REVISED FINAL TECHNICAL REPORT

Methodology for Determination of Texas Oil Fields Eligible for Variance from Area of Review Requirements in Underground Injection Control Regulations for Class II Injection Wells

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EXECUTIVE SUMMARY

Permitting of salt-water injection wells requires oil companies or operators to perform an Area of Review (AOR) study within a 0.25-mi radius of a proposed well. The purpose of an AOR study is to identify unplugged wells that may allow injected fluids to migrate upward from the production-zone and endanger the overlying underground sources of drinking water (USDW).

The Bureau of Economic Geology (BEG), University of Texas at Austin, in conjunction with the Railroad Commission of Texas (RRC), evaluated oil fields in Texas for possible variance to the AOR permitting process on the basis of the separation between production-zone fluid levels and base of USDW. The purpose was for RRC and industry to use these data and methodology in AOR variance application and review of Texas oil fields.

The RRC query of their H15 database identified 1,587 oil fields having an average static fluid level at least 500 ft below the deepest USDW. BEG further queried the RRC H15 database and identified 113 oil fields having sufficient data for AOR variance analysis.

The 113 oil fields were screened and further sorted on the basis of histogram plots of production-zone fluid levels and base of useable quality drinking water (BUQW) into three groups: those that would most likely qualify for a recommendation for variance (18 oil fields), those that would most likely not qualify for a variance recommendation (53 oil fields), and those that might qualify when additional H15 fluid-level measurements become available or unrepresentative measurements are removed from the H15 database (42 oil fields). Of these, the 60 fields that would most likely or might qualify for variance were further evaluated for AOR variance analysis using statistical and GIS methods.

Our results show that

- 2 fields can be recommended for AOR variance as they now stand,
- 24 fields can be recommended for AOR variance if more production-zone fluid-level data are submitted to RRC, if RRC approves separations less than 500 ft for particular fields, or if H15 well locations are approved by RRC,
- 16 fields can be recommended for AOR variance if a single outlier value is resolved and if additional production-zone fluid-level data are submitted to the RRC, and
- 18 fields do not qualify for AOR variance.

The two fields that qualify for AOR variance without additional data are Panhandle (Red Cave), and Vealmoor.

INTRODUCTION

Permitting of salt-water injection wells requires oil companies or operators to perform an Area of Review (AOR) study within a 0.25-mi radius of a proposed well. The purpose of an AOR study is to identify unplugged wells that may allow injected fluids to migrate upward from the production-zone and endanger the overlying underground sources of drinking water (USDW). Issuing a variance to the AOR requirement might be justified by one of the following conditions:

- absence of a USDW,
- under-pressured conditions in the reservoir relative to the USDW (that is, adequate separation between production-zone fluid levels and USDW),
- local geological conditions that preclude upward fluid movement that could endanger USDW's, or
- other compelling evidence.

The Bureau of Economic Geology (BEG), University of Texas at Austin, in conjunction with the Railroad Commission of Texas (RRC), evaluated oil fields in Texas for possible variance to the AOR permitting process. The purpose of this study was to document the applicability of the second AOR variance condition—separation between production-zone fluid levels and USDW—for RRC and industry to use in variance application and review of Texas oil fields.

Our goals were to

(1) establish a methodology for use in identifying which oil fields may qualify for AOR variance and thereby facilitate review of AOR variance applications,

(2) identify oil fields that may qualify for AOR variance, and

(3) identify Texas oil fields that may qualify for AOR variance when more information such as additional production-zone fluid-level data become available.

The premise of the second AOR variance condition—separation between production-zone fluid levels and USDW—is that if production-zone pressure head is sufficiently below the stratigraphic base of useable quality drinking water (BUQW), there is little potential for fluids to migrate upward from the production-zone and contaminate drinking water even if there are unplugged (and unidentified) wells in the vicinity of an oil field. The amount of separation should be greater than the cumulative effect of pressure buildup from fluid injection.

As a result of multiple database queries, BEG selected 113 fields for AOR variance analysis. We then focused on those fields most likely to qualify for a variance recommendation as well as those fields where additional data might allow a recommendation for variance to be made. We targeted fields where Class II injection-well permitting activity is most active and attempted to evaluate fields in an effort to maximize the number of operators benefiting from the fields receiving variances. Areas that have been previously evaluated for AOR variance (that is, East Texas field) were excluded from this study (Warner and others 1996; Warner and others, 1997).

METHODOLOGY

As the main source of information, BEG used records of data compiled from RRC Form H15, which are maintained in an RRC database. For inactive wells that are at least 25 years old and have been shut in, operators are required to prove they are not leaking by completing requirements outlined on the RRC Form H15 (RRC Rule 14 (b) (2) (E)). Operators have the choice of either performing a mechanical integrity test every 5 years or measuring fluid levels annually. Sonic or wireline devices are most commonly used for measuring production-zone fluid levels.

In this study, we used H15 annual fluid-level data collected between 1993 and 1998. Although these data were collected and intended to indicate pollution risk from loss of well integrity, we used them here to evaluate vertical separation between production zone fluid levels and the BUQW. An important assumption is that the H15 fluid level is an accurate and representative estimate of a static fluid level in the reservoir. This assumption would be invalid if a well casing has a plug and fluid has been loaded in the casing to maintain a positive head differential or to facilitate surface monitoring.

The RRC database includes depth to the BUQW as defined by the Texas Natural Resource Conservation Commission (TNRCC) for each well. RRC and BEG have used H15 and BUQW data to identify oil fields that might qualify for AOR variance. In addition, BEG compiled other hydrogeologic data from the Texas Natural Resources Information System (TNRIS) digital database and from files and reports at BEG. The steps we used to evaluate selected Texas oil fields are detailed below.

RRC Database Preparation

The RRC initiated this project in early 1998 by examining H15 fluid-level data from 8,144 oil fields in Texas. They restricted their query using the following criteria resulting from discussion with the Texas Oil and Gas Forum AOR Committee:

- fields for which there have been at least 25 new UIC permits issued since 1990,
- fields for which there were at least 50 UIC wells remaining as of 1995, and
- fields where the average H15 fluid level is at least 500 ft below the average BUQW.

RRC extracted information on H15 wells that met these criteria, cross-referenced them with API numbers, and transferred the files to BEG.

In addition, RRC provided BEG with geographic information system (GIS) data files containing

- county boundaries,
- a listing of API-numbered wells located within individual oil fields, and
- available x-y locations for API-numbered wells in the state.

The RRC database for locations of API-numbered wells is incomplete at this time. In some cases there are API-numbered wells for which x-y locations are not available in electronic format. In other cases there are wells with x-y locations for which an API number is not available in electronic format. GIS plots showing locations of wells within oil fields, which are presented in a later section of the report, may not have all existing H15 or UIC well locations plotted. However, the plots (appendices C-1 and C-2) are still very useful in evaluating the oil fields for AOR variance.

BEG Database Preparation

BEG started AOR database preparation by importing the RRC query results into Microsoft Access database software. Our AOR database consists of tables with a subset of the RRC H15 database, the RRC database for Class II underground injection control wells (UIC), and a master table containing oil-field summary information created by RRC. The H15 table is the main source of information used in this study. In addition to fluid levels and dates of measurement, it contains perforated intervals of wells and field numbers. We linked the H15 database by field number to the other data tables to obtain field names, information on operators, lease numbers, and numbers and types of injection wells for a particular field. We combined all pertinent information into one Access table and extracted it by field number for the fields most likely to qualify for AOR variance.

Our extractions from the combined Access data table were limited to oil fields

- having wells with fluid-level measurements as opposed to mechanical integrity test data. H15TOF levels were only available for wells at which operators chose to measure fluid-levels annually instead of performing mechanical integrity tests every 5 years.

- fields having new UIC permits issued since 1990. For fields with less than 3,000 ft of separation, five new permits were required. For fields with greater than 3,000 ft of separation, two new permits were required, and

The RRC H15 database contains numerous H15TOF entries of "0" and "1." It is not clear from information entered into the database or from that contained on the hard-copy H15 form whether these are valid fluid-level measurements. For example, if a production-zone fluid-level is reported at a depth shallower than the BUQW, then the well fails the H15 test and a value of "1" is entered as a flag in the database. In some cases the production-zone fluid-level may be at ground surface and either a "0" or a "1" may have been entered into the database depending on the type of data-entry terminal being used at the time. These surface measurements might either be representative of a highly pressurized production/injection zone or be an artifact of a well in which the operator installed a bridge plug. We were unable to document which wells contain bridge plugs on the basis of H15 form inspection. Therefore, we omitted H15TOF measurements of "0" and "1" under the assumption that they either are not representative of production-zone pressure or indicate an erroneous measurement.

The number of H15TOF measurements turned out to be the limiting factor in field selection. Initially we considered only fields having at least 10 H15TOF measurements, but we later relaxed this requirement to a minimum of 3 data points to increase the number of fields that could be considered for variance analysis. Because of the scarcity of valid H15TOF levels for some fields, we did not limit field selection by restricting the number of operators.

Use of Histograms

It was not feasible to define a potentiometric surface for each field for comparison to a structure map of the BUQW. A sufficient number of locational coordinates of H15-wells were not available for use in constructing plan-view maps of the potentiometric surface of reservoirs. In addition, the highly variable H15 data suggested that a simple potentiometric surface could not be readily defined even if more locational coordinates were available.

We decided, therefore, to screen fields on the basis of graphs that show the distribution of reservoir fluid level with depth. Our graphical approach was to tally the number of H15 fluid levels at a given depth and display this information as a histogram.

BUQW values for the field are also plotted on the histogram for comparison. Thus, the range in separation between the BUQW and each H15 reading is readily apparent.

For a given field with low topographic relief, depth to production-zone fluid in a well provides a proxy for mapping the potentiometric surface; the datum is effectively switched from sea level to local ground surface. For most fields in Texas, topographic variation is much less than the 500-ft BUQW and production-zone fluid level separation criterion. Thus, the histogram is an efficient tool for quickly screening oil fields that might readily qualify for a variance on the basis of the separation criterion. We constructed histograms for 113 oil fields in Texas that appeared most likely to qualify for AOR variance, then separated them into YES, NO, or MAYBE categories. Fields that fell into the YES and MAYBE categories were taken to the next phase of AOR variance analysis. Fields that fell into the NO category were set aside for possible later consideration.

Statistical Analysis of H15TOF's

Some of the oil fields have a small number of H15 wells that define depth to production-zone; other fields have H15 wells with fluid levels that extend over a large range (several thousand feet). Although depth to production fluid (H15TOF values) for the existing wells may fall below the BUQW on a histogram, more data might reveal fluid levels above the BUQW. The uncertainty resulting from not having enough data for a particular field with a particular range of fluid-level values can be quantified using statistics. Specifically, we used statistical tests on H15TOF data from each YES and MAYBE category field to determine

(1) whether the data are normally distributed,

(2) the mean and standard deviation or quartiles of the measured values,

(3) the number of samples required to adequately define the distribution,

(4) the probable range in data (probable standard deviation), and

(5) the probable outlier values using standard deviation, probable standard deviation, and inner or outer fences.

Fields that have normally distributed H15 data can be evaluated using parametric statistical techniques. Fields for which data are not normally distributed require nonparametric statistical techniques. Parametric techniques primarily use the arithmetic mean and standard deviation of measured values. The nonparametric statistical techniques used to calculate probable ranges of data in this study rely on calculations using quartiles instead of arithmetic mean and standard deviation.

We determined the number of samples needed to adequately characterize a field by finding out how many samples were required to define the population mean to within 10 percent of the sample mean at a confidence level of 90 percent (Mendenhall, 1987, p.331). This statistical test depends on the expected sample variance. This parametric test, which was used for all fields regardless of distribution type, results in a number that is a rough approximation for poorly defined distributions (not many samples), but it is the best method available (Mendenhall, 1987, p. 333).

The probable range in H15TOF values for normally distributed data sets was defined by the 90-percent confidence interval for the variance, thus indicating a 90-percent confidence level that the true variance of the sample population lies within the calculated interval (Mendenhall, 1987, p. 441). This statistical test uses the chi-square probability distribution and depends on the number of samples and the sample variance. A larger number of samples and a smaller sample variance lead to smaller confidence intervals; a smaller number of samples and a larger variance lead to larger confidence intervals. If data for an oil field met the minimum number of H15TOF values needed then we used only the measured fluid levels and the actual separation between production-zone fluid level and BUQW to determine if a field qualified for further AOR variance analysis.

Results from the statistical tests include the probable standard deviation values that we used to calculate a probable minimum H15TOF. For fields that do not have a sufficient number of data to adequately define a distribution, we calculated what might be the shallowest production-zone fluid level (probable minimum H15TOF) and compared this calculated fluid level to the BUQW to estimate probable separation. Our calculated probable minimum H15TOF is the sample mean minus two times the probable standard deviation.

Outlier Analysis

An outlier is a sample that appears improbably large or small compared to the other samples. Statistical outliers may:

- be valid data points (that is, measurements taken in H15 wells that are influenced by a nearby injection well),
- arise from faulty fluid level measurement techniques,
- reflect anomalous well conditions, or
- reflect data reporting or entry errors.

We tested for outliers using two statistical techniques: (1) sample z-scores and (2) box plots. The test involving sample z-scores is a parametric technique and states that if a sample measurement is more than two standard deviations away from the mean, it is probably an outlier. Box plots are a nonparametric technique by which suspected outliers are found greater or less than 1.5 times the interquartile range (upper quartile minus lower quartile) away from the upper or lower quartile. Values that are unquestionably outliers are found greater or less than 1.5 times the interquartile range away from the upper or lower quartile (Mendenhall, 1987, p. 66).

GIS Mapping

It was necessary to complete two phases of GIS mapping for the YES and MAYBE category fields. We first needed to know where the oil fields are located within a county or counties and mapped locations of oil fields by querying a GIS database containing all API-numbered wells in Texas on a field-by-field basis. We then combined individual field maps to make regional AOR oil field location maps (figs. 1 through 5).

In order to see spatial distributions of individual wells within a single oil field, we linked the location data for API-numbered wells identified as falling within that field with H15, UIC, and Texas Water Development Board (TWDB) databases. All well locations were imported into ArcView to create field-specific well-location maps (herein referred to as H15/UIC plots).

Aquifer Descriptions

Regional and local hydrologic information for areas in which YES and MAYBE category fields lie were compiled from TNRCC data, BEG publications, TWDB reports, and published literature. Coordinates, elevations, water levels, and aquifer identification codes for State-numbered water wells were downloaded from two TWDB database files on the Internet and combined into one database.

BUQW's for individual oil wells were originally assigned by TNRCC personnel. An electronic record of the TNRCC BUQW picks for H15 wells in each oil field were transferred to the BEG in the RRC H15-database. TNRCC typically chooses BUQW depths primarily on the basis of a 3,000 mg/L total dissolved solids (TDS) cutoff value. However, if someone is using or has in the past used a lower quality and deeper water-bearing unit for local consumption (human or livestock), then the BUQW possibly includes a higher TDS zone.

It was agreed that BEG would accept the TNRCC BUQW values as posted in the RRC database. For a quality-control check, we compared BUQW from each of the YES and MAYBE fields to aquifers identified in our independent research in the vicinity of each oil field.

RESULTS

Categorization of Oil Fields Based on Average Fluid Levels

The RRC query of their H15 database identified a total of 1,587 oil fields having average static fluid level at least 500 ft below the deepest ground water or BUQW. RRC set the 500-ft minimum separation as an estimate of the typical pressure head increase that would result from salt-water injection. These 1,587 fields contain a total of 36,284 active underground injection control (UIC) wells. RRC sorted their query results into three categories based on vertical separation between average H15TOF and average BUQW for an entire oil field. The categories are

- Category I – fields averaging less than 500 ft of vertical separation,
- Category II – fields averaging between 500 and 3,000 ft of vertical separation, and
- Category III – fields averaging greater than 3,000 ft of vertical separation.

Fields that fell into Category I received no further attention in this study under the assumption that they were unlikely to qualify for AOR variance.

BEG further queried the RRC H15 database and identified 113 oil fields from categories II and III having sufficient data for AOR variance analysis. The 113 fields were chosen in two steps using different criteria. In the first step we did not include fields having more than three wells (for Category II fields) or six wells (for Category III fields) injecting into a zone overlying the oil-production-zone. This was because we did not realize the RRC would exclude shallow injection wells from AOR variance. Sixty-four fields were chosen for study in the first half of this project and were evaluated in the interim report.

RRC personnel then suggested we include in AOR variance analysis fields that have shallow injection because only wells injecting into the production-zone would be eligible. By removing the nonproduction-zone injection restriction and considering only fields that contain sufficient H15TOF measurements, we were able to add 49 oil fields (46 from Category II and 3 from Category III) to the study. Summaries of injection well and field and operator information for 113 (64 from interim report and an additional 49) fields are presented in tables 1 through 3.

Categorization of Oil Fields Based on Fluid Levels in Individual Wells

The 113 Category II and Category III oil fields were screened and further sorted on the basis of the histograms into three groups: (1) those that would most likely qualify for a recommendation for variance (18 oil fields in the YES category), (2) those that would most likely not qualify for a variance recommendation (53 oil fields in the NO category), and (3) those that might qualify when additional H15 fluid-level measurements become available or unrepresentative measurements are removed from the H15 database (42 fields in the MAYBE group). Histograms for the YES, NO, and MAYBE fields are in appendices A-1, A-2, and A-3. Printouts of files containing the H15 data used to evaluate each of the 60 YES and MAYBE category fields are contained in appendices B-1 and B-2.

The 60 YES and MAYBE oil fields lie within 37 Texas counties (figs. 1 through 5). Most of the fields are in the Permian Basin area of West Texas and the adjacent Eastern Shelf. A few are in the Anadarko or Gulf Coast Basins. The East Texas Basin was excluded from the study because it was included in previous AOR variance studies.

Upon inspection of the histograms, we noted that for many fields there is a wide spread in H15TOF data with no clear median or clustering of measurements (for example, Bradford (Tonkawa) field in appendix A-3). Many fields have too few H15TOF measurements to define a statistical distribution type or to confidently recommend for AOR variance (for example, Huntley, East (San Andres) in appendix A-1). For these reasons, we relied on statistical analysis of H15TOF measurements to identify:

- whether H15TOF data in a particular field are normally distributed,
- which fields contain a sufficient number of H15TOF data, and
- for those fields without a sufficient number of H15TOF measurements, how actual H15TOF and BUQW fluid-level separations differ from probable (calculated) fluid-level separations.

Tabulated results of statistical analyses for the YES (table 4) and MAYBE (table 5) categories are grouped according to whether H15TOF data from a particular field are normally or nonnormally distributed.

Oil Fields Meeting Minimum H15TOF Measurement Criterion

We calculated the probable minimum number of H15TOF measurements needed for a field using the chi-square method described previously and then compared this number to the actual number of H15TOF measurements for each field listed in tables 4 and 5 ("No. of

H15TOF Needed" versus "No. of H15TOF Have"). Seven of the 18 YES and 12 of the 42 MAYBE fields meet the criterion for minimum number of H15TOF measurements (tables 4 and 5).

For the 7 YES and 12 MAYBE fields, we relied solely on positive values for actual separation (column 8 in tables 4 and 5) to prioritize the fields for further AOR variance analysis. All seven of the YES fields that meet the minimum H15TOF criterion—Hitts Lake (Paluxy), Joy (Strawn), K-M-A (Ellenburger), Panhandle (Red Cave), Ranger, Sullivan (Delaware), and Vealmoor—have positive values for actual separation (table 4). Only three of the 12 MAYBE fields that meet the H15 TOF minimum criterion—Adair (Wolfcamp), Ken Regan (Delaware), and Post (Glorieta)—have positive values for actual separation (table 5).

Actual separations for the 7 YES and 3 MAYBE fields range from 110 ft for Ken Regan (Delaware) to 1,482 ft for K-M-A (Ellenburger) (table 4). Six of the fields have separations less than the 500-ft minimum cutoff value defined by the RRC. Injection-well pressure-front calculations, which may be performed by RRC personnel as a follow-up to this report, could result in field-specific separation requirements that are less than 500 ft. Therefore, all 7 YES fields and the 3 MAYBE fields qualify for further AOR variance analysis.

The remaining 9 MAYBE fields—Carthage (Pettit, Upper), Emperor-Deep, Goldsmith, N. (San Andres, Con.), Midland Farms, Panhandle (Moore County), Sand Hills (McKnight), Sharon Ridge (Clear Fork), Thompson, North, and TXL (Tubb) —contain a sufficient number of fluid-level measurements but have negative actual fluid-level separations (table 4). These fields might also qualify for further AOR variance analysis if some of the H15TOF values (outliers) can be shown not to be representative of production-zone conditions.

One explanation for outlier H15TOF values could be data-entry errors when keying from hard copy H15 forms to the RRC electronic database. BEG personnel located 100 out of 132 hard-copy H15 forms in RRC files; others may have been undergoing data entry. Of the 100 records checked, we found only one data-entry error.

Some oil companies have taken extra precautions to ensure integrity of casings by installing cast-iron bridge plugs (CIBP) at an arbitrary depth and filling the casing with water. In this situation, the H15TOF will definitely not be representative of production-zone conditions. We were unable to find indications of the presence or absence of CIBP's on the hard-copy H15 forms.

Other possibilities for erroneous H15TOF values include

- wells that are included in an H15 database for a particular field but are actually perforated in a different interval,
- reporting errors, such as an H15 level of 17,621 ft in Crossett, West (Clear Fork, Up.), and
- measurement errors.

Oil Fields Not Meeting Minimum H15TOF Measurement Criterion

The 11 remaining YES fields—Coleman Ranch, Crossett, West (Clear Fork, Up.), Donnelly (San Andres), Frass (Tonkawa), Garza, Gillock (East segment), Huntley, East (San Andres), Sawyer Canyon, Share SE (Morrow, Upper), Three Bar (Devonian), and Todd, Deep (Crinoidal) —(table 4) do not meet the criterion for minimum number of H15TOF measurements, but they do have sufficient actual separations to qualify for further AOR variance analysis.

Similarly, there are 9 MAYBE fields that do not meet the minimum H15TOF criterion, but do have positive actual separations between BUQW and production-zone pressure head (H15TOF) and should therefore be considered for further AOR variance analysis. These fields are: Bradford (Tonkawa), Choate (Cisco -K-), Embar (Permian), Grice (Delaware), Knox City, North (Canyon), Reinecke, TXL (Ellenburger), Waha, North (Delaware), and Woodkirk (Strawn).

Spatial Relationship between Wells

In addition to adequate separation between production-zone fluid level and BUQW, spatial distribution of wells within the oil field is relevant to whether an AOR variance should be issued. After prioritizing the oil fields on the basis of histogram screening and statistical analyses, we identified important questions relating to spatial relationships of API-numbered wells, UIC wells, H15 wells, and regional ground-water wells located within individual oil fields. We addressed the following questions:

- are the H15 well locations distributed across the oil field so as to be representative of production-zone pressures and the corresponding fluid levels for the entire field?
- are H15 wells located close enough to active UIC wells to provide a measure of the effects of injection?, and

- do screened intervals of water wells contained in the TWDB database correspond to the BUQW values assigned to each of the H15 wells by the TNRCC?

BEG results from queries of RRC H15 and UIC databases and the TWDB water-well database cross-referenced to GIS files of API-numbered well locations allowed us to prepare maps for individual fields.

Field-specific H15/UIC plots (appendices C-1 and C-2) show locations of the API-numbered wells that define particular fields, and API-numbered H15 and UIC wells. In most cases, enough API-numbered wells could be matched with location coordinates to make the plots very useful. For example, in the Three Bar (Devonian) field (appendix C-1) we were able to plot all four of the H15 and many of the UIC well locations. The four H15 wells are clustered in the center of the field, away from most of the UIC wells. Because of this, additional fluid-level measurements covering a wider geographic area will be required before AOR variance can be issued for the Three Bar (Devonian) field. By using the H15/UIC plot we can identify that in order for this field to qualify for AOR variance, additional production-zone fluid levels would be required from other areas of the oil field. The status of each YES and MAYBE field studied is provided in appendices D-1 and D-2.

Initially we included water wells from the TWDB database on the maps to determine which of the State-numbered water wells lie within the immediate vicinity of a particular oil field. However, we omitted water wells from final versions of the H15/UIC maps in order to make them more readable. Printouts of files containing data for State-numbered wells corresponding to each YES and MAYBE category oil field are in appendices E-1 and E-2. Summaries of the useable aquifers present in each of the YES and MAYBE fields are in appendices F-1 and F-2, respectively.

DISCUSSION

Since the H15 database was not originally intended for purposes other than to provide confirmation of casing integrity, there are a few problems with using it as the sole source of data for AOR variance analysis. The problems include

- operator use of CIBP's without indication of this useage on the H15 form, and
- lack of updated information for H15 wells that first fail to get approval and for which a second measurement is subsequently submitted.

For example, in some cases there has been more than one fluid level per well submitted in the same year. We are not sure if only one measurement per well per year should be considered or if all entries should be evaluated in the AOR variance review process.

Another point to consider is that in some fields an operator may chose to only submit results of mechanical integrity tests instead of measuring fluid levels. Because these fields lack H15 data, our methodology could not be applied. Field operators, however, might have access to fluid levels or bottom-hole pressure data that could show that a given field could qualify for an AOR variance. Oil-field operators can facilitate the AOR variance process by

- providing information to help find and delete erroneous H15 measurements from the RRC database,
- identifying which wells contain CIBP's, and
- providing additional production-zone fluid level measurements for fields that do not pass the criterion for minimum number of H15TOF measurements.

CONCLUSIONS

Summaries of each YES and MAYBE Category field (appendices D-1 and D-2) include bulleted notes representing conclusions from each stage of our AOR variance analysis. Each field is ranked using asterisks next to the field name. The two fields that qualify for AOR variance without additional data are Panhandle (Red Cave) and Vealmoor. Fields that do not have an asterisk next to the name are not being recommended for AOR variance (1 of the YES category fields and 17 of the MAYBE category fields). The remaining fields have either one, two, or three asterisks. Fields with one asterisk can be recommended for AOR variance if a single outlier value is resolved and if additional production-zone fluid-level data are submitted to the RRC (16 of the MAYBE category fields). Fields with two asterisks can be recommended for AOR variance if: (1) more production-zone fluid level data are submitted to RRC, (2) if H15 well locations are approved by RRC (15 of the YES category fields and nine of the MAYBE category fields), or (3) if separations less than 500 ft are approved by RRC. Fields with three asterisks can be recommended for AOR variance as they now stand (two of the YES category fields).

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Tables

Table 1.
Results of BEG Oil-field Screening Using Histograms - YES Category

Screening Results	Count	Field Name	RRC Dist.	County	Field Number	BEG/RRC Category	UIC Wells Permitted Since 1/1/90	UIC Wells Remaining in Field	Nonproduction Zone Disposal Wells	Production Zone Disposal Wells	Secondary Recovery Wells
Yes	1	COLEMAN RANCH	8	MITCHELL	19541001	II	12	63	3	6	73
Yes	2	CROSSETT, WEST (CLEAR FORK, UP.)	8	CRANE	21915750	III	2	3	0	3	0
Yes	3	DONNELLY (SAN ANDRES)	8	ECTOR	25347875	II	5	8	0	3	16
Yes	4	FRASS (TONKAWA)	10	LIPSCOMB	32773875	III	3	2	3	2	1
Yes	5	GARZA	8A	GARZA	34113001	II	198	399	1	43	392
Yes	6	GILLOCK (EAST SEGMENT)	3	GALVESTON	34925111	III	2	4	5	0	2
Yes	7	HITTS LAKE (PALUXY)	6	SMITH	41713333	II	5	14	2	4	13
Yes	8	HUNTLEY, EAST (SAN ANDRES)	8A	GARZA	43732500	II	18	28	2	17	14
Yes	9	JOY (STRAWN)	9	CLAY	47372568	III	4	21	4	4	63
Yes	10	K-M-A (ELLENBURGER)	9	WICHITA	47902332	II	5	4	1	1	5
Yes	11	PANHANDLE (RED CAVE)	10	MOORE	68825800	II	6	11	1	8	5
Yes	12	RANGER	7B	EASTLAND	74657001	II	22	87	0	8	149
Yes	13	SAWYER (CANYON)	7C	SUTTON	81267333	III	9	13	15	1	0
Yes	14	SHARE, SE. (MORROW, UPPER)	10	OCHILTREE	82696800	III	17	15	0	0	16
Yes	15	SULLIVAN (DELAWARE)	8	REEVES	87025500	II	5	7	1	9	1
Yes	16	THREE BAR (DEVONIAN)	8	ANDREWS	89690250	III	7	43	1	0	45
Yes	17	TODD, DEEP (CRINOIDAL)	7C	CROCKETT	90315333	II	5	18	0	2	19
Yes	18	VEALMOOR	8	HOWARD	93308001	II	8	11	3	5	7

Percent Category II fields (those with average separation between 501 and 2,999 ft) : 61
Percent Category III fields (those with average separation greater than 3,000 ft) : 39

Table 2.
Results of BEG Oil-Field Screening Using Histograms - NO Category

Screening Results	Count	Field Name	RRC Dist.	County	Field Number	BEG/RRC Category	UIC Wells Permitted Since 1/1/90	UIC Wells Remaining in Field	Nonproduction Zone Disposal Wells	Production Zone Disposal Wells	Secondary Recovery Wells
No	1	ACKERLY (DEAN SAND)	8A	DAWSON	448200	III	18	54	2	1	73
No	2	CARTHAGE (PETTIT, LOWER GAS)	6	PANOLA	16032650	III	15	18	2	16	2
No	3	CAYUGA	6	ANDERSON	16481001	II	5	15	15	4	0
No	4	COWDEN, NORTH	8	ECTOR	21289001	II	251	942	83	1076	0
No	5	DIAMOND -M- (CANYON LIME AREA)	8A	SCURRY	24562142	II	76	89	1	162	0
No	6	DUNE	8	CRANE	26538001	II	57	317	1	42	355
No	7	EMPEROR (HOLT)	8	WINKLER	28961568	II	17	21	1	3	20
No	8	ESPERSON DOME	3	LIBERTY	29375001	II	5	30	4	30	0
No	9	FANNETT	3	JEFFERSON	30153001	II	7	13	1	1	2
No	10	GERALDINE (FORD)	8	REEVES	34529666	II	75	114	1	6	138
No	11	GIDDINGS (AUSTIN CHALK-3)	3	LEE	34733500	II	32	24	3	2	0
No	12	GOLDSMITH (5600)	8	ECTOR	35652868	II	54	315	1	20	355
No	13	GOOSE CREEK	3	HARRIS	35862001	II	11	17	9	9	0
No	14	HARPER	8	ECTOR	39176001	II	41	87	19	128	0
No	15	HASTINGS, EAST	3	BRAZORIA	39598001	II	9	12	1	0	0
No	16	HAWKINS	6	WOOD	39724001	II	61	71	13	77	3
No	17	HIGH ISLAND	3	GALVESTON	41139001	II	8	12	8	5	0
No	18	HOWARD GLASSCOCK (CLEAR FORK, MI)	8	HOWARD	42971166	II	5	7	1	2	6
No	19	HULL	3	LIBERTY	43381001	II	11	42	5	6	0
No	20	JOHN SCOTT (GRAYBURG)	7C	REAGAN	46935500	II	6	19	1	3	27
No	21	K-M-A	9	WICHITA	47902001	II	66	213	87	381	0
No	22	KATZ	7B	STONEWALL	48294001	II	19	22	2	2	29
No	23	KATZ (5100)	7B	STONEWALL	48294666	II	24	54	2	4	66
No	24	KELLY-SNYDER	8A	SCURRY	48583001	II	191	567	44	590	0
No	25	KERMIT	8	WINKLER	49038001	II	53	108	86	191	0
No	26	KEYSTONE (ELLENBURGER)	8	WINKLER	49129330	III	8	8	0	3	12
No	27	LEVELLAND	8A	COCHRAN	53411001	II	1111	2031	124	2145	0
No	28	LIBERTY, SOUTH	3	LIBERTY	53498001	II	6	19	11	5	0
No	29	MCCAMEY	7C	UPTON	58840001	II	91	115	46	102	0
No	30	NENA LUCIA (STRAWN REEF)	7B	NOLAN	64946664	II	61	95	2	15	125
No	31	OBRIEN (STRAWN)	7B	HASKELL	66633500	III	2	14	0	11	11
No	32	OLD OCEAN (LARSEN)	3	BRAZORIA	67011900	II	9	2	0	0	14
No	33	PANHANDLE CARSON COUNTY FIELD	10	CARSON	68845001	II	91	158	136	141	0
No	34	PANHANDLE GRAY COUNTY FIELD	10	GRAY	68873001	II	135	292	294	487	0
No	35	PANHANDLE HUTCHINSON COUNTY FLD.	10	HUTCHINSON	68887001	II	119	296	407	233	0

Table 2.
Results of BEG Oil-Field Screening Using Histograms - NO Category

Screening Results	Count	Field Name	RRC Dist.	County	Field Number	BEG/RRC Category	UIC Wells Permitted Since 1/1/90	UIC Wells Remaining in Field	Nonproduction Zone Disposal Wells	Production Zone Disposal Wells	Secondary Recovery Wells
No	36	PANHANDLE WHEELER COUNTY FIELD	10	WHEELER	68929001	II	15	65	81	38	0
No	37	PANHANDLE, WEST	10	POTTER	68831001	II	7	18	11	3	0
No	38	PEGASUS (DEVONIAN)	7C	MIDLAND	70279125	III	15	7	0	0	24
No	39	PEGASUS (PENNSYLVANIAN)	7C	UPTON	70279500	III	33	31	0	1	45
No	40	PEGASUS (SPRABERRY)	7C	UPTON	70279750	II	5	11	0	1	46
No	41	PEWITT RANCH	6	TITUS	71031001	II	6	13	1	7	0
No	42	PLYMOUTH	4	SAN PATRICIO	72043001	II	5	13	3	1	0
No	43	ROUND TOP (PALO PINTO REEF)	7B	FISHER	78567500	II	40	46	1	8	79
No	44	RUSSELL, NORTH (DEVONIAN)	8A	GAINES	79004250	III	12	10	15	10	0
No	45	SAND HILLS (TUBB)	8	CRANE	80473682	II	118	171	8	176	0
No	46	SHAFTER LAKE (SAN ANDRES)	8	ANDREWS	82570500	II	60	122	3	154	0
No	47	SIVELLS BEND	9	COOKE	83816001	II	17	32	2	2	47
No	48	SPRABERRY (TREND AREA)	7C	REAGAN	85279200	II	75	152	22	104	0
No	49	SPRABERRY (TREND AREA CL. FK.)	7C	REAGAN	85279400	III	2	6	1	6	4
No	50	SPRABERRY, W. (DEEP, SPRABERRY)	8A	DAWSON	85292450	II	21	21	1	0	21
No	51	TALCO	6	TITUS	88207001	II	18	79	21	37	0
No	52	WELCH	8A	DAWSON	96062001	II	350	500	2	21	517
No	53	WITHERS, NORTH	3	WHARTON	98290001	II	5	9	3	5	8

Percent Category II fields (those with average separation between 501 and 2,999 ft) : 85
Percent Category III fields (those with average separation greater than 3,000 ft) : 15

Table 3.
Results of BEG Oil-Field Screening Using Histograms - MAYBE Category

Screening Results	Count	Field Name	RRC Dist.	County	Field Number	BEG/RRC Category	UIC Wells Permitted Since 1/1/90	UIC Wells Remaining in Field	Nonproduction Zone Disposal Wells	Production Zone Disposal Wells	Secondary Recovery Wells
Maybe	1	ADAIR (WOLFCAMP)	8A	TERRY	570500	II	8	19	0	0	22
Maybe	2	BAYVIEW (GLORIETA)	8	CRANE	6378284	II	6	6	0	0	7
Maybe	3	BRADFORD (TONKAWA)	10	LIPSCOMB	11226800	II	5	6	3	4	5
Maybe	4	BROWN & THORP (CLEAR FORK)	8	PECOS	12448200	II	7	9	1	5	10
Maybe	5	BRYSON, EAST	9	JACK	12800001	II	9	20	7	8	33
Maybe	6	CARTHAGE (PETTIT, UPPER)	6	PANOLA	16032667	III	6	5	0	6	0
Maybe	7	CHOATE (CISCO -K-)	9	FOARD	17891568	II	6	6	0	0	7
Maybe	8	COWDEN, SOUTH (CANYON 8900)	8	ECTOR	21292250	II	5	5	0	0	11
Maybe	9	EMBAR (PERMIAN)	8	ANDREWS	28843666	II	6	6	1	0	8
Maybe	10	EMPEROR, DEEP	8	WINKLER	28962001	II	6	40	0	16	61
Maybe	11	FULLERTON (SAN ANDRES)	8	ANDREWS	33230500	II	197	231	0	12	232
Maybe	12	GOLDSMITH (CLEAR FORK)	8	ECTOR	35652062	II	157	285	1	6	312
Maybe	13	GOLDSMITH, N. (SAN ANDRES, CON.)	8	ECTOR	35654664	II	6	31	1	12	46
Maybe	14	GRICE (DELAWARE)	8	LOVING	36924500	II	6	5	0	4	4
Maybe	15	HARDIN	3	LIBERTY	38964001	II	6	13	18	0	0
Maybe	16	KEN REGAN (DELAWARE)	8	REEVES	48754500	II	6	10	2	10	3
Maybe	17	KEYSTONE (SAN ANDRES)	8	WINKLER	49129594	II	9	10	2	8	3
Maybe	18	KNOX CITY, NORTH (CANYON)	9	KNOX	50009250	II	6	19	0	0	30
Maybe	19	MAGUTEX (DEVONIAN)	8	ANDREWS	56822125	III	2	6	8	3	0
Maybe	20	MEANS, N. (QUEEN SAND)	8	GAINES	60139500	II	12	28	0	0	39
Maybe	21	MIDLAND FARMS	8	ANDREWS	61118001	II	11	274	1	2	318
Maybe	22	MONAHANS (QUEEN SAND)	8	WARD	62415747	II	10	13	0	2	13
Maybe	23	MOORE	8	HOWARD	62711001	II	20	61	15	74	0
Maybe	24	MOORES ORCHARD*	3	FORT BEND	62739002	III	2	2	0	2	0
Maybe	25	PANHANDLE MOORE COUNTY FIELD	10	MOORE	68901001	II	19	40	11	36	8
Maybe	26	POST (GLORIETA)	8A	GARZA	72552500	II	14	39	13	21	33
Maybe	27	QUITMAN	6	WOOD	73844001	II	10	14	6	2	0
Maybe	28	REINECKE	8A	BORDEN	75780001	II	46	60	0	60	0
Maybe	29	RUSSELL (CLEAR FORK 7000)	8A	GAINES	79002166	II	80	114	6	2	121
Maybe	30	SAND HILLS (MCKNIGHT)	8	CRANE	80473310	II	10	111	0	3	122
Maybe	31	SHARON RIDGE (CLEAR FORK)	8A	SCURRY	82710166	II	131	229	3	16	233
Maybe	32	SHERIDAN (WILCOX)	3	COLORADO	83107175	III	4	1	4	0	0
Maybe	33	STOWELL (CRAWFORD U-1)	3	JEFFERSON	86429026	III	2	2	2	1	0
Maybe	34	TEXAS HUGOTON	10	SHERMAN	89120001	II	6	23	1	0	0
Maybe	35	THOMPSON, NORTH	3	FORT BEND	89527001	II	14	15	3	10	0

Table 3.
Results of BEG Oil-Field Screening Using Histograms - MAYBE Category

Screening Results	Count	Field Name	RRC Dist.	County	Field Number	BEG/RRC Category	UIC Wells Permitted Since 1/1/90	UIC Wells Remaining in Field	Nonproduction Zone Disposal Wells	Production Zone Disposal Wells	Secondary Recovery Wells
Maybe	36	TOMBALL	3	HARRIS	90620001	II	17	17	17	14	0
Maybe	37	TXL (ELLENBURGER)	8	ECTOR	88071290	III	3	2	0	7	0
Maybe	38	TXL (TUBB)	8	ECTOR	88071696	II	105	119	2	0	142
Maybe	39	WAHA, NORTH (DELAWARE SAND)	8	REEVES	94650333	III	4	5	1	0	4
Maybe	40	WELLMAN	8A	TERRY	96180001	III	4	10	5	0	9
Maybe	41	WHEAT	8	LOVING	96742001	II	9	17	7	8	0
Maybe	42	WOODKIRK (STRAWN)	9	JACK	98535666	II	8	10	1	1	8

Percent Category II fields (those with average separation between 501 and 2,999 ft) : 81
Percent Category III fields (those with average separation greater than 3,000 ft) : 19

Table 4.
Statistical Analysis of Normally and Nonnormally Distributed H15 Fluid Levels - Yes Category

Normally Distributed

Field	Mean H15TOF (ft bgl)	Std Dev H15TOF (ft bgl)	No. of H15TOF Have	Min. No. of H15TOF Needed	Min. H15TOF (ft bgl)	Max. BUQW (ft bgl)	Actual Separation (ft)	Minimum H15TOF Using 2*Std Dev (ft bgl)	Separation Using 2*Std Dev (ft)	Probable Standard Deviation (higher)	Probable Minimum H15TOF (ft bgl)	Probable Separation (ft)
COLEMAN RANCH	1857	793	11	49	1030	350	680	272	-78	1263	-669	-1019
CROSSETT, WEST (CLEAR FORK, UP.)	2564	536	4	12	1762	400	1362	1492	1092	1569	-574	-974
DONNELLY (SAN ANDRES)	2761	847	13	25	1767	1300	467	1068	-232	1282	196	-1104
FRASS (TONKAWA)	5670	1394	6	16	3339	550	2789	2883	2333	2906	-141	-691
GARZA	1751	463	5	19	975	175	800	825	650	1098	-446	-621
GILLOCK (EAST SEGMENT)	4623	2240	13	64	1750	1050	700	143	-907	3394	-2164	-3214
HITTS LAKE (PALUXY)	4115	1197	23	23	2055	1650	405	1721	71	1599	918	-732
HUNTLEY, EAST (SAN ANDRES)	1445	1271	3	209	704	125	579	-1097	-1222	5612	-9778	-9903
K-M-A (ELLENBURGER)	1640	74	7	1	1542	60	1482	1492	1432	141	1358	1298
PANHANDLE (RED CAVE)	1820	239	31	5	1403	600	803	1342	742	304	1212	612
RANGER	2558	612	118	15	558	250	308	1334	1084	693	1171	921
SAWYER (CANYON)	5065	1474	10	21	2488	900	1588	2116	1216	2426	214	-686
SHARE, SE. (MORROW, UPPER)	5311	2358	9	53	1670	625	1045	595	-30	4037	-2763	-3388
SULLIVAN (DELAWARE)	2186	192	5	2	1983	800	1183	1803	1003	455	1276	476
THREE BAR (DEVONIAN)	5377	1097	8	11	3780	1400	2380	3182	1782	1971	1435	35
TODD, DEEP (CRINOIDAL)	1794	407	6	14	1404	625	779	979	354	849	95	-530
VEALMOOR	2177	572	20	19	1085	375	710	1033	658	810	557	182

Nonnormally Distributed

Field	Mean H15TOF (ft bgl)	Std Dev H15TOF (ft bgl)	No. of H15TOF Have	Min. No. of H15TOF Needed	Min. H15TOF (ft bgl)	Max. BUQW (ft bgl)	Actual Separation (ft)	Lower Quartile (ft bgl)	Upper Quartile (ft bgl)	Inter-quartile Range (ft)	Inner Fence (ft bgl)	Outer Fence (ft bgl)
JOY (STRAWN)	3641	842	42	14	744	300	444	3768	4009	241	3406	3045

Table 5.
Statistical Analysis of Normally and Nonnormally Distributed H15 Fluid Levels - Maybe Category

Normally Distributed

Field	Mean H15TOF (ft bgl)	Std Dev H15TOF (ft bgl)	No. of H15TOF Have	No. of H15TOF Needed	Min. H15TOF (ft bgl)	Max. BUQW (ft bgl)	Actual Separation (ft)	Min H15TOF Using 2*Std Dev (ft bgl)	Separation Using 2*Std Dev (ft)	Probable Standard Deviation (higher)	Probable Minimum H15TOF (ft bgl)	Probable Separation (ft)
ADAIR (WOLFCAMP)	657	93	7	5	514	300	214	471	171	178	300	0
BAYVIEW (GLORIETA)	2070	1255	4	99	366	525	-159	-440	-965	3675	-5280	-5805
BRADFORD (TONKAWA)	3413	1261	20	37	1248	900	348	891	-9	1728	-43	-943
BROWN & THORP (CLEAR FORK)	2609	794	17	25	263	2300	-2037	1021	-1279	1126	357	-1943
BRYSON, EAST	2277	938	18	46	290	550	-260	401	-149	1313	-349	-899
CHOATE (CISCO -K-)	2047	870	5	49	1390	150	1240	307	157	2065	-2083	-2233
COWDEN, SOUTH (CANYON 8900)	4982	3078	4	103	915	1500	-585	-1174	-2674	9012	-13042	-14542
EMBAR (PERMIAN)	4127	1566	7	39	1333	1300	33	996	-304	2995	-1863	-3163
EMPEROR, DEEP	1473	506	66	32	189	750	-561	461	-289	592	288	-462
FULLERTON (SAN ANDRES)	2413	1508	3	106	896	1800	-904	-603	-2403	6744	-11075	-12875
GOLDSMITH (CLEAR FORK)	2877	1775	24	103	132	1400	-1268	-673	-2073	2353	-1829	-3229
GRICE (DELAWARE)	2092	630	7	25	1120	975	145	832	-143	1205	-318	-1293
HARDIN	3943	1889	21	62	5	2650	-2645	165	-2485	2565	-1186	-3836
KEN REGAN (DELAWARE)	2331	456	20	10	1610	1500	110	1419	-81	625	1082	-418
KEYSTONE (SAN ANDRES)	2237	1411	15	108	15	750	-735	-585	-1335	2060	-1883	-2633
KNOX CITY, NORTH (CANYON)	1782	1077	50	99	284	100	184	-372	-472	1294	-806	-906
MAGUTEX (DEVONIAN)	5356	2898	15	79	1271	1750	-479	-439	-2189	4230	-3103	-4853
MEANS, N. (QUEEN SAND)	3328	1320	10	43	374	1900	-1526	688	-1212	2171	-1013	-2913
MIDLAND FARMS	2697	1035	59	40	506	1600	-1094	627	-973	1223	250	-1350
MONAHANS (QUEEN SAND)	1612	772	6	62	155	500	-345	68	-432	1610	-1608	-2108
MOORE	1846	823	35	54	277	325	-48	200	-125	1030	-215	-540
MOORES ORCHARD	5161	2283	24	53	434	2200	-1766	595	-1605	3026	-891	-3091
POST (GLORIETA)	1728	579	74	30	418	300	118	570	270	671	386	86
QUITMAN	2001	1151	18	90	589	800	-211	-301	-1101	1612	-1223	-2023
REINECKE	1857	788	18	49	500	400	100	281	-119	1104	-350	-750
RUSSELL (CLEAR FORK 7000)	5652	2288	9	44	175	2000	-1825	1076	-924	3917	-2181	-4181
SAND HILLS (MCKNIGHT)	2255	694	37	26	535	1100	-565	867	-233	1438	-621	-1721
SHARON RIDGE (CLEAR FORK)	1862	690	39	37	159	400	-241	481	81	853	156	-244
SHERIDAN (WILCOX)	6779	3532	21	73	713	1850	-1137	-285	-2135	4795	-2811	-4661
STOWELL (CRAWFORD U-1)	5429	1991	24	36	214	1000	-786	1447	447	1850	1729	729
TEXAS HUGOTON	2538	915	30	35	250	1000	-750	708	-292	1171	196	-804
TOMBALL	3155	863	14	20	1364	1950	-586	1429	-521	1282	591	-1359
TXL (ELLENBURGER)	4321	2088	15	63	1507	1350	157	144	-1206	3049	-1776	-3126
TXL (TUBB)	3726	1328	219	34	352	1350	-998	1070	-280	1505	717	-633
WAHA, NORTH (DELAWARE)	3748	1223	10	29	1736	1300	436	1302	2	2011	-274	-1574
WELLMAN	3612	1664	17	57	654	350	304	284	-66	2359	-1106	-1456
WHEAT	2426	965	31	43	112	1500	-1388	495	-1005	1230	-33	-1533
WOODKIRK (STRAWN)	2142	764	9	34	713	175	538	614	439	1308	-474	-649

Nonnormally Distributed

Field	Mean H15TOF (ft bgl)	Std Dev H15TOF (ft bgl)	No. of H15TOF Have	No. of H15TOF Needed	Min. H15TOF (ft bgl)	Max. BUQW (ft bgl)	Actual Separation (ft)	Lower Quartile (ft bgl)	Upper Quartile (ft bgl)	Inter-quartile Range (ft)	Inner Fence (ft bgl)	Outer Fence (ft bgl)
CARTHAGE (PETTIT, UPPER)	5225	1496	35	22	326	550	-224	5220	5827	607	4310	3399
GOLDSMITH, N. (SAN ANDRES, CON.)	3300	1054	72	28	700	1400	-700	2736	4037	1385	659	1419
PANHANDLE MOORE COUNTY FIELD	3032	368	135	4	320	850	-530	2904	3255	351	2378	1851
THOMPSON, NORTH	5386	1301	70	16	570	2600	-2030	5159	6023	864	3863	2567

Figures

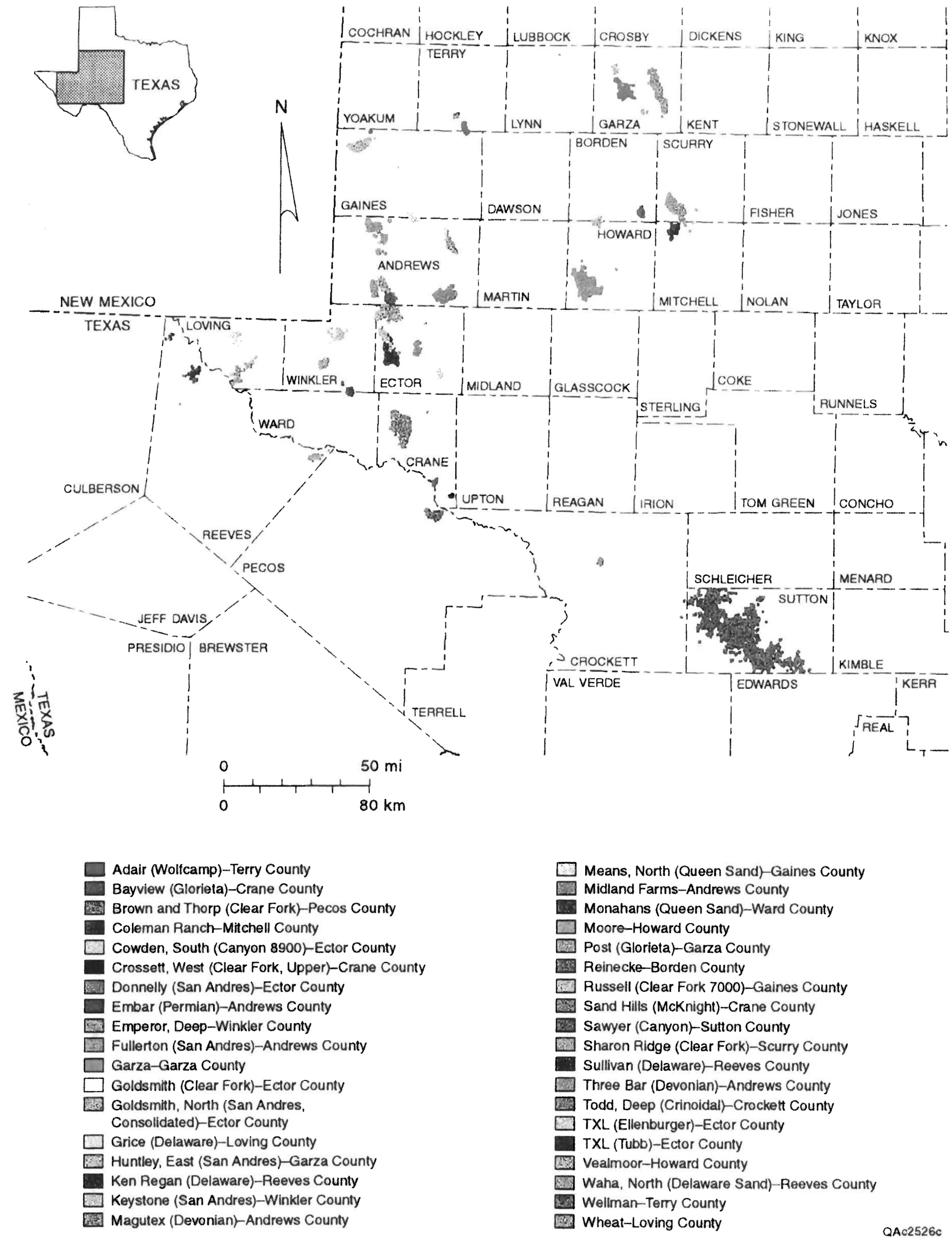


Figure 1. West Texas AOR Fields

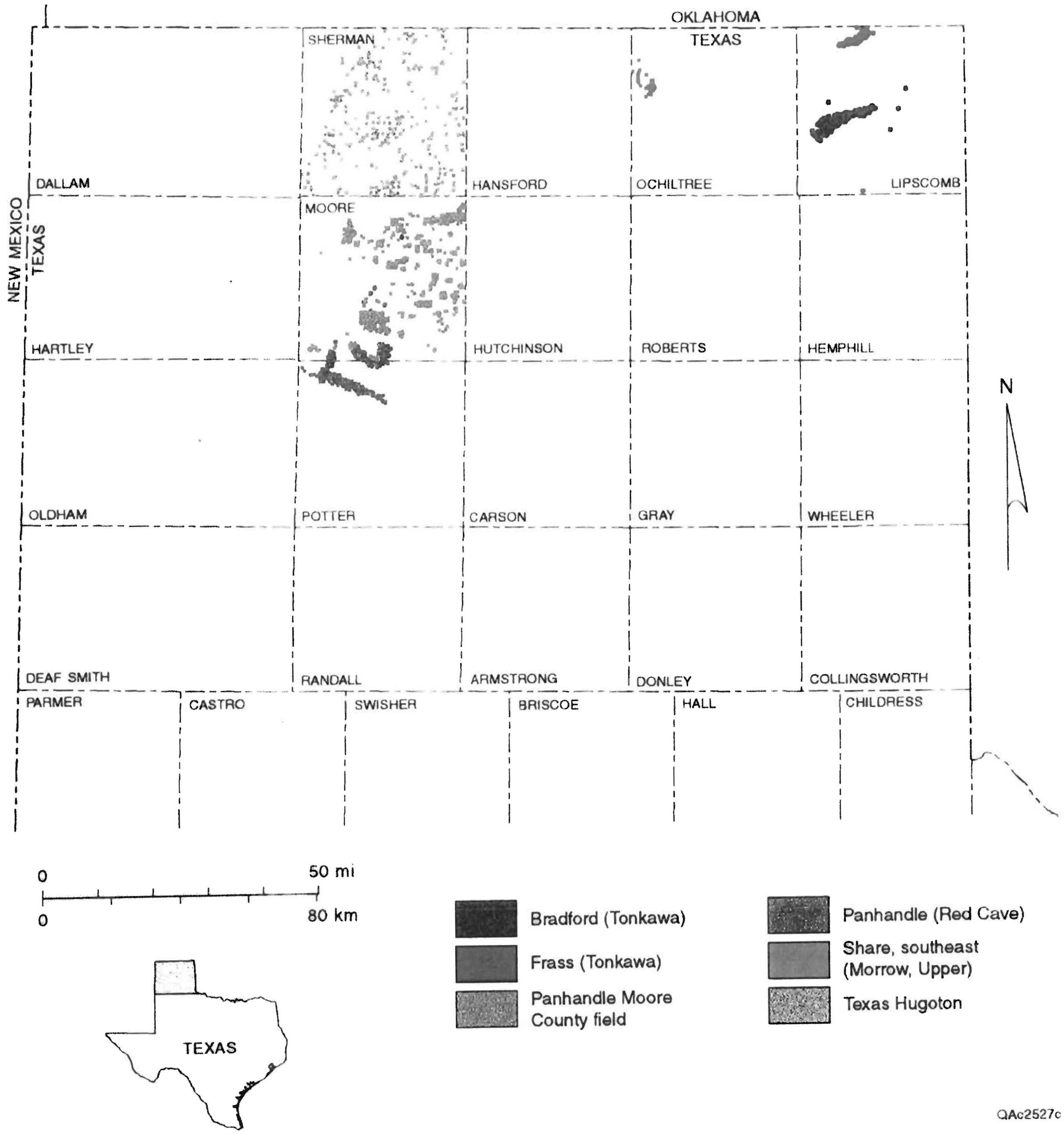


Figure 2. Panhandle AOR Fields

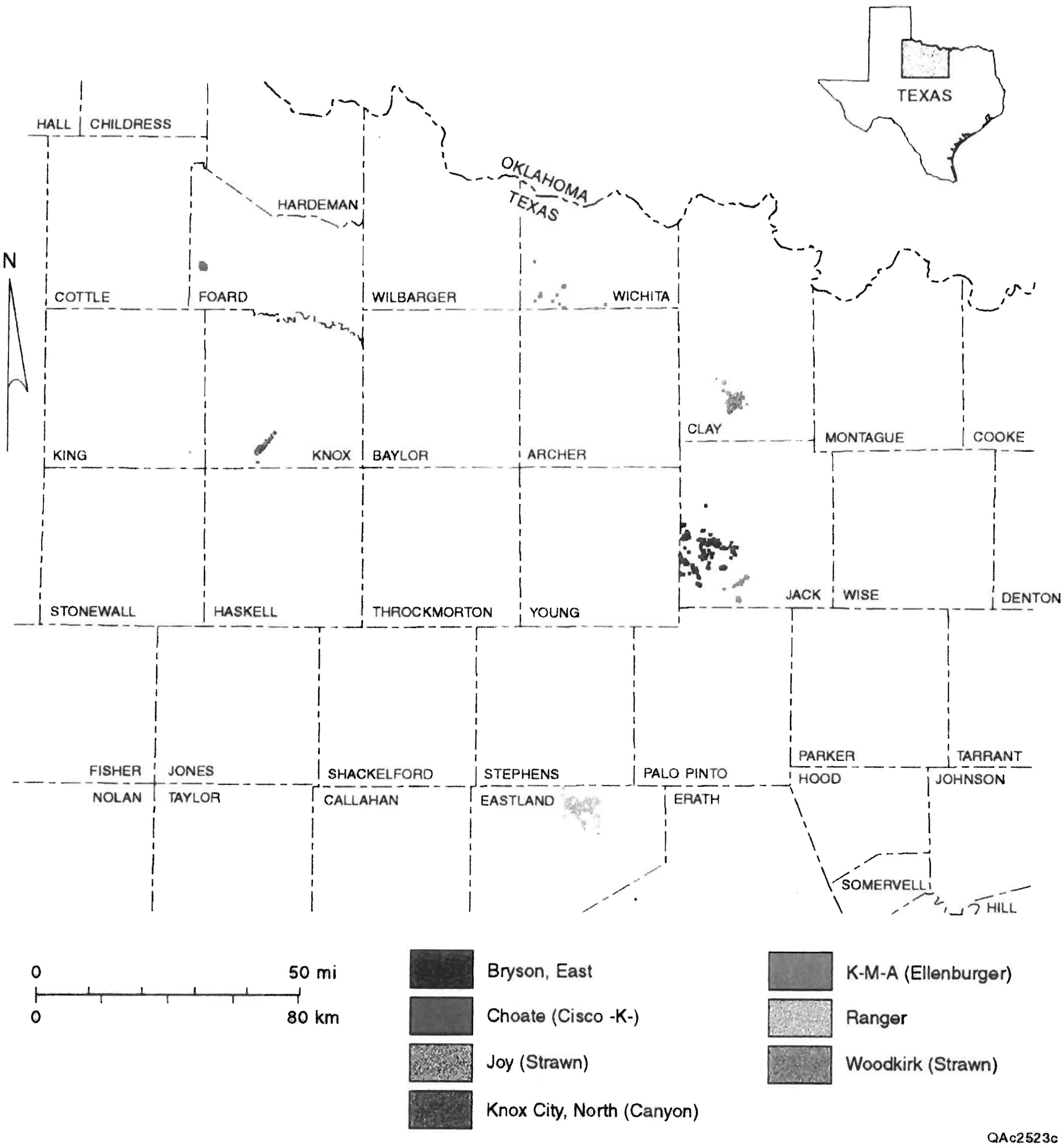


Figure 3. North Texas AOR Fields

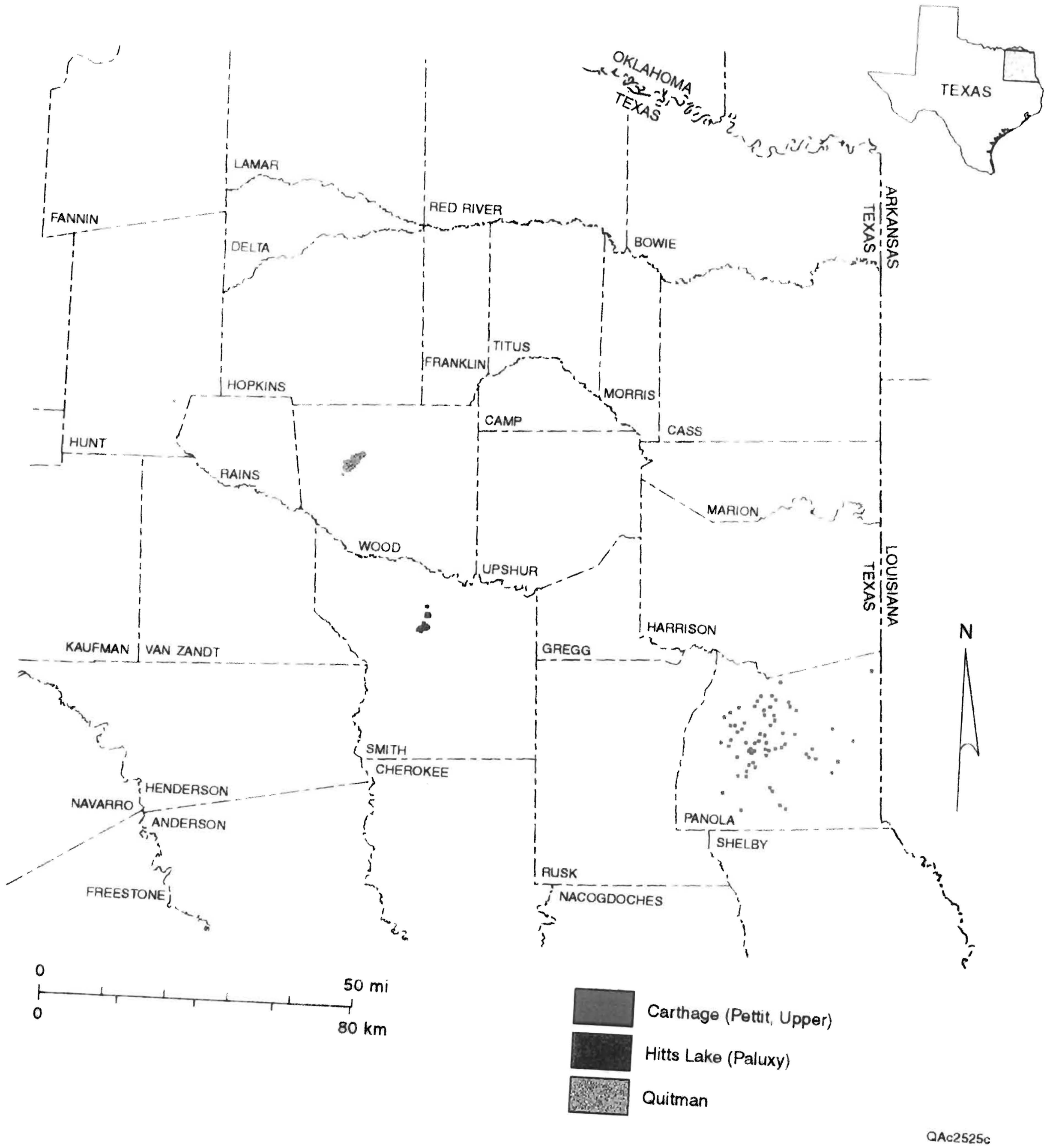


Figure 4. East Texas AOR Fields

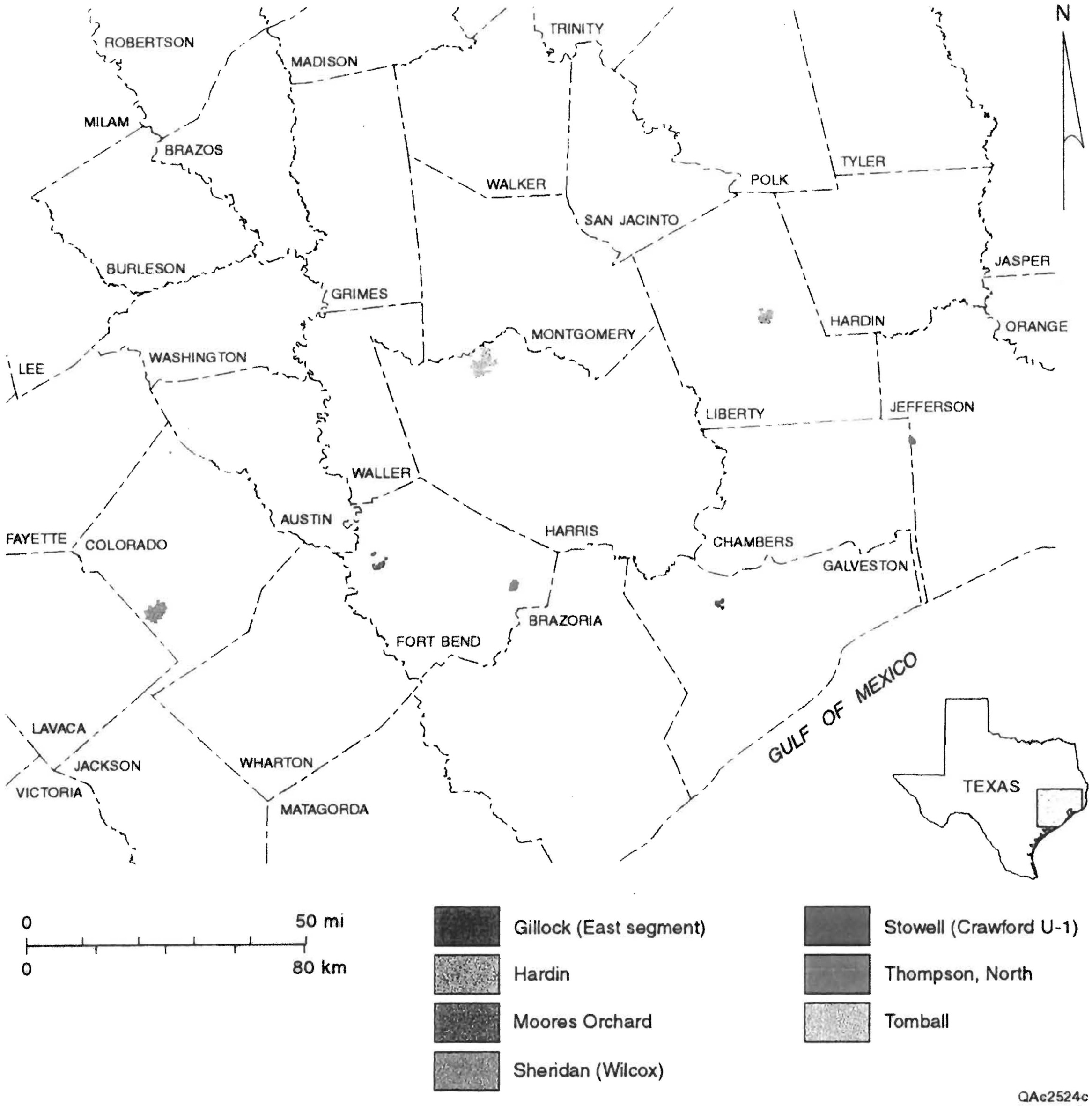
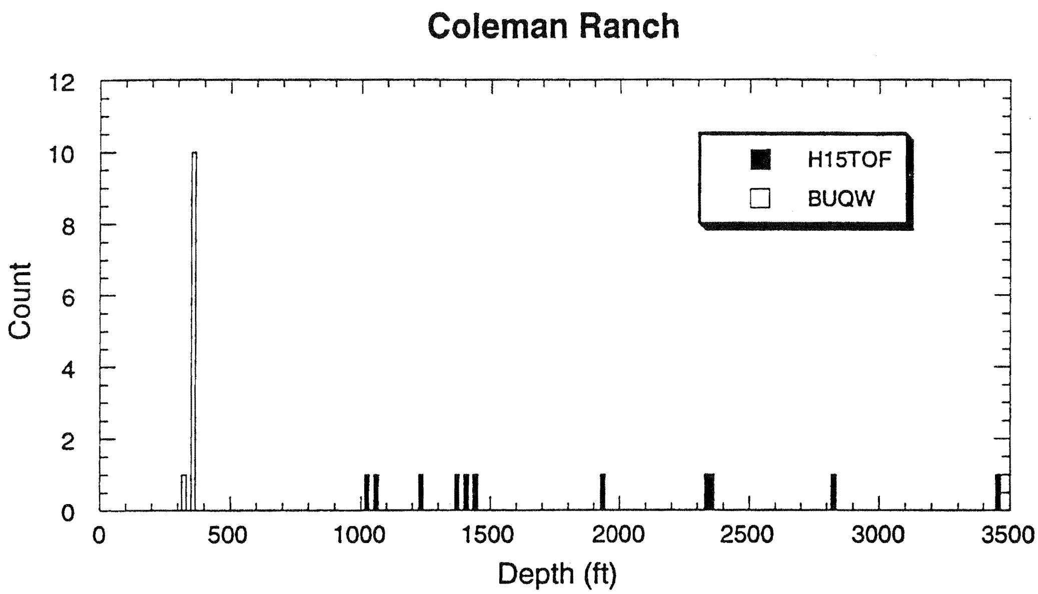


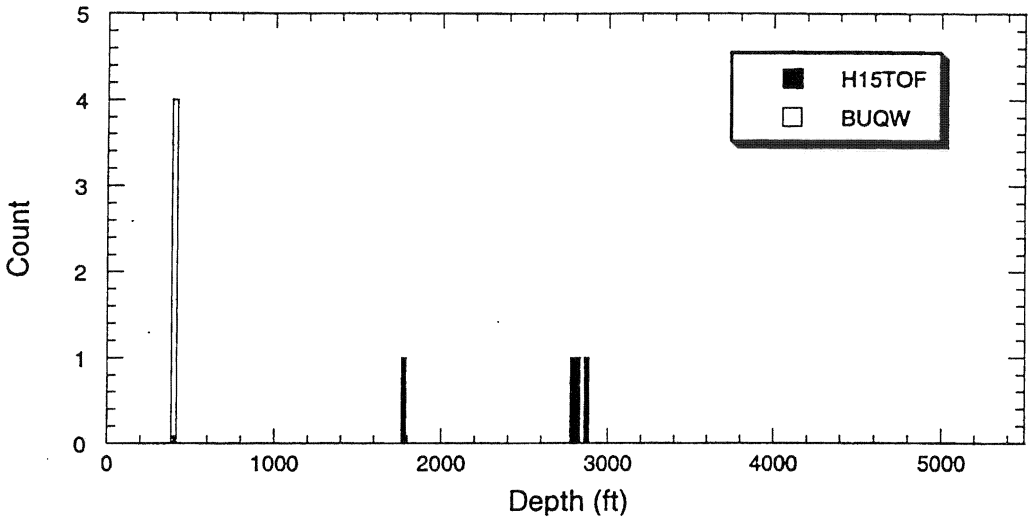
Figure 5. Southeast Texas AOR Fields

Appendix A-1
AOR Field Histograms - YES Category



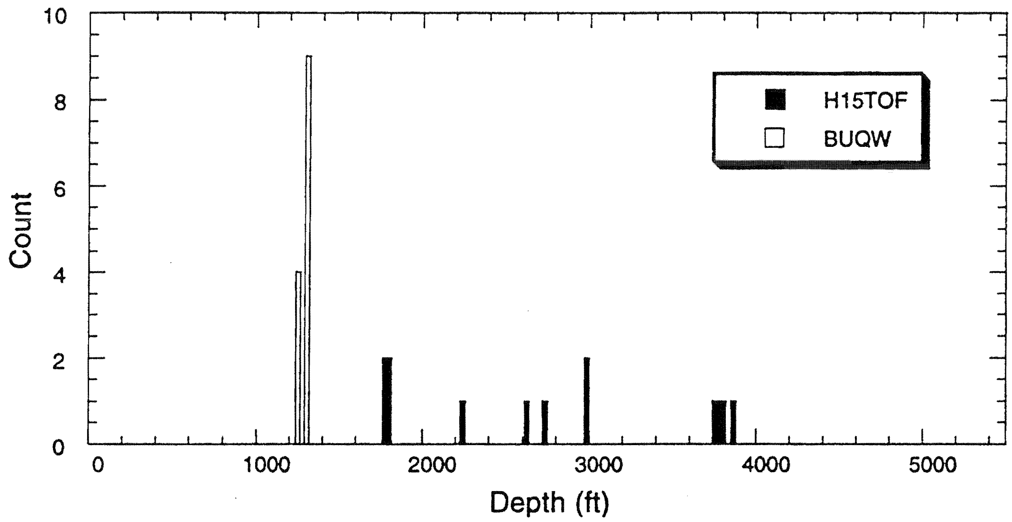
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Mitchell	63	2500	1943
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
11	6	1030	3450	1119
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
325	350	1995-97	2524-3120	73

Crossett, West (Clear Fork, Upper)



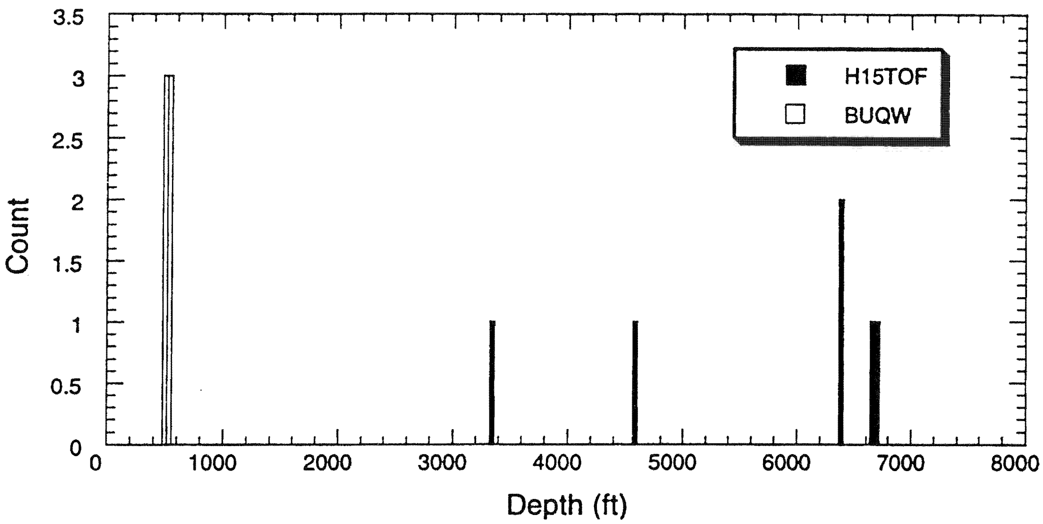
RRC District	**County**	**Number of UIC Wells**	**Depth of Production Zone (ft)**	**Year Field Discovered**
8	Crane	3	2858	1962
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
4	2	2790	17621(?)	93
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
400	400	1995-97	2900-2938	0

Donnelly (San Andres)



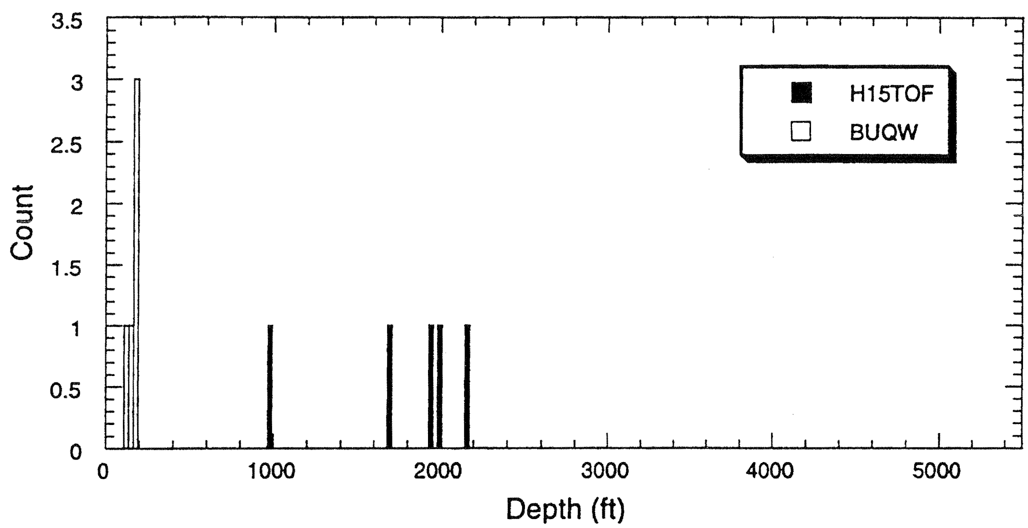
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Ector	8	4175	1950
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
13	10	1767	3875	0
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
1250	1300	1996-97	3888-4382	16

Frass (Tonkawa)



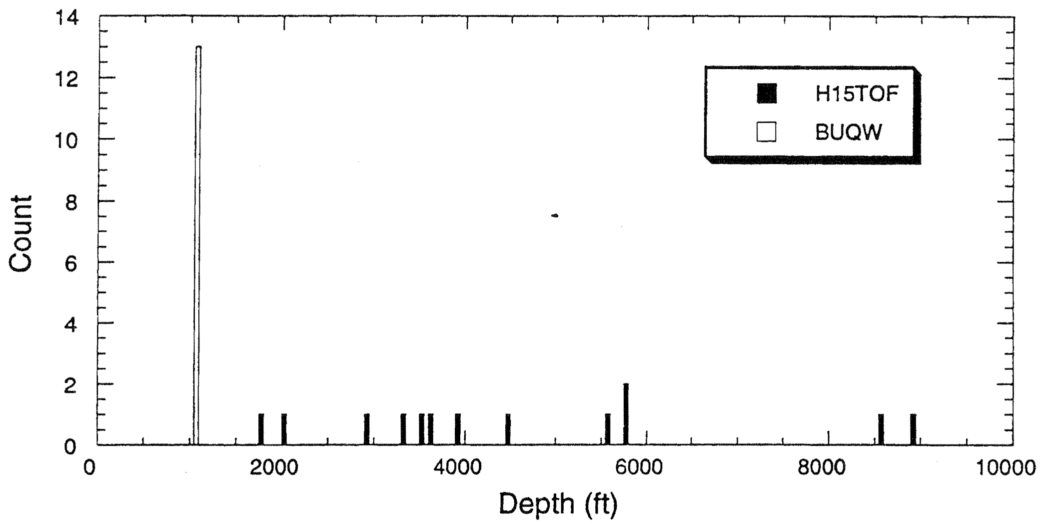
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
10	Lipscomb	2	6200	1957
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
6	4	3339	6710	3024
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
500	550	1995-97	3018-6365	1

Garza



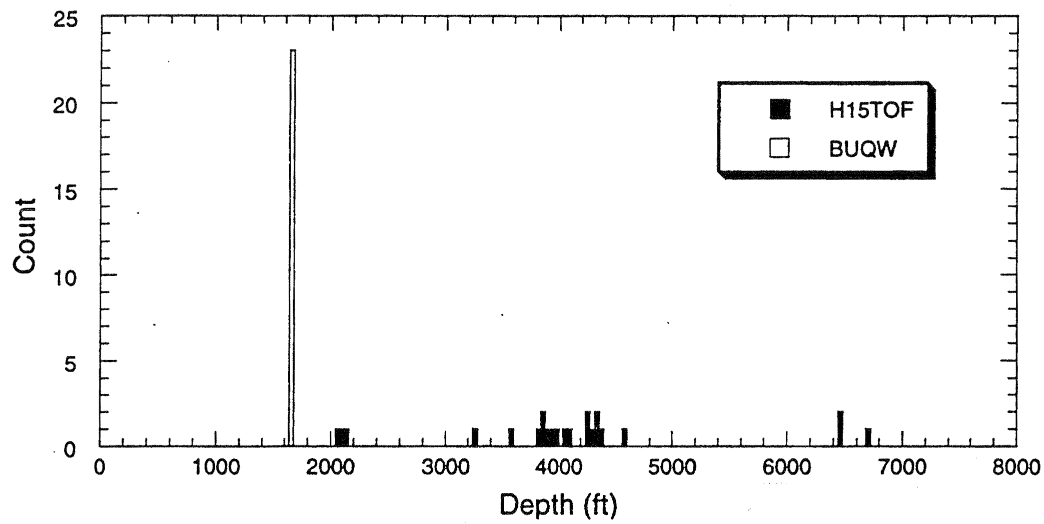
RRC District	**County**	**Number of UIC Wells**	**Depth of Production Zone (ft)**	**Year Field Discovered**
8A	Garza	399	500	1967
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
5	2	975	2152	452
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
125	175	1994-97	No data	392

Gillock (East Segment)



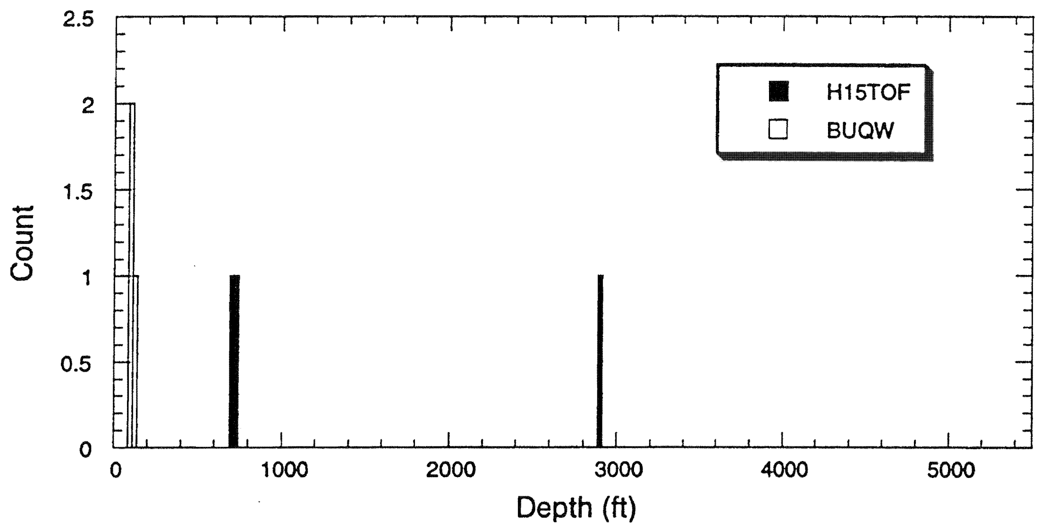
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
3	Galveston	4	9365	1951
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
13	7	1750	8946	3815
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
1050	1050	1994-97	8749-9481	2

Hitts Lake (Paluxy)



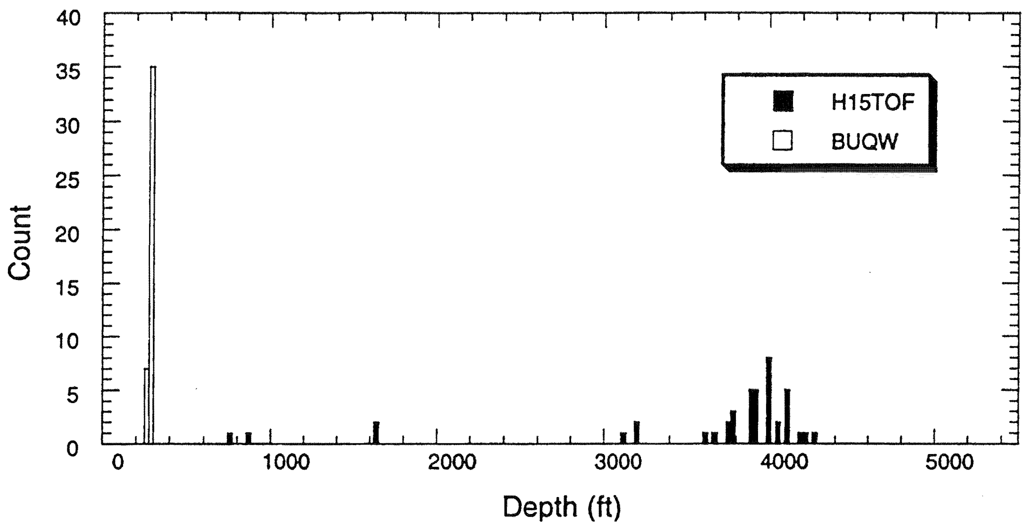
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
6	Smith	14	7220	1953
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
23	7	2055	6685	580
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
1650	1650	1994-97	No data - 7307	13

Huntley, East (San Andres)



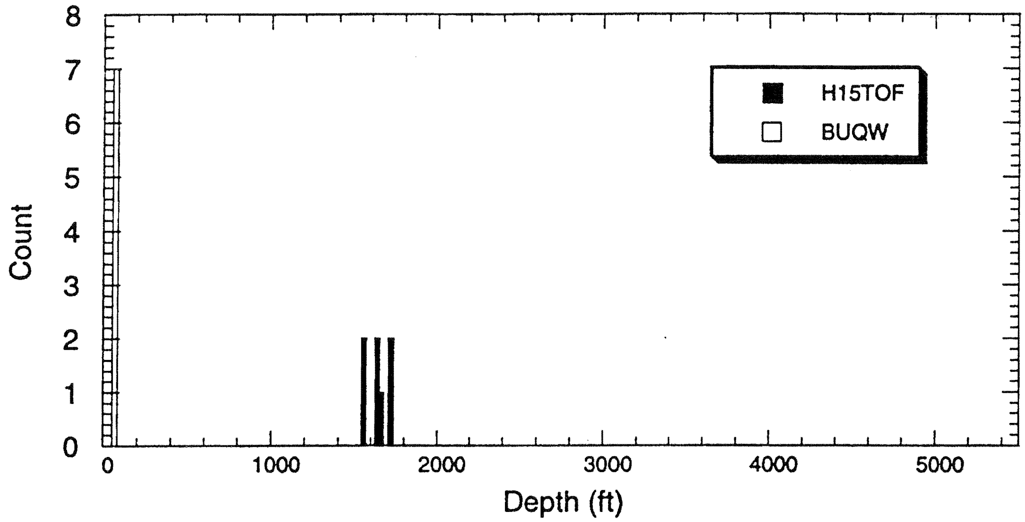
RRC District	**County**	**Number of UIC Wells**	**Depth of Production Zone (ft)**	**Year Field Discovered**
8A	Garza	28	3300	1956
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
3	2	704	2913	15
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
100	125	1993-97	No data - 3310	14

Joy (Strawn)



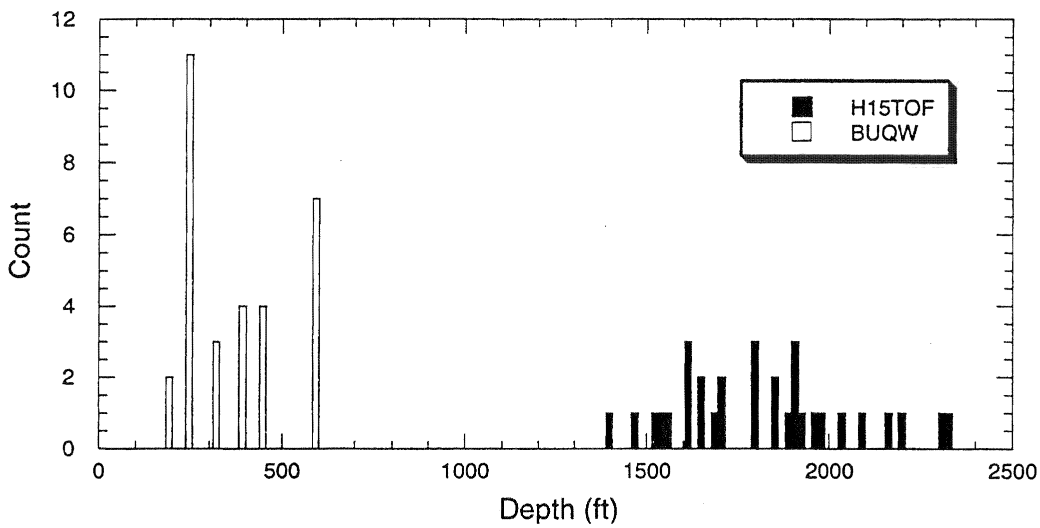
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
9	Clay	21	4400	1950
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
42	38	744	4275	0
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
250	300	1995-97	No data	63

K-M-A (Ellenburger)



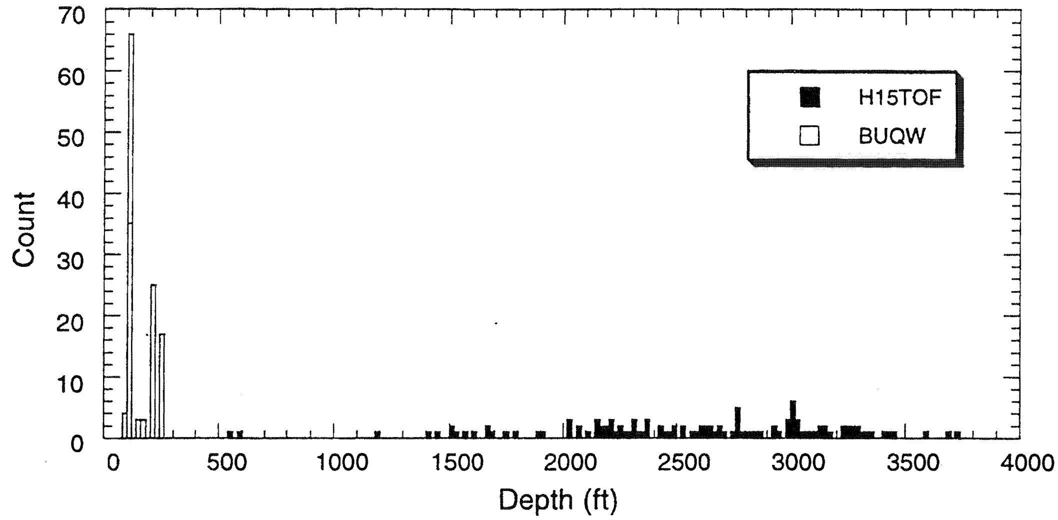
RRC District	**County**	**Number of UIC Wells**	**Depth of Production Zone (ft)**	**Year Field Discovered**
9	Wichita	4	????	????
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
7	3	1542	1725	175
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
60	60	1995-97	3621-4515	5

