Balancing the groundwater checking account through House Bill 1763

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It might have been a groundwater district manager that first said the only thing that is guaranteed in life is change (and taxes!). Recent groundwater policy changes certainly illustrate this point. As a result of legislation in 2005, new accounting procedures for groundwater management in Texas are now required. One of the most significant new requirements is to establish what aquifers should look like in the future, in legal parlance what their "desired future condition" should be. Based on that desired future condition, a key piece of water resource information will be determined: the managed available groundwater in the state's aquifers. This document discusses the evolution of groundwater management and related legislation and offers some suggestions and insights into the processes for developing desired future conditions. We hope these insights will assist in the discussions about desired future conditions in groundwater management area meetings.

Groundwater management practices prior to House Bill 1763

Several years ago the legislature designated groundwater conservation districts as the preferred way of managing groundwater resources in Texas and required each district to develop a management plan. As part of that plan, the districts had to determine the total amount of useable groundwater. That posed a challenge.

For example, before House Bill 1763 many districts thought that using recharge would be a conservative approach to estimating useable groundwater: every year you should pull out of the ground only the amount of water that goes into the ground. However, this concept may not have applied everywhere. A single-county district in a rural area that mainly pumps groundwater for crops and livestock may only have a small part of the land surface where the aquifer could get refilled or recharged. Most of the recharge may occur not in the district’s county but in the counties next to it. According to experts, recharge to an aquifer may take a long time, hundreds or even thousands of years, depending on where water enters the aquifer and what kind of rock the water has to travel through.

If the single-county district borders a district that is more populated or one that is unregulated and pumps as much water as it wants, then pumping in that area may outpace the estimate of recharge within the single-county district. Because aquifers do not begin and end at a county line, managing groundwater in a district could benefit from accounting for all of the groundwater usage in neighboring districts and in surrounding counties.

In 2002, the legislature directed the Texas Water Development Board (TWDB) to create groundwater management areas that covered all the major and minor aquifers in the state. With the help of public input, TWDB divided the state into 16 management areas, much

bigger than a county but sometimes smaller than the entire aquifer. The groundwater management areas made it easier for districts to figure out which districts they should be planning with. However, there were no specific instructions, with the exception of sharing groundwater management plans, about the level or direction of planning.

Another legislative change that affected groundwater management was the regional water planning process instituted about a decade ago. Texas changed from a centralized planning approach to a more 'bottom up' approach. As part of the regional water planning process, the groundwater conservation districts provided information to the appropriate regional water planning groups for consideration in their regional plans. This information was then rolled up into the state water plan. Currently this process is repeated and refined every five years. However, regional water planning groups were only required to consider information from groundwater conservation districts; they were not required to use that information. This led to several conflicts in which the districts and the regions did not agree on groundwater availability, and the law at that time sided with the planning groups.

House Bill 1763

Enter House Bill 1763. In 2005, the legislature regionalized decisions on groundwater availability and addressed the conflict between districts and regional water planning groups by enacting House Bill 1763. This legislation directed districts within a groundwater management area to work together. All the districts within a groundwater management area are required to meet at least annually for joint planning. They must also develop a statement of what the aquifers in their respective areas should look like in the future. This policy is called the desired future condition of an aquifer. Some, but not all, of the questions to be answered in determining a desired future condition are: Do we want to use up all of the aquifer? Some of the aquifer? None of the aquifer? Do we need to maintain a certain amount of spring flow, as the Edwards Aquifer Authority is required by law to do?

After the districts in a groundwater management area determine the desired future conditions of their aquifers, they must submit them to TWDB. TWDB then translates the desired future conditions into an estimate of the amount of managed available groundwater for use by both the groundwater conservation districts and the regional water planning groups. An important change in this legislation is that regional water planning groups are now required to use—not just consider—the managed available groundwater estimates provided to them by TWDB as determined by the districts' desired future conditions.

