

**UTILITY STUDY  
BLACK ROCK COFFEE  
BAR  
PARKER POINTE  
SOUTH PARKER ROAD AND STROH ROAD**

**PREPARED FOR:  
BLACK ROCK DEVELOPMENT COMPANY, LLC**

**PREPARED BY: ATWELL, LLC.  
6200 S. Syracuse Way, SUITE 475  
Englewood, CO 80111  
CONTACT: Donna Barrentine, P.E.  
(303 222-5036**

**Atwell Project No. 24003198**

**December 9, 2024**



## ENGINEER'S STATEMENT

I hereby attest that this report for the Utility Design of, Parker Pointe, was prepared by me, or under my direct supervision, in accordance with the provisions of the Parker Water and Sanitation District (District) Standards and Specifications for the responsible parties thereof. I understand that the District does not and shall not assume liability for utility facilities designed by others.



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Donna E. Barrentine, P.E.  
Colorado Registration No. 44754



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## Section 1: PROJECT BACKGROUND

### 1.1 Site Location

The project site location is on Lot 13 within the Parker Pointe Filing 1, Master Commercial Development, located at the southeast corner of South Parker Road and Stroh Road, Figure 1. Lot 13 is one of 14 commercial/retail parcels within the 14.3-acre master commercial subdivision. Lot 13 is bordered on the west by S. Parker Road, Lot 14 (vacant) to the north, Declan Drive to the east and Lot 12 (vacant) to the South.

Figure 1: Vicinity Map



## **1.2 Description of Property**

The 0.50-acre Lot 13 parcel is being developed for a proposed 1,460 square-foot retail coffee shop with dine-in and drive thru service. Excluding road rights-of-way, the developable portion of the site encompasses 0.43 total acres. The site is currently undeveloped; however, master development has recently completed construction of the water, sanitary and storm infrastructure within the within Declan Drive, which provides water main and sanitary sewer tie-in locations for this parcel.

## **1.3 Existing Utility Conditions**

An existing 8-inch water main was recently constructed within Declan Drive, providing a water service connection to the southeast corner of the Lot 13 parcel. A fire hydrant is located at the northeast corner of the parcel. An existing 8-inch sanitary sewer line was recently constructed within Declan Drive, just east of the water main, which will provide available sanitary sewer service connection toward the middle of parcel.

## Section 2: WATER AND SANITARY UTILITIES

### 2.1 Proposed Development

The Project is to develop the Black Rock Coffee on 0.43 acres of the 0.50-acre site. A portion of the site extends out to Declan Drive which is a private access road that provides site access and utility corridors for water, sanitary sewer and storm sewer. The proposed building square footage is 1,460 SF.

#### 2.1.1 Proposed Water Service

A 1-inch domestic water service line is proposed at the southeast corner of the site to connect to the existing stub-out that connects to the existing 8-inch water main within Declan Drive. An existing fire hydrant located at the northeast corner of the site is available to meet the fire flow requirements of this development. A separate ¾-inch irrigation service line will also be connected to the existing 8-inch water main adjacent to the site. Separate domestic and irrigation meters will be provided along with backflow preventors in accordance with Parker Water and Sanitation District standards and specifications.

No new regional water mains will need to be designed to service this parcel. The proposed 1-inch domestic water service and ¾-inch irrigation lines will be connected to the stub-outs provided by the Master Development. The Master Development has an approved Master Utility Study prepared by Perception Design Group, Inc. dated September, 2017. The master study was prepared in accordance with the District's standards. According to the master utility study, the site is within Zone 2 with a static pressure of approximately 133 psi. Zone 2 has a static hydraulic grade line of 6315 to 6324 MSEL.

##### 2.1.1.1 Domestic Demands

The water demands for this site are calculated using the applicable site area 0.43 acres and using the District's average daily water demand criteria for commercial sites at 677 gallons per day per acre. The maximum day demand is estimated at 2.5 x the average daily flow, while the peak hour demand is projected at 5.5 times the average day demand according to District Criteria.

DEMAND SCENARIO	Demand (GPD)	Demand (GPM)
Average Day	291.11	0.2
Maximum Day	727.77	0.51
Peak Day	1601.05	1.20

Notes:

Per District Criteria: Commercial Demand = 677 GPD / AC; Max Day Demand Factor = 2.5; Peak Factor = 5.5

Table 1: Water Demand Calculations

Although the above demands are estimated based on District criterion, historical water demands from other Black Rock Coffee Bars have been requested from the corporation. This information will be shared with the District if determined to be available.

### 2.1.1.2 Fire Flow Demands

Fire flow for the site is calculated using the building square footage of 1,460 SF and the International Fire Code, Table B105.1 (2) and B102.2. For a building with Construction Type IIB, the minimum fire flow of 1500 gpm for a 2-hour duration is required. Given a building that is fully sprinkled, a 75% reduction in fire flow is allowed. However, no less than 1,500 gpm can be provided, therefore, the required fire flow is 1,500 gpm. Parker Water and Sanitation District has been contacted for conducting a fire hydrant flow test for the fire hydrant immediately adjacent to the site.

### 2.1.2 Proposed Sanitary Service

A 4-inch sanitary sewer service will be provided and will extend from the middle of lot out to the stub-out within Declan Drive. The service line will be District design criteria at a minimum slope of 2%.

#### 2.1.2.1 Sanitary Demands

The projected sanitary sewer flow is based on a commercial demand criterion of 273 gpd/acre and a peak factor of 3.2. The sanitary flow projections are shown in the table below.

<b>DEMAND SCENARIO</b>	<b>Demand (GPD)</b>
Average Day Flow	117.39
Peak Day Flow	375.65

Table 2: Sanitary Sewer Demand Calculations

Although the above sanitary flows are estimated based on District criterion, historical water demands from other Black Rock Coffee Bars have been requested from the corporation. This information will be shared with the District if available. A standard conversion ratio of 80 to 90% water to wastewater can be applied to determine estimated sanitary flows based on historical water records once available.

### **Section 3: CONCLUSIONS**

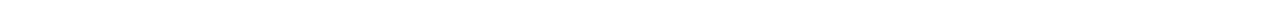
The proposed water and sanitary sewer service lines are designed in accordance District standards. No new regional water mains or gravity sanitary sewer lines will be required to be constructed to serve this parcel. There are existing water and sanitary sewer lines on the east side of parcel within the recently constructed Declan Drive. The water and sanitary demands for this site are in accordance with the projected demands within the Master Utility Study.

