

**Agenda Item: #12  
Public Hearing  
University of Mary Hardin Baylor**

**Staff Report**  
**Application for Drilling Permit**  
**N3-23-005P**



**Applicant/Owner:** University of Mary Hardin Baylor  
c/o Dr. Gretchen Miller, Collier Consulting  
900 College St.  
Belton, TX 76513

**Location of Well:**  
28.12-acre tract located at N. W. corner of W. Martin Luther King Junior Ave and Nolan Creek, Belton TX. Latitude 31.069169°/Longitude -97.472680°

<p><b>Proposed Annual Withdrawal:</b></p> <p><b>Initial Rate :</b> 270-gpm  <b>Max Column Pipe:</b> 4-inch</p> <p><b>Withdrawal:</b>  Proposed annual quantity not to exceed 64 acre-feet or 20,854,464 gallons per year.</p>	<p><b>Proposed Use</b></p> <p>Irrigation Use Permit</p> <p>Proposed for the University Practice Golf Course</p>	<p><b>Aquifer:</b></p> <p>Hosston Layer of the Trinity Aquifer</p> <p>Belton Lake Management Zone as described in Rule 7.1</p>	<p><b>Nearest Existing Wells:</b></p> <p>7 @ 1/2 mile  4 in Edwards Equiv.  2 in the Hensel Layer of the Trinity Aquifer  1 in the Alluvial Formation</p> <p>0 wells in the Hosston Layer of the Trinity</p>
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**General Information**

The University of Mary Hardin Baylor (UMHB) project area is located just west of the University of Mary Hardin-Baylor (UMHB) in Belton along Martin Luther King Blvd. and Nolan Creek, Texas. Per UMHB’s representative they desire to drill an irrigation well located on the southwest side of a 3-hole practice golf course. The well is to irrigate some 14.5 acres. Its location has been approximated with coordinates of 31.069169 and -97.47268 (decimal degrees).

The area is within the District’s Belton Lake Management Zone. During initial discussions, the District suggested we consider use of the Lower Trinity Aquifer as the source of groundwater. In addition, the proposed annual production of the proposed well is 64 acre-feet per year with an instantaneous pumping rate of 270 gallons per minute (gpm).

The applicant has submitted a needs assessment only for irrigation of the prescribed 14.5-acres based on a schematic drawing of the course and engineering by the Larry Rodgers Design Group from the Dallas/Fort Worth Area. Table 3 in the application considers evapotranspiration, rainfall, and applied irrigation for the golf course for each month in 2023. Total water usage for the year is estimated at

nearly 21 million gallons, which is the basis for the 64 acre-feet of required groundwater. Peak production occurs in July at just under 270 gpm.

The District's consultant has reviewed the application and the needs assessment. In his evaluation of the irrigation requirements, he utilized the District's Excel workbook developed by Texas A&M AgriLife Extension Service. This workbook uses the 25th percentile of annual rainfall between 1940 and 2021 as the expected annual rainfall, which is distributed monthly, average monthly reference evapotranspiration values calculated from local weather station data, a constant crop coefficient of 0.8 for turf grass, and 75 percent irrigation efficiency. Table 2 in his report provides the projected irrigation demand for the 14.5 acres of golf course turf grass using the District's A&M workbook.

His work shows a different conclusion of the needs for the 14.5-acre site but the discrepancies can be resolved once the applicant submits their final "Operating Permit" upon completion of the well.

### **Per Rules 6.9 and 6.10**

In deciding whether or not to issue a permit, the Board must consider the following:

1. **Does the application contain all the information requested, and is the application accurate? Does it meet spacing and production limitations identified by District Rules, and does it conform to all application requirements which include public notification and accompanied by the prescribed fees? (Rule 6.10.24(a)(b), TWC 36.116(a)(1), TWC 36.113(d)(1) and Rule 6.9.1(b)(1)(2)**

The application is complete—all requested information has been provided. The application conforms to said rules with all required application fees. In addition, the applicant has met all notification requirements in a proper manner per District Rules.

- 2) **Is the proposed use of water dedicated to a beneficial use? (TWC 36.113(d)(3) and District Rule 6.10.24 (d).**

The groundwater produced from this well is for irrigation use per District Rules and Chapter 36 qualities as beneficial. Applicant and/or Applicant's representatives are encouraged to testify to use and needs assessment. The discrepancy on the needs will need to be resolved once the well is completed and the applicant returns for prescribed need in the Operating Permit process that requires application, well completion report, and the final needs assessment.

- 3) **Has the applicant agreed to avoid waste and achieve water conservation? (TWC 36.113(d)(6) and Rule 6.10.24(f)**

The applicant should testify they understand per District Rules and that by signing the application form the applicant and applicant's representatives agree to stating compliance with the District's Groundwater Management Plan.

- 4) **Has the applicant agreed that reasonable diligence will be used to protect groundwater quality and that the applicant will follow well plugging guidelines at the time of well closure? (TWC 36.113(d)(7) and Rule 6.10.24(g))**

The applicant (*by signing the application form*) and should offer testimony that if the well deteriorates over time or becomes damaged in such a way that the well is inoperable that state law and district rules require such a well to be plugged before a replacement well can be drilled.

**5) Will the proposed water well comply with spacing and production limitations identified in our rules? (TWC 36.116(a)(1) and Rule 6.10.24(b)) and Rule 9.5.2**

The proposed well is in the “*Belton Lake Management Zone*” of Bell County. The applicant states they need a maximum column pipe size of 4-inch, and 270-gpm is anticipated for the course stated in the needs assessment. Based on this column pipe size, a minimum size tract of 30-acres is required and is met. The required well spacing of (Figure 1) 1980-foot spacing requirement from other wells completed in the Hosston Layer of the Trinity Aquifer. The well must also be located 75 feet from the property line. Testimony from the applicant that they will continue to adhere to all spacing requirements per District Rule 9.5 Spacing Requirements.



Figure 1. Illustrates wells no wells from the Lower Trinity exist within 1980 feet of the proposed well site.

The District rules do not impose production limitations other than those determined applicable in the review of today’s drilling permit request for a well to conduct the study the prescribed Well Completion Report per District Rule 6.9.2 (f)(1)-(8).

The applicant and their representative must understand that future operating permit application that they must provide evidence that the permit must not cause any unacceptable level of decline in water quality of the aquifer, or as may be necessary to prevent waste and achieve water conservation, minimize as far as practicable the drawdown of the water table or the reduction of artesian pressure, lessen interference between wells, or control and prevent subsidence.

These issues are considered in Items 6 & 7 below and with staff recommendations to address potential concerns of adjacent property owners.

**6) Will the proposed use of water unreasonably affect existing groundwater and surface water resources or existing permit holders?**

Based upon our best available information, there are 7 wells as defined for domestic or landscape use completed, from other formations and not from the Lower Layer of Trinity aquifer as defined by TWDB. This layer is completely confined from the others

**7 wells are within 1/2 mile (No wells are completed in the Lower Trinity) 1 well active and completed in the Alluvial, 2 wells in the Middle Trinity, and 4 in the Edwards Equivalent. 4 are active and 3 are inactive.**

Mike Keester, RW Harden & Associates, has reviewed the application and has projected anticipated drawdown and has provided the *attached MK report*.

Keester's initial conclusions and recommendations are in the attached report. We recommend the applicant due to the difference in calculated irrigation water demand provide additional information related to their irrigation requirement assumptions.

I note that during the Board's deliberation on a future operating permit application, understanding the rationale behind the applicant's assumptions will aid in determining the allocation for beneficial use as it relates to a future operating permit application to substantiate the projected water use of 64 acre-feet per year.

Additionally, the District, to the extent possible, must issue permits up to the point the total volume of exempt and permitted groundwater production will achieve the applicable Desired Future Condition (DFC) per TWC 36.1132(a)(b) and Rule 6.10.25(a)(b)(c)(d)(e).

**7) Is the proposed use of water is consistent with the District's Groundwater Water Management Plan related to the approved DFC and the defined available groundwater for permitting?**

The District's current Groundwater Management Plan reflects a groundwater availability figure in the Lower Trinity Aquifer of **7193 ac-ft/year Modeled Available Groundwater** (minus the reserve 178 ac-ft/year for exempt well use) thus **7015 ac-ft/year is the Managed Available Groundwater for permitting. For the record the actual MAG, per GMA8-Round 3, will increase to 7900 ac-ft/year, once the District amends the current GMP.**

The Board, per the District Management Plan, has evaluated groundwater available for permitting the Lower Trinity Aquifer and evaluated the available groundwater for permitting (*consistent with the management plan as stated on pages 9-10*).

The requested permit amount relative to the current modeled available groundwater MAG determined by the Texas Water Development Board (TWDB) based on the desired future conditions (DFCs) established by the District for the Lower Trinity Aquifer was set by CUWCD based on 330-ft of drawdown over 60-yrs. This was reviewed and again approved by the board in January 2019. To achieve this DFC, the TWDB used a model that indicated the MAG was equal to 7193 acre-feet per year from the Lower Trinity.

A summary of YTD 2023 permit production, HEUP & OP Permit Analysis, pending applications, and \*Exempt Well Reservations for the Lower Trinity, per District Report illustrates current Lower Trinity Aquifer permits total 4390.661 ac-ft/year. Currently, the District has a pending permit of 0.38 ac-ft/year, thus available for permitting is only 2624.339 acre-feet/year. (see attached Lower Trinity Aquifer Status Report, June 2023).

**8) What are the Modeled Available Groundwater calculations determined by the Executive Administrator of the Texas Water Development Board?**

The current modeled available groundwater MAG determined by the Executive Administrator with the Texas Water Development Board (TWDB) based on the desired future conditions (DFCs) established by Joint Planning in GMA8 (**Round-2**) the District for the Lower Trinity Aquifer was determined based on 330-ft of drawdown over 60 yrs. This was reviewed and again approved by the board in January 2019. To achieve this DFC, the TWDB used a model that indicated the MAG was equal to 7193 acre-feet per year from the Lower Trinity.

The modeled available groundwater will not be exceeded by granting this permit. (see attached Trinity Aquifer Status Report, June 2023).

**9) What has the Executive Administrator of the Texas Water Development Board's estimate of the current and projected amount of groundwater produced under the exemptions in District Rule 8.3?**

Refer to #7 above. Reservation of Modeled available groundwater for **exempt well** use will not be exceeded by granting this permit. 178 ac-ft/year vs 59 ac-ft estimated to be used annually in the Lower Trinity. (see 2022 district exempt use report)

**10) What is the amount of groundwater authorized under permits previously issued by the District?**

Refer to #7 above. Existing permits do not exceed the managed available groundwater (*modeled available groundwater – exempt well use = Managed Available Groundwater*) for the Lower Trinity Aquifer which is 4390.661 ac-ft per year.

**11) What is the reasonable estimate of the amount of groundwater that is produced annually under existing non-exempt permits issued by the District?**

The total permitted amounts for non-exempt wells in the Lower Trinity Aquifer in 2022 was **4390.61 ac-feet/yr.** and the actual production in 2022 was **1842.71 ac-ft/yr (42%)** of the permitted amount. (*Figures are based upon monthly production reports submitted to Clearwater by the permit holders in 2022.*)

**12) Yearly precipitation and production patterns.**

Clearwater is currently in no drought management stage based on the PDI system (average running total annual rainfall) over the Trinity Aquifer in the District, is currently at **28.932** inches of rain received in the last 365 days (6-23-2023) thus 87.67% of annual expected rainfall of 33 inches. The Lower Trinity permit holders in all of 2022 have used 42% of the total permitted amounts in the Aquifer. Permit holders did not exceed their total permitted amounts in 2020, 2021, and 2022.

The gravity of the current drought is reminiscent of the epic drought of 2011-2013, the significant drought in 2018, 2020, and again in 2022-23. The current drought trends do necessitate the need for all permit applications to be evaluated based on conservative needs and usage that are not contradicted by the current voluntary drought contingency plan stage. The applicant should testify about the irrigation system's efficiency and willingness to be conscious and conservative when using groundwater during extreme drought situations.

**Conclusions and Recommendations:**

- 1) District GM recommends that the Board only approve drilling permit per Rule 6.7.1 and per Rule 6.9.2(f) they must provide the Well Completion Report, when the applicant returns to the District for an final Operating Permit per Rule 6.6.1 within 30-days of completion of the well and per Rule 6.6.3 preparation of the required well completion report.
- 2) District GM recommends the Applicant's representatives provide more clarification on the stated needs assessment of the groundwater production and account for the discrepancies with the District's calculations when submitting the final operating permit application.
- 3) District GM concurs with Keester that the well completion report will aid the Board's understanding of anticipated impacts over and above our current understanding of the system.
- 4) District GM recommends that the well be equipped with a meter for monthly recording of production in accordance with District Rule.
- 5) District should require the well owner to participate in the Districts continuous water level recorder program with a device provided and maintained by the District Staff.

Attachments are as follows:

<i>Keester PG Technical Memorandum</i>	<i>06/??/2023</i>
<i>CUWCD Aquifer Status Report</i>	<i>06/13/2023</i>
<i>CUWCD 2022 Exempt Well Estimate of Use Report</i>	<i>12/31/2022</i>
<i>CUWCD Site Map</i>	<i>See Attached</i>
<i>Applications, fees and Notification Affidavit</i>	<i>See Attached</i>

**Mike Keester, PG**  
**RW Harden & Associates**  
**July 7, 2023 Hydrogeologic Evaluation**



## TECHNICAL MEMORANDUM

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**To:** Dirk Aaron, General Manager – Clearwater Underground Water Conservation District

**From:** Michael R. Keester, PG – R. W. Harden & Associates, Inc.

**Date:** July 7, 2023

**Subject:** Hydrogeologic Evaluation of the University of Mary Hardin-Baylor Well (N3-23-005P) Drilling Permit Application

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**Proposed Well ID:** *N3-23-005P*

**Well Owner Name:** *University of Mary Hardin-Baylor*

**Tract Size:** *28.12 Acres*

**Column Pipe Size:** *Max 4 inches*

**Aquifer:** *Lower Trinity*

**Proposed Annual Production:** *64 Acre-Feet per Year*

**Proposed Instantaneous Pumping Rate:** *270 Gallons per Minute*

According to information provided by the applicant’s consultants, the proposed well is intended to supply water for irrigation use on the applicant’s three-hole practice golf course located on the west side of Belton. The applicant’s consulted reported projected annual irrigation water demand for the golf course is 20,872,481 gallons or approximately 64 acre-feet. To meet peak demand, the anticipated capacity of the well is 270 gallons per minute from the Lower Trinity Aquifer in the Belton Lake Management Zone. Table 1 is a copy of the applicant’s projected irrigation water demand as reported by George (2023).

To evaluate irrigation requirements, the District utilizes an Excel workbook developed by Texas A&M AgriLife Extension Service. This workbook uses the 25<sup>th</sup> percentile of annual rainfall between 1940 and 2021 as the expected annual rainfall which is distributed monthly, average monthly reference evapotranspiration values calculated from local weather station data, a constant crop coefficient of 0.8 for turf grass, and 75 percent irrigation efficiency. Table 2 provides the projected irrigation demand for the 14.5 acres of golf course turf grass using the District’s workbook.

Comparison of the projections from the applicant’s consultant and the District’s tool reveals the District’s estimate is a little more than one-half of the applicant’s projection. One factor for the difference is the applicant’s evapotranspiration (labeled “Evt”) is used for calculating required irrigation (labeled “Req Irr”) without modification by a crop coefficient. In addition, precipitation (labeled “Rf”) applied to the irrigation requirement is reduced by one-half and termed effective precipitation (labeled “Eff Rf”). Finally, the applied irrigation (labeled “Appl Irr”) assumes an irrigation efficiency of 85 percent. Due to the differences in approach, the applicant should be prepared to present the rationale for their irrigation requirement assumptions to the Board as part of their future operating permit application.