Although TWDB estimates and provides values for managed available groundwater, similar to a bank providing checking account balances, the values will be controlled by what the districts decide for the desired future conditions. Because regional water planning is based on county, river basin, and regional boundaries, TWDB will provide managed available groundwater estimates to the regional water planning groups at the combined county, river basin, and regional level. Unless otherwise indicated in the desired future condition statement, TWDB will also provide the managed available

groundwater estimates at the groundwater conservation district level to the districts in the groundwater management areas.

Districts have until September 1, 2010, to determine a desired future condition of their aquifers. However, if districts want the managed available groundwater estimates to be part of the next regional and state water plans, their desired future condition must be submitted much earlier. Although the next regional water plans are not due until 2011, the planning process will start well before this. Because knowing how much water is available and how much water is needed is one of the first things the regional groups must sort out, districts really only have until the end of 2007 to determine their desired future condition in order to have the resulting managed available groundwater estimates included in the next regional and state water plans. This gives TWDB about six months to estimate managed available groundwater. That is not much time, especially if everyone submits desired future conditions to TWDB at the same time. If districts wait until the legislatively mandated deadline, managed available groundwater estimates will not be part of the regional water plans until 2016 and will not be part of the state water plan until 2017.

Desired future condition of an aquifer—getting started

So what is a desired future condition? There have been a lot of different ideas about what is and is not a desired future condition, and TWDB has assembled some suggestions on what a desired future condition is and how to put it in words. A desired future condition of the aquifer can consider water levels, amount of water in storage, discharge to springs, or base flow to streams and rivers, to name a few options. Each aquifer may have a separate desired future condition for specific parts of the aquifer; however, simpler conditions are easier to quantify. To use a checkbook analogy, the desired future condition of your checkbook may be that you maintain a certain minimum balance (water level), so much money in savings (storage), or have enough funds to cover your annual service fee (spring discharge or base flow to streams and rivers).

If a statement is not a condition of the aquifer, then it cannot be a desired future condition. For example, recharge is not a condition of the aquifer. Recharge and pumpage are basically the means of *achieving* a desired future condition of an aquifer, but they are not technically the desired future condition. In the checkbook analogy, recharge is equivalent to deposits made to your account. If the desired future condition of the bank account is to maintain a certain balance, this could be accomplished by either writing less checks or making more deposits.

A desired future condition also needs to include a time component. For example, a desired future condition might stipulate that water levels *never* drop below a certain amount or that on average water levels are maintained at a certain level *for 50 years*. Since the managed available groundwater estimates will be used by both the regional water planning groups and the districts, considering at least a 50-year planning horizon is advisable.

Desired future condition statements may look like the following:

- "Using current water levels as a baseline, we do not want the average water level to decline more than 50 feet over the next 50 years in aquifer X."

- "We do not want the amount of groundwater from aquifer X discharging to rivers and streams to decline more than 25 percent over the next 50 years."

- "We want the amount of groundwater in storage in aquifer X to decline no more than 1.25 percent per year for the next 50 years starting with 1998."

Back to the checkbook analogy: When paying bills, it is always good to know in advance if you have enough money in your account. Likewise, it is advisable to know if the desired future condition of an aquifer will result in enough managed available water for existing permits or future water needs or demands. If the managed available groundwater estimates are below the estimated future demands, then districts will have to decide whether to resubmit an adjusted desired future condition statement to end up with a larger managed available groundwater estimate or to adjust current or future permitting in the district. TWDB recommends considering draft desired future conditions as quickly as possible so that the districts can use that information in developing their final desired future conditions.

Some districts want to use "sustainability" as a desired future condition. The U.S. Geologic Survey defines sustainability as "…the development and use of groundwater in a manner that can be maintained for an indefinite time without causing unacceptable environmental, economic, or social consequences." Therefore, a key part of using sustainability as a desired future condition is to identify what the unacceptable environmental, economic, or social consequences are. Environmental consequences may include spring flow, base flow to rivers and streams, and groundwater levels. Economic and social consequences may include how the resulting managed available groundwater volume affects local and state agricultural and urban economies. Sustainability in a desired future condition is expressed as maintaining a certain desired future condition in perpetuity (in other words, forever).

