CROSS CREEK – MULTIFAMILY

Neighborhood 1, Map Area B

AURORA, COLORADO

AMENDMENT #01 TO MASTER UTILITY STUDY

AUGUST 2021

Prepared by:

Kimley»Horn

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RESPONSIBLE PARTY CERTIFICATION

"Landmark Companies" hereby certifies that the sewer and water system for the Cross Creek Multifamily project will be constructed according to the design presented in this report. I understand that the City of Aurora does not and shall not assume liability for the sewer and water system designed and/or certified by my engineer. I understand that the City of Aurora reviews utility plans but cannot, on behalf of Landmark Companies and/or their successors assign of future liability for improper design. I further understand that approval of the Plat and/or Development Permit does not imply approval of my engineer's utility design."

Attest: _____

Landmark Companies

_____ _____

Notary Public Authorized Signature

ENGINEER'S STATEMENT

"I hereby state that this Compliance Letter for the preliminary utility design of Cross Creek Multifamily was prepared by me (or under my direct supervision) in accordance with the provisions of the City of Aurora Standards and Specifications for the Design and Construction of Public and Private Improvements for the Responsible Parties thereof. I understand that the City of Aurora does not and shall not assume liability for utility facilities designed by others."

Kevin Johnk, P.E.

Registered Professional Engineer

State of Colorado No. 53395

INTRODUCTION

The purpose of this Master Utility Report, Amendment #01 (REPORT AMENDMENT) is to amend the Cross Creek Initial Phase Development Utility Report for Cross Creek (ORIGINAL MASTER REPORT), prepared by High Country Engineering, Inc. and approved by the City on October 30, 2002.

This REPORT AMENDMENT depicts Map Area B as shown in Cross Creek Framework Development Plan, prepared by Norris Design, and dated February 12, 2018. This area was originally anticipated as 9.8 acres of commercial development.

The Applicant proposes the replacement of approximately 8.25 acres of this original commercial area - designated as Office in the Original Master Report - for the development of approximately 272 units of multifamily housing.

This REPORT AMENDMENT demonstrates the water and sanitary sewer associated with the development of Map Area B is consistent with the City requirements and will not cause negative impacts to the existing utility infrastructure.

A Final Utility Compliance Letter will be prepared with subsequent development submittals to ensure appropriate utility system design on-Site, as well as compliance with the ORIGINAL MASTER REPORT.

GENERAL LOCATION AND PROJECT DESCRIPTION

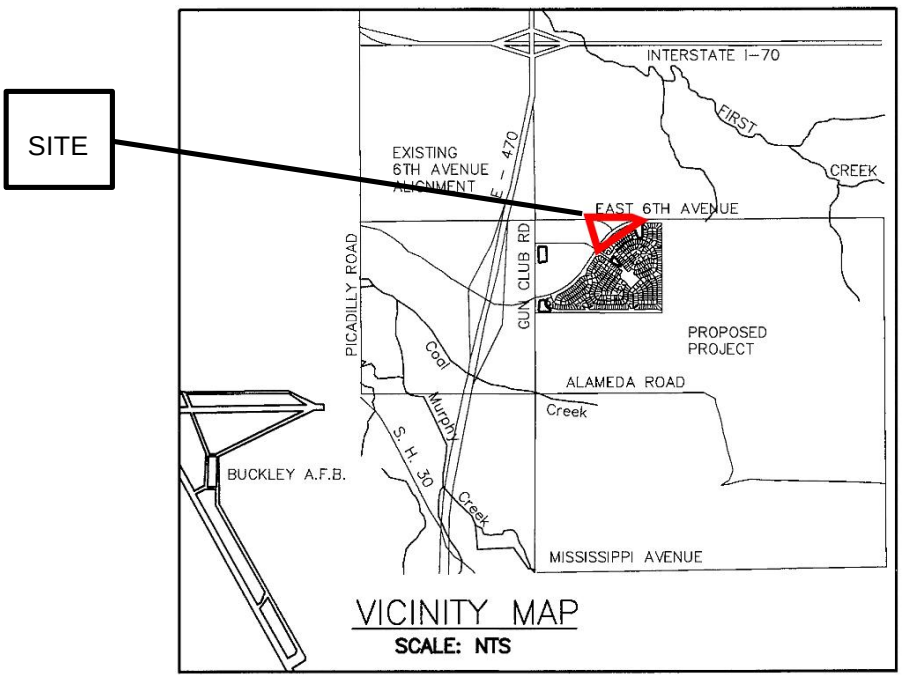
SITE LOCATION

The Overall Cross Creek development is located in Section 7, Township 4 South, Range 65 West of the Sixth Principal Meridian, County of Arapahoe, State of Colorado.

Map Area B is approximately 10.0 acres, according to the ORIGINAL MASTER REPORT, and is located at the northeast corner of Cross Creek. The Site is bounded by 6th Avenue to the north, Catawba Way to the west, and 6th Parkway to the east.

The proposed Multi-Family development (The SITE or the PROJECT) is located within the western portion of Map Area B.

A vicinity map is provided below for reference:



DESCRIPTION OF PROPERTY

Map Area B is shown in the ORIGINAL MASTER REPORT as approximately 10 acres of office development. The PROJECT is anticipated to replace approximately 8.25 acres of that area to develop approximately 272 units of multifamily housing, along with associated drives, parking, utilities, landscape/hardscape improvements, and other project amenities to support the development.

The existing vacant ground cover consists of sparse vegetation of native weeds and grasses. A review of the Natural Resource Conservation Service (NRCS) Web Soil Survey determined that the Site is made up of Fondis Silt Loam, consistent with an NRCS Soil Types of C. Soil Types C have been utilized for calculations included within this report. The NRCS study is found in **Appendix A** of the report.

The SITE is located within Sanitary Basin C of the ORIGINAL MASTER REPORT.

There is an existing 12" sanitary sewer line that runs along Catawba Way along the entire project frontage. An 8" sanitary stub is provided off of this line, at the intersection of 5th Ave, to serve the SITE. Additionally, there is an existing 30" PVC sanitary line that runs along 6th Pkwy where all of the Basins of Cross Creek (A, B, C, and D in the ORIGINAL MASTER REPORT) outfall to.

There is an existing 12" water line that runs along Catawba Way along the entire project frontage. Additionally, there is an existing 30" water line that runs along 6th Pkwy where all of the Distribution Regions of Cross Creek (1-6 in the ORIGINAL MASTER REPORT) connect to. The utility map from the ORIGINAL MASTER REPORT has been included in **Appendix A** for reference.

The sanitary sewer and water designs presented herein will focus on the sanitary sewer flows and water demands anticipated with development of the Site.

