

PRELIMINARY UTILITY REPORT

FOR

**COSTCO WHOLESALE DEVELOPMENT
TOWN OF CASTLE ROCK, COLORADO
SDP23-0020**

Prepared for:

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August 1, 2024

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: Todd Walma
Registered Professional Engineer
State Of Colorado No. 59513
(Affix Seal)

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.

ACM Dawson Trails VIII JV, LLC
Name of Developer

[Signature]
Authorized Signature

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1. PROJECT LOCATION AND DESCRIPTION

A. General

The purpose of this Preliminary Utility Report is to present the design of the water and wastewater distribution systems for the Costco Wholesale development. This Preliminary Utility Report analyzes the proposed infrastructure associated with the development of Costco Wholesale, hereon referred to as the "Site".

B. Site Location

The legal description of the site is Dawson Filing No. 1, Lot 1, pending recording of the plat. The Site is approximately centered within Section 22, Township 8 South, Range 67 West of the Sixth Principal Meridian. The Site is bounded by Interstate 25 to the east, Dawson Trails Boulevard the west, an Crystal Valley Parkway and Gambel Ridge Tributary on south, and Tract L of Dawson Filing No. 1 to the north. A vicinity map for the site can be found in Appendix A.

C. Project Description

The purpose of this report is to analyze potential future densities of the development to ensure that proper infrastructure is accounted for and will be installed to accommodate the ultimate build-out of the project. Per the Site Development Plan, currently in review, the Site will consist of 19.65 acres of commercial development. The proposed Costco Wholesale warehouse is within the Dawson Trails planned development. At present, the site is vacant land and is not accessible by public roads. It is 0.05 miles west of the BSNF railroad and 0.10 miles north of Territorial Road. The development parcel lies within Planning Area F-2, which permits residential and nonresidential as allowable uses. Early phases of infrastructure around the site will construct the following improvements:

- An interchange on Interstate 25 with Crystal Valley Parkway south of the site
- Dawson Trails Boulevard along the west edge of the site
- Collector B along the east edge of the site
- Stabilization of Gambel Ridge Tributary along the south edge of the site
- Regional detention facility C1 on the south side of Crystal Valley Parkway
- Regional detention facility B1 in the upper Gambel Ridge watershed
- Potable water and sanitary sewer improvements to support development of Dawson Trails
- Overlot grading of Dawson Trails Filing No. 1, including the Costco parcel.

The above improvements will be constructed prior to or concurrent with the Costco project, and all intended to be complete by the conclusion of construction on the Costco site.

This report proposes conceptual locations and sizes for the water and wastewater systems and analyzes the proposed networks using criteria from the Town of Castle Rock Water System Design 2018 Criteria Manual and Wastewater Collection Design 2018 Criteria Manual.

This report analyzes the proposed water and sanitary sewer systems which will be constructed as part of the development, as well as the connections to the surrounding existing infrastructure. The utility design will conform to the current Town of Castle Rock standards. Easements will be provided for utilities that fall out of the public right-of-way. These will be dedicated on the final plat or at the time of final design/construction documents. The proposed water line will be accessible within the site, predominantly within the proposed roadways.

2. WATER SYSTEM

A. General

The water system will be served by a network of Red Zone water distribution lines operated by Castle Rock Water, located within the surrounding public roadway and internal to the site within utility easements. A Water System Map has been included in Appendix E.

B. Master Plan: Water Distribution System

The layout and design of the major water distribution system proposed in this report generally conforms with the Town of Castle Rock 2017 Water Master Plan. The Site is serviced by the Red Pressure Zone. Some surrounding roads contain Blue Zone infrastructure, but there are no Blue Zone connections to the Costco site. The water distribution system bringing potable water to the Site is shown on the Overall Water Map in Appendix E and will consist of the following:

Included with Dawson Trails Filing 1 Infrastructure

- Blue Zone loop installed with Dawson Trails Filing 1 Infrastructure, necessary to feed the Red Zone
- Water Booster Pump from the Blue Zone to Red Zone

Included with Dawson Trails Filing 2 Infrastructure

- Tank 19 (Red Zone)
- A 24"/20" Transmission main connection between the Blue Zone/Red Zone pump station and the Red Zone Tank

High water and low water levels for Red Zone Tank 19 are obtained from design documents currently in development. See Appendix E for an Overall Water Plan Map.

C. Regional Offsite Improvements

The Costco Wholesale development will require four (4) significant offsite improvements located within the vicinity of the development. The first is Tank 19 which will be a supply for the Red Zone. The exact location of the site has not yet been determined. The second offsite improvement is a connection to the existing 12" Blue Zone water main at Crystal Valley Parkway, just west of Plum Creek Blvd, on the east side of Interstate I-25. This will be a 24-inch connection would require a directional bore below two (2) existing railroad tracks, Interstate-25, and Plum Creek. The third offsite improvement is a connection to the 16" proposed Blue Zone water main in Plum Creek Parkway, therefore providing looping to the major water distribution system.

D. Phasing

The construction of the water infrastructure will be completed in one phase. The phasing is an approximation and is subject to change based on the developer's discretion and further analysis during final design.

Phase 1 infrastructure lies within both the Blue and Red Zones. The water main will have a minimum of two (2) points of connection to the town's existing system, providing adequate looping for the development. The first connection is to a 16" Blue Zone water main supplied by the Meadows Tank, Tank 8, at Plum Creek Parkway and is proposed by the Miller's Landing Development. The second connection will be to an existing 12" Blue Zone water main on the east side of Interstate 25 at Crystal Valley Parkway. This connection is a 24" pipeline and will require a direct water boring

underneath two (2) railroad tracks, Plum Creek, and Interstate-25. Although both existing connections are in the Blue Zone, the Meadows Blue Zone has a higher HGL than that of Tank 4, so a PRV will be needed to balance pressures to the development.

Tank 19, a proposed Red Zone tank, will be essential to the initial phases of the Dawson Trails development, and will be designed and constructed in Phase 1. It is assumed that Tank 19 will be located in the vicinity of existing water tank near the central part of the development. The total Red Zone tank volume at buildout is approximately 5.04 million gallons; the initial tank volume will be determined during the design phase of this facility. A new Red Zone Booster Pump Station will be designed and constructed. It is currently planned near the intersection of Collector A and Collector B within Dawson Trails Filing 1, at the interface between the Blue and Red Zones. The proposed pump station will be sized to supply the required flows in both the Red and Green Zones. In addition, the distribution system will have PRVs at all connections between the Red and Blue Zones.

E. Demand Categories, Design Criteria

Water consumption demands from Section 4.4.1 Design Demands were used for the Average Day Demands (ADD) and peaking factors as shown in Table 2.1: Water System Design Values from the Town of Castle Rock Water System Design 2018 Criteria Manual.

Table 2.1: Water System Design Values

Criteria	Value
Average Day Demand (ADD) per SFE	400 gallons per day (gpd)
Average Day Demand (ADD) per Multi-Family	260 gallons per day (gpd)
Maximum Daily Demand (MDD) Factor	2.5 times ADD
Peak Hour Demand (PHD) Factor	5.5 times ADD
Minimum Static Pressure with Zero Demand (20% Tank Stage)	43 psi
Minimum Static Pressure with Zero Demand (100% Tank Stage)	125 psi
Minimum Dynamic Pressures (based on 20% Tank Stage)	
Max Daily Demand + Fire Flow	20 psi
Peak Hour Demand	35 psi

The following Single-Family Equivalents were used to calculate water demands.

Table 2.2: Single Family Equivalents

Criteria	Value
Retail/Offices	0.0005 / SqFt
Irrigated Land	9.38 / acre

Parameters used with the model of the Dawson Trails Water System are now as follows:

- **Average Day Demand (ADD)** is the total water use during a year divided by the number of days in a year (365).
- **Maximum Day Demand (MDD)** is the average demand in the month with the overall highest usage during the year (typically July or August). MDD is used to size water pipelines when combined with fire flows. MDD is also used to size water storage tanks (along with fire flow volumes).
- **Peak Hour Demand (PHD)** is the highest hourly demand occurring during the year. PHD is used to evaluate the required size of distribution pipelines.

The anticipated Costco Development will be located in Planning Area F-2. Water demands and pressure requirements from the Costco Wholesale Development Requirements, December 18, 2020 can be found in Appendix D.

In addition to the parameters above, fire flows were analyzed (along with the Maximum Day Demand) as follows:

- **Fire Flow Demand (FFD)** – Fire flow requirements within Town of Castle Rock are dictated by the Town's Fire Department and the latest edition of the International Fire Code (IFC). Fire flow demands (FFD) vary depending on building usage (residential versus commercial), building square footage, and type of building construction which are defined in Appendix B of the IFC. 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.

The Costco warehouse is the only building anticipated to have sprinklers in the Costco Wholesale development. The specific building square footage will be 161,000 sf for retail use. A fueling station with a capacity of 16 fuel pumps will be constructed at the southwest corner of the site. Fire hydrants will be designed as needed for the fueling station. For the water model, a controlling fire flow demand of 4,000 gpm was used for the warehouse building and 1,500 gpm was used for the fueling station. Fire Flow requirements applied to this site are detailed in section 2.F of this report. The Costco development will require a total storage volume of 569,870 Gallons based on expected demand. The two Red Zone Tanks each contain 1.8 million gallons, for a combined storage volume of 3.6 million gallons. The storage computation is provided in Appendix B.

Fire flows and required pressures from the Costco Wholesale Development Requirements, Dated December 18, 2020 can be found in Appendix D. In summary, the Costco development has two fire flow conditions to satisfy: 4,000 gpm with 20 psi residual pressure (CRW requirements) and 2,150 gpm with 65 psi residual pressure. CORE has analyzed the water distribution system to meet both CRW and Costco Wholesale requirements.

F. Water System Modeling and Analysis

The water system was modeled by MSK Consulting, LLC. using InfoWater software. The InfoWater results are included in Appendix B along with a Vicinity Map in Appendix A for the simulation. Simulations were run for the following scenarios:

- Minimum and Maximum Static Pressures with Zero Demand (20% and 100% Tank level)

- Peak Hour Demand (PHD)
- Max Day Demand + Fire Flow (MDD+FF)
- Extended Period Simulation (EPS)

The steady-state simulations (PHD and MDD+FF) were run separately for each pressure zone since booster pump stations and pressure reducing valves will isolate one zone from another. For the EPS scenario, all three pressure zones were modeling concurrently.

Additionally, sub-scenarios of the PHD and MDD+FF cases were modeled with one critical distribution loop out of service. The distribution loop selected for closure in the model is pipe 4142, which is the 12" main that connects to the Costco development from the 24" transmission main in Dawson Trails Boulevard. That link is selected as a worst-case because it is a 12" connection, because it is the most direct link from the Red Zone tank, and because it conveys the greatest amount of flow to the site in un-closed scenarios.

Static Pressure with Zero Demand

Prior to applying any demands, the static pressures at each junction were evaluated for two conditions: 20% full tank and 100% full tank. The 20% full condition determines the low static pressure and the 100% full scenario reveals the maximum station pressure. For this analysis, the following tank levels were used:

Table 2.3 Red Zone Tank Water Levels

Tank	20% Full Elevation	100% Full Elevation
Red Zone Tank 19	6662 ft	6680 ft

The majority of the junctions have a static pressure within the required range (43 psi to 125 psi). There are a few junctions in each pressure zone that will need to be raised or lowered during the final design process. Results are provided in Appendix B.

Peak Hour Demand

A PHD scenario was performed on each pressure zone assuming full buildout and the tank levels at 20% full. The PHD factors were applied to average day demands and the model output was evaluated for junction pressure and pipe velocity. A summary of the results is provided below, and full output is included in Appendix B.

Table 2.4 PHD Results

Zone	Lowest Junction Pressure (PSI)	Highest Pipe Velocity (FPS)
Blue	37.90 (J12)	6.55 (P-11)
Red	41.65 (J100)	7.85 (P-30)
Green	35.52 (J48)	4.94 (P-19)

MDD+FF

A maximum day demand plus fire flow (MDD+FF) scenario for each pressure zone was performed. As stated previously, the fire flow demand for all commercial, multi-family, or school development is assumed to be 4,000 gpm. The fire flow for all single-family residential developments is 1,500 gpm. Fire flows were applied during the MDD condition, and all fire hydrant junctions satisfied the CRW's requirement of a minimum of 20 psi residual pressure. Water to the Costco site will be looped. A summary of the results is provided below, and complete results are in Appendix B.

Table 2.5 MDD+FF Results

Zone	Lowest Residual Pressure (PSI)
Blue	34.09 (J12)
Red	53.41 (J66)
Green	42.26 (J136)

COSTCO FIRE FLOW ANALYSIS

Two separate minimum fire flow evaluations are detailed below. The greater flow is modeled in the water network analysis.

Town of Castle Rock / IFC Fire Flow requirement

The Costco warehouse building will be equipped with a sprinkler systems compliant with NFPA 13. Per Table B105.2 of the International Fire Code (IFC), the minimum required fire flow is 25% of the value in Table B105.1, the maximum of which is 8,000 gpm. Therefore, the minimum required fire flow for the sprinklered warehouse building, as dictated by the IFC, will not exceed **2,000 gpm**.

The required flow duration corresponding to 2,000 gpm minimum fire flow is **2 hours**.

As mentioned previously, Costco requires that two fire flow conditions are satisfied. The first is the jurisdiction's requirements (**4,000 gpm** with 20 psi residual pressure per CRW requirements). The second is **2,150 gpm** with 65 psi residual pressure.

Criteria	Min. Fire Flow (gpm)	Duration (gpm)	Min. Residual Pressure (psi)
TOCR Water / IFC App.B	2,000	2 hrs	20
Costco Devel. Reqs. 06.C.5.b	4,000	Not specified	20
Costco Devel. Reqs. 06.C.5.b	2,150	Not specified	65

Costco is anticipated to be in Planning Area F-2, which generally lies within the Blue Zone. The static pressure at this location is 48 psi, thus the Costco requirement of 65 psi of residual pressure cannot be met. As a result, it is proposed that Costco's water service will be provided by the Red Zone. As currently planned, the Costco site is approximately 1,000 feet from the nearest Red Zone water line. A 12" water line is proposed to the Costco site. With service from the Red Zone, the Costco fire flow requirement can be satisfied. A summary of the Costco fire flow analysis is provided below.

Table 2.6 Costco MDD+FF Results

Serviced By Zone	Fire Flow Demand	Residual Pressure
Red	4,000 GPM	105.87 PSI
Red	2,150 GPM	130.31 PSI

Note: If connected to the Red Zone, the Costco static pressure will exceed 125 psi.

3. WASTEWATER COLLECTION SYSTEM

A. General

The wastewater collection system will be served with gravity sanitary sewer lines, lift station(s), and force mains operated by the Town of Castle Rock. The main lines will run within the backbone road system and in access roads along the perimeter of the tracts generally running west to east, while the interceptor will be running south to north along the east edge of the site. These runs are graphically shown in the Overall Sanitary Sewer Map in Appendix E. The anticipated total wastewater load for the Site is 16.7 gallons per minute. The non-residential loads to the system include 852904.8 sqft (19.58 ac). Table 3.1 includes a synopsis of the different land uses accounted for. The ultimate outfall of the Site is a 24" sanitary offsite interceptor to the east.

Table 3.1 Land Use Summary Table

	Use	Quantities	Totals
Non-Residential	Retail (SF)	161,000	161,000

B. Wastewater Collection System

The plan is in general accordance with the Castle Rock Water 2016 Wastewater Master Plan Update. The main discrepancy from the Master Plan is rather than a 15-inch pipe at the downstream end of the interceptor, further analysis concluded that a 24-inch pipe will be needed to accommodate for the density and magnitude of the Site. Additionally, the Town is responsible for reconnecting the sanitary sewer main across Plum Creek Parkway to tie into the existing wastewater collection system. The Town is anticipating upsizing these interceptors to adequately

convey the flows of the ultimate buildout. The wastewater collection system serving the Dawson Trails Development will consist of the following:

- 8"/12"/15"/18"/21"/24" gravity sanitary sewer
- Lift station(s)
- Sanitary sewer force main(s)

Routing

As shown in the Overall Wastewater Map. Flows from the Site will be accepted at Junction 7.02 and taken to Junction 7. The flows will enter a 24" offsite sanitary interceptor to the east and taken north. A hydraulic capacity and routing of the proposed pipes was done using a CORE developed spreadsheet. The results of this analysis can be found in Appendix C.

C. Regional and Offsite Improvements

The Town of Castle Rock currently has an existing 12 and 15-inch sanitary sewer gravity mains serving the southwest quadrant of Town and terminates at Territorial Road and Interstate-25. The existing mains will be removed and replaced with a 24-inch sanitary sewer interceptor running north along the west side of the I-25 Frontage Road to Plum Creek Parkway. See the Overall Wastewater Map in Appendix E for the proposed conceptual alignment.

D. Phasing

The Overall Utility and Phasing Map can be found in Appendix E. The phasing generally moves in a north to south and east to west direction, in a downstream to upstream fashion. The northern portion of the sanitary interceptor bounding the east property line of the site will be constructed initially, while later phased mains and associated upstream interceptor lines will tie into it. Phasing locations and associated planning areas are discussed in Section 2.D of this report and additional phasing information can be found in the Approved PDP in Appendix D.

E. Demand Categories, Design Criteria

Wastewater demands, were taken from 4.4.1.1 Wastewater System Average Daily Flow (ADF) of the Town of Castle Rock Wastewater Collection Design 2018 Criteria Manual.

