

The Texas Groundwater Quality Monitoring Strategy

Presented to the National Water Quality Monitoring
Council, May 20, 2008 Atlantic City New Jersey

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Texas Groundwater Protection Committee



The Importance of Groundwater in Texas



- Groundwater provides about 59 percent of the 15 million plus acre-feet used by the citizens of the state each year.



Before 1940, groundwater provided less than 1 million acre-feet of water per year to Texans. Since the drought of the 1950s, groundwater production has been about 9 to 10 million acre-feet per year.

The Importance of Groundwater in Texas



- Agriculture uses about 79 percent of this groundwater



Pictured is a center pivot irrigation system, common to the high plains and the Ogallala aquifer. The color infrared image is a map view of center pivot irrigation systems in place – each circle is a center pivot, filling the center of each quarter section of land (1/4 square mile). This is a good thing, because center pivot irrigation is more efficient for irrigating crops, causing less water to be withdrawn from the aquifer. The Ogallala Aquifer provides 82 percent of all groundwater used for irrigation or 6.0 million acre-feet per year.

The Importance of Groundwater in Texas

- The next highest use category is for municipal water supplies at 15%



The Texas Groundwater Protection Committee

- Texas Commission on Environmental Quality
- Texas Water Development Board
- Railroad Commission of Texas
- Texas Department of Agriculture
- Texas State Soil and Water Conservation Board
- Department of State Health Services
- Texas AgriLife Research
- Texas Alliance of Groundwater Districts
- Texas Department of Licensing and Regulation
- University of Texas at Austin, Bureau of Economic Geology



Nine State agencies and one state recognized association comprise the Texas Groundwater Protection Committee (TGPC). The TGPC is a state agency with no budget and no staff, however, the Texas Commission on Environmental Quality chairs the committee and provides support for committee activities. The committee is charged with developing the state's strategy for protecting groundwater quality, which includes development of a state groundwater monitoring strategy.

Texas' Current Groundwater Monitoring Efforts



The log information is verified using the most sophisticated methods available . . .



Candidate sites are located in the field, and information is verified. GPS coordinates are obtained, and initial samples are taken. The vertical location of the water bearing zone (ie, the formation) is determined by best professional judgement by geologists in Austin, after an extensive review of library data, the well log, and the field trip.

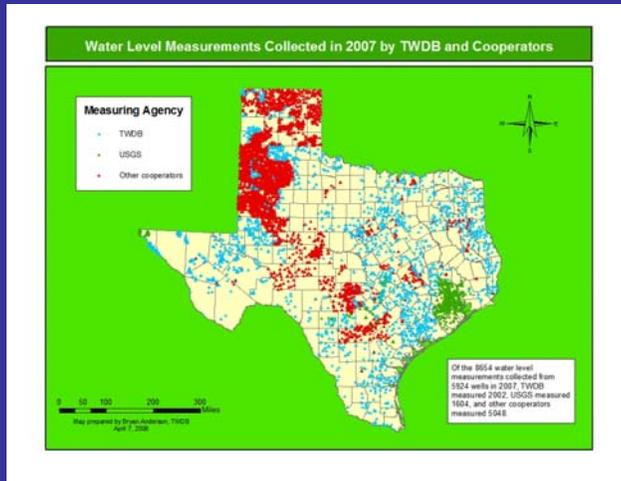
Texas' Current Groundwater Monitoring Efforts

- Annual Groundwater Level Observation Program
- Automatic Groundwater Level Recorder Program
- Ambient Groundwater Quality Monitoring
- Public Drinking Water Monitoring Program



The state sponsors four major groundwater monitoring programs. Three are conducted by the Texas Water Development Board, vice chair of the TGPC, and the lead planning agency for the state's water resources. The fourth program, for public drinking water, is carried out under the Safe Drinking Water Act by the TCEQ.

Annual Groundwater Level Observation Program



The state's groundwater level observation program is intended to detect trends in water levels over time on a regional basis, and to collect information for groundwater modeling. Groundwater modeling provides support for groundwater management, state and regional water planning. In operation since 1957, the program relies on a network of approximately 8,000 observation wells. The majority of the wells—86 percent—are in major aquifers, with the remainder in minor or other undesignated aquifers, such as the Rio Grande Alluvium.

The TWDB collects over 2,000 water level measurements each year and receives more measurements from other organizations, primarily groundwater conservation districts. TWDB and others collect water levels from wells in nearly all of the state's counties. TWDB measures water levels once a year to ascertain the aquifers' levels under static conditions. Some of the cooperating organizations, however, are able to collect more frequently, which provides even more information on the effects of pumping and seasonal changes on groundwater levels.

Ground water-level information includes state well number, depth from land surface datum, date of measurement, measuring agency, method of measurement, remarks where appropriate, and designation of measurement as publishable or non-publishable. As of October 2004, more than 74,500 wells in the database had miscellaneous measurements, and some 8,300 were classified as current observation wells with at least one yearly measurement.