DESIGN CRITERIA

REGULATIONS

This Project will substantially comply with the current City of Aurora Water, Sanitary Sewer & Storm Drainage Infrastructure Standards & Specifications.

SANITARY SEWER SYSTEM DESIGN CRITERIA

The sanitary sewer criteria utilized to design the system were assumed as follows:

Flow Calculations:

- Residential sewage contribution shall be based on 68-gpcd average flows.
- Minimum residential population density shall be figured on a basis of 2.77 persons per dwelling unit and approximately 272 dwelling units proposed for the PROJECT.
- Estimates shall include allowances for a maximum infiltration of 10% of average flow.

$$\text{Multi-Family: } \left(68 \frac{Gallons}{\frac{Capita}{Day}} x\ 2.77\ \frac{person}{DU} x\ 272\ DU\right) = 51{,}234\ \frac{Gallons}{Day} + 10\%\ Infiltration = 56{,}357\ \frac{Gallons}{Day}$$

$$\text{Office: } \left(1{,}500 \frac{Gallons}{\frac{Day}{Acre}} x\ 1.75\ Acres\right) = 2{,}625\ \frac{Gallons}{Day} + 10\%\ Infiltration = 2{,}887\ \frac{Gallons}{Day}$$

$$\text{Total: } 59{,}244\ \frac{Gallons}{Day} = 0.09\ \frac{ft^3}{sec}$$

Pipe Sizing Calculations:

- Sanitary Sewer mains shall be eight-inch (8") diameter or larger. Service connections are four-inch (4") diameter or larger.
- Minimum Slope for a 4" sewer size = 2%
- Minimum Slope for an 8" sewer size = 0.4%
- The flow velocity shall not exceed 10 feet per second flowing full or half-full using Manning's formula (and N-0.011 for PVC) or (N=0.013 for RCP).

Cross Creek Map Area B is part of the overall Cross Creek development. The previous developer installed a 12" sanitary line along Catawba Way and provided an 8" stub at the intersection of 5th Ave to serve the Site. It is estimated that the proposed 8-inch main will serve approximately 272 multi-family Dwelling Units (DUs) and 1.75 acres of office use.

- Avg. Day Flow (w/ 10% infiltration): 58,244 GPD or 0.09 cfs
- Peak Hour Demand (PF of 4.5): 0.41 cfs

Calculations, which are included in Appendix B, were performed to analyze the capacity of the existing 8" sanitary stub provided to serve this site. Assuming a minimum allowable slope of 0.4%, the pipe was found to flow approximately 48% full during a peak scenario.

Non-typical wastes will not be directed through the sanitary sewer.

Comparison with Original Master Report Calculations:

The Report anticipated approximately 10 acres of Office Type 1 uses, with an equivalent population of 65, loading rate of 500 gallons/day/acre, infiltration factor of 10%, and a peaking factor of 4, resulting in an

average daily flow of 3.8 gallons per minute, or 5,472 gallons per day, and a peak demand of 14.2 gallons per minute, or 20,448 gallons per day.

- Avg. Day Flow (w/ 10% infiltration): 5,472 GPD or 3.8 GPM
- Peak Hour Demand (PF of 4): 14.2 GPM

The proposed change from the Original Master Report represents a significant increase from the anticipated value within the Original Master Report. The primary source of this increase is the addition of Multi-Family development to the parcel. Additionally, the City-recommended "people per unit" value has increased from 1.7 as shown in the Original Master Report, to 2.77 as shown in the current City Standards: an increase of 163%.

Considering this increase in demand for Basin C, calculations were performed to analyze the capacity of the 12" sanitary sewer in Catawba Way, which are included in Appendix B. Flows from the Data Center to the North were also included as a contributing flow. Assuming a minimum slope of 0.4%, the following pipe flow characteristics were found:

- DATA CENTER (223505 East 6th Ave, NOT A PART OF CROSS CREEK):

$$\text{Industrial: } \left(1{,}200 \frac{Gallons}{\frac{Day}{Acre}} x\ 100\ Acres\right) = 120{,}000\ \frac{Gallons}{Day} + 10\%\ Infiltration = 132{,}000\ \frac{Gallons}{Day} = 91.7\ \frac{Gallons}{Min}$$

- ORIGINAL MASTER REPORT: 357.6 GPM (Peak Demand), approx. 73% full (8-inch pipe)
    - The original master report did not include flows from the Data Center.
    - The original master report incorrectly sized the sanitary main within Catawba Way to be an 8-inch line. As-Built records with the COA indicates a 12-inch main was constructed.
- REPORT AMENDMENT: 448.6 GPM (Peak Demand), approx. 41% full (12-inch pipe)
    - Includes flows from the Data Center as noted above.
    - This calculation accounts for the 12-inch pipe that is currently installed in Catawba Way

Considering this increase in demand for Basin C, calculations were performed to analyze the capacity of the 30" sanitary sewer in 6th Pkwy, which are included in Appendix B. Assuming a minimum slope of 0.4%, the following pipe flow characteristics were found:

- ORIGINAL MASTER REPORT: 714 GPM (Peak Demand), approx. 10% full
- REPORT AMENDMENT: 937.5 GPM (Peak Demand), approx. 12% full

As shown above, despite the increase in sanitary demand, the 8" stub off Catawba Way as well as the 30" sanitary pipe in 6th Pkwy still maintain adequate capacity to serve the Site.

WATER SYSTEM DESIGN CRITERIA

The water demand rates and distributions system design are based on the City of Aurora Standards and Specifications for Water.

Water Distribution Loading:

The domestic water and fire flow design has been based on the following typical demand rates, consistent with the City Criteria as outlined below in Tables 1 and 2.

Table 1: Domestic Water Demands					
Use	*People per Unit*	*Average Day*	*Loading Rate*	*Max Day*	*Max Hour*
Residential	2.77	-	68 gpcd	-	-
Industrial	-	1,200 gpd/acre	-	3,360 gpd/acre	5,400 gpd/acre
Commercial/Retail	-	1,500 gpd/acre	-	4,200 gpd/acre	6,750 gpd/acre

Table 2: Fire Flow Demands[1]	
Use	*Demand (gpm)*
Residential	1,500
Industrial	3,500
Commercial/Retail	2,500

[1]For the purposes of a conservative analysis, 2,500gpm fire flow demand has been utilized for both the commercial and residential planning areas.

