ADDENDUM NO. ONE TO SYSTEM INVENTORY AND ASSESSMENT STUDY FOR COLORADO SPRINGS UTILITIES WATER SYSTEM CONVERSION

for

CASCADE METROPOLITAN DISTRICT NO. 1

GMS, Inc.
Consulting Engineers

ADDENDUM NO. ONE TO
SYSTEM INVENTORY AND ASSESSMENT STUDY
FOR COLORADO SPRINGS UTILITIES WATER SYSTEM CONVERSION
OF
CASCADE METROPOLITAN DISTRICT NO. 1

PROJECT NO. 15061.100

MARCH 2016

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CASCADE METROPOLITAN DISTRICT NO. 1
SYSTEM INVENTORY AND ASSESSMENT STUDY FOR
COLORADO SPRINGS UTILITIES WATER SYSTEM CONVERSION
AMENDMENT NO. ONE
March 9, 2016

This Amendment No. One is made to the Cascade Metropolitan District No. 1 (CMD1) System Inventory and Assessment Study for Colorado Springs Utilities (CSU) Water System Conversion (Study). The Amendment is based on the initial review input received from the Colorado Springs Utilities (CSU) staff. The final Study was submitted to CSU on December 28, 2015 in accordance with the Settlement Agreement.

A meeting with CSU, Cascade Metropolitan District No. 1 (CMD1), and GMS, Inc., Consulting Engineers representatives was held on January 27, 2016 to review CSU's initial review comments on the Study. The primary topic was whether or not to keep the District's existing water storage tank in service. The Study recommended demolishing the 65 year old welded steel storage tank and providing the needed distribution system storage from the CSU facilities at the Ute Pass water treatment plant. Following review of the Study, CSU staff believed that the existing storage tank should remain in service as a backup supply since the District is served from a single water transmission main. CSU staff also had concerns with the service life of the existing tank even if rehabilitation improvements were made.

In order to provide reliable service to the CMD1 service area, the following alternatives were agreed upon to be evaluated:

1. Replacement of the existing storage tank with a similar volume size generally in the same location.
2. A new water storage tank within the District's service area at an alternative location. The existing service tank would be removed from service and demolished.
3. Installation of a new, second transmission main to the CMD1 service area from the Green Mountain Falls distribution system. The existing storage tank would be removed from service and demolished.

Other minor revisions recommended by CSU staff are also included in this Amendment to the Study. The recommended system improvements presented in the Study, with the exception of the recommended storage tank alternative, remain for the most part unchanged. This Amendment also presents revised proposed system mapping and project cost estimates.

This Amendment No. 1 shall be attached to and become part of the December 28, 2015 System Inventory and Assessment Study for Colorado Springs Utilities Water System Conversion. Amended portions of that Study are presented herein with reference to the sections and sub-sections of said Study.

SECTION 1.19 – WATER METERS AND METER SETTERS

Presented in the original section was a short discussion regarding the water services being provided to the Cascade Volunteer Fire Protection District. Water services provided include service to the north side of the library, the upper barn to the west of the library and a third service included in the billing summary, but does not constitute an individual service to a structure. A statement was made that both individual services are metered with no mention to the third service. Information has become available that brings clarification to these services, if they are metered and how they are billed.

Based on the Intergovernmental Agreement between the two Districts, the District does not charge the Cascade Volunteer Fire Protection District for any water usage. This includes the two individual service lines to the north side of the library and to the upper barn in addition to the third service. The third service is referencing any usage from the District's fire hydrants as a result of the fire protection District's activities. The individual service to the north side of the library is metered while the service to the upper barn is not metered. No metering is conducted by the Cascade Volunteer Fire Protection District on any fire hydrant usage.

As a result of the service to the upper barn not being metered, the District will install a new meter pit for this individual service line within the project. This change does not modify the overall total number of services, which stands at 365. The only change is 364 of the services are metered while one is not. This will be revised to the full 365 services being metered after the project has been completed.

SECTION 3.17.0 – WATER QUALITY

Water Quality sampling and testing of eight (8) specified fire hydrants was required to be presented in the Study by CSU. The Study indicated that at the time of printing, the sample results were not available from the laboratory. Although sample bottles were ordered by the District, the samples were not taken. Subsequently, sampling of these 8 locations was conducted by CSU. The results are attached to this Amendment under Appendix E-3.

Hydrants were sampled for free chlorine residual, pH, temperature and conductivity. Chlorine residual samples ranged from 0.09 to 0.63 mg/l, averaging 0.45 mg/l. One sample was below 0.2 mg/l. Sample CMD_HWD_2 from fire hydrant FH-E04 located at the south end of Outpost Drive was sampled at 0.09 mg/l. This location has the longest detention time in the existing system at 185 hours. The low chlorine level may be attributed to the inconsistent chlorine dosage added at the discharge of the storage tank. Within the proposed water system improvements, water age will be slightly reduced at this location and the booster chlorination dosage will be made consistent. Following completion of the water system improvements, this location should be monitored closely. Sample CWD_HYD_5 from fire hydrant FH-W04 at the west end of Emporia Avenue was noted to have discharged discolored water. This condition will likely be eliminated as a result of the recommended water system improvements replacing considerable quantities of small diameter cast iron piping. The pH sampling ranged from 7.14 to 7.96, averaging 7.61 at the eight sample sights. The field measured water temperature range from 3.8 to 7.5 degrees C. Conductivity ranged from 121.1 to 159.2 umho/cm.

SECTION 3.17.2 – AVERAGE AGE OR CHLORINE LEVELS IN THE SYSTEM

The average water age within the water distribution system was modeled and presented in Table 7 of the Study for both the existing distribution system configuration and the proposed distribution system configuration. The original recommended improvements have been revised as a result of this Amendment No. 1. The recommendations now include a redundancy alternative to provide a second water supply to the CMD1 service area. The average water age calculated as a result of the Amendment's revised recommendations are presented in the following Table 7 along with the existing conditions.

TABLE 7

DISTRIBUTION SYSTEM WATER AGE FROM CSU CONNECTION[1)]

CSU Requested Testing Location		Modeled Location	Modeled Water Age, hours	
			Existing Conditions	Proposed Conditions
1.	Fire hydrant on US Highway 24 frontage road in southwest corner of CMD1.	Existing Condition at end blow off. Node J-170. Proposed condition at end blow off. Node J-210.	55.1 [2)]	57.2
2.	Fire hydrant on southeast edge of service area at southern end of Outpost Road.	Hydrant FH-E01. Node J-28.	185.5 [2)]	170.6
3.	Fire hydrant at northern end of Aspenglow Lane.	North end of Aspenglow Lane, Hydrant FH-W22. Node J-83.	60.7	1.4
4.	Fire hydrant at intersection of US Highway 24 and Rampart Terrace Road.	US Highway 24 and Rampart Terrace. Hydrant FH-E21. Node J-89.	0.8	1.5
5.	Western end of Emporia Avenue.	Park Street Pump House. Node J-186.	58.0 [2)]	25.3
6.	Any fire hydrant in the vicinity of Santa's Workshop.	Santa's Workshop Meter. Node J-80.	27.2	14.1
7.	Fire hydrant at intersection of Pyramid Mountain Road and Gardiner Road.	Intersection of Pyramid Mountain and Gardiner. Node J-34.	4.9	19.5

1) Based on Average Demand Day

2) Adjusted from modeled results to account for existing storage tank.

SECTION 4.9 – IDENTIFICATION OF ANY ADDITIONAL EASEMENTS OR OTHER PROPERTY INTERESTS NECESSARY FOR CSU TO HAVE FULL ACCESS TO, AND OWN AND OPERATE THE CMD1 WATER SYSTEM

A comprehensive review of water system properties and easements was conducted by CSU. Many of the needed easements were identified in Paragraph 4.9 of the December 28, 2015 study. CSU property and easement review comments were briefly discussed at the January 27, 2016 study review meeting with CSU. These comments and mapping were provided to the consultant on February 16, 2016 and have been included in this Amendment No. 1 Appendix D3. Responses to the CSU comments have been prepared by the consultants professional land surveyor and are also included in Appendix D3. All necessary public water system easements will be secured by the CMD1 during the Conversion Period. The final determinations for easements will be made after concurrence is reached on required improvements and the locations of the new facilities as located within the design documents. Property owners of private water system components, primarily water service lines, requiring easements will be notified of this need during the Conversion Period.

Private water system easements will not be secured by CMD1. Preparation and securing of easements will occur once final agreement is reached on what new lines will be installed and their specific location. All required easements will be in place prior to bidding and construction of the new public water lines. Those existing lines that require new easements will be obtained during the Conversion Period.

SECTION 6.1.2 – DISTRIBUTION SYSTEM MODELING

Distribution system modeling was conducted for both existing and proposed conditions. The December 28, 2015 Study recommended eliminating the existing storage tank. This Amendment No. 1 includes the evaluation of three storage tank redundancy alternatives which are presented under Section 7.1. These alternatives were modeled with their associated results being presented in Appendix G of this Amendment No. 1. Proposed system node maps have also been updated and are included in Appendix G1 of this Amendment. The following revised Table 14 reflects the recommended proposed storage tank alternative, which consists of a second main connection with the Green Mountain Falls water distribution system.

TABLE 14

AVAILABLE FIRE FLOW

Hydrant No.	Location	Existing Condition, gpm [1)]	Proposed Condition, gpm [1)]
FH-E01	*Marigreen Pines - east edge of access road*	*Not Operating, Not Modeled*	*2,323*
FH-E02	Marigreen Pines north of church building near yard hydrant	913	2,178
FH-E03	South end of Outpost Road	914	1,768
FH-E04	End of cul-de-sac Outpost Road	914	2,099
FH-E05	Across street from 4335 Heizer Street	384	2,021
FH-E07	Marriott Rd & Outpost Road	914	2,324
FH-E08	7765 Marriott Road	910	2,004
FH-E09	Hagerman Ave & Severy Ave	907	2,352
FH-E10	Heizer Street & Severy Ave	913	2,322
FH-E11	Across from 7725 Severy Ave	637	1,398

Hydrant No.	Location	Existing Condition, gpm [1)]	Proposed Condition, gpm [1)]
FH-E12	Hagerman Ave & Topeka Ave	894	2,390
FH-E13	N Topeka Ave & S Topeka Ave	945	2,328
FH-E14	7770 N Topeka Ave	967	1,972
FH-E15	Across street from 4890 Pyramid Mountain Road/Gardiner	2,105	1,726
FH-E16	Mesa Road & Fox Road	696	2,055
FH-E17	Hagerman Ave north of Topeka Ave	771	2,305
FH-E18	1/2 way up Pyramid Mountain Road from US Hwy 24	2,266	2,000
FH-E20	Pyramid Mountain Road & US Highway 24	2,500	2,500
FH-E21	Rampart Terrace Road	2,500	2,500
FH-E22	Timber Road & US Highway 24	1,617	2,500
FH-E23	Marigreen Pines north side access road into property	Sample Hydrant, Not Modeled	Sample Hydrant, Not Modeled
FH-E24	Marigreen Pines End of CMD main area	Not Operating, Not Modeled	2,323
FH-W01	SW end of Town along US Highway 24	589	2,135
FH-W03	Emporia Ave behind Triangle building	903	2,500
FH-W04	Amemone Hill Road	683	939
FH-W05	4675 Fountain Ave	171	2,239
FH-W07	Pike Road east of Pikes Peak Highway	856	1,941
FH-W08	Across from 8140 Chipita Park Road	1031	2,037
FH-W09	Pike Road & Dodd Road	856	1,816
FH-W10	Pikes Peak Highway & Chipita Pines Drive	664	1,228
FH-W11	5130 Chipita Pines Drive	588.59	1,055
FH-W13	South of 8270 Chipita Park Road	2500	2,500
FH-W14	Chipita Park Road & Aspenglow Lane	520	912
FH-W15	Across from Santa's Workshop - Pikes Peak Highway	474	820

Hydrant No.	Location	Existing Condition, gpm [1)]	Proposed Condition, gpm [1)]
FH-W16	Aspenglow Lane	462	795
FH-W17	Chipita Pines Drive	525	921
FH-W19	8420 Aspenglow Lane	443	759
FH-W20	8570 Aspenglow Lane	424	721
FH-W21	Entrance to Pikes Peak Highway tollgate	351	564
FH-W22	8615 Aspenglow Lane	418	710
FH-W23	Chipita Park Road - CSU vault area	Not Operating, Not Modeled	Not Operating, Not Modeled
FH-PROP1	Near 8270 Chipita Park Road	N/A	2,063
FH-PROP10	SW end of Town along US Highway 24	N/A	2,500
FH-PROP11	Near 8016 Ute Pass Ave	N/A	2,352
FH-PROP2	N End of Rampart Terrace Road	N/A	1,641
FH-PROP3	450' N of Emporia Ave on Fountain Ave	N/A	2,464
FH-PROP4	Oak Street and Martindale Ave Intersection	N/A	2,492
FH-PROP5	Prairie Street	N/A	2,245
FH-PROP6	Near 4705 Hagerman Road	N/A	2,328
FH-PROP7	End of Mariposa Lane	N/A	1,405
FH-PROP8	Near 7720 Severy Road	N/A	2,039
FH-PROP9	Oak Street and Poplar Street Intersection	N/A	2,227

1) gpm = gallons per minute

Under proposed conditions all fire hydrants meet the minimum 500 gpm needed fire flow. Note that the December 28, 2015 Study indicated that the needed fire flow was 750 gpm. This was based on the 2008 ISO Guidance manual. However, the 2014 ISO Guidance has been revised to require a minimum needed fire flow of 500 gpm for all residential structures with a structure separation of greater than 30 feet.

SECTION 6.2 – FIRE FLOWS

Revisions to this section are made to Paragraph 3 on page 76 of the December 28, 2015 Study. Residential structure separation distances and the fire flow delivery duration has been revised in the 2014 "Guide for Determination of Needed Fire Flow" by the Insurance Service Office. This current guidance requires a minimum fire flow of 500 gpm for one hour for residential structures with greater than 30 foot of separation.

SECTION 7.1 – RECOMMENDED IMPROVEMENTS BEFORE CONVERSION

The December 28, 2015 Study recommended that the existing 150,000 gallon welded steel storage tank in the CMD1 system be removed from service and demolished. This recommendation was made contingent upon the CSU treatment and storage facilities having sufficient capacities to meet the equalization, fire and emergency storage requirements of all three communities served. This includes Chipita Park, Green Mountain Falls and Cascade. A February 5, 2016 email from CSU confirmed that sufficient storage capacity is available to serve all three communities. Thus, CMD1 is not reliant on its existing water storage tank

Currently the CMD1 service area is provided with water by a single pipeline. The existing storage tank is recommended to be demolished. In order to provide water supply redundancy to the CMD1 service area, three supply alternatives were agreed upon to be evaluated.

a) Replace existing storage tank on existing site.

Within this alternative, the existing storage tank would be demolished and the site would be regraded (Improvement No. 13). The new storage tank has been sized based on equalization, fire, and emergency storage components. The equalization storage need of 33,150 gallons is based on 15% of maximum day demand. The fire flow storage component of the tank consists of the maximum day demand (153 gpm) plus the maximum fire flow requirement (2000 gpm) less the supply input over a required duration of time for the maximum needed fire flow. This volume is calculated at 258,360 gallons for a condition with zero system in flow; however, the recommended fire storage component of the storage for this alternative was based on the providing residential fire flow (500

gpm) plus maximum day demand (153 gpm) over a one-hour period. The remaining 1,500 gpm flow for the maximum needed fire flow condition (2,153 – 653 gpm) would be provided through the existing CSU supply connection. Thus, the fire storage component of storage for this alternative is calculated at 39,180 gallons. The emergency storage component of 44,200 gallons is based on providing 12 hours of average day demand. This total storage requirement of 116,530 gallons for this alternative is less than the 150,000 gallons available from the existing storage tank. The new tank dimensions would be a 30-foot diameter by 24-foot high tank with the overflow at 23 feet. The maximum storage volume would be 121,600 gallons. The overflow of the tank would be set slightly below the delivery hydraulic grade line to the CMD1 system to promote flow through the new tank.

Two new pressure reducing valves would be required to maintain the lower pressure zone area within the system. The first would be located on Fountain Avenue just north of Emporia Avenue. The second would be located on the new section of six-inch piping in Hagerman Avenue near the intersection of Fox Road.

The discharge of the new storage tank would be equipped with a flow paced booster chlorination system in order to maintain consistent dosages of disinfectant. A check valve would also be installed on the tank discharge to prevent back feed from the higher pressure zone.

Estimated construction cost: $442,000

b) New storage tank at alternate location.

Several locations were considered within the District's service area for siting a new storage tank. Based on topography, the most viable site would be located near the District's abandoned storage tank located just south of the Pikes Peak Highway toll booth. The storage tank for this alternative has been sized the same as the first storage tank alternative at 121,600 gallons.

A dedicated 8-inch supply line from the CSU transmission main would extend from the intersection of Chipita Pines Road and Chipita Park Road up to the tank site. At the tank inlet, an altitude valve would be installed to close when the tank is full. This vault would also include a flow meter. The discharge from the tank would include a new flow paced booster chlorination system. Distribution system improvements would require a 12-inch line extending from the tank to the Pikes Peak Highway and an 8-inch main extending southeast in the Pikes Peak Highway in the Chipita Pines Road and connecting to existing piping in the Pikes Peak Highway. These improvements also include the demolition and regrading of the existing tank and tank site (Improvement No 13).

Estimated construction cost: $1,107,700

c) Redundant Water Supply

This alternative consists of the elimination of treated water storage within the District and providing a redundant water supply pipeline from the Green Mountain Falls system. This will provide the necessary redundancy within the system. As previously indicated, CSU has indicated that sufficient water storage capacity is available within the overall supply system to support the storage needs of CMD1.

This improvement would include the extension of a 6-inch supply main extending from the northwest end of Aspenglow Lane to the existing Green Mountain Falls distribution system in Kulsa Road. A pressure reducing valve vault would be installed at the connection point in Aspenglow Lane to match the delivery pressures of the existing system's connection to the CSU transmission main. Flow paced booster chlorination systems would be installed at both the existing delivery point and new delivery point in Aspenglow Lane.

This alternative creates a closed distribution system. If a pressure reducing valve at one of the two CSU connection points were to fail in the open position there would be no place for the high pressure to be relieved. Extreme over pressurization of the CMD1 distribution system would occur. In order to protect

the system from this potential, a pressure relief valve is proposed to be installed in the proposed pressure reducing valve vault in the US Highway 24 Frontage Road (Improvement No 8). This emergency discharge will release chlorinated water. The CDPHE may require this discharge to secure an NPDES permit. This stream segment is designated Segment 1a in the Fountain Creek Basin in Regulation 32 – Classifications and Numeric Standards for Arkansas River Basin. This segment has an acute chlorine standard of 0.019 mg/l. Typically chlorinated water running on the ground or pavement surface (750 feet in this case) dissipates or consumes chlorine quickly. However, due to the stream segment classification, the need for a discharge permit and a dechlorination facility is assumed to be needed. Permit and design details will be determined during the design phase of this improvement. In addition, a high pressure sensor could be installed in the existing PRV vault and connected to the CSU SCADA system to provide a high pressure alarm notification.

This alternative also includes the demolition and regrading of the existing storage tank and site (Improvement No 13).

Estimated construction cost: $306,000

The lowest cost option is Alternative c with a new second water supply pipeline to the District. This provides a redundant supply to the CMD1 service area that is currently provided by the old storage tank. Detailed construction cost estimates for each alternative are included in Appendix F1.

The recommended improvement Nos. 1 through 12, and 15 through 20 inclusive presented in the December 28, 2015 Study remain and are not revised. The estimated constructed cost for Improvement No. 13 – Demolition of the existing 150,000 gallon storage tank has been revised to $90,000.

The following recommended improvements have been revised or added:

IMPROVEMENT NO. 14 – CSU CONNECTION TO SYSTEM

This improvement consists of a second water supply transmission main connected to the CSU system in Green Mountain Falls. This improvement, in conjunction with Improvement No. 13 to remove the existing storage tank, provides supply redundancy. The new 6-inch transmission main will extend north from the end of Aspenglow Lane cross country to Kelsa Road. A pressure reducing valve vault and backflow prevention/meter vault, similar to the existing supply connection on Chipita Park Road will be located at the Aspenglow Lane connection point. A system pressure relief valve is proposed to be installed in the PRV vault (Improvement No 8) to protect the distribution system from high pressures if one or both of the supply connection PRV's were to fail open. Existing metering telemetry at the new Aspenglow Lane meter vault is proposed to be provided and installed by CSU. The existing booster chlorination system at the storage tank is proposed to be removed from service with the tank's demolition. At this point, the need for additional chlorination has not been fully determined; however, with the new CDPHE minimum disinfectant residual requirements and the current need for booster chlorination, the presumption is that the booster chlorination facilities will be required. Therefore a small chlorination station is recommended to be installed at both connection locations to provide adequate chlorine residual throughout the CMD1 distribution system.

This improvement falls under the category of protection of public health with the ability to provide the required chlorine residual throughout the distribution system; and system reliability with the provisions of two water supply connection points.

Estimated construction cost: $306,000

IMPROVEMENT NO. 21 – SERVICE LINES

Two specific existing customer services were identified as requiring upgrades. A single service line and meter provides service to two separate houses located on the southwest side of Pikes Peak Highway. At this location, a separate meter and service line is required. The second location is on the south side of Severy Avenue where a 4-inch distribution main serves a single customer. At this location a 4-inch valve at the street is proposed. The 4-inch line will be designated as private.

These improvements fall under the category of system reliability as the current configuration of these two services do not meet CSU standards.

