Bluebonnet Groundwater Conservation District
1903 Dove Crossing Lane Suite A, P.O. Box 269
Navasota, TX 77868
Phone: 936-825-7303 Fax: 936-825-7331
Email: BGCD@bluebonnetgroundwater.org

BGCD Well ID #: _____

NON-EXEMPT WATER WELL REGISTRATION APPLICATION

Please complete all questions. Please print or type information, or place an "x" in the appropriate space.

Drill New Well: X Register an Existing Well: _____ Replace Existing Well: _____ Increase Size of Existing Well: _____

Increase Pump Size of Existing Well: _____ Abandon/Cap/Plug Existing Well: _____ Perform Dye Trace: _____

Well Owner: City of Katy, Texas Phone: 281-391-4800

Address: 901 Avenue C, Katy TX 77493

Fax: n/a Email: mrucker@cityofKaty.com & david.kasper@arkkengineers.com

Drilling Company: To be determined by Public Bid Phone

Address:

Fax: Email:

Driller License#

Well Location: County: Waller Well Site Address or Location: 3168 Pitts Road, Katy TX 77493

Latitude: 29°49.10445' **Longitude:** -95°50.35639

Proposed Water Use: Public Water Supply: X Industrial: _____ Recreational: _____ Commercial: _____

Hydraulic Fracturing: _____ Transport Outside of District: _____

Proposed depth: 1,000 ft. Aquifer Evangeline Date drilling is scheduled to begin 2024

Proposed casing size: 24 in. Proposed casing depth: 750 ft. Pump depth: 600 ft. Pump size 350 hp.

Type Pump: Turbine: x Submersible: _____ Windmill: _____ Other (specify): _____

Pump fuel or power source: Electricity: x Natural Gas: _____ Wind: _____ Other (specify): _____

Pump Bowls: Size 14-inch est # of Stages: 9 est Pump Column: Inside Diameter: 10 in. Length: 600 ft.

Pump discharge pipe: Size 10 in. Rated pump horsepower: 350 **Pump Discharge**: 1,500 est gpm

Water bearing formation: Evangeline Aquifer

Estimated Annual Water Production: _____ Acre-Feet or 262,800,000 (0.720 MGD Avg. Daily) Gallons

If the water produced from this well will be used in whole or in part on property other than the property where the well is located, **describe the location where the water will be used.** Transportation of water produced and moved to another location may require a District Transportation Permit. See District Rules, Section 10 or contact the District office for information.

_____

_____

BLUEBONNET GROUNDWATER CONSERVATION DISTRICT

Permit form approved on: _____ By: _____ Zach Holland, General Manger

(Continued) NON-EXEMPT WATER WELL DRILLING PERMIT FORM (Continued)

The following documentation, attachments and fee payments must accompany this form when it is submitted for consideration by the District.

a. Plat or map showing location of the property and location on property of well for which form is submitted.
b. If owner and/or operator of a well is different from property owner, provide written documentation from property owner authorizing construction and operation of this well.
c. All the information and documentation required for the type and class of well for which authorization is requested by Section 8 of the District Rules and that information and documentation required by Rule 8.5.
d. Forms for non-exempt well authorizations must be accompanied by the information required by Rule 8.5A1:
    a. 8.5A1(e) – a statement of the projected effect of the proposed withdrawal on the aquifer or aquifer conditions, depletion, subsidence, or effects on existing permit holders or other groundwater users in the District;
    b. 8.5A1(f) – the applicant's water conservation plan or a declaration the applicant and subsequent user will comply with the District's management plan;
    c. 8.5A1(g)(2) – well construction diagram;
    d. 8.5A1(g)(3) – a map showing the location of the proposed well or wells, all existing well, hydrologic features, and geologic features located within half (1/2) mile radius of the proposed well or wells site;
    e. 8.5A1(h) – the applicant's well closure plan or a declaration the applicant will comply with well plugging guidelines and report closure to the applicable authorities, including the District.
e. Payment for applicable fees must accompany the form. Additional fees may apply as documented in the District's adopted Fee Schedule.

Well Development Fee	$75.00	
Operating Permit Application Fee	$375.00	
Hydrogeologic Report Fee – applicable if well completed with eight (8) inches or greater inside casing diameter		
	Phase I-a Report (less than 200MG/yr)	Phase I-b Report (> 200MG/yr)
District Prepared Report	$1,500.00	$7,500.00
Applicant Prepared/District Review	$500.00	$1,500.00

f. Forms for new non-exempt wells must be accompanied by an Operating Permit Application and, if appropriate, a Transport Permit Application.

I, the undersigned applicant, hereby agree and certify that:

a. this well will be drilled within 30 feet of the location specified and not elsewhere;
b. I will furnish the District with a copy of the completed driller's log, any electric log, the well completion report, and any water quality test report within 60 days of completion of this well and prior to production of water there from (other than such production as may be necessary to the drilling and testing of such well);
c. in using this well, I will avoid waste, achieve water conservation, protect groundwater quality and the water produced from this well will be for a beneficial use;
d. I will comply with all District and State well plugging and capping guidelines in effect at the time of well closure;
e. I agree to abide by the terms of the District Rules, the District Management Plan, and orders of the District Board of Directors currently in effect and as they may be modified, changed, and amended from time to time;
f. I hereby certify that the information contained herein is true and correct to the best of my knowledge and belief.

Signature: _____ Date: _____

Printed Name: David W. Kasper, P.E. Title: City Engineer for the City of Katy

September 8, 2023

Mr. Zach Holland
General Manager
Bluebonnet Groundwater Conservation District
1903 Dove Crossing Lane Suite A
Navasota, Texas 77868

Re: New Water Well Application

Dear Mr. Holland:

The City of Katy is proposing to construct a new municipal water well facility within the Boundaries of the District. The location of the water well would be at the northeast corner of the intersection of Pitts Road and Morton Road. The water well is presently in the engineering design phase with myself and Mr. John Seifert of Ground Water Consultants, LLC. We plan to advertise for bids in November-December of this year, provided that we receive permission from the District to move forward.

I understand that fees to be paid by the City of Katy are:

Well Development Fee of $75.00
Operating Permit Application Fee of $375.00
Hydrogeologic (Phase 1) Report Fee of $7,500.00

Included with this application is a check for $7,950.00. Please call if additional information is needed., 713-254-0091 cell

Sincerely,
ARKK ENGINEERS, LLC
City Engineer for the City of Katy

David W. Kasper, P.E.
Principal/Senior Project Manager

7322 Southwest Fwy Suite 1040 • Houston, TX 77074 • (713) 400-ARKK • www.arkkengineers.com • TX PE Firm No. 13872

September 8, 2023

Mr. Zach Holland
General Manager
Bluebonnet Groundwater Conservation District
1903 Dove Crossing Lane Suite A
Navasota, Texas 77868

Re: New Water Well Application
Item b. – Documentation from Property Owner

Dear Mr. Holland:

The City of Katy is in the process of acquiring the water well site property. The City is presently appraising the property so that a fair market value can be determined. It is not anticipated that the property will require condemnation proceedings to acquire. The City of Katy is in coordination with the owner of the property and the property owner is aware of the City's plans. The City will be subdividing the property to provide for this water well site, a new detention pond site, right-of-way to widen Pitts Road and Morton Road, and a residual tract that will be retained by the current owner. The current use of the property is a sand pit operation. The sand pit is planned to be converted to a detention pond and park area.

The map on the following pages shows the location of the proposed water well, as required by application item a. which requires:

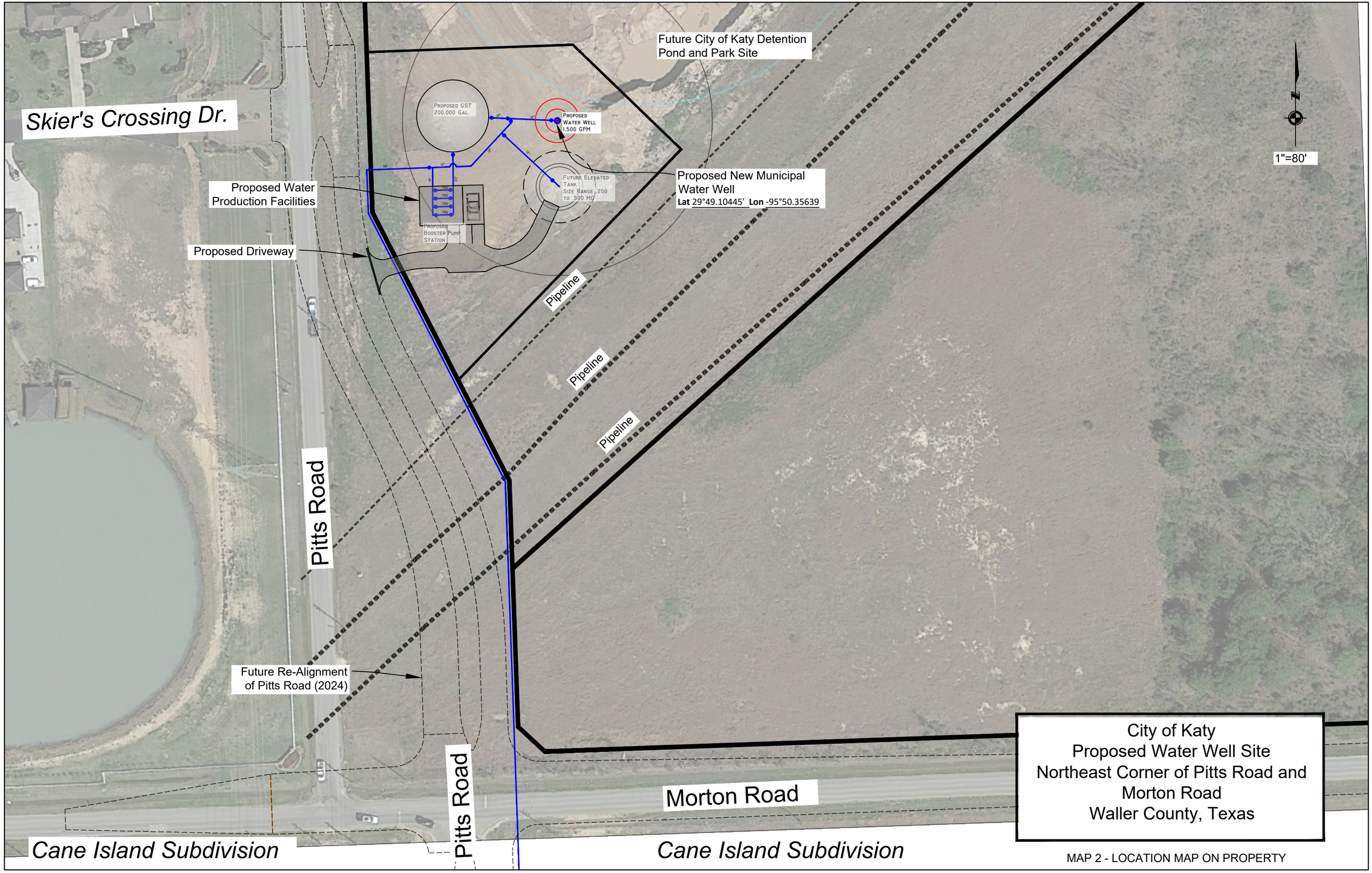
> *"a. Plat or map showing location of the property and location on property of well for which form is submitted"*

Please call if additional information is needed., 713-254-0091 cell

Sincerely,
ARKK ENGINEERS, LLC
City Engineer for the City of Katy

David W. Kasper, P.E.
Principal/Senior Project Manager

7322 Southwest Fwy Suite 1040 • Houston, TX 77074 • (713) 400-ARKK • www.arkkengineers.com • TX PE Firm No. 13872



MAP 2 - LOCATION MAP ON PROPERTY

September 8, 2023

Mr. Zach Holland
General Manager
Bluebonnet Groundwater Conservation District
1903 Dove Crossing Lane Suite A
Navasota, Texas 77868

Re: New Water Well Application
Item 8.5A1(e) – Projected Effect of the Proposed Withdrawal

Dear Mr. Holland:

The purpose of this letter is to respond to application item 8.5A1(e) which requires:

> *"A statement of the projected effect of the proposed withdrawal on the aquifer or aquifer conditions, depletion, subsidence, or effects on existing permit holders or other groundwater users in the District"*

The details of the effects of groundwater withdrawal would be contained in the Phase 1 Hydrogeologic Report. **The City of Katy wishes to engage the District to prepare this report for a well whose anticipated withdrawal rate exceeds 200 MG/year**.

The purpose of this proposed water well is to supplement the City's three other water wells that serve, primarily, the Cane Island Subdivision in Waller County. By operating this well, we expect that the load carried by the existing three wells will be lessoned, and spread across four wells rather than three. The City is having issues in 2022 and 2023 with very low pump submergence in these three existing wells.. By constructing this well, we expect that the pump submergence experienced by the other three wells will improve due to the projected lessoning of pump run times. This proposed well would be constructed a distance of 1.0 miles from the nearest other City water well.

Please call if additional information is needed, 713-254-0091 cell

Sincerely,
ARKK ENGINEERS, LLC
City Engineer for the City of Katy

David W. Kasper, P.E.
Principal/Senior Project Manager

7322 Southwest Fwy Suite 1040 • Houston, TX 77074 • (713) 400-ARKK • www.arkkengineers.com • TX PE Firm No. 13872

September 8, 2023

Mr. Zach Holland
General Manager
Bluebonnet Groundwater Conservation District
1903 Dove Crossing Lane Suite A
Navasota, Texas 77868

Re: New Water Well Application
Item 8.5A1(f) – Water Conservation Plan

Dear Mr. Holland:

The purpose of this letter is to respond to application item 8.5A1(f) which requires:

> *"the applicant's water conservation plan or a declaration the applicant and subsequent user will comply with the District's management plan;"*

This letter confirms that:

a) The City has a Water Conservation Plan and Drought Contingency Plan as evidenced by City of Katy Code of Ordinances Article 10.13, a copy of which is attached, and;

b) The City of Katy will comply with the District's Management Plan.

Please call if additional information is needed., 713-254-0091 cell

Sincerely,
ARKK ENGINEERS, LLC
City Engineer for the City of Katy

David W. Kasper, P.E.
Principal/Senior Project Manager

7322 Southwest Fwy Suite 1040 • Houston, TX 77074 • (713) 400-ARKK • www.arkkengineers.com • TX PE Firm No. 13872

DIVISION 2
Water Conservation Plan

§ 13.10.031. Declaration of policy, purpose, and intent.

(a) The City of Katy (the "city"), a community located within Harris, Waller, and Fort Bend County, Texas, recognizing the need for efficient use of existing water supply and treatment facilities, shall adopt the following water conservation plan for the purposes of identifying and establishing principles and practices to effectively monitor and conserve the efficient use of available water supplies and distribution system capacity. This is an update of the current plan previously adopted on August 11, 2014. The plan was prepared in general accordance with the Texas Water Development Board's Water Conservation Plan requirements contained in title 31, part 10, chapter 363, subchapter A, rule 363.15 of the Texas Administrative Code.

(b) In order to conserve the available water supply and/or to protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the city adopts the following water conservation plan.

(c) Water uses regulated or prohibited under the water conservation plan (the "plan") are considered to be nonessential and continuation of such uses during times of water shortage or other emergency water supply condition is deemed to constitute a waste of water which subjects the offender(s) to penalties as referenced in section 13.10.049 of this article.

§ 13.10.032. Definitions.

For the purpose of this plan, the following definitions shall apply:

Aesthetic water use. Water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use. Water use which is integral to the operations of commercial and nonprofit establishments and governmental entities, such as retail establishments, hotels and motels, restaurants, and office buildings.

Conservation. Those practices, techniques, and technologies that reduce the consumption of water, reduce the loss and/or waste of water, improve the efficiency of the use of water, and increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

Customer. Any person, company, or organization using water supplied by the city.

Domestic water use. Water use for personal needs or for household or sanitary purposes such as drinking, cooking, bathing, heating, cooling, sanitation, or for cleaning a residence, business, industry, or institution.

Drought contingency plan. A strategy or combination of strategies for temporary supply and demand management responses to temporary and potentially recurring water supply shortages and other water supply emergencies. A drought contingency plan may be a separate document identified as such or may be contained within another water management document(s).

Landscape irrigation use. Water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, rights-of-way, and medians.

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Municipal per capita water use. The sum total of water diverted into a water supply system for residential, commercial, public, and institutional uses divided by actual population served.

Municipal use. The use of potable water within or outside a municipality and its environs whether supplied by a person, privately owned utility, political subdivision, or other entity as well as the use of sewage effluent for certain purposes, including the use of treated water for domestic purposes, fighting fires, sprinkling streets, flushing sewers and drains, watering parks and parkways, and recreational purposes, including public and private swimming pools, the use of potable water in industrial and commercial enterprises supplied by a municipal distribution system without special construction to meet its demands, and for the watering of lawns and family gardens.

Municipal use in gallons per capita per day. The total average daily amount of water diverted or pumped for treatment for potable use by a public water system. The calculation is made by dividing the water pumped for treatment for potable use by population served. Indirect reuse volumes shall be credited against total diversion volumes for the purpose of calculation gallons per capita per day for targets and goals.

Non-essential water use. Water uses that are neither essential nor required for the protection of public health, safety, and welfare, including:

(1) Irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided for under this plan.

(2) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane, or other vehicle.

(3) Use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surface areas.

(4) Use of water to wash down buildings or structures for purposes other than immediate fire protection.

(5) Flushing gutters or permitting water to run or accumulate in any gutter or street.

(6) Use of water to fill, refill, or add to any indoor or outdoor swimming pool or Jacuzzi-type pools.

(7) Use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life.

(8) Failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s).

(9) Use of water from hydrants for construction purposes or any other purposes other than firefighting.

Pollution. The alteration of the physical, thermal, chemical, or biological quality of, or the contamination of any water in the state that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, or property, or to the public health, safety, or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.

Public water supplier. An individual or entity that supplies water to the public for human consumption.

Regional water planning group. A group established by the state water development board to prepare a regional water plan under Texas Water Code, section 16.053.

Retail public water supplier. An individual or entity that for compensation supplies water to the public for human consumption. The term does not include an individual or entity that supplies water to it or its employees or tenants when the water is not resold to or used by others.

Reuse. The authorized use for one or more beneficial purposes of use of water that remains unconsumed

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after the water is used for the original purpose of use and before that water is either disposed of or discharged or otherwise allowed to flow into a watercourse, lake, or other body of state-owned water.

Water conservation plan. A strategy or combination of strategies for reducing the volume of water withdrawn from a water supply source, for reducing the loss or waste of water, for maintaining or improving the efficiency in the use of water, for increasing the recycling and reuse of water, and for preventing the pollution of water. A water conservation plan may be a separate document identified as such or may be contained within another water management document(s).
(Ordinance 2912 adopted 7/22/19)

§ 13.10.033. Review and modification of plan.

This water conservation plan will be reviewed and updated, as appropriate, based on an assessment of previous five-year and ten-year targets and any other new or updated information. The city will review and update the next revision of its water conservation plan not later than May 1, 2024, and every five years after that date to coincide with the regional water planning group.
(Ordinance 2912 adopted 7/22/19)

§ 13.10.034. Authorization, implementation and enforcement.

The city administrator, or his/her designee, is hereby authorized and directed to implement and enforce this water conservation plan.
(Ordinance 2912 adopted 7/22/19)

§ 13.10.035. Applicability.

The provisions of this plan shall apply to all persons, customers, and properties utilizing water provided by the city. The terms person and customers as used in the plan include individuals, corporations, partnerships, associations, and all other legal entities.
(Ordinance 2912 adopted 7/22/19)

§ 13.10.036. Utility profile.

The city utility profile is found under exhibit A to this water conservation plan and is maintained on file in the office of the city secretary.
(Ordinance 2912 adopted 7/22/19)

§ 13.10.037. Specification of conservation goals and objectives.

(a) In accordance with 30 TAC part 1, chapter 288, subchapter C, rule 288.2(a)(1)C the following objectives and five (5) and ten (10) year targets have been established.

(b) The objectives of this water conservation plan are as follows:

(1) Maintain the per capita municipal water use below the specified amount in gallons per capita per day in a normal climate year, as shown in the completed table 3.1.

(2) To promote water conservation.

(3) To determine and control unaccounted water usage.

(4) To reduce the loss and waste of water.

(5) To maintain an accurate record of water usage.

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(c) Goals of the program (5 year and 10 year):

(1) Maintain the level of unaccounted water in the system below 7 percent annually in 2019 and subsequent years, as discussed in section 13.10.039.

(2) The projected baseline to reduce per capita per day consumption is 199 GPCD.

(3) To accomplish these goals the city will utilize the programs and policies in this plan such as accurate metering devices, universal metering, meter testing and repair, periodic meter replacement, control of unaccounted water, public education, nonpromotional water rates, and leak detection and repair.

Table 3.1
WATER CONSERVATION PLAN
5- AND 10-YR GOALS FOR WATER SAVINGS

	Historic 5-yr Average	Baseline (2018)	5-yr Goal for Year 2024	10-yr Goal for Year 2029
Total GPCD[1]	181*	199	192	185
Residential GPCD[2]	93*	101	97	93
Water Loss (GPCD)[3]	11*	10.2	10	9.5
Water Loss (Percentage)[4]	6%	5%	5%	5%

* Based on 2014-2018

(Ordinance 2912 adopted 7/22/19)

§ 13.10.038. Metering.

(a) The city meters 100% of the connections to the distribution system including municipal uses. Meters range in size from 3/4” to 8”. All meters are designed to provide accurate flows to within +/- 5%. The city has begun upgrading water meters to the flex net system to allow for real-time readings. Utility personnel and customers are able to collect electronic readings hourly. The flex net system will help with investigating abnormal usage on a daily basis.

(b) The city practices a meter change-out program whereby meters are changed out as needed. Additionally, larger meters are field tested and repaired for accuracy. Generally, the city does not use repaired meters in the system.

(c) The water treatment plants have metering for treated water. The metering is accomplished through turbine meters. Certified calibration is performed bi-annually.

(Ordinance 2912 adopted 7/22/19)

§ 13.10.039. Determination and control of unaccounted water usage.

Unaccounted water is the difference between water pumped and metered water sales to customers, plus authorized but unmetered uses. (Authorized but unmetered uses would include use for firefighting, releases for flushing of lines, uses associated with new construction, etc.) Unaccounted water can include several categories:

(1) Losses due to water main breaks and leaks in the water distribution system.

(2) The water plants are monitored daily and system pressure is checked, but any unusual pressure level may be indicative of sizeable leaks and reported to the maintenance section as soon as noted.

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(3) Inaccuracies in customer meters. (Customer meters tend to run more slowly as they age and under-report actual use.)

(4) Losses due to illegal connections and theft.

