GROUND-WATER AVAILABILITY IN THE VICINITY OF PLAINVIEW, TEXAS

Prepared for

Freese and Nichols, Inc.
Fort Worth, Texas

By

William F. Guyton Associates, Inc.
Consulting Ground-Water Hydrologists
Austin - Houston, Texas

May 1993

GROUND-WATER AVAILABILITY IN THE VICINITY OF PLAINVIEW, TEXAS

Prepared for

Freese and Nichols, Inc.
Fort Worth, Texas

By

William F. Guyton Associates, Inc.
Consulting Ground-Water Hydrologists
Austin - Houston, Texas

May 1993

WILLIAM F. GUYTON ASSOCIATES, INC.
CONSULTING GROUND-WATER HYDROLOGISTS
AUSTIN-HOUSTON

WILLIAM F. GUYTON
MERVIN L. KLUG
WILLIAM J. SEIFERT, JR.
WILLIAM B. KLEMT
RALPH A. SCALAPINO
JOSEPH K. LONGACRE

~~3555 BEE CAVE ROAD, SUITE 401 AUSTIN, TEXAS 78746~~ (512) 327-9640
1101 S. Capital of Texas Hwy., Suite B-220
Austin, Texas 78746-6437

May 19, 1993

Mr. Tom Gooch, P.E.
Principal
Freese and Nichols, Inc.
Consulting Engineers
4055 International Plaza, Suite 200
Fort Worth, Texas 76109-4895

Dear Tom:

Attached is our report on ground-water conditions and availability in the vicinity of the City of Plainview. The results of the study show that there is a large amount of ground water in storage beneath the City and that the City should begin acquiring additional water in storage to increase its supply for the long-term future.

We have enjoyed working on this project and want to thank you and Mr. Bill Hogge and members of his staff with the City of Plainview for your cooperation and assistance.

If you have any questions concerning our report, please do not hesitate to call me.

Sincerely yours,

WILLIAM F. GUYTON ASSOCIATES, INC.

John Seifert

W. John Seifert, Jr.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLES

ILLUSTRATIONS

APPENDIX

CONCLUSIONS AND RECOMMENDATIONS

1. The City of Plainview obtains water from wells that screen the Ogallala aquifer. Plainview has 15 wells that currently provide water to its system. The depths of the wells range from 280 to 367 feet. Pumping rates of the wells range from about 340 to 1,100 gallons per minute (gpm), and average about 600 to 650 gpm.

2. Pumpage of ground water by Plainview has averaged about 2,600 acre-feet per year during the past 10 years. For the period from 1989 through 1991, average pumpage by Plainview was about 3,000 acre-feet per year. In comparison, estimated pumpage for irrigation in the study area was about 210,000 acre-feet in 1989. Thus, withdrawals by Plainview are a very small percentage of the amount of water that is withdrawn for irrigation in the study area.

3. Plainview uses ground water in combination with surface water from the Canadian River. Water from Wells 13 and 14 is blended with surface water at a water-treatment plant located near the wells. It is estimated that at least 50 to 60 percent of the ground water that is pumped by Plainview comes from these two wells. The other Plainview wells are used principally to provide water during periods of high demand.

4. Water levels in wells screening the Ogallala aquifer in the study area have declined about 120 to 150 feet since about 1945. From January 1968 through December 1991 or February 1992, the average water-level decline in available observation wells located outside the City has been about 67 feet. The average water-level decline in the Plainview wells was about 42 feet during essentially this same time period. The smaller amount of decline in the Plainview wells is believed to result primarily from lower overall pumpage per square mile in and near Plainview.

5. The City of Plainview's wells produce water having a total dissolved solids content that generally is below 500 milligrams per liter (mg/l). Chemical analyses of water samples from Wells 5 and 12 show total dissolved solids of 798 and 763 mg/l, respectively. While these concentrations are above 500 mg/l, they are still below the 1,000-mg/l maximum recommended limit for water to be used for public supply.

6. Some local ground-water contamination has occurred in the vicinity of two commercial facilities located northwest and north of Plainview. This contamination appears to be local and thus does not pose an immediate threat to the water supply for the City. However, the water-quality monitoring that is occurring at these facilities should

be reviewed by the City periodically so that it will be aware of any changes that take place.

7. Plainview's wells are equipped to provide water at a combined peak rate of about 9,000 to 10,000 gpm at the present time. Checks of the performances of the City's wells and pumps show that there has been a decrease in specific capacity and/or pump performance for a few of the wells. These decreases can contribute to the reductions in pumping rates that are shown for some of the wells. Details of the results of these checks are given in the report.

8. It is estimated that 190,000 acre-feet of water in storage in the Ogallala under Plainview is available for development by the City. It probably is practicable to withdraw only about two-thirds to three-quarters of this water, however. Thus, about 127,000 to 143,000 acre-feet of water is available from the Ogallala within the City for its future use. If the City continues to use ground water at a rate of about 3,000 acre-feet per year, the recoverable water in storage will supply its needs for about 42 to 48 years.

9. It is recommended that Plainview begin acquiring land with water rights or just the water in storage to help increase its supply. The estimated saturated thickness of the

Ogallala aquifer within Plainview ranges from about 110 to 170 feet; in the area to the east of Plainview, it ranges from about 100 to 170 feet; and in the area to the northwest of Plainview, it ranges from about 80 to 140 feet. It is estimated that, with an average saturated thickness of 120 feet, about 10 square miles would provide a water supply that could last about 30 to 35 years, assuming that the pumpage was about 3,000 acre-feet per year.

10. The cost of purchasing the water in storage, exclusive of the surface rights, is estimated to be in the range from about $200.00 to $450.00 per acre based on current sales prices in the area. The cost of the land itself could vary depending on its proximity to Plainview, the character of the soil, and on land improvements.

11. Site-specific information for determining the amount and quality of the water in storage should be collected and analyzed for any area that is considered for acquisition of water rights or water in storage. Any existing irrigation wells on the land should be pumped and sampled for water quality. Test hole drilling may be required to further assess the amount and quality of the water in storage beneath a given tract of land.

INTRODUCTION

This report presents the results of a study of ground-water conditions and availability in the vicinity of the City of Plainview, Texas. This study is part of a larger water-supply and treatment study for the City of Plainview being performed by Freese and Nichols, Inc. Work began on the water-supply and treatment study in April 1992.

The City of Plainview (Plainview) has obtained ground water from the Ogallala aquifer since near the time of its founding in 1887. Up until 1968, the Ogallala aquifer was the sole source of water for Plainview. In 1968, Plainview began obtaining some surface water from the Canadian River. Since that time, Plainview has had a combined supply of surface water and ground water.

An objective of this study is to estimate, insofar as practical using existing data, the amount of ground water that is available in Plainview and in the general areas around the city to supply part of Plainview's future water needs. Another objective is to provide Plainview some general guidelines regarding wellhead protection.

The area of study is shown on Figure 1. It extends about 10 miles west, 12 miles east, and 9 miles north and south from near the center of Plainview. The study has included the compilation and evaluation of information available for existing wells, other existing ground-water data, and the collection and evaluation of new data. The following work tasks were accomplished during the study:

1. Review of reports and information on geology and ground-water availability in the area that were obtained from the City of Plainview, Texas Water Development Board, Texas Water Commission, U. S. Geological Survey, and William F. Guyton Associates.

2. Compilation and evaluation of drillers'-log and general well-construction information on Plainview's large-capacity wells and on other selected large-capacity wells in the study area surrounding Plainview that were obtained from the files of the City of Plainview, Texas Water Development Board, Texas Water Commission, U. S. Geological Survey, local water-well contractors, private entities, and William F. Guyton Associates.

3. Compilation and evaluation of published and unpublished data on ground-water pumpage, water levels in wells, and chemical quality of ground water that were obtained from the files of the City of Plainview, Texas Water Development Board, Texas Water Commission, U. S. Geological Survey, and some private entities.

4. Performance of specific-capacity and pump-performance checks on Plainview's production wells that could be tested.

5. Performance of a field inventory to measure static water levels and pumping rates of selected wells and to obtain water samples for chemical analysis.

6. Review of recharge information utilized in the ground-water flow model for the Ogallala aquifer that was prepared by the Texas Water Development Board.

7. Collection of data on the cost of land and water in the Plainview area.

8. Collection of information on the cost of test hole drilling, water sampling, well pumping, and well construction.

9. Participation in meetings with the staff of the City of Plainview and Freese and Nichols, Inc. and the preparation of this report.

GEOLOGY

The principal fresh water-bearing formation that provides water to almost all of the wells in the study area is the Ogallala Formation, better known as the Ogallala aquifer. Lower Cretaceous strata, which lie below the Ogallala Formation in a very small part of the study area located about 8 to 10 miles south of Plainview, represent a minor water-bearing formation. The Lower Cretaceous strata extend further to the south outside the southern boundary of the study area.

Ogallala Aquifer

The Ogallala crops out at the land surface along the banks of Running Water Draw, which passes through the study area. It is Tertiary in geologic age and is comprised of layers and lenses of silt, sand, clay, gravel, rock, and caliche. The sands and gravels exhibit varying degrees of cementation. A review of drillers'-log data indicates there is not a large degree of cementation of the sands and gravels in the aquifer in the study area, and local drillers report that in the area around Plainview cementation of the sands and gravels is generally only noticed while drilling through the very bottom part of the aquifer.

Although individual layers cannot be traced or correlated over long distances, caliche beds appear to be most predominant at or just a few feet below land surface near the top of the Ogallala aquifer. Windblown sand or playa deposits are at land surface in the study area except along Running Water Draw and Callahan Draw where alluvium or the Ogallala outcrops. The total thickness of the Ogallala aquifer ranges from about 250 feet north of Plainview at the Hale County line to about 400 feet in the very southeast part of the study area. In the very southern part of the study area, where the Lower Cretaceous strata occur, the thickness of the Ogallala decreases rapidly to only about 100 feet.

The Ogallala was deposited on the eroded surface of the underlying Chinle Formation, except where the elevated plateau of Lower Cretaceous strata is present about 5 to 10 miles east of the town of Hale Center. The erosional surface of the Chinle and the elevated plateau of Lower Cretaceous strata are reflected in the contours of the base of the Ogallala aquifer shown on Figure 2. The subsurface valleys and ridges help produce the range in the thickness of the Ogallala both areally and locally. Deposition of the Ogallala, which was by streams into isolated channels and as sheetwash over broad areas, resulted in the variable composition of the material, both areally and with depth.

The Chinle is Triassic in geologic age and is referred to locally as the "Red Bed." It consists primarily of shale and clay with scattered lenses of sand and silt. Drillers use the Red Bed as a marker for determining when a test hole or well has been drilled completely through the Ogallala aquifer. The Chinle is not a source of ground water in the study area.

Lower Cretaceous Strata

As shown on Figure 2, a structural high in the base of the Ogallala is present in the area about 8 to 10 miles south of Plainview. The Ogallala in this area is underlain by Lower Cretaceous strata composed of beds of limestone and dolomite that exhibit sporadic fracturing of Cretaceous age. These sediments extend several miles further south of the study area in Hale County. They were originally deposited on top of the Chinle in shallow seas over a much greater area, but erosion prior to the deposition of the Ogallala reduced their areal extent and thickness.

Records of wells that penetrate the Lower Cretaceous strata in the southern portion of the study area indicate that the depth to the base of these strata ranges from about 120 to possibly 160 feet below land surface. Based on the review of drillers' logs in the area, the thickness of the Cretaceous ranges from about 50 to 90 feet. Yields of wells screening the Cretaceous sediments range greatly, and the general lack of water from the formation limits its use for irrigation supplies in this part of the area. The Cretaceous is not considered a source of any substantial amount of ground water for Plainview.

RECORDS OF WELLS

Hundreds of water wells and test holes have been drilled in the study area. A large majority of the wells were drilled to provide water for irrigation. Records of 384 of the wells and test holes are given in Table 1. More wells than this have been drilled in the area of study, but the wells in Table 1 were selected because they provide information on the composition and base of the Ogallala aquifer, depth to water, pumping rate, specific capacity, or quality of water. The locations of the wells and test holes in Table 1 are shown on Figure 1.

The well-numbering system used in this report is that used by the Texas Water Development Board, Texas Water Commission, and U. S. Geological Survey. Under this system, each one-degree quadrangle in the state is given a number consisting of two digits. These are the first two digits in the well number. Each one-degree quadrangle is divided into 7-1/2-minute quadrangles which are given two-digit numbers from 01 to 64. These are the third and fourth digits of the well number. Each 7-1/2-minute quadrangle is subdivided into 2-1/2-minute quadrangles, which are given a single-digit number from 1 to 9. This is the fifth digit of the well number. Each well within a 2-1/2-minute quadrangle is given a two-digit number in the order in which it is inventoried, and these are the last two digits of the well number. Thus, an example of an inventoried well number is 11-51-104.

Wells which have not been inventoried in the field, as is required in order to assign them a permanent well number, are given temporary numbers by the Texas Water Development Board, such as 11-51-2D. A few wells listed in this report did not have permanent or temporary State numbers assigned to them. For purposes of this report, these wells were assigned the same number as a nearby well having a permanent number, with the addition of an uppercase letter, such as 11-50-605A.

The irrigation wells in the study area normally are constructed with 12- to 16-inch diameter screen or slotted pipe and blank casing. Many of the irrigation wells have a gravel pack in the annulus between the wall of the hole and the screen or slotted pipe. However, some irrigation wells are reported to be constructed without any gravel-pack material outside the casing and screen or slotted pipe.

The irrigation wells range in depth from about 125 to 414 feet, based on the data given in Table 1. The few wells that are about 125 feet deep are located in Grids 11-59 and 11-60, near the structural high associated with the Lower Cretaceous strata. In general, the irrigation wells are about 275 to 350 feet deep in the northwest part of the study area and gradually increase in depth to about 325 to 414 feet in the southeast part of the study area. The depths of the City of Plainview's wells range from 280 to 367 feet.

The pumping rates of the large-capacity irrigation wells range from about 150 to 1,000 gallons per minute (gpm). Many of the irrigation wells with higher pumping rates are located in the areas generally northwest and east of Plainview, where the saturated thickness of the aquifer is greater than in other areas. The pumping rates of the City of Plainview's wells range from about 340 to 1,100 gpm.

The limited pumping-rate and drawdown data that are available for irrigation wells in the study area are given in the remarks column of Table 1. Specific capacities in gallons per minute per foot of drawdown (gpm/ft) computed from these data range from about 6 to 45 gpm/ft. Most of the irrigation wells have specific capacities of from 10 to 25 gpm/ft.

By comparison, the specific capacities of the City of Plainview's wells, which are given in Table 2, range from about 4.1 to 36.9 gpm/ft and average about 18.7 gpm/ft. The wells with higher specific capacities are generally located in the central and northern parts of Plainview. This indicates that the Ogallala aquifer in these parts of the city probably is composed of sands and gravels having a greater permeability than those in the southern part of Plainview. Specific capacities of the City's wells are discussed further in the following section of this report.

WELL AND PUMP PERFORMANCES

Plainview has 15 wells that can provide water to the distribution system. The pumping rates of some of the wells have decreased over the past several years based on the data that were collected and reviewed during the study. Therefore, well- and pump-performance checks were made to try to determine why the pumping rates had changed with time and how the pumps installed in the wells are performing. The pumping rate of a well can decrease because of a reduction in the performance of the pump, a decline in the well's specific capacity, a lowering of the static water level in the area around the well, a leak in the pump column, a restriction in the pump column, or a combination of two or more of these reasons.

Pump-performance and specific-capacity checks were made at 12 of the City of Plainview's wells to collect information for identifying changes in the pumping rates with time and their possible causes. The wells tested were Wells 11-51-508 (Well 4), -507 (Well 5), -405 (Well 8), -410 (Well 9), -412 (Well 11), -413 (Well 12), -414 (Well 13), -415 (Well 14), -510 (Well 15), -416 (Well 16), -417 (Well 17), and -105 (Well 19). Well-performance and specific-capacity checks were not carried out for Wells 11-51-404 (Well 7) and -418 (Well 18) because it was not possible to measure their pumping levels. Well 11-51-411 (Well 10) was not checked because the ground storage tank that receives water from the well was not operational.

The well- and pump-performance checks involved determining, when possible, the one-half-hour specific capacities of the wells, the head-capacity characteristics of the pumps, and the suspended solids (sand) content of the water produced by each well. The checks were made during June and July 1992, with assistance from personnel with the City of Plainview's Water Production Department. General construction and pumping-equipment data, and results of the specific-capacity checks are given in Table 2.

Measurements made during the check of each well included static water level, pumping water level, discharge rate, discharge pressure, and where possible, suspended solids produced with the discharging water. Water levels were measured with a steel tape, air line, or electric line, and discharge pressures were measured with a pressure gauge. The discharge rates were measured with the existing in-line propeller flow meters installed at the wells. Suspended solids were measured with a one-liter Imhoff cone.

Copies of the pump- and well-performance checks have been provided to Plainview's Water Production staff.

Well Performances

The specific capacity of a well is a measure of the well's performance in terms of its efficiency in transmitting the water from the aquifer to the inside of the well screen. For wells that are thoroughly developed, the specific capacity of a well is indicative of the transmissivity of the portion of the aquifer screened by the well. Specific capacities in this report are expressed in gallons per minute per foot of drawdown (gpm/ft) and are obtained by dividing the pumping rate by the amount the water level in the well is lowered as a result of pumping from it. Normally the values are for one-half hour of pumping.

The results of the specific-capacity checks that were made of the City's wells are given in Table 2. As shown by data in the table, the specific capacities of Plainview's Wells 13, 14, and 19 have not changed appreciably since the time of the last check. In other words, the wells are producing the same amount of water now with the same amount of water-level drawdown as measured at the time of the last checks. The specific-capacity checks for Plainview's Wells 5, 8, 9, 11, 12, 15, 16, and 17, show that the performances of these wells have decreased since the time of the last checks. The lower specific capacities contribute to the lower pumping rates of the wells because they result in deeper pumping levels. Prior specific-capacity data are not available for determining whether changes have occurred at Well 4.

Plainview installed 12-inch diameter internal liners, with screens, in Wells 5 and 8 a few years ago and placed a fine-grained, high-quality Texas Mining Company gravel between the new 12-inch liner and the existing 16-inch liner. However, some if not all of the reduction in the specific capacities of the wells is believed to have happened prior to setting the internal liner and probably was caused by plugging of the old slotted pipe. In the case of Well 5, installation of the internal screen might possibly have caused some reduction in specific capacity because setting just 60 feet of screen may limit the area through which flow through the old slotted pipe can enter the well. Prior to installing the internal liners, the wells were producing water with large amounts of sand. The water from the two wells now contains very small amounts of sand, and it can be pumped directly into the system without creating any problems. This is a great asset to the overall water-supply system for Plainview.

The reduction in the specific capacities of Plainview's Wells 9, 11, and 16 may partially be due to the lowering of the static water levels in the area. However, it also is possible that the static water-level decline has not been great enough to cause all of the decline in specific capacity that has occurred at these three wells. A more likely cause for the reduction in specific capacity of these three wells, as well as the reductions that are shown for Plainview's Wells 12, 15, and 17, is partial clogging of the screen or slotted pipe and the gravel pack. If there is partial clogging of the screens or slotted pipe in these six wells, it may be possible to restore part of the lost specific capacity by using mechanical swabbing, chemical treatment, including the use of acids, small explosive charges in the screen section, cleaning detergents, or a combination of these methods. A decision on whether an attempt should be made to restore lost specific capacity should be made if the City determines that the well is not providing water at an acceptable rate and after a camera survey is made of the well bore to help assess the condition of the screen and blank casing. Recovering part or all of the lost specific capacity in a well should result in some increase in its pumping rate, even if the same pump is reinstalled in the well.

Pump Performances

Measurements used for determining pump performance are pumping water level, discharge rate, and discharge pressure. These measurements were made essentially simultaneously during the pump-performance checks. The resultant field head-capacity data for one or more pumping rates were then compared with head-capacity data presented by laboratory performance curves which show how the pump should generally perform if there is no wear and the impellers are properly set in the bowls. Of the 12 pumps that were checked, field performance curves were not available for the pumps in Wells 9 and 12. Thus changes in the performance of the pumps in these two wells could not be determined.

The results of the pump-performance checks for Plainview's Wells 4, 5, 8, 11, 13, 14, 15, 16, 17, and 19 are shown graphically in the appendix. Checks were not made at Wells 7 and 18 because it was not possible to measure the pumping levels. Well 10 could not be pumped because there was no place to dispose of the water. However, performance curves for these three pumps also are included in the appendix. We were unable to find performance curves for the pumps installed in Plainview's Wells 9 and 12. The following general comments about the performance of each pump are based on a comparison of the field test-data points with the laboratory-performance curves given in the appendix.

Well 4. The data point from the 1992 check is slightly below the head-capacity curve. Thus, the pump may be performing about as when it was installed in 1983.

Well 5. The field-data points fall below the head-capacity curve, and this could indicate there has been some wear to the pump. There are no records as to whether the pump performed in accordance with the curve when it was installed.

Well 8. The field-data points fall below the head-capacity curve. This indicates there has been some wear to the pump since it was installed in 1989 provided it operated in accordance with the manufacturer's curve at that time.

Well 11. The field-data point matches the head-capacity curve. This indicates there has been no wear to the pump.

Well 13. It appears that the field-data points could match the head-capacity curve. However, sufficiently complete data are not available for the pump for making such a determination with certainty.

Well 14. The field-data points fall below what appears to be the original head-capacity curve for the pump. Thus there probably has been some wear to the pump if the pump operated in accordance with the manufacturer's curve when it was installed.

Well 15. Data points from the 1992 check are lower than those measured in 1969. This indicates some wear to the pump could have occurred.

Well 16. The field-data points fall below the head-capacity curve. This indicates there has been some wear if the pump was performing in accordance with the curve when it was installed.

Well 17. The field-data points indicate the pump is performing below the manufacturer's head-capacity curve. However, there is reason to question whether this is the correct curve because the field-data points are so far below the curve. The field data indicate the 40-horsepower motor installed on the pump is too small for the head-capacity curve shown and the pump should be equipped with at least a 50-horsepower motor. The electrical load on the motor should be monitored in an attempt to resolve this question.

Well 19. The field-data point measured in 1992 is significantly below the head-capacity curve. Thus there has been some wear to the pump since it was installed in 1984.

In summary, the data collected as part of the present checks show that the pumps in Plainview's Wells 4 and 11 are generally performing as they should. The performances of the pumps installed in Plainview Wells 13, 15, 17, and 19 are poorer than is indicated by their laboratory performance curves, although there is some question as to whether the pump curve for Well 17 is the correct one. The reduction in the performance of the pumps, which probably is due to general wear, contributes to the lower pumping rates of the wells. Almost all wells produce at least a small amount of sand and this can cause wear to the pumps.

The performance of the pumps in Wells 15 and 17 might be improved a small amount by adjusting the setting of the impellers in the bowl assemblies. Submersible pumps are installed in Wells 13 and 19 and the position of the impellers in the bowls was set at the factory, thus precluding the practicality of adjusting them now. Another method of improving the performance of a pump would be to either rebuild the pump bowl assembly, if practical, or replace the bowl assembly with a new one. The cost to remove a pump from a well, rebuild or replace the pump bowls, and reinstall the pump would be at least $4,000.00 to $5,000.00.

Suspended Solids (Sand) Checks

The suspended solids (sand) content of the water from Plainview's Wells 4, 5, 8, 9, 11, 12, 14, 15, 17, and 19 was measured while performing the specific-capacity and pump-performance checks. A sand check also was made at Well 18. Suspended solids were not measured for Wells 7, 13, and 16 because there were no sampling ports available to collect water, and it was not possible to pump Well 10. Results of the measurements that were taken show that the wells produced a very small amount of sand after pumping for 5 to 10 minutes. The recorded measurements show only a trace or a few grains of sand per liter of water. The wells were pumped for relatively short times of from about an hour to a few hours during the course of the checks.

PUMPAGE OF GROUND WATER

Pumpage of ground water in the study area is for municipal, domestic and stock, industrial, and irrigation uses. Based on the last Texas Water Development Board crop survey, an estimated 210,000 acre-feet of ground water was pumped for irrigation in 1989 in the study area as shown on Figure 1. This is equivalent to an average continuous pumping rate of 187.5 million gallons per day (mgd). In 1989, the combined municipal pumpage by the City of Plainview, Hale Center, and Kress was about 3,322 acre-feet (equivalent to an average of about 3.0 mgd), and pumpage for industrial use was estimated at about 1,360 acre-feet (1.2 mgd). Pumpage for domestic and stock use was estimated at possibly 2,000 acre-feet (1.8 mgd). Pumpage by the City of Plainview alone was about 2,880 acre-feet (2.6 mgd). Thus, pumpage by the City of Plainview was about 1.3 percent of the 216,682 acre-feet of water pumped in the study area in 1989, and about 1.4 percent of the amount of water pumped for irrigation.

Municipal Withdrawals

Records of ground-water pumpage were obtained from the Texas Water Development Board for the City of Plainview, Hale Center, Kress, Westridge Water Company, the Ebeling Water Supply Corporation, and the Pleasant Hills #2 water system. The town of Kress is located on Highway 27 about 3.5 miles north of the Hale-Swisher County line, but it produces some of its water from Well 11-43-704 located near Finney in Hale County. Pumpage records for Plainview and Hale Center begin in 1955, for the Westridge Water Company in 1979, for the Ebeling and Pleasant Hills #2 water systems in 1983; and for Kress in 1984.

The lower graph on Figure 3 shows total annual pumpage for municipal supply in Hale County beginning in 1955 for Plainview and the combined pumpage by Hale Center, Westridge Water Company, and the Ebeling and Pleasant Hills #2 water systems. As shown on Figure 3, Plainview's pumpage averaged about 2.8 mgd in 1955, and its average annual pumpage reached a maximum of about 4.3 mgd in 1965. In late 1968 or early 1969, Plainview began obtaining and treating water from the Canadian River to provide part of its overall supply. As a result, Plainview's average annual pumpage was reduced. From 1969 through 1991, it has ranged from about 1.5 to 2.9 mgd. In 1990 and 1991, Plainview's pumpage averaged 2.9 and 2.5 mgd, respectively.

Water from Wells 11-51-414 (Plainview's Well 13) and -415 (Plainview's Well 14) is blended with water treated at the surface-water plant. Available records of pumpage for individual wells show that Wells 13 and 14 produced about 66 and 75 percent of the total amount of ground water pumped by Plainview in 1986 and 1991, respectively. While records are not available to show pumpage for individual wells by years for the entire period of record, the records for 1986 and 1991 and conversations with the Plainview staff indicate that probably at least 50 to 60 percent of the ground water that has been pumped each year since 1968 has come from Wells 13 and 14. Wells 13 and 14, plus any other wells that are drilled to provide water to the surface-water treatment plant, probably will continue to provide a large percentage of the ground water used in the system. Water pumped from the other 13 Plainview wells mainly is used to provide water for peaking during the months with higher water demand and also to provide water to the parts of Plainview that are farther from the surface-water treatment plant.

Pumpage data for Kress do not show how much water was pumped from Well 11-43-704 nor how much was pumped from its wells in Swisher County, but it appears from available information that about 66 percent of the town's total pumpage was from the well in Hale County. The Westridge Water Company, which included Well 11-50-608, was acquired by Plainview in 1992. The Pleasant Hills #2 water system pumps water from Wells 11-50-605A and -605B, and the Ebeling Water Supply Corporation pumps water from Well 11-50-605C.

Pumpage data for the Westridge Water Company, Pleasant Hills #2 water system, and Ebeling Water Supply Corporation are available for recent years. Pumpage by the Westridge Water Company was about 0.023 mgd in 1979, peaked at about 0.045 mgd in 1980, and was about 0.04 mgd in 1990. Pumpage data for the Ebeling and Pleasant Hills #2 water systems are available beginning in 1988. The combined pumpage of both of these systems in 1990 was about 0.025 mgd.

Hale Center, in the very southwest part of the study area, also pumps ground water for municipal use. Its pumpage in 1955, 1960, 1970, 1980, and 1990 was 0.25, 0.35, 0.30, 0.37, and 0.37 mgd, respectively.

