



BOARD MEETING

SEPTEMBER 11, 2018

LSGCD



***NOTICE OF MEETINGS AND HEARINGS
OF THE BOARD OF DIRECTORS OF THE
LONE STAR GROUNDWATER CONSERVATION DISTRICT
To be held on Tuesday, September 11, 2018
Lone Star GCD – James B. "Jim" Wesley Board Room
655 Conroe Park North Drive
Conroe, Texas 77303***

NOTICE OF MEETING

TUESDAY, SEPTEMBER 11, 2018, AT 9:00 A.M.

SPECIAL MEETING OF THE DISTRICT BOARD

1. Call to Order and Declare Meeting Open to the Public.
2. Roll Call.
3. Executive Session - The Board will recess for a closed Executive Session pursuant to Texas Government Code, Section 551.071, to consult with the District's attorney regarding pending or contemplated litigation, settlement offers, or on matters in which the duty of the attorney to the governmental body under the Texas Disciplinary Rules of Professional Conduct of the State Bar of Texas clearly conflicts with the Texas Open Meetings Act, Chapter 551, Government Code regarding any agenda item on any of the board meetings or hearings posted for today.

No action will be taken in Executive Session.

4. Re-convene in Open Session.
5. Adjourn Special Board Meeting.



***NOTICE OF PUBLIC MEETING
OF THE BOARD OF DIRECTORS OF THE
LONE STAR GROUNDWATER CONSERVATION DISTRICT***

TUESDAY, SEPTEMBER 11, 2018, AT 10:00 A.M.

**PUBLIC HEARING ON PROPOSED RE-ADOPTION OF GROUNDWATER
MANAGEMENT PLAN**

1. Call to Order and Declare Hearing Open to the Public.
2. Roll Call.
3. Presentation and discussion of the District Groundwater Management Plan proposed for re-adoption as required by Chapter 36 of the Texas Water Code and Chapter 356 of the Texas Water Development Board's ("TWDB's") rules contained in Title 30 of the Texas Administrative Code.
4. Public comment on the Groundwater Management Plan proposed for re-adoption.
5. Discussion, consideration, and possible action approving the proposed Groundwater Management Plan for re-adoption.
6. Adjourn.

At the conclusion of the hearing or any time or date thereafter, the proposed Management Plan may be adopted in the form presented or as amended based upon comments received from the public, the TWDB, District staff, attorneys, consultants, or members of the Board of Directors without any additional notice.



***NOTICE OF PUBLIC HEARING
OF THE BOARD OF DIRECTORS OF THE
LONE STAR GROUNDWATER CONSERVATION DISTRICT***

NOTICE OF PUBLIC HEARING

TUESDAY, SEPTEMBER 11, 2018, AT 10:00 A.M.

PUBLIC HEARING ON PERMIT AND PERMIT AMENDMENT APPLICATIONS

1. Call to Order and Declare Hearing Open to the Public
2. Roll Call
3. Prayer and Pledges of Allegiance
4. Receive Permit Hearing Report from General Manager, Any Public Comments or Requests to Contest, and Consider Granting, Denying, or Amending Applications for the following Operating Permits and/or Meter Exemptions – Samantha Reiter.
 1. Ron Weiss (The Ridge Mobile Home Park), for a proposed amendment to OP-11041901, increase of 2.00 mg for 2018 only, 26105 Woodcroft, Conroe, Public Supply (PWS) use;
 2. PTT Properties, LLC, for a proposed amendment to OP-17041801, increase of 0.6 mg annually, 915 N. Frazier St., Conroe, Irrigation & Commercial use;
 3. Hanson Aggregates, LLC, for a proposed amendment to OP-17092001, add existing well not permitted with the District at 17146 Hwy 75 N, Willis, Irrigation & Commercial use;
 4. Kingwood 360 Storage LLC A Delaware Limited Liability Company, for a proposed amendment to OP-16051701, increase of 0.008 mg for 2018 only, 1964 J Northpark, Kingwood, Commercial use;
 5. Crystal Springs Water (Waukegan Way), for a proposed well to be drilled at 1 1/2 miles east of intersection of Schank Rd & Jernigan Rd, Lat. 30/19/13, Long. 95/19/40, Conroe, not to exceed 5.0 mg for 2018 and 9.995 mg for 2019 and annually thereafter, Public Supply (PWS) use (Driller of record: Johnston Water Wells);



6. Rabbit Hill Properties #7, LLC, for a proposed well to be drilled at 21275 Lodge Rd, New Caney, not to exceed 5 mg annually, Irrigation & Lake Replenishment use, (Driller of record: Coastal Water Well);
 7. Security G2K Development, LLC, for a proposed well to be drilled at 20074 Hwy 105 East, Cleveland, not to exceed 0.25 mg for 2018 and 0.5 mg annually, Commercial and Irrigation use, (Driller of record: To be determined); and
 8. Magnolia ISD (Magnolia Jr High), for a proposed well to be drilled at 31138 Nichols Sawmill Rd, Magnolia, not to exceed 2.5 mg for 2018 and 6 mg annually, Irrigation use, (Driller of record: Weisinger Incorporated).
5. Adjourn or continue permit hearing in whole or in part.



***NOTICE OF PUBLIC MEETING
OF THE BOARD OF DIRECTORS OF THE
LONE STAR GROUNDWATER CONSERVATION DISTRICT***

NOTICE OF MEETING

TUESDAY, SEPTEMBER 11, 2018, AT 10:00 A.M.

REGULAR MEETING OF THE DISTRICT BOARD

The Board of Directors may discuss, consider, and take action, including expenditure of funds, on any item or subject matter posted in this agenda.

1. Call to Order and Declare Regular Meeting Open to the Public.
2. Roll Call.
3. Public Comment (Public comment is limited to a maximum of 5 minutes per speaker)
4. Discuss, consider, and take action as necessary concerning approval of Meeting Minutes:
 - a) August 14, 2018, Special Board Meeting
 - b) August 14, 2018, Public Hearing on Permit Applications
 - c) August 14, 2018, Public Hearing on Amendments to Permits to Establish Total Qualifying Demand
 - d) August 14, 2018, Regular Board of Directors Meeting
5. Receive update from the Harris Galveston Subsidence District on recent research and subsidence in the Region – Van Kelly (INTERA)
6. Discuss, consider, and take action as necessary concerning approval of joint-funding agreement with USGS for the period of 01.01.19 through 12.31.19 – USGS.
7. Committee Reports:
 - A. Executive Committee and/or Settlement Committee – Rick Moffatt, President
 - 1) Brief the Board on the Committee's activities since the last regular Board meeting
 - 2) Defense of the following lawsuit, including without limitation mediation and/or settlement offers: City of Conroe et al. v. Lone Star Groundwater Conservation District (and the District's directors and general manager in their official capacities)
 - B. Water Awareness and Conservation Committee – Billy Wood, Chair



- 1) Brief the Board on the Committee's activities since the last regular Board meeting
 - 2) Update on public outreach activities, water efficiency, and conservation efforts
- C. Rules and Regulatory Planning Committee – Jim Stinson, Chair
- 1) Brief the Board on the Committee's activities since the last regular Board meeting
 - 2) Receive summary report on well spacing rules development for the Gulf Coast and Catahoula Aquifers for discussion and possible acceptance
- D. Policy and Personnel Development Committee - Jace Houston, Chair
- 1) Brief the Board on the Committee's activities since the last regular Board meeting
- E. Budget and Finance Development Committee – Billy Wood, Chair
- 1) Brief the Board on the Committee's activities since the last regular Board meeting
 - 2) Review of unaudited financials for the month of August 2018
- F. Findings and Review Committee – Rick Moffatt, Chair
- 1) Brief the Board on the Committee's activities since the last regular Board meeting – Rick Moffatt
 - 2) Brief the Board on status of groundwater management plan update.
8. Groundwater Management Area 14 – Update the board on the legal, technical, and financial issues related to joint planning activities and development of desired future conditions in GMA 14 – Kathy Turner Jones
9. General Manager's Report – The General Manager will brief the Board on pertinent operational and management issues that the District, its employees, or consultants have encountered since the last regular Board meeting. – Kathy Turner Jones.
- 1) Brief the Board on the November 6, 2018, Board of Directors' election.
10. General Counsel's Report – The District's legal counsel will brief the Board on pertinent legal issues and developments impacting the District since the last regular Board meeting, and legal counsel's activities on behalf of the District, including without limitation: waste injection well monitoring activities and injection well applications filed at the Railroad Commission of Texas or the Texas Commission on Environmental Quality, including District protests or other actions regarding same; District rules enforcement activities;



District Regulatory Plan, District Rules, and District Management Plan development or implementation issues; groundwater-related legislative activities; joint planning and desired future conditions development activities; pending litigation involving the District; developments in groundwater case law and submission of legal briefs; contractual issues related to the District; open government, policy, personnel, and financial issues of the District; and other legal activities on behalf of the District. – Brian L. Sledge.

11. New Business

12. Adjourn

The above agenda schedules for the meetings and hearings of the District represent an estimate of the order for the indicated items and are subject to change at any time.

These public hearings and meetings are available to all persons regardless of disability. If you require special assistance to attend the meeting or hearing, please contact the Lone Star GCD at 936/494-3436 at least 24 hours in advance of the meeting.

At any time during one the above meetings or hearings and in compliance with the Texas Open Meetings Act, Chapter 551, Government Code, Vernon's Texas Codes, Annotated, the Lone Star Groundwater Conservation District Board may meet in executive session on any of the above agenda items for consultation concerning attorney-client matters (§551.071); deliberation regarding real property (§551.072); deliberation regarding prospective gift (§551.073); personnel matters (§551.074); and deliberation regarding security devices (§551.076). Any subject discussed in executive session may be subject to action during an open meeting.

Certification

I, the undersigned authority, do hereby certify that on September 7, 2018, at or before 5:00 p.m., I posted and filed the above notices of meeting(s) and hearing(s) with the Montgomery County Clerk's office and also posted a copy in the front window of the Lone Star GCD office in a place convenient and readily accessible to the general public all times and that it will remain so posted continuously for at least 72 hours preceding the scheduled time of said meeting in accordance with the Texas Government Code, Chapter 551.

A handwritten signature in blue ink, which appears to read "Kathy Turner Jones", is written over a light blue rectangular background.

Kathy Turner Jones, General Manager
Lone Star Groundwater Conservation District

RESOLUTION NO. #18-007

**RESOLUTION OF THE BOARD OF DIRECTORS OF THE LONE STAR
GROUNDWATER CONSERVATION DISTRICT
READOPTING DISTRICT GROUNDWATER MANAGEMENT PLAN**

THE STATE OF TEXAS

§

§

LONE STAR GROUNDWATER CONSERVATION DISTRICT

§

WHEREAS, the Lone Star Groundwater Conservation District (“District”) was created by the Texas Legislature through the enactment of House Bill 2362, Chapter 1321, Acts of the 77th Legislature, Regular Session, 2001 (the “Act”), pursuant to the authority of Article XVI, § 59 of the Texas Constitution, as a groundwater conservation district operating under Chapter 36, Texas Water Code, Section 59, Article XVI of the Texas Constitution, and the Act;

WHEREAS, the creation of the District was confirmed by the voters of Montgomery County on November 6, 2001, and as required by Chapter 356 of Title 31 of the Texas Administrative Code as in effect at the time, the District’s original Management Plan was adopted and submitted to the Texas Water Development Board within two years of the confirmation election and subsequently amended and re-adopted in 2008 and again on November 12, 2013;

WHEREAS, Senate Bill 660, as passed during the 82nd Regular Session of the Texas Legislature, modified the statutory requirements for management plans to be developed and adopted by groundwater conservation districts;

WHEREAS, Section 36.1072(e) of the Texas Water Code requires the District to review and readopt its Management Plan with or without revisions at least once every five years;

WHEREAS, under the direction of the District Board of Directors (“Board”), the District’s staff, legal counsel, and geoscientists reviewed, analyzed, and revised the District’s Management Plan in accordance with the statutory requirements provided by Section 36.1071 of the Texas Water Code and the administrative requirements provided by Chapter 356 of Title 31 of the Texas Administrative Code;

WHEREAS, prior to September 11, 2018, a copy of the proposed Management Plan was provided to the Texas Water Development Board (“TWDB”) for a preliminary and courtesy review, and all recommendations offered by TWDB staff were considered and incorporated into the revised Management Plan;

WHEREAS, the District issued notice in the manner required by state law and held a public hearing on September 11, 2018, to receive public and written comments on the revised Management Plan;

WHEREAS, based on written and public comments received by the District, the proposed Management Plan was non-substantially changed;

WHEREAS, the District will coordinate with the appropriate surface water management entities after the public hearing and readoption of its Management Plan to afford surface water

management entities within the boundaries of the District the opportunity to review and provide comments to the District on its Management Plan;

WHEREAS, the Board finds that the revised Management Plan meets all of the requirements of Chapter 36, Texas Water Code, and 31 Texas Administrative Code Chapter 356; and

WHEREAS, the Board finds that the readoption of its Management Plan at its September 11, 2018, meeting will restart the five-year statutory time period by which the District must readopt its Management Plan.

NOW, THEREFORE, BE IT ORDERED BY THE BOARD OF DIRECTORS OF THE LONE STAR GROUNDWATER CONSERVATION DISTRICT THAT:

1. The above recitals are true and correct;
2. The Board of Directors hereby readopts its revised Management Plan as the Management Plan of the District, including any revisions made based on comments received from the public at the public hearing or Board meeting, or based on recommendations from the District Board, staff, legal counsel, geoscientist, or TWDB;
3. The Board of Directors, District staff, and the District's legal counsel and geoscientist are further authorized to take all steps necessary to implement this resolution and submit the revised Management Plan to the TWDB for its approval; and
4. The Board of Directors, the District staff, and the District's legal counsel and geoscientist are further authorized to take any and all action necessary to coordinate with the TWDB as may be required in furtherance of TWDB's approval pursuant to the provisions of Section 36.1072 of the Texas Water Code.

AND IT IS SO ORDERED.

PASSED AND ADOPTED on this 11th day of September 2018.

LONE STAR GROUNDWATER CONSERVATION DISTRICT.

By: _____

Board President, Rick Moffatt

ATTEST:

Board Secretary, Gregg Hope

LONE STAR GROUNDWATER CONSERVATION DISTRICT

August 14, 2018

MINUTES OF SPECIAL MEETING

The Board of Directors of the Lone Star Groundwater Conservation District (“District”) held a “Special Meeting,” open to the public, in the Lone Star GCD – James B. “Jim” Wesley Board Room located at 655 Conroe Park North Drive, Conroe, Texas, within the boundaries of the District on August 14, 2018.

President Moffatt called the meeting to order at 9:00 AM, announcing that it was now open to the public.

The roll was called of the members of the Board of Directors, to wit:

John D. Bleyl, PE
Gregg Hope
Jace Houston
Roy McCoy, Jr.
Webb Melder
Rick J. Moffatt
Jim Stinson, PE
M. Scott Weisinger, PG
W. B. Wood

All members of the Board were present, with the exceptions of Director(s) McCoy, Stinson, Houston and Weisinger thus constituting a quorum of the Board of Directors. Also, in attendance at said meeting were Kathy Turner Jones, District General Manager; Samantha Reiter, Assistant General Manager; Brian L. Sledge, District Counsel, District staff and members of the public. *Copies of the public sign-in sheets are attached hereto as Exhibit “A”.*

After a proper and legally sufficient announcement to the public by President Moffatt, the Board of Directors went into a Closed Executive Session at 9:00 AM pursuant to Texas Government Code, Sections 551.071, to consult with the District’s attorney regarding pending or contemplated litigation, settlement offers, personnel matters, or on matters in which the duty of the attorney to the governmental body under the Texas Disciplinary Rules of Professional Conduct of the State Bar of Texas clearly conflicts with the Texas Open Meetings Act, Chapter 551, Government Code.

Director Houston arrived at 9:02 AM. Following Executive Session, the Board reconvened in Open Session and President Moffatt declared it open to the public at 9:22 AM.

No additional action was taken on matters discussed in Executive Session and President Moffatt adjourned the meeting at 9:22 AM.

PASSED, APPROVED, AND ADOPTED THIS 11th DAY OF SEPTEMBER 2018.

Gregg Hope, Board Secretary

LONE STAR GROUNDWATER CONSERVATION DISTRICT

August 14, 2018

MINUTES OF PUBLIC HEARING ON PERMIT APPLICATIONS

The Board of Directors of the Lone Star Groundwater Conservation District (“District”) met in regular session, open to the public, in the Lone Star GCD – James B. “Jim” Wesley Board Room located at 655 Conroe Park North Drive, Conroe, Texas, within the boundaries of the District on August 14, 2018.

CALL TO ORDER:

President Moffatt called to order the Public Hearing on Permit Applications at 10:01 AM announcing the meeting open to the public.

ROLL CALL:

The roll was called of the members of the Board of Directors, to wit:

John D. Bleyl, PE
Gregg Hope
Jace Houston
Roy McCoy, Jr.
Webb Melder
Rick J. Moffatt
Jim Stinson, PE
M. Scott Weisinger, PG
W. B. Wood

All members of the Board were present with the exception of Director(s) McCoy, Melder, Stinson and Weisinger, thus constituting a quorum of the Board of Directors. Also, in attendance at said meeting were Kathy Turner Jones, General Manager; Samantha Reiter, Assistant General Manager; Brian L. Sledge, District Counsel; District staff; and members of the public. *Copies of the public sign-in sheets are attached hereto as Exhibit “A”.*

PRAYER AND PLEDGES OF ALLEGIANCE:

President Moffatt led the Pledge of Allegiance and the Pledge of Allegiance to the state flag. Director Bleyl gave the opening prayer. Director Melder rejoined at 10:02 AM.

Assistant General Manager, Samantha Reiter informed the Board that there were four permit applications received for the month, three of which were for new permit applications and the fourth was for a change in the primary water use type. Ms. Reiter then stated that for items #1-4 it was the General Manager's recommendation to approve as requested.

Item #1, Mt. Pleasant Village Water System

Applicant is requesting an amendment to an Operating Permit for drilling authorization for a new well. No additional production authorization is being requested at this time. Based on technical review of the information supplied, it is the General Manager's recommendation to approve that which is requested.

Item #2, East Montgomery County MUD #5

Applicant is requesting an amendment to an Operating Permit for drilling authorization for a new well. No additional production authorization is being requested at this time. Based on technical review of the information supplied, it is the General Manager's recommendation to approve that which is requested.

Item #3, KRVA - SVP

Applicant is requesting registration of a new well and production authorization in the amount of 400,000 gallons for 2018 and 950,000 gallons for 2019 and annually thereafter. Based on technical review of the information supplied, it is the General Manager's recommendation to approve that which is requested.

Item #4, Spring Creek Feed Center (well #2)

Applicant is requesting a change in primary water use type from "Public Water Supply" to "Commercial" use with "Public Supply" as a secondary use. No additional changes to the permit is being requested at this time. Based on technical review of the information supplied, it is the General Manager's recommendation to approve that which is requested.

Following Ms. Reiter's report, a motion was made by Director Wood, seconded by Director Hope to approve items #1-4. The motion was approved.

President Moffatt adjourned the public hearing on permit applications at 10:04 AM.

PASSED, APPROVED, AND ADOPTED THIS 11th DAY OF SEPTEMBER 2018.

Gregg Hope, Board Secretary

LONE STAR GROUNDWATER CONSERVATION DISTRICT

August 14, 2018

MINUTES OF PUBLIC HEARING ON AMENDMENTS TO PERMITS TO ESTABLISH TOTAL QUALIFYING DEMAND UNDER THE DISTRICT REGULATORY PLAN

The Board of Directors of the Lone Star Groundwater Conservation District (“District”) met in regular session, open to the public, in the Lone Star GCD – Board Room located at 655 Conroe Park North Drive, Conroe, Texas, within the boundaries of the District on August 14, 2018.

President Moffatt called to order the Public Hearing on amendments to permits to establish total qualifying demand under the District Regulatory Plan at 10:05 AM.

The roll was called of the members of the Board of Directors, to wit:

John D. Bleyl, PE
Gregg Hope
Jace Houston
Roy McCoy, Jr.
Webb Melder
Rick J. Moffatt
Jim Stinson, PE
M. Scott Weisinger, PG
W. B. Wood

All members of the Board were present, except Director(s) McCoy, Stinson and Weisinger thus constituting a quorum of the Board of Directors. Also, in attendance at said meeting were Kathy Turner Jones, District General Manager; Samantha Reiter, Assistant General Manager; Brian L. Sledge, General Counsel; District staff; and members of the public. *Copies of the public sign-in sheets are attached hereto as Exhibit “A” of the “August 14, 2018, Regular Board of Directors Meeting minutes”.*

President and Presiding Officer Moffatt called to order the Public Hearing on Amendments to Permits to Establish Total Qualifying Demand under the District Regulatory Plan and appointed Brian L. Sledge, District General Counsel, to serve as Co-Presiding Officer for the limited purpose of conducting the preliminary hearing and ruling on procedural issues and

legal matters. The Co-Presiding Officer observed that the following notice requirements had been met:

- (1) The General Manager timely published the appropriate notice in the newspaper;
- (2) The General Manager provided notice of the proposed permit amendments and hearing to each permit applicant and each person who requested a special notice under the District Rule; and posted it at the District Office and at the County Courthouse.

RECEIVE PERMIT HEARING REPORT FROM GENERAL MANAGER AND/OR DISTRICT ENGINEER ON PROPOSED PERMIT AMENDMENTS AND TECHNICAL REVIEWS ON THE PERMITS LISTED IN THE FOLLOWING TABLE TO ESTABLISH THE FINAL CALENDAR YEAR 2009 PRODUCTION AUTHORIZATION FOR THE PERMITS FOR PURPOSES OF ESTABLISHING THEIR TOTAL QUALIFYING DEMAND UNDER THE DISTRICT REGULATORY PLAN (DRP):

PERMIT(S) NUMBER	PERMITTEE NAME & ADDRESS	LOCATION OF WELL(S) / PURPOSE OF USE	GENERAL MANAGER'S RECOMMENDED TOTAL QUALIFYING DEMAND UNDER THE DRP
OP03-0044D/ OP-07022201A	East Montgomery County MUD 4 c/o Mr. David Marks Marks Richardson PC 3700 Buffalo Speedway, Ste. 830 Houston, TX 77098	1 well located at 23205 State Hwy 242 (NW of US 59 & Hwy 242 Intersection), New Caney and 2 wells located at 23412 Hwy 242, New Caney Public Supply (PWS) Use	9,000,000 gallons

A motion was made by Director Hope and seconded by Director Wood to approve the permit amendment in accordance with the recommendation of the General Manager. The motion passed with Director Bleyl abstaining.

There being no further permit amendments for action and no need to schedule a continuation of contested hearings, the Public Hearing on Amendments to Permits to Establish Total Qualifying Demand under the District Regulatory Plan was adjourned at 10:07 AM.

PASSED, APPROVED, AND ADOPTED THIS 11TH DAY OF SEPTEMBER 2018.

Gregg Hope, Board Secretary

LONE STAR GROUNDWATER CONSERVATION DISTRICT

August 14, 2018

MINUTES OF REGULAR MEETING

The Board of Directors of the Lone Star Groundwater Conservation District (“District”) met in regular session, open to the public, in the Lone Star GCD - James B. “Jim” Wesley Board Room located at 655 Conroe Park North Drive, Conroe, Texas, within the boundaries of the District on August 14, 2018.

CALL TO ORDER:

President Moffatt presided and called to order the regular Board of Directors meeting at 10:07 AM, announcing that it was open to the public.

ROLL CALL:

The roll was called of the members of the Board of Directors, to wit:

John D. Bleyl, PE
Gregg Hope
Jace Houston
Roy McCoy, Jr.
Webb Melder
Rick J. Moffatt
Jim Stinson, PE
M. Scott Weisinger, PG
W. B. Wood

All members of the Board were present, with the exceptions of Director(s) Stinson, McCoy and Weisinger thus constituting a quorum of the Board of Directors. Also in attendance at said meeting were Kathy Turner Jones, General Manager; Samantha Reiter, Assistant General Manager; Brian L. Sledge, District Counsel, District staff; and members of the public. *Copies of the public sign-in sheets are attached hereto as Exhibit "A".*

PUBLIC COMMENTS:

Mike Stoecker provided public comment on the agenda item related to the District’s Water Management Plan. President Moffatt noted that Mr. Stoecker’s question would be revisited during discussion of agenda item #F.2.

APPROVAL OF THE MINUTES:

President Moffatt stated the Board would consider all meeting minutes as listed for approval on today's agenda as one item. A motion was made to approve the meeting minutes by Director Wood and seconded by Director Bleyl. The motion to approve the minutes was approved unanimously by those present.

- a) July 10, 2018, Special Board Meeting
- b) July 10, 2018, Public Hearing on Permit Applications
- c) July 10, 2018, Regular Board of Directors Meeting

COMMITTEE REPORTS:

A. Executive Committee and/or Settlement Committee – Rick Moffatt, Chair

- 1) Brief the Board on the Committee's activities since the last regular Board meeting – No meeting.
- 2) Defense of the following lawsuit: City of Conroe et al. v. Lone Star Groundwater Conservation District (and the District's directors and general manager in their official capacities) – Mr. Sledge reported that there was no update as he was still waiting to receive communication from the District Court's visiting judge.

B. Water Awareness and Conservation Committee - Billy Wood, Chair

- 1) Brief the Board on the Committee's activities since the last regular Board meeting – No meeting.
- 2) Update on public outreach activities, water efficiency, and conservation efforts – James Ridgway. Mr. Ridgway reported that Knox Jr. High School will be added to the growing list of schools visited by the mobile lab. He highlighted the last Water Efficiency Network meeting which focused on research and oyster recovery programs in Galveston Bay. Announcements: the next meeting of the Water Efficiency Network is scheduled for Thursday, July 30th.
 - a) WaterWise educational program report - Mr. Ridgway provided a summary report of the 2017- 2018 Texas WaterWise Program offered by Lone Star Groundwater Conservation District to 1,147 teachers, 5th grade students and their families in the area. He noted question #13 of the report for illustrating the increase of students that took home the Texas WaterWise Kit and worked within their family to implement the water conservation program. Mr. Ridgway referenced Resource Action as a company which can calculate the actual water savings results from the WaterWise Program. Director Moffatt suggested that the millions of gallons of water savings results from this school outreach program be published in the 2018 Annual Report.

C. Rules and Regulatory Planning Committee – Jim Stinson, Chair

- 1) Brief the Board on the Committee's activities since the last regular board meeting – President Moffatt reported the committee met on July 31st and planned to meet again before presenting final draft recommendations for well spacing guidelines to the Board at the September board meeting.

D. Policy and Personnel Development Committee – Jace Houston, Chair

- 1) Brief the Board on the Committee's activities since the last regular Board meeting – No report.

E. Budget and Finance Development Committee – Billy Wood, Chair

- 1) Brief the Board on the Committee's Activities – Director Wood stated that the committee met July 26th to review recommended updates to the District's investment policy to include the addition of a performance benchmark goal under Section 10.02 for use when income exceeds the benchmark as an indicator of unacceptable high risk. Also included was the disclosure requirement under Section 4.03 that business contacts do not boycott the State of Israel and will not boycott the State of Israel during term of any contract with the District.
- 2) Review of monthly financial reports – Director Wood reported that, for the month of July, revenue was budgeted at \$198,630—actual was \$198,918. Expenses were budgeted at \$195,177—actual expenses were \$129,953. Net income for the month was \$68,965. Year-to-date net income is \$488,792.
- 3) Authorize General Manager to enter into and Agreed Upon Procedures (AUP) engagement with Brooks Watson Co., PLLC for supplemental audit services for the period January 1, 2018, through October 31, 2018. Not to exceed \$6,000. Following discussion, Director Hope motioned authorizing the General Manager to enter into the AUP engagement with Brooks Watson Co., PLLC for supplemental audit services. Motion was seconded by Director Wood and unanimously approved by all members present.
- 4) Discuss, consider, and take action as necessary to approve Resolution #18-003 reviewing and approving Investment Policy and Investment Strategies as required annually by the Public Funds Investment Act of Texas. Following discussion, Director Bleyl motioned to approve Resolution #18-003 reviewing and approving investment policy and investment strategies. Motion was seconded by Director Hope and unanimously approved by all members present. *A copy of the Resolution is attached hereto as Exhibit "B".*
- 5) Discuss, consider, and take action as necessary to approve Resolution #18-004 amending and re-adopting list of qualified brokers authorized to engage in investment transactions with the Lone Star Groundwater Conservation District. Following discussion, Director Bleyl motioned to approve Resolution #18-004 amending and re-adopting list of qualified brokers. Motion was seconded by Director Hope and

unanimously approved by all members present. *A copy of the Resolution is attached hereto as Exhibit "C".*

- 6) Consider and act on Resolution #18-005 re-establishing administrative fee schedule. Following discussion, Director Hope motioned to approve Resolution #18-005 re-establishing the administrative fee schedule. Motion was seconded by Director Wood and unanimously approved by all members present. *A copy of the Resolution is attached hereto as Exhibit "D".*
- 7) Discuss, consider, and act on Resolution #18-006 authorizing water use fee rate schedule for 2019. Kay Martin discussed the cash projections for the remainder of 2018. The District will be receiving 4th quarter 2018 water use fees income of approximately \$460,000 in October. After that, the next substantial cash receipts will arrive in December 2018, for the 2019 water use fees. Depending on the timing of payments for expenses the District will make during the last quarter of 2018, there is a possibility that a draw will need to be made on the line of credit. If the water use fees remained the same for 2019, then this would facilitate an increase in the cash position to achieve the desired six-month cash reserve. Following discussion, Director Hope motioned to approve Resolution #18-006 setting forth the water use fee rates and groundwater transport rates for calendar year 2019. Motion was seconded by Director Bleyl and unanimously approved by all members present. *A copy of the Resolution is attached hereto as Exhibit "E".*

F. Findings and Review Committee – Rick Moffatt, Chair

- 1) Brief the Board on the Committee's activities since the last regular Board meeting – President Moffatt reported the committee met on August 13th to discuss updating the groundwater management plan.
- 2) Brief the Board on status of groundwater management plan update – Director Moffatt explained that the GCD was required under Ch. 36.1071-36.1073 of the Texas Water Code to review and readopt its management plan, with or without revisions, and submit it to the TWDB for approval at least once every five years. Further, that a District can also choose to review and submit its plan more frequently if it desires, including following changes in the MAG and/or DFCs. The Findings and Review Committee met and reviewed statutory requirements to readopt the District's management plan without revisions, with the exception of updating data information supplied from the 2017 Texas State Water Plan that is required to be included in the updated plan.

Although Lone Star's current management plan expires December 17th of this year, the District is still required to hold a public hearing and adopt a final version 90-days in advance of the expiration. Staff is working with INTERA to make the required updates to the data information and is expected to have a final draft available for the public hearing at the District's September 11th board meeting.

Director Moffatt returned to address Mike Stoecker's public comment. Mr. Stoecker asked for an explanation of the purpose and goal of the water management plan. Director Moffatt explained the current water management was adopted in 2013 and a partial list of the goals are providing most effective use of groundwater, controlling and preventing waste of groundwater, addressing natural resource issues, etc. Further, he added that the Desired Future Conditions are included in the plan but that it would not change as the GMA 14 has not amended the DFC. Staff noted that the current Groundwater Management Plan is found on LSGCD's website.

- 3) Groundwater Management Area 14 - Update the board on the legal, technical, and financial issues related to joint planning activities and development of desired future conditions in GMA 14 - Ms. Jones reported that GMA 14 met in July. Currently, GMA 14 member districts are scheduling meetings to finalize their interlocal agreements. Next meeting of the GMA 14 is scheduled for September 26th, 10 AM at the LSGCD offices.

GENERAL MANAGER'S REPORT:

Ms. Jones reported that the Sunset Advisory Commission staff recently issued an opinion that state regulation of geoscience is unnecessary to protect the public and recommends discontinuing the regulation of professional geoscientists. While the Commission's staff's recommendation are not intended to diminish the importance of geoscience, it is intended to speak to the need and effectiveness of state regulation and the agencies that perform this regulation. This has caused great concern in the groundwater conservation communities. The Sunset Advisory Commission will present the report and receive limited public comment on August 29-30.

GENERAL COUNSEL'S REPORT:

Mr. Sledge had no addition to his report previously given in Executive Session. Director Wood asked for an update on the TexCom disposal well application appeal. General Manager, Kathy Turner Jones, commented that staff had been in contact with residents opposing TexCom's permit.

There was no new business.

There being no further business, upon a motion made by Director Wood and seconded by Director Hope, the meeting was adjourned at 10:46 AM.

PASSED, APPROVED, AND ADOPTED THIS 11th DAY OF SEPTEMBER 2018.

Gregg Hope, Board Secretary

RESOLUTION NO. #18-003

LONE STAR GROUNDWATER CONSERVATION DISTRICT

**RESOLUTION REVIEWING AND APPROVING INVESTMENT POLICY AND
INVESTMENT STRATEGIES**

THE STATE OF TEXAS §

COUNTY OF MONTGOMERY §

WHEREAS, the Lone Star Groundwater Conservation District ("District") was created by the Legislature of the State of Texas in Acts 2001, 77th Leg., R.S., ch. 1321, p. 3246, § 1(a);

WHEREAS, the Public Funds Investment Act of Texas ("the Investment Act") requires that the Board of Directors annually review the investment policy and investment strategies of the District and that the written instrument so adopted shall record any changes made to either the investment policy or investment strategies;

WHEREAS, Sec. 36.1561, Water Code, requires the investment officers of the District to attend six hours of initial training within twelve months after taking office or assuming duties and four hours of renewal investment training instruction relating to investment responsibilities not less than once every two years from an independent source approved by the Board of Directors of the District;

WHEREAS, the Budget and Finance Development Committee of the Board of Directors is charged with reviewing annually the investment policy and investment strategies of the District and drafting amendments for consideration by the Board;

WHEREAS, on July 26, 2018, said Budget and Finance Development Committee met and reviewed the Investment Policy of the District, attached hereto, and the investment strategies contained therein, and has submitted proposed amendments for consideration from the Board;

WHEREAS, said committee has reviewed the investment officer designations of the District and has determined such designations are current;

WHEREAS, the investment officers of the District have attended investment training through an independent source approved by the Board and are meeting the training requirements set forth in the Investment Act; and

WHEREAS, said committee has reviewed monthly financial reports in compliance with requirements set forth in the Investment Act.

**NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF
THE LONE STAR GROUNDWATER CONSERVATION DISTRICT AS FOLLOWS:**

1. The Board of Directors of the District, after reviewing the existing investment policy and investment strategies of the District, hereby approves the District's Investment Policy with changes (*see attached*).
2. That such Investment Policy supersedes any and all Investment Policy previously adopted by the Board of Directors.
3. The General Manager and a member of the Budget and Finance Development Committee are hereby authorized to continue to serve as Investment Officers for the District. This designation may be changed from time to time without reference to or repeal of this resolution.
4. The General Manager is authorized to take any and all action necessary for the implementation of this resolution.

AND IT IS SO ORDERED.

PASSED AND ADOPTED this 14th day of August 2018.

LONE STAR GROUNDWATER CONSERVATION DISTRICT

By: _____

Rick Moffatt, President

ATTEST:

Gregg Hope

INVESTMENT POLICY

This Investment Policy (the “Policy”) is adopted by the Board of Directors of Lone Star Groundwater Conservation District, of Montgomery County, Texas (the “District”), pursuant to Chapter 2256 of the Texas Government Code and Chapter 36 of the Texas Water Code.

ARTICLE I

Section 1.01. Purpose.

This investment policy establishes the principles and criteria by which the Lone Star Groundwater Conservation District shall invest its public funds to ensure the safety and protection of these funds at all times while providing adequate liquidity for all District cash flow demands and optimizing the District’s investment returns. This investment policy is in compliance with all state and local statutes governing the investment of public funds including the Public Funds Investment Act, Chapter 2256, Government Code and the Public Funds Collateral Act, Chapter 2257, Government code. This policy also will specify the scope of authority of District Officials responsible for the investment of District funds.

Section 1.02. Annual Review.

The District shall review this Investment Policy at least annually and adopt a resolution confirming the continuance of the Investment Policy without amendment or adopt an Amended Investment Policy.

ARTICLE II

Section 2.01. Definitions.

Unless the context requires otherwise, the following terms and phrases used in this Policy shall mean the following:

- a) “Authorized Collateral” or “Collateral” means any security with which District funds may be secured under Chapter 2257, Texas Government Code.
- b) “Authorized Investment” shall mean any security the District is authorized to purchase as an investment under Chapter 2256, Texas Government Code.
- c) "Board" shall mean the Board of Directors of the Lone Star Groundwater Conservation District.

- d) "Director" shall mean a person appointed to serve on the Board of Directors of the District.
- e) "District" shall mean the Lone Star Groundwater Conservation District, a political subdivision of the State of Texas, created under authority of Article XVI, §59 of the Texas Constitution and with Act of May 17, 2001, 77th Leg., R.S., ch. 1321, 2001 Tex. Gen. Laws 3246 (as amended), (H.B. No. 2362) and Chapter 36, Water Code.
- f) "District Officials" shall mean the Investment Officer, District Directors, officers, employees, and persons and business entities handling investments for the District.
- g) "Employee" shall mean any person employed by the District, but does not include independent contractors or professionals hired by the District as outside consultants.
- h) "Investment Act" shall mean the Public Funds Investment Act, Chapter 2256, Texas Government Code, as amended from time to time.
- i) "Investment Officer(s)" means the Director(s) or Employee(s) of the District appointed from time to time by the Board to invest and reinvest the funds of the District.

ARTICLE III

Section 3.01. Policy of Investment.

A. The preservation of the District's principal shall be the primary concern of the District Officials who are responsible for the investment of District funds. It is the policy of the District that after allowing for the anticipated cash flow requirements of the District and giving due consideration to the safety and risk of investment, all available funds shall be invested in conformance with these legal and administrative guidelines seeking to optimize interest earnings. Applicable legislation includes, but is not limited to, Public Funds Investment Act, Chapter 2256, Government Code, Public Funds Collateral Act, Chapter 2257, Government Code, and any other applicable State or Federal laws or restrictions.

B. District funds shall be invested and reinvested by the District's Investment Officer only in specific allowable investments types as listed in Chapter 2256, Texas Government Code, and the District shall not invest in any investments not specifically allowed under that statute or deemed inappropriate by the District's Board of Directors.

Principal and accrued interest invested in Certificates of Deposit ("CDs") in accordance with this policy shall not exceed the FDIC, or its successor's, insurance limits or the Collateral pledged as security for the District's investments. It shall be acceptable for the District's Investment Officer to periodically receive interest on the CDs if needed to keep the amount of the funds under the insurance or collateral limits.

It shall be the responsibility of the District's Investment Officer to invest and reinvest the District funds in accordance with this policy to meet the needs and requirements of the District. The Board, by separate resolution, may provide that the Investment Officer may withdraw or transfer funds from and to accounts of the District on such terms as the Board considers advisable.

ARTICLE IV

Section 4.01. Investment Officer.

The District's Board of Directors shall designate one or more officers or employees of the District to be responsible for the investment of its funds and be the Investment Officer. No person may deposit, withdraw, invest, transfer, or otherwise manage funds of the District without this express authority. Investment Officer(s) shall be responsible for the investment of District funds, consistent with the investment policy adopted by the District. An Investment Officer's authority is effective until rescinded by the Board of Directors or until termination of employment by the District. Designated Board Members and Investment Officer(s) shall comply with all continuing training requirements including those established by Government Code §2256.008.

Section 4.02. Training.

The Investment Officer(s) of the District shall attend one or more investment training sessions as required by the Investment Act and Chapter 36.1561(b), Water Code, through courses and seminars offered by professional organizations, associations, and other independent sources in order to ensure the quality and capability of investment management in compliance with the Investment Act. The Investment Officer of the District shall attend a training session of at least six hours of instruction relating to investment responsibilities under Chapter 2256, Government Code, not later than the first anniversary of the date the officer takes office or assumes the officer's duties. The Investment Officer shall attend at least four hours of additional investment training on or before the second anniversary of the last training session the officer attended. The investment training session shall be provided by an independent source approved by the Board. For purposes of this policy, an "independent source" from which investment training shall be obtained shall include a professional organization, an institution of higher education or any other sponsor other than a business organization with whom the District may engage in an investment transaction.

Training under this section must include education in investment controls, security risks, strategy risks, market risks, diversification of investment portfolio, and compliance with Chapters 2256 and 2257, Government Code.

Section 4.03. Disclosures Required of Persons Selling Investments of the District.

The Investment Officer(s), the District bookkeeper, and any person who assists the Investment Officer with the Investment Officer's duties hereunder shall disclose in writing any personal business relationship or relationship within the second degree by affinity or consanguinity and any individual seeking to sell an investment to the District as required by the Investment Act.

Such disclosure statement shall be filed with the Board. In addition, any individual or business organization seeking to sell an investment to the District shall provide a written statement they do not boycott the State of Israel and will not boycott the State of Israel during the term of any contract with the District.

Section 4.04. Certification from Sellers of Investments.

The Investment Officer(s) shall present this Policy to any person offering to engage in an investment transaction with the District and shall obtain from such person a certificate in substantially the form attached here as “Exhibit A”, signed by a qualified representative of the business organization offering to engage in an investment transaction with the District. This certificate will document such person’s receipt, review, and understanding of this Policy; will reflect that the business organization has implemented reasonable procedures and controls in an effort to preclude investment transactions conducted between the business organization and the District that are not authorized by the District’s investment policy, as required by the Investment Act; and will reflect that the business organization has reviewed the terms and characteristics of the investment and determined that the investment complies with the requirements of the Investment Act.

Section 4.05. Safekeeping and Custody (FIRREA)

The Financial Institutions Reform, Recovery, and Enforcement Act of 1989 (FIRREA) requires that the depository institution’s board of directors or a designated committee approve depository agreements which must be an official record of the institution continuously since its execution. The Investment Officer(s) shall request a copy of the depository’s resolution approving the agreement.

Depository agreements executed in accordance with FIRREA, and requiring a resolution of the bank board or bank loan committee, will be established before funds are deposited.