(Ordinance 2912 adopted 7/22/19)

§ 13.10.040. Public education.

(a) The city will support programs to educate the public regarding water conservation activities that support its goals. This includes educating the general public on the need for and practices of water conservation through public service announcements and other means. This information will be provided by means of public notice, web site, press releases, and mailings.

(b) Through the city website and the annual consumer customer report, the city will provide water conservation tips to its customers. In addition, the city will partner with the schools to educate the students on water conservation.

(c) Through flex net system customers are educated on how to monitor their water usage on a daily basis.

(d) The city is providing to new residents a new moisture meter to monitor the soil moisture in yards and landscaping to reduce the use of over watering.

(Ordinance 2912 adopted 7/22/19)

§ 13.10.041. Water rates.

The city has base rates determined by the size of the meter, and a declining block rate. Exhibit B to this plan, which is maintained on file in the office of the city secretary, is a copy of the water rates from the Code of Ordinances.

(Ordinance 2912 adopted 7/22/19)

§ 13.10.042. Water systems operations.

The city owns and operates six (6) ground water plants. Two of the plants are in Harris County, three in Waller County, and one plant in Fort Bend County. The water is pumped from the wells, and it is treated and stored in ground storage tanks and/or elevated storage tanks, which produces the water pressure for residential and commercial use. The volume capacity of the five (5) storage facilities is 7,250,000 gallons. The six (6) water plants are able to produce 9,914,400 gallons of water per day.

(Ordinance 2912 adopted 7/22/19)

§ 13.10.043. Records management system.

(a) The public works department maintains records of:

(1) Water received from the ground plants.

(2) Water pumped to the distribution system.

(3) Water used for flushing and sewer line cleaning.

(4) Estimates of water losses due to water leaks, fire hydrant flushing, and firefighting/training.

(b) The utility department maintains records of:

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(1) Water sold.

(2) Water rates.

(Ordinance 2912 adopted 7/22/19)

§ 13.10.044. Water supply and interconnect contract.

The city has two water supply and interconnect contracts with Fort Bend County Municipal Utility District No. 37 and Willow Creek Farms Municipal Utility District, which is only used on an emergency situation basis.

(Ordinance 2912 adopted 7/22/19)

§ 13.10.045. Plumbing codes.

(a) The city operates under the 2017 International Plumbing Code. This code has been formally adopted by the city council and is included in the city Code of Ordinances. A copy of this code is on file with the city secretary. The city routinely inspects new construction, remodeling, add-ons, etc., through building permits. All new construction is required to meet state and federal rules regarding water-conserving plumbing fixtures.

(b) The city does not offer a program for the replacement or retrofit of water conserving plumbing fixtures in existing structures other than what would be required through the permitting process for remodels and building upgrades.

(Ordinance 2912 adopted 7/22/19)

§ 13.10.046. Recycling and reuse.

The city reclaims and reuses nonpotable water for the cleaning of the wastewater plant.

(Ordinance 2912 adopted 7/22/19)

§ 13.10.047. Other conservation measures.

The city recognizes that in order to accomplish the goals and objectives of this water conservation plan, other conservation measures may be required that are not outlined within the body of this document. The city is aware of the water conservation best management practices guide ("BMP") and as deemed necessary, the city will implement other measures either from the BMP guide or as otherwise seen fit to assure compliance with the plan.

(Ordinance 2912 adopted 7/22/19)

§ 13.10.048. Drought contingency plan.

In addition to this water conservation plan, the city also has a drought contingency plan. Drought contingency planning has been developed as a part of this water conservation plan as a means of dealing with conditions which occur from drought and/or water emergencies. The drought contingency and water emergency management phase of the conservation plan has been developed using the guidelines of the state commission on environmental quality (TCEQ) and the TWDB.

(Ordinance 2912 adopted 7/22/19)

§ 13.10.049. Enforcement.

(a) No person shall knowingly or intentionally allow the use of water from the city for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any

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provision of this plan, or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken by the city administrator, or his/her designee, in accordance with provisions of this plan.

(b) Any person who violates this plan is guilty of a misdemeanor and upon conviction shall be punished by a fine of not less than $200.00. Each day that one or more of the provisions in this plan is violated shall constitute a separate offense. If a person is convicted of three or more distinct violations of this plan, the city administrator, or his/her designee, shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur. Services discounted under such circumstances shall be restored only upon payment of a reconnection charge in accordance with current policies and ordinances and any other costs incurred by the city in discontinuing service. In addition, suitable assurance must be given to the city administrator, or his/her designee, that the same action shall not be repeated while the plan is in effect. Compliance with this plan may also be sought through injunctive relief in the district court.

(Ordinance 2912 adopted 7/22/19)

§ 13.10.050. through § 13.10.080. (Reserved)

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DIVISION 3
Drought Contingency Plan

§ 13.10.081. Introduction and objectives.

(a) Water supply has always been a key issue in the development of the state. In recent years, the increasing population and economic development in regional planning group H have led to growing demands for water. At the same time, local and less expensive sources of water supply are largely developed. Additional supplies to meet higher demands will be expensive and difficult to develop. Therefore, it is important that we make efficient use of existing supplies and make them last as long as possible. This will delay the need for new supplies, minimize the environmental impacts associated with developing new supplies, and delay the high cost of additional water supply development.

(b) Recognizing the need for efficient use of existing water supplies, the state commission on environmental quality (TCEQ) has developed guidelines and requirements governing the development of drought contingency plans for public water suppliers.

(c) The TCEQ rules governing development of drought contingency plans for public water suppliers are contained in title 30, part 1, chapter 288, subchapter B, rule 288.20 of the Texas Administrative Code. For the purpose of these rules, a drought contingency plan is defined as: "A strategy or combination of strategies for temporary supply and demand management responses to temporary and potentially recurring water supply shortages and other water supply emergencies. A drought contingency plan may be a separate document identified as such or may be contained within another water management document(s)."

(d) The city has adopted this drought contingency plan pursuant to TCEQ guidelines and requirements.

(e) The purpose of this drought contingency plan is as follows:

(1) To conserve the available water supply in times of drought and emergency.

(2) To maintain supplies for domestic water use, sanitation, and fire protection.

(3) To protect and preserve public health, welfare, and safety.

(4) To minimize the adverse impacts of water supply shortages.

(5) To minimize the adverse impacts of emergency water supply conditions.

§ 13.10.082. State requirements.

(a) This drought contingency plan is consistent with state commission on environmental quality (TCEQ) guidelines and requirements for development of drought contingency plans by public drinking water suppliers, contained in title 30, part 1, chapter 288, subchapter B, rule 288.20 of the Texas Administrative Code, and contained in section 11.039 of the Texas Water Code.

(b) TCEQ's minimum requirements for drought contingency plans are addressed in the following subsections of this report:

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288.20(a)(1)(A) - Provisions to inform the public and provide opportunity for public input	Section 13.10.083
288.20(a)(1)(B) - Provisions for continuing public education and information	Section 13.10.084
288.20(a)(1)(C) - Coordination with regional water planning group	Section 13.10.089
288.20(a)(1)(D) - Criteria for initiation and termination of drought stages	Section 13.10.085
Section 11.039, TWC - Initiation of drought response stages	
288.20(a)(1)(E) - Drought and emergency response stages	Section 13.10.086
288.20(a)(1)(F) - Specific, quantified targets for water use reductions	Section 13.10.086
288.20(a)(1)(G) - Water supply and demand management measures for each stage	Section 13.10.086
288.20(a)(1)(H) - Procedures for initiation and termination of drought stages	Section 13.10.086
288.20(a)(1)(I) - Procedures for granting variances	Section 13.10.087
288.20(a)(1)(J) - Procedures for enforcement of mandatory restrictions	Section 13.10.088
288.20(a)(3) - Consultation with wholesale supplier (City of Katy not applicable)	
288.20(b) - Notification of implementation of mandatory measures	Section 13.10.085
288.20(c) - Review and update of plan	Section 13.10.090

(Ordinance 2912 adopted 7/22/19)

§ 13.10.083. Provisions to inform the public and opportunity for public input.

Notice of the adoption of this division at a regular city council meeting was posted and interested members of the public were given an opportunity to express opinions and concerns regarding the plan.
(Ordinance 2912 adopted 7/22/19)

§ 13.10.084. Continuing public education and information.

(a) The city will inform and educate the public about its drought contingency plan by the following means:

(1) Making the plan available to the public through the city's website at www.cityofkaty.com.

(2) Notifying local organizations, schools, and civic groups that city staff members are available to make presentations on the drought contingency plan.

(b) At any time that the drought contingency plan is activated or the drought stage changes, the city will notify local media of the issues, the drought response stage, and the specific actions required of the public. The information will also be publicized on the city's website, www.cityofkaty.com. Billing inserts or mail-outs will also be used as appropriate.

(Ordinance 2912 adopted 7/22/19)

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§ 13.10.085. Initiation and termination of drought response stages.

(a) Initiation.

(1) The mayor or his/her official designee may order the implementation of a drought response stage or water emergency when one or more of the trigger conditions for that stage is met. The following actions will be taken when a drought stage is initiated:

(A) The public will be notified through local media, website postings, message boards, and other communication strategies as they are developed.

(B) If any mandatory provisions of the drought contingency plan are activated, the city will notify the executive director of the TCEQ within five business days

(2) For other trigger conditions, the mayor or his/her designee may decide not to order the implementation of a drought response stage or water emergency even though one or more of the trigger criteria for the stage are met. Factors that could influence such a decision include, but are not limited to, the time of the year, weather conditions, the anticipation of replenished water supplies, or the anticipation that additional facilities will become available to meet needs.

(b) Termination.

(1) The mayor or official designee may order the termination of a drought response stage or water emergency when the conditions for termination are met or at his/her discretion. The following actions will be taken when a drought stage is terminated:

(A) The public will be notified through local media, website postings, message boards, and other communication strategies as they developed.

(B) When any mandatory provisions of the drought contingency plan that have been activated are terminated, the city will notify the executive director of the TCEQ within five business days.

(2) The mayor or his/her designee may decide not to order the termination of a drought response stage or water emergency even though the conditions for termination of the stage are met. Factors that could influence such a decision include, but are not limited to, the time of the year, weather conditions, or the anticipation of potential changed conditions that warrant the continuation of the drought stage.

(Ordinance 2912 adopted 7/22/19; Ordinance 3051 adopted 7/28/2022)

§ 13.10.086. Triggering conditions and response measures.

(a) Initiation. Customers shall be required to comply with the requirements and mandatory restrictions on certain nonessential water uses and shall be requested to adhere to voluntary measures provided in this plan when:

(1) Stage 1, mild.

(A) Triggering and termination conditions for stage 1.

(i) When total daily water demand equals or exceeds 75% of total water well pumpage for three (3) consecutive days;

(ii) Water demand for all or part of the delivery system approaches delivery capacity

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because delivery capacity is inadequate;

(iii) The supply source becomes contaminated;

(iv) The water supply system is unable to deliver water due to the failure or damage of major water system components; or

(v) Water demand is approaching the limit of the permitted supply.

Termination: Stage 1 can be terminated when the circumstances that caused the initiation of stage 1 no longer prevail.

(B) Goal for use reduction and actions available under stage 1. The goal for water use reduction under stage 1, mild, is a 5 percent of water use compared to baseline historical monthly average water usage as calculated by the city (based on the water usage data over the previous 12-month period). The purpose of actions under stage 1, mild, is to raise public awareness of potential drought problems. The mayor or his/her designee can order the implementation of any of the actions listed below, as deemed necessary:

(i) Request voluntary reductions in water use by the public.

(ii) Increase public education efforts on ways to reduce water use.

(iii) Review the problems that caused the initiation of stage 1.

(iv) Notify major water users and work with them to achieve voluntary water use reductions.

(v) Intensify efforts on leak detection and repair.

(vi) Reduce nonessential city government water use, including street cleaning, vehicle washing, and operation of ornamental fountains.

(vii) Reduce city government water use for landscape irrigation.

(viii) Ask the public to voluntary reduce watering and/or irrigate landscape between 12:00 a.m. to 8:00 a.m. and 8:00 p.m. to 11:59 p.m.

(ix) Encourage reduction of draining and refilling of swimming pools. Water may be added to existing pools to replace losses from normal use and operation.

(2) Stage 2, moderate.

(A) Triggering and termination conditions for stage 2.

(i) When total daily water demand equals or exceeds 80% of total water well pumpage for three (3) consecutive days;

(ii) Water demand for all or part of the delivery system equals delivery capacity because delivery capacity is inadequate;

(iii) The supply source becomes contaminated;

(iv) The water supply system is unable to deliver water due to the failure or damage of major water system components; or

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(v) Water demand is approaching the limit of the permitted supply.

Termination: Stage 2 can terminate when the circumstances that caused the initiation of stage 2 no longer prevail. Stage 1 becomes operative on termination of stage 2.

(B) Goal for use reduction and actions available under stage 2. The goal for water use reduction under stage 2, moderate, is a 10 percent of water use compared to baseline historical monthly average water usage as calculated by the city (based on the water usage data over the previous 12-month period). The mayor or his/her designee can order the implementation of any of the actions listed below, as deemed necessary:

(i) Continue or initiate any actions available under stage 1.

(ii) Initiate engineering studies to evaluate alternatives should conditions worsen.

(iii) Further accelerate public education efforts on ways to reduce water use.

(iv) Halt nonessential city government water use, including street cleaning, vehicle washing, and operation of ornamental fountains.

(v) Encourage the public to wait until the current drought or emergency situation has passed before establishing new landscaping.

a. Ask the public to reduce watering and/or irrigate landscape to three (3) times per week and water between 12:00 a.m. to 8:00 a.m. and 8:00 p.m. to 11:59 p.m. based on the last digit of the address as defined in table 13.10A. (Exceptions: Foundations, new plantings (first year) of trees and shrubs may be watered for up to two hours on any day by a handheld hose or a soaker hose without restrictions.)

(vi) Limit hydrant flushing (except for water system repairs), flushing gutters, or allowing water to run or accumulate in any street.

(vii) Encourage reduction of water use for power washing of buildings, sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas.

Table 13.10A
Three Days Per Week Watering Schedule (12:00 a.m. to 8:00 a.m. and 8:00 p.m. to 11:59 p.m.)

Last Digit of Address	Allowed Landscape Watering Days
Even Number (0, 2, 4, 6, 8)	Monday, Wednesday, Saturday
Odd Number (1, 3, 5, 7, 9)	Tuesday, Thursday, Sunday
Commercial, HOA, Greenspace, Right-of-Way	Wednesday, Friday, Sunday

(3) Stage 3, severe.

(A) Triggering and termination conditions for stage 3.

(i) When total daily water demand equals or exceeds 85% or total water well pumpage for three (3) consecutive days;

(ii) Water demand for all or part of the delivery system exceeds delivery capacity because delivery capacity is inadequate;

(iii) The supply source becomes contaminated;

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(iv) The water supply system is unable to deliver water due to the failure or damage of major water system components; or

(v) Water demand is approaching the limit of the permitted supply.

Termination: Stage 3 can terminate when the circumstances that caused the initiation of stage 3 no longer prevail. Stage 2 becomes operative on termination of stage 3.

(B) Goal for use reduction and actions available under stage 3. The goal for water use reduction under stage 3, severe, is a reduction of 15 percent of water use compared to baseline historical monthly average water usage as calculated by the city (based on the water usage data over the previous 12-month period). If the circumstances warrant, the mayor or his/her designee can set a goal for greater water use reduction. The mayor or his/her designee can order the implementation of any of the actions listed below, as deemed necessary. Measures described as "requires notification to TCEQ" impose mandatory requirements on retail and wholesale customers. The city staff must notify TCEQ within five business days if these measures are implemented.

(i) Continue or initiate any actions available under stage 1 and 2.

(ii) Implement viable alternative water supply strategies.

(iii) Discontinue city government water use for landscape irrigation, except as needed to prevent foundation damage and preserve new plantings.

(C) Requires notification to TCEQ.

(i) Initiate mandatory water use restrictions as follows:

a. Prohibit hosing of paved areas, buildings, windows, and any hard-surfaced areas.

b. Prohibit operation of ornamental fountains.

c. Prohibit washing or rinsing of vehicles by hose.

d. Prohibit using water in such a manner as to allow runoff or other waste.

(ii) Limit landscape watering at each service address to 12:00 a.m. to 8:00 a.m. and 8:00 p.m. to 11:59 p.m. twice per week based on the last digit of the address as defined in table 13.10B. (Exceptions: Foundations, new plantings (first year) of trees and shrubs may be watered for up to two hours on any day by a handheld hose or a soaker hose without restrictions.)

(iii) Prohibit draining and filling of existing pools and filling of new pools. (Pools may add water to replace losses during normal use.)

(iv) Prohibit establishment of new landscaping.

Table 13.10Bb
Two Days Per Week Watering Schedule (12:00 a.m. to 8:00 a.m. and 8:00 p.m. to 11:59 p.m.)

Last Digit of Address	Allowed Landscape Watering Days
Even number (0, 2, 4, 6, 8)	Sunday and Thursday
Odd number (1, 3, 5, 7, 9)	Saturday and Wednesday

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Table 13.10Bb
Two Days Per Week Watering Schedule (12:00 a.m. to 8:00 a.m. and 8:00 p.m. to 11:59 p.m.)

Last Digit of Address	Allowed Landscape Watering Days
Commercial, HOA, Greenspace, right-of-way	Tuesday and Friday
Monday - No watering (storage recovery days)	

(4) Stage 4, emergency.

(A) Triggering and termination conditions for stage 4.

(i) When total daily water demand equals or exceeds 90% of total water well pumpage for three (3) consecutive days;

(ii) Water demand for all or part of the delivery system seriously exceeds delivery capacity because the delivery capacity is inadequate;

(iii) The supply source becomes contaminated;

(iv) The water supply system is unable to deliver water due to the failure or damage of major water system components; or

(v) Water demand is approaching the limit of the permitted supply.

Termination: Stage 4 can terminate when the circumstances that caused the initiation of stage 4 no longer prevail. Stage 3 becomes operative on termination of stage 4.

(B) Goal for use reduction and actions available under stage 4. The goal for water use reduction under stage 4, emergency, is a reduction of 20 percent of water use compared to baseline historical monthly average water usage as calculated by the city (based on the water usage data over the previous 12-month period). If circumstances warrant, the mayor/manager or his/her designee can set a goal for greater water use reduction. The mayor/manager or his/her designee can set a goal for greater water use reduction. The mayor or his/her designee can order the implementation of any of the actions listed below, as deemed necessary. Measures described as "requires notification to TCEQ" impose mandatory requirements on retail and wholesale customers. The city staff must notify TCEQ within five business days if these measures are implemented.

(i) Continue or initiate any actions available under stages 1, 2 and 3.

(ii) Implement viable alternative water supply strategies.

(C) Requires notification to TCEQ.

(i) Prohibit washing of vehicles except as necessary for health, sanitation or safety reasons, including carwashes.

(ii) Limit landscape watering at each service address to one (1) day per week and water between 12:00 a.m. to 8:00 a.m. and 8:00 p.m. to 11:59 p.m. based on the last digit of the address as defined in table 13.10. (Exceptions: Foundations, new plantings (first year) of trees and shrubs may be watered for up to two hours on any day by a handheld hose or a soaker hose without restrictions.)

(iii) Prohibit any filling of private pools. Commercial and public pools may refill to replace losses during normal use.

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(iv) Require all commercial water users to reduce water use by a percentage established by the mayor and his/her designee.

Table 13.10
One Day Per Week Watering Schedule (12:00 a.m. to 8:00 a.m. and 8:00 p.m. to 11:59 p.m.)

Last Digit of Address	Allowed Landscape Watering Days
1, 3	Tuesday
0, 2	Wednesday
5, 7	Thursday
4, 6	Friday
8, 9	Saturday
Commercial, HOA, Greenspace, right-of-way	Sunday
Monday - No watering (storage recovery days)	

(Ordinance 2912 adopted 7/22/19; Ordinance 3051 adopted 7/28/2022)

§ 13.10.087. Variances.

(a) The mayor/manager and his/her designee may grant temporary variances for existing water uses otherwise prohibited under this drought contingency plan if one or more of the following conditions is met:

(1) Failure to grant such a variance would cause an emergency condition adversely affecting health, sanitation, or fire safety for the public or the person requesting the variance.

(2) Compliance with this plan cannot be accomplished due to technical or other limitations.

(3) Alternative methods that achieve the same level of reduction in water use can be implemented.

(b) Variances shall be granted or denied at the discretion of the mayor or his/her designee. All petitions for variances should be in writing and should include the following information:

(1) Name and address of the petitioner(s).

(2) Purpose of water use.

(3) Specific provisions from which relief is requested.

(4) Detailed statement of the adverse effect of the provision from which relief is requested.

(5) Description of relief requested.

(6) Period of time for which the variance is sought.

(7) Alternative measures that will be taken to reduce water use.

(Ordinance 2912 adopted 7/22/19)

§ 13.10.088. Procedures for enforcement of mandatory restrictions; penalty.

Mandatory water use restrictions may be imposed in stage 3 and stage 4 drought stages. These mandatory waters use restrictions will be enforced by warnings and penalties as follows:

(1) Stage 3 enforcement procedures.

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(A) On the first violation, customers will be given a written warning that they have violated mandatory restrictions.

(B) On the second and subsequent violations, citations may be issued to customers with fines not less than $200.00 and not to exceed $2,000.00 per incident - the city may cut off water service to the customer, subject to appeal.

(2) Stage 4 enforcement procedures.

(A) On the first violation, customers will be given a written warning that they have violated mandatory restrictions.

(B) On the second and subsequent violations, citations may be issued to customers with fines not less than $200.00 and not to exceed $2,000.00 per incident - the city may cut off water service to the customer, subject to appeal.

(Ordinance 2912 adopted 7/22/19; Ordinance 3051 adopted 7/28/2022)

§ 13.10.089. Coordination with regional water planning group.

The city is located within the Region H water planning area. Appendix C of Ordinance 2501 includes a copy of a letter sent to the chair of the Region H Water Planning Group (RCWPG) with this drought contingency plan.

(Ordinance 2912 adopted 7/22/19)

§ 13.10.090. Review and update of plan.

As required by TCEQ rules, the city will review this drought contingency plan every five years to coincide with RCWPG. The plan will be updated as appropriate based on new or updated information. As the plan is reviewed and subsequently updated, a copy of the revised drought contingency plan will be kept on file on the city's website, www.cityofkaty.com, and submitted to the RCWPG and TCEQ for their records.

