The Honorable William P. Hobby  
Lieutenant Governor  
Texas Senate  
70th Legislature

Honorable Members  
Texas Senate  
70th Legislature

Dear Governor Hobby and Fellow Members:

The Senate Committee on Natural Resources respectfully submits its interim report for consideration by the Members of the 70th Legislature.

H. Tati Santiesteban, Chairman  
John T. Montford, Vice Chairman
The Senate Committee on Natural Resources held six hearings during the interim following the 69th Regular Session to study significant natural resource issues facing the 70th Legislature. The statements and conclusions in this report reflect testimony from a variety of sources, including agency reports, public testimony (oral and written), and expert witnesses.

Sitting on the Committee were Senator H. Tati Santiesteban, Chairman; Senator John Montford, Vice Chairman; and Senators Richard Anderson, J.E. "Buster" Brown, Glenn Kothmann, Cyndi Krier, Ted Lyon, Bill Sarpalius, Bill Sims, Carlos Truan, Hector Uribe, and John Whitmire. The staff included Jane Pulaski, Committee Clerk; Alicia Daniel, Research Director; and Mannie Kalman, General Counsel. Willette Lipscomb and Linda Willis provided secretarial assistance.

Each section of the report identifies an issue, presents a history of the topic, and summarizes suggestions for legislative action.

This report is respectfully submitted to the Members of the 70th Legislature.

H. Tati Santiesteban, Chairman
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COLONIAS: WATER AND WASTEWATER FUNDING ISSUES
COLONIAS: WATER AND WASTEWATER FUNDING ISSUES

I. HISTORY

Colonias are unincorporated subdivisions built along the Texas-Mexico border that frequently lack sewage facilities, drinking water, electricity, and gas utility services. The factors contributing to the growth of these subdivisions are as many and varied as the conditions that give the border its unique culture. Poverty, unemployment, and increasing population all contribute to substandard living conditions and are factors that stem from policies and politics, national and global.

One of the difficulties that haunts any discussion of the colonias is a lack of available information. The numbers that surface during a colonias discussion vary widely, and until recently almost no reliable data about the way people in colonias live had been gathered. In November of 1986, the Water Development Board, contracting with the engineering firm Turner, Collie, and Braden, surveyed a three-county area in the Lower Rio Grande Valley in an attempt to assess water and wastewater utility services of the colonias in that area. The task was tremendous and the work still ongoing. And Cameron, Willacy, and Hidalgo
counties are only three of the dozen or more counties experiencing colonias growth.

II. LIFE IN THE COLONIAS

What is known about the colonias is that living without water is more than an inconvenience. Residents in these subdivisions commonly have hand-dug pit latrines or privies. While such facilities might be appropriate in some climates, here they are often a serious health hazard. Many of the colonias develop in locations where flooding is chronic. Soils are generally clays with low permeability. Shallow water tables help carry pathogens to low areas where ponding occurs and children play. Flooding then brings the fecal wastes out of the privies and into the streets. In order to obtain drinking water, residents of some colonias reportedly drive miles to a public spigot. Or they swim, bathe in, or draw drinking water from irrigation or drainage ditches that run near the developments.

The Water Development Board identified 770 unincorporated communities in the tri-county study area. Of those, 435 were identified as falling within this definition of a colonia: an unincorporated area populated as a primarily
residential development with at least some substandard housing and without benefit of adequate water supply and/or wastewater services. Hidalgo county has 366, Cameron county has 65, and Willacy has 4.

The Board discovered in preliminary findings that over 96% of the colonias surveyed have adequate plumbing and/or potable water. That does not, however, mean that each residence within a colonia will have water. The study noted 135 residences that have no apparent water source at the house or in the yard, even though the colonias themselves appear to have water available. An additional 138 units share water with their neighbors from a common source, often by using garden hoses. Thus, at least 273 of the colonia residences observed in the drive-by survey did not have their own water supply line. While this is less than 2 percent of the total residences observed, for those residents without water the situation is intolerable. In addition, there is good reason to believe that some colonias have water that is of poor quality, either because of its source (irrigation canals) or improper plumbing.

The findings on wastewater disposal were bleaker. All 435 colonias dispose of sanitary waste through onsite methods.
such as latrines or septic tanks. In virtually all cases, waste disposal was found to be inadequate.

Here are some of the other demographics of Hidalgo, Willacy, and Cameron county colonias:

--seventy-three percent of the households interviewed are headed by an unskilled worker, and 53% are unemployed or receiving Social Security or welfare. Fifty-seven percent of the households had a monthly income of less than $500, including welfare and Social Security. The average number of people occupying the households interviewed is 4.7.

--the average monthly water bill was $20 per month.

--the average value of the lot, with the house, was $14,000.

As bad as the situation may seem, according to the Texas Department of Agriculture report, Challenge of the Colonias, conditions have improved markedly in the past ten years. Water supplies have been brought to many of the colonias by rural water-supply corporations such as the Military Highway Water Supply Corporation, the North Alamo Water Supply Corporation, and the East Rio Hondo
Water Supply Corporation. These entities serve rural areas with the help of grants and loans from the Farmers Home Administration of the U.S. Department of Agriculture. However, funding from these traditional sources has declined significantly over the past four years. Many of the extensions of these systems to the poorest communities have also been made with the supplemental use of community development block grants through the Texas Department of Community Affairs.

III. THE PRICE OF REFORM

The report adds that bringing water to the colonias has in some cases exacerbated the problem, by increasing wastewater flow where there are no acceptable means of treating it. More recently block-grant proposals for the construction of wastewater systems have been submitted to the state by local sponsoring governments on behalf of colonias. However, the colonias must compete with local government entities for these limited funds, and even with the cooperation and coordination of the Lower Rio Grande Valley Development Council, grants available from the State have funded traditional wastewater services to colonias at the rate of three per year.
The State of Texas has responded to the declining involvement of the federal government in traditional areas of financing water development. In November 1985, Texas voters approved constitutional amendments to allow the State to issue about one billion dollars of tax-exempt general obligation bonds to assist small and medium-sized units of government in financing needed water-related projects. Eligible projects include water supply and wastewater treatment systems. In addition to the direct loan funds to be made available, the State has been authorized to ensure or guarantee as much as 500 million additional dollars of the tax-exempt bonds for local political subdivisions. The state program was also expanded to include nonprofit rural water associations as eligible borrowers.

This expansion of the State's financial assistance programs, although a step in the right direction, was aimed primarily at reducing financing costs for moderate-sized cities and towns. Colonias lack the tax base to qualify for loans.

Incorporation of some of the larger colonias has been discussed, but in the process of incorporating as a city or town, a colonia might have to assume other
responsibilities that would outweigh possible benefits, and the prospect seems overwhelming to many of those involved. In any event, simply incorporating would not, of itself, improve the tax base of a colonia from a lender's point of view. For similar reasons, low-interest loans from the State have not proven sufficient enticement to local governments to annex colonias in order to extend their services to them because annexing of the colonias would not proportionately enlarge the governments' tax bases.

IV. LEGAL ANALYSIS FOR THE COLONIAS

The authority of city and county governments to regulate subdivisions in Texas is contained in several statutes, including: V.T.C.A. Articles 974a, 970a, 6702-1, 6626a.2, 6626c, and 4477-1.

The most widely applicable statute conferring regulatory power on county governments is V.T.C.A. Article 6702-1, Subchapter E., Sec. 2.401. "Road Regulations in Subdivisions." This subsection requires persons who subdivide land to make and file an accurate plat, and also authorizes the county to establish standards for the width of right-of-ways and specifications for their paving and
drainage in "accordance with standard engineering practices." It further authorizes the county to establish methods by which bond or other sureties may be posted by the subdivider to guarantee performance. Penalty provisions in said subsection authorize the county to recover monetary damages adequate for the county to undertake any construction necessary to complete the required improvement.

Subsection 2.401(b) defines the county's jurisdiction over real estate subdivisions as extending to "land without the corporate limits of any city." No delineation is made as to the specific distance a subdivision must be to constitute "without" city limits; this general language operates in tandem with V.T.C.A. Articles 970a, Section 3, "Municipal Annexation Act," and 974a.

Article 970a grants to cities certain powers to regulate a subdivision within a specified area outside their corporate limits; these areas are commonly referred to as "Extraterritorial Jurisdiction." As the court notes in La Cour Du Roi, Inc. v. Montgomery County, Texas, 698 S.W.2d 178 (Tex. Civ. App.--Beaumont 1985):
The Legislature did not intend to create an area where developers would be free of regulation...The Legislature intended counties to regulate subdivisions outside city limits so that they could develop and maintain adequate county road systems. At the same time, the Legislature intended cities to regulate subdivisions within their corporate limits, as well as within the five mile extraterritorial zone.

In addition to the provisions of Article 6702-1, certain counties are also empowered to "determine and describe the boundaries of flood or rising water prone areas," and also to "enact and enforce regulations which regulate, restrict, or control the management and use of land, structures, and other development in flood, or rising water prone areas in such a manner as to reduce the danger of damage caused by losses." V.C.T.A. Article 1581e-1.

This power and authority includes, but is not limited to, "requirements for flood proofing of existing or future structures constructed in these areas, regulations covering the minimum elevation of a structure permitted to be erected in or improved in such areas, specifications
for drainage, and any other action which is feasible to minimize flooding and rising water damage."

Section 26.032. of the Texas Water Code authorizes counties to adopt orders to abate or prevent pollution or injury to public health "whenever it appears to the commissioners court that the use of private sewage facilities is causing or may cause pollution or injury to public health."

The standards created to promote this authority are contained in a joint Texas Water Commission/Department of Health document entitled Construction Standards for Private Sewage Facilities. Included in the document's provisions is the requirement that "platted subdivisions of single family residences served by public water supply but utilizing individual subsurface absorptive methods for sewage disposal should provide for individual lots having surface areas of at least 15,000 square feet." In those instances where the subdivisions are served by individual water systems "the plat should show the approved well locations, and a sanitary zone around the well within a 100 foot radius in which no absorptive type septic tank may be constructed. To minimize the possibility of transmission of water borne disease due to the pollution
of the water supplied for domestic use, each lot in a platted subdivision should not contain less area than 20,000 square feet."

The provisions contained in the Construction Standards for Private Sewage Facilities document, while anticipating the standards (or substandards) prevalent in many colonias, does not contain language that commands compliance, or provides for enforcement.

V. LEGISLATIVE HEARING

Pursuant to a formal charge from Lieutenant Governor Hobby to the Committee to consider alternative sources of funding that might be used to address these problems, Senator Santiesteban convened the Committee on Natural Resources in Austin on December 22, 1986.

Testimony was presented by Valley Interfaith, two state agencies, a County Commissioner from Cameron County, as well as other interested persons with experience with Colonia issues.

Testimony from the Texas Water Development Board, in concert with Turner, Collie, and Braden, Inc., described
the study by that engineering firm of the water supply and sewer needs of colonias of Cameron, Hidalgo, and Willacy counties. The study revealed location of colonias, determination of water and sewer service arrangements, population and water use of each colonia, projected water and sewer service needs through the year 2010, and an estimate of costs of those water and sewer services to meet projected needs.

For purposes of estimating those costs of wastewater services, the report identified five approaches to sanitary waste disposal, including expanding existing regional systems; developing centralized systems for one or more colonias, developing cluster systems within a colonia, maintaining on-site septic disposal, and maintaining improved latrine systems.

The report also identified types of financing programs and management agencies available to implement water supply and wastewater project alternatives. These include: U.S. EPA Construction Grants program; U.S. Farmers Home Administration grants and loans; U.S. Housing and Urban Development Department's Community Development Block Grant Program; Texas Community Development Program's Community Development Project Fund; Area Revitalization Fund, and
Emergency/Urgent Need Fund; and the Texas Water Development Board's loan, local bond insurance, and planning grant programs.

Finally, the report estimated costs to provide necessary water service to the existing and projected 2010 population of the colonias at approximately $12.4 million. Additionally, the estimated cost to provide necessary wastewater services was estimated to range from $93 million for minimal facilities to $153 million for more adequate facilities.

The Turner, Collie, and Braden report, it should be noted, was not advocating or recommending specific plans of action. The contract with Water Development Board was to use $215,000 of regional water and sewer planning funds to conduct a reconnaissance level engineering study of the water and sewer needs of the Colonias of Cameron, Hidalgo, and Willacy Counties. However, the results of those studies show that the estimated costs of providing services are quite high in relation to what people who live in colonias can afford to pay. Water Development Board Chairman Thomas Dunning suggested that since funds for public assistance are so limited, it might be prudent if grant funds for water and sewer services to the
colonias were leveraged to the very maximum—perhaps by a factor of five, six, or seven times. Further, he suggested that one way to achieve the highest leverage rates would be to use grant funds to pay the interest charges for a given period of time on water and sewer loans to cities for the installation of water and sewer projects to serve newly annexed colonias. Additionally, a similar arrangement could be made with special districts for water and sewer projects to serve colonias that could not be annexed by cities.

Chairman Dunning also suggested that public sector grant funding be made available to cities and special districts to assist in paying the costs of providing water and sewer services for colonias. But Chairman Dunning was emphatic that Water Development Fund monies can only be used to make loans; they must be repaid.

Cameron County Commissioner Tony Gutierrez cited an inability to pay for water and sewer services as the primary problem facing colonia residents. As a result, residents resort to reduced or no-cost alternatives, which ultimately result in contaminated water supplies and sewer disposal systems which pose health hazards. Additionally, he said that sewer services are considered a low priority
item by colonia residents when compared to paved roads and streets.

Commissioner Gutierrez said there is limited statutory authority that could be utilized to establish or enforce effective and acceptable standards for subdivision development. Also, the remote location of the colonias reduces the feasibility of providing sewer services to those residents at a reasonable cost, and available funding assistance is very limited. Cameron County is perhaps unique in enforcing more stringent building codes. County Commissioners require enforced size of lots, health codes, septic tanks, paved roads, and platting of subdivisions. Subdivisions without these basic provisions would not be approved by Commissioner's court.

Commissioner Gutierrez also informed the Committee that the Federal Housing Authority moves very slowly, sometimes taking 5-6 months to process an application for rehabilitation of homes. He suggested private mortgage companies taking some of the loans for home improvements and upgrading of existing homes.

The testimony from Valley Interfaith came from three witnesses, all activists in colonia-related problems.
Sister Christine Stephens, representing Valley Interfaith in the Lower Rio Grande Valley, issued a series of recommendations based on the Turner, Collie, and Braden study and their own knowledge of the colonia situation. Those recommendations included establishment of a multi-county regional authority to implement the Turner, Collie, Braden findings, and the building of sewer systems. If that system were not feasible, next preferred plan would be to give counties the authority to plan for and build those systems. Additionally, she said counties should have the authority to require new developments to have water and sewer systems in place before the lots are sold.

Valley Interfaith recognized the possibility that the cost of wastewater services would exceed the colonia residents' ability to pay. Therefore, members recommended that a mixture of grants and low interest loans be made available to build the systems. Also, the organization recommended that grants from the Department of Community Affairs earmark $3-5 million per year for border colonias and from a legislatively created "hardship" grant fund that could supply grants to supplement Texas Water Plan loan funds.
Further, Valley Interfaith suggested that some of the Exxon settlement monies be used to install or improve plumbing in qualified homes owned by colonias residents, or to tie into the system. And since loan monies from the Water Development Board cannot be used by rural water supply corporations for distribution systems, Valley Interfaith suggests a legislative change for these monies to be made available to rural water supply corporations for distribution systems.

