Control to : 6W-S
cc: MOK, KK

GW cc: 6A

due 6/30/89

PHILLIPS 66 **PHILLIPS PETROLEUM COMPANY**

6W-1237

May 25, 1989

RECEIVED
WATER MANAGEMENT DIVISION
89 JUN -7 PM 1:11

Environmental Protection Agency
Region VI
1445 Ross Avenue
Dallas, Texas 75202-2733

Attention: Mr. Robert E. Layton, Jr.
Regional Administrator

Gentlemen:

Phillips Petroleum Company ("Phillips") hereby requests that portions of certain aquifers, here named the "Z-Sand" and the "Happy Hollow" (more specifically described later in this letter), be exempted from protection under the Underground Injection Control ("UIC") regulations for the Osage Mineral Reserve codified at Subpart GGG of 40 C.F.R. §147. The Administrator may designate any aquifer or part of an aquifer as an exempted aquifer under the terms of 40 C.F.R. §147.2908. As will be more fully described later, the area for which the exemption is requested is contiguous with portions of both the North Burbank Unit ("NBU") and the South Burbank Unit ("SBU").

In order to enable the Environmental Protection Agency's ("EPA") review of this Aquifer Exemption Request, the following information will be provided in this letter:

1. Certain general information about the area and the aquifers as requested by EPA.

2. A demonstration that the aquifers do not currently serve as a source of drinking water.

3. A demonstration that any injected waste will remain in the exempted portion of the zones.

4. A demonstration that the aquifers cannot now nor will they in the future serve as a source of drinking water because both are situated at a depth or location which makes recovery of water for drinking water purposes economically and technologically impossible.

5. A demonstration that the Total Dissolved Solids ("TDS") content of the water in the aquifers is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.

GENERAL INFORMATION

I. Map of the area for which exemption is requested.

A map of the area for which exemption is requested is submitted as Attachment I to this letter. The three areas for which exemption is requested are shaded green, red and diagonally lined.

II. Written description of the aquifers or formations for which exemption is requested:

A. Name of formation or aquifer:

"Z-Sand"

The aquifer is a previously unnamed sandstone in the Buck Creek Formation of the Wabaunsee Group in the Pennsylvania series. This sandstone occurs approximately 10 feet below the Bird Creek Limestone member of the Wabaunsee Group.

The name "Z-Sand" was applied for identification purposes to this sandstone by Phillips' log analysis and engineering personnel in their efforts to locate and define the base of fresh water in the area beginning in late 1984.

"Happy Hollow"

The "Happy Hollow" is a limestone, in the Buck Creek Formation, of the Wabaunsee Group in the Pennsylvania series. This formation occurs approximately 60 feet above the Bird Creek Limestone member of the Wabaunsee Group. A portion of this formation, and a portion of the "Z-Sand" are the subjects of this exemption request, and will be referred to as the "Happy Hollow", "Z-Sand", or "Z-Sand"/"Happy Hollow", henceforth in this request.

B. Subsurface depth or elevation of zones:

The subsurface elevation of the "Z-Sand" is detailed in Attachment II, a map depicting the structure on top of the "Z-Sand", with a datum of sea level.

The subsurface elevation of the "Happy Hollow" is approximately 100 feet above the top of the "Z-Sand" in Area A, shown in Attachment I.

C. Vertical confinement from other underground sources of drinking water:

The first step in determining vertical confinement from other underground sources of drinking water is to determine the location of any other USDW's.

Aquifers in an interval between a horizon uniformly 100 feet below the surface and the base of the geologic horizon identified as the "Z-Sand" were assessed to determine the status of these aquifers as USDW's. TDS estimates of the water contained in the aquifers have been made using EPA's definition of fresh (treatable) water and evaluation of the spontaneous potential ("SP") response of these zones as shown on electric logs of a number of individual wells spaced across the area for which the exemption is requested.