Based on the typical demand rates as summarized in Tables 1 and 2, the resulting water demands for the Project are as follows:

Table 3: Water Demand Analysis Summary			
Area/Land Use	*Demand (gpm)*		
	Average Day	*Max Day*	Peak Hour
Building 1	10.49	29.38	47.21
Building 2	10.49	29.38	47.21
Building 3	10.49	29.38	47.21
Building 4	10.49	29.38	47.21
Building 5	5.44	15.23	24.48
Building 6	5.44	15.23	24.48
Rec / Leasing Office	0.22	0.61	0.98
Offsite Office	1.82	5.10	8.20
Total	**53.06**	**148.58**	**237.80**

Water Distribution Modeling:

Bentley WaterCAD was utilized for the modeling of the proposed water distribution system. The Project is located in Zone 3 with an HGL of 5,720 ft. Consistent with the City Criteria and ISO Criteria, the system has been analyzed based on the maximum day plus fire flow demand with a minimum residual pressure of 20 psi. The City of Aurora Criteria specifies that the maximum allowable velocity for 8- to 12-inch mains is to be 3 fps. During the Average Day, Max Day, and Peak Hour scenarios, the velocity of each pipes remains at or below the maximum allowable velocity. The velocity within the pipes exceeds 3 fps during Fire Flow conditions and ranges between 7 fps and 12 fps. The fire flow component of the water distribution system was evaluated to display 2,500 gpm of flow is available at each hydrant and throughout the system while maintaining allowable pressures. It is noted that only 1,500 gpm is required for residential areas, however

it is assumed that if the system may provide a higher fire flow, it will be able to withstand this lower fire flow demand where needed.

The WaterCAD Model was created to run three scenarios as follows:

- Average Day Demand
- Max Day plus Fire Flow
- Peak Hour

The model assumes an 8-inch diameter water main internal to the site, connecting to the 12-inch and 30-inch existing water main at two locations within Catawba Way. Table 4 below, provides a summary of the proposed water system for each of the above noted scenarios.

Table 4: Water Model Summary

Scenario	*Min Pressure (psi)*	*Max Pressure (psi)*	*Max Velocity (fps)*
Average Day	56	56	0.21
Peak Hour	56	56	0.94
Max Day + Fire	48	56	11.99

Fire Flow Modeling

Bentley WaterCAD was utilized for the modeling of the anticipated fire flow demands. Per the City criteria, the system shall provide a minimum of 2,500 gpm for 2-hours for commercial areas and 1,500 gpm for residential areas. For this system, we chose to analyze 2,500 gpm to display a more conservative situation. The fire flow report provided displays fire demand being available at each node in the system. This displays that the future development will be able to construct a fire line anywhere in the system and still have sufficient pressures to meet the fire flow requirements. Based on the analysis, the required fire flow will be available, and the system will withstand these pressures for any duration of time assuming the water main properties remain constant.

The full results of the WaterCAD Model are included in **Appendix B.**

Water Connectivity

Catawba way runs along the entire project frontage. North of the intersection of Catawba and 5th Ave, there is an existing 12-inch water line, and South of the intersection is an existing 30-inch water line. Additionally, there is an existing 30" water line that runs along 6th Pkwy where all of the Distribution Regions of Cross Creek (1-6 in the ORIGINAL MASTER REPORT) connect to. The utility map from the ORIGINAL MASTER REPORT has been included in **Appendix C** for reference.

CONCLUSION

COMPLIANCE WITH STANDARDS

This master utility report amendment was prepared in compliance with the City of Aurora Standards and Specifications for Wastewater and Water Distribution Systems. The proposed sanitary sewer and domestic water systems will provide adequate capacity to serve the Cross Creek Multifamily Development.

REFERENCES

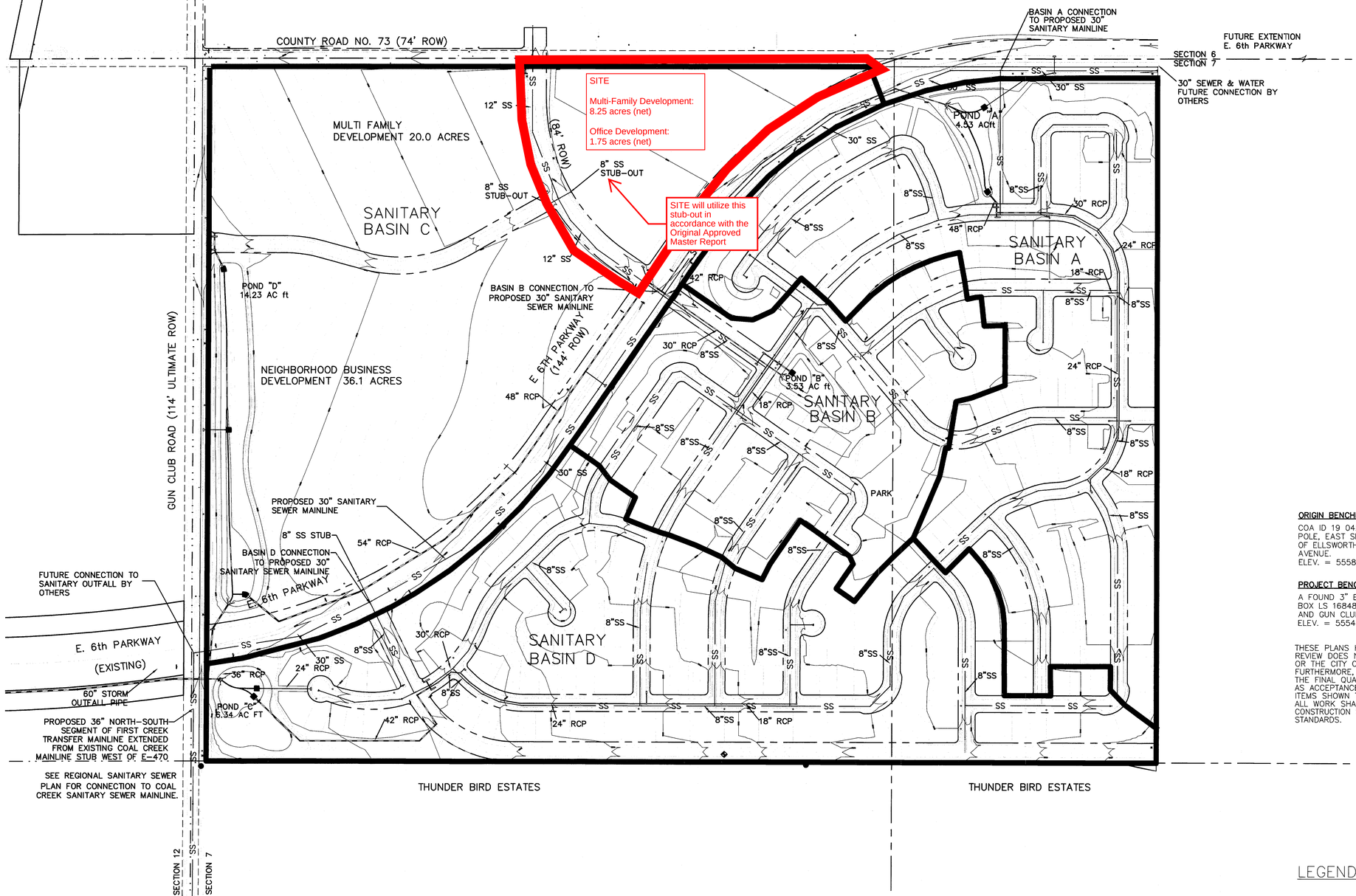
Water, Sanitary Sewer & Storm Drainage Infrastructure Standards and Specifications, City of Aurora; September 2019.