**Table 1. Applicant’s projection of irrigation water demand (George, 2023).**

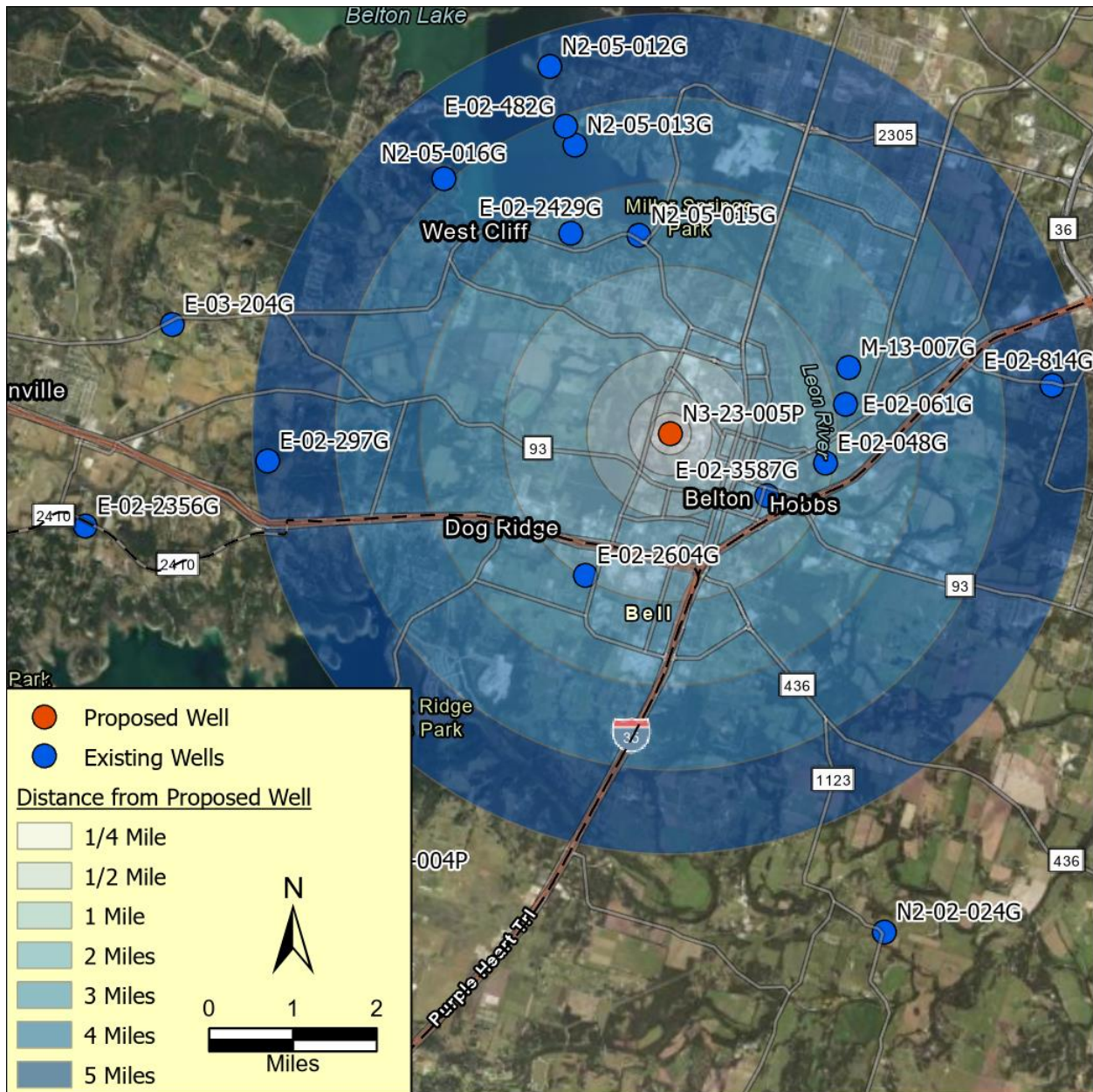
Month	Evt Inches	Rf Inches	Eff Rf Inches	Req Irr Inches	Appl Irr Inches	Acres Irr.	Gal. per day	Total Vol per month	GPM*
JAN.	1.92	1.75	0.00	0.00	0.00	14.5	0	0	0.00
FEB.	2.57	2.25	1.13	1.45	1.70	14.5	21,592	669,346	51.41
MAR.	4.27	2	1.00	3.27	3.85	14.5	48,862	1,514,714	116.34
APRIL	5.26	3.75	1.88	3.39	3.98	14.5	50,580	1,567,984	120.43
MAY	7.55	4.75	2.38	5.18	6.09	14.5	77,327	2,397,139	184.11
JUNE	8.38	3	1.50	6.88	8.09	14.5	102,804	3,186,921	244.77
JULY	8.74	2.25	1.13	7.62	8.96	14.5	113,787	3,527,384	270.92
AUG.	8.27	2	1.00	7.27	8.55	14.5	108,631	3,367,575	258.65
SEPT.	6.3	3.5	1.75	4.55	5.35	14.5	67,988	2,107,630	161.88
OCT.	4.94	3.5	1.75	3.19	3.75	14.5	47,666	1,477,657	113.49
NOV.	2.74	2.5	1.25	1.49	1.75	14.5	22,264	690,191	53.01
DEC.	1.79	2	1.00	0.79	0.93	14.5	11,805	365,940	28.11
<b>Total</b>	<b>62.73</b>	<b>33.25</b>	<b>15.75</b>	<b>45.06</b>	<b>53.01</b>	<b>14.5</b>		<b>20,872,481</b>	

**Table 2. District’s projected irrigation need for 14.5 acres of golf course turf grass.**

Month	Crop Water Requirement (inches)	Expected Rainfall (inches)	Crop Deficit (inches)	Crop Deficit (gallons)	Irrigation Water Requirement (gallons)	Irrigation Water Requirement (acre-feet)
1	1.75	1.62	0.13	50,579	67,439	0.21
2	2.16	1.93	0.22	87,324	116,432	0.36
3	3.47	2.10	1.37	540,272	720,362	2.21
4	4.51	2.56	1.95	768,042	1,024,056	3.14
5	5.44	3.63	1.81	714,345	952,460	2.92
6	6.19	2.76	3.43	1,351,375	1,801,834	5.53
7	6.49	1.51	4.98	1,959,397	2,612,529	8.02
8	6.36	1.77	4.59	1,807,360	2,409,813	7.40
9	4.81	2.66	2.15	847,543	1,130,058	3.47
10	3.67	2.77	0.91	357,082	476,109	1.46
11	2.27	2.07	0.20	79,585	106,113	0.33
12	1.84	1.83	0.01	3,568	4,758	0.01
<b>Total</b>	<b>48.96</b>	<b>27.20</b>	<b>21.76</b>	<b>8,566,472</b>	<b>11,421,963</b>	<b>35.05</b>

According to the CUWCD geologic model, the top of the Lower Trinity is about 1,000 feet below ground level and less than 150 feet thick at the proposed well location. Site specific conditions encountered while drilling will determine the final depth of the well and completion interval. To meet the requirements of District Rule 6.9.2(f), the applicant will need to collect lithology samples and conduct geophysical logging of the open borehole while will also support delineation of the subsurface geologic units.

The groundwater availability model (Kelley and others, 2014) indicates the Lower Trinity Aquifer transmissivity is about 2,650 gallons per day per foot (gpd/ft) with a storage coefficient of 0.00006. Aquifer testing conducted in collaboration with the District has resulted in revision of the model transmissivity for the Lower Trinity Aquifer. According to the CUWCD updated model datasets, the transmissivity of the Lower Trinity Aquifer at the proposed well site is about 5,800 gpd/ft (Keester and Konetchy, 2016; Konetchy and Beach, 2020). Testing conducted following completion of the well will provide the site specific aquifer hydraulic conditions. However, for our analysis of effects due to the proposed production, we used the higher transmissivity estimate and the storativity value from the groundwater availability model to assess the potential drawdown at the proposed well and at the existing wells located within five miles from the proposed well (Figure 1).



**Figure 1. The proposed well and existing CUWCD Lower Trinity wells. Detailed information for each well shown is available through the District’s website (<https://cuwcd.org>).**

The potential effects of the proposed production on local water levels in the aquifer are calculated using the Theis equation (Theis, 1935), which relates water-level decline (that is, drawdown) to the pumping rate of a well and properties of the aquifer. While the equation does not account for aquifer conditions which may affect the calculation of long-term water level declines (for example: aquifer recharge, faulting, or changes in aquifer structure), it does provide a very good, reliable, and straightforward method for estimating relatively short-term drawdown in and near a well due to pumping. As the duration of pumping and distance from the well increase, the uncertainty in the calculated drawdown also increases.

Table 1 presents the range in calculated drawdown based on an annual production rate of 64 acre-feet per year. For *1-Day Drawdown*, we applied the proposed instantaneous pumping rate of 270 gpm for a period of 24 hours. For *1-Month Drawdown*, we used the data provided by the applicant’s consultant which indicated 3,527,384 gallons (10.8 acre-feet) in July. For the *1-Year Drawdown*, we used the total proposed annual production amount.

**Table 3. Calculated drawdown at the proposed well and other wells within five miles completed in the Lower Trinity Aquifer based on annual production rate of 64 acre-feet. Values less than one foot are reported as Negligible.**

CUWCD Well ID	Distance from Proposed Well (mile)	1-Day Drawdown (feet)	1-Month Drawdown (feet)	1-Year Drawdown (feet)
N3-23-005P (UMHB Well)	—	91.8	32.2	18.1
E-02-3587G	1.4	1.2	4.5	4.2
E-02-048G	1.9	Negligible	3.6	3.7
E-02-2604G	2.0	Negligible	3.4	3.6
E-02-061G	2.1	Negligible	3.2	3.5
M-13-007G	2.3	Negligible	3.0	3.4
N2-05-015G	2.4	Negligible	2.9	3.3
E-02-2429G	2.7	Negligible	2.6	3.1
N2-05-013G	3.6	Negligible	1.8	2.7
E-02-482G	3.9	Negligible	1.6	2.6
N2-05-016G	4.1	Negligible	1.5	2.5
E-02-814G	4.6	Negligible	1.2	2.3
N2-05-012G	4.6	Negligible	1.2	2.3
E-02-297G	4.8	Negligible	1.1	2.2

The predicted drawdown amounts are based on our current understanding of the aquifer hydraulic properties and the estimated production from the proposed well. The predicted drawdown values presented do not include the effects from other wells pumping near the proposed well. Predicted drawdown of less than one foot is considered negligible for analysis purposes due to inherent uncertainty in the aquifer hydraulic characteristics.

The nearest Lower Trinity District monitoring well is M-13-007G. Since 2014, the District has regularly obtained water level measurements from the well. Based on these measurements, water levels in the Lower Trinity are declining at a rate of about 4.0 feet per year in the area (Keester and Pedrazas, 2020). The most recent water level measurement reports the depth to water at 279.9 feet below ground level (May 1, 2023).

With the top of the aquifer at 1,000 feet below ground level, groundwater rises more than 700 feet above the top of the aquifer.

Predicted drawdown after one year of production is about four feet or less at other wells within five miles of the proposed well. With water rising over 700 feet above the top of the aquifer in the well, the predicted drawdown and regional water level decline will not inhibit the ability to produce groundwater from existing wells in the foreseeable future.

As part of the well drilling and completion process, the applicant will conduct a minimum 24-hour pumping test and collect water samples for lab analysis. Based on the projected effect on M-13-007G, we recommend the District set monitoring equipment to record water levels in the well at 10 minute intervals for five days before and after the pumping test. Results of the pumping test and sampling will be beneficial in the analysis of the potential effects of production associated with the anticipated future operating permit application.

The District's adopted desired future condition (DFC) for the Lower Trinity Aquifer is 375 feet of average drawdown from 2010 through 2080. This adopted DFC results in a modeled available groundwater (MAG) value of 7,900 acre-feet per year (Shi and Harding, 2022). Based on monitoring data, the District is currently below the adopted DFC (Keester and Pedrazas, 2020) and District reporting indicates there is more than 2,000 acre-feet available for permitting from the Lower Trinity Aquifer (CUWCD, 2023).

## **Conclusions and Recommendations**

Based on our current understanding of the local aquifer conditions, the proposed well will not inhibit the ability of other users to access groundwater from the Lower Trinity. In addition, the proposed production associated with a future operating permit is less than the volume reported as available for permitting. Based on our current understanding of the system, the nearest known Lower Trinity well is estimated to experience approximately four feet of drawdown from the annual production after one year. Data provided in association with the well completion report (Rule 6.9.2(f)) will aid the Board's consideration of the anticipated operating permit.

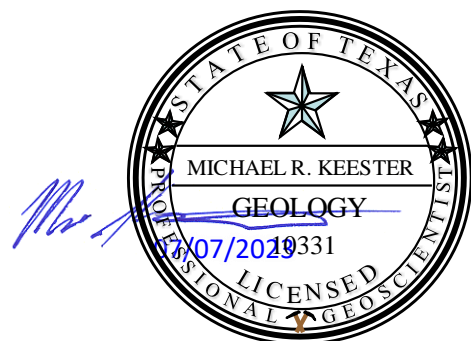
Due to the difference in calculated irrigation water demand between the method(s) used by the applicant and the method used by the District, we recommend the applicant provide additional information related to their irrigation requirement assumptions. During the Board's deliberation on a future operating permit application, understanding the rationale behind the applicant's assumptions will aid in determining the allocation for beneficial use.

## References

- CUWCD, 2023, Aquifer Status & Production Reports, <https://cuwcd.org/wp-content/uploads/2023/06/Aquifer-Status-Production-Reports.pdf>, accessed July 2023.
- George, P., 2023, Groundwater Assessment of an Irrigation Well for the University of Mary Hardin-Baylor in Belton, Texas: Report prepared for The University of Mary Hardin-Baylor by Collier Consulting, 9 p.
- Keester, M. and Konetchy, B., 2016, February 5, Results of Northern Trinity / Woodbine Groundwater Availability Model Simulations using a Modified Lower Trinity Transmissivity Distribution: Technical Memorandum.
- Keester, M. and Pedrazas, M., 2020, User Guide for CUWCD DFC Compliance Assessment Tool: Technical Memorandum to Dirk Aaron, General Manager – Clearwater Underground Water Conservation District for Update and Revisions to the District DFC Compliance Assessment Tool, 11 p.
- Kelley, V.A., Ewing, J., Jones, T.L., Young, S.C., Deeds, N., and Hamlin, S., eds., 2014, Updated Groundwater Availability Model of the Northern Trinity and Woodbine Aquifers: Vol 1, Austin, Texas, Intera, 990 p.
- Konetchy, B. and Beach, J., 2020, Update of the Modified CUWCD NTWGAM: Draft Technical Memo to Dirk Aaron, General Manager of Clearwater UWCD dated May 7, 2020, 16 p.
- Shi, J. and Harding, J., 2022, GAM Run 21-013 MAG: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 8: TWDB GAM Run, 92 p, [http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR21-013\\_MAG.pdf?d=13878](http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR21-013_MAG.pdf?d=13878).
- Theis, C.V., 1935, The Relation Between the Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Ground-Water Storage: American Geophysical Union Transactions, v. 16, p. 519-524.

## Geoscientist Seal

The signature and seal appearing on this document was authorized by Michael R. Keester, P.G. on July 7, 2023. R.W. Harden & Associates Texas Board of Professional Geoscientist Firm Registration Number 50033.



# CUWCD Aquifer Status Report

## Trinity Aquifer Status Report – June 2023

<u>DFC Analysis Over Time</u> (2000-Present) <i>Modeled Available Groundwater</i>			<u>HEUP and OP Permit Analysis</u> <i>Relative to the Modeled Available Groundwater</i>			<u>2023 YTD</u> <u>Total Prod.</u> <i>Jan - May</i> <b>674.56 ac-ft</b> <b>13.51%</b>		<u>Pending Applications</u>		<u>Exempt Well Reservations</u>		
<b>Trinity Aquifer</b> (by layer)	<b>DFC Adopted *</b> Average Drawdown (by layer)	<b>MAG **</b> Ac-ft	<b>HEUP</b> Ac-ft (by layer)	<b>OP</b> Ac-ft (by layer)	<b>Total Permitted</b> Ac-ft (by layer)	<b>2022 YTD Prod.</b> (by layer)	<b>2023 YTD Prod.</b> (by layer)	<b>Available for Permitting</b> Ac-ft (by layer)	<b>Pending Applications</b> Ac-ft (by layer)	<b>Exempt Well Reserve</b> Ac-ft (by layer)	<b>2022 Exempt Well Use Estimate</b> Ac-ft (by layer)	<b>Available Exempt Use</b> Ac-ft (by layer)
	Current											
Pawluxy	NA	0	0	0	0	0	0	0	0			0
Glen Rose (upper)	<b>-1.38 ft/yr</b> -83 ft/60 yrs	974	61.9	72.73	<b>134.63</b>	23.79	7.64	<b>146.37</b>	0	693	189	504
Hensell (middle)	<b>-2.28 ft/yr</b> -137 ft/60 yrs	1099	259.3	207.77	<b>467.07</b>	67.06	16.66	<b>73.23</b>	***23.00	548	527	21
Hosston (lower)	<b>-5.50 ft/yr</b> -330 ft/60 yrs	7193	1181.4	3209.261	<b>4390.661</b>	1842.71	650.26	<b>2624.339</b>	0.38	178	59	119
<b>Total</b>		<b>9266</b>	1502.6	3489.71	<b>4992.361</b>	1933.56 (40.77%)	674.56 (13.51%)	<b>2843.939</b>	<b>23.38</b>	1419	793	626

\*Desired Future Conditions (DFC) is the description of how the aquifer should look in the future (60 years).

\*\*The Modeled Available Groundwater (MAG) is the estimated amount of water available for permitting assigned to Clearwater UWCD by the Executive Administrator of TWDB.