Table 3.1 – Wastewater Collection System Evaluation Parameters

Flow Parameters	
Average Daily Flow (ADF)	200 gpd / dwelling unit
Peaking Factor (PF)	$PF = 3.65 * [(ADF)^{-0.168}]$ Maximum PF = 5
Infiltration and Inflow (I/I)	$I/I = 0.1 * ADF$
Peak Design Flow (PDF)	$PDF = ADF * PF + (I/I)$
Gravity Flow Pipe Parameters	
Minimum Pipe Size	8-inch
Manning's Roughness Coefficient	0.011
Minimum Velocity	2.0 ft/s
Maximum Velocity	10.0 ft/s
Maximum Flow in Pipe (d/D)	0.75
Force Main Parameters	
Minimum Pipe Size	4-inch
Minimum Velocity	3.0 ft/s
Maximum Velocity	7.0 ft/s

The following Single-Family Equivalents were used to calculate Sanitary Demands.

Criteria	Value
Industrial / Commercial	3.0 / acre

Parameters used with the model of the Costco Warehouse collection system are as follows:

- **Average Daily Flow (ADF)** are the total wastewater flows generated in year divided by the number of days in a year (365). Average Daily Flows, or base flows, are contributed to the collection system from residential, industrial, commercial, and schools.
- **Peak Design Flow (PDF)** is the highest hourly demand occurring during the year. These flows were used for the analysis of the sanitary sewer system.

F. Wastewater System Modeling and Analysis

The wastewater system was modeled using an Excel spreadsheet shown in Appendix C. The runs are included in the Overall Sanitary Sewer Map in Appendix C. Preliminary road grades have been designed, therefore sanitary sewer slopes have been analyzed at a slope less than that of its associated roadway grade for a conservative evaluation.

4. CONCLUSIONS

Executive Summary

This Master Utility Report is intended to provide analysis and guidance to ensure the various filings and phases of the development are constructed in accordance with the overall needs and requirements of the development, and that the proposed infrastructure considers the full build-out condition.

The Town of Castle Rock currently does not have any domestic water connections to Dawson Trails. The connections to the Blue Zone will be from Plum Creek Parkway and Crystal Valley

Parkway. The Red and Green Zones will both need to construct new tanks for service. There will be booster pumps and pressure reducing valves connecting the zones to each other.

According to the 2010 Wastewater Master Plan, the existing 12-inch and 15-inch will need to be upsized to 15-inch and 18-inch, respectively. However, the calculations within this report and conversations with the Town concluded that the sanitary sewer needs to be removed and replaced with a 24-inch interceptor based on the density from the Dawson Trails Planned Development Plan, approved in September of 2022.

The developers and design engineers will continue to work closely with the Town of Castle Rock as the various phases of the project are designed and constructed to ensure adequate infrastructure is provided to ultimately serve the full build-out of the development.

Compliance with Master Plans

The proposed water and wastewater layouts presented in the report provide systems which are in substantial conformance with the 2016 and 2017 Master Plan Updates.

Final Utility Report

The layout and design of the water and wastewater system proposed in this report, although in conformance with the Town of Castle Rock Water and Wastewater Collection System Design Criteria Manuals, is general in nature. Once a more refined design for the future development is available, a Final Utility Report shall be prepared and submitted with a final plat and construction drawings for each portion of the development.

REFERENCES

Costco Wholesale. December 18, 2020. Costco Wholesale Development Requirements

TOCR (Town of Castle Rock). December 4, 2018. Town of Castle Rock Water System Design Criteria Manual.

TOCR (Town of Castle Rock). December 4, 2018. Town of Castle Rock Wastewater Collection System Design Criteria Manual.

TOCR (Town of Castle Rock). 2016, Town of Castle Rock, 2016 Wastewater Master Plan.

TOCR (Town of Castle Rock). 2017. Town of Castle Rock, 2017 Water Master Plan Update.

Dawson Trails Planned Development Plan. September 2022.

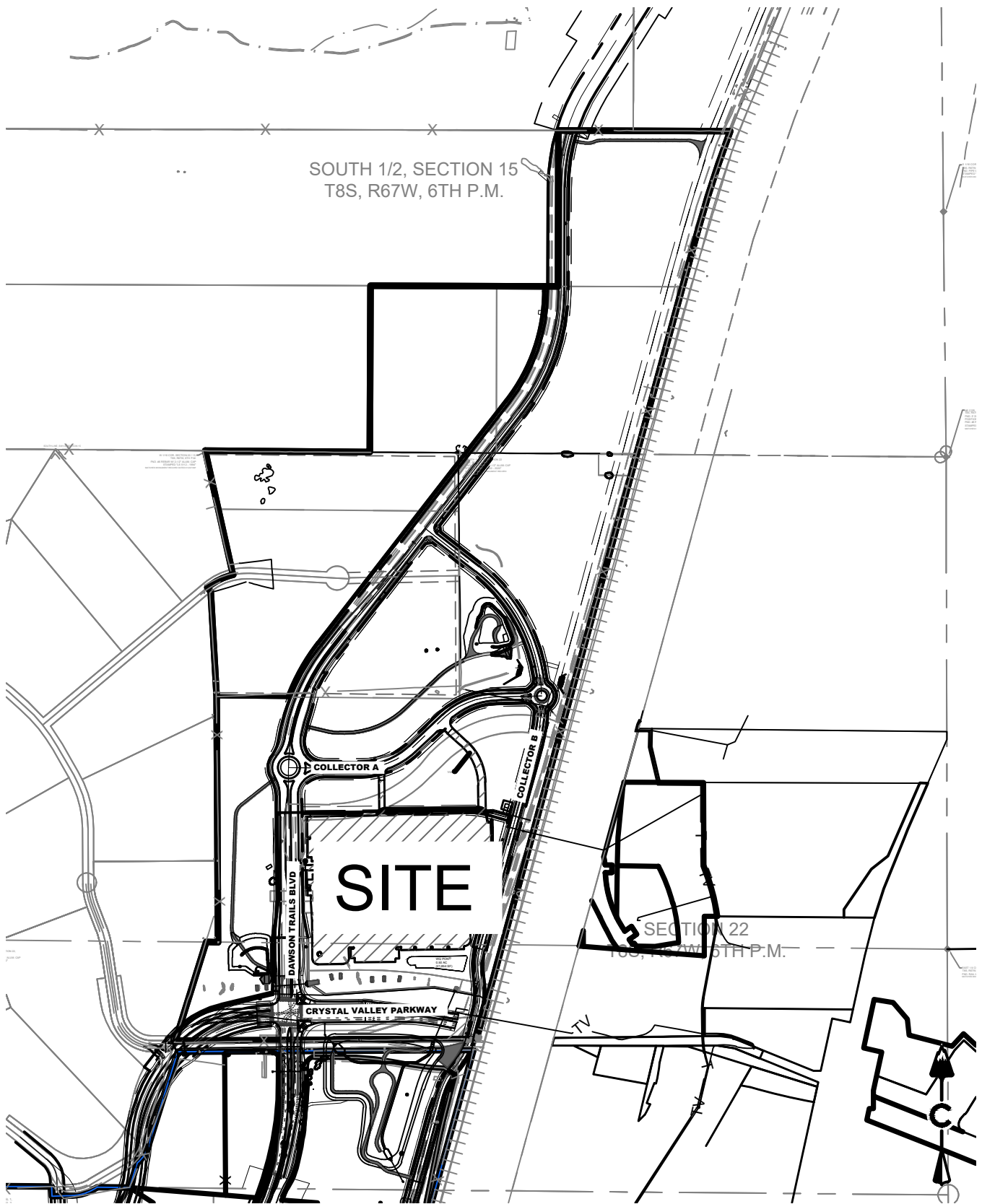
Computer Modeling Programs:

Bentley Systems, Inc., Version 2018. WaterCAD

Excel by Microsoft, Inc.

Appendix A

Figures



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Appendix B

Water Modeling / Calculations

Dawson Trails
Water Storage Calculations
Master Utility Report

CORE # 20-224-005
April 24, 2024
CGV

Costco Dawson Trails
Water Demand and Storage

DEMAND COMPONENT	COMMERCIAL			DEMAND								
	RETAIL/ OFFICE			SFE	AVG DAY		PEAK HOUR	PEAK HOUR		MAX DAY	MAX DAY	
	SF	SFE / SF	GPD/SFE	(DU)	(GPD)	(GPM)	FACTOR	(GPD)	(GPM)	FACTOR	(GPD)	(GPM)
Costco Building	160981	0.0005	400	80	32,196	22	5.50	177,079	123	2.50	80,491	56
Fire Flow @ 4000 gpm @ 2 hours	0	0.0		0.0	0	0	0.00	0	0	0.00	480,000	333
IRRIGATED LAND			AVG DAY									
IRRIGATION	ACRE	SFE/ACRE		(DU)	(GPD)							
Landscaped Area	2.5	9.38	400	23	9,375	7	1.00	9,375	7	1.00	9,375	7
Total				104	41,571	29		186,454	129		569,866	396

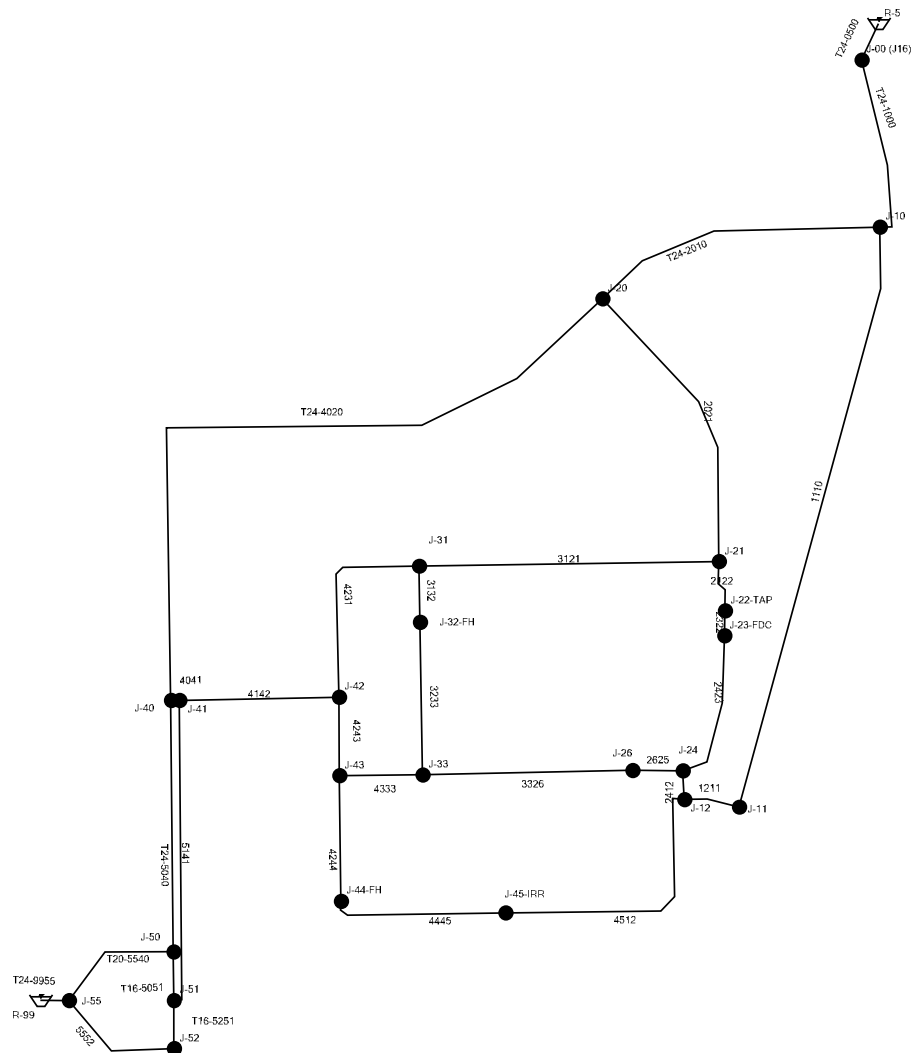
TOTAL STORAGE VOLUME (GALLONS) 569,866
TOTAL STORAGE VOLUME (MG) 0.57

Water Model Results Summary

Scenario	Closed Link?	Min Pressure (psi)			Max Velocity (ft/s)			Max Headloss Rates (ft/1000 ft)								
		Allowable	Actual	Node	Allowable	Actual	Link	24" Transmission Main			20" Transmission Main			16" Transmission Main		
Static	N	43	132	Multiple	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Peak Hour Demand	N	35	124	J-22	10	0.43	2122	1.0	<0.1	N/A	1.5	<0.1	N/A	2.0	<0.1	N/A
	4142	35	124	J-22	10	0.46	2122	1.0	<0.1	N/A	1.5	<0.1	N/A	2.0	<0.1	N/A
Max Day Demand + Fire Flow * * 2000 gpm Fire Flow per TOCR/ IFC	N	20	118	J-23	15	6.65	2122	1.0	0.3	5040	1.5	0.6	5540	2.0	0.2	5251
	4142	20	116	J-23	15	6.74	2122	1.0	0.1	4020	1.5	0.6	5540	2.0	0.2	5251
	T24-5040	20	110	J-23	15	6.64	2122	N/A	0.4	4020	N/A	0.6	5540	N/A	0.2	5251
	5141	20	91	J-23	15	6.65	2122	N/A	0.4	5040	N/A	0.6	5540	N/A	0.2	5251
Max Day Demand + Fire Flow ** ** 4000 gpm Fire Flow per Costco	N	20	105	J-23	15	13.08	2122	N/A	1.1	5040	N/A	2.1	5540	N/A	0.6	5251
	4142	20	98	J-23	15	13.98	2122	N/A	1.3	4020	N/A	2.1	5540	N/A	0.6	5251
	T24-5040	20	76	J-23	15	13.08	2122	N/A	0.4	4020	N/A	2.0	5540	N/A	0.7	5251
	5141	20	105	J-23	15	13.09	2122	N/A	1.3	5040	N/A	2.1	5540	N/A	0.6	5251

 Shading indicates demand/closure scenarios that are beyond Town's water modelling criteria. These have been evaluated for pressure and velocity limits only, in accordance with Section 4.4.3.

Scenario: Water Model Map



100% Static Reservoir Table
Reservoir Table - Time: 0.00 hours

ID	Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
86	R-99	6,680.00	Red	0	6,680.00
172	R-5	6,680.00	Red	0	6,680.00

STATIC 100%

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-43	6,376.00	Red	0	6,680.00	132
J-42	6,376.00	Red	0	6,680.00	132
J-31	6,376.00	Red	0	6,680.00	132
J-33	6,376.00	Red	0	6,680.00	132
J-22-TAP	6,376.00	Red	0	6,680.00	132
J-23-FDC	6,376.00	Red	0	6,680.00	132
J-24	6,376.00	Red	0	6,680.00	132
J-44-FH	6,376.00	Red	0	6,680.00	132
J-12	6,376.00	Red	0	6,680.00	132
J-21	6,376.00	Red	0	6,680.00	132
J-32-FH	6,376.00	Red	0	6,680.00	132
J-26	6,376.00	Red	0	6,680.00	132
J-41	6,383.00	Red	0	6,680.00	128
J-40	6,383.00	Red	0	6,680.00	128
J-20	6,366.00	Red	0	6,680.00	136
J-11	6,371.00	Red	0	6,680.00	134
J-10	6,354.00	Red	0	6,680.00	141
J-00 (J16)	6,347.00	Red	0	6,680.00	144
J-45-IRR	6,376.00	Red	0	6,680.00	132
J-55	6,655.42	<None>	0	6,680.00	11
J-50	6,562.87	<None>	0	6,680.00	51
J-51	6,580.63	<None>	0	6,680.00	43
J-52	6,604.15	<None>	0	6,680.00	33

Maximum Pressure
(Variance Request)

STATIC 100%

Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Length (Scaled) (ft)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	Headloss Gradient (ft/1000ft)	Is Closed?	Has User Defined Length?
4243	J-43	J-42	154	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
4231	J-42	J-31	409	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
4333	J-33	J-43	163	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
2322	J-22-TAP	J-23-FDC	48	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
2423	J-23-FDC	J-24	301	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
4244	J-43	J-44-FH	246	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
1211	J-12	J-11	110	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
2412	J-24	J-12	56	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
3121	J-31	J-21	588	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
2122	J-21	J-22-TAP	103	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
2021	J-21	J-20	597	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
3132	J-31	J-32-FH	110	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
3233	J-32-FH	J-33	299	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
2625	J-24	J-26	99	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
3326	J-26	J-33	411	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
4142	J-42	J-41	313	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
4041	J-41	J-40	17	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
T24-4020	J-40	J-20	1,470	24.0	PVC	150.0	0	0.00	0.00	0.0	False	False
T24-2010	J-20	J-10	585	24.0	PVC	150.0	0	0.00	0.00	0.0	False	False
1110	J-10	J-11	1,172	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
T24-1000	J-10	J-00 (J16)	358	24.0	PVC	150.0	0	0.00	0.00	0.0	False	False
4445	J-44-FH	J-45-IRR	344	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
4512	J-45-IRR	J-12	558	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
T24-9955	J-55	R-99	56	24.0	PVC	150.0	0	0.00	0.00	0.0	False	True
T24-5040	J-40	J-50	492	20.0	PVC	150.0	0	0.00	0.00	0.0	False	True
T20-5540	J-50	J-55	253	20.0	PVC	150.0	0	0.00	0.00	0.0	False	True
5141	J-41	J-51	602	12.0	PVC	150.0	0	0.00	0.00	0.0	False	True
T16-5051	J-50	J-51	95	16.0	PVC	150.0	0	0.00	0.00	0.0	False	False
T16-5251	J-51	J-52	94	12.0	PVC	150.0	0	0.00	0.00	0.0	False	True
5552	J-52	J-55	252	12.0	PVC	150.0	0	0.00	0.00	0.0	False	True
T24-0500	J-00 (J16)	R-5	79	24.0	PVC	150.0	0	0.00	0.00	0.0	False	False

