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STATE OF NEBRASKA
DEPARTMENT OF NATURAL RESOURCES

APPLICATION FOR A MUNICIPAL AND RURAL DOMESTIC GROUND WATER TRANSFERS PERMIT

INSTRUCTIONS

Complete items 1 through 10 by printing in ink or typing the appropriate information and by placing an (X) in the appropriate boxes.

The following information shall be provided on 8½ x 11 inch paper (or folded to such size). An answer is required for each item of A-H. Each answer must be clearly identified in the application. When using a ground water model, justify the applicability to the given geologic setting.

For Department Use Only

Application Number: MT-32
Date Filed: June 5, 2008
Receipt Number: G-130
Amount: $70.00

A. Discussion of impacts on surrounding ground water and surface water supplies. Include expected radius of cone of depression and how it was determined and location of any existing wells or water rights that may be impacted.
B. Statement of impacts on any existing threatened or endangered species in project area.
C. Pump test information, if available, including length of test, data from pump test, and location of observation wells.
D. Information on geology and hydrology of area such as thickness of aquifer, depth to water, aerial extent, transmissivity and how it was determined, and whether aquifer is confined or unconfined.
E. Description of type of well, including drawings.
F. Planned operation schedule. (Describe hours per day the wells will likely be pumped, whether there will be seasonal changes to schedule, whether there will be a rotation of wells pumped, and whether certain wells are only for backup purposes.)
G. Explanation of the basis for the amount of water requested. This should include current population and projected growth, daily per capita water use data, current industrial or other large uses and projected growth. The explanation should also include answers to the requirements for approval of the application stated in § 46-642, R.R.S., 1943, as amended, namely: whether request is reasonable, not contrary to the conservation and beneficial use of ground water, and not detrimental to the public welfare.
H. Map showing location of proposed wells, pipelines (exclusive of distribution lines) and the area of proposed use. The map shall be legible and at a scale of not less than one inch to the mile.

A non-refundable filing fee (payable to the Department of Natural Resources) can be computed from the table below and must accompany this application.

QUANTITY OF WATER REQUESTED (daily average)	COST
First 5,000,000 gallons per day	$50.00
Each additional increment (or portion) of 5,000,000 gallons per day	$20.00

1. Name, address and telephone number of Applicant:

City of Scottsbluff
1818 Avenue A
Scottsbluff, NE 69361 308-630-6258

Name, address and telephone number of person to contact concerning application:

Jack Satur, Water Supervisor
City of Scottsbluff, 1818 Avenue A, Scottsbluff, NE 69361
308-630-6257

2. Identify the city, village, rural area or other entity to be supplied water:

City of Scottsbluff

3. Maximum rate of withdrawal for which a permit is requested (complete both) 14,000 gallons per minute
20,000,000 gallons per day

Indicate whether the amount is for each well or a total rate for all wells.
All Wells

app

4. The daily AVERAGE amount of water requested: 5,753,400 Gallons per day

5. Total quantity of water to be withdrawn annually (gallons). 2,100,000,000

6. Number of wells proposed: 13 Number of existing wells: 11

7. Location of the proposed ground water wells and existing wells:
(Indicate 40-acre government subdivision, Section, Township, Range and County, and registration number(s) if applicable):

See Attached

8. Construction will start on or before _____, 20_____.

9. Construction will be completed on or before _____, 20_____.

10. If the permit is granted, does the applicant request imposition of statutory spacing protection for one year for test holes or wells to be constructed? ☐ Yes ☒ No

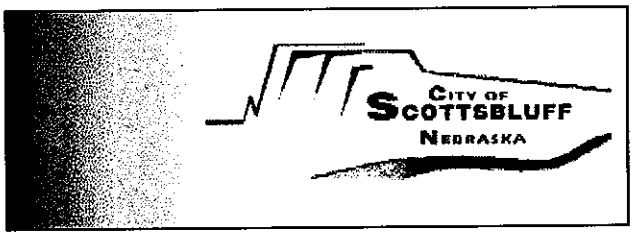
If yes, indicate below the name and address of the owners and occupiers of land affected by the granting of such spacing protection, and a description of the land they own or occupy.

I certify that I am familiar with the information contained in this application, and that to the best of my knowledge and belief, such information is true.

Jack Satin Water System Supervisor 5-8-08
Applicant (Signature and Title) Date

Forward application and fee to:

State of Nebraksa
Department of Natural Resources
301 Centennial Mall South
P.O. Box 94676
Lincoln, Nebraska 68509-4676
(402)471-2363



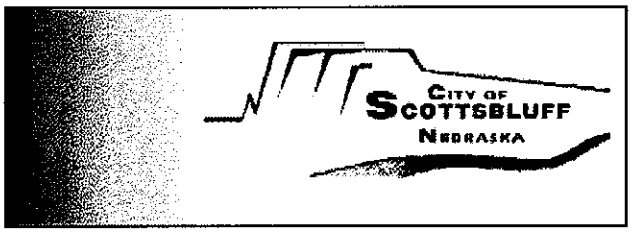
Application for a Municipal and Rural Domestic Ground Water Transfers Permit

for

City of Scottsbluff, Nebraska

May 2008

Jacobson Satchell
CONSULTANTS



Application for a Municipal and Rural Domestic Ground Water Transfers Permit

for

City of Scottsbluff, Nebraska

May 2008

Jacobson Satchell
CONSULTANTS

CITY OF SCOTTSBLUFF, NEBRASKA
MUNICIPAL AND RURAL DOMESTIC
GROUND WATER TRANSFER PERMIT

SUPPORT DOCUMENTATION

A. Discussion of impacts on surrounding water and surface water supplies. Include expected radius of cone of depression and how it was determined and location of any existing wells or water rights that may be impacted.

The Scottsbluff West Well Field is located approximately two miles west of the City of Scottsbluff near a bend in the North Platte River. At its closest point, the North Platte is three quarters of a mile west of the well field. Ground water pumped from the current two West Well Field wells is derived from the unconsolidated sand and gravels of the North Platte Alluvium. A third well was recently constructed at the West Well Field and is in the process of being connected to Scottsbluff's distribution system. The Nebraska Department of Natural Resources has determined that the North Platte Alluvial sediments in the Scottsbluff vicinity are in direct hydrologic contact with the North Platte River. Figure A-1 shows the location of the West Well Field, the North Platte River and nearby registered water wells. In Paragraph I of this Support Documentation, Issue 4 discusses the calculated impact on the North Platte River using the Stream Depletion Factor Analysis.

The aerial extent of the cones of depression for the two current municipal water supply wells at the West Well Field were estimated from the aquifer hydrologic response to the initial Well 17 pump testing. Water levels were recorded at two monitoring wells during the pumping and recovery phases of the pump test.

The following table shows the estimated drawdowns with distance for an alluvial well pumping between 1,000 and 3,000 gallons per minute. Based on the Jacob-Straight Line Method calculations, the expected cones of depression for wells at the West Well Field are expected to be less than 1,000 feet in radius. Wells 17 and 18 are currently capable of pumping 2,200 gallons per minute, but each well averages 700 gpm for an entire year.

Table A-1: Estimated Drawdown in Feet With Distance From a West Well Field Well at Varying Pump Rates

Pump Rate (gpm)	100 feet	200 feet	400 feet	600 feet	800 feet	Calculated Zero Radius of Influence (feet)
1.000	1.1	0.7	0.2	0	0	560
2,000	1.9	1.4	0.6	0.3	0	660
3,000	4.1	2.8	1.4	0.6	0.1	820

For ease of estimating the overlapping effects of pumping wells at the well field, a zero radius of 1,000 feet was used for each West Well Field well. There are not any registered wells located within a 1,000 foot radius of the existing wells. Figure A-2 shows the areas under the influence of the combined cones of depression of the two West Well Field wells.

B. Statement of impacts on any existing threatened or endangered species in project area.

The Nebraska Game and Parks Commission uses the NatureServe.org Explorer Database to list threatened and endangered species in Nebraska. For Scottsbluff County, the bald eagle and the swift fox are the only two species listed on the database. Specifically, in the Scottsbluff area the cottonwoods adjacent to the River can provide perches for bald eagles. The swift fox prefers prairie/grassland habitats. The well field area is surrounded by agricultural-use properties, a golf course and housing. The natural areas are found immediately adjacent to the North Platte River west and south of the well field.

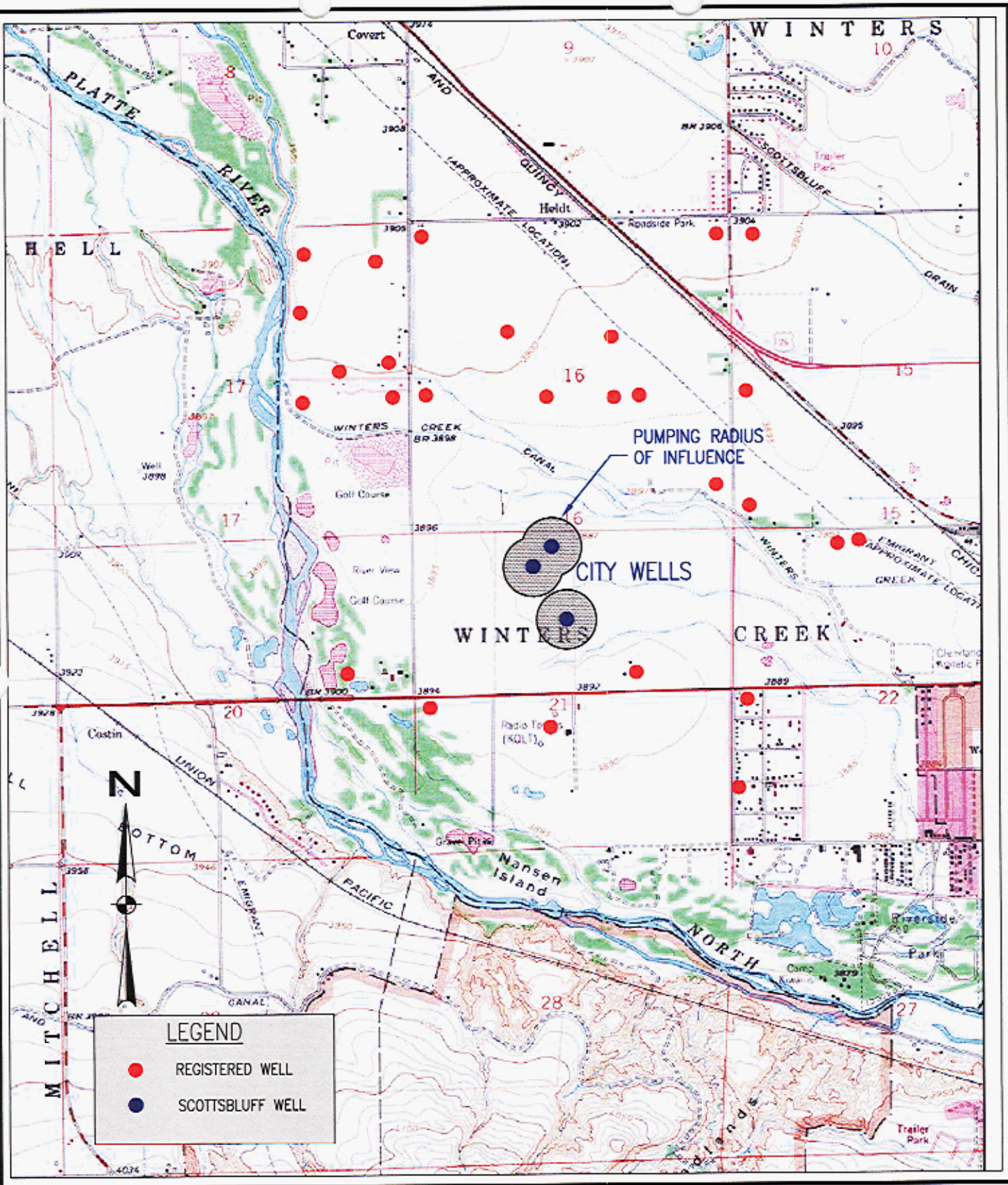
The City's ground water supply wells are currently spread out along four miles of the River. Approximately 42 percent of the water pumped out of the Alluvial Aquifer is returned directly to the river as discharge from the City's Wastewater Treatment Plant. It is estimated that 28 percent of the municipal water pumped in to the City will also be returned to the Alluvial Aquifer across the City through infiltration to the subsurface. Seasonal water table change information indicates that the Alluvial Aquifer in the vicinity of the well field only varies from two to three feet seasonally. The operation of the Well Field is not expected to have a negative impact on any of the identified threatened or endangered species in the Scottsbluff area.

C. Pump test information, if available, including length of test, data from pump test, and location of observation wells.

Scottsbluff Wells 17 and 18 were pump tested at 3,000 gallons per minute (gpm) each after the completion of well construction. Only limited information is available as to the details of the pump tests on these wells. At the present time, we have not been able to locate water level response data for the Well 18 pump test.

Well 17 was offset by two monitoring wells, MW-1 is located 72 feet west of the pumped well and MW-2 is located 101.5 feet west of Well 17. Well 17 was pumped continuously for 24 hours and water levels were recorded electronically at both monitoring wells during the pumping phase. Recovery water level response data was recorded at both monitoring wells, but the recorder at MW-2 was stopped after 275 minutes of recovery.