(Ordinance 2912 adopted 7/22/19)

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September 8, 2023

Mr. Zach Holland
General Manager
Bluebonnet Groundwater Conservation District
1903 Dove Crossing Lane Suite A
Navasota, Texas 77868

Re: New Water Well Application
Item 8.5A1(g)(2) – Well Construction Diagram

Dear Mr. Holland:

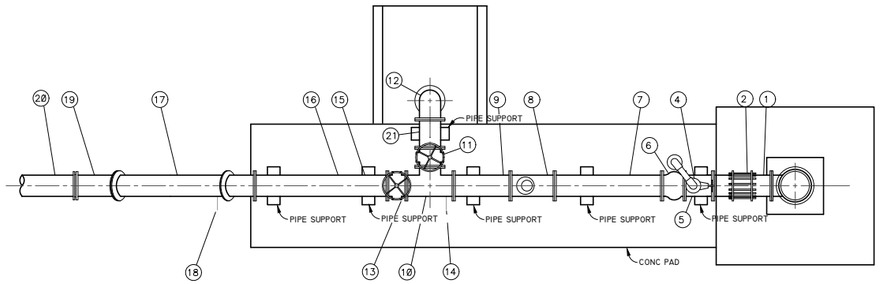
The purpose of this letter is to respond to application item 8.5A1(g)(2) which requires a Well Construction Diagram. The drawing on the following page provides the proposed Well Construction Diagram.

Please call if additional information is needed, 713-254-0091 cell

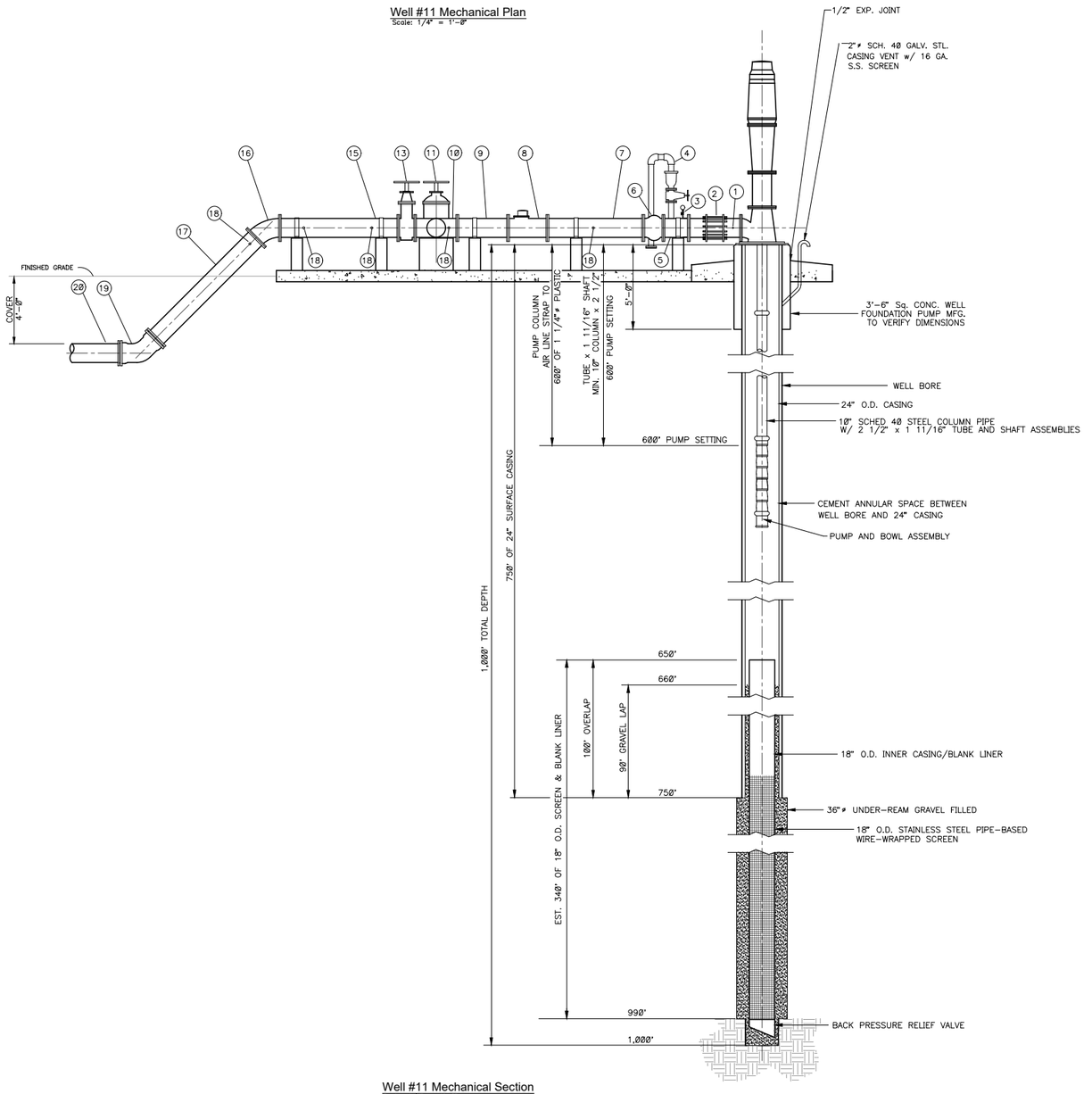
Sincerely,
ARKK ENGINEERS, LLC
City Engineer for the City of Katy

David W. Kasper, P.E.
Principal/Senior Project Manager

7322 Southwest Fwy Suite 1040 • Houston, TX 77074 • (713) 400-ARKK • www.arkkengineers.com • TX PE Firm No. 13872



Well #11 Mechanical Plan
Scale: 1/4" = 1'-0"



Well #11 Mechanical Section
Scale: 1/4" = 1'-0"

WELL NO. 8 VALVE & FITTING SCHEDULE

MARK	QTY	DESCRIPTION
1	1	1/2" HOSE BIB (SAMPLING TAP)
2	1	12" DRESSER TYPE COUPLING – STYLE 53
3	1	1/2" TAP, 1/2" BALL VALVE & 3" PRESSURE GAUGE
4	1	3" TAP, 3" AIR/VACUUM VALVE WITH 3" GATE VALVE & SCREENED DISCHARGE
5	1	12" SPOOL – 1'-6" LONG
6	1	12" GLOBE TYPE CHECK VALVE
7	1	12" SPOOL – 5'-0" LONG
8	1	12" SENSUS FLOW METER
9	1	12" SPOOL – 3'-0" LONG
10	1	12" X 12" TEE
11	1	12" GATE VALVE WITH WHEEL ACTUATOR RISING STEM
12	1	12" 90° BEND
13	1	12" GATE VALVE WITH WHEEL ACTUATOR RISING STEM
14	–	(RESERVED)
15	1	12" SPOOL – 1'-8" LONG
16	1	12" 45° BEND
17	1	12" SPOOL FLG TO MJ
18	1	1 1/2" NPT CONNECTION W/ 1 1/2" BALL VALVE
19	1	12" 45° MJ
20	1	12" PVC PIPE
21	1	12" SPOOL – 1'-6" LONG

MK.	DESCRIPTION	DATE	DWN.	CHK.

This document is released for the purpose of review under the authority of David W. Kasper, P.E. 86294 on 8/7/2023. It is not to be used for construction purposes.

ARKK ENGINEERS
7322 Southwest Freeway, Suite 1040 • Houston, Texas 77074
(713) 400-2755 • www.arkkengineers.com • TX PE Firm No. 13872

City of Katy, Texas

Water Well No. 11

Mechanical Plan and Section

Job No.: 23-039	Scale: As Shown	SHEET 5 OF 15
Date: August 2023		
Dwn By: C. Chudoba		
Chkd By: D. Kasper		

September 8, 2023

Mr. Zach Holland
General Manager
Bluebonnet Groundwater Conservation District
1903 Dove Crossing Lane Suite A
Navasota, Texas 77868

Re: New Water Well Application
Item 8.5A1(g)(3) – ½ Mile Well Map

Dear Mr. Holland:

The purpose of this letter is to respond to application item 8.5A1(g)(3) which requires:

> *"a map showing the location of the proposed well or wells, all existing wells, hydrologic features, and geologic features located within half (1/2) mile radius of the proposed well or wells site"*

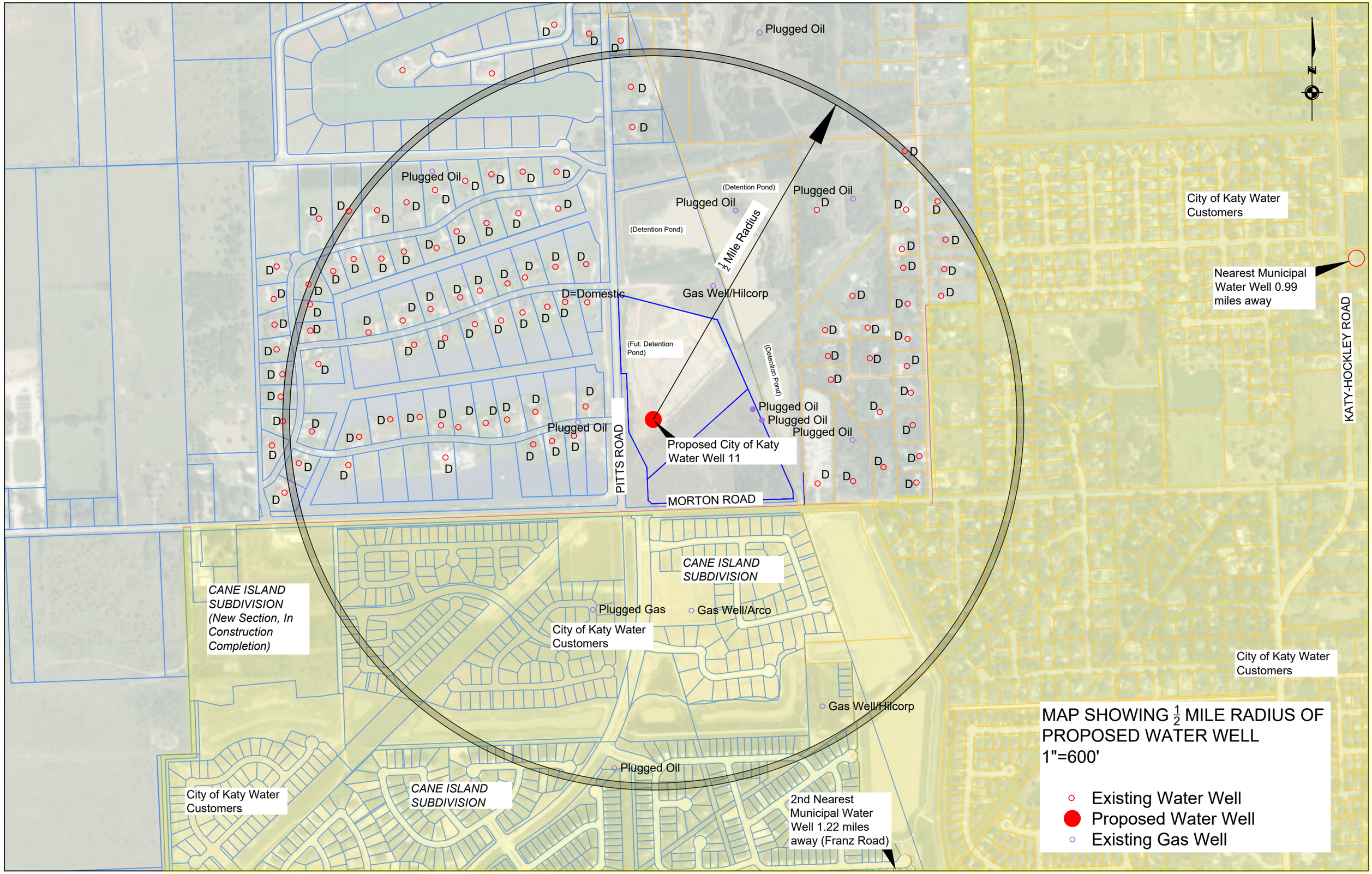
The attached map provides the requested information.

Please call if additional information is needed., 713-254-0091 cell

Sincerely,
ARKK ENGINEERS, LLC
City Engineer for the City of Katy

David W. Kasper, P.E.
Principal/Senior Project Manager

7322 Southwest Fwy Suite 1040 • Houston, TX 77074 • (713) 400-ARKK • www.arkkengineers.com • TX PE Firm No. 13872


Plugged Oil
Plugged Oil
(Detention Pond)
Plugged Oil
(Detention Pond)
½ Mile Radius
D=Domestic
Gas Well/Hilcorp
(Fut. Detention Pond)
(Detention Pond)
Plugged Oil
Plugged Oil
Plugged Oil
Proposed City of Katy Water Well 11
PITTS ROAD
MORTON ROAD
City of Katy Water Customers
Nearest Municipal Water Well 0.99 miles away
KATY-HOCKLEY ROAD
CANE ISLAND SUBDIVISION
CANE ISLAND SUBDIVISION (New Section, In Construction Completion)
Plugged Gas
Gas Well/Arco
City of Katy Water Customers
City of Katy Water Customers
Gas Well/Hilcorp
Plugged Oil
CANE ISLAND SUBDIVISION
City of Katy Water Customers
2nd Nearest Municipal Water Well 1.22 miles away (Franz Road)
MAP SHOWING ½ MILE RADIUS OF PROPOSED WATER WELL
1"=600'
Existing Water Well
Proposed Water Well
Existing Gas Well

September 8, 2023

Mr. Zach Holland
General Manager
Bluebonnet Groundwater Conservation District
1903 Dove Crossing Lane Suite A
Navasota, Texas 77868

Re: New Water Well Application
Item 8.5A1(h) – Weel Closure Plan / Declaration

Dear Mr. Holland:

The purpose of this letter is to respond to application item 8.5A1(h) which requires:

> *"the applicant's well closure plan or a declaration the applicant will comply with well plugging guidelines and report closure to the applicable authorities, including the District."*

We can confirm to you that the City of Katy will comply with well plugging guidelines and will report closure to the applicable authorities, including the District.

Please call if additional information is needed., 713-254-0091 cell

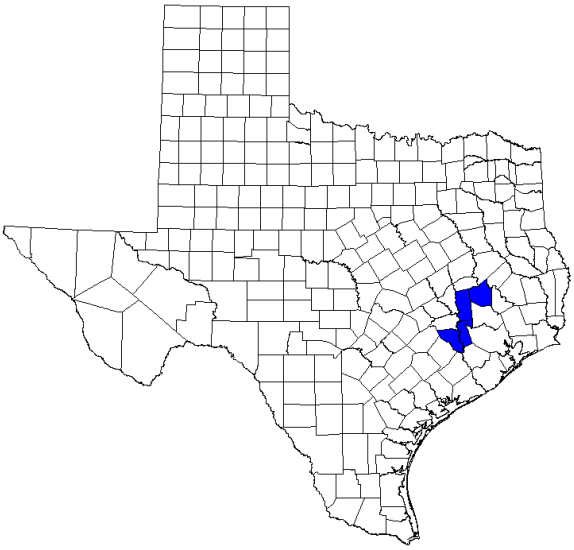
Sincerely,
ARKK ENGINEERS, LLC
City Engineer for the City of Katy

David W. Kasper, P.E.
Principal/Senior Project Manager

7322 Southwest Fwy Suite 1040 • Houston, TX 77074 • (713) 400-ARKK • www.arkkengineers.com • TX PE Firm No. 13872

Final Report

Phase 1-b Report:
City of Katy Proposed Well Application (BWLL-0011E, Well 11)
Submitted on September 8, 2023 by ARKK Engineers



Prepared for:

Zach Holland
General Manager
Bluebonnet Groundwater Conservation District
P.O. Box 269
Navasota, TX 77868-0269

Prepared by:

William R. Hutchison, Ph.D., P.E., P.G.
Independent Groundwater Consultant
909 Davy St.
Brenham, TX 77833
512-745-0599
billhutch@texasgw.com

November 13, 2023

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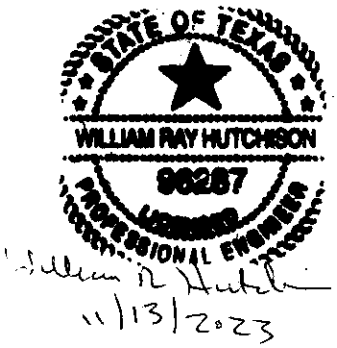
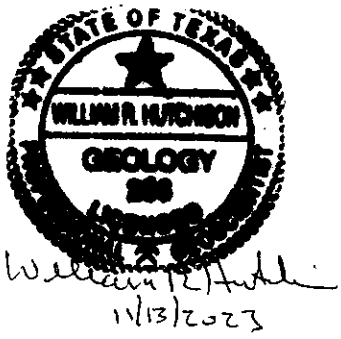
Appendices

Professional Engineer and Professional Geoscientist Seals

This report was prepared by William R. Hutchison, Ph.D., P.E., P.G., who is licensed in the State of Texas as follows:

- Professional Engineer (Geological and Civil) No. 96287
- Engineering Firm Registration No. 14526
- Professional Geoscientist (Geology) No. 286





1.0 Introduction

The City of Katy has submitted a Non-Exempt Water Well Registration to the Bluebonnet Groundwater Conservation District (BGCD) for a new public water supply well. The proposed well locations and estimated total water production are summarized below:

- Well Location: northeast corner of the intersection of Pitts Road and Morton Rd.
- Latitude: 29° 49' 6.267" N (28.81841)
- Longitude: 95° 50' 21.3834" W (-95.8393)
- Estimated Annual Water Production: 262.8 million gallons.

The rules of BGCD require the applicant to submit Phase I and Phase II hydrogeologic reports for non-exempt wells with an inside diameter casing of eight inches or greater as part of the permit application process. These reports include hydrogeologic information addressing, and specifically related to, the impacts of the proposed well (e.g. area of influence, drawdown, recovery time, and potential for subsidence).

Because the requested permit amount is greater than 200 million gallons per year, a Phase I-b report is required. In general, the Phase I-b report is intended to be a preliminary report that relies on existing regional information and data, and the Phase II report is intended to be a final report that relies on site specific data, information, test results and analyses.

As required in the Guidelines for Submitting Data and Information and the Preparation of Hydrogeologic Reports in Support of Applications for the Permitted Use of Groundwater (dated April 14, 2023), this report contains the Phase I-a tables and the results of a simulation using the Groundwater Availability Model of the area that adds the proposed wells to the most recent run that was used to establish the desired future condition.

All files associated with this report are available for download at the following location:

https://www.dropbox.com/scl/fo/je0qzrri0evbmetcezpc7/h?rlkey=5rx2rrn6u91er7w3xnghnkgpu&dl=0

2.0 Phase I-a Tables

2.1 Well Locations on HAGM Grid

The latitude and longitude data provided in the application were used to convert the location data to x- and y-coordinates in the GAM coordinate system using Surfer, a commercial gridding program. In addition, registered wells within one mile of the proposed well were identified and their latitude and longitude coordinates were also converted to x- and y-coordinates. All well locations are presented in Figure 1.

The Fortran program *PointRC.exe* was used to find the HAGM cell for the x- and y-coordinates of the proposed production well. The Fortran program *PointRCReg.exe* was used to find the HAGM cells for the x- and y-coordinates of the registered wells. The results are summarized in Table 1.