The town of Kress in Swisher County has used a well located at Finney in Hale County for the past 5 to 7 years. If the well provides about 66 percent of the water used by Kress, as might be inferred from data obtained from the Texas Water Development Board, average annual pumpage from the well probably has ranged from about 0.049 to 0.081 mgd during the past 5 to 7 years.

Industrial Withdrawals

Three industrial water users were identified in the area surrounding Plainview during the field inventory. Zipp Industries, which produces fertilizer, is located just northwest of Plainview. Its reported use of about 0.014 mgd is pumped from Well 11-50-3A. Water pumped at the plant is recycled, which helps reduce consumption.

The Excel meat-packing plant, located north of Plainview, reported that its long-term average water usage can vary from about 0.4 to 1.3 mgd, but that it averages about 1.0 mgd. Water usage at the plant from July 1991 through June 1992 was about 1.2 mgd. Personnel with Excel did not indicate that they plan to increase their use of ground water. Excel obtains its water from Wells 11-51-204A and -204B and three other wells located near the plant.

The Azteca Milling Company, located south of Plainview, obtains water from Wells 11-50-905A and 11-59-101B. These two wells were completed in 1990 and 1991, and the reported average pumping rate from mid-1991 to mid-1992 was about 0.25 mgd.

Irrigation Withdrawals

A vast majority of the ground water that is pumped in the study area is used for the irrigation of crops. Most of the irrigated acreage is planted to cotton, grain sorghum, or corn, with some planted to soybeans, other row crops, and wheat. Based on the results of surveys of irrigation in Texas published by the Texas Water Development Board, the irrigated acreage in Hale and Floyd Counties has gradually decreased since 1958. It is assumed that the irrigated acreage in the study area also has changed to the same extent as the total irrigated acreage in the two counties. The amount of water applied per acre per year also has gradually decreased. The crop surveys performed in Hale County in 1969 and 1989 showed duties of about 1.93 and 1.30 acre-feet of water per acre of irrigated land, respectively. The crop surveys performed in 1969 and 1989 in Floyd County show duties of 1.00 and 0.58 acre-feet of water applied per acre of irrigated land, respectively. The irrigation duty in Floyd County is less than in Hale County, probably because a larger percentage of the irrigated acres is planted to crops that require less water than is the case in Hale County.

The latest published irrigation inventory by the Texas Water Development Board was performed in 1989. Based on the 1989 survey, it is estimated that about 210,000 acre-feet of water was pumped for irrigation in the study area, which is located in both Hale and Floyd Counties. Irrigation pumpage in 1958, 1969, 1979, and 1984 is estimated to have been about 264,000, 332,000, 176,000, and 249,000 acre-feet, respectively. In arriving at these pumpage estimates, the percentage of the total land area for a given county that was irrigated was multiplied by the land area of that county located within the study area to arrive at the irrigated acreage within that portion of the study area. This irrigated acreage then was multiplied by the applicable irrigation duty for that county to arrive at irrigation pumpage within that portion of the study area. The calculated irrigation pumpage for the two parts of the study area then were added together to provide an estimate of total irrigation pumpage for the study area.

Water is pumped for irrigation of the golf course of the Plainview Country Club and for greenscape irrigation at Wayland Baptist University. It is estimated that about 225 acre-feet per year is pumped to irrigate about 120 acres at the golf course and about 55 acre-feet per year is pumped to irrigate about 30 acres of greenscape, including athletic fields, at the university. The pumpage varies from year to year depending on climatic factors, including the amount and timing of precipitation and the length of the growing season.

There is adequate saturation of the Ogallala aquifer in almost all of the study area to continue to support irrigated agriculture and other related uses. It is expected that irrigation and other large-scale pumpage will continue in the study area for many years.

WATER LEVELS

Static water levels have been measured in at least a few wells in the study area since the early part of the 1900's. In general, the data show that the static water levels in wells screening the Ogallala aquifer have declined more than 100 feet since the mid-1940's when large-scale irrigation started. Declines have been gradual, with the rate of water-level decline being somewhat reduced since about the mid-1980's.

The long-term decline in the static water levels in selected Plainview wells is shown on Figure 3. As shown by Figure 3, water levels in Well 11-51-403 (Well 2) declined about 59 feet from 1955 to 1992. Although not shown on Figure 3, a similar amount of water-level decline occurred over this same time period in Well 11-51-508 (Well 4), and water levels declined about 69 feet in Wells 11-51-405 (Well 8) and -507 (Well 5). Data for these wells are given in Tables 1 and 2. Water-level data for Well 11-51-105 (Well 19) show a static water-level decline of about 7 feet from 1983 to June 1992. Data for Well 11-51-403 (Well 2) show that the rate of water-level decline from about 1988 through 1992 was less than it was for the period from 1967 to 1988.

Static water levels were measured in a number of Plainview's wells in June 1968 and June 1992. Measured depths to the water and the amounts and rates of water-level declines between the two dates are given in Table 3. Static water-level data for other wells located in parts of the study area outside Plainview also are given in the table and the well locations are shown on Figure 1. The data show that the average rates of water-level decline in Wells 11-51-414 (Well 13) and -415 (Well 14) were greater than they were in the other City of Plainview wells, and this is believed to be due to the higher average rate of withdrawal from these two wells.

As shown by the data in Table 3, the amounts of water-level decline that occurred in the nine wells located outside Plainview ranged from about 46 to 85 feet and averaged about 67 feet for the period between January 1968 and December 1991 or February 1992. The rate of decline for these nine wells over this period of time averaged about 2.79 feet per year. The average amount of water-level decline that occurred in the Plainview wells from 1968 to 1992 was only about 42 feet or an average of 1.75 feet per year. The lower amount of decline in the Plainview wells is believed to be primarily due to the lower overall pumpage per square mile in and near Plainview.

Long-term water-level hydrographs for wells that are located to the northwest, east, and southwest of Plainview are shown on Figure 4. They show that water levels have declined about 150 feet since about 1945 when large-scale irrigation started in the study area. Declines have been gradual, with the rate of water-level decline decreasing since about 1985. The decreased rate of decline is believed to be due to generally higher than normal amounts of precipitation during the 1980's and the resultant reduction in the amount of water pumped for irrigation. Depths to static water levels in the irrigation wells in December 1991 ranged from about 195 to 235 feet below ground level. By comparison, depths to static water levels in the Plainview wells ranged from about 141 to 192 feet below ground level when measured in June 1992.

The estimated altitudes of water levels in wells screened in the Ogallala aquifer in the winter of 1991 and the spring of 1992 are shown on Figure 5. The water-level data show that the general direction of ground-water movement through most of the study area is to the east and southeast. As discussed in a previous section of the report, there is a thinning of the Ogallala south of Plainview because of the presence of the structural high that is associated with the Lower Cretaceous strata. As a result, the ground-water movement in this area is to the north and east as water moves downgradient from the Lower Cretaceous high.

The hydraulic gradient in the aquifer in the study area is generally downward to the east-southeast. It ranges from about 7 to 14 feet per mile. The water-level contours show that there is a flattening of the hydraulic gradient in the area of Plainview, indicating a small mounding of ground water in storage in the aquifer below Plainview.

WATER QUALITY

Water-quality data are available for Plainview's wells, wells owned by Hale Center, and for other wells located in the study area. The results of chemical analyses are given in Table 4, and selected water-quality data are shown on Figure 6. In general, the data show that water from the wells that were sampled is of good quality. It contained total dissolved solids (TDS) of less than about 500 milligrams per liter (mg/l). The recommended upper limit for water to be used for public supply is 1,000 mg/l. Total dissolved solids values for wells in the study area are included with the water-quality data shown on Figure 6.

Chemical-analysis results show that Plainview's wells have TDS that range from about 357 to 798 mg/l. Analyses of samples collected from Wells 11-51-414 (Well 13) and -415 (Well 14) in April 1987 had TDS concentrations of 419 and 440 mg/l, respectively. These two wells have provided a majority of the ground water used by Plainview since about 1969.

Total dissolved solids in samples collected from Wells 11-51-413 (Well 12) in June 1992 and 11-51-507 (Well 5) in April 1987 were 763 and 798 mg/l, respectively. There does not appear to be anything unusual about the location or the construction of these two wells that would cause them to produce water with higher TDS values than other Plainview wells located nearby. The constituents that are at higher concentrations in the water from these wells are sodium, sulfate, and chloride. It is recommended that as the wells are used water samples should be collected periodically and analyzed for the general mineral constituents that constitute TDS.

Well 11-51-404 (Well 7) was sampled in April 1987 and had a TDS content of 798 mg/l. The well was sampled again in June 1992 and had a TDS content of 535 mg/l. The reason for the fluctuation in the TDS in this well has not been identified, but it is suggested that water samples be collected from it about every 6 months and analyzed for the general mineral constituents that make up the TDS value to see if there is a progressive change in water quality.

Results of analysis of water samples collected from Well 11-50-301A, owned by Zipp Industries, show an elevated concentration of TDS of 5,200 mg/l beginning in 1972. Well 11-50-301A is an irrigation well that is located within an area of old evaporation ponds just east of the Zipp Industries plant. Prior to about 1981, the well was used to supply water for process cooling in the ammonia plant, and the water was eventually discharged into the evaporation ponds. Local contamination of the ground water at the facility apparently occurred in the 1960's and part of the 1970's, and the plant has been conducting remedial pumping over the past 10 years or so to remove the contaminated water from the aquifer.

The chemical-analysis data show that the TDS content of the water from Well 11-50-301A has been gradually decreasing over the past several years, and in June 1991 it was down to a level of about 2,641 mg/l. The analyses for water from Well 11-50-3A, located near Well 11-50-301A, show a recent TDS value of 745 mg/l. The chemical-analysis data indicate that the increase in TDS in the water from Well 11-50-3A since early 1982 of 231 mg/l has been gradual, possibly as the result of the aquifer contamination that occurred in the vicinity of the old evaporation ponds. Water-quality data for water from other wells located near the Zipp Industries wells show that the aquifer contains concentrations of TDS that do not appear to be elevated. The water quality for this facility is continuing to be reviewed as part of an ongoing Zipp Industries and Texas Water Commission monitoring program.

The City of Plainview's Well 11-51-105 (Well 19) is located about 0.7 mile southeast of Well 11-50-301A. Plainview should stay abreast of the continuing water-quality monitoring program at Zipp Industries and be ready to respond if there is an indication that there are increases in TDS in any wells located between Zipp Industries and the location of Well 11-51-105 (Well 19).

A total dissolved solids content of 1,598 mg/l was measured in a water sample collected in May 1992 from Well 11-43-8A. This well, located north of Plainview, is owned by Excel. The water sample was collected from the well as part of an ongoing water-quality investigation by Excel. The elevated concentrations of TDS, sodium, and chloride in the sample show that there has been some local contamination of the aquifer. Water samples have been collected from Wells 11-51-204A and -204B that are also located on the Excel plant property. The TDS in Well 11-51-204A does not appear to be elevated, but the TDS in Well 11-51-204B appears to be somewhat elevated compared to the values shown on Figure 6 for other wells in the area that screen the Ogallala aquifer. The data collected to date do not indicate that the ground-water contamination that has occurred at the Excel plant poses a threat to the water supply for Plainview. However, Plainview should stay informed of the results of the ongoing investigation of water quality at the plant.

The total hardness content in water samples collected from most of the wells screening the Ogallala aquifer in the study area ranged from 131 to 385 mg/l as calcium carbonate. Water with these concentrations is classified as moderate to very hard in total hardness. In the area within about 3 miles to the east-northeast of Plainview, the limited data show a total hardness ranging from about 231 to 265 mg/l.

The recommended primary drinking-water standards limit for fluoride in water to be used for public supply is 4.0 mg/l and the recommended secondary limit is 2.0 mg/l. Results of analyses of samples collected from wells in the study area show that the recommended limit of 4.0 mg/l of fluoride was not exceeded except for a sample collected from Well 11-58-401 in 1945. The data show that water samples obtained from some of the wells, including some of the wells owned by Plainview, did contain concentrations of fluoride which exceeded 2.0 mg/l. As shown by the data on Figure 6, the higher concentrations of fluoride generally occur in wells that are located in the eastern and southern parts of the study area.

Water samples from a few of the wells providing water to Plainview have been analyzed for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. For the most part, these samples were collected and analyzed in 1987. The results of the analyses show that the concentrations of these eight constituents were below detection limits, and thus it is reasonable to believe they have always been below the maximum levels allowed for water to be used for public supply.

A few of the wells providing water to Plainview have been sampled and analyzed for radionuclides. Results of the analyses show that radionuclides in the water are below the limits allowed for public supply.

Water samples normally are not collected from individual wells for analysis of herbicides, pesticides, trihalomethanes, volatile organic compounds, and radionuclides unless the Texas Water Commission determines that samples should be collected and analyzed for these constituents. A search of the files at the Texas Water Commission failed to locate any analyses for these constituents, except for a few analyses for radionuclide constituents as discussed above. According to the records of the Texas Water Commission in Austin, water provided by Plainview's wells is not listed as being in violation of any of the Primary Drinking Water Standards. In the future, water samples will need to be collected where water enters the distribution system in order to be in compliance with Phase II of the Safe Drinking Water Act. This means that water samples will need to be collected from any of the City's wells that pump directly into the distribution system. Samples also will need to be collected at the discharge from pump stations that obtain water from one or more wells or that distribute water from the surface-water treatment plant.

SATURATED THICKNESS

The saturated thickness of the Ogallala aquifer is the difference in the depth or elevation between the static water level and the base of the aquifer. Drillers' logs were used to pick the base of the aquifer, and water-level measurements made in wells or test holes were used to determine the position of the water level. As noted in an earlier section of this report, the aquifer is composed principally of interbedded sands, gravels, and clays.

Information for the base of Ogallala aquifer as shown on Figure 2 was used with the water-level measurements and contours shown on Figure 5 to estimate the saturated thickness of the aquifer. The elevation control used for the wells on both maps was from U. S. Geological Survey topographic maps having contour intervals of 5 feet and a scale of 1 inch equals 2,000 feet. The saturated thickness in the immediate area of Plainview ranges from about 110 to 170 feet as shown on Figure 7. This area has one of the greater overall saturated thicknesses for the study area. To the east of Plainview, the saturated thickness ranges from about 100 to 170 feet. The saturated thickness decreases significantly north and northeastward from Plainview, and at the intersection of Highway 27 and the Swisher County line, the estimated saturated thickness is less than 50 feet. To the west and northwest of Plainview, the saturated thickness ranges from about 70 to 140 feet. In the vicinity of the Lower Cretaceous high south of Plainview, there are small areas where the saturated thickness of the Ogallala is estimated to be as little as 10 feet. However, there are areas just east of the Lower Cretaceous high where the saturated thickness is estimated to be as great as 180 feet.

As discussed earlier, the water-level hydrographs on Figures 3 and 4 show that the water levels in the Ogallala aquifer have declined over the past approximately 50 years about 120 to 150 feet. Therefore, the saturated thickness of the aquifer has decreased accordingly over this time period, because each foot of water-level decline represents one foot less saturated thickness.

WATER IN STORAGE

The Ogallala aquifer receives very little recharge due to the relatively modest amount of precipitation and the high rate of evaporation in the area. In a regional model report prepared by the U. S. Geological Survey entitled "Digital Simulation of Ground-water Flow in the High Plains Aquifer in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming," it is estimated that recharge in the Hale County area was only about 0.1 inch per year. This is a very small amount of recharge per year, particularly when compared to the amount of pumpage that occurs in the area. Because of the small amount of recharge, almost all of the water pumped from the aquifer is from water in storage. Withdrawing water from storage results in a lowering of the water table. The amount of water available from storage is dependent on the saturated thickness and the water-bearing and water-yielding characteristics of the permeable sediments.

Based on a review of the drillers' logs and a few electric logs for wells and test holes within the study area, it is estimated that, in general, about 75 percent of the saturated thickness of the aquifer is permeable material. The permeable sediments are principally recorded as sand and gravel on drillers' logs. Essentially all of the water that can be obtained from the aquifer comes from water stored in the pore space of these sediments. For purposes of estimating the amount of water in storage, it was assumed that the drainable porosity (specific yield or storage coefficient) of the permeable materials was 25 percent. That is, 25 percent of the volume of these water-bearing materials is water which will be released or drained from storage as the sediments are unwatered due to water-level declines.

The amount of water in storage was estimated for the approximate 13 square miles of area that is inside the city limits of Plainview. Based on a review of drillers' logs and electric logs for wells and test holes drilled in Plainview, it is estimated that about 80 percent of the total saturated thickness is permeable material and that the porosity of the material is 25 percent. The estimated saturated thickness within the city limits ranges from a high of about 170 feet to a low of about 110 feet. Using the data and assumptions given above, it is calculated that about 240,000 acre-feet of water is in storage in the Ogallala aquifer beneath Plainview. Of the 240,000 acre-feet, it is estimated that about 40,000 acre-feet is in storage in the area south of Southwest Third Street.

Irrigation wells are located very near Plainview, and in fact, some are inside the city limits as shown on Figure 1. Pumping from these irrigation wells withdraws some of the water that is in storage beneath Plainview. Therefore, Plainview cannot count on all this water being available for its future water supply. If it is assumed that 20 percent of the water in storage beneath Plainview will be withdrawn by others in the future, about 190,000 acre-feet of water still will be available beneath Plainview. About 150,000 acre-feet of this amount is located north of Southwest Third Street.

There is a large amount of water in storage in the area surrounding Plainview. If the saturated thickness in an area is 100 feet and 75 percent of that thickness is permeable material with a specific yield (storage coefficient) of 25 percent, there is about 12,000 acre-feet of water in storage under each square mile. In areas where the saturated thickness is as much as 150 feet, there would be about 18,000 acre-feet of water in storage under each square mile.

GROUND-WATER AVAILABILITY

City of Plainview Area

Information presented in the previous two sections of this report shows that 190,000 acre-feet of water is estimated to be in storage in the aquifer beneath Plainview and available for development by the City. An important qualification of this storage estimate is that this volume of water can be withdrawn only if the Ogallala is completely drained to its base. Since it usually is not possible to lower the water level on an areal basis to the base of the aquifer by pumping, a volume somewhat smaller than that given above would actually be recoverable. It is estimated that about two-thirds to three-fourths of the estimated 190,000 acre-feet that is in storage for City use can be withdrawn by wells. Thus, about 127,000 to 143,000 acre-feet of water is available from the Ogallala within the City for its future use. If the City continues to use water in the aquifer at the rate of about 3,000 acre-feet per year, the recoverable water in storage would provide a supply for about 42 to 48 years. If Plainview was to use water at a greater rate, the supply would last for a shorter period of time.

As the saturated thickness of the Ogallala beneath Plainview decreases with the continued withdrawal of water, the specific capacities and yields of wells will decrease. When the saturated thickness decreases to an estimated 50 feet or so, the yields could be a few hundred gpm for properly constructed and thoroughly developed wells. Plainview has 15 operating wells with a combined pumping rate of about 9,000 to 10,000 gpm or an average rate per well of about 600 to 660 gpm. If the yield per well at some time in the future is 300 to 400 gpm, 23 to 33 wells would be required for Plainview to maintain a combined pumping rate of 9,000 to

10,000 gpm. Presently, the saturated thickness in the wells operated by Plainview ranges from about 130 to 170 feet. Thus, it will take many years for the saturated thickness of the Ogallala beneath Plainview to reach 50 feet, assuming the present rates of water-level decline continue in the Plainview wells.

If market conditions for agriculture were to improve and more acres were irrigated, pumpage for irrigation would increase in proximity to Plainview and additional water would be withdrawn from the aquifer. Additional irrigation pumpage also would reduce the overall amount of water that remains in storage, in particular under the peripheral areas of Plainview.

Area Surrounding Plainview

As stated earlier, there is a large amount of ground water in storage in areas surrounding Plainview. The areas of greater saturated thickness are located to the east and northwest of the City. To the east of Plainview, the saturated thickness ranges from about 100 to 170 feet. Northwest of Plainview it ranges from about 70 to 140 feet. If the average saturated thickness in both areas is 120 feet and 75 percent of the thickness is permeable material with a specific yield of 25 percent, there is about 14,400 acre feet of water stored under each square mile. If two-thirds to three-fourths of the water could be recovered by wells, there would be about 9,500 to 10,800 acre feet of water available under each square mile. This quantity of water under one square mile of area would satisfy the ground-water usage in the City of Plainview for a period of about 3 to 3-1/2 years at its present rate of water use. From these estimates, one can see that Plainview would need to acquire about 10 sections (square miles) of land to have a 30- to 35-year supply of water from storage.

It is recommended that Plainview start acquiring water rights in the areas just west or east of the City and/or start investigating the acquisition of water rights in areas farther removed from Plainview either to the northwest or east of the City. Purchasing water rights now and eliminating pumpage from the acquired area will help reduce the rate of static water-level decline due to pumpage for irrigation and thus help to preserve the water that is in storage under the property.

Water Rights Costs

Information on the cost of water rights in the area of study was obtained from Jones Appraisal - Farm & Ranch, a firm that appraises the value of water rights for income tax depletion purposes. The information is based on land sales that were recorded in 1990 and 1991. The land-sales data show that the cost of land sold with the water in storage below it can vary from about $500.00 to $1,200.00 per acre within 5 miles of Plainview. The average cost of the water rights and land was about $750.00 per acre. At greater distances to the east and the northwest of Plainview, the water rights and land costs ranged from about $550.00 to $800.00 per acre. The average cost of land with no water rights was about $350.00 per acre. Based on the land prices just given, the cost of buying water in storage without purchasing the surface rights could range from about $150.00 to $850.00 per acre and could average closer to $200.00 to $450.00 per acre. The land-sales data show that the cost of land has not been increasing over the past few years. They also show that the sizes of the tracts that were sold ranged from about 70 to 318 acres with the average size being about 160 acres. Thus, it appears that acquiring a large block of water rights could require about four land purchases per section of land.

GROUND-WATER DEVELOPMENT

Drilling of new wells in Plainview or the purchase of water rights and subsequent drilling of wells outside the City should be preceded by acquisition and evaluation of site-specific data to determine whether a site is favorable for constructing a well. Prior to constructing a new well in Plainview, a test hole should be drilled at the site to obtain specific information on the composition and thickness of the Ogallala aquifer and the quality of the water in the aquifer. In addition, the site and the surrounding area should be checked with regard to its compliance with rules and regulations on wellhead protection, including the delineation of an estimated wellhead-protection area.

Potential areas inside or near Plainview that appear favorable for constructing additional wells when needed are shown on Figure 7. The area on the west side of Plainview provides a location or locations for wells to pump some of the water that now is supplied by Wells 11-51-414 (Well 13) and -415 (Well 14). The area just to the east of Plainview provides potential sites for construction of a well or wells that could provide additional water and/or a backup supply for the Texas Department of Corrections facility that is going to be constructed about 2 miles east of Plainview. Wells constructed in these areas should be spaced about one-half mile apart.

Plainview has four production wells that are 30 or more years old. If a well develops a problem that cannot be economically repaired, the City should consider constructing a replacement well near the site of the existing well if there is enough space for another well.

Prior to acquiring water rights for any tract of land outside of Plainview, it is recommended that all available drillers'-log and water-quality data be obtained for the wells that are located on or near the prospective tract. Water samples should be obtained from wells on or bordering the tract. The samples should be analyzed for the constituents that are included in the complete primary and secondary drinking-water standards for water to be used for public supply. We estimate that the cost to set a large-capacity pump in an existing unequipped irrigation well, pump a sample, and analyze it for the complete primary and secondary drinking-water standard constituents to be about $5,000.00. The cost of the analysis is about $1,200.00 to $1,500.00 of the total cost just given. We also recommend that about three properly spaced test holes be drilled on each square mile of water-rights area that is to be acquired, if existing well data for the tract is not sufficient to define the thickness, character, and water quality of the aquifer.

Test Hole Drilling

Each test hole should be drilled to obtain the best samples possible of the water-bearing formation. Circulated drill-cutting samples should be collected from the test hole from just below land surface to its total depth. The test hole should be drilled completely through the Ogallala and into the top of the Red Bed. The collected drill-cutting samples should be saved and sieve analyses run to determine the size and distribution of the sand and gravel grains in the sample. After the test hole has been drilled to its total depth, an electric log should be run in the test hole. The electric log should include at least two resistivity curves, a gamma ray curve, and a spontaneous potential curve. The electric log will provide additional information on the thickness and position of the various strata encountered and some information on the general quality of the water.

After examination of the drill-cutting samples and the electric log, at least one depth interval in the test hole should be selected for water sampling. A water sample can be collected from the test hole by setting temporary mill-slotted pipe and casing at least 4 inches in diameter in the hole. A water sample then can be pumped from the sampling interval by using a submersible or high-lift type pump set inside the mill-slotted pipe and casing.

The water sample should be collected after the temporary well has been pumped long enough to provide water that is completely clear. The water sample that is obtained from the test hole should be analyzed for the constituents included in the complete primary and secondary drinking-water standards for water to be used for public supply. The water-quality data obtained from the test hole will help assess the quality of the water in the Ogallala at the site, but the final quality of the water produced by a production well will only be known after the production well is pumped and tested.

The cost of a test hole drilled to 350 feet, including an electric log and sieve analysis of the drill-cutting samples, is estimated to be about $7,000.00 to $8,000.00. A water-sampling operation complete with associated chemical analysis is estimated to cost about $7,000.00 to $9,000.00 per water sample. Thus, the complete drilling, logging, and water-sampling operation is estimated to cost approximately $14,000.00 to $17,000.00 per test hole. Better estimates of the cost of test hole drilling and water sampling can be obtained after it is known where and how many test holes are to be drilled. The above estimates do not include the cost of site easements and engineering which could add about 25 to 30 percent to the overall drilling and water-sampling costs.

Production Well

If the results of test-hole drilling and sampling are encouraging, the next step would be to drill a production well. It would be desirable to have a test hole at the site where the City would like the production well.

At present, it is estimated that the production well would be constructed with 30-inch diameter casing set and pressure cemented to a depth of at least 100 feet. The screen and blank liner for the well would be 16 inches in diameter. It would be set in a 28-inch diameter hole drilled below the surface casing. It is recommended that the screen for the well either be a louvered screen made of stainless steel or stainless-steel wire-wrapped screen on mild-steel pipe. It is estimated that the well would be about 310 feet deep and that it would have approximately 120 feet of screen set opposite the water-bearing sands and gravels of the Ogallala aquifer. The gravel pack for the well should be of good quality, such as a Texas Mining Company gravel or Colorado silica sand. The well should be thoroughly developed by agitation and pumping to obtain the highest specific capacity possible, and also to orient and stabilize the gravel pack so that the well produces little if any sand with the water. We estimate that the pumping rate of a production well could range from 700 to possibly 1,000 gpm.

It is estimated that the cost of a well constructed in this manner would be about $70,000.00 to $90,000.00. This estimate does not include the cost of land or right-of-way, engineering, surveying, or a pump and motor for the well. The costs for two different sizes of pumping units for production wells have been estimated based on the information that is now available. A water-lubricated pump capable of producing about 700 gpm and equipped with a 100-horsepower 1,770 rpm electric motor, switchgear, and starter is estimated to cost about $27,000.00. An alternate water-lubricated pump, rated to provide 1,000 gpm at a total head of about 350 feet, and equipped with a 125-horsepower 1,770 rpm electric motor, complete with switchgear and starter, is estimated to cost about $30,000.00. The cost of engineering and field inspection associated with the construction and equipping of a well is estimated to be about 20 percent of the construction costs.

WELLHEAD PROTECTION

One of the objectives of the study was to provide general guidelines for wellhead protection for the City. Wellhead protection involves the protection of the land area around a well from activities that could lead to contamination of water in the aquifer. The Safe Drinking Water Act defines a wellhead-protection area as the surface and subsurface area through which contaminants are likely to pass before reaching a well or group of wells used for public water supplies.

A wellhead-protection area can be divided into zones to allow for varying degrees of management relative to the sensitivity of each zone to ground-water contamination. For example, the outer boundary might be drawn to protect all recharge water to a particular well, based on the zone of contribution. Within this outer boundary, inner zones could be delineated using a variety of methods for wellhead protection. The zone requiring the most restrictive management, for example, could be designated as the area immediately surrounding the well or the area from which ground water is expected to reach the well within a relatively short time.