The following revised preliminary construction cost estimate reflects the revisions to the recommended improvements presented in this Amendment No.1

TABLE 17

WATER SYSTEM IMPROVEMENTS - PRELIMINARY CONSTRUCTION COST ESTIMATE [1)]

Improvement	Location	Description	Total Cost
1.	**Chipita Park Road**	**Replace 2-inch Galvanized Iron Piping**	
a.	Chipita Park Road	Replace existing with 4" and 8" pipe	$76,778
2.	**Rampart Terrace US Highway 24 Area**	**Replace 2-inch Galvanized Iron Piping**	
a.	Rampart Terrace Road and Private Access Roads	Replace existing with 4" and 6" pipe	$169,199
b.	Crystola Circle	Replace existing with 4" pipe	$28,610
c.	US Hwy 24 West side, South of Pyramid Mountain Road	Replace existing with 4" pipe	$33,740
		Subtotal	$231,549
3.	**Fountain/Chipita Park/Martindale Area**	**New System Loop Piping and Replace 3-inch Ductile Iron Piping**	
a.	Chipita Park Road	New 8" pipe	$89,003
b.	Pike Road	New 8" pipe	$16,333
c.	Fountain Avenue	Replace existing and add new 8" pipe	$317,050
d.	Martindale Avenue	Replace existing with 8" pipe	$114,333
		Subtotal	$536,720
4.	**Hagerman/Forest/Mariposa/Columbine/ Mesa Area**	**New System Loop Piping and Replace 2-inch Galvanized Iron Piping**	
a.	Hagerman Avenue	New 6" pipe	$115,727
b.	Forest Road	Replace existing with 4" pipe	$68,750
c.	Mariposa Lane and Gardiner Road	Replace existing with 6" pipe	$65,707
d.	Columbine Lane	New 2" pipe	$22,931
e.	Mesa Road thence west to Hagerman	New 6" pipe	$112,411
		Subtotal	$385,526
5.	**Pyramid Mountain Road Area**	**Replace 4-inch Ductile Iron Piping**	
a.	Pyramid Mountain Road	Replace existing with 8" pipe	$184,722
b.	Severy Avenue	Replace existing with 8" pipe	$82,261
		Subtotal	$266,983
6.	**Poplar/Martindale Area**	**Replace 3-inch Ductile Iron Piping**	
a.	Poplar Street	Replace existing with 8" pipe	$77,794
b.	Martindale Avenue	Replace existing with 4" pipe	$34,167
		Subtotal	$111,961
7.	**Prairie/Oak/Park Area**	**Replace 3-inch Ductile Iron Piping**	
a.	Prairie Street and Oak Street	Replace existing with 4" and 6" pipe	$111,381
b.	Park Street	Replace existing with 4" pipe	$26,011
		Subtotal	$137,392

Improvement	Location	Description	Total Cost
8.	**US Highway 24 Frontage Road**	**Replace 4-inch Ductile Iron and 2-inch Galvanized Iron Piping**	
a.	Frontage Road	Replace existing with 6" and 8" pipe. Add Pressure reducing valve vault.	$445,659
9.	**Modjeska/Hagerman/Severy Area**	**New System Loop Piping and Replace 1 1/2-inch and 2-inch Galvanized Iron Piping**	
a.	Modjeska Street	Replace existing and add new 4" pipe	$34,572
b.	Hagerman Avenue	New 4" pipe	$79,514
c.	Severy Avenue	Replace existing with 8" pipe	$92,756
		Subtotal	$206,842
10.	**Heitzer Street Area**	**New System Loop Piping and Replace 2-inch Galvanized Iron Piping**	
a.	Heitzer Street	Replace existing and add new 6" pipe	$66,133
b.	Cross Country - Heitzer Street to Outpost Road	Replace existing with 6" pipe. Add Pressure reducing valve vault.	$87,517
		Subtotal	$153,650
11.	**South Topeka Avenue**	**Replace 2-inch Galvanized Iron Piping**	
a.	South Topeka Avenue	Replace existing with 4" and 6"pipe	$28,780
12.	**Outpost Road**	**Replace 8-inch Ductile Iron Piping not in Right-of-Way**	
a.	Outpost Road	Replace existing with 6" pipe	$122,453
13.	**Existing 150,000 gal. Storage Tank**	Remove from service and demolish tank, demolish chlorination building, abandon existing piping	$90,000
14.	**CSU Connection to system**		
a.	Existing Connection - Chipita Park Rd.	New booster chlorination station	$45,000
b.	New Connection - Aspenglow Lane	New booster chlorination station	$45,000
c.	Cross Country - Aspenglow Lane to Kelsa Road	1,700 LF 6" transmission piping @ $90/LF	$153,000
d.	Aspenglow Lane	PRV and Meter/BFP vaults (SCADA by CSU)	$60,000
e.	Aspenglow Lane and Kelsa Road	Connections to existing Piping	$3,000
f.	US Highway 24 Frontage Road	System pressure relief valve in proposed Frontage Rd PRV vault.	$25,000
		Subtotal	$331,000
15.	**Replace Inoperable Valves**		
a.	8" valve	3 each @ $2,400	$7,200
b.	6" valve	1 each @ $2,000	$2,000
c.	4" valve	2 each @ $1,900	$3,800
d.	2" valve	1 each @ $1,200	$1,200
		Subtotal	$14,200
16.	**Raise Buried Valve Boxes**	19 @ $500 ea.	$9,500
17.	**Replace Existing Hydrant**	1 @ $5,000 ea.	$5,000
18.	**Demolish Park Street Pump House**		$30,000
19.	**Demolish Topeka Avenue Pump House**		$30,000
20.	**Demolish Abandoned Storage Tank**		$30,000
21.	**Service Lines**		
a.	5520 Pikes Peak Hwy, Lot 2	New service line and meter pit to split dual service	$18,000
b.	7759 Marriott Rd	New 4" valve on 4" service line	$2,000
		Subtotal	$20,000

Subtotal preliminary cost	$3,263,994
Project contingencies @ 15%	489,599
Engineering design/contract administration	303,800
Construction observation based on 220 calendar days	191,000
Other Engineering [2)]	186,000
Administrative expenses [2)]	33,000
Total preliminary project cost estimate	$4,467,393

1) See Appendix F1 for detailed quantities and unit prices of recommended work.
2) Includes additional easements for second CSU connection to Green Mountain Falls. See breakdown contained in Appendix F1.

AMENDMENT NO. 1
APPENDIX D3 – ASSETS NOT WITHIN EASEMENT/RIGHTS-OF-WAY BY PARCEL

The following comments and responses address concerns expressed by CSU regarding existing and proposed water facilities within the CMD1. Following each comment is the response prepared by GMS, Inc.

CMD Easement Comments

The numbering on this document reference numbers on the map created by Andy Rose.

- #1 - A common water service line. New service line run to second customer. [Notice to owners if either service line is on their neighbor's property and that they should obtain an easement for their line that crosses their neighbor's property.] **[Add new service line and Notice Letter.]**
  Response: A second water service line is proposed at this location to serve the second customer. We concur with CSU that a Notice Letter should be provided to both property owners recommending a cross easement be prepared.
- #2 - This 3-inch water line appears to be within an easement granted by Book 1703 Page 615 which may restrict the use of the easement to a 3-inch water line that terminates at the valve house. **Does CMD need to own this anymore? It could be designated as a service line for Santa's Workshop.**
  Response: It is not absolutely necessary that the CMD continue to own this line; however, there are fire suppression facilities connected to this line that would then make them private facilities. In addition, causing the line to become private would require placement of an isolation valve at the Pikes Peak Highway. Presently Santa's Workshop is served by a two-inch meter which would require metering equipment be moved as well. Placing a new metering vault and meter would be expensive and not necessarily warranted at this time. If the three-inch DIP line remains under the ownership of the CMD an expanded easement will be required around the metering manhole which lies outside of the existing easement.
- #3 - The water line appears to cross into private property. An easement from the property owner shall be acquired. **[30' Easement needed]**
  Response: We concur with CSU that an additional easement is required. Please reference Page 66 of the PER, Table 13, Additional Easement's Required, lines 7 and 8 of the Table.
- #4 - The water line appears to cross into private property. An easement from the property owner shall be acquired. **[30' Easement Needed]**
  Response: We concur with CSU that an additional easement is required. Please reference Page 66 of the PER, Table 13, Additional Easements Required, line 4 of the Table.
- #5 - The water line appears to cross into private property. An easement from the property owner shall be acquired. Even though both #4 and #5 are owned by the same property owner, these shall be separate documents**. [30' Easement Needed]**
  Response: We concur with CSU that an additional easement is required. Please reference Page 66 of the PER, Table 13, Additional Easements Required, line 5 of the Table.
- **#5A** - This water line is critical and appears to only be within a ten foot side lot easement. CSU needs to have a thirty foot easement for this line. **[Wider easement needed. 30']**

Response: Inasmuch as the water line lies within an existing easement, we concur with CSU that a wider easement is required due to the critical nature of this water line.

- #6 - This segment of water line crosses 3 private parcels. Three different easements shall be acquired. **[30' Easement Needed.]**

  Response: We concur with CSU that additional easements are required at this location. Please reference Page 66 of the PER, Table 13, Additional Easements Required, lines 1, 2 and 3 of the Table which identify the three parcels.
- #7 - This segment of the water line crosses two or three private parcels. This appears to be a private road or a shared driveway, but that, in itself, does not demonstrate a utility easement. An easement needs to be acquired from each property owner. **[30' Easement Needed.]**

  Response: We concur with CSU that additional easements are required at this location. Please reference Page 66 of the PER, Table 13, Additional Easements Required, lines 9 and 13 of the Table which identify the parcels.
- #8 - In looking at the Guier subdivision plat, there is no evidence of a grant of easement for this segment of the water line. This appears to follow some sort of drive, but we see no evidence of a public right of way. This will require many separate grants as this segment of the water line crosses numerous properties. **[30' Easement Needed.]**

  Response: We concur with CSU that additional easements are required. In as much as several of the properties are covered with a blanket easement for water lines as recorded in Book 1443 at Page 377, we recommend additional and new easements be acquired that more clearly delineate the easement corridor. Please reference Page 66 of the PER, Table 13, Additional Easements Required, lines 14 through 20 which identify the parcels.
- #9 - In looking at the Reeves subdivision plat, there is no evidence of a grant of easement for this segment of the water line. This appears to follow for a short way some sort of drive, but we see no evidence of a public right of way from the end of the public right of way. The grant from Tesker to Reeves (book 2961 Page 800) is not a grant of a public easement for water line and should be disregarded. Need multiple grants of easement from the various property owners. **[30' Easement Needed.]**

  Response: We acknowledge the following statement from CSU "the grant from Tesker to Reeves (Book 2961 Page 800) is not a grant of public easement for a water line and should be disregarded." The document actually reads "A Right-of-Way for roadway purposes, for ingress and egress and for public utilities over and across…" With that said, we believe a water line falls within the "public utilities" description. A new water line is proposed to be placed in the corridor into the Reeves Subdivision plat. In the process of constructing the new water line, an easement can be prepared that will accommodate the request of CSU, ensuring a 30' corridor is available.
- #10 - The 4-inch lines cross numerous private properties. Note: There are some small areas covered by an easement document, but the areas covered are for that part of the pipeline that is being identified as "to be abandoned." **[30' Easement Needed.]**

Response: We concur with CSU that there is need for additional easements in this area. Please reference Page 66 of the PER, Table 13, Additional Easements Required, lines 10, 11 and 12 of the Table.

- #11 - This short segment of pipeline appears to be within a paved roadway that appears to be used as a public ROW; however, CSU sees no dedication of the roadway as a public ROW. [Note: Need to determine CSU's requirement for this property. An easement on the north side of this parcel, so it may be a non-issue to obtain an additional grant of easement, but we don't want to undermine the position of the county as it relates to this stretch of roadway. **[Need to determine if this is County road.]**

  Response: We concur with CSU comments regarding additional research being needed on Pyramid Mountain Road. We will assist in that effort and keep CSU posted on what is found. There is a 60' wide corridor described in Book 5821 at Page 626 that may delineate the limits at this location.
- #12 - These segments of waterline appears to be within private road. Easement from each property owner will need to be obtained. It is unclear whether on Ives property is a service line or part of the public system. **[30' Easement Needed.]**

  Response: We concur with CSU comments regarding the need for additional easements. Please reference Page 67 of the PER, Table 13, Additional Easements Required, lines 23 through 26 where we indicate additional easements are required for this location.
- #13 - These segments of waterline appear to be within private roads. An easement from each property owner will need to be obtained **[30' Easement Needed.]**

  Response: We concur with CSU comments regarding the need for additional easements. Please reference Page 67 of the PER, Table 13, Additional Easements Required, line 22 regarding an easement required across the Barryman property.
- #14 - It is unclear if the Blow Off is within the ROW or on private property. If on private property, then need a 30' easement. **[If Blow Off is on private property then 30' Easement needed.]**

  Response: We concur with CSU comments regarding a determination being needed on the final placement of the Blowoff assembly. Once a final determination is made during the design phase of the project, confirmation will be made on where the Blowoff will be placed and to ensure it is placed within a 30-foot wide easement, if necessary.
- #15 - The aerial shows this line to be on private property but this depends on where the line is. If not within the ROW, need a 30' easement. **[Determine line location and 30' (or less) Easement needed?]**

  Response: We concur with CSU comments regarding the location of the existing water line, but more importantly, the proposed water line. It is the intent during the design phase of the new water line, that it will be placed in the right-of-way of Poplar Street rather than on private property where the existing line may be located. The proposed improvements include placement of a new 4-inch and 8-inch line in Martindale Avenue and Poplar Street. The proposed line will be placed within the road right-of-way to eliminate the need for an additional easement at this location.

- #16 - This water line appears to cross private property. **[30' (or less) Easement Needed.]**
  Response: We concur with CSU comments that the existing water line appears to cross private property and recommend that once the actual location of the existing water line is determined; that an easement be prepared that will encompass the existing location.
- #17 - This two inch water line serves only one house. There appears to be no reason for this to be a main. This two inch GS should be a service line. [Notice to owner of service line that they are the owner and that they should obtain an easement for their line that crosses their neighbor's property.] **[Notice Letter.]**
  Response: We concur with CSU comments that this line appears to only serve one house and should be a service line. We also concur that a Notice Letter should be sent to the property owners recommending a cross easement between the property owners should be executed.
- #18 - Water line appears to cross corner of private property. **[30' (or less) Easement Needed.]**
  Response: We concur with CSU comments that the existing water line appears to cross a corner of private property and that an easement is required. Please reference Page 67 of the PER, Table 13, Additional Easements Required, line 28 where an easement is required.
- #19 - This 4" line serves only one property owner. The line crosses two parcels but the parcels are owned by the same owner. Can this be a service line? If a service line, then the property owner needs to be sent a notice letter? If this remains part of the CMD system, then a 30' Easement is needed. **[CSU preference is secondary valve at property line and this is now service line.]**
  Response: We concur with CSU's observation that the 4-inch line serves one property owner, but two parcels which are owned by the same property owner. We recommend this be converted to a service line with a secondary valve and metering facilities placed at the property line and a Notice Letter provided to the property owner indicating he will be responsible for the line identified now as their service line.
- #20 - The water line is along property line. Need an easement from each property owner. Easement should total 30'. **[Easements totaling 30' needed.]**
  Response: We concur with CSU comments that an easement will be required along the new water line pending its future location across private property. Please refer to Page 67 of the PER, Table 13, Additional Easements Required, line 34.
- #21 - More than one water line appears to cross this property owned by the Cascade CO Parks Assoc. **[30' Easement Needed.]** Also nearby and the south the 8" may cross into the Newman property. If so, then an easement will be needed from Newman. **[30' (or less) Easement may be needed.]**
  Response: We concur with CSU comments regarding an easement being required across the parcel of land being owned by the Cascade Colorado Parks Association. Please reference Page 67 of the PER, Table 13, Additional Easements Required, line 36.
- #22 - The water line appears to cross the tennis court property. **[30' Easement Needed]**
  Response: the GIS parcel map provided by CSU would indicate the existing water line lies in the Emporia Avenue right-of-way. If it is determined that the existing water line lies inside private property, we recommend an additional easement be acquired providing access to the existing

water line. We have concern that a 15 foot corridor either side of the existing line may encroach into the existing tennis courts. We recommend the specific location of the existing water line be determined and an easement be prepared providing access to the existing water line, if necessary.

- #23 - This private service line appears to cross the property of another. Owner of service line should have an easement for the service line from the owner of the property. **[Notice letter]**
  Response: We concur with CSU comments. Please reference Page 67 of the PER, Table 13, line 29 where a recommendation is made to acquire an easement. We concur with CSU's observation that a Notice Letter should be provided to the owners addressing the need for an easement.
- #24 - Is this two-inch GS to be abandoned? If so, then ok. If not being abandoned, then need a 30' easement. **[Need to determine if this line is to be abandoned.]**
  Response: With the placement of the new service lines off the new 8-inch main in Severy Avenue, the 2-inch galvanized line is anticipated to be abandoned as indicated by CSU.
- #25 - This water line appears to be within an old platted ROW; however, the El Paso County parcel map show the ROW as vacated and this line crosses through private property. **[Need a 30' Easement]**
  Response: We concur with the findings of CSU on the vacation of the originally platted Beaver Street. With the right-of-way vacated an easement will be required for the placement for the proposed 8-inch line or a relocation of the 8-inch line will be required. Either way, a 30 foot wide easement will be required.
- #26 - The 6 inch water line crosses private property. **[Need a 30' Easement.]**
  Response: We concur with CSU comments regarding the need for an easement across this parcel. Please reference Page 67 of the PER, Table 13, Additional Easements Required, line 32 (Apotheker).
- #27 - The 8 inch water line crosses several properties. **[Need a 30' Easement.]**
  Response: We concur with CSU's comments regarding the need for several easements across properties. We recommend a conclusion be reached on prior discussions between CMD, CSU and GMS, Inc. regarding the placement of an isolation valve, relocation of the meter vault and the pressure reducing valve vault near the right-of-way of Out Post Road thereby making the entire segment across private properties a private service line. A Notice Letter would then be served to all property owners advising them of the private service line and the need to make accommodations for access, repair and replacement of the service line between property owners, i.e. a cross easement.
- #28 - The existing and to be built water line along Highway 24 needs to be within the ROW or within easements. Based upon aerial photos it appears that sections are not with the ROW. **[Need to either be within ROW or provided 30' easements.]**
  Response: We acknowledge comments by CSU regarding the location of existing and proposed water lines along US Highway 24. The proposed lines, as shown on the drawings, are shown graphically only. During the design phase of the new water line extension to the southeast, an investigation will be made of existing property lines and an attempt will be made to place all

new water lines within right-of-way. If that cannot be accomplished, easements will be acquired across those properties where the new water line cannot be installed within right-of-way.

- #29 - Two service lines appear to cross properties of another. Owners of service lines should be notified that their service lines cross other people's properties and they should obtain easements from their neighbors for their service lines. **[Notice Letters]**

  Response: We concur with the recommendation of CSU to send out Notice Letters to adjoining property owners for the execution of a cross easement.

- #30 - This 8-inch line appears to be in a narrow platted ROW. Unknown what the condition of the ROW is and whether the width is sufficient. **[Decisions need to be made about this ROW for the public main.]**

  Response: We acknowledge the concern expressed by CSU regarding the width of the narrow platted right-of-way, which may not be adequate for operation and maintenance of the water main. We concur that a decision needs to be made regarding this right-of-way. Based upon our review of the Blue Mesa Addition subdivision, the alley appears to be 16-feet in width as platted.

- #31 **-** The Inflow and Outflow easements from the tank site. Currently the easement width is 20' wide. It needs to be a 30' wide easement. Also, can the pipeline be located to determine whether within the existing 20' easement? **[Need wider easement 15' feet either side of pipe for a total of a 30' wide easement.]**

  Response: We concur with CSU regarding their comments on the Inflow and Outflow easements. The suggestion to accurately determine the specific location of the existing pipeline is advisable. We recommend a new 30-foot wide easement encompassing the actual location of the existing line be prepared. Prior to that work being accomplished, we recommend a decision be made on whether the tank will remain at this location or if other alternatives will be implemented.

- #32 - Tank site. Need a grant of formal Access to the tank site from the property owner. Have no information about the existing two-track. **[Need Access Easement from Pyramid Mtn Rd to the Tank Site Property.]**

  Response: We acknowledge the existing two tracks may not follow the existing easement. If it is determined the tank site will remain in place and the Inflow and Outflow easements are required, we recommend the existing lines be located in accordance with comment number 31. A new easement will be prepared 30-feet in width with an access road constructed over the existing pipeline corridor thus eliminating the need for a separate access easement. Constructing the access road over the pipeline will enhance access to the water main for operation and maintenance responsibilities.

LEGEND OF LINES AND SYMBOLS

EXISTING FEATURES

- 6"PVC — WATER MAIN AND SIZE. PVC – POLYVINYLCHLORIDE, DIP – DUCTILE IRON, GS – GALVANIZED STEEL, HDPE – HIGHDENSITY POLYETHYLENE, UNK – UNKNOWN
- OR WS — WATER SERVICE LINE
- GATE VALVE
- GS — GALVANIZED STEEL WATER LINE
- DISTRICT BOUNDARY
- FIRE HYDRANT
- B.O. — BLOW OFF HYDRANT
- EXTERIOR WATER METER
- INTERIOR WATER METER
- W — WATER METER VAULT
- YARD HYDRANT
- TBA — TO BE ABANDONED
- CONTROL POINT

RECOMMENDED IMPROVEMENTS

- 6" — WATER MAIN AND SIZE
- WATER SERVICE LINE
- FIRE HYDRANT
- B.O. — BLOW OFF HYDRANT
- (1) CHEPETA PARK ROAD
- (2) RAMPART TERRACE/HWY 24 AREA
- (3) FOUNTAIN/CHIPITA PARK/MARIPOSA/COLUMBINE
- (4) HAGERMAN/FOREST/MARIPOSA/COLUMBINE/MESA
- (5) PYRAMID MOUNTAIN ROAD
- (6) POPLAR/MARTIANDALE
- (7) PRAIRIE/OAK/PARK AREA
- (8) FRONTAGE ROAD
- (9) MODJESKA/HAGERMAN/SEVERY
- (10) HEIZER STREET
- (11) SOUTH TOPEKA AVE.
- (12) OUTPOST ROAD

NOTE:

DISTRICT BOUNDARY SHOWN IS BASED ON CSU LOT LAYOUT. EL PASO COUNTY LOT LAYOUT VARIES SLIGHTLY.