Cross Creek Initial Phase Development Utility Report, Prepared by High County Engineering, Inc., Approved October 30, 2002.

APPENDIX A

202189 3/3

revisions to ORIGINAL MASTER REPORT



GRAPHIC SCALE
0 100 200 400
(IN FEET)
Horiz. 1 inch = 200 ft.

ORIGIN BENCHMARK

COA ID 19 042 RAILROAD SPIKE IN WEST SIDE POWER POLE, EAST SIDE GUN CLUB ROAD 0.4 MILES NORTH OF ELLSWORTH AVENUE 0.2 MILES SOUTH OF 6th AVENUE.
ELEV. = 5558.69

PROJECT BENCHMARK

A FOUND 3" BRASS CAP IN (CITY OF AURORA) RANGE BOX LS 16848 AT THE INTERSECTION OF 6th AVENUE AND GUN CLUB ROAD.
ELEV. = 5554.79

THESE PLANS HAVE BEEN REVIEWED BY THE CITY OF AURORA FOR CONCEPT ONLY. THE REVIEW DOES NOT IMPLY RESPONSIBILITY BY THE REVIEWING DEPARTMENT, THE CITY ENGINEER, OR THE CITY OF AURORA FOR ACCURACY AND CORRECTNESS OF THE CALCULATIONS. FURTHERMORE, THE REVIEW DOES NOT IMPLY THAT QUANTITIES OF ITEMS ON THE PLANS ARE THE FINAL QUANTITIES REQUIRED. THE REVIEW SHALL NOT BE CONSTRUED FOR ANY REASON AS ACCEPTANCE OF FINANCIAL RESPONSIBILITY BY THE CITY FOR ADDITIONAL QUANTITIES OF ITEMS SHOWN THAT MAY BE REQUIRED DURING THE CONSTRUCTION PHASE.
ALL WORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH CITY OF AURORA "STANDARD CONSTRUCTION SPECIFICATIONS FOR PUBLIC WORKS" AND / OR OTHER CITY APPROVED APPLICABLE STANDARDS.

THIS REPRODUCIBLE MYLAR IS A FACSIMILE OF A SIGNED AND SEALED PRINT TRANSMITTED TO THE CITY OF AURORA.

RICK ROME, P.E. — DATE 10/21/02
COLORADO REGISTRATION NUMBER 35103

CROSS CREEK SUBDIVISION
PREPARED FOR:
US HOME
9990 PARK MEADOWS DRIVE
LONE TREE, CO 80124
ATTN: VARNEL ROBERTS

LEGEND

- SANITARY SEWER MANHOLES
- SS — SANITARY SEWER MAIN
- A1 — STORM SEWER
- STORM SEWER
- SANITARY BASIN BOUNDARY

NOTE: THE STREET AND LOT LAYOUT IN THESE PLANS IS CONCEPTUAL IN NATURE. APPROVAL OF THIS PLAN DOES NOT CONSTITUTE APPROVAL OF THE STREET AND LOT LAYOUT.

APPROVED FOR ONE YEAR FROM THIS DATE
10-30-2002

Director of Public Works — Date 10-30-02

Director of Utilities Department — Date 10-21-02

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
or 534-6700 IN METRO DENVER
CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

NO.	DATE	REVISION	BY

DES.
DR.
CK.
DATE
FILE: BASINEXH

HIGH COUNTRY ENGINEERING, INC.
14 INVERNESS DRIVE EAST, SUITE D-186
ENGLEWOOD, CO 80112
PH:(303) 925-0544 FX:(303) 925-0547

US HOME
AURORA, COLORADO

CROSS CREEK
SANITARY SEWER BASINS

PROJECT NO.
2022004

202189 3/3

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Sep 2 2021

12-inch Sanitary Sewer Main in Catawba Way

Circular

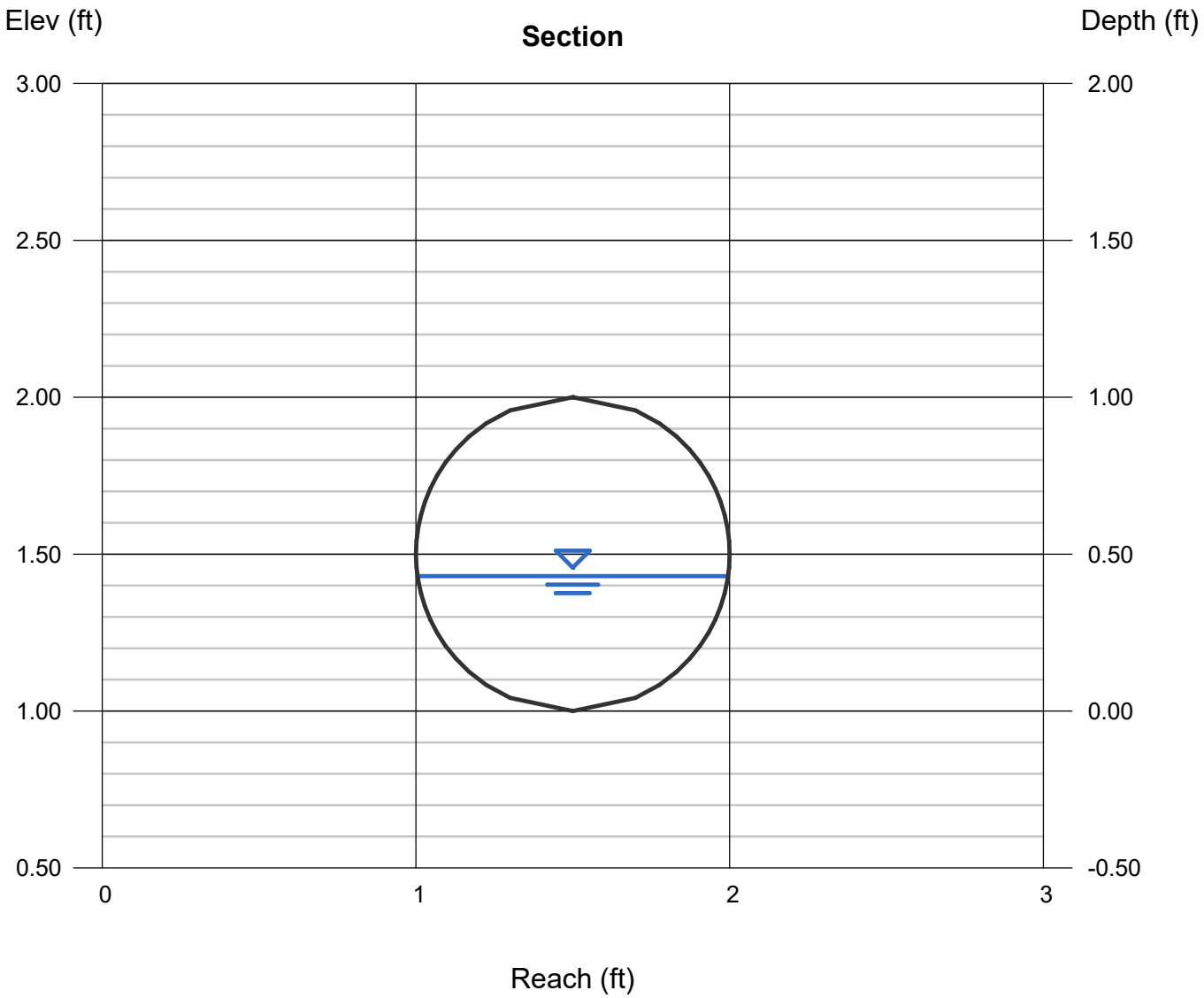
Diameter (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.40
N-Value	= 0.011