Wellhead-Protection Survey

Prior to the final selection of a site for a production well, a wellhead-protection survey should be conducted at the site. Such a survey should include an inventory of all potential sources of contamination within the wellhead-protection area. At a minimum, the survey should cover an area within one-quarter (1/4) of a mile of the proposed well site. The survey should seek to identify, and where possible, eliminate, any sources which may contaminate water produced from the new well. Remediation of contamination after a well is in service can be costly and often prohibitive.

Potential sources of contamination to look for include the following: (a) land disposal of either solid or liquid wastes; (b) abandoned wells, test holes, etc.; (c) animal feedlots; (d) fertilizer and pesticide use; (e) accidental spills of chemicals or other contaminants; (f) septic tanks, cesspools, privies, etc.; (g) underground and aboveground storage tanks; (h) underground pipelines and sewer lines; (i) waste ponds and lagoons; and (j) graveyards.

Resources which can be used in these surveys include historical and recent aerial photographs, zoning and deed records, state and federal agency files, interviews with residents and senior citizens, newspaper files, and old business or telephone directories.

Well Construction

In general, new public water-supply wells should not be located near waste-storage or mixing areas for pesticides, motor fuels, or other contaminants. Wells should be located a minimum horizontal distance of 50 feet from any watertight sewage and/or liquid-waste collection facility. Also, wells should be located a minimum horizontal distance of 150 feet from any concentrated sources of contamination such as septic system absorption fields, privies, and existing or proposed livestock or poultry yards.

Plastic casing should be avoided if wells are to be located near chemical plants, industries using solvents, underground petroleum storage tanks and pipelines, or near rail lines or highways where organic solvents are frequently transported.

Texas Water Commission Rules specify that most wells should have the casing-borehole annular space filled with cement from the ground level to a depth of not less than 10 feet. However, with regard to new wells, the City of Plainview should consider filling the surface casing-borehole annular space with cement from the ground level to a depth of at least 100 feet and possibly 150 feet. This will provide added protection from concentrated pollution sources, and infiltration of surface water.

Installation of a concrete slab or sealing block around the surface casing and over the surface casing-borehole annular seal is important to protecting the well from contamination. The slab surface and land surface surrounding the slab should slope away from the well in all directions so that surface runoff drains away from the well. Care should also be taken to seal around the casing and pump base.

Protection Techniques

A variety of factors, including dependence on ground water, local commitment to a ground-water protection program, and other factors will help to determine Plainview's local objectives in wellhead-protection management. The community may wish to provide protection against contamination of their new wells through the adoption of land-use regulations and ordinances. On the other hand, the City may wish to give highest priority to current or future problems stemming from particular sources, such as abandoned wells, underground storage tanks, industrial waste disposal, or agricultural practices.

Land-use regulations and ordinances can be tailored to meet Plainview's needs with regard to wellhead protection. Zoning ordinances, for example, can be used to prevent new potential sources of contamination from being located within the wellhead-protection boundaries. Other types of ordinances can require the proper closure of abandoned water wells and storage tanks.

Another means of limiting potential sources of contamination near wells is through the restriction of major capital improvements such as roads, sewers, and water mains, which are essential for intensive development.

Educational programs and community involvement are important in establishing a local ground-water management and protection plan. A local ground-water protection committee should be formed to work with the City to insure that best-management practices, ordinances, and regulations exist at the local level to control potential sources of contamination. This committee, in addition to other topics, should address the proper handling and disposal of hazardous materials by homeowners.

FUTURE OBSERVATION DATA COLLECTION

Water levels, specific capacities, and pump performances for Plainview's wells have been measured on a rather infrequent basis in the past. It is recommended that in the future the static water level should be measured in each Plainview well at least once a month during the summer and about once every 3 months during the fall, winter, and spring. The specific capacity of each well should be determined at least once a year, and pump performance should be checked each time specific-capacity measurements are made. The specific-capacity and pump-performance checks require measuring the static water level, pumping water level, discharge rate, and discharge pressure at the well. A form, that can be used for recording this type of information, is given in the appendix of this report.

The suspended solids (sand content) of the water produced by the wells also should be measured periodically. The sand content of the water can be measured with a 1-liter Imhoff cone. The tip of the cone should be graduated to provide measurements down to tenths of a milliliter.

The amount of water pumped from each well is currently measured, but it should be tabulated on a monthly basis to provide more detailed information on the temporal and areal distribution of pumpage.

After the data are collected, we recommend that Plainview develop and maintain charts which show how the water level in each well is varying with time and pumpage, and how the specific capacity and sand content of the produced water for each well is changing through the years.

TABLE 1. RECORDS OF WATER WELLS

Well Number	Owner and Owner's Well Number	Driller	Year Com-pleted	Ground-Level Eleva-tion (feet)	Estimated Elevation of Base of Ogallala (feet)	Screened Interval or Total Depth (feet)	Static Water-Level Data: Depth to Water (feet)	Static Water-Level Data: Date	Use of Water 1/	Remarks
Hale County										
11-42-405	Graddy Tunnell	Hi Plains Drilling, Inc.	1981	3,486	-	225-348	212.7	7- 7-92	-	Observation well.
4A	Tunnell & Tunnell	Bogle & Flake Drilling Co.	1963	3,480	3,202	-	-	-	Irr	
5A	Weldon Blount	Hi Plains Drilling, Inc.	1974	3,465	3,109	265-375	-	-	Irr	
5B	Big Tex Farms	Green Machinery Co.	1974	3,472	3,124	236-356	-	-	Irr	
5C	Elmer Koenning	O. R. C. Drilling	1976	3,472	3,159	-	-	-	Irr	
603	Horne Bros.	-	-	3,463	-	-	97.18	1- 5-54	Irr	Observation well.
							166.40	1- 7-68		
							194.10	1-11-80		
							235.38	12-12-91		
6A	Elmer Koenning	Hi Plains Drilling, Inc.	1974	3,458	3,146	238-318	-	-	Irr	
6B	J. F. Williams	Walker Drilling Co.	1975	3,461	3,126	259-339	-	-	Irr	
704	W. G. Goyne	-	1965	3,480	-	287	125.28	1- 9-66	-	
							132.98	1- 7-68		
							167.90	1-14-80		
							194.70	12-12-91		
7A	D. M. Painter	Green Machinery Co.	1970	3,483	3,193	187-295	-	-	Irr	
7B	Bayne McCurry	J. B. Thrush Drilling Co.	1966	3,479	3,197	286	-	-	Irr	Deepened from 220 to 285 feet.
7C	Elmo Snelling	J. B. Thrush Drilling Co.	1968	3,471	3,196	185-285	-	-	Irr	Deepened from 215 to 285 feet.
7D	Albert Groff	Green Machinery Co.	1968	3,460	3,165	172-300	-	-	Irr	Reported pumping rate 800 gpm in 1968.
802	C. E. Carter	Green Machinery Co.	1974	3,445	3,106	246-342	179.79	1-18-77	Irr	Observation well.
							199.12	12-12-91		
8A	Shelby Howell	J. B. Thrush Drilling Co.	1967	3,467	3,167	225-305	-	-	Irr	Deepened from 245 to 305 feet.
8B	Shelby Howell	J. B. Thrush Drilling Co.	1968	3,451	3,156	300	-	-	Irr	Deepened from 270 to 300 feet.
8C	A. T. Henderson	Green Machinery Co.	1969	3,442	3,112	214-342	-	-	Irr	Reported pumping rate 700 gpm in 1969.
8D	Bob Carter	Green Machinery Co.	1969	3,452	3,162	205-301	-	-	Irr	
8E	G. G. Vernon Estate	J. B. Thrush Drilling Co.	1972	3,462	3,184	180-290	-	-	Irr	Deepened from 240 to 290 feet.
8F	Earl Windenor	Langston Drilling Co.	1965	3,459	3,146	168-316	-	-	Irr	
901	E. L. Monroe	Pioneer Drilling Co.	-	3,449	-	-	48.00	1942	Irr	Observation well.
							143.26	1- 7-68		
							222.85	12-12-91		
902	Wm. Toliver	Tx Land & Development Co.	1916	3,428	-	252	46.00	7- 7-16	Irr	Observation well.
							131.80	1- 7-68		
907	Horne Brothers	Garrett Pump & Drlg. Co.	1985	3,442	-	260-338	-	-	Irr	Reported pumping rate 600 gpm in 1985.
9A	Martin Schur	J. B. Thrush Drilling Co.	1967	3,440	3,113	197-335	-	-	Irr	Deepened from 220 to 335 feet.
9B	Martin Schur	Green Machinery Co.	1967	3,433	3,091	207-347	-	-	Irr	
9C	Don McCullock	Green Machinery Co.	1968	3,422	3,107	160-320	-	-	Irr	Reported pumping rate 800 gpm in 1968.
9D	Horne Brothers	Hi Plains Drilling, Inc.	1974	3,445	3,157	214-294	-	-	Irr	
9E	Charles Kay	Langston Drilling Co.	1974	3,423	3,129	145-295	-	-	Irr	
11-43-407	T. A. Nuckles	T. L. & D. Co.	1916	3,451	-	-	124.00	1- 8-60	Irr	
							163.20	1- 7-68		
							203.27	1-11-80		
							225.80	7- 7-92		
4A	Harley Wells	J. B. Thrush Drilling Co.	1970	3,436	3,149	195-295	-	-	Irr	Deepened from 220 to 295 feet.
503	-	-	-	3,404	-	-	57.00	4- 2-17	Irr	
							207.20	7- 7-92		
504	W. C. Whittle	-	1915	3,403	-	-	130.05	1-19-62	Irr	
							154.95	1- 8-68		
							186.30	1-12-80		
5A	Mrs. John Dubose	J. B. Thrush Drilling Co.	1966	3,405	3,120	-	-	-	Irr	Deepened from 200 to 285 feet.
5B	Mrs. B. Adams	Jack Seay Drilling Co.	1971	3,412	3,120	199-299	-	-	Irr	
5C	C. H. Neel	Hale Center Drilling	1975	3,392	3,089	185-308	-	-	Irr	
5D	J. D. & Benny James	J. B. Thrush Drilling Co.	1970	3,387	3,117	175-275	-	-	Irr	Deepened from 195 to 275 feet.
604	Wm. H. Sisemore	Bud Gibbons Drilling	1972	3,391	-	162-302	-	-	-	
606	Bob Hooper	Fox Drilling Co.	1971	3,376	-	132-272	-	-	-	

Well Number	Owner and Owner's Well Number	Driller	Year Com- pleted	Ground- Level Eleva- tion (feet)	Estimated Elevation of Base of Ogallala (feet)	Screened Interval or Total Depth (feet)	Static Water-Level Data: Depth to Water (feet)	Static Water-Level Data: Date	Use of Water 1/	Remarks
Hale County	(Continued)									
11-43-6A	Cecil Curry	J. B. Thrush Drilling Co.	1967	3,383	3,118	182-282	-	-	Irr	Deepened from 220 to 282 feet.
6B	Cecil Curry	J. B. Thrush Drilling Co.	1967	3,378	3,098	184-284	-	-	Irr	Deepened from 210 to 284 feet.
6C	W. M. Clark	J. B. Thrush Drilling Co.	1969	3,376	3,088	180-290	-	-	Irr	Deepened from 195 to 290 feet.
704	City of Kress	Wall & Sons Drilling, Inc.	1983	3,403	3,103	218-307	180.00	3-83	PS	
7A	Horne Bros.	J. B. Thrush Drilling Co.	1966	3,401	3,106	177-297	-	-	Irr	Deepened from 180 to 297 feet.
7B	J. E. Buchanan	Green Machinery Co.	1969	3,400	3,100	208-304	-	-	Irr	
7D	Vinson Dixon	Hi Plains Drilling, Inc.	1974	3,411	3,133	205-283	-	-	Irr	
7E	H. W. Garrett	J. B. Thrush Drilling Co.	1974	3,404	3,101	205-305	-	-	Irr	Deepened from 220 to 305 feet.
7F	Robert Schoppa	J. B. Thrush Drilling Co.	1975	3,415	3,135	228-285	-	-	Irr	Deepened from 246 to 285 feet.
803	Homer Rook	T. L. & D. Co.	-	3,380	-	280	46.70	4-23-36	Irr	Reported pumping rate 764 gpm.
							132.27	1- 8-68		
804	E. R. White	Hi Plains Drilling, Inc.	1984	3,371	-	154-254	-	-	-	
8A	Excel - Well #2	Walco Drilling, Inc.	1970	3,388	3,118	146-272	-	-	Ind(U)	
8B	Glenn James	J. B. Thrush Drilling Co.	1972	3,388	3,128	180-280	-	-	Irr	Deepened from 200 to 280 feet.
902	-	-	-	3,375	-	200	60.76	1-17-48	-	
							133.97	1- 8-68		
9A	L. R. Gandy	Goyne Drilling Co.	1972	3,376	3,124	172-257	-	-	Irr	
9B	R. H. Lawrence	J. B. Thrush Drilling Co.	1972	3,370	3,115	112-262	-	-	Irr	Deepened from 155 to 262 feet.
9C	Bill Sorelle	J. B. Thrush Drilling Co.	1973	3,371	3,066	217-317	-	-	Irr	Deepened from 230 to 317 feet.
9D	Joe Leach	O. R. C. Drilling	1974	3,371	3,115	210-230	-	-	Irr	
11-44-4A	Jim Burgess	Bud Gibbons Drilling	1970	3,368	3,105	-	-	-	Irr	
4B	L. B. Brandes	Sanders Pump & Drilling Service	1975	3,359	3,063	223-303	-	-	Irr	Reported yield 250 gpm.
4C	B. F. Sammann, Jr.	O. R. C. Drilling	1970	3,368	3,065	284-304	-	-	Irr	
702	-	-	1947	3,357	-	224	70.40	3-19-47	-	
							149.70	1- 8-68		
704	Paul Williams	Green Machinery Co.	1967	3,050	-	150-297	-	-	-	
706	-	-	-	-	-	300	-	-	-	
708	-	-	-	-	-	300	-	-	-	
709	Paul Stukey	Green Machinery Co.	1967	3,332	-	300	-	-	-	
712	-	-	-	-	-	300	-	-	TH	
7A	H. H. Sammann	Green Machinery Co.	1954	3,341	3,041	-	-	-	Irr	
7B	Jack Stephens	Hi Plains Drilling, Inc.	1970	3,348	3,070	253-282	-	-	Irr	
7C	Harold Perkins	Green Machinery Co.	1974	3,348	3,033	244-324	-	-	Irr	
7D	Jack Williams	Green Machinery Co.	1976	3,365	3,065	204-308	-	-	Irr	
811	Ms. J. Abbott	-	-	3,341	-	172-288	177.10	1-12-80	Irr	Observation well.
							214.32	12-12-91		
812	L. B. Brandes	Sanders Pump & Drilling Co.	1974	3,334	3,027	201-319	-	-	-	Drawdown 10 feet pumping 250 gpm in 1-74.
8A	J. H. Abbott	O. R. C. Drilling Co.	1976	3,343	3,068	277	-	-	Irr	
11-50-102	J. W. & S. E. Curry	Bud Gibbons Drilling	1941	3,465	-	200	48.06	3-26-43	Irr	Observation well.
							140.50	1- 7-68		
							171.08	1-14-80		
105	S. C. Horan	Hi Plains Drilling, Inc.	1981	3,465	-	185-275	-	-	-	
1A	Mrs. S. A. Haley	Goyne Drilling Co.	1966	3,459	3,169	199-294	-	-	Irr	
1C	Ronald Adrian	J. B. Thrush Drilling Co.	1976	3,447	3,157	-	-	-	Irr	Deepened from 238 to 293 feet.
1D	Ralph Miller	Green Machinery Co.	1975	3,467	3,162	210-308	-	-	Irr	
1E	L. T. Mayhugh	Langston Drilling Co.	1971	3,478	3,167	200-316	-	-	Irr	
201	C. A. Robinson	-	-	3,442	-	208	85.64	1- 9-56	-	
							134.30	1- 6-68		
203	Jack James	J. B. Thrush Drilling Co.	1974	3,437	3,231	90-280	178.76	1-18-77	Irr	Observation well.
							181.72	1-14-80		
							205.05	12-12-91		

Table 1. Records of Water Wells (Continued)

Well Number	Owner and Owner's Well Number	Driller	Year Com-pleted	Ground-Level Eleva-tion (feet)	Estimated Elevation of Base of Ogallala (feet)	Screened Interval or Total Depth (feet)	Static Water-Level Data: Depth to Water (feet)	Static Water-Level Data: Date	Use of Water 1/	Remarks
Hale County	(Continued)									
11-50-204	Don Robinson	-	1969	3,442	-	204-322	159.92 194.61	1-14-80 12-11-91	Irr	Observation well.
205	Marvin Goddard	Green Machinery Co., Inc.	1971	3,447	-	211-275	-	-	-	
2A	W. E. Terrell	Bud Gibbons Drilling	1969	3,438	3,121	324	-	-	Irr	
2B	Marvin Goddard	Green Machinery Co., Inc.	1971	3,447	3,110	211-275	-	-	Irr	
2C	Bob Hooper Estate	J. B. Thrush Drilling Co.	1975	3,438	3,158	225-285	-	-	Irr	Deepened from 240 to 285 feet.
2D	John C. Carter	J. B. Thrush Drilling Co.	1975	3,444	3,169	200-280	-	-	Irr	Deepened from 200 to 280 feet.
301A	Zipp Industries - Well #1	-	-	3,404	-	-	-	-	Irr	Located near evaporation ponds.
3A	Zipp Industries - Well #4	Hi Plains Drilling Co.	1974	3,410	3,140	197-277	-	-	Ind	Drawdown 60 feet pumping 400 gpm in 6-74.
3B	Jack James	J. B. Thrush Drilling Co.	1970	3,416	3,113	185-305	-	-	Irr	Deepened from 185 to 305 feet.
3C	M. O. Stapleton	O. R. C. Drilling	1974	3,410	3,100	292-312	-	-	D	
3D	Ralph Miller	Green Machinery Co.	1973	3,410	3,083	253-333	-	-	Irr	
3F	J. D. Cobb	Hi Plains Drilling, Inc.	1973	3,424	3,100	240-280	-	-	Irr	
3G	Donald Terrell	Green Machinery Co.	1973	3,412	3,092	238-323	-	-	Irr	
4A	John Bell	J. B. Thrush Drilling Co.	1968	3,470	3,150	203-323	-	-	Irr	Deepened from 240 to 323 feet.
4B	Davis Horne	Green Machinery Co.	1974	3,458	3,131	267-330	-	-	Irr	
4C	Robert Wilson	Walker Drilling Co.	1975	3,465	3,115	250-352	-	-	Irr	
4D	Henry Heck & J. N. Marks	Walker Drilling Co.	1975	3,480	3,120	286-366	-	-	Irr	
4E	Thrane Parsons	Green Machinery Co.	1975	3,470	3,115	250-360	-	-	Irr	
501A	J. P. Senter	-	-	3,442	-	-	199.79	7- 7-92	-	
5A	Lewis Senter	Hi Plains Drilling, Inc.	1976	3,435	3,117	220-320	-	-	Irr	
5B	Texas Tech University HCK Feedlot	Hi Plains Drilling, Inc.	1970	3,428	3,110	222-322	122.00	4-70	Irr	Drawdown 20 feet.
5C	Glenn Lester	Green Machinery Co.	1978	3,410	3,080	244-335	-	-	Irr	
5E	Andy Taylor, Jr.	J. B. Thrush Drilling Co.	1974	3,427	3,110	187-220	-	-	Irr	Deepened from 220 to 320 feet.
5F	T. C. Clanton	Hale Center Drilling	1975	3,420	3,094	214-334	-	-	Irr	
5G	Ed & Mary Donaldson	J. B. Thrush Drilling Co.	1976	3,445	3.126	197-297	-	-	Irr	Deepened from 208 to 297 feet.
605	Jack James	-	1976	3,396	3,099	170-305	153.26 146.85 160.80	1-18-77 1-16-80 12-11-91	Irr	Observation well.
605A	Pleasant Hills #2 - Well #2	Orval Rollins Drilling	1978	3,410	3,090	260-320	161.00	4-78	PS	Pumping 100 gpm.
605B	Pleasant Hills #2 - Well #1	Walker Drilling Co.	197-	3,410	-	321	-	-	PS	
605C	Ebeling Water Supply	-	-	3,413	-	277+	169.00	12- 5-86	PS	Pumping 175 gpm in 12-91.
608	City of Plainview	Peerless Pump Co.	1961	3,385	-	299	-	-	-	
608A	City of Plainview	Hi Plains Drilling, Inc.	1982	3,385	3,078	-	-	-	TH	
6A	J. J. Kirchoff	Bogle & Flake Drilling Co.	1962	3,401	3,091	193-317	-	-	Irr	
6B	Ralph Miller	Green Machinery Co.	1972	3,395	3,092	238-308	-	-	Irr	
6C	Douglas C. Graham	J. B. Thrush Drilling Co.	1969	3,414	3,074	182-342	-	-	Irr	Deepened from 210-342 feet.
6D	E. R. Conklin	Green Machinery Co.	1975	3,385	3,065	213-325	-	-	Irr	
6E	Walker Bros. Produce	Hi Plains Drilling, Inc.	1973	3,389	3,080	-	-	-	Irr	
702	Ms. L. McClusky	-	-	3,466	-	-	164.88 229.95	2- 3-71 12-11-91	Irr	Observation well.
7A	Wilson McEachern	Green Machinery Co.	1967	3,468	3,118	195-355	-	-	Irr	
7B	Fay Gore	Green Machinery Co.	1976	3,430	3,091	236-342	-	-	Irr	
7C	Tom Karrh	O. R. C. Drilling, Co.	1975	3,470	3,140	332	-	-	Irr	
7D	L. V. Ratliff, Jr.	Green Machinery Co.	1976	3,464	3,144	231-327	-	-	Irr	
7E	J. G. Cannon	Hi Plains Drilling, Inc.	1977	3,452	3,138	215-315	-	-	Irr	
7F	J. B. Curry	J. B. Thrush Drilling Co.	1976	3,448	3,158	-	-	-	Irr	Deepened from 185 to 298 feet.
8A	Frank Schulte	Bud Gibbons Drilling	1973	3,420	3,145	302	-	-	Irr	
8B	Lloyd Laughton	Langston Drilling Co.	1974	3,431	3,151	290	-	-	Irr	
8C	Bill Hooper	O. R. C. Drilling, Co.	1974	3,443	3,109	315-355	-	-	D	
904	Elmo Ellis	Walker Drilling Co.	1978	3,422	3,112	318	181.78 198.53	1-16-80 12-11-91	Irr	Observation well.
905	Bill Walls	Hi Plains Drilling, Inc.	1981	3,398	-	202-302	-	-	Irr	
905A	Azteca Milling Co.	Hi Plains Drilling, Inc.	1990	3,392	-	205-285	-	-	Ind	Well #1.
9A	J. B. Thaxton	Green Machinery Co.	1974	3,421	3,111	202-315	-	-	Irr	

Well Number	Owner and Owner's Well Number	Driller	Year Com-pleted	Ground-Level Eleva-tion (feet)	Estimated Elevation of Base of Ogallala (feet)	Screened Interval or Total Depth (feet)	Static Water-Level Data: Depth to Water (feet)	Static Water-Level Data: Date	Use of Water 1/	Remarks
Hale County	(Continued)									
11-50-9B	Ms. E. Daughtery	O. R. C. Drilling, Co.	1968	3,405	3,120	288	-	-	D	
9C	J. D. James	Green Machinery Co.	-	3,401	3,114	292	-	-	Irr	
9D	James Taylor	J. B. Thrush Drilling Co.	1970	3,397	3,107	288-294	-	-	Irr	Deepened from 250 to 294 feet.
11-51-102	J. S. Simpson	-	1914	3,395	-	-	42.00	1914	Irr	Observation well.
							141.34	1- 7-68		
							156.35	1-14-80		
							186.88	12-12-91		
104	Jack James	J. B. Thrush Drilling Co.	1970	3,403	3,131	156-276	158.25	1-17-77	Irr	Deepened from 160 to 276 feet. Observation well.
							160.75	1-14-80		
							182.40	12-12-91		
105	City of Plainview - Well #19	Western Well & Pump	1983	3,407	3,028	263-360	174.00	11- 3-83	PS	Drawdown 60 feet pumping 1,016 gpm in 7-83. Pump setting = 310 feet.
							185.00	10- 4-89		
							185.20	6- 3-92		
1A	Dee Martin	Green Machinery Co.	1969	3,399	3,105	203-299	-	-	Irr	
1B	Jack Corn	J. B. Thrush Drilling Co.	1973	3,402	3,115	190-290	-	-	Irr	Deepened from 210 to 290 feet.
201	L. Draper	-	1948	3,365	-	-	86.84	12-15-54	-	
							124.50	1- 8-68		
							168.64	1-19-81		
							209.85	12-12-91		
202	-	-	-	3,364	-	-	42.68	8-26-37	-	
204	James Taylor	Green Machinery Co.	1968	3,378	3,078	155-315	-	-	Irr	
204A	Excel - Well #6	Hi Plains Drilling, Inc.	1988	3,393	3,131	200-260	201.00	5-12-88	Ind	
204B	Excel - Well #7	Hi Plains Drilling, Inc.	1990	3,381	-	198-258	186.00	3-18-90	Ind	
2A	Alton Dixon	J. B. Thrush Drilling Co.	1967	3,366	3,086	205-285	-	-	Irr	Deepened from 195 to 285 feet.
2B	Kenneth Adams	Hi Plains Drilling, Inc.	1977	3,374	3,094	185-285	-	-	Irr	
2C	Jim Higdon	Green Machinery Co.	1977	3,370	3,075	218-302	-	-	Irr	
2D	Gene McLain	J. B. Thrush Drilling Co.	1976	3,365	3,047	174-319	-	-	Irr	Deepened from 200 to 319 feet.
2F	R. C. Palmer	J. B. Thrush Drilling Co.	1970	3,372	3,085	190-295	-	-	Irr	Deepened from 212 to 295 feet.
2G	J. D. James	Langston Drilling Co.	1971	3,383	3,087	266-304	-	-	Irr	
2H	Pioneer Hi-Bred Co.	Green Machinery Co.	1974	3,387	3,098	201-291	-	-	Irr	
301	R. C. Hudgins	Green Machinery Co.	1943	3,359	-	-	60.93	3-13-47	Irr	Observation well.
							138.48	1- 8-68		
							172.37	1-12-80		
							201.87	12-12-91		
303	Harley Wells	-	1948	3,368	-	-	57.00	2-21-48	-	
							132.70	1- 8-68		
							168.67	1-12-80		
							194.15	12-12-91		
3A	Bill Hayes	O. R. C. Drilling	1974	3,347	3,019	310-330	-	-	D	
3B	Neal Burnett	J. B. Thrush Drilling Co.	1975	3,359	3,039	203-323	-	-	Irr	Deepened from 240 to 323 feet.
3C	H. Blankenship	K & F Drilling Co.	1968	3,354	3,054	185-305	-	-	Irr	
3D	Neal Burnett	J. B. Thrush Drilling Co.	1975	3,362	3,057	212-312	-	-	Irr	Deepened from 240 to 312 feet.
3E	Hollis Sweat	J. B. Thrush Drilling Co.	1974	3,361	3,076	187-287	-	-	Irr	Deepened from 200 to 287 feet.
401	City of Plainview - Well #3	L. A. Peeples	1937	3,385	-	100-247	44.00	5-28-37	PS(U)	Well abandoned.
							104.80	6-22-55		
							121.00	6-68		
							135.00	1976		
402	City of Plainview - Well #1	L. A. Peeples	1937	3,385	-	153-298	47.00	5-15-37	PS(U)	Well abandoned.
							104.00	6-22-55		
							120.00	6-68		
							135.00	1976		
403	City of Plainview - Well #2	L. A. Peeples	1937	3,387	-	132-298	45.00	5- 5-37	PS(U)	Well abandoned.
							104.70	6-22-55		
							123.00	6-68		
							134.50	1976		
							164.80	2- 6-92		

Well Number	Owner and Owner's Well Number	Driller	Year Completed	Ground-Level Elevation (feet)	Estimated Elevation of Base of Ogallala (feet)	Screened Interval or Total Depth (feet)	Static Water-Level Data: Depth to Water (feet)	Static Water-Level Data: Date	Use of Water 1/	Remarks
Hale County	(Continued)									
11-51-403A	City of Plainview	Hi Plains Drilling, Inc.	1982	3,370	3,065	-	-	-	TH	
404	City of Plainview - Well #7	Robertson Drilling Co.	1953	3,372	3,050	100-323	112.00 120.00 159.00	12-31-56 6-68 10- 4-89	PS	Pump setting = 230 feet.
405	City of Plainview - Well #8	Robertson Drilling Co.	1953	3,378	3,056	223-283	95.00 123.00 165.00 164.00	8- 2-55 6-68 11-20-90 6- 4-92	PS	Pump setting = 265 feet.
410	City of Plainview - Well #9	Bud Gibbons Drilling	1957	3,377	3,059	120-320	107.00 124.00 162.20 169.60	1-25-58 6-68 10- 4-89 6- 2-92	PS	
411	City of Plainview - Well #10	Bud Gibbons Drilling	1958	3,383	3,058	169-312	113.00 121.00 162.00	6- 9-60 6-68 10- 4-89	PS	Pump setting = 298 feet.
412	City of Plainview - Well #11	Bud Gibbons Drilling	1959	3,375	-	189-298	114.00 132.00 154.00 162.50	6- 9-60 6-68 10- 4-89 6- 2-92	PS	Pump setting = 270 feet.
413	City of Plainview - Well #12	Bud Gibbons Drilling	1963	3,380	3,062	200-330	124.00 122.00 164.00 164.20	11-10-64 6-68 10- 4-89 6- 4-92	PS	Pump setting = 240 feet.
414	City of Plainview - Well #13	Bud Gibbons Drilling	1964	3,402	3,078	240-330	130.00 139.00 172.00 191.40	11-10-64 6-68 10- 4-89 6- 1-92	PS	Pump setting = 270 feet.
415	City of Plainview - Well #14	Bud Gibbons Drilling	1965	3,400	3,075	238-336	136.00 136.00 178.00 191.60	8-14-67 6-68 10- 4-89 6- 1-92	PS	Pump setting = 290 feet.
416	City of Plainview - Well #16	Hi Plains Drilling, Inc.	1968	3,355	3,080	128-271	95.00 139.00 141.20	7-29-68 10- 4-89 6- 3-92	PS	Drawdown 85 feet pumping 1,001 gpm in 7-68. Pump setting = 230 feet.
417	City of Plainview - Well #17	Hi Plains Drilling, Inc.	1968	3,366	3,081	189-289	114.00 154.90 160.00	7-16-68 4-24-92 6- 4-92	PS	Drawdown 166 feet pumping 757 gpm in 7-68. Pump setting = 280 feet. New 7-stage pump bowls.
418	City of Plainview - Well #18	Hi Plains Drilling, Inc.	1968	3,370	3,087	138-288	108.00 160.00 154.20	6-68 10- 4-89 6- 5-92	PS	Drawdown 165 feet pumping 899 gpm in 7-68. Pump setting = 270 feet.
420	Wayland Baptist University	Hi Plains Drilling, Inc.	1985	3,387	-	314	-	-	Irr	Reported yield of 750 gpm with 88 feet of drawdown after 7 hours.
4E	Plainview Country Club	Green Machinery Co.	1978	3,370	3,080	218-308	-	-	Irr	
503	City of Plainview	-	-	3,350	-	158	41.90 98.18 123.87	6-27-49 1-15-68 1-17-80	PS(U)	Observation well.
507	City of Plainview - Well #5	L. A. Peeples	1949	3,364	3,072	230-290	90.00 110.00 159.00	8- 1-55 6-68 6- 4-92	PS	Pump setting = 270 feet.
508	City of Plainview - Well #4	Western Well & Pump	1963	3,365	3,056	229-309	131.00 157.30 158.90	6-68 10-21-89 6- 5-92	PS	Pump setting = 270 feet.
509	City of Plainview - Well #6	Green Machinery Co.	1952	3,360	3,061	102-303	121.00 114.00 164.00	1- 3-57 6-68 6-24-91	PS(U)	Well abandoned.
510	City of Plainview - Well #15	Hi Plains Drilling, Inc.	1968	3,360	3,050	229-329	110.00 155.00 165.40	6-68 10- 4-89 6- 2-92	PS	Drawdown 46 feet pumping 1,104 gpm in 6-68. Pump setting = 290 feet.