\*\*\*Pending applications

Big Elm RV Resort N2-22-003P (23.00 ac-ft/yr)

Ken Baumgardner N3-23-003P (0.38 ac-ft/yr)



**CUWCD Exempt Well  
Estimate of Use Report**



# CUWCD Exempt Well Use Summary

As of: 2/9/2023

Aquifer	Total Active Registered Exempt Wells <sup>3</sup>	Registered Domestic Wells	Estimated Domestic Use Gallons/Day <sup>1,2</sup>	Estimated Domestic Use Ac-ft/Year <sup>1,2</sup>	Registered Stock Wells	Estimated Stock Use Gallons/Day <sup>4</sup>	Estimated Stock Use Ac-ft/Year <sup>4</sup>	Total Estimated Use Gallons/Day <sup>7</sup>	Total Estimated Exempt Well Use Ac-ft/Year <sup>7</sup>	MAG Reserved Exempt Well Use
Glen Rose (Upper Trinity)	426	349	102,103	114	77	66,528	75	168,631	189	
Hensell (Middle Trinity)	972	911	417,446	468	61	52,704	59	470,150	527	
Hosston (Lower Trinity)	159	148	43,299	49	11	9,504	11	52,803	59	
Trinity (Total) <sup>6</sup>	1,557	1,408	562,848	630	149	128,736	144	691,584	775	1,419
Edwards BFZ	846	715	209,180	234	131	113,184	127	322,364	361	825
Edwards Equivalent	485	386	112,928	126	99	85,536	96	198,464	222	
Buda	28	15	4,388	5	13	11,232	13	15,620	17	
Lake Waco	8	3	878	1	5	4,320	5	5,198	6	
Austin Chalk	226	141	41,251	46	85	73,440	82	114,691	128	
Ozan	161	114	33,352	37	47	40,608	45	73,960	83	
Pecan Gap	67	44	12,873	14	23	19,872	22	32,745	37	
Kemp	15	11	3,218	4	4	3,456	4	6,674	7	
Alluvium	584	377	110,295	124	207	178,848	200	289,143	324	
Other <sup>5</sup>	1,574	1,091	319,183	358	483	417,312	467	736,495	825	
<b>CUWCD Total Active</b>	<b>3,977</b>	<b>3,214</b>	<b>1,091,212</b>	<b>1,222</b>	<b>763</b>	<b>659,232</b>	<b>738</b>	<b>1,750,444</b>	<b>1,961</b>	

- Domestic use estimate assumes 106 gallons/person per day (USGS estimate of domestic use outside of a municipal water system) and 2.76 persons/household (U.S. Census Bureau, Population Estimates Program (PEP) July 1, 2019)
- Benjamin G. Wherley, Ph.D. Associate Professor- Turfgrass Science & Ecology Dept. of Soil and Crop Sciences Texas A&M University estimate of 2,000ft<sup>2</sup> warm season turfgrass requires 38,855gal/yr/lawn or 106gal/day/lawn; "Ranchette" Avg. lawn size is 13,042ft<sup>2</sup>, 6.5X larger; 6.5 X 106gal/day/lawn= 689gal/day/lawn; ~217 "Ranchette" Middle Trinity Wells; 689 X 217=an additional 150,924gal/day/lawn; **490ac-ft/yr or an 89% increase in Middle Trinity exempt well use from the 2018 estimate of 258ac-ft/yr.**
- Exempt well use estimate factors out all plugged, capped, monitor and inactive wells in the database.
- Source of stock water estimates is Texas Agrilife Extension @ 18 gallons water per day per cow. Livestock water use estimates are based on the 2017 Census of Agriculture, USDA National Agricultural Statistics Service. 36,868 cows / 771 stock wells= 48 cows/stock well; 48\* 18gpd= 846 gal/day/stock well, **747ac-ft/yr or a 34% increase in annual stock use from the 2018 estimate of 556ac-ft/yr.**
- The "Other" designation is the total of minor aquifer and alluvium source designation of the exempt wells.
- Trinity Aquifer wells registered with unknown depth are assigned to the Middle Trinity per Board decision.
- All estimates of groundwater use by exempt well owners is based on assumptions and scientific data, but by no means are they to be interpreted as recommended practices by CUWCD.

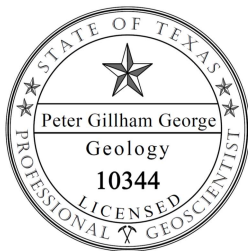
**University of Mary Hardin Baylor  
C/o Collier Consulting  
Application Documentation**

Prepared For:  
The University of Mary Hardin-Baylor

## Groundwater Assessment of an Irrigation Well for the University of Mary Hardin-Baylor in Belton, Texas



*View of three-hole golf course just west of the University*



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Peter George, Ph.D., P.G.  
June 15, 2023



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## Introduction

The project area is located just west of the University of Mary Hardin-Baylor (UMHB) in Belton, Texas (**Figure 1**). The Client, UMHB, wishes to drill an irrigation well located on the southwest side of a 3-hole practice golf course. The well is to irrigate some 14.5 acres. Its location has been approximated with coordinates of 31.069169 and -97.47268 (decimal degrees).

The study area is in central Bell County where groundwater resources are managed by the Clearwater Underground Water Conservation District (CUWCD). The area is also within the District's Belton Lake Management Zone. During initial discussions, the District suggested we consider use of the lower Trinity Aquifer as the source of groundwater. In addition, the proposed annual production of the proposed well is 64 acre-feet per year with an instantaneous pumping rate 271 gallons per minute (gpm).

## Well Data

The water wells displayed in the figures of this hydrogeologic assessment are from multiple databases (**Figure 2**). These databases provide the supporting basis of this report. The sources of the data include:

1. Texas Water Development Board (TWDB). The TWDB Groundwater Database (GWDB) includes information on water levels, water chemistry, and producing stratigraphic units.
2. TWDB and the Texas Department of Licensing and Regulation (TDLR). The Submitted Driller's Reports (SDRs) from TWDB and TDLR contain useful information such as rock types encountered while drilling, water levels, general water quality, production rates, and well design and construction. Unlike the TWDB groundwater database, SDRs do not identify the aquifer.
3. The TWDB BRACS (Brackish Resources Aquifer Characterization System) Database provided the geophysical logs displayed in the cross-sections for the study.
4. Well data from the CUWCD. The District provides a well data viewer that is accessible on their website. Much of their data is included in the TWDB Groundwater Database, but some additional information about producing zones and production amounts are not.

## Hydrogeology of the Project Area

The project area is located in an area underlain by the Trinity Aquifer, defined by the TWDB as a major aquifer. The Edwards BFZ Aquifer is located just to the south. The

Trinity Aquifer in Bell County is composed of the Glen Rose Formation, and the Hensell, Pearsall, and Hosston Members of the Travis Peak Formation. (**Table 1**).

**Table 1. Stratigraphic units of the Trinity Aquifer (modified from Kelley and others, 2014).**

Period	Group	North and West	Central		South	
		Formation	Formation	Member	Formation	Member
Cretaceous	Trinity	Antlers	Paluxy		Paluxy	
			Glen Rose		Glen Rose	
			Twin Mountains	Hensell	Travis Peak	Hensell
				Pearsall		Pearsall/ Hammett/ Cow Creek
				Hosston		Sycamore /Hosston/ Sligo
Permian	Wichita					
	Bowie					

In Bell County the Glen Rose Formation consists of alternating beds of thin to medium-bedded limestone and marl (Adkins and Arick, 1930). Marl is defined as a calcium carbonate sedimentary rock with clay and silt. The Glen Rose is considered a marine unit deposited on a shallow carbonate shelf. It produces small to moderate amounts of fresh to slightly saline water (Duffin and Musick, 1991). It is underlain by the Hensell Member of the Travis Peak Formation. The Hensell member is predominately a sandstone unit deposited in coastal plain and deltaic environments (Kelly and others, 2014). Like the Glen Rose, it is known to produce small to moderate amounts of fresh to slightly saline water. Beneath the Hensell Member are the Pearsall, Cow Creek, and Hammett Shale Members. They consist mostly of limestone and shale deposited in a marine shelf environment. The Cow Creek Member (predominately limestone) and Hammett Member (predominately shale) occur more to the east. To the west limestones of the Cow Creek Member thin and gradually pinch out. The shales of the Cow Creek and Hammett Members coalesce to form the Pearsall Member (Klemm and others, 1975). The lowermost units of the Trinity Aquifer are the Hosston and Sligo Members. The Sligo Member is a fine-grained marine sediment that occurs west of the project

area. In central Bell County the Hosston Member is a bedded sandstone with high sand percentages of greater than 60% (Kelly and others, 2014). The Hosston was deposited in a fluvial coastal plain environment. It is known to produce anywhere from small to large quantities of fresh to slightly saline water.

## Well Depths

**Figure 2** displays depths of Trinity wells from the TWDB Groundwater (GWDB), Submitted Driller's reports (SDR), and the CUWCD databases. The wells are from 350 to 1262 feet deep. The Upper, Middle, and Lower Trinity designations are based on information from the online CUWCD well data viewer. The Upper Trinity is equivalent to the Glen Rose and the Middle Trinity includes the Hensell and Pearsall Members. The Lower Trinity is equivalent to the Hosston member. As shown in Figure 2 the majority of wells withdraw groundwater from the Middle Trinity. For this reason the District prefers the UMHB irrigation well to be screened across the Lower Trinity, so as to not affect the water levels of other wells in the area. These Hosston wells have borehole depths of 1,180 to 1,262 feet bgs (below ground surface).

## Screened Intervals

**Figure 3** shows the screen interval depths, along with their respective diameters. The majority of wells have diameters of 4.5 to 6 inches. One exception is a Lower Trinity well in the east that has a 9-inch screen. The screen intervals of Lower Trinity wells in the local area extend from about 900 to 1,250 feet bgs. The depths of the screens increase slightly to the east along with the gradual structural dip of the aquifer.

## Production Rates and Water Quality

Information on production rates and water quality are shown in **Figure 4**. Rates vary from 30 gpm to as high as 1,000 gpm. Larger production rates tend to occur in the deeper and larger diameter wells. The Lower Trinity well with the 9-inch diameter screen produces 600 gpm, and one 6 inch diameter well has produced 1,000 gpm. The latter well is a public water supply well owned by the City of Belton that is screened across the Hosston Formation. The location of that well (Well ID 33582) and its geophysical log are shown in **Figures 5 and 6**. The well appears to be screened across the lower Pearsall Member and into the Hosston from 1,021 to 1,169 feet bgs.


Water quality data from the TWDB Groundwater Database is limited in the local area (**Figure 4**). The data that has been collected indicates that both Middle and Lower Trinity wells produce groundwater that is slightly saline, ranging from 1,183 mg/l to 1,555 mg/l total dissolved solids (TDS). This range is considered "permissible" in terms of suitability for irrigation (525 mg/l to 1,400 mg/l). Groundwater with TDS values of 175 mg/l to 525 mg/l is considered "good," and water <175 mg/l is "excellent" (Fipps, 2003).

## Geophysical Logs

Three logs from the TWDB BRACS database are located in **Figure 5** and shown in the cross-section in **Figure 6**. They show the boundaries between the Trinity members and their respective thicknesses. These thicknesses will not necessarily be the same at the proposed wellsite given they are one to two miles downdip from the proposed wellsite and that the Lower Trinity thickens to the east. Groundwater Availability Models (GAMs) of the TWDB have thicknesses of 100 to 125 feet for the Hosston near the wellsite (Kelley and others, 2014). The geophysical logs in Figure 6 show a slightly smaller thickness of 90 feet. The difference may be due to the fact that the Hosston was deposited in a fluvial and coastal plain environment where thicknesses can vary along strike depending on the locations of paleochannels. The Hensell is thought to be more consistent in terms of thickness. The Northern Trinity GAM shows a net sandstone thickness across most of Bell County as 25-50 feet, and both logs in Figure 6 indicate a 50-foot sand. Between the Hensell and Hosston sands is a 140-foot section of the Pearsall Member, consisting of mostly finer grained clay and shale.

Depth to the top of the Hensell Sand is about 880-950 feet bgs in the logs, and would be slightly less updip near the wellsite. The top of the Hosston is at about 1,090 to 1,140 feet bgs. The CUWCD estimates the depth to the top of the Hensell near the wellsite to be at 857 feet bgs and the top of the Hosston at 1013 feet bgs (**Table 2**). The District's estimate for the Lower Trinity thicknesses are 580 feet for the Glen Rose, 44 feet for the Hensell, 112 feet for the Pearsall and Hammett Shale, and 143 feet for the Hosston Member.

**Table 2. CUWCD estimates of depths and thickness at the wellsite.**

 <b>CUWCD VIRTUAL BORE</b> Created: February 24th 2023, 3:13pm					
Latitude: <b>31.069150</b>		Approximate Ground Surface Elevation: <b>544.62</b>			
Longitude: <b>-97.473240</b>					
Top Elev. (ft)	Bottom Elev. (ft)	Depth to Formation (ft)*	Formation Thickness (ft)*	Formation (Geologic Unit)	
544.6	420.8	0	123.9	Edwards & Commanche Peak Limestone	
420.8	268	123.9	152.8	Walnut	
268	-312.3	276.7	580.3	Glen Rose	
-312.3	-356.1	857	43.7	Hensell & Cow Creek Limestone	
-356.1	-468.3	900.7	112.3	Pearsall & Hammett Shale	
-468.3	-611.7	1013	143.4	Hosston	

\*Depths / Thicknesses are not to scale

**Disclaimer:** This product is for informational purposes only and has not been prepared for or suitable for legal, engineering, or other purposes. All representations in this virtual bore represent only the approximate relative depths and thicknesses based on geological interpretation and extrapolation of available well data. Additional data may modify one or more of these formation surfaces. The Clearwater Underground Water Conservation District expressly disclaims any and all liability in connection herewith.



## Water Levels

Three wells near the wellsite provide recent water level data from the CUWCD and TWDB databases (**Figure 7a, b, and c**). Two of the wells are from Middle Trinity units (N2-11-003G, N2-04-011P) and one from the City of Temple (M-13-007G) is a deep Hosston well. The two Middle Trinity wells show very similar water level histories. Water levels are from 300 to 250 feet above mean sea level (msl). From 2014 to 2022 water levels have risen and then gradually fallen to 260 to 270 feet above msl in both wells (Figures 7a and 7b). For the Hosston Member well water levels have fallen steadily from 1950 to 2023 (Figure 7c). Since 2017 water levels have fallen from 267 feet to 238 feet above msl. Screen depths in the City of Temple well are from 600 to 700 feet below mean sea level, so there still is more than 800 feet until water levels fall below the top of the screen.

## Needs Assessment

The acreage to be irrigated is 14.5 acres based on a schematic drawing of the course and engineering by the Larry Rodgers Design Group from the Dallas/Fort Worth Area (**Table 3**). Table 3 considers evapotranspiration, rainfall, and applied irrigation for the golf course for each month in 2023. Total water usage for the year is estimated at nearly 21 million gallons, which is the basis for the 64 acre-feet of required groundwater. Peak production occurs in July at over 271 gpm. **Table 4** is an irrigation pond drawdown table, also provided by the Larry Rodgers Design Group.

**Table 3. Estimated water usage for the UMHB Golf Course in 2023**

Month	Evt Inches	Rf Inches	Eff Rf Inches	Req Irr Inches	Appl Irr Inches	Acres Irr.	Gal. per day	Total Vol per month	GPM*
JAN.	1.92	1.75	0.00	0.00	0.00	14.5	0	0	0.00
FEB.	2.57	2.25	1.13	1.45	1.70	14.5	21,592	669,346	51.41
MAR.	4.27	2	1.00	3.27	3.85	14.5	48,862	1,514,714	116.34
APRIL	5.26	3.75	1.88	3.39	3.98	14.5	50,580	1,567,984	120.43
MAY	7.55	4.75	2.38	5.18	6.09	14.5	77,327	2,397,139	184.11
JUNE	8.38	3	1.50	6.88	8.09	14.5	102,804	3,186,921	244.77
JULY	8.74	2.25	1.13	7.62	8.96	14.5	113,787	3,527,384	<b>270.92</b>
AUG.	8.27	2	1.00	7.27	8.55	14.5	108,631	3,367,575	258.65
SEPT.	6.3	3.5	1.75	4.55	5.35	14.5	67,988	2,107,630	161.88
OCT.	4.94	3.5	1.75	3.19	3.75	14.5	47,666	1,477,657	113.49
NOV.	2.74	2.5	1.25	1.49	1.75	14.5	22,264	690,191	53.01
DEC.	1.79	2	1.00	0.79	0.93	14.5	11,805	365,940	28.11
<b>Total</b>	<b>62.73</b>	<b>33.25</b>	<b>15.75</b>	<b>45.06</b>	<b>53.01</b>	<b>14.5</b>		<b>20,872,481</b>	

\*7 hour window

Evt=Evapotranspiration

Rf=Rainfall

Effective Rf=Effective Rainfall (50% of Rf)

Req Irr=Required Irrigation

Appl Irr=Applied Irrigation (Req Irr/85% water application efficiency)

**Table 4. Irrigation Pond Drawdown**

IRRIGATION POND DRAWDOWN TABLE			
Freeboard drop (Total Feet based on an 8 hr. water window)	Pond Recharge Rate (based on 662,465 Gallons/Day in July)	Pond Recharge Time (Hours)	Total Well Run Time (Hours)
0.5	871 gpm	4.7	12.7
0.9	460 gpm	16.0	24.0

### Well Interference

The CUWCD provided Collier with a table showing the potential effects of the proposed production on local water levels from three nearby wells (**Table 5**). The locations of these wells are displayed in **Figure 8**. Using the Thesis equation and values from groundwater availability model datasets (Kelley and others, 2014) drawdown numbers were calculated from production in the Lower Trinity. For the 1-Day Drawdown, the District used the instantaneous pumping rate of 261 gpm for a period of 24 hours. For the 30-Day Drawdown, CUWCD assumed pumping during the summer of about 15 percent more than the average monthly amount (the proposed annual production rate divided by 12 then multiplied by 1.15). For the 1-Year Drawdown, CUWCD used the proposed annual production amount of 64.4 acre-feet.