Based on this review, Phillips concludes that in the area for which the exemption is requested, there are no USDW's below the horizon which runs uniformly 100 feet below the surface and above the top of the "Z-Sand", except for that portion of the "Happy Hollow" limestone shown in Attachment I as Area A. Area A is also the subject of this aquifer exemption request. For the purpose of establishing vertical confinement, note that the top of the "Happy Hollow" is within 100 feet above the top of the "Z-Sand". Also, the location of the "Happy Hollow" with respect to significant intervening shale layers and assumed other underground sources of drinking water, is the same as that of the "Z-Sand".

Note: The nominal minimum surface casing base is 100 feet below the surface. Also, note: Use of the SP response to evaluate zones within 100 feet of the surface is not possible due to interference from the surface casing.

While, as stated in Phillips' October 2, 1987, letter to the Regional Administrator, "whether there is a USDW within. . . SBU is problematic;" for purposes of this Aquifer Exemption Request, the base of a horizon uniformly 100 feet below the surface will be assumed to be the nearest "other underground source of drinking water." To depict this horizon on a consistent basis,

Attachment I-A shows this feature extended through the aquifer exemption area, in terms of an isopleth, with units of "feet above mean sea level".

Given this assumed location for the nearest other underground source of drinking water, vertical confinement between the base of this horizon and the top of the "Z-Sand" ranges from approximately 360 to 500 feet.

Except in wellbores, confinement between these zones is provided by several shale beds of various thicknesses; the most significant of these being:

SHALE	CUMULATIVE THICKNESS
Silver Lake Shale	30 feet
Auburn Shale	40 to 60 feet
Langdon Shale	55 to 60 feet
Total	125 to 150 feet

For a description of the methods used to arrive at the TDS estimates of the water contained in aquifers, refer to the "Electric Log Survey" which was transmitted to EPA as Attachment IV to Phillips' letter to the Region VI Administration dated October 2, 1987. A copy of this same "Electric Log Survey" is transmitted with this request as Attachment III.

D. Thickness of proposed exempted aquifers:

"Z-Sand"

The "Z-Sand" ranges from 40 feet to 60 feet in thickness over the area in question. The most typical thickness is 55 feet.

"Happy Hollow"

The "Happy Hollow" limestone ranges from 8 feet to 30 feet in thickness over the area in question.

E. Area of exemption:

The size of area for which exemption is requested is approximately 13,760 acres (Area A - 3,520 acres; Area B - 9,600 acres; diagonally lined four quarter sections - 640 acres).

F. Water quality analysis of the horizon to be exempted:

1. The most encompassing information available about the quality of the water in the "Z-Sand" and the "Happy Hollow" is gained from calculating the salinity of the water utilizing the SP curve from electric logs as described in C., above. The results of these calculations for the wells inside the area that have electric logs are as follows:

AREA A

WELL	WATER QUALITY (TDS,PPM) HAPPY HOLLOW	Z-SAND
NBU 113-6A	8,741	22,420
NBU 114-W11	9,302	28,068
NBU 114-3A	11,321	24,208
NBU 114-W7A	11,829	16,993
NBU 113 W7A	9,736	37,245

AREA B

WELL	"Z-SAND" WATER QUALITY (TDS,PPM)
SBU C-06	8676
SBU E-07	57367
SBU E-08	9007
SBU H-10	11535
SBU F-05	3670
SBU F-06	10224
SBU J-16	10394
SBU L-03	4129
SBU M-13	17154
SBU O-14	13061
SBU O-11	5427
SBU M-10	7882
SBU R-12	6168
SBU S-07	5002

Copies of computer printouts of the calculations used to arrive at these salinity values are attached as Attachment IV.

2. The most recent analyses of water from the "Z-Sand" inside the area for which exemption is requested were obtained from two test holes drilled in the NW/4 of Section 9-T25N-R6E in August, 1984.