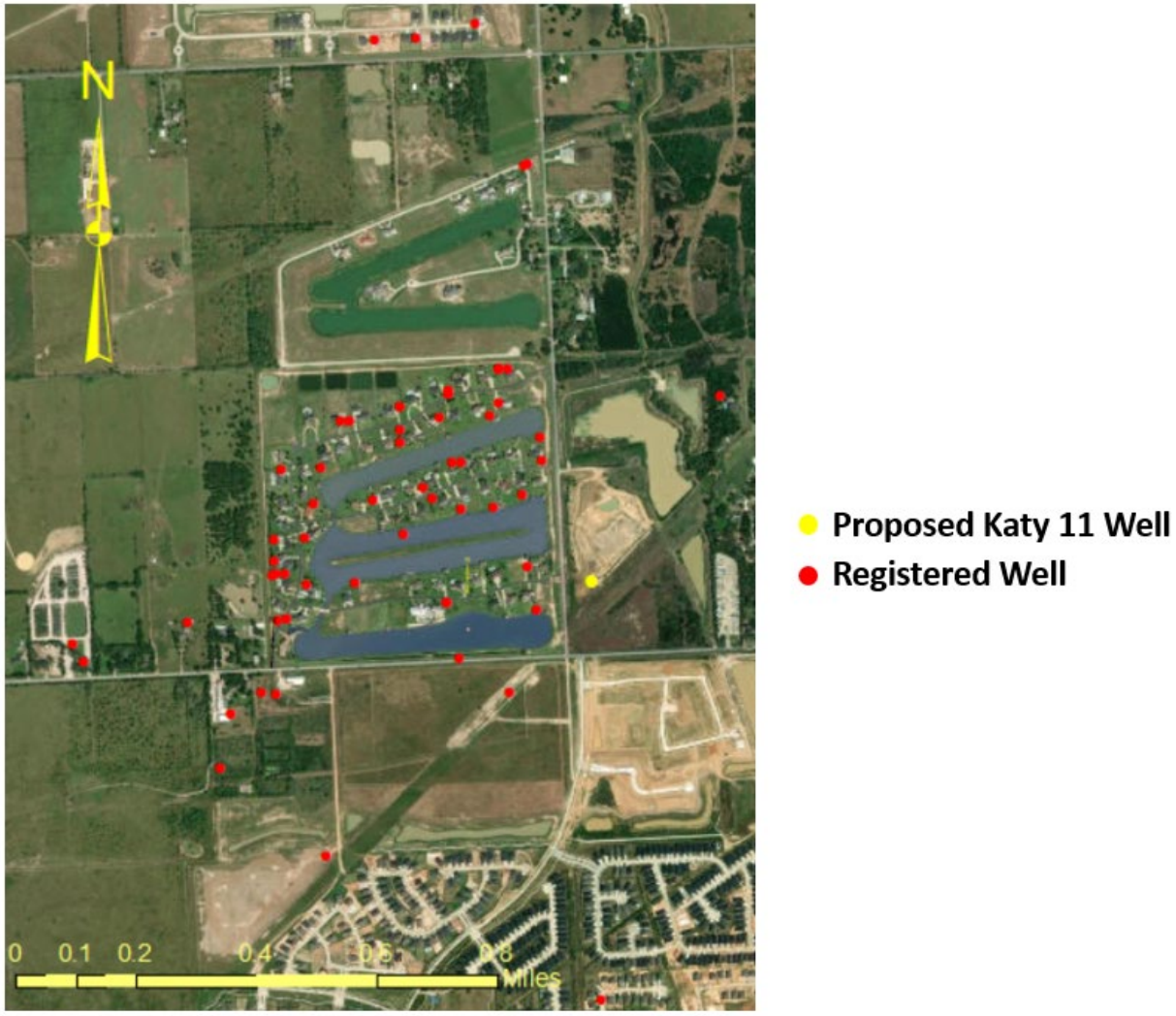


Figure 1. Well Locations

Table 1. Well Location Coordinates

Well ID	Distance to Katy 11 Well (miles)	Estimated Depth (ft)	Latitude	Longitude	GAMx	GAMy	HAGM Row	HAGM Column
Proposed Well (Katy 11)	0.00	1000	29.8184075	-95.83927317	6238066.273	19188008.58	54	80
BWLL-0072A	0.70		29.828531	-95.840619	6237501.958	19191678.28	53	80
BWLL-0072B	0.70		29.828492	-95.840744	6237462.954	19191662.6	53	80
BWLL-0074	0.64	270	29.815556	-95.849444	6234887.798	19186849.55	54	79
BWLL-0087	0.86	258	29.816937	-95.853479	6233592.485	19187304.48	53	79
BWLL-4208	0.39	264	29.82055763	-95.84527742	6236137.499	19188720	54	80
BWLL-4218	0.31	263	29.82139151	-95.84305536	6236828.998	19189050	54	80
BWLL-4222	0.32	260	29.82083093	-95.84388888	6236573	19188836	54	80
BWLL-4242	0.29	228	29.82138792	-95.84277732	6236917	19189052	54	80
BWLL-4250	0.24	260	29.81805514	-95.84333399	6236786.5	19187832	54	80
BWLL-4313	0.68	264	29.8177798	-95.85055489	6234506.001	19187646	54	79
BWLL-4329	0.37	265	29.82249925	-95.84333306	6236726	19189450	53	80
BWLL-4330	0.39	260	29.82360942	-95.84166644	6237238.001	19189874	53	80
BWLL-4338	0.43	315	29.82277725	-95.84444489	6236370.499	19189538	53	80
BWLL-4383	0.38	455	29.82361132	-95.84138816	6237326.001	19189878	53	80
BWLL-4389	0.26	260	29.81666722	-95.84305577	6236893.5	19187330	54	80
BWLL-4393	0.48	260	29.81861049	-95.84722193	6235549	19187988	54	80
BWLL-4394	0.48	460	29.82249846	-95.84583369	6235934.999	19189420	53	80
BWLL-4395	0.32	460	29.82249788	-95.84194531	6237164.999	19189466	54	80
BWLL-4406	0.55	260	29.82138632	-95.84777851	6235335.001	19188992	53	80
BWLL-4408	0.22	260	29.82138676	-95.840555	6237619.998	19189078	54	80
BWLL-4409	0.53	260	29.81971989	-95.84805598	6235269.999	19188382	53	80
BWLL-4462	0.10	265	29.8177757	-95.84083296	6237581.5	19187760	54	80
BWLL-4463	0.49	265	29.82138853	-95.84666723	6235686.501	19189006	53	80
BWLL-4506	0.24	250	29.81805514	-95.84333399	6236786.5	19187832	54	80
BWLL-4523	0.21	460	29.82027855	-95.8419449	6237195.499	19188658	54	80
BWLL-4533	0.48	460	29.82249846	-95.84583369	6235934.999	19189420	53	80
BWLL-4534	0.43	460	29.82277725	-95.84444489	6236370.499	19189538	53	80
BWLL-4547	0.32	470	29.81972291	-95.84444416	6236412.501	19188426	54	80
BWLL-4596	0.51	460	29.81888868	-95.84777743	6235369.499	19188082	54	80
BWLL-4680	0.39	460	29.82305602	-95.84305608	6236805.999	19189656	53	80
BWLL-4681	0.39	460	29.82305602	-95.84305608	6236805.999	19189656	53	80
BWLL-4705	0.48	460	29.8205571	-95.84694499	6235610.001	19188700	53	80
BWLL-4706	0.53	460	29.81916507	-95.84805623	6235277.501	19188180	54	80
BWLL-4792	0.26	465	29.82194712	-95.84055604	6237611.999	19189282	54	80
BWLL-4794	0.23	250	29.81583079	-95.84166629	6237344.5	19187042	54	80
BWLL-4795	0.53	460	29.81777524	-95.84805621	6235296.499	19187674	54	80
BWLL-4796	0.18	339	29.82055345	-95.84111108	6237455.5	19188768	54	80
BWLL-4860	0.33	240	29.82277991	-95.84166697	6237249.502	19189572	54	80
BWLL-4872	0.39	445	29.82360942	-95.84166644	6237238.001	19189874	53	80
BWLL-4955	0.53	460	29.81889037	-95.84805546	6235281.499	19188080	54	80
BWLL-4986	0.37	240	29.822778	-95.835556	6239182.255	19189644.01	54	80
BWLL-5205	0.97	255	29.83166906	-95.84472277	6236161.002	19192772	53	80
BWLL-5207	0.39	342	29.82360942	-95.84166644	6237238.001	19189874	53	80
BWLL-5212	0.50	460	29.82250204	-95.84611173	6235846.999	19189418	53	80
BWLL-5371	0.30	264	29.82055819	-95.84361142	6236664.5	19188740	54	80
BWLL-5567	0.95	260	29.831944	-95.841945	6237035.833	19192905.11	53	80
BWLL-5568	0.95	260	29.831667	-95.843611	6236512.677	19192784.46	53	80
BWLL-5571	0.49	270	29.819722	-95.847222	6235533.787	19188392.67	54	80
BWLL-5626	0.39	450	29.821944	-95.844445	6236381.86	19189234.63	53	80
BWLL-5655	0.64		29.812023	-95.846942	6235727.589	19185592.99	54	79
BWLL-5656	0.69		29.814267	-95.849789	6234796.263	19186376.17	54	79
BWLL-5657	0.58		29.816036	-95.848583	6235153.616	19187034.53	54	79
BWLL-5658	0.56		29.815989	-95.848167	6235285.858	19187022.36	54	79
BWLL-5811	0.39	265	29.823611	-95.841667	6237237.802	19189874.57	53	80
BWLL-5864	0.39	265	29.818611	-95.845834	6235988.048	19188004.67	54	80
BWLL-5876	0.70		29.808333	-95.839444	6238150.177	19184338.69	54	80
BWLL-5993	0.51	200	29.817778	-95.847778	6235384.47	19187678.31	54	80
BWLL-6134	0.87	350	29.817393	-95.853736	6233504.962	19187467.45	53	79
BWLL-6147	0.41	265	29.822222	-95.84444	6236379.639	19189335.91	53	80
BWLL-6232B	0.40	465	29.823133	-95.843083	6236796.431	19189683.71	53	80
BWLL-6369	0.53	465	29.81885	-95.84815	6235252.144	19188064.18	54	80
BWLL-6454	0.25	275	29.82026	-95.84286	6236906.277	19188640.37	54	80
BWLL-6455	0.11	280	29.818816	-95.84105	6237498.602	19188136.16	54	80

2.2 HAGM Grid Parameters

The Excel spreadsheet named *BGCD Parameters.xlsx* contains all the data needed for the review and Phase 1-a calculations. The data for the proposed well were extracted and saved in the Excel file named *Katy 11Phase I-a Tables.xlsx*. The tab named *gridparam* contains the HAGM grid data and is presented as Table 2. Please note that all model layers for the proposed well location (HAGM Row 54, Column 80) are included.

Table 2. HAGM Grid Parameters for Proposed Katy 11 Well

County Name	Waller	Waller	Waller	Waller
County Code	237	237	237	237
Outcrop Layer	1	1	1	1
Layer	1	2	3	4
Row	54	54	54	54
Column	80	80	80	80
x-coordinate (GAM-ft)	6238499	6238499	6238499	6238499
y-coordinate (GAM-ft)	19187420	19187420	19187420	19187420
Surface Elevation (ft MSL)	149	149	149	149
Cell Top Elevation (ft MSL)	149	-273	-1486	-1787
Cell Bottom Elevation (ft MSL)	-273	-1486	-1787	-2584
Cell Thickness (ft)	422	1213	301	797
Clay Thickness (ft)	210	623	176	548
Clay Thickness (% of Cell Thickness)	49.76	51.36	58.45	68.76

2.3 HAGM Aquifer Parameters

The Excel spreadsheet named *BGCD Parameters.xlsx* contains all the data needed for the review and Phase 1-a calculations. The data for the proposed well were extracted and saved in the Excel file named *Katy 11 Phase I-a Tables.xlsx*. The tab named *HAGMparam* contains the HAGM aquifer parameter data and is presented as Table 3. Please note that all model layers for the proposed well location (HAGM Row 54, Column 80) are included.

Table 3. HAGM Aquifer Parameters for Proposed Katy 11 Well

County Name	Waller	Waller	Waller	Waller
County Code	237	237	237	237
Outcrop Layer	1	1	1	1
Layer	1	2	3	4
Row	54	54	54	54
Column	80	80	80	80
Hydraulic Conductivity (ft/day)	19.68	0.90	0.01	1.88
Transmissivity (gpd/ft)	62,124	8,166	21	11,189
Leakage (1/day)	8.00E-06	5.40E-06	2.06E-08	0.00E+00
Storativity (dimensionless)	1.00E-01	3.60E-04	3.00E-04	2.20E-04
Elastic Storativity (dimensionless)	2.00E-05	1.50E-04	1.80E-07	5.23E-06
Inelastic Storativity (dimensionless)	2.00E-03	1.50E-02	1.80E-05	5.23E-04

2.4 HAGM Results

The Excel spreadsheet named *BGCD Parameters.xlsx* contains all the data needed for the review and Phase 1-a calculations. The data for the proposed well were extracted and saved in the Excel file named *Katy 11 Phase I-a Tables.xlsx*. The tab named *HAGMresults* contains the HAGM results and is presented as Table 4. Please note that all model layers for the proposed well location (HAGM Row 54, Column 80) are included.

Table 4. HAGM Results for Proposed Katy 11 Well

County Name	Waller	Waller	Waller	Waller
County Code	237	237	237	237
Outcrop Layer	1	1	1	1
Layer	1	2	3	4
Row	54	54	54	54
Column	80	80	80	80
Groundwater Elevation in 2009 (ft MSL)	0	-37	-36	69
Groundwater Elevation in 2080 (ft MSL)	-63	-144	-144	-151
DFC Drawdown (ft)	63	107	108	219
Artesian Head (ft)	-149	236	1450	1856
Subsidence in 2009 (ft)	2.01	2.01	2.01	2.01
Subsidence in 2080 (ft)	3.6	3.6	3.6	3.6
Subsidence from 2009 to 2080 (ft)	1.59	1.59	1.59	1.59
Cell Pumping in 2009 (AF/yr)	0	0	0	0
Cell Pumping in 2080 (AF/yr)	0	0	0	0

2.5 Theis Parameters

The Excel spreadsheet named *BGCD Parameters.xlsx* contains all the data needed for the review and Phase 1-a calculations. The data for the proposed well were extracted and saved in the Excel file named *Katy 11 Phase I-a Tables.xlsx*. The tab named *theisparam* contains the Theis parameters and is presented as Table 5. The Theis parameters are associated with the estimation of drawdown using the Theis equation as described below. Please note that only data from the Evangeline (Layer 2) and Jasper (Layer 4) for the proposed well location (HAGM Row 54, Column 80) are included.

Table 5. Theis Parameters for Proposed Katy 11 Well

County Name	Waller	Waller
County Code	237	237
Outcrop Layer	1	1
Layer	2	4
Row	54	54
Column	80	80
Drawdown in Production Well at 100 gpm for 36 hours	24.60	18.78
Drawdown 1/2 mile from Production Well at 100 gpm for 36 hours	1.07	1.39
Drawdown 1/2 miles from Production Well at 100 gpm for 1 year	8.25	6.85
Drawdown-Pumping Ratio for Production Well for 36 hours	0.24596	0.18779
Drawdown-Pumping Ratio for 1/2 mile from Production Well for 36 hours	0.01066	0.01391
Drawdown-Pumping Ratio for 1/2 mile from Production Well for 1 yr	0.08250	0.06849

2.6 Theis Results

Groundwater production data from the permit application were used along with the drawdown-pumping ratios contained in Table 5 to develop three estimates of drawdown:

- Scenario 1: drawdown in the production well after 36 hours of pumping at three times the average annual pumping rate.
- Scenario 2: drawdown in a well ½ mile from the production well after 36 hours of pumping at three times the average annual pumping rate.
- Scenario 3: drawdown in a well ½ mile from the production well after one year of pumping at the average annual pumping rate.

Results of these calculations for the Evangeline Aquifer (Layer 2) are presented in Table 6.

Table 6. Theis Results for Proposed Katy 11 Well

Production Summary	Value
Annual Permit Production Limit (gallons)	262,800,000
Annual Permit Production Limit (acre-feet)	806
Average Pumping Rate (gpm)	500
Average Pumping Rate (cfd)	96257
3X Average Pumping Rate (gpm)	1500

	Evangeline	
Drawdown Calculations	Drawdown-Pumping Ratios	Calculated Drawdown (ft)
Production Well - 36 hours (3X avg pumping)	0.24596	368.94
1/2 mile from Production Well - 36 hours (3X avg pumping)	0.01066	15.99
1/2 mile from Production Well - one year (avg pumping)	0.08250	41.25

3.0 Phase I-b Results

Phase I-b requirements include the results of a simulation using the HAGM for the area that adds the proposed well to the most current model simulation that was used to establish the desired future condition. The documentation of BGCD implementation of the most recent desired future condition simulation is contained in Hutchison (2021).

As required in the Phase I-b guidelines, this section of the report contains the results of the simulation:

- Drawdown hydrographs
- Subsidence hydrographs
- Summary tables of drawdown and subsidence
- A county-aquifer level groundwater budget that includes a comparison of the HAGM simulation with the proposed well and the groundwater water budget of the desired future condition simulation.

3.1 Drawdown Hydrographs

The data from individual wells in Table 1 show many wells with depths in the range of 250 to 400 feet. Data from the HAGM suggests that the Chicot Aquifer in this area is about 420 feet thick (Table 2). Based on these regional data the many of the nearby registered wells are completed in the Chicot Aquifer. Some of the registered wells are completed in the upper portion of the Evangeline Aquifer. The simple conceptualization of the HAGM layering is likely insufficient to definitively categorize the aquifer completion, and additional site-specific data (including monitoring during the aquifer test as part of Phase II) will be needed.

Drawdown hydrographs at the location of the proposed well (Row 54, Column 80) for the Chicot (the overlying formation) and the Evangeline (the production formation) are shown in Figures 2 and 3, respectively. These hydrographs present the predicted drawdown for the DFC run of the HAGM and for the run where the proposed well is added to the DFC run. Figure 4 presents the difference between the two scenarios, or the drawdown that is attributable to the proposed well in both the Chicot and the Evangeline.

Drawdown hydrographs for all the locations of wells previously presented in Table 1 are presented in Appendix A.

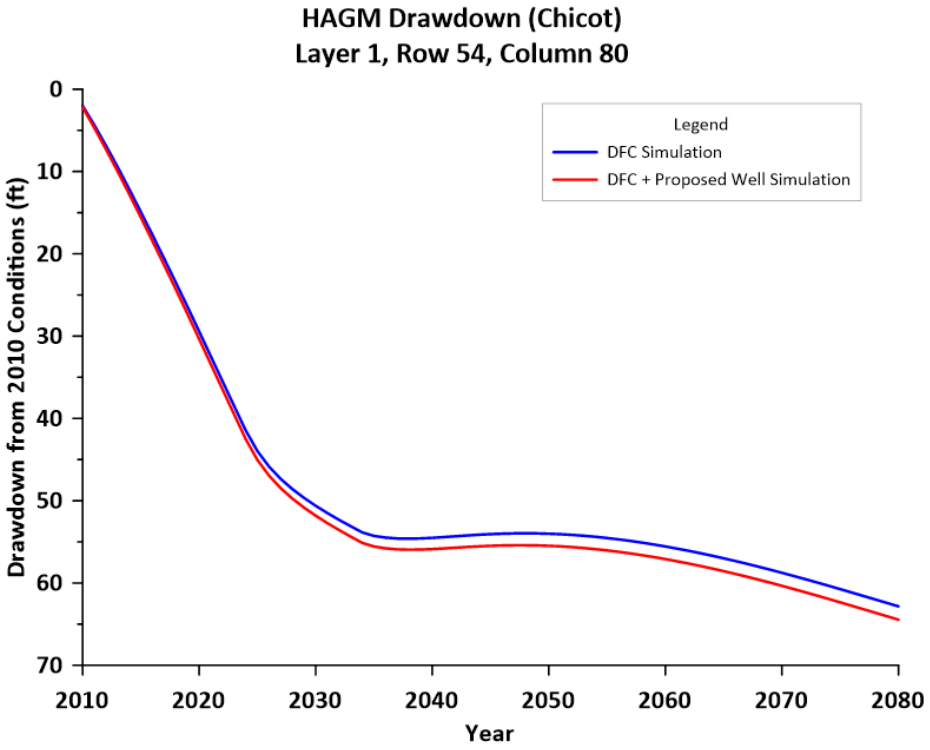


Figure 2. Drawdown Hydrograph for Row 54, Column 80 (Chicot)

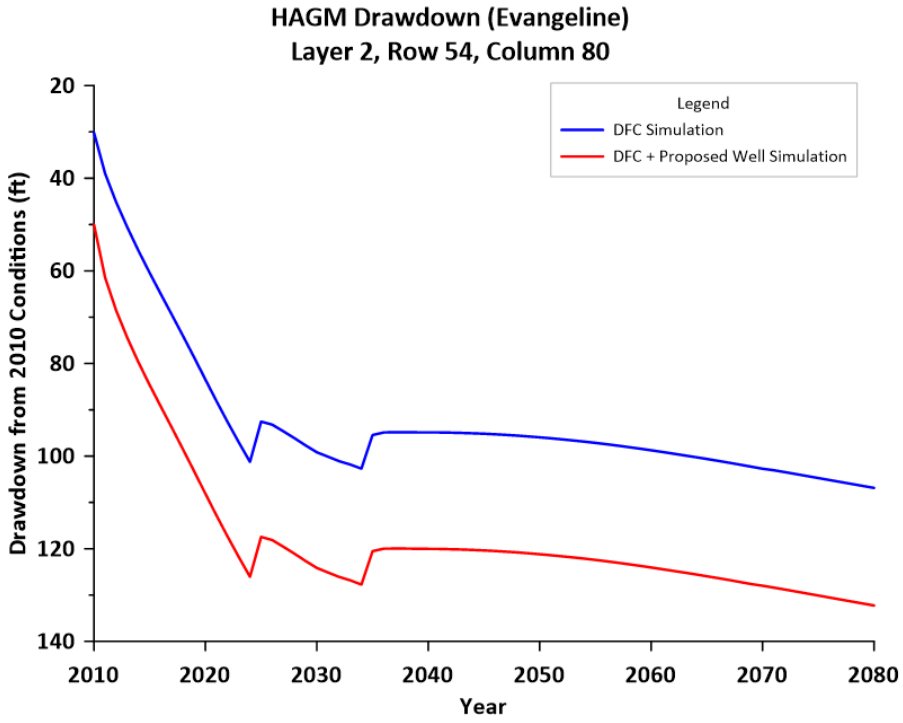


Figure 3. Drawdown Hydrograph for Row 54, Column 80 (Evangeline)

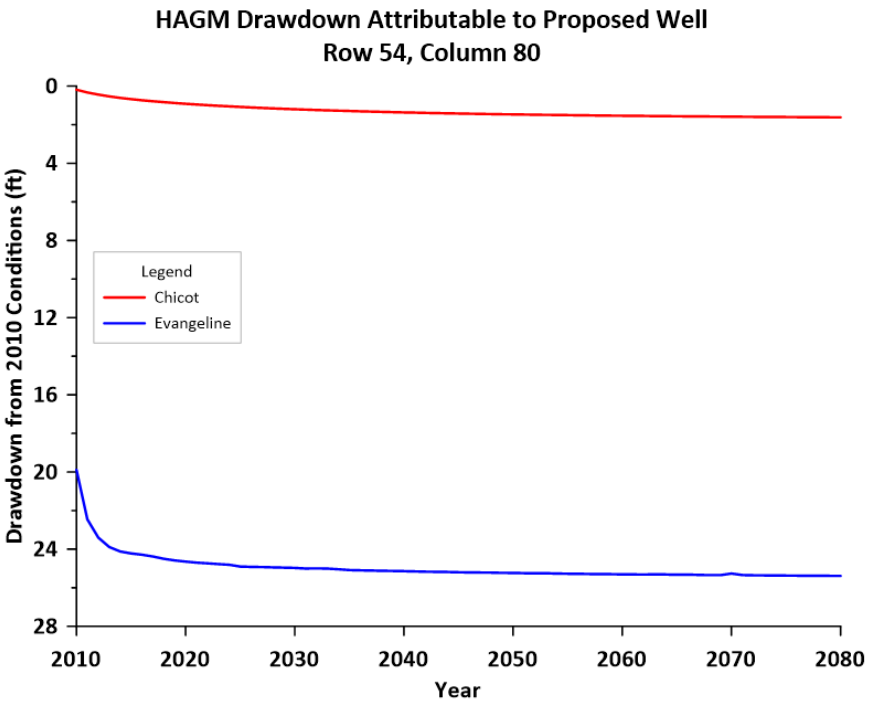


Figure 4. Drawdown Attributable to Proposed Pumping for Row 54, Column 80

3.2 Subsidence Hydrographs

The subsidence hydrograph at the location of the proposed well (Row 54, Column 80) is presented in Figure 5. This hydrograph presents the predicted subsidence for the DFC run of the HAGM and for the run where the proposed well is added to the DFC run. Figure 6 presents the difference between the two scenarios, or the subsidence that is attributable to the proposed well.

Subsidence hydrographs for all the locations of wells previously presented in Table 1 are presented in Appendix B.

