

PRELIMINARY UTILITY REPORT

For:

**OUTLETS AT CASTLE ROCK – PAD B1
SDP24-0024**

**LOT 1, BLOCK 1, OUTLETS AT CASTLE ROCK FILING NO. 1
5050 FACTORY SHOPS BOULEVARD, CASTLE ROCK, COLORADO**

OWNER/DEVELOPER:

Craig Realty Group
5050 Factory Shops Blvd., Suite 842
Castle Rock, CO 80108
Contact: Patrick Wentland
Phone: 303.468.1684

ENGINEER:

Farnsworth Group, Inc.
5613 DTC Parkway
Suite #1100
Greenwood Village, CO 80111
Contact: Jay M. Newell, PE
303.692.8838

August 2024

II. UTILITY REPORT APPROVAL BLOCKS

Engineer's Statement:

The enclosed utility report, and exhibits, were prepared by me or under my direct supervision and is correct to the best of my knowledge and belief. Said utility report has been prepared in accordance with applicable Town of Castle Rock criteria and is in conformance with the master utility plans for the affected area. I accept responsibility for any liability caused by negligent acts, errors, or omissions on my part in preparing this report.

Signature: _____
Registered Professional Engineer
State Of Colorado No. 35219

Owner/Developer's Statement:

As Owner/Developer of Land(s) identified within this report; I agree to proceed, implement and comply with all recommendations and requirements outlined herein.

Name of Developer

Authorized Signature

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IV. PROJECT LOCATION AND DESCRIPTION

A. Site Location

1. A vicinity map is included in the Appendices of this report for reference.
2. The proposed site, at 5050 Factory Shops Boulevard, is situated in the north half of Section 27, Township 7 South, Range 67 West of the 6th Principal Meridian, Town of Castle Rock, County of Douglas, State of Colorado.
3. Factory Shops Boulevard lies generally west of the site; the Outlet Access road intersecting with Factory Shops Boulevard lies generally north of the site; the Outlets at Castle Rock retail development lies generally east of the site; and parking and a Qdoba and Starbucks lies generally south of the site.
4. Castle Pines Commercial Filing 10A lies generally west across Factory Shops Boulevard from the site. This development includes the Lowe's home improvement store and various commercially developed outlots. The Promenade at Castle Rock development lies generally north and west of the site including Sam's Club to the north, King Sooper's to the northwest, and various other commercial developments and vacant lots. The Outlets at Castle Rock lies east of the site. Existing commercial development, including the Outlets at Castle Rock's west parking area, lies more immediately north and south of the site; and additional commercial development lies further south of the site across New Memphis Court, including various restaurants and retailers.

B. Description of Property and Land Use

1. The **subject site** is approximately 1.8 acres within the Outlets at Castle Rock retail development. Portions of the subject site are intended to be developed by the owner as a pad lot, generally within the existing parking field west of the overall outlet development. Final development of the pad site, including building construction, is to be accomplished by future tenants. The portion of the subject site to be developed as a pad lot is approximately 1.26 acres, and the portion to be developed as pad site is approximately 0.23 acre within this pad lot.
2. As described herein, the pad lot will be constructed by the property owner including construction of site and utility infrastructure. The pad site, including buildings, site improvements immediately adjacent to the buildings, and building utility service extensions from provided stubs will be constructed by future tenants. Final water meter sizes will be determined at the time of building permitting based on the required demand of the total building water supply fixture units and any additional water usage, as shown on the commercial fixture unit worksheet to be provided to the Town of Castle Rock. Other phasing is not applicable to the proposed development described in this report.

3. A breakdown of SFEs for the proposed development of the subject site (1.5 total) is included in the Appendices of this report for reference.
4. Areas and land uses are described above and herein, and are included in the Site Map and calculations included in the Appendices of this report for reference. Pad Site B1 is anticipated to be developed as an approximately 2,910 sf retail/office (bank).
5. Irrigated open space and park areas other than landscaping typical of commercial development is not applicable to the proposed development. As indicated by Section 4.4.1.1 – Water System Average Daily Demands (ADD) within the *Town of Castle Rock, Water System Design, 2018 Criteria Manual* (a.k.a. **WATER MANUAL**; see appendices), “...All tabulated ADD rates include irrigation demands with the exception of multi-family residential, car washes, gyms/fitness centers, and schools...” Regardless, the site is served by several separate, existing irrigation taps which will be re-used to irrigate existing and proposed common landscape areas. No tap or stub is proposed for Pad Site B1.
6. Anticipated commercial building size is reported in the calculations included in the Appendices of this report for reference.
7. Neither Navigable Waterways nor major or minor drainageways and floodplains appear to be applicable to the development described in this report.
8. Existing irrigation canals and ditches do not appear to be applicable to the development described in this report.
9. Significant geologic features and topography do not appear to be applicable to the development described in this report.
10. Existing On-Site Wastewater Treatment Systems (OWTS) do not appear to be applicable to the development described in this report.
11. Existing water wells do not appear to be applicable to the development described in this report.

V. CALCULATED WATER DEMANDS

A. Average Daily Demands (ADD)

1. ADDs (582 gpd total) are tabulated in the Appendices of this report for reference. Initial and full build-out are considered the same for the purposes of this report.

B. Max Day Demands (MDD)

1. MDDs (1,455 gpd total) are tabulated in the Appendices of this report for reference. Initial and full build-out are considered the same for the purposes of this report.
2. The largest potential commercial fire flow required for the size and type of the proposed buildings is reported in the Appendices of this report for reference (1,500 gpm for the proposed use of Pad B1). The proposed building is assumed to be non-sprinklered.
3. Residential fire flow is not applicable to the development described in this report.
4. MDDs associated with open space, parks, fields, and common area landscaping are not applicable to the development described in this report.
5. Required storage volume (0.181 MG) and fire flow (1,500 gpm for the bank of Pad B1) is reported in the Appendices of this report for reference.

C. Peak Hour Demands (PHD)

1. PHDs (3,201 gpd total) are tabulated in the Appendices of this report for reference. Initial and full build-out are considered the same for the purposes of this report.
2. PHDs associated with open space, parks, fields, and common area landscaping is not applicable to the development described in this report.

D. Irrigation Demands

1. As described herein, separate irrigation demands are not applicable to the development described in this report.

VI. EXISTING WATER SYSTEM

A. Existing Distribution System

1. Town, *Castle Rock Utility Map* (a.k.a. **ToCR MAP I**; see appendices) indicates a 12" DIP waterline exists in the drive immediately west of the Outlets at Castle Rock's buildings, east of the proposed pad lot. The same *Castle Rock Utility Map* indicates this waterline is a part of the overall system serving the subject site, the Outlets at Castle Rock, and the surrounding development.
2. No known or anticipated shortcomings or bottlenecks are associated with this specific portion of the existing system.

3. Pump station capacities do not appear to be applicable to the development described in this report.

B. Existing Supply Facilities

1. The proposed development lies within Parcel Number 10/11 of the *1st Amendment to the Final Water and Sanitary Sewer System Study for Castle Pines Commercial PD*, prepared by TST Inc. of Denver, Consulting Engineers, dated revised September 9, 2006 (a.k.a. **STUDY**; see appendices). The STUDY indicates that a “...previous report entitled *Water and Sanitary Sewer System Study*, dated November, 1994, was prepared for the overall Castle Pines Commercial PD...[and that the STUDY]...updates the previous reports...” The STUDY includes the subject site within the Town of Castle Rock’s Yellow Pressure Zone. The *Town of Castle Rock Water Master Plan 2017* (a.k.a. **WATER MASTER PLAN**; see appendices) corroborates inclusion of the subject site within the Yellow Pressure Zone and indicates said zone is supplied by Tanks 12A and 12B.
2. The highest and lowest elevations of the subject site and subsequent anticipated maximum and minimum static water pressures will be reported in the calculations in the Appendices of this report for reference.
3. Tanks 12A and 12B serving the subject site are located to the southwest, near the intersection of Meadows Parkway and Coachline Road. Their volumes, as reported in the WATER MASTER PLAN are 3.94 MG and 6.13 MG respectively. Required storage for the subject site is included in the Appendices of this report for reference and is less than the total storage provided by Tank 12A and Tank 12B. The WATER MASTER PLAN also indicates that, “...Tank 18 (yellow zone) in Cobblestone Ranch is planned to be constructed in the 2019-2020 planning horizon...and will add an additional 2.2 MG of storage.” The WATER MASTER PLAN continues, “...The Cobblestone Ranch subdivision (formerly known as Liberty Village) currently is served through a long transmission main that crosses three pressure zones. A 2 MG water storage tank is planned to provide dedicated storage for maximum day demand plus fire flow in this area...” It is unclear from the WATER MASTER PLAN how the subject site’s storage requirements might impact the existing and planned storage.

VII. PROPOSED WATER SYSTEM

A. Proposed Distribution System

1. The proposed water facilities consist of the installation of approximately 400’ of 1” type K copper water service line from the main to the subject site as shown in the Site Map included in the Appendices of this report for reference. No proposed fire hydrants are anticipated. Any future development of the existing water infrastructure needed to serve the subject site is the responsibility of the developer.
2. Looping in addition to that described herein is not anticipated.

3. Proposed SFEs associated with the subject site are included in the Appendices of this report for reference. The WATER MASTER PLAN's Figures 4.4a and 4.4b indicate that the subject site is a part of their Planned Development Zoning number 10 and that this PD along with PD numbers 8, 9, 43, and 91 were zoned for a maximum of 1008 SFEs (0 SF + 1550 MF), platted and SDP approved for 690 SFEs (0 SF + 1062 MF) and re-entitled for 662 SFEs (0 SF + 1018 MF). It is unclear from the WATER MASTER PLAN how the subject site's SFE requirements might impact the WATER MASTER PLAN's modeling.
4. There do not appear to be assumptions specific to the subject site within the WATER MASTER PLAN. Therefore, any re-evaluation appears inapplicable, unless determined applicable by the Town of Castle Rock.

B. Proposed Supply Facilities

1. No additional pump stations, wells, PRVs, storage reservoirs, or purification facilities are anticipated to be necessary to adequately serve the subject site.

C. Required Fire Flow

1. Required fire flows and durations are included in the Appendices of this report for reference. A "Confirmation Memo for Required Fire Flow" provided by the Castle Rock Fire and Rescue Department will be included in the Appendices of the final version of this report for reference.

D. Land Dedication Requirements

1. All portions of the proposed water system are planned to be located outside the public right-of-way, and may therefore require the dedication of utility easements to the town.
2. No portions of the proposed water system are anticipated to be difficult for the town to access or maintain.

VIII. PROPOSED WATER SYSTEM ANALYSIS AND MODELING

A. Hydraulic Models

1. Hydraulic modeling will be included with the final version of this report. Analysis will be performed with the assistance of the U.S. Environmental Protection Agency, National Risk Management Research Laboratory, Water Supply and Water Resources Division software application, EPANET.

B. Hydraulic Modeling Scenarios

- I. Static development pressures (zero demands) with the supplying storage tank at twenty percent and one hundred percent full will be included in the calculations in the Appendices of the final version of this report for reference.
2. All dynamic water modeling included in the final version of this report will be performed at a minimum (twenty percent) tank stage.
3. A water quality aging analysis is not included in this report.

C. Hydraulic Modeling Output and Required Schematics

- I. Junction reports that identify junction ID, demand, and residual pressure will be included in the Appendices of the final version of this report for reference.

D. Fire Flow Test Results

- I. Fire Flow Test Results from the STUDY are included in the Appendices of the final version of this report for reference and Fire Flow Test Results coordinated more recently with the Town may be included in the final version of this report for reference.

IX. CALCULATED WASTEWATER FLOWS

A. Average Daily Wastewater Flows (ADF)

- I. ADFs (291 gpd total) are tabulated in the Appendices of this report for reference. Initial and full build-out are considered the same for the purposes of this report.

B. Peaking Factor (PF)

- I. PFs (5.0 max for design) are tabulated in the Appendices of this report for reference.

C. Peak Design Flows (PDF)

- I. PDFs (1,484 gpd total) are tabulated in the Appendices of this report for reference. Initial and full build-out are considered the same for the purposes of this report.

X. EXISTING WASTEWATER SYSTEM

A. Existing Collection System

1. Town, *Castle Rock Utility Map* (a.k.a. **ToCR MAP I**; see appendices) included in the Appendices of this report for reference indicates an 8" PVC sanitary sewer line exists east of the subject site and continues south then west into the Factory Shops Boulevard R.O.W. west of the subject site. The same *Castle Rock Utility Map* indicates this sanitary sewer line is a part of the overall system serving the subject site, the Outlets at Castle Rock, and the surrounding development.
2. The proposed development lies within Parcel Number 10/11 of the *1st Amendment to the Final Water and Sanitary Sewer System Study for Castle Pines Commercial PD*, prepared by TST Inc. of Denver, Consulting Engineers, dated revised September 9, 2006 (a.k.a. **STUDY**; see appendices). The STUDY indicates that a "...previous report entitled Water and Sanitary Sewer System Study, dated November, 1994, was prepared for the overall Castle Pines Commercial PD...[and that the STUDY]...updates the previous reports..." The *Town of Castle Rock Wastewater Master Plan 2016* (a.k.a. **WASTEWATER MASTER PLAN**) does not appear to include a breakdown of specific wastewater collection subbasin(s).

XI. PROPOSED WASTEWATER SYSTEM

A. Proposed Collection System

1. The proposed wastewater facilities consist of the installation of a wastewater service line to the subject site as shown in the Site Map included in the Appendices of this report for reference. The proposed service line is 6" diameter. Any future development of the existing wastewater infrastructure needed to serve the subject site is the responsibility of the developer including the installation of any grease interceptors which must be in accordance with the Plum Creek Water Reclamation Authority Code of Rules and Regulations. At such time as pad site tenant(s) apply for Commercial Building Permit(s), said tenants will be required to submit a Grease Interceptor Requirement form. In addition, and in conjunction with the submittal of the Grease Interceptor Requirement form, a Plum Creek Water Reclamation Authority, Industry Information Questionnaire must be complete and submit by the tenant(s).
2. Proposed SFEs associated with the subject site are included in the Appendices of this report for reference. The WASTEWATER MASTER PLAN does not appear to include a breakdown of SFEs used in the town's hydraulic modeling. Therefore, comparison is not possible.

B. Proposed Wastewater Facilities

1. No additional lift stations, force mains, or pretreatment facilities are anticipated to be necessary to adequately serve the subject site.

C. Land Dedication Requirements

1. All portions of the proposed wastewater system are planned to be located outside the public right-of-way and may therefore require the dedication of utility easements to the town.
2. No portions of the proposed wastewater system are anticipated to be difficult for the town to access or maintain.

XII. PROPOSED WASTEWATER SYSTEM ANALYSIS AND MODELING

A. Hydraulic Models

1. Hydraulic modeling will be included with the final version of this report and will be with the assistance of Bentley Systems Incorporated's software application, FlowMaster.

B. Hydraulic Modeling Scenarios

1. ADF calculations for the proposed system are included in the calculations and results in the Appendices of the final version of this report for reference. Initial and full build-out are considered the same for the purposes of this report. Calculations will be included for both minimum and maximum allowable slopes per the WASTEWATER MANUAL.
2. PDF calculations for the proposed system are included in the calculations and results in the Appendices of the final version of this report for reference. Initial and full build-out are considered the same for the purposes of this report. Calculations will be included for both minimum and maximum allowable slopes per the WASTEWATER MANUAL. In addition, calculations determining the minimum required slope to achieve the minimum required velocity will be included.

