Town of Calhan, Colorado

Infrastructure Capacity Assessment for Proposed Annexation

October 2026

Moore Project No. 31289

moore engineering, inc.

a Vistal company

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Acronyms and Abbreviations

acre-feet	ac-ft
aquifer determination tool	ADT
best management practices	BMPs
biochemical oxygen demand	BOD
Colorado Department of Public Health and Environment	CDPHE
Colorado Department of Transportation	CDOT
Colorado Groundwater Commission	CGWC
cubic feet	ft^3
gallons per day	gpd
gallons per minute	gpm
milligrams per liter	mg/L
Moore Engineering, Inc.	MEI
not-nontributary	NNT
pounds per day	lbs/day
single family equivalent	SFE
square feet	ft^2
Town of Calhan	Calhan or Town

1. INTRODUCTION

1.1. Background

The Town of Calhan ("Town" or "Calhan") is evaluating a proposed annexation that would significantly increase population size and system demands beyond the Town's current ability to serve. The Town requested that Moore Engineering, Inc. ("MEI") complete an Infrastructure Capacity Assessment for the proposed annexation to understand the existing system's capabilities and identify the improvements the system would need to effectively support the proposed expansion related to the North Tree annexation.

The number of single family equivalents ("SFEs") that the developer's engineer, Kimley-Horn, gave for this report was 467 SFEs on 95.02 acres (Preliminary Utility Report, August 7, 2026), and this number was used to develop the infrastructure demands in this report. Other documents use somewhat different numbers. The traffic study evaluates about 473 lots, and the General Development Plan describes 5 dwelling units per acre on 95.9989 acres, or up to about 480 units. The Town's planner estimates that the Town's 7,500 square foot minimum lot and parkland dedication standard would yield a maximum of about 463 lots, before streets, drainage, and utilities. Across 463 to 480 units, the findings and recommended improvements in this report do not change materially, and each unit changes residential water demand by 0.35 acre feet per year. The Town Board will work with staff and the developer to establish the allowable number of SFEs and the site area through the annexation agreement and the Planned Unit Development process.

1.2. Objective

This report provides an evaluation of the existing capacities of the water, wastewater, stormwater, and transportation systems and what improvements need to be made for the proposed annexation to function at efficient service levels and comply with both Town and State regulations. Cost estimates for the identified improvements have also been developed, so the Town has a clear technical and cost layout that can assist the Town with assessing the annexation of the North Tree property.

2. PROPOSED NORTH TREE ANNEXATION WATER DEMANDS AND SUPPLIES

The North Tree property is 95.9989 acres according to the annexation plat, located in Section 2, Township 12 South, Range 62 West. The location of the property related to the Town's boundary is shown in **Figure 1**. This property is contiguous to the Town's current boundaries. It is proposed through the annexation process that the North Tree property be provided with water and wastewater service from the Town.

2.1. Estimated Water Demands

Based on the Preliminary Utility Report, dated August 7, 2026, and prepared by Kimley-Horn on behalf of the North Tree annexation, the proposed development plan consists of 467 single family equivalents ("SFEs"), as well as 1.605 acres of irrigated parks (**Appendix A**). Based on the Town's recently adopted water demand standards of 0.35 acre-feet per year ("ac-ft/yr") per SFE and 2.5 acre feet per acre ("ac-ft/ac"), the estimated total demand for the North Tree annexation is 167.5 ac-ft/yr. This equates to an average day demand of 149,535 gallons ("gal"), or 104 gallons per minute ("gpm").

For planning purposes, a maximum day peaking factor of 2.0 was applied to develop projected maximum day demands.

$$149{,}535\ gal * 2.0 = 299{,}070\ gal$$

$$299{,}070\ \frac{gal}{day} * \frac{1}{1440}\frac{day}{min} = 208\ \frac{gal}{min}$$

The current average day and maximum day demands within the Town are estimated to be 67 gpm and 133 gpm, respectively, based on actual use records. Therefore, the Town's and North Tree's total demand on the Denver Basin aquifers as the principal water supply is estimated to be 171 gpm for average day demand and 341 gpm as a maximum day demand at buildout of the annexation area.

2.2. Water Supplies

The proposed water supply for the North Tree property is the available Denver Basin aquifer water beneath the property. There are three principal Denver Basin aquifers beneath this property, the Denver, Arapahoe, and Laramie-Fox Hills. The Denver Basin aquifer water has not been previously quantified, therefore, we have estimated water supply availability using the Colorado Division of Water Resources Aquifer Determination Tool ("ADT"). The annual estimated volumes in each aquifer are shown in **Table 1**.

Table 1 - Denver Basin Water Supply Availability, North Tree Annexation Property

Aquifer	Annual Allocation (ac-ft)		Legal Status[3)]
	100-Year Life	*300-Year Life*	
Denver	29.6	9.9	NNT
Arapahoe	35.4	11.8	NT
Laramie-Fox Hills	33.0	11.0	NT
TOTAL[1)]	**98.0**		
TOTAL (300-Year)[3)]	**32.7**		

1) From ADT estimates and a 100-yr aquifer life.
2) Based on a 300-yr aquifer life.
3) NT=nontributary, NNT=not-nontributary.

The annexation area (as well as Calhan) is located in the Upper Big Sandy Designated Groundwater Basin. In a designated basin, stream depletions during pumping have to be replaced, while post-pumping depletions do not have to be replaced. For nontributary water, a 2 percent depletion replacement has to be delivered back to the stream during the pumping period. A check of the location of the North Tree property reveals that the NNT Denver aquifer beneath the property is in an area where 4 percent replacement is required during the pumping period (Rules and Regulations for the Management and Control of Designated Ground Water, Rule 5.3.6.2.B.). As such, to use the NNT Denver aquifer water, there is not the need for a replacement plan to be approved by the Colorado Groundwater Commission ("CGWC").

Based on an estimated average annual demand of 167.5 ac-ft at buildout of North Tree, and an available 300-yr life water supply of 32.7 ac-ft/yr, there is an estimated water supply shortfall of 134.8 ac-ft/yr. At this time, the means to deal with the water supply shortfall has not been addressed by the Town Board.

While the maximum annual Denver Basin aquifer water supply beneath the North Tree property is estimated to be 32.7 ac-ft/yr, based on a 300-yr water supply, there is also an extenuating issue related to the use of the Laramie-Fox Hills aquifer water beneath the property. Calhan has three existing permitted Laramie-Fox Hills aquifer wells (Permit Nos. 9691-F-R, 12104-F, and 24160-F) and two of those wells are pre-Senate Bill 213 ("pre-SB 213") water rights (9691-F-R and 12104-F). The significance of pre-SB 213 water rights is that these rights are not tied to overlying land ownership so Calhan has more Laramie-Fox Hills aquifer water than what could be approved under current law. **Figure 2** shows the area both inside and outside the Town boundaries that have been appropriated by the two pre-SB 213 wells.

As **Figure 2** shows, the Calhan pre-SB 213 circle of appropriation of Permit No. 9691-F-R also overlaps the North Tree property. As such, approximately 24 percent of the property is covered by the 9691-F-R circle of appropriation and this reduces the annual appropriable volume in the Laramie-Fox Hills aquifer from 33.0 ac-ft/yr to 25.0 ac-ft/yr. When the 300-yr rule is imposed, this annual volume is further reduced to 8.3 ac-ft/yr. Therefore, the total 300-yr water supply is estimated to be 30.0 ac-ft/yr.

While it is our opinion that the Denver and Arapahoe aquifer water rights beneath the North Tree property could be incorporated into joint wellfields with Calhan's water supply availability in those aquifers, it is likely that isn't the case in the Laramie-Fox Hills aquifer. The reason for this is that any application for a new appropriation in the Laramie-Fox Hills aquifer with the CGWC could result in Calhan losing its pre-SB 213 water right status. As such, it may be problematic to develop the Laramie-Fox Hills beneath the North Tree property as (a) it likely can't be incorporated into the Calhan wellfield and (b) it is uneconomical to develop a Laramie-Fox Hills aquifer well to produce 8.3 ac-ft/yr.

While it is fairly well understood the yield of the Laramie-Fox Hills locally beneath Town lands due to the well testing that has been conducted (LWS, June 22, 2026), there are no known Denver or Arapahoe aquifer wells in the immediate vicinity. Therefore, while the legal availability of water, as estimated by the values shown in **Table 1**, the physical capability of wells to produce the legal water supply is relatively unknown. However, given the small annual volumes available, it is likely that wells completed in these aquifers can produce the 300-yr supplies identified in **Table 1**.

In summary, the volumes of Denver Basin aquifer water available from each of the aquifers beneath the North Tree property are, in our opinion, too small to develop through individual wells. They will need to be developed as part of the larger wellfields that include Calhan lands to provide more economically-viable wells. With the issue with the Laramie-Fox Hills aquifer, it is unclear how the North Tree Laramie-Fox Hills aquifer water can be developed beneath North Tree. The existing capacity in the Calhan Laramie-Fox Hills aquifer wells currently appears to be sufficient to meet initial residential demands at North Tree, but likely would need upgrades to the existing wells, and

possibly a new well to fully serve the North Tree development. These options include using Town water rights to serve much of the proposed North Tree development and it is currently unknown if the Town Board will agree to this water supply means to serve North Tree and, if so, how this would work relative to a fee in lieu for North Tree to utilize some of the Town's water rights.

2.3. Required Water Supply Infrastructure Upgrades

The Town has an annual appropriation of 462 ac-ft/yr in the Laramie-Fox Hills aquifer; however, this water is not part of the available water supply for use by North Tree as part of the annexation process, as annexations should be based on the water supply beneath the annexing property. However, the Town's existing water supply may provide some of the initial water supply for North Tree to meet demands if (a) the Town Board approves such use and (b) the developer of the property pays a fee-in-lieu for the use of Town water supplies. Assuming that the Town's water supplies may be used as an initial supply, we recommend that water supply infrastructure upgrades be completed at the applicant's cost.

Given a projected annual full buildout demand in North Tree of 167.5 ac-ft, and a peak day demand of 208 gpm in the annexation area and an additional maximum day demand in the Town of 133 gpm (total of 341 gpm), there will need to be work completed on the existing Town Laramie-Fox Hills aquifer wells to help meet some of these increased demands, although it is unlikely the existing wells can meet the full buildout demands for North Tree.

Based on work previously completed for the Town, the current maximum well capacity of the three Laramie-Fox Hills wells is approximately 275 gpm. However, to achieve this capacity as a reliable water supply it is our opinion that, based on work conducted recently at the existing wells (LWS, June 22, 2026), well rehabilitation is necessary to make the current well system viable to potentially meet some of the increased water demands associated with the North Tree annexation. These well rehabilitations (Railroad well, Permit No. 24166-F, Tower well, Permit No. 9691-F-R, and Gordon well, Permit No. 12104-FP) would include bailing, chemical addition and mechanical scrubbing process, followed by surging and pumping the well. To increase the flow rate in the wells, it is proposed that the existing pumps be replaced and new pumps be lowered in the wells to maintain a higher flow rate than what can currently be produced from these wells. Currently, it is estimated that the Railroad well may be capable of a production rate of 155 gpm, the Tower well may be capable of a production rate of 50 gpm, and the Gordon well may be capable of 70 gpm. we note that the Railroad well is permitted for a maximum pumping rate of 100 gpm, therefore, if that rate is exceeded a modified Order from the CGWC will be required.

The estimated costs for the rehabilitation work, as well as purchasing new, higher horsepower pumps and installing the equipment at a lower level in the three existing Laramie-Fox Hills wells would be in the range of $600,000. However, these rehabilitation efforts on the existing Laramie-Fox Hills aquifer wells will likely not meet all of the projected peak day demands for the Town's existing demands plus the full buildout demands for the North Tree annexation, as even if these rates can be achieved through rehabilitation and lowering of the pumps in the wells, there would still be an approximate 66 gpm shortfall for meeting peak day demands. If the rates estimated from the MEI initial pump tests can't be achieved through rehabilitation, pump lowering, and pump upsizing, then supplemental wells completed in the Laramie-Fox Hills aquifer will be necessary, at

significant additional costs. We assume that the costs to provide supplemental supplies to meet North Tree demands would be borne by the applicant.

Based on the 2026 well testing evaluation, rehabilitation and optimization of the existing Laramie-Fox Hills wells may provide sufficient source capacity to support initial phases of the proposed annexation if the Town Board approves use of its water rights to partially serve the North Tree property. Assuming successful rehabilitation of the Laramie-Fox Hills wells, the Town may be able to serve approximately 250 to 300 SFEs in North Tree while maintaining reasonable operational flexibility. However, as a standalone supply, the economically-available water beneath the annexation property is only 21.7 ac-ft/yr, which can only serve 62 SFEs. These data clearly show that the North Tree annexation development plan cannot be served solely with existing Town Laramie-Fox Hills aquifer wells, even if the Town Board approves use of the Town's approved water rights to serve some of the North Tree demands.

An additional issue is that water supply redundancy becomes increasingly limited as development progresses. Therefore, planning, permitting, and design of an additional municipal production well should begin during the early phases of development, and the level of new well development will depend on a number of factors related to the long-term yield of the existing wells. A minimum of one new well will need to be drilled and completed that would provide a minimum of 66 gpm of reliable yield. It is estimated that the cost to complete an additional well, likely completed in the nontributary Arapahoe aquifer, would cost in the range of $1,800,000 to make operational.

In addition to the work that needs to be completed on the existing Town Laramie-Fox Hills aquifer wells, to allow for the potential necessary development of an Arapahoe aquifer well (as well as other future wells) beneath the North Tree property, we recommend that one well site easement be included in the development plan of a minimum of 1.5 acres to be consistent with Town Ordinance 2026-12. The easement needs to be of a shape and slope to allow full ingress and egress across the entire site and is compatible for drilling deep bedrock wells within the easement. Approval of the site by the Town should precede any acceptance of the well site easement.

3. INFRASTRUCTURE CAPACITY EVALUATION

The Town has not seen recent significant growth, therefore, the annexation of the North Tree property represents a significant addition to not only the Town's water supply capabilities as described in **Section 2**, but also to the water supply distribution and storage requirements and the wastewater treatment needs.

3.1. Water Distribution System Evaluation

3.1.1. Distribution System Evaluation and Modeling

The existing water distribution system in Calhan consists of PVC water mains that primarily range in size from 4-inch to 10-inch in diameter. Kimley-Horn developed a hydraulic model of the Town's water distribution system with Bentley WaterCAD software. Kimley-Horn's model writeup describing the modeling process and results is included in Appendix B.