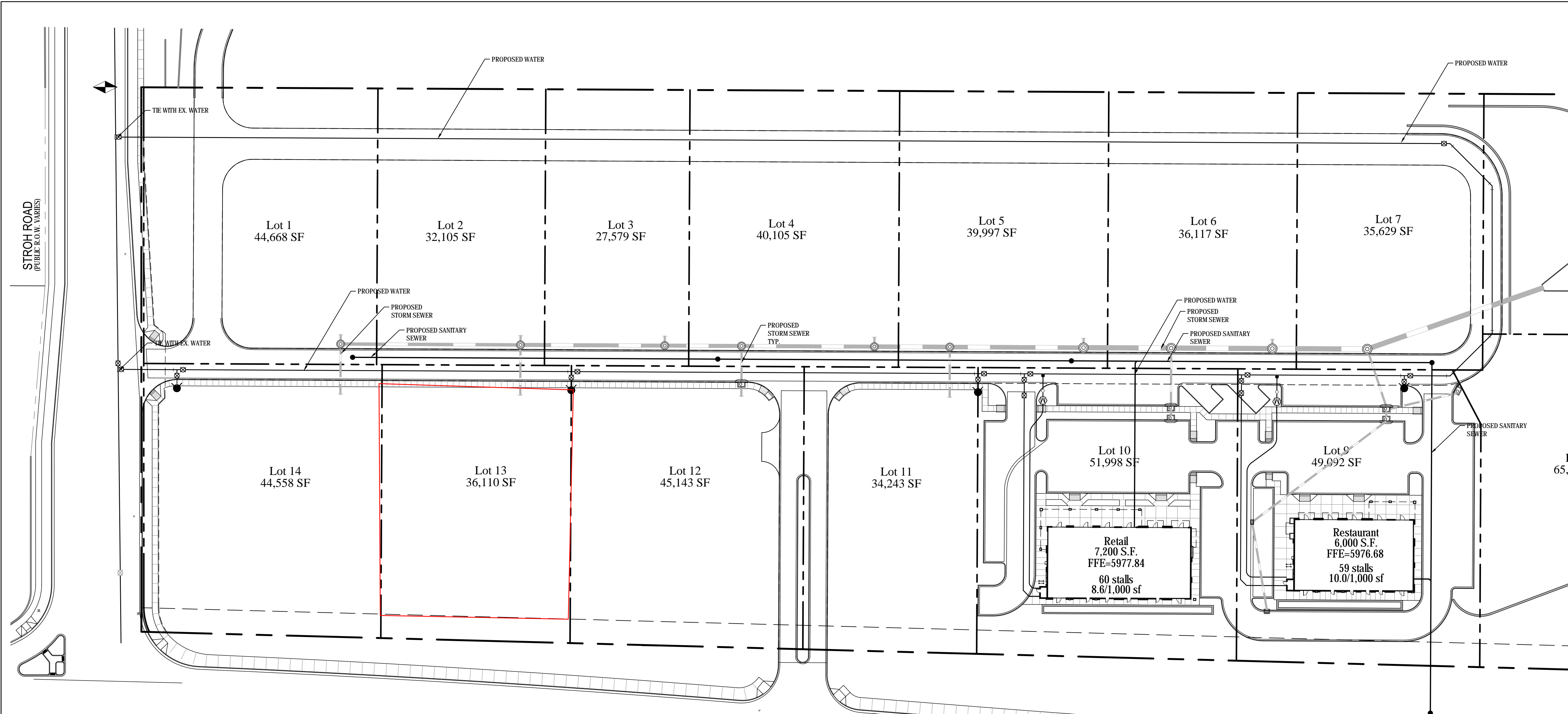
## **REFERENCES**

1. Parker Water & Sanitation District 2014 Water and Wastewater Master Plan
2. Water and Sanitary Sewer Construction Plans, Perception Design Group, Inc. June 28, 2022
3. Final Utility Study for Parker Pointe, Perception Design Group, Inc., Sept. 18, 2017

**Appendix A:**

Overall Utility Plan Parker Pointe Master Development  
Water and Sanitary Sewer Construction Plans, Perception, June 2022





### LEGEND

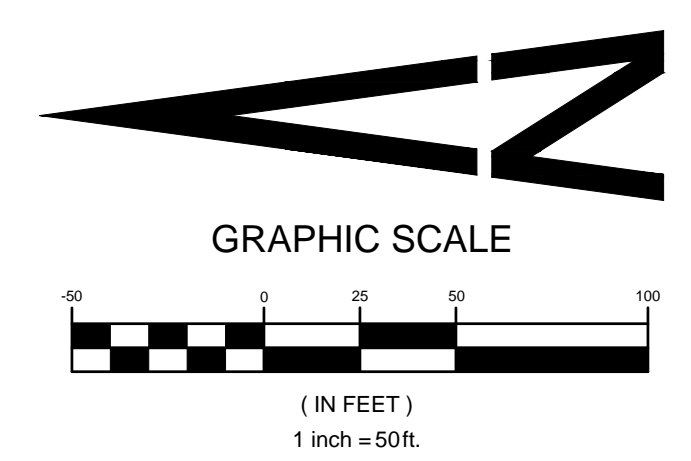
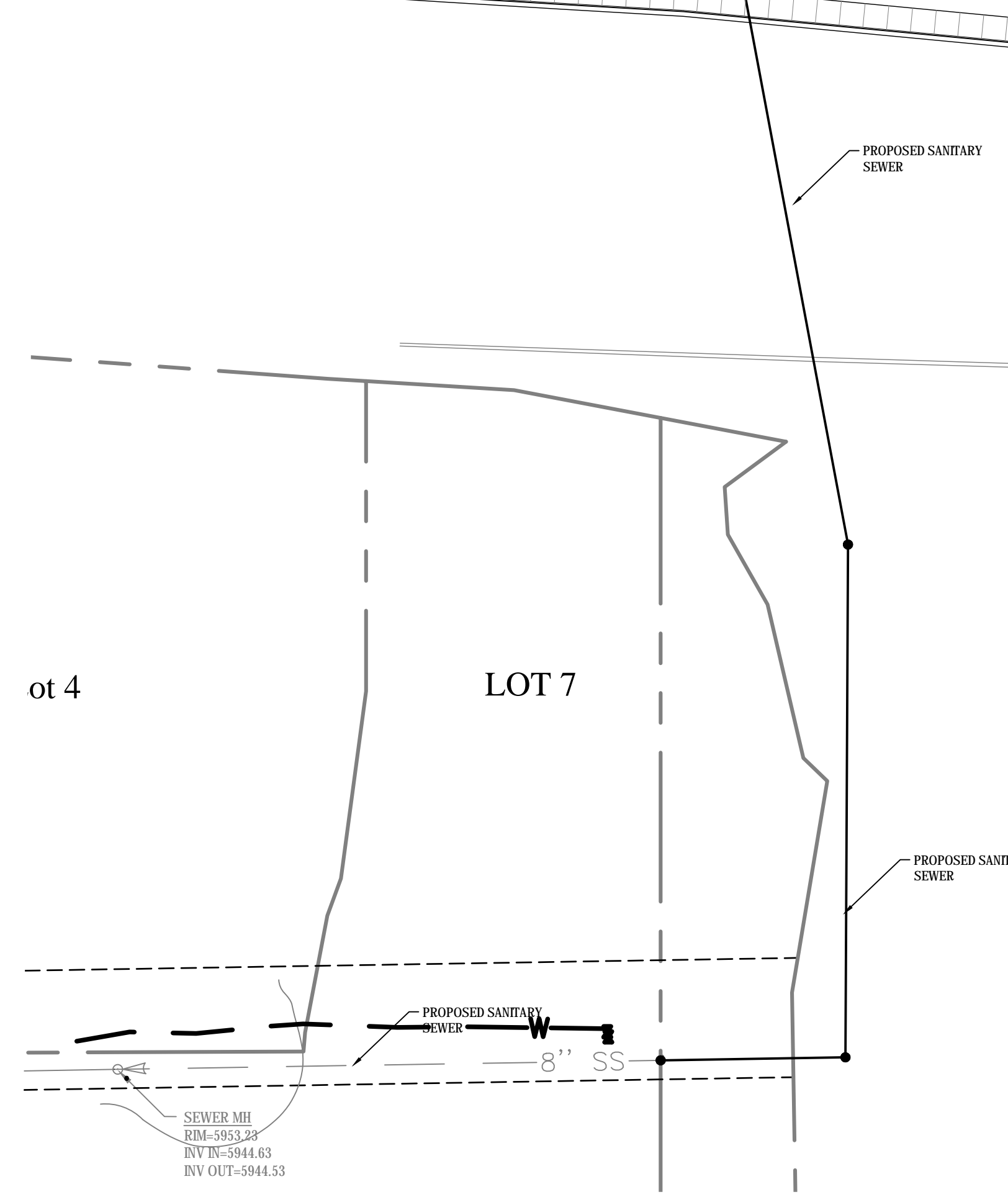
	PROPERTY LINE
	LOT LINE
	PROPOSED EASEMENT / SETBACK
	EXISTING RIGHT-OF-WAY
	PROPOSED SAWCUT LINE
	PROPOSED CURB
	PROPOSED FLOW LINE
	PROPOSED PAN/FLIP
	PROPOSED SANITARY SEWER
	EXISTING SANITARY SEWER
	PROPOSED WATERLINE
	EXISTING WATERLINE
	PROPOSED STORM SEWER
	EXISTING STORM SEWER
	PROPOSED WATERLINE BEND *
	PROPOSED WATERLINE TEE / CROSS *
	PROPOSED WATERLINE PLUG & CAP *
	PROPOSED GATE VALVE *
	PROPOSED WATER METER *
	PROPOSED FIRE HYDRANT *
	EXISTING / PROPOSED SANITARY MANHOLE *
	EXISTING / PROPOSED CLEAN OUT *
	UNDERGROUND UTILITY CROSSING

### ABBREVIATIONS

ASSY	ASSEMBLY
BP	BOTTOM OF PIPE
ESMT	EASEMENTS
ELEV	ELEVATION
EX	EXISTING
DIP	DUCTILE IRON PIPE
FG	FINISHED GRADE
FH	FIRE HYDRANT
FL	FLOWLINE
FU	FUTURE
GV	GATE VALVE
INV	INVERT
KB	KICK BLOCK / THRUST BLOCK
PR	PROPOSED
PVC	POLYVINYL CHLORIDE PIPE
TP	TOP OF PIPE
W	WITH

