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August 18, 2015

Mr. Larry French
Director, Groundwater Resource Division
Texas Water Development Board
1700 North Congress Avenue
Austin, Texas 78711-3231

Dear Mr. French:

This letter responds to statements that Dr. Curtis Chubb has provided to TCEQ concerning differences in the TWDB groundwater database and the POSGCD monitoring well database regarding aquifer assignments to wells. On August 19, POSGCD will response to Dr. Chubb's statements at TCEQ offices. Prior to their meeting with TCEQ, POSGCD would like to discuss with TWDB staff several key points presented in this letter.

Mr. Chubb submitted his concerns in a petition reply to the TCEQ on August 6, 2015 (TCEQ Docket No. 2015-0844-MIS). At the time of Dr. Chubb's submission, POSGCD listed 88 wells in its monitoring program. Exhibit A lists 19 wells that Dr. Chubb identified as having different source aquifers between the TWDB and the POSGCD databases.

Based on my conversation with you on August 14, I understand that TWDB is aware of Dr. Chubb's reply and has reviewed the aquifer classifications listed in Exhibit A. Because TWDB has Dr. Chubb's reply I have not included any more than Exhibit A. POGCD's rebuttal consists of the seven points discussed in Exhibit B and summarized below in Table 1.

Table 1. Points of POSGCD Rebuttal

Key Point of Rebuttal	Implication
1. POSGCD assigns wells to aquifers per guidelines in its management plan and rules	POSGCD has authority to classify aquifers as part of their well inventory and this authority is acknowledged by the TWDB.
2. POSGCD tracks aquifers assigned to wells by the TWDB	Dr. Chubb's statement that the District does not know the TWDB's aquifer assignment is false. The District includes the TWDB aquifer assignments in the District's well database.
3. Several of the TWDB aquifer assignments cannot be used by POSGCD	For eight of the 19 wells in Exhibit A, the TWDB assigned aquifer names to wells that are not appropriate for the POSGCD monitoring program and therefore need to be changed.
4. TWDB acknowledges that some wells in its database have inappropriate aquifer assignments	TWDB database website states that some aquifer assignments need refinement and that this process is ongoing.
5. TWDB supports GCDs' efforts to refine aquifer assignments to wells	TWDB understands that in some cases, GCDs may have better science and information for well classification.
6. POSGCD uses a wide range of data to assign an aquifer to a well	Aquifer assignment to wells can be significantly more e difficult than the level of effort implied by Dr. Chubb
7. POSGCD continually re-evaluates its monitoring well network	POSGCD will improve the documentation associated with its monitoring program to help avoid future misunderstandings by concerned stakeholders

POSGCD and I would appreciate an opportunity to discuss this letter at your earliest convenience.

Sincerely,

Steven C Young

Steve Young, PG, PE. Ph.D
Principal Hydrogeologist

Exhibit A
List of 19 Monitoring Wells With Source Aquifer Assignments Differences Between POSGCD and the TWDB Data Files

Petitioner's Reply Brief - Appendix 4 *Petition for Inquiry – Chubb* *6 August 2015*

LIST OF 19 MONITORING WELLS WHOSE SOURCE AQUIFER IDENTITIES DIFFER BETWEEN DISTRICT AND TWDB DATA FILES

(TWDB well identification numbers are in parentheses)

Well ID Numbers	Source Aquifer – *District*	Source Aquifer – *TWDB*
25 (5917409)	Simsboro	Hooper
59 (5911402)	Carrizo	Calvert Bluff
77 (5919103)	Carrizo	Calvert Bluff
99 (5925508)	Carrizo	Calvert Bluff
223 (5902706)	Hooper	Wilcox
236 (5902307)	Simsboro	Wilcox
256 (5902901)	Simsboro	Wilcox
268 (5832101)	Simsboro	Hooper
433 (5920410)	Carrizo	Simsboro
457 (5919502)	Simsboro	Carrizo/Simsboro
638 (5937101)	Sparta	Queen City
1062 (5918101)	Simsboro	Calvert Bluff
1063 (5918104)	Simsboro	Calvert Bluff
1064 (5918908)	Simsboro	Carrizo/Simsboro
1066 (5918705)	Carrizo	Simsboro
1575 (5927718)	Carrizo	Carrizo/Calvert Bluff
6243 (5925502)	Calvert Bluff	Carrizo/Calvert Bluff
7774 (5910705)	Simsboro	Calvert Bluff
7793 (5925103)	Simsboro	Wilcox