C. Hydraulic Modeling Output and Required Schematics

1. Pipe reports that identify Manning's "n" coefficient for proposed PVC pipe, pipe size, design slope, and computed velocities will be included in the Appendices of the final version of this report for reference.
2. Tabulations identifying ADF, Peaking Factor, and PDF are included in the Appendices of the final version of this report for reference.

XIII. POTENTIAL PERMITTING REQUIREMENTS

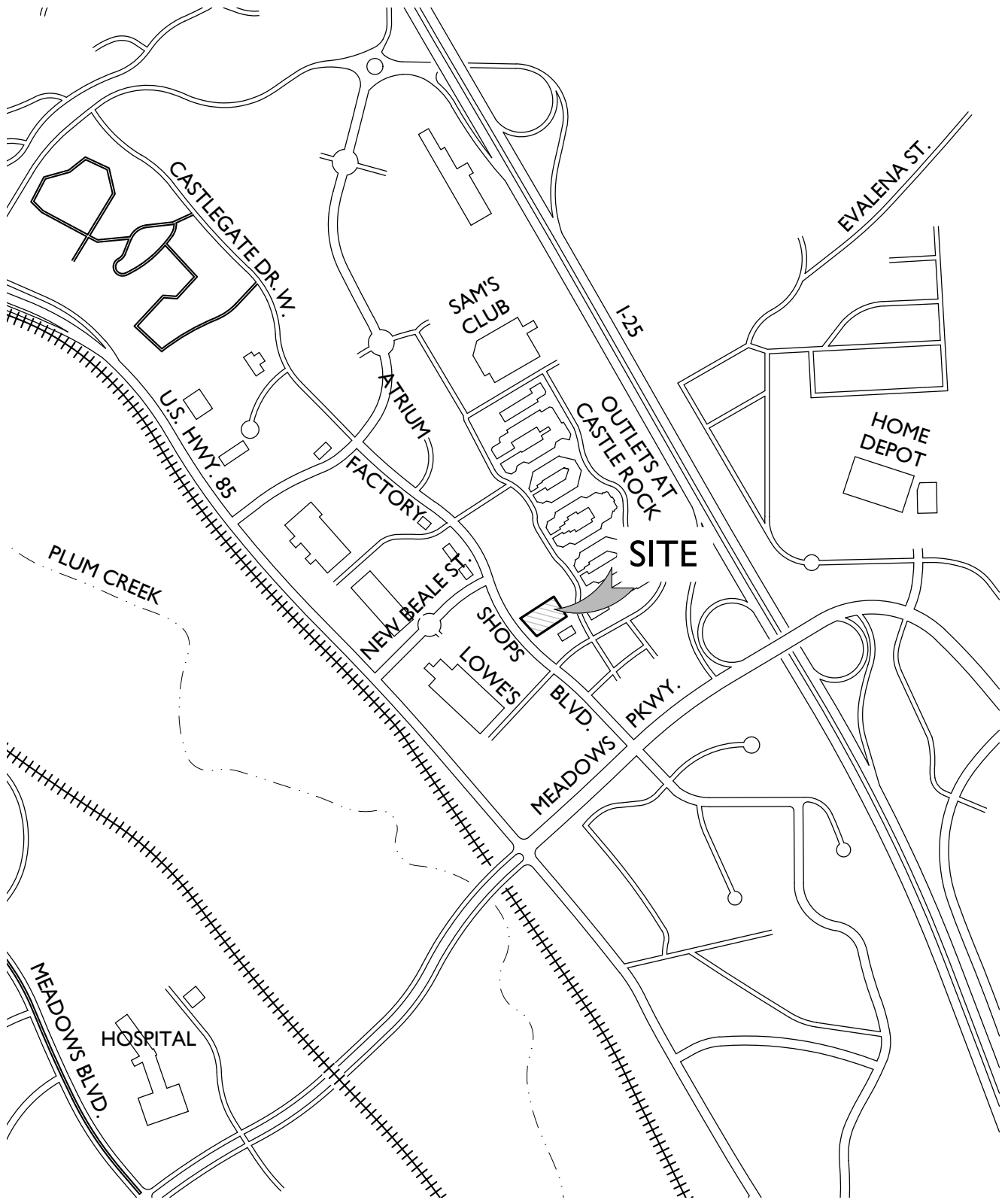
There are no foreseeable Federal, State, or County permitting requirements associated with this project. Permits typical for the construction of waterline within the Town of Castle Rock are anticipated.

XIV. REFERENCES

1. *Town of Castle Rock, Water System Design, 2018 Criteria Manual*, current edition; Town of Castle Rock.
2. *1st Amendment to the Final Water and Sanitary Sewer System Study for Castle Pines Commercial PD*, revised September 9, 2006; TST Inc. of Denver, Consulting Engineers.
3. *Town of Castle Rock Water Master Plan 2017*, current edition; Town of Castle Rock.
4. *Town of Castle Rock Wastewater Master Plan 2016*, current edition; Town of Castle Rock.
5. *Town of Castle Rock, Wastewater Collection Design, 2018 Criteria Manual*, current edition; Town of Castle Rock.
6. *Concept Utility Letter for Promenade at Castle Rock PD*, revised December 10, 2014; Bowman/VISION LAND.

XV. APPENDICES

APPENDIX A – GENERAL MAPS AND PLANS



1

VICINITY MAP

SCALE: 1"=1000'



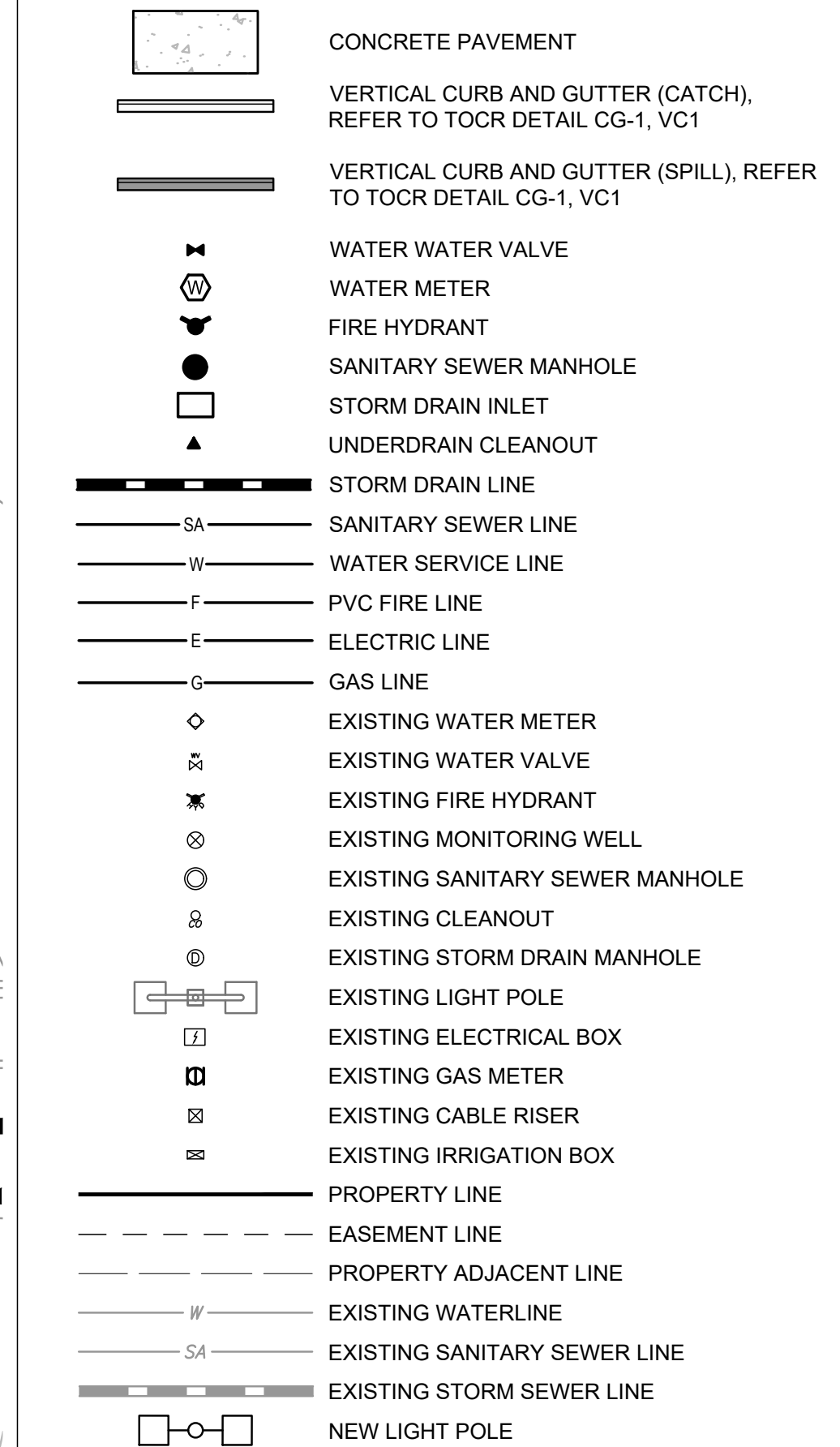
Farnsworth
GROUP

5613 DTC PARKWAY, SUITE 1100
GREENWOOD VILLAGE, COLORADO 80111
(303) 692-8838 / info@f-w.com

VICINITY MAP
CROM PAD B1

PROJECT NO.: 0240544.00
DRAWN: DEK
REVIEWED: DEK
DATE: 5/15/24

LEGEND



GENERAL NOTES

TOWN OF CASTLE ROCK UTILITY NOTES

1. THIS SITE IS LOCATED WITHIN THE TOWN OF CASTLE ROCK YELLOW WATER PRESSURE ZONE.
2. ALL PROPOSED EASEMENTS MUST BE RECORDED PRIOR TO ISSUANCE OF CONSTRUCTION PERMITS.
3. ALL UTILITY EASEMENTS FOR WATER AND WASTEWATER LINES SHALL BE FOR THE EXCLUSIVE USE OF THE TOWN SO THAT ACCESS AND MAINTENANCE MAY BE PERFORMED.
4. THE MINIMUM SEPARATION BETWEEN WATERLINES, SANITARY SEWER AND STORM SEWER LINES IS 10 FEET.
5. THE MINIMUM SEPARATION BETWEEN WATER SERVICE LINES IS 5 FEET.
6. ANY TIE-IN, CROSSING OR LOWERING OF TOWN CRITICAL INFRASTRUCTURE WILL REQUIRE A TIME AND MATERIALS PERMIT (TMU) WITH FEES REQUIRED PRIOR TO CONSTRUCTION.
7. ANY REQUIRED GREASE INTERCEPTOR SHALL BE IN ACCORDANCE WITH THE PLUM CREEK WATER RECLAMATION AUTHORITY CODE OF RULES AND REGULATIONS.

Farnsworth

GROUP

5613 DTC PARKWAY, SUITE 1100
GREENWOOD VILLAGE, COLORADO 80111
(303) 692-8838 / info@f-w.com

www.f-w.com
Engineers | Architects | Surveyors | Scientists

ISSUE: _____

DATE: DESCRIPTION: _____

Project Status

PROJECT:

CRAIG REALTY GROUP

OUTLETS AT CASTLE ROCK PAD B1

5050 FACTORY SHOPS BLVD.
CASTLE ROCK, CO 80108

DATE: 8/12/2024

DESIGNED: DEK

DRAWN: DJM

REVIEWED: DEK

FIELD BOOK NO.:

HEET TITLE:

GENERAL UTILITY PLAN

HEET NUMBER: _____

5

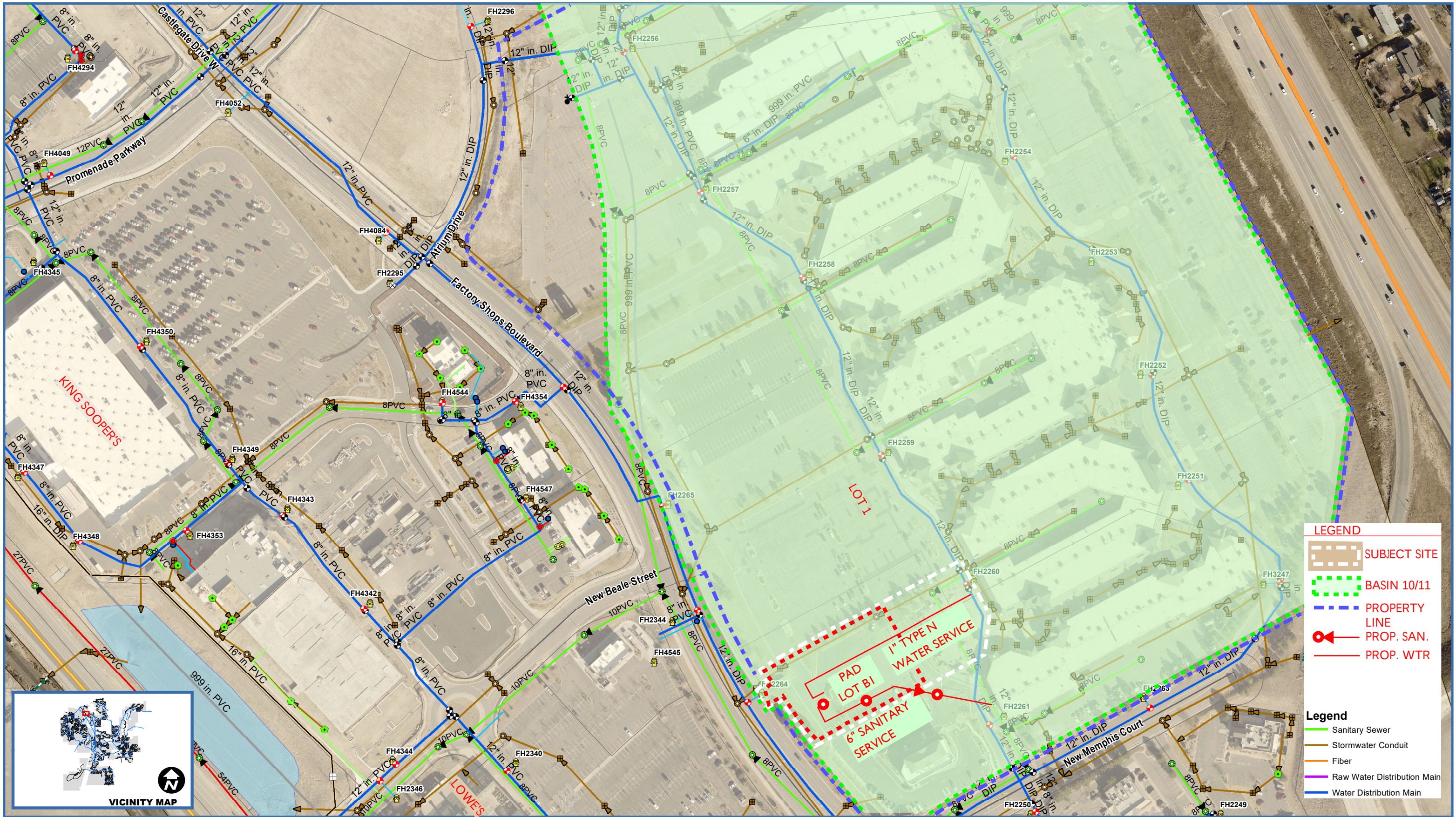
of 10

PROJECT NO. SDP24-00024

SITE DEVELOPMENT PLAN - FOR A PORTION OF LOT 1, BLOCK 1, OUTLETS AT CASTLE ROCK PROJECT NO.: 0240544.00

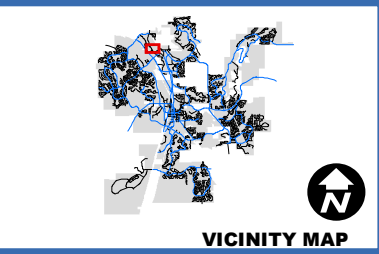
inewell | J:\2024\0240544.00 - Pad B1\04_Drawings\DWG\SDP\5 UTILITY PLAN.dwg | 8/13/2024 9:47 AM |

Town of Castle Rock - Map I



- LEGEND**
- SUBJECT SITE
 - BASIN 10/11
 - PROPERTY LINE
 - PROP. SAN.
 - PROP. WTR

- Legend**
- Sanitary Sewer
 - Stormwater Conduit
 - Fiber
 - Raw Water Distribution Main
 - Water Distribution Main



0 90 180 360 540 Feet
1 inch = 186 feet



Disclaimer: The data presented has been compiled from various sources, each of which introduces varying degrees of inaccuracies or inconsistencies. Such discrepancies in data are inherent and in supplying this product the Town of Castle Rock assumes no liability for its use or accuracy. Questions or comments regarding the cartographic composition of this map including, but not limited to, errors, omissions, corrections, and/or updates, should be directed to the Utilities Department, Town of Castle Rock, (720) 733-6087. Copyright 2017, Town of Castle Rock Utilities Mapping.