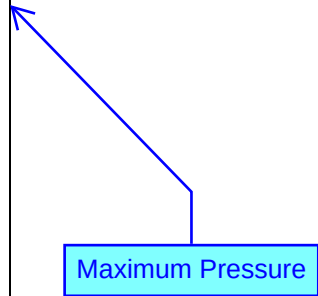
20% Static Reservoir Table
Reservoir Table - Time: 0.00 hours

ID	Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
86	R-99	6,662.00	Red	0	6,662.00
172	R-5	6,662.00	Red	0	6,662.00

STATIC 20%

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-43	6,376.00	Red	0	6,662.00	124
J-42	6,376.00	Red	0	6,662.00	124
J-31	6,376.00	Red	0	6,662.00	124
J-33	6,376.00	Red	0	6,662.00	124
J-22-TAP	6,376.00	Red	0	6,662.00	124
J-23-FDC	6,376.00	Red	0	6,662.00	124
J-24	6,376.00	Red	0	6,662.00	124
J-44-FH	6,376.00	Red	0	6,662.00	124
J-12	6,376.00	Red	0	6,662.00	124
J-21	6,376.00	Red	0	6,662.00	124
J-32-FH	6,376.00	Red	0	6,662.00	124
J-26	6,376.00	Red	0	6,662.00	124
J-41	6,383.00	Red	0	6,662.00	121
J-40	6,383.00	Red	0	6,662.00	121
J-20	6,366.00	Red	0	6,662.00	128
J-11	6,371.00	Red	0	6,662.00	126
J-10	6,354.00	Red	0	6,662.00	133
J-00 (J16)	6,347.00	Red	0	6,662.00	136
J-45-IRR	6,376.00	Red	0	6,662.00	124
J-55	6,600.00	Red	0	6,662.00	27
J-50	6,385.00	Red	0	6,662.00	120
J-51	6,390.00	Red	0	6,662.00	118
J-52	6,437.00	Red	0	6,662.00	97



STATIC 20%

Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Length (Scaled) (ft)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	Headloss Gradient (ft/1000ft)	Is Closed?	Has User Defined Length?
4243	J-43	J-42	154	12.0	PVC	150.0	0	0.00	0.00	0.0	False	True
4231	J-42	J-31	409	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
4333	J-33	J-43	163	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
2322	J-22-TAP	J-23-FDC	48	8.0	PVC	150.0	0	0.00	0.00	0.0	False	True
2423	J-23-FDC	J-24	301	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
4244	J-43	J-44-FH	246	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
1211	J-12	J-11	110	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
2412	J-24	J-12	56	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
3121	J-31	J-21	588	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
2122	J-21	J-22-TAP	103	8.0	PVC	150.0	0	0.00	0.00	0.0	False	True
2021	J-21	J-20	597	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
3132	J-31	J-32-FH	110	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
3233	J-32-FH	J-33	299	8.0	PVC	150.0	0	0.00	0.00	0.0	False	False
2625	J-24	J-26	99	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
3326	J-26	J-33	411	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
4142	J-42	J-41	313	12.0	PVC	150.0	0	0.00	0.00	0.0	False	True
4041	J-41	J-40	17	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
T24-4020	J-40	J-20	1,470	24.0	PVC	150.0	0	0.00	0.00	0.0	False	False
T24-2010	J-20	J-10	585	24.0	PVC	150.0	0	0.00	0.00	0.0	False	False
1110	J-10	J-11	1,172	12.0	PVC	150.0	0	0.00	0.00	0.0	False	False
T24-1000	J-10	J-00 (J16)	358	24.0	PVC	150.0	0	0.00	0.00	0.0	False	False
4445	J-44-FH	J-45-IRR	344	8.0	PVC	150.0	0	0.00	0.00	0.0	False	True
4512	J-45-IRR	J-12	558	8.0	PVC	150.0	0	0.00	0.00	0.0	False	True
T24-9955	J-55	R-99	56	24.0	PVC	150.0	0	0.00	0.00	0.0	False	False
T24-5040	J-40	J-50	492	24.0	PVC	150.0	0	0.00	0.00	0.0	False	True
T20-5540	J-50	J-55	253	20.0	PVC	150.0	0	0.00	0.00	0.0	False	True
5141	J-41	J-51	602	12.0	PVC	150.0	0	0.00	0.00	0.0	False	True
T16-5051	J-50	J-51	95	16.0	PVC	150.0	0	0.00	0.00	0.0	False	True
T16-5251	J-51	J-52	94	16.0	PVC	150.0	0	0.00	0.00	0.0	False	True
5552	J-52	J-55	252	12.0	PVC	150.0	0	0.00	0.00	0.0	False	True
T24-0500	J-00 (J16)	R-5	79	24.0	PVC	150.0	0	0.00	0.00	0.0	False	True

Scenario: Peak Hour

FlexTable: Reservoir Table

Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-99	6,662.00	Red	133	6,662.00

Scenario: Peak Hour

FlexTable: Junction Table

Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-55	6,600.00	Red	0	6,662.00	27
J-52	6,437.00	Red	0	6,661.98	97
J-51	6,390.00	Red	0	6,661.98	118
J-50	6,385.00	Red	0	6,661.98	120
J-45-IRR	6,376.00	Red	10	6,661.96	124
J-44-FH	6,376.00	Red	0	6,661.97	124
J-43	6,376.00	Red	0	6,661.97	124
J-42	6,376.00	Red	0	6,661.97	124
J-41	6,383.00	Red	0	6,661.97	121
J-40	6,383.00	Red	0	6,661.97	121
J-33	6,376.00	Red	0	6,661.97	124
J-32-FH	6,376.00	Red	0	6,661.96	124
J-31	6,376.00	Red	0	6,661.96	124
J-26	6,376.00	Red	0	6,661.96	124
J-24	6,376.00	Red	0	6,661.96	124
J-23-FDC	6,376.00	Red	0	6,661.93	124
J-22-TAP	6,376.00	Red	123	6,661.93	124
J-21	6,376.00	Red	0	6,661.94	124
J-20	6,366.00	Red	0	6,661.97	128
J-12	6,376.00	Red	0	6,661.97	124
J-11	6,371.00	Red	0	6,661.97	126
J-10	6,354.00	Red	0	6,661.97	133
J-00	6,347.00	Red	0	6,661.97	136

Nodes at Tank
Connection

Residual Pressure

Scenario: Peak Hour

FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	Headloss Gradient (ft/1000ft)	Is Closed?	Has User Defined Length?
T24-9955	J-55	R-99	56	24.0	PVC	120.0	-133	0.09	0.00	0.0	False	False
T24-5040	J-40	J-50	1,100	24.0	PVC	120.0	-117	0.08	0.00	0.0	False	True
T24-4020	J-40	J-20	1,470	24.0	PVC	120.0	72	0.05	0.00	0.0	False	False
T24-2010	J-20	J-10	585	24.0	PVC	120.0	35	0.02	0.00	0.0	False	False
T24-1000	J-10	J-00	358	24.0	PVC	120.0	0	0.00	0.00	0.0	False	False
T20-5540	J-50	J-55	6,480	20.0	PVC	120.0	-104	0.11	0.02	0.0	False	True
T16-5251	J-51	J-52	3,450	16.0	PVC	120.0	-29	0.05	0.00	0.0	False	True
T16-5051	J-50	J-51	525	16.0	PVC	120.0	-13	0.02	0.00	0.0	False	True
5552	J-52	J-55	4,950	12.0	PVC	120.0	-29	0.08	0.02	0.0	False	True
5141	J-41	J-51	1,675	12.0	PVC	120.0	-16	0.05	0.00	0.0	False	True
4512	J-45-IRR	J-12	558	8.0	PVC	120.0	-1	0.01	0.00	0.0	False	False
4445	J-44-FH	J-45-IRR	344	8.0	PVC	120.0	9	0.06	0.00	0.0	False	False
4333	J-33	J-43	163	12.0	PVC	120.0	-35	0.10	0.00	0.0	False	False
4244	J-43	J-44-FH	246	8.0	PVC	120.0	9	0.06	0.00	0.0	False	False
4243	J-43	J-42	154	12.0	PVC	120.0	-44	0.12	0.00	0.0	False	False
4231	J-42	J-31	409	8.0	PVC	120.0	18	0.11	0.00	0.0	False	False
4142	J-42	J-41	313	12.0	PVC	120.0	-61	0.17	0.01	0.0	False	False
4041	J-41	J-40	17	12.0	PVC	120.0	-45	0.13	0.00	0.0	False	False
3326	J-26	J-33	411	12.0	PVC	120.0	-22	0.06	0.00	0.0	False	False
3233	J-32-FH	J-33	299	8.0	PVC	120.0	-13	0.08	0.00	0.0	False	False
3132	J-31	J-32-FH	110	8.0	PVC	120.0	-13	0.08	0.00	0.0	False	False
3121	J-31	J-21	588	8.0	PVC	120.0	30	0.19	0.02	0.0	False	False
2625	J-24	J-26	99	12.0	PVC	120.0	-22	0.06	0.00	0.0	False	False
2423	J-23-FDC	J-24	301	8.0	PVC	120.0	-56	0.36	0.03	0.1	False	False
2412	J-24	J-12	56	12.0	PVC	120.0	-34	0.10	0.00	0.0	False	False
2322	J-22-TAP	J-23-FDC	48	8.0	PVC	120.0	-56	0.36	0.00	0.1	False	False
2122	J-21	J-22-TAP	103	8.0	PVC	120.0	67	0.43	0.01	0.1	False	False
2021	J-21	J-20	597	8.0	PVC	120.0	-37	0.24	0.03	0.0	False	False
1211	J-12	J-11	110	12.0	PVC	120.0	-35	0.10	0.00	0.0	False	False
1110	J-10	J-11	1,172	12.0	PVC	120.0	35	0.10	0.01	0.0	False	False

Max Velocity

Scenario: Max Day + 2000 gpm Fire Flow (IFC)
Link 4142 Closed

FlexTable: Junction Table

Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-55	6,600.00	Red	0	6,662.00	27
J-52	6,437.00	Red	0	6,661.98	97
J-51	6,390.00	Red	0	6,661.98	118
J-50	6,385.00	Red	0	6,661.98	120
J-45-IRR	6,376.00	Red	10	6,661.93	124
J-44-FH	6,376.00	Red	0	6,661.93	124
J-43	6,376.00	Red	0	6,661.93	124
J-42	6,376.00	Red	0	6,661.93	124
J-41	6,383.00	Red	0	6,661.97	121
J-40	6,383.00	Red	0	6,661.97	121
J-33	6,376.00	Red	0	6,661.93	124
J-32-FH	6,376.00	Red	0	6,661.93	124
J-31	6,376.00	Red	0	6,661.93	124
J-26	6,376.00	Red	0	6,661.93	124
J-24	6,376.00	Red	0	6,661.93	124
J-23-FDC	6,376.00	Red	0	6,661.91	124
J-22-TAP	6,376.00	Red	123	6,661.90	124
J-21	6,376.00	Red	0	6,661.92	124
J-20	6,366.00	Red	0	6,661.97	128
J-12	6,376.00	Red	0	6,661.93	124
J-11	6,371.00	Red	0	6,661.94	126
J-10	6,354.00	Red	0	6,661.97	133
J-00	6,347.00	Red	0	6,661.97	136

Nodes at Tank
Connection

Residual Pressure

Scenario: Peak Hour
Link 4142 Closed

FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	Headloss Gradient (ft/1000ft)	Is Closed?	Has User Defined Length?
T24-9955	J-55	R-99	56	24.0	PVC	120.0	-133	0.09	0.00	0.0	False	False
T24-5040	J-40	J-50	1,100	24.0	PVC	120.0	-117	0.08	0.00	0.0	False	True
T24-4020	J-40	J-20	1,470	24.0	PVC	120.0	133	0.09	0.00	0.0	False	False
T24-2010	J-20	J-10	585	24.0	PVC	120.0	82	0.06	0.00	0.0	False	False
T24-1000	J-10	J-00	358	24.0	PVC	120.0	0	0.00	0.00	0.0	False	False
T20-5540	J-50	J-55	6,480	20.0	PVC	120.0	-104	0.11	0.02	0.0	False	True
T16-5251	J-51	J-52	3,450	16.0	PVC	120.0	-29	0.05	0.00	0.0	False	True
T16-5051	J-50	J-51	525	16.0	PVC	120.0	-13	0.02	0.00	0.0	False	True
5552	J-52	J-55	4,950	12.0	PVC	120.0	-29	0.08	0.02	0.0	False	True
5141	J-41	J-51	1,675	12.0	PVC	120.0	-16	0.04	0.00	0.0	False	True
4512	J-45-IRR	J-12	558	8.0	PVC	120.0	-10	0.07	0.00	0.0	False	False
4445	J-44-FH	J-45-IRR	344	8.0	PVC	120.0	0	0.00	0.00	0.0	False	False
4333	J-33	J-43	163	12.0	PVC	120.0	10	0.03	0.00	0.0	False	False
4244	J-43	J-44-FH	246	8.0	PVC	120.0	0	0.00	0.00	0.0	False	False
4243	J-43	J-42	154	12.0	PVC	120.0	10	0.03	0.00	0.0	False	False
4231	J-42	J-31	409	8.0	PVC	120.0	10	0.07	0.00	0.0	False	False
4142	J-42	J-41	313	12.0	PVC	120.0	0	0.00	0.00	0.0	True	False
4041	J-41	J-40	17	12.0	PVC	120.0	16	0.04	0.00	0.0	False	False
3326	J-26	J-33	411	12.0	PVC	120.0	21	0.06	0.00	0.0	False	False
3233	J-32-FH	J-33	299	8.0	PVC	120.0	-11	0.07	0.00	0.0	False	False
3132	J-31	J-32-FH	110	8.0	PVC	120.0	-11	0.07	0.00	0.0	False	False
3121	J-31	J-21	588	8.0	PVC	120.0	21	0.13	0.01	0.0	False	False
2625	J-24	J-26	99	12.0	PVC	120.0	21	0.06	0.00	0.0	False	False
2423	J-23-FDC	J-24	301	8.0	PVC	120.0	-51	0.32	0.03	0.1	False	False
2412	J-24	J-12	56	12.0	PVC	120.0	-72	0.20	0.00	0.0	False	False
2322	J-22-TAP	J-23-FDC	48	8.0	PVC	120.0	-51	0.32	0.00	0.1	False	False
2122	J-21	J-22-TAP	103	8.0	PVC	120.0	72	0.46	0.02	0.2	False	False
2021	J-21	J-20	597	8.0	PVC	120.0	-51	0.33	0.05	0.1	False	False
1211	J-12	J-11	110	12.0	PVC	120.0	-82	0.23	0.00	0.0	False	False
1110	J-10	J-11	1,172	12.0	PVC	120.0	82	0.23	0.03	0.0	False	False

Max Velocity

Scenario: Max Day + 2000 gpm Fire Flow (IFC)

FlexTable: Reservoir Table

ID	Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
86	R-99	6,662.00	Red	2,066	6,662.00

Scenario: Max Day + 2000 gpm Fire Flow (IFC)

FlexTable: Junction Table

Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-55	6,600.00	Red	0	6,661.98	27
J-52	6,437.00	Red	0	6,658.70	96
J-51	6,390.00	Red	0	6,658.14	116
J-50	6,385.00	Red	0	6,658.12	118
J-45-IRR	6,376.00	Red	10	6,656.52	121
J-44-FH	6,376.00	Red	0	6,656.63	121
J-43	6,376.00	Red	0	6,656.71	121
J-42	6,376.00	Red	0	6,656.92	122
J-41	6,383.00	Red	0	6,657.76	119
J-40	6,383.00	Red	0	6,657.78	119
J-33	6,376.00	Red	0	6,656.54	121
J-32-FH	6,376.00	Red	0	6,656.24	121
J-31	6,376.00	Red	0	6,656.13	121
J-26	6,376.00	Red	0	6,656.34	121
J-24	6,376.00	Red	0	6,656.29	121
J-23-FDC	6,376.00	Red	2,000	6,649.73	118
J-22-TAP	6,376.00	Red	56	6,650.73	119
J-21	6,376.00	Red	0	6,653.09	120
J-20	6,366.00	Red	0	6,657.60	126
J-12	6,376.00	Red	0	6,656.37	121
J-11	6,371.00	Red	0	6,656.47	124
J-10	6,354.00	Red	0	6,657.58	131
J-00	6,347.00	Red	0	6,657.58	134

Nodes at Tank
Connection

Residual Pressure

Scenario: Max Day + 2000 gpm Fire Flow (IFC)

FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	Headloss Gradient (ft/1000ft)	Is Closed?	Has User Defined Length?
T24-9955	J-55	R-99	56	24.0	PVC	120.0	-2,066	1.47	0.02	0.4	False	False
T24-5040	J-40	J-50	1,100	24.0	PVC	120.0	-1,816	1.29	0.33	0.3	False	True
T24-4020	J-40	J-20	1,470	24.0	PVC	120.0	1,117	0.79	0.18	0.1	False	False
T24-2010	J-20	J-10	585	24.0	PVC	120.0	544	0.39	0.02	0.0	False	False
T24-1000	J-10	J-00	358	24.0	PVC	120.0	0	0.00	0.00	0.0	False	False
T20-5540	J-50	J-55	6,480	20.0	PVC	120.0	-1,619	1.65	3.86	0.6	False	True
T16-5251	J-51	J-52	3,450	16.0	PVC	120.0	-447	0.71	0.56	0.2	False	True
T16-5051	J-50	J-51	525	16.0	PVC	120.0	-197	0.31	0.02	0.0	False	True
5552	J-52	J-55	4,950	12.0	PVC	120.0	-447	1.27	3.28	0.7	False	True
5141	J-41	J-51	1,675	12.0	PVC	120.0	-250	0.71	0.38	0.2	False	True
4512	J-45-IRR	J-12	558	8.0	PVC	120.0	95	0.61	0.15	0.3	False	False
4445	J-44-FH	J-45-IRR	344	8.0	PVC	120.0	105	0.67	0.11	0.3	False	False
4333	J-33	J-43	163	12.0	PVC	120.0	-569	1.61	0.17	1.0	False	False
4244	J-43	J-44-FH	246	8.0	PVC	120.0	105	0.67	0.08	0.3	False	False
4243	J-43	J-42	154	12.0	PVC	120.0	-673	1.91	0.22	1.4	False	False
4231	J-42	J-31	409	8.0	PVC	120.0	275	1.76	0.79	1.9	False	False
4142	J-42	J-41	313	12.0	PVC	120.0	-949	2.69	0.83	2.7	False	False
4041	J-41	J-40	17	12.0	PVC	120.0	-699	1.98	0.02	1.5	False	False
3326	J-26	J-33	411	12.0	PVC	120.0	-376	1.07	0.20	0.5	False	False
3233	J-32-FH	J-33	299	8.0	PVC	120.0	-192	1.23	0.30	1.0	False	False
3132	J-31	J-32-FH	110	8.0	PVC	120.0	-192	1.23	0.11	1.0	False	False
3121	J-31	J-21	588	8.0	PVC	120.0	467	2.98	3.04	5.2	False	False
2625	J-24	J-26	99	12.0	PVC	120.0	-376	1.07	0.05	0.5	False	False
2423	J-23-FDC	J-24	301	8.0	PVC	120.0	-1,015	6.48	6.56	21.8	False	False
2412	J-24	J-12	56	12.0	PVC	120.0	-638	1.81	0.07	1.3	False	False
2322	J-22-TAP	J-23-FDC	48	8.0	PVC	120.0	985	6.29	1.00	20.6	False	False
2122	J-21	J-22-TAP	103	8.0	PVC	120.0	1,041	6.65	2.35	22.8	False	False
2021	J-21	J-20	597	8.0	PVC	120.0	-574	3.66	4.52	7.6	False	False
1211	J-12	J-11	110	12.0	PVC	120.0	-544	1.54	0.10	1.0	False	False
1110	J-10	J-11	1,172	12.0	PVC	120.0	544	1.54	1.11	1.0	False	False

Max Velocity

Scenario: Max Day + 2000 gpm Fire Flow (IFC)
Link 4142 Closed

FlexTable: Junction Table

Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-55	6,600.00	Red	0	6,661.98	27
J-52	6,437.00	Red	0	6,658.70	96
J-51	6,390.00	Red	0	6,658.14	116
J-50	6,385.00	Red	0	6,658.12	118
J-45-IRR	6,376.00	Red	10	6,651.03	119
J-44-FH	6,376.00	Red	0	6,650.94	119
J-43	6,376.00	Red	0	6,650.88	119
J-42	6,376.00	Red	0	6,650.87	119
J-41	6,383.00	Red	0	6,657.78	119
J-40	6,383.00	Red	0	6,657.78	119
J-33	6,376.00	Red	0	6,650.88	119
J-32-FH	6,376.00	Red	0	6,650.66	119
J-31	6,376.00	Red	0	6,650.58	119
J-26	6,376.00	Red	0	6,650.96	119
J-24	6,376.00	Red	0	6,650.98	119
J-23-FDC	6,376.00	Red	2,000	6,645.25	116
J-22-TAP	6,376.00	Red	56	6,646.39	117
J-21	6,376.00	Red	0	6,649.05	118
J-20	6,366.00	Red	0	6,657.21	126
J-12	6,376.00	Red	0	6,651.21	119
J-11	6,371.00	Red	0	6,651.71	121
J-10	6,354.00	Red	0	6,657.12	131
J-00	6,347.00	Red	0	6,657.12	134

Nodes at Tank
Connection

Residual Pressure

Scenario: Max Day + 2000 gpm Fire Flow (IFC)
Link 4142 Closed

FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	Headloss Gradient (ft/1000ft)	Is Closed?	Has User Defined Length?
T24-9955	J-55	R-99	56	24.0	PVC	120.0	-2,066	1.47	0.02	0.4	False	False
T24-5040	J-40	J-50	1,100	24.0	PVC	120.0	-1,825	1.29	0.34	0.3	False	True
T24-4020	J-40	J-20	1,470	24.0	PVC	120.0	2,066	1.47	0.57	0.4	False	False
T24-2010	J-20	J-10	585	24.0	PVC	120.0	1,276	0.90	0.09	0.2	False	False
T24-1000	J-10	J-00	358	24.0	PVC	120.0	0	0.00	0.00	0.0	False	False
T20-5540	J-50	J-55	6,480	20.0	PVC	120.0	-1,619	1.65	3.86	0.6	False	True
T16-5251	J-51	J-52	3,450	16.0	PVC	120.0	-447	0.71	0.56	0.2	False	True
T16-5051	J-50	J-51	525	16.0	PVC	120.0	-206	0.33	0.02	0.0	False	True
5552	J-52	J-55	4,950	12.0	PVC	120.0	-447	1.27	3.28	0.7	False	True
5141	J-41	J-51	1,675	12.0	PVC	120.0	-241	0.68	0.35	0.2	False	True
4512	J-45-IRR	J-12	558	8.0	PVC	120.0	-102	0.65	0.17	0.3	False	False
4445	J-44-FH	J-45-IRR	344	8.0	PVC	120.0	-92	0.59	0.09	0.3	False	False
4333	J-33	J-43	163	12.0	PVC	120.0	66	0.19	0.00	0.0	False	False
4244	J-43	J-44-FH	246	8.0	PVC	120.0	-92	0.59	0.06	0.3	False	False
4243	J-43	J-42	154	12.0	PVC	120.0	159	0.45	0.01	0.1	False	False
4231	J-42	J-31	409	8.0	PVC	120.0	159	1.01	0.29	0.7	False	False
4142	J-42	J-41	313	12.0	PVC	120.0	0	0.00	0.00	0.0	True	False
4041	J-41	J-40	17	12.0	PVC	120.0	241	0.68	0.00	0.2	False	False
3326	J-26	J-33	411	12.0	PVC	120.0	230	0.65	0.08	0.2	False	False
3233	J-32-FH	J-33	299	8.0	PVC	120.0	-164	1.05	0.22	0.7	False	False
3132	J-31	J-32-FH	110	8.0	PVC	120.0	-164	1.05	0.08	0.7	False	False
3121	J-31	J-21	588	8.0	PVC	120.0	323	2.06	1.53	2.6	False	False
2625	J-24	J-26	99	12.0	PVC	120.0	230	0.65	0.02	0.2	False	False
2423	J-23-FDC	J-24	301	8.0	PVC	120.0	-943	6.02	5.73	19.0	False	False
2412	J-24	J-12	56	12.0	PVC	120.0	-1,174	3.33	0.22	4.0	False	False
2322	J-22-TAP	J-23-FDC	48	8.0	PVC	120.0	1,057	6.74	1.14	23.5	False	False
2122	J-21	J-22-TAP	103	8.0	PVC	120.0	1,113	7.10	2.66	25.8	False	False
2021	J-21	J-20	597	8.0	PVC	120.0	-790	5.04	8.17	13.7	False	False
1211	J-12	J-11	110	12.0	PVC	120.0	-1,276	3.62	0.51	4.6	False	False
1110	J-10	J-11	1,172	12.0	PVC	120.0	1,276	3.62	5.41	4.6	False	False

Max Velocity

Scenario: Max Day + 2000 gpm Fire Flow (IFC)
Link 5040 Closed

FlexTable: Junction Table

Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-55	6,600.00	Red	0	6,661.98	27
J-52	6,437.00	Red	0	6,658.09	96
J-51	6,390.00	Red	0	6,657.42	116
J-50	6,385.00	Red	0	6,658.31	118
J-45-IRR	6,376.00	Red	10	6,637.27	113
J-44-FH	6,376.00	Red	0	6,637.39	113
J-43	6,376.00	Red	0	6,637.47	113
J-42	6,376.00	Red	0	6,637.69	113
J-41	6,383.00	Red	0	6,638.55	111
J-40	6,383.00	Red	0	6,638.49	111
J-33	6,376.00	Red	0	6,637.30	113
J-32-FH	6,376.00	Red	0	6,637.00	113
J-31	6,376.00	Red	0	6,636.89	113
J-26	6,376.00	Red	0	6,637.09	113
J-24	6,376.00	Red	0	6,637.04	113
J-23-FDC	6,376.00	Red	2,000	6,630.48	110
J-22-TAP	6,376.00	Red	56	6,631.47	111
J-21	6,376.00	Red	0	6,633.83	112
J-20	6,366.00	Red	0	6,638.31	118
J-12	6,376.00	Red	0	6,637.11	113
J-11	6,371.00	Red	0	6,637.21	115
J-10	6,354.00	Red	0	6,638.29	123
J-00	6,347.00	Red	0	6,638.29	126

Nodes at Tank
Connection

Residual Pressure

Scenario: Max Day + 2000 gpm Fire Flow (IFC)
Link 5040 Closed

FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	Headloss Gradient (ft/1000ft)	Is Closed?	Has User Defined Length?
T24-9955	J-55	R-99	56	24.0	PVC	120.0	-2,066	1.47	0.02	0.4	False	False
T24-5040	J-40	J-50	1,100	24.0	PVC	120.0	0	0.00	0.00	0.0	True	True
T24-4020	J-40	J-20	1,470	24.0	PVC	120.0	1,106	0.78	0.18	0.1	False	False
T24-2010	J-20	J-10	585	24.0	PVC	120.0	534	0.38	0.02	0.0	False	False
T24-1000	J-10	J-00	358	24.0	PVC	120.0	0	0.00	0.00	0.0	False	False
T20-5540	J-50	J-55	6,480	20.0	PVC	120.0	-1,576	1.61	3.67	0.6	False	True
T16-5251	J-51	J-52	3,450	16.0	PVC	120.0	-490	0.78	0.67	0.2	False	True
T16-5051	J-50	J-51	525	16.0	PVC	120.0	1,576	2.51	0.88	1.7	False	True
5552	J-52	J-55	4,950	12.0	PVC	120.0	-490	1.39	3.89	0.8	False	True
5141	J-41	J-51	1,675	12.0	PVC	120.0	-2,066	5.86	18.88	11.3	False	True
4512	J-45-IRR	J-12	558	8.0	PVC	120.0	97	0.62	0.16	0.3	False	False
4445	J-44-FH	J-45-IRR	344	8.0	PVC	120.0	107	0.68	0.12	0.3	False	False
4333	J-33	J-43	163	12.0	PVC	120.0	-576	1.63	0.17	1.1	False	False
4244	J-43	J-44-FH	246	8.0	PVC	120.0	107	0.68	0.08	0.3	False	False
4243	J-43	J-42	154	12.0	PVC	120.0	-683	1.94	0.22	1.5	False	False
4231	J-42	J-31	409	8.0	PVC	120.0	277	1.77	0.80	2.0	False	False
4142	J-42	J-41	313	12.0	PVC	120.0	-960	2.72	0.85	2.7	False	False
4041	J-41	J-40	17	12.0	PVC	120.0	1,106	3.14	0.06	3.5	False	False
3326	J-26	J-33	411	12.0	PVC	120.0	-384	1.09	0.21	0.5	False	False
3233	J-32-FH	J-33	299	8.0	PVC	120.0	-192	1.23	0.30	1.0	False	False
3132	J-31	J-32-FH	110	8.0	PVC	120.0	-192	1.23	0.11	1.0	False	False
3121	J-31	J-21	588	8.0	PVC	120.0	469	2.99	3.06	5.2	False	False
2625	J-24	J-26	99	12.0	PVC	120.0	-384	1.09	0.05	0.5	False	False
2423	J-23-FDC	J-24	301	8.0	PVC	120.0	-1,015	6.48	6.57	21.8	False	False
2412	J-24	J-12	56	12.0	PVC	120.0	-631	1.79	0.07	1.3	False	False
2322	J-22-TAP	J-23-FDC	48	8.0	PVC	120.0	985	6.28	1.00	20.6	False	False
2122	J-21	J-22-TAP	103	8.0	PVC	120.0	1,041	6.64	2.35	22.8	False	False
2021	J-21	J-20	597	8.0	PVC	120.0	-572	3.65	4.49	7.5	False	False
1211	J-12	J-11	110	12.0	PVC	120.0	-534	1.52	0.10	0.9	False	False
1110	J-10	J-11	1,172	12.0	PVC	120.0	534	1.52	1.08	0.9	False	False

Max Velocity

Scenario: Max Day + 2000 gpm Fire Flow (IFC)
Link 5141 Closed

FlexTable: Junction Table

Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-55	6,600.00	Red	0	6,661.98	27
J-52	6,437.00	Red	0	6,658.74	96
J-51	6,390.00	Red	0	6,658.19	116
J-50	6,385.00	Red	0	6,658.10	118
J-45-IRR	6,376.00	Red	10	6,656.40	121
J-44-FH	6,376.00	Red	0	6,656.51	121
J-43	6,376.00	Red	0	6,656.59	121
J-42	6,376.00	Red	0	6,656.81	121
J-41	6,383.00	Red	0	6,657.64	119
J-40	6,383.00	Red	0	6,657.68	119
J-33	6,376.00	Red	0	6,656.42	121
J-32-FH	6,376.00	Red	0	6,656.12	121
J-31	6,376.00	Red	0	6,656.01	121
J-26	6,376.00	Red	0	6,656.23	121
J-24	6,376.00	Red	0	6,656.18	121
J-23-FDC	6,376.00	Red	2,000	6,649.62	118
J-22-TAP	6,376.00	Red	56	6,650.62	119
J-21	6,376.00	Red	0	6,652.97	120
J-20	6,366.00	Red	0	6,657.50	126
J-12	6,376.00	Red	0	6,656.25	121
J-11	6,371.00	Red	0	6,656.36	123
J-10	6,354.00	Red	0	6,657.48	131
J-00	6,347.00	Red	0	6,657.48	134

Nodes at Tank
Connection

Residual Pressure

Scenario: Max Day + 2000 gpm Fire Flow (IFC)
Link 5141 Closed

FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	Headloss Gradient (ft/1000ft)	Is Closed?	Has User Defined Length?
T24-9955	J-55	R-99	56	24.0	PVC	120.0	-2,066	1.47	0.02	0.4	False	False
T24-5040	J-40	J-50	1,100	24.0	PVC	120.0	-2,066	1.47	0.42	0.4	False	True
T24-4020	J-40	J-20	1,470	24.0	PVC	120.0	1,120	0.79	0.18	0.1	False	False
T24-2010	J-20	J-10	585	24.0	PVC	120.0	546	0.39	0.02	0.0	False	False
T24-1000	J-10	J-00	358	24.0	PVC	120.0	0	0.00	0.00	0.0	False	False
T20-5540	J-50	J-55	6,480	20.0	PVC	120.0	-1,622	1.66	3.88	0.6	False	True
T16-5251	J-51	J-52	3,450	16.0	PVC	120.0	-444	0.71	0.56	0.2	False	True
T16-5051	J-50	J-51	525	16.0	PVC	120.0	-444	0.71	0.08	0.2	False	True
5552	J-52	J-55	4,950	12.0	PVC	120.0	-444	1.26	3.23	0.7	False	True
5141	J-41	J-51	1,675	12.0	PVC	120.0	0	0.00	0.00	0.0	True	True
4512	J-45-IRR	J-12	558	8.0	PVC	120.0	94	0.60	0.15	0.3	False	False
4445	J-44-FH	J-45-IRR	344	8.0	PVC	120.0	104	0.67	0.11	0.3	False	False
4333	J-33	J-43	163	12.0	PVC	120.0	-567	1.61	0.17	1.0	False	False
4244	J-43	J-44-FH	246	8.0	PVC	120.0	104	0.67	0.08	0.3	False	False
4243	J-43	J-42	154	12.0	PVC	120.0	-671	1.90	0.22	1.4	False	False
4231	J-42	J-31	409	8.0	PVC	120.0	275	1.75	0.79	1.9	False	False
4142	J-42	J-41	313	12.0	PVC	120.0	-946	2.68	0.83	2.7	False	False
4041	J-41	J-40	17	12.0	PVC	120.0	-946	2.68	0.04	2.7	False	False
3326	J-26	J-33	411	12.0	PVC	120.0	-375	1.06	0.20	0.5	False	False
3233	J-32-FH	J-33	299	8.0	PVC	120.0	-192	1.23	0.30	1.0	False	False
3132	J-31	J-32-FH	110	8.0	PVC	120.0	-192	1.23	0.11	1.0	False	False
3121	J-31	J-21	588	8.0	PVC	120.0	467	2.98	3.04	5.2	False	False
2625	J-24	J-26	99	12.0	PVC	120.0	-375	1.06	0.05	0.5	False	False
2423	J-23-FDC	J-24	301	8.0	PVC	120.0	-1,015	6.48	6.56	21.8	False	False
2412	J-24	J-12	56	12.0	PVC	120.0	-640	1.82	0.07	1.3	False	False
2322	J-22-TAP	J-23-FDC	48	8.0	PVC	120.0	985	6.29	1.00	20.6	False	False
2122	J-21	J-22-TAP	103	8.0	PVC	120.0	1,041	6.65	2.35	22.8	False	False
2021	J-21	J-20	597	8.0	PVC	120.0	-574	3.67	4.52	7.6	False	False
1211	J-12	J-11	110	12.0	PVC	120.0	-546	1.55	0.10	1.0	False	False
1110	J-10	J-11	1,172	12.0	PVC	120.0	546	1.55	1.12	1.0	False	False