Exhibit B
Key Points of POSGCD Rebuttal

1. POSGCD Assigns Wells to Aquifer Per Guidelines in Management Plan and Rules
   Management plans and rules

   In Section 9 "Water Well Inventory", the POSCD Management Plan states:

   > "The District will assign permitted wells to a management zone and to an aquifer based on the location of the well's screen or well depth using the Rules of the District. If no well screen information is available then a permitted well will be assigned to a management zone and to an aquifer based on the total depth of the well. The assignment of the permitted well will be made at the time of permit. The District will assign exempt wells to a management zone and to an aquifer based on available information for the exempt well. The District will use the assignments to help track the permitted pumping and production for each aquifer and for each management zone."

   In Section 4 "Groundwater Resources", the POSGCD Management Plan provides references to the surfaces that the District uses to define the top and bottom of the Trinity, Wilcox, Sparta, Queen City, and Yegua/Jackson aquifers. POSGCD groundwater Rule 7.11(4) and Rule 7.12(8) discuss the District's approach to assigning an aquifer to exempted and permitted wells.

   The TWDB has reviewed and has approved the District's management plan.

2. POSGCD Tracks Aquifers Assigned to Wells by TWDB
   In his reply to the TCEQ, Dr. Chubb states:

   > "I know of no valid excuse/reason for having 19 monitoring wells that appear to be measuring water levels in aquifers different from those identified by the District. It doesn't matter what excuse the District provides, the fact is that the District didn't even know that TWDB reports those 19 wells as monitoring aquifers different from those identified by the District. The rules must be changed to prevent monumental failures such as not knowing what your monitoring network is monitoring."

   Dr. Chubb statement that the District didn't even know that the TWDB reports those 19 wells as monitoring aquifers different from those identified by the District is false. As part of its ACCESS well inventory, the District explicitly lists and compares the aquifer assigned to the well by both POSGCD and TWDB. This comparison can be found in several tables and forms in the ACCESS database. Figure 1 shows an example of such a comparison using the Individual Well Data Sheet Form in the POSGCD database for POSGCD Well ID 236. Included in the Well Data Sheet Form in Figure 1 are information blocks that list the aquifer coded assigned to the well by the TWDB and by POSGCD.

3. Several of the TWDB's Aquifer Assignments Cannot be used by the POSGCD

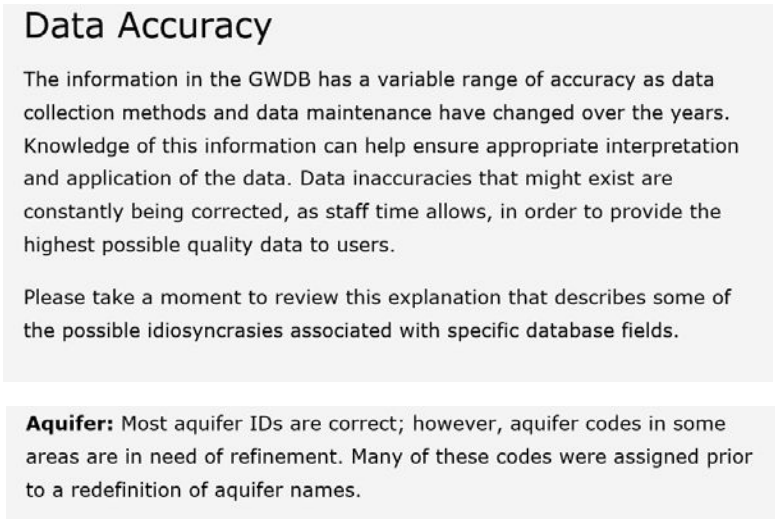
   Currently, the POSGCD assigns a well to a single aquifer. The TWDB database supports the options of assigning a well to multiple formations or to a generic aquifer system. An example of a generic aquifer system is the Wilcox. As explained by the POSGCD management plan:

   > "The Wilcox Aquifer refers to three geological formations that are considered to be relevant aquifers by GMA 12. These three geologic formations are the Hooper, the Simsboro, and the Calvert Bluff. The top and bottom surfaces for these three geological formations are defined by their model layer in the Central Carrizo GAM (Kelley and others, 2004). The Upper Wilcox Aquifer is associated with the Calvert Bluff Formation. The Middle Wilcox Aquifer is associated with the Simsboro Formation. The Lower Wilcox Aquifer is associated with the Hooper Formation. (pg, 2)".

In Exhibit A, eight of the 19 wells listed by Dr. Chubb are assigned to two or more aquifers defined by POSGCD and GMA 12 as relevant. As a result, the TWDB assignments are not transferable to the aquifer naming convention used by POSGCD and therefore must be changed to meet our management duties that we are statutorily required to perform

4. TWBD Acknowledges that Potential Problems Exist with Some of its Aquifer assignments

The TWDB groundwater database represents many years of data collection efforts. As of March 2013, it contains information for nearly 140,000 sites and includes data on water wells, springs, oil/gas tests, water levels, and water quality. The TWDB encourages users of the database to review issues regarding development and the accuracy of its groundwater database at http://www.twdb.texas.gov/groundwater/faq/faqgwdb.asp. Listed below are two screenshots from the TWDB URL listed above regarding accuracy of the database entry.



Data Accuracy

The information in the GWDB has a variable range of accuracy as data collection methods and data maintenance have changed over the years. Knowledge of this information can help ensure appropriate interpretation and application of the data. Data inaccuracies that might exist are constantly being corrected, as staff time allows, in order to provide the highest possible quality data to users.

Please take a moment to review this explanation that describes some of the possible idiosyncrasies associated with specific database fields.

Aquifer: Most aquifer IDs are correct; however, aquifer codes in some areas are in need of refinement. Many of these codes were assigned prior to a redefinition of aquifer names.

The screenshots above recognizes the TWDB's position that the aquifer assignment in its groundwater database are not regarded by TWDB as absolute and that refinement of these assignments should be performed as information becomes available.

5. TWDB Supports GCD Efforts to Refine Aquifer Assignments to Wells

The TWDB has stated publicly that it recognizes groundwater conservation districts (GCDs) as the State's preferred method of groundwater management. The TWDB has also stated publically stated that it welcomes GCDs assistance and information to promote and improve groundwater science. Based on our discussions with the TWDB, we understand that the TWDB supports GCD efforts to assemble water well information and to refine aquifer assignments.

The TWDB estimates that less than 10% of the state wells are included in their groundwater database (http://www.twdb.texas.gov/groundwater/faq/faqgwdb.asp). The TWDB does not have the resources nor is it in their mission to assign all wells in GCDs or POSGCD to aquifers. Therefore, the TWDB supports GCDs like POSGCD who are developing the appropriate data and methodology to operate a groundwater monitoring program that includes assigning wells to aquifers.

6. POSGCD Uses a Comprehensive Data Set to Assign an Aquifer to a Well

In his reply, Dr. Chubb (pg 14) states:

> "When I found the source aquifer identification problems, I contacted TWDB's groundwater technical assistance division to inquire about how difficult it is to distinguish the different aquifers. They replied that it is not difficult. For an example, they said to differentiate the Simsboro and Hooper; it is as simple as differentiating sand (Simsboro) from mud (Hooper). (pg 14)"

The above paragraph greatly oversimplifies the potential difficulty with assigning an aquifer to some wells and it may not be an accurate representation of the TWDB position regarding the boundary between the Simsboro and the Hooper aquifers.