The water level response data from the two monitoring wells was graphically plotted with respect to time and calculated using the Neuman Method for constant discharge from a fully penetrating well in an unconfined aquifer with delayed gravity response. The water



Jacobson Satchell CONSULTANTS	DATE: 03/13/08
FILE NO.: 69501-FIG A2.DWG	SCALE: 1" = 2000'
	PROJ. NO.: 695-01
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	FIGURE: A-2

PUMPING RADIUS OF INFLUENCE
SCOTTSBLUFF, NEBRASKA
WEST WELL FIELD

JUN 05 2008

level changes with time during the pump test show an early unconfined aquifer response due to gravity drainage and a later increase in drawdown due to horizontal flow.

The plots of water level change vs time are included in the appendix of this Transfer Permit Application along with the calculations. The following Table summarizes the results of the Neuman method calculations.

Table C-1: Summary of Hydraulic Properties

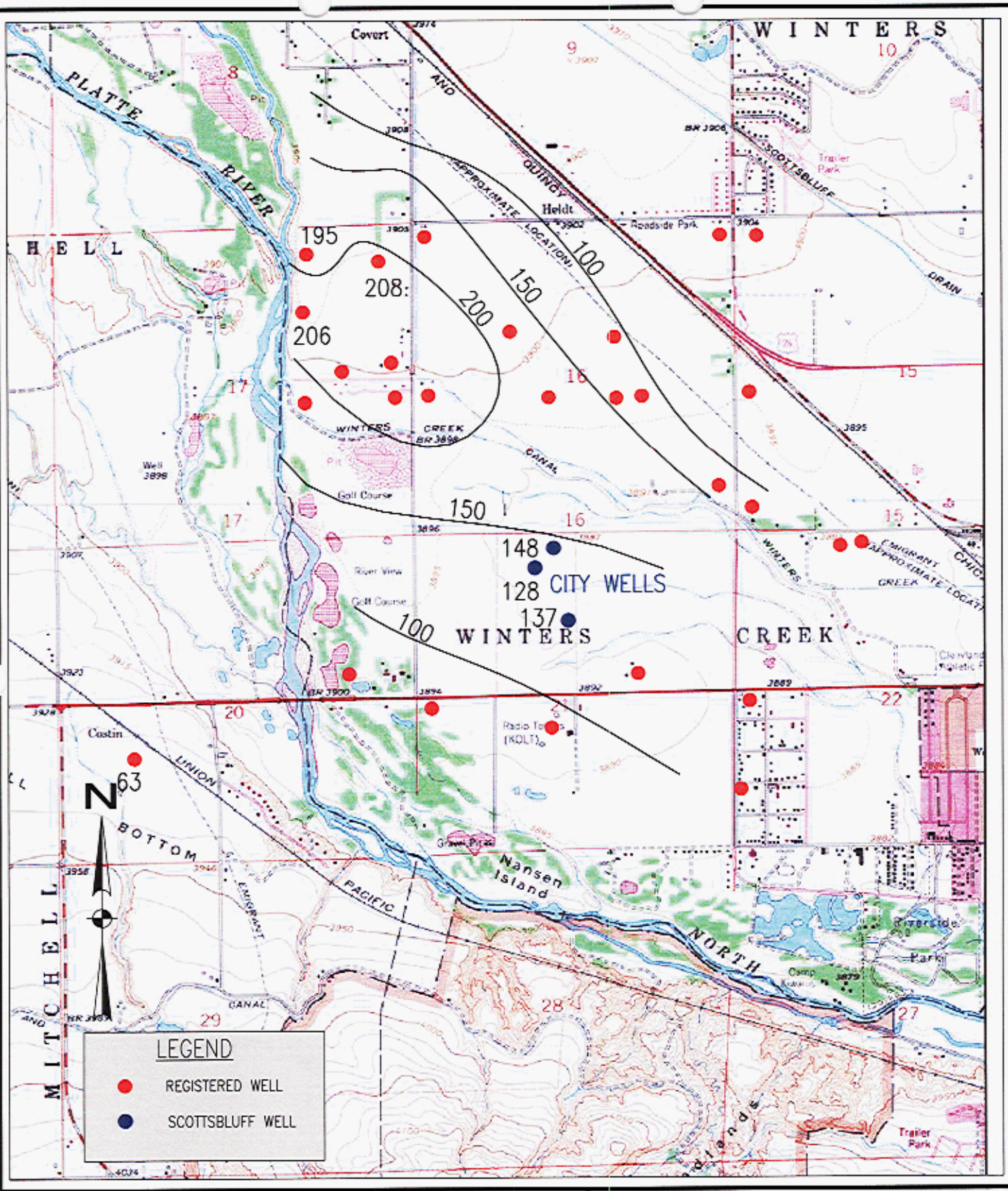
Pump Test	Measurement Point	Average Transmissivity (feet squared per day)	Specific Yield (unitless number)
Well 17 Pump	MW-1	40,100	0.275
Well 17 Pump	MW-2	42,100	0.127
Well 17 Recovery	MW-1	53,300	0.176
Well 17 Recovery	MW-2	49,965	0.141

Well 19 was pumped for 24-hours at 3,250 gallons per minute. The drawdown in the well bore at the end of the pump test was 38.25 feet. The anticipated drawdown in the well bore at 2,000 gallons per minute is expected to be 23.5 feet. Water levels were recorded in the well during pumping and for a few hours after the pump was shut off. There were no offsetting piezometers used to monitor water level drawdown at distance during this pump test. The estimated transmissivity for this well is 70,600 feet squared per day, which is significantly higher than the values calculated for Well 17.

D. Information on geology and hydrology of the area such as the thickness of the aquifer, depth to water, aerial extent, transmissivity and how it was determined, and whether the aquifer is confined or unconfined.

In the Scottsbluff area, the primary aquifer is the shallow alluvial sediments produced by the downcutting and filling of the North Platte River Valley. The Alluvium itself consists of 50 to 225 feet of fine to coarse-grained unconsolidated sand with variable quantities of gravel and local thin clay horizons. The paleo-channel of the River does not follow the current location of the River. Figure D-1 shows the Alluvial thickness on the west side of Scottsbluff and in the vicinity of the West Well Field. The West Well Field is located near the thickest part of the paleo-channel. The older City municipal water wells and the two wells at the Airport also pump water from the North Platte Alluvial Aquifer.

The North Platte Alluvium is an unconfined aquifer. In the vicinity of the well field, the water table ranges in depth from 10 to 15 feet below the surface. The transmissivity of the aquifer in the West Well Field is estimated to be 50,000 feet squared per day. The transmissivity was determined from the pump test data described in Section C of this Application. The unconfined nature of the Aquifer was determined by the lack of confining beds between the base of the Alluvium and the very shallow near surface water table. The pump test data calculations produce specific yield values of 0.20 which are typical of unconfined aquifers.



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PROJ. NO.:	695-01
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FIGURE:	D-1

ALLUVIAL AQUIFER THICKNESS
SCOTTSBLUFF, NEBRASKA
WEST WELL FIELD
(50 FOOT CONTOUR INTERVAL)

JUN 05 2008

Figure D-2 shows the configuration of the water table in the vicinity of the West Well Field. Water level information was derived from the Nebraska DNR Water Well Database. The North Platte Alluvial water table shows a general northwest to southeast flow that is influenced by the North Platte River.

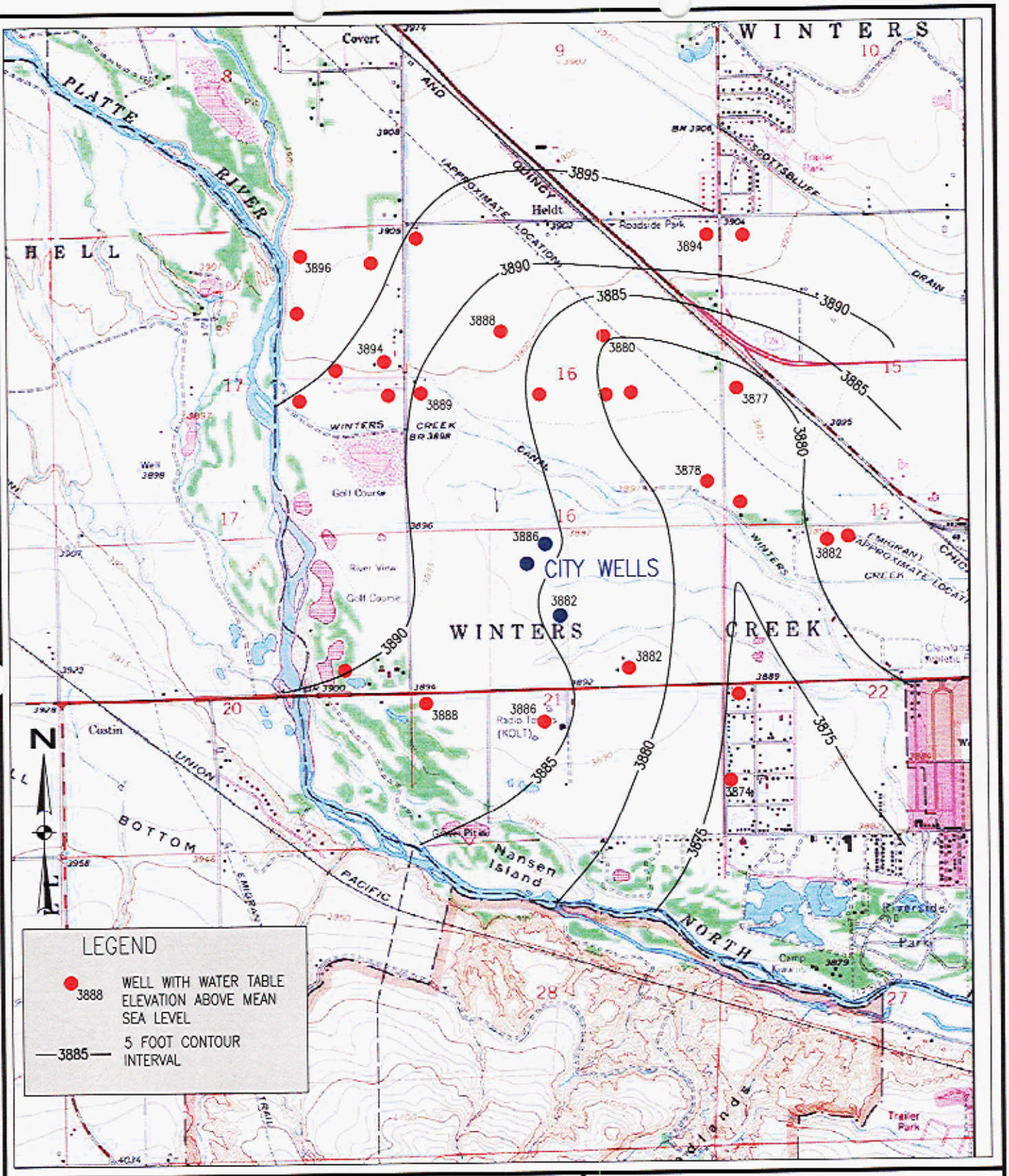
E. Description of type of well, including drawings.

Wells 17 and 18 at the West Well Field are constructed with 18-inch diameter casing and well screens. Well screen aperature openings are 0.090 inch. Both Wells 17 and 18 were constructed with 50 feet of stainless steel well screens. Wells are gravel-packed to 60 feet above the well screens and are cement-grouted to the surface. Well pumps are set at approximately 100 feet below the surface (50 feet above the well screen). The drop pipes are 12-inches in diameter. Both wells have pumps that are capable of 2,200 gpm. A typical well construction diagram is included in the Appendix of this Permit Application. Well 19 was constructed with 20-inch diameter casing and screen.

The following Table E-1 outlines the key construction components of all of the City of Scottsbluff's wells that are connected to the main municipal distribution system.

Table E-1: Municipal Well System Construction Summary

Well	Total Depth (feet)	Total Screen Length (feet)	Well Diameter (inches)	Maximum Pump Rate (gpm)
1	88	25	12	750
3	88.6	28	16	1,200
5	100	32	16	1,000
9	113	40	16	1,100
10	100	50	24 (14"Liner)	900
11	114	50	24	1,100
12	130	35	16	650
13	110	50	24	1,000
17	158	50	18	2,200
18	152	50	18	2,200
19	137	50	20	2,200



Jacobson Satchell
CONSULTANTS

FILE NO.: 69501-FIG D2.DWG

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FIGURE:	D-2

WATER TABLE ELEVATION
SCOTTSBLUFF, NEBRASKA
WEST WELL FIELD
(5 FOOT CONTOUR INTERVAL)

JUN 05 2008

Table E-2 outlines the key well construction components of the two Airport system water wells.

Table E-2: Airport Well Construction Summary

Well	Total Depth (feet)	Total Screen Length (feet)	Well Diameter (inches)	Maximum Pump Rate (gpm)
14	82	?	16	800
15	75	10	10	250

F. Planned operational schedule.

Currently, the City of Scottsbluff operates nine municipal water wells to supply the City's water distribution system. An additional two municipal-water supply wells are located at the City's airport. The two airport wells are not physically connected to the City's main municipal distribution network.