**Table 5. CUWCD estimates of well interference.**

Well Name	Distance from Proposed Well (feet)	1-Day Drawdown (feet)	30-Day Drawdown (feet)	1-Year Drawdown (feet)
UMHB Scenario B (north location)	---	86.5	18.2	17.8
E-02-3587G	7489	1	2.5	4.1
N2-02-023G	9951	0	2	3.6
E-02-048G	10120	0	2	3.6

CUWCD noted in their analysis that the predicted drawdown presented above is based on their current understanding of the aquifer hydraulic properties and the estimated production from the proposed well. In addition, the predicted drawdown values presented do not include the effects from other wells pumping near the proposed well.

### Conclusions and Recommendations

Based on information from the TWDB and CUWCD it is clear that the best option for the University is to withdraw water from the Lower Trinity (i.e. Hosston Member of the Travis Peak Formation). The depth of the well should be about 1,200 feet bgs based on the well logs presented in Figure 6. The Hosston Member appears to be about 90 feet thick locally so the screened interval should include all of that. A 4-inch column pipe and 10-inch diameter screen is recommended to allow for pumping at 260 gpm.

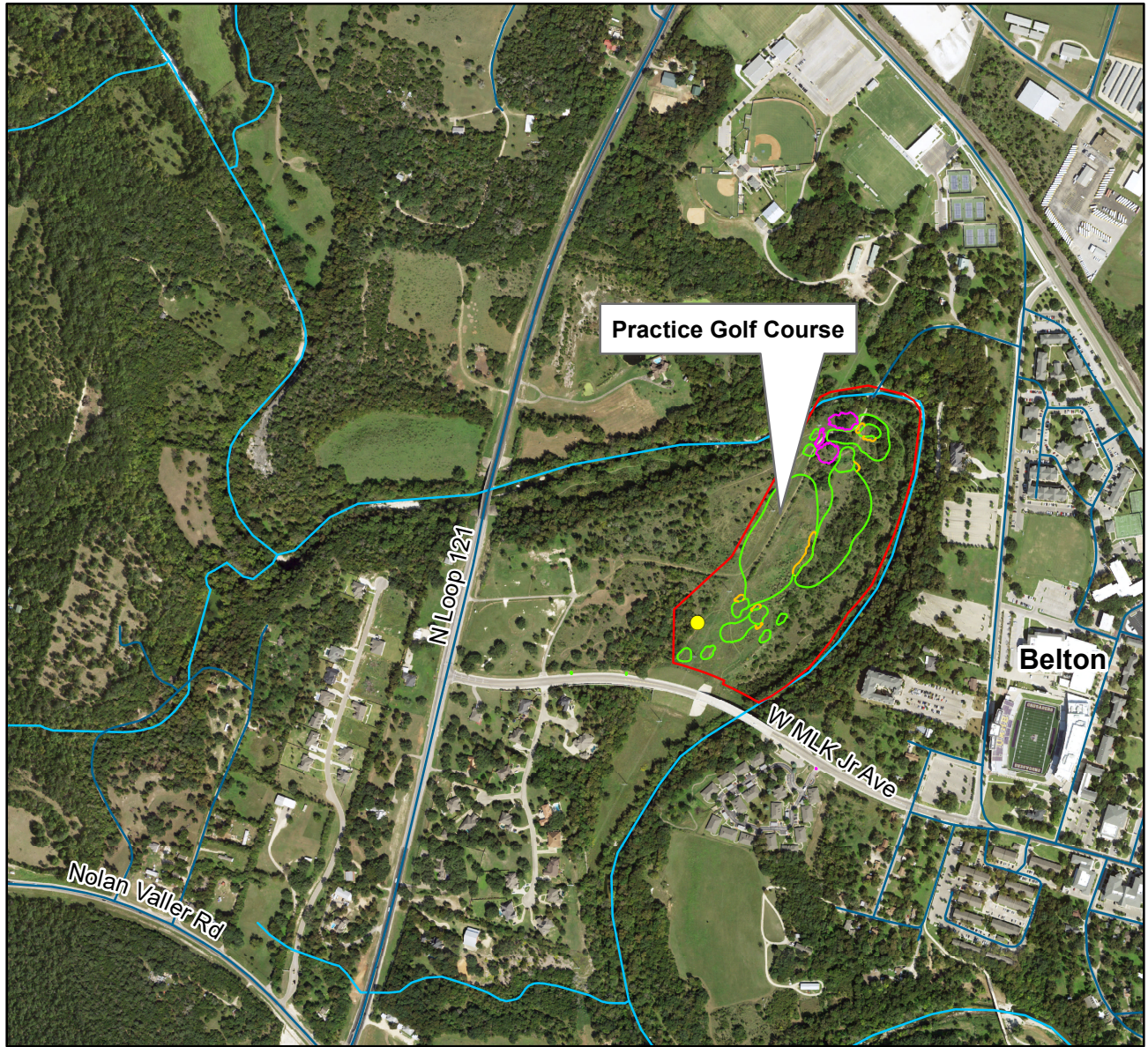
The City of Belton is aware of the proposed well and has sent a letter of approval to the University, including their ordinance regarding water wells inside City limits (**Appendix**). That ordinance allows for wells to be drilled inside City limits if “the tract on which it is proposed to be located is over ten (10) acres in size, subject to permitting/registration standards, as required by the Clearwater Underground Water Conservation District (CUWCD).” The well is located on a parcel that is approximately 28 acres in size, well above the 10 acres requirement.

## References

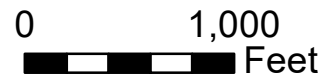
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- Duffin, G., and Musick, S.P., 1991, Evaluation of water resources in Bell, Burnet, Travis, Williamson and parts of adjacent counties, Texas: Texas Water Development Report 326, 74p. [https://www.twdb.texas.gov/publications/reports/numbered\\_reports/doc/R326/report326.asp](https://www.twdb.texas.gov/publications/reports/numbered_reports/doc/R326/report326.asp)
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- Klemt, W.R., Perkins, R.D., and Alvarez, H.J., 1975, Ground-water resources of part of central Texas with emphasis on the Antlers and Travis Peak formations, Volume 1: TWDB, Report 195, Austin, TX. [https://www.twdb.texas.gov/publications/reports/numbered\\_reports/doc/R195/Report195.asp](https://www.twdb.texas.gov/publications/reports/numbered_reports/doc/R195/Report195.asp)

## Figures

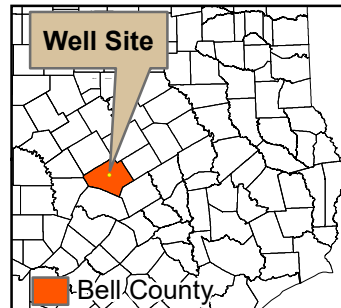
# Irrigation Well for University of Mary Hardin-Baylor



2020 NAIP Imagery



EXPLANATION	
<span style="color: yellow;">●</span>	Proposed well
<span style="border: 2px solid red; display: inline-block; width: 15px; height: 15px;"></span>	Parcel Boundary (28.12 acres)



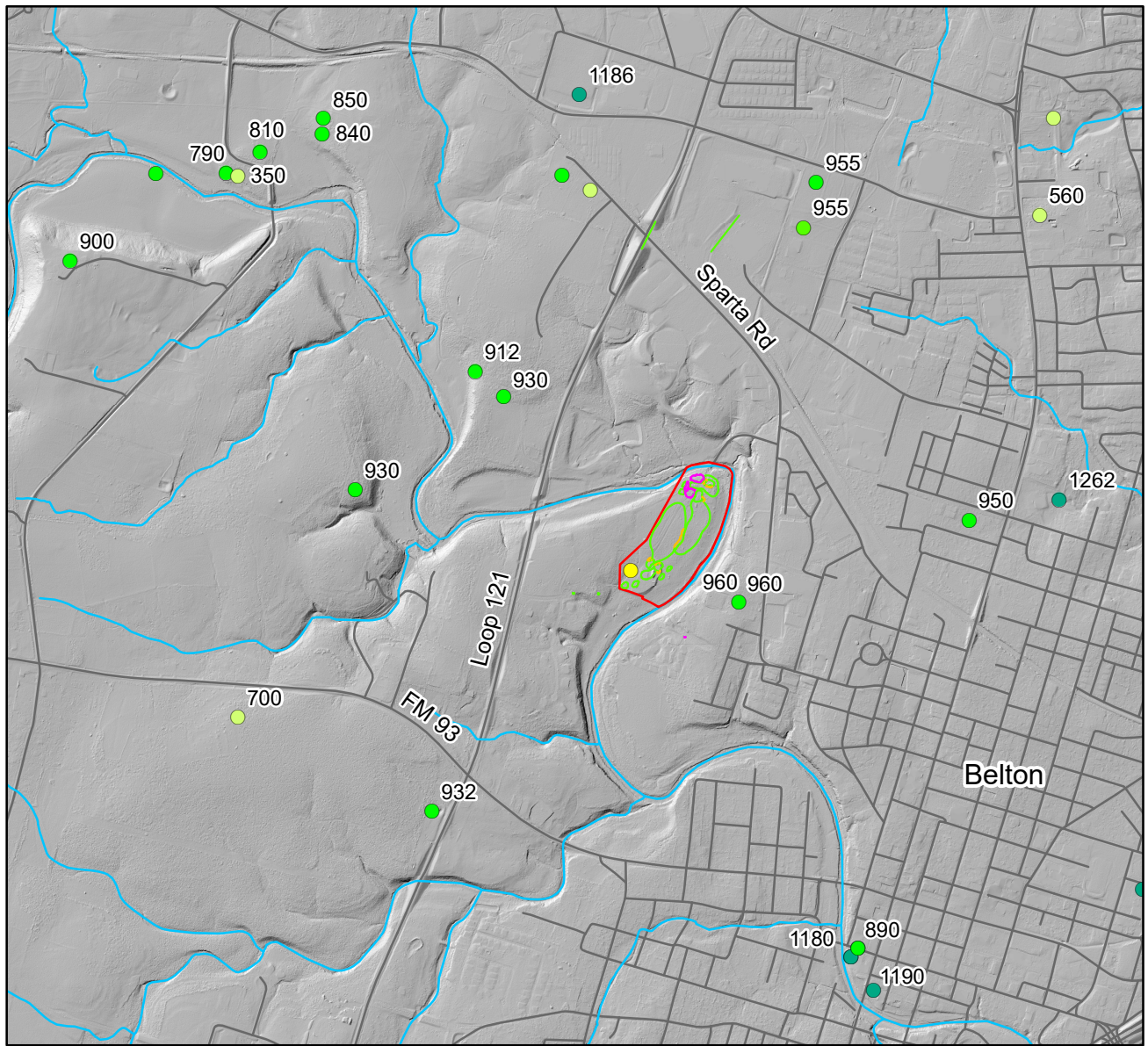
<b>Figure 1</b>		
<b>Property Location</b>		
University of Mary Hardin-Baylor		
Bell County		
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DRAWN: PG	SCALE: 1:11,000	REVISION: 1

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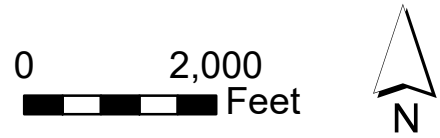
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# Irrigation Well for University of Mary Hardin-Baylor



2010 Lidar data from TNRIS



EXPLANATION	
● (Yellow)	Proposed Well
● (Light Green)	Upper Trinity
● (Green)	Middle Trinity
● (Dark Green)	Lower Trinity

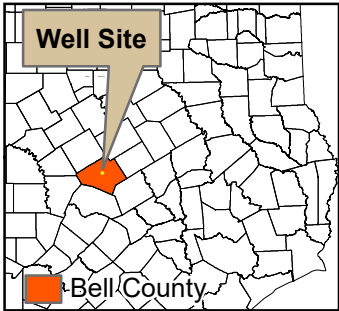


Figure 2		
Local Wells with Borehole Depths (ft)		
University of Mary Hardin-Baylor		
Bell County		
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DRAWN: PG	SCALE: 1:24,000	REVISION: 1

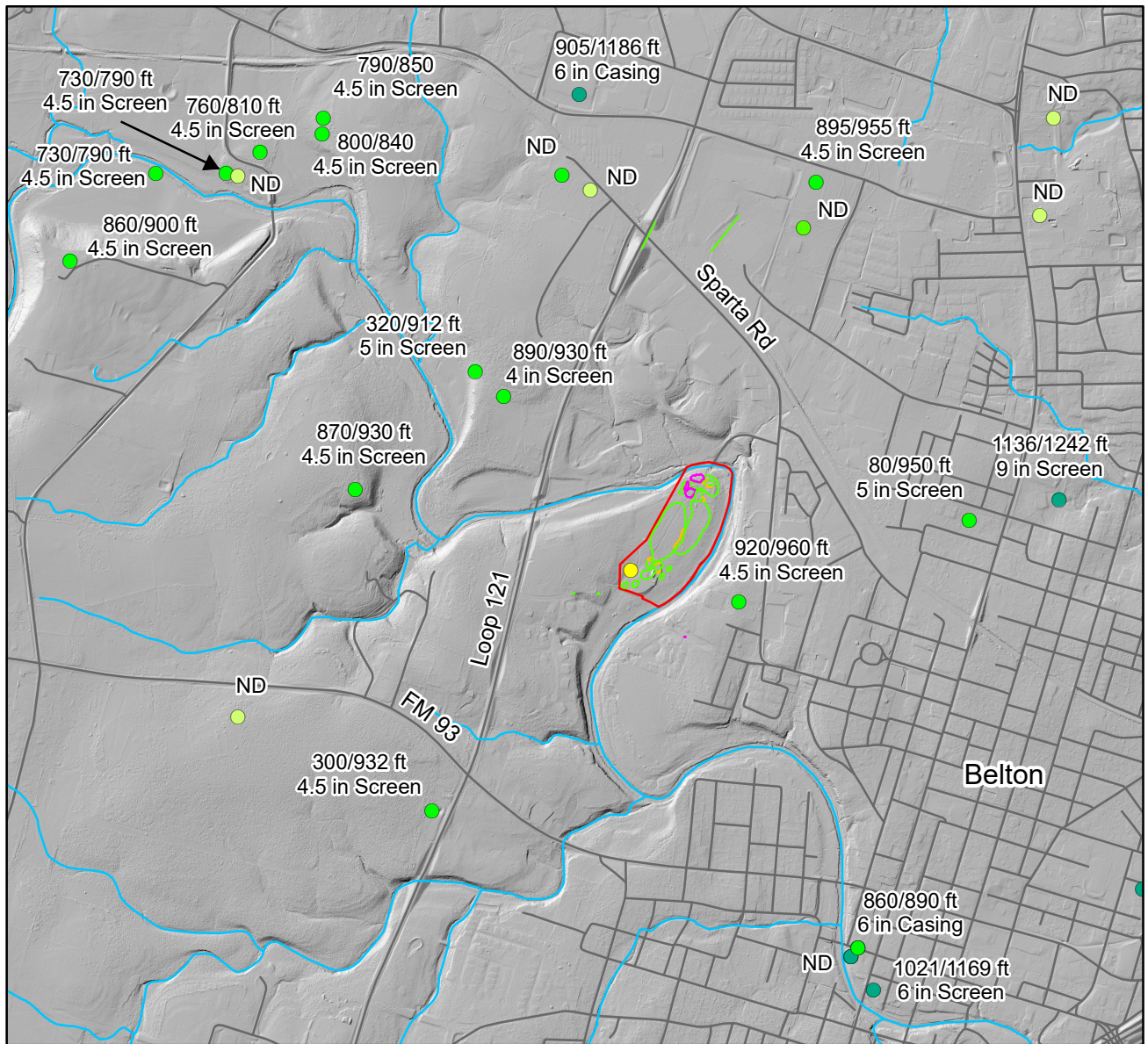


**COLLIER**  
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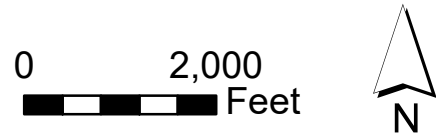
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[www.collierconsulting.com](http://www.collierconsulting.com)