Another consideration in defining the desired future condition of an aquifer is that they have to be physically possible, both individually and collectively. Some groundwater management area members may be under the impression that if the groundwater management area is subdivided into smaller and smaller units (either counties, groundwater conservation districts, or even smaller) that this will make the process simpler. However, the opposite is true. The more a groundwater management area is subdivided into geographic areas with a different desired future condition, the more difficult the process becomes. Subdividing the groundwater management area increases the likelihood that the desired future conditions in adjacent areas are not physically possible. For example, if a groundwater management area is divided up at the county level and one county sets their desired future condition at zero drawdown and several

adjacent counties set their desired future condition at 50 feet of drawdown over 50 years, then neither of these contradictory desired future conditions can be reached. If the desired future condition of the counties with 50 feet of drawdown over 50 years is achieved, then there will be drawdown in the county that desires none. And if no drawdown is achieved in that county, then it is not possible to pump enough in the adjacent counties to get 50 feet of drawdown in 50 years. This illustrates that districts in the groundwater management area will have to coordinate and cooperate to develop desired future conditions that are compatible and are physically possible for the entire groundwater management area.

In addition, subdividing a groundwater management area into small units will also require more time to construct pumping files and to make and evaluate model runs, even if the desired future conditions of the aquifer are physically possible.

And finally, if a groundwater management area is subdivided into many smaller geographic areas, each of these small areas will have to be managed separately by the districts that contain them, including developing rules and management plans that address how this management will occur. Each district has to have the intention and ability to manage each of these subdivided areas separately.

Translating a desired future condition into managed available groundwater

Once a draft or final statement of the future desired condition of an aquifer is developed by the districts within a groundwater management area and submitted to TWDB, TWDB will begin the process of translating this into estimates of managed available groundwater. In many cases, but not all, this will be the groundwater availability models or the information used to develop the models. If a groundwater availability model exists, analyzing how the aquifer would respond if historical pumpage continues into the future is a good starting point. TWDB has already checked the models against water level measurements that were taken in the late 1990s, so one option is to see what would happen if we continue to pump groundwater like we did in the late 1990s. Would water levels drop? Would they rise? Would they remain the same? How long does it take to see a response or reaction in the aquifer? Another advantage to this approach is that districts may get a better understanding of how existing pumpage in other districts affects aquifer conditions in their own districts or how pumpage within their districts affects other areas. The districts may then decide to compare the amount of pumping in the model run to how much groundwater has already been permitted and/or how much groundwater is currently listed as available or needed in the regional plans. The good news is that TWDB has already begun doing these runs.

Using the calibrated models, where they exist, the modeler may adjust pumping recharge or pumping (or both) until a specified condition of the aquifer is reached. For example, pumping can be adjusted in one of several ways:

- The most recent historic pumping estimates (usually 1999) can be adjusted by a factor to obtain a new pumping amount. The advantage of this method is that the

current distribution of pumping will be kept the same, and the new pumping file can be easily constructed. The disadvantage of this method is that existing pumping centers may be pumped more and more heavily, which may not be a realistic representation of how pumping will increase in the future.

- Additional future pumping may be added onto the existing 1999 estimated pumping equally throughout a geographic area. This will evenly distribute additional pumping, which may more realistically represent how future groundwater development will occur in an area. In other words, if someone is going to develop groundwater resources in an area, they may not want to do so in an area already being pumped heavily. They will go somewhere where groundwater is not heavily used. This scenario will retain existing pumping patterns and also examine untapped regions of the aquifer system.