Max Velocity

Scenario: Max Day + 4000 gpm Fire Flow (Costco)

FlexTable: Reservoir Table

Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-99	6,662.00	Red	4,066	6,662.00

Scenario: Max Day + 4000 gpm Fire Flow (Costco)

FlexTable: Junction Table

Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-55	6,600.00	Red	0	6,661.92	27
J-52	6,437.00	Red	0	6,650.44	92
J-51	6,390.00	Red	0	6,648.46	112
J-50	6,385.00	Red	0	6,648.40	114
J-45-IRR	6,376.00	Red	10	6,642.81	115
J-44-FH	6,376.00	Red	0	6,643.19	116
J-43	6,376.00	Red	0	6,643.46	116
J-42	6,376.00	Red	0	6,644.22	116
J-41	6,383.00	Red	0	6,647.14	114
J-40	6,383.00	Red	0	6,647.23	114
J-33	6,376.00	Red	0	6,642.86	115
J-32-FH	6,376.00	Red	0	6,641.82	115
J-31	6,376.00	Red	0	6,641.43	115
J-26	6,376.00	Red	0	6,642.17	115
J-24	6,376.00	Red	0	6,642.00	115
J-23-FDC	6,376.00	Red	4,000	6,618.82	105
J-22-TAP	6,376.00	Red	56	6,622.50	107
J-21	6,376.00	Red	0	6,630.76	110
J-20	6,366.00	Red	0	6,646.59	121
J-12	6,376.00	Red	0	6,642.25	115
J-11	6,371.00	Red	0	6,642.62	118
J-10	6,354.00	Red	0	6,646.53	127
J-00	6,347.00	Red	0	6,646.53	130

Nodes at Tank
Connection

Residual Pressure

Scenario: Max Day + 4000 gpm Fire Flow (Costco)

FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	Headloss Gradient (ft/1000ft)	Is Closed?	Has User Defined Length?
T24-9955	J-55	R-99	56	24.0	PVC	120.0	-4,066	2.88	0.08	1.3	False	False
T24-5040	J-40	J-50	1,100	24.0	PVC	120.0	-3,574	2.53	1.17	1.1	False	True
T24-4020	J-40	J-20	1,470	24.0	PVC	120.0	2,200	1.56	0.64	0.4	False	False
T24-2010	J-20	J-10	585	24.0	PVC	120.0	1,070	0.76	0.07	0.1	False	False
T24-1000	J-10	J-00	358	24.0	PVC	120.0	0	0.00	0.00	0.0	False	False
T20-5540	J-50	J-55	6,480	20.0	PVC	120.0	-3,186	3.25	13.53	2.1	False	True
T16-5251	J-51	J-52	3,450	16.0	PVC	120.0	-880	1.40	1.97	0.6	False	True
T16-5051	J-50	J-51	525	16.0	PVC	120.0	-388	0.62	0.07	0.1	False	True
5552	J-52	J-55	4,950	12.0	PVC	120.0	-880	2.50	11.49	2.3	False	True
5141	J-41	J-51	1,675	12.0	PVC	120.0	-492	1.40	1.32	0.8	False	True
4512	J-45-IRR	J-12	558	8.0	PVC	120.0	192	1.23	0.56	1.0	False	False
4445	J-44-FH	J-45-IRR	344	8.0	PVC	120.0	202	1.29	0.38	1.1	False	False
4333	J-33	J-43	163	12.0	PVC	120.0	-1,122	3.18	0.59	3.6	False	False
4244	J-43	J-44-FH	246	8.0	PVC	120.0	202	1.29	0.27	1.1	False	False
4243	J-43	J-42	154	12.0	PVC	120.0	-1,324	3.76	0.76	4.9	False	False
4231	J-42	J-31	409	8.0	PVC	120.0	542	3.46	2.78	6.8	False	False
4142	J-42	J-41	313	12.0	PVC	120.0	-1,866	5.29	2.92	9.3	False	False
4041	J-41	J-40	17	12.0	PVC	120.0	-1,374	3.90	0.09	5.3	False	False
3326	J-26	J-33	411	12.0	PVC	120.0	-744	2.11	0.70	1.7	False	False
3233	J-32-FH	J-33	299	8.0	PVC	120.0	-378	2.42	1.05	3.5	False	False
3132	J-31	J-32-FH	110	8.0	PVC	120.0	-378	2.42	0.38	3.5	False	False
3121	J-31	J-21	588	8.0	PVC	120.0	920	5.87	10.68	18.2	False	False
2625	J-24	J-26	99	12.0	PVC	120.0	-744	2.11	0.17	1.7	False	False
2423	J-23-FDC	J-24	301	8.0	PVC	120.0	-2,006	12.80	23.18	76.9	False	False
2412	J-24	J-12	56	12.0	PVC	120.0	-1,263	3.58	0.25	4.5	False	False
2322	J-22-TAP	J-23-FDC	48	8.0	PVC	120.0	1,994	12.73	3.68	76.0	False	False
2122	J-21	J-22-TAP	103	8.0	PVC	120.0	2,050	13.08	8.26	80.0	False	False
2021	J-21	J-20	597	8.0	PVC	120.0	-1,130	7.21	15.83	26.5	False	False
1211	J-12	J-11	110	12.0	PVC	120.0	-1,070	3.04	0.37	3.3	False	False
1110	J-10	J-11	1,172	12.0	PVC	120.0	1,070	3.04	3.91	3.3	False	False

Max Velocity

Scenario: Max Day + 4000 gpm Fire Flow (Costco)
Link 4142 Closed

FlexTable: Junction Table

Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-55	6,600.00	Red	0	6,661.92	27
J-52	6,437.00	Red	0	6,650.44	92
J-51	6,390.00	Red	0	6,648.47	112
J-50	6,385.00	Red	0	6,648.40	114
J-45-IRR	6,376.00	Red	10	6,623.60	107
J-44-FH	6,376.00	Red	0	6,623.27	107
J-43	6,376.00	Red	0	6,623.04	107
J-42	6,376.00	Red	0	6,622.99	107
J-41	6,383.00	Red	0	6,647.23	114
J-40	6,383.00	Red	0	6,647.22	114
J-33	6,376.00	Red	0	6,623.05	107
J-32-FH	6,376.00	Red	0	6,622.27	107
J-31	6,376.00	Red	0	6,621.99	106
J-26	6,376.00	Red	0	6,623.33	107
J-24	6,376.00	Red	0	6,623.39	107
J-23-FDC	6,376.00	Red	4,000	6,603.12	98
J-22-TAP	6,376.00	Red	56	6,607.29	100
J-21	6,376.00	Red	0	6,616.62	104
J-20	6,366.00	Red	0	6,645.23	121
J-12	6,376.00	Red	0	6,624.18	107
J-11	6,371.00	Red	0	6,625.95	110
J-10	6,354.00	Red	0	6,644.91	126
J-00	6,347.00	Red	0	6,644.91	129

Nodes at Tank
Connection

Residual Pressure

Scenario: Max Day + 4000 gpm Fire Flow (Costco)
Link 4142 Closed

FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	Headloss Gradient (ft/1000ft)	Is Closed?	Has User Defined Length?
T24-9955	J-55	R-99	56	24.0	PVC	120.0	-4,066	2.88	0.08	1.3	False	False
T24-5040	J-40	J-50	1,100	24.0	PVC	120.0	-3,591	2.55	1.18	1.1	False	True
T24-4020	J-40	J-20	1,470	24.0	PVC	120.0	4,066	2.88	1.98	1.3	False	False
T24-2010	J-20	J-10	585	24.0	PVC	120.0	2,511	1.78	0.32	0.6	False	False
T24-1000	J-10	J-00	358	24.0	PVC	120.0	0	0.00	0.00	0.0	False	False
T20-5540	J-50	J-55	6,480	20.0	PVC	120.0	-3,186	3.25	13.53	2.1	False	True
T16-5251	J-51	J-52	3,450	16.0	PVC	120.0	-880	1.40	1.97	0.6	False	True
T16-5051	J-50	J-51	525	16.0	PVC	120.0	-405	0.65	0.07	0.1	False	True
5552	J-52	J-55	4,950	12.0	PVC	120.0	-880	2.50	11.49	2.3	False	True
5141	J-41	J-51	1,675	12.0	PVC	120.0	-475	1.35	1.24	0.7	False	True
4512	J-45-IRR	J-12	558	8.0	PVC	120.0	-196	1.25	0.58	1.0	False	False
4445	J-44-FH	J-45-IRR	344	8.0	PVC	120.0	-186	1.19	0.32	0.9	False	False
4333	J-33	J-43	163	12.0	PVC	120.0	126	0.36	0.01	0.1	False	False
4244	J-43	J-44-FH	246	8.0	PVC	120.0	-186	1.19	0.23	0.9	False	False
4243	J-43	J-42	154	12.0	PVC	120.0	312	0.89	0.05	0.3	False	False
4231	J-42	J-31	409	8.0	PVC	120.0	312	1.99	1.00	2.5	False	False
4142	J-42	J-41	313	12.0	PVC	120.0	0	0.00	0.00	0.0	True	False
4041	J-41	J-40	17	12.0	PVC	120.0	475	1.35	0.01	0.7	False	False
3326	J-26	J-33	411	12.0	PVC	120.0	449	1.27	0.27	0.7	False	False
3233	J-32-FH	J-33	299	8.0	PVC	120.0	-323	2.06	0.78	2.6	False	False
3132	J-31	J-32-FH	110	8.0	PVC	120.0	-323	2.06	0.29	2.6	False	False
3121	J-31	J-21	588	8.0	PVC	120.0	635	4.05	5.37	9.1	False	False
2625	J-24	J-26	99	12.0	PVC	120.0	449	1.27	0.07	0.7	False	False
2423	J-23-FDC	J-24	301	8.0	PVC	120.0	-1,866	11.91	20.27	67.3	False	False
2412	J-24	J-12	56	12.0	PVC	120.0	-2,315	6.57	0.78	13.9	False	False
2322	J-22-TAP	J-23-FDC	48	8.0	PVC	120.0	2,134	13.62	4.17	86.2	False	False
2122	J-21	J-22-TAP	103	8.0	PVC	120.0	2,190	13.98	9.33	90.4	False	False
2021	J-21	J-20	597	8.0	PVC	120.0	-1,555	9.92	28.61	48.0	False	False
1211	J-12	J-11	110	12.0	PVC	120.0	-2,511	7.12	1.77	16.2	False	False
1110	J-10	J-11	1,172	12.0	PVC	120.0	2,511	7.12	18.96	16.2	False	False

Max Velocity

Scenario: Max Day + 4000 gpm Fire Flow (Costco)
Link 5040 Closed

FlexTable: Junction Table

Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-55	6,600.00	Red	0	6,661.92	27
J-52	6,437.00	Red	0	6,648.30	91
J-51	6,390.00	Red	0	6,645.97	111
J-50	6,385.00	Red	0	6,649.06	114
J-45-IRR	6,376.00	Red	10	6,575.38	86
J-44-FH	6,376.00	Red	0	6,575.77	86
J-43	6,376.00	Red	0	6,576.05	87
J-42	6,376.00	Red	0	6,576.83	87
J-41	6,383.00	Red	0	6,579.82	85
J-40	6,383.00	Red	0	6,579.62	85
J-33	6,376.00	Red	0	6,575.44	86
J-32-FH	6,376.00	Red	0	6,574.40	86
J-31	6,376.00	Red	0	6,574.02	86
J-26	6,376.00	Red	0	6,574.72	86
J-24	6,376.00	Red	0	6,574.54	86
J-23-FDC	6,376.00	Red	4,000	6,551.35	76
J-22-TAP	6,376.00	Red	56	6,555.02	77
J-21	6,376.00	Red	0	6,563.27	81
J-20	6,366.00	Red	0	6,578.99	92
J-12	6,376.00	Red	0	6,574.79	86
J-11	6,371.00	Red	0	6,575.15	88
J-10	6,354.00	Red	0	6,578.93	97
J-00	6,347.00	Red	0	6,578.93	100

Nodes at Tank
Connection

Residual Pressure

Scenario: Max Day + 4000 gpm Fire Flow (Costco)
Link 5040 Closed

FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	Headloss Gradient (ft/1000ft)	Is Closed?	Has User Defined Length?
T24-9955	J-55	R-99	56	24.0	PVC	120.0	-4,066	2.88	0.08	1.3	False	False
T24-5040	J-40	J-50	1,100	24.0	PVC	120.0	0	0.00	0.00	0.0	True	True
T24-4020	J-40	J-20	1,470	24.0	PVC	120.0	2,177	1.54	0.62	0.4	False	False
T24-2010	J-20	J-10	585	24.0	PVC	120.0	1,052	0.75	0.06	0.1	False	False
T24-1000	J-10	J-00	358	24.0	PVC	120.0	0	0.00	0.00	0.0	False	False
T20-5540	J-50	J-55	6,480	20.0	PVC	120.0	-3,101	3.17	12.87	2.0	False	True
T16-5251	J-51	J-52	3,450	16.0	PVC	120.0	-965	1.54	2.34	0.7	False	True
T16-5051	J-50	J-51	525	16.0	PVC	120.0	3,101	4.95	3.09	5.9	False	True
5552	J-52	J-55	4,950	12.0	PVC	120.0	-965	2.74	13.62	2.8	False	True
5141	J-41	J-51	1,675	12.0	PVC	120.0	-4,066	11.53	66.14	39.5	False	True
4512	J-45-IRR	J-12	558	8.0	PVC	120.0	197	1.26	0.58	1.0	False	False
4445	J-44-FH	J-45-IRR	344	8.0	PVC	120.0	207	1.32	0.39	1.1	False	False
4333	J-33	J-43	163	12.0	PVC	120.0	-1,137	3.22	0.61	3.7	False	False
4244	J-43	J-44-FH	246	8.0	PVC	120.0	207	1.32	0.28	1.1	False	False
4243	J-43	J-42	154	12.0	PVC	120.0	-1,344	3.81	0.78	5.1	False	False
4231	J-42	J-31	409	8.0	PVC	120.0	545	3.48	2.82	6.9	False	False
4142	J-42	J-41	313	12.0	PVC	120.0	-1,889	5.36	2.99	9.5	False	False
4041	J-41	J-40	17	12.0	PVC	120.0	2,177	6.18	0.21	12.4	False	False
3326	J-26	J-33	411	12.0	PVC	120.0	-759	2.15	0.73	1.8	False	False
3233	J-32-FH	J-33	299	8.0	PVC	120.0	-378	2.41	1.05	3.5	False	False
3132	J-31	J-32-FH	110	8.0	PVC	120.0	-378	2.41	0.38	3.5	False	False
3121	J-31	J-21	588	8.0	PVC	120.0	924	5.89	10.75	18.3	False	False
2625	J-24	J-26	99	12.0	PVC	120.0	-759	2.15	0.17	1.8	False	False
2423	J-23-FDC	J-24	301	8.0	PVC	120.0	-2,007	12.81	23.20	77.0	False	False
2412	J-24	J-12	56	12.0	PVC	120.0	-1,249	3.54	0.25	4.4	False	False
2322	J-22-TAP	J-23-FDC	48	8.0	PVC	120.0	1,993	12.72	3.68	76.0	False	False
2122	J-21	J-22-TAP	103	8.0	PVC	120.0	2,049	13.08	8.25	80.0	False	False
2021	J-21	J-20	597	8.0	PVC	120.0	-1,125	7.18	15.72	26.4	False	False
1211	J-12	J-11	110	12.0	PVC	120.0	-1,052	2.98	0.35	3.2	False	False
1110	J-10	J-11	1,172	12.0	PVC	120.0	1,052	2.98	3.78	3.2	False	False