### UTILITY NOTES

- ALL UTILITY CONSTRUCTION SHALL CONFORM TO PARKER WATER AND SANITATION DISTRICT AND CRITERIA REFERENCE. LOCAL AGENCY INFRASTRUCTURE DESIGN AND CONSTRUCTION STANDARDS.
- NOMINAL DEPTH OF WATER MAIN SHALL BE 4.5' FROM FINISHED GRADE TO TOP OF PIPE.
- ALL MATERIALS AND WORKMANSHIP SHALL BE SUBJECT TO INSPECTION BY THE PARKER WATER AND SANITATION DISTRICT. THE DISTRICT RESERVES THE RIGHT TO ACCEPT OR REJECT ANY SUCH MATERIALS AND WORKMANSHIP THAT DOES NOT CONFORM TO ITS STANDARDS AND SPECIFICATIONS.
- THE CONTRACTOR IS RESPONSIBLE FOR LOCATING THE HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UTILITIES. EXISTING UTILITIES SHOWN ON THIS PLAN ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME OF DESIGN AND DO NOT REFLECT A COMPLETE SURVEY OF EXISTING UTILITIES. CONTACT THE ENGINEER WITH DISCREPANCIES.
- SAWCUT OF EXISTING STREETS SHALL BE IN CONFORMANCE WITH TOWN STANDARDS. CUTS SHALL STRAIGHT WITH CLEAN EDGES. REMOVE EXISTING CURB AND GUTTER TO NEAREST JOINT RETURN ALONG EXISTING LINE AND GRADE.
- THE OWNER AND OR THEIR REPRESENTATIVE SHALL BE RESPONSIBLE FOR COORDINATION WITH EXISTING FRANCHISE UTILITIES TO INCLUDE COMCAST, XCEL, CENTURY LINK OR OWNERS OF EXISTING DRY UTILITY LINES.
- EXISTING UTILITY SURFACE APPURTENANCES SHALL BE RAISED TO FINISHED GRADE. THIS INCLUDES BUT IS NOT LIMITED TO MANHOLE LIDS, VALVE COVERS.
- SITE SURVEY IS PROVIDED BY AZTEC CONSULTING INC. DATED 1-3-2017



**BENCHMARK**  
 BENCHMARK: DOUGLAS COUNTY SURVEY CONTROL MONUMENT TT15A - 3" DIAMETER DOUGLAS COUNTY GIS ALUMINUM CAP AT THE NE CORNER OF STROH ROAD AND SOUTH PARKER ROAD (US HIGHWAY 83) ELEVATION: 5970.79 FEET (NAVD 1988 DATUM)

**CALL UTILITY NOTIFICATION CENTER OF COLORADO 1-800-922-1987**  
 CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

CAUTION: NOTICE TO CONTRACTOR THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE LOCAL UTILITY LOCATION CENTER AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATIONS OF THE UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.

**Perception Design Group, Inc.**  
 Consulting Civil Engineers  
 6901 South Pierce Street, Suite 315  
 Greenwood Village, Colorado 80126  
 303.732.8088

PREPARED UNDER THE DIRECT SUPERVISION OF JERRY W. DAVIDSON, P.E. COLORADO REG # 30226 FOR AND ON BEHALF OF PERCEPTION DESIGN GROUP, INC.

NO.	DATE	DESCRIPTION
102417	INITIAL SUBMITTAL	

**OVERALL UTILITY PLAN**  
 PARKER POINTE  
 LOTS 1 THRU 14 AND TRACT A, PARKER POINTE FILING NO. 1  
 SOUTHEAST CORNER PARKER ROAD AND STROH ROAD  
 PARKER, COLORADO

design by: JWD  
 approved by: JWD  
 project no.: 2015-015  
 date: 10/01/17

SHEET  
**C7.02**

**Appendix B:**  
Black Rock Coffee Bar

Site Plan

Overall Utility Plan

Aerial Photograph

Fire Flow Calculations







# Black Rock Coffee

Aerial Photograph

## Legend

- Antonio's Pizza Pasta Wings
- BRC - Parker, CO
- Christian Brothers Automotive Parker South
- King Soopers
- NATIONAL WILDLIFE REFUGE
- Parker Pour House
- Twin Aspen Dental Center
- Untitled Polygon
- Walgreens



STROH ROAD

S. PARKER ROAD

SITE LOCATION  
LOT 13

Google Earth

© 2023 Google



600 ft

**TABLE B105.1(2)**  
**REFERENCE TABLE FOR TABLES B105.1(1) AND B105.2**

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute) <sup>b</sup>	FLOW DURATION (hours)
Type IA and IB <sup>a</sup>	Type IIA and IIIA <sup>a</sup>	Type IV and V-A <sup>a</sup>	Type IIB and IIIB <sup>a</sup>	Type V-B <sup>a</sup>		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	3
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m<sup>2</sup>, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

- a. Types of construction are based on the *International Building Code*.
- b. Measured at 20 psi residual pressure.

**TABLE B105.2**  
**REQUIRED FIRE-FLOW FOR BUILDINGS OTHER THAN ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES**

AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE-FLOW (gallons per minute)	FLOW DURATION (hours)
No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2)
Section 903.3.1.1 of the <i>International Fire Code</i>	25% of the value in Table B105.1(2) <sup>a</sup>	Duration in Table B105.1(2) at the reduced flow rate
Section 903.3.1.2 of the <i>International Fire Code</i>	25% of the value in Table B105.1(2) <sup>b</sup>	Duration in Table B105.1(2) at the reduced flow rate

For SI: 1 gallon per minute = 3.785 L/m.

- a. The reduced fire-flow shall be not less than 1,000 gallons per minute.
- b. The reduced fire-flow shall be not less than 1,500 gallons per minute.

Calculated Minimum Fire Flow per Bldg SF, given sprinklered building  
= 0.25 x 1,500 gpm = 375 gpm.

Note: The required fire flow shall not be less than 1,500 gpm.

**Appendix C:**

Final Utility Study, Parker Point, Perception, September 2017



**FINAL UTILITY STUDY  
PARKER POINTE  
SOUTHEAST CORNER OF  
SOUTH PARKER ROAD AND STROH ROAD**

**PREPARED FOR:  
PARKER AND STROH, LLC  
975 LINCOLN STREET, SUITE 204  
DENVER, CO 80203**

**CONTACT: DAN YACOVETTA  
303-699-3368**



**6901 SOUTH PIERCE STREET, SUITE 315  
LITTLETON, CO 80128  
CONTACT: CLIFFORD D. NETUSCHIL, P.E.  
(303) 232-5255**

**JOB #2015-015**

**SEPTEMBER 18, 2017**

## **ENGINEER'S STATEMENT**

I hereby attest that this report for the Utility Design of, Parker Pointe, was prepared by me, or under my direct supervision, in accordance with the provisions of the Parker Water and Sanitation District (District) Standards and Specifications for the responsible parties thereof. I understand that the District does not and shall not assume liability for utility facilities designed by others.

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Clifford D. Netuschil, P.E.  
Colorado Registration No. 38138  
For and on behalf of Perception Design Group, Inc.

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- C OVERALL UTILITY MAP

# Section 1: GENERAL LOCATION & SITE CONDITION

## 1.1 Site Location

Parker Pointe, (Project / Site) is located on an unplatted parcel of situated in the southeast corner of South Parker Road and Stroh Road, Figure 1.

Locally the Site is located in moderately developed area. Commercial development is located to the west, northwest of the Site. Large Lot residential is located to the east. Open space is located to the south of the Site.

By rectangular survey coordinates the project is located in the Section 3, Township 7 South, Range 66 West of the 6th Prime Meridian, Douglas County, State of Colorado.