Two samples of the "Z-Sand" water from each test well were analyzed with the following results:

Well:
Lemsco #4
Sample 1. Tested Zone Depth 510-525 ft.
TDS 3220 Mg/L; Chloride 1593 Mg/L

Sample 2. Tested Zone Depth 510-525 ft.
TDS 3056 Mg/L; Chloride 1416 Mg/L

Well:
Lemsco #5
Sample 1. Tested Zone Depth 510-525 ft.
TDS 3740 Mg/L; Chloride 1947 Mg/L

Sample 2. Tested Zone Depth 510-525 ft.
TDS 3616 Mg/L; Chloride 1770 Mg/L

A copy of the letter transmitting these analyses results is attached as Attachment V to this letter.

The TDS content of the "Z-Sand" water in these two water wells was also determined by Phillips by calculation from the electric logs run on the wells. The results of the calculations were:

Well:
Lemsco #4 "Z-Sand" TDS by Log 2800 ppm

Well:
Lemsco #5 "Z-Sand" TDS by Log 3700 ppm

3. Additional water quality analysis information:

A search of the oil production and saltwater injection files in the area for which exemption is requested turned up some detailed historical water quality analysis data for the "Z-Sand".

Apparently water samples from water producing zones were gathered and analyzed during the drilling of the wells in the NW/4 of Section 15-T25N-R6E, which was known as the Eva Bean lease in the South Burbank pool and is now known as South Burbank Unit "T" Quarter Section, and is in the area for which exemption is requested.

These wells were drilled in 1934. On all but one well from which sample results were reported, one of the zones from which samples were taken correlates to the "Z-Sand". The Total Solids Content of the "Z-Sand" in each of the wells in 1934 was as follows:

WELL	DEPTH	TOTAL SOLIDS PPM
Eva Bean #2 (SBU T-W02)	590'	3640
Eva Bean #5 (SBU T-05)	600'	3415
Eva Bean #6 (SBU T-W06)	635-650'	5852
Eva Bean #7 (SBU T-W07)	650'	11140
Eva Bean #8 (SBU T-08)	650'	11028

The report from which the above information was taken also shows a breakdown of the concentration of each component of the Total Solids Content. The report containing this detailed information is transmitted with this letter as Attachment VI.

Based upon the foregoing data, a map of the aquifer exemption area is attached hereto as Attachment IX. The area of the "Z-Sand" for which current EPA Region VI data reflects water quality to be between 3,000 and 10,000 ppm TDS is colored in red. The extension of this area for which an exemption is requested consisting of four quarter sections is diagonally lined on Attachment IX. The technical justification for including these four sections in the area for which an exemptions is requested (the area in which water quality is greater than 3,000 ppm TDS, but less than 10,000 ppm TDS) is based upon the data from the Eva Bean Wells.

DEMONSTRATION THAT AQUIFER DOES NOT CURRENTLY SERVE AS A SOURCE OF DRINKING WATER

The area for which exemption is requested was surveyed in order to identify any water supply wells which tap the "Z-Sand". Only

two apparent water wells were located within the area for which exemption is requested. The first well did not tap the "Z-Sand"; in fact, the apparent depth of the well was only six feet. The well is not in use, nor is it in usable condition. This well is located in the SW/SE/SE of Section 2-T25N-R6E. The second well is located in the SE 1/4 of Section 7-T25N-R6E. This was a hand dug well, completed into the bank of Lost Man Creek. The well is not in usable condition. Three other wells are located outside the aquifer exemption area, but within the EPA-specified 1/4 mile buffer zone. These wells, all in the S 1/2 of Section 4-T26N-R6E, are completed into the Hughes Creek Limestone. None of these three wells are in use, nor are they in usable condition.

For a description of all existing water supply wells in the area, refer to the "Shallow Ground Water Survey for North and South Burbank Unit Area" which was transmitted to EPA as Exhibit III to Phillips' letter to the Region VI Administrator dated October 2, 1987. A copy of the "Shallow Ground Water Survey" is also transmitted with this aquifer exemption request as Attachment VII.

DEMONSTRATION THAT INJECTED WASTE WILL REMAIN IN THE EXEMPTED PORTION OF THE ZONE

This exemption request is for only a portion of the aquifer, and it is not the intention of the operator (Phillips) to inject into the exempted zone. Because the intent of this exemption request is to allow the operator to maintain fluid levels in injection wells in the area above the exempted aquifer, the following discussion is provided.

As presented in Part II., C., above, a horizon ranging between 900 and 1,000 feet above mean sea level (MSL) is assumed to be the next closest base of USDW. Per the Osage UIC Regulations for inactive injection wells, the operator would be required to maintain fluid levels in these inactive wells below this new base of fresh water. Phillips also seeks authorization to operate injection wells if the fluid levels are kept below the base of such water.

The top of the "Z-Sand" ranges from 460 to 600 feet below ground level over the area. In order to maintain fluid levels below the 100 foot horizon, the "Z-Sand" would be subjected to no more than 360 to 500 feet of head. The potential maximum pressure imposed on the "Z-Sand" would be given as:

$$= \frac{\text{Pressure, psi}}{500 \times 1.05} \quad \frac{\text{HEAD (FT) X SPEC. GRAV.}}{2.31} \quad \frac{}{2.31}$$

$$= 227 \text{ PSI}$$

The only mechanism by which fluid could be injected into the "Z-Sand" would be if the pressure exerted by fluid in the wellbore exceeded the reservoir pressure in the aquifer.

A review of the cable tool driller's logs of 111 cable tool drilled oil wells inside the proposed exempted area turned up the fact that the "Z-Sand" flowed water into the wellbore in virtually all of the wells drilled. In fact, typically, the "Z-Sand" filled the hole with water and casing was generally set through the "Z-Sand" to shut off the water flow.

Given this history of water flow from the "Z-Sand" filling the wellbores with water to surface, the chance of inadvertent injection of saltwater into the "Z-Sand" is nil, if the fluid levels in the inactive injection wells are kept below the assumed base of fresh water.

DEMONSTRATION THAT AQUIFER CANNOT NOW AND WILL NOT IN THE FUTURE SERVE AS A SOURCE OF DRINKING WATER BECAUSE: IT IS SITUATED AT A DEPTH OF LOCATION WHICH MAKES RECOVERY OF WATER FOR DRINKING WATER PURPOSES ECONOMICALLY OR TECHNOLOGICALLY IMPOSSIBLE

I. Availability of Alternative Supplies:

Alternative water supplies in the area for which aquifer exemption is requested can be grouped and will be discussed as follows:

A. Rural Water System; Public Supply

B. Surface Water

C. Shallow Well Water

Discussion:

A. Rural Water System

The only source of drinking water in the area for which exemption is being requested that is being used at this time is the O-K Rural Water System. The area is

sparsely populated, but the few residences in the area are connected to this public water supply system.

Attachment VIII is a copy of a map that shows the coverage by the O-K Rural Water System of the area to be exempted. Note, all residences in the area are served by this water system.

B. Surface Water

All of the three municipalities nearest to the area for which exemption is being requested utilize surface water for all or a portion of their water supply.

The town of Fairfax takes its water supply from Fairfax Lake; the town of Shidler takes its water supply from Shidler Lake (Phillips Lake); and the town of Burbank takes its water supply part of the year from wells which have a high degree of interconnection with Salt Creek, and other times from rock quarries in the area. Note, all of these municipalities are outside the area for which exemption is requested.

There is no surface water developed for drinking water purposes inside the area for which exemption is requested.

C. Shallow Well Water

As stated previously, the few water wells located in the area or buffer area for which exemption is requested are not used or usable. The wells did not penetrate the aquifer for which exemption is requested.

For a more complete discussion of the very limited use of the shallow groundwater in the area, refer to the "Shallow Ground Water Survey," Attachment VII attached to this exemption request.

There is no underground source of water developed for drinking water purposes in the area for which exemption is requested.

II. Adequacy of Alternative Supplies to Meet Present and Future Needs.

The primary water supply system in the area for which exemption is requested is the O-K Rural Water System. The current daily average water volume throughout for the O-K Rural Water System is 40,000 GPD. The water system obtains its water supply from alluvial aquifers associated with the

Arkansas River near Newkirk, Oklahoma. The system operates three water supply wells in this alluvial deposit. The approximate daily pumping capacity of the wells and pumps that make up the system is 330,000 GPD. As can be seen, this total system capacity exceeds the current system demand by a factor of over eight (8) times.

The information above clearly shows that the O-K Rural Water System has sufficient capacity to meet current drinking water supply needs in the area for which exemption is requested.

Adequacy of the O-K Rural Water System to meet future water supply needs in the area hinges both on current and potential system capacity and anticipated population density changes in the area.

The information shown above indicates that the O-K Rural Water System has substantial capacity above current requirements.

Projected future population density can be best addressed by a discussion of the current uses to which the land area is being put and the historical population trends associated with these uses.

The land area overlying the area for which exemption is being requested is devoted to two primary uses, those being oil production operations and cattle grazing.

The oil production operations in the area are in a state of extended decline. The Burbank fields were discovered in the late 1920's. The period of maximum population density in the area most likely occurred during the "boom" that accompanied the rapid development, and rapid initial depletion, of the Burbank oil fields in the late 1920's. A second increase in activity in the fields, and a consequential increase in population density, took place when waterflood development (secondary recovery) of the fields was undertaken in the early 1950's through the early 1960's. Since completion of waterflood development in the fields, population in the area has been subject to steady decline.

Continual oil field production decline, a steady increase in the amount of water produced per each barrel of oil, and the oil price declines of the past seven to eight years have resulted in continual, sometimes substantial, employment level declines in the oil production operations, which have

resulted in the current very low population density level in the area.

All significant deeper potential producing horizons below the main Burbank producing zone have been tested unsuccessfully in the area. Also, the North Burbank Unit underwent tertiary (enhanced) recovery operations in the early 1980's, but no permanent increase in employment level was necessary to undertake this operation. So, the conclusion is that, even if oil prices were to recover substantially in the future, little if any increase in population density in the area would occur as a result of any increase in oil production operations activity.

Agricultural activity in the area is also at a state of maximum development at this time, and no population increase can be foreseen for this sector. The land surface overlying the aquifer to be exempted is shared by cattle grazing and the oil production operations. The land is not suitable for cultivation, and is, most likely, being grazed as intensely as economically desirable now. The long-term population trend for agricultural areas is a decline, and there is no mechanism foreseen by which the cattle grazing activity would result in more intense settlement in the area.

The area in question is very remote from any population center, so the chances for startup of any industrial activity in the area, or expansion of residential activity related to a population center is nil. Existence of any other natural resources in the area that might be exploited at some time is not known, but also not suspected.

In conclusion, the rural water system now serving the area for which exemption is requested has capacity far beyond any anticipated future increase in demand for drinking water.

III. Demonstration of Major Costs Associated With Use of Water From the "Z-Sand" for Drinking Water Purposes.

In order to demonstrate the magnitude of the costs associated with using water from the "Z-Sand" for drinking water purposes, a comparison of the cost of obtaining and using water from the "Z-Sand" with the cost of obtaining a drinking water supply from the O-K Rural Water System will be presented. (NOTE: For the purpose of this demonstration, the term "Z-Sand" is meant to include both the "Z-Sand" and the "Happy Hollow" limestone in the area designated for aquifer exemption.)

For purposes of this demonstration, the assumption will be made that the most likely drinking water development need in the area would be for a drinking water supply for an individual household. The conclusions reached in the discussion concerning future growth prospects, presented above, support the validity of this assumption.

A. Estimated cost of obtaining drinking water supply from the "Z-Sand" installation costs:

1.	Well Plus Pump	$10,000
2.	Reverse Osmosis De-Salinization Unit Plus Filters, Smallest Unit Available Capacity 1000 GPD	$ 7,000
3.	Surge Tank, Distribution Piping, and Miscellaneous	$13,000
4.	Total Installation Cost.	$30,000

B. Estimated cost of obtaining drinking water supply from the "Z-Sand," Operating Expense:

1.	Assumed Monthly Usage, Gallons	10,000
2.	Yearly Membrane Replacement Expense	$ 2,000
3.	Monthly Chemical and Electric Expense	$ 350
4.	Total Expense Per Month	$ 516
5.	Expense per 1,000 Gallons	$ 51.60

C. Estimated cost of obtaining drinking water supply from the O-K Rural Water System, installation costs:

1.	Membership fee, nonreimbursable	$ 500
2.	Typical Installation Cost, including meter and road crossing	$ 200
3.	Total	$ 700

D. Estimated cost of obtaining drinking water supply from the O-K Rural Water System, Operating Expense:

1.	Assumed Monthly Usage, Gallons	10,000
2.	Water Bill	$ 33.00
3.	Expense per 1,000 gallons	$ 3.30

The total installation cost for a system such as would be required to obtain water from the "Z-Sand" and treat it to a point where the quality of the water would be suitable to use for drinking water is estimated at $30,000 versus an average installation cost to obtain the same or superior water supply from the O-K Rural Water System of $700. The initial expenditure to develop a drinking water supply from the "Z-Sand" is $29,300 or 43 times greater than the initial expenditure required to obtain a similar drinking water supply from the source already in place.

The monthly operating expense for the system necessary to obtain drinking water from the "Z-Sand" is $516, versus a monthly cost of only $33 to obtain the same supply from the rural water system. This is a difference of $483 per month, or $5,800 per year. Obviously, no one would incur this expenditure; therefore, the costs are prohibitive.

IV. Additional Consideration: Technological Impracticality of Recovery of Water From "Z-Sand"/"Happy Hollow" for Drinking Water Purposes.

One physical factor concerning the "Z-Sand" even further reduces the suitability of this aquifer as a potential source of drinking water supply. The "Z-Sand" is a contiguous sandstone member that can be readily identified over one mile south, and several miles north from the area for which exemption is requested. The sand may be contiguous over even greater distances than these but this investigation did not extend that far. The northwest boundary of the area for which exemption is requested is defined by the gradient line where the character of the water in the "Z-Sand" changes from a TDS content of less than 10,000 ppm to a TDS content of greater than 10,000 ppm. This means that water in the "Z-Sand" defined as "treatable," is hydraulically coexistent with and physically very near water of much greater TDS content which is not afforded protection under the UIC Regulations. There are also occurrences of water in the "Z-Sand" in the area for

which exemption is requested with TDS content greater than 10,000 ppm, as shown under General Information Part II., F., 1., 2., and 3.

There are many examples of "Z-Sand" and "Happy Hollow" water with TDS content greater than 10,000 ppm immediately to the northwest of the proposed exempted area in the North Burbank Unit.

The "Z-Sand" water in North Burbank Unit ("NBU") 141-4 (SW/4, Sec. 33-T26N-R6E) has a TDS content of 16,956 ppm by calculation from the SP curve on electric log. The "Z-Sand" water in NBU 138-W10 (SW/4, Sec. 28-T26N-R6E) has a TDS content of 61,835 ppm by calculation from electric log.

Any attempt to develop the "Z-Sand" or "Happy Hollow" as a source of drinking water in the area for which exemption is requested would run the risk of being subject to greatly increasing TDS content of the produced water as lower-quality waters outside the area are drawn in to replace water produced from the aquifer.

V. Specific Items That EPA Requests Be Addressed.

A. Distance from the proposed exempted aquifer to public water supplies.

As presented in Part I., A., above, the area under which the proposed exempted aquifer lies is served by the O-K Rural Water System. This public water system overlies the "Z-Sand"/"Happy Hollow", the proposed exempted aquifers. Please refer to Attachment VIII to this request, which is a map showing both the area to be exempted and coverage of that area by the O-K Rural Water System. <u>All</u> residents in the area overlying the proposed exempted aquifer are served by the O-K Rural Water System. As reflected in Part II., above, the O-K Rural Water System is supplied from aluvial aquifers located outside and uninfluenced by the proposed exempted area.

B. Current Sources of Water supply for Potential Users of the Proposed Exempted Aquifer.
The only source of drinking water supply for potential users of the proposed exempted aquifer that is currently in use is the O-K Rural Water System.

C. Availability and Quality of Alternative Water Supply Sources.

As discussed in Part II., above, substantial quantities of drinking water are readily available from the O-K Rural Water System. There are no problems with the quality of the water supply furnished by this water system. There is no history of interruptions of supply, and use of the O-K Rural Water System is readily accepted by the area residents to the virtual exclusion of any other water supply source.

D. Analysis of Future Water Supply Needs Within the General Area.

An in-depth analysis of anticipated future water supply needs within the general area was presented in Part II., above, Adequacy of Alternative Supplies to Meet Present and Future Needs.

E. Depth of Proposed Exempted Aquifer.

The depth of the proposed exempted aquifer is presented under General Information, Part II., B., above. The subsurface depth of the "Z-Sand" is detailed on Attachment II, a map depicting the structure on top of the "Z-Sand," with a datum of sea-level.

The depth of the "Happy Hollow" is approximately 100 feet above the top of the "Z-Sand" in the location marked as Area A in Attachment I.

F. Quality of the Water in the Proposed Exempted Aquifer.

An in-depth discussion of the quality of the water in the "Z-Sand"/"Happy Hollow" is presented under General Information, Part II., F., 1., 2., and 3, above.

G. Costs to Develop the Proposed Exempted Aquifer as A Water Supply Source Including Any Treatment Costs and Costs to Develop Alternative Water Supplies.

An in-depth discussion of the costs associated with obtaining and using water from the "Z-Sand"/"Happy Hollow" and a comparison with the cost of obtaining a similar drinking water supply from the O-K Rural Water System is presented under DEMONSTRATION THAT AQUIFER CANNOT NOW AND WILL NOT IN THE FUTURE SERVE AS A SOURCE OF DRINKING WATER BECAUSE IT IS SITUATED AT A DEPTH OR LOCATION WHICH MAKES RECOVERY OF WATER FOR DRINKING WATER PURPOSES ECONOMICALLY OR TECHNOLOGICALLY IMPOSSIBLE, Part III, above.

DEMONSTRATION THAT THE TOTAL DISSOLVED SOLIDS CONTENT OF THE WATER IN THE AQUIFER IS MORE THAN 3,000 AND LESS THAN 10,000 MG/L AND IT IS NOT REASONABLY EXPECTED TO SUPPLY A PUBLIC WATER SYSTEM

I. Quality of Water From the Aquifer Proposed for Exemption.

All available information concerning the quality of the water in the "Z-Sand" and "Happy Hollow" is presented above in General Information, Part II., F., 1., 2., and 3.

II. Availability of Water From the Aquifer Proposed for Exemption.

Water appears to be readily available from the "Z-Sand." The drillers' logs of cable-tool-drilled oil wells in the proposed exempted area almost universally indicate substantial water in the "Z-Sand." The typical log entry when drilling through the "Z-Sand" is "Hole Full of Water." This entry indicated that the influx of water from the "Z-Sand" was substantial enough to fill the well with water to near the surface. Also, casing was set through the "Z-Sand" in nearly all of the cable tool wells within the area. Setting casing across any particular zone in a cable tool well is evidence that the amount of water flowing into the wellbore from that zone is great enough to hamper drilling operations, thus it is faster and more economical to shut the water off by running casing than to try to keep the hole bailed dry.

No other quantative information about the volume of water that is possible to be produced from the "Z-Sand" within this area is available.

There is no such uniform indication that the water, if any, produced from the "Happy Hollow", during drilling, was

available in the quantities similar to that produced from the "Z-Sand". Likewise, we have no information on the quality of "Happy Hollow" water other than TDS estimates from the SP response.

III. Potential for Public Water Supply Use of the "Z-Sand."

An extensive discussion of the potential for public water supply use of the "Z-Sand"/"Happy Hollow" has been presented earlier in this letter request under the heading: DEMONSTRATION THAT AQUIFER CANNOT NOW AND WILL NOT IN THE FUTURE SERVE AS A SOURCE OF DRINKING WATER BECAUSE IT IS SITUATED AT A DEPTH OR LOCATION WHICH MAKES RECOVERY OF WATER FOR DRINKING WATER PURPOSES ECONOMICALLY OR TECHNOLOGICALLY IMPRACTICAL. Please refer to this section for the requested information.

A. Description of current sources of public water supply in the area.

See Part I., A., B. and C., under the heading referred to above.

B. Discussion of the Adequacy of Current Water Supply Sources to Supply Future Needs.

See Part II., "Adequacy of Alternative Supplies to Meet Present and Future Needs," under the heading referred to above.

C. Population Projections and Economy:

See Part II., "Adequacy of Alternative Supplies to Meet Present and Future Needs" under the heading referred to above.

D. Future Technology.

As presented in Part III., "Demonstration of Major Costs Associated With Use of Water From the 'Z-Sand'/'Happy Hollow' for Drinking Water Purposes", even if some new technology were to enable water from the "Z-Sand"/"Happy Hollow" to be treated for use as drinking water more economically than current technology allows, the cost of a 450 to 600 foot-deep well and energy required to pump the water to surface would still be more costly than securing a source of drinking water supply from the O-K Rural Water System.

The small likelihood of substantial future population development in the area, coupled with the ready availability of alternate sources of drinking water supply make it unlikely that any future technological development would create a demand to exploit the "Z-Sand"/"Happy Hollow" for a drinking water supply.

E. Discussion of Other Available Water Supply Sources Within the Area.

For a discussion of other available water supply sources within the area, see Part I., A., B., and C., and Part II., under the heading referred to above.

SUMMARY

Phillips has presented information that demonstrates that certain portions of two aquifers named the "Z-Sand" and "Happy Hollow" are eligible for exemption from protection under the EPA's Osage Underground Injection Control Regulations in areas depicted in the map shown as Attachment I.

The information presented demonstrates that the "Z-Sand"/"Happy Hollow":

1. Does not currently serve as a source of drinking water;

2. Cannot now and will not in the future serve as a source of drinking water because: It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impossible; and

3. The total dissolved solids content of the ground water in the "Z-Sand"/"Happy Hollow" is more than 3,000 and less than 10,000 MG/L and it is not reasonably expected to supply a public water system.

The information presented in the body of this letter request demonstrates that the described portion of the aquifers named the "Z-Sand" and "Happy Hollow" meet the conditions which EPA has set as prerequisite to the consideration for aquifer exemption. Therefore, Phillips requests that the EPA exempt the "Z-Sand" and "Happy Hollow", over the area described above, from protection under the Osage UIC Regulations. This exemption is submitted for consideration of the Regional Administrator under 40 C.F.R. §146.4, 40 C.F.R. §144.7, and 40 C.F.R. §147.2908.

Very truly yours,

PHILLIPS PETROLEUM COMPANY

B J Ingram

B. J. Ingram
Oklahoma Area
Operations Manager
Post Office Box 358
Borger, Texas 79008
(806) 283-3433

BJI:RBC:am:512

Attachments

LIST OF ATTACHMENTS
IN NUMERICAL ORDER

I. Map of the area for which exemption is requested.

I-A. Map of Area showing base of Fresh Water-Isopleth.

II. Map depicting the structure on top of the "Z-Sand", sea level datum.

III. Electric Log Survey

IV. Computer Printouts - Calculations used to arrive at salinity values.

V. Letter - Well analysis results.

VI. Report - TDS content "Z-Sand".

VII. "Shallow Ground Water Survey for North and South Burbank Unit Area"

VIII. Map of O-K Rural Water System within area to be exempted.

IX. Delineation of TDS contours for exempted aquifers.