**CASTLE ROCK
UTILITIES MAP
(INTERNAL USE ONLY)**

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Date: 9/6/2019

APPENDIX B – WATER DEMANDS



Water Analysis

Job Name: CROM Pad B1 - Castle Rock, Colorado

Date: 8/13/24

By: DEK

CALCULATED DEMANDS

Use	¹ Typical ADD/Unit (gpd/sf)	¹ SFEs/Unit (SFE/sf)	Bldg. Area (sf)	ADD (gpd)	ADD (gpm)	ADD (acft/yr)	² MDD (gpd)	MDD (gpm)	² PHD (gpd)	PHD (gpm)	SFE
Retail/Offices (Pad B1)	0.20	0.0005	2,910	582	0.4	0.7	1,455	1.0	3,201	2.2	1.5

¹Town of Castle Rock, Water System Design, 2018 Criteria Manual ; Section 4.4.1 - Design Demands

²Town of Castle Rock, Water System Design, 2018 Criteria Manual ; Section 4.4.1.2 - Demand Factors; MDD/ADD = 2.5; PHD/ADD = 5.5

PROPOSED WATER SYSTEM

Use	³ Construction Type	Bldg. Area (sf)	⁴ Fire Demand (gpm)	(gpd)
Retail/Offices (Pad B1)	V-B	2,910	1,500	2,160,000

³Assumed

⁴IFC (2012; 2018), Appendix B, Table B105.1 and B105.1(2) (respectively); 2 hr duration, no sprinkler reduction

TABLE B105.1

MINIMUM REQUIRED FIRE-FLOW AND FLOW DURATION FOR BUILDINGS

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute) ^b	FLOW DURATION (hours)
Type IA and IB ^a	Type IIA and IIIA ^a	Type IV and V-A ^a	Type IIB and IIIB ^a	Type V-B ^a		
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	
70,901- 83,700	39,701- 47,100	25,501- 30,100	18,401- 21,800	11,301- 13,400	3,000	3
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	

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) ^b	FLOW DURATION (hours)
Type IA and IB ^a	Type IIA and IIIA ^a	Type IV and V-A ^a	Type IIB and IIIB ^a	Type V-B ^a		
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	
70,901- 83,700	39,701- 47,100	25,501- 30,100	18,401- 21,800	11,301- 13,400	3,000	3
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	

APPENDIX C – WATER STORAGE



Farnsworth
GROUP

Water Analysis

Job Name: CROM Pad - Castle Rock, Colorado

Date: 8/13/24

By: DEK

STORAGE VOLUME

Use	MDD (gpm)	Fire Flow (gpm)	⁵ Storage (MG)
Retail/Offices (Pad B1)	1.0	1,500	0.181

⁵Town of Castle Rock, Water System Design, 2018 Criteria Manual ; Section 4.4.2 - Storage Requirements (MDD*60 min/hr*24 hrs + Fire Flow*60 min/hr*2 hr)

APPENDIX D – WATER HYDRAULIC ANALYSIS AND MODELING

**1st Amendment to the
FINAL WATER AND SANITARY SEWER SYSTEM
STUDY**

FOR

***CASTLE PINES COMMERCIAL PD
CASTLE ROCK, COLORADO***

(Filing 12: PWP 05-004)
(Filing 10A: PWP 03-108)

PREPARED FOR
DEV-VIC LLC
March 14, 2006
Revised: September 9, 2006

BY:
TST INC. OF DENVER, CONSULTING ENGINEERS
9222 TEDDY LANE
LONE TREE, COLORADO 80124

PROJECT NO. 771-039/040

TST

APPENDIX A
WATER DEMANDS



Utilities Department

FF #54

Drew

FIRE FLOW TEST RESULTSPRESSURE TEST ONLY (if circled)

DISCLAIMER NOTICE

The following results are for the determination of fire flow parameters in the immediate area as identified. It shall be expressly understood that the results of the below noted fire flow test are representative of the Town's water system at the time of actual testing. The flow results may be subject to change in the future. The Town shall not be held responsible for any such change due to either system failure or system reconfiguration.

Requested by: Neil Kempcke Company: Kiowa Eng
Phone #: 719-630-7342 Fax #: 719-630-0406
Date requested: 7/26/05 Date of test: 7/27/05

Flow tester: D. Hays Residual tester: D. Ashlock

Hydrant flowed: 109H16 Location: Castlegate Dr

Hydrant read: 109H17 Location: Castlegate Dr

Project location:

Lot: _____ Block: _____ Address: _____

Type of hydrant: Muller Nozzle: 2.5"

Main line size: 12" Main line type: UNK

Static pressure: 130 Residual pressure: 117 Pitot reading: 100

Attachments to fax:

Comments:

From: TST INC. OF DENVER

 $303+792+9489$

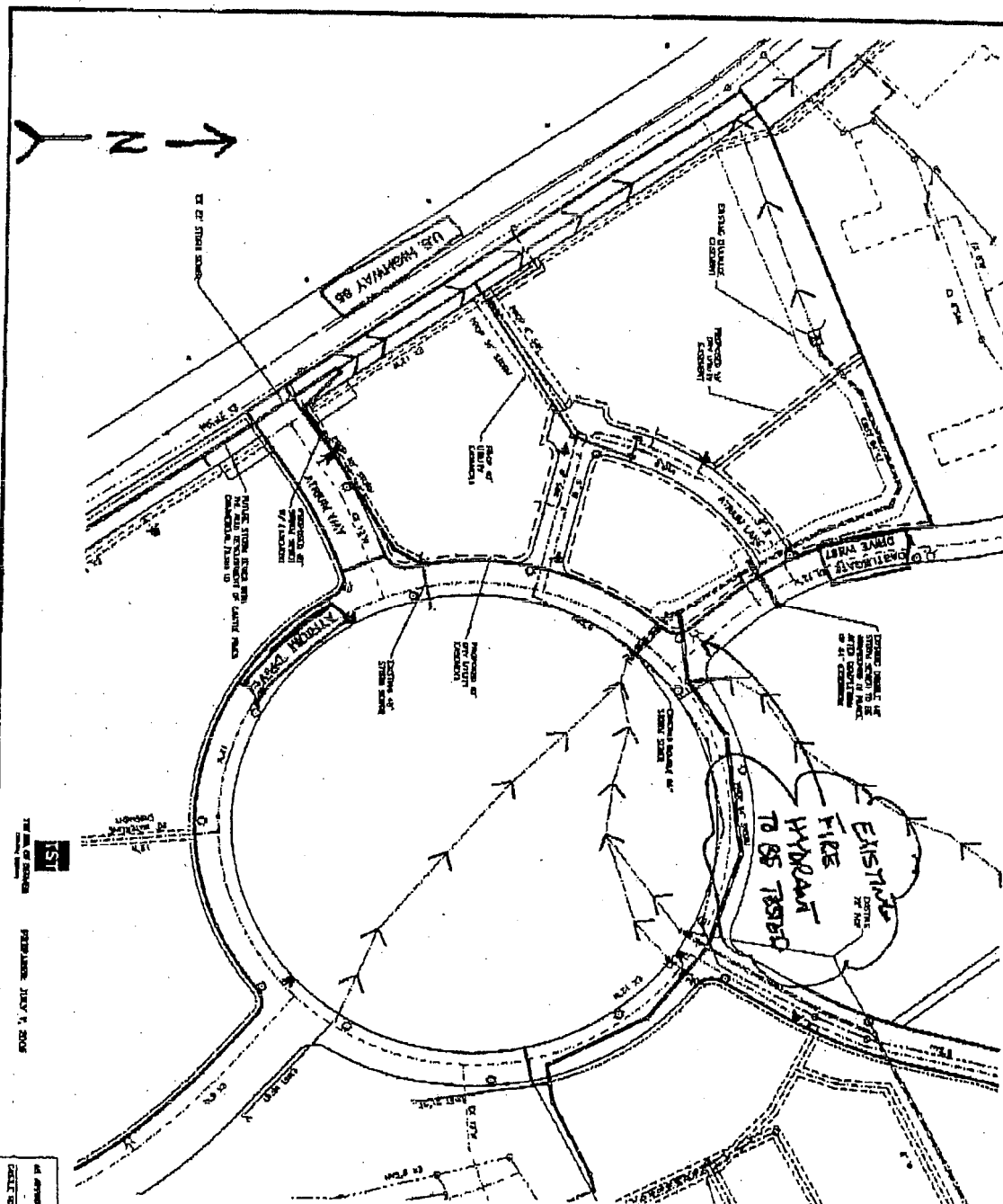
12/02/2005 16:00 #045 P.002

EXHIBIT 1

CASTLE PINES COMMERCIAL FILING 12

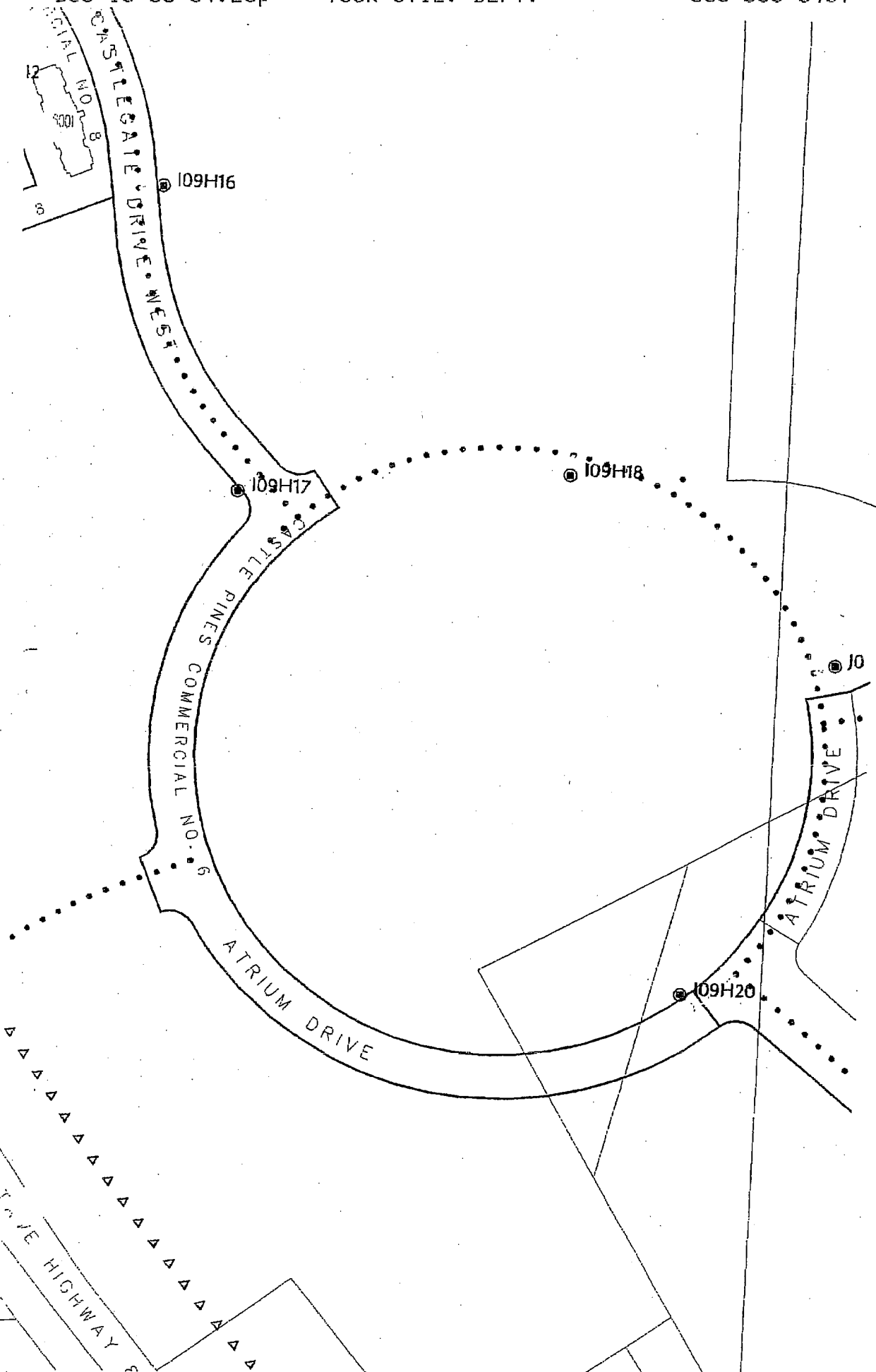
PREREQUISITE PLAT

A PORTION OF SECTIONS 22 AND 27 OF T28, R37W, OF THE 8th PRINCIPAL MERIDIAN
TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO
UTILITY & EASEMENT PLAN