ABANDONED STORAGE TANK

ASPENGLOW LANE

PIKES PEAK HIGHWAY

CHIPITA PARK ROAD

CHIPITA PIKES ROAD

COLORADO SPRINGS UTILITIES 12" POTABLE WATER

COLORADO SPRINGS UTILITIES PRESSURE REDUCING METERING STATION

US HIGHWAY 24

RAMPART TERRACE

CRYSTOLA CIRCLE (PRIVATE)

AREA KNOWN AS FITZ GULCH

CASCADE METROPOLITAN DISTRICT NO.1 BOUNDARY

AIR RELEASE VALVE

PIKE ROAD

DODD ROAD

SANTAS WORKSHOP

SERVICE LINE – TYP.

POPLAR STREET

MARTIANDALE AVENUE

HAGERMAN AVENUE

FOREST ROAD

PYRAMID MOUNTAIN ROAD

FOX ROAD

FENCE

ALTITUDE VALVE VAULT (TBA)

EXISTING WATER STORAGE TANK 150,000gal. WELDED STEEL (TBA)

No. 1 No. 2 No. 3 No. 4 No. 5 No. 5A No. 6 No. 7 No. 8 No. 9 No. 10 No. 11 No. 12 No. 13 No. 14 No. 15 No. 29 No. 31 No. 32

VALVE CLOSED

N

0' 200' 400'

SCALE: HORIZ. 1" = 200'

DRAWING NOTES: THE DRAWING COORDINATE SYSTEM IS NAD83 COLORADO STATE PLANES, CENTRAL ZONE, US FEET

SEE SHEET 1

G:\CASCADE METRO DIST\15061\100\Water Study\Figure 7.dwg, Proposed Sheet 2, 12/24/2015 11:45:59 AM, ec, 24x36.pc3, 1:1

XREF FILENAME: G:_BASE DWG_G\
PLOT STYLE FILE: 10SOC PRELIMINARY COPY STAMP.CTB
FILENAME: G:\CASCADE METRO DIST\15061\100\WATER STUDY\FIGURE 7.DWG

PROPOSED WATER SYSTEM IMPROVEMENTS

WATER SYSTEM ASSESSMENT AND INVENTORY STUDY

CASCADE METROPOLITAN DISTRICT NO.1

DRAWN	SKC
DESIGNED	TAM
CHECKED	DRF/JDM
DATE	DECEMBER 2015
PROJECT NO.	15061.100
GMS FILE NO.	XXXX

GMS, INC.
CONSULTING ENGINEERS
611 N. WEBER, SUITE 300
COLORADO SPRINGS, COLORADO 80903

SEE SHEET 2

LEGEND OF LINES AND SYMBOLS

EXISTING FEATURES

- 6"PVC — WATER MAIN AND SIZE. PVC – POLYVINYLCHLORIDE, DIP – DUCTILE IRON, GS – GALVANIZED STEEL, HDPE – HIGHDENSITY POLYETHYLENE, UNK – UNKNOWN
- OR WS — WATER SERVICE LINE
- GATE VALVE
- GS — GALVANIZED STEEL WATER LINE
- DISTRICT BOUNDARY
- FIRE HYDRANT
- B.O. — BLOW OFF HYDRANT
- EXTERIOR WATER METER
- INTERIOR WATER METER
- W — WATER METER VAULT
- YARD HYDRANT
- TBA — TO BE ABANDONED
- CONTROL POINT

RECOMMENDED IMPROVEMENTS

- 6" — WATER MAIN AND SIZE
- WATER SERVICE LINE
- FIRE HYDRANT
- B.O. — BLOW OFF HYDRANT

(1) CHEPETA PARK ROAD
(2) RAMPART TERRACE/HWY 24 AREA
(3) FOUNTAIN/CHIPITA PARK/MARIPOSA/COLUMBINE
(4) HAGERMAN/FOREST/MARIPOSA/COLUMBINE/MESA
(5) PYRAMID MOUNTAIN ROAD
(6) POPLAR/MARTIANDALE
(7) PRAIRIE/OAK/PARK AREA
(8) FRONTAGE ROAD
(9) MODJESKA/HAGERMAN/SEVERY
(10) HEIZER STREET
(11) SOUTH TOPEKA AVE.
(12) OUTPOST ROAD

CASCADE METROPOLITAN DISTRICT NO.1 BOUNDARY

NOTE:

DISTRICT BOUNDARY SHOWN IS BASED ON CSU LOT LAYOUT. EL PASO COUNTY LOT LAYOUT VARIES SLIGHTLY.

CASCADE METROPOLITAN DISTRICT NO.1 BOUNDARY

No. 14 No. 15 No. 16 No. 17 No. 18 No. 19 No. 20 No. 21 No. 22 No. 23 No. 24 No. 25 No. 26 No. 27 No. 28 No. 30 No. 31

POPLAR STREET
MARTINDALE AVENUE
PRAIRIE STREET
OAK STREET
FOUNTAIN AVENUE
PARK STREET
EMPORIA AVENUE
ANEMONE AVENUE
PARK STREET PUMP HOUSE (TBA) 10" CASING
PRESSURE REDUCING VALVE VAULT
US HIGHWAY 24
16" CASING
HAGERMAN AVENUE
FOREST ROAD
MESA ROAD
FOX ROAD
COLUMBINE LANE
MARIPOSA LANE
GARDINER ROAD
N TOPEKA AVENUE
TOPEKA AVENUE PUMP HOUSE (TBA)
S TOPEKA AVENUE
EDWARDS PLACE
SEVERY AVENUE
MODJESKA STREET
HEIZER STREET
MARRIOTT ROAD
OUTPOST ROAD
BLUFF ROAD
PYRAMID MOUNTAIN ROAD
SERVICE LINE – TYP.
PRESSURE REDUCING VALVE VAULT
METER VAULT
HOLY CROSS NOVITIATE
ABANDONED FIRE HYDRANT

N

0' 200' 400'
SCALE: HORIZ. 1" = 200'

DRAWING NOTES: THE DRAWING COORDINATE SYSTEM IS NAD83 COLORADO STATE PLANES, CENTRAL ZONE, US FEET

G:\CASCADE METRO DIST\15061\100\Water Study\Figure 7.dwg, Proposed Sheet 1, 12/24/2015 11:46:34 AM, ec, 24x36.pc3, 1:1

XREF FILENAME: G:\
BASE DWG: G:\
PLOT STYLE FILE: 15061 CASCADE PROP CVWLCTB
FILENAME: G:\CASCADE METRO DIST\15061\100\WATER STUDY\FIGURE 7.DWG

PROPOSED WATER SYSTEM IMPROVEMENTS
WATER SYSTEM ASSESSMENT AND INVENTORY STUDY
CASCADE METROPOLITAN DISTRICT NO.1

DRAWN	SKC
DESIGNED	TAM
CHECKED	DRF/JDM
DATE	DECEMBER 2015
PROJECT NO.	15061.100
GMS FILE NO.	XXXX

GMS, INC.
CONSULTING ENGINEERS
611 N. WEBER, SUITE 300
COLORADO SPRINGS, COLORADO 80903

SHEET 1 OF 2

AMENDMENT NO. 1
APPENDIX E3 – CSU REQUESTED SAMPLING

Colorado Springs Utilities
It's how we're all connected

Colorado Springs Utilities
Laboratory Services
Grab Samples

Cascade Water District
Sample Date: 1-12-16

LOCATION	# Bottles	LIMS #	Sample Time	Sampler	Free Chlorine (mg/L), field SM 4500 Cl G	pH (su), field SM 4500 H B	Temperature (°C), field SM 2550 B	Conductivity (umhos/cm), Field SM 2510 B	Gallons Discharged	Comments
					Please mark boxes that apply.					
CWD_HYD_1 Hydrant on HWY 24 frontage Rd. in SW corner of CMD	0	246472	1139	CGT/JRS	0.42	7.14	5.9	135.6	75	
CWD_HYD_2 Hydrant on SE edge of town at southern end of Out Post Rd.	0	246473	1037	CGT/JRS	0.09	7.96	5.9	159.2	1500	0.09 Cl_2 after 20 minutes of flushing
CWD_HYD_3 Hydrant at northern end of Aspen Glow Lane	0	246474	0928	CGT/JRS	0.46	7.57	7.5	127.6	75	
CWD_HYD_4 Hydrant at intersection of HWY 24 and Rampart Terrace Rd.	0	246475	1120	CGT/JRS	0.63	7.76	5.8	136.9	50	
CWD_HYD_5 Western end of Emporia Ave.	0	246476	1000	CGT/JRS	0.28	7.41	3.2	139.7	200	Water discolored
CWD_HYD_6 Any hydrant in the vicinity of Santa's Workshop	0	246477	0917	CGT/JRS	0.53	7.67	7.2	121.1	75	
CWD_HYD_7 Hydrant at inersection of Pyramid Mountain Rd & Gardiner Rd.	0	246478	1110	CGT/JRS	0.56	7.64	5.2	156.7	75	
CWD_HYD_8 Hydrant at 8270 Chipita Park Rd.	0	246479	0939	CGT/JRS	0.62	7.72	4.1	154.7	50	
Total # of Bottles										

Signature/Print last name — Date/Time

Relinquished by: Cory Thiel — 1-12-16 @ 1310

Received by: Kristin Wirkkala — 1/12/16 @ 1310

Additional Comments / Sample Rejections/ Actions
Template: CWD_DIST
Sample ID: see above
Project: CWD
Test Schedule: SYS_EXTEN

Samples transported on ice
* Samples preserved with STS

AMENDMENT NO. 1
APPENDIX F1 – CONSTRUCTION COST ESTIMATE

CASCADE METROPOLITAN DISTRICT NO. 1

WATER SYSTEM IMPROVEMENTS - PRELIMINARY CONSTRUCTION COST ESTIMATE [1)]

Amendment No. 1 - Revised

Improvement	Location	Description	Total Cost
1.	**Chipita Park Road**	**Replace 2-inch Galvanized Iron Piping**	
a.	Chipita Park Road	Replace existing with 4" and 8" pipe	$76,778
2.	**Rampart Terrace US Highway 24 Area**	**Replace 2-inch Galvanized Iron Piping**	
a.	Rampart Terrace Road and Private Access Roads	Replace existing with 4" and 6" pipe	$169,199
b.	Crystola Circle	Replace existing with 4" pipe	$28,610
c.	US Hwy 24 West side, South of Pyramid Mountain Road	Replace existing with 4" pipe	$33,740
		Subtotal	$231,549
3.	**Fountain/Chipita Park/Martindale Area**	**New System Loop Piping and Replace 3-inch Ductile Iron Piping**	
a.	Chipita Park Road	New 8" pipe	$89,003
b.	Pike Road	New 8" pipe	$16,333
c.	Fountain Avenue	Replace existing and add new 8" pipe	$317,050
d.	Martindale Avenue	Replace existing with 8" pipe	$114,333
		Subtotal	$536,720
4.	**Hagerman/Forest/Mariposa/Columbine/ Mesa Area**	**New System Loop Piping and Replace 2-inch Galvanized Iron Piping**	
a.	Hagerman Avenue	New 6" pipe	$115,727
b.	Forest Road	Replace existing with 4" pipe	$68,750
c.	Mariposa Lane and Gardiner Road	Replace existing with 6" pipe	$65,707
d.	Columbine Lane	New 2" pipe	$22,931
e.	Mesa Road thence west to Hagerman	New 6" pipe	$112,411
		Subtotal	$385,526
5.	**Pyramid Mountain Road Area**	**Replace 4-inch Ductile Iron Piping**	
a.	Pyramid Mountain Road	Replace existing with 8" pipe	$184,722
b.	Severy Avenue	Replace existing with 8" pipe	$82,261
		Subtotal	$266,983
6.	**Poplar/Martindale Area**	**Replace 3-inch Ductile Iron Piping**	
a.	Poplar Street	Replace existing with 8" pipe	$77,794
b.	Martindale Avenue	Replace existing with 4" pipe	$34,167
		Subtotal	$111,961
7.	**Prairie/Oak/Park Area**	**Replace 3-inch Ductile Iron Piping**	
a.	Prairie Street and Oak Street	Replace existing with 4" and 6" pipe	$111,381
b.	Park Street	Replace existing with 4" pipe	$26,011
		Subtotal	$137,392
8.	**US Highway 24 Frontage Road**	**Replace 4-inch Ductile Iron and 2-inch Galvanized Iron Piping**	
a.	Frontage Road	Replace existing with 6" and 8" pipe. Add Pressure reducing valve vault.	$445,659
9.	**Modjeska/Hagerman/Severy Area**	**New System Loop Piping and Replace 1 1/2-inch and 2-inch Galvanized Iron Piping**	
a.	Modjeska Street	Replace existing and add new 4" pipe	$34,572
b.	Hagerman Avenue	New 4" pipe	$79,514
c.	Severy Avenue	Replace existing with 8" pipe	$92,756
		Subtotal	$206,842
10.	**Heitzer Street Area**	**New System Loop Piping and Replace 2-inch Galvanized Iron Piping**	
a.	Heitzer Street	Replace existing and add new 6" pipe	$66,133
b.	Cross Country - Heitzer Street to Outpost Road	Replace existing with 6" pipe. Add Pressure reducing valve vault.	$87,517
		Subtotal	$153,650
11.	**South Topeka Avenue**	**Replace 2-inch Galvanized Iron Piping**	

a.	South Topeka Avenue	Replace existing with 4" and 6"pipe	$28,780
12.	**Outpost Road**	**Replace 8-inch Ductile Iron Piping not in Right-of-Way**	
a.	Outpost Road	Replace existing with 6" pipe	$122,453
13.	**Existing 150,000 gal. Storage Tank**	Remove from service and demoish tank, demolish chlorination building, abandon existing piping	$90,000
14.	**CSU Connection to system**		
a.	Existing Connection - Chipita Park Rd.	New booster chlorination station	$45,000
b.	New Connection - Aspenglow Lane	New booster chlorination station	$45,000
c.	Cross Country - Aspenglow Lane to Kelsa Road	1,700 LF 6" transmission piping @ $90/LF	$153,000
d.	Aspenglow Lane	PRV and Meter/BFP vaults (SCADA by CSU)	$60,000
e.	Aspenglow Lane and Kelsa Road	Connections to existing Piping	$3,000
f.	US Highway 24 Frontage Road	System pressure relief valve in proposed Frontage Rd PRV vault.	$25,000
		Subtotal	$331,000
15.	**Replace Inoperable Valves**		
a.	8" valve	3 each @ $2,400	$7,200
b.	6" valve	1 each @ $2,000	$2,000
c.	4" valve	2 each @ $1,900	$3,800
d.	2" valve	1 each @ $1,200	$1,200
		Subtotal	$14,200
16.	**Raise Buried Valve Boxes**	19 @ $500 ea.	$9,500
17.	**Replace Existing Hydrant**	1 @ $5,000 ea.	$5,000
18.	**Demolish Park Street Pump House**		$30,000
19.	**Demolish Topeka Avenue Pump House**		$30,000
20.	**Demolish Abandoned Storage Tank**		$30,000
21.	**Service Lines**		
a.	5520 Pikes Peak Hwy, Lot 2	New service line and meter pit to split dual service	$18,000
b.	7759 Marriott Rd	New 4" valve on 4" service line	$2,000
		Subtotal	$20,000
Subtotal preliminary cost			$3,263,994
Project contingencies @ 15%			489,599
Engineering design/contract administration			303,800
Construction observation based on 220 calendar days			191,000
Other Engineering [2)]			186,000
Administrative expenses [2)]			33,000
Total preliminary project cost estimate			$4,467,393

1) See Appendix F1 for detailed quantities and unit prices fo recommended work.
2) See breakdown contained in Appendix F1.

CASCADE METROPOLITAN DISTRICT NO. 1
WATER SYSTEM IMPROVEMENTS - PRELIMINARY PROJECT COST ESTIMATE
Amendment No. 1 - Revised

Administrative		
• Advertising		$500
• Single Project Audit		2,500
• General legal counsel		30,000
	Subtotal	$33,000
Engineering Basic Fees		$303,800
Other Engineering Fees		
• Environmental Site Assessments		$20,000
• Operation and Maintenance Manual		5,000
• Cross-Connection Control Plan		4,000
• Easements/rights-of-way/property ownership		60,000
• Geotechnical Services		20,000
• Reproduction		2,500
• Funding Administration		20,000
• Permits		7,500
• CDPHE Submissions/Reviews		7,000
• CSU Coordiantion/Reviews		40,000
	Subtotal	$186,000
Project Inspection Fees (220 day duration)		$191,000
Soft Costs		$713,800
Construction		$3,263,994
	Subtotal	$3,977,794
Construction Contingencies - 15%		489,599
TOTAL		$4,467,393

CASCADE METROPOLITAN DISTRICT NO. 1
WATER SYSTEM IMPROVEMENTS - PRELIMINARY CONSTRUCTION COST ESTIMATE
DISTRIBUTION SYSTEM COMPONANTS

Location	4" Piping, LF	6" Piping, LF	8" Piping, LF	2" HDPE, LF	4" GV, EA	6" GV, EA	8" GV, EA	Connect to Existing, EA	Driveway Pavement and Chip&Seal, SY	4" Pavement, SY	Hwy Pavement Section with Flowfill	Service Reconnect, EA	New Service Line, LF	FH New, EA	Blowoff, EA	Other	Total Cost
	$55.00	$58.00	$65.00	$38.00	$1,400	$1,600	$2,000	$2,500	$40.00	$60.00	$90.00	$900	$28	$5,000	$2,000		
Improvement 1 - Chipita Park Road - Replace 2-inch Galvanized Iron Piping																	
Chipita Park Road	420		440				1	1	204.4			6		1	1		$76,778
Improvement 2 - Rampart Terrace/Highway 24 Area - Replace 2-inch Galvanized Iron Piping																	
Rampart Terrace Road and Private Access Roads	390	1270			2	5		2	782.2			20		1	2		$169,199
Crystola Circle	210				1			1				4	270		1		$28,610
Hwy 24 West side, South of Pyramid Mountain Road	300				1			1				7	180		1		$33,740
Total	900	1270			4	5		4	782.2			31	450	1	4		$231,549
Improvement 3 - Fountain/Chipita Park/Martindale Area - New System Loop Piping and Replace 3-inch Ductile Iron Piping																	
Chipita Park Road			670				1	1		595.6		3	90				$89,003
Pike Road			100				1	1		88.9							$16,333
Fountain Avenue			2450				8	3		1840.0		21		1			$317,050
Martindale Avenue			1060				3	1	533.3	26.7		10		1			$114,333
Total			4280				13	6	533.3	2551.1		34	90	2			$536,720
Improvement 4 - Hagerman/Forest/Mariposa/Columbine/Mesa Area - New System Loop Piping and Replace 2-inch Galvanized Iron Piping																	
Hagerman Avenue		1020				3		2	906.7			3	100	1			$115,727
Forest Road	770				1			1	400.0			5			1		$68,750
Mariposa Lane and Gardiner Road		480				2		1	426.7			5	200	1			$65,707
Columbine Lane				200	1				177.8			1	140		1		$22,931
Mesa Road thence west to Hagerman		890				2		2	497.8			8	910				$112,411
Total	770	2390		200	2	7		6	2408.9			22	1350	2	2		$385,526
Improvement 5 - Pyramid Mountain Road - Replace 4-inch Ductile Iron Piping																	
Pyramid Mountain Road			1660				3	2	1475.6			2		1			$184,722
Severy Avenue			650				2	3	577.8			6					$82,261
Total			2310				5	5	2053.3			8		1			$266,983
Improvement 6 - Poplar/Martindale Area - Replace 3-inch Ductile Iron Piping																	
Poplar Street	250		400				1		551.1	26.7		6		1	1		$77,794
Martindale Avenue	300				1				266.7			4			1		$34,167
Total	550		400		1		1		817.8	26.7		10		1	2		$111,961
Improvement 7 - Prairie/Park/Oak Area - New System Loop Piping and Replace 3-inch and 4-inch Ductile Iron Piping																	
Prairie Street and Oak Street	910	440			4	2		2	177.8			11		1			$111,381
Park Street	200				1			1	177.8							40' of 8" casing	$26,011
Total	1110	440			5	2		3	355.6			11		1			$137,392
Improvement 8 - Highway 24 Frontage Road - Replace 4-inch Ductile Iron and 2-inch Galvanized Iron Piping																	
Frontage Road		750	1580			1	1	2			2071.1	15	1320	1	1	80' of 12" casing, PRV vault.	$445,659
Improvement 9 - Modjeska/Hagerman/Severy Area - New System Loop Piping and Replace 1 1/2-inch and 2-inch Galvanized Iron Piping																	
Modjeska Street	450				1			1	35.6			5					$34,572
Hagerman Avenue	710				2			1	631.1			2	290				$79,514
Severy Avenue			860				1	1	248.9			10	300	1			$92,756
Total	1160		860		3		1	3	915.6			17	590	1			$206,842
Improvement 10 - Heitzer Street - New System Loop Piping and Replace 2-inch Galvanized Iron Piping																	
Heitzer Street	600					2		2	533.3			4					$66,133
Cross Country - Heitzer Street to Outpost Road	650					2		3	106.7			2				PRV Vault	$87,517
Total	1250					4		5	640.0			6					$153,650
Improvement 11 - South Topeka Avenue - Replace 2-inch Galvanized Iron Piping																	
South Topeka Avenue	320	60			1			1				2			1		$28,780
Improvement 12- Outpost Road - Replace 8-inch Ductile Iron Piping																	
Outpost Road		960		50	1	2		3	853.3			12	280				$122,453
Preliminary Construction Grand Total	6480	5870	9870	250	17	21	22	39	9564.4	2577.8	2071.1	174	4080	11	11		$2,704,293