Panhandle (Red Cave)



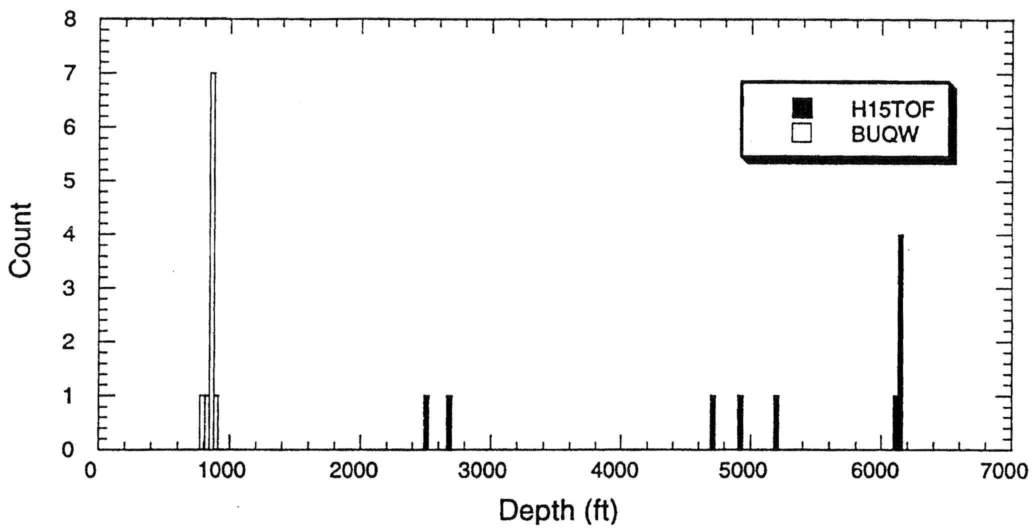
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
10	Moore	11	1900	1921?
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
31	25	1403	2325	515
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
200	600	1995-98	1808-2380	5

Ranger



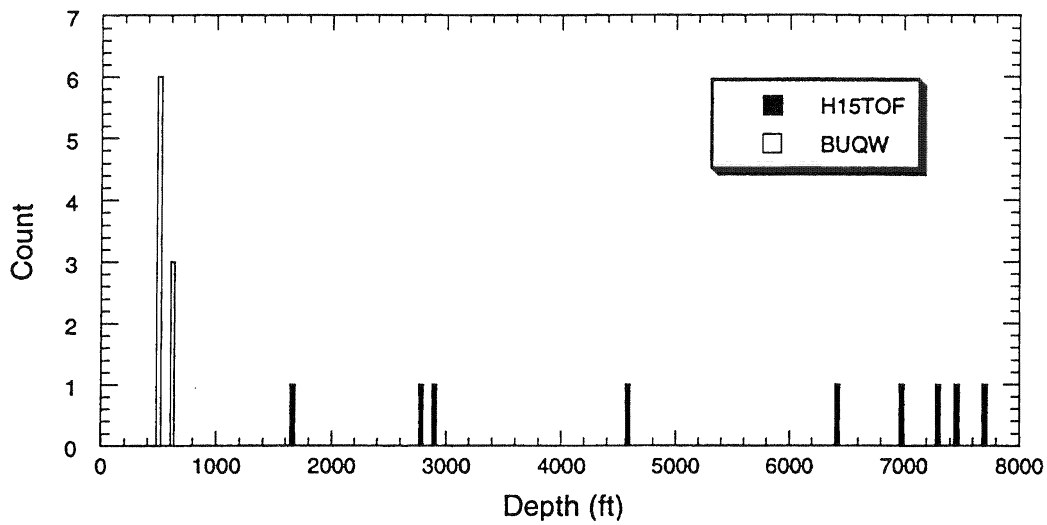
RRC District	**County**	**Number of UIC Wells**	**Depth of Production Zone (ft)**	**Year Field Discovered**
7B	Eastland	87	3458	1917
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
118	37	558	3720	1808
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
90	250	1993-97	3180-3679	149

Sawyer (Canyon)



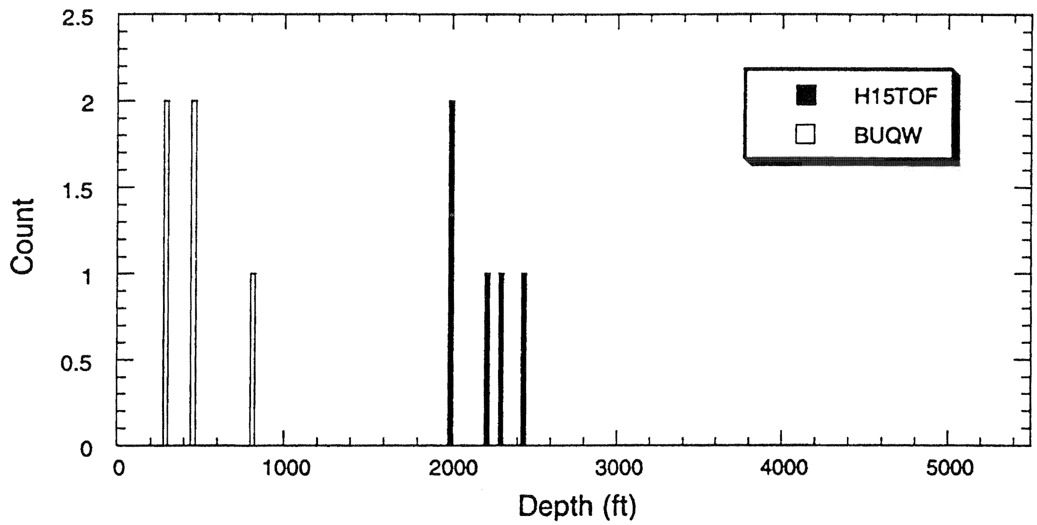
RRC District	**County**	**Number of UIC Wells**	**Depth of Production Zone (ft)**	**Year Field Discovered**
7C	Sutton	13	5800	1967
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
10	7	2488	6151	21
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
775	900	1994-97	6149-6172	0

Share, SE (Morrow, Upper)



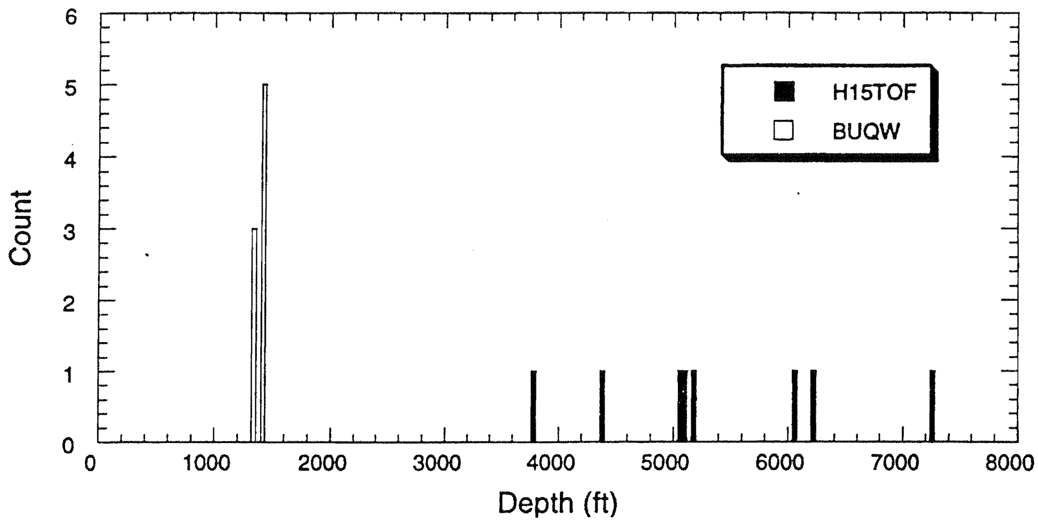
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
10	Ochiltree	15	7558	1959
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
9	6	1670	7701	5796
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
500	625	1995-97	7430-7583	16

Sullivan (Delaware)



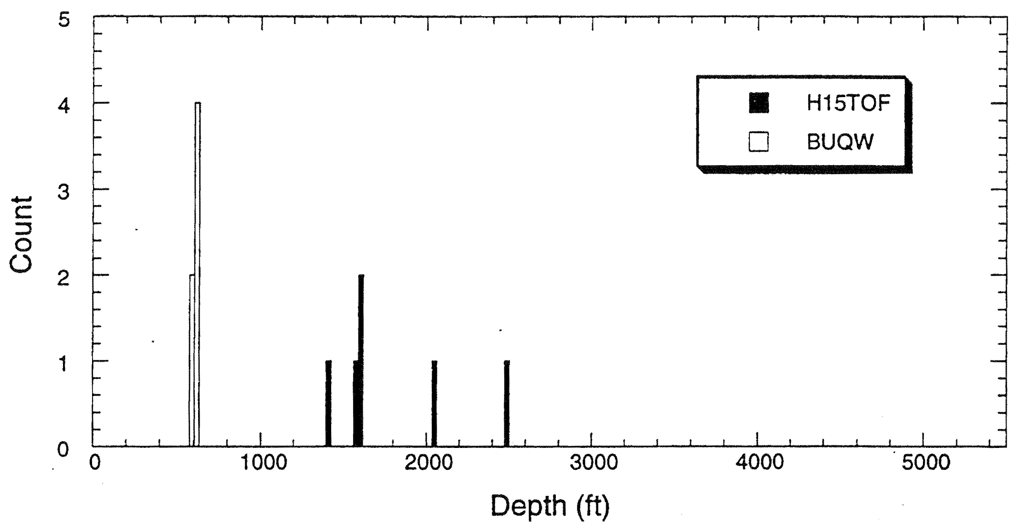
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Reeves	7	2200	1969
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
5	4	1983	2424	424
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
300	800	1995-97	No data - 2754	1

Three Bar (Devonian)



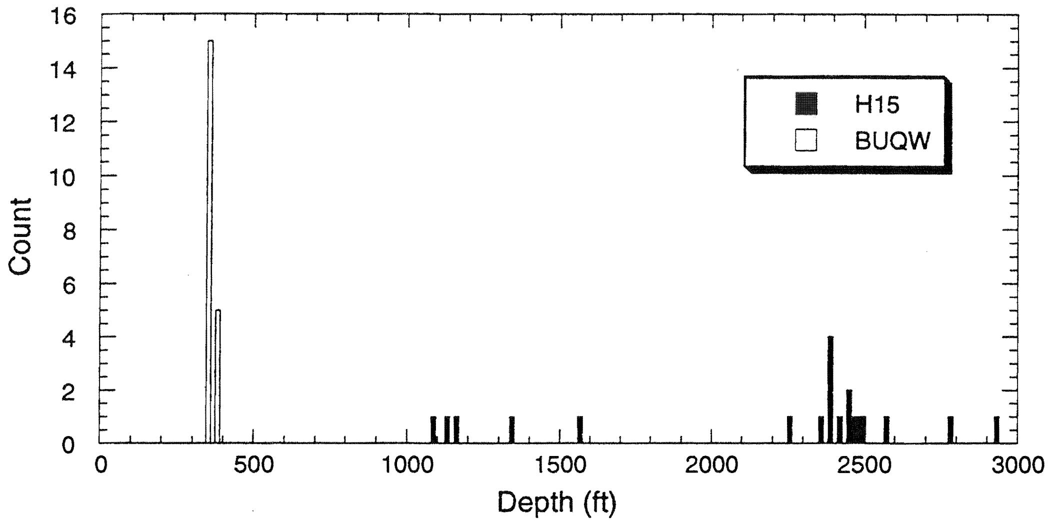
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Andrews	43	8100	1945
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
8	4	3780	7245	3465
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
1350	1400	1994-97	8165-8256	45

Todd, Deep (Crinoidal)



RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
7C	Crockett	18	????	????
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
6	3	1404	2496	436
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
600	625	1993-97	5808-5852	19

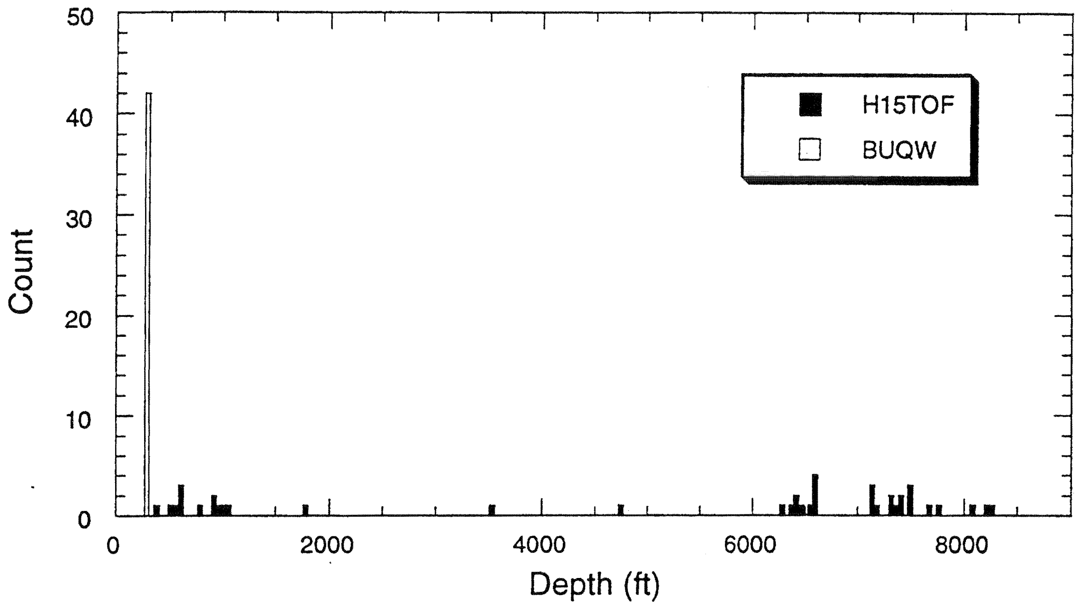
Vealmoor



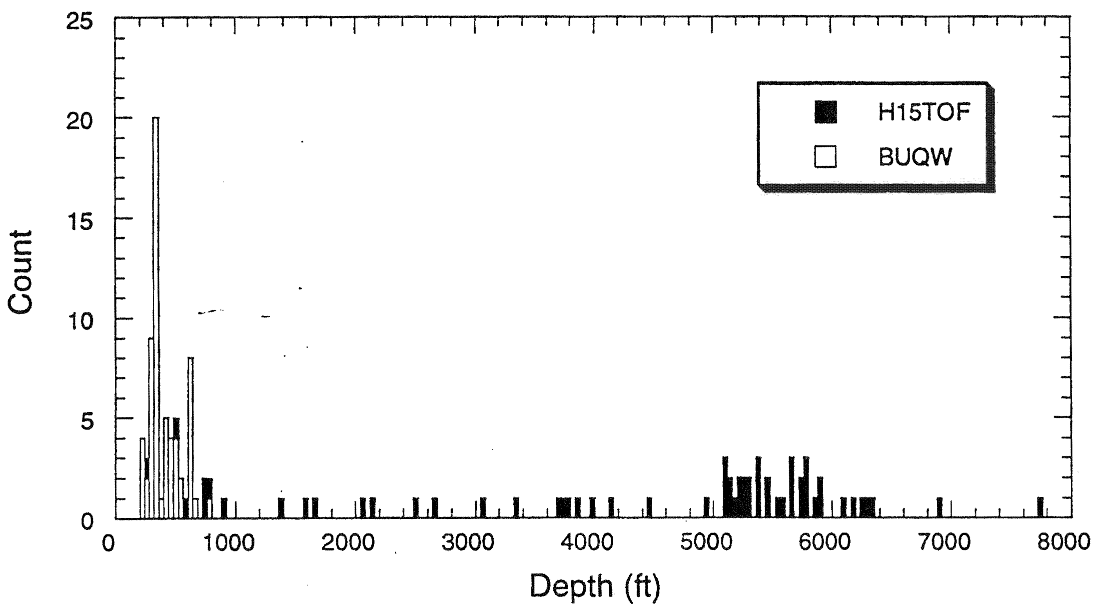
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Howard	11	7800	1948
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
20	8	1085	2929	675
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
350	375	1994-97	7793-7942	7

Appendix A-2
AOR Field Histograms - NO Category

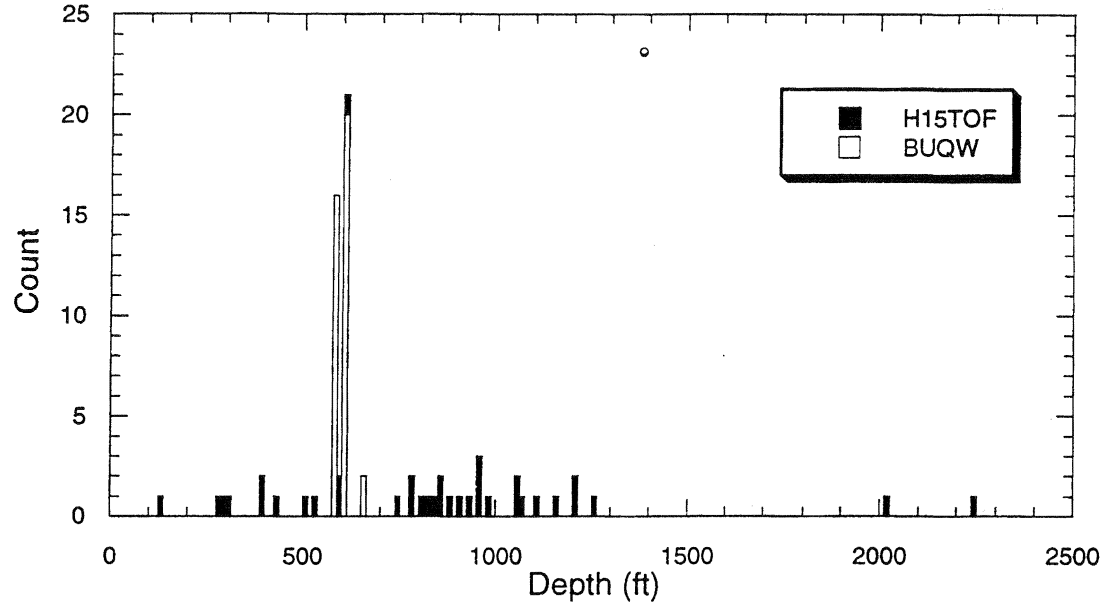
Ackerly (Dean Sand)



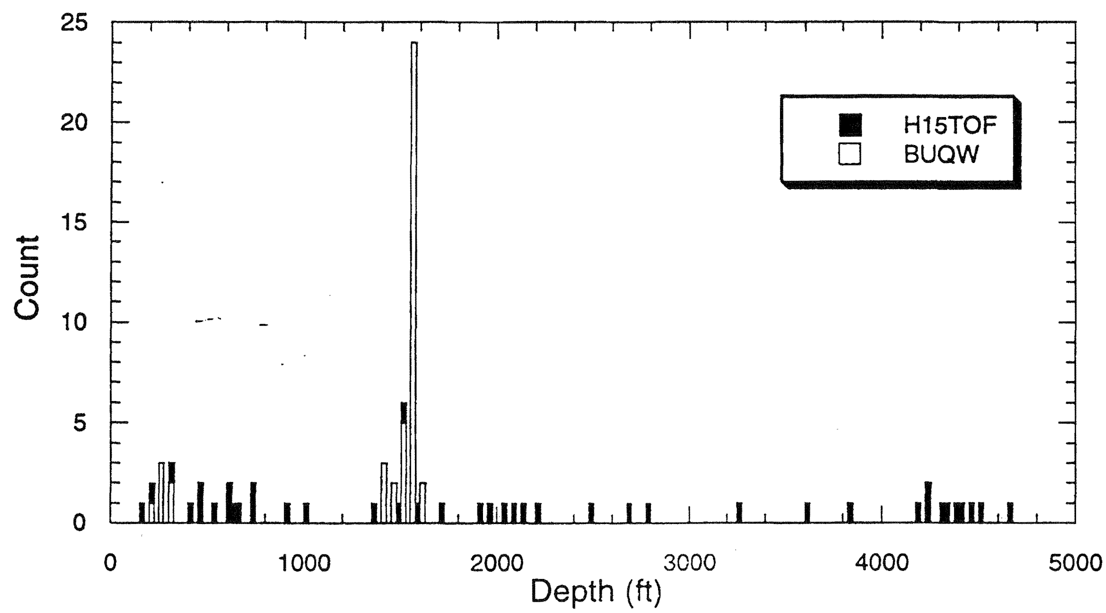
Carthage (Petit, Lower Gas)



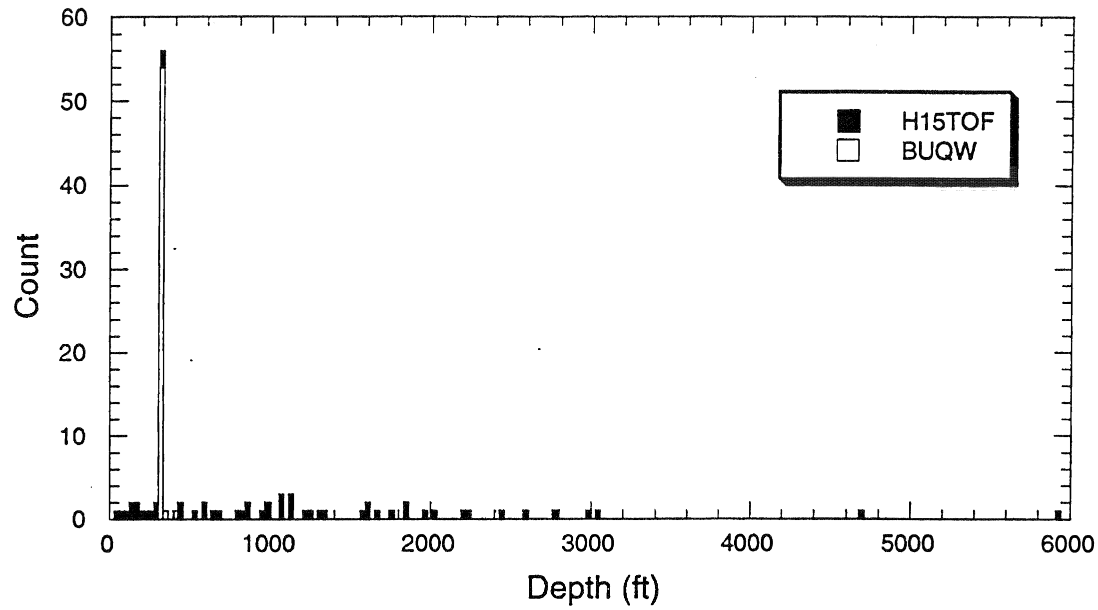
Cayuga



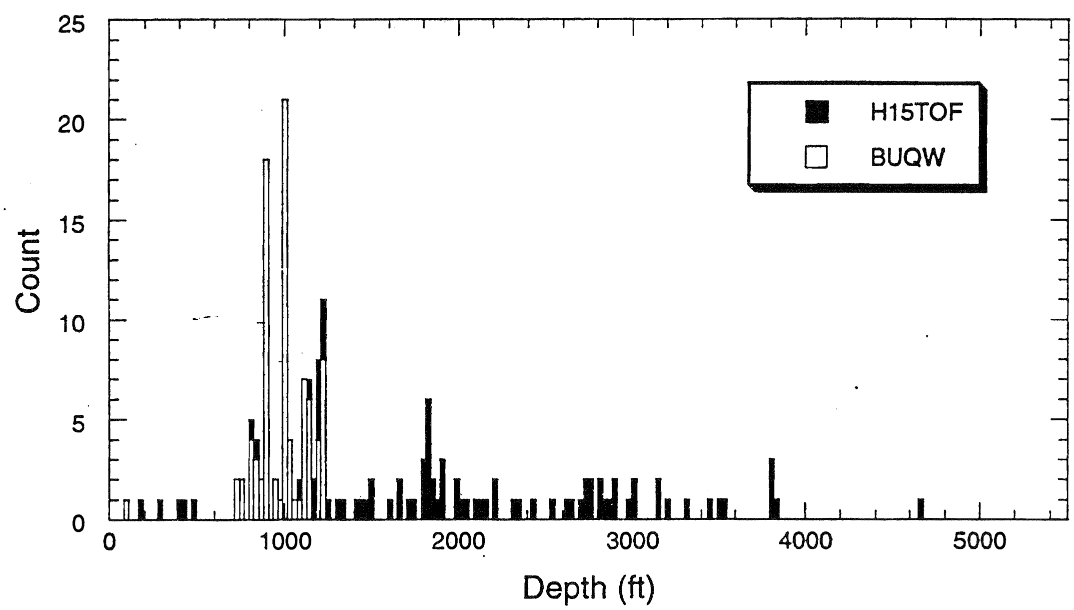
Cowden, North



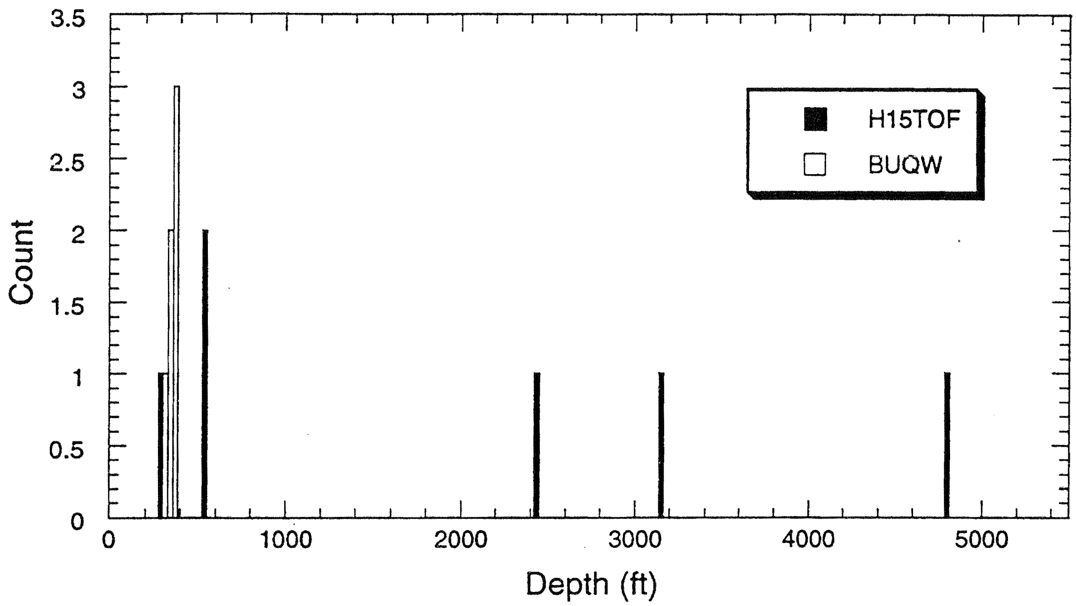
Diamond-M-(Canyon Lime Area)



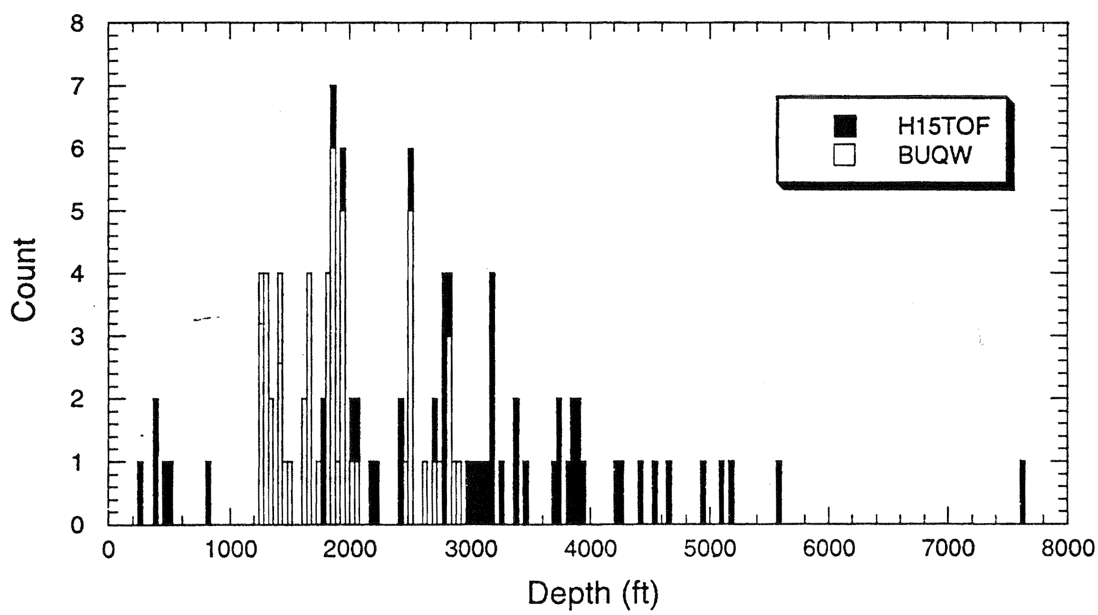
Dune



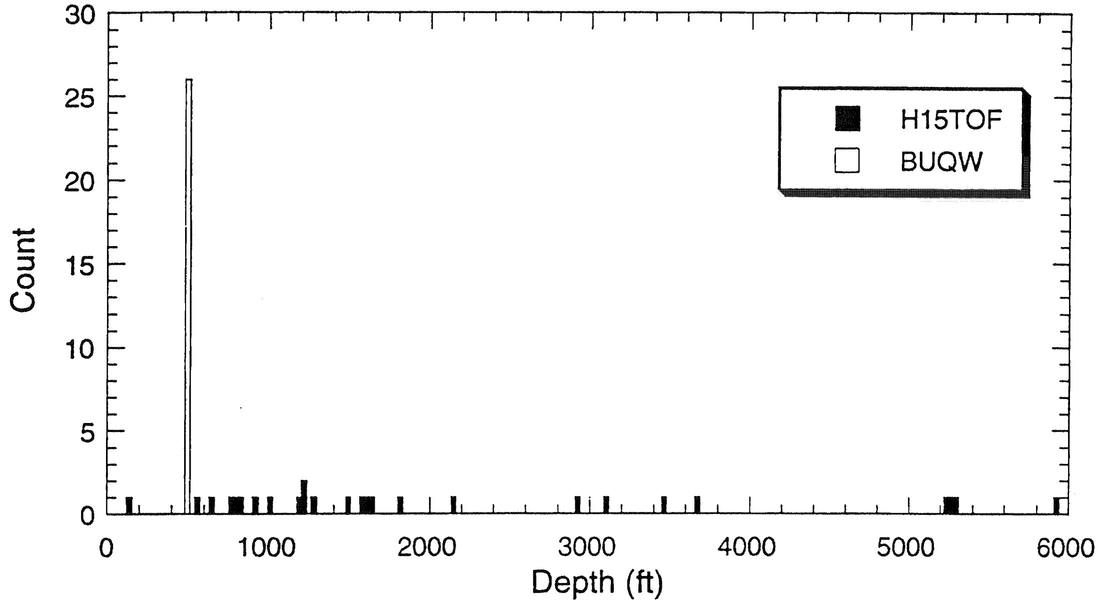
Emperor (Holt)



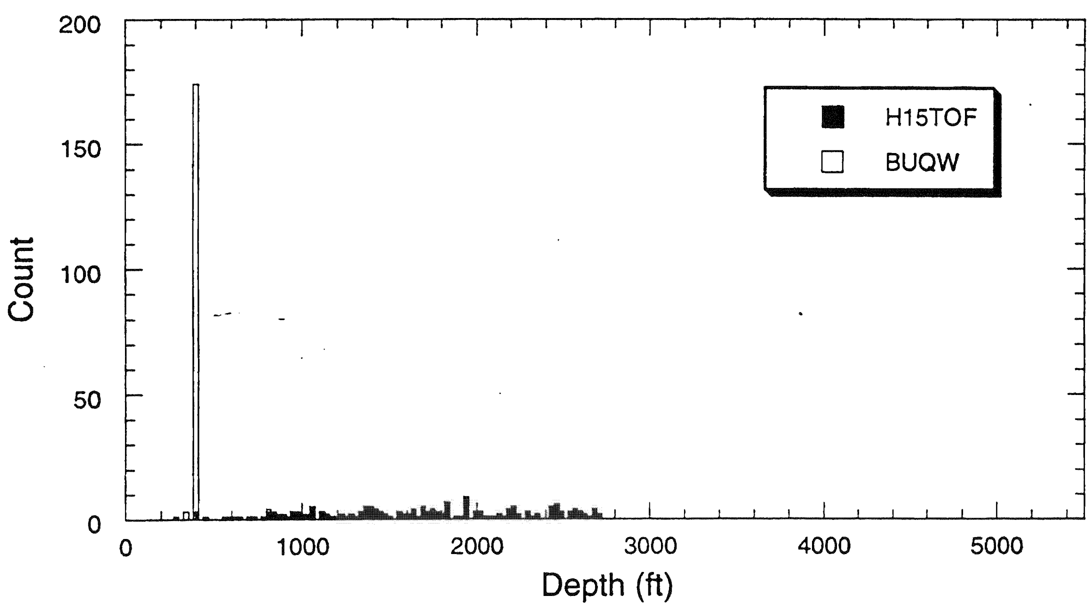
Esperson Dome



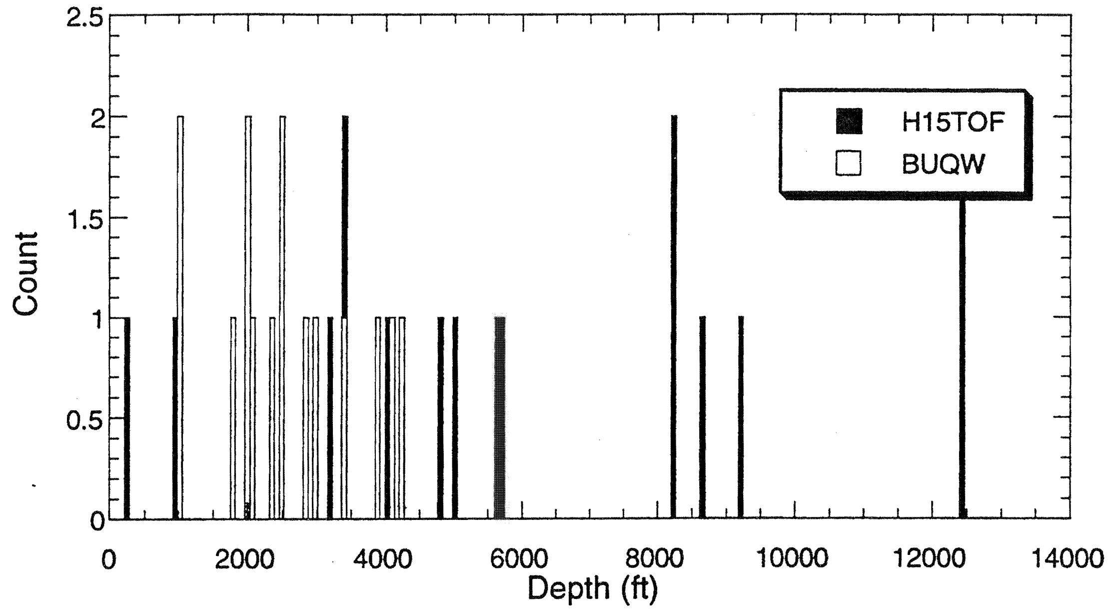
Fannett



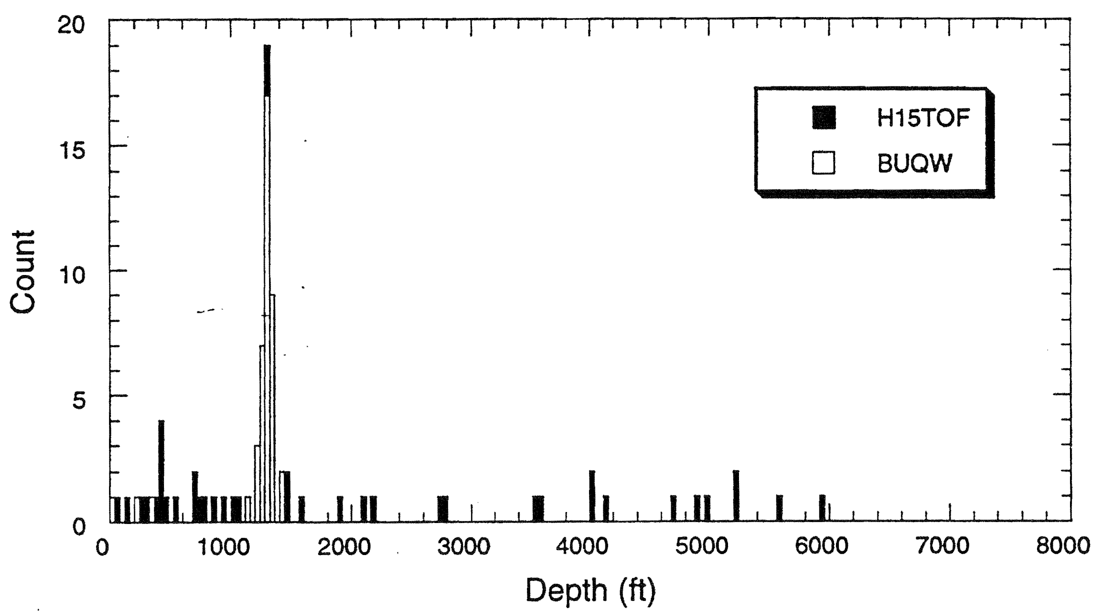
Geraldine (Ford)



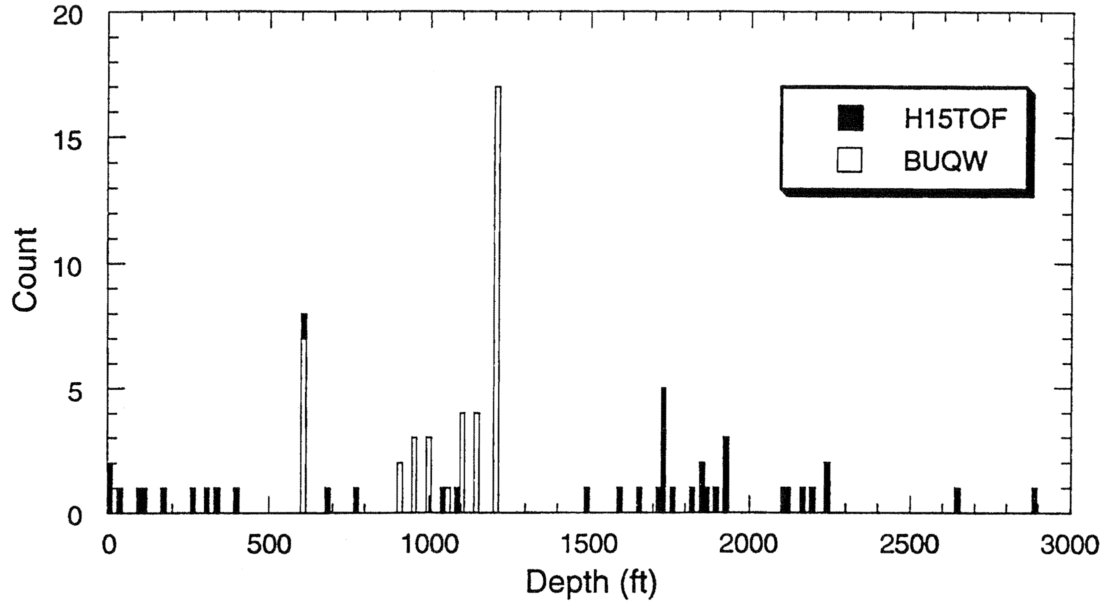
Giddings (Austin Chalk-3)



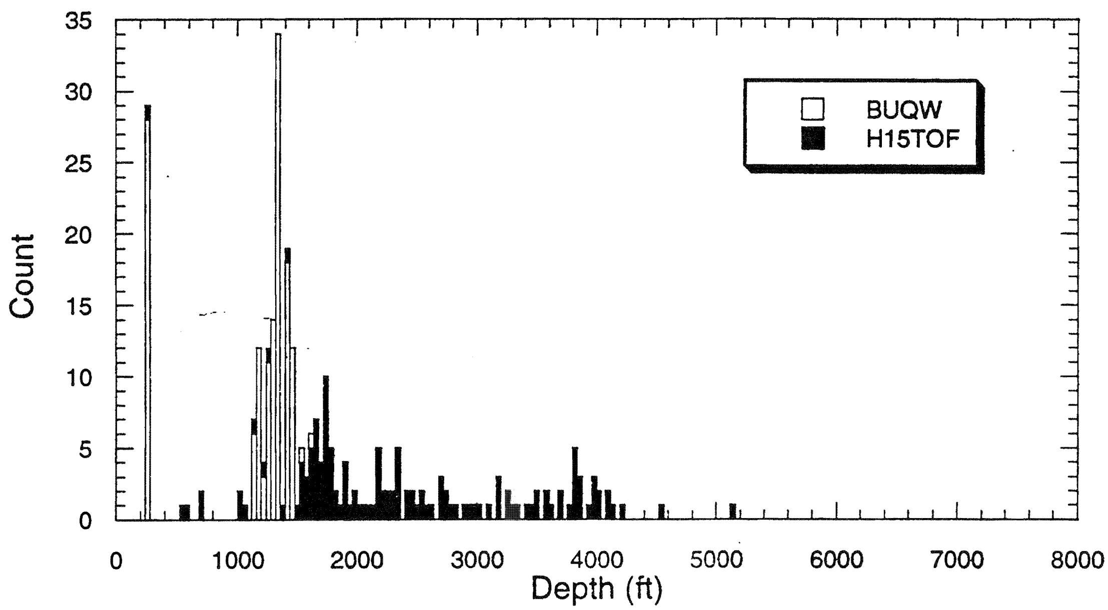
Goldsmith (5600)



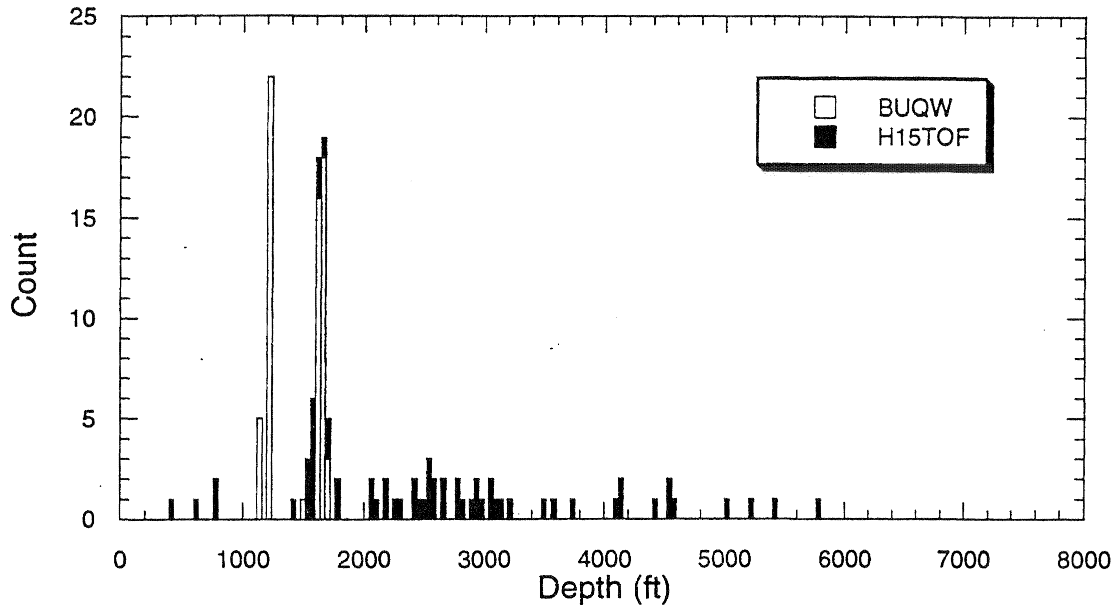
Goose Creek



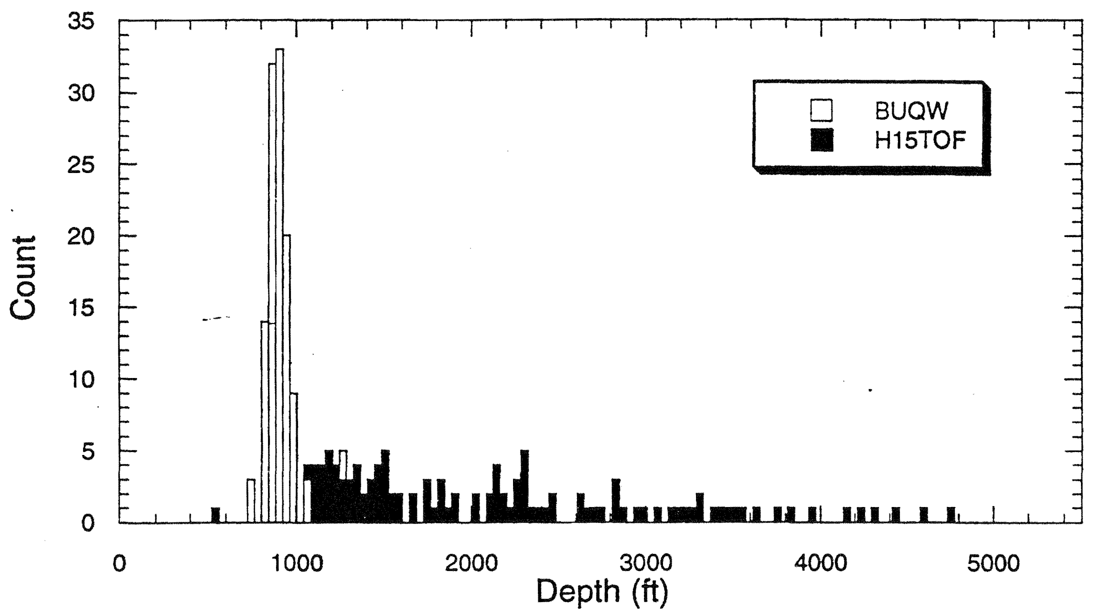
Harper



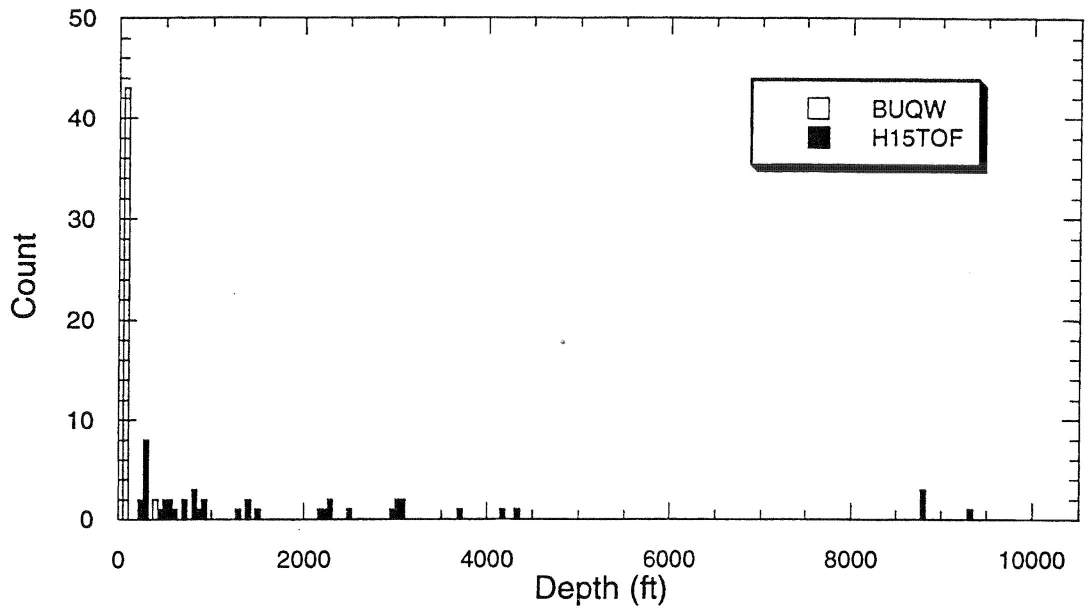
Hasting East



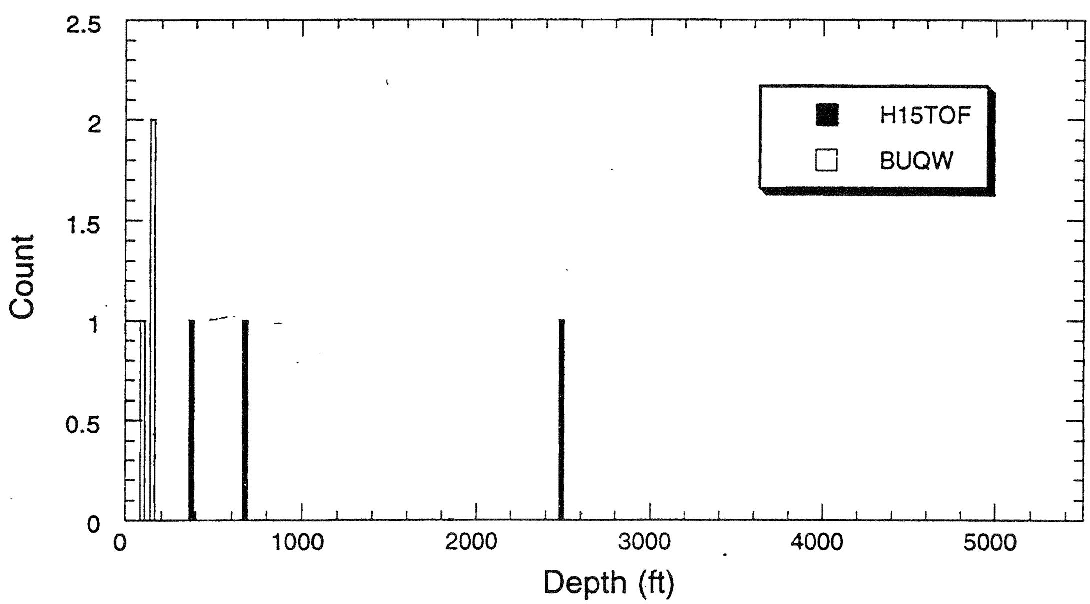
Hawkins



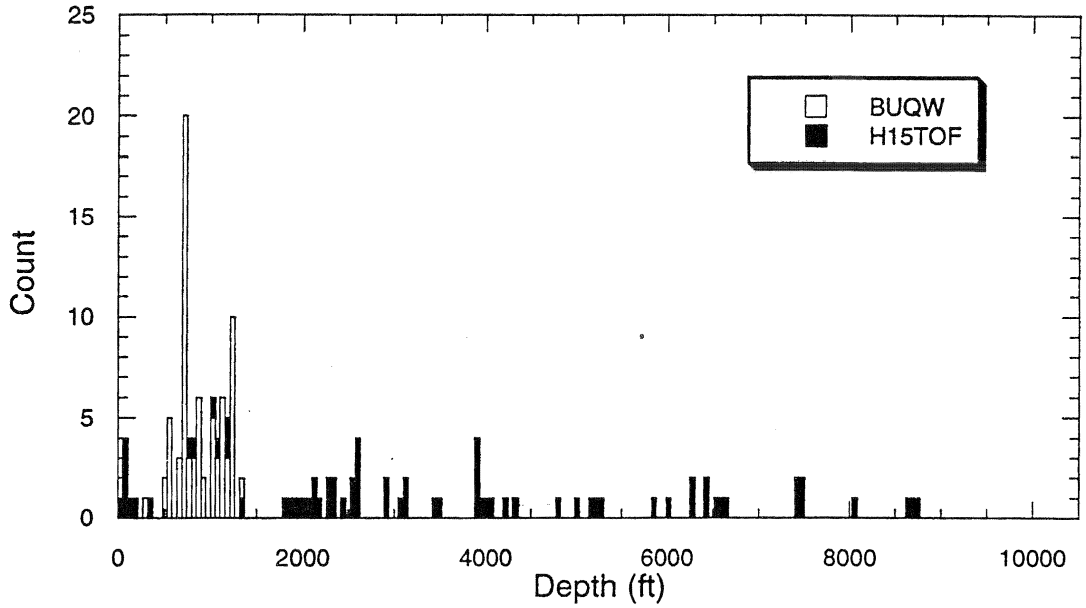
High Island



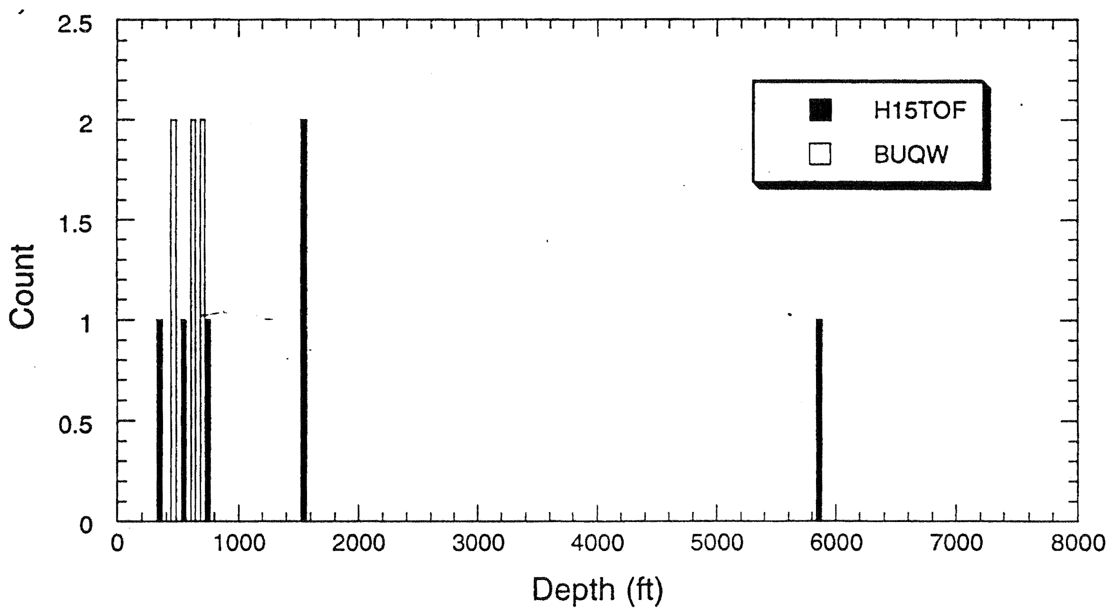
Howard Glasscock (Clear Fork, Middle)



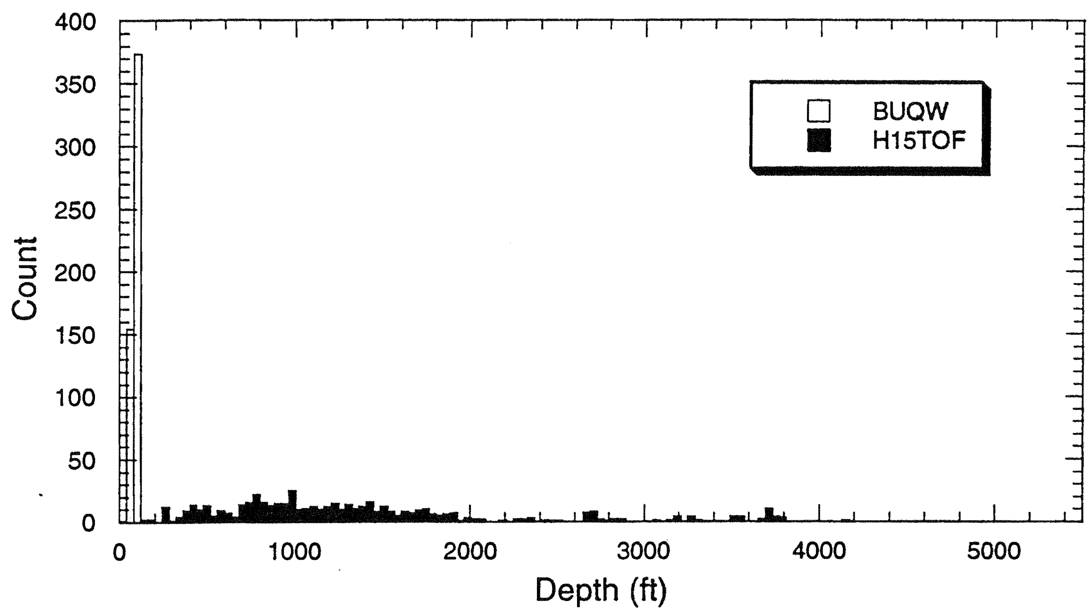
Hull



John Scott (Grayburg)

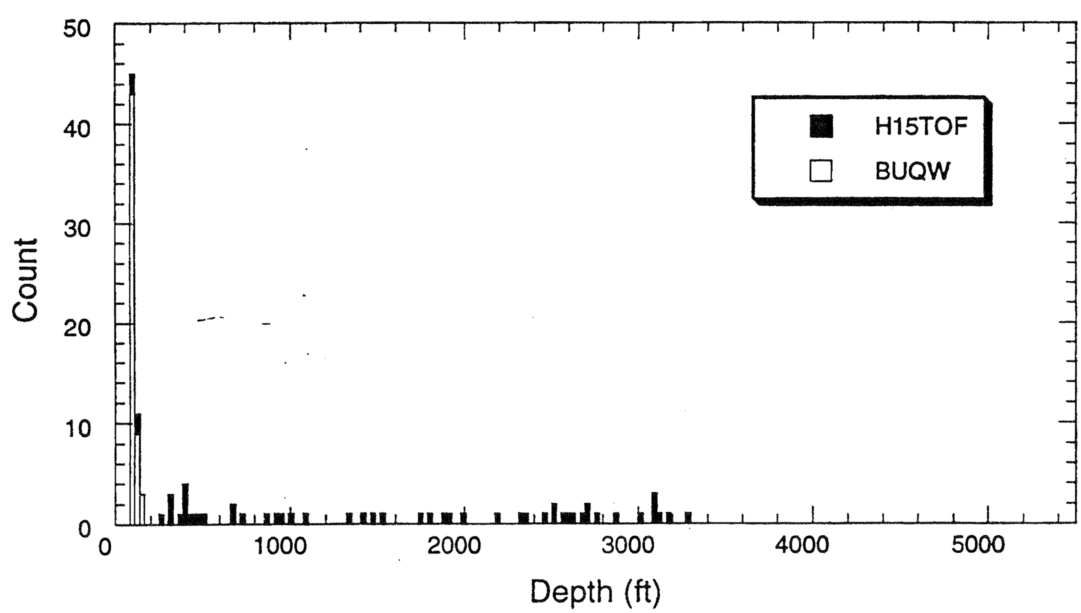


K-M-A



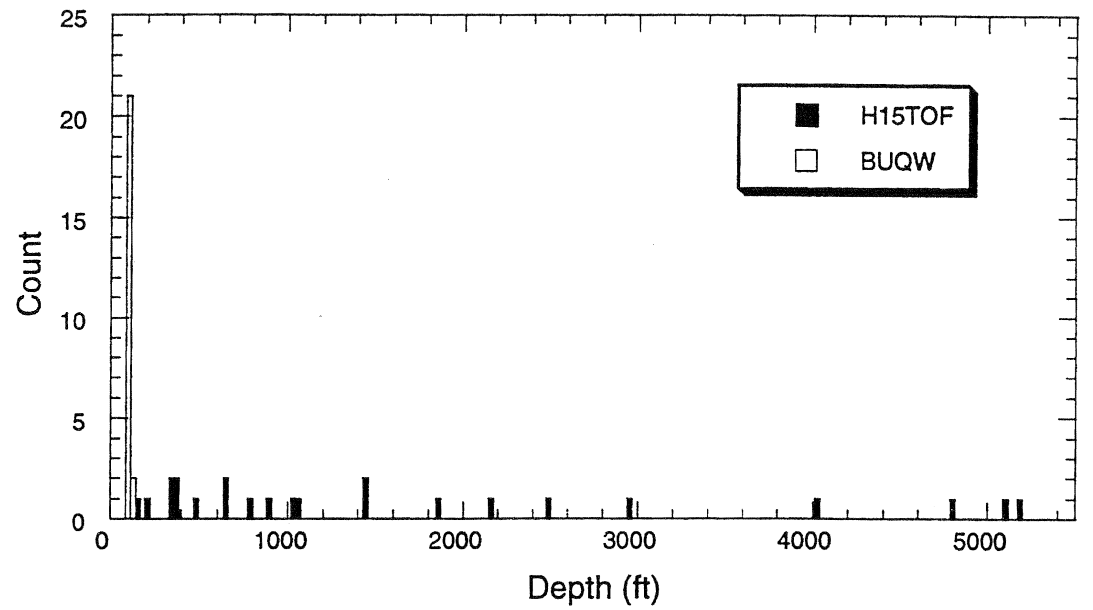
400
350
300
250
200
150
100
50
0
Count
0
1000
2000
3000
4000
5000
Depth (ft)
BUQW
H15TOF

Katz

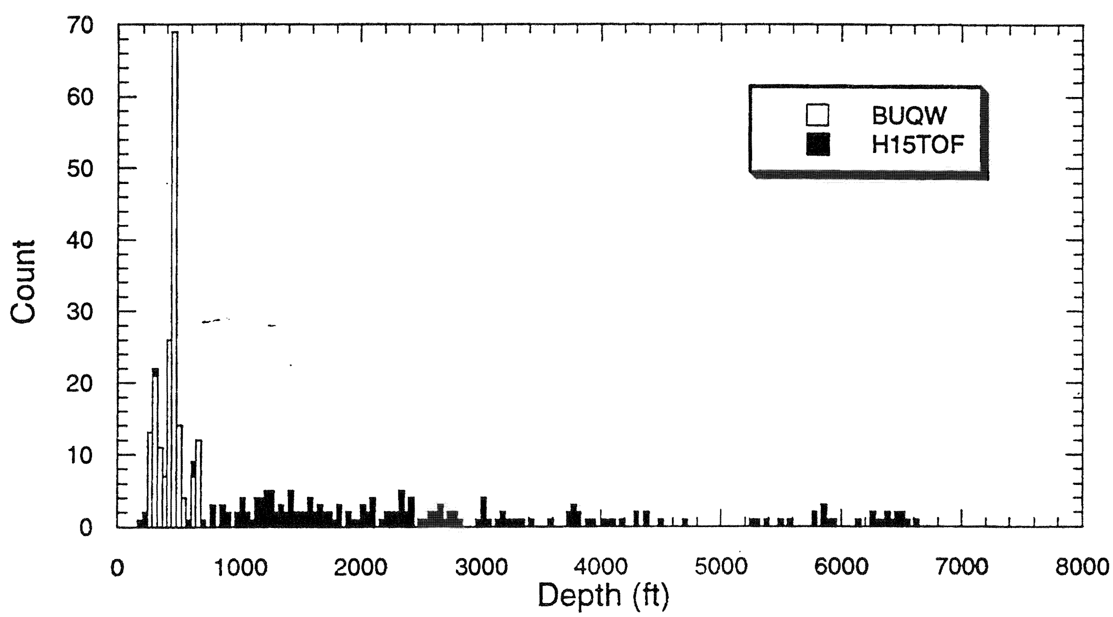


50
40
30
20
10
0
Count
0
1000
2000
3000
4000
5000
Depth (ft)
H15TOF
BUQW

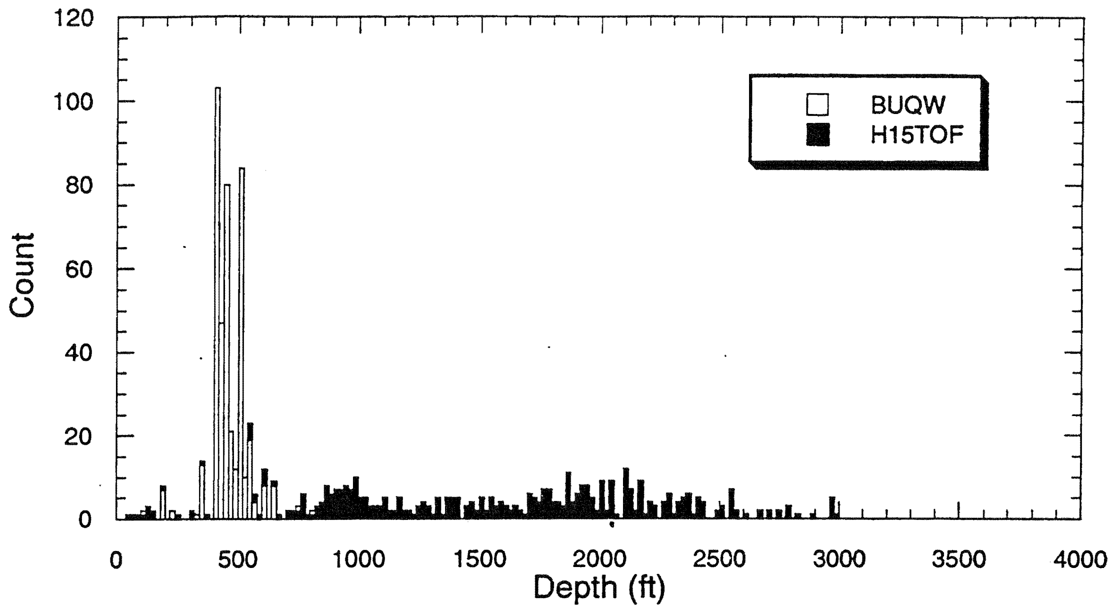
Katz (5100)



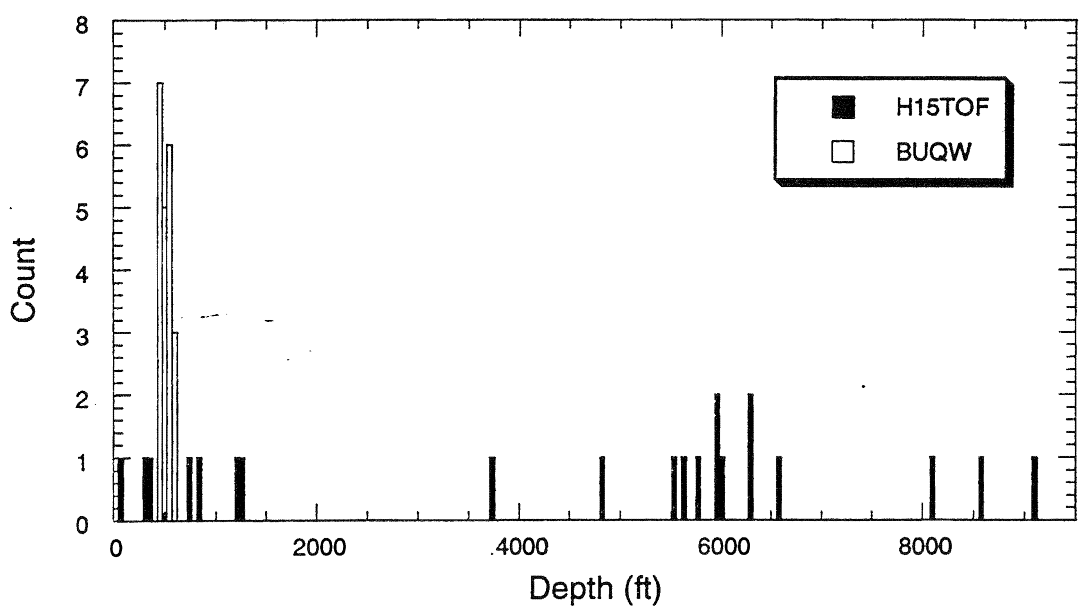
Kelly-Snyder



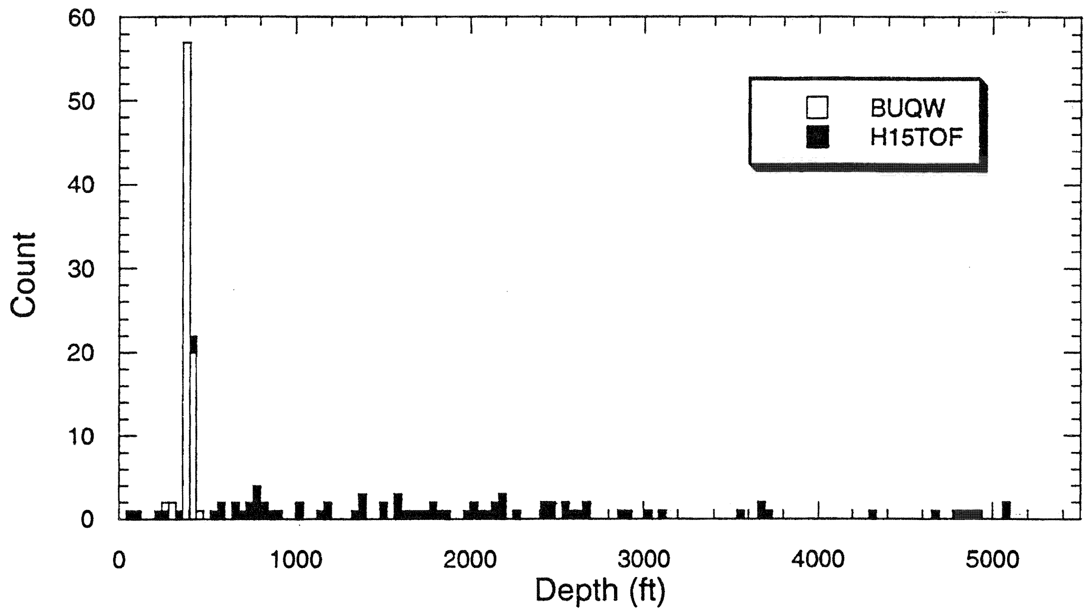
Kermit



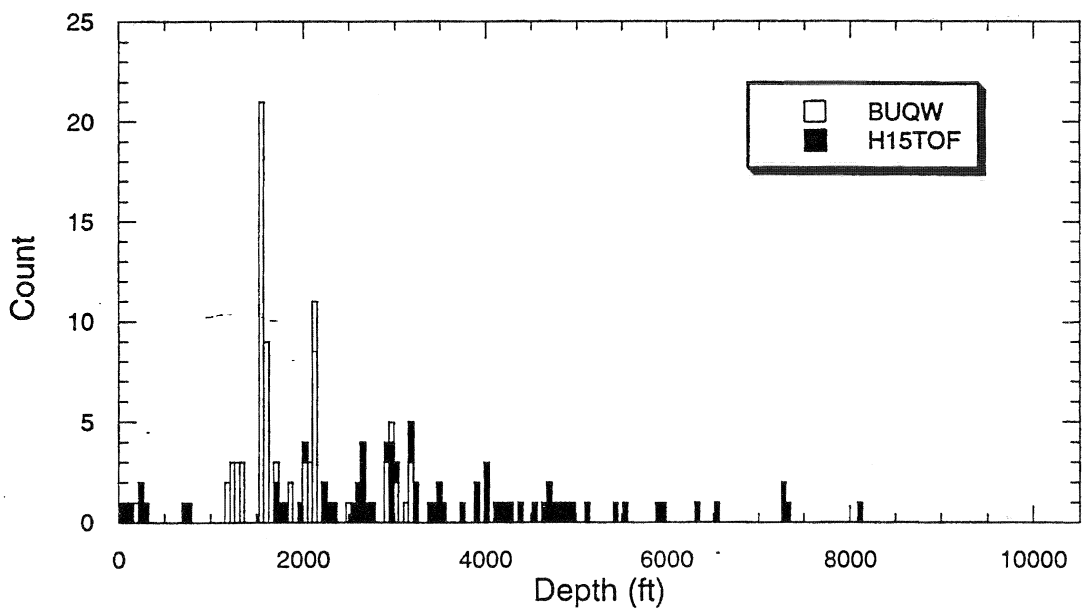
Keystone (Ellenburger)



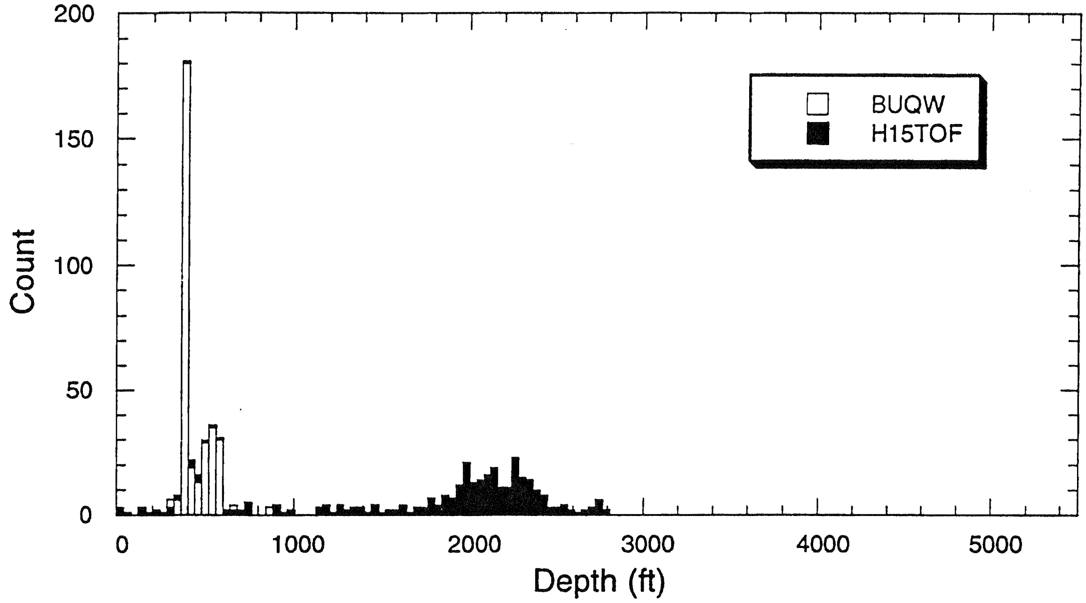
Levelland



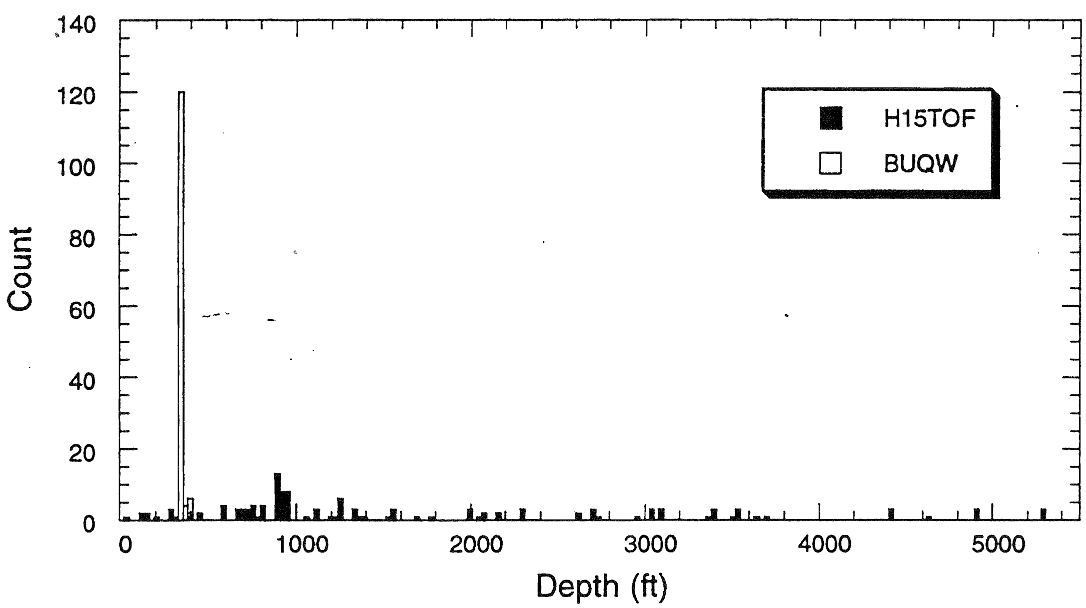
Liberty



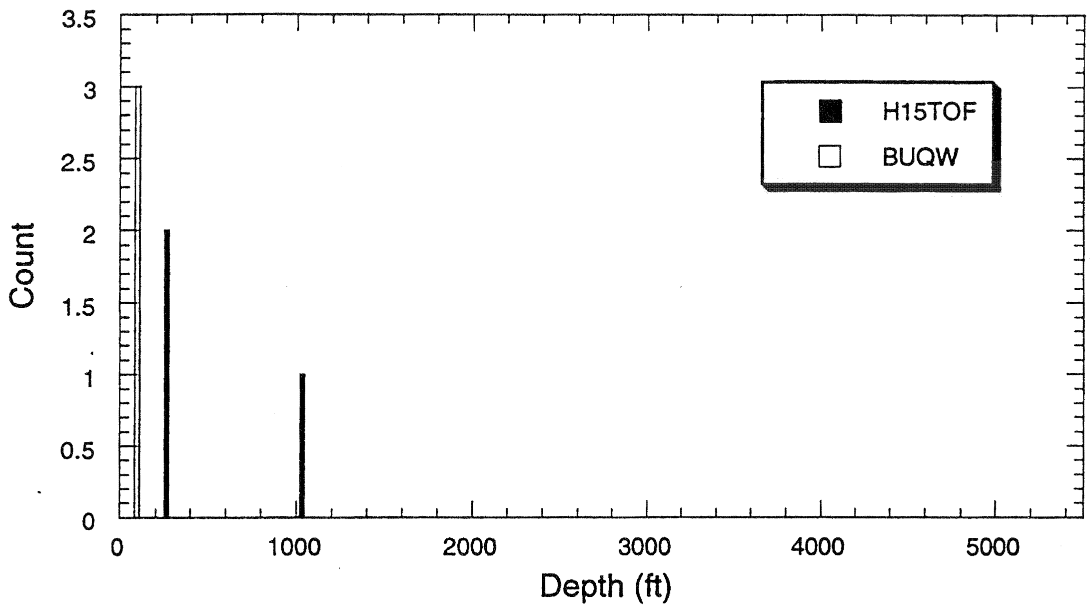
McCamey



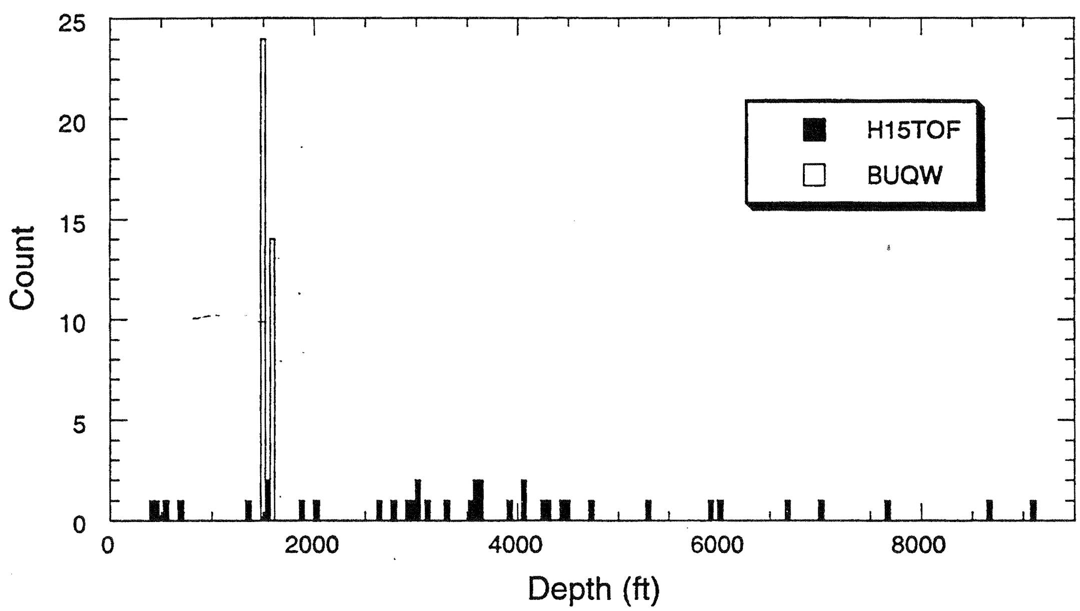
Nena Lucia (Strawn Reef)



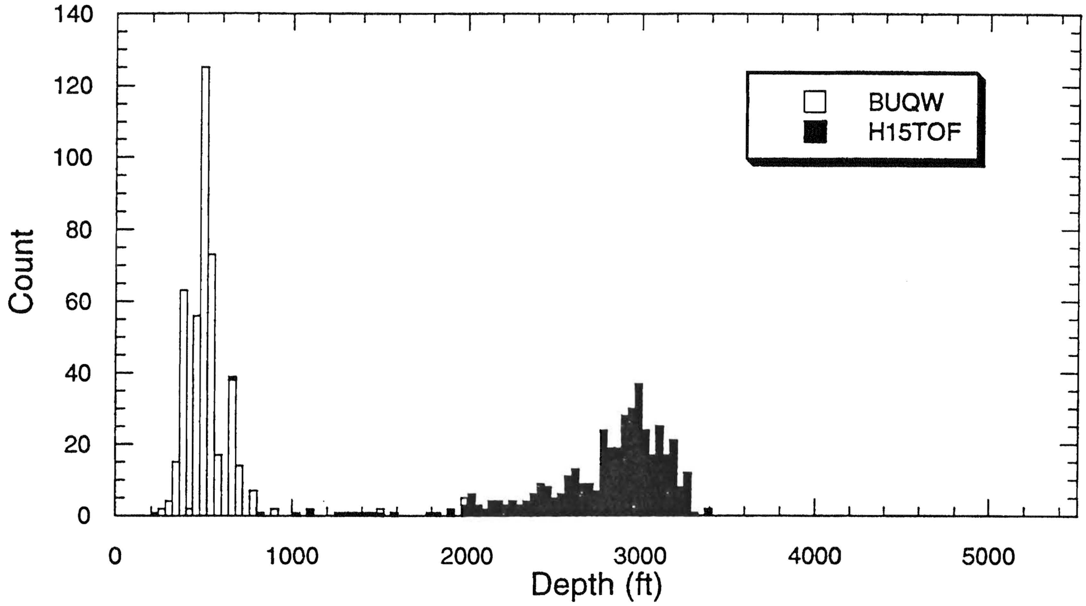
Obrien (Strawn)



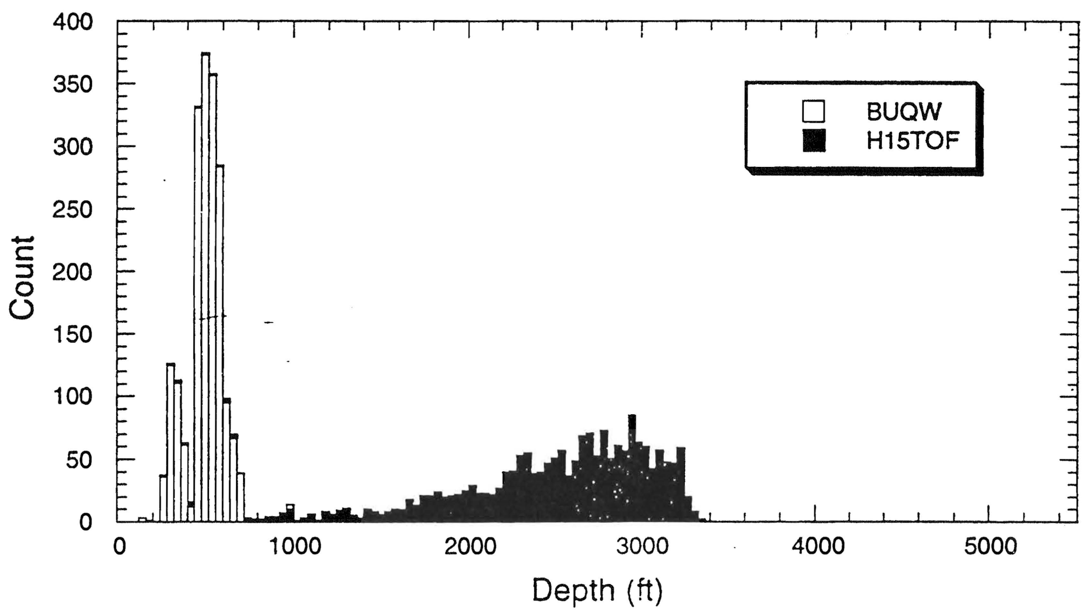
Old Ocean (Larsen)