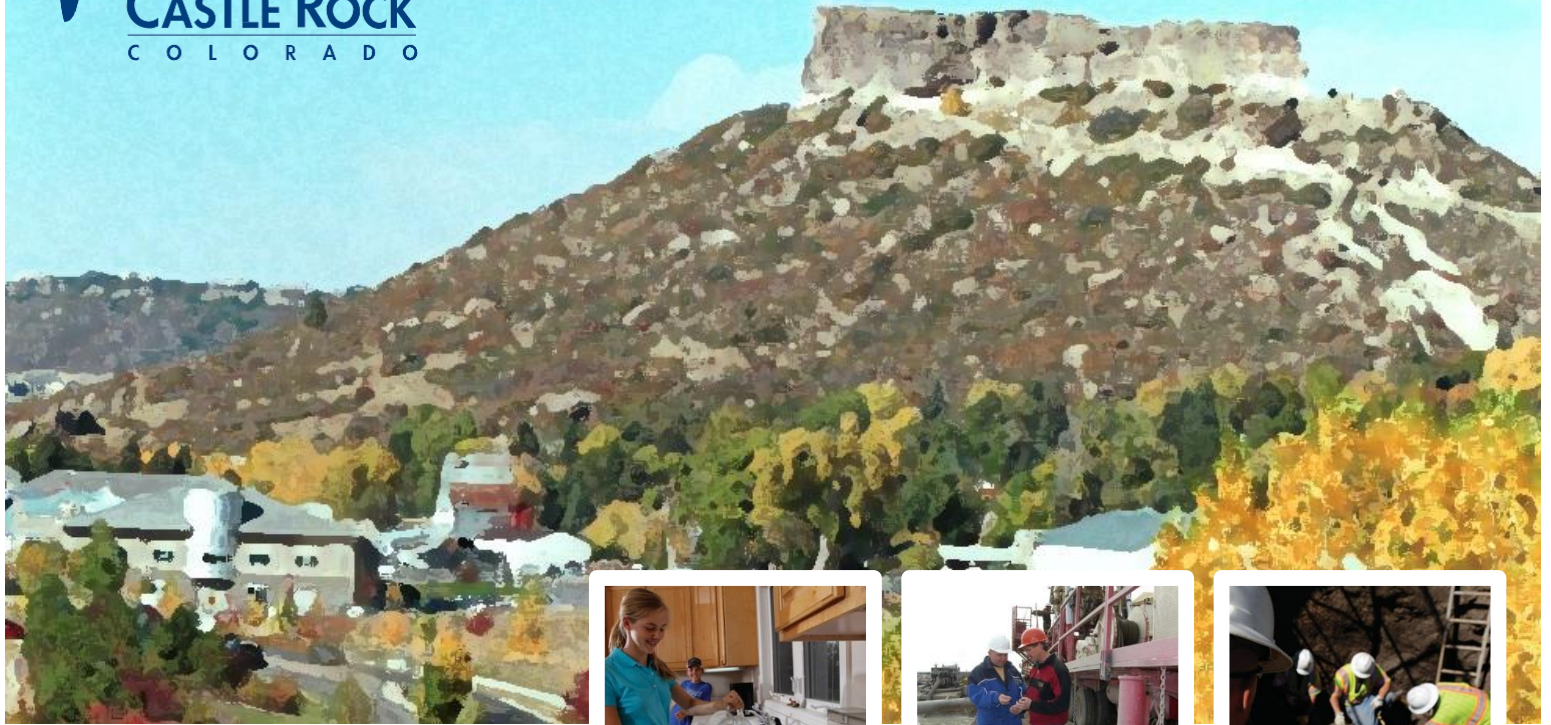


POINTS

1. ALL UTILITY LINES AND EEDS-OF-WAY WILL BE F
2. FROM HOLDINGS. PROCEED
3. ALL EXISTING AND FUTURE
4. LINES WILL BE PLACED
5. 1. ALL EXISTING AND FUTURE
6. AND BENTONED.
7. 4. ALL PROPOSED UTILITY
8. PLACED TO CHANGE FROM
9. 3. FROM NEW WATER SUPPLY
10. ARE NOT NEEDED FOR PRO
11. PROVIDED AT A MAXIMUM
12. 6. SHORT-TERM PROPERTIES
13. UTILITY SERVICE AS DESIR



APPENDIX E – WATER MAPS AND PLANS



TOWN OF CASTLE ROCK

Water System Design

2018 CRITERIA MANUAL



Published by the Town of Castle Rock, 100 N. Wilcox St., Castle Rock, CO 80104
December 4, 2018

associated with the Town's Concept, Preliminary, and Final Development Packages are documented in Chapter 3 of these Criteria.

4.4.1. Design Demands

The tabulation below provides the Average Daily Demand (ADD) rates that shall be applied to compute the demands associated with the various types of land use within the development. Demands shall be computed for intermediate and full build-out phases of the development, and shall be assigned to the appropriate design points within the model to accurately reflect the geographical distribution of land use throughout the site.

Land Use	Typical ADD/Unit	Typical SFEs/Unit
Single Family Residential and Duplexes	400 gpd/dwelling unit	1.00/dwelling unit
Multi-Family Residential (Townhomes and	260 gpd/dwelling unit	0.65/dwelling unit
Retail/Offices	0.2 gpd/SF	0.0005/SF
Hotels/Motels	75 gpd/room	0.19/room
Restaurants	3.0 gpd/SF	0.0075/SF
Car Washes	5,000 gpd/facility	12.5/facility
Industrial / Other Commercial	1,200 gpd/acre	3.0/acre
Institutional	800 gpd/acre	2.0/acre
Rates for Typical Douglas County		
School Sizes:		
Elementary (10 ac, 675 students)	3,375 gpd/school	8.44/school
Middle (25 ac, 850 students)	8,500 gpd/school	21.25/school
High (50 ac, 1,700 students)	17,000 gpd/school	42.50/school
Rates for Alternate School Sizes:		
Elementary – Domestic	5 gpd/student	0.013/student
Middle – Domestic	10 gpd/student	0.025/student
High – Domestic	10 gpd/student	0.025/student
Elementary Schools – Irrigation	3,000 gpd/total acreage	7.5/total acreage
Middle Schools – Irrigation	5,250 gpd/total acreage	13.1/total acreage
High Schools – Irrigation	4,400 gpd/total acreage	11.0/total acreage
Churches	600 gpd/church	1.5/church
Gym/Fitness Center	0.5 gpd/SF	0.00125 SFE/SF
Irrigated Land (Sports Fields and School Sites Excluded)	3,750 gpd/ irrigated acre	9.38/acre

4.4.1.1 Water System Average Daily Demands (ADD)

Notes:

- (1) All tabulated ADD rates include irrigation demands with the exception of multi-family residential, car washes, gyms/fitness centers, and schools.
- (2) Irrigation demands shall be in accordance with the Irrigation Plan approved by Castle Rock Water and hours of irrigation shall comply with the latest edition of the Town's Water Use Management Plan. Irrigation demands in this Table are for planning purposes only. Peak irrigation rates for 'Irrigated Land' and 'School Irrigation' categories tabulated above shall be in accordance with the approved Irrigation Plan, and shall not be based on the peaking factors identified in the section below.
- (3) The "Irrigated Land" rate identified above may be higher for active sports fields (e.g., irrigated fields within parks) as determined by the approved Irrigation Plan.
- (4) School sizes in this table are for planning purposes, per the Douglas County School District. Regarding design flows for schools, planned school sizes shall be confirmed with the Douglas County School District and documented in the Utility Report. The tabulated rates shown above shall be applied as appropriate, depending on the information provided by the School District.
- (5) Reasonable engineering judgment shall be used in determining the estimated ADD for commercial, industrial and institutional sites. Individual evaluation and justification, including fixture unit counts, shall be provided when the proposed use is not specifically represented in the table above, or when the proposed demands will be inconsistent with the tabulated values. For example, each car wash's unique operating plan, including recycling of wash water, shall be considered. Justification of all non-residential demands shall be addressed in the Utility Report.

4.4.1.2 Demand Factors

Once the ADD has been computed in accordance with the demand rates tabulated above, Maximum Day Demands (MDD) and Peak Hour Demands (PHD) shall be computed by multiplying the ADD by the following factors:

Maximum Day Demand/Average Day Demand:	2.5	MDD/ADD
Peak Hour Demand/Average Day Demand:	5.5	PHD/ADD

Peaking factors are not applied to irrigation ADD demands. Max Day Demand and Peak Hour Demand are calculated by multiplying the ADD demand by the demand factors. If the site's irrigation demands are calculated using the table in section 4.4.1, the irrigation ADD is added to the calculated MDD and PHD, computed as follows:

$$\text{MDD} = \text{Domestic ADD} \times \text{Maximum Day Factor} + \text{Irrigation ADD}$$
$$\text{PHD} = \text{Domestic ADD} \times \text{Peak Hour Factor} + \text{Irrigation ADD}$$

4.4.1.3 Fire Flows

Fire flows shall conform to the latest edition of the International Fire Code (IFC) and shall be confirmed by the Town's Fire Department, as described in section 3.6.XII of

this criteria. A 50 percent reduction in required fire flow may be allowed for approved residential sprinkler systems, and a 75 percent reduction may be allowed for approved commercial sprinkler systems at the discretion of the Town of Castle Rock Fire Chief. The minimum fire flow for the water distribution system is 1,500 gpm, unless otherwise approved by the Fire Department.

4.4.2 Storage Requirements

The required storage volume associated with a particular development shall be computed as follows:

$$\text{Storage Volume (MG)} = \text{Maximum Day Demand (MG)} + \text{Fire Flow (MG)}$$

Example Calculation:

Based on an assumed 1500 gpm two-hour fire and an MDD rate of 75 gpm, the storage requirement would be:

75 gpm x 60 min/hr x 24 hrs =	108,000 gallons
+ 1500 gpm x 60 min/hr x 2 hrs =	<u>180,000 gallons</u>
Total required storage =	288,000 gallons (0.288 MG)

Based on the computed storage volume, Castle Rock Water will evaluate whether the development is compatible with the location and magnitude of the existing and master-planned storage volume within the pressure zone, or if additional storage must be considered to provide the appropriate level of service to the development. Due to hydraulic constraints and limitations within the service area, fire storage within the pressure zone may need to be duplicated as determined by Castle Rock Water.

4.4.3 Minimum Hydraulic Performance Criteria

All mains shall be sized to provide for domestic, irrigation and fire protection demands to all points in the development without violating the pressure, velocity, and headloss criteria set forth herein. The proposed network shall be evaluated by the engineer under the hydraulic conditions stipulated in the following table using an approved hydraulic network analysis model. In some cases, the Town may require the oversizing of certain mains based on required master-planned sizes associated with the overall Town system. Recovery costs of such oversizing shall be in accordance with the Town Municipal Code, and pursuant to applicable executed agreements.

Hydraulic Condition	Pressure (psi)
Minimum static pressure with zero demand (20% tank stage)	43
Maximum static pressure with zero demand (100% tank stage)	125
Minimum dynamic pressures (based on 20% tank stage):	
Max Daily Demand + fire flow (see note below)	20
Peak Hour Demand (see note below)	35

Note: Pressure and Velocity criteria listed above for the MDD plus fire flow and PHD conditions shall be satisfied with one critical distribution loop out of service.

4.4.3.1 Operating Pressures and Pressure Zone Characteristics

The required operating pressures listed above apply to pressures within the mains, and shall be satisfied in accordance with the general pressure zone elevation data tabulated below (Vertical Datum NAVD 88).

Pressure Zone Designation	Max HGL Elev.	Top Elev. Served	Low Elev. Served
1 (Orange)	6192	6072	5915
2 (Yellow)	6352	6230	6065
3a (Blue-east)	6508	6389	6221
3b (Blue-west)	6523	6399	6236
4 (Purple)	6594	6474	6308
5 (Red)	6680	6557	6393
6 (Green)	6824	6700	6537

Notes: (1) Elevations shown above are general guidelines. Engineer shall contact Castle Rock Water to confirm the appropriate numbers for a specific site. (2) Pressure evaluations in areas served solely by PRVs shall be based on the PRV settings, as provided by Castle Rock Water.

4.4.3.2 Assumed Pressures at Existing System Connections

Primary distribution and transmission mains between the supplying storage tank and

**1st Amendment to the
FINAL WATER AND SANITARY SEWER SYSTEM
STUDY**

FOR

***CASTLE PINES COMMERCIAL PD
CASTLE ROCK, COLORADO***

(Filing 12: PWP 05-004)
(Filing 10A: PWP 03-108)

PREPARED FOR
DEV-VIC LLC
March 14, 2006
Revised: September 9, 2006

BY:
TST INC. OF DENVER, CONSULTING ENGINEERS
9222 TEDDY LANE
LONE TREE, COLORADO 80124

PROJECT NO. 771-039/040

TST

INTRODUCTION

A previous report entitled *Water and Sanitary Sewer System Study*, dated November, 1994, was prepared for the overall Castle Pines Commercial PD. Several updates have been prepared to reflect the parcels being developed. This report updates the previous reports and specifically analyzes the requirements for potable water and sanitary sewer lines within Parcels 7 & 16 (Castle Pines Commercial Filing 12) and Parcels 12 and 15 (Castle Pines Commercial Filing 10A). From this analysis, line sizes for the mains are recommended. In making this analysis, representatives of Dev-Vic Ltd. Liability Co. and others were consulted to determine their opinion of the planned build-out density of the development. The densities and uses in this report were primarily based on their opinion of the most intense usage of the property. A copy of the most recent PD has been included in Appendix F.

LOCATION

The Castle Pines Commercial PD ("PD") lies between Interstate 25 and U.S. Highway 85, primarily on the north side of Meadows Parkway, approximately two miles north of Castle Rock. Parcel 7 and 16, which is west of Atrium Drive, is planned for the development of commercial, office and retail uses. Parcel 12 and 15, which is north of Meadows Parkway, is planned for commercial, office and retail uses. There is currently development either complete or in progress on several other parcels, including the Castle Rock Factory Shops, Castlegate apartments and two other mixed use parcels within the PD. The general location is shown on Figure 1 located in Appendix A.

WATER SYSTEM ANALYSIS

This analysis of the proposed water distribution system was conducted using the CyberNet network analysis software. The PD distribution system is tied to the Town of Castle Rock system in two locations. The first is the 16-inch line in Meadows Parkway in the Yellow pressure Zone, which is the furthest eastern extent of the Meadows system. For the purposes of this analysis, the Meadows system is assumed to be able to supply flows at 98 PSI at the east side of the Plum Creek bridge on Meadows Parkway, per the *Water and Sanitary Sewer System Study for Castle Pines Commercial P.D.* dated June, 1994 by TST Inc. of Denver. The second source of supply is a tie to the Town's Yellow Zone system through a 16" line in West Castleton Road. The maximum hydraulic grade of the Yellow Zone is 6349'. The hydraulic grade used in this model is 6040 feet. This hydraulic grade was provided by the Town of Castle Rock engineering department for use in the report. Both Filing 10A and Filing 12 can be served by the Yellow Zone at the elevations shown on the construction plans.

