151       S and and gravel, medium to fine         79       86       Sand and gravel, medium to fine, with clay       151       153       Cemented sand, hard         79       86       Sand and gravel, medium to fine, with clay       151       153       Cemented sand, hard         86       103       Clay, white, hard, with streaks, comented sand       streaks, brown       streaks, brown         103       107       Clay, tan and white, hard, silty       154       161       Clay, brown, hard, with gravel streaks         CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:       This water well was (1)       Coenstructed)       (2) reconstructed       (3) plugged         under my jurisdiction and was completed on (mo/day/year)       07:10-07       and this record is true to the bet of my knowledge and belief.  | 0 3                                     | Topsoil  |                                 | 107                     | 122                        | Sand and              | gravel, medium        | n to fine                  |
| 15       29       Clay, light gray, hard       Cemented sand         29       38       Sand and gravel, medium to fine       131       133       Sand and gravel, medium to fine         38       47       Clay, gray, hard       133       135       Clay, brown, hard         47       71       Sand and gravel, coarse to fine       135       142       Cemented sand, hard, and clay, white         71       79       Clay, tan and white, hard       142       151       Sand and gravel, medium to fine         79       86       Sand and gravel, medium to fine, with clay       151       153       Cemented sand, hard         103       107       Clay, tan and white, hard, silty       154       161       Clay, brown, hard, with gravel streaks, torown         103       107       Clay, tan and white, hard, silty       154       161       Clay, brown, hard, with gravel streaks         CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:       This water well was (1)       Constructed)       (2) reconstructed       (3) plugged         under my jurisdiction and was completed on (mo/day/year)       07:10-07       and this record is true to the best of my knowledge and belief.         Kansas Water Well Contractor's License No       185       This Water Well Record was completed on (mo/day/year)       07:10-07         U   | 3 15                                    | Clay, brown, silty, hard   |                                 | 122                     | 131                        | Clay, tan             | and white, hard       | silty, with streaks,       |
| 29       38       Sand and gravel, medium to fine       131       133       Sand and gravel, medium to fine         38       47       Clay, gray, hard       133       135       Clay, brown, hard         47       71       Sand and gravel, coarse to fine       135       142       Cemented sand, hard, and clay, white         71       79       Clay, tan and white, hard       142       151       S and and gravel, medium to fine         79       86       Sand and gravel, medium to fine, with clay       151       153       Cemented sand, hard         103       107       Clay, tan and white, hard, silty       154       161       Clay, brown, hard, with gravel streaks, brown         103       107       Clay, tan and white, hard, silty       154       161       Clay, brown, hard, with gravel streaks         CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:       This water well was (1)       Coenstructed)       (2) reconstructed       (3) plugged         under my jurisdiction and was completed on (mo/day/year)       07-10-07       and this record is true to the best of my knowledge and belief.         Kansas Water Well Contractor's License No       185       This Water Well Record was completed on (mo/day/year)       07-10-07         Under the busineess name of Clarke Well & Equipment, Inc.       by (signature)       by (signature)   | 15 29                                   | Clay, light gray, hard   |                                 |                         |                            | cementer              | d sand                |                            |
| 38       47       Clay, gray, hard       133       135       Clay, brown, hard         47       71       Sand and gravel, coarse to fine       135       142       Cemented sand, hard, and clay, while         71       79       Clay, tan and white, hard       142       151       S and and gravel, medium to fine         79       86       Sand and gravel, medium to fine, with clay       151       153       Cemented sand, hard         103       107       Clay, tan and white, hard, silty       154       161       Clay, brown, hard, with gravel, medium to fine, with clay         103       107       Clay, tan and white, hard, silty       154       161       Clay, brown, hard, with gravel streaks         CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:       This water well was (I)       Coenstructed)       (2) reconstructed       (3) plugged         under my jurisdiction and was completed on (mo/day/year)       07-10-07       and this record is true to the best of my knowledge and belief.         Kansas Water Well Contractor's License No       185       This Water Well Record was completed on (mo/day/year)       07-10-07         Under the business name of Clarke Well & Equipment, Inc.       by (signature)       by (signature)       07-11-07         INSTRUCTIONS:       Use typewriter or ball point pen. <u>PLEdSE PRESE FIMMLY</u> and <u>PENT</u> clearly. Please fill in bl   | 29 38                                   | Sand and gravel, medium  | n to fine                       | 131                     | 1.33                       | Sand and              | gravel, mediun        | n to fine                  |
| 47       71       Sand and gravel, coarse to time       135       142       Cemented sand, hard, and clay, white         71       79       Clay, tan and white, hard       142       151       Sand and gravel, medium to fine         79       86       Sand and gravel, medium to fine, with clay       151       153       Cemented sand, hard, and clay, white         79       86       Sand and gravel, medium to fine, with clay       151       153       Cemented sand, hard         86       103       Clay, white, hard, with streaks, comented sand       153       154       S and and gravel, medium to fine, with clay         86       103       Clay, thite, hard, silty       154       161       Clay, brown, hard, with gravel streaks         103       107       Clay, tan and white, hard, silty       154       161       Clay, brown, hard, with gravel streaks         103       107       Clay, tan and white, hard, silty       154       161       Clay, brown, hard, with gravel streaks         103       107       Clay, tan and was completed on (mo/day/year)       07-10-07       and this record is true to the best of my knowledge and belief.         Kansas Water Well Contractor's License No.       185       This Water Well Record was completed on (mo/day/year)       07-11-07         Under the business name of Clarke Well & Equipm   | 38 47                                   | Clay, gray, hard   | 10 fo a                         | 133                     | 1:35                       | Clay, bro             | wn, hard              |                            |
| 11       13       Cearry, tail and white, hand       142       101       Saind and gravel, medium to fine         79       86       Sand and gravel, medium to fine, with clay       151       153       Cemented sand, hard         86       103       Clay, white, hard, with streaks, comented sand       153       154       S and and gravel, medium to fine, with clay         103       107       Clay, this, hard, with streaks, comented sand       153       154       S and and gravel, medium to fine, with clay         103       107       Clay, tai and white, hard, silty       154       161       Clay, brown, hard, with gravel streaks         CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:       This water well was (1) constructed       (2) reconstructed (3) plugged         under my jurisdiction and was completed on (mo/day/year)       07-10-07       and this record is true to the best of my knowledge and belief.         Kansas Water Well Contractor's License No.       185       This Water Well Record was completed on (mo/day/year)       07-11-07         Under the business name of Clarke Well & Equipment, Inc.       by (signature)       by (signature)       07-11-07         INSTRUCTIONS:       Use typewriter or ball point pen. <u>EL645E PEGSF FIRMUT</u> and <u>PEMT</u> clearly. Please fill in blanks, underline or circle the correct answers. Scad top three copies to Kansas Department of Health and Environment. Bureau of Water, Geology S bection, 1000 SW Jac  | 47 71                                   | Sand and gravel, coarse  | to tine                         | 135                     | 142                        | Cemente<br>Sand acc   | o sand, hard, ar      | id clay, white             |
| 103         103         104 <td>79 86</td> <td>Sand and gravel medium</td> <td>n to fine, with day</td> <td>151</td> <td>153</td> <td>Cemente</td> <td>d sand, hard</td> <td>no me</td>  | 79 86                                   | Sand and gravel medium   | n to fine, with day             | 151                     | 153                        | Cemente               | d sand, hard          | no me                      |
| 86         103         Clay, while, hard, with streaks, commented sand         streaks, brown           103         107         Clay, tan and while, hard, silly         154         161         Clay, brown, hard, with gravel streaks           103         107         Clay, tan and while, hard, silly         154         161         Clay, brown, hard, with gravel streaks           CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:         This water well was (1)         constructed         (2) reconstructed         (3) plugged           under my jurisdiction and was completed on (mo/day/year)         07-10-07         and this record is true to the best of my knowledge and belief.           Kansas Water Well Contractor's License No.         185         This Water Well Record was completed on (mo/day/year)         07-11-07           Under the business name of Clarke Well & Equipment, Inc.         by (signature)         by (signature)         07-11-07           INSTRUCTIONS:         Use typewriter or ball point pen. <u>ELEGES FIRMLY</u> and PSDT clearly. Please fill in blanks, underline or circle the correct answers. Scad top three copies to Kansas Department of Health and Environment, Bureau of Water, Geology Section, 1000 SW Jackson St., Suite 420, Topeka, Kansas 66612-1367. Telephone           78:-296-2522. Send one to WATER WELL OWNER and retain one for your records. Fee of \$5.00 for each constructed well.         vell.         vell.         vell.         vell.         vell.         vell.         vell.  | 10 00                                   | streaks, tan   | and the start                   | 153                     | 154                        | Sand and              | gravel, medium        | to fine, with clay         |
| 103         107         Clay, tan and white, hard, silty         154         161         Clay, brown, hard, with gravel streaks           CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:<br>under my jurisdiction and was completed on (mo/day/year)         This water well was (1)         constructed)         (2) reconstructed         (3) plugged           Kansas Water Well Contractor's License No.         185         This Water Well Record was completed on (mo/day/year)         07-10-07         and this record is true to the best of my knowledge and belief.           Under the business name of Clarke Well & Equipment, Inc.         by (signature)         07-11-07         07-11-07           INSTRUCTIONS: Use typewriter or ball point pen. <u>ELEASE PRESS FIRME</u> and PSIME and PSIME and PSIME Greaty. Please fill in blanks, underline or circle the correct answers. Scad top three copies to Kansas Department of Health and Environment, Bureau of Water, Geology Section, 1000 SW Jackson St., Suite 420, Topeka, Kansas 66612-1367. Telephone           78:-296-5232. Send one to WATER WELL OWNER and retain one for your records. Fee of \$5.00 for each constructed well.         vell.         vell.  | 86 103                                  | Clay, white, hard, with streaks  | cemented sand                   |                         |                            | streaks, k            | brown                 | , to halo, maroloy         |
| CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed (2) reconstructed (3) plugged under my jurisdiction and was completed on (mo/day/year)         under my jurisdiction and was completed on (mo/day/year)       07-10-07       and this record is true to the best of my knowledge and belief.         Kansas Water Well Contractor's License No.       185       This Water Well Record was completed on (mo/day/year)       07-11-07         Under the business name: of Clarke Well & Equipment, Inc.       by (signature)       07-11-07         INSTRUCTIONS: Use typewriter or ball point pen. <u>PLEASE PRESS FIRM()</u> and PSDT clearly. Please fill in blanks, undefine or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Geology Section, 1000 SW Jackson SL, Suite 420, Topeka, Kansas 66612-1367. Telephone         78:-296-5322. Send one to WATER WELL OWNER and retain one for your records. Fee of \$5.00 for each constructed well.   | 103 107                                 | Clay, tan and white, hard  | l, siity                        | 154                     | 161                        | Clay, bro             | wn, hard, with g      | ravel streaks              |
| under my jurisdiction and was completed on (mo/day/year)<br>Kansas Water Well Contractor's License No. 185<br>Under the business name of Clarke Well & Equipment, Inc. by (signature)<br>INSTRUCTIONS: Use typewriter or ball point pen. <u>PLEASE PRESS FIRM</u> () and PSDT clearly. Please fill in blanks, underline or circle the correct answers. Send top three<br>copies to Kansas Department of Health and Environment, Bureau of Water, Geology Section, 100 SW Jackson SL, Suite 420, Topeka, Kansas 66612-1367. Telephone<br>782-296-5522. Send one to WATER WELL OWNER and retain one for your records. Fee of \$5.00 for each constructed well.   | CONTRACTOR                              | 'S OR LANDOWNER'S CI   | ERTIFICATION: T                 | his water w             | ell was (l                 | construct             | ed (2) reconstru      | acted (3) plugged          |
| Kansas: Water Well Contractor's License No.       185       This Water Well Record was completed on Pho/day/year       03211-07         Under the business name of Clarke Well & Equipment, Inc.       by (signature)       0511-07         INSTRUCTIONS: Use typewriter of ball point pen. <u>PL645E PESSF FIRMEr</u> and <u>PENF</u> clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Geology Section, 1000 SW Jackson SL, Suite 420, Topeka, Kansas 66612-1367. Telephone 785-296-5522. Send one to WATER WELL OWNER and retain one for your records. Fee of \$5.00 for each constructed well.   | under my jurisdiction                   | and was completed on (mo/day   | /year) 07-10-0                  | and                     | this record                | is true to the        | e best of my knowle   | dge and belief.            |
| Under the business name of Clarke Well & Equipment, Inc. by (signature)<br>INSTRUCTIONS: Use typewriter or ball point pen. <u>PLEASE PRESS FIRMLY</u> and <u>PRINT</u> clearly. Please fill in blanks, underline or circle the correct answers. Scid top three<br>copies to Kansas Department of Health and Environment, Bureau of Water, Geology Section, 1000 SW Jackson SL, Suite 420, Topeka, Kansas 66612-1367. Telephone<br>782-296-5322. Send one to WATER WELL OWNER and retain one for your records. Fee of \$5.00 for each constructed well.   | Kansas Water Well (                     | Contractor's License No.   | 165 This Water                  | well Recon              | d was con                  | pieled on the         | o'day/year)           | 211-07                     |
| copies to Kansas Department of Health and Environment, Bureau of Water, Geology Section, 1000 SW Jackson SL, Suite 420, Topeka, Kansas 66612-1367. Telephone<br>785-296-522. Send one to WATER WELL OWNER and retain one for your records. Fee of \$5.00 for each constructed well.  | Under the business n                    | ame of Clarke Well & Equip   | FRESS FIRMLY and PROFES         | by (si<br>learly, Plear | ghature)<br>se fill in bla | nks, underline        | or circle the comment | Swers Send too three       |
| 785-296-5522. Send one to WATER WELL OWNER and retain one for your records. Fee of \$5.00 for each constructed well.   | copies to Kansas Depart                 | ment of Health and Environment, B  | ureau of Water, Geology See     | ction, 1000 S           | W Jackson                  | SL, Suite 420,        | Topeka, Kansas 6661   | 2-1367. Telephone          |
|  | 785-296-5522. Send on                   | e to WATER WELL OWNER and  | retain one for your records.    | Fec of \$5.00           | for each go                | nstructed well.       |                       |                            |

| A REAL PROPERTY AND A REAL  | ATER WELL:   | Fraction   | Section Nu   | mber   | Cownship Number  | Range Number  |
|---|--|--|--|--|--|---|
| County: Scott   |  | NE 1/4 NE 1/4 NE   | 1/4 1  |  | r 18 s   | R 33 E (W   |
| Distance and direction  | from nearest town or city str  | ect address of well if locat   | ed Global Pos  | itioning S   | ystems (decimal degi   | rees, min. of 4 digits)   |
| within city? Approxit   | mately 2 1/2 miles nort  | n or Scott City  | Latitude:  | 38.525   | 51   |   |
| WATER WELL OF   | WNER: Mewersity of Kans  | Kansas Geological Sur  | Longitude  | : -100.s   | 100705   |   |
| RR#, St. Address, B   | ox N Center ID Research  | th, Inc.1930 Constant Ave.   | Datum  | NAD83  | /////  |   |
| City, State, ZIP Cod  | e 2385 loving Hill Ro<br>Lawrence, KS 66   | 045-7563   | Data Coll  | ection Me  | thod: WAAS GPS   | S Unit  |
| LOCATE WELL'S   | 4 DEPTH OF COMPI   | LETED WELL   |  | ſt.  |  |   |
| LOCATION  | Denth(s) Groundwater   | Encountered (1)  | ft. (  | 2)   | ft. (3)  | 0   |
| WITH AN "X" IN  | WELL'S STATIC WA   | TER LEVEL  | ft. below land   | surface n  | ressured on mo/day   | dur   |
| SECTION BOX:  | Pump test data   | a: Well water was  | ft. after  |  | hours pumping  | gpm   |
|   | Est. Yieldgpn  | n: Well water was  | ft. after  |  | hours pumping  |   |
| NWNE  | WELL WATER TO B  | BE USED AS: 5 Public   | c water supply   | 8 Air cor  | ditioning 11 Ir  | njection well   |
| [E  | 1 Domestic 3   | Feedlot 6 Oil field  | water supply   | 9 Dewate   | aring 12 O   | ther (Specify below)  |
|   | 2 Irrigation 4   | Industrial 7 Domesti   | c (lawn & garden)  | 10 Monito  | ring well  |   |
| SWSE  | Was a chemical/bacter  | iological sample submit  | tted to Departmen  | t? Yes   | No I   | f yes, mo/day/yrs   |
|   | Sample was submitted   |  | Water well disinf  | ected? Ye  | s No   |   |
| 5 TYPE OF CASING  | USED 5 Wrought   | t Iron 8 Concr   | ete tile C   | ASING J  | OINTS: Glued   | Clamped   |
| Steel 3 RM  | MP (SR) 6 Asbestos   | s-Cement 9 Other   | (specify below)  |  | Welded   |   |
| 2 PVC 4 A   | BS 7 Fibergla  | 55   |  |  | Threaded   |   |
| Blank casing diameter   | in. to   | ft., Diameter  | in. to   | ñ., D  | iameter  | in. to ft.  |
| Casing height above lan   | d surface  | in., weight  | lbs./ft. Wa  | ll thickne   | ss or gauge No.  |   |
| TYPE OF SCREEN OF   | PERFORATION MATE   | RIAL:<br>rolass 7 PVC  | 9 ABS  |  | Other (Specify)  |   |
| 2 Brees 4 C   | caluonized Steel 6 Con   | crete tile 8 RM (SR  | ) 10 Ashestos-0  | Cement 12  | None used (open h  | ole)  |
| CREEN OR PERFOR   | ATION OPENINGS ARE   | kiele nie – v kan (ok.   | ) 10 /1000000  | Jennens 11   | . Home used (open in   | oic)  |
| 1 Continuous slot   | t 3 Mill slot 5  | Gauzed wrapped 7 To  | rch cut 9 Dri  | lied holes   | 11 None (open hol  | c)  |
| 2 Louvered shutter  | er 4 Keypunched 6  | Wire wrapped 8 Sa  | w Cut 10 Oth   | er (Specify  | )  |   |
| SCREEN-PERFORAT   | ED INTERVALS: From   | fL to  | ft., l   | From   | ft. to   | ft.   |
|   | From   | ft. 10   | fL, I  | From   | ft. to   |   |
| CD LUET DI  | W DETERMANCE Content   | 6  | 0  | Canada   | <b>D</b> 1-1   |   |
| GRAVEL PAC  | CK INTERVALS: From<br>From   | ft. to   | ft., l<br>ft., l   | From   | ft. to'  | ι.<br>ft.   |
| GRAVEL PAC  | CK INTERVALS: From<br>From   | ft. to<br>ft. to<br>Cement grout 3 Bento   | ft., 1<br>ft., 1<br>nite 4 Other   | From<br>From   | ft. to'<br>fL to   | ft.<br>ft.<br>ft.   |
| GRAVEL PAC  | CK INTERVALS: From<br>From<br>IL: 1 Neat Cement 2  | ft. to<br>ft. to<br>Cement grout 3 Bento   | ft., i<br>ft., i<br>nite 4 Other   | From   | ft. to'<br>ft. to  | n.<br>ft.<br>ft.  |
| GRAVEL PAC<br>6 GROUT MATERIA<br>Grout Intervals: 1<br>What is the nearest source   | CK INTERVALS: From<br>From<br>IL: 1 Neat Cement 2<br>From ft. to<br>of possible concarmination:  | ft. to<br>ft. to<br>Cement grout 3 Bento<br>   | ft.,  <br>ft.,  <br>nite 4 Other<br>ft. to   | From<br>From<br>ft.,   | ft. to<br>ft. to   | ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.             |
| GRAVEL PAC  | CK INTERVALS: From<br>From<br>LL: 1 Neat Cement 2<br>From ft to<br>e of possible contamination:<br>4 Lateral lines 7   | ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10  | ft., 1<br>ft., 1<br>nite 4 Other<br>ft. to<br>Livestock pens   | From<br>From<br>ft.,<br>13 Insecti   | ft. to<br>ft. to<br>From   | ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.      |
| GRAVEL PAC<br>6 GROUT MATERIA<br>Grout Intervals: 1<br>What is the nearest source<br>1 Septic tank<br>2 Sewer lines   | CK INTERVALS: From<br>From<br>LL: 1 Neat Cement 2<br>From ft to<br>c of possible contamination:<br>4 Lateral lines 7<br>5 Cess pool 8<br>6 Seenage nit 0   | ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>2   | ft., 1<br>ft., 1<br>ft. t. 1<br>ft. to<br>Livestock pens<br>Fuel storage<br>Eastiliars Storage   | From<br>From<br>ft.,<br>13 Insecti<br>14 Aband<br>15 Oil we                                      | fL to<br>fL to<br>fL to<br>From<br>cide Storage<br>oned water well<br>alf/oas well   | ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.      |
| GRAVEL PAC<br>6 GROUT MATERIA<br>Grout Intervals: 4<br>What is the nearest source<br>1 Septic tank<br>2 Sewer lines<br>3 Watertight sewer lines<br>1 Direction from well?   | L: 1 Neat Cement 2<br>From ft to<br>e of possible contamination:<br>4 Lateral lines 7<br>5 Cess pool 8<br>5 6 Seepage pit 9  | ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Ho   | ft., 1<br>ft., 1<br>ft. to<br>Livestock pens<br>Fuel storage<br>Fertilizer Storage<br>w many feet?   | From<br>From<br>13 Insecti<br>14 Aband<br>15 Oil we  | fL to<br>fL to<br>fL to<br>From<br>cide Storage<br>oned water well<br>il/gas well  | ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.      |
| GRAVEL PAC<br>GROUT MATERIA<br>Grout Intervals: )<br>What is the nearest source<br>1 Septic tank<br>2 Sewer lines<br>3 Watertight sewer line:<br>Direction from well?<br>FROM TO  | LTHOLOGIC LC   | ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Ho<br>XG   | ft., 1<br>ft., 1<br>ft. to<br>ft. to<br>Livestock pens<br>Fuel storage<br>Fertilizer Storage<br>w many feet?<br>FROM TO  | From<br>From<br>13 Insecti<br>14 Aband<br>15 Oil we  | fL to<br>fL to<br>fL to<br>From<br>cide Storage<br>oned water well<br>al/gas well<br>PLUGGING INTE   | ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.      |
| GRAVEL PAC<br>6 GROUT MATERIA<br>Grout Intervals: )<br>What is the nearest source<br>1 Septic tank<br>2 Sewer lines<br>3 Watertight sewer lines<br>Direction from well?<br>FROM TO<br>161 174 Sa  | LTHOLOGIC LC<br>and and gravel, medium   | ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Ho<br>XG<br>10 fine, cemented,   | ft., 1<br>ft., 1<br>ft. to<br>ft. to<br>Livestock pens<br>Fuel storage<br>Fertilizer Storage<br>w many feet?<br>FROM TO  | From<br>From<br>ft.,<br>13 Insecti<br>14 Aband<br>15 Oil we                                      | fL to<br>fL to<br>fL to<br>From<br>cide Storage<br>oned water well<br>all/gas well<br>PLUGGING INTE  | ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.      |
| GRAVEL PAC<br>GROUT MATERIA<br>Grout Intervals:<br>What is the nearest source<br>1 Septic tank<br>2 Sewer lines<br>3 Watertight sewer lines<br>Direction from well?<br>FROM TO<br>161 174 Sa<br>ha  | CK INTERVALS: From<br>From<br>LI: 1 Neat Cement 2<br>From ft to<br>e of possible contamination:<br>4 Lateral lines 7<br>5 Cess pool 8<br>6 Seepage pit 9<br>LITHOLOGIC LC<br>and and gravel, medium<br>rd, with clay streaks, w  | ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Ho<br>XG<br>10 fine, cemented,<br>hite   | ft., 1<br>ft., 1<br>ft. to<br>ft. to<br>Livestock pens<br>Fuel storage<br>Fertilizer Storage<br>w many feet?<br>FROM TO  | From<br>From<br>13 Insecti<br>14 Aband<br>15 Oil we  | fL to<br>fL to<br>fL to<br>From<br>cide Storage<br>oned water well<br>il/gas well<br>PLUGGING INTE   | ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.      |
| GRAVEL PAC<br>6 GROUT MATERIA<br>Grout Intervals:<br>What is the nearest source<br>1 Septic tank<br>2 Sewer lines<br>3 Watertight sewer lines<br>Direction from well?<br>FROM TO<br>161 174 Sa<br>174 196 Sa<br>100 50 50 50 50 50 50 50 50 50 50 50 50 5   | CK INTERVALS: From<br>From<br>L: 1 Neat Cement 2<br>From ft to<br>e of possible contamination:<br>4 Lateral lines 7<br>5 Cess pool 8<br>6 Seepage pit 9<br>LITHOLOGIC LC<br>and and gravel, medium<br>rd, with clay streaks, w<br>and and gravel, coarse l   | ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Feedyard 12<br>NO<br>OG<br>to fine, cemented,<br>hite<br>to fine   | ft.,<br>ft.,<br>ft.,<br>ft. to<br>ft. to<br>Livestock pens<br>Fuel storage<br>Fertilizer Storage<br>w many feet?<br>FROM TO  | From<br>From<br>13 Insecti<br>14 Aband<br>15 Oil we  | fL to<br>fL to<br>fL to<br>From<br>cide Storage<br>oned water well<br>all/gas well<br>PLUGGING INTE  | ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.      |
| GRAVEL PAC<br>6 GROUT MATERIA<br>Grout Intervals:<br>What is the nearest source<br>1 Septic tank<br>2 Sewer lines<br>3 Watertight sewer lines<br>Direction from well?<br>FROM TO<br>161 174 Se<br>174 196 Se<br>196 213 CE  | CK INTERVALS: From<br>From<br>IL: 1 Neat Cement 2<br>From ft to<br>e of possible contamination:<br>4 Lateral lines 7<br>5 Cess pool 8<br>6 Seepage pit 9<br>LITHOLOGIC LC<br>and and gravel, medium<br>rd, with clay streaks, w<br>and and gravel, coarse i<br>ay, white, hard, with gravel  | ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Feedyard 12<br>Ho<br>OG<br>to fine, cemented,<br>hite<br>to fine<br>avel streaks   | ft.,<br>ft.,<br>ft.,<br>ft. to<br>ft. to<br>Livestock pens<br>Fuel storage<br>Fertilizer Storage<br>w many feet?<br>FROM TO  | From<br>From<br>13 Insecti<br>14 Aband<br>15 Oil we  | fL to<br>fL to<br>fL to<br>fL to<br>From<br>cide Storage<br>oned water well<br>all/gas well<br>PLUGGING INTE   | ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.      |
| GRAVEL PAC<br>6 GROUT MATERIA<br>Grout Intervals:<br>1 Septic tank<br>2 Sewer lines<br>3 Watertight sewer line:<br>Direction from well?<br>FROM TO<br>161 174 Sa<br>174 196 Sa<br>196 213 Cl<br>218 Cl<br>218 223 Sever<br>196 223 Sever<br>196 223 Sever<br>196 223 Sever<br>196 223 Sever<br>196 223 Sever<br>197 200 Sever<br>197 2 | CK INTERVALS: From<br>From<br>L: 1 Neat Cement 2<br>From ft to<br>e of possible contamination:<br>4 Lateral lines 7<br>5 Cess pool 8<br>6 Seepage pit 9<br>LITHOLOGIC LC<br>and and gravel, medium<br>rd, with clay streaks, w<br>and and gravel, coarse I<br>ay, white, hard, with gra<br>ay, tannish yellow, hard<br>and gravel medium   | ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Ho<br>OG<br>to fine, cemented,<br>hite<br>to fine<br>avel streaks<br>to fine   | ft.,<br>ft.,<br>ft.,<br>ft. to<br>ft. to<br>Livestock pens<br>Fuel storage<br>Fertilizer Storage<br>w many feet?<br>FROM TO  | From<br>From<br>13 Insecti<br>14 Aband<br>15 Oil we  | fL to<br>fL to<br>fL to<br>fL to<br>fL to<br>fL to<br>fL to<br>fL to<br>fL<br>fL to<br>fL<br>fL to<br>fL<br>fL to<br>fL<br>fL to<br>fL<br>fL to<br>fL | ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.      |
| GRAVEL PAC<br>6 GROUT MATERIA<br>Grout Intervals:<br>1 Septic tank<br>2 Sewer lines<br>3 Watertight sewer line<br>Direction from well?<br>FROM TO<br>161 174 Sa<br>174 196 Sa<br>196 213 Cl<br>213 218 Cl<br>218 223 Sa   | CK INTERVALS: From<br>From<br>L: 1 Neat Cement 2<br>From ft to<br>e of possible contamination:<br>4 Lateral lines 7<br>5 Cess pool 8<br>6 Seepage pit 9<br>LITHOLOGIC LC<br>and and gravel, medium<br>rd, with clay streaks, wi<br>and and gravel, coarse I<br>ay, white, hard, with gra<br>ay, tannish yellow, hard<br>and and gravel, medium<br>eathered shale, soft   | ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Ho<br>OG<br>to fine, cemented,<br>hite<br>to fine<br>avel streaks<br>in to fine  | ft.,<br>ft.,<br>ft.,<br>ft. to<br>ft. to<br>Livestock pens<br>Fuel storage<br>Fertilizer Storage<br>w many feet?<br>FROM TO  | From<br>From<br>13 Insecti<br>14 Aband<br>15 Oil we  | fL to<br>fL to<br>fL to<br>fL to<br>From<br>cide Storage<br>oned water well<br>all/gas well<br>PLUGGING INTE   | ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.      |
| GRAVEL PAC<br>6 GROUT MATERIA<br>Grout Intervals:<br>1 Septic tank<br>2 Sewer lines<br>3 Watertight sewer line<br>Direction from well?<br>FROM TO<br>161 174 Sa<br>174 196 Sa<br>196 213 Cl<br>213 218 Cl<br>213 228 W<br>223 228 W   | CK INTERVALS: From<br>From<br>L: 1 Neat Cement 2<br>From ft. to<br>e of possible contamination:<br>4 Lateral lines 7<br>5 Cess pool 8<br>6 Seepage pit 9<br>LITHOLOGIC LC<br>and and gravel, medium<br>rd, with clay streaks, wi<br>and and gravel, coarse 1<br>ay, white, hard, with gra<br>ay, tannish yellow, hard<br>and gravel, medium<br>eathered shale, soft<br>nale, dark gray, hard   | ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Ho<br>OG<br>to fine, cemented,<br>hite<br>to fine<br>avel streaks<br>in to fine  | ft.,<br>ft.,<br>ft.,<br>ft. to<br>ft. to<br>Livestock pens<br>Fuel storage<br>Fertilizer Storage<br>w many feet?<br>FROM TO  | From<br>From<br>13 Insecti<br>14 Aband<br>15 Oil we  | fL to<br>fL to<br>fL to<br>fL to<br>fL to<br>fL to<br>fL to<br>fL to<br>fL<br>fL to<br>fL<br>fL to<br>fL<br>fL to<br>fL<br>fL to<br>fL<br>fL to<br>fL | ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.      |
| GRAVEL PAC<br>6 GROUT MATERIA<br>Grout Intervals:<br>What is the nearest source<br>1 Septic tank<br>2 Sewer lines<br>3 Watertight sewer line<br>Direction from well?<br>FROM TO<br>161 174 Sa<br>174 196 Sa<br>196 213 Cli<br>213 218 Cli<br>213 228 Wi<br>223 528 Wi<br>228 232 Sh   | CK INTERVALS: From<br>From<br>L: 1 Neat Cement 2<br>From ft. to<br>e of possible contamination:<br>4 Lateral lines 7<br>5 Cess pool 8<br>6 Seepage pit 9<br>LITHOLOGIC LC<br>and and gravel, medium<br>rd, with clay streaks, wi<br>and and gravel, coarse 1<br>ay, white, hard, with gra<br>ay, tannish yellow, hard<br>and and gravel, medium<br>eathered shale, soft<br>nale, dark gray, hard   | ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Ho<br>OG<br>to fine, cemented,<br>hite<br>to fine<br>avel streaks<br>to fine   | ft.,<br>ft.,<br>ft.,<br>ft. to<br>ft. to<br>Livestock pens<br>Fuel storage<br>Fertilizer Storage<br>w many feet?<br>FROM TO  | From<br>From<br>13 Insecti<br>14 Aband<br>15 Oil we  | fL to<br>fL to<br>fL to<br>fL to<br>fL to<br>fL to<br>fL to<br>fL<br>fL to<br>fL<br>fL<br>fL<br>fL<br>fL<br>fL<br>fL<br>fL<br>fL<br>fL<br>fL<br>fL<br>fL   | It.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>f |
| GRAVEL PAC<br>6 GROUT MATERIA<br>Grout Intervals:<br>What is the nearest source<br>1 Septic tank<br>2 Sewer lines<br>3 Watertight sewer line<br>Direction from well?<br>FROM TO<br>161 174 Sa<br>174 196 Sa<br>196 213 Cl<br>213 218 Cl<br>213 218 Cl<br>223 Sa<br>228 W2<br>228 232 Sh   | CK INTERVALS: From<br>From<br>L: 1 Neat Cement 2<br>From ft. to<br>e of possible contamination:<br>4 Lateral lines 7<br>5 Cess pool 8<br>6 Seepage pit 9<br>LITHOLOGIC LC<br>and and gravel, medium<br>rd, with clay streaks, wi<br>and and gravel, coarse 1<br>ay, white, hard, with gra<br>ay, tannish yellow, hard<br>and and gravel, medium<br>eathered shale, soft<br>nale, dark gray, hard   | ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Ho<br>NG<br>to fine, cemented,<br>hite<br>to fine<br>avel streaks<br>to to fine  | ft.,<br>ft.,<br>ft.,<br>ft. to<br>ft. to<br>Livestock pens<br>Fuel storage<br>Fertilizer Storage<br>w many feet?<br>FROM TO  | From<br>From<br>13 Insecti<br>14 Aband<br>15 Oil we  | ft. to<br>ft. to<br>ft   | ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.      |
| GRAVEL PAC<br>6 GROUT MATERIA<br>Grout Intervals:<br>1 Septic tank<br>2 Sewer lines<br>3 Watertight sewer line<br>Direction from well?<br>FROM TO<br>161 174 Sa<br>174 196 Sa<br>196 213 Cli<br>213 218 Cli<br>213 218 Cli<br>213 228 Wi<br>223 528 Wi<br>228 232 Sh<br>CONTR - CROTOR  | CK INTERVALS: From<br>From<br>L: 1 Neat Cement 2<br>From ft. to<br>e of possible contamination:<br>4 Lateral lines 7<br>5 Cess pool 8<br>6 Seepage pit 9<br>LITHOLOGIC LC<br>and and gravel, medium<br>rd, with clay streaks, w<br>and and gravel, medium<br>rd, with clay streaks, w<br>and and gravel, medium<br>ay, tannish yellow, hard<br>and and gravel, medium<br>eathered shale, soft<br>nale, dark gray, hard   | ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Ho<br>OG<br>to fine, cemented,<br>hite<br>to fine<br>avel streaks<br>to fine<br>DTIFICATION  | ft.,<br>ft.,<br>ft.,<br>ft. to<br>ft. to<br>Livestock pens<br>Fuel storage<br>Fertilizer Storage<br>w many feet?<br>FROM TO  | From<br>From<br>13 Insecti<br>14 Aband<br>15 Oil we  | ft. to<br>ft. to<br>ft   | II. ft. ft. ft. ft. ft. ft. ft. ft. ft. ft                              |
| GRAVEL PAC  | CK INTERVALS: From<br>From<br>L: 1 Neat Cement 2<br>From ft. to<br>e of possible contamination:<br>4 Lateral lines 7<br>5 Cess pool 8<br>6 Seepage pit 9<br>LITHOLOGIC LC<br>and and gravel, medium<br>rd, with clay streaks, w<br>and and gravel, medium<br>rd, with clay streaks, w<br>and and gravel, medium<br>eathered shale, soft<br>nale, dark gray, hard<br>DR LANDOWNER'S CE<br>was completed on (moday   | ft. to<br>ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Ho<br>OG<br>to fine, cemented,<br>hite<br>to fine<br>avel streaks<br>to fine<br>Streaks<br>S<br>The fine<br>Cement of the streaks<br>S<br>The fine<br>Cement of the streaks<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S | ft., 1 ft | From<br>From<br>13 Insecti<br>14 Aband<br>15 Oil we  | ft. to<br>ft.  | It.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>f |
| GRAVEL PAC<br>6 GROUT MATERIA<br>Grout Intervals:<br>What is the nearest source<br>1 Septic tank<br>2 Sewer lines<br>3 Watertight sewer line<br>Direction from well?<br>FROM TO<br>161 174 Se<br>196 213 Cli<br>213 218 Cli<br>218 223 Se<br>223 228 W<br>223 228 W<br>228 232 Sh<br>CONTRACTOR'S C<br>under my jurisdiction and<br>Kansas Water Well Control   | CK INTERVALS: From<br>From<br>L: 1 Neat Cement 2<br>From ft. to<br>e of possible contamination:<br>4 Lateral lines 7<br>5 Cess pool 8<br>6 Seepage pit 9<br>LITHOLOGIC LC<br>and and gravel, medium<br>rd, with clay streaks, w<br>and and gravel, medium<br>rd, with clay streaks, w<br>and and gravel, medium<br>ay, tannish yellow, hard<br>and and gravel, medium<br>eathered shale, soft<br>hale, dark gray, hard<br>DR LANDOWNER'S CE<br>4 was completed on (mo/day<br>ractor's License No.                            | ft. to<br>ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Ho<br>OG<br>to fine, cemented,<br>hite<br>to fine<br>avel streaks<br>to fine<br>RTIFICATION: Thi<br>Vyear) 07-10-07<br>This Water W  | ft., ft., ft., i<br>ft., i<br>ft. o<br>ft. to<br>Livestock pens<br>Fuel storage<br>Fertilizer Storage<br>w many feet?<br>FROM TO<br>FROM TO<br>i<br>s water well was (1)<br>and this record<br>fell Record was com   | From<br>From<br>13 Insecti<br>14 Aband<br>15 Oil we  | ft. to<br>ft. to   | It.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>f |
| GRAVEL PAC  | CK INTERVALS: From<br>From<br>L: 1 Neat Cement 2<br>From ft. to<br>e of possible contamination:<br>4 Lateral lines 7<br>5 Cess pool 8<br>6 Seepage pit 9<br>LITHOLOGIC LC<br>and and gravel, medium<br>rd, with clay streaks, w<br>and and gravel, medium<br>rd, with clay streaks, w<br>and and gravel, medium<br>ray, tannish yellow, hard<br>and and gravel, medium<br>eathered shale, soft<br>hale, dark gray, hard<br>DR LANDOWNER'S CE<br>4 was completed on (mo/day<br>ractor's License No.<br>of Clarke Well & Equip | ft. to<br>ft. to<br>ft. to<br>Cement grout 3 Bento<br>ft., From<br>Pit privy 10<br>Sewage lagoon 11<br>Feedyard 12<br>Ho<br>DG<br>to fine, cemented,<br>hite<br>to fine<br>avel streaks<br>to fine<br>Streaks<br>S<br>to fine<br>RTIFICATION: This<br>Water With the fill<br>to fine   | ft.,<br>ft.,<br>ft.,<br>ft. to<br>ft. to<br>ft. to<br>Livestock pens<br>Fuel storage<br>Fertilizer Storage<br>w many feet?<br>FROM TO<br>swater well was (1)<br>and this record<br>to record was com<br>by (signature)   | From<br>From<br>13 Insecti<br>14 Aband<br>15 Oil we<br>construe<br>is true to t<br>platest on (n | ft. to<br>ft. to   | It.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>ft.<br>f |

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| 159<br>WATEF  | 8726<br>WELL   | Site #1 OBGMD-4<br>RECORD  | Corrected Co<br>Form WWC-      | gу           | Division      | of Water     | Resources; App. No.       |                          |
|---|--|--|--------------------------------|--------------|---------------|--------------|---------------------------|--------------------------|
| 1 LOCA  | TION OF  | WATER WELL:  | Fraction                       |              | Section N     | umber        | Township Number           | Range Number             |
| Coun  | County: Thomas NW 1/4 NW 1/4 NW 1/4  |  |                                |              |               |              | T 9 S                     | R 33 E (W                |
| Distan  | Distance and direction from nearest town or city street address of well if located |  |                                |              |               |              | Systems (decimal deg      | grees, min. of 4 digits) |
| within city? Approximatory i minor here a minor freet of balacy |  |  |                                |              | Latitude:     | 39.2         | 1 018504                  |                          |
| 2 WATE  | ER WELI  | OWNER: University of Ka  | Ansas Geological               | Survey       | Elevation     |              | nown                      |                          |
| RR#,  | St. Addres   | s, Box # Center for Bea  | earch, Inc. 1930 Constant Av   | e.           | Datum:        | NAD8         | 3                         |                          |
| City,   | State, ZIP   | Code 2385 Joing Hill   | 66045-7503                     | 045          | Data Col      | lection 1    | Method: WAAS GP           | 'S Unit                  |
| 3 LOCA  | TE WEL   | L'S 4 DEPTH OF COM   | APLETED WELL                   | 28           | 6             | ft.          |                           |                          |
| LOC   | ATION  | Depth(s) Groundwa  | ter Encountered (1)            |              | ft.           | (2)          | ft. (3)                   | ft.                      |
| SECT  |  | WELL'S STATIC  | WATER LEVEL 213.               | .67 ft       | below lan     | d surface    | e measured on mo/da       | v/vr 07-03-07            |
| JECI  | N  | Pump test  | data: Well water was No        | t checke     | d ft. after.  |              | hours pumping.            | gpm                      |
| ×   |  | Est. Yield Unknown   | gpm: Well water was            |              | ft. after     |              | hours pumping.            | gpm                      |
| NW  | / NE   | WELL WATER TO  | O BE USED AS: 5 Put            | olic water   | supply        | 8 Air o      | conditioning 11           | njection well            |
| *   |  | E I Domestic   | 3 Feedlot 6 Oil fie            | ld water s   | upply         | 9 Dew        | ratering (12) (           | Other (Specify below)    |
|   |  | 2 Irrigation   | 4 Industrial 7 Dome            | stic (lawn   | & garden)     | 10 Mon       | itoring well              | Observation              |
| -SW   | SE   | Was a chemical/ba  | cteriological sample subr      | nitted to    | Departmen     | nt? Yes      | No 🗸                      | If yes, mo/day/yrs       |
|   |  | Sample was submit  | ted                            | Water        | well disin    | fected?      | Yes No                    | /                        |
| C TVD   | S<br>E OE CAS  | TNC USED: 5 Wrow   | ight Iron & Con                | crete tile   |               | CASING       | IOINTS: Glued             | Clamped                  |
| SIT   | E OF CAS   | RMP(SR) 6 Asbe   | stos-Cement 9 Oth              | er (specif   | v below)      | 0/10/110     | Welded                    | Y Clamped                |
| Ó   | PVC 4  | ABS 7 Fiber  | glass                          | or (opeon    | .,,           |              | Threaded                  | i                        |
| Blank ca  | sing diame   | ter 2 1/2 in. to 2   | 74 ft., Diameter               | i            | n. to         | ft.,         | Diameter                  | in. to ft.               |
| Casing h  | eight abov   | e land surface 24  | in., weight 1.                 | 10           | lbs./ft. Wa   | all thick    | ness or gauge No.         | .203                     |
| TYPE O  | F SCREEN   | OR PERFORATION MA  | TERIAL:                        | 0            | ADC           |              | 11 Other (Creek)          |                          |
| 1   | Steel  | 3 Stainless Steel 5  | Concergiass () PVC             | 9<br>10      | ABS           | C            | 11 Other (Specify)        |                          |
|   | U OD DEDI  | 4 Galvanized Steel 6   | PF.                            | SK) 10       | Aspestos-     | Cement       | 12 None used (open )      | noie)                    |
| , l   | Continuou  | s slot (3) Mill slot   | 5 Gauzed wrapped 7             | Torch cut    | 9 Dr          | illed hole   | s 11 None (open ho        | le)                      |
| 2   | Louvered :   | shutter 4 Key punched  | 6 Wire wrapped 8               | Saw Cut      | 10 Oth        | her (Speci   | ify)                      |                          |
| SCREEN  | N-PERFOR   | ATED INTERVALS: Fro  | m 274 ft. to                   | 28           | 4 ft.,        | From         | ft. to                    | ft.                      |
|   |  | Fro  | m ft. to                       |              | ft.,          | From         | ft. to                    | ft.                      |
|   | GRAVEL   | PACK INTERVALS: Fro  | m 250 ft. to                   | 28           | 4 ft.,        | From         | ft. to-                   | ft.                      |
| CODOT   |  | Procession Procession  | 0m II. 10                      | 7            |               | From         | It. to                    | tt.                      |
| 6 GROI  | UT MATE  | RIAL: Neat Cement  | 2 Cement grout 3 Ber           | tonite (     | 4)Other       |              | Bentonite Hole            | piug                     |
| Grout In<br>What is a   | ntervals:  | From 4 ft. to  | 25 ft., From                   |              | ft. to        | f            | t., From 0                | ft. to4ft.               |
| 1 Septi   | c tank   | 4 Lateral lines  | 7 Pit privy 1                  | 0 Livesto    | ck pens       | 13 Inse      | cticide Storage           | (16) Other (specify      |
| 2 Sewe  | er lines   | 5 Cess pool  | 8 Sewage lagoon 1              | 1 Fuel sto   | rage          | 14 Aba       | ndoned water well         | None known               |
| 3 Wate  | rtight sewer   | lines 6 Seepage pit  | 9 Feedyard                     | 2 Fertiliz   | er Storage    | 15 01        | well/gas well             | NOLIC KIOWI              |
| Direction   | n from wel   |  | 10G                            | FROM         |               | 1            | PLUGGING INT              | EDVAIS                   |
| - ROM   | 10   | Tonsoil  |                                | 157          | 161           | Sand         | and gravel coarse         | to fine with streaks     |
| 3   | 7  | Clay, dark gray, hard  |                                |              | 101           | cemer        | nted sand                 | to fine, whith succars   |
| 7   | 37   | Clay, tan, soft, silty   |                                | 161          | 169           | Clay,        | brown, sandy, hard        |                          |
| 37  | 51   | Clay, white, sandy, har  | ď                              | 169          | 176           | Ceme         | nted sand, hard           |                          |
| 51  | 62   | Clay, tannish white, ha  | rd, with gravel streaks,       | 176          | 201           | Sand a       | nd gravel, coarse to fine | , table chatter          |
|   |  | medium to fine   | a la Gas latta atait           | 201          | 211           | Clay,        | tan, hard, with stream    | aks, sand and            |
| 62  | 103  | Sand and gravel, coan  | se to fine, table chatter      | 214          | 217           | grave        | i, 50/50 mix              |                          |
| 103   | 129  | ciay, requisit brown, s  | anuy, with graver              | 211          | 217           | Sand         | and gravel modium         | n to fine with clay      |
| 129   | 145  | Sand and gravel, medi  | um to fine                     |              | 200           | streak       | s. white                  | n to nine, with day      |
| 145   | 157  | Clay, tan, hard  |                                | 1            |               |              |                           |                          |
| CON   | TRACTO   | 'S OR LANDOWNER'S  | CERTIFICATION: 1               | his water    | well was (1   | ) const      | ructed (2) reconstru      | ucted (3) plugged        |
| under m   | y jurisdictio  | n and was completed on (mo/  | day/year) 07-03-0              | 7 ar         | d this record | d is true to | o the best of my knowle   | edge and belief.         |
| Kansas  | Water Well   | Contractor's License No.   | 185 This Water                 | Well Rec     | ord was con   | pletod on    | (mo/day/year)             | 17-10-07                 |
| Under th  | e business r   | ame of Clarke Well & Eq  | uipment, Inc.                  | by (         | signature)    | 8 da         | ul w Ch                   | 2                        |
| copies to   | LIIONS: Use<br>Kansas Depar  | typewriter or ball point pen. <u>PL</u><br>tment of Health and Environment | I, Bureau of Water, Geology Se | ction, 1000  | SW Jackson    | St., Suite   | 420, Topeka, Kansas 6661  | 2-1367. Telephone        |
| 785.706.4   | S22 Sendo  | WATER WELL OWNER   | nd retain one for your records | Fee of \$5.0 | 0 for each co | instructed v | well                      |                          |

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| 160<br>WATER            | 8726<br>WELL             | Site #1 OBGMD-4 (Cont'd) Corrected Copy<br>FCORD Form WWC-5 Division of Water Resources; App. No.  |
|-------------------------|--------------------------|--|
| 1LOCA                   | TION OF                  | WATER WELL: Fraction Section Number Township Number Range Number   |
| County                  | y: Thoma                 | s NW 1/4 NW 1/4 NW 1/4 33 T 9 S R 33 E (W  |
| Distanc                 | e and direc              | on from nearest town or city street address of well if located<br>winately 8 miles west and 7 miles porth of Opklay  |
| within                  | city? Appl               | Latitude: 39.234500  |
| 2 WATE                  | RWELL                    | OWNER: University of Kansase Kansas Geological Survey Elevation: Unknown   |
| RR#, 1                  | St. Addres               | Box # Center for Research, Inc. 1930 Constant Ave.<br>Datum: NAD83   |
| City, S                 | State, ZIP               | Code : 2385 Towng Hill Read Lawrence, KS 66045-7563 Data Collection Method: WAAS GPS Unit  |
| 3 LOCA                  | TE WEL                   | 'S 4 DEPTH OF COMPLETED WELL ft.   |
| LOCA                    | TION                     | Depth(s) Groundwater Encountered (1) ft (2) ft (3) ft  |
| WITH                    | AN "X"                   | N WELL'S STATIC WATER LEVEL ft below land surface measured on molday/yr  |
| SECT                    | ION BOX                  | Pump test data: Well water was ft. after hours pumping gpm   |
|                         | <u> </u>                 | Est. Yield   |
| NW                      | NE                       | WELL WATER TO BE USED AS: 5 Public water supply 8 Air conditioning 11 Injection well   |
| w                       | · -                      | E         I         Domestic         3         Feedlot         6         Oil field water supply         9         Dewatering         12         Other (Specify below)  |
|                         | 1                        | 2 Irrigation 4 Industrial 7 Domestic (lawn & garden) 10 Monitoring well  |
| sw-                     | SE                       | Was a chemical/bacteriological sample submitted to Department? Yes No If yes, mo/day/yrs   |
|                         |                          | Sample was submitted Water well disinfected? Yes No  |
|                         | S                        | ALC YOUR 5 Wrought Iron & Concrete tile CASING IOINITS Glued Clamped   |
| 5 TYPE                  | COF CAS                  | NG USED: 5 Wrought from 8 Concrete the CASING JOINTS, Glued Clamped  |
| 20                      | VC 4                     | ARS 7 Fiberglass Threaded  |
| Blank cas               | sing diame               | er in. to ft., Diameter in. to ft., Diameter in. to ft.  |
| Casing he               | ight above               | land surface in., weight lbs./ft. Wall thickness or gauge No.  |
| TYPE OF                 | SCREEN                   | OR PERFORATION MATERIAL:   |
| 1                       | Steel                    | Stainless Steel 5 Floerglass 7 FVC 9 Abs 11 Outer (specify)  |
| CREEN                   | OR PERF                  | ORATION OPENINGS ARE:  |
| 1                       | Continuous               | slot 3 Mill slot 5 Gauzed wrapped 7 Torch cut 9 Drilled holes 11 None (open hole)  |
| 2                       | Louvered s               | utter 4 Key punched 6 Wire wrapped 8 Saw Cut 10 Other (Specify)  |
| SCREEN                  | -PERFOR                  | ATED INTERVALS: From ft. to ft., From ft. to ft.   |
|                         |                          | From ft. to ft., From ft. to ft.   |
|                         | GRAVEL                   | ACK INTERVALS: From II. to II., From II. to II.  |
| 6 CROU                  | TMATE                    | PIAL + 1 Next Cement 2 Cement grout 3 Bentonite A Other  |
| UGROU                   | IMALE                    | dad. I hear content 2 centent grout 5 bentonne 4 Outer   |
| Grout In<br>What is the | tervals:<br>he nearest s | From   |
| 1 Septio                | tank                     | 4 Lateral lines 7 Pit privy 10 Livestock pens 13 Insecticide Storage 16 Other (specify   |
| 2 Sewer                 | rlines                   | 5 Cess pool 8 Sewage lagoon 11 Fuel storage 14 Abandoned water well celow)   |
| 3 Water                 | from well                | ines 6 Seepage pit 9 Feedyard 12 Ferdizet Stolage 15 on the gas then   |
| FROM                    | TO                       | LITHOLOGIC LOG FROM TO PLUGGING INTERVALS  |
| 260                     | 270                      | Clay, tan, hard, with gravel streaks, medium   |
|                         |                          | to fine, 50/50 mix   |
| 270                     | 272                      | Cemented sand, with clay streaks   |
| 272                     | 284                      | Clay, tan, naro, with sand and gravel,   |
| 284                     | 294                      | Shale weathered green, gray, hard  |
|                         | 2.04                     | childer in contract Brown Brown Brown  |
|                         |                          |  |
|                         |                          |  |
|                         |                          |  |
| L CONT                  | DACTOR                   | IS OP LANDOWNED'S CERTIFICATION. This water will be a first and the second seco |
| under my                | jurisdictio              | and was completed on (mo/day/year) 07-03-07 and this record is true to the best of my knowledge and belief.  |
| Kansas V                | Vater Well               | contractor's License No. 185 This Water Well Record was completed on mo/day/year) 07-10-07   |
| Under the               | e business n             | ime of Clarke Well & Equipment, Inc. by (signature) Carles W Clarke  |
| INSTRUC                 | TIONS: Use               | typewriter or ball point pen. <u>PLEASE PRESS FIRMLY</u> and <u>PRINT</u> clearly. Please fill in blanks, underline or circle the correct answers. Send top three or of Health and Environment. Buteau of Water, Geology Section, 1000 SW Jackson St., Suite 420, Topeka, Kansas 66612-1167, Talanbook   |
| 785-296-5               | 522. Send or             | to WATER WELL OWNER and retain one for your records. Fee of \$5.00 for each constructed well.  |

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# GMD3 - Haskell County Natural Gamma (Smoothed)

GMD3 - Haskell County Resistivity





GMD1 - Scott County Natural Gamma (Smoothed)

GMD1 - Scott County Resistivity





GMD4 - Thomas County Natural Gamma (Smoothed)