Additional testimony was presented by Texas Rural Legal Aid. Presenting testimony for Evonne Charbonneau of Texas Rural Legal Aid, Vikki Flores cited one specific instance where colonia residents supplied the labor and used borrowed equipment to hook up to another local system at a cost of $5,000. The estimate from the water supply corporation to supply water to this colonia was $60,000. Additionally, TRLA proposed meaningful review of proposals by those persons who are to benefit from the projects. They advocate that relevant information be made readily available; that public forums be held with adequate notice and interpreters; and that they be held in the Valley at times that workers could attend.
VI. FUNDING OPTIONS NOW

Listed below are the current funding options available for water and wastewater systems in the State:

**TDCA Community Development Program Regular Fund:**
$350,000-500,000 in grants. This is a regional competition among small cities and counties. It is a non-entitlement program (federal monies eligible only through TDCA if population is 50,000 or less).

**TDCA Special Impact Fund:** This is a maximum of $350,000 in grants in a statewide competition. This is strictly for counties, and is designed to assist substandard subdivisions in the unincorporated areas of the county. These monies may not be used for housing-related activities, but can be used for street and drainage improvements, and water and sewer improvements.

**TDCA Areawide Revitalization Fund:** Provides up to $600,000 in grants in statewide competition for small cities and counties. The focus here is on housing-related activities.

**Farmers Home Administration Rural Water Supply Loans/Grants:** Rural water supply companies can apply here. Partial grants are needed to reduce the loan
amount, which, in turn, reduces the repayment burden on water and sewer customers.

**Municipal Utility Districts:** These may be considered for individual colonias of substantial size. Taxing and bond issuing capabilities would provide revenue for infrastructure improvements.

**Environmental Protection Agency:** Construction grants may be available to cities and utilities to provide wastewater treatment and collection for colonias. Location of industrial growth in strategic areas could offset the cost of extending water and sewer lines. EPA public works grants would reduce the overall cost here.

**Community and Health Service Organizations:** Organizations that are possible sources of funding for grants or no-interest loans for hook-up fees and home improvement efforts include private foundations, health and human services administration, and community services administration.
VII. SUMMARY

It is clear that the colonias in the Lower Rio Grande Valley do not have wastewater management systems in place because conventional systems are too expensive and the residents cannot afford either the initial hook-up costs or the additional monthly charge for those services. To correct the current situation will require better use of existing water resources, further consideration of alternative wastewater systems, and possibly some direct financial assistance, either in the form of grants or low-interest loans.
The State of Texas  
Office of the Lieutenant Governor  
Austin  
78711-2068  

October 28, 1986

The Honorable H. Tati Santiesteban  
State Senator  
Carmen Building, Suite 100  
747 E. San Antonio Street  
El Paso, Texas 79901

Dear Tati:

As you know, the people who live in the more than 600 colonias in the lower Rio Grande Valley undergo hardship caused by the lack of adequate water and sewer systems. The Texas Water Development Board is surveying the colonias in South Texas to determine ways that these systems might be installed or improved.

The board is also considering ways that the bond money authorized by the Texas Water Plan could be used to help improve that situation.

There may be other state resources that can be brought to bear on this problem. There may be other sources of funding that could be used to address living conditions in the colonias.

I would be pleased if the Natural Resources Committee would examine some of the resources and funds outside the Water Development Board that could be used in the colonias and make a recommendation to the 70th Legislature.

Thank you.

Sincerely,

[Signature]

William P. Hobby  
Lieutenant Governor
## COLONIA PROJECTS FUNDED
UNDER THE TEXAS COMMUNITY DEVELOPMENT PROGRAM

### 1986 PROGRAM YEAR

<table>
<thead>
<tr>
<th>COLONIA</th>
<th>GRANT AMOUNT</th>
<th>PROJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameron County</td>
<td>$266,400</td>
<td>Street Improvements</td>
</tr>
<tr>
<td>(La Coma, Section III)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hidalgo County</td>
<td>$350,000</td>
<td>Street and Drainage Improvements</td>
</tr>
<tr>
<td>(Progreso, Llano Grande, Agua Dulce, Colonia Nueva)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weslaco (Diana and Olivarez Subdivisions)</td>
<td>$200,000</td>
<td>Water and Sewer Improvements</td>
</tr>
<tr>
<td>Val Verde County</td>
<td>$323,068</td>
<td>Water System Improvements</td>
</tr>
<tr>
<td>(Northeast Val Verde Park, Cienegas Terrace and Chapparal Hills)</td>
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</tbody>
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**1986 TOTAL**   **$1,139,468**

**FOUR YEAR TOTAL**   **$8,576,293**
<table>
<thead>
<tr>
<th>COLONIAS</th>
<th>GRANT AMOUNT</th>
<th>PROJECT/STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. El Paso County</td>
<td>$400,000.00</td>
<td>Street improvements (pre-construction/design activities in process)</td>
</tr>
<tr>
<td>(Fabens, San Elizario, Canutillo, Westway)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Brewster County</td>
<td>$282,289.00</td>
<td>Water/sewer line extensions housing rehabilitation, and clearance/demolition (under construction)</td>
</tr>
<tr>
<td>(Marathon)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Maverick County</td>
<td>$279,321.00</td>
<td>Water line extensions (under construction)</td>
</tr>
<tr>
<td>(Las Hacienditas, Las Garretas, Lago Vista)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Starr County</td>
<td>$331,432.00</td>
<td>Street improvements (under construction)</td>
</tr>
<tr>
<td>(Three Colonias)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Hidalgo County</td>
<td>$331,432.00</td>
<td>Road and drainage improvements (under construction)</td>
</tr>
<tr>
<td>(12 Colonias)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Cameron County</td>
<td>$350,000.00</td>
<td>Street improvements (under construction)</td>
</tr>
<tr>
<td>(Juarez/Las Palmas Subdivisions)</td>
<td></td>
<td></td>
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<tr>
<td><strong>1985 Total</strong></td>
<td><strong>$1,974,474.00</strong></td>
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### 1984 Program Year

<table>
<thead>
<tr>
<th>Colonias</th>
<th>Grant Amount</th>
<th>Project/Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. El Paso County (Westway)</td>
<td>$500,000.00</td>
<td>Water line hookups for 82 households (under construction)</td>
</tr>
<tr>
<td>2. Maverick County (Chula Vista and Quinton Fronterias)</td>
<td>$276,934.00</td>
<td>Street paving (completed)</td>
</tr>
<tr>
<td>3. Starr County (Salineno, San Julian Fronton, Falcon Heights La Casita, La Puerta, Alto and San Isidro)</td>
<td>$500,000.00</td>
<td>Street paving (completed)</td>
</tr>
<tr>
<td>4. Webb County (Larga Vista and Empresas El Rancho)</td>
<td>$306,122.00</td>
<td>Construction of water distribution system (completed)</td>
</tr>
<tr>
<td>5. Hidalgo County (Hidalgo Park)</td>
<td>$402,950.00</td>
<td>Construction of sanitary sewer service (completed)</td>
</tr>
<tr>
<td>6. Weslaco (Diana and Olivarez subdivisions)</td>
<td>$124,345.00</td>
<td>Sewer lines construction (completed)</td>
</tr>
<tr>
<td>7. Cameron County (Portway Acres)</td>
<td>$500,000.00</td>
<td>Water, sewer, drainage, and street improvements (completed)</td>
</tr>
</tbody>
</table>

**1984 Total**  
$2,610,351.00
### 1983 PROGRAM YEAR

<table>
<thead>
<tr>
<th>COLONIA</th>
<th>GRANT AMOUNT</th>
<th>PROJECT/STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. El Paso County (Fabens, Socorro)</td>
<td>$500,000.00</td>
<td>Neighborhood revitalization and construction of a drug treatment facility (completed)</td>
</tr>
<tr>
<td>2. El Paso County (Canutillo)</td>
<td>$285,000.00</td>
<td>Construction of pedestrian overpass, water lines, and neighborhood revitalization (completed)</td>
</tr>
<tr>
<td>3. El Paso County (Lower Valley)</td>
<td>$250,000.00</td>
<td>Construction of water connections for 70 households (completed)</td>
</tr>
<tr>
<td>4. Maverick County (Seco Mines)</td>
<td>$500,000.00</td>
<td>Construction of new sewer lines, and streets with curb and gutter (completed)</td>
</tr>
<tr>
<td>5. Hidalgo County (Evans and Las Milpas Colonias)</td>
<td>$500,000.00</td>
<td>Construction of phase one of a multi-phase effort to provide sewer service (completed)</td>
</tr>
<tr>
<td>6. Cameron County (Cameron Park)</td>
<td>$500,000.00</td>
<td>Water, septic system, street and drainage improvements (completed)</td>
</tr>
<tr>
<td>7. Willacy County (Sebastian)</td>
<td>$317,000.00</td>
<td>Street and drainage improvements (completed)</td>
</tr>
</tbody>
</table>

**1983 Total** $2,852,000.00
GROUNDWATER OF HOUSTON

I. HISTORY

Houston's rapid population growth and its large and growing geographical area combine to challenge the ability to provide an adequate and safe water supply for the residents and industries in the area. Houston is the largest American city with no zoning ordinances, which the citizens have repeatedly rejected in favor of deed restrictions. In spite of careful planning, the absence of zoning makes the city's direction of growth somewhat unpredictable. The outward movement of developments creates numerous small packaging plants to treat the sewage of new communities that cannot be hooked to regional plants because of the enormous cost of laying the pipe. Yet as the city's limits move outward, these small plants often are taken over by the city's regional systems and subsequently abandoned at a loss.

Another factor that contributes to Houston's water problems is one that was historically viewed as a blessing: the area receives between 46 and 56 inches of annual rainfall. But though there is ample rain, it falls in concentrations (i.e. hurricanes) which contribute to
flooding problems and make the rain difficult to capture. Much of it returns to the sea unused.

Additionally, there are three lakes, but the flatness of the coastal terrain makes them shallow with high rates of evaporation. One of these lakes, Lake Houston, supplies 40 percent of the municipal and industrial water requirements in the Houston area and serves as a major recreational resource for surrounding urban communities. The Lake's total watershed area is 2,828 square miles, and population in the entire Lake Houston watershed is expected to increase by approximately 350,000 persons by 1990. The rapid development along the Lake's major tributaries threatens the water quality with excessive loads of suspended solids, nutrients, and possible trace level organics from point sources and nonpoint urban and industrial pollution.

Besides the area lakes, Houston's main source of municipal and industrial water is the Gulf Coast Aquifer, the third largest aquifer in the nation. For many years, Houston's primary water supply was groundwater retrieved from wells. Although groundwater is traditionally cleaner and less expensive than surface water, it also has drawbacks. Chief among them is subsidence.
II. SUBSIDENCE

The withdrawal of large quantities of groundwater in Harris and Galveston Counties of Texas has resulted in a critical subsidence problem, especially in the low-lying areas along the coast. Concern about the loss of elevation, measured in excess of 9.8 feet along the Houston Ship Channel, led to the creation of the Harris-Galveston Coastal Subsidence District by the Legislature in 1975. Regulation of groundwater withdrawal by the District and surface water conversion in these two counties have effected a 16 percent decrease in groundwater pumpage during the past nine years. In spite of recent progress, the area now has the largest subsidence bowl in the United States. Approximately 4,700 miles of land have subsided between 0.5 and 10 feet.

A complex hydrological relationship exists between the excessive pumping of groundwater and the resulting sinking of the land surface. With the rapid growth of the Houston-Galveston areas since 1940, groundwater withdrawals for municipal and industrial use have increased proportionately, reaching a peak of 457 million gallons per day in 1976.
This rate of groundwater withdrawal resulted in drastic declines in the surface of the two aquifers underlying the area. These aquifers are composed of alternate layers of water-bearing sand and clay. Declining pressures in the aquifers causes compaction in the clay layers with a cumulative effect at the land surface called subsidence. This compaction is irreversible.

Because the areas most affected in the past are converting to surface water use, concern is now shifting to the western and southwestern parts of Harris County, where rapid growth has accelerated subsidence, and where flooding problems continue to plague the city.

III. FLOODING

Two principal types of flood hazards exist in the Texas Coastal Zone: storm-surge tidal flooding and fresh-water flooding. During the passage of hurricanes and tropical storms, storm-surge tides may flood low-lying coastal areas up to elevations above 20 feet. Fresh-water flooding, on the other hand, results from hurricane-aftermath rainfall, as well as from severe thunderstorms and frontal-related storms. Fresh-water flooding may occur as stream flooding of flood plains or
as rainfall flooding of broad areas of the coastal plain. On the flat coastal plain, the runoff is ponded in natural depressions or dammed behind highways, railroads, and other man-made structures.

Shoreline erosion and land subsidence, both natural factors that can be accelerated by human impact, are increasing the hazard of storm-surge and fresh-water flooding in the Coastal Zone. As shorelines retreat, or as lands subside, greater areas of the Coastal Zone are exposed to storm-surge tides. Similarly, land subsidence, whether due to natural compaction or to groundwater withdrawal, produces broad irregular depressions that can pond substantial volumes of rainfall on the impermeable muddy substrates of much of the lower coastal plain.

Rains may precede the landfall of a hurricane, but as the storm center moves inland, heavy rainfall, often accompanied by tornadoes, generally strikes the coastal plain. If the hurricane moves directly inland, the period of heavy rainfall may be limited to three or four hours. If the storm moves parallel to the coastline or repeatedly changes its forward direction, excessive rains may continue for many hours or even several days.
Hurricane aftermath rainfall is generally so excessive that coastal streams inundate floodplains. Floodwaters are discharged into the various Texas bays, which are already experiencing high tides. As a result, combined storm-surge tides and overbank stream flooding may devastate vast areas of the flat, lower coastal plains. As the hurricane moves inland, rainfall runoff continues to flood drainage systems. Streams may discharge floodwaters into bays for many days following storm passage.

In addition to hurricane aftermath rainfall, Houston's development patterns almost ensure that flooding problems will be compounded. The new Harris County development areas are to the north, northwest, west, and southwest, and they all drain through the lower parts of the county. Therefore, as new development causes increased runoff from urbanization, the increased stormwater must flow through previously developed areas of the city. In other words, the general development direction is "upwatershed." As long as major drainage laterals and storm sewers keep adding more flood water to the bayous, it is unrealistic to believe the flooding problems will be made less severe.
Although lives may be lost in hurricane-aftermath flooding, more commonly the principal loss is to property, such as bridges, highways, and homes. Thousands of persons may be left temporarily homeless by the stream flooding and ponding; transportation systems may be destroyed or blocked. Flooding also damages water and sewage facilities, leading to the threat of epidemic diseases.

IV. WATER QUALITY

URBAN RUNOFF

Urban runoff is stormwater from city streets and gutters which contain debris, organic wastes, and bacteria picked up from the land over which the stormwater has traveled. Contaminants in urban runoff come from litter, sands and dust that have accumulated on city streets, air pollutants which fall to earth with rain, fertilizers, herbicides, pesticides, animal wastes, and combustion emissions from vehicular traffic.

Urban development brings about large concentrations of these pollutants in relatively small areas. Of all the activities associated with urban development, one of the largest sources of nonpoint pollution is construction.
Construction sites generate great amounts of suspended solids through the displacement of soil and vegetation, which increases the probability of erosion and allows for easy transport of solids into the receiving waters. Most solids are generated during the initial phases of construction: clearing, excavating, and grading. Solids can impact water quality by making receiving waters cloudy (turbid). The higher the turbidity, the less light penetrates the water. Too much turbidity in receiving waters prevents light from reaching aquatic plants. Not only do these plants need light to produce oxygen needed by fish and other aquatic life, they also serve as a direct food source for some species. In Lake Houston, turbidity has been shown to be the major factor in the lack of eutrophication.

EUTROPHICATION

Eutrophication, from the Greek word for well-nourished or enriched, is a natural process. It is a natural state in many lakes and ponds which have a rich supply of nutrients and it also occurs as part of the aging process in lakes as nutrients accumulate through natural succession. Eutrophication becomes excessive, however, when abnormally high amounts of nutrients from sewage, fertilizer, animal
wastes, and detergents enter streams and lakes, causing a rapid growth of micro-organisms and aquatic vegetation. Sewage is the largest single factor contributing to excessive eutrophication. (More than 13% of all the wastewater discharged in Texas goes into the Houston Ship Channel.)