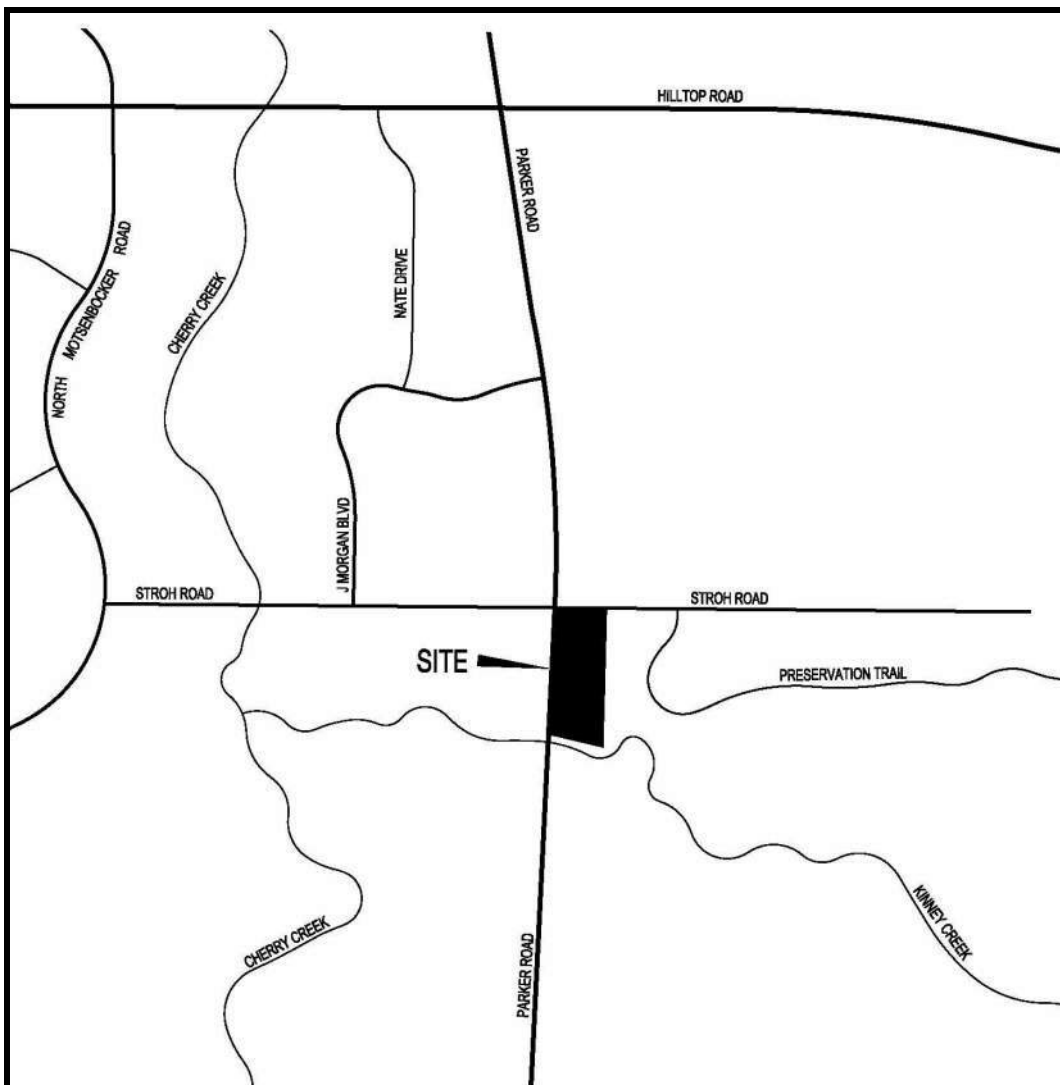


Figure 1: Vicinity Map

## **1.2 Description of Property**

The Site is being annexed and zoned C (Commercial) pursuant to the Town of Parker. The Site is un-development property located in a moderately development area of the City. The Site encompasses 14.66 acres that is vacant land and adjacent to a public roadways, South Parker Road and Stroh Road to the west and north respectively.

A single story brick building is located in the northwest corner of the Site.

The Site is moderately vegetated with existing grasses, weeds.

## **1.3 Existing Utility Conditions**

### **1.3.1 Existing Water**

Existing 8-inch and 12-inch water main is located in Stroh Road, which parallels the Site's north boundary. The main shown on the District's utility plans for Stroh Crossing Filing No.1. The 8-inch main upsizes to a 12-inch main at the intersection of Stroh Road and Parker Road.

### **1.3.2 Existing Sanitary Sewer**

An existing 8-inch pvc sanitary sewer is aligned along Lot 7 Reata West, which on the west side of South Parker Road, adjacent to the Site's southern boundary. The main is a gravity main that drains to the north and is aligned along Stroh Ranch Court.

## Section 2: SITE UTILITY DESIGN

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### 2.1 Proposed Development

The Project is to develop the Site as a commercial retail shopping center. Presently the Site will be subdivided into 14 lots that vary in size from 0.7 to 1.1 acres. Private access roads will be provided for site access and utility corridors for water, sanitary sewer and storm sewer. Proposed buildings are planned to be constructed on each lot for retail business.

#### 2.1.1 Proposed Water

An 8-inch main is proposed to loop through the Site along the private drives with connection points to the existing 8-inch main located in Stroh Road. From the 8-inch main, domestic water and fire sprinkler service will be tapped and stub onto each lot. The service stubs will provide water and fire service to the future developments.

Onsite fire hydrants will also be tapped from the on-site 8-inch main.

Site irrigation will be provided from a tap off the domestic service line past the meter and backflow preventer. Onsite landscaping will be irrigated by a private irrigation system installed on site. The onsite landscaped area will privately owned and maintained by the Owner.

##### 2.1.1.1 Water Design Regulations

The water main design for the Project has been prepared in accordance with the District's Master Study. System design information was provided by the District.

The site mean sea elevation (MSEL) is between 5962 to 6006.

Zone 2 static pressure = 133 psi.

Zone 2 The static hydraulic grade line = 6315 to 6324 MSEL.

Commercial Demands = 677 GPD / AC

Max Day Demand Factor = 2.5

Peak Hour Factor = 5.0

##### 2.1.1.2 Domestic Demands

The gross site area 14.66 acres, This is the area of the site where domestic water service will be provided.

DEMAND SCENARIO	Demand (GPD)	Demand (GPM)
Average Day	9,924	6.8
Max Day	24,812	17.2
Peak Day	49,624	34.5

**Table 1:** Water Demand Calculations (Courtesy City Standards)

Pipe loss and velocity in an 8-inch PVC main are negligible for the domestic demands.

### 2.1.1.3 Fire Flow Demands

Fire flow for the site is calculated for lot 10 as this is largest of the building sites and will result in calculations that would satisfy the condition for the Site. The results are based on Fire Flow demand of 1000 gpm.

Gross Bldg Area = 7,200 sqft

Construction Type = IIB

Required Fire Flow = 2,000 gpm.

Fully Sprinkled Building Fire Flow = 1,000 gpm.

Pipe Loss 8-Inch PVC Main = 23.5-feet, Pressure Drop = 10.2 psi.

### 2.1.2 Proposed Sanitary Service

Sanitary sewer service will be provided for each lot by a single 4-inch service line. The sanitary main will be aligned with a private drive onsite. The line will drain from north south. The line will be extended west crossing under South Parker Road, and tie to existing sanitary sewer located in Lot 7 Reata West.

The sanitary sewer design for the Project has been prepared in accordance with the Districts Master Study, Sanitary Sewer Facilities.

Commercial Demands = 273 GPD / AC

Peak Factor = 3.2

#### 2.1.2.1 Domestic Demands

The gross floor area of the office, 1,200 sqft, within Building 1-A was used to calculate the domestic demand. This is the area of the site where domestic water service will be provided.

DEMAND SCENARIO	Demand (GPD)	Demand (CFS)
Average Day Flow	4,002	0.006
Peak Day Flow	12,806	0.02

**Table 2:** Sanitary Sewer Demand Calculations (Courtesy City Standards)

Pipe capacity is negligible for the design flow. A 8-inch pvc service line at 2-percent grade will be less than 0.1-percent full. Full flow condition results in pipe velocity of 0.96 fps.

### **Section 3: CONCLUSION**

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The proposed water and sanitary sewer will operate within District standards.

## References

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1. Parker Water and Sanitation District, Parker Water & Sanitation District 2014 Water and Wastewater Master Plan. .

## **Appendix A: DISTRICTS FIGURES AND DATA**

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### WATER FIGURES AND TABLES

PRESSURE ZONE MAP FIGURE 5-1

WATER DEMAND TABLE 5-9

HGL TABLE 5-1

PEAK FACTORS TABLE 3-4

### SANITARY SEWER FIGURES AND TABLES

SANITARY SEWER STANDARDS TABLE 6-3

EXISTING WASTE WATER FLOW BY LAND USE TABLE 6-4

multifamily irrigation taps, and irrigated rights-of-way (ROW) and medians. These demands were distributed among the Irrigated, Single Family, Multifamily, Commercial and Public Facility land uses based on land use acreages. The Irrigated land use was assumed to be strictly irrigated parks, sodded with Kentucky Bluegrass which requires approximately 26" of irrigation per growing season (year) to produce an acceptable quality turf. (Refer to Appendix 5F for supplemental information on Kentucky Bluegrass irrigation requirements.) Based on these assumptions, an annual irrigation demand was calculated and assigned only to the Irrigated land use (parks). The Irrigated land use demand was then deducted from the total irrigation customer class demand, where the remaining customer class demand was assumed to equal the irrigation demands for the commercial and multifamily irrigation taps and irrigated ROW and medians. The remaining customer class demands were distributed among Single Family, Multifamily, Commercial, and Public Facility based on land use acreage. A summary of the existing average day demands by land use are provided in Table 5-9, "Existing Average Day Demand by Land Use." These values were used in conjunction with the various land uses, shown in Section 2, Figure 2-6, to determine model input demands.

There is no specific land use that currently exists within the PWSA service area that is similar to the City Center (High Density) land use proposed in the Ridgeway Development. This land use area is shown on Figure 2-6 in Section 2. As a result, there is no comparable water demand data available upon which to make future demand estimates. The Ridgeway developer has provided PWSA with water rights for 12,000 dwelling units (DUs); therefore, this number was used to calculate the development

water demands. Based on DU projections provided by the developer for the planned Ridgeway Development presented in Section 2, Figure 2-4, water demands for the City Center area were calculated using 4,370 DUs. The remaining dwelling units (7,630 DUs) are for residential and mixed use areas outside of the City Center.