The City's water system is divided into two different pressure systems. Wells 1, 11 and 12 are located in the High Zone north of Highway 26. Wells 3, 9, 10, 13, 17,18 and 19 are located in the Low Zone south of Highway 26.

Due to a combination of age and concerns with regard to the presence of man-made contaminants in the southern part of the City, Scottsbluff has had to abandon Wells 4, 5, 6, 7 and 8.

At the present time, the City pumps approximately 1.7 billion gallons of water per year. Of that total volume, 40 percent of it's municipal water supply is derived from Wells 17 and 18. During summer months the City typically pumps between 6.8 to 7.7 million gallons per day. Winter low volume pumping months average from 2.4 to 3.0 million gallons per day.

If any older wells require replacement due to age or water quality issues, the City plans to construct additional replacement wells at the West Well Field. The West Well Field could have a maximum of six wells at full development. Table F-1 lists the current and planned wells at the West Well Field and the older City wells that require replacement or may be future candidates for future replacement. Older abandoned Wells No. 6 and No. 4 have been replaced with new Wells 17 and 18. Older City Well No. 8 has been replaced with Well 19. Well No. 7 is also no longer in service. Wells No. 3 and No. 5 are tentative replacement candidates as both wells are over 50 years old.

Table F-1: Replacement Well Plan

West Well Field Wells	Older City Wells
Well 17	Well 6
Well 18	Well 4
Well 19	Well 8
Well 20 (future)	Well 7
Well 21 (future)	Well 3
Well 22 (future)	Well 5

Figure F-1 shows the locations of the three Scottsbluff municipal wells that have been constructed at the well field and the planned locations for three future wells.

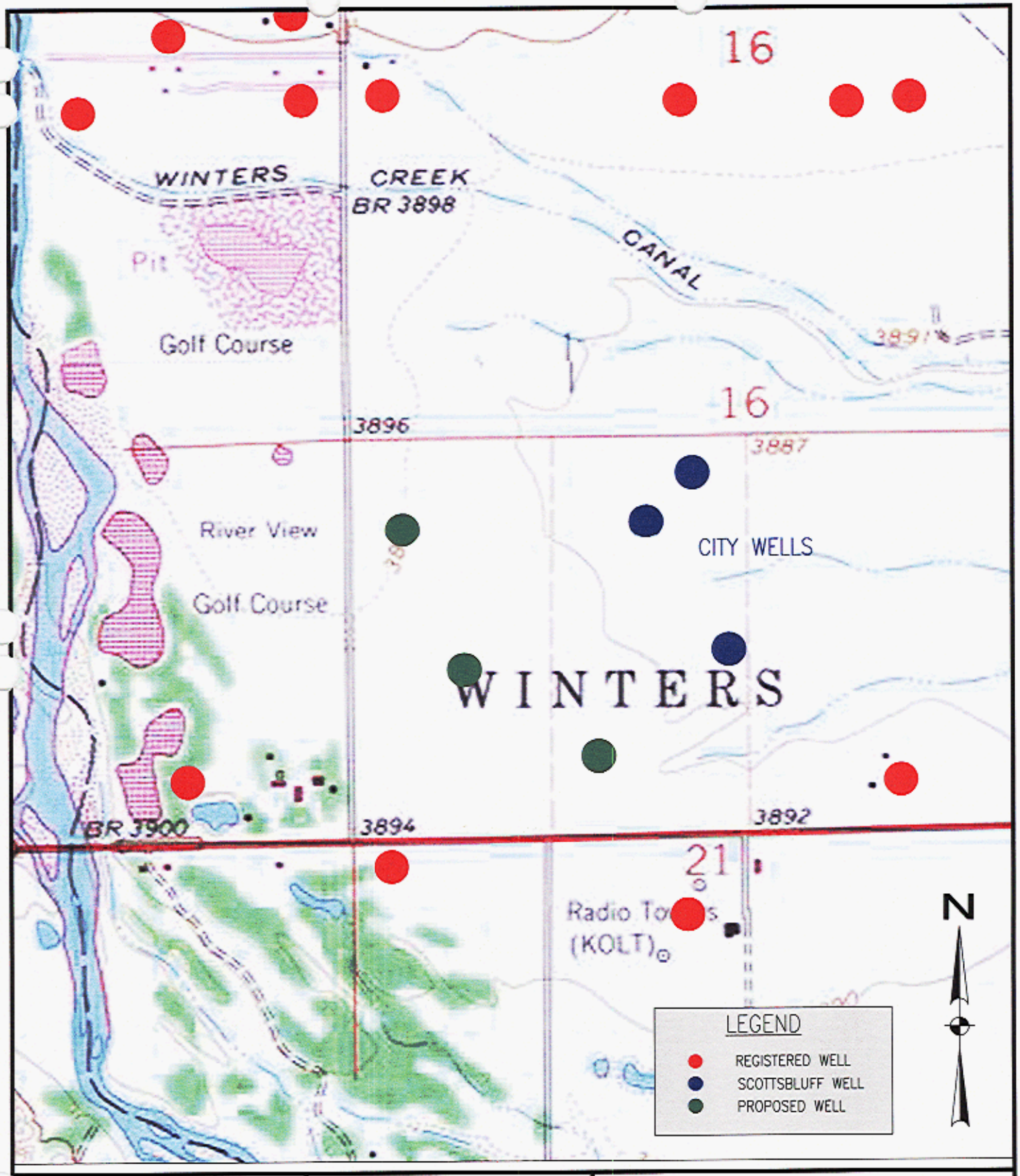
G. Explanation of the basis for the amount of water requested.

The City of Scottsbluff has two Municipal and Rural Domestic Ground Water Transfer Permits. Permits A-11085 and A-16550 allow the City to pump a combined 20,000,000 gallons per day from the nine original City wells. The following table shows the water pumping history for the City of Scottsbluff over the past 12 years.

Table G-1: Historic Water Pumping Totals

Year	Number of Pumping Wells	Total Volume of Water Pumped (gallons)
1995	10	1,316,810,000
1996	10	1,350,909,000
1997	10	1,327,608,000
1998	12	1,377,976,000
1999	12	1,290,913,000
2000	12	1,492,115,000
2001	12	1,390,381,000
2002	12	1,556,430,000
2003	11	1,595,140,000
2004	10	1,605,167,000
2005	9	1,636,069,000
2006	9	1,691,209,000
2007	9	1,819,227,000

From 1995 through 2003, a 13-year period, annual water pumping has increased by almost 500,000,000 gallons per year, a 38 percent increase. From 2003 through 2007 the annual water pumpage averages 1,669,400,000 gallons per year. Winter months average 100,000,000 gallons per month and summer months average 240,000,000 gallons of water for the entire Scottsbluff system. The average annual daily pump rate is 4,630,000 gallons and the peak day for 2006 was 10,713,000 gallons of water.



Jacobson Satchell
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FIGURE: F-1

PROPOSED FUTURE WELLS
SCOTTSBLUFF, NEBRASKA
WEST WELL FIELD

JUN 05 2008

Table G-2: Airport Water System Historic Water Pumping Totals

Year	Number of Pumping Wells	Total Volume of Water Pumped (gallons)
1994	2	9,667,000
1995	2	7,176,000
1996	2	6,358,000
1997	2	7,786,000
1998	2	8,777,000
1999	2	5,600,000
2000	2	4,931,000
2001	2	4,566,000
2002	2	4,825,000
2003	2	5,219,000
2004	2	4,042,000
2005	2	4,378,000
2006	2	4,511,000
2007	2	5,652,000

Over the 14-year period of water pumping as listed in Table G-2, the two airport wells averaged 5,963,429 gallons per year which is the equivalent of one well pumping 11 gallons per minute on a year-round basis.

The City of Scottsbluff is also requesting a maximum annual withdrawal volume of 2,100,000,000 gallons of water which is a 23 percent increase in total pumping to allow for expected growth over the next 20 years.

H. Map showing location of proposed wells, pipelines and the area of proposed use.

See attached map H-1.

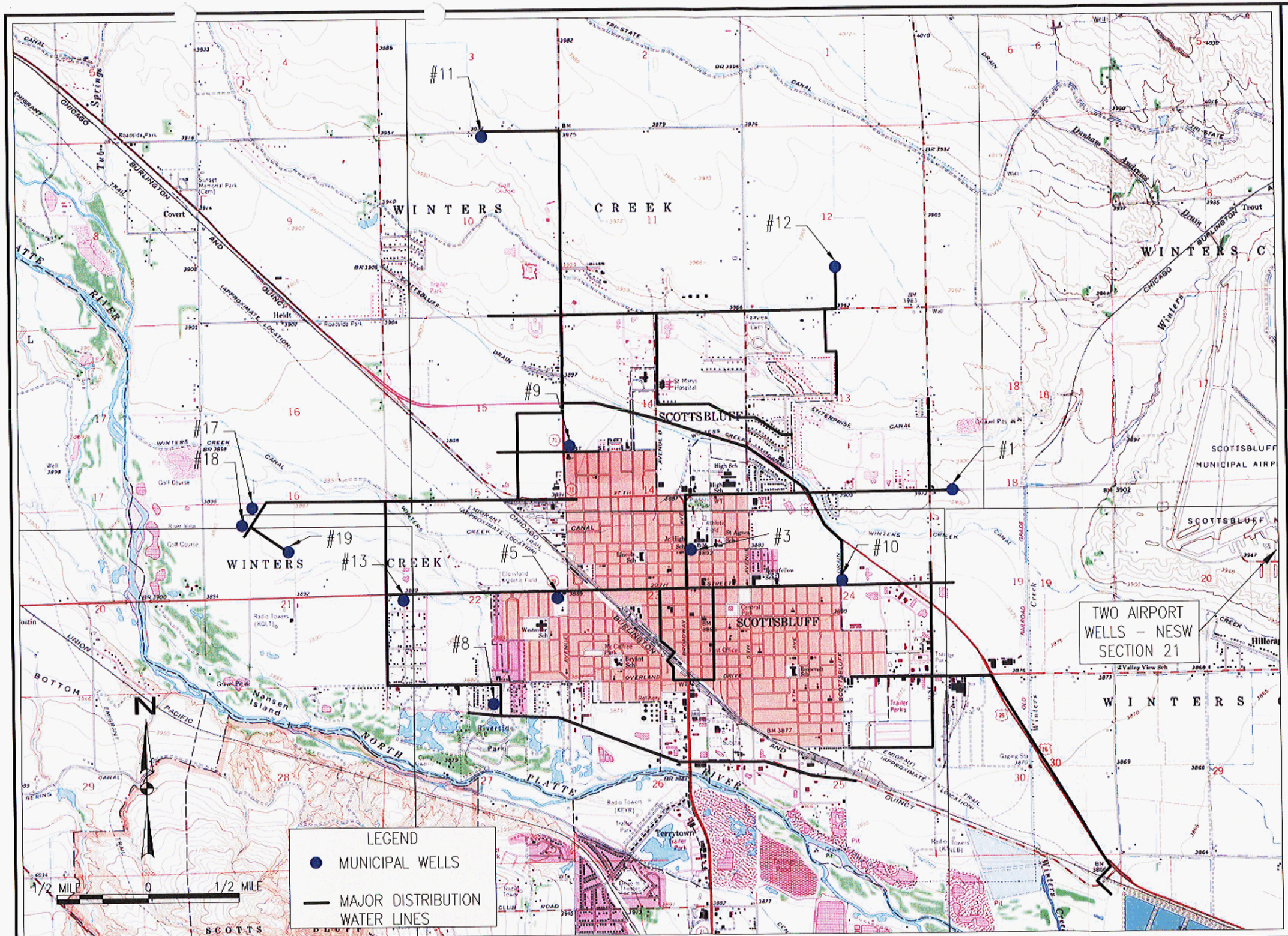
I. Additional Ground Water Issues

§46-613.01 requires that the Director of the Department of Natural Resources consider the following issues prior to issuing a Ground Water Transfer Permit:

(1) The nature of the proposed use and whether it is a beneficial use of ground water;

The water currently pumped by the City of Scottsbluff into its water supply distribution system is for the beneficial use of residents, commuting employees and visitors to the City, for fire control, health and sanitation at residences and commercial locations. Use by citizens is overwhelmingly domestic as there are few industrial users and such use is minimal in volume. The City encourages conservation and penalizes unnecessary use though its rate structure and water restriction ordinances.

CITY OF SCOTTSBLUFF, NEBRASKA
WATER SYSTEM



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Jacobson Satchell CONSULTANTS

JUN 05 2008

(2) The availability to the applicant of alternative sources of surface or ground water;

Alternative water sources available to the City of Scottsbluff include: the North Platte River, the Brule Formation and the Ogallala Aquifer. Even though the North Platte River is physically adjacent to the City of Scottsbluff, the water in the River itself is fully appropriated and the City does not have a right to use that water. Additionally, the use of North Platte River water would entail expensive filtration and disinfection systems. The low flow periods in the River during summer months are also the times of the year that are the high demand periods for the City.

The Brule Aquifer produces water from fractured siltstones and mudstones located both north and south of Scottsbluff. The volumes of water that can be pumped from the Brule vary widely and the aquifer tends to have lowered water levels during summer months. The Brule water also contains variable concentrations of arsenic and uranium that can be above the maximum contaminant levels for municipal water use. Because the Brule is fractured, it is subject to surface influences from rainstorms and snow melt. The fractures provide a direct pipeline for potential surface contamination to reach this water supply.