Table 1. Records of Water Wells (Continued)

Well Number	Owner and Owner's Well Number	Driller	Year Com-pleted	Ground-Level Eleva-tion (feet)	Estimated Elevation of Base of Ogallala (feet)	Screened Interval or Total Depth (feet)	Static Water-Level Data: Depth to Water (feet)	Static Water-Level Data: Date	Use of Water 1/	Remarks
Hale County	(Continued)									
11-51-511B	Alvin Noels	-	-	-	-	-	186.20	6- 5-92	Irr	
511C	City of Plainview	-	-	3,364	-	-	179.77	6- 5-92	Irr	
5B	Douglas Graham	Bud Gibbons Drilling	1968	3,365	3,024	-	-	-	Irr	
5F	J. L. Francis	Green Machinery Co.	1975	3,365	3,025	235-345	-	-	Irr	
6A	Mrs. I. B. Rankin	J. B. Thrush Drilling Co.	1966	3,353	3,023	-	-	-	Irr	Deepened from 198 to 333 feet.
6B	Martin Schur	Green Machinery Co.	1974	3,353	2,997	264-365	-	-	Irr	
6C	L. O. McClusky Estate	Green Machinery Co.	1972	3,353	2,988	237-370	-	-	Irr	
6D	Raymond Akin	Crosby County Pump Co.	1976	3,345	3,015	227-334	-	-	Irr	
6E	Farmers National Chemical	Hi Plains Drilling, Inc.	1974	3,338	2,986	245-355	-	-	Ind	
6F	Transco Corp.	Hale Center Drilling	1975	3,342	3,008	250-340	-	-	Irr	
703	Jack Roberson	Bud Gibbons Drilling	1974	3,385	3,100	295	161.85	1-16-80	Irr	Observation well.
							177.38	12-12-91		
7A	T. C. Clanton	K & F Drilling Co.	1968	3,378	3,098	192-312	-	-	Irr	
7B	A. W. Howerton	Langston Drilling	1974	3,376	3,091	150-290	-	-	Irr	
7D	Marshall Kemp	Russell Drilling	1969	3,381	3,093	148-288	-	-	Irr	Deepened from 160 to 288 feet.
7F	J. R. Mallow	Jack Seay Drilling Co.	1969	3,385	3,067	190-330	-	-	Irr	
7G	Haynes Machinery Co.	Bud Gibbons Drilling	1970	3,379	3,067	298	-	-	Irr	
8A	Allen Angel	J. B. Thrush Drilling Co.	1968	3,340	3,045	180-300	-	-	Irr	Deepened from 200 to 300 feet.
8B	Vinson Dixon	J. B. Thrush Drilling Co.	1969	3,358	3,058	190-310	-	-	Irr	Deepened from 210 to 310 feet.
8C	Daugherty Bros.	Bud Gibbons Drilling	1970	3,352	3,048	318	-	-	Irr	
8E	Elton Wilson	Langston Drilling, Co.	1971	3,351	3,041	194-314	-	-	Irr	
8F	Southwestern Grain Inc.	J. B. Thrush Drilling Co.	1974	3,343	3,026	180-320	-	-	Irr	Deepened from 178 to 320 feet.
8J	-	-	-	3,358	3,063	-	-	-	-	
901	G. D. Ellis	Bud Gibbons Drilling	1971	3,335	-	185-325	176.11	1-17-77	Irr	Observation well.
							162.63	1-17-80		
							186.20	12-12-91		
9A	Clayton Terrell	J. B. Thrush Drilling Co.	1966	3,334	3,014	-	-	-	Irr	Deepened from 220 to 325 feet.
9B	W. S. Noel	O. R. C. Drilling	1977	3,340	3,008	334	-	-	D	
9C	Bolin & Stalcup	Bud Gibbons Drilling	1970	3,330	3,000	336	-	-	Irr	
9D	E. W. Crisp	Bud Gibbons Drilling	1971	3,350	3,020	344	-	-	Irr	
9E	Jack Ellis	J. B. Thrush Drilling Co.	1975	3,341	3,006	340	-	-	Irr	Deepened from 240 to 340 feet.
9F	Elmo Stephens	O. R. C. Drilling	1974	3,335	2,997	320-340	-	-	D	
9G	Jack Roberson	Walker Drilling Co.	1975	3,337	3,027	237-317	-	-	Irr	
11-52-1A	C & S Pump & Machine Co.	Bud Gibbons Drilling	1970	3,335	3,000	340	-	-	Irr	
1B	Glenn Terrell	Hi Plains Drilling, Inc.	1975	3,337	3,018	238-319	-	-	Irr	
1C	Ms. C. Shelton	Bud Gibbons Drilling	1974	3,337	2,995	348	-	-	Irr	
1D	Harvey Hayes	J. B. Thrush Drilling Co.	1977	3,342	2,984	240-357	-	-	Irr	Deepened from 260 to 357 feet.
1E	Jack Stephens	Green Machinery Co.	1978	3,330	2,990	236-348	-	-	Irr	
202	Herbert King, Jr.	-	1954	3,333	-	237	79.97	12-15-54	Irr	Observation well.
							127.12	1- 8-68		
							160.18	1-11-80		
206	Albert Kelm	Sanders Pump & Drilling	1973	3,330	3,018	202-322	140.00	12-73	Irr	Drawdown 10 feet pumping 250 gpm in 12-73.
2A	Melvin Kelm	Bud Gibbons Drilling	1972	3,323	3,030	303	-	-	Irr	
401	Carl Jackson	Green Machinery Co.	-	3,331	-	225	63.41	3- 7-49	Irr	Observation well.
							182.66	1-12-80		
							212.20	12-12-91		
404	-	-	-	3,334	-	60	39.73	6- 5-37		
406B	Maurice Hastey	-	-	3,328	-	-	188.41	6- 5-92	Irr	
408	Billy Young	Bud Gibbons Drilling	1974	3,324	2,951	281-381	188.40	6- 5-92		
4A	Ida Seman	J. B. Thrush Drilling Co.	1967	3,333	2,974	230-362	-	-	Irr	Deepened from 250 to 362 feet.
4B	Truman Reese	Green Machinery Co.	1976	3,343	2,973	257-325	-	-	Irr	
4C	Billy Young	Bud Gibbons Drilling	1974	3,324	2,951	281-381	-	-	Irr	
4D	Elmer Lee	Bud Gibbons Drilling	1974	3,338	2,958	304-384	-	-	Irr	
4E	Hattie Scrivner	J. B. Thrush Drilling Co.	1975	3,336	2,976	222-362	-	-	Irr	Deepened from 240 to 363 feet.

Table 1. Records of Water Wells (Continued)

Well Number	Owner and Owner's Well Number	Driller	Year Com-pleted	Ground-Level Eleva-tion (feet)	Estimated Elevation of Base of Ogallala (feet)	Screened Interval or Total Depth (feet)	Static Water-Level Data: Depth to Water (feet)	Static Water-Level Data: Date	Use of Water 1/	Remarks
Hale County	(Continued)									
11-52-5A	M. C. Nance	J. B. Thrush Drilling Co.	1976	3,314	2,944	213-373	-	-	Irr	Deepened from 225 to 373 feet.
5B	L. L. Sililey	Green Machinery Co.	1977	3,323	2,999	229-334	-	-	Irr	
702	-	-	-	3,336	-	292	106.34	1-13-55	Irr	
							106.96	1-12-74		
703	Wayne Rankin	-	1917	3,331	-	292	46.00	1-20-17	Irr	Observation well.
							147.70	1- 8-68		
							180.00	1-17-80		
							203.75	12-12-91		
7A	Clyde Young	Bogle & Flake Drilling Co.	1963	3,317	3,004	168-318	-	-	Irr	
7B	C. Castleberry	Bud Gibbons Drilling	1970	3,325	2,988	343	-	-	Irr	
7C	Thomas Browning	Walker Drilling Co.	1975	3,317	2,982	260-342	-	-	Irr	
7D	Melvin Young	Green Machinery Co.	1978	3,302	2,967	195-340	-	-	Irr	
807	Ann Thomas	Green Machinery Co.	1972	3,313	2,964	231-359	222.80	6- 5-92	-	
8B	Hulan Hamlin	Langstron Drilling	1974	3,315	2,938	243-383	-	-	Irr	
8C	Thurman Thomas	Green Machinery Co.	1975	3,314	2,952	264-364	-	-	Irr	
8D	Hollis Sweatt	Green Machinery Co.	1975	3,297	2,942	236-356	-	-	Irr	
11-58-103	Edwin Gloyna	Bud Gibbons Drilling	1972	3,438	3,105	336	176.20	1-16-80	Irr	Observation well.
							212.25	12-10-91		
104	G. C. Johnson	Hi Plains Drilling Co.	1973	3,428	-	240-320	-	-	-	
105	John Bowling	Hi Plains Drilling Co.	1976	3,452	-	349	-	-	-	
106	Gary Helbert	Wall & Sons Drilling	1985	3,451	-	229-344	-	-	-	
1A	J. L. Hobbs	Bogle Drilling Co.	1965	3,433	3,117	176-318	-	-	Irr	
1C	Benny James	J. B. Thrush Drilling Co.	1971	3,480	3,105	222-378	-	-	Irr	Deepened from 350 to 378 feet.
1D	Joe Webb	Green Machinery Co.	1975	3,456	3,096	254-365	-	-	Irr	
204	W. T. Jones	-	1948	3,424	-	-	65.64	3- 7-49	Irr	Observation well.
							155.56	1- 5-68		
							188.33	1-17-80		
							221.25	12-10-91		
205	Joe Turner	Bud Gibbons Drilling	1973	3,407	3,067	345	176.56	1-18-77	Irr	Observation well.
							183.49	1-17-80		
							209.25	12-10-91		
2A	Troy Brown	Hi Plains Drilling, Inc.	1973	3,431	3,119	222-318	-	-	Irr	
2B	U. V. Helbert	O. R. C. Drilling	1974	3,418	3,083	320-340	-	-	D	
2C	W. L. Reese	Hale Center Drilling	1976	3,435	3,096	244-344	-	-	Irr	
2D	Woody Harper	Green Machinery Co.	1978	3,415	3,092	225-333	-	-	Irr	
2E	E. W. Smith	B & F Drilling Co.	1955	3,408	3,069	337	-	-	Irr	
301	W. C. Johnson	-	1944	3,387	-	-	57.39	3-14-47	Irr	Measured yield 330 gpm in 1955 Observation well.
							152.80	1- 5-68		
							225.28	12-10-91		
3A	Glen Day	Hi Plains Drilling, Inc.	1974	3,399	3,082	223-319	-	-	Irr	
3C	Ed Well	Hale Center Drilling	1977	3,393	3,049	227-348	-	-	Irr	
3D	R. G. Russ	Langston Drilling Co.	1971	3,385	3,088	183-307	-	-	Irr	
3E	Robert Johnson	Hi Plains Drilling, Inc.	1977	3,398	3,068	250-330	-	-	Irr	
3F	Clyde Byrd	J. B. Thrush Drilling Co.	1974	3,404	3,114	224-296	-	-	Irr	Deepened from 268 to 296 feet.
3G	O. F. Mason	Hi Plains Drilling, Inc.	1973	3,408	3,063	215-348	-	-	Irr	
401	City of Hale Center	Grams and Mount	1936	3,422	-	123	51.00	1-36	PS	Drawdown 40 feet pumping 500 gpm in 1-36.
402	City of Hale Center	Peerless Pump Co.	1953	3,425	3,103	117-317	-	-	PS	Pumping level 187 feet at 630 gpm.
404	City of Hale Center	Hi Plains Drilling, Inc.	1976	3,422	-	206-307	142.00	6-76	PS	Drawdown 67 feet pumping 115 gpm in 6-76.
405	City of Hale Center	Hi Plains Drilling, Inc.	1979	3,429	-	195-295	126.00	5-79	PS	Drawdown 58 feet pumping 140 gpm in 5-79.
406	W. C. Burden	Green Machinery Co.	1968	3,439	3,129	-	-	-	Irr	Reported yield 560 gpm.
407	Carter Caldwell	Hi Plains Drilling, Inc.	1969	3,443	-	220-340	-	-	-	
409	City of Hale Center	-	-	3,429	-	-	-	-	PS	

Table 1. Records of Water Wells (Continued)

Well Number	Owner and Owner's Well Number	Driller	Year Com-pleted	Ground-Level Eleva-tion (feet)	Estimated Elevation of Base of Ogallala (feet)	Screened Interval or Total Depth (feet)	Static Water-Level Data: Depth to Water (feet)	Static Water-Level Data: Date	Use of Water 1/	Remarks
Hale County	(Continued)									
11-58-410	City of Hale Center	Bud Gibbons Drilling	1963	3,425	-	212-330	-	-	PS	
411	City of Hale Center	-	-	3,423	-	-	-	-	PS	
412	-	-	-	3,426	-	-	51.92	5-11-36	-	
4C	Carter Caldwell	Hi Plains Drilling, Inc.	1973	3,443	3,118	222-328	-	-	Irr	
4D	Aubrey Terrell	J. B. Thrush Drilling Co.	1978	3,445	3,117	186-330	-	-	Irr	Deepened from 210 to 330 feet.
4E	Rex Harrison	Bud Gibbons Drilling	1971	3,428	3,106	-	-	-	Irr	
5A	U. V. Helbert	Green Machinery Co.	1974	3,426	3,094	241-361	-	-	Irr	
5B	J. C. Logan Estate	Hale Center Drilling	1975	3,408	3,083	231-331	-	-	Irr	
5C	Melvin Mahagan	Walker Drilling Co.	1976	3,390	3,085	-	-	-	Irr	
5D	W. Roddy	Green Machinery Co.	1945	3,412	3,122	-	-	-	Irr	
5E	Ben Roney	Hi Plains Drilling, Inc.	1973	3,395	3,095	211-305	-	-	Irr	
5F	John Lyles	Hi Plains Drilling, Inc.	1973	3,418	3,106	234-319	-	-	Irr	
603	H. S. Dunaway	-	-	3,396	-	-	91.25	12-13-54	U	Observation well.
							152.90	1- 5-68		
							172.42	1-16-80		
							189.18	12-10-91		
6A	Grady Shepard	Peerless Pump Co.	1953	3,390	3,082	312	-	-	Irr	
6B	Ms. O. Stout	Carmel Hudgins Drilling	1970	3,378	3,118	-	-	-	D	
6C	Bert Jacobs	Bud Gibbons Drilling	1973	3,387	3,072	-	-	-	Irr	
6D	Fred Autry	Walker Drilling Co.	1978	3,378	3,063	-	-	-	Irr	
6F	J. R. Caldwell	O. R. C. Drilling	1974	3,399	3,089	292-312	-	-	D	
11-59-101	O. C. McClain	-	-	3,387	-	-	64.63	3- 4-49	Irr	Observation well.
							149.09	1- 5-68		
							184.87	1-16-80		
							191.00	3-91		
101B	Azteca Milling Co.	Hi Plains Drilling, Inc.	1991	3,385	-	236-296			Ind	Well #2.
1A	Woody Harper	Hi Plains Drilling, Inc.	1973	3,378	3,068	195-315			Irr	
1B	James Cannon	J. B. Thrush Drilling Co.	1965	3,383	3,045	340	-	-	Irr	Deepened from 245 to 340 feet.
1C	James Cannon	J. B. Thrush Drilling Co.	1965	3,382	3,044	340	-	-	Irr	Deepened from 250 to 340 feet.
1D	George Benefield	Green Machinery Co	1971	3,376	3,036	220-348	-	-	Irr	
1E	Riley True	Hale Center Drilling	1975	3,387	3,040	265-355	-	-	Irr	
1F	Jason Gordan	Jack Seay Drilling Co.	1970	3,355	3,035	190-330	-	-	Irr	
1G	Raymond Miller	Bud Gibbons Drilling	1970	3,349	3,050	303	-	-	Irr	
1H	Laura Simms	J. B. Thrush Drilling Co.	1970	3,381	3,076	171-310	-	-	Irr	Deepened from 205 to 310 feet.
202	Hershel Blankenship	Goyne Drilling Co.	1970	3,342	3,030	315	184.67	1-17-77	Irr	Observation well.
							177.26	1-17-80		
							207.25	12-12-91		
2A	R. C. Yarbrough	Bogle & Flake Drilling Co.	1963	3,339	3,017	154-329	-	-	Irr	
2B	Curtis Groff	Green Machinery Co.	1977	3,352	3,052	182-308	-	-	Irr	
2D	C. C. Castleberry	Langston Drilling	1970	3,338	3,053	178-289	-	-	Irr	
2E	Ms. Moody McCullock	Green Machinery Co.	1975	3,355	3,027	212-331	-	-	Irr	
2F	Charles Clements	Green Machinery Co.	1953	3,347	3,059	292	-	-	Irr	
2G	T. I. Loter	O. R. C. Drilling	1971	3,356	3,026	335	-	-	D	
2H	Haynes Machinery Co.	Bud Gibbons Drilling	1971	3,352	3,042	320	-	-	Irr	
301	-	-	-	3,339	-	185	43.54	11-28-45	-	
302	Gaylan Schumacher	-	-	3,331	3,121	175	53.30	1-14-47	-	
							211.62	7- 6-92		
3A	Jack Phipps	Hi Plains Drilling, Inc.	1970	3,319	3,026	220-320	-	-	D	
3B	Jimmy Cornelius	J. B. Thrush Drilling Co.	1966	3,314	3,014	305	-	-	Irr	Deepened from 200 to 305 feet.
3C	Wesley Schumacher	Langston Drilling Co.	1973	3,337	3,017	140-326	204.59	7- 6-92	Irr	
3D	Jack Roberson	Bud Gibbons Drilling	1974	3,336	3,041	206-304	-	-	Irr	
3E	Charles Noel	Hale Center Drilling	1975	3,331	3,028	193-308	-	-	Irr	
3F	Wesley Schumacher	O. R. C. Drilling	1976	3,326	2,996	331	-	-	D	
3G	Wesley Schumacher	J. B. Thrush Drilling Co.	1972	3,335	3,013	225-325	-	-	Irr	Deepened from 250 to 325 feet.
3K	Mark Schumacher	-	-	3,336	3,042	-	-	-	Irr	
401	-	-	-	3,384	-	240	48.53	3-14-47	-	
							159.85	1- 2-68		

Table 1. Records of Water Wells (Continued)

Well Number	Owner and Owner's Well Number	Driller	Year Com-pleted	Ground-Level Eleva-tion (feet)	Estimated Elevation of Base of Ogallala (feet)	Screened Interval or Total Depth (feet)	Static Water-Level Data: Depth to Water (feet)	Static Water-Level Data: Date	Use of Water 1/	Remarks
Hale County (Continued)										
11-59-402	A. L. Higgans	-	1954	3,341	-	-	60.55	1-20-55	Irr	Observation well.
							89.14	1- 2-68		
							85.75	1- 2-80		
							203.60	1- 6-92		
404	Boyce A. Bryan	Green Machinery Co., Inc.	1978	3,375	3,060	-	179.69	1- 2-80	Irr	Observation well.
							203.60	1- 6-92		
405	-	-	-	3,339	-	-	74.18	2- 8-90	-	
							78.95	1- 6-92		
503	C. E. Crooks	-	-	3,327	-	150	86.50	11-17-72	Irr	Observation well.
							80.97	1- 2-80		
							85.28	1- 6-92		
504	Daniel Crooks	J. B. Thrush Drilling	1978	3,321	-	125	-	-	Irr	
11-60-1B	Jack Robertson	J. B. Thrush Drilling Co.	1966	3,304	2,969	200-340	-	-	Irr	Deepened from 230 to 340 feet.
1C	Floyd Terrell	Walker Drilling Co.	1978	3,314	2,953	225-361	-	-	Irr	
1D	Robert Kincaid	K & F Drilling Co.	1968	3,306	3,006	185-305	-	-	Irr	
201	R. L. Powell	-	-	3,310	-	276	47.60	6-27-14	Irr	Observation well.
							155.90	1- 8-68		
							194.50	1-18-80		
							217.40	12-12-91		
2A	Dale Lacewell	J. B. Thrush Drilling Co.	1967	3,293	2,948	188-348	-	-	Irr	Deepened from 210 to 348 feet.
2B	Warren Mathis	Bud Gibbons Drilling	1972	3,294	2,944	359	-	-	Irr	
401	Wilkin Farms	M. E. Courtney	1937	3,303	-	135	34.11	9-10-37	U	Observation well.
							89.09	1- 2-68		
							95.22	1- 2-80		
							102.20	1- 6-92		
4A	John Ross	Green Machinery Co.	1971	3,287	2,987	208-305	-	-	Irr	
4B	Robert Kincaid	K & F Drilling Co.	1968	3,298	2,978	203-323	-	-	Irr	
Floyd County										
11-44-5A	Luther B. Brandes	Green Machinery Co., Inc.	1953	3,338	3,086	80-244	-	-	Irr	
6A	L. B. Brandes	Green Machinery Co., Inc.	1964	3,322	3,087	118-238	-	-	Irr	
6B	Mrs. A. M. Dietrich	Frank Stark	1974	3,305	3,065	180-232	-	-	Irr	
8A	R. K. Ooley et al	A. W. Fish	1965	3,328	3,066	166-266	115.00	1-65	Irr	Reported pumping rate 1,000 gpm in 1965.
8B	W. Stoerner	Green Machinery Co., Inc.	1967	3,321	3,060	128-270	140.00	5-67	Irr	Drawdown 40 feet pumping 800 gpm in 5-67.
8C	L. Moore	Bud Gibbons Drilling	1970	3,325	3,057	198-272	-	-	Irr	Reported pumping rate 1,000 gpm in 1970.
901	M. C. Scheele	Green Machinery Co., Inc.	1936	3,322	-	213	48.00	4-28-36	-	
							135.88	1-11-68		
903	Mike & Warren Mathis	-	-	3.321	-	213	177.65	2-14-83	-	
							193.75	2- 8-91		
9A	K. C. Pritchard	Bud Gibbons Drilling	1965	3,322	3,102	124-242	110.00	7-65	Irr	Drawdown 70 feet pumping 850 gpm in 1965.
9B	W. McLaughlin	Green Machinery Co., Inc.	1956	3,320	3,093	130-230	101.00	1-56	Irr	Reported pumping rate 800 gpm in 1956.
9C	Clyde Gallagher	Bud Gibbons Drilling	1969	3,314	3,109	111-161	-	-	Irr	Reported pumping rate 700 gpm in 1969.
9D	M. C. Scheele	Curtis Sanders	1973	3,317	3,100	190-210	145.00	12-73	Irr	Drawdown 45 feet pumping 560 gpm in 12-73.
9E	Jean Holeman	Curtis Sanders	1971	3,318	3,110	146-219	143.00	1971	Irr	Drawdown 17 feet pumping 560 gpm in 1971.
9F	W. A. Boedeker	Green Machinery Co., Inc.	1969	3,325	3,108	94-222	145.00	2-69	Irr	Drawdown 30 feet pumping 800 gpm in 2-69.
9G	O. D. Torpley	Green Machinery Co., Inc.	1970	3,311	3.099	128-224	160.00	11-70	Irr	Drawdown 40 feet pumping 600 gpm in 11-70.