The previous looped system of lines within the PD was updated to reflect the actual site layout for this model. The conditions for average day flows, max day flows and peak hour flows were reviewed, along with the available fire flows at max day flow, and the systems for Parcels 7, 12, 15 and 16 were sized based upon these results. Printouts of the results of the

APPENDIX A
WATER DEMANDS

WATER USAGE CALCULATION



TST INC. OF DENVER
CONSULTING ENGINEERS
 9222 Teddy Lane Lone Tree, CO 80124
 (303)792-0557 (phone)
 (303)792-9489 (FAX)

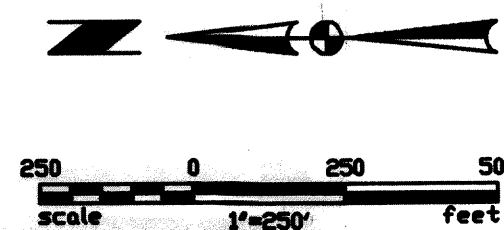
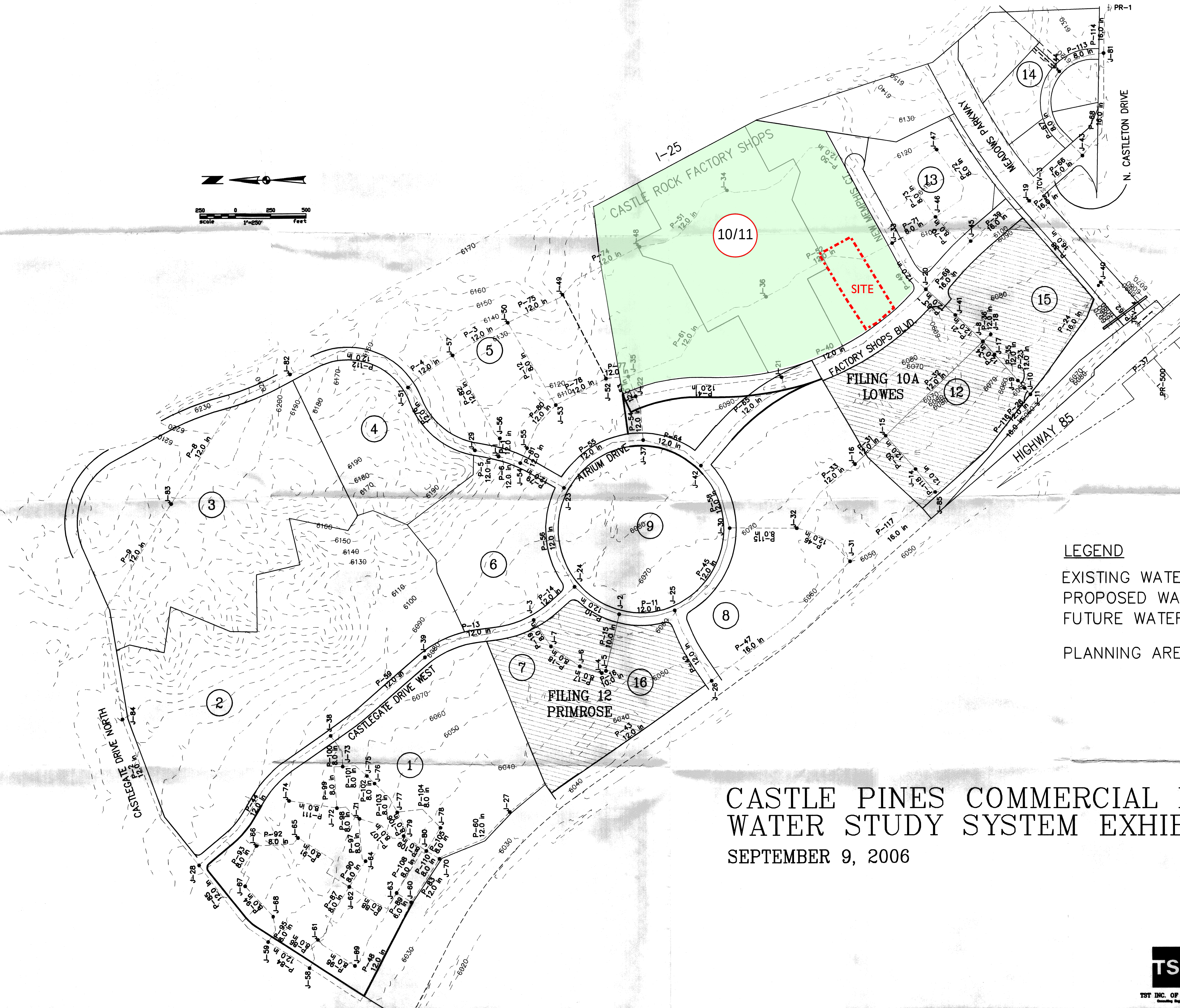
PROJECT: CP COMMERCIAL
PROJECT NO.: 771-039/771-040
ENGINEER: GLENDON W. BERRETT P.E.
CRITERIA
 TCR PUBLIC WORKS REGULATIONS SECTION II - CHAPTER. 14
 ACREAGES - DWELLING UNITS FROM CASTLE PINES COMMERCIAL PD, 4th AMENDMENT
 COM - COMMERCIAL - DEMAND 1200 gpad
 RMF - MULTIFAMILY RESIDENTIAL - DEMAND 260 gpd/D.U.
 *DEMAND RATE PER D.U. OR ACREAGE
 MAX DAY FACTOR - 2.65
 PEAK HOUR FACTOR - 4.5

PLANNING AREA	USE	ACREAGE	DWELLING UNITS	*DEMAND	AV. DAY (gpd)	AV. DAY (gpm)	MAX DAY (gpm)	PEAK HOUR (gpm)	# OF NODES
01	RMF	41.7	750	260	195000	135	359	609	24
02	RMF	27.8	300	260	78000	54	144	244	4
03	RMF	29.8	400	260	104000	72	191	325	2
04	COM	17.8		1200	21360	15	39	67	2
05	COM	22.1		1200	26520	18	49	83	7
06	COM	23.9		1200	28680	20	53	90	3
07	COM	11.8		1200	14160	10	26	44	2
08	COM	4.0		1200	4800	3	9	15	3
09	COM	15.8		1200	18960	13	35	59	7
10 & 11	COM	63.0		1200	75600	53	139	236	8
12	COM	40.3		1200	48360	34	89	151	12
13	COM	9.0		1200	10800	8	20	34	2
14	COM	13.3		1200	15960	11	29	50	3
15	COM	4.0		1200	4800	3	9	15	3
16	COM	4.0		1200	4800	3	9	15	2
TOTALS					651800	453	1199	2037	

DEMAND PER NODE			
AREA	AV. DAY (gpm)	MAX DAY (gpm)	PEAK HOUR (gpm)
01	6	15	25
02	14	36	61
03	36	96	163
04	7	20	33
05	3	7	12
06	7	18	30
07	5	13	22
08	1	3	5
09	2	5	8
10 & 11	7	17	30
12	3	7	13
13	4	10	17
14	4	10	17
15	1	3	5
16	2	4	8

APPENDIX F

MAPS/PLANS



LEGEND

- EXISTING WATER PIPE -----
- PROPOSED WATER PIPE =====
- FUTURE WATER PIPE - - - - -
- PLANNING AREA NO. (1)

CASTLE PINES COMMERCIAL P.D. WATER STUDY SYSTEM EXHIBIT SEPTEMBER 9, 2006



Water Master Plan 2017



Engineering Division

Water Master Plan 2017 Update

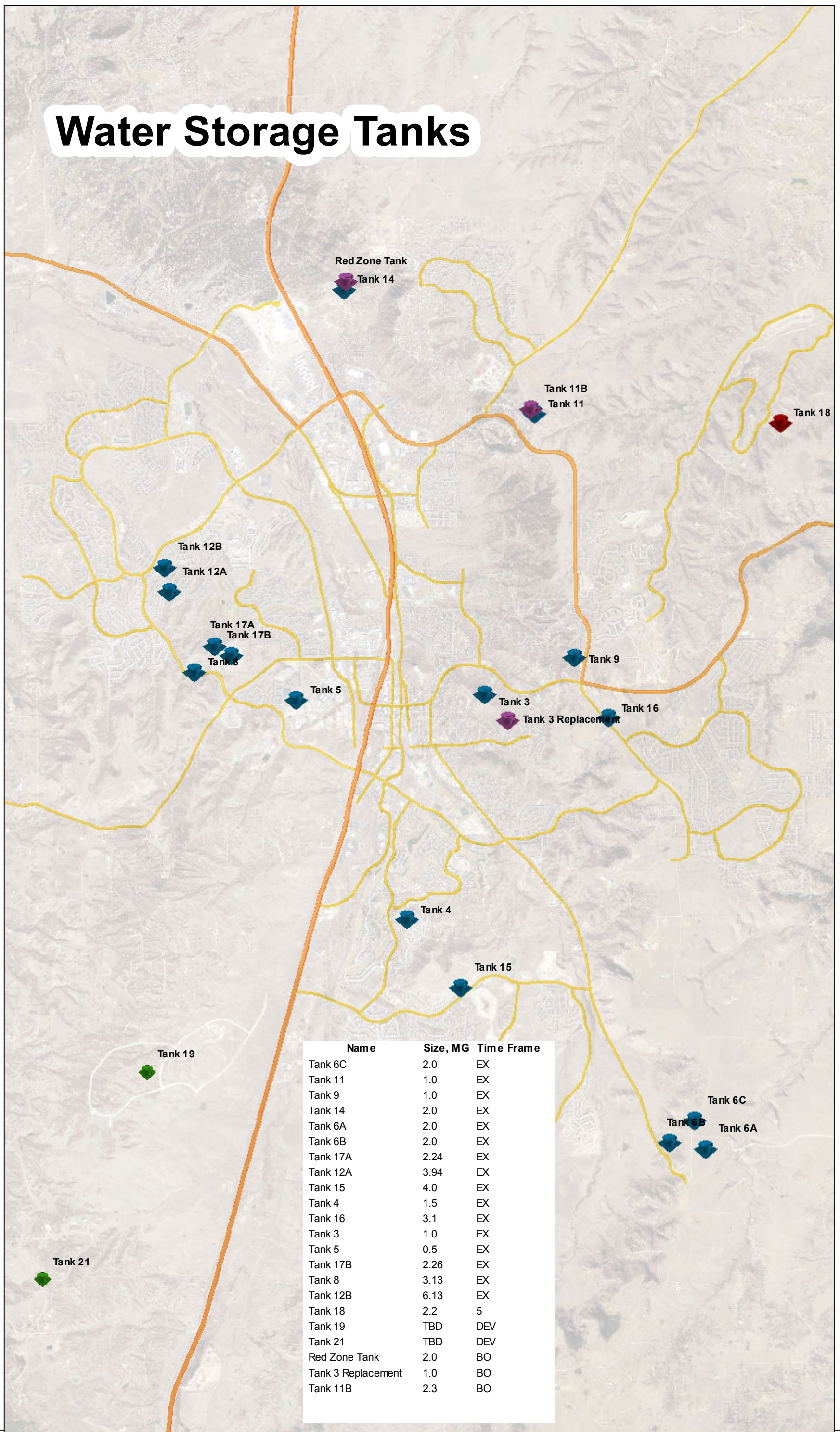
A corrosion control study would include but not be limited to a system-wide water quality evaluation (samples taken at various locations throughout the system for laboratory testing), evaluation of current water treatment methods and possible future changes to treatment or water sources, a review of materials in the distribution system, and an evaluation of corrosion control treatments in the system based on further testing. Study results would be used to prepare a report that evaluates potential additional corrosion control treatments (as needed) and compares their ability to reduce lead and/or copper in private plumbing that contains lead and copper. Completing a corrosion control study would require additional staff time and various costs, such as those for lab testing and engineering consultant services.

Water quality within the Town's distribution network has been historically stable, with no action level exceedances of lead or copper since the Town began testing for these compounds in 1992. The Colorado Primary Drinking Water Regulations (5 CCR 1002-11) allows an exemption from completing the corrosion control study for water systems that already meet specific water quality parameters (currently have optimal corrosion control). CRW met those requirements and submitted a request to CDPHE seeking the exemption from completing the study. CDPHE approved CRW's request to be deemed a system having optimal corrosion control (not having to complete the corrosion control study). CRW will continue to monitor system water quality and report those results to CDPHE and to the public in the annual Consumer Confidence Report (CCR).

Water Storage

Finished water storage is critical for meeting peak demands and fire flow requirements. The Town has fourteen active water storage tanks located in the various pressure zones with a total storage capacity of 35.62 million gallons (MG). Table 3-2 provides an inventory of existing water storage tanks. The Town plans to maintain these existing tanks and add several more as the Town continues to grow. Tank 3, the Town's oldest storage tank, was rehabilitated in 2016. Tank 18 (yellow zone) in Cobblestone Ranch is planned to be constructed in the 2019-2021 planning horizon, dependent on the rate of growth, and will add an additional 2.2 MG of storage. Other future tanks include a new purple zone Tank 11B and a new red zone Tank. Tank 6B has deteriorated to the point that it has been removed from service and will be demolished in 2018. See Figure 3.1 for locations of existing and future tanks.

Water Storage Tanks



Water Master Plan 2017 Update

Table 3-2 Finished Water Storage Tank Inventory

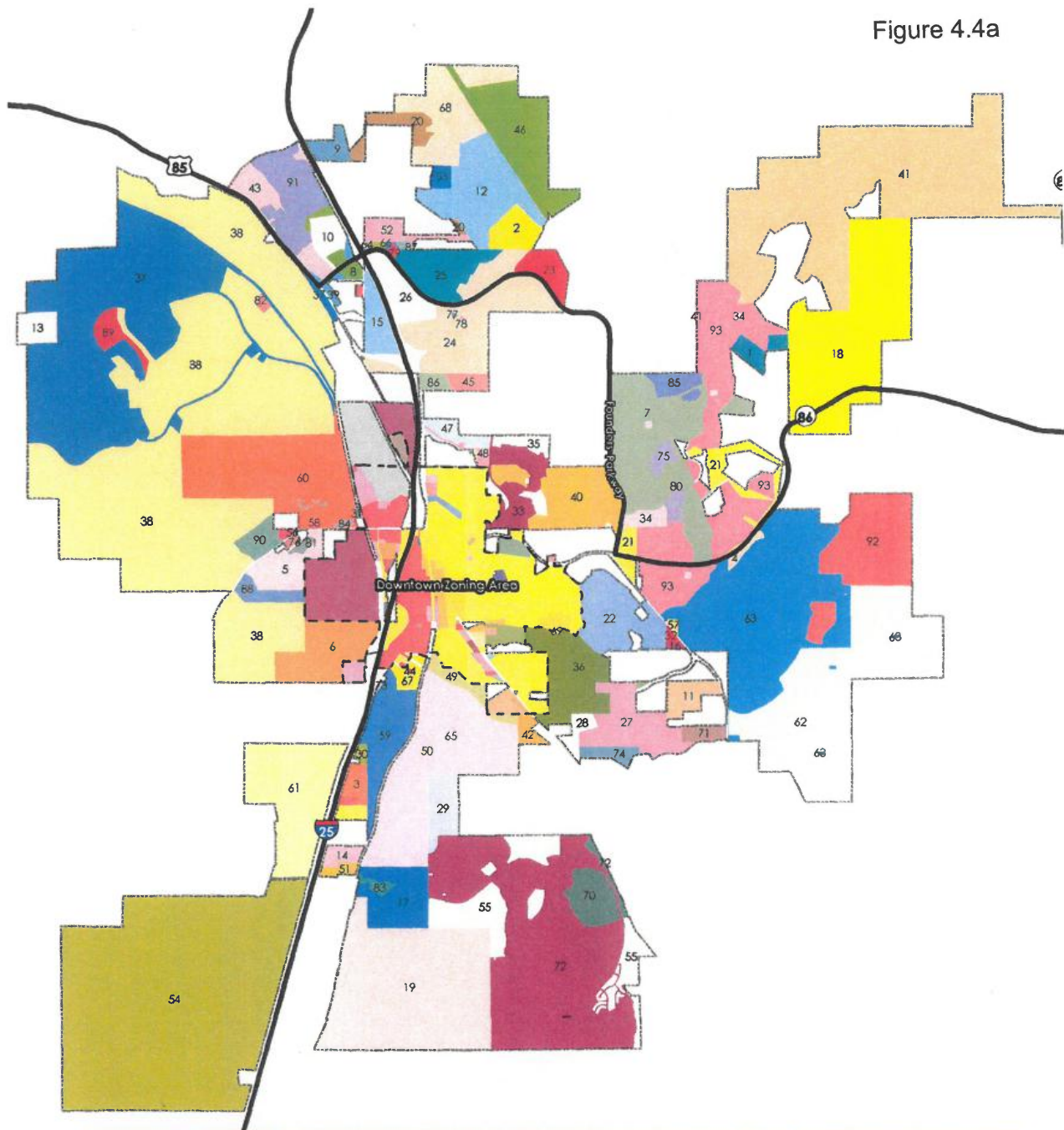
Tank ID	Year Built	Capacity (MG)	Diameter (ft)	Height (ft)	Pressure Zone	Status
Tank 1						Demolished
Tank 3	1969	1.04	92.6	19.1	Purple	Active
Tank 4	1984	1.51	118.0	18.6	Blue	Active
Tank 5 ¹	1984	(0.5)	66.0	19.4	Yellow	Not in Service
Tank 6A	1986	2.0	120.0	23.5	Green	Active
Tank 6B ²	1997	(2.0)	120.0	23.5	Green	Not in Service
Tank 6C	2010	2.22	120.0	23.5	Green	Active
Tank 7 ³	1986	(2.0)	122.0	22.7	Red	Not in Service
Tank 8	1987	3.13	147.0	24.8	Blue	Active
Tank 9	1989	1.0	96.0	19.3	Purple	Active
Tank 11	1998	1.0	92.5	24.0	Purple	Active
Tank 12A	1999	3.94	172.0	22.8	Yellow	Active
Tank 12B	2007	6.13	172.0	22.8	Yellow	Active
Tank 14	2001	2.0	121.0	23.3	Red	Active
Tank 15	2002	4.03	174.0	22.7	Red	Active
Tank 16	2004	3.11	140.0	27.0	Red	Active
Tank 17A	2005	2.24	136.0	20.6	Red	Active
Tank 17B	2009	2.26	136.0	20.6	Red	Active
Total Active Storage Capacity		35.6				

¹ Tank 5 is located in Citadel Station and currently is not in service. It has been physically disconnected from the distribution system and its future use will be evaluated.