Sewage treatment is usually considered in three stages: 1) primary treatment, which removes large objects and suspended solids; 2) secondary treatment, which supplies aeration and bacteriological action to decompose organic compounds, then disinfects the remaining wastewater with chlorine; and 3) tertiary treatment, which removes nitrates and phosphates and releases pure water. The large majority of wastewater treatment plants provide only primary or secondary treatment. Tertiary treatment is expensive, rare, and found only in very special circumstances, where a high level of environmental management and quality is supported.

Even the most modern secondary sewage plants, which precipitate solids and inactivate most bacteria in domestic wastewater, do not remove basic nutrients such as ammonia, nitrogen, nitrates, nitrites, and phosphates.
These nutrients stimulate algae growth and lead to plankton blooms.

Plankton blooms or green algae do not always produce undesirable odors or toxic products, but they can still create problems of oxygen supply in the water. While these blooms exist under abundant sunlight, they contribute oxygen to the water through photosynthesis, but under conditions of prolonged cloudiness, they begin to decay and consume more oxygen than they produce, leading to oxygen depletion in the water. Consequently, dissolved oxygen may decline rapidly from favorable levels of 10-12 ppm (parts per million) to 2 or 3 ppm, at which point fish begin to suffocate. Highly enriched streams just below sewage outfall often show a severe reduction in fish populations. In July 1985, over 250,000 fish died in two incidents attributed to effluent in the Trinity River. One of those kills reported 184,000 dead fish with a net worth of $300,000.

INDUSTRY

The potential for industrial nonpoint, source-related water quality problems lies in the storage and handling of products or other materials used on site. Properly stored
and handled materials—like petroleum products and solvents—will not be washed from the storage site by storm runoff. Storage facilities are regulated by the Texas Water Commission through discharge permits, which cover stormwater runoff. To meet permit requirements, an industry must show the absence of any site contamination that could lead to contaminated runoff entering a receiving stream.

Among the most visible effects of industrial water pollution are the many fish kills reported to the EPA each year that are related to industrial waste. As a matter of procedure, paper mills discharge lignite and sulfite, cotton seed plants release sulfuric acid, and steel companies drain cyanide from their blast furnaces. Increasing use of powerful chemicals in industrial and agricultural operations increases the risk of environmental damage through accidents.

Another cause for concern is that industries are often water-intensive operations. In areas where the surface and groundwater supplies are limited, many cities will soon be using all available fresh water. The technology necessary to recycle wastewater exists, but this adds substantially to the cost of water treatment. The hope
for meeting future needs—in Houston and throughout the state—depends on strict conservation, the discovery of new sources, and the development and implementation of new technology.

V. HOUSTON WATER: A LEGISLATIVE HISTORY

As a result of two major floods between 1929 and 1935, substantial attention was directed toward a concerted effort to obtain flood relief for Harris County. In 1937, a bill was introduced in the Texas Legislature to create the Harris County Flood Control District and a second bill was introduced to allow the State of Texas to remit to the Harris County Flood Control District one-half of all State ad-valorem taxes collected in Harris County for a 10-year period. The tax remission bill was introduced because the cost for flood control in Harris County was expected to be high, and the sponsors stated that all of Texas would benefit from the stabilized commerce resulting from flood control efforts in the County.

In 1937, the 45th Legislature passed both bills. The first created the Flood Control District and the second granted tax remission. However, Governor Allred vetoed the tax remission bill. The Senate voted to override the
veto, but the House did not. Therefore, the Flood Control District was approved in 1937, but a substantial amount of its proposed funding was not approved.

In 1939, the tax remission bill was again introduced to the Texas Legislature and was signed into law by Governor O'Daniel on May 8 of that year.

Although the District did run out of money in 1968, several bond issues have been passed since that time. In 1969, a $21.5 million issue was approved. In 1973, a $30 million issue was approved, and in 1975 a $65 million bond issue was passed by voters. These bond issues were utilized to finance channelization projects on certain major streams such as Greens Bayou as well as tributaries and drainage laterals draining into most streams into Harris County.

During 1973, a major alteration in flood control policy was initiated. Prior to this time, development could occur anywhere in the county without respect to flooding. In fact, many developers built immediately adjacent to major streams and bayous without consideration of the flood damage the consumer would absorb. Groups such as the Bayou Preservation association were concerned about
these development practices and about the absence of flood insurance in Harris County. As a result of these development practices and interest groups pressure, Harris County formed the Harris County Flood Control Task Force to address the issue of flood plain management and entry into the Federal Flood Insurance Program.

The intent of the Federal Flood Insurance Program is to provide incentive insurance in exchange for development controls with respect to flood plains. The program is based upon the 100 year flood, or that flood having a one percent chance of occurring in any given year. In those areas located with in 200 year flood plain, construction is to be performed in a specified manner. The primary requirement is that the floor slab be elevated above the 100 year flood level or that the structure be flood proofed.

In 1973, Harris County petitioned for entry into the program, and the City of Houston followed shortly thereafter. This application was timely because had these entities not applied, funds for the purchase of flood-prone lands would have been denied under the provisions of the Flood Disaster Protection Act of 1973. This legislation required that all FHA and VA projects, as
well as all loans made by lending institutions associated with the FDIC and FSLIC guaranty programs for land in flood plains, be covered by flood insurance. If these jurisdictions were accepted into the program, then residents of the flood-prone areas could purchase flood insurance otherwise unavailable through private insurance companies. After attempting to get the Federal Insurance Administration to accept a 50-year flood plain for regulatory purposes (an exception to the FIA regulations), and failing, both Harris County and the City of Houston voted to enter the program. Therefore, as of 1974, development controls restricting the form of development in flood hazard areas were initiated.

Flood control solutions are being developed that are responsive to the public's concern about costs as well as environmental damage while still addressing flood problems. This trend was supported by Section 73 of the Flood Control Act of 1974 that, for the first time, allowed the Army Corps of Engineers to pursue nonstructural approaches. In the past, the local sponsor had to pay for land acquisition costs, and nonstructural alternatives are land-intensive. Section 73 allows the Corps to participate in such costs.
In 1975, the Texas Legislature created the Harris-Galveston Coastal Subsidence District, charged with the responsibility of regulating the withdrawal of groundwater within its two-county jurisdiction, for the purpose of ending subsidence that contributes to or precipitates flooding.

Groundwater withdrawal across an area of 2,171 square miles is controlled by requiring permits for the drilling and operation of wells. Permits restrict the amount of groundwater which may be withdrawn during a one-year period and may include other conditions. Public hearings are held annually for each permit. After all testimony is heard, a recommendation is made to the District's 15-member Board of Directors who authorize the amount of groundwater withdrawal.

After 1975, no substantial water legislation pertinent to the Houston area was passed until the state-wide water plan of 1985. This water plan adopted by voters on November 5, 1985, provides a new program of assistance for flood control projects. Also, previous restrictions limiting Houston's access to the existing water supply and water quality funds have been lifted. Additionally, cities building regional facilities or cities converting
from groundwater to surface water (as Houston is doing) are now eligible for state loans.

Other 1985 water-related legislation included SB 249 (Sharp, 69th Legislative Session), which amended Chapter 26 of the Water Code. Chapter 26 is the original backbone of the Water Quality Act of 1967. Basically, SB 249 reworked Chapter 26 and gave regulatory functions to the Texas Water Commission that had previously been delegated to other agencies. It also provided the Sunset mechanism by which Texas Department of Water Resources was split into the current Texas Water Commission and the Texas Water Development Board.

VI. LEGISLATIVE HEARING

The Senate Committee on Natural Resources held a public hearing in Houston on October 25, 1985 at the University of Texas at Houston. The purpose of the hearing was to allow interested parties to express their concerns and recommendations about the water issues in the Houston area and to garner support for the Water Plan (HB 1 and HB 2) that was voted on and did pass the following month.
Most of the testimony focused on the flooding and subsidence problems in the Houston area and the steps that have been taken to alleviate them. The fact that additional monies would be available with the passage of HB 2 pleased most of the people who testified. Witnesses felt that the system was working and needed more funds to continue to address the problems through flood control construction and the continued monitoring of groundwater withdrawal.

Mr. Jim Blackburn, an attorney who teaches Environmental Law and Environmental Planning at Rice University, suggested the following: changing Section 16.236 of the Water Code so that if an area has a master plan for drainage improvements, that it would be exempted from the Texas Water Commission overview. He said that the Texas Law of Drainage is set up to protect one private landowner from another private landowner. There was no precedent at the time that the law was written of 3 people going out and forming a government and changing themselves from a private party to a public party and having an unequal power over their neighbor. If a government entity is flooding a private property owner by pushing water downstream, the private party cannot get an injunction.
Blackburn suggests that a master plan concept would solve these problems by anticipating them before they happen.

VII. SUMMARY

The Harris-Galveston Coastal Subsidence District has done much to address the flooding and subsidence problems in those two counties. However, the pumping of groundwater in adjacent counties also contributes to flooding and subsidence problems and cannot be controlled by the district unless it is renamed to reflect a more extensive jurisdiction. Since the compaction of the clay caused by declining pressures in the aquifers is irreversible, the steps being taken to halt subsidence should be encouraged and expanded.
GROUNDWATER OF EL PASO
GROUNDWATER OF EL PASO

I. HISTORY

Desert scenery, sunbelt weather, and a multicultural character provide El Paso with an attractive environment. These attributes have spurred rapid growth in recent years, and as of 1984 the city's population was about 480,000. El Paso is the sixth fastest-growing city in the United States.

The water in the Hueco Bolson and the Mesilla Bolson aquifers, which underlie the El Paso area, is being withdrawn for municipal and agricultural uses at the rate of four times the recharge rate. In other words, the supply is being depleted four times as fast as it is being replenished. These two aquifers supply 90% of the fresh water in the El Paso area, so their health and well-being are linked closely with the health and well-being of El Paso.

To insure that the city can continue to support its current population, much less grow larger, the water within the Hueco Bolson and the Mesilla Bolson must be protected from contamination and conserved for future use.
It is unlikely that the water obtainable through surface sources or from other states will ever replace the underground water as the primary source of water for El Paso, unless the groundwater is rendered undrinkable or exhausted from overdrafting. The tragic nature of either of these outcomes can hardly be overstated.

II. GROUNDWATER

Groundwater is simply water that has percolated down through the soil from rain and melting snow. Where it collects underground is called a zone of saturation, the top of which is the water table. The formation in which the groundwater collects is called an aquifer. Aquifers occur at different depths, depending on the geologic formation, but most groundwater—50 times the volume of the Nation's surface water—is found within 2,500 feet of the land surface.

Water in and on the earth is constantly in motion. This hydrologic cycle integrates the gaseous, liquid, and solid forms of water as it moves through the atmosphere; the oceans, lakes, and rivers; and in and out of the ground. Less than three percent of the water on the planet is
fresh, and only about a third of this amount is available to users.

The knowledge that all water is integrated leads to other observations: surface and ground waters are often linked, and contamination in one water body influences the contamination, or potential for contamination, in another body of water. Thus, pollutants in the air, on the land, or in surface waters have the potential to be carried to any part of the hydrologic cycles, including the groundwater. Perhaps because groundwater is unseen, current knowledge and understanding of the problem of groundwater contamination is still very much in the early stages as interest has concentrated on the more visible surface waters.

III. SURFACE AND GROUND WATERS

While surface and ground waters do interact with each other, they behave quite differently. Groundwater, for example, often moves very slowly--sometimes as little as a few feet per year--and its flow is laminar (moving in very distinct paths and with little mixing). As a result, groundwater pollutants also will move very slowly, in
concentrated slugs called plumes, and will likely not be
diluted and dispersed through mixing.

In contrast, surface water flow is turbulent, often fast,
and frequently causes pollutants to be well mixed and
dispersed throughout the water system.

Another difference between surface and ground waters has
to do with the water's ability to break down contaminants
through physical, biological, and chemical activity.
Surface waters, because of their exposure to sunlight,
oxygen, a variety of temperatures, and numerous beneficial
life forms, generally can remove or break down many
accumulated wastes.

IV. WHAT ARE THE SOURCES OF GROUNDWATER CONTAMINATION?

All groundwater contains dissolved chemicals or suspended
solids, the sources of which generally fall into three
categories.

(1) Natural pollutants: Minerals dissolution from the
surrounding soil and saltwater encroachment are primary
examples.
(2) Human waste disposal activities: Examples of this source of groundwater contamination include industrial and municipal landfill operation, underground injection of wastes, and individual septic systems.

-- Of the industrial landfill sites evaluated by EPA in 1982, 70 percent were found to be unlined, 50 percent were sitting directly on top of groundwater aquifers, and 95 percent were located within one mile of a drinking well. Discarded chemical products, as well as wastes from their manufacture, end up in many of these landfills. Wastes from smaller commercial enterprises (printers, dry cleaners, gas stations) are also disposed of in this manner, as is sewage sludge, which may contain heavy metals or organic chemicals. Toxic wastes which have leached from these municipal and industrial landfills are being discovered in underlying aquifers.

-- The existing requirements for injection wells currently don't prohibit injection above underground sources of drinking water. This practice is considered, even by the EPA, to be "inherently dangerous."

-- Private septic tank systems' total estimated discharge of liquid wastes in the ground reaches one
trillion gallons per year in the U.S. In addition to human wastes, a variety of consumer products containing potentially hazardous chemicals are often disposed of in septic systems which have the potential to pollute groundwater. One example is the organic solvent trichloroethylene, or TCE, which has been used to clean out septic systems as a cheaper alternative to pumping. A known animal carcinogen, TCE is one of the most commonly found contaminants of groundwater.

3) Human activities other than waste disposal: Many of the contaminants entering groundwater constitute what are known as non-point sources of pollution (not coming from a pipe). These include runoff or leaching from agriculture (fertilizers and pesticides), mining, oil and gas, roadway de-icing agents, acid precipitation, and accidental spills.

Regarding accidental spills, some of the largest contributors to groundwater contamination are underground pipelines and storage tanks, such as gasoline tanks underneath service stations. Leakage from these transmission and storage facilities is often very slow; thus, leakage may occur for long periods before detection.
Furthermore, these pipelines are mainly metal and corrode over time.

V. HOW DO GROUNDWATER CONTAMINANTS BEHAVE?

As noted earlier in the comparison between surface and ground waters, groundwater contaminants generally move slowly and in distinct, undiluted plumes. These contaminants undergo little degradation in the relative abiotic and chemically inactive underground environment, and because there is little dilution or dispersion of the plumes, a particularly disturbing characteristic of groundwater contamination occurs: contaminant concentrations in groundwater are often orders of magnitude higher than those found in raw or treated drinking water drawn from the most contaminated surface water supplies.

A further complication regarding contaminant plumes is that their slow rate of movement and dilution means that monitoring wells may easily miss the plumes and the resulting contamination problem may not be detected for many years.
VI. HOW CAN GROUNDWATER CONTAMINATION BE PREVENTED?

Clearly, the best way to prevent contamination of groundwater is to keep contaminants out of it. Although improperly disposed hazardous wastes present one of the greatest potential threats to groundwater, the technology exists to minimize the environmental release of most waste products, and many industries have recognized the environmental and economic benefits of reducing their waste loads. One important lesson learned from the growing national awareness of the environmental and health threats of improper hazardous waste disposal is that the costs to clean up contamination sites and groundwater supplies far exceed the estimated costs to prevent the problem from occurring in the first place.

VII. WHAT CAN BE DONE AFTER CONTAMINATION?

In most cases of groundwater contamination, a series of steps can be taken to deal with the problem. Most common groundwater contaminants can be removed through existing water treatment technologies, but practice has shown that these technologies are applied most cost-effectively at the level of the water supply system. This solution is not practical for private wells, the most common source of water in most rural areas. Estimated costs for treatment of public water supplies contaminated with organic
chemicals range from $1.50 to $4.00 per month, in 1982 dollars, per family served.