**Table 5-9  
Existing Average Day Demand by Land Use**

Land Use Type	Demand
	GPD/acre
Right-of-Way	0
Commercial	677
Public Facility	677
Open Space	0
Irrigated	1,930
Single Family	2,074
Single Family Large	446
Single Family Estate	749
Single Family Rural	115
Single Family Well & Septic	0
Multifamily	3,384

**5.3.5 Modeled Scenarios and Settings**

Steady-state and extended period simulations were conducted on the existing and build-out water systems, respectively. Steady state analyses were run to simulate worst case conditions within the existing system to identify system deficiencies, whereas, an extended period simulation was performed on the build-out system to size future infrastructure. A list of the modeled scenarios are provided in Table 5-10, "Modeled Scenarios." A general summary of the model settings used to execute the model

**Table 5-10  
Modeled Scenarios**

Scenario	Condition	Simulation Type	Evaluation
Peak Hour	Existing	Steady State	Worst case operating scenario; identify system deficiencies for pressure and pipe velocities
Maximum Day + Fire Flow	Existing	Steady State	Fire flow analysis; identify system deficiencies for residual pressure, ability to supply required fire flow, pipe velocities
Maximum Day	Build-Out	Extended Period	24-hour Maximum Day diurnal curve including Peak Hour; identify pipe sizing, storage tank volumes, pump station sizing, evaluate system performance

**5.1****Purpose of the Section**

This Section describes the existing water distribution system and the improvements needed to support the build-out populations and development described in previous Sections. The improvements are based upon existing and future system analysis with a computer hydraulic model using Innovyze InfoWater® software. This Section will review the analysis results for the following key issues:

- Peak hour demands and fire flow for the existing system.
- WISE participant flows conveyed through the existing PWSD system.
- Future water distribution system piping, storage, and boost pump station requirements.
- Determination of the system improvements needed by Phase for 2020, 2025, 2035 and build-out.

This Section will touch on the future supply sources from the existing wells and the Rueter-Hess Water Purification Facility (RHWPF) currently under construction. However, a complete evaluation of the existing and future water supply sources (including wells) will be covered in detail in Section 7, "Water Supply System Evaluation." This Section will also identify the future capital projects needed to support the water distribution system growth. The costs for these improvements will be presented in Section 9, "Summary of Recommended Capital Improvements."

**5.2****Description of Existing Water Distribution System**

The PWSD existing water distribution system consists of three (3) main pressure zones and a multifaceted network of storage tanks, groundwater wells, booster pump stations, and transmission mains. A map of the existing water system facilities is shown in Figure 5-1, "PWSD Existing Water Distribution System." Figure 5-1 presents the major transmission mains in the system

and does not include all the smaller distribution system piping within the District or the pipe diameters for clarity on the figure. The piping shown in Figure 5-1 also reflects the pipe network used in the water model. A map of the District's existing water distribution system, including all pipe sizes, is provided in Appendix 5A. A detailed description of the existing water distribution system facilities are provided in the following sections.

**5.2.1 Pressure Zones**

The PWSD current service area has varying topography and is centered on the middle reach of the Cherry Creek watershed basin. As a result, the PWSD system has developed into three (3) pressure zones, with Zone 1 being the lowest elevation immediately along Cherry Creek followed by Zones 2 then Zone 3 as ground elevations increase. Pressure Zones 2 and 3 are further divided into East and West portions due to the Cherry Creek Valley being located through the middle of the service area. The Zone 2 East and West portions are not directly connected hydraulically across the Cherry Creek Valley. Zone 3, however, is hydraulically connected with a 30" east-west pipeline along Stroth Road that joins the Zone 3 East and West portions. Elevation ranges and hydraulic grade lines for these pressure zones are shown in Table 5-1, "Pressure Zone Summary." The pressure zone areas are depicted on Figure 5-1.

**Table 5-1  
Pressure Zone Summary**

Pressure Zone	Ground Elevation Range ft	Minimum Hydraulic Grade Line <sup>1</sup> ft	Maximum Hydraulic Grade Line ft
1	5,780 – 6,000	6,103.0 <sup>2</sup>	6,128.5
2 <sup>3</sup>	6,000 – 6,205	6,315.0	6,324.0
3	6,205 – 6,440	6,581.0	6,592.0

Notes:  
<sup>1</sup> The minimum hydraulic grade line represents the storage tanks being approximately ½ their full depth.  
<sup>2</sup> Based on the ½ full depths of the Butterfield Tanks.  
<sup>3</sup> Zone 2 is separated into an East and West side and is not directly hydraulically connected.

A graphical representation of the projected average water demand provided in Table 3-3 is shown in Figure 3-3, "Historical and Forecasted Averaged Day Demands." As a comparison, a "best fit" straight line projection is shown based on the historical demands. The historical straight line projections also correlated to a single family rate of growth of 470 Du/year. It can be seen that the projected demand rises slightly above this line as would be expected due to the proposed start of the Ridgeway, Canyons and Freshfields developments along the I-25 corridor.

For water system master planning maximum day (MD) and peak hour (PH) water demands are required. While the MD demand is used to size treatment plant and storage tank capacities, PH demand is used to properly size pump stations and distribution pipelines. Peaking factors were calculated based on 2012 and 2013 water demand data. The calculated MD factor was 2.4 and the corresponding PH factor was 4.8. Since limited data was available for an extensive assessment of these factors, an MD factor of 2.5 and a PH factor of 5.0 were assumed. These factors match those used in the 2009 PWSD Water and Wastewater Master Plan.

A summary of the MP peaking factors are provided in Table 3-4, "Peaking Factors." Peak water demand projections are shown in Table 3-5, "Projected Peak Water Demands."

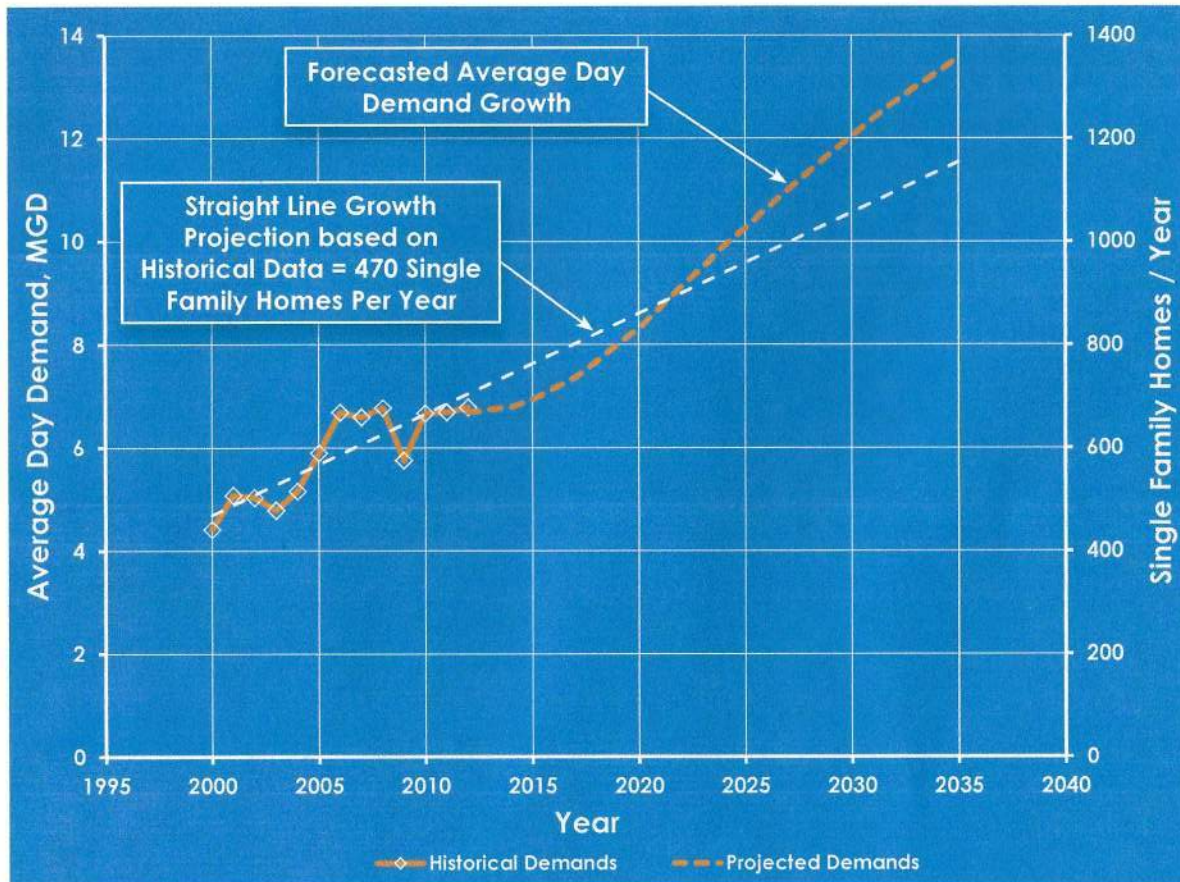
**Table 3-4  
Peaking Factors**

Condition	Peaking Factor
Maximum Day (MD)	2.5
Peak Hour (PH)	5.0

### 3.6 Diurnal Flow Characteristics

For modeling the PWSD water distribution system and evaluating system storage requirements, an accurate diurnal flow curve is needed. A diurnal flow curve represents how the demands in the system vary during a 24-hour period. To develop this curve, data from 2012 and 2013 was used to represent the current trends in water use. Typical summer and winter diurnal curves were developed and are provided in Figure 3-4, "Summer and Winter