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.00

Highlighted

Depth (ft)	= 0.43
Q (cfs)	= 1.000
Area (sqft)	= 0.33
Velocity (ft/s)	= 3.07
Wetted Perim (ft)	= 1.43
Crit Depth, Yc (ft)	= 0.42
Top Width (ft)	= 0.99
EGL (ft)	= 0.58



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jun 30 2021

Capacity Analysis (ORIGINAL MASTER REPORT CONDITIONS) - 6th Pkwy Sanitary Mair

Circular

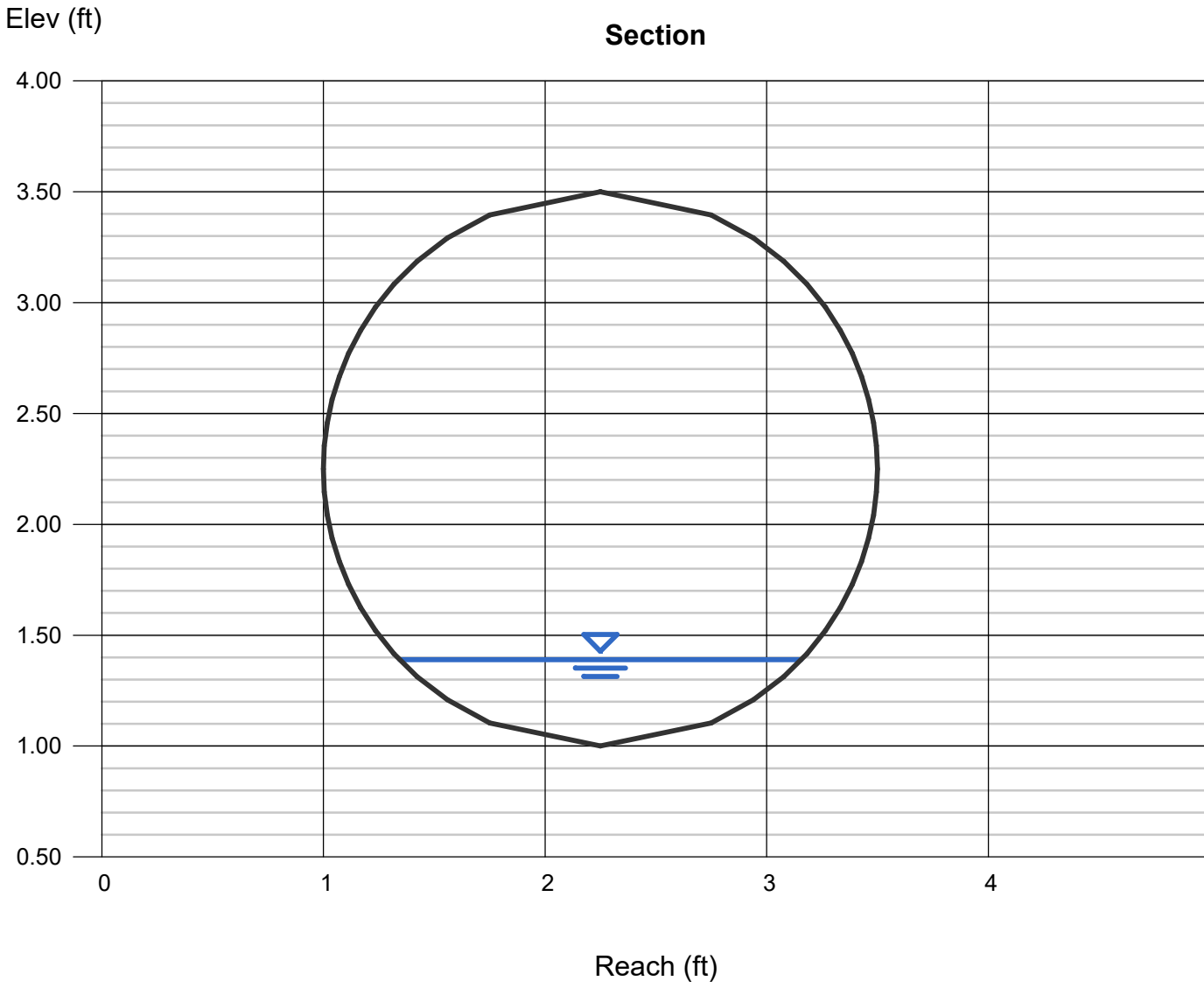
Diameter (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.40
N-Value	= 0.011

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.57

Highlighted

Depth (ft)	= 0.39
Q (cfs)	= 1.570
Area (sqft)	= 0.49
Velocity (ft/s)	= 3.18
Wetted Perim (ft)	= 2.04
Crit Depth, Yc (ft)	= 0.41
Top Width (ft)	= 1.82
EGL (ft)	= 0.55