Max Velocity

Scenario: Max Day + 4000 gpm Fire Flow (Costco)
Link 5141 Closed

FlexTable: Junction Table

Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-55	6,600.00	Red	0	6,661.92	27
J-52	6,437.00	Red	0	6,650.59	92
J-51	6,390.00	Red	0	6,648.64	112
J-50	6,385.00	Red	0	6,648.35	114
J-45-IRR	6,376.00	Red	10	6,642.41	115
J-44-FH	6,376.00	Red	0	6,642.78	115
J-43	6,376.00	Red	0	6,643.05	116
J-42	6,376.00	Red	0	6,643.80	116
J-41	6,383.00	Red	0	6,646.71	114
J-40	6,383.00	Red	0	6,646.86	114
J-33	6,376.00	Red	0	6,642.46	115
J-32-FH	6,376.00	Red	0	6,641.41	115
J-31	6,376.00	Red	0	6,641.02	115
J-26	6,376.00	Red	0	6,641.76	115
J-24	6,376.00	Red	0	6,641.60	115
J-23-FDC	6,376.00	Red	4,000	6,618.43	105
J-22-TAP	6,376.00	Red	56	6,622.11	106
J-21	6,376.00	Red	0	6,630.36	110
J-20	6,366.00	Red	0	6,646.22	121
J-12	6,376.00	Red	0	6,641.85	115
J-11	6,371.00	Red	0	6,642.22	117
J-10	6,354.00	Red	0	6,646.16	126
J-00	6,347.00	Red	0	6,646.16	129

Nodes at Tank Connection

Residual Pressure

Scenario: Max Day + 4000 gpm Fire Flow (Costco)
Link 4142 Closed

FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	Headloss Gradient (ft/1000ft)	Is Closed?	Has User Defined Length?
T24-9955	J-55	R-99	56	24.0	PVC	120.0	-4,066	2.88	0.08	1.3	False	False
T24-5040	J-40	J-50	1,100	24.0	PVC	120.0	-4,066	2.88	1.48	1.3	False	True
T24-4020	J-40	J-20	1,470	24.0	PVC	120.0	2,205	1.56	0.64	0.4	False	False
T24-2010	J-20	J-10	585	24.0	PVC	120.0	1,075	0.76	0.07	0.1	False	False
T24-1000	J-10	J-00	358	24.0	PVC	120.0	0	0.00	0.00	0.0	False	False
T20-5540	J-50	J-55	6,480	20.0	PVC	120.0	-3,192	3.26	13.58	2.1	False	True
T16-5251	J-51	J-52	3,450	16.0	PVC	120.0	-874	1.39	1.95	0.6	False	True
T16-5051	J-50	J-51	525	16.0	PVC	120.0	-874	1.39	0.30	0.6	False	True
5552	J-52	J-55	4,950	12.0	PVC	120.0	-874	2.48	11.34	2.3	False	True
5141	J-41	J-51	1,675	12.0	PVC	120.0	0	0.00	0.00	0.0	True	True
4512	J-45-IRR	J-12	558	8.0	PVC	120.0	191	1.22	0.55	1.0	False	False
4445	J-44-FH	J-45-IRR	344	8.0	PVC	120.0	201	1.28	0.37	1.1	False	False
4333	J-33	J-43	163	12.0	PVC	120.0	-1,119	3.17	0.59	3.6	False	False
4244	J-43	J-44-FH	246	8.0	PVC	120.0	201	1.28	0.27	1.1	False	False
4243	J-43	J-42	154	12.0	PVC	120.0	-1,320	3.74	0.75	4.9	False	False
4231	J-42	J-31	409	8.0	PVC	120.0	541	3.45	2.78	6.8	False	False
4142	J-42	J-41	313	12.0	PVC	120.0	-1,861	5.28	2.91	9.3	False	False
4041	J-41	J-40	17	12.0	PVC	120.0	-1,861	5.28	0.15	9.3	False	False
3326	J-26	J-33	411	12.0	PVC	120.0	-740	2.10	0.69	1.7	False	False
3233	J-32-FH	J-33	299	8.0	PVC	120.0	-378	2.42	1.05	3.5	False	False
3132	J-31	J-32-FH	110	8.0	PVC	120.0	-378	2.42	0.38	3.5	False	False
3121	J-31	J-21	588	8.0	PVC	120.0	920	5.87	10.66	18.1	False	False
2625	J-24	J-26	99	12.0	PVC	120.0	-740	2.10	0.17	1.7	False	False
2423	J-23-FDC	J-24	301	8.0	PVC	120.0	-2,006	12.80	23.17	76.9	False	False
2412	J-24	J-12	56	12.0	PVC	120.0	-1,266	3.59	0.26	4.6	False	False
2322	J-22-TAP	J-23-FDC	48	8.0	PVC	120.0	1,994	12.73	3.68	76.1	False	False
2122	J-21	J-22-TAP	103	8.0	PVC	120.0	2,050	13.09	8.26	80.1	False	False
2021	J-21	J-20	597	8.0	PVC	120.0	-1,131	7.22	15.86	26.6	False	False
1211	J-12	J-11	110	12.0	PVC	120.0	-1,075	3.05	0.37	3.4	False	False
1110	J-10	J-11	1,172	12.0	PVC	120.0	1,075	3.05	3.94	3.4	False	False

Max Velocity

Appendix C

Sanitary Calculations

PROJECT: DAWSON TRAILS 03/26/24 LC Date Initials						Town of Castle Rock Criteria											Unit Conversions		Design Criteria																
						Single Family Residential and Duplexes Multi-Family Residential (Townhomes and Condos) Retail/ Offices* Restaurants* Hotel** Industrial*** Car Wash Elementary School Parks						Typical ADF/ Unit 200 GPD/DU 130 GPD/DU 0.1 GPD/SF 1.5 GPD/SF 75 GPD/Room 600 GPD/AC 5,000 GPD/AC 3,375 GPD/School 200 GPD/SFE		0.18 GPD/SF 0.01 GPD/SF		*Restaurant area anticipated to be 10-15% of the allocated restaurant, retail and office space **Assuming 115 rooms/ hotel and average 48,000 SF hotel ***Assuming 40% building area																			
																Pipe (in)		Slope		Capac (gpm)															
																Min	Max	Min	Max																
																8	0.40%	7.50%	374	1,619															
																10	0.25%	5.50%	536	2,514															
																12	0.20%	4.50%	780	3,698															
																15	0.15%	3.50%	1,224	5,913															
																18	0.11%	2.50%	1,705	8,126															
																21	0.09%	2.00%	2,326	10,964															
24	0.08%	1.80%	3,131	14,850																															
27	0.07%	1.50%	4,009	18,559																															
30	0.06%	1.30%	4,916	22,882																															
PROJECTED FLOW DETERMINATION																											SEWER DESIGN								
DESIGN POINT						RESIDENTIAL			NON-RESIDENTIAL							PEAK FLOW			INFILTRATION & INFLOW		CUMULATIVE TOTAL FLOW						Pipe Size (in)	Number of Pipes	Approximate Design Pipe Slope (ft/100 ft)	Min Pipe Slope (ft/100 ft)	Max Pipe Slope (ft/100 ft)	Capacity (gpm) @ 75% depth @ Min Pipe Slope	Capacity (gpm) @ 75% depth @ Max Slope		
Design Point Location	PLANNING AREA	Phase	Contributing Flow 1	Contributing Flow 2	Contributing Flow 3	Multi Family (DU's)	Single Family (DU's)	Average Daily Flow (GPD)	School (EA.)	Parks (SFE)	Car Wash (AC)	Industrial (Gross SF)	Hotel (Gross SF)	Restaurants (Gross SF)	Retail / Office (Gross SF)	Average Daily Flow (GPD)	Total Average Daily Flow (GPD)	Total Average Flow (gpm)	Peak Hour Flow (gpm)	Infiltration & Inflow (GPD)	Infiltration & Inflow (gpm)	Total Peak Sewage Flow (gpm)	Contributing Flow 1	Contributing Flow 2	Contributing Flow 3	Cumulative Total Peak Flow (gpm)								Cumulative Total Peak Flow (cfs)	
						a	b	c	d	dd	ddd	e	ee	f	ff	g	h	i	j	k	m	n	o	p	q	r								rr	s
						Map	Map	130*a + 200*b	Map	Map	Map	Map	Map	Map	Map		c + g	h/24/60	i * 5	0.1*h	k/(24*60)	j + m	r	r	r	n+o+p+q	r / 0.1337*60								
J-7.01	E-1	1A													25,000	25,000	40,000	40,000	27.78	138.89	4,000	2.78	141.7				141.7	0.32	8	1	1.00	0.40	7.50	374	1619
J-7.02	F-2	1A	J-7.01												50,000	5,000	5,000	3.47	17.36	500	0.35	17.8	141.7			159.5	0.36	8	1	1.50	0.40	7.50	374	1619	
J-7.03	F-2	1A	J-7.02								3				161,000	28,600	28,600	19.86	99.31	2,860	1.99	101.3	159.5			260.8	0.58	8	1	1.50	0.40	7.50	374	1619	
TOTAL									-	-	3	-	-	50,000	311,000	118,600	118,600	82.36	411.81	11,860	8.24	420.3				260.8	0.58								

Appendix D

Excerpts



Excerpts from
"Costco
Wholesale
Development
Requirements"
Prepared by
Costco Wholesale
Dated December
18, 2020

DEVELOPMENT REQUIREMENTS

**Version 2020
December 18, 2020**

SUMMARY OF CHANGES **(Highlighted)**

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COSTCO WHOLESALE DEVELOPMENT REQUIREMENTS

SECTION 06 SITE UTILITIES (WET AND DRY)

- a) At the latest, dry utilities shall be in service by the required racking date, or Day sixty-five (65) of the project schedule, whichever is earlier.
 - b) For Building Only Projects (Site Delivery Option #4), wet utilities shall be installed by the Developer and ready for use at the time Costco Wholesale General Contractor mobilizes onto the site.
 - c) Required wet utilities include water (potable, irrigation and fire protection), sanitary sewer, and storm drainage.
 - d) Minimum pipe slope for gravity piping is one-half (0.5%) percent.
 - e) At a minimum, pipe invert elevations shall be set at a depth that provides frost cover protection equal to the local frost depth, as determined by the Costco Wholesale Geotechnical Engineer. See Detail: 06_03 Typical Utility Inverts.
 - f) Gravity service connections must pass beneath the structural footings and provide a minimum six (6") inch separation between the bottom of the footing and the outer wall of the pipe. Coordinate final invert elevations with the Costco Wholesale Mechanical Engineer and Structural Engineer. See Detail: 06_03 Typical Utility Inverts.
- 2) **Sanitary Sewer**
- a) **Sanitary sewer laterals shall be a minimum of six (6) inches (152 mm).**
 - b) Sanitary sewer design shall be in accordance with the authority having jurisdiction, including provisions for oil / water separation, effluent concentrations, flow velocity, and maintenance/operations provisions.
 - c) Confirm depth downstream connection to existing system is at an adequate depth to allow sewer service connections to pass beneath structural footings (below frost).
 - Line inverts shall be sufficiently deep as to receive all building flow by gravity (without pumping).
 - **All gravity sanitary sewer conveyance lines serving the Costco Wholesale facilities must have a gradient of one-half (0.5%) percent or greater.**
 - d) NO PUMP STATIONS – unless prior approval is received from Costco Wholesale.
 - e) At a minimum, provide nine (9) six (6) inch (152 mm) waste connections along the Warehouse exterior. Refer to the utility plan for specific locations. **Provide for a Sewer flow range of five**

COSTCO WHOLESALE DEVELOPMENT REQUIREMENTS

SECTION 06 SITE UTILITIES (WET AND DRY)

Castle Rock Requires 0.1
GPD/ AC for retail/ office
space. With Costco being
about 150,000 SF of
retail/office space (15,000
GPD) ToCR is more
conservative and therefore
utilized in the calculations.

thousand and five hundred (5,500) gallons (20,814 L) to eight thousand and five hundred
(8,500) gallons (32,173 l) per day of waste.

- See Detail: 06_01 Typical Utility Plan, 06_06 Sewer and Water Service Availability Letter, 06_13 Typical Sanitary Sewer Point of Connection Plan, and 06_13A Typical Sanitary Sewer Point of Connection Plan – with Liquor Sales
 - f) Provide two (2) grease interceptors. One minimum volume of one thousand fifteen (1,500) gallons (5,676 L) at the Fresh Line and the second minimum volume of one thousand (1,000) gallons (3,785 L) at the Food Service. Verify with minimum size and acceptable manufacturer and obtain final approval from AHJ prior to installation.
 - g) Provide one (1) oil and sand separator capable of handling a load of approximately eight hundred (800) gallons (3,027 L).
 - h) Provide one (1) oil / water separator, waste oil storage tank and associated piping for the Tire Installation bays in accordance with the local jurisdiction's requirement, where required.
 - i) Evaluate requirements for sanitary sewer service to the Fuel Facility and / or the compactor drain and provide sewer service as required by the jurisdiction.
 - j) Verify with the architect if a sanitary sewer connection needs to be provided to the sprinkler riser room.
- 3) Water – Domestic Service
- a) Provide a Domestic Water service to the Warehouse at the location shown on the Utility Plan, or as determined by Costco Wholesale. Clearly identify the location and type of the Domestic water meter.
 - b) The Domestic water service shall be connected directly to the local public water system infrastructure or onsite (public) water system and shall be metered separately from irrigation and fire service connections and Fuel Facility. Connection of the Costco Wholesale domestic water service to a closed (stagnant) system, with backflow preventing free-flowing circulation with the adjacent public water system is not allowed.
 - c) Clarify whether the Onsite Water System is public (with easements) or private (with backflow at property line).
 - d) Confirm backflow and metering requirements.

COSTCO WHOLESALE DEVELOPMENT REQUIREMENTS

SECTION 06 SITE UTILITIES (WET AND DRY)

- e) The Domestic water service shall be a minimum size of three (3) inch (76.2 mm) and have minimum static pressure of seventy (70) pounds per sq. inch (482.6 kPa) downstream of backflow prevention.
- See Detail: 06_01 Typical Utility Plan, 06_07 Water Service Availability Letter, 06_12 Typical Water System Point of Connection Plan, and 06_12A Typical Water System Point of Connection Plan- with Liquor Sales.
 - For Canada projects, domestic water supply is typically provided by a sixty-five (65) mm service delivering three hundred and eighty (380) liters per minute at 5.2 bar.
 - For all other countries, verify availability.
- f) Approval from Costco Wholesale is required for lower pressure service.
- g) Provide a pressure reducing valve (PRV) if required due to high system pressures.
- h) Provide backflow prevention as required by the authority having jurisdiction.
- Identify available water pressure after applying required backflow protection device losses.
 - Coordinate with the Costco Wholesale Architect and Mechanical Engineer.
- 4) Water – Irrigation Service
- a) Provide irrigation water service (separate from domestic service) at a location as determined by Costco Wholesale. Irrigation service is to be metered separately from Domestic and Fire Protection services. Clearly identify the location and type of Irrigation water meter.
- b) The irrigation water service shall be as recommended by the Landscape Architect and approved by Costco Wholesale. Confirm backflow and metering requirements.
- c) Identify anticipated water pressure at the Irrigation System connection and coordinate with the Landscape Architect. Provide a pressure reducing valve (PRV) if required due to high pressure systems. Coordinate with landscape architect for project-specific requirements.
- d) Provide necessary water meter (separate from domestic) and backflow prevention device as required by the authority having jurisdiction. Verify that the irrigation water usage does not impact the sanitary sewer billing.
- 5) Water – Fire Protection Service

COSTCO WHOLESALE DEVELOPMENT REQUIREMENTS

SECTION 06 SITE UTILITIES (WET AND DRY)

- a) Verify availability of fire protection water service capable of providing a minimum delivery pressure of seventy-five (75) pounds per square inch (517.11 kPa).
- b) For a non-boosted system, provide a minimum of two thousand one hundred and fifty (2,150) gallons per minute (8,138 Lpm) at a residual pressure of sixty-five (65) pounds per square inch (448 kPa) and a general firefighting flow of four thousand (4,000) gallons per minute (15,142 Lpm) at a residual pressure of twenty (20) pounds per square inch (137.95 kPa), or as required by the jurisdiction.
- c) Verify that a pump is not required.
- d) Verify connection and impact fees and provide a detailed and itemized breakdown to the Costco Wholesale Development Director.
- e) The below referenced criteria shall be conducted by an Engineer certified in the state in which the project is sited. The hydrant flow test information shall be accompanied by the stamp and signature of the professional Engineer certifying that the water flow test has been completed in accordance with NFPA 291.
- f) A hydraulic analysis of the Onsite Water system and corresponding connections to the adjacent water system(s) shall be completed by both the Civil Engineer responsible for onsite water system design and Costco Wholesale Fire Protection consultant to determine the available water pressure at base of riser (BOR).
 - The analysis should clearly identify if the onsite water system is public or private.
 - Hydraulic modeling for design of the onsite water system and determining the available water pressure at the base of riser shall account for required back flow protection location and type, and water meter (if required for Fire flows).
- g) All fire protection designs, plans and Specifications shall be reviewed and approved by the Costco Wholesale Fire Protection Consultant.
- h) Complete all designs in accordance with the Costco Wholesale design criteria and the requirements of the authority having jurisdiction. Where discrepancies occur between the standards, the more restrictive shall apply. For any location where an ESFR Fire System will be installed, Costco Wholesale Risk Management Department is to be notified.
- i) Adequacy of service, site piping design, pressure and flow shall be verified with the regulating authority and these requirements. Provide water mains of sufficient size to adequately supply

COSTCO WHOLESALE DEVELOPMENT REQUIREMENTS

SECTION 06 SITE UTILITIES (WET AND DRY)

both fire protection and domestic demands simultaneously, or separate lines, if required by local authorities.