Collateral will be pledged under the terms of a written tri-party agreement executed under the terms of FIRREA. If the custodian is the Federal Reserve the District will execute a Circular 7 pledge agreement. The agreement will be approved by resolution of the bank’s board or loan committee.

Section 4.06. Reporting by the Investment Officer.

Not less than quarterly and within a reasonable time after the end of the period reported, the Investment Officer(s) shall prepare and submit to the Board a written report of the investment transactions for all funds of the District for the preceding reporting period. The report must:

1. Describe in detail the investment position of the District on the date of the report, including a listing of each individual security held at the end of the reporting period;

2. Be prepared jointly by all the Investment Officers of the District, if the District appoints more than one;
3. Be signed by all Investment Officers and District Officials who prepare the report;
4. State the book value and the market value of each separately invested asset showing the unrealized gains or losses resulting from appreciation or depreciation at the beginning and end of the reporting period by the type of asset and fund type invested;
5. Show the average weighted yield to maturity of the portfolio.
6. Show the percentage of the total portfolio that each type of investment represents;
7. State the maturity date of each separately invested asset that has a maturity date;
8. State the District fund for which each individual investment was acquired; and
9. State the compliance of the investment portfolio as it relates to this Policy and the Investment Act.

The District's annual audit shall include a formal annual review of the investment reports with the results reported to the Board.

Section 4.07. Assistance with Certain Duties of the Investment Officer.

The Board hereby authorizes and directs the District's Bookkeeper and any other District Officials requested by the Investment Officer to assist the Investment Officer(s) with any of his duties, including but not limited to the following:

1. Presenting a copy of the Policy to any person or business organization seeking to sell an investment to the District and obtaining the necessary written certification from such seller referred to in this section;
2. Handling investment transactions;
3. Preparing and submitting to the Board the written report of all investment transactions for the District as required by this section;
4. Researching investment options and opportunities;
5. Obtaining written depository pledge agreements as required herein;
6. Obtaining safe-keeping receipts from the Texas financial institution which serves as a depository for pledged Collateral; and

7. Reviewing the market value of the District's investments and of the Collateral pledged to secure the District's funds.

ARTICLE V PROCEDURES FOR INVESTMENT OF DISTRICT MONIES

Section 5.01. General Provisions

All funds and accounts of the District shall be invested only in authorized investments in accordance with this Policy and shall comply with any additional requirements imposed by applicable state law or federal tax law, including the Investment Act and the Public Funds Collateral Act. The Investment Officer(s) may withdraw or transfer funds from and to accounts of the District only in compliance with this Policy. No fund groups shall be pooled for the purposes of investment. Methods shall be in place to monitor the market price of investments acquired with District funds.

Section 5.02. Solicitation of Bids for Certificates of Deposit.

Requests and bids for certificates of deposit shall be solicited in writing, electronically, or in any combination of those methods.

Section 5.03. Settlement Basis.

All purchases on investments, except investment in investment pools or in mutual funds, shall be made on a delivery versus payment basis. The safekeeping entity for all District investments and for all Collateral pledged to secure District funds shall be approved by the Investment Officer(s).

Section 5.04. Monitoring of the Market Value of Investments and Collateral.

The Investment Officer(s), with the help of District Officials as needed, shall determine the market value of each investment and of all Collateral pledged to secure deposits of District funds at least quarterly and at a time as close as practicable to the closing of the reporting period for investment. Pledged collateral values shall be included on the investment report. The following methods shall be used:

- (a) Certificates of deposit shall be valued at their face value plus any accrued but unpaid interest.
- (b) Shares in money market mutual funds and investment pools shall be valued at par plus any accrued but unpaid interest.
- (c) Other investment securities with a remaining maturity of one year or less may be valued in any of the following ways:

- (1) the lower of two bids obtained from securities broker/dealers for such security;
 - (2) the average of the bid and asked prices for such investment security as published in The Wall Street Journal or The New York Times;
 - (3) the bid price published by any nationally recognized security pricing service; or
 - (4) the market value quoted by the seller of the security or the owner of such Collateral.
- (d) Other investment securities with a remaining maturity greater than one year shall be valued at the lower of two bids obtained from securities broker/dealers for such security, unless two bids are not available, in which case the securities may be valued in any manner provided in 5.06(c) hereof.

ARTICLE VI

PROVISIONS APPLICABLE TO ALL FUNDS

Section 6.01. Provisions Applicable to All Fund Groups.

A. All Funds of the District shall be invested only in accordance with this Policy and shall comply with any additional requirements imposed by Bond Resolutions of the District and applicable state law or federal tax law, including the Investment Act and the Public Funds Collateral Act.

B. The Board, by separate resolution, may provide that the District's bookkeeper, under direction from the Investment Officer(s), may withdraw or transfer funds from and to accounts of the District only in compliance with this Policy.

C. No fund groups shall be pooled for the purposes of investment.

Section 6.02. Policy of Securing Deposits of District Funds – Applicable to All Deposited District Funds.

A. The District recognizes that FDIC (or its successor) insurance is available for District funds deposited at any one Texas Financial Institution (including branch banks) only up to a maximum of \$250,000 (including accrued interest) for each of the following: (i) demand deposits, (ii) time and savings deposits, and (iii) deposits made pursuant to an indenture or pursuant to law in order to pay bondholders or noteholders. It is the policy of the District that all deposited funds in each of the District's accounts shall be insured by the FDIC, or its successor, and to the extent not insured, shall be secured by Collateral pledged to the extent of the fair market value of the principal amount deposited plus accrued interest.

B. If it is necessary for the District's depositories to pledge Collateral to secure the District's deposits, (1) the Collateral pledge agreement must be in writing, (2) the Collateral pledge agreement must be approved by the depository's board of directors or loan committee, (3) the depository's approval of the Collateral pledge agreement must be reflected in the minutes of the meeting of the depository's board or loan committee approving the same, and (4) the Collateral pledge agreement must be kept in the official records of the depository. The depository must provide to the Investment Officer or District Officials written proof of the depository's approval of the pledge agreement as required herein in a form acceptable to the District. A signed or certified copy of the minutes of the meeting of the depository's board or loan committee reflecting the approval of the Collateral pledge agreement or other written documentation of such approval acceptable to the Investment Officer will be accepted. It is the preference of the Board that all requirements of this section be met prior to the deposit of any District funds in such financial institution when a pledge of Collateral is required; however, the Board recognizes that compliance with this preference might not be practicable due to time constraints for making a deposit. In such event, the Board directs the Investment Officer and District Officials to proceed diligently to have such agreement approved and documented to assure protection of the District's funds. If the decision is made to forego the protection of a collateral pledge agreement with any depository, the District bookkeeper shall be responsible for maintaining the balance of deposit(s) in such depository plus any accrued but unpaid interest at or below FDIC insurance levels.

C. Collateral pledged by a depository shall be held in safekeeping at an independent third party institution, and the District bookkeeper shall obtain safe-keeping receipts from the Texas financial institution or the safekeeping institution that reflect that Collateral as allowed by this investment Policy and in the amount required was pledged to the District. Principal and accrued interest on deposits in a financial institution shall not exceed the FDIC's, or is successor's, insurance limits or the market value of the Collateral pledged as security for the District's deposits. It shall be acceptable for the bookkeeper to periodically receive interest on deposits to be deposited to the credit of the District if needed to keep the amount of the funds under the insurance or Collateral limits. It is the preference of this Board that there be no sharing, splitting or co-tenancy of Collateral with other secured parties or entities; however, in the event that a depository cannot accommodate this preference due to the denominations of the securities to be pledged, the Board directs the Investment Officer and District Officials to obtain appropriate protections in the pledge agreement with the depository to assure that the Collateral is liquidated and the funds distributed appropriately to all parties with a security interest in such Collateral. The District bookkeeper shall monitor the pledged Collateral to assure that it is pledged only to the District, review the fair market value of the Collateral to ensure that the District's funds are fully secured, and report periodically to the Investment Officer and the Board regarding the Collateral.

D. The District's funds deposited in any Texas financial institution, and to the extent they are not insured, may be secured in any manner authorized by law for the District as such law is currently written or as amended in the future. The following are the securities that may be used as Collateral:

1. Obligations of the U.S. or its agencies and instrumentalities;

2. Direct obligations of the State of Texas or its agencies and instrumentalities;
3. Collateralized mortgage obligations directly issued by a federal agency or instrumentality or the U.S., the underlying security for which is guaranteed by an agency or instrumentality of the U.S.;
4. Other obligations, the principal and interest of which are unconditionally guaranteed or insured by or backed by the full faith and credit of the U.S. or the State of Texas or their respective agencies and instrumentalities;
5. Obligations of states, agencies, counties, cities, and other political subdivisions of any state rated as to investment quality by a nationally recognized investment rating firm not less than A or its equivalent.
6. Certificates of deposit issued by a depository institution that has its main office or a branch office in Texas guaranteed by the Federal Deposit Insurance Corporation or the National Credit Union Share Insurance Fund or its successor that are secured by the obligations in which the District may invest under the Investment Act.
7. Certificates of Deposit (Out-of-State) issued by one or more federally insured depository institutions, wherever located – but arranged through a depository institution that has its main office or a branch office in Texas. (Each certificate of deposit's principal and interest is fully insured by US.)

E. Notwithstanding anything to the contrary provided above, the following may not be used as Collateral and are not authorized as investments for the District under the Investment Act:

1. Obligations whose payment represents the coupon payments on the outstanding principal balance of the underlying mortgage-backed security collateral and pays no principal;
2. Obligations whose payment represents the principal stream of cash flow from the underlying mortgage-backed security collateral and bears no interest;
3. Collateralized mortgage obligations that have a final stated maturity date of greater than 10 years; or
4. Collateralized mortgage obligations the interest rate of which is determined by an index that adjusts opposite to the changes in a market index.

Section 6.03. Diversification.

The Investment Officer may invest up to 100% of the funds of the District in any investment instrument authorized in this Policy.

ARTICLE VII AUTHORIZED INVESTMENTS

Section 7.01. Authorized Investments.

Unless specifically prohibited by law or elsewhere by this Policy, District monies in any of its fund groups may be invested and reinvested only in the following types of Investments:

1. Obligations of the U.S. or its agencies and instrumentalities. Not to exceed 2 years to stated maturity.
2. Certificates of deposit issued by a depository institution that has its main office or a branch office in Texas guaranteed by the Federal Deposit Insurance Corporation or the National Credit Union Share Insurance Fund or its successor that are secured by the obligations in which the District may invest under the Investment Act. Not to exceed one year to stated maturity. Collateral shall be provided in accordance with this Policy.
3. Certificates of Deposit (Out-of-State) issued by one or more federally insured depository institutions, arranged through a depository institution that has its main office or a branch office in Texas. Not to exceed one year to stated maturity. Collateral shall be provided in accordance with this Policy.
4. Investment pools that: a) meet the requirements of Chapter 2256.016 of the Public Funds Investment Act; b) are rated no lower than AAA or an equivalent rating by at least one nationally recognized rating service; and c) are authorized by Board resolution.
5. Certificates of Deposit obtained through a depository institution or broker that has its main office or a branch office in Texas and that contractually agrees to place the funds in federally insured depository institutions in accordance with the conditions prescribed in Section 2256.010(b) of the Public Funds Investment Act. Not to exceed one year to stated maturity. Collateral shall be provided in accordance with this Policy.

Section 7.02. Prohibited Investments.

Notwithstanding anything to the contrary stated herein, no funds of the District may be invested in the following or in any other type of investment prohibited by the Investment Act or other applicable law:

1. Obligations whose payment represents the coupon payments on the outstanding principal balance of the underlying mortgage-backed security collateral and pays no principal (IO's);

2. Obligations whose payment represents the principal stream of cash flow from the underlying mortgage-backed security collateral and bears no interest (PO's);
3. Collateralized mortgage obligations that have a stated final maturity date of greater than 10 years; and
4. Collateralized mortgage obligations the interest rate of which is determined by an index that adjusts opposite to the changes in a market index (inverse floaters).

ARTICLE VIII INVESTMENT STRATEGIES

Section 8.01. Investment Strategy for the Operating Fund.

Funds in the Operating or General Account shall be invested to meet the operating requirements of the District as determined by the annual operating budget prepared by the General Manager and adopted by the Board. The District's investment strategy for this fund shall be to invest such funds as to accomplish the following objective, which are listed in the order of importance:

1. Understanding of the suitability of the investment to the financial requirements of the District;
2. Preservation and safety of principal;
3. Liquidity;
4. Marketability of the investment if the need arises to liquidate the investment before maturity;
5. Diversification of the investment portfolio; and
6. Yield.

Section 8.02. Investment Strategy for Special Funds.

Special Funds shall be invested to meet the operating requirements of the District as determined by the annual operating budget adopted by the Board or as determined by the Board. The District's investment strategy for this fund shall be to invest such funds to accomplish the following objectives, which are listed in the order of importance.

1. Understanding of the suitability of the investment to the financial requirements of the District;

2. Preservation and safety of principal;
3. Liquidity;
4. Marketability of the investment if the need arises to liquidate the investment before maturity;
5. Diversification of the investment portfolio; and
6. Yield.

It shall be the policy of the District that Special Funds shall not be invested for longer than thirteen (13) months. Funds placed in demand, savings, or time deposits shall be insured or secured as provided in the Policy.

ARTICLE IX

Section 9.01. Miscellaneous.

A. Checks/Drafts: All checks, drafts, notes, or other orders for the payment of money issued in the name of the District shall be signed by such officers or employees of the District as shall from time to time be authorized by resolution of the Board.

B. Depositories: All funds of the District except petty cash shall be deposited from time to time to the credit of the District in such banks or accounts as the Board may, from time to time, designate, and upon such terms and conditions as shall be fixed by the Board. The Board may, from time to time, authorize the opening and maintaining of general and special accounts within any such depository as it may designate, and may make such special rules and regulations with respect thereto as it may deem expedient.

Section 9.03. Superseding Clause.

This Policy supersedes any prior policies adopted by the Board of Directors regarding investment or securitization of District Funds.

Section 9.04. Open Meeting.

The Board officially finds, determines, and declares that this Investment Policy was reviewed, carefully considered, and adopted at a meeting of the Board, and that a sufficient written notice of the date, hour, place, and subject of this meeting was posted at a place convenient to the public in Montgomery County for the time required by law preceding this meeting, as required by the Open Meetings Act, Chapter 551, Texas Government Code, and that this meeting had been open to the public as required by law at all times during which this Policy

was discussed, considered and acted upon. The Board further ratifies, approves, and confirms such written notice and the contents and posting thereof.

ARTICLE X

Section 10.01. Performance Standards

The District's investment portfolio will be managed in accordance with the parameters specified within this policy. The portfolio shall be designed with the objective of obtaining a rate of return through budgetary and economic cycles, commensurate with the investment risk constraints and the cash flow requirements of the District.

Section. 10.02. Performance Benchmark

It is the policy of the District to purchase investments with maturity dates coinciding with cash flow needs. Through this strategy, the District shall seek to optimize interest earnings utilizing allowable investments available on the market at that time. Market value will be calculated on a quarterly basis on all securities owned and compared to current book value. The District's portfolio shall be designed with the objective of regularly meeting the average rate of return on U.S. Treasury Bills at a maturity level comparable to the District's weighted average maturity in days.

Exhibit A

CERTIFICATE OF COMPLIANCE FROM SELLERS OR INVESTMENTS
AS REQUIRED BY THE PUBLIC FUNDS INVESTMENT ACT

To: Lone Star Groundwater Conservation District

From: _____,
[Name of the person offering or the "qualified representative of the business organization" offering to engage in an investment transaction with the District] [Office such person holds]

of _____ (the "Business Organization")
[Name of financial institution, business organization or investment pool]

Date: _____, 20____

In accordance with the provisions of Chapter 2256 of the Texas Government Code, I hereby certify that:

1. I am an individual offering to enter into an investment transaction with the District or a "qualified representative" of the Business Organization offering to enter into an investment transaction with the District, as applicable, as such terms are used in the Public Funds Investment Act, Chapter 2256, Texas Government Code, and that I meet all requirements under such Act to sign this Certificate.
2. I or the Business Organization, as applicable, anticipate selling to the District investments that comply with the District's Investment Policy and the Investment Act (collectively referred to herein as the "Investments") dated _____, 20____ (the "Investment Policy").
3. I or a registered investment professional that services the District's account, as applicable, have received and reviewed the Investment Policy, which the District has represented is the complete Investment Policy of the District now in full force and effect. The District has further acknowledged that I or the Business Organization, as applicable, may rely upon the Investment Policy until the District provides me or the Business Organization, as applicable, with any amendments to or any newly adopted form of the Investment Policy.
4. I or the Business Organization, as applicable, have/has implemented reasonable procedures and controls in an effort to preclude investment transactions between the District and me

or the Business Organization, as applicable, that are not authorized by the Investment Policy, except to the extent that this authorization is dependent upon an analysis of the District's entire portfolio or requires an interpretation of subjective investment standards.

5. I or the Business Organization, as applicable, have/has reviewed or will review prior to sale, the terms, conditions and characteristics of the investments to be sold to the District and determined (i) that each of the Investments is an authorized investment for local governments under the Investment Act and (ii) each of the Investments is an authorized investment as to whether any limits on the amount of District monies to be invested in the Investments exceeds or in any way violates the Investment Policy.
6. The Business Organization makes no representations or guarantees regarding the prudence, reasonableness or adequacy of the Investment Policy.
7. The Business Organization has attached hereto, for return to the District, or will provide a prospectus or disclosure document for each of the Investments other than certificates of deposit and direct obligations of the United States
8. This Business Organization does not boycott the State of Israel and will not boycott the State of Israel during the term of this contract.

By: _____

Name: _____

Title: _____

Investments, other than certificates of deposit, are not FDIC insured, are not deposits or other obligations of me, the Business Organization or any of its affiliates, and are subject to investment risks, including possible loss of the principal amount invested.

APPENDIX A

LSGCD INVESTMENT POLICY REVISION/AMENDMENTS

Amended – 07.14.15	Remove references to performance benchmarks
Amended – 07.14.15	Update and include Exhibit “A” – Qualified Brokers
Reviewed – 08.30.16	No recommended changes
Re-adopted – 09.13.16	Updated
Amended – 10.10.17	Section 5.02 Restated requests for bids must be in writing. Removed “orally”.
Amended – 08.14.18	Updated to include Article X. Benchmarks may be a useful where investment income exceeds the benchmark as an indication of unacceptably high risk.
Amended – 08.14.18	Updated to include Section 2270.002 of the Texas Government Code statutory requirements that business contacts do not boycott the State of Israel and will not boycott the State of Israel during the term of any contract with the District.

RESOLUTION NO. #18-004

LONE STAR GROUNDWATER CONSERVATION DISTRICT

**RESOLUTION ADOPTING LIST OF QUALIFIED BROKERS AUTHORIZED TO
ENGAGE IN INVESTMENT TRANSACTIONS WITH LONE STAR GROUNDWATER
CONSERVATION DISTRICT**

THE STATE OF TEXAS

§

COUNTY OF MONTGOMERY

§

WHEREAS, the Board of Directors of the Lone Star Groundwater Conservation District (the "District") is an administrative agency organized and existing under the laws of the State of Texas; and

WHEREAS, Chapter 2256, Texas Government Code, as amended, requires that the Board of Directors annually review, revise and adopt a list of qualified brokers that are authorized to engage in investment transactions with the District; and

WHEREAS, the Budget and Finance Development Committee met July 26, 2018 to review staff's recommended changes to the list of qualified brokers authorized to engage in investment transaction with the District for recommendation to the Board of Directors for acceptance and approval;

**NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF
THE LONE STAR GROUNDWATER CONSERVATION DISTRICT THAT:**

1. The Board of Directors hereby adopts the list of financial institutions, brokers and dealers attached hereto as Exhibit "A" as the list of qualified brokers that are authorized to engage in investment transactions with the District.
2. The provisions of this Resolution shall be effective as of its date of approval by the Board of Directors and shall remain in effect until modified by action of the Board of Directors, and any resolution heretofore adopted by the Board of Directors adopting a list of qualified brokers that are authorized to engage in investment transactions with the District shall be and is hereby revoked as of the effective date of this Resolution.
3. The General Manager is further authorized to take any and all reasonable action necessary for the implementation of this resolution.

AND IT IS SO ORDERED.

PASSED AND ADOPTED this 14th day of August, 2018.

LONE STAR GROUNDWATER CONSERVATION DISTRICT

By: 
Rick Moffatt, President

ATTEST:


Gregg Hope

EXHIBIT "A"
LIST OF AUTHORIZED
BROKERS

Effective September 1, 2018

Allegiance Bank	Guaranty Bank & Trust, N.A.
Amegy Bank, N.A., a division of ZB N.A.	Heritage Bank, N.A.
American Bank of Commerce (ABC Bank)	Herring Bank
Austin Capital Bank SSB	Hilltop Securities, Inc./First Southwest Asset Management
Bank of America N.A./Merrill Lynch	HomeTown Bank, N.A.
Bank of Texas, a division of BOKF, N.A.	IberiaBank
Bank of the Ozarks	Icon Bank of Texas, N.A.
Bank of the West	Independent Bank
BBVA – Compass Bank	Integrity Bank, SSB
Beal Bank SSB	International Bank of Commerce (IBC Bank)
Blackrock Investments, Inc.	Inter National Bank
BOK Financial Securities, Inc.	J.P. Morgan Chase & Co./J.P. Morgan Securities
Branch Banking and Trust Company (BB&T)	JPMorgan Chase Bank, N.A.
Business Bank of Texas, N.A.	Legacy Texas Bank
Cadence Bank, N.A.	Legg Mason, Inc.
Capital Bank of Texas	LOGIC (Local Gov't. Investment Cooperative)
Capital One, N.A.	Lone Star Bank
Central Bank	Lone Star Investment Pool/First Public, LLC
Chasewood Bank	Lowery Bank, a division of Huntington State Bank
Citibank N.A./Citigroup	MidSouth Bank, N.A.
Comerica Bank	Moody National Bank
Commercial State Bank	Morgan Stanley
Community Bank of Texas	NewFirst National Bank
East West Bank	Pioneer Bank
Edward Jones	PlainsCapital Bank
Federated Investors Inc.	Plains State Bank
Fidelity Investments	Post Oak Bank
First Bank and Trust East Texas	Preferred Bank
First Citizens Bank	Prosperity Bank
First Financial Bank, N.A.	Raymond James Financial, Inc.
First National Bank Texas/First Convenience Bank	R Bank
First State Bank Central Texas	RBC Capital Markets/RBC Investments
First Texas Bank	Regions Bank
First United Bank	Robert W. Baird & Company, Inc.
Frontier Bank of Texas	Santander Bank, N.A.
Frost Bank	Spirit of Texas Bank SSB
FTN Financial	State Street Bank & Trust Co.
Green Bank, N.A.	

EXHIBIT "A"
LIST OF AUTHORIZED
BROKERS

Texan Bank	Trustmark National Bank
Texas Capital Bank, N.A.	UBS Financial Services, Inc.
Texas Citizens Bank	UBS Securities LLC.
Texas C.L.A.S.S.	United Bank of El Paso del Norte
Texas Exchange Bank	United Texas Bank
Texas First Bank	Unity National Bank
Texas Gulf Bank, N.A.	Wallis State Bank
TexPool/TexPool Prime	Wells Fargo Advisors
Tex Star Investment Pool	Wells Fargo Bank, N.A.
The Bank of New York Mellon	Wells Fargo Investments, LLC
The Bank of New York Mellon Trust Company, N.A.	Wells Fargo Securities, LLC
The Bank of River Oaks	Westbound Bank
The First National Bank of Bastrop	West Star Bank
The Independent Bankers Bank (TIB)	Whitney Bank
Third Coast Bank S.S.B.	Woodforest National Bank

RESOLUTION #18-005

LONE STAR GROUNDWATER CONSERVATION DISTRICT

**RESOLUTION AMENDING AND REESTABLISHING ADMINISTRATIVE FEE
SCHEDULE FOR THE LONE STAR GROUNDWATER CONSERVATION DISTRICT
PURSUANT TO RULE 9.2 OF THE RULES OF THE LONE STAR GROUNDWATER
CONSERVATION DISTRICT**

THE STATE OF TEXAS §

COUNTY OF MONTGOMERY §

WHEREAS, the Lone Star Groundwater Conservation District ("District") was created by the Legislature of the State of Texas in Acts 2001, 77th Leg., R.S., ch. 1321, p. 3246, § 1(a), as amended (the "Enabling Act"), as a groundwater conservation district operating under Chapter 36, Texas Water Code, and the Enabling Act; and

WHEREAS, § 36.205(a) of the Texas Water Code authorizes a groundwater conservation district to set fees for administrative acts of the district;

WHEREAS, the Budget and Finance Development Committee met July 26, 2018 to review current administrative fees and determined that such administrative fee schedule in need of modification and has made necessary amendments for recommendation to the Board of Directors for acceptance and approval;

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE LONE STAR GROUNDWATER CONSERVATION DISTRICT AS FOLLOWS:

1. The administrative fee schedule attached hereto is hereby amended and adopted as the administrative fee schedule of the District;
2. The administrative fee schedule so adopted shall be effective September 1, 2018, unless otherwise noted, and continue in effect until modified by the Board of Directors;
3. That administrative fee schedule so adopted shall supersede any and all such schedules previously adopted by Resolution or other action of the Board of Directors; and
4. The General Manager is further authorized to take any and all reasonable action necessary for the implementation of this resolution.

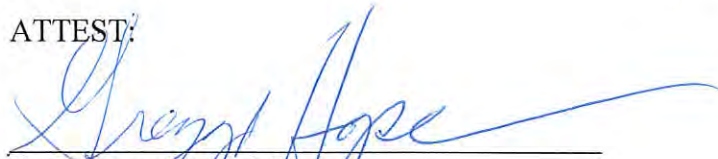
AND IT IS SO ORDERED.

PASSED AND ADOPTED this 14th day of August 2018.

LONE STAR GROUNDWATER CONSERVATION DISTRICT

By: 
Rick Moffatt, Board President

ATTEST:


Gregg Hope, Board Secretary

**ADMINISTRATIVE FEE SCHEDULE OF THE
LONE STAR GROUNDWATER CONSERVATION DISTRICT
Reviewed and Reapproved
August 14, 2018 (Effective 9/1/18)**

Permit Application Fees:

1. Application for New Small Volume Groundwater User (SVGU) Operating Permit = \$250 per Operating Permit application + publication fee
2. Application for SVGU Operating Permit – Existing Well(s) (for an existing well that was never permitted and should have been) = \$100 X ID of the well casing + publication fee. Minimum Application fee = \$300
3. Application to Amend Permit – Aggregate Existing Permit(s) = \$250 per application
4. Application for Water Meter Exception = \$100 per well + publication fee
5. Application for Permit Amendment That **Does** Require Notice and Hearing (Major Amendment) = \$300 per permit + publication fee
 - a. Application to Amend SVGU Permit – Change Water Use Type
 - b. Application to Amend SVGU Operating Permit – Increase in Allocation/Add Well to Aggregate System
6. Application for Permit Amendment That Does **Not** Require Notice and Hearing (Minor Amendment excluding permit transfer) = \$100 per permit
 - a. Application to Amend – Replacement Well
 - b. Change of Ownership

Large Volume Groundwater Usage Permit Application Fees:

1. Application for LVGU Operating Permit = \$500 per Operating Permit application + publication fee
2. Application to Amend LVGU Operating Permit – Add Well Only = \$250 per application + publication fee
3. Application to Amend LVGU Permit – Transfer of Historic Use Permit/Operating Permit = \$1,000 for each application to transfer permit
4. Application to Amend LVGU Permit – Decrease Authorized Withdrawal for GRP Participant = \$500 per application

Alternative Water Source (AWS) Application Fees:

1. Application for Alternative Water Source (AWS) Test Bore Drilling Permit = \$750 for each application
2. Application for Alternative Water Source (AWS) Production Permit = \$1,500 + publication fee

3. Application to Amend Alternative Water Source (AWS) Production Permit – Increase in Allocation/Add Well to Aggregate System = \$750 + publication fee

Groundwater Reduction Plan (GRP) Fees:

1. Minor GRP and Joint GRP Amendment = \$500 for each submittal
2. Major GRP and Joint GRP Amendment = \$1,500 for each submittal

Miscellaneous Fees:

1. Publication Fee = \$70 per applicable Permit Application or GRP/Joint GRP submission or amendment
2. Returned check fee = \$50 per check
3. Fee to cover cost(s) of Certified/Returned Receipt Mailing for non-compliance of District Rules = minimum \$10
4. Meter Verification Re-inspection = \$250 each site visit
5. Well Abandonment/Capping Re-inspection = \$250 each site visit
6. Early Conversion Credit Transfer Application = \$500 for each transfer of Early Conversion Credits
7. Application for Emergency Approval to Drill = \$1,500 per well included in Permit Application (in addition to Permit Application Fee)
8. Expedited Permit Application Fee: Request for “Special” Hearing on Permit Application (hearing at request of applicant in advance of regularly scheduled hearing date) = \$3,750 per well included in Expedited Application + publication fee.
 - Application fee required in advance of scheduling “Special” Hearing.
 - \$1,200 non-refundable fee, should “Special” Hearing on Expedited Permit be cancelled prior to hearing and/or a mutually acceptable hearing date unavailable.
 - Application must meet all Notice of Hearing requirements per Texas Water Code.
 - In addition to applicable application fee(s) owed and due under an “Expedited Permit Application”, applicant is responsible for all reasonable costs associated with holding “Special” Hearing on an Expedited Permit Application that requires a public hearing in advance of a regularly scheduled hearing of the District; including, but not limited to, any and all attorney, engineering, and technical costs that may be associated with the “Special” Hearing and notice of “Special” Hearing.

RESOLUTION NO. #18-006

LONE STAR GROUNDWATER CONSERVATION DISTRICT

**RESOLUTION ADOPTING 2019 WATER USE FEES FOR THE LONE STAR
GROUNDWATER CONSERVATION DISTRICT PURSUANT TO RULE 9.1 AND
RULE 9.3 OF THE RULES OF THE LONE STAR GROUNDWATER CONSERVATION
DISTRICT**

THE STATE OF TEXAS §

COUNTY OF MONTGOMERY §

WHEREAS, the Lone Star Groundwater Conservation District ("District") was created by the Legislature of the State of Texas in Acts 2001, 77th Leg., R.S., ch. 1321, p. 3246, § 1(a), as amended (the "Enabling Act"), as a groundwater conservation district operating under Chapter 36, Texas Water Code, and the Enabling Act; and

WHEREAS, pursuant to said Act, § 5(a), the District Board of Directors of the District (the "Board") has the permitting and general management powers granted under Chapter 36 of the Texas Water Code;

WHEREAS, § 36.101 of the Texas Water Code authorizes a groundwater conservation district to make and enforce rules to provide for conserving, preserving, protecting, and recharging of the groundwater or of a groundwater reservoir or its subdivisions in order to control subsidence or prevent waste of groundwater and to carry out the powers and duties provided by Chapter 36 of the Texas Water Code;

WHEREAS, the Board of Directors of the District has adopted rules for the District;

WHEREAS, §§ 36.205 and 36.122 of the Texas Water Code and the Act authorize the District to assess fees on the production of groundwater within its jurisdiction and for the transfer of such water for use outside of the District;

WHEREAS, the assessment of such fees serve a legitimate regulatory purpose;

WHEREAS, Rule 9.1 of the rules of the District authorizes the Board of Directors of the District to establish by resolution a regulatory water use fee to accomplish the purposes of the District;

WHEREAS, Rule 9.3 of the rules of the District authorizes the Board of Directors of the District to establish by resolution a groundwater transport fee for the transportation of groundwater out of the District;

WHEREAS, the District's Budget and Finance Committee have worked diligently to forecast all reasonably anticipated revenues, expenses, and activities; and after giving much consideration to these important factors, recommends maintaining a regulatory water use fee of \$0.105 per 1,000 gallons for all groundwater permitted, other than agricultural use and that permitted in the Catahoula Restricted Aquifer for the calendar year 2019;

**NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF
THE LONE STAR GROUNDWATER CONSERVATION DISTRICT AS FOLLOWS:**

1. A regulatory water use fee of \$1 per acre-foot of groundwater permitted for "agricultural use," as that term is defined by § 36.001(20), TEX. WATER CODE ANN. (Vernon Supp. 2004); a regulatory water use fee of \$0.105 per 1,000 gallons for all uses, other than "agricultural use", of groundwater permitted in the Gulf Coast Aquifer; and a regulatory water use fee of \$0.06 per 1,000 gallons for all uses, other than "agricultural use", of groundwater permitted in the Catahoula Restricted Aquifer, are hereby adopted as the regulatory water use fees of the District for the calendar year 2019. Notwithstanding the previous sentence, in the event that the application of these adopted rates results in a total annual regulatory water use fee payment of less than (\$10.00) for an individual permit issued by the District, the regulatory water use fee payment to be assessed to such a permit shall be the Minimum Regulatory Water Use Fee, which is hereby established as (\$10.00) and so adopted. The District shall impose a 50 percent export surcharge in addition to the District's regulatory water use fee for in-District use for transportation of groundwater for use outside of the District, subject to the Act and District Rules. Such fees set forth above shall be assessed as set forth in the Rules of the District for the time period of January 1, 2019, through December 31, 2019;
2. The regulatory water use and groundwater transport fees so adopted shall be effective January 1, 2019, and continue in effect until modified by the Board of Directors;
3. The regulatory water use and groundwater transport fees so adopted shall supersede any and all such fees previously adopted by Resolution or other action of the Board of Directors; and
4. The General Manager is further authorized to take any and all reasonable action necessary for the implementation of this resolution.

AND IT IS SO ORDERED.

PASSED AND ADOPTED this 14th day of August, 2018.

LONE STAR GROUNDWATER CONSERVATION DISTRICT

By: 

Rick Moffatt, President

ATTEST:


Gregg Hope, Board Secretary



United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Texas Water Science Center
1505 Ferguson Lane
Austin, TX 78754

September 7, 2018

Ms. Kathy Jones
General Manager
Lone Star Groundwater Conservation District
655 Conroe Park North Drive
Conroe, TX 77303

Dear Ms. Jones:

Enclosed are two signed originals of our standard joint-funding agreement for the project(s) Texas Water Science Center Water Resources Investigations, during the period January 1, 2019 through December 31, 2019 in the amount of \$231,375 from your agency. U.S. Geological Survey contributions for this agreement are \$56,625 for a combined total of \$288,000. Please sign and return one fully-executed original to Beau Griffin at the address above.

Federal law requires that we have a signed agreement before we start or continue work. Please return the signed agreement by **October 1, 2018**. If, for any reason, the agreement cannot be signed and returned by the date shown above, please contact David Brown by phone number (936) 271-5312 or email dsbrown@usgs.gov to make alternative arrangements.

This is a fixed cost agreement to be billed quarterly via Down Payment Request (automated Form DI-1040). Please allow 30-days from the end of the billing period for issuance of the bill. If you experience any problems with your invoice(s), please contact Kandis Becher at phone number (682) 316-5051 or email at kkbecher@usgs.gov.

The results of all work performed under this agreement will be available for publication by the U.S. Geological Survey. We look forward to continuing this and future cooperative efforts in these mutually beneficial water resources studies.

Sincerely,

Timothy H. Raines
Director

Enclosure
19SJFATX137000 (2)

Form 9-1366
(May 2018)

U.S. Department of the Interior
U.S. Geological Survey
Joint Funding Agreement
FOR
Water Resource Investigations

Customer #: 6000000642
Agreement #: 19SJFATX137000
Project #: SJ009ME
TIN #: 41-2024515

Fixed Cost Agreement YES[X] NO[]

THIS AGREEMENT is entered into as of the January 1, 2019, by the U.S. GEOLOGICAL SURVEY, Texas Water Science Center, UNITED STATES DEPARTMENT OF THE INTERIOR, party of the first part, and the Lone Star Groundwater Conservation District party of the second part.

1. The parties hereto agree that subject to the availability of appropriations and in accordance with their respective authorities there shall be maintained in cooperation Water Resource Investigations (per attachment), herein called the program. The USGS legal authority is 43 USC 36C; 43 USC 50, and 43 USC 50b.

2. The following amounts shall be contributed to cover all of the cost of the necessary field and analytical work directly related to this program. 2(b) include In-Kind-Services in the amount of \$0.00

- (a) \$56,625 by the party of the first part during the period
January 1, 2019 to December 31, 2019
- (b) \$231,375 by the party of the second part during the period
January 1, 2019 to December 31, 2019
- (c) Contributions are provided by the party of the first part through other USGS regional or national programs,
in the amount of: \$0

Description of the USGS regional/national program:

- (d) Additional or reduced amounts by each party during the above period or succeeding periods as may be determined by mutual agreement and set forth in an exchange of letters between the parties.
- (e) The performance period may be changed by mutual agreement and set forth in an exchange of letters between the parties.

3. The costs of this program may be paid by either party in conformity with the laws and regulations respectively governing each party.

4. The field and analytical work pertaining to this program shall be under the direction of or subject to periodic review by an authorized representative of the party of the first part.

5. The areas to be included in the program shall be determined by mutual agreement between the parties hereto or their authorized representatives. The methods employed in the field and office shall be those adopted by the party of the first part to insure the required standards of accuracy subject to modification by mutual agreement.

6. During the course of this program, all field and analytical work of either party pertaining to this program shall be open to the inspection of the other party, and if the work is not being carried on in a mutually satisfactory manner, either party may terminate this agreement upon 60 days written notice to the other party.

7. The original records resulting from this program will be deposited in the office of origin of those records. Upon request, copies of the original records will be provided to the office of the other party.

8. The maps, records or reports resulting from this program shall be made available to the public as promptly as possible. The maps, records or reports normally will be published by the party of the first part. However, the party of the second part reserves the right to publish the results of this program, and if already published by the party of the first part shall, upon request, be furnished by the party of the first part, at cost, impressions suitable for purposes of reproduction similar to that for which the original copy was prepared. The maps, records or reports published by either party shall contain a statement of the cooperative relations between the parties. The Parties acknowledge that scientific information and data developed as a result of the Scope of Work (SOW) are subject to applicable USGS review, approval, and release requirements, which are available on the USGS Fundamental Science Practices website (<https://www2.usgs.gov/fsp/>).

Form 9-1366
(May 2018)

U.S. Department of the Interior
U.S. Geological Survey
Joint Funding Agreement
FOR
Water Resource Investigations

Customer #: 6000000642
Agreement #: 19SJFATX137000
Project #: SJ009ME
TIN #: 41-2024515

9. Billing for this agreement will be rendered quarterly. Invoices not paid within 60 days from the billing date will bear Interest, Penalties, and Administrative cost at the annual rate pursuant the Debt Collection Act of 1982, (codified at 31 U.S.C. § 3717) established by the U.S. Treasury.

USGS Technical Point of Contact

Name: David Brown
Associate Director - Gulf Coast Texas
Program
Address: 19241 David Memorial Drive Suite 180
Shenandoah, TX 77385
Telephone: (936) 271-5312
Fax: (936) 271-5399
Email: dsbrown@usgs.gov

Customer Technical Point of Contact

Name: Kathy Jones
General Manager
Address: 655 Conroe Park North Drive
Conroe, TX 77303
Telephone: (936) 494-3436
Fax: (936) 494-3438
Email: kjones@lonestargcd.org

USGS Billing Point of Contact

Name: Kandis Becher
Budget Analyst
Address: 501 W. Felix Street Bldg 24
Fort Worth, TX 76115
Telephone: (682) 316-5051
Fax: (682) 316-5022
Email: kkbecher@usgs.gov

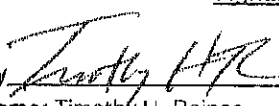
Customer Billing Point of Contact

Name: Linda Kolander
Address: 655 Conroe Park North Drive
Conroe, TX 77303
Telephone: (936) 494-3436
Fax:
Email: lkolander@lonestargcd.org

U.S. Geological Survey
United States
Department of Interior

Lone Star Groundwater Conservation District

Signature

By  Date: 09/07/2018
Name: Timothy H. Raines
Title: Director

Signatures

By _____ Date: _____
Name:
Title:

By _____ Date: _____
Name:
Title:

By _____ Date: _____
Name:
Title:

Lone Star Groundwater Conservation District
19SJJAATX137000

DESCRIPTION	USGS Funds	LSGCD Funds	Total Cost
00250: GROUND WATER PROGRAM			
This project is a component of the USGS Ground Water Data Collection and Subsidence Program. The Ground Water Data Collection project is responsible for (1) the inventory of select wells that can be incorporated into the ground-water network, (2) collection of ground-water-quality data in the Houston area, and (3) provide an annual report of water-level and water-quality data. The Program is coordinated with the City of Houston, the Harris - Galveston Subsidence District, the Fort Bend Subsidence District, and Brazoria County Groundwater Conservation District to provide regional data coverage and to avoid duplication of effort.			
a. Inventory new large-capacity wells and properly record and archive discontinued sites	\$5,000	\$9,500	\$14,500
b. Prepare water-level and water-quality data in the USGS National Water Information System (NWIS) web database. Current active network is about 170 water-level sites in the Montgomery	\$1,500	\$3,500	\$5,000
c. Operation and maintenance of continuous water-level gages in Montgomery County - redevelop	\$7,000	\$28,000	\$35,000
d. Measure nested Jasper and Catahoula wells in the Montgomery County area monthly and provide information to the public	\$5,000	\$20,000	\$25,000
e. Install one new continuous water-level gage in Montgomery County at location to be determined	\$2,000	\$12,500	\$14,500
TOTAL	<u>\$20,500</u>	<u>\$73,500</u>	<u>\$94,000</u>

9X1FX: Groundwater Monitoring and Historical Trend Analysis

This project is a component of the USGS Ground Water Data Collection and Subsidence Program. The objective of this project is to determine the magnitude and extent of land-surface subsidence due to withdrawals of ground water and to create an annual series of water-level reports to determine the possible relationship between faulting, land-surface subsidence, and drainage changes at elevations not subject to flooding by tidal waters.