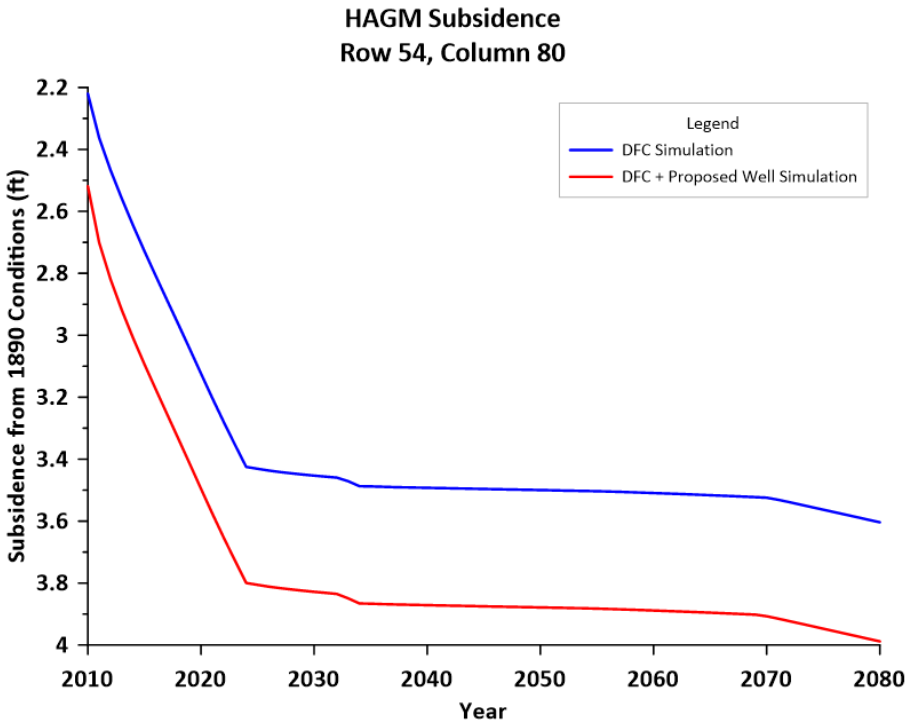


Figure 5. Subsidence Hydrograph for Row 54, Column 80

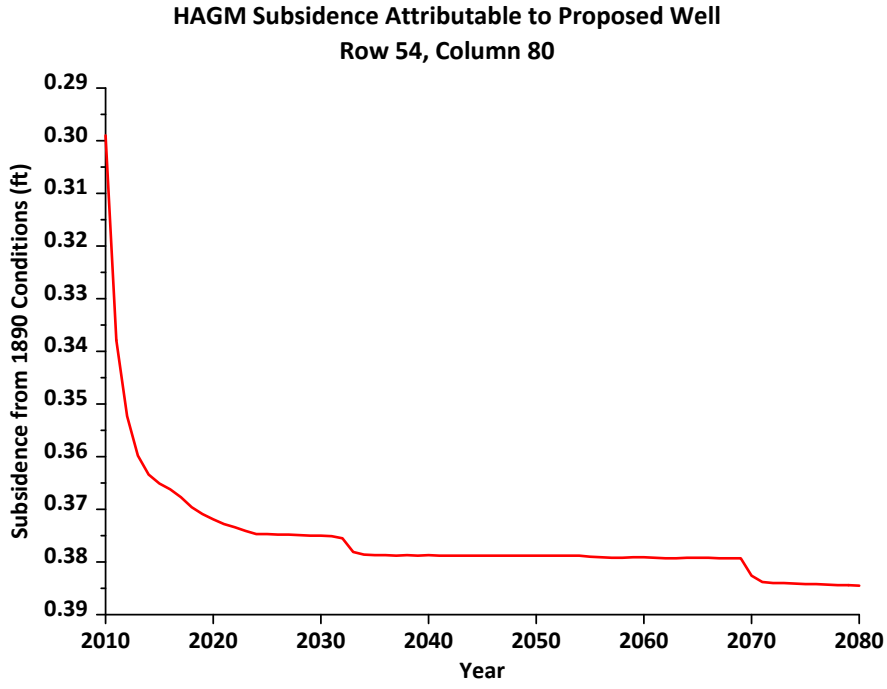


Figure 6. Subsidence Attributable to Proposed Well for Row 54, Column 80

3.3 Tabular Summary of Drawdown and Subsidence

The summary of drawdown and subsidence attributable to the proposed pumping for all well locations is presented in Table 7.

Table 7. Tabular Summary of Drawdown and Subsidence

Well ID	Distance to Katy 11 Well (mile)	Estimated Depth (ft)	HAGM Row	HAGM Column	Drawdown Attributable to Proposed Well (2010 to 2080 - ft)		Subsidence Attributable to Proposed Well (1890 to 2080 - ft)
					Chicot Aquifer	Evangeline Aquifer	
Proposed Well (Katy 11)	0.00	1000	54	80	1.6	25.4	0.4
BWLL-0072A	0.70		53	80	1.6	8.7	0.11
BWLL-0072B	0.70		53	80	1.6	8.7	0.11
BWLL-0074	0.64	270	54	79	1.5	10.5	0.09
BWLL-0087	0.86	258	53	79	1.5	6.6	0.04
BWLL-4208	0.39	264	54	80	1.6	25.4	0.4
BWLL-4218	0.31	263	54	80	1.6	25.4	0.4
BWLL-4222	0.32	260	54	80	1.6	25.4	0.4
BWLL-4242	0.29	228	54	80	1.6	25.4	0.4
BWLL-4250	0.24	260	54	80	1.6	25.4	0.4
BWLL-4313	0.68	264	54	79	1.5	10.5	0.09
BWLL-4329	0.37	265	53	80	1.6	8.7	0.11
BWLL-4330	0.39	260	53	80	1.6	8.7	0.11
BWLL-4338	0.43	315	53	80	1.6	8.7	0.11
BWLL-4383	0.38	455	53	80	1.6	8.7	0.11
BWLL-4389	0.26	260	54	80	1.6	25.4	0.4
BWLL-4393	0.48	260	54	80	1.6	25.4	0.4
BWLL-4394	0.48	460	53	80	1.6	8.7	0.11
BWLL-4395	0.32	460	54	80	1.6	25.4	0.4
BWLL-4406	0.55	260	53	80	1.6	8.7	0.11
BWLL-4408	0.22	260	54	80	1.6	25.4	0.4
BWLL-4409	0.53	260	53	80	1.6	8.7	0.11
BWLL-4462	0.10	265	54	80	1.6	25.4	0.4
BWLL-4463	0.49	265	53	80	1.6	8.7	0.11
BWLL-4506	0.24	250	54	80	1.6	25.4	0.4
BWLL-4523	0.21	460	54	80	1.6	25.4	0.4
BWLL-4533	0.48	460	53	80	1.6	8.7	0.11
BWLL-4534	0.43	460	53	80	1.6	8.7	0.11
BWLL-4547	0.32	470	54	80	1.6	25.4	0.4
BWLL-4596	0.51	460	54	80	1.6	25.4	0.4
BWLL-4680	0.39	460	53	80	1.6	8.7	0.11
BWLL-4681	0.39	460	53	80	1.6	8.7	0.11
BWLL-4705	0.48	460	53	80	1.6	8.7	0.11
BWLL-4706	0.53	460	54	80	1.6	25.4	0.4
BWLL-4792	0.26	465	54	80	1.6	25.4	0.4
BWLL-4794	0.23	250	54	80	1.6	25.4	0.4
BWLL-4795	0.53	460	54	80	1.6	25.4	0.4
BWLL-4796	0.18	339	54	80	1.6	25.4	0.4
BWLL-4860	0.33	240	54	80	1.6	25.4	0.4
BWLL-4872	0.39	445	53	80	1.6	8.7	0.11
BWLL-4955	0.53	460	54	80	1.6	25.4	0.4
BWLL-4986	0.37	240	54	80	1.6	25.4	0.4
BWLL-5205	0.97	255	53	80	1.6	8.7	0.11
BWLL-5207	0.39	342	53	80	1.6	8.7	0.11
BWLL-5212	0.50	460	53	80	1.6	8.7	0.11
BWLL-5371	0.30	264	54	80	1.6	25.4	0.4
BWLL-5567	0.95	260	53	80	1.6	8.7	0.11
BWLL-5568	0.95	260	53	80	1.6	8.7	0.11
BWLL-5571	0.49	270	54	80	1.6	25.4	0.4
BWLL-5626	0.39	450	53	80	1.6	8.7	0.11
BWLL-5655	0.64		54	79	1.5	10.5	0.09
BWLL-5656	0.69		54	79	1.5	10.5	0.09
BWLL-5657	0.58		54	79	1.5	10.5	0.09
BWLL-5658	0.56		54	79	1.5	10.5	0.09
BWLL-5811	0.39	265	53	80	1.6	8.7	0.11
BWLL-5864	0.39	265	54	80	1.6	25.4	0.4
BWLL-5876	0.70		54	80	1.6	25.4	0.4
BWLL-5993	0.51	200	54	80	1.6	25.4	0.4
BWLL-6134	0.87	350	53	79	1.5	6.6	0.04
BWLL-6147	0.41	265	53	80	1.6	8.7	0.11
BWLL-6232B	0.40	465	53	80	1.6	8.7	0.11
BWLL-6369	0.53	465	54	80	1.6	25.4	0.4
BWLL-6454	0.25	275	54	80	1.6	25.4	0.4
BWLL-6455	0.11	280	54	80	1.6	25.4	0.4

3.4 Groundwater Budget Comparison

The summary groundwater budget comparison of the DFC simulation and the simulation where the proposed well is added to the DFC simulation is presented in Table 8. Please note that about 19 percent of the production from the proposed well will come from groundwater storage (including interbed storage), and about 69 percent of proposed pumping will come from captured outflow that would have flowed to Fort Bend and Harris counties. The remaining 12 percent of the production of the proposed well is induced recharge and induced inflow from Austin County.

Table 8. Groundwater Budget Summary

	DFC Run (2010 to 2080)	Katy 11 Run (2010 to 2080)	Difference (AF/yr)	Diffference (% of Pumping Increase)
Inflow				
Recharge and Net Surface Water Inflow (GHB Boundary)	41,382	41,460	78	9.6
Interbed Storage	2,956	2,986	30	3.7
From Austin County	6,232	6,250	17	2.1
From Grimes County	1,816	1,816	0	0.0
From Washington County	1,243	1,243	0	0.0
Total Inflow	53,629	53,754		
Outflow				
Pumping	55,495	56,302	807	100.0
To Fort Bend County	10,422	10,287	-135	16.7
To Harris County	4,157	3,732	-425	52.7
To Montgomery County	5,922	5,922	0	0.0
Total Outflow	75,996	76,243		
Inflow - Outflow	-22,367	-22,489		
Model Calculated Storage Change	-22,366	-22,488	-122	15.1
Model Error	-1	-1		

4.0 Conclusions and Recommendations

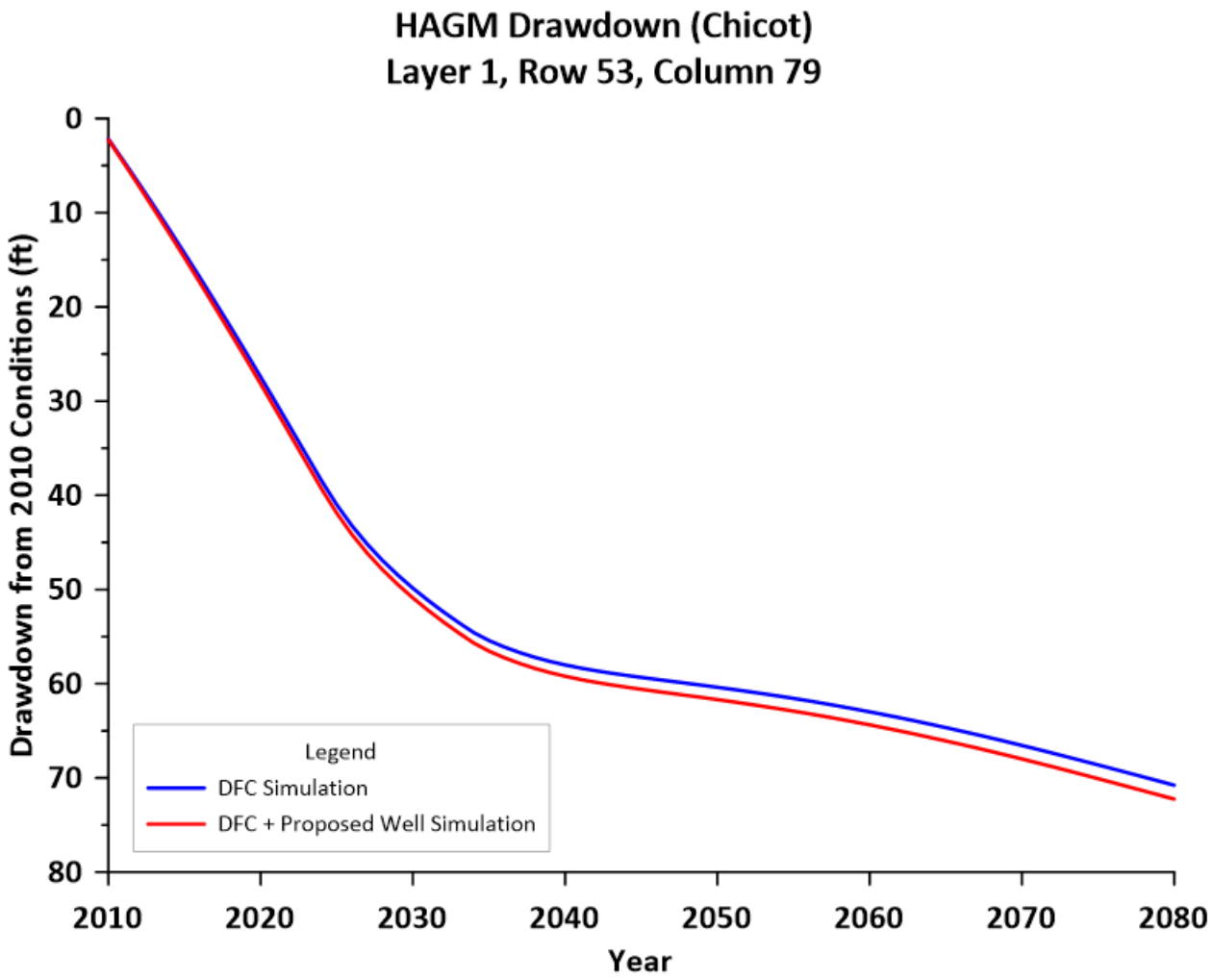
The permit application for this well should be approved to proceed to the Phase II activities. Due to the potential to affect many registered wells and the uncertainty associated with aquifer completions, it is recommended that monitoring wells be used (or constructed if no existing wells can be used) during the aquifer test. Specifically, at least one Evangeline well within ½ mile and at least one Chicot well within ½ mile are recommended. Based on the test results and an update of the analyses in this Phase I-b report, a reduction in the permitted amount of production may be recommended.

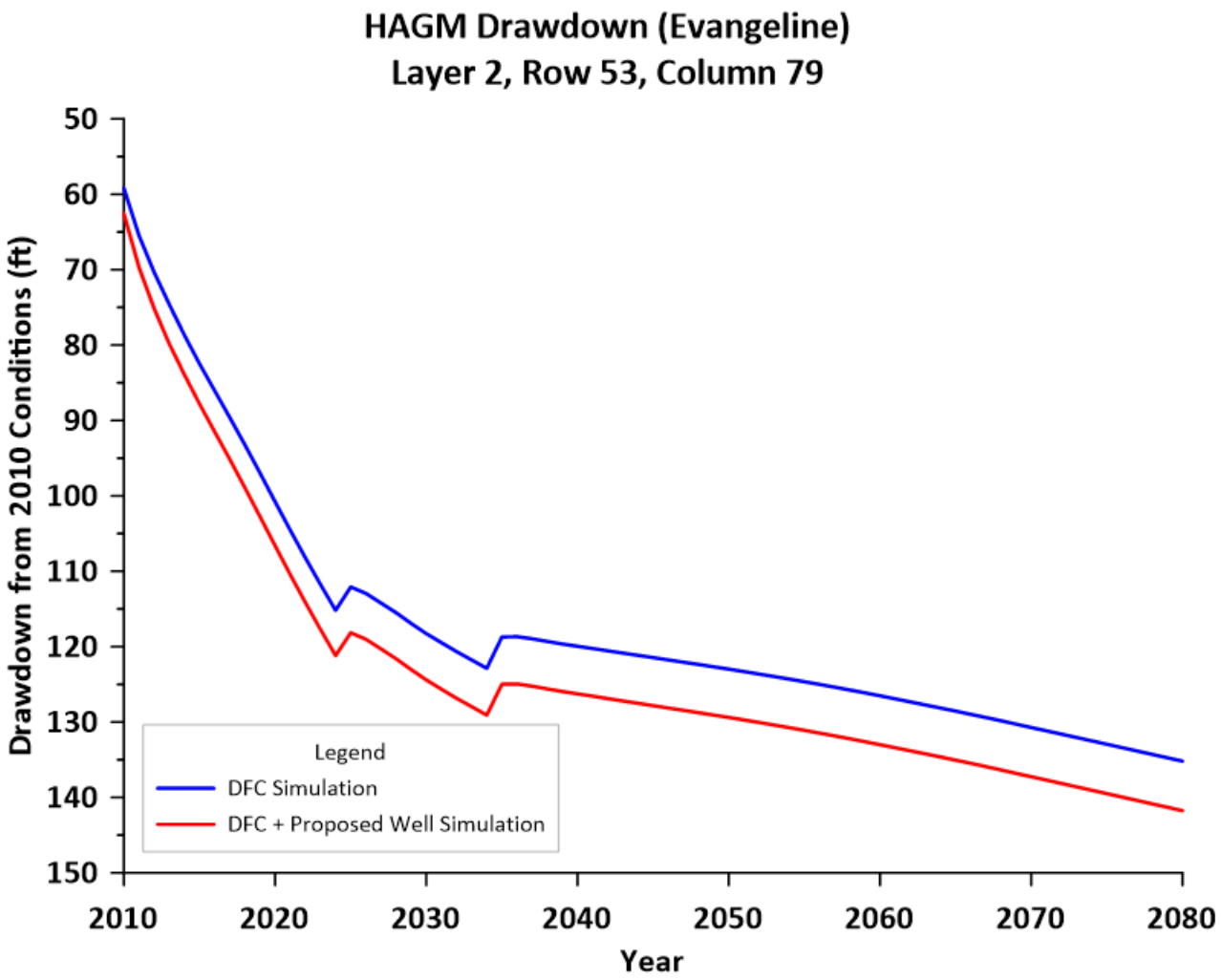
5.0 References

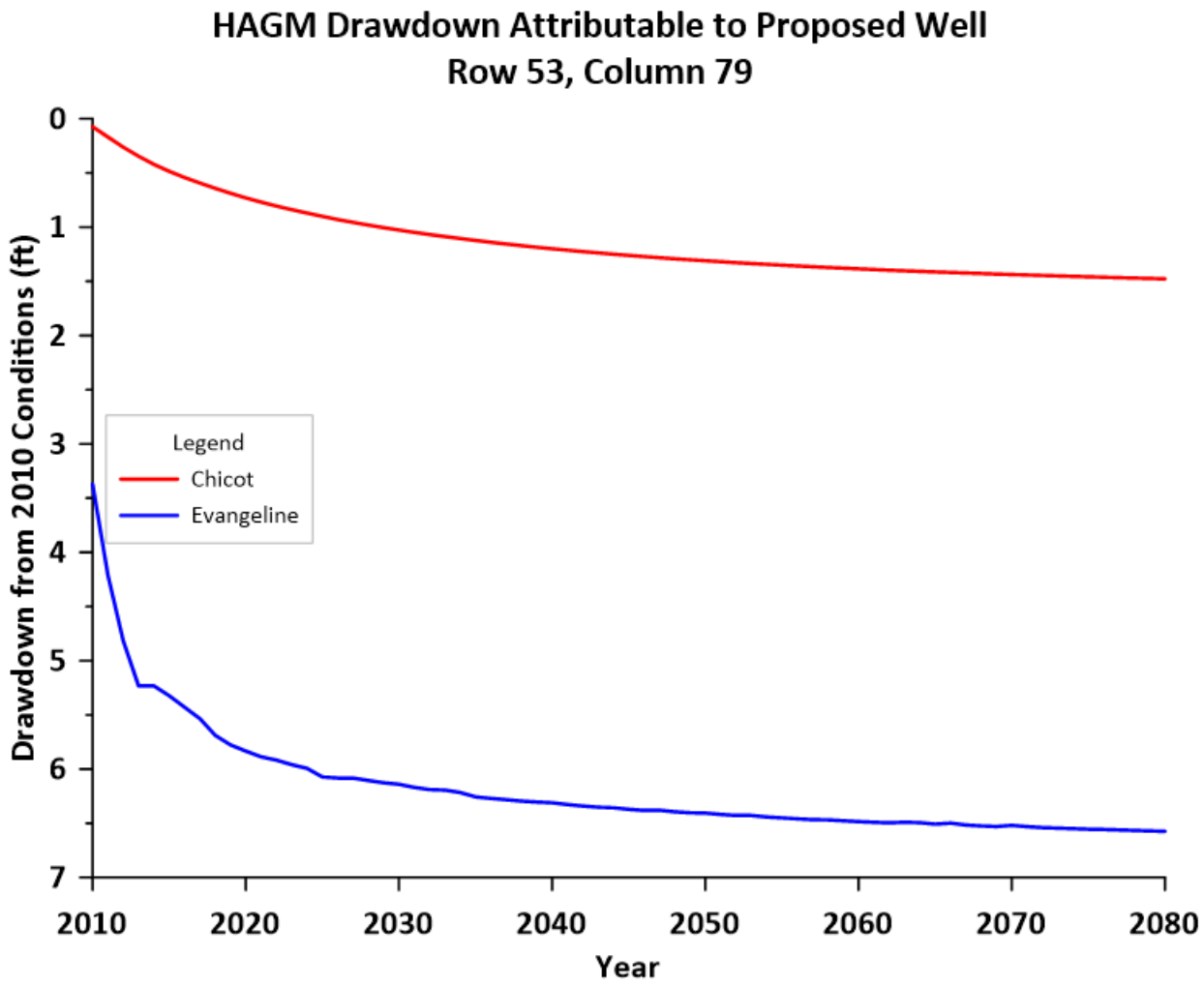
Hutchison, W.R., 2021. Implementation of GMA 14 Desired Future Condition Based on Multi-Metric Simulation (70% Available Drawdown, 1 Foot of Subsidence, 30K Pumping Limit, 2016 Pumping Distribution). Final Report to Zach Holland, General Manager of Bluebonnet Groundwater Conservation District, April 27, 2021, 54p.