3.1.1.1.Distribution System – Maximum Day Analysis

The review of the WaterCAD model is intended to provide an independent assessment of the assumptions and results. Following discussions after initial model review, the model was updated to show water demand in the proposed annexation area to reflect 0.35 acre-feet per year per dwelling unit. The model demonstrates that the maximum day demand described in Section 2.1 can be met within the combined existing and proposed annexation area. The model showed system service pressures ranged between 53-96 psi with a maximum velocity in the piping at 0.99 ft/s.

3.1.1.2.Distribution System – Fire Flow Analysis

A fire flow analysis was performed in addition to the maximum day analysis discussed above to evaluate if fire flow demand requirements could be met with the proposed annexation connections. A fire flow condition of 1,500 gpm at 20 psi residual pressure was used for this evaluation.

The analysis was first run in the model on the existing system without any new connections to the proposed annexation. The model showed existing fire flow deficiencies in the Town that fail to meet the 1,500 gpm at 20 psi fire flow requirement. These deficiencies shown in the model are known to exist in the system as demonstrated by actual fire flow testing. The model appears to be calibrated accurately as it shows the known fire flow deficiencies in the existing system.

Fire flow modeling with the proposed annexation area included shows that all nodes in the proposed development meet the fire flow requirement of 1,500 gpm at 20 psi. These conditions were evaluated with two 8" pipe connections to the existing Town distribution system. The model results show two additional hydrants in the existing town system fell short of the fire flow demand when the proposed annexation connections are added. Closer examination of these two additional deficiencies showed that these locations were short of the fire flow requirement by 3 gpm in the software model. This would be within the measurement accuracy of physical fire flow testing and is not cause for any further concern. The model demonstrates that two 8" connections to the existing Town distribution system would not require any other changes to the distribution system.

3.1.1.3.Distribution System – Connection Points to Existing System

The initial model presented showed two connections off the same leg crossing 3rd Street. This single point of connection would create a common point of failure for the annexed area. Following discussions with Kimley-Horn based on the initial model review, two alternative connection points were identified. Kimley-Horn re-configured the model to present both alternative connection points. Alternative 1 shown in Appendix B is an 8-inch connection at Highway 24 near the intersection of 8th Street. Alternative 2 is an 8-inch connection at 4th Street that is also shown in Appendix B.

No changes would be required to the existing Town distribution system would be needed other than the two 8" connections shown in the two alternatives evaluated. The developer will need to further evaluate the feasibility of the two connection points that were identified.

3.1.2. Water Storage Evaluation

The Town currently has an existing water storage of 700,000 gallons consisting of two storage tanks. As seen in **Figure 1**, there is the Hahn tank that has a storage of 350,000 gallons and a second storage tank with 350,000 gallons of storage. With the proposed annexation water usage will increase and the need for more storage will need to be evaluated.

The average day demand and max day demand developed in Section 2.1 were used to evaluate the system storage capacity.

$$Average\ Day\ Demand = 171\ \frac{gal}{min} = 246{,}240\ \frac{gal}{day}$$

$$Maximum\ Day\ Demand = 341\ \frac{gal}{min} = 491{,}040\ \frac{gal}{day}$$

Multiple factors are considered total required storage; the three primary components are to meet the hourly variations in water demand for equalization storage, fire storage, and emergency storage.

Based on historical water system documentation for the Town, the equalization storage was defined as 30 percent of maximum daily demand. This results in an equalization storage volume of 147,312 gallons.

$$491{,}040\ gal * 0.3 = 147{,}312\ gal$$

Emergency storage is the storage that is available when the normal distribution system is disrupted, an example of this is a power outage. Typically, outages last no more than a couple of hours but an extreme emergency event could cause an outage that would last a full 24-hour timeframe. To accommodate this event, the emergency storage should match the average daily demand of 246,240 gallons.

Fire storage is the portion of the total water storage that is needed for firefighting. Based on historical water system documentation for the Town, the fire flow needed for the Town is 1,500 gpm. Using the fire flow and assuming the need for at least three hours of firefighting capacity, the fire storage would be 270,000 gal.

$$1{,}500\frac{gal}{min} * 180\ minutes = 270{,}000\ gal$$

Combining equalization, fire, and emergency storage cumulates to a total required storage of 632,066 gal.

$$147{,}312\ gal + 246{,}240\ gal + 270{,}000\ gal = 632{,}066\ gallons$$

The Town's existing storage capacity is 700,000 gal, therefore, based on these calculations, the existing storage tanks provide enough capacity to accommodate the future population of 1,930 with the proposed annexation. This storage scenario does not provide for any redundancy when one tank needs to be taken offline for service. Further evaluation of future storage for redundancy is recommended.

3.1.3. Automation, Controls and Emergency Power

The wells and storage tanks for drinking water distribution in Calhan are operated manually. The only well that has some degree of automation is the Railroad well and only one of the tanks has level monitoring. None of the wells has permanent generators, so the Town would need to rely on portable generators in the event of an extended power outage. It's recommended that the system be upgraded to improve automation and emergency power to provide better reliability and operation.

3.1.4. Water System Recommended Improvements

Based on the evaluation completed as part of this assessment, MEI recommends an initial project that focuses on rehabilitation and optimization of the existing groundwater supply system that includes Railroad Well, Gordon Well, & Tower. As development progresses, a new municipal production well should be planned, permitted, and constructed to provide additional source capacity and system redundancy necessary to support future growth associated with the proposed annexation.

The existing water storage system consists of two 350,000-gallon storage tanks providing a total storage capacity of 700,000 gallons. Based on the projected future demands, the existing storage volume is sufficient to accommodate the proposed annexation. No additional storage improvements are recommended at this time. However, the current configuration does not provide full redundancy when one tank is removed from service for maintenance.

Review of the hydraulic model prepared by Kimley-Horn indicates that the existing distribution system can serve the projected water demands associated with the proposed annexation. The primary water distribution improvements are associated with providing connections between the proposed development and the existing Town system.

3.1.5. Opinion of Probable Cost

Planning-level opinions of probable cost for the recommended water supply improvements are summarized in **Table 2**.

Table 2 - Planning-Level Opinions of Probable Cost-Water Supply

Improvement	Estimated Cost
Railroad Well Rehabilitation	$200,000
Gordon Well Rehabilitation	$200,000
Tower Well Rehabilitation	$200,000
New Production Well	$1,860,000
SCADA/Controls Upgrades	Current Project being Completed

Back-up Power	$100,000
TOTAL	**$2,560,000**

3.2. Wastewater System Evaluation & Treatment

As with the water supply infrastructure assessment, the capacity of the wastewater treatment system was evaluated to determine whether improvements will be needed to accommodate the proposed annexation. The existing wastewater collection system and location of the treatment facility is shown in Figure 3.

3.2.1. Existing Wastewater Treatment Conditions

The existing wastewater treatment facility was constructed in 1995. At the entrance to the facility, the influent wastewater flows through a Parshall flume with 6-inch width and 24-inch sidewall height. The flume has flow measuring equipment, including an ultrasonic type of level sensor and a remote flow indicator, totalizer and recorder.

The influent flow goes through a screening process that consists of three (3) manual bar screens, and each bar screen is 24-inches wide and 45-inches high. From there the flow enters an earthen-lined basin. The basin is equipped with a 15-horsepower Aqua-Aerobics "Aqua-Jet" floating aerator to break down the organic materials in the wastewater. The flow is then sent to a similar aerated earthen lined basin for the flow to go through an equivalent biological process. The flow then enters a third earthen lined basin. The purpose of this basin is to settle suspended solids from the water. Each basin has an approximate surface area of 10,420 square feet ("ft^2"), an overall depth of 12 ft and a total approximate volume of 458,000 gal.

Once the flow is processed through the basins it goes to a gravel filtration pond. The pond utilizes gravel media ranging from ¾-inch to 2-inches in diameter. The media depth is approximately 36 inches, with an average media surface area of 25,350 ft^2 and a total media volume of approximately 76,000 cubic feet ("ft^3"). A note to add is the existing pond is the probable cause of the effluent flow being significantly smaller in quantity compared to the receiving influent as the pond has a possible large infiltration rate occurring due to it not being lined. Regardless of the annexation process, it is our opinion that this leakage from the gravel infiltration pond should be minimized.

After filtration, the wastewater is sent to the disinfection station where the flow is disinfected with a sodium hypochlorite dosing system. The flow through the disinfection process is given a contact time through buried piping. The effluent flow is measured though a Parshall flume located in the disinfection building with a level sensor for recording and calculating flow. **Table 3** depicts flows measured at the wastewater facility from January 2025 to December 2025. Both influent and effluent flows are shown, which indicates losses could be as large as 56 percent. These losses are illustrated in **Figure 4** where the effluent flow is significantly lower than the influent. This is suspected to be due to potential leakage from the gravel filtration pond and evaporation from the pond and the three (3) earthen basins.

Table 3 - Existing Wastewater Facility Flows

Month	Influent 30 Day Avg (MGD)	Effluent 30 Day Avg (MGD)
Jan-25	0.05910	0.04955
Feb-25	0.06185	0.05211
Mar-25	0.05889	0.04366
Apr-25	0.05772	0.04460
May-25	0.05521	0.03296
Jun-25	0.05677	0.03331
Jul-25	0.06163	0.02702
Aug-25	0.05989	0.03001
Sep-25	0.05636	0.02961
Oct-25	0.05450	0.03577
Nov-25	0.05865	0.03737
Dec-25	0.05812	0.04283

Figure 4 displays the influent and effluent flows compared to the permitted capacity. As shown in **Figure 4**, the existing system is below the permitted hydraulic capacity of 0.08 million gallons per day ("MGD"). The average influent flow for 2025 was 0.60 MGD, which is 75 percent of the permitted capacity.

Graph 1 - Measured Wastewater Flows Relative to Permitted Capacity

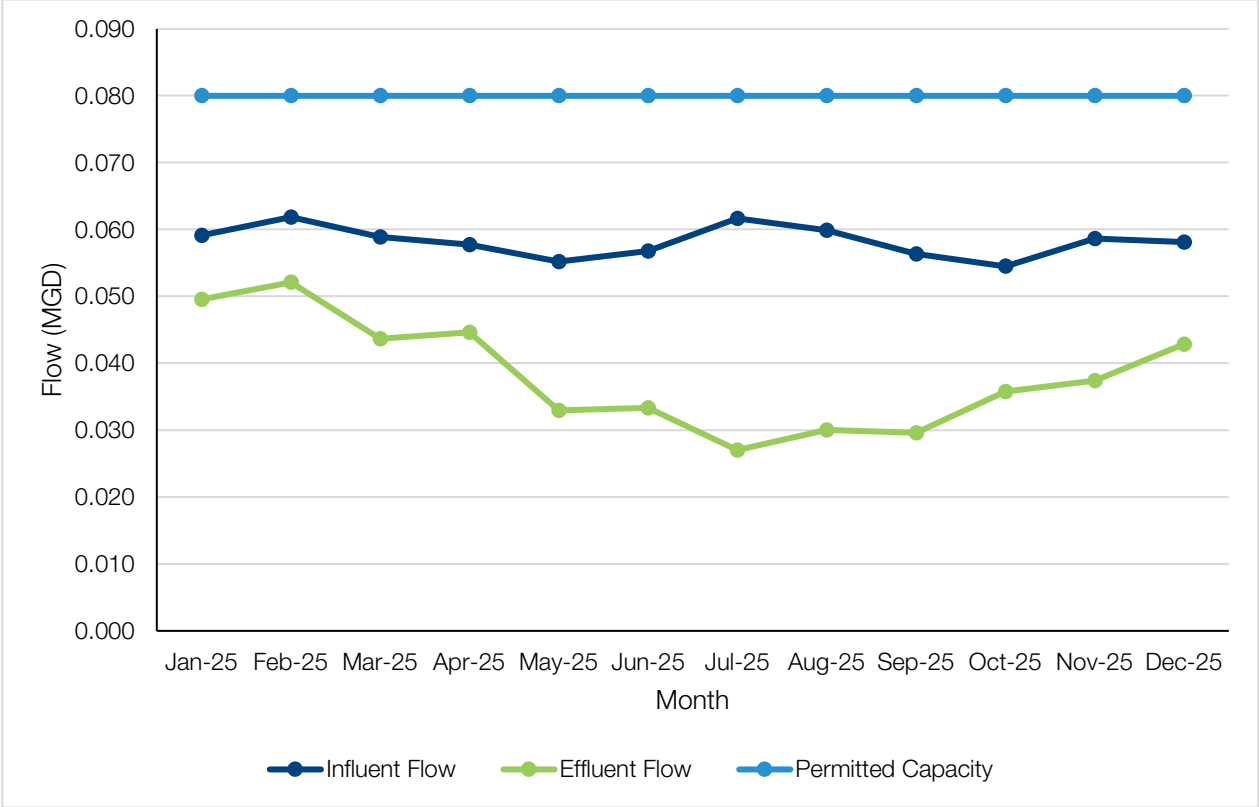


Table 4 depicts the monthly influent biochemical oxygen demand ("BOD") load during 2025.

Table 4 - Wastewater Facility Organic Load

Month	Influent BOD load (lb/day)
Jan-25	84.02
Feb-25	123.68
Mar-25	111.86
Apr-25	128.34
May-25	165.33
Jun-25	99.35
Jul-25	115.70
Aug-25	96.58
Sep-25	99.66
Oct-25	115.75
Nov-25	93.54
Dec-25	120.48

Figure 5 provides a comparison of the measured organic loads compared to the current permitted limit. As shown in **Figure 5**, Calhan's influent BOD load is below their current permit limit of 170 pounds per day ("lbs/day") throughout the whole year. The BOD load in May; however, is very close to the limit, measured at a load of 165.33 lbs/day. This was the result of a measured concentration of 371 milligrams per liter ("mg/L"), which is significantly higher than the average concentration of 237 mg/L. It's assumed that this reading was an anomaly and not typical of domestic wastewater. The organic capacity of the facility was approximately 66 percent of the permitted capacity in 2025.