# Irrigation Well for University of Mary Hardin-Baylor



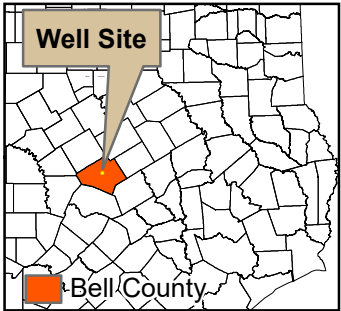
2010 Lidar data from TNRIS



**EXPLANATION**

- Proposed Well
- Upper Trinity
- Middle Trinity
- Lower Trinity

**830/890 ft** (Screen Interval)  
**4.5 in Screen** (Diameter, inches)



**Figure 3**  
**Screen and Casing Parameters**

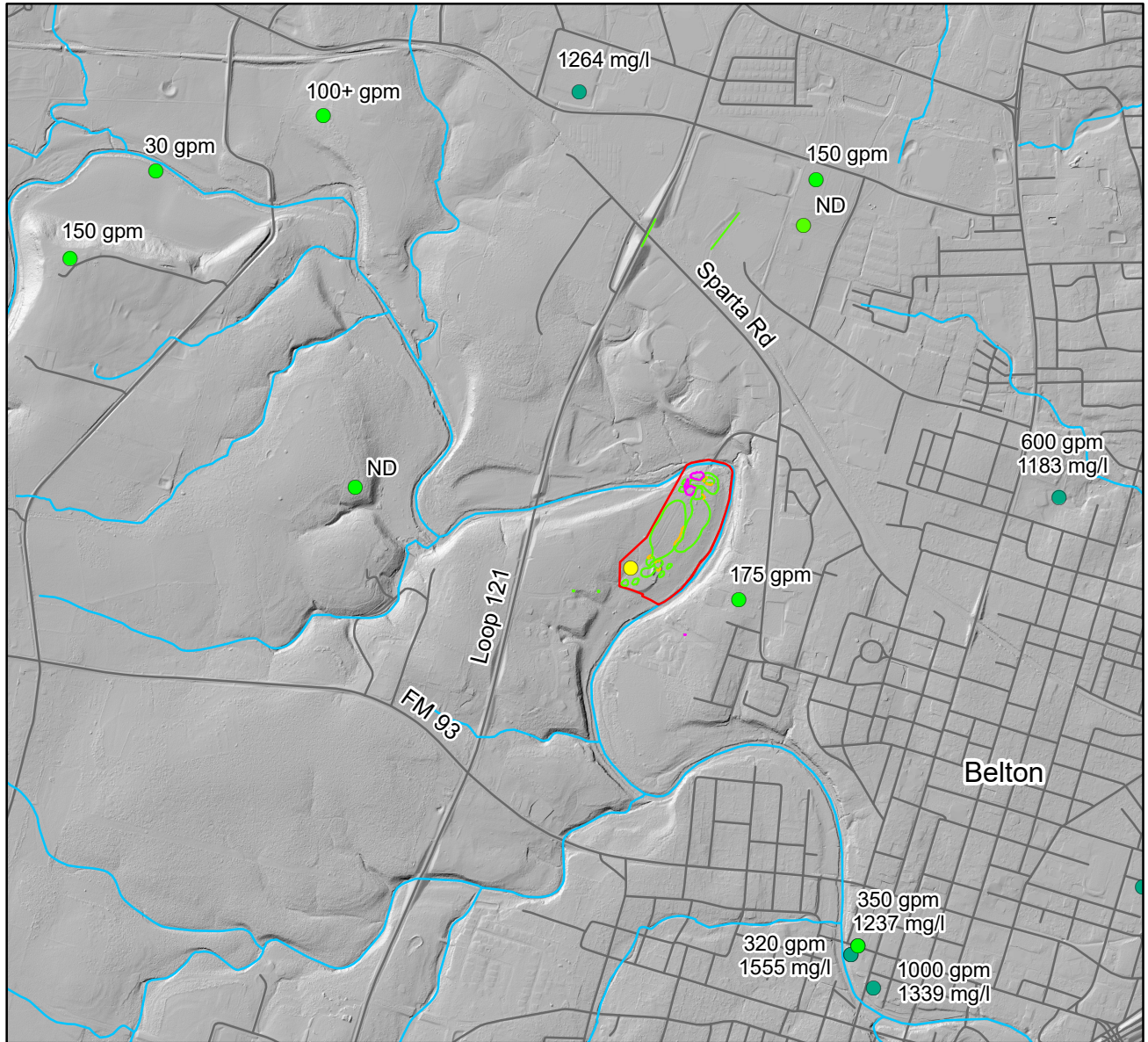
University of Mary Hardin-Baylor  
 Bell County

DESIGN: BG	CHECKED: GM	5/18/2023
DRAWN: PG	SCALE: 1:24,000	REVISION: 1

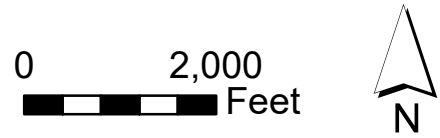
**COLLIER**  
CONSULTING

**254-968-8741**  
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# Irrigation Well for University of Mary Hardin-Baylor



2010 Lidar data from TNRIS



EXPLANATION	
<span style="color: yellow;">●</span>	Proposed Well
<span style="color: lightgreen;">●</span>	Upper Trinity
<span style="color: green;">●</span>	Middle Trinity
<span style="color: teal;">●</span>	Lower Trinity
320 gpm	Estimated yield
1234 mg/l	TDS

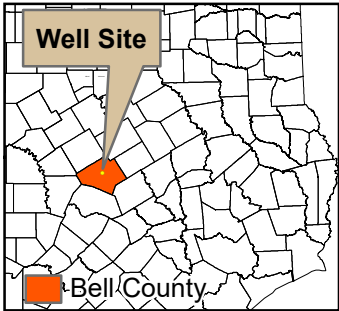


Figure 4		
Local Wells with Estimated Yield and Water Quality		
University of Mary Hardin-Baylor		
Bell County		
DESIGN: BG	CHECKED: GM	5/18/2023
DRAWN: PG	SCALE: 1:24,000	REVISION: 1



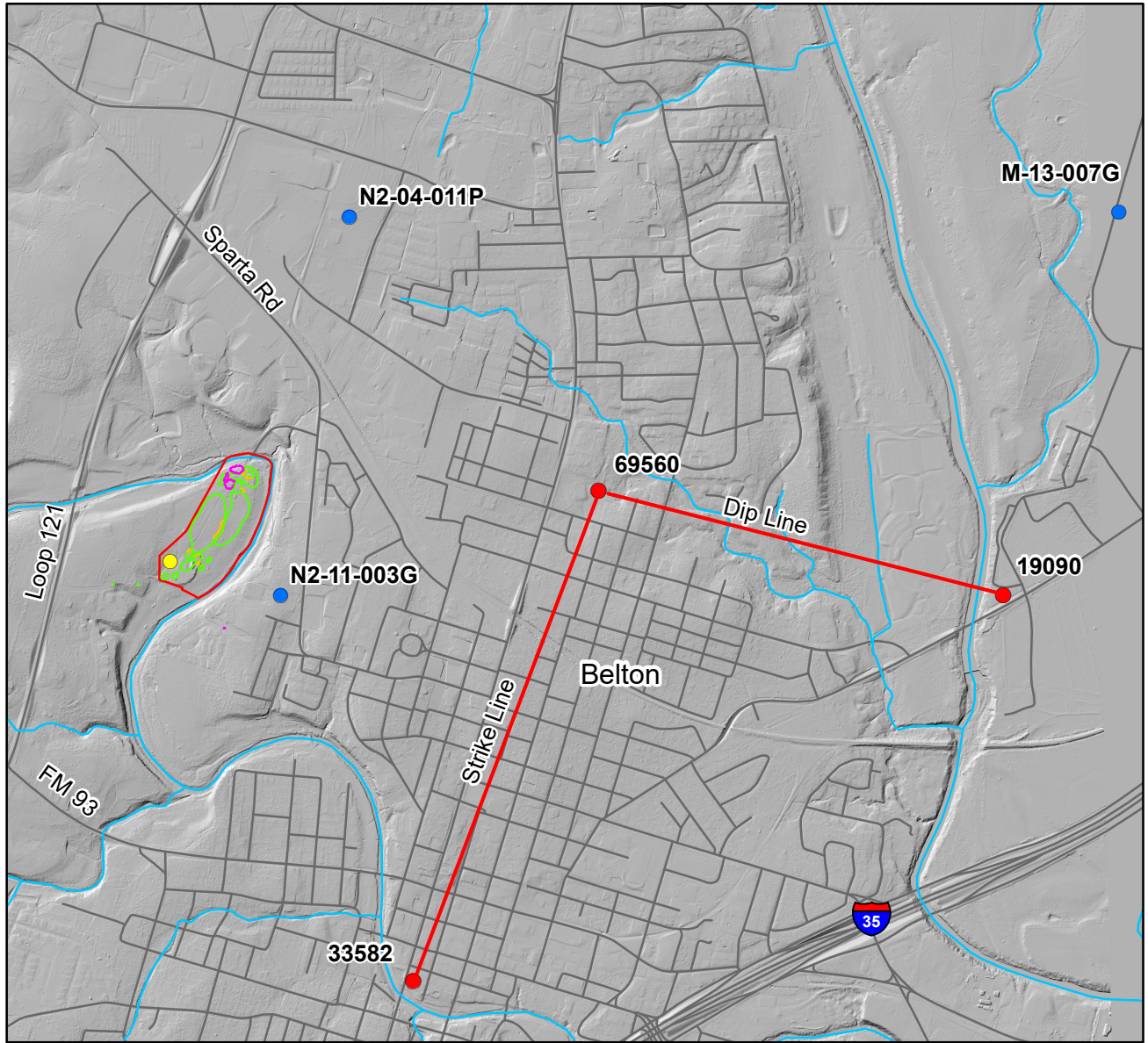
**COLLIER**  
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254-968-8741

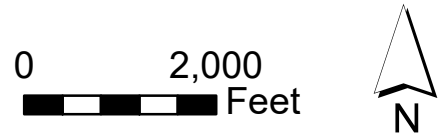
[www.collierconsulting.com](http://www.collierconsulting.com)



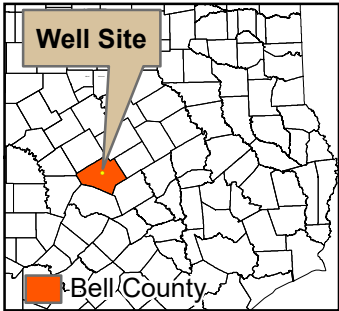
# Irrigation Well for University of Mary Hardin-Baylor



2010 Lidar data from TNRIS



EXPLANATION	
<span style="color: yellow;">●</span>	Proposed Well
<span style="color: red;">●</span>	Wells with Geophysical Logs
<span style="color: blue;">●</span>	Wells with Hydrograph Data
<span style="color: red;">—</span>	Section Line



**Figure 5**  
**Wells with Geophysical Logs and Hydrographs**  
 University of Mary Hardin-Baylor  
 Bell County

DESIGN: BG	CHECKED: GM	5/18/2023
DRAWN: PG	SCALE: 1:24,000	REVISION: 1

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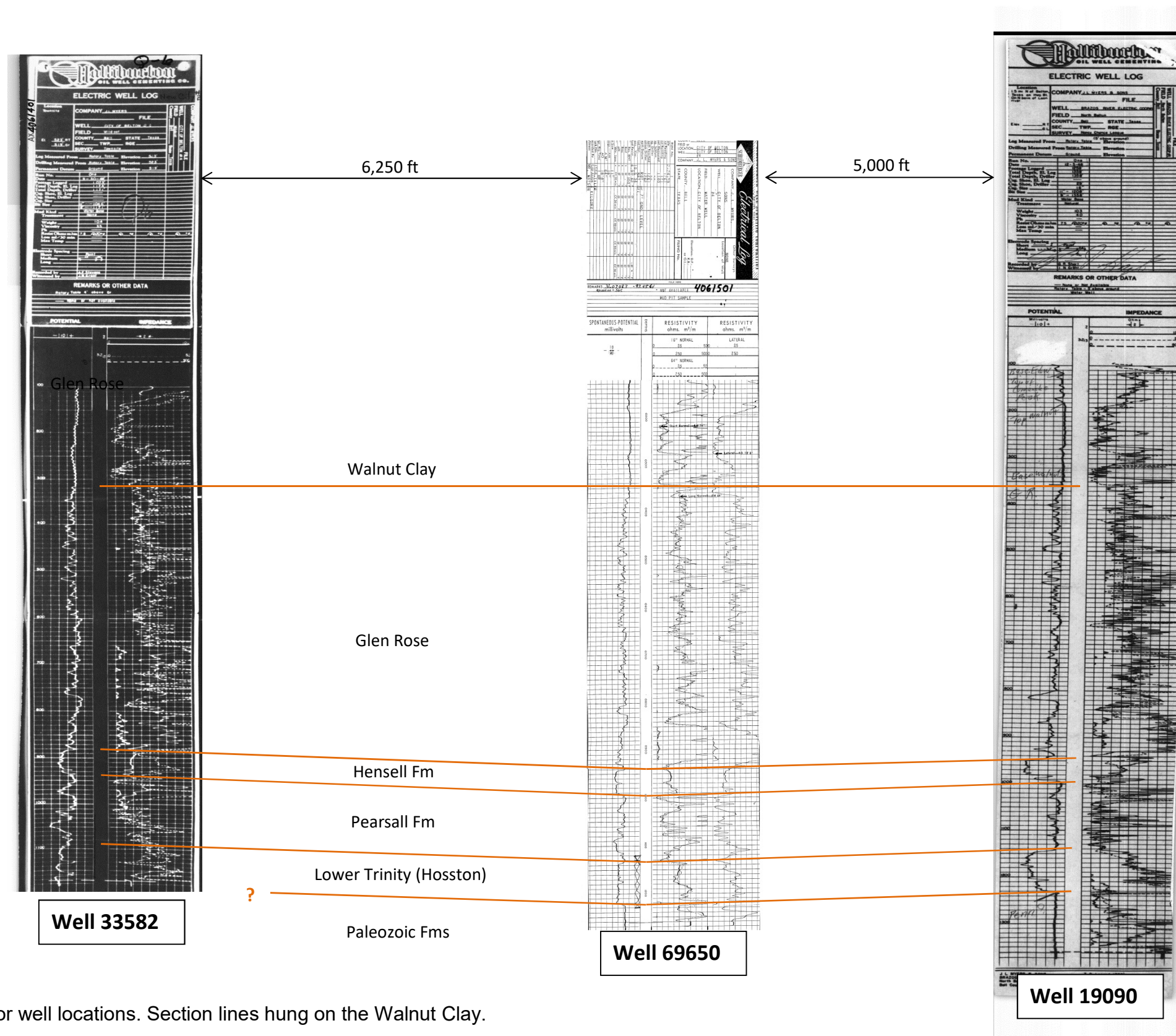


Figure 6. See Figure 5 for well locations. Section lines hung on the Walnut Clay.