The Ogallala Aquifer is present from 18 to 25 miles north of the City. The closest Ogallala Formation water bearing sediments are located near the western margin of the formation where the aquifer is thinning westward towards Wyoming. The Ogallala Aquifer in western Nebraska suffers from low natural recharge rates and local areas of high intensity center-pivot irrigation with a resultant regional lowering of water tables. The Ogallala Aquifer south of Scottsbluff suffers from thin aquifer development and limited saturated thicknesses which makes the location of a high volume source of water problematic in this area. The distances to potential Ogallala well sites, expensive subsurface exploration programs and current moratoriums on new well drilling combine to make this alternative water source cost prohibitive.

The North Platte Alluvium is the only economically viable source of water available to the City. The Alluvium provides sufficient volumes of water to meet the City's current and future needs with minimal impacts on the environment.

(3) Any negative effect of the proposed withdrawal on ground water supplies needed to meet present or reasonable future demands for water in the area of the proposed withdrawal, to comply with any interstate compact or decree, or to fulfill the provisions of any other formal state contract or agreement;

The City of Scottsbluff's current ground water system relies upon wells scattered across the community. As older wells need replacement, the City plans to shift ground water pumping to the west side of the City to an area of better hydraulic properties in the Alluvial Aquifer and to minimize the potential for man-made contamination within the City itself. As future wells are drilled in closer proximity, well to well interference issues may have the potential to locally lower ground water levels. As the water table in the

Scottsbluff Valley are very close to the surface, a one to two foot lowering of the water table on the west side of Scottsbluff is considered a minimal impact.

Of the total volume of water pumped by the City, an estimated 70 percent is returned to the Alluvial Aquifer and the North Platte River. Table 3-1 shows the current volumes of water consumptively used by the City and the future water demands. The Transfer Permit application for 2.1 billion gallons of water per year will have a net impact of increasing the consumptive use by 120 million gallons per year.

Table: 3-1 Scottsbluff Consumptive Use Analysis

Water Component	Current Annual Water Volumes (Gallons)	Percentage (%)	Future Maximum Water Volumes (Gallons)
Total Withdrawals	1,700,000,000	100	2,100,000,000
WWTP Return To North Platte River	715,000,000	42	882,000,000
Infiltration & Other Returns to Aquifer	476,000,000	28	588,000,000
Net Returns	1,191,000,000	70	1,470,000,000
Consumptive Use	510,000,000	30	630,000,000

(4) Any negative effect of the proposed withdrawal on surface water supplies needed to meet present or reasonable future demands within the state, to comply with any interstate compact or decree, or to fulfill the provisions of any other formal state contract or agreement;

In order to quantify the effect of ground water pumping at the West Well Field on the North Platte River, a Stream Depletion Factor Analysis (SDF) was calculated using the Jenkins Equations mandated by the Department of Natural Resources. For the Jenkins SDF Analysis, a transmissivity of 50,000 feet squared per day was used with a specific yield of 0.2 and a distance of 3,500 feet from a well to the River. The calculations are included in the Appendix of this Transfer Permit Application. At an annual average pump rate of 700 gallons per minute, the River is minimally depleted after 49 days of pumping. The SDF calculations indicate that after one year of pumping, 80 percent of the ground water is derived from the River itself.

The Jenkins SDF Analysis predicts that the current two West Well Field wells would reduce River flows by 1,120 gallons per minute between the Well Field and the Waste Water Treatment Plant. The Jenkins SDF Analysis assumes that the River has a fully penetrating channel, in other words, a channel approximately 200 feet deep. In actual fact, the River channel varies from a couple of feet to no more than 10 feet deep.

The static water level data from the West Well Field shows that the Alluvial water table near the well field varies minimally from summer high pumping conditions to low withdrawal winter months. There does not appear to be any permanent lowering of the water table.

The consumptive use analysis shown in the previous paragraph shows that 70 percent of the water pumped by the City is returned either directly to the River or as recharge directly to the Alluvial Aquifer. The net withdrawal of ground water from the Platte River/Alluvial water system by the entire City well system is the current 500 million gallons per year of consumptive use water.

(5) Any adverse environmental effect of the proposed withdrawal or transportation of ground water;

The net impact on the environment would be due to minimal reduced flows in the North Platte River between the West Well Field and the City's Waste Water Treatment Plant.

(6) The cumulative effect of the proposed withdrawal and transfer relative to the matters listed in subdivisions (3) through (6) of this section when considered in conjunction with all other transfers subject to this section;

The City of Scottsbluff needs to have the ability to provide water for its citizens and the commercial entities within its City limits. The City needs to plan for increased growth over the next twenty years. A 20 percent increase in water pumped over the next 20 years will have a net impact of increasing consumptive use by 120 million gallons per year. Physical impacts to the North Platte River and the North Platte Alluvium are confined to the six-mile segment of the River between the West Well Field and the Waste Water Treatment Plant.

(7) Any other factors consistent with the purpose of this section that the director deems relevant to protect the health, safety, and welfare of the State and its citizens.

The City of Scottsbluff, which provides the domestic water supply for approximately 37 percent of the population of Scottsbluff County, is mandated statutorily to provide a safe and secure water supply system for its citizens. Uncertainty with regard to future water availability in the North Platte Valley and water quality concerns require that the City have a source of water that will meet both Nebraska water quality requirements and the volumetric needs of its citizens. The North Platte Alluvial Aquifer at the site of the West Well Field does meet those standards.

CITY OF SCOTTSBLUFF

WEST WELL FIELD

CURRENTLY OPERATIONAL WELLS

CITY OF SCOTTSBLUFF, NEBRASKA

MUNICIPAL WATER WELLS

CURRENTLY OPERATIONAL ALLUVIAL WELLS

Well Name	Location	Date Constructed	DNR Registration Number
Well 1	SW SW Section 18 T22N-R55W	02-19-1980	A-011085A
Well 3	SW NE Section 23 T22N-R55W	03-03-1940	A-011085B
Well 5	NE SE Section 22 T22N-R55W	08-17-1948	A-011085D
Well 9	NW SW Section 14 T22N-R55W	09-20-1972	A-011085H
Well 10	SE NW Section 24 T22N-R55W	12-10-1959	A-011085I
Well 11	SE SW Section 3 T22N-R55W	09-24-1965	A-011085J
Well 12	SE SW Section 12 T22N-R55W	07-15-1979	A-011085K
Well 13	NE SW Section 22 T22N-R55W	10-17-1977	A-011085L

NEW WEST WELL FIELD

Well Name	Location	Date Constructed	DNR Registration Number
Well 17	NE NW Section 21 T22N-R55W	10-09-1997	G-93466
Well 18	NE NW Section 21 T22N-R55W	10-08-1997	G-93467
Well 19	SE NW Section 21 T22N-R55W	10-02-2007	A-011085G

AIRPORT WELL FIELD

Well Name	Location	Date Constructed	DNR Registration Number
Well	NE SW Section 21 T22N-R54W	6-17-2004	A-011085M
Well	NE SW Section 21 T22N-R54W	8-1973	A-011085N

CITY OF SCOTTSBLUFF

WEST WELL FIELD

TYPICAL WELL CONSTRUCTION DIAGRAM

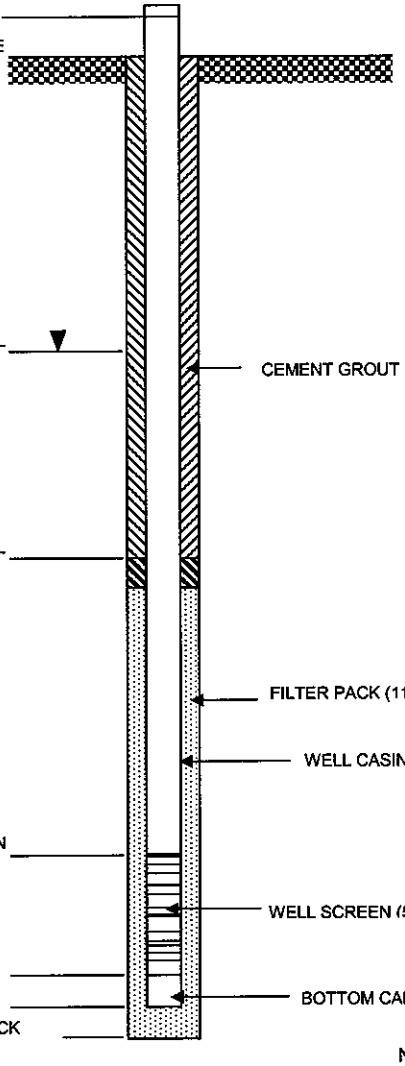
TYPICAL WELL PROFILE

Pumping Well Construction

Project Name	Project No.	Drilling Company	Date Drilled
SCOTTSBLUFF WEST WELL FIELD		SARGENT DRILLING	9-Oct-97
Well No.	**Location**	**Ground Surface El.**	**Drilling Rig Type**	**Date Constructed**
No. 17	NE NW SEC 21-T22N-R55W	3886'	REVERSE ROTARY	9-Oct-97

	Elevation	Depth From Reference	
Borehole Diameter: 28 INCHES			
Survey Reference Point	3991'	3.0'	TOP OF CASING
Joint Type: WELDED	3886'	0'	GROUND SURFACE
Type/Size of Casing: 388' 18" STEEL			
Type/Size of Screen: 50' 18" STNL STEEL			
Screen Slot Size: 0.090 INCH			
Type/Amount of Grout/Fill: 45' CEMENT GROUT		3'	STATIC WATER LEVEL
Type/Amount of Seal: 3' BENTONITE CHIPS IN SEAL BELOW CEMENT GROUT		45-48'	TOP BENTONITE SEAL
Type/Amount of Filter Pack: 110' CUSTOM FILTER 'ACK			
Development Technique: AIR JETTING & SURGE BLOCK		108'	TOP OF SCREEN
Well Test: 2000 GPM/ 24 HOURS		158'	BOTTOM OF SCREEN
		158'	BOTTOM OF CASING
		158'	BOTTOM OF FILTER PACK
Notes:			

110' FILTER PACK = 13.0 YARDS
3' BENTONITE CHIPS = 0.3YARDS
45' CONCRETE = 4.5 YARDS



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CITY OF SCOTTSBLUFF

WEST WELL FIELD

WELL 17 AND WELL 19 HYDRAULIC ANALYSIS

Jacobson Helgoth CONSULTANTS

Project: Well 17 & 18 Testimonte | Computed: N. Hoss | Date: 10-27-06
Project No.: 695-01 | Checked: | Date:
Subject: Estimated Transmissivity | Sheet: 1 | Of: 2

Due to the lack of hydraulic testing information available for Scotts Bluff Wells 17 & 18, Transmissivity (T) was estimated using the USGS equations for estimating T from specific capacity (S)

S = pump rate (gpm) / drawdown (feet)

For both Wells 17 and 18 the reported static water level (SWL) was 3' from the surface. Both wells were pumped @ 2000 gpm with a drawdown of 40 feet in the wellbore.

$$T = 308 \frac{Q}{s} \quad \text{(common U.S. units)}$$

$$T = 308 \times \frac{2000 \text{ gpm}}{40 \text{ feet}} = 15,400 \text{ ft}^2/\text{day}$$

Because only 50 feet of screen was used in each well, the T term - assumes total aquifer thickness

$$K_{(\text{screen})} \text{ (Hydraulic conductivity)} = \frac{T}{50} = \frac{15,400 \text{ ft}^2/\text{day}}{50} = 308 \text{ ft/day}$$

Well 17 aquifer thickness = 155' - 3' = 152 feet

Well 18 aquifer thickness = 147 - 3' = 144 feet

Well 17 $T = K_{\text{screen}} \times \text{Aquifer thickness}$

$T = 308 \text{ ft/day} \times 152 \text{ feet} = 46816 \text{ ft}^2/\text{day}$

Well 18 $T = T = 308 \text{ ft}^2/\text{day} \times 144 \text{ feet} = 44352 \text{ ft}^2/\text{day}$

Note: Source of estimate is: U.S. Geological Survey Water Supply Paper 2220 "Basic Ground-Water Hydrology", 1989, p. 60-61

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Jacobson Helgoth CONSULTANTS

Project Well 19 | Computed W. Hoss | Date 1-23-08
Project No. 695-01 | Checked | Date
Subject Estimated transmissivity | Sheet 2 | Of 2

Using the same analysis that was used to estimate Transmissivity in wells 17 and 18 yield the following results.