9X1F01: Water-level Monitoring Network

a. Measure static ground-water levels in active Gulf Coast aquifer wells during the winter in Montgomery and adjacent counties	\$8,000	\$33,000	\$41,000
b. Prepare a report of water-level altitudes and altitude changes in the Gulf Coast aquifer System for the current water year	\$3,000	\$12,000	\$15,000
c. Measure pumping ground-water levels in active Gulf Coast aquifer wells during the summer in Montgomery and adjacent counties	\$8,000	\$33,000	\$41,000
TOTAL	<u>\$19,000</u>	<u>\$78,000</u>	<u>\$97,000</u>

9X1F02: Technical Assistance and Special Projects

a. Provide technical information in the form of meetings, presentations, and field surveys as it relates to the groundwater resources and subsidence in the Montgomery County area. Provide information and technical explanation to stakeholders and the public as needed or requested

Was \$20,000 in FY 2016, \$0 in FY 2017, and \$0 in FY18

\$	-	\$	-	\$	-
TOTAL	\$	-	\$	-	\$

EUW02: Catahoula Water Chemistry Network

In 2009, large volume groundwater users began the exploration of the Catahoula Sandstone as an alternate water source in Montgomery County. In 2011, test wells were drilled and installed in the Catahoula. Little to no information on water quality in the Catahoula Sandstone exists. In 2012, additional test and production wells may be drilled in the Catahoula Sandstone. The objective of this study is to assess quality and determine the "chemical fingerprint" of the water from the Catahoula Sandstone from selected wells screened in the Catahoula Sandstone in the Montgomery County area. Samples for major ions, stable isotopes, dissolved and noble gases, trace metals, and radionuclides will be collected and analyzed as a reconnaissance of the quality of the water as well as its potential origins, meteoric or connate.

n. Collection of samples and interpretation of results

\$ 17,125 \$ 79,875 \$ 97,000

TOTAL \$17,125 \$79,875 \$97,000

SUMMARY LONE STAR GCD			
	USGS	LSGCD	TOTAL COST
00250: Groundwater Level Data Collection	\$ 20,500	\$ 73,500	\$ 94,000
9X101: Water - Level Change and Subsidence Research	\$ 19,000	\$ 78,000	\$ 97,000
9X102: Technical Assistance and Special Projects	\$ -	\$ -	\$ -
EUW02: Catahoula Water Chemistry Network	\$ 17,125	\$ 79,875	\$ 97,000
TOTAL	\$ 56,625	\$ 231,375	\$ 288,000

LONE STAR GROUNDWATER CONSERVATION DISTRICT

MEMORANDUM

TO: Board of Directors
Lone Star Groundwater Conservation District

THROUGH: Kathy Jones, General Manager
General Counsel

FROM: Rules and Regulatory Planning Committee Members

DATE: August 28, 2018

RE: Rules and Regulatory Planning Committee's Summary
Report on Well Spacing Rules Development for the Gulf
Coast and Catahoula Aquifers

I. INTRODUCTION

The Lone Star Groundwater Conservation District ("District") has spent a significant amount of time and effort over the course of several years working on the development of well spacing rules. While, as of the date of this memorandum, the District has not adopted well spacing rules beyond the general rules applicable to water well drillers through the Texas Department of Licensing and Regulation, the current or a future Board of Directors ("Board") of the District may wish to pursue the adoption of well spacing rules at a future date. To assist in any efforts by existing or future Board members to pursue well spacing rules, this memorandum serves as a guide to better understand the basics of well spacing and how it is utilized as a regulatory tool by groundwater conservation districts across the state. Additionally, this memorandum serves to apprise existing and future Board members of the District's initiatives and efforts to date in the development of well spacing rules, including the District's analysis and review of different well spacing options, in order to preserve the important information derived from the District's extensive work in this area and the investment of District funds that went into that work.

II. UNDERSTANDING THE BASICS OF WELL SPACING

One of the most common regulatory tools used by groundwater districts in Texas is the imposition of well spacing regulations.¹ When a new well is drilled and begins pumping, it can draw down water levels in the aquifer and impact existing wells in the vicinity. Well spacing regulations are designed primarily to minimize these localized impacts. While Chapter 36 of the Texas Water Code grants districts broad authority to regulate well spacing through its rules,

¹ TEX. WATER CODE ANN. § 36.116(a)(1)(A)-(C).

districts generally adopt rules that utilize one or more of the following three approaches to regulating well spacing:

1. rules that impose minimum well spacing distances from adjacent property lines;
2. rules that impose minimum well spacing distances from wells in existence at the time a new well is drilled; and
3. rules that impose minimum tract size requirements to drill a well.

Districts that adopt minimum well spacing requirements from property lines or existing wells typically require distances that are proportional to the production capacity of the well to be drilled—the larger the capacity, the greater the required setback distances from property lines and existing wells.² While rigorous well-spacing requirements do have some effect on limiting total aquifer production by limiting the size of a well that can be placed on a particular parcel of land, they typically cannot be relied on in most aquifers, including the aquifers in the District, as a means of ensuring that total pumping from an aquifer will be limited to a level that will achieve the applicable desired future conditions, and are not truly a method of allocating groundwater in that sense.

Many districts, especially in urban and suburban settings, implement well spacing through the imposition of a minimum tract size requirement.³ Under this approach, parcels of land must be of a certain size, unless grandfathered by a district, in order to be eligible to have a new well drilled on them. This method of well spacing is typically designed to address groundwater issues related to the proliferation of residential subdivisions in which a developer sells small residential lots to prospective homeowners without centralized water or sewer services and each homeowner is expected to install a water well and septic system. If lot sizes are too small, groundwater availability and quality issues can arise due to the high density of wells and septic systems.

Ultimately, in developing well spacing rules, districts must balance the following interests:

1. protecting existing well owners' investments by minimizing the impacts of new wells; and
2. affording all landowners the opportunity to access the groundwater beneath their properties to produce their fair share of the resource.

² *Id.* § 36.116(a)(1)(B).

³ *See id.* § 36.002(d)(1) (recognizing districts' authority to limit or prohibit the drilling of a well by a landowner for failure or inability to comply with minimum well spacing or tract size requirements adopted by the district).

III. THE DISTRICT'S DEVELOPMENT OF PROPOSED WELL SPACING RULES: 2013 – 2015

In 2013, the District initiated the evaluation of potential well spacing and tract size requirements in response to requests from existing well owners for protection of their investments in the production of groundwater from the Gulf Coast and Catahoula aquifers. At the outset, the District retained INTERA to perform various technical analyses of the aquifers in the District related to well spacing. Over the course of two years, the District's Rules and Regulatory Planning Committee worked diligently with legal counsel, INTERA, and other technical consultants to discuss, analyze, prepare, and review various options for well spacing and tract size requirements.

The Rules and Regulatory Planning Committee elected not to pursue rules that would require minimum well spacing distances from property lines.⁴ While the benefits of such rules work well in rural parts of the state with large tracts of land (typically in areas of substantial agricultural irrigation) by ensuring that both landowners on either side of a property line have substantial well location setbacks to minimize interference between their wells, such rules would be problematic in Montgomery County. This is due primarily to the fact that most large well owners have small tract sizes, thus foreclosing the ability to drill a well at a substantial distance from the property line, and because it is rare for two or more large wells to be located on adjacent tracts in Montgomery County, where the vast majority of large wells are public water supply wells.

After much study on the local hydrogeology of the Gulf Coast and Catahoula aquifers, the Rules and Regulatory Planning Committee proposed amendments to the District Rules related to well spacing and minimum tract size requirements for future wells in the Gulf Coast Aquifer, and to well spacing requirements for future wells in the Catahoula Aquifer from existing wells in the Catahoula Aquifer.

For new wells completed in the Gulf Coast Aquifer, a minimum tract size of 1.5 acres was proposed, which was derived by considering both Montgomery County's platting requirements and technical information prepared by the District's hydrogeologists on water level drawdown and well interference from typical domestic (household) wells. In response to public comments that the proposed rules would put an undue burden on wells to be drilled or completed in the Gulf Coast Aquifer on tracts less than 1.5 acres in subdivisions platted prior to the effective date of the rules, the proposed rules were further revised to exempt from the minimum tract size requirements any wells to be drilled or completed on a tract platted in a subdivision as a tract smaller than 1.5 acres prior to the effective date of the rules. However, this exemption would not apply if the plat of the subdivision were altered in any way after the effective date of the rules, including any re-platting or new platting of the subdivision. Additionally, the proposed rules required all new wells completed in the Gulf Coast Aquifer to be screened at a depth no less than 150 feet (regardless of the capacity of the well) in order to prevent well interference problems caused by wells being drilled too shallow. The rationale behind this approach was to put all water well drillers on an even economic playing field in bidding for jobs to drill household wells, while at the same time

⁴ Please note that all wells drilled in the District must comply with the Texas Water Well Drillers and Pump Installer Administrative Rules, Title 16, Part 4, Chapter 76, Texas Administrative Code, which provide minimum spacing requirements from adjacent property boundaries.

protecting homeowners who may not be aware of the performance issues that can arise with water wells that are drilled too shallow. Without this rule, a well that is designed too shallow is likely to be the lowest bid, providing an incentive for drillers to complete wells in a manner that can result in well performance issues or failure as water levels decline over time or in drought conditions. Finally, in an effort to ensure all landowners are afforded the opportunity to produce their fair share of the groundwater, the proposed rules included a variance process that authorized the District to grant exceptions to the proposed minimum tract size requirements as necessary to protect landowners' private property rights.

For the Catahoula Aquifer, minimum spacing requirements were proposed for new wells from existing Catahoula wells based on the production capacity of the new well. During deliberations of the potential approaches available for establishing spacing rules, the District evaluated a number of impact parameters to serve as the basis for the proposed well spacing rules for the Catahoula Aquifer. The minimum spacing requirements ultimately proposed by the District were based on limiting the impact of a new well on an existing well to no more than 100 feet of drawdown after 10 years. Through its technical evaluations of aquifer characteristics, the District recognized the dampening effect that vertical separation of well screens can have on the impact of one well on another. The proposed rules authorized spacing requirements to be reduced if there was a vertical offset of 100 feet or more in the elevation of the well screen of the new well and that of any existing well. Finally, in recognition of the fact that the Catahoula Aquifer in Montgomery County is not a homogeneous geologic unit, the proposed rules also included a variance process to allow the District to make exceptions to the proposed minimum spacing requirements if site-specific information warranted a different spacing requirement.

The District's Board of Directors initially held a rulemaking hearing to consider for adoption the proposed amendments to the District Rules in October 2014, which, largely due to the public's request for additional time to review the proposed amendments, was continued to allow for public comment at public hearings in November, December, and January. The District also held public workshops on the proposed rules in November 2014 and January 2015, during which the District's staff and consultants provided more detailed explanation of the proposed rules and addressed questions and concerns raised by the public.

In late 2014 and early 2015, the District received strong opposition from certain LVGUs (who later sued the District on other aspects of the District Regulatory Plan), developers, and the local leadership on the District's adoption of any well spacing rules. As a result, the District Board decided to table the adoption of the proposed well spacing and minimum tract size rules for deliberation and discussion at a future time.

IV. THE DISTRICT'S DEVELOPMENT OF PROPOSED WELL SPACING RULES: 2018

In late 2017 and early 2018, the same LVGUs that had opposed the District's efforts to develop proposed well spacing rules in 2014 and 2015 requested that the District resume its efforts on the development of proposed well spacing rules. In response, the District retained INTERA to assist with the evaluation of potential well spacing rules, including the proposed well spacing rules that were tabled in 2015. The purpose of INTERA's work was to 1) summarize the District's

previous well spacing studies and rules development; 2) review and summarize the well spacing approaches adopted by other groundwater conservation districts; and 3) in coordination with the District, develop recommended approaches to well spacing.

The Rules and Regulatory Planning Committee had several meetings with INTERA throughout 2018 to review well spacing concepts, previous studies, the rules of other districts, and potential well spacing rule priorities with the committee members. On June 5, 2018, the Rules and Regulatory Planning Committee had a meeting with INTERA to discuss the District's policy priorities and their relationship to the purposes of well spacing rules. Based on these discussions, the Rules and Regulatory Planning Committee determined that any proposed "blanket" well spacing rules imposing minimum spacing distances from property lines or existing wells based on the production capacity of a new well is not necessary at this time. Instead, the Rules and Regulatory Planning Committee determined that the District should focus on considering other regulatory approaches that may better address local-scale impacts caused by new higher capacity wells drilled in the District, as such wells typically have greater potential for impacting neighboring wells, based upon a site-specific hydrogeologic analysis of the proposed well. Such an analysis would include the evaluation of local aquifer conditions, projections of impacts to neighboring wells, and/or aquifer tests to better understand site-specific aquifer properties. A copy of a letter prepared by INTERA on draft proposed rule concepts and guidelines for hydrogeologic assessments is attached to this memorandum.

V. RECOMMENDATION

Because of the timing issues associated with the development of proposed rules language, the time required for public hearings on such proposed rules, and the impending change in the structure of the District's Board of Directors from an appointed to an elected board in November 2018, the Rules and Regulatory Planning Committee recommends that the current Board of Directors take no action on the further development of well-spacing rules. With that said, the Rules and Regulatory Planning Committee recommends that this memorandum and the information derived from the District's historical efforts in well spacing rules development as referenced herein be provided to the incoming Board of Directors for its use in pursuit of the groundwater management priorities it wishes to achieve.

ATTACHMENTS

- Development of Well Spacing Recommendations, prepared by INTERA, July 11, 2013.
- Well Spacing Calculations for the Catahoula Aquifer for the Lone Star Groundwater Conservation District, prepared by INTERA, August 28, 2014.
- Hydrogeologic Basis for Proposed Well Spacing and Tract-Size Rules, prepared by Mullican and Associates and INTERA, October 14, 2015.
- Summary of Well Spacing Rule Development Assistance and Status, prepared by INTERA, June 29, 2018.
- DRAFT Proposed Rule Concepts and Guidelines for Hydrogeologic Assessment, Prepared by INTERA, August 24, 2018.

Development of Well Spacing Recommendations

Presented at:

Lone Star Groundwater Conservation District
LSGCD Technical Committee
Conroe, Texas

Presented by:

Steven C. Young Ph.D., P.G., P.E
INTERA, Austin, TX

July 11, 2013



Primary Presentation (~ 30 slides)

- ◆ Approach for Developing Well Spacing Calculations
- ◆ Well Spacing Calculations for the Catahoula
- ◆ Summary of Well Spacing Calculations for Chicot, Evangeline, and Jasper Aquifers



Additional Presentation Material **(~ 60 slides)**

- ◆ **Considerations Associated with Developing Well Spacing Calculations for Chicot, Evangeline, and Jasper Aquifers**
 - Design and Construction Existing Wells
 - Aquifer Hydraulic Properties
 - Aquifer Surfaces (Tops and Bottoms)
- ◆ **Development of Well Spacing Equation**
- ◆ **Well Spacing Calculation for Chicot, Evangeline, and Jasper Aquifers**
- ◆ **Parcel Investigation**





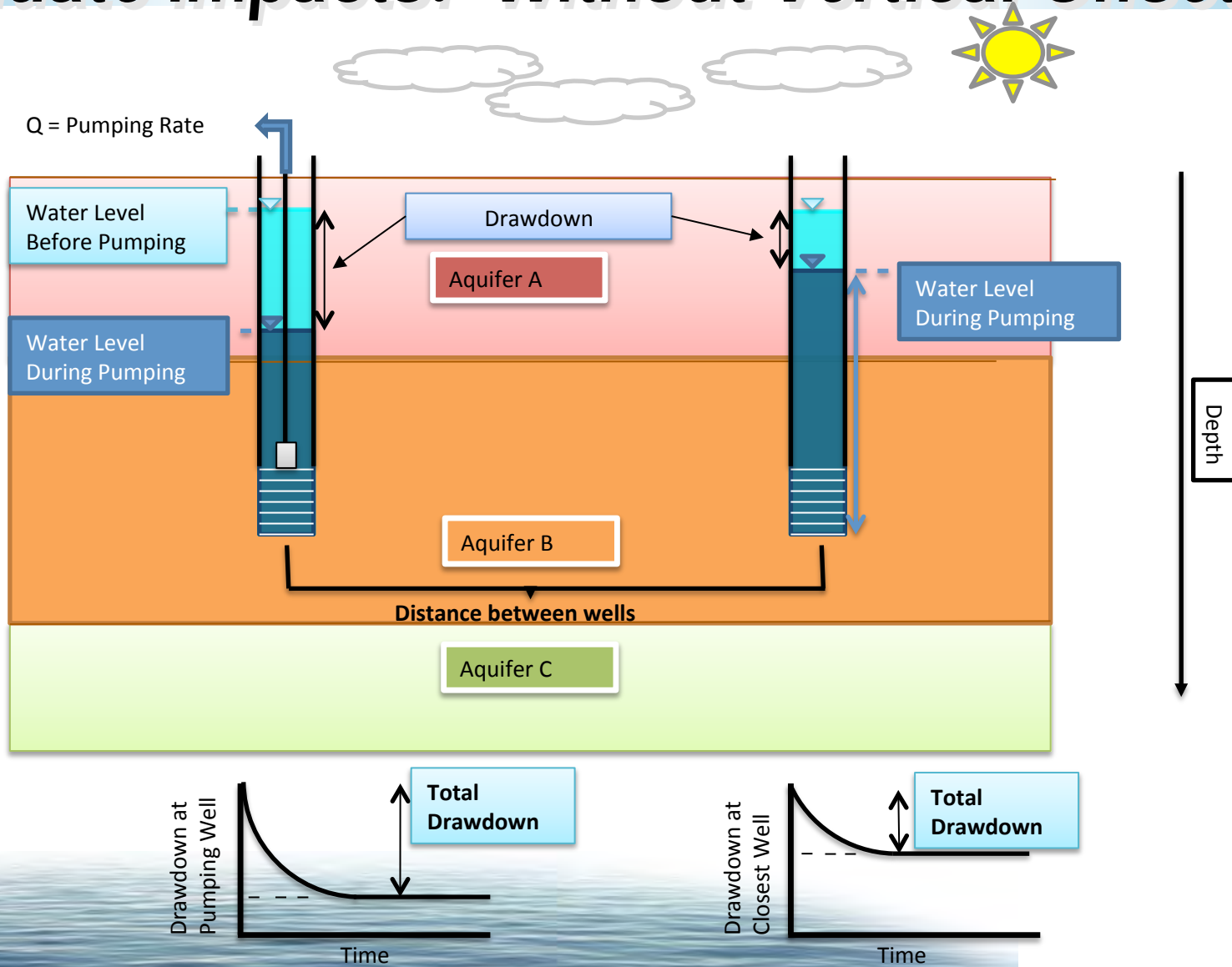
Approach for Developing Well Spacing Recommendations

Approach: Considerations

- ◆ **Developed Using Best Available Science**
 - Calculations based on equations for flow to a well
 - Aquifer data based on best available information
- ◆ **Developed with Practical Considerations**
 - Locations of existing wells
 - Have consistency among the calculations for the different aquifers
 - Do not hamstring the design of an efficient well
- ◆ **Acknowledge Uncertainty in Aquifer Properties**
 - Minimum well spacing requirements considered for low pumping rates
 - Hydrogeological assessments considered for high pumping rates
- ◆ **Implementation**
 - Straightforward to apply
 - Framework allows for updates as new information becomes available



Approach: Schematic of Simulations Used to Evaluate Impacts: Without Vertical Offsets



Approach: Definitions and Data

- ◆ Pumping Rate - considered to be the highest average pumping rate over a three-month period
- ◆ Drawdown Impacts at Wells - based on 1-year of pumping; note that majority of the impacts occur during first 3-months
- ◆ Aquifer Thicknesses –based on most recent TWDB Gulf Coast Study and LSGCD Catahoula Report (Guyton and INTERA, 2012)
- ◆ Aquifer Properties – based on HAGM parameters, aquifer pumping tests, and LSGCD Catahoula Report (Guyton and INTERA, 2012)
- ◆ Well Specifications – range of well screens and pumping rates based on LSGCD database



◆ Screen Length – Top of highest screen minus bottom of lowest screen

Approach: Definitions and Data (con't)

Well/User Type	Production Range (gal/year)	Production Range (gal/min)	Production Range (acre-ft/yr)
Domestic and Livestock	Exempt	Exempt	Exempt
Small Volume Groundwater Users (SVGU)	100,000 – 10,000,000	0.2 – 19	0.3 – 30
Large Volume Groundwater User (LVGU)	>10,000,000	>19	>30



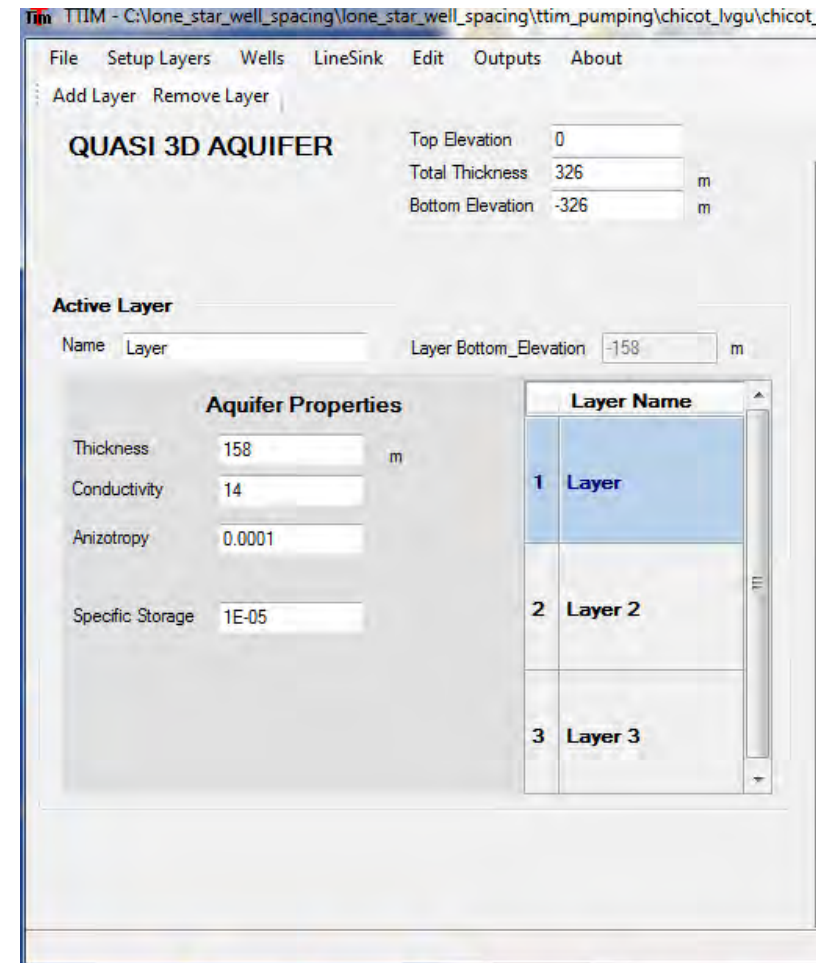
Approach: Definitions and Data (con't)

- ◆ Hydraulic Conductivity = K or K_h (ft/day) – largely controlled by connectivity of sandy units in the horizontal directions
- ◆ Vertical Hydraulic Conductivity = K_v (ft/day) – largely controlled by the vertical profile of clayey/shaly units between the sandy units
- ◆ Hydraulic Conductivity Anisotropy = K_v/K_h – reasonable estimate for average between 0.001 and 0.0001 for an 1 to 4 square mile around well
- ◆ Transmissivity = T or K^* aquifer thickness



Approach: Analytical Model called TTIM is used to Predict Drawdown Values

- ◆ Developed as part of an EPA project ; Graphic User Interface developed by INTERA and SSPA
- ◆ Code algorithms documented in professional journals
- ◆ INTERA has used TTIM for two years to evaluate permit applications at GCDs



Approach: Working Definition of Acceptable Impacts for this Presentation

- ◆ Well spacing criteria is based on predicted drawdowns at the closest well
- ◆ Acceptable drawdown (for this initial study)
 - 15% to 25% of drawdown occurring at pumping well for LVGU
 - 15% to 25% of drawdown occurring at pumping well or 10 ft for SVGU
- ◆ Acceptable criteria can be easily changed





Well Spacing Calculations for Catahoula

Well Spacing Calculations:

◆ Considerations

- Aquifer Thicknesses
- Estimated Properties from LSGCD Catahoula Aquifer Characterization Study

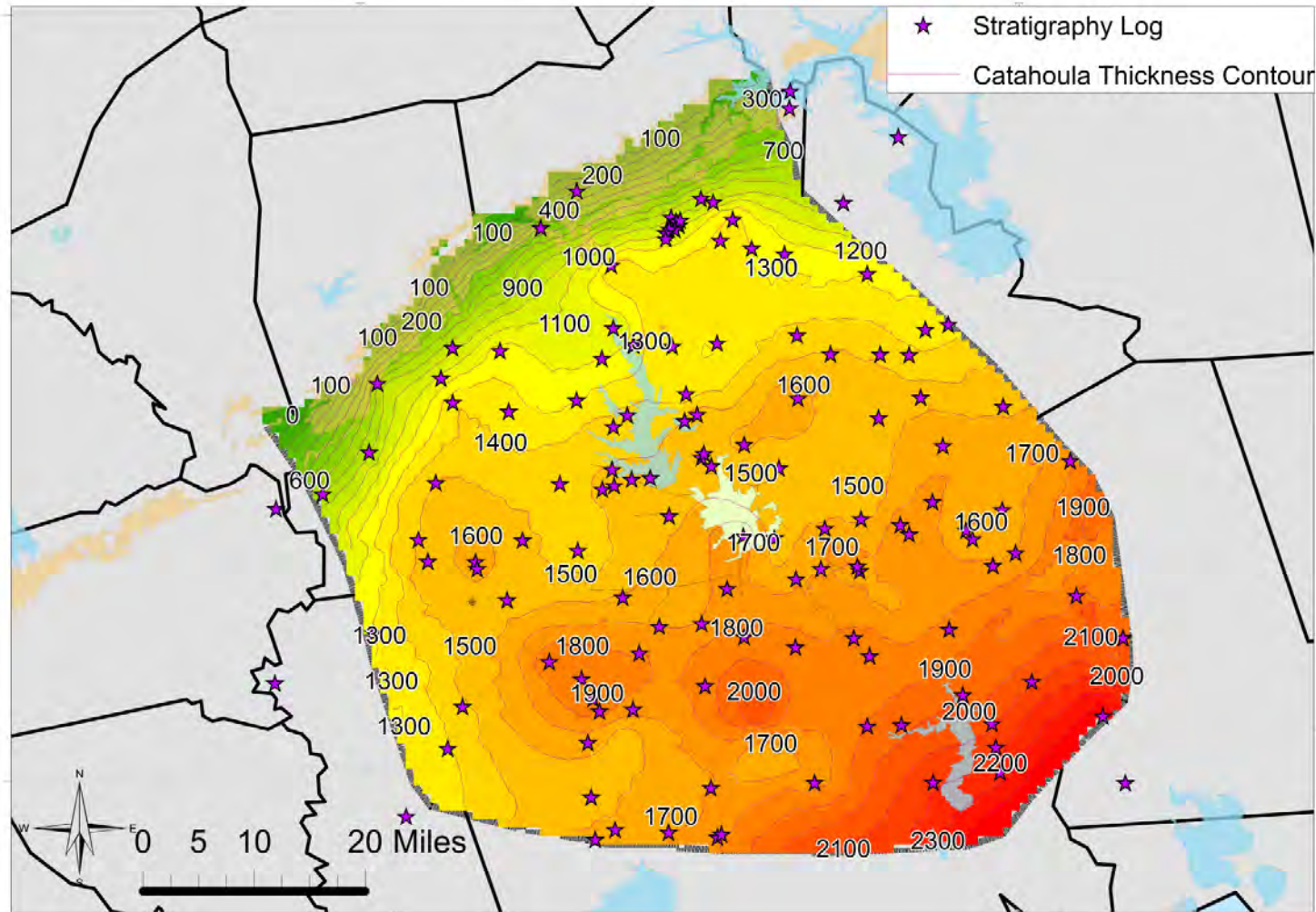
◆ Pumping Scenarios for LVGU and SVGU

- Scenario 1 – pumping between two identical wells at same elevation
- Scenario 2 – pumping between two identical wells at different elevations



Catahoula Thickness (from LSGCD Catahoula report)

14



Catahoula Hydraulic Properties (from LSGCD Catahoula report)

Owner	Well	Transmissivity (ft ² /day) Calculated from		Length of Screened Interval (ft)	Average K (ft/day) Calculated from		Percent Difference between the Measured and Predicted Values
		Aquifer Pumping Test	Lithologic Data ¹		Aquifer Pumping Test	Lithologic Data ¹	
City of Huntsville	Well 19	2,311	1875	570	4.1	3.3	21%
City of Huntsville	Well 18	1,732	1649	720	2.4	2.3	5%
City of Huntsville	Well 17	1,606	1967	515	3.1	3.8	-20%
City of Huntsville	Well 14	850	1239	482	1.8	2.6	-37%
City of Huntsville	Well 13	708	1596	470	1.5	3.4	-77%
City of Huntsville	Well 12	1,378	1295	448	3.1	2.9	6%
City of Huntsville	Well 16	1,220	1590	510	2.4	3.1	-26%
City of Huntsville	Well 15	2,035	1695	526	3.9	3.2	18%
Montgomery County MUD 18	Well 3	1,693	1380	620	2.7	2.2	21%
Montgomery County UD 3	Well 3	1,587	1078	300	5.3	3.6	-77%
Panaorama Village	Well 4	1,725	1637	768	2.2	2.1	-14%
	Average	1,531	1,545	539	2.9	3.0	-16%

- 1 Litho-group Sand assigned a K of 7 ft/dy
 Litho-group Sand w/clay assigned a K of 3 ft/dy
 Litho-group Clay w/sand assigned a K of 1 ft/dy
 Litho-group Clay assigned a K of 0.1ft/dy

Not that average K calculated for MUD 18, UD 3, and Panarorma has been adjusted to 20°C from 40°C



Aquifer Properties for Evaluation of Well Spacing

◆ Catahoula

- Average Thickness of 1300 feet in Area of Interest
- Average Hydraulic Conductivity of 4 ft/day

◆ Other Aquifers

Aquifer	Hydraulic Conductivity (ft/day)	Average Thickness (ft)
Chicot	14	337
Evangeline	5	624
Jasper	8	1250



Pumping Scenario 1

- ◆ Large Volume Groundwater User (LVGU) Scenario
 - Pumping Rates of 100 gpm, 500 gpm, 1000 gpm, 1500 gpm
 - Screened Interval of 200 ft, 400 ft, 600 ft, 800 ft

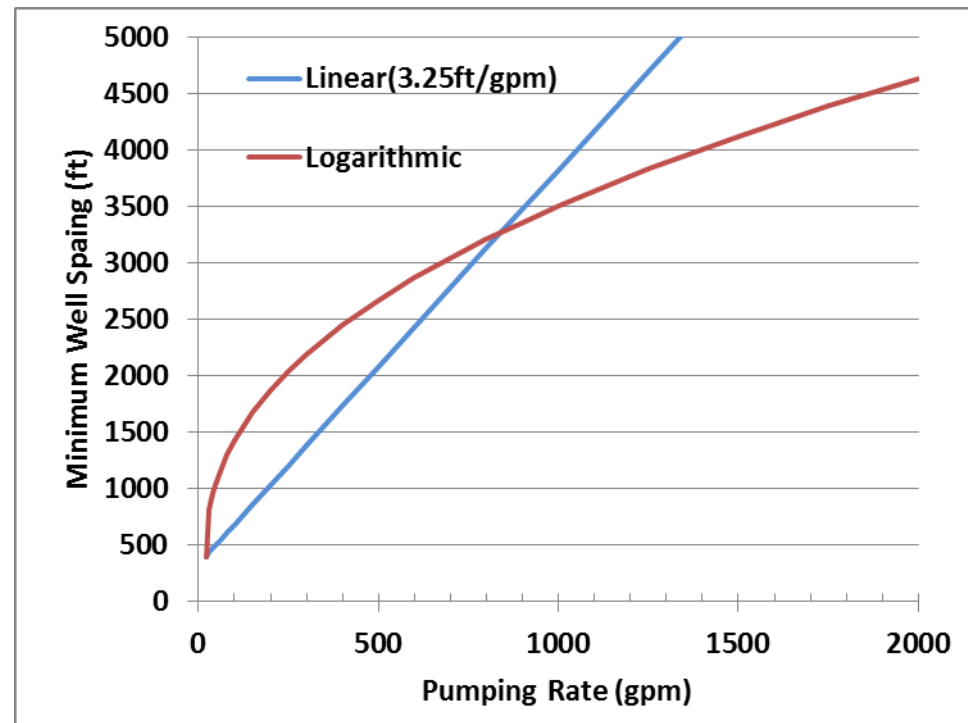
- ◆ Small Volume Groundwater User (SVGU) Scenario
 - Pumping Rates of 5 gpm, 10 gpm, 20 gpm
 - Screened Interval of 10 ft, 20 ft, 40 ft



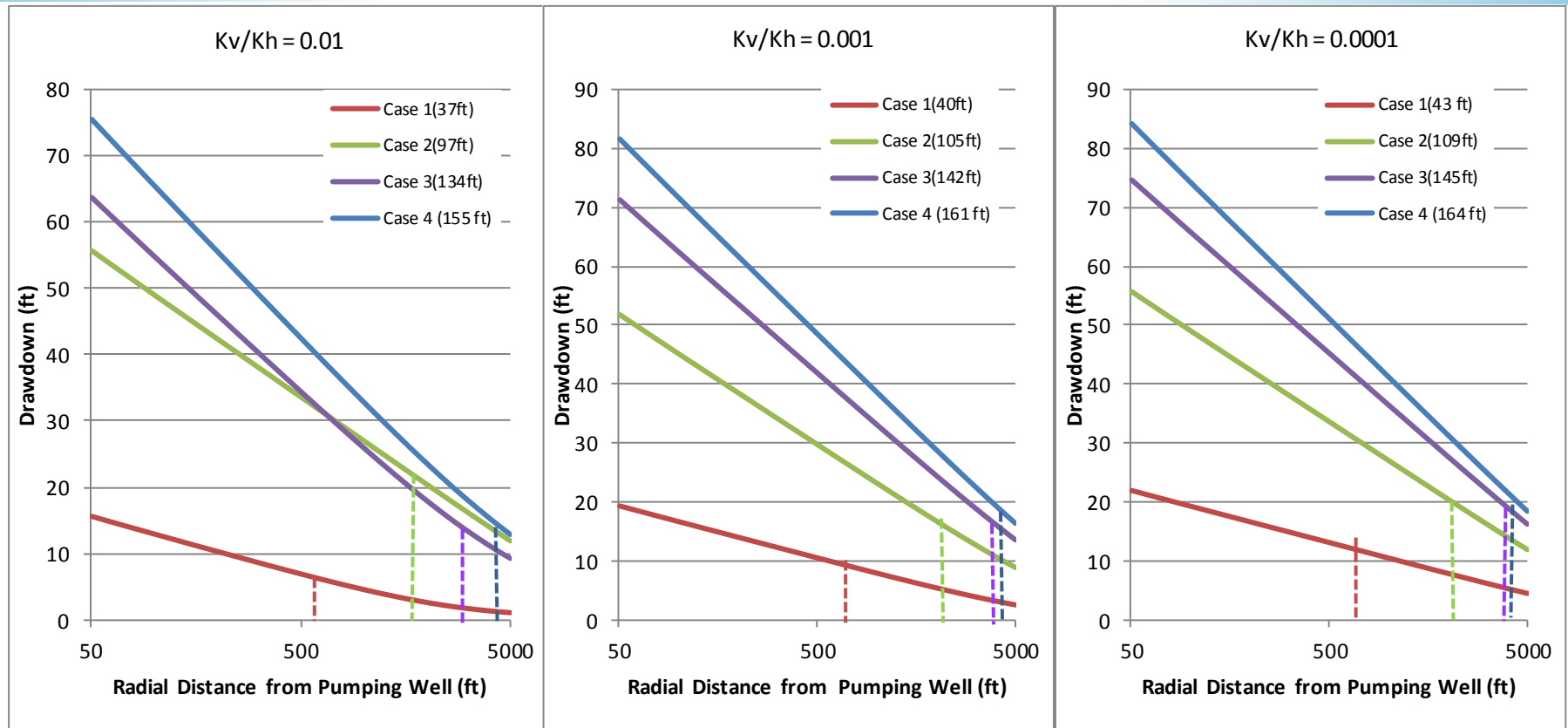
Possible Catahoula Well Spacing Rule for LVGU:

- LVGU well (>20 gpm) spacing based on a non-linear equation that has a minimal well spacing of 400 feet

Max. Pumping	Min. Well	Max. Pumping	Min. Well
20	400	400	2447
30	813	500	2669
40	960	600	2866
50	1070	700	3045
60	1160	800	3209
80	1309	900	3363
100	1431	1000	3506
150	1677	1250	3833
200	1874	1500	4124
250	2042	1750	4389
300	2190	2000	4633



Predicted Drawdowns For LVGU in Catahoula (no vertical offset)



Case	Pumping Rate (gpm)	Screen Length(ft)	Rule Spacing (ft)
1	100	200	680
2	500	400	2080
3	1000	600	3830
4	1500	800	4124



Possible Catahoula Well Spacing Rule: Vertical Offset of 300 feet

- ◆ For vertical offset of 300 feet, reduce spacing by 80%

Pumping Rate (gpm)	Screen Length (ft)	Vertical Offset (ft)	Rule Spacing (ft)	Estimated Drawdown (ft) with Kv/Kh=0.01	Estimated Drawdown (ft) with Kv/Kh=0.001	Estimated Drawdown (ft) with Kv/Kh=0.0001
1000	600	0	3506	11.3	17.6	20.6
1300	600	0	3894	14.7	21.3	25.0
1600	600	0	4233	17.0	24.7	29.2

Best Estimate

Pumping Rate (gpm)	Screen Length (ft)	Vertical Offset (ft)	Rule Spacing (ft)	Estimated Drawdown (ft) with Kv/Kh=0.01	Estimated Drawdown (ft) with Kv/Kh=0.001	Estimated Drawdown (ft) with Kv/Kh=0.0001
1000	600	300	701	12.2	5.2	1.8
1300	600	300	779	15.9	6.8	2.4
1600	600	300	847	17.7	8.4	2.9



Other Possible Considerations:

- ◆ Spacing requirements for drilling wells set to Texas Department of Licenses and Regulations
- ◆ Aggregate Permits (combining multiple wells effects at a single well)
- ◆ Hydrological Assessments or Aquifer Pumping Tests as part of application
- ◆ Request for Variance

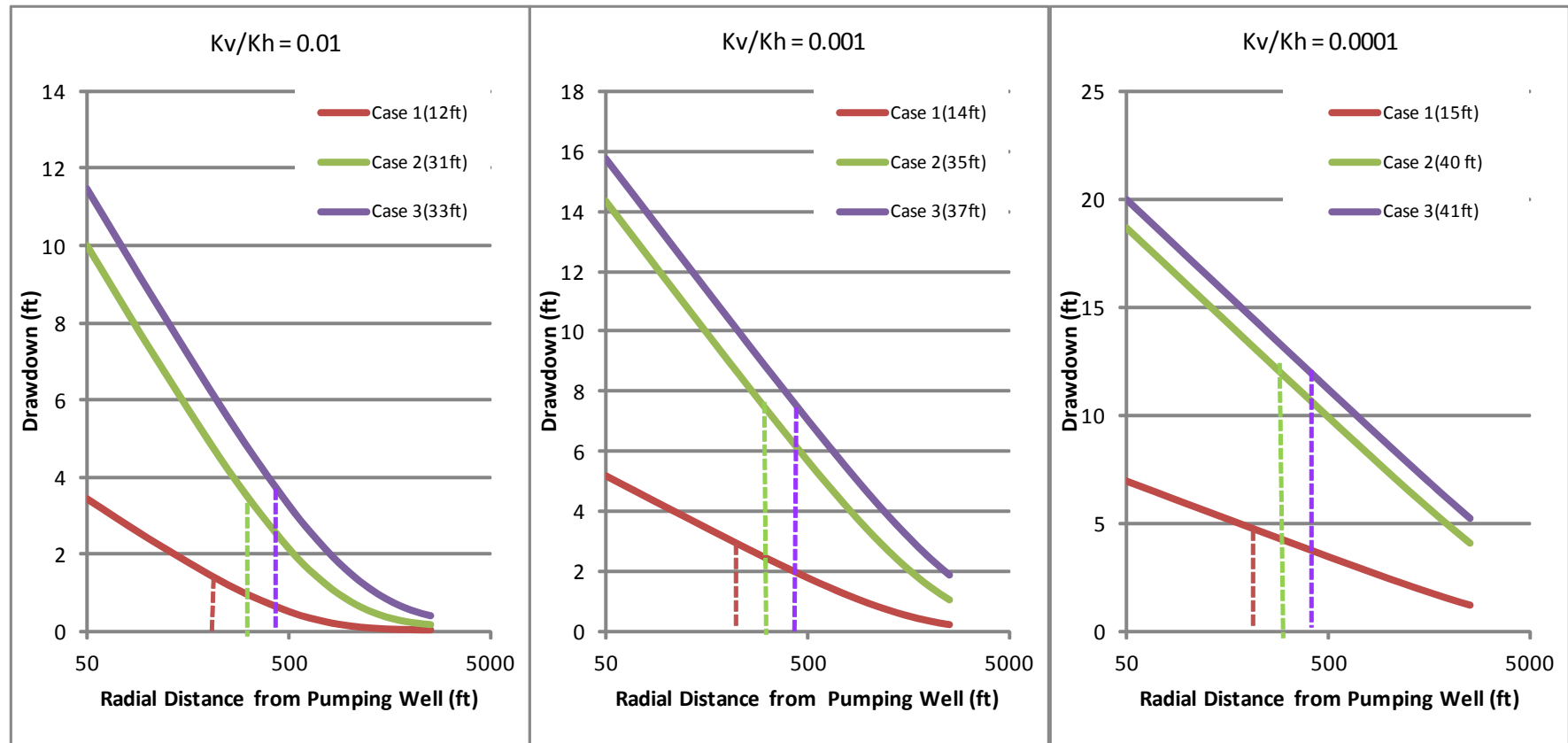


Possible Catahoula Well Spacing Rule for SVGU:

- ◆ Less than 10 gpm - 200 ft spacing
- ◆ Greater than 10 gpm but less than 15 gpm - 300 ft Spacing
- ◆ Greater than 15 gpm but less than 20 gpm – 400 ft spacing



Predicted Drawdowns For SVGU in Catahoula (no vertical offset)



Case	Pumping Rate (gpm)	Screen Length(ft)	Rule Spacing (ft)
1	2	10	200
2	10	20	300
3	20	40	400

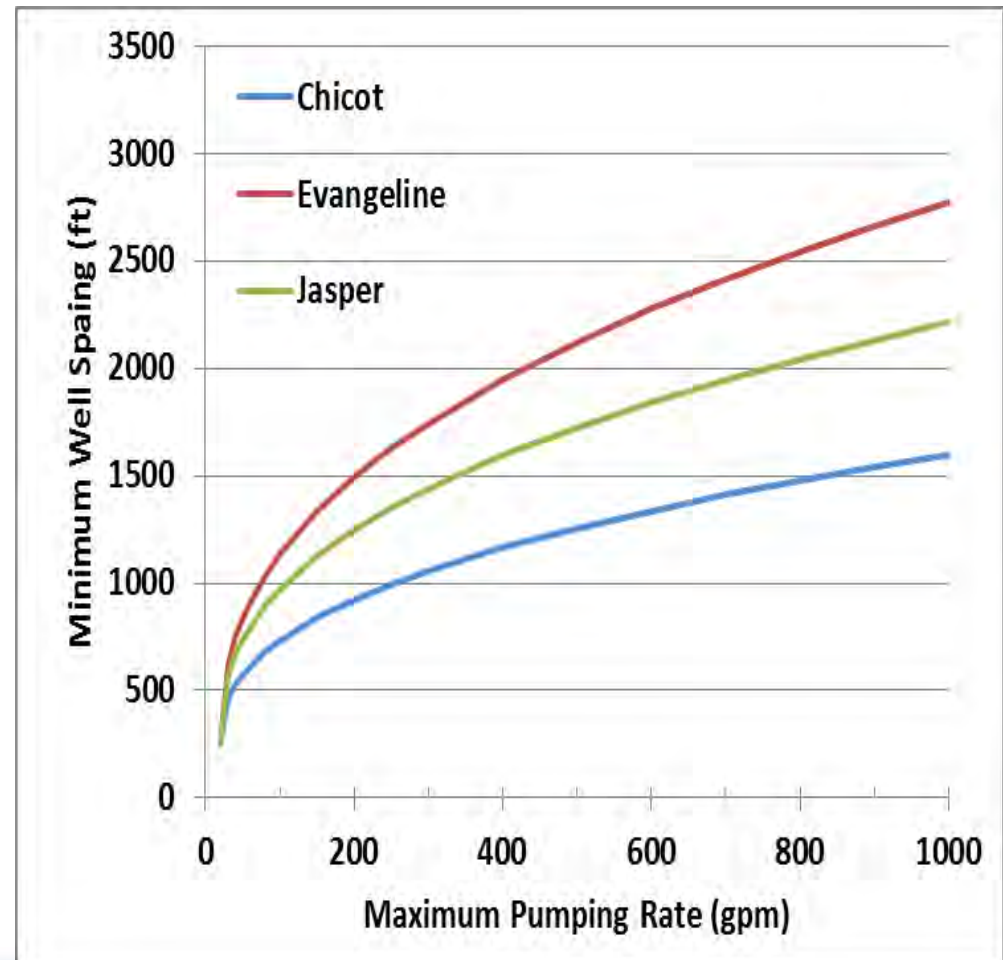




Summary of Possible Well Spacing Calculations for Chicot, Evangeline, and Jasper

Well Spacing Calculations for Chicot, Evangeline, and Jasper Aquifers:

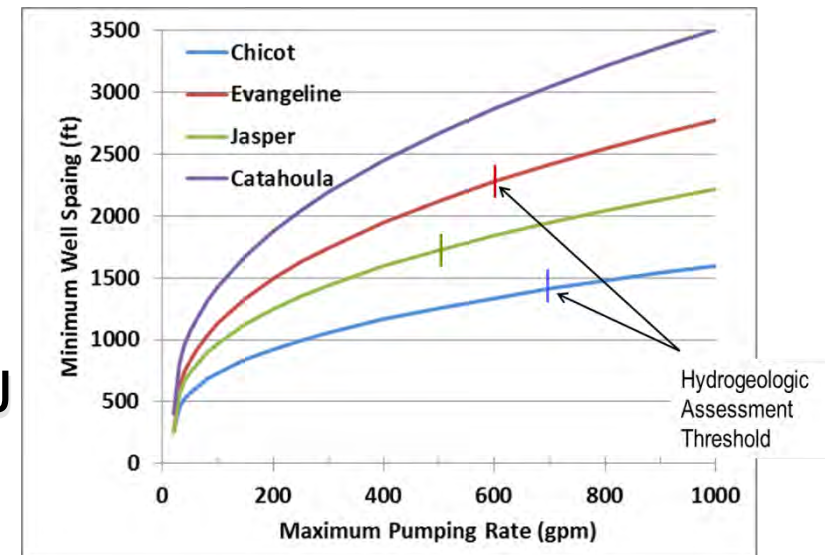
- ◆ SVGU (< 20 gpm) wells have same spacing
 - = < 10 gpm -150 ft spacing
 - = ≥ 10 gpm & < 15 gpm -200 ft spacing
 - = ≥ 15 gpm & < 20 gpm -250 ft spacing
- ◆ LVGU wells (>20 gpm) have spacing based on a non-linear equation that includes a minimal well spacing of 250 feet at 20 gpm



Recommendation Highlights:

- ◆ **Different Set of Well Spacing Rules for Each Aquifer**
 - Well spacing is based primarily on estimated average hydraulic conductivity

Catahoula (4 ft/day)	Evangeline (5 ft/day)
Jasper (7 ft/day)	Chicot (14 ft/day)
 - Largest Well spacing required for Catahoula: smallest well spacing required for Chicot
- ◆ **Spacing is based on the maximum production rate**
 - Spacing requirements for LVGUs are calculated from a non-linear equation that requires only the permitted production rate
 - Spacing requirements for SVGUs are from obtained from a look up table
- ◆ **Minimum Well Spacing for SVGU and LVGU**
- ◆ **Hydrological Assessments Required for High Pumping Rates**



Theoretical Considerations: Factors that Lessen Pumping Impacts at Existing Wells

- ◆ **Consider the Protection Provided by Vertical Offsets between the Well Screens of Adjacent Wells**
 - Clay beds between sand layers reduces values for K_v
 - Low values for K_v/K_h (ratio of vertical to horizontal hydraulic conductivity) promotes lateral flow and hinders the vertical migration of the pressure decline
- ◆ **Consider Recharge Sources Including Cross-flow to Prevent Continual Expansion of Cone-of-Depression**
 - Requires considerable knowledge and a sophisticated model for the Gulf Coast aquifer system
 - Complex issues and approach that may be difficult to validate



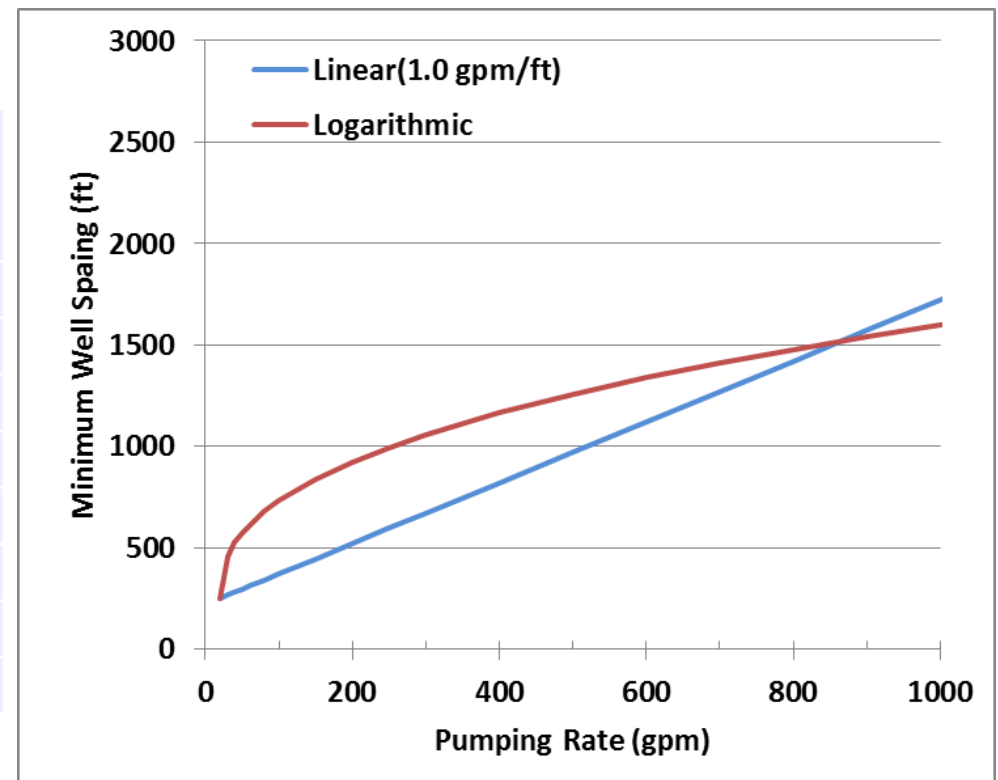
Well Spacing Calculations for Chicot, Evangeline, and Jasper Aquifers:

- ◆ Well Spacing Requirement are Reduced when at least 200 feet of Vertical Distance between the Well Screen of the Permit Well and the Well Screen of the Closest Well
 - For both SVGU (< 20 gpm) and LVGU wells (>20 gpm) the well spacing is reduced by 80% of the well spacing with no vertical offset
 - Case Example
 - No vertical offset: well spacing = 100 feet
 - With 200 feet of vertical offset: well spacing=20 ft



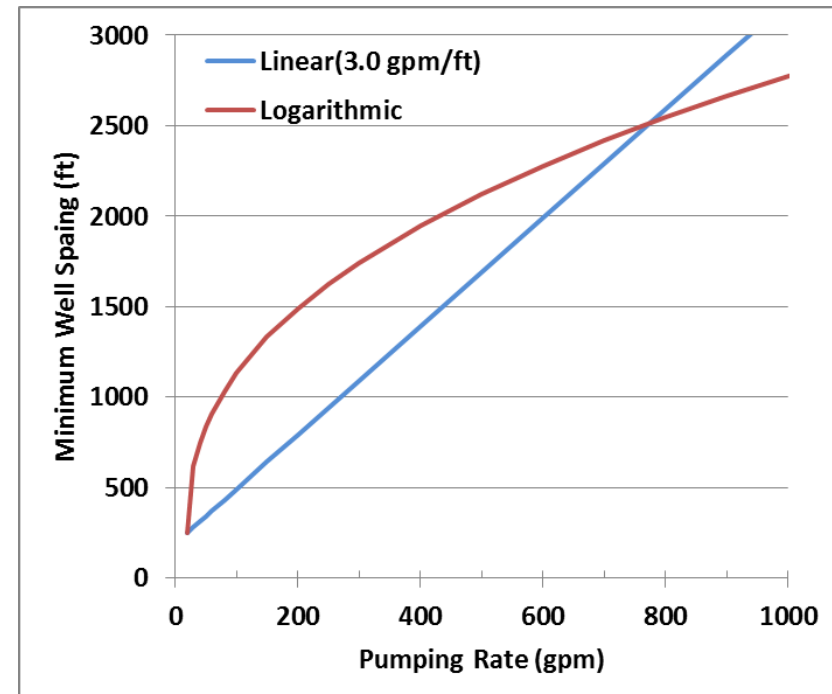
Well Spacing Calculations for Chicot Aquifer LVGU Wells: No Vertical Offset

Max. Pumping Rate (gpm)	Min. Well Spacing (ft)	Max. Pumping Rate (gpm)	Min. Well Spacing (ft)
20	250	200	923
30	456	250	994
40	523	300	1056
50	573	400	1164
60	613	500	1256
80	679	600	1337
100	732	700	1410
150	839	800	1477



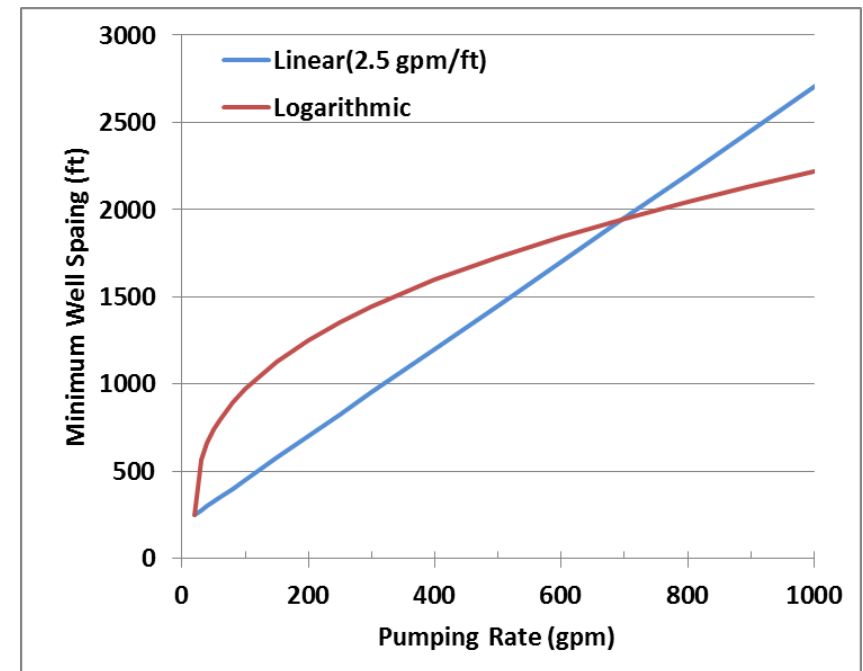
Well Spacing Calculations for Evangeline Aquifer LVGU Wells: No Vertical Offset

Max. Pumping Rate (gpm)	Min. Well Spacing (ft)	Max. Pumping Rate (gpm)	Min. Well Spacing (ft)
20	250	200	1490
30	618	250	1624
40	743	300	1743
50	834	400	1947
60	909	500	2122
80	1032	600	2277
100	1132	700	2417
150	1331	800	2545



Well Spacing Calculations for Jasper Aquifer LVGU Wells: No Vertical Offset

Max. Pumping Rate (gpm)	Min. Well Spacing (ft)	Max. Pumping Rate (gpm)	Min. Well Spacing (ft)
20	250	200	1248
30	564	250	1351
40	664	300	1441
50	737	400	1595
60	797	500	1727
80	893	600	1843
100	971	700	1948
150	1126	800	2044





Considerations Associated with Developing Well Spacing Calculations for Chicot, Evangeline, and Jasper

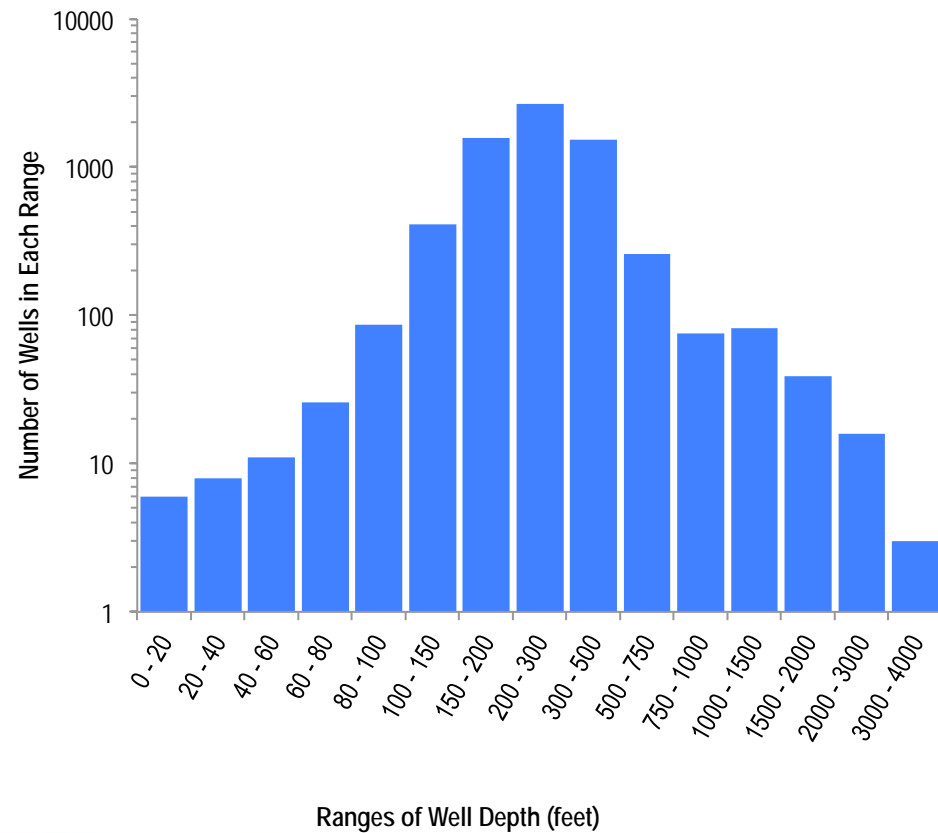


Location and Construction of Existing Wells

Well Depth Distribution

Bin	Frequency
0 - 20	6
20 - 40	8
40 - 60	11
60 - 80	26
80 - 100	86
100 - 150	413
150 - 200	1578
200 - 300	2668
300 - 500	1532
500 - 750	259
750 - 1000	76
1000 - 1500	82
1500 - 2000	39
2000 - 3000	16
3000 - 4000	3
No Data	312

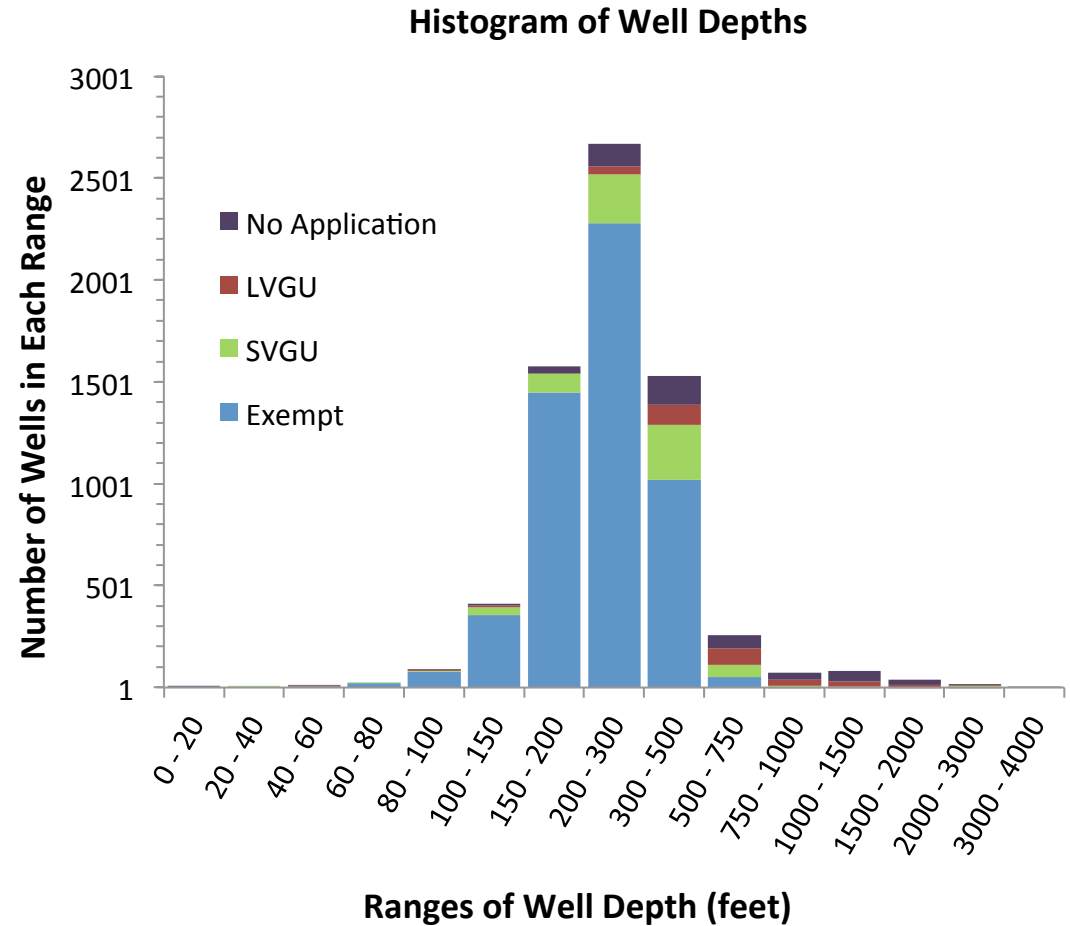
Histogram of Well Depths



Note: Unequal axis intervals

Well Depth Distribution by Well Type

Bin	Frequency			
	LVGU	SVGU	Exempt	No Application
0 - 20	0	0	5	1
20 - 40	0	1	7	0
40 - 60	0	2	9	0
60 - 80	0	2	24	0
80 - 100	1	4	80	1
100 - 150	7	38	357	11
150 - 200	2	95	1448	33
200 - 300	37	242	2279	110
300 - 500	98	267	1022	145
500 - 750	79	59	54	67
750 - 1000	29	9	0	38
1000 - 1500	24	5	0	53
1500 - 2000	12	2	0	25
2000 - 3000	5	9	0	2
3000 - 4000	0	1	1	1



Note: Unequal axis intervals

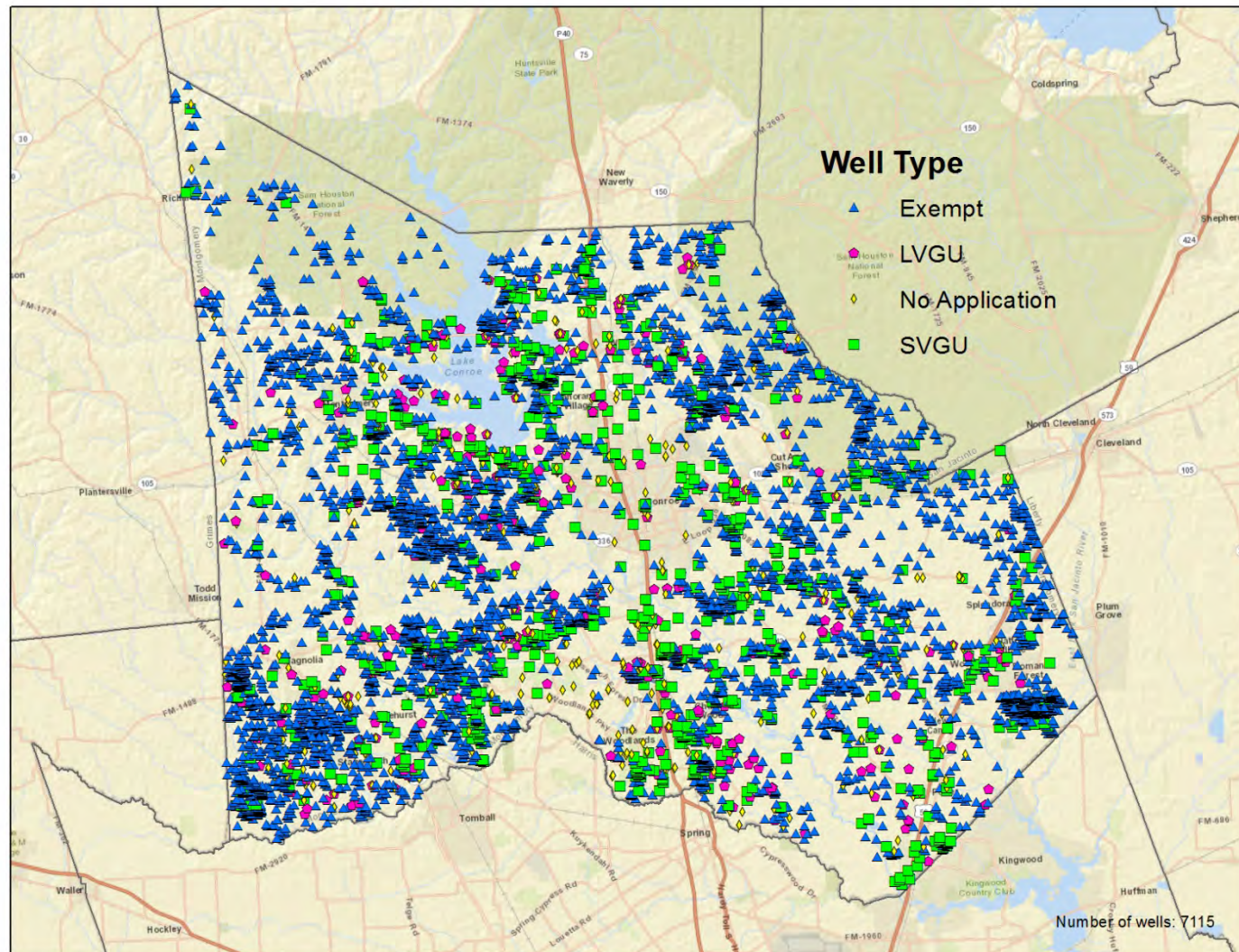


Well Depth Distribution by Well Type and Aquifer

	Well Depth (ft)											
	Chicot			Evangeline			Jasper			All		
Percentile	Exempt	SVGU	LVGU	Exempt	SVGU	LVGU	Exempt	SVGU	LVGU	Exempt	SVGU	LVGU
10%	145	155	205	200	201	315	170	222	402	156	175	271
25%	180	200	271	250	300	399	215	316	531	190	220	350
33%	190	220	300	275	323	442	240	360	635	200	240	397
50%	208	250	342	325	371	532	285	415	745	220	300	502
66%	227	295	380	370	404	651	338	472	948	250	358	650
75%	240	305	430	398	450	698	371	530	1085	280	400	738
90%	280	380	586	445	600	910	454	758	1513	370	528	1090
Average	210	261	363	325	390	596	300	494	856	246	363	633
Std dev.	55	88	151	95	155	278	109	363	405	100	346	452



Practical Considerations : Location of Existing Wells



Practical Considerations: Location of Existing Wells (con't)

Well Spacing Requirements Should not be Overly Restrictive.

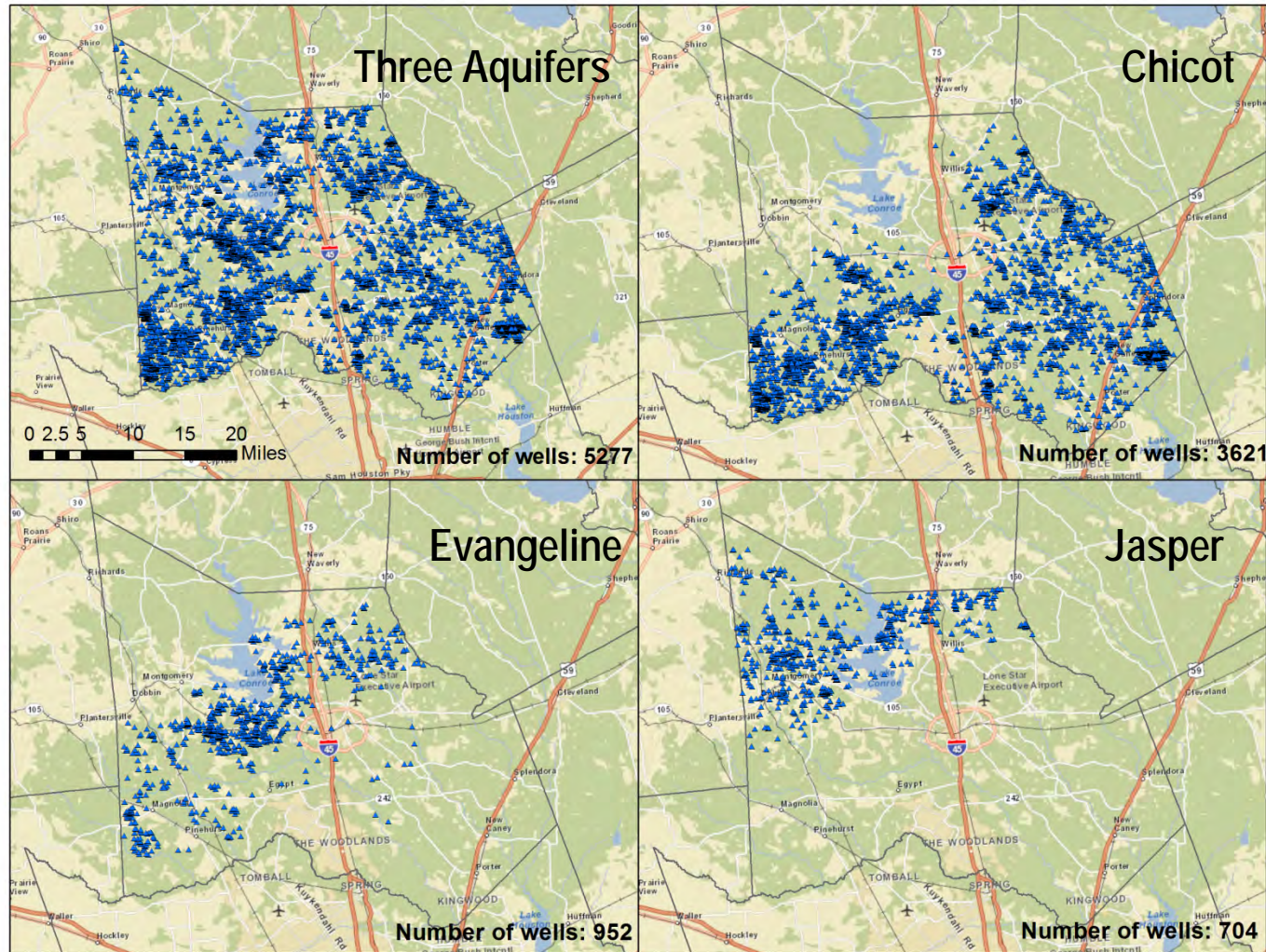
Should Consider Factors that could Lessen Impacts at Existing Wells

Well Type	Radial Distance (ft)						Total
	<500	500-1000	1000-1500	1000-2000	2000-2500	> 2500	
Exempt	2725	1463	587	265	132	128	5300
LVGU	168	51	44	20	9	10	302
SVGU	446	227	91	58	26	20	868
NoApplication	410	86	60	18	13	19	606
Grand Total	3749	1827	782	361	180	177	7076
note 1 : removed 37 wells that had the same coordinates as another well							
note 2: Numbers of wells with another well closer than the radial distance. For example, there are 2725 exempt wells that are within 500 ft of another well.							

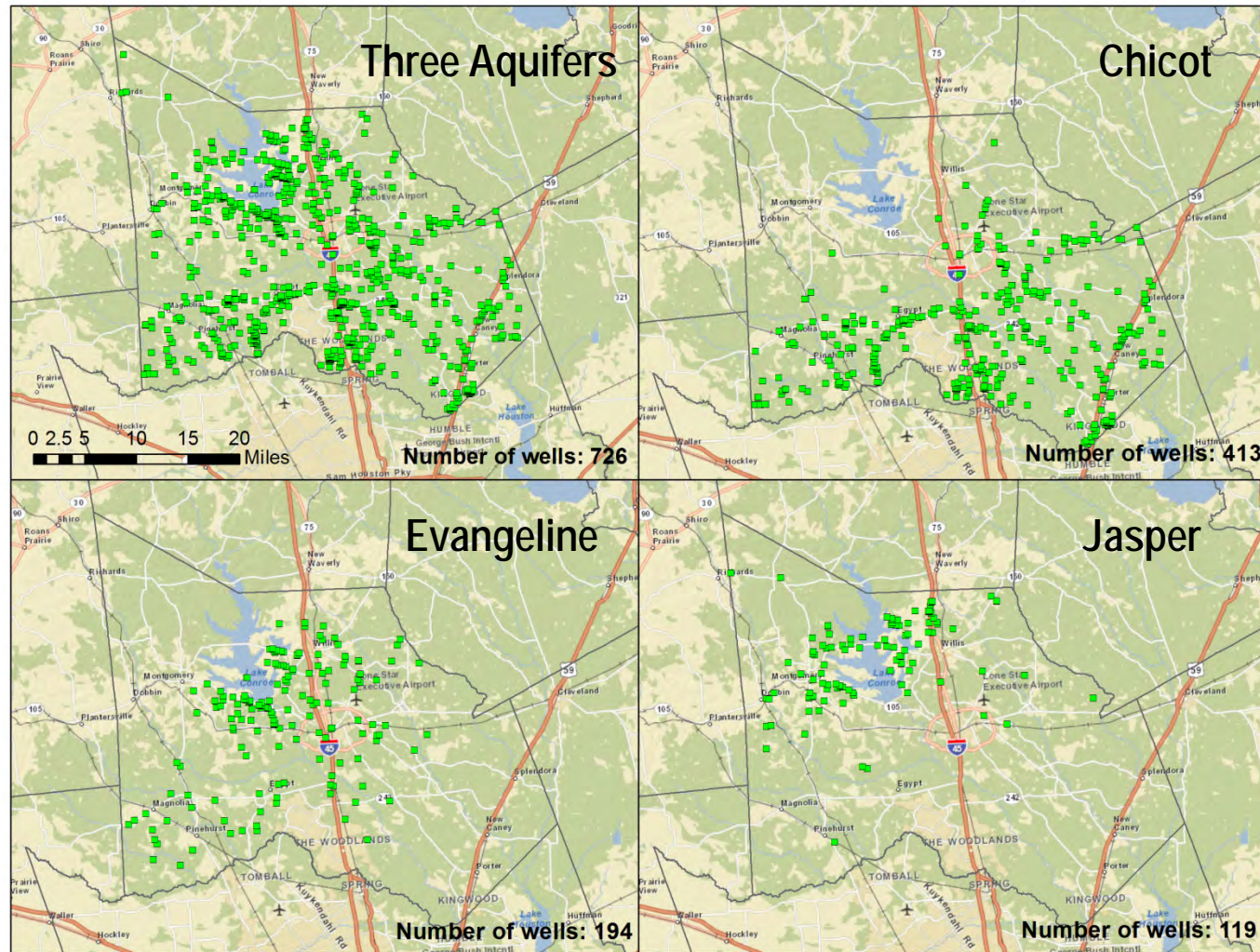
Area Associated with Buffers Around Existing Wells	Area (mi ²)	Area (mi ²) Covered by Buffers and Lake Conroe	Percent of County Available for Permitting
500-ft buffers	133	167	84%
1000-ft buffers	362	396	63%
1500-ft buffers	569	603	44%
Montgomery County	1077		
Lake Conroe	35		



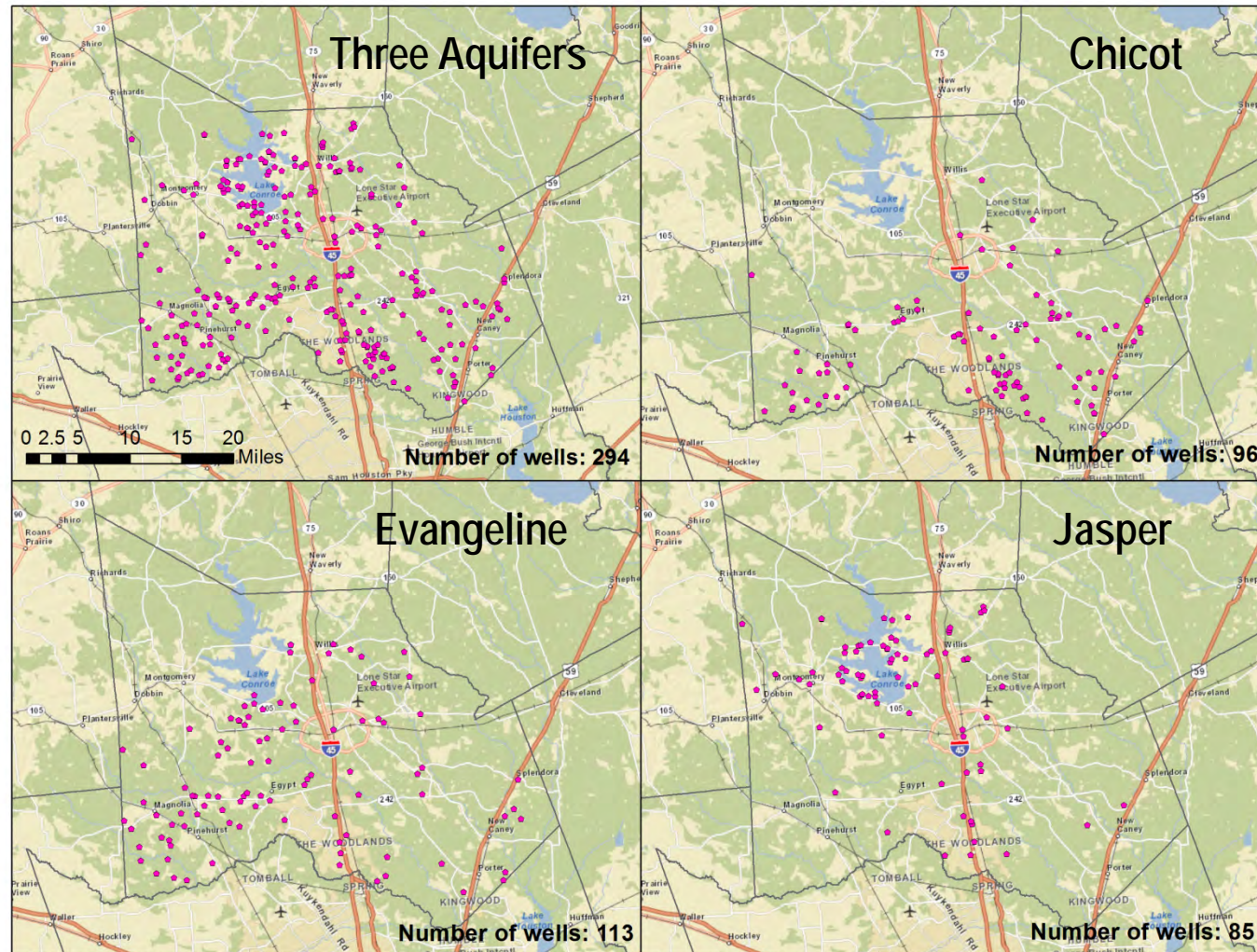
Distribution of Exempt Wells



Distribution of SVGU Wells



Distribution of Large Volume Groundwater User



Distribution of Well Screens and Production

	Chicot					
	Exempt		LVGU		SVGU	
Percentile	Screen Length	Annual Production	Screen Length	Annual Production	Screen Length	Annual Production
0.1	10	<0.2	0	22.8	0	0.2
0.25	10	<0.2	10	31.1	10	0.4
0.33	10	<0.2	20	39.6	10	0.6
0.5	15	<0.2	22	73.7	20	1.0
0.66	20	<0.2	40	97.9	20	1.9
0.75	20	<0.2	62	142.0	20	3.8
0.9	20	<0.2	178	554.3	42	10.6
Average	16	<0.2	60	173.2	25	3.4
Std dev.	13	na	88	257.7	34	4.8

	Evangeline					
	Exempt		LVGU		SVGU	
Percentile	Screen Length	Annual Production	Screen Length	Annual Production	Screen Length	Annual Production
0.1	10	<0.2	0	27.6	0	0.2
0.25	10	<0.2	20	44.0	10	0.6
0.33	11	<0.2	20	50.2	10	1.0
0.5	20	<0.2	40	76.2	20	1.9
0.66	20	<0.2	58	141.3	20	5.1
0.75	20	<0.2	71	180.3	23	7.6
0.9	23	<0.2	254	405.8	60	13.1
Average	17	<0.2	89	265.1	31	4.7
Std dev.	14	na	150	1204.0	61	5.4

	Jasper					
	Exempt		LVGU		SVGU	
Percentile	Screen Length	Annual Production	Screen Length	Annual Production	Screen Length	Annual Production
0.1	10	<0.2	0	32.6	0	0.2
0.25	10	<0.2	14	52.4	2	0.7
0.33	12	<0.2	21	61.1	10	1.0
0.5	20	<0.2	49	127.0	20	5.7
0.66	20	<0.2	103	314.6	31	9.5
0.75	20	<0.2	213	408.6	38	12.0
0.9	25	<0.2	400	600.8	111	15.3
Average	18	<0.2	128	467.9	68	6.8
Std dev.	13	na	161	1299.4	202	6.2

	All					
	Exempt		LVGU		SVGU	
Percentile	Screen Length	Annual Production	Screen Length	Annual Production	Screen Length	Annual Production
0.1	10	<0.2	0	26.0	0	0.1
0.25	10	<0.2	15	41.9	10	0.5
0.33	10	<0.2	20	50.4	10	0.7
0.5	20	<0.2	36	86.6	20	1.4
0.66	20	<0.2	60	145.3	20	3.8
0.75	20	<0.2	100	243.8	25	7.0
0.9	20	<0.2	307	562.6	60	13.6
Average	17	<0.2	102	303.3	34	4.2
Std dev.	48	na	176	1028.2	94	5.3