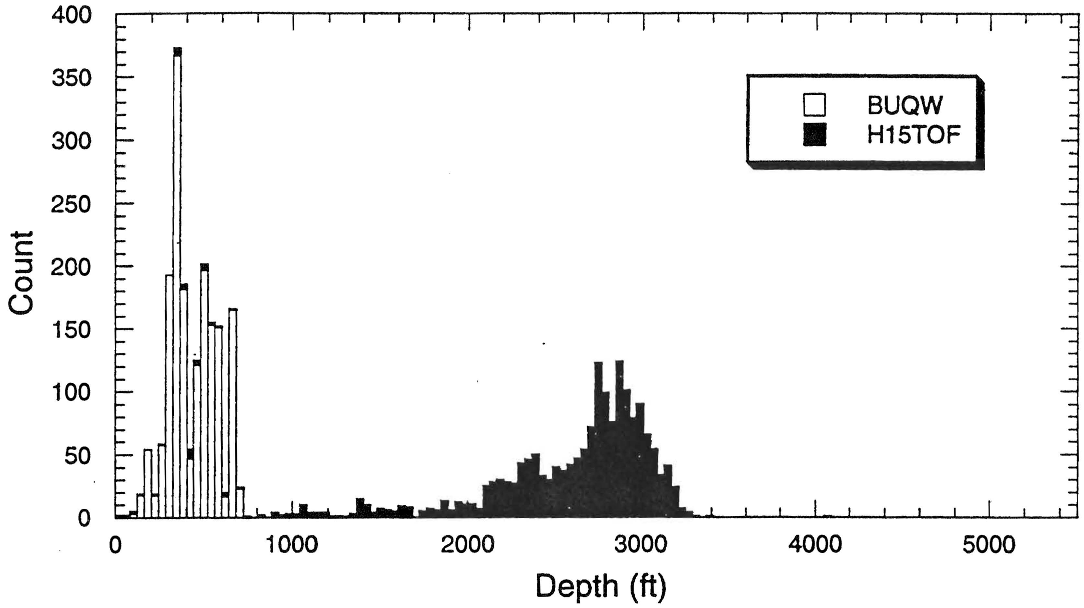
Panhandle Carson County Field



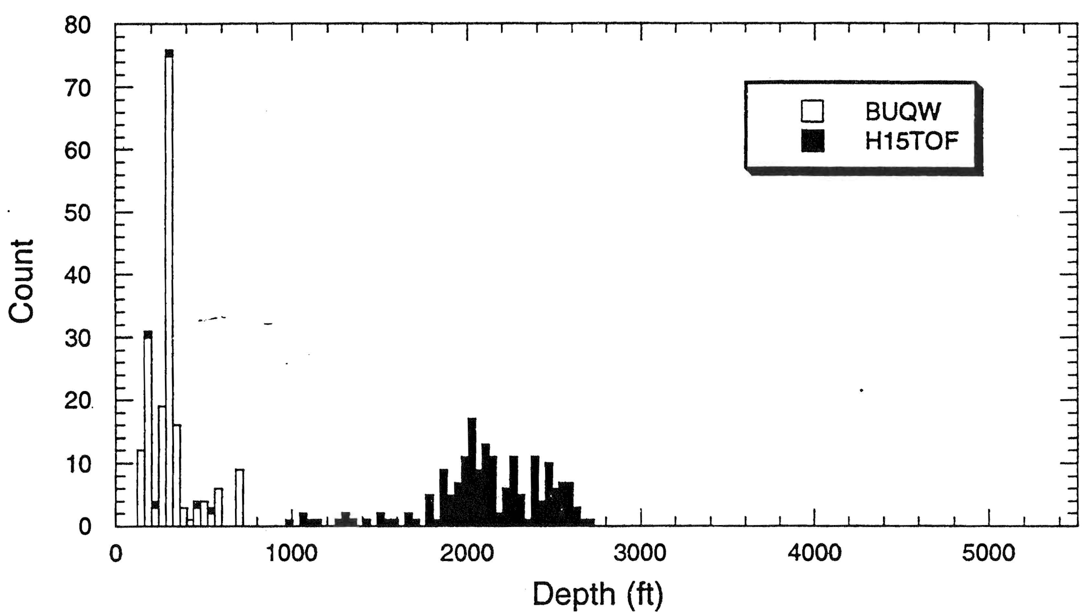
Panhandle Gray County Field



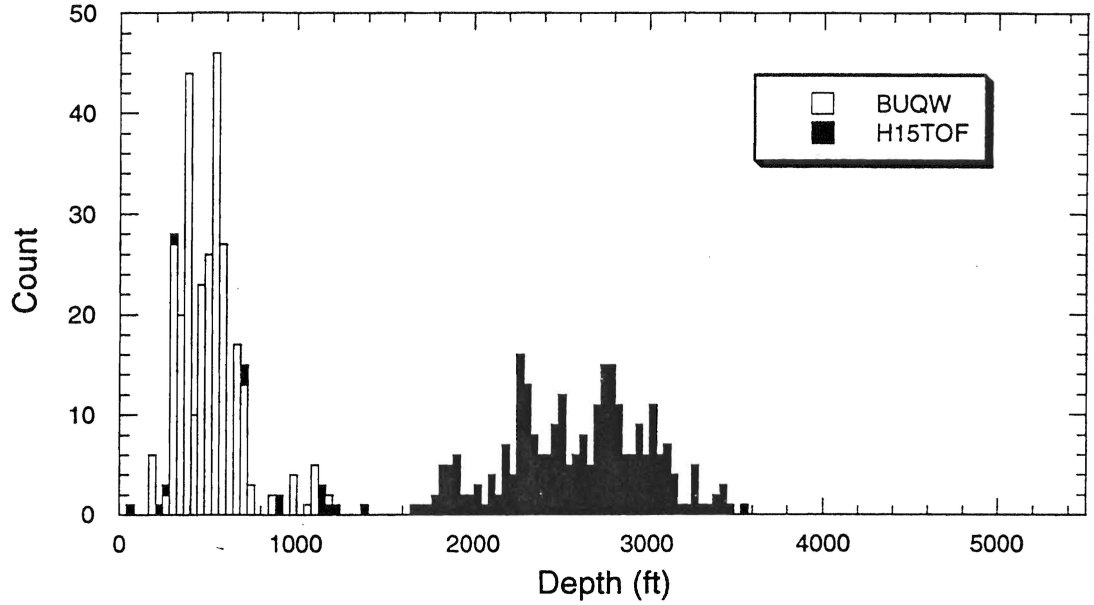
Panhandle Hutchinson County Field



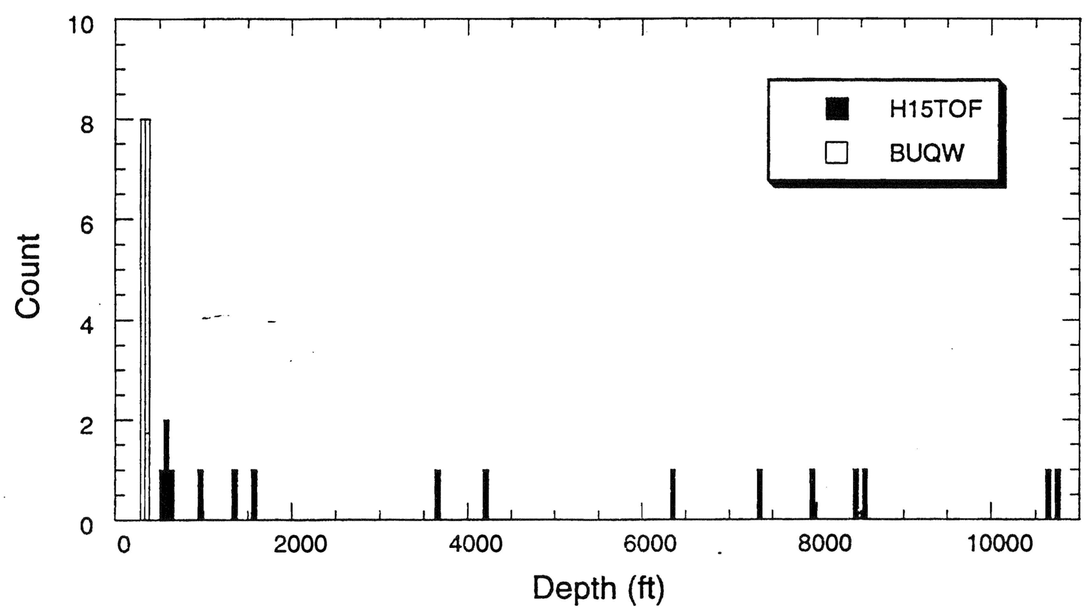
Panhandle Wheeler County Field



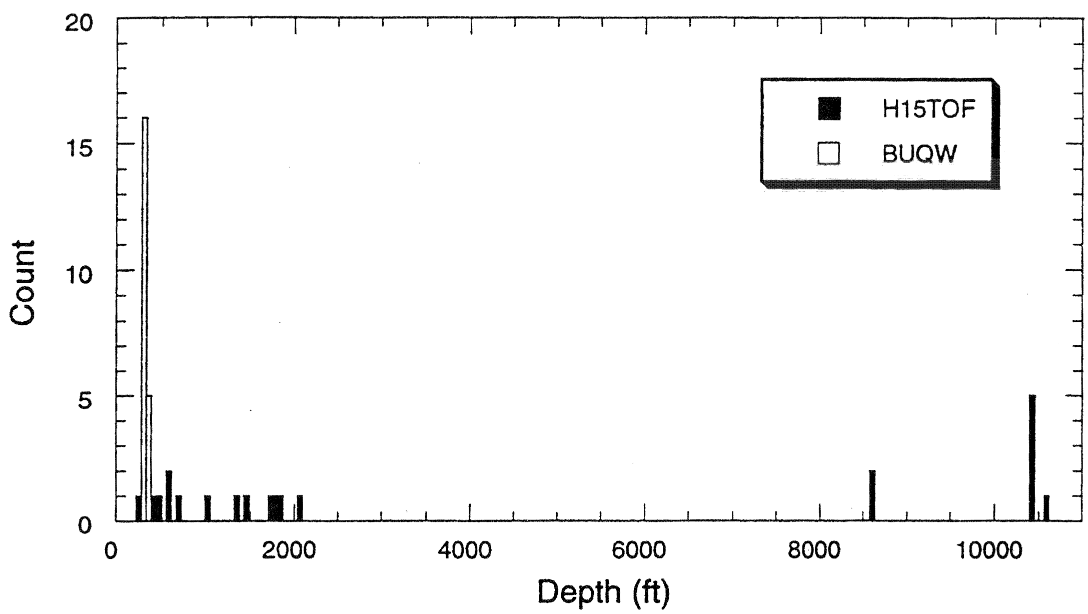
Panhandle, West



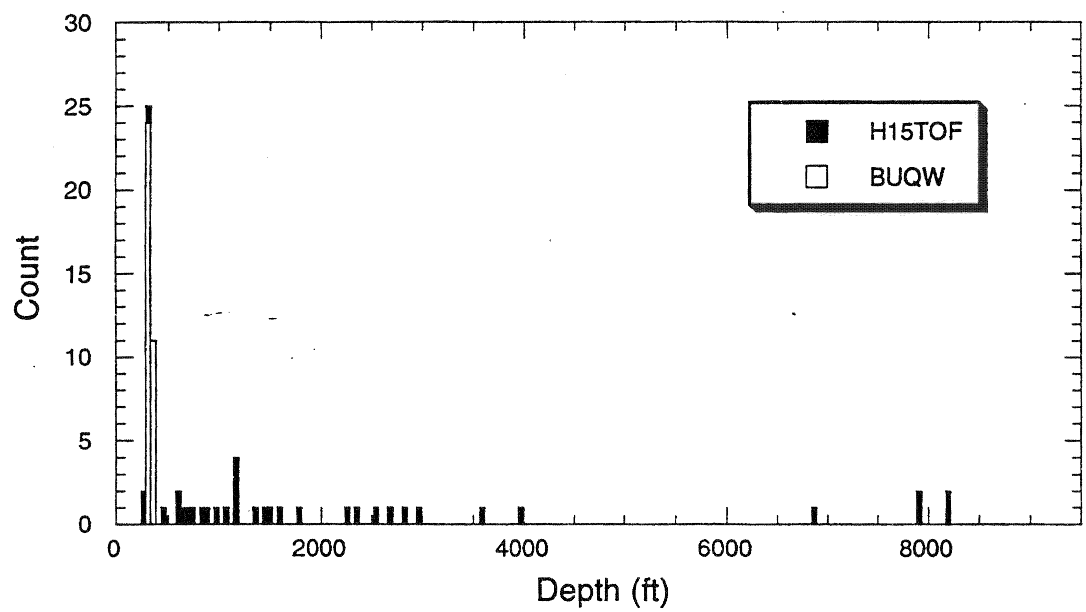
Pegasus (Devonian)



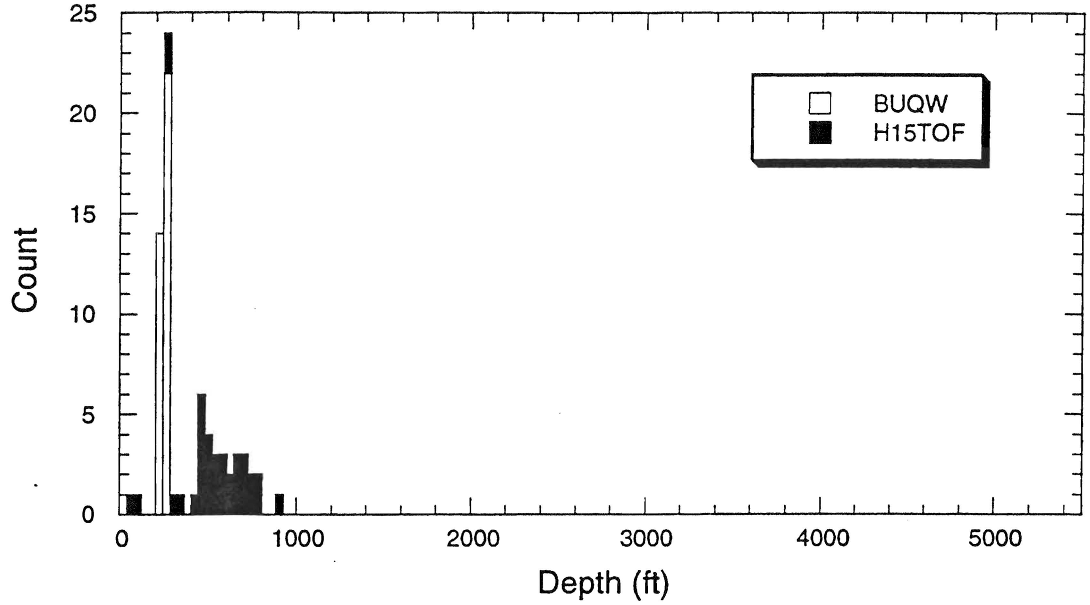
Pegasus (Pennsylvanian)



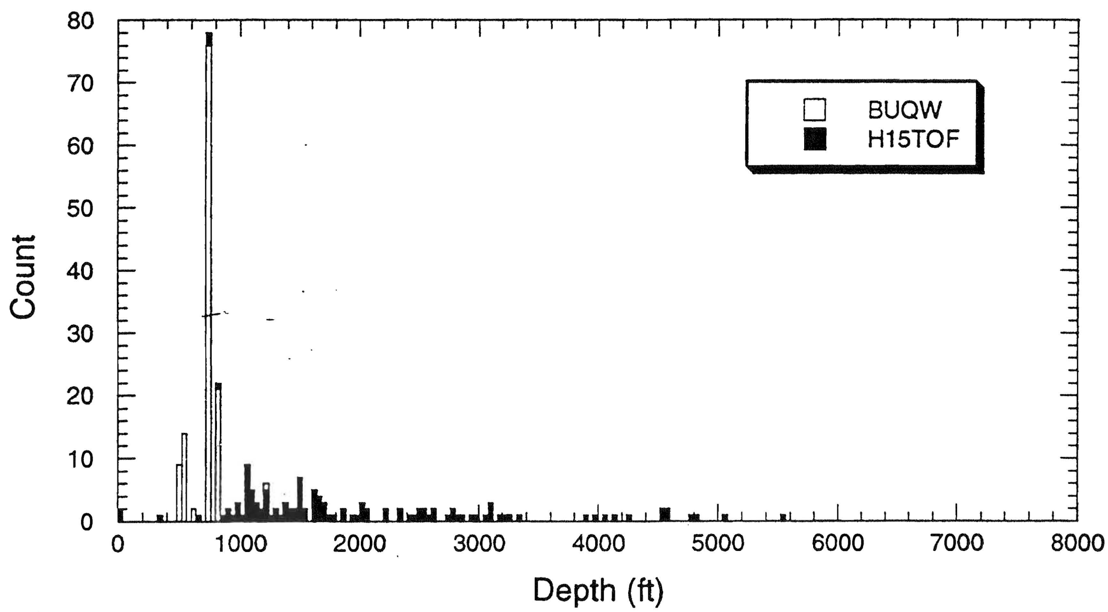
Pegasus (Sprayberry)



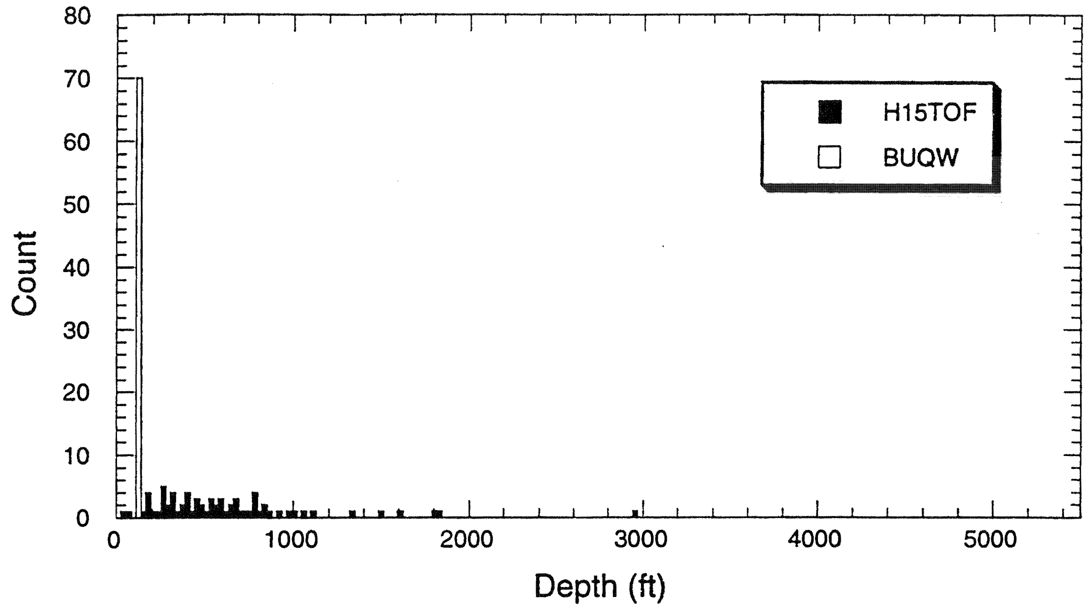
Pewitt Ranch



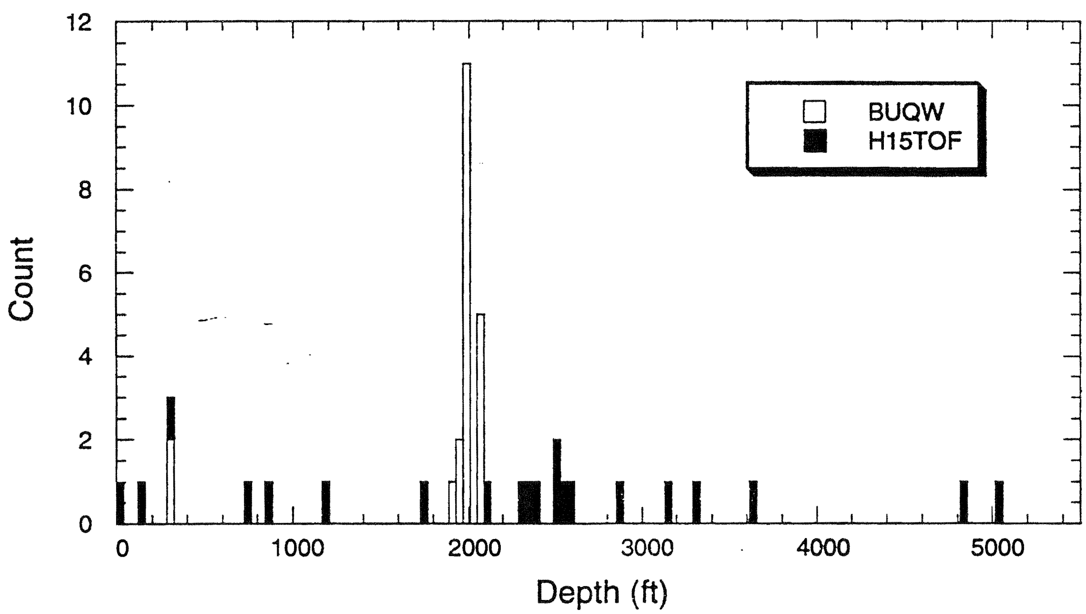
Plymouth



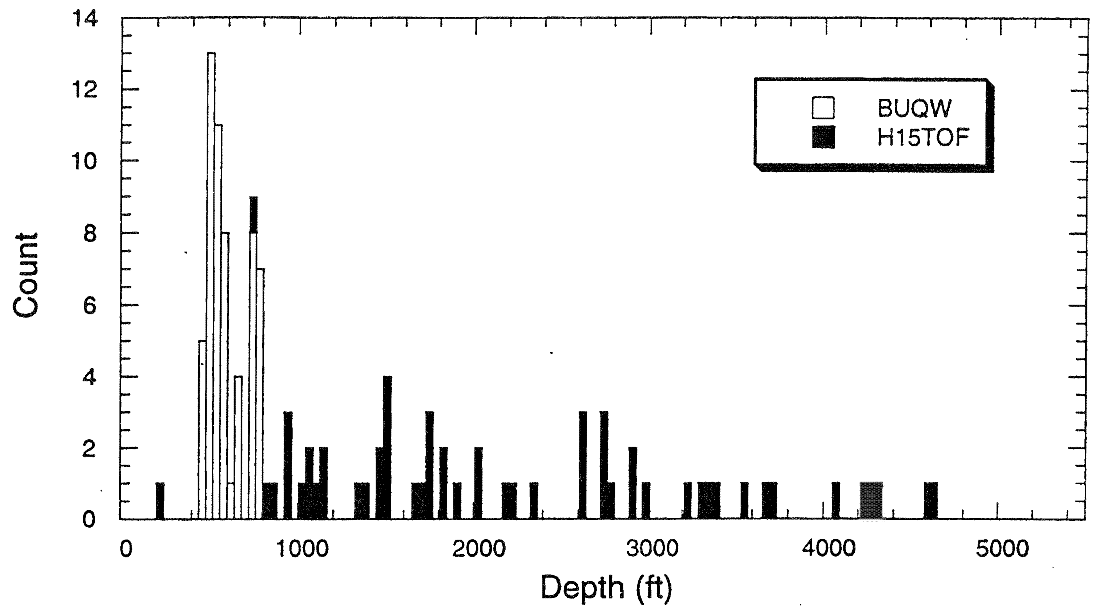
Round Top (Palo Pinto Reef)



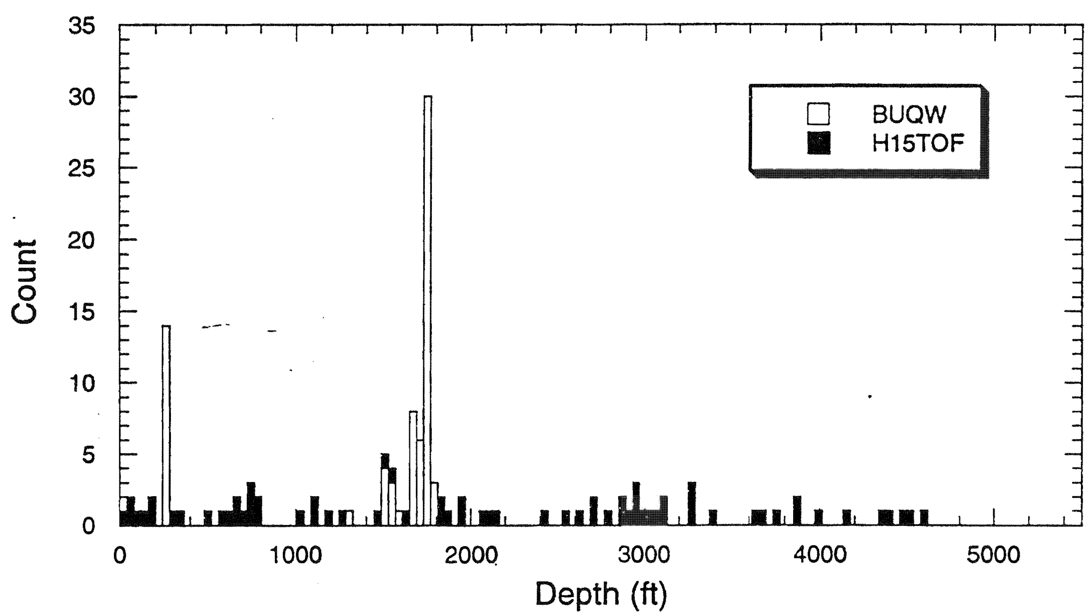
Russell, North (Devonian)



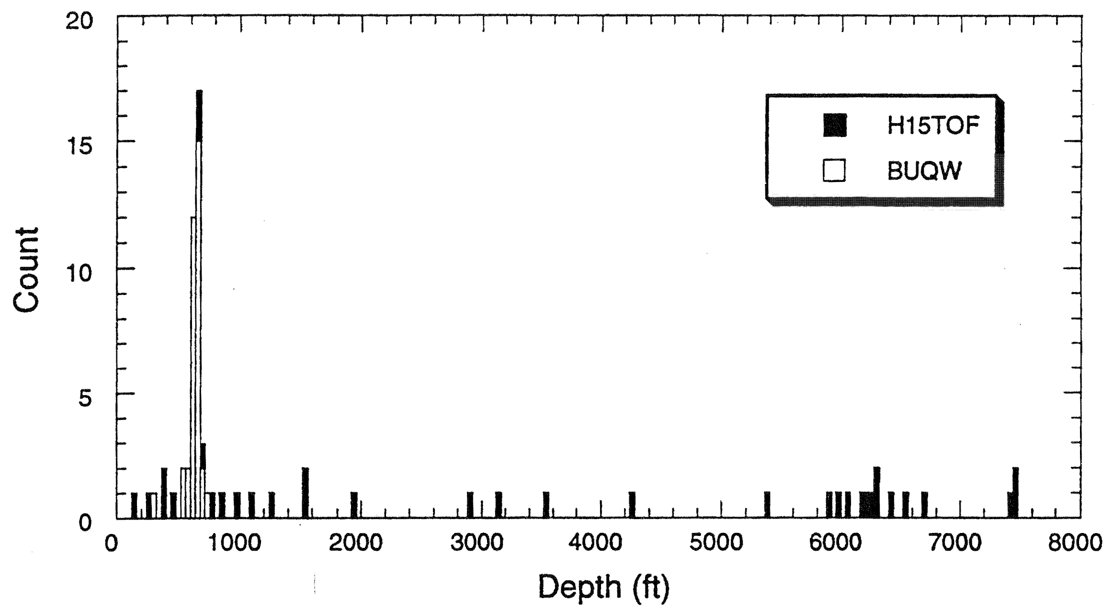
Sand Hills (Tubb)



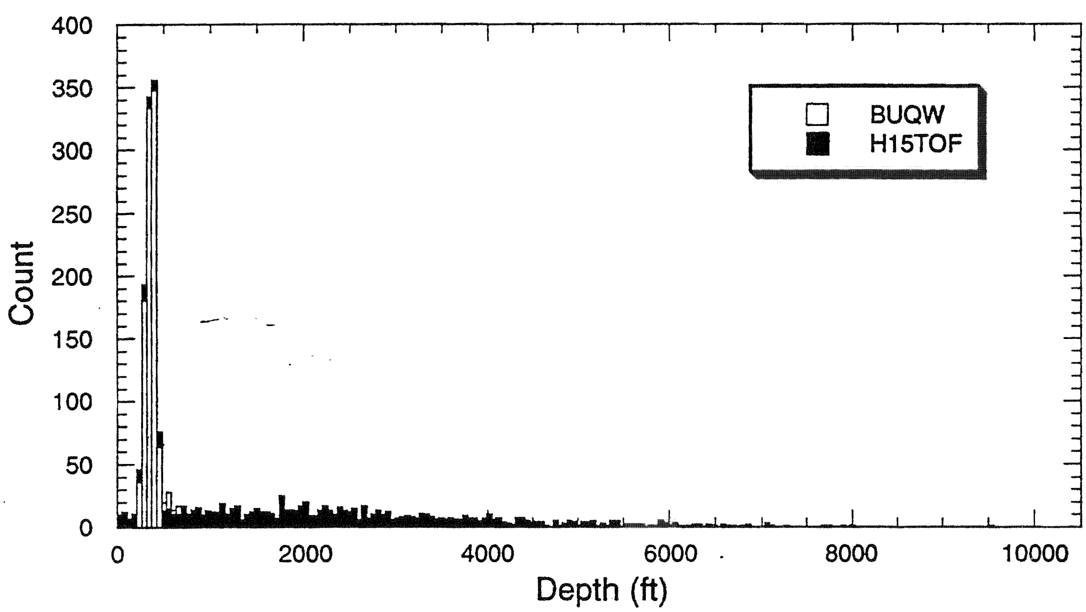
Shafter Lake (San Andres)



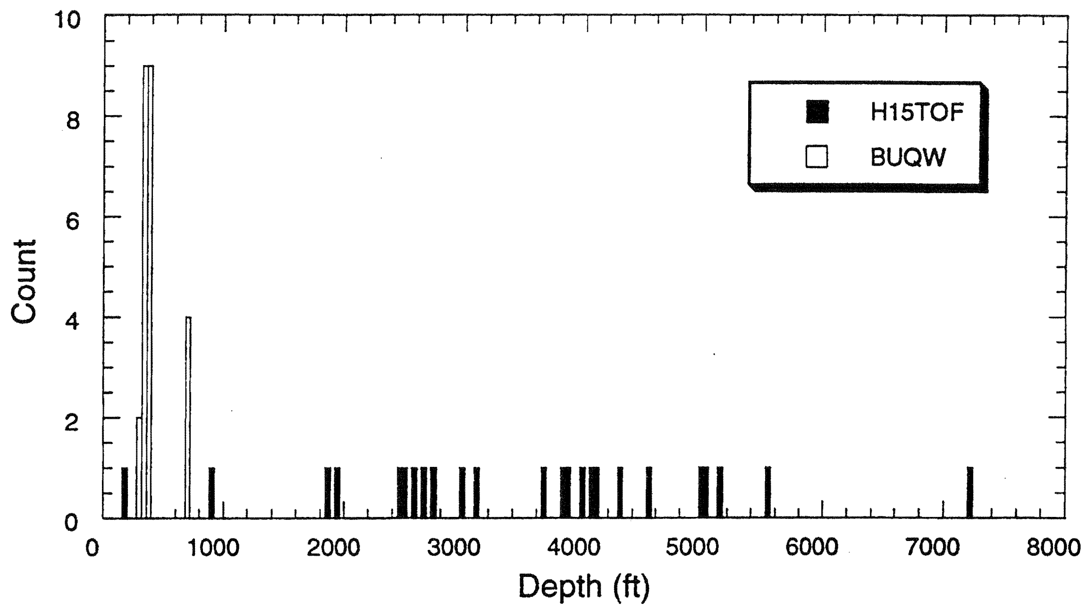
Sivells Bend



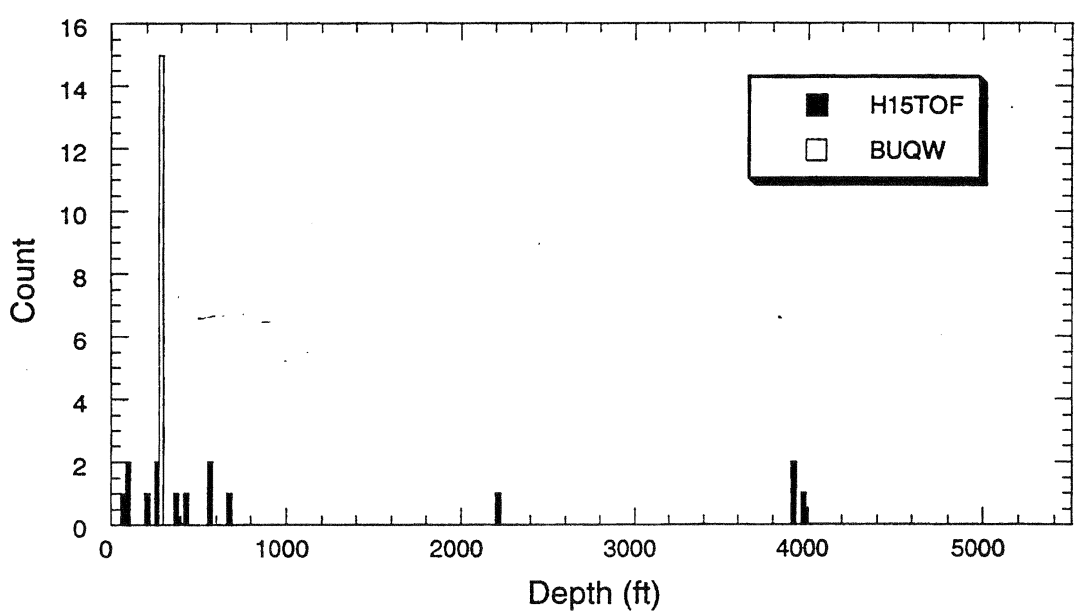
Spraberry (Trend Area)



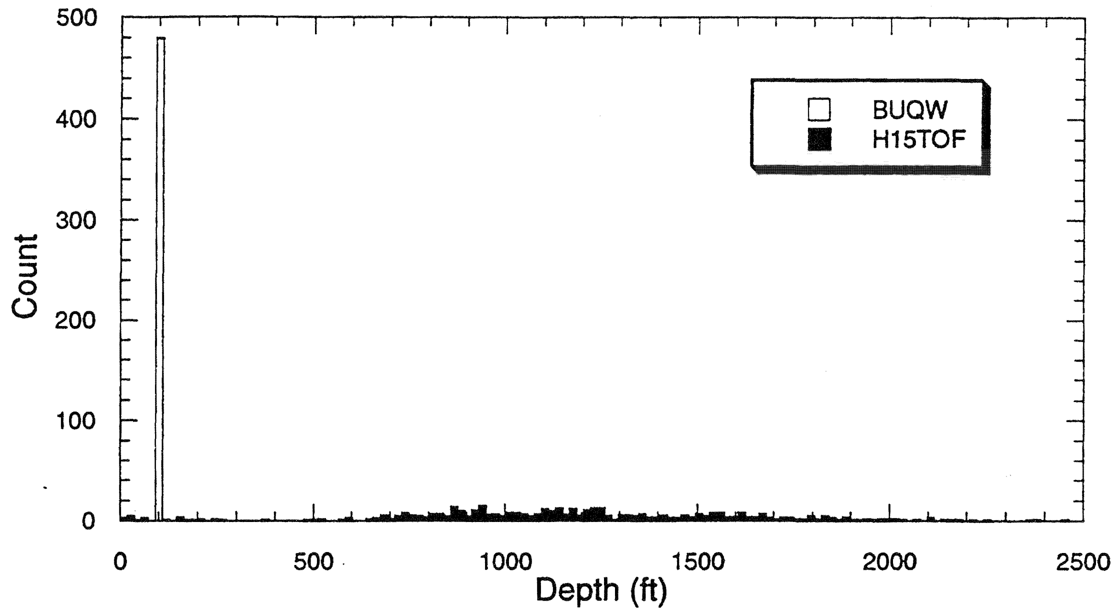
Sprayberry (Trend Area Clear Fork)



Sprayberry, West (Deep)

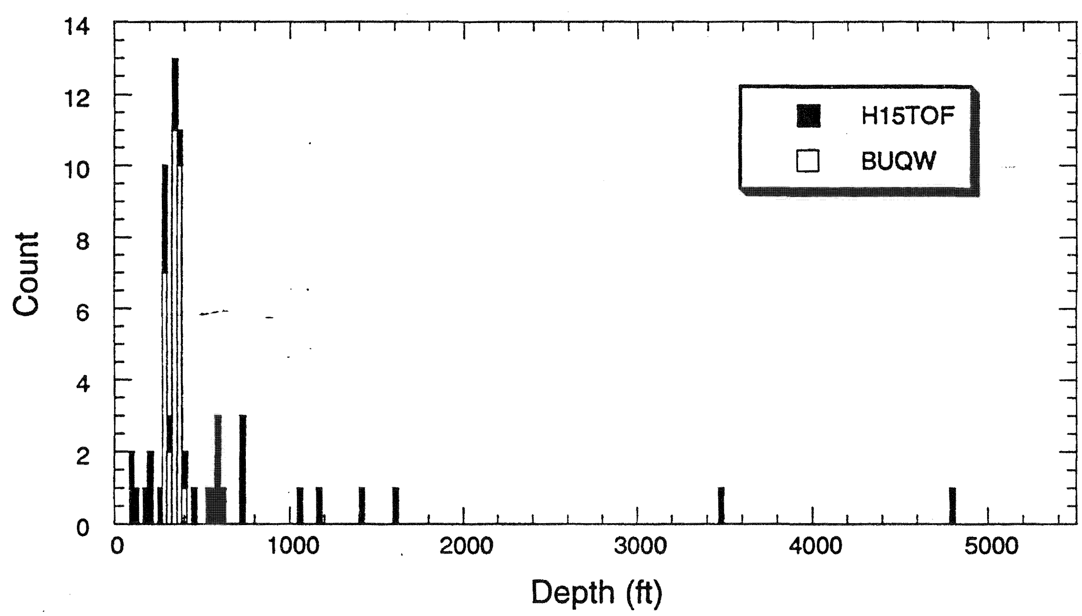


Talco



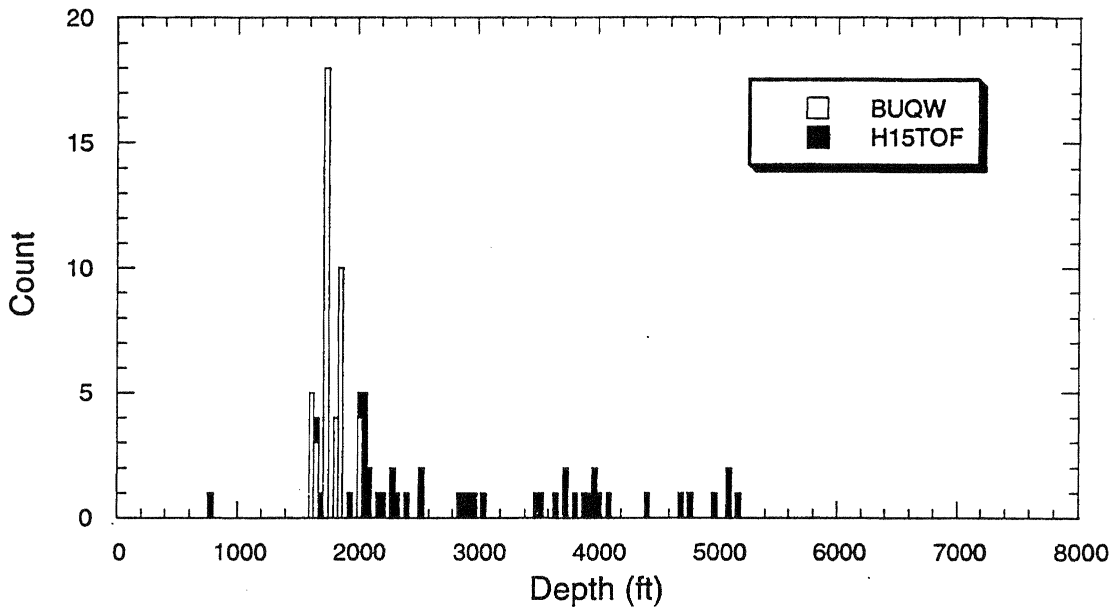
500
400
300
200
100
0
Count
0
500
1000
1500
2000
2500
Depth (ft)
BUQW
H15TOF

Welch



14
12
10
8
6
4
2
0
Count
0
1000
2000
3000
4000
5000
Depth (ft)
H15TOF
BUQW

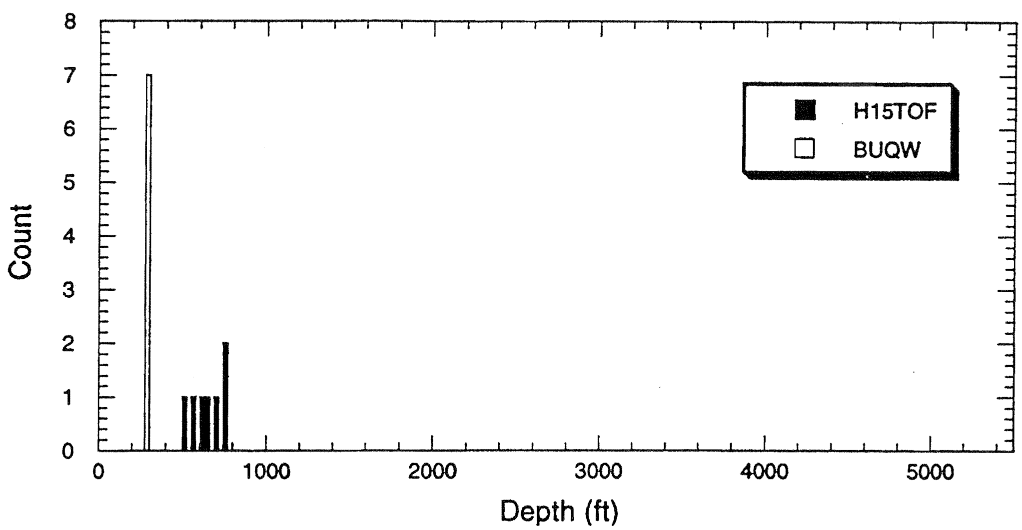
Withers, North



Appendix A-3

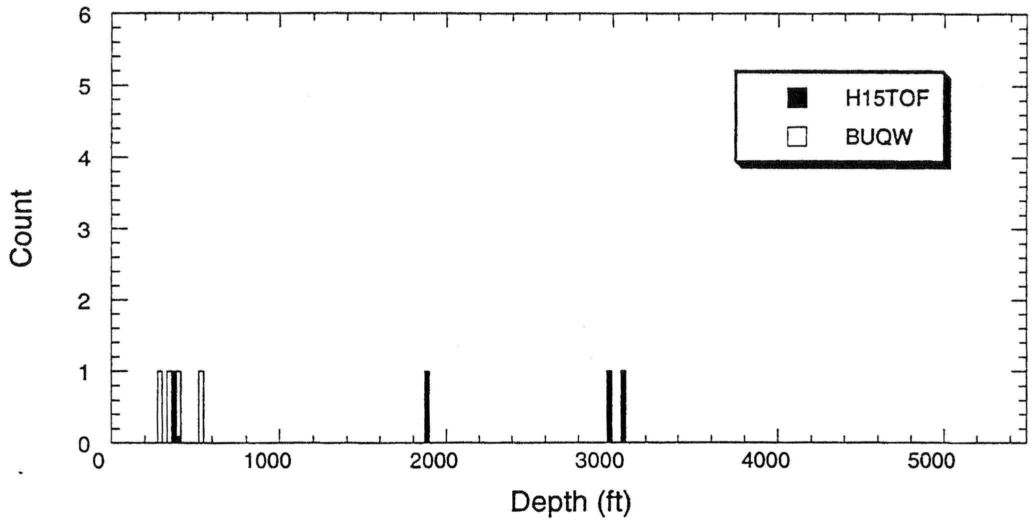
AOR Field Histograms - MAYBE Category

Adair (Wolfcamp)



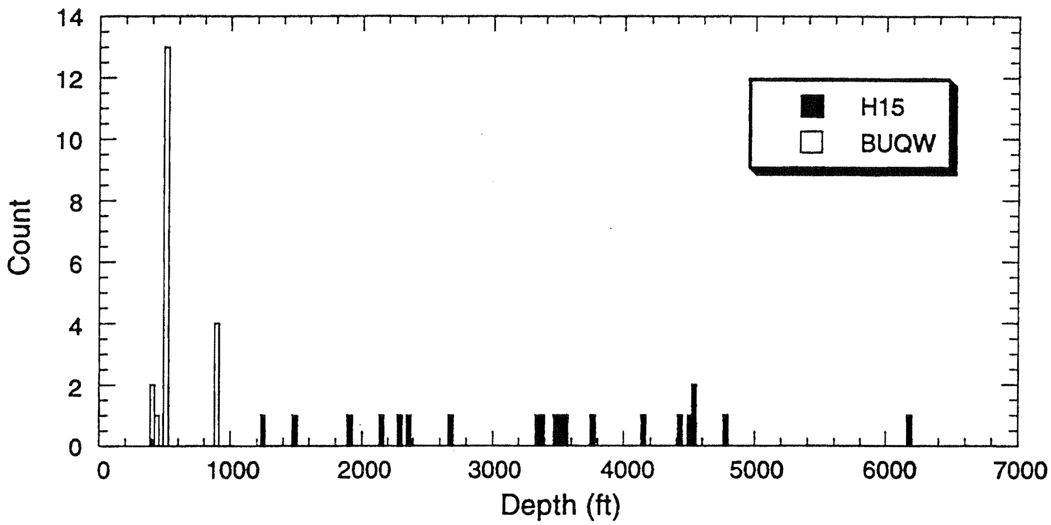
RRC District	**County**	**Number of UIC Wells**	**Depth of Production Zone (ft)**	**Year Field Discovered**
8A	Terry	19	????	????
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
7	3	514	768	142
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
300	300	1994-97	1394-1912	22

Bayview (Glorieta)



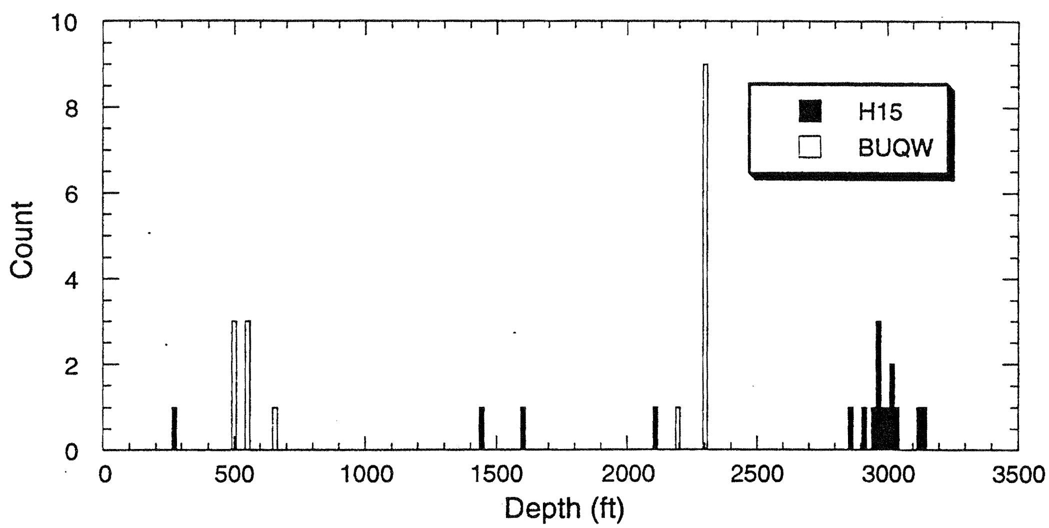
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Crane	6	2950	1961
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
4	3	366	3055	80
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
300	525	1994-97	2035-3025	7

Bradford (Tonkawa)



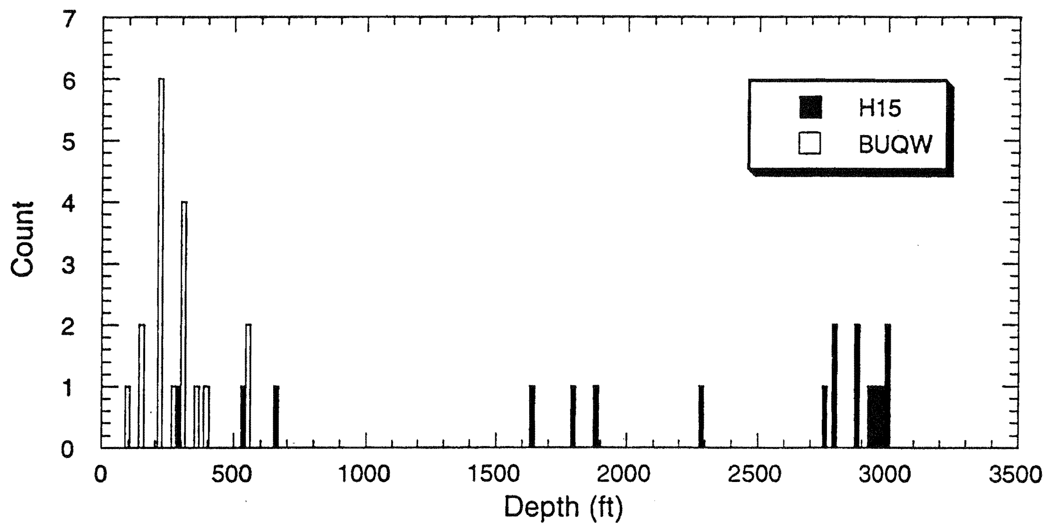
RRC District	**County**	**Number of UIC Wells**	**Depth of Production Zone (ft)**	**Year Field Discovered**
10	Lipscomb	6	6510	1958
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
20	8	1248	6174	3308
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
400	900	1995-98	No data - 6576	5

Brown & Thorp (Clear Fork)

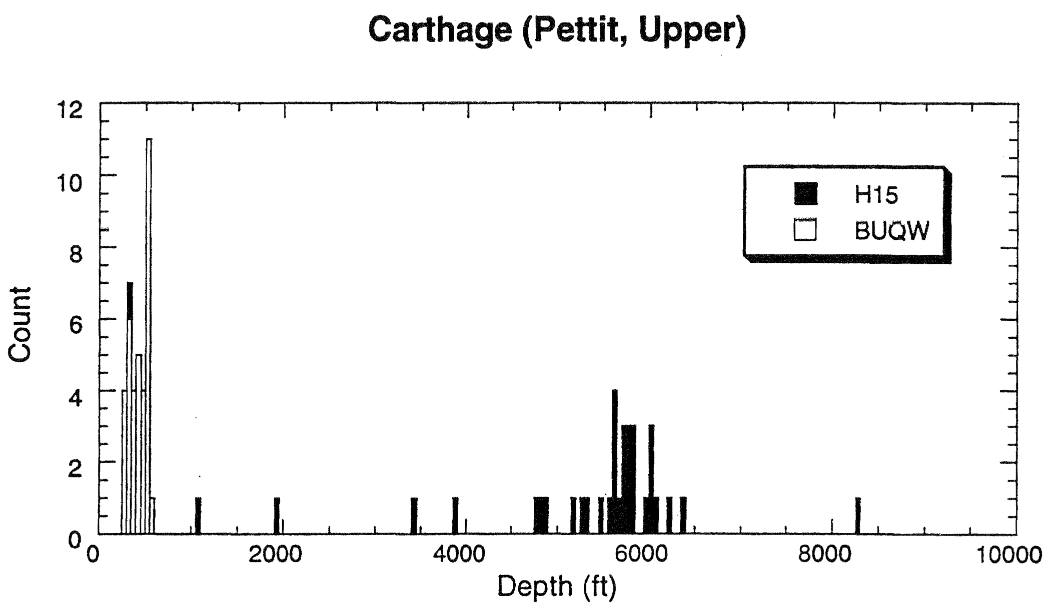


RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Pecos	9	3000	1950
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
17	5	263	3141	1562
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
500	2300	1993-98	3028-3140	10

Bryson, East

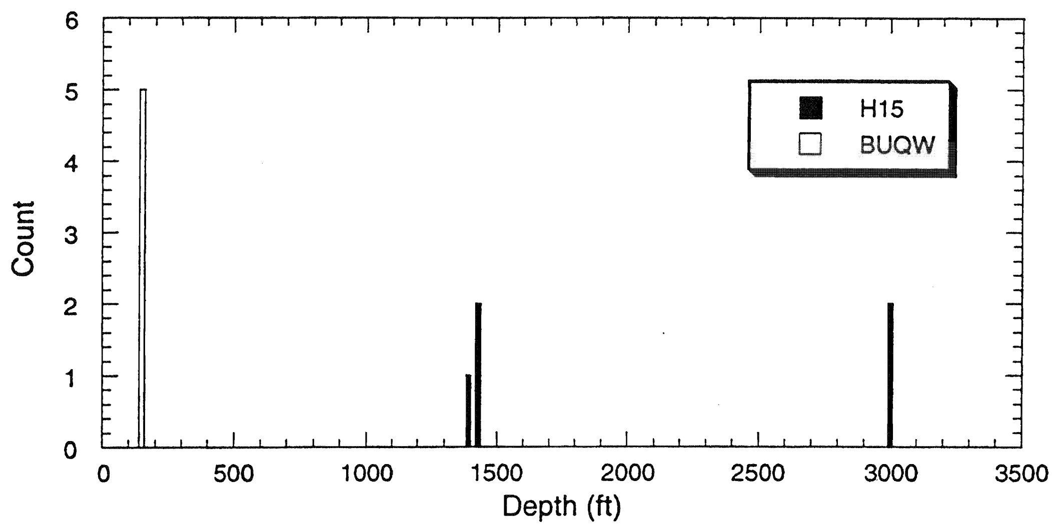


RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
9	Jack	20	2850	1936
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
18	10	290	2999	1273
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
100	550	1995-98	2884-3174	33



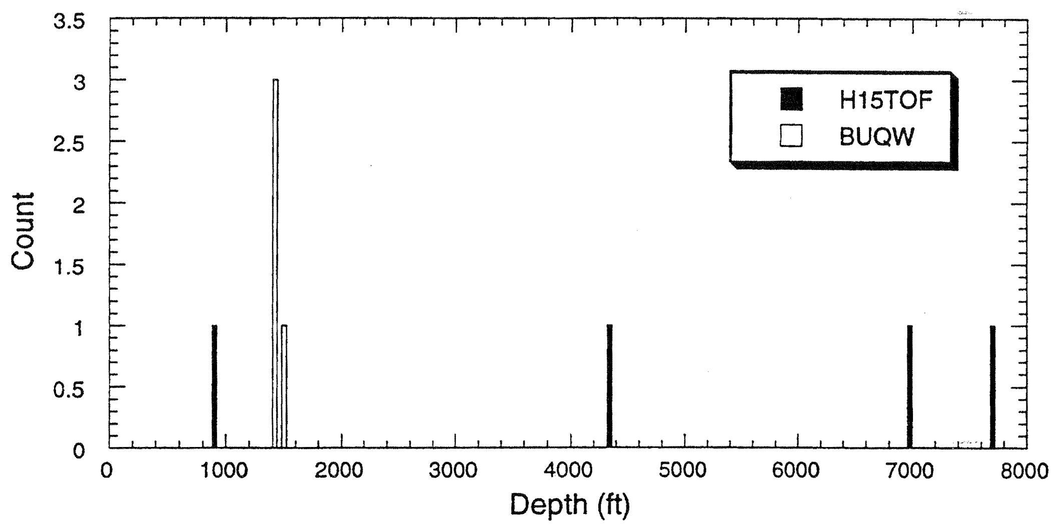
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
6	Panola	5	5650	1936
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
35	17	326	8250	2280
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
250	500	1993-98	5690-6222	0

Choate (Cisco-K)



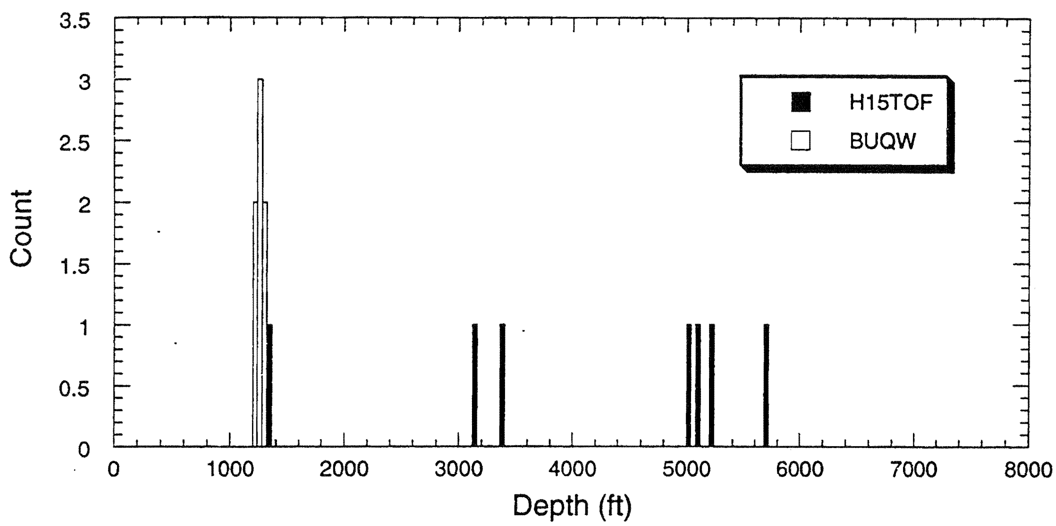
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
9	Foard	6	????	????
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
5	3	1390	3000	36
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
150	150	1995-97	No data - 3864	7

Cowden, South (Canyon 8900)



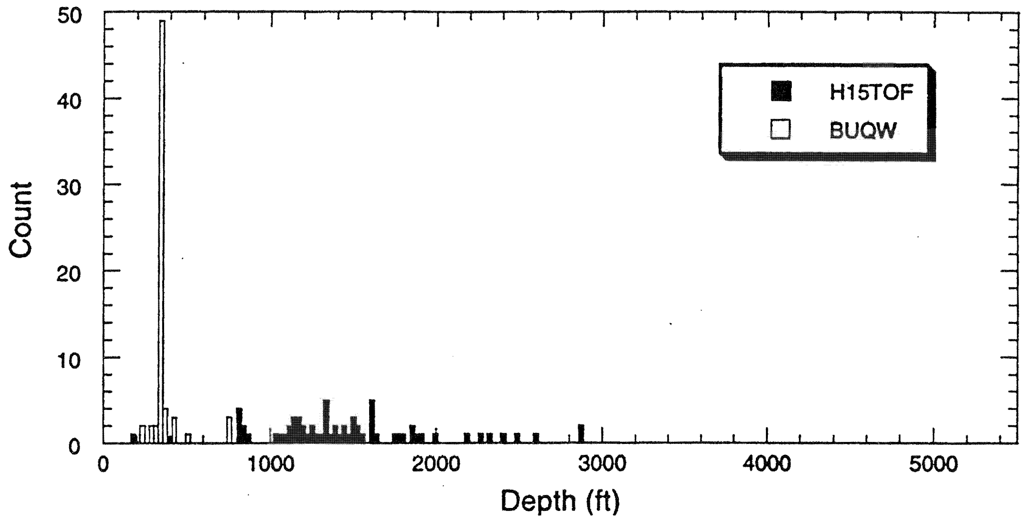
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Ector	5	8876	1968
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
4	4	915	7710	----
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
1400	1500	1997	No data-9038	11

Embar (Permian)



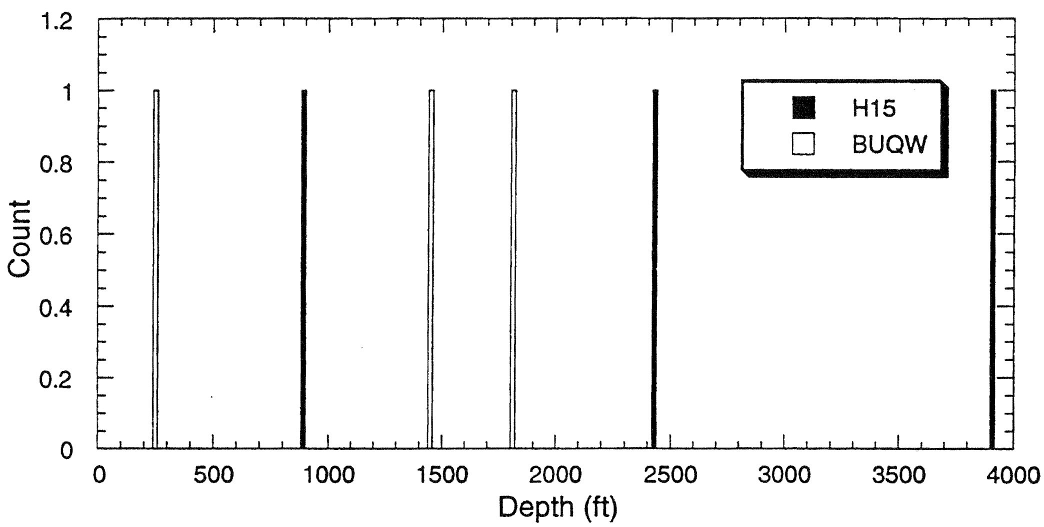
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Andrews	6	6280	1942
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
6	4	1333	5217	252
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
1200	1300	1994-95	6172-6274	8

Emperor (Deep)



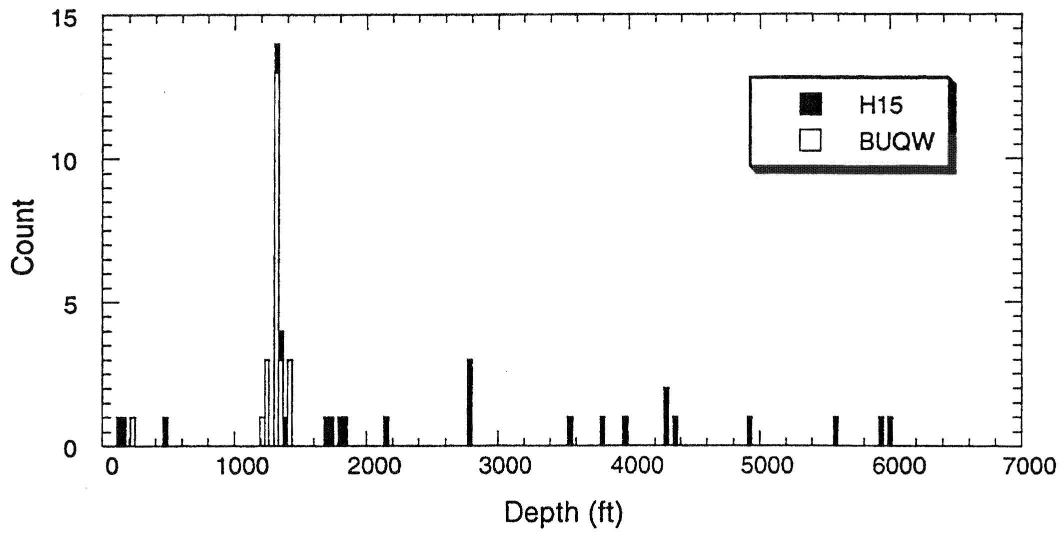
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Winkler	40	2800	1936
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
66	28	189	2870	1519
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
225	750	1993-97	2350-3270	61

Fullerton (San Andres)



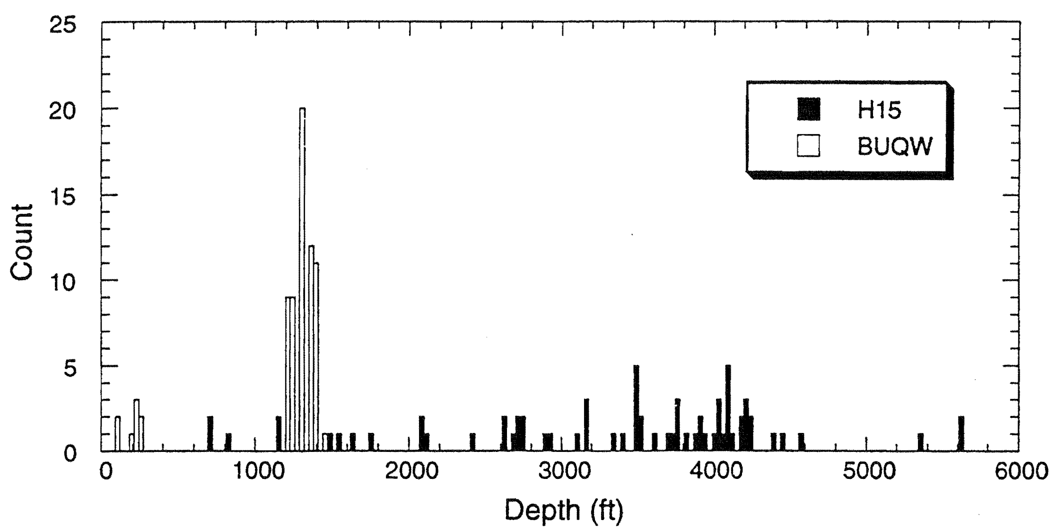
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Andrews	231	4580	1945
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
3	2	896	3911	1537
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
250	1800	1994-96	4498-4785	232

Goldsmith (Clear Fork)



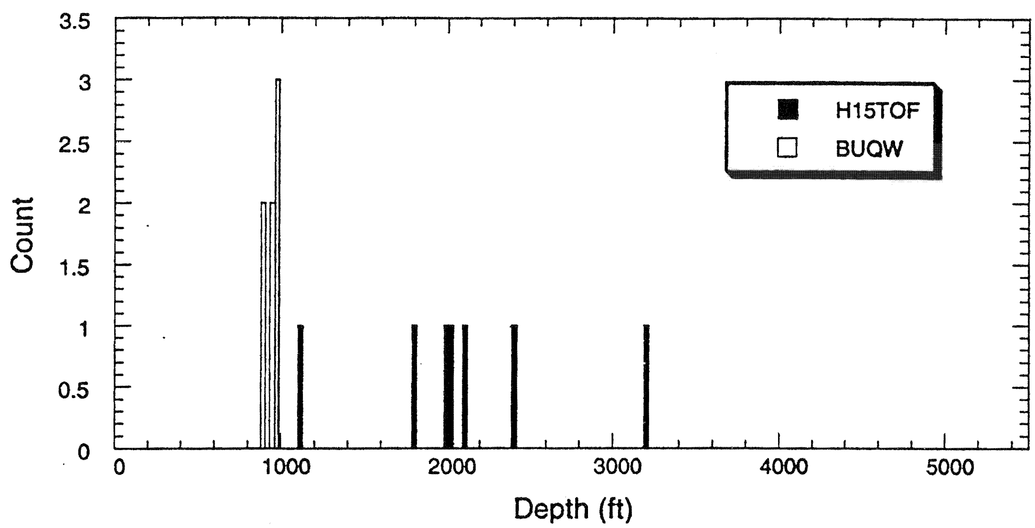
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Ector	285	5600	1934
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
24	17	132	6005	2109
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
225	1400	1994-97	5224-6300	312

Goldsmith, N.(San Andres, Con.)



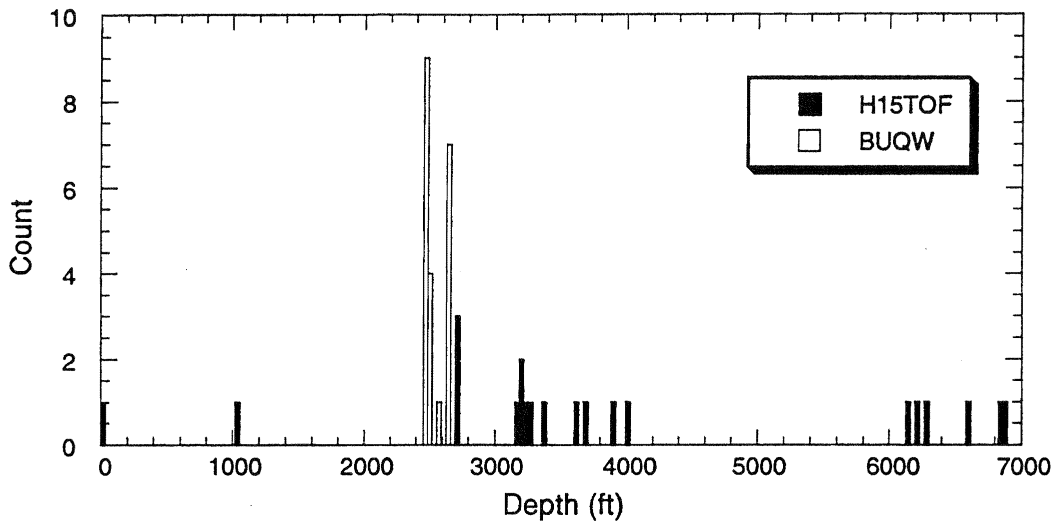
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Ector	31	4130	1956
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
72	36	700	5632	2720
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
100	1400	1993-97	4030-5902	46

Grice (Delaware)



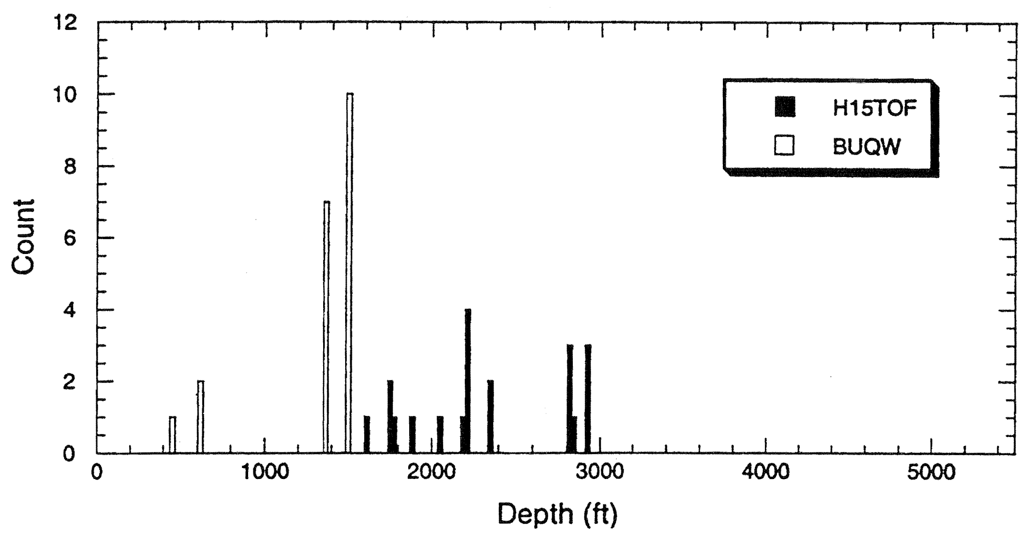
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Loving	5	4500	1956
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
7	4	1120	3200	1298
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
900	975	1994-97	No data - 4756	4

Hardin



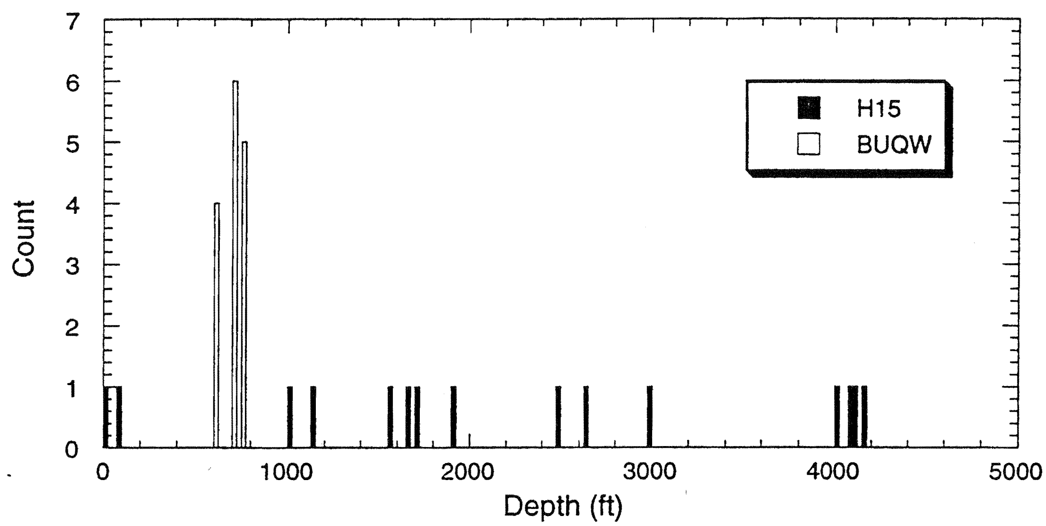
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
3	Liberty	13	7450	1935
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
21	9	5	6882	3247
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
2450	2650	1993-97	3170-7825	0

Ken Regan (Delaware)



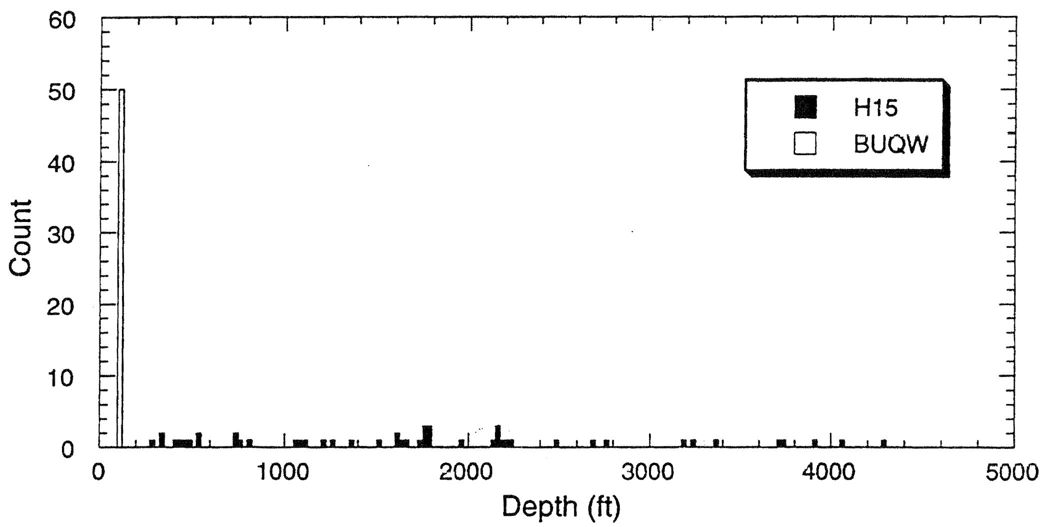
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Reeves	10	3350	1954
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
9	5	1610	2362	316
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
625	1350	1995-97	3374-3390	3

Keystone (San Andres)



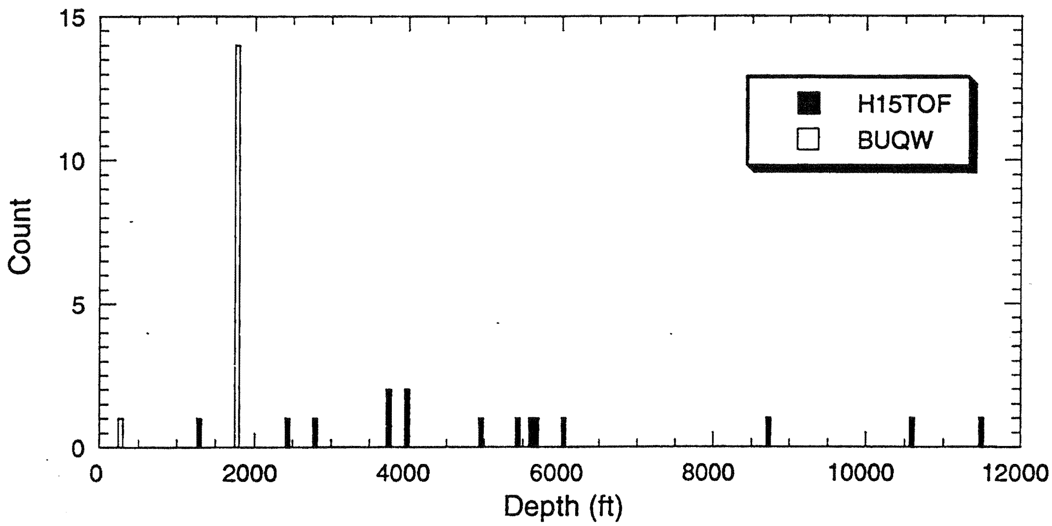
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Winkler	10	????	1950
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
15	6	15	4162	2550
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
600	750	1993-98	4042-4947	3

Knox City, North (Canyon)



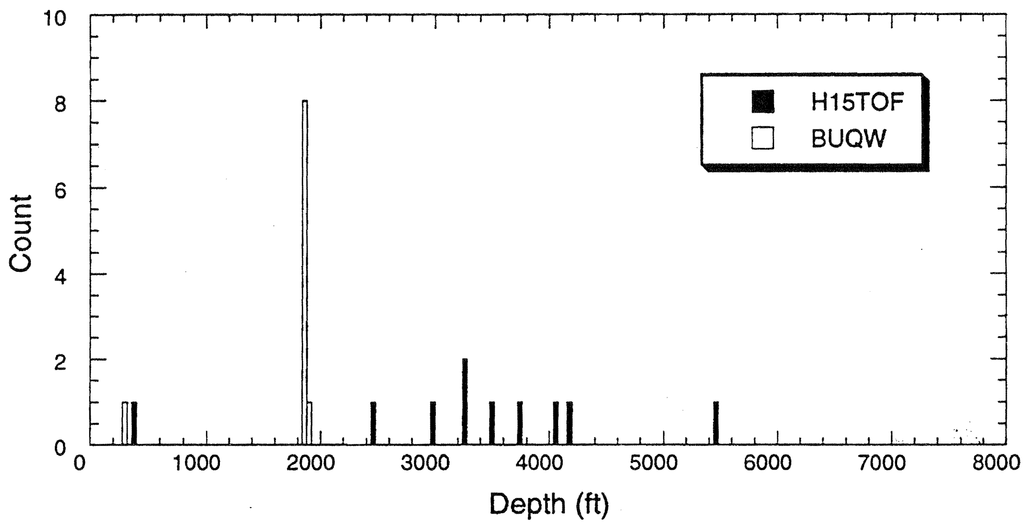
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
9	Knox	19	4200	1950
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
50	16	284	4284	2835
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
100	100	1994-98	4163-4353	30

Magutex (Devonian)



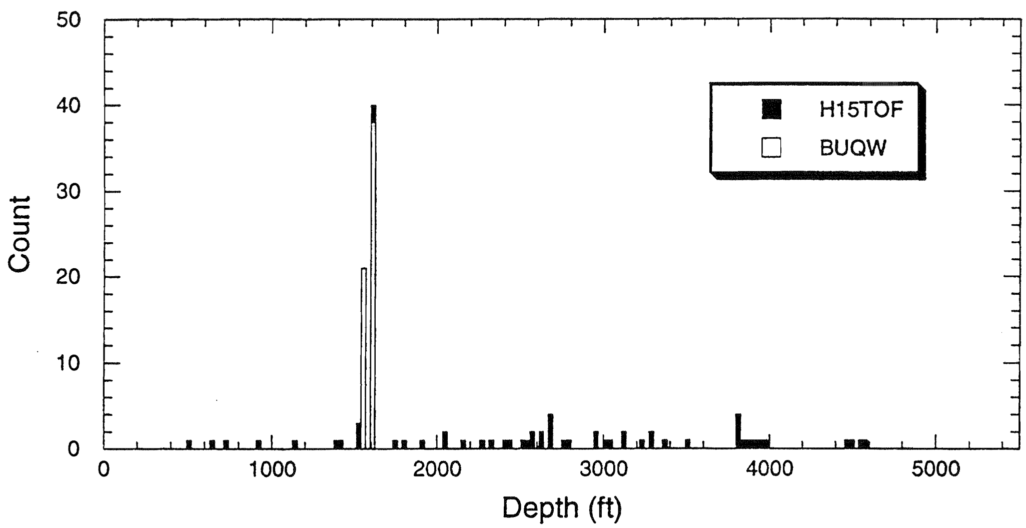
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Andrews	6	12500	1958
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
15	6	1274	11470	7719
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
250	1750	1994-97	12454-12518	0

Means, North (Queen Sand)



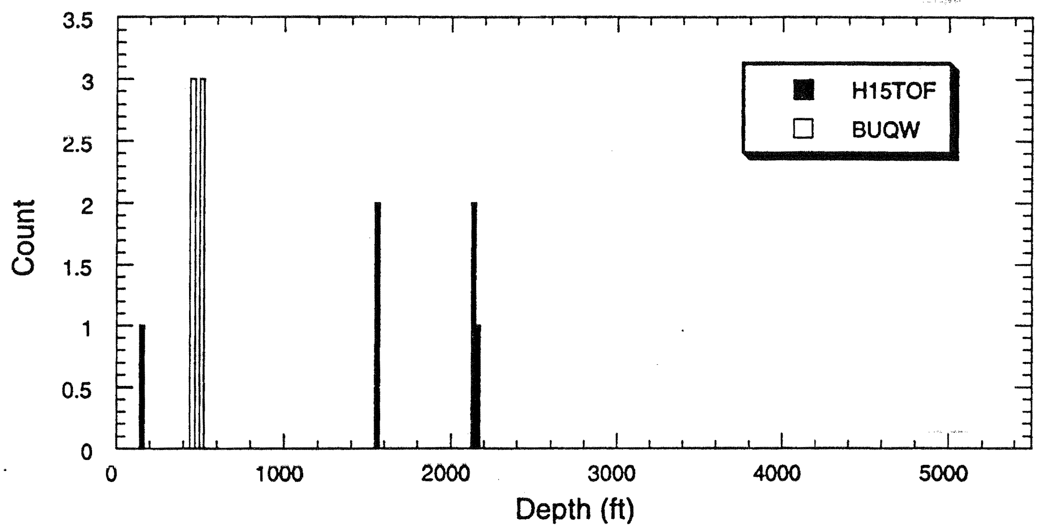
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Gaines	28	4320	1955
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
14	7	2142	3710	556
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
1700	1750	1994-98	4400-4890	39

Midland Farms



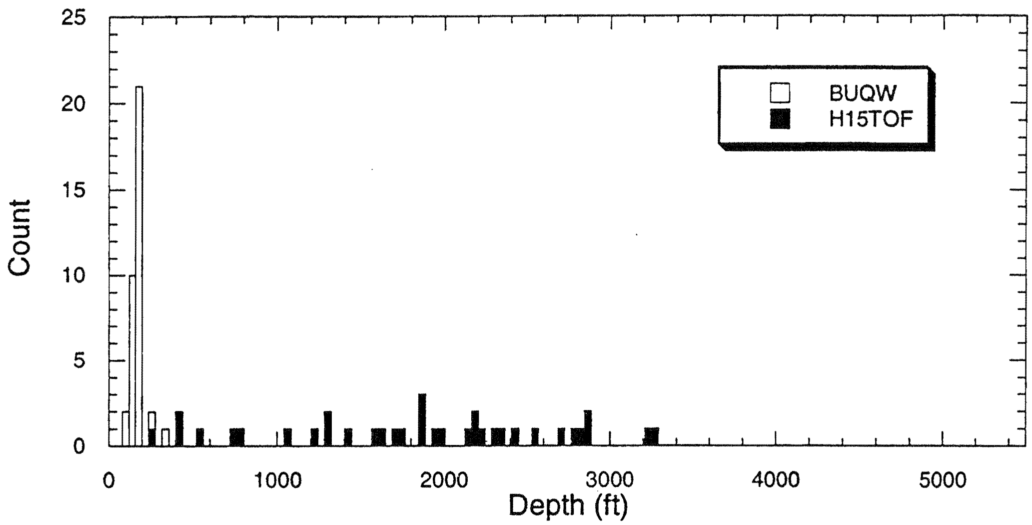
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Andrews	274	4820	1944
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
59	43	506	3952	1455
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
1550	1600	1994-97	4624-8583	318

Monahans (Queen Sand)



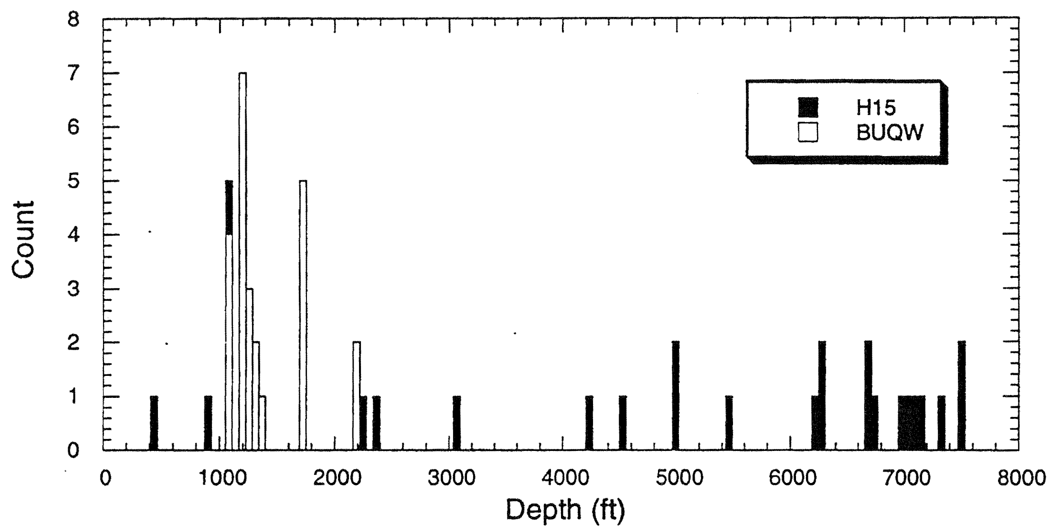
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Ward	13	3108	1910
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
6	3	155	2150	10
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
450	500	1993-97	848-3192	13

Moore



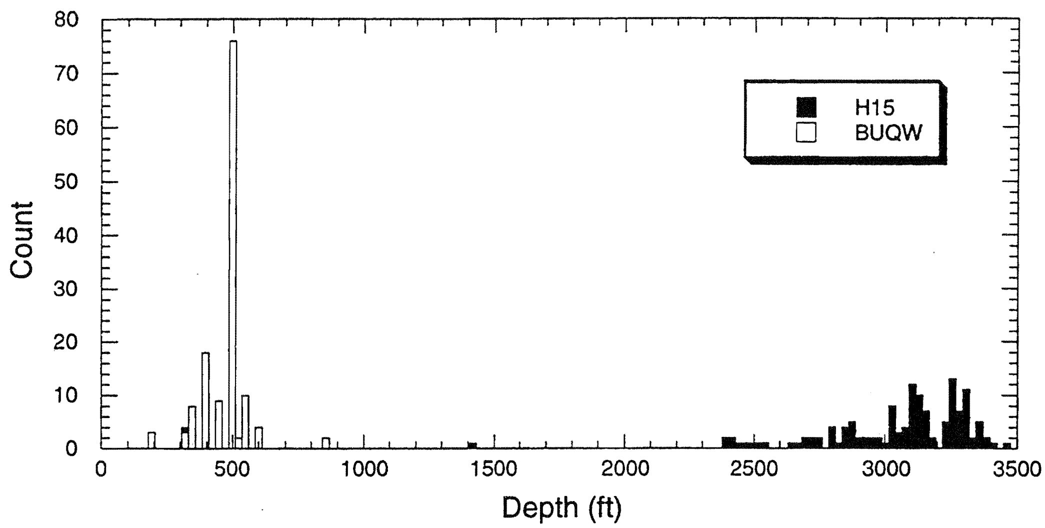
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Howard	61	3150	1937
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
35	32	277	3289	2465
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
100	325	1993-97	2954-3240	0

Moore's Orchard



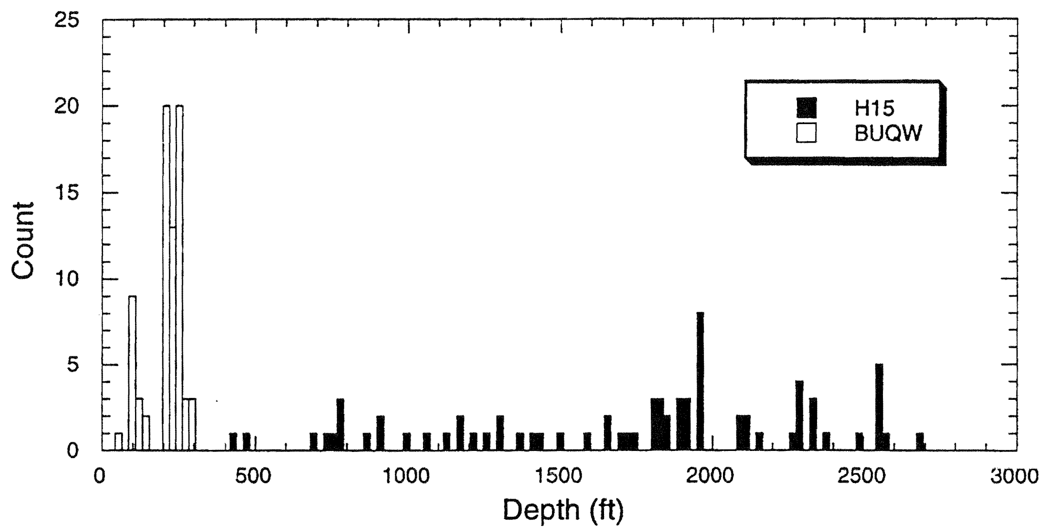
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
3	Fort Bend	2	7694	1950
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
24	10	434	7500	5765
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
1200	2200	1993-97	6860-7962	0

Panhandle Moore County



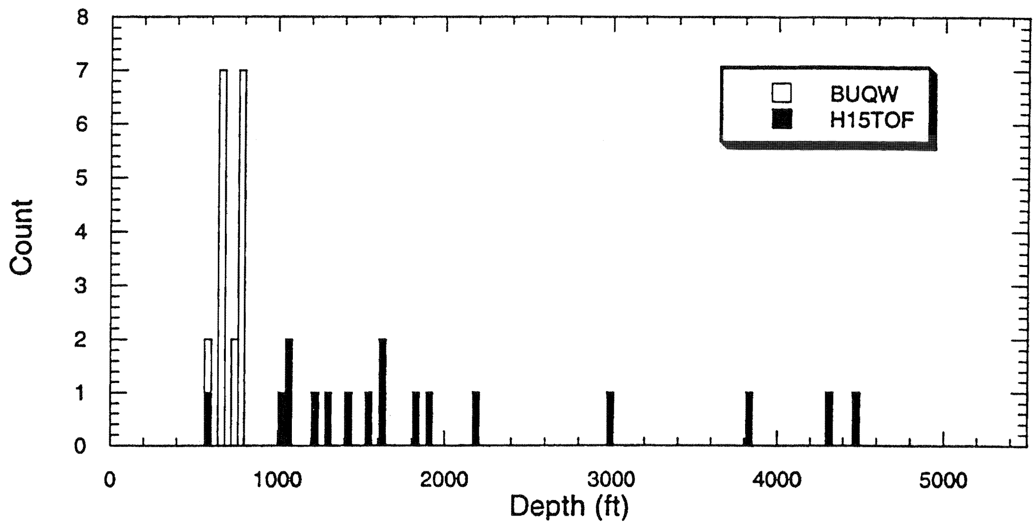
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
10	Moore	40	3250	1921
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
135	71	320	3471	2742
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
190	850	1994-98	2860-3665	8

Post (Glorieta)



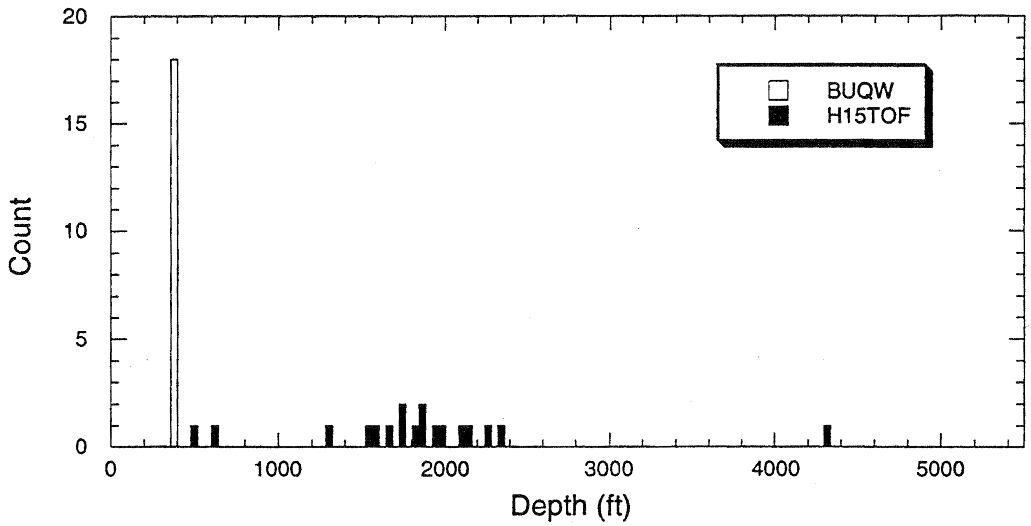
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8A	Garza	39	2528	1955
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
74	40	418	2689	882
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
100	300	1994-98	2441-2801	33

Quitman



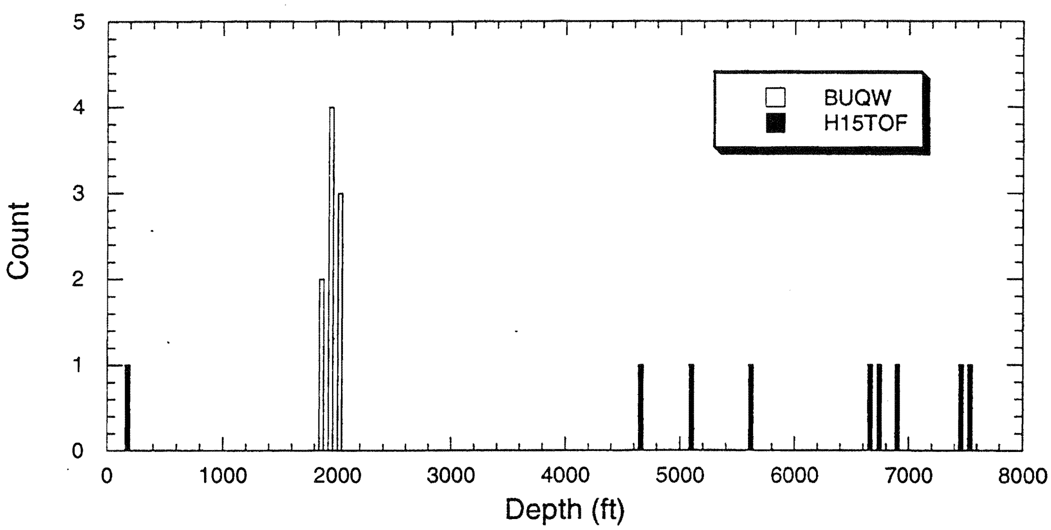
RRC District	**County**	**Number of UIC Wells**	**Depth of Production Zone (ft)**	**Year Field Discovered**
6	Wood	14	6200	1942
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
18	11	589	4464	600
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
600	800	1994-98	6075-6317	0