For well 19 the reported static water level (SWL) is 3' from the surface. Well 19 was pumped at 3,250 gpm for 24 hours. Drawdown in the well bore was 38.25 feet.

$$T = 308 \frac{Q}{s} \quad \text{(in common U.S. units)}$$

$$T = 308 \times \frac{3250 \text{ gpm}}{38.25 \text{ feet}} = 26,170 \text{ ft}^2/\text{day}$$

Because only 50 feet of screen was used in the well, the T term - assumes total aquifer thickness.

$$K_{(\text{screen})} \text{ (hydraulic conductivity)} = \frac{T}{50} = \frac{26,170 \text{ ft}^2/\text{day}}{50 \text{ feet}} = 523 \text{ ft/day}$$

$$T = K \times \text{Aquifer thickness} \ (137 \text{ feet} - 3 \text{ feet})$$

$$T = 523 \text{ ft/day} \times 135 \text{ feet} = 70,605 \text{ ft}^2/\text{day}$$

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Jacobson Helgoth CONSULTANTS

Project Scottsbluff Transfer Plant | Computed N. Hoss | Date 12-14-06
Project No. 645-01 | Checked | Date
Subject Well 17 Pump Analysis | Sheet 1 | Of 3

Drawdown and Recovery water Level data was analyzed using Neuman Type curves for unconfined aquifers

$$T = \frac{Q}{4\pi (h_o - h)} W(u_A, u_B, T)$$

where:

$h_o - h$ = drawdown in feet

Q = pump rate in ft^3/day

T = transmissivity in ft^2/day

r = radial distance from pumped well (feet)

S = storativity

S_y = specific yield $\quad S_y = \frac{4Tt u_B}{r^2}$

t = time

Source: from C.W. Fetter "Applied Hydrogeology" - 1988

1. MW-1 Pump response

Late data: $h_o - h$ = 0.11 @ 0.1

t = 12.5 min @ 1

$$T = \frac{578{,}800\ ft^3/day \times 0.1}{4\pi\ (0.11\ feet)} = 41{,}878\ ft^2/day$$

$$S_y = \frac{4 \times 41{,}878\ ft^2/day \times 0.0087\ day \times 1}{(72.75\ feet)^2} = 0.275$$

Early data: $h_o - h$ = 0.12 feet (0.1)

time = 0.7 minutes

$$T = \frac{578{,}800\ ft^3/day \times 0.1}{4\pi\ (0.12\ feet)} = 40{,}133\ ft^2/day.$$

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2. MW-1 Recovery Response

Later data $h_o - h = 0.083$ feet @ 0.1
$t = 6$ minutes

$$T = \frac{578{,}880 \text{ ft}^3/\text{day} \times 0.1}{4\pi\,(0.083 \text{ feet})} = 55{,}493 \text{ ft}^2/\text{day}$$

$$S_y = \frac{4 \times 55{,}493 \text{ ft}^2/\text{day} \times 0.0042 \text{ day} \times 1}{(72.75 \text{ feet})^2} = 0.176$$

Early data $h_o - h = 0.09$ feet (0.1)
$t = 0.044$ min (1)

$$T = \frac{578{,}880 \text{ ft}^3/\text{day} \times 0.1}{4\pi\,(0.09 \text{ feet})} = 51{,}184 \text{ ft}^2/\text{day}$$

3. MW-2 Pumping Response

Later data $h_o - h = 0.083$ feet (0.1)
$t = 0.05$ min (1)

$$T = \frac{578{,}880 \times 0.1}{4\pi\,(0.083 \text{ feet})} = 55{,}501 \text{ ft}^2/\text{day}$$

$$S_y = \frac{4 \times 55{,}501 \text{ ft}^2/\text{day} \times 0.0059 \text{ day} \times 1}{(101.5 \text{ feet})^2} = 0.127$$

Early data $h_o - h = 0.16$ feet

$$T = \frac{578{,}880 \text{ ft}^2/\text{day} \times 0.1}{4\pi\,(0.16 \text{ feet})} = 28{,}791 \text{ ft}^2/\text{day}$$

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4. MW-2 Recovery Response

Late data (based on 275 min of recovery)

$h_o - h =$ 0.135 feet (0.1)

$t =$ 10.5 min.

$$T = \frac{578{,}880 \text{ ft}^3/\text{day} \times 0.1}{4\pi (0.135 \text{ feet})} = 34{,}123 \text{ ft}^2/\text{day}$$

$$S_Y = \frac{4 \times 34{,}123 \text{ ft}^2/\text{day} \times 0.0073 \text{ days} \times 1}{(101.5 \text{ feet})^2}$$

$S_Y =$ 0.047

Early data $h_o - h =$ 0.07 feet (0.1)

time = 0.043 min

$$T = \frac{578{,}880 \text{ ft}^3/\text{day} \times 0.1}{4\pi (0.07 \text{ feet})} = 65{,}808 \text{ ft}^2/\text{day}$$

Note: Late data analysis is low because recovery was cut off early and did not allow full match of late curve data. Actual T should be in the 50,000 to 60,000 ft²/day range

—11—

QUIFER TEST DATA — MW-1

TYPE OF AQUIFER TEST: Well 17 Pump Test
HOW Q MEASURED:
HOW W.L.'s MEASURED:
RAD./DIST. OF/FROM PUMPING WELL: 72.75 feet
MEAS. POINT FOR W.L.'S:
ELEVATION OF MEAS. POINT:

PUMPING or (OBSERVATION WELL)
(PUMPING) or RECOVERY DATA
PAGE: _____ OF: _____
DEPTH OF PUMP/AIRPIPE:
PUMP ON: date 11-3-1997 time:
PUMP OFF: date 11-4-1997 time:
DURATION OF AQUIFER TEST: 24 Hours.

LOCATION
PERSONNEL
PROJECT

TIME t= _____ at t'=o					WATER LEVEL DATA STATIC WATER LEVEL _____					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CONVERSIONS OR CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
			0.1					0.363					
			0.25					0.948					
			0.50					1.533					
			0.75					1.895					
			1.0					2.101					
			2					2.717					
			3					2.970					
			4					3.096					
			5					3.191					
			7					3.270					
			10					3.333					
			20					3.444					
			30					3.507					
			46					3.602					
			60					3.665					
			90					3.791					
			120					3.855					
			150					3.918					
			200					4.012					
			250					4.092					
			300					4.138					
			400					4.250					
			500					4.313					
			600					4.360					
			700					4.423					
			800					4.487					
			900					4.534					
			1000					4.565					
			1200					4.645					
			1300					4.676					
			1400					4.723					
			1435					4.723					

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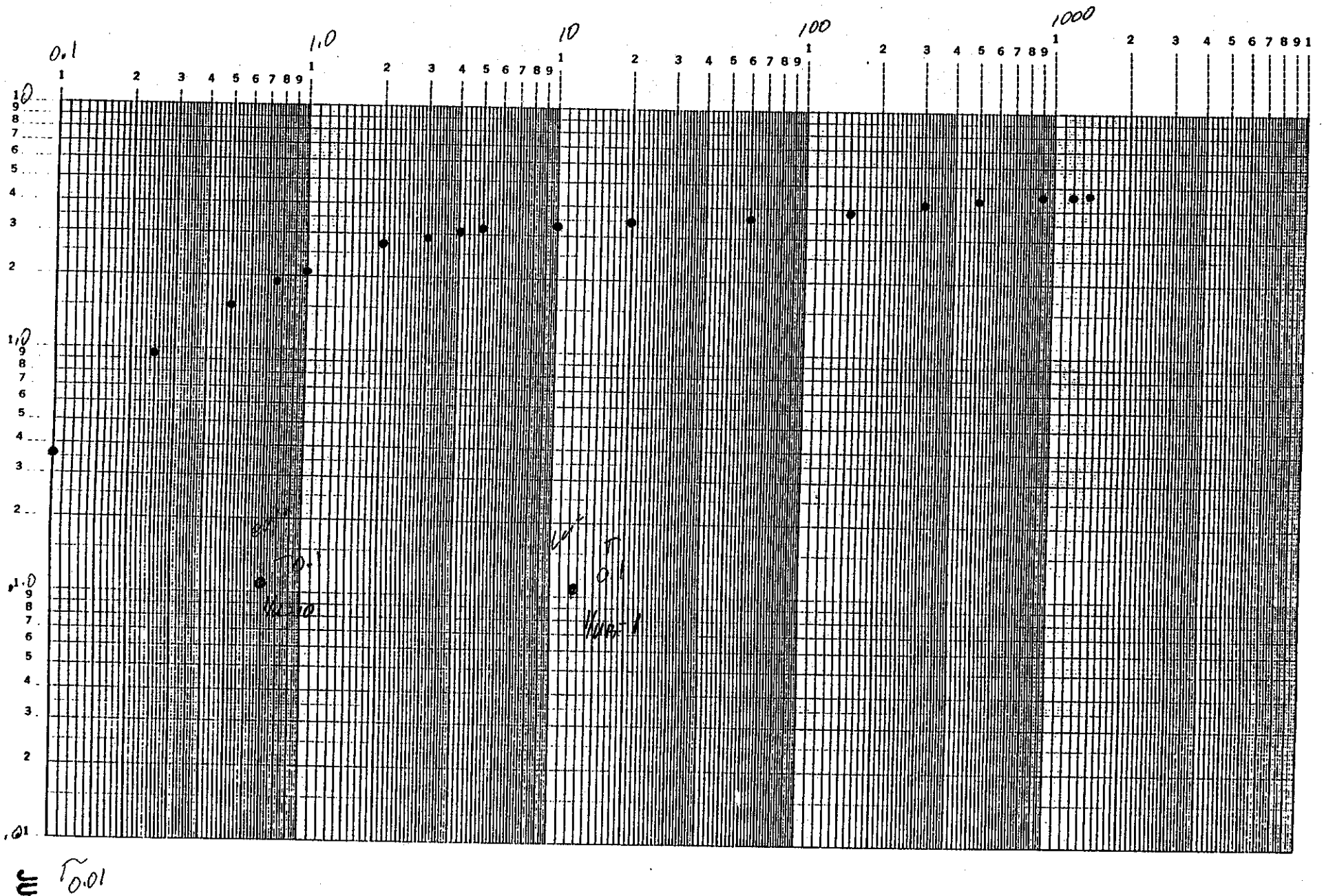
K•E LOGARITHMIC 3 x 5 CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 7520

MW-1
Well 17 Pump Data



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AQUIFER TEST DATA

L MW-1

TYPE OF AQUIFER TEST Well 17 Recovery
HOW Q MEASURED
HOW W.L.'s MEASURED
RAD./DIST. OF/FROM PUMPING WELL 72.75 feet
MEAS. POINT FOR W.L.'S
ELEVATION OF MEAS. POINT

PUMPING or (OBSERVATION WELL)
PUMPING or (RECOVERY DATA)
PAGE ____ OF ____
DEPTH OF PUMP/AIRPIPE
PUMP ON: date ____ time ____
PUMP OFF: date 11-4-1997 time ____
DURATION OF AQUIFER TEST 24 hours

LOCATION
PERSONNEL
PROJECT

TIME t= ____ at t'=o					Pumping WATER LEVEL DATA STATIC WATER LEVEL 4.660					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CONVERSIONS OR CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
			0.01			4.613		0.047					
			0.10			4.076		0.584					
			0.20			3.491		1.169					
			0.50			2.749		1.911					
			0.75			2.465		2.195					
			1			2.306		2.354					
			2			2.085		2.575					
			3			2.006		2.654					
			5			1.959		2.701					
			7			1.927		2.733					
			10			1.880		2.780					
			20			1.785		2.875					
			30			1.737		2.923					
			50			1.627		3.033					
			70			1.563		3.097					
			90			1.501		3.159					
			120			1.422		3.238					
			150			1.343		3.317					
			180			1.280		3.380					
			220			1.200		3.460					
			300			1.074		3.586					
			400			0.948		3.712					
			500			0.821		3.839					
			700			0.647		4.013					
			900			0.521		4.139					
			1000			0.474		4.186					
			1200			0.395		4.265					
			1400			0.332		4.328					
			1445			0.316		4.344					
			/										