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Sep 2 2021

30-inch Sanitary Sewer Main in 6th Pkwy

Circular

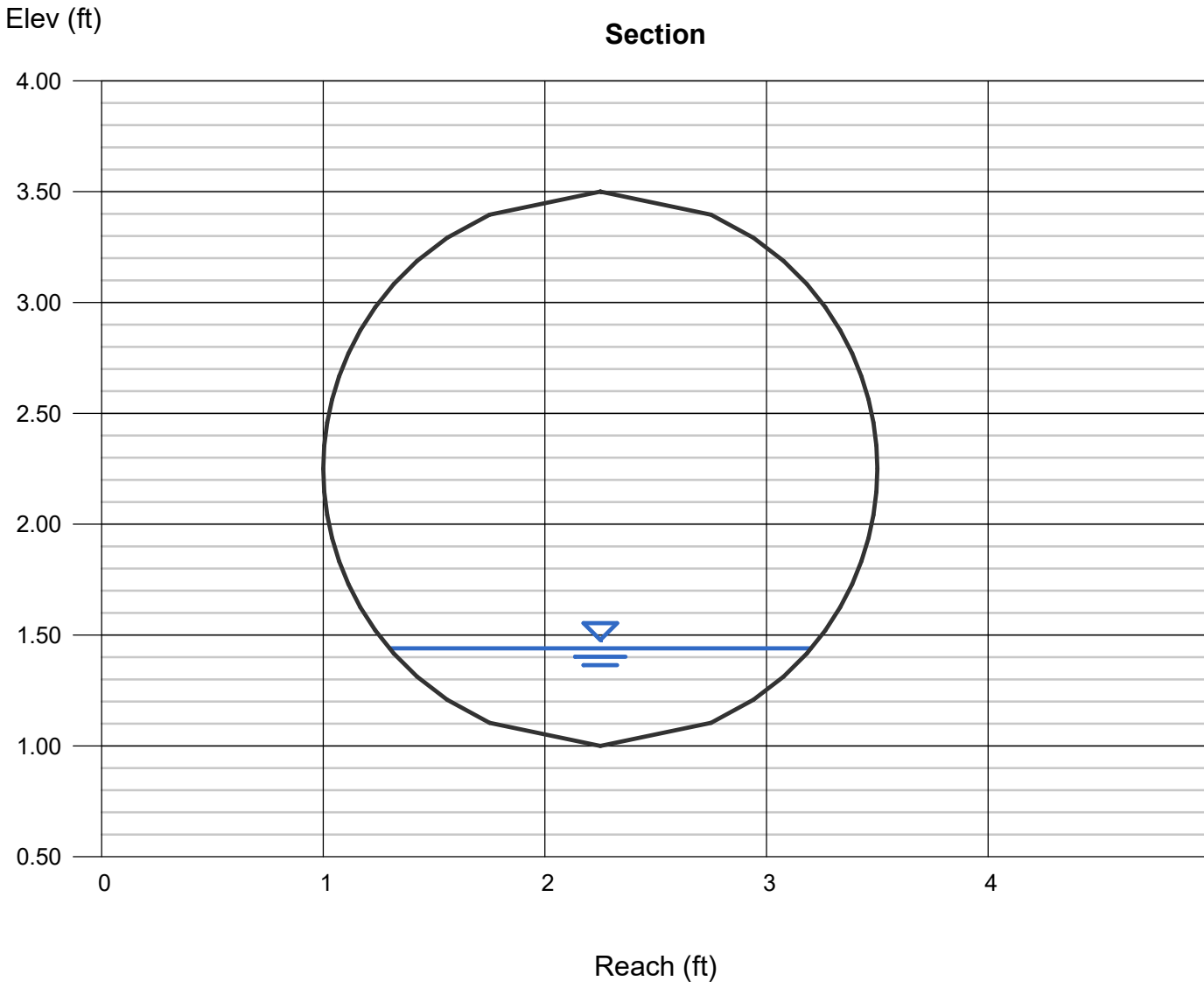
Diameter (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.40
N-Value	= 0.011

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.09

Highlighted

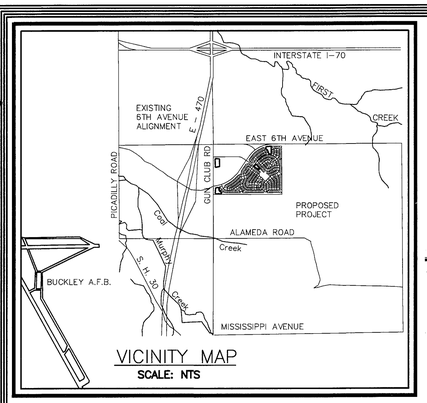
Depth (ft)	= 0.44
Q (cfs)	= 2.090
Area (sqft)	= 0.59
Velocity (ft/s)	= 3.55
Wetted Perim (ft)	= 2.17
Crit Depth, Yc (ft)	= 0.47
Top Width (ft)	= 1.91
EGL (ft)	= 0.64