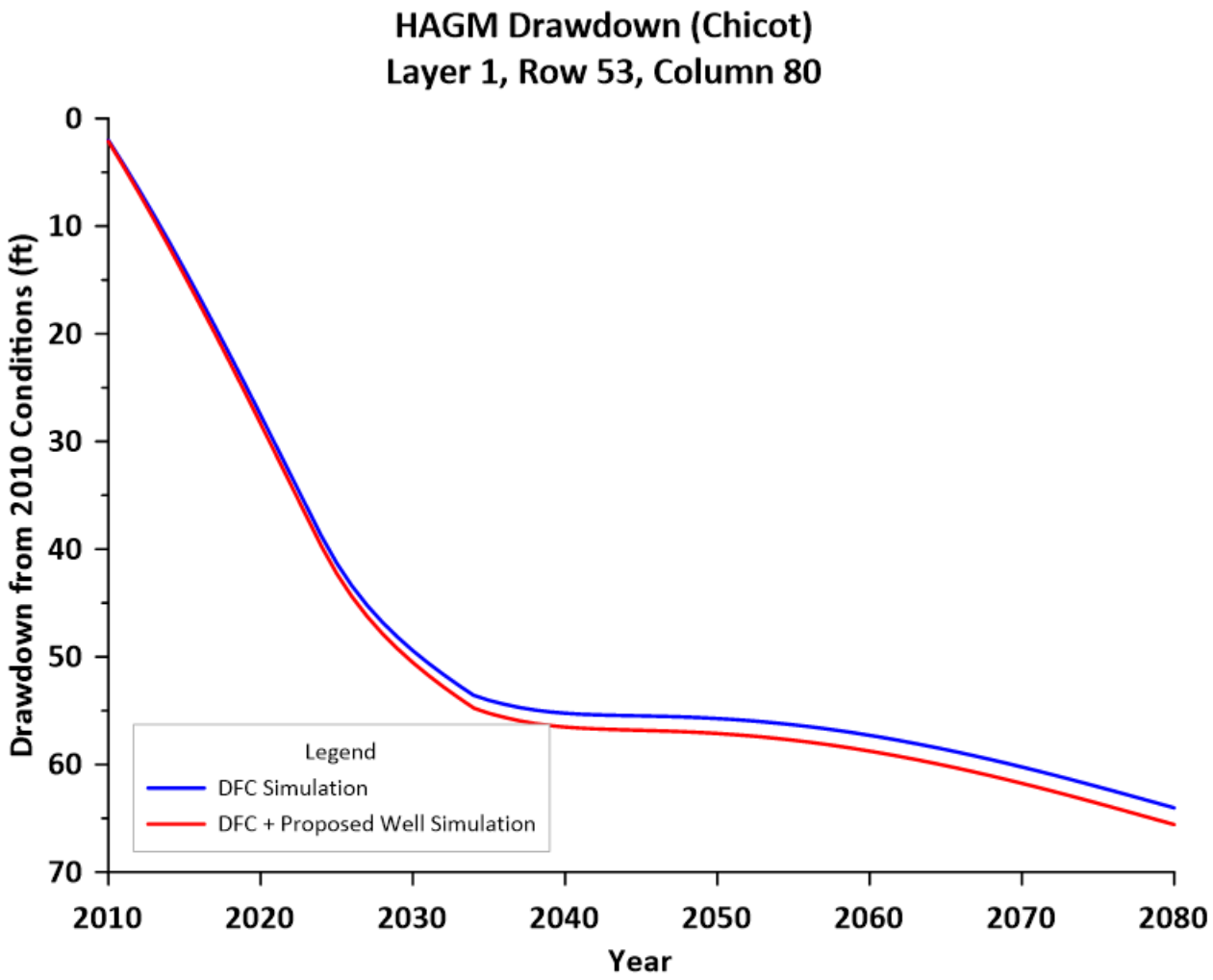
Appendix A

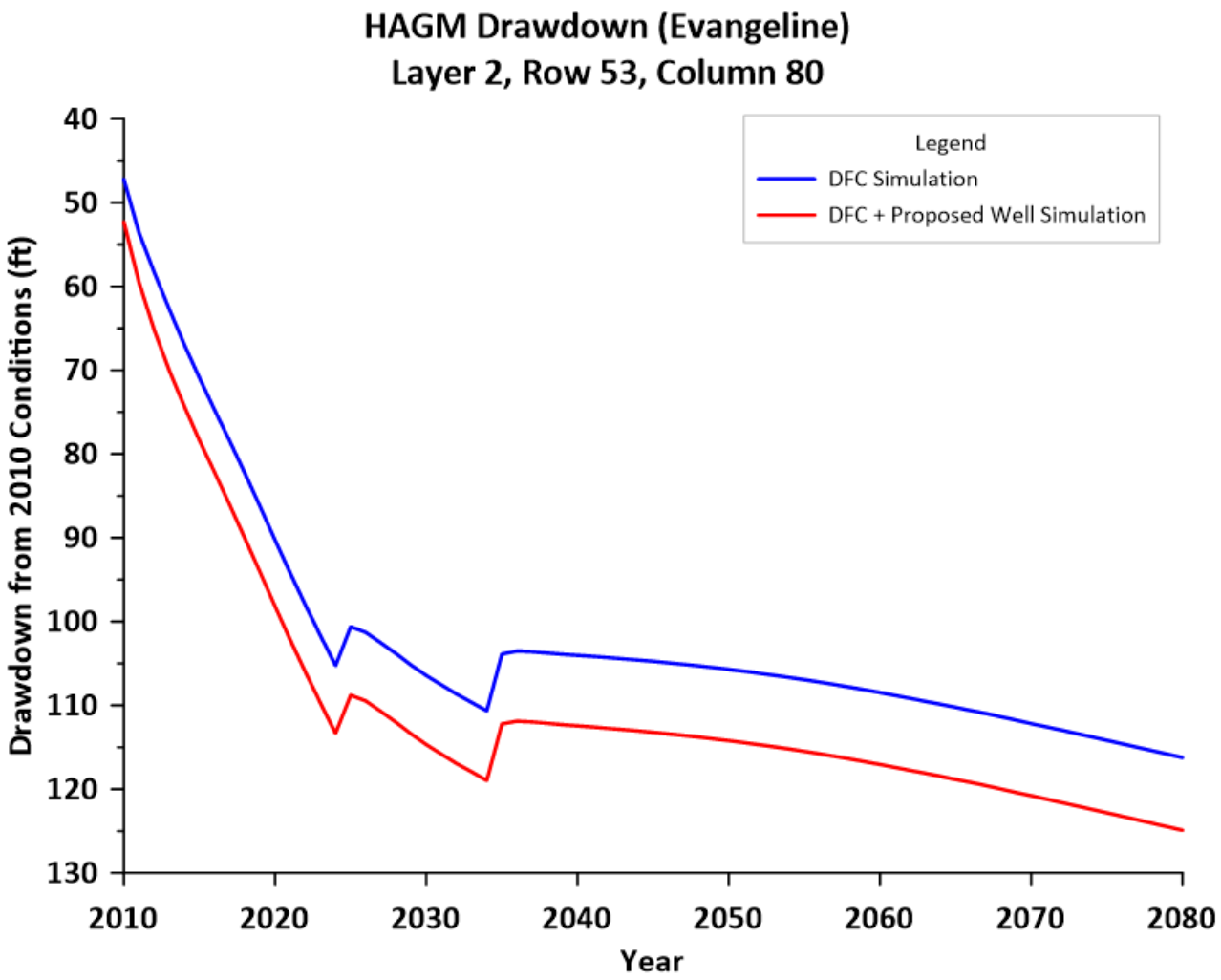
Drawdown Hydrographs

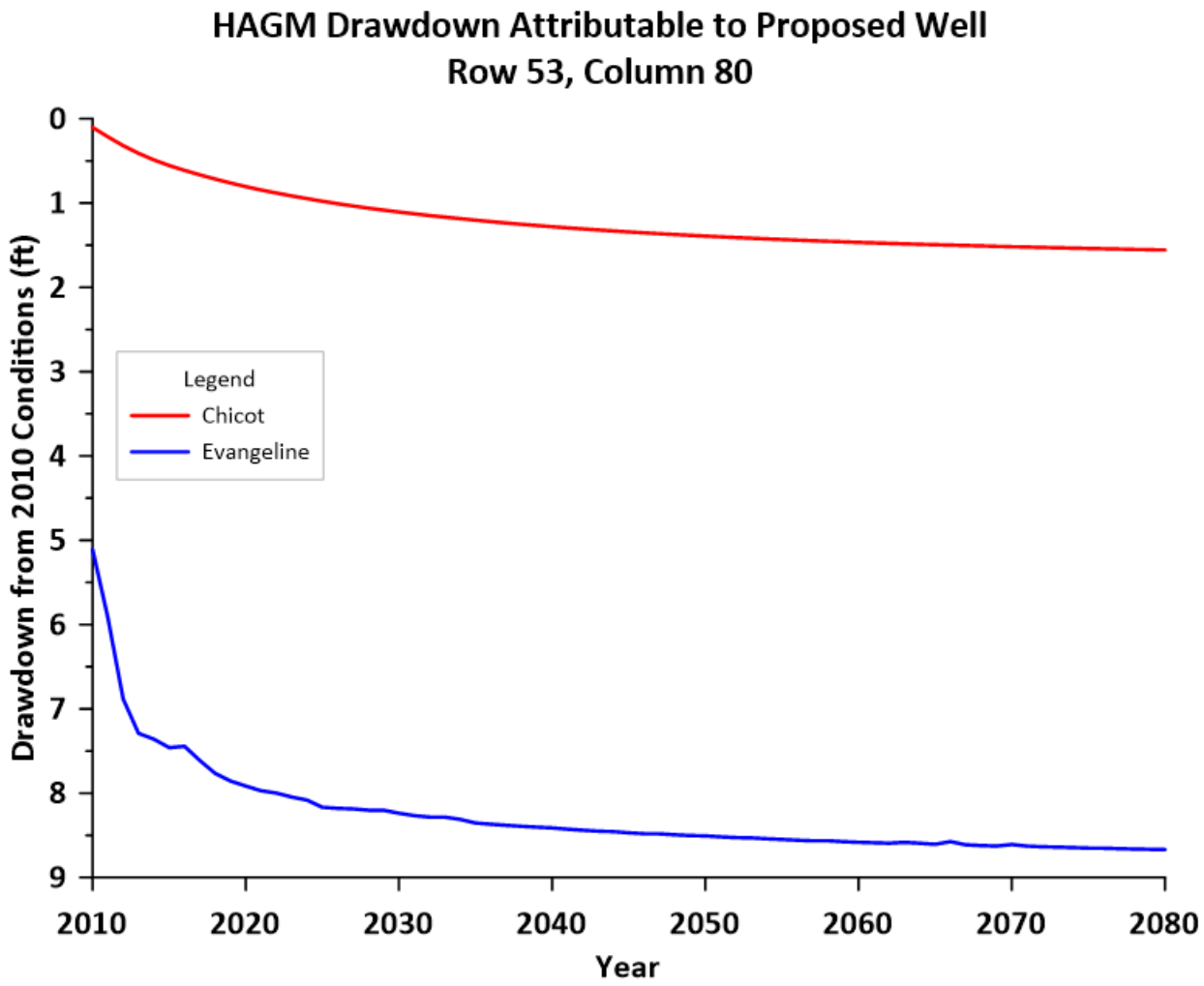

HAGM Drawdown (Chicot)
Layer 1, Row 53, Column 79
Drawdown from 2010 Conditions (ft)
0
10
20
30
40
50
60
70
80
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
DFC Simulation
DFC + Proposed Well Simulation

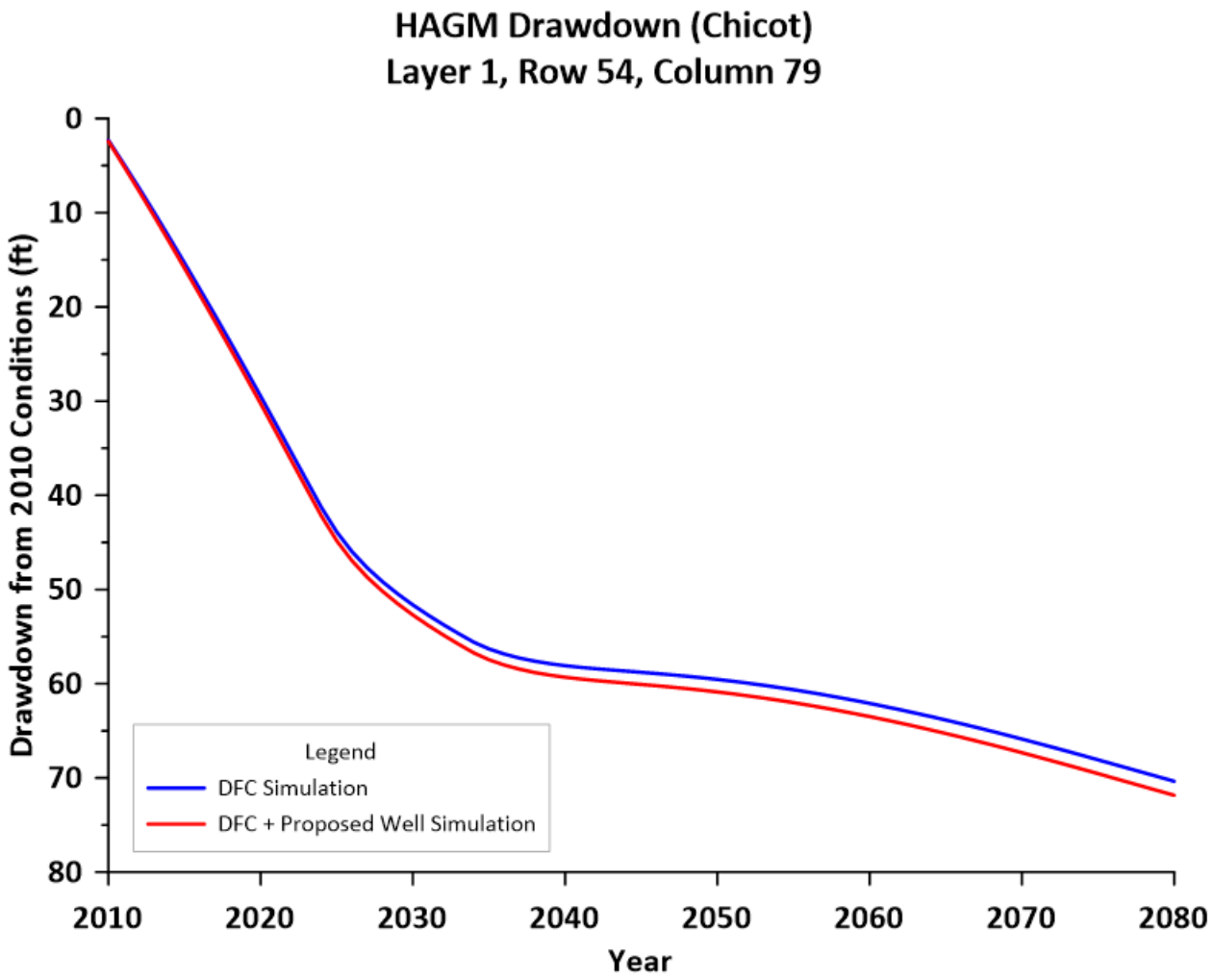

HAGM Drawdown (Evangeline)
Layer 2, Row 53, Column 79
Drawdown from 2010 Conditions (ft)
50
60
70
80
90
100
110
120
130
140
150
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
DFC Simulation
DFC + Proposed Well Simulation

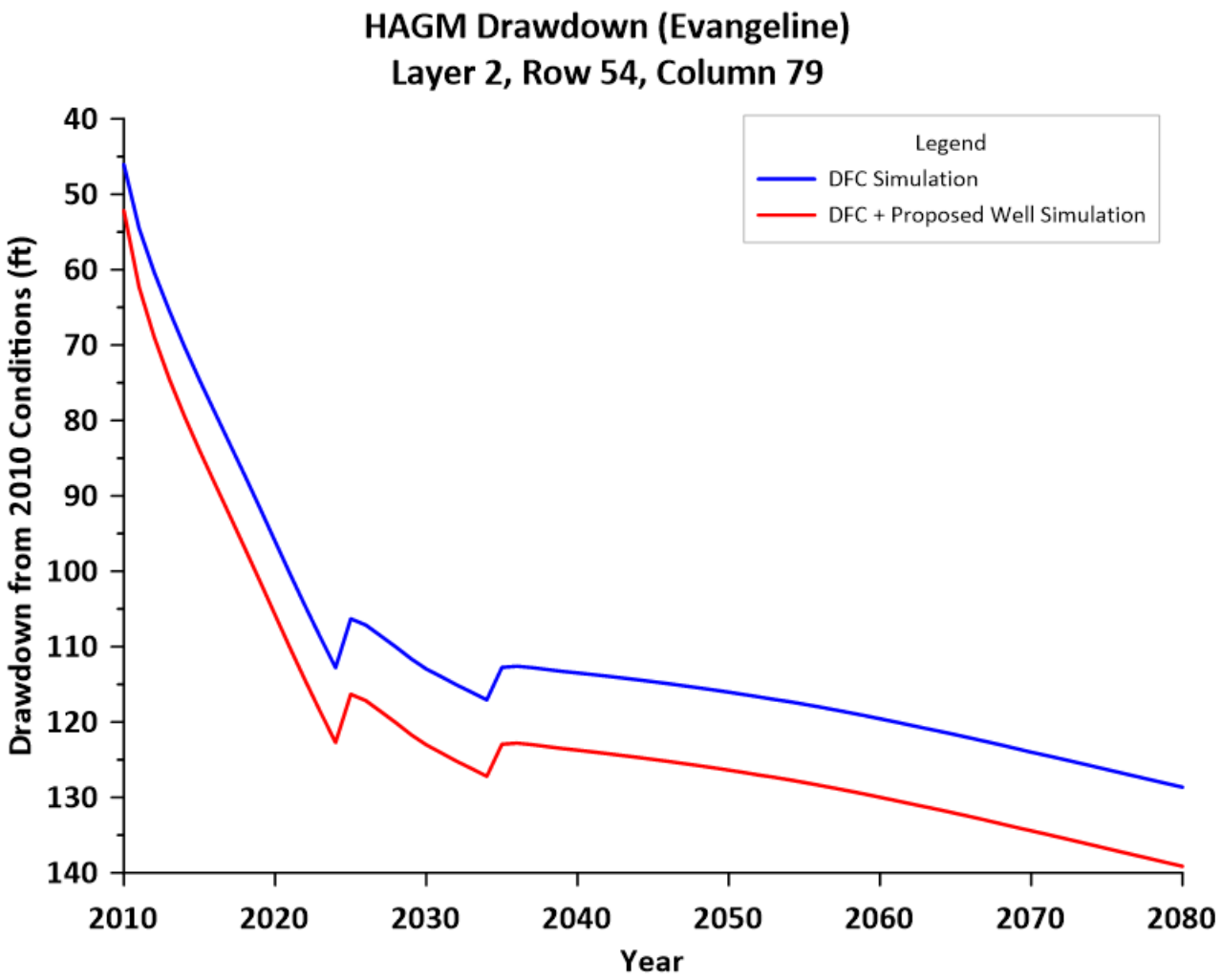

HAGM Drawdown Attributable to Proposed Well
Row 53, Column 79
Drawdown from 2010 Conditions (ft)
0
1
2
3
4
5
6
7
Legend
Chicot
Evangeline
2010
2020
2030
2040
2050
2060
2070
2080
Year

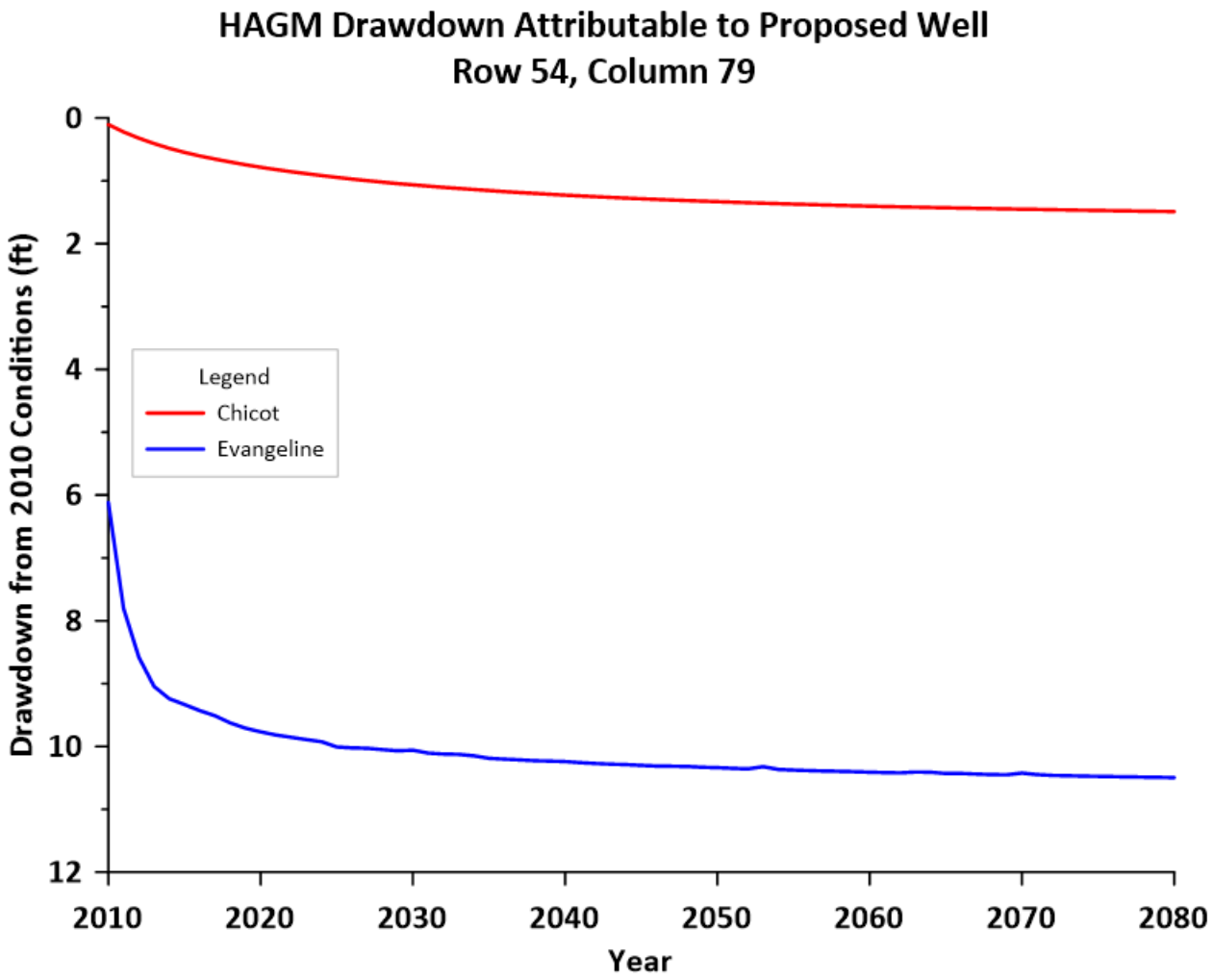

HAGM Drawdown (Chicot)
Layer 1, Row 53, Column 80
Drawdown from 2010 Conditions (ft)
0
10
20
30
40
50
60
70
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
DFC Simulation
DFC + Proposed Well Simulation