Table 1. Records of Water Wells (Continued)

Well Number	Owner and Owner's Well Number	Driller	Year Completed	Ground-Level Elevation (feet)	Estimated Elevation of Base of Ogallala (feet)	Screened Interval or Total Depth (feet)	Static Water-Level Data: Depth to Water (feet)	Static Water-Level Data: Date	Use of Water 1/	Remarks
Floyd County (Continued)										
11-52-2A	Dollie Street	W. L. Langston	1971	3,323	3,103	150-222	150.00	2-71	Irr	Reported pumping rate 700 gpm in 1971.
2B	Albert Schelle	Curtis Sanders	1973	3,323	3,083	-	138.00	12-73	Irr	Drawdown 72 feet pumping 560 gpm in 12-73.
2C	B. H. Quebe	Geo. H. Robertson	1963	3,319	3,089	100-233	98.00	9-63	Irr	Drawdown 22 feet pumping 1,000 gpm in 9-63.
2D	Floyd Tomlinson	Geo. H. Robertson	1954	3,317	3,048	59-269	80.00	3-54	Irr	Drawdown 60 feet pumping 1,000 gpm in 3-54.
2E	C. B. Moore	H. O. Bogle, Jr.	1965	3,317	3,007	-	-	-	Irr	
2F	Floyd Tomlinson	Bud Gibbons Drilling	1969	3,310	3,010	156-306	120.00	1-69	Irr	Drawdown 80 feet pumping 1,000 gpm in 1-69.
305	Ewald Quebe	Bud Gibbons Drilling	1964	3,313	3,067	252	139.00	1-26-66	Irr	Observation well.
							146.30	1-10-68		
							182.50	1- 8-80		
							194.90	2-12-92		
3A	Lucy Clements	Henry Robertson	1962	3,322	3,089	120-235	93.00	3-62	Irr	Reported pumping 1,000 gpm.
3B	Helmuth Quebe	Bud Gibbons Drilling	1970	3,305	3,105	199-229	140.00	3-70	Irr	Drawdown 30 feet pumping 650 gpm in 3-70.
3C	D & B Rathman	Green Machinery Co., Inc.	1957	3,308	3,062	-	-	-	Irr	
3D	Oscar Golden	Haynes Machinery Co.	1959	3,317	3,030	140-290	90.00	2-59	Irr	Drawdown 50 ft pumping 1,000 gpm in 2-59.
3E	Ewald Quebe	Bud Gibbons Drilling	1973	3,312	3,013	-	-	-	Irr	
5A	C. C. Huddleston	W. G. Goyne	1968	3,312	2,982	-	-	-	Irr	
5B	Lewis Cox	Bud Gibbons Drilling	1968	3,310	2,947	-	-	-	Irr	
5C	Douglas Cox	Haynes Machinery Co.	1964	3,307	2,939		-	-	Irr	
603	Ivan J. Thompson	-	-	3,310	-	298	49.50	1- 3-14	Irr	Observation well.
							198.80	1- 8-80		
609	Henry C. Ford	A. W. Fish	1967	3,314	-	223-373	160.00	4-10-67	-	
							221.38	2-12-92		
6A	L. L. Rhodes	Jack Seay Drilling	1967	3,304	2,964	-	-	-	Irr	
6B	H. C. Ford	A. W. Fish	1967	3,314	2,952	223-373	160.00	4-67	Irr	Reported pumping rate 1,000 gpm in 1967.
6C	G. V. Jackson	H. A. Walker	1966	3,306	2,926	-	-	-	Irr	
6D	Tri C Corporation	Bogle & Flake Drilling Co.	1960	3,304	2,934	-	-	-	Irr	
6E	W. J. Lee	Green Machinery Co., Inc.	1972	3,304	2,918	-	-	-	Irr	
8A	Hardy Fugate	Bud Gibbons Drilling	1970	3,311	2,937	-	-	-	Irr	
901	Martin Bradley	TC & D Co.	1913	3,302	-	274	51.20	1914	Irr	Observation well.
							204.89	1- 8-80		
							233.94	2-12-92		
902	Ivan Green	T. L. & D. Co.	1916	3,304	-	286	47.00	2-29-16	Irr	
							157.25	1- 9-68		
907	Acco Seed Co.	Bud Gibbons Drilling	1972	3,302	-	290-390	-	-	Ind	
908	J. R. Belt, Jr.	H. O. Bogle, Jr.	1965	3,299	-	248-401	157.90	1-26-66	Irr	Observation well.
							164.18	1- 9-68		
							201.65	1- 4-80		
							241.21	2-12-92		
9A	W. L. Bradley	W. L. Langston	1973	3,302	2,926	188-378	173.00	4-73	Irr	Reported pumping rate 700 gpm in 1973.
9B	C. A. Lucas	Geo. H. Robertson	1960	3,301	2,911	-	-	-	Irr	
9C	Oscar Golden	Green Machinery Co., Inc.	1966	3,302	2,905	-	-	-	Irr	Drawdown 50 feet pumping 850 gpm in 4-66.
9D	Oscar Golden	H. A. Walker	1964	3,295	2,919	186-376	150.00	4-64	Irr	Drawdown 20 feet pumping 800 gpm in 4-64.
9E	Clyde Lucas	Jack Seay Drilling Co.	1963	3,299	2,899	-	-	-	Irr	
11-60-2A	Clayton Terrell	Bud Gibbons Drilling	1971	3,293	2,941	220-360	-	-	Irr	Pumping 700 gpm.

Table 1. Records of Water Wells (Continued)

Well Number	Owner and Owner's Well Number	Driller	Year Completed	Ground-Level Elevation (feet)	Estimated Elevation of Base of Ogallala (feet)	Screened Interval or Total Depth (feet)	Static Water-Level Data: Depth to Water (feet)	Static Water-Level Data: Date	Use of Water 1/	Remarks
Floyd County	(Continued)									
11-60-302	Walter Taack	-	-	3,292	-	278	44.50 160.94 209.40 241.51	4- 2-14 1- 9-68 1- 4-80 2-12-92	Irr	Observation well.
3A	A. D. Morris	Bogle & Flake Drilling Co.	1963	3,280	2,913	214-364	-	-	Irr	Reported pumping rate 600 gpm in 1963; pumping level 190 feet.
3B	L. E. Graham	Bud Gibbons Drilling	1972	3,280	2,892	242-398	150.00	7-72	Irr	Reported pumping rate 700 gpm.
502	Clyde Applewhite	Bud Gibbons Drilling	1964	3,276	2,951	270-350	197.39 209.44 233.76	8- 7-75 1- 4-80 2-18-92	Irr	Observation well.
5A	Donald G. Akin	J. D. Fox	1974	3,277	2,912	171-371	200.00	3-74	Irr	Drawdown 50 feet pumping 560 gpm in 3-74.
602	D. V. Probasco	Peerless Pump Co.	1937	3,265	-	192	57.50	3-18-47	-	
605	D. V. Probasco	H. O. Bogle, Jr.	1954	3,265	2,865	154-414	165.30 110.65 165.00 221.37 240.82	1- 8-68 1- 6-56 1- 6-68 1- 4-80 2-18-92	Irr	Observation well.
6A	K. E. Probasco	-	1963	3,265	2,876	140-394	-	-	Irr	

FOOTNOTE:

1/ D = Domestic well
Ind = Industrial well
Irr = Irrigation well
PS = Public supply well
TH = Test hole
U = Unused well

TABLE 2. WATER-LEVEL AND PERFORMANCE DATA FOR CITY OF PLAINVIEW WELLS

State Well Number	City Number	Driller	Year Completed	Ground-Level Elevation (feet)	Depth of Well (feet)	Screened Interval (feet)	Casing and Screen Diameter (inches) 1/	Static Water Level: Depth (feet)	Static Water Level: Date	Specific Capacity: Pumping Rate (gpm)	Specific Capacity: Specific Capacity (gpm/ft)	Specific Capacity: Date	Motor: Horsepower	Motor: RPM	Pump Information: Manufacturer	Pump Information: Pump Bowl	Remarks
11-51-105	19	Western Well & Pump	1983	3,407	367	263-360	C=16 S=16	178 174 185 185.2 185.3	4-83 11- 3-83 10- 4-89 6- 3-92 7- 8-92	1,000 1,140 1,000 1,033	14.3 - - 13.4	4-83 10-89 6- 3-92 7- 8-92	150	1,770	Byron Jackson	11MQ-9	Pump setting = 310 feet.
11-51-401	3	L. A. Peeples	1937	3,385	254	100-247	C=18,12 S=12	104.8 121 135	6-22-55 6-68 1976	600	35.3	6-68	-	-	-	-	Well unused.
11-51-402	1	L. A. Peeples	1937	3,385	298	153-298	C=18,12 S=12	104 120 135	6-22-55 6-68 1976	600	35.3	6-68	-	-	-	-	Well unused.
11-51-403	2	L. A. Peeples	1937	3,387	298	132-298	C=18,12 S-12	104.7 123 134.5 164.8	6-22-55 6-68 1976 2- 6-92	600	60.0	6-68	-	-	-	-	Well unused.
11-51-404	7	Robertson Drilling Co.	1953	3,372	323	100-323	C=16 S=16	120 159	6-68 10- 4-89	900 400 343	45.0 - -	6-68 10- 4-89 6- 2-92	-	1,770	Peerless	12MA-4	Pump setting = 230 feet.
11-51-405	8	Robertson Drilling Co.	1953	3,378	322	223-283	C=16 S=12	123 165 164	6-68 11-20-90 6- 4-92	1,000 510 505	76.9 5.6 6.6	6-68 11-89 6- 4-92	75	3,600	Byron Jackson	8MQ-3	Pump setting = 265 feet.
11-51-410	9	Bud Gibbons Drilling	1957	3,377	334	120-320	C=16 S=16	124 162.2 169.6	6-68 10- 4-89 6- 2-92	800 450 512	57.1 - 32.2	6-68 10- 4-89 6- 2-92	-	1,770	Pomona	-	Pump setting = ?
11-51-411	10	Bud Gibbons Drilling	1958	3,383	312	169-312	C=16 S=16	121 162	6-68 10- 4-89	750 850	37.5 -	6-68 10- 4-89	75	3,600	Byron Jackson	8MQ-3	Pump setting = 298 feet.
11-51-412	11	Bud Gibbons Drilling	1959	3,375	293	189-298	C=16,12 S=16	132 154 162.5	6-68 10- 4-89 6- 2-92	750 800 703	46.9 40.0 34.7	6-68 10- 4-89 6- 2-92	75	3,600	Byron Jackson	8MQ-3	Pump setting = 270 feet.
11-51-413	12	Bud Gibbons Drilling	1963	3,380	330	200-330	C=16 S=16	122 164 191.4	6-68 10- 4-89 6- 1-92	750 400 428	28.8 - 19.6	6-68 10- 4-89 6- 4-92	50	1,700	Byron Jackson	-	Pump setting = 240 feet.
11-51-414	13	Bud Gibbons Drilling	1964	3,402	330	240-330	C=16 S=16	139 172 191.4	6-68 10- 4-89 6- 1-92	1,300 1,200 1,113	36.1 23.9 36.9	6-68 10- 4-89 6- 1-92	100	1,760	Byron Jackson	11MQH	Pump setting = 270 feet.
11-51-415	14	Bud Gibbons Drilling	1965	3,400	336	238-336	C=16 S=16	136 178 191.6	6-68 10- 4-89 6- 1-92	1,150 860 800	21.3 - 20.3	6-68 10- 4-89 6- 1-92	75	1,760	Peerless	12MB-5	Pump setting = 290 feet.
11-51-416	16	Hi Plains Drilling & Supply	1968	3,355	280	128-271	C=24,16 S=16	95 139 141.2	7-29-68 10- 4-89 6- 3-92	750 525 660	30.0 - 14.0	6-68 10- 4-89 6- 3-92	50	1,760	Worthington	10H75-5	Pump setting = 230 feet.
11-51-417	17	Hi Plains Drilling & Supply	1968	3,366	299	189-289	C=24,16 S=16	114 154.9 160 153	7-16-68 4-24-92 6- 4-92 7- 8-92	900 600 497 487	30.0 - 7.1 7.3	6-68 10- 4-89 6- 4-92 7- 8-92	40	1,760	Byron Jackson	10GH2M5-7	Pump setting = 280 feet. New 7-stage pump bowls.

Table 2. Water-Level and Performance Data for City of Plainview Wells (Continued)

State Well Number	City Number	Driller	Year Completed	Ground-Level Elevation (feet)	Depth of Well (feet)	Screened Interval (feet)	Casing and Screen Diameter (inches) 1/	Static Water Level		Specific Capacity			Motor		Pump Information		Remarks
								Depth (feet)	Date	Pumping Rate (gpm)	Specific Capacity (gpm/ft)	Date	Horsepower	RPM	Manufacturer	Pump Bowl	
11-51-418	18	Hi Plains Drilling & Supply	1968	3,370	298	138-288	C=24,16 S=16	108 160 154.2	8- 5-68 10- 4-89 6- 5-92	850 450 390	25.8 - -	6-68 10- 4-89 6- 5-92	40	1,760	Worthington	10H61-5	Pump setting = 230 feet.
11-51-507	5	L. A. Peeples	1949	3,364	305	230-290	C=16 S=12	110 159	6-68 6- 4-92	850 403	50.0 4.1	6-68 6- 4-92	75	3,600	Byron Jackson	8MQ-3	Pump setting = 270 feet.
11-51-508	4	Western Well & Pump	1983	3,365	314	229-309	C=20,16 S=16	131 157.3 158.9 158.5	6-68 10-21-89 6- 5-92 7- 8-92	980 1,002 1,000	- - 13.2	10- 4-89 6- 5-92 7- 8-92	125	1,760	Byron Jackson	11MQ-10	Pump setting = 270 feet.
11-51-509	6	Green Machinery Co.	1952	3,360	303	102-303	C=16 S=16	114 164	6-68 6-24-91	600	17.6	6-68	-	-	-	-	Well unused.
11-51-510	15	Hi Plains Drilling & Supply	1968	3,360	339	229-329	C=24,16 S=16	110 155 165.4	6-68 10- 4-89 6- 2-92	1,150 700 623	57.5 - 22.5	6-68 10- 4-89 6- 2-92	50	1,760	Worthington	10H75-5	Pump setting = 290 feet.

FOOTNOTE: 1/ C = Casing
S = Screen

TABLE 3. WATER LEVELS AND WATER-LEVEL DECLINE IN WELLS LOCATED IN AND NEAR PLAINVIEW

Well Numbers	Date[1/] of Measurement 1968	1991-1992	Water-Level Decline (feet)	Average Rate of Decline (feet/year)
Wells Located in Plainview				
11-51-405, City Well 8	123	164	41	1.70
-410, City Well 9	124	169.6	45.6	1.90
-412, City Well 11	132	162.5	30.5	1.27
-413, City Well 12	122	164.2	42.2	1.76
-414, City Well 13	139	191.4	52.4	2.18
-415, City Well 14	136	191.6	55.6	2.32
-416, City Well 16	95	141.2	46.2	1.92
-417, City Well 17	114	160	46	1.92
-418, City Well 18	108	154.2	46.2	1.93
-507, City Well 5	110	159	49.0	2.04
-508, City Well 4	131	158.9	27.9	1.16
Wells Located Outside Plainview				
11-42-603	166.40	235.38	68.98	2.87
-704	132.98	194.90	61.72	2.57
-901	143.26	222.85	79.59	3.32
11-51-102	141.34	186.88	45.54	1.90
-201	124.50	209.85	85.35	3.56
11-52-703	147.70	203.75	56.05	2.34
-908	164.18	241.21	77.03	3.21

Table 3. (Continued)

Well Numbers	Date[1/] of Measurement 1968	1991-1992	Water-Level Decline (feet)	Average Rate of Decline (feet/year)
Wells Located Outside Plainview (Continued)				
11-58-204	155.56	221.25	65.69	2.74
11-60-201	155.90	217.40	61.50	2.56

1/ Water levels in City wells were measured in June or July of 1968 and in June of 1992. Water levels in wells outside the City were measured in January 1968 and in December 1991 or February 1992.

TABLE 4. CHEMICAL ANALYSES OF WATER FROM WELLS
(Results in milligrams per liter except specific conductance and pH)

Well Number	Screened Interval or Depth (feet)	Date Sampled	Laboratory 1/	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved Solids	Total Hardness as $CaCO_3$	Specific Conductance (µmhos/cm @ 25° C)	pH
<u>Hale County</u>																			
11-42-603	-	7-17-70	TDH	48	-	-	53	27	33	-	323	24	20	1.6	0.4	365	243	565	7.7
		7- 2-76	TDH	48	-	-	56	26	30	-	322	25	19	1.8	1.0	365	245	569	7.7
901	-	7-29-71	TDH	46	0.02	0.48	52	31	33	-	346	26	12	2.3	0.4	372	258	570	7.4
		7-12-91	TDH	51	-	-	66	40	27	9	372	36	39	1.8	10.2	465	331	781?	7.0
902	252	7-29-71	TDH	47	-	-	61	29	31	-	351	28	16	1.9	-	388	274	586	7.4
11-43-407	-	7-29-71	TDH	48	-	-	56	27	32	-	340	23	15	2.3	0.4	370	253	562	7.7
504	-	7-17-70	TDH	53	-	-	49	26	48	4	326	25	28	2.6	0.4	396	227	597	8.0
		6-25-86	TDH	54	-	-	61	33	38	8	317	33	55	1.8	11.2	452	288	640	8.4
704	-	6-14-91	TDH	-	0.02	0.07	68	38	42	9	323	68	56	1.9	10.3	451	326	792	7.2
803	280	7-29-71	TDH	48	-	-	53	26	36	-	326	26	20	2.1	1.0	372	240	572	7.6
8A	146-272	5- 5-92	EXC	-	-	-	-	-	186	-	445	10	621	-	-	1,598	-	2,640	7.05
902	200	7-29-71	-	55	-	-	57	39	25	-	354	27	20	2.7	5.0	404	301	610	7.6
11-44-702	224	7-17-70	-	53	-	-	61	41	31	-	337	51	42	2.5	0.4	447	320	691	7.7
706	300	2-14-74	-	11	-	-	49	23	27	9	281	24	13	2.1	9.0	305	219	509	7.9
708	300	2-14-74	-	11	-	-	49	29	44	9	333	31	23	2.7	0.4	362	240	596	8.1
709	300	4-10-75	-	32	-	-	52	17	19	-	253	16	12	1.6	0.9	274	199	447	8.1
712	300	-	-	-	-	-	-	-	-	-	-	-	-	2.4	-	443	131	-	-
11-50-102	200	7-29-71	-	41	-	-	49	30	40	-	336	32	18	2.3	0.4	377	247	580	7.9
		6-23-86	TDH	44	-	-	51	30	46	8	348	31	26	1.9	5.7	410	252	585	8.3
201	208	7-29-71	TDH	48	-	-	53	34	34	-	350	29	20	2.4	1.0	393	273	598	7.7
	208	5-31-91	TDH	48	0.02	0.02	56	37	46	9	340	36	48	2.1	5.4	454	291	749	7.4
3A	197-277	3-24-82	ZIPP	-	-	-	66	50	-	-	-	41	110	-	-	514	-	-	7.11
		5-11-82	-	54.6	0.08	0.04	74.4	59.9	57.4	11.0	237	44.1	125	-	-	665	-	910	8.18
		3-24-86	ZIPP	-	-	-	59	73	-	-	-	37	143	-	-	601	-	-	7.30
		3-26-92	ZIPP	-	-	-	-	-	-	2	-	67	-	-	-	745	-	-	8.39
301A	-	2-26-64	-	-	-	-	110	144	-	-	-	31	24	-	-	-	254	-	7.6
		4- 1-68	-	-	-	-	760	1,052	-	-	-	1,530	102	-	-	-	1,812	-	7.0
		5-18-72	TWQB	80	-	-	550	510	260	-	530	3,210	87	3.7	368	5,200	3,480	4,730	7.1
		7-20-79	TWQB	74	-	-	590	410	482	-	488	2,772	108	1.9	1,024	5,430	3,162	3,790	7.8
		3-24-82	ZIPP	-	-	-	577	399	-	72	-	3,436	114	-	-	5,402	-	-	6.87
		8-11-82	-	73.0	0.17	1.08	522	470	331	56.9	408	2,977	102	-	-	4,820	-	5,400	7.79
		3-25-86	ZIPP	-	-	-	321	228	-	76	-	1,996	128	-	-	3,290	-	-	7.01
		6-27-91	ZIPP	-	-	-	-	-	-	23	-	1,339	-	-	-	2,641	-	-	-
608	299	8-10-76	TDH	-	-	-	68	35	35	-	338	43	38	2.9	13.0	401	314	-	7.9
	299	12-14-83	TDH	-	<0.02	0.02	69	43	36	9	338	63	58	2.9	23.9	470	352	-	7.9

Table 4. Chemical Analyses of Water from Wells (Continued)

Well Number	Screened Interval or Depth (feet)	Date Sampled	Laboratory 1/	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved Solids	Total Hardness as $CaCO_3$	Specific Conductance (µmhos/cm @ 25° C)	pH
<u>Hale County</u> (Continued)																			
11-50-605A	260-320	7-27-89	TDH	-	<0.02	<0.02	6	2	150	-	344	32	24	2.7	-	391	243	-	8.1
605C	277+	6- 8-88	TDH	-	<0.02	<0.02	66	31	35	-	346	45	33	2.7	-	395	294	-	7.9
7R	-	7- 8-92	EWL	40	<0.01	<0.01	95	20	28	-	295	53	60	1.9	14.0	456	320	940	7.9
11-51-104	156-276	7-12-91	TDH	48	0.02	<0.02	55	39	44	10	311	52	65	2.5	9.7	478	297	812	7.2
105	263-360	4-26-87	TDH	49	-	-	50	39	43	9	337	54	40	2.4	1.5	454	286	647	8.3
201	-	7-29-71	TDH	55	-	-	52	38	25	-	326	29	23	3.3	0.4	385	285	580	7.7
	-	6-26-86	TDH	51	-	-	50	29	34	8	314	34	23	2.9	2.0	391	247	544	8.4
204A	200-260	5- 5-92	-	-	-	-	-	-	33	-	283	29	31.9	-	-	328	-	610	7.68
	-	6- 2-92	-	-	-	-	-	-	30	-	281	34	28.4	-	-	512	-	620	7.71
204B	198-258	5- 5-92	-	-	-	-	-	-	40	-	283	46	117	-	-	546	-	980	7.53
	-	6- 2-92	-	-	-	-	-	-	36	-	280	42	120	-	-	704	-	970	7.75
301	-	7-29-71	TDH	48	-	-	49	35	31	-	342	27	15	3.1	0.4	376	265	576	7.6
404	100-323	3-31-76	TDH	-	<0.02	<0.05	49	33	34	7	321	31	27	3.0	2.1	510	260	-	7.8
	100-323	4-26-87	TDH	32	-	-	52	31	185	7	267	149	208	1.7	1.7	798	256	1,520	8.2
	100-323	6- 2-92	EWL	-	-	-	-	-	-	-	-	-	105	-	-	535	288	920	-
405	100-302	6- 4-92	EWL	43	0.18	0.01	46	30	37	-	319	27	21	2.9	0.8	357	238	620	7.9
410	120-320	4-26-87	TDH	32	-	-	52	31	189	7	279	153	214	1.7	1.7	819	259	1,149	7.7
	120-320	6- 3-92	EWL	-	-	-	-	-	-	-	-	-	106	-	-	587	258	1,010	-
411	169-342	4-26-87	TDH	66	-	-	53	45	40	8	399	30	31	2.7	4.6	482	319	670	8.4
412	293	4-26-87	TDH	65	-	-	43	37	34	8	309	32	36	3.2	6.2	417	261	580	8.2
	293	6- 2-92	EWL	-	-	-	-	-	-	-	-	-	24	-	-	-	244	600	-
413	200-330	4-26-87	TDH	31	-	-	52	31	196	7	265	159	233	1.7	1.6	833	258	1,164	8.1
	200-330	6- 3-92	EWL	29	0.12	<0.01	61	31	165	-	280	145	181	1.9	2.6	763	278	1,290	7.7
414	240-330	1-10-74	TDH	-	<0.02	<0.05	46	33	38	-	329	28	22	2.7	<0.4	499	250	-	7.2
	240-330	4-26-87	TDH	56	-	-	47	35	39	7	335	34	30	2.6	3.0	419	262	595	8.2
415	238-336	12-15-69	TDH	-	0.13	<0.05	47	35	36	-	318	31	36	2.9	<0.4	510	262	-	7.4
	238-336	4-26-87	TDH	56	-	-	50	35	42	8	329	38	43	2.5	0.3	440	271	625	8.2
416	128-271	4-26-87	TDH	53	-	-	67	40	40	9	326	63	64	2.8	5.4	505	333	719	8.1
417	189-289	4-26-87	TDH	51	-	-	61	37	42	8	312	53	59	2.8	3.9	476	307	682	8.4
418	138-288	3-31-76	TDH	-	0.30	<0.05	74	43	36	9	340	72	60	2.8	4.5	640	363	-	7.6
	138-288	4-26-87	TDH	54	-	-	78	46	41	9	353	79	77	2.7	7.6	568	385	797	8.2
503	158	9-22-75	-	-	-	-	-	-	-	-	-	-	-	0.9	0.4	-	-	705	8.3
507	96-305	4-26-87	TDH	32	-	-	52	31	185	7	267	149	208	1.7	1.7	798	256	1,133	8.2
508	229-309	7-23-83	TDH	-	0.08	<0.02	60	23	46	8	338	32	24	2.5	1.2	363	244	-	8.0
	229-309	4-26-87	TDH	54	-	-	50	42	36	9	331	38	50	2.6	8.0	453	299	655	8.2

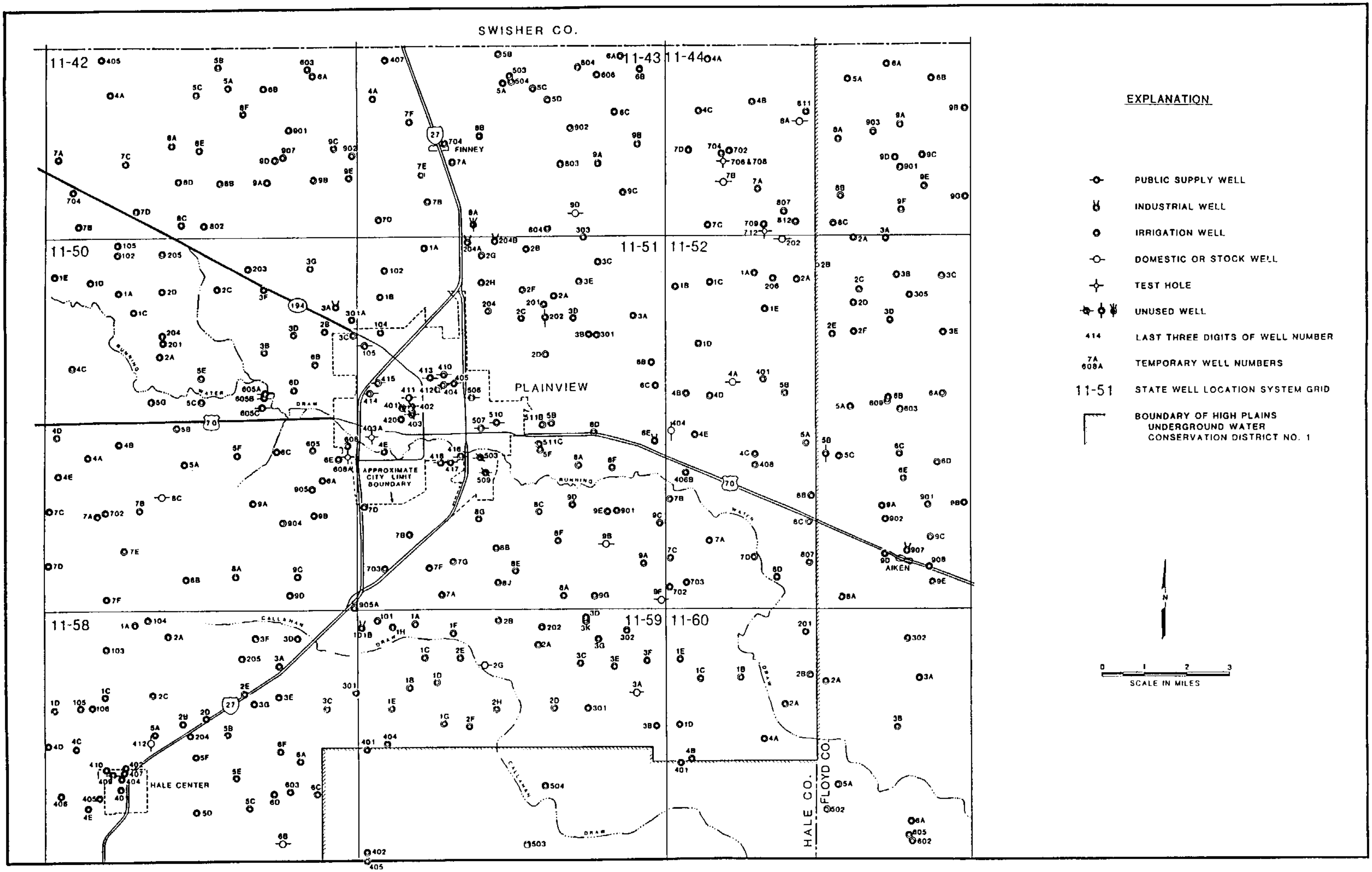
Table 4. Chemical Analyses of Water from Wells (Continued)