Most importantly, it appears that Dr. Chubb is confusing the process of identifying an aquifer with the process of assigning a well to an aquifer. Whereas the former process often involves the analysis based on measured properties based on the analysis geophysical and hydrogeological data across a region, the latter process often involves the placement of a well screen that can span several aquifers into a single aquifer based on just the well depth or, at best, the interpretation of a single driller's log. In short, the two processes are not comparable and neither is as simple as implied by Dr. Chubb's statement.

As a company who is well versed in defining aquifers for the State, INTERA would like to provide the TCEQ with some of its experience with aquifer definition. INTERA was the prime contractor who developed the three GAMs currently used by GAM 12. These include the Northern Trinity and Woodbine GAM, the Queen City and Sparta GAM (this includes the Carrizo & Wilcox aquifers), and the Yegua-Jackson GAM. Also, INTERA is currently working on the Brazos River Alluvium GAM for GMA 12 and has been selected to update and revise the Queen City and Sparta GAM for GMA 12.

INTERA would like to state for the record that considerable funding and effort has been invested by the TWDB, the Bureau of Economic Geology, and other agencies to analyze geophysical logs to define the aquifers in GMA 12. A review of these studies will show that although there are conceptual differences in the aquifers, the actual practice of defining the boundary between two aquifers such as the Hooper and Simboro can be difficult as a result of unconformities (erosion surfaces), faulting, and spatial variations and overlaps of depositional environmental among adjacent aquifers. In short, there can be difficulty in picking aquifer boundaries because the Hooper aquifer ,which is conceptualized generally as being more clayey than the Simsboro, can contain sand layers that are in contact with the Simsboro. And similarly, because the Simsboro Aquifer can contain clayey layers that are in contact with the Hooper aquifer. Based on INTERA's and POSGCD's experience, it should be noted that differences of several hundred feet in the location of these aquifer surfaces between comparable studies is more the rule than the exception.

Moreover, the process of assigning a well to a single aquifer can be significantly more difficult than identifying aquifer boundaries because the well may be screened across multiple aquifers, the well documentation may not contain well screen information, and the well driller logs for the well may be of poor quality.

For the record, the POSGCD does not agree that assigning an aquifer to a wells is inherently a simple process. In order to help properly assigned an appropriate aquifer to a well, the POSGCD currently uses numerous types of data to determine appropriate aquifer assignments. This data includes the following:

- TWDB aquifer assignments;
- well driller log aquifer assignments;
- well depth and well screen information;
- aquifer elevation provided by GAM MODFLOW model files;
- continuous aquifer surfaces generated from GAM aquifer elevations;
- vertical profiles of sands interpreted from geophysical logs;
- vertical profiles of total dissolved solids (TDS) concentrations interpreted from geophysical logs;
- analysis of measured hydraulic head from the well; and

- proximity of the well to identified faults,

Because of the comprehensive evaluation of multiple information used by the POSGCD to assign a well to an aquifer, the POSGCD expects that some of its aquifer assignments will differ from the aquifer assignments provided in the TWDB's groundwater database.

7. POSGCD Continually Re-evaluates Its Monitoring Well Network

Within the last several years, interested parties have requested POSGCD Microsoft ACCESS well database and POSGCD has provided it along with appropriate explanations. Several of Dr.Chubb's concerns would have been addressed if he had met with POSGCD to discuss their Microsoft ACCESS database and attempted to understand the logic and work that underlies it. To facilitate the transfer of information to the public, POSGCD has been working to transition the entire monitoring database and related data to a web-based application. This application is expected to go live by early November 2015. To help citizens like Dr. Chubb better understand our monitoring well network and monitoring data, POSGCD will expand the web application to address issues discussed in this memo.

In addition to improving the communication of monitoring data via a web-based application, POSGCD has recently expanded its monitoring well network by 21 wells. This expansion occurred by including 21 wells that were formally monitored by ALCOA for the Texas Railroad Commission (TRC).

As part of updating its monitoring program, POSGCD will be reviewing guidelines for well aquifer assignments, well aquifer assignments, and monitoring data as part of the development of the web-based application. When this process is completed, POSGCD will solicit comments from the public on its updated and web-based monitoring program to guide our next phase of improvements.