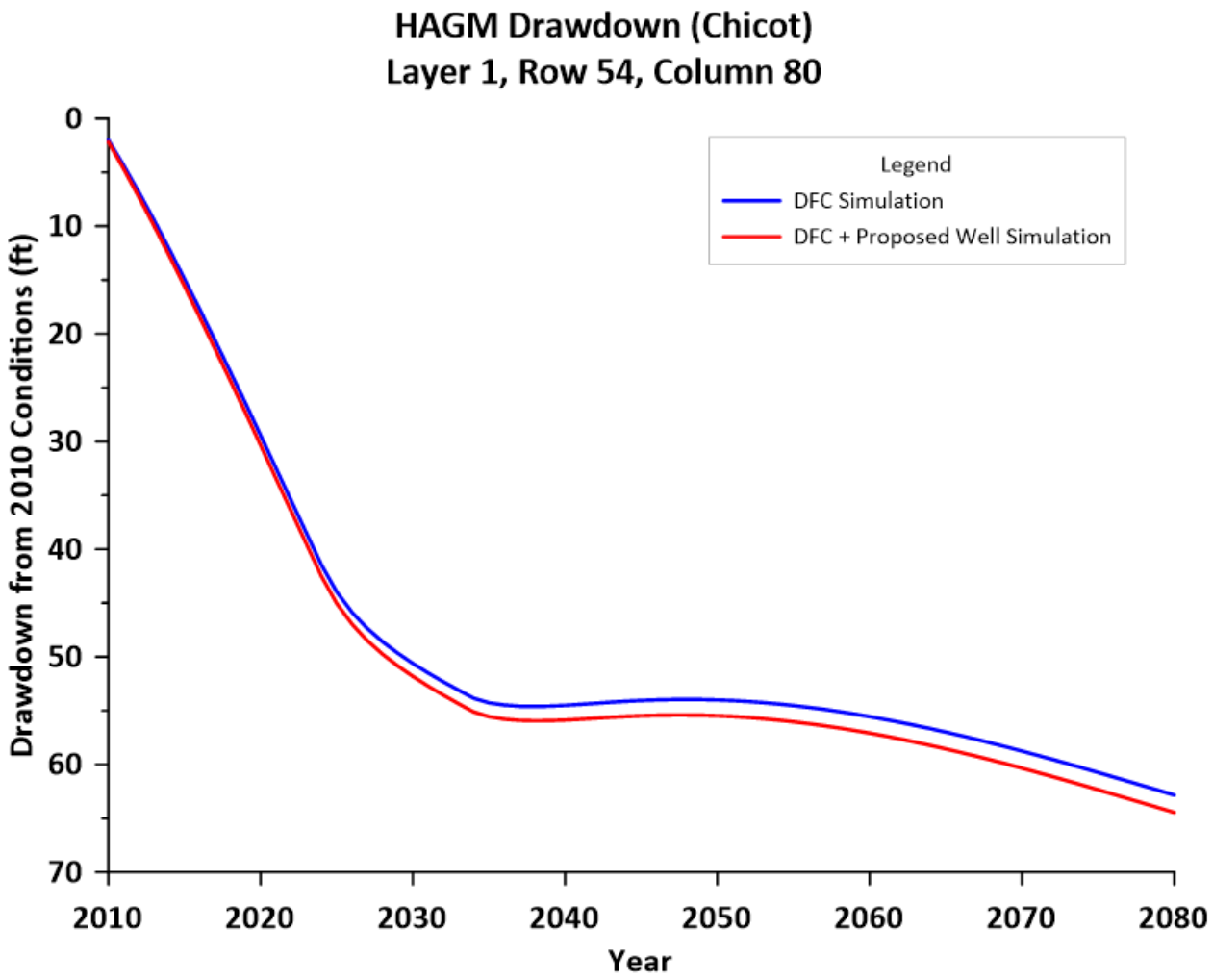

HAGM Drawdown (Evangeline)
Layer 2, Row 53, Column 80
Legend
DFC Simulation
DFC + Proposed Well Simulation
Drawdown from 2010 Conditions (ft)
40
50
60
70
80
90
100
110
120
130
2010
2020
2030
2040
2050
2060
2070
2080
Year

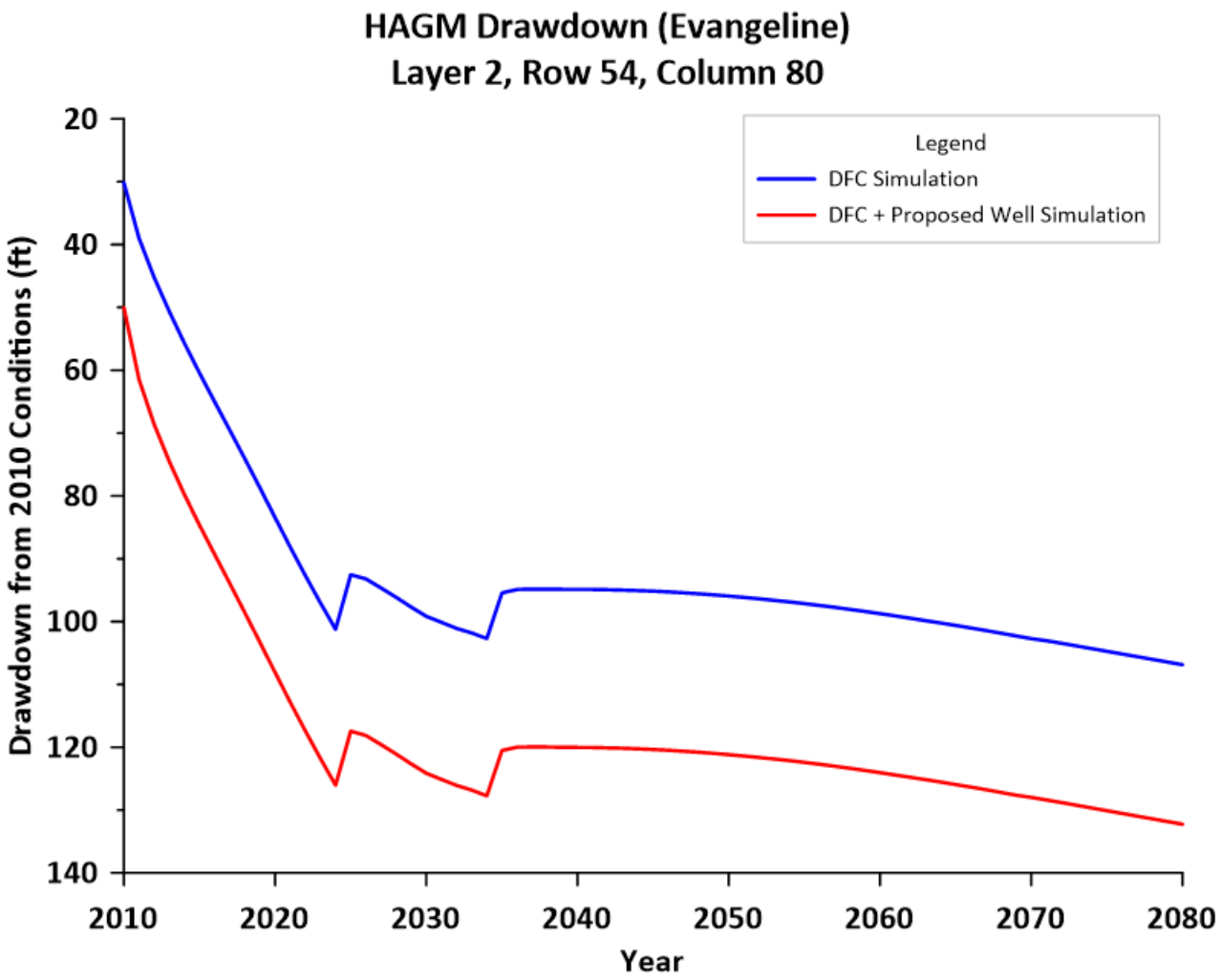

HAGM Drawdown Attributable to Proposed Well
Row 53, Column 80
Drawdown from 2010 Conditions (ft)
0
1
2
3
4
5
6
7
8
9
Legend
Chicot
Evangeline
2010
2020
2030
2040
2050
2060
2070
2080
Year

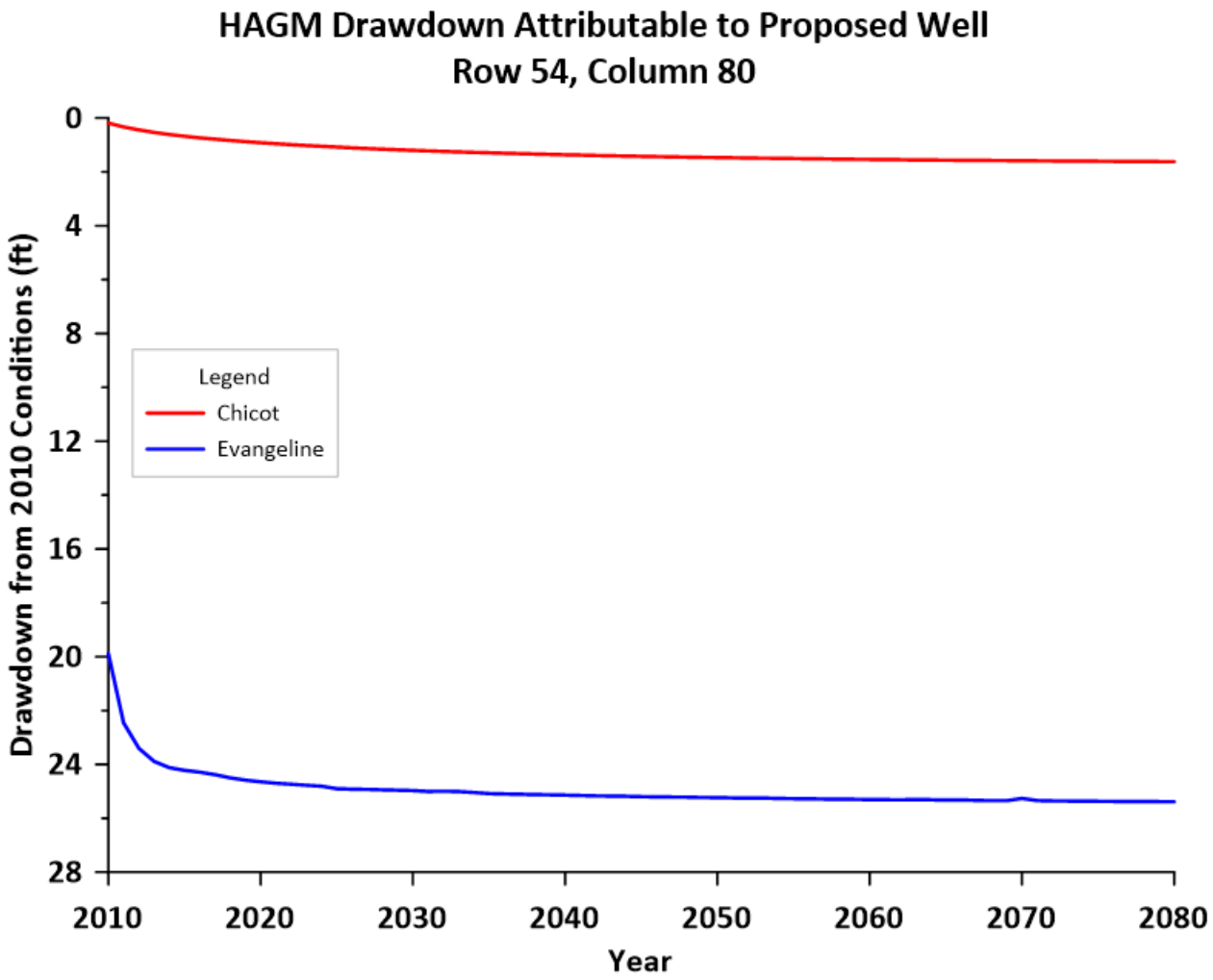

HAGM Drawdown (Chicot)
Layer 1, Row 54, Column 79
Drawdown from 2010 Conditions (ft)
0
10
20
30
40
50
60
70
80
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
DFC Simulation
DFC + Proposed Well Simulation


HAGM Drawdown (Evangeline)
Layer 2, Row 54, Column 79
Legend
DFC Simulation
DFC + Proposed Well Simulation
Drawdown from 2010 Conditions (ft)
40
50
60
70
80
90
100
110
120
130
140
2010
2020
2030
2040
2050
2060
2070
2080
Year


HAGM Drawdown Attributable to Proposed Well
Row 54, Column 79
Drawdown from 2010 Conditions (ft)
0
2
4
6
8
10
12
Legend
Chicot
Evangeline
2010
2020
2030
2040
2050
2060
2070
2080
Year

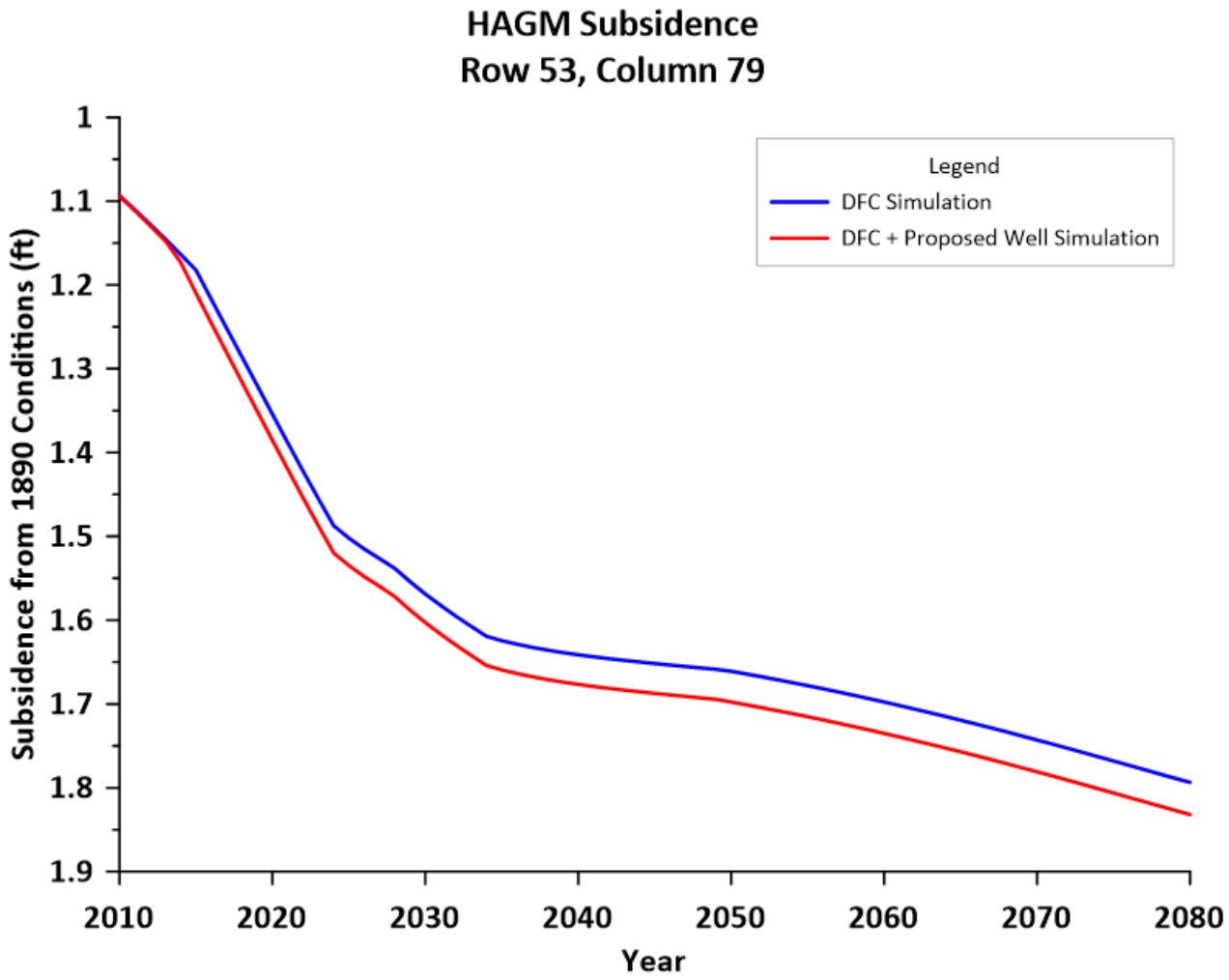

HAGM Drawdown (Chicot)
Layer 1, Row 54, Column 80
Legend
DFC Simulation
DFC + Proposed Well Simulation
Drawdown from 2010 Conditions (ft)
0
10
20
30
40
50
60
70
2010
2020
2030
2040
2050
2060
2070
2080
Year

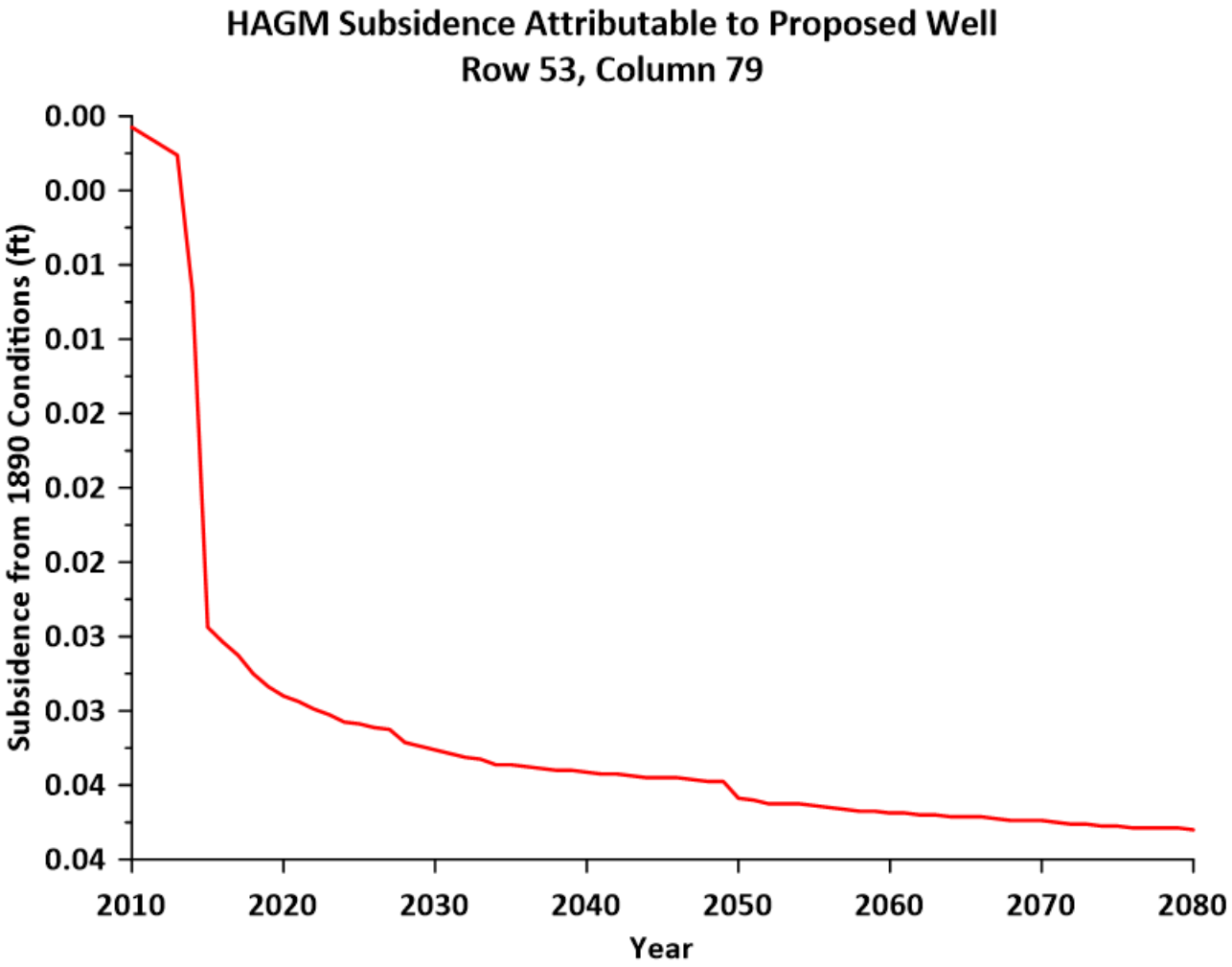

HAGM Drawdown (Evangeline)
Layer 2, Row 54, Column 80
Legend
DFC Simulation
DFC + Proposed Well Simulation
Drawdown from 2010 Conditions (ft)
20
40
60
80
100
120
140
2010
2020
2030
2040
2050
2060
2070
2080
Year

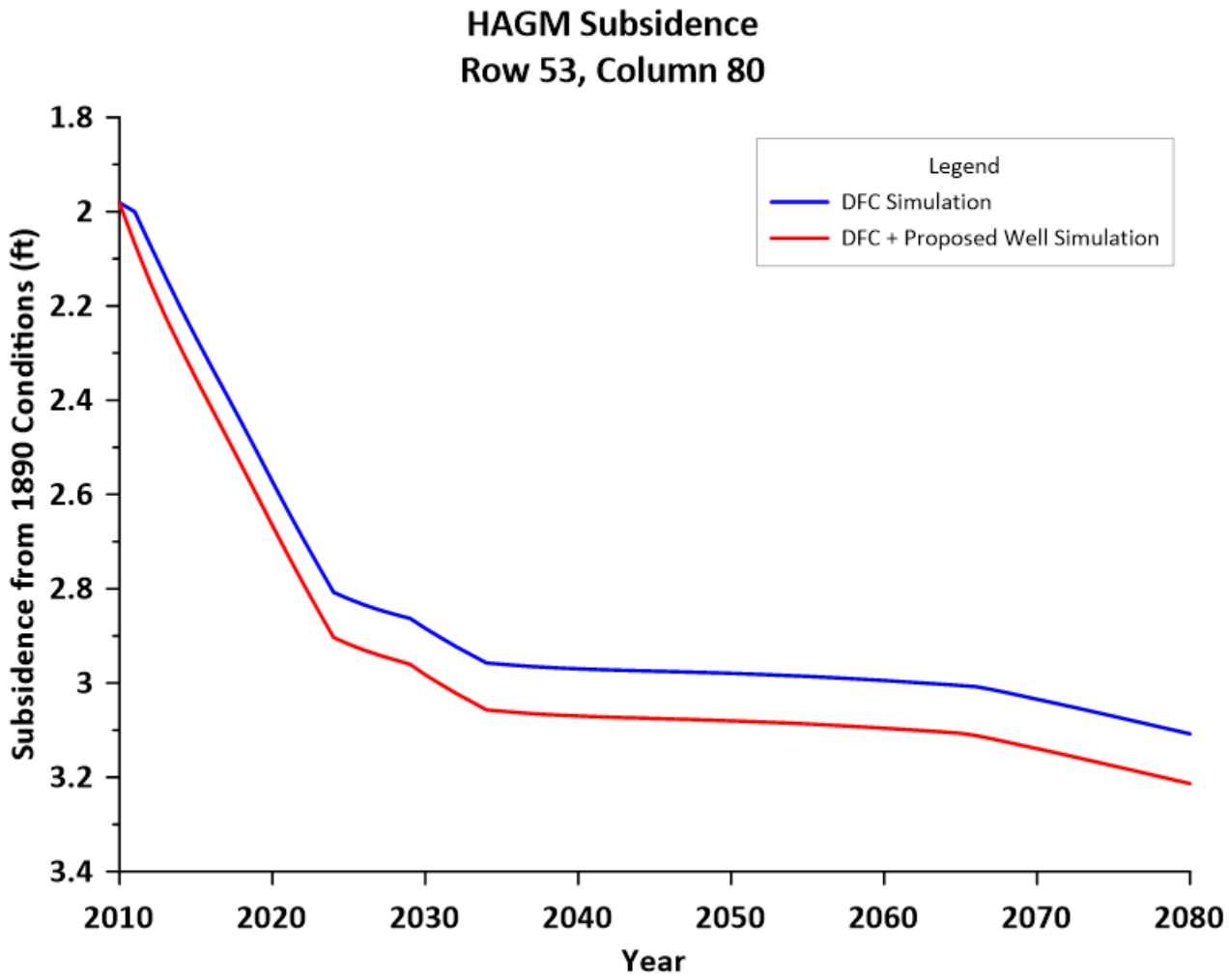

HAGM Drawdown Attributable to Proposed Well
Row 54, Column 80
Drawdown from 2010 Conditions (ft)
0
4
8
12
16
20
24
28
Legend
Chicot
Evangeline
2010
2020
2030
2040
2050
2060
2070
2080
Year