Well Number	Screened Interval or Depth (feet)	Date Sampled	Laboratory 1/	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved Solids	Total Hardness as $CaCO_3$	Specific Conductance (µmhos/cm @ 25° C)	pH
Hale County (Continued)																			
11-51-510	229-329	3-31-76	TDH	-	0.04	<0.05	47	25	50	7	336	24	20	2.6	2.0	510	221	-	7.8
	229-329	4-26-87	TDH	53	-	-	43	30	50	8	331	31	30	2.6	6.2	416	231	587	8.3
11-52-408	281-381	7- 8-92	EWL	36	<0.01	<0.01	90	8	41	-	339	32	24	3.0	0.2	376	256	780	7.8
702	292	7-30-71	-	50	-	-	45	37	35	-	326	30	26	3.1	0.4	386	267	585	7.6
703	292	7-17-70	-	50	-	-	44	34	40	-	338	28	22	2.5	0.4	387	250	601	7.8
11-58-204	-	6-24-86	TDH	45	-	-	50	28	35	8	325	24	14	3.1	1.6	356	242	632	8.4
401	123	3- 3-45	TDH	54	0.02	-	50	52	21	9	349	43	35	4.4	5.2	445	339	-	7.6
402	117-317	6-26-86	TDH	37	-	-	39	29	46	9	344	23	13	3.1	2.0	370	218	522	8.3
404	206-307	6-26-86	TDH	40	-	-	47	27	46	9	343	23	19	2.7	3.7	380	228	546	8.1
405	195-295	6-28-85	TDH	39	-	-	50	32	48	9	338	38	34	2.8	7.0	396	255	592	8.3
	195-295	7-12-91	TDH	27	<0.02	0.12	41	31	44	10	344	24	15	3.3	2.4	366	229	624	7.2
409	-	6-26-86	TDH	38	-	-	43	26	41	8	329	21	14	2.9	2.9	358	215	500	8.3
410	212-330	6-26-86	TDH	37	-	-	45	26	53	8	337	31	25	2.5	4.2	398	221	556	8.2
411	-	6-26-86	TDH	38	-	-	46	27	48	8	343	25	21	2.6	3.4	360	227	545	8.2
11-59-101	-	7-17-70	TDH	48	-	-	63	20	38	6	322	25	24	2.8	3.5	389	238	589	7.8
		6-26-86	TDH	46	-	-	44	28	38	8	317	26	21	2.9	5.2	366	228	527	8.0
3K	-	7- 6-92	EWL	39	0.02	<0.01	58	14	58	-	346	24	14	2.4	3.8	378	202	740	7.9
401	240	7-17-70	-	43	-	-	51	26	39	-	332	23	15	2.6	1.0	363	232	573	7.7
402	135	6-25-80	TDH	66	-	-	72	65	50	-	329	111	109	3.0	11.7	672	447	923	7.6
503	150	7-15-75	TDH	48	-	-	69	52	26	11	390	53	52	3.5	4.7	510	389	798	8.2
	150	8- 6-87	TDH	54	-	-	68	50	23	9	387	45	46	2.9	7.1	498	376	703	8.4
504	125	5-31-83	TDH	55	-	-	68	66	49	10	362	78	119	3.6	7.2	672	443	990	8.1
11-60-201	276	7-30-71	TDH	50	-	-	48	41	23	-	332	27	23	3.4	1.0	379	289	586	7.7
	276	6- 1-91	TDH	48	<0.02	<0.02	35	33	57	9	343	32	26	2.7	6.1	417	223	674	7.8
Floyd County																			
11-44-901	213	4-20-70	TDH	49	-	-	50	36	26	-	333	27	17	3.1	<0.4	372	270	575	7.6
903	-	8-12-87	TDH	58	-	-	68	45	33	8	391	52	44	3.1	<0.0	503	355	698	8.3
11-52-603	278	8-14-80	TDH	68	-	-	49	44	25	-	311	39	42	3.9	1.1	430	305	600	7.7
609	373	8-19-86	TDH	53	-	-	46	38	33	8	348	33	21	3.4	2.2	408	271	720	8.3

Table 4. Chemical Analyses of Water from Wells (Continued)

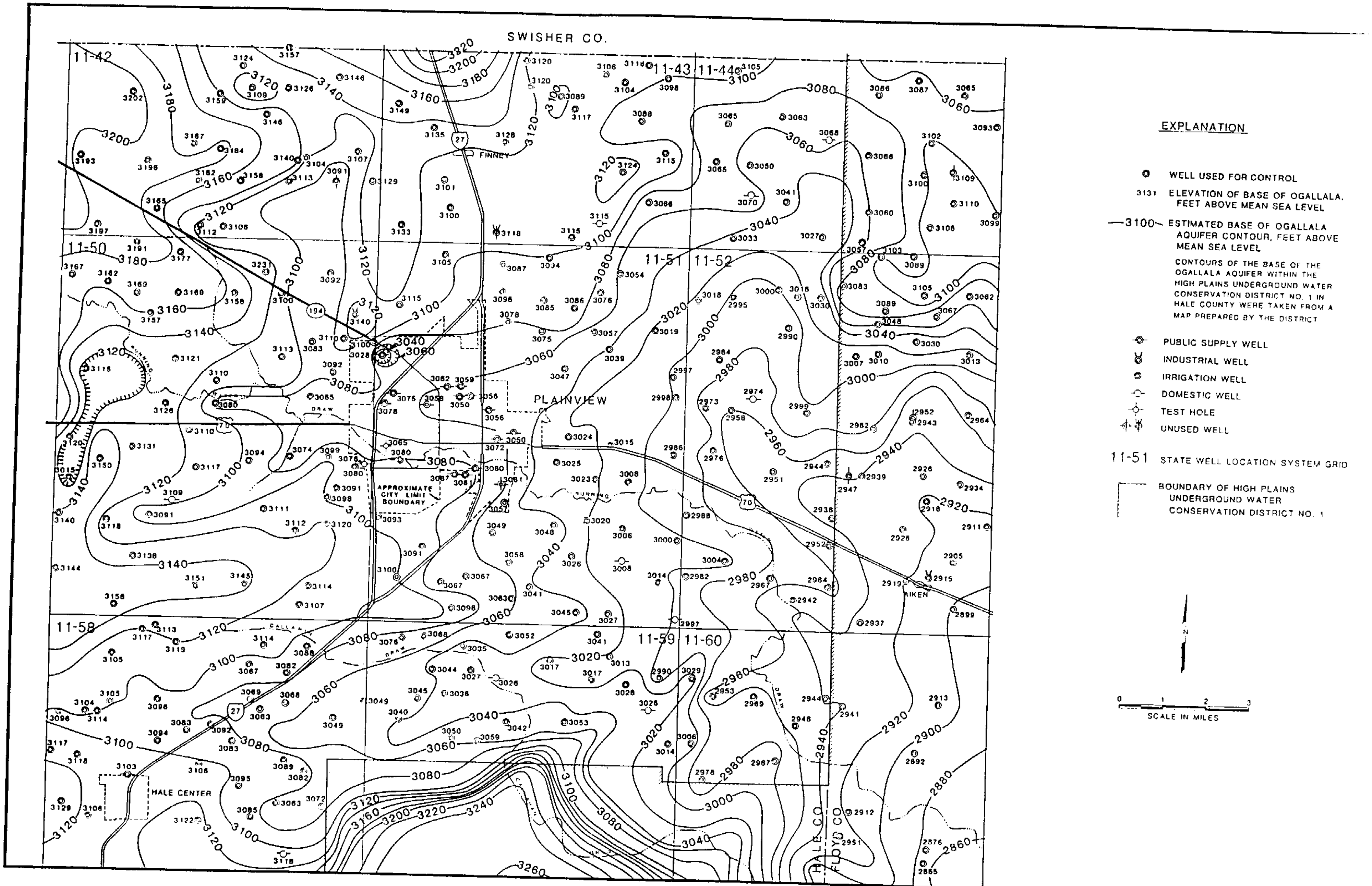
Well Number	Screened Interval or Depth (feet)	Date Sampled	Laboratory 1/	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved Solids	Total Hardness as $CaCO_3$	Specific Conductance (µmhos/cm @ 25° C)	pH
Floyd County (Continued)																			
11-52-901	395	7-24-86	TDH	53	-	-	52	43	36	9	323	55	44	3.4	13.3	488	307	655	8.3
902	286	8-12-75	TDH	52	-	-	54	36	37	-	332	35	32	3.5	3.3	416	283	643	8.3
907	390	8-13-87	TDH	56	-	-	9	30	155	-	314	26	90	3.4	1.5	596	147	810	9.2
908	401	8-13-87	TDH	52	-	-	42	31	45	8	332	30	22	3.3	2.2	399	232	562	8.3
11-60-602	192	5- 4-70	TDH	44	-	-	42	39	24	-	327	19	15	3.7	<0.4	347	265	612	7.7
	192	7-21-80	TDH	50	-	-	43	31	36	7	336	25	16	3.3	1.2	365	236	544	7.9
605	414	7-24-86	TDH	50	-	-	40	33	35	8	336	26	15	3.4	2.0	346	238	535	8.2

FOOTNOTE: 1/ EWL = Edna Wood Laboratories, Inc.
TDH = Texas Department of Health
TTU = Texas Tech University
TWQB = Texas Water Quality Board
UNK = Unknown, data provided in tabular form by Texas Water Commission
ZIPP = Zipp Industries, Inc. or its predecessors



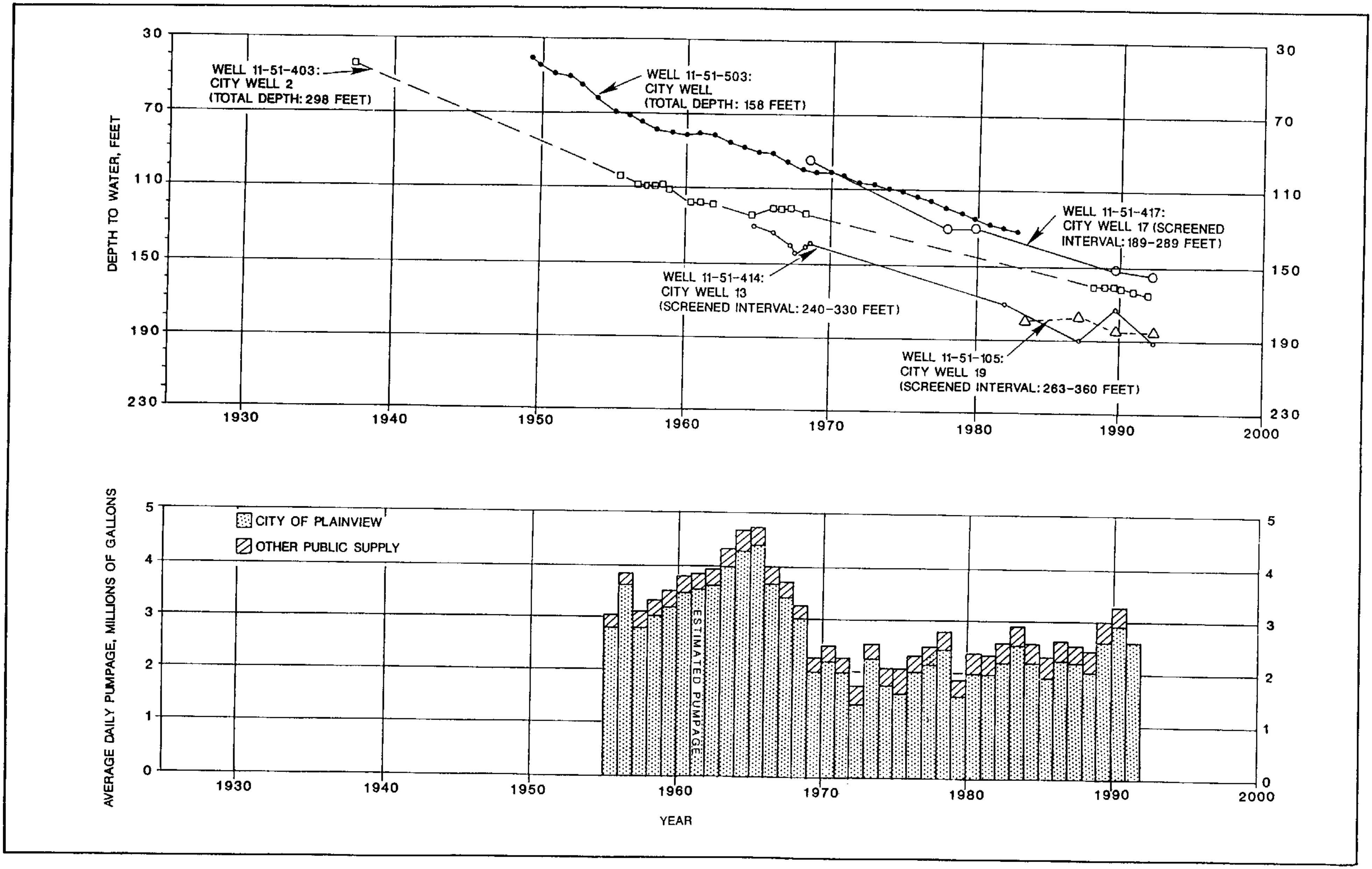
LOCATIONS OF WELLS AND TEST HOLES

Figure 1



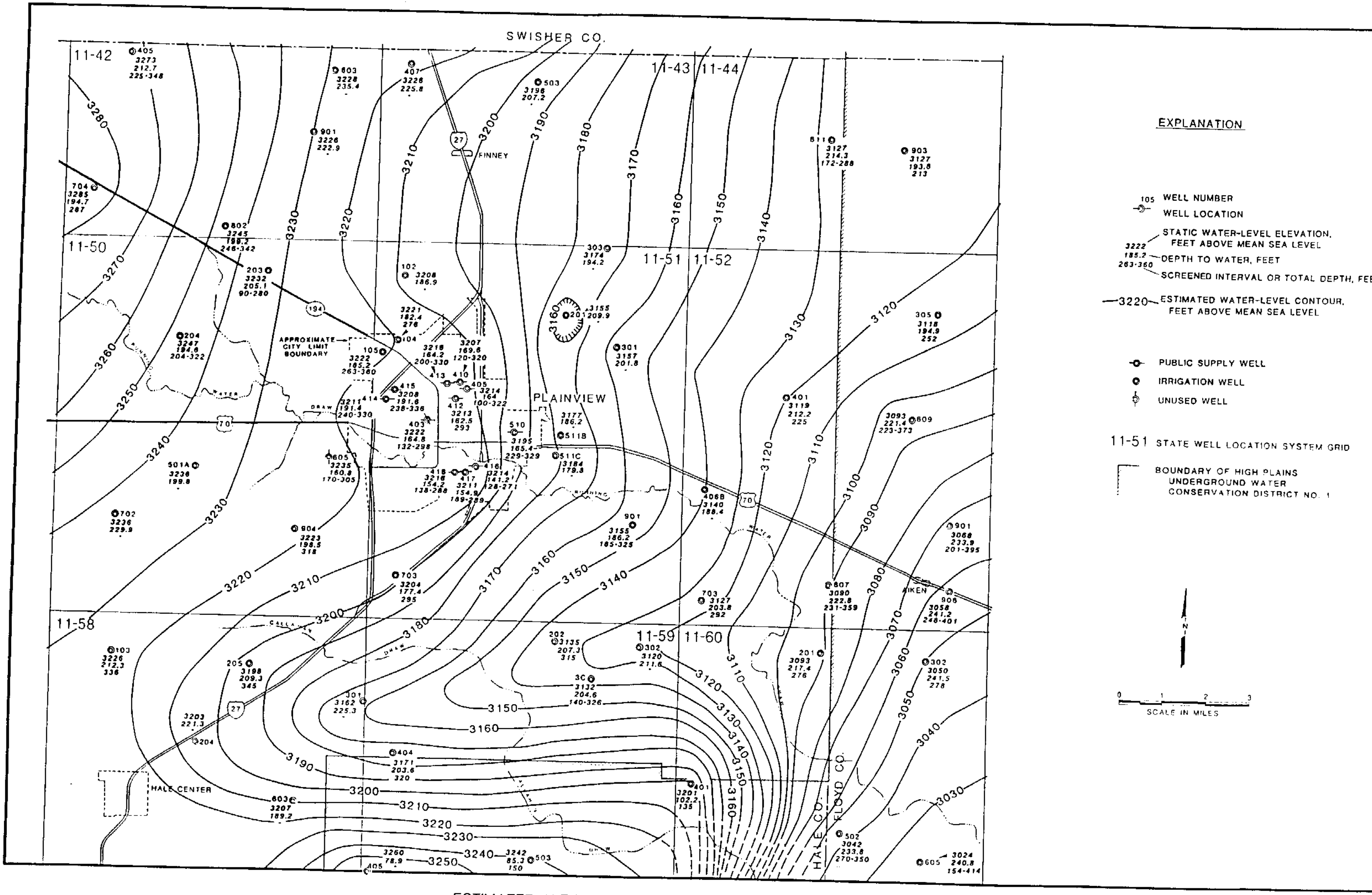
ESTIMATED ALTITUDE OF THE BASE OF THE OGALLALA AQUIFER

Figure 2



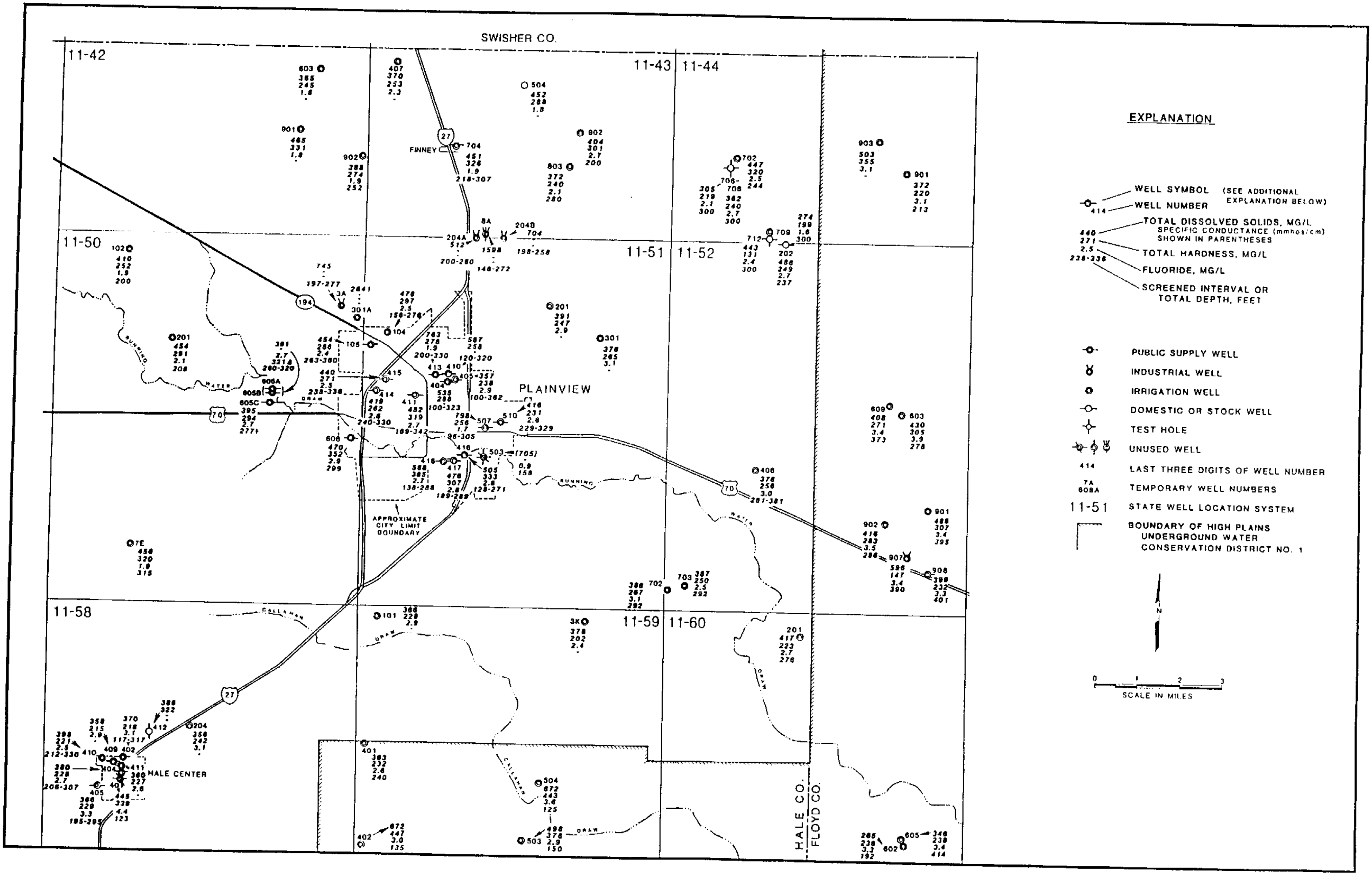
PUBLIC SUPPLY GROUND-WATER PUMPAGE AND WATER-LEVEL GRAPHS

Figure 3



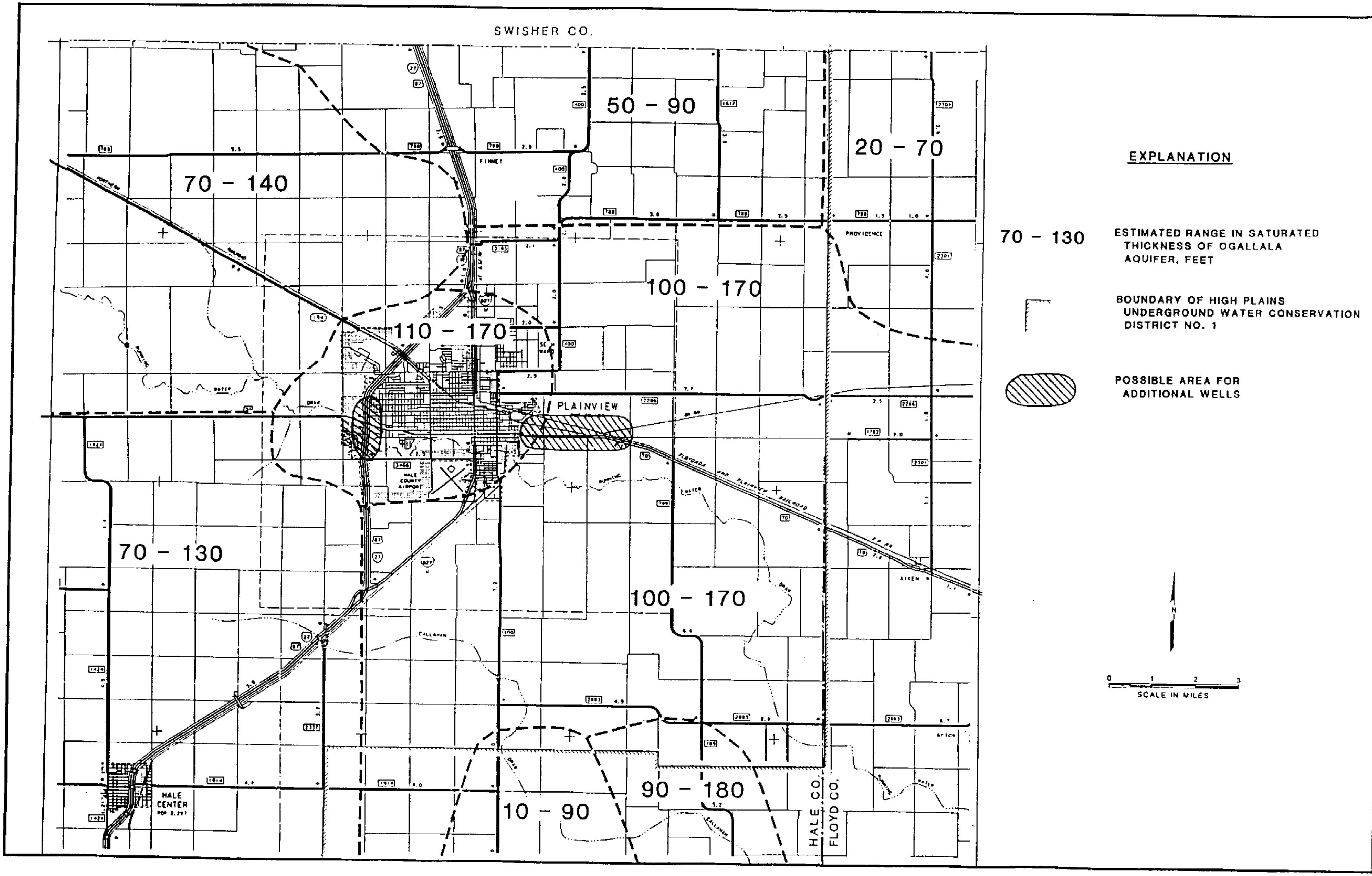
ESTIMATED ALTITUDE OF WATER LEVEL, WINTER 1991-SPRING 1992