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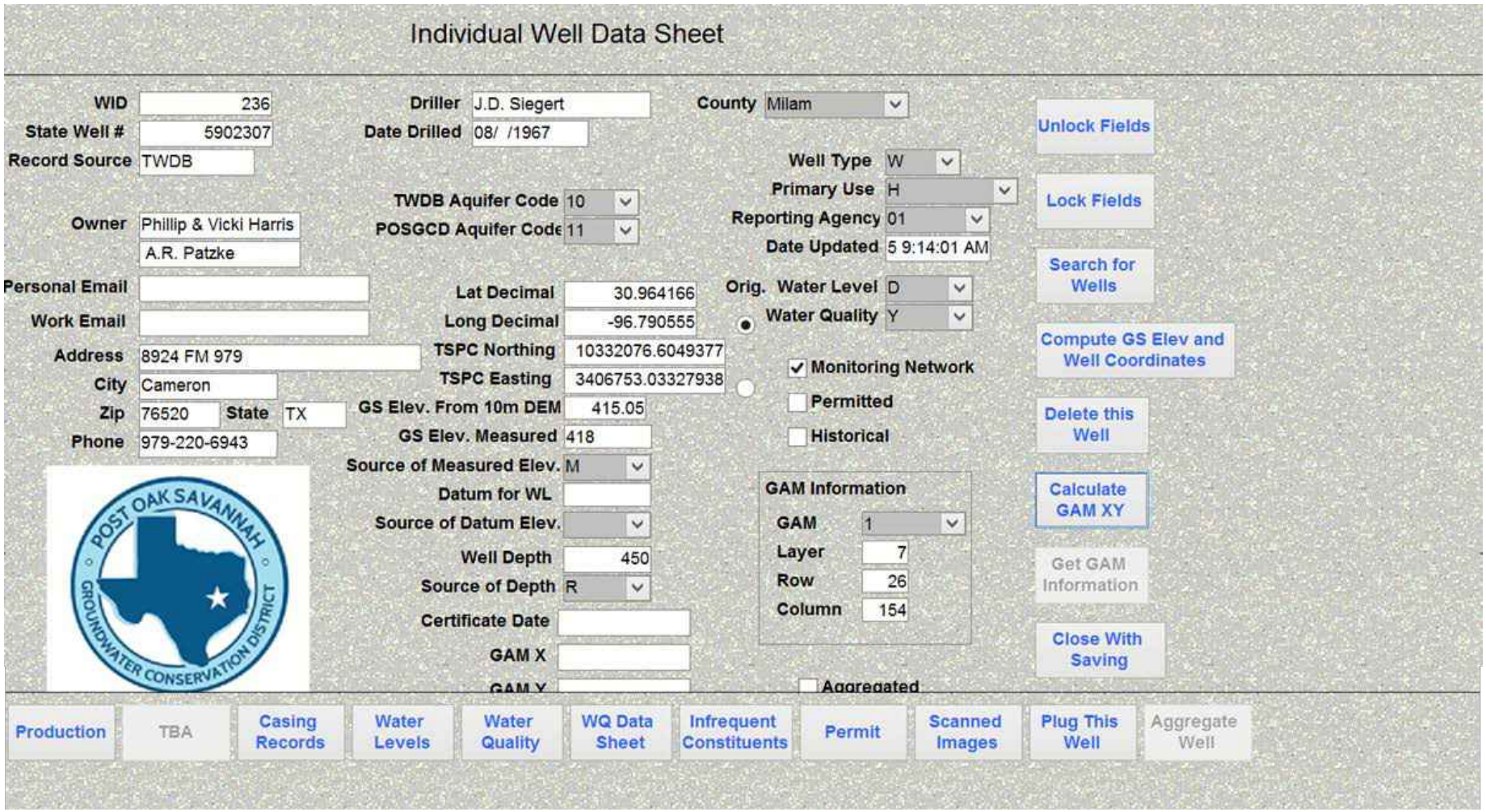

Figure 1. Screen shot from POSGCD ACCESS Well Database for Well ID 236