**Figure 3-3  
Historical and Forecasted Average Day Demands**



**Table 6-3  
Wastewater Collection System Evaluation Parameters**

Parameter	Value
Flow Parameters	
Average Day Flows	Existing – 2.95 MGD
	Build-out – 8.79 MGD
Maximum Month Flows	Existing – 3.54 MGD
	Build-out – 10.55 MGD
Peak Flows (10-Year Storm Frequency)	Existing – 9.44 MGD
	Build-out – 28.13 MGD
Peaking Factor (10-Year Storm Frequency)	3.2
Base Infiltration	Included as part of the Average Day Flows
Gravity Flow Pipe Parameters	
Minimum Pipe Size	8 inch
Minimum Pipe Depth	8 feet
Manning's Roughness Coefficient <sup>1</sup>	0.013
Maximum Flow in Pipe <sup>3</sup> , d/D d = depth of flow; D = pipe diameter	0.80
Maximum Pipe Velocity <sup>1</sup>	10 ft/s
Force Main Parameters	
Hazen-William C Factor <sup>2</sup>	120
Maximum Pipe Velocity During Peak Flows <sup>2</sup>	8 ft/s
Notes:	
<sup>1</sup> ASCE. Manual No. 60 – Gravity Sanitary Sewer Design and Construction, 1982. (Appendix 6C)	
<sup>2</sup> Jones, G., et al. Pumping Station Design, Third Revision, 2008. (Appendix 6C)	
<sup>3</sup> CDPHE, WQCD. WPC-DR-1 State of Colorado Design Criteria for Domestic Wastewater Treatment Works, September 14, 2012. (Appendix 6C)	

### 6.3.2 Software

InfoSewer® is the modeling software used to analyze the hydraulic performance of the PWSD wastewater collection system. The model includes a network of pipes, manholes and lift stations represented by wet wells, pumps, and force mains. For the purposes of this Master Plan and to determine future capital improvement needs, a skeletonized model was developed based on the pipes shown in Figure 6-1. The skeletonized model used major collector and interceptor pipelines, typically 12" diameter and larger, with some smaller 8" mains necessary for flow allocation.

### 6.3.3 Flow Categories

Flows in the PWSD wastewater collection system can be divided into the following three (3) categories for modeling purposes:

- **Average day (AD)** flows are the total wastewater flows generated in a year divided by the number of days in a year (365). AD flows, or base flows, are contributed to the collection system

from residential, commercial, institutional, and industrial sources.

- **Base Infiltration** is groundwater entering the sewer system through defective pipe joints and cracked pipes on a continuous basis when there is not a wet weather event occurring.
- **Infiltration and Inflow (I/I)** are peak flows, or wet weather flows, that result from precipitation events. Rainfall induced wet weather infiltration is precipitation that flows through the ground before entering the sewer system through cracked pipes and defective joints. Inflow is storm water that enters the collection system through surface means such as manhole lids and leaking seals and joints in manholes. In some systems the inflow can also enter through storm or roof drain connections.

Peak flows were analyzed based on storm return frequency (or probability) and were presented in Section 4. Various rainfall frequencies were

evaluated. Based on discussion and review of this analysis with PWSD, it was decided that the 10-year storm return frequency peak flows would be used for evaluating the collection system for planning and design purposes.

### 6.3.4 Flows by Land Use

Determining the wastewater flows by land use and drainage basin area is important for developing the model input flows and their distribution across the wastewater collection system. Wastewater flows based on land use were generated from the average daily water demand projections by customer classification presented in Section 5, Table 5-8. The water demands for Single Family, Multifamily, and Commercial classifications were multiplied by the wastewater to water GPCD ratio (69 GPCD/137 GPCD = 0.5) and normalized to equal the average day projected wastewater flows provided in Section 4, Table 4-6. Wastewater flows for the Single Family category were further apportioned to the Single Family, Single Family Large, Single Family Estate, and Single Family Rural land uses based on a weighting for lot size. Public Facilities were considered commercial uses and were assigned the same flow contributions as the Commercial land use. A summary of the existing average day wastewater flows by land use are provided in Table 6-4, "Existing Average Day Wastewater Flows by Land Use." These values were used in conjunction with the various land uses, shown in Section 2, Figure 2-6, to determine model input flows.

**Table 6-4**  
**Existing Average Day Wastewater Flows by Land Use**

Land Use Type	Flow Loading
	GPCD/Acre
Right-of-Way	0
Commercial	273
Public Facility	273
Open Space	0
Irrigated	0
Single Family	1,076
Single Family Large	430
Single Family Estate	258
Single Family Rural	65
Single Family Well & Septic	0
Multifamily	1,729

There is no specific land use that currently exists within the PWSD service area that is similar to the

City Center (High Density) land use proposed in the Ridgeway Development. This land use area is shown on Figure 2-6 in Section 2. As a result, there is no comparable wastewater flow data available upon which to make future flow estimates. The Ridgeway developer has provided PWSD with water rights for 12,000 dwelling units (DUs); therefore, this number was used to calculate the development wastewater flows. Based on DU projections provided by the developer for the planned Ridgeway Development presented in Section 2, Figure 2-4, wastewater flows for the City Center area were calculated using 4,370 DUs. The remaining dwelling units (7,630 DUs) are for residential and mixed use areas outside of the City Center.



### 6.3.5 Modeled Scenarios and Settings

Steady state model simulations were conducted on the existing and build-out wastewater collection system. A steady state scenario was analyzed using the 10-year storm return frequency peak flows to simulate worst case conditions within the wastewater collection system for identifying existing system deficiencies and sizing future system facilities. A summary of the model scenarios are provided in Table 6-5, "Modeled Scenarios." A general summary of the model settings used to execute the model simulations are provided in Table 6-6, "Model Settings." Refer to Appendix 6D for supplemental information on the model facility settings.

### 6.3.6 Wastewater Flow Allocation

Wastewater flows were added to the model using the Load Allocator Module and Polygon Intersection Method within the InfoSewer® software. The Polygon Intersection Method calculated the flows between the demand polygon and the land use polygon. The demand polygon is a compilation of smaller demand polygons that are designated to the individual manhole nodes in the model. A general demand polygon was created by the Load Allocator using the basin areas provided in Figure 6-1. Manual adjustments were made to the general demand polygon so that the polygon boundaries further aligned with the development areas shown on Section 1, Figure 1-2.

## **Appendix B: DEMAND CALCULATIONS**

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WATER SYSTEM PIPE LOSS CALCULATIONS

WATER SYSTEM HGL AND PIPE SIZING CALCULATIONS



6901 South Pierce Street,  
 Suite 315., Littleton, Colorado 80128  
 Voice 303-232-8088 Fax 303-232-5255

**HEADLOSS AND PIPE SIZING**

PARKER POINTE WATER LINE HEADLOSS

Pressure Pipe Loss      loss =  $\frac{10.44 * L * Q^{1.85}}{C^{1.85} * d^{4.8655}}$

**MAX DAY DEMAND**

L (ft)	1200
Q (gpm)	34.5
C	130
d (in)	8

hf = 0.04 ft

**COEFFICIENT "C VALUE"**

PVC	130
DIP	140
Copper	130

**MAX DAY DEMAND + FIRE FLOW**

L (ft)	1200
Q (gpm)	1034.5
C	130
d (in)	8

hf = 23.46 ft

Note C value should to verified



6901 South Pierce Street,  
 Suite 315., Littleton, Colorado 80128  
 Voice 303-232-8088 Fax 303-232-5255

**PRESSURE PIPE SIZING  
 PARKER POINTE WATER LINE**

Design:           CN            
 Project:           Parker Pointe          

**Design Criteria:**

Maximum Velocity in Pipe (fps):	5
Maximum Velocity in Pipe MD+FF (fps):	10
Minimum Diameter (in)	8
Hazen Williams C	130
Ground Elevation at Site (ft)	6006
Minimum Pressure (psi)	133

Pipe Run	Scenario	Water Line Nodes	Flow (gpm)	Max Design Flow (gpm)	Min Pipe Diameter (in)	Pipe Diameter Used (in)	Resulting Velocity (fps)	Pipe Length (ft)	Head Loss (ft)	Total Head Loss (ft)
P-1 to P-2	PEAK DAY	P2	34.5	34.5	1.7	8	0.2	1200	0.0	0.0
P-1 to P-2	PEAK DAY+FF	P2	1000	1034.5	6.5	8	6.6	1200	23.5	23.5

Ground Elevation at Site (ft)	Dynamic HGL (ft)	Resulting Pressure (psi)
6006.0	6313.2	133.0
6006.0	6289.7	122.8



6901 South Pierce Street,  
Suite 315., Littleton, Colorado 80128  
Voice 303-232-8088 Fax 303-232-5255

**SANITARY SEWER DEMAND CALCULATIONS**

Use	Occupancy (Capita)	Average Daily Sewage Flow	PEAK FACTOR
-----	-----------------------	------------------------------	-------------