Reinecke



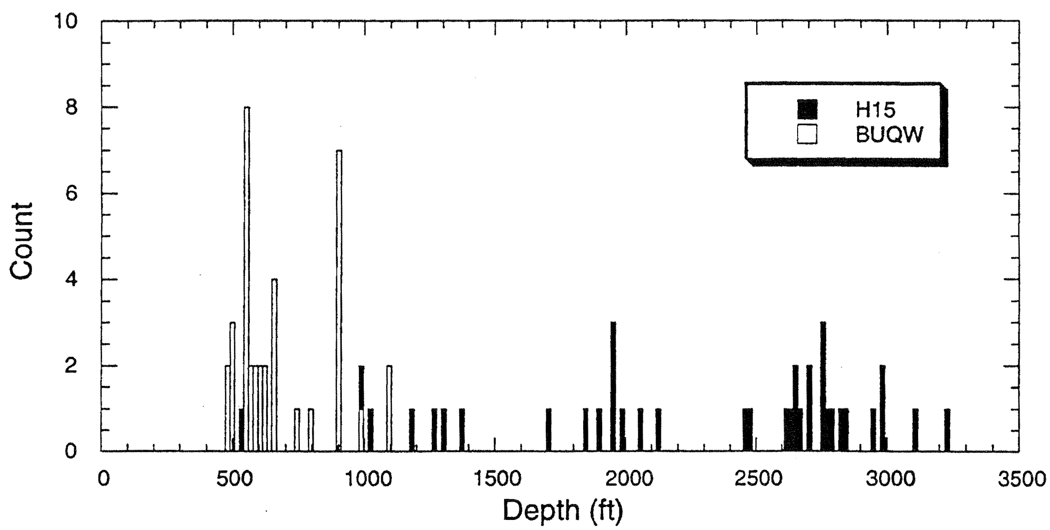
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8A	Borden	60	6800	1950
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
18	5	500	4329	807
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
400	400	1994-97	No data	0

Russell (Clearfork 7000)



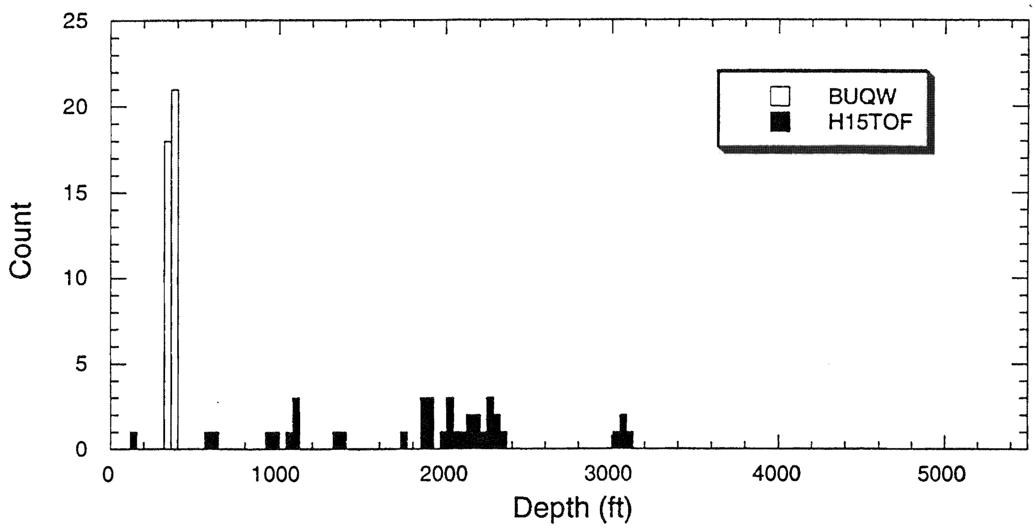
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8A	Gaines	114	7300	1943
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
9	5	175	7521	7285
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
1875	2000	1993-97	No data	121

Sand Hills (McKnight)



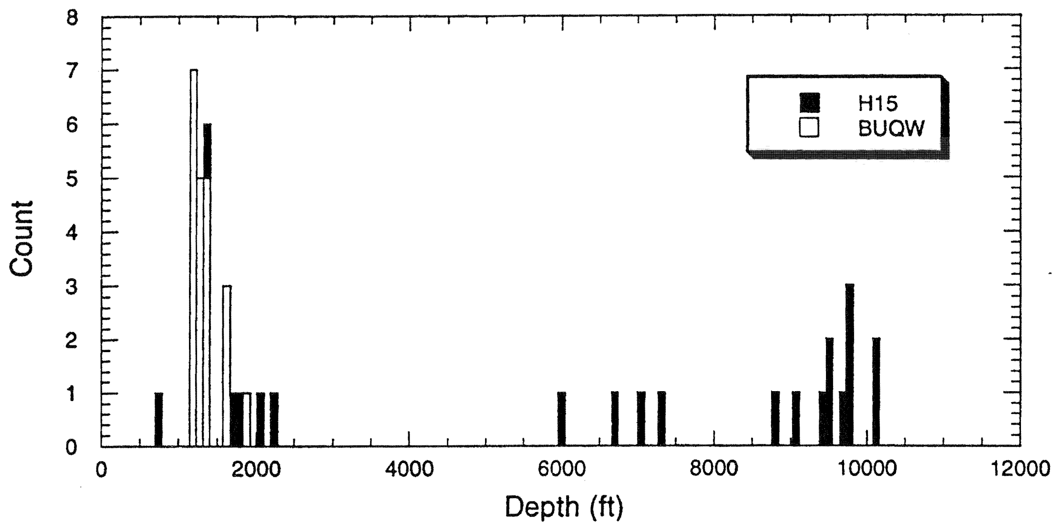
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Crane	111	4000?	1944
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
37	19	535	3224	902
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
475	1100	1993-98	2663-4556	122

Sharon Ridge (Clear Fork)



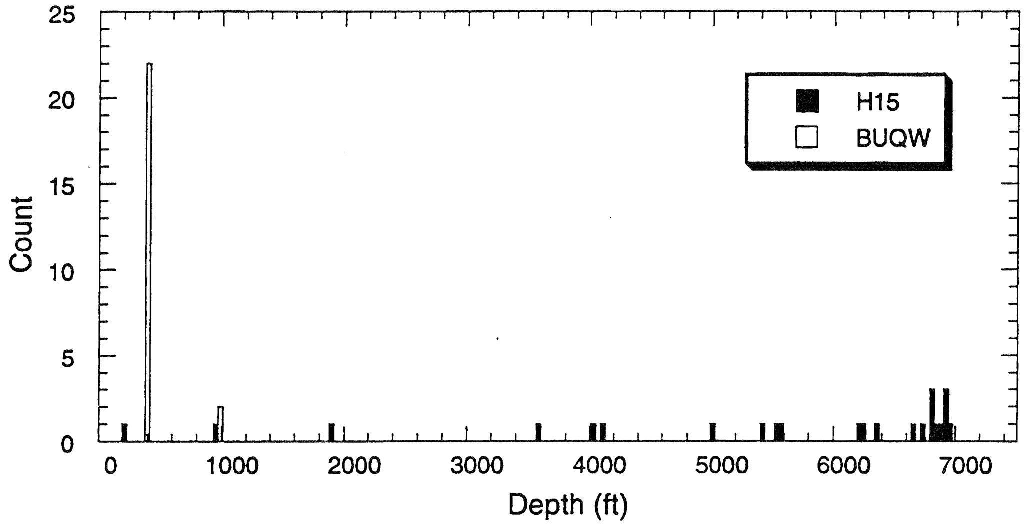
RRC District	**County**	**Number of UIC Wells**	**Depth of Production Zone (ft)**	**Year Field Discovered**
8A	Scurry	229	3100	1950
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
40	22	159	3100	1976
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
350	400	1994-97	2263-3175	233

Sheridan (Wilcox)



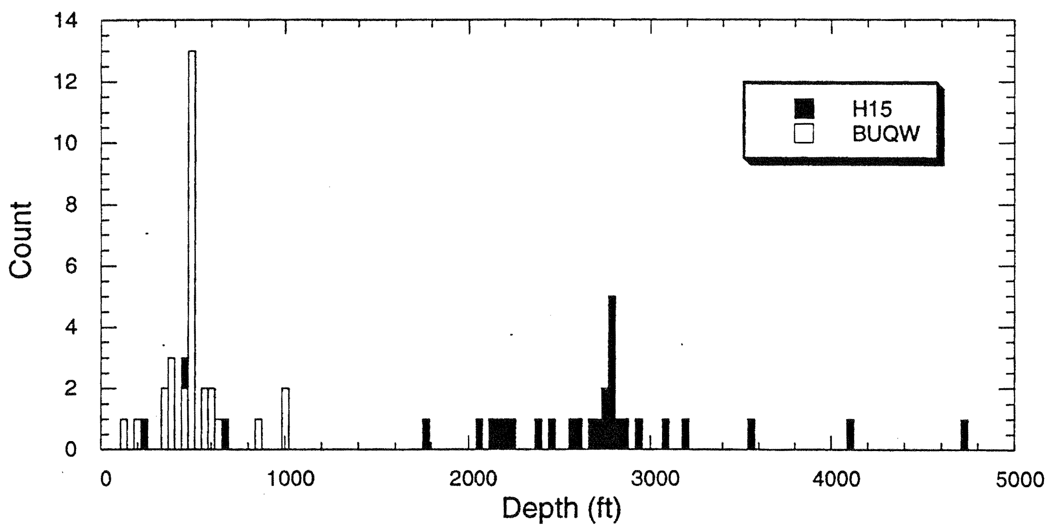
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
3	Colorado	1	9500	1940
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
21	9	713	10100	8077
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
1200	1850	1993-97	9025-10345	0

Stowell (Crawford U-1)



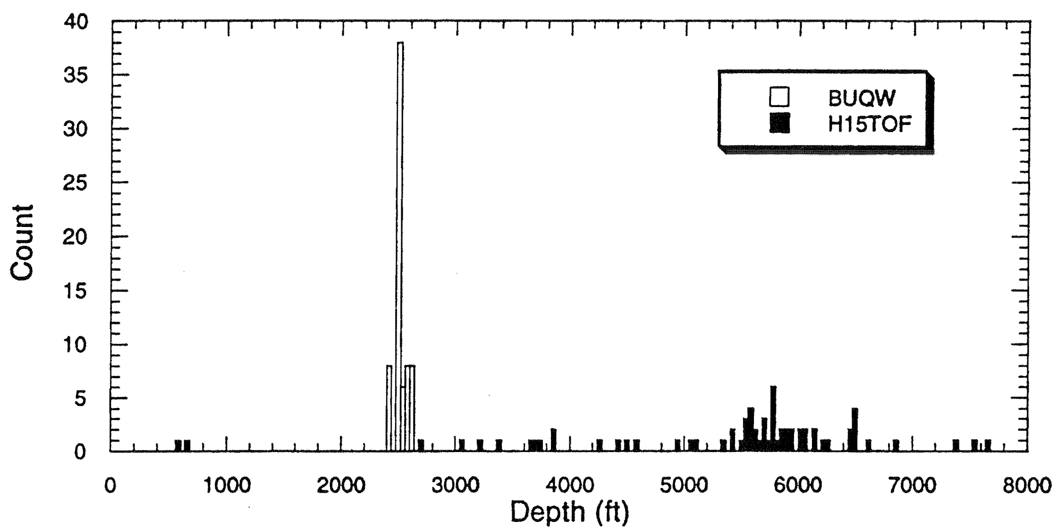
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
3	Jefferson	2	????	????
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
24	12	214	6961	2162
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
400	1000	1993-97	7504-7694	0

Texas Hugoton



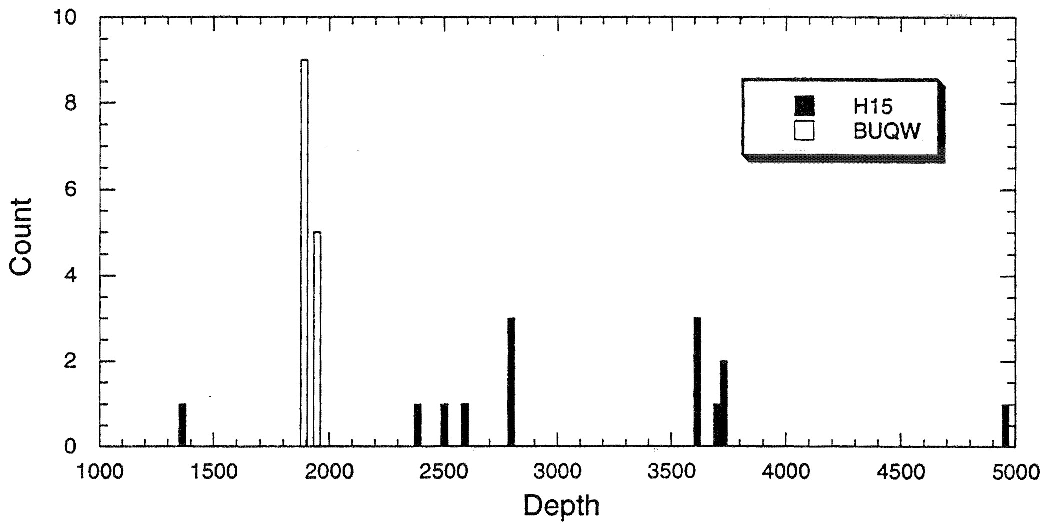
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
10	Sherman	23	2600	1927
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
30	16	250	4710	2060
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
140	1000	1993-98	3009-3470	0

Thompson, North



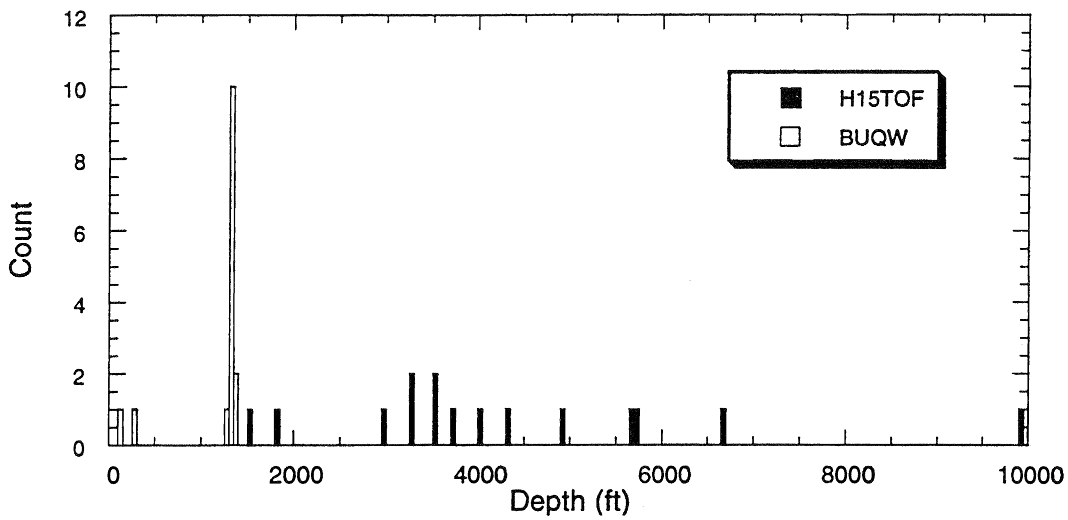
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
3	Fort Bend	15	8020	1939
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
70	27	570	7654	3153
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
2400	2600	1993-97	4689-7992	0

Tomball



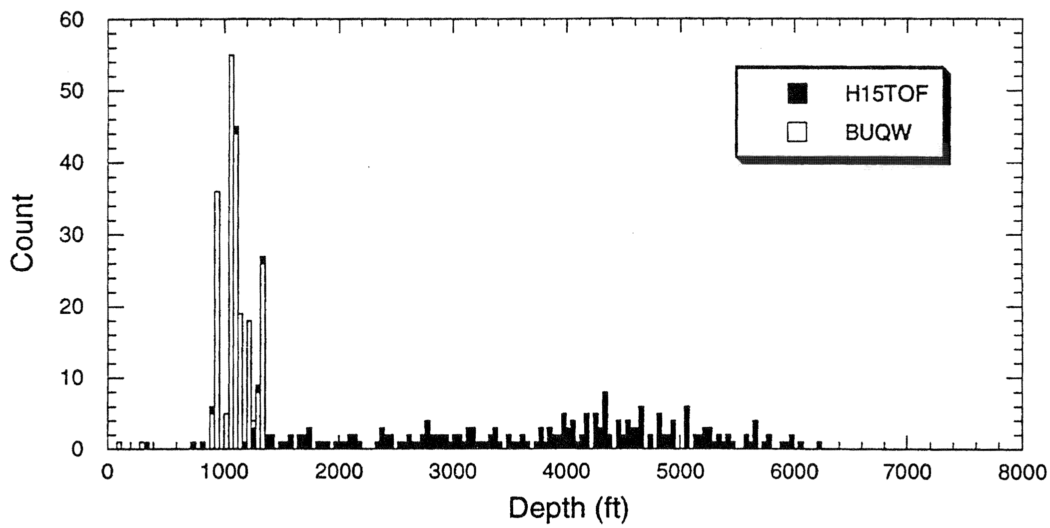
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
3	Harris	17	5450	1933
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
14	6	1364	4960	2560
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
1900	1950	1993-98	5412-5420	0

TXL (Ellenburger)



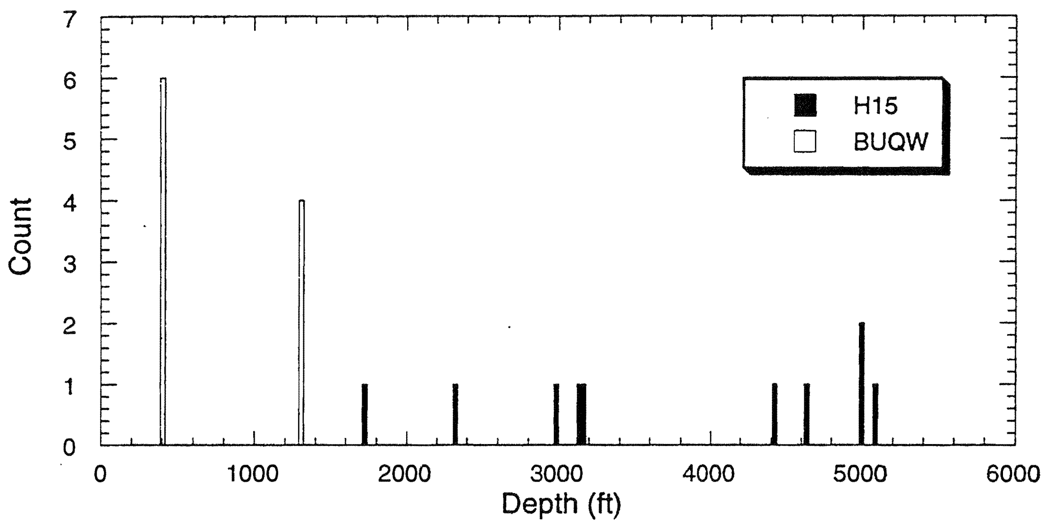
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Ector	2	9500	1946
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
15	5	1507	9920	8413
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
100	1350	1993-97	9382-9400	0

TXL (Tubb)



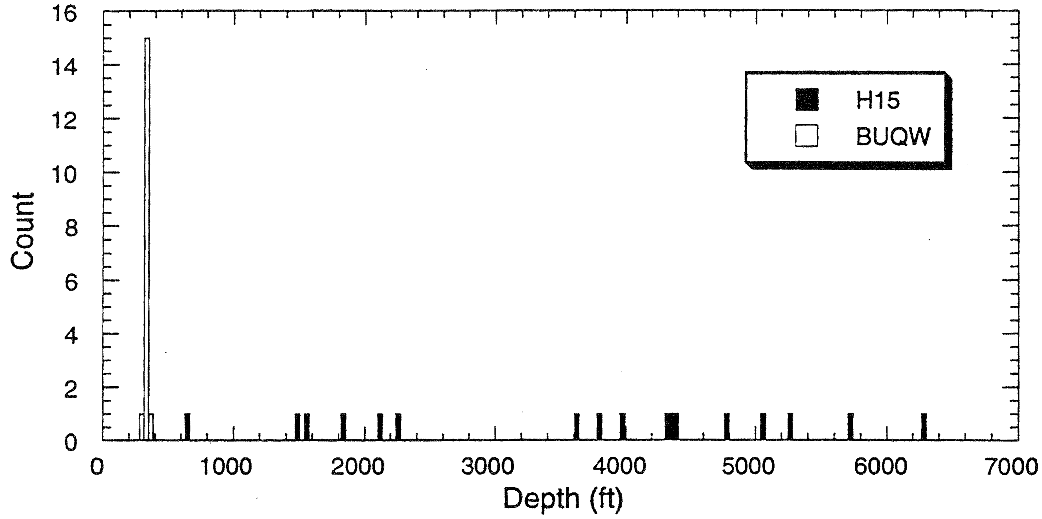
RRC District	**County**	**Number of UIC Wells**	**Depth of Production Zone (ft)**	**Year Field Discovered**
8	Ector	119	6200	1967
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
219	137	352	6208	3951
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
100	1350	1993-97	4280-6781	142

Waha (Delaware)



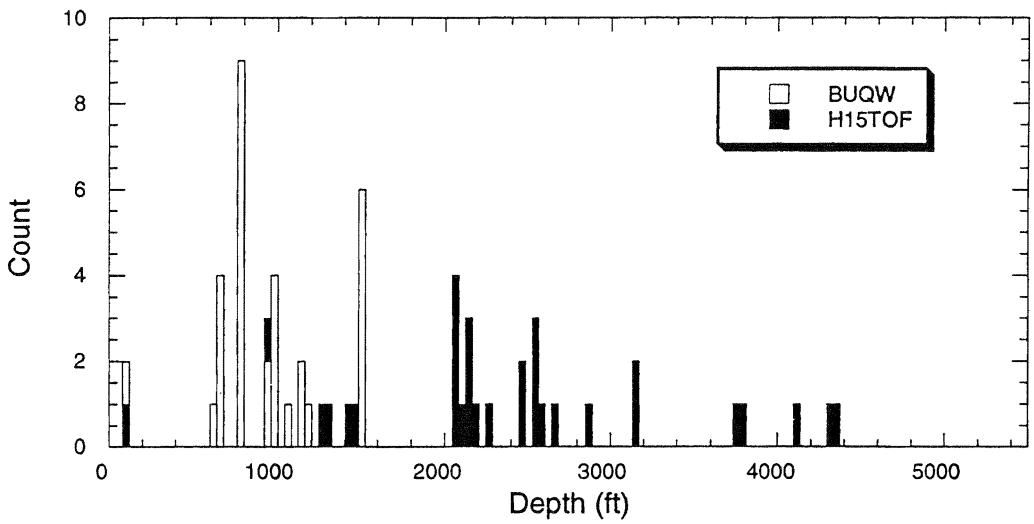
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8	Reeves	5	????	????
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
10	6	1736	5090	2658
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
400	1300	1994-97	4906-4995	4

Wellman



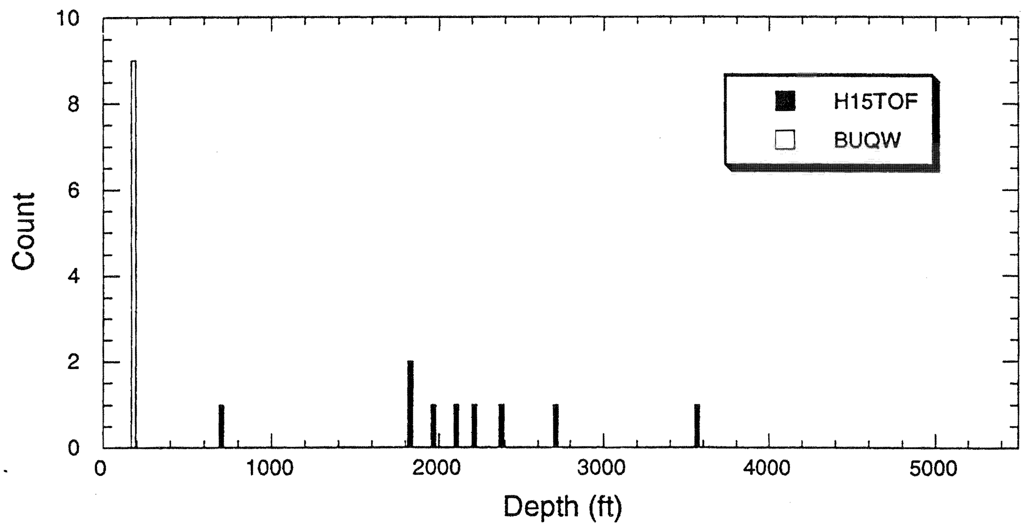
RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
8A	Terry	10	9300	1950
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
17	8	654	6281	4399
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
300	325	1993-98	9394-9666	9

Wheat



RRC District	**County**	**Number of UIC Wells**	**Depth of Production Zone (ft)**	**Year Field Discovered**
8	Loving	17	4300	1925
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
31	16	112	4340	3379
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
120	1500	1993-97	No data-4751	0

Woodkirk (Strawn)



RRC District	County	Number of UIC Wells	Depth of Production Zone (ft)	Year Field Discovered
9	Jack	10	????	????
Number of H15 Data Entries	**Number of H15 Wells**	**Shallowest H15 Level (ft)**	**Deepest H15 Level (ft)**	**Max. H15 Change in a Single Well (ft)**
9	9	713	3565	----
Shallowest BUQW (ft)	**Deepest BUQW (ft)**	**H15 Data Period**	**Perforation Zone (ft)**	**Number of Secondary Recovery Wells**
175	175	1996	2068-2142	8

Appendix B-1
H15 Database Printouts - YES Category

Coleman Ranch

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4233500250	1231	5/15/97	702	—	—	350	561136	23672
4233500250	2335	4/28/96	702	—	—	350	561136	23672
4233500250	2350	5/4/95	702	—	—	350	561136	23672
4233500261	1451	5/15/97	1007	—	—	350	561136	23672
4233500261	1930	5/16/96	1007	—	—	350	561136	23672
4233530049	1030	5/12/96	1107	—	—	350	561136	23672
4233530049	1401	5/12/97	1107	—	—	350	561136	23672
4233531733	2825	5/6/97	1	2524	2846	350	923063	26067
4233532283	3450	5/6/97	6	2744	3120	325	923063	27510
4233580700	1050	5/12/96	1103	2691	2778	350	561136	23672
4233580700	1375	5/26/97	1103	2691	2778	350	561136	23672

Crossett, West (Clear Fork, Up.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4210310028	17621	5/14/97	9	2928	2938	400	621750	17708
4210310080	2883	5/2/95	1 U	2900	2906	400	687166	17880
4210310080	2790	5/28/96	1 U	2900	2906	400	687166	17880
4210310080	2820	5/29/97	1 U	2900	2906	400	687179	17880

Donnelly (San Andres)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4213503024	2741	11/3/97	2	—	—	1300	39806	11846
4213503025	2615	11/3/97	4	—	—	1300	39806	11846
4213503026	1767	10/23/96	1	—	—	1300	763000	13093
4213503026	1767	7/17/97	1	—	—	1300	763000	13093
4213503027	1798	10/23/96	2	—	—	1300	763000	13093
4213503027	1798	7/17/97	2	—	—	1300	763000	13093
4213503028	2976	10/23/96	3	—	—	1300	763000	13093
4213503028	2976	7/17/97	3	—	—	1300	763000	13093
4213503030	2232	7/17/97	4	4175	4198	1300	763000	13093
4213531380	3875	4/1/97	7	3988	4319	1250	601025	15056
4213531474	3754	4/1/97	6	3888	4330	1250	601025	13785
4213532935	3810	4/1/97	14	3924	4382	1250	601025	13785
4213532953	3785	4/1/97	3R	4035	4371	1250	601025	13785

Frass (Tonkawa)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4229500934	6363	8/23/95	1D	3018	3417	500	657835	02267
4229530982	4567	3/21/97	5	6324	6360	550	657835	02270
4229580379	6679	3/21/97	2	—	6156	550	657835	02205
4229580379	6710	8/23/95	2	—	6156	500	657835	02205
4229580380	3339	3/24/97	3	—	6365	550	657835	02205
4229580380	6363	8/23/95	3	—	6365	500	657835	02205

Garza

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4216900040	1700	5/17/95	403 T	—	—	150	714267	61053
4216900040	1943	5/12/96	403 T	—	—	175	714267	61053
4216900040	1984	5/22/97	403 T	—	—	175	714267	61053
4216900040	2152	6/21/94	403 T	—	—	175	714267	61053
4216901290	975	5/14/97	27	—	—	125	627127	11908

Gillock (East Segment)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4216700979	8946	9/21/95	8	—	9150	1050	257082	01649
4216700981	3500	1/24/95	6	—	9481	1050	597371	01648
4216700981	3600	7/16/96	6	—	9481	1050	597371	01648
4216700981	4486	5/15/97	6	—	9481	1050	549832	01648
4216700981	5776	1/18/94	6	—	9481	1050	597371	01648
4216700982	1750	1/18/94	7	—	9462	1050	597371	01648
4216700982	3300	7/16/96	7	—	9462	1050	597371	01648
4216700982	5565	1/24/95	7	—	9462	1050	597371	01648
4216700982	5750	5/15/97	7	—	9462	1050	549832	01648
4216700985	3900	5/15/97	10	9326	9332	1050	549832	01648
4216730031	2945	7/10/97	10S	9056	9068	1050	257082	01649
4216730061	2015	7/10/97	13	8947	8971	1050	257082	01649
4216731134	8571	4/9/97	18R	8749	8752	1050	257082	01649

Hitts Lake (Paluxy)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4242300503	3985	2/10/95	701	—	7199	1650	881167	05990
4242300503	4090	5/23/94	701	—	7199	1650	881167	05990
4242300503	4335	4/7/97	701	—	7199	1650	881167	05990
4242300503	4565	7/19/96	701	—	7199	1650	881167	05990
4242300504	6455	5/18/95	901	—	7295	1650	881167	05990
4242300504	6460	4/8/97	901	—	7295	1650	881167	05990
4242300504	6685	7/19/96	901	—	7295	1650	881167	05990
4242300506	3850	5/23/94	601	—	7264	1650	881167	05990
4242300506	3905	2/10/95	601	—	7264	1650	881167	05990
4242300509	3240	2/10/95	1302	—	7307	1650	881167	05990
4242300509	4045	7/19/96	1302	—	7307	1650	881167	05990
4242300509	4250	4/8/97	1302	—	7307	1650	881167	05990
4242300579	3595	2/10/95	401	—	7200	1650	881167	05990
4242300579	3825	5/23/94	401	—	7200	1650	881167	05990
4242300579	3875	4/7/97	401	—	7200	1650	881167	05990
4242300579	3940	7/19/96	401	—	7200	1650	881167	05990
4242300626	4270	7/19/96	112	—	7131	1650	881167	05990
4242300626	4295	5/23/94	112	—	7131	1650	881167	05990
4242300626	4325	4/7/97	112	—	7131	1650	881167	05990
4242300626	4360	5/18/95	112	—	7131	1650	881167	05990
4242380160	2055	2/14/95	104	—	—	1650	881167	05990
4242380160	2115	7/30/96	104	—	—	1650	881167	05990
4242380160	2130	4/7/97	104	—	—	1650	881167	05990

Huntley, East (San Andres)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4216900175	704	10/22/95	2	—	3310	100	862199	13096
4216900175	719	6/2/97	2	—	3310	100	862199	13096
4216902086	2913	5/7/93	4	—	3217	125	172230	15325

Joy (Strawn)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4207705275	744	7/26/95	14	—	—	271	88600	01781
4207780895	868	7/25/95	1	—	—	300	88600	01779
4207780897	1643	6/14/96	3	—	—	250	88600	01779
4207780897	1643	5/26/97	3	—	—	250	88600	01779
4207780902	3193	6/14/96	11	—	—	250	88600	01779
4207780902	3193	5/26/97	11	—	—	250	88600	01779
4207780915	4064	6/14/96	12	—	—	250	88600	01781
4207780915	4064	7/14/97	12	—	—	250	88600	01781
4207781114	3880	8/10/95	102 W	—	—	275	393278	08670
4207781121	3910	8/17/95	109	—	—	275	393278	08670
4207781123	3770	8/19/95	111	—	—	275	393278	08670
4207781124	3911	8/10/95	112 W	—	—	275	393278	08670
4207781125	3766	8/17/95	113	—	—	275	393278	08670
4207781130	3880	8/11/95	120	—	—	275	393278	08670
4207781131	3908	8/11/95	121	—	—	275	393278	08670
4207781138	3920	8/9/95	129	—	—	275	393278	08670
4207781145	3620	8/9/95	136	—	—	275	393278	08670
4207781146	3110	8/9/95	137	—	—	275	393278	08670
4207781152	3990	8/12/95	143	—	—	275	393278	08670
4207781155	3678	8/9/95	146	—	—	275	393278	08670
4207781158	3990	8/2/95	14 W	—	—	275	393278	12833
4207781158	3770	8/9/95	149	—	—	275	393278	08670
4207781159	3882	8/17/95	151	—	—	275	393278	08670
4207781536	4275	8/4/95	1 S	—	—	275	393278	12833
4207781540	4004	8/4/95	5 W	—	—	275	393278	12833
4207781542	3896	8/2/95	7	—	—	275	393278	12833
4207781548	4008	8/4/95	13	—	—	275	393278	12833
4207781551	4102	8/4/95	16	—	—	275	393278	12833
4207781554	4110	8/2/95	19	—	—	275	393278	12833
4207781555	4102	8/4/95	20	—	—	275	393278	12833
4207781556	4122	8/4/95	21 W	—	—	275	393278	12833
4207781557	3767	8/2/95	23 W	—	—	275	393278	12833
4207781563	3998	8/4/95	29 W	—	—	275	393278	12833
4207781566	3888	8/4/95	32 W	—	—	275	393278	12833
4207781567	3779	8/4/95	33	—	—	275	393278	12833
4207781568	4005	8/9/95	34 W	—	—	275	393278	12833
4207781569	4002	8/2/95	35	—	—	275	393278	12833
4207781570	3920	8/4/95	37	—	—	275	393278	12833
4207781571	4120	8/2/95	38	—	—	275	393278	12833
4207781572	4202	8/4/95	39 W	—	—	275	393278	12833
4207781574	4009	8/4/95	41 W	—	—	275	393278	12833
4207781575	4220	8/4/95	42 W	—	—	275	393278	12833

K-M-A (Ellenburger)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4248540096	1542	5/6/97	2	4495	4515	60	436155	20987
4248587151	1550	5/30/95	2	—	—	60	714190	06310
4248587151	1725	8/16/96	2	—	—	60	714190	06310
4248587151	1725	5/23/97	2	—	—	60	714190	06310
4248587154	1633	4/28/97	79	3621	3629	60	436155	06324
4248587154	1644	6/11/96	79	3621	3629	60	436155	06324
4248587154	1660	5/5/95	79	3621	3629	60	436155	06324

Panhandle (Red Cave)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
34130154	1550	5/27/95	52	2005	2190	400	66750	2324
34130172	2325	12/8/97	7	2136	2380	450	427283	3771
34130208	2300	12/8/97	10RC	2105	2350	450	427283	3771
34131239	1903	12/22/96	3302	1942	2294	600	540354	5882
34131239	1922	12/2/97	3302	1942	2294	600	540354	5882
34131389	1890	12/22/96	3308	1950	2300	600	540354	5882
34131389	1860	12/2/97	3308	1950	2300	600	540354	5882
34131390	1953	12/22/96	3307	1986	2286	600	540354	5882
34131390	1907	12/2/97	3307	1986	2286	600	540354	5882
34131390	1907	12/2/97	3307	1986	2286	600	540354	5882
34131866	2091	5/26/95	59	2126	2216	400	66750	2324
34181600	2035	3/18/97	101	—	—	400	161639	3782
34181600	1520	2/4/98	101	—	—	450	161639	3782
34181604	1612	3/18/97	105	—	—	400	161639	3782
34181604	1612	2/4/98	105	—	—	450	161639	3782
37530942	1798	1/10/97	3144	1886	2125	250	706407	5305
37530945	2164	2/24/97	1102	1859	2072	250	706407	6440
37530966	1693	11/21/96	1405	1868	2058	325	706407	6440
37530995	1711	11/26/96	1411	1822	2037	325	706407	6440
37530997	1403	11/20/96	1412	1766	1975	325	706407	6440
37531050	1617	11/29/96	3431	1811	2107	250	706407	5305
37531053	1798	1/10/97	3413	1850	2132	250	706407	5305
37531055	1705	1/10/97	3402	1822	2102	250	706407	5305
37531058	2201	1/10/97	3126	1816	2112	250	706407	5305
37531092	1647	11/24/96	3376	2316	2322	200	706407	5305
37531094	1556	11/24/96	3357	2258	2264	200	706407	5305
37531296	1470	2/24/97	1108	1950	2177	250	706407	6440
37531304	1800	11/22/96	1004	1808	1964	250	706407	6440
37531312	1983	11/30/96	1005	1862	1988	250	706407	6440
37531335	1653	2/24/97	901	—	—	250	706407	6440
37531350	1848	2/24/97	904	—	—	250	706407	6440

Ranger

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
13300664	2857	5/27/97	1	3268	3503	100	614120	21134
13300664	2999	7/16/96	1	3268	3503	100	614120	27936
13300664	3076	5/26/95	1	3268	3503	100	614120	21395
13300665	3155	5/26/95	2	3248	3554	100	614120	00000
13303044	2254	5/22/95	9107	—	—	200	614120	00000
13303044	3179	5/15/97	9107	—	—	200	614120	00000
13303044	3333	7/12/96	9107	—	—	200	614120	00000
13303123	2560	5/26/95	9108	—	—	200	614120	21789
13303226	1565	5/27/97	10	3458	3489	100	614120	00000
13303226	1615	7/13/96	10	3458	3489	100	614120	00000
13303226	3256	5/26/95	10	3458	3489	100	614120	21395
13303228	2341	5/31/94	19	3295	3320	250	614120	0
13303228	3120	7/13/96	19	3295	3320	250	614120	00000
13303228	3226	5/26/95	19	3295	3320	250	614120	00000
13303228	3265	5/27/97	19	3295	3320	250	614120	00000
13303228	3400	5/5/93	19	3295	3320	250	614120	00000
13303229	3010	5/1/95	8	3222	3495	175	614120	23604
13303229	3596	5/27/97	8	3222	3495	175	614120	23604
13303229	3692	7/13/96	8	3222	3495	175	614120	23604
13303230	2180	7/13/96	3	3234	3499	100	614120	00000
13303230	2224	5/27/97	3	3234	3499	100	614120	00000
13303230	3004	5/26/95	3	3234	3499	100	614120	23604
13320013	2925	6/1/94	18	3290	3508	100	614120	00000
13320013	3028	7/13/96	18	3290	3508	100	614120	00000
13320013	3040	5/27/97	18	3290	3508	100	614120	00000
13320013	3117	5/26/95	18	3290	3508	100	614120	00000
13320074	2682	7/13/96	15	3400	3410	250	614120	00000
13320074	2764	5/27/97	15	3400	3410	250	614120	00000
13320074	2830	5/1/95	15	3400	3410	250	614120	00000
13320074	2864	5/31/94	15	3400	3410	250	614120	00000
13332700	3720	7/21/97	7	3636	3679	250	253221	07831
13380036	2200	5/30/95	809	3400	3420	100	614120	00000
13380036	2310	7/13/96	809	3400	3420	100	614120	00000
13380036	2379	5/22/97	9	3400	3420	100	614120	21395
13380103	2623	5/15/97	1706	3216	3220	250	614120	21395
13380103	3140	5/1/95	1706	3216	3220	250	614120	21134
13380103	3226	7/13/96	1706	3216	3220	250	614120	07831
13380106	2161	5/26/95	3005	3488	3515	150	614120	21395
13380106	2985	5/15/97	3005	3488	3515	150	614120	21395
13380106	3007	7/13/96	3005	3488	3515	150	614120	00000
13380156	1452	6/3/94	302	—	—	100	614120	21395
13380156	1501	5/26/95	302	—	—	100	614120	00000
13380156	1506	5/5/93	302	—	—	100	614120	00000
13380156	2198	5/19/97	302	—	—	100	614120	00000
13380156	2207	7/13/96	302	—	—	100	614120	00000
13380165	3033	5/26/95	1001	—	3449	250	614120	21395

Ranger (cont)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
13380165	3358	5/22/97	1001	—	3449	250	614120	23604
13380165	3440	7/13/96	1001	—	3449	250	614120	21395
13380167	2072	7/18/97	3006	3455	3475	90	614120	23604
13380167	2325	5/31/95	3006	3455	3475	100	614120	00000
13380167	2361	5/6/93	3006	3455	3475	100	400109	23604
13380167	2425	7/13/96	3006	3455	3475	100	614120	00000
13380167	2645	5/27/94	3006	3455	3475	100	614120	00000
13380168	2025	5/6/93	3004	3243	3467	100	614120	00000
13380168	2063	5/31/95	3004	3243	3467	100	614120	07831
13380168	2590	6/3/94	3004	3243	3467	100	400109	00000
13380168	2615	7/18/97	3004	3243	3467	90	614120	23604
13380168	2630	7/13/96	3004	3243	3467	100	614120	21134
13380169	2117	5/6/93	3005	3450	3508	100	614120	00000
13380169	2140	7/18/97	3005	3450	3508	90	614120	23604
13380169	2150	8/24/94	3005	3450	3508	100	614120	00000
13380169	2152	5/31/95	3005	3450	3508	100	400109	00000
13380169	2480	7/18/96	3005	3450	3508	100	614120	0
13380195	1786	5/22/97	12	—	—	100	614120	00000
13380195	1890	7/13/96	812	—	—	100	614120	21134
13380195	2256	5/31/95	812	—	—	100	614120	23604
13380195	2272	5/31/94	812	—	—	100	614120	21395
13380195	2520	5/5/93	812	—	—	100	614120	07831
13380196	2024	5/15/97	14	—	—	100	614120	27938
13380196	2172	5/31/95	814	—	—	100	614120	23604
13380196	2310	7/13/96	814	—	—	100	614120	23604
13380538	2030	7/18/97	2	—	—	90	400109	21134
13380538	2607	7/16/96	902	—	—	100	614120	07831
13380538	2954	5/31/95	902	—	—	100	614120	27937
13380549	558	7/18/96	701	—	—	100	614120	00000
13380549	589	5/30/97	1	—	—	100	614120	21395
13380549	1410	5/30/95	701	—	—	100	614120	23604
13380591	2443	6/1/94	225	3286	3493	100	614120	00000
13380591	2768	5/15/97	225	3286	3493	100	614120	00000
13380591	3008	7/13/96	225	3286	3493	100	614120	21395
13380591	3427	5/5/93	225	3286	3493	100	614120	0
13380592	1197	5/22/95	226	—	—	100	614120	0
13380592	2784	5/15/97	226	—	—	100	614120	00000
13380592	3005	7/13/96	226	—	—	100	614120	00000
13380594	1742	5/15/97	228	—	—	100	614120	00000
13380594	1907	7/13/96	228	—	—	100	614120	00000
13380594	2299	5/22/95	228	—	—	100	614120	00000
13380597	2680	5/22/95	232	—	—	100	614120	00000
13380597	2776	5/15/97	232	—	—	100	614120	00000
13380597	3081	7/13/96	232	—	—	100	614120	0
13380603	2934	7/12/96	9105	—	—	200	614120	23604
13380603	2998	5/31/95	9105	—	—	200	614120	23604

Ranger (cont)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
13380603	3019	5/15/97	9105	—	—	200	614120	00000
13380604	3261	5/15/97	9106	3272	3335	200	614120	00000
13380604	3292	7/12/96	9106	3272	3335	200	614120	21395
13380610	3244	5/22/97	208	—	—	250	614120	00000
13380611	1524	5/31/95	6301	—	—	200	614120	00000
13380611	2710	7/13/96	6301	—	—	200	614120	21395
13380611	2755	5/15/97	6301	—	—	200	614120	00000
13380613	3028	5/19/95	8101	—	—	200	614120	00000
13380613	3120	7/13/96	8101	—	—	200	614120	23604
13380613	3318	5/15/97	8101	—	—	200	614120	00000
13380614	1673	7/13/96	8102	—	—	200	614120	00000
13380614	1678	5/15/97	8102	—	—	200	614120	23604
13380614	1680	5/19/95	8102	—	—	200	614120	00000
13380615	2310	7/13/96	8103	3180	3328	200	614120	0
13380615	2368	5/15/97	8103	3180	3328	200	614120	23604
13380615	2462	5/31/94	8103	3180	3328	200	614120	07831
13380615	2535	5/5/93	8103	3180	3328	200	614120	00000
13380615	3280	5/19/95	8103	3180	3328	200	614120	00000
13380616	2672	7/13/96	8106	—	—	200	614120	00000
13380616	2775	5/15/97	8106	—	—	200	614120	00000
13381241	2214	5/30/95	805	3445	3466	100	614120	00000
13381241	2425	7/13/96	805	3445	3466	100	614120	21134
13381241	2480	5/15/97	5	3445	3466	100	614120	07831
13381242	2656	5/31/95	811	—	—	100	614120	00000
13381242	2765	5/22/97	11	—	—	100	614120	00000
13381242	2809	7/13/96	811	—	—	100	614120	00000

Sawyer (Canyon)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4243500198	6130	5/15/96	2	6149	6172	850	630611	00000
4243500198	6151	5/26/94	2	6149	6172	850	630611	00000
4243500198	6151	6/1/95	2	6149	6172	850	630611	00000
4243500198	6151	6/2/97	2	6149	6172	850	630611	00000
4243510060	4914	7/8/96	1	—	—	850	253196	00000
4243530039	2677	4/10/97	1	—	—	820	228125	00000
4243530065	6097	4/10/97	1	—	—	850	228125	00000
4243530070	5197	4/10/97	1	—	—	775	228125	00000
4243530079	4693	4/10/97	1	—	—	850	228125	00000
4243530127	2488	4/10/97	1	—	—	900	228125	00000

Share, SE (Morrow, Upper)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4235700153	2898	5/24/95	1 L	—	7430	500	862594	02061
4235702359	2772	5/24/95	3 L	7462	7476	500	47175	02061
4235780713	7308	5/24/95	2 L	—	7460	500	862594	02052
4235780714	6993	5/24/95	4	—	7532	500	862594	02052
4235780715	1670	5/24/95	5 L	—	7583	500	862594	02052
4235780715	6426	5/20/97	5 L	—	7583	625	824758	02052
4235780715	7466	9/13/96	5 L	—	7583	625	862594	02052
4235780716	4568	5/24/95	6 L	—	7515	500	862594	02052
4235780716	7701	9/13/96	6 L	—	7515	625	862594	02052

Sullivan (Delaware)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4238900154	2300	9/2/95	2	—	2620	300	786465	11510
4238900669	2225	10/10/97	1	—	2692	450	144181	12749
4238900671	1983	10/10/97	3	—	2754	450	144181	12749
4238901178	2000	9/2/95	3	—	2676	300	786465	11510
4238901178	2424	6/2/97	3	—	2676	800	786465	11510

Three Bar (Devonian)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4200303008	5072	11/18/96	31	—	—	1400	737890	00000
4200303008	5103	8/31/94	31	—	—	1400	737890	00000
4200303008	6076	6/17/97	31	—	—	1350	737890	00000
4200303011	4371	6/17/97	34	8165	8256	1350	737890	06781
4200303018	5166	9/17/95	41	—	—	1400	737890	32093
4200303018	6200	6/17/97	41	—	—	1350	737890	32093
4200303019	3780	8/31/94	42	—	—	1400	737890	32100
4200303019	7245	8/28/96	42	—	—	1400	737890	32100

Todd, Deep (Crinoidal)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4210500078	2060	4/7/93	23	—	—	600	172230	02014
4210500078	2496	3/8/94	23	—	—	600	172230	02014
4210500695	1581	5/20/97	10	—	—	625	617042	02014
4210500695	1600	5/31/95	10	—	—	625	172230	02014
4210500695	1620	5/29/96	10	—	—	625	617042	02014
4210500696	1404	3/10/94	16	5808	5852	625	172230	02014

Vealmoor

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
22703031	1085	4/6/95	3	—	7942	375	693691	07092
22703031	1125	5/8/97	3	—	7942	375	247762	07092
22703031	1155	7/22/96	3	—	7942	375	693691	07092
22703032	1347	5/9/97	4	—	7912	375	693691	07099
22703001	1570	5/9/97	3	—	7911	375	693691	07083
22703059	2250	5/9/97	13	7807	7832	350	844118	07099
22703020	2360	5/9/97	3	—	7895	350	247762	07099
22703053	2387	10/5/94	4	7796	7801	350	844118	07099
22703059	2397	10/5/94	13	7807	7832	350	844118	07099
3300850	2399	7/22/96	14	7793	7802	350	844118	07089
22703059	2399	7/22/96	13	7807	7832	350	844118	07090
3300850	2429	10/5/94	14	7793	7802	350	844118	07099
22703020	2452	7/22/96	3	—	7895	350	693691	07090
22703053	2457	7/22/96	4	7796	7801	350	693691	07099
3300850	2464	5/17/94	14	7793	7802	350	844118	07099
22703020	2480	4/6/95	3	—	7895	350	693691	07099
22703053	2499	5/17/94	4	7796	7801	350	844118	07099
22703018	2576	5/9/97	1	—	7905	350	693691	07092
22703053	2782	5/9/97	4	7796	7801	350	844118	07090
22703059	2929	5/17/94	13	7807	7832	350	693691	07099

Appendix B-2
H15 Database Printouts - MAYBE Category

Adair (Wolfcamp)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4244500056	711	7/7/94	6WS	1394	1912	300	16980	09892
4244500056	626	9/29/94	6WS	1394	1912	300	16980	09892
4244500056	654	1/3/96	6WS	1394	1912	300	16980	09892
4244500056	768	3/7/97	6WS	1394	1912	300	16980	09892
4244500070	752	5/24/94	904	—	—	300	16980	09892
4244500560	576	5/24/94	604	—	—	300	16980	09892
4244500560	514	10/13/94	604	—	—	300	16980	09892

Bayview (Glorieta)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4210311060	366	5/29/96	1	—	3000	350	818215	20601
4210311196	2975	10/11/95	7	3011	3025	400	357094	20586
4210311196	3055	5/22/97	7	3011	3025	300	819540	20586
4210382430	1885	8/18/94	2	2035	3013	525	627020	20586

Bradford (Tonkawa)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4229500992	6174	1/31/95	1	—	6448	900	877099	2668
4229580355	2300	8/7/96	2722	—	6465	500	190468	1982
4229580355	3769	4/22/97	2722	—	6465	500	562560	1982
4229580398	1248	1/19/95	4	—	6510	400	895060	2359
4229580398	2135	4/12/96	4	—	6510	400	895060	2359
4229580429	4536	1/31/95	1	—	6448	900	877099	2630
4229580429	4495	8/6/96	1	—	6448	900	877099	2630
4229580429	4536	3/26/97	1	—	6448	500	877099	2630
4229580429	4158	1/21/98	1	—	6448	900	877099	2630
4229580616	3371	1/31/95	C 1	—	6578	500	877099	3345
4229580617	4410	1/31/95	C 2	—	6563	500	877099	3345
4229580617	3565	8/6/96	C 2	—	6563	500	877099	3345
4229580617	3528	3/30/97	C 2	—	6563	500	877099	3345
4229580617	3497	1/21/98	C 2	—	6563	500	877099	3345
4229580619	2363	3/30/97	D 1	—	6524	450	877099	3345
4229580619	1890	1/21/98	D 1	—	6524	500	877099	3345

Bradford (Tonkawa) (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4229580620	4788	1/31/95	D 2	—	6576	500	877099	3345
4229580620	3339	5/30/96	D 2	---	6576	500	877099	3345
4229580620	1480	3/30/97	D 2	—	6576	500	877099	3345
4229580620	2678	1/21/98	D 2	—	6576	500	877099	3345

Brown & Thorp (Clear Fork)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4237101231	2862	12/16/96	301S	—	3028	2200	58893	22482
4237101807	1449	12/8/93	6	—	3028	550	58893	00510
4237101807	3000	5/2/95	6	—	3028	500	58893	00510
4237101807	3011	10/20/95	6	—	3028	2300	58893	00510
4237101807	2964	1/3/97	6	—	3028	2300	58893	00510
4237101807	2990	1/21/98	6	—	3028	2300	58893	00510
4237101814	2111	12/8/93	8	—	3028	550	58893	00511
4237101814	2970	5/2/95	8	—	3028	500	58893	00511
4237101814	2971	10/20/95	8	—	3028	2300	58893	00511
4237101814	2940	1/3/97	8	—	3028	2300	58893	00511
4237101814	2911	1/21/98	8	—	3028	2300	58893	00511
4237101818	1607	12/8/93	14	—	3028	550	58893	00511
4237101818	3030	5/2/95	14	—	3028	500	58893	00511
4237101818	3010	10/20/95	14	—	3028	2300	58893	00511
4237101818	3122	1/3/97	14	—	3028	2300	58893	00511
4237101818	3141	1/21/98	14	—	3028	2300	58893	00511
4237120038	263	5/17/95	13	3097	3143	650	930860	00524

Bryson, East

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4223736686	1886	1/27/98	1	3168	3174	550	240125	25443
4223736726	2281	10/20/97	1A	2884	2888	350	68287	0
4223781533	651	3/19/97	1	—	—	400	79560	3515
4223781541	2870	5/20/95	3	—	3100	150	139947	3522
4223781541	2870	5/6/96	3	—	3100	150	139947	3522
4223781541	2750	5/2/97	3	—	3100	300	139947	3522
4223781562	2949	8/21/95	1	—	—	225	9430	3546
4223781562	2999	5/8/96	1	—	—	225	9430	3546
4223781562	2995	4/16/97	1	—	—	225	9430	3546
4223781563	2935	8/21/95	2	—	—	225	9430	3546
4223781563	2985	5/8/96	2	—	—	225	9430	3546
4223781563	2970	4/15/97	2	—	—	225	9430	3546
4223781576	527	2/29/96	4	—	—	300	548715	3551
4223781576	1800	8/10/97	4	—	—	100	548715	3551
4223781595	2790	6/12/95	1	—	3100	300	754025	3576
4223781595	2788	7/22/97	1	—	3100	300	754025	3576
4223782142	290	5/23/95	3A	—	—	275	366830	11005
4223782423	1643	8/14/96	3	—	—	550	194245	11638

Carthage, (Petit Upper)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
36500087	8250	8/11/94	1 C	6112	6132	500	507850	00000
36500087	6000	2/7/95	1 C	6112	6132	500	507850	00000
36500087	6000	6/27/96	1 C	6112	6132	500	507850	00000
36500087	5970	5/1/97	1 C	6112	6132	500	507850	00000
36500088	5817	2/24/98	1	6104	6128	500	480930	00000
36501403	1900	5/17/94	6 T	—	—	250	254060	00000
36501405	4867	8/18/94	2	5672	5708	250	652352	00000
36501405	4836	9/18/95	2	5672	5708	250	652352	00000
36501410	5642	8/15/94	2	5790	5817	325	652352	00000
36501410	5704	9/18/95	2	5790	5817	325	652352	00000
36501441	1071	2/4/94	1 U	5776	5800	350	29340	00000
36501459	6223	6/17/96	1 C	5804	5844	350	876645	00000
36501459	5766	3/22/97	1 C	5804	5844	350	876645	00000
36501530	6078	5/11/93	1 U	5920	5950	450	844118	00000
36501530	6363	2/28/95	1 U	5920	5950	500	844118	00000
36501530	5826	4/9/97	1 U	5920	5950	500	844118	00000
36501556	5828	5/27/97	1 C	—	—	425	883810	00000
36501614	326	8/15/94	1	5690	5700	250	652352	00000
36501667	6033	6/2/93	1 C	6102	6126	550	876645	00000
36580070	5620	7/8/94	1 C	6202	6222	500	709680	00000
36580070	5620	5/2/95	1 C	6202	6222	500	709680	00000
36580070	5690	4/10/96	1 C	6202	6222	500	709680	00000
36580070	5730	5/5/97	1 C	6202	6222	500	709680	00000
36580073	3875	6/2/93	1 C	5770	5810	300	876645	00000
36580073	5160	5/19/95	1 C	5770	5810	300	876645	00000
36580073	5302	6/17/96	1 C	5770	5810	300	876645	00000
36580077	5720	6/2/93	1 C	5834	5860	450	876645	00000
36580077	5640	7/11/95	1 C	5834	5860	450	876645	00000
36580077	4763	6/17/96	1 C	5834	5860	450	876645	00000
36580079	5781	6/2/93	1 C	—	—	350	876645	00000
36580081	5750	6/3/93	1 C	5870	5896	400	876645	00000
36580081	5280	5/19/95	1 C	5870	5896	400	876645	00000
36580081	5556	6/17/96	1 C	5870	5896	400	876645	00000
36580081	5450	4/16/97	1 C	5870	5896	400	876645	00000
36580115	3447	4/30/97	1	5908	5946	300	844118	00000

Choate (Cisco-K)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4215530006	3000	4/30/97	50	—	3864	150	164448	13349
4215530009	3000	4/30/97	51	—	3768	150	164448	13349
4215580054	1426	5/11/95	32	—	—	150	518415	13349
4215580054	1420	3/19/96	32	—	—	150	164448	13349
4215580054	1390	4/16/97	32	—	—	150	164448	13349

Cowden, South (Canyon 8900)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4213530335	915	3/28/97	1	—	9038	1400	252131	23179
4213530526	6983	3/28/97	8	—	9022	1400	252131	23179
4213530531	7710	3/28/97	10	—	9018	1400	252131	23179
4213530584	4320	5/29/97	118	—	8926	1500	164464	32791

Embar (Permian)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4200304516	5009	2/2/95	18	6232	6274	1250	663680	1269
4200304516	5217	11/13/95	18	6232	6274	1250	663680	1269
4200304588	5094	5/3/94	69 L	—	6198	1250	663680	1270
4200304802	3140	2/21/95	99	6216	6272	1200	663680	1270
4200304802	3392	11/15/95	99	6216	6272	1200	663680	1270
4200304806	1333	5/9/95	104	6172	6250	1300	663680	1270

Emperor, Deep

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
49500031	1386	5/7/93	1	2350	2650	350	18023	18685
49500031	1260	4/7/94	1	2350	2650	350	18023	18685
49500031	1302	5/17/95	1	2350	2650	350	18023	18685
49500928	1488	5/16/95	C 5	2825	3054	350	195651	13746
49500928	1519	5/11/96	C 5	2825	3054	350	806470	13746
49500928	1525	5/10/97	C 5	2825	3054	350	806470	13746
49500932	1470	5/20/93	B 3	—	—	350	388776	13746
49500932	1612	3/28/94	B 3	—	—	350	388776	13746
49500932	1488	5/16/95	B 3	—	—	350	195651	13746
49500932	1333	5/26/96	B 3	—	—	350	806470	13746
49500932	1340	5/26/97	B 3	—	—	350	806470	13746
49500934	1380	5/20/93	C 1	—	—	350	388776	13746
49500934	1333	3/28/94	C 1	—	—	350	388776	13746
49500934	868	5/16/95	C 1	—	—	350	195651	13746
49500934	806	5/16/96	C 1	—	—	350	806470	13746
49500934	806	5/10/97	C 1	—	—	350	806470	13746
49500935	1364	3/28/94	C 3	—	—	350	388776	13746
49500935	2480	5/11/96	C 3	—	—	350	806470	13746
49500940	1054	5/16/95	D 4	2802	3026	350	195651	13746
49500940	1116	5/11/96	D 4	2802	3026	350	806470	13746
49500940	1120	5/11/97	D 4	2802	3026	350	806470	13746
49500944	1800	5/20/93	C 2	—	—	350	388776	13746
49500944	1984	3/28/94	C 2	—	—	350	388776	13746
49500944	1891	5/16/95	C 2	—	—	350	195651	13746
49500944	1860	5/11/96	C 2	—	—	350	806470	13746
49500944	1860	5/1/97	C 2	—	—	350	806470	13746
49500945	1230	5/20/93	B 2	—	—	350	388776	13746
49500945	1457	3/28/94	B 2	—	—	350	388776	13746
49500945	1150	5/30/95	B 2	—	—	350	195651	13746
49500945	2865	5/30/96	B 2	—	—	350	806470	13746
49500945	2870	4/30/97	B 2	—	—	350	806470	13746
49500947	1320	5/20/93	A 2	2704	3007	350	388776	13746
49500947	1426	3/28/94	A 2	2704	3007	350	388776	13746
49500947	1209	5/16/95	A 2	2704	3007	750	195651	13746
49500947	1178	5/15/96	A 2	2704	3007	750	806470	13746
49500947	1180	5/15/97	A 2	2704	3007	750	806470	13746
49502439	1612	5/14/95	1	2830	3139	350	18023	15581
49502439	1550	5/9/96	1	2830	3139	350	18023	15581
49502620	1040	5/7/93	3	—	—	350	18023	1337
49502620	810	4/7/94	3	—	—	350	18023	1337
49502620	1488	5/17/95	3	—	—	350	18023	1337
49502636	2400	9/1/95	2	2584	2596	225	786465	1340
49502636	2186	6/2/97	2	2584	2596	350	786465	1340
49502642	189	5/7/93	4	—	—	300	18023	1328
49502644	1622	8/18/94	3	—	—	350	786465	8987
49502644	1900	9/1/95	3	—	—	500	786465	8987

Emperor, Deep (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
49502644	1610	6/2/97	3	—	—	350	786465	8987
49503545	845	8/22/95	15	2870	3087	425	621097	15232
49505160	1600	9/1/95	4	—	—	225	786465	8987
49505160	1138	6/2/97	4	—	—	350	786465	8987
49506137	1085	5/14/95	4	2892	3022	325	18023	15678
49506137	2604	5/9/96	4	2892	3022	325	18023	15678
49506139	1240	5/14/95	5	3082	3270	375	18023	1331
49506188	1323	5/7/93	1	2694	2710	350	18023	17104
49506188	1140	4/7/94	1	2694	2710	350	18023	17104
49506188	1271	5/17/95	1	2694	2710	350	18023	17104
49510230	2319	5/17/95	2	—	—	350	18023	18685
49510231	1767	5/17/95	4	2637	3002	350	18023	1337
49510232	1736	5/17/95	5	—	—	350	18023	1337
49510233	1209	5/17/95	8	—	—	375	18023	1336
49510464	2268	5/7/93	5	2973	3104	300	18023	1328
49510466	1643	5/14/95	8	—	—	375	18023	1329
49510466	806	5/9/96	8	—	—	375	18023	1329
49530134	842	8/22/95	19WS	—	—	425	621097	15232
49580063	1457	5/17/95	1	—	—	350	18023	1336
49581442	1182	8/22/95	5	—	—	425	621097	15232

Fullerton (San Andres)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
301549	896	5/14/96	2	4498	4785	1450	450175	16638
301549	2433	8/1/94	2	4498	4785	1800	527220	16638
306716	3911	3/22/95	31S	4549	4584	250	20425	13967

Goldsmith (Clear Fork)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4200304497	460	10/26/95	6	—	5599	1250	663680	8387
4213500029	4367	4/11/95	6	5574	5633	1300	20572	20543
4213500321	2140	4/11/95	26	5495	5792	1300	20572	20543
4213500355	3982	9/12/95	5	5512	6296	1300	20572	20543
4213500382	1713	4/11/95	34	5532	5779	1300	20572	20543
4213500980	132	12/6/93	602 C	—	—	1300	148113	2100
4213503194	4900	5/14/96	A 6	—	6300	1350	663680	21193
4213503194	2791	2/24/97	A 6	—	6300	1350	663680	21193
4213503226	5580	9/27/94	2	6254	6294	225	748109	9796
4213503226	5923	6/6/96	2	6254	6294	1250	748109	9796
4213503229	3538	6/6/97	1 C	—	—	1250	521563	9796
4213504482	1357	4/11/95	113	—	—	1300	20572	20543
4213504482	1378	4/3/96	113	—	—	1300	20572	20543
4213504482	4285	4/10/97	113	—	—	1300	20572	20543
4213506379	1806	5/3/94	10 T	5470	6280	1400	663680	2138
4213506385	1727	6/11/96	11	—	6260	1400	161619	2139
4213506385	1836	5/10/97	11	—	6260	1400	161619	2139
4213507494	157	4/11/95	43	5638	5697	1300	20572	20543
4213507525	4290	1/19/95	3809	—	5640	1300	630591	20888
4213507525	3812	1/19/96	9 L	6138	6270	1300	172230	12773
4213507525	2786	5/9/97	9 L	6138	6270	1300	172230	12773
4213530318	1307	4/21/97	1280	5224	5934	1200	148113	2290
4213584562	6005	3/22/96	B 6	—	6300	1350	663680	21193
4213584566	2784	4/9/96	C 3	—	—	1300	663680	21193

Goldsmith, N. (San Andres)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
300311	1158	2/23/95	5	4248	4439	1300	20572	22681
301439	2700	7/15/95	1	—	—	1200	748744	0
301439	2730	5/7/97	1	—	—	1200	748744	0
301448	700	8/25/95	2	—	—	1400	748744	20713
301451	2697	5/8/97	4	5862	5902	1300	748744	20713
302500	1761	11/18/93	53	—	—	1300	257097	18573
303104	1476	2/23/95	30	—	—	1300	20572	22681
303104	1157	3/19/96	30	—	—	1300	20572	22681
303206	3119	4/10/97	29	—	—	1300	20572	22681
303918	2821	5/18/94	1	4120	4332	1250	20783	30731
304107	3500	5/30/94	4	—	4500	100	480165	29267
304107	3500	9/17/95	4	—	4500	100	480165	29267
304107	3500	1/3/98	4	—	4500	1450	480165	29267
304165	4035	5/28/93	1	—	—	1250	441020	0
304165	4041	6/16/94	1	—	—	1250	441020	0
304165	4061	8/17/95	1	—	—	1250	441020	0
304165	4096	6/16/97	1	—	—	1250	441020	0
304596	5632	2/17/95	28 C	—	—	1400	663680	0
304596	2912	10/26/95	28 C	—	—	1400	663680	0
304798	3749	2/4/95	95 U	—	—	1200	663680	0
304798	4028	3/24/96	95 U	—	—	1200	663680	0
304798	4001	2/24/97	95 U	—	—	1200	663680	0
310024	3889	5/9/95	107	—	—	1200	663680	0
310024	3334	11/14/95	107	—	—	1200	663680	0
310151	3533	11/13/95	9	4192	4137	1250	663680	0
310151	3712	12/7/95	9	4192	4137	1250	663680	0
310202	1643	5/9/95	106	4030	4050	1200	663680	0
310202	4203	11/15/95	106	4030	4050	1200	663680	0
310967	1558	8/18/94	1	—	—	1400	20572	22681
310967	837	3/19/96	1	—	—	1300	20572	22681
330046	4245	12/7/94	82	4295	4497	1400	257097	18573
384619	2738	8/18/94	2	—	—	1400	20572	22681
384619	2611	2/23/95	2	—	—	1300	20572	22681
384619	2638	3/19/96	2	—	—	1300	20572	22681
384619	2096	4/10/97	2	—	—	1300	20572	22681
13500045	3499	4/10/97	4 C	4118	4140	1250	20572	24278
13500052	3620	8/18/94	1	4266	4336	1400	20572	21677
13500052	4182	4/10/95	1	4266	4336	1300	20572	21677
13500052	3816	3/19/96	1	4266	4336	1300	20572	21677
13500144	3658	5/26/95	3	4223	4450	1350	630591	31416
13500159	3750	5/27/95	11	—	—	1300	170450	0
13500159	4102	5/28/96	11	—	—	1300	170450	0
13500159	3940	6/13/97	11	—	—	1300	170450	0
13500294	3172	5/30/96	2	—	—	1350	20783	18525
13500294	3168	5/8/97	2	—	—	1350	20783	18525
13502426	4387	4/12/93	1	4120	4155	1300	663680	30014

Goldsmith, N. (San Andres) (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
13502426	4192	1/5/94	1	4120	4155	200	663680	30014
13502426	5626	2/10/95	1	4120	4155	1300	663680	30014
13502426	4454	3/6/95	1	4120	4155	1300	663680	30014
13502684	3168	4/5/94	34	—	—	1250	844118	0
13502684	3906	7/20/95	34	—	—	1350	844118	0
13503162	4233	5/10/94	5	4175	4200	1350	516260	0
13503180	3500	5/15/94	4	—	4190	1350	516260	22139
13503180	3525	7/8/95	4	—	4190	1350	518394	22139
13503199	3906	9/27/94	2	—	—	225	748109	0
13503199	2898	6/15/96	2	—	—	225	748109	0
13503199	4095	8/20/97	2	—	—	225	748109	0
13503213	3565	8/17/93	3	4278	4298	1300	525380	29649
13503213	3542	7/20/94	3	4278	4298	1300	441020	29649
13503213	3658	8/16/95	3	4278	4298	1300	441020	29649
13503213	3628	7/24/96	3	4278	4298	1300	441020	29649
13503213	3612	7/8/97	3	4278	4298	1300	441020	29649
13508325	4223	8/18/94	1	—	4500	1400	786465	18605
13508325	2090	9/5/95	1	—	4500	1400	786465	18605
13508325	4216	6/3/97	1	—	4500	1400	786465	18605
13520058	1643	2/10/95	10 U	—	—	1350	663680	18590
13520127	4095	5/10/96	39 U	4055	4085	1350	844118	18614
13520669	3400	5/31/95	1	—	—	1350	196965	19922
13521106	4117	7/23/96	1	4036	4117	250	337106	20084
13521106	2108	8/11/97	1	4036	4117	250	337106	20084
13521428	713	8/30/95	2	—	—	1350	545300	20084
13530742	3778	5/2/97	49	4108	4164	1400	663680	18589

Grice (Delaware)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4230100384	3200	3/28/95	2	—	4618	950	895060	13804
4230100519	1800	3/28/95	3	—	4756	950	895060	12684
4230100756	1120	11/3/94	1	—	4520	900	370063	11752
4230100756	2418	6/12/96	1	—	4520	900	370063	11752
4230100972	2015	5/5/95	6	—	4681	975	876520	15645
4230100972	1985	4/26/96	6	—	4681	975	93548	15645
4230100972	2108	5/24/97	6	—	4681	975	93548	15645

Hardin

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4229102312	2695	10/26/94	1	—	7616	2500	675250	7739
4229102312	2728	5/21/96	1	—	7616	2500	675250	7739
4229102312	2700	4/24/97	1	—	7616	2500	675250	7739
4229102329	5	8/10/94	1	7594	7600	2650	206755	1909
4229102347	1021	9/10/93	1	7822	7825	2500	675250	1889
4229102356	3999	5/9/95	1	7580	7584	2475	675250	7870
4229102356	3906	5/21/96	1	7580	7584	2475	675250	7870
4229102356	3700	4/24/97	1	7580	7584	2475	675250	7870
4229102372	3365	5/22/96	1	—	—	2650	675250	5400
4229102372	3200	4/3/97	1	—	—	2650	675250	5400
4229102373	3635	7/15/93	2	7490	7500	2650	675250	5400
4229102373	6882	5/9/95	2	7490	7500	2650	675250	5400
4229102373	6851	5/22/96	2	7490	7500	2650	675250	5400
4229102373	6600	4/24/97	2	7490	7500	2650	675250	5400
4229102380	3180	9/7/93	1	3170	3180	2575	37103	1907
4229105231	6293	5/10/95	2	7518	7524	2450	675250	8415
4229105231	6200	5/17/96	2	7518	7524	2450	675250	8415
4229105231	6140	4/25/97	2	7518	7524	2450	675250	8415
4229105255	3286	5/10/95	3	—	7303	2450	675250	8415
4229105255	3224	5/17/96	3	—	7303	2450	675250	8415
4229105255	3190	4/24/97	3	—	7303	2450	675250	8415

Ken Regan (Delaware)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4238900275	1610	8/10/97	2	3374	3374	625	447978	12244
4238900279	2173	8/10/97	6	0	3381	625	447978	12244
4238900947	1733	5/21/95	1W	0	3388	1350	787409	14886
4238900947	1750	7/16/96	1W	0	3388	1350	787409	14886
4238900947	1764	5/27/97	1W	0	3388	1350	787409	14886
4238910225	2362	5/21/95	1	0	3390	1350	787409	19406
4238910225	2350	7/16/96	1	0	3390	1350	787409	19406
4238910225	2046	5/27/97	1	0	3390	1350	787409	19406
4238930339	1890	1/29/97	2	0	3370	1350	787409	23315

Keystone (San Andres)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
49501232	4162	8/17/93	8	—	4469	750	556235	23120
49501232	2635	5/3/95	8	—	4469	700	556235	23120
49501232	2496	7/12/96	8	—	4469	750	556235	23120
49501232	4080	6/24/97	8	—	4469	750	866222	23120
49501232	4000	1/21/98	8	—	4469	750	866222	23120
49501359	1700	1/21/98	210	—	4947	750	866222	23120
49501360	2976	4/28/95	211	—	4416	700	556235	23120
49503704	1134	4/27/94	44	4042	4357	600	54700	28522
49503704	1009	5/3/95	44	4042	4357	600	54700	28522
49503704	96	5/6/96	44	4042	4357	600	54700	28522
49503728	15	3/30/93	20D	4615	4785	600	54700	28522
49505302	1674	5/12/94	3	—	4348	700	91093	23108
49505302	4100	5/23/95	3	—	4348	700	91093	23108
49505302	1550	5/29/96	3	—	4348	700	640880	23108
49505302	1922	6/17/97	3	—	4348	700	640880	23108

Knox City, North (Canyon)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
27500989	3181	4/28/95	3	—	—	100	667867	9795
27500989	2237	7/22/96	3	—	—	100	667867	9795
27500990	2677	4/28/95	30	4192	4196	100	667867	9795
27500990	347	7/22/96	30	4192	4196	100	667867	9795
27500990	347	4/17/97	30	4192	4196	100	667867	9795
27500990	460	1/18/98	30	4192	4196	100	834092	9795
27500992	3748	4/17/97	17	4174	4200	100	667867	9795
27500992	3710	1/17/98	17	4174	4200	100	834092	9795
27500994	1953	5/21/96	36	4163	4190	100	667867	9795
27500994	2174	4/17/97	36	4163	4190	100	667867	9795
27500994	2166	1/19/98	36	4163	4190	100	834092	9795
27500995	4063	4/28/95	40	4224	4284	100	667867	9795
27501018	2488	2/15/95	16	—	—	100	667867	9795
27501019	2772	4/28/95	11	—	—	100	667867	9795
27501019	284	7/31/96	11	—	—	100	667867	9795
27501022	2197	4/17/97	3	4170	4190	100	667867	9795
27501022	2210	1/18/98	3	4170	4190	100	834092	9795
27504038	1364	6/16/94	51	4177	4247	100	667867	9795
27504038	1512	4/28/95	51	4177	4247	100	667867	9795
27504038	1764	7/20/96	51	4177	4247	100	667867	9795
27504038	417	4/17/97	51	4177	4247	100	667867	9795

Knox City, North (Canyon)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
27580237	3906	4/28/95	1	—	—	100	667867	9795
27580237	1796	7/31/96	1	—	—	100	667867	9795
27580237	1796	4/17/97	1	—	—	100	667867	9795
27580256	1674	6/16/94	20	4171	4210	100	667867	9795
27580256	3244	4/28/95	20	4171	4210	100	667867	9795
27580256	733	7/22/96	20	4171	4210	100	667867	9795
27580256	733	4/17/97	20	4171	4210	100	667867	9795
27580256	760	1/17/98	20	4171	4210	100	834092	9795
27580262	1795	4/28/95	26	—	—	100	667867	9795
27580262	1638	7/31/96	26	—	—	100	667867	9795
27580262	1623	4/17/97	26	—	—	100	667867	9795
27580262	1600	1/18/98	26	—	—	100	834092	9795
27580263	3370	4/28/95	27	4292	4307	100	667867	9795
27580263	535	7/22/96	27	4292	4307	100	667867	9795
27580263	2142	4/17/97	27	4292	4307	100	667867	9795
27580283	1767	6/16/94	48	4297	4353	100	667867	9795
27580283	1732	4/28/95	48	4297	4353	100	667867	9795
27580283	536	7/20/96	48	4297	4353	100	667867	9795
27580283	434	4/17/97	48	4297	4353	100	667867	9795
27580283	480	1/26/98	48	4297	4353	100	834092	9795
27580284	1071	5/21/96	49	—	—	100	667867	9795
27580284	1264	4/17/97	49	—	—	100	667867	9795
27580284	1213	1/19/98	49	—	—	100	834092	9795
27580289	2170	6/16/94	54	4260	4270	100	667867	9795
27580289	4284	4/28/95	54	4260	4270	100	667867	9795
27580289	1764	7/20/96	54	4260	4270	100	667867	9795
27580289	1101	4/17/97	54	4260	4270	100	667867	9795
27580289	1080	1/19/98	54	4260	4270	100	834092	9795

Magutex (Devonian)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4200303785	10574	5/23/94	2	12454	12484	1750	572550	4038
4200303785	3968	8/25/95	2	12454	12484	1750	572550	4038
4200303785	3751	5/8/96	2	12454	12484	1750	572550	4038
4200303785	11470	5/29/97	2	12454	12484	1750	860851	4038
4200303786	5425	5/8/96	2 U	—	12465	1750	572550	4039
4200303786	4000	5/29/97	2 U	—	12465	1750	860851	4039
4200304734	1271	5/27/94	9	—	12515	1750	663680	4041
4200304734	4950	6/30/94	9	—	12515	1750	663680	4041
4200304734	3724	10/18/94	9	—	12515	1750	663680	4041
4200304739	2430	5/27/94	12	—	12476	1750	663680	4041
4200304739	2786	10/18/94	12	—	12476	1750	663680	4041
4200304741	8723	5/27/94	14	—	12518	1750	663680	4041
4200304741	5670	10/18/94	14	—	12518	1750	663680	4041
4200304741	5601	1/30/96	14	—	12518	1750	663680	4041
4200310129	6000	8/8/95	12 H	—	12490	250	652400	11628

Means, N. (Queen Sand)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
301723	3710	8/26/94	4	4400	4890	1750	639460	29327
301723	3426	10/21/96	4	4400	4890	1750	639460	29327
301868	3072	8/26/94	7	—	—	1750	639460	26322
301868	2865	5/18/96	7	—	—	1750	639460	26322
301868	2526	12/27/97	7	—	—	1750	639460	26322
307611	2372	8/7/95	1	—	4400	1700	639460	4243
307611	2556	6/20/97	1	—	4400	1700	639460	4243
307614	2142	8/7/95	2	—	4400	1700	639460	4243
307614	2698	6/20/97	2	—	4400	1700	639460	4243
332200	2769	2/11/97	7	4554	4584	1750	639460	25723
332200	2750	3/2/98	7	4554	4584	1750	639460	25723
332297	2414	2/11/97	12	—	4571	1750	639460	26074
332297	2420	3/2/98	12	—	4571	1750	639460	26074
334358	2769	6/20/97	2	4510	4530	1750	639460	29327

Midland Farms

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
300079	1518	3/7/96	264	—	—	1600	20425	15874
300079	2947	5/20/95	264	—	—	1600	20425	15874
300079	2062	4/15/94	264	—	—	1600	20425	15874
300096	2166	5/6/96	245	4664	4872	1600	20425	15874
300238	1905	4/12/95	260	4653	4862	1600	20425	15874
301226	2057	4/17/95	324	4816	4817	1600	20425	15874
301239	2620	4/19/95	341	4832	4833	1600	20425	15874
301266	2547	3/9/94	71	—	—	1550	20425	15874
301269	2689	3/9/94	127	—	—	1550	20425	15874
301270	2277	4/6/94	183	—	—	1550	20425	15874
301271	2514	4/6/94	130	—	—	1550	20425	15874
301272	1744	4/15/94	301	—	—	1550	20425	15874
301273	2581	3/17/94	76	—	—	1550	20425	15874
301274	2777	3/17/94	72	—	—	1550	20425	15874
301275	2442	3/17/94	75	—	—	1550	20425	15874
303339	2337	4/10/95	102	—	—	1600	20425	15874
303339	1598	3/12/96	102	—	—	1600	20425	15874
304300	717	5/4/94	356	4763	4814	1600	20425	15874
305699	1376	4/3/95	26	—	—	1550	20425	15874
305712	1616	4/6/95	65	—	—	1550	20425	15874
305716	3857	3/9/94	54	—	—	1600	20425	15874
305716	3519	5/3/95	54	—	—	1600	20425	15874
305719	1417	4/6/95	81	—	—	1550	20425	15874
305720	2676	3/21/94	77	—	—	1550	20425	15874
305722	1151	3/12/96	125	4624	4820	1550	20425	15874
305727	2681	5/22/97	117	—	—	1600	20425	15874
305727	2684	3/7/96	117	—	—	1600	20425	15874
305735	2787	4/10/95	105	—	—	1600	20425	15874
305736	2958	3/21/94	104	—	—	1600	20425	15874
305736	2571	4/10/95	104	—	—	1600	20425	15874
305743	3285	4/6/94	133	—	—	1550	20425	15874
305777	2406	4/15/94	290	—	—	1550	20425	15874
305813	649	5/11/93	9	4647	4848	1550	20425	15874
305818	3133	4/10/95	140	—	—	1600	20425	15874
306042	3806	5/22/97	118	—	—	1600	20425	15874
306042	3817	3/7/96	118	—	—	1600	20425	15874
306042	3813	4/10/95	118	—	—	1600	20425	15874
306046	2613	3/9/94	70	—	—	1550	20425	15874
306049	3026	3/21/94	95	—	—	1600	20425	15874
306049	4481	4/10/95	95	—	—	1600	20425	15874
306065	3298	5/21/97	88	—	—	1600	20425	15874
306065	3801	3/7/96	88	—	—	1600	20425	15874
306065	3908	4/6/95	88	—	—	1600	20425	15874
306066	4589	4/3/95	56	—	—	1600	20425	15874
306066	3967	3/12/96	56	—	—	1600	20425	15874
306080	4547	4/3/95	55	—	—	1600	20425	15874

Midland Farms (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
306080	3878	3/12/96	55	—	—	1600	20425	15874
306087	1537	4/6/95	83	8474	8583	1550	20425	15874
306098	3219	3/12/96	60	—	—	1600	20425	15874
306098	4484	4/3/95	60	—	—	1600	20425	15874
306133	925	5/11/93	28	4677	4836	1550	20425	15874
306291	506	5/11/93	19	4658	4790	1550	20425	15874
306293	1793	4/6/95	68	4625	4670	1550	20425	15874
306301	3952	4/6/95	87	—	—	1600	20425	15874
306301	3017	5/21/97	87	—	—	1600	20425	15874
306301	3824	3/7/96	87	—	—	1600	20425	15874
310788	1539	5/17/95	204 A	4666	4690	1600	20425	15874
330264	3379	5/20/97	375	—	—	1600	20425	15874
330265	3114	5/20/97	374	—	—	1600	20425	15874

Monahans (Queen Sand)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4247511195	2150	5/5/95	1	—	3170	500	569339	21118
4247511195	2140	5/13/96	1	—	3170	500	569339	21118
4247511195	2140	4/11/97	1	—	3170	500	569339	21118
4247534168	155	5/11/93	3S	848	950	450	774720	14727
4249530233	1540	11/12/96	2	3178	3192	450	569342	25245
4249530233	1545	5/12/97	2	3178	3192	450	569342	25245

Moore

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4222700377	1715	6/22/95	94	—	—	200	835982	20544
4222700832	1970	3/1/94	5	—	3200	150	835982	8721
4222700834	2201	3/1/94	5	—	3200	200	835982	9269
4222700836	1859	3/1/94	6	—	3200	150	835982	8721
4222700838	788	3/1/94	6	—	3200	200	835982	9269
4222700841	429	3/1/94	8	—	3092	150	835982	8721
4222700891	2360	3/17/94	55WI	3122	3180	200	835982	20544
4222700908	277	8/30/94	80	—	3200	150	835982	20544
4222700983	1645	6/20/95	63	—	3200	200	835982	20544
4222701041	2414	3/1/94	3	—	3200	135	835982	8870
4222701043	2306	3/1/94	4	—	3200	135	835982	8870
4222701631	1065	3/1/94	3	—	3200	125	835982	9293
4222701632	1859	3/1/94	4	—	3200	125	835982	9293
4222701642	2717	6/21/95	117	—	—	125	835982	20544
4222701649	1734	3/18/94	1	—	—	200	835982	9100
4222701654	1877	3/10/94	5	—	—	200	835982	9100
4222701786	1573	6/20/95	9	—	3200	200	835982	20544
4222701812	2788	3/17/94	89WI	3130	3173	200	835982	20544
4222701820	2842	3/16/94	1	—	3200	175	835982	9774
4222702457	2216	6/22/95	23	—	—	200	835982	20544
4222702504	2145	3/17/94	5WI	3115	3205	200	835982	20544
4222703691	1966	3/17/94	2W	3108	3165	200	835982	20544
4222703691	1287	6/22/95	2W	3108	3165	200	835982	20544
4222703710	3215	3/1/96	4	—	—	200	841347	4431
4222703710	750	8/15/97	4	—	—	175	516247	4431
4222703862	1287	6/2/93	51WI	2954	3240	200	835982	20544
4222703862	1216	3/17/94	51WI	2954	3240	200	835982	20544
4222704079	2880	5/19/97	2	—	3200	100	362980	9823
4222704157	410	6/21/95	96	—	3200	150	835982	20544
4222704163	2538	3/23/94	66WI	3156	3195	200	835982	20544
4222704187	525	8/15/97	76	—	3200	175	516247	20544
4222704213	3289	3/18/94	1	—	3200	100	835982	9823
4222710905	2181	3/1/94	7	—	3200	200	835982	9269
4222733102	2860	6/26/97	3	3165	3215	249	873466	27808
4222733351	1410	5/10/97	2	3166	3198	325	899037	28937

Moore's Orchard

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
15701195	6240	5/10/93	58	7587	7600	1700	148113	0
15701195	7499	5/9/94	58	7587	7600	1700	148113	0
15701195	7500	3/3/95	58	7587	7600	1700	148113	0
15701195	5483	4/24/96	58	7587	7600	1700	148113	0
15701195	7176	4/10/97	58	7587	7600	1700	148113	0
15701219	1080	5/24/94	84	—	7220	1100	148113	3092
15701224	6695	5/17/94	89 C	—	6884	1250	148113	3092
15701224	6685	3/3/95	89 C	—	6884	1250	148113	3092
15701224	930	4/25/96	89 C	—	6884	1250	148113	3092
15701269	4500	5/12/95	134	—	—	1100	148113	0
15701269	4991	4/30/96	134	—	—	1100	148113	0
15701269	4991	4/10/97	134	—	—	1100	148113	0
15702823	7000	5/12/95	149 U	7063	7074	1200	148113	3092
15702823	6719	5/1/96	149 U	7063	7074	1200	148113	3092
15702823	6250	4/14/97	149 U	7063	7074	1200	148113	3092
15703009	7091	5/24/94	163	7190	7200	1200	148113	3092
15703009	7050	3/3/95	163	7190	7200	1200	148113	3092
15703009	4235	5/1/96	163	7190	7200	1200	148113	3092
15703009	7322	4/14/97	163	7190	7200	1200	148113	3092
15730053	2379	4/25/96	176	6860	6874	1300	148113	3092
15730053	2271	4/15/97	176	6860	6874	1300	148113	3092
15730054	434	5/8/96	175 L	7236	7254	1400	148113	3092
15731356	3069	10/27/97	1	—	—	2200	138630	0
15731396	6262	10/27/97	1	7954	7962	2200	138630	16212

Panhandle Moore County

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
34100201	3062	2/15/94	10	3224	3280	520	408850	1349
34100210	2794	2/15/94	19	—	—	190	408850	1349
34100210	320	4/25/96	19	—	—	500	408850	1349
34100931	2472	1/12/96	1	—	—	500	888005	2220
34100936	2850	1/12/96	2	—	—	500	888005	2220
34100941	2992	1/12/96	3	—	—	500	888005	2220
34100944	3100	9/16/95	4	—	—	500	888005	2220
34101034	3118	3/20/96	2	—	—	500	663680	2418
34101658	2913	1/12/96	5	—	—	500	888005	2220
34130023	2400	2/15/94	3	3222	3300	541	408850	6472
34130023	2499	3/12/96	3	3222	3300	541	663680	6472
34130023	2941	7/16/96	3	3222	3300	541	408850	6472

Panhandle Moore County (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
34130023	2719	2/24/98	3	3222	3300	541	663680	6472
34130039	3252	5/13/97	2	—	—	450	518279	5819
34130049	3330	3/22/97	1	2960	3294	500	888033	7052
34130265	3365	3/2/98	2048	3224	3270	450	88628	3992
34130494	2908	3/2/98	1048	3221	3381	450	88628	4288
34130708	2750	2/6/98	1	—	—	450	837701	5207
34130767	2970	2/6/98	5	3200	3340	450	837701	5207
34131016	2852	7/18/97	1	3468	3579	500	291898	5560
34131222	2728	3/21/97	1	2896	3554	500	381190	5916
34131297	3069	5/12/97	2	3016	3349	500	291898	5560
34131318	2883	10/24/97	1	2886	3100	500	722190	5937
34131358	2759	11/20/97	1	3304	3312	500	912700	5956
34131438	3038	10/24/97	9	2948	2968	510	722190	5937
34131456	2504	2/6/97	2	—	—	400	894210	6255
34131457	2821	2/6/97	1	3112	—	400	894210	6255
34131507	2980	9/15/96	1	3522	3588	850	701880	6447
34131507	2948	8/8/97	1	3522	3588	850	701880	6447
34131550	2706	4/1/97	2	3206	3616	490	935664	5877
34131749	2790	11/13/96	1318	3256	3264	500	223488	6156
34131749	2880	10/17/97	1318	3256	3264	500	223488	6156
34131933	3140	11/21/96	6	—	—	550	514720	6566
34131933	3126	11/18/97	6	—	—	550	514720	6566
34131936	3020	11/21/96	3	3503	3570	500	514720	6431
34131936	3037	11/18/97	3	3503	3570	500	514720	6431
34131941	3075	1/8/97	8	—	—	550	34241	6584
34131948	3190	11/21/96	4	2991	3029	500	514720	6449
34131949	3190	11/21/96	4	—	—	500	514720	6567
34131956	3422	11/21/96	4	3110	3609	550	514720	6398
34131956	3362	11/17/97	4	3110	3609	550	514720	6398
34131959	3300	11/21/96	4	3215	3504	500	514720	6216
34131959	3471	1/20/98	4	3215	3504	550	514720	6216
34131984	3080	11/21/96	5	3250	3400	600	514720	6405
34131984	3057	1/21/98	5	3250	3400	600	514720	6405
34131986	2920	11/21/96	3	3250	3421	600	514720	6405
34131986	2879	1/20/98	3	3250	3421	600	514720	6405
34131994	3330	11/21/96	3	3178	3665	500	514720	6398
34131994	3382	11/17/97	3	3178	3665	500	514720	6398
34131996	2880	11/21/96	5	—	—	500	514720	6398
34131996	2859	11/17/97	5	—	—	500	514720	6398
34132034	3162	11/20/97	13A	3310	3432	500	912700	5956
34132040	1426	11/20/97	12A	3536	3566	500	912700	5956
34181405	3144	2/15/94	10	—	—	450	408850	1347
34181405	3150	5/24/95	10	—	—	450	408850	1347
34181405	3100	4/25/96	10	—	—	450	408850	1347
34181405	3100	4/15/97	10	—	—	450	408850	1347
34181417	3095	2/15/94	9	3215	3350	191	408850	1349
34181417	2900	4/25/96	9	3215	3350	191	408850	1349