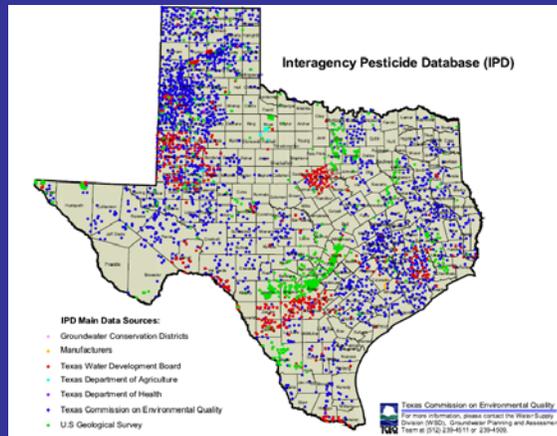
Automatic Groundwater Level Recorder Program

<http://www.twdb.state.tx.us/data/waterwells/>



TWDB, along with other entities, operates a second groundwater level program to detect trends in groundwater levels on a daily basis at more than 100 specific well sites. These water levels are from wells equipped to record water levels continuously—called recorders or recorder wells. The information from TWDB wells is transmitted daily to TWDB, where it is posted on the TWDB Web site at <http://www.twdb.state.tx.us/data/waterwells/>.

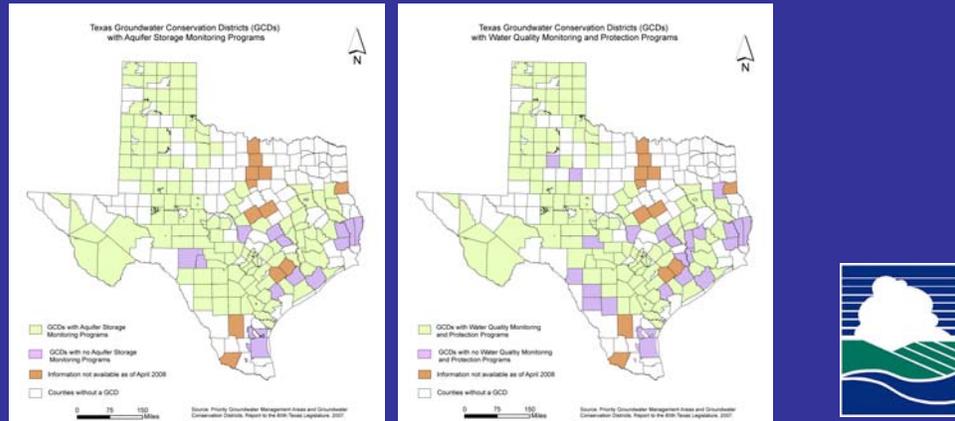
Ambient Groundwater Quality Monitoring



Though not an official part of the ambient groundwater quality monitoring program, the TCEQ has been collecting pesticide occurrence data for many years. Recent pesticide monitoring has focused on the triazine family and metolachlor. TCEQ screens for pesticides using immunoassay methods, augmented by laboratory analysis.

Cooperators

Chief cooperators are the USGS and Local Groundwater Conservation Districts



There are a total of 97 Groundwater Conservation Districts in the state. Of these, 78 have “Aquifer Storage Monitoring Programs.” 10 do not. Similarly, 73 have some form of Water Quality Monitoring and Protection Programs, while 15 do not. Information was unavailable for 9 of the districts.

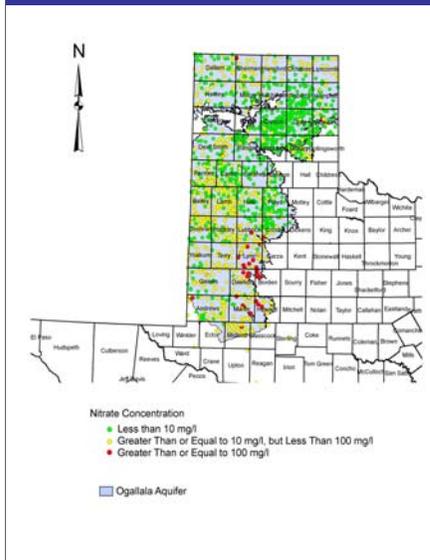
Public Drinking Water Monitoring Program

- 6,726 Water Supply Systems
- 11,966 Operational and Demand Wells
- 17,830 Samples
- 172 Actual Groundwater Samples



Because Public Water Supply systems test water quality at Points of Entry, actual groundwater data is difficult to extract from the database maintained by the TCEQ. When a contaminant is detected at the Point of Entry, additional testing may be conducted to determine the source. When actual groundwater data is obtained, the information is forwarded to the Texas Water Development Board for inclusion in their database, along with associated metadata.

Texas' Current Groundwater Monitoring Efforts



The current monitoring program allows us to make some general characterizations on groundwater quality.