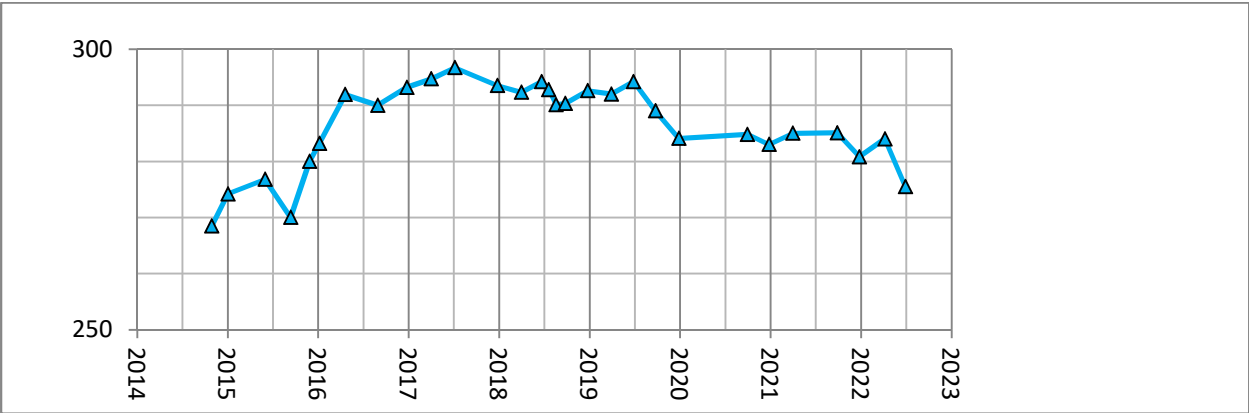
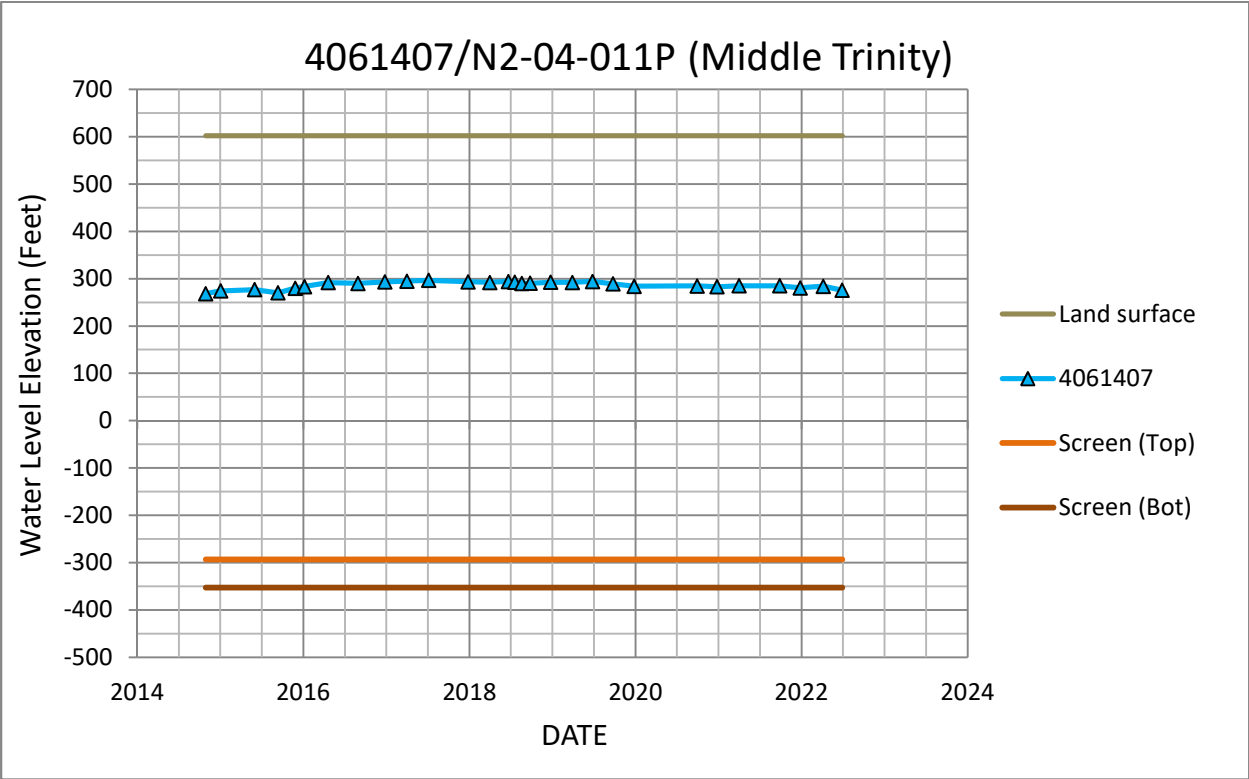


Figure 7a. Water level data from BellTec well N2-04-011P. See Figure 5 for its location. Lower graph is an expanded view of data from 2014 to 2022.

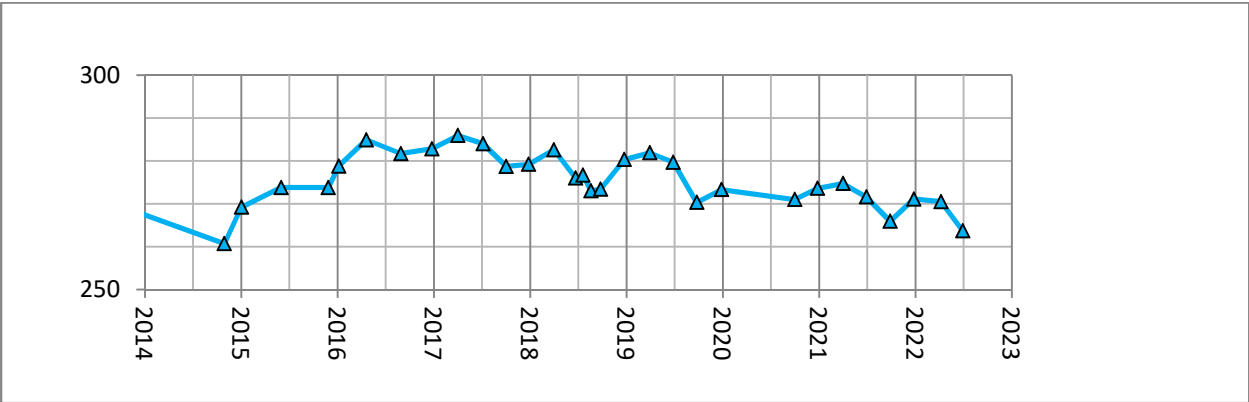
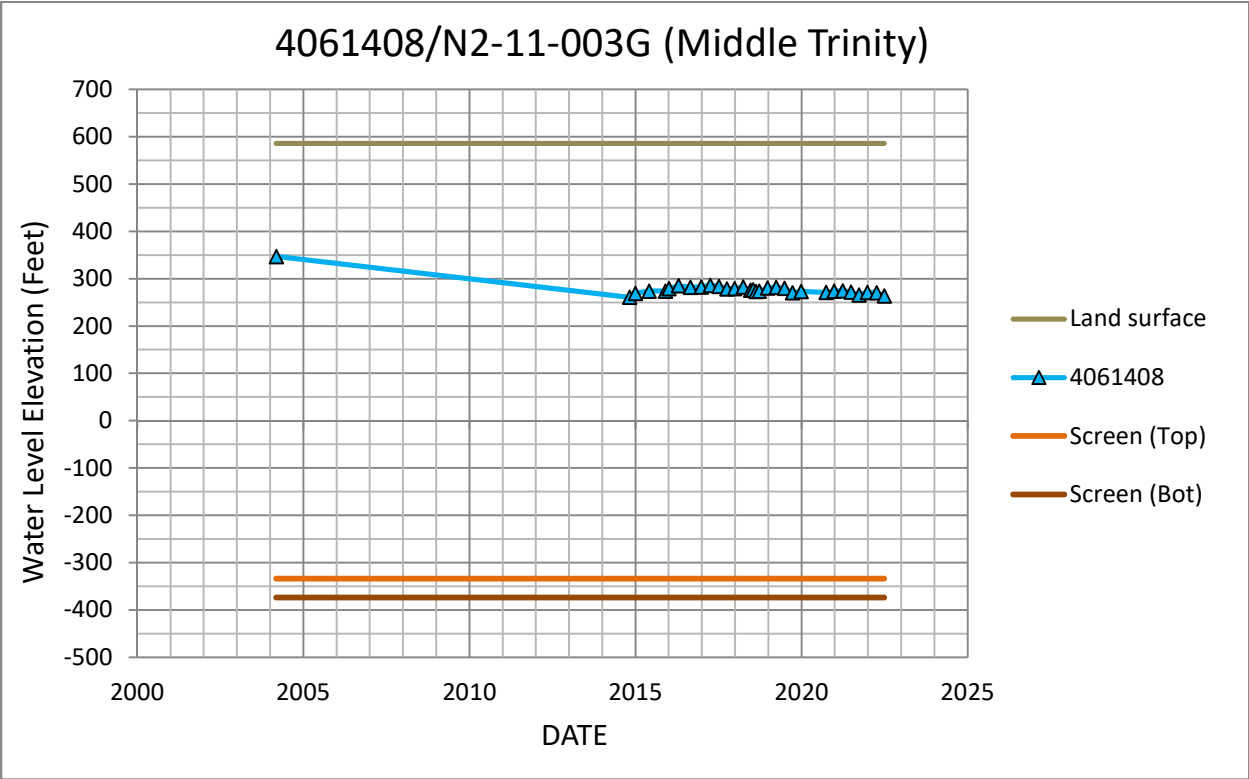


Figure 7b. Water level data from UMHB well N2-11-003G. See Figure 5 for its location. Lower graph is an expanded view of data from 2014 to 2022.

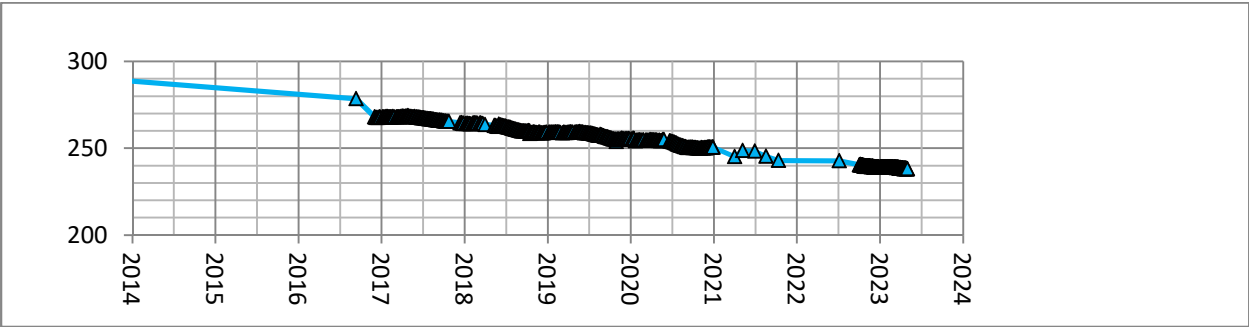
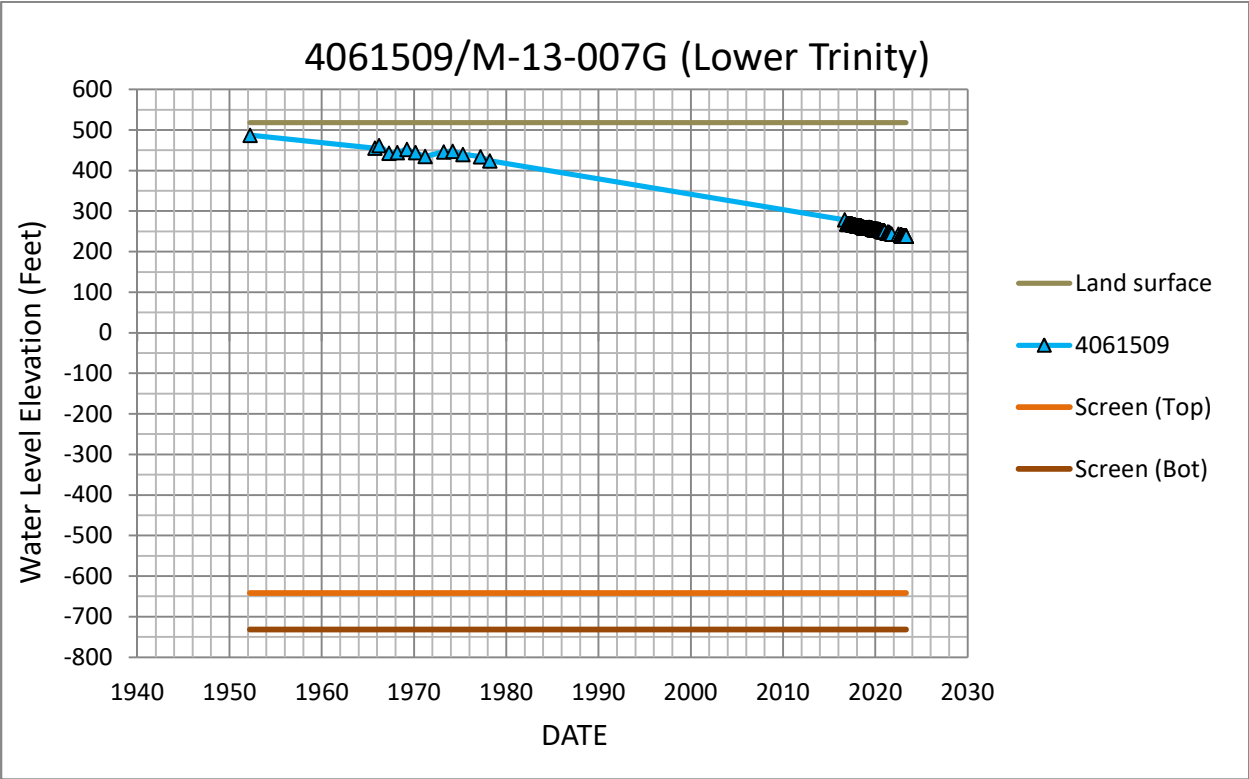
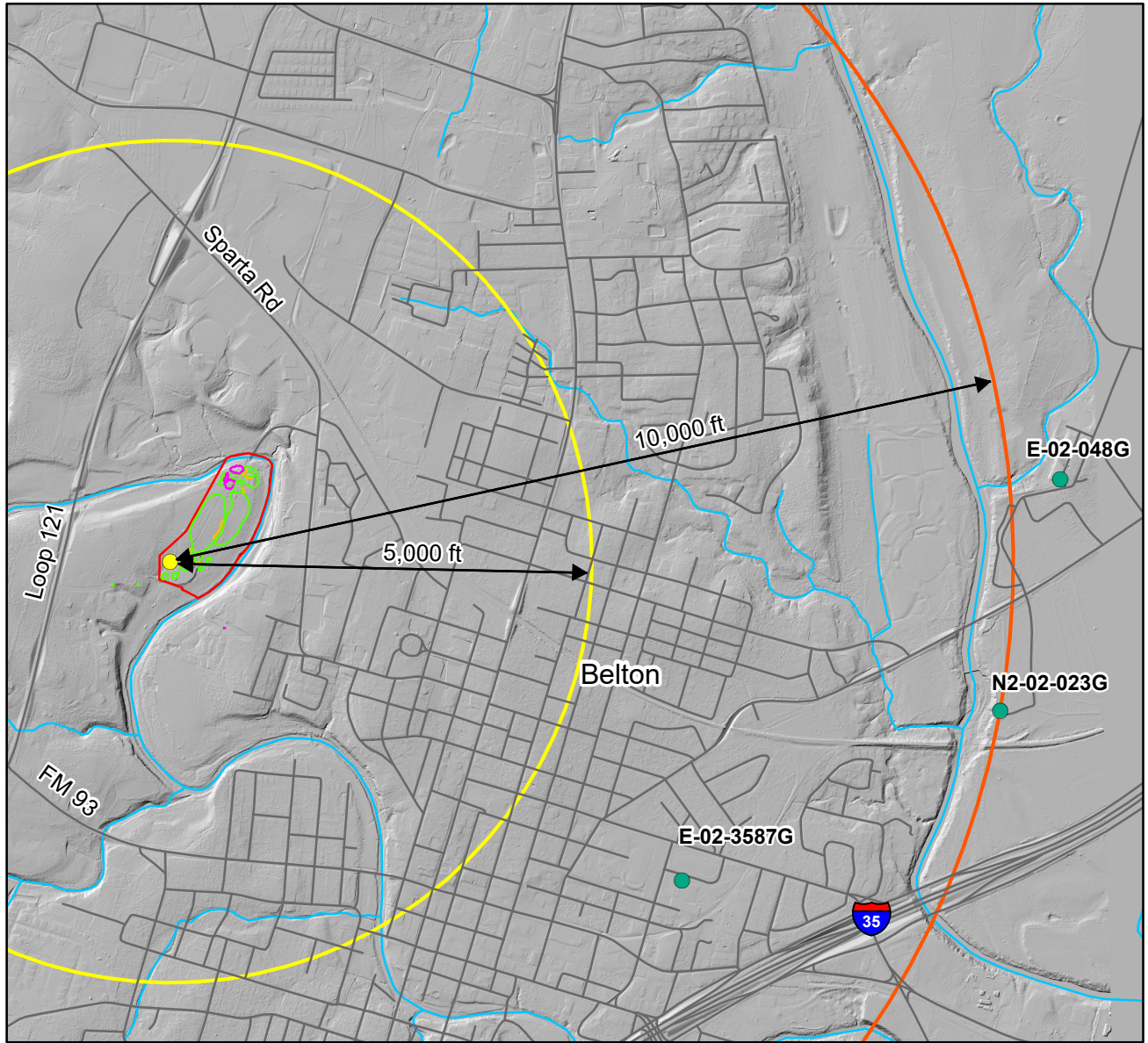
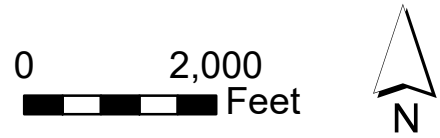


Figure 7c. Water level data from City of Temple Well#3. See Figure 5 for its location. Lower graph is an expanded view of data from 2014 to 2023.

# Irrigation Well for University of Mary Hardin-Baylor



2010 Lidar data from TNRIS



EXPLANATION	
●	Proposed Well
●	Lower Trinity Wells

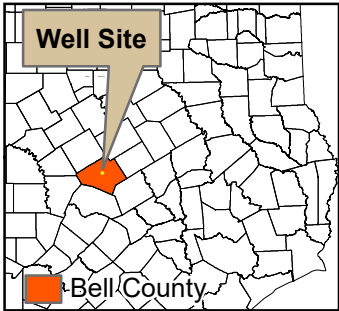


Figure 8		
Wells used in the Interference Analysis		
University of Mary Hardin-Baylor		
Bell County		
DESIGN: BG	CHECKED: GM	5/18/2023
DRAWN: PG	SCALE: 1:24,000	REVISION: 1



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## Appendix

**From:** Matthew Bates <MBates@BeltonTexas.Gov>  
**Sent:** Tuesday, June 13, 2023 8:25 AM  
**To:** Ee, Marvin <mee@umhb.edu>  
**Cc:** Dodd, Scott <SDodd@umhb.edu>; Stewart, Laura <lstewart@umhb.edu>  
**Subject:** RE: Authorization of Well Permit

Good Morning Marv,

Please let this email serve as approval/ authorization from the City of Belton for UMHB to proceed with submitting a well request to CUWCD.