Panhandle Moore County (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
34181422	3062	2/15/94	14	—	—	512	408850	1349
34181422	2863	5/24/95	14	—	—	500	408850	1349
34181422	2790	4/25/96	14	—	—	500	408850	1349
34181422	2792	4/30/97	14	—	—	500	408850	1349
34181433	3015	8/18/95	4	—	—	500	888005	1352
34181433	3015	5/24/96	4	—	—	500	888005	1352
34181433	3015	3/8/97	4	—	—	500	888033	1352
34181435	3139	8/18/95	6	—	—	500	888005	1352
34181435	3139	5/24/96	6	—	—	500	888005	1352
34181435	3139	3/8/97	6	—	—	500	888033	1352
34181449	2418	5/27/95	1	—	—	400	66750	1524
34181449	2697	5/7/96	1	—	—	400	66750	1524
34181449	2666	4/25/97	1	—	—	400	66750	1524
34181450	3255	5/27/95	3	—	—	400	66750	1524
34181450	3255	5/7/96	3	—	—	400	66750	1524
34181450	3255	4/25/97	3	—	—	400	66750	1524
34181457	2542	5/26/95	10	—	—	400	66750	1698
34181457	3255	5/7/96	10	—	—	400	66750	1698
34181457	3255	4/25/97	10	—	—	400	66750	1698
34181458	3255	5/27/95	12	—	—	400	66750	1698
34181458	3100	5/7/96	12	—	—	400	66750	1698
34181458	3103	4/25/97	12	—	—	400	66750	1698
34181460	3100	5/27/95	14	—	—	400	66750	1698
34181460	2852	5/7/96	14	—	—	400	66750	1698
34181460	3016	4/25/97	14	—	—	400	66750	1698
34181461	3100	5/26/95	16	—	—	350	66750	1698
34181461	3286	5/7/96	16	—	—	350	66750	1698
34181461	3248	4/25/97	16	—	—	400	66750	1698
34181462	3069	5/25/95	25	—	—	325	66750	1698
34181462	3255	5/7/96	25	—	—	325	66750	1698
34181462	3016	4/25/97	25	—	—	325	66750	1698
34181463	3224	5/25/95	26	—	—	350	66750	1698
34181463	3317	5/7/96	26	—	—	350	66750	1698
34181463	3132	4/25/97	26	—	—	350	66750	1698
34181471	2418	5/25/95	35	—	—	350	66750	1698
34181471	2387	7/30/96	35	—	—	350	66750	1698
34181471	2449	4/25/97	35	—	—	350	66750	1698
34181477	3276	5/9/95	3	—	—	500	457780	1944
34181477	3263	5/1/96	3	—	—	500	457780	1944
34181477	2650	5/27/97	3	—	—	500	216735	1944
34181480	3150	5/24/96	1	—	—	500	888005	2003
34181480	3150	3/11/97	1	—	—	500	888033	2003
34181483	3290	3/11/97	5	—	—	500	888033	2003
34181489	3312	5/24/96	11	—	—	500	888005	2003
34181489	3312	3/11/97	11	—	—	500	888033	2003
34181509	3102	9/18/95	2	—	—	500	888005	2362
34181516	3303	5/24/96	1 M	—	—	500	888005	7016

Panhandle Moore County (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
34181516	3303	3/13/97	1 M	—	—	500	888033	7016
34181517	3300	5/24/96	2 M	—	—	500	888005	7016
34181517	3300	3/13/97	2 M	—	—	500	888033	7016
34181518	3250	8/18/95	3 M	—	—	500	888005	5440
34181518	3250	5/25/96	3 M	—	—	500	888005	7016
34181518	3250	3/15/97	3 M	—	—	500	888033	7016
34181519	3287	8/19/95	4 M	—	—	500	888005	5440
34181519	3287	5/25/96	4 M	—	—	500	888005	7016
34181519	3287	3/15/97	4 M	—	—	500	888033	7016
34181520	3300	8/19/95	5 M	—	—	500	888005	5440
34181520	3300	5/25/96	5 M	—	—	500	888005	7016
34181520	3300	3/15/97	5 M	—	—	500	888033	7016
34181523	3114	8/18/95	8 M	—	—	500	888005	5440
34181523	3114	5/25/96	8 M	—	—	500	888005	7016
34181523	3114	3/18/97	8 M	—	—	500	888033	7016
34181525	3289	3/18/97	10 M	—	—	500	888033	7016
34181540	3367	4/3/97	2	—	—	500	888033	7049
34181542	3240	6/14/94	4 G	—	—	500	888005	5440
34181542	3240	8/21/95	4 G	—	—	500	888005	5440
34181542	3240	5/24/96	4	—	—	500	888005	7049
34181542	3240	4/3/97	4	—	—	500	888033	7049
34181548	3150	8/21/95	4	—	—	500	888005	7050
34181548	3150	3/18/97	4	—	—	500	888033	7050
34181549	3125	8/30/95	5 B	—	—	500	888005	5440
34181549	3125	5/24/96	5	—	—	500	888005	7050
34181549	3125	3/21/97	5	—	—	500	888033	7050
34181566	3390	3/21/97	4	—	—	500	888033	7051
34181575	3356	5/24/96	1 R	—	—	500	888005	5440
34181575	3356	3/13/97	1 R	—	—	500	888033	5440

Post (Glorieta)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
16900609	2285	7/12/97	17 L	—	2542	225	722932	14106
16900747	2548	6/21/94	6	—	2752	200	714267	14109
16900747	2548	5/17/95	6	—	2752	200	714267	14109
16900747	2368	5/12/96	6	—	2752	200	714267	14109
16900747	2337	5/22/97	6	—	2752	200	714267	14109
16900783	2340	5/17/95	31	—	2693	200	714267	14114
16900783	2112	5/12/96	31	—	2693	200	714267	14114
16900783	2112	5/22/97	31	—	2693	200	714267	14114
16901093	1950	9/24/95	2	—	2554	225	695916	17281
16901093	2160	6/3/97	2	—	2554	225	695916	17281
16901095	1950	9/24/95	3	—	2598	250	695916	17281
16901095	2340	5/29/97	3	—	2598	250	695916	17281
16901098	1950	9/24/95	5	—	2576	250	695916	17281
16901098	1950	5/29/97	5	—	2576	250	695916	17281
16901102	1950	9/24/95	7	—	2608	225	695916	17281
16901102	2100	5/29/97	7	—	2608	225	695916	17281
16901284	1800	7/15/96	1	2566	2620	200	343108	64741
16901668	2580	6/16/95	5	—	2665	275	857742	14124
16901668	2550	6/20/96	5	—	2665	200	857742	14124
16901668	2475	5/23/97	5	—	2665	275	857742	14124
16901825	1720	5/17/95	4	—	2547	250	714267	16343
16901825	992	5/12/96	4	—	2547	250	714267	16343
16901825	1735	5/22/97	4	—	2547	250	714267	16343
16901854	1925	6/5/95	5	—	2590	100	722932	14127
16901854	1800	4/1/97	5	—	2590	150	722932	14127
16901860	1900	6/5/95	11	—	2537	100	722932	14106
16901860	1920	4/1/97	11	—	2537	200	722932	14106
16901921	2550	6/16/95	1	—	2758	200	857742	14128
16901921	2550	6/20/96	1	—	2758	200	857742	14128
16901922	1920	5/19/94	3	—	2468	100	722932	14127
16901922	1900	6/5/95	3	—	2468	60	722932	14127
16901923	1850	6/5/95	4W	—	2513	100	722932	14127
16901930	2100	6/30/94	2	—	2515	150	722932	14106
16901930	1950	6/5/95	2	—	2515	100	722932	14106
16901930	1950	4/1/97	2	—	2515	200	722932	14106
16901934	1950	6/5/95	A 4	—	2563	100	722932	14106
16901943	1850	5/20/94	1	—	2529	250	722932	14127
16901943	1900	6/5/95	1	—	2529	100	722932	14127
16901970	2290	5/17/95	7 L	—	2425	250	714267	16343
16901970	1408	5/12/96	7 L	—	2425	250	714267	16343
16901970	2290	5/22/97	7 L	—	2425	250	714267	16343
16901994	1580	10/10/94	1 A	—	2598	120	362980	14135
16901994	1820	5/20/96	1 A	—	2598	120	362980	14135
16901994	1820	5/27/97	1 A	—	2598	120	362980	14135
16901997	1209	10/23/96	1 L	—	2500	200	858160	15867
16901997	1178	11/5/97	1 L	—	2500	200	858160	15867

Post (Glorieta) (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
16901998	1302	10/23/96	2 L	—	2470	200	858160	15867
16901998	682	11/6/97	2 L	—	2470	200	858160	15867
16901999	418	10/23/96	3 L	—	2534	200	858160	15867
16901999	465	11/5/97	3 L	—	2534	200	858160	15867
16902063	1250	5/19/94	B 1	—	2608	100	722932	14125
16902063	1300	6/5/95	B 1	—	2608	100	722932	14125
16930876	1504	10/10/96	1	—	2806	250	858160	61963
16930876	1426	11/4/97	1	—	2806	250	858160	61963
16930971	1690	10/10/96	7	2636	2795	250	858160	61963
16930971	1643	11/6/97	7	2636	2795	250	858160	61963
16931006	915	10/24/96	11	2592	2776	225	858160	61963
16931006	899	11/5/97	11	2592	2776	225	858160	61963
16931177	1132	10/24/96	8	2600	2725	225	858160	61963
16931177	1070	11/4/97	8	2600	2725	225	858160	61963
16931264	775	10/25/96	12	2689	2801	300	858160	61963
16931264	775	11/5/97	12	2689	2801	300	858160	61963
16931266	868	11/5/97	14	2613	2759	300	858160	61963
16931621	1163	10/10/96	9	2585	2658	225	858160	61963
16931621	1364	11/4/97	9	2585	2658	225	858160	61963
16931825	1829	11/5/97	21	2624	2707	250	858160	61963
16931829	2260	8/4/97	6	2560	2570	200	950479	64226
16931855	2689	10/10/96	17	2587	2654	225	858160	61963
16931855	2278	11/4/97	17	2587	2654	225	858160	61963
16931888	750	3/21/97	22	2806	2824	275	858160	61963
16932684	1650	12/20/96	14W	2441	2455	250	343108	17280
16932684	1800	1/9/98	14W	2441	2455	250	343108	17280
16980967	775	10/25/96	5	2628	2736	250	858160	61963
16980967	744	11/5/97	5	2628	2736	250	858160	61963

Quitman

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4249900230	1611	5/2/95	1	—	6282	675	190468	1367
4249900230	1609	1/30/96	1	—	6282	675	190468	1367
4249900230	1553	5/5/97	1	—	6282	675	190468	1367
4249900231	2170	5/15/97	1	—	6317	675	190468	1366
4249900236	3007	5/15/97	7	—	6192	675	190468	1359
4249900244	3844	5/15/97	4	—	6075	600	190468	1372
4249900583	1832	2/24/95	1	—	6225	775	313990	1380
4249900753	1240	12/23/94	1	—	6292	800	190468	1362
4249900753	1054	4/30/96	1	—	6292	800	190468	1362
4249900753	1017	5/5/97	1	—	6292	800	190468	1362
4249902598	4464	3/14/96	9	—	6203	675	190468	4322
4249902598	4308	4/15/97	9	—	6203	675	190468	4322
4249902624	589	12/23/94	1	—	6246	725	190468	1352
4249930043	1054	5/15/97	1 R	6304	6307	725	190468	1354
4249931394	2031	2/27/98	1 R	6221	6223	775	313990	1377
4249980295	1426	5/22/95	2	—	6254	775	745020	1344
4249980295	1303	4/29/96	2	—	6254	775	744776	1344
4249980295	1903	5/16/97	2	—	6254	775	744700	1344

Reineke

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4203300251	615	5/27/93	75	—	—	400	876520	60780
4203300251	500	5/19/94	75	—	—	400	876520	60780
4203380463	1604	5/27/93	16	—	—	400	876520	60780
4203380463	1312	5/19/94	16	—	—	400	876520	60780
4203380463	1555	5/18/95	16	—	—	400	876520	60780
4203380463	1859	5/13/96	16	—	—	400	876520	60780
4203380463	2119	6/11/97	16	—	—	400	876520	60780
4203380476	1868	5/27/93	34	—	—	400	876520	60780
4203380476	1684	5/19/94	34	—	—	400	876520	60780
4203380476	1828	5/18/95	34	—	—	400	876520	60780
4203380476	2256	5/13/96	34	—	—	400	876520	60780
4203380476	2330	6/11/97	34	—	—	400	876520	60780
4203380486	4329	6/11/97	45	—	—	400	876520	60780
4203380499	2000	5/27/93	63	—	—	400	876520	60780
4203380499	1760	5/19/94	63	—	—	400	876520	60780
4203380499	1737	5/18/95	63	—	—	400	876520	60780
4203380499	1936	5/13/96	63	—	—	400	876520	60780
4203380499	2138	6/11/97	63	—	—	400	876520	60780

Russell (Clearfork 7000)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4216500960	6913	6/3/93	9	—	—	2000	572550	60679
4216501699	6660	5/18/95	149	—	—	1875	572550	60679
4216502591	7460	5/18/95	174	—	—	1875	572550	60679
4216502591	4663	8/6/96	174	—	—	1950	572550	60679
4216502591	175	7/14/97	174	—	—	1950	572550	60679
4216503072	7521	5/18/95	26	—	—	2000	572550	60679
4216503072	5088	8/6/96	26	—	—	1950	572550	60679
4216503096	6754	5/18/95	32	—	—	2000	572550	60679
4216503096	5636	8/6/96	32	—	—	1950	572550	60679

Sand Hills (McKnight)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
10301814	1843	5/3/96	346	—	—	500	805625	0
10301814	1367	4/30/97	346	—	—	500	109336	0
10301964	1178	2/7/94	507	—	3510	900	805625	15266
10301964	1896	6/23/95	507	—	3510	900	805625	15266
10301979	1272	9/9/94	529	—	3490	900	805625	15266
10302010	1707	2/18/94	560	—	3464	1100	805625	15266
10302010	1980	5/16/95	560	—	3464	1100	805625	15266
10302232	2952	11/9/95	785	—	—	550	805625	0
10302232	2050	3/1/96	785	—	—	550	561114	0
10302232	2467	5/21/97	785	—	—	550	109336	0
10302744	2976	5/14/93	2	—	3016	550	257097	15315
10302749	2852	4/3/96	7	—	2925	475	257097	15842
10302749	2759	12/20/96	7	—	2925	475	257097	15842
10302812	2790	4/12/95	5	—	3030	585	257097	24214
10302812	2759	1/13/96	5	—	3030	585	257097	24214
10302833	3100	12/10/93	69 U	4264	4556	625	257097	15315
10302833	2976	12/20/96	69 U	4264	4556	625	257097	15315
10303191	535	5/26/93	1	—	2949	800	268321	21848
10303198	1953	5/19/94	9	2822	2908	500	268321	21848
10303631	2645	5/10/95	9	—	3478	900	572550	15268
10303631	3224	5/8/96	9	—	3478	900	572550	15268
10303631	2614	5/29/97	9	—	3478	750	860851	15268
10304060	2780	6/27/94	3	—	3404	995	931337	15270
10304060	2650	8/30/95	3	—	3404	650	931337	15270
10304553	2703	5/7/97	10	2663	2820	575	744600	0
10304553	2703	1/15/98	10	2663	2820	575	744600	0
10310167	1302	3/1/96	89	—	3106	650	652352	18155

Sand Hills (McKnight) (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
10310167	1023	3/20/97	89	—	3106	650	652352	18155
10310167	984	2/18/98	89	—	3106	650	652352	18155
10310647	2821	3/18/97	102	—	3165	550	652352	18155
10310668	1951	3/20/97	94	—	3200	600	652352	18155
10310668	1953	2/18/98	94	—	3200	600	652352	18155
10310836	2666	2/15/96	104	—	3163	550	652352	18155
10310836	2635	3/20/97	104	—	3163	550	652352	18155
10310836	2480	2/13/98	104	—	3163	550	652352	18155
10331895	2129	5/20/94	1101	3428	3600	900	805625	15266
10331895	2764	5/16/95	1101	3428	3600	900	805625	15266

Sharon Ridge (Clear Fork)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
41500163	2237	12/6/94	2	—	3082	325	20572	8460
41500163	2130	4/22/96	2	—	3082	325	20572	8460
41500163	2251	4/18/97	2	—	3082	325	20572	8460
41500368	1891	5/26/97	4	—	2400	325	3125	61725
41500612	1984	12/15/94	2	—	2400	375	20572	67008
41500645	1083	7/14/97	4	—	2994	325	20572	10796
41500813	600	1/12/96	1	—	2400	350	355812	62799
41500814	600	1/12/96	2	—	2400	350	355812	62799
41500816	1000	1/12/96	1	—	2400	350	355812	60430
41502137	637	4/21/95	1	—	2994	350	20572	9349
41502302	1390	7/16/96	2	—	2371	375	3140	61215
41502302	1860	5/26/97	2	—	2371	375	3125	61215
41502303	1860	7/16/96	3	—	2400	375	3140	61393
41502303	1920	5/26/97	3	—	2400	375	3125	61393
41502305	1330	7/16/96	5	—	2371	375	3140	61215
41502305	1921	5/26/97	5	—	2371	375	3125	61215
41502306	2040	7/16/96	6	—	2400	375	3140	61393
41502306	2074	5/26/97	6	—	2400	375	3125	61393
41502307	2100	7/16/96	7	—	2400	375	3140	61393
41502307	2015	5/26/97	7	—	2400	375	3125	61393
41502960	1116	5/23/95	3	—	2400	350	855610	67068
41502960	1102	7/30/96	3	—	2400	350	855610	67068
41502960	1100	4/1/97	3	—	2400	350	855610	67068
41503067	3075	6/16/95	2A	—	2500	400	516247	13220
41503067	3100	12/27/96	2A	—	2500	400	516247	13220
41503067	3075	7/16/97	2A	—	2500	400	516247	13220
41503068	2250	6/16/95	3A	—	2458	400	516247	13220

Sharon Ridge (Clear Fork) (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
41503068	3050	7/16/97	3A	—	2458	400	516247	13220
41504203	1730	3/27/95	3	2263	2384	400	20572	67009
41504224	930	1/13/95	3	—	2400	400	20572	67011
41504787	2190	5/23/95	1	—	2994	350	493400	5627
41504787	2190	5/14/96	1	—	2994	350	493400	5627
41504787	2019	5/13/97	1	—	2994	350	493400	5627
41510137	2135	5/1/95	1	—	2480	375	20572	67020
41510137	159	4/22/96	1	—	2480	375	20572	67020
41510366	2250	6/17/95	3	—	2478	350	516247	60091
41510366	2300	12/27/96	3	—	2478	350	516247	60091
41510366	2350	7/16/97	3	—	2478	350	516247	60091
41510396	1860	5/26/97	2	—	3175	350	3125	60344

Sheridan (Wilcox)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
8900490	7037	9/6/95	35	9357	9390	1650	774720	0
8900490	9688	5/2/97	35	9357	9390	1650	774720	0
8900490	1767	5/30/95	35	9357	9390	1650	774720	0
8900505	1350	5/10/94	27 L	10674	10798	1200	774720	0
8900505	1736	9/5/95	27 L	10674	10798	1200	774720	0
8900513	7321	1/21/93	19 U	—	—	1200	774720	0
8900513	10100	5/24/96	19 U	—	—	1250	774720	0
8900513	9068	5/2/97	19 U	—	—	1200	774720	0
8900513	2023	5/19/95	19 U	—	—	1250	774720	0
8900525	6665	5/18/95	23 L	—	—	1200	774720	0
8900532	6030	1/21/93	9 U	9025	9055	1850	774720	0
8900551	9765	5/22/96	34 L	10147	10345	1350	774720	0
8900551	9450	4/16/93	34 L	10147	10345	1350	774720	0
8900551	9480	5/10/94	34 L	10147	10345	1350	774720	0
8900551	9796	5/18/95	34 L	10147	10345	1350	774720	0
8900551	9796	5/10/97	34 L	10147	10345	1350	774720	0
8900552	8773	5/25/95	38	9963	10112	1250	774720	13526
8900910	10080	5/10/94	63 L	—	—	1200	774720	0
8900910	9480	1/12/93	63 L	—	—	1200	774720	0
8900916	2233	5/18/95	66 U	—	—	1250	774720	0
8900916	713	5/22/96	66 U	—	—	1250	774720	0

Stowell (Crawford U-1)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
24502574	1885	5/10/95	2	—	7694	400	844118	8981
24502580	214	6/11/93	1	7505	7518	400	741047	0
24503224	6789	4/19/95	3	—	—	400	253196	0
24503224	6867	5/16/96	3	—	—	400	253196	0
24503224	6789	5/21/97	3	—	—	400	253196	0
24503387	6231	5/11/95	2	—	7610	400	675250	9398
7101824	5518	4/19/95	1	—	7626	400	253196	8969
7101824	5576	5/16/96	1	—	7626	1000	253196	8969
7101824	5425	5/21/97	1	—	7626	1000	253196	8969
7101827	5010	9/7/93	1	—	7610	400	675250	8970
7101827	6851	5/11/95	1	—	7610	400	675250	8970
7101845	6961	3/10/93	1	7504	7516	400	253196	9802
7101845	6930	4/26/94	1	7504	7516	400	253196	9802
7101845	6913	4/19/95	1	7504	7516	400	253196	9802
7101845	6930	5/16/96	1	7504	7516	400	253196	9802
7101845	6727	5/21/97	1	7504	7516	400	253196	9802
7101847	3573	9/9/94	2	7556	7562	400	675250	11090
7101849	6795	9/4/93	1	—	7635	400	675250	8967
7101849	6665	5/11/95	1	—	7635	400	675250	8967
7103448	4100	10/26/94	2 U	—	7591	400	675250	9309
7103448	6200	5/10/95	2 U	—	7591	400	675250	9309
7103448	4038	5/20/96	2 U	—	7591	400	675250	9309
7103479	6355	5/11/95	2	—	—	400	675250	0
7181471	950	8/15/95	1	—	7660	400	97600	8976

Texas Hugoton

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4219580284	2842	9/8/94	A 2	—	—	210	28990	0
4219580284	4710	3/13/96	A 2	—	—	1000	28990	0
4219580284	4092	11/3/97	A 2	—	—	1000	28990	0
4219580559	2232	6/29/95	1	3096	3100	350	140273	0
4219580559	2139	5/9/96	1	3096	3100	350	140273	0
4234130262	2945	3/14/98	1	3408	3470	850	837701	0
4242100119	3570	9/26/95	9	—	—	140	190940	0
4242100176	438	5/20/93	1	—	—	500	663680	0
4242100333	250	10/4/95	1	—	—	635	6460	0
4242100544	1760	6/6/94	1	—	—	479	58855	0
4242100544	2624	5/10/95	1	—	—	400	58855	0
4242100544	2560	5/8/96	1	—	—	400	58855	0

Texas Hugoton (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4242100544	3200	3/26/97	1	—	—	400	663680	0
4242100908	2730	4/1/95	1	—	—	500	190043	0
4242100908	670	8/8/96	1	—	—	440	190043	0
4242101030	2178	3/28/94	1	—	—	475	712840	0
4242101030	2050	10/26/95	1	—	—	475	712840	0
4242130027	2200	2/28/98	1	3009	3118	500	837701	0
4242180084	2378	11/22/96	1	—	—	600	6460	0
4242180394	2800	5/5/95	A 1	—	—	500	598292	0
4242180394	2800	4/27/96	A 1	—	—	500	598292	0
4242180394	2800	5/6/97	A 1	—	—	500	598292	0
4242180394	2800	1/5/98	A 1	—	—	500	598292	0
4242180396	2860	9/11/95	A 1	—	—	600	6460	0
4242180405	2772	8/28/95	1	—	—	500	216668	0
4242180405	2804	1/19/98	1	—	—	500	216668	0
4242180738	2670	4/1/95	1	—	—	500	190043	0
4242180738	2740	8/8/96	1	—	—	460	190043	0
4242180754	3070	8/18/94	1	3094	3117	550	16950	0
4242180754	2469	8/11/96	1	3094	3117	550	16950	0

Thompson, North

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4215700733	5580	5/27/94	4	—	7800	2575	549832	4139
4215700733	5549	5/19/95	4	—	7800	2575	549832	4139
4215700735	6053	5/27/94	2B	—	7800	2575	549832	4140
4215700735	6145	5/19/95	2B	—	7800	2575	549832	4140
4215700740	5495	5/27/94	2	7952	7992	2575	549832	4141
4215700742	6030	5/27/94	4	—	7800	2575	549832	4141
4215700742	6240	5/19/95	4	—	7800	2575	549832	4141
4215700743	5598	5/27/94	1	4689	4830	2575	549832	4142
4215700746	5754	8/17/93	4	—	—	2600	150790	4136
4215700746	5630	10/5/95	4	—	—	2600	150790	4136
4215700746	3700	7/11/97	4	—	—	2600	150790	4136
4215700747	570	8/17/93	5	—	—	2600	150790	4136
4215700752	3040	5/27/94	4	7957	7964	2500	549832	4138
4215700752	3870	5/8/95	4	7957	7964	2500	549832	4138
4215700754	5550	6/8/93	6	—	—	2500	549832	4131
4215702731	5850	6/8/93	5A	—	—	2500	549832	4129
4215702731	4402	5/9/95	5A	—	—	2500	549832	4129
4215702731	2697	4/18/96	5A	—	—	2500	549832	4129

Thompson, North (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4215702731	3387	5/27/97	5A	—	—	2500	549832	4129
4215702732	4950	8/3/93	6A	—	—	2500	549832	4129
4215702732	6152	5/9/95	6A	—	—	2500	549832	4129
4215702732	6479	5/23/96	6A	—	—	2500	549832	4129
4215702732	3755	5/27/97	6A	—	—	2500	549832	4129
4215702737	5760	6/8/93	2	—	7800	2500	549832	4133
4215702738	6446	5/27/94	3	7788	7821	2500	549832	4133
4215702738	6494	5/8/95	3	7788	7821	2500	549832	4133
4215702740	5940	6/8/93	5	—	7800	2500	549832	4133
4215702746	5805	6/8/93	1	—	—	2500	549832	4132
4215702746	5797	5/8/95	1	—	—	2500	549832	4132
4215702746	5764	4/24/96	1	—	—	2500	549832	4132
4215702746	5682	5/27/97	1	—	—	2500	549832	4132
4215702748	5915	5/27/94	3	—	7809	2500	549832	4132
4215702748	5673	5/8/95	3	—	7809	2500	549832	4132
4215702748	5764	4/19/96	3	—	7809	2500	549832	4132
4215702748	5582	5/27/97	3	—	7809	2500	549832	4132
4215702749	5805	6/8/93	4	—	—	2500	549832	4132
4215702749	5880	5/9/95	4	—	—	2500	549832	4132
4215702749	6069	4/19/96	4	—	—	2500	549832	4132
4215702749	5063	5/27/97	4	—	—	2500	549832	4132
4215702752	3220	5/8/95	3	—	—	2550	549832	4134
4215702752	3873	4/19/96	3	—	—	2550	549832	4134
4215702752	4270	5/20/97	3	—	—	2550	549832	4134
4215702753	5400	6/8/93	1	—	—	2400	549832	4131
4215702753	5430	5/8/95	1	—	—	2400	549832	4131
4215702753	4514	4/18/96	1	—	—	2400	549832	4131
4215702753	5689	5/20/97	1	—	—	2400	549832	4131
4215702754	6855	6/8/93	2	—	7919	2400	549832	4131
4215702754	5355	5/9/95	2	—	7919	2400	549832	4131
4215702754	5551	4/19/96	2	—	7919	2400	549832	4131
4215702754	5582	5/20/97	2	—	7919	2400	549832	4131
4215702756	5760	6/8/93	4	—	—	2500	549832	4131
4215702756	4586	5/9/95	4	—	—	2500	549832	4131
4215702756	5093	4/19/96	4	—	—	2500	549832	4131
4215702756	5713	5/20/97	4	—	—	2500	549832	4131
4215702758	6000	6/8/93	2	—	—	2500	549832	4130
4215702758	5859	5/8/95	2	—	—	2500	549832	4130
4215702758	5612	4/19/96	2	—	—	2500	549832	4130
4215702758	5942	5/20/97	2	—	—	2500	549832	4130
4215702762	6630	8/17/93	2	—	—	2600	150790	4136
4215702762	6510	10/5/95	2	—	—	2600	150790	4136
4215702762	3645	7/11/97	2	—	—	2600	150790	4136
4215702763	660	8/17/93	1	—	—	2600	150790	4135
4215731600	5795	4/19/96	2	7756	7773	2500	549832	4128
4215731600	5795	5/20/97	2	7756	7773	2500	549832	4128

Thompson, North (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4215780543	6487	5/9/95	1B	—	—	2500	549832	4129
4215780543	6222	4/18/96	1B	—	—	2500	549832	4129
4215780543	6487	5/20/97	1B	—	—	2500	549832	4129
4215780546	7527	5/9/95	11B	—	—	2550	549832	4129
4215780546	7381	4/18/96	11B	—	—	2550	549832	4129
4215780546	7654	5/20/97	11B	—	—	2550	549832	4129

Tomball

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4220100386	3720	5/15/95	5	—	—	1950	862750	4339
4220100386	2496	5/8/96	5	—	—	1950	862750	4339
4220100386	2600	5/20/97	5	—	—	1950	862750	4339
4220100433	2800	5/8/96	6	—	—	1900	862750	4345
4220100433	2800	5/20/97	6	—	—	1900	862750	4345
4220100436	4960	5/8/96	9	—	—	1900	862750	4345
4220100436	2400	5/20/97	9	—	—	1900	862750	4345
4220100555	3690	5/15/95	3	—	—	1950	862750	4339
4220100555	3717	5/8/96	3	—	—	1900	862750	4339
4220100555	2800	5/20/97	3	—	—	1900	862750	4339
4220100568	3600	5/15/95	1	—	—	1900	862750	0
4220100568	3616	5/8/96	1	—	—	1900	862750	0
4220100568	3600	5/20/97	1	—	—	1900	862750	0
4220100571	1364	4/19/93	6	5412	5420	1950	257097	4215

TXL (Ellenburger)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4213503700	3700	8/19/94	6	—	—	100	745020	6989
4213503700	4012	5/15/95	6	—	—	1250	745020	6989
4213504583	5671	4/15/97	2	—	—	1300	20572	6973
4213505418	4333	8/19/93	2	—	—	1300	743279	6951
4213505418	4930	8/18/95	2	—	—	1300	743279	6951
4213507079	3286	8/31/93	1 C	—	—	1350	844118	6995
4213507079	3286	8/31/93	1 C	—	—	1350	844118	6995
4213507079	2976	5/23/95	1 C	—	—	1300	844118	6995
4213507079	3503	5/20/96	1 C	—	—	1300	27200	6995
4213507079	3500	5/27/97	1 C	—	—	1300	27200	6995
4213507533	1507	4/13/93	3	9382	9400	1300	172230	6956
4213507533	1800	3/28/94	3	9382	9400	250	172230	6956
4213507533	6665	5/24/95	3	9382	9400	1300	172230	6956
4213507533	9920	5/15/96	3	9382	9400	1300	274230	6956
4213507533	5725	5/6/97	3	9382	9400	1300	274230	6956

TXL (Tubb)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
13502218	2944	4/5/94	7501	5414	5806	1100	844118	20726
13502218	2781	2/27/95	7501	5414	5806	1100	844118	20726
13502219	2112	3/29/94	7502	—	—	1100	844118	20726
13502219	3134	2/27/95	7502	—	—	1100	844118	20726
13502219	3373	2/28/96	7502	—	—	1100	20572	20726
13502219	5056	4/17/97	7502	—	—	1100	20572	20726
13502221	3925	2/27/95	7504	5433	5698	1100	844118	20726
13502444	2464	3/30/94	3701	—	6158	1100	844118	20726
13502444	4253	3/3/95	3701	—	6158	1150	844118	20726
13502444	836	3/1/96	3701	—	6158	1150	20572	20726
13502447	3415	3/1/96	3704	—	6158	1150	20572	20726
13502447	3191	4/14/97	3704	—	6158	1150	20572	20726
13502448	5280	4/4/94	3705	5562	5705	1100	844118	20726
13502448	5251	3/3/95	3705	5562	5705	1150	844118	20726
13502449	4348	4/4/94	3706	—	6158	1100	844118	20726
13502449	3777	3/7/95	3706	—	6158	1150	844118	20726
13502450	5248	4/4/94	3707	5596	5802	1100	844118	20726
13502450	3268	3/3/95	3707	5596	5802	1150	844118	20726
13503651	3819	3/3/95	7302	5640	5808	1100	844118	20726
13503652	4058	3/3/95	7301	5409	5646	1100	844118	20726
13503653	3940	3/3/95	7104	5522	5742	1100	844118	20726

TXL (Tubb) (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
13503659	3200	3/29/94	4205	5566	5768	1100	844118	20726
13503659	3388	2/27/95	4205	5566	5768	1200	844118	20726
13503663	4320	4/2/94	3901	5625	5905	1100	844118	20726
13503663	4265	2/27/95	3901	5625	5905	1200	844118	20726
13503664	2028	2/27/95	4102	5584	5818	1200	844118	20726
13503665	3840	4/2/94	4101	6172	6348	1100	844118	20726
13503665	4665	2/27/95	4101	6172	6348	1200	844118	20726
13503679	352	4/26/93	1002	—	6158	1100	844118	20726
13503767	5663	2/27/95	2804	—	6158	1200	844118	20726
13503767	4594	2/27/96	2804	—	6158	1200	20572	20726
13503767	4121	4/11/97	2804	—	6158	1200	20572	20726
13503769	2182	2/27/95	2803	5710	5840	1200	844118	20726
13503982	2144	3/29/94	4002	5630	5800	1100	844118	20726
13503982	4045	2/27/95	4002	5630	5800	1200	844118	20726
13504504	1253	5/5/97	2	6524	6770	300	525380	32408
13504524	1116	4/13/95	250 L	5618	6025	1350	774720	20487
13504938	4928	4/4/94	3302	5616	5728	1100	844118	20726
13504938	4929	3/7/95	3302	5616	5728	1050	844118	20726
13504940	5466	3/7/95	3304	5624	5926	1050	844118	20726
13504941	1367	3/3/95	3305	6114	6330	1050	844118	20726
13504942	2373	3/7/95	3306	—	6158	1050	844118	20726
13504942	3189	2/27/96	3306	—	6158	1050	20572	20726
13504942	3496	4/14/97	3306	—	6158	1050	20572	20726
13504944	5751	3/3/95	3308	6145	6344	1050	844118	20726
13505201	4832	3/29/94	7801	5384	5719	1100	844118	20726
13505201	3134	2/27/95	7801	5384	5719	1100	844118	20726
13505202	3878	2/27/95	7802	5403	5818	1100	844118	20726
13505208	2368	3/30/94	5602	—	6158	1100	844118	20726
13505208	4342	3/3/95	5602	—	6158	1100	844118	20726
13505346	4046	3/17/95	5105	—	6158	1075	844118	20726
13505346	1412	3/7/96	5105	—	6158	1075	20572	20726
13505346	5120	4/14/97	5105	—	6158	1075	20572	20726
13505372	4247	3/22/95	679 L	—	—	1250	774720	20487
13505372	4338	3/20/96	679 L	—	—	1350	774720	20487
13505381	1757	4/20/95	655	5818	5844	1350	774720	20487
13505381	1245	3/20/96	655	5818	5844	1350	774720	20487
13505394	4859	3/20/96	345 L	5926	5993	1350	774720	20487
13505424	5077	3/16/95	2208W	5504	5953	1150	844118	20726
13505444	2547	3/16/95	5202	5458	5710	1075	844118	20726
13505445	2807	3/16/95	5203	5687	6106	1075	844118	20726
13505445	5651	3/5/96	5203	5687	6106	1075	20572	20726
13505446	5799	3/16/95	5204	5688	5912	1075	844118	20726
13505502	4000	6/2/95	430 L	—	—	1300	774720	20487
13505635	4500	3/30/94	2501	—	6158	1100	844118	20726
13505730	4838	5/31/94	553	4280	4364	1300	774720	20487
13505894	2765	3/7/95	1405	—	6158	1300	844118	20726

TXL (Tubb)(cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
13505894	1518	3/12/96	1405	—	6158	1300	20572	20726
13505894	2746	4/11/97	1405	—	6158	1300	20572	20726
13505929	4247	4/13/95	341 L	5726	5866	1350	774720	20487
13505929	4178	3/20/96	341 L	5726	5866	1350	774720	20487
13505930	5642	3/22/95	262	5607	6604	1300	774720	20487
13505930	4583	3/22/96	262	5607	6604	1350	774720	20487
13505930	4657	4/15/97	262	5607	6604	1350	20572	20487
13505931	5766	3/22/95	260	5635	6399	1300	774720	20487
13505931	5221	3/22/96	260	5635	6399	1350	774720	20487
13505975	2325	3/23/95	242	5548	6709	1300	774720	20487
13505980	2619	3/17/95	5402	6164	6184	1075	844118	20726
13505980	2848	3/5/96	5402	6164	6184	1075	20572	20726
13505980	6041	4/14/97	5402	6164	6184	1075	20572	20726
13505981	887	3/3/95	2601A	5608	5820	1150	844118	20726
13506141	1971	3/17/95	4601	—	6158	900	844118	20726
13506141	5127	3/1/96	4601	—	6158	900	20572	20726
13506141	2133	4/14/97	4601	—	6158	900	20572	20726
13506588	3489	2/27/95	7901	5462	5668	1100	844118	20726
13506686	1391	3/16/95	5201	6207	6240	1075	844118	20726
13506686	2426	3/5/96	5201	6207	6240	1075	20572	20726
13506984	3081	3/7/95	1901	6110	6344	1200	844118	20726
13506986	2448	3/7/95	1903	6146	6384	1200	844118	20726
13506987	5616	2/22/96	1904	5630	5924	1200	20572	20726
13506987	1270	4/11/97	1904	5630	5924	1200	20572	20726
13507007	4743	4/13/95	324 L	—	6534	1350	774720	20487
13507007	4022	3/20/96	324 L	—	6534	1350	774720	20487
13507055	4540	3/20/96	780	—	—	1350	774720	20487
13507107	2618	2/22/95	104	—	6158	1100	844118	20726
13507107	2076	2/13/96	104	—	6158	1100	20572	20726
13507107	1691	4/11/97	104	—	6158	1100	20572	20726
13507114	2712	3/7/95	1805	—	6158	1200	844118	20726
13507114	1355	2/22/96	1805	—	6158	1200	20572	20726
13507114	2870	4/11/97	1805	—	6158	1200	20572	20726
13507119	4640	3/30/94	2002	5552	5716	1100	844118	20726
13507119	2898	3/7/95	2002	5552	5716	1200	844118	20726
13507176	5925	3/17/95	5101	—	—	1075	844118	20726
13507176	1676	3/7/96	5101	—	—	1075	20572	20726
13507176	5674	4/14/97	5101	—	—	1075	20572	20726
13507177	3905	3/17/95	5103	—	6158	1075	844118	20726
13507178	5978	3/16/95	5104	5657	5760	1075	844118	20726
13507179	5436	3/16/95	5106	5637	5818	1075	844118	20726
13507189	4808	3/16/95	1502	—	6158	1050	844118	20726
13507189	4667	2/13/96	1502	—	6158	1050	20572	20726
13507189	4358	4/11/97	1502	—	6158	1050	20572	20726
13507190	4726	2/22/95	1504	—	6158	1050	844118	20726
13507190	1436	2/13/96	1504	—	6158	1050	20572	20726

TXL (Tubb) (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
13507190	4924	4/11/97	1504	—	6158	1050	20572	20726
13507191	3334	3/16/95	1505	—	6158	1050	844118	20726
13507191	1898	2/13/96	1505	—	6158	1050	20572	20726
13507191	2772	4/11/97	1505	—	6158	1050	20572	20726
13507193	2408	2/22/95	1508	—	6158	1050	844118	20726
13507193	2368	2/13/96	1508	—	6158	1050	20572	20726
13507193	2995	4/11/97	1508	—	6158	1050	20572	20726
13507219	4029	3/17/95	5302	—	6158	1075	844118	20726
13507337	3012	3/17/95	3003B	—	6158	1050	844118	20726
13507737	3529	3/17/95	3101B	—	6158	1050	844118	20726
13507738	3668	3/17/95	3102B	—	6158	1050	844118	20726
13507739	5198	3/17/95	3103B	—	6158	1050	844118	20726
13507740	4907	3/17/95	3104B	—	6158	1050	844118	20726
13507742	3069	3/17/95	3106B	—	6158	1050	844118	20726
13507743	5257	3/16/95	4701	—	6158	950	844118	20726
13507743	5046	3/4/96	4701	—	6158	950	20572	20726
13507743	4840	4/14/97	4701	—	6158	950	20572	20726
13507744	5432	3/16/95	4702	5544	5581	950	844118	20726
13507745	4330	3/17/95	3201	—	6158	1050	844118	20726
13507745	4281	1/30/96	3201	—	6158	1050	20572	20726
13507745	4153	4/11/97	3201	—	6158	1050	20572	20726
13507748	5071	3/16/95	4703	—	6158	950	844118	20726
13507748	5053	3/4/96	4703	—	6158	950	20572	20726
13507748	4910	4/14/97	4703	—	6158	950	20572	20726
13507749	5186	3/17/95	4704	—	6158	950	844118	20726
13507749	3385	3/4/96	4704	—	6158	950	20572	20726
13507749	4807	4/14/97	4704	—	6158	950	20572	20726
13507751	5325	3/17/95	4706	5655	5907	950	844118	20726
13507751	5577	3/4/96	4706	5655	5907	950	20572	20726
13507751	5230	4/14/97	4706	5655	5907	950	20572	20726
13507752	2663	3/17/95	4707	—	6231	950	844118	20726
13507752	4189	3/4/96	4707	—	6231	950	20572	20726
13507752	4389	4/14/97	4707	—	6231	950	20572	20726
13507753	4518	3/17/95	4708	—	6236	950	844118	20726
13507753	4391	3/4/96	4708	—	6236	950	20572	20726
13507753	4249	4/14/97	4708	—	6236	950	20572	20726
13508015	1539	3/16/95	6901	5398	5920	1000	844118	20726
13508016	1737	3/16/95	6902	—	6158	1000	844118	20726
13508016	756	2/27/96	6902	—	6158	100	20572	20726
13508017	1849	3/16/95	6903	5228	5818	1000	844118	20726
13508021	1175	3/16/95	6802	—	6158	1000	844118	20726
13508022	4108	3/16/95	6803	—	6210	1000	844118	20726
13508072	4626	3/3/95	3402	6110	6296	1050	844118	20726
13508073	4579	3/3/95	3403	6120	6395	1050	844118	20726
13508074	4323	3/3/95	3404	6059	6468	1050	844118	20726
13508099	2900	12/14/97	1	5570	6615	1100	857405	32722

TXL (Tubb) (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
13508152	3616	3/29/94	6202	5670	5870	1100	844118	20726
13508152	1828	2/22/95	6202	5670	5870	1125	844118	20726
13508154	3589	2/27/95	6204	5442	5772	1125	844118	20726
13508157	4622	3/3/95	7003	5473	5792	1100	844118	20726
13508178	4190	3/3/95	3501	5632	5682	1050	844118	20726
13508180	3963	3/3/95	3503	6085	6300	1050	844118	20726
13508181	3620	3/3/95	3504	6064	6290	1050	844118	20726
13508184	5228	3/30/94	3601	5662	5767	1100	844118	20726
13508184	3896	3/3/95	3601	5662	5767	1150	844118	20726
13508186	4056	3/7/95	3603	5596	5650	1150	844118	20726
13508187	3291	3/7/95	3604	5656	5682	1150	844118	20726
13508190	1738	3/7/95	3803	—	6158	1150	844118	20726
13508288	6208	3/30/94	5903	5414	5738	1100	844118	20726
13508288	3984	3/3/95	5903	5414	5738	1100	844118	20726
13508291	1309	3/3/95	5701	—	6158	1100	844118	20726
13508292	2589	3/16/95	5702	5460	5778	1100	844118	20726
13508293	4160	3/30/94	5703	5651	5761	1100	844118	20726
13508293	4445	3/3/95	5703	5651	5761	1100	844118	20726
13508294	3776	4/2/94	5704	—	—	1100	844118	20726
13508294	3198	3/3/95	5704	—	—	1100	844118	20726
13508335	5904	3/17/95	5001	5628	5918	950	844118	20726
13508335	5049	3/1/96	5001	5628	5918	950	20572	20726
13508335	2951	4/17/97	5001	5628	5918	950	20572	20726
13508336	4672	3/17/95	5002	5596	5857	950	844118	20726
13508336	4670	3/1/96	5002	5596	5857	950	20572	20726
13508336	5993	4/21/97	5002	5596	5857	950	20572	20726
13508337	3012	3/17/95	5003	—	6158	950	844118	20726
13508337	1703	3/4/96	5003	—	6158	950	20572	20726
13508337	1576	4/14/97	5003	—	6158	950	20572	20726
13508339	3136	3/30/94	6002	5532	5772	1100	844118	20726
13508339	4447	2/27/95	6002	5532	5772	1125	844118	20726
13508340	3073	2/27/95	6101	5594	5806	1125	844118	20726
13508341	2743	2/27/95	6102	5638	5846	1125	844118	20726
13508342	1589	3/7/95	6103	5547	5789	1125	844118	20726
13508999	5593	3/17/95	5108	5605	5777	1075	844118	20726
13508999	1642	3/4/96	5108	5605	5777	1075	20572	20726
13520108	4839	3/17/95	4902	6100	6216	950	844118	20726
13520108	4549	3/1/96	4902	6100	6216	950	20572	20726
13520108	3991	4/14/97	4902	6100	6216	950	20572	20726
13520171	4290	3/17/95	5004	—	6158	950	844118	20726
13520171	4331	3/1/96	5004	—	6158	950	20572	20726
13520171	2106	5/17/97	5004	—	6158	950	20572	20726
13520235	2812	3/16/95	6703	6118	6296	950	844118	20726
13520235	2788	2/27/96	6703	6118	6296	950	20572	20726
13521078	4462	5/21/96	2	—	6194	900	197690	15144
13521078	3751	5/9/97	2	—	6194	900	878413	15144

TXL (Tubb) (cont.)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
13583863	4460	3/22/96	229 L	5714	5874	1350	774720	20487
13583863	4300	4/16/97	229 L	5714	5874	1350	20572	20487
13583865	4557	4/13/95	231 L	5730	5955	1350	774720	20487
13583865	4534	3/22/96	231 L	5730	5955	1350	774720	20487
13583865	4929	4/16/97	231 L	5730	5955	1350	20572	20487
13583882	3968	4/13/95	333 L	5706	6282	1350	774720	20487
13583887	3782	4/13/95	344 L	6163	6416	1350	774720	20487
13583887	3873	3/20/96	344 L	6163	6416	1350	774720	20487
13583901	3998	4/15/97	421 L	5589	5902	1350	20572	20487
13583902	5363	3/23/95	423 L	5719	5917	1350	774720	20487
13583902	4634	3/20/96	423 L	5719	5917	1350	774720	20487
13583902	3330	4/15/97	423 L	5719	5917	1350	20572	20487
13583910	4186	4/15/97	441	5629	6781	1350	20572	20487
13584318	5339	2/27/95	2802	—	—	1200	844118	20726

Waha (Delaware)

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
38900365	5090	5/23/95	5	—	4912	1300	148113	16028
38910046	3162	12/8/95	2	—	4918	400	148113	17459
38910046	2992	7/17/97	2	—	4918	400	148113	17459
38910050	1736	11/15/94	9	4906	4942	400	148113	16028
38910060	2336	5/19/97	11	—	4942	1300	292232	16028
38910060	4994	5/18/96	11	—	4942	1300	292232	16028
38910060	4994	5/23/95	11	—	4942	1300	148113	16028
38910121	4630	7/17/97	4	—	4995	400	148113	18217
38910121	3131	12/8/95	4	—	4995	400	148113	18217
38930215	4410	7/17/97	10	—	4910	400	148113	17459

Wellman

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4244500072	2244	5/23/94	21	—	—	325	572550	62337
4244500072	3812	5/17/95	21	—	—	325	933800	62337
4244500084	5255	6/9/93	42	9616	9666	300	572550	62337
4244500087	3968	5/23/94	45	—	—	325	572550	62337
4244500087	3633	5/17/95	45	—	—	325	933800	62337
4244500089	6281	6/9/93	72	9558	9588	325	572550	62337
4244500423	654	5/23/94	86	—	—	325	572550	62337
4244500423	5053	5/17/95	86	—	—	325	933800	62337
4244500423	2108	7/12/96	86	—	—	325	933800	62337
4244500423	4774	5/15/97	86	—	—	325	933800	62337
4244500423	4309	2/4/98	86	—	—	325	933800	62337
4244500579	4347	6/9/93	52	9394	9464	350	572550	62337
4244500579	1829	5/23/94	52	9394	9464	325	933800	62337
4244500582	1550	5/19/94	55	—	—	325	572550	62337
4244500582	1486	5/17/95	55	—	—	325	933800	62337
4244530070	5724	5/15/97	33	—	—	325	933800	62337
4244530070	4376	2/4/98	33	—	—	325	933800	62337

Wheat

API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4230100023	4300	1/16/95	1	—	4300	650	191905	7962
4230100041	2602	9/19/97	2	—	—	1200	399651	7950
4230100306	3168	5/22/96	1	—	—	1500	599328	7967
4230100306	3155	6/9/97	1	—	—	1500	599328	7967
4230100307	2476	5/22/96	2	—	—	1500	599328	7967
4230100307	2472	6/9/97	2	—	—	1500	599328	7967
4230100449	2562	8/24/94	2	—	4300	1050	292189	7998
4230100449	2554	5/30/96	2	—	4300	1500	292189	7998
4230100449	2550	6/6/97	2	—	4300	1500	292189	7998
4230100656	2084	8/18/95	1	—	—	1150	118700	8355
4230100656	2074	7/15/97	1	—	—	1150	118700	8355
4230100865	4100	1/16/95	4	—	4225	625	191905	7963
4230100928	2670	8/25/95	10	—	—	675	54675	7993
4230100965	3751	5/7/93	1	—	—	650	74781	7950
4230100965	3790	5/5/94	1	—	—	650	74781	7950
4230110079	1418	5/21/96	1	—	4751	1000	88380	18923
4230110079	1272	4/14/97	1	—	4751	1000	88380	18923
4230110081	1481	5/21/96	2	—	4728	1000	88380	18795
4230110081	1292	4/14/97	2	—	4728	1000	88380	18795

Wheat (cont.)

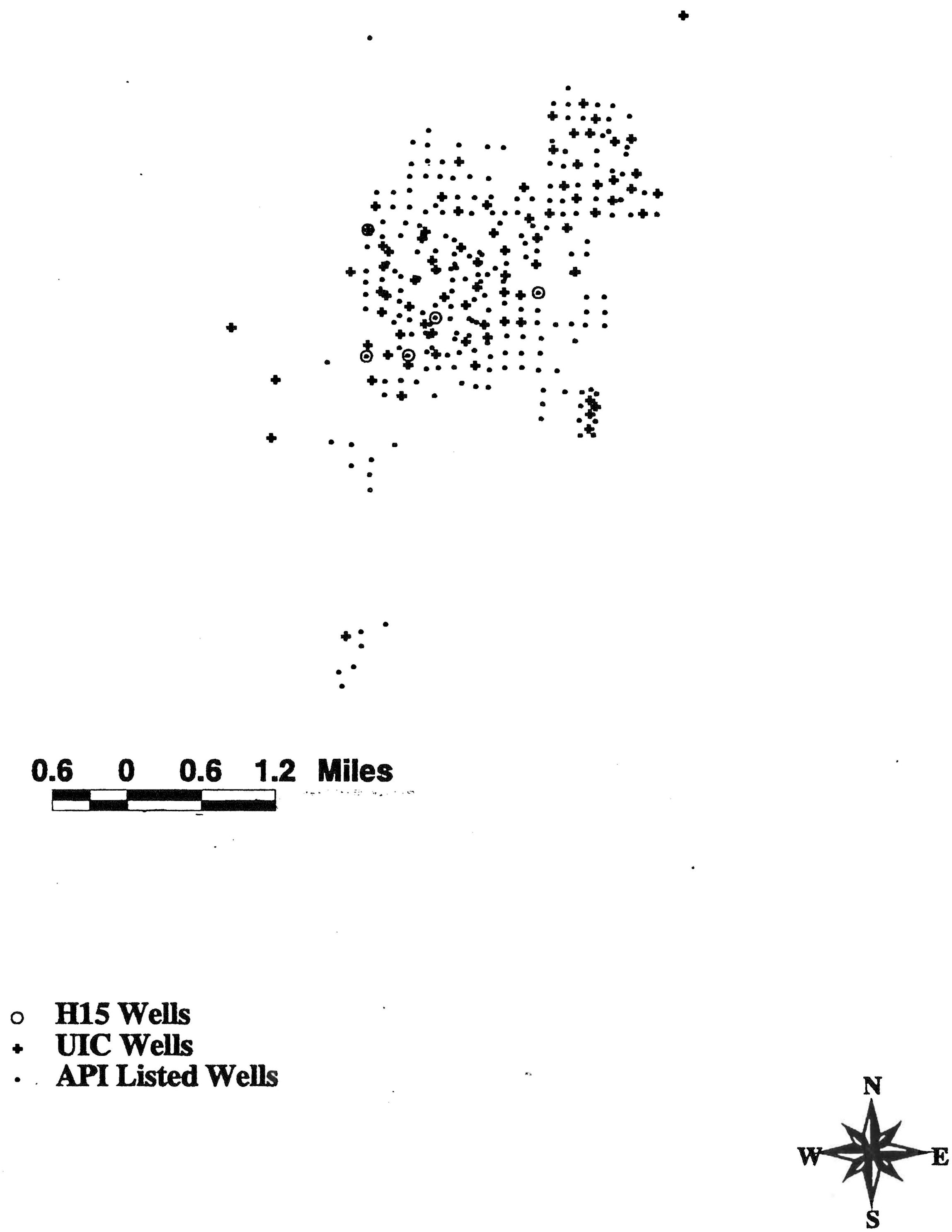
API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4230110153	2070	5/24/95	101	—	4425	775	787409	20065
4230110153	2070	7/16/96	101	—	4425	775	787409	20065
4230110153	2205	5/27/97	101	—	4425	775	787409	20065
4230110156	2142	5/24/95	201W	—	4414	775	787409	20065
4230110156	2135	7/16/96	201W	—	4414	775	787409	20065
4230110156	2870	5/27/97	201W	—	4414	775	787409	20065
4230110162	2110	5/24/95	302	—	4439	775	787409	20065
4230110162	2140	7/16/96	302	—	4439	775	787409	20065
4230110162	2277	5/27/97	302	—	4439	775	787409	20065
4230110195	112	8/28/95	1	—	4328	120	844355	19332
4230110206	4340	5/31/95	4	—	4735	950	197416	18980
4230110206	961	7/18/96	4	—	4735	950	197416	18980

Woodkirk (Strawn)

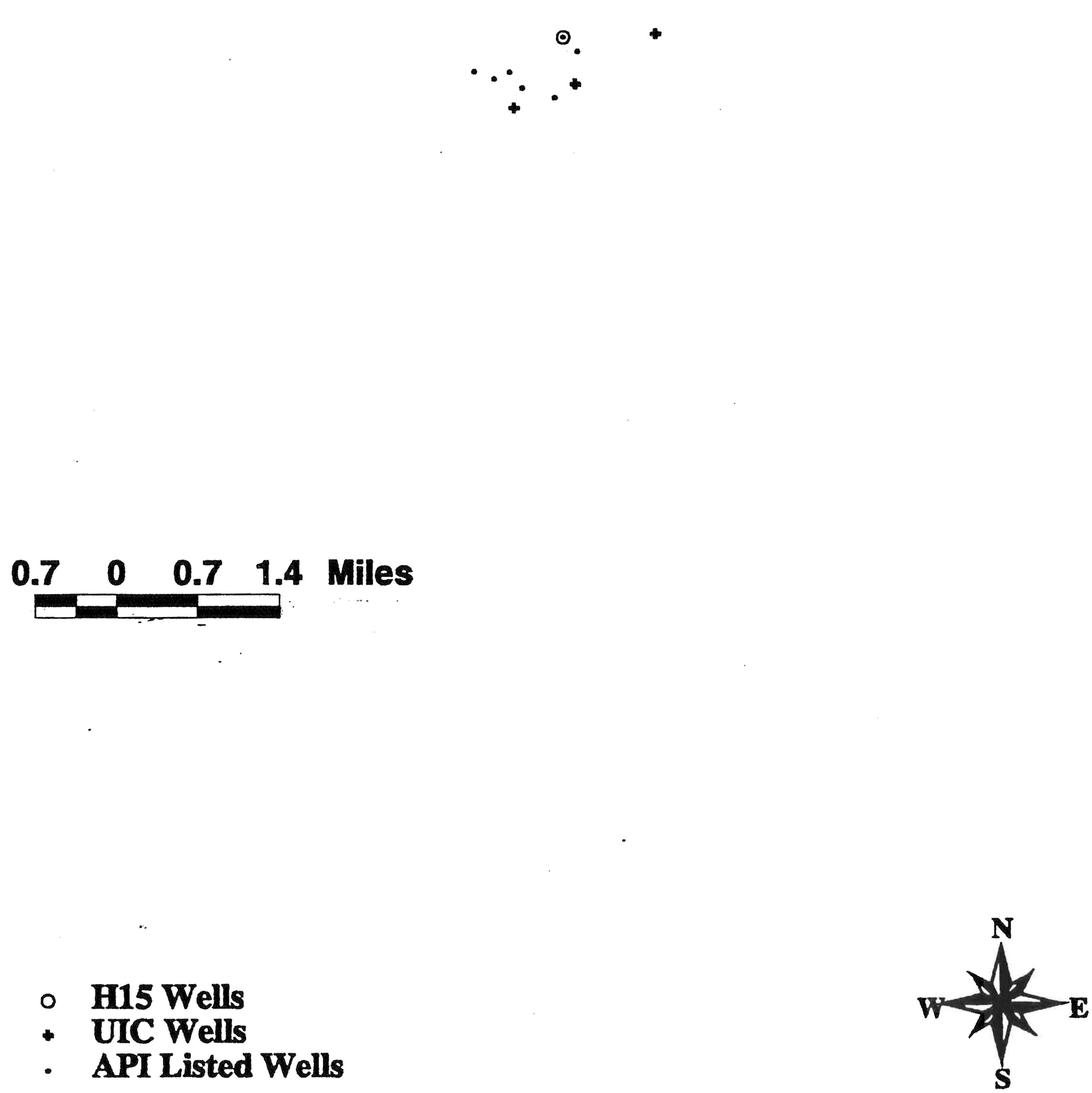
API Number	H15 Top of Fluid (ft bgl)	H15 Date Measured	Well Number	Top of Perforation (ft bgl)	Bottom of Perforation (ft bgl)	BUQW (ft bgl)	Operator Number	Lease Number
4223732984	713	8/5/96	8	2130	2132	175	817515	19770
4223733001	1829	8/5/96	5	2084	2088	175	817515	19770
4223733426	1953	8/5/96	3	2130	2135	175	817515	20868
4223733427	3565	8/5/96	4	2068	2074	175	817515	20868
4223733958	2387	8/5/96	6	2116	2126	175	817515	20868
4223733967	2108	8/5/96	7	2137	2142	175	817515	20868
4223733998	2201	8/5/96	6	2113	2121	175	817515	21835
4223734240	1829	8/5/96	8	2108	2115	175	817515	20868
4223783412	2697	8/5/96	1	2136	2140	175	817515	20868

Appendix C-1
H15/UIC Well Location Plots - YES Category

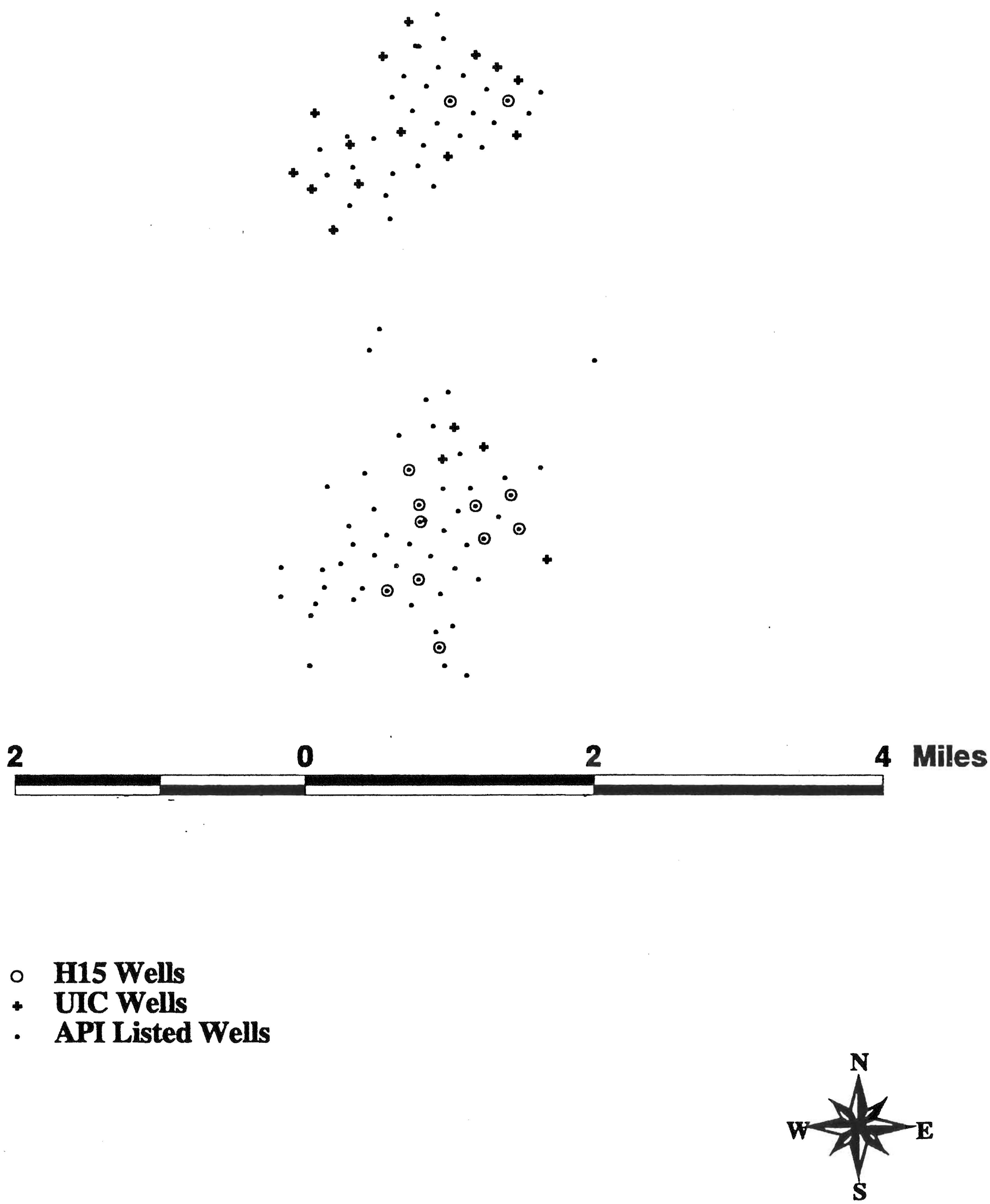
Coleman Ranch
Mitchell County, Texas
H15, UIC, and API Listed Wells



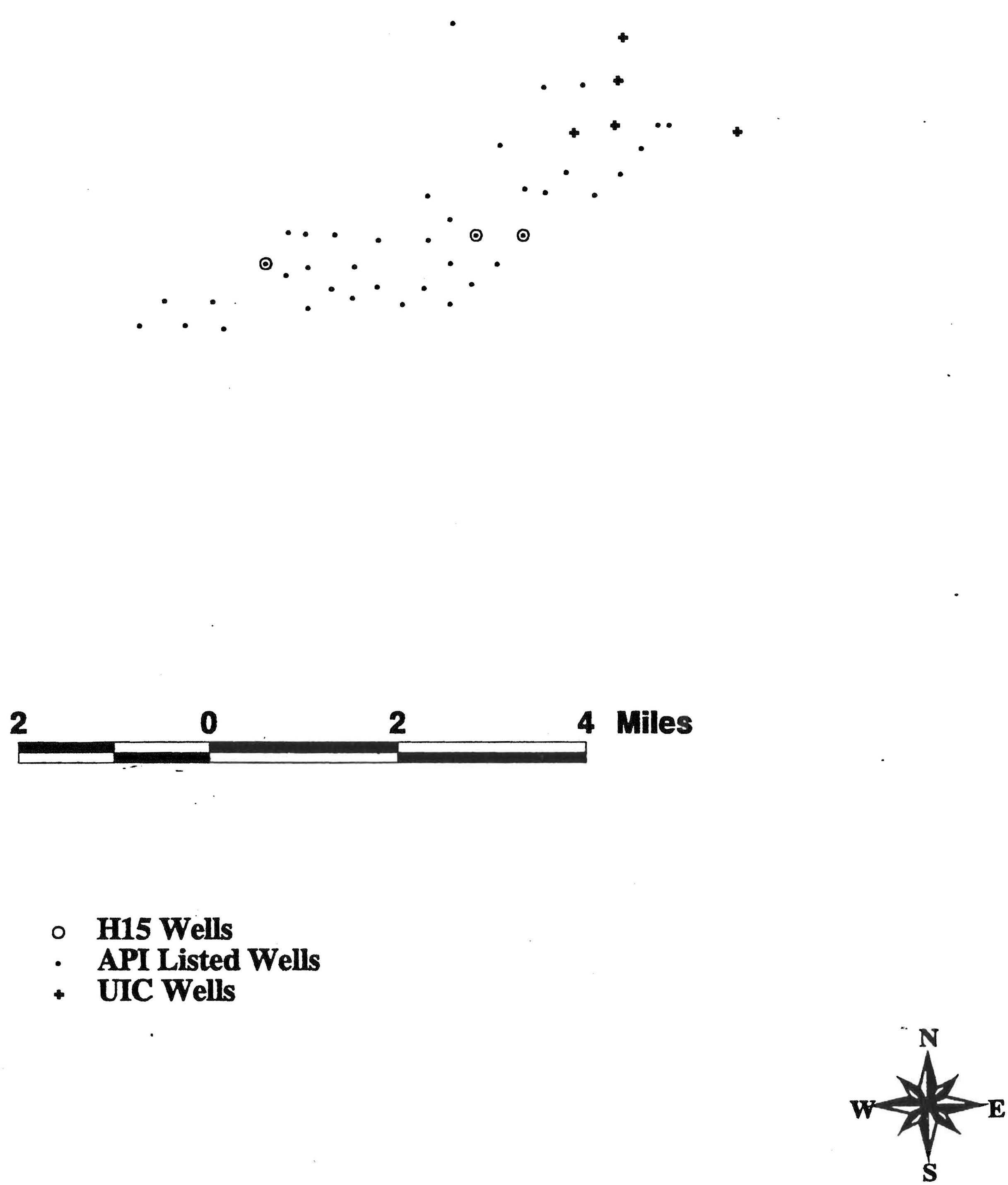
Crossett, West (Clear Fork, Up)
Crane County, Texas
H15, UIC, and API Listed Wells



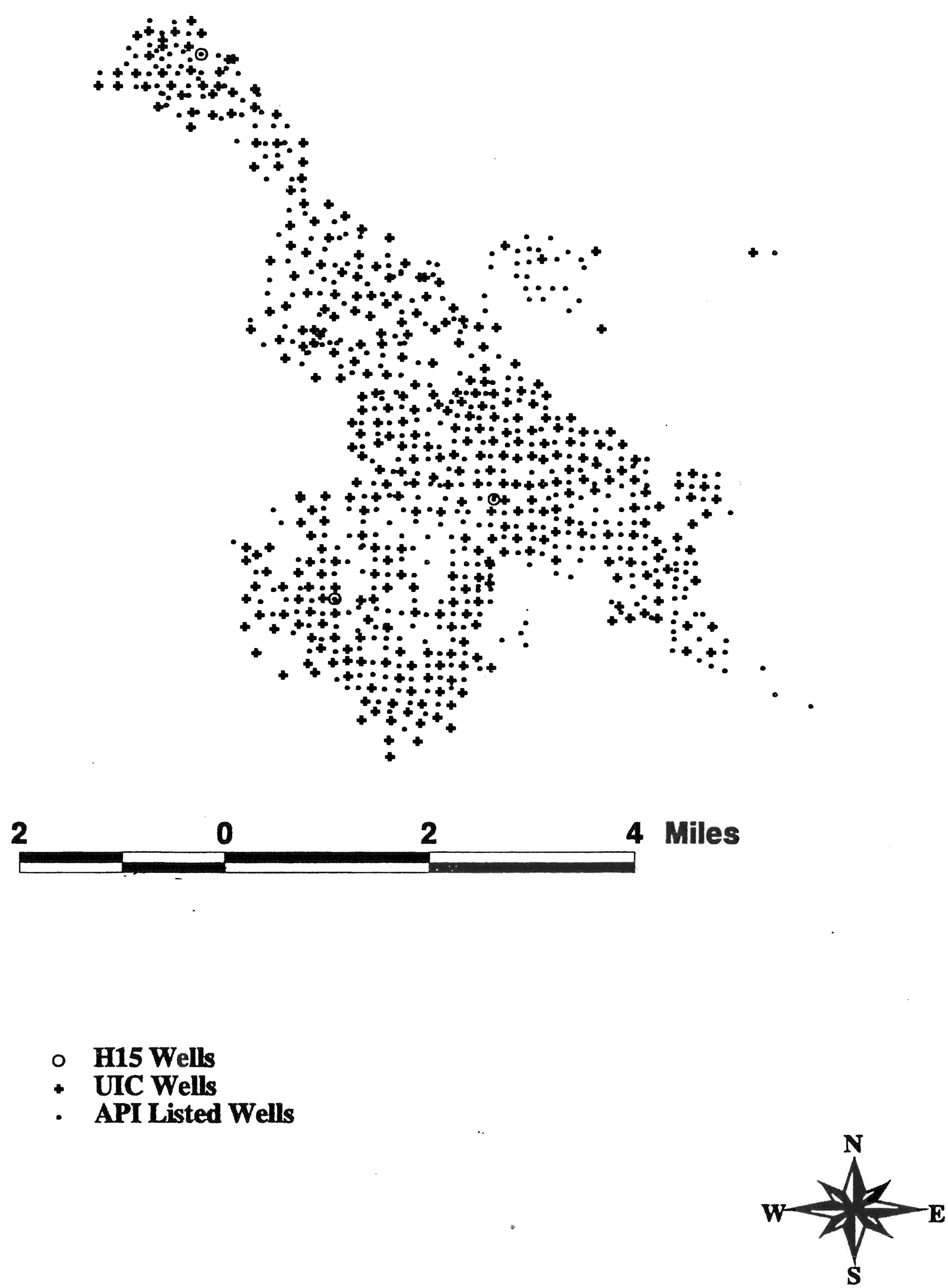
Donnelly (San Andres)
Ector County, Texas
H15, UIC, and API Listed Wells



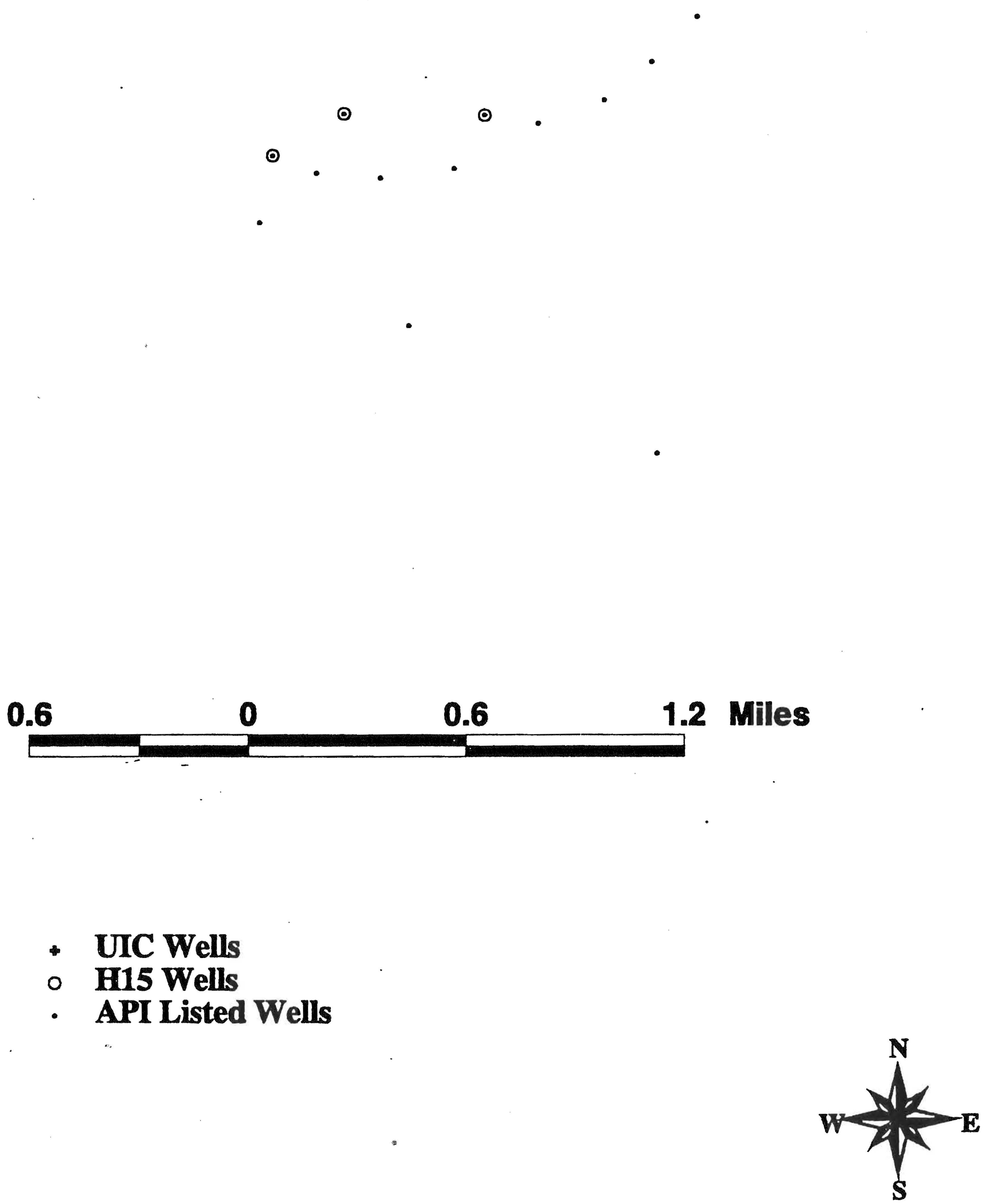
Frass (Tonkawa)
Lipscomb County, Texas
H15, UIC, and API Listed Wells



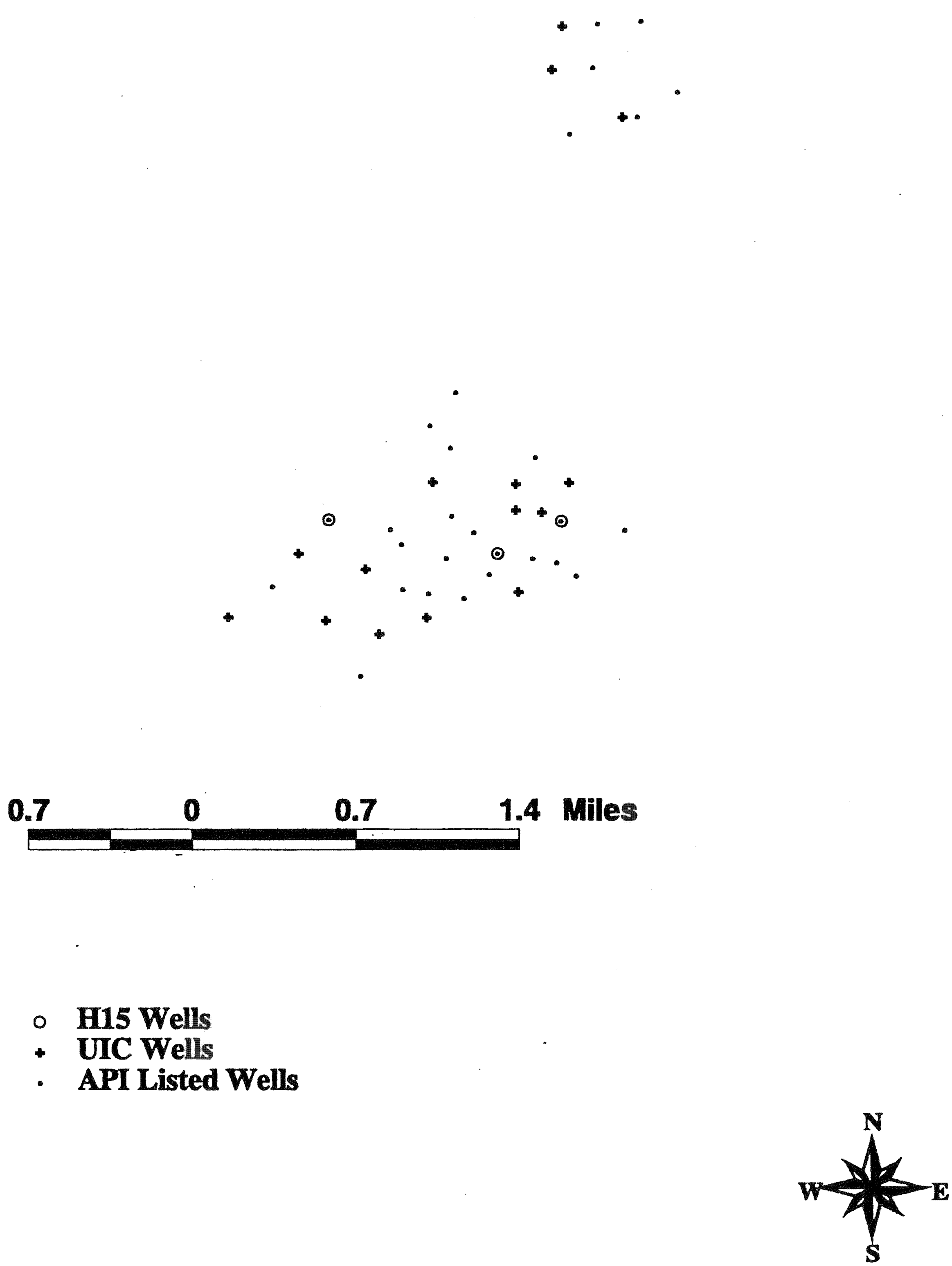
Garza
Garza County, Texas
H15, UIC, and API Listed Wells



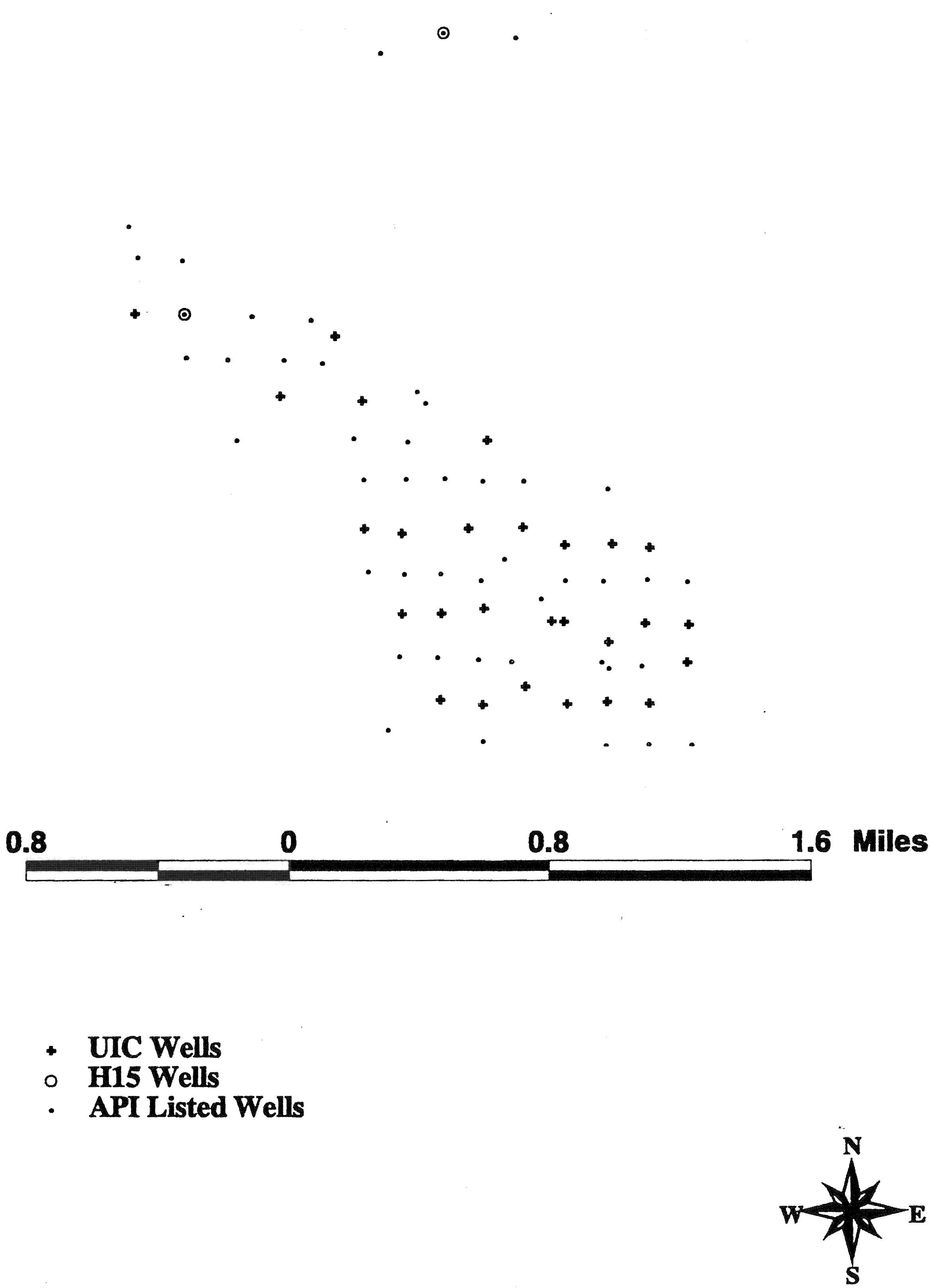
Gillock (East Segment)
Galveston County, Texas
H15, UIC, and API Listed Wells



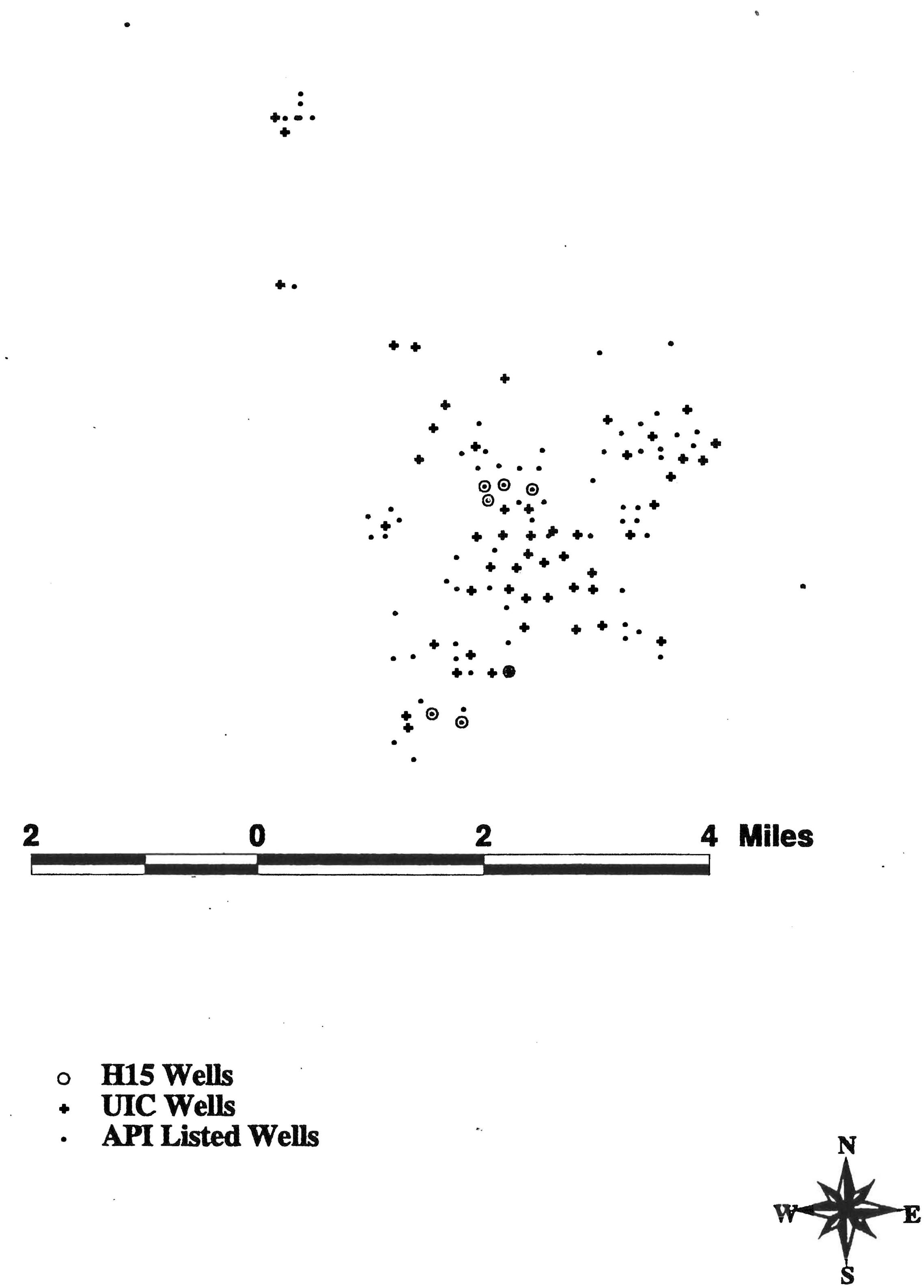
Hitts Lake (Paluxy)
Smith County, Texas
H15, UIC, and API Listed Wells



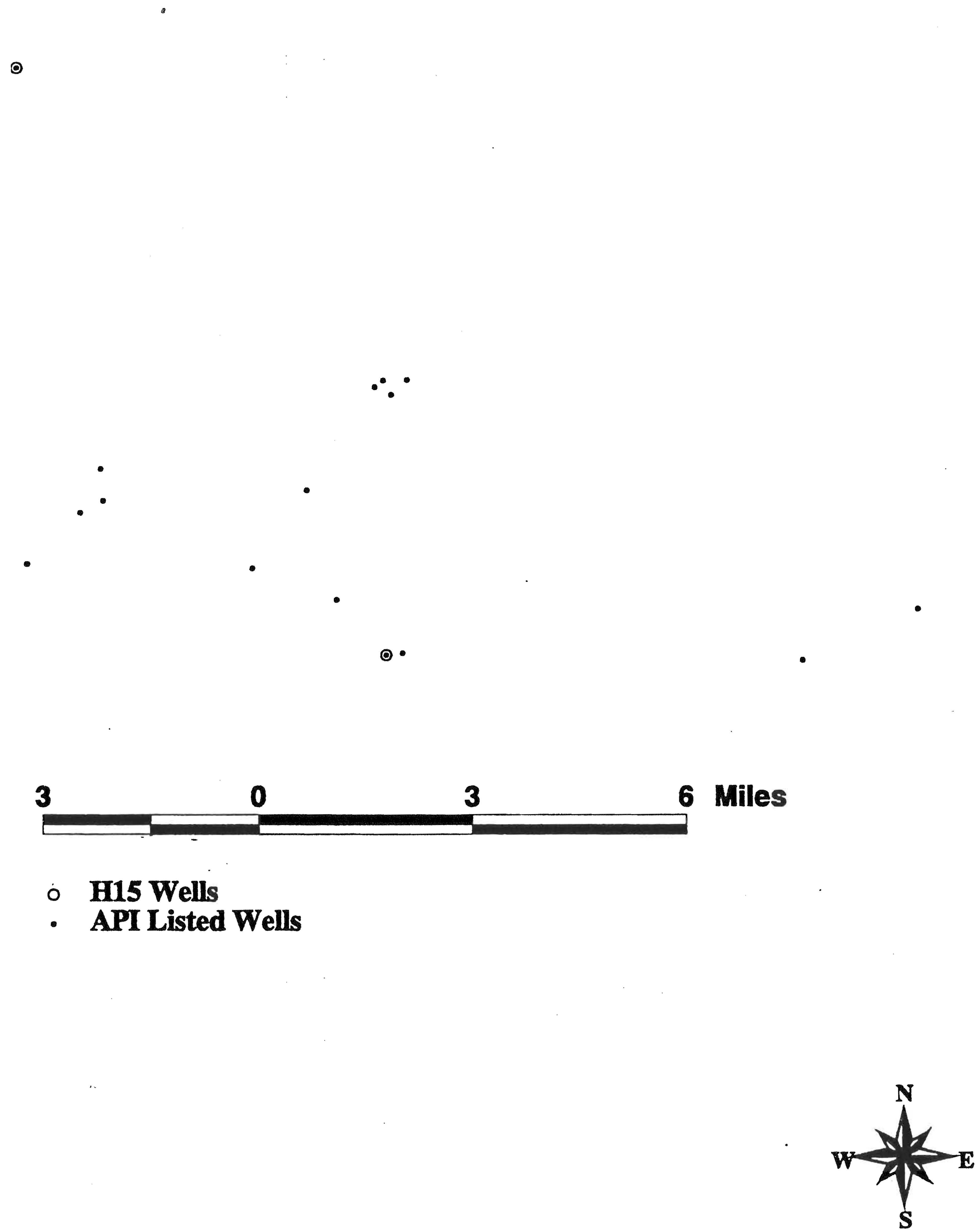
Huntley, East (San Andres)
Garza County, Texas
H15, UIC, and API Listed Wells