² Tank 6B has been removed from service due to a structural failure. This tank is scheduled for demolition in the 5-year CIP.

³ Tank 7 is located in Dawson Ridge and currently is not in service. This tank will need to be evaluated to determine if it can be used for future use.

Figure 4.4a



Planned Development Zoning

An overview of the history and boundaries of all Planned Development Zoning Districts and Amendments. This map is for informational purposes only and does not constitute a legal document. The Town of Castle Rock, Colorado, is the sole authority on the subject of zoning. The map is based on the most current information available and is subject to change without notice. The map is not intended to be used for legal purposes. For more information, please contact the Town of Castle Rock, Colorado, at (303) 688-1000.

Legend

0 0.5 1 Miles

Disclaimer: The data presented has been compiled from various sources, each of which has provided varying degrees of accuracy and timeliness. Such discrepancies in data are inherent and in applying this product to the public the Town of Castle Rock assumes no liability for its use or accuracy. For questions or comments regarding omissions, corrections, or updates please visit CastleRockColorado.gov for contact information.

Copyright © 2014, Town of Castle Rock
This map was approved on 1/22/2015
Ordinance No. 2002-04
Revision Date: 7/26/2014
Coordinate System: NAD 83 Colorado Central (5002)
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Feet US

1. 1ST AMD TO CASTLE OAKS PRELIM PD SITE PLAN AMD 1
2. BROOKWOOD PD
3. BURT AT CASTLE ROCK PD
4. CAMBRIDGE HEIGHTS PD
5. CASTLE HIGHLANDS MAJOR MODIFICATION
6. CASTLE MEADOWS INTERCHANGE OVERLAY PDP
7. CASTLE OAKS AMENDMENT NO. 1
8. CASTLE PINES COMMERCIAL AMENDMENT (1995)
9. CASTLE PINES COMMERCIAL MAJOR MODIFICATION
10. CASTLE PINES COMMERCIAL PD
11. CASTLE RIDGE PD
12. CASTLE ROCK ESTATES I AMENDMENT
13. CHURCH OF THE ROCK PD
14. CREEKSIDE PD
15. DOUGLAS COUNTY JUSTICE CENTER MAJOR MODIFICATION
16. FAITH LUTHERAN CHURCH PD
17. HECKENDORF RANCH AMENDMENT NO. 2
18. HERITAGE FARM PD
19. THE LANTERNS AMENDMENT NO. 3
20. MAHER RANCH PD
21. MALL AND OFFICE CENTER INFILL
22. MEADOWS YOUNG INFILL
23. METZLER RANCH 2ND MAJOR AMENDMENT
24. METZLER RANCH PD (1996)

25. METZLER RANCH THIRD MAJOR AMENDMENT
26. MILESTONE OFFICE CAMPUS AMENDED (1998)
27. OAKS OF CASTLE ROCK AMENDMENT NO. 1
28. OAKS OF CASTLE ROCK PD
29. PLUM CREEK SOUTH PD
30. PLUM CREEK WEST PD
31. RED HAWK PD32. RIDGE VIEW PD
33. SCOTT RANCH PD
34. VILLAGES AT CASTLE ROCK PD
35. WOODLANDS MINOR MODIFICATION
36. YOUNG AMERICAN PD
37. MEADOWS THIRD AMENDMENT
38. MEADOWS FOURTH AMENDMENT
39. MEADOWS PARKWAY PD
40. WOODLANDS SECOND AMENDMENT
41. LIBERTY VILLAGE 2ND AMENDMENT
42. STANBRO PD
43. CASTLE PINES COMMERCIAL AMENDMENT (2000)
44. CENTRE ON PLUM CREEK FLG 2 AMENDED
45. HAZEN MOORE AMENDMENT
46. MAHER RANCH MAJOR AMENDMENT (PHASE 1)
47. SCOTT I MAJOR MODIFICATION
48. SCOTT II AMENDED
49. PLUM CREEK FIRST AMENDMENT

50. PLUM CREEK SECOND AMENDMENT
51. PLUM CREEK POINTE AMENDMENT
52. COOPER-HOOK PD
53. CASTLE ROCK ESTATES II PD
54. DAWSON RIDGE AMENDMENT
55. CRYSTAL VALLEY RANCH MAJOR AMENDMENT
56. ARBORS PD
57. MT. ZION LUTHERAN CHURCH PD
58. WOLFENBERGER PDP
59. BROOKSIDE BUSINESS CENTER AMENDED
60. RED HAWK AMENDMENT NO. 1
61. WESTFIELD TRADE CENTER 2ND AMENDMENT
62. CASTLEWOOD RANCH MINOR AMENDMENT
63. FOUNDERS VILLAGE AMENDED (1994)
64. 1-25 AND FOUNDERS PKWY CONOCO PD
65. PLUM CREEK AMENDED
66. MAIN PLACE PD
67. MILLER RANCH PD
68. MAHER RANCH MAJOR AMENDMENT (PHASE 2)
69. YOUNG AMERICAN SECOND AMENDMENT
70. CRYSTAL VALLEY RANCH 2ND AMENDMENT
71. OAKS OF CASTLE ROCK AMENDMENT NO. 3
72. CRYSTAL VALLEY RANCH 4TH AMENDMENT

73. DEMIS PD
74. OAKS OF CASTLE ROCK AMENDMENT NO. 4
75. CASTLE OAKS AMENDMENT NO. 1 PPD, 2ND
76. EPIPHANY EVANGELICAL LUTHERAN CHURCH
77. METZLER RANCH PPD 4TH AMENDMENT
78. METZLER RANCH PPD 5TH AMENDMENT
79. SHOPPES ON FOUNDERS
80. CASTLE OAKS AMENDMENT NO. 1 PPD, 3RD
81. AUBURN RIDGE PD
82. MEADOWS PDP NO. 1
83. HECKENDORF RANCH PDP AMD NO. 3
84. RED HAWK CROSSING PDP
85. CASTLE OAKS ESTATES PDP NO. 1
86. HAZEN MOORE PDP NO. 1
87. MONTANA VISTA PDP
88. COVENANT AT CASTLE ROCK PDP
89. MEADOWS PDP NO. 2
90. HILLSIDE PDP
91. PROMENADE AT CASTLE ROCK PDP
92. BELLA MESA PDP
93. TERRAIN PDP

Water Master Plan 2017 Update

Build-out Planning Numbers

Figure 4.4b

Data through June 30, 2017, please note that these are estimates, and numbers are subject to change

PD #	Planned Developments (year zoned)	MAXIMUM ZONED UNITS			PLATTED (SF) SDP (MF)			Full Growth @ 100% Build Out			COMMENTS
		SF	MF	Total	SF	MF*	Total	SF	MF	Total	
56	Arbors (2002)	38	80	118	0	0	0	38	80	118	Undeveloped, proposed to be developed in conjunction with this site
81	Auburn Ridge (2013)	0	289	289	0	289	289	0	289	289	Full development is expected in 2018, pending approved zoning & SDP recordation
2	Brookwood (2003)	72	0	72	72	0	72	72	0	72	Full development is expected
4	Cambridge Heights (2003)	0	100	100	0	0	0	0	100	100	Undeveloped, no dates for activity
5	Castle Highlands (1994)	132	358	490	131	200	331	132	358	490	Project completed, no additional lots are platted.
6	Castle Meadows (1989)	70	218	288	0	0	0	70	218	288	Full development is expected
7, 75, 80, 85, 93	Castle Oaks / Terrain (2002)	1992	775	2767	1696	0	1696	1992	775	2767	Full development is expected
8, 9, 10, 43, 91	Castle Pines Commercial / Promenade (1997)	0	1550	1550	0	1062	1062	0	1550	1550	Project re-entitled by Alberta Corporation. Total MF build-out equals 1016 MF units, not the previously-entitled 1550 MF units.
11	Castle Ridge East (1996)	30	0	30	28	0	28	30	0	30	Project is complete
12 & 53	Castle Rock Estates - Diamond Ridge (1995)	126	0	126	126	0	126	126	0	126	Project is complete
27 & 71 & 74 & 28	Castleview Estates - The Oaks of Castle Rock (1985)	248	326	574	239	0	239	248	326	574	Full development is expected
62	Castlewood Ranch (1998)	1300	0	1300	1288	0	1288	1300	0	1300	Remaining lots platted for sale, most will be custom homes, full development expected
straight zones, downtown	Central Castle Rock (various)	1538	883	2421	1522	791	2313	1538	883	2421	Development nearly complete, approximately 20 SF units remaining
88	Covenant At Castle Rock (2014)	58	0	58	58	0	58	58	0	58	Full development is expected
55, 70	Crystal Valley Ranch (2000)	2722	753	3475	1306	0	1306	2722	753	3475	Full development is expected
54	Dawson Ridge (1986)	2447	5453	7900	0	0	0	2447	5453	7900	Project was entitled in the late 1980's. The property has been vacant since the early 1990's with no specific plans for improvement. All involved with property ownership and development discussions agree that a new land use plan, infrastructure plan, Development Agreement and service plans need to be submitted and approved by Council prior to any development of the site no matter what decision are made on the existing entitlement.
63, 92	Founders Village - Inc. Founders 24 and Bella Mesa (1985)	1754	3667	5421	2634	0	2634	1754	3667	5421	Project is approximately 1/3 built with the expectation of the entitled 5421 residential units will be constructed.
45, 86	Hazen Moore (2000)	243	0	243	161	0	161	243	0	243	Full development is expected
17	Heckendorf Ranch (1985)	406	224	630	301	0	301	406	224	630	A portion of the property is developed. Full development expected.
90	Hillside (2005)	120	0	120	0	0	0	120	0	120	Full development is expected
19	Lantana (2003)	1200	0	1200	0	0	0	1200	0	1200	The property was recently entitled for an increase from 548 units to 1200 homes.
41	Liberty Village (2004)	1245	0	1245	1212	0	1212	1245	0	1245	Full development is expected
20, 46, 68	Maier Ranch (1988)	2309	100	2409	761	98	857	2309	100	2409	Full development is expected
37, 38, 82, 89	Meadows (1985)	6642	4002	10644	7188	240	7428	6642	4002	10644	The developer consistently states the intent to build the entire number of lots.
22	Memmen Young Infill (1985)	559	476	1035	0	0	0	559	476	1035	The property is entitled and undeveloped but questions remain whether the entitled density can be reached due to topography, skyline / Ridgeline and presence of cap rock throughout the property.
23 & 24 & 25	Metzler Ranch (1996)	1056	660	1716	727	683	1410	1056	660	1716	It is uncertain at this time if the property will develop to the entitled number of residential homes.
49, 50, 65	Plum Creek (1993)	3025	0	3025	1177	360	1537	3025	0	3025	There are areas remaining where additional lots could be plat and homes constructed. It is uncertain at this time if or when the remaining lots will be built.
no PD number, downtown area	Plum Creek Ridge (2006)	92	70	162	65	45	110	92	70	162	Full development is expected, MF are Townhomes
29	Plum Creek South (1995)	307	198	505	140	0	140	307	198	505	They are close to completion, approx. 3.5 acres remaining undeveloped on north side of Emerald Drive. Full development is not expected.
60	Red Hawk (1996)	658	268	926	887	0	887	658	268	926	Full development is expected
47, 48	Scott II (1987)	85	240	325	78	220	298	85	220	305	This project is complete.
42	Stanley P.D. (1997)	92	0	92	0	0	0	92	0	92	Full development is expected
34	Villages at Castle Rock (1981)	0	626	626	0	0	0	0	626	626	Full development is expected
58	Wolfsberger - formerly Graham P.D. (1996)	0	56	56	0	56	56	0	56	56	Full development is expected
40, 33, and 35	Woodlands - Inc. Scott Ranch (1993)	1160	0	1160	551	0	551	1160	0	1160	Lots platted, but not all built Full development is expected
36	Young American (1993)	78	1128	1206	375	188	561	78	1128	1206	Full development is expected
ZONED UNITS											
* MF counts shown approved by SDP											
PLATTED (SF) SDP (MF)											
TOTAL UNITS											
POPULATION ESTIMATES											
SF MF Total SF MF* Total SF MF Total											
31,744 22,572 54,316 27,723 4,220 26,951 31,744 22,572 54,316											
86,582 45,144 131,646 83,978 8,468 77,534 86,582 45,144 131,646											

approximately 1.725 SF A units within SF lots
Persons Per Household: 1.34 SF D, 2.34 SF A, 2.00 MF*

Water Master Plan 2017 Update

Tank Mixers

Tank mixers are being installed in some of the tanks to promote mixing, decrease stratification and improve water quality within the tanks. Water age becomes an issue in some of the larger tanks, particularly in the lower demand periods of the year. Five tanks have been outfitted with tank mixers, and several more are planned (Tank 15 and Tank 16), then the program will be complete.