Below is our ordinance regarding Water wells inside City limits.

**Sec. 23-41. - Water wells.**

**[SHARE LINK TO SECTIONPRINT SECTIONDOWNLOAD \(DOCX\) OF SECTIONEMAIL SECTION](#)**

It shall be unlawful for any person to drill or commence to drill a water well in the city limits without first obtaining approval from the director of public works. Standards for evaluation of the appropriateness of a water well shall include the following elements, and the review process will be administered by the director of public works.

(1)

A water well is allowed in the city if the tract on which it is proposed to be located is over ten (10) acres in size, subject to permitting/registration standards, as required by the Clearwater Underground Water Conservation District (CUWCD).

(2)

A water well proposed on a tract between five (5) acres and ten (10) acres in size is permitted in the city in accordance with permitting/registration standards as required by the Clearwater Underground Water Conservation District (CUWCD) and the city. The city's review process on tracts between five (5) and ten (10) acres will involve identification of available and planned public water supplies and the conveyance of that information to the applicant.

(3)

A water well proposed on a tract less than five (5) acres in size is prohibited in the city if an adequate public water supply is located adjacent, across the street, or within three hundred (300) feet of the property on which a well site is proposed.

An adequate public water supply shall mean City of Belton water supply or an authorized rural water system either of which is capable of permitting additional water meters and which has a water supply which will meet the applicant's needs for water service.

(4)

Beyond the three hundred (300) feet in distance identified above, the city will evaluate its water master plan, and the water master plan of authorized rural water system providers in the vicinity, to determine realistic water availability to the site which the water well is proposed. The director of public works shall make a reasonable determination of the appropriateness of the well permit request based on this information.

(5)

The director of public works shall take the information provided by an applicant and, within seven (7) business days of submission, make a determination about the appropriateness of the well permit request. His decision shall be transmitted to the applicant in writing.

If a well is determined appropriate by the director of public works, it is allowed in accordance with the permitting/registration standards required by the Clearwater Underground Water Conservation District (CUWCD).



(6)

An appeal of the decision of the director of public works may be made in writing to the city manager.

(7)

An appeal of the decision of the city manager may be made in writing to the city council. The decision of the city council shall be final.

(8)

No private water well may be connected in any manner to the city's public water system. A property owner responsible for any such cross connection shall be liable to the city for the maximum fine permissible by law, as well as all costs required by TCEQ for flushing, disinfecting, and testing the city's water line after the cross connection is terminated.

Thanks,

Please take a moment to complete the City of Belton [Customer Satisfaction Survey](#).

**Matt Bates**

*Director of Public Works*

1502 Holland Rd.

Belton, TX 76513

T 254.933.5823

[mbates@belontexas.gov](mailto:mbates@belontexas.gov)

[www.BeltonTexas.Gov](http://www.BeltonTexas.Gov)



Phone: 254/933-0120 Fax: 254/933-8396  
P.O. Box 1989, Belton, TX 76513

Every drop counts!

# Application for Non-Exempt Well Classification 3

Check one of the following:

- COMBINATION PERMIT**
- DRILLING PERMIT**
- OPERATING PERMIT**
- PERMIT AMENDMENT**

Answer the following:

Is this for a New Well?	Yes	No
Is this for a Replacement Well?	Yes	No
Do you plan to Export Water Outside District?	Yes	No
Are you modifying a Drilling Permit?	Yes	No
Are you modifying an Operating Permit?	Yes	No

**1. Owner Information**

Well Owner: \_\_\_\_\_ Email: \_\_\_\_\_ Telephone: \_\_\_\_\_  
 Address (Street/P.O. Box, City, State, ZIP): \_\_\_\_\_  
 Contact Person (if other than owner): \_\_\_\_\_ Telephone: \_\_\_\_\_  
 If ownership of Well has changed, name the previous owner: \_\_\_\_\_ State Well #: \_\_\_\_\_

**2. Property Location & Proposed Well Location**

Owner of Property (if different from Well Owner): \_\_\_\_\_  
 The well is located in Management Zone: \_\_\_\_\_  
 Acreage: \_\_\_\_\_ Bell CAD Property ID #: \_\_\_\_\_ Latitude: \_\_\_\_\_ Longitude: \_\_\_\_\_

**3. Well Description** (Submit if State of Texas Well Report is Available)

a. Proposed use of well and estimated amount of water, **in acre-feet**, to be **used for each purpose:**  
 \_\_\_\_\_ **\*Domestic;** \_\_\_\_\_ **Livestock/Poultry;** \_\_\_\_\_ **Agricultural/Irrigation;**  
 \_\_\_\_\_ **\*\* Public Supply;** \_\_\_\_\_ **Industrial** \_\_\_\_\_ **Other**  
 \*Total number of houses to be serviced by the well \_\_\_\_\_.  
 \*\* Applicant is required to give notice to TCEQ to obtain or modify a Certificate of Convenience and Necessity to provide water or wastewater service with water obtained pursuant to the requested permit.

b. Estimated distance, **in feet**, from the nearest:  
 \_\_\_\_\_ N / S Property Line; \_\_\_\_\_ E / W Property Line; \_\_\_\_\_ Existing Septic Leach Field  
 \_\_\_\_\_ River, Stream, or Lake; \_\_\_\_\_ Existing Water Well; \_\_\_\_\_ Livestock Enclosure;  
 \_\_\_\_\_ Other Source of Contamination (cemetery, pesticide mixing/loading, petroleum storage tank, etc.)

c. **Estimated Rate of Withdrawal (GPM):** \_\_\_\_\_

d. **Is the Property subject to flooding?**

e. **Is there another well on the property?** ; If YES, how many wells? \_\_\_\_\_

f. **Is the well part of a multi-well aggregate system?**  
 If YES, list the State or District Well Numbers: \_\_\_\_\_

**REQUIRED BY LAW: Pump Installer / Well Driller Information**

Name: \_\_\_\_\_ Street Address: \_\_\_\_\_  
 TDLR Pump Installer License #: \_\_\_\_\_ City, State, ZIP: \_\_\_\_\_  
 TDLR Well Driller License #: \_\_\_\_\_ Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 Email: \_\_\_\_\_

Name of Consultant preparing Application (if applicable): \_\_\_\_\_  
 Con. Phone: \_\_\_\_\_ Con. Fax: \_\_\_\_\_ Con. Email: \_\_\_\_\_

**4. Completion Information**

Provide the following information to the extent known and available at the time of application:

**Proposed Total Depth of Well:** 1200 ft;  
**Borehole Diameter (Dia):** 13.75 inches (in) from 0 to 1013 ;  
**Dia (2)** \_\_\_\_\_ in from \_\_\_\_\_ to \_\_\_\_\_ ;  
**Casing Material:** Carbon Steel ; **Inside Diameter (ID):** \_\_\_\_\_ in;  
**Screen Type:** Stainless Steel ; **Screen Dia.** 10 in from 1013 to 1200 ; **# of Packers:** \_\_\_\_\_  
**Pump Type:** Submersible ; **Power:** Electric ; **Horsepower Rating:** \_\_\_\_\_ ;  
**Pump Depth:** 1013 ; **Column Pipe ID:** 4 in.  
**Date Completed:** N/a  
**Proposed Water Bearing Formation:** Lower Trinity ; **Management Zone:** Belton Lake

**5. Operating Permit**

**Number of contiguous acres owned or leased on which water is to be produced:** 28.12 acres  
**Total annual production requested with this operating permit:** 64 acre-feet  
**If exporting water,** what is the annual volume requested for export out of the District: \_\_\_\_\_ Gallons  
What is the annual volume requested for export as a % of total pumpage: \_\_\_\_\_ %  
**If modifying an operating permit,** what is the current, permitted annual production: \_\_\_\_\_ ac-ft  
What is the requested amount of annual production: \_\_\_\_\_ ac-ft

**6. Attachments**

Include a statement/documentation explaining your requested production.  
**If amending an existing permit,** explain the requested amendment and the reason for the amendment in a signed and dated letter, attached to this application.  
**If requesting operating permits or permit renewals for multiple wells,** please attach a separate sheet with the information requested in Section 5 for each well.  
**If applicant plans to export water outside the District,** address the following in an attachment and provide documents relevant to these issues:

- The availability of water in the District and in the proposed receiving area during the period requested
- The projected effect of the proposed export on aquifer conditions, depletion, subsidence, or effects on existing permit holders or other groundwater users within the District
- How the proposed export is consistent with the approved regional water plan and certified District Management Plan

For more attachments that may be needed, please see the *Full Summary of the Permit Application Process* document.

**7. Certification**

*I hereby certify that the information contained herein is true and correct to the best of my knowledge and belief. I certify to abide by the terms of the District Rules, the District Management Plan, and orders of the Board of Directors. I agree to comply with all District well plugging and capping guidelines as stated in the District Rules.*

Typed Name of the Owner or Designee: STEVE THEODORE

Signature:  Date: 6-16-2023

**Permit Fee Schedule  
Drilling Permit Application  
N3-23-005P 64.4 ac-ft/yr  
Hosston Layer of Trinity Aquifer**

# Payment Receipt

Clearwater Underground Water Conservation

PO Box 1989  
Belton, TX 76513

Received From
UMHB Attn: Dr. Steve Theodore

Date	6/20/2023
Payment Method	Check
Check/Ref No	13802

Payment Amount	\$1,291.00
Total Amount Due	\$0.00

**Invoices Paid**

Date	Invoice Number	Amount Due	Amount Applied
6/19/2023	194	\$1,291.00	\$1,291.00

WARNING – THIS CHECK IS PROTECTED BY SPECIAL SECURITY GUARD PROGRAM™ FEATURES



**UNIVERSITY OF MARY HARDIN-BAYLOR**

BOX 8003 UMHB STATION  
BELTON, TEXAS 76513

CHECK NO. **13802**

FIRST TEXAS BANK  
BELTON, TEXAS 88-227/1119

VOID AFTER 180 DAYS

DATE	AMOUNT
6/20/2023	\$ *****1,291.00

**PAY ONE THOUSAND TWO HUNDRED NINETY ONE AND NO/100 DOLLARS**

UNIVERSITY OF MARY HARDIN-BAYLOR  
PLANT FUND

TO Clearwater Underground Water Conservati  
THE P.O. Box 1989  
ORDER Belton, TX 76513  
OF



*Randy O'Rear*  
*Charla Kelly*

THIS CHECK CONTAINS MULTIPLE SECURITY FEATURES – SEE BACK FOR DETAILS



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Drilling Permit for Well #N3-23-005P  
University of Mary Hardin Baylor  
c/o Dr. Steve Theodore

Permit Fee Schedule



Title	Annual Withdrawal (ac-ft)	Withdrawal Limit Condition	Drilling Permit Base Fee	Drilling Permit Progressive Fee	Progressive Fee Unit	Operating Permit Base Fee	Operating Permit Progressive Fee	Progressive Fee Unit
Level I†	0	Up to and including 1 ac-ft	\$ 150.00	\$ -	-	\$ -	\$ -	-
Level II†	1	Up to but not including 5 ac-ft	\$ 150.00	\$ 210.00	per ac-ft	\$ -	\$ -	-
Level III	5	Up to but not including 130 ac-ft	\$ 400.00	\$ 15.00	per ac-ft	\$ 600.00	\$ 20.00	per ac-ft
Level IV	130	Equal to or Greater than 130 ac-ft	\$ 2,200.00	\$ 7.50	per ac-ft	\$ 3,300.00	\$ 10.00	per ac-ft

† Level I and Level II use a Combination Permit, the Combination Permit fees are listed under Drilling Fees

Enter Your Proposed Withdrawal in ac-ft: **64.4**

The above amount requires a **Two-Step Permit \*\***

\*A Combination Permit covers both drilling and operating a well

\*\*A Two-Step Permit requires 1 drilling permit and 1 operating permit

Combined Permit Cost: n/a

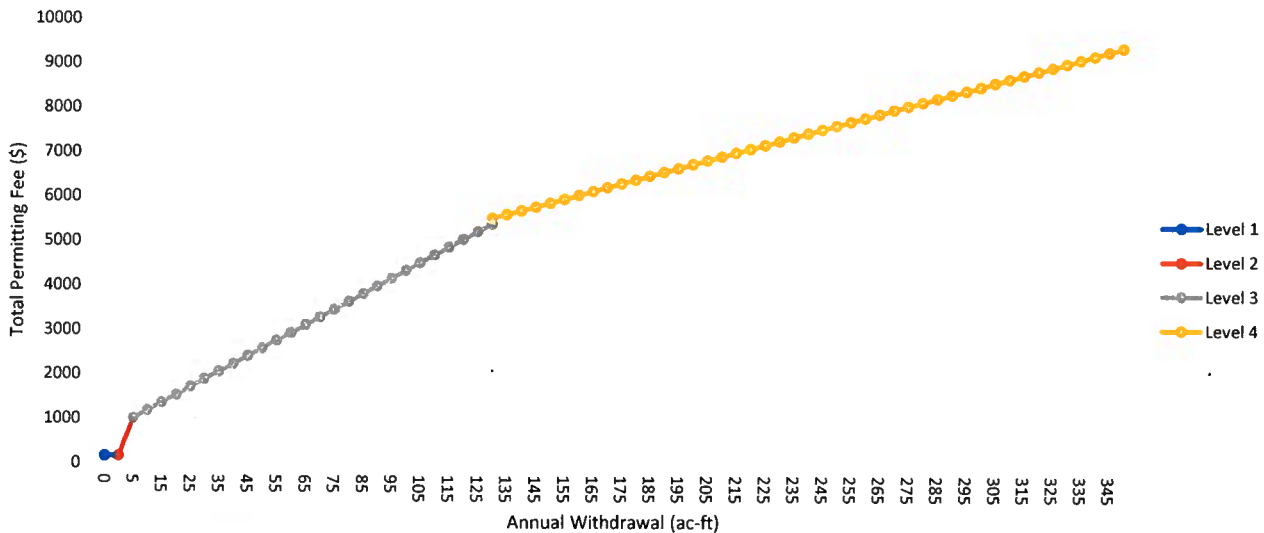
Two-Step Permit Cost:

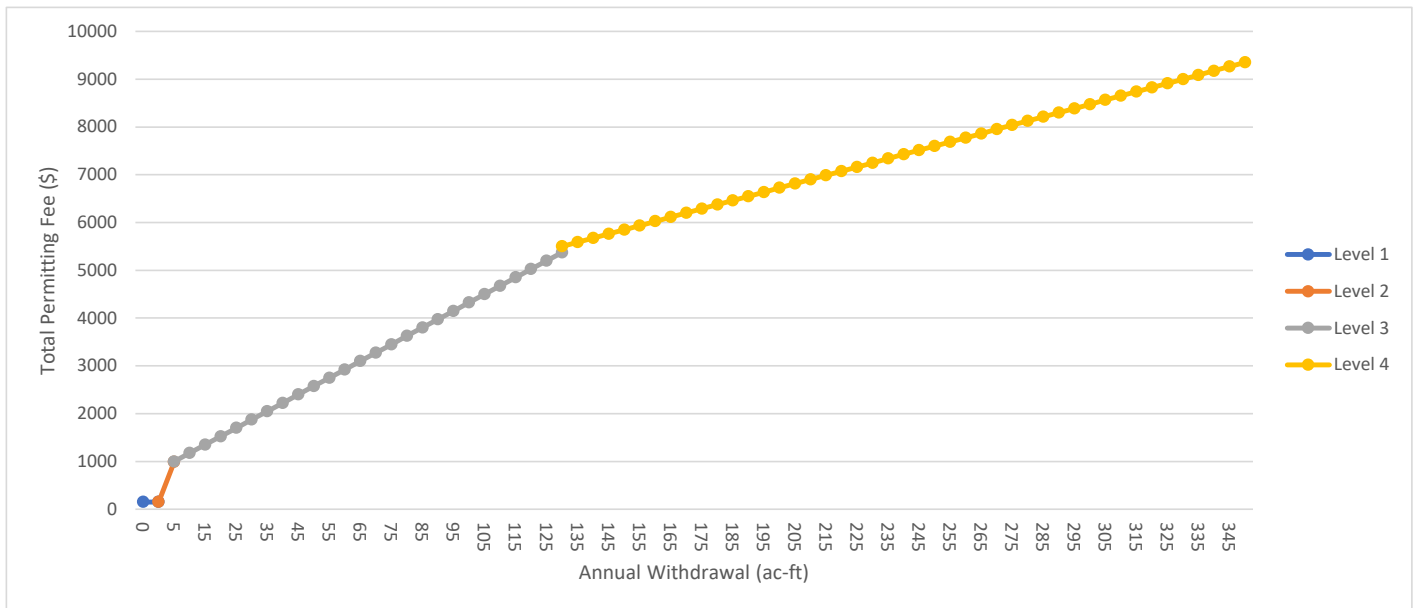
	Maximum
Drilling Permit Cost: \$ 1,291.00	\$ 7,500.00
Operating Permit Cost: \$ 1,788.00	\$ 10,000.00
Total Cost to Permit: \$ 3,079.00	\$ 17,500.00