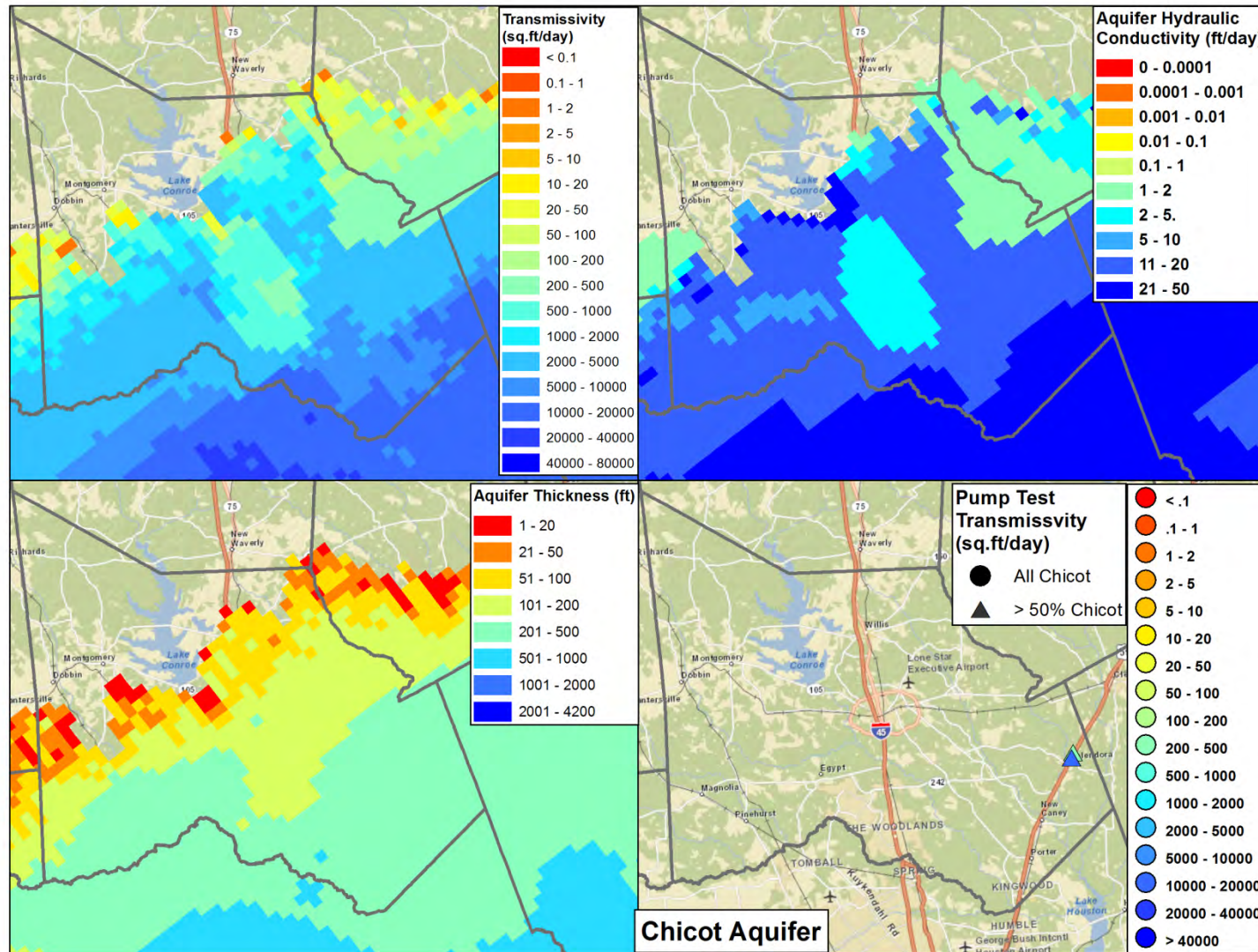
Well Statistics From LSGCD Well Database

	Count	Average Well Depth (feet)	Standard Deviation Well Depth	Average Production (gpm)	Standard Deviation Production (gpm)	Average Screen Length (feet)	Standard Deviation Screen Length
LVGU	310	635	452	303	1028	123	186
SVGU	883	365	346	4.2	5.3	41	102
Exempt	5304	244	100	<0.2	na	19	159
No Application	618	570	442			110	227

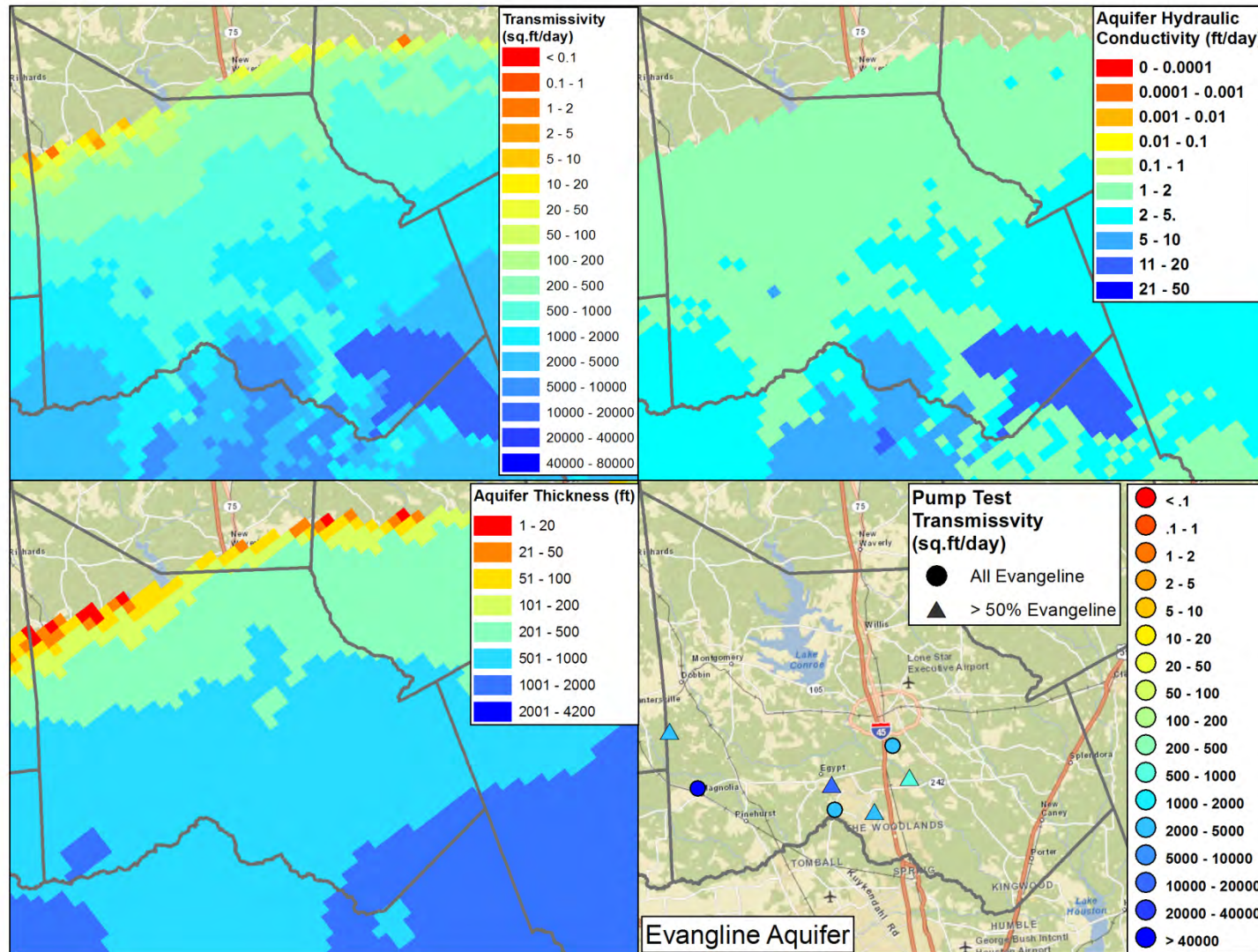


Aquifer Hydraulic Properties

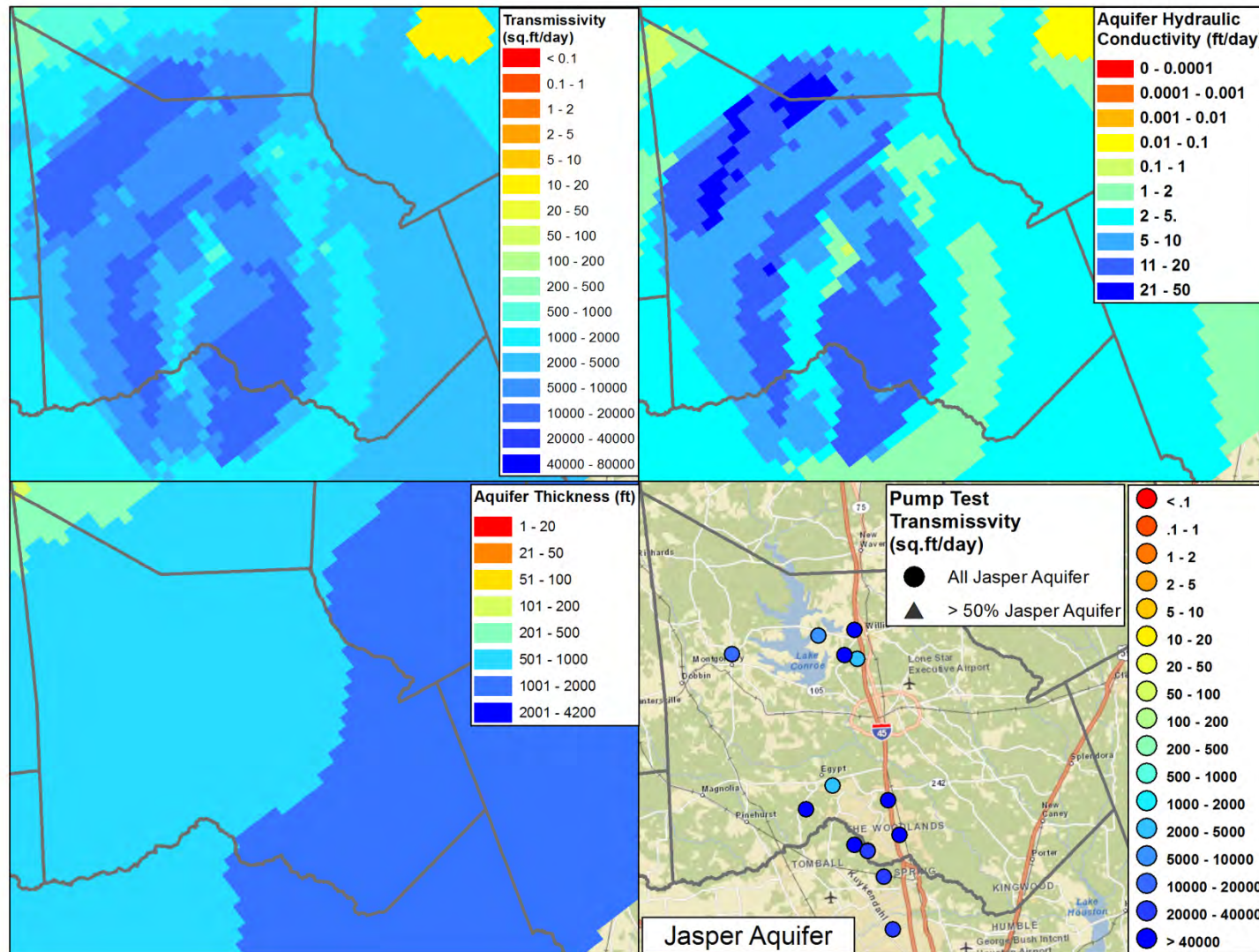
HAGM Aquifer Properties: Chicot



HAGM Aquifer Properties: Evangeline



HAGM Aquifer Properties: Jasper



Hydraulic Conductivity & Transmissivity Values

HAGM	Hydraulic Conductivity (ft/day)			
Percentile	Chicot	Evangeline	Burkeville	Jasper
0.05	1.4	1.2	0.00	1.3
0.25	9.1	1.2	0.00	2.0
0.50	14.1	1.6	0.01	4.9
0.75	18.1	2.3	0.01	10.6
0.95	34.1	13.5	0.02	17.2
Mean	14.7	2.7	0.01	6.8
Stand. Dev.	9.3	3.2	0.01	5.4

GMA 14	Hydraulic Conductivity (ft/day)			
Percentile	Chicot	Evangeline	Burkeville	Jasper
0.05	1.4	0.2	0.00	0.6
0.25	12.1	0.2	0.01	1.3
0.50	16.7	1.1	0.01	1.4
0.75	141.4	2.2	0.01	1.9
0.95	200.0	2.9	0.02	5.4
Mean	77.8	1.6	0.01	2.3
Stand. Dev.	184.4	3.5	0.01	4.5

HAGM	Transmissivity (sqft/day)			
Percentile	Chicot	Evangeline	Burkeville	Jasper
0.05	155	184	0.0	1290
0.25	795	582	0.7	2270
0.50	2630	1010	2.4	4100
0.75	4545	1830	3.3	9195
0.95	11700	12600	5.0	14500
Mean	3596	2078	2.3	5872
Stand. Dev.	3662	3408	1.7	4533

GMA 14	Transmissivity (sqft/day)			
Percentile	Chicot	Evangeline	Burkeville	Jasper
0.05	163	31	0.0	565
0.25	1946	100	1.0	995
0.50	4470	835	2.0	1362
0.75	22214	1576	3.0	1745
0.95	56448	3083	5.0	4575
Mean	13637	1152	2.3	2053
Stand. Dev.	17598	2087	1.7	3671

Note: HAGM average hydraulic conductivity in Chicot is reduced by a factor of 5 increased in the Jasper the hydraulic conductivity is increased by a factor of 3



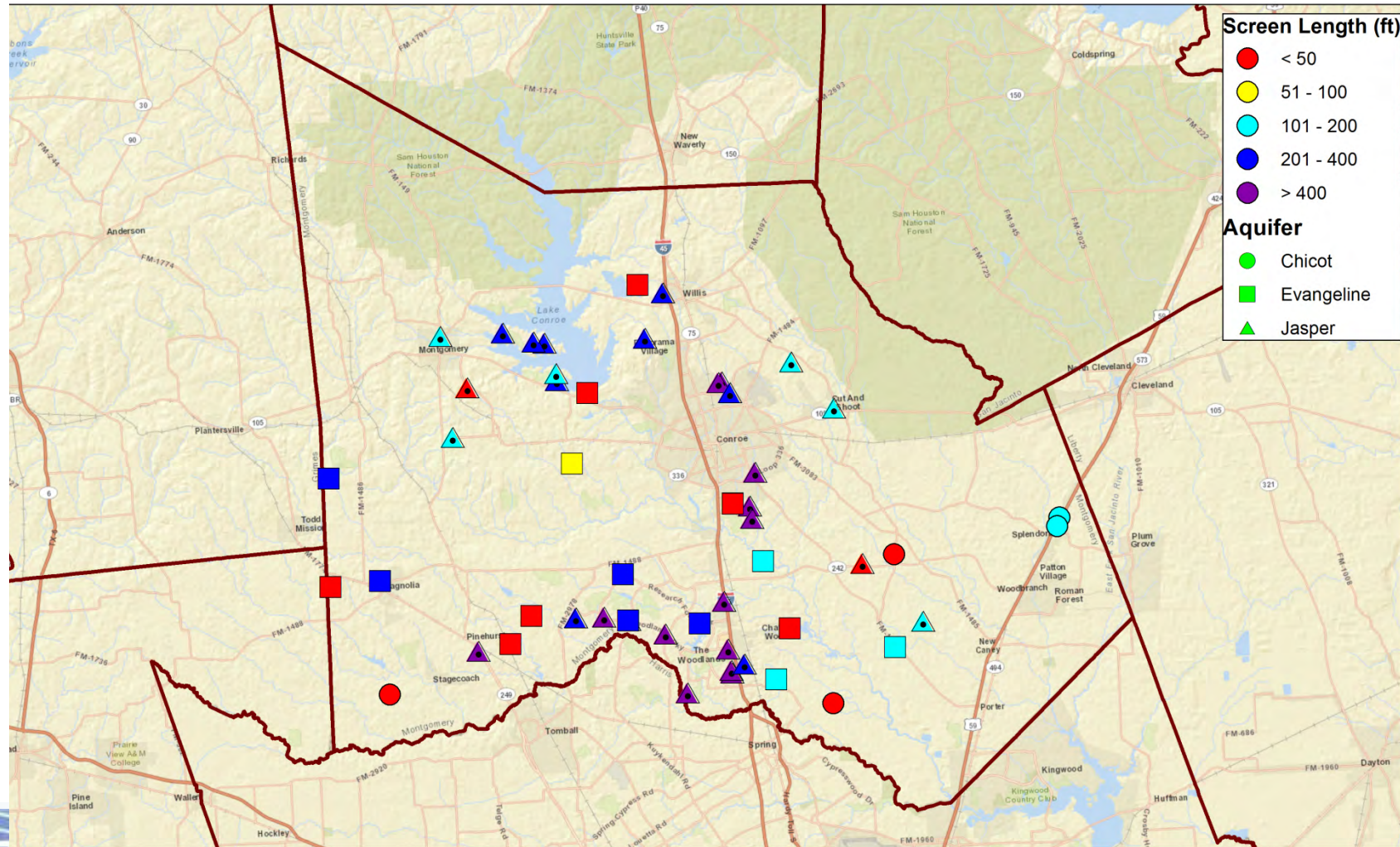
Specific Storage & Storativity Values

HAGM	Storativity (-)			
Percentile	Chicot	Evangeline	Burkeville	Jasper
0.05	0.0500	0.0004	0.0001	0.0003
0.25	0.0500	0.0004	0.0002	0.0004
0.50	0.1000	0.0004	0.0002	0.0004
0.75	0.1000	0.0090	0.0003	0.0005
0.95	0.1500	0.0900	0.0500	0.2000
Mean	0.0890	0.0160	0.0030	0.0108
Stand. Dev.	0.0371	0.0357	0.0115	0.0444
Area(mi ²)	823	1029	1068	1131

HAGM	Thickness (ft)			
Percentile	Chicot	Evangeline	Burkeville	Jasper
0.05	43.0	153.0	45.7	713.0
0.25	126.5	472.0	154.0	809.5
0.50	210.0	624.0	208.0	861.0
0.75	306.5	780.0	252.0	1034.5
0.95	382.7	1057.6	358.7	1281.0
Mean	213.1	615.5	204.8	920.5
Stand. Dev.	110.9	257.2	89.1	189.1
Area(mi ²)	823	1029	1068	1131

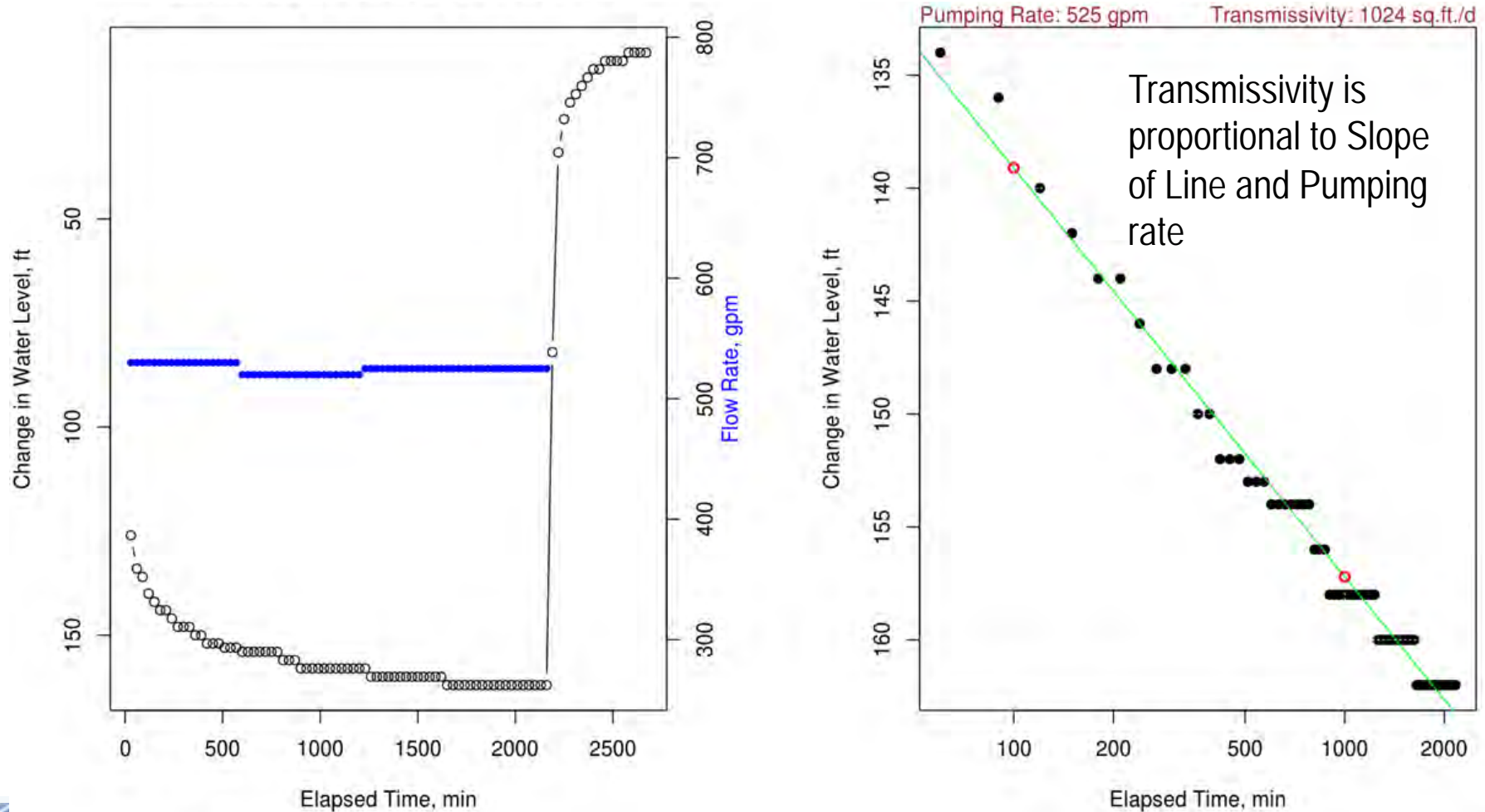


Location of Aquifer Tests Based on TWBD-Revised GAM Surfaces



Cooper-Jacob Straight-Line Analysis

Method Used to Calculate Transmissivity



Comparison Aquifer Test Results to HAGM Aquifer Properties

GAM Layer	Statistic	Aquifer Tests			Model Parameter at Test Locations		Ratio for Hydraulic Conductivity Medians for Aquifer Tests and Model
		Number of Tests	Hydraulic Conductivity (ft / day)	Screen Length(ft)	Hydraulic Conductivity (ft /day)	Layer Thickness (ft)	
Chicot	Average	2	19.9	125	13.8	352	1.4
	Median		19.9	125	13.8	352	
Evangeline	Average	8	21.5	293	3.3	697	11.1
	Median		17.0	306	1.5	695	
Jasper	Average	25	21.0	361	9.3	900	1.2
	Median		12.5	422	10.2	861	

Note: Results from single well aquifer test with well having at least 100 feet interval between top-of-screen and bottom-of-screen for Chicot, Evangeline, and Burkeville, at least 200 feet interval for Jasper



Adjustment of Aquifer Test Results for Partial Penetration

GAM Layer	Statistic	Hydraulic Conductivity (ft /day)	
		From Aquifer Tests (Transmissivity/ Screen Length)	Adjustment for Partial Penetrating Wells *
Chicot	Median	19.9	13
Evanageline	Median	17.0	7
Jasper	Median	12.5	10

- Adjustments based on analytical models for partial penetrating wells to see how much hydraulic conductivity is over estimated when the well is not full penetration and aquifer above and below the well screen is contributing water




Estimate of Hydraulic Conductivity for Chicot, Evangeline, and Jasper

Aquifer	Best Estimate of Median Hydraulic Conductivity Based on Aquifer Tests		Median Hydraulic Conductivity (ft/dy) From HAGM	Hydraulic Conductivity (ft/dy) for Evaluation of Well Space Recommendations
	Value (ft/day)	Confidence Interval		
Chicot ¹	13	Low	14.1	14
Evangeline ¹	7	Moderate	1.6	5
Jasper ²	10	Moderate to Good	4.9	8

¹ Chicot and Evangeline are defined by the TWDB-revised GAM Surfaces for the Chicot and the Evangeline Aquifer, respectively

² Jasper includes both the Middle Lagarto and the Jasper Aquifer as defined by the TWDB-revised GAM Surfaces

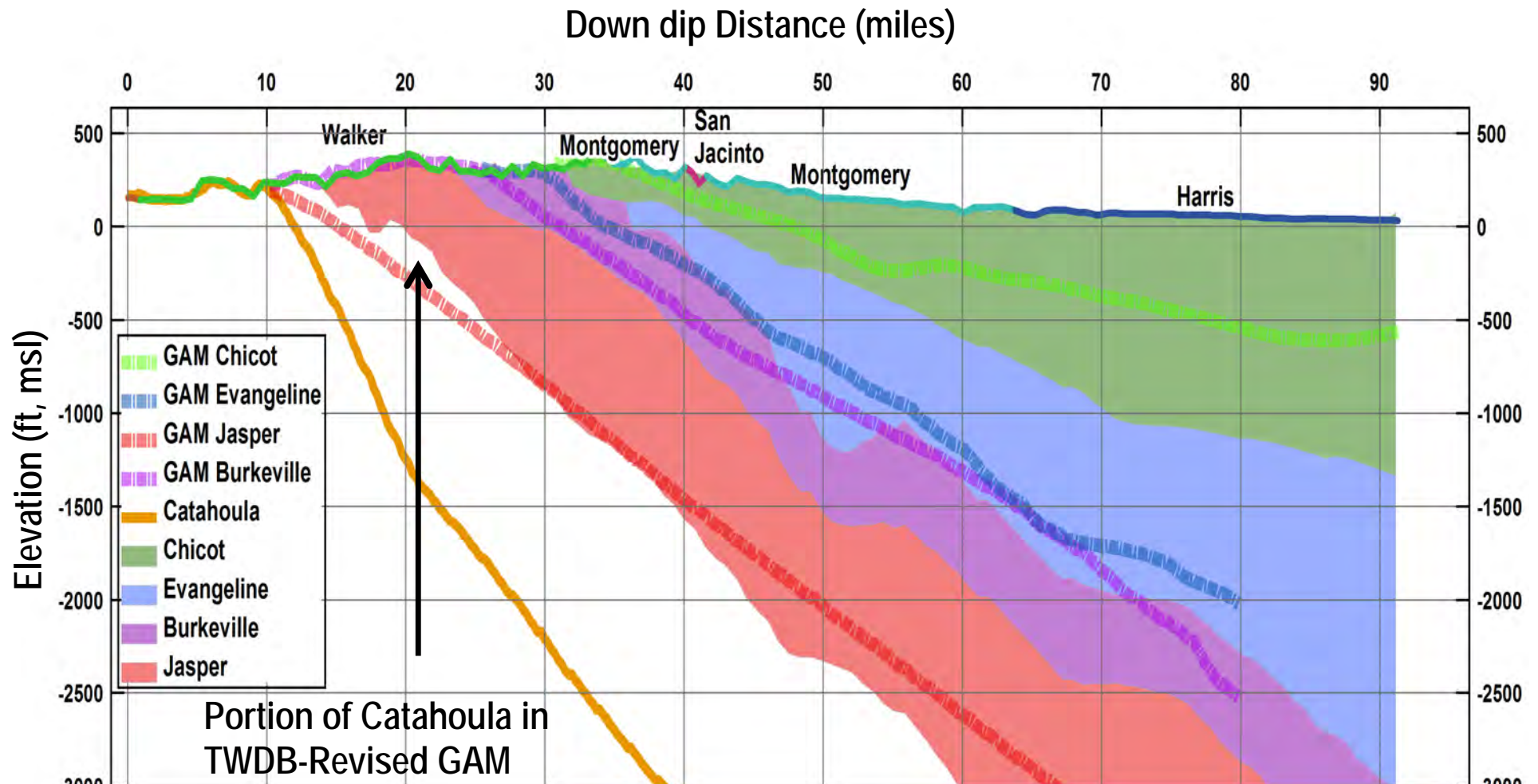




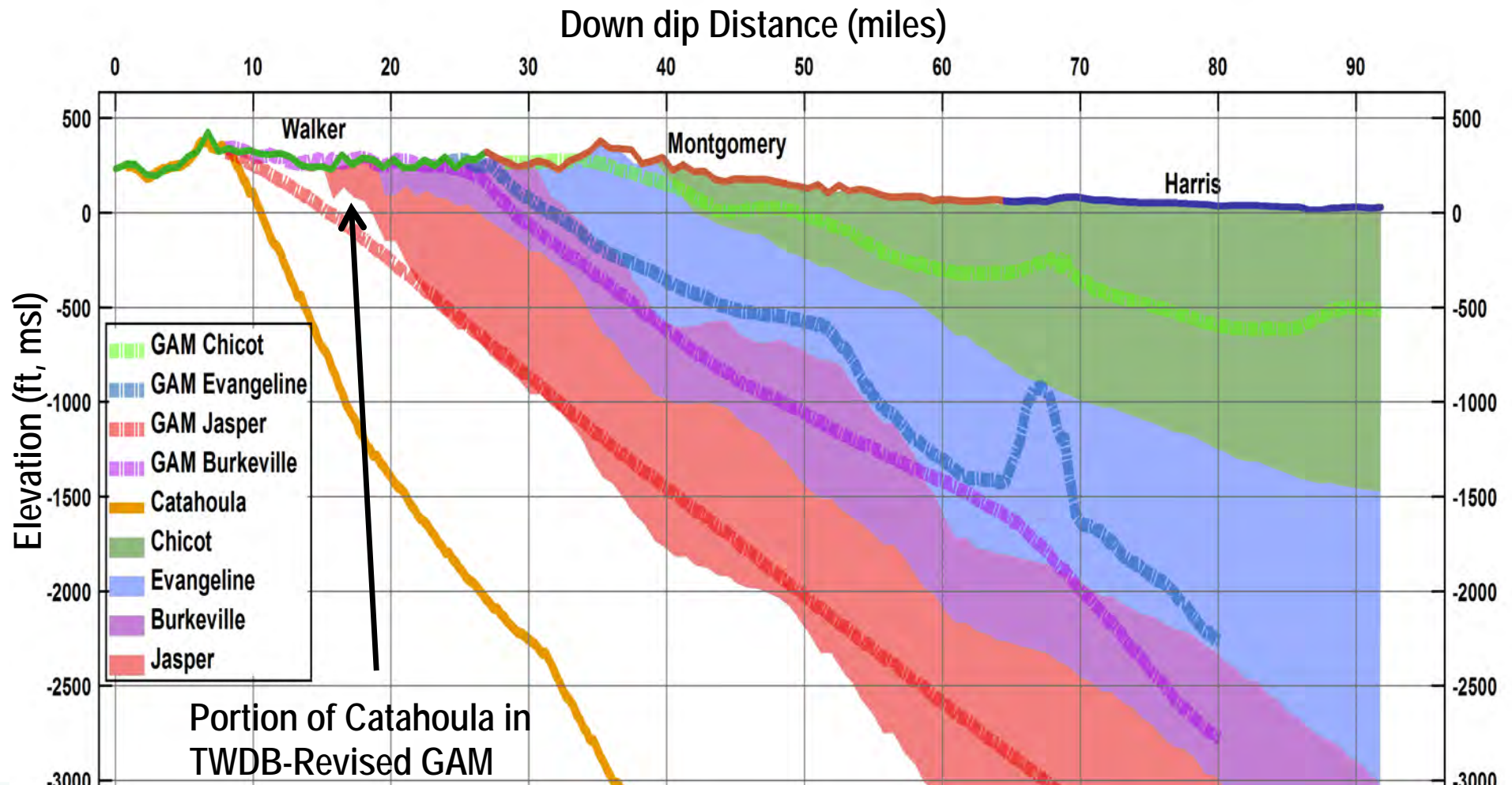
Aquifer Boundaries (Tops and Bottoms)



USGS-SWAP Surfaces and TWDB-Revise GAM Surfaces: Transect 2 (Northeast)



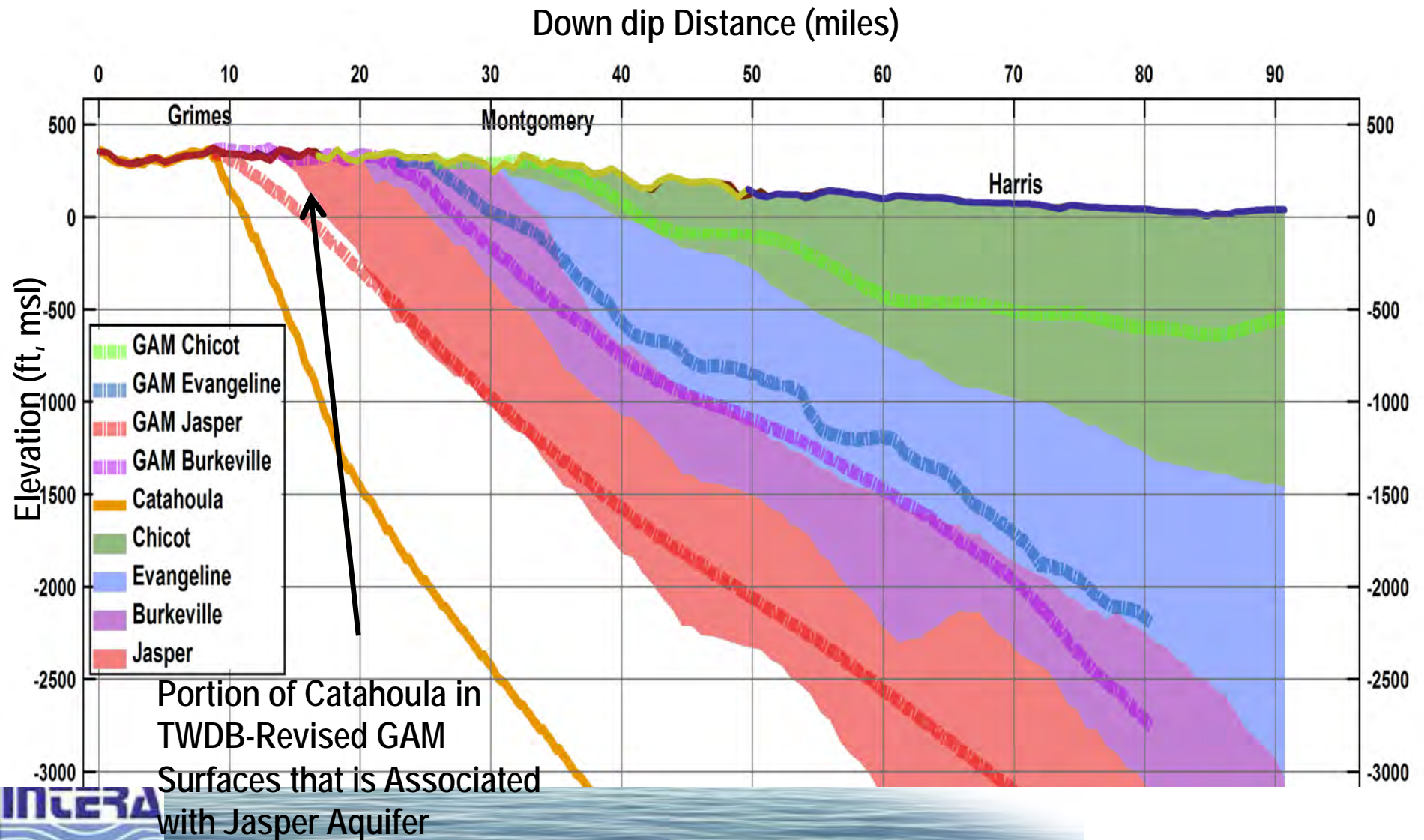
Comparison among USGS-SWAP Surfaces and TWDB- Revise GAM surfaces: Transect 3 (Middle)



Surfaces that is Associated
with Jasper Aquifer



USGS-SWAP Surfaces and TWDB-Revise GAM Surfaces: Transect 4 (Southwest)



General Findings Regarding SWAP and TWDB Databases for Montgomery County

- ◆ Aquifer Outcrops at similar Locations
- ◆ Base of Chicot is Deeper for TWDB- Revise GAM near Harris County
- ◆ Bases of Evangeline are Similar near Harris County
- ◆ TWDB-GAM Revise Middle Lagarto is not a comparable unit to SWAP Burkeville
 - Middle Lagarto does not represent a continuous low permeability deposit layer several hundred feet thick
 - Middle Lagarto contains substantial clays but can support modest groundwater production at some locations and likely provides opportunity for cross-flow between Jasper and Evangeline
 - Middle Lagarto is generally thicker and deeper than “Burkeville Confining Unit”
- ◆ Base of Jasper is Similar for TWDB-GAM and SWAP





Development of a Well Spacing Equation

Theoretical Considerations: Physics Regarding Flow to a Well

◆ Key Points From Simple Aquifer Example

- Drawdown is proportional to pumping rate
- Drawdown is proportional to transmissivity
- Incremental drawdown does not vary linearly with radial distance – it varies exponentially (non-linearly)

◆ Simple Aquifer Pumping Example

- Transmissivity = 10,000 ft²/day (or 5,000 ft²/day)
- Fully penetrating well, well radius = 0.1 ft

Pumping Rate = 260 gpm		
Radial Distance	Drawdown (ft)	Difference in drawdowns (ft) for adjacent times
0.1 (at	17.3	1.8
1	15.5	
10	13.7	1.8
100	11.8	
1000	10.0	1.8
10000	8.2	
100000	6.3	
Drawdown decreases 1.8 ft with every ten fold increase in Radial Distance		

Pumping Rate = 260 gpm		
Radial Distance (ft)	Drawdown (ft)	Difference in drawdowns (ft) for adjacent times
0.1 (at well)	34.1	3.7
1	30.4	
10	26.8	3.7
100	23.1	
1000	19.4	3.7
10000	15.8	
100000	12.1	

Drawdown decreases 3.7 (2*1.8)ft with every ten fold increase in radial distance (Trans=5,000 ft²/day)

Pumping Rate = 2090 gpm (8 * 260)		
Radial Distance	Drawdown (ft)	Difference in drawdowns (ft) for adjacent times
0.1 (at	138.6	14.7
1	124.0	
10	109.3	14.7
100	94.6	
1000	80.0	14.7
10000	65.3	
100000	50.7	
Drawdown decreases 14.7 (8*1.8)ft with every ten fold increase in Radial Distance		

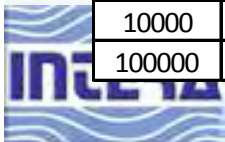


Theoretical Considerations: Linear Well Spacing Calculations

- ◆ Linear well spacing requirements are common in GCD rules (a.k.a.one foot spacing per one gpm pumping)
- ◆ Linear spacing requirements mean that as the pumping rate doubles so does the well spacing (likewise, triple the pumping causes triple the spacing)
- ◆ For steady-radial flow to a well, however, doubling the pumping produces about double the drawdown at double the well spacing – and tripling the pumping produces about triple the drawdown at triple the well spacing
- ◆ Therefore linear well spacing requirements may not be the best approach for well spacing rules aimed at managing drawdown impacts from pumping

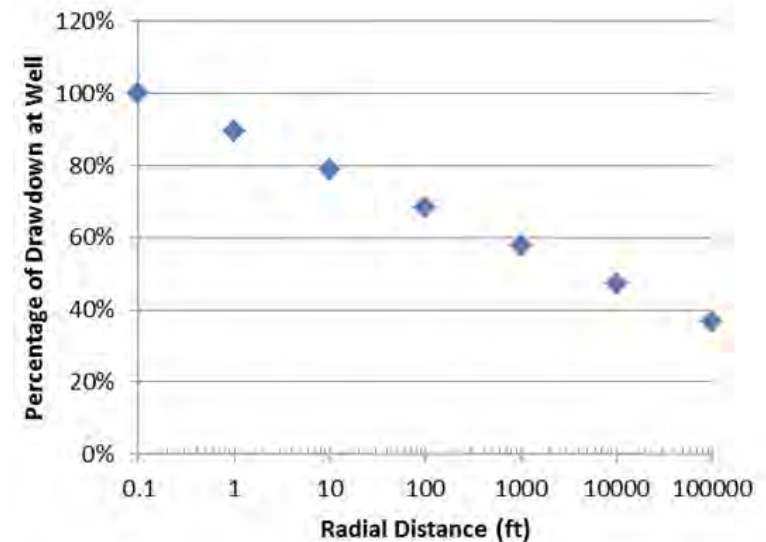
Pumping 130 gpm		Pumping 260 gpm		Ratio of Drawdowns: 130 gpm pumping at distance x and 260 gpm pumping at 2x
Radial Dist. (ft)	Drawdown (ft)	Radial Distance	Drawdown (ft)	
0.1	8.7	0.2	17.3	2.0
1	7.7	2	16.8	2.2
10	6.8	20	14.9	2.2
100	5.9	200	13.1	2.2
1000	5.0	2000	11.3	2.3
10000	4.1	20000	9.4	2.3
100000	3.2	200000	7.6	2.4

Pumping 130 gpm		Pumping 390 gpm		Ratio of Drawdowns: 130 gpm pumping at distance x and 390 gpm pumping at 3x
Radial Dist. (ft)	Drawdown (ft)	Radial Distance	Drawdown (ft)	
0.1	8.7	0.3	25.992193	3.0
1	7.7	3	24.680821	3.2
10	6.8	30	21.932313	3.2
100	5.9	300	19.183804	3.2
1000	5.0	3000	16.435296	3.3
10000	4.1	30000	13.686787	3.4
100000	3.2	300000	10.938279	3.5