Pavement square yardage based on 8' wide, 2" thick for driveways and chip&seal replacement, 4" thick for roads, 6" on flowfill in CDOT asphalt.
New hydrants include 6" lateral pipe, valve and surface restoration

CASCADE METROPOLITAN DISTRICT NO. 1
WATER SYSTEM IMPROVEMENTS - PRELIMINARY CONSTRUCTION COST ESTIMATE
TANK ALETERNATIVES
Amendment No. 1 - Revised

Cost estimates for these alternatives are in addition to the recommended improvements presented in the 12/28/15 Study

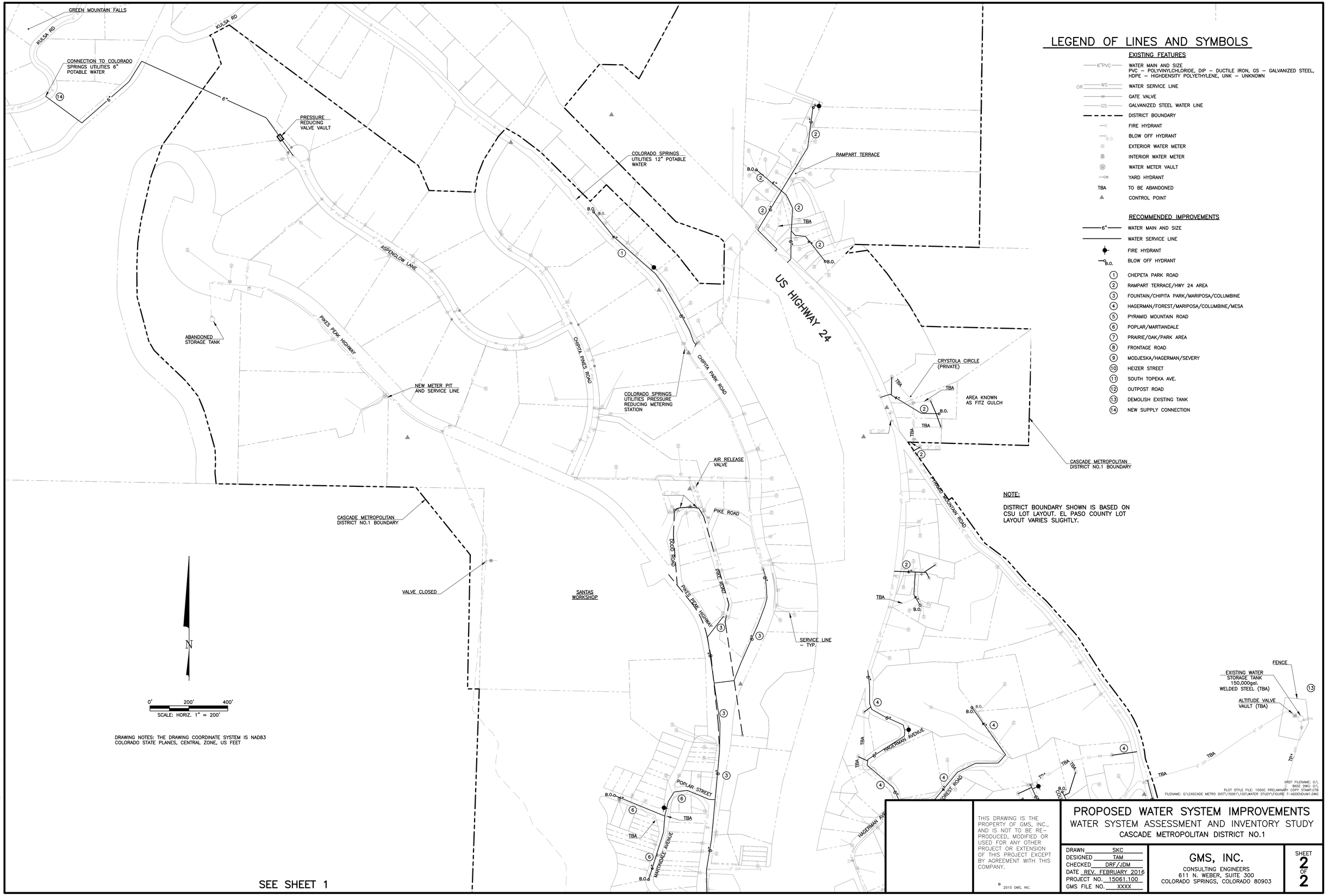
1.	**New Storage Tank at Existing Site**	
a.	Demolish existing storage tank	
b.	Site grading	
c.	New welded steel storage tank. 24'H. x 30' dia.	$234,000
d.	Foundation	$20,000
e.	New altitude valve vault	$18,000
f.	Yard Piping	$15,000
g.	Booster chlorination system at Tank	$45,000
h.	Discharge vault with flow meter, bypass piping and check valve	$25,000
i.	Electrical and controls	$15,000
j.	New PRV vault on Hagerman Road	$35,000
k.	New PRV vault on Fountain Avenue	$35,000
	Total Estimated Construction Cost	$442,000

2.	**New Storage Tank at Northwest Side of District**	
a.	Demolish existing storage tank	
b.	Site grading of existing site	
c.	New welded steel storage tank. 24'H. x 30' dia.	$234,000
d.	Access Road	$15,000
e.	Site grading	$15,000
f.	Yard Piping	$15,000
g.	Foundation	$20,000
h.	New altitude valve vault	$18,000
i.	Booster chlorination system at Tank	$45,000
j.	Discharge vault with flow meter and bypass piping	$23,000
k.	Electrical and controls	$15,000
l.	2,300 LF of new 8" transmission main from Chipita Park Rd and Chipita Pines Dr to the New Storage Tank	$149,500
m.	400 LF of new 12" distribution system piping from the new storage tank to Pikes Peak Highway	$48,000
n.	2,100 LF of new 8" distribution piping in Pikes Peak Highway southeast to Chipita Pines Dr.	$136,500
o.	500 LF of new 8" distribution piping in Chipita Pines Dr.extending from the existing deadend north to Chipita Park Rd.	$32,500
p.	Connections to existing Piping	$9,000
q.	New PRV vault on Fountain Avenue	$35,000
r.	Pavement replacement, 3,120 SY	$187,200
s.	Easements	$20,000
	Total Estimated Construction Cost	$1,017,700

3.	New Transmission Main from Kulsa Rd to Aspenglow Ln	
a.	Demolish existing storage tank	
b.	Site grading of existing site	
c.	1,700 LF of new 6" transmission piping from Kelsa Rd to Aspenglow Ln	$153,000
d.	New PRV vault and Meter/BFP vault on Aspenglow Ln (SCADA by CSU)	$60,000
e.	New booster chlorination system on Aspenglow Ln	$45,000
f.	Connections to existing Piping	$3,000
g.	System pressure relief valve in proposed Frontage Rd PRV vault including discharge permitting and dechlorination facilities	$25,000
h.	Easements	$20,000
	Total Estimated Construction Cost	$306,000

AMENDMENT NO. 1

APPENDIX F2 – PROPOSED WATER SYSTEM IMPROVEMENTS, MAPS



LEGEND OF LINES AND SYMBOLS

EXISTING FEATURES

- 6"PVC — WATER MAIN AND SIZE PVC – POLYVINYLCHLORIDE, DIP – DUCTILE IRON, GS – GALVANIZED STEEL, HDPE – HIGHDENSITY POLYETHYLENE, UNK – UNKNOWN
- OR WS — WATER SERVICE LINE
- GATE VALVE
- GS — GALVANIZED STEEL WATER LINE
- DISTRICT BOUNDARY
- FIRE HYDRANT
- B.O. — BLOW OFF HYDRANT
- EXTERIOR WATER METER
- INTERIOR WATER METER
- W — WATER METER VAULT
- YARD HYDRANT
- TBA — TO BE ABANDONED
- CONTROL POINT

RECOMMENDED IMPROVEMENTS

- 6" — WATER MAIN AND SIZE
- WATER SERVICE LINE
- FIRE HYDRANT
- B.O. — BLOW OFF HYDRANT
- (1) CHEPETA PARK ROAD
- (2) RAMPART TERRACE/HWY 24 AREA
- (3) FOUNTAIN/CHIPITA PARK/MARIPOSA/COLUMBINE
- (4) HAGERMAN/FOREST/MARIPOSA/COLUMBINE/MESA
- (5) PYRAMID MOUNTAIN ROAD
- (6) POPLAR/MARTIANDALE
- (7) PRAIRIE/OAK/PARK AREA
- (8) FRONTAGE ROAD
- (9) MODJESKA/HAGERMAN/SEVERY
- (10) HEIZER STREET
- (11) SOUTH TOPEKA AVE.
- (12) OUTPOST ROAD
- (13) DEMOLISH EXISTING TANK
- (14) NEW SUPPLY CONNECTION

NOTE:

DISTRICT BOUNDARY SHOWN IS BASED ON CSU LOT LAYOUT. EL PASO COUNTY LOT LAYOUT VARIES SLIGHTLY.

DRAWING NOTES: THE DRAWING COORDINATE SYSTEM IS NAD83 COLORADO STATE PLANES, CENTRAL ZONE, US FEET

SEE SHEET 1

XREF FILENAME: G:\
BASE DWG: G:\
PLOT STYLE FILE: 1050C PRELIMINARY COPY STAMP.CTB
FILENAME: G:\CASCADE METRO DIST\15061\100\WATER STUDY\FIGURE 7–ADDENDUM1.DWG

PROPOSED WATER SYSTEM IMPROVEMENTS

WATER SYSTEM ASSESSMENT AND INVENTORY STUDY

CASCADE METROPOLITAN DISTRICT NO.1

DRAWN	SKC
DESIGNED	TAM
CHECKED	DRF/JDM
DATE	REV. FEBRUARY 2016
PROJECT NO.	15061.100
GMS FILE NO.	XXXX

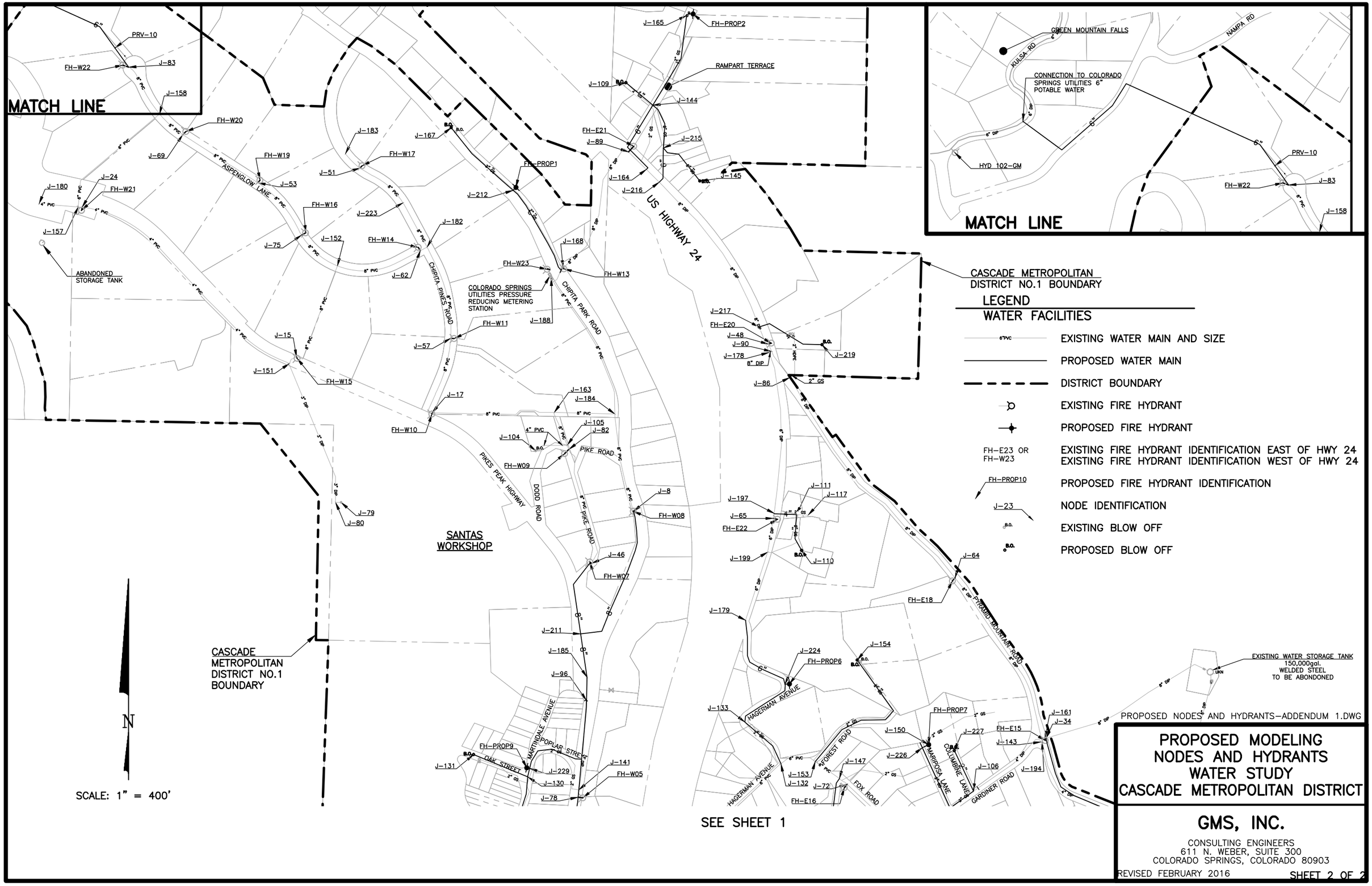
GMS, INC.
CONSULTING ENGINEERS
611 N. WEBER, SUITE 300
COLORADO SPRINGS, COLORADO 80903

SHEET 2 OF 2

G:\CASCADE METRO DIST\15061\100\Water Study\Figure 7-Addendum1.dwg, Proposed Sheet 2, 2/12/2016 3:29:27 PM, jwel, DWG To PDF.pc3, 1:1

AMENDMENT NO. 1

APPENDIX G1 – MODELING MAPS



PROPOSED MODELING NODES AND HYDRANTS WATER STUDY CASCADE METROPOLITAN DISTRICT

GMS, INC.
CONSULTING ENGINEERS
611 N. WEBER, SUITE 300
COLORADO SPRINGS, COLORADO 80903

REVISED FEBRUARY 2016

AMENDMENT NO. 1

APPENDIX G6 – PROPOSED AVERAGE DAY

Cascade Metro District Proposed Water System ADD with Addtl Feed Line (Nodes)

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-245	7803	0	7993	82
J-8	7443	0.41	7847	175
J-11	7492	0.41	7847	154
J-15	7661	0.41	7847	81
J-17	7589	0.41	7847	112
J-21	7476	0.41	7847	161
J-24	7730	0.41	7847	51
J-26	7557	0.41	7847	126
J-28	7279	0.67	7706	185
J-30	7609	0.41	7847	103
J-31	7528	0.41	7847	138
J-34	7655	0.41	7847	83
J-36	7394	0.41	7847	196
J-37	7470	0.41	7847	163
J-41	7327	0.41	7750	183
J-44	7435	0.41	7847	178
J-46	7493	0.41	7847	153
J-48	7473	0.41	7847	162
J-50	7515	0.41	7847	144
J-51	7529	0.41	7847	138
J-53	7609	0.41	7847	103
J-57	7562	0.41	7847	124
J-59	7483	0.41	7847	158
J-62	7540	0.41	7847	133
J-64	7621	0.41	7847	98
J-65	7435	0.41	7847	178
J-68	7441	0.41	7847	176
J-69	7625	0.41	7847	96
J-72	7543	0.41	7847	132
J-73	7551	0.41	7847	128
J-75	7594	0.41	7847	110
J-78	7403	0.41	7847	192
J-79	7696	0.41	7847	66
J-80	7696	0.41	7847	66
J-82	7482	0.41	7847	158
J-83	7611	0.41	7847	102
J-86	7493	0.41	7847	153
J-87	7313	0	7706	170
J-89	7480	0.41	7847	159
J-90	7473	0.41	7847	162
J-92	7469	0.41	7847	163
J-93	7431	0.41	7847	180
J-96	7403	0.41	7847	192
J-98	7380	0.41	7847	202
J-99	7376	0.41	7847	204

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-100	7492	0.41	7847	154
J-101	7480	0.41	7847	159
J-102	7402	0.41	7847	192
J-103	7417	0.41	7847	186
J-104	7505	0.41	7847	148
J-105	7492	0.41	7847	154
J-106	7614	0.41	7847	101
J-107	7594	0.41	7847	110
J-109	7542	0.41	7847	132
J-110	7461	0.41	7847	167
J-111	7452	0.41	7847	171
J-112	7353	0.41	7847	214
J-113	7361	0.41	7847	210
J-114	7463	0.41	7847	166
J-115	7477	0.41	7847	160
J-117	7470	0.41	7847	163
J-119	7402	0.41	7847	192
J-120	7417	0.41	7847	186
J-121	7465	0.41	7847	165
J-123	7580	0.41	7847	116
J-124	7552	0.41	7847	128
J-125	7520	0.41	7847	142
J-126	7500	0.41	7847	150
J-129	7567	0.41	7847	121
J-130	7455	0.41	7847	170
J-131	7495	0.41	7847	152
J-132	7511	0.41	7847	145
J-133	7482	0.41	7847	158
J-134	7398	0.41	7847	195
J-135	7398	0.41	7847	195
J-136	7614	0.41	7847	101
J-137	7594	0.41	7847	109
J-138	7461	0.41	7847	167
J-139	7474	0.41	7847	161
J-140	7476	0.41	7847	161
J-141	7404	0.41	7847	192
J-142	7460	0.41	7847	168
J-143	7655	0.41	7847	83
J-144	7504	0.41	7847	148
J-145	7491	0.41	7847	154
J-147	7542	0.41	7847	132
J-149	7499	0.41	7847	151
J-150	7585	0.41	7847	113
J-151	7663	0.41	7847	80
J-152	7572	0.41	7847	119

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-153	7527	0.41	7847	138
J-154	7557	0.41	7847	126
J-155	7441	0.41	7847	176
J-157	7730	0.41	7847	51
J-158	7620	0.41	7847	98
J-159	7511	0.41	7847	146
J-161	7655	0.41	7847	83
J-162	7611	0.41	7847	102
J-163	7497	0.41	7847	152
J-164	7478	0.41	7847	160
J-165	7580	0.41	7847	116
J-167	7458	0.41	7847	169
J-168	7436	0.41	7847	178
J-169	7320	0.41	7750	186
J-173	7435	0.41	7847	178
J-174	7568	0.41	7847	121
J-176	7525	0.41	7847	139
J-177	7470	0.41	7847	163
J-178	7473	0.41	7847	162
J-179	7423	0.41	7847	183
J-180	7733	0.41	7847	49
J-181	7376	0.41	7847	204
J-182	7541	0.41	7847	132
J-183	7531	0.41	7847	137
J-184	7454	0.41	7847	170
J-185	7408	0.41	7847	190
J-186	7464	0.41	7847	166
J-188	7444	0.41	7847	175
J-190	7495	0.41	7847	152
J-194	7647	0.41	7847	86
J-197	7436	0.41	7847	178
J-199	7431	0.41	7847	180
J-200	7473	0.41	7847	162
J-202	7490	0.41	7847	155
J-205	7425	0.41	7847	183
J-206	7409	0.41	7847	190
J-207	7386	0.41	7847	199
J-208	7490	0.41	7847	155
J-210	7302	2.18	7750	194
J-211	7436	0.41	7847	178
J-212	7445	0.41	7847	174
J-215	7498	0.41	7847	151
J-216	7478	0.41	7847	160
J-217	7474	0.41	7847	162
J-219	7530	0.41	7847	137

Cascade Metro District Proposed Water System ADD with Addtl Feed Line (Nodes)

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-222	7472	0.41	7847	162
J-223	7535	0.41	7847	135
J-224	7470	0.41	7847	163
J-225	7423	0.41	7847	184
J-226	7586	0.41	7847	113
J-227	7610	0.41	7847	103
J-228	7606	0.41	7847	104
J-229	7450	0.41	7847	172
J-233	7477	0.41	7847	160
J-234	7525	0.41	7847	139