Treating the water in an aquifer is complicated. It is impossible to design a pumping well system to capture only the contaminated water in a plume. Because a pumping well draws water from all directions and mixes fresh and contaminated water, it is necessary to pump and treat many times the volume of a plume before all the contaminants are removed.

VIII. GROUNDWATER PROTECTION

Unlike other media—surface water, air, and land—groundwater is not the principal focus of any single Federal environmental law. Rather, EPA's groundwater protection program has been fashioned out of a series of laws with different, albeit related, purposes. As a result, EPA recognizes that Federal groundwater protection efforts are fragmented, inconsistent, and limited.

Because of growing problems and the lack of Federal guidance to the states on protecting groundwater, it may be timely for Texas to formulate a comprehensive groundwater protection and conservation policy before the
Federal government intercedes. In this regard, two alternatives may be considered:

--Amend each environmental act to be more responsive to groundwater protection (perhaps by emphasizing integration of the various statutes); or

--Enact a groundwater-specific protection law.

One reason it is important to act quickly in regards to groundwater protection is this: accelerated pollutant cleanup in one medium (air, water, or land) generally means that the pollutant will be transferred to another—and usually least regulated—medium.

IX. GROUNDWATER CONSERVATION

No discussion of groundwater in El Paso would be complete without touching on conservation. When a city of El Paso’s size is located in a desert, supply is always an issue. Besides the obvious solution of designing residential and industrial water systems that use less water, El Paso’s Water Utilities Company is trying to slow the decline in the city's primary source of drinking water by turning waste water into potable water. Waste water,
which is either sewage or impure water that has been used
in manufacturing or industrial processes, is purified
through the use of a powdered activated carbon treatment
and returned to the aquifer.

The $33 million El Paso project is the first such
operation in the country. It was started March 1985 and
includes a new treatment facility and wells for pumping
water. Harmful bacteria are removed from waste water
through several different stages of treatment, and after
the water is purified it is pumped into an underground
aquifer. After two years there, it will become part of
the water supply.

X. LEGISLATIVE HEARING

Natural Resources Committee held a public hearing on April
17, 1986 in El Paso to discuss groundwater quality.
Testimony was heard from the El Paso Water Utilities
director about its unique Fred Hervey Water Reclamation
Plant. This treatment plant takes raw sewage and makes
drinking-quality water out of it for re-injection into the
Hueco Bolson. El Paso has the first plant in the country
which starts with raw sewage and turns it into drinking
water.
Additional testimony from witnesses concerned El Paso's particular water sources and how El Paso has become accustomed to "stretching" its water. This is done by blending water from several wells of different quality which may not individually meet the recommended limits but do when blended collectively to meet regulatory requirements.

Another method involves the use of surface water. The City of El Paso uses the seasonal Rio Grande as much as possible, within the limits of its treatment capacity. A very successful program of conservation by individual homeowners and industries includes planting native or rock-type landscaping, which reduces the amount of water required for watering purposes. Almost 20% of the single-family homes in El Paso have some type of native or rock-type landscaping in their front yards and thereby reduce the amount of water they each require by more than 100,000 gallons per year. This, together with many other conservation measures, appears to have stabilized the per capita use of water at about 190-195 gallons per person per day. For more than 30 years, the per capita use of water was increased by more than 3 gallons per person per day per year, and had been expected to reach 245-250
gallons per person by 1985. The per capita use today is about 20% less than historical projections would indicate.

Ken Kramer, Sierra Club, presented testimony on groundwater contamination in the state. Kramer emphasized that a major problem of groundwater contamination is inadequate comprehensive monitoring of water from rural water wells in the state. Additionally, the monitoring of public water supply wells usually does not include monitoring and analysis of toxic water contaminants. Kramer cited specific incidents of groundwater contamination from pesticide sources in West Texas, the Ogallala Aquifer, and the Lower Rio Grande Valley.

Kramer requested a log of industrial waste facilities in District 10 from the Texas Water Commission, which are currently the subject of enforcement actions for noncompliance with laws, regulations, or permits. Three of those facilities demonstrated serious noncompliance problems, which allegedly had resulted in groundwater contamination problems. Even though these facilities were cited and fined, the groundwater remains contaminated.

Testimony provided by Rick Piltz, Office of Natural Resources, Texas Department of Agriculture, suggested that
the most difficult decisions on groundwater protection should occur at the state and local levels. Specifically, Piltz described the need for more monitoring of the groundwater resources. While there are a number of state agencies that collect data, what those agencies look for in groundwater is very limited—there is no in-depth examination of toxic and chemical constituents in groundwater.

Further, private water wells in Texas are currently unmonitored. With over 400,000 private water wells in the State, there are neither provisions for testing for chemical contamination nor are their provisions for covering the well once it's been drilled. Piltz suggested that more effective state and local initiative is needed to prevent the pollution in the first place, especially in sensitive areas of aquifer recharge zones and well fields, and perhaps the Water Commission should be the agency responsible for setting minimum state standards for local groundwater districts.

Piltz's recommendations were drafted by the Groundwater Working Group of the Texas Rural Water Task Force, under the guidance of the Texas Department of Agriculture. Those recommendations parallel a set of goals adopted by
the National Groundwater Policy Forum, which was chaired by former Arizona Governor Bruce Babbit, and included the governors of New Jersey and Wisconsin as well as representatives of some of the largest corporations in the United States. The report called for comprehensive federal groundwater legislation that would require states to pass their own comprehensive groundwater protection legislation.

Testimony was also presented by Edd Fifer, General Manager of the El Paso County Water Improvement District. Mr. Fifer recommended supporting local control of water through groundwater districts. Additionally, Mr. Fifer recommended that groundwater districts have broad powers to protect their resource from industrial, municipal, and solid waste pollution. He also recommended that district power should include prioritizing different qualities of water, and even withdrawal fees.

XI. SUMMARY

Desert scenery, sunbelt weather, and multicultural characteristics have spurred rapid growth in recent years in El Paso to rate it the sixth fastest growing city in the United States. Water from the Hueco and Mesilla
Bolson aquifers, the major suppliers of fresh water for the El Paso area, is being withdrawn for municipal and agricultural uses four times the recharge rate. The knowledge that all water is integrated leads to the premise that surface and groundwaters are closely linked, and contamination in one water body could possibly influence contamination in another. Therefore, waters within the bolsons should be protected from contamination and conserved for future use.

All groundwater contains dissolved chemicals or suspended solids, the sources of which fall into three categories: 1) natural pollutants, which include mineral dissolution from surrounding soil and saltwater encroachment; 2) human waste disposal, which include contamination from septic systems, industrial and municipal landfill operations; and 3) contaminants entering the groundwater system, known as "non-point" sources of pollution, which include runoff from agriculture (fertilizers and pesticides), mining, oil and gas operations, and accidental spills.

No discussion of groundwater in El Paso would be complete without touching on conservation. Located in a desert, water supply will always be an issue in El Paso. The innovative Fred Hervey Water Reclamation Plant is one
example of how El Paso "stretches" its water resources by
reclaiming wastewater and re-injecting it into the
aquifers. Additional facilities of this type could
greatly reduce the rate of depletion, and may be necessary
if other alternatives are not available or prove to be
more expensive.
HAZARDOUS WASTE: MANAGEMENT IN TEXAS
HAZARDOUS WASTE: MANAGEMENT IN TEXAS

I. HISTORY

During the 20th century, and especially since World War II, Americans have benefited from the development of new industrial technologies, materials, and products that make life easier and more productive. Many of these beneficial processes have, however, harmful by-products, and the last several decades have seen a considerable expansion in the number of chemical wastes entering the environment. Since the mid 70's, the issue of how society handles and regulates hazardous wastes has become a major environmental issue in the United States.

The primary federal statutory vehicle for hazardous waste regulation is Resource Conservation and Recovery Act (RCRA), passed by Congress in 1976. Under RCRA, a waste is classified as hazardous if it exhibits such characteristics as ignitability, corrosivity, or toxicity, or if it is listed by name by the Environmental Protection Agency. Examples of substances regulated as hazardous wastes include sulfuric acid, hydrochloric acid, pesticide residues, degreasing agents, and dry-cleaning fluids.
The E.P.A. has authorized some states, including Texas, to administer their own hazardous waste programs under federal oversight, in lieu of federal regulation. In Texas, the RCRA and hazardous waste Underground Injection Control programs are administered by the Texas Water Commission, under the state Solid Waste Disposal Act (V.A.C.S., Art. 4477-7), and the Injection Well Act (Water Code, Chapter 27). Additionally, the Water Commission is the lead agency for the state's participation in the federal Superfund program, while the Railroad Commission regulates underground injection activities associated with oil and gas production.

In February 1984, Governor White issued Executive Order MW-19, establishing the Governor's Task Force on Hazardous Waste Management. The creation of the 33-member Task Force occurred at a time shortly after the EPA's consideration of permit applications for ocean incineration of hazardous waste in the Gulf of Mexico. Clearly, rising public sentiment over the entire hazardous waste management and development issue was a major incentive in the creation of the Task Force. What ensued from the Task Force was the omnibus Hazardous Waste Bill of 1985 (H.B. 2358, Schlueter, 69th Reg. Session). H.B. 2358 was a unique piece of statewide legislation, a bill
touted by both industry and environmentalists as a good start toward agreement on hazardous waste management in Texas.

II. TEXAS NUMBER ONE IN HAZARDOUS WASTE PRODUCTION

Nationally, Texas ranks first in the amount of hazardous chemical waste produced by its two major industries: petroleum refineries and chemical plants. A recent Congressional Budget Office study estimates that the 38 million tons of hazardous waste generated in Texas in 1983 was 13% of the national total (300 million tons). This averages about 5,000 pounds of hazardous waste annually for every person in Texas.

According to the Texas Water Commission, currently there are about 200 operating hazardous waste land disposal facilities statewide, with about another 230 waste storage and processing facilities. Until recently, only those generators of more than 1000 kilograms (450 pounds) per month of hazardous waste were required to be registered with the Water Commission. This included all the chemical plants and oil refineries. What were not included in any regulatory provision were small quantity generators (SQG's): businesses generating hazardous waste in
quantities less than 1000 kilograms per month. Such businesses include pesticide applicators, gas stations, dry cleaners, print shops, painting contractors, hospitals, veterinarians, laboratories, commercial metal platers, photographic processors, furniture and automobile refinishers, building contractors, and military installations. As of September 22, 1986, businesses generating more than 100 kilograms (about 220 pounds) per month will be regulated by EPA via the Water Commission.

III. HANDLING HAZARDOUS WASTE TODAY

Three general categories of waste management are storage, treatment, and disposal. Approximately 13.2 million tons (21%) of the amounts managed in 1983 were stored in-state at the end of the reporting year. There are regulatory disincentives against storing waste in large quantities longer than 90 days, and most stored waste is ultimately treated or disposed. Under the state's regulatory program, all waste storage, treatment, and disposal facilities must have a permit from the Water Commission. Permit requirements include provisions for design, construction, operation, emergency procedures, monitoring, closure, post-closure care, and financial responsibility.
Traditional methods of land disposal are by far the most common and the most familiar to waste disposers and the general public. Landfills and surface impoundments, while designed with security and extensive state-of-the-art features, cannot contain the waste indefinitely. Studies have shown that chemicals placed in a landfill will tend—in the long run—not to stay where they are placed; rather, they will become dispersed in the environment. And while land disposal is relatively cheap compared to other alternatives, ultimately someone will have to pay for the cleanup of the uncontrolled site. The costs for such cleanups could be hundreds of times more expensive than the original costs of treating the waste. It is fair to say that land disposal containment systems fail; the major uncertainty is when.

In Texas, the largest volume of hazardous waste is disposed of in underground disposal wells, called injection wells. A 1984 Texas Department of Water Resources report entitled Underground Injection Operations in Texas estimated 6 billion gallons (20 million tons) of hazardous waste is disposed of annually by deep well injection. This figure does not include oil and gas related wastes disposed of by this method, which fall under Railroad Commission purview.
Again, Texas ranks first nationally in the use of injection wells for disposal of hazardous waste. Most of these injection wells are located along the Gulf Coast in conjunction with the petrochemical industry in that region. And while the Water Commission's Underground Injection Control section chief believes that "...there is solid technical basis for believing that injection wells can isolate hazardous wastes for millions of years, not just for a few decades as with landfills...," serious questions about deep well injection have been raised.

In a recent report entitled **Deeper Problems: Limits to Underground Injection as a Hazardous Waste Disposal Method**, the Natural Resources Defense Council notes that "major well failures, groundwater contamination, and other environmental damage by injection operations have been documented" in Erie, Pennsylvania; Vickery, Ohio; and Lake Charles, Louisiana.

Texas has had problems, too. In Beaumont, an on-site disposal well used to inject highly acidic herbicide wastes (including dioxin) was discovered in 1976 to have contaminated a moderately saline groundwater aquifer. And while today's technology offers continued advances, fundamental uncertainties remain. A 1983 Office of
Technology Assessment report noted numerous "...potential contamination pathways resulting from faulty construction, operation, and/or deterioration of the well...."
Additionally, these faults could include upward migration of the waste liquid from the receiving zone along the outside of the well casing, escape of the waste into potable aquifers due to well-bore failure, leakage through confining beds, displacement of saline water or migration of injected wastes into a fresh-water aquifer, and vertical migration and leakage through abandoned and unplugged or improperly plugged wells in the vicinity.

IV. ABANDONED WELLS CAUSE GREAT CONCERN

Of greatest concern are the hundreds of thousands of dry holes and improperly plugged, abandoned oil wells which facilitate upward migration of waste. Some areas where hazardous waste injection is practiced also have a long history of oil exploration and production. While today's state regulations require those wells to be plugged, previously those wells were left open and abandoned. The Railroad Commission is charged with the task of finding and plugging those abandoned oil wells. Despite its importance, the Well Plugging Fund suffered nearly a $2.4 million cut for FY '87 during the 3rd C.S. (The total
amount expended in FY 86 equaled $2.58 million.) This significant funding cut will only slow the process of locating and plugging abandoned wells.

Additionally, Texas contains 26 abandoned or uncontrolled hazardous waste disposal sites that have been placed on the National Priority List, making them eligible for federally funded cleanup action under the Superfund program. These are among the most dangerous sites where hazardous waste has been improperly disposed of in the past. Site eligibility for the Superfund program is based on the likelihood of contamination of groundwater, surface water, air, the quantity and nature of wastes present, and closeness to populated areas and sensitive natural environments. At least six of those 26 sites in Texas awaiting remedial action are located in rural areas. In addition to the Superfund sites, Texas contains more than 1000 potential hazardous waste sites currently being inspected by EPA.

V. A SHIFT AWAY FROM ON-SITE DISPOSAL

Before the RCRA program, the state required permits for commercial hazardous waste management facilities, but not for on-site facilities, at which the great majority of
hazardous waste is disposed. Under RCRA, not only must proposed new facilities obtain permits from the Water Commission, but existing on-site facilities must also go through the permitting process to show they meet RCRA requirements. Additionally, existing commercial waste management facilities that already have permits must be re-permitted on the basis of the RCRA requirements.

Obviously, the process of permitting and re-permitting the hundreds of hazardous waste management sites in Texas will take years (Water Commission officials predict about five years). In the meantime, the existing facilities have been operating under "interim status," which allows them to continue operating as long as they meet certain interim status requirements.

November 8, 1985, was an important date in this "interim status" classification. After Congressional enactment of RCRA in 1976, on-site facilities were allowed to operate under "interim status" for nine years before being required to submit a full permit application providing regulators with the opportunity to elaborate on the specific conditions for construction, operation, monitoring, and closure of the facility. Part of this application required applicants to show that they are
monitoring groundwater for chemical contamination at their site, and they must provide assurance of financial responsibility, including liability insurance coverage. Operators of existing hazardous waste facilities not meeting these requirements were required by law to submit a closure plan within 15 days of that November 8th deadline.