Tank Mixing Projects Completed:

- Tank 17A and 17B (Meadows Red Zone)
- Tank 14 (Maher Ranch Red Zone)
- Tanks 12A and 12B (Meadows Yellow Zone)

New Storage

Liberty Village Yellow Zone Tank (Tank 18)

The Cobblestone Ranch subdivision (formerly known as Liberty Village) currently is served through a long transmission main that crosses three pressure zones. A 2 MG water storage tank is planned to provide dedicated storage for maximum day demand plus fire flow in this area, but construction of the tank is currently contingent upon the timing of new schools in the area since system demand is being provided by Tank 16. The project is planned for 2020 and the estimated cost is \$3,246,000. The Cobblestone developer is required to construct almost a mile of 16 inch pipeline to send water to and from the proposed tank.

Pumping

Ray Waterman Regional Water Treatment Center Pumping Improvements

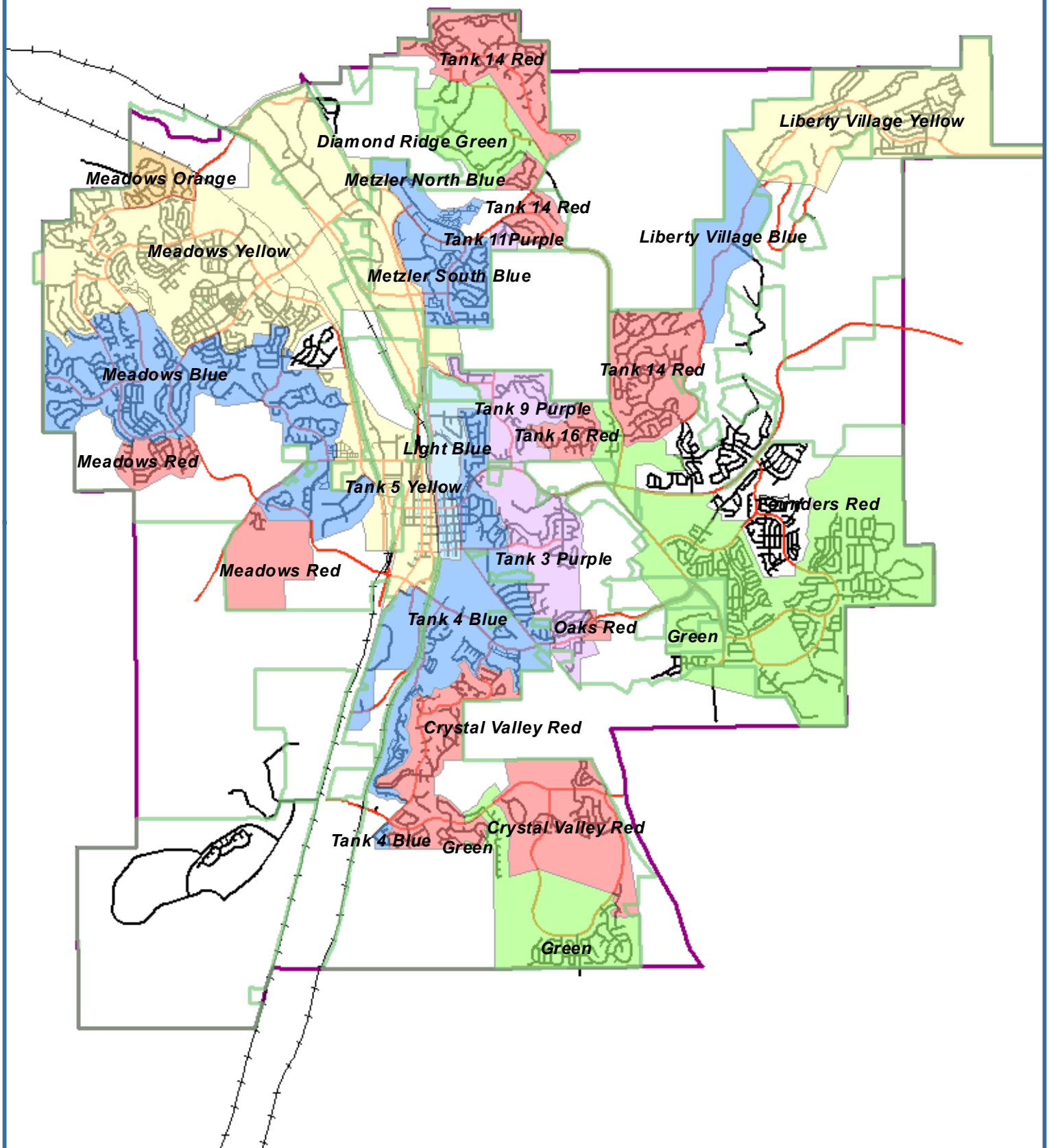
Future pumping improvements will be needed as the WISE water becomes more available. The red zone and green zone pumps at the Ray Waterman Regional Water Treatment Center (RWRWTC) will undergo several phases of upgrades to keep up with future increasing supplies of water to the plant. Phase 1 Red Zone Pumping Upgrades at RWRWTC are planned in this timeframe.

Transmission Lines

Future transmission lines may be required to efficiently move water supplies around Town. Developers install the distribution lines required to serve their developments, and the Town can request that the lines be “upsized”, with the additional upside costs incurred by the Town. Future in-fill annexations in the Pine Canyon, Pioneer Ranch, Canyons South, and Southwest Quadrant could require transmission lines. Depending on the timing of developer projects, future demands, and availability of out of service area water supplies, it could be necessary for the Town to build infrastructure, with potential recoupment from future benefited development.

Pressure Zones

Figure 7.1



APPENDIX F – WASTEWATER FLOWS



Farnsworth GROUP

Wastewater Analysis

Job Name: CROM Pad - Castle Rock, Colorado

Date: 6/17/24

By: DEK

CALCULATED FLOWS

Design Point	Use	¹ Typical ADD/Unit (gpd/sf)	¹ SFEs/Unit (SFE/sf)	Bldg. Area (sf)	ADF (gpd)	ADF (gpm)	ADF (cfs)	² PF (calculated)	² PF (design)	³ PDF (gpd)	³ PDF (gpm)	³ PDF (cfs)
I	Retail/Offices (Pad B1)	0.10	0.0005	2,910	291	0.20	0.0005	14.33	5.00	1,484	1.03	0.0023

¹Town of Castle Rock, Wastewater Collection Design, 2018 Criteria Manual ; Section 4.4.1 - Design Flows

²Town of Castle Rock, Wastewater Collection Design, 2018 Criteria Manual ; Section 4.4.1.2 - Peaking Factor; PF = 3.65*ADF^{0.168} or 5.0 max.

³Town of Castle Rock, Wastewater Collection Design, 2018 Criteria Manual ; Section 4.4.1.3 - Peak Design Flow Rate; PDF = (ADF*PF) + (0.1*ADF)

APPENDIX G – WASTEWATER HYDRAULIC ANALYSIS AND MODELING

APPENDIX H – WASTEWATER MAPS AND PLANS

**1st Amendment to the
FINAL WATER AND SANITARY SEWER SYSTEM
STUDY**

FOR

***CASTLE PINES COMMERCIAL PD
CASTLE ROCK, COLORADO***

(Filing 12: PWP 05-004)
(Filing 10A: PWP 03-108)

PREPARED FOR
DEV-VIC LLC
March 14, 2006
Revised: September 9, 2006

BY:
TST INC. OF DENVER, CONSULTING ENGINEERS
9222 TEDDY LANE
LONE TREE, COLORADO 80124

PROJECT NO. 771-039/040

TST

INTRODUCTION

A previous report entitled Water and Sanitary Sewer System Study, dated November, 1994, was prepared for the overall Castle Pines Commercial PD. Several updates have been prepared to reflect the parcels being developed. This report updates the previous reports and specifically analyzes the requirements for potable water and sanitary sewer lines within Parcels 7 & 16 (Castle Pines Commercial Filing 12) and Parcels 12 and 15 (Castle Pines Commercial Filing 10A). From this analysis, line sizes for the mains are recommended. In making this analysis, representatives of Dev-Vic Ltd. Liability Co. and others were consulted to determine their opinion of the planned build-out density of the development. The densities and uses in this report were primarily based on their opinion of the most intense usage of the property. A copy of the most recent PD has been included in Appendix F.

LOCATION

The Castle Pines Commercial PD ("PD") lies between Interstate 25 and U.S. Highway 85, primarily on the north side of Meadows Parkway, approximately two miles north of Castle Rock. Parcel 7 and 16, which is west of Atrium Drive, is planned for the development of commercial, office and retail uses. Parcel 12 and 15, which is north of Meadows Parkway, is planned for commercial, office and retail uses. There is currently development either complete or in progress on several other parcels, including the Castle Rock Factory Shops, Castlegate apartments and two other mixed use parcels within the PD. The general location is shown on Figure 1 located in Appendix A.

WATER SYSTEM ANALYSIS

This analysis of the proposed water distribution system was conducted using the CyberNet network analysis software. The PD distribution system is tied to the Town of Castle Rock system in two locations. The first is the 16-inch line in Meadows Parkway in the Yellow pressure Zone, which is the furthest eastern extent of the Meadows system. For the purposes of this analysis, the Meadows system is assumed to be able to supply flows at 98 PSI at the east side of the Plum Creek bridge on Meadows Parkway, per the *Water and Sanitary Sewer System Study for Castle Pines Commercial P.D.* dated June, 1994 by TST Inc. of Denver. The second source of supply is a tie to the Town's Yellow Zone system through a 16" line in West Castleton Road. The maximum hydraulic grade of the Yellow Zone is 6349'. The hydraulic grade used in this model is 6040 feet. This hydraulic grade was provided by the Town of Castle Rock engineering department for use in the report. Both Filing 10A and Filing 12 can be served by the Yellow Zone at the elevations shown on the construction plans.

The previous looped system of lines within the PD was updated to reflect the actual site layout for this model. The conditions for average day flows, max day flows and peak hour flows were reviewed, along with the available fire flows at max day flow, and the systems for Parcels 7, 12, 15 and 16 were sized based upon these results. Printouts of the results of the

volume available.

SANITARY SEWER SYSTEM ANALYSIS

Analysis of the proposed sanitary sewer system was conducted using the wastewater flow rates by land use defined by the Town of Castle Rock Regulation 15.3.1. A peaking factor was calculated based on the formula from the City and County of Denver of $PF = 3.79 \times [(average\ flow\ in\ cfs)^{-0.168}]$, with a maximum of $PF = 5$. This peaking factor converts average day flows to peak rates. These flows were then aggregated in the appropriate lines and the pipes were checked using Manning's equation. A Manning's "n" of 0.011 was used per the Town of Castle Rock's criteria, assuming that PVC pipe would be installed.

Table 3.1-Wastewater Flow Rates by Land Use

Land Use	Demand Rate	Equivalent
Residential-Single Family (RSF)	200 GPD/DU	1 SFE/du
Residential-Multi Family (RSF)	130 GPD/DU	0.65 SFE/du
Commercial (COM)	600 GPAD	3 SFE/ac
Industrial (IND)	600 GPAD	3 SFE/ac
Institutional (INS)	400 GPAD	2 SFE/ac
Churches	300 PGD/CHU	1.5 SFE/chu
School-Elementary	9,376 GPD/School	115 SFE/school
School-Junior/Senior High	37,400 GPD/School	187 SFE/school

Off-site wastewater flows from Silver Heights are routed through the sanitary sewer lines in the PD via Line "A-8", east of the existing Castle Rock Factory Shops. Capacity for up to 600 dwelling units has been included in the calculations for this flow. A table, including the sanitary sewer assumptions, and calculations related to use, density, and flow for the PD, is included as Appendix D.

From this analysis, pipes were sized and the minimum slope necessary to carry the capacity was determined, except in the areas where existing lines are in place. In these locations the actual minimum slope was used to calculate capacity of the lines. A printout of this analysis is included in Appendix D. From the analysis of the sanitary system, it was determined that the flows from Silver Heights in the Town's existing line exceed the line capacity based on calculation methods required by the Town of Castle Rock. This is public sanitary sewer line owned and maintained by the Town of Castle Rock. It is recommended that this area be further evaluated by the Town through the Capital Improvements Projects. The schematic layout of the sanitary sewer system is located in the pocket at the back of this report. The system will connect to the East Plum Creek Interceptor at two locations (A-1 and B-1).

For purposes of this analysis, a minimum velocity of 2 ft/sec at peak design flow was used. Final design of the lines should confirm that maximum velocities do not exceed 10 ft/sec. Analysis of the minimum design slope ($s = 0.54\%$) within Filing 12 indicated a velocity of 1.83 ft/sec. This is a result of minimal flow entering at the dead end of the sanitary sewer

main. This main serves one lot and has a manhole at the upstream end for maintenance purposes. All other flows exceed the minimum velocity of 2 ft/sec.

Based on the results of the analysis and the calculations shown in Appendix D, a system of 8-inch and 10-inch pipes will be sufficient with a minimum slope of 0.40%.

At full buildout of the Castle Pines Commercial PD, an additional 3.49 cfs (1,567 gpm) will be conveyed to the existing 27" interceptor running parallel to State Highway 85. The restricting slope of the existing 27" interceptor is 300 feet north of Castlegate Drive North at $s=0.10\%$, yielding a capacity of 12.45 cfs (5,587 gpm). Peak flows entering the 27" interceptor upstream of the Castle Pines Commercial PD are 4.38 cfs (1,966 gpm). With the additional 3.49 cfs at full buildout including the development of Parcels 7, 12, 15, and 16, the capacity in the existing 27" interceptor is 63%.

CONCLUSION

The development of Filing 10A and 12 within the Castle Pines Commercial PD complies with all requirements and standards within the Town of Castle Rock Public Works Regulations, revised February 1999, the *Wastewater and Reclaimed Water Master Plans*, dated December 2003 and the *2000 Water Facilities Master Plan*. This report uses standards required by Town regulations and implements these factors to a design that will provide services to the planned development without any further upgrades to the existing system, using nonrenewable groundwater as established within the Castle Pines Commercial water rights and removing the wastewater in a safe and economical manner.

The analysis included in this report indicates that the Castle Pines Commercial PD as currently planned, and more specifically Parcel 7, 12, 15 and 16, and can be adequately serviced with both potable water and sanitary sewer. Layout of the existing mainline system to accomplish this service is shown on the system schematic in the pocket at the end of this report. As further parcels are developed, they should be linked to the mainlines in conformance with this plan and similar amendments to this report should be developed. Additional data and reports shall be necessary as development plans for Parcel 7, 12, 15 and 16 are firmly identified for the remaining lots.