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
Main (Polyline)-1	39.42	J-51	FH-W17	6	PVC	118	4.1	0	0
Main (Polyline)-2	18.79	J-53	FH-W19	6	PVC	118	4.1	0	0
Main (Polyline)-3	22.91	J-69	FH-W20	6	PVC	118	4.1	0	0
Main (Polyline)-4	32.43	J-83	FH-W22	6	PVC	118	4.1	0	0
Main (Polyline)-6	32.85	J-75	FH-W16	6	PVC	118	4.1	0	0
Main (Polyline)-7	22.32	J-65	FH-E22	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-8	15.79	J-41	FH-W1	4	Ductile Iron	118	4.1	0.01	0.0002
Main (Polyline)-9	52.79	J-59	FH-E17	6	PVC	118	4.1	0.01	0.0001
Main (Polyline)-10	36.82	J-8	FH-W8	6	PVC	118	4.1	0.01	0.0001
Main (Polyline)-11	32.89	FH-W7	J-46	6	PVC	118	4.1	0	0
Main (Polyline)-12	12.7	FH-W3	J-36	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-13	21.34	J-57	FH-W11	6	PVC	118	4.1	0.01	0.0001
Main (Polyline)-14	168.29	J-112	J-113	8	Ductile Iron	120	0	-0.42	0.0027
Main (Polyline)-15	44.42	J-48	J-90	8	Ductile Iron	120	0	-0.42	0.0027
Main (Polyline)-17	30.24	FH-E18	J-64	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-20	23.75	FH-W13	J-168	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-22	37.79	FH-E5	J-50	6	PVC	118	4.1	0	0
Main (Polyline)-24	174.44	J-114	J-115	2	PVC	118	0	-0.41	0.0421
Main (Polyline)-27	313.82	J-139	J-140	4	Ductile Iron	118	0	-0.41	0.0105
Main (Polyline)-29	276.05	J-134	J-135	3	Ductile Iron	118	0	-0.41	0.0187
Main (Polyline)-30	41.29	J-79	J-80	3	Ductile Iron	118	0	-0.41	0.0187
Main (Polyline)-31	38.25	J-93	FH-W4	4	Ductile Iron	118	4.1	0	0.0001
Main (Polyline)-32	42.54	FH-W10	J-17	6	PVC	118	4.1	0	0
Main (Polyline)-33	29.78	FH-W15	J-15	6	PVC	118	4.1	0	0
Main (Polyline)-34	621.9	J-157	J-158	6	PVC	118	0	-4.77	0.0541
Main (Polyline)-36	74.83	FH-W9	J-82	6	PVC	118	4.1	0	0
Main (Polyline)-37	161.28	J-104	J-105	4	PVC	118	0	-0.41	0.0105
Main (Polyline)-38	167.32	J-144	J-109	4	Ductile Iron	118	0	0.41	0.0105
Main (Polyline)-42	34.64	FH-W5	J-78	6	Ductile Iron	118	4.1	-0.01	0.0001
Main (Polyline)-43	232.01	J-123	J-124	2	Galvanized iron	100	0	-0.41	0.0421
Main (Polyline)-44	474.07	J-143	J-106	4	Ductile Iron	118	0	1.62	0.0414

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
Main (Polyline)-45	280.04	J-132	J-133	6	Ductile Iron	118	0	-3.71	0.0421
Main (Polyline)-47	444.38	J-93	J-186	4	Ductile Iron	118	0	-0.42	0.0107
Main (Polyline)-48	151.08	J-100	J-101	4	Ductile Iron	118	0	0.42	0.0107
Main (Polyline)-50	260.89	J-130	J-131	4	Ductile Iron	118	0	0.41	0.0105
Main (Polyline)-51	757.93	J-153	J-154	4	Ductile Iron	118	0	0.41	0.0105
Main (Polyline)-53	294.55	J-136	J-137	6	Ductile Iron	118	0	0.41	0.0047
Main (Polyline)-54	31.49	FH-E21	J-89	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-64	554.76	J-125	J-126	4	Ductile Iron	118	0	0.66	0.0168
Main (Polyline)-66	148.55	J-102	J-103	6	Ductile Iron	118	0	-0.41	0.0047
Main (Polyline)-70	256.2	J-107	J-129	6	PVC	118	0	-0.45	0.0051
Main (Polyline)-71	164.35	J-106	J-107	6	Ductile Iron	118	0	0.8	0.0091
Main (Polyline)-74	207.69	J-119	J-120	2	PVC	118	0	0.41	0.0421
Main (Polyline)-86	201.46	J-98	J-99	8	Ductile Iron	120	0	6.42	0.041
Main (Polyline)-87	38.71	J-31	FH-E10	6	PVC	118	4.1	0	0
Main (Polyline)-88	27.61	FH-E13	J-21	6	Ductile Iron	118	4.1	-0.01	0.0001
Main (Polyline)-89	32.07	FH-E9	J-68	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-95	13.09	FH-E14	J-26	6	Ductile Iron	118	4.1	-0.01	0.0001
Main (Polyline)-96	22.43	FH-E15	J-34	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-97	31.35	FH-E16	J-72	6	PVC	118	4.1	0	0
Main (Polyline)-98	30.17	FH-E12	J-44	6	PVC	118	4.1	-0.01	0.0001
Main (Polyline)-99	12.49	FH-E7	J-11	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-100	20.87	J-37	FH-E4	6	PVC	118	4.1	0	0
Main (Polyline)-102	21.34	FH-E1	J-28	6	Ductile Iron	130	0	0	0
Main (Polyline)-103	29.11	FH-E3	J-92	6	PVC	118	4.1	-0.01	0.0001
Main (Polyline)-104	29.63	J-73	FH-E8	6	PVC	118	4.1	0	0
Main (Polyline)-105	10.39	FH-E11	J-30	4	Ductile Iron	118	4.1	0	0.0001
Main (Polyline)-106	30.66	FH-W14	J-62	6	PVC	118	4.1	-0.01	0.0001
Main (Polyline)-107	37.07	FH-E20	J-48	6	Ductile Iron	118	4.1	0	0
P-5	333.48	J-190	J-100	6	PVC	118	0	0.15	0.0017
P-6	335.82	J-176	J-190	6	Ductile Iron	118	0	1.18	0.0134
P-11	37.21	R-1	J-188	36	PVC	150	0	29.8	0.0094

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-12	27.02	J-24	FH-W21	6	PVC	118	4.1	0.01	0.0001
P-20	625.18	J-155	J-113	8	Ductile Iron	120	0	0.83	0.0053
P-30	911.45	J-36	J-186	8	Ductile Iron	120	0	-3.98	0.0254
P-35	472.84	J-8	J-184	8	PVC	120	0	-12.1	0.0772
P-36	729.25	J-184	J-188	8	PVC	120	0	-3.9	0.0249
P-37	94.6	J-117	J-111	4	Ductile Iron	118	0	-0.41	0.0105
P-40	44.12	J-44	J-173	6	PVC	118	0	-0.88	0.01
P-41	169.18	J-163	J-105	8	PVC	120	0	14.16	0.0904
P-44	435.14	J-30	J-174	8	Ductile Iron	120	0	3.37	0.0215
P-46	295.96	J-177	J-92	6	Ductile Iron	118	0	0.42	0.0048
P-50	197.04	J-130	J-142	4	Ductile Iron	118	0	0.41	0.0105
P-51	679.54	J-151	J-80	3	Ductile Iron	118	0	0.82	0.0374
P-53	49.49	J-151	J-15	8	PVC	120	0	2.28	0.0146
P-54	507.15	J-15	J-152	8	PVC	120	0	1.87	0.0119
P-61	188.12	J-180	J-157	4	PVC	118	0	-0.41	0.0105
P-66	470.95	J-144	J-165	6	Ductile Iron	118	0	0.42	0.0048
P-67	14.32	J-161	J-34	8	Ductile Iron	120	0	0.42	0.0027
P-71	442.25	J-190	J-50	6	PVC	118	0	1.66	0.0189
P-72	639.2	J-50	J-177	6	Ductile Iron	118	0	1.24	0.0141
P-73	445.7	J-68	J-159	8	Ductile Iron	120	0	3.94	0.0251
P-82	36.65	J-62	J-182	8	PVC	120	0	25.68	0.1639
P-83	107.68	J-138	J-37	6	Ductile Iron	118	0	0.01	0.0001
P-84	11.79	J-37	J-177	6	Ductile Iron	118	0	-0.41	0.0046
P-86	116.86	J-136	J-30	8	Ductile Iron	120	0	3.79	0.0242
P-88	331.37	J-53	J-75	8	PVC	120	0	25.06	0.16
P-89	20.78	J-105	J-82	8	PVC	120	0	13.34	0.0851
P-90	582.81	J-82	J-46	8	PVC	120	0	12.92	0.0825
P-92	43	J-124	J-26	6	Ductile Iron	118	0	-1.43	0.0162
P-93	691.31	J-26	J-162	6	Ductile Iron	118	0	-1.85	0.021
P-97	98.07	J-183	J-51	8	PVC	120	0	-0.41	0.0026
P-99	18.11	J-157	J-24	4	Ductile Iron	118	0	3.94	0.1006

Cascade Metro District Proposed Water System ADD and Addtl Feed Line (Pipelines)

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-100	1268.73	J-24	J-151	4	PVC	118	0	3.52	0.0899
P-101	393.57	J-57	J-17	8	PVC	120	0	23.61	0.1507
P-103	139.73	J-99	J-98	8	Ductile Iron	120	0	-7.82	0.0499
P-105	779.41	J-178	J-197	6	Ductile Iron	118	0	7.43	0.0843
P-106	35.61	J-197	J-65	6	Ductile Iron	118	0	5.78	0.0656
P-107	14.62	J-178	J-90	8	Ductile Iron	120	0	12.25	0.0782
P-109	55.85	J-185	J-96	8	Ductile Iron	120	0	23.36	0.1491
P-110	487.04	J-96	J-141	8	Ductile Iron	120	0	22.95	0.1465
P-111	692.03	J-174	J-73	6	Ductile Iron	118	0	1.47	0.0166
P-112	456.88	J-73	J-190	6	Ductile Iron	118	0	1.05	0.0119
P-115	143.84	J-159	J-31	6	Ductile Iron	118	0	0.52	0.0059
P-116	395.54	J-31	J-174	6	Ductile Iron	118	0	-1.49	0.0169
P-118	360.79	J-41	J-169	8	Ductile Iron	120	0	2.6	0.0166
P-122	426.69	J-69	J-53	8	PVC	120	0	25.49	0.1627
P-124	120.34	J-89	J-164	8	Ductile Iron	120	0	23.81	0.152
P-126	890.41	J-64	J-161	8	Ductile Iron	120	0	10.58	0.0676
P-128	269.5	J-28	FH-E24	8	Ductile Iron	120	0	0	0
P-129	44.91	J-141	J-78	8	Ductile Iron	120	0	20.88	0.1333
P-130	187.53	J-78	J-135	8	Ductile Iron	120	0	20.46	0.1306
P-131	336.66	J-173	J-155	8	Ductile Iron	120	0	6.42	0.041
P-132	3.65	J-155	J-68	8	Ductile Iron	120	0	4.36	0.0278
P-133	230.58	J-75	J-152	8	PVC	120	0	24.65	0.1573
P-134	420.21	J-152	J-62	8	PVC	120	0	26.1	0.1666
P-136	387.64	J-132	J-59	6	PVC	118	0	1.12	0.0127
P-138	457.26	J-182	J-57	8	PVC	120	0	24.03	0.1534
P-139	594.57	J-17	J-163	8	PVC	120	0	23.19	0.148
P-140	290.10	J-163	J-184	8	PVC	120	0	8.62	0.055
P-142	307.83	J-87	J-28	8	Ductile Iron	120	0	0.68	0.0044
P-143	155.24	J-90	J-86	8	Ductile Iron	120	0	11.42	0.0729
P-144	1255.49	J-86	J-64	8	Ductile Iron	120	0	11	0.0702
P-145	74.1	J-188	J-168	8	Ductile Iron	120	0	25.48	0.1626

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-146	692.44	J-168	J-89	8	Ductile Iron	120	0	24.23	0.1546
P-148	174.33	J-153	J-132	6	PVC	118	0	-2.17	0.0246
P-149	2.77	J-99	J-181	6	Ductile Iron	118	0	13.83	0.1569
P-150	320.24	J-181	J-119	6	Ductile Iron	118	0	10.41	0.1181
P-153	271.48	J-83	J-158	8	PVC	120	0	31.08	0.1984
P-154	149.44	J-158	J-69	8	PVC	120	0	25.9	0.1653
P-155	38.19	J-119	J-103	6	Ductile Iron	118	0	9.59	0.1088
P-156	256.87	J-103	J-173	6	Ductile Iron	118	0	8.76	0.0994
P-158	167.06	J-147	J-153	6	PVC	118	0	-1.35	0.0153
P-165	354.59	J-173	J-140	6	Ductile Iron	118	0	1.05	0.0119
P-166	36.97	J-140	J-21	6	Ductile Iron	118	0	0.22	0.0026
P-167	234.48	J-21	J-149	6	Ductile Iron	118	0	-0.19	0.0022
P-168	667.95	J-149	J-124	6	Ductile Iron	118	0	-0.61	0.0069
P-170	32.85	J-72	J-147	6	PVC	118	0	-1.28	0.0145
P-171	602.58	J-159	J-11	8	Ductile Iron	120	0	3	0.0192
P-172	16.45	J-11	J-100	8	Ductile Iron	120	0	2.59	0.0165
P-174	709.29	J-115	J-138	6	Ductile Iron	118	0	1.09	0.0124
P-175	31.56	J-143	J-194	4	Ductile Iron	118	0	-2.04	0.052
P-176	106.16	J-111	J-197	4	Ductile Iron	118	0	-1.24	0.0316
P-179	174.48	J-65	J-199	6	Ductile Iron	118	0	5.36	0.0608
P-180	345.1	J-199	J-179	6	Ductile Iron	118	0	4.95	0.0561
P-184	196.49	J-200	J-125	4	Ductile Iron	118	0	1.07	0.0273
P-186	349.06	J-186	J-202	6	Ductile Iron	118	0	0.17	0.002
P-187	137.88	J-202	J-126	4	Ductile Iron	118	0	-0.25	0.0063
P-188	26.26	H-PROP5	J-202	6	Ductile Iron	118	4.1	0	0
P-191	332.15	J-205	J-200	8	Ductile Iron	120	0	6.88	0.0439
P-192	267.58	J-205	J-206	8	Ductile Iron	120	0	11.92	0.0761
P-193	51.71	J-98	J-207	8	Ductile Iron	120	0	-14.65	0.0935
P-194	98.52	J-207	J-36	8	Ductile Iron	120	0	-3.56	0.0227
P-195	140.31	J-206	J-207	8	Ductile Iron	120	0	11.51	0.0735
P-196	253.18	J-121	J-208	4	Ductile Iron	118	0	0.4	0.0103

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-197	252.51	J-208	J-101	4	Ductile Iron	118	0	-0.01	0.0002
P-198	259.7	J-176	J-31	6	Ductile Iron	118	0	-1.59	0.0181
P-200	403.14	J-129	J-72	6	PVC	118	0	-0.86	0.0097
P-201	863.58	J-169	J-210	6	Ductile Iron	118	0	2.18	0.0247
P-203	36.2	I-PROP10	J-169	6	Ductile Iron	118	4.1	0	0
P-205	397.64	J-46	J-211	8	Ductile Iron	120	0	12.5	0.0798
P-206	193.01	J-211	J-185	8	Ductile Iron	120	0	23.77	0.1517
P-207	751.28	J-211	J-8	8	Ductile Iron	120	0	-11.68	0.0746
P-209	175.35	J-111	J-110	4	Ductile Iron	118	0	0.41	0.0105
P-210	475.12	J-167	J-212	4	Ductile Iron	118	0	-0.41	0.0105
P-211	367.12	J-212	J-168	8	Ductile Iron	120	0	-0.83	0.0053
P-212	47.52	H-PROP1	J-212	4	Ductile Iron	118	4.1	0	0.0001
P-213	40.67	H-PROP2	J-165	6	Ductile Iron	118	4.1	0	0
P-218	375.69	J-144	J-164	6	Ductile Iron	118	0	-4.17	0.0473
P-219	226.84	J-144	J-215	6	Ductile Iron	118	0	2.93	0.0332
P-220	246.92	J-215	J-145	4	Ductile Iron	118	0	0.41	0.0105
P-221	137.09	J-164	J-216	8	Ductile Iron	120	0	19.23	0.1227
P-223	216.72	J-215	J-216	6	Ductile Iron	118	0	2.1	0.0239
P-224	841.14	J-216	J-217	8	Ductile Iron	120	0	20.92	0.1335
P-225	91.35	J-217	J-178	8	Ductile Iron	120	0	20.09	0.1282
P-227	296.54	J-217	J-219	4	Ductile Iron	118	0	0.41	0.0105
P-228	27.13	J-112	H-PROP11	6	Ductile Iron	118	4.1	0.01	0.0001
P-231	59.48	J-87	FH-E2	6	Ductile Iron	118	4.1	0	0
P-236	59.52	J-200	J-222	8	Ductile Iron	120	0	5.4	0.0345
P-237	681.4	J-222	J-186	8	Ductile Iron	120	0	4.98	0.0318
P-238	28.02	J-222	FH-PROP4	6	Ductile Iron	118	4.1	0	0
P-239	268.66	J-51	J-223	8	Ductile Iron	120	0	-0.83	0.0053
P-240	241.57	J-223	J-182	8	Ductile Iron	120	0	-1.24	0.0079
P-242	369.91	J-179	J-224	6	Ductile Iron	118	0	4.54	0.0515
P-243	237.69	J-224	J-133	6	Ductile Iron	118	0	4.12	0.0467
P-244	36.4	H-PROP6	J-224	6	Ductile Iron	118	4.1	-0.01	0.0001

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-245	704.78	J-135	J-225	8	Ductile Iron	120	0	19.64	0.1253
P-246	49.91	J-225	J-205	8	Ductile Iron	120	0	19.22	0.1227
P-247	27.09	H-PROP3	J-225	6	Ductile Iron	118	4.1	0	0
P-248	313.82	J-107	J-226	6	Ductile Iron	118	0	0.83	0.0094
P-249	50.57	J-226	J-150	6	Ductile Iron	118	0	0.41	0.0047
P-250	30.59	H-PROP7	J-226	6	Ductile Iron	118	0	-0.01	0.0001
P-251	227.88	J-106	J-227	2	Ductile Iron	118	0	0.41	0.0421
P-252	113.54	J-162	J-228	8	Ductile Iron	120	0	5.03	0.0321
P-253	828.62	J-228	J-136	8	Ductile Iron	120	0	4.61	0.0294
P-254	24.99	H-PROP8	J-228	6	Ductile Iron	118	4.1	0	0
P-255	458.59	J-141	J-229	8	Ductile Iron	120	0	1.66	0.0106
P-256	49.96	J-229	J-130	8	Ductile Iron	120	0	1.24	0.0079
P-257	28.4	H-PROP9	J-229	6	Ductile Iron	118	4.1	0	0
P-266	74.46	J-181	PRV-4	8	Ductile Iron	120	0	3	0.0192
P-267	1145.08	PRV-4	J-41	8	Ductile Iron	120	0	3.02	0.0193
P-268	86.41	J-138	PRV-5	8	Ductile Iron	120	0	0.67	0.0043
P-269	1285.12	PRV-5	J-87	8	Ductile Iron	120	0	0.69	0.0044
P-271	494.46	J-59	J-233	6	Ductile Iron	118	0	0.7	0.008
P-272	320.77	J-233	J-44	6	Ductile Iron	118	0	-0.46	0.0053
P-273	350	J-233	J-234	6	Ductile Iron	118	0	0.76	0.0086
P-274	530.31	J-234	J-147	6	Ductile Iron	118	0	0.34	0.0039
P-275	476.97	J-155	J-121	4	Ductile Iron	118	0	0.82	0.0209
P-277	375.45	J-100	J-115	6	Ductile Iron	118	0	1.91	0.0217
P-278	69.44	PRV-6	J-194	8	Ductile Iron	120	0	9.74	0.0622
P-279	61.82	J-161	PRV-6	8	Ductile Iron	120	0	9.75	0.0623
P-282	72.81	R-2	J-245	24	Ductile Iron	130	0	31.45	0.0223
P-290	675.9	J-194	J-162	8	Ductile Iron	120	0	7.29	0.0466
P-301	1592.21	J-245	PRV-10	6	Ductile Iron	118	0	31.46	0.357
P-302	38.3	PRV-10	J-83	6	Ductile Iron	118	0	31.5	0.3575

Cascade Metro District Proposed Water System Age at Nodes ADD With New Feed Line

Label	Age (Calculated) (hours)	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	CSU Water Testing Location
J-245	0.10	7803	0	7993	82	
J-8	11.15	7443	0.41	7847	175	
J-11	41.47	7492	0.41	7847	154	
J-15	9.98	7661	0.41	7847	81	
J-17	7.40	7589	0.41	7847	112	
J-21	60.01	7476	0.41	7847	161	
J-24	5.11	7730	0.41	7847	51	
J-26	27.66	7557	0.41	7847	126	
J-28	170.59	7279	0.67	7706	185	2
J-30	28.65	7609	0.41	7847	103	
J-31	40.43	7528	0.41	7847	138	
J-34	15.38	7655	0.41	7847	83	
J-36	35.26	7394	0.41	7847	196	
J-37	75.06	7470	0.41	7847	163	
J-41	41.45	7327	0.41	7750	183	
J-44	26.64	7435	0.41	7847	178	
J-46	11.10	7493	0.41	7847	153	
J-48	9.29	7473	0.41	7847	162	
J-50	60.29	7515	0.41	7847	144	
J-51	28.37	7529	0.41	7847	138	
J-53	2.80	7609	0.41	7847	103	
J-57	6.68	7562	0.41	7847	124	
J-59	23.52	7483	0.41	7847	158	
J-62	5.75	7540	0.41	7847	133	
J-64	10.23	7621	0.41	7847	98	
J-65	7.29	7435	0.41	7847	178	
J-68	27.81	7441	0.41	7847	176	
J-69	2.07	7625	0.41	7847	96	
J-72	35.22	7543	0.41	7847	132	
J-73	45.81	7551	0.41	7847	128	
J-75	3.37	7594	0.41	7847	110	
J-78	14.67	7403	0.41	7847	192	
J-79	14.69	7696	0.41	7847	66	
J-80	14.08	7696	0.41	7847	66	6
J-82	9.14	7482	0.41	7847	158	
J-83	1.44	7611	0.41	7847	102	3
J-86	5.27	7493	0.41	7847	153	
J-87	152.10	7313	0	7706	170	
J-89	1.47	7480	0.41	7847	159	4
J-90	4.67	7473	0.41	7847	162	
J-92	90.16	7469	0.41	7847	163	
J-93	36.82	7431	0.41	7847	180	
J-96	13.65	7403	0.41	7847	192	
J-98	22.72	7380	0.41	7847	202	