Many interim-status disposal facilities, especially on-site facilities, will be closed as a result of these requirements regarding groundwater monitoring and liability insurance, primarily because those operators were either unwilling or unable to comply. Consequently, some of the waste currently managed on-site will ultimately end up in commercial sites. Water Commission files indicate that closure plans have been submitted for approximately 100 of the 200 land disposal facilities in the state. What is unclear is how many of these sites are adequate in terms of design and operation and maintenance.

VI. COURT RULINGS ON HAZARDOUS WASTE LAWS

The adequacy of the state's permitting process was recently questioned by a state court's decision striking down a permit for a proposed hazardous waste disposal
facility in Brazoria County (Brazoria County, Texas, and Citizens in Protest of Browning-Ferris Waste Disposal Well v. Texas Department of Water Resources). The court found that the Water Commission failed to properly apply its rules requiring adequate operating, contingency, closure plans, and an adequate showing of financial assurance, and did not determine the potential impacts on mineral and other rights. The court returned the permit to the Commission for further consideration.

There is a nominal amount of case law arising out of litigation in Texas pertaining to hazardous waste; this dearth of court rulings applies both to definitional holdings as to what constitutes said waste, and the process by which state agencies administer state health promulgations under the Texas Solid Waste Disposal Act (V.T.C.S., Art. 4477-7).

The absence of substantial case law to the contrary, there are several holdings that are noteworthy, particularly in the manner in which they address and articulate upon the following issues: (1) the constitutional necessity for clear and unambiguous language as to the statutory requirements for waste disposal sites; (2) administrative law issues as to the sufficiency of the evidence made in
site determinations; (3) the weight, if any, to be given by the courts as to a local community's opposition to the development of hazardous waste sites; and (4) delimitations upon state agency authority on orders being challenged in Texas courts.

The first of the aforementioned issues, that of clear and unambiguous language in a statutory promulgation, was addressed in the case of Browning-Ferris, Inc., v. Texas Department of Health, 625 S.W.2d 764 (Tex. Civ. App.--Austin 1981, writ ref'd n.r.e.). The issue before the court was whether the Department of Health guidelines that stated "the attention of the applicants shall be directed to the absolute necessity for the land use compatibility of solid waste facilities with other land uses within the impact area of the proposed site" was constitutionally void for vagueness. Browning-Ferris at 766.

Appellant Browning-Ferris argued that this language violated due process in that it was so vague as to require persons of common intelligence to guess at its meaning and differ as to its application. The court, in affirming the denial of appellant's application, held that the terms of the Department's guidelines identified a sufficient range
of considerations to be utilized in their determination process as to make the "void for vagueness" challenge untenable.

In Browning-Ferris the court held further that the Department of Health had substantial evidence upon which it made its determination to deny the waste site application; a party seeking to overturn an agency order would be required to show that the agency order was arbitrary and capricious. According to the court, "substantial evidence need not be much evidence, and although 'substantial' means more than a mere scintilla, or some evidence, it is less than is required to sustain a verdict being attacked as against the great weight and preponderance of the evidence."

In Starr County v. Starr Industrial Services, Inc. (Tex. Civ. App.--Austin 1979, writ ref'd n.r.e.) the issue before the court was whether the Texas Water Quality Board had erred in denying an application for a solid waste permit due to local opposition, despite the applicant's compliance with permit requirements. The court affirmed judgment for appellee Starr Industrial Services and concluded that as the issue of local opposition to the granting of a permit was not a part of the relevant
factors contained in the statutes, the Board had acted arbitrarily and capriciously in denying the permit.

In the case of South Texas Industrial Services, Inc. v. Texas Department of Water Resources 573 S.W. 2d 302 (Tex. Civ. App.--Austin 1978, writ ref'd n.r.e.), the court held that the Department of Water Resources had the exclusive and original jurisdiction to determine questions of changed conditions (including in this instance illegal waste disposal as well as breach of corporate fiduciary duties) with respect to a permit for the disposal of hazardous waste materials, and enter a different order upon a showing of said changed circumstances. The court concluded that this authority was incompatible with established law that when a suit is brought to test the validity of an agency order, the agency loses jurisdiction over the subject matter of such order while the suit is pending.

VII. ALTERNATIVES TO LAND DISPOSAL

As previously stated, hazardous wastes can be managed, broadly speaking, either by disposal or by treatment. "Disposal," including landfills, surface impoundments, and underground injection wells, might be better termed
"containment," in that it is designed to inhibit releases into the environment. Treatment—whether by chemical, biological, or physical processes—is designed to reduce the hazard level by separating the waste into component parts, reducing its volume, reducing its hazardousness, or destroying it. Perhaps the most controversial alternative to disposal in recent years is the proposed burning of toxic waste in the Gulf of Mexico off the Texas coast.

In October 1983, the Environmental Protection Agency announced its tentative decision to permit two incinerator ships to burn 80 million gallons of toxic waste in the Gulf, about 180 miles east of South Padre Island. The ships, the Vulcanus I and Vulcanus II, are owned by Chemical Waste Management, Inc., of Oakbrook, Illinois.

The specially designed incinerator ships, equipped with furnaces and stacks, have been used to burn European hazardous wastes in the North Sea for a decade. Most of the waste burned has been PCBs. Supporters of incineration at sea consider this method superior to disposal in landfills, because incineration under proper conditions can destroy more than 99.99 percent of the waste, which on land would pose a long-term threat.
Ocean incineration is considerably less expensive than incineration on land, because the ships are not required to have smokestack scrubbers to remove hydrogen chloride, an acid released during burning. EPA and company officials say the acid is neutralized in contact with seawater. However, others contend that no one knows for sure whether the acid is rendered harmless at sea, and so incinerator ships should be required to use the same pollution-control technology as land-based incinerators. Requiring scrubbers would significantly reduce the cost advantage of ocean burning.

VIII. OCEAN INCINERATION DRAWS MIXED REVIEWS

Proponents of ocean-burning say that for a decade the Vulcanus ships have operated in the North Sea without incident. They say the ships are state-of-the-art vessels with double hulls and bottoms that will contain the waste on board in case of an accident. And, furthermore, they state that even if the Vulcanus did have a massive spill, it would be no worse than the dumping of toxic chemicals in the Gulf that went on during the early 70's.

Not everyone is as optimistic about ocean incineration. Jacques Cousteau has argued before Congress that either
waste neutralization or incineration on land would be preferable to incineration at sea. Treating the waste on land involves less risk of transportation accidents, and makes accidents easier to contain. Insurance rates substantiate the claim that transportation by sea is more dangerous than by land. Cousteau contends, "A million tons of ships go down to the bottom at sea every year, some with dangerous cargo."

Most incineration involves the use of combinations of ignitable wastes and fuels—typically fuel oil, but also natural gas or coal. However, several other thermal destruction technologies show promise for use in decomposing hazardous waste. These technologies vary in cost, stage of development, applicability to various waste streams, and environmental implications. They include: Fluidized Bed Combustion, Molten Salt Reactors, High Temperature Electric Reactors, Plasma-Arc Reactors, Wet Air Oxidation, and Super Critical Water. For a good, brief description of each of these processes see page 49 of the Texas Department of Agriculture's report Hazardous Waste in Texas, enclosed in the briefing books.

In addition to thermal techniques for waste disposal, there are also chemical and biological treatment
technologies. These technologies decompose hazardous wastes into simpler, less toxic or non-toxic compounds. Chemical treatments include chlorinolysis, neutralization, precipitation, and ion-exchange. Chlorinolysis detoxifies chlorinated hydrocarbons such as Agent Orange by subjecting them to high pressure and low temperature. Chlorinolysis is used in Europe, but no commercial plants exist in the U.S. now. Neutralization involves mixing acid and base waste streams to produce a solution with a pH closer to neutral. Precipitation, for heavy metals, involves removing a dissolved substance in a solution by transforming the substance into a solid. Ion exchange, for heavy metals and cyanides, involves a series of chemical reactions to stabilize a waste by removing unstable materials.

Biological treatment detoxifies organic wastes through biodegradation processes. Through a process similar to that used for municipal sewage treatment, waste can be digested aerobically by microorganisms. Genetic engineering has produced new mutant bacteria, known as "superbugs," that can eat several thousand times the toxic concentration of their precursors.
IX. REDUCING WASTE PRODUCTION

One factor that could simplify the waste management problem would be the implementation of better methods of waste reduction on site. Four general methods are available to reduce hazardous waste generation: source segregation or separation, recycling and reuse, process modification, and end-product substitution. Source segregation or separation involves keeping hazardous waste streams from the production process separate in the plant to reduce waste volume and make by-products easier to recover and reuse. Source segregation can prevent contamination of large volumes of nonhazardous waste by separating out the hazardous constituents, which can also be the first step in a recycling process. This is the simplest and probably the least expensive method of waste reduction.

Recycling and reuse involves treatment to recover a process effluent that can be used as a raw material, through in-plant processes, commercial recovery and recycling, or waste exchanges.

Process modification involves changing the design or operation of manufacturing processes to make them more efficient in minimizing waste. This may involve major changes such as the use of new equipment, or small
changes, such as modifying temperature or pressure, or the nature or composition of raw materials.

The other way to reduce waste is to substitute a product that does not require as much use of toxic chemicals for one that is waste intensive.

X. LEGISLATIVE HEARING

The Committee met in a public hearing on November 19, 1986 in Lake Jackson to discuss hazardous waste management in the State. Testimony was presented by industry representatives, environmentalists, and concerned citizens on the management of hazardous waste. Specifically, the desire to completely eliminate land disposal as a disposal technique was the common thread in all witness testimony at the Lake Jackson hearing. However, management of hazardous wastes necessitates developing a combination of options resulting in the highest level of protection possible for public health and the environment. While the ideal situation is to totally destroy hazardous substances, in reality this is not always possible.

DOW Chemical's testimony focused on their program of incineration, and how this has been its preferred method
for disposal of hazardous waste generated on-site for years. While it does have some land disposal on-site facilities still in operation, the majority of its hazardous waste is incinerated.

Dr. Suellen Pirages, Director of the Institute of Chemical Waste Management (National Solid Waste Management Association), said she recognized the need for long-term solutions to protect public health and the environment, but admitted many products used by individuals during a normal day have the potential to generate and release some hazardous substances into our environment. The effectiveness of any management option will depend on the properties of the waste and limits of technology. Dr. Pirages was in agreement, for the most part, with the Texas Department of Agriculture's report, Hazardous Waste in Texas: Alternatives to Land Disposal. She did dispute the report to some degree on the matter of groundwater contamination. However, she concurred with TDA's recommendation of increased educational and technical assistance activities to help the public begin to put hazardous waste management activities into a more realistic perspective—one that recognizes the need for these facilities, the alleged threats they pose to health
and the environment, and the benefits afforded to society when wastes are treated properly.

Rick Piltz, who wrote the TDA report, stressed that land disposal is an outdated, dangerous method to dispose of hazardous waste. Piltz said the law does not actually require the use of alternatives to land disposal. He said TDA would like to see a concerted effort between government and industry to ensure state-of-the-art hazardous waste management systems.

XI. SUMMARY

If the industrial sector in the United States is to accommodate the public desire for more careful waste management, a renewed commitment to rapid development of new treatment capability is needed. The waste service industry is eager to invest in expansion of current capacities and development of new facilities.

Recent trends toward stronger regulatory policy, increasing disposal costs and liability for cleanup costs and damages, and local opposition to siting of new hazardous waste facilities continue to plague the industry. Siting problems must be resolved, regulatory
standards identified and equally enforced, and permits processed expeditiously.

The argument could be advanced that the tools for better management of hazardous waste are available, to provide greater protection to public health and the environment. Government, the public, and industry should be encouraged to work together in a cooperative venture to implement state-of-the-art management of hazardous waste.
HORSE RACING: THE EFFECTS OF PARI-MUTUEL WAGERING ON THE TExAS FARM ECONOMY
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TEXAS FARM ECONOMY

I. HISTORY

Horse racing has always been legal in Texas, but without
track betting, the tracks around the state have never been
able to draw crowds. The legislature first experimented
with legalizing racetrack gambling in 1905, but outlawed it
again four years later. It was revived in 1933 by a
special session of the 43rd Legislature. During the
closing hours of the session, with many of the weary
members so eager to get home they failed to attend to
business, a rider setting up a Texas racing commission and
legalizing racetrack gambling was tacked on to the general
appropriations bill. With the rider attached, the
Legislature faced the dilemma of voting against the entire
bill or accepting horse race betting.

Proponents had won the battle, but not yet the war.
Almost from the day he took the oath of office in 1935,
Governor James V. Allred crusaded to outlaw racetrack
gambling. Horse racing enthusiasts today suggest that
Allred's animosity grew out of a personal feud with
Arlington Downs developer W. T. Waggoner, a rancher and
horse breeder who spent $2,500,000 in 1933 to build a major race track near Fort Worth-Dallas. But Allred himself insisted that delegations of Texas businessmen convinced him that racetrack gambling resulted in economic blight. He argued that people, usually those who could least afford it, gambled their money away and then couldn’t pay their legitimate bills. He also argued that law-enforcement costs rose because of racetrack gambling, and he voiced concern about organized crime. Allred minimized the tax benefits of the law, saying that it is "axiomatic that taxation of immorality and vice is the resort of a weak government."

In 1937, the governor prevailed. A called session of the 45th Legislature repealed the law authorizing horse-race betting. Two years later a bill was introduced in the House to create a horse race commission but was killed by a House vote.

II. PARI-MUTUEL IN THE COURTS

There has been a dearth of case law about pari-mutuel wagering in the fifty-year period since the Texas Legislature repealed horse race betting in this state. The Legislature’s purview in this realm has been

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challenged most notably in the case of Panas v. Texas
Breeders and Racing Association, 80 S.W.2d 1020 (Tex. Civ.
App.--Galveston 1935), writ dism'd.

In Panas the constitutionality of horse race betting was
challenged; specifically, plaintiff averred that the
certificate system of gambling (betting on horses)
violated Texas Constitution Article 3, Sec. 47:

The Legislature shall pass laws prohibiting the
establishment of lotteries and gift enterprises
in this State, as well as the sale of tickets in
lotteries, gift enterprises or other evasions
involving the lottery principle, established or
existing in other states.

The Court, in denying plaintiff's motion for an injunction
on the operation of defendant's horse race track, held
that horse-race betting was not a lottery as defined in
Article 3, and therefore not in violation of said
constitutional proscriptions.
III. HISTORY

In almost every session since 1937 the Legislature has dealt with horse racing bills in one form or another. In 1940, for instance, the Texas Thoroughbred Horse Association noted the increased impetus in national defense created a heavier demand for good Army horses and that horse racing encouraged good horse breeding. The horse racing bill introduced at the next session of the Legislature was designed to pour more than $3 million annually into the State treasury and was earmarked "for distribution to needy persons."

In 1946, the chief spokesman for the horse racing measure was Robert J. Kleberg of the King Ranch. Kleberg's horse Assault had been the Kentucky Derby winner the year before. Reverend J. Lester Finnell, a retired Christian minister from Fort Worth and a former resident of Kentucky, told a legislative committee that year that he had frequented the races at Arlington when the horses had run there, but he had never bet. He stated that both gambling and drinking were worse at the football games where denominational college teams play.

In 1961, San Antonio Representative V. E. (Red) Berry, a self-proclaimed professional gambler and a tavern-keeper, began his decade-long crusade to legalize pari-mutuel
betting. As far back as 1935, Berry had been the target of Texas Ranger investigations into bookmaking, and in the late 1940's his Turf Club in San Antonio was raided by police.