Retail / Commercial		273	<i>GPD/AC</i>	3.2	
Development Type	Commercial				
Acres	14.66				
	GPD	CFS			
Average Flow	4002.18	0.006			
Infiltration					
Peak Flow	12806.98	0.02			



# Channel Report

## <Name>

### Circular

Diameter (ft) = 8.00

Invert Elev (ft) = 1.00

Slope (%) = 2.00

N-Value = 0.009

### Calculations

Compute by: Known Q

Known Q (cfs) = 0.02

### Highlighted

Depth (ft) = 0.03

Q (cfs) = 0.020

Area (sqft) = 0.02

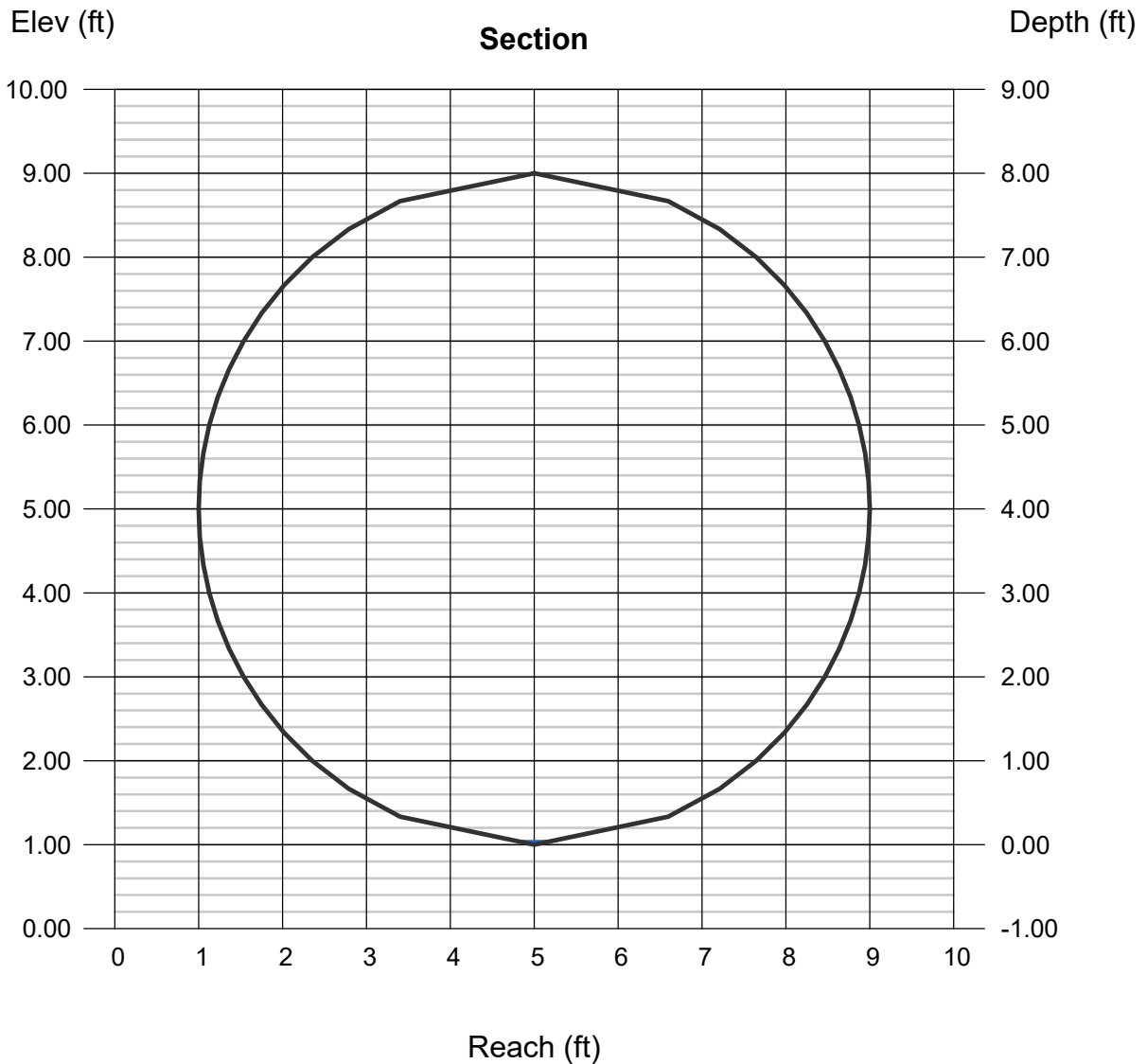
Velocity (ft/s) = 0.96

Wetted Perim (ft) = 1.00

Crit Depth,  $Y_c$  (ft) = 0.04

Top Width (ft) = 1.00

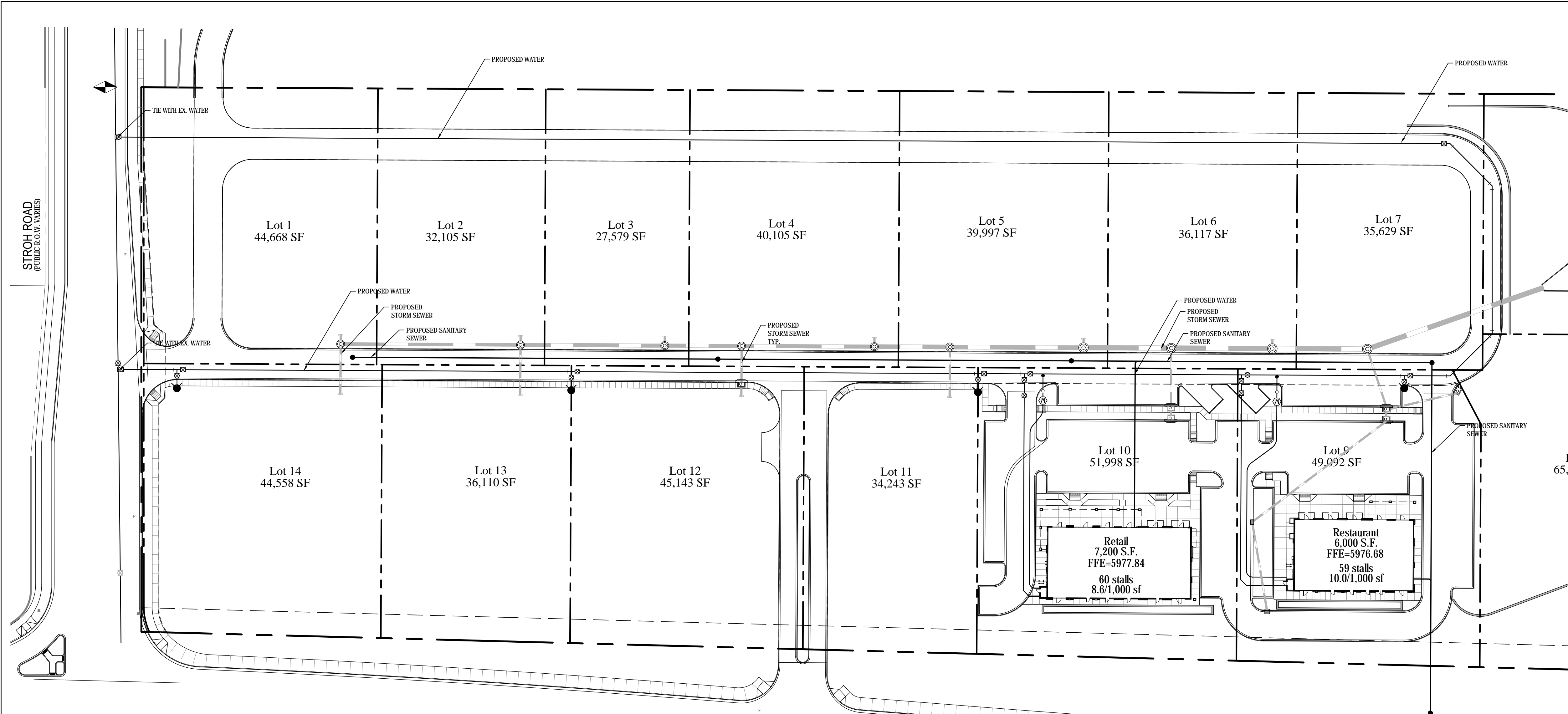
EGL (ft) = 0.04



## **Appendix C: OVERALL UTILITY MAP**

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OVERALL UTILITY MAP



### LEGEND

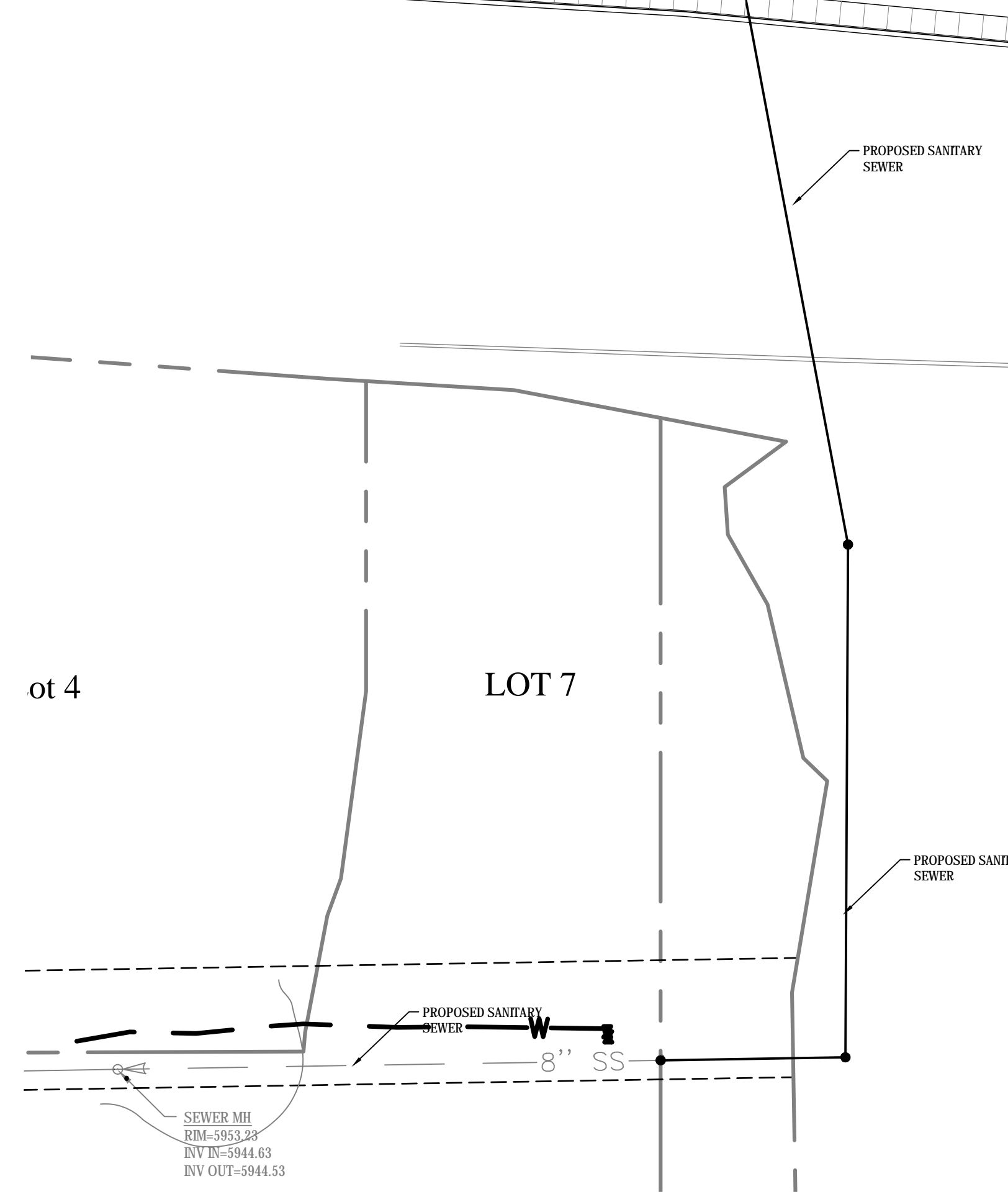
	PROPERTY LINE
	LOT LINE
	PROPOSED EASEMENT / SETBACK
	EXISTING RIGHT-OF-WAY
	PROPOSED SAWCUT LINE
	PROPOSED CURB
	PROPOSED FLOW LINE
	PROPOSED PAN/PIP
	PROPOSED SANITARY SEWER
	EXISTING SANITARY SEWER
	PROPOSED WATERLINE
	EXISTING WATERLINE
	PROPOSED STORM SEWER
	EXISTING STORM SEWER
	PROPOSED WATERLINE BEND *
	PROPOSED WATERLINE TEE / CROSS *
	PROPOSED WATERLINE PLUG & CAP *
	PROPOSED GATE VALVE *
	PROPOSED WATER METER *
	PROPOSED FIRE HYDRANT *
	EXISTING / PROPOSED SANITARY MANHOLE *
	EXISTING / PROPOSED CLEAN OUT *
	UNDERGROUND UTILITY CROSSING

### ABBREVIATIONS

ASSY	ASSEMBLY
BP	BOTTOM OF PIPE
ESMT	EASEMENTS
ELEV	ELEVATION
EX	EXISTING
DIP	DUCTILE IRON PIPE
FG	FINISHED GRADE
FH	FIRE HYDRANT
FL	FLOWLINE
FU	FUTURE
GV	GATE VALVE
INV	INVERT
KB	KICK BLOCK / THRUST BLOCK
PR	PROPOSED
PVC	POLYVINYL CHLORIDE PIPE
TP	TOP OF PIPE
W	WITH

### UTILITY NOTES

- ALL UTILITY CONSTRUCTION SHALL CONFORM TO PARKER WATER AND SANITATION DISTRICT AND CRITERIA REFERENCE. LOCAL AGENCY INFRASTRUCTURE DESIGN AND CONSTRUCTION STANDARDS.
- NOMINAL DEPTH OF WATER MAIN SHALL BE 4.5' FROM FINISHED GRADE TO TOP OF PIPE.
- ALL MATERIALS AND WORKMANSHIP SHALL BE SUBJECT TO INSPECTION BY THE PARKER WATER AND SANITATION DISTRICT. THE DISTRICT RESERVES THE RIGHT TO ACCEPT OR REJECT ANY SUCH MATERIALS AND WORKMANSHIP THAT DOES NOT CONFORM TO ITS STANDARDS AND SPECIFICATIONS.