Table of Fees			
ac-ft	Combined Fee	Drilling Fee	Operating Fee
0.5	\$ 150.00	-	-
1	\$ 150.00	-	-
2	\$ 360.00	-	-
3	\$ 570.00	-	-
4	\$ 780.00	-	-
5	\$ 1,000.00	\$ 400.00	\$ 600.00
30	\$ 1,875.00	\$ 750.00	\$ 1,125.00
55	\$ 2,750.00	\$ 1,100.00	\$ 1,650.00
80	\$ 3,625.00	\$ 1,450.00	\$ 2,175.00
105	\$ 4,500.00	\$ 1,800.00	\$ 2,700.00
130	\$ 5,500.00	\$ 2,200.00	\$ 3,300.00
155	\$ 5,937.50	\$ 2,375.00	\$ 3,562.50
180	\$ 6,375.00	\$ 2,550.00	\$ 3,825.00
205	\$ 6,812.50	\$ 2,725.00	\$ 4,087.50
230	\$ 7,250.00	\$ 2,900.00	\$ 4,350.00
<b>Your Fee</b>			
64.4	\$ 3,079.00	\$ 1,291.00	\$ 1,788.00

**How do I use this tool?**

1. Enter your proposed withdrawal amount (in ac-ft) in the blue rectangle cell above
2. The tool will tell you whether your withdrawal amount requires a **Combination Permit** or a **Two-Step Permit**
3. The cell(s) highlighted in green show how much a permit for your proposed withdrawal amount will cost **BEFORE** the cost maximum is applied.
4. The cells in the "Your Fee" section, under the Table of Fees, shows the same permit cost **AFTER** the cost maximum is applied
5. Below is a graphic representation of Clearwater's schedule of fees





**Administrative Fees:**

<b>Groundwater Availability Study Review<sup>1</sup></b>	<b>\$ 1250.00</b>
<b>Encumbrance Agreement Review &amp; Recording Fee<sup>1</sup></b>	<b>\$ 150.00</b>
<b>Encumbrance Agreement Recording Fee (When District Forms are used)<sup>1</sup></b>	<b>\$ 50.00</b>
<b>Shared Well Agreement Review &amp; Recording Fee<sup>1</sup></b>	<b>\$ 150.00</b>
<b>Shared Well Agreement Recording (when District Forms are used)</b>	<b>\$ 50.00</b>
<b>Export Surcharge<sup>2</sup></b>	<b>\$0.025/1,000 Gallons of Water</b>

**Printing & Copying Fees & Maps<sup>3</sup>**

District Documents (max 1 copy)	No Fee
Miscellaneous Copying (max 1 copy)	No Fee
Map Size (8.5 x 11, 8.5 x 14, 11 x 17)	No Fee

**Classification N3: A NON-EXEMPT WELL is a well that satisfies one or more of the following conditions:**

- ✓ A water well used for domestic purposes or for watering livestock or poultry that is drilled, equipped or completed so that it is capable of producing groundwater depending identified need, column pipe size, and the prescribed management zone to be located in and a tract of land consisting of less than 10-acres and greater than or equal to 2-acres of land, subdivided as of March 1, 2004, is a Non-Exempt wells (N3) Classified as a Level I per the fee schedule, or
- ✓ A groundwater well used for other beneficial purposes and capable of producing groundwater for a prescribed need, is a Non-Exempt Well (N3), Classified as Level I – Level IV per the fee schedule, or
- ✓ A groundwater well used for purposes other than domestic, livestock or poultry, Classified as Level I – Level IV per the fee schedule; or
- ✓ A water well used to serve two or more homes with a shared well agreement on tracts of land less than 10 acres and equal to or greater than 2 acres, Classified as Level I – Level IV per the fee schedule.

---

<sup>1</sup> Fees Shown are for administrative review, technical review, and legal consultation on behalf of the Applicant and the District. Full payment of all fees is required before application may be deemed administratively complete. See above for a description of an N3 drilling or operating permits. (No fee is required for a change in well ownership for either an exempt well or a non-exempt well.)

<sup>2</sup> As allowed in Texas Water Code, Chapter 36.122(e)(2).

<sup>3</sup> Includes documents such as Rules, Management Plan, Bylaws, Annual Report, etc. This does not include studies such as *historic hydrogeologic reports, groundwater availability studies, Well Completion Reports and any other reports that can be provided electronically*. Studies are available at cost.

**NOTE:**

- Most documents are available on the District’s web site—[www.cuwcd.org](http://www.cuwcd.org).
- Technical and legal expenses often exceed the fees established by Clearwater UWCD.
- All additional costs over the established fee for administrative, technical, and legal review will be covered by Clearwater UWCD.



Needs Assessment [REDACTED]  
N3-23-005P

University of Mary Hardin Baylor  
Hosston Layer of Trinity Aquifer

## Needs Assessment

The acreage to be irrigated is 14.5 acres based on a schematic drawing of the course and engineering by the Larry Rodgers Design Group from the Dallas/Fort Worth Area (Table 3). Table 3 considers evapotranspiration, rainfall, and applied irrigation for the golf course for each month in 2023. Total water usage for the year is estimated at nearly 21 million gallons, which is the basis for the 64 acre-feet of required groundwater. Peak production occurs in July at over 271 gpm. Table 4 is an irrigation pond drawdown table, also provided by the Larry Rodgers Design Group.

**Table 3. Estimated water usage for the UMHB Golf Course in 2023**

Month	Evt Inches	Rf Inches	Eff Rf Inches	Req Irr Inches	Appl Irr Inches	Acres Irr.	Gal. per day	Total Vol per month	GPM*
JAN.	1.92	1.75	0.00	0.00	0.00	14.5	0	0	0.00
FEB.	2.57	2.25	1.13	1.45	1.70	14.5	21,592	669,346	51.41
MAR.	4.27	2	1.00	3.27	3.85	14.5	48,862	1,514,714	116.34
APRIL	5.26	3.75	1.88	3.39	3.98	14.5	50,580	1,567,984	120.43
MAY	7.55	4.75	2.38	5.18	6.09	14.5	77,327	2,397,139	184.11
JUNE	8.38	3	1.50	6.88	8.09	14.5	102,804	3,186,921	244.77
JULY	8.74	2.25	1.13	7.62	8.96	14.5	113,787	3,527,384	270.92
AUG.	8.27	2	1.00	7.27	8.55	14.5	108,631	3,367,575	258.65
SEPT.	6.3	3.5	1.75	4.55	5.35	14.5	67,988	2,107,630	161.88
OCT.	4.94	3.5	1.75	3.19	3.75	14.5	47,666	1,477,657	113.49
NOV.	2.74	2.5	1.25	1.49	1.75	14.5	22,264	690,191	53.01
DEC.	1.79	2	1.00	0.79	0.93	14.5	11,805	365,940	28.11
<b>Total</b>	<b>62.73</b>	<b>33.25</b>	<b>15.75</b>	<b>45.06</b>	<b>53.01</b>	<b>14.5</b>		<b>20,872,481</b>	

\*7 hour window

Evt=Evapotranspiration

Rf=Rainfall

Effective Rf=Effective Rainfall (50% of Rf)

Req Irr=Required Irrigation

Appl Irr=Applied Irrigation (Req Irr/85% water application efficiency)

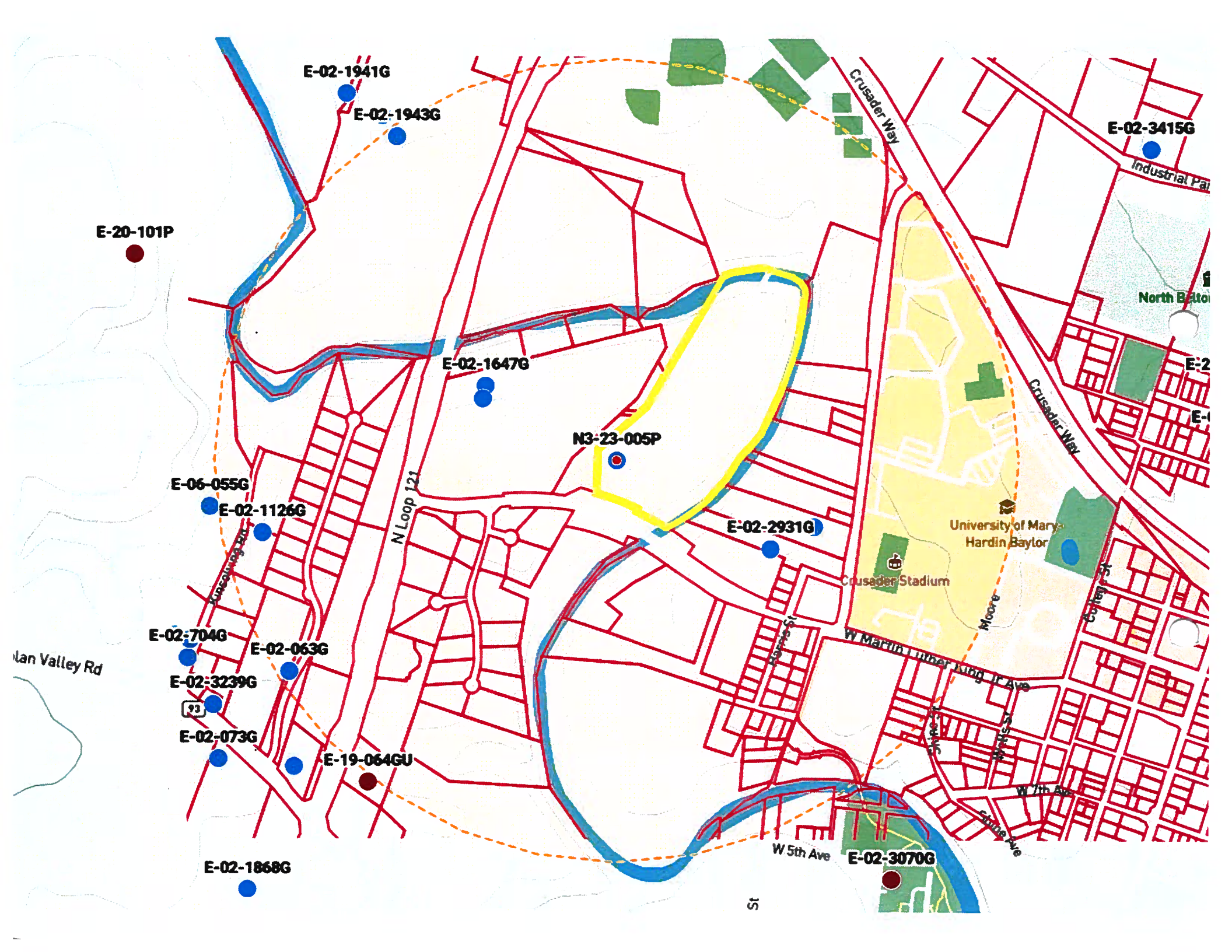
**Table 4. Irrigation Pond Drawdown**

IRRIGATION POND DRAWDOWN TABLE			
Freeboard drop (Total Feet based on an 8 hr. water window)	Pond Recharge Rate (based on 662,465 Gallons/Day in July)	Pond Recharge Time (Hours)	Total Well Run Time (Hours)
0.5	871 gpm	4.7	12.7
0.9	460 gpm	16.0	24.0



**Radius Map & Tract Size  
Drilling Permit Application  
N3-23-005P 28.12-acres  
Hosston Layer of Trinity Aquifer**





### N3-23-003P Contact List

#### **Wells 1/2 Mile**

<u>Prop ID</u>	<u>Name</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Well #</u>	<u>Status</u>	<u>Depth</u>	<u>Aquifer</u>	<u>Use</u>	<u>Distance</u>
439559	University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513	N-11-003G	Active	960	Middle Trinity	Ag/Irrigation	1,368 ft
129368	University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513	E-02-2931G	Active	unknown	Alluvium	Domestic	1,169 ft
44388	First Baptist Church of Belton	506 N Main St	Belton	TX	76513	E-02-1647G	Inactive	150	Edwards Equiv.	Not Used	987 ft
44388	First Baptist Church of Belton	506 N Main St	Belton	TX	76513	E-02-1648G	Inactive	102	Edwards Equiv.	Domestic	974 ft
465511	Creekside Estates Belton Homeowners Association	205 Paloma Dr	Temple	TX	76502	E-02-063G	Active	96	Edwards Equiv.	Domestic	2,563 ft
127795	Dora Olivarez	21116 Cypress Rosehill Rd	Tomball	TX	77377	E-02-1126G	Active	80	Edwards Equiv.	Domestic	2,376 ft
51538	Owner information not available in BELCAD					E-02-1943G	Inactive	930	Middle Trinity	Not Used	2,562 ft

#### **Adjacent Property**

318007	University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513
44420	University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513
397311	University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513
397312	University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513
484235	University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513
15328	University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513
66830	University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513
442111	University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513
51677	University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513
112472	Flora Stowers	415 South Pearl St	Belton	TX	76513
30010	Edwin & Welba Dorsey	914 University Dr	Belton	TX	76513
439559	University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513
129368	University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513
387584	University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513
382851	City of Belton	PO Box 120	Belton	TX	76513
354279	Cliffs of Nolan Creek Home Owners Association c/o Carol Mills	606 Cliff Dr	Belton	TX	76513

Name	Address	City	State	Zip
University of Mary Hardin Baylor	900 College St, UMHB Box 8441	Belton	TX	76513
First Baptist Church of Belton	506 N Main St	Belton	TX	76513
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Cliffs of Nolan Creek Home Owners Association c/o Carol Mills	606 Cliff Dr	Belton	TX	76513



**Drilling Permit Application  
N3-23-005P  
Notification Language  
Hosston Layer of Trinity Aquifer**

**NOTICE OF APPLICATION FOR A DRILLING PERMIT FROM  
CLEARWATER UNDERGROUND WATER CONSERVATION DISTRICT**

Gretchen Miller, Ph.D., PE, has submitted an application, on behalf of The University of Mary Hardin Baylor, to the Clearwater Underground Water Conservation District (CUWCD) on June 8, 2023, for a drilling permit to authorize drilling for a proposed new well.

This permit will authorize the drilling and completion of a well (#N3-23-005P) in the Belton Lake Management Zone described in District Rule 7.1. The proposed well is to be completed in the Lower Trinity Aquifer (Hosston Layer), with a maximum 4-inch column pipe on a 28.12-acre tract located at 900 College St., Belton, Texas, Latitude 31.069169°/Longitude -97.472680°, to produce groundwater for agricultural irrigation at a proposed annual quantity not to exceed 64.4 acre-feet or 20,984,832 gallons per year total at a maximum pumping rate not-to-exceed 261 gallons per minute.

This application will be set for hearing before the CUWCD Board upon notice posted at the Bell County Clerk's Office and at the CUWCD Office. If you would like to support, protest, or provide comments on this application, you must appear at the hearing and comply with District Rule 6.10. For additional information about this application or the permitting process, please contact the CUWCD at 700 Kennedy Court, Belton, Texas 76513, 254-933-0120. The applicant may be contacted at 900 College St, UMHB Box 8441, Belton, TX 76513, or by phone at 254-295-4519. The applicant's representative, Dr. Gretchen Miller, can be contacted at 512-851-8740.

June 19, 2023

**NOTICE OF APPLICATION FOR DRILLING PERMIT**

*Name*  
*Address*  
*City, TX Zip*

**VIA CERTIFIED MAIL  
RETURN RECEIPT REQUESTED**

RE: Application for a Drilling Permit

To Whom It May Concern:

I, Gretchen Miller, Ph.D., PE, have submitted an application, on behalf of The University of Mary Hardin Baylor, to the Clearwater Underground Water Conservation District (CUWCD) on June 8, 2023, for a drilling permit to authorize drilling for a proposed new well.

This permit will authorize the drilling and completion of a well (#N3-23-005P) in the Belton Lake Management Zone described in District Rule 7.1. The proposed well is to be completed in the Lower Trinity Aquifer (Hosston Layer), with a maximum 4-inch column pipe on a 28.12-acre tract located at 900 College St., Belton, Texas, Latitude 31.069169°/Longitude -97.472680°, to produce groundwater for agricultural irrigation at a proposed annual quantity not to exceed 64.4 acre-feet or 20,984,832 gallons per year total at a maximum pumping rate not-to-exceed 261 gallons per minute.

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Sincerely,

Gretchen Miller, Ph.D., PE  
Collier Consulting