- j) Provide an eight (8) inch (203 mm) minimum onsite water system, with sufficient isolation valves to facilitate maintenance/operations. Include an appropriately sized connection to the fire protection system riser and onsite fire hydrants. The location of the fire protection stub connection and base of riser shall be at a location and elevation specified per Costco Wholesale requirements.
 - k) Hydraulic analysis design of the onsite water system shall evaluate the hydraulic benefits of looping the system around the Warehouse, upsizing of the connections to the existing system and/or onsite water system piping.
 - All available water system design configurations shall be evaluated prior to proposing a pump.
 - Provide a separate meter for the fire protection water service only if required.
 - l) Confirm whether a water meter is required on the Fire Protection service. If required, clearly identify the location and type of the Fire Protection water meter.
 - m) Design Water system so that the fire sprinkler system does not require a pump or onsite storage tank. Any design requiring a pump and/or storage tank must be accepted in writing by Costco Wholesale.
- 6) Water – Fire Hydrants
- a) Provide fire hydrants at a maximum of three hundred (300) foot, (91.44 m) intervals around the building, or as required by the authority having jurisdiction. Confirm whether there is also a minimum distance from the Warehouse.
 - b) Provide one (1) fire hydrant within one hundred (100) feet (30.48 m) of the Costco Wholesale Fire Department Connection (FDC) or as required by the authority having jurisdiction. Verify location of FDC and nearest hydrant with the local fire official.
 - Where a Fuel Facility is included, provide one (1) fire hydrant within one hundred (100) feet (30.48 m) of the Fuel Facility. Verify exact location with Costco Wholesale.
 - Verify with the local fire official if additional hydrants are required. If additional hydrants are required, identify their location and coordinate with Site Utility Plan.

COSTCO WHOLESALE DEVELOPMENT REQUIREMENTS

SECTION 06 SITE UTILITIES (WET AND DRY)

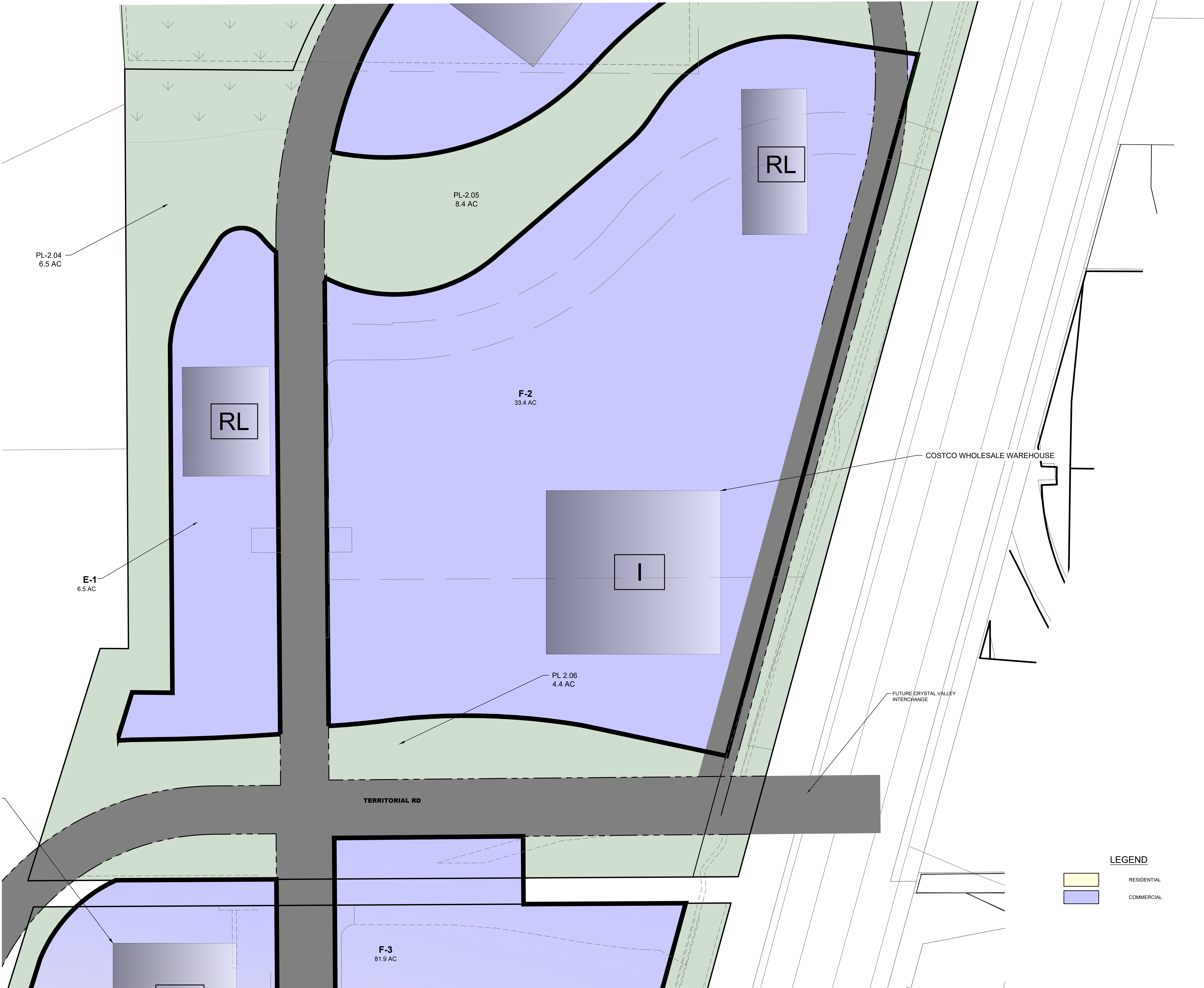
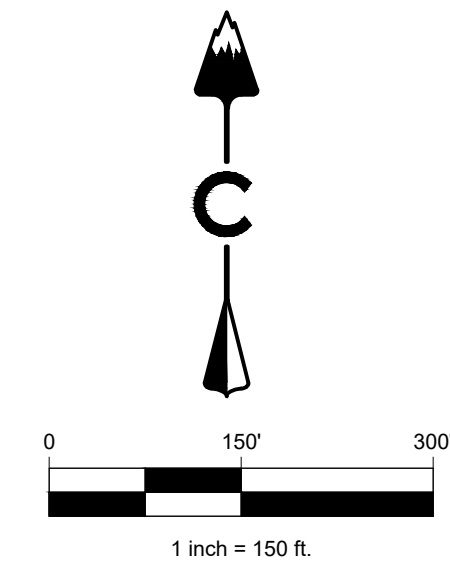
- c) Verify with the local fire official if a Post Indicator Valve (PIV) is required, and the type of Fire Hydrant connection(s).
 - Confirm local Fire Protection standards for hydrant nuts and valve.
 - Provide copy of local Fire Hydrant standards and details.
- 7) Water – Fire Backflow Protection
 - a) Provide backflow protection in accordance with the authority having jurisdiction. Identify the size, type, manufacturer and model for the backflow protection device(s) proposed for use.
 - b) Verify if location of backflow is inside Warehouse, or out at property line, and whether the unit is to be installed below grade (in buried vault) or above grade.
 - If above grade, confirm if screening is required.
 - If installed outside of Warehouse, confirm whether frost-protection is required. Identify necessary provisions for an insulated "Hot-Box" structure, and coordinate other utilities (drains, electric power, etc.) as required.
 - The location of the backflow protection device is typically dependent on whether the onsite water system is private, or public (with easements).
 - c) Based on this, it should be determined early in the process whether the onsite water system is to be private or public, so that the appropriate backflow protection and metering can be designed.
- 8) Storm Drainage - See Section 07 Site Storm Drainage for requirements.

D. Dry Utilities

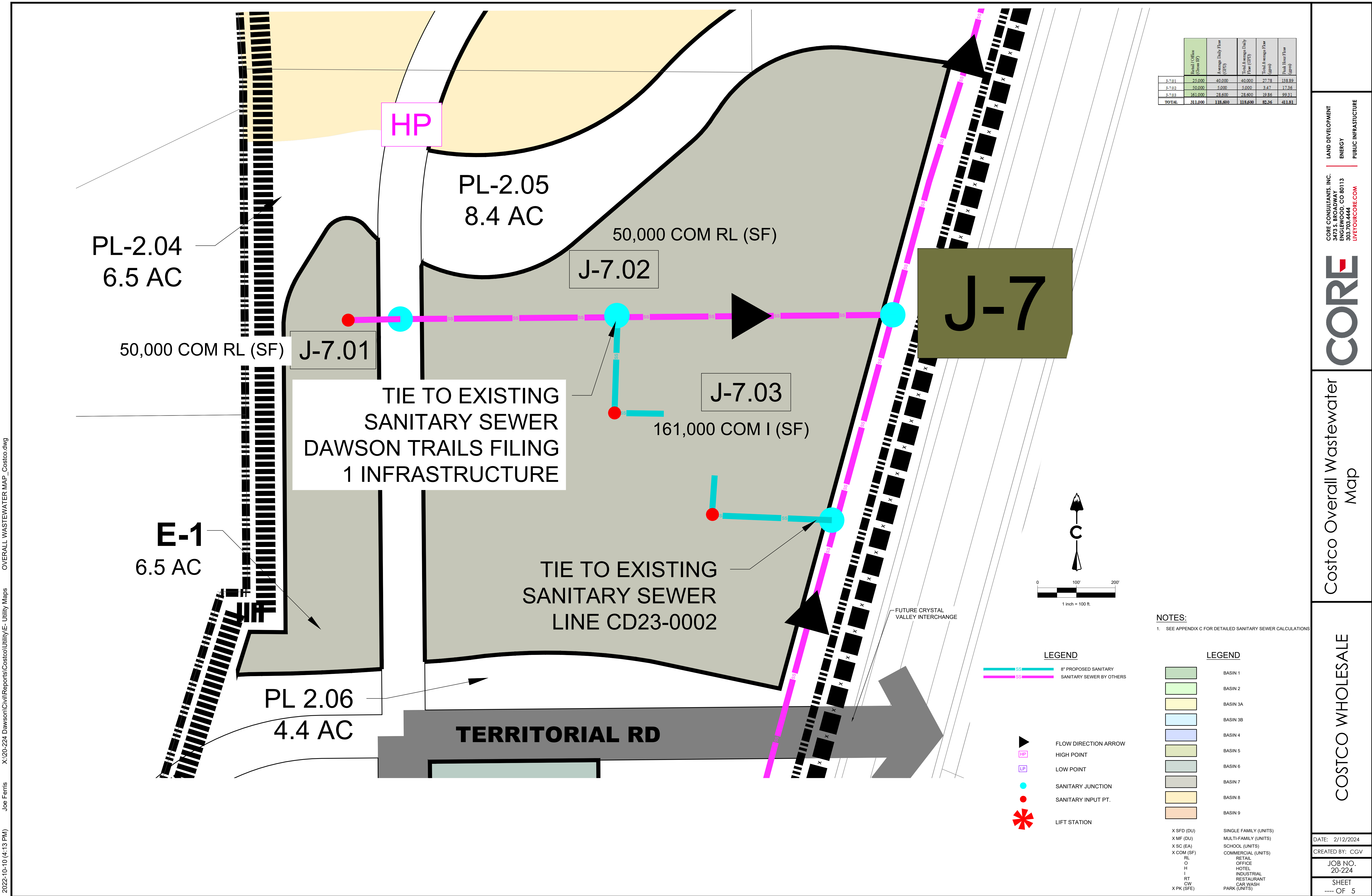
- 1) Dry utilities are necessary to operate a Costco Wholesale Warehouse and Fuel Facility (where included). The responsibility of providing these utility services may involve several different consultants; therefore, documentation of all correspondence with utility providers is essential. See Detail: 06_10 Dry Utility Matrix for purposes of tracking permits and approvals.
 - a) Required dry utilities include electric power, telephone/computer and natural gas. When a Fuel Facility is to be constructed, Communications Conduits between the Controller Enclosure and the Warehouse EDP Room are also required.

Appendix E

Maps



2022-10-10 (4:13 PM) Joe Ferris X:\20-224 Dawson\Civil\Reports\Costco\UtilityE- Utility Maps OVERALL WASTEWATER MAP _Costco.dwg



CORE

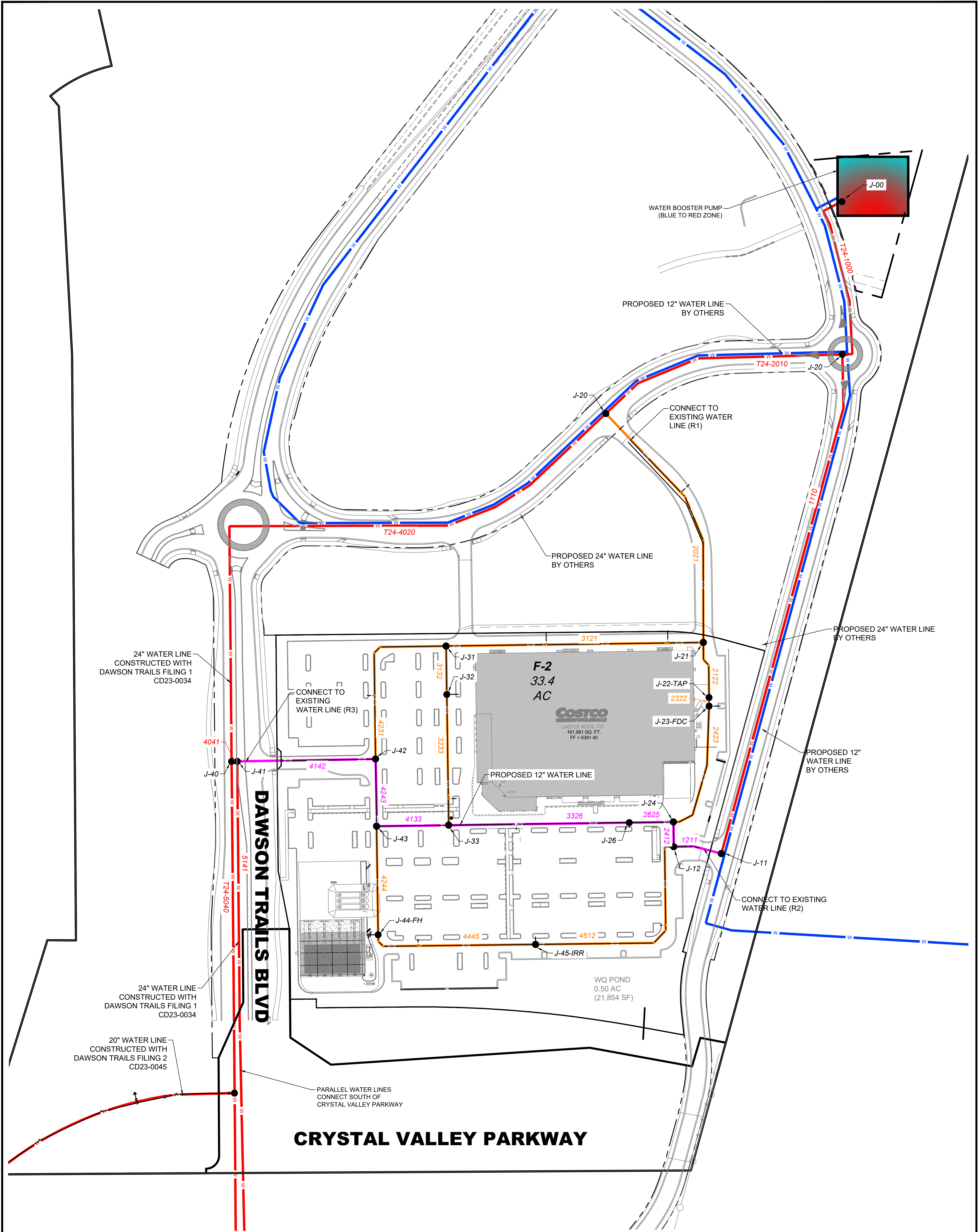
CORE CONSULTANTS, INC.
3472 S. BROADWAY
DENVER, CO 80113
303.703.4444
LIVEYOURCORE.COM

LAND DEVELOPMENT
ENERGY
PUBLIC INFRASTRUCTURE

Costco Overall Wastewater Map

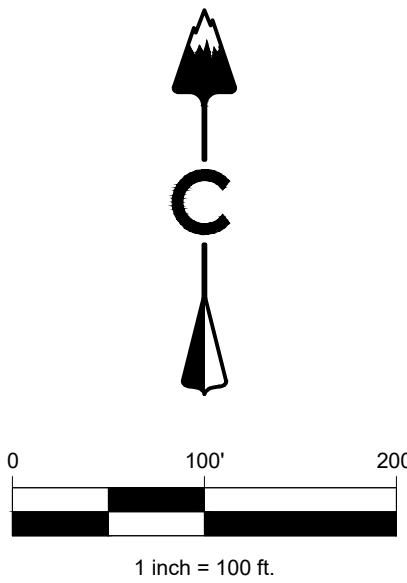
COSTCO WHOLESALE

DATE: 2/12/2024
CREATED BY: CGV
JOB NO.: 20-224
SHEET
--- OF 5



LEGEND

- | | |
|--|---|
| | PROPOSED 12" RED ZONE WATER LINE |
| | PROPOSED 8" RED ZONE WATER LINE |
| | RED ZONE WATER LINE BY OTHERS |
| | BLUE ZONE WATER LINE BY OTHERS |
| | BOOSTER PUMP (COLOR VARIES BY ZONE) |
| | WATER DEMAND PT. (COLOR VARIES BY ZONE) |
| | PROPOSED TANK (COLOR VARIES BY ZONE) |
| | PRV (COLOR VARIES PER ZONE) |