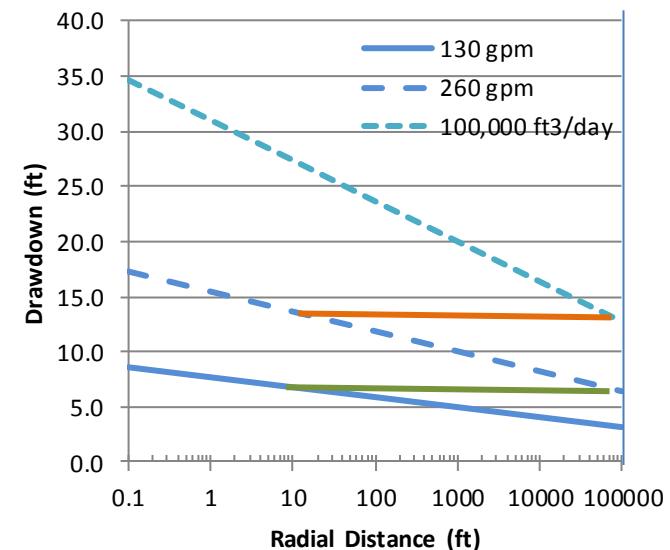


Theoretical Considerations: Physics Regarding Our Simple Flow Example

◆ To have comparable drawdowns for a wide range of pumping rates, the well spacing has to vary exponentially with the pumping rate ---- but, that would lead to excessive and impractical well spacing requirements



Radial Distance (ft)	Pumping Rate (gpm)			
		130	260	390
0.1		8.7	17.3	34.7
1		7.7	15.5	31.0
10		6.8	13.7	27.3
100		5.9	11.8	23.7
1000		5.0	10.0	20.0
10000		4.1	8.2	16.3
100000		3.2	6.3	12.7

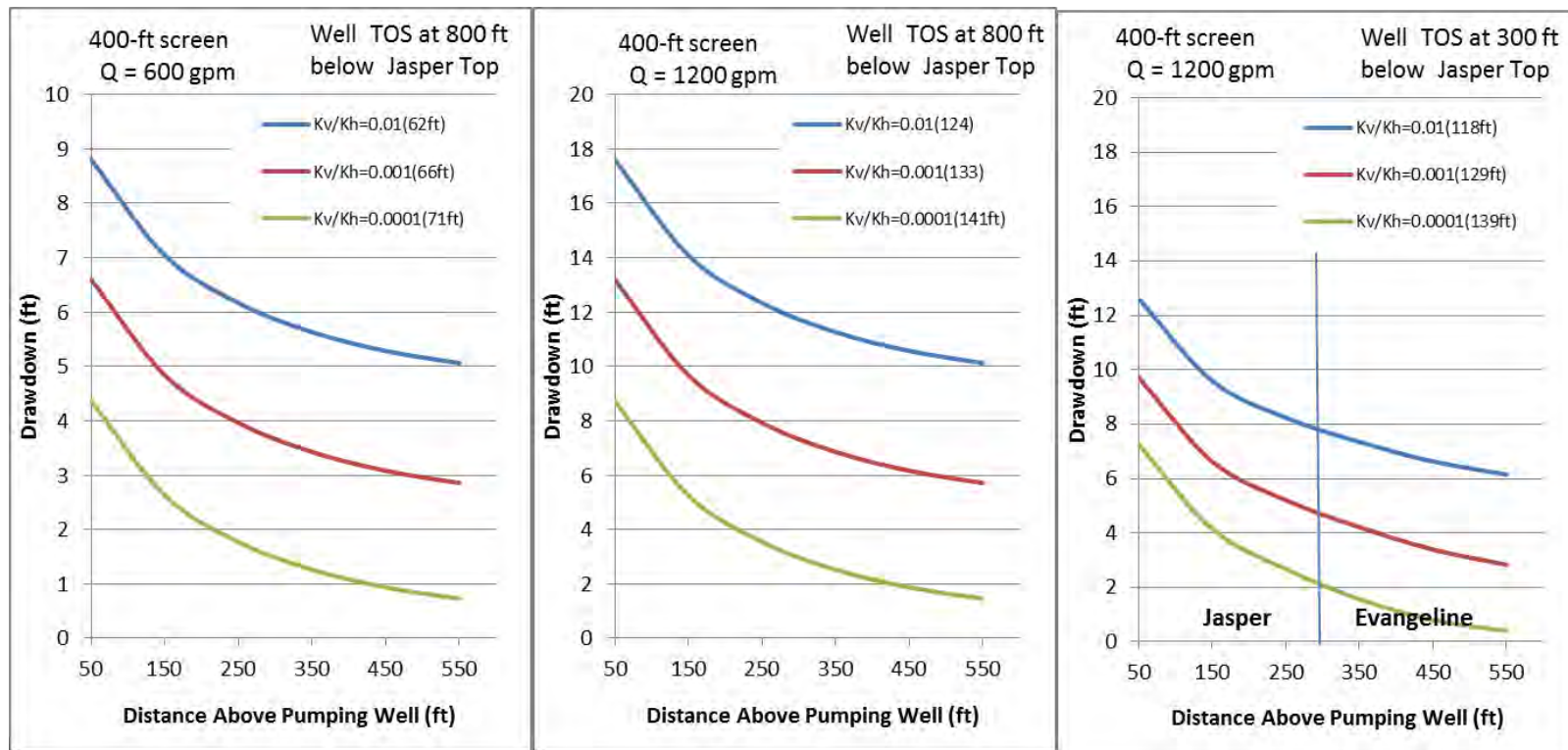


Theoretical Considerations: Factors that Lessen Pumping Impacts at Existing Wells

- ◆ **Consider the Protection Provided by Vertical Offsets between the Well Screens of Adjacent Wells**
 - Clay beds between sand layers reduces values for K_v
 - Low values for K_v/K_h (ratio of vertical to horizontal hydraulic conductivity) promotes lateral flow and hinders the vertical migration of the pressure decline
- ◆ **Consider Recharge Sources Including Cross-flow to Prevent Continual Expansion of Cone-of-Depression**
 - Requires considerable knowledge and a sophisticated model for the Gulf Coast aquifer system
 - Complex issues and approach that may be difficult to validate



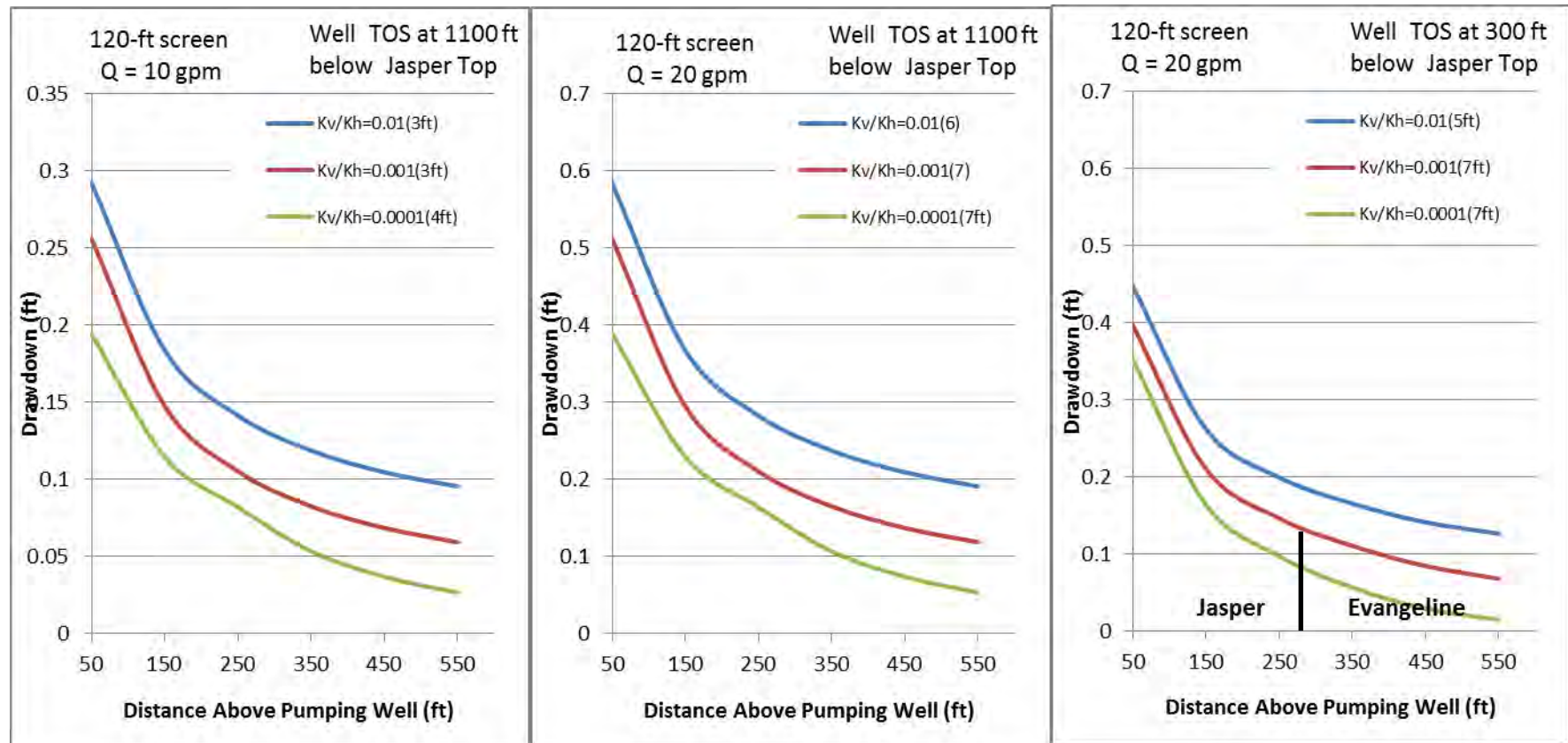
Predicted Drawdowns As a Function of Vertical Distance from Hypothetical LVGU Jasper Wells



- ◆ Number in () is drawdown in the well
- ◆ K_v/K_h of 0.001 is estimated for Gulf Coast based on results of regional groundwater modeling and an estimate of 0.001 ft/day for vertical hydraulic conductivity for clay
- ◆ At about 200 feet above well and for pumping 600 gpm, the drawdown is estimated at about 4 feet (~5% of drawdown in well)



Predicted Drawdowns As a Function of Vertical Distance from Hypothetical SVGU Jasper Wells



At about 200 feet above well and for pumping 20 gpm, the drawdown is estimated at about 0.4 to 0.6 feet (~7% of drawdown in well)



Other Considerations: Not Addressed in Presentation

- ◆ Spacing requirements for drilling wells set to Texas Department of Licenses and Regulations
- ◆ Aggregate Permits (combining multiple wells into a single permit)
- ◆ Requirements for Hydrological Assessments and Aquifer Pumping Tests for high well pumpers





Well Spacing Calculations for Chicot, Evangeline, and Jasper Aquifers

Well Spacing Calculations:

◆ Considerations

- Existing Well Locations
- Aquifer Thicknesses
- Large Volume Groundwater User

◆ Location

- Distribution
- Spacing

◆ General Properties

- Depths
- Screen Lengths
- Permit Amounts/Productions

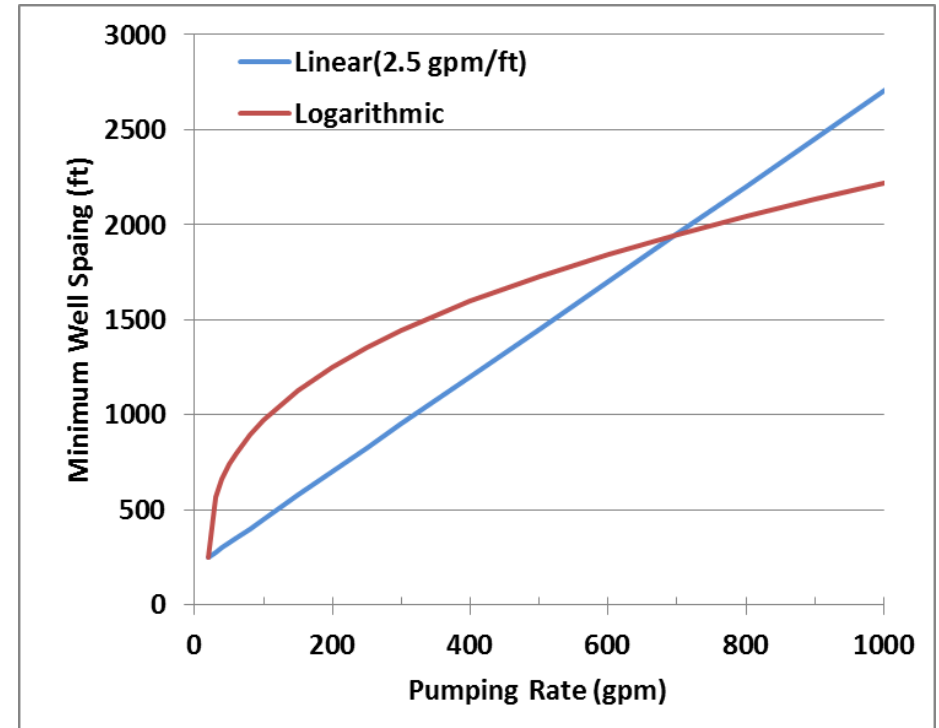


Well Spacing Requirements for Jasper Aquifer

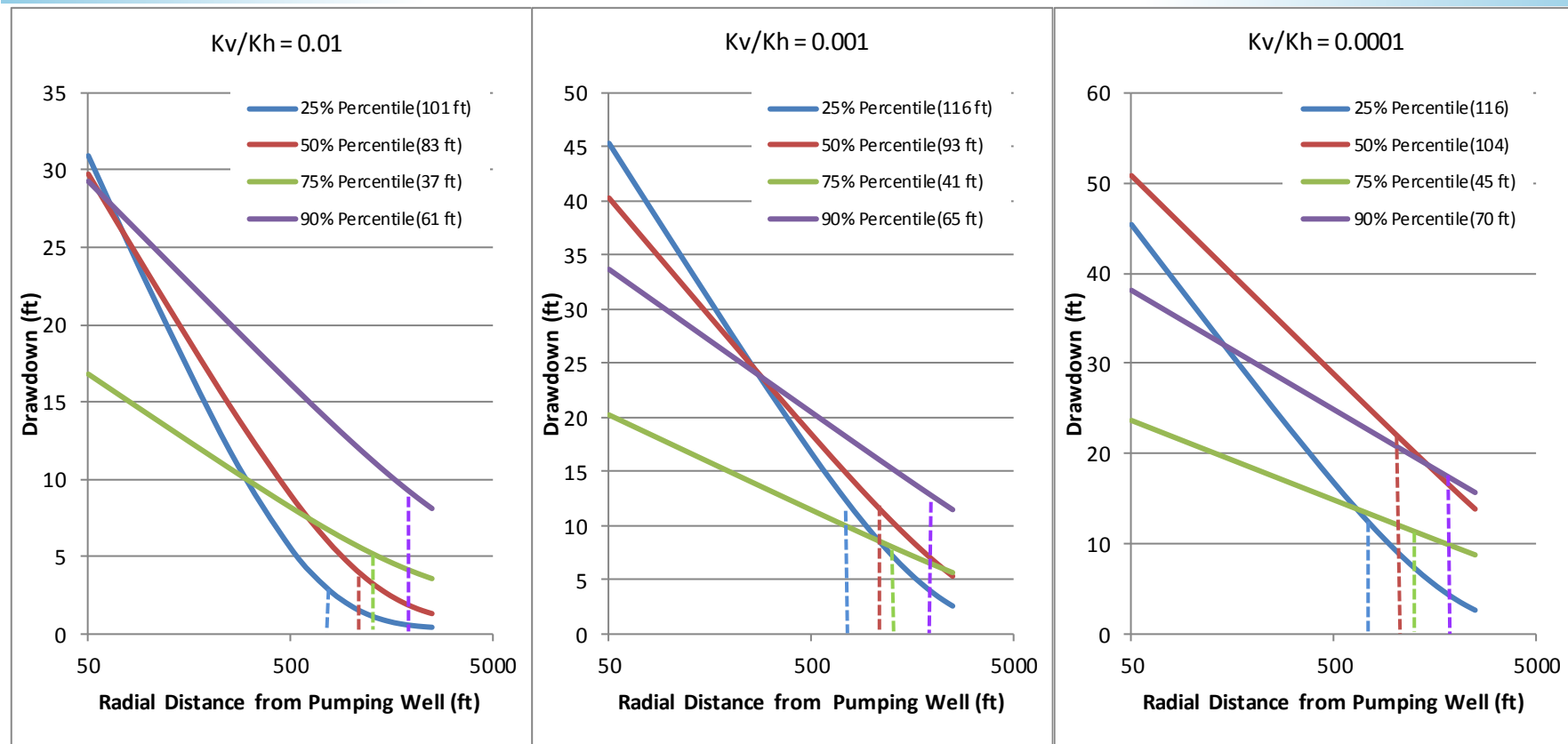
LVGU Wells: No Vertical Offset

- ◆ LVGU well (>20 gpm) spacing based on a non-linear equation that has a minimal well spacing of 250 feet

Max. Pumping Rate (gpm)	Min. Well Spacing (ft)	Max. Pumping	Min. Well Spacing (ft)
20	250	200	1248
30	564	250	1351
40	664	300	1441
50	737	400	1595
60	797	500	1727
80	893	600	1843
100	971	700	1948
150	1126	800	2044



Predicted Drawdowns For LVGU in Jasper (no vertical offset)



Percentile	Pumping Rate (gpm)	Screen Length(ft)	Rule Spacing (ft)
25%	50	15	737
50%	125	50	1054
75%	200	200	1248
90%	600	400	1843



Note: Ranking of impacts depends on Kv/Kh value

Drawdowns in Jasper for 0-ft and 200-ft Vertical Offset Based on Recommended Rule

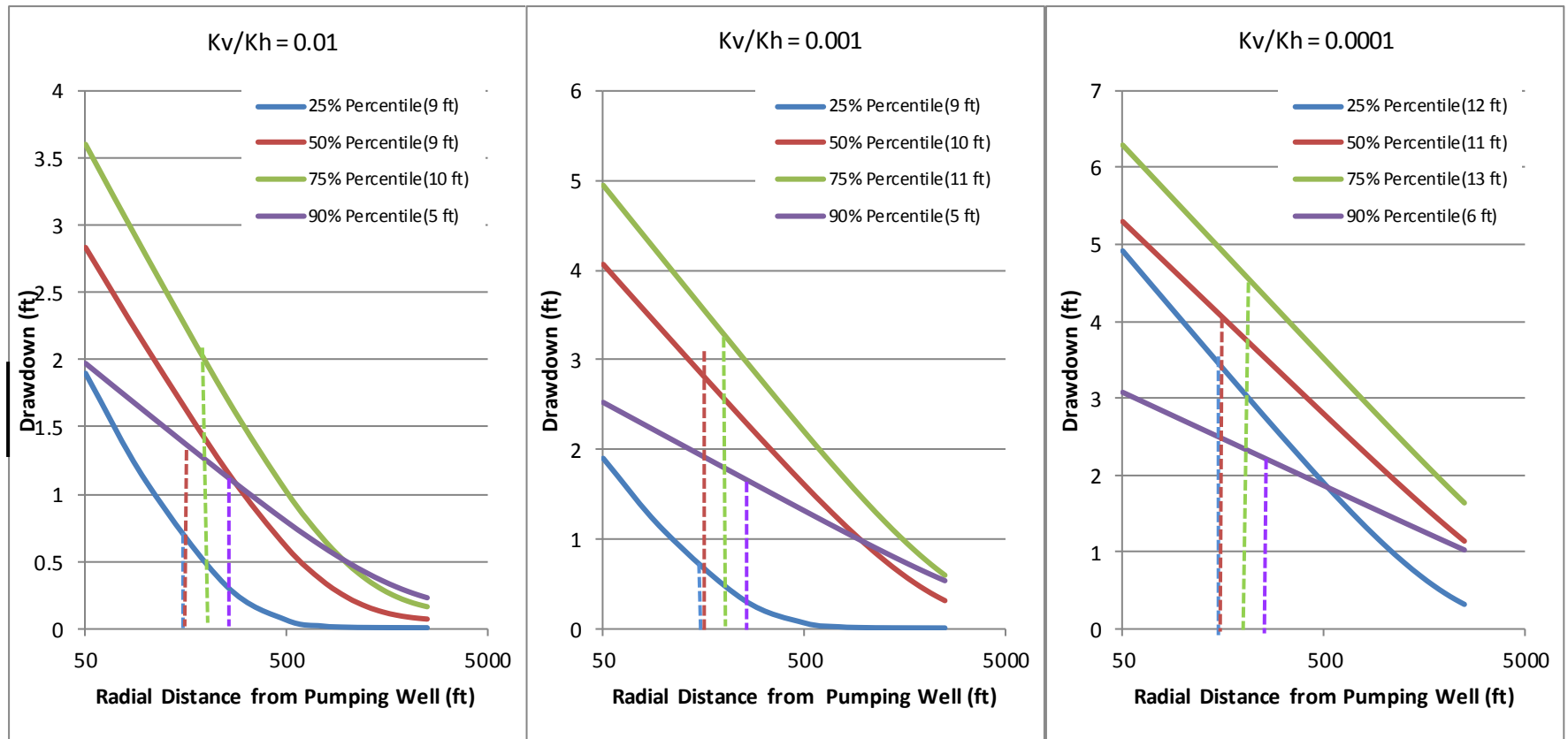
Pumping Rate (gpm)	Screen Length (ft)	Vertical Offset (ft)	Rule Spacing (ft)	Estimated Drawdown (ft) with $K_v/K_h=0.01$	Estimated Drawdown (ft) with $K_v/K_h=0.001$	Estimated Drawdown (ft) with $K_v/K_h=0.0001$
400	400	0	1595	6.7	9.3	12.1
600	400	0	1843	9.3	13.1	17.3
800	400	0	2044	11.9	16.7	22.3

Best Estimate

Pumping Rate (gpm)	Screen Length (ft)	Vertical Offset (ft)	Rule Spacing (ft)	Estimated Drawdown (ft) with $K_v/K_h=0.01$	Estimated Drawdown (ft) with $K_v/K_h=0.001$	Estimated Drawdown (ft) with $K_v/K_h=0.0001$
400	400	200	319	4.3	2.9	1.4
600	400	200	369	6.5	4.3	2.1
800	400	200	409	8.6	5.7	2.8



Predicted Drawdowns For SVGU in Jasper (no vertical offset)



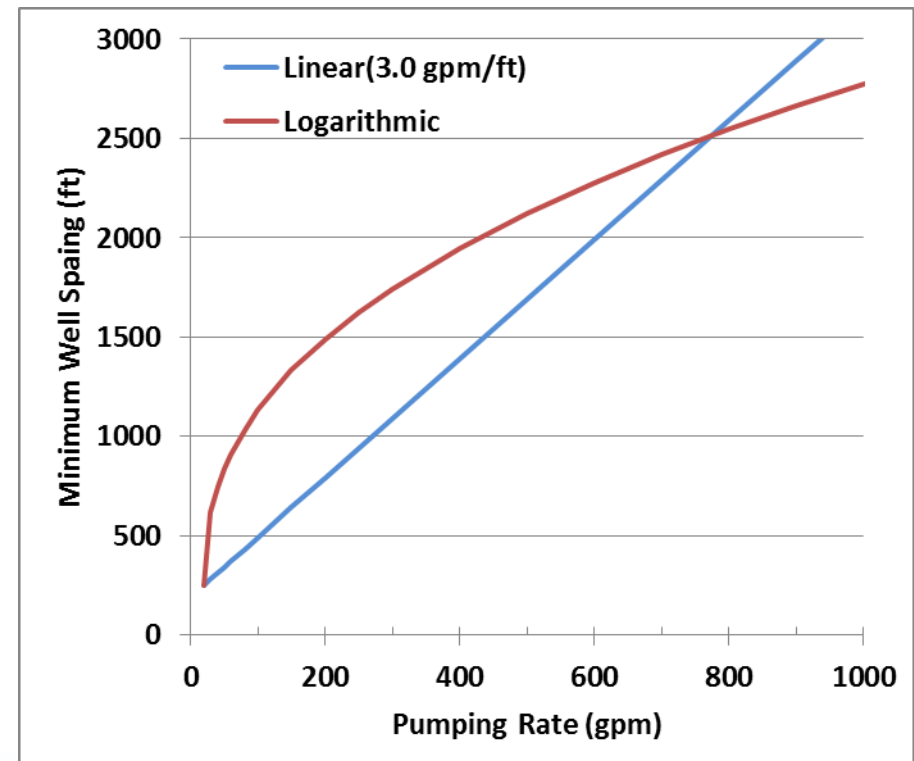
Percentile	Pumping Rate (gpm)	Screen Length(ft)	Rule Spacing (ft)
25%	0.7	2	150
50%	5.7	20	150
75%	12	38	200
90%	15.3	111	250



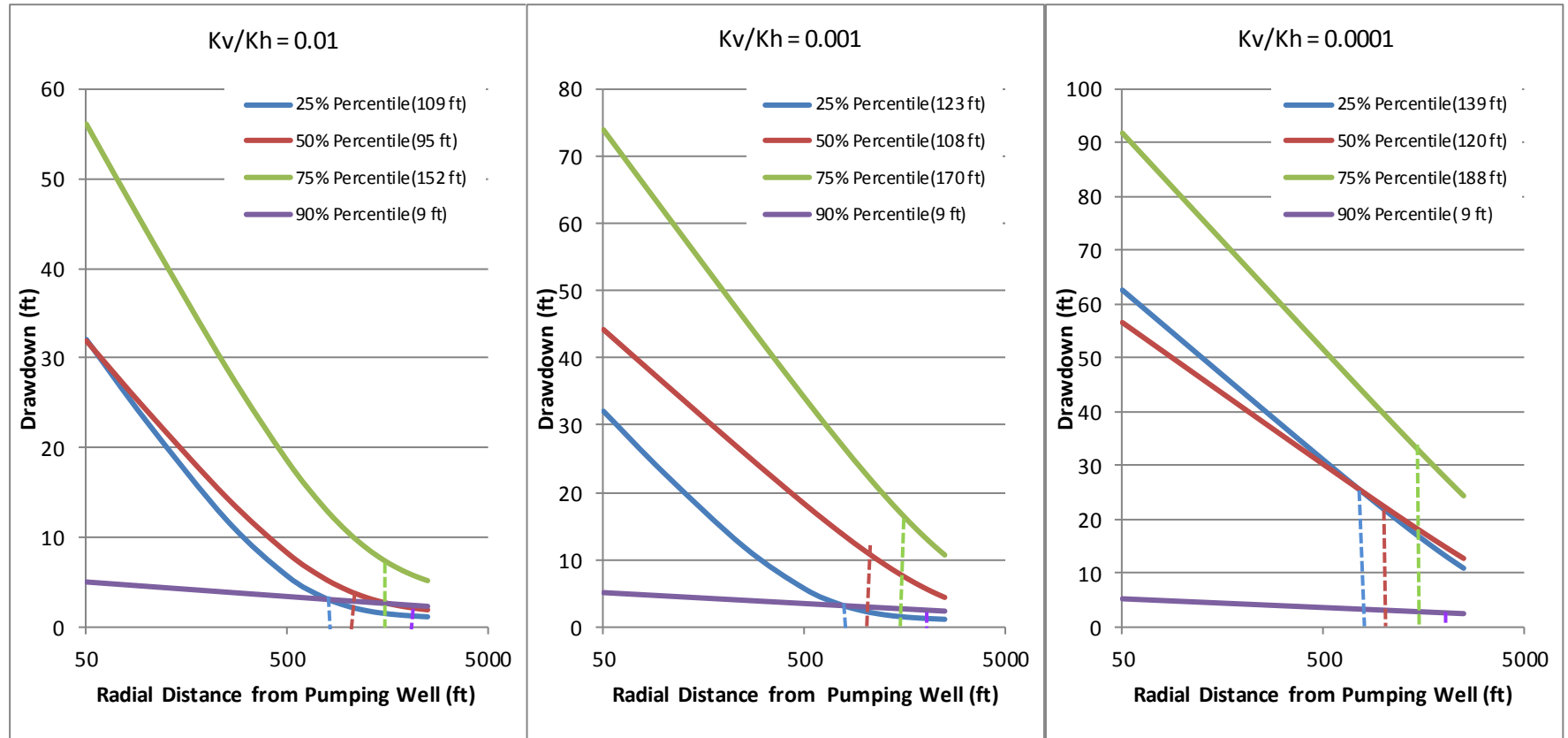
Recommend Evangeline Well Spacing:

- ◆ LVGU well (>20 gpm) spacing based on a non-linear equation that has a minimal well spacing of 250 feet

Max. Pumping	Min. Well Spacing (ft)	Max. Pumping	Min. Well Spacing (ft)
20	250	200	1490
30	618	250	1624
40	743	300	1743
50	834	400	1947
60	909	500	2122
80	1032	600	2277
100	1132	700	2417
150	1331	800	2545



Predicted Drawdowns For LVGU in Evangeline (no vertical offset)



Percentile	Pumping Rate (gpm)	Screen Length(ft)	Rule Spacing (ft)
25%	45	20	791
50%	75	40	1003
75%	200	70	1490
90%	410	254	1965



Drawdowns in Evangeline for 0-ft and 200-ft Vertical Offset Based on Recommended Rule

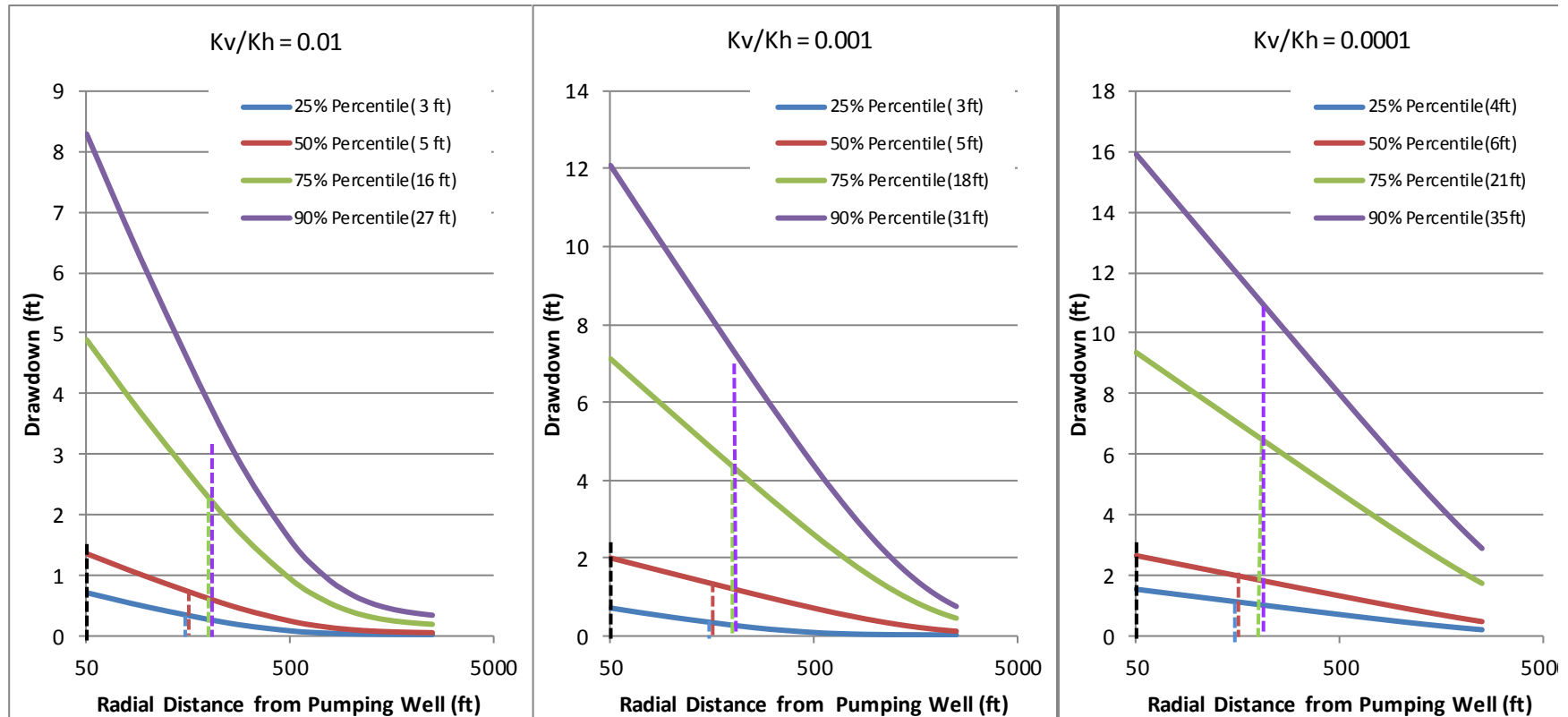
Pumping Rate (gpm)	Screen Length (ft)	Vertical Offset (ft)	Rule Spacing (ft)	Estimated Drawdown (ft) with $K_v/K_h=0.01$	Estimated Drawdown (ft) with $K_v/K_h=0.001$	Estimated Drawdown (ft) with $K_v/K_h=0.0001$
250	250	0	1624	7.4	10.1	13.9
400	250	0	1947	11.8	16.2	22.3
550	250	0	2201	15.1	20.7	28.9

Best Estimate

Pumping Rate (gpm)	Screen Length (ft)	Vertical Offset (ft)	Rule Spacing (ft)	Estimated Drawdown (ft) with $K_v/K_h=0.01$	Estimated Drawdown (ft) with $K_v/K_h=0.001$	Estimated Drawdown (ft) with $K_v/K_h=0.0001$
250	250	200	325	5.7	2.9	0.5
400	250	200	389	9.1	4.7	0.8
550	250	200	440	12.5	6.4	1.1



Predicted Drawdowns For SVGU in Evangeline (no vertical offset)



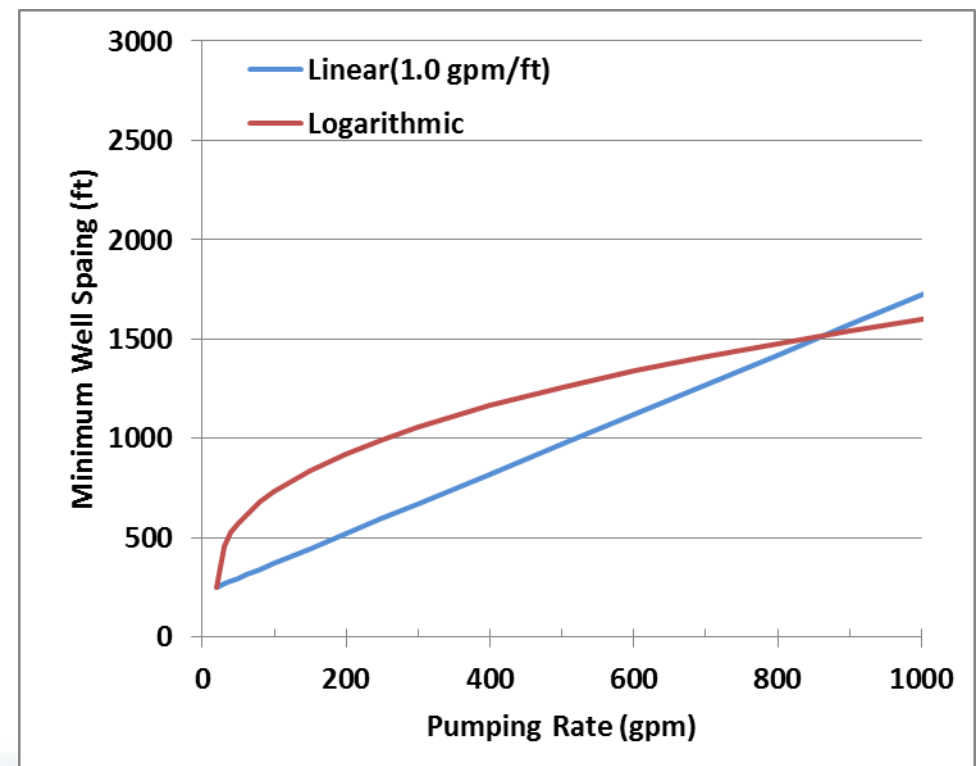
Percentile	Pumping Rate (gpm)	Screen Length(ft)	Rule Spacing(ft)
25%	0.6	10	150
50%	1.9	20	150
75%	7.6	23	200
90%	13	60	200



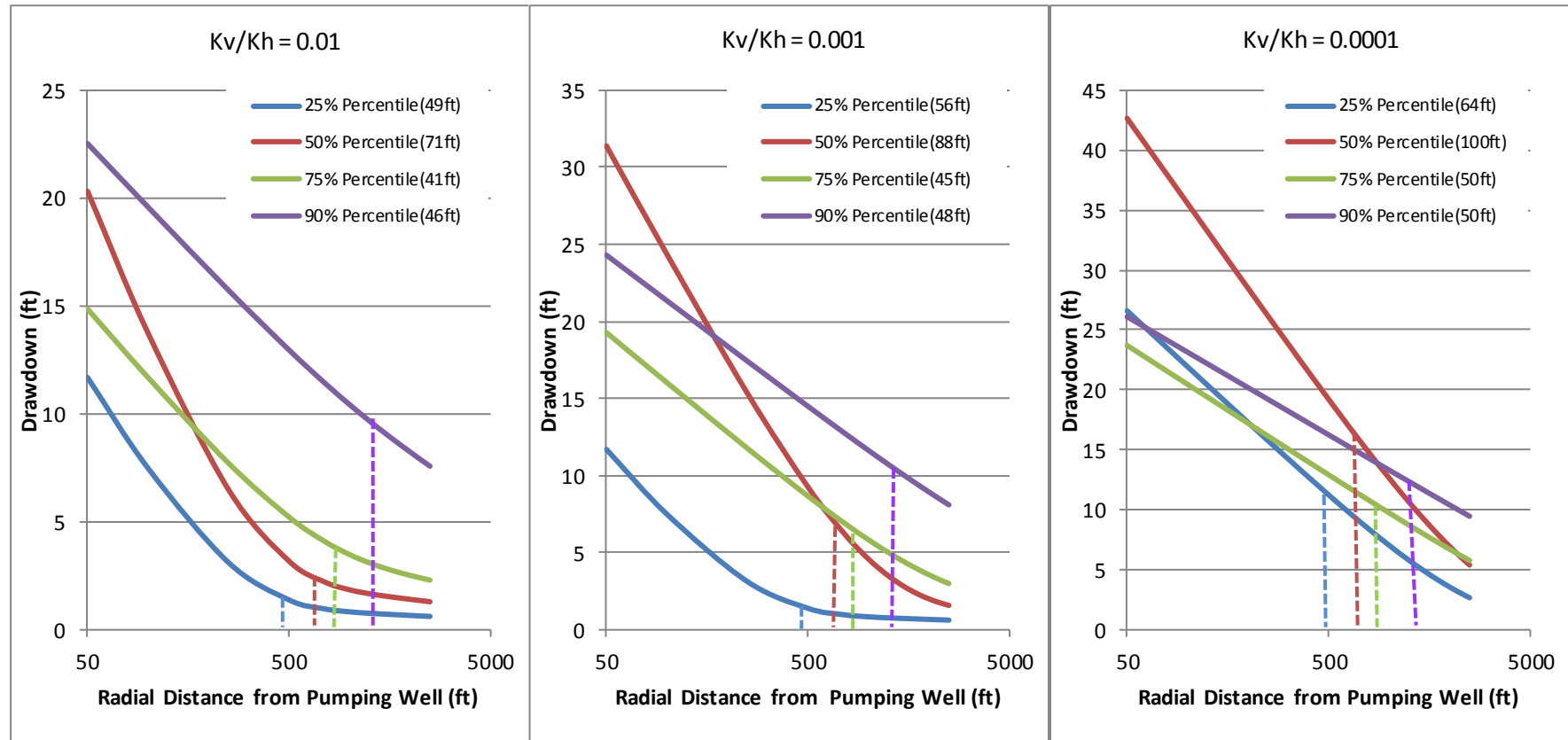
Recommend Chicot Well Spacing:

- ◆ LVGU well (>20 gpm) spacing based on a non-linear equation that has a minimal well spacing of 250 feet

Max. Pumping	Min. Well	Max. Pumping	Min. Well
20	250	200	923
30	456	250	994
40	523	300	1056
50	573	400	1164
60	613	500	1256
80	679	600	1337
100	732	700	1410
150	839	800	1477



Predicted Drawdowns For LVGU in Chicot (no vertical offset)



Percentile	Pumping Rate (gpm)	Screen Length(ft)	Rule Spacing (ft)
25%	31	10	464
50%	74	22	661
75%	142	42	823
90%	554	180	1300



Drawdowns in Chicot for 0-ft and 200-ft Vertical Offset Based on Recommended Rule