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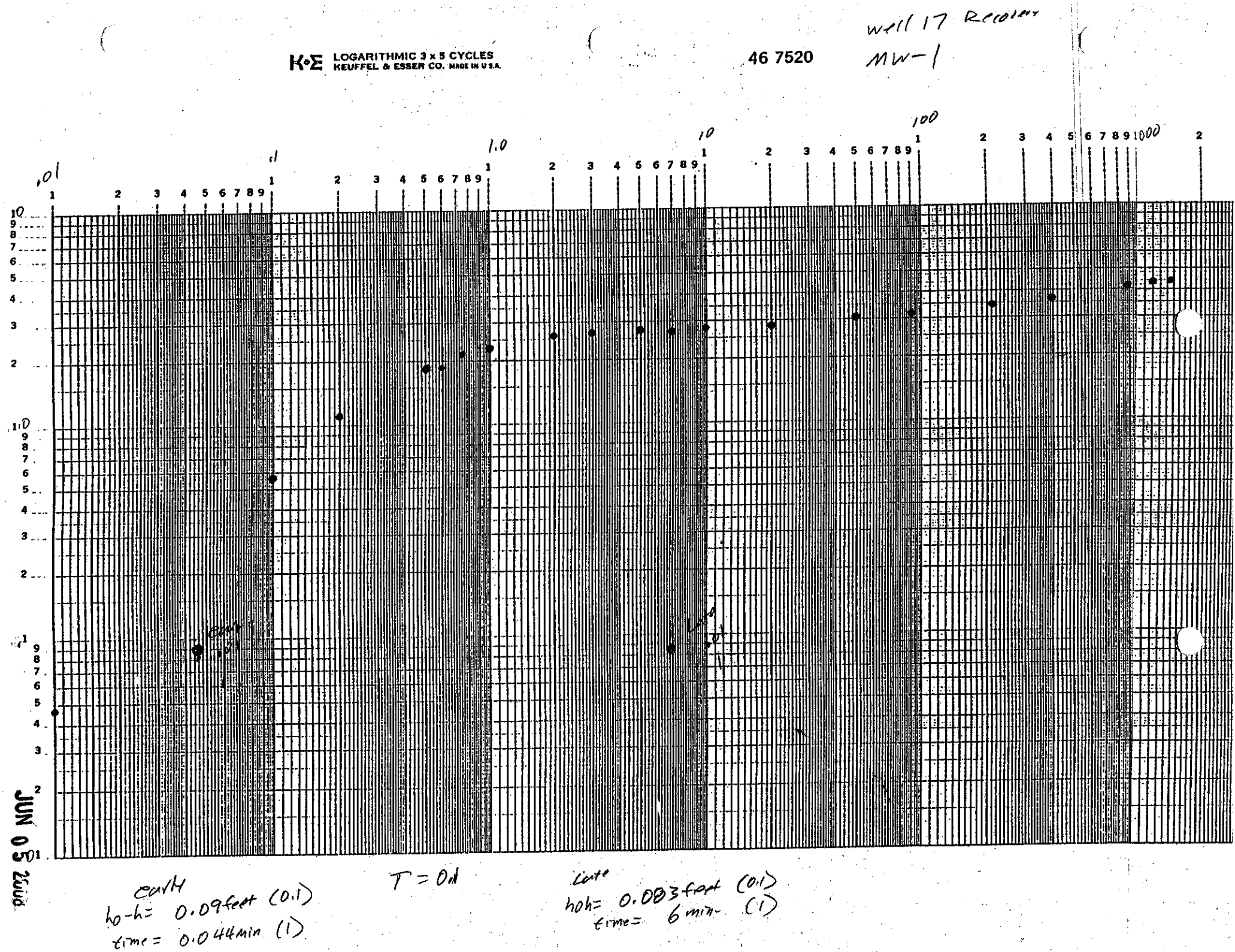
K•Σ LOGARITHMIC 3 x 5 CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 7520
well 17 Recovery
MW-1
JUN 0 5 2002
early
late
early
h0-h= 0.09feet (0.1)
time= 0.044min (1)
T = 0.11
late
h0h= 0.083feet (0.1)
time= 6 min (1)

QUIFER TEST DATA — MW-2

TYPE OF AQUIFER TEST Well 7 Pump Test
HOW Q MEASURED
HOW W.L.'s MEASURED
RAD./DIST. OF/FROM PUMPING WELL 101.5 feet
MEAS. POINT FOR W.L.'S
ELEVATION OF MEAS. POINT

PUMPING or (OBSERVATION WELL)
(PUMPING) or RECOVERY DATA
PAGE ____ OF ____
DEPTH OF PUMP/AIRPIPE
PUMP ON: date 11-3-1997 time
PUMP OFF: date 11-4-1997 time
DURATION OF AQUIFER TEST 24 hours

LOCATION
PERSONNEL
PROJECT

TIME t= ____ at t'=o					WATER LEVEL DATA STATIC WATER LEVEL ____					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CONVERSIONS OR CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
			0.1					0.016					
			0.25					0.334					
			0.5					0.923					
			0.75					1.209					
			1					1.385					
			2					1.926					
			3					2.181					
			4					2.308					
			5					2.388					
			7					2.499					
			10					2.563					
			20					2.690					
			30					2.754					
			46					2.833					
			60					2.897					
			90					3.008					
			120					3.088					
			150					3.152					
			200					3.231					
			250					3.295					
			300					3.359					
			400					3.454					
			500					3.550					
			600					3.598					
			700					3.645					
			800					3.677					
			900					3.741					
			1000					3.788					
			1200					3.868					
			1300					3.900					
			1400					3.932					
			1435					3.932					

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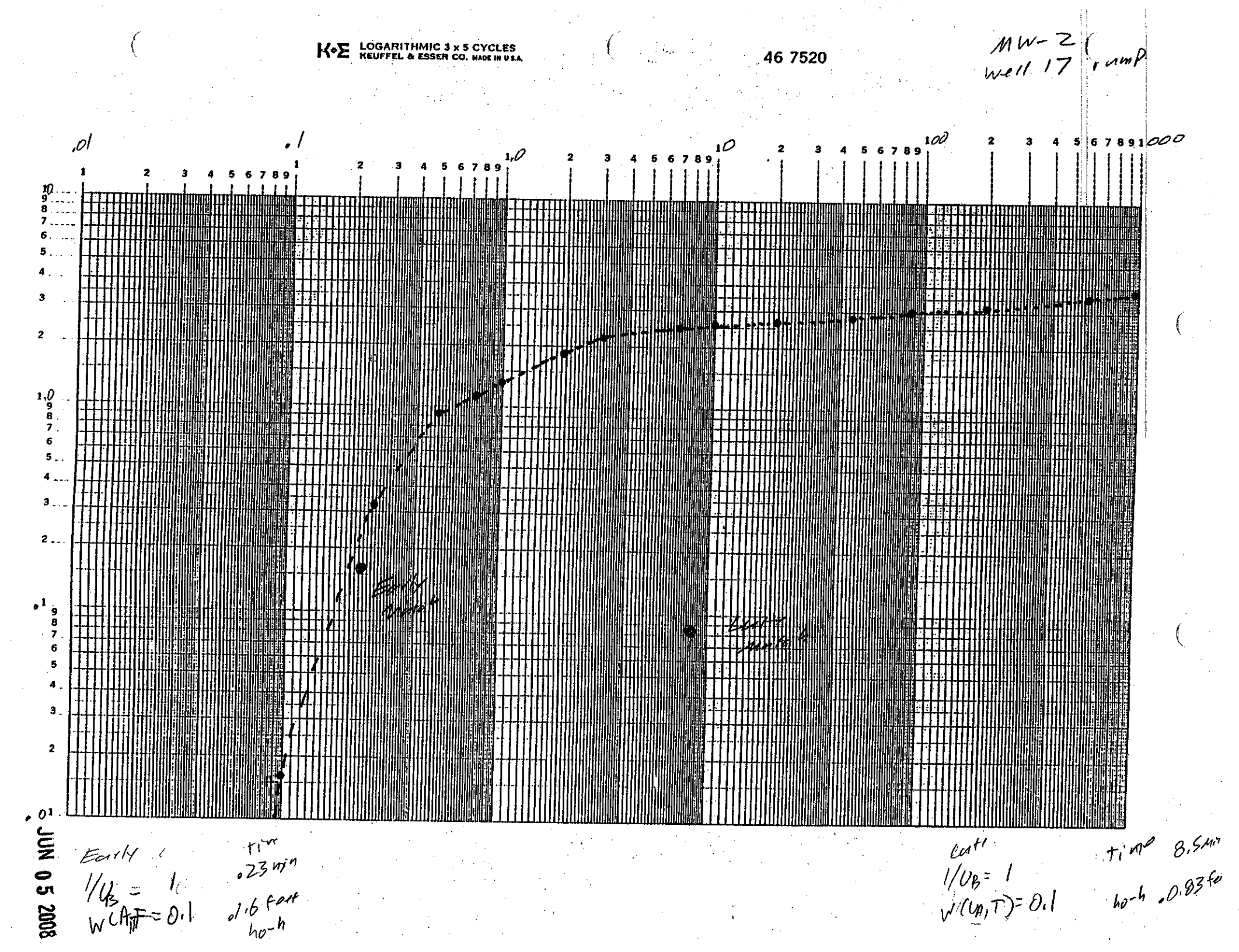
K•E LOGARITHMIC 3 x 5 CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 7520
MW-2
well 17, ump
Early
Later
Early
1/UB = 1
W(UA,T) = 0.1
time
.23 min
1.6 feet
ho-h
Late
1/UB = 1
W(UA,T) = 0.1
time 8.5 min
ho-h .0.83 fe
JUN 05 2008

QUIFER TEST DATA

MW-2

TYPE OF AQUIFER TEST: well 17 Recovery
HOW Q MEASURED:
HOW W.L.'s MEASURED:
RAD./DIST. OF/FROM PUMPING WELL: 101.5 feet
MEAS. POINT FOR W.L.'S:
ELEVATION OF MEAS. POINT:

PUMPING or (OBSERVATION WELL)
PUMPING or (RECOVERY DATA)
PAGE 1 OF 1
DEPTH OF PUMP/AIRPIPE:
PUMP ON: date: time:
PUMP OFF: date: 11-4-1997 time:
DURATION OF AQUIFER TEST: 275 mm, -

LOCATION
PERSONNEL
PROJECT

TIME t= ____ at t'=o					Pumping WATER LEVEL DATA 3.916 STATIC WATER LEVEL:					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CONVERSIONS OR CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
			0.01				3.836	0.08					Q was 3000 GPM
			0.10				3.486	0.43					
			0.20				3.057	0.859					
			0.50				2.467	1.449					
			0.75				2.213	1.703					
			1				2.069	1.847					
			2				1.815	2.101					
			3				1.751	2.165					
			5				1.704	2.212					
			7				1.687	2.229					
			10				1.639	2.277					
			20				1.544	2.372					
			30				1.496	2.420					
			50				1.417	2.499					
			70				1.337	2.579					
			90				1.274	2.642					
			120				1.194	2.722					
			150				1.114	2.802					
			180				1.050	2.866					
			220				0.955	2.961					
			275				0.860	3.056					

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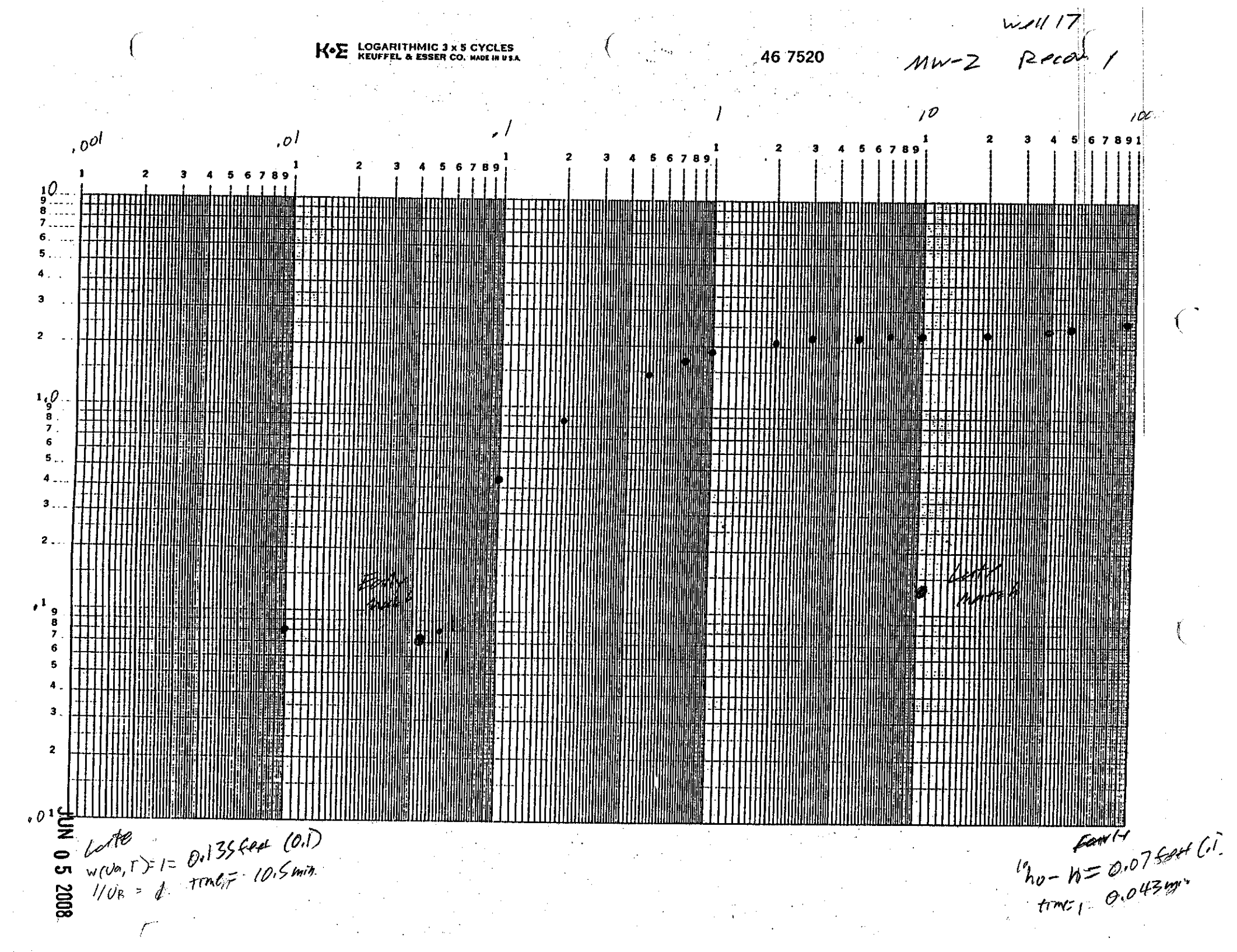

K•Σ LOGARITHMIC 3 x 5 CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 7520
Well 17
MW-2 Recal 1
,001
,01
,1
1
10
100
JUN 05 2008
Early
Late
Early
Late
w(Va,r)=1= 0.135 feet (0.1)
1/UB = 1 time= 10.5 min.
"h0 - h = 0.07 feet (0.1
time= 0.043 min