Appendix F

Utility Plans

SITE DEVELOPMENT PLAN

LOT I, FILING I, DAWSON TRAILS

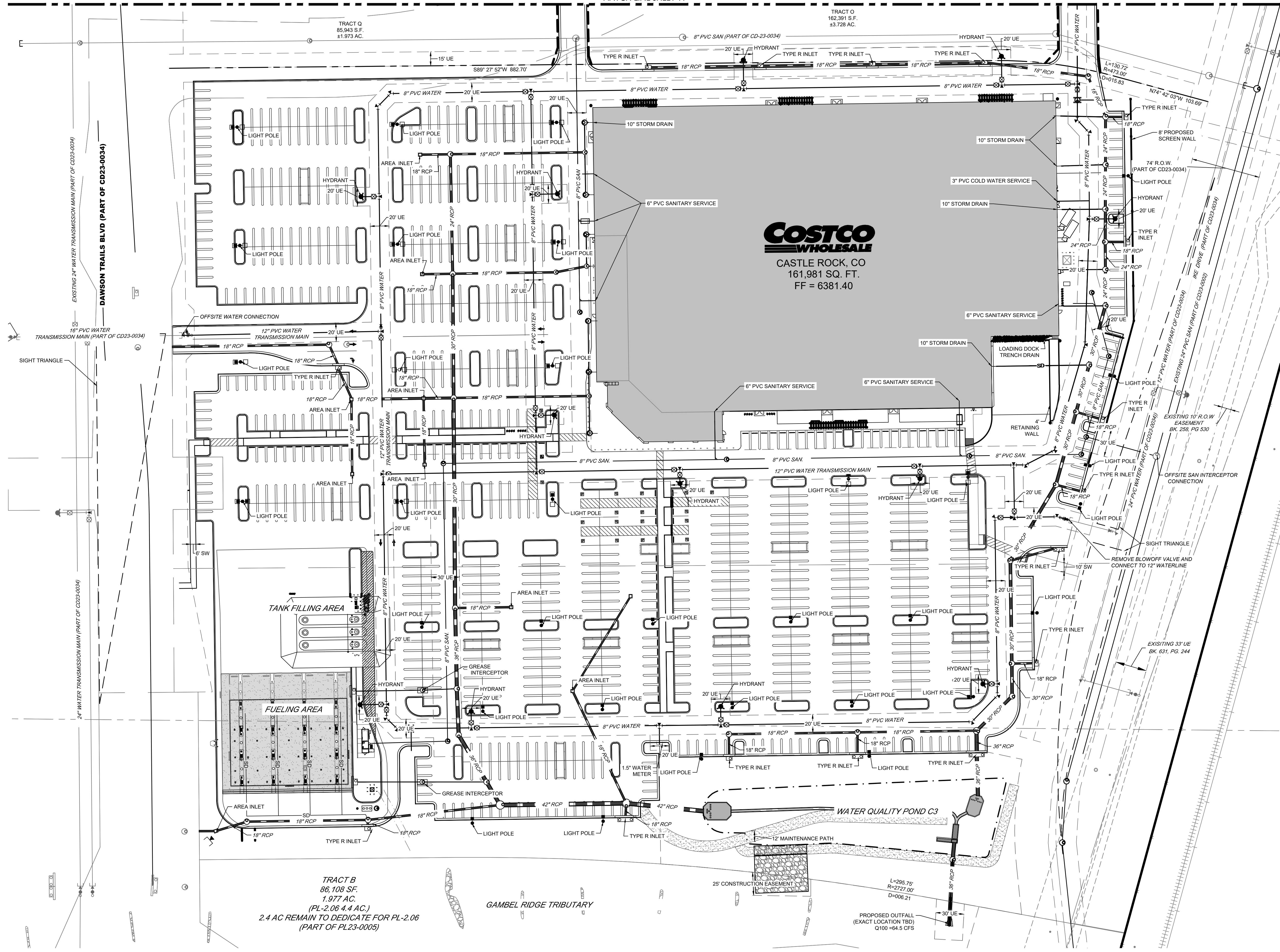
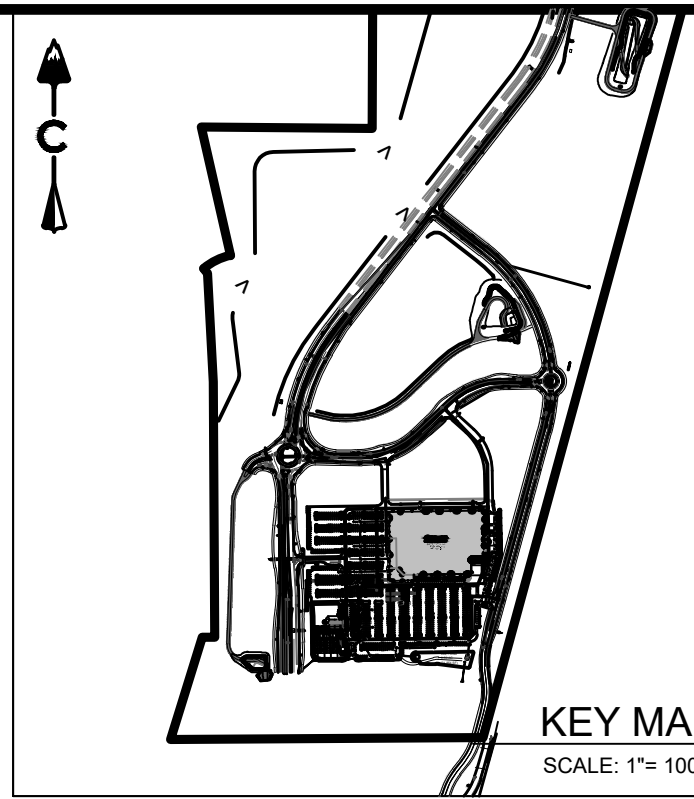
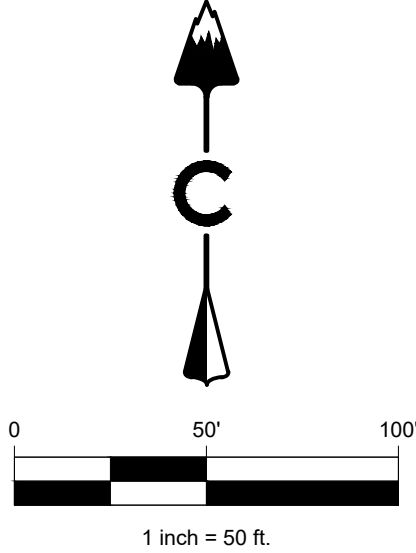
COSTCO

LOCATED IN SECTION 22,

TOWNSHIP 8 SOUTH, RANGE 67 WEST OF THE SIXTH PRINCIPAL MERIDIAN

TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO

MATCH LINE SHEET 11



LEGEND

	EASEMENT
	RIGHT OF WAY (R.O.W.)
	CENTERLINE
	PROJECT BOUNDARY
	PROPOSED CURB & GUTTER
	PROPOSED IRRIGATION & STUB OUT
	PROPOSED STORM & STUB OUT
	PROPOSED SANITARY & STUB OUT
	PROPOSED WATER & STUB OUT
	EXISTING IRRIGATION & STUB OUT
	EXISTING STORM & STUB OUT
	EXISTING SANITARY & STUB OUT
	EXISTING WATER & STUB OUT
	FUTURE IRRIGATION & STUB OUT
	FUTURE SANITARY & STUB OUT
	FUTURE STORM & STUB OUT
	FUTURE WATER & STUB OUT
	IRRIGATION SERVICE
	SANITARY SERVICE
	WATER SERVICE
	EXISTING STREET LIGHT POLES
	PROPOSED STREET LIGHT POLES
	POWER POLES
	GUY WIRE
	SANITARY MANHOLES
	SANITARY CLEAN OUT
	WATER VALVES
	BEND AND THRUST BLOCK
	FIRE HYDRANTS
	WATERLINE REDUCER
	WATER STUB WITH BLOW OFF
	AIR RELEASE VALVE MH & VENT PIPE
	STORM MANHOLES
	STORM INLETS
	FES, FOREBAY, & TRICKLE CHANNEL
	OUTLET STRUCTURE
	CRUSHER FINES
	MAINTENANCE ACCESS
	RIPRAP
	EXISTING ELECTRIC
	EXISTING TELEPHONE
	EXISTING FIBER OPTIC
	EXISTING GAS
	EXISTING OVER HEAD ELECTRIC
	STORM UNDERDRAIN
	100 YEAR FLOODPLAIN
	WETLAND

- NOTES:
1. ALL PROPOSED EASEMENTS MUST BE RECORDED PRIOR TO ISSUANCE OF CONSTRUCTION PERMITS.
 2. THE MINIMUM SEPARATION BETWEEN WATERLINES, SANITARY SEWER, AND STORM LINES IS 10 FEET.
 3. THE MINIMUM SEPARATION BETWEEN WATER SERVICE LINES IS 5 FEET.
 4. THIS SITE IS LOCATED WITHIN THE TOWN OF CASTLE ROCK RED WATER PRESSURE ZONE

COSTCO
SITE DEVELOPMENT PLAN
PROJECT NO. SDP 23-0020

CORE
NORRIS
DESIGN
PEOPLE • PLACEMAKING

LAND DEVELOPMENT
ENERGY
PUBLIC INFRASTRUCTURE

#	REVISION DESCRIPTION	BY	DATE
1	SECOND SDP SUBMITTAL	JF	02.20.23
2	THIRD SDP SUBMITTAL	JF	02.22.23
3	FOURTH SDP SUBMITTAL	JF	02.20.24
4	FIFTH SDP SUBMITTAL	JF	04.19.24

COSTCO

CASTLE ROCK, COLORADO

SITE DEVELOPMENT PLAN

UTILITY PLAN (1 OF 2)

DESIGNED BY: MW

DRAWN BY: MW

CHECKED BY: TW

JOB NO.
20-224

SHEET
10 OF 29

SITE DEVELOPMENT PLAN
LOT I, FILING I, DAWSON TRAILS

COSTCO
LOCATED IN SECTION 22,
TOWNSHIP 8 SOUTH, RANGE 67 WEST OF THE SIXTH PRINCIPAL MERIDIAN
TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO

TRACT F
1921,185 S.F
44.104 AC
(PL-1.07, 44.1 AC.)
(PART OF
PL23-0005)

TRACT G
562,878 S.F
5.389 AC
(PART OF PL23-0005)

TRACT H
234,738 S.F
5.389 AC
(PL-2.05, 8.4 AC.)
(PART OF PL23-0005)

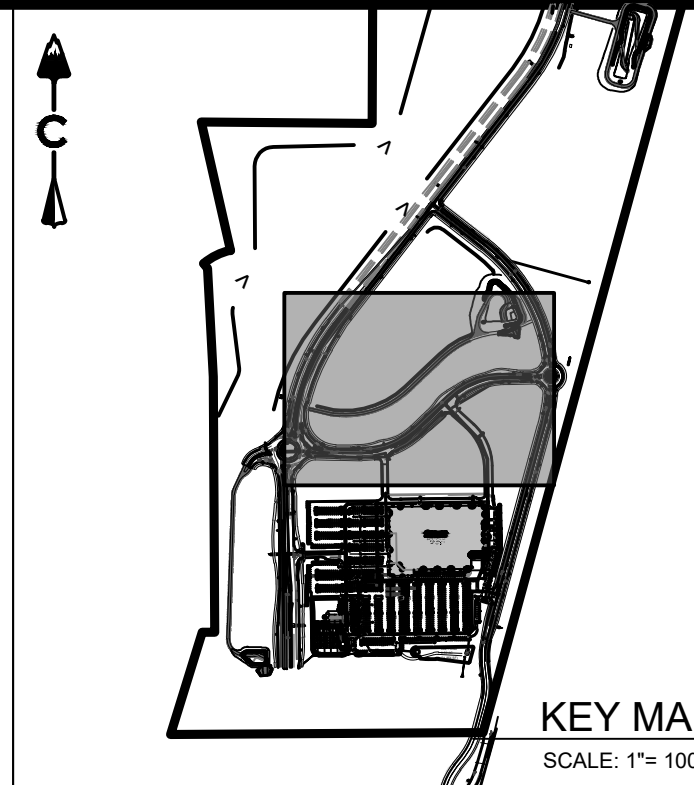
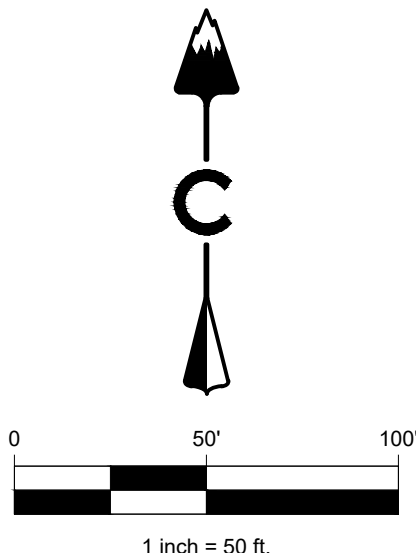
TRACT Q
85,943 S.F.
±1.973 AC.

TRACT P
7,210 S.F.
±0.166 AC.

TRACT O
162,391 S.F.
±3.728 AC.

TRACT N
28,850 S.F.
±0.546 AC.

TRACT M
158,421 S.F.
±3.637 AC.



LEGEND

	EASEMENT
	RIGHT OF WAY (R.O.W.)
	CENTERLINE
	PROJECT BOUNDARY
	PROPOSED CURB & GUTTER
	PROPOSED IRRIGATION & STUB OUT
	PROPOSED STORM & STUB OUT
	PROPOSED SANITARY & STUB OUT
	PROPOSED WATER & STUB OUT
	EXISTING IRRIGATION & STUB OUT
	EXISTING STORM & STUB OUT
	EXISTING SANITARY & STUB OUT
	EXISTING WATER & STUB OUT
	FUTURE IRRIGATION & STUB OUT
	FUTURE SANITARY & STUB OUT
	FUTURE STORM & STUB OUT
	FUTURE WATER & STUB OUT
	IRRIGATION SERVICE
	SANITARY SERVICE
	WATER SERVICE
	EXISTING STREET LIGHT POLES
	PROPOSED STREET LIGHT POLES
	EXISTING POWER POLES
	PROPOSED POWER POLES
	EXISTING GUY WIRE
	PROPOSED GUY WIRE
	EXISTING SANITARY MANHOLES
	PROPOSED SANITARY MANHOLES
	EXISTING SANITARY CLEAN OUT
	PROPOSED SANITARY CLEAN OUT
	EXISTING WATER VALVES
	PROPOSED WATER VALVES
	EXISTING BEND AND THRUST BLOCK
	PROPOSED BEND AND THRUST BLOCK
	EXISTING FIRE HYDRANTS
	PROPOSED FIRE HYDRANTS
	EXISTING WATERLINE REDUCER
	PROPOSED WATERLINE REDUCER
	EXISTING WATER STUB WITH BLOW OFF
	PROPOSED WATER STUB WITH BLOW OFF
	EXISTING AIR RELEASE VALVE MH & VENT PIPE
	PROPOSED AIR RELEASE VALVE MH & VENT PIPE
	EXISTING STORM MANHOLES
	PROPOSED STORM MANHOLES
	EXISTING STORM INLETS
	PROPOSED STORM INLETS
	EXISTING FES, FOREBAY, & TRICKLE CHANNEL
	PROPOSED FES, FOREBAY, & TRICKLE CHANNEL
	EXISTING OUTLET STRUCTURE
	PROPOSED OUTLET STRUCTURE
	EXISTING CRUSHER FINES
	PROPOSED CRUSHER FINES
	EXISTING MAINTENANCE ACCESS
	PROPOSED MAINTENANCE ACCESS
	EXISTING RIPRAP
	PROPOSED RIPRAP
	EXISTING ELECTRIC
	PROPOSED ELECTRIC
	EXISTING TELEPHONE
	PROPOSED TELEPHONE
	EXISTING FIBER OPTIC
	PROPOSED FIBER OPTIC
	EXISTING GAS
	PROPOSED GAS
	EXISTING OVER HEAD ELECTRIC
	PROPOSED OVER HEAD ELECTRIC
	EXISTING STORM UNDERDRAIN
	PROPOSED STORM UNDERDRAIN
	EXISTING 100 YEAR FLOODPLAIN
	PROPOSED 100 YEAR FLOODPLAIN
	EXISTING WETLAND
	PROPOSED WETLAND

NOTES:

1. ALL PROPOSED EASEMENTS MUST BE RECORDED PRIOR TO ISSUANCE OF CONSTRUCTION PERMITS.
2. THE MINIMUM SEPARATION BETWEEN WATERLINES, SANITARY SEWER, AND STORM LINES IS 10 FEET.
3. THE MINIMUM SEPARATION BETWEEN WATER SERVICE LINES IS 5 FEET.
4. THIS SITE IS LOCATED WITHIN THE TOWN OF CASTLE ROCK RED WATER PRESSURE ZONE

COSTCO
SITE DEVELOPMENT PLAN
PROJECT NO. SDP 23-0020

DESIGNED BY: MW
DRAWN BY: MW
CHECKED BY: TW

JOB NO.
20-224
SHEET
11 OF 29

COSTCO
CASTLE ROCK, COLORADO
SITE DEVELOPMENT PLAN
UTILITY PLAN (2 OF 2)

NORRIS
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PUBLIC INFRASTRUCTURE

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