Figure 5



WATER-QUALITY DATA

Figure 6



ESTIMATED SATURATED THICKNESS OF OGALLALA AQUIFER

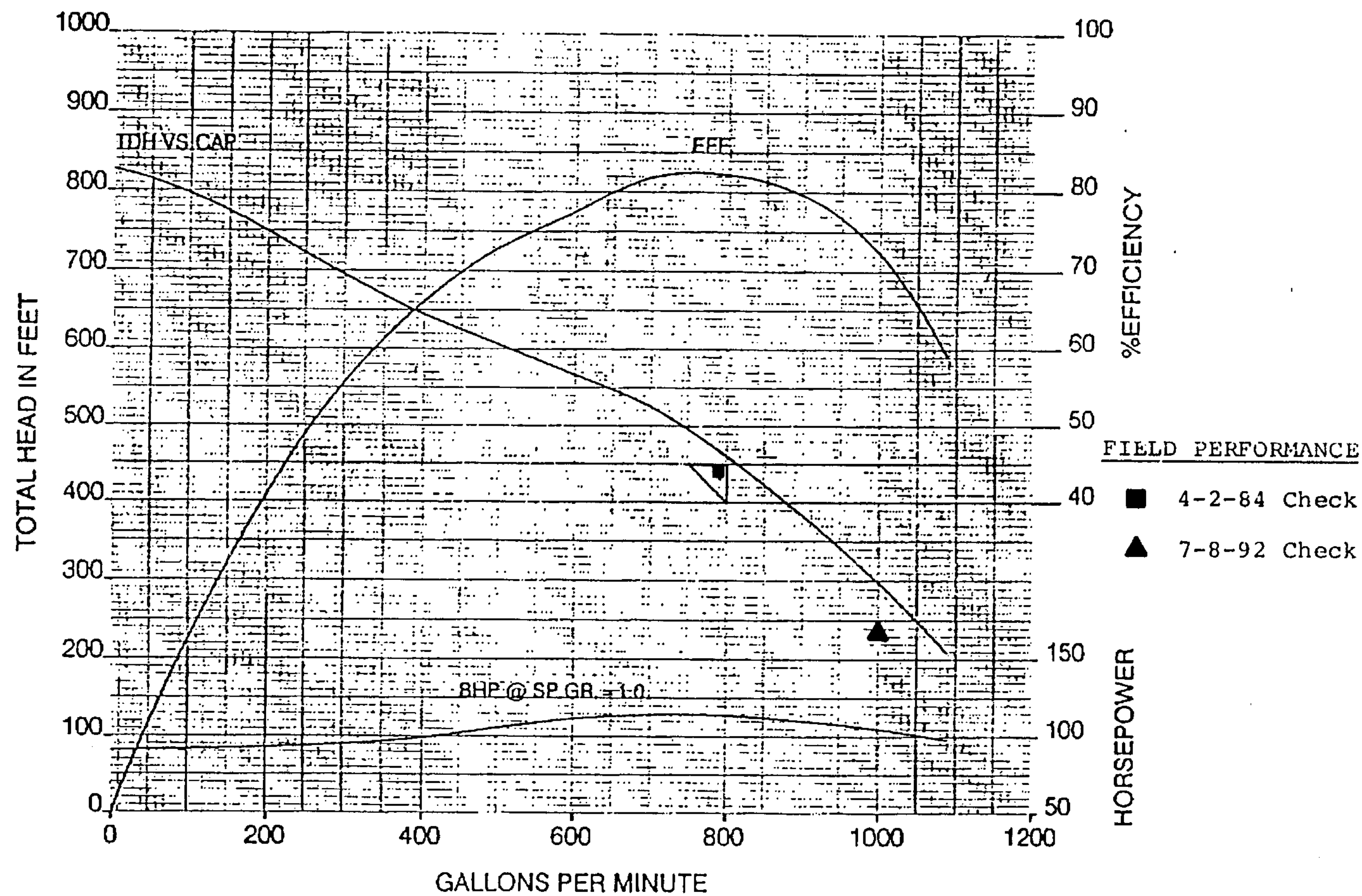
Figure 7

APPENDIX

BW/IP International, Inc. — BYRON JACKSON Products

IMP LIFT 1/4" — 8" COL. TAP

CITY OF PLAINVIEW WELL 4

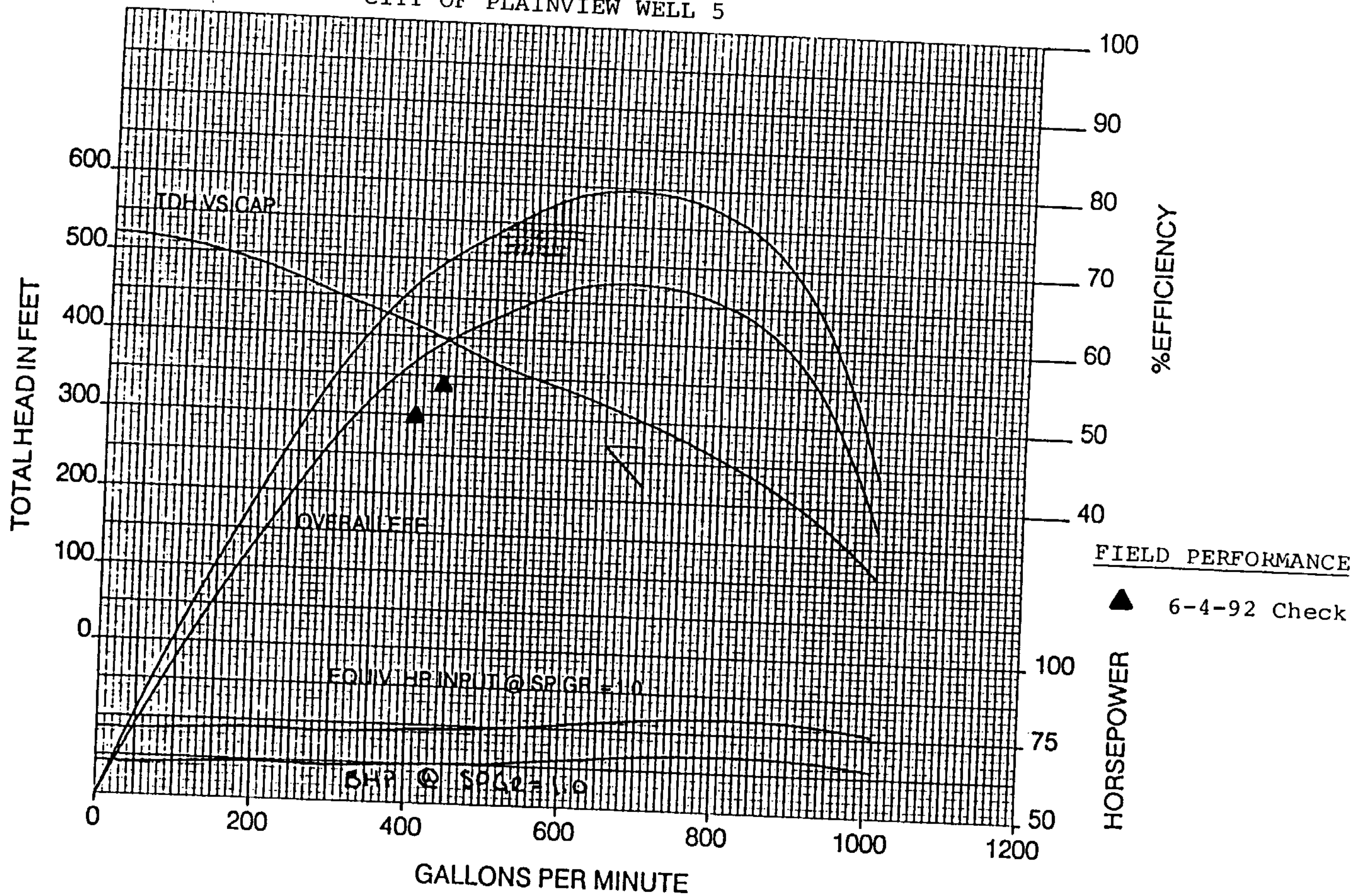


Pump Size & Type		RPM	Imp. Number	Vanes	Diameter	Underfile	Stages
11MQ	10 STG L10	1770	169730	5	7-15/16"	STD. #1	10L
By	RC RW	Date					
By	SB	3 OCT 83			Pump Motor		
Factory No. 836-S-1219	Customer No.	Item No.	Imp. Material LY		Motor H.P. 125 HP	Curve No. 11MQ-203	

Byron Jackson Products

8" COL. TAP

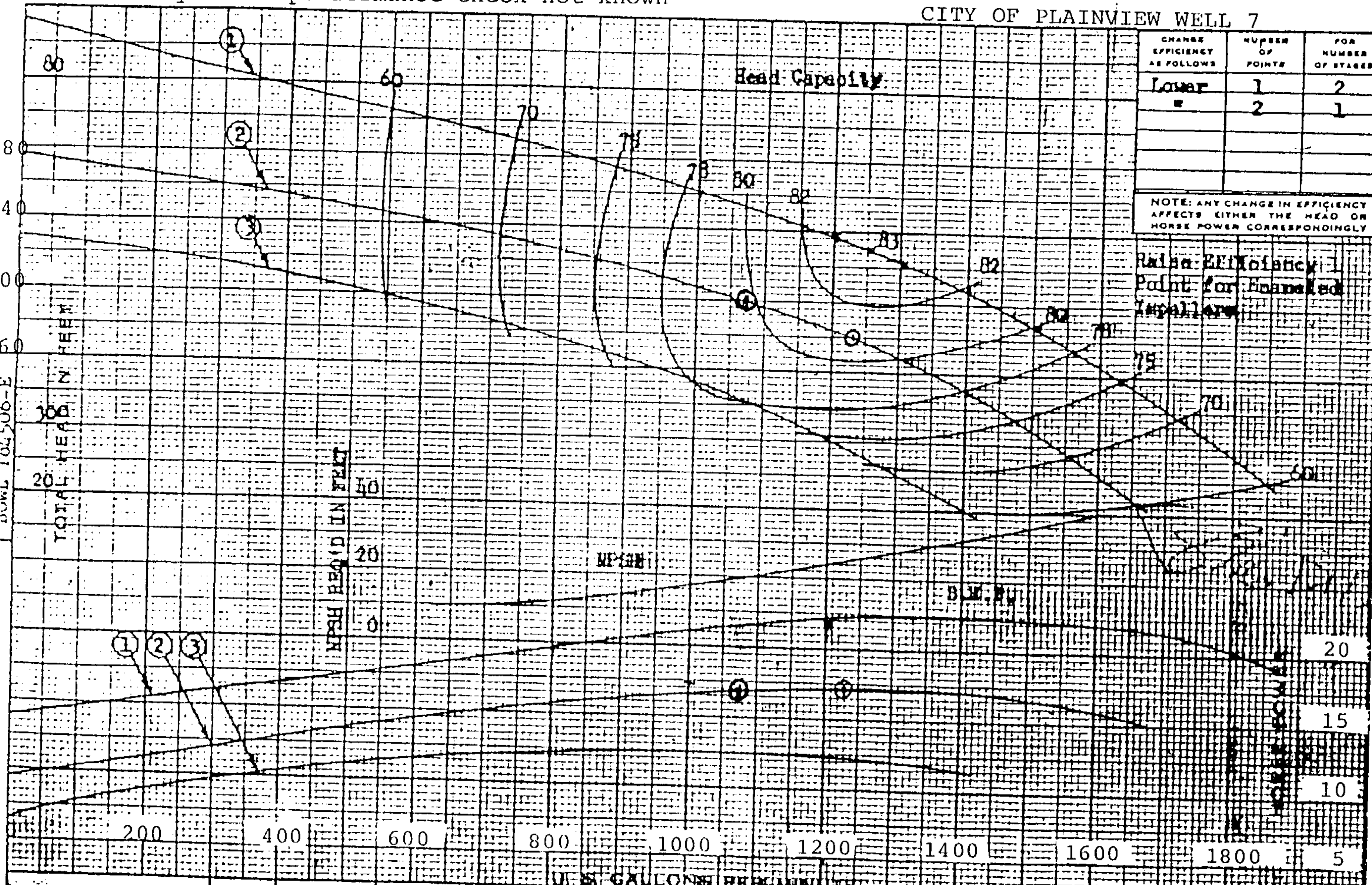
CITY OF PLAINVIEW WELL 5



Pump Size & Type		RPM	Imp. Number	Vanes	Diameter	Underfile	Stages
8MQ 3 STG. 1X,2H		2P/60HZ	267788	3	5.625	STD.#1.5	1X
Data By: BM			169838	6	5.125	STD.#1.5	2H
Curve By: BM		Date: 6 OCT 89			Pump Motor		
Factory No.: 891-H-0072	Customer No.	Item No.	Imp. Material: BRZ.				
			Bowl Material: MEEH		Motor H.P.: 75 HP	Curve No.: 8MQ-286	

Date of any field performance check not known

CITY OF PLAINVIEW WELL 7



CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF POINTS	FOR NUMBER OF STAGES
Lower	1	2
"	2	1

NOTE: ANY CHANGE IN EFFICIENCY AFFECTS EITHER THE HEAD OR HORSE POWER CORRESPONDINGLY

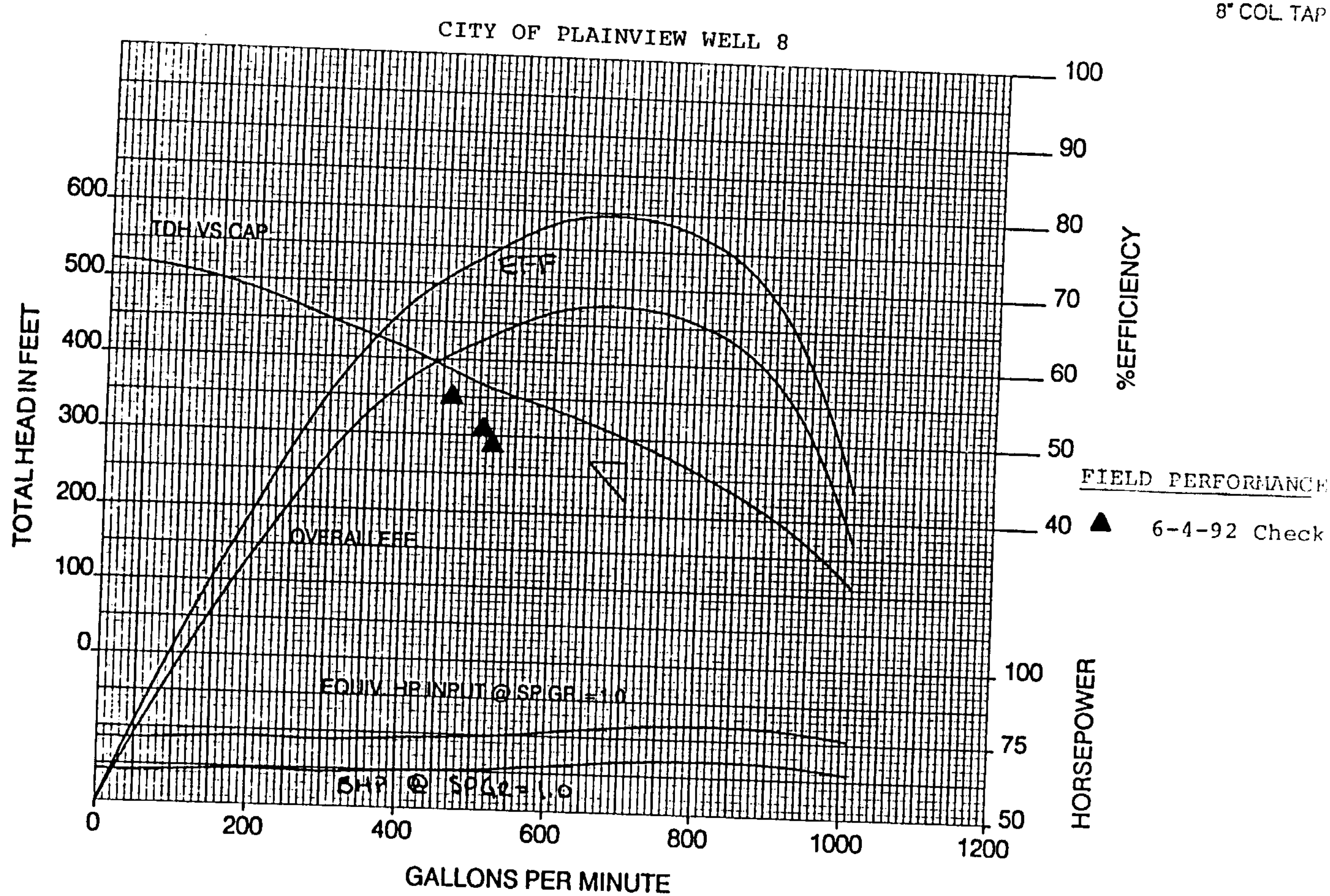
HYDRAULIC PERFORMANCE GUARANTEED AT THE DESIGNATED POINT ONLY.	CURVE NO.	IMPELLER NO.	IMPELLER DIA.	TAKEN FROM
Efficiency must be reduced for bronze & special material bowls - See Application Data	1	T84509	8-11/16	27615
	2	T84509	8-3/16	27675

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
LOS ANGELES 31, CALIFORNIA

PERFORMANCE PER STAGE	
12 MA	
1760	R. P. M.

IMP. LIFT 1/4"

8" COL. TAP

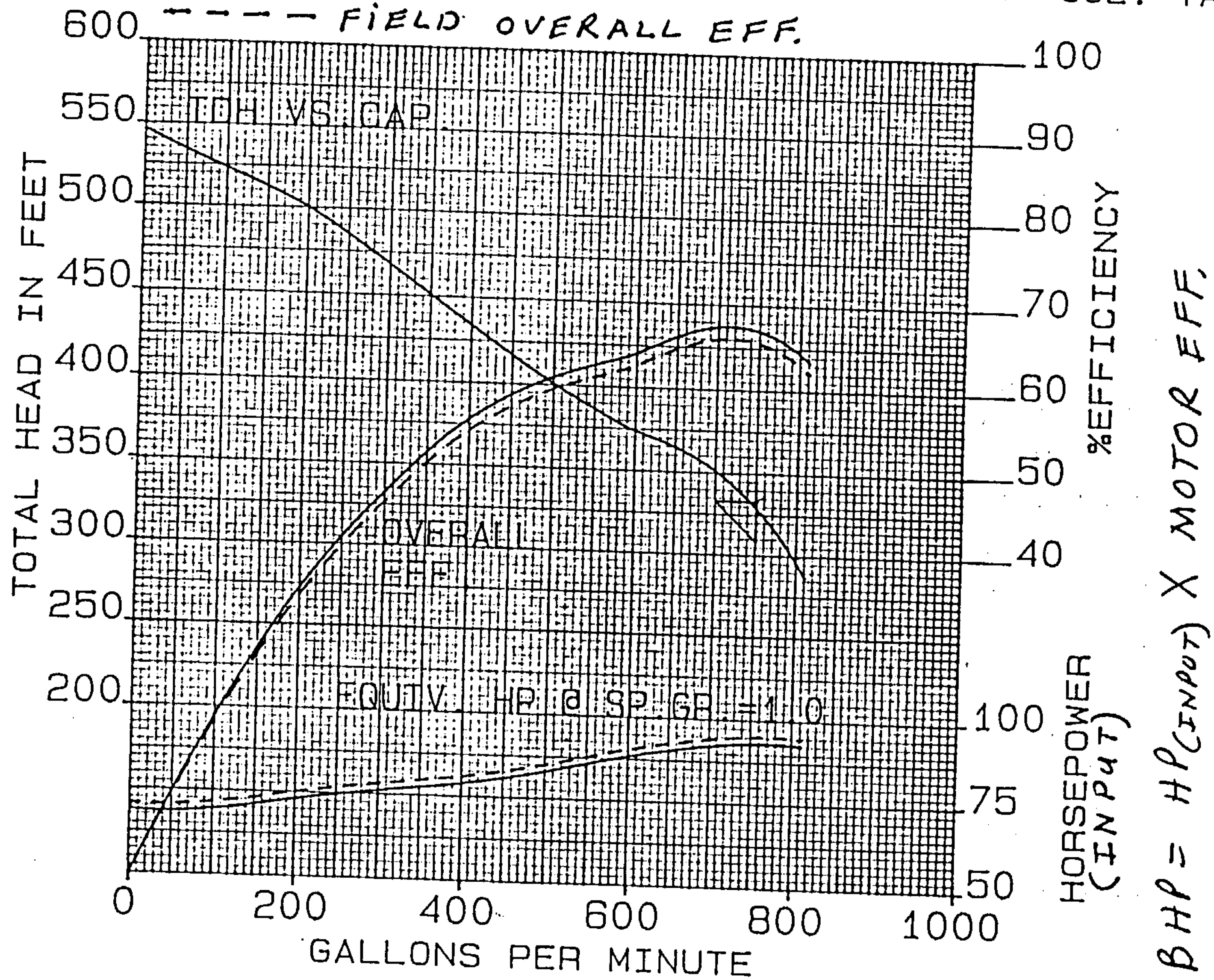


Pump Size & Type		RPM	Imp. Number	Vanes	Diameter	Underfile	Stages
8MQ	3 STG. 1X,2H	2P/60HZ	267788	3	5.625	STD.#1.5	1X
Data By	BM		169838	6	5.125	STD.#1.5	2H
Curve By	BM	Date 6 OCT 89			Pump Motor		
Factory No. 891-H-0072	Customer No.	Item No.	Imp. Material	BRZ.	Motor H.P. 75 HP	Curve No. 8MQ-286	
			Bowl Material	MEEH			

Byron Jackson Pump Division
BORG-WARNER CORPORATION

CITY OF PLAINVIEW WELL 10

IMP. LIFT 1/4" CUSTOMER MOTOR FRANKLIN MOTOR 6" COL. TAP



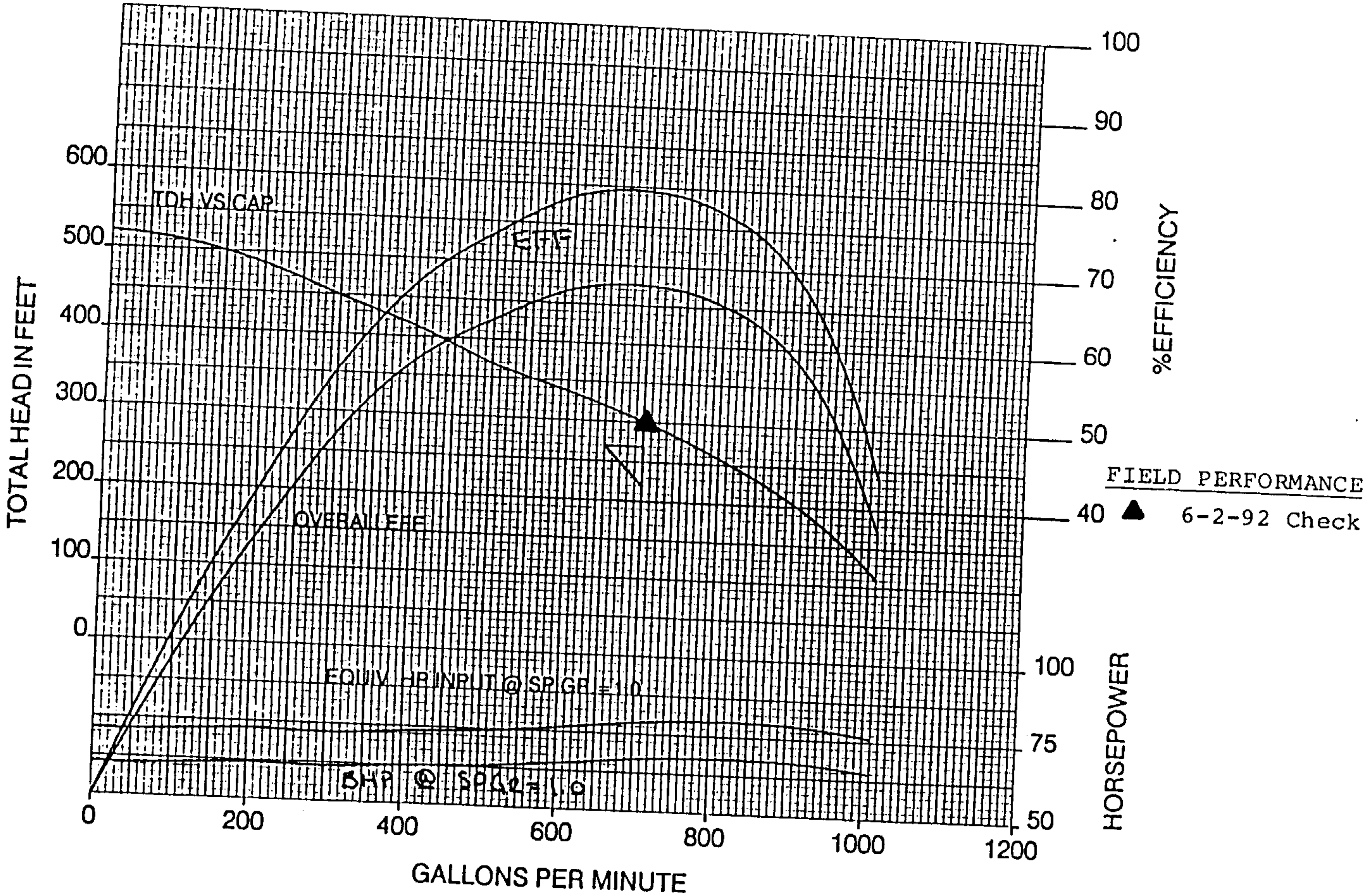
PUMP SIZE AND TYPE 3 STG.		RPM	IMP. NUMBER	VANES	EYE DIA.	EYE AREA	MAX. DIA.	TEST DIA.	UNDERFILE	STGS.
8MQ	H3	2 POLE/60 HZ	169838					5-9/16"	STD. #1	3H
ITEM NO.	DATA BY RW KD	DATE 23 OCT 85								
FACTORY NO. 851-H-0469	DRAWN BY CTW	CUSTOMER'S ORDER NO.	POLISHED: IMP.	BOWL		MOTOR H.P. 75	INT. DRIVE	PEAK EFF.	PEAK EFF.	T-8MQ-243
			MATERIAL: IMP FA	BOWL LY						

IMP. LIFT 1/4"

Byron Jackson Pump Division

CITY OF PLAINVIEW WELL 11

8" COL. TAP

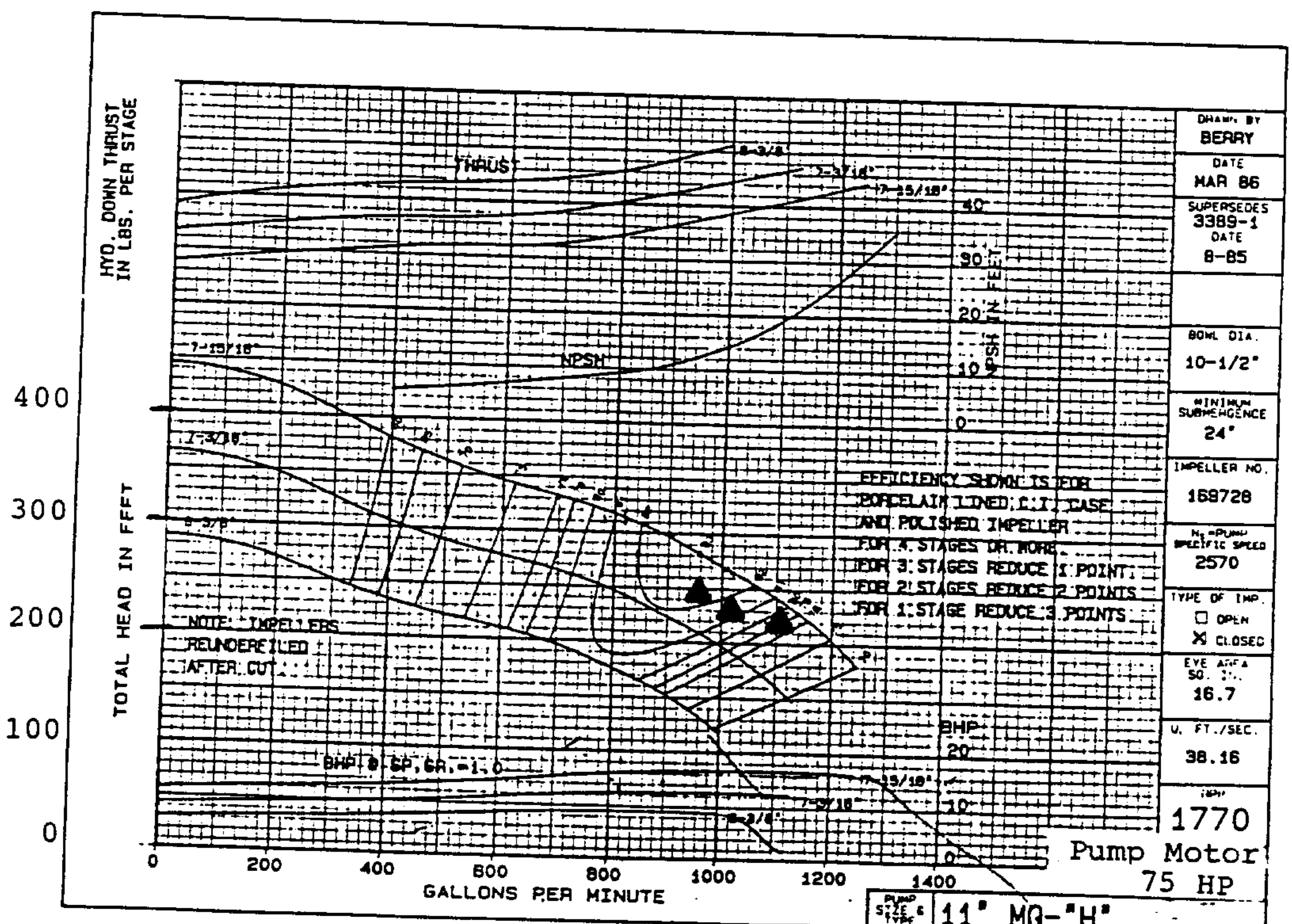


Pump Size & Type		RPM	Imp. Number	Vanes	Diameter	Underfile	Stages
8MQ	3 STG. 1X,2H	2P/60HZ	267788	3	5.625	STD.#1.5	1X
Data By: BM			169838	6	5.125	STD.#1.5	2H
Curve By: BM		Date: 6 OCT 89			Pump Motor		
Factory No.: 891-H-0072	Customer No.	Item No.	Imp. Material: BRZ.		Motor H.P.: 75 HP	Curve No.: 8MQ-286	
			Bowl Material: MEEH				