Graph 2 - Measured Organic Loads Relative to Permitted Capacity

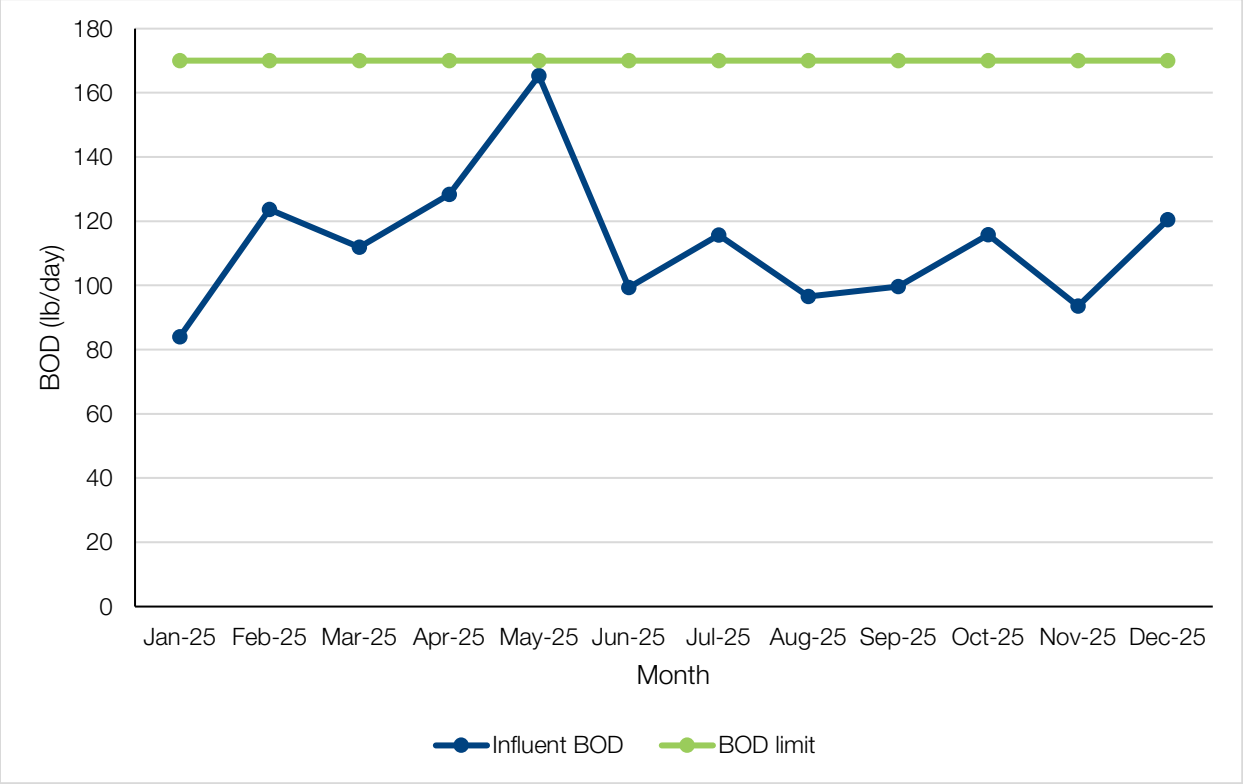


Table 5 shows the existing and future permit limits the Town's wastewater treatment facility will have to meet.

Table 5 - Current Town Wastewater Effluent Permit Limits

Parameter	Current Permit Limit (until 2/28/2029)	Future Permit Limit (beginning 3/1/2029)
Flow, MGD (30-day Avg)	0.08	0.08
BOD, mg/L (30-day Avg)	30	30
TSS, mg/L (30-day Avg)	75	75
pH (Daily Max)	6.5-9.0	6.5-9.0
E. Coli, no/100 mL (30-day Avg)	443	126
Total Residual Chlorine (30-day Avg)	0.5	0.011
Total Inorganic Nitrogen (Daily Max)	50	10
Total Ammonia, mg/L as N (30-day Avg)	7.2 to 52.0(varies by month)	3.0 to 7.0(varies by month)

3.2.2. Required Future Wastewater Treatment Capacity

The existing wastewater treatment plant is near its useful capacity and could only support a limited number of new connections. The Colorado Department of Public Health and Environment ("CDPHE") requires facility planning for capacity expansion when wastewater flows and loads exceed 80 percent of the permitted capacity. The existing flows are at 75 percent, which indicates that planning for expansion would need to begin soon. With the pending North Tree annexation,

we recommend that this process needs to start as soon as if, and when, the annexation is approved by the Town Board.

Annual average daily wastewater flows in 2025 were approximately 60,000 gpd. Based on the current population of 763, the average wastewater generation rate per person is 76.3 gpd. This generation rate was used to project the additional capacity needed. Based on an estimated occupancy rate of 2.5 person per SFE, with an additional population of 1,167 (467 SFEs * 2.5) in the proposed annexation, the additional treatment capacity needed would be 89,100 gpd. This results in a total projected average annual wastewater flow of approximately 150,000 gpd. Additional capacity needs to be provided above this flow to allow for related commercial development, wet weather flows and potential future growth. An additional 25 percent capacity was added to the target design flow. We have projected that the design wastewater flow rate should be 200,000 gpd.

3.2.3. Wastewater Treatment Plant Expansion Options

The proposed annexation plan will approximately double the required capacities for the wastewater treatment system. To accommodate the expansion, there are three (3) alternatives MEI has considered. The first alternative would be expanding the existing system per the original plans. The second alternative would remove all existing processes and not have a treatment system and instead construct evaporation ponds. The third alternative is to construct an additional three earthen basins to the existing system. Each of these options is described in the following sections.

3.2.3.1. Alternative 1: Aerated Lagoon System

The original design for the existing wastewater treatment plant included room to expand the system by adding three additional ponds and room for an additional constructed wetland treatment basin. Two of the new earthen basins would be installed with aeration processes and the third would act as a settling pond. The basins would work in parallel with the existing ponds.

This proposed expansion would provide a doubling of the existing capacity. Based on the existing permitted capacity of 80,000 gpd, this would provide a capacity of approximately 160,000 gpd, which would not be sufficient to serve the full proposed buildout of the North Tree property. A 2003 capacity evaluation prepared for the Town concluded that the physical capacity of the facility is 92,850 gpd. The Town did not pursue a re-rating due to additional and stricter effluent limits that would have been imposed as part of the process as the existing facility design would not accommodate the more stringent limits. It is not recommended to expand the capacity with more aerated lagoons and constructed wetlands because this process cannot meet the future effluent limits without additional treatment additions and modifications and even a doubling of the size of the treatment capacity would not be sufficient to fully serve the Town and the North Tree property.

3.2.3.2. Alternative 2: Evaporation Ponds

The evaporation ponds alternative for the wastewater system would replace the existing treatment with evaporation ponds that would not require a surface discharge of treated water. The Town recently acquired land that is shown in **Figure 3** that could provide additional area to construct evaporation ponds.

A high-level review of the approximately fifty acres recently acquired by the Town indicates that the existing wetlands on the property and the need for multiple ponds would not provide sufficient area to match the existing capacity of the treatment facility. Preliminary calculations indicate that 45.6 acres of pond area would be required to approximately match the current 80,000 gpd permitted capacity. This area does not include the area required for dikes between multiple ponds and any set-back requirements. Additional land area would be required to match the current permitted capacity, and more area would be needed to meet the additional capacity needed to serve the proposed annexation. The estimated pond area needed to provide a design capacity of 200,000 gpd is around 114 acres plus additional area for dikes, access roads and setbacks. Therefore, it is not recommended that this option be pursued if the wastewater treatment capacity needs to be expanded to serve the North Tree annexation property.

3.2.3.3. Alternative 3: Mechanical Package Plant

The mechanical, package plant alternative consists of replacing the existing treatment system with a mechanical treatment plant that would consist of an extended aeration process that would include an anoxic tank with recycle pumps to remove nitrogen. The package plant would be constructed of steel with integrated pumps and blowers. This type of treatment system would require a higher level of operator certification due to the nitrogen removal and more complex treatment process.

The package plant approach would allow for the capacity to be expanded in stages. An initial package plant with a capacity of 100,000 gpd would provide sufficient capacity to serve the existing population and allow for construction of an initial portion of the proposed annexation. The packaged treatment plant would also be capable of meeting the more stringent effluent limits. A second parallel 100,000 gpd package treatment train would provide capacity for the remaining proposed annexation homes. It would allow for commercial growth, wet weather flows and other residential growth. As such, if the Town approves the annexation of the North Tree property, we recommend that the mechanical package plant option be pursued.

3.2.4. Wastewater Treatment Recommended Improvements

Based on the existing facility evaluation and projected wastewater demands associated with the proposed annexation, improvements to the wastewater treatment system will be required to provide sufficient treatment capacity and maintain compliance with future discharge permit requirements. The existing treatment facility currently operates at approximately 75 percent of its permitted hydraulic capacity and will require expansion to accommodate future growth associated with the proposed annexation. MEI recommends a new mechanical package treatment plant as the preferred long-term solution. This option provides sufficient treatment capacity for the proposed annexation, can be expanded in stages as development progresses, and can satisfy future discharge permit requirements than expansion of the existing lagoon-based treatment process.

Review of the proposed annexation will not impact the Town's existing collection system infrastructure. A dedicated sanitary sewer main is proposed to convey wastewater flows from the proposed annexation directly to the Town's wastewater treatment facility. Based on the available

information, upgrades to the existing collection system are not anticipated at this time. Expected improvements are limited to treatment capacity expansion and construction of the new collection system extension serving the annexation area.

3.2.5. Opinion of Probable Cost

The wastewater improvements consist of expanding capacity of the wastewater treatment system. It is assumed that the existing collection system infrastructure won't be affected. Cost estimates for wastewater treatment improvements are shown in **Table 6**.

Table 6 - Planning-Level Opinions of Probable Cost-Wastewater Treatment

Improvement	Estimated Cost
Package WWTP	$6,730,000
Collection System Improvements	$0
TOTAL	$6,730,000*

*Cost for full 200,000 GPD capacity at buildout.

3.3. Stormwater and Drainage Evaluation

MEI reviewed the proposed annexation area and Kimley-Horn's work on drainage to evaluate potential impacts on stormwater management and drainage infrastructure. This section summarizes the findings of that review.

3.3.1. Existing Stormwater Drainage Conditions

A creek runs through the Town from south to north, where it joins the Big Sandy Creek River which flows 200 miles to join the Arkansas river. The proposed development consists of 90 acres situated on the northeast side of town, north of highway 24. Existing land use is grassland pasture. There is a 38-acre portion of land to the west of the lot that flows through the project area, making total drainage area 128 acres. During storm events, water flows from southwest to northeast, then travels east along McClasky Road, under McClasky Road's existing culvert, and discharges into the nearby creek.

3.3.2. North Tree Development Impacts to Stormwater Runoff

The proposed development will increase runoff volumes and discharge rates due to added impervious area, which prevents water from infiltrating into the ground, and decreases the time of concentration. This results in runoff events that yield both an increased volume of water, and a shorter time to the increased peak discharge rate. KH's preliminary analysis predicts an increase in runoff rate of up to 270% for 100-year storm events. When property is developed and/or changes the path of historical runoff, it triggers the requirement for a Drainage Report and Storm Water Management Plan. These are to be completed by Engineers that specialize in Stormwater design, following El Paso County and Mile High Flood District standards.

The purpose of the report and plan is to account for excess flows by one of two ways, 1.) if there are regional stormwater detention basins, the new development must have a conveyance system the safely transports the 100-year flow to the regional major storm system, or 2.) if there are not

regional stormwater detention basins, the development would need to store water from rain events up to 100 year and provide rate control to match existing conditions. In this scenario, onsite stormwater BMPs are required to provide rate control as no regional treatment systems exist. Drastic increases in runoff volumes or rates can have significant impacts to receiving waters and infrastructure if not considered in design. This could include, but may not be limited to increased erosion, more frequent road overtopping, culvert failures, and increased frequency and severity of flooding on downstream properties.

The increase in runoff rates can be managed using routing and storage techniques that comply with the El Paso Drainage Criteria Manual and the Mile High Flood District standards. With a combination of planned pervious areas, gutters, storm drain inlet, storm drainpipe, open channels, and storage basins, the excess water can be held on site and released slowly to prevent overloading the stormwater system. Using MHFD tools, the KH analysis predicts a preliminary conceptual pond footprint of approximately 4 acres would provide an outflow rate of 105 cfs, which is a 40% reduction of existing peak outflow from the 100-year storm event.

The preliminary detention pond design assumes the entire 128-acre drainage area contributes runoff to the pond, providing a conservative basis for estimating storage requirements. However, KH estimates approximately 27 acres of the total drainage area will discharge offsite rather than contribute flow directly to the pond. Therefore, the proposed pond sizing represents a preliminary, conservative estimate and will be refined during subsequent design iterations as drainage patterns and contributing areas are further evaluated. Based on preliminary analysis, KH recommends location the detention pond either near the center of the property, or in the northeastern portion of the site.

Table 7 - Existing VS Proposed Flow Rate

	Max Dircharge Rate (cfs)	Velocity (ft/s)
Existing	**181**	**Not Available**
Proposed	**106**	**4.2**

Table 8 - Preliminary Pond Data

	Volume Inflow (ac-ft)	Max Pond Storage (ac-ft)	100-year discharge rate (cfs)	Pond surface area (ac)
Proposed Pond	18.6	14.741	106	4.0

The volume of runoff will increase as a result of the proposed development, which, if not adequately managed, may exacerbate existing drainage and flooding concerns in downstream areas. The map of 1% annual chance flood hazard from the Town of Calhan Comprehensive Plan shows potential impact areas. The Plan identifies potential impacts, including road overtopping from undersized culverts, stream back erosion, high-water levels from insufficient creek storage capacity, and pooling and ponding.

In order to decrease risk, in addition to a stormwater pond that stores excess volume controls discharge rate to match preexisting conditions, improving the infrastructure along the existing creek (roads, culverts, bank stability), and increase volume that stream can hold, would mitigate against potential flooding concerns downstream of the development.

3.3.3. Stormwater Management Recommended Improvements

The overall goal of stormwater management for developed areas is to minimize the difference between pre-development and post-development runoff conditions. Stormwater planning should be initiated during the earliest phases of development to identify appropriate locations and sizing requirements for detention facilities and other stormwater infrastructure before the site layout is finalized.

A regional detention facility should be considered to provide stormwater storage and rate control for the development; however, alternative management strategies may also be evaluated during final design. If regional detention is not feasible, additional improvements to the downstream drainage system may be required to safely convey increased runoff volumes and maintain existing levels of service.

Potential improvements could include culvert replacements, channel and creek capacity enhancements, additional flood storage facilities, roadway improvements, regional detention facilities, or other drainage conveyance improvements. **Table 9** below presents costs estimates for potential improvements to drainage that would be needed along McClasky Road.

Table 9 - Planning-Level Opinions of Probable Cost-Stormwater Management

Improvement	Estimated Cost
36” RCP Culvert Upgrade and Drainage Improvements	$500,000
TOTAL	**$500,000**

3.4. Transportation Assessment

Moore Engineering reviewed the Traffic Impact Study prepared by Kimley-Horn for the proposed North Tree Annexation and generally concurs with the projected traffic volumes, operational analysis, and recommended roadway improvements identified in the study. The study evaluated the impacts associated with approximately 467 single-family residential lots and concluded that the proposed development can be accommodated within the existing and future roadway network with implementation of select intersection improvements. The transportation exhibits provided by Kimley-Horn showing the proposed improvements are included with this report in **Appendix C**.