Berry, first as a representative, then as a state senator, continued his crusade throughout the 1960's, and in 1969, frustrated yet again, he announced that he was considering an effort to split Texas into two states, claiming that the people in North Texas kept running the business of the people in South Texas.

IV. A STATE DIVIDED

"Let North Texas have Austin," Berry said. "San Antonio can be capital of South Texas. We already have the buildings there left over from HemisFair."

Comments like that convinced the horse racing set by the mid 60's that a social roustabout like Red Berry was not the paragon of respectability their effort needed, so the old gambler went at it alone. At one point, after losing 145 to 5 on a proposed constitutional amendment to legalize racetrack gambling in Bexar and Harris counties,
Berry grumbled that he could get 135 votes on the issue on a secret ballot.

In 1983, when the Senate took the first turn at bat, lobbyist Bob Johnson came very close to getting the measure through. It cleared committee, got the critical 21-10 two-thirds vote necessary to bring it up on the floor of the Senate, and then won final passage by a vote of 18 to 13. The bill then went to the House, where it was tabled on the floor by a razor-thin vote of 75 to 73.

In 1985, with lobbyist Jack Gullahorn at the helm, the bill made it out of a House committee, amid expectations that it had a good chance of passing the House. It was carried by Rep. Hugo Berlanga, D-Corpus Christi, the speaker pro tem. A previous child welfare earmarking was left out of the 1985 bill. But in order to court members of the black caucus, who threatened to vote against the bill, Berlanga allowed amendments that required that minorities would own 15 percent of the tracks and construction contracts for the tracks.

But that loading down of the bill angered other legislators, who thought the affirmative action language was unnecessary. Several blacks still didn't think it was
enough. The result was that the measure died on a vote of 96 to 52.

V. HORSE RACING AND THE TEXAS FARM ECONOMY

No single segment of the agriculture community in Texas can claim a large benefit from the potential addition of pari-mutuel betting to state statutes. The effect when spread over all of the people involved in the farm economy is slight for each group of producers. But when these increments are added together the effect is astonishing—measuring in the billions—for the farm economy as a whole.

Clearly, horse racing would not introduce horses to Texas. Texas already leads the nation in quarter horse breeding and is the ninth largest producer of Thoroughbreds. Most of the horses in the state are used for show, roping, jumping, pleasure riding or ranch work. The rest are used for racing at the eight quarter horse tracks in the state, at county fairs, or at tracks in other states and Mexico.
VI. TO BET OR NOT TO BET?

For obvious reasons, such as its location, climate, large population and well-established breeding industry, Texas is a leading candidate for the racing circuit. In spite of natural features that favor horses, the political climate has not been favorable to horse betting. As noted, each time a bill has been introduced, it has met strong opposition from those who perceive a link between wagering on horses and organized crime and also those who fear that gambling may contribute to a cycle of chronic poverty by introducing "latent" compulsive gamblers to temptation. Additionally, opponents argue that poor people would spend a larger percent of their total income visiting the tracks, and say, therefore, that pari-mutuel racing constitutes a regressive tax.

But, despite general disagreements about the benefits versus the costs of pari-mutuel betting, horse racing would help the farm economy--there's no doubt. A larger horse population translates into an increased market for Texas farm products. Demand for corn, oats, and hay would increase, and that would mean added farm revenue for Panhandle farmers who grow corn and alfalfa, South Texas farmers who grow corn, Central Texas farmers who grow oats and hay and East Texas farmers who grow hay. Texas Department of Agriculture figures show that by the turn of
the century, the additional acreage needed to meet this
demand would total 62,000 acres. In addition, there would
be enough increased demand for straw that more farmers
around the state would produce the goods to fill that
demand. Now, most horse owners rely on out-of-state or
foreign production.

This is money for Texas—not from the tracks, but from the
farms. Take oats, for an example. Up until the 1930's,
when Texas had about two million horses and a racing
industry, Texas farmers produced as much as 65 million
bushels of oats a year. But, as the horse population
dwindled, the demand for oats also dwindled and production
fell to today's level of about 25 million bushels. Now,
Texas doesn't even meet its own in-state demand for
oats—most of the oats fed to the estimated one million
horses in Texas must be imported from the Dakotas and
Minnesota. Oats are just one of the things that fall
under feeding and bedding needs. This memorandum will
look at those needs as well as the increase in
agriculture-related jobs.
VII. FEEDING AND BEDDING NEEDS

Horses typically forage for grass and are also fed hay, oats and a mixed-grain feed. Thus, to meet the required diet for quarter horses and Thoroughbreds, there must be a network of seed and feed manufacturers and suppliers, plus producers who grow oats, corn alfalfa and other hays, milo, soybeans and seeds for forage crops.

A mature quarter horse or Thoroughbred (about 1,000 to 1,300 pounds) will eat about 20 to 25 pounds of feed per day. About half the total should be grain for the horse to be maintained in racing condition.

FORAGING

Horses also must have pasture land for foraging. The best grass for horses is oat and wheat grass, so TDA uses them in figuring seed costs. TDA estimates that the increased demand for foraging crops would be $6.60 a year for each additional horse (one acre per horse planted anew in forage crops, with one bushel of oats and one bushel of wheat per acre).

HAY

Already about 1.2 million tons of hay goes to feed Texas horses each year. About half that is alfalfa and the other half is grass hays such as Bermuda. Because alfalfa has greater nutritional value than other hays, it is the
preferred hay for racehorses. However, it is much more expensive and not as available in Texas, so good-quality grass hays are also used. Virtually all of the alfalfa used in Texas is grown out of state, because alfalfa needs more rain and constant moisture than is available in Texas, except in the Panhandle and parts of West Texas where irrigation is widely used. Texas harvested only 816,000 tons of alfalfa on 170,000 acres in 1983--most of it in the irrigated areas of the Panhandle.

Texas is the leading producer of hays other than alfalfa, so most of the grass hay that horse owners use is grown in Texas. In 1983, 6.7 million tons of hay other than alfalfa was harvested from 2.9 million acres in Texas. Of that figure, about 600,000 tons was consumed by horses. Grass hay does not require as much water as alfalfa, and is grown throughout northeast and central Texas.

Horse owners prefer to buy feed grown locally, due to lower transportation costs, so the demand for Texas alfalfa would be strengthened. If we assume that 40 percent of the hay consumed would be alfalfa, that half of the alfalfa demand would be met by Texas production and that all of the increased demand for grass hay would be
met by Texas production, the per horse total for new hay production in Texas would be $122.64 a year.

OATS

Grains make up the bulk of the racehorse diet. Oats are preferred horse feed because they are high in fiber and protein. Horses eat oats alone or in combination with other grains in mixed feed or pellets. TDA assumes four pounds of straight oats per horse per day and that no more than one-fourth of the new demand for oats would be met with Texas products. This would increase demand for Texas oats by 365 pounds per horse, or $22.81 per horse for straight oats.

MULTI-GRAIN FEEDS

The primary feed market for racehorses will be in commercially mixed feeds, some of which would come from out-of-state feed mills. A typical commercial horse feed mixture would be about 40 percent oats, 25 percent corn, 15 percent soybean meal, and 7 percent wheat bran, plus molasses and cottonseed meal. We can assume consumption of about eight pounds of mixed feed per day, or 2,920 pounds a year. If 40 percent of that is oats, oat consumption would increase 1,168 pounds a year per horse; if corn is 25 percent of that, corn consumption would increase 730 pounds.
Again assuming that only about one-fourth of the increased oat demand for mixed-grain feed would be met by Texas farmers, new demand would be 292 pounds per horse, or $18.25. Texas corn is more readily available than Texas oats. Irrigated corn is grown in the Panhandle and non-irrigated corn is grown in South Texas. Texas corn growers would be able to meet most of the increased demand, but because of seasonal fluctuations in supply, could not likely fill it all. We assume that three-fourths of the demand would be met by Texas corn; this translates to 548 pounds per horse, or $31.77 per horse.

BEDDING

Horses that are not left in pastures must have bedding in their stalls. The bedding can be from one of several sources, such as straw, pine shavings or rice hulls. Straw is cleaner as a bedding, but horses sometimes eat the straw and it is frequently not available. Pine shavings are more readily available and are more absorbent, so they are generally preferred.

Pine shavings come from lumber mills and cannot be considered a farm product as is straw. We estimate that one-fourth of the new bedding used would be straw, and that the per-horse cost for straw would be about $51.
Adding the above calculations yields the following new demand for Texas farm products created by the addition of one horse to the Texas horse industry: $253.07. Since these figures are estimates, TDA rounds the figure to $250 per horse. The total impact on the Texas farm economy depends on the number of horses, but if horse racing adds 45,000 horses to the state the increased income in feed and bedding would be $11,250,000. This is an estimate of new Texas farm revenue; the actual cost to a horse owner of feeding one horse would be nearly four times higher. Texas farm revenue only represents about one-fourth of the total feed and bedding costs.

VIII. ON FARM JOBS

Increased sales of feed and bedding are just one way that horse racing would benefit the Texas economy. Increased horse-related activity would provide jobs throughout the Texas economy, starting with jobs on the breeding and training farms. Some on-farm office and professional jobs would be created, as well as jobs directly dealing with horses. The job categories would include managers, secretaries, public relations workers, security personnel, maintenance and repair personnel, equipment operators,
veterinarians, farriers, trainers, riders, feeders, "hot walkers," stall cleaners, and breeders.

When Killingsworth Associates surveyed the New York racing industry, researchers found that breeding farms used .11 full-time equivalent employees per horse. Racehorse owners used .79 full-time equivalent employees per horse in training at the tracks and for horses at training farms the figure was estimated at .45. When Killingsworth studied the Washington racing industry, researchers found less intensive labor use. Breeding farms used .073 full-time equivalent employees per horse, training farms used .17, and racetracks used .26. (These figures do not include employees of the racetrack, such as the pari-mutuel clerks or concessionaires; they include only those employees paid by horse owners and trainers in the stable area, known as the backstretch.)

New York is more comparable to Texas (large state, leading racing and breeding state) than is Washington, so we will assume that employment figures would be closer to those found in New York than in Washington. We will assume that breeding farms will use .1 employee per horse, training farms will use .4 employees per horse, and track backstretches will use .7 employees per horse. Applying
these ratios to the expected Texas horse population yields an estimate of more than 7,000 jobs by 1991 and more than 9,000 jobs by the turn of the century.

Most, but not all, of these new workers would be classified as livestock workers, so we will assume that the average wage rate would be about $4.50 an hour, or $9,000 a year on a full-time basis. Thus in 1991, total wages paid should be $65.7 million and by 2000, $82.7 million.

In addition to the economic benefits for Texas farmers and farmworkers—that is, the amount of sales that Texas farmers would make because of increased horse activity and increases in the number of farm jobs, there would also be increased activity in other agriculture-related areas: veterinary and medical care; capital expenditures for fencing, stalls, and equipment, farriers; tack and horse transportation. The TDA report found in the briefing book includes a step by step analysis of these related areas.

In the report Potential Impact of Horse Racing on the Texas Farm Economy, Dr. Gary Keith concludes that pari-mutuel horse racing would generate direct economic activity of $230 million in the state's farm economy by
the year 2000, with a total economic effect of $713
million for state agriculture. In a study conducted last
year for the Texas Horse Racing Association, Peat,
Marwick, Mitchell & Company pegged the total boost to the
Texas economy at more than $1.2 billion a year.

IX. LEGISLATIVE HEARING

The Senate Committee on Natural Resources held a public
hearing in Tyler on June 20, 1986 at the University of
Texas at Tyler. The purpose of the hearing was to allow
interested parties to present their views on the effects
of horse racing and breeding--related to pari-mutuel
wagering--on the Texas farm economy.

An estimated 150 people attended the hearing, which lasted
from 9:30 a.m. to 1:30 p.m. The majority of those who
tested were opposed to legalized betting for a variety
of reasons. The most common concern expressed was the
fear that gambling would lead to the deterioration of the
moral fiber and the quality of life in the community near
a racetrack. Other concerns included an empathy for the
horses forced to compete and a concern for their welfare.
However, the invited witnesses presented convincing arguments that pari-mutuel wagering would in fact provide a new market for Texas farm products and farm labor. Dr. Gary Keith, a researcher for the Texas Department of Agriculture, discussed at length his report Potential Impact of Horse Racing on the Texas Farm Economy which concludes that pari-mutuel horse racing would generate direct economic activity of $230 million in the state's farm economy by the year 2000.

Except for positions for or against pari-mutuel wagering, no other recommendations were forthcoming from testimony.

X. SUMMARY

In August of 1986, during the 2nd Called Session, the 69th Legislature passed SB 15 legalizing pari-mutuel wagering in Texas. The bill passed into law when the Governor Mark White took no action on it within 30 days. It will go before the voters in the form of a referendum in November, 1987.
RENEWABLE ENERGY
RENEWABLE ENERGY

I. HISTORY

The energy headlines of the mid-eighties are dominated by the economic collapse of the U.S. nuclear industry and the political collapse of the OPEC oil cartel. Yet amid the chaos of shifting circumstances, the U.S. energy situation has improved significantly. The development of renewable energy has become a small, but important, success story.

Since 1978, energy use in the United States has fallen 10 percent, oil consumption has dropped 20 percent, and oil imports have been slashed 35 percent. Most of this improvement comes not from coal or nuclear power as the experts had predicted, but from a 23 percent boost in the efficiency of U.S. products. Homes are better insulated, industry is less energy-intensive, and cars are more efficient.

Renewable energy sources have a major role to play in the more efficient economy now developing in the United States. In 1979, President Carter’s Domestic Policy Review, flying in the face of official forecasts, concluded that renewable sources could meet 20 percent of
U.S. energy needs by the end of the century. That goal, it is now clear, was not overly ambitious. Since 1979, the renewable share of the energy supply has risen from 6 to 9 percent.

The most important advances made in renewable energy are not yet visible on the national energy charts. Windpower installations have doubled each year and now exceed 8,000 machines; photovoltaics output rises 50 percent annually, and alcohol-blended fuels will soon supply more than 10 percent of the automotive fuels market. By the year 2000, the renewable energy picture will no longer be dominated by wood and hydropower as it is today.

In Texas, the renewable energy industry appears to be stirring. Texas has one of the nation's largest wind farms in the Panhandle, biomass (the production of energy from wastes) is being studied by several companies, and solar energy is widely used, especially in residences. Texas has two fuel alcohol plants. Cogeneration (using one form of energy to produce two forms of energy), while not strictly a "renewable" energy source, was studied in 1986 by a special joint interim committee established to consider its immediate potential Texas also has a massive
geothermal resource along the Gulf Coast which can produce natural gas as a coproduct.

II. TAX CREDIT CRISIS

From 1979 to 1985, the renewable industry enjoyed federal energy tax credits. These tax credits provided financial assistance to new renewable energy supply companies, and also provided a method for lowering the monthly utility bills of households and businesses. Expenditure of these monies has resulted in several benefits to the economy. In 1983, renewable energy provided 9.6 percent of the nation's primary energy, according to DOE studies. Renewable energy sources also produced $39 billion worth of energy between 1975 and 1984, while using only $2 billion in tax credits and $4 billion in research and development funds. Renewable energy sources have brought more energy on-line in the U.S. over the past few years than both coal and nuclear power combined; biomass alone has provided more energy than has nuclear power. Currently, production of alcohol fuel provides a new market for more than 80 million bushels of corn. And according to a 1980 Solar Advisory Committee report to Texas Environmental and Natural Resources Advisory
Council, solar and wind energy alone could be expected to supply 15 percent of Texas' energy needs by the year 2000.

However, 1985 saw the end of these federal tax credits for renewable energy industries. These federal tax subsidies for renewable energy tax credits were given a "sunset" date with expiration set for December 31, 1985. The renewable energy tax credits were unique in being available to consumers as well as to energy producers. Consumers were able to deduct up to 40 percent of the purchase price of such equipment from their net tax burden. Advocates claim that elimination of the tax credits at a time when renewable energy technologies are making critical headway will push their commercialization back five or ten years, making these energy sources largely unavailable if predicted oil and electricity shortages materialize in the early 1990's.