APPENDIX D

WASTEWATER FLOWS

**CASTLE PINES COMMERCIAL PD
SANITARY SEWER ANALYSIS**

BASIN	LINE NO.	PLAN AREA	ASSUMED OCCUPANCY	ACRES/ DU	GPD/ ACRE	SFE	AVG FLOW (gpd)	Peak Factor	PEAK FLOW	CUM AVG FLOW	Peak Factor	CUM. FLOW IN LINE	LINE SIZE (in.)	MIN. PIPE SLOPE (%)	LINE CAPAC. (gpd)	Velocity at Peak Design Flow (fps)	% Design Peak Flow/Max Capacity	Notes
A	A-9	5	RETAIL	22.11	600	66	13,266	5.000	66,330									
										13,266	5.000	66,330	8	0.40%	583,443	1.82	11.4%	
	A-8	S.Hts.	RESIDENTIAL	600	200	600	120,000	5.000	600,000									
										133,266	4.941	658,500	8	0.40%	583,443	3.25	112.9%	4
	A-7	3/4 of 10	RETAIL	47.25	600	142	28,350	5.000	141,750									
										161,616	4.784	773,122	8	0.72%	782,771	3.25	98.8%	4
	A-6	1/4 of 10	RETAIL	15.75	600	47	9,450	5.000	47,250									
		13	COMMERCIAL	9.00	600	27	5,400	5.000	27,000									
										14,850	5.000	74,250	8	0.40%	583,443	1.87	12.7%	
	A-4	1/2 of 12	MIXED USE	20.15	600	60	12,090	5.000	60,450									
		15	COMMERCIAL	4.00	600	12	2,400	5.000	12,000									
										14,490	5.000	72,450	8	0.40%	583,443	1.87	12.4%	
B	A-2	1/2 of 12	MIXED USE	20.15	600	60	12,090	5.000	60,450									
										12,090	5.000	60,450	8	0.40%	583,443	1.77	10.4%	
	A-1	A-5	A-6 & A-7							176,466	4.714	831,785	10	1.00%	1,672,735	3.59	49.7%	
		A-3	A-4 & A-5							190,956	4.651	888,230	10	1.00%	1,672,735	3.63	53.1%	
		A-1	A-2 & A-3							203,046	4.604	934,776	10	1.00%	1,672,735	3.67	55.9%	
	B-7	4 & 5	RETAIL	39.90	600	120	23,940	5.000	119,700									
										23,940	5.000	119,700	8	0.40%	583,443	2.16	20.5%	
	B-6	6	RETAIL	23.90	600	72	14,340	5.000	71,700									
										14,340	5.000	71,700	8	0.40%	583,443	1.87	12.3%	
	B-5		B-6 & B-7															
										38,280	5.000	191,400	8	0.40%	583,443	2.49	32.8%	
	B-4	9	RETAIL	15.80	600	47	9,480	5.000	47,400									
B										9,480	5.000	47,400	8	0.40%	583,443	1.64	8.1%	
	B-3		B-4 & B-5															
										47,760	5.000	238,800	8	0.40%	583,443	2.64	40.9%	
	B-2	7 & 16	RETAIL	15.80	600	47	9,480	5.000	47,400									
										9,480	5.000	47,400	8	0.40%	583,443	1.64	8.1%	
	B-1		B-2 & B-3															
										57,240	5.000	286,200	8	0.40%	583,443	2.76	49.1%	

NOTES:

- 1 All pipe material existing is PVC.
- 2 All proposed sanitary sewer shall be PVC per the Town of Castle Rock requirements.
- 3 Manning's "n" Value: 0.011 for PVC
- 4 Existing upstream pipes-See explanation on Page 5.
- 5 See next sheet for Filing 12 Specific pipe slopes

**CASTLE PINES COMMERCIAL PD
FILING 12-SANITARY SEWER ANALYSIS**

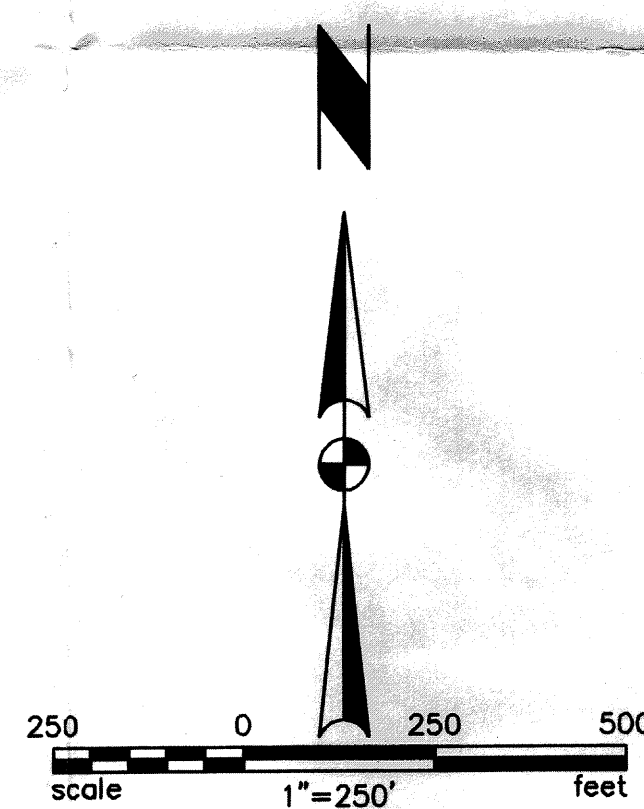
BASIN	LINE NO.	PLAN AREA	Upstream Manhole Number	Downstream Manhole Number	ASSUMED OCCUPANCY	ACRES/DU	GPD/ACRE	SFE	AVG FLOW (gpd)	Peak Factor	PEAK FLOW	CUM AVG FLOW	Peak Factor	CUM. FLOW IN LINE	LINE SIZE (in.)	MIN. PIPE SLOPE (%)	LINE CAPAC. (gpd)	Velocity at Peak Design Flow (fps)	% Design Peak Flow/Max Capacity
B	B-7	4 & 5			RETAIL	39.90	600	120	23,940	5.000	119,700								
												23,940	5.000	119,700	8	0.40%	583,443	2.16	20.5%
	B-6	6			RETAIL	23.90	600	72	14,340	5.000	71,700								
												14,340	5.000	71,700	8	0.40%	583,443	1.87	12.3%
	B-5				B-6 & B-7														
												38,280	5.000	191,400	8	0.40%	583,443	2.49	32.8%
	B-4	9			RETAIL	15.80	600	47	9,480	5.000	47,400								
												9,480	5.000	47,400	8	0.40%	583,443	1.64	8.1%
	B-3		SS-MH-B-6	SS-MH-5	B-4 & B-5														
												47,760	5.000	238,800	8	2.00%	1,304,618	2.64	18.3%
	B-2	7 & 16	SS-MH-8	SS-MH-7	RETAIL	15.80	600	47	9,480	5.000	47,400								
												9,480	5.000	47,400	8	0.54%	677,899	1.64	7.0%
	B-1		SS-MH-2	EX-SS-MH-1	B-2 & B-3														
												57,240	5.000	286,200	8	0.93%	889,631	2.76	32.2%

NOTES:

- 1 All pipe material existing is PVC.
- 2 All proposed sanitary sewer shall be PVC per the Town of Castle Rock requirements.
- 3 Manning's "n" Value: 0.011 for PVC

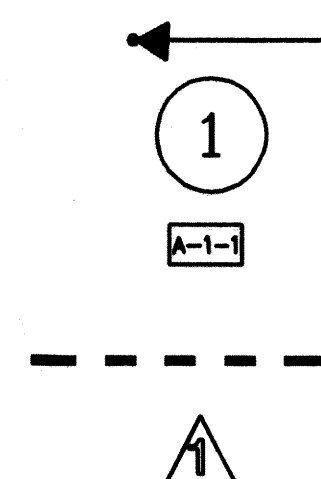
APPENDIX F

MAPS/PLANS



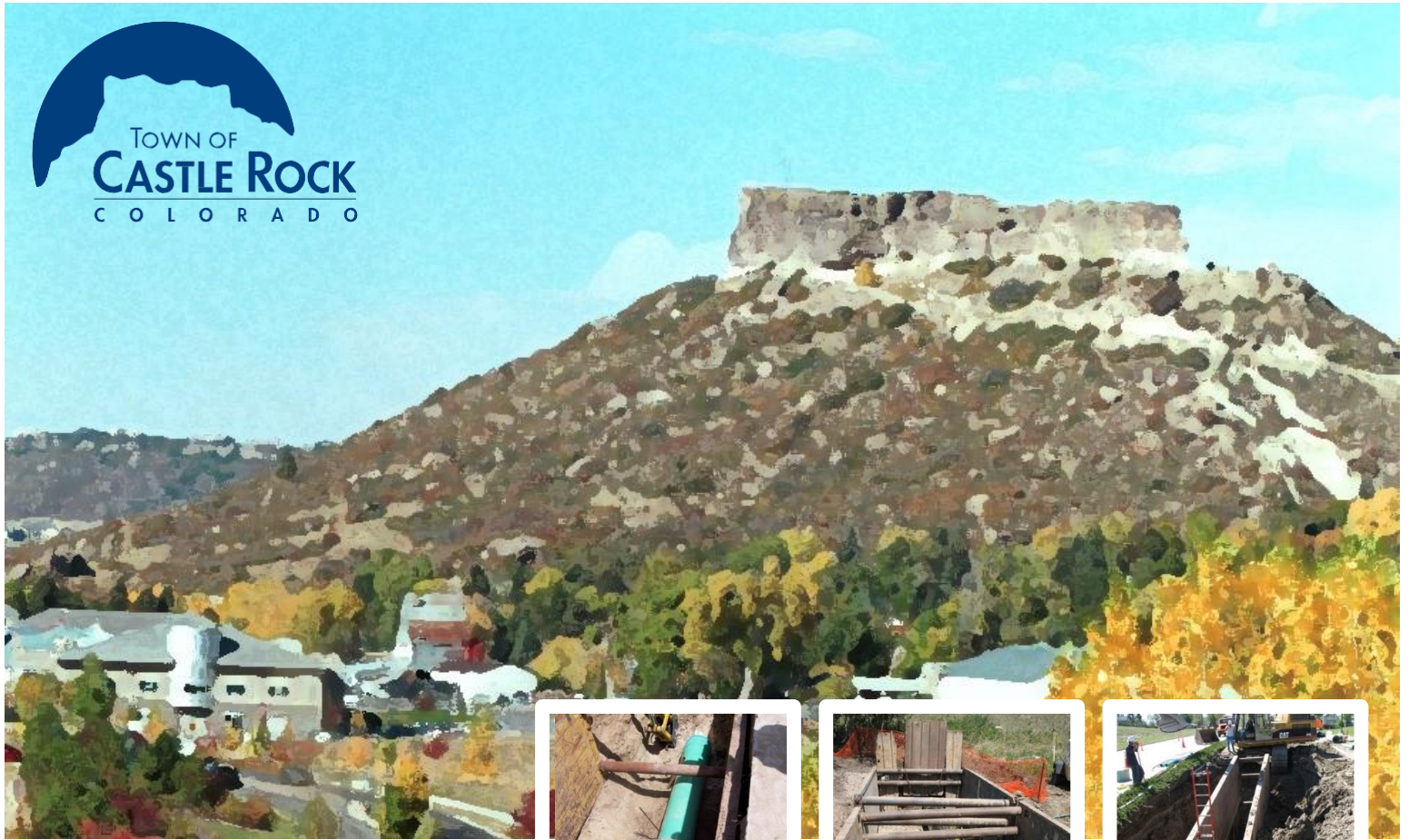
LEGEND

- SEWER LINE
- PARCEL NO.
- SEWER SEGMENT
- BASIN BOUNDARY
- DESIGN POINT



DEV-VIC LLC CASTLE PINES COMMERCIAL PD SANITARY SEWER MAP

TST TST INC. OF DENVER Consulting Engineers	
JOB NO.	771-039
SCALE	1"=250'
DATE	SEPTEMBER 9, 2006
SHEETS	SHEET
1	1



TOWN OF CASTLE ROCK

Wastewater Collection Design

2018 CRITERIA MANUAL



4.4.1.1 Wastewater System Average Daily Flow (ADF)

Land Use	Typical ADF/Unit	Typical SFEs/Unit
Single Family Residential and Duplexes	200 gpd/dwelling unit	1.00/dwelling unit
Multi-Family Residential (Townhomes and Condos)	130 gpd/dwelling unit	0.65/dwelling unit
Retail/Offices	0.1 gpd/SF	0.0005/SF
Hotels/Motels	75 gpd/room	0.375/room
Restaurants	1.5 gpd/SF	0.0075/SF
Car Washes	5,000 gpd/acre	25.0/acre
Industrial/Other Commercial	600 gpd/acre	3.0/acre
Institutional	400 gpd/acre	2.0/acre
Churches	300 gpd/church	1.5/church
Gym/Fitness Center	0.5 gpd/SF	0.00125 SFE/SF
Irrigated Land	0 gpd/acre	0.0/acre
<u>Rates for Typical Douglas County School Sizes:</u>		
Elementary (10 ac, 675 Students)	3,375 gpd/school	16.88/school
Middle (25 ac, 850 students)	8,500 gpd/school	42.50/school
High (50 ac, 1700 students)	17,000 gpd/school	85.00/school
<u>Rates for Alternate School Sizes:</u>		
Elementary	5 gpd/student	0.025/student
Middle	10 gpd/student	0.050/student
High	10 gpd/student	0.050/student

The demands noted in the table above represent the “winter time” or “dry weather” Average Daily Flow (ADF) with no allowance for infiltration and inflow (I/I). I/I shall be accounted for in accordance with the Peak Design Flow computation discussed in the sections to follow.

Regarding design flows for schools, planned school sizes shall be confirmed with the Douglas County School District and documented in the Utility Report. The tabulated rates

shown above shall be applied as appropriate, depending on the information provided by the School District. Reasonable engineering judgment shall be used in determining the estimated ADF for commercial, industrial and institutional sites. Individual evaluation and justification shall be provided when the proposed use is not specifically represented in the table above, or when the proposed flows will be inconsistent with the tabulated values. Justification of all non-residential flows shall be addressed in the Utility Report.

4.4.1.2 Peaking Factor

The portion of the Peak Design Flow calculation exclusive of I/I shall be determined by multiplying the ADF in the preceding section by a peaking factor (PF). The PF is a function of ADF, and shall be computed as follows: $PF = 3.65 \times [(ADF)^{-0.168}]$.

The maximum PF shall be 5.0, and ADF shall be expressed in units of million gallons per day (MGD).

4.4.1.3 Peak Design Flow Rate

The Peak Design Flow (PDF) shall be computed at all pertinent design points throughout the system, and used to size the corresponding wastewater facilities. The PDF shall be determined by multiplying the ADF by the calculated peaking factor (PF), plus an I/I allowance equal to ten percent of the ADF as expressed by the following formula:

$$PDF = \text{peak base flow} + \text{I/I allowance} = (ADF * PF) + (0.1 * ADF)$$

Once computed, the PDF shall be used to determine the sizes of the facilities in accordance with the criteria established below.

4.4.2 Hydraulic Design

Wastewater systems shall be designed to provide a minimum velocity of two feet per second at the Peak Design Flow. In situations where the minimum velocity of 2.0 feet per second cannot be met, an explanation and justification shall be included in the Final Utility Report. The maximum velocity shall not exceed ten feet per second. Drop manholes shall be provided to break steep slopes to limit the velocities in conformance with this criterion. Where drop manholes are impractical for velocity reduction, the sewer must be approved by variance and shall be of PVC or other abrasion resistant material approved by Castle Rock Water.

Where actual flow will be much below normal for several years, the minimum velocity shall be achieved by suitable grades at the partial design flow rate. Care shall be taken to design invert elevations at manholes in such a manner that the energy gradient is consistently falling in the direction of the flow. Sanitary sewers shall be sized to convey the Peak Design Flow while flowing no more than 75 percent of the maximum pipe flow capacity. Computation of velocity of flow shall be based on a coefficient of roughness "n" in the Manning formula of 0.011 for PVC. At all junctions where a smaller diameter main discharges into a larger one, the invert of the larger sanitary sewer shall be lowered so that the energy gradients of the sewers at the junction are at the same level. Generally, this condition will be met by placing the 0.80 depth point of both sewers at