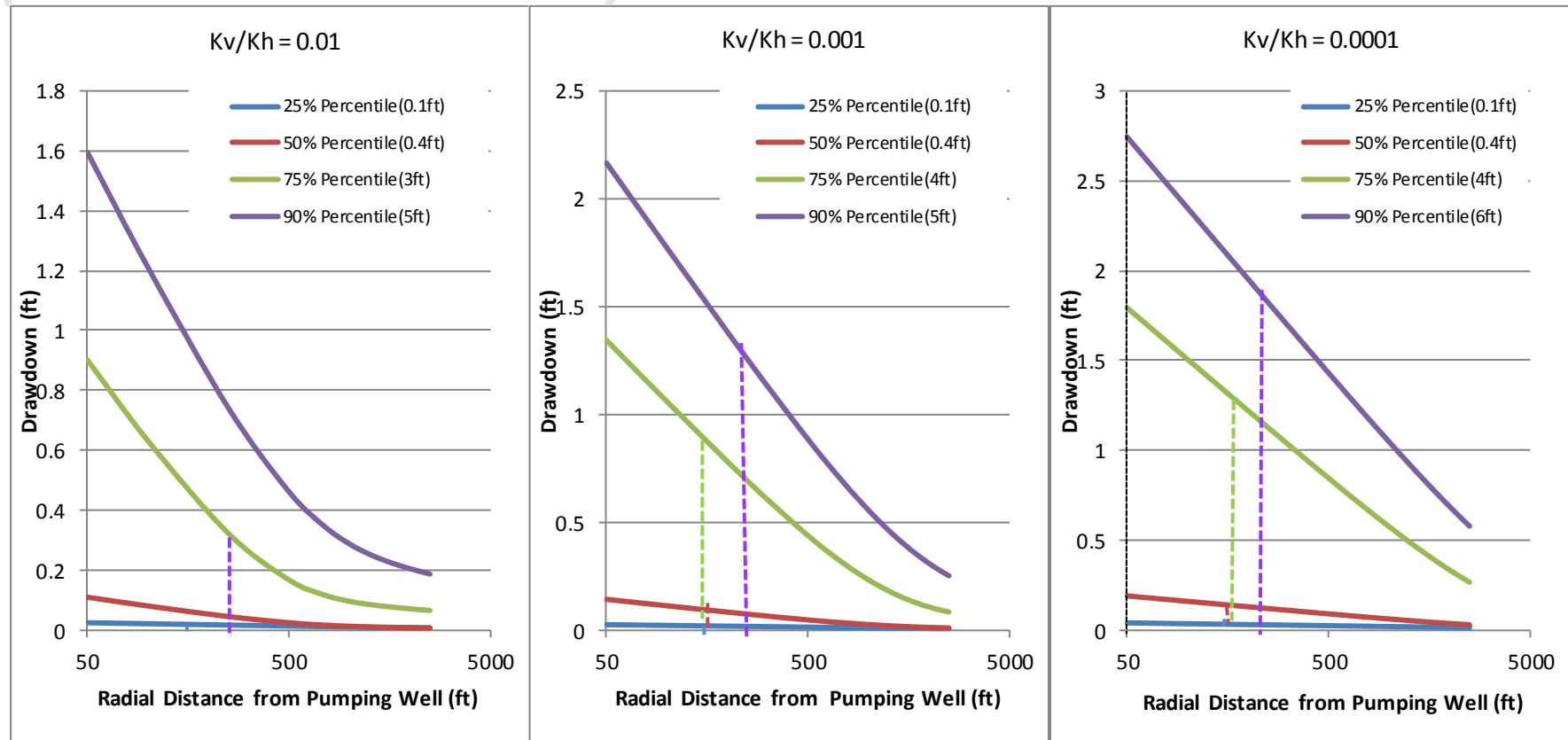
Pumping Rate (gpm)	Screen Length (ft)	Vertical Offset (ft)	Rule Spacing (ft)	Estimated Drawdown (ft) with $K_v/K_h=0.01$	Estimated Drawdown (ft) with $K_v/K_h=0.001$	Estimated Drawdown (ft) with $K_v/K_h=0.0001$
400	200	0	1164	9.0	10.3	12.2
550	200	0	1297	11.9	13.7	16.2
700	200	0	1410	14.7	17.4	20.0

Best Estimate

Pumping Rate (gpm)	Screen Length (ft)	Vertical Offset (ft)*	Rule Spacing (ft)	Estimated Drawdown (ft) with $K_v/K_h=0.01$	Estimated Drawdown (ft) with $K_v/K_h=0.001$	Estimated Drawdown (ft) with $K_v/K_h=0.0001$
400	200	200	233	5.6	3.1	0.8
550	200	200	259	7.7	4.3	1.1
700	200	200	282	9.7	5.5	1.4



Predicted Drawdowns For SVGU in Chicot (no vertical offset)



Percentile	Pumpng Rate (gpm)	Screen Length(ft)	Rule Spacing(ft)
25%	0.4	10	150
50%	1	20	150
75%	3.8	20	150
90%	11	42	200





Parcel Investigation

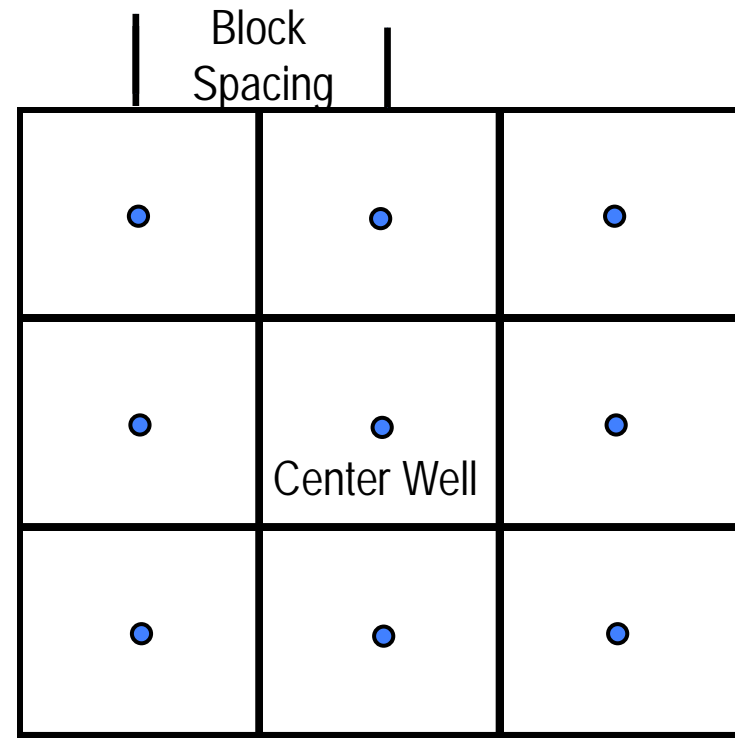
Parcel Investigation Approach

◆ Assumptions

- Parcels are square
- A well is at center at each parcel
- All wells pump the same amount

◆ Possible Criteria/Considerations

- Minimum spacing distance of 250 feet
- Ratio of drawdown at center well from the center well and the adjacent wells



Parcel Investigation: Jasper Aquifer

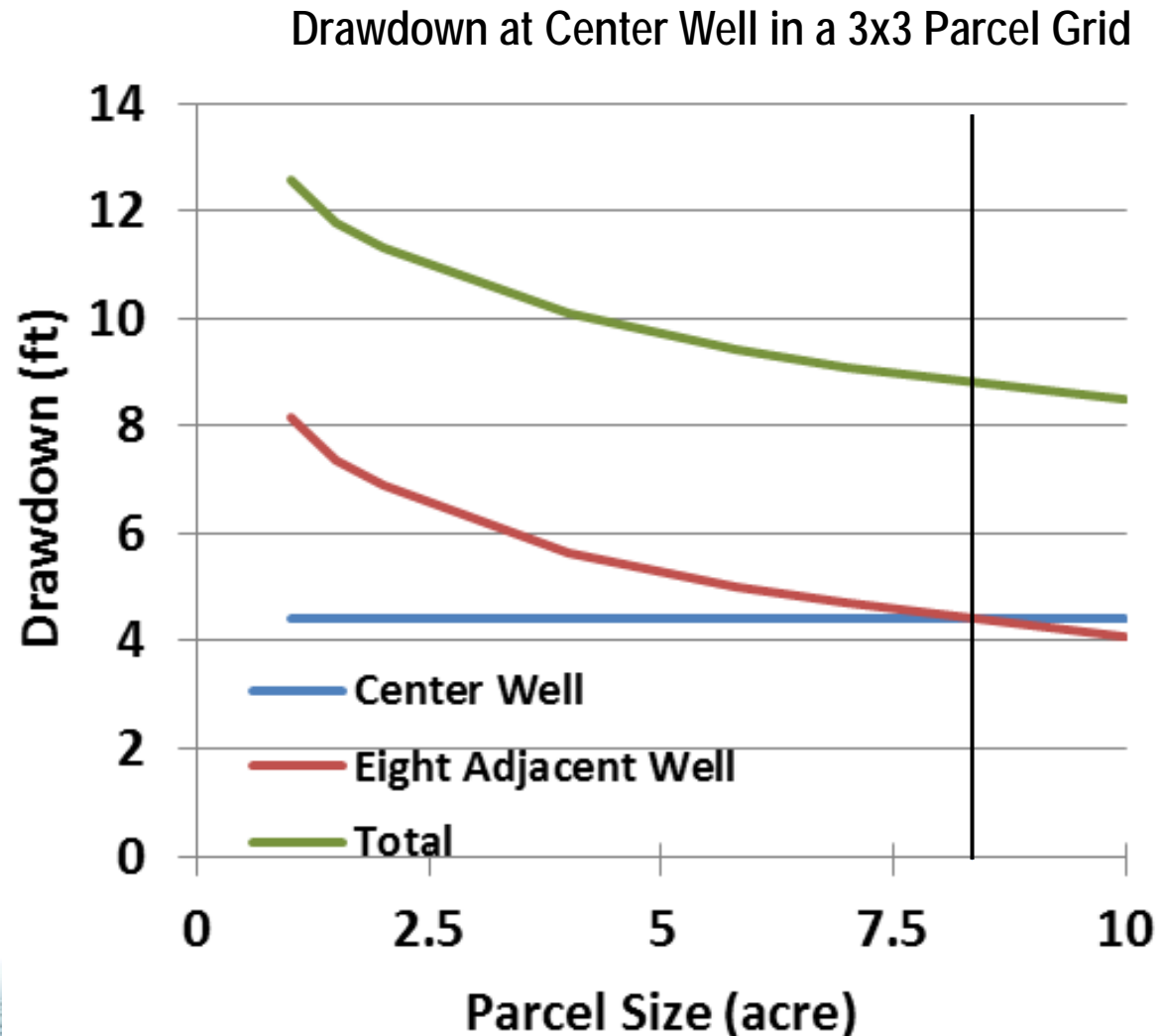
- ◆ Reference Info
 - Jasper properties
 - 20-ft well screen
 - For each parcel, drawdowns for different pumping rates can be accurately estimated from existing results (for 0.25 gpm divided 2.5 gpm results by 10)

Parcel Size (acre)	Distance Between Block Centers (ft)	Pumping Rate (gpm) Each well/Total Wells	Drawdown (ft)		
			From Center Well	From Eight Surround Wells	Total at Center Well
1	209	2.5/22.5	4.4	8.2	12.6
		5/45	8.8	16.3	25.2
		10/90	17.7	32.7	50.4
1.5	256	2.5/22.5	4.4	7.4	11.8
		5/45	8.8	14.8	23.6
		10/90	17.7	29.7	47.4
2	295	2.5/22.5	4.4	6.9	11.3
		5/45	8.8	13.8	22.6
		10/90	17.7	27.6	45.3
4	417	2.5/22.5	4.4	5.7	10.1
		5/45	8.8	11.3	20.1
		10/90	17.7	22.6	40.3
5.8	500	2.5/22.5	4.4	5.0	9.4
		5/45	8.8	10.0	18.9
		10/90	17.7	20.1	37.8
7	552	2.5/22.5	4.4	4.7	9.1
		5/45	8.8	9.4	18.2
		10/90	17.7	18.8	36.4
10	660	2.5/22.5	4.4	4.1	8.5
		5/45	8.8	17.0	17.0
		10/90	17.7	34.1	34.1



Parcel Investigation: Jasper Aquifer

- Below 8 acres, drawdown from eight adjacent well causes more than 50% of drawdown at center well
- Above 8 acres, drawdown from eight adjacent well causes less than 50% of drawdown at center well



M E M O R A N D U M

To: Kathy Turner Jones, Lone Star Groundwater Conservation District
Through: Bill Mullican, PG, Mullican and Associates
From: Wade Oliver, PG, INTERA Inc.
Date: August 28, 2014
Re: **Well Spacing Calculations for the Catahoula Aquifer in Lone Star Groundwater Conservation District**

Background

This memorandum was developed to document a series of well spacing calculations performed for the Catahoula Aquifer in Lone Star Groundwater Conservation District (Montgomery County, Texas). The Catahoula Aquifer underlies the units of the Gulf Coast Aquifer in the District including the Chicot, Evangeline, Burkeville, and Jasper.

The existing rules of Lone Star Groundwater Conservation District (LSGCD) state that “all new wells must comply with the spacing and location requirements set forth under the Texas Water Well Drillers and Pump Installers Administrative Rules” (LSGCD, 2010). These rules are found in Chapter 76 of the Texas Administrative Code, but in general restrict well spacing to 50 feet from a property line and 50 to 150 feet from potential sources of contamination such as septic tanks. Wells with an alternative surface completion can be located as close as 5 feet from property lines.

The Texas Water Well Drillers and Pump Installers administrative rules are designed primarily to protect wells from surface contamination. They are not designed to protect wells from other impacts such as water level declines from pumping in nearby wells. The analyses documented here were developed in collaboration with Mullican and Associates and LSGCD to reflect a potentially viable option for well spacing rules in the District that balances the competing interests in well spacing to 1) provide protection of the investment of existing well owners, and 2) not unnecessarily limit an individual or entity’s access to groundwater beneath their property. After a review of a wide range of spacing options with the LSGCD Rules and Bylaws Committee (the Committee), the well spacing calculations described herein, based on guidance from the Committee, are based on limiting the impact of a new well on an existing well to no more than 100 feet of drawdown in an existing well after 10 years of production.

Hydraulic Properties

The amount of drawdown at various distances from a pumping well depends on the properties of the aquifer. For this reason, it is important that well spacing rules be tailored to the specific aquifer. Table 1 shows a collection of aquifer properties derived from single-well pumping tests in the Catahoula Aquifer both within and outside Montgomery County. This includes data from Young (2013) as well as interpretations for three newly available single-well pumping tests for public water supply wells in the Catahoula Aquifer provided by LSGCD. These interpretations, shown in the Appendix, were made using AQTESOLV and the Papadopoulos-Cooper method, which accounts for well-bore storage (Duffield, 2007; Papadopoulos and Cooper, 1967). The average hydraulic conductivity among all tests shown in Table 1 is 3.7 feet per day with a range between 1.5 and 7.9 feet per day. The average for the tests within

Montgomery County is 5.0 feet per day, ranging between 3.4 and 7.9 feet per day. We used a representative hydraulic conductivity of 4 feet per day for the well spacing calculations described below.

As shown in the Appendix, storage properties (Storativity or “S”) were also included in the pump test interpretations. However, storage properties from single-well pump tests are not considered representative of the aquifer formation due to the impacts of well bore storage and disturbance of the aquifer near the well caused by drilling. The representative storativity used in the well spacing calculations was 0.0001 (unitless), which is a typical value for a confined unit such as the Catahoula Aquifer.

Vertical Offsets

In aquifers with interbedded layers of sand and clay, it is typically much easier for water to move laterally within individual sand units than vertically across less permeable clay layers. The property of the aquifer that describes how easily groundwater can flow vertically is called vertical hydraulic conductivity. Vertical hydraulic conductivity is difficult to measure, but can be as much as 10,000 times less than the horizontal hydraulic conductivity. For this reason, drawdown impacts between wells which are completed within the same aquifer - in this case the Catahoula Aquifer – but are offset vertically may be significantly reduced.

Figure 1 shows an example of two wells which are offset vertically. The amount of the offset is the difference between the elevation of the top of the shallowest screened portion of the well on the left and the elevation of the bottom of the deepest screened portion of the well on the right.

Since vertical offsets can limit the impact one well has on another, we have incorporated a vertical offset of 100 feet into this analysis. This threshold was chosen because, below this value, there is a heightened risk that the screened intervals of the wells are connected. Vertical offsets much above this value (e.g. several hundred feet) would provide additional hydrologic separation and protection from impacts, but would not likely be common given the thickness of the Catahoula Aquifer. For the purpose of developing well spacing rules, this analysis assumes two categories of wells: 1) those which are not vertically offset, and 2) those which are offset by 100 feet or more.

The vertical hydraulic conductivity for the non-vertically offset model simulations described below was set to 1,000 times less than the horizontal hydraulic conductivity of 4 feet per day (or 0.004 feet per day). For the simulations in which vertical offsets are considered, a more conservative value of 10 times less than the horizontal hydraulic conductivity was used.

Well Spacing Calculations

To perform the well spacing calculations, we used TTIM, an analytic element model useful for assessing drawdowns at and near wells (Bakker, 2012). This is in contrast to the better known groundwater availability models in Texas such as the Houston Area Groundwater Model, which use MODFLOW, are regional in scale, and are not appropriate for well spacing calculations.

Based on guidance from the Committee, we ran the TTIM simulations in order to develop a relationship between pumping rate and spacing distance that limits impacts of one well on another to 100 feet after 10 years. In these simulations, we assumed that the pumping well was screened over approximately half the total thickness of the Catahoula Aquifer. The time period of 10 years was chosen to represent relatively long-term conditions at which water level drawdowns have generally stabilized. For wells that are not vertically offset, this relationship is shown as the blue line in Figure 2. At a rate of 2,500 gallons per

minute, there is approximately 100 feet of drawdown after 10 years at a distance of 2,500 feet. The equation describing this relationship is:

$$D = 0.000888Q^2 - 1.4Q + 487$$

where D is the spacing distance in feet and Q is the pumping rate in gallons per minute.

We also developed the relationship with a vertical offset of 100 feet. This is shown as the green line in Figure 2. At a rate of 2,500 gallons per minute, there is approximately 100 feet of drawdown after 10 years at a distance of 1,500 feet. The equation describing this relationship is:

$$D = 0.00031Q^2 + 1.07Q - 3060$$

Using the 2,500 gallons per minute example, the spacing requirement for wells vertically offset by 100 feet or more is 1000 feet less than if the wells are not vertically offset. The values that come out of the relationship above are also shown in Table 2. Note that both equations are not valid at low pumping rates that would not produce more than 100 feet of drawdown at the pumping well.

It is common for groundwater conservation districts to have different well spacing requirements for different pumping rates, but also to establish a minimum well spacing. A minimum well spacing is the distance a new well must be placed away from an existing well regardless of pumping rate or vertical offset. This minimum well spacing can protect existing wells from localized aquifer conditions that may differ from the representative properties chosen for the aquifer in this analysis.

To evaluate minimum well spacing, which would apply in situations where the above two equations do not (e.g. the pumping well does not produce 100 feet of drawdown using the representative aquifer properties), we reviewed the drawdowns at distances up to 1000 feet that would occur if the hydraulic conductivity was half (2 feet per day) the representative value developed through interpretation of the pump tests. This relationship is shown in Figure 3 for a pumping rate of 1000 gallons per minute. The reduced hydraulic conductivity representing potential local variability within the aquifer produces drawdowns above 100 feet out to 800 feet from the pumping well. Very near the pumping well (within 100 feet), the drawdowns can be above 200 feet. For the Catahoula Aquifer, we recommend the District consider a minimum well spacing of 400 feet, which would provide a reasonable balance between the competing interests to protect existing wells and allow flexibility in the siting of new wells. This threshold of a minimum spacing of 400 feet is also shown in Figure 2.

Conclusion

The well spacing calculations documented here were performed to assist LSGCD better understand the relationship between pumping rates and impacts to the Catahoula Aquifer using aquifer-specific assumptions such as thickness and hydraulic properties. These are based on an impact to existing wells of 100 feet of drawdown over 10 years, though well spacing rules cannot guarantee a specific level of protection due to local variability within the aquifer. Developing a minimum well spacing requirement in addition to the pumping rate-based spacing requirements can alleviate some of the risk of local variability.

References

Bakker, M., 2012, TTim, A multi-aquifer transient analytic element model, version 0.2, Delft University of Technology, Delft, The Netherlands. <http://ttim.googlecode.com>.

Duffield, G.M., 2007, AQTESOLV for Windows Version 4.5 Professional, HydroSOLVE Inc., www.aqtesolv.com.

Lone Star Groundwater Conservation District, 2010. Lone Star Groundwater Conservation District – District Rules. As amended, effective May 11, 2010.

Papadopoulos, I.S. and H.H. Cooper, 1967. Drawdown in a well of large diameter, Water Resources Research, vol. 3, no. 1, pp. 241-244.

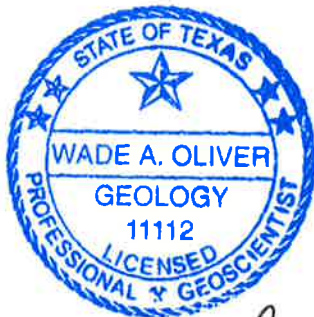
Young, S.C., 2013. Development of Well Spacing Recommendations. Presented to Lone Star Groundwater Conservation District Rules and Bylaws Subcommittee on May 9, 2013.

Professional Seal

The information presented here was developed by:

Wade A. Oliver, P.G.

Licensed Texas Professional Geoscientist No. 11112



Wade A. Oliver
8/28/2014

Table 1. Catahoula Aquifer properties interpreted from pumping tests. Results include tests newly interpreted as shown in (Appendix below) as well as previously reported in Young (2013).

County	Owner	Well	Transmissivity (ft ² /d)	Aquifer Thickness* (ft)	Hydraulic Conductivity** (ft/d)
Montgomery	Stanley Lake MUD	Well 3	1,905	428	4.5
	City of Willis	Well 6	3,938	767	5.1
	City of Willis	Well 7	4,234	826	5.1
	Montgomery County MUD 18	Well 3	2,540	620	4.1
	Montgomery County UD 3	Well 3	2,380	300	7.9
	Panorama Village	Well 4	2,587	768	3.4
Walker	City of Huntsville	Well 19	2,311	570	4.1
	City of Huntsville	Well 18	1,732	720	2.4
	City of Huntsville	Well 17	1,606	515	3.1
	City of Huntsville	Well 14	850	482	1.8
	City of Huntsville	Well 13	708	470	1.5
	City of Huntsville	Well 12	1,378	448	3.1
	City of Huntsville	Well 16	1,220	510	2.4
	City of Huntsville	Well 15	2,035	526	3.9
Lone Star GCD (Montgomery County) Average			2,514	618	5.0
Average			1,923	568	3.7

* Aquifer thickness calculated as the top of the shallowest screen minus the bottom of the deepest screen.

Table 2. Spacing distances at which 100 feet of drawdown occurs after 10 years at various pumping rates in the Catahoula Aquifer using representative aquifer properties.

Pumping Rate (gallons per minute)	Spacing Distance (No Vertical Offset)	Spacing Distance (Vertical Offset Greater Than 100 ft)
1,000	-	-
1,100	21	-
1,200	86	-
1,300	168	-
1,400	267	-
1,500	385	-
1,600	520	-
1,700	673	-
1,800	844	-
1,900	1,033	92
2,000	1,239	320
2,100	1,463	554
2,200	1,705	794
2,300	1,965	1,041
2,400	2,242	1,294
2,500	2,537	1,553
2,600	2,850	1,818
2,700	3,181	2,089
2,800	3,529	2,366
2,900	3,895	2,650
3,000	4,279	2,940
3,100	4,681	3,236
3,200	5,100	3,538
3,300	5,537	3,847
3,400	5,992	4,162
3,500	6,465	4,483

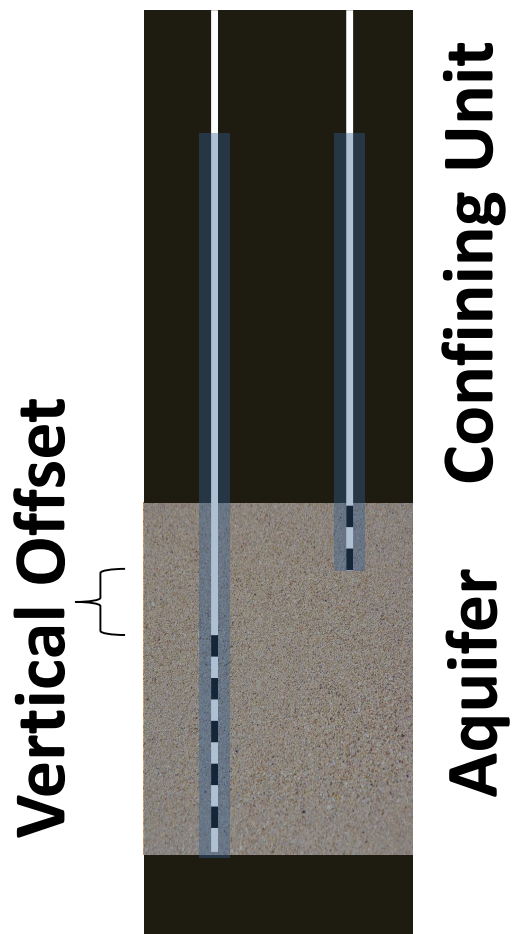


Figure 1. Diagram showing vertical offset of two wells screened within the same aquifer.

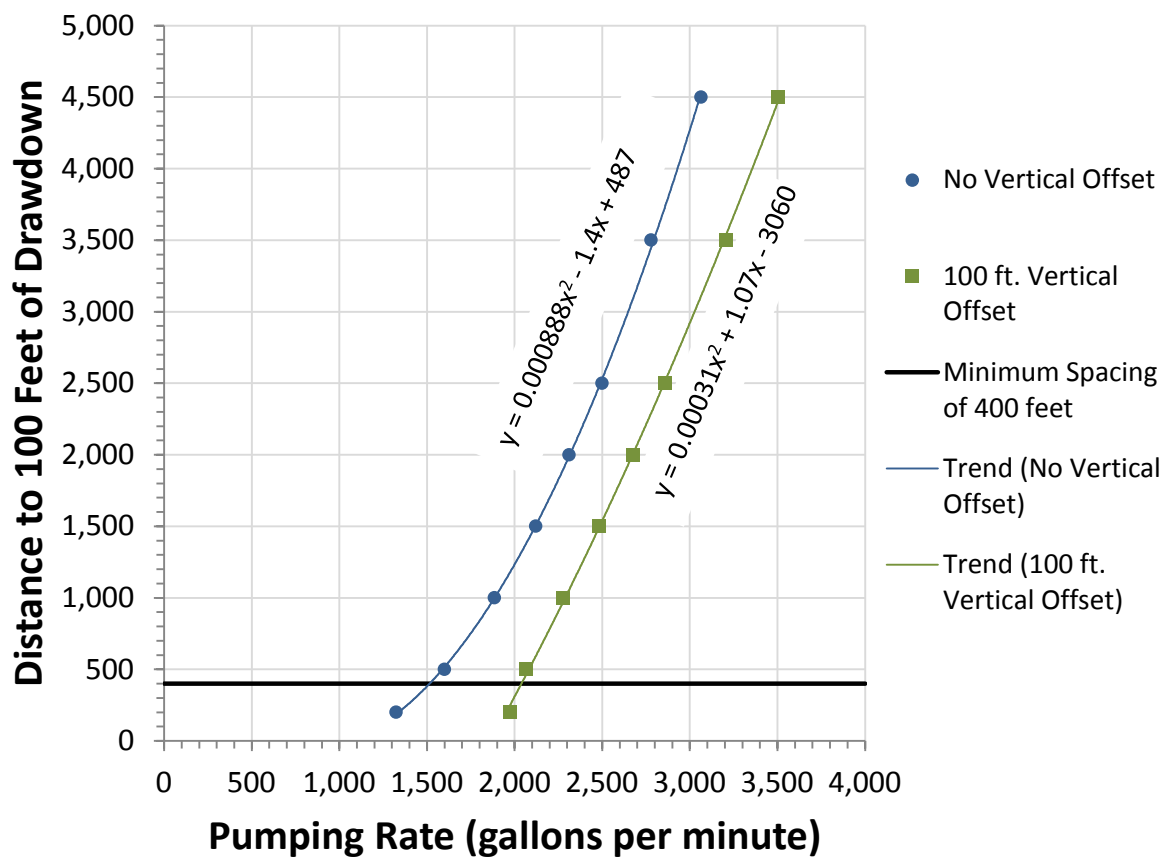


Figure 2. The distance at which 100 feet of drawdown occurs after 10 years due to various levels of pumping. Conditions with and without a vertical offset are shown. The points shown reflect TTIM model output.

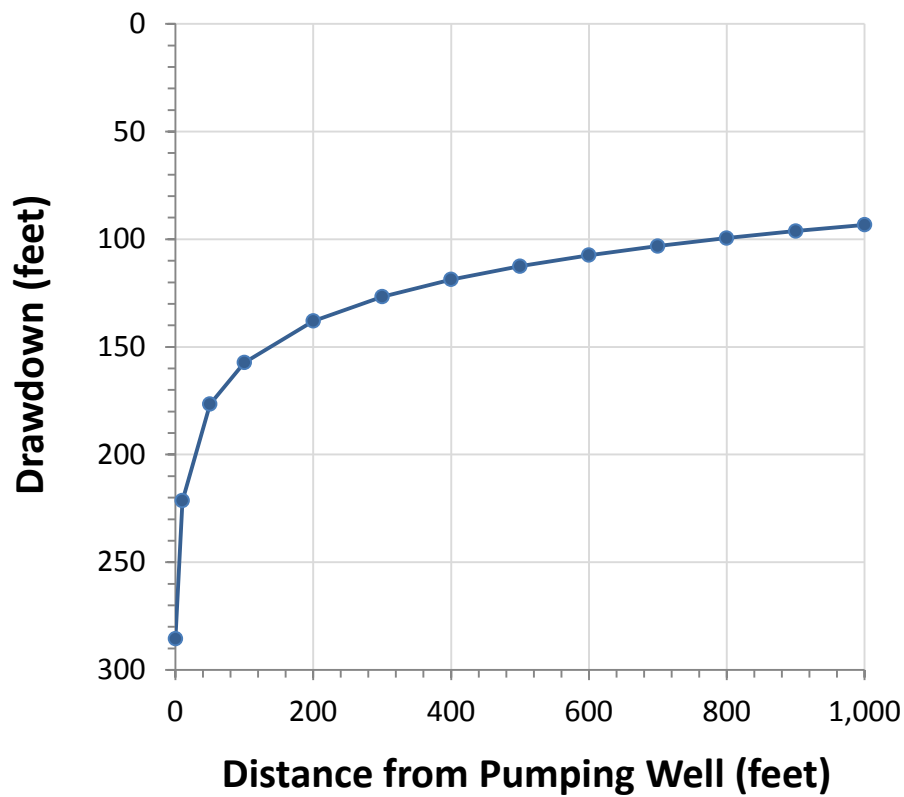
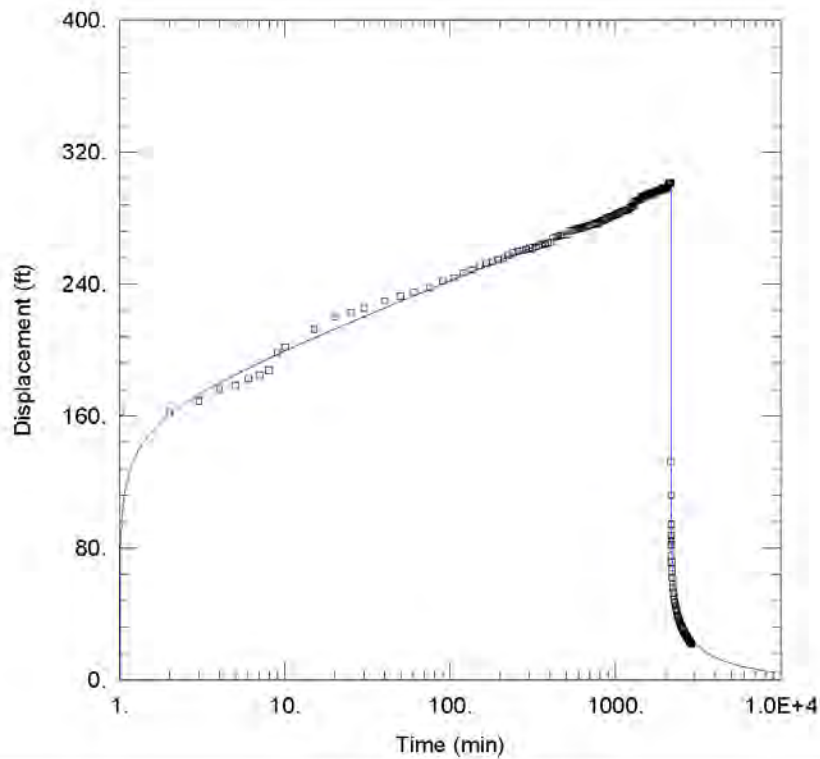


Figure 3. Drawdown at various distances from a pumping well at 1000 gallons per minute and a hydraulic conductivity of 2 feet per day (half the representative value).

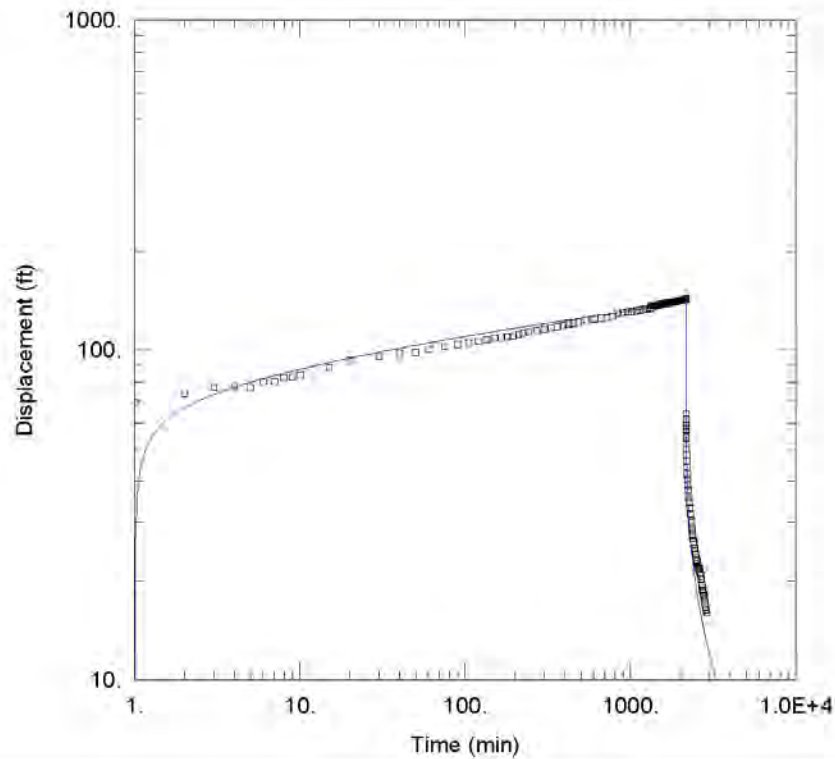
Appendix

Pump Test Interpretations



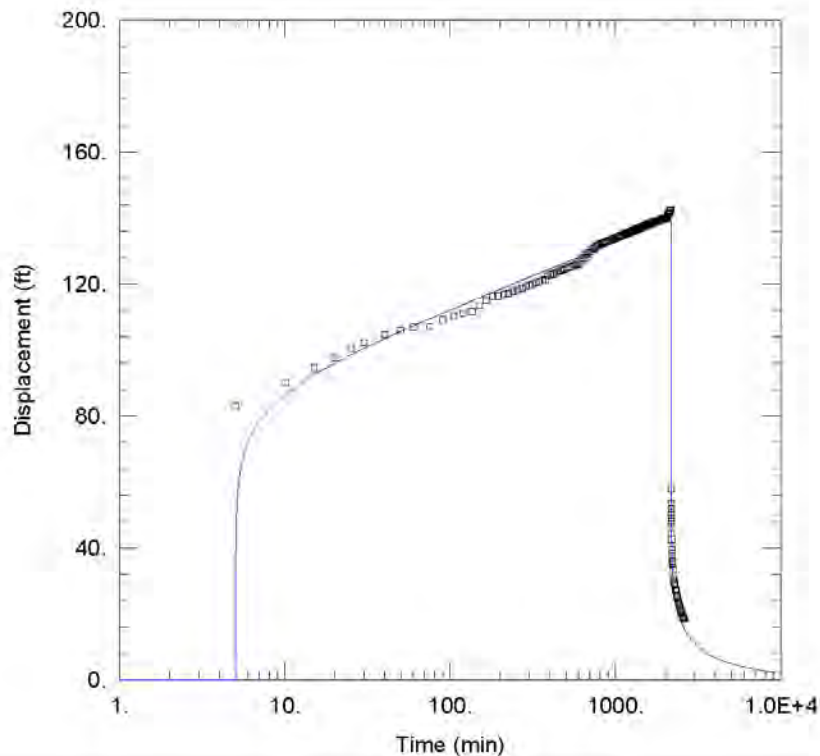
WELL TEST ANALYSIS					
Data Set:			Time: 15:54:31		
Date: 07/10/14					
PROJECT INFORMATION					
Test Well: Stanley Lake Well No. 3					
Test Date: 6/4/2012					
AQUIFER DATA					
Saturated Thickness: 428. ft			Anisotropy Ratio (Kz/Kr): 1.		
WELL DATA					
Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
Stanley Lake Well No. 3	0	0	Stanley Lake Well No. 3	0	0
SOLUTION					
Aquifer Model: Confined			Solution Method: Papadopolos-Cooper		
T = 1904.8 ft ² /day			S = 0.0004984		
r(w) = 0.833 ft			r(c) = 0.5833 ft		

Figure A-1. Estimation of transmissivity from pump test of Stanley Lake Well Number 3.



WELL TEST ANALYSIS					
Data Set: C:\Projects\LoneStarGCD\Well_Spacing_May2013\Data\AQTESOLV\Willis_Well_No6.agt					
Date: 07/11/14			Time: 08:58:58		
PROJECT INFORMATION					
Test Well: Willis Well No. 6					
Test Date: 4/17/13					
AQUIFER DATA					
Saturated Thickness: 767. ft			Anisotropy Ratio (Kz/Kr): 1.		
WELL DATA					
Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
Willis No. 6	0	0	Willis No. 6	0	0
SOLUTION					
Aquifer Model: Confined			Solution Method: Papadopolus-Cooper		
T = 3938.3 ft ² /day			S = 0.005		
r(w) = 1. ft			r(c) = 0.4167 ft		

Figure A-2. Estimation of transmissivity from pump test of Willis Well Number 6.



WELL TEST ANALYSIS					
Data Set: C:\Projects\LoneStarGCD\Well_Spacing_May2013\Data\AQTESOLV\Willis_Well_No7.aqt					
Date: 07/11/14			Time: 09:29:49		
PROJECT INFORMATION					
Test Well: Willis Well No. 7					
Test Date: 4/24/13					
AQUIFER DATA					
Saturated Thickness: 826. ft			Anisotropy Ratio (Kz/Kr): 1.		
WELL DATA					
Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
Willis Well No. 7	0	0	Willis Well No. 7	0	0
SOLUTION					
Aquifer Model: Confined			Solution Method: Papadopolus-Cooper		
T = 4233.7 ft ² /day			S = 0.001664		
r(w) = 1. ft			r(c) = 0.4167 ft		

Figure A-3. Estimation of transmissivity from pump test of Willis Well Number 7.