The elimination of the tax credits is also expected to put many companies out of business, resulting in the sacrifice of significant capital investment, a slip in world technological leadership, and the yielding of worldwide renewable energy equipment markets to other nations. To prevent a crash of the renewable energy industry, government analysts at the Office of Technology Assessment
have recommended consideration of a phasedown of the renewable energy tax credits instead of abrupt elimination.

III. WINDS OF CHANGE

The growth of the wind industry has been phenomenal. In 1980, there was very little electricity produced by wind power. But by the end of 1984, a new industry had put 600 megawatts of wind capacity in place—enough to supply the needs of 40,000 homes. Nearly all of the recent growth in the industry has been in "windfarms"—large tracts of land where banks of windmills are erected and attached to an electrical transmission grid. All of the electricity produced is sold directly to a public utility.

Critics have charged that wind systems produce more of a tax shelter than electricity. Clearly, wind systems are only cost effective and efficient in the proper environment. Industry experts contend, however, that wind has the potential to provide energy that costs between 5 and 7 cents per kilowatt hour, and could supply up to the equivalent of three million barrels of oil a day (about 7 percent of the total energy demand). Wind energy, it is
alleged, could ultimately provide about 12 percent of the world's electricity generating capacity.

In 1980, TENRAC's Solar Advisory Committee Report confirmed that, "the State of Texas is one of the best regions in the U.S. for wind energy." According to that report "...saturable windpower in Texas is estimated at 250,000 MW, about five times the installed electric generating capacity in the State." The energy that is possible to be extracted from Texas winds annually is equivalent to the energy in 1.3 billion barrels of crude oil. Roughly 40% of this potential is in the Texas Panhandle, with another 10% occurring along the Texas Gulf Coast.

The Alternative Energy Institute at West Texas State University (WTSU) in Canyon has been cited as being perhaps the most active university wind research operation in the U.S. Unfortunately it does not enjoy the sort of reputation that would make it a world-class authority on the topic. Operating experience at the Hope Complex Wind Park near Pampa (a private venture installed in 1981) verify that not only does the Texas Panhandle have a wealth of extractable wind energy, but the technologically also exists to develop it.
Texas has a wind turbine manufacturer. Its market, however, lies in California, where a combination of fair avoided cost rates, a windy season that coincides with peak summer electrical demand, state tax credits, and state governmental goals encourage wind power. In California, wind turbines produce the energy equivalent of a major central power plant. A large manufacturer of oil rigs near Houston (Skytop Brewster), has recently obtained a multi-million dollar contract to manufacture large wind generators. Their production, however, is destined for the West Coast wind fields, not West Texas.

Texas has three excellent wind regions, a good tax climate, the right wildcatter spirit and tradition, but an injurious avoided-cost rate for non-firm power sources. Additionally, institutional barriers remain which discourage those who would install small individual systems such as those that would be utilized on farms, ranches, or rural residents generally. Consequently, wind generators installed in Texas number only a few hundred, producing less than 2 megawatts (MW) of on-line electricity.

Clearly the loss of federal tax incentives will harm the U.S. wind energy industry. The Office of Technology
Assessment had urged consideration of a phasedown of the wind credits to soften the shock. Currently, wind will be the first major commercial (i.e. non-subsidized) form of renewable energy. At present, wind energy costs about twice that of coal, and is heavily dependent on electric rates, which are a local factor. The early 1990's should see wind become cost competitive with conventional electric energy.

IV. PHOTOVOLTAICS: SELLING SOLAR CELLS

Photovoltaic panels--solar collectors which convert sunlight to electricity--have been an object of fascination since the early 1950's. The U.S. space program brought about fundamental breakthroughs for photovoltaic technology, and for the past decade the federal government has led the world in advocating and funding research and development of photovoltaic systems. By 1984, more than 60 firms were actively engaged in significant research or sales of photovoltaic equipment. Three large oil companies are key industry participants.

The chief barriers to the development of photovoltaics involve low efficiency of the cells and high prices. Already the price for single crystal silicon modules has
dropped from $100 per peak watt to less than $10 per peak watt, a reduction gained by applying mass production and automation to single-crystal silicon technology. Critical to the continued progress of photovoltaics is the development of markets and the attraction of investors and buyers. A DOE report (1984) found that without the tax credits, the competitive position of U.S. manufacturers in the worldwide photovoltaic market would be seriously compromised. Japanese photovoltaic companies enjoy the strong support of their government under a ten-year plan known as "Project Sunshine," and may ultimately locate part of their production in the U.S. In September 1985, both large companies, such as Minnesota Mining and Manufacturing (3M), and small firms were considering shutdown of their photovoltaic operations despite substantial financial investment.

Industry analysts place photovoltaics as commercially viable for peaking power somewhere around the mid 1990's. Currently, electricity produced photovoltaics cost roughly eight times more than the going rate for electricity, and until the technology is developed to make this form of renewable economically attractive, industry experts encourage any monies spent in this field to go to research.
V. SOLAR: THE HOT AND COLD OF IT

The use of solar thermal energy to heat and cool buildings and to heat water is the most simple and widespread solar technology. There are two types of solar systems: passive systems which take advantage of the sun by using windows, skylights, roof overhangs, and attached greenhouses; and active systems which use solar collectors. In 1974, there were only 45 companies engaged in the manufacture of solar collectors in the U.S. By 1984, there were more than 200 major manufacturers of nationally known solar-thermal equipment located in Texas include Alternative Energy Resources, Inc., (El Paso); Cole Solar Systems, Inc., (Austin); and Solar King, Inc., (Waco). Texas Renewable Energy Industries Association (TREIA) estimated that in 1984 some 150 businesses in Texas sold approximately $25 million worth of solar thermal equipment in the state.

Although commercial businesses and industry have installed solar collector systems, residential use makes up 70% of the total market. Disadvantages to residential solar collectors lie mostly in the investment—about $4,000—which dissuades many potential customers. Comparatively, Japan's "Project Sunshine" offers loans up to $8,500 at
5.5% interest repayable over five years for residential solar heating and hot water applications. Because of the availability of "up front" money and the fact that Japanese systems cost as little as $1,000 more than 2 million solar hot water collectors had been installed in Japan by the end of 1983.

VI. LEADING THE SUN TO WATER

Solar thermal technologies capture the sun's energy with solar ponds, troughs, dishes, and "power towers"—high temperature solar reflectors spread over as many as one hundred acres which focus the sun's energy on a central boiler to produce intense heat and electricity. Solar ponds are moving out of the experimental phase into applications and commercial viability. Israel is convinced of their value and has made major commitments to solar ponds. Solar ponds can be used to provide energy for many different types of applications. The smaller ponds have been used mainly for space and water heating, while the larger ponds are proposed for industrial process heat, electric power generation, and desalination.

El Paso has a solar pond which supplies process heat or electricity to a food canning plant. The pond supplies
53% of the energy and will give a payback in 2.4 years. Although land costs may be only a small percentage of total costs in a project, the ponds are particularly attractive if unused land is available. This situation occurs frequently in the Southwestern desert of the United States, where the isolation level is high and moderate temperatures reduce heat losses and increase efficiency. The largest U.S. pond has been constructed by the Tennessee Valley Authority, but an even larger pond was scheduled for completion in 1985 in the Danby Dry Lake area of California.

Because solar ponds can provide process heat directly or electricity through conversion with a heat engine-generator, food processing and canning industries are good candidates for solar pond application. These industries use large amounts of both electrical and thermal energy. In 1984, centralized solar thermal applications received $40 million in direct federal outlays for research and development in Investment Tax Credits. Currently, solar ponds are the technology closest to being economical.
VII. BIOMASS: RAGS TO RICHES

Municipal and agricultural wastes are another energy source that have gone largely untapped. Dumping 450,000 tons of waste in the U.S. each day is equivalent to dumping more than 700,000 million barrels of oil. As with other renewable energy sources, there has been a surge of interest in waste-to-energy plants since the oil shock of 1973.

The driving force behind that surge has not been energy production, but the need to shrink rising mountains of trash. Decomposing organic matter gives off methane gas, which can be used as a substitute for natural gas. More than 45 trash-burning plants are now operating, with nearly the same amount being constructed. The City of Austin is building its own generation plant, which will burn up to 600 tons of garbage every day, and provide 10-15 megawatts of power.

Another form of renewable energy already used for electricity production is the burning of crops and their residues. The most available materials include wheat, corn, rice, and grain sorghum. Other less frequently grown crops such as sugar cane, sugar beets, artichokes, rye, barley, oats and forestry products and by-products are also resources for burning. Additionally,
agricultural residues currently being left in the fields or at processing plants after harvest (cotton gin trash, rice hulls, etc.), can also be burned to produce heat for steam and/or electricity. Feed lot wastes, garbage, and plants capable of producing hydrocarbons such as oil and latex (petroculture), are considered renewable fuels, too.

In addition to the 20 million tons of crop residues (220 trillion Btu's), other biomass resources in Texas include:

-- 3,175,000 acres of high production land, 10,749,000 acres of medium production land, and 49,809,000 acres of marginal production land now in pasture, range, forest, and other uses that could be converted to cultivation, if needed, for energy crops;

-- approximately five million tons of logging residues annually from forestry operations (expected to double by 2004), and 45 million tons of rough and rotten trees in standing volume, with two million tons of dead trees available for harvest; and

-- 13 million tons of municipal solid waste available annually, including waste from the 16 most-populated counties, which represents energy equivalent to 6% of the
state's thermal energy requirements for electric power for non-industrial uses.

VIII. ADVANCEMENTS IN BURNING WASTES

Manufacturers of biomass burners have solved many of the pollution problems that had plagued the process. Several biomass plants have incorporated cogeneration technology to capture combustion heat and thus produce even more energy. The result is that the use of biomass energy has nearly doubled in the last decade. Today it represents more than 5% of the nation's energy—more than nuclear power. The Office of Technology Assessment has estimated that biomass could provide as much as 20% of American energy by the end of the century.

Although industry is the biggest user of biomass energy, homeowners use their share as well. About one-third of the wood burned today goes to heat homes. This has been a bonanza for the 700 or so companies that manufacture wood stoves and similar equipment in the U.S. Their sales were over $1 billion in 1985.

Another fuel produced from biomass is methane. In Lubbock, a large poultry operation (Sunnymead Farms) will
soon be using electricity generated onsite using manure. A private Texas firm (Organiz Fuels, Inc.) has installed equipment to produce methane gas for fueling generators. A Dallas firm (Valley View Energy Corporation) is building two 50 megawatt plants that will burn manure as a fuel in Hereford and Gruver.

In West Columbia, private enterprise has entered into contracts with both the city and the utility to burn refuse and produce two megawatts. The power will be sold to Houston Lighting and Power at an initial rate of over seven cents per kwh. Biomass is already economical, and is especially attractive if it doesn't need to be collected, but rather can be burned onsite.

IX. ALCOHOL FUELS

As early as the 1930's, farmers in the Midwest were using "agrol" in their tractors—an alcohol fuel produced from corn. In 1978, the "gasohol" program brought alcohol fuels back into the forefront. In the six years during which the federal government provided support for the alcohol fuel industry, more than $1.5 billion was invested. Ethanol-blended fuel supplies more than 5 percent of the gasoline market. In 1984, U.S. motorists
drove 100 billion miles on 5.6 billion gallons of ethanol containing gasoline.

Ethanol production in the U.S. costs about $1.50 per gallon (i.e. about $63 per barrel). This price is supported by a federal excise tax exemption of 60 cents per gallon of alcohol used in blends with gasoline, an average state tax exemption of 30 cents per gallon, and an energy investment tax credit of 10 percent. A 1984 General Accounting Office report found that "...we could not determine whether the ultimate revenue impact from the ethanol subsidy was positive or negative..." The study did conclude that it was not possible to determine whether the net effect on the U.S. economy was positive or negative.

In 1981, the Texas Legislature instituted a 5 cents per gallon direct credit against the Texas Motor Fuels Tax for 10% ethanol-content gasoline, or a subsidy of $.50 per gallon of pure fuel ethanol. Additionally, the State indirectly pays $.51 of the Federal subsidy of $.60 per gallon, for a total of $1.01 per gallon ethanol. In 1983, the Legislature placed a cap of $11 million per year on the fund for the direct state credit. The state credit is scheduled to begin phasedown at $.10 per gallon per year.
beginning in 1987, and terminating in 1992 when the Federal credit ends.

At the time the Texas credit was instituted, there was little reason for gasoline refiners to consider blending what was then called "gasohol." Because the credits were set to go to the blender/distributor, the majority of the activity has occurred in a mid-step between the refinery and the retail service station, 'terminal blending' or "tanktruck blending." Texas refiners, who produce 30% or more of this country's gasoline, received new impetus for considering ethanol blends in 1984 when the EPA ruled on the phaseout of lead in gasoline to take place through 1987.

In 1985, about 43 million gallons of ethanol were blended in the U.S. Of this figure, 42.5 million gallons were blended out of state, thereby leaving only 0.5 million gallons produced in Texas. The indirect subsidy for this was $22 million, while the direct subsidy was $14.8 million, making a combined cost to the State of $36.7 million. A second ethanol plant with a million gallon capacity has started operating recently in the Fort Worth area. However, the oil price outlook is grim as further
expansion in the ethanol industry doesn't appear especially promising.

Considerable research is being conducted on the production of ethanol and methanol ("wood alcohol") from cellulose-based biomass, since this resource base is larger than for grains and would not impact food prices. The resource base for methanol, in particular, is enormous, since it can be made from natural gas, coal, or biomass at about $.70, $1.05, or $1.10 per gallon, respectively. It is estimated that U.S. coal reserves can supply enough methanol for essentially the entire gasoline market.

X. TEXAS LEGISLATIVE HISTORY

There has been a plethora of legislation relating to renewable energy since the early 1970's. Among measures that passed were bills creating of the Texas Energy and Natural Resources Advisory Council (Schwartz, SB 921, 66th Reg. Session (1979)); directing the Public Utility Commission to develop an energy conservation program consistent with the provisions of the National Energy Conservation Policy Act of 1978 (John Wilson, HCR 161, 66th Reg. Session); and making available State loans to
finance the purchase, installation, or repair of energy conservation devices and renewable energy systems in residences.

Other legislation, although introduced, never made it through the legislative process. Those bills covered topics ranging from tax credits for corporations engaged in the business of manufacturing, selling, or installing solar energy devices (Santiesteban, SB 198, 68th Reg. Session (1983)) to the planning for, development, and regulation of the use of renewable energy (Keese, et al, HB 814, 67th Reg. Session (1981)).

SB 860 (Parmer, 69th Reg. Session), proposed to give the PUC the authority to give incentives to those utilities practicing energy efficient methods and conservation procedures, as well as incentives to those utilities producing energy more efficiently. It further proposed state buildings and new construction meet certain energy efficiency standards, and some went so far as to suggest that language should have been included to require state buildings to use solar energy sources. While SB 860 passed the Senate (May 13, 1985), it died in the House. SCR 148 (Lyon, 69th Reg. Session) proposed to encourage
Congress to extend the federal renewable energy and conservation tax credits.

Clearly, with the demise of the federal tax credits for renewable energy use and research, the industry has been dealt a major setback. While it can be argued that renewables may never enjoy the sort of first-place stature in the market arena that fossil fuels have, they nonetheless appear to have the potential to play a very important part in the future of the entire energy industry. Renewables contribute barely 10% of the nation's energy today, but proponents contend that with tax incentives, renewables could account for a full fifth of energy use by the turn of the century.