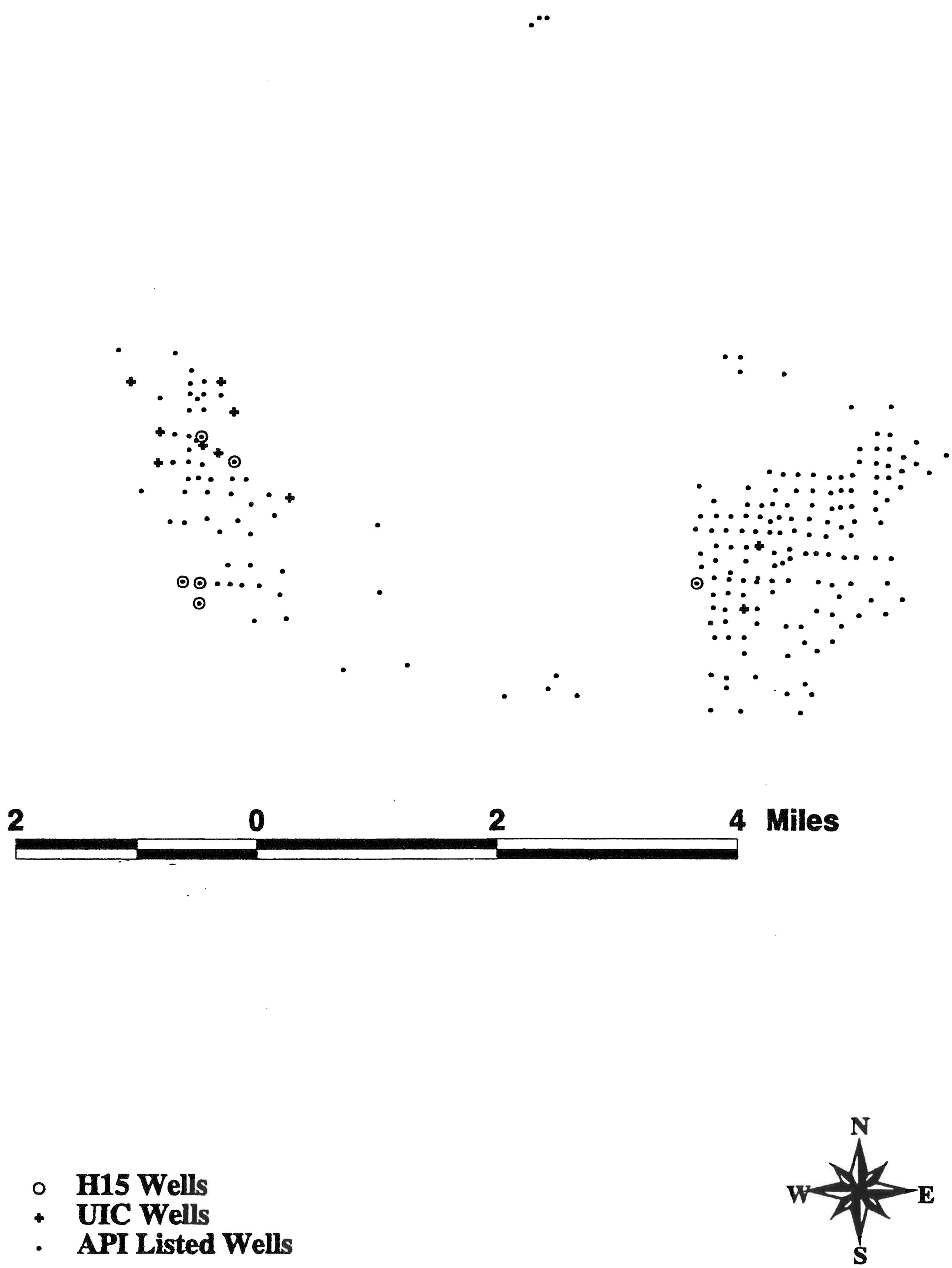
Joy (Strawn)
Clay County, Texas
H15, UIC, and API Listed Wells



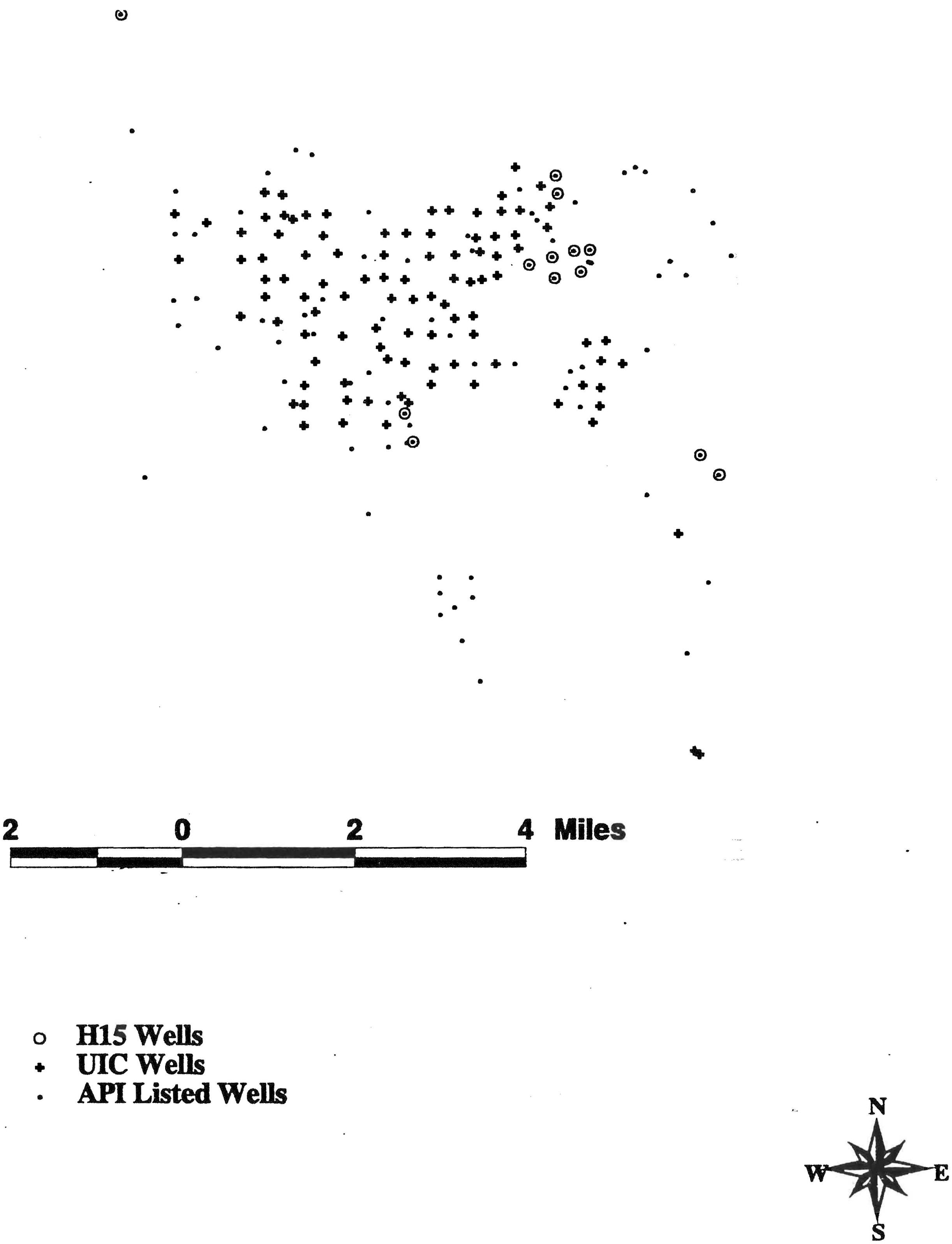
K-M-A (Ellenberger)
Wichita County, Texas
H15 and API Listed Wells



Panhandle (Red Cave)
Moore County, Texas
H15, UIC, and API Listed Wells

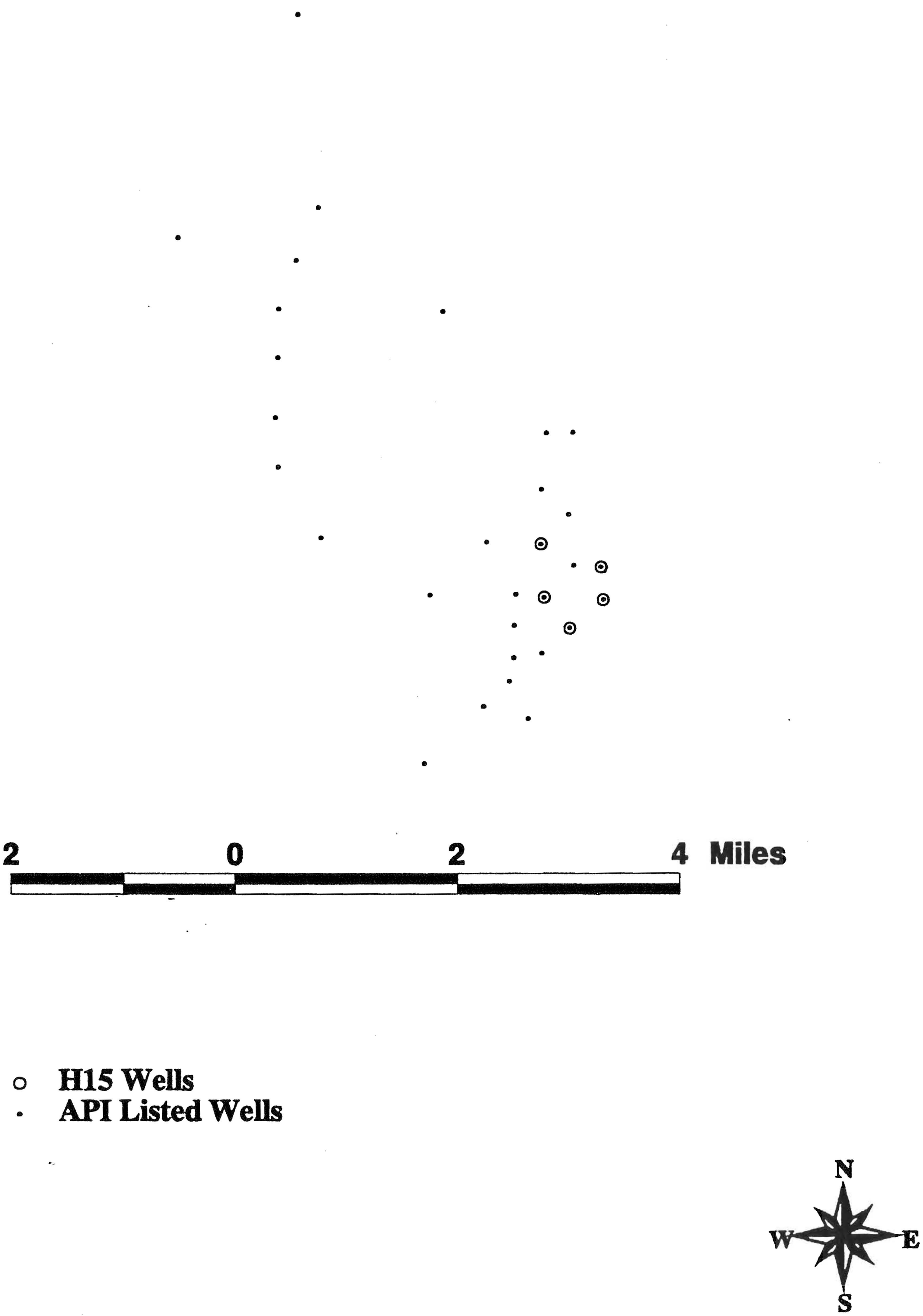


Ranger
Eastland County, Texas
H15, UIC, and API Listed wells

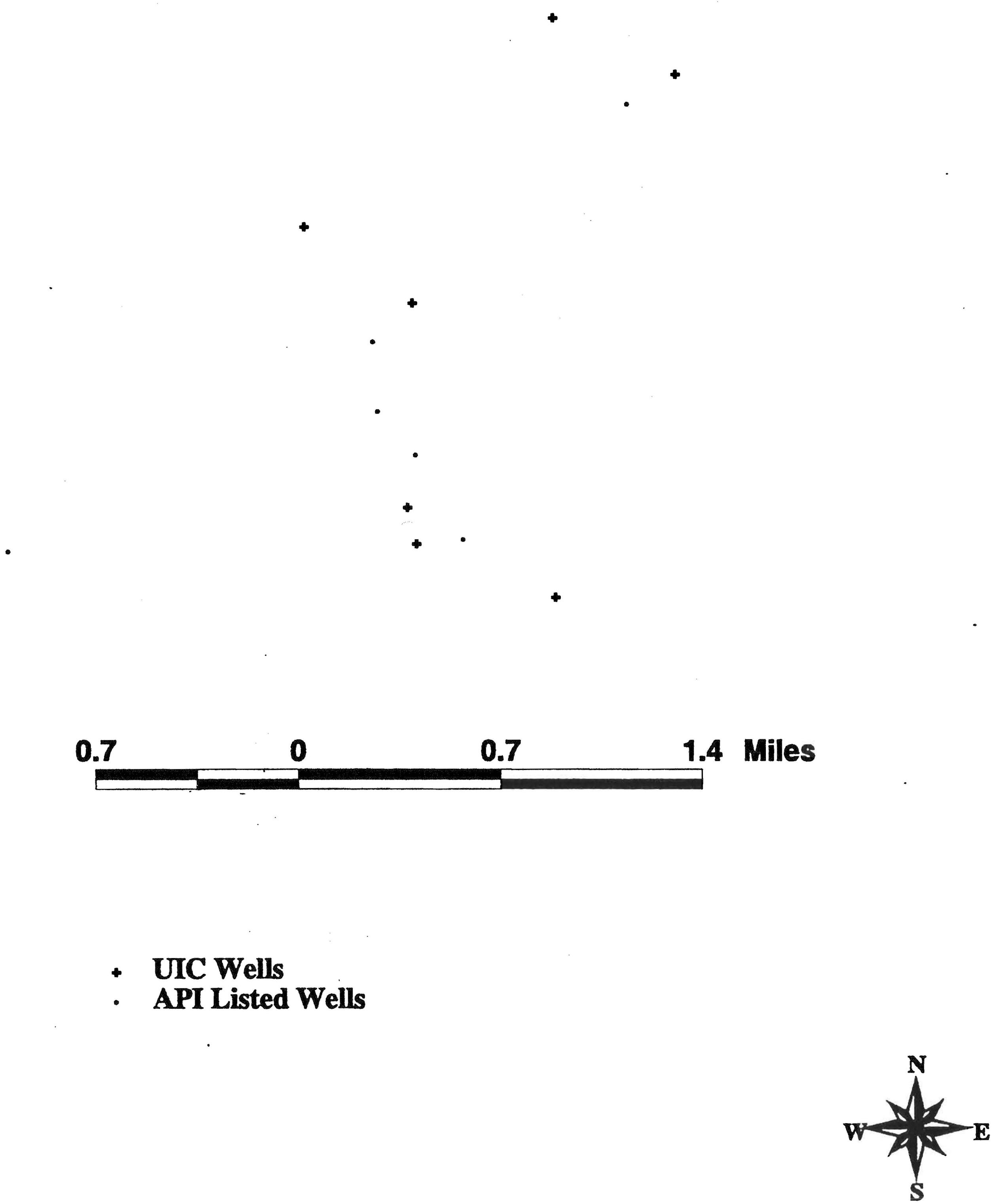


Sawyer (Canyon)
Sutton County, Texas
H15, UIC, and API Listed Wells

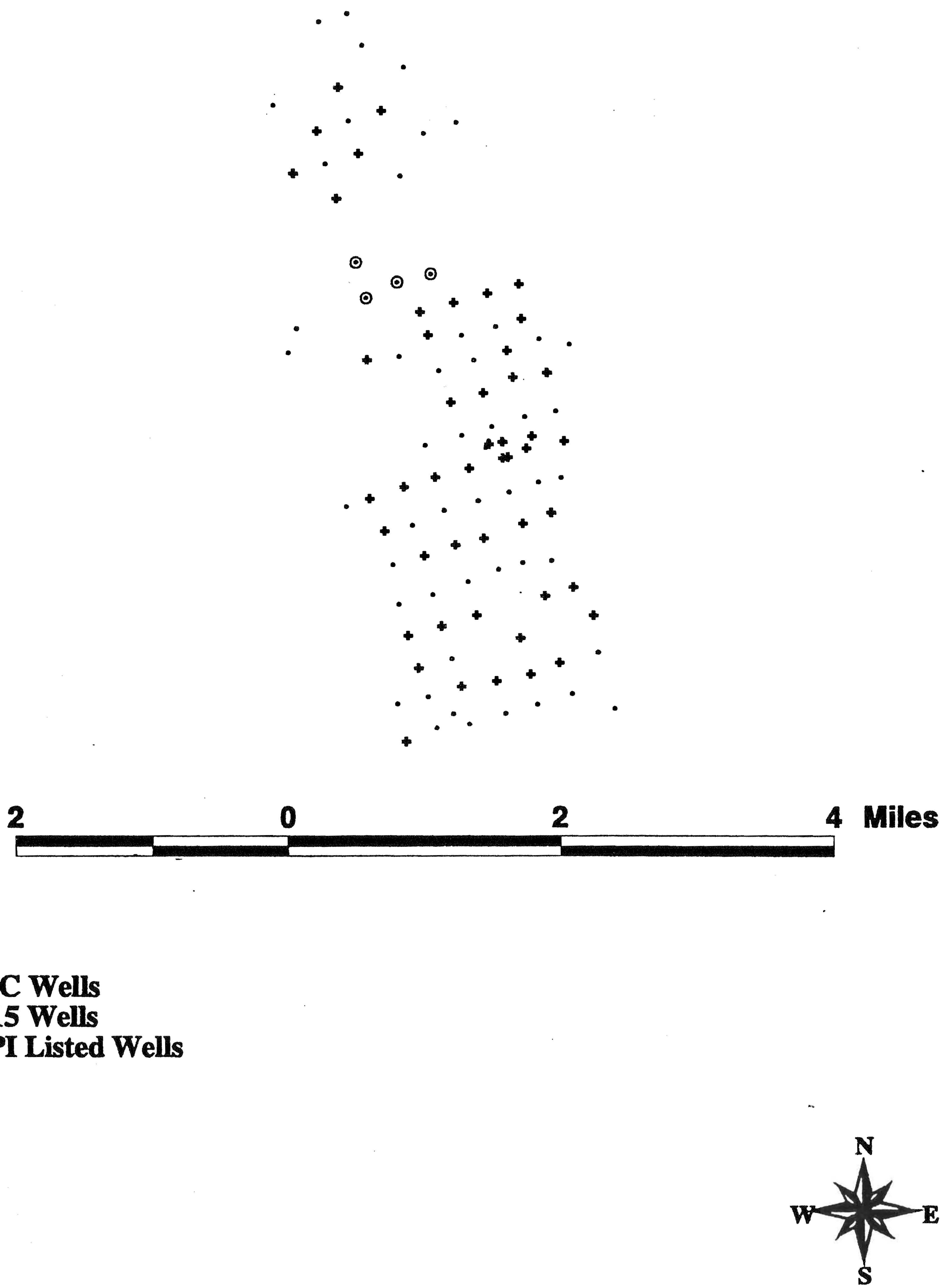
Share, SE (Morrow, Upper)
Ochiltree County, Texas
H15, UIC, and API Listed Wells



Sullivan (Delaware)
Reeves County, Texas
H15, UIC, and API Listed Wells

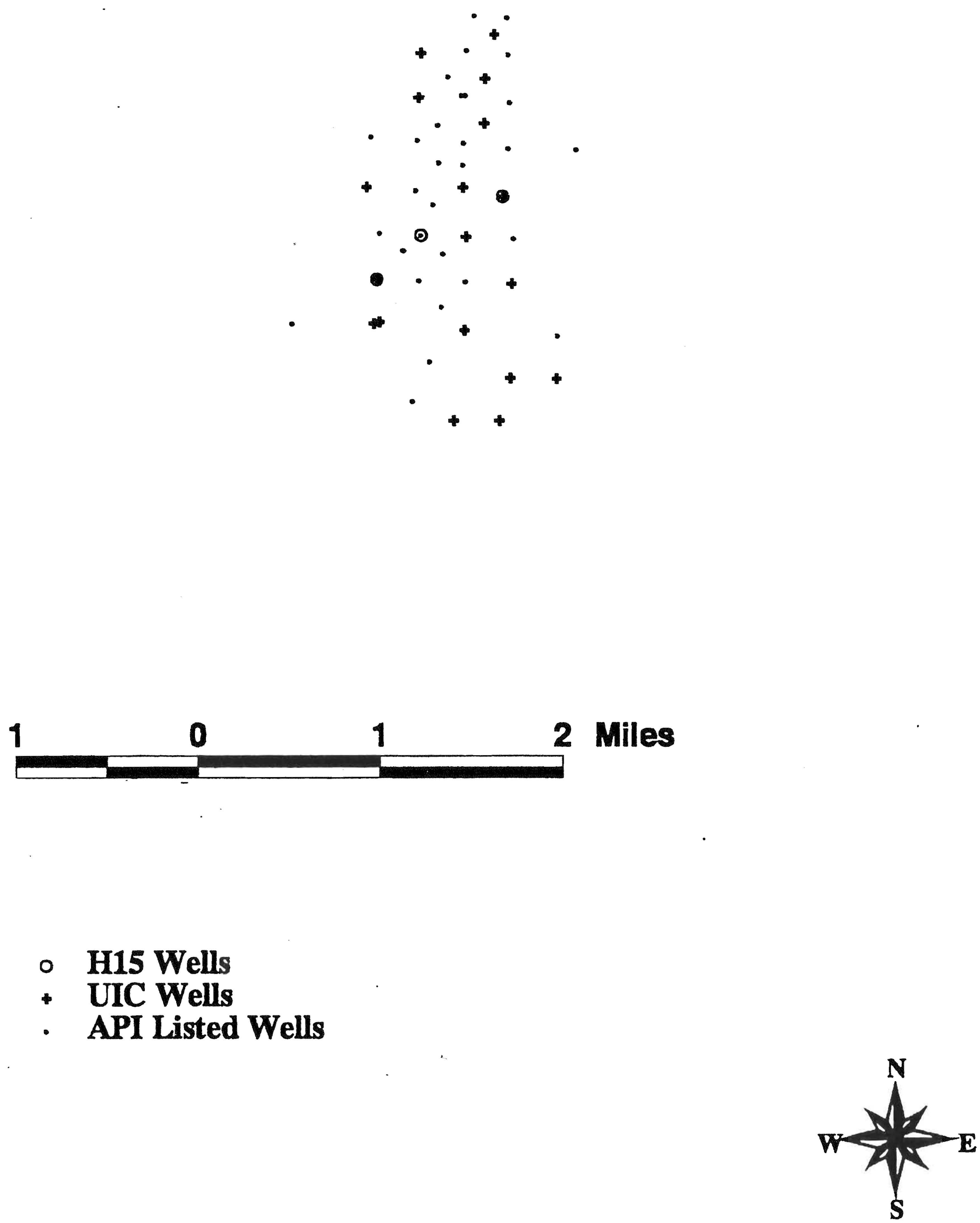


Three Bar (Devonian) Field
Andrews County, Texas
H15, UIC, and API Listed Wells

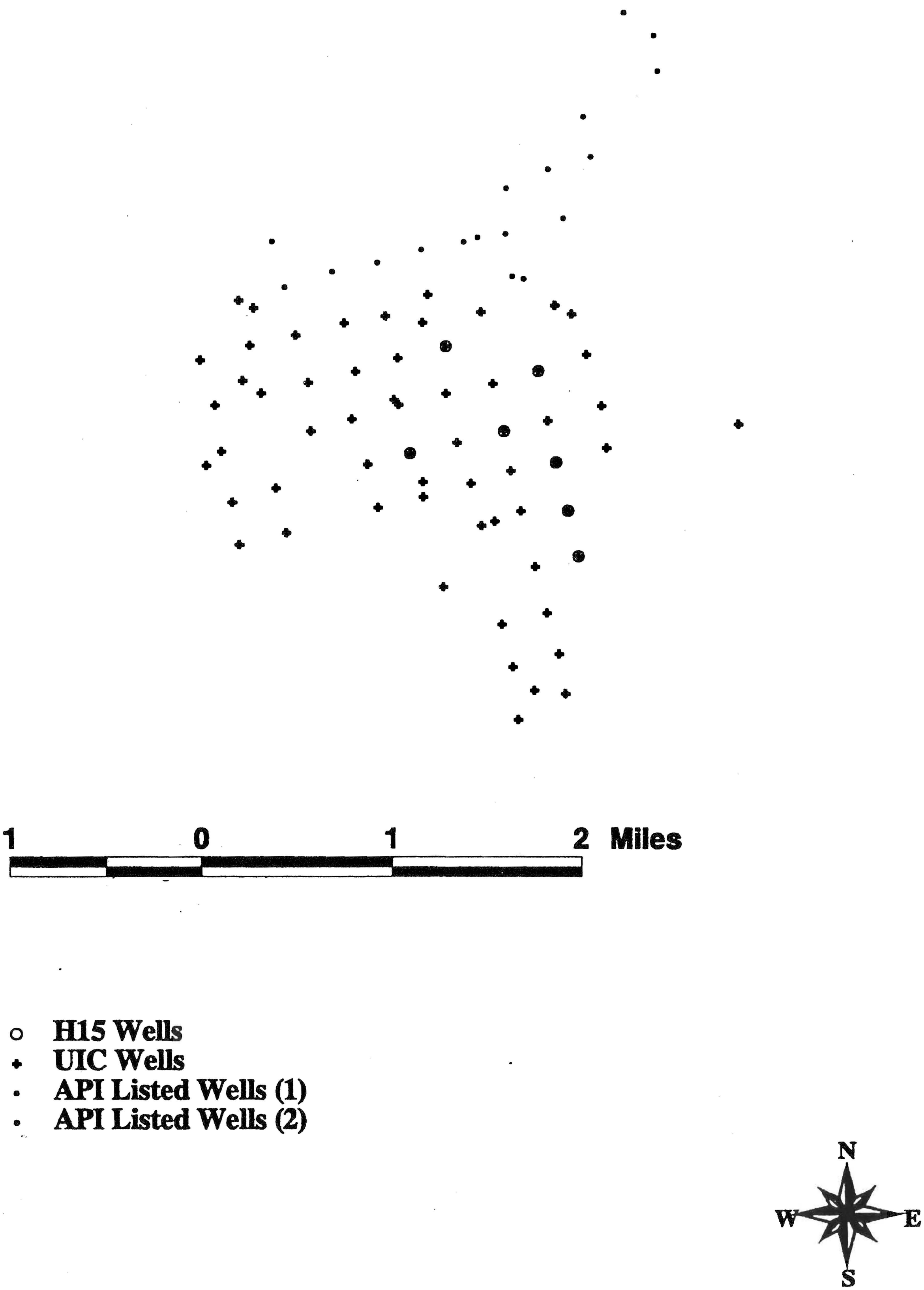


- UIC Wells
- H15 Wells
- API Listed Wells

Todd , Deep (Crinoidal)
Crockett County, Texas
H15, UIC, and API Listed Wells

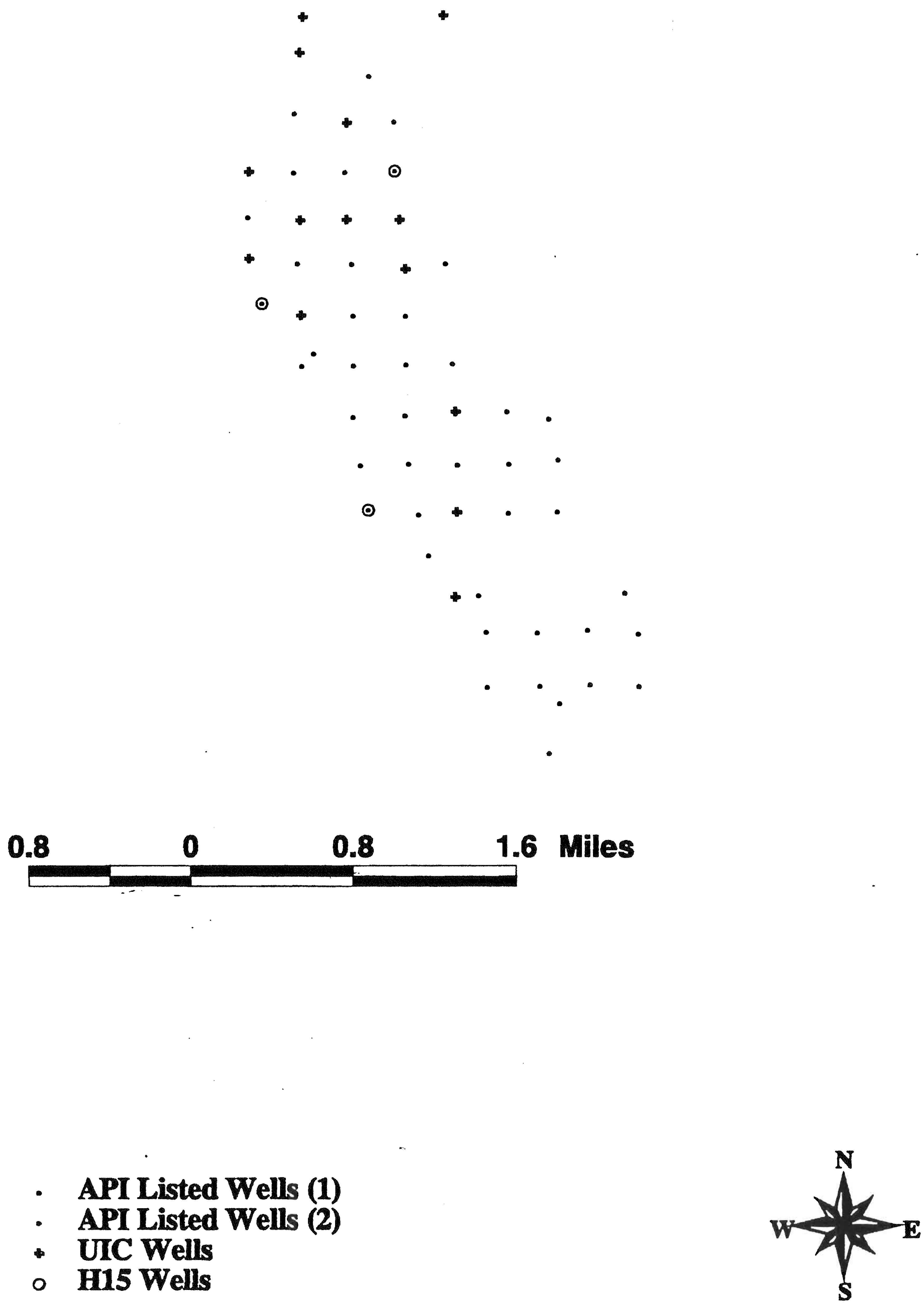


Vealmoor
Howard County, Texas
H15, UIC, and API Listed Wells

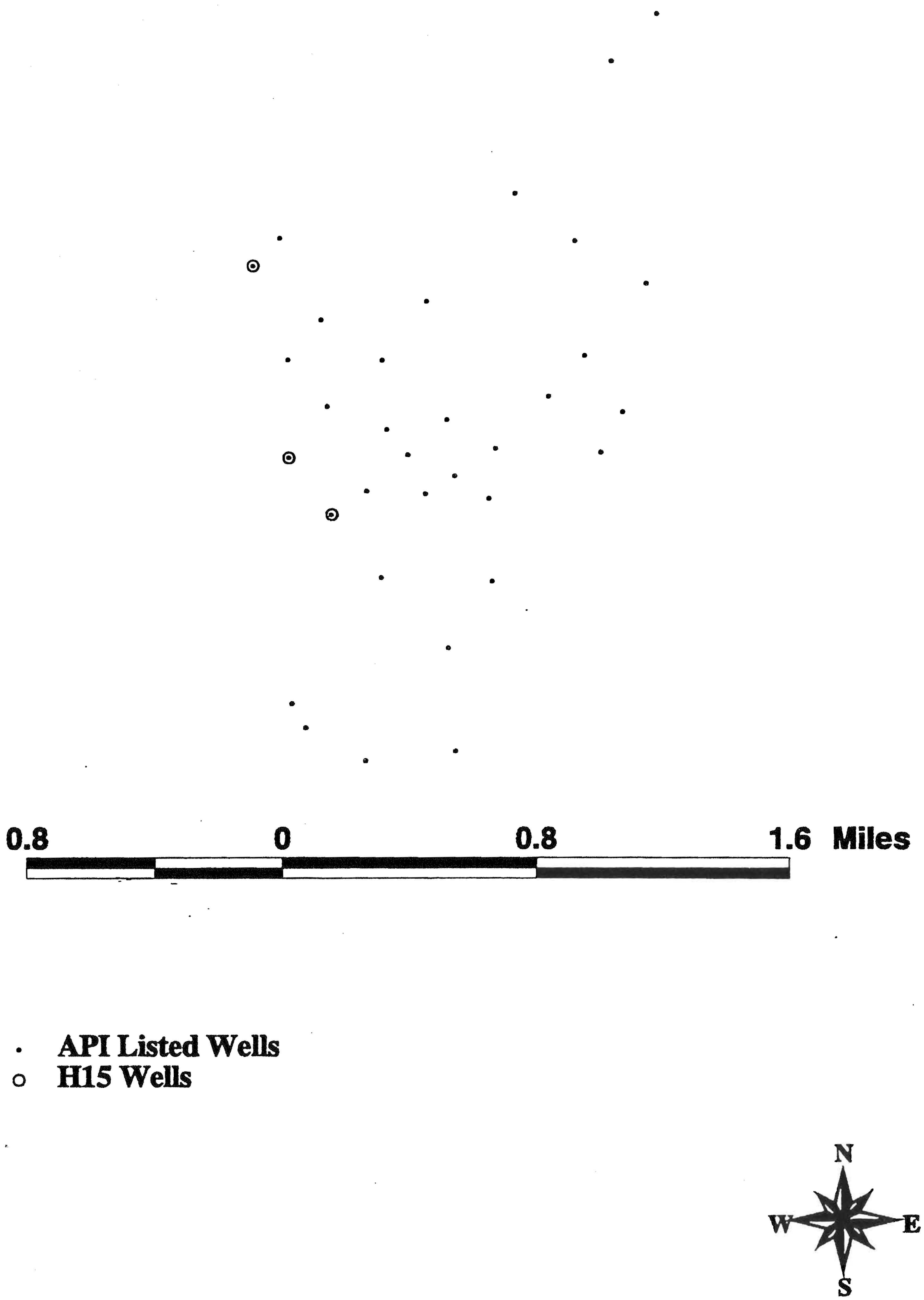


Appendix C-2
H15/UIC Well Location Plots - MAYBE Category

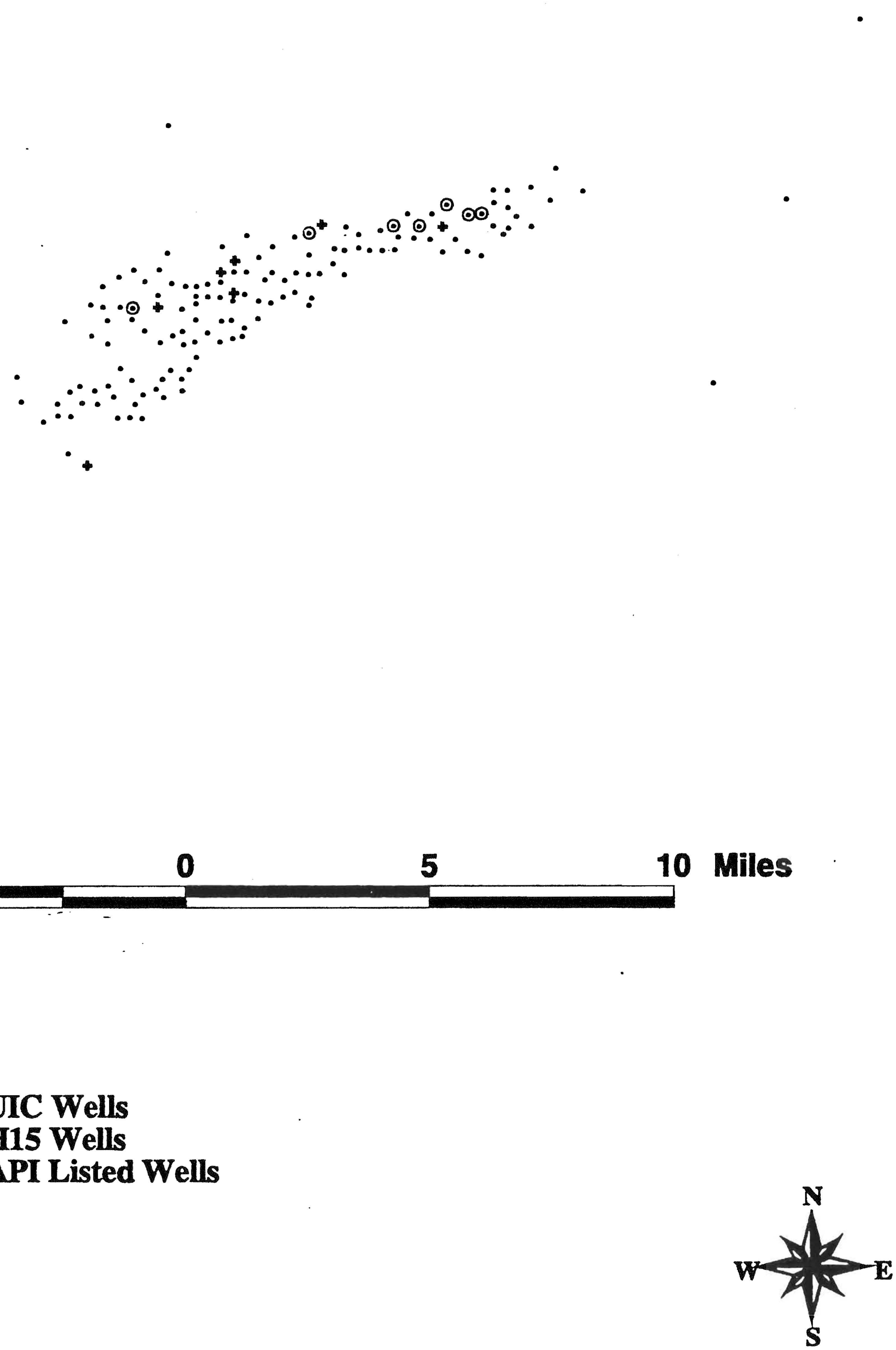
Adair (Wolfcamp)
Terry County, Texas
H15, UIC, and API Listed Wells



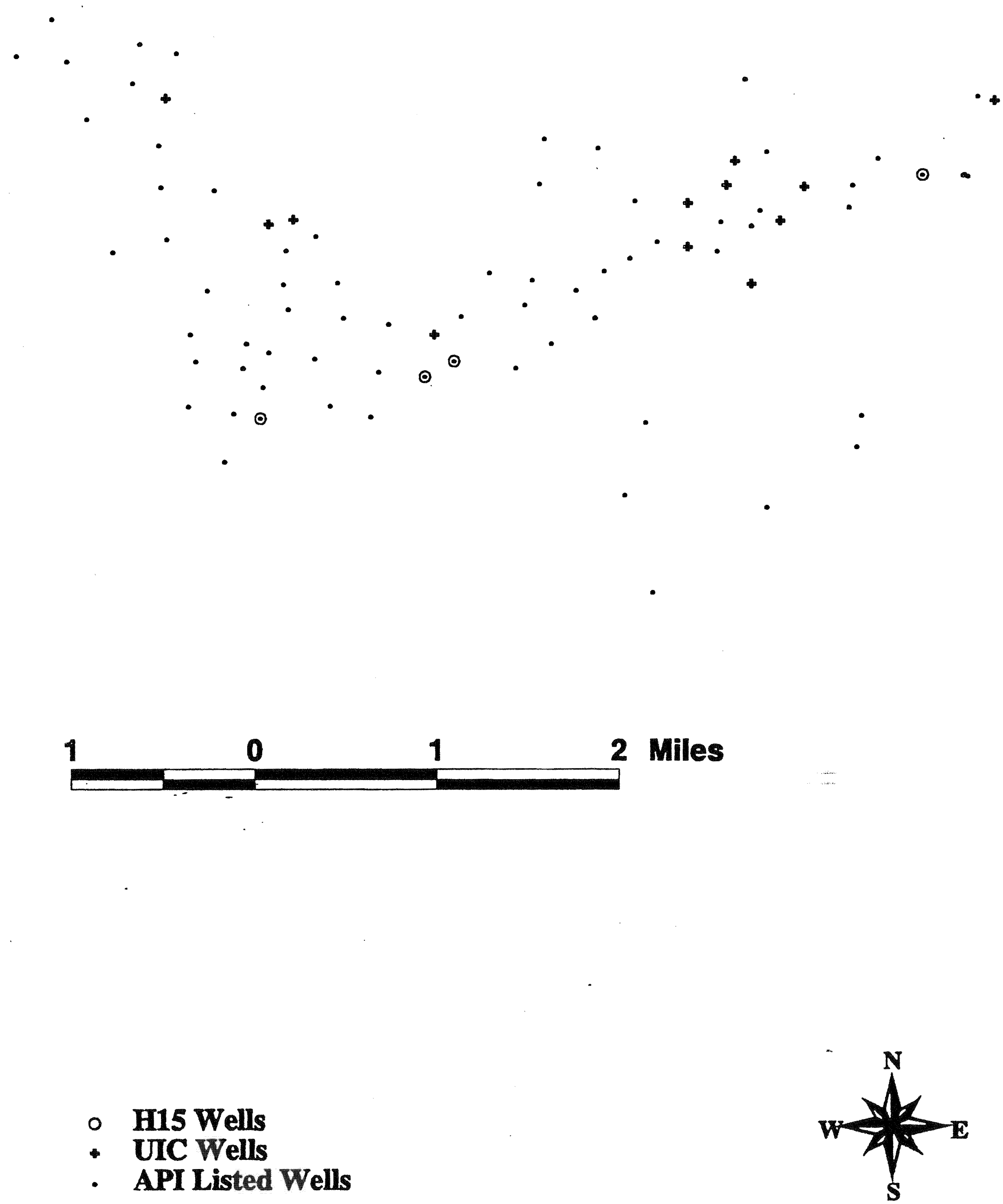
Bayview (Glorieta)
Crane County, Texas
H15, UIC, and API Listed Wells



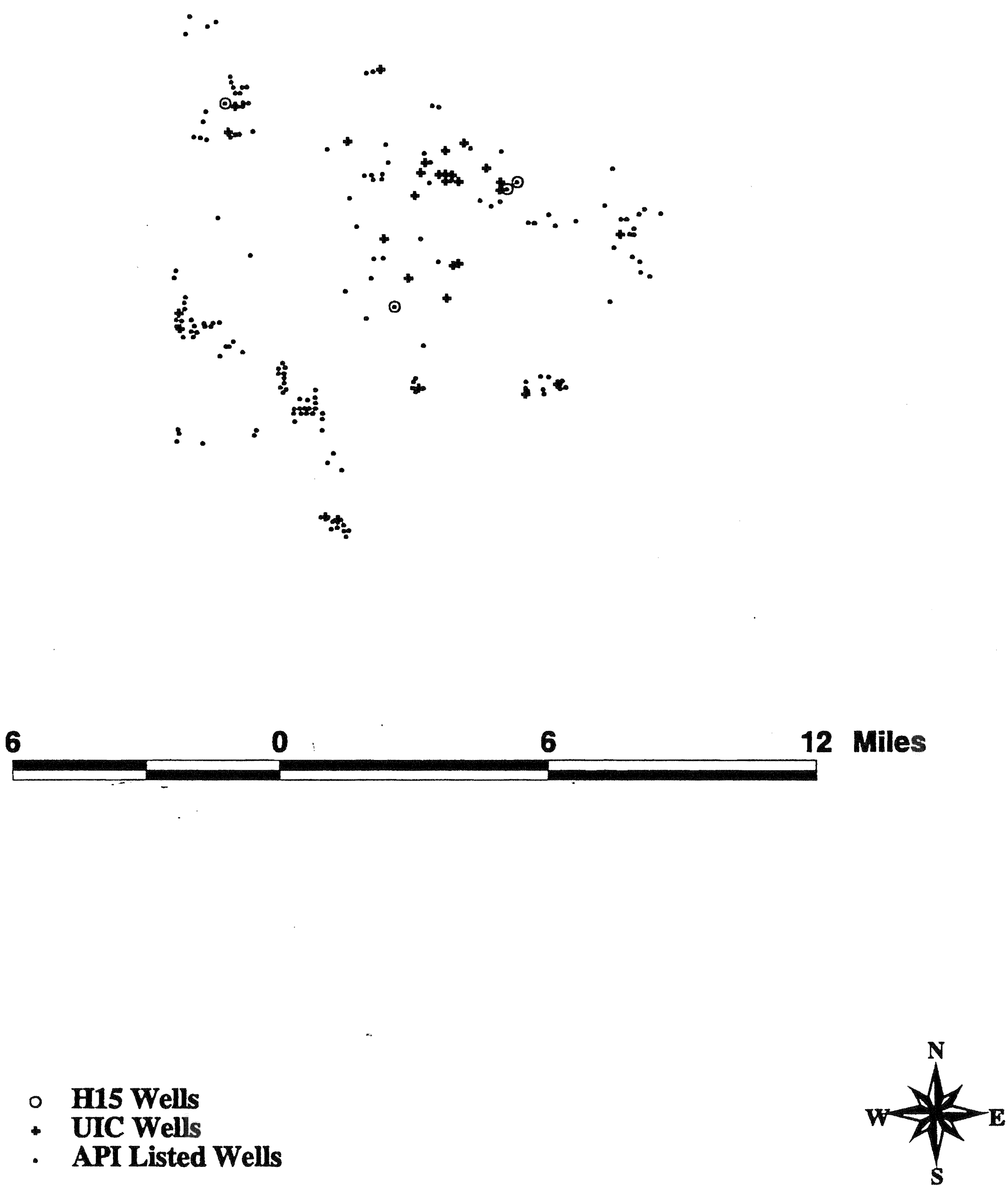
Bradford (Tonkawa)
Lipscomb County, Texas
H15, UIC, and API Listed wells



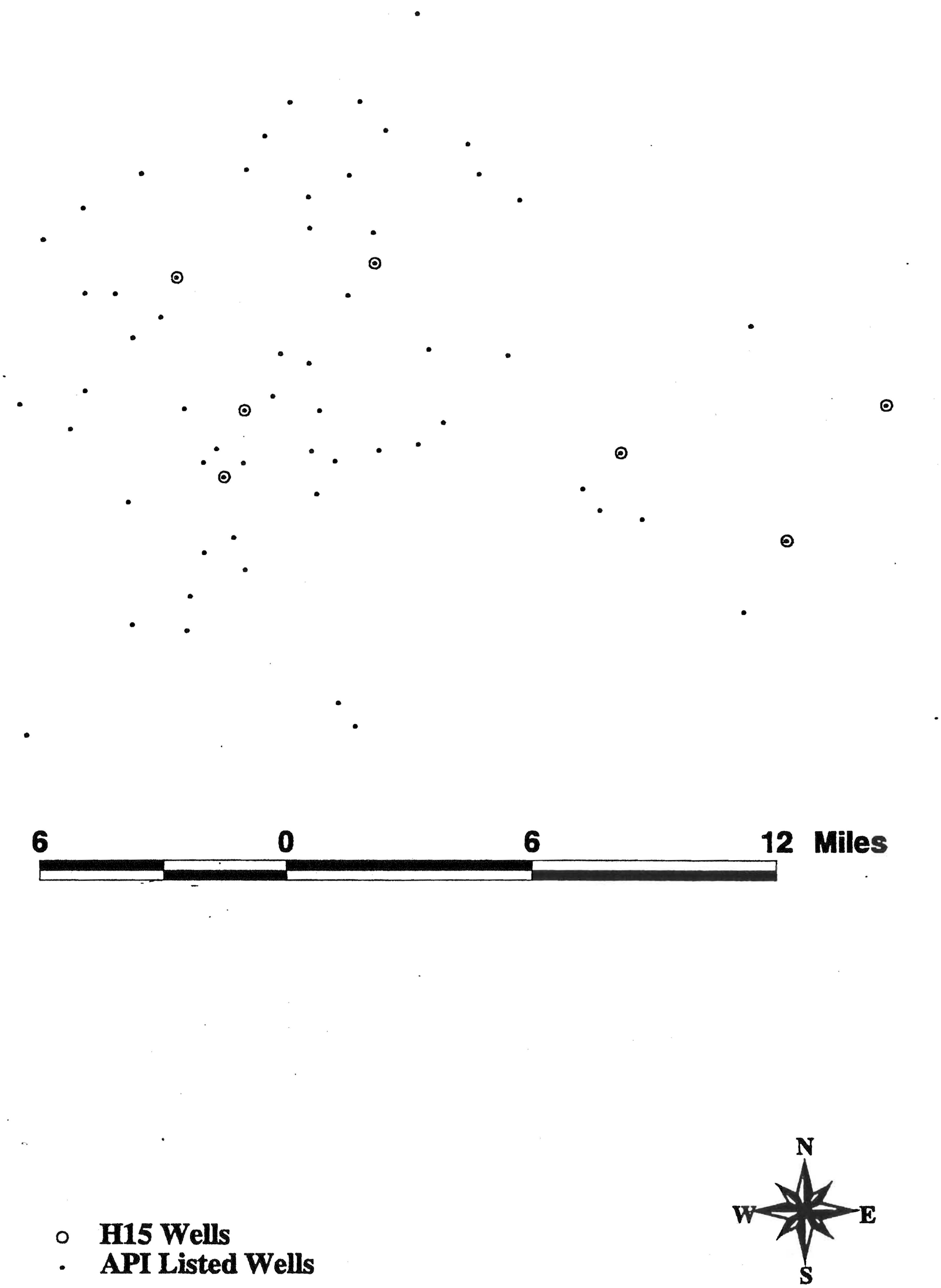
Brown & Thorp (Clear Fork)
Pecos County, Texas
H15, UIC, and API Listed Wells



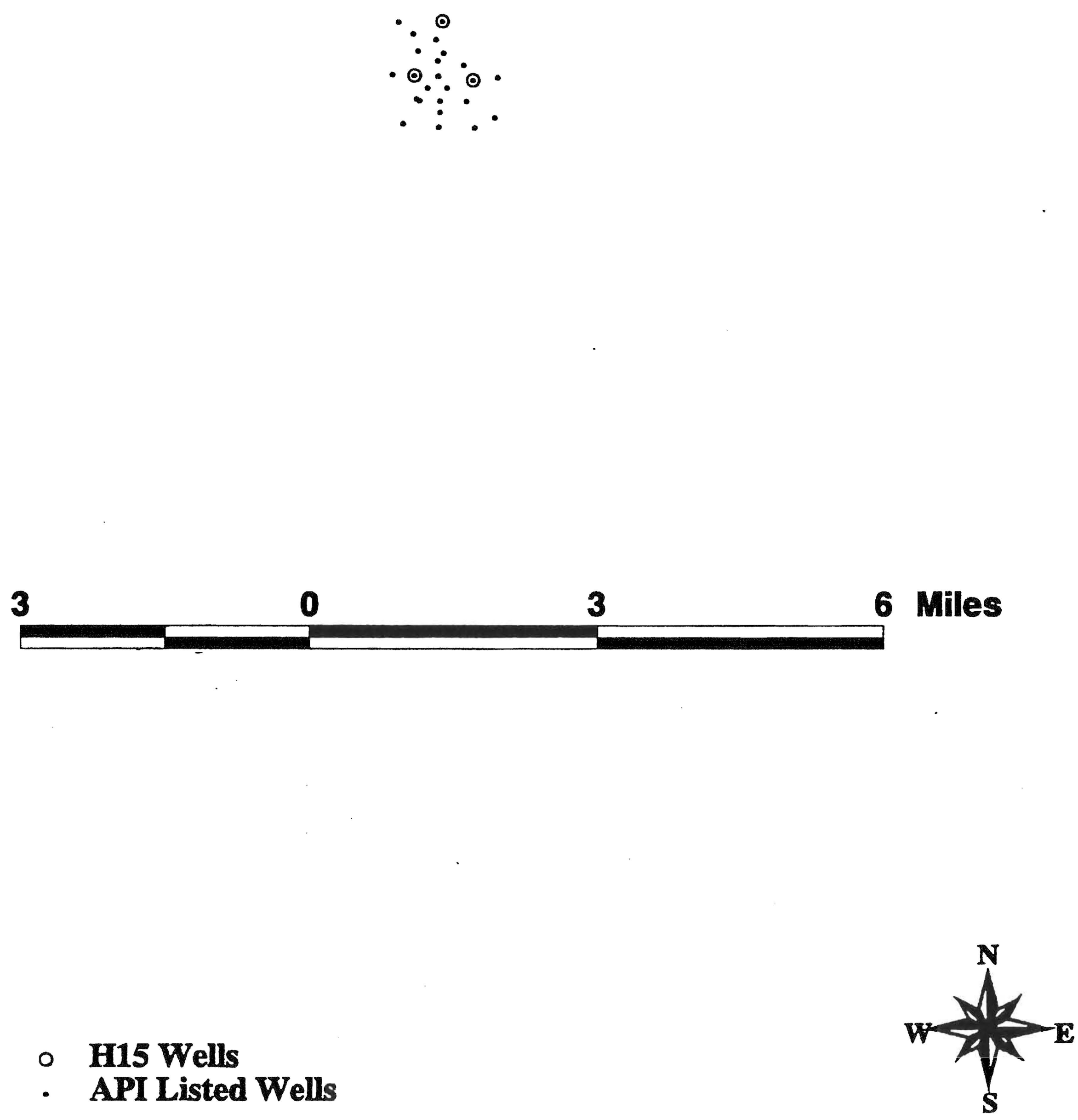
Bryson, East
Jack County, Texas
H15, UIC, and API Listed Wells



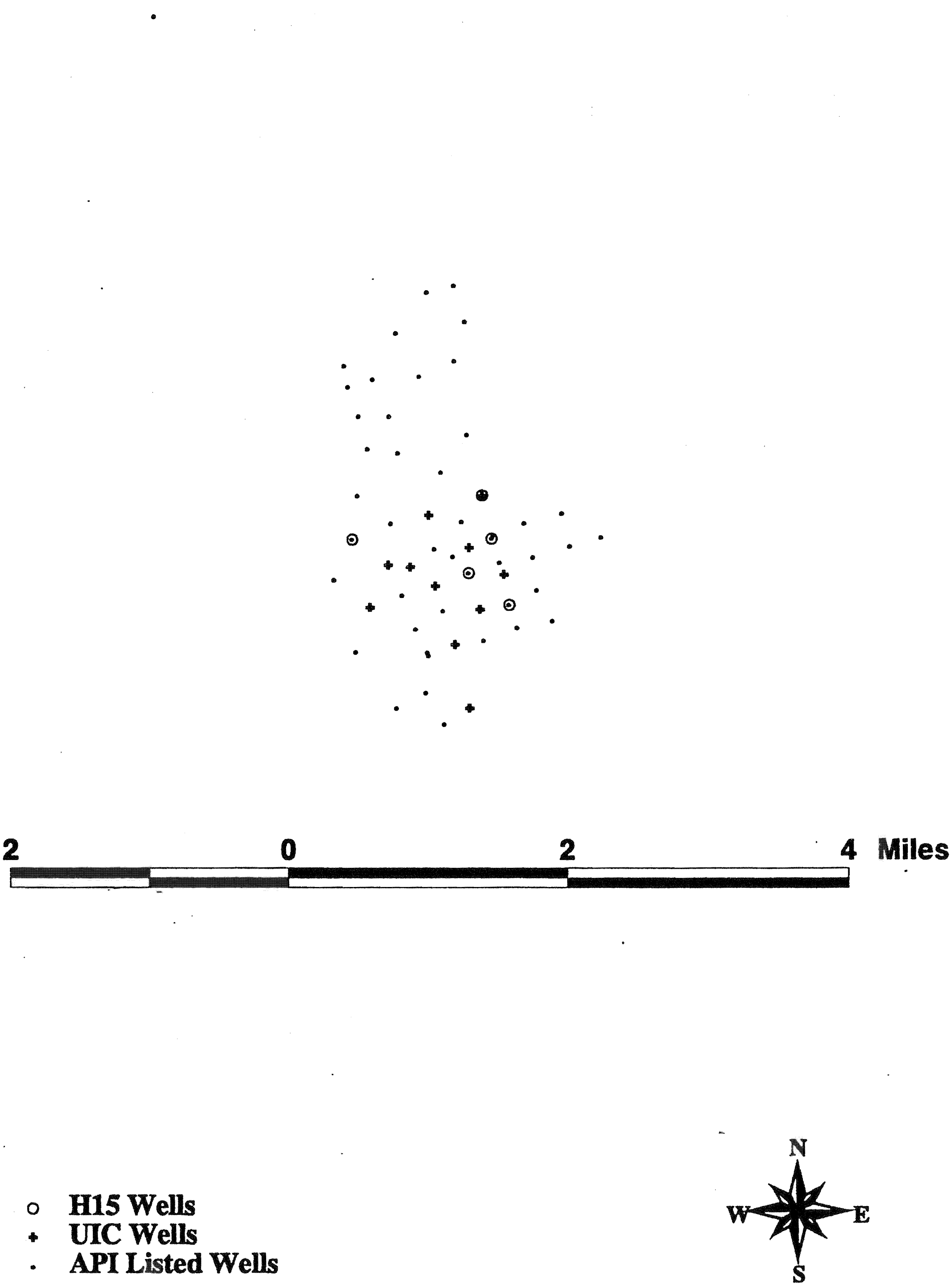
Carthage (Pettit, Upper)
Panola County, Texas
H15, UIC, and API Listed Wells



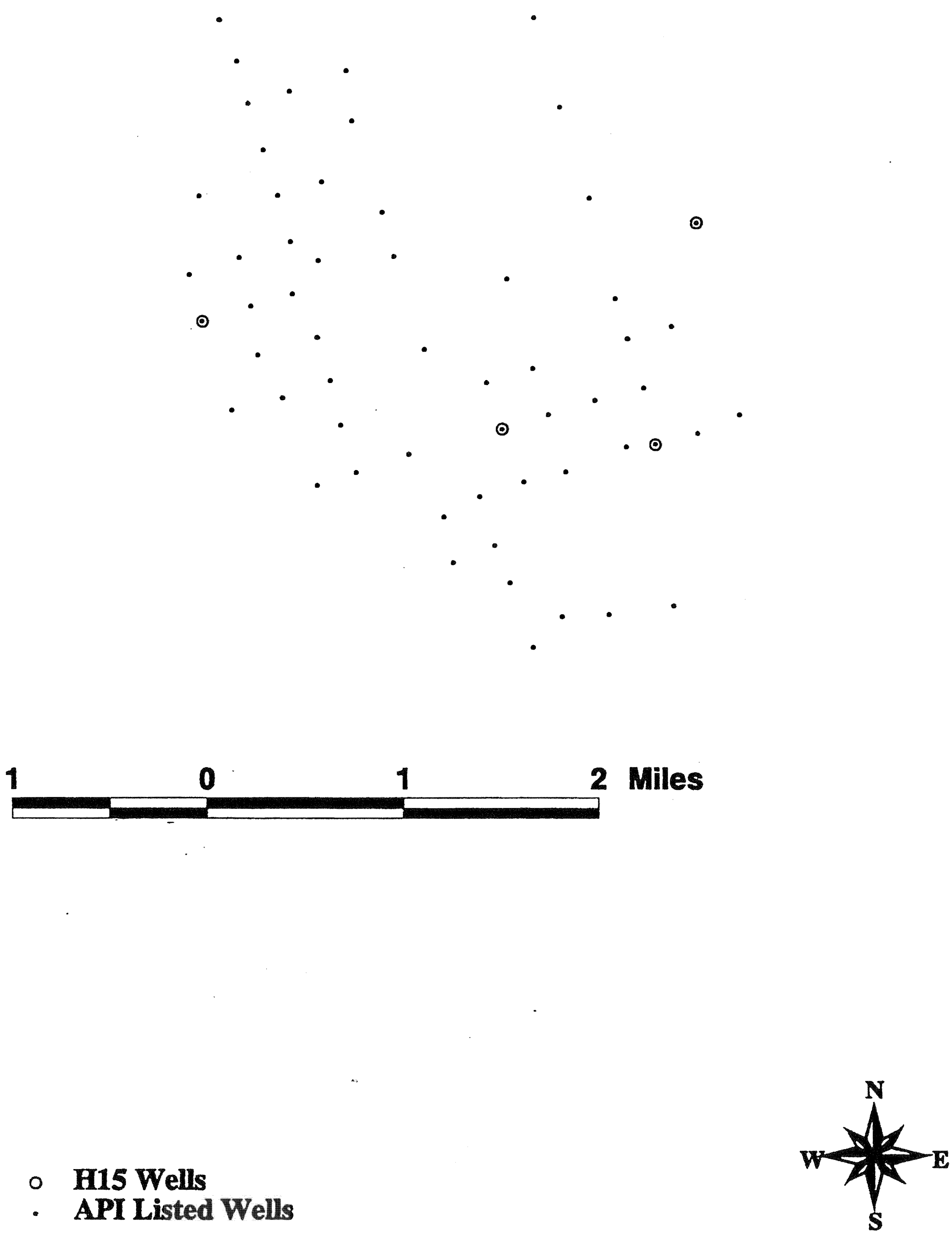
Choate (Cisco -K-)
Foard County, Texas
H15, UIC, and API Listed Wells



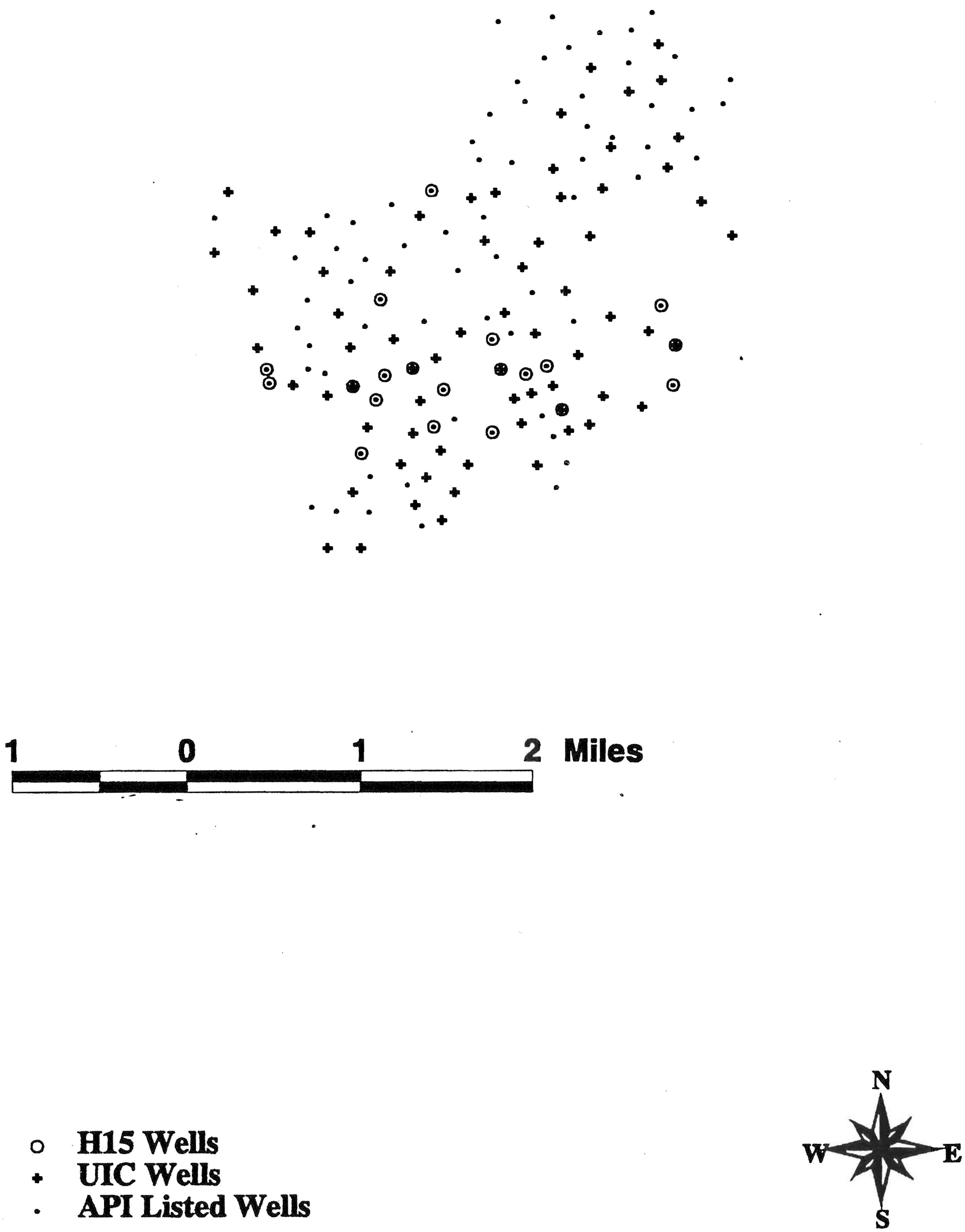
Cowden, South (Canyon 8900)
Ector County, Texas
H15, UIC, and API Listed Wells



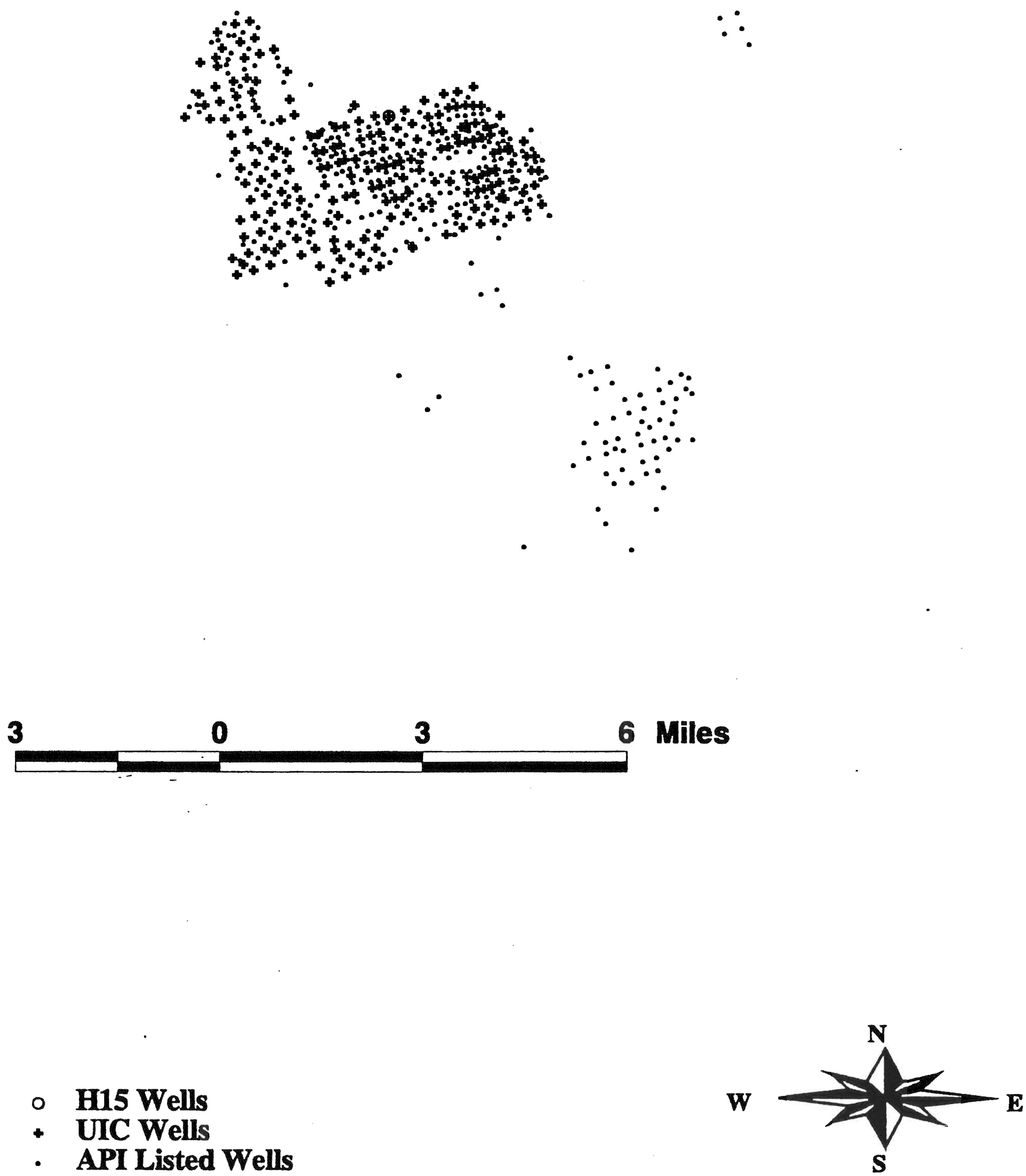
Embar (Permian)
Anrews County, Texas
H15, UIC, and API Listed Wells



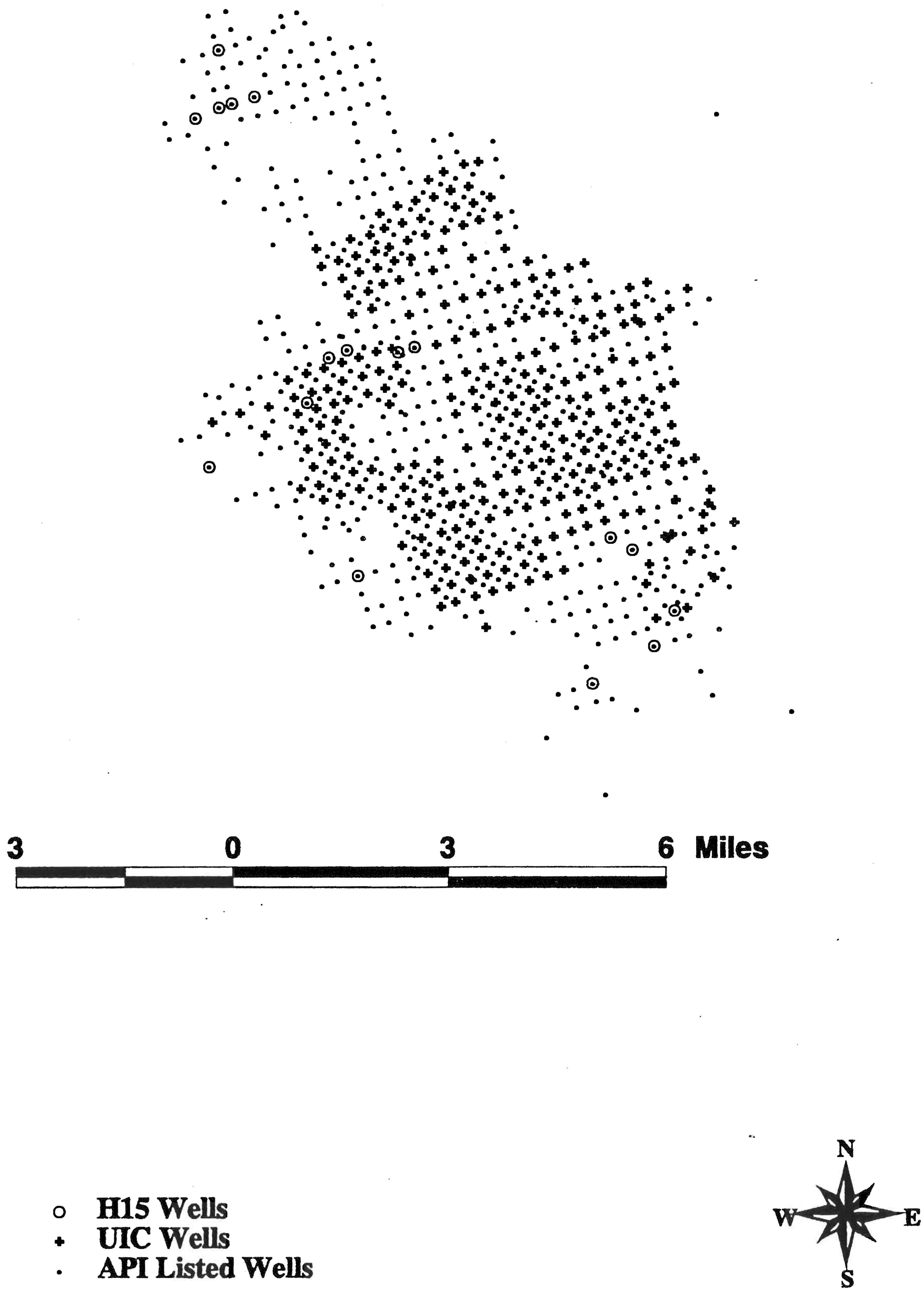
Emperor, Deep
Winkler County, Texas
H15, UIC, and API Listed Wells



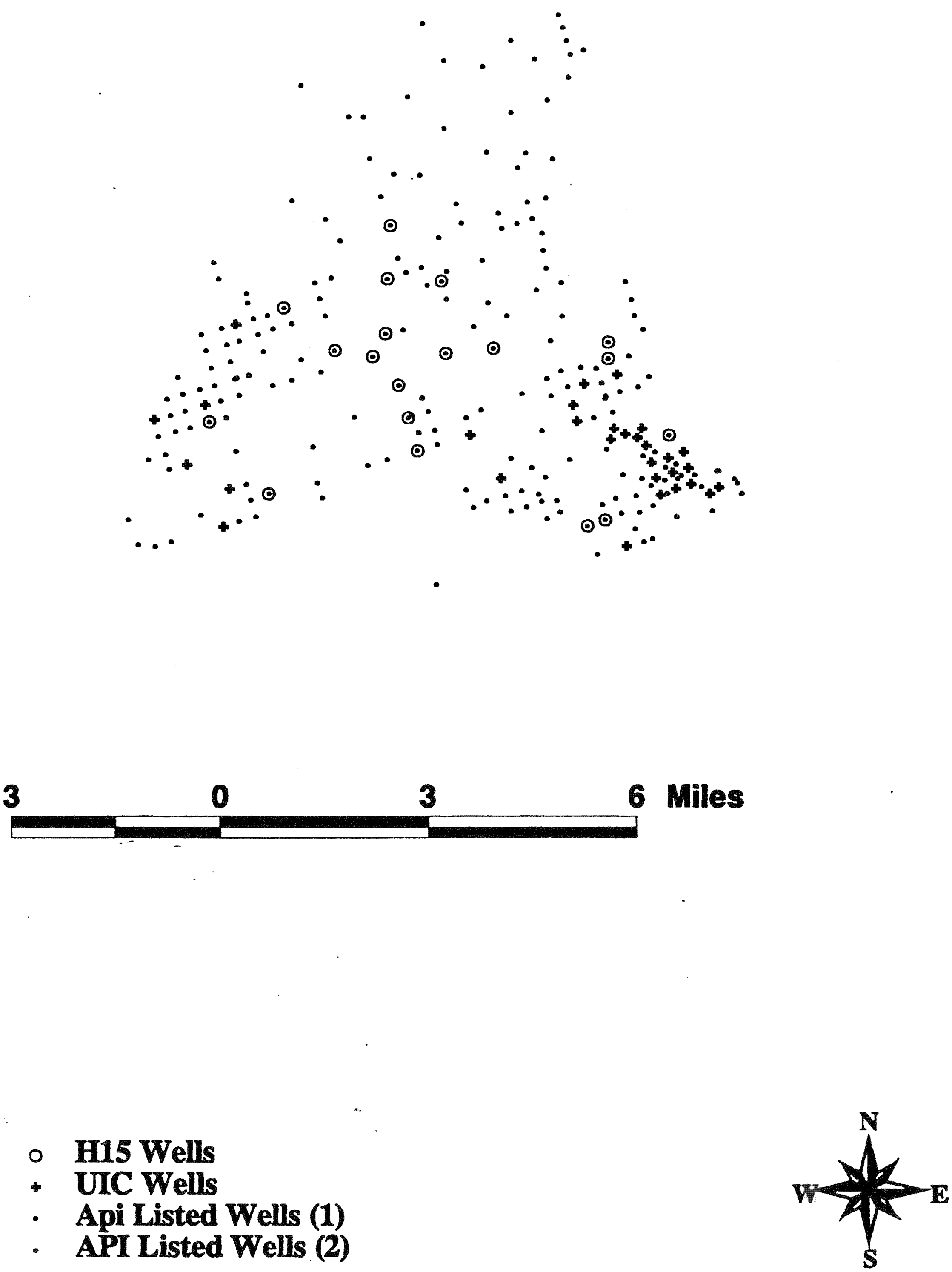
Fullerton (San Andres)
Andrews County, Texas
H15, UIC, and API Listed Wells



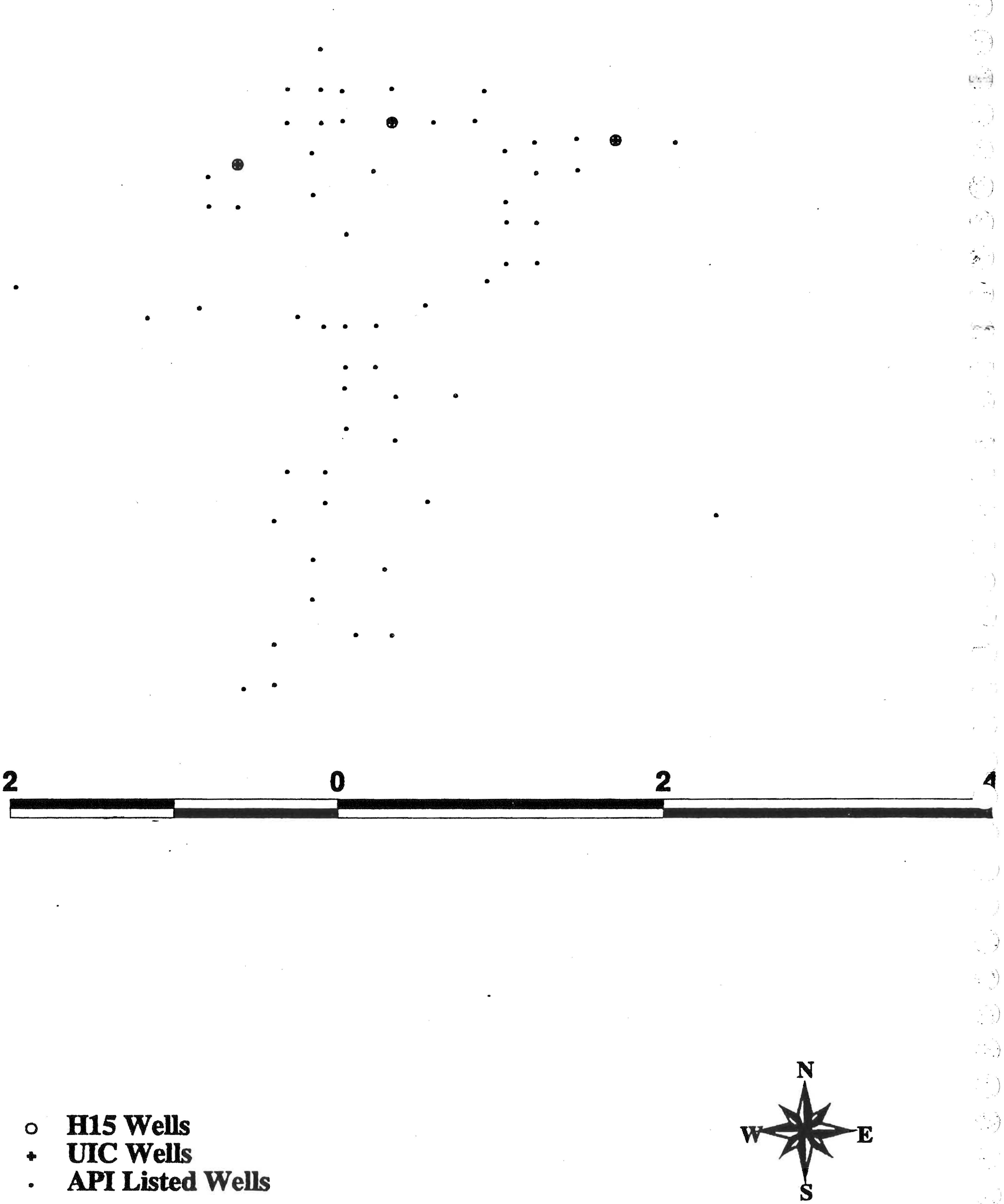
Goldsmith (Clear Fork)
Ector County, Texas
H15, UIC, and API Listed Wells



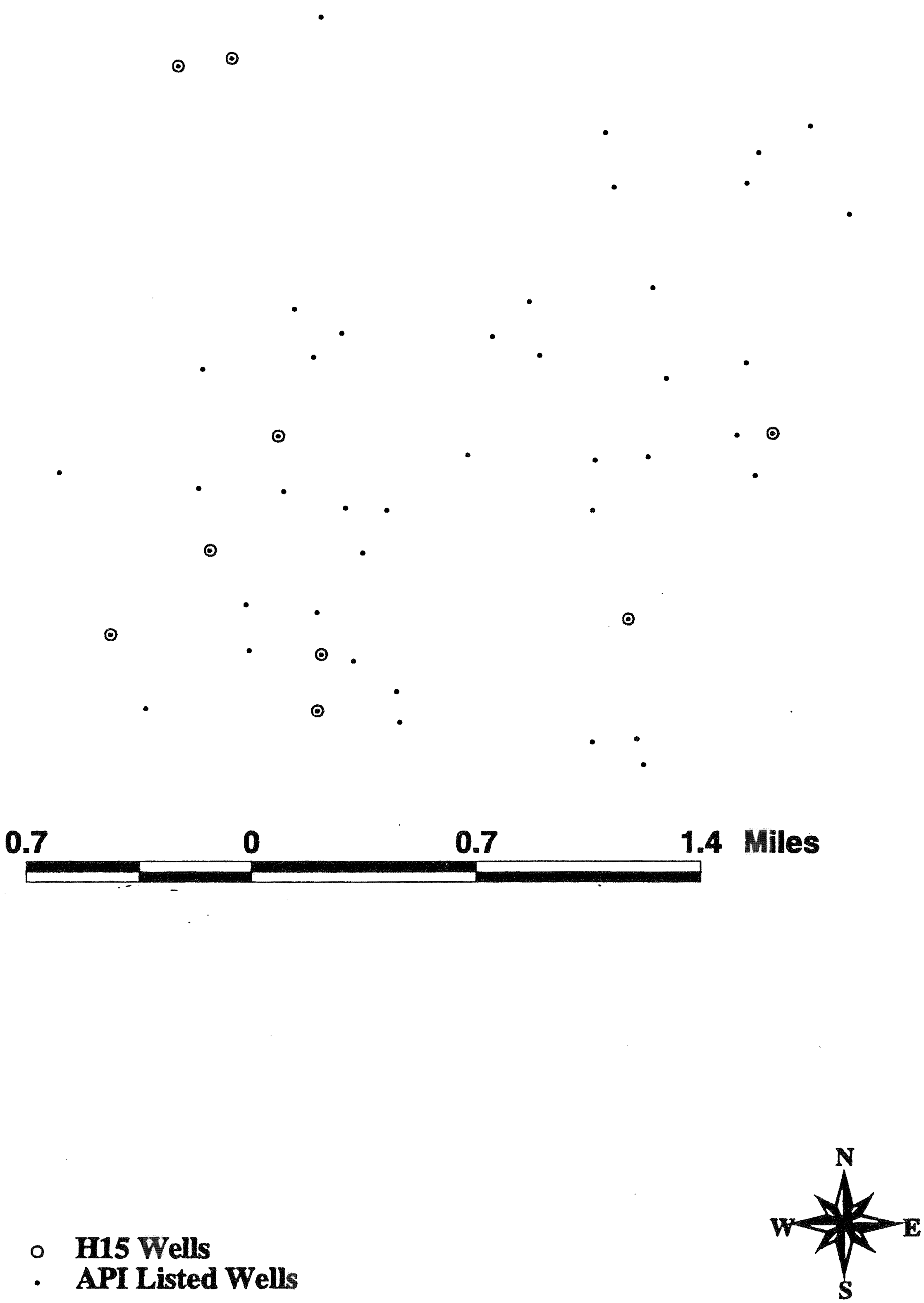
Goldsmith, N. (San Andres, Con.)
Ector County, Texas
H15, UIC, and API Listed Wells



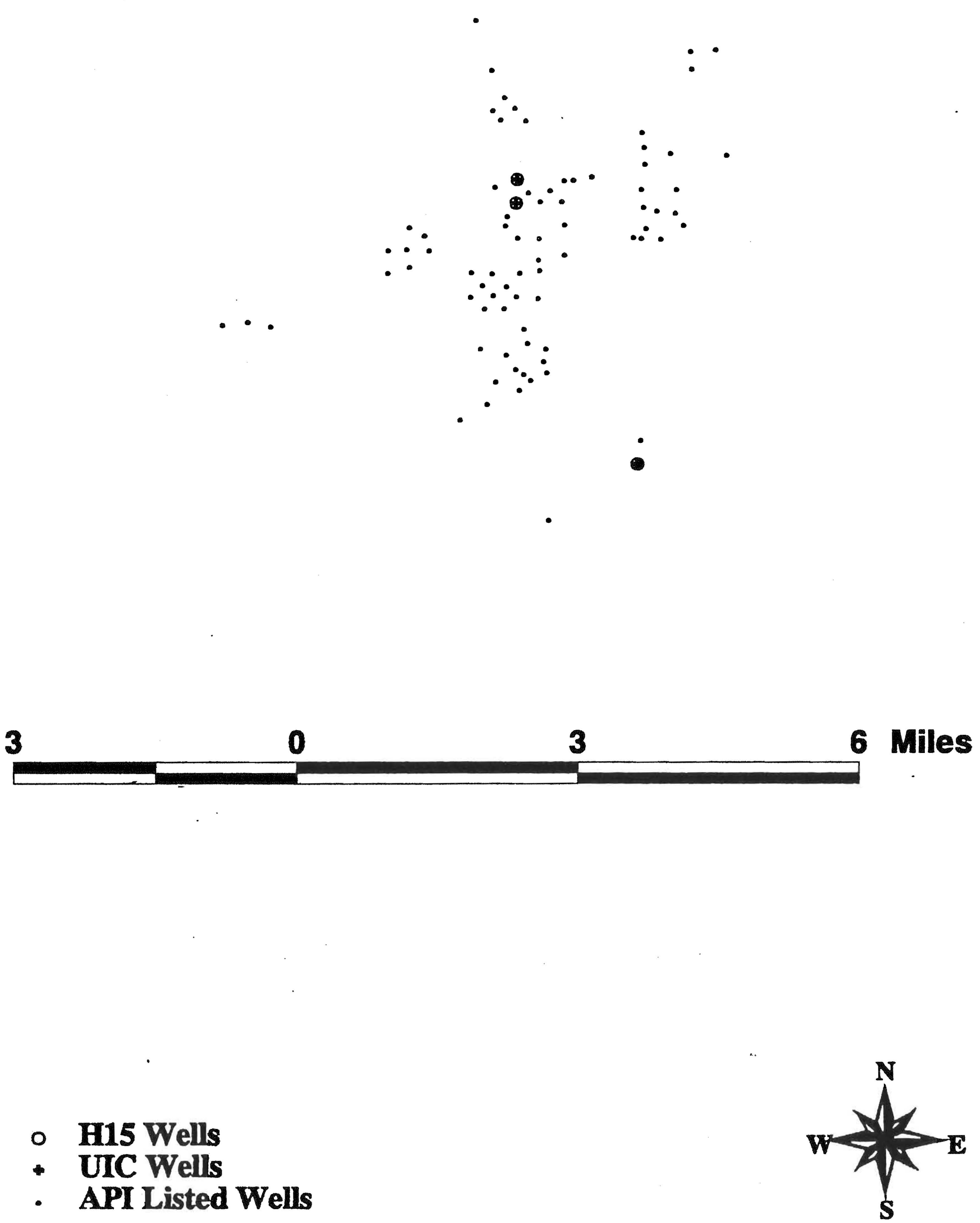
Grice (Delaware)
Loving County, Texas
H15, UIC, and API Listed Wells



