OCCURRENCE AND AVAILABILITY OF GROUND WATER IN THE VICINITY OF COMMERCE, TEXAS

Prepared

By

Bernard B. Baker

Texas Water Development Board

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Introduction

A brief investigation of the ground water resources in the vicinity of Commerce, Texas was undertaken in late 1970 and proceeded intermittently through March 1971. This work was done as a result of a request from Mr. Frazer Edmonds, City Manager of the City of Commerce. Mr. Edmonds was particularly interested in the possibility of developing a fresh water supply from the Paluxy Sand.

The Texas Water Development Board agreed to compile available information on the Paluxy Sand and the Nacatoch Sand in northeastern Hunt and western Delta Counties which will assist the city in determining whether or not to drill a test well to the Paluxy Sand or to continue to explore the Nacatoch Sand which currently supplies the City of Commerce, East Texas State University and numerous stock and domestic supplies in the Commerce area.

This report presents information pertaining to the geology of the Commerce area, the water-bearing characteristics of the Paluxy and Nacatoch Sands and the theoretical effects of pumping on water levels in areas of potential development. In addition, basic data contained in this report includes records of wells and test holes drilled in the Commerce area, drillers logs and chemical analysis of water from selected wells.

Well Numbering System

The well numbering system used in this report was adopted by the Texas Water Development Board for use throughout the State (Figure 1). Under this system each 1-degree quadrangle in the State is given a number consisting of two digits. All of the wells numbered as a result of this investigation falls entirely within quadrangle 17. This is the first two digits in the well number. Each 1-degree quadrangle is divided into 64, 7 ½ minute quadrangles, each numbered from 01 to 64. These are the third and fourth numbers of the well number. The area covered by this report fall within 7 ½ minute quadrangles 41, 42, 49 and 50. Each 7 ½ minute quadrangle is subdivided into 9, 2 ½ minute quadrangles and given a single digit number, 1 to 9. This is the fifth digit of the well number. Finally, each well within each 2 ½ minute quadrangle is numbered consecutively beginning with 01. This is the last two digits of the well number.

The location of wells and test holes numbered during this investigation are shown on Figure 2. Each of these numbered data points are listed in Table 2, Records of Wells and Test Holes. Drillers logs and chemical analyses from the wells and test holes are given in Tables 3 and 4 respectively and in each case bear the assigned well number.

LOCATION OF WELL 29-44-201

29 1-degree quadrangle
44 7 1/2 minute quadrangle
2 2 1/2 minute quadrangle
01 Well number within 2 1/2 minute quadrangle

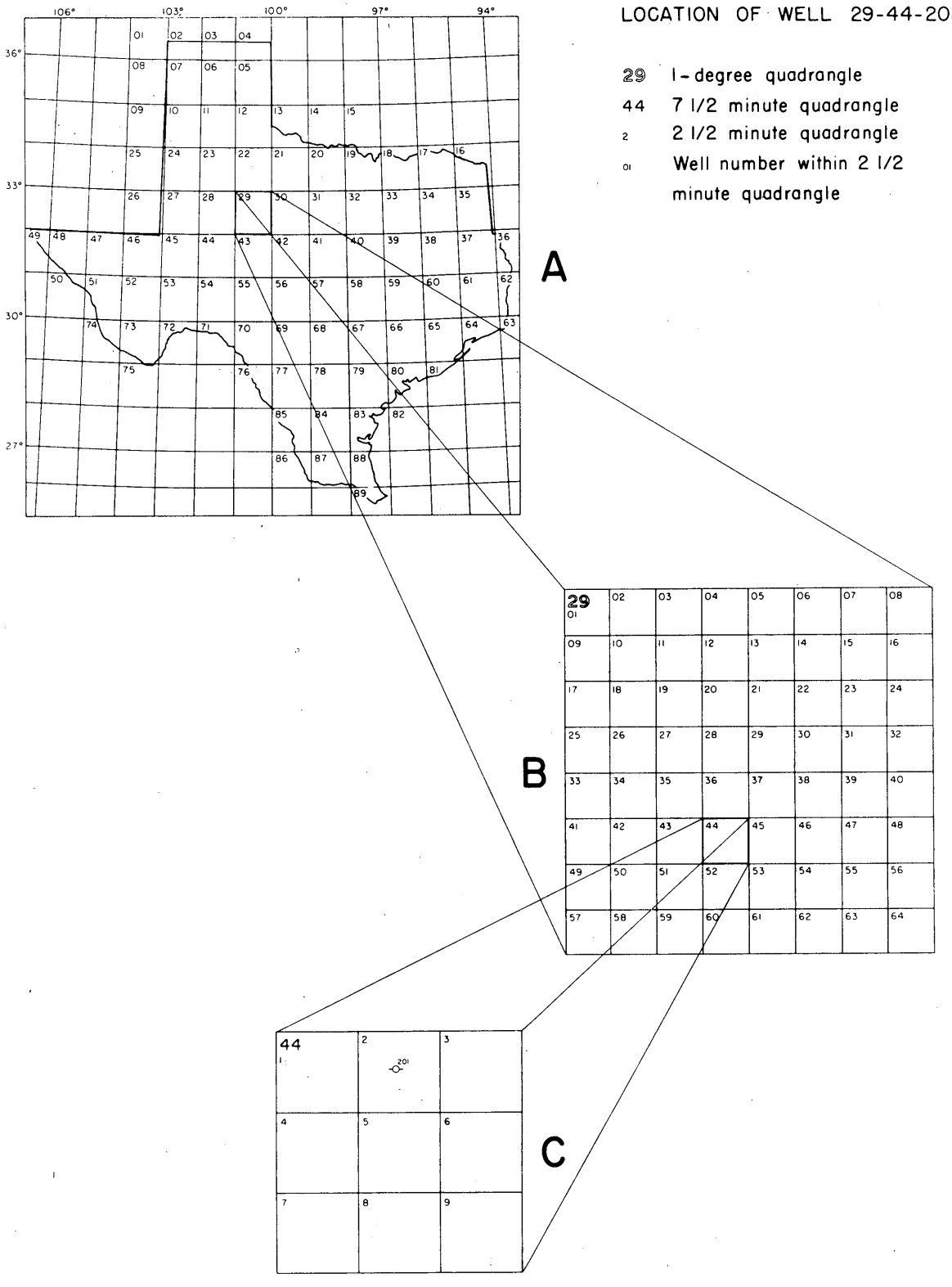

Figure 1
Well-Numbering System

Paluxy Sand

The Paluxy Sand is widespread throughout much of north central Texas. From its outcrop in Montague, Cooke, Wise, and Parker Counties the sand dips eastward and southeastward in the subsurface at about 40 to 75 feet per mile to occur at depths of 4,000 to 5,000 feet in the vicinity of Commerce. The otherwise continuous sand is disrupted by faulting along the Luling-Mexia-Talco Fault System which has broken and displaced the formation into a series of fault blocks. The Luling-Mexia-Talco Fault System consists of a series of more or less parallel faults which trend west-southwest in southern Delta and northern Hopkins County, entering Hunt County at Commerce and then south-southwestward across central Hunt County and east central Texas as far south as Guadalupe County.

The Paluxy Sand consists of fine grained sand with minor amounts of clay and shale. Its thickness in Hunt and adjoining counties generally ranges between 100 and 300 feet.

Only limited information on the Paluxy Sand is available in the Commerce area. However, the sand is encountered in oil tests at several localities in Hunt and adjoining counties. No water wells are known that produce from the Paluxy Sand in Hunt County. The nearest Paluxy well which produces water for municipal purposes is located at the City of Ladonia in southern Fannin County approximately 14 miles north of Commerce where the Paluxy was encountered at a depth of 3700 feet.

Most of the data available relating to water-bearing characteristics of the Paluxy pertain to Dallas and Tarrant Counties, where the formation is relatively uniform in thickness, transmissibility, and lithologic character and may not be applicable in areas outside the two county area.

Coefficients of transmissibility determined from pumping tests in Dallas and Tarrant Counties range from 3,000 to 5,700 gallons per day per foot (gpd/ft) and averaged 4,400 gpd/ft. Coefficients of permeability range from 36 to 47 gpd/ft^2. The coefficients of storage range from 0.000087 to 0.000034.

Pumping rates of wells completed in the Paluxy are as much as 400 gallons per minute (gpm). However, the more common pumping rates of larger wells are about 150 to 200 gpm. Specific capacities are generally less than 2.0 gpm per foot of drawdown. This indicates that large drawdowns are necessary for large yields, and a large artesian head (available drawdown) is required for large yields. For example, if a well with a specific capacity of 2.0 gpm per foot of drawdown is to be pumped at 400 gpm, more than 200 feet of available drawdown will be required to prevent dewatering the producing sands.

At Ladonia, in Fannin County, a 24 hour production test on the city's Paluxy well, had a drawdown of 47 feet while pumping 253 gpm. This is a specific capacity of 5.0 gpm/ft; higher than those recorded in Dallas or Tarrant Counties. The static water level before pumping at Ladonia was reported to be 206 feet below ground level and 3,594 feet above the top of the aquifer.

Since it is known however, that the Paluxy does yield usable quality ground water at Ladonia, north of Commerce, available electric logs of oil tests in northern Hunt and western Delta counties in the Texas Water Development Board files were examined to determine depths at which the Paluxy occurs and to estimate the quality of water in the Paluxy at the test site.

Table 1. Estimated Mineral Concentration in Water from the Paluxy Sand in Northeastern Hunt County and Adjoining Parts of Delta and Fannin Counties.

County	Survey	Well	Distance & Direction from Commerce	Depth to top of Paluxy	Mineral Content[1/] In (mgl)
Hunt	J.H. Jackson A-549	Nicklos O & G W.A. Swindell #1	½ mile NE	5300'	30,000
Hunt	J. Billingsley A-37	Oscar Kemp et al Brooks Cole #1	19½ miles W. SW	3170'	5,000
Hunt	Caloway Davis A-227	T.L. Mabry #1 Stephens et al	7 miles N.	3700'	3,500
Hunt	J.C. Sadler A-953	Roy White #1 Pan American	6 miles NW	3560'	2,800
Delta	J. Thadlock A-357	Knight G.U. #C-1	5½ miles E	4615'	20,000
Delta	J.C. Williams	Shaw and Manziol J.W. McCrary #1	3½ miles NE	4230'	30,000
Fannin	-	City of Ladonia	14 miles N	3700'	910

1/All estimates of mineral content are based on interpretations of electric logs except for the City of Ladonia which is that reported on an analysis of water from the City well.

Table 1 provides information on the depth to the top of the Paluxy and the estimated mineral concentration in water from the sand at seven localities in northeast Hunt, and adjoining parts of Delta and Fannin Counties.

Development of a municipal water supply for the City of Commerce from the Paluxy Sand does not appear to be very promising because of the depth at which the sand occur and because the water in the sands is highly mineralized. Limited data indicates the formation contains saline water in most parts of Hunt County and adjoining parts of Delta County. The formation in the immediate vicinity of Commerce contains saline water, probably on the order of 30,000 milligrams per liter (mgl).

The Paluxy is believed to contain between 2800 to 3500 mgl total dissolved solids at two localities, 6 to 7 miles north of town (Table 1). Water of this quality is generally considered to be undesirable for most uses.

The Paluxy Sand at Ladonia yields good quality water. An analysis of water taken from the municipal well during this investigation indicates the water contains 910 mgl, total dissolved solids. Concentration of the principal chemical constituents are as follows:

Silica	22 mgl	Bicarbonate	710 mgl
Calcium	3 "	Sulphate	128 "
Magnesium	2 "	Chloride	40 "
Sodium	354 "	Fluoride	2.4 "

The temperature of the water is 119°Fahrenheit.

The most promising area for exploration appears to be 10 to 14 miles north of the city in extreme northern part of Hunt County or southern Fannin County near Ladonia. The Paluxy is a proven source of good quality water in that locality. However, southward toward Commerce the Paluxy becomes deeper and the water becomes more mineralized and it should be borne in mind that the quality of water could change greatly within short distances.

It is estimated that yields of 200 to 400 gallons per minute can be developed from the Paluxy in southern Fannin County. Drawdowns of 50 to 200 feet should be expected initially depending upon pumping rates and aquifer characteristics. Long term drawdowns under continuous pumping of 200 to 400 gpm will be on the order of 100 to 250 feet. Although the expected yields of Paluxy wells would be greater than the current city wells which are developed in the Nacatoch Sand, the cost of exploratory testing, well construction, pumping equipment and pipeline facilities required to develop a Paluxy well in southern Fannin County would be great.

In addition the water will need to be cooled since temperatures of over 100 degrees Fahrenheit can be expected from the Paluxy in northern Hunt and southern Fannin Counties.

Should the city decide to pursue further the possibility of developing the Paluxy Sand for a municipal Supply, the services of an engineering consultant should be retained before exploration begins. A consultant could advise the city whether it would be more economical to test and develop the Paluxy or to continue to develop the Nacatoch Sand which is the source of the City's present supply.

Nacatoch Sand

The Nacatoch Sand is a member of the Navarro Group which in ascending order consists of the Neylandville Marl, the Nacatoch Sand, Corsecana Marl and the Kemp Clay. The outcrop of the Nacatoch Sand has not been mapped in the Commerce area, however, it is known to occur as a northeastward trending belt, approximately 1 to 4 miles wide, extending across central Hunt, southern Delta and northern Hopkins counties.

The Nacatoch Sand consists of sand, sandstone, shale and sandy shale. In the Commerce area, the formation ranges in total thickness from about 90 to 200 feet. In most places, however, the thickness ranges from about 100 to 150 feet. The formation usually consists of two sand beds separated by a shale and sandy shale unit. Locally a third sand bed occurs at the base of the formation but does not seem to be persistant in either occurrence or character. The thickness of the sand and shale units seem to vary locally and commonly the sand beds are broken with interbedded sand and shale and sandy shale. The formation tends to be somewhat thicker in western Delta County, than in Hunt County due mainly to the occurrence of the aforementioned basal sand lens. This lens is illustrated on Cross Section A-A' (Figure 4).

The total sand thickness within the formation ranges from about 45 foot up to 110 feet. In most places, the total sand thickness ranges between 60 and 90 feet. Like the total formation thickness, the sand thickness seems somewhat greater in Delta County, though not appreciably. The normal dip of the Nacatoch, where undisturbed by faulting, is about 50 to 150 feet per mile.

In the vicinity of the city of Commerce and adjacent parts of Hunt, Hopkins and Delta counties the Nacatoch Sand is cut by numerous faults of the Luling-Mexia-Talco Fault System. The System in the Commerce area consists of numerous, more or less parallel faults occurring in a zone several miles wide and extending westward through northern Hopkins County and southern Delta County, entering Hunt County at Commerce and then trending southwestward across Hunt County. Most of the major faults along this zone have been mapped. Probably numerous other faults of small displacement also occur in the zone but these have not been mapped. The faults are normal faults with the downthrown side commonly on the north or northwest. Some faults, however, are downthrown on the east or southeast thus down-thrown blocks or "grabens" occur between the faults.

The occurrence of the Nacatoch Sand in the vicinity of Commerce is affected by at least two major faults. One, the Peerless-Campbell fault trends across northern Hopkins County in the vicinity of Peerless, across southern Delta County entering Hunt County about 2 miles southeast of Commerce and passes about 1 mile south of the City then trends southwest to the vicinity of Campbell (Figure 3). The down-thrown side of this fault is to the north and west and in the vicinity of Commerce its displacement is about 400 feet. The other major, but unnamed fault, paralleling the Peerless-Campbell fault about 3 miles north, crosses the Hunt Delta County line about 3 miles northeast of Commerce. The fault is unmapped in Hunt County but is probably present north of the City of Commerce and possibly northwest of the City also. The downthrown side of this fault is on the south thus forming a graben between it and the

Peerless-Campbell fault to the south. The displacement along this fault is probably 300 to 400 feet.

The Nacatoch Sand occurs at or near the land surface south of the Peerless-Campbell fault where it dips south and eastward underlying younger rocks. North of Peerless-Campbell Fault, in the graben area, the Nacatoch sand had been displaced downward 300 to 400 feet.

The Nacatoch also probably occurs north of the graben in Delta County. Its extent, however, is not known but is probably limited.

Figure 3 shows the altitude of the top and depth to the top of the Nacatoch Sand in the graben area. Geologic cross-section A-A' (Figure 4) runs generally parallel to the faults which form the graben structure. Geologic cross-section B-B', (Figure 5) drawn across the strike of both faults illustrates the graben structure as well as illustrating the occurrence and relationship of the Nacatoch Sand within the graben and both north and south of the major faults.

The occurrence and availability of ground water in the Nacatoch sand in the Commerce area is largely controlled by the above described structure. The sand in the graben is effectively separated and isolated from other parts of the formation by the faults which form the graben structure. The Nacatoch Sand is recharged from precipitation falling on its outcrop. Although the outcrop is not mapped in Hunt County, the recharge area is believed to occur mainly west to southwest of the City. The water then moves generally eastward, parallel to the faulting. Thus the Nacatoch in the Graben is isolated from the remainder of the Nacatoch by the faults which form the Graben except west and southwest of Commerce where the sand is apparently continuous to the outcrop.

All the large capacity wells presently producing in the Commerce area including the City's municipal wells at Commerce and City wells in the Horton well field in Delta County, and the East Texas State University wells located southwest of Commerce are producing water from the Nacatoch sand in the graben (Figure 2).

Water Levels

Except in outcrop areas, water in the Nacatoch is under artesian pressure, and when the sand is penetrated by wells, the water under the pressure will rise above the top of the aquifer. Predevelopment water levels, that is, water levels in wells prior to the development of large number of high capacity wells often stood 250 to 100 feet above the top of the aquifer and in places less than 100 feet below land surface.

With the development of large capacity wells, water levels have declined markedly. Well 17-41-901 (City of Commerce Well No. 1) was drilled in 1914 and the reported water level was 125 feet below land surface or 425 feet above sea level. In 1953, the water level in this well was reported to be 280.9 feet below land surface or 269.1 feet above sea level, a decline of 155.9 feet in the 39 year period. An attempt to measure well 17-41-901 in February 1971 was unsuccessful. However, well 17-41-902 (City of Commerce well #2) located about 250 feet northwest of well 17-41-901 was measured and the water level was 318.8 feet below land surface or 241 feet above sea level. Comparing the water levels in the two closely spaced wells, adjusted to the same datum (sea level) it would seem that there has been an additional decline of 28 feet in the 21-year period since 1953 or a little over one foot per year. Total decline in the area since 1914 is 183.9 feet.

Since establishment of the City's Horton Well Field in western Delta County in 1965, water levels have also declined in that area and some persons residing in the area have reported the necessity of lowering their

pumps and in some cases drilling a new well. During this brief investigation it was not possible to obtain sufficient water level data, historical or current to establish overall declines in the Horton area.

Prior to development, water levels commonly stood 250 feet above the top of the sand. Now, in some areas the static levels are less than 100 feet above the top of the sand and pumping levels of the major wells are probably all near or below the top of the aquifer.

Available water level data are shown in Table 2, Records of Wells and Test Holes.

Water Quality

Water from the Nacatoch Sand in the Commerce area is generally of good quality. Analyses of water taken from wells in the area during this and previous studies indicate the mineral content ranges from 442 to 5500 milligrams per liter (mgl) total dissolved solids. Most of the samples, however, contain between 500 and 1000 mgl total dissolved solids (Table 4). The water has low concentrations of chlorides and sulphate and is suitable for most purposes.

Three wells sampled during this investigation (well 17-49-315 in Hunt County and wells 17-42-503 and 504 in Delta Counties) contain mineral concentrations in excess of 1000 mgl total dissolved solids and chloride concentrations of 349, 400 and 3260 mgl. These concentrations seem unusually high in comparison to other samples of Nacatoch water. In all three instances the wells are located very near major faults and possibly indicate the occurrence of poor quality water near these structures.

Water-bearing Characteristics

Aquifer tests conducted during previous investigations determined that the coefficients of transmissibility and storage of the Nacatoch Sand in the Commerce Area to be 2700 gallons per day per foot and .0006 respectively. These coefficients, indicate the aquifers ability to transmit and store water and are relatively low.

Theoretical effects of pumping

When water is pumped from a well, the water table (piezometric surface in artesian aquifer) is lowered in the vicinity of the well. The water table surrounding the pumping well assumes more or less the shape of an inverted cone with its apex at the pumping well. This cone is termed the cone of depression. The original water-level before pumping begins is termed the static level and the decline in the water table at any point caused by the pumping well is termed the drawdown. The size and shape of the cone depends upon transmissibility and storage coefficients of the aquifer, the pumping rate, length of pumping period, slope of the water table and recharge or barriers within the zone of influence of the well.

Figure 6 shows distance-drawdown graphs which were prepared using the aquifer coefficients determined from aquifer tests on the Nacatoch Sand in the Commerce area. These graphs represent the theoretical decline in water levels which would be experienced at varying times and varying distances from a well pumping at a constant rate of 100 gallons per minute from an aquifer with characteristics similar to that of the Nacatoch Sand in the Commerce area.

The graphs indicate that the greatest decline in water levels occur within the first 24 hours of pumping. Thereafter, the cone of depression continues to expand and water levels continue to decline at a progressively slower rate. The graphs show that pumping only 100 gallons per minute from

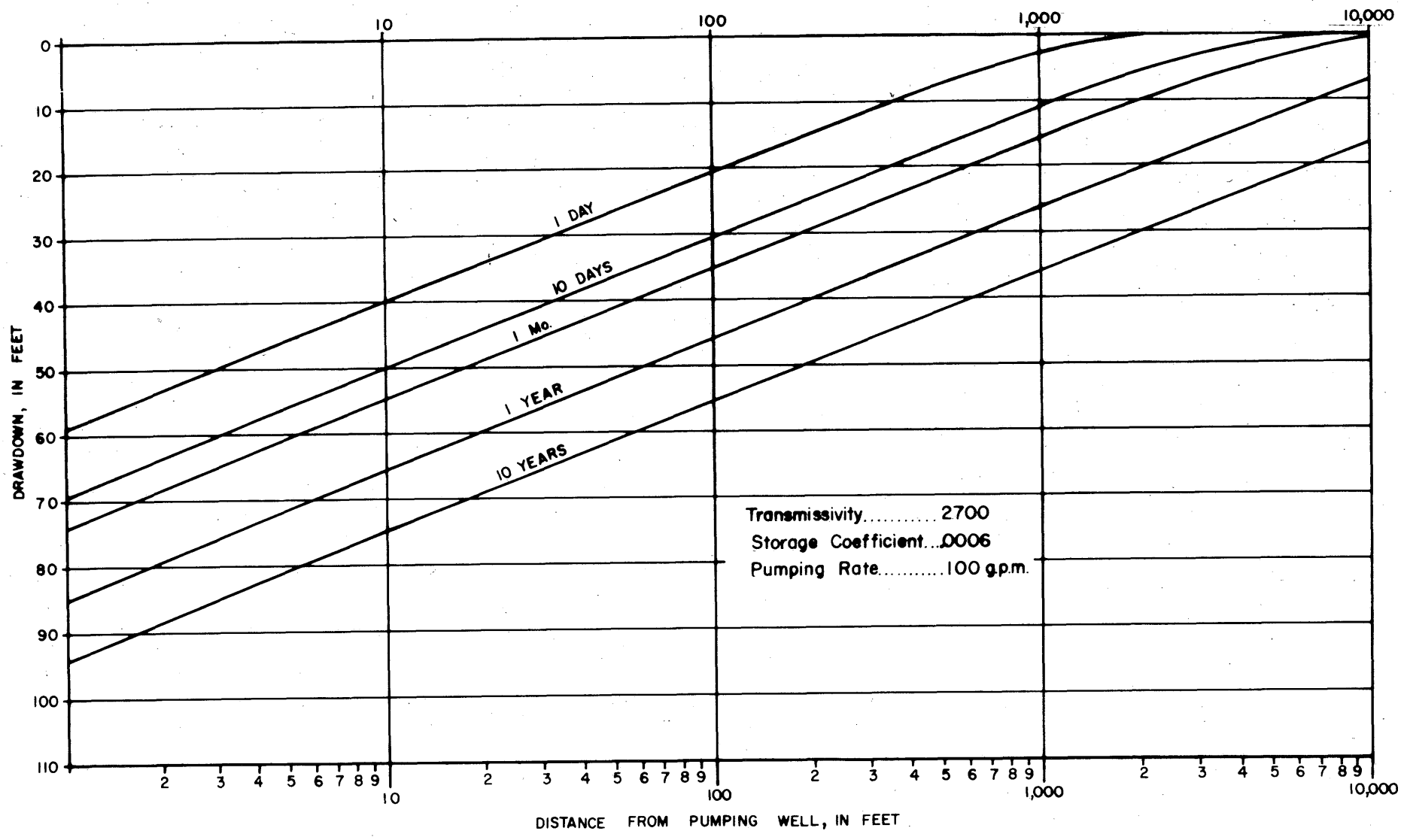

Figure 6

Distance Drawdown Curves After Various Times of Pumping from the Nacatoch Sand

the Nacatoch will cause declines in water levels at relatively great distances from the pumping well. After pumping 1 day (24 hours) water levels are affected nearly 2000 feet away from the pumping well and after pumping 10 days at the same rate, water levels decline nearly 2 miles away from the well.

The graphs also illustrate the importance of well spacing. When two or more pumping wells are located within each others zone of influence their cones of depression overlap and the drawdowns caused by each well are cumulative. Thus, the total drawdown in each well would be the drawdown caused by the pumping well itself plus the drawdowns caused by other pumping wells in the area.

In a way of a specific illustration consider that wells 17-41-901 and 902 (City of Commerce wells #1 & 2) are about 250 feet apart. Assume that one of these wells is pumped at a rate of 100 gallons per minute (gpm) for 10 days. According to the distance-drawdown graph the theoretical drawdown caused by this well at a point 1 foot from the well would be about 70 feet. Actually, due to well losses the drawdown in the well itself would probably be on the order of 90 feet. At the non-pumping well, 250 feet away the drawdown caused by the pumping well after 10 days would be about 23 feet. Now assume that both wells pump at 100 gpm. After ten days the drawdown in each well would be 90 feet due to its own pumping plus an additional 23 feet caused by interference from the other well or a total drawdown of 113 feet in each well.

When it is considered that the present static water level in the vicinity of the two wells used in the illustration above is only 56 feet above the top of the Nacatoch Sand, pumping only one well at 100 gpm would actually dewater about 34 feet of the sand. If both wells were pumped at the same time, water levels at each well would decline about 113 feet and thus dewater 57 feet of the Sand. Actually the drawdown would be greater than the theoretical drawdown presented above because when a portion of the sand becomes dewatered the

transmissibility is reduced and water level will further decline if pumping at the assumed rate is maintained. Of course, if the pump on either well is not set sufficiently deep the combined drawdown of both wells could cause it to break suction and the well would fail. It is not intended that the distance drawdown graphs presented in this report be used, except in a general sense, for the purpose of spacing future large capacity wells. It is included to illustrate what can happen and what has apparently happened if proper well spacing is not considered.

The effect of impermeable barriers such as the faults which occur in the Commerce area presents an additional well placement problem that should be considered.

When a pumping well is situated near a fault or other impermeable barrier the cone of depression will expand during pumping until it reaches the barrier and can no longer expand in that direction. Water levels will then decline at a greater rate than normal near the fault zone and if the well is near enough, the pumping level in the well itself will decline a greater amount and at a greater rate than would be the case if the fault was not there. It has been found that a fault occurring in the vicinity of a pumping well will effect the cone of depression and water level declines similar to that which would be experienced due to interference caused by another water well pumping at the same rate and located twice the distance from the first well to the fault. Thus the closer the well to the fault the greater the declines of water level at the fault and in the pumping well and the greater the distance from the fault the less the effect.

Areas Favorable for Additional Development

A review of available information indicates that the potential for additional development of the Nacatoch Sand is somewhat more favorable in western Delta County within the down-thrown fault block or graben area than any other area of equal distances from Commerce.

The circumstances which make this area the most favorable include a somewhat greater aquifer and total sand thickness and greater available drawdown than that available at Commerce, southwest of Commerce, or areas south and southeast of the Peerless-Campbell fault, out of the Graben area.

There is no indication however that yields greater than that experienced in the Horton well field are likely to be encountered. Therefore, the most logical area for further testing and possible development would be an area lying northeast of the present Horton well field, or more specifically east and northeast of Well 17-42-808 and south of the Middle Sulphur River . In addition, further exploration might be undertaken along a strip extending from the Delta County line east-northeastward between the Middle Sulphur River and the present city wells located in the vicinity of the Horton Community and spaced in such a manner that minimum interference would result from the present city wells and the fault located just north of the Middle Sulphur River. Any new wells developed in the area thus described would be as far away as practical from major faults which forms the limits of the downthrown fault block (Graben) and the Horton wells. The reasons for placing any new wells as far as practical from faults and other large capacity wells are described in the previous section.

It is specifically recommended that no additional wells be drilled within the Commerce city limits. Large declines in water levels and well yields have occurred due to pumpage from the several city and University

wells located in this area and additional wells would result in further declines and could dewater the water-bearing sand.

Summary and Conclusions

1. There are no water wells in Hunt or western Delta County known to be producing water from the Paluxy Sand.
2. The Paluxy Sand in the immediate vicinity of Commerce occurs at depths ranging from approximately 4000 to 5000 feet. The Sand in this area contains brackish water and is unsuitable for municipal use.
3. The nearest water well to the City of Commerce producing potable water from the Paluxy Sand is located at Ladonia, about 14 miles north of Commerce.
4. The Nacatoch Sand is the only source of underground water in the vicinity of the City of Commerce. Further, the only area that appears to be feasible for additional development of the Nacatoch in the Commerce area is limited to the graben area, in western Delta County.
5. All large capacity wells supplying the City and East Texas State University are completed in the Nacatoch Sand in the graben area, the downthrown block approximately 3 miles wide trending northeast-southwest across southern Delta and eastern Hunt County.
6. There is no indication that any areas are likely to be discovered in which wells of larger capacity can be developed than those which already supply water to the City and the University.
7. Information is scanty but the Nacatoch apparently does not occur or occurs only in limited areas north of the graben in the Commerce area. South of the Peerless-Campbell Fault, the Nacatoch occurs at the surface or near the surface, and dips to the southeast into the subsurface. The Nacatoch Sand south and east of the Peerless fault in the vicinity of Commerce does not appear favorable for development of large capacity wells because of the limited drawdown available near the fault and the

liklihood of poorer quality of the water at a distance downdip.

9. If it is necessary for the City to develop additional water supplies, the most favorable area for exploration and possible development is north and northeast of the Citys wells in the Horton Community. It is specifically recommended that the City not drill additional wells within the present city limits because of the large declines in water levels caused by pumpage from municipal and University wells located in this area.

Table 2.--Records of Wells and Test Holes, Commerce Area, Hunt and Delta Counties, Texas

All Wells are Drilled Unless Otherwise Noted in Remarks Column.

Water Level : Reported water levels given in feet; measured water levels given in feet and tenths.

Method of Lift and Type of Power: E, electric; N, none; S, submersible; T, turbine.

Use of Water : D, domestic; Ind, industrial; N, none; P, public supply; S, livestock.

	Well	Owner	Driller	Date completed	Depth of Well (ft)	Casing		Water-bearing unit	Altitude of land surface (ft)	Water level		Method of lift	Use of water	Remarks
						Diameter (in.)	Depth (ft)			Below land-surface datum (ft)	Date of measurement			
						HUNT COUNTY								
*	17-41-901	City of Commerce	- Tomlin	1914	500	10	375	Nacatoch	550	125	- 1914	E T	N	City Well No. 1. Casing perforated 374 to 412 feet.
						8	375-500			190	- 1918			
										227	- 1925			
										220	- 1935			
										228	- 1941			
										225.9	Nov. 7, 1943			
										280.9	Jan. 29, 1953			
*	902	City of Commerce	- Jones	1923	580	12	580	do	560	235	Feb. 6, 1939	E T	P	City Well No. 2. Casing perforated 375 to 435 feet.
										298.3	Jan. 29, 1953			
										308	Aug. 11, 1960			
										317.9	Feb. 2, 1971			
*	903	City of Commerce	J. L. Meyers	1936	433	15	41	do	550	269.5	Jan. 29, 1953	N	N	City Well No. 3. Well abandoned in 1948. Casing perforated from 368 to 408 feet.2/
						12	365			308	Jan. 17, 1961			
						10	352-433							
*	904	City of Commerce	Ritchie Drilling Co.	1949	468	-	-	do	468	252	- , 1949	E T	P	City Well No. 4. Screen set 380 to 410 feet and 425 to 475 feet.2/
	905	City of Commerce	Layne Texas	1970	510	10	370	Nacatoch	525	332	Sept. 8, 1970	E T	P	City Well No. 7. Screen set 380 to 410 feet and 425 to 475 feet. Specific capacity, 1.4 gallons per foot of drawdown. 1/ 2/
						6	270-380							
						6	410-425							
						6	475-510							
	906	City of Commerce	Kaye Drilling Co.	1962	710	-	-	do	505	-	-	N	N	Test hole. No well completed at this location. 1/ 2/
*	17-42-707	J. G. Grove	H. L. Pernell	1952	430	6	430	do	541	270.69	May 18, 1971	E S	D S	2/
	17-49-101	Nicklos Oil & Gas Co. O. E. Luckett et al No. 1	-	1962	3789	-	-;	-	517	-	-	-	-	Oil Test. 1/
	201	Stanolind Oil & Gas Co. I. W. Bickley No. 1	-	1943	5975	-	-	-	498	-	-	-	-	Oil Test. 1/ 2/

See footnotes at end of table.

Table 2.--Records of Wells and Test Holes, Commerce Area, Hunt and Delta Counties, Texas--Cont.'d.

	Well	Owner	Driller	Date completed	Depth of well (ft)	Casing		Water-bearing unit	Altitude of land surface (ft)	Water level		Method of lift	Use of water	Remarks
						Diameter (in.)	Depth (ft)			Below land-surface datum (ft)	Date of measurement			
	17-49-202	East Texas State University	J. L. Meyers	1962	492	-	-	-	525	-	-	N	N	Test hole. No well completed at this location. 1/ 2/
	203	McCasland	J. D. Baxter	1969	320	4	320	Nacatoch	510	-	-	E S	D	Casing slotted from 272 to 320 feet. 2/
	204	C. C. Gammon		1968	600±	4	-	do	530	255.5 261.9	Feb. 5, 1971 May 18, 1971	N	N	Well never used. Reported insufficient water.
	301	Peueto & Byars Lemay Gibson No. 1	-	1952	3101	-	-	-	518	-	-	-	-	Oil Test. 1/
	302	Stanolind Oil & Gas Co. W. M. Bickley No. 1	-	1943	4520	-	-	-	515	-	-	-	-	Oil Test. 1/ 2/
	303	East Texas State University	J. L. Meyers	1952	454	-	-	Nacatoch	525	193	Jan. 28, 1953	E T	P	University Well No. 2. 1/
*	304	do	Layne Texas	1950	440	16 10 10	324 326 353-380 419-437	do	529	-	-	E T	P	University Well No. 1. Screen set from 326 to 353 feet and 380 to 419 feet. 1/ 2/
*	305	City of Commerce	Ritchie Drilling Co.	1949	453	10	379	do	535	227 219.7 304	Sept. 1, 1949 Jan. 29, 1953 Feb. 2, 1971	E T	P	City Well No. 5. 10 inch casing slotted from 355 to 379 feet. 8 inch casing drill perforated from 374 to 453 feet. 2/
	306	do	Kaye Drilling Co.	1962	542	-	-	do	540	276	Oct. 26, 1962	E T	P	City Well No. 6. 1/ 2/
	307	do	J. L. Meyers	1963	756	-	-	do	505	200	Dec. 1963	N	N	Test hole. No well completed at this location. Known as "Rix Park" Test. 1/
*	308	Cotton Belt Railroad	-	1910	418	8 6	-	do	540	-	-	N	N	Well No. 1.
*	309	do	-	1911	429	8 6	-	do	540	220	Oct. 15, 1954	N	N	Well No. 2. Well located 119 feet southwest of No. 1. Casing perforated from 353 to 429 feet.
*	310	East Texas State University	Layne Texas	1963	466	16 10 10 10	320 331 366-387 432-464	do	515	229	July 15, 1963	E T	P	University Well No. 3. Screen set from 331 to 366 and from 387 to 432. Specific capacity, 1.8 gallons per foot of drawdown. 1/ 2/
*	311	do	Texas Water Wells Inc.	1967	483	16 10 10 10	335 338 359-362 450-483	do	490	299	July 1967	E T	P	University Well No. 4. Screen set from 338 to 359 feet, 362 to 382 feet and 402 to 360 feet. 1/ 2/
	312	do	J. L. Meyers	1962	485	-	-	do	520	-	-	N	N	Test hole. No well completed at this location. 1/ 2/

See footnotes at end of table.

TWDBE-GW-59 b

Table 2.--Records of Wells and Test Holes, Commerce Area, Hunt and Delta Counties, Texas--Cont'd.

	Well	Owner	Driller	Date completed	Depth of well (ft)	Casing		Water-bearing unit	Altitude of land surface (ft)	Water level		Method of lift	Use of water	Remarks
						Diameter (in.)	Depth (ft)			Below land-surface datum (ft)	Date of measurement			
	17-49-313	East Texas State University	J. L. Meyers	1962	485	-	-	Nacatoch	520	-	-	N	N	Test hole. No well completed at this location. 1/ 2/
	314	do	Texas Water Wells Inc.	1967	409	-	-	do	500	-	-	N	N	Test hole. No well completed at this location. 1/
*	315	B. Eastland	J. D. Baxter	1969	300	4	300	do	500	50	Jan. 1, 1969	E S	D	Casing slotted from 235 to 300 feet. 2/
	501	Hollandsworth Drilling Co. C. M. Kimball No. 2	-	1944	4507	-	-	-	587	-	-	-	-	Oil Test. 1/
	502	Hollandsworth Drilling Co. C. M. Kimball No. 1	-	1944	5209	-	-	-	535	-	-	-	-	Oil Test. 1/
	503	R. L. Peveto et al Adams No. 1	-	1953	3407	-	-	-	500	-	-	-	-	Oil Test. 1/
						DELTA COUNTY								
	17-42-502	R. L. Moore	-	1955	169	4	-	Nacatoch	< 177	-	-	N	N	Well originally 180 feet in depth. Measured depth Feb. 5, 1971, 169 feet. No water in well. Owner reported well went dry in 1967.
*	503	do	J. D. Baxter	1967	398	4	-	do	477	60 70.2	1967 Feb. 5, 1971	E S	D S	Water has salty taste, see analysis. 2/
*	504	do	do	1967?	281	4	-	do	477	185.8	Feb. 5, 1971	E S	D S	
	701	Bond Oil Corp.	N. Albowitch No. 1	1960	5893	-	-	-	490	-	-	-	-	Oil Test. 1/
	702	Shaw-Manziel	J. W. McCrary No. 1	1960	4428	-	-	-	475	-	-	-	-	Oil Test. 1/
*	703	George Hoffman	J. D. Baxter	1967	416	4	416	Nacatoch	500	204	June 2, 1967	E S	D S	Casing slotted 386 to 416 feet. 2/
	704	Robert Shipp	do	1970	460	4	460	do	495	-	-	E S	D S	Casing slotted 414 to 460 feet. 2/
*	705	E. R. Petty	do	1970	462	4	460	do	528	-	-	E S	D S	Casing slotted 419 to 460 feet. 2/
*	706	City of Commerce	Layne Texas	1970	510	14 9 9 9	394 400 440-450 490-508	do	510	332	Sept. 8, 1970	E T	P	Horton Field. Well No. 4. Screen set from 400 to 440 feet and from 450 to 490 feet. 1/ 2/
	801	Hickey-Randall E. R. Petty No. 1	-	1956	6005	-	-	-	484	-	-	-	-	Oil Test. 1/

See footnotes at end of table.

TWDBE-GW-59 b

Table 2.--Records of Wells and Test Holes, Commerce Area, Hunt and Delta Counties, Texas--Cont'd.

Well	Owner	Driller	Date completed	Depth of well (ft)	Casing		Water-bearing unit	Altitude of land surface (ft)	Water level		Method of lift	Use of water	Remarks
					Diameter (in.)	Depth (ft)			Below land-surface datum (ft)	Date of measurement			
17-42-802	Pan American Petroleum Corp. Knight Gas Unit No. C-1	-	1965	9800	-	-	-	477	-	-	-	-	Oil Test. 1/
803	W. I. Turrentine	H. L. Pernell	1966	460	4 3	200 200-460	Nacatoch	481	85 281.9	Feb. 1966 Feb. 4,1971	N	N	Casing slotted from 410 to 460 feet.
* 804	do	J. D. Baxter	1967	460	4	460	do	481	-	-	E S	D S	Casing slotted from 410 to 460 feet. 2/
805	O. E. Scott	do	1970	470	4	456	do	472	-	-	E S	D S	Casing slotted from 456 to 470 feet. 2/
* 806	City of Commerce	Layne Texas	1965	540	14 9 9 9	417 422 462-485 525-538	do	485	159	Oct. 14,1965	E T	P	Horton Field, Well No. 1. Screen set from 422 to 462 feet and from 485 to 525 feet. Pump set at 470 feet. Specific capacity, 1.05 gallons per foot of drawdown. 1/ 2/
* 807	do	do	1965	635	14 9 9 9	497 507 555-575 620-633	do	480	148	Nov. 15,1965	E T	P	Horton Field, Well No. 2. Screen set from 507 to 555 feet and from 575 to 620 feet. Pump set at 560 feet. Specific capacity, 1.2 gallons per foot of drawdown. 1/ 2/
* 808	do	do	1965	538	14 9 9 9	417 425 465-482 525-536	do	475	148	Dec. 8,1965	E T	P	Horton Field, Well No. 3. Screen set from 425 to 465 feet and from 482 to 525 feet. Pump set at 470 feet. Specific capacity, 1.0 gallons per foot of drawdown. 1/ 2/
809	do	do	1965	709	-	-	do	475	-	-	N	N	Test hole. No well completed at this location. 2/
901	Talco Asphalt & Ref. Co. W. T. Peek No. 1	-	1941	4699	-	-	-	443	-	-	-	-	Oil Test. 1/
50-101	Morty Freedman Derring No. 1	-	1949	4849	-	-	-	486	-	-	-	-	Oil Test. 1/
102	Morty Freedman M. L. Pritchard No. 1	-	1949	6225	-	-	-	473	-	-	-	-	Oil Test. 1/
201	Perryman & Greer et al. W. T. Peek Estate No. 1	-	1958	4738	-	-	-	482	-	-	-	-	Oil Test. 1/

* See Table 3 for chemical analysis.

1/ Electric log in files of the Texas Water Development Board.

2/ Drillers log of well in Table 2.

Table 3. -- Drillers Logs of Wells

Hunt County

Well 17-41-903

Owner: City of Commerce No. 3
Driller: J.L. Meyers

	THICKNESS (ft.)	DEPTH (ft.)
Surface soil	8	8
Yellow clay	7	15
Yellow sandy clay	8	23
Dark blue shale	177	200
Hard lime rock	2	202
Gray shale	3	205
Hard lime rock	5	210
Medium hard lime rock	5	215
Variation of light and dark gray shale	149	364
Hard lime or cap rock	1	365
Hard coarse sand, water bearing	40	405
Black shale, soft	7	412
Black sandy shale	5	417
Dark gray shale	8	425
Dark gray sandy shale	5	430
Black shale	3	433

Well 17-41-904

Owner: City of Commerce No. 4
Driller: J.W. Ritchie Drlg. Co.

	THICKNESS (ft.)	DEPTH (ft.)
Surface soil	4	4
Blue shale	20	24
Blue shale and shells	143	167
Rock	7	174
Sandy shale	16	190
Shale and rock and shells	44	234
Blue shale and shells	9	343
Shale and lignite	25	368
Sand and broken shale	12	380
Sandy shale	16	396
Hard rock	6	402
Sand	8	410
Sand rock	7	417
Sand, water-bearing	51	468

Table 3. -- Drillers Logs of Wells - Continued

	THICKNESS (ft.)	DEPTH (ft.)
Well 17-41-905		
Owner: City of Commerce No. 7		
Driller: Layne, Texas		
Top soil	2	2
Red sandy clay	35	37
Blue sandy clay	19	56
Shale and sandy shale	159	215
Sandy shale and sand layers	166	381
Sand (cut good)	27	408
Shale and sand streaks	9	417
Shale	8	425
Sand and shale streaks	9	434
Rock	1	435
Sand and streaks of shale	42	477
Shale	22	499
Sandy shale and sand streaks	42	541
Well 17-41-906		
Owner: City of Commerce (Test Hole)		
Driller: Kaye Drilling Co.		
Top soil	3	3
Brown clay	15	18

	THICKNESS (ft.)	DEPTH (ft.)
(Well 17-41-906) Continued		
Dark shale	24	46
Shale and sandy streaks	126	172
Blue shale some soft sticky streaks	154	326
Fine loose sand - water-bearing	28	354
Blue shale sticky	24	378
Fine loose sand - water-bearing	26	404
Rock 6" very hard	2	406
Blue shale hard and soft streaks	56	556
Hard Sandstone and some shale possibly some water	10	566
Blue shale soft sticky streaks and soft sandy shale streaks	139	705
Well 17-41-707		
Owner: J.G. Grove		
Driller: H.R. Pernell		
Clay	32	32
Shale	98	130

Table 3. -- Drillers Logs of Wells - Continued

	THICKNESS (ft.)	DEPTH (ft.)
(Well 17-41-707) Continued		
Crumbly shale	40	170
Sandy shale	80	250
Hard shale; rock at 286'	36	286
Shale	111	397
Coarse sand	17	414
Fine sand	16	430
Well 17-49-201 (partial log)		
Owner: I.W. Bickley No. 1		
Driller: Stanolind Oil Co.		
Surface clay	67	67
Sand and shells	145	212
Sand and shale	28	240
Water sand	90	330
Sand and shale	170	500
Sandy shale	25	525
Sand shale and shells	413	938
Sand	213	1150
Shale and shells	355	1505
Sandy shale	48	1553
Shells	47	1600
Sandy shale	75	1675

	THICKNESS (ft.)	DEPTH (ft.)
(Well 17-49-201) Continued		
Shells	35	1710
Sandy shale	137	1847
Sand, sticky	93	1945
Chalk	140	2035
Shale, sticky	170	2255
Shale and shells	925	2550
Shale	25	2575
Chalk	15	2590
Shale and chalk streaks	38	2628
Shale	71	2700
Sand	10	2710
Shale	430	3140
Hard sandy shale	30	3170
Shale sticky	10	3180
Shale	10	3190
Hard shale and lime shells	80	3270
Shale	87	3357
Sandy shale	150	3507
Shale	53	3560
Sand	25	3585

	THICKNESS	DEPTH
(Well 17-49-201) Continued		
Sandy shale	37	3622
Shale	288	3910
Sandy shale	80	3970
Shale	20	3990
Sand	65	4055
Shale	25	4080
Sand and shale	172	4252
Georgetown lime	19	4271
Sand and shale	15	4286
Sand	30	4316
Hard sandy shale	9	4325
Sand	10	4335
Hard shale	55	4390
Hard sandy shale	22	4412
Total depth		5997

Well 17-49-202

Owner: East Texas State University (Test hole)
Driller: J.L. Meyers

Shale	284	284
Sand, streaks shale	41	325
Shale, streaks sand	20	345
Sand, streaks shale	45	390

	THICKNESS	DEPTH
(Well 17-49-202) Continued		
Shale	102	492

Well 17-49-203

Owner: - McCasland
Driller: J.D. Baxter

Top soil	2	2
Clay	33	35
Blue shale	69	104
Rock	1	105
Blue shale	8	113
Rock	1	114
Blue shale	158	272
Sand	38	310
Blue shale	10	320

Well 17-49-302

Owner: W.M. Beckley
Driller: Stanolind Oil and Gas Co.

Sandy shale	365	365
Water sand	40	405
Sand and sandy shale	143	548
Shale	70	618
Water sand	52	670
Shale	70	740

Table 3. -- Drillers Logs of Wells - Continued

	THICKNESS (ft.)	DEPTH (ft.)
(Well 17-49-302) Continued		
Shale and sand	410	1150
Shale	180	1330
Shale and chalk	140	1470
Shale and shells	430	1900
Shale	210	2110
Shale and chalk	95	2205
Shale	240	2445
Shale and sand	183	2628
Shale	307	2935
Shale and lime	170	3105
Shale	45	3150
Shale and red bed	120	3270
Sand	40	3310
Shale and red bed	160	3470
Sand	20	3490
Sand and shale	60	3550
Shale and red bed	127	3677
Sand and red bed	36	3713
Shale and red bed	23	3736
Lime and shale	54	3790
Shale and red bed	30	3820
Shale and streaks of lime	60	3880
(Well 17-49-302) Continued		
Shale and lime	213	4093
Shale and red bed	17	4110
Shale and lime	127	4237
Shale and red bed	143	4380
Sandy shale	5	4385
Shale and lime	75	4460
Shale	70	4530
Lime	30	4560
Lime and sandy shale	27	4587
Sandstone, shale and water sand	21	4608
Shale and sand	49	4657
Shaley sand	23	4680
Shale	13	4693
Shale and sand	5	4698
Well 17-49-304		
Owner: East Texas State University No. 1		
Driller: Layne, Texas		
Rotary to ground	4	4
Clay	36	40
Hard gray shale	133	173
Rock	2	175

Table 3. -- Drillers Logs of Wells - Continued

	THICKNESS (ft.)	DEPTH (ft.)
(Well 17-49-304) Continued		
Hard gray shale	27	202
Rock	2	204
Hard shale	127	331
Fine sand, hard	26	357
Shale	26	383
Fine sand, thin shale breaks in top 35 feet	47	430
Shale, sandy hard	10	440
Well 17-49-305		
Owner: City of Commerce No. 5		
Driller: J.W. Ritche Drilling Co.		
Surface soil	5	5
Yellow clay	21	26
Yellow clay	6	32
Gray shale	43	75
Sand, gray	12	87
Blue shale	67	154
Shale and shells	26	180
Shale	35	215
Shale and rock	39	254
Shale and shell	64	318

	THICKNESS (ft.)	DEPTH (ft.)
(Well 17-49-305) Continued		
Sandy shale	34	352
Hard rock	3	355
Water sand	47	402
Hard rock	3	405
Water sand	42	447
Rock	2	449
Shale	4	453
Well 17-49-306		
Owner: City of Commerce No. 6		
Driller: Kaye Drilling Company		
Top soil	4	4
Light brown clay	32	36
Blue shale	13	49
Hard shale streak	2	51
Sticky blue shale	105	156
Blue shale with some hard lime streaks	33	189
Sticky blue shale	161	350
Fine water sand	30	380
Sticky blue shale	20	400

Table 3. -- Drillers Logs of Wells - Continued

	THICKNESS (ft.)	DEPTH (ft.)
(Well 17-49-306) Continued		
Hard lime and shale	8	408
Fine gray water sand	30	438
Hard shale and lime streaks	104	542

Well 17-49-310

Owner: East Texas State University No. 3
Driller: Layne, Texas

Surface soil	2	2
Gray clay	8	10
Sandy clay	8	18
Clay	38	56
Black shale	49	105
Gray shale	35	140
Gray shale and streaks of shale	25	165
Gray and brown shale	31	196
Sticky shale	30	226
Gray shale and hard streaks	31	257
Gray shale	61	318
White sand, streaks of lignite	26	344

	THICKNESS (ft.)	DEPTH (ft.)
(Well 17-49-310) Continued		
Sand, shale and lignite	20	364
Sandy shale and sand streaks	19	383
Sand, few shale streaks	40	423
Shale	5	428
Sand	3	431
Shale	39	470

Well 17-49-311

Owner: East Texas State University No. 4
Driller: Texas Water Well Inc.

Rotary to ground level	4	4
Top soil	7	11
Yellow clay	20	31
Shale	32	63
Sandy shale	29	92
Shale	33	125
Shale	30	255
Sand and lime streaks	26	281
Shale	9	290
Sand and lime streaks	10	300
Shale and lime streaks	25	325

Table 3. -- Drillers Logs of Wells - Continued

	THICKNESS (ft.)	DEPTH (ft.)
(Well 17-49-311) Continued		
Sand and lime streaks	43	368
Shale	43	411
Total Depth	-	483

Well 17-49-312

Owner: East Texas State University (Test hole)
Driller: J.L. Meyers

Clay-shale	67	67
Shale-streaks of sand	53	120
Shale	174	294
Shale-streaks of sand	13	307
Sand-streaks of shale	30	337
Shale-streaks of sand	20	357
Sand streaks of shale	46	403
Shale	82	485

Well 17-49-313

Owner: East Texas State University (Test hole)
Driller: J.L. Meyers

Clay shale	143	143
Shale	165	308
Sand-streaks shale	41	349
Shale-streaks sand	13	362
Sand-streaks shale	54	416
Shale	69	485

Well 17-49-315

Owner: B. Eastland
Driller: J.D. Baxter

Soil	2	2
Clay	43	45
Sand	13	58
Coal	3	61
Blue shale sand	91	152
Rock	1	153
Blue shale	82	235
Sand	55	290
Blue shale	10	300

Delta County

Well 17-42-503

Owner: R.L. Moore
Driller: J.D. Baxter

	THICKNESS (ft.)	DEPTH (ft.)
Top soil	4	4
Clay	41	45
Shell	80	125
Rock	1	126
Shell	35	161
Rock	3	164
Sand	15	179
Shell	35	214
Sand and shell	24	238
Shell	23	261
Sand	8	269
Shell	5	274
Sand	6	280
Rock	2	282
Sand	9	291
Shell	4	295
Sand	5	300
Shell	24	324
Rock	1	325
Shell	67	392
Sand	3	395
Rock	3	398
Sand	-	-

(Well 17-42-503) Continued

Well 17-42-703

Owner: George Hoffman
Driller: J.D. Baxter

	THICKNESS (ft.)	DEPTH (ft.)
Top soil	1	1
Brown clay	3	4
Gray clay	22	26
Orange Clay	32	58
Blue shell	44	102
Blue mealy shell	23	125
Rock	.5	125.5
Blue mealy shell	94.5	220.
Rock	1	221
Blue shell	39	260
Blue gummy shell	22	382
Rock	4	386
Water sand	27	413
Shell	3	416

Table 3. -- Drillers Logs of Wells - Continued

	THICKNESS (ft.)	DEPTH (ft.)
Well 17-42-704		
Owner: Robert Shipp Driller: J.D. Baxter		
Top soil	2	2
Clay	43	45
Blue shell	203	248
Rock	1	249
Blue shell	156	405
Cap rock	3	408
Sand	6	414
Sandy shell	22	436
Sand	8	444
Blue shell	16	460
Well 17-42-705		
Owner: E.R. Petty Driller: J.D. Baxter		
Top soil	2	2
Clay	36	38
Blue shell	379	417
Cap rock	2	419
Sand	41	460
Well 17-42-706		
Owner: City of Commerce (Horton well field No. 4) Driller: Layne, Texas		
Top soil	8	8
(Well 17-42-706) Continued		
White and gray clay	112	120
Gray clay	80	200
Shale and streaks of sand	6	206
Shale	25	231
Shale with streaks of sandy shale	6	237
Sandy shale	4	241
Rock	2	243
Sandy shale	6	249
Shale and sandy shale	55	304
Sandy shale	94	398
Sand and shale streaks	10	408
Shale and sand layers	7	415
Sand and shale layers	13	428
Shale and sand layers	4	432
Sand and shale (broken)	17	449
Rock	2	451
Sand and shale streaks	39	490
Shale and sand streaks	22	512
Rock	1	513
Shale and sand layers	12	525
Rock and shale	11	536
Sand and shale layers	12	548

	THICKNESS (ft.)	DEPTH (ft.)
(Well 17-42-706) Continued		
Sandy shale and sand streaks	12	560
Shale	20	580
Well 17-42-804		
Owner: W.I. Turrentine Driller: J.D. Baxter		
Top soil	3	3
Clay	37	40
Shell	145	185
Sand	10	195
Shell	60	255
Rock	1	256
Shell	14	270
Rock	1	271
Rock	135	406
Sand	49	455
Shell	5	460
Well 17-42-805		
Owner: O.E. Scott Driller: J.D. Baxter		
Top soil	2	2
Clay	38	40
Blue shell	390	430
(Well 17-42-805) Continued		
Sand	10	440
Blue shell	8	448
Sand	8	456
Blue sandy shell	12	468
Blue shell	2	470
Well 17-42-806		
Owner: City of Commerce (Horton well field No. 1) Driller: Layne, Texas		
Soil	2	2
Brown clay	10	12
Sand and clay	5	17
Brown clay	23	40
Gray shale and streaks of sand	135	175
Gray shale	25	200
Shale and thin sand layers	11	211
Shale	53	264
Rock	1	265
Shale	157	422
Sand and shale layers	6	428
Sand	12	440

Table 3. -- Drillers Logs of Wells - Continued

	THICKNESS (ft.)	DEPTH (ft.)
(Well 17-42-806) Continued		
Shale	3	443
Sand and shale	11	454
Sand	7	461
Shale	23	484
Sand and hard streaks	19	503
Sand	23	526
Shale	14	540

Well 17-42-807

Owner: City of Commerce (Horton well field No. 2)
Driller: Layne, Texas

Soil	2	2
Yellow clay	16	18
Gray clay	22	40
Sand clay	12	52
Gray shale	21	73
Shale and clay streaks	40	113
Sandy shale	61	174
Shale and sandy shale	104	278
Sand and shale	27	305
Shale and sand layers	78	383
Shale and rock streaks	112	495

	THICKNESS (ft.)	DEPTH (ft.)
(Well 17-42-807) Continued		
Sandy shale	13	508
Sand	43	551
Sand and shale layers	6	557
Sandy shale	21	578
Sand	18	596
Rock	3	599
Sand	16	615
Sandy shale	20	635

Well 17-42-808

Owner: City of Commerce (Horton well field No. 3)
Driller: Layne, Texas

Soil	3	3
Gray clay	5	8
Yellow clay	24	36
Gray shale	180	216
Sandy shale	16	232
Shale	36	268
Sandy shale	13	281
Shale	129	410
Shale and sand streaks	17	427
Sand	28	455

	THICKNESS (ft.)	DEPTH (ft.)
(Well 17-42-808) Continued		
Sand and shale layers	10	465
Shale	24	489
Sand	31	520
Shale	20	540

Well 17-42-809

Owner: City of Commerce (test hole)
Driller: Layne, Texas

Red clay	2	2
Yellow clay	32	34
Sandy clay	7	41
Shale	153	194
Shale	6	200
Shale and sand streaks	20	220
Shale and sand streaks	164	384
Shale and sand streaks	18	402
Shale and sand streaks	70	472
Shale and sand streaks	55	527
Shale and sand streaks	49	576
Rock	1	577
Shale	23	600
Sand and shale	6	606
Sand	13	619
Shale	14	633

	THICKNESS (ft.)	DEPTH (ft.)
(Well 17-42-809) Continued		
Rock	3	636
Sand	4	640
Shale	69	709

Table 4. -- Chemical Analyses of Water from Wells,

Commerce Area, Hunt and Delta Counties, Texas

All analyses are of water from wells completed in the Nacatoch Sand

Analyses are in milligrams per liter except specific conductance and pH

Well	Owner	Depth of well (ft)	Date of collection	Silica (SiO_2)	Calcium (Ca)	Magnesium (Mg)	Sodium* (Na)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate	Dissolved solids	Total hardness as $CaCO_3$	Percent sodium	Specific conductance (Micromhos at 25°C.)	pH	SAR
Hunt County																		
17-41-901	City of Commerce	500	[2/] May 3, 1961	12	1.0	0.0	261	452	57	98	0.5	0.5	674	2	100	1,120	8.5	-
-902	do.	580	[2/] Sept. 14, 1943	14	2.7	0.5	266	474	73	80	0.5	0.8	678	8	-	-	9.0	-
-903	do.	433	[2/] Sept. 14, 1943	10	2.9	0.4	272.4	471	91	80	0.3	0.5	694	8	-	-	8.8	-
-904	do.	468	[2/] Feb. 4, 1953	13	1.8	1.0	285.5	464	124	86	0.3	4.0	756	8	-	-	8.6	-
17-42-707	J.G. Groves	430	[2/] Feb. 4, 1953	9.6	2.2	0.9	339	500	198	88	0.7	3.3	922	9	-	1,410	8.5	-
			[1/] May 18, 1971	11	3	2	271	459	156	30	0.5	3.5	720	16	-	1,084	8.7	-
17-49-304	East Texas State University.	440	[2/] Feb. 4, 1953	12	0.8	0.3	175.9	318	45	19	0.6	3.0	442	3	-	703	8.8	-
			[1/] Sept. 25, 1970	12	1	1	208	389	49	27	0.4	2.5	530	8	-	849	9.1	-
-305	City of Commerce	453	[2/] Feb. 4, 1953	12	0.6	0.4	185.9	364	45	22	0.7	0.5	464	3		737	8.9	-
-308	Cotton Belt Railroad	418	[2/] Nov. 13, 1943	12	7.6	0.9	199.8	368	69	28	0.5	0.2	528	22	-	-	8.0	-
-309	do.	429	[3/] Oct. 19, 1954	15	1.1	0.2	207.	378	48	23	-	-	740.5	5	-	-	8.0	-
17-49-310	East Texas State University	466	[3/] July 16, 1963	14.0	1.3	0.4	247.5	390.4	92.2	46.0	-	-	847	5	-	974	8.9	-
-311	do.	483	[3/] June 30, 1967	-	-	-	-	427.0	44.4	40.0	-	-	-	-	-	-	-	-
			[3/] Sept. 12, 1967	16.0	1.6	0.4	233.9	353.8	98.5	43.0	-	-	804	5.6	-	985	-	-
			[2/] Sept. 25, 1970	11	1	1	217	357	74	43	0.4	2.5	560	7	-	909	9.1	-
-315	B. Eastland	300	[1/] May 18, 1971	10	3	3	530	720	5	400	2.0	0.4	1310	22	-	2,160	8.3	-

See footnotes at end of table.

Table 4. -- Chemical Analyses of Water from Wells, Commerce Area, Hunt and Delta Counties, Texas.

Well	Owner	Depth of well (ft)	Date of collection	Silica (SiO_2)	Calcium (Ca)	Magnesium (Mg)	Sodium* (Na)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate	Dissolved solids	Total hardness as $CaCO_3$	Percent sodium	Specific conductance (Micromhos at 25°C.)	pH	SAR
Delta County																		
17-42-503	R.L. Moore	398	1/ Feb. 5, 1971	10	37	9	2100	214	< 4	3260	0.8	< 0.4	5500	127	-	8380	7.9	-
-504	do.	281	1/ May 18, 1971	12	3	1	413	510	< 4	349	1.9	< 0.4	1030	12	-	1730	7.9	-
-703	George Hoffman	416	1/ Feb. 2, 1971	11	2	1	210	389	55	24	0.5	< 0.4	530	10	-	845	9.1	-
-705	E.R. Petty	462	1/ May 18, 1971	11	3	5	217	468	43	17	0.6	< 0.4	550	28	-	866	8.9	-
-706	City of Commerce	510	4/ Aug. 5, 1970	10	1	0	232	400	40	47	-	-	772	2	-	958	9.1	-
-804	W.I. Turrentine	460	1/ May 19, 1971	11	7	9	444	464	42	408	1.1	0.4	1150	55	-	1930	8.2	-
-806	City of Commerce	540	4/ Oct. 16, 1967	11	1.5	0	271	432	109	60	-	-	910	4	-	1140	9.0	-
-807	do.	635	4/ Nov. 17, 1965	10	1	0.4	275	417	101	57	1.0	1.2	906	4	-	1130	8.8	-
-808	do.	538	4/ Dec. 10, 1965	11	1.5	0.5	292	428	37	43	1.6	1.3	813	6	-	980	8.7	-

1/ Analyses made by Texas State Department of Health

2/ Analyses made by United States Geological Survey

3/ Analyses made by Curtis Laboratories, Houston, Texas

4/ Analyses made by Microbiology Service Laboratories, Edna Wood Laboratories Houston, Texas