Constructing the pumping files for the model runs can be fairly simple or extremely complicated. The two methods described above (either adjusting pumping based on the 1999 distribution or adjusting pumping equally across an entire county in addition to the 1999 pumpage distribution) are fairly simple to do, and multiple runs can be done with a moderate amount of effort. However, the more complex the request, the more time it takes to construct the model files. Running the models should be an iterative process, with the groundwater management area members providing input to TWDB or a consultant on how they want a model run to be done, and the TWDB or a consultant providing the model run results back to the groundwater management area members. The groundwater management area members will then review the results, adjust their request and refine their desired future conditions, and resubmit.

Some groundwater management areas are planning to have a consultant prepare their desired future condition statement and managed available groundwater estimates. This is acceptable; however, TWDB will have to verify the approach and calculations for the managed available groundwater numbers. There are a few important things to note if a consultant is used.

- When the final desired future condition is submitted by the groundwater management area, presumably with an estimate of the managed available groundwater calculated by the consultant, all relevant information must be submitted at the same time. This includes a report detailing all aspects of the model run(s) and calculations used to develop the managed available groundwater, including the data used, the assumptions made, detailed documentation of recharge and pumpage files, and anything else that may be relevant to how the model runs were done. In addition, all of the files used in the model runs must also be provided to TWDB. With the best available tools, TWDB will have to reproduce the model run and the resulting managed available groundwater from the files provided by the consultant. Contact information may help if technical questions or concerns arise during evaluation of the information.

- If a consultant is going to do model runs for a groundwater management area, TWDB encourages the groundwater management area to have the consultant coordinate their work with TWDB. The model runs that will be done for this process may be very complicated, and the consultant must use the same process and assumptions that TWDB will use in doing their runs. If the consultant does not use the same process and assumptions, it is likely that the managed available groundwater the consultant develops will be different from that of TWDB. Also, the model runs that the consultant performs may not be acceptable because they do not meet TWDB standards.

TWDB's process of reviewing the desired future condition of an aquifer and making model runs is projected to be fairly complicated and time consuming, especially for the first model runs for a groundwater management area. The request and any questions or clarifications about the request must be reviewed, and the appropriate information must then be gathered. Therefore, the groundwater management area should designate a representative for TWDB to contact if technical aspects of the requests need to be clarified. Some issues may need to be discussed by all the members of the groundwater management area, which may further delay the process. Once TWDB and the groundwater management area members are clear on all facets of the desired future condition of an aquifer, the model will then need to be prepared and a pumping file constructed based on the parameters specified by the groundwater management area members. After this initial process has been completed, subsequent runs should take less time but still may be time consuming.

Timing

TWDB has stated that if managed available groundwater values are to be included in the next regional and state water plans, then a physically possible desired future condition statement has to be submitted by December 1, 2007. If the desired future condition submitted at that time is not physically possible, it will be rejected and sent back to the groundwater management area for re-evaluation and resubmittal. In that case, there is no guarantee that TWDB will be able to evaluate the desired future condition in time to include the managed available groundwater estimates in the next regional and state water plans. The statutory deadline for submitting desired future condition statements is September 1, 2010.

Defining a desired future condition is not a one-time event. House Bill 1763 requires districts to revisit their desired future condition at least every five years. This means that as our tools, such as groundwater availability models, improve and our understanding of the aquifers expands, districts have the opportunity to refine and change their statements. Districts can revisit their desired future condition more often if they want to, but they have to revisit them at least every five years. However, to be included in the regional and state water plans, the conditions will still be restricted to certain windows of time.

Summary

In summary, balancing the groundwater checking account has the potential for being a challenging and iterative, but achievable, process. Analyzing how an aquifer responds to

maintaining historical pumpage into the future as a baseline is a good starting point for deciding on a feasible desired future condition. Communicating with TWDB is highly recommended to help expedite the process, especially for complex or geographically subdivided scenarios. Staff contact information is provided below.

Many policy decisions will need to be determined by districts within the groundwater management areas concerning a desired future condition including, but not limited to, the effects of a desired future condition on the entire aquifer system. The sooner the desired future condition statements are submitted to TWDB, the better the likelihood of reaching a managed available groundwater estimate in a timely manner.

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