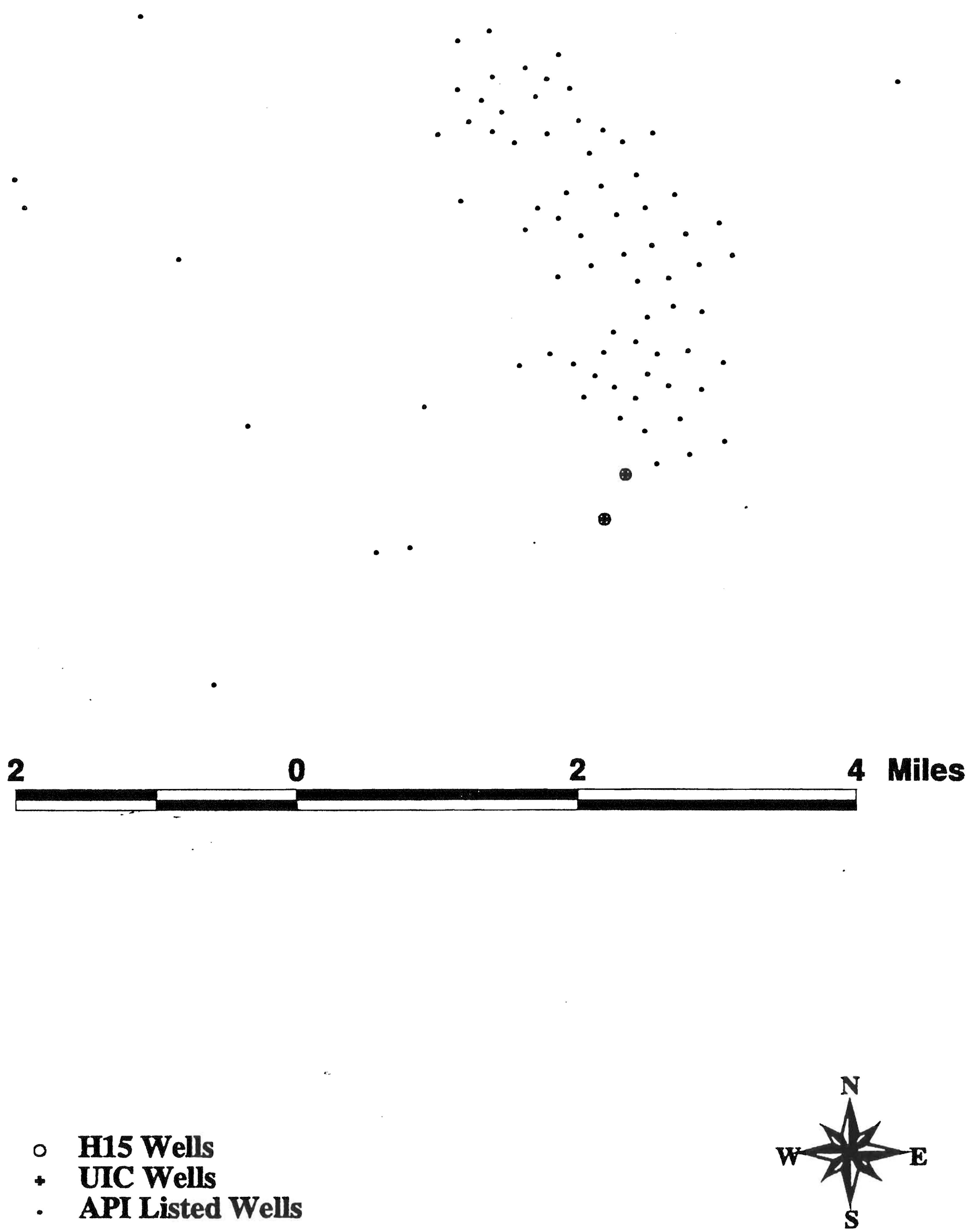
Hardin
Liberty County, Texas
H15, UIC, and API Listed Wells



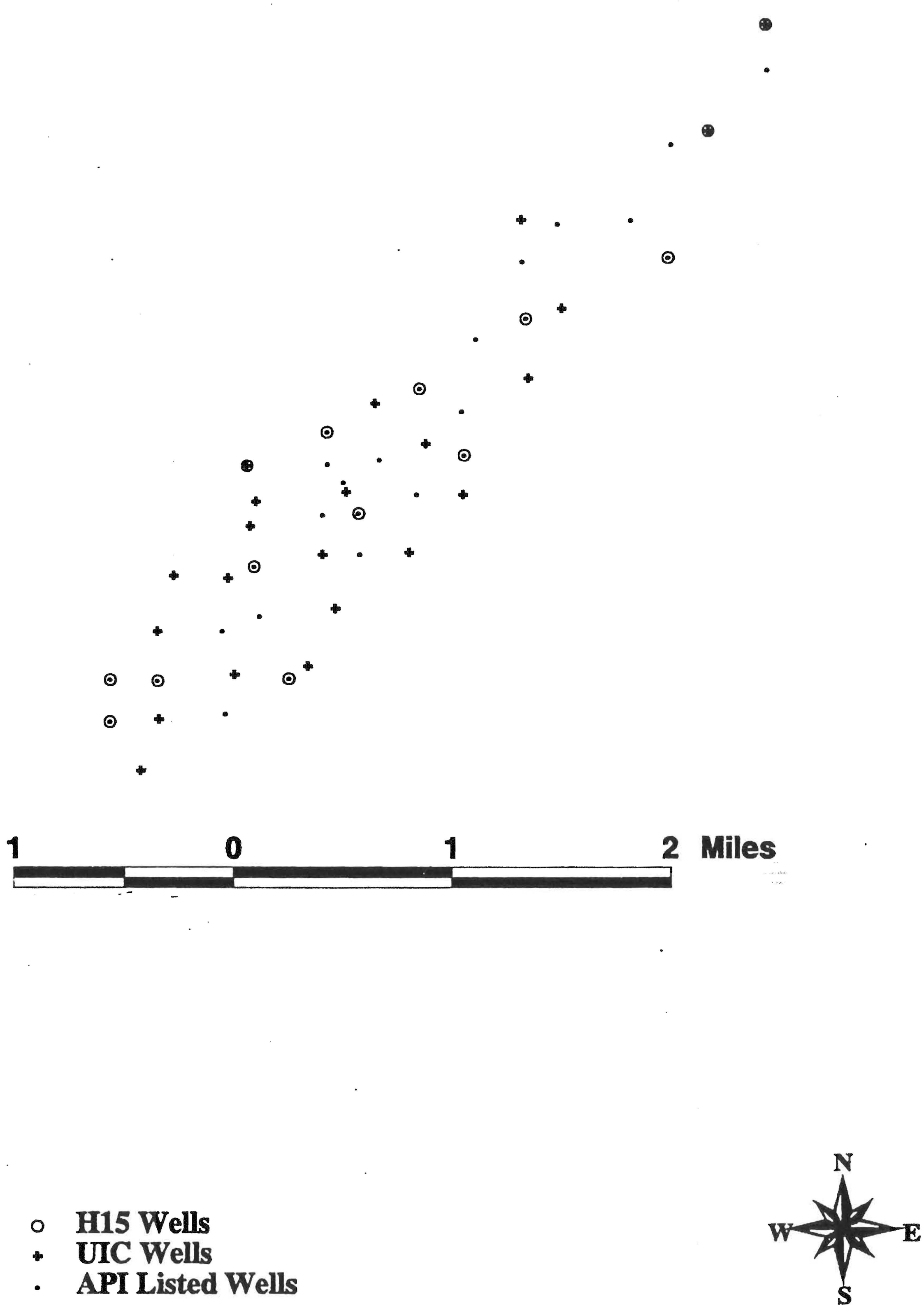
Ken Regan (Delaware)
Reeves County, Texas
H15, UIC, and API Listed Wells



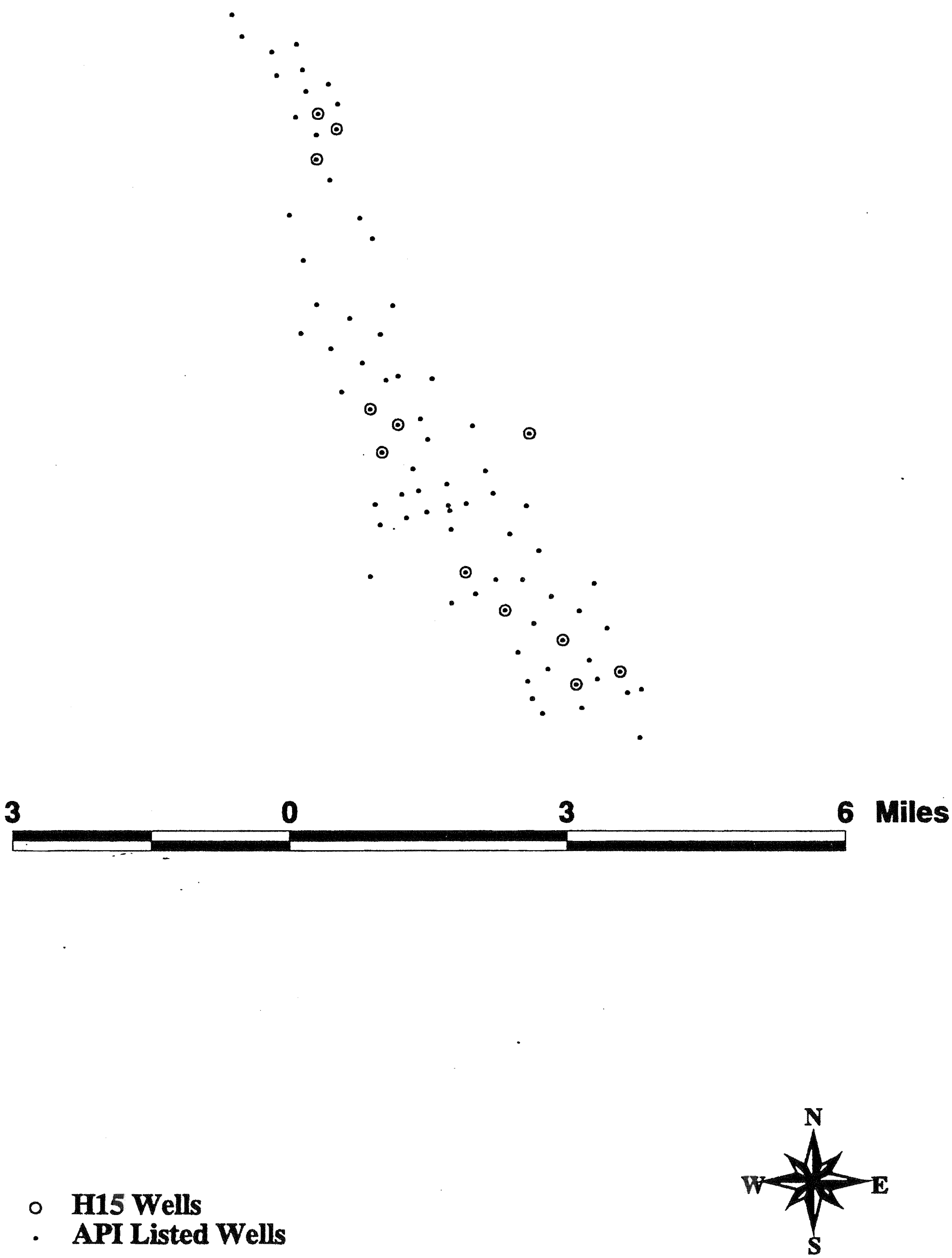
Keystone (San Andres)
Winkler County, Texas
H15, UIC, and API Listed Wells



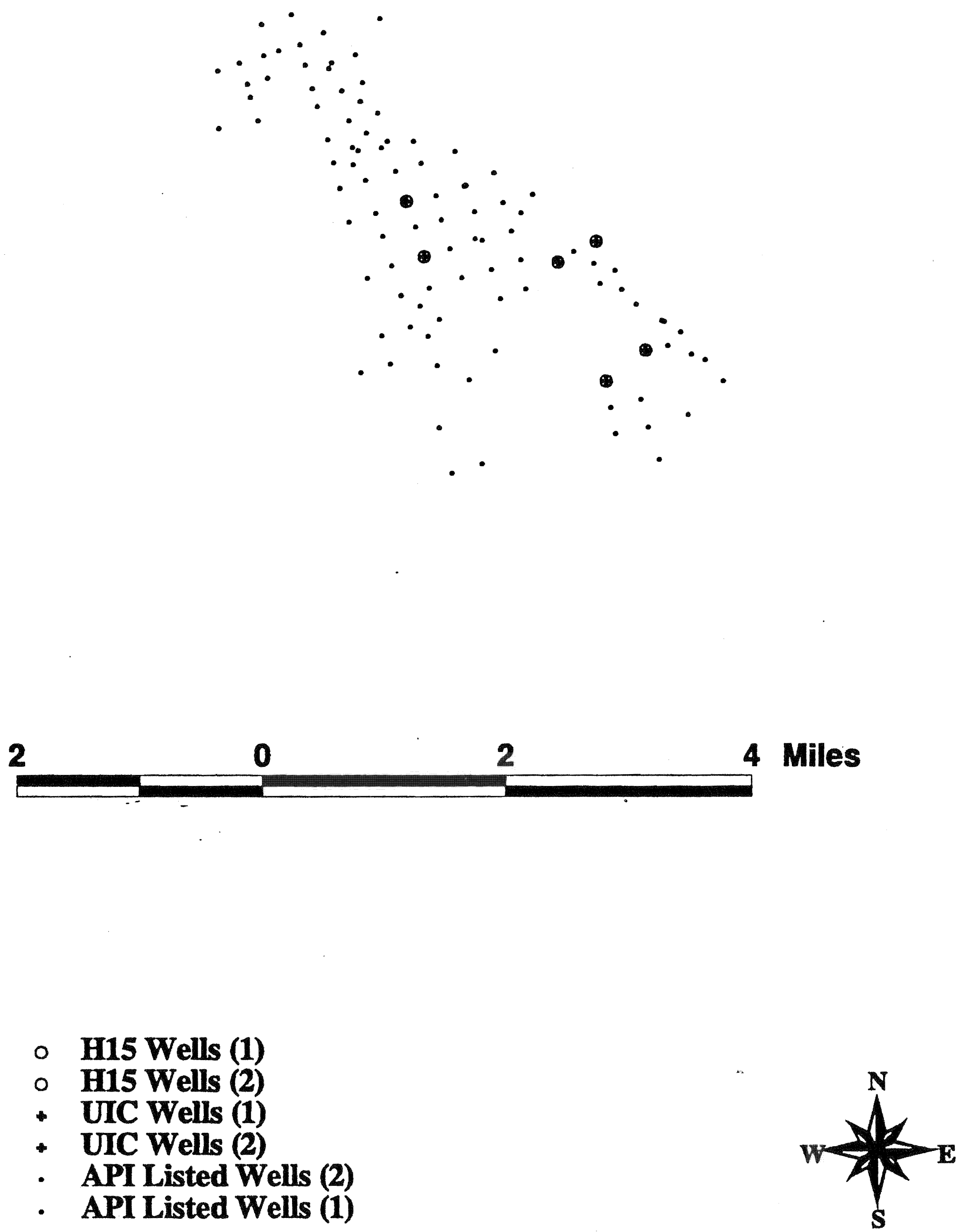
Knox City, North (Canyon)
Knox County, Texas
H15, UIC, and API Listed Wells



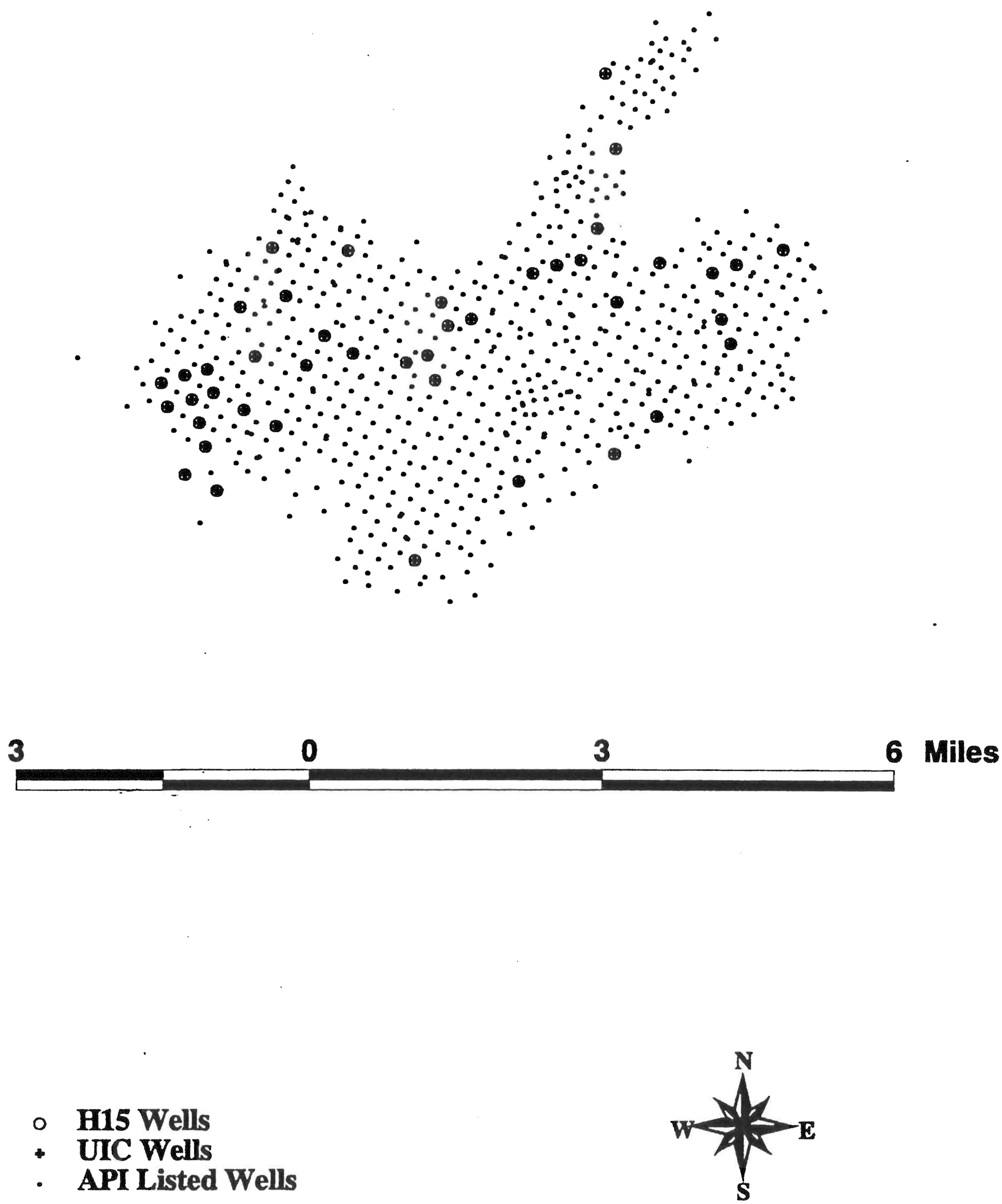
Magutex (Devonian)
Andrews County, Texas
H15, UIC, and API Listed Wells



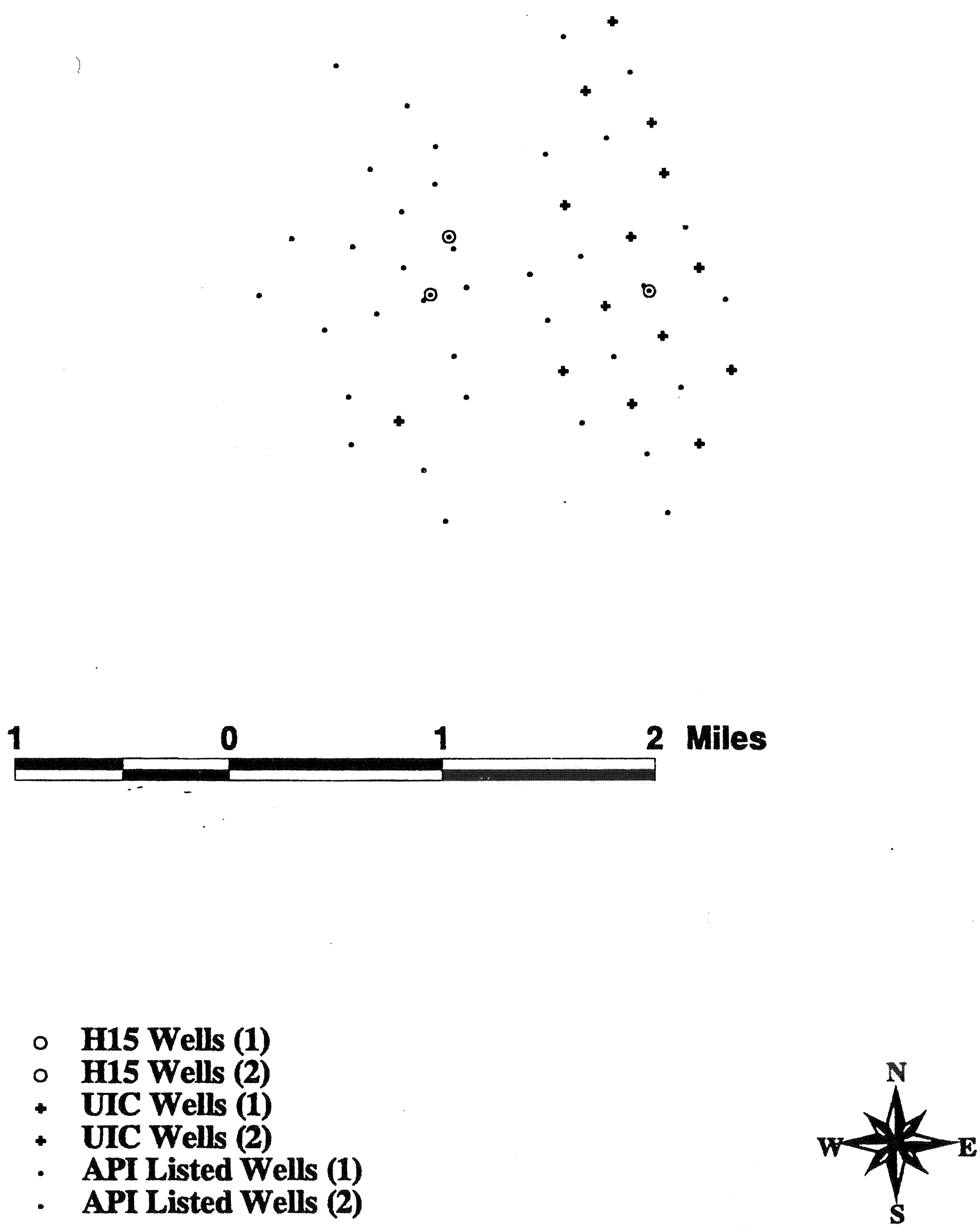
Means, N. (Queen Sand)
Gaines & Andrews Counties, Texas
H15, UIC, and API Listed Wells



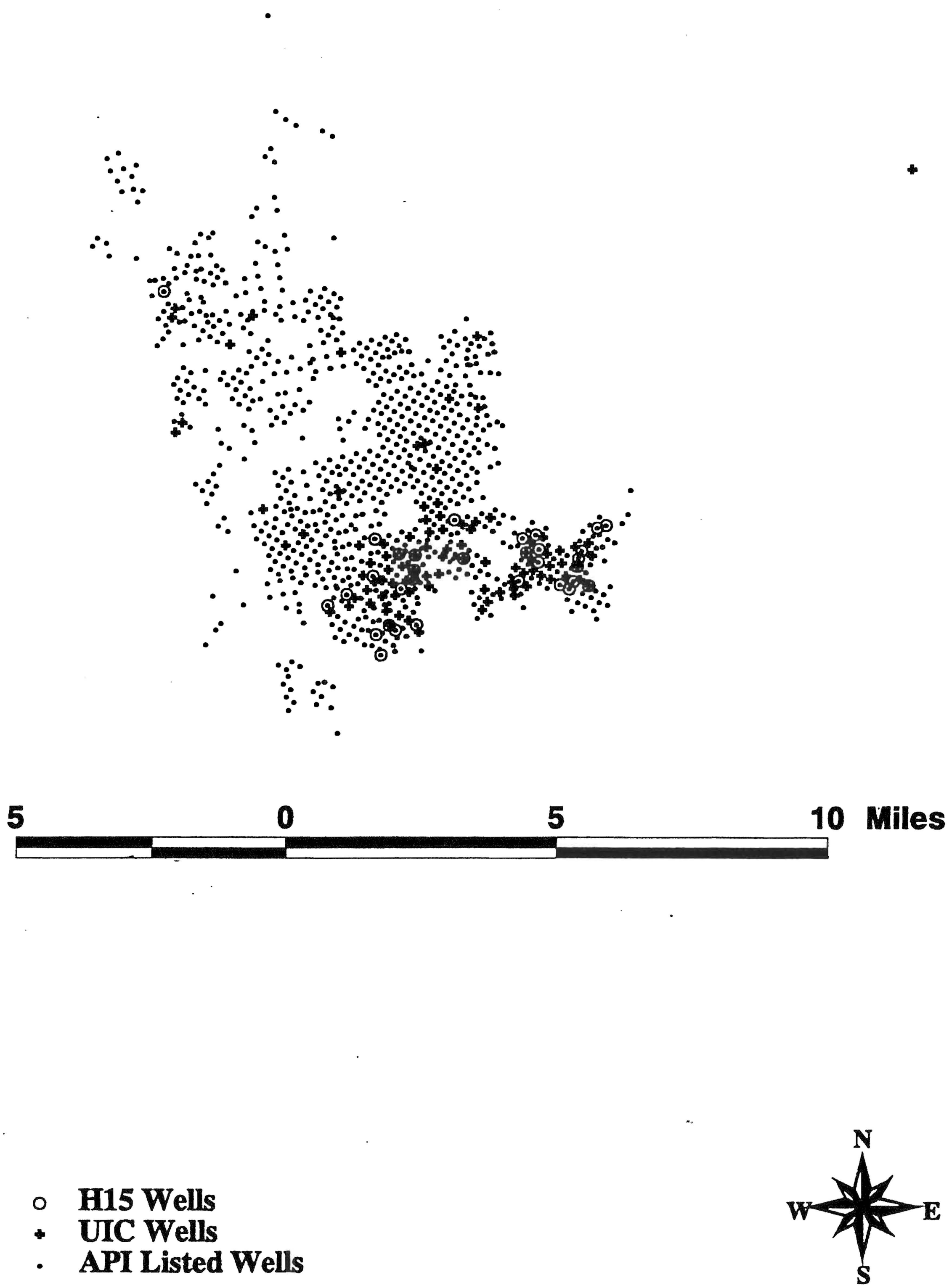
Midland Farms
Andrews County, Texas
H15, UIC, and API Listed Wells



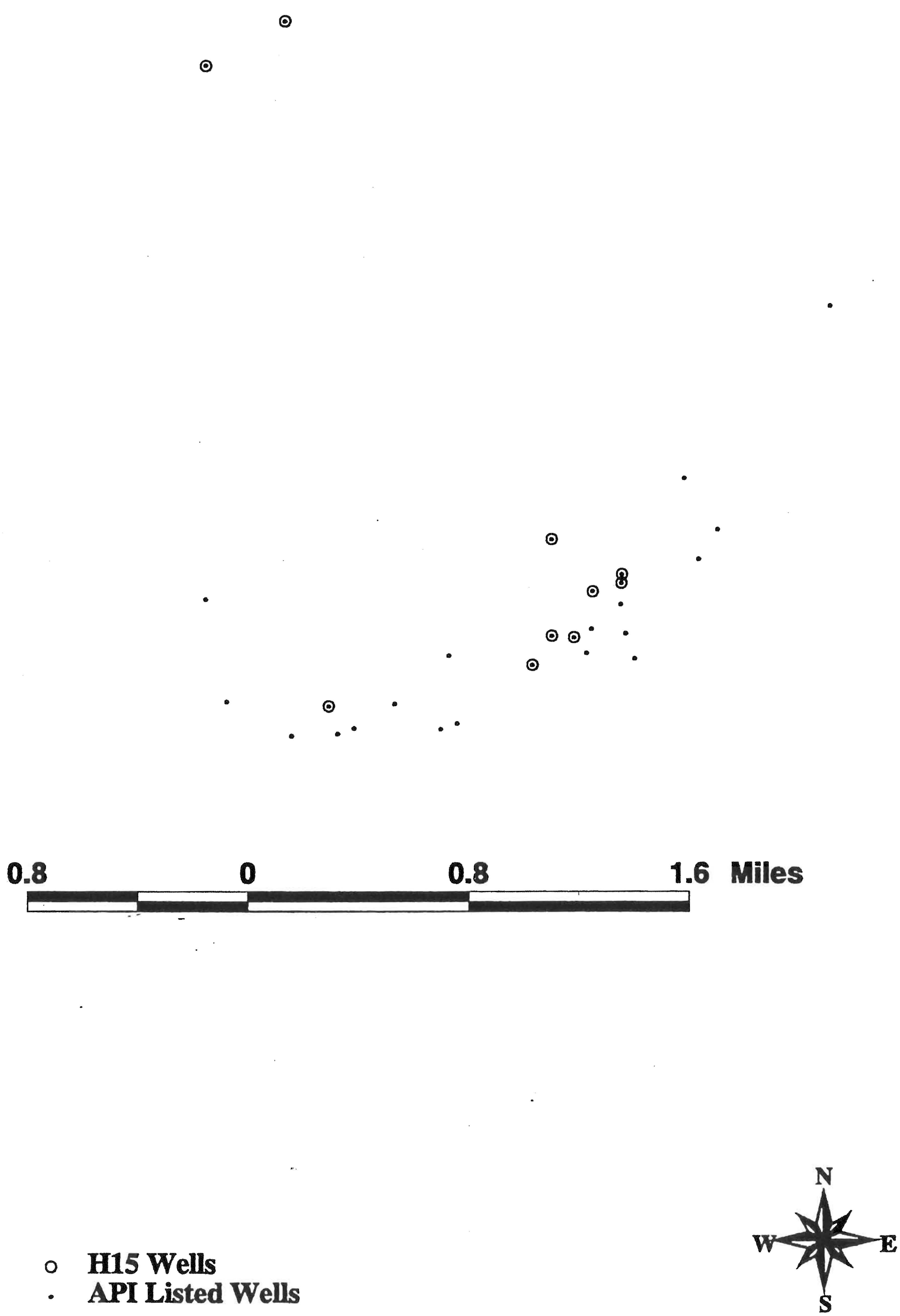
Monahans (Queen Sand)
Ward and Winkler Counties, Texas
H15, UIC, and API Listed Wells



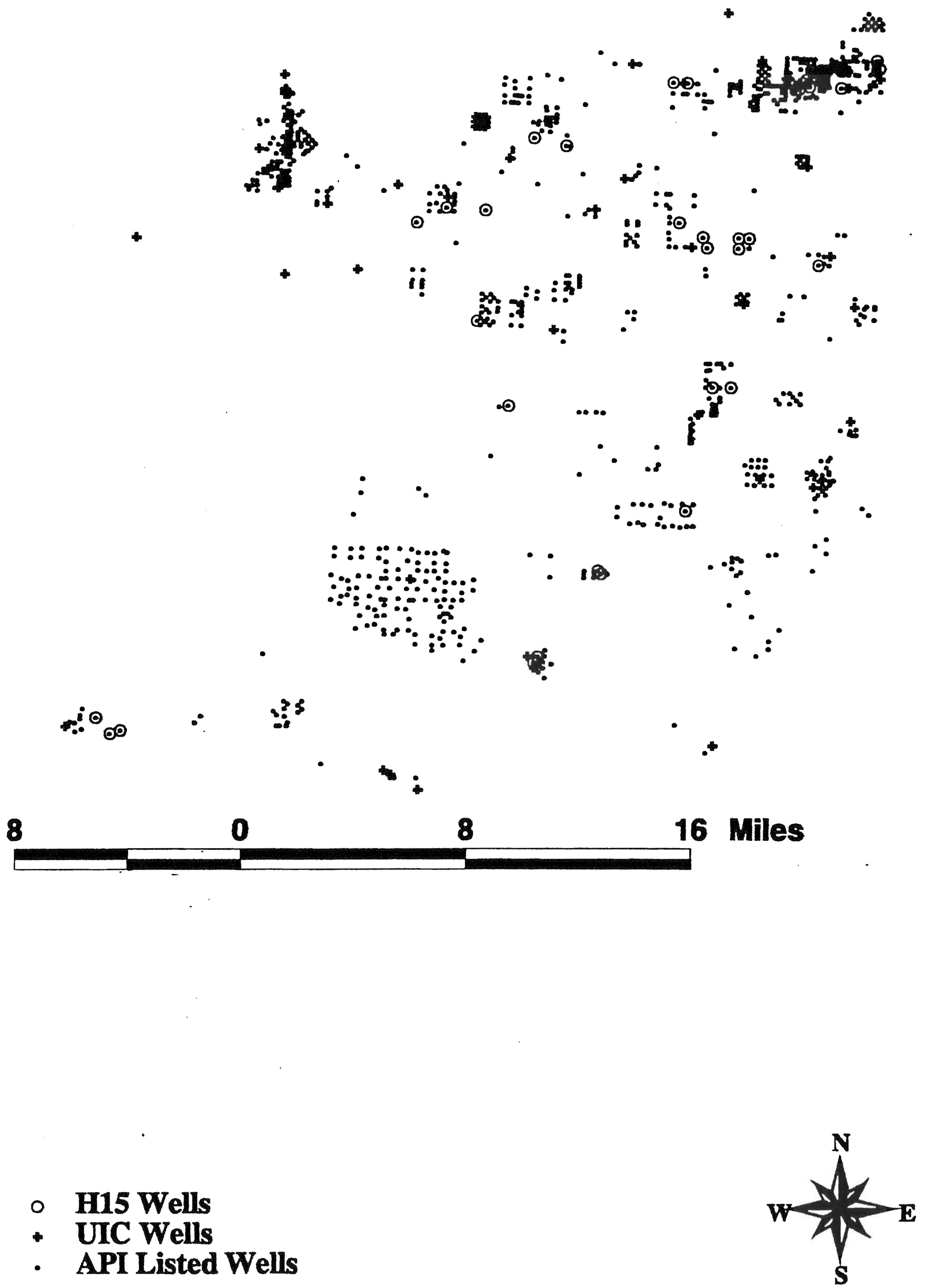
Moore
Howard County, Texas
H15, UIC, and API Listed Wells



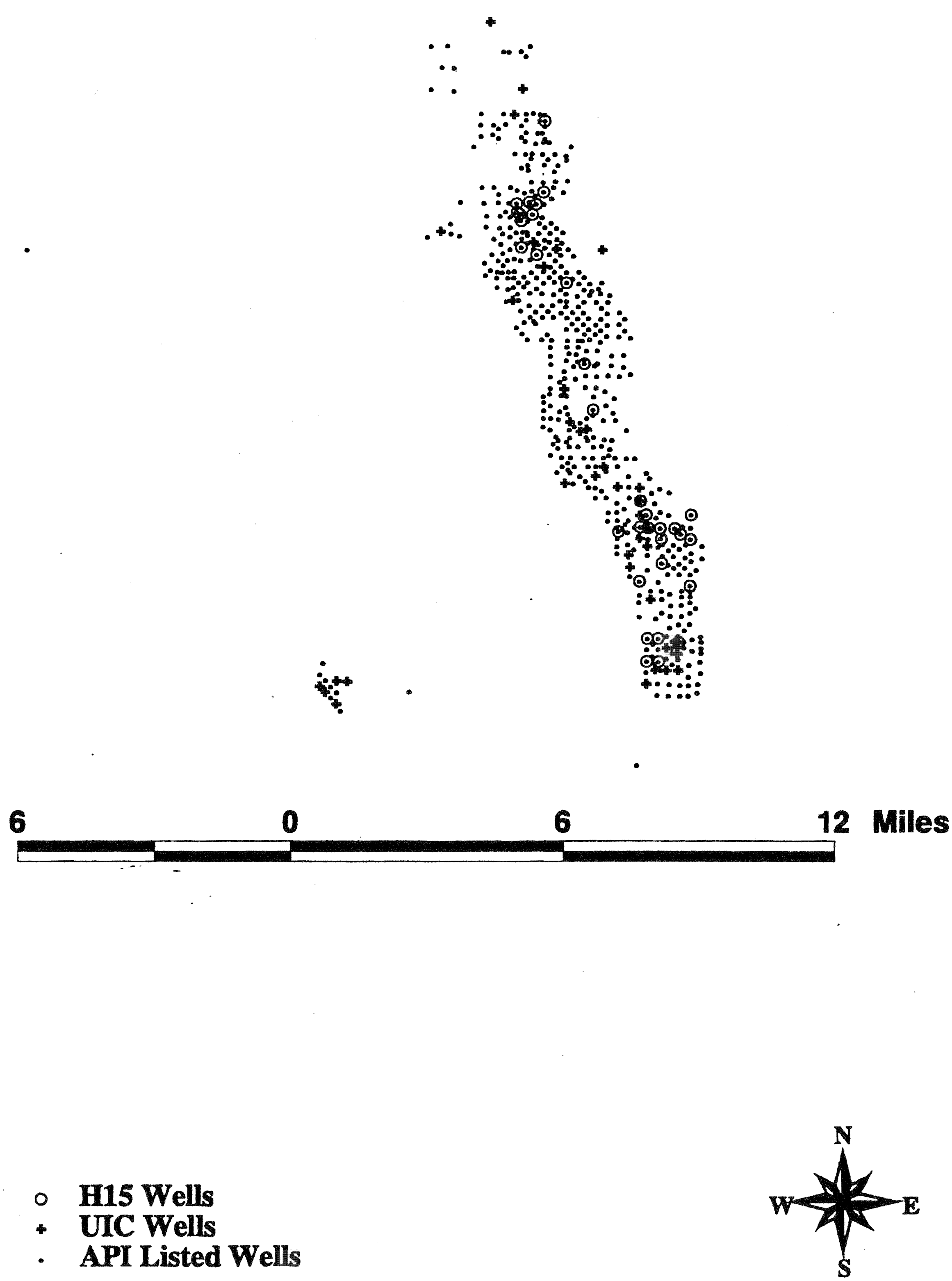
Moores Ochard
Fort Bend County, Texas
H15, UIC, and API Listed Wells



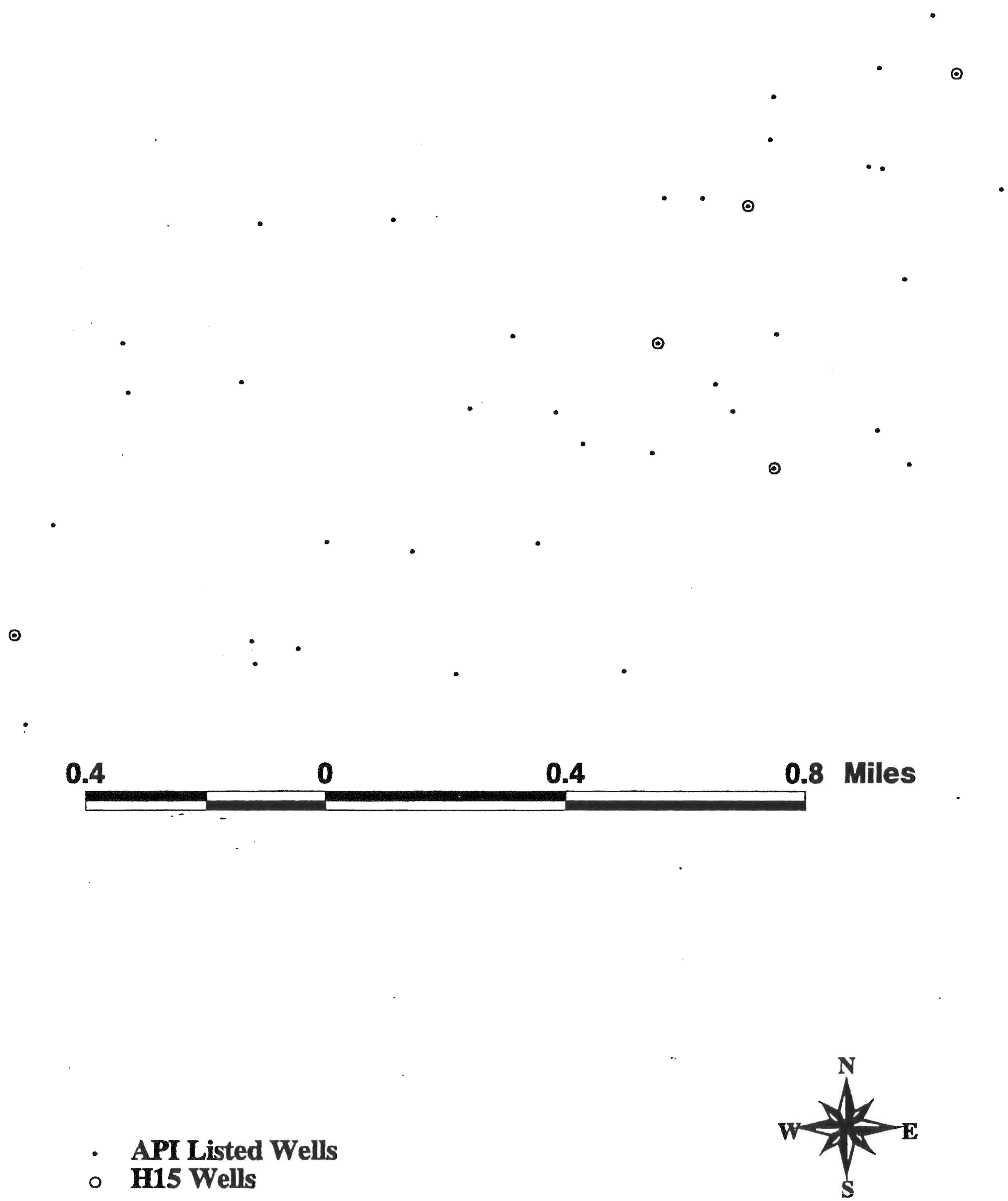
Panhandle (Moore Co.)
Moore County, Texas
H15, UIC, and API Listed Wells



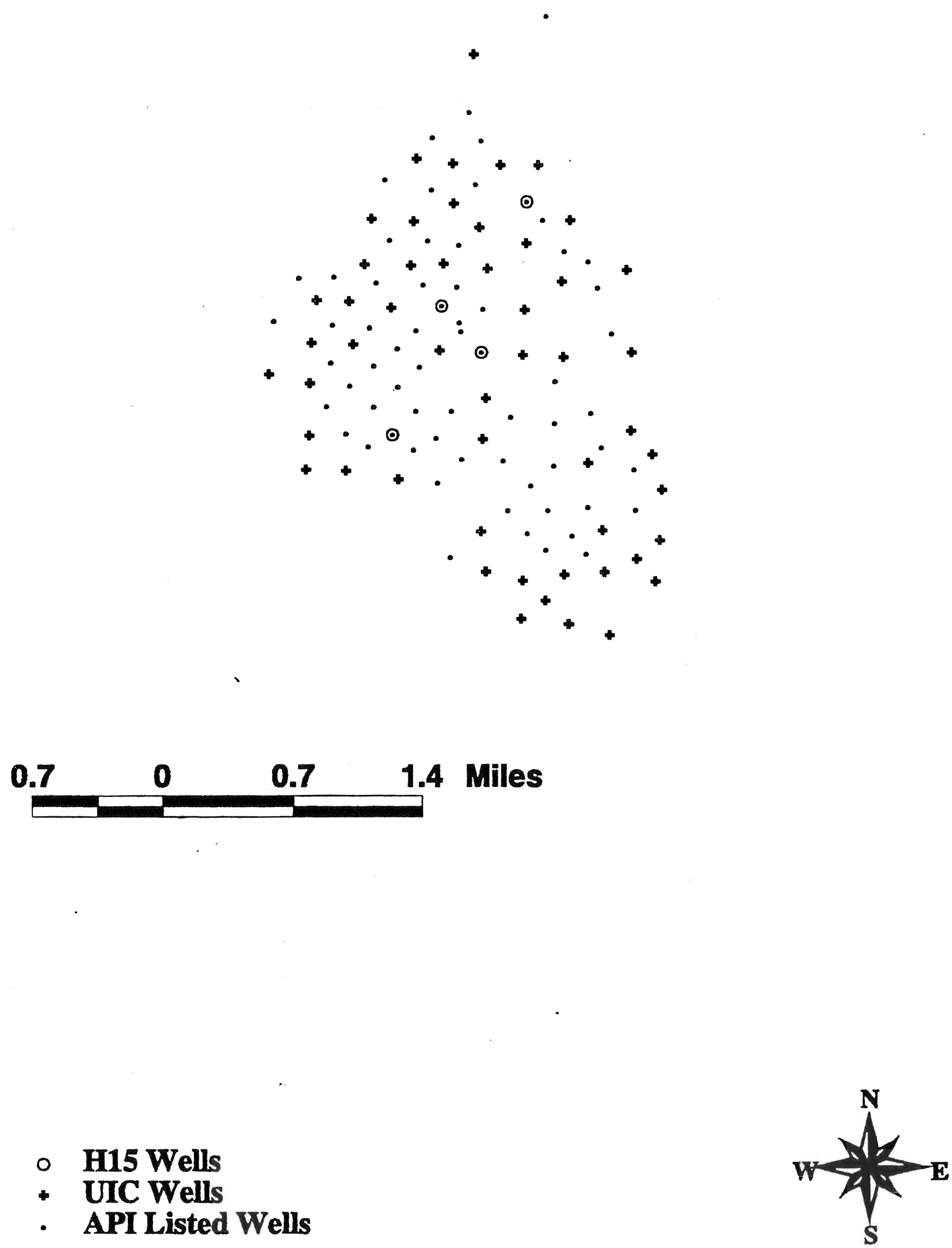
Post (Glorieta)
Garza County, Texas
H15, UIC, and API Listed Wells



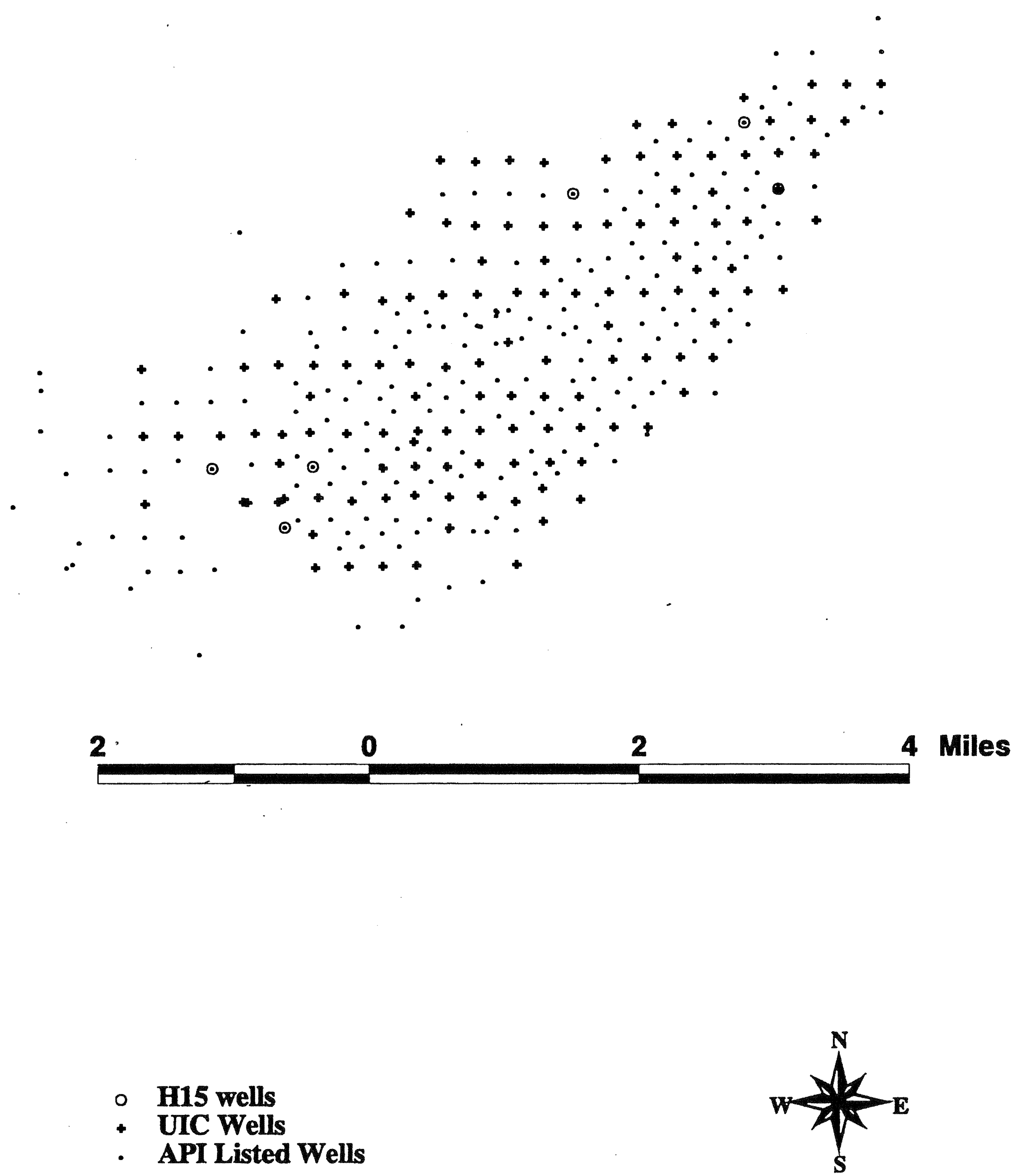
Quitman
Wood County, Texas
H15, UIC, and API Listed Wells



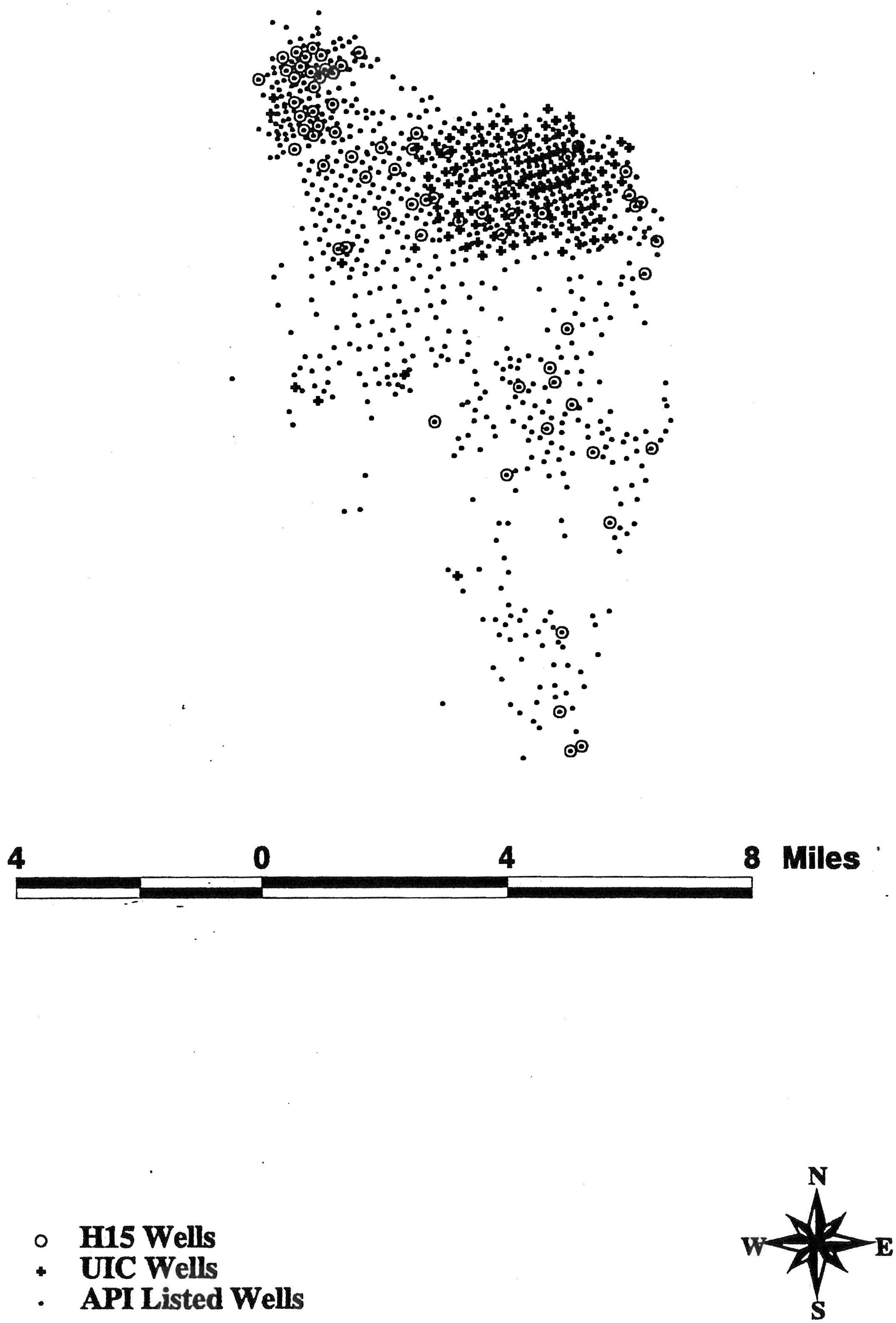
Reinecke
Borden County, Texas
H15, UIC, and API Listed Wells



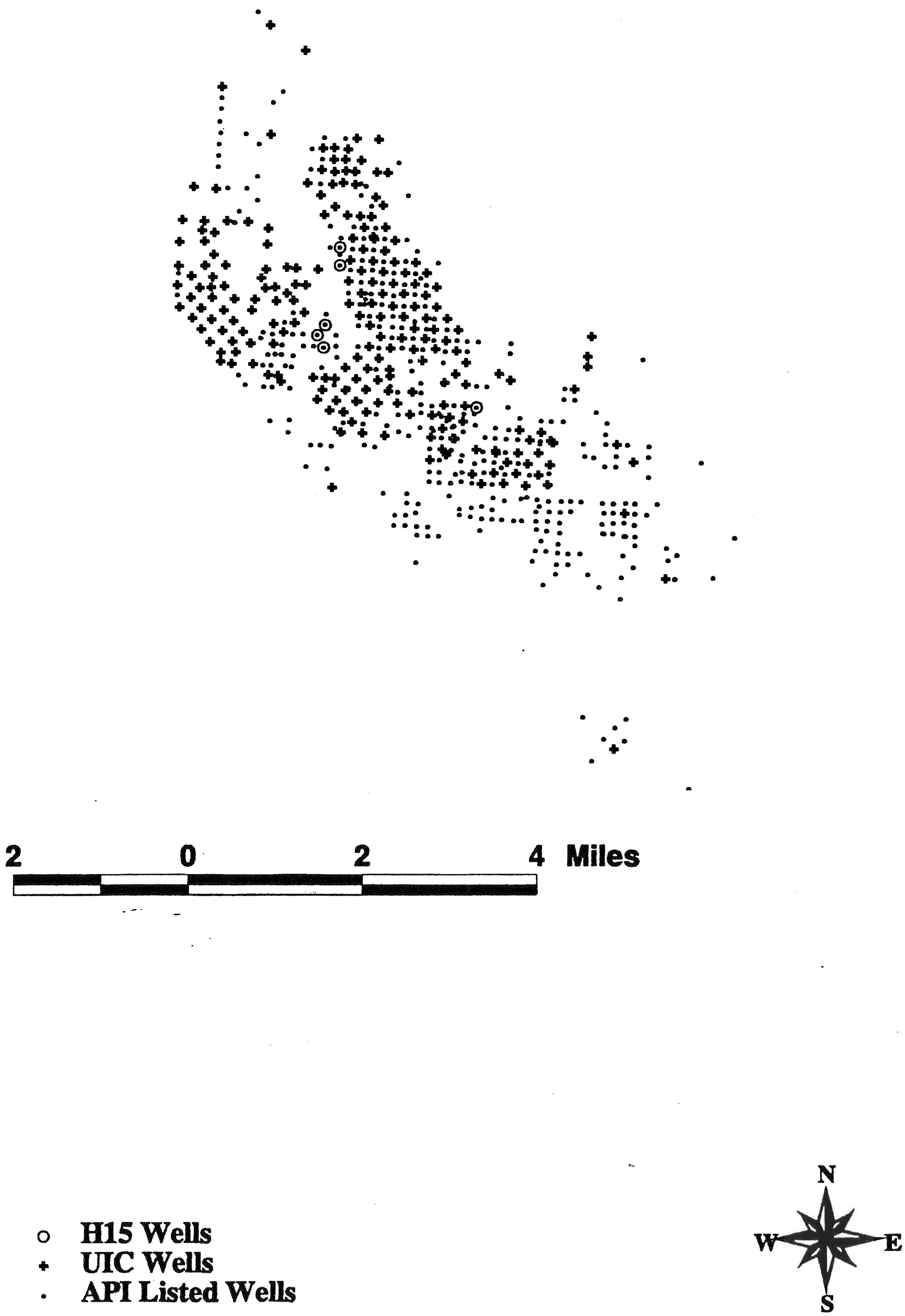
Russell (Clear Fork 7000)
Gaines County, Texas
H15, UIC, and API Listed Wells



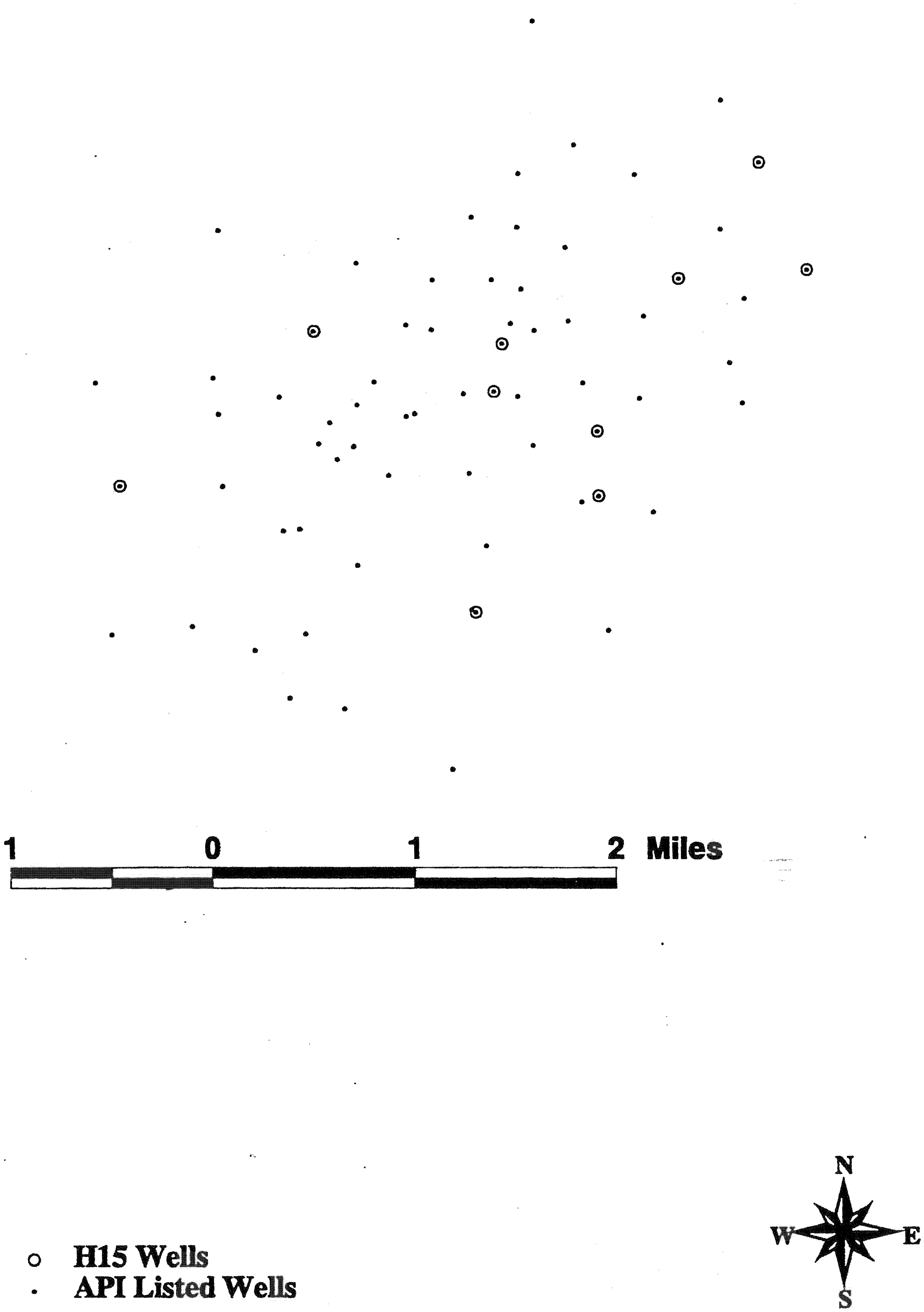
Sand Hills (McKnight)
Crane County, Texas
H15, UIC, and API Listed Wells



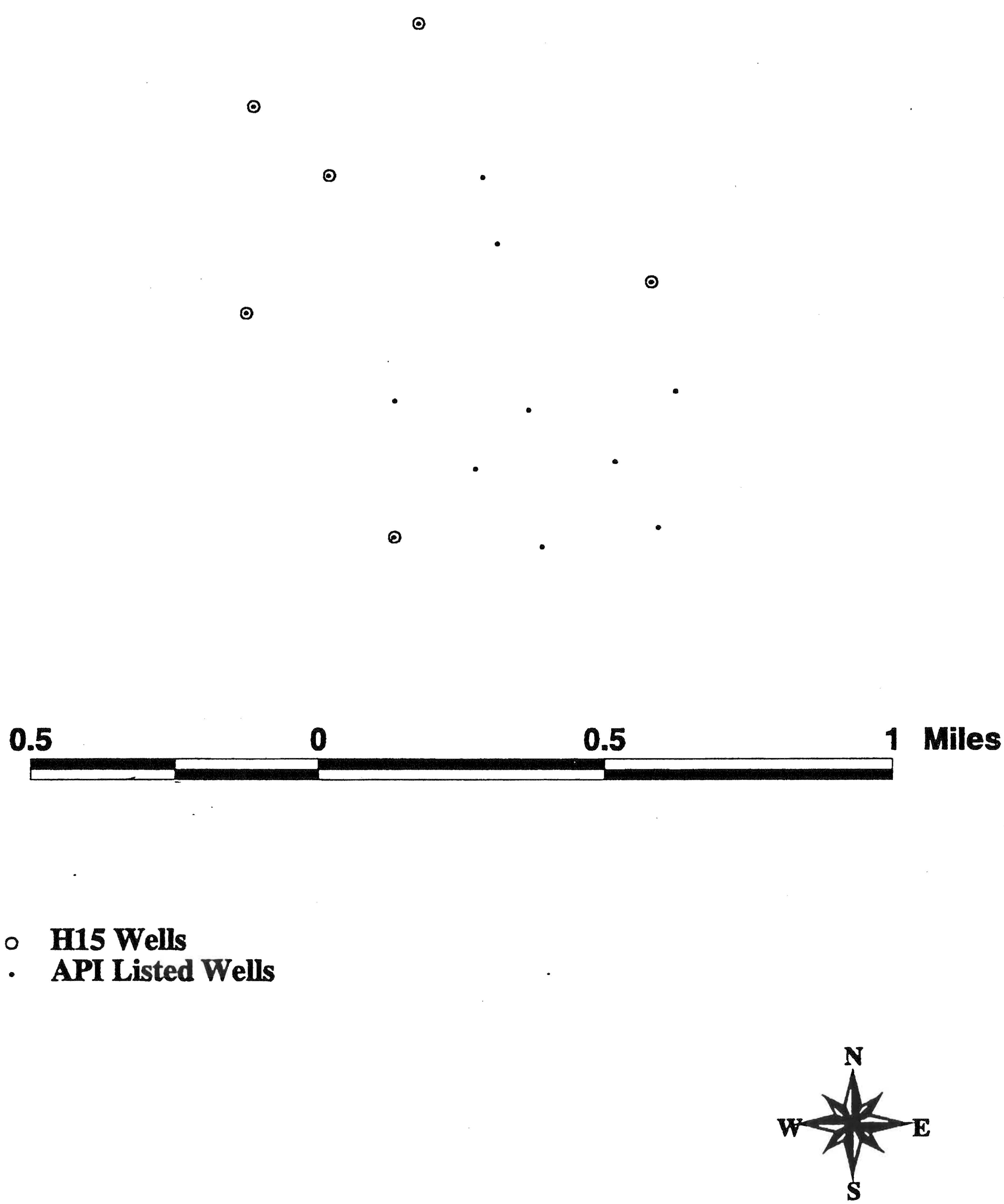
Sharon Ridge (Clear Fork)
Scurry County, Texas
H15, UIC, and API Listed Wells



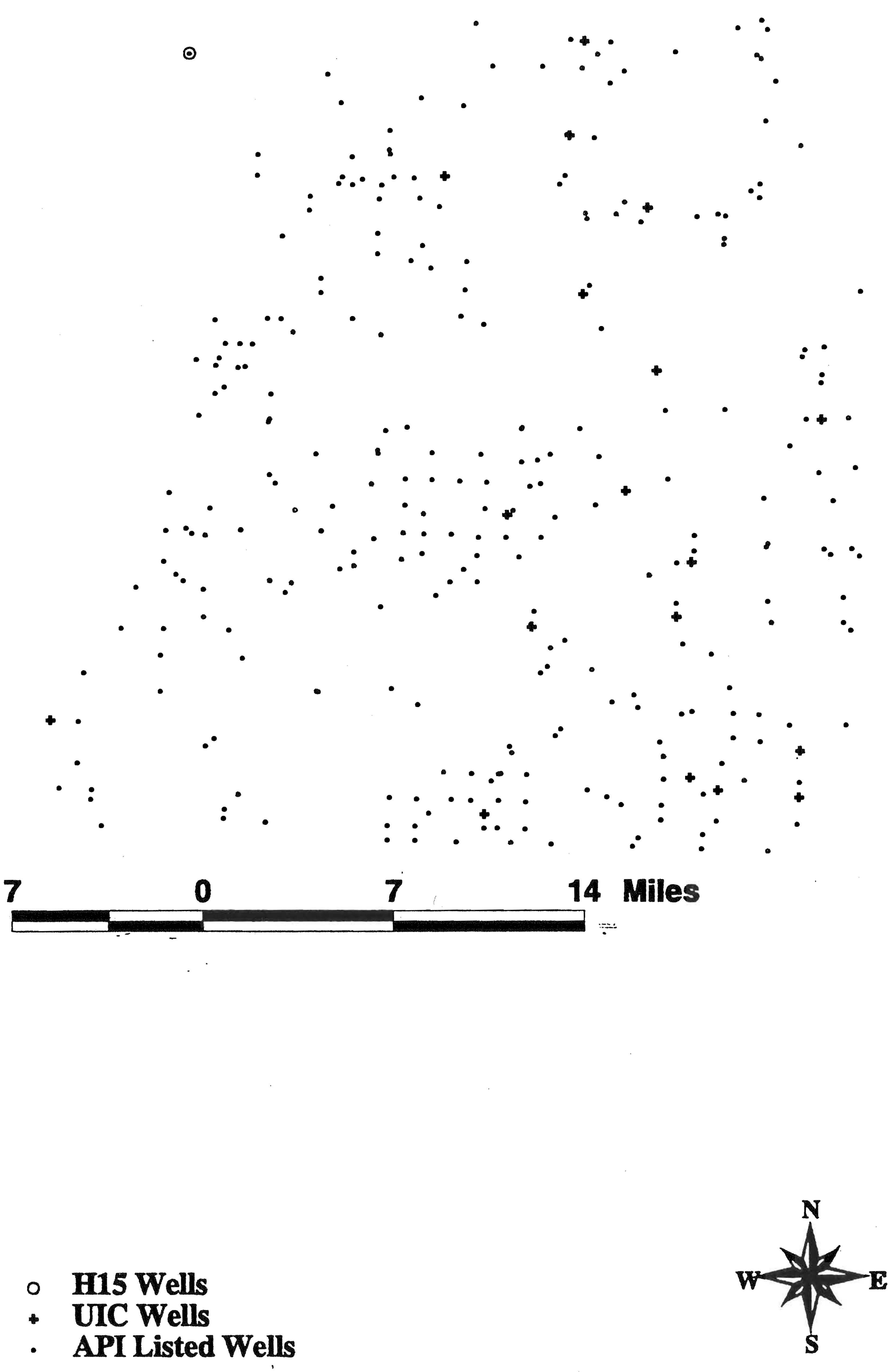
Sheridan (Wilcox)
Colorado County, Texas
H15, UIC, and API Listed Wells



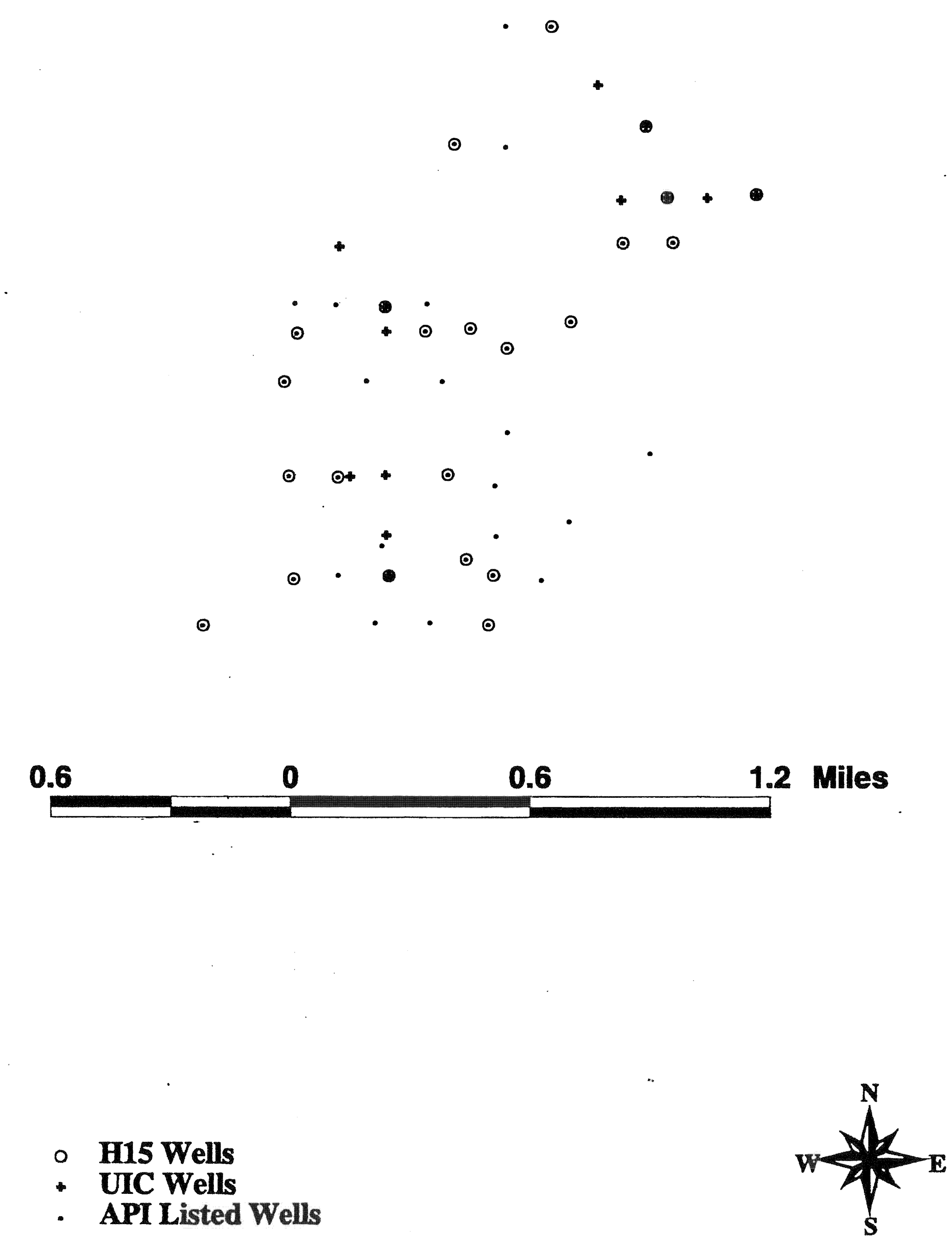
Stowell (Crawford U-1)
Jefferson County, Texas
H15, UIC, and API Listed Wells



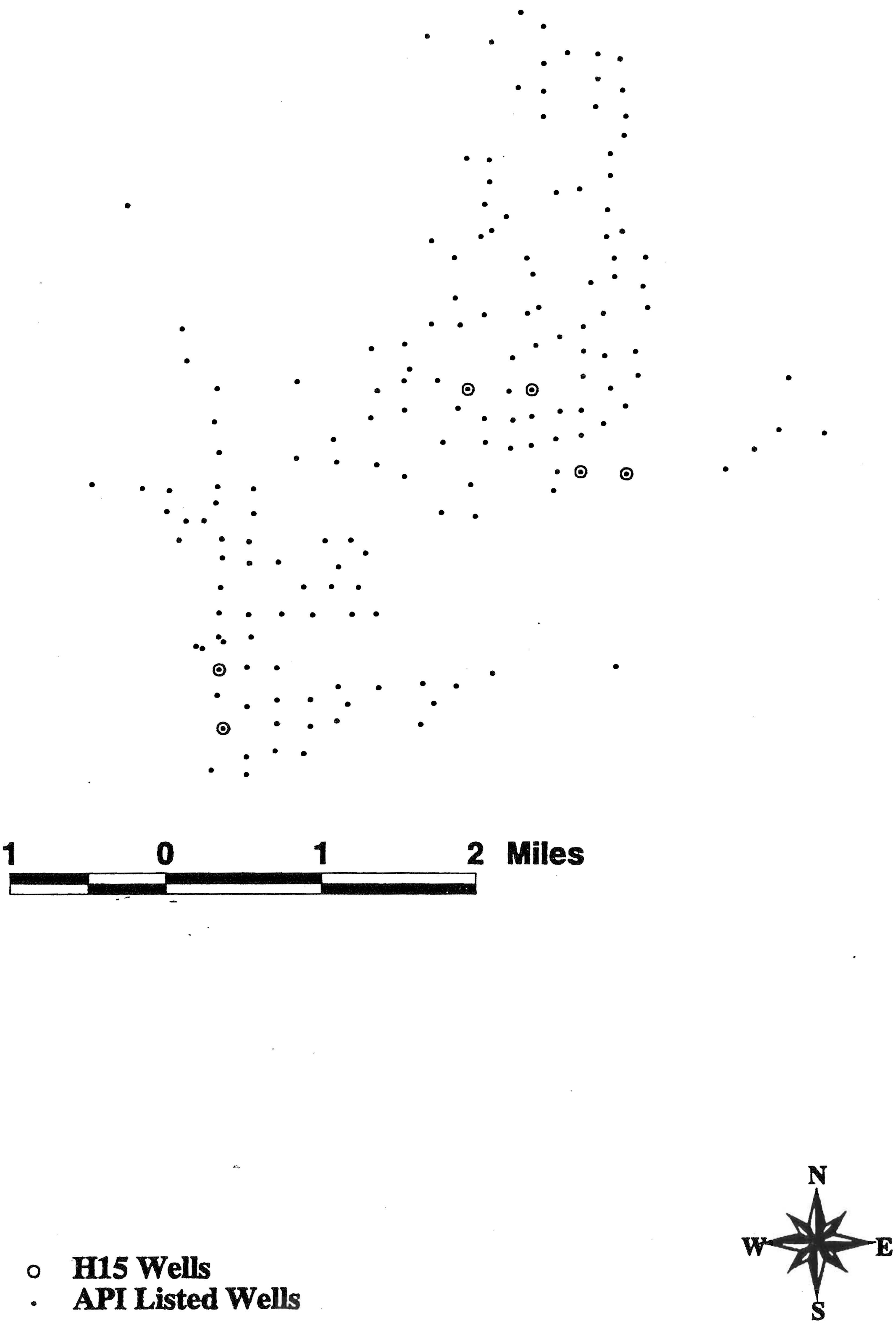
Texas Hugoton
Sherman County, Texas
H15, UIC, and API Listed Wells



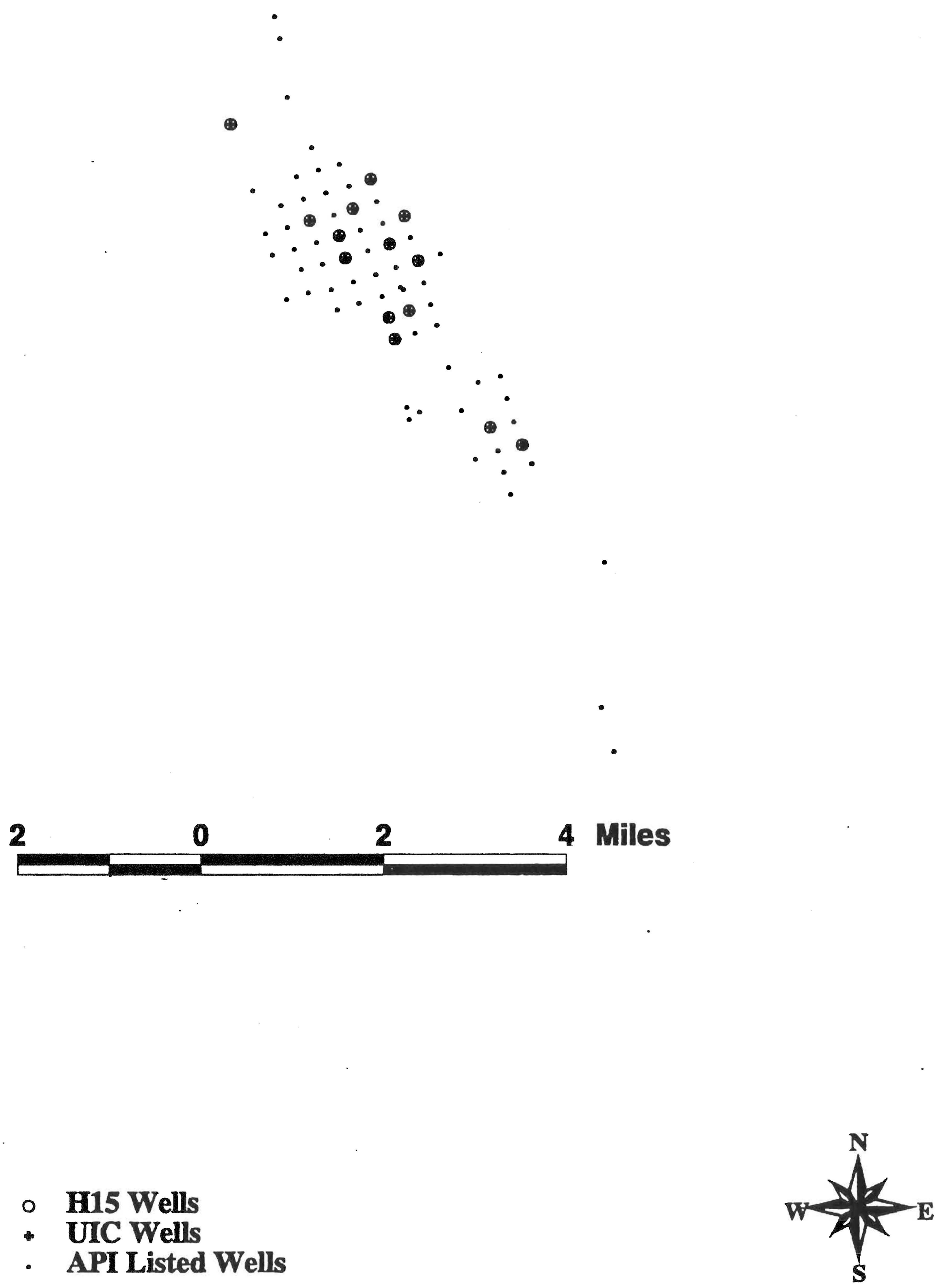
Thompson, North
For Bend County, Texas
H15, UIC, and API Listed Wells



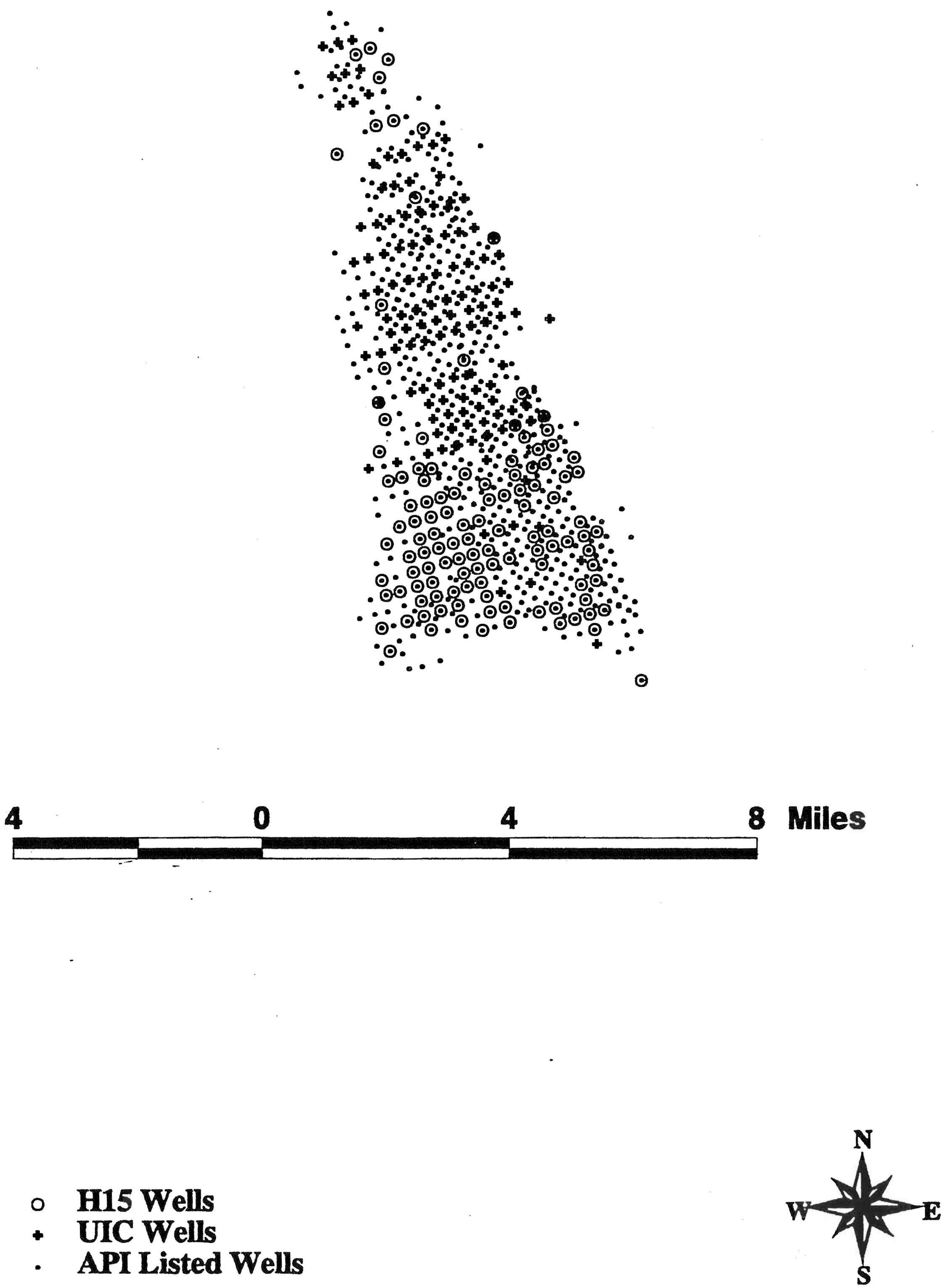
Tomball
Harris County, Texas
H15, UIC, and API Listed Wells



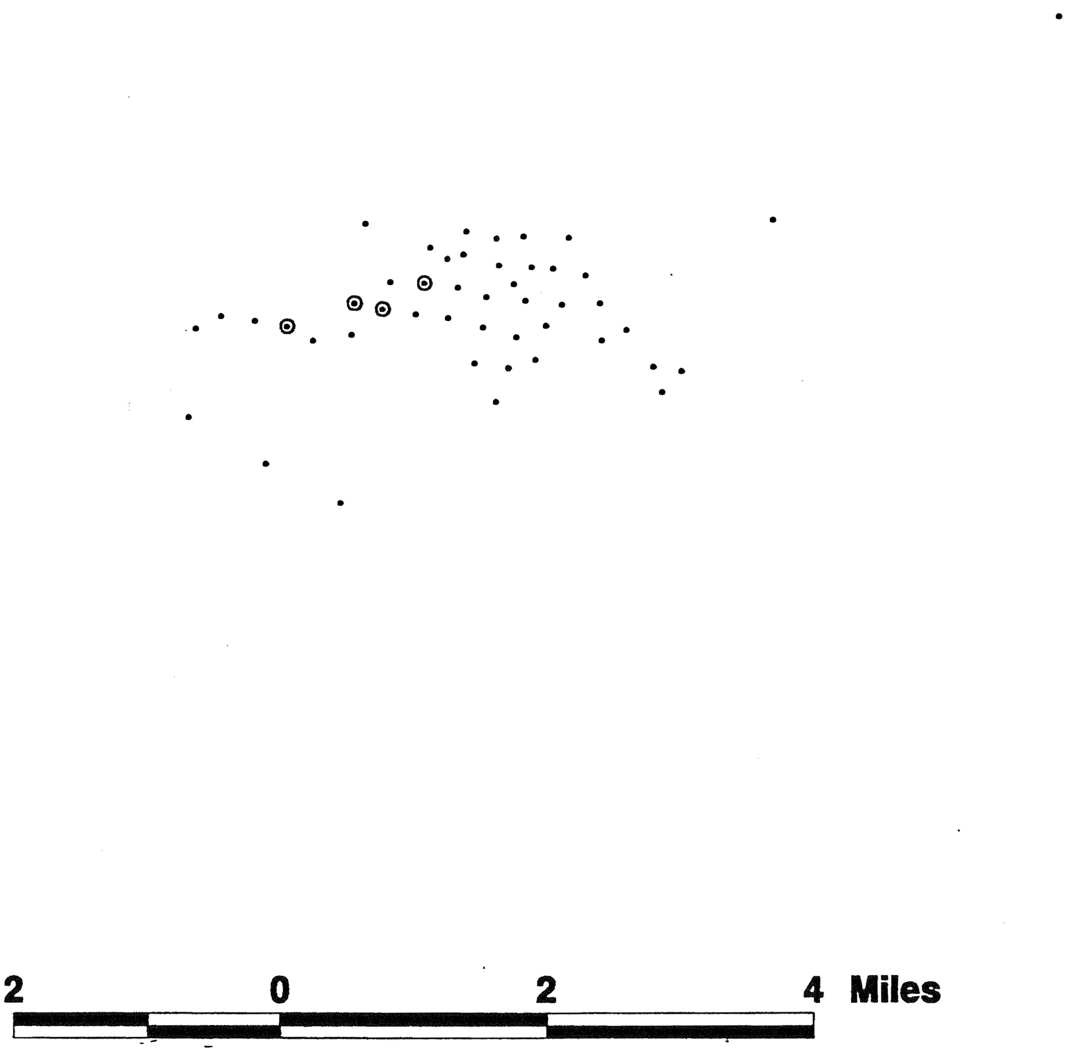
Txl (Ellenburger)
Ector County, Texas
H15, UIC, and API Listed Wells

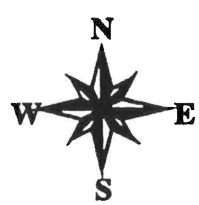


Txl (Tubb)
Ector County, Texas
H15, UIC, and API Listed Wells



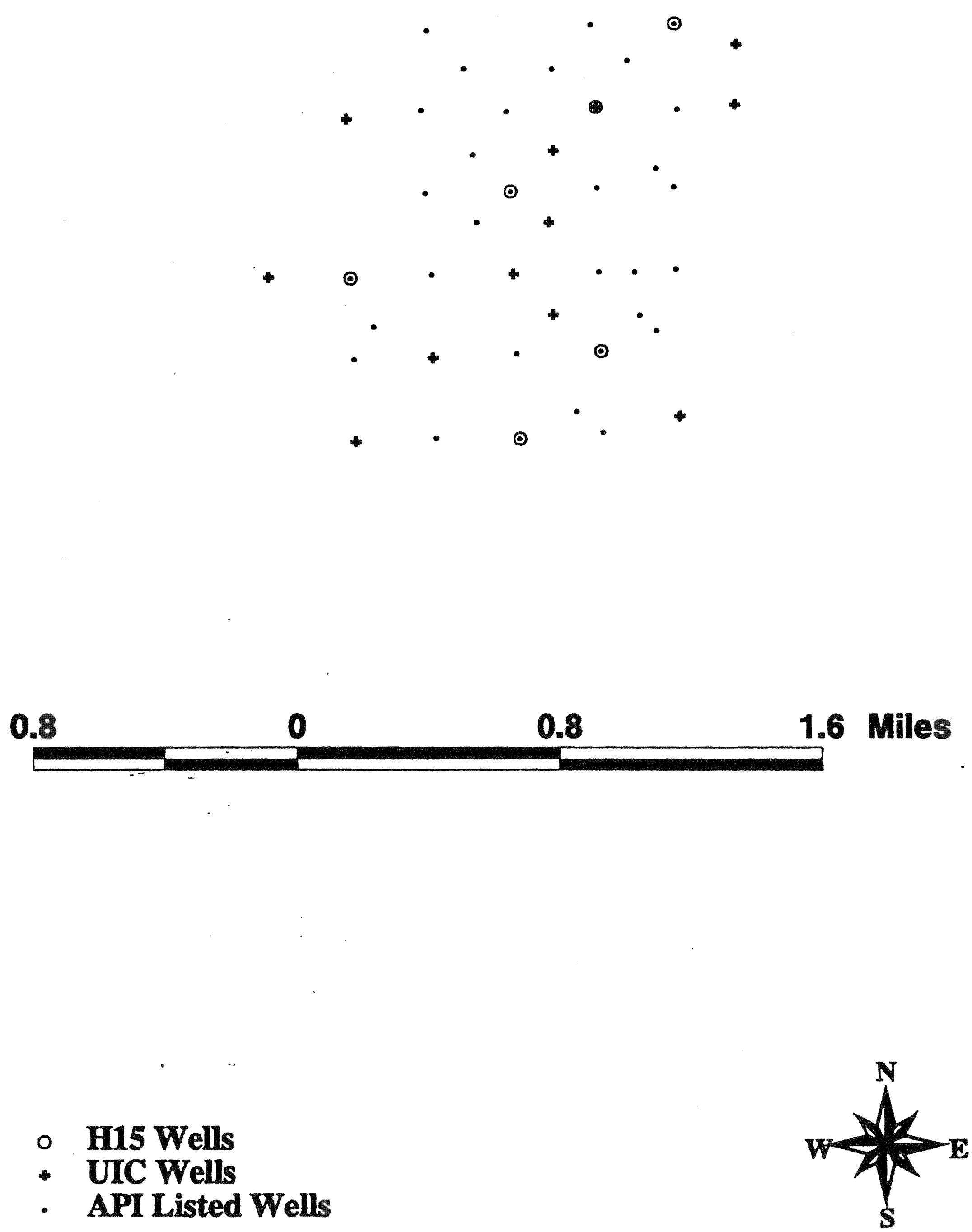
Waha, North (Delaware Sand)
Reeves County, Texas
H15, UIC, and API Listed Wells



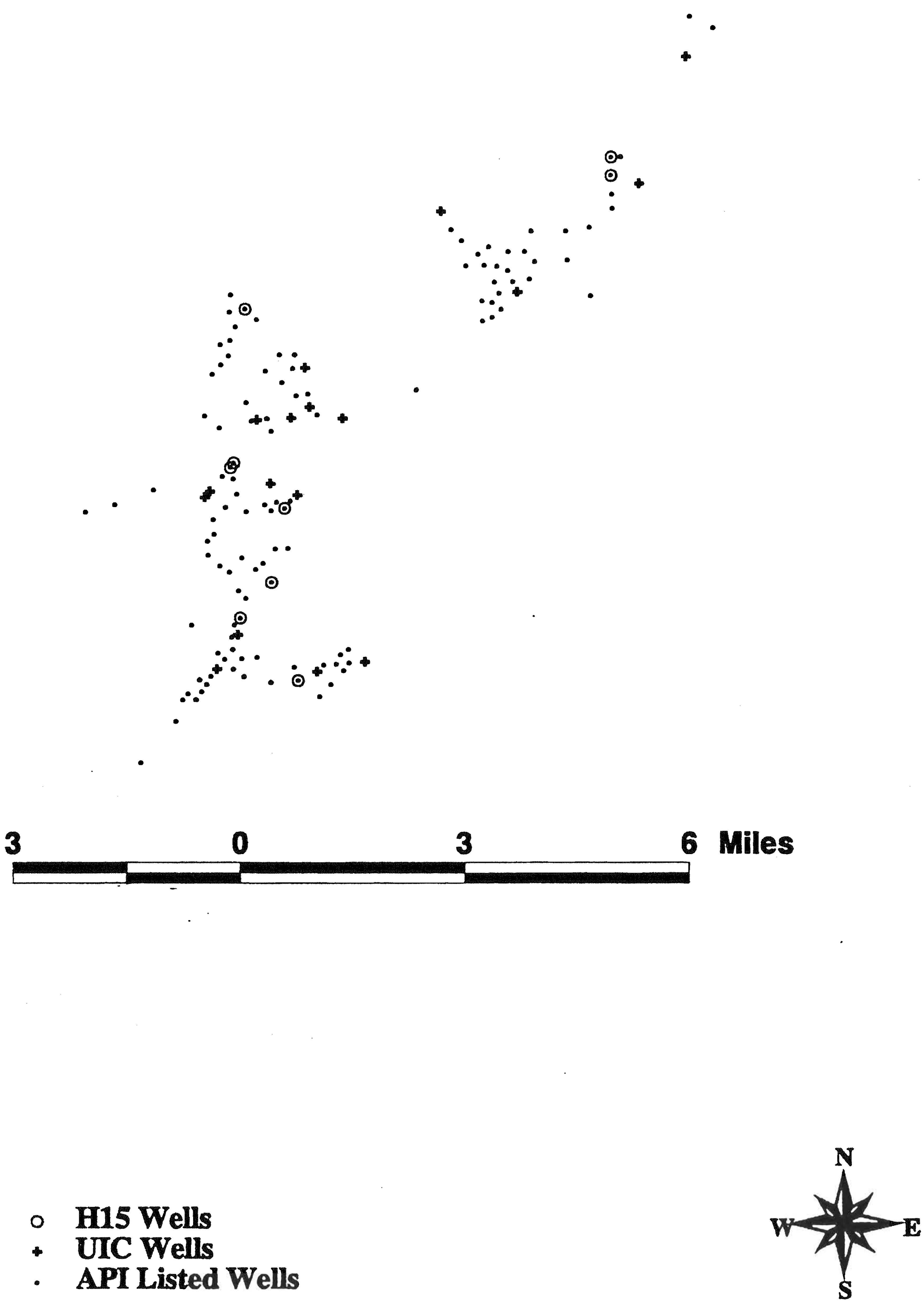


o H15 Wells
· Api Listed Wells

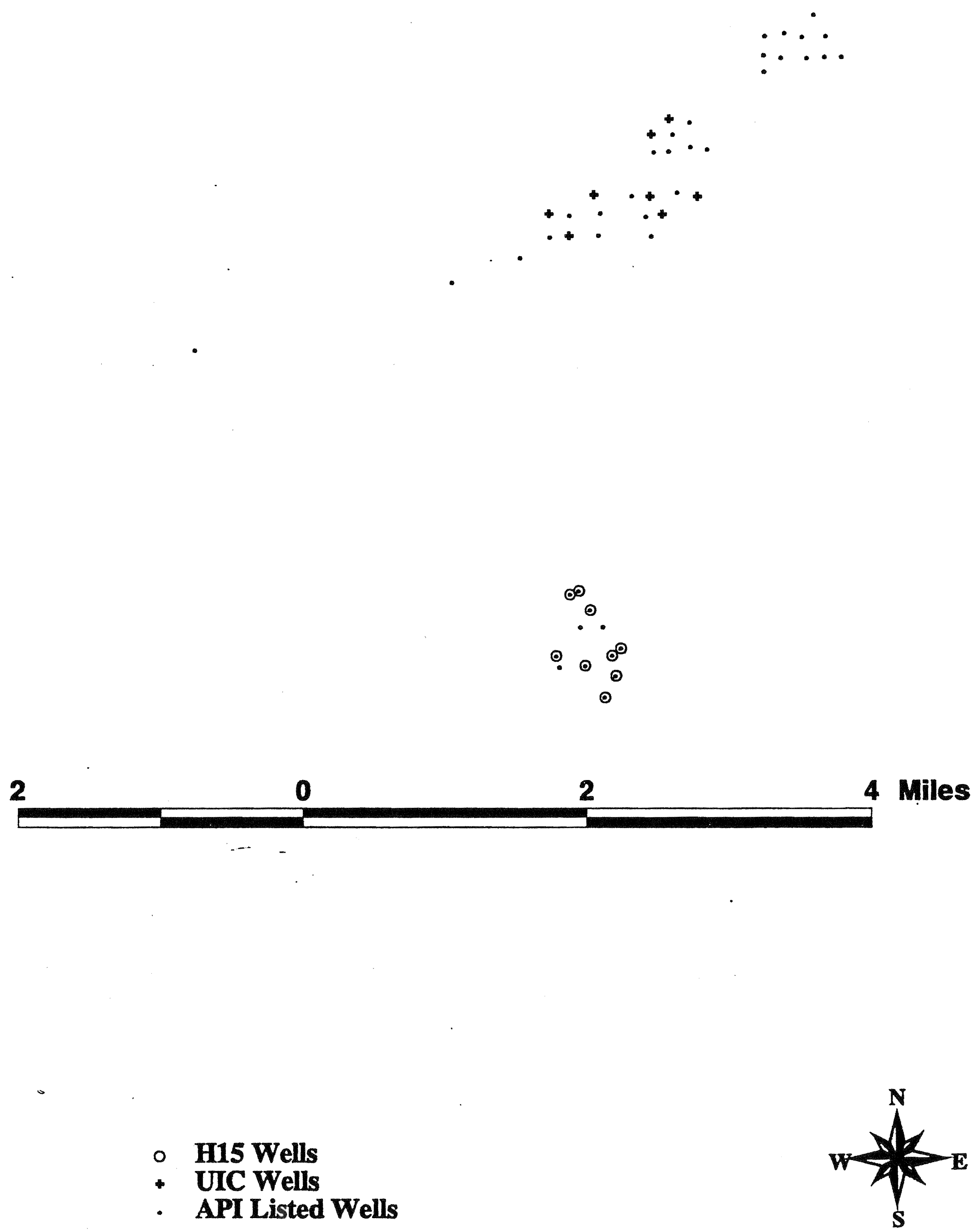
Wellman
Terry County, Texas
H15, UIC, and API Listed Wells



Wheat
Loving County, Texas
H15, UIC, and API Listed Wells



Woodkirk (Strawn)
Jack County, Texas
H15, UIC, and API Listed Wells



Appendix D-1
AOR Field Summaries - YES Category

AOR FIELD SUMMARIES - YES CATEGORY

****Coleman Ranch****

- Does not pass statistical test for minimum number of H15TOF measurements.
- Actual separation between BUQW and shallowest H15TOF is greater than 500 ft; therefore, field may qualify for AOR variance if more production zone fluid level data are submitted to RRC.
- One H15 well is also a UIC well.
- Location information not available for one of the six H15 wells.