Cascade Metro District Proposed Water System Age at Nodes ADD With New Feed Line

Label	Age (Calculated) (hours)	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	CSU Water Testing Location
J-99	23.76	7376	0.41	7847	204	
J-100	45.41	7492	0.41	7847	154	
J-101	49.27	7480	0.41	7847	159	
J-102	33.52	7402	0.41	7847	192	
J-103	24.71	7417	0.41	7847	186	
J-104	13.29	7505	0.41	7847	148	
J-105	9.04	7492	0.41	7847	154	
J-106	17.83	7614	0.41	7847	101	
J-107	36.39	7594	0.41	7847	110	
J-109	8.31	7542	0.41	7847	132	
J-110	12.70	7461	0.41	7847	167	
J-111	8.08	7452	0.41	7847	171	
J-112	77.91	7353	0.41	7847	214	
J-113	60.43	7361	0.41	7847	210	
J-114	51.33	7463	0.41	7847	166	
J-115	50.18	7477	0.41	7847	160	
J-117	10.57	7470	0.41	7847	163	
J-119	24.61	7402	0.41	7847	192	
J-120	25.98	7417	0.41	7847	186	
J-121	34.06	7465	0.41	7847	165	
J-123	29.93	7580	0.41	7847	116	
J-124	28.40	7552	0.41	7847	128	
J-125	20.85	7520	0.41	7847	142	
J-126	30.03	7500	0.41	7847	150	
J-129	46.62	7567	0.41	7847	121	
J-130	28.38	7455	0.41	7847	170	
J-131	35.26	7495	0.41	7847	152	
J-132	15.06	7511	0.41	7847	145	
J-133	13.21	7482	0.41	7847	158	
J-134	19.17	7398	0.41	7847	195	
J-135	15.07	7398	0.41	7847	195	
J-136	27.31	7614	0.41	7847	101	
J-137	44.79	7594	0.41	7847	109	
J-138	66.15	7461	0.41	7847	167	
J-139	42.01	7474	0.41	7847	161	
J-140	33.72	7476	0.41	7847	161	
J-141	14.57	7404	0.41	7847	192	
J-142	33.58	7460	0.41	7847	168	
J-143	14.65	7655	0.41	7847	83	
J-144	3.90	7504	0.41	7847	148	
J-145	12.31	7491	0.41	7847	154	
J-147	34.59	7542	0.41	7847	132	
J-149	55.20	7499	0.41	7847	151	
J-150	48.68	7585	0.41	7847	113	

Cascade Metro District Proposed Water System Age at Nodes ADD With New Feed Line

Label	Age (Calculated) (hours)	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	CSU Water Testing Location
J-151	9.03	7663	0.41	7847	80	
J-152	5.05	7572	0.41	7847	119	
J-153	17.03	7527	0.41	7847	138	
J-154	37.02	7557	0.41	7847	126	
J-155	27.71	7441	0.41	7847	176	
J-157	5.01	7730	0.41	7847	51	
J-158	1.82	7620	0.41	7847	98	
J-159	32.74	7511	0.41	7847	146	
J-161	13.90	7655	0.41	7847	83	
J-162	18.51	7611	0.41	7847	102	
J-163	8.52	7497	0.41	7847	152	
J-164	1.69	7478	0.41	7847	160	
J-165	31.41	7580	0.41	7847	116	
J-167	31.98	7458	0.41	7847	169	
J-168	0.23	7436	0.41	7847	178	8
J-169	47.49	7320	0.41	7750	186	
J-173	25.43	7435	0.41	7847	178	
J-174	34.27	7568	0.41	7847	121	
J-176	44.42	7525	0.41	7847	139	
J-177	72.87	7470	0.41	7847	163	
J-178	4.57	7473	0.41	7847	162	
J-179	9.80	7423	0.41	7847	183	
J-180	9.98	7733	0.41	7847	49	
J-181	23.86	7376	0.41	7847	204	
J-182	5.85	7541	0.41	7847	132	
J-183	38.72	7531	0.41	7847	137	
J-184	9.45	7454	0.41	7847	170	
J-185	13.54	7408	0.41	7847	190	
J-186	25.28	7464	0.41	7847	166	5
J-188	0.10	7444	0.41	7847	175	
J-190	53.78	7495	0.41	7847	152	
J-194	14.48	7647	0.41	7847	86	
J-197	7.14	7436	0.41	7847	178	
J-199	8.09	7431	0.41	7847	180	
J-200	18.85	7473	0.41	7847	162	
J-202	52.06	7490	0.41	7847	155	
J-205	16.75	7425	0.41	7847	183	
J-206	17.73	7409	0.41	7847	190	
J-207	22.56	7386	0.41	7847	199	
J-208	44.15	7490	0.41	7847	155	
J-210	57.19	7302	2.18	7750	194	1
J-211	13.19	7436	0.41	7847	178	
J-212	19.45	7445	0.41	7847	174	
J-215	5.79	7498	0.41	7847	151	

Cascade Metro District Proposed Water System Age at Nodes ADD With New Feed Line

Label	Age (Calculated) (hours)	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	CSU Water Testing Location
J-216	2.62	7478	0.41	7847	160	
J-217	4.38	7474	0.41	7847	162	
J-219	12.20	7530	0.41	7847	137	
J-222	19.33	7472	0.41	7847	162	
J-223	14.30	7535	0.41	7847	135	
J-224	11.79	7470	0.41	7847	163	
J-225	16.64	7423	0.41	7847	184	
J-226	45.65	7586	0.41	7847	113	
J-227	19.33	7610	0.41	7847	103	
J-228	19.49	7606	0.41	7847	104	7
J-229	26.62	7450	0.41	7847	172	
J-233	41.83	7477	0.41	7847	160	
J-234	53.15	7525	0.41	7847	139	

AMENDMENT NO. 1

APPENDIX G7 – PROPOSED MAXIMUM DAY

Cascade Metro District Proposed Water System MDD with Addtl Feed Line (Nodes)

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-245	7803	0	7993	82
J-8	7443	1.07	7847	175
J-11	7492	1.07	7847	153
J-15	7661	1.07	7847	81
J-17	7589	1.07	7847	112
J-21	7476	1.07	7847	161
J-24	7730	1.07	7847	51
J-26	7557	1.07	7847	125
J-28	7279	0.67	7706	185
J-30	7609	1.07	7847	103
J-31	7528	1.07	7847	138
J-34	7655	1.07	7847	83
J-36	7394	1.07	7847	196
J-37	7470	1.07	7847	163
J-41	7327	1.07	7750	183
J-44	7435	1.07	7847	178
J-46	7493	1.07	7847	153
J-48	7473	1.07	7847	162
J-50	7515	1.07	7847	144
J-51	7529	1.07	7847	138
J-53	7609	1.07	7847	103
J-57	7562	1.07	7847	124
J-59	7483	1.07	7847	157
J-62	7540	1.07	7847	133
J-64	7621	1.07	7847	98
J-65	7435	1.07	7847	178
J-68	7441	1.07	7847	176
J-69	7625	1.07	7847	96
J-72	7543	1.07	7847	132
J-73	7551	1.07	7847	128
J-75	7594	1.07	7847	110
J-78	7403	1.07	7847	192
J-79	7696	1.07	7847	66
J-80	7696	1.07	7847	66
J-82	7482	1.07	7847	158
J-83	7611	1.07	7847	102
J-86	7493	1.07	7847	153
J-87	7313	0	7706	170
J-89	7480	1.07	7847	159
J-90	7473	1.07	7847	162
J-92	7469	1.07	7847	163
J-93	7431	1.07	7847	180
J-96	7403	1.07	7847	192
J-98	7380	1.07	7847	202
J-99	7376	1.07	7847	204

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-100	7492	1.07	7847	153
J-101	7480	1.07	7847	159
J-102	7402	1.07	7847	192
J-103	7417	1.07	7847	186
J-104	7505	1.07	7847	148
J-105	7492	1.07	7847	154
J-106	7614	1.07	7847	101
J-107	7594	1.07	7847	109
J-109	7542	1.07	7847	132
J-110	7461	1.07	7847	167
J-111	7452	1.07	7847	171
J-112	7353	1.07	7847	214
J-113	7361	1.07	7847	210
J-114	7463	1.07	7847	166
J-115	7477	1.07	7847	160
J-117	7470	1.07	7847	163
J-119	7402	1.07	7847	192
J-120	7417	1.07	7847	186
J-121	7465	1.07	7847	165
J-123	7580	1.07	7847	116
J-124	7552	1.07	7847	128
J-125	7520	1.07	7847	141
J-126	7500	1.07	7847	150
J-129	7567	1.07	7847	121
J-130	7455	1.07	7847	170
J-131	7495	1.07	7847	152
J-132	7511	1.07	7847	145
J-133	7482	1.07	7847	158
J-134	7398	1.07	7847	194
J-135	7398	1.07	7847	194
J-136	7614	1.07	7847	101
J-137	7594	1.07	7847	109
J-138	7461	1.07	7847	167
J-139	7474	1.07	7847	161
J-140	7476	1.07	7847	161
J-141	7404	1.07	7847	192
J-142	7460	1.07	7847	168
J-143	7655	1.07	7847	83
J-144	7504	1.07	7847	148
J-145	7491	1.07	7847	154
J-147	7542	1.07	7847	132
J-149	7499	1.07	7847	151
J-150	7585	1.07	7847	113
J-151	7663	1.07	7847	80
J-152	7572	1.07	7847	119

Cascade Metro District Proposed Water System MDD with Addtl Feed Line (Nodes)

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-153	7527	1.07	7847	138
J-154	7557	1.07	7847	126
J-155	7441	1.07	7847	176
J-157	7730	1.07	7847	51
J-158	7620	1.07	7847	98
J-159	7511	1.07	7847	146
J-161	7655	1.07	7847	83
J-162	7611	1.07	7847	102
J-163	7497	1.07	7847	152
J-164	7478	1.07	7847	160
J-165	7580	1.07	7847	116
J-167	7458	1.07	7847	169
J-168	7436	1.07	7847	178
J-169	7320	1.07	7750	186
J-173	7435	1.07	7847	178
J-174	7568	1.07	7847	121
J-176	7525	1.07	7847	139
J-177	7470	1.07	7847	163
J-178	7473	1.07	7847	162
J-179	7423	1.07	7847	183
J-180	7733	1.07	7847	49
J-181	7376	1.07	7847	204
J-182	7541	1.07	7847	132
J-183	7531	1.07	7847	137
J-184	7454	1.07	7847	170
J-185	7408	1.07	7847	190
J-186	7464	1.07	7847	166
J-188	7444	1.07	7847	175
J-190	7495	1.07	7847	152
J-194	7647	1.07	7847	86
J-197	7436	1.07	7847	178
J-199	7431	1.07	7847	180
J-200	7473	1.07	7847	162
J-202	7490	1.07	7847	154
J-205	7425	1.07	7847	183
J-206	7409	1.07	7847	190
J-207	7386	1.07	7847	199
J-208	7490	1.07	7847	154
J-210	7302	2.18	7750	194
J-211	7436	1.07	7847	178
J-212	7445	1.07	7847	174
J-215	7498	1.07	7847	151
J-216	7478	1.07	7847	160
J-217	7474	1.07	7847	161
J-219	7530	1.07	7847	137

Cascade Metro District Proposed Water System MDD with Addtl Feed Line (Nodes)

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-222	7472	1.07	7847	162
J-223	7535	1.07	7847	135
J-224	7470	1.07	7847	163
J-225	7423	1.07	7847	183
J-226	7586	1.07	7847	113
J-227	7610	1.07	7847	103
J-228	7606	1.07	7847	104
J-229	7450	1.07	7847	172
J-233	7477	1.07	7847	160
J-234	7525	1.07	7847	139

Cascade Metro District Proposed Water System MDD and Addtl Feed Line (Pipelines)

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
Main (Polyline)-10	36.82	J-8	FH-W8	6	PVC	118	4.1	0	0
Main (Polyline)-99	12.49	FH-E7	J-11	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-20	23.75	FH-W13	J-168	6	Ductile Iron	118	4.1	-0.01	0.0001
Main (Polyline)-33	29.78	FH-W15	J-15	6	PVC	118	4.1	0	0
Main (Polyline)-32	42.54	FH-W10	J-17	6	PVC	118	4.1	0	0
Main (Polyline)-88	27.61	FH-E13	J-21	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-95	13.09	FH-E14	J-26	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-102	21.34	FH-E1	J-28	6	Ductile Iron	130	0	0	0
Main (Polyline)-105	10.39	FH-E11	J-30	4	Ductile Iron	118	4.1	0	0.0001
Main (Polyline)-87	38.71	J-31	FH-E10	6	PVC	118	4.1	0.01	0.0001
Main (Polyline)-96	22.43	FH-E15	J-34	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-12	12.7	FH-W3	J-36	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-100	20.87	J-37	FH-E4	6	PVC	118	4.1	0	0
Main (Polyline)-8	15.79	J-41	FH-W1	4	Ductile Iron	118	4.1	0	0.0001
Main (Polyline)-98	30.17	FH-E12	J-44	6	PVC	118	4.1	-0.01	0.0001
Main (Polyline)-11	32.89	FH-W7	J-46	6	PVC	118	4.1	0	0
Main (Polyline)-107	37.07	FH-E20	J-48	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-22	37.79	FH-E5	J-50	6	PVC	118	4.1	0	0
Main (Polyline)-1	39.42	J-51	FH-W17	6	PVC	118	4.1	0	0
Main (Polyline)-2	18.79	J-53	FH-W19	6	PVC	118	4.1	0	0
Main (Polyline)-13	21.34	J-57	FH-W11	6	PVC	118	4.1	0	0
Main (Polyline)-9	52.79	J-59	FH-E17	6	PVC	118	4.1	0.01	0.0001
Main (Polyline)-106	30.66	FH-W14	J-62	6	PVC	118	4.1	-0.01	0.0001
Main (Polyline)-17	30.24	FH-E18	J-64	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-7	22.32	J-65	FH-E22	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-89	32.07	FH-E9	J-68	6	Ductile Iron	118	4.1	-0.01	0.0001
Main (Polyline)-3	22.91	J-69	FH-W20	6	PVC	118	4.1	0.01	0.0001
Main (Polyline)-97	31.35	FH-E16	J-72	6	PVC	118	4.1	0	0
Main (Polyline)-104	29.63	J-73	FH-E8	6	PVC	118	4.1	0.01	0.0001
Main (Polyline)-6	32.85	J-75	FH-W16	6	PVC	118	4.1	0.01	0.0001
Main (Polyline)-42	34.64	FH-W5	J-78	6	Ductile Iron	118	4.1	0	0

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
Main (Polyline)-30	41.29	J-79	J-80	3	Ductile Iron	118	0	-1.07	0.0483
Main (Polyline)-36	74.83	FH-W9	J-82	6	PVC	118	4.1	0	0
Main (Polyline)-4	32.43	J-83	FH-W22	6	PVC	118	4.1	0	0
Main (Polyline)-54	31.49	FH-E21	J-89	6	Ductile Iron	118	4.1	0	0
Main (Polyline)-15	44.42	J-48	J-90	8	Ductile Iron	120	0	-1.07	0.0068
Main (Polyline)-103	29.11	FH-E3	J-92	6	PVC	118	4.1	-0.01	0.0001
Main (Polyline)-31	38.25	J-93	FH-W4	4	Ductile Iron	118	4.1	0.01	0.0002
Main (Polyline)-86	201.46	J-98	J-99	8	Ductile Iron	120	0	14.45	0.0922
Main (Polyline)-48	151.08	J-100	J-101	4	Ductile Iron	118	0	1.2	0.0305
Main (Polyline)-66	148.55	J-102	J-103	6	Ductile Iron	118	0	-1.07	0.0121
Main (Polyline)-37	161.28	J-104	J-105	4	PVC	118	0	-1.07	0.0272
Main (Polyline)-71	164.35	J-106	J-107	6	Ductile Iron	118	0	2.11	0.024
Main (Polyline)-38	167.32	J-144	J-109	4	Ductile Iron	118	0	1.07	0.0272
Main (Polyline)-14	168.29	J-112	J-113	8	Ductile Iron	120	0	-1.07	0.0068
Main (Polyline)-24	174.44	J-114	J-115	2	PVC	118	0	-1.07	0.1088
Main (Polyline)-74	207.69	J-119	J-120	2	PVC	118	0	1.07	0.1088
Main (Polyline)-43	232.01	J-123	J-124	2	Galvanized iron	100	0	-1.07	0.1088
Main (Polyline)-64	554.76	J-125	J-126	4	Ductile Iron	118	0	1.51	0.0385
Main (Polyline)-70	256.2	J-107	J-129	6	PVC	118	0	-1.09	0.0123
Main (Polyline)-50	260.89	J-130	J-131	4	Ductile Iron	118	0	1.07	0.0272
Main (Polyline)-45	280.04	J-132	J-133	6	Ductile Iron	118	0	-9.61	0.1091
Main (Polyline)-29	276.05	J-134	J-135	3	Ductile Iron	118	0	-1.07	0.0483
Main (Polyline)-53	294.55	J-136	J-137	6	Ductile Iron	118	0	1.07	0.0121
Main (Polyline)-27	313.82	J-139	J-140	4	Ductile Iron	118	0	-1.07	0.0272
Main (Polyline)-47	444.38	J-93	J-186	4	Ductile Iron	118	0	-1.07	0.0274
Main (Polyline)-51	757.93	J-153	J-154	4	Ductile Iron	118	0	1.07	0.0272
Main (Polyline)-34	621.9	J-157	J-158	6	PVC	118	0	-7.82	0.0887
P-5	333.48	J-190	J-100	6	PVC	118	0	0.52	0.0059
P-6	335.82	J-176	J-190	6	Ductile Iron	118	0	2.79	0.0316
P-11	37.21	R-1	J-188	36	PVC	150	0	107.68	0.0339
P-12	27.02	J-24	FH-W21	6	PVC	118	4.1	0	0

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-20	625.18	J-155	J-113	8	Ductile Iron	120	0	2.14	0.0136
P-30	911.45	J-36	J-186	8	Ductile Iron	120	0	-8.82	0.0563
P-35	472.84	J-8	J-184	8	PVC	120	0	-30.18	0.1926
P-36	729.25	J-184	J-188	8	PVC	120	0	-40.85	0.2607
P-37	94.6	J-117	J-111	4	Ductile Iron	118	0	-1.07	0.0272
P-40	44.12	J-44	J-173	6	PVC	118	0	-2.15	0.0243
P-41	169.18	J-163	J-105	8	PVC	120	0	32.82	0.2095
P-44	435.14	J-30	J-174	8	Ductile Iron	120	0	8.52	0.0544
P-46	295.96	J-177	J-92	6	Ductile Iron	118	0	1.07	0.0122
P-50	197.04	J-130	J-142	4	Ductile Iron	118	0	1.07	0.0272
P-51	679.54	J-151	J-80	3	Ductile Iron	118	0	2.13	0.0967
P-53	49.49	J-151	J-15	8	PVC	120	0	1.42	0.0091
P-54	507.15	J-15	J-152	8	PVC	120	0	0.35	0.0022
P-61	188.12	J-180	J-157	4	PVC	118	0	-1.07	0.0272
P-66	470.95	J-144	J-165	6	Ductile Iron	118	0	1.07	0.0122
P-67	14.32	J-161	J-34	8	Ductile Iron	120	0	1.07	0.0068
P-71	442.25	J-190	J-50	6	PVC	118	0	3.76	0.0427
P-72	639.2	J-50	J-177	6	Ductile Iron	118	0	2.69	0.0305
P-73	445.7	J-68	J-159	8	Ductile Iron	120	0	9.36	0.0597
P-82	36.65	J-62	J-182	8	PVC	120	0	30.69	0.1959
P-83	107.68	J-138	J-37	6	Ductile Iron	118	0	0.52	0.0059
P-84	11.79	J-37	J-177	6	Ductile Iron	118	0	-0.55	0.0062
P-86	116.86	J-136	J-30	8	Ductile Iron	120	0	9.6	0.0613
P-88	331.37	J-53	J-75	8	PVC	120	0	33.55	0.2141
P-89	20.78	J-105	J-82	8	PVC	120	0	30.69	0.1959
P-90	582.81	J-82	J-46	8	PVC	120	0	29.62	0.1891
P-92	43	J-124	J-26	6	Ductile Iron	118	0	-3.89	0.0441
P-93	691.31	J-26	J-162	6	Ductile Iron	118	0	-4.96	0.0563
P-97	98.07	J-183	J-51	8	PVC	120	0	-1.07	0.0068
P-99	18.11	J-157	J-24	4	Ductile Iron	118	0	5.69	0.1452
P-100	1268.73	J-24	J-151	4	PVC	118	0	4.62	0.1178