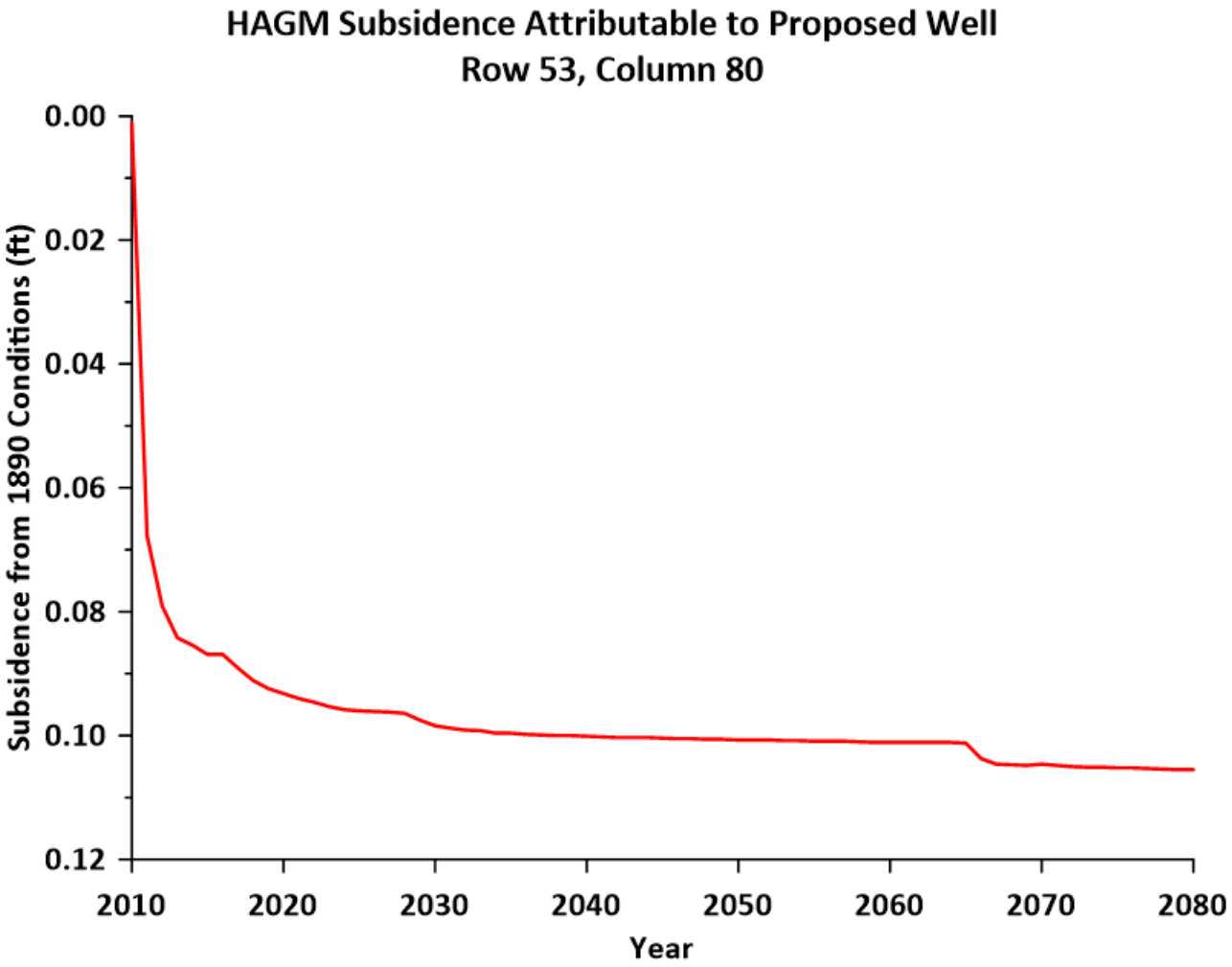
Appendix B

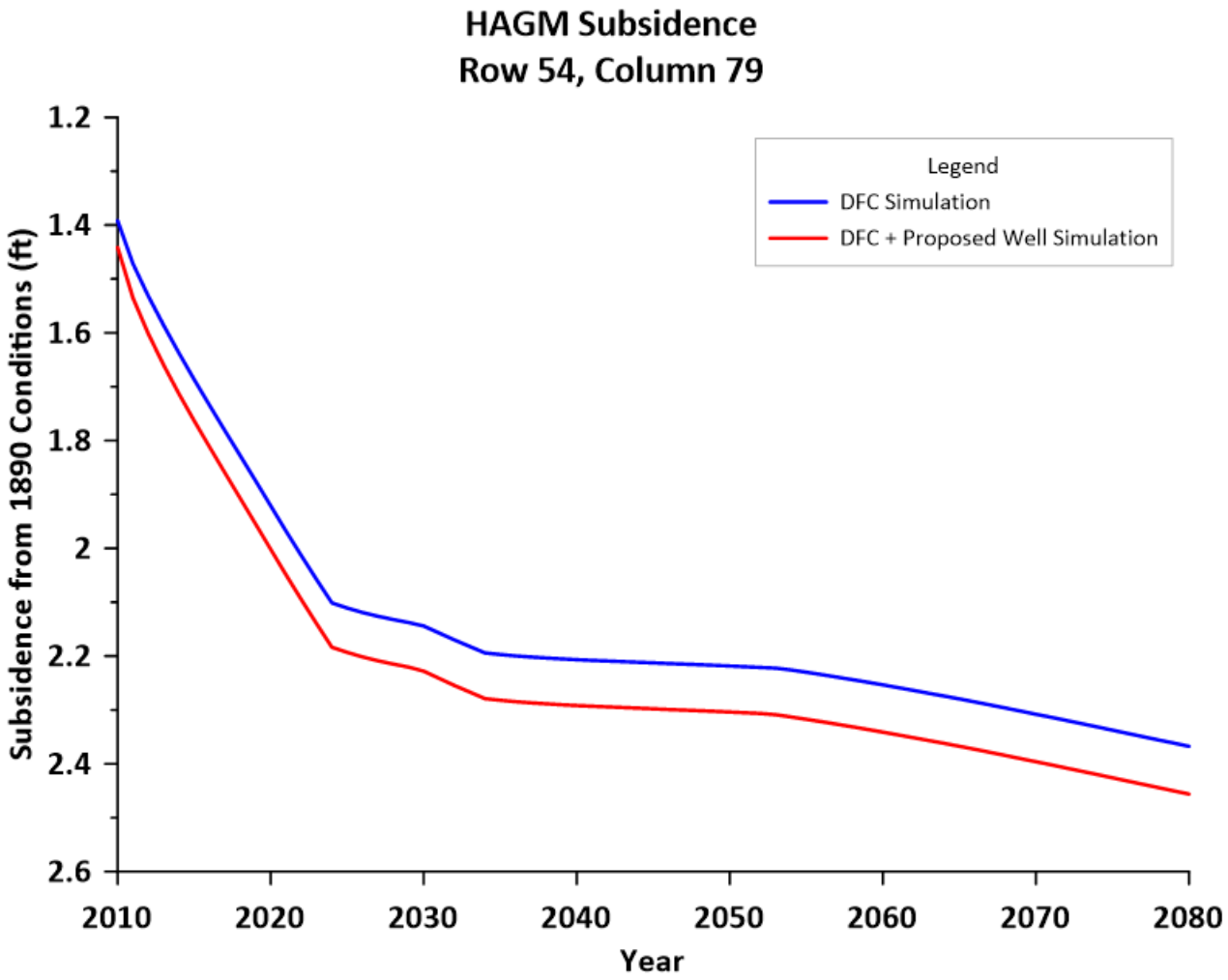
Subsidence Hydrographs

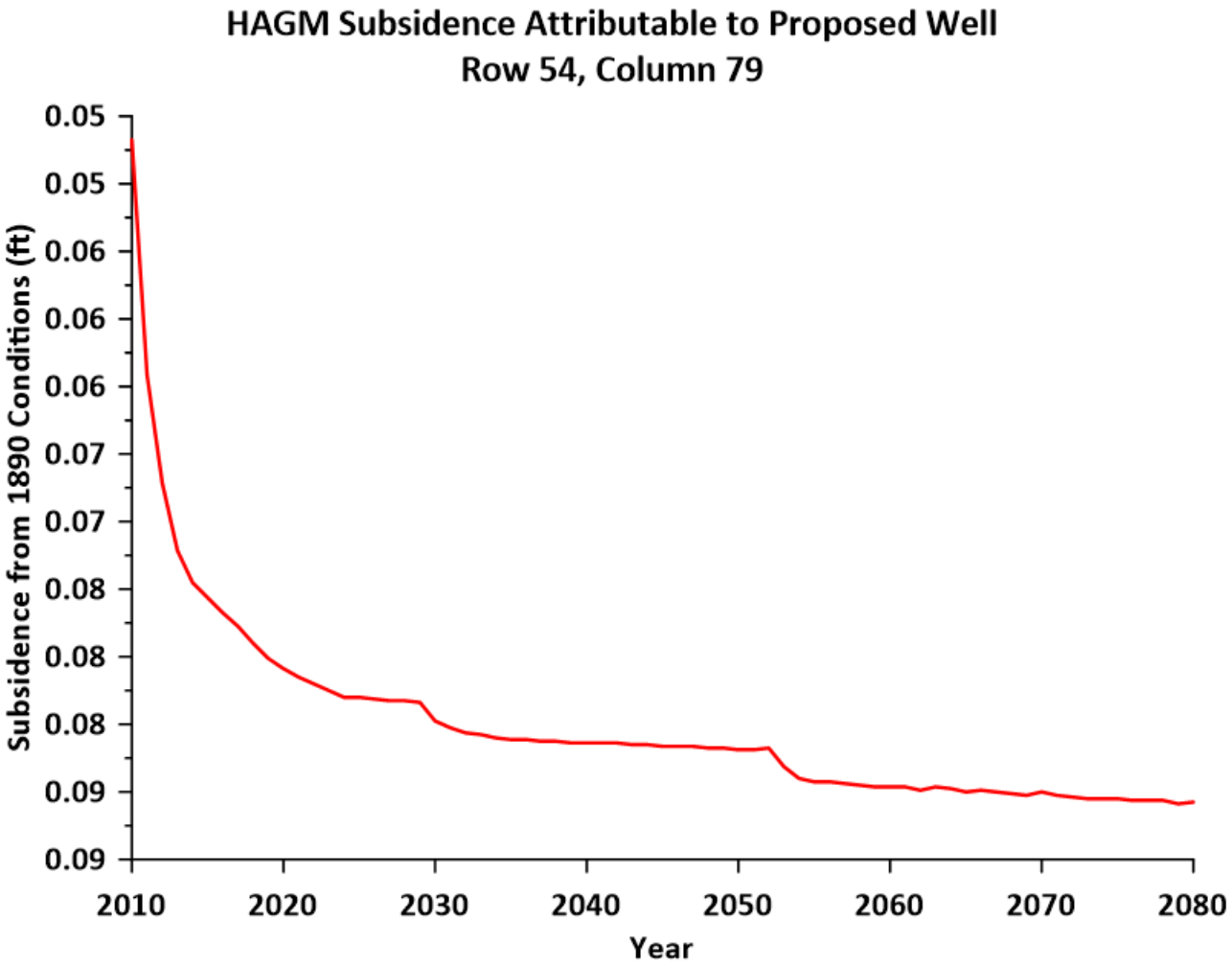

HAGM Subsidence
Row 53, Column 79
Legend
DFC Simulation
DFC + Proposed Well Simulation
Subsidence from 1890 Conditions (ft)
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2010
2020
2030
2040
2050
2060
2070
2080
Year

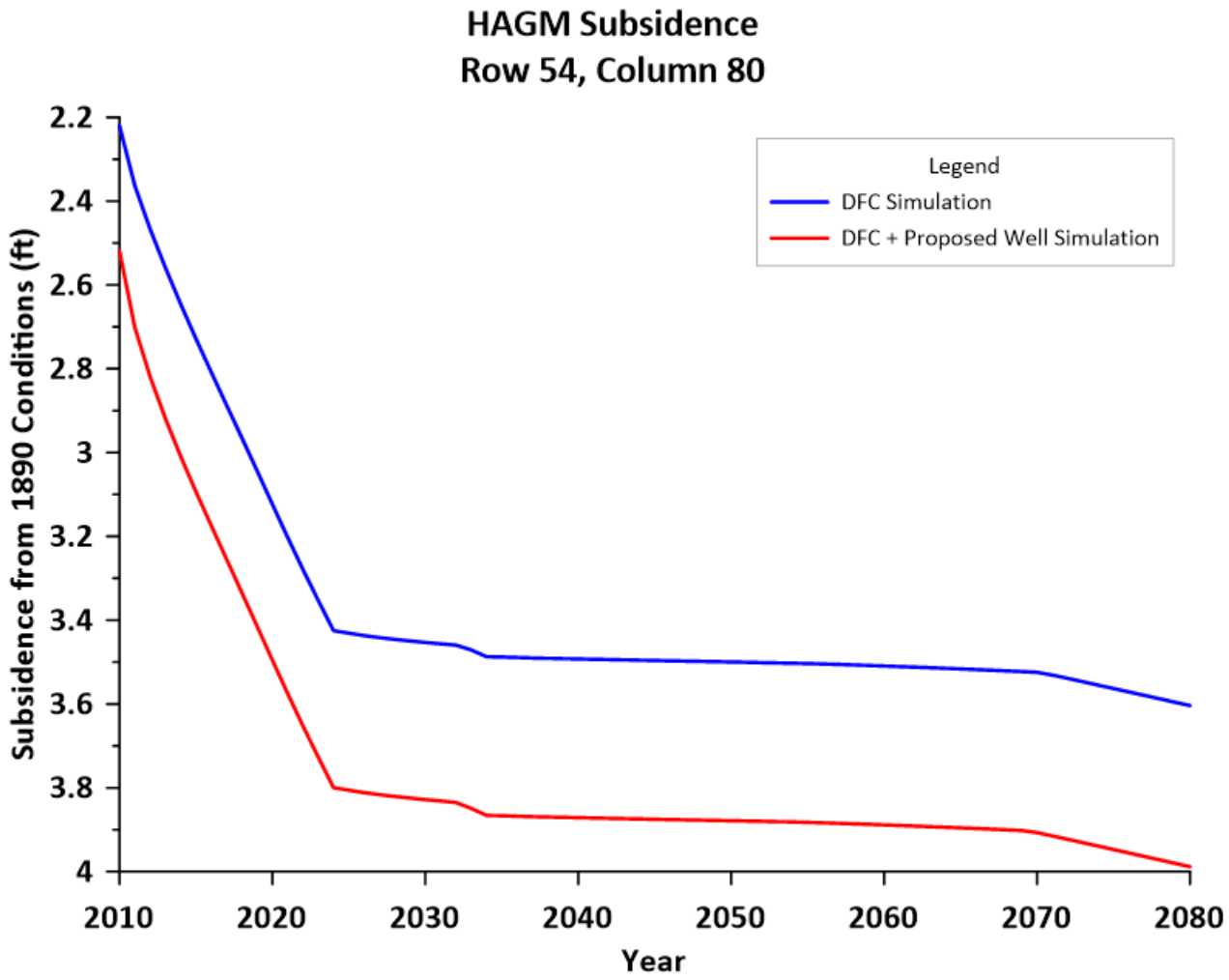

HAGM Subsidence Attributable to Proposed Well
Row 53, Column 79
Subsidence from 1890 Conditions (ft)
0.00
0.00
0.01
0.01
0.02
0.02
0.02
0.03
0.03
0.04
0.04
2010
2020
2030
2040
2050
2060
2070
2080
Year

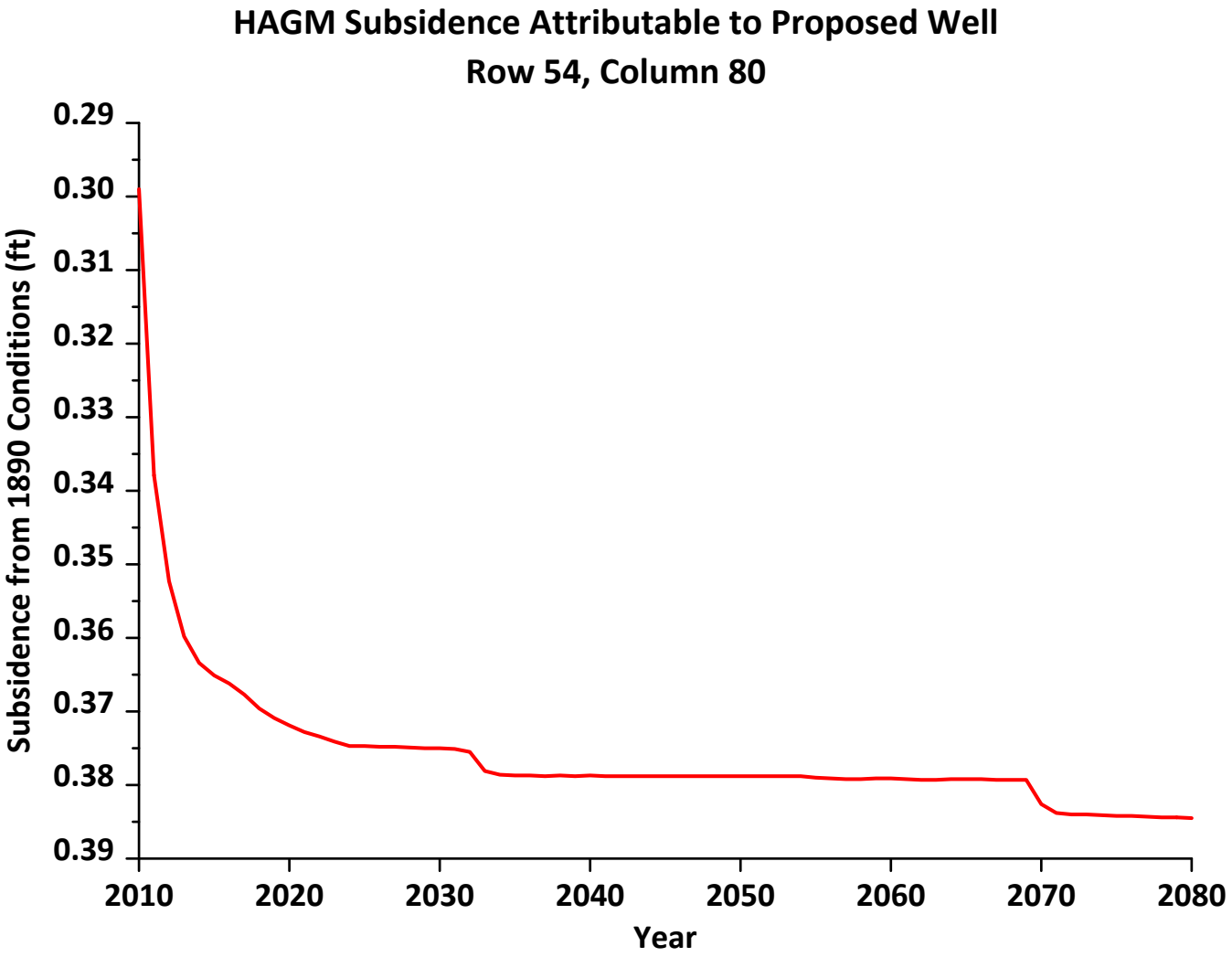

HAGM Subsidence
Row 53, Column 80
Legend
DFC Simulation
DFC + Proposed Well Simulation
Subsidence from 1890 Conditions (ft)
1.8
2
2.2
2.4
2.6
2.8
3
3.2
3.4
2010
2020
2030
2040
2050
2060
2070
2080
Year


HAGM Subsidence Attributable to Proposed Well
Row 53, Column 80
Subsidence from 1890 Conditions (ft)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
2010
2020
2030
2040
2050
2060
2070
2080
Year


HAGM Subsidence
Row 54, Column 79
Legend
DFC Simulation
DFC + Proposed Well Simulation
Subsidence from 1890 Conditions (ft)
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2010
2020
2030
2040
2050
2060
2070
2080
Year


HAGM Subsidence Attributable to Proposed Well
Row 54, Column 79
Subsidence from 1890 Conditions (ft)
0.05
0.05
0.06
0.06
0.06
0.07
0.07
0.08
0.08
0.08
0.09
0.09
2010
2020
2030
2040
2050
2060
2070
2080
Year


HAGM Subsidence
Row 54, Column 80
Legend
DFC Simulation
DFC + Proposed Well Simulation
Subsidence from 1890 Conditions (ft)
2.2
2.4
2.6
2.8
3
3.2
3.4
3.6
3.8
4
2010
2020
2030
2040
2050
2060
2070
2080
Year


HAGM Subsidence Attributable to Proposed Well
Row 54, Column 80
Subsidence from 1890 Conditions (ft)
0.29
0.30
0.31
0.32
0.33
0.34
0.35
0.36
0.37
0.38
0.39
2010
2020
2030
2040
2050
2060
2070
2080
Year