AQUIFER TEST DATA

WELL Scotts Bluff Well 19

TYPE OF AQUIFER TEST 24-Hour Pump Test
HOW Q MEASURED
HOW W.L.'s MEASURED
RAD./DIST. OF/FROM PUMPING WELL
MEAS. POINT FOR W.L.'S
ELEVATION OF MEAS. POINT

(PUMPING) or OBSERVATION WELL
(PUMPING) or RECOVERY DATA
PAGE ____ OF ____
DEPTH OF PUMP/AIRPIPE
PUMP ON: date 8-2-07 time 11:33
PUMP OFF: date 8-3-07 time 11:29
DURATION OF AQUIFER TEST 24 Hours

LOCATION
PERSONNEL
PROJECT

TIME Minutes t= ____ at t'=o					WATER LEVEL DATA STATIC WATER LEVEL 5.14 ft.					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CONVERSIONS OR CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
1			0.25					20.24					3250 GPM
			0.75					32.35					
			1.25					35.29					
			3					35.56					
			6					36.10					
			10					35.62					
			17					35.54					
			27					38.49					
			43					38.65					
			60					38.74					
			90					38.65					
			120					38.76					
			240					38.73					
			420					38.35					
			660					38.42					
			780					38.61					
			900					38.56					
			1020					38.64					
2			1260					38.27					
			1380					38.31					
			1436					38.25					

JUN 05 2008

AQUIFER TEST DATA

Scottsbluff well 19

WELL _____

TYPE OF AQUIFER TEST Recovery from Pump Test
HOW Q MEASURED _____
HOW W.L.'s MEASURED _____
RAD./DIST. OF/FROM PUMPING WELL _____
MEAS. POINT FOR W.L.'S _____
ELEVATION OF MEAS. POINT _____

(PUMPING) or OBSERVATION WELL
PUMPING or (RECOVERY) DATA
PAGE _____ OF _____
DEPTH OF PUMP/AIRPIPE _____
PUMP ON: date _____ time _____
PUMP OFF: date 8-3-07 time 11:29
DURATION OF AQUIFER TEST 24 Hour Pump

LOCATION _____
PERSONNEL _____
PROJECT _____

TIME t= 11:29 Minutes at t'=o

Pumping WATER LEVEL DATA
~~STATIC~~ WATER LEVEL 38.25 feet

DAY	CLOCK TIME	t	t'		READING	CONVERSIONS OR CORRECTIONS	WATER LEVEL	s or s'		DISCHARGE READING	DISCHARGE Q	RECORDED BY	COMMENTS
1			0.5					16.60					Recovery from
			1					1.87					24 hours
			1.5					1.22					Pumping @
			2					1.06					3250 gpm.
			4					1.04					
			5					1.00					
			10					0.96					
			20					0.87					
			30					0.75					
			60					0.67					
			90					0.57					
			150					0.47					
			159					0.45					end of
													recorded
													data

JUN 05 2008

CITY OF SCOTTSBLUFF

WEST WELL FIELD

DISTANCE-DRAWDOWN HYDRAULIC CALCULATIONS

Jacobson Helgoth CONSULTANTS

Project Scottsbluff Transfer Project | Computed N. Hoses | Date 4-5-07
Project No. 695-01 | Checked | Date
Subject Distance-Drawdown- | Sheet 1 | Of 2

Estimation of drawdown with distance for different pump rates.

Method: Modified Jacob- Straight Line Method

$$T = \frac{70Q}{\Delta(h_o - h)}$$

Where

T = transmissivity (ft^2/day) Q = Constant Pump Rate (GPM)

$\Delta h_o - h$ = drawdown per log cycle of distance (feet)

r_o = intercept of the straight line with the zero drawdown Axis (feet)

From Monitoring well pump/recovery response analysis

$T = 50,000\ ft^2/day$

For Q = 3000 gpm then $\Delta h_o - h$ = 4.2 feet

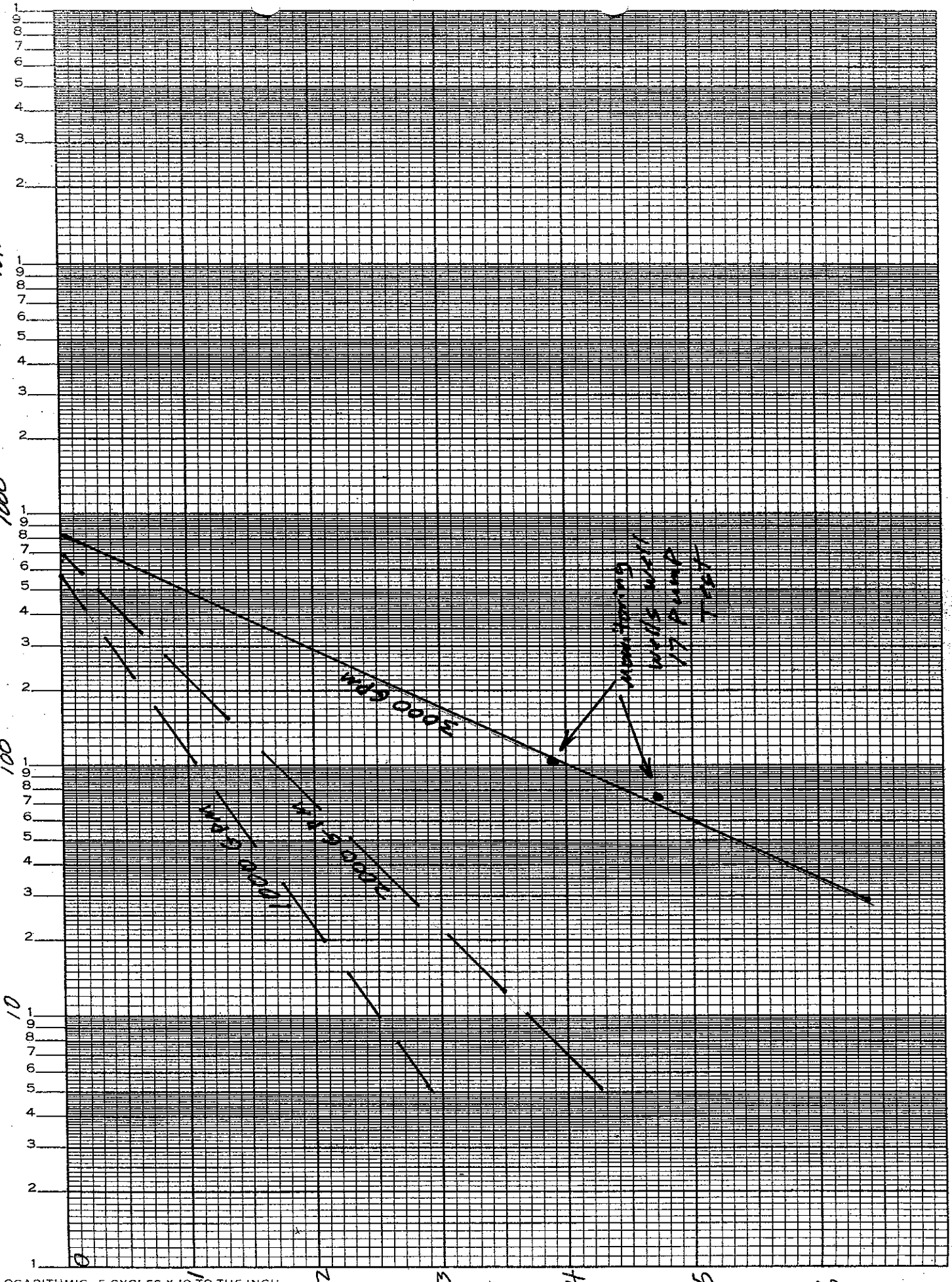
Q = 2000 gpm then $\Delta h_o - h$ = 3.1 feet

Q = 1000 gpm then $\Delta h_o - h$ = 1.4 feet

	Distance From Pumped well (feet)					
Q (GPM)	100	200	400	600	800	r_o
3000	4.1	2.75	1.4	0.6	0.05	820
2000	1.9	1.4	0.55	0.3	0	660
1000	1.1	0.65	0.2	0	0	560

JUN 05 2008

Distance Drawdown Calculations



SEMI-LOGARITHMIC, 5 CYCLES X 10 TO THE INCH
5TH LINES ACCENTED

JUN 05 2008

CITY OF SCOTTSBLUFF

WEST WELL FIELD

STREAM DEPLETION FACTOR ANALYSIS

Jacobson Helgoth CONSULTANTS

Project Scottsbluff Transfer Permit | Computed T. Hoos | Date 1-9-07
Project No. 695-01 | Checked | Date
Subject SDF Analysis | Sheet 1 | Of 1

Stream Depletion Factor Analysis

Methodology from C.T. Jenkins "Computation of Rate and Volume of Stream Depletion by Wells" 1968 U.S.G.S Techniques of Water-Resources Investigations

Parameters:

Transmissivity = T = 50,000 ft²/day (well 17)

Specific Yield = S = 0.2 (well 17)

a = distance to stream = 3,500 feet

Q = Pump Rate = 700 gpm average for One Year

SDF = Stream depletion factor

$$SDF = \frac{a^2 \times S}{T} = \frac{(3{,}500\ ft)^2 \times 0.2}{50{,}000\ ft^2/day}$$

SDF = 49 days

Calculate Effect of Pumping well for One Year on North Platte River

$$\frac{t}{sdf} = \frac{365 days}{49 days} = 7.45$$

From the Jenkins Fig 1 curve $\frac{q}{Q} = 0.8$ where

q = rate of depletion of stream

Q well 17 = 350,500,000 gallons per year

or- 46,967,000 ft³/year-

q = 0.8 × 46,967,000 ft³/year = 37,573,600 ft³/year

or-

281,050,500 gallons/year-

JUN 05 2007

CITY OF SCOTTSBLUFF

WEST WELL FIELD

WASTEWATER TREATMENT PLANT DISCHARGE HISTORY

CITY OF SCOTTSBLUFF
WASTEWATER TREATMENT PLANT
EFFLUENT DISCHARGE HISTORY

YEAR	DISCHARGE OUTFALL (GALLONS)
1995	702,634,000
1996	635,002,000
1997	715,191,000
1998	1,870,773,000
1999	691,736,000
2000	178,403,000
2001	740,954,800
2002	293,496,100
2003	719,101,000
2004	806,935,000
2005	508,910,000
2006	506,231,300
2007	532,417,000
Average Annual Discharge	***684,753,000***