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-101	393.57	J-57	J-17	8	PVC	120	0	25.35	0.1618
P-103	139.73	J-99	J-98	8	Ductile Iron	120	0	-17.6	0.1124
P-105	779.41	J-178	J-197	6	Ductile Iron	118	0	19.21	0.218
P-106	35.61	J-197	J-65	6	Ductile Iron	118	0	14.95	0.1696
P-107	14.62	J-178	J-90	8	Ductile Iron	120	0	31.6	0.2017
P-109	55.85	J-185	J-96	8	Ductile Iron	120	0	55.53	0.3544
P-110	487.04	J-96	J-141	8	Ductile Iron	120	0	54.46	0.3476
P-111	692.03	J-174	J-73	6	Ductile Iron	118	0	3.63	0.0412
P-112	456.88	J-73	J-190	6	Ductile Iron	118	0	2.56	0.0291
P-115	143.84	J-159	J-31	6	Ductile Iron	118	0	1.1	0.0125
P-116	395.54	J-31	J-174	6	Ductile Iron	118	0	-3.83	0.0434
P-118	360.79	J-41	J-169	8	Ductile Iron	120	0	3.25	0.0208
P-122	426.69	J-69	J-53	8	PVC	120	0	34.62	0.221
P-124	120.34	J-89	J-164	8	Ductile Iron	120	0	61.47	0.3924
P-126	890.41	J-64	J-161	8	Ductile Iron	120	0	27.33	0.1744
P-128	269.5	J-28	FH-E24	8	Ductile Iron	120	0	0	0
P-129	44.91	J-141	J-78	8	Ductile Iron	120	0	49.13	0.3136
P-130	187.53	J-78	J-135	8	Ductile Iron	120	0	48.06	0.3068
P-131	336.66	J-173	J-155	8	Ductile Iron	120	0	15.63	0.0998
P-132	3.65	J-155	J-68	8	Ductile Iron	120	0	10.43	0.0666
P-133	230.58	J-75	J-152	8	PVC	120	0	32.48	0.2073
P-134	420.21	J-152	J-62	8	PVC	120	0	31.76	0.2027
P-136	387.64	J-132	J-59	6	PVC	118	0	2.94	0.0334
P-138	457.26	J-182	J-57	8	PVC	120	0	26.43	0.1687
P-139	594.57	J-17	J-163	8	PVC	120	0	24.28	0.155
P-140	290.1	J-163	J-184	8	PVC	120	0	-9.6	0.0613
P-142	307.83	J-87	J-28	8	Ductile Iron	120	0	0.68	0.0044
P-143	155.24	J-90	J-86	8	Ductile Iron	120	0	29.47	0.1881
P-144	1255.49	J-86	J-64	8	Ductile Iron	120	0	28.4	0.1813
P-145	74.1	J-188	J-168	8	Ductile Iron	120	0	65.75	0.4197
P-146	692.44	J-168	J-89	8	Ductile Iron	120	0	62.54	0.3992

Cascade Metro District Proposed Water System MDD and Addtl Feed Line (Pipelines)

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-148	174.33	J-153	J-132	6	PVC	118	0	-5.61	0.0636
P-149	2.77	J-99	J-181	6	Ductile Iron	118	0	30.99	0.3516
P-150	320.24	J-181	J-119	6	Ductile Iron	118	0	25.61	0.2906
P-153	271.48	J-83	J-158	8	PVC	120	0	44.57	0.2845
P-154	149.44	J-158	J-69	8	PVC	120	0	35.69	0.2278
P-155	38.19	J-119	J-103	6	Ductile Iron	118	0	23.48	0.2664
P-156	256.87	J-103	J-173	6	Ductile Iron	118	0	21.35	0.2423
P-158	167.06	J-147	J-153	6	PVC	118	0	-3.48	0.0394
P-165	354.59	J-173	J-140	6	Ductile Iron	118	0	2.51	0.0285
P-166	36.97	J-140	J-21	6	Ductile Iron	118	0	0.38	0.0043
P-167	234.48	J-21	J-149	6	Ductile Iron	118	0	-0.69	0.0079
P-168	667.95	J-149	J-124	6	Ductile Iron	118	0	-1.76	0.0199
P-170	32.85	J-72	J-147	6	PVC	118	0	-3.22	0.0366
P-171	602.58	J-159	J-11	8	Ductile Iron	120	0	7.19	0.0459
P-172	16.45	J-11	J-100	8	Ductile Iron	120	0	6.12	0.0391
P-174	709.29	J-115	J-138	6	Ductile Iron	118	0	2.26	0.0256
P-176	106.16	J-111	J-197	4	Ductile Iron	118	0	-3.2	0.0816
P-179	174.48	J-65	J-199	6	Ductile Iron	118	0	13.88	0.1575
P-180	345.1	J-199	J-179	6	Ductile Iron	118	0	12.81	0.1454
P-184	196.49	J-200	J-125	4	Ductile Iron	118	0	2.57	0.0657
P-186	349.06	J-186	J-202	6	Ductile Iron	118	0	0.63	0.0071
P-187	137.88	J-202	J-126	4	Ductile Iron	118	0	-0.44	0.0113
P-188	26.26	FH-PROP5	J-202	6	Ductile Iron	118	4.1	0	0
P-191	332.15	J-205	J-200	8	Ductile Iron	120	0	16.29	0.104
P-192	267.58	J-205	J-206	8	Ductile Iron	120	0	27.5	0.1755
P-193	51.71	J-98	J-207	8	Ductile Iron	120	0	-33.12	0.2114
P-194	98.52	J-207	J-36	8	Ductile Iron	120	0	-7.75	0.0495
P-195	140.31	J-206	J-207	8	Ductile Iron	120	0	26.43	0.1687
P-196	253.18	J-121	J-208	4	Ductile Iron	118	0	0.93	0.0238
P-197	252.51	J-208	J-101	4	Ductile Iron	118	0	-0.13	0.0034
P-198	259.7	J-176	J-31	6	Ductile Iron	118	0	-3.85	0.0437

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-200	403.14	J-129	J-72	6	PVC	118	0	-2.15	0.0244
P-201	863.58	J-169	J-210	6	Ductile Iron	118	0	2.18	0.0247
P-203	36.2	FH-PROP10	J-169	6	Ductile Iron	118	4.1	0	0
P-205	397.64	J-46	J-211	8	Ductile Iron	120	0	28.55	0.1822
P-206	193.01	J-211	J-185	8	Ductile Iron	120	0	56.59	0.3612
P-207	751.28	J-211	J-8	8	Ductile Iron	120	0	-29.11	0.1858
P-209	175.35	J-111	J-110	4	Ductile Iron	118	0	1.07	0.0272
P-210	475.12	J-167	J-212	4	Ductile Iron	118	0	-1.07	0.0272
P-211	367.12	J-212	J-168	8	Ductile Iron	120	0	-2.14	0.0136
P-212	47.52	FH-PROP1	J-212	4	Ductile Iron	118	4.1	0	0.0001
P-213	40.67	FH-PROP2	J-165	6	Ductile Iron	118	4.1	0	0
P-218	375.69	J-144	J-164	6	Ductile Iron	118	0	-10.77	0.1222
P-219	226.84	J-144	J-215	6	Ductile Iron	118	0	7.57	0.0858
P-220	246.92	J-215	J-145	4	Ductile Iron	118	0	1.07	0.0272
P-221	137.09	J-164	J-216	8	Ductile Iron	120	0	49.64	0.3168
P-223	216.72	J-215	J-216	6	Ductile Iron	118	0	5.44	0.0617
P-224	841.14	J-216	J-217	8	Ductile Iron	120	0	54.01	0.3447
P-225	91.35	J-217	J-178	8	Ductile Iron	120	0	51.88	0.3311
P-227	296.54	J-217	J-219	4	Ductile Iron	118	0	1.07	0.0272
P-228	27.13	J-112	H-PROP11	6	Ductile Iron	118	4.1	0	0
P-231	59.48	J-87	FH-E2	6	Ductile Iron	118	4.1	0	0
P-236	59.52	J-200	J-222	8	Ductile Iron	120	0	12.66	0.0808
P-237	681.4	J-222	J-186	8	Ductile Iron	120	0	11.59	0.0739
P-238	28.02	J-222	FH-PROP4	6	Ductile Iron	118	4.1	0	0
P-239	268.66	J-51	J-223	8	Ductile Iron	120	0	-2.14	0.0136
P-240	241.57	J-223	J-182	8	Ductile Iron	120	0	-3.2	0.0204
P-242	369.91	J-179	J-224	6	Ductile Iron	118	0	11.75	0.1333
P-243	237.69	J-224	J-133	6	Ductile Iron	118	0	10.68	0.1212
P-244	36.4	FH-PROP6	J-224	6	Ductile Iron	118	4.1	0	0
P-245	704.78	J-135	J-225	8	Ductile Iron	120	0	45.93	0.2932
P-246	49.91	J-225	J-205	8	Ductile Iron	120	0	44.86	0.2863

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-247	27.09	FH-PROP3	J-225	6	Ductile Iron	118	4.1	0	0
P-248	313.82	J-107	J-226	6	Ductile Iron	118	0	2.14	0.0242
P-249	50.57	J-226	J-150	6	Ductile Iron	118	0	1.07	0.0121
P-250	30.59	FH-PROP7	J-226	6	Ductile Iron	118	0	0	0
P-251	227.88	J-106	J-227	2	Ductile Iron	118	0	1.07	0.1088
P-252	113.54	J-162	J-228	8	Ductile Iron	120	0	12.8	0.0817
P-253	828.62	J-228	J-136	8	Ductile Iron	120	0	11.73	0.0748
P-254	24.99	FH-PROP8	J-228	6	Ductile Iron	118	4.1	0	0
P-255	458.59	J-141	J-229	8	Ductile Iron	120	0	4.27	0.0272
P-256	49.96	J-229	J-130	8	Ductile Iron	120	0	3.19	0.0204
P-257	28.4	FH-PROP9	J-229	6	Ductile Iron	118	4.1	0	0
P-266	74.46	J-181	PRV-4	8	Ductile Iron	120	0	4.31	0.0275
P-267	1145.08	PRV-4	J-41	8	Ductile Iron	120	0	4.32	0.0276
P-268	86.41	J-138	PRV-5	8	Ductile Iron	120	0	0.67	0.0043
P-269	1285.12	PRV-5	J-87	8	Ductile Iron	120	0	0.69	0.0044
P-271	494.46	J-59	J-233	6	Ductile Iron	118	0	1.87	0.0212
P-272	320.77	J-233	J-44	6	Ductile Iron	118	0	-1.07	0.0122
P-273	350	J-233	J-234	6	Ductile Iron	118	0	1.88	0.0213
P-274	530.31	J-234	J-147	6	Ductile Iron	118	0	0.81	0.0092
P-275	476.97	J-155	J-121	4	Ductile Iron	118	0	2	0.051
P-277	375.45	J-100	J-115	6	Ductile Iron	118	0	4.39	0.0498
P-282	72.81	R-2	J-245	24	Ductile Iron	130	0	45.58	0.0323
P-290	675.9	J-194	J-162	8	Ductile Iron	120	0	18.82	0.1202
Main (Polyline)-44	474.07	J-143	J-106	4	Ductile Iron	118	0	4.24	0.1083
P-175	31.56	J-143	J-194	4	Ductile Iron	118	0	-5.31	0.1355
P-279	61.82	J-161	PRV-6	8	Ductile Iron	120	0	25.19	0.1608
P-278	69.44	PRV-6	J-194	8	Ductile Iron	120	0	25.2	0.1608
P-301	1592.21	J-245	PRV-10	6	Ductile Iron	118	0	45.59	0.5173
P-302	38.3	PRV-10	J-83	6	Ductile Iron	118	0	45.64	0.5179

AMENDMENT NO. 1

APPENDIX G8 – PROPOSED PEAK HOUR

Cascade Metro District Proposed Water System PHD with Addtl Feed Line (Nodes)

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-245	7803	0.0000	7993	82
J-8	7443	1.4975	7847	175
J-11	7492	1.4975	7847	153
J-15	7661	1.4975	7847	81
J-17	7589	1.4975	7847	112
J-21	7476	1.4975	7847	160
J-24	7730	1.4975	7847	51
J-26	7557	1.4975	7847	125
J-28	7279	0.6700	7706	185
J-30	7609	1.4975	7847	103
J-31	7528	1.4975	7847	138
J-34	7655	1.4975	7847	83
J-36	7394	1.4975	7847	196
J-37	7470	1.4975	7847	163
J-41	7327	1.4975	7750	183
J-44	7435	1.4975	7847	178
J-46	7493	1.4975	7847	153
J-48	7473	1.4975	7847	162
J-50	7515	1.4975	7847	144
J-51	7529	1.4975	7847	138
J-53	7609	1.4975	7847	103
J-57	7562	1.4975	7847	124
J-59	7483	1.4975	7847	157
J-62	7540	1.4975	7847	133
J-64	7621	1.4975	7847	98
J-65	7435	1.4975	7847	178
J-68	7441	1.4975	7847	176
J-69	7625	1.4975	7847	96
J-72	7543	1.4975	7847	131
J-73	7551	1.4975	7847	128
J-75	7594	1.4975	7847	110
J-78	7403	1.4975	7847	192
J-79	7696	1.4975	7847	66
J-80	7696	1.4975	7847	66
J-82	7482	1.4975	7847	158
J-83	7611	1.4975	7847	102
J-86	7493	1.4975	7847	153
J-87	7313	0.0000	7706	170
J-89	7480	1.4975	7847	159
J-90	7473	1.4975	7847	162
J-92	7469	1.4975	7847	163
J-93	7431	1.4975	7847	180
J-96	7403	1.4975	7847	192
J-98	7380	1.4975	7847	202
J-99	7376	1.4975	7847	204

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-100	7492	1.4975	7847	153
J-101	7480	1.4975	7847	159
J-102	7402	1.4975	7847	192
J-103	7417	1.4975	7847	186
J-104	7505	1.4975	7847	148
J-105	7492	1.4975	7847	154
J-106	7614	1.4975	7847	101
J-107	7594	1.4975	7847	109
J-109	7542	1.4975	7847	132
J-110	7461	1.4975	7847	167
J-111	7452	1.4975	7847	171
J-112	7353	1.4975	7847	214
J-113	7361	1.4975	7847	210
J-114	7463	1.4975	7847	166
J-115	7477	1.4975	7847	160
J-117	7470	1.4975	7847	163
J-119	7402	1.4975	7847	192
J-120	7417	1.4975	7847	186
J-121	7465	1.4975	7847	165
J-123	7580	1.4975	7847	115
J-124	7552	1.4975	7847	128
J-125	7520	1.4975	7847	141
J-126	7500	1.4975	7847	150
J-129	7567	1.4975	7847	121
J-130	7455	1.4975	7847	170
J-131	7495	1.4975	7847	152
J-132	7511	1.4975	7847	145
J-133	7482	1.4975	7847	158
J-134	7398	1.4975	7847	194
J-135	7398	1.4975	7847	194
J-136	7614	1.4975	7847	101
J-137	7594	1.4975	7847	109
J-138	7461	1.4975	7847	167
J-139	7474	1.4975	7847	161
J-140	7476	1.4975	7847	160
J-141	7404	1.4975	7847	192
J-142	7460	1.4975	7847	168
J-143	7655	1.4975	7847	83
J-144	7504	1.4975	7847	148
J-145	7491	1.4975	7847	154
J-147	7542	1.4975	7847	132
J-149	7499	1.4975	7847	150
J-150	7585	1.4975	7847	113
J-151	7663	1.4975	7847	80
J-152	7572	1.4975	7847	119

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-153	7527	1.4975	7847	138
J-154	7557	1.4975	7847	125
J-155	7441	1.4975	7847	176
J-157	7730	1.4975	7847	51
J-158	7620	1.4975	7847	98
J-159	7511	1.4975	7847	145
J-161	7655	1.4975	7847	83
J-162	7611	1.4975	7847	102
J-163	7497	1.4975	7847	151
J-164	7478	1.4975	7847	160
J-165	7580	1.4975	7847	115
J-167	7458	1.4975	7847	169
J-168	7436	1.4975	7847	178
J-169	7320	1.4975	7750	186
J-173	7435	1.4975	7847	178
J-174	7568	1.4975	7847	121
J-176	7525	1.4975	7847	139
J-177	7470	1.4975	7847	163
J-178	7473	1.4975	7847	162
J-179	7423	1.4975	7847	183
J-180	7733	1.4975	7847	49
J-181	7376	1.4975	7847	204
J-182	7541	1.4975	7847	132
J-183	7531	1.4975	7847	137
J-184	7454	1.4975	7847	170
J-185	7408	1.4975	7847	190
J-186	7464	1.4975	7847	166
J-188	7444	1.4975	7847	175
J-190	7495	1.4975	7847	152
J-194	7647	1.4975	7847	86
J-197	7436	1.4975	7847	178
J-199	7431	1.4975	7847	180
J-200	7473	1.4975	7847	162
J-202	7490	1.4975	7847	154
J-205	7425	1.4975	7847	183
J-206	7409	1.4975	7847	189
J-207	7386	1.4975	7847	199
J-208	7490	1.4975	7847	154
J-210	7302	2.1800	7750	194
J-211	7436	1.4975	7847	178
J-212	7445	1.4975	7847	174
J-215	7498	1.4975	7847	151
J-216	7478	1.4975	7847	160
J-217	7474	1.4975	7847	161
J-219	7530	1.4975	7847	137

Cascade Metro District Proposed Water System PHD with Addtl Feed Line (Nodes)

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-222	7472	1.4975	7847	162
J-223	7535	1.4975	7847	135
J-224	7470	1.4975	7847	163
J-225	7423	1.4975	7847	183
J-226	7586	1.4975	7847	113
J-227	7610	1.4975	7847	102
J-228	7606	1.4975	7847	104
J-229	7450	1.4975	7847	172
J-233	7477	1.4975	7847	160
J-234	7525	1.4975	7847	139

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
Main (Polyline)-1	39.42	J-51	FH-W17	6	PVC	118	4.1	0.0041	0
Main (Polyline)-2	18.79	J-53	FH-W19	6	PVC	118	4.1	0.0041	0
Main (Polyline)-3	22.91	J-69	FH-W20	6	PVC	118	4.1	0.0041	0
Main (Polyline)-4	32.43	J-83	FH-W22	6	PVC	118	4.1	0.0041	0
Main (Polyline)-6	32.85	J-75	FH-W16	6	PVC	118	4.1	0.0041	0
Main (Polyline)-7	22.32	J-65	FH-E22	6	Ductile Iron	118	4.1	0.0082	0.0001
Main (Polyline)-8	15.79	J-41	FH-W1	4	Ductile Iron	118	4.1	0.0082	0.0002
Main (Polyline)-9	52.79	J-59	FH-E17	6	PVC	118	4.1	0.0041	0
Main (Polyline)-10	36.82	J-8	FH-W8	6	PVC	118	4.1	0.0041	0
Main (Polyline)-11	32.89	FH-W7	J-46	6	PVC	118	4.1	-0.0041	0
Main (Polyline)-12	12.7	FH-W3	J-36	6	Ductile Iron	118	4.1	-0.0041	0
Main (Polyline)-13	21.34	J-57	FH-W11	6	PVC	118	4.1	0.0041	0
Main (Polyline)-14	168.29	J-112	J-113	8	Ductile Iron	120	0	-1.5041	0.0096
Main (Polyline)-15	44.42	J-48	J-90	8	Ductile Iron	120	0	-1.5041	0.0096
Main (Polyline)-17	30.24	FH-E18	J-64	6	Ductile Iron	118	4.1	-0.0041	0
Main (Polyline)-20	23.75	FH-W13	J-168	6	Ductile Iron	118	4.1	-0.0041	0
Main (Polyline)-22	37.79	FH-E5	J-50	6	PVC	118	4.1	-0.0041	0
Main (Polyline)-24	174.44	J-114	J-115	2	PVC	118	0	-1.4975	0.1529
Main (Polyline)-27	313.82	J-139	J-140	4	Ductile Iron	118	0	-1.4975	0.0382
Main (Polyline)-29	276.05	J-134	J-135	3	Ductile Iron	118	0	-1.4975	0.068
Main (Polyline)-30	41.29	J-79	J-80	3	Ductile Iron	118	0	-1.4975	0.068
Main (Polyline)-31	38.25	J-93	FH-W4	4	Ductile Iron	118	4.1	0.0082	0.0002
Main (Polyline)-32	42.54	FH-W10	J-17	6	PVC	118	4.1	-0.0041	0
Main (Polyline)-33	29.78	FH-W15	J-15	6	PVC	118	4.1	-0.0041	0
Main (Polyline)-34	621.9	J-157	J-158	6	PVC	118	0	-10.143	0.1151
Main (Polyline)-36	74.83	FH-W9	J-82	6	PVC	118	4.1	-0.0041	0
Main (Polyline)-37	161.28	J-104	J-105	4	PVC	118	0	-1.4975	0.0382
Main (Polyline)-38	167.32	J-144	J-109	4	Ductile Iron	118	0	1.4975	0.0382
Main (Polyline)-42	34.64	FH-W5	J-78	6	Ductile Iron	118	4.1	-0.0041	0
Main (Polyline)-43	232.01	J-123	J-124	2	Galvanized iron	100	0	-1.4975	0.1529
Main (Polyline)-44	474.07	J-143	J-106	4	Ductile Iron	118	0	5.9837	0.1528