****Crossett, West (Clear Fork, Upper)****

- Does not pass statistical test for minimum number of H15TOF measurements; this field only had two wells with H15TOF information and only one of the wells has an x-y coordinate in the API database.
- H15 hard copy confirmed H15TOF outlier of 17621 ft bgl. This must be an erroneous reading.
- Actual separation between BUQW and shallowest H15TOF is greater than 500 ft; therefore, field may qualify for AOR variance if additional production zone fluid level data are submitted to RRC and if erroneous H15TOF value is corrected.

Donnelly (San Andres)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Actual separation between BUQW and shallowest H15TOF is less than 500 ft and probable separation is negative; therefore, field will probably not qualify for AOR variance.
- Location information was not available for two of the 12 H15 wells.

****Frass (Tonkawa)****

- Does not pass statistical test for minimum number of H15TOF measurements.
- Actual separation between BUQW and shallowest H15TOF is greater than 500 ft; therefore, field may qualify for AOR variance if more production zone fluid level data are submitted to RRC.
- Location information was not available for one of the four H15 wells.

****Garza****

- Does not pass statistical test for minimum number of H15TOF measurements.
- No H15 hard copy was found for the H15 level of 975 ft bgl.
- There were no data for perforated intervals of H15 wells.
- This field has 399 UIC wells and 392 secondary recovery wells.
- Actual separation between BUQW and shallowest H15TOF is greater than 500 ft; therefore, field may qualify for AOR variance if more production zone fluid level data are submitted to RRC.
- Field only had two wells with H15 TOF information, but there is location information for three H15 wells in the GIS database.

Ranger

- Does pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed the H15 TOF outliers of 558, 589 and 1197 ft bgl.
- Most likely will qualify for AOR variance if RRC approves the 308 ft separation between BUQW and shallowest H15TOF and location of H15 wells.
- Location information was not available for 24 of the 37 H15 wells.

Sawyer (Canyon)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Actual separation between BUQW and shallowest H15TOF is greater than 500 ft; therefore, field may qualify for AOR variance if more production zone fluid level data are submitted to RRC.
- Location information was not available for two of the seven H15 wells.

Share SE (Morrow, Upper)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Actual separation between BUQW and shallowest H15TOF is greater than 500 ft; therefore, field may qualify for AOR variance if more production zone fluid level data are submitted to RRC and if RRC approves locations of H15 wells.
- Location information was not available for one of the six H15 wells.

Sullivan

- Does pass statistical test for minimum number of H15TOF measurements.
- Actual separation between BUQW and shallowest H15TOF is greater than 500 ft; therefore, field may qualify for AOR variance if more production zone fluid level data are submitted to RRC and if RRC approves locations of H15 wells.
- Location information was not available for any of the four H15 wells.

Three Bar (Devonian)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Actual separation between BUQW and shallowest H15TOF is greater than 500 ft; therefore, field may qualify for AOR variance if more production zone fluid level data are submitted to RRC and if RRC approves locations of H15 wells.
- Location information is available for all four of the H15 wells but they are clusted together away from UIC wells.

Todd, Deep (Crinoidal)

- Does not pass statistical test for minimum number of H15TOF measurements.
- No information was available for this field regarding the depth of production and year discovered.
- Actual separation between BUQW and shallowest H15TOF is greater than 500 ft; therefore, field may qualify for AOR variance if more production zone fluid level data are submitted to RRC.
- Two of the three H15 wells are also UIC wells.

Appendix D-2
AOR Field Summaries - MAYBE Category

AOR FIELD SUMMARIES - MAYBE CATEGORY

Adair (Wolfcamp)

- Does pass statistical test for minimum number of H15TOF measurements.
- No information available for this field for depth to production zone and year discovered.
- Most likely will qualify for AOR variance if RRC approves the 214 ft separation between BUQW and shallowest H15TOF.

Bayview (Glorieta)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copy confirmed the H15TOF outlier of 366 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative. Field might qualify for AOR variance if single outlier value is shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.

Bradford (Tonkawa)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Most likely will qualify for AOR variance if RRC approves the 348 ft separation between BUQW and shallowest H15TOF and if more production zone fluid level data are submitted to RRC.
- Location information not available for one of eight H15 wells.

Brown & Thorp (Clear Fork)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed the H15TOF outliers of 263, 1449, 1607, 2111 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative. Field might qualify for AOR variance if single outlier value is shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.
- Location information not available for one of the five H15 wells.

Bryson, East

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed the H15 TOF outliers of 290, 527, and 651 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative; therefore, field will probably not qualify for AOR variance.
- Location information not available for six of the 10 H15 wells.

Carthage (Pettit, Upper)

- Does pass statistical test for minimum number of H15TOF measurements.
- Hard copy confirmed the H15TOF outlier of 326 ft bgl. Other outlier hard copies found for 300, 1071, and 1178 are in Carthage (Pettit, Lower).
- Actual separation between BUQW and shallowest H15TOF is negative; therefore, field will probably not qualify for AOR variance.
- Location information not available for 10 of the 17 H15 wells.

Choate (Cisco-K)

- Does not pass statistical test for minimum number of H15TOF measurements.
- The H 15 hard copy indicates that the H15TOF of 300 ft bgl was a typographic error that should be 3000 ft bgl. Correction made in histograms and appendix files.
- Unable to confirm production zone depth for this field.
- Actual separation between BUQW and shallowest H15TOF is greater than 500 ft; therefore, field may qualify for AOR variance if more production zone fluid level data are submitted to RRC.

Cowden, South (Canyon 8900)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copy confirmed outlier H15TOF of 915 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative. Field might qualify for AOR variance if single outlier value is shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.
- One H15 wells is also a UIC well.
- Field only had four wells with H15TOF information, but there is location information for five H15 wells in the GIS database.

Embar (Permian)

- Does not pass statistical test for minimum number of H15TOF measurements.
- The hard copy confirmed the outlier H15TOF of 1333 ft bgl.
- Field might qualify for AOR variance if single outlier value is shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.

Emperor, Deep

- Does pass statistical test for minimum number of H15TOF measurements.
- The hard copy confirmed the outlier H15TOF of 189 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative; therefore, field will probably not qualify for AOR variance.
- Five H15 wells are also UIC wells.
- Location information not available for 10 of the 28 H15 wells.

Fullerton (San Andres)

- Does not pass statistical test for minimum number of H15TOF measurements. There are only two H15TOF wells for this field.
- Hard copy confirmed outlier H15TOF of 896 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative. Field might qualify for AOR variance if single outlier value is shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.
- Location information not available for one of two H15 wells.

Goldsmith (Clear Fork)

- Does not pass statistical test for minimum number of H15TOF measurements.
- The hard copy confirmed the H15 TOF outlier of 157 ft bgl. No hard copy found for H15TOF outlier of 132 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative; therefore, field will probably not qualify for AOR variance.

Goldsmith N. (San Andres Con.)

- Does pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed H15TOF outliers of 700 and 737 ft bgl. No hard copy was found for H15TOF outlier of 713 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative; therefore, field will probably not qualify for AOR variance.
- Location information not available for 17 of 36 H15 wells.

Grice

- Does not pass statistical test for minimum number of H15TOF measurements.
- Field might qualify for AOR variance if single outlier value is shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.
- Three H15 wells are also UIC wells.
- Location information was not available for one of four H15 wells.

Hardin

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copy confirmed H15TOF outlier of 5 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative; therefore, field will probably not qualify for AOR variance.

Ken Regan (Delaware)

- Does pass statistical test for minimum number of H15TOF measurements.
- Most likely will qualify for AOR variance if RRC approves the 110 ft separation between BUQW and shallowest H15TOF and if RRC approves location of H15 wells.
- Three H15 wells are also UIC wells.
- Location information not available for two of five H15 wells.

Keystone (San Andres)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed H15TOF outliers of 15 and 96 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative. Field might qualify for AOR variance if two outlier values are shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.
- Unable to confirm production zone depth for this field.
- Two H15 wells are also UIC wells.
- Location information not available for four of six H15 wells.

Knox City, North (Canyon)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed H15TOF outliers of 284, 347, 417, 434, 536, 536, and 733 ft bgl. No hard copies found for H15TOF outliers of 460, 480, 760, and 800 ft bgl.
- Most likely will qualify for AOR variance if RRC approves the 184 ft separation between BUQW and shallowest H15TOF and if more production zone fluid level data are submitted to RRC.
- Three of 16 H15 wells are also UIC wells.
- Location information not available for two of 16 H15 wells.

Magutex (Devonian)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed H15TOF outliers of 60 and 1271 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative. Field might qualify for AOR variance if single outlier value is shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.
- Field only had six wells with H15TOF information, but there is location information for 12 H15 wells in the GIS database.

Means, N. (Queen Sand)

- Does not pass statistical test for minimum number of H15TOF measurements.
- No hard copy found for H15TOF outlier of 374 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative. Field might qualify for AOR variance if single outlier value is shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.
- Six H15 wells are also UIC wells.
- Location information not available for one of seven H15 wells.

Midland Farms

- Does pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed H15TOF outliers of 506, 649, and 925 ft bgl. No hard copies found for H15TOF outlier of 717 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative; therefore, field probably does not qualify for variance.
- All 43 H15 wells are also UIC wells.

Monahans (Queen Sand)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copy confirmed H15TOF outlier of 155 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative. Field might qualify for AOR variance if single outlier value is shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.

Moore

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed H15TOF outliers of 277, 429, and 788 ft bgl. No hard copies found for H15TOF outlier of 410 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative; therefore, field probably does not qualify for AOR variance.
- Two of 32 H15 wells are also UIC wells.

Moore's Orchard

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed the H15TOF outliers of 434, 930, 1080, 1313, and 1389 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative; therefore, field probably does not qualify for AOR variance.

Panhandle Moore County

- Does pass statistical test for minimum number of H15TOF measurements.
- Hard copy confirmed H15TOF outlier of 320 ft bgl. No hardcopy found for H15TOF outlier of 1426 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative. Most likely will qualify for AOR variance if single outlier value is shown not to be representative of production zone pressure.
- Not all H15 locations shown on H15/UIC plot.

Post (Glorieta)

- Does pass statistical test for minimum number of H15TOF measurements.
- The hard copy confirmed the H15 TOF outlier of 992 ft bgl. No other hard copies were found.
- Most likely will qualify for AOR variance if RRC approves the 118 ft separation between BUQW and shallowest H15TOF.
- Three H15 wells are also UIC wells.
- Location information not available for seven of 40 H15 wells.

Quitman

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copy confirmed the H15 TOF outlier of 589 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative. Field might qualify for AOR variance if single outlier value is shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.
- Location information not available for six of 11 H15 wells.

Reinecke

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed H15TOF outliers of 500 and 615 ft bgl.
- Field might qualify for AOR variance if two outlier values are shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.
- Location information not available for one of five H15 wells.

Russell (Clearfork 7000)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copy confirmed H15TOF outlier of 175 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative. Field might qualify for AOR variance if single outlier value is shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.

Sand Hills (McKnight)

- Does pass statistical test for minimum number of H15TOF measurements.
- Hard copy confirmed H15TOF outlier of 572 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative; therefore, field probably does not qualify for AOR variance.
- One H15 well is also a UIC well.
- Field only had 19 wells with H15TOF information, but there is location information for 70 H15 wells in the GIS database.

Sharon Ridge (Clear Fork)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed H15TOF outliers of 637 and 930 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative. Field might qualify for AOR variance if two outlier values are shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.
- Location information not available for 16 of 22 H15 wells.

Sheridan (Wilcox)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Actual separation between BUQW and shallowest H15TOF is negative; therefore field probably does not qualify for AOR variance.
- Field only had 9 wells with H15TOF information, but there is location information for 10 H15 wells in the GIS database.

Stowell (Crawford U-1)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Actual separation between BUQW and shallowest H15TOF is negative. Field might qualify for AOR variance if two outlier values are shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.
- Location information not available for six of 12 H15 wells.

Texas Hugoton

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed H15TOF outliers of 438 and 670 ft bgl. No hard copy found for H15TOF outlier of 250 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative; therefore field probably does not qualify for AOR variance.
- Location information not available for 15 of 16 H15 wells.

Thompson, North

- Does pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed H15TOF outliers of 570 and 660 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative; therefore field probably does not qualify for AOR variance.
- Location information not available for four of 27 H15 wells.
- Five H15 wells are also UIC wells.

Tomball

- Does not pass statistical test for minimum number of H15TOF measurements.
- Actual separation between BUQW and shallowest H15TOF is negative. Field might qualify for AOR variance if single outlier value is shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.

TXL (Ellenburger)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Field might qualify for AOR variance if two outlier values are shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.
- Field only had 5 wells with H15TOF information, but there is location information for 14 H15 wells in the GIS database.
- All 14 H15 wells are also UIC wells.

TXL (Tubb)

- Does pass statistical test for minimum number of H15TOF measurements.
- Hard copies confirmed H15TOF outliers of 228, 352, 756, and 836 ft bgl. No hard copy found for H15TOF outlier of 887 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative; therefore field probably does not qualify for AOR variance.
- Not all H15 locations are shown on H15/UIC plot.

Waha (Delaware)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Unable to confirm the production zone depth for this field.
- Most likely will qualify for AOR variance if RRC approves the 118 ft separation between BUQW and shallowest H15TOF and if additional production zone fluid levels are submitted to RRC.
- Location information not available for four of six H15 wells.

Wellman

- Does not pass statistical test for minimum number of H15TOF measurements.
- No hard copy found for H15TOF outlier of 654 ft bgl.
- Field might qualify for AOR variance if single outlier value is shown not to be representative of production zone pressure and if more production zone fluid level data are submitted to RRC.
- Location information not available for two of eight H15 wells.
- One H15 wells is also a UIC well.

Wheat

- Does not pass statistical test for minimum number of H15TOF measurements.
- No hard copy found for H15TOF outlier of 961 ft bgl.
- Actual separation between BUQW and shallowest H15TOF is negative; therefore field probably does not qualify for AOR variance.
- Location information not available for seven of 16 H15 wells.

Woodkirk (Strawn)

- Does not pass statistical test for minimum number of H15TOF measurements.
- Hard copy confirmed H15TOF outlier of 713 ft bgl.
- Unable to confirm the production zone depth for this field.
- Actual separation between BUQW and shallowest H15TOF is greater than 500 ft; therefore, field may qualify for AOR variance if more production zone fluid level data are submitted to RRC and if RRC approves locations of H15 wells.

*- Can be recommended for AOR variance if single outlier value is resolved and if more production zone fluid level data are submitted to RRC.
** - Can be recommended for AOR variance if more production zone fluid level data are submitted to RRC or if H15 well locations are approved by RRC.
*** - Can be recommended for AOR variance as they are.

Appendix E-1
Aquifer Database Printouts - YES Category
(on file in RRC Austin office)

Appendix E-2
Aquifer Database Printouts - MAYBE Category
(on file in RRC Austin office)

Appendix F-1
Aquifer Summaries - YES Category

Dockum Group (Lower)

Description Sheet

County location: Mitchell

Oil field: Coleman Ranch

Aquifer type (confined, unconfined): Confined where below Chinle; may be unconfined at outcrop (outcrops as Santa Rosa Fm., a lower unit of the Dockum) in vicinity of oil field.

Major or sole source of water?: Sole source in some areas (western and central part of county), or supplement to other supplies elsewhere. Moderate supply capability, but poor quality (highly mineralized) at depth.

Depth to top of aquifer: Approximate altitude of formation top: ground surface (2,000 to 2,200 ft msl). Approximate altitude of potentiometric surface: 2,175 ft msl or less (regional) (Dutton and Simpkins, 1986); 2,000 to 2,140 ft msl (Shamburger, 1967).

Depth to bottom of aquifer: Approximate altitude of base of Santa Rosa, about 1740 to 1800 ft msl (Shamburger, 1967). Lower Dockum Group is about 400 ft thick in area of oil field (Dutton and Simpkins, 1986). Wells in the area show a thickness of the Santa Rosa to be about 150 to 200 ft in irrigation wells. Most wells less than 300 ft deep (Shamburger, 1967).

Range of saturated thicknesses in vicinity of oil field: Up to 300 ft thick (Santa Rosa) in northern part of county (Shamburger, 1967).

Regional lithology: Terrigenous shale, clay, sands and gravels, fine- to coarse-grained quartzose sandstone, and basal conglomerates from meandering and braided streams and alluvial fans. Mudstone is also common. Sandstones show little regional lateral continuity. Thick, coarse-grained sandstones common in eastern parts of the Group. The Lower Dockum overlies Permian mudstones and evaporites (confining zone) (Shamburger, 1967; Dutton and Simpkins, 1986).

Local (county) information: Water quality near and west of oil field area tends to have TDS > 3000 mg/L.

Water quality: TDS, 605-6,756 mg/L; total hardness, 197-2280 mg/L; chloride, 62-2,240 mg/L; sulfate, 28-2,000 mg/L (Shamburger, 1967; Dutton and Simpkins, 1986).

Predominant uses: Agriculture (irrigation, stock) and domestic supply.

Aquifer properties: Approximate yield: 35-179 gpm; drawdown 28-133 ft; specific capacity: 0.4-2.7 gpm/ft (Shamburger, 1967).

Regional flow direction: Northwest to southeast but varies locally (Dutton and Simpkins, 1986).

Cenozoic Alluvium

Description Sheet

County location: Crane

Oil field: Crossett West, Clear Fork (Upper)

Aquifer type (confined, unconfined): Unconfined.

Major or sole source of water?: Major source. Triassic rocks (Dockum) below also are a minor source.

Depth to top of aquifer: Approximate altitude of formation top: 2,340 to 2,508 ft msl (approx. at ground surface). Approximate altitude of potentiometric surface: 2,315 to 2,483 ft msl. The potentiometric surface is above that of the underlying, and hydraulically connected, Triassic Dockum (Santa Rosa) aquifer, indicating potential for vertical downward movement (Rees, 1987).

Depth to bottom of aquifer: Approximate altitude of base of aquifer 2,295 to 2,192 ft msl (Rees, 1987).

Range of saturated thicknesses in vicinity of oil field: 50 to 200 ft thick.

Regional lithology: Gravel, sand, silt, and clay deposited by the Rio Grande and tributaries or in local stream basins. Tertiary sediments may also be present, including reworked tuffs and alluvial deposits of reworked volcanic debris. Supplies small to large amounts of fresh or slightly saline water.

Local (county) information: Cenozoic alluvium often misidentified as Quaternary in well logs, but may also include Tertiary sediments. Dockum Fm. is below the Cenozoic and is hydraulically connected. Dockum underlies most of the county and is a minor source of small amounts of ground water.

Water quality: Deeper zones may have more saline waters in lacustrine or fine-grained deposits. TDS are approximately 2,000 mg/L in region of oil field, increasing to 12,000 to the west. Sodium approximately 50 mg/L, chloride approximately 150 mg/L, sulfate about 1,430 mg/L (Rees, 1987).

Predominant uses: Agriculture (irrigation, stock), oil field/industrial, and drinking supply.

Aquifer properties: Regional data: yield, 250 to 1,470 gal/min; specific capacity, 9 to 27 gal/min/ft; coeffiecient of storage, 0.0003-0.001; coefficient of permeability, 137 to 1,420 gal/d/ft^2; coeffiecient of transmissibility, 9,320-71,300 gal/d/ft (Rees, 1987).

Regional flow direction: Northeast to southwest (discharge to Pecos R. to southwest).

Dockum Fm. (Santa Rosa)

Description Sheet

County location: Crane

Oil field: Crossett West, Clear Fork (Upper)

Aquifer type (confined, unconfined): Unconfined to semi-confined.

Major or sole source of water?: Minor to moderate source, after Cenozoic alluvium which overlies Dockum.

Depth to top of aquifer: Approximate altitude of formation top: 2100-2300 ft msl. Approximate altitude of potentiometric surface: 2297-2407 ft msl. The potentiometric surface is near or below that of the overlying High Plains aquifer, where present, and thus there is the potential for vertical downward flow (Rees, 1987).

Depth to bottom of aquifer: Approximate altitude of base of aquifer 1,100 ft msl (Dutton and Simpkins, 1986).

Range of saturated thicknesses in vicinity of oil field: Greater than 75 ft, up to 1000 ft (Rees, 1987; Dutton and Simpkins, 1986).

Regional lithology: Santa Rosa sandstone is medium to coarse-grained, arkosic cross-bedded, conglomeratic, interbedded with siltstone and shale and normally about 350-520 ft thick (Rees, 1987).

Local (county) information: Dockum Fm. underlies most of the county and is a minor source of small amounts of ground water.

Water quality: Total dissolved solids approx. 3200-5600 mg/L, sodium, 460 mg/L, chloride 580-700 mg/L, sulfate 1,670-1480 mg/L, nitrate 29-44 mg/L (Rees, 1987).

Predominant uses: Agriculture (irrigation, stock), industrial/oil field, and drinking supply.

Aquifer properties: Regional data: yield 126 gal/min, coefficient of storage: 0.0001, coefficient of transmissibility: 2580 gal/d/ft (Rees, 1987).

Regional flow direction: Approximately northwest to southeast, but may vary locally and may be impacted by Pecos drainage divide.

Antlers Formation

Description Sheet

County location: Ector

Oil field: Donnelly (San Andres)

Aquifer type (confined, unconfined): Unconfined, may be confined locally below clay lenses.

Major or sole source of water?: Major source. Ogallala is an important local source where it exists and is connected to Antlers.

Depth to top of aquifer: Aquifer near oil field is overlapped slightly by Ogallala Fm. Top of the Trinity Group which contains the Antlers is between 3100 and 3000 ft msl in central part of county. Approximate altitude of ground surface in county is 3300 ft msl (Walker, 1979). Approximate altitude of piezometric surface in Antlers varies from 2,900-3,100, sloping downward from west to east in area of oil field.

Depth to bottom of aquifer: Thickness of the Antlers is difficult to determine because of the presence of reworked lower beds at the formation base. The thickness of the Antlers varies from 70-120 ft in Ector county (Walker, 1979). The altitude of the base of the Edwards-Trinity (Plateau) group is about 2900-3000 msl (Walker, 1979).

Range of saturated thicknesses in vicinity of oil field: Approximately 70-120 ft (Walker, 1979).

Regional lithology: Antlers sand is part of the Cretaceous Edwards-Trinity (Plateau) aquifers. The Antlers is a white to red, fine to medium-grained sand with some beds of clay, scattered gravel lenses, conglomeritic at base in some locations.

Local (county) information: Flow directions normally to southeast, locally variable depending upon discharge zones. The Antlers may be in connection with the underlying Santa Rosa (Triassic Dockum Fm.) Formations above, such as the Ogallala or the Edwards are unsaturated in parts of Ector county.

Water quality: Typical sulfate: 55-530 mg/L; chloride, 38-530 mg/L; nitrate, 9.5-34 mg/L; TDS, 375-1070 mg/L (Walker, 1979). Quality is poorer in western and central part of county.

Predominant uses: Agriculture (irrigation, stock), oil field/industrial, and drinking supply.

Aquifer properties: Average specific capacity in Midland County (adjacent) was 0.85 (average of 2 tests, Walker, 1979).

Regional Flow direction: west to east.

Average Yearly pumpage
Changes in pumpage or sat thickness/time (graph)

Prognosis for future use,
changes in future use scenarios.

Dockum Group (Lower)

Description Sheet

County location: Garza

Oil field: Garza

Aquifer type (confined, unconfined): Unconfined to east near outcrop, otherwise locally confined.

Major or sole source of water?: Sole source in some areas (eastern part of county), or supplement to other supplies elsewhere. Small to moderate supply capability.

Depth to top of aquifer: Approximate altitude of formation top: 3330 ft msl (ground surface). Approximate altitude of potentiometric surface: 2850-2500 ft msl in Garza Co., sloping downward from northwest to southeast (Dutton and Simpkins, 1986).The potentiometric surface of the Dockum is 100 to 700 ft below that of the overlying High Plains aquifer, where present, and thus there is the potential for vertical downward flow (Dutton and Simpkins, 1986; Knowles et al., 1982). Interconnections may be poor, however, owing to permeability contrasts.

Depth to bottom of aquifer: Approximate altitude of base of aquifer 1030 ft msl (2300 ft bgl) (Dutton and Simpkins, 1986).

Range of saturated thicknesses in vicinity of oil field: Water-bearing zones are discontinuous sands and thus are variable in thickness.

Regional lithology: Terrigenous sands and gravels, fine- to coarse-grained quartzose sandstone and conglomerates from meandering and braided streams and alluvial fans. Mudstone is also common. Sandstones show little regional lateral continuity. The Lower Dockum overlies Permian mudstones and evaporites (confining zone) (Dutton and Simpkins, 1986).

Local (county) information: Dockum Fm. underlies most of the county and is a minor source of small amounts of ground water. The Ogallala Fm. (aquifer) is the chief source of water for the western part of the county.

Water quality: Total Dissolved Solids (TDS) is given as 5,610-46,000 mg/L, sodium is reported as 2,020-16,930 mg/L, and chloride is listed as 2,170-25,160 mg/L. Quality is variable with source depth and potential effects of evaporite deposits (Dutton and Simpkins, 1986). More saline ground waters tend to occur in sand-poor areas of the formation. The county lies within an area of Na-Cl ground water facies within the aquifer. Shallow brine disposal wells and pits may have caused local aquifer contamination.

Predominant uses: Agriculture (irrigation, stock) and drinking supply.

Aquifer properties: No information available.

Regional flow direction: Northwest to southeast (Dutton and Simpkins, 1986).

Chicot Fm.

Description Sheet

County location: Galveston

Oil field: Gillock (East Segment)

Aquifer type (confined, unconfined): Confined in most areas, but variable with location.

Major or sole source of water?: Major source.

Depth to top of aquifer: Altitude of water table (1975) was approximately -100 to -120 ft msl (Gabrysch, 1980). Current data indicate a rebound to about -50 ft msl in vicinity of oil field.

Depth to bottom of aquifer: Altitude of base of aquifer in vicinity of oil field: -900 to -1000 ft msl (Jorgensen, 1975; Gabrysch, 1980). Base defined as water with 1000 mg/L TDS or less. Well depths up to 1000 ft in area, may extend somewhat into underlying Evangeline Fm. where water quality permits.

Range of saturated thicknesses in vicinity of oil field: Up to 1000 ft bgs.

Regional lithology: Quaternary-age sediments with discontinuous layers of sand and clay, large sand-clay ratio. Sand beds typically tens of ft thick, with intervening lower-permeability clays. Includes Beaumont Fm., with clay, silt, sand, including stream channel, point bar, levee, backswamp, and coastal marsh deposits, Willis Sand, Lissie Fm., and Quaternary alluvium. Base of the Chicot is the Evangeline Fm, a more consolidated formation.

Local (county) information: Area around Texas City (near oil field) is heavily pumped. Gabrysch (1980) noted a 10 to 30 ft decline in Chicot head levels from 1965 to 1975. Some rebound has been recorded in more recent times, based on well measurements near the oil field.

Water quality: Relatively good quality, but susceptible to pollution. Quality tends to deteriorate with depth (increasing TDS) and with increasing decrease in water levels in wells. TDS concentrations near oil field were relatively constant in the mid-70's (Gabrysch, 1980).

Predominant uses: Public/municipal supply, industrial, agricultural/irrigation.

Aquifer properties: Not available.

Regional flow direction: Southeasterly, with dip of formation.

Carrizo-Wilcox

Description Sheet

County location: Smith

Oil field: Hitts Lake (Paluxy)

Aquifer type (confined, unconfined): Confined in most areas, but variable with location.

Major or sole source of water?: Major source, Wilcox Group. is deepest source of fresh water in area. Carrizo Fm. contributes part of supply.

Depth to top of aquifer: Carrizo Fm. overlies the Wilcox and is hydraulically connected to it. Approximately 200 to 500 ft bgl in both formations (Preston and Moore, 1991).

Depth to bottom of aquifer: About 1000 ft bgl in vicinity of oil field (Dillard, 1963) Up to 1,600 ft bgl or more toward southeast. May be variable laterally owing to depositional features (Preston and Moore, 1991).

Range of saturated thicknesses in vicinity of oil field: 1,000 to 1,200 ft thick in vicinity of oil field (Preston and Moore, 1991). Fresh water may be found to depths of 3,000 ft in the Carrizo-Wilcox.

Regional lithology: Carrizo Fm., which is alluvial sand (up to 90%) interbedded with silt and clay. This overlies the Wilcox Group which is interbedded gravel, sand, clay, and shale, with lignite deposits, from river, delta and shallow marine environments. River alluvium contains more massive, linear sands which are extended from north to south, divided by clays and shales.

Local (county) information: Water levels in this area have declined as much as 500 ft since 1945 (Preston and Moore, 1991) owing to increased usage, particularly in vicinity of municipal wells.

Water quality: Relatively good quality, but susceptible to pollution. Quality tends to deteriorate with depth.

Predominant uses: Public/municipal supply, industrial.

Aquifer properties: Transmissivities: Carrizo Fm. <3,000 to 30,000 ft^2/d; mean approximately 12,000 ft^2/d. Wilcox Fm. <1,000 to 30,000 ft^2/d, average 15,000 ft^2/d (regional data, Preston and Moore, 1991).

Regional flow direction: Southeasterly, but locally variable depending on discharge areas.

Ogallala Aquifer

Description Sheet

County location: Garza

Oil field: Huntley East (San Andres)

Aquifer type (confined, unconfined): Unconfined where found in county.

Major or sole source of water?: Both, in area of oil field.

Depth to top of aquifer: Approximately 10 to 80 ft bgl to top of aquifer, up to 125 ft bgl to water table. Altitude of water table 2820-2860 ft msl, sloping downward from west to east, in 1979-1980, in vicinity of oilfield (Knowles et al., 1981). Surface elevation approximately 2900 ft msl.

Depth to bottom of aquifer: Altitude of base of aquifer 2800 to 2840 ft msl, sloping downward from northwest to southeast (Knowles et al., 1981). Aquifer is underlain by Permian red bed Dockum Fm. Aquifer saturated thickness varies, up to 100 ft in thickness .

Range of saturated thicknesses in vicinity of oil field: Measured: 25-50 ft (1974); <25-50 ft (1990, projected); <25-25 ft (2000, projected) (Bell and Morrison, 1981).

Regional lithology: Late Tertiary (Pliocene) age rocks of the Ogallala formation comprised of interfingering, unconsolidated fine to coarse sand, gravel silt, and clay. Caliche layers or beds present near the formation top and in outcrops. (Bell and Morrison, 1981; Gutentag et al., 1984). Valley-fill, eolian, and braided stream deposits predominate. Aquifer thickness may vary widely over short horizontal distances due to the infilling of pre-Ogallala valley cuts (Weeks, et al., 1988). Underlain in Garza County by Triassic Upper Dockum Fm. (claystone to gravels, limestone) (Knowles et al., 1982).

Local (county) information: Ogallala outcrops in county and is extant in the subsurface only in western one-third of county, west of Post. As a result, the aquifer is very thin in this area. Older rocks below are in connection but yield only small amounts of ground water, so most wells are developed in the western part of the county.

Water quality: Variable. Total Dissolved Solids (TDS) are 250-1000 mg/L and sodium 25-50 mg/L (Gutentag et al. 1984). Knowles et al. (1982) list TDS from 800-1000 mg/L. Some areas impacted by presence of nitrate from agriculture. Chloride increases to west, varies from 100-500 mg/L (Knowles et al. (1982).

Predominant uses: Agriculture (irrigation) and drinking supply.

Aquifer properties: Coefficient of storage is nearly equal to the specific yield, defined as the quantity of water that a formation will yield under the force of gravity, as a percentage of the volume of the material drained. Storage coefficient is 0.15 on average for the Ogallala (Bell and Morrison, 1981). Specific yield in Garza is 10-20 percent (Gutentag et al., 1984). Average hydraulic conductivity for Garza county: 0-100 ft/day. Permeability: <250 gpd/ft^2.

Regional flow direction: Southeast.

Cisco Group

Description Sheet

County location: Clay

Oil field: Joy (Strawn)

Aquifer type (confined, unconfined): Unconfined to confined, depending on location.

Major or sole source of water: Sole source of ground water in area of oil field. Not a major aquifer.

Depth to top of aquifer: Approximate altitude of formation top (Archer City Fm.) is outcrop at ground surface (Duffin and Beynon, 1992), approximately 1000 ft msl (BEG 1972); 1100 to 972 ft msl. Depth to water from TWDB: 18 to 180 ft bgl (989 to1282 ft msl) (TWDB, 1998).

Depth to bottom of aquifer: Maximum thickness of formation is approximately 800 to 1000 ft. Individual unit thicknesses may vary markedly over relatively short horizontal distances. Protected thickness approx. 200 ft bgl (TNRCC, 1998).

Range of saturated thickness in vicinity of oil field: May be 0 to 800 ft regionally (Duffin and Beynon, 1992). Formation bottom is not necessarily base of usable water.

Regional Lithology: Shale, sandstone, conglomerate, limestone, and a few coal beds. Yields small to moderate quantities of fresh to moderately saline water (Duffin and Beynon, 1992).

Local (County) Information: Primary source of ground water in the Cisco group is sandstones, particularly basal units.

Water quality: Fresh (<1000 mg/L) to moderately saline (3,000 to 10,000 mg/L). Total dissolved solids are typical for area.

Predominant uses: Public and domestic supply, oil field use, industrial, agriculture (irrigation, stock).

Aquifer properties: Not available.

Regional flow direction: Likely down dip from outcrop to north or northwest.

Seymour Fm.

Description Sheet

County location: Wichita

Oil field: K-M-A Ellenburger

Aquifer type (confined, unconfined): Unconfined.

Major or sole source of water: Major source of ground water in some areas. Horizontal and vertical extent of aquifer are variable.

Depth to top of aquifer: Approximate altitude of formation top (Quaternary Alluvium) is outcrop at ground surface (Duffin and Beynon, 1992), approximately 1100 ft msl (BEG 1972).

Depth to bottom of aquifer: Maximum thickness of formation is approximately 100 ft bgl, with some exceptions up to 350 ft thick in paleokarst fills (Duffin and Beynon, 1992). Thickness may vary markedly over relatively short horizontal distances.

Range of saturated thickness in vicinity of oil field: May be 0 to 100 ft regionally (Duffin and Beynon, 1992). Formation bottom is not necessarily base of usable water because of hydraulic connection with lower formations.

Regional lithology: Alluvium, including surficial flood plain and terrace deposits consisting of gravel, sand, silt, and clay with caliche. Yields small quantities of fresh to moderately saline water to wells along rivers and major tributaries (Duffin and Beynon, 1992).

Local (county) information: May be hydrologically connected with lower Quaternary terrace deposits and Permian formations.

Water quality: Variable, dependent upon recharge areas. Fresh (<1,000 mg/L) to moderately saline (3,000 to 10,000 mg/L) total dissolved solids are typical for area (Duffin and Beynon, 1992). Quality often deteriorates with depth, distance from recharge areas, and in oil field (salt) and agricultural areas (nitrate).

Predominant uses: Public and domestic supply, oil-field use, industrial, agriculture (irrigation, stock).

Aquifer properties: Range of coefficients of transmissibility: 25,000 to 115,000 gpd/ft. Range of storage coefficients: 0.11 to 0.18. Range of coefficient of permeability: 790 to 17,000 gpd/ft^2 (Duffin and Beynon, 1992).

Regional flow direction: Variable, controlled by discharge to streams.

Wichita Group

Description Sheet

County location: Wichita

Oil field: K-M-A Ellenburger

Aquifer type (confined, unconfined): Unconfined. Comprised in Wichita County of Petrolia Fm.

Major or sole source of water: Sole source of ground water in some areas, but not a major source. Extent of aquifer is variable. May be overlain by Seymour Group (alluvium).

Depth to top of aquifer: Highest altitude of formation top is outcrop at ground surface (Duffin and Beynon, 1992); approximately: 1,100 ft msl (BEG 1972).

Depth to bottom of aquifer: Maximum thickness of formation is approximately 360 to 400 ft (Duffin and Beynon, 1992). Protected thickness 100 ft (TNRCC, 1998).

Range of saturated thickness in vicinity of oil field: May be 400 ft regionally (Duffin and Beynon, 1992). Usable water found to 100 ft bgl.

Regional lithology: Gray and red shale, minor amounts of limestone, sandstone, siltstone, conglomerate, and coal. Yields small quantities of fresh to slightly saline water to wells in the outcrop area (Duffin and Beynon, 1992; Hentz, 1988).

Local (county) information: May be hydrologically connected with lower Permian formations. Wells often produce low yield and do not sustain prolonged pumpage. Poor quality may preclude use.

Water quality: Variable, dependent upon recharge areas. Fresh (<1,000 mg/L) to moderately saline (3,000 to 10,000 mg/L) total dissolved solids are typical for area (Duffin and Beynon, 1992). Quality often deteriorates with depth, distance from recharge areas, and in oil field (salt) and agricultural areas (nitrate).

Predominant uses: Domestic supply, livestock.

Aquifer properties: Not available.

Regional flow direction: Variable.

Antlers Formation

Description Sheet

County location: Eastland

Oil field: Ranger

Aquifer type (confined, unconfined): Unconfined, but may be confined locally below clay lenses.

Major or sole source of water: Major source where found. Antlers Fm. underlies part of oil field area.

Depth to top of aquifer: Approximate altitude of piezometric surface in Antlers Fm. varies from 1540 to 1413 ft msl, sloping downward from west to east in area of oil field (TWDB, 1998). Approximate altitude of ground surface in county is 1400 to 1500 ft msl (Nordstrom, 1987).

Depth to bottom of aquifer: Thickness of the Antlers Fm. is difficult to determine because of the presence of reworked lower beds at the formation base (Walker, 1979). Thickness reported to be from 50 to 220 ft. Hosston Fm. (lower part of aquifer) is the most productive member.

Range of saturated thickness in vicinity of oil field: Approximately 70 to 200 ft (Nordstrom, 1987).

Regional lithology: Antlers Fm. is part of the Cretaceous Edwards-Trinity (Plateau) aquifers. The Antlers is a white to red, fine to coarse-grained sand with beds of clay, shale, sandstone. It contains scattered gravel lenses, and is conglomeritic at base in some locations. Some limestone and marl are found near top of formation in the Glen Rose Formation.

Local (county) information: None available.

Water Quality: Typical sulfate: 10 to 254 mg/L; chloride, 9 to 5,200 mg/L; nitrate, 0.4 to 648 mg/L; TDS, 200 to 8,500 mg/L (Nordstrom, 1987). Can be brackish in some areas. Some areas susceptible to oil field brine contamination.

Predominant uses: Agriculture (irrigation, stock), domestic and public supplies.

Aquifer properties: Measured specific capacities in Eastland County are 2.5 and 5.1 gal/min/ft (2 tests). Transmissibility 5,140 to 13,200 gal/d/ft (Nordstrom, 1987).

Regional flow direction: West to east. Flow directions normally to southeast, away from outcrop recharge zone. Flow is locally variable.

Edwards-Trinity (Plateau)

Description Sheet

County location: Sutton

Oil field: Sawyer (Canyon) Field

Aquifer type (confined, unconfined): Unconfined to confined; variable with location.

Major or sole source of water?: Major source, predominantly Edwards limestone. South of the Glen Rose Fm. pinch-out (southern half of county) the Edwards-Trinity aquifer includes all rocks from the top of the Glen Rose to the top of the Georgetown Fm. (Walker, 1979).

Depth to top of aquifer: Approximate altitude of Trinity Group formation top: 1900-1700 ft msl (Walker, 1979). Approximate altitude of land surface: 2400-2200 ft msl. Land surface elevation highly variable due to stream valley dissection. Elevation range (1972) of water levels in Edwards-Trinity: 1900-2100 ft msl in vicinity of oil field.

Depth to bottom of aquifer: Approximate altitude of base of aquifer: 1400-1800 ft msl (Walker, 1979). Wells are frequently up to 500 ft deep (Muller and Pool, 1972), most typically from 200-400 ft deep. Base of aquifer slopes to south and southeast. TNRCC protects to base of Cretaceous Fms. In this area (TNRCC, 1998).

Range of saturated thicknesses in vicinity of oil field: Thickness is greater where Glen Rose Fm. Is present in southern half of county, maximum estimated to be about 400-800 ft thick.

Regional lithology: Edwards Fm. is thin-bedded to massive, fossiliferous, honey-combed limestone with chert or flint nodules. In Sutton County, can be granular to crystalline, dolomitic limestone with caverns and solution channels.

Local (county) information: Entire county underlain by Edwards Fm. and associated limestones, which are underlain by the Glen Rose Fm. of the Antlers Group in the southern half of the county, Pennsylvanian and/or Permian rocks elsewhere (Walker, 1979).

Water quality: TDS, 257-1710 mg/L in region of oil field. Sulfate, 9-447 mg/L; chloride, 10-351 mg/L, nitrate, <0.4-130 mg/L (Walker, 1979).

Predominant uses: Agriculture (irrigation, stock), public supply, domestic supply.

Aquifer properties: Regional yields are 44 to 668 gal/min; coefficient of permeability, 13-38 gal/d/ft^2; coefficient of transmissibility; 1,100-6,573 gal/d/ft (Walker, 1979).

Regional flow direction: Southeasterly, but locally variable depending upon discharge areas. Tends to conform to surface topography locally.

Ogallala Aquifer

Description Sheet

County location: Ochiltree

Oil field: Share, S.E. (Morrow, Upper)

Aquifer type (confined, unconfined): Unconfined throughout county.

Major or sole source of water?: Yes.

Depth to top of aquifer: Altitude of water table approximately 2800 ft msl, sloping downward from west to east, in 1980, in vicinity of oilfield (Gutentag et al., 1984). Knowles et al. (1982) list 2750-2700 ft msl in winter 1979, or about 120-100 ft bgl.

Depth to bottom of aquifer: Altitude of base of aquifer 2392 ft msl, overall altitude is extremely variable in county. Depth to base 590 ft bgl (Knowles et al., 1981; Knowles et al., 1984). Aquifer is underlain by Permian red bed shales.

Range of saturated thicknesses in vicinity of oil field: Aquifer saturated thickness varies from 200-300 ft in vicinity of oil field (Knowles et al. 1981). Gutentag et al. (1984) give thickness of 100-400 ft. Projected thicknesses: 125-300 ft (1990, projected); 100-275 ft (2000, projected) (Bell and Morrison, 1980).

Regional lithology: Late Tertiary (Pliocene) age rocks of the Ogallala Formation are comprised of interfingering, unconsolidated fine to coarse sand, gravel silt, and clay. Caliche layers or beds present near the formation top and in outcrops. (Bell and Morrison, 1981; Gutentag et al., 1984). Valley-fill, eolian, and braided stream deposits predominate. Aquifer thickness may vary widely over short horizontal distances due to the infilling of pre-Ogallala valley cuts (Weeks, et al., 1988). Underlain in Ochiltree County by Triassic Upper Dockum Fm. (claystone to gravels, limestone) (Knowles et al., 1982).

Local (county) information: Ogallala underlies all of the county.

Water Quality: Variable. Total Dissolved Solids (TDS) is 250-1000 mg/L and sodium is 50 to more than 100 mg/L (Gutentag et al. 1984). Knowles et al. (1982) list TDS at 400 mg/L or less. Some areas impacted by presence of nitrate from agriculture. Chloride is variable, from <50 to 400 mg/L in some localized areas (Knowles et al. (1982).

Predominant uses: Agriculture (irrigation) and drinking supply.

Aquifer properties: Coefficient of storage is nearly equal to the specific yield, defined as the quantity of water that a formation will yield under the force of gravity, as a percentage of the volume of the material drained. Storage coefficient is 0.15 on average for the Ogallala (Bell and Morrison, 1981). Specific yield in Ochiltree is 16-20 percent (Gutentag et al., 1984). Average hydraulic conductivity for Ochiltree county: 0-100 ft/day. Permeability: 250 gpd/ft^2.

Regional flow direction: East or southeast.

Cenozoic Alluvium

Description Sheet

County location: Reeves

Oil field: Sullivan (Delaware)

Aquifer type: (confined, unconfined): Unconfined

Major or sole source of water: Major source. Permian rocks (Rustler Fm.) below can be an erratic source for irrigation or livestock.

Depth to top of aquifer: Approximate altitude of formation top: 2850 ft msl (land surface). Approximate altitude of potentiometric surface: 100 to 400 ft bgs (2750 ft msl) regionally. Underlying and hydraulically connected Permian strata indicate potential for vertical downward movement of ground water (Rees, 1987).

Depth to bottom of aquifer: Altitude of base of aquifer may be up to 1500 ft bgs, regionally (Rees, 1987).

Range of saturated thickness in vicinity of oil field: May be 30 to 1250 ft regionally (Rees, 1987).

Regional lithology: Gravel, sand, silt, and clay deposited by the Pecos and Rio Grande and tributaries or in local stream basins. Caliche can also be present. Tertiary sediments may also be present, including reworked tuffs and alluvial deposits of reworked volcanic debris.

Local (county) information: Cenozoic alluvium often misidentified as Quaternary in well logs, may also include Tertiary sediments.

Water quality: TDS may vary from 500 to 13,000 mg/L regionally, locally approximately 2,000 mg/L (Rees, 1987), increasing to 12,000 to the west. Sodium approximately 100 mg/L, chloride approximately 100 mg/L, sulfate approximately 2,000 mg/L (Rees, 1987).

Predominant uses: Agriculture (irrigation, stock), industrial supply, public and domestic supply.

Aquifer properties: Regional data: yield: 460 gal/min; specific capacity: 2.7 gal/min/ft; Coefficient of transmissibility: 2,710 gal/d/ft (Rees, 1987).

Regional flow direction: East to west (discharge to Pecos River to east).

Rustler Fm.

Description Sheet

County location: Reeves

Oil field: Sullivan (Delaware)

Aquifer type (confined, unconfined): Unconfined to confined.

Major or sole source of water: Variable source. Cenozoic Alluvium above is main source in county. Dependent upon secondary porosity and salinity. Not normally usable for human consumption.

Depth to top of aquifer: Approximate altitude of formation top: up to 1500 ft bgs regionally.

Depth to bottom of aquifer: Base of aquifer may be 200 to 375 ft below formation top.

Range of saturated thickness in vicinity of oil field: May be 200 to 375 ft regionally (Rees, 1987).

Regional lithology: Massive, flinty dolomite with anhydrite, clastic deposits, shale and some salt. Supplies small to large amounts of slightly to moderately saline water.

Local (county) information: None available.

Water quality: None available.

Predominant uses: Agriculture (irrigation, stock).

Aquifer properties: None available.

Regional flow direction: Not available.

Ogallala Aquifer

Description Sheet

County location: Andrews

Oil field: Three Bar (Devonian)

Aquifer type (confined, unconfined): Unconfined throughout county.

Major or sole source of water: Major source.

Depth to top of aquifer: Altitude of water table 3000 to 3250 ft msl, sloping downward variably from west to east, in 1980, in vicinity of oilfield (Knowles and others,1982). Gutentag and others, (1984) list 2800 to 3200 ft msl in 1980, or about 0 to 100 ft of thickness.

Depth to bottom of aquifer: Altitude of base of aquifer is 2924 ft msl, overall altitude is variable in county. Depth to base 115 ft bgs. See attached figure (Knowles and others, 1981; 1984).

Range of saturated thickness in vicinity of oil field: Aquifer saturated thickness varies from 20 to 60 ft in vicinity of oil field (Knowles and others 1981). Gutentag and others (1984) give thickness of 0 to 100 ft. Projected thickness changes from 10 to 50 ft of drawdown by 2020 (Weeks and others, 1980).

Regional lithology: Late Tertiary (Pliocene) age rocks of the Ogallala formation comprised of interfingering, unconsolidated fine to coarse sand, gravel silt, and clay. Caliche layers or beds present near the formation top and in outcrops (Bell and Morrison, 1981; Gutentag and others, 1984). Valley-fill, eolian, and braided stream deposits predominate. Aquifer thickness may vary widely over short horizontal distances due to the infilling of pre-Ogallala valley cuts (Weeks, and others, 1988). Underlain in Andrews County by Cretaceous (Antlers Fm., shale, sandstone, limestone) and Triassic (Upper Dockum Fm., siltsone, clay stone, sandstone, limestone) (Knowles and others, 1982).

Local (county) information: Ogallala underlies almost all of the county. Triassic sediments (Dockum) which underlie part of the Ogallala are also a source of water in Andrews County.

Water quality: TDS are 600 to 2000 mg/L and chloride is variable, from 50 to 500 mg/L (Knowles and others, 1982). Gutentag and others (1984) list TDS at 500 to >1000 mg/L and sodium from 50 to >100 mg/L.

Predominant uses: Agriculture (irrigation) and drinking supply

Aquifer properties: Coefficient of storage is nearly equal to the specific yield, defined as the quantity of water that a formation will yield under the force of gravity, as a percentage of the volume of the material drained. Storage coefficient is 0.15 on average for the Ogallala (Bell and Morrison, 1981). Specific yield in Andrews Co. is 12 to 20 percent. Reported transmissivities for Andrews county: 7,800 to 44,000 gpd/ft. Permeability is 127 to 964 gpd/ft^2 (Knowles and others, 1982). Gutentag and others (1984) report hydraulic conductivity to be 25 to 100 ft/day and specific yield to be 0 to 30 percent.

Regional flow direction: southeast

Dockum Group (Lower)

Description Sheet

County location: Andrews

Oil field: Three Bar (Devonian)

Aquifer type (confined, unconfined): Unconfined to confined, may interconnect with Ogallala.

Major or sole source of water: Supplement to other supplies (Ogallala). Small to moderate supply capability. May be slightly to very saline.

Depth to top of aquifer: Approximate altitude of formation top: approximately 100 ft bgl. Approximate altitude of potentiometric surface: 2800 ft msl or 500 ft bgl in oil field area (Dutton and Simpkins, 1986).The potentiometric surface of the Dockum is below that of the overlying Ogallala aquifer; therefore, there is the potential for vertical downward flow (Dutton and Simpkins, 1986; Knowles and others, 1982).

Depth to bottom of aquifer: Approximate altitude of base of aquifer up to 2,000 ft bgl (Ashworth and others, 1991; Dutton and Simpkins, 1986).

Range of saturated thickness in vicinity of oil field: Combined thickness of Upper and Lower Dockum units is up to 1,800 ft thick in vicinity of oil field, (Dutton and Simpkins, 1986).

Regional lithology: Terrigenous sands and gravels, fine- to coarse-grained quartzose sandstone and conglomerates from meandering and braided streams and alluvial fans. Mudstone is also common. Sandstones show little regional lateral continuity. The Lower Dockum overlies Permian mudstones and evaporates (confining zone) (Dutton and Simpkins, 1986).

Local (county) information: Dockum Fm. underlies most of the county and is a minor source of small amounts of ground water. Lower Dockum in the area of the oil field is 10 to 30 percent sand. The Ogallala Fm. (aquifer) is the chief source of water for the western part of the county.

Water quality: TDS: 2000 to 4000 mg/L (Ashworth and others 1991). Lower Dockum: sodium, 860 mg/L; chloride, 518 mg/L, sulfate, 760 mg/L (Dutton and Simpkins, 1986).

Predominant uses: Agriculture (irrigation, stock). Often blended with Ogallala. Also some domestic supply, depending upon quality (usually Upper Dockum) (Knowles and others 1982).

Aquifer properties: Average transmissivity: 170 ± 70 ft^2/d (one well).

Regional flow direction: West to east but varies locally (Dutton and Simpkins, 1986).

Ogallala Aquifer

Description Sheet

County location: Lipscomb

Oil field: Tonkawa

Aquifer type (confined, unconfined): Unconfined throughout county.

Major or sole source of water?: yes

Depth to top of aquifer: 100 ft bgl, altitude of water table 2500-2300 ft msl, sloping downward from west to east, in 1980 (Gutentag et al., 1984).

Depth to bottom of aquifer: Up to 700 ft bgl. Altitude of base of aquifer 2400-2100 ft msl, sloping downward from west to east. See attached figure (Gutentag et al., 1984). Aquifer is underlain by Permian red bed shales. Aquifer saturated thickness varies from 100-400 ft.

Range of saturated thicknesses in vicinity of oil field: Measured: 175-300 ft (1974); 150-300 ft (1980, projected); 125-275 ft (1990, projected); 100-250 ft (2000, projected) (Bell and Morrison, 1981). Measured: 420-160 ft (Knowles et al., 1982).

Regional lithology: Late Tertiary (Pliocene) age rocks of the Ogallala formation are comprised of interfingering, unconsolidated fine to coarse sand, gravel silt, and clay. Caliche layers or beds present near the formation top and in outcrops. (Bell and Morrison, 1981; Gutentag et al., 1984). Valley-fill, eolian, and braided stream deposits predominate. Aquifer thickness may vary widely over short horizontal distances due to the infilling of pre-Ogallala valley cuts (Weeks, et al., 1988).

Local (county) lithology: Underlies entire county.

Water quality: Generally good. Total Dissolved Solids (TDS) are 250-1000 mg/L in the local area. Sodium concentration 25-100 mg/L (Gutentag et al, 1984). Knowles et al. (1982) list TDS of 400-600 mg/L. Some areas impacted by presence of nitrate from agriculture.

Predominant uses: Agriculture (irrigation) and drinking supply.

Aquifer properties: Coefficient of storage is nearly equal to the specific yield, defined as the quantity of water that a formation will yield under the force of gravity, as a percentage of the volume of the material drained. Storage coefficient is 0.15 on average for the Ogallala (Bell and Morrison, 1981). Average transmissivity for Lipscomb county: 48,000 gpd/ft. Permeability average: 149 gpd/ft^2.

Regional flow direction: East.

Ogallala Aquifer

Description Sheet

County location: Howard

Oil field: Vealmoor

Aquifer type (confined, unconfined): Unconfined throughout county.

Major or sole source of water: Major source in southwestern and central part of county.

Depth to top of aquifer: Aquifer outcrops in county at 2750 ft msl near oil field. Altitude of water table is 130 ft bgl in vicinity of oilfield (Knowles and others, 1984; Taylor, 1979).

Depth to bottom of aquifer: Altitude of base of aquifer is approximately 2600 ft msl. Overall altitude is variable in county (Knowles and others, 1984).

Range of saturated thickness in vicinity of oil field: Aquifer saturated thickness varies from 20 to 60 ft in vicinity of oil field (Knowles and others 1979). Gutentag and others, (1984) give thickness of 0 to 100 ft. Projected thickness changes from 10 to 50 ft of drawdown by 2020 (Weeks and others, 1980).

Regional lithology: Late Tertiary (Pliocene) age rocks of the Ogallala formation are composed of interfingering, unconsolidated fine to coarse sand, gravel silt, and clay. Caliche layers or beds present near the formation top and in outcrops. (Bell and Morrison, 1981; Gutentag and others, 1984). Valley-fill, eolian, and braided stream deposits predominate. Aquifer thickness may vary widely over short horizontal distances due to the infilling of pre-Ogallala valley cuts (Weeks, and others, 1988). Underlain in Howard County by Triassic (Upper Dockum Fm., siltsone, clay stone, sandstone, limestone) (Knowles and others, 1982).

Local (county) information: Ogallala underlies about two-thirds of the county. Triassic sediments (Dockum) which underlie the Ogallala are also a source of water in Howard County.

Water quality: TDS are 600 to 2,000 mg/L and chloride is variable, from 50 to 500 mg/L (Knowles and others, 1982). Gutentag and others (1984) list TDS at 500 to 1,000 mg/L and sodium from 50 to 100 mg/L.

Predominant uses: Agriculture (irrigation) and drinking supply

Aquifer properties: Storage coefficient is 0.15 on average for the Ogallala (Bell and Morrison, 1981). Reported transmissivities for average Ogallala: 315 to 201,000 gpd/ft. Specific yield is 7 to 20 percent; permeability, 22 to 1,950 gpd/ft^2 (Knowles and others, 1982). Gutentag and others (1984) report hydraulic conductivity to be 25 to 100 ft/day and specific yield between 0 and 30 percent.

Regional flow direction: southeast

Dockum Group (Lower)

Description Sheet

County location: Howard

Oil field: Vealmoor

Aquifer type (confined, unconfined): Unconfined (outcrops in vicinity of oil field).

Major or sole source of water: Sole source in some areas (eastern part of county), or supplement to other supplies elsewhere. Small to moderate supply capability. TNRCC does not protect this unit in many areas where Cretaceous (overlying) aquifers are viable (TNRCC, 1998).

Depth to top of aquifer: Approximate altitude of formation top: approximately ground surface (2750 ft msl) and up to 200 ft bgs to south. Approximate altitude of potentiometric surface: 2250 (regional) (Dutton and Simpkins, 1986).The potentiometric surface of the Dockum is below that of the overlying High Plains and Ogallala aquifers, where present. Thus there is the potential for vertical downward flow (Dutton and Simpkins, 1986; Knowles and others, 1982).

Depth to bottom of aquifer: Approximate altitude of base of aquifer, up to 1000 ft bgs (Dutton and Simpkins, 1986). TNRCC normally protects the unit in area of the oil field to about 400 ft bgs.

Range of saturated thickness in vicinity of oil field: Up to 1000 ft thick.

Regional lithology: Terrigenous sands and gravels, fine- to coarse-grained quartzose sandstone and conglomerates from meandering and braided streams and alluvial fans. Mudstone is also common. Sandstones show little regional lateral continuity. Thick, coarse-grained sandstones common in eastern parts of the Group. The Lower Dockum overlies Permian mudstones and evaporates (confining zone) (Dutton and Simpkins, 1986).

Local (county) information: Dockum Fm. underlies most of the county and is a minor source of small amounts of ground water. The Ogallala Fm. (aquifer) is the chief source of water for the western part of the county. Edwards-Trinity (High Plains aquifer) Group or Ogallala may overlap slightly in this area south of the oil field; some wells cross both Dockum and higher formations. Saturated thickness of that group is <50 ft (Ashworth and others, 1991). Depth to water in Ogallala was 130 ft bgs in 1977 (Taylor, 1979).

Water quality: TDS, 5,900 mg/L; sodium, 2,050 mg/L; chloride, 1,571 mg/L; sulfate, 1,656 mg/L (Dutton and Simpkins, 1986).

Predominant uses: Agriculture (irrigation, stock) and domestic drinking supply.

Aquifer properties: none available.

Regional flow direction: Northwest to southeast but varies locally (Dutton and Simpkins, 1986).

Appendix F-2
Aquifer Summaries - MAYBE Category

Ogallala Aquifer

Description Sheet

County location: Terry

Oil fields: Adair (Wolfcamp), Wellman

Aquifer type (confined, unconfined): Unconfined throughout county.

Major or sole source of water?: Yes.

Depth to top of aquifer: Approximately 10-80 ft bgl.

Depth to bottom of aquifer: Altitude of base of aquifer 3000-3400 ft msl, overall altitude is variable in county (Cronin, 1971). Aquifer saturated thickness varies from 100-400 ft.

Local (county) information: Ogallala underlies almost all of Terry county. Triassic sediments (Dockum) which underlie part of the Ogallala are also a source of water.

Water quality: Total Dissolved Solids (TDS) is 250-2000 mg/L Chloride increases to west, varies from 100-500 mg/L (Knowles et al. (1982).

Ogallala Aquifer

Description Sheet

County location: Lipscomb

Oil field: Bradford (Tonkawa)

Aquifer type (confined, unconfined): Unconfined throughout county.

Major or sole source of water?: Major source.

Depth to top of aquifer: Land surface elevation varies from 2850-2000 ft msl. Depth to water table 15-350 ft bgl, sloping downward from west to east, in county; water elevation varied from 2500-2350 ft msl in 1984 in vicinity of oil field (Knowles et al., 1984).

Depth to bottom of aquifer: Altitude of base of aquifer 2400-2100 ft msl, overall altitude is extremely variable in county. Depth to base up to 600 ft bgl (Knowles et al., 1981; Knowles et al., 1984). Aquifer is underlain by Permian red bed shales.

Canyon and Cisco Groups

Description Sheet

County location: Jack

Oil fields: Bryson, East; Woodkirk (Strawn)

Aquifer type (confined, unconfined): Confined.

Major or sole source of water?: Multiple units within these two groups are responsible for most water sources in the county. None are a major source by themselves.

Depth to top of aquifer: Approximate altitude of formation top is outcrop of Cisco Group at ground surface (Duffin and Beynon, 1992; Nordstrom, 1988), approximately 950-1420 msl Approximate altitude of water table variable 880-1350 ft msl in county historically and depending upon formation measured (Harden, 1978).

Depth to bottom of aquifer (BGS): Saturated thicknesses vary with formation. Total thickness of Canyon Group measured to be about 1200 ft (Nordstrom, 1988). The groups dip toward northwest, and so the base of aquifer deepens in this direction, up to 500 ft msl elevation approximately (Duffin and Beynon, 1992).

Seymour Fm.

Description Sheet

County location: Foard, Knox

Oil fields: Choate (Cisco-K), Knox City, North (Canyon)

Aquifer type (confined, unconfined): Unconfined.

Major or sole source of water?: Major source of ground water and sole source of fresh water where extant. Horizontal and vertical extent of aquifer is variable.

Depth to top of aquifer: Approximate altitude of formation top is outcrop at ground surface (Duffin and Beynon, 1992), approximately 1525 ft msl. Approximate altitude of water table is 1400-1650 ft msl in county historically (Harden, 1978).

Depth to bottom of aquifer: Maximum saturated thickness of formation is approximately 50 ft (Harden, 1978). Total thickness is about 100 ft (Duffin and Beynon, 1992). Thickness may vary markedly over relatively short horizontal distances. Base of aquifer up to 94 ft bgl, variable between 20-94 ft (Harden, 1978).

Dockum Group (Lower)

Description Sheet

County location: Andrews, Gaines

Oil field: Fullerton, Magutex, Means, N., Midland Farms, Russell, Embar

Aquifer type (confined, unconfined): Unconfined to confined, may interconnect with Ogallala.

Major or sole source of water?: Supplement to other supplies (Ogallala). Small to moderate supply capability. May be slightly to very saline.

Depth to top of aquifer: Approximate altitude of formation top: approximately 100 ft bgs. Approximate altitude of potentiometric surface: 2800 ft msl or 500 ft bgl in oil field area (Dutton and Simpkins, 1986).

Depth to bottom of aquifer: Approximate altitude of base of aquifer up to 2000 ft bgl (Ashworth et al., 1991; Dutton and Simpkins, 1986).

Local (county) information: Dockum Fm. underlies most of the county and is a minor source of small amounts of ground water. Lower Dockum in the area of the oil field is 10-30 percent sand. The Ogallala Fm. (aquifer) is the chief source of water for the western part of the county.

Water quality: TDS, 2,000-4,000 mg/L (Ashworth et al. 1991). Lower Dockum, sodium, 860 mg/L; chloride, 518 mg/L; sulfate, 760 mg/L (Dutton and Simpkins, 1986).

Chicot Fm. and Evangeline Fm.

Description Sheet

County location: Hardin

Oil field: Hardin

Aquifer type (confined, unconfined): Confined in most areas but variable with location.

Major or sole source of water?: Major source, quality good where not affected by salt domes.

Depth to top of aquifer: Altitude of water table was approximately 0 to -50 ft msl (Baker, 1986). Some authors document rising piezometric surfaces regionally (Gabrysch, 1980). Ground surface is at about 30-100 ft msl, so that depth to water is approximately between 15 and 90 ft bgl.

Depth to bottom of aquifer: Base of fresh water in sands is defined as water with <3000 mg/L TDS or less based on electric logs (Baker, 1979). Altitude of base of Lower Chicot formation in county is between -200 to -800 ft msl (Baker, 1986). Well depths extend through the Evangeline Fm. where water quality permits, up to about -2300 ft msl.

Cenozoic Alluvium

Description Sheet

County location: Reeves

Oil fields: Ken Regan (Delaware), Waha, North (Delaware Sand)

Aquifer type (confined, unconfined): Unconfined.

Major or sole source of water?: Major source. Edwards-Trinity Fms. and Permian rocks (Rustler Fm) below can be sources for irrigation or livestock.

Depth to top of aquifer: Approximate altitude of formation top: 2600-3000 ft msl (may be land surface). Approximate altitude of potentiometric surface: 50 ft bgl and up to 460 ft bgl (2490-2900 ft msl) regionally. Underlying, and hydraulically connected Santa Rosa Fm. indicates potential for vertical downward movement (Rees, 1987; Garza and Wesselman, 1959).

Depth to bottom of aquifer: Altitude of base of aquifer varies from 1400 ft to near 3000 ft msl in the region, mostly within the Pecos Trough (Ashworth, 1990).

Range of saturated thicknesses in vicinity of oil field: May be 30-1250 ft regionally (Rees, 1987; Ashworth, 1990).

Ogallala Aquifer

Description Sheet

County location: Andrews, Gaines

Oil fields: Midland Farms, Fullerton, Magutex, Means, N., Russell, Embar.

Aquifer type (confined, unconfined): Unconfined throughout county.

Major or sole source of water?: Yes.

Depth to top of aquifer: Approximately 10-80 ft bgl. Altitude of water table 2900-3250 ft msl, sloping downward variably from west to east (Knowles et al.,1982). 0-100 ft of thickness (Gutentag et al., 1984).

Depth to bottom of aquifer: Altitude of base of aquifer 2700-2924 ft msl, overall altitude is variable in county (Knowles et al., 1981). Aquifer is underlain by Permian red bed shales. Aquifer saturated thickness varies from 100-400 ft.

Local (county) information: Ogallala underlies almost all of Andrews county. Triassic sediments (Dockum) which underlie part of the Ogallala are also a source of water in Andrews County. Ogallala outcrops in Gaines county and is extant in the subsurface only in western one-third of county, west of Post. As a result, the aquifer is very thin in this area.

Water quality: Total Dissolved Solids (TDS) are 250-2000 mg/L. Chloride increases to west, varies from 100-500 mg/L (Knowles et al. (1982).

Cenozoic Alluvium

Description Sheet

County location: Ward, Winkler, Loving

Oil fields: Monahans (Queen Sand), Emperor (Deep), Grice (Delaware), Wheat, Keystone

Aquifer type (confined, unconfined): Unconfined.

Major or sole source of water?: Major source. Dockum Fm. and Permian rocks (Rustler Fm) below can be sources for irrigation or livestock.

Depth to top of aquifer: Approximate altitude of formation top: 2600-3000 ft msl (may be land surface). Approximate altitude of potentiometric surface: 50 ft bgs and up to 460 ft bgs (2490-2900 ft msl) regionally. Underlying, and hydraulically connected Santa Rosa Fm. indicates potential for vertical downward movement (Rees, 1987; Garza and Wesselman, 1959).

Depth to bottom of aquifer: Altitude of base of aquifer varies from 1800 to near 3000 ft msl in the region, mostly within the Monument Draw Trough (Ashworth, 1990).

Range of saturated thicknesses in vicinity of oil field: May be 30-1250 ft regionally (Rees, 1987).

Antlers Formation

Description Sheet

County location: Howard

Oil field: Moore

Aquifer type (confined, unconfined): Unconfined where outcropping, may be confined locally below clay lenses.

Major or sole source of water?: Major source. Ogallala is also an important local source where it exists and is connected to Antlers.

Depth to top of aquifer: Aquifer in county is overlapped slightly by Ogallala Fm. Approximate altitude of piezometric surface in Antlers varies from 2500-2450 ft msl, sloping variably in vicinity of oil field. Saturated thickness 20-80 ft (Knowles et al., 1984).

Depth to bottom of aquifer: Thickness of the Antlers is difficult to determine because of the presence of reworked lower beds at the formation base. The altitude of the base of the Edwards-Trinity (Plateau) group is about 2400-2500 msl (Knowles et al., 1984).

Ogallala Aquifer

Description Sheet

County location: Howard

Oil field: Moore

Aquifer type (confined, unconfined): Unconfined throughout county.

Major or sole source of water?: Major source in southwestern and central part of county.

Depth to top of aquifer: Aquifer outcrops in county at 2348-2800 ft msl. Saturated thickness 0-100 ft (Cronin, 1971).

Depth to bottom of aquifer: Altitude of base of aquifer approximately 2400-2600 ft msl (Cronin, 1971; Knowles et al.,1984). Well depths vary from 11 to 233 ft.

Chicot Fm. and Lower Chicot

Description Sheet

County location: Ft. Bend

Oil field: Moores Orchard, Thompson North

Aquifer type (confined, unconfined): Confined in most areas but variable with location.

Major or sole source of water?: Major source, quality very good.

Depth to top of aquifer: Altitude of water table (1990) was approximately 80 to -30 ft msl (Thorkildsen, 1990), although some authors document rising piezometric surfaces regionally (Gabrysch, 1980). Ground surface is at about 60 to 125 ft msl, so that depth to water is between 15 and 90 ft bgl.

Depth to bottom of aquifer: Altitude of base of Lower Chicot formation in county is between 420 to 800 ft msl (Thorkildsen, 1990). Base of fresh water in sands defined as water with <3000 mg/L TDS or less based on electric logs, indicated as about -500 ft msl (Baker, 1979). Well depths may extend somewhat into underlying Evangeline Fm. where water quality permits.

Ogallala Aquifer

Description Sheet

County location: Moore, Carson, Gray, Hutchinson, Wheeler, Sherman

Oil fields: Panhandle (Red Cave), Panhandle Field, Texas Hugoton

Aquifer type (confined, unconfined): Unconfined.

Major or sole source of water?: Yes, part of High Plains Aquifer.

Depth to top of aquifer: Altitude of water table 3100-3450 ft msl, sloping downward from west to east, in 1980, in region (Gutentag et al., 1984). Depth to water typically 120-300 ft bgl.

Depth to bottom of aquifer: Altitude of base of aquifer 2300-3400 ft msl, rising from east to west typically. Overall altitude is extremely variable in region. Aquifer is underlain by Permian red bed shales.

Range of saturated thicknesses in vicinity of oil field: Aquifer saturated thickness varies from 20-420 ft in area (Knowles et al. 1981). Gutentag et al. (1984) give thickness of 100-400 ft. Water level altitude 2350-3500 ft msl regionally (Knowles et al. 1984).

Dockum Group (Lower)

Description Sheet

County location: Garza

Oil field: Post (Glorieta)

Aquifer type (confined, unconfined): Unconfined to east near outcrop, otherwise locally confined.

Major or sole source of water?: Sole source in some areas (eastern part of county), or supplement to other supplies elsewhere. Small to moderate supply capability.

Depth to top of aquifer: Approximate altitude of formation top: 3330 ft msl (approximately at ground surface). Approximate altitude of potentiometric surface: 2850-2500 in Garza Co., sloping downward from northwest to southeast (Dutton and Simpkins, 1986). The potentiometric surface of the Dockum is 100 to 700 ft below that of the overlying High Plains aquifer, where present, and thus there is the potential for vertical downward flow (Dutton and Simpkins, 1986; Knowles et al., 1982). Interconnections may be poor, however, owing to permeability contrasts.

Depth to bottom of aquifer: Approximate altitude of base of aquifer 1030 ft msl or 2300 ft bgl (Dutton and Simpkins, 1986).

Local (county) information: Dockum Fm. underlies most of the county and is a minor source of small amounts of ground water. The Ogallala Fm. (aquifer) is the chief source of water for the western part of the county.

Water Quality: Total Dissolved Solids (TDS) are given as 5,610-46,000 mg/L; sodium is reported as 2,020-16,930 mg/L; chloride is listed as 2,170-25,160 mg/L. Quality is variable with source depth and potential effects of evaporite deposits (Dutton and Simpkins, 1986). More saline ground waters tend to occur in sand-poor areas of the formation. The county lies within an area of Na-Cl ground water facies within the aquifer. Shallow brine disposal wells and pits may have caused local aquifer contamination.

Carrizo-Wilcox Fms.

Description Sheet

County location: Wood

Oil fields: Quitman

Aquifer type (confined, unconfined): Confined in some areas, but variable with outcrop location.

Major or sole source of water?: Major source, Wilcox Group. is deepest source of fresh water in area.

Depth to top of aquifer: Outcrops at surface in county, surface elevation from 450-460 ft msl. Depth to water varies from 60 to 100 ft bgl. Elevation of potentiometric surface varies from 360 to 390 ft msl.

Depth to bottom of aquifer: Exposed at ground surface in county. The Wilcox is up to 900 ft thick, and so the base of aquifer elevation is approximately -100 to -400 msl in vicinity of oil field (Broom, 1968).

Dockum Group (Lower)

Description Sheet

County location: Borden

Oil field: Reinecke

Aquifer type (confined, unconfined): Unconfined (outcrops in county).

Major or sole source of water?: Sole source in some areas. Small to moderate supply capability. TNRCC does not protect this unit below certain depths (TNRCC, 1998).

Depth to top of aquifer: Approximate altitude of formation top: approximately ground surface. Approximate altitude of potentiometric surface: 600 ft bgs (<2000) (regional) (Dutton and Simpkins, 1986).

Depth to bottom of aquifer: Approximate altitude of base of aquifer, up to 800 ft bgs (Dutton and Simpkins, 1986).

Cenozoic Alluvium and Alluvium

Description Sheet

County location: Pecos, Crane

Oil fields: Sand Hills (McKnight), Bayview (Glorieta), Brown and Thorpe (Clear Fork)

Aquifer type (confined, unconfined): Unconfined.

Major or sole source of water?: Major source. Edwards-Trinity Fms. and Dockum Fm. below can be sources for irrigation or livestock.

Depth to top of aquifer: Approximate altitude of formation top: 2300-2700 ft msl (may be land surface). Approximate altitude of potentiometric surface: 10 ft bgl and up to 200 ft bgl (2200-2650 ft msl) regionally. Underlying, and hydraulically connected Santa Rosa Fm. indicates potential for vertical downward movement (Rees, 1987; Garza and Wesselman, 1959).

Depth to bottom of aquifer: Altitude of base of aquifer varies from 1400 to near 2700 ft msl in the region, mostly adjacent to the Mountain Draw Trough (Ashworth, 1990).

Range of saturated thicknesses in vicinity of oil field: May be 30-300 ft regionally (Rees, 1987; Ashworth, 1990).

Dockum Group (Lower)

Description Sheet

County location: Scurry

Oil field: Sharon Ridge (Clear Fork)

Aquifer type (confined, unconfined): Confined where below Chinle; may be unconfined at outcrop (outcrops as Santa Rosa (lower unit of Dockum).

Major or sole source of water?: Sole source in some areas. Moderate supply capability, but poor quality (highly mineralized) at depth.

Depth to top of aquifer: Approximate altitude of formation top is ground surface. Approximate depth of potentiometric surface: 15-215 ft bgl (Shamburger, 1967).

Depth to bottom of aquifer: Approximate altitude of base of Santa Rosa, about 1550-1900 ft msl (Shamburger, 1967). Lower Dockum Group is about 800-1000 ft thick in area of oil field. Most wells less than 500 ft deep, some over 800 ft deep (Dutton and Simpkins, 1986).

Chicot Fm. and Evangeline Aquifers

Description Sheet

County location: Colorado

Oil field: Sheridan

Aquifer type (confined, unconfined): Confined in most areas but variable with location.

Major or sole source of water?: Major source, quality very good.

Depth to top of aquifer: Altitude of water table was approximately at sea level (0 msl) (Baker, 1986), although some authors document rising piezometric surfaces regionally (Gabrysch, 1980). Ground surface is at about 150 ft msl, so that depth to water is about 150 ft bgl.

Depth to bottom of aquifer: Regional altitude of base of Lower Chicot formation in county is down to -300 ft msl (Baker, 1986). Deepest fresh water in sands defined as water with <3000 mg/L TDS or less based on electric logs, indicated as about -1200 ft msl (Baker, 1979). Well depths can extend into underlying Evangeline Fm. and Jasper aquifers where water quality permits.

Upper Chicot Fm.

Description Sheet

County location: Jefferson

Oil field: Stowell (Crawford U-1)

Aquifer type (confined, unconfined): Confined in most areas, but variable with location.

Major or sole source of water?: Major source.

Depth to top of aquifer : Altitude of water table (1975) was approximately -120 to -100 ft msl (Gabrysch, 1980). Current data indicate a rebound to about -20 ft msl in the county (Gabrysch, 1980). Altitude of base of fresh water given as 200 ft below msl in the Upper Chicot (Wesselman 1973).

Depth to bottom of aquifer: Altitude of base of aquifer formation in vicinity of oil field: -700 to -1000 ft msl (Jorgensen, 1975; Gabrysch, 1980). Base of fresh water in sands defined as water with <3000 mg/L TDS or less based on electric logs, indicated as about -500 ft msl (Baker, 1979). Well depths may extend somewhat into underlying Evangeline Fm. where water quality permits. Two wells (6414406, 6414407) drilled in vicinity of oil field to 223 and 253 ft, respectively (Wesselman, 1973).

Range of saturated thicknesses in vicinity of oil field: Up to 500 ft of fresh water (see above).

Regional lithology: Quaternary-age sediments with discontinuous layers of sand and clay, large sand-clay ratio. Sand beds typically tens of ft thick, with intervening lower-permeability clays. Includes Beaumont Fm., with clay, silt, sand, including stream channel, point bar, levee, backswamp, and coastal marsh deposits, Willis Sand, Lissie Fm., and Quaternary alluvium. Base of the Chicot is the Evangeline Fm, a more consolidated formation.

Local (county) information: Gabrysch (1980) noted a 10 to 30 ft decline in Chicot head levels from 1965-1975 in areas that are heavily pumped, although some rebound has been recorded in more recent times. Only small amounts of water of less than 1,000 mg/L TDS available in county (Wesselman, 1973).

Water quality: Relatively good quality, but susceptible to pollution. Quality tends to deteriorate with depth (increasing TDS) and with increasing decrease in water levels in wells.

Predominant uses: Public/municipal supply, industrial, agricultural/irrigation.

Aquifer properties: Coefficients of permeability: 108-1,670 gpd/ft2. The lower Chicot is more permeable than the upper (Wesselman, 1973).

Regional flow direction: Southeasterly, with dip of formation.

Edwards-Trinity (Plateau)

Description Sheet

County location: Crockett

Oil field: Todd Deep (Crinoidal)

Aquifer type (confined, unconfined): Unconfined, may be confined locally below clay lenses in Antlers Sand and Triassic. Interconnected with Santa Rosa Fm. below (Triassic Dockum Fm.).

Major or sole source of water?: Major source. Aquifer of note is Edwards with associated limestones connected with underlying Antlers Sand (Trinity Group) and Santa Rosa Fm.

Depth to top of aquifer: Formation outcrops at surface throughout county. Depth to top of potentiometric surface varies from 2400-1800 ft msl (Walker, 1979).

Depth to bottom of aquifer: 1400-1200 ft msl is elevation of base of aquifer (Walker, 1979).

Range of saturated thicknesses in vicinity of oil field: Up to 400 ft in Crockett county, including underlying Santa Rosa where present (Walker, 1979).

Regional Lithology: Edwards and associated limestones include white to gray fossiliferous thin to massive limestone with chert beds, brown, granular dolomite. Antlers Sand includes white to red, fine to medium-grained sand with some beds of caliche. Scattered lenses of gravel, in places conglomeritic at base. Santa Rosa Fm. is multicolored, fine to coarse-grained, micaceous sandstone interbedded with variegated shale.

Local (county) information: Edwards and Antlers Fm. exist throughout county, Santa Rosa underlies one portion of area. Aquifers are interconnected and total thickness is used to determine base. Saline waters lie below the base interface.

Water quality: Typical sulfate, 9-788 mg/L; chloride, 17-1260 mg/L; nitrate, 9-29 mg/L; TDS, 270-2550 mg/L (Walker, 1979). Quality is a blend of water from several formations and varies considerably with the intercepted formations. Antlers water is more highly mineralized than water from the Edwards limestones.

Predominant uses: Agriculture (irrigation, stock), oil field/industrial, and drinking supply.

Aquifer properties: Average well yield in county, 242 gpm in 1979. One specific capacity test gave a value of 9.56 gpm/ft. Specific capacity from the Antlers aquifer in nearby counties varied from 0.257 to 2,200 gpm/ft (Walker, 1979).

Regional flow direction: West to east.

Chicot Fm. and Evangeline Fm.

Description Sheet

County location: Harris

Oil field: Tomball

Aquifer type (confined, unconfined): Confined in most areas but variable with location.

Major or sole source of water?: Major source, quality good where not affected by salt domes.

Depth to top of aquifer: Altitude of water table was approximately 150 to -200 ft msl (Baker, 1986). Some authors document rising piezometric surfaces regionally (Gabrysch, 1980). Ground surface is at about 30-200 ft msl, so that depth to water is approximately between 15 and 200 ft bgl.

Depth to bottom of aquifer: Base of fresh water in sands is defined as water with <3000 mg/L TDS or less based on electric logs (Baker, 1979). Altitude of base of Lower Chicot formation in county is between 0 to -800 ft msl (Baker, 1986). Well depths extend through the Evangeline Fm. where water quality permits, up to about -2500 ft msl.

Antlers Formation

Description Sheet

County location: Ector

Oil fields: Txl(Tubb), Goldsmith (clear fork), Goldsmith, N.(San Andres), Cowden, S., Txl(Ellenburger).

Aquifer type (confined, unconfined): Unconfined, may be confined locally below clay lenses.

Major or sole source of water?: Major source.

Depth to top of aquifer: Aquifer may be overlapped slightly by thin Ogallala Fm. Top of the Trinity Group which contains the Antlers is between 3100 and 3000 ft msl in central part of county. Approximate altitude of ground surface in county is 3300 ft msl (Walker, 1979). Approximate altitude of piezometric surface in Antlers varies from 2900-3100, sloping downward from west to east in area of oil field.

Depth to bottom of aquifer: Thickness of the Antlers is difficult to determine because of the presence of reworked lower beds at the formation base. The thickness of the Antlers varies from 70-120 ft in Ector county (Walker, 1979). The altitude of the base of the Edwards-Trinity (Plateau) group is about 2900 to 3000 ft msl (Walker, 1979).

Local (county) information: Flow directions normally to southeast, locally variable depending upon discharge zones. The Antlers may be in connection with the underlying Santa Rosa (Triassic Dockum Fm.) Formations above, such as the Ogallala or the Edwards are unsaturated in parts of Ector county.

Water quality: Typical sulfate, 55-530 mg/L; chloride, 38-530 mg/L; nitrate, 9.5-34 mg/L; TDS, 375-1070 mg/L (Walker, 1979). Quality is poorer in western and central part of county.