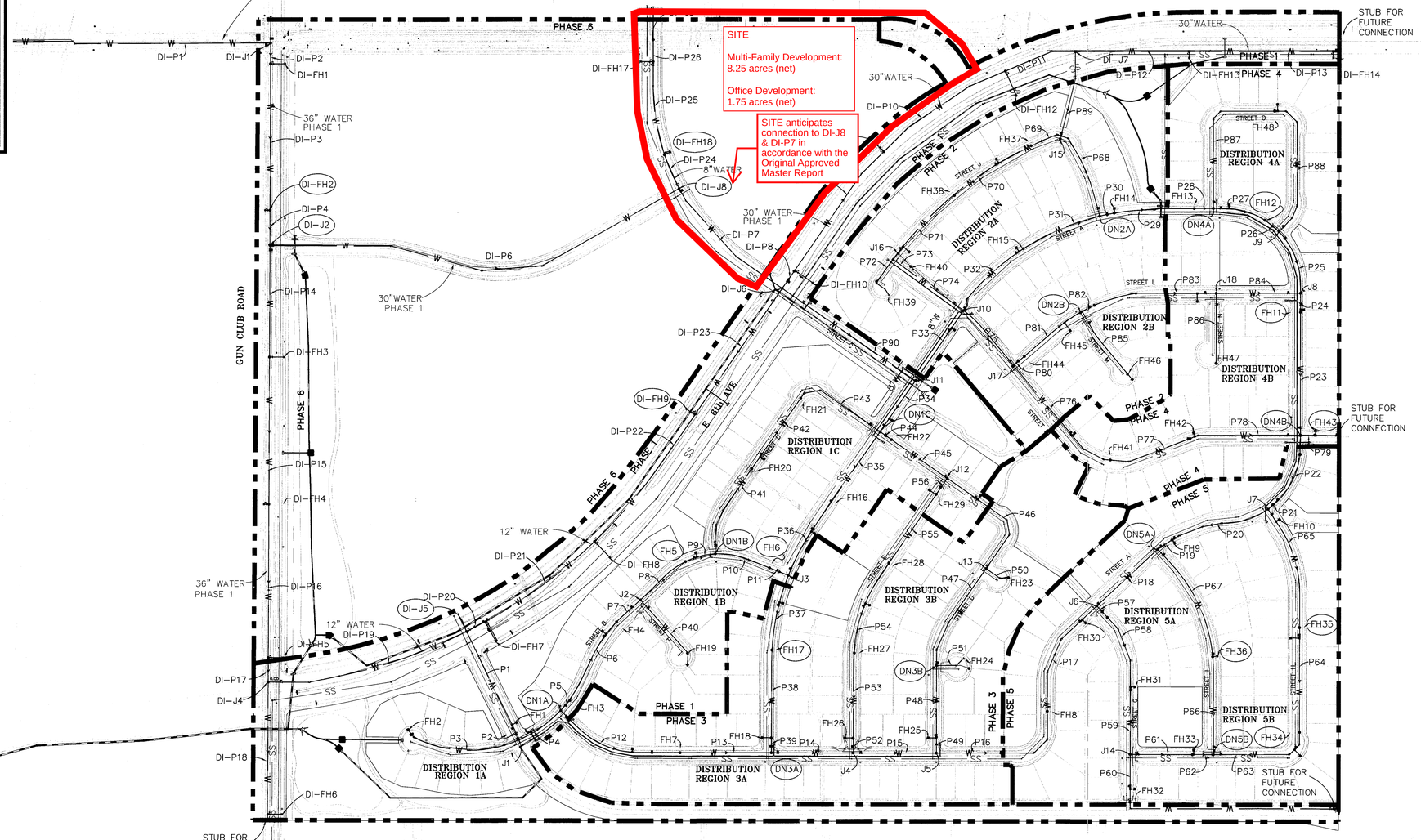
202189 1/3

CROSS CREEK SUBDIVISION
WATER EXHIBIT

pages from ORIGINAL MASTER REPORT



VICINITY MAP
SCALE: NTS



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0 100 200 400
(IN FEET)
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INDICATES A DEMAND MODELED IN ONE OR MORE SCENERIOS.

ORIGIN BENCHMARK

COA ID 19 042 RAILROAD SPIKE IN WEST SIDE POWER POLE, EAST SIDE GUN CLUB ROAD 0.4 MILES NORTH OF ELLSWORTH AVENUE 0.2 MILES SOUTH OF 6th AVENUE.
ELEV. = 5558.69

PROJECT BENCHMARK

A FOUND 3" BRASS CAP IN (CITY OF AURORA) RANGE BOX LS 16848 AT THE INTERSECTION OF 6th AVENUE AND GUN CLUB ROAD.
ELEV. = 5554.79

LEGEND

DN#	DEMAND NODE
FH#	FIRE HYDRANT
J#	JUNCTION NODE
P#	DEVELOPER PIPE
DIFH#	DISTRICT FIRE HYDRANT
DIP#	DISTRICT PIPE
DIJ#	DISTRICT JUNCTION

THIS REPRODUCIBLE MYLAR IS A FACSIMILE OF A SIGNED AND SEALED PRINT TRANSMITTED TO THE CITY OF AURORA.

10/21/02
RICK ROME, P.E. DATE
COLORADO REGISTRATION NUMBER 35103
CROSS CREEK SUBDIVISION
PREPARED FOR:
US HOME
9990 PARK MEADOWS DRIVE
LONE TREE, CO 80124
ATTN: VARNEL ROBERTS

APPROVED FOR ONE YEAR FROM THIS DATE
10-30-2002

Director of Public Works	10-22-02 Date
~~Director~~ Utilities Department	10-21-02 Date
Fire Department	10/22/02 Date

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987 OR 534-6700 DENVER
CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