With the end of the federal tax credits, many renewable energy companies will not find it viable to continue their efforts. Clearly, the tax changes will shift the boundary of what is economic. Oil and gas companies will more than likely continue to receive government subsidies, making continuing to consume conventional fuels oil relatively more attractive. And nuclear power, which provides less than 2% of the nation's delivered energy, and for which there have been no new orders since 1978, receives 34% of all federal energy subsidies.
One solution would be an immediate end to all energy tax subsidies. Renewable energy technologies should be free to slug it out with the big guys in an unstacked marketplace—in the same vein as personal computers and small cars. That scenario, however, seems highly unlikely. However, in a time of budget austerity, the decision of whether to directly fund technology development or subsidize renewable energy use becomes more crucial for governments to contemplate and consider legislatively.

XI. LEGISLATIVE HEARING

The Committee met in a public hearing on April 17, 1986, in El Paso to discuss renewable energy in the State. Peggy Rosson, Chair of the Public Utility Commission, presented testimony with regard to the PUC's commitment to efficient and careful use of the resources used in electrical generation. Ms. Rosson informed the Committee that no one agency or office in the State is doing any planning for the State with regard to developing, executing, and monitoring an effective energy management plan for the State.
Ms. Rosson alleges that this problem extends to individual agencies as well; very few agencies have their own energy managers. Ms. Rosson suggested that the greatest potential for energy savings lies in the proper design, orientation, and construction of buildings. Since no one agency has design authority over all State structures, State construction continues to use archaic, outdated design, especially regarding energy conservation techniques.

Ms. Rosson also suggested that the State was not pursuing all of the least costly options available to it for energy efficiency investments. According to Ms. Rosson, these investments in energy efficiency techniques could be described as "revenue neutral," in that after they have paid for themselves through energy savings, those same conservation measures could actually make money for the State by virtue of the avoided energy costs. She suggested appropriating some of the Exxon Oil overcharge monies due the State to create a revolving loan fund for energy conservation measures. Additionally, interest-free loans to State agencies and institutions could be paid back out of those energy savings, while the agency or office designated to administer that fund could also be
authorized to implement and enforce an energy management plan for the State itself.

Testimony from representatives of the Texas Renewable Energy Industries Association (TREIA) suggested the Legislature consider providing the PUC the authority to levy significant fines on utilities which refuse to cooperate with developers of renewable energy projects. Additionally, they suggested incentives for utilities that would improve efficiencies and increase the use of renewable energy. Further, they suggested state agencies could update their existing policies on renewable energy and expand those programs to reduce energy consumption, to include cogeneration and energy efficient building design. TREIA would like to see a continuation of funding for research at state universities in the area of renewables, and suggested the wheeling of power and energy between facilities owned by the same company.

Dr. Robert Reid, Chairman of the Mechanical and Chemical Engineering Department at the University of Texas at El Paso, presented testimony on his work with solar ponds. The solar pond project in El Paso, which began in 1983 as a cooperative State-federal-local venture, will, in 1987, become the first solar pond in the world to produce
potable water from brackish well water. Currently, UTEP is the country's leading university in solar pond research.

The pond, on the property of Bruce Foods, supplies heat to the food processing and canning plant. In 1986, an engine-generator delivered from Israel was installed at the plant to make this pond the first in the U.S. to generate electricity. The total cost of the pond was $164,000 and it will save $28,000 a year in natural gas for the plant. With the plant using $100,000 a year in natural gas, pay back on the pond will be in 3 years.

Dr. Reid alleges that solar ponds are a viable source for renewable energy, and that they can be built even cheaper than the Bruce Foods pond. While Dr. Reid suggested that solar ponds could not be used on a per home basis, one could be used effectively in a subdivision on the theory that ponds become more economical on a larger scale. Dr. Reid suggested that further research and development was needed to spur large-scale implementation of solar ponds in the State.
XII. SUMMARY

Renewable energy sources have a major role to play in the more efficient economy now developing in the United States. While the most important advances made in renewable energy are not yet visible on the national energy charts, by the year 2000, it is predicted that the renewable energy picture will not be dominated by wood and hydropower as it is today.

The Texas renewable energy industry seems to be stirring. With one of the largest wind farms out in the Panhandle, two alcohol fuel plants, and a massive geothermal resource along the Gulf Coast, Texas can boast an active industry.

From 1979 to 1985, the renewable industry enjoyed federal energy tax credits, providing financial assistance to new renewable energy supply companies, while providing a method for lowering the monthly utility bills of households and businesses. However, 1985 saw the end of these federal tax credits for renewable energy industries. Advocates of renewables claim that elimination of the tax credits will push their commercialization back five or ten years, making these energy sources largely unavailable if the predicted oil and electricity shortages materialize in the early 1990's.
The elimination of the tax credits is also expected to put many companies out of business, resulting in the sacrifice of significant capital investment, a slip in world technological leadership, and the yielding of worldwide renewable energy equipment markets to other nations. To prevent a crash of the renewable energy industry, government analysts at the Office of Technology Assessment have recommended consideration of a phasing out of the renewable tax energy credits, instead of abrupt elimination.

With the end of federal tax credits, many renewable energy companies will not find it viable to continue their efforts. Clearly, tax changes will shift the boundary of what is economic. Nuclear power, which provides less than 2% of the nation's delivered energy, and for which there have been no new orders since 1978, receives 34% of all federal energy subsidies.

One solution would be an immediate end to all energy tax subsidies. Renewable energy technologies could be free to slug it out with the big guys in an unstacked marketplace. That scenario, seems unlikely. However, in a time of budget austerity, the decision of whether to directly fund technology development or subsidize renewable energy use
becomes more crucial for governments to contemplate and consider legislatively.
WHITE OIL
WHITE OIL

I. HISTORY

Rights to billions of dollars in oil and gas are at stake in a multifaceted legal dispute pitting independent Panhandle oil operators against major petroleum companies that own the gas rights in the Panhandle Field near Amarillo. The dispute takes its name from the liquid some oil operators have been distilling from Panhandle gas by refrigerating it at their wells. By counting this liquid as crude oil, they have tried to maintain their right to take casinghead gas (a by-product of oil production) from gas-rich, oil-poor layers of the Panhandle Field.

The Texas Railroad Commission has ruled that this practice violates state law, and the Federal Energy Regulatory Commission has found that this and related practices also violate federal law and facilitate illegal overcharges for the gas produced from oil wells. The issues have been litigated in various forums, with appeals by the white oilers now pending. The state is concerned not only about the economic consequences of the dispute, a loss of millions of dollars for the Panhandle, but also about the federal agency's interpretation of state oil and gas law.
II. WHITE OIL

The Panhandle field is the only major field where gas rights and oil rights are still sold separately. Geologists estimate that as much as $27 billion in hydrocarbon reserves lie in the underground dome in West Texas. Under certain pressures and temperatures those hydrocarbons form gas, and under others they form oil.

Most of the gas rights were snapped up by the majors, starting in 1918 when the world's largest gas reserves were discovered below nine Panhandle counties. Big companies such as Phillips, Mobil, Diamond Shamrock, Pioneer and Dorchester weren't terribly interested in oil rights, because there wasn't enough oil to support large commercial drilling. The majors bought gas rights dirt cheap and entered into long-term contracts with pipeline companies, which in turn entered into contracts to supply natural gas to cities in the Midwest. Meanwhile, landowners retained oil royalty rights against the day when they would be worth something.

That day came in 1977 when the chief counsel of the Texas Railroad Commission wrote a letter that in effect started
the white-oil boom. The intent was to extend the life of aging oil wells, but it had a broader effect.

Under the guidelines, speculators began to drill new wells. Then using LTX (low-temperature-extraction) units, they condensed enough white oil to call the new wells oil wells. They also produced the allowed amount of casinghead gas--100,000 cubic feet per barrel of oil. It is the sale of the casinghead gas as well as the white oil that forms the crux of the issue.

III. CASINGHEAD GAS

The owners of new oil wells are at a double advantage in the natural gas market. In order to encourage the production of oil during the Arab oil embargo, the Railroad Commission gave priority pipeline access to casinghead gas, a by-product of oil production that has sometimes been considered a nuisance. State regulations permitted any well in the 1.5 million-acre Panhandle field to produce 100,000 cubic feet of gas for every barrel of oil pumped in a day. The oilmen do own the rights to casinghead gas produced in the process of producing oil. The priority access to pipelines virtually assures casinghead gas a market. However, the majors contend that
the white oil is not oil and that therefore the gas is not casinghead gas, but shallow gas owned by the majors.

The second advantage that the new oil well owners enjoy is the benefits of the 1978 Natural Gas Policy Act. This Act deregulated gas from new wells. (Old wells still must sell their gas at regulated prices). When the Act went into effect, the value of the gas from the Panhandle oil wells skyrocketed.

Moreover, in the Panhandle Field, gas wells are limited to one well per square mile, while up to 64 oil wells may be drilled in that same square mile.

All these wells meant dollars for the Panhandle and the State. New businesses and even small towns developed and prospered. Things looked better for the Panhandle economy than they have for years.

In May 1985, at the request of the Dorchester and Phillips Petroleum Companies, the Railroad Commission reviewed the Panhandle situation and issued ruling formally prohibiting the use of refrigeration units. As the result of a separate case, the Federal Energy Regulatory Commission on
July 12 ordered independent operators to cease their operations.

IV. THE AFTERMATH

Across the Panhandle of Texas independents interpreted this decision as State and federal regulators coming down squarely on the side of Big Oil, threatening to end white-oil fever and all the wealth and employment it had brought to the Texas Panhandle in the last seven years.

Everyone from ranch owners to refrigerator installation mechanics, retired couples to bankers profited from this oil boom, which explains why the Panhandle was suddenly gripped with panic. The economy in the Panhandle has suffered from the depressed agricultural market, as well as declines in oil prices worldwide. Now after years of lobbying and litigation, major oil companies convinced State and federal regulators that the locals were mere oil-patch rustlers, bent on sucking Big Oil dry.

State Comptroller Bob Bullock has estimated that Texas could lose as much as $100 million a year in oil and gas severance tax revenues, besides the blow the elimination of white oil activity will strike to local economies.
Bullock further estimates that the Panhandle economy alone stands to lose as much as $18 million a year. Nearly 50 percent of the businesses in Borger face bankruptcy and businesses in Pampa and Dumas may soon follow suit. Area bankers have had to extend payments on loans with no guarantee that the white oilers can ever repay them.

The bankers and independents claim that they have been operating in good faith on the basis of an existing legal ruling allowing the use of refrigeration units to produce white oil. Now, they say, the Railroad Commission is changing the rules after the fact.

However, Railroad Commissioner Buddy Temple wrote in a letter to House Study Group member Dan Kelly that the "law cannot be altered by commission staff error or reliance on that error, even if proven." Temple also stated that the Legislature has not granted the Railroad Commission the authority to "consider general economic consequences of its acts and to allow those consideration to override state conservation laws."

V. LEGISLATIVE HISTORY

STATE DECISIONS

Issue: The central state issue involving white oil is
whether or not it should continue to be counted as oil in calculating the oil-gas ratio that determines whether a well should be classified as a gas or oil well.

December 1977--Letter from Chief Counsel of Railroad Commission which permitted refrigeration unit production of white-oil in the calculation of gas-oil ratios.

September 1981--Phillips Petroleum asked for review of the use of LTX liquids in well classification. Phillips contended white oil should not be included in gas-oil ratio calculations used to classify wells. This was contested by those producing white oil.

May 1985--The Railroad Commission handed down its final order on the white oil issue, ruling that white oil was not to be determinative in calculating ratios and establishing well status. Retests of the white oil wells were ordered, with the objective of shutting them down if the wells did not produce enough oil without refrigeration units.

September 1985--The order of the Commission was appealed in the 250th District Court in Travis County. Judge
Harley Clark ruled that there were no substantive errors in the decisions and actions of the Commission. However, the order was held to be null and void on procedural grounds. According to the Administrative Procedure and Texas Register Act, the Commission should have handled the case as a "rulemaking" rather than a "contested" case. The court refused to enjoin the retesting of wells, thus allowing the continuance of retests and shut-ins by the Commission. The case was brought by Hufo Oils and 18 other members of the Panhandle Independent Producers' Group. (Hufo v. Railroad Commission).

FEDERAL DECISIONS

Issue: The federal issue involves the allegedly widespread practice of drilling new oil wells in order to capitalize on the price advantages given the sellers of "new" gas. The operators of the new wells have been charged by the FERC Enforcement Staff and Dorchester Gas Company with illegally diverting "old gas" from Dorchester leases to "new gas". The "old gas" originating from Dorchester's wells has been committed to interstate commerce, hence the involvement of FERC.

February 1984--FERC ordered 37 oil well operators in the Panhandle Field to show cause why they have not violated
certain federal laws. These applicable laws are contained in the Natural Gas Act and the Natural Gas Policy Gas Act. These Acts prohibit the intrastate production and sale of gas that has been committed or dedicated to interstate commerce. Further, the laws prohibit the charge and collection of prices in excess of the lawful maximum.

January 1985--FERC issued a recommended decision reached by Administrative Law Judge Brenda Murray. The decision recommended that FERC order all except two oil operators (Meyer Farms and J.B. Watkins) to cease immediately the violation of pertinent laws. The decision instructed FERC to gather further information on the two operators not ordered to cease and desist.

July 1985--FERC adopted Judge Murray's recommended decision as its final ruling against the oil operators.

April 1986--Projected date for setting the penalties to impose for violating federal law based on FERC's previous hearings.
VI. LEGISLATIVE HEARING

The Senate Committee on Natural Resources held a public hearing in Amarillo on February 27, 1986, at the Texas Tech University Health Science Center Auditorium. The purpose of the hearing was to allow interested parties to express their concerns and recommendations about the white oil issues in the Panhandle and to seek legislative solutions to this dispute, if a compromise between the parties could not be reached.

The hearing was set to begin at 9:00 a.m., but by 6:30 that morning people were lining up outside the auditorium, despite chilling winds. By the time the doors opened, over 500 people were waiting to be heard. While the invited witnesses spoke convincingly about the similarities between white and black oil and favored a legal definition that would allow independents to recover white oil and casinghead gas, the majority of the public testimony favored the large gas royalty owners like Phillips.

VII. SUMMARY

On July 12, 1985, the Federal Energy Regulatory Commission (FERC) shut down 37 independent oil operators on grounds they were producing from a gas reservoir. The
independents claimed the Railroad Commission did not have a rule on gas-oil contact, alleging that the Commission regulated gas and oil rights by allowing oil producers to produce no more that 100,000 cubic feet of gas for every barrel of oil. The FERC asked the Railroad Commission to explain its rules on gas and oil production, but the Commission refused to testify, leaving FERC to interpret Texas law on its own. When the Commission issued a letter on July 8th asking oil operators to report where they were producing in relation to the gas-oil contact, FERC ruled against the independents.

After that letter and the FERC ruling, major gas producing companies began litigation proceedings against hundreds of independents for producing gas from above the gas-oil contact. These lawsuits eventually shutdown more that 1,000 wells in the Panhandle Field.

On September 22, 1986, jurors in U.S. District Judge Lucius Bunton's Midland court decided in favor of 42 independent oilmen who were defendants in the Panhandle Eastern Exploration Company and Anadarko Petroleum Company lawsuit.
On October 7, 1986, approximately 40 cases went before U.S. District Court Judge Mary Lou Robinson in Amarillo. In pretrial hearings, Judge Robinson ruled that unless attorneys could show the need for Railroad Commission testimony with regard to rules on gas-oil production, the final decisions by FERC or the Commission regarding white oil would not be used as evidence in the trial. Additionally, she ruled that attorneys for the defendants would not be allowed to inform the jury that some of their clients were in bankruptcy proceedings unless relevancy could be proven.

Furthermore, on August 13, 1986, U.S. District Court Judge Harley Clark overruled his previous decision of September 1985, which was a decision in favor of the Railroad Commission to cease production of white oil. At this date, application for writ was filed with the Texas Supreme Court, but no action has been taken.