- THE CONTRACTOR IS RESPONSIBLE FOR LOCATING THE HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UTILITIES. EXISTING UTILITIES SHOWN ON THIS PLANS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME OF DESIGN AND DO NOT REFLECT A COMPLETE SURVEY OF EXISTING UTILITIES. CONTACT THE ENGINEER WITH DISCREPANCIES.
- SAWCUT OF EXISTING STREETS SHALL BE IN CONFORMANCE WITH TOWN STANDARDS. CUTS SHALL STRAIGHT WITH CLEAN EDGES. REMOVE EXISTING CURB AND GUTTER TO NEAREST JOINT RETURN ALONG EXISTING LINE AND GRADE.
- THE OWNER AND OR THEIR REPRESENTATIVE SHALL BE RESPONSIBLE FOR COORDINATION WITH EXISTING FRANCHISE UTILITIES TO INCLUDE COMCAST, XCEL, CENTURY LINK OR OWNERS OF EXISTING DRY UTILITY LINES.
- EXISTING UTILITY SURFACE APPURTENANCES SHALL BE RAISED TO FINISHED GRADE. THIS INCLUDES BUT IS NOT LIMITED TO MANHOLE LIDS, VALVE COVERS.
- SITE SURVEY IS PROVIDED BY AZTEC CONSULTING INC. DATED 1-3-2017



**CALL UTILITY NOTIFICATION  
CENTER OF COLORADO  
1-800-922-1987**  
CALL 2-BUSINESS DAYS IN ADVANCE  
BEFORE YOU DIG, GRADE, OR EXCAVATE  
FOR THE MARKING OF UNDERGROUND  
MEMBER UTILITIES.

CAUTION: NOTICE TO CONTRACTOR THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE LOCAL UTILITY LOCATION CENTER AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATIONS OF THE UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.

**Perception  
Design Group, Inc.**  
Consulting Civil Engineers  
6901 South Pierce Street, Suite 315  
Denver, Colorado 80126  
303.532.8088

PREPARED UNDER THE DIRECT  
SUPERVISION OF  
JERRY W. DAVIDSON, P.E.  
COLORADO REG # 30226  
FOR AND ON BEHALF OF  
PERCEPTION DESIGN GROUP, INC.

NO.	DATE	DESCRIPTION
102417	INITIAL SUBMITTAL	

**OVERALL UTILITY PLAN**  
PARKER POINTE  
LOTS 1 THRU 14 AND TRACT A, PARKER POINTE FILING NO. 1  
SOUTHEAST CORNER PARKER ROAD AND STROH ROAD  
PARKER, COLORADO

design by: JWD  
approved by: JWD  
project no.: 2015-015  
date: 10/01/17

SHEET  
**C7.02**

**BENCHMARK**  
BENCHMARK: DOUGLAS COUNTY SURVEY CONTROL MONUMENT  
TT15A - 3" DIAMETER DOUGLAS COUNTY GIS ALUMINUM CAP AT  
THE NE CORNER OF STROH ROAD AND SOUTH PARKER ROAD (US  
HIGHWAY 83) ELEVATION: 5970.79 FEET (NAVD 1988 DATUM)