The Transportation Impact Study prepared by Kimley-Horn concluded that the surrounding roadway network is expected to accommodate traffic associated with the proposed North Tree Annexation while maintaining acceptable operating conditions with implementation of recommended improvements. The study identified construction of an eastbound left-turn lane at the intersection of US-24 (5th Street) and Crystola Street/8th Street as the primary transportation improvement and recognized the need for future access permitting and coordination with CDOT

for connections to US-24. The findings generally support the broader transportation planning efforts completed by the Town and HR Green's planning work, which emphasize maintaining safe access, preserving local roadway connectivity, and planning for future transportation improvements as growth occurs north of US-24.

Moore Engineering also reviewed comments provided by the Colorado Department of Transportation (CDOT) regarding the proposed annexation. In addition to the eastbound left-turn lane identified in the traffic study, CDOT recommended consideration of a westbound right-turn deceleration lane and a southbound right-turn deceleration lane at the US-24 and Crystola Street intersection. CDOT further noted that the existing five-leg intersection formed by US-24, Crystola Street, and 8th Street may present long-term operational and safety concerns as traffic volumes increase and future development occurs.

Beyond the transportation improvements identified in the Traffic Impact Study, the Town's Comprehensive Plan and previous planning efforts identify several potential roadway improvements intended to support future growth and improve community connectivity. These include improvements along McClasky Road, enhancements to the Yoder Street corridor extending north from US-24, other roadway network improvements intended to enhance local connectivity and support future development. As development occurs, additional transportation improvements may be warranted to support future traffic demands and roadway connectivity objectives. The Town should continue evaluating these corridors through future development review and transportation planning efforts to determine the appropriate timing, extent, and funding responsibilities for implementation.

Consistent with the Town's Comprehensive Plan, future evaluation of a roundabout alternative at the US-24, Crystola Street, and 8th Street intersection may also be warranted as traffic volumes increase and intersection improvements are further refined.

3.4.1. Transportation Recommended Improvements

Based on the Transportation Impact Study prepared by Kimley-Horn, comments provided by CDOT, and Moore Engineering's review, transportation improvements associated with the proposed annexation should focus on maintaining safe and efficient operations along the US-24 corridor while preserving local roadway connectivity within Calhan.

Moore Engineering concurs with the CDOT recommendation to construct additional turn-lane improvements at the US-24 and Crystola Street intersection to improve traffic operations, reduce vehicle queuing, and enhance overall intersection safety. In addition, the existing five-leg intersection formed by US-24, Crystola Street, and 8th Street presents operational challenges due to its skewed geometry and closely spaced approaches. As traffic volumes increase, the Town should continue evaluating intersection improvements that enhance safety, improve traffic operations, and maintain east-west connectivity along 8th Street.

Beyond the transportation improvements identified in the Traffic Impact Study, the Town's Comprehensive Plan and previous planning efforts identify several potential roadway improvements intended to support future growth and improve community connectivity. These

include improvements along McClasky Road, enhancements to the Yoder Street corridor extending north from US-24, and other roadway network improvements intended to enhance local connectivity and support future development. As development occurs, additional transportation improvements may be warranted to support future traffic demands and roadway connectivity objectives. The Town should continue evaluating these corridors through future development review and transportation planning efforts to determine the appropriate timing, extent, and funding responsibilities for implementation.

Consistent with the Town's Comprehensive Plan, future intersection improvements at the US-24, Crystola Street, and 8th Street intersection may include either conventional intersection modifications or a roundabout alternative. Both approaches have the potential to improve traffic operations, enhance safety, and support long-term connectivity objectives as traffic volumes increase. The ultimate intersection configuration should be determined through future traffic analysis, roadway design, coordination with CDOT, and consideration of the Town's transportation goals and community preferences.

3.4.2. Transportation Opinion of Probable Cost

Planning-level Opinions of Probable Cost were prepared for transportation improvements identified through the review of the Kimley-Horn Traffic Impact Study, CDOT comments, and the Town's planning efforts. Two potential improvement scenarios were evaluated, including a turn-lane/intersection improvement scenario and a roundabout alternative scenario.

Planning-level Opinions of Probable Cost were prepared for transportation improvements identified through the review of the Kimley-Horn Traffic Impact Study, CDOT comments, and the Town's planning efforts. Costs include the recommended US-24 turn-lane improvements, conceptual improvements at the Crystola Street/8th Street intersection, and a planning-level estimate of a roundabout alternative at the intersection of US-24, Crystola Street, and 8th Street.

Additional transportation improvements identified through the Town's Comprehensive Plan and broader planning efforts, including potential improvements along McClasky Road, the Yoder Street corridor extending north from US-24, and other future roadway network enhancements, have not been included in the Opinion of Probable Cost. The timing, extent, and responsibility for these improvements will depend on future development patterns, transportation needs, and Town priorities. As development occurs, the Town should continue evaluating these improvements through future transportation planning, annexation discussions, and development review processes. Cost estimates for two alternative scenarios of transportation improvements are shown in **Table 10** below.

Table 10 - Planning-Level Opinions of Probable Cost -Transportation

Scenario 1 – Turn Lane and Intersection Improvements	
Improvement	**Estimated Cost**
Hwy 24 Turn Lane Improvements	$1,330,000
Crystola Street Intersection Imp	$810,000
Local Street Connection Improvements	$750,000

TOTAL	**$2,890,000**
Scenario 2 – Roundabout Alternative	
Improvement	**Estimated Cost**
Single-Lane Roundabout at US-24/Crystola/8th Street	$6,000,000
Local Street Connection Improvements	$750,000
TOTAL	**$6,750,000**

4. SUMMARY

There are several Town infrastructure components that will be impacted by the annexation of the North Tree property, as it will essentially more than double the homes and population in the Town. Based on the information available to MEI, we have provided our analysis of how the Town's water supply wells, potable water distribution system, water storage, wastewater treatment system, stormwater management, and transportation infrastructure will have to be improved to accommodate the proposed annexation.

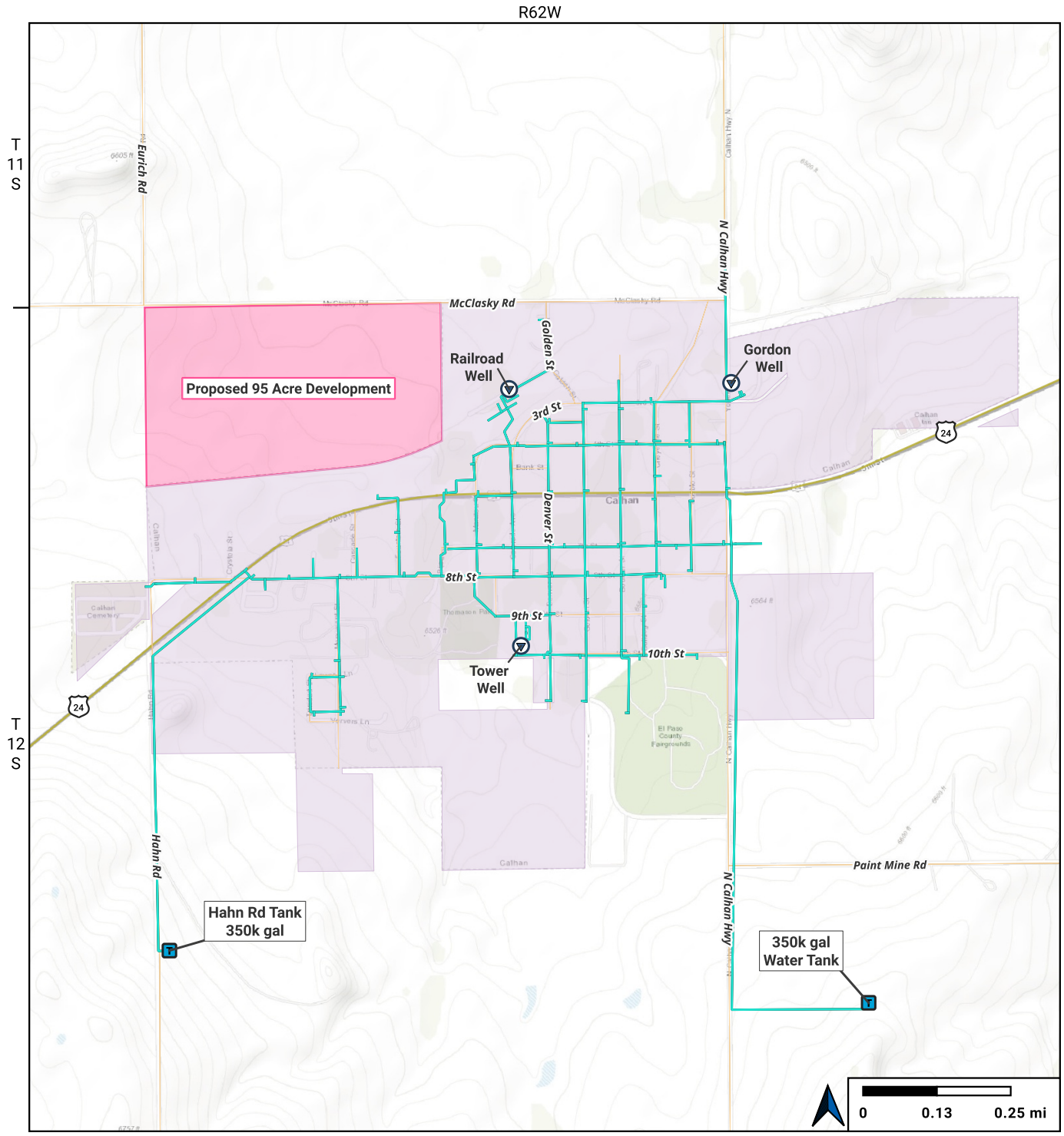
If you have questions regarding the evaluation of the potential impacts and costs related to the annexation of the North Tree property, please feel free to contact the undersigned. This assessment is subject to revision based on receipt of future information and input from the public, the Town Board, and the applicant."

_____	_____	_____
Kent Ritterman, PE	Jeremy Wurpts	Bruce A Lytle, PE
Senior Project Manager	Senior Professional Engineer	Market Leader

FIGURE 1 - WATER INFRASTRUCTURE MAP

moore engineering, inc.
a Vistal company

moore engineering, inc.
a Vistal company



LEGEND

- Well
- Water Tank
- Water Main
- Annexation Property
- Town of Calhan

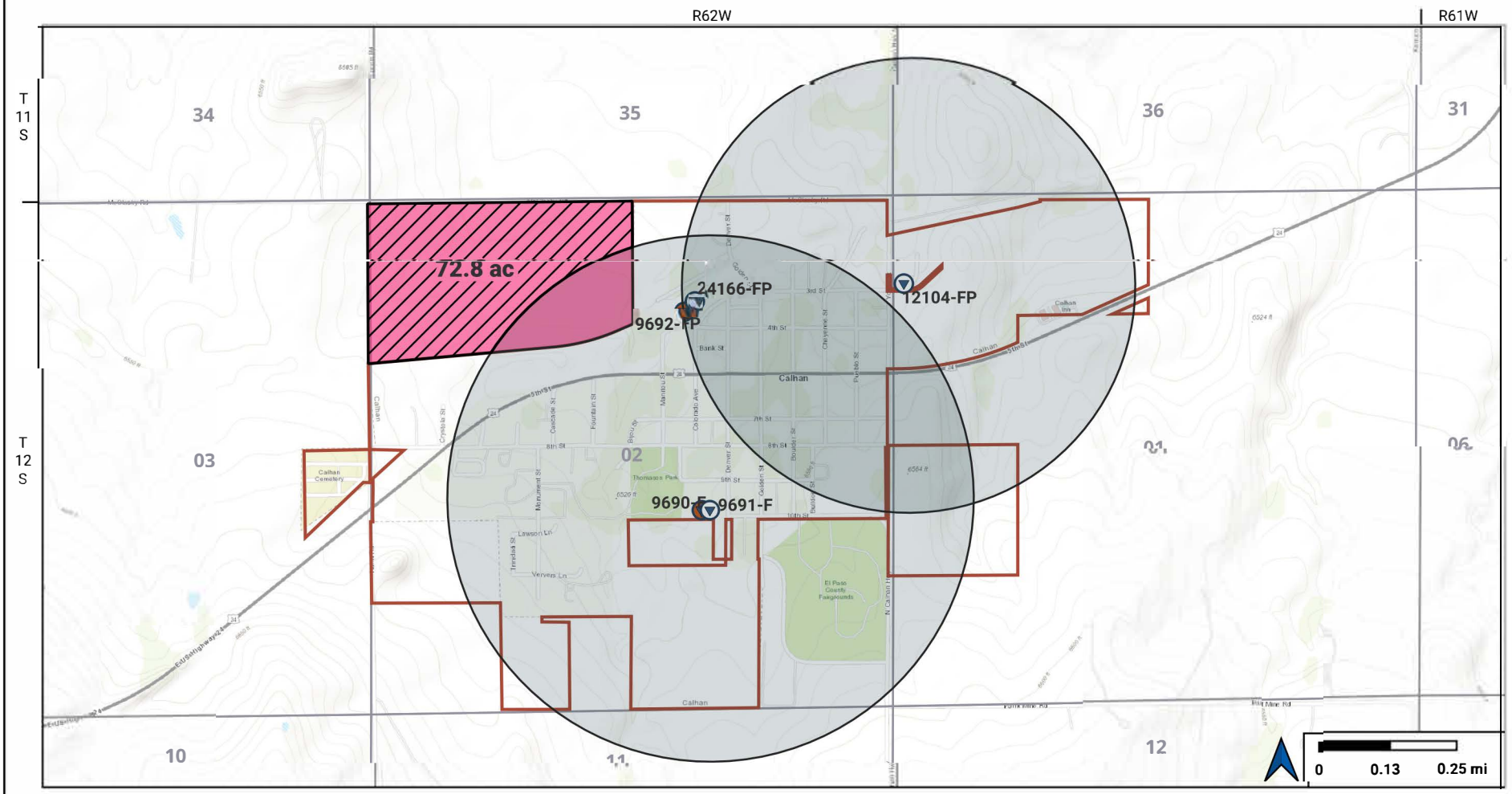
TOWN OF CALHAN

WATER INFRASTRUCTURE

File: Infrastructure.qgz - WaterMap		Date: 08/03/2026
Project No: 31289	Drawn by: CDH	Fig. No.: 1

FIGURE 2 - LARAMIE-FOX HILLS AQUIFER WELL PRE-SB213 CYLINDERS OF APPROPRIATIONS





LEGEND

Well Location
- Alluvial Aquifer
- LFH Aquifer

- Annexation Property Outside Pre-213 Cylinder
- Annexation Property
- Pre-213 Cylinder
- Town Boundary
- PLSS Section