Current data gives us “snapshots in time” for Texas’ groundwater quality. Trend analysis is problematic, because collection and analytical methods for data gathered prior to 1988 may be inconsistent with data obtained after that date. Sampling on a four-year cycle also does not necessarily permit temporal comparability for sampling, and seasonal variations are difficult to detect.

Texas' Current Groundwater Monitoring Efforts



The suite of constituents also limits precise characterization of groundwater quality. Known historic groundwater contamination incidents escape detection under current monitoring programs



In the early 1940's, a massive blowout of a natural gas well in the Bammell Field, in the north part of present day Houston, pressurized three formations in the Gulf Coast aquifer with natural gas, benzene and other petroleum constituents. The present extent of this contamination is believed to cover 100 square miles, however, there is no comprehensive monitoring program that can verify this. Public Water Supply testing has shown the presence of natural gas constituents in the general area, but it is unknown whether these occurrences are the lingering result of the Bammell event, or if they are from a new source of contamination – the Bammell Field is now one of the largest gas storage facilities in the continental United States. Testing for volatile organic compounds and semivolatile compounds would assist in determining the extent of contamination of this type.

Texas' New Strategy

Under Construction



Recognizing the need for a more comprehensive groundwater monitoring program, the TGPC set out to enhance current monitoring efforts. The desire was to avoid throwing the baby out with the bathwater, and to build on what is overall a pretty good system.

Texas' New Strategy

Monitoring Objectives:

- Establish a baseline set of data
- Evaluate trends in groundwater quality
- Analyze land-use effects on groundwater quality
- Evaluate recharge and variability for all aquifers
- Determine constituents of concern
- Determine aquifer water levels
- Evaluate cycles in groundwater quality



A series of contracts with the USGS and local research organizations produced a framework document to be used by the TGPC to develop a groundwater monitoring strategy. These are the vetted monitoring objectives, ranked in order of importance. For constituents of concern, methods of early detection are also desired. Water levels and quality cycles are based on regional priority.

Texas' New Strategy

Monitoring Regimes:

- Basic – to represent aquifer-wide, ambient conditions
- Reference – selected to represent undisturbed/least disturbed setting
- Targeted – selected to encompass local water quality issues



Reference sites are to be used for comparison as changes are detected – this provides the “background” conditions that many of our hazardous waste and water quality permits use as a yardstick for determining when a permitted facility has impacted or is impacting groundwater. Once the network is established, Basic and Reference sites will remain static, unless a monitored constituent reaches a “trigger” point, at which time the site will be moved into the “Targeted” regime. A “trigger” may be an MCL, or a percentage of an MCL.

Texas' New Strategy

Aquifer Priority Levels:

- Priority 1 – 4 Major aquifers, 6 Minor aquifers
- Priority 2 – 4 Major aquifers, 8 Minor aquifers
- Priority 3 – 3 Major aquifers, 7 Minor aquifers



Aquifers have been assigned to Priority Levels based on current conditions. Aquifer Priority Level standing may change as factors such as population, land use or geo-hydrology change. These same factors were used in determining the segmentation of several of the Major aquifers (remember, there are only 9 Major, aquifers, but there are 11 shown across the priorities – three have been segmented).

Texas' New Strategy

Proposed Constituent Groups:

- Field parameters
- Inorganics
- Trace elements
- Nutrients
- Organics
- Pesticides
- Microbiology
- Radionuclides
- Gases
- Emerging contaminants



Field parameters include water level, pH, dissolved oxygen, specific conductance, temperature and alkalinity

Inorganics mirror the existing suite for ambient groundwater quality constituents.

Trace elements include Arsenic, iron, lead and manganese for all sites, and includes other metals from aluminum to zinc

Texas' New Strategy

Sampling Intervals:

- Basic and Reference Sites – 3, 4, or 6 year intervals, depending upon parameter and aquifer priority
- Targeted Sites – 1, 3, 4, or 5 year intervals, depending upon parameter and aquifer priority
- Gases and Emerging Contaminants – As needed



A matrix has been developed to guide sampling intervals.

Details Yet to be Worked Out

- Funding
- “Buy-in” from member agencies of the Texas Groundwater Protection Committee
- Data Management systems
- Assessment methodologies



Management of the various member agencies is unaware of the scope of what the TGPC is planning. It is clear that the Texas Water Development Board cannot shoulder the burden of implementing this program by itself. Currently, the committee envisions a cooperative approach for actual sampling, and various agencies chipping in funds for analytical costs, depending on each agency's constituents of concern. These items, and other details, are currently under discussion with adoption of the strategy anticipated in August or September, 2008.

Never Forget the Importance of Water, or the Consequences from the Lack of it



Thanks.

If you desire additional information, please feel free to contact me, via e-mail at cbetz@tceq.state.tx.us or by telephone, (512) 239-4506

Additional information will also be posted on the Texas Groundwater Protection Committee website as it becomes available. Visit:

<http://www.tgpc.state.tx.us/>