NO.	DATE	REVISION	BY

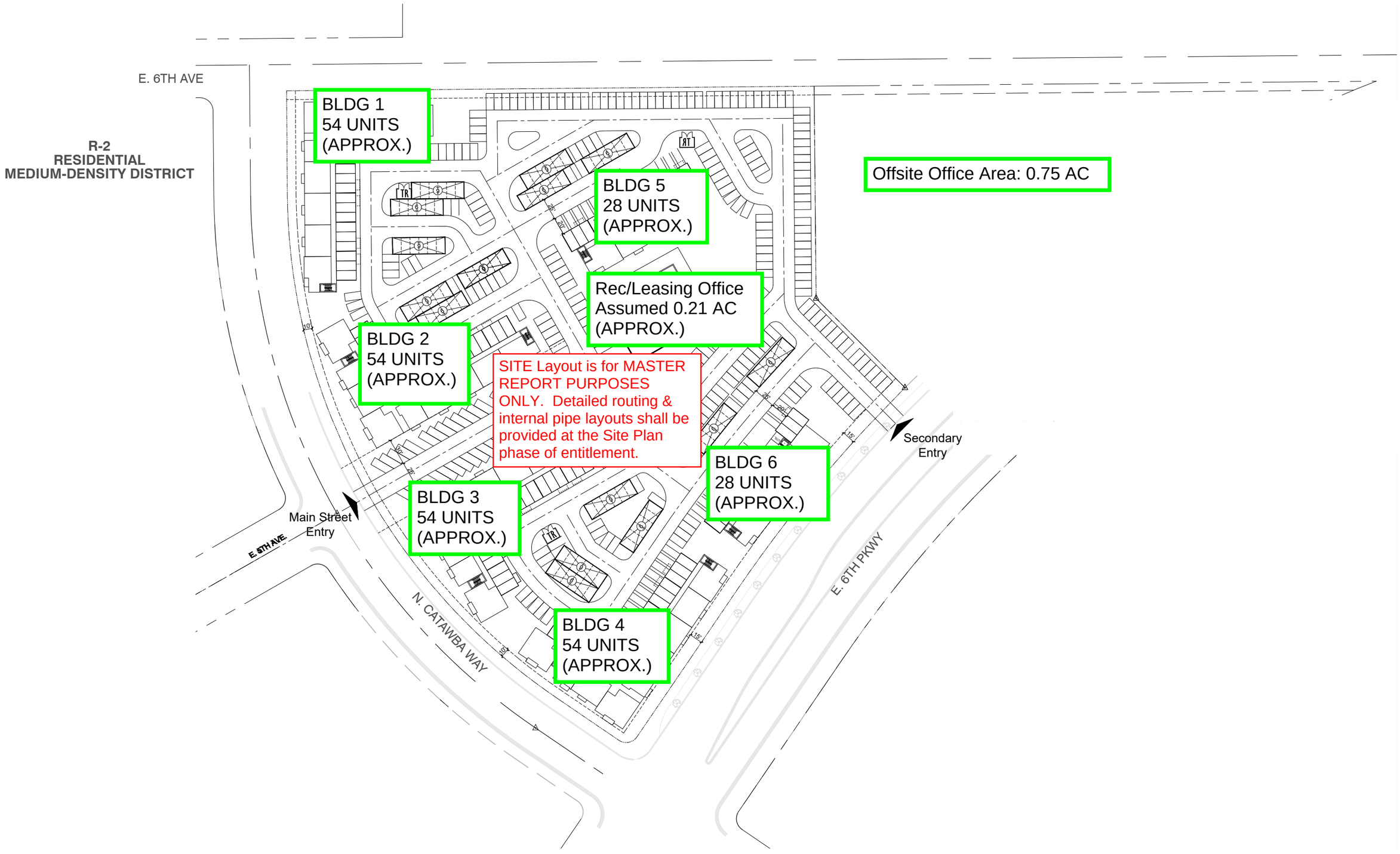
DES.
DR.
CK.
DATE 10/02
FILE RWTRCAD2

HIGH COUNTRY ENGINEERING, INC.
14 INVERNESS DRIVE EAST, SUITE D-186
ENGLEWOOD, COLORADO 80112
PH:(303) 925-0544 FX:(303) 925-0547

US HOME
AURORA, COLORADO
CROSS CREEK
WATER EXHIBIT

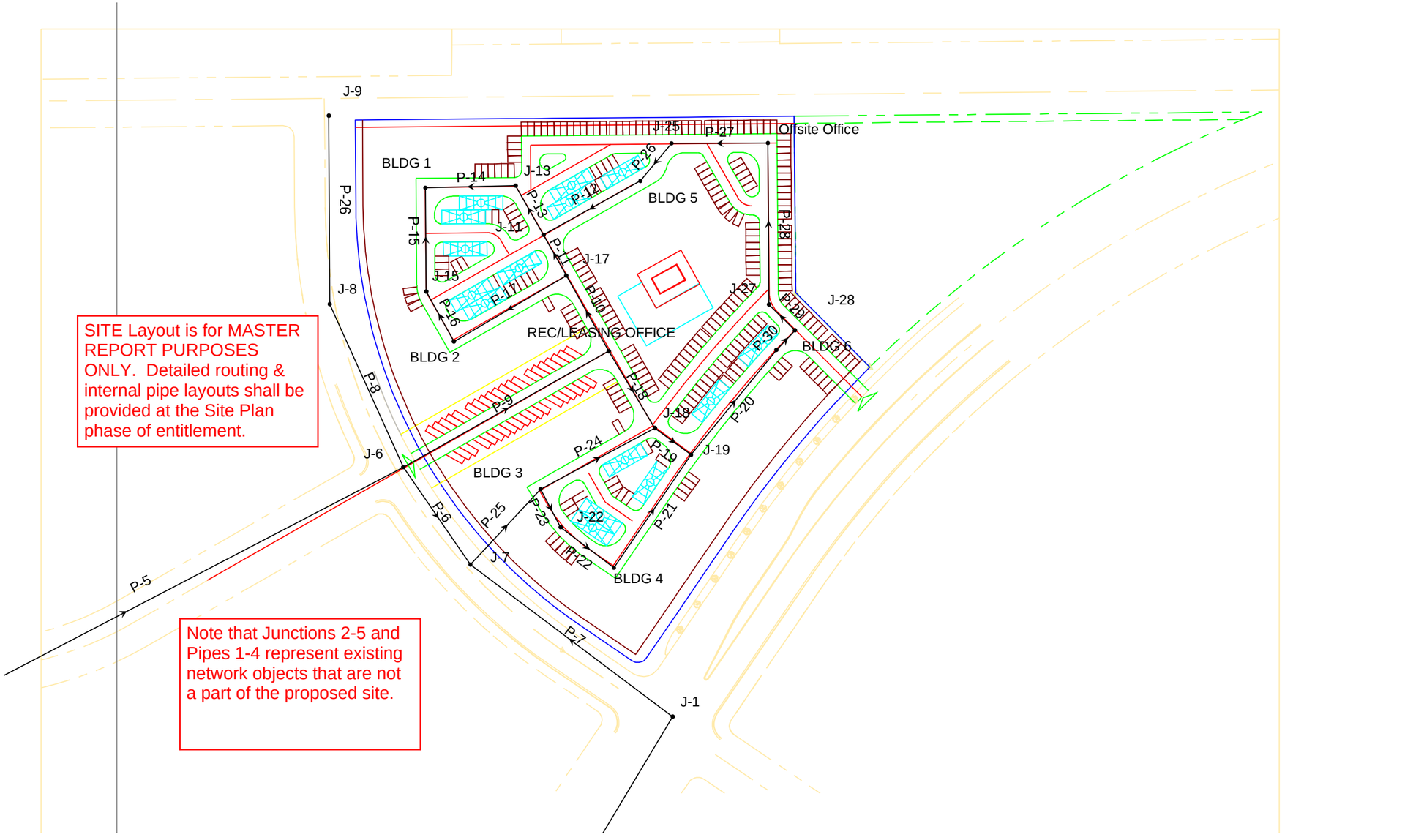
PROJECT NO.
2022004.54

202189 1/3



ktgy
Architecture + Planning
820 16th Street, Suite 500
(303) 825-6400
ktgy.com

LANDMARK
COMPANIES


J-9
P-26
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J-1
BLDG 1
P-14
J-13
P-26
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P-13
P-15
J-11
J-15
P-16
P-17
J-17
P-10
P-11
BLDG 2
REC/LEASING OFFICE
P-9
P-18
J-18
P-24
P-19
J-19
P-20
BLDG 3
P-25
P-23
J-22
P-21
P-22
BLDG 4
J-25
P-27
Offsite Office
BLDG 5
P-28
J-27
J-28
P-29
P-30
BLDG 6
SITE Layout is for MASTER REPORT PURPOSES ONLY. Detailed routing & internal pipe layouts shall be provided at the Site Plan phase of entitlement.
Note that Junctions 2-5 and Pipes 1-4 represent existing network objects that are not a part of the proposed site.

Cross Creek Multifamily
Aurora, Colorado

9