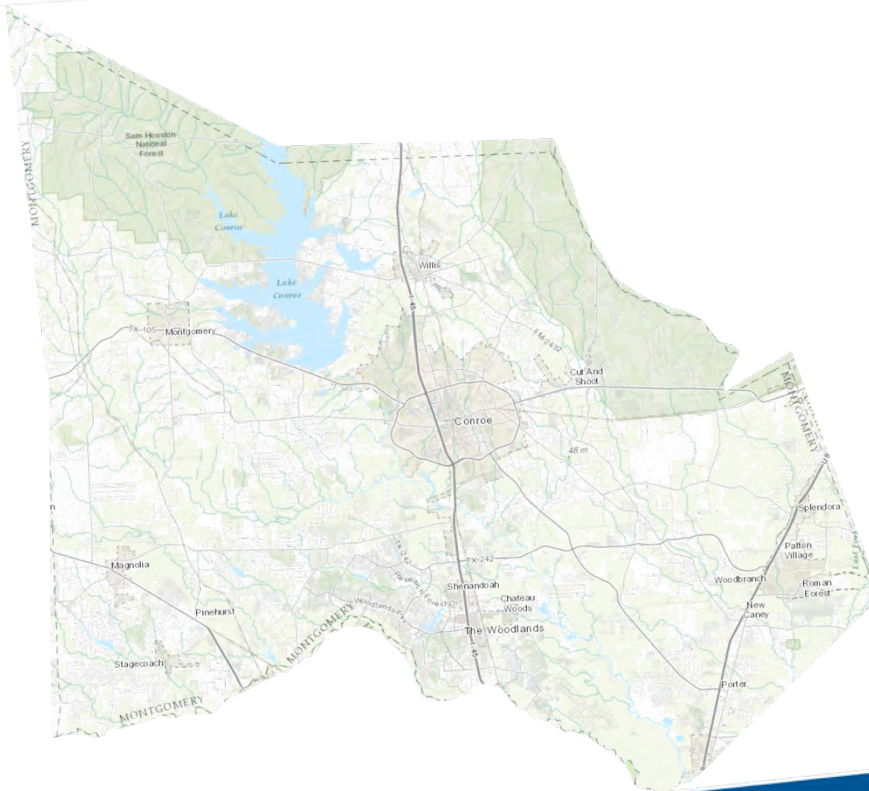
Hydrogeologic Basis for Proposed Spacing and Tract-Size Rules

Prepared For:



Prepared By:

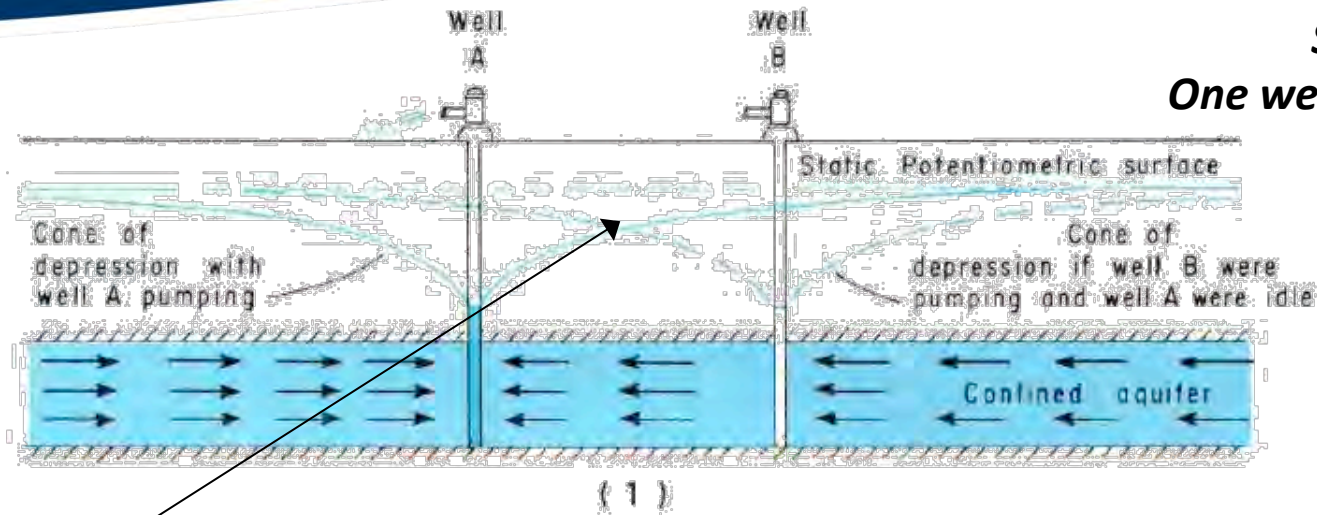
Mullican and
Associates



October 14, 2014

Concept of Well Interference

Scenario 1: One well pumping



Well Interference:

1. Drawdowns add up
2. Wells can impact each other

Scenario 2: Two wells pumping

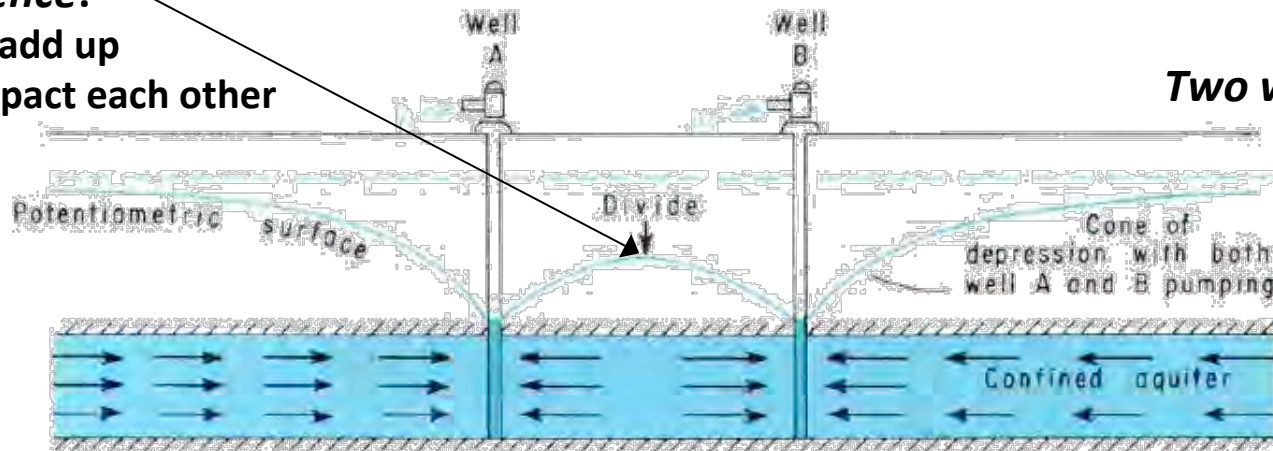


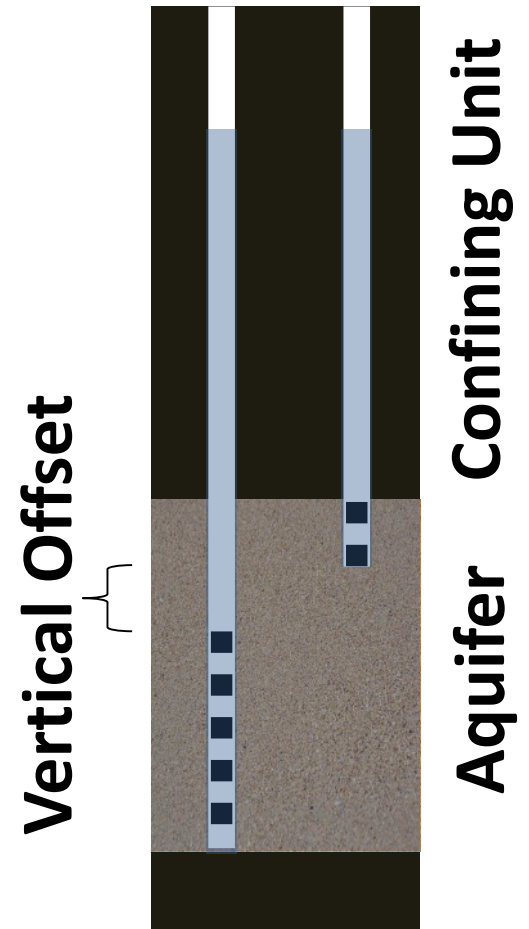
Image source: Heath (1983)

Gulf Coast Aquifer Tract Size and Spacing Rules

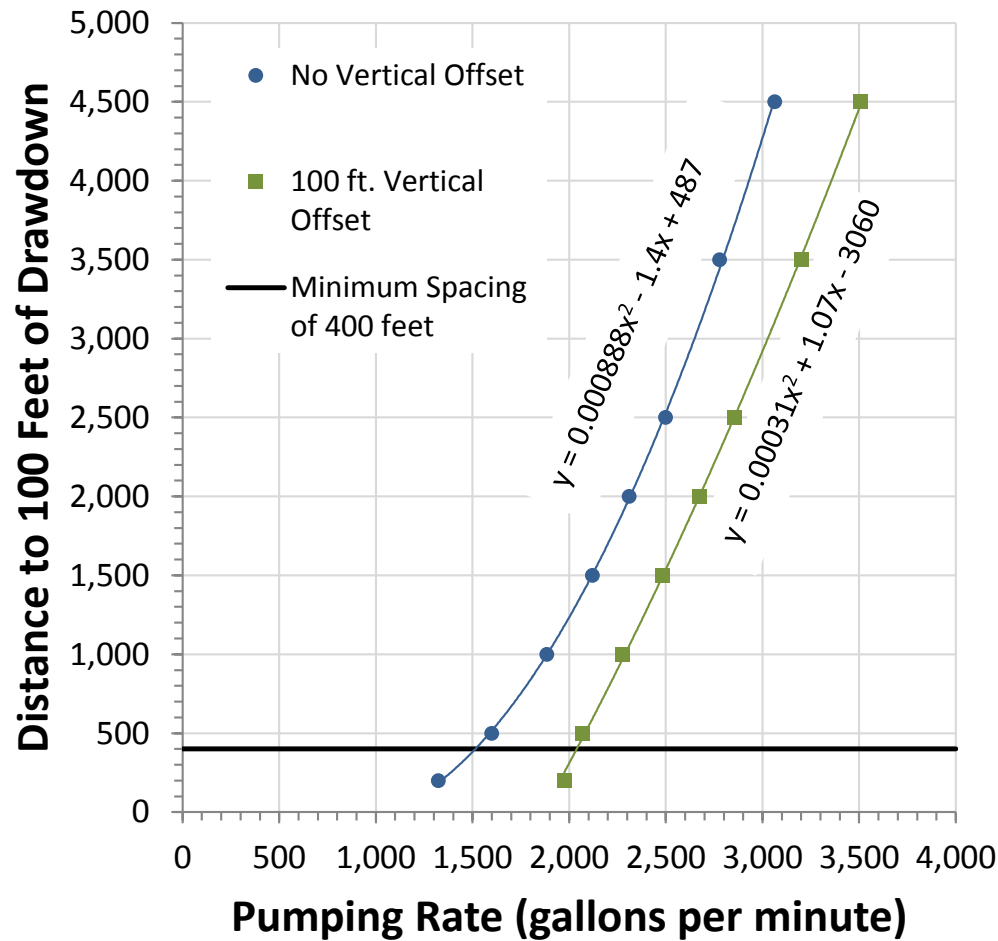
- District has analyzed in-depth the options for limiting well interference impacts in the Gulf Coast Aquifer
- Following this investigation, it was determined that a tract size requirement paired with a minimum depth was the best approach for minimizing well interference impacts
- All new wells drilled into the Gulf Coast Aquifer must have a minimum tract size of 1.5 acres and be drilled at least 150 feet deep
 - The tract size requirement ensures there is sufficient land to space well at some distance from neighbors
 - Depth requirement is to protect against smaller well interference or other fluctuations in the water table
- Two new wells on the same property must be completed to different aquifers or be spaced at least 255 feet apart

Catahoula Spacing Rules

- Developed accounting for the hydrogeology of the Catahoula Aquifer (thickness, properties, etc.)
- Spacing requirements balance desire to limit interference between wells with practical considerations for those wanting to use the aquifer
- Wells with well screen elevations offset by 100 feet or more are subject to less stringent spacing requirements due to likely hydrogeologic separation



Catahoula Spacing Rules



Pumping Rate (gallons per minute)	Spacing Distance (No Vertical Offset)	Spacing Distance (Vertical Offset Greater Than 100 ft)
1,000	400	400
1,500	400	400
2,000	1,239	400
2,500	2,537	1,553
3,000	4,279	2,940
3,500	6,465	4,483

Catahoula Spacing Rules

- Conceptually developed based on well interference impact of 100 feet after 10 years of pumping from the new well
- The 100-foot threshold is a guide based on representative properties of the aquifer
- It is not a guarantee of a certain level of protection for well owners

Catahoula Spacing Rules

- For wells with screens offset by less than 100 feet:

$$\underline{D = 0.000888Q^2 - 1.4Q + 487}$$

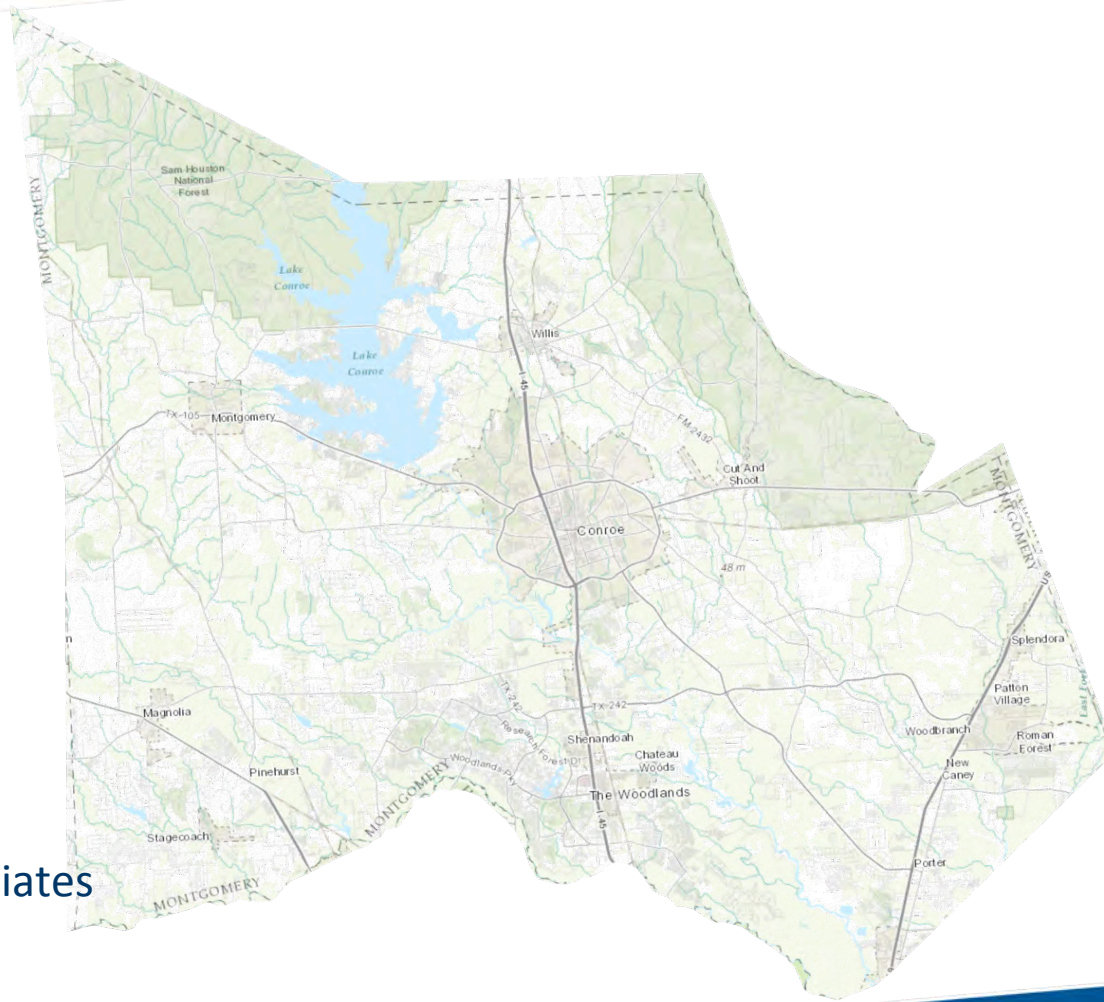
where D is the minimum spacing distance (feet) and Q is the maximum design capacity of the well

- For wells with screens offset by 100 feet or more:

$$\underline{D = 0.00031Q^2 - 1.07Q + 3060}$$

- Catahoula wells must be spaced at least 400 feet apart regardless of vertical offset

Bill Mullican, P.G.
Mullican and Associates
Wade Oliver, P.G.
INTERA Inc.



June 29, 2018

Ms. Kathy Jones
General Manager
Lone Star Groundwater Conservation District
655 Conroe Park North Drive
Conroe, TX 77303

RE: Summary of Well Spacing Rule Development Assistance and Status

Dear Ms. Jones,

Lone Star Groundwater Conservation District (the “District”) retained INTERA at the beginning of 2018 to assist with the evaluation of potential well spacing rules. INTERA and others have previously performed technical analyses of the aquifers in the District related to well spacing. The purpose of the current effort is to 1) summarize these previous well spacing studies, 2) review and summarize the well spacing approaches adopted by other groundwater conservation districts, and 3) in coordination with the District, develop recommended approaches to well spacing. This purpose of this letter is to document the status of these well spacing rule discussions.

INTERA met with the Lone Star GCD Rules and Regulatory Planning Committee on March 29th, 2018. At this meeting INTERA reviewed well spacing concepts, previous studies, the rules of other GCDs, and potential well spacing rule priorities with the District members. After District members reviewed the materials provided at this meeting, INTERA again met with the committee on June 5th, 2018. At this meeting, the District members discussed the District’s policy priorities and their relationship to the purposes of well spacing rules.

Well spacing is a tool available to districts that allows them to manage local-scale impacts (typically drawdown) between wells. These are separate from rules designed to manage production from the aquifer to achieve desired future conditions, which are more regional in scale. When considering well spacing rules, Districts must balance: 1) protecting the investment of existing well owners by minimizing the impacts of new wells, and 2) not unnecessarily limiting a landowner’s use of groundwater beneath his/her property.

From the discussion at the June 5th, 2018 meeting, the committee did express a desire to better understand the local-scale impacts of new higher capacity wells, which typically have greater potential for impacting neighboring wells. To achieve this, some districts require applicants for wells above a certain production threshold to perform hydrological assessments as part of the permitting process. These assessments may include an evaluation of local aquifer conditions, projections of impacts to neighboring wells, and/or aquifer tests to better understand site-specific aquifer properties.

If the District opts to require hydrological assessments to better understand the impacts of high-capacity wells, the specific threshold for requiring an assessment will contain policy as well as technical considerations. From our analysis of the District’s existing wells and expected impacts at a range of

pumping rates, we expect this threshold will be at a capacity between 500 and 1,000 gallons per minute. For context, approximately 87 percent of the non-exempt wells in the District have a production capacity below 500 gallons per minute. Approximately 90 percent of the non-exempt wells have a production capacity below 1000 gallons per minute. Some policy considerations include the expected costs to the well applicant, which will depend on the specific requirements of the assessment, and how the District plans to use the information.

If you have any questions or would like any additional information, please do not hesitate to contact me at (281) 560-4562 or by email at woliver@intera.com.

Sincerely,



Wade Oliver, P.G.
Senior Hydrogeologist
INTERA, Inc.

DRAFT

Proposed Rule Concepts and Guidelines for Hydrogeologic Assessments For Discussion Purposes Only

Proposed Rule Concepts for Hydrogeologic Assessments

Any application for a new operating permit or an amendment to an existing operating permit shall include a Hydrogeologic Assessment if:

1. the new or amended operating permit is for a well (or multiple wells on the same property) equipped to produce greater than 500 gallons per minute; and
2. any of the wells associated with the new or amended permit are less than 2000 feet from another well registered with the District and completed, in whole or in part, into the same aquifer(s).

The Hydrogeologic Assessment shall be sealed by a licensed professional engineer or geoscientist in Texas and completed in accordance with the District's Hydrogeologic Assessment Guidelines. Upon request, the District will provide the applicant with information on the locations and depths of nearby registered wells necessary to determine if a Hydrogeologic Assessment is required.

The District shall review each Hydrogeologic Assessment for completeness and may request additional information if the data or analyses are found to be insufficient for characterizing the aquifers and potential impacts of the proposed pumping.

DRAFT

Proposed Hydrogeologic Assessment Guidelines

These guidelines were developed by Lone Star Groundwater Conservation District to guide completion of Hydrogeologic Assessments required under District Rule X.X. All Hydrogeologic Assessments must contain the following items:

- The location of the well or wells associated with the new or amended operating permit.
- The actual or proposed diameter, depth, and completion interval of each well.
- A description of the geologic and hydrologic conditions at the site, including:
 - the depths and thicknesses of each aquifer at the site (Chicot Aquifer, Evangeline Aquifer, Burkeville Confining Unit, Jasper Aquifer, and Catahoula Formation);
 - the current measured or estimated water levels in each aquifer;
 - the estimated horizontal and vertical hydraulic conductivity of each aquifer;
 - the estimated storativity and, if applicable, specific yield of each aquifer; and
 - the data sources and methods used to develop each of the items above (for example, include any drillers reports, geophysical logs, or aquifer test data used).
- An analysis of the estimated drawdown after 1 year and 10 years of production in the well or wells associated with the operating permit and any registered wells within a 1-mile radius. The analysis must include a description of the methods and tools used to develop the estimated drawdowns. Drawdown estimates should only reflect impacts from the wells associated with the new or amended operating permit. It is not necessary to evaluate impacts due to pumping from wells not associated with the permit. Upon request, the District will provide information on the locations and depths of nearby registered wells for this item.
- The seal and signature of the Texas licensed professional engineer or geoscientist responsible for the above analyses.

If the estimated drawdown after 10 years in any registered wells is equal to or greater than 25 percent of the drawdown estimated in any of the wells associated with the permit application, the District may find that proposed production has the potential to cause an unreasonable impact. If this condition is met, the applicant must also include the following items with the Hydrogeologic Assessment:

- identify any wells meeting the 25 percent drawdown threshold;
- describe the monitoring activities or mitigation measures applicant proposes to track and address potential unreasonable impacts; and
- if applicable, describe any other factors applicant believes mitigate the potential for unreasonable impacts.

The District encourages all applicants to notify and work with the District throughout the completion of any Hydrogeologic Assessments. If you have any questions about these guidelines, please contact Lone Star Groundwater Conservation District at (936) 494-3436.

Lone Star Groundwater Conservation District

Balance Sheet

As of August 31, 2018

Accrual Basis

	Aug 31, 18
ASSETS	
Current Assets	
Checking/Savings	
First Bank (Money Market)	180,543.46
First Bank (Operating)	16,554.72
TexPool	169,651.02
Total Checking/Savings	366,749.20
Accounts Receivable	
Accounts Receivable	26,622.29
Total Accounts Receivable	26,622.29
Other Current Assets	
Allow for Bad Debts	-22,904.13
Prepaid Insurance	
Prepaid Dishonesty Bond	694.98
BCBS premium	8,372.87
Prepaid Insurance - Other	11,744.57
Total Prepaid Insurance	20,812.42
Total Other Current Assets	-2,091.71
Total Current Assets	391,279.78
Fixed Assets	
Bldg & Land	
Conroe Park - Land	260,187.00
Conroe Park - Building & Design	1,593,552.27
Accumulated Depr - Bldg	-267,332.04
Total Bldg & Land	1,586,407.23
Furniture & Equipment	
Furniture/Fixture/Equipment	255,046.42
Accumulated Depreciation	-234,521.00
Total Furniture & Equipment	20,525.42
Total Fixed Assets	1,606,932.65
TOTAL ASSETS	1,998,212.43
LIABILITIES & EQUITY	
Liabilities	
Current Liabilities	
Accounts Payable	
Accounts Payable	43,698.68
Total Accounts Payable	43,698.68
Other Current Liabilities	
Deposits Payable	54.00
Accrued Expenses	905.80
Accrued Vacation Time	14,376.57
Deferred Revenue	293,043.73

Lone Star Groundwater Conservation District

Balance Sheet

As of August 31, 2018

Accrual Basis

	Aug 31, 18
Direct Deposit Liabilities	
AFLAC-EE portion	377.06
ICMA 401(a)-EE portion	-0.04
ICMA-401(a) - ER portion	-0.18
Humana-EE portion	-128.64
Humana-ER portion	-670.22
BCBS-EE portion	290.00
Total Direct Deposit Liabilities	-132.02
Flex 125 Spending Account	-1,166.40
Total Other Current Liabilities	307,081.68
Total Current Liabilities	350,780.36
Total Liabilities	350,780.36
Equity	
Invested in Capital Assets, net	1,606,932.65
Retained Earnings	-529,388.08
Net Income	569,887.50
Total Equity	1,647,432.07
TOTAL LIABILITIES & EQUITY	1,998,212.43

Lone Star Groundwater Conservation District
Statement of Revenues and Expenditures - Budget vs. Actual
August 2018

	Aug 18	Budget	Jan - Aug 18	YTD Budget	Annual Budget
Ordinary Income/Expense					
Income					
Early Conversion Credit Water U	0.00	1,250.00	29,612.68	10,000.00	15,000.00
Administrative Fee					
Application Fee					
Application Fee-Other	0.00	413.00	0.00	3,298.00	4,950.00
Transfer of Early Con Credits	0.00	83.00	0.00	668.00	1,000.00
Transfer Permitted Authorizati	0.00	125.00	0.00	1,000.00	1,500.00
AWS Production Permit	0.00	250.00	0.00	2,000.00	3,000.00
AWS Groundwater Test Well	0.00	125.00	0.00	1,000.00	1,500.00
Emergency Permit	0.00		1,500.00		
Existing Well Application	0.00	125.00	2,000.00	1,000.00	1,500.00
GRP Amendment Submission	0.00	166.00	500.00	1,328.00	2,000.00
Operating Permit	2,150.00	1,833.00	12,800.00	14,664.00	22,000.00
Total Application Fee	2,150.00	3,120.00	16,800.00	24,958.00	37,450.00
Administrative Fees - Other	418.30	0.00	418.30	0.00	0.00
Change of Ownership/Type	600.00	333.00	2,100.00	2,664.00	4,000.00
Publication Fees	630.00	416.00	3,640.00	3,328.00	5,000.00
Record Request	0.00	125.00	462.02	1,000.00	1,500.00
Returned Check Fee	0.00	5.00	100.00	40.00	50.00
Well/Meter Re-inspection Fees	0.00	167.00	1,000.00	1,336.00	2,000.00
Total Administrative Fee	3,798.30	4,166.00	24,520.32	33,326.00	50,000.00
Interest Income	367.11		2,633.21		
Lone Star GCD Fees					
Agricultural Permits					
Agricultural Use Fee	144.00	145.00	1,152.00	1,153.00	1,733.00
Total Agricultural Permits	144.00	145.00	1,152.00	1,153.00	1,733.00
Export Fees	0.00	50.00	820.87	400.00	600.00
Historic Use Fee					
Historic Use Fee 2018	137,495.00	141,833.00	1,108,765.57	1,134,664.00	1,701,995.00
Total Historic Use Fee	137,495.00	141,833.00	1,108,765.57	1,134,664.00	1,701,995.00
Operating Permit Fees					
Operating Permit 2018	44,042.00	37,667.00	351,813.91	301,331.00	451,999.00
Operating Permit 2017	0.00		889.36		
Operating Permit 2016	0.00		161.10		
Operating Permit 2015	0.00		161.10		
Operating Permit 2014	0.00		161.10		
Total Operating Permit Fees	44,042.00	37,667.00	352,986.57	301,331.00	451,999.00

Lone Star Groundwater Conservation District
Statement of Revenues and Expenditures - Budget vs. Actual
August 2018

	Aug 18	Budget	Jan - Aug 18	YTD Budget	Annual Budget
AWS Production fees					
AWS Production Fees - 2018	12,644.00	12,644.00	102,441.20	101,152.00	151,728.00
AWS Production Fees - 2017	0.00		15,285.00		
Total AWS Production fees	12,644.00	12,644.00	117,726.20	101,152.00	151,728.00
Overpumpage of a Permit	0.00	459.00	10,655.55	3,672.00	5,500.00
Penalty/ Interest	0.00	417.00	7,780.55	3,336.00	5,000.00
Total Lone Star GCD Fees	194,325.00	193,215.00	1,599,887.31	1,545,708.00	2,318,555.00
Total Income	198,490.41	198,631.00	1,656,653.52	1,589,034.00	2,383,555.00
Gross Profit	198,490.41	198,631.00	1,656,653.52	1,589,034.00	2,383,555.00
Expense					
Election Expense	0.00	0.00	6,210.00	0.00	175,000.00
Litigation					
2017 Engineering/Consultant Ser	0.00		14,129.21		
GMA 14 Planning (amendment)	0.00	1,667.00	0.00	13,336.00	20,000.00
Engineering Consultant Services	0.00	6,250.00	899.00	50,000.00	75,000.00
Legal-DFC Appeal	0.00	1,667.00	4,889.58	13,336.00	20,000.00
Legal-Lawsuit	11,260.35	33,750.00	186,671.15	270,000.00	405,000.00
Total Litigation	11,260.35	43,334.00	206,588.94	346,672.00	520,000.00
Educate/Public Aware Coordinate					
Community Aware/Public Relation					
Educational Curriculum Schools	0.00	0.00	0.00	0.00	50,000.00
Rainwater Collection Expansion	0.00	83.00	91.90	664.00	1,000.00
Website Modification	0.00	583.00	0.00	4,664.00	7,000.00
ET Weather Station Network	84.00	625.00	6,684.91	5,000.00	7,500.00
Communication/Public Awareness	71.56	625.00	2,574.75	5,000.00	7,500.00
Water Efficiency Network	0.00	333.00	380.38	2,664.00	4,000.00
Conservation Products	0.00	250.00	0.00	2,000.00	3,000.00
Total Community Aware/Public Relation	155.56	2,499.00	9,731.94	19,992.00	80,000.00
Total Educate/Public Aware Coordinate	155.56	2,499.00	9,731.94	19,992.00	80,000.00
Attorney Fees					
General Counsel Work	21,050.08	8,333.00	45,284.02	66,664.00	100,000.00
Legal Work - additional	0.00	2,500.00	677.50	20,000.00	30,000.00
Total Attorney Fees	21,050.08	10,833.00	45,961.52	86,664.00	130,000.00
Board Expense					
Per Diem	4,300.00	4,333.00	22,850.00	34,664.00	52,000.00
Payroll Tax Liability - Board	306.00	333.00	1,648.60	2,664.00	4,000.00
Board Meeting Expense	97.99	333.00	725.58	2,664.00	4,000.00
Total Board Expense	4,703.99	4,999.00	25,224.18	39,992.00	60,000.00
Advertising/Public Notices	1,473.89	750.00	4,911.24	6,000.00	9,000.00
Audit Fees	0.00	0.00	8,500.00	8,500.00	8,500.00

Lone Star Groundwater Conservation District
Statement of Revenues and Expenditures - Budget vs. Actual
August 2018

	Aug 18	Budget	Jan - Aug 18	YTD Budget	Annual Budget
Building Expense					
Building Maintenance	965.00	833.00	17,271.50	6,664.00	10,000.00
Utilities & Housekeeping	3,450.84	2,292.00	23,656.03	18,336.00	27,500.00
Total Building Expense	4,415.84	3,125.00	40,927.53	25,000.00	37,500.00
Computer Support					
Hosting/Internet/Backup	58.10	1,000.00	464.80	8,000.00	12,000.00
Repair & Support	1,231.00	1,250.00	10,372.43	10,000.00	15,000.00
Software	346.58	250.00	4,770.59	2,000.00	3,000.00
Total Computer Support	1,635.68	2,500.00	15,607.82	20,000.00	30,000.00
Engineering					
Well Spacing	2,835.34	917.00	10,815.34	7,336.00	11,000.00
Engineering Consult Svcs	2,345.00	7,083.00	6,931.79	56,664.00	85,000.00
GMA 14 Planning	0.00	10,833.00	0.00	86,664.00	130,000.00
Well Permit Database Management	0.00	792.00	0.00	6,336.00	9,500.00
Total Engineering	5,180.34	19,625.00	17,747.13	157,000.00	235,500.00
Field/Technical Expense					
Field Supplies	142.67	150.00	1,900.46	1,200.00	1,800.00
Vehicle Fuel Expense	266.19	225.00	1,898.92	1,800.00	2,700.00
Vehicle Repair & Maintenance	62.90	292.00	1,108.30	2,336.00	3,500.00
Total Field/Technical Expense	471.76	667.00	4,907.68	5,336.00	8,000.00
Insurance					
Bonds	36.59	167.00	652.72	1,336.00	2,000.00
Building & Property Insurance	244.00	214.00	1,773.02	1,712.00	2,570.00
Errors and Omissions	357.08	292.00	2,456.68	2,336.00	3,500.00
Liability	113.83	104.00	846.68	832.00	1,250.00
Vehicle Insurance	262.08	258.00	2,053.14	2,064.00	3,100.00
Total Insurance	1,013.58	1,035.00	7,782.24	8,280.00	12,420.00
Manager					
Travel/Edu/Training	888.00	500.00	4,525.34	4,000.00	6,000.00
Vehicle Allowance	1,000.00	1,000.00	8,000.00	8,000.00	12,000.00
Total Manager	1,888.00	1,500.00	12,525.34	12,000.00	18,000.00
Memberships Dues /Subscriptions	150.00	500.00	1,559.78	4,000.00	6,000.00
Miscellaneous	43.69	83.00	619.74	664.00	1,000.00
Office Expenses					
Office Equipment	0.00	0.00	10,654.81	10,500.00	10,500.00
Office Supplies	0.00	625.00	1,115.85	5,000.00	7,500.00
Total Office Expenses	0.00	625.00	11,770.66	15,500.00	18,000.00

Lone Star Groundwater Conservation District
Statement of Revenues and Expenditures - Budget vs. Actual
 August 2018

	Aug 18	Budget	Jan - Aug 18	YTD Budget	Annual Budget
Payroll Expenses					
Salaries	50,330.75	49,167.00	389,237.75	393,336.00	590,000.00
Payroll Tax Liability	3,712.21	3,663.00	28,582.65	29,304.00	43,965.00
Retirement	2,969.99	2,950.00	23,304.50	23,600.00	35,400.00
Medical/Life	6,272.70	7,667.00	61,977.37	61,336.00	92,000.00
SUI	0.00	0.00	1,458.00	800.00	800.00
Workman's Comp	196.58	192.00	1,631.68	1,536.00	2,300.00
Payroll Service Fees	34.00	67.00	262.00	536.00	800.00
Total Payroll Expenses	63,516.23	63,706.00	506,454.15	510,448.00	765,255.00
Postage Expense					
Postage Meter & Supplies	0.00	62.00	386.90	502.00	750.00
Postage/Shipping/Delivery Ser	0.00	417.00	860.88	3,336.00	5,000.00
Total Postage Expense	0.00	479.00	1,247.78	3,838.00	5,750.00
Printing	286.44	667.00	3,059.47	5,336.00	8,000.00
Programs					
Hydrogeological Modeling/Protec	0.00	83.00	350.00	664.00	1,000.00
USGS Joint Funding Agreement					
USGS - Groundwater Level Data	0.00	0.00	36,750.00	36,750.00	73,500.00
USGS - Water Level chg/subside	0.00	0.00	39,000.00	39,000.00	78,000.00
Total USGS Joint Funding Agreement	0.00	0.00	75,750.00	75,750.00	151,500.00
Total Programs	0.00	83.00	76,100.00	76,414.00	152,500.00
Rebate Water Use Fees	0.00	0.00	77,882.87	15,000.00	15,000.00
Travel/Training Staff	150.00	292.00	1,446.01	2,336.00	3,500.00
Depreciation	0.00	0.00	0.00	0.00	60,000.00
Total Expense	117,395.43	157,302.00	1,086,766.02	1,368,972.00	2,358,925.00
Net Ordinary Income	81,094.98	41,329.00	569,887.50	220,062.00	24,630.00
Net Income	81,094.98	41,329.00	569,887.50	220,062.00	24,630.00

LSGCD Bd		Ballot		
Position	NAME FOR BALLOT	Position		
Place 1	Stuart Traylor	1		
Place 2	Garry Oakley	1		
	Jim Spigener	2		
	Scott Railey	3		
Place 3	Jon Paul Bouche'	1		
	Richard Rankel	2		
	Rick Moffatt	3		
	Christina Moore	4		
Place 4	Jonathan Prykryl	1		
	Gail Carney	2		
	Nathanial Wells	3	withdrew (8/31/18)	
Place 5	Gregg Hope	1		
	Francis J. Bourgeois	2		
	Harry Hardman	3		
Place 6	Graesen McCaulley Smith	1		
	Jackie W. Chance SR.	2		
	Webb Melder	3		
	Carlotta Lansford	4	withdrew (9/7/18)	
Place 7	Larry A. Rogers	1		
	Emery E. Gallagher	2		
	Kent Maggert	3		

Educational Outreach



By James Ridgway, Jr. | Education/Public Awareness Coordinator | Lone Star Groundwater Conservation District | jridgway@lonestargcd.org

Since last September, we've toured throughout this great county on quite a few educational outreach activities, often with our mobile lab in tow. We've interacted with well over 10,000 people, tiny tots to great-grandparents—and every age in between. Hands down, it's the best part of the job.

Last September we kicked off the season taking our mobile lab to The Woodlands Landscaping Solutions. It's always a great event with so many informative exhibits. The weather is also pretty nice. We'll be there again this year. Come check it out on Saturday, September 29th, 9:00 a.m. to noon at the Recreation Center at Rob Fleming Park in the Village of Creekside.

By mid October, we were headed east for a two-day mobile lab visit at Splendora Jr. High School. Gary Irving, AKA Mr. Gary, our Field Operations Technician, who often joins me on these excursions, really captured the attention of these students as he explained the inner-workings of the school's on-site public well. "Mr. Gary," as I have heard many times, "is cool." That he is.

In November, December, and January, we made several stops, including at Ford Elementary and Patterson Elementary, both in Conroe ISD, and Cannan Elementary and Parmley Elementary, both in Willis ISD. All of these visits were tied to last year's FIRST LEGO League challenge—Hydro Dynamics. If you're unfamiliar, FIRST LEGO League, or FLL, holds annual challenges where teams research a real-world problem and are challenged to develop a solution. They also must design,

build, and program a robot, then compete on a table-top playing field. Jealous yet? I wish I had this in elementary school.

I have since reached out to every school district in the county to discover just how popular FLL is. I counted somewhere around seventy active teams right here in Montgomery County.

The challenges for this school year were recently announced. For grades K-3 the challenge is "Mission Moon." For grades 4-8, it is "Into Orbit." To all you parents out there, it's a really great program. Check it out.

And since human-centric space exploration is intricately tied to water conservation, we'll certainly be looking to make similar visits again this year.

As 2018 rolled in, and school was back in session, we rolled up to a three-day mobile lab visit at Vogel Intermediate. It's a 5th and 6th grade Conroe ISD campus with about 1,100 students enrolled. We were able to schedule a half hour with every fifth-grade class.

This trip had an extra bonus. There's an educational program we've been doing the last several years called WaterWise, specifi-

cally geared toward fifth-grade students. The program provides a WaterWise kit of water saving devices to be installed at home with their parents, along with a detailed student curriculum book to be used in class. Each year, LSGCD receives detailed survey feedback. For instance, here are some highlights from the 2017-2018 school year:

- **100 percent** - Teachers who indicated parents supported the program.
- **100 percent** - Teachers who indicated they would recommend this program to other colleagues.
- **100 percent** - Teachers who indicated they would conduct this program again.

Our three-day trip lined up right as the kiddos received their WaterWise kits. They really liked the shower timers. Incidentally, the survey results back this up. It notes that about 70 percent of them are regularly using it. The survey also includes several handwritten notes from the students. Here's one of our favorites; it's from another fan of the



shower timer. *"Now my older sister isn't in the shower so long."*

In February, I was invited to speak at the Conroe Noon Lions Club to present on the importance of water education. It was a wonderful audience, and quite large, too. It was a real honor. Jason A. Miller, Lions Club Columnist for The Courier Newspaper, nailed it in his column a few days later:

"Mr. Ridgway's message is one that we all need to hear and work to do our part in order to sustain future fresh water resources for our kids, grandkids, and future generations to come."



In a similar capacity, from February to March, I presented to the Magnolia Rotary Club as well as the Montgomery Lions Club. Both superb organizations.

March is when things get really busy. For National Groundwater Awareness Week, we visited Little Beakers near Oak Ridge North as well as the Primrose School off Texas 242. We made edible and not-edible aquifers in cups. While one of those was clearly favored over the other, it was a good time all around.

Later in the month, it was time for one of the bigger annual events, the Woodland & Wildlife Expo. It's hard to compete with exotic snakes, birds, and wolves—but we manage. A few weeks later and I was actually in the woods teaching at the Texas A&M Forest Service's Classroom without Walls in Jones State Forest.

In April, it was off to the Houston Scout Fair, the Montgomery County Fair Association's Kid's Day, and the City of Conroe's Kidzfest. We engaged many thousands of people at these three events alone.

In May, we joined St. Anthony of Padua Catholic School's Earth Day event. We also partnered with the Extension Office to host a Rainwater Harvesting Workshop. And, lastly, fit in one more multi-day mobile lab visit at Stewart Creek Elementary, in Montgomery ISD, before school was out for summer.

In June, we visited SHSU's Brighton Academy Charter School in The Woodlands. Back at the office, we met a big group of high school students, from across the state, affiliated with the Texas 4-H Water Ambassadors, and gave a tour of our facilities. We also joined in on some educational activities through Lone Star College's Discovery Camp.

It's amazing how quickly a year can whip by when you're having fun.

FOR IMMEDIATE RELEASE

September 5, 2018



CONTACT: Ronda Trow

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**SAN JACINTO RIVER AUTHORITY WINS
IMPORTANT COURT RULING PAVING THE WAY FOR FAST-TRACK
ENFORCEMENT OF ITS GRP CONTRACTS**

The Austin Third Court of Appeals ruled Friday in favor of the San Jacinto River Authority (SJRA) on three key issues in its lawsuit related to its GRP contracts. This ruling paves the way for an Austin trial court to use a fast-track legal proceeding to decide the legal validity of the contracts and the 2017 GRP water rates.

In 2010, the City of Conroe and almost 90 other public and private water utilities entered into a contract to implement a joint, countywide groundwater reduction plan (GRP) whereby SJRA would deliver treated surface water to supplement existing supplies and meet growing demands. The GRP contract included provisions for periodic rate increases, which would be reviewed and approved by a committee comprised of GRP participants prior to adoption by SJRA's board.

The Third Court's ruling is a crucial interim victory for SJRA in the saga that began when the City of Conroe refused to pay SJRA's 2017 GRP rate increase, despite the GRP customer committee's unanimous approval of the proposed rates. The City of Magnolia later joined Conroe in refusing to pay the full rates, leaving other GRP participants—including area cities, municipal utility districts, and ultimately citizens—to make up the shortfall. SJRA General Manager Jace Houston noted the Cities' refusal to honor their contracts has forced other GRP participants to make up over \$2,236,000 in unpaid rates.

Houston stated that the Cities' inexplicable attempt to walk away from a contract they willingly entered into would create fiscal uncertainty and repercussions for all of the GRP participants. The Cities have refused to pay on the theory that the GRP contracts (which require the Cities to pay SJRA's rates) are invalid.

"The GRP contracts secure more than \$500 million in government bonds, the vast majority of which are held by the Texas Water Development Board," noted Houston. "If the GRP cannot make its payments, then Texas taxpayers could be unfairly burdened with the debt."

In response, SJRA filed a lawsuit to determine whether the GRP contracts and the 2017 rates are valid. SJRA sued under the Expedited Declaratory Judgment Act (EDJA), which authorizes fast-track resolution.

The Cities opposed and argued that the EDJA did not cover SJRA's claims. When the trial court sided with SJRA, the Cities appealed.

The Austin Third Court of Appeals unanimously agreed with SJRA on the key issues in a comprehensive 42-page opinion. Specifically, the Court affirmed that the EDJA covers three of SJRA's four requested declarations:

- SJRA is authorized to set rates pursuant to the GRP Contracts;
- SJRA issued its fiscal year 2017 Rate Order, including the 2017 rates, in accordance with the GRP Contracts; and
- SJRA's fiscal year 2017 rates, Rate Order, and GRP Contracts are legal and valid.

The Third Court's opinion means that SJRA will return to the district court in Travis County to obtain those declarations, which would then be binding in future litigation, including a suit determining whether Conroe and Magnolia have breached their GRP contracts by refusing to pay the 2017 rate increases.

The Cities would have an uphill battle in contesting the GRP contracts. The Third Court of Appeals' opinion states that the GRP contract "approvals by the Attorney General and ensuing events are deemed by statute to render both the bonds and the GRP Contracts valid, binding, and 'incontestable' in a court or other forum" under three different statutes. The Court did note that the parties disagree as to the effect of the incontestability, an issue to be resolved in the trial court.

Houston said that the Third Court's ruling is a significant step forward for SJRA and GRP participants.

"The Third Court correctly recognized that the Legislature wanted fast resolution of these crucial validity issues. Our other GRP members have been pushing to get answers and to hold Conroe and Magnolia accountable for the payments they have been avoiding and the increased costs they've caused the GRP to incur. The Cities can't keep delaying."

The Court also held that SJRA's fourth claim—whether the Cities breached their GRP contracts by not paying the 2017 rate increases—is not covered by the EDJA. According to Houston, this latter ruling poses no problem for SJRA.

"Once the trial court rules that the contracts and rates are valid, then it is clear that the Cities are breaching the contracts by refusing to pay." Houston added, "The EDJA will allow the Court to determine validity relatively quickly. Once the contracts and rates are declared valid, SJRA can easily prove breach in a separate suit."

For additional background information about this litigation, visit our website at <http://www.sjra.net/grp/>