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
Main (Polyline)-45	280.04	J-132	J-133	6	Ductile Iron	118	0	-13.54	0.1536
Main (Polyline)-47	444.38	J-93	J-186	4	Ductile Iron	118	0	-1.5041	0.0384
Main (Polyline)-48	151.08	J-100	J-101	4	Ductile Iron	118	0	1.712	0.0437
Main (Polyline)-50	260.89	J-130	J-131	4	Ductile Iron	118	0	1.4975	0.0382
Main (Polyline)-51	757.93	J-153	J-154	4	Ductile Iron	118	0	1.4975	0.0382
Main (Polyline)-53	294.55	J-136	J-137	6	Ductile Iron	118	0	1.4975	0.017
Main (Polyline)-54	31.49	FH-E21	J-89	6	Ductile Iron	118	4.1	-0.0041	0
Main (Polyline)-64	554.76	J-125	J-126	4	Ductile Iron	118	0	2.0674	0.0528
Main (Polyline)-66	148.55	J-102	J-103	6	Ductile Iron	118	0	-1.4975	0.017
Main (Polyline)-70	256.2	J-107	J-129	6	PVC	118	0	-1.5104	0.0171
Main (Polyline)-71	164.35	J-106	J-107	6	Ductile Iron	118	0	2.9887	0.0339
Main (Polyline)-74	207.69	J-119	J-120	2	PVC	118	0	1.4975	0.1529
Main (Polyline)-86	201.46	J-98	J-99	8	Ductile Iron	120	0	19.747	0.126
Main (Polyline)-87	38.71	J-31	FH-E10	6	PVC	118	4.1	0.0041	0
Main (Polyline)-88	27.61	FH-E13	J-21	6	Ductile Iron	118	4.1	-0.0082	0.0001
Main (Polyline)-89	32.07	FH-E9	J-68	6	Ductile Iron	118	4.1	-0.0041	0
Main (Polyline)-95	13.09	FH-E14	J-26	6	Ductile Iron	118	4.1	-0.0041	0
Main (Polyline)-96	22.43	FH-E15	J-34	6	Ductile Iron	118	4.1	-0.0082	0.0001
Main (Polyline)-97	31.35	FH-E16	J-72	6	PVC	118	4.1	-0.0082	0.0001
Main (Polyline)-98	30.17	FH-E12	J-44	6	PVC	118	4.1	-0.0041	0
Main (Polyline)-99	12.49	FH-E7	J-11	6	Ductile Iron	118	4.1	-0.0082	0.0001
Main (Polyline)-100	20.87	J-37	FH-E4	6	PVC	118	4.1	0.0082	0.0001
Main (Polyline)-102	21.34	FH-E1	J-28	6	Ductile Iron	130	0	-0.0041	0
Main (Polyline)-103	29.11	FH-E3	J-92	6	PVC	118	4.1	-0.0082	0.0001
Main (Polyline)-104	29.63	J-73	FH-E8	6	PVC	118	4.1	0.0041	0
Main (Polyline)-105	10.39	FH-E11	J-30	4	Ductile Iron	118	4.1	-0.0082	0.0002
Main (Polyline)-106	30.66	FH-W14	J-62	6	PVC	118	4.1	-0.0041	0
Main (Polyline)-107	37.07	FH-E20	J-48	6	Ductile Iron	118	4.1	-0.0082	0.0001
P-5	333.48	J-190	J-100	6	PVC	118	0	0.768	0.0087
P-6	335.82	J-176	J-190	6	Ductile Iron	118	0	3.8509	0.0437
P-11	37.21	R-1	J-188	36	PVC	150	0	156.8	0.0494

Cascade Metro District Proposed Water System PHD and Addtl Feed Line (Pipelines)

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-12	27.02	J-24	FH-W21	6	PVC	118	4.1	0.0082	0.0001
P-20	625.18	J-155	J-113	8	Ductile Iron	120	0	3.0016	0.0192
P-30	911.45	J-36	J-186	8	Ductile Iron	120	0	-12.014	0.0767
P-35	472.84	J-8	J-184	8	PVC	120	0	-42.122	0.2689
P-36	729.25	J-184	J-188	8	PVC	120	0	-62.805	0.4009
P-37	94.6	J-117	J-111	4	Ductile Iron	118	0	-1.4975	0.0382
P-40	44.12	J-44	J-173	6	PVC	118	0	-2.9654	0.0336
P-41	169.18	J-163	J-105	8	PVC	120	0	45.181	0.2884
P-44	435.14	J-30	J-174	8	Ductile Iron	120	0	11.947	0.0763
P-46	295.96	J-177	J-92	6	Ductile Iron	118	0	1.5041	0.0171
P-50	197.04	J-130	J-142	4	Ductile Iron	118	0	1.4975	0.0382
P-51	679.54	J-151	J-80	3	Ductile Iron	118	0	2.995	0.1359
P-53	49.49	J-151	J-15	8	PVC	120	0	1.1536	0.0074
P-54	507.15	J-15	J-152	8	PVC	120	0	-0.3509	0.0022
P-61	188.12	J-180	J-157	4	PVC	118	0	-1.4975	0.0382
P-66	470.95	J-144	J-165	6	Ductile Iron	118	0	1.5041	0.0171
P-67	14.32	J-161	J-34	8	Ductile Iron	120	0	1.5041	0.0096
P-71	442.25	J-190	J-50	6	PVC	118	0	5.151	0.0584
P-72	639.2	J-50	J-177	6	Ductile Iron	118	0	3.6486	0.0414
P-73	445.7	J-68	J-159	8	Ductile Iron	120	0	12.936	0.0826
P-82	36.65	J-62	J-182	8	PVC	120	0	36.496	0.2329
P-83	107.68	J-138	J-37	6	Ductile Iron	118	0	0.859	0.0097
P-84	11.79	J-37	J-177	6	Ductile Iron	118	0	-0.6471	0.0073
P-86	116.86	J-136	J-30	8	Ductile Iron	120	0	13.452	0.0859
P-88	331.37	J-53	J-75	8	PVC	120	0	41.353	0.2639
P-89	20.78	J-105	J-82	8	PVC	120	0	42.186	0.2693
P-90	582.81	J-82	J-46	8	PVC	120	0	40.682	0.2597
P-92	43	J-124	J-26	6	Ductile Iron	118	0	-5.5253	0.0627
P-93	691.31	J-26	J-162	6	Ductile Iron	118	0	-7.0293	0.0798
P-97	98.07	J-183	J-51	8	PVC	120	0	-1.4975	0.0096
P-99	18.11	J-157	J-24	4	Ductile Iron	118	0	7.1478	0.1825

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-100	1268.73	J-24	J-151	4	PVC	118	0	5.6461	0.1442
P-101	393.57	J-57	J-17	8	PVC	120	0	28.995	0.1851
P-103	139.73	J-99	J-98	8	Ductile Iron	120	0	-24.061	0.1536
P-105	779.41	J-178	J-197	6	Ductile Iron	118	0	27.035	0.3068
P-106	35.61	J-197	J-65	6	Ductile Iron	118	0	21.045	0.2388
P-107	14.62	J-178	J-90	8	Ductile Iron	120	0	44.461	0.2838
P-109	55.85	J-185	J-96	8	Ductile Iron	120	0	76.799	0.4902
P-110	487.04	J-96	J-141	8	Ductile Iron	120	0	75.302	0.4806
P-111	692.03	J-174	J-73	6	Ductile Iron	118	0	5.0697	0.0575
P-112	456.88	J-73	J-190	6	Ductile Iron	118	0	3.5656	0.0405
P-115	143.84	J-159	J-31	6	Ductile Iron	118	0	1.4711	0.0167
P-116	395.54	J-31	J-174	6	Ductile Iron	118	0	-5.3801	0.061
P-118	360.79	J-41	J-169	8	Ductile Iron	120	0	3.684	0.0235
P-122	426.69	J-69	J-53	8	PVC	120	0	42.86	0.2736
P-124	120.34	J-89	J-164	8	Ductile Iron	120	0	86.478	0.552
P-126	890.41	J-64	J-161	8	Ductile Iron	120	0	38.458	0.2455
P-128	269.5	J-28	FH-E24	8	Ductile Iron	120	0	0.0041	0
P-129	44.91	J-141	J-78	8	Ductile Iron	120	0	67.808	0.4328
P-130	187.53	J-78	J-135	8	Ductile Iron	120	0	66.304	0.4232
P-131	336.66	J-173	J-155	8	Ductile Iron	120	0	21.719	0.1386
P-132	3.65	J-155	J-68	8	Ductile Iron	120	0	14.44	0.0922
P-133	230.58	J-75	J-152	8	PVC	120	0	39.849	0.2543
P-134	420.21	J-152	J-62	8	PVC	120	0	38.001	0.2426
P-136	387.64	J-132	J-59	6	PVC	118	0	4.1545	0.0471
P-138	457.26	J-182	J-57	8	PVC	120	0	30.499	0.1947
P-139	594.57	J-17	J-163	8	PVC	120	0	27.492	0.1755
P-140	290.10	J-163	J-184	8	PVC	120	0	-19.186	0.1225
P-142	307.83	J-87	J-28	8	Ductile Iron	120	0	0.6829	0.0044
P-143	155.24	J-90	J-86	8	Ductile Iron	120	0	41.459	0.2646
P-144	1255.49	J-86	J-64	8	Ductile Iron	120	0	39.962	0.2551
P-145	74.1	J-188	J-168	8	Ductile Iron	120	0	92.49	0.5903

Cascade Metro District Proposed Water System PHD and Addtl Feed Line (Pipelines)

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-146	692.44	J-168	J-89	8	Ductile Iron	120	0	87.984	0.5616
P-148	174.33	J-153	J-132	6	PVC	118	0	-7.8877	0.0895
P-149	2.77	J-99	J-181	6	Ductile Iron	118	0	42.311	0.4801
P-150	320.24	J-181	J-119	6	Ductile Iron	118	0	35.638	0.4044
P-153	271.48	J-83	J-158	8	PVC	120	0	56.004	0.3575
P-154	149.44	J-158	J-69	8	PVC	120	0	44.364	0.2832
P-155	38.19	J-119	J-103	6	Ductile Iron	118	0	32.643	0.3704
P-156	256.87	J-103	J-173	6	Ductile Iron	118	0	29.648	0.3364
P-158	167.06	J-147	J-153	6	PVC	118	0	-4.8927	0.0555
P-165	354.59	J-173	J-140	6	Ductile Iron	118	0	3.4663	0.0393
P-166	36.97	J-140	J-21	6	Ductile Iron	118	0	0.4713	0.0053
P-167	234.48	J-21	J-149	6	Ductile Iron	118	0	-1.0328	0.0117
P-168	667.95	J-149	J-124	6	Ductile Iron	118	0	-2.5303	0.0287
P-170	32.85	J-72	J-147	6	PVC	118	0	-4.5119	0.0512
P-171	602.58	J-159	J-11	8	Ductile Iron	120	0	9.967	0.0636
P-172	16.45	J-11	J-100	8	Ductile Iron	120	0	8.463	0.054
P-174	709.29	J-115	J-138	6	Ductile Iron	118	0	3.0265	0.0343
P-175	31.56	J-143	J-194	4	Ductile Iron	118	0	-7.4812	0.191
P-176	106.16	J-111	J-197	4	Ductile Iron	118	0	-4.4925	0.1147
P-179	174.48	J-65	J-199	6	Ductile Iron	118	0	19.539	0.2217
P-180	345.1	J-199	J-179	6	Ductile Iron	118	0	18.042	0.2047
P-184	196.49	J-200	J-125	4	Ductile Iron	118	0	3.5649	0.091
P-186	349.06	J-186	J-202	6	Ductile Iron	118	0	0.9341	0.0106
P-187	137.88	J-202	J-126	4	Ductile Iron	118	0	-0.5699	0.0146
P-188	26.26	H-PROP5	J-202	6	Ductile Iron	118	4.1	-0.0041	0
P-191	332.15	J-205	J-200	8	Ductile Iron	120	0	22.516	0.1437
P-192	267.58	J-205	J-206	8	Ductile Iron	120	0	37.791	0.2412
P-193	51.71	J-98	J-207	8	Ductile Iron	120	0	-45.306	0.2892
P-194	98.52	J-207	J-36	8	Ductile Iron	120	0	-10.51	0.0671
P-195	140.31	J-206	J-207	8	Ductile Iron	120	0	36.294	0.2317
P-196	253.18	J-121	J-208	4	Ductile Iron	118	0	1.283	0.0328

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-197	252.51	J-208	J-101	4	Ductile Iron	118	0	-0.2145	0.0055
P-198	259.7	J-176	J-31	6	Ductile Iron	118	0	-5.3484	0.0607
P-200	403.14	J-129	J-72	6	PVC	118	0	-3.0079	0.0341
P-201	863.58	J-169	J-210	6	Ductile Iron	118	0	2.18	0.0247
P-203	36.2	H-PROP10	J-169	6	Ductile Iron	118	4.1	-0.0082	0.0001
P-205	397.64	J-46	J-211	8	Ductile Iron	120	0	39.176	0.2501
P-206	193.01	J-211	J-185	8	Ductile Iron	120	0	78.297	0.4998
P-207	751.28	J-211	J-8	8	Ductile Iron	120	0	-40.618	0.2593
P-209	175.35	J-111	J-110	4	Ductile Iron	118	0	1.4975	0.0382
P-210	475.12	J-167	J-212	4	Ductile Iron	118	0	-1.4975	0.0382
P-211	367.12	J-212	J-168	8	Ductile Iron	120	0	-3.0016	0.0192
P-212	47.52	H-PROP1	J-212	4	Ductile Iron	118	4.1	-0.0041	0.0001
P-213	40.67	H-PROP2	J-165	6	Ductile Iron	118	4.1	-0.0082	0.0001
P-218	375.69	J-144	J-164	6	Ductile Iron	118	0	-15.145	0.1719
P-219	226.84	J-144	J-215	6	Ductile Iron	118	0	10.646	0.1208
P-220	246.92	J-215	J-145	4	Ductile Iron	118	0	1.4975	0.0382
P-221	137.09	J-164	J-216	8	Ductile Iron	120	0	69.835	0.4457
P-223	216.72	J-215	J-216	6	Ductile Iron	118	0	7.651	0.0868
P-224	841.14	J-216	J-217	8	Ductile Iron	120	0	75.989	0.485
P-225	91.35	J-217	J-178	8	Ductile Iron	120	0	72.994	0.4659
P-227	296.54	J-217	J-219	4	Ductile Iron	118	0	1.4975	0.0382
P-228	27.13	J-112	H-PROP11	6	Ductile Iron	118	4.1	0.0041	0
P-231	59.48	J-87	FH-E2	6	Ductile Iron	118	4.1	0.0041	0
P-236	59.52	J-200	J-222	8	Ductile Iron	120	0	17.453	0.1114
P-237	681.4	J-222	J-186	8	Ductile Iron	120	0	15.949	0.1018
P-238	28.02	J-222	FH-PROP4	6	Ductile Iron	118	4.1	0.0082	0.0001
P-239	268.66	J-51	J-223	8	Ductile Iron	120	0	-3.0016	0.0192
P-240	241.57	J-223	J-182	8	Ductile Iron	120	0	-4.4991	0.0287
P-242	369.91	J-179	J-224	6	Ductile Iron	118	0	16.544	0.1877
P-243	237.69	J-224	J-133	6	Ductile Iron	118	0	15.037	0.1706
P-244	36.4	H-PROP6	J-224	6	Ductile Iron	118	4.1	-0.0041	0

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)
P-245	704.78	J-135	J-225	8	Ductile Iron	120	0	63.309	0.4041
P-246	49.91	J-225	J-205	8	Ductile Iron	120	0	61.805	0.3945
P-247	27.09	H-PROP3	J-225	6	Ductile Iron	118	4.1	-0.0041	0
P-248	313.82	J-107	J-226	6	Ductile Iron	118	0	3.0016	0.0341
P-249	50.57	J-226	J-150	6	Ductile Iron	118	0	1.4975	0.017
P-250	30.59	H-PROP7	J-226	6	Ductile Iron	118	0	-0.0041	0
P-251	227.88	J-106	J-227	2	Ductile Iron	118	0	1.4975	0.1529
P-252	113.54	J-162	J-228	8	Ductile Iron	120	0	17.949	0.1146
P-253	828.62	J-228	J-136	8	Ductile Iron	120	0	16.447	0.105
P-254	24.99	H-PROP8	J-228	6	Ductile Iron	118	4.1	-0.0082	0.0001
P-255	458.59	J-141	J-229	8	Ductile Iron	120	0	5.9966	0.0383
P-256	49.96	J-229	J-130	8	Ductile Iron	120	0	4.4925	0.0287
P-257	28.4	H-PROP9	J-229	6	Ductile Iron	118	4.1	-0.0082	0.0001
P-266	74.46	J-181	PRV-4	8	Ductile Iron	120	0	5.175	0.033
P-267	1145.08	PRV-4	J-41	8	Ductile Iron	120	0	5.188	0.0331
P-268	86.41	J-138	PRV-5	8	Ductile Iron	120	0	0.67	0.0043
P-269	1285.12	PRV-5	J-87	8	Ductile Iron	120	0	0.6893	0.0044
P-271	494.46	J-59	J-233	6	Ductile Iron	118	0	2.6504	0.0301
P-272	320.77	J-233	J-44	6	Ductile Iron	118	0	-1.4613	0.0166
P-273	350	J-233	J-234	6	Ductile Iron	118	0	2.6142	0.0297
P-274	530.31	J-234	J-147	6	Ductile Iron	118	0	1.1167	0.0127
P-275	476.97	J-155	J-121	4	Ductile Iron	118	0	2.7805	0.071
P-277	375.45	J-100	J-115	6	Ductile Iron	118	0	6.0215	0.0683
P-278	69.44	PRV-6	J-194	8	Ductile Iron	120	0	35.454	0.2263
P-279	61.82	J-161	PRV-6	8	Ductile Iron	120	0	35.456	0.2263
P-282	72.81	R-2	J-245	24	Ductile Iron	130	0	57.444	0.0407
P-290	675.9	J-194	J-162	8	Ductile Iron	120	0	26.476	0.169
P-301	1592.21	J-245	PRV-10	6	Ductile Iron	118	0	57.44	0.6518
P-302	38.3	PRV-10	J-83	6	Ductile Iron	118	0	57.505	0.6525

AMMENDMENT NO. 1

APPENDIX G9 – PROPOSED MAXIMUM DAY WITH FIRE FLOW

Cascade Metro District Proposed Water System MDD with FF and Addtl Feed Line (Hydrants)

Label	Elevation (ft)	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Pressure (Residual Lower Limit)	Pressure (Calculated Residual) (psi)	Junction w/ Minimum Pressure (System)
FH-E1	7279	TRUE	500	2323	20	22	J-143
FH-E2	7312	TRUE	500	2178	20	20	J-143
FH-E3	7474	TRUE	500	1768	20	20	J-180
FH-E4	7470	TRUE	500	2099	20	20	J-143
FH-E5	7515	TRUE	500	2021	20	20	J-180
FH-E7	7492	TRUE	500	2324	20	41	J-143
FH-E8	7552	TRUE	500	2004	20	20	J-180
FH-E9	7434	TRUE	500	2352	20	74	J-143
FH-E10	7528	TRUE	500	2322	20	24	J-143
FH-E11	7609	TRUE	500	1398	20	20	J-180
FH-E12	7435	TRUE	500	2390	20	74	J-143
FH-E13	7476	TRUE	500	2328	20	32	J-143
FH-E14	7557	TRUE	500	1972	20	20	J-123
FH-E15	7655	TRUE	500	1726	20	20	J-34
FH-E16	7543	TRUE	500	2055	20	24	J-106
FH-E17	7485	TRUE	500	2305	20	20	J-106
FH-E18	7621	TRUE	500	2000	20	20	FH-E15
FH-E20	7473	TRUE	500	2500	20	68	FH-E15
FH-E21	7485	TRUE	500	2500	20	90	J-180
FH-E22	7435	TRUE	500	2500	20	25	J-143
FH-E24	7257	TRUE	500	2323	20	23	J-143
FH-PROP1	7445	TRUE	500	2063	20	20	J-180
FH-PROP2	7580	TRUE	500	1641	20	20	J-165
FH-PROP3	7423	TRUE	500	2464	20	86	J-180
FH-PROP4	7472	TRUE	500	2492	20	53	J-180
FH-PROP5	7490	TRUE	500	2245	20	20	J-180
FH-PROP6	7470	TRUE	500	2328	20	20	J-143
FH-PROP7	7586	TRUE	500	1405	20	20	J-226
FH-PROP8	7606	TRUE	500	2039	20	20	J-143
FH-PROP9	7450	TRUE	500	2227	20	80	J-180

Cascade Metro District Proposed Water System MDD with FF and Addtl Feed Line (Hydrants)

Label	Elevation (ft)	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Pressure (Residual Lower Limit)	Pressure (Calculated Residual) (psi)	Junction w/ Minimum Pressure (System)
FH-PROP10	7320	TRUE	500	2500	20	44	J-180
FH-PROP11	7353	TRUE	500	2352	20	74	J-143
FH-W1	7327	TRUE	500	2135	20	20	J-180
FH-W3	7394	TRUE	500	2500	20	94	J-180
FH-W4	7431	TRUE	500	939	20	20	J-180
FH-W5	7403	TRUE	500	2239	20	116	J-180
FH-W7	7493	TRUE	500	1941	20	100	J-180
FH-W8	7443	TRUE	500	2037	20	119	J-180
FH-W9	7483	TRUE	500	1816	20	106	J-180
FH-W10	7589	TRUE	500	1228	20	74	J-180
FH-W11	7561	TRUE	500	1055	20	89	J-180
FH-W13	7436	TRUE	500	2500	20	135	J-180
FH-W14	7541	TRUE	500	912	20	99	J-180
FH-W15	7661	TRUE	500	820	20	45	J-180
FH-W16	7591	TRUE	500	795	20	78	J-180
FH-W17	7528	TRUE	500	921	20	101	J-180
FH-W19	7608	TRUE	500	759	20	71	J-180
FH-W20	7625	TRUE	500	721	20	64	J-180
FH-W21	7730	TRUE	500	564	20	20	J-180
FH-W22	7611	TRUE	500	710	20	69	J-180