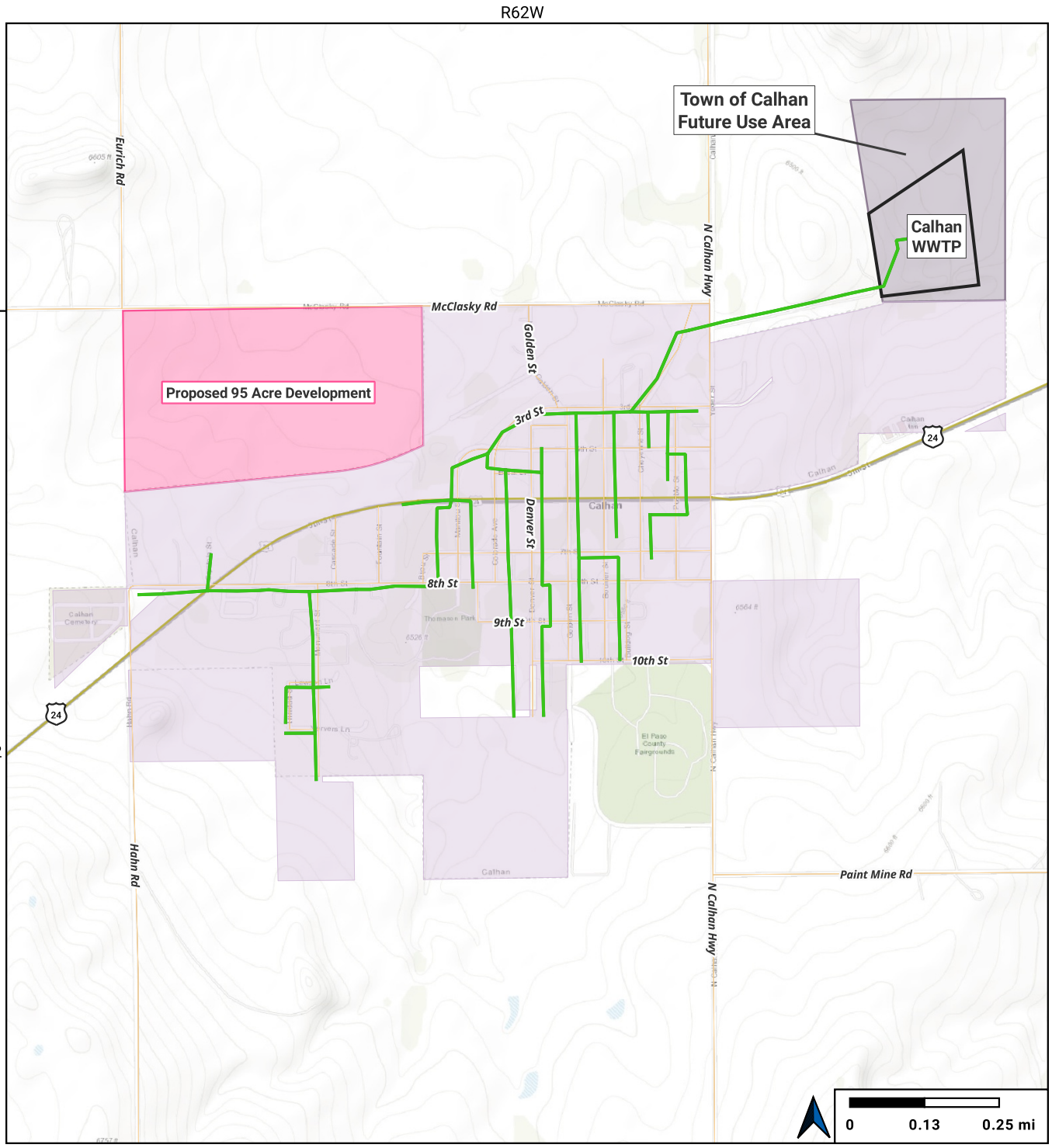
TOWN OF CALHAN

LARAMIE-FOX HILLS AQUIFER WELL PRE-SB213 CYLINDERS OF APPROPRIATIONS

File: Annexation - Pre-213Cylinders		Date: 03/24/2026
Project No: 24717	Drawn by: CDH	Fig. No.: 2

FIGURE 3 - SANITARY INFRASTRUCTURE MAP





LEGEND

- Sewer Line
- Wastewater Treatment Plant
- Annexation Property
- Town of Calhan

TOWN OF CALHAN

SANITARY INFRASTRUCTURE

File: Infrastructure.qgz - SewerMap		Date: 08/11/2026
Project No: 31289	Drawn by: CDH	Fig. No.: 2

APPENDIX A - NORTH TREE ANNEXATION WATER RESOURCES AND SANITARY SEWER REPORT



EXHIBIT E

NORTH TREE ANNEXATION

TOWN OF CALHAN
EL PASO COUNTY, COLORADO

WATER RESOURCES & SANITARY SEWER REPORT

AUGUST 7, 2026

Prepared by:

Kimley»Horn

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GENERAL LOCATION AND PROJECT DESCRIPTION

This Preliminary Utility Report covers the demands and design of the water and sewer services for the North Tree Single Family Development (herein referred to as "the Project/Site"). This report demonstrates that the proposed water and sanitary sewer infrastructure for this Project will be sufficient to service the development. Water and sanitary sewer mainlines will be owned and maintained by the Town of Calhan and fire protection will be provided by Calhan Fire Department.

SITE LOCATION

The Project Site is located in Northeast quarter of Section 2, Township 12 South, Range 62 West of the 6th Principal Meridian, City of Calhan, County of El Paso, State of Colorado (see Vicinity Map below). More specifically, the Site is generally bound by the following:

North:	McClasky Road
East:	Single Family / Golden Street
South:	Vacated Right-Of-Way
West:	Vacant Land

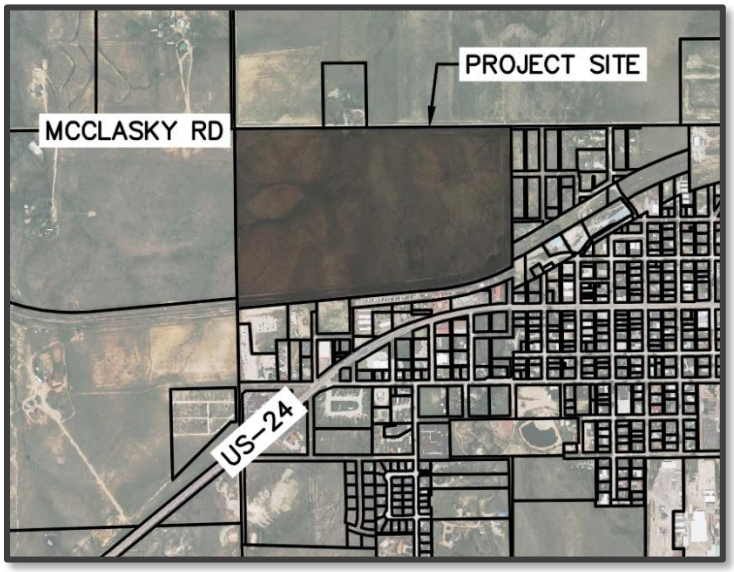


Figure 1: Vicinity Map (N.T.S.)

DESCRIPTION OF PROPERTY AND LAND USE

The entire North Tree Single Family Development consists of approximately 95.02 acres of land per the pending annexation into the Town of Calhan. The proposed development will consist of 467 single family homes and tracts dedicated to parks and a potable water well. Site improvements for the development include the construction of the aforementioned buildings, utilities, storm sewer, landscaping improvements, and internal private drives. Utility easements will be provided for utilities outside the public ROW as required by the utility agencies.

INFORMATION REGARDING SUFFICIENT QUANTITY OF WATER

WATER SYSTEM LAYOUT AND DEMANDS

The project site is currently undeveloped farmland with no existing potable water wells or on-site water supply. The proposed water service will be provided by a connection to the existing water main within the Town of Calhan's water system located in Crystola Street, south of the site.

Water demand was estimated based on the potential range per single family equivalent (SFE) provided by the Town's water attorney, 0.25-0.30 ac-ft/Yr/SFE. North Tree utilized the low end of the range, as the development consists of small-lot, compact, entry level homes. This development type is in line with the *Town of Calhan Comprehensive Plan 2035* that was unanimously approved by the Board in 2025.

Table 1: SFE Based Water Demand Calculations

User Type	Unit Count (Lots)	Irrigated Area (Acres)	Unit Demand (ac-ft/Yr/SFE)	Total Demand (ac-ft/Yr)	Total Demand (ac-ft/Day)	Total Demand (GPD)
Household	467		0.25	116.8	0.320	104,243
Park Irrigation		1.605	2.46	3.9	0.011	3,525
			Total	***120.7***	***0.331***	***107,768***

Park irrigation demand was estimated based on an irrigated area equal to 30 percent of the total 5.35-acre park area, with irrigation demand applied on a per-irrigated-acre basis. The SFE demand assumptions utilized are also in line with El Paso County's water demand generation factor of 0.26 ac-ft/yr/SFE. In addition to the water demand per household, North Tree also included estimation for park irrigation for a conservative estimate of anticipated total water demands for the development at full buildout.

AVAILABLE QUANTITY AND DEPENDABILITY OF WATER SUPPLY

Calhan holds water rights in four aquifers within the Denver Basin: Big Sandy Alluvial (BSA), Denver, Arapahoe, and Laramie-Foxhills (LFH). These aquifers include both not non-tributary and non-tributary groundwater sources, which are distinguished by the degree to which surface water influences aquifer recharge. The BSA and Denver aquifers are classified as not non-tributary, meaning they receive recharge from precipitation and surface water infiltration. The Arapahoe and LFH aquifers are classified as non-tributary, meaning they are confined, have limited connection to surface water, and recharge slowly; therefore, they are generally considered non-renewable sources. Because the BSA and Denver aquifers are renewable sources, withdrawals from these aquifers require replacement of at least 4 percent of the withdrawn volume to surface water bodies to supplement natural recharge. The Town has existing potable water wells in BSA and LFH only.

Testing on three existing permitted Town of Calhan wells was performed from late May to early June of 2026 by Moore Engineering and was observed by Kimley-Horn. The purpose of this testing was to assess available quantity of water supply using existing infrastructure and quality of water produced. As part of this testing, constant rate tests, step tests, and water quality tests were performed on the Railroad alluvial well (RRA), Permit No. 9692-F; the Railroad Laramie-Foxhills (LFH) well, Permit No. 24166-F; and the Tower LFH well, permit 9691-FR. Findings from the tests performed are summarized in **Table 2**.

Table 2: Summary of Water Availability from Moore Engineering Study

Well	Permit No.	Aquifer	Water Right		Tested Availability	
			(ac-ft/yr)	(gpm)	(ac-ft/yr)	(gpm)
Railroad Alluvial (RRA)	9692-F	Upper Big Sandy	77	48	Unknown	Unknown
Railroad	24166-F	Laramie-Foxhills	160	100	160+	100+
Tower	9691-RF	Laramie-Foxhills	175	109	45	30
Gordon	12104-FP	Laramie-Foxhills	127	70	Not Tested	Not Tested
Total			**539**	**327**	**200-225**	**120-140**

During testing, it was discovered that RRA well was not functional and had no pump installed due to its antiquated condition. Improvements, such as installation of new casing, submersible pump, or replacement of raw water lines can be completed along with further testing and evaluation to confirm the well's production capability. Similarly, it was found that the Tower LFH well had much lower production rates than outlined in Permit No. 9691-RF, likely attributable to degradation of the well since its installation in 1992. In contrast, the Railroad LFH well was able to produce water at rates exceeding its maximum permitted capacity at a high efficiency. Because the Railroad and Tower LFH wells are within close proximity of each other and pull out of the same aquifer, it is anticipated that the poor performance of the Tower LFH well is not due to poor aquifer conditions in the area and can instead be attributed to well degradation. Additionally, the Moore Engineering study found that the well pumps in both the Railroad and Tower LFH wells sit substantially above the bottom of each well.

In addition to the tested wells, the Town of Calhan also owns and operates a third potable water well within the LFH aquifer, the Gordon LFH well (Permit No. 12104-FP). Due to the variability in yield observed between the two tested LFH wells, the Gordon LFH well yield was not estimated as part of the study. However, the well is permitted to produce up to approximately 70 gpm. Further testing and evaluation will be needed to confirm the well's current production capability. Between the 3 currently operated LFH wells, as shown in Table 3, the Town of Calhan is permitted to draw a maximum of 462 ac-ft/yr. Based on the testing performed on the Tower and Railroad LFH wells, it is estimated that these two wells are capable of producing 200-225 ac-ft/yr. Based on the reported capability of the Gordon LFH well, it is estimated by Moore Engineering that the current LFH instantaneous production rate is likely in the range of 250-275 ac-ft/yr. This production rate may decrease with increased usage and degradation of the older wells.
The Moore Engineering report identified several solutions to maximize the currently permitted wells including:

- Evaluating rehabilitation and/or redrilling of the RRA and/or Tower LFH wells.
- Lowering the pumps in the Railroad and/or Tower LFH wells to create more favorable pumping conditions and potentially boost production.
- Testing the Gordon LFH well to confirm current pumping capacity.

Additionally, to increase potential water supply, the Town could also develop its existing Denver and Arapahoe water rights, of which there is anticipated to be 300 ac-ft/yr cumulatively available, not including the estimated supply associated with the proposed North Tree Annexation.

Table 3, below, shows the amount of single-family equivalents (SFEs) that could be supported under different water rights development scenarios. The first scenario assumes that the Town of Calhan water supply is equivalent to the estimated current capacity of the LFH wells. The second scenario assumes that the Town of Calhan is able to redrill or rehabilitate the current LFH wells to meet their full permitted capacity. The third scenario assumed that the Town of Calhan is able to utilize the full permitted supply from all 3 LFH wells and RRA. The fourth scenario assumes that the Town of Calhan is able to utilize the full permitted supply from all 3 LFH wells and RRA and is able to obtain and develop 300 ac-ft of annual supply from their currently undeveloped Denver and Arapahoe water rights. The fifth and final scenario assumes that, in addition to the supplies identified in scenario four, the Town is also able to develop the water rights that they would obtain during the annexation of North Tree, estimated to be 65 ac-ft/yr from the Denver and Arapahoe aquifers. It was assumed that 0.25 ac-ft/yr would be used for each compact, small-lot, entry-level unit proposed at North Tree.

Table 3: Calhan Potable Water System Capacity for New Single-Family Homes

Scenario	Available Supply (ac-ft/yr)	Current Town usage (ac-ft/yr)	Remaining Available Supply (ac-ft/yr)	Usage (ac-ft/yr/SFE)	Supportable SFEs
Current LFH Capacity	250	80	170	0.25	680
Permitted LFH	462	80	382	0.25	1,528
Total Active Permit	539	80	459	0.25	1,836
Total Active Permits + Current Town Owned Undeveloped Denver and Arapahoe rights	839	80	759	0.25	3,036
Total Active Permits + Current Town Owned Undeveloped Denver and Arapahoe Supply + Additional Denver and Arapahoe Supply from Annexation	904	80	824	0.25	3,296

INFORMATION REGARDING SUFFICIENT WATER QUALITY

During Moore Engineering's testing, water quality samples from the RRA and Railroad LFH wells were analyzed for primary and secondary drinking water MCLs, general cations/anions, and TDS. Results indicated that LFH water quality is generally better than the alluvial supply, with the Railroad LFH well meeting all tested MCLs and exhibiting low TDS. The RRA well showed manganese above the secondary MCL and elevated TDS, which are not anticipated to pose health concerns at current concentrations but may affect taste or cause staining. If alluvial supplies are developed, blending with LFH water is recommended to reduce manganese and TDS concentrations or additional treatment measures should be installed at the alluvia well sites.

SANITARY SEWER SYSTEM

EXISTING SANITARY SEWER SYSTEM

The project site currently consists of vacant farmland and does not have any existing sanitary sewer infrastructure. An existing wastewater treatment plant is located east of the site and would receive flows from the proposed development.

The wastewater treatment plant has a permitted hydraulic capacity of 0.08 MGD (80,000 GPD). Based on operational data from 2025, the facility generally operates between 68 and 78 percent of permitted capacity. Sustained flows above approximately 64,000 GPD (80 percent of capacity) would require coordination with CDPHE regarding capacity planning or system upgrades.

PROPOSED SANITARY SEWER SYSTEM

Wastewater generated by the development will be conveyed through proposed sanitary sewer infrastructure throughout the site before being collected by the existing infrastructure adjacent to the development and ultimately discharging to the existing wastewater treatment plant.

The proposed layout for the sanitary sewer system was determined by evaluating the existing grade, the flow direction in the areas of the proposed housing plots, and the existing sanitary sewer infrastructure.

In general, the existing grade facilitates flow towards the northeast corner of the site, towards the intersection of McClasky Road and proposed access point. The flow would then be collected into the proposed sewer main along McClasky Road, and flow eastward into the existing lagoon treatment facility.

The proposed sanitary sewer alignments were evaluated for feasibility using surveyed existing manhole elevations, existing grades, and proposed grading information. The layout was developed based on a minimum slope of 0.5 percent and a minimum cover of 7 feet. Based on the available data and applicable design criteria, the proposed alignment is feasible, and flows are anticipated to discharge directly to the treatment facility through the proposed piping without impacting the existing collection system.

SANITARY SEWER FLOWS

Sanitary sewer demand calculations were prepared under the assumption that 80 percent of the total household water demand would be returned to the sanitary sewer system. 80 percent of the unit water demand generation factor was implemented. Results from this calculation are shown in **Table 4**, below.

Table 4: EPC Land Development based Sewer Return Rate

User Type	Unit Count	Unit Demand	Total Average Daily Demand			
	(Lots)	(AC-FT/Yr/Lot)	(AC-FT/Yr)	(AC-FT/Day)	(GPD)	(MGD)
Household	467	0.20	93.4	0.26	83,394	0.08

EXISTING CAPACITY ANALYSIS

The Calhan WWTF operates under a permitted hydraulic capacity of 0.08 million gallons per day. Under its existing permit, current hydraulic capacity of the plant is calculated as a 30-day average. Based on available flow monitoring data, highest 30-day average capacity recorded at the facility was 0.0624 MGD, representing approximately 78 percent of the permitted capacity.

Per CDPHE regulations, when a wastewater treatment plant reaches 80 percent of its permitted hydraulic or organic capacity, a schedule for planning for a facility expansion must be developed unless it can be proven that the exceedance was an anomaly. The difference between 80 percent of the permitted hydraulic capacity and the current peak month hydraulic capacity is 2 percent, or approximately 0.001593 MGD (1,593 GPD). This represents the amount of flow that can be added from the proposed development before a plan to upgrade the wastewater treatment facility must be developed.

Per CDPHE regulations, when a wastewater treatment plant reaches 95 percent of its permitted hydraulic or organic capacity, a schedule for construction of a facility expansion must be developed unless it can be proven that the exceedance was an anomaly. The difference between 95 percent of the permitted hydraulic capacity and the current peak capacity yields a remaining available hydraulic capacity of approximately 0.01359 MGD (13,559 GPD). This represents the amount of flow that can be added from the proposed development before a schedule for construction for wastewater treatment facility upgrades must be developed.

The number of additional single-family residential units the facility could support within its existing permitting capacity before CDPHE would require the development of planning and construction timelines was estimated and results are shown in **Table 5**. To calculate these values, the aforementioned methods of calculating the projected sanitary sewer flows were utilized. On this basis, per the most conservative estimate calculated, the Calhan WWTF could support 7 single-family residential units before hitting 80 percent hydraulic capacity and 67 single-family residential units before hitting 95 percent hydraulic capacity. In other words, it is estimated that 7 single-family residential units could be brought online before design for an upgraded or new facility must be started and it is estimated that 67 single-family residential units could be brought online before construction of a new facility or existing facility upgrades must be started.

Table 5: Calhan WWTF Capacity for New Single-Family Houses

% Capacity of Existing Plant	Available Capacity (GPD)	SFEs before capacity reached
80%	1,593	8
95%	13,593	73

Note that these estimations are based solely on hydraulic capacity and do not take into account the permitted organic capacity. No exceedances of the permitted hydraulic or organic capacity were observed in the monitoring data provided from January 2025 to December 2025, however, data for the existing facility on the CDPHE website indicates that there have been several exceedances of the organic capacity limit in previous years. It is assumed that the prior exceedances were anomalies and that the hydraulic capacity of the existing WWTF is the limiting factor when analyzing available capacity.

CONCLUSION

Based on the available information, the Town of Calhan has sufficient permitted water supply to serve the proposed North Tree development, particularly if existing LFH sources are maintained, rehabilitated, or supplemented with undeveloped Denver and Arapahoe water rights. Current active water permits are estimated to support more than 1,800 additional SFEs, which exceeds the 467 SFEs proposed for the development. Available sanitary sewer treatment capacity is more limited, with the existing WWTF operating near the 80 percent planning threshold. Calhan is currently pursuing state grant funding for WWTF improvements, and newly installed flow meter data is being reviewed in coordination with Moore Engineering to verify treatment plant capacity. As a result, water supply appears adequate for the proposed development, while sanitary sewer capacity will require continued coordination, flow verification, and planning for treatment facility upgrades to support full buildout.

REFERENCES

How We Use Water, EPA, August 2025.

Town Of Calhan – Existing Water Lines, HR Green, August 2024.

Town of Calhan Comprehensive Plan 2035, HR Green, May 2025.

Water Master Plan, El Paso County, 2019 February.

Land Development Code, El Paso County, Revised February 2024.

Regulation NO. 43 - On-Site Wastewater Treatment System Regulation, State of Colorado, June 2025

APPENDIX B – KIMLEY-HORN WATER MODEL WRITEUP



EXISTING SYSTEM AND OPERATIONS

The Town of Calhan (Town) owns and operates a municipal potable water system that serves customers within the incorporated Town and surrounding service area. The system relies entirely on groundwater supplied by deep bedrock wells completed in the Laramie-Fox Hills Aquifer and shallow alluvial wells completed within the Big Sandy Creek alluvium.

Groundwater from the Town's wells is conveyed through the existing transmission and distribution system to residential and commercial customers. Water storage is provided by two 350,000-gallon storage tanks located southwest and southeast of Town. The tanks operate together within a single pressure zone and provide system balancing, operating storage, and support for fire-flow conditions. The Town distribution system primarily consists of 10-inch transmission mains from the tanks to the distribution system, and a variety of 4-inch – 8-inch diameter pipes within the system. The hydraulic model described below represents the existing wells, tanks, distribution mains, customer demands, and other appurtenances necessary to evaluate current system performance and the effect of the proposed North Tree development.

EXISTING LAND USE AND DEMANDS

Existing water use was evaluated using customer billing records provided by the Town for 2024 through August 2026. The billing records identified Church, Commercial, and Residential customer classifications. Because the Church and Commercial classifications exhibited similar water-use characteristics, they were combined into a single Commercial category for planning and hydraulic modeling purposes. The resulting customer inventory includes 54 Commercial units and 355 Residential units.

The demand analysis used billing data from 2025 and the available 2026 billing period through August because these datasets include summer irrigation use. The 2024 records did not include the summer irrigation period and were therefore not used to establish planning demands. Table 1 summarizes the billed water use used in the analysis.

Table 1 - Existing Customer Billing Summary

Existing Land Use Type	Number of Units	2025 Total Water Usage (Thousand Gallons)	2026 Total Water Usage (Thousand Gallons)
Commercial	54	5,774	3,823
Residential	355	20,289	24,376
Total		**26,063**	**28,199**

AVERAGE DAY DEMAND

Average day demand (ADD) planning values were developed separately for the Commercial and Residential customer categories. For each period, billed water use was normalized by the number of units and the applicable billing period. The calculated unit demands from 2025 and 2026 were then averaged and rounded upward to the nearest 25 gallons per day per unit (gpd/unit) to establish planning-level inputs for the hydraulic model. Table 2 presents the adopted ADD values.

Table 2 - Existing Unit Average Day Demands

Existing Land Use Type	ADD (GPD)
Commercial	300
Residential	225

MAXIMUM DAY DEMAND

Daily and hourly production or advanced metering data were not available to calculate a system-specific peaking factor. Accordingly, a planning-level ADD-to-MDD peaking factor of 2.0 was applied to the existing unit demands. This approach is appropriate for planning-level evaluation but should be revisited if daily production records or more detailed customer-use data become available. The adopted peaking factor and resulting maximum day demand (MDD) values are presented in Tables 3 and 4.

Table 3 - Existing System Peaking Factor

ADD to MDD Peaking Factor	2

Table 4 - Existing Unit Maximum Day Demand

Existing Land Use Type	MDD (GPD)
Commercial	600
Residential	450

FIRE FLOW

A required fire flow of 1,500 gallons per minute (gpm) was used for the planning-level evaluation of the existing system. Fire-flow availability was evaluated at existing modeled fire hydrants under the applicable demand condition. Available fire flow was defined as the

flow that could be delivered while maintaining a minimum residual pressure of 20 pounds per square inch (psi). The modeling results and locations that do not meet the adopted criterion should be summarized in the hydraulic model evaluation section of the final report.

PROPOSED LAND USE AND DEMANDS

The proposed North Tree development is anticipated to include 467 single-family residential dwelling units and approximately 5.35 acres of park area. For planning purposes, two residential demand scenarios were calculated and compared using the El Paso County planning criterion of 0.25 versus 0.35 acre-feet per year per dwelling unit. Park irrigation demand was calculated assuming that 30 percent of the park area, or approximately 1.61 acres, will be irrigated at a rate of 2.46 acre-feet per year per irrigated acre. These criteria form the basis of the two proposed development demands summarized below.

ADD

The calculated demands represent the total average day demand for the proposed development. The adopted single-family residential demand is approximately 223 gpd per dwelling unit. Table 5 and 6 summarize the proposed development ADD when using 0.25 versus 0.35 acre-feet per year per dwelling unit.

Table 5 - Proposed Development Average Day Demands (0.25 acre-feet per year per dwelling unit)

Existing Land Use Type	ADD (GPD)
Single-Family Residential	104,243
Park Irrigation	3,525
Total	**107,768**

Table 6 - Proposed Development Average Day Demands (0.35 acre-feet per year per dwelling unit)

Existing Land Use Type	ADD (GPD)
Single-Family Residential	145,941
Park Irrigation	3,525
Total	**149,466**

MDD

The proposed residential MDD was calculated by applying the same planning-level peaking factor of 2.0 used for the existing system. The peaking factor was not applied to the park irrigation demand because the irrigation estimate already represents the planned irrigation

requirement used for the model scenario. Table 7 and 8 summarize the proposed development MDD when using 0.25 versus 0.35 acre-feet per year per dwelling unit.

Table 7 - Proposed Development Maximum Day Demands (0.25 acre-feet per year per dwelling unit)

Existing Land Use Type	MDD (GPD)
Single-Family Residential	208,486
Park Irrigation	3,535
Total	**212,021**

Table 8 - Proposed Development Maximum Day Demands (0.25 acre-feet per year per dwelling unit)

Existing Land Use Type	MDD (GPD)
Single-Family Residential	291,882
Park Irrigation	3,535
Total	**295,417**

FIRE FLOW

Fire flow for the proposed system was assumed to be 1,500 GPM. Within the hydraulic modeling section below, this flow was evaluated at all existing fire hydrants to evaluate if a residual pressure of over 20 psi was feasible.

HYDRAULIC MODEL

MODEL CREATION AND CALIBRATION

A hydraulic model of the Town's potable water distribution system was developed in Bentley WaterCAD using water-main and facility information provided by the Town. The model includes the distribution piping, the two existing storage tanks, existing customer demands, and the proposed North Tree development demands. Pipe and junction elevations were assigned using United States Geological Survey light detection and ranging (LiDAR) topographic data. Modeled pipe elevations were established using an assumed burial depth of 5 feet below the ground surface.

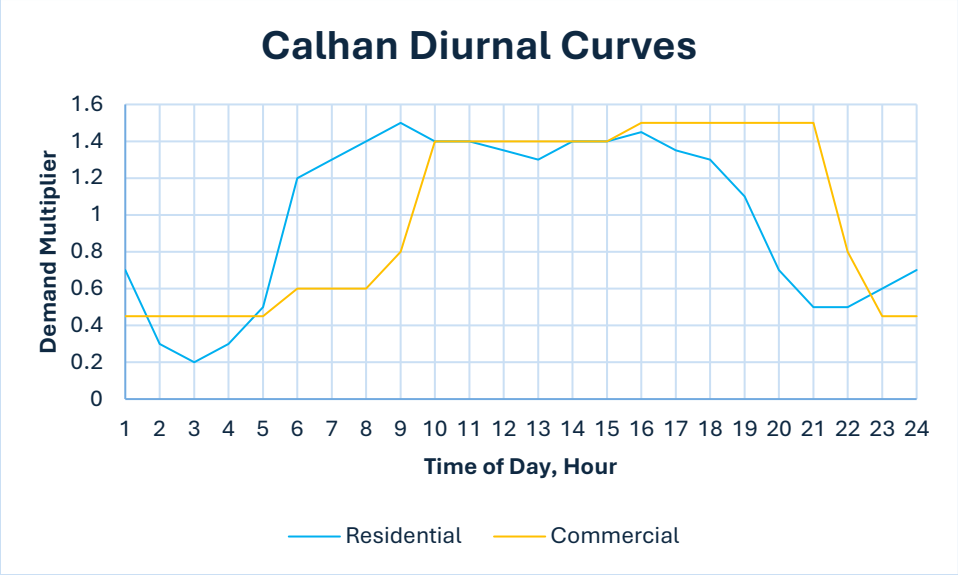
The existing storage tanks were represented using available tank geometry and operating-level information. Model connectivity, pipe diameters, facility settings, and boundary conditions were reviewed for consistency with the available mapping and system information. The model was calibrated using fire-flow testing completed in September 2026 and provided by the Town. Calibration consisted of comparing modeled static and

residual pressures with observed test pressures and adjusting uncertain model parameters, as appropriate, within reasonable engineering ranges.

DEMAND PATTERNS

Extended-period demand patterns were assigned by customer type to represent hourly variation in water use. The residential and commercial diurnal patterns were based on standard patterns presented in AWWA Manual M32. Each pattern distributes the applicable daily demand over a 24-hour period while maintaining an average multiplier of 1.0.

Figure 1 – Diurnal Curves



DEMAND INPUT

Existing demands were assigned to customer-meter locations using billing records and El Paso County land-use geographic information system (GIS) data. Each meter was classified using the Commercial or Residential land-use designation established for the billing analysis, and the corresponding ADD and MDD unit demands were assigned to the nearest appropriate model junction. Demand allocation was reviewed to confirm that the total assigned model demand matched the planning totals presented in this report.

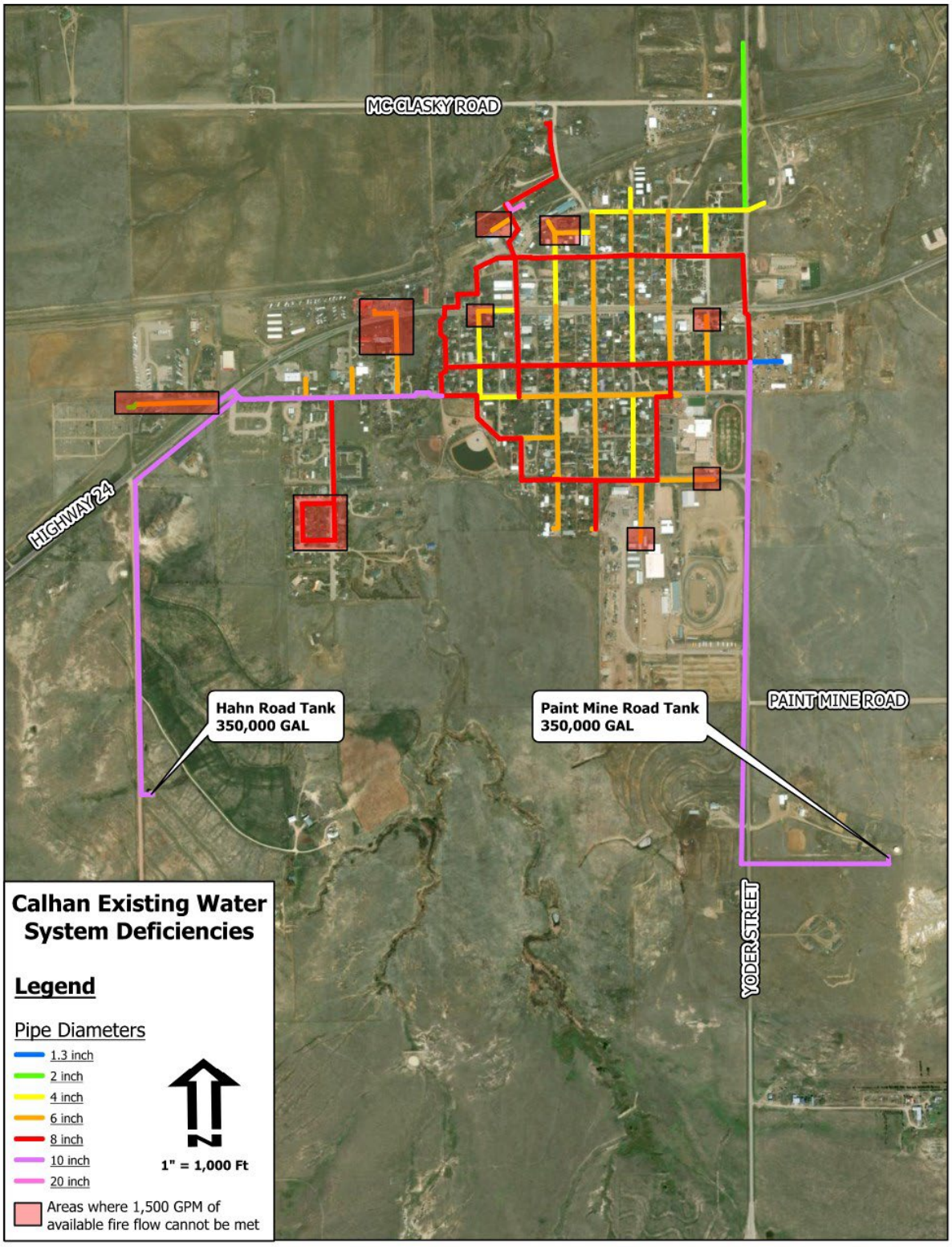
EXISTING SYSTEM EVALUATION

Maximum Day Analysis

All calculated existing system maximum day demands as seen in **Table 4** can be provided with the existing distribution system. The pressures within the existing distribution system for services were between 53-97 psi and a maximum velocity of 0.29 ft/s.

Fire Flow Analysis and Existing System Deficiencies

Fire flow analysis was evaluated on the existing system to identify if fire flow demands can be met. The majority of existing hydrant locations could provide 1,500 gpm of available fire flow at 20 psi residual pressure within the existing distribution system. However, 10 fire hydrants were identified within the existing system that did not meet the 1,500 gpm of available fire flow at 20 psi residual pressure requirements. See identified fire flow issue areas in the exhibit below.


MC CLASKY ROAD
HIGHWAY 24
Hahn Road Tank
350,000 GAL
Paint Mine Road Tank
350,000 GAL
PAINT MINE ROAD
YODER STREET
Calhan Existing Water System Deficiencies
Legend
Pipe Diameters
1.3 inch
2 inch
4 inch
6 inch
8 inch
10 inch
20 inch
Areas where 1,500 GPM of available fire flow cannot be met
N
1" = 1,000 Ft

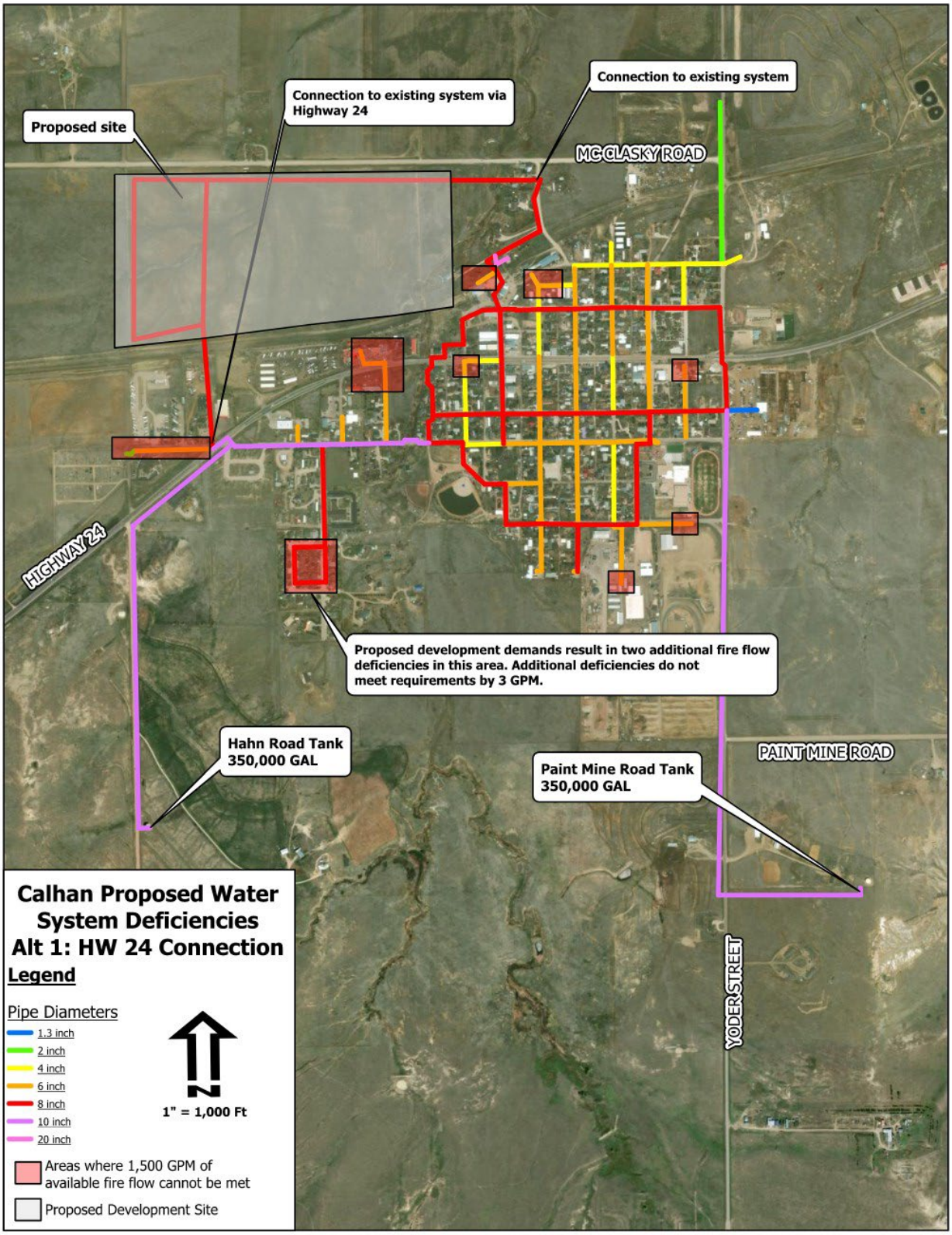
PROPOSED SYSTEM EVALUATION

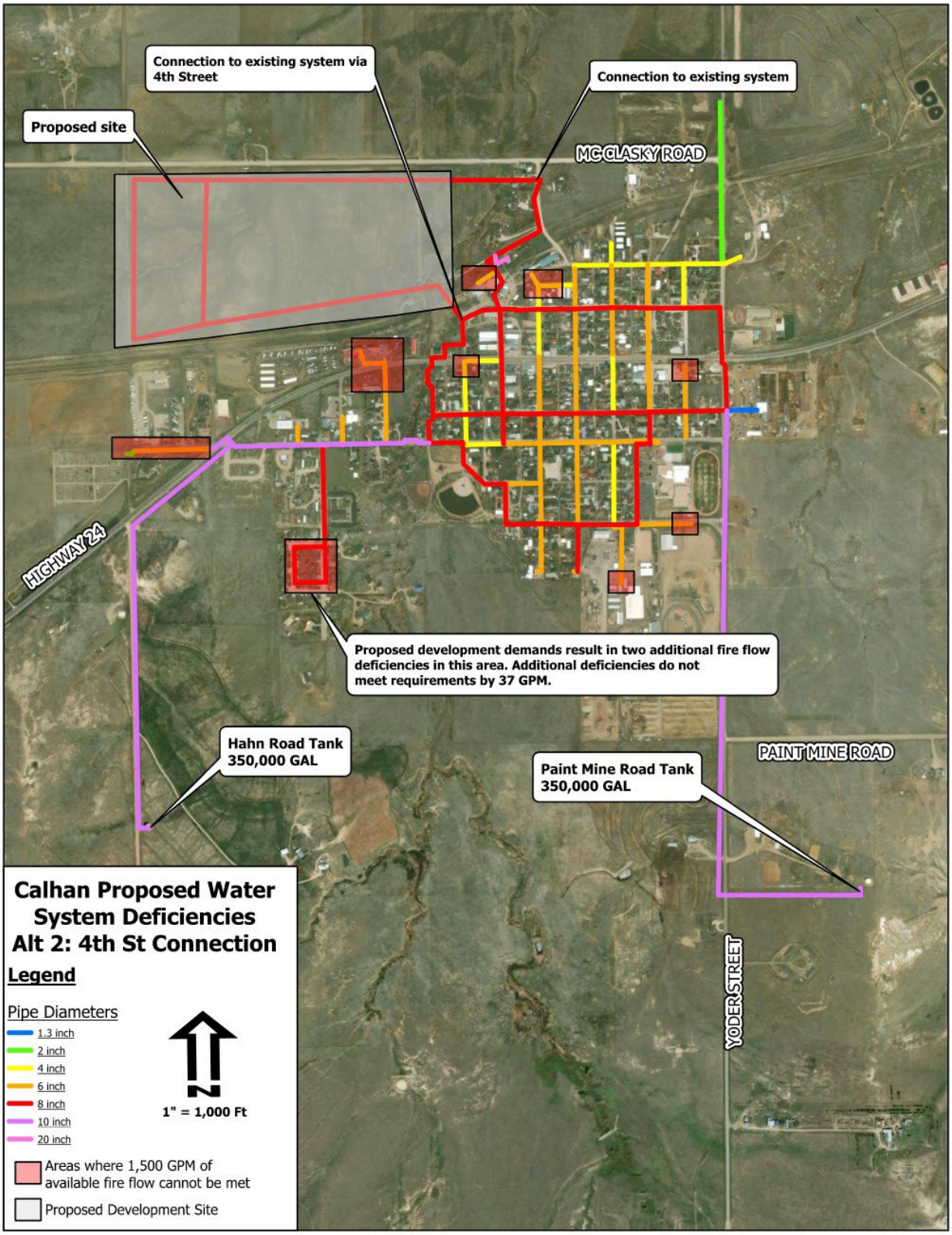
Maximum Day Analysis

All calculated maximum day demands seen in **Tables 6 and 8** can be provided to the existing system and proposed development connecting to the town's existing system either via the Highway 24 connection or the 4th Steet connection. Additionally, maximum day demands can be provided when evaluating unit demands at 0.25 or 0.35 acre-feet per year per dwelling unit. The pressures within the connected proposed and existing distribution system for services were between 53-96 psi and a maximum velocity of 0.99 ft/s.

Fire Flow Analysis and Existing System Deficiencies

Fire flow analysis was evaluated on the existing system and proposed development system connecting to the town's existing distribution system to identify if future fire flow demands can be met. Two alternative connections to the existing system were evaluated: Alternative 1 at Highway 24 and Alternative 2 at 4th Street. Additionally, both alternatives were evaluated under a unit demand of 0.25 or 0.35 acre-feet per year per dwelling unit. All nodes within the proposed development could provide 1,500 gpm of available fire flow at 20 psi residual pressure with 8-inch pipe connections to the existing system under both alternatives. The fire flow issue areas identified in the existing system analysis were still present with the connection of the proposed system. However, with the addition of the proposed development, two additional hydrants in the existing system failed to meet the fire flow requirements although these hydrants are located adjacent to a hydrant failing in the existing condition and only fail in the proposed condition by a maximum of 37 gpm in the alternate 2 scenario. This area is identified along with the existing system fire flow issue areas in the exhibits below.


Proposed site
Connection to existing system via Highway 24
Connection to existing system
MC CLASKY ROAD
HIGHWAY 24
Proposed development demands result in two additional fire flow deficiencies in this area. Additional deficiencies do not meet requirements by 3 GPM.
Hahn Road Tank 350,000 GAL
Paint Mine Road Tank 350,000 GAL
PAINT MINE ROAD
YODER STREET
Calhan Proposed Water System Deficiencies
Alt 1: HW 24 Connection
Legend
Pipe Diameters
1.3 inch
2 inch
4 inch
6 inch
8 inch
10 inch
20 inch
N
1" = 1,000 Ft
Areas where 1,500 GPM of available fire flow cannot be met
Proposed Development Site

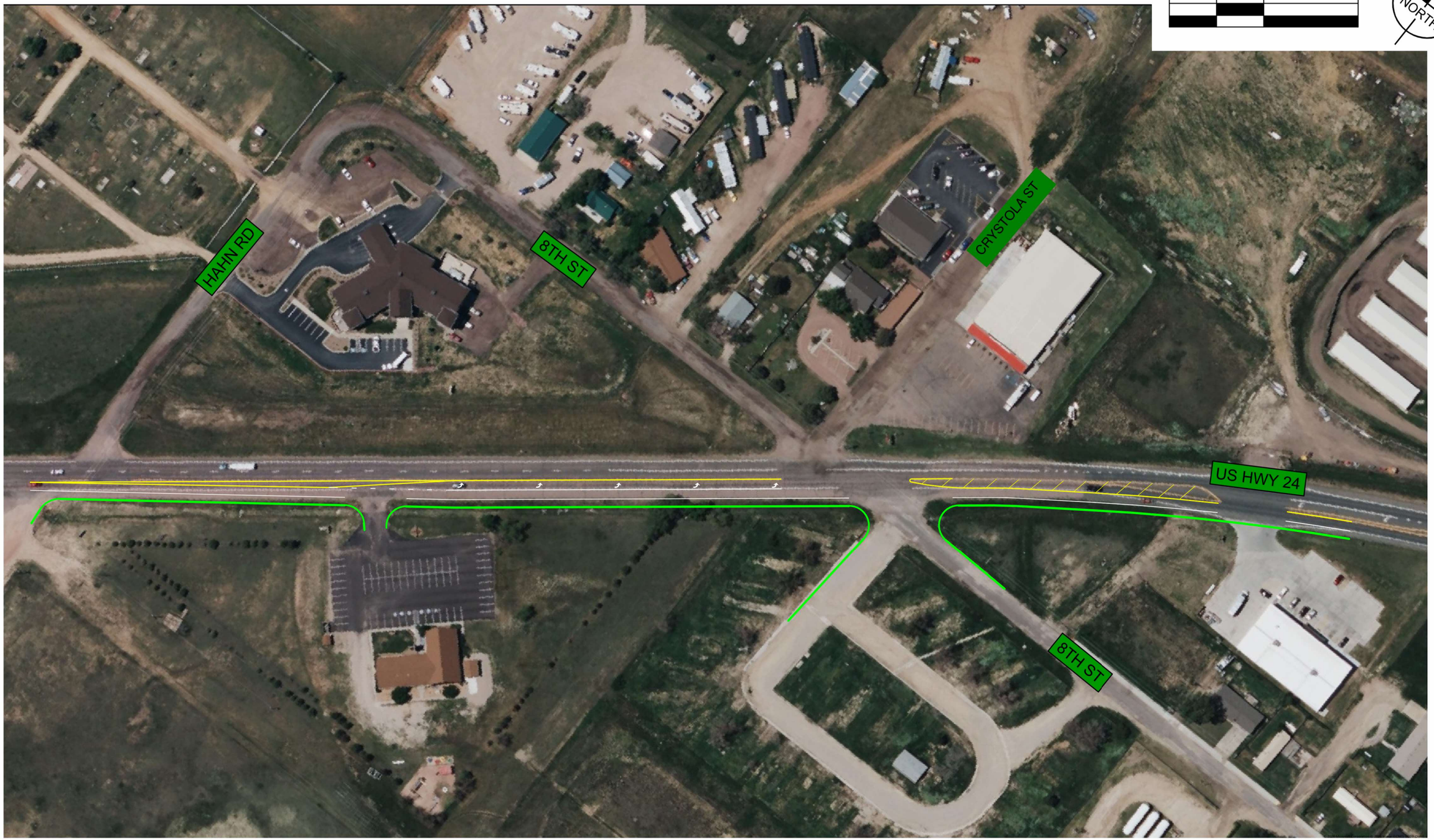

Connection to existing system via 4th Street
Connection to existing system
Proposed site
MC CLASKY ROAD
HIGHWAY 24
Proposed development demands result in two additional fire flow deficiencies in this area. Additional deficiencies do not meet requirements by 37 GPM.
Hahn Road Tank 350,000 GAL
Paint Mine Road Tank 350,000 GAL
PAINT MINE ROAD
YODER STREET
Calhan Proposed Water System Deficiencies Alt 2: 4th St Connection
Legend
Pipe Diameters
1.3 inch
2 inch
4 inch
6 inch
8 inch
10 inch
20 inch
N
1" = 1,000 Ft
Areas where 1,500 GPM of available fire flow cannot be met
Proposed Development Site

APPENDIX C - TRANSPORTATION EXHIBITS



GRAPHIC SCALE IN FEET
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NORTH



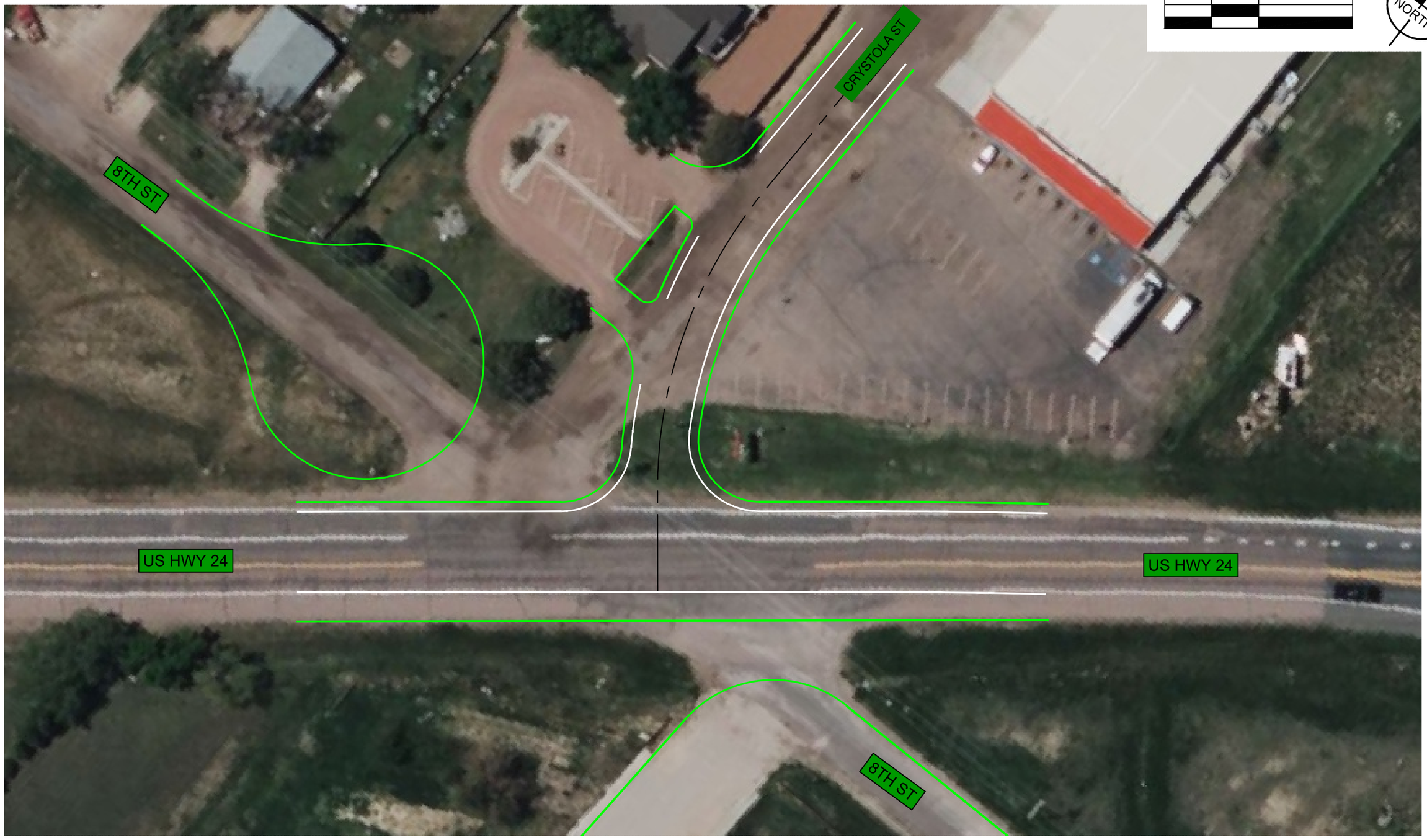
US HIGHWAY 24 & 8TH STREET & CRYSTOLA STREET (TOWN OF CALHAN, CO)
INTERSECTION ALTERNATIVE 2: AUXILIARY TURNING LANES

Kimley»Horn
© 2025 KIMLEY-HORN AND ASSOCIATES, INC.
2 N. NEVADA AVE., SUITE 900, CO SPGS, CO 80903
PHONE: 719-453-0180

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GRAPHIC SCALE IN FEET
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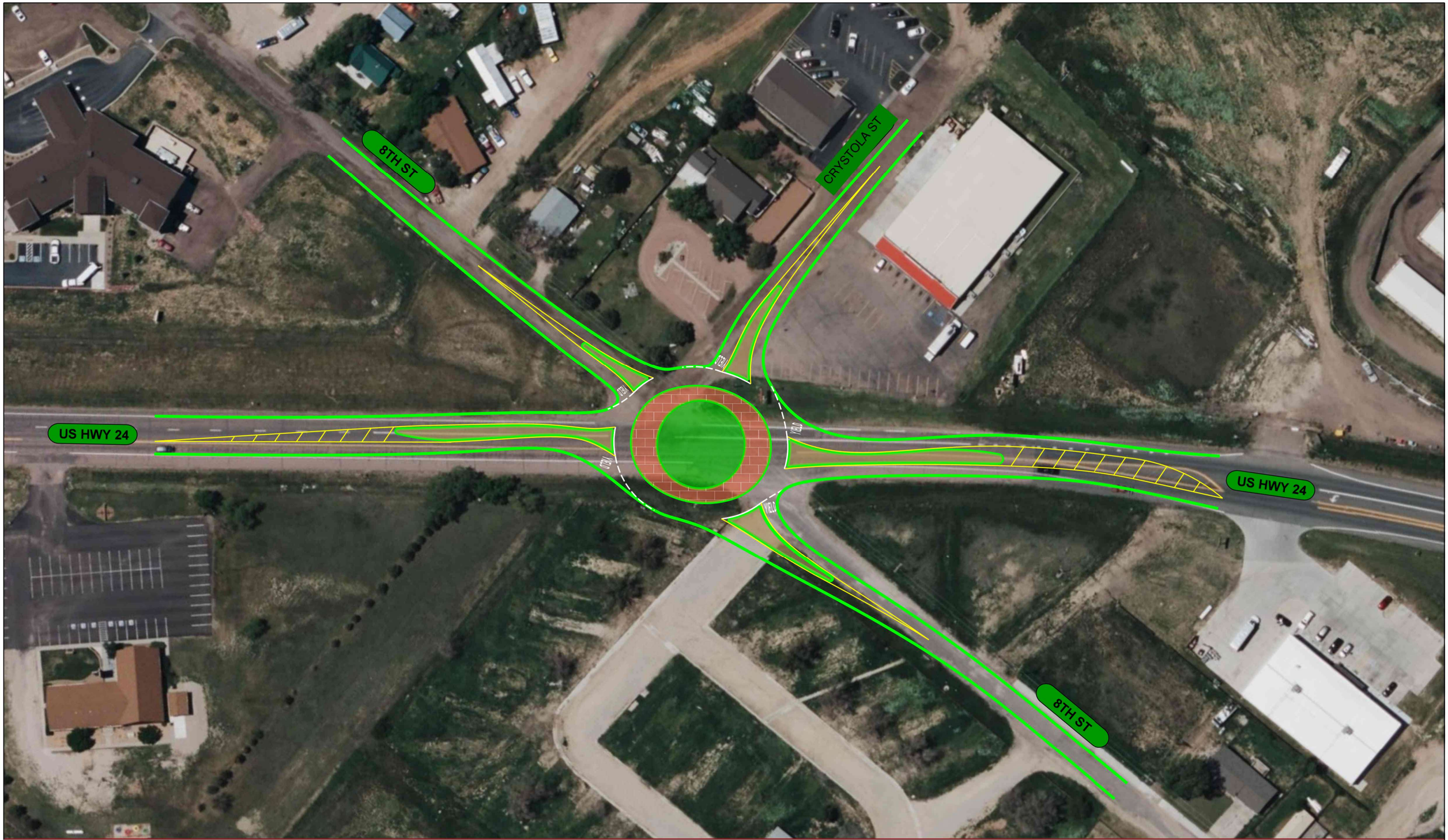
NORTH



US HIGHWAY 24 & 8TH STREET & CRYSTOLA STREET (TOWN OF CALHAN, CO)
INTERSECTION ALTERNATIVE 3: T INTERSECTION

Kimley»Horn
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2 N. NEVADA AVE., SUITE 900, CO SPGS, CO 80903
PHONE: 719-453-0180

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Kimley»Horn

Microsoft Bing

US HIGHWAY 24 AND 8TH STREET AND CRYSTOLA STREET

TOWN OF CALHAN, CO

ROUNDABOUT CONCEPT

SCALE

0 40 80

EXHIBIT: 1.1

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