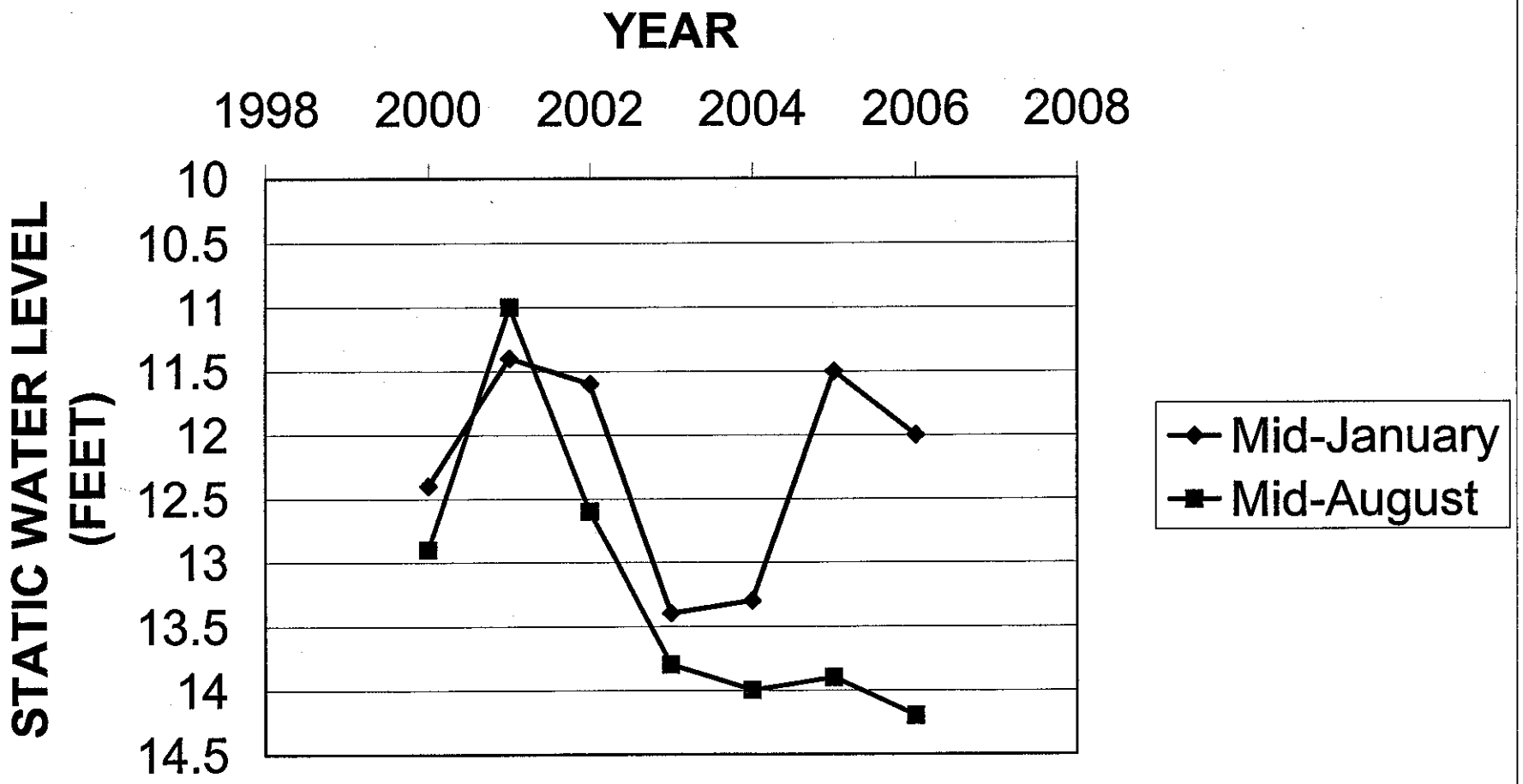
CITY OF SCOTTSBLUFF

WEST WELL FIELD

STATIC WATER LEVEL HISTORY

Water Level Data From Wells 17 and 18

WEST WELL FIELD WINTER VS SUMMER WATER LEVELS



JAN 5 2008

Well #17 By Riverview Golf Course

Date	2000	2001	2002	2003	2004	2005	2006	MIN	AVG	MAX
01/06/06	11.8	11.3	11.5	13.4	12.7	11.4	12.7	11.30	12.11	13.40
01/13/06	12.4	11.4	11.6	13.4	13.3	11.5	12	11.40	12.23	13.40
01/20/06	12.4	11.4	11.6	13.4	13.3	11.5	12	11.40	12.23	13.40
01/27/06	12.4	11.4	11.6	13.4	13.3	11.5	12	11.40	12.23	13.40
02/03/06	12.4	11.4	11.6	13.4	13.3	11.5	12	11.40	12.23	13.40
02/10/06	12.5	11.4	11.5	13.4	13.3	11.6	12	11.40	12.24	13.40
02/17/06	12.5	11.5	11.5	13.6	13.5	11.6	12	11.50	12.31	13.60
02/24/06	12.5	11.5	11.5	13.6	13.5	11.6	12.1	11.50	12.33	13.60
03/03/06	12.5	11.5	11.5	13.6	13.5	11.6	12.1	11.50	12.33	13.60
03/10/06	12.4	11.8	12.1	13.6	13.5	13.1	12	11.80	12.64	13.60
03/17/06	12.4	11.8	12.1	12.5	13.1	13.1	12	11.80	12.43	13.10
03/24/06	12.4	11.8	12.1	12.5	13.1	13.1	12	11.80	12.43	13.10
03/31/06	12.4	11.8	12.1	12.5	13.1	13.1	12	11.80	12.43	13.10
04/07/06	12.4	11.8	12.1	12.5	13.1	13.4	12	11.80	12.47	13.40
04/14/06	12.7	11.5	12.1	12.5	13.6	13.4	12	11.50	12.54	13.60
04/21/06	12.7	11.5	12.6	12.5	13.6	13.4	13	11.50	12.76	13.60
04/28/06	12.7	11.5	12.6	13	13.6	13.4	13	11.50	12.83	13.60
05/05/06	12.7	11.5	12.6	13	13.6	13.4	13	11.50	12.83	13.60
05/12/06	12.6	11	12.4	13.2	13.6	13.8	14	11.00	12.94	14.00
05/19/06	12.6	11	12.4	13.1	13.8	13.8	14	11.00	12.96	14.00
05/26/06	12.6	11	12.4	13.2	13.8	13.8	14	11.00	12.97	14.00
06/02/06	12.6	11	12.4	13.5	13.8	13.8	14	11.00	13.01	14.00
06/09/06	12.6	11.2	12.4	13.5	13.8	13.7	13	11.20	12.89	13.80
06/16/06	12.6	11.2	13.9	13.4	14.1	13.7	13	11.20	13.13	14.10
06/23/06	12.9	11.2	13.3	13.4	14.1	13.7	13	11.20	13.09	14.10
06/30/06	12.9	11.2	13	13.4	14	13.8	13	11.20	13.04	14.00
07/07/06	12.9	11.2	13	13.4	14	13.8	13	11.20	13.04	14.00
07/14/06	13.2	11.1	12.7	13.8	13.9	13.9	14	11.10	13.23	14.00
07/21/06	13.2	11.1	12.7	13.5	13.9	14	14	11.10	13.20	14.00
07/28/06	13.2	11.1	12.7	13.6	13.9	14	14	11.10	13.21	14.00
08/04/06	13.2	11.1	12.7	13.6	13.9	14	14	11.10	13.21	14.00
08/11/06	12.9	11	12.6	13.8	13.9	13.9	14	11.00	13.16	14.00
08/18/06	12.9	11	12.6	13.8	14	13.9	14.2	11.00	13.20	14.20
08/25/06	12.9	11	12.5	13.7	14	13.9	14.2	11.00	13.17	14.20
09/01/06	12.9	11	12.5	13.6	14	13.9	14.2	11.00	13.16	14.20
09/08/06	12.7	11	12.5	13.6	14	13.5	14.1	11.00	13.06	14.10
09/15/06	12.7	11.2	12.9	13.1	13.5	13.5	14.1	11.20	13.00	14.10
09/22/06	12.7	11.2	12.9	13.1	13.5	13.5	14.1	11.20	13.00	14.10
09/29/06	12.7	11.2	12.9	13.1	13.5	13.5	14.1	11.20	13.00	14.10
10/06/06	12.7	11.2	12.9	13.1	13.5	13.5	14.1	11.20	13.00	14.10
10/13/06	12.4	11.2	13	13.2	13.5	12.9	14	11.20	12.89	14.00
10/20/06	12.4	11	13	13.2	12	12.9	14	11.00	12.64	14.00
10/27/06	12.4	11	13	13.2	12	12.9	14	11.00	12.64	14.00
11/03/06	12.4	11	13	13.2	12	12.9	14	11.00	12.64	14.00
11/10/06	12.2	10.9	12.9	13.2	12	12.8	14	10.90	12.57	14.00
11/17/06	12.2	10.9	12.9	12.2	11.3	12.8	13.9	10.90	12.31	13.90
11/24/06	12.2	10.9	12.9	12.2	11.3	12.8	13.9	10.90	12.31	13.90
12/01/06	12.2	10.9	12.9	12.2	11.3	12.8	13.9	10.90	12.31	13.90
12/08/06	12.2	10.9	12.9	12.2	11.3	12.7	12.9	10.90	12.16	12.90
12/15/06	11.3	11.5	13.4	12.7	11.4	12.7	12.9	11.30	12.27	13.40
12/22/06	11.3	11.5	13.4	12.7	11.4	12.7	12.9	11.30	12.27	13.40
12/29/06	11.3	11.5	13.4	12.7	11.4	12.7	12.9	11.30	12.27	13.40
MIN	11.30	10.90	11.50	12.20	11.30	11.40	12.00	10.90	12.11	12.90
MAX	13.20	11.80	13.90	13.80	14.10	14.00	14.20	11.80	13.23	14.20
AVG	12.52	11.25	12.53	13.16	13.18	13.07	13.22	11.24	12.70	13.77

Well #18 By Riverview Golf Course

Date	2000	2001	2002	2003	2004	2005	2006	MIN	AVG	MAX
01/06/06	12	11.3	11.4	13	12.5	11.3	12.5	11.30	12.00	13.00
01/13/06	12.5	11.5	11.5	13	13.2	11.4	11.8	11.40	12.13	13.20
01/20/06	12.5	11.5	11.5	13	13.2	11.4	11.8	11.40	12.13	13.20
01/27/06	12.5	11.5	11.5	13	13.2	11.4	11.8	11.40	12.13	13.20
02/03/06	12.5	11.5	11.5	13	13.2	11.4	11.8	11.40	12.13	13.20
02/10/06	12.6	11.5	11.4	13	13.2	11.5	11.8	11.40	12.14	13.20
02/17/06	12.6	11.6	11.4	13.3	13.4	11.5	11.8	11.40	12.23	13.40
02/24/06	12.6	11.6	11.4	13.3	13.4	11.5	11.9	11.40	12.24	13.40
03/03/06	12.6	11.6	11.4	13.3	13.4	11.5	11.9	11.40	12.24	13.40
03/10/06	12.5	11.9	12	13.3	13.4	13	11.8	11.80	12.56	13.40
03/17/06	12.5	11.9	12	12.5	13	13	11.8	11.80	12.39	13.00
03/24/06	12.5	11.9	12	12.5	13	13	11.8	11.80	12.39	13.00
03/31/06	12.5	11.9	12	12.5	13	13	11.8	11.80	12.39	13.00
04/07/06	12.5	11.9	12	12.5	13	13.3	11.8	11.80	12.43	13.30
04/14/06	12.6	11.6	12	12.5	13.5	13.3	11.8	11.60	12.47	13.50
04/21/06	12.6	11.6	12.5	12.5	13.5	13.3	12.8	11.60	12.69	13.50
04/28/06	12.6	11.6	12.5	13.1	13.5	13.3	12.8	11.60	12.77	13.50
05/05/06	12.6	11.6	12.5	13.1	13.5	13.3	12.8	11.60	12.77	13.50
05/12/06	12.5	11	12.3	13.3	13.5	13.7	14	11.00	12.90	14.00
05/19/06	12.5	11	12.3	13	13.7	13.7	14	11.00	12.89	14.00
05/26/06	12.5	11	12.3	13.1	13.7	13.7	14	11.00	12.90	14.00
06/02/06	12.5	11	12.3	13.4	13.7	13.7	13.8	11.00	12.91	13.80
06/09/06	12.5	11.1	12.3	13.4	13.7	13.6	12.8	11.10	12.77	13.70
06/16/06	12.5	11.1	13.8	13.3	14	13.6	12.8	11.10	13.01	14.00
06/23/06	12.8	11.1	13.1	13.3	14	13.6	12.8	11.10	12.96	14.00
06/30/06	12.8	11.1	12.9	13.3	13.9	13.6	12.8	11.10	12.91	13.90
07/07/06	12.8	11.1	12.9	13.3	13.9	13.6	12.8	11.10	12.91	13.90
07/14/06	13.1	11	12.6	13.7	13.8	13.7	13.8	11.00	13.10	13.80
07/21/06	13.1	11	12.6	13.4	13.8	13.8	13.8	11.00	13.07	13.80
07/28/06	13.1	11	12.6	13.5	13.8	13.8	13.8	11.00	13.09	13.80
08/04/06	13.1	11	12.6	13.5	13.8	13.8	13.8	11.00	13.09	13.80
08/11/06	12.8	11.2	12.5	13.7	13.8	13.7	13.8	11.20	13.07	13.80
08/18/06	12.8	11.2	12.5	13.7	13.9	13.7	14	11.20	13.11	14.00
08/25/06	12.8	11.2	12.4	13.6	13.9	13.7	14	11.20	13.09	14.00
09/01/06	12.8	11.2	12.4	13.5	13.9	13.7	14	11.20	13.07	14.00
09/08/06	12.7	11.2	12.4	13.5	13.9	13.3	13.9	11.20	12.99	13.90
09/15/06	12.7	11.3	12.8	13	13.4	13.3	13.9	11.30	12.91	13.90
09/22/06	12.7	11.3	12.8	13	13.4	13.3	13.9	11.30	12.91	13.90
09/29/06	12.7	11.3	12.8	13	13.4	13.3	13.9	11.30	12.91	13.90
10/06/06	12.7	11.3	12.8	13	13.4	13.3	13.9	11.30	12.91	13.90
10/13/06	12.5	11.3	12.9	13.1	13.4	12.7	13.8	11.30	12.81	13.80
10/20/06	12.5	11.2	12.9	13.1	11.9	12.7	13.8	11.20	12.59	13.80
10/27/06	12.5	11.2	12.9	13.1	11.9	12.7	13.8	11.20	12.59	13.80
11/03/06	12.5	11.2	12.9	13.1	11.9	12.7	13.8	11.20	12.59	13.80
11/10/06	12.2	11.1	12.8	13.1	11.9	12.6	13.8	11.10	12.50	13.80
11/17/06	12.2	11.1	12.8	12	11.2	12.6	13.7	11.10	12.23	13.70
11/24/06	12.2	11.1	12.8	12	11.2	12.6	13.7	11.10	12.23	13.70
12/01/06	12.2	11.1	12.8	12	11.2	12.6	13.7	11.10	12.23	13.70
12/08/06	12.2	11.1	12.8	12	11.2	12.5	12.7	11.10	12.07	12.80
12/15/06	11.3	11.4	13.3	12.5	11.3	12.5	12.7	11.30	12.14	13.30
12/22/06	11.3	11.4	13.3	12.5	11.3	12.5	12.7	11.30	12.14	13.30
12/29/06	11.3	11.4	13	12.5	11.3	12.5	12.7	11.30	12.10	13.00
MIN	11.30	11.00	11.40	12.00	11.20	11.30	11.80	11.00	12.00	12.80
MAX	13.10	11.90	13.80	13.70	14.00	13.80	14.00	11.80	13.11	14.00
AVG	12.51	11.32	12.42	13.02	13.08	12.92	13.03	11.29	12.[illegible]	13.00