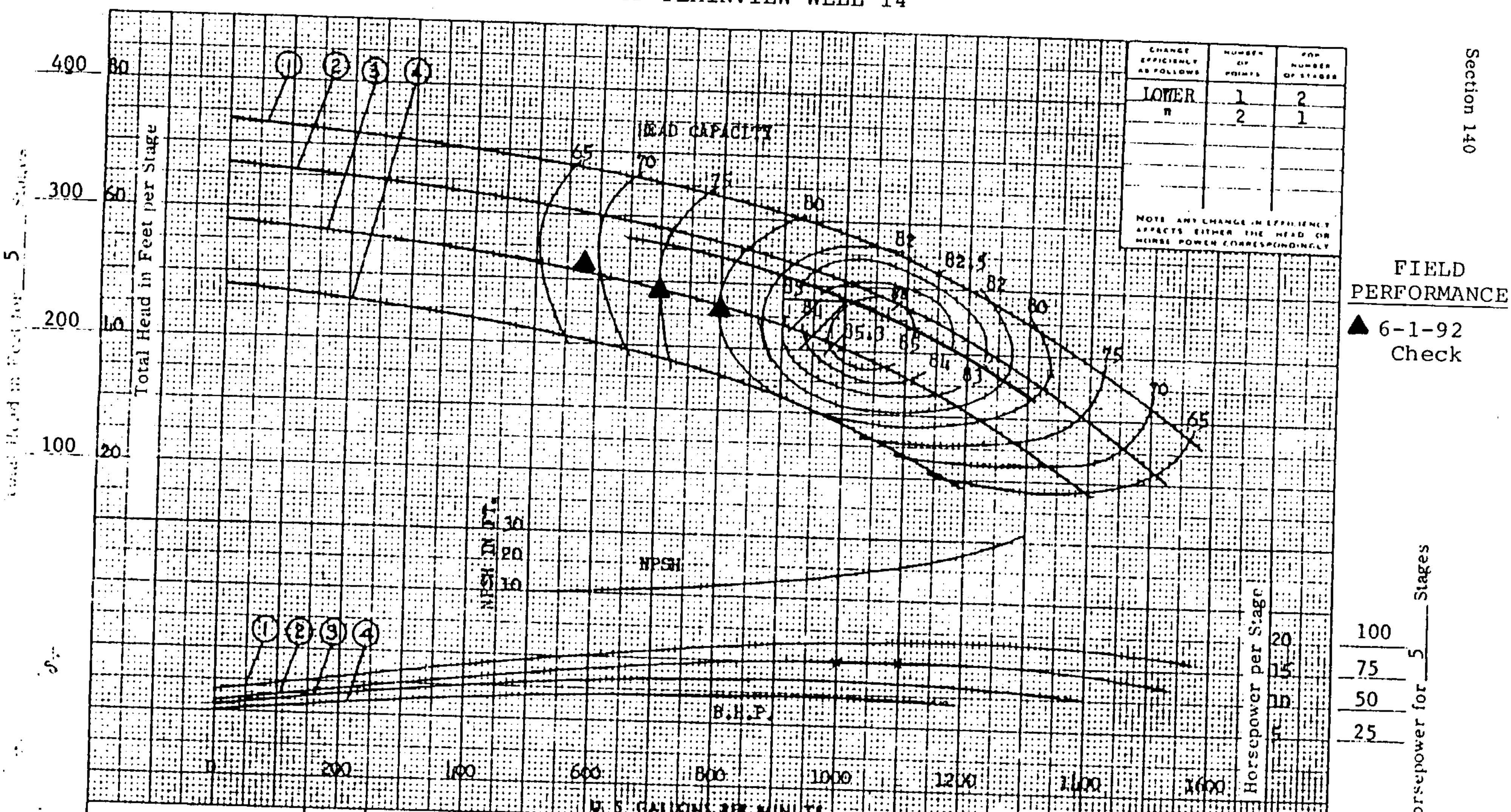
CITY OF PLAINVIEW WELL 13

FIELD PERFORMANCE

▲ 6-1-92 Check



CITY OF PLAINVIEW WELL 14



CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF POINTS	FOR NUMBER OF STAGES
LOWER	1	2
"	2	1

NOTE: ANY CHANGE IN EFFICIENCY AFFECTS EITHER THE HEAD OR HORSE POWER CORRESPONDINGLY

HYDRAULIC PERFORMANCE WARRANTY	CURVE NO.	IMPELLER NO	IMPELLER DIA	TAKEN FROM
Guaranteed at designated point only, and contingent on:	1	2624332	8 7/8"	40375
Proper flow to pump suction	2	2624332	8 11/16"	40963
Proper submergence; Fluid free of gas, air & abrasives	3	2624332	8 3/16"	38536
Proper lateral setting of impeller	4	2624332	7 11/16"	

Customer: City of Plainview, Texas

Item No:

Peerless Ref. No:

Laboratory Performance

SIZE	RPM	BOWL	CURVE
12 MB	1760	T-84506-E	2842929

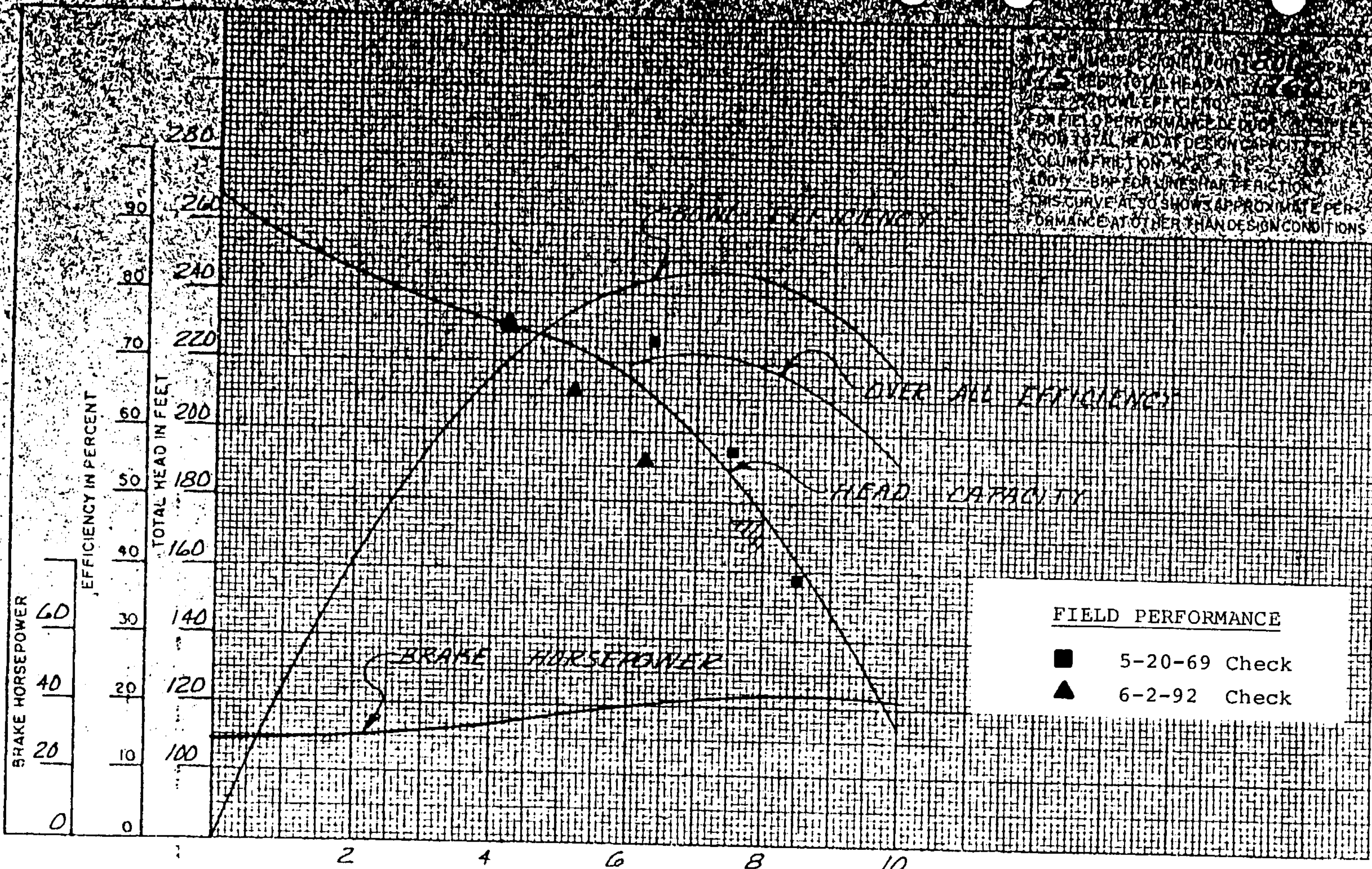
fmc CORPORATION

PEERLESS PUMP

PUMP DESCRIPTION: Driver 75 HP GE Submersible Motor ; Head 8" Sub Base ; Column 8"ID Std. WT Pipe

GUARANTEED FIELD PERFORMANCE: Capacity 1000 gpm; Head 235' ft; Eff * 81 %; BHP * 73.2

* Above efficiency and horsepower indicates field performance.



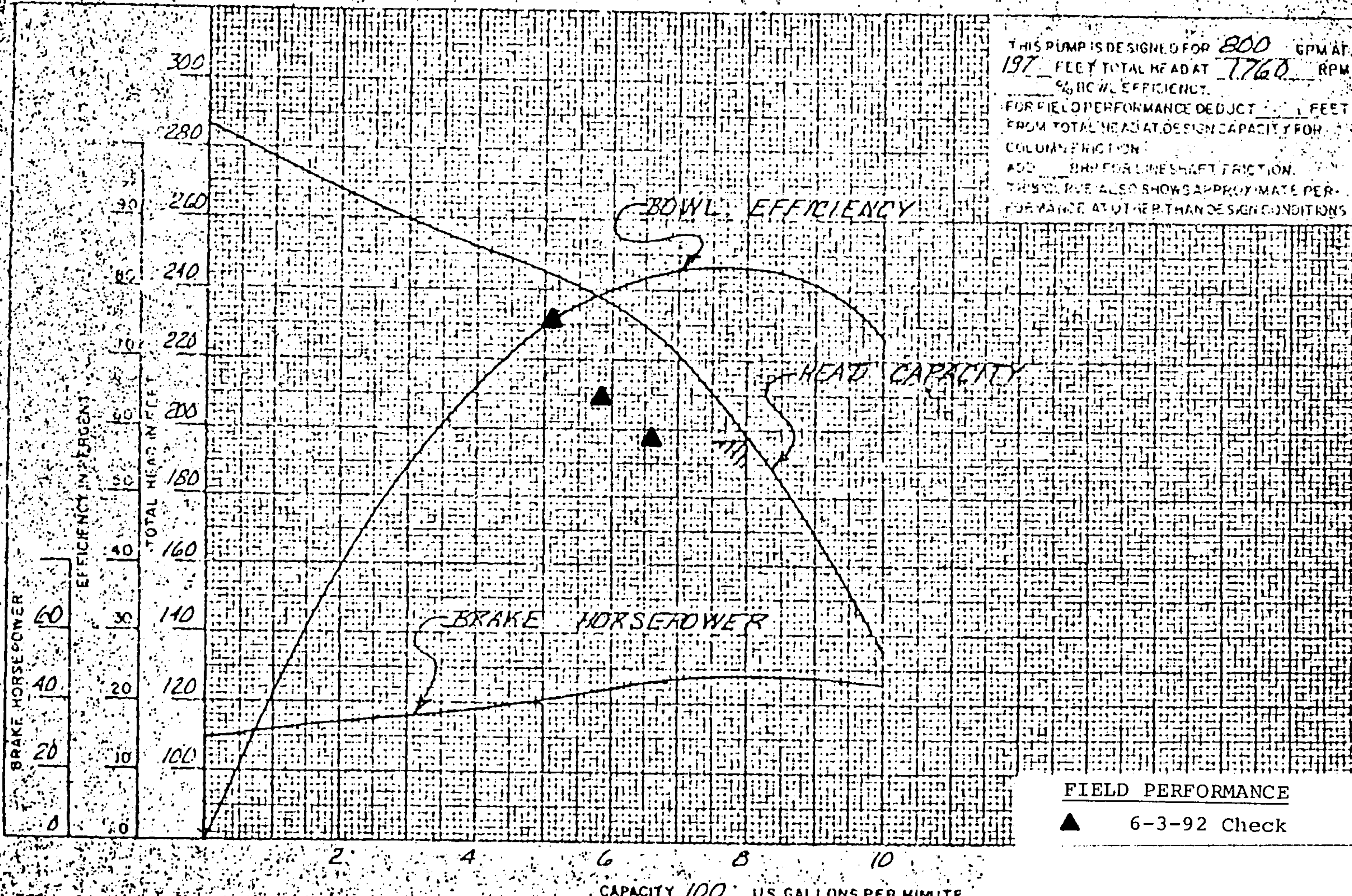
CITY OF PLAINVIEW WELL 15

CAPACITY 100 US GALLONS PER MINUTE

Well #15

BRONZE IMPELLER	C.I. ENAM. BOWL	10H-75 PUMP	WORTHINGTON CORPORATION	8-23-68 DATE	SERIAL NO
IMP DIA	50 H.P. DRIVER	5 NO OF STAGES	VERTICAL PUMP DIVISION	CUST NO	60-6276 ORDER NO
TEST NO	1760 RPM	L.A.L. DRAWN BY	DENVER, COLORADO, U.S.A. ALHAMBRA, CALIFORNIA, U.S.A.	QUOTE NO	DEN-22073 CURVE NO

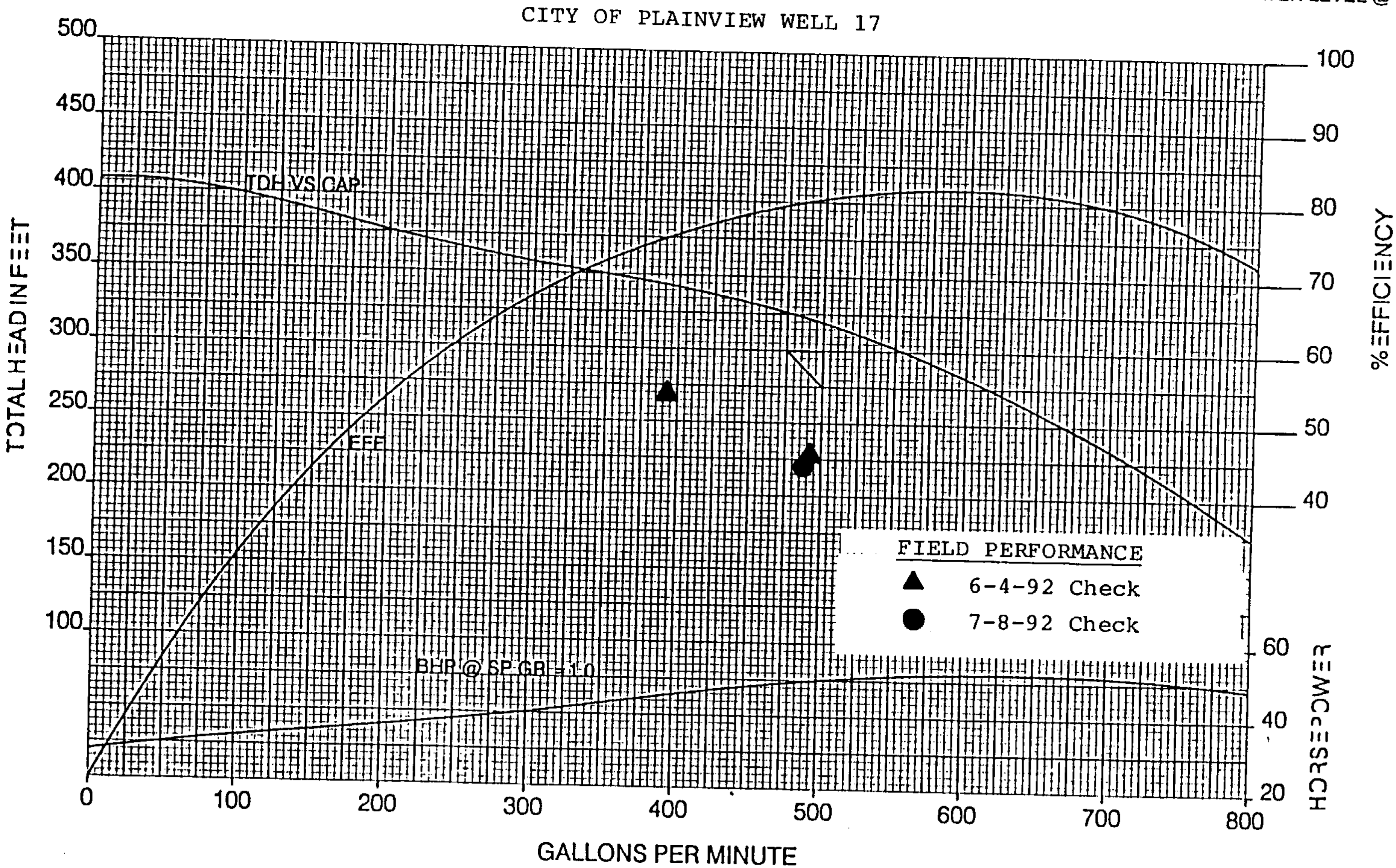
CITY OF PLAINVIEW WELL 16



THIS PUMP IS DESIGNED FOR 800 GPM AT 197 FEET TOTAL HEAD AT 1760 RPM ___ % BOWL EFFICIENCY.
FOR FIELD PERFORMANCE DEDUCT ___ FEET FROM TOTAL HEAD AT DESIGN CAPACITY FOR COLUMN FRICTION.
ADD ___ BHP FOR LINESHAFT FRICTION.
THIS CURVE ALSO SHOWS APPROXIMATE PERFORMANCE AT OTHER THAN DESIGN CONDITIONS

BRONZE IMPELLER	C.I. ENAM. BOWL	10H-75 PUMP	WORTHINGTON CORPORATION	8-2-68 DATE	SERIAL NO.
IMP. DIA.	Pump Motor 50 HP	5 NO OF STAGES	VERTICAL PUMP DIVISION	CUST NO	60-6279 ORDER NO.
TEST NO	1760 RPM	L.R.L. DRAWN BY	DENVER, COLORADO U.S.A. · ALHAMBRA, CALIFORNIA U.S.A.	QUOTE NO	DEN-21972 CURVE NO.

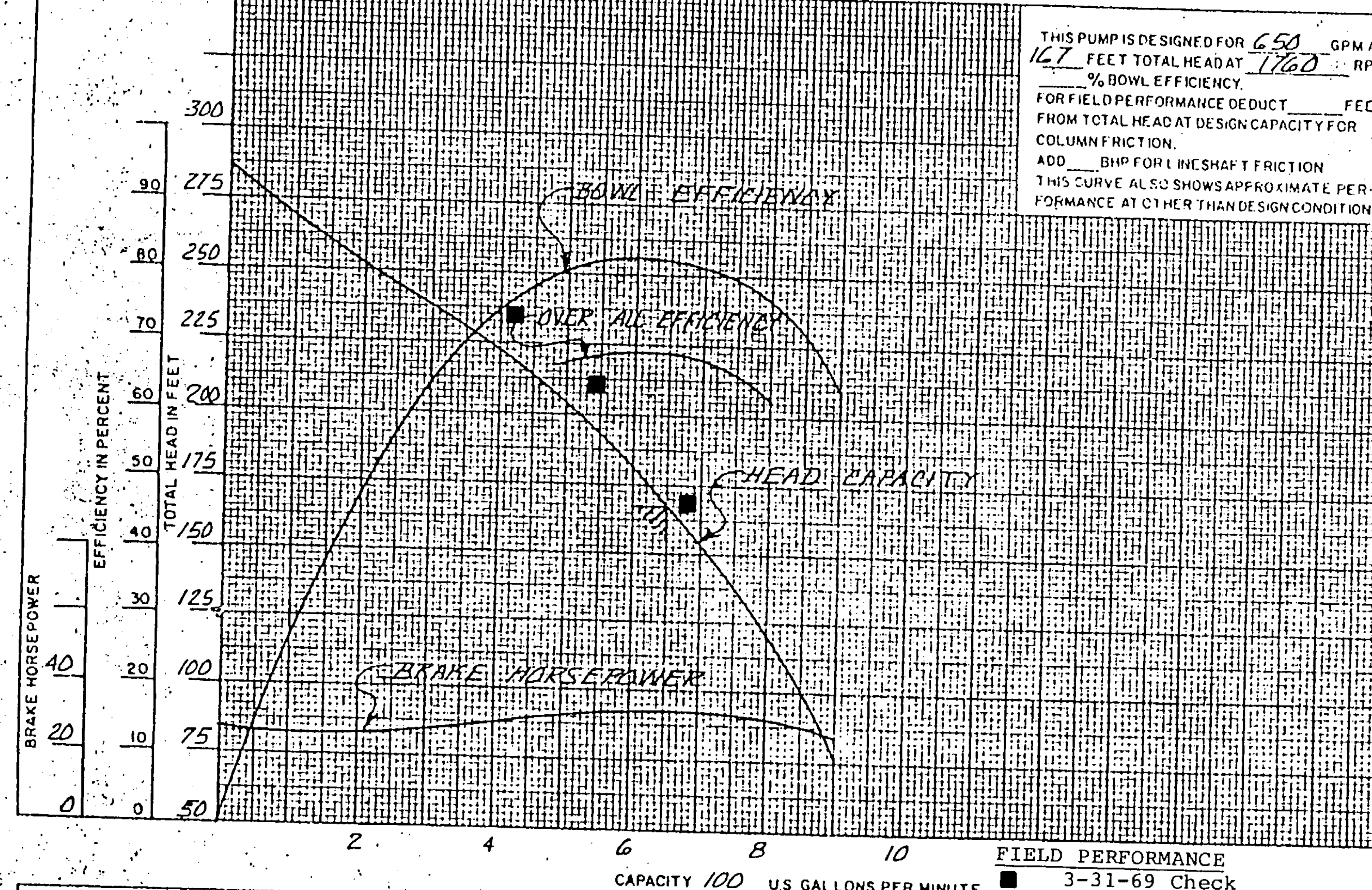
CITY OF PLAINVIEW | BASED ON SIMILAR TEST | CITY WELL #17 | BW/IP # 921H304800 | SET @ 280 FEET | WATER LEVEL @ 160



Pump Size & Type	RPM	Imp. Number	Vanes	Diameter	Underfile	Stages
10GH2M5 DWT 7 STAGE H2M5	1770	750435FA	8	7.0625	STD # 2.0	2
		750438FA	7	7.1875	STD # 2.0	5
Data By: COMPUTER	Date: 03 JUNE 92			Pump Motor		
Curve By: BERRY						
Factory No.: 921H3048	Customer No.:	Item No.: WELL#17	Imp. Material: BRZ / Bowl Material: IRN	Motor H.P.: 40 HP	Curve No.: 92H3048	

DEN-7868-A

CITY OF PLAINVIEW WELL 18



FIELD PERFORMANCE

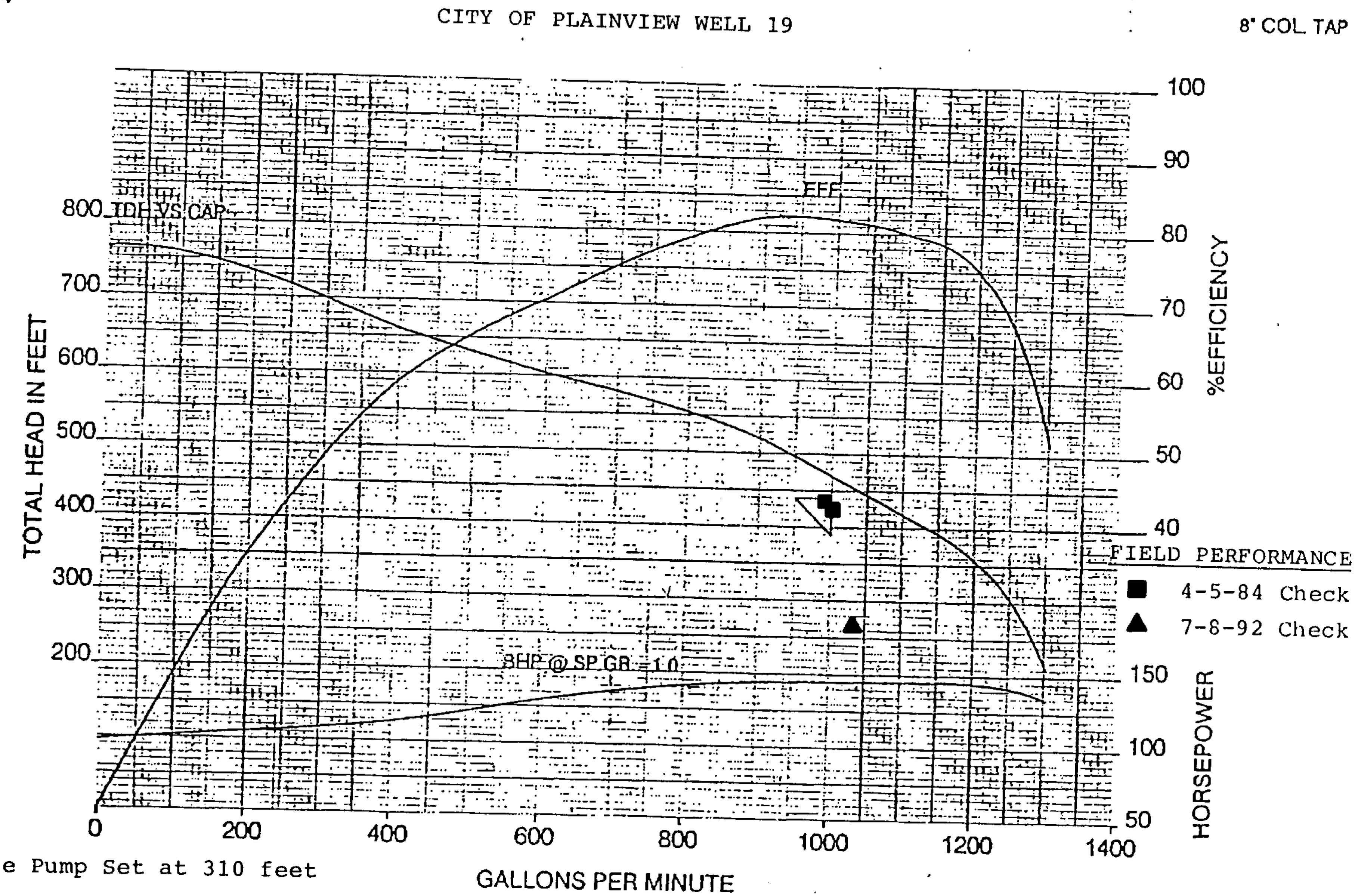
■ 3-31-69 Check

BRONZE IMPELLER	C.I.ENAM. BOWL	10H-61 PUMP	WORTHINGTON CORPORATION	9-4-68 DATE	SERIAL NO
IMP. DIA.	Pump Motor 40 HP	5 NO. OF STAGES	VERTICAL PUMP DIVISION	CUST NO.	60-6278 ORDER NO.
TEST NO.	1760 RPM.	L.A.L. DRAWN BY	DENVER, COLORADO U.S.A. ALHAMBRA, CALIFORNIA, U.S.A.	QUOTE NO.	DEN-22075-A CURVE NO.

BW/IP International, Inc.

BYRON JACKSON Products

IMP LIFT 1/4"



Submersible Pump Set at 310 feet

Pump Size & Type		RPM	Imp. Number	Vanes	Diameter	Underfile	Stages
11MQ	9 STG H9	1770	169728	6	7-15/16"	STD. #1	9H
Data By	RC RW	Date					
Curve By	SB	3 OCT 83			Pump Motor		
Factory No. 836-S-1218	Customer No.	Item No.	Imp. Material LY / Case Material LY			Motor H.P. 150 HP	Curve No. 11MQ-202

WELL AND PUMP CHECK DATA

OWNER	WELL	LOCATION		
PUMP MANUFACTURER	BOWL	NO. OF STAGES	SETTING	COLUMN SIZE
MOTOR SIZE	FLOW MEASURING EQUIPMENT	WATER LEVEL MEASURING EQUIPMENT		

DATE	TIME	GALLONS PER MINUTE	WATER LEVEL,[1] FEET	DISCHARGE PRESSURE, FEET	TOTAL HEAD, FEET	SAND CONTENT ml/l	REMARKS AND NOTES

[1] RECORD STATIC WATER LEVELS AND PUMPING WATER LEVELS IN THIS COLUMN.