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NO.: 10-152.05

January 24, 2011

Perry Park Water and Sanitation District
5676 West Red Rock Drive
Larkspur, CO 80118

RE: Water & Sewer Service, Fire Protection Feasibility/Impact Study
Lots 18 & 19, Block 6, Lot 5, Block 5, Filing 4 (Country Club Drive)

The District has requested that The Engineering Company, in cooperation with SEMOCOR, Inc., prepare an analysis of the possible impacts to the District's system by providing water and sewer service and fire protection to the study area. Please reference Exhibit 4, Vicinity Map.

I. General

The study area consists of three single-family lots which average slightly less than one acre in size and is located in the northwest region of the Perry Park West service region. The study area is adjacent to Country Club Drive.

The study area is located within the confines of the current District service boundary. The study area was considered as part of the "Current Platted Growth" area in the preparation of the District's Master Plan. The study area fits well into the District's Master Plan for provisions of sewer and water service and fire protection with the provisions described in this study.

This study will focus on the physical delivery of water for domestic service and fire protection, available water supplies, physical collection and conveyance of wastewater, and available wastewater treatment capacity.

A. **Water: Please reference Exhibit 1.** The study area is located within the confines of Perry Park West region pressure zone 3, which is supplied by the Echo Hills tanks. Water mains have been extended by others in the vicinity of the study area as follows:

1. A 10-inch waterline was installed in Country Club Drive approximately 60 ft. beyond the common property line of lots 19 and 20, Block 6 and terminates with a plug. This work was completed as part of the Country Club LID.
2. A 10-inch waterline was installed in Perry Park Boulevard to the intersection of Country Club Drive and terminates with a fire hydrant, valve, and plug. This work was completed as part of the improvements to Perry Park Boulevard.
3. Fire hydrants have been installed in the vicinity of the study area as illustrated by Exhibit 1.

B. **Sanitary Sewer: Please reference Exhibit 2.** The study area is located within the confines of the Waucondah wastewater collection and treatment system. Sewer mains have been extended by others in the vicinity of the study area as follows:

1. An 8-inch sewer main was extended in Country Club Drive approximately 60 ft. beyond the common property line of Lots 19 and 20, Block 6 where it terminates with a plug. This work was completed as part of the Country Club LID.

2. An 8-inch sewer main was extended in Perry Park Boulevard approximately 15' beyond the common property line of Lots 8 and 9, PP Filing 4, Block 6 where it terminates with a manhole. This work was completed as part of the improvements to Perry Park Boulevard.

Wastewater generated by the study area will flow by gravity to the east to the Waucondah WWTP.

II. Required Water System Improvements

In order to provide water service and fire protection to the study area, the following minimum water system improvements will be required. All proposed water mains, appurtenances, water services, and fire hydrants shall be installed in accordance with the Perry Park Water and Sanitation District's Rules and Regulations. The spacing of all proposed fire hydrants, hydrant valves, and main line valves will need to meet current Perry Park Water and Sanitation District Rules and Regulations. Final sizing of all water services for the study area will need to be submitted to the District for approval prior to installation.

1. **Please reference Exhibit 1.** Provisions of water service and fire protection to the study area could be provided by the installation of the following:

   - Removal of the existing 10-inch plug and installation of approximately four hundred (400') feet of 10-inch watermain and appurtenances in Country Club Drive terminating with a fire hydrant to be placed a minimum of ten (10') feet beyond the west limit of Lot 18, Block 6. Because the proposed water line will result in a long dead end line, the water line is required to be 10-inches in diameter to meet District regulations.
   - Three (3) water services will need to be installed from the required 10-inch main to serve the study area.
   - Two (2) additional water services will need to be installed from the required 10-inch main to serve Lots 6 and 7, Block 5. District policy requires installation of water improvements in roadways when applicable. In this case, since the applicant must complete the water main installation in Country Club Drive to a point at least ten (10') feet beyond the limits of Lot 18, Block 6 the applicant will also be required to install water services to lots adjacent to Country Club Drive.

Fire Protection: One of the primary concerns when considering inclusion of development into the District is the water system's capabilities to provide fire protection. We recognize that the District is attempting to adhere to the Larkspur Fire Department definitions of adequate fire protection. Adequate fire protection is defined as the capability of the system to furnish 1,000 gallon per minute (gpm) at a single location for a period of two (2) hours with minimum residual pressure of no less than 20 pounds per square inch (psi).

In order to evaluate the adequacy of the water system to provide fire protection to the study area, both the existing system and anticipated near-term, build-out water models were considered and run, assuming complete occupancy of the study area. All fire flow scenarios were modeled assuming the level at the Echo Hills tanks to be two-thirds full. The analysis for providing fire protection was based on the required completion of the 10-inch diameter water main in Country Club Drive.

To study the fire protection capabilities of the District's system to the study area, a number of fire flow scenarios were completed. **Please reference Figure 1.**

Scenario #1: A model run was performed with a fire flow demand of 1,000 gpm at node number 5012. Node number 5012 is located in Country Club Drive just beyond the west limit of Lot 18, Block 6 and represents the west limit of the study area. The resultant residual pressure equals approximately 74 psi, **which is greater than or equal to the minimum residual pressure requirement of 20 psi.**

Scenario #2: A model run was performed with a fire flow demand of 1,000 gpm at node number 5396 located in Country Club Drive at the existing fire hydrant located on the common property line between Lots 19 and 20 Block 6 and represents the east limit of the study area. The resultant residual pressure equals approximately 67 psi, **which is greater than or equal to the minimum residual pressure requirement of 20 psi.**

Domestic Water Service: In order to evaluate the adequacy of the water system to provide domestic service to the study area, both the current system and anticipated near-term, build-out water models were considered, assuming complete occupancy of the study area. All domestic pressure scenarios were modeled assuming the level at the Echo Hills tanks to be two-thirds full. To study the domestic service capabilities of the District's system to the study area, a number of domestic (max-day demand) scenarios were completed. The analysis for providing domestic water service was based on the required completion of the 10-inch diameter water main in Country Club Drive. **Please reference Figure 2.**

Scenario #1: A model run was performed with a domestic demand at node number 5012. Node number 5012 is located in Country Club Drive just beyond the west limit of Lot 18, Block 6 and represents the west limit of the study area. Domestic (max-day) pressure equals approximately 85 psi **which is within acceptable limits.**

Scenario #2: A model run was performed with a domestic demand at node number 5396. Node number 5396 is located in Country Club Drive at the existing fire hydrant located on the common property line between Lots 19 and 20, Block 6 and represents the east limit of the study area. Domestic (max-day) pressure equals approximately 76 psi **which is within acceptable limits.**

III. Water Availability

Note: In the preparation of this study, we are considering water demand and supply District-wide as the East region supply and treatment infrastructure provides water to both the East and West service regions.

Current Water Demand: Referencing the December 2009 Systems Report, the District provides water service to a total of 1,296 taps of which 730 are located in the West region and 566 are located in the East region. The resulting number of EQR's equals 1,342 EQR's. The discrepancy in the number of taps (1,296) versus EQR's (1,342) is that some of the taps in service equate to more than one EQR. Of the 1,342 EQR's, 763 are located in the West region and 579 are located in the East region. As previously discussed, water to the study area would be provided by the combined District-wide supply, treatment, and distribution system.

Potential of Immediate Demand: In addition to the 1,342 EQR's currently served, the District has accepted a number of main line extensions and development projects (completed water infrastructure installation) which could potentially require immediate demand. The District has 309 EQR's which fall into this category. These projects were previously platted lots within the current District service

boundary, and because of the current availability of service infrastructure could add to the potential, immediate demand.

Potential of Near-Term Demand, Approved Construction Plans (waiting for construction): In addition to the 1,342 EQR's currently served and the 309 EQR's which could require service in the immediate future, the District has approved a number of construction plans. These approved construction plans are the final step for provisions of water service and fire protection. These study areas could create a near-term demand on the system following construction. A summary of the approved construction plans, their system location, and their potential, near-term demand is as follows:

Study Area / Region	No. of Lots	No. of EQR's	No. of GPM	Date Approved
Sandstone Ranch (west)	106 lots	113 EQR's	59.9 GPM	5-18-2009
Shrine Circle (east)	3 lots	3 EQR's	1.6 PM	7-1-2009
Elati-Delaware (west)	10 lots	10 EQR's	5.3 GPM	7-1-2009
Total	**119 lots**	**126 EQR's**	**66.8 GPM**	

Potential of Near-Term Demand, Approved Feasibility Studies: In addition to the 1,342 EQR's being served by the District, the 309 EQR's which could require service in the immediate future, and the 126 EQR's from District approved construction plans which could require service in the near-term, the District has accepted a number of feasibility studies. Feasibility studies are the first step towards preparing developments for installation of water system infrastructure. These study areas could create a near-term demand on the system. A summary of the accepted studies, their system location, and their potential water system demands is as follows:

Study Area / Region	No. of Lots	No. of EQR's	No. of GPM	Date Accepted
*Remuda Ranch (west)	87 lots	87 EQR's	46.1 GPM	7-23-2009
Acoma Drive (west)	8 lots	8 EQR's	4.2 GPM	2-16-2010
Total	**95 lots**	**95 EQR's**	**50.3 GPM**	

***Note: Previously accepted Feasibility/Impact Studies which will expire after 7-23-2011.**

The total EQR's which the District is either presently serving (1,342), has committed service to (309), has approved construction plans for (126), and has approved feasibility studies for (95) equals 1,872 EQR's.

Available Water Supply: ***It is important to note that the term "available water supply" does not include water storage on hand within the District.*** As previously mentioned, the District currently provides water service to a total of 1,342 EQR's. This equates to a **max-day** demand of 711 gpm (1,342 EQR's x 0.53 gpm/EQR).

The District-wide infrastructure (East and West regions) of water treatment is capable of providing approximately 870 gpm, of which 220 gpm is provided by the West region's Glen Grove WTP which currently receives water supplies from the WP-2 well, the Grant Ditch well, and the Glen Grove well. The remaining 650 gpm is provided by the East region's Sageport WTP which currently receives water supplies from the A-2 well, the A-3 well, the A-4 well, and the D-4 well.

When considering available water storage it is important to note that a reserve of water storage equal to 240,000 gallons must be kept for fire protection as noted in Table III-1.

Table III-2 illustrates the number of days the District could rely on their available water storage to supply a District-wide, continuous **max-day demand with a factor of safety** event. Table III-2 evaluates two scenarios of water storage. One scenario represents all tanks to maximum storage capacity and a second scenario with the tank storage capacity at fifty (50%) percent full. Both capacity figures account for 240,000 gallons left in reserve for fire protection.

Table III-2

Projected Max-Day Demand with Factor of Safety (gpm)	District-Wide Water Supply (w/o Storage) (gpm)	Projected District-Wide Water Supply Shortages (w/o Storage) (gpm)	Resultant District-Wide Water Supply (w/o Storage)	Shortages in Water Supply to to be Subsidized by Storage (gpm)	Available Storage Vol. 100% Full Accounting for Fire Protection (gallons)	Days of Avail. Storage from 100% Full Storage to Cover Shortages in Water Supply During Continuous Max-Day Events (days)	Available Storage Vol. 50% Full (gallons)	Days of Avail. Storage from 50% Full Storage to Cover Shortages in Water Supply During Continuous Max-Day Events (days)
872	870	50	820	52	1,943,000	26	851,500	11
872	870	100	770	102	1,943,000	13	851,500	6
872	870	150	720	152	1,943,000	9	851,500	4
872	870	200	670	202	1,943,000	7	851,500	3
872	870	250	620	252	1,943,000	5	851,500	2

IV. Required Sanitary Sewer System Improvements

In order to provide sewer service to the study area, the following minimum sewer system improvements will be required. All proposed sewer mains, appurtenances, and sewer services will be installed in accordance with the Perry Park Water and Sanitation District's Rules and Regulations.

1. **Please reference Exhibit 2.** Provisions of sewer service could be provided to the study area by the installation of the following:

   - Approximately one hundred thirty (130') feet of 8-inch gravity sewer main and appurtenances will need to be installed in Country Club Drive from the existing plug west to a minimum of ten (10') feet past the common lot line between Lots 5 and 6, Block 5. The main would end with a manhole.
   - Three (3) sewer services will need to be installed from the required 8-inch main to serve the study area.
   - One (1) additional sewer service will need to be installed from the required 8-inch main to serve Lot 6, Block 5. District policy requires installation of sewer improvements in roadways when applicable. In this case, since the applicant must complete the sewer main installation in Country Club Drive to a point at least ten (10') feet beyond the limits of Lot 18, Block 6 the applicant will also be required to install a sewer service to the lot adjacent to Country Club Drive. The sewer service to serve Lot 6 will need to be directed to the required manhole.
   - Approximately two hundred seventy (270') feet of sewer force main (size to be determined by the District at the time of construction plans submittal by the applicant) will need to be installed in Country Club Drive. The force main will extend from the required manhole located just west of the west limit

of Lot 5, Block 5 to a minimum of ten (10') feet beyond the west limit of Lot 18, Block 6. District policy requires installation of sewer improvements in roadways when applicable as previously discussed.

2. **Please reference Exhibit 2 and Exhibit 3.** It is important to note that the previously described means of providing sewer service to the study area deviates from the Master Plan. The Master Plan calls for Lots 1-5, Block 5 and Lots 19-23, Block 6 to be served from a main in Country Club Drive which would flow by gravity to the Waucondah WWTP. Contrary to the Master Plan, the described means of providing sewer service to the study area as described by this Feasibility/Impact study calls for Lots 1-6, Block 5 and Lots 18-23, Block 6 to be served from a main in Country Club Drive which would flow by gravity to the Waucondah WWTP. The provision of service to Lot 6, Block 5 and Lot 18, Block 6 is the deviance from the Master Plan. Further, the Wastewater grade break is also a deviation from the Master Plan. The availability of reliable topographic data at the time of preparation of this study allowed us to consider an extension of the gravity sewer to the west to serve these additional two (2) lots.

   Deviation from the recommendations outlined by the Master Plan will require Board of Directors approval and should be a condition of the acceptance of the study area for sewer service.

The Perry Park West region wastewater collection and treatment system has adequate capacity for the projected demand created by the proposed single lot.

V. Conclusion

In order to serve the study area for fire protection and domestic service approximately four hundred (400') feet of 10-inch diameter water main, appurtenances and fire hydrants will need to be installed from the limit of the existing 10-inch water main in Country Club Drive to a minimum of ten (10') feet past the west limit of Lot 18, Block 6. To serve the study area for domestic service, three (3) water services will need to be installed. An additional two (2) water services will need to be installed to satisfy District policy. This applies to Lots 6 and 7, Block 5.

In order to serve the study area for sewer service, approximately one hundred thirty (130') feet of 8-inch sewer main and appurtenances will need to be installed from the limit of the existing 8-inch sewer main to a minimum of ten (10') feet past the common lot line of Lots 18 and 19, Block 6. In addition, three (3) sewer services will need to be installed to serve the study area. Additionally, approximately two hundred and seventy (270') feet of sewer force main will need to be installed. **Approval by the Board of Directors will be required to deviate from the Master Plan.**

Special Note: The results and recommendations of this Feasibility/Impact study were developed with the requirement that the final elevation (grade) of Country Club Drive not deviate from the current elevation. The ability of the District to provide sewer service to the study area is predicated on the requirement to follow the District's rules and regulations. In particular, cover requirements.

It is the responsibility of the applicant to satisfy the County's requirements for improvements to Country Club Drive. Further, the approved Country Club Drive improvements must also meet the District's requirements for installation of sewer and water infrastructure.

Based on our analysis, we recommend acceptance of the study area as described for water and sewer service and fire protection with the requirements documented in this analysis. Should you have questions please do not hesitate to contact our office.

Special Note: This Feasibility/Impact Study will expire two (2) years from the date of acceptance by the Perry Park Water and Sanitation District Board.

Respectfully yours,

Rick R. Pickard, P. E.
District Engineer
The Engineering Company

Attachments

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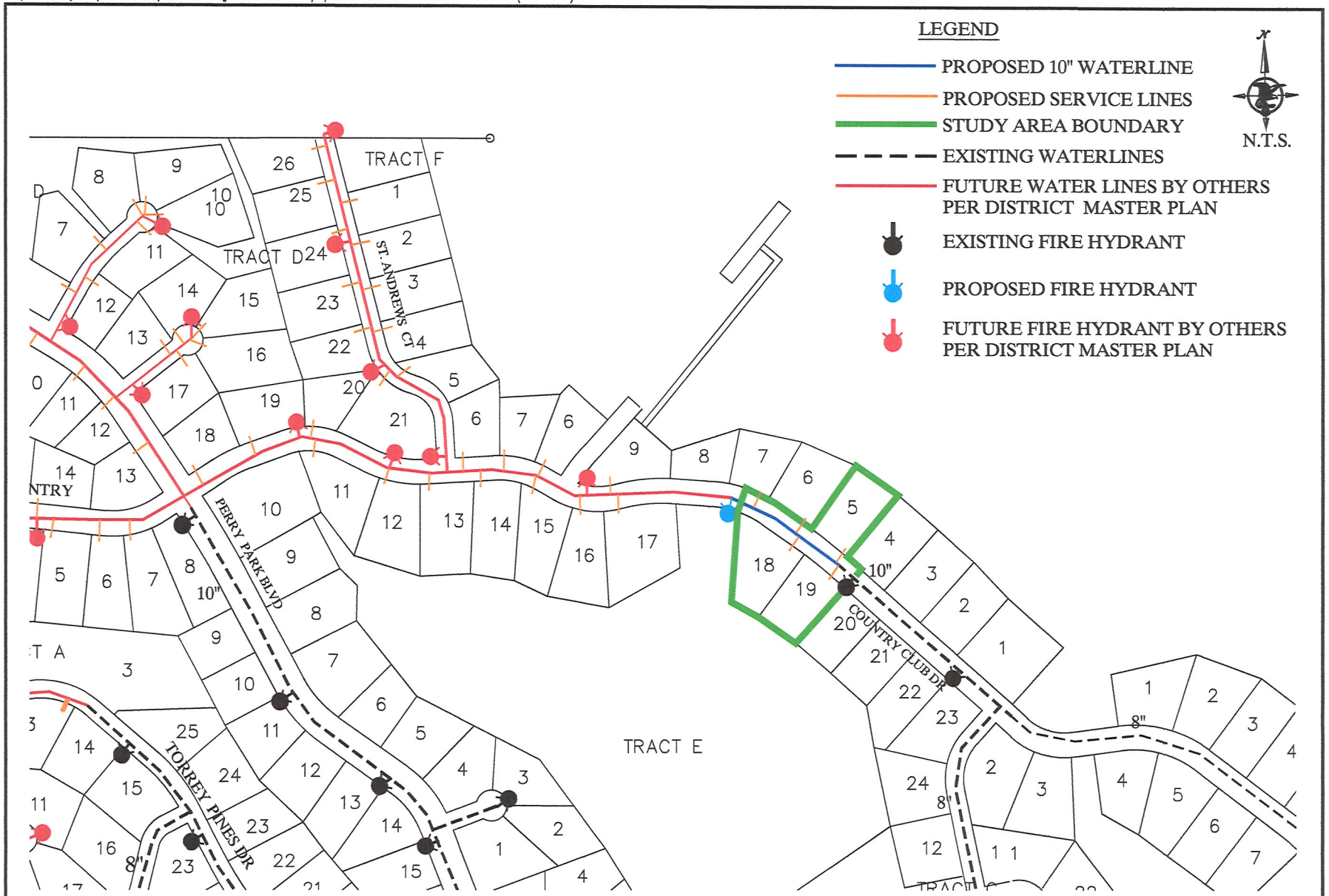

NOTE: FINAL LOCATION OF WATER SERVICES TO BE DETERMINED BY THE DISTRICT.

The **Engineering** Company
FORT COLLINS, COLORADO

LOTS 18,19 (BLK 6), LOT 5 (BLK 5)
FILING 4, FEASIBILITY STUDY
WATER SYSTEM IMPROVEMENTS
EXHIBIT 1

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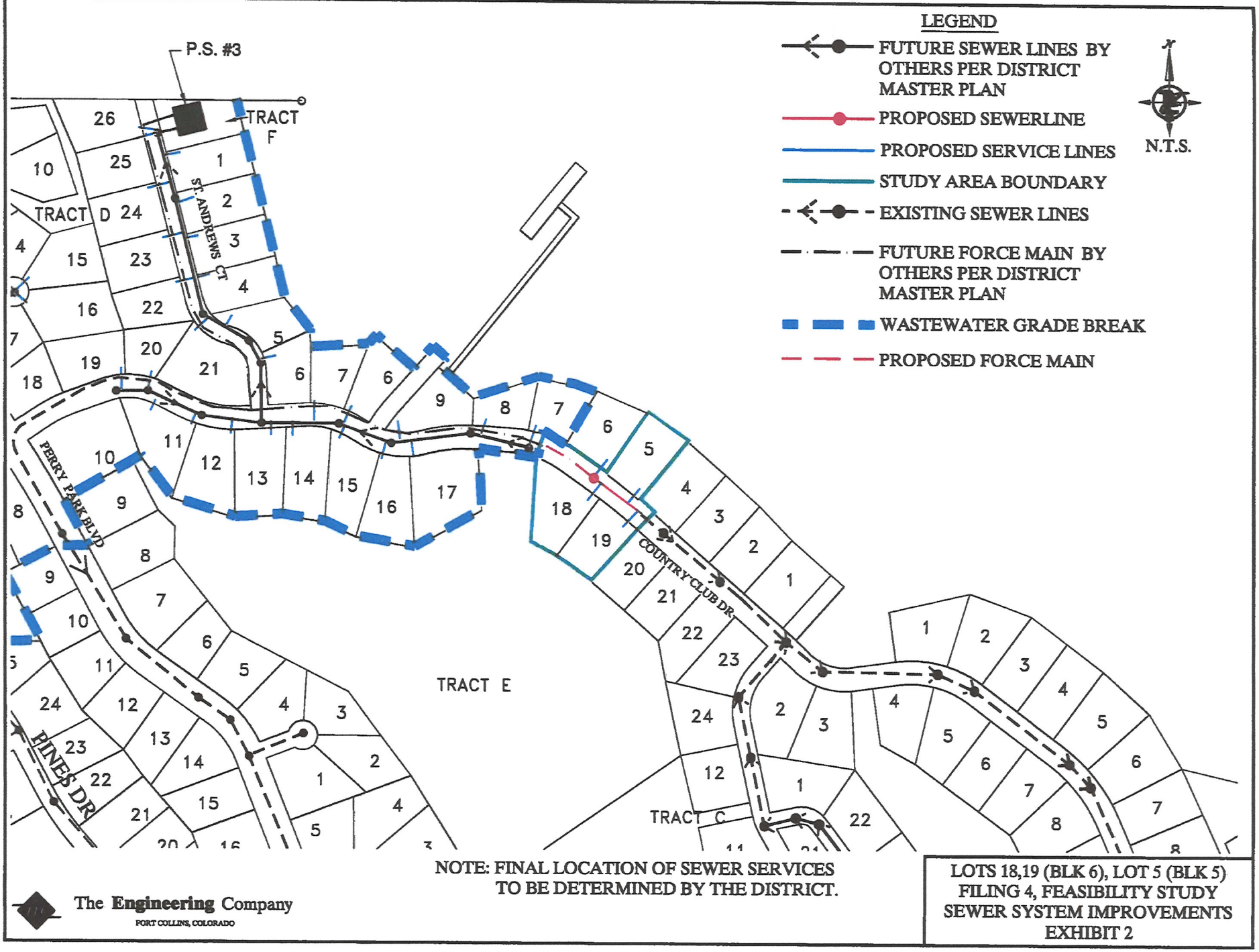

NOTE: FINAL LOCATION OF SEWER SERVICES TO BE DETERMINED BY THE DISTRICT.

The Engineering Company
FORT COLLINS, COLORADO

LOTS 18,19 (BLK 6), LOT 5 (BLK 5)
FILING 4, FEASIBILITY STUDY
SEWER SYSTEM IMPROVEMENTS
EXHIBIT 2

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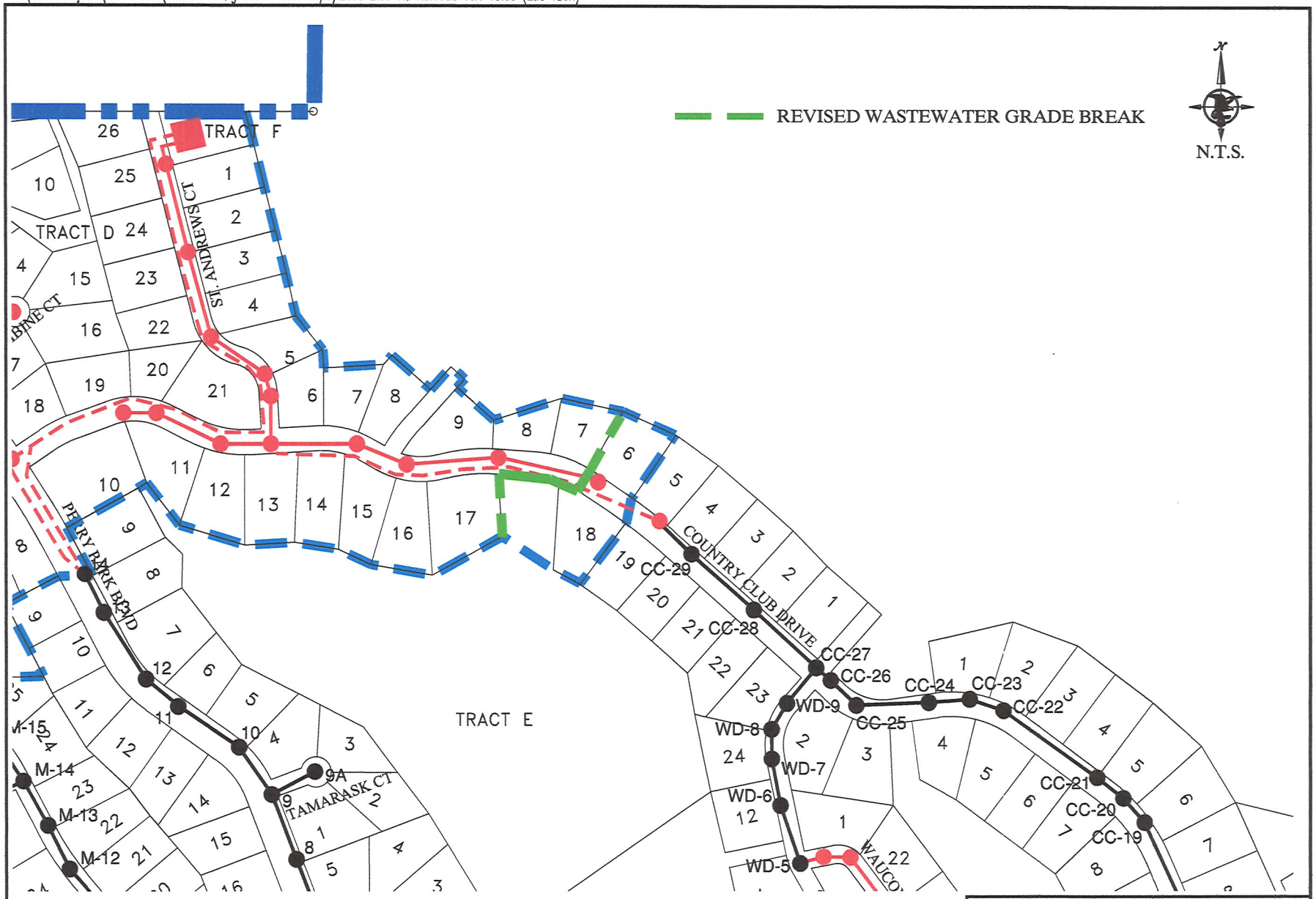

The **Engineering** Company
FORT COLLINS, COLORADO

LOTS 18,19 (BLK 6), LOT 5 (BLK 5)
FILING 4, FEASIBILITY STUDY
CURRENT MASTER PLAN
EXHIBIT 3

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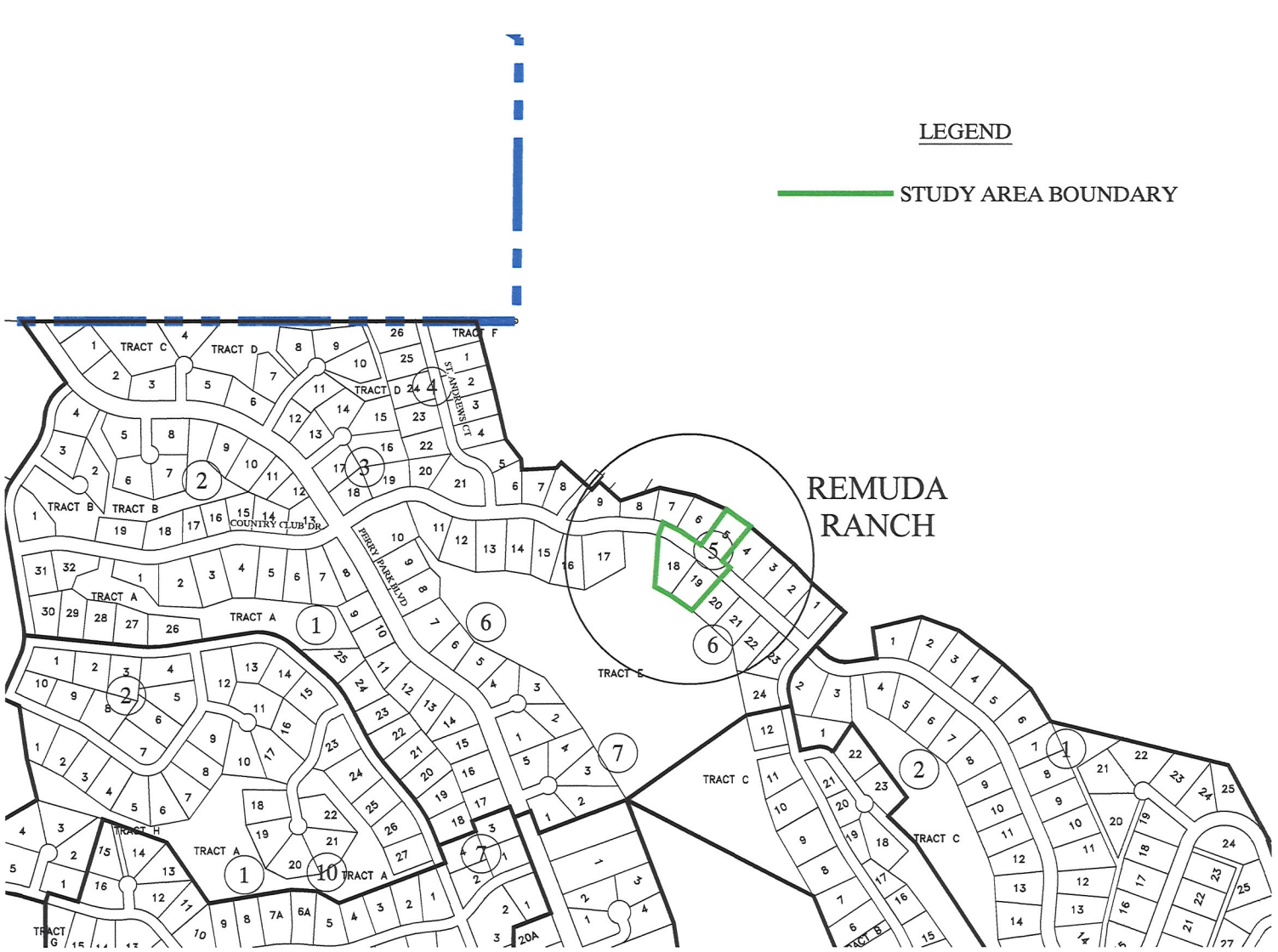

The **Engineering** Company
FORT COLLINS, COLORADO

LOTS 18,19 (BLK 6), LOT 5 (BLK 5) FILING 4
FEASIBILITY STUDY
VICINITY MAP
EXHIBIT 4

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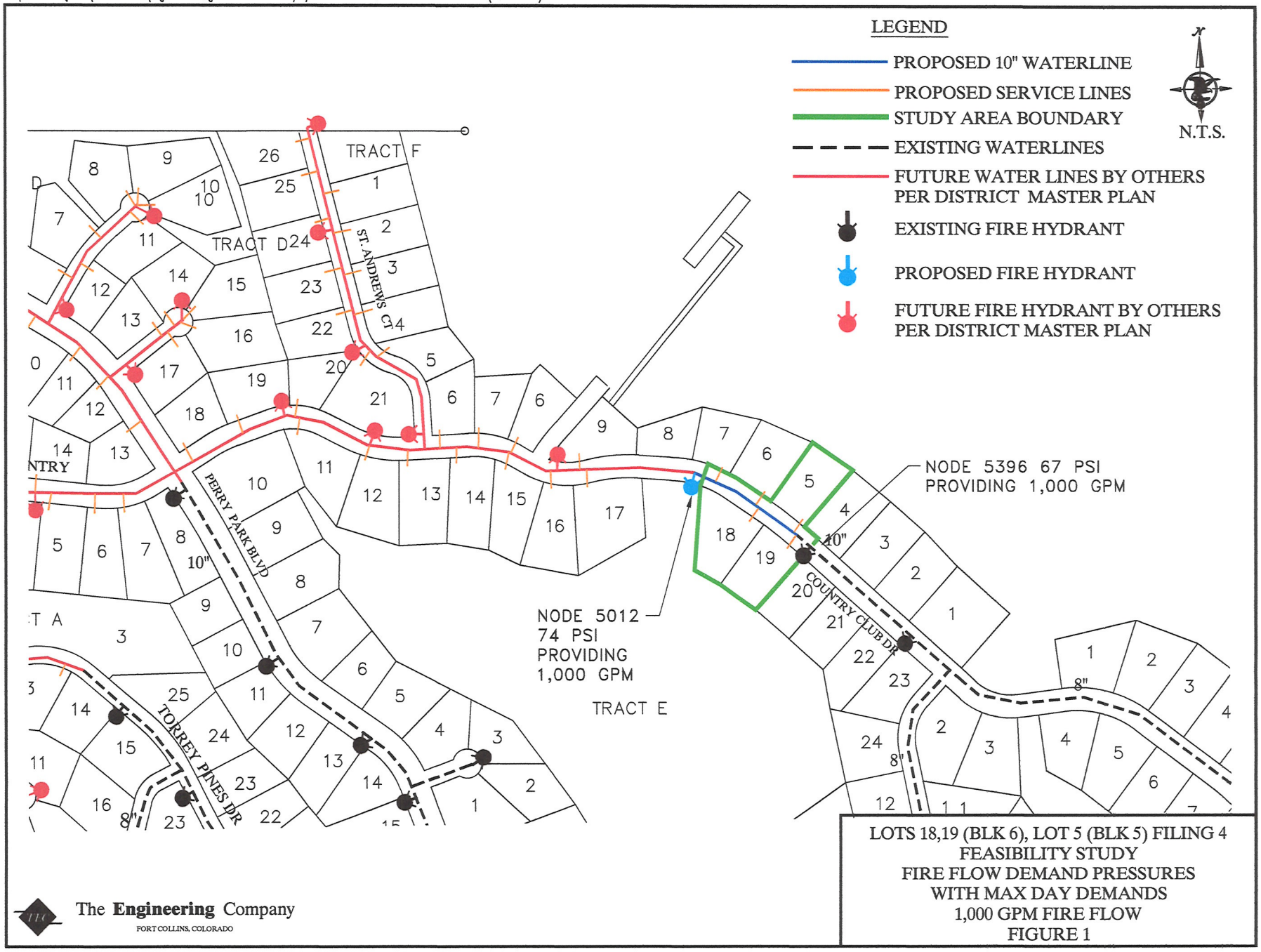

The **Engineering** Company
FORT COLLINS, COLORADO

LOTS 18,19 (BLK 6), LOT 5 (BLK 5) FILING 4
FEASIBILITY STUDY
FIRE FLOW DEMAND PRESSURES
WITH MAX DAY DEMANDS
1,000 GPM FIRE FLOW
FIGURE 1

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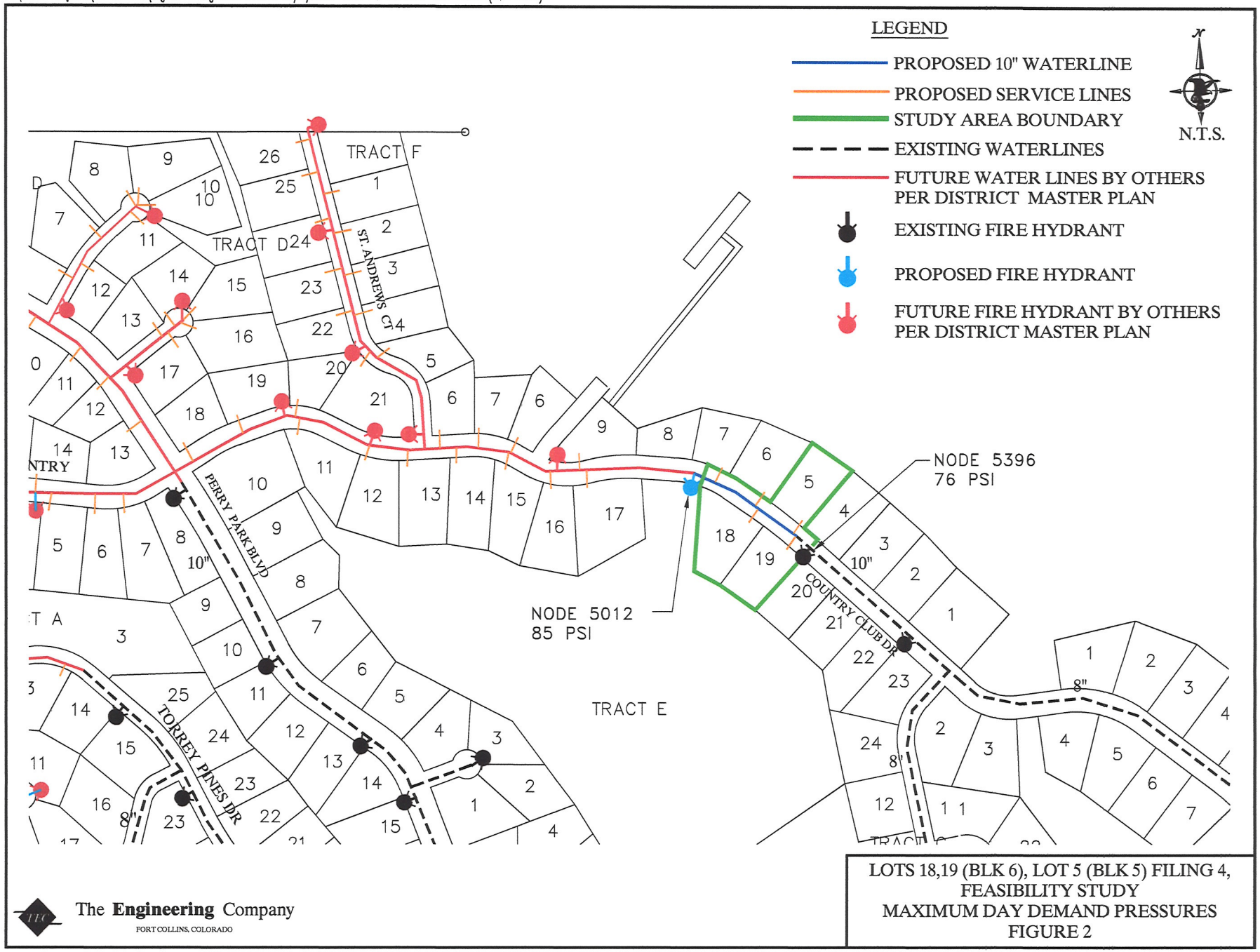

The **Engineering** Company
FORT COLLINS, COLORADO

LOTS 18,19 (BLK 6), LOT 5 (BLK 5) FILING 4,
FEASIBILITY STUDY
MAXIMUM DAY DEMAND PRESSURES
FIGURE 2