STATE OF SOUTH DAKOTA
M. Michael Rounds, Governor

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Steven M. Pirner, Secretary

DIVISION OF FINANCIAL AND TECHNICAL ASSISTANCE
David Templeton, Director

GEOLOGICAL SURVEY PROGRAM
Derric L. Iles, State Geologist

OPEN-FILE REPORT 91-UR

RESULTS OF AN AQUIFER TEST AT VERMILLION, SOUTH DAKOTA

by

TOM RICH

Akeley-Lawrence Science Center
University of South Dakota
Vermillion, South Dakota

2006

GEOLOGICAL SURVEY PROGRAM

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
AKELEY-LAWRENCE SCIENCE CENTER
414 EAST CLARK STREET
VERMILLION, SOUTH DAKOTA 57069-3290
(605) 677-5227

Derric L. Iles, M.S.	State Geologist
Sarah A. Chadima, M.S.	Senior Geologist
Timothy C. Cowman, M.S.	Natural Resources Administrator
Brian A. Fagnan, M.S.	Geologist
Dragan Filipovic, M.S.	Senior Hydrologist
Thomas N. Haggar, B.S.	Geologist
Ann R. Jensen, B.S.	Senior Geologist
Matthew T. Noonan, B.S.	Hydrologist
Thomas B. Rich, M.S.	Senior Hydrologist
Layne D. Schulz, B.S.	Senior Geologist
Dennis W. Tomhave, B.A.	Geology Specialist
Dennis D. Iverson	Civil Engineering Technician
Gary W. Jensen	Civil Engineering Technician
Scott W. Jensen	Civil Engineering Technician
Ted R. Miller	Natural Resources Technician
Colleen K. Odenbrett	Word Processing Supervisor
Lori L. Roinstad	Cartographer
Priscilla E. Young, B.S.	Senior Secretary

RAPID CITY REGIONAL OFFICE
2050 WEST MAIN, SUITE 1
RAPID CITY, SOUTH DAKOTA 57702-2493
(605) 394-2229

Mark D. Fahrenbach, Ph.D.	Senior Geologist
Kelli A. McCormick, Ph.D.	Senior Geologist
J. Foster Sawyer, Ph.D.	Hydrology Specialist

CONTENTS

Page

INTRODUCTION 1

HYDROGEOLOGIC SETTING 1

THE AQUIFER TEST 2

METHODOLOGY 2

RESULTS AND INTERPRETATION 3

SUMMARY 6

REFERENCES 8

FIGURES

1. Map of the study area

2. Locations of wells

3. Cross section A-A’

4. Cross section B-B’

5. Total drawdown versus distance from the pumping well

TABLES

1. Schedule for pumping and measurement of water levels

2. Aquifer parameters calculated form water level drawdown data

APPENDICES

A. Field data

B. Key to analytical solutions

C. Results of analyses of aquifer test data using AQTESOLV software

INTRODUCTION

From June 2 through June 4, 2003, the Geological Survey Program, South Dakota Department of Environment and Natural Resources, conducted an aquifer test within the city of Vermillion's well field in cooperation with the city of Vermillion. The well field is located in N½ sec. 24, T. 92 N., R. 52 W. in southwestern Vermillion (figs. 1 and 2). The test consisted of an initial non-pumping phase during which water levels were allowed to recover to equilibrium or near equilibrium conditions, a second phase that consisted of pumping one municipal well, and a third phase during which water levels were again allowed to recover. The purpose of the test was to assess and characterize the general hydraulic properties of the aquifer in the Vermillion well field in an effort to assist the city in determining any appropriate modifications to its wellhead protection area.

HYDROGEOLOGIC SETTING

Vermillion is located in southern Clay County adjacent to, and in, the Missouri River valley (fig. 1). Surface sediments in the part of Vermillion occurring in the Missouri River valley are composed primarily of overbank deposits (figs. 3 and 4). These overbank deposits are up to 65 feet thick and are composed of clay and silt with minor amounts of sand (Christensen, 1967). They extend from the edge of the bluff southward to approximately one-third mile south of the Vermillion River. In this area, the overbank deposits comprise an aquitard above the underlying outwash. Within the immediate well field area, these generally fine-grained sediments are thickest to the north and west and become thinner to the south and east. The water table occurs in the fine-grained overbank deposits at a depth of about 16 feet immediately south of the bluff (Zutz, 2003).

Most of Vermillion occurs on uplands to the north of the Missouri River valley. Surface sediments on the uplands are composed primarily of loess-mantled till that is about 120 feet thick (Christensen, 1967). Christensen indicates the loess to range in thickness from 0 to 15 feet. Thus, there may be areas where loess is absent resulting in till being the surface sediment. The narrow bluff separating the Missouri River valley from the uplands is mapped as having till as the surface sediment (Christensen, 1967). The till is generally considered to be a unit of low permeability and forms an aquitard above the underlying outwash.

All areas of Vermillion are underlain at depth by outwash (sand and gravel), as indicated in figures 3 and 4, that was deposited by glacial meltwater (Christensen, 1967). The outwash that underlies the overbank sediments in the Missouri River valley is named the Missouri aquifer. The outwash that underlies the till in the bluff and uplands is named the Lower-Vermillion-Missouri aquifer. However, these two named aquifers are in direct hydraulic connection, occur at essentially the same elevation, act as a single water-bearing unit, and are referred to in this report as outwash. The outwash thickness in the well field ranges from about 55 to 76 feet.

The Graneros Shale directly underlies the outwash in the part of Vermillion that occurs in the Missouri River valley (Tomhave and Schulz, 2004). In Clay County, the Graneros Shale is

less than 30 feet thick (Christensen, 1967). The Dakota Formation, a source of artesian water, directly underlies the Graneros Shale.

Vermillion's well field is located within the city limits and mostly in the Missouri River valley (figs. 1 and 2). All except one of Vermillion's water supply wells is completed in the Missouri aquifer. The lone exception is the water-supply well identified as #6-Active, which is located on the bluff between the valley and the uplands. This well is completed in the Lower-Vermillion-Missouri aquifer.

Considering the outwash may be confined or partially confined in and immediately surrounding Vermillion's well field, the recharge to the outwash in the well field is primarily from lateral inflow. Recharge may also be from upward flow/leakage from the underlying Dakota Formation (Jorgensen, 1960). Some discharge from the outwash in the vicinity of the well field is into the Vermillion River. Farther away, some discharge from the Missouri aquifer would be into the Missouri River. However, during times of high stream flow, the rivers may be sources of recharge to the outwash. Water is also discharged from the outwash by lateral flow through the well field area and through pumping of wells.

THE AQUIFER TEST

Water-level data were collected from all eight wells shown on figure 2. These data are included in this report in appendix A. The water supply wells are 12 inches in diameter. The screen lengths of these wells range from 12 to 22 feet, only partially penetrating the full thickness of the aquifer (figs. 3 and 4). Well #3-Active was the only well that was pumped during the pumping phase of the study. All available wells were used to observe the development of the cone of depression induced by pumping and the deterioration of the cone of depression during the two non-pumping/recovery phases of the aquifer test. The test was conducted according to the schedule presented in table 1. The duration of the initial non-pumping phase was 13 hours, during which time the ground water was allowed to stabilize to equilibrium conditions, or near equilibrium conditions. The potentiometric surface of the outwash determined from water levels in the wells at equilibrium conditions is shown on figures 3 and 4. The subsequent pumping phase during which the cone of depression developed around the pumping well was 24 hours in duration. Finally, the second non-pumping, or recovery, phase lasted 4 hours. The pumping rate during the pumping phase of the test was kept steady at 520 gallons per minute and pumped water was discharged into the city's water storage facilities. Distances from the pumping well to the observation wells (non-pumping production wells or former production wells) ranged from 76 to 1,079 feet (table 2).

METHODOLOGY

AQTESOLV, a software program for determining aquifer parameters, was used to analyze aquifer test data.. Data were collected at pumping well #3-Active, and at observation wells #1-Inactive, #2-Active, #3-Inactive, #4-Active, #4-Inactive, and #6-Active. The data from well

#5-Active was not used to determine aquifer parameters due to the inaccurate and imprecise pressure gauge that was used to collect data from that well.

Both the Hantush-Jacob solution for leaky confined aquifers and the Thiem solution were applied to the drawdown data collected during the aquifer test. The Hantush-Jacob solution can be applied to non-equilibrium or unsteady flow conditions while the Thiem solution applies to equilibrium or steady-state flow conditions. The drawdown data indicate that equilibrium or steady-state flow conditions were reached, or nearly reached, in the aquifer by the conclusion of the aquifer test. However, a determination of equilibrium conditions being reached, or not, cannot be reliably made due to the short duration of the test and because of the uncertainties introduced by multiple field personnel making measurements on a given well. Thus, both Hantush-Jacob and Thiem solutions were applied to the data.

The Hantush-Jacob solution for leaky confined aquifers provided a good fit to the data using the AQTESOLV software. The formula for the Hantush-Jacob solution, along with the conditions assumed to exist when using this solution under ideal circumstances, is listed in appendix B. All conditions ideally assumed to exist are actually seldom, if ever, met in the course of conducting aquifer tests. As not all the assumptions listed in appendix B apply to the city's well field, the results of the calculations must be considered to be approximations.

Calculations for transmissivity using the Thiem equation for steady-state radial flow to wells in confined aquifers were performed manually. Storativity cannot be calculated using the Thiem solution. The formula for the Thiem solution, along with the conditions assumed to exist under ideal circumstances, is listed in appendix B. As with the Hantush-Jacob solution, not all of these conditions apply to the city's well field, and the results must be considered to be approximations.

A semi-log plot of the total drawdown occurring during the pumping phase of the test versus distance from the pumping well, #3-Active, was constructed, as shown in figure 5. Drawdown data from all observation wells except well #5-Inactive were used to determine the radius of influence of the pumping well (r_o) as the point on the distance axis that is intersected by the line of best fit to the data points. The specific capacity (pumping rate divided by total drawdown) of well #3-Active (the pumping well) was determined manually from its drawdown data.

RESULTS AND INTERPRETATION

Water levels in all assessed wells began to decline within the first 5 minutes of the pumping phase of the test. Recharge and discharge of water reached, or very nearly reached, equilibrium in all observation wells during the later part of the pumping phase of the aquifer test.

The Hantush-Jacob solution for leaky confined aquifers provided a good fit to the data from all observation wells using the AQTESOLV software. Results of the analysis of drawdown data from wells #1-Inactive, #2-Active, #3-Active, #3-Inactive, #4-Active, #4-Inactive and #6-Active determined using this solution are shown in table 2 and appendix C. The transmissivities determined for observation wells #1-Inactive, #3-Inactive, #4-Active and #4-Inactive, the four observation wells closest to the pumping well, ranged from 54,000 to 56,000 ft^2/day. Storativities

of these four observation wells were 0.0005244, 0.0001557, 0.0002967, and 0.0003133, respectively. Thus, there was no substantial difference in the values of transmissivity, and the storativities were within the same order of magnitude among these four observation wells using the Hantush-Jacob solution. Three of these four wells are farther from the pumping well than the distance beyond which partial penetration of the screened portions of wells through the outwash has negligible effect on the analyses as described by Fetter (1988). Because there was no difference in transmissivities at distances greater and less than this critical distance, any effect of partial penetration of observation wells is assumed to have been negligible.

The transmissivities calculated using the Hantush-Jacob solution for wells #2-Active and #6-Active were 50,000 and 75,000 ft^2/day, respectively. The storativities calculated for these two wells using this solution were 0.001168 and 0.0009802, respectively. The difference between the aquifer parameters calculated for these wells and those calculated for the four observation wells closest to the pumping well is attributed to heterogeneous conditions in the outwash. The median transmissivity and storativity calculated using the Hantush-Jacob solution for all six assessed observation wells were 55,000 ft^2/day and 0.000419, respectively.

The results of five calculations of transmissivity using the Thiem steady-state solution are shown in table 2. These transmissivity values ranged from 37,000 to 45,000 ft^2/day. The median transmissivity of these calculations was 43,000 ft^2/day. The minor difference in the median transmissivity values calculated using the Hantush-Jacob and Thiem solutions is accounted for by the fact that these solutions use different factors in calculating aquifer parameters. Change in drawdown occurring within a well and leakage are factored only into the Hantush-Jacob solution, while the difference in total drawdown between wells is only factored into the Thiem solution. In addition, the ratio of the distances from the pumping well of two observation wells is factored only into the Thiem equation.

Transmissivity values calculated with the Thiem solution are more likely to be accurate than those obtained from a transient analysis (Fetter, 1988). However, there is some uncertainty as to whether steady-state conditions occurred in pumping wells #3-Active, well #4-Active, and well #4-Inactive. In addition, the use of the Hantush-Jacob solution accommodates reporting of storativity values. The good of fit of the data to the Hantush-Jacob solution is also indicative of leakage from an aquitard as a source of recharge during the aquifer test. Therefore, results of both the Hantush-Jacob and Thiem solutions are reported. The median transmissivity values calculated by the Hantush-Jacob and Thiem analytical solutions are both substantially higher than 14,000 ft^2/day, which is the threshold transmissivity of a good aquifer (Freeze and Cherry, 1979).

Under ideal conditions, all flow to pumping wells in a completely confined aquifer occurs laterally. However, three possible additional sources of recharge to the aquifer during the test are suggested by this study. The Vermillion River was one probable source of recharge as it lies within the 2,400-foot radius of influence of the pumping well determined from the semi-log plot of total drawdown versus distance from the pumping well (fig. 5). The position of the data point corresponding with well #2-Active on figure 5 indicates that there was slightly less drawdown in this well than would be predicted from the line of best fit for all data. Since well #2-Active is closer to the Vermillion River than any other wells, this relatively smaller amount of drawdown

most likely indicates recharge from the river. An implication of the apparent recharge to the outwash from the river during the aquifer test is that the river is also a natural source of recharge to the outwash at times of high stream flow.

Another possible source of recharge to the observation wells during the aquifer test is upward flow of ground water induced by artesian pressure within the Dakota aquifer. Leakage of ground water through the Graneros Shale, which is believed to lie between the Dakota aquifer and most, if not all, of the outwash in the well field, is consistent with the good fit of the data from all observation wells to the Hantush-Jacob solution. The Hantush-Jacob solution is for leaky confined aquifers assuming steady-state flow (no storage) in the aquitard(s). Equilibrium between recharge and discharge during pumping was reached, or nearly reached, at all observation wells, including well #6-Active, which is evidence for recharge as leakage through an aquitard. Well #6-Active was the farthest observation well from the river and therefore the least likely to receive recharge from the river of all the wells monitored during the test.

The coefficient of determination (R^2) for the data to the negatively sloping line on the total drawdown versus distance from pumping well semi-log plot shown in figure 5 was 0.9282. This very good fit of the data to the semi-log line implies that distance from pumping well #3-Active was a principle determinant of the amount of drawdown in the observation wells. While this goodness of fit is consistent with lateral flow as a recharge source, it is also consistent with the presence of a source of recharge approximately equidistant from all wells, such as leakage through the Graneros Shale.

The fine-grained sediments that overlie the outwash in the well field area are another possible source of recharge to the outwash. This source of recharge is also approximately equidistant to the outwash throughout the well field and therefore consistent with the good fit of the distance versus drawdown data points to the line of best fit shown in figure 5. Leakage from these sediments is also consistent with the goodness of fit of the drawdown data from all observation wells to the Hantush-Jacob solution. However, substantial gravity drainage of water from such fine-grained sediments is not likely. Significant leakage into the outwash is also unlikely from the till underlying the uplands. Whether there is any flow of water into the outwash from the overlying sediments during pumping cannot be determined from the test data. If available, a shallow observation well located south of the bluff near a pumping well and screened at or near the water table could be used to determine the effect of pumping on the water table. If the water table elevation falls in response to pumping, some recharge to the outwash from the overlying fine grained sediments would be indicated.

There may not have been any influence of pumping during the aquifer test on the ground water within the 2,400-foot calculated radius of influence (fig. 5) south of the Vermillion River because the river is a ground water boundary. However, at high pumping rates over extended periods of time, ground water could potentially be drawn northward under the Vermillion River from south of the river. The radius of influence determined for pumping in the well field would probably have been larger had more than one of the city's wells had been pumping simultaneously or had the rate of pumping been higher.

Several criteria indicate that the ground water in the outwash in the city of Vermillion's well field exists under confined conditions. One criterion is the position of the potentiometric surface of the outwash in the overbank sediments and till that comprise the upper aquitard (figs. 3 and 4). The lack of a gently sloping segment of the curve on the log drawdown versus log time plots shown in appendix C preceded and followed by more steeply sloping segments also indicates confined hydraulic conditions. Data plots of time versus drawdown for aquifers under water table conditions show such gently sloping segments corresponding with gravity drainage of ground water (Freeze and Cherry, 1979). Another indication of confined conditions is the order of magnitude of the storativity values for the outwash that were calculated. A typical range of storativity values for confined aquifers is from 0.00001 to 0.001 (Driscoll, 1986). The 2,400-foot radius of influence of the pumping well determined on figure 5 probably also indicates confined conditions. Thus, while the fine-grained sediments overlying the outwash from which the city of Vermillion obtains its water supply retard downward migration of any potential contaminants, they also cause confined hydraulic conditions to prevail in the outwash. As a result of this confined condition and the high transmissivity of the outwash, the area of influence of pumping is substantially greater than would occur under water table conditions and lower transmissivity.

Water table conditions exist south of the Vermillion River (fig. 4) and might also be present in the area between the southeastern part of the well field and the Vermillion River. It is inferred that any existing water table conditions in those portions of these two areas lying within the radius of influence of the pumping well had no influence on drawdown rates in the observation wells during the aquifer test. This lack of influence on drawdown rates is attributed to the relatively great distance of these areas from the pumping and observation wells. In the area south of the Vermillion River, the lack of influence on drawdown rates also resulted from the river being a ground water boundary.

The specific capacity of well #3-Active was determined to be 36.5 gallons/minute/foot, as shown on table 2. However, drawdown of the water level in the pumping well, #3-Active, may have still been occurring at the end of the pumping phase of the aquifer test. Therefore, the actual specific capacity of this well may be somewhat lower than the specific capacity calculated from the test data.

SUMMARY

All wells in the Vermillion well field are located in the Missouri River valley except well #6-Active, which is located on the bluff between the uplands and the Missouri River valley (figs. 1 and 2). Surface sediments in the part of the well field south of the bluff in the Missouri River valley are composed primarily of fine grained, relatively impermeable overbank sediments (figs. 3 and 4). These sediments range in thickness from 65 feet in the northern and western part of the well field to 5 feet just southeast of the well field. At well #6-Active, located on the bluff, a 49-foot thick surficial layer of glacial till is present. The permeable outwash sediments that underlie these surficial sediments range in thickness from about 55 to 76 feet in the well field. The outwash is underlain by the Graneros Shale which is about 30 feet thick. The Graneros Shale is underlain by the Dakota aquifer.

Water-level data were collected from eight wells shown on figure 2, including well #3-Active, the only well that was pumped during the pumping phase of the test. All available wells were used to observe the development of the cone of depression induced by pumping at a rate of 520 gallons per minute and the deterioration of the cone of depression during the two non-pumping/recovery phases.

The drawdown data from all wells except well #5-Active were analyzed using AQTESOLV software (data from well #5-Active were deemed unreliable). The Hantush-Jacob solution provided a good fit to the data collected during the pumping phase of the test. Log time versus log drawdown plots of the drawdown data along with the curve for this solution can be seen in appendix C. The median transmissivity calculated using this solution was 54,500 ft^2/day while the median storativity was 0.000419. The median of five transmissivity values calculated manually using the Thiem solution was 43,000 ft^2/day.

Equilibrium between recharge and discharge occurred, or very nearly occurred, as indicated by the stabilization of water levels in all observation wells during the later part of the pumping phase of the test. Three possible sources of recharge to the outwash in addition to lateral flow toward the pumping well during the test are suggested by the study. The Vermillion River was one probable source of recharge as it lies within the 2,400-foot radius of influence of the pumping well determined from the test data (fig. 5). Leakage through aquitards underlying and overlying the outwash during pumping was also possible, particularly as flow through the underlying Graneros Shale from artesian pressure in the Dakota aquifer. The test results cannot eliminate from possibility that some recharge to the outwash from the overlying aquitard may occur. However, substantial flow into the outwash from these surficial sediments is not likely to have occurred, especially where the overlying aquitard is relatively thick.

Multiple criteria indicate that the ground water in the outwash in the city of Vermillion's well field exists under confined hydraulic conditions. These criteria are the position of the potentiometric surface of the outwash in the upper aquitard (figs. 3 and 4), the shape of the curve that best fits the drawdown data (app. C), the order of magnitude of storativities calculated for the outwash (table 2), and the 2,400-foot radius of influence of the pumping well during the aquifer test (fig. 5). The fine-grained sediments overlying the outwash from which the city of Vermillion obtains its water supply act as a confining layer and retard downward migration of potential contaminants. As a result of this confined condition and the high transmissivity of the outwash, the area of influence of pumping is substantially greater than would occur under water table conditions and lower transmissivity. Water table conditions exist south of the Vermillion River (fig. 4) and might also exist in the area between the southeastern part of the well field and the Vermillion River. The area of influence of pumping may increase with higher discharge rates and pumping simultaneously from multiple wells. At high pumping rates over extended periods of time, ground water could potentially be drawn northward under the Vermillion River from south of the river.

The specific capacity of well #3-Active was determined to be 36.5 gallons/minute/foot (table 2). However, drawdown of the water level in the pumping well, #3-Active, may have still been occurring at the end of the pumping phase of the aquifer test. Therefore, the actual specific

capacity of this well may be somewhat lower than the specific capacity calculated from the test data.

REFERENCES

Christensen, C.M., 1967, *Geology and water resources of Clay County, South Dakota; Part I, Geology*: South Dakota Geological Survey Bulletin 19, 86 p.

Driscoll, F.G., 1986, *Groundwater and wells* (second edition): St. Paul, MN, H.M. Smyth Company, Inc., 1089 p.

Duffield, G.M., 2000, *AQTESOLV for Windows user's guide*: HydroSOLVE, Inc.

Fetter, C.W., 1988, *Applied hydrogeology* (second edition): Columbus, OH, Merrill Publishing Company, 592 p.

Freeze, R.A., and Cherry, J.A., 1979, *Groundwater*: Englewood Cliffs, NJ, Prentice-Hall, Inc., 604 p.

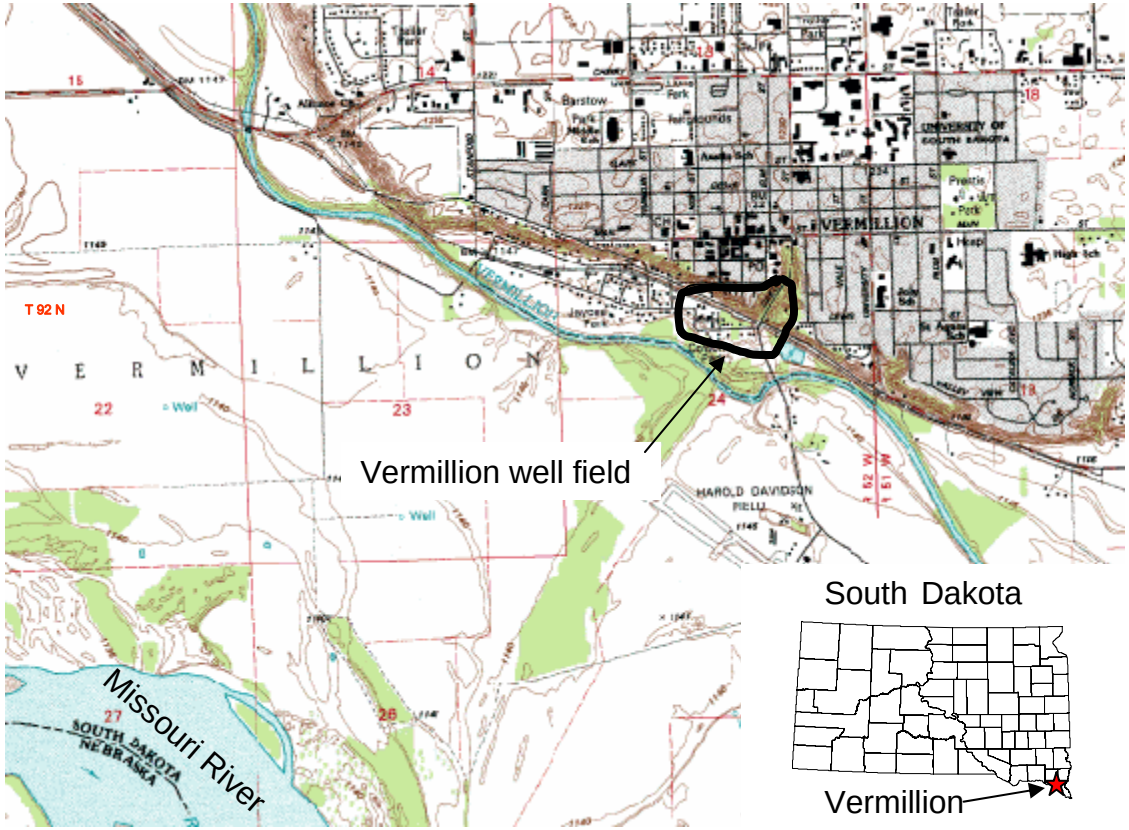
Jorgensen, D.G., 1960, *Geology and shallow ground water resources of the Missouri Valley between North Sioux City and Yankton, South Dakota*: South Dakota Geological Survey Report of Investigations 86, 54 p.

Kruseman, G.P., and de Ridder, N.A., 1994, *Analysis and evaluation of pumping test data* (second edition): International Institute for Reclamation and Improvement Publication 47.

Tomhave, D.W., and Schulz, L.D., 2004, *Bedrock geologic map showing configuration of the bedrock surface in South Dakota east of the Missouri River*: South Dakota Geological Survey General Map 9, scale 1:500,000.

Zutz, J.K., 2003, *Monitoring well installation and groundwater monitoring, former Vermillion power plant:* Geotek Engineering & Testing Services, Inc. Report to the city of Vermillion, 11 p.

Figure 1. Map of the study area.



Map base from U.S. Geological Survey 1:24,000 scale Vermillion quadrangle, 7.5 minute series (topographic) digital raster graphic.

Figure 2. Locations of wells.

Figure 3. Cross section A-A'.

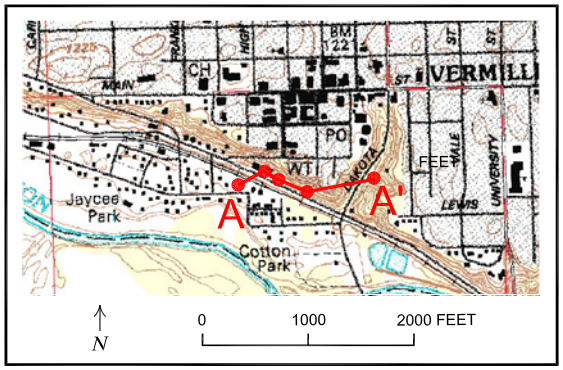
Qe _____Loess
Qob _____Overbank deposit
Qt _____Glacial till
Qo _____Outwash
Kgr _____Graneros shale

Potentiometric surface of outwash

Well sceen. Screen depth and length unknown in wells # 1- Inactive and # 3 - Inactive

Well or test hole

Lithologic contact. Dashed where approximate



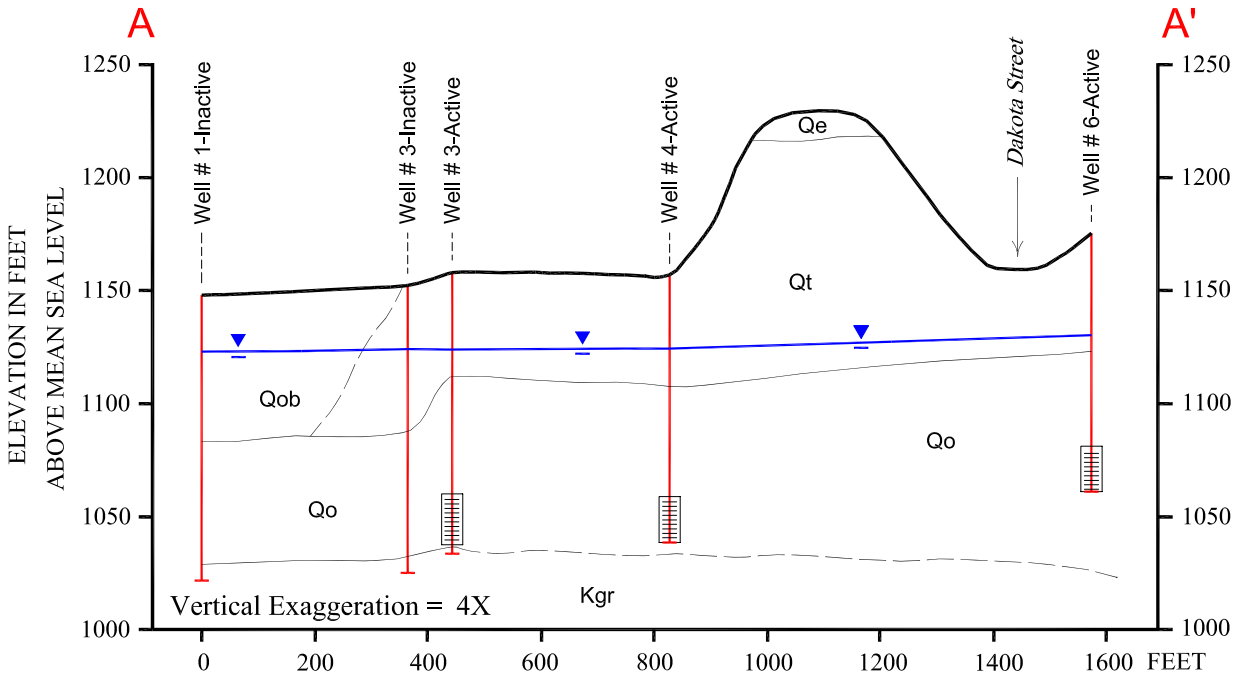


Figure 4. Cross section B-B'.

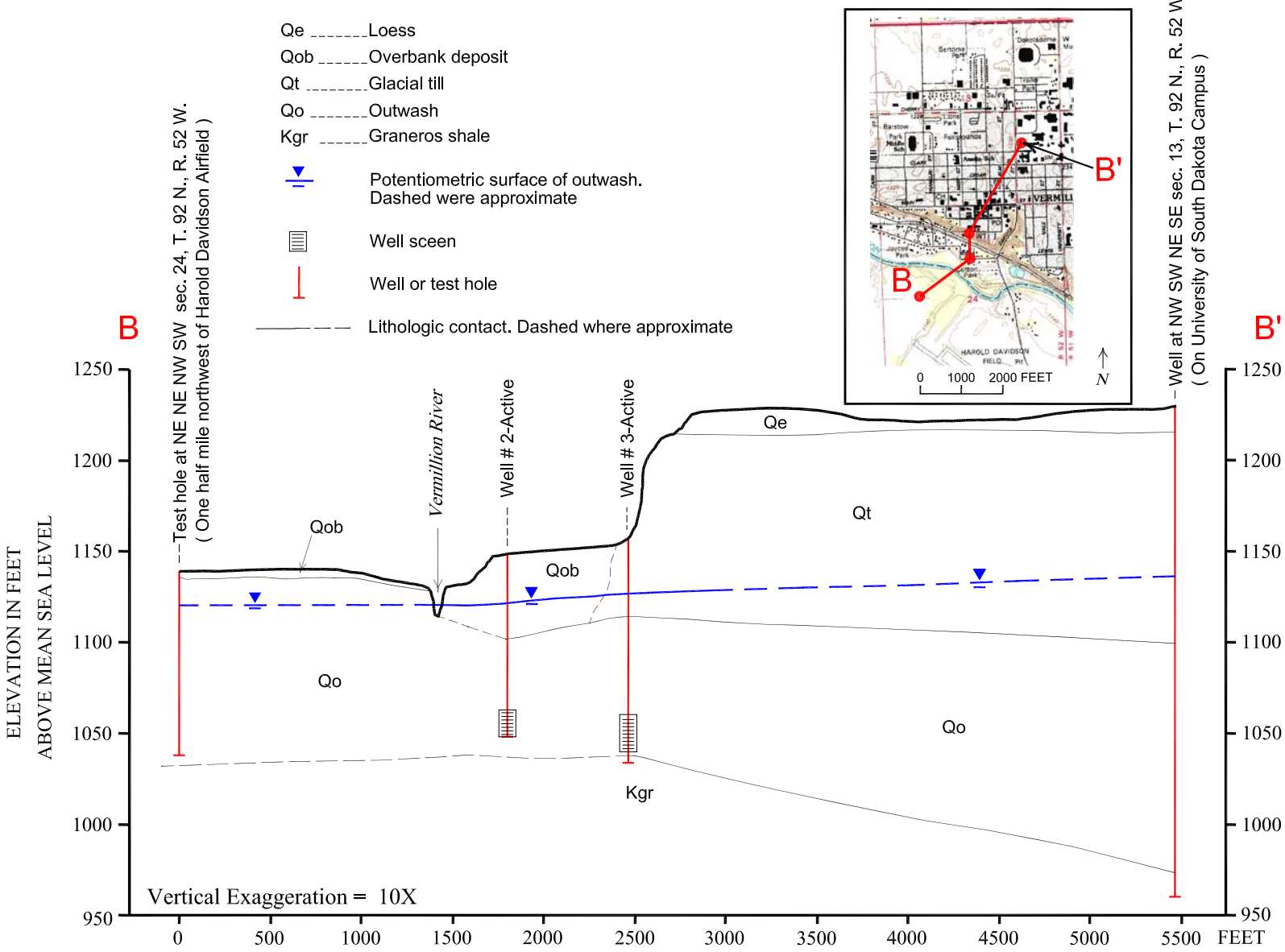


Figure 5. Total drawdown versus distance from the pumping well.

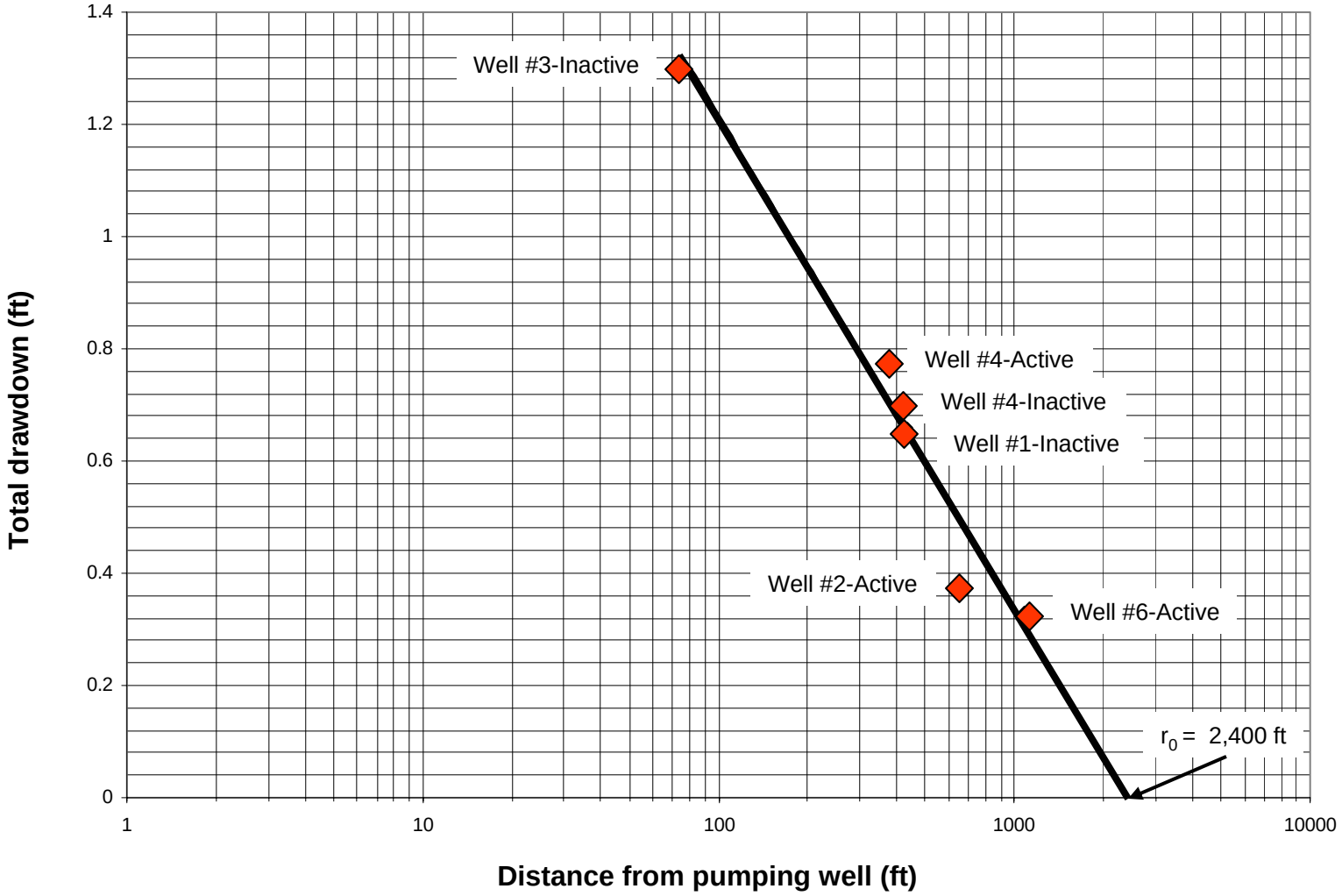


Table 1. Schedule for pumping and measurement of water levels

Date	Description of time period	Description of activities
Immediately prior to prepumping-stabilization phase of the test		Wells #3-Active and #4-Active are pumping to provide drinking water to Vermillion residents
Mon., June 2, 2003	Approximately 7:55 PM	Water levels in all wells were measured
	8:00 PM	All pumping wells were shut off
	8:00–10:00 PM, or 0 to 120 minutes of the initial stabilization phase of the test	Water levels are allowed to recover from pumping; water levels are measured at 15, 30, 45, 60, 90, and 120 minutes
Mon. and Tues., June 2 and 3, 2003	10:00 PM on June 2 through 8:55 AM on June 3	Water levels were measured every 2 hours and at 8:55 AM on June 3
Tues., June 3, 2003	9:00 AM	Pumping phase of the test started using municipal well #3-Active
	9:00–9:10 AM, or 0 to 10 minutes of the pumping phase of the test	Water levels were measured, relative to the start of pumping, at 30 sec., 60 sec., 90 sec., 2 min., 2 min. 30 sec., 3 min. 15 sec., 4 min., 5 min., 6 min. 30 sec., 8 min., and 10 min.
	9:15–10:50 AM, or 15 to 100 minutes of the pumping phase of the test	Water levels were measured, relative to the start of pumping, at 15, 20, 25, 30, 40, 50, 65, 80, and 100 min.
Tues. and Wed., June 3 and 4, 2003	10:50 AM on June 3 through 9:00 AM on June 4	Water levels were measured every 1 to 2 hours and at approximately 8:55 AM on June 4
Wed., June 4, 2003	9:00 AM	Pump in well #3-Active is shut off; this ended the pumping phase of the test
	9:00–9:10 AM, or 0 to 10 minutes of the recovery phase of the test	Water levels were measured, relative to the end of pumping, at 30 sec., 60 sec., 90 sec., 2 min., 2 min. 30 sec., 3 min. 15 sec., 4 min., 5 min., 6 min. 30 sec., 8 min., and 10 min.
	9:15–10:40 AM, or 15 to 100 minutes of the recovery phase of the test	Water levels were measured, relative to the end of pumping, at 15, 20, 25, 30, 40, 50, 65, 80, and 100 min.
	10:40 AM–1:00 PM, or 15 to 240 minutes of the recovery phase of the test	Water levels were measured at 1-hour intervals
	1:00 PM	Wells #3-Active and #4-Active were turned on to provide drinking water to Vermillion residents

Table 2. Aquifer parameters calculated from water level drawdown data

Well name(s)	Distance from pumping well (ft)	Analytical method	Transmissivity (ft^2/day)	Storativity (dimensionless)	r_o (ft)	Specific capacity (gal/min/ft)
#1-Inactive	434	Hantush-Jacob	56,000	0.0005244	---	---
#2-Active	677	Hantush-Jacob	50,000	0.001168	---	---
#3-Active	0	Manual calculation	---	---	---	36.5
#3-Inactive	76	Hantush-Jacob	55,000	0.0001557	---	---
#4-Active	385	Hantush-Jacob	54,000	0.0002967	---	---
#4-Inactive	408	Hantush-Jacob	54,000	0.0003133	---	---
#6-Active	1079	Hantush-Jacob	75,000	0.0009802	---	---
All*		Jacob modified	---	---	2,400	---
#1-Inactive and #3-Inactive		Thiem	43,000	---	---	---
#3-Inactive and #4-Inactive		Thiem	45,000	---	---	---
#3-Inactive and #6-Active		Thiem	44,000	---	---	---
#4-Active and #6-Active		Thiem	37,000	---	---	---
#4-Inactive and #6-Active		Thiem	43,000	---	---	---

r_o – The maximum distance from the pumping well at which drawdown of water level occurred
* – Except #5-Active and #3-Active

APPENDIX A

Field data

Note: Because not all watches used by personnel measuring water levels were properly synchronized, it was necessary to adjust the times of many water level measurements taken during the first 10 minutes of the pumping phase of the test according to the measurement schedule presented in table 1 in determining aquifer parameters.

Well # 1

Address 205 West Broadway

All wells # _____ turned off at 8:00 P.M. Date 6-2-03

Pretest (before wells turned off.

Static Level 27.68 ft. Time: hours 7 minutes 58 seconds 35

1.	Static level 27.61	Time: hours 8	minutes 0	seconds 50			
2.	Static level 27.07	Time: hours 8	minutes 15	seconds 07			
3.	Static level 26.90	Time: hours 8	minutes 32	seconds 15			
4.	Static level 26.82	Time: hours 8	minutes 45	seconds 05			
5.	Static level 26.75	Time: hours 9	minutes 03	seconds 15			
6.	Static level 26.70	Time: hours 9	minutes 28	seconds 10			
7.	Static level 26.64	Time: hours 10	minutes 02	seconds 12			RI
8.	Static level 26.57	Time: hours 12	minutes 18	seconds 00	VH		
9.	Static level 26.45	Time: hours 2	minutes 16	seconds 25	VH		
10.	Static level 26.41	Time: hours 4	minutes 12	seconds 55			
11.	Static level 26.38	Time: hours 6	minutes 13	seconds 35			
12.	Static level 26.36	Time: hours 8	minutes 09	seconds 20	RI		
13.	Static level _____	Time: hours _____	minutes _____	seconds _____			
14.	Static level _____	Time: hours _____	minutes _____	seconds _____			
15.	Static level _____	Time: hours _____	minutes _____	seconds _____			
16.	Static level _____	Time: hours _____	minutes _____	seconds _____			
17.	Static level _____	Time: hours _____	minutes _____	seconds _____			
18.	Static level _____	Time: hours _____	minutes _____	seconds _____			
19.	Static level _____	Time: hours _____	minutes _____	seconds _____			
20.	Static level _____	Time: hours _____	minutes _____	seconds _____			
21.	Static level _____	Time: hours _____	minutes _____	seconds _____			
22.	Static level _____	Time: hours _____	minutes _____	seconds _____			
23.	Static level _____	Time: hours _____	minutes _____	seconds _____			
24.	Static level _____	Time: hours _____	minutes _____	seconds _____			

Well # ~~2~~ 1   Dana / other   ~~218 S. Dakota St.~~

The BIG day!

Date 6-3 to ______

Tues.

↙ measurements taken when VOICE said to test, (is not matching with calculated time) ↓

our watch

our watch is 1 min faster than the voice

	Static level	Time: hours	minutes	sec.		our watch
	26 . 35				8:55 AM	
	~~26 . 35~~				9.00.00	
	26 . 35				9.00.30	:30
	26 . 35				9.01.00	1:30
	26 . 42		1	00	9.01.30	2:00
	26 . 48				9.02.00	2:30
	26 . 50				9.02.30	3:00
	26 . 52				9.03.15	3:40
	26 . 56				9.04.00	4:23
	26 . 60				9.05.00	5:00
	26 . 61				9.06.30	6.06
	26 . 65				9.08.00	7.30
	26 . 68				9.10.00	9,06
	26 . 71				9.15	11:04
	26 . 76				9.20	16:04
	26 . 79				9.25	21:11
	26 . 81				9.30	26:06
	26 . 82				9.40	31,09 41.04
	26 . 83				9.50	51:10
	26 . 87				10.05	10:06:01
	26 . 90				10.20	10:21:05
	26 . 90				10.40	10:41:11
	26 . 91					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					
	.					

205 West [illegible] [redacted]

Well # 1

Date 6-3-03 to 6-4-03

Start 12:00 PM (Noon) Seven 04 a.m

	Static level	Time: hours	minutes	sec.	
RI	26.96	12 PM	03	46	6-3-03 Noon
SM	26.96	12	58	7	
RI	26.97	2	04	04	
RI	26.98	3	04	20	
SM	26.97	4	17	10	
VH	26.~~52~~ 97	5	12	08	
VH	26.98	6	14	00	
VH	26.97	7	14	00	
TR	26.98	8	22	00	
TR	27.00	10	25	45	Midnight
TR	27.00	12	02	30	
VH	27.00	12	26	10	
SM	27.00	2	01	14	
SM	26.99	3	10	02	
SM	26.99	4	12	31	
CH	27.00	5	10	20	
CH	27.00	7	04	00	
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				

205 West Broadway

Date June 4, 2003

Static levels on well # 1

Well # 3 (active) turned off at 9:00 a.m. on June 4, 2003

Static level on well # 1 _____ at 8:55 a.m. was 27.01

Test # 1 Static level 26.99
Scheduled time for test Hrs 9 Min. 00 Sec. 30
Test taken at: Hrs_____ Min._____ Sec. 30

Test # 2 Static level 26.94
Scheduled time for test Hrs 9 Min 01 Sec 00
Test taken at: Hrs_____ Min._____ Sec. 00

Test # 3 Static level 26.91
Scheduled time for test Hrs 9 Min. 01 Sec. 30
Test taken at: Hrs_____ Min._____ Sec. 30

Test # 4 Static level 26.86
Scheduled time for test Hrs. 9 Min. 02 Sec. 00
Test taken at: Hrs_____ Min._____ Sec. 00

Test # 5 Static level 26.84
Scheduled time for test Hrs. 9 Min. 02 Sec. 30
Test taken at: Hrs_____ Min._____ Sec. 30

Test # 6 Static level 26.80
Scheduled time for test Hrs. 9 Min. 03 Sec. 15
Test taken at: Hrs_____ Min._____ Sec. 15

Test # 7 Static level 26.77
Scheduled time for test Hrs. 9 Min. 04 Sec. 00
Test taken at: Hrs_____ Min._____ Sec. 00

Test # 8 Static level 26.75
Scheduled time for test Hrs. 9 Min. 05 Sec. 00
Test taken at: Hrs_____ Min._____ Sec. 03

Test # 9 Static level 26.72
Scheduled time for test Hrs. 9 Min. 06 Sec. 30
Test taken at: Hrs_____ Min._____ Sec. 35

Test # 10 Static level 26.69
Scheduled time for test Hrs. 9 Min. 08 Sec. 00
Test taken at: Hrs_____ Min._____ Sec. 02

Well # 1 June 4, 2023 205 West Broadway

Test # 11 Static level 26.67
Scheduled time for test Hrs. 9 Min. 10 00
Test taken at: Hrs_____ Min._____ Sec. 05

Test # 12 Static level 26.61
Scheduled time for test Hrs. 9 Min. 15 Sec. 00
Test taken at: Hrs_____ Min._____ Sec. 00

Test # 13 Static level 26.57
Scheduled time for test Hrs. 9 Min. 20 Sec. 00
Test taken at: Hrs_____ Min._____ Sec. 03

Test # 14 Static level 26.55
Scheduled time for test Hrs. 9 Min. 25 Sec. 00
Test taken at: Hrs_____ Min._____ Sec. 06

Test # 15 Static level 26.51
Scheduled time for test Hrs. 9 Min. 30 Sec. 00
Test taken at: Hrs_____ Min._____ Sec. 00

Test I# 16 Static level 26.50
Scheduled time for test Hrs. 9 Min. 40 Sec. 00
Test taken at: Hrs_____ Min._____ Sec. 01

Test # 17 Static level 26.47
Scheduled time for test Hrs. 9 Min. 50 Sec. 00
Test taken at: Hrs_____ Min._____ Sec. 00

Test # 18 Static level 26.42
Scheduled time for test Hrs. 10 Min. 05 Sec. 00
Test taken at: Hrs_____ Min._____ Sec. 05

Test # 19 Static level 26.41
Scheduled time for test Hrs. 10 Min. 20 Sec. 00
Test taken at: Hrs_____ Min._____ Sec. 10

Test # 20 Static level 26.40
Scheduled time for test Hrs. 10 Min. 40 Sec. 00
Test taken at: Hrs_____ Min._____ Sec. 03

Test # 21 Static level _____._____
Scheduled time for test Hrs_____ Min._____ Sec._____
Test taken at: Hrs_____ Min._____ Sec._____

Test # 22 Static level _____._____
Scheduled time for test Hrs_____ Min._____ Sec._____
Test taken at: Hrs_____ Min._____ Sec._____

6-4-03 WELL #1

Start of test
11:02 AM
6-4-03

	Static level		Time: hours	minutes	sec.
CH	26	36	11	2	15
RH	26	36	11	22	20
CH	26	35	11	42	25
CH	26	34	12	01	35
R1+5m	27	66	1	04	12

3-A

Well # 2

Address 108 West Broadway

All wells # _____ turned off at 8:00 P.M. Date 6-2-03

Pretest (before wells turned off.

Static Level 28 4 7/8 ft. Time: hours 7 minutes 55 seconds 0

1.	Static level	27' 10"	Time: hours	8	minutes	17	seconds	28
2.	Static level	27' 8 5/8"	Time: hours	8	minutes	30	seconds	09
3.	Static level	27 8 1/8	Time: hours	8	minutes	47	seconds	45
4.	Static level	27 7 5/8	Time: hours	9	minutes	00	seconds	10
5.	Static level	27 6 7/8	Time: hours	9	minutes	32	seconds	13
6.	Static level	27 5 7/8	Time: hours	9	minutes	58	seconds	42
7.	Static level	27 4 3/4	Time: hours	12	minutes	23	seconds	40
8.	Static level	27 4 1/2	Time: hours	2	minutes	20	seconds	18
9.	Static level	27 3 3/4	Time: hours	4	minutes	20	seconds	55
10.	Static level	27 2 3/4	Time: hours	6	minutes	18	seconds	10
11.	Static level	27 2 1/2	Time: hours	8	minutes	11	seconds	53
12.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
13.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
14.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
15.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
16.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
17.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
18.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
19.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
20.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
21.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
22.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
23.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
24.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____

RI

VH

VH

TK

Well # 2 Curt / Stacey ~~218 S. Dakota St.~~

Date 6/3/03 9AM to 10:40 AM 6-3-03

27.2¼

	Static level		Time: hours	minutes	sec.	
6-3-03	27	3 1/8	8	55	30	8:55 AM
~~Static level~~			~~Time: hours~~	~~minutes~~	~~sec.~~	
	27	2 1/4	8	59	27	
	27	30	9	00	00	
1	27	2 1/2	9	00	30	
2	27	2 3/4	9	01	00	
3	27	30	9	01	30	
4	27	3 1/2	9	02	15	
5	27	3 1/4	9	03	00	
6	27	40	9	04	00	
7	27	4 1/4	9	05	30	
8	27	40	9	07	00	
9	27	4 1/2	9	09	00	
10	27	5	9	14	55	
11	27	5 1/4	9	19	50	
12	27	6 1/2	9	24	50	
13	27	6	9	29	50	
14	27	5 3/4	9	39	55	
15	27	6 3/4	9	49	50	
16	27	7	10	4	50	
17	27	6 3/8	10	19	50	
18	27	7 1/4	10	39	55	

Curt / [illegible]

Well # ~~B~~ 2 [illegible]

9:00 AM — 10:40 AM

Date 6-3-03 to 6-3-03

	Static level		Time: hours	minutes	sec.	
6-3-03	27	3 1/8	8	55	30	8:55 AM
1	27'	2 1/4"	8	59	27	
2	27'	3"	9	00	00	
3	27'	2 1/2"	9	00	30	
4	27'	2 3/4"	9	01	00	
5	27'	3"	9	01	30	
6	27'	3 1/2"	9	02	15	
7	27'	3 1/4"	9	03	00	
8	27'	4"	9	04	00	
9	27'	4 1/4"	9	05	30	
10	27'	4"	9	07	00	
11	27	4 1/2"	9	09	00	
12	27'	5"	9	14	55	✓
13	27'	5 1/4	9	19	50	✓
14	27'	6 1/2"	9	24	50	✓
15	27'	6"	9	29	50	✓
16	27'	5 3/4"	9	39	55	✓
17	27'	6 1/4"	9	49	50	✓
18	27'	7"	10	4	50	✓
19	27'	6 7/8"	10	19	50	✓
20	27'	7 1/4"	10	39	55	✓

Well # 2 ~~[illegible]~~ 108 West Broadway

Date 6-3-03 to

6-3-03 Noon

	Static level		Time: hours	minutes	sec.
RI	27	7 1/8	12	07	50
SM	27	7 1/8	1	06	47
RF	27	7 1/8	2	09	45
RI	27	7 1/2	3	08	20
SM	27	7 1/2	4	21	37
VH	27	7 5/8	5	24	30
VH	27	7 1/2	6	21	00
VH	27	7 1/2	7	22	00
TR	27	7 5/8	8	~~25~~ 27	~~30~~ 52
TR	27	7 4/8	10	34	00 midnight
VH	27	7 4/8	12	30	10
SM	27	7 3/8	2	6	52
SM	27	7 3/8	3	16	33
SM	27	7 3/8	4	15	47
CH	27	7 3/4	5	13	45
CH	27	7 1/4	7	7	45

108 West Broadway

Date June 4, 2003

Static levels on well # 2

Well # 3 (active) turned off at 9:00 a.m. on June 4, 2003

Static level on well # 2 8:55 at 8:55 a.m. was 27.50 1/2"

Test # 1 Static level 27.7 1/2"
Scheduled time for test Hrs 9 Min. 00 Sec. 30
Test taken at: Hrs 9 Min. 00 Sec. 35

Test # 2 Static level 27.7 1/4"
Scheduled time for test Hrs 9 Min 01 Sec 00
Test taken at: Hrs 9 Min. 01 Sec. 00

Test # 3 Static level 27.7"
Scheduled time for test Hrs 9 Min. 01 Sec. 30
Test taken at: Hrs 9 Min. 01 Sec. 30

Test # 4 Static level 27.7"
Scheduled time for test Hrs. 9 Min. 02 Sec. 00
Test taken at: Hrs 9 Min. 02 Sec. 00

Test # 5 Static level 27.7"
Scheduled time for test Hrs. 9 Min. 02 Sec. 30
Test taken at: Hrs 9 Min. 02 Sec. 30

Test # 6 Static level 27.6 3/4"
Scheduled time for test Hrs. 9 Min. 03 Sec. 15
Test taken at: Hrs 9 Min. 03 Sec. 15

Test # 7 Static level 27.6"
Scheduled time for test Hrs. 9 Min. 04 Sec. 00
Test taken at: Hrs 9 Min. 04 Sec. 00

Test # 8 Static level 27.6"
Scheduled time for test Hrs. 9 Min. 05 Sec. 00
Test taken at: Hrs 9 Min. 05 Sec. 00

Test # 9 Static level 27.5 3/4"
Scheduled time for test Hrs. 9 Min. 06 Sec. 30
Test taken at: Hrs 9 Min. 06 Sec. 30

Test # 10 Static level 27.5 5/8"
Scheduled time for test Hrs. 9 Min. 08 Sec. 00
Test taken at: Hrs 9 Min. 08 Sec. 00

WeLL # 2 June 4, 2003 108 West Broadway

Test # 11 Static level 27.5 1/4"
Scheduled time for test Hrs. 9 Min. 10 00
Test taken at: Hrs 9 Min. 10 Sec. 00

Test # 12 Static level 27.4 3/4"
Scheduled time for test Hrs. 9 Min. 15 Sec. 00
Test taken at: Hrs 9 Min. 15 Sec. 00

Test # 13 Static level 27.4 3/8"
Scheduled time for test Hrs. 9 Min. 20 Sec. 00
Test taken at: Hrs 9 Min. 20 Sec. 00

Test # 14 Static level 27.3 7/8"
Scheduled time for test Hrs. 9 Min. 25 Sec. 00
Test taken at: Hrs 9 Min. 25 Sec. 00

Test # 15 Static level 27.3 3/8"
Scheduled time for test Hrs. 9 Min. 30 Sec. 00
Test taken at: Hrs 9 Min. 30 Sec. 02

Test I# 16 Static level 27.3 3/8"
Scheduled time for test Hrs. 9 Min. 40 Sec. 00
Test taken at: Hrs 9 Min. 40 Sec. 02

Test # 17 Static level 27.3 1/4"
Scheduled time for test Hrs. 9 Min. 50 Sec. 00
Test taken at: Hrs 9 Min. 50 Sec. 00

Test # 18 Static level 27.3"
Scheduled time for test Hrs. 10 Min. 05 Sec. 00
Test taken at: Hrs 10 Min. 05 Sec. 03

Test # 19 Static level 27.2 3/4"
Scheduled time for test Hrs. 10 Min. 20 Sec. 00
Test taken at: Hrs 10 Min. 20 Sec. 00

Test # 20 Static level 27.2 1/2"
Scheduled time for test Hrs. 10 Min. 40 Sec. 00
Test taken at: Hrs 10 Min. 40 Sec. 05

Test # 21 Static level _____
Scheduled time for test Hrs_____ Min._____ Sec._____
Test taken at: Hrs_____ Min._____ Sec._____

Test # 22 Static level _____
Scheduled time for test Hrs_____ Min._____ Sec._____
Test taken at: Hrs_____ Min._____ Sec._____

6-4-03 WELL #2

(Start of test on this sheet 11:00 AM)

	Static level		Time: hours	minutes	sec.	
CH ~~[illegible]~~	27'	2"	11	00	00	AM
CH.	27'	2"	11	20	30	AM
CH	27'	1 3/4"	11	40	00	A.M.
CH	27'	1 3/4"	12 N	00	00	
VH	47'	4"	1	05	00	PM

6-A

Well # 3 Active

Address 113 Chestnut St.

All wells # _____ turned off at 8:00:00 P.M. Date 6-2-03

Pretest (before wells turned off.

Static Level 50.03 ft. Time: hours 7 minutes 55 seconds 03

1.	Static level ~~50.03~~	Time: hours ~~7~~	minutes ~~55~~	seconds ~~03~~	6-2-03
2.	Static level 36.46	Time: hours 8	minutes 05	seconds 00	
3.	Static level 36.16	Time: hours 8	minutes 15	seconds 00	
4.	Static level 36.01	Time: hours 8	minutes 30	seconds 00	
5.	Static level 35.98	Time: hours 8	minutes 45	seconds 00	
6.	Static level 35.78	Time: hours 9	minutes 00	seconds 00	
7.	Static level 35.77	Time: hours 9	minutes 30	seconds 00	
8.	Static level 35.74	Time: hours 9	minutes 47	seconds 00	
9.	Static level 35.71	Time: hours 10	minutes 00	seconds 00	
VH 10.	Static level 35.60	Time: hours 12	minutes 11	seconds 00	
VH 11.	Static level 35.52	Time: hours 2	minutes 09	seconds 05	
12.	Static level 35.50	Time: hours 4	minutes 08	seconds 45	
13.	Static level 35.48	Time: hours 6	minutes 08	seconds 15	
14.	Static level 35.46	Time: hours 8	minutes 5	seconds 0	
15.	Static level _____	Time: hours _____	minutes _____	seconds _____	
16.	Static level _____	Time: hours _____	minutes _____	seconds _____	
17.	Static level _____	Time: hours _____	minutes _____	seconds _____	
18.	Static level _____	Time: hours _____	minutes _____	seconds _____	
19.	Static level _____	Time: hours _____	minutes _____	seconds _____	
20.	Static level _____	Time: hours _____	minutes _____	seconds _____	
21.	Static level _____	Time: hours _____	minutes _____	seconds _____	
22.	Static level _____	Time: hours _____	minutes _____	seconds _____	
23.	Static level _____	Time: hours _____	minutes _____	seconds _____	
24.	Static level _____	Time: hours _____	minutes _____	seconds _____	

Well # ~~?~~ 3A Tom R / Ryan 218 S. Dakota St.

Date 6-3-03 to [illegible]

6-3-03
8:55 AM

	Static level	Time: hours	minutes	sec.	
	.				
	35 . 45	8	55	10	ok
	48 . 66	9	01	35	0:35
	48 . 88	9	02	10	1:10
	48 . 97	9	02	35	1:35
	48 . 99	9	03	05	2:05
	49 . 06	9	03	35	2:35
	49 . 07	9	04	20	3:20
	49 . 12	9	04	05	4:05
	49 . 15	9	05	05	5:05
	49 . 17	9	07	40	6:40
	49 . 20	9	08	05	
	49 . 24	9	10	05	
	49 . 27	9	15	00	
	49 . 36	9	20	00	
	49 . 40	9	25	00	
	49 . 41	9	30	00	
	49 . 43	9	35	00	Extra
	49 . 45	9	40	00	
	49 . 48	9	50	00	
	49 . 51	10	05	00	
	49 . 52	10	20	00	
	49 . 52	10	40	00	
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				

Corrected min & sec (bracketing 0:35 – 6:40)

Well # ~~[illegible]~~ 3A ~~[illegible]~~ 113 Chestnut St

Date 6-3-03 to

	Static level	Time: hours	minutes	sec.	
RI	49.56	11	57	50	6-3-03 Noon
SM	49.57	12	51	18	✓
RI	49.59	1	57	30	✓
RI	49.60	3	[illegible]	0	✓
SM	49.62	4	8	35	✓
VH/TR	49.61	5	10	35	✓
VH	49.62	6	11	00	✓
VH	49.60	7 ~~6~~	11	00	✓
TR	49.60	8	15	00	✓
TR	49.64	10	13	00	✓
VH	49.65	12	20	30	Midnight
SM	49.64	1	57	42	✓
SM	49.65	3	04	46	✓
SM	49.66	4	07	21	✓
CH	49.62	5	05	35	✓
LH	49.66	7	00	46	✓
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				

Active 113 Chestnut St.

Date June 4, 2003

Static levels on well # 3

Well # 3 (active) turned off at 9:00 a.m. on June 4, 2003

Static level on well # 3 Active at 8:55 a.m. was 49.65

Test # 1 Static level _____
Scheduled time for test Hrs 9 Min. 00 Sec. 30
Test taken at: Hrs 9 Min. 00 Sec. _____ missed one

Test # 2 Static level 36.16
Scheduled time for test Hrs 9 Min 01 Sec 00
Test taken at: Hrs 9 Min. 01 Sec. 05

Test # 3 Static level 36.08
Scheduled time for test Hrs 9 Min. 01 Sec. 30
Test taken at: Hrs 9 Min. 01 Sec. 25

Test # 4 Static level 36.02
Scheduled time for test Hrs. 9 Min. 02 Sec. 00
Test taken at: Hrs 9 Min. 02 Sec. 05

Test # 5 Static level 35.99
Scheduled time for test Hrs. 9 Min. 02 Sec. 30
Test taken at: Hrs 9 Min. 02 Sec. 30

Test # 6 Static level 35.92
Scheduled time for test Hrs. 9 Min. 03 Sec. 15
Test taken at: Hrs 9 Min. 03 Sec. 15

Test # 7 Static level 35.89
Scheduled time for test Hrs. 9 Min. 04 Sec. 00
Test taken at: Hrs 9 Min. 04 Sec. 03

Test # 8 Static level 35.87
Scheduled time for test Hrs. 9 Min. 05 Sec. 00
Test taken at: Hrs 9 Min. 05 Sec. 02

Test # 9 Static level 35.87
Scheduled time for test Hrs. 9 Min. 06 Sec. 30
Test taken at: Hrs 9 Min. 06 Sec. 31

Test # 10 Static level 35.78
Scheduled time for test Hrs. 9 Min. 08 Sec. 00
Test taken at: Hrs 9 Min. 08 Sec. 03

Well # 3 Active
6-4-03 113 Chestnut

Test # 11 Static level 35.74
Scheduled time for test Hrs. 9 Min. 10 00
Test taken at: Hrs 9 Min. 10 Sec. 04

Test # 12 Static level 35.70
Scheduled time for test Hrs. 9 Min. 15 Sec. 00
Test taken at: Hrs 9 Min. 14 Sec. 55

Test # 13 Static level 35.65
Scheduled time for test Hrs. 9 Min. 20 Sec. 00
Test taken at: Hrs 9 Min. 20 Sec. 03

Test # 14 Static level 35.63
Scheduled time for test Hrs. 9 Min. 25 Sec. 00
Test taken at: Hrs 9 Min. 25 Sec. 00

Test # 15 Static level 35.60
Scheduled time for test Hrs. 9 Min. 30 Sec. 00
Test taken at: Hrs 9 Min. 30 Sec. 01

Test I# 16 Static level 35.57
Scheduled time for test Hrs. 9 Min. 40 Sec. 00
Test taken at: Hrs 9 Min. 40 Sec. 00

Test # 17 Static level 35.54
Scheduled time for test Hrs. 9 Min. 50 Sec. 00
Test taken at: Hrs 9 Min. 49 Sec. 56

Test # 18 Static level 35.51
Scheduled time for test Hrs. 10 Min. 05 Sec. 00
Test taken at: Hrs 10 Min. 05 Sec. 02

Test # 19 Static level 35.49
Scheduled time for test Hrs. 10 Min. 20 Sec. 00
Test taken at: Hrs 10 Min. 20 Sec. 15

Test # 20 Static level 35.47
Scheduled time for test Hrs. 10 Min. 40 Sec. 00
Test taken at: Hrs 10 Min. 40 Sec. 01

Test # 21 Static level _____
Scheduled time for test Hrs_____ Min._____ Sec._____
Test taken at: Hrs_____ Min._____ Sec._____

Test # 22 Static level _____
Scheduled time for test Hrs_____ Min._____ Sec._____
Test taken at: Hrs_____ Min._____ Sec._____

3 [scribbled out] Active

6-4-03
Start of test this sheet
11:07 AM

	Static level		Time: hours	minutes	sec.
C.H.	35	44	11	7	30
RI	35	44	11	21	30
RI	35	44	11	41	35
RI	35	44	11	57	20
RI	48	90	12	58	15

9-A

Well # 3 — Inactive

Address 113 Chestnut St.

All wells # 3 and # 4 turned off at 7:59 P.M. Date 6-2-03

Pretest (before wells turned off.

Static Level 31.55 ft. Time: hours 7 minutes 55 seconds 06

1.	Static level	30.66	Time: hours	8	minutes 03	seconds	10
2.	Static level	30.23	Time: hours	8	minutes 10	seconds	04
3.	Static level	30.13	Time: hours	8	minutes 15	seconds	0
4.	Static level	29.97	Time: hours	8	minutes 30	seconds	0
5.	Static level	29.88	Time: hours	8	minutes 45	seconds	0
6.	Static level	29.82	Time: hours	89	minutes 0	seconds	04
7.	Static level	29.74	Time: hours	9	minutes 30	seconds	11
8.	Static level	29.71	Time: hours	9	minutes 46	seconds	21
9.	Static level	29.69	Time: hours	10	minutes 0	seconds	02
6-3-03 ↓ 10.	Static level	29.57	Time: hours	12	minutes 12	seconds	09 Midnight
11.	Static level	29.53	Time: hours	2	minutes 12	seconds	0
12.	Static level	29.43	Time: hours	4	minutes 04	seconds	40
13.	Static level	29.43	Time: hours	6	minutes 05	seconds	59
14.	Static level	29.42	Time: hours	8	minutes 03	seconds	35
15.	Static level	.	Time: hours		minutes	seconds	
16.	Static level	.	Time: hours		minutes	seconds	
17.	Static level	.	Time: hours		minutes	seconds	
18.	Static level	.	Time: hours		minutes	seconds	
19.	Static level	.	Time: hours		minutes	seconds	
20.	Static level	.	Time: hours		minutes	seconds	
21.	Static level	.	Time: hours		minutes	seconds	
22.	Static level	.	Time: hours		minutes	seconds	
23.	Static level	.	Time: hours		minutes	seconds	
24.	Static level	.	Time: hours		minutes	seconds	

Yes Well # 3I Vern / ww person [illegible]

Date 6-3-02 to

	Static level	29.40	Time: hours 8	minutes 55	sec. 02	6-3-03 8:55 AM
	Static level	29.72	Time: hours 9	minutes 0	sec. 04	
1	Static level	29.45	Time: hours 9	minutes 0	sec. 32	
2	Static level	30.50	Time: hours 9	minutes 1	sec. 03	
3	Static level	30.12	Time: hours 9	minutes 1	sec. 32	
4	Static level	30.15	Time: hours 9	minutes 1	sec. 45	
5	Static level	30.20	Time: hours 9	minutes 2	sec. 02	
6	Static level	30.24	Time: hours 9	minutes 2	sec. 32	
7	Static level	30.28	Time: hours 9	minutes 3	sec. 05	
8	Static level	30.32	Time: hours 9	minutes 4	sec. 08	
9	Static level	30.34	Time: hours 9	minutes 5	sec. 05	
10	Static level	30.39	Time: hours 9	minutes 6	sec. 45	
11	Static level	30.42	Time: hours 9	minutes 11	sec. 06	
12	Static level	30.43	Time: hours 9	minutes 16	sec. 00	
13	Static level	30.47	Time: hours 9	minutes 21	sec. 55	
14	Static level	30.50	Time: hours 9	minutes 26	sec. 58	
15	Static level	30.52	Time: hours 9	minutes 31	sec. 06	
16	Static level	30.54	Time: hours 9	minutes 36	sec. 10	
17	Static level	30.57	Time: hours 9	minutes 51	sec. 00	
18	Static level	30.58	Time: hours 10	minutes 06	sec. 00	
19	Static level	30.60	Time: hours 10	minutes 21	sec. 00	
20	Static level	30.63	Time: hours 10	minutes 41	sec. 00	
21	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	30.54
	Static level	.	Time: hours	minutes	sec.	59.72
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	85
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	
	Static level	.	Time: hours	minutes	sec.	

Well # ~~B~~ 3I Inactive ~~98 S. Dakota St~~ 113 Chestnut St

Date 6-3-03 to ____________

6-3-03 Noon

Initials	Static level	Time: hours	minutes	sec.
RJ	30.68	11	55	50
SM	30.68	~~1~~ 12	55	38
RI	30.69	1	55	00
RI	30.69	2	56	03
SM	30.68	4	14	18
VH	30.68	5	08	50
VH	30.68	6	08	00
VH	30.68	7	08	00
TR	30.69	8	12	00
TR	30.70	10	16	00
VH	30.70	12	18	00
SM	30.70	1	55	05
SM	30.71	3	02	18
SM	30.70	4	03	27
CH	30.69	5	02	39
CH	30.71	6	58	10
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			

Midnight

113 Chestnut St.

Date June 4, 2003

Static levels on well # 3 Inactive

Well # 3 (active) turned off at 9:00 a.m. on June 4, 2003

Static level on well # 3 Inactive at 8:55 a.m. was 30.70 (8:55 05)

Test # 1 Static level 30.35
Scheduled time for test Hrs 9 Min. 00 Sec. 30
Test taken at: Hrs 9 Min. 00 Sec. 03

Test # 2 Static level 30.15
Scheduled time for test Hrs 9 Min 01 Sec 00
Test taken at: Hrs 9 Min. 01 Sec. 04

Test # 3 Static level 30.07
Scheduled time for test Hrs 9 Min. 01 Sec. 30
Test taken at: Hrs 9 Min. 01 Sec. 31

Test # 4 Static level 30.01
Scheduled time for test Hrs. 9 Min. 02 Sec. 00
Test taken at: Hrs 9 Min. 02 Sec. 02

Test # 5 Static level 29.95
Scheduled time for test Hrs. 9 Min. 02 Sec. 30
Test taken at: Hrs 9 Min. 02 Sec. 31

Test # 6 Static level 29.90
Scheduled time for test Hrs. 9 Min. 03 Sec. 15
Test taken at: Hrs 9 Min. 03 Sec. 17

Test # 7 Static level 29.88
Scheduled time for test Hrs. 9 Min. 04 Sec. 00
Test taken at: Hrs 9 Min. 04 Sec. 02

Test # 8 Static level 29.84
Scheduled time for test Hrs. 9 Min. 05 Sec. 00
Test taken at: Hrs 9 Min. 05 Sec. 02

Test # 9 Static level 29.80
Scheduled time for test Hrs. 9 Min. 06 Sec. 30
Test taken at: Hrs 9 Min. 06 Sec. 31

Test # 10 Static level 29.75
Scheduled time for test Hrs. 9 Min. 08 Sec. 00
Test taken at: Hrs 9 Min. 08 Sec. 03

Well #3 Inactive

113 Chestnut St. June 4, 2003

Test # 11 Static level 29.73
Scheduled time for test Hrs. 9 Min. 10 00
Test taken at: Hrs 9 Min. 10 Sec. 03

Test # 12 Static level 29.68
Scheduled time for test Hrs. 9 Min. 15 Sec. 00
Test taken at: Hrs 9 Min. 15 Sec. 00

Test # 13 Static level 29.63
Scheduled time for test Hrs. 9 Min. 20 Sec. 00
Test taken at: Hrs 9 Min. 20 Sec. 00

Test # 14 Static level 29.61
Scheduled time for test Hrs. 9 Min. 25 Sec. 00
Test taken at: Hrs 9 Min. 25 Sec. 00

Test # 15 Static level 29.60
Scheduled time for test Hrs. 9 Min. 30 Sec. 00
Test taken at: Hrs 9 Min. 30 Sec. 00

Test I# 16 Static level 29.57
Scheduled time for test Hrs. 9 Min. 40 Sec. 00
Test taken at: Hrs 9 Min. 40 Sec. 00

Test # 17 Static level 29.53
Scheduled time for test Hrs. 9 Min. 50 Sec. 00
Test taken at: Hrs 9 Min. 50 Sec. 01

Test # 18 Static level 29.51
Scheduled time for test Hrs. 10 Min. 05 Sec. 00
Test taken at: Hrs 10 Min. 05 Sec. 00

Test # 19 Static level 29.48
Scheduled time for test Hrs. 10 Min. 20 Sec. 00
Test taken at: Hrs 10 Min. 20 Sec. 00

Test # 20 Static level 29.45
Scheduled time for test Hrs. 10 Min. 40 Sec. 00
Test taken at: Hrs 10 Min. 40 Sec. 00

Test # 21 Static level _____
Scheduled time for test Hrs_____ Min._____ Sec._____
Test taken at: Hrs_____ Min._____ Sec._____

Test # 22 Static level _____
Scheduled time for test Hrs_____ Min._____ Sec._____
Test taken at: Hrs_____ Min._____ Sec._____

Recovery Test ended at 12:03

Start of test this sheet 6-4-03

3 Inactive 6-4-03

	Static level	.	Time: hours	minutes	sec.
RI	29	~~[illegible]~~ 43	11	05	50
RF	29	42	11	19	44
RI	29	41	11	39	50
RI	29	40	11	55	05
	39	51	12	54	40

Wells started at 12:03 pm

Wells 2-3-4-6

12-A

Well # 4 Active

Address 5 Chestnut St.

All wells # _____ turned off at 8:00 P.M. Date 6-2-03

Pretest (before wells turned off.

Static Level 50 . 04 ft. Time: hours 7 minutes 55 seconds 40

		34	04					
1.	Static level	~~50~~	~~04~~	Time: hours	8	minutes	~~55~~	seconds ~~40~~
2.	Static level	33	.89	Time: hours	8	minutes	30	seconds 7
3.	Static level	33	.80	Time: hours	8	minutes	45	seconds 16
4.	Static level	33	.74	Time: hours	9	minutes	00	seconds 4
5.	Static level	33	.65	Time: hours	9	minutes	30	seconds 13
6.	Static level	33	.62	Time: hours	10	minutes	00	seconds 12
VH 7.	Static level	33	.49	Time: hours	12	minutes	03	seconds 10 (midnight)
VH 8.	Static level	33	.46	Time: hours	2	minutes	03	seconds 02
9.	Static level	33	.41	Time: hours	4	minutes	00	seconds 04
10.	Static level	33	.38	Time: hours	6	minutes	02	seconds 00
11.	Static level	33	.38	Time: hours	7	minutes	59	seconds 35
12.	Static level		.	Time: hours		minutes		seconds
13.	Static level		.	Time: hours		minutes		seconds
14.	Static level		.	Time: hours		minutes		seconds
15.	Static level		.	Time: hours		minutes		seconds
16.	Static level		.	Time: hours		minutes		seconds
17.	Static level		.	Time: hours		minutes		seconds
18.	~~Static level~~		.	Time: hours		minutes		seconds
19.	Static level	33	.33	Time: hours	9	minutes	40	seconds 05
20.	Static level	33	.33	Time: ~~hours~~		minutes		~~seconds~~
21.	Static level		.	Time: hours		minutes		seconds
22.	Static level		.	Time: hours		minutes		seconds
23.	Static level		.	Time: hours		minutes		seconds
24.	Static level		.	Time: hours		minutes		seconds

test with Jessica

Yes Well # 4 A (Active) 5 Chestnut

Date 6-3-02 to Terry / Jessica

	Static level		Time: hours	minutes	sec.	
	33	33	8	55	25	8:55 AM
	~~Static level~~		~~Time: hours~~	~~minutes~~		
	33	33	9	6	30	
	33	44	9	01	05	
	33	49	9	1	35	
	33	54	9	2	05	
	33	55	9	2	35	
	33	60	9	3	15	
	33	65	9	3	55	
	33	68	9	4	45	
	33	72	9	5	30	
	33	75	9	7	35	
	33	78	9	9	50	
	33	83	9	15	12	
	33	86	9	20	6	
	33	88	9	25	9	
	33	89	9	30	7	
	33	92	9	40	5	
	33	94	9	50	3	
	33	96	10	5	23	
	33	98	10	20	14	
	34	00	10	40	7	

Well # 4A Astric

5 Chestnut St.

Date 6-3-03 to

	Static level		Time: hours	minutes	sec.	
RI	34	01	11	46	0	6-3-03
SM	34	02	12	45	17	Noon
RI	34	06	1	51	20	
RI	34	06	2	52	25	
SM	34	07	4	7	33	
VH	34	07	5	05	02	
VH	34	06	6	05	00	
VH	34	06	7	05	00	
TR	34	06	8	07	10	
TR	34	07	10	03	15	
VH	34	07	12	12	00	Midnight
SM	34	08	1	50	24	
SM	34	09	2	57	03	
SM	34	09	4	00	17	
CH	34	07	4	58	30	
CH	34	10	6	56	10	

5 Chestnut St.

Date June 4, 2003

Static levels on well # 4 Active

Well # 3 (active) turned off at 9:00 a.m. on June 4, 2003

Static level on well # 4 Active at 8:55 a.m. was 35.01

Test # 1 Static level ~~33.~~ 33.94
Scheduled time for test Hrs 9 Min. 00 Sec. 30
Test taken at: Hrs 9 Min. 02 Sec. 25

Test # 2 Static level ____.____
Scheduled time for test Hrs 9 Min 01 Sec 00
Test taken at: Hrs 9 Min. 2 Sec. 55

Test # 3 Static level ~~8.05~~ 33.85
Scheduled time for test Hrs 9 Min. 01 Sec. 30
Test taken at: Hrs 9 Min. 03 Sec. 25

Test # 4 Static level ~~8.05~~
Scheduled time for test Hrs. 9 Min. 02 Sec. 00
Test taken at: ~~Hrs 9 Min. 25 Sec. 34~~

Test # 5 Static level 33.96
Scheduled time for test Hrs. 9 Min. 02 Sec. 30
Test taken at: ~~Hrs 9 Min. 6 Sec. 15~~

Test # 6 Static level ____.____
Scheduled time for test Hrs. 9 Min. 03 Sec. 15
Test taken at: Hrs____ Min.____ Sec.____

Test # 7 Static level 33.79
Scheduled time for test Hrs. 9 Min. 04 Sec. 00
Test taken at: Hrs 9 Min. 4 Sec. 00

Test # 8 Static level 33.75
Scheduled time for test Hrs. 9 Min. 05 Sec. 00
Test taken at: Hrs 9 Min. 5 Sec. 00

Test # 9 Static level 33.69
Scheduled time for test Hrs. 9 Min. 06 Sec. 30
Test taken at: Hrs 9 Min. 06 Sec. 30

Test # 10 Static level 33.69
Scheduled time for test Hrs. 9 Min. 08 Sec. 00
Test taken at: Hrs 9 Min. 08 Sec. 00

Well # 4 Active 5 Chestnut St.

6-4-03

Test # 11 Static level 33.65
Scheduled time for test Hrs. 9 Min. 10 00
Test taken at: Hrs 9 Min. 10 Sec. 00

Test # 12 Static level 33.60
Scheduled time for test Hrs. 9 Min. 15 Sec. 00
Test taken at: Hrs 9 Min. 15 Sec. 00

Test # 13 Static level 33.55
Scheduled time for test Hrs. 9 Min. 20 Sec. 00
Test taken at: Hrs 9 Min. 19 Sec. 59
19

Test # 14 Static level 33.54
Scheduled time for test Hrs. 9 Min. 25 Sec. 00
Test taken at: Hrs 9 Min. 25 Sec. 01

Test # 15 Static level 33.52
Scheduled time for test Hrs. 9 Min. 30 Sec. 00
Test taken at: Hrs 9 Min. 30 Sec. 01

Test I# 16 Static level 33.50
Scheduled time for test Hrs. 9 Min. 40 Sec. 00
Test taken at: Hrs 9 Min. 40 Sec. 00

Test # 17 Static level 33.48
Scheduled time for test Hrs. 9 Min. 50 Sec. 00
Test taken at: Hrs 9 Min. 50 Sec. 00

Test # 18 Static level 33.44
Scheduled time for test Hrs. 10 Min. 05 Sec. 00
Test taken at: Hrs 10 Min. 04 Sec. 59

Test # 19 Static level 33.43
Scheduled time for test Hrs. 10 Min. 20 Sec. 00
Test taken at: Hrs 10 Min. 20 Sec. 02

Test # 20 Static level 33.39
Scheduled time for test Hrs. 10 Min. 40 Sec. 00
Test taken at: Hrs 10 Min. 40 Sec. 00

Test # 21 Static level _____
Scheduled time for test Hrs 11 Min. 00 Sec. 00
Test taken at: Hrs _____ Min. _____ Sec. _____

Test # 22 Static level _____
Scheduled time for test Hrs _____ Min. _____ Sec. _____
Test taken at: Hrs _____ Min. _____ Sec. _____

Well # 4A

Date 6-4-03 to

	Static level		Time: hours	minutes	sec.	
SM	33	38	11	02	04	AM
SM	33	36	11	22	17	
SM	33	35	11	42	05	
SM	33	34	12	01	12	
SM	48	79	1	01	07	PM

Wells 2-3-4-6 started at 12:03 PM

15-A

Well # 4 Inactive

Address 5 Chestnut St.

All wells # _____ turned off at 8:00 P.M. Date 6-2-03

Pretest (before wells turned off.

Static Level 37.31 ft. Time: hours 7 minutes 56 seconds 20

1.	Static level	35.26	Time: hours	8	minutes	16	seconds	12
2.	Static level	35.11	Time: hours	8	minutes	31	seconds	0
3.	Static level	35.02	Time: hours	8	minutes	46	seconds	14
4.	Static level	34.97	Time: hours	9	minutes	01	seconds	18
5.	Static level	34.90	Time: hours	9	minutes	31	seconds	11
6.	Static level	34.85	Time: hours	10	minutes	01	seconds	19
VH 7.	Static level	34.73	Time: hours	12	minutes	00	seconds	02 (Midnight)
8.	Static level	34.65	Time: hours	2 AM	minutes	01	seconds	00
TK 9.	Static level	34.41	Time: hours	3	minutes	54	seconds	00
11 10.	Static level	34.59	Time: hours	6	minutes	00	seconds	4
11.	Static level	34.53	Time: hours	7	minutes	57	seconds	34
12.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
13.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
14.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
15.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
16.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
17.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
18.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
19.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
20.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
21.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
22.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
23.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____
24.	Static level	_____	Time: hours	_____	minutes	_____	seconds	_____

Yes Well # 4 I Randy/ Anna

Date 6-3-03 to ______

Static level	Time: hours	minutes	sec.	
34.56	8	55	07	8:55 AM
~~34.59~~	~~9~~	~~00~~	~~30~~	
34.64	9	01	00	
34.70	9	01	29	
34.74	9	02	00	
34.78	9	02	30	
34.81	9	03	05	
34.85	9	04	00	
34.89	9	05	00	
34.93	9	06	32	
34.96	9	08	00	
34.98	9	10	01	
35.02	9	15	01	
35.05	9	20	00	
35.07	9	25	01	
35.09	9	30	00	
35.11	9	40	01	
35.13	9	50	00	
35.15	10	05	00	
35.17	10	20	00	
35.19	10	40	00	
.	10			
.	10			
.	10			
.	9			
.	9			
.	9			
.	9			
.	9			
.	9			
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				

Well # [redacted] 4I ~~Inactive~~ [redacted]

6-3-03 5 Chestnut St.

Date ~~6-2-03~~ to ______

	Static level	Time: hours	minutes	sec.	
RI	35 . 21	11	43	00	6-3-03 Noon
SM	35 . 23	12	43	08	
RI	35 . 24	1	48	00	
RI	35 . 24	2	50	05	
SM	35 . 24	4	05	27	
VH	35 . 24	5	03	00	
VH	35 . 24	6	03	05	
VH	35 . 23	7	03	00	
TR	35 . ~~23~~ 22	8	04	05	
TR	35 . 24	10	00	00	Midnight
VH	35 . 24	12	05	00	
SM	35 . 25	1	47	47	
SM	35 . 25	2	55	35	
SM	35 . 25	3	59	04	
CH	35 . 25	4	55	00	
CH	35 . 25	6	53	10	
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				

5 Chestnut St.

Date June 4, 2003

Static levels on well # 4 Inactive

Well # 3 (active) turned off at 9:00 a.m. on June 4, 2003

Static level on well # 4 Inactive at 8:55 a.m. was 35.26

Test # 1 Static level 35.25
Scheduled time for test Hrs 9 Min. 00 Sec. 30
Test taken at: Hrs 9 Min. 00 Sec. 30

Test # 2 Static level 35.19
Scheduled time for test Hrs 9 Min 01 Sec 00
Test taken at: Hrs 9 Min. 01 Sec. 00

Test # 3 Static level 35.13
Scheduled time for test Hrs 9 Min. 01 Sec. 30
Test taken at: Hrs 9 Min. 01 Sec. 31

Test # 4 Static level 35.09
Scheduled time for test Hrs. 9 Min. 02 Sec. 00
Test taken at: Hrs 9 Min. 02 Sec. 01

Test # 5 Static level 35.05
Scheduled time for test Hrs. 9 Min. 02 Sec. 30
Test taken at: Hrs 9 Min. 02 Sec. 30

Test # 6 Static level 35.01
Scheduled time for test Hrs. 9 Min. 03 Sec. 15
Test taken at: Hrs 9 Min. 03 Sec. 15

Test # 7 Static level 34.98
Scheduled time for test Hrs. 9 Min. 04 Sec. 00
Test taken at: Hrs 9 Min. 04 Sec. 00

Test # 8 Static level 34.94
Scheduled time for test Hrs. 9 Min. 05 Sec. 00
Test taken at: Hrs 9 Min. 05 Sec. 02

Test # 9 Static level 34.91
Scheduled time for test Hrs. 9 Min. 06 Sec. 30
Test taken at: Hrs 9 Min. 06 Sec. 30

Test # 10 Static level 34.88
Scheduled time for test Hrs. 9 Min. 08 Sec. 00
Test taken at: Hrs 9 Min. 08 Sec. 00

Well # 4 Inactive
6-4-03 5 Chestnut St.

Test # 11 Static level 34.85
Scheduled time for test Hrs. 9 Min. 10 00
Test taken at: Hrs 9 Min. 10 Sec. 00

Test # 12 Static level 34.80
Scheduled time for test Hrs. 9 Min. 15 Sec. 00
Test taken at: Hrs 9 Min. 15 Sec. 00

Test # 13 Static level 34.77
Scheduled time for test Hrs. 9 Min. 20 Sec. 00
Test taken at: Hrs 9 Min. 20 Sec. 01

Test # 14 Static level 34.75
Scheduled time for test Hrs. 9 Min. 25 Sec. 00
Test taken at: Hrs 9 Min. 25 Sec. 00

Test # 15 Static level 34.73
Scheduled time for test Hrs. 9 Min. 30 Sec. 00
Test taken at: Hrs 9 Min. 30 Sec. 01

Test I# 16 Static level 34.70
Scheduled time for test Hrs. 9 Min. 40 Sec. 00
Test taken at: Hrs 9 Min. 40 Sec. 00

Test # 17 Static level 34.68
Scheduled time for test Hrs. 9 Min. 50 Sec. 00
Test taken at: Hrs 9 Min. 50 Sec. 00

Test # 18 Static level 34.65
Scheduled time for test Hrs. 10 Min. 05 Sec. 00
Test taken at: Hrs 10 Min. 05 Sec. 00

Test # 19 Static level 34.63
Scheduled time for test Hrs. 10 Min. 20 Sec. 00
Test taken at: Hrs 10 Min. 20 Sec. 05

Test # 20 Static level 34.60
Scheduled time for test Hrs. 10 Min. 40 Sec. 00
Test taken at: Hrs 10 Min. 40 Sec. 01

Test # 21 Static level _____
Scheduled time for test Hrs_____ Min._____ Sec._____
Test taken at: Hrs_____ Min._____ Sec._____

Test # 22 Static level _____
Scheduled time for test Hrs_____ Min._____ Sec._____
Test taken at: Hrs_____ Min._____ Sec._____

Well # 4 Inactive ~~228 S. Dakota St~~

Date 6-4-03 to

	Static level		Time: hours	minutes	sec.
SM	34	60	11	0	03
SM	34	58	11	20	05
SM	34	56	11	40	04
SM	34	55	12	00	07
SM	37	37	1	00	03

Wells 2-3-4-6 started at 12:03 pm June 4-2003

18-A

Well # 5

Address 412 South Dakota St.

All wells # 3 & 4 turned off at 7:58 P.M. Date

Pretest (before wells turned off.

Static Level 47. ft. Time: hours 7 minutes 48 seconds 0

1.	Static level	47.	Time:	hours	7	minutes	58	seconds 10
2.	Static level	47.	Time:	hours	8	minutes	13	seconds 8
3.	Static level	47.	Time:	hours	8	minutes	28	seconds 7
4.	Static level	47.	Time:	hours	8	minutes	43	seconds 8
5.	Static level	47.	Time:	hours	8	minutes	58	seconds 8
6.	Static level	47.	Time:	hours	12	minutes	26	seconds 0
7.	Static level	47.	Time:	hours	2	minutes	23	seconds 50
8.	Static level	47.	Time:	hours	4	minutes	23	seconds 30
9.	Static level	47.	Time:	hours	6	minutes	21	seconds 0
10.	Static level	47.	Time:	hours	8	minutes	17	seconds 10
11.	Static level	.	Time:	hours		minutes		seconds
12.	Static level	.	Time:	hours		minutes		seconds
13.	Static level	46.5	Time:	hours	9	minutes	0	seconds 15
14.	Static level	46.5	Time:	hours	9	minutes	0	seconds 30
15.	Static level	46.5	Time:	hours	9	minutes	0	seconds 45
16.	Static level	46.5	Time:	hours	9	minutes	1	seconds 00
17.	Static level	46.5	Time:	hours	9	minutes	1	seconds 30
18.	Static level	46.5	Time:	hours	9	minutes	2	seconds 01
19.	Static level	46.5	Time:	hours	9	minutes	3	seconds 00
20.	Static level	46.5	Time:	hours	9	minutes	4	seconds 01
21.	Static level	46.5	Time:	hours	9	minutes	6	seconds 01
22.	Static level	46.5	Time:	hours	9	minutes	8	seconds 00
23.	Static level	46.5	Time:	hours	9	minutes	13	seconds 00
24.	Static level	46.5	Time:	hours	9	minutes	18	seconds 00

Yes Well # 5 Wade - alone

Date 6-3-03 to

	Static level	Time: hours	minutes	sec.
Wb	46.5	8	55	00
	46.5			
	46.5			
	46.5	9	0	15
	46.5	9	0	30
	46.5	9	0	45
	46.5	9	1	00
	46.5	9	1	30
	46.5	9	2	01
	46.5	9	3	00
	46.5	9	4	01
	46.5	9	6	01
	46.5	9	8	00
	46.5	9	13	00
	46.5	9	18	00
	46.5	9	23	00
	46.5	9	28	00
	46.5	9	38	10
	46.5	9	48	00
	47.0	10	00	30
	47.0	10	03	15
	47.0	10	18	04
	47.0	10	38	00
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			
	.			

Well # 5 ~~412 S. Dakota St.~~ 412 S. Dakota St.

Date 6-3-03 to

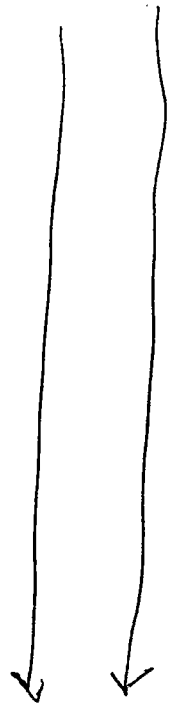
Initials	Static level		Time: hours	minutes	sec.	
RI	14	psi	12	12	15	6-3-03 Noon
SM	14	PSI	1	7	4	
RI	14	"	2	12	30	
RI	14	"	3	11	25	
SM	14	PSI	4	24	51	
VH	14	PSI	5	28	50	
VH	14	PSI	6	28	00	
VH	14	PSI	7	26	00	
TR	15	PSI	8	33	30	
TR	15	PSI	10	34	00	
VH	14	PSI	12	34	50	Midnight
SM	14	PSI	2	9	33	
SM	14	PSI	3	17	23	
SM	14	PSI	4	18	09	
CH	14	PSI	5	17	15	
CH	14	PSI	7	10	20	

#5 Well 412 S. Dakota St.

Wednesday June 4, 2003

[redacted]

Test #							
1	Hrs. 8	Min. 55	Sec. 15	PSI 14		47'0"	
2	Hrs. 9	Min. 00	Sec. 00	PSI 14	off	47'0"	
3	Hrs. 9	Min. 00	Sec. 31	PSI 14			
4	Hrs. 9	Min. 01	Sec. 00	PSI 14			
5	Hrs. 9	Min. 01	Sec. 31	PSI 14			
6	Hrs. 9	Min. 02	Sec. 00	PSI 14			
7	Hrs. 9	Min. 02	Sec. 30	PSI 14			
8	Hrs. 9	Min. 03	Sec. 15	PSI 14			
9	Hrs. 9	Min. 04	Sec. 00	PSI 14			
10	Hrs. 9	Min. 05	Sec. 01	PSI 14			
11	Hrs. 9	Min. 06	Sec. 30	PSI 14			
12	Hrs. 9	Min. 08	Sec. 01	PSI 14			
13	Hrs. 9	Min. 10	Sec. 00	PSI 14			
14	Hrs. 9	Min. 15	Sec. 00	PSI 14			
15	Hrs. 9	Min. 20	Sec. 00	PSI 14			
16	Hrs. 9	Min. 25	Sec. 00	PSI 14			
17	Hrs. 9	Min. 30	Sec. 00	PSI 14			
18	Hrs. 9	Min. 40	Sec. 00	PSI 14			
19	Hrs. 9	Min. 50	Sec. 00	PSI 14			
20	Hrs. 10	Min. 05	Sec. 02	PSI 14			
21	10	20	00	14			
22	10	40	00	14			



Well # 5 6-4-03

Address _____

All wells # _____ turned off at _____ P.M. Date _____

Pretest (before wells turned off.

Static Level _____ . _____ ft. Time: hours _____ minutes _____ seconds _____

WM	1. Static level	47 . 00	Time: hours	11 AM	minutes	00	seconds	00	
VH	2. Static level	46 . 00	Time: hours	11	minutes	22	seconds	00	15 PSI
VH	3. Static level	46 . 00	Time: hours	11	minutes	40	seconds	00	15 PSI
VH	4. Static level	46 . 00	Time: hours	12 PM	minutes	00	seconds	00	15 PSI
WM	5. Static level	47 . 00	Time: hours	1	minutes	00	seconds	00	14 PSI
	6. Static level	.	Time: hours		minutes		seconds		
	7. Static level	.	Time: hours		minutes		seconds		
	8. Static level	.	Time: hours		minutes		seconds		
	9. Static level	.	Time: hours		minutes		seconds		
	10. Static level	.	Time: hours		minutes		seconds		
	11. Static level	.	Time: hours		minutes		seconds		
	12. Static level	.	Time: hours		minutes		seconds		
	13. Static level	.	Time: hours		minutes		seconds		
	14. Static level	.	Time: hours		minutes		seconds		
	15. Static level	.	Time: hours		minutes		seconds		
	16. Static level	.	Time: hours		minutes		seconds		
	17. Static level	.	Time: hours		minutes		seconds		
	18. Static level	.	Time: hours		minutes		seconds		
	19. Static level	.	Time: hours		minutes		seconds		
	20. Static level	.	Time: hours		minutes		seconds		
	21. Static level	.	Time: hours		minutes		seconds		
	22. Static level	.	Time: hours		minutes		seconds		
	23. Static level	.	Time: hours		minutes		seconds		
	24. Static level	.	Time: hours		minutes		seconds		

Wells 2-3-4-6 started at 12:03 pm 6-4-03

20-A

Well # 6

Address 218 S. Dakota St.

All wells # 384 turned off at 7:59 P.M. Date 6-2-03

Pretest (before wells turned off.

Static Level 45 .7,5 ft. Time: hours 7 minutes 55 seconds 10

1. Static level 45 .7,2 Time: hours 7 pm minutes 59 seconds 0 Wells-off
2. Static level 45 .42 Time: hours 8 minutes 15 seconds 15
3. Static level 45 .31 Time: hours 8 minutes 30 seconds 12
4. Static level 45 .25 Time: hours 8 minutes 45 seconds 10
5. Static level 45 .17 Time: hours 9 minutes 0 seconds 2
6. Static level 45 .12 Time: hours 9 minutes 15 seconds 0
7. Static level 45 .2 Time: hours 9 minutes 30 seconds 0
8. Static level 45 .2 Time: hours 9 minutes 45 seconds 3
9. Static level 45 .5 Time: hours 10 minutes 0 seconds 0
10. Static level 44 .90 Time: hours 12 minutes 31 seconds 10
11. Static level 44 .87 Time: hours 2 minutes 30 seconds 40
12. Static level 44 .83 Time: hours 4 minutes 27 seconds 13
13. Static level 44 .81 Time: hours 6 minutes 26 seconds 20
14. Static level 44 .76 Time: hours 7 minutes 58 seconds 0
15. Static level ____ Time: hours ____ minutes ____ seconds ____
16. Static level ____ Time: hours ____ minutes ____ seconds ____
17. Static level ____ Time: hours ____ minutes ____ seconds ____
18. Static level ____ Time: hours ____ minutes ____ seconds ____
19. Static level ____ Time: hours ____ minutes ____ seconds ____
20. Static level ____ Time: hours ____ minutes ____ seconds ____
21. Static level ____ Time: hours ____ minutes ____ seconds ____
22. Static level ____ Time: hours ____ minutes ____ seconds ____
23. Static level ____ Time: hours ____ minutes ____ seconds ____
24. Static level ____ Time: hours ____ minutes ____ seconds ____

Yl? Well # 6   Derek / Harold   218 S. Dakota St.

Date 6-3-03 to ________

Static level	Time: hours	minutes	sec.	
44.77	8	54	50	8:55 AM
44.78	8	59	48	
44.78	9	00	15	
44.78	9	00	48	
44.76	9	01	15	
44.76	9	01	45	
44.76	9	02	15	
44.77	9	03	00	
44.77	9	03	45	
44.80	9	04	46	
44.82	9	06	17	
44.84	9	07	48	
44.84	9	09	46	
44.86	9	14	47	
44.89	9	19	45	
44.89	9	24	45	
44.90	9	29	42	
44.93	9	39	60	
44.95	9	49	45	
44.95	10	04	46	
44.98	10	19	47	
45.00	10	39	45	
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				
.				

Well # 6 — 218 S. Dakota St.

Date 6-3-03 to A.M. 6-4-03
12:00 pm — 7:15:25 AM

Initials	Static level	Time: hours	minutes	sec.	
RF	45'.05	12	16	45	6-3-03 Noon
SM	45 .05.	1	12	27	
RF	45 .06	2	17	20	
RI	45 .07	3	15	40	
SM	45 .08	4	28	28	
VH	45 .08	5	35	00	
VH	45 .08	6	35	00	
VH	45 .08	7	35	00	
VH	45 .07	8	35	15	
JR	45 . ~~08~~ 32	10	45	45	
VH	45 .08	12	41	30	Midnight
SM	45 .07	2	13	00	
SM	45 .09	3	20	42	
SM	45 .09	4	22	11	
CH	45 .05	5	23	05	
CH	45 .01	7	15	25	
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				
	.				

218 S. Dakota St

Date June 4, 2003

Static levels on well # 6

Well # 3 (active) turned off at 9:00 a.m. on June 4, 2003

Static level on well # 6 _____ at 8:55 a.m. was 45.10

Test # 1 Static level 45.11
Scheduled time for test Hrs 9 Min. 00 Sec. 30
Test taken at: Hrs 9 Min. 00 Sec. 37

Test # 2 Static level 45.11
Scheduled time for test Hrs 9 Min 01 Sec 00
Test taken at: Hrs 9 Min. 01 Sec. 07

Test # 3 Static level 45.11
Scheduled time for test Hrs 9 Min. 01 Sec. 30
Test taken at: Hrs 9 Min. 01 Sec. 31

Test # 4 Static level 45.09
Scheduled time for test Hrs. 9 Min. 02 Sec. 00
Test taken at: Hrs 9 Min. 02 Sec. 01

Test # 5 Static level 45.08
Scheduled time for test Hrs. 9 Min. 02 Sec. 30
Test taken at: Hrs 9 Min. 02 Sec. 34

Test # 6 Static level 45.06
Scheduled time for test Hrs. 9 Min. 03 Sec. 15
Test taken at: Hrs 9 Min. 03 Sec. 22

Test # 7 Static level 45.05
Scheduled time for test Hrs. 9 Min. 04 Sec. 00
Test taken at: Hrs 9 Min. 04 Sec. 05

Test # 8 Static level 45.03
Scheduled time for test Hrs. 9 Min. 05 Sec. 00
Test taken at: Hrs 9 Min. 05 Sec. 08

Test # 9 Static level 45.03
Scheduled time for test Hrs. 9 Min. 06 Sec. 30
Test taken at: Hrs 9 Min. 06 Sec. 34

Test # 10 Static level 45.02
Scheduled time for test Hrs. 9 Min. 08 Sec. 00
Test taken at: Hrs 9 Min. 08 Sec. 06

Well #6
218 S. Dakota St. June 4- 2003

Test # 11 Static level 45.00
Scheduled time for test Hrs. 9 Min. 10 00
Test taken at: Hrs 9 Min. 10 Sec. 05

Test # 12 Static level 44.96
Scheduled time for test Hrs. 9 Min. 15 Sec. 00
Test taken at: Hrs 9 Min. 15 Sec. 05

Test # 13 Static level 44.95
Scheduled time for test Hrs. 9 Min. 20 Sec. 00
Test taken at: Hrs 9 Min. 20 Sec. 05

Test # 14 Static level 44.92
Scheduled time for test Hrs. 9 Min. 25 Sec. 00
Test taken at: Hrs 9 Min. 25 Sec. 03

Test # 15 Static level 44.91
Scheduled time for test Hrs. 9 Min. 30 Sec. 00
Test taken at: Hrs 9 Min. 30 Sec. 03

Test I# 16 Static level 44.89
Scheduled time for test Hrs. 9 Min. 40 Sec. 00
Test taken at: Hrs 9 Min. 40 Sec. 02

Test # 17 Static level 44.86
Scheduled time for test Hrs. 9 Min. 50 Sec. 00
Test taken at: Hrs 9 Min. 50 Sec. 03

Test # 18 Static level 44.84
Scheduled time for test Hrs. 10 Min. 05 Sec. 00
Test taken at: Hrs 10 Min. 05 Sec. 04

Test # 19 Static level 44.83
Scheduled time for test Hrs. 10 Min. 20 Sec. 00
Test taken at: Hrs 10 Min. 20 Sec. 03

Test # 20 Static level 44.80
Scheduled time for test Hrs. 10 Min. 40 Sec. 00
Test taken at: Hrs 10 Min. 40 Sec. 03

Test # 21 Static level _____
Scheduled time for test Hrs _____ Min. _____ Sec. _____
Test taken at: Hrs _____ Min. _____ Sec. _____

Test # 22 Static level _____
Scheduled time for test Hrs _____ Min. _____ Sec. _____
Test taken at: Hrs _____ Min. _____ Sec. _____

11-12 well #6
6-4-03 Derek

Initials	Static level	.	Time: hours	minutes	sec.	
DM	44	79	11	00	02	AM
DM	44	~~[illegible]~~ 75	11	20	09	
DM	44	75	11	40	03	
DM	44	75	12	00	04	
DM	56	21	1	00	03	PM

Wells 23-4 started at 12:03 pm

23-A

APPENDIX B

Key to analytical solutions

The Hantush-Jacob solution for a pumping test in a leaky aquifer is given as:

$s = [Q/4\pi T]\ W(u, r/B)$ and $u = r^2S/4Tt$

Where the integral expression W(u, r/B) is referred to as the Hantush well function and:

B = leakage factor determined by the Aqtesolv® software
Q = flow rate from pumping well
r = distance from pumping well
S = storativity
s = drawdown at time since pumping began
T = transmissivity
t = time since pumping began

Conditions assumed to exist when applying the Hantush-Jacob solution (Duffield, 2000):

- Aquifer has infinite areal extent
- Aquifer is homogeneous, isotropic, and of uniform thickness
- Aquifer potentiometric surface is initially horizontal
- Pumping well is fully or partially penetrating
- Flow to pumping well is horizontal when pumping well is fully penetrating
- Aquifer is leaky
- Flow is unsteady
- Water is released instantaneously from storage with decline in hydraulic head
- Diameter of pumping well is very small so that storage in well can be neglected
- Confining bed(s) is overlain by an infinite constant-head plane source
- Flow in the aquitard(s) is vertical

The Thiem equation for steady-state flow in a confined aquifer is given as:

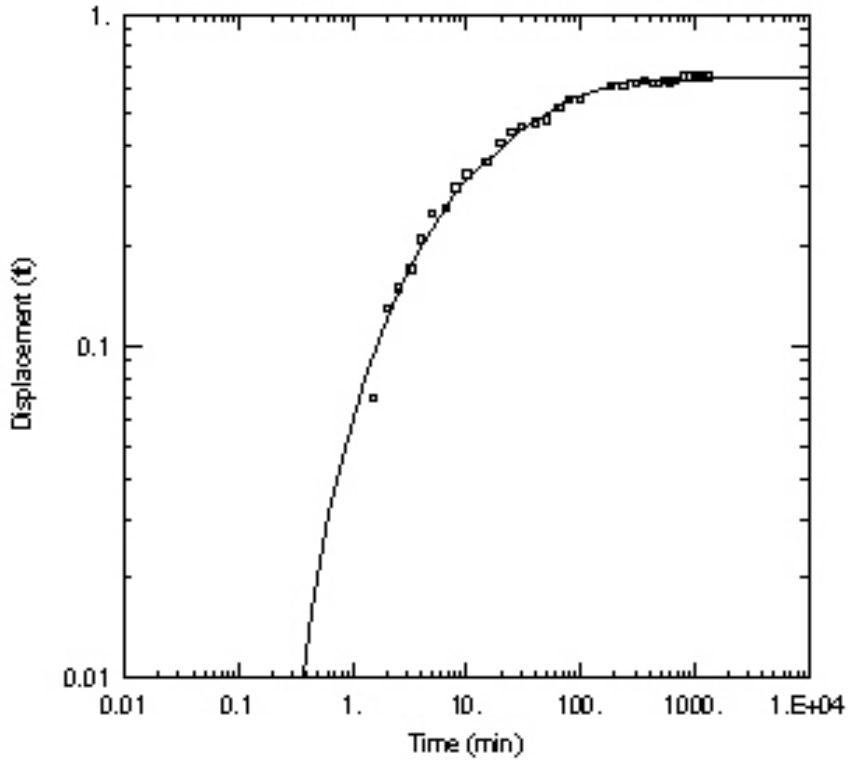
$T = Q\ln(r_2/r_1)/2\pi(h_2-h_1)$ Where: h_1, h_2 = respective steady-state drawdowns
Q = flow rate from pumping well
r_1, r_2 = respective distances from pumping well

Conditions assumed to exist when applying the Thiem solution (Kruseman and de Rider, 1994):

- The aquifer is confined
- The aquifer has an infinite areal extent
- The aquifer is homogeneous, isotropic, and of uniform thickness
- Prior to pumping the piezometric surface is horizontal
- The pumping rate is constant
- The well is screened over the entire thickness of the aquifer
- The hydrologic system is at a steady-state
- Water is released instantaneously from storage with decline in hydraulic head
- Diameter of pumping well is very small so that storage in well can be neglected

APPENDIX C

Results of analyses of aquifer test data using AQTESOLV software



WELL TEST ANALYSIS

Data Set: C:\Program Files\HydroSOLVE\AQTESOLV\for Windows Pro 3.0\Well #1-Inactive.aqt
Date: 06/15/06 Time: 16:32:48

PROJECT INFORMATION

Company: SDGS
Client: City of Vermillion
Test Well: #3-Active
Test Date: 6-3-03

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
#3-Active	0	0

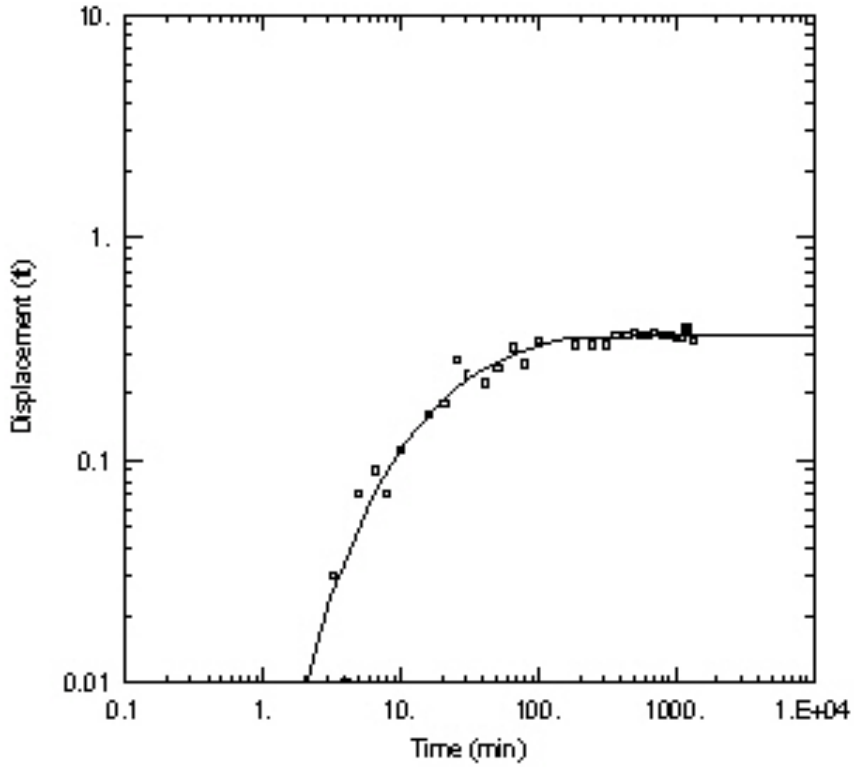
Observation Wells

Well Name	X (ft)	Y (ft)
#1-Inactive	-424	-90

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 5.633E+04 ft^2/day
S = 0.0005244
r/B = 0.1192
Kz/Kr = 1.
b = 76. ft



WELL TEST ANALYSIS

Data Set: C:\Program Files\Hydro SOLVE\AQTESOLV\for Windows Pro 3.0\Well #2-Active.aqt
Date: 06/15/06 Time: 16:49:20

PROJECT INFORMATION

Company: SDGS
Client: City of Vermillion
Test Well: #3-Active
Test Date: 6-3-03

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
#3-Active	0	0

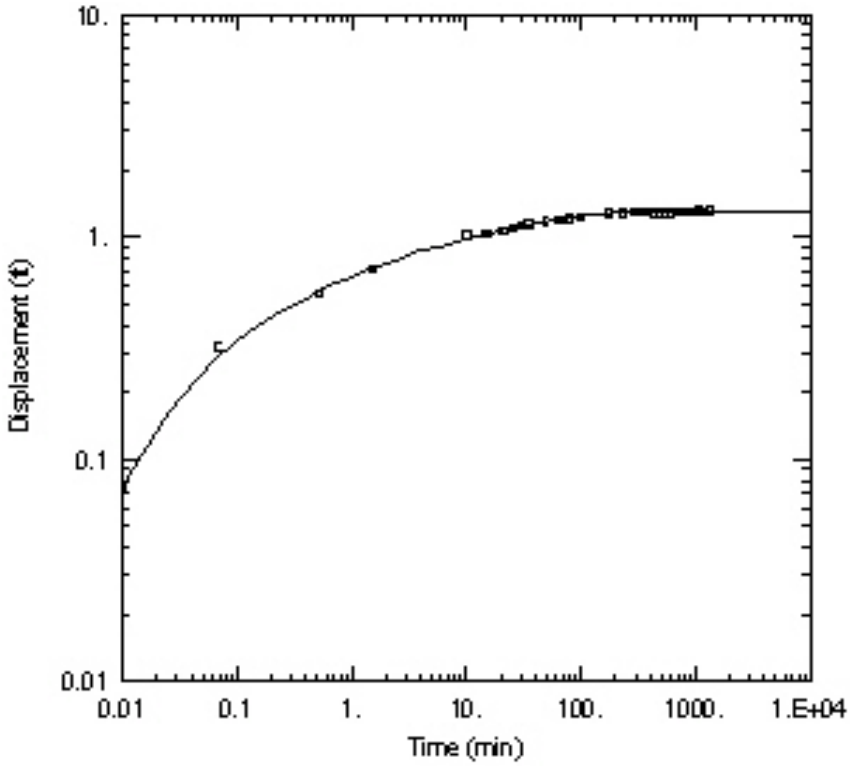
Observation Wells

Well Name	X (ft)	Y (ft)
#2-Active	-209	-643

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 4.953E+04 ft^2/day
S = 0.001168
r/B = 0.401
Kz/Kr = 1.
b = 76. ft



WELL TEST ANALYSIS

Data Set: C:\Program Files\Hydro SOLVE\AQTESOLV\for Windows Pro 3.0\Well #3-Inactive.aqt
Date: 06/15/06 Time: 16:52:30

PROJECT INFORMATION

Company: SDGS
Client: City of Vermillion
Test Well: #3-Active
Test Date: 6-3-03

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
#3-Active	0	0

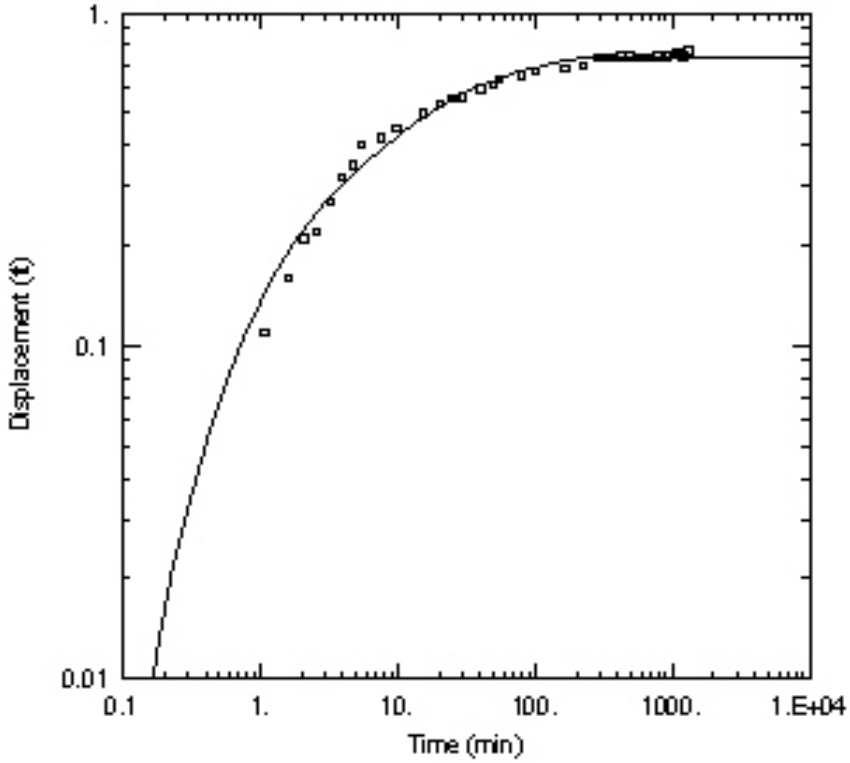
Observation Wells

Well Name	X (ft)	Y (ft)
#3-Inactive	-69	32

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 5.541E+04 ft^2/day
S = 0.0001557
r/B = 0.01247
Kz/Kr = 1.
b = 76. ft



WELL TEST ANALYSIS

Data Set: C:\Program Files\HydroSOLVE\AQTESOLV\for Windows Pro 3.0\#4-Active.aqt
Date: 06/15/06 Time: 16:55:33

PROJECT INFORMATION

Company: SDGS
Client: City of Vermillion
Test Well: #3-Active
Test Date: 6-3-03

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
#3-Active	0	0

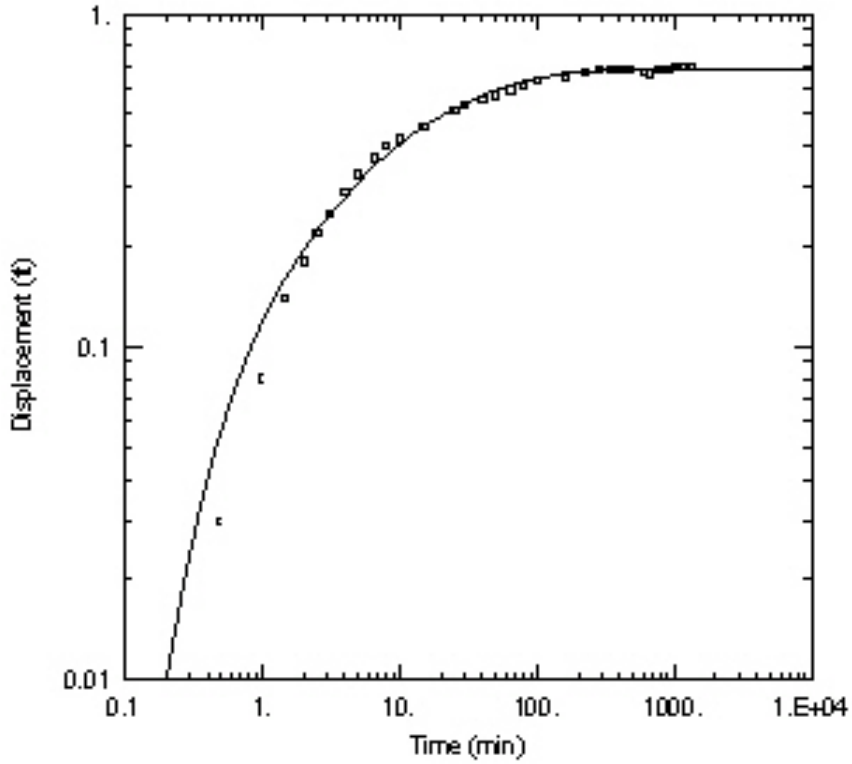
Observation Wells

Well Name	X (ft)	Y (ft)
#4-Active	346	-169

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 5.44E+04 ft^2/day
S = 0.0002967
r/B = 0.09088
Kz/Kr = 1.
b = 76. ft



WELL TEST ANALYSIS

Data Set: C:\Program Files\HydroSOLVE\AQTESOLV\for Windows Pro 3.0\Well #4 Inactive.aqt
Date: 06/15/06 Time: 17:00:48

PROJECT INFORMATION

Company: SDGS
Client: City of Vermillion
Test Well: #3-Active
Test Date: 6-3-03

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
#3-Active	0	0

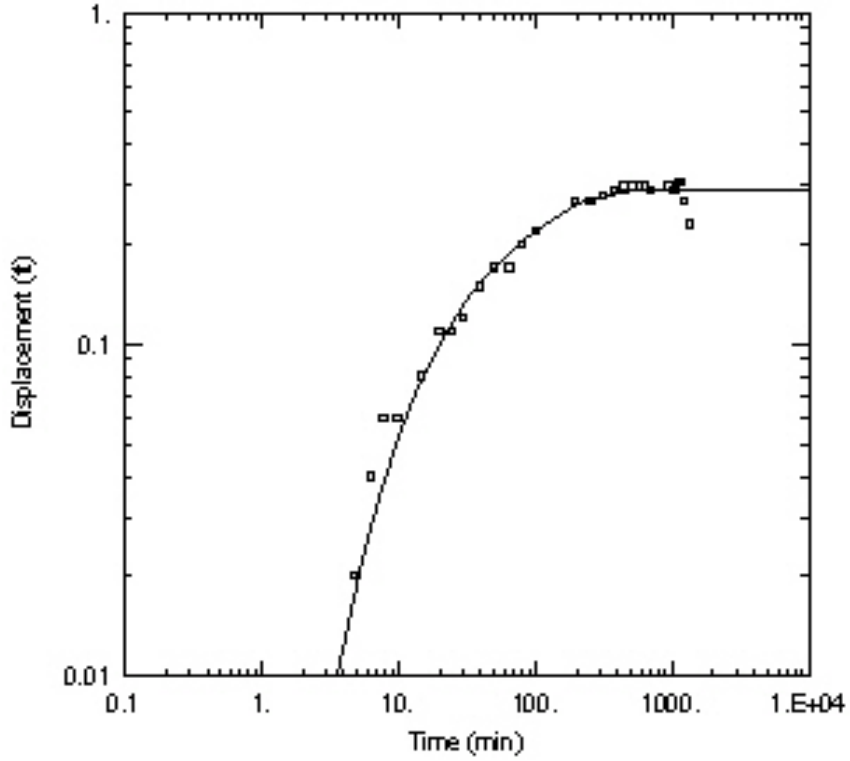
Observation Wells

Well Name	X (ft)	Y (ft)
#4-Inactive	373	-166

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 5.386E+04 ft^2/day
S = 0.0003133
r/B = 0.1144
Kz/Kr = 1.
b = 76. ft



WELL TEST ANALYSIS

Data Set: C:\Program Files\HydroSOLVE\AQTESOLV\for Windows Pro 3.0\#6-Active.aqt
Date: 06/15/06 Time: 17:03:25

PROJECT INFORMATION

Company: SDGS
Client: City of Vermillion
Test Well: #3-Active
Test Date: 6-3-03

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
#3-Active	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
#6-Active	1077	56

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 7.54E+04 ft^2/day
S = 0.0009802
r/B = 0.2957
Kz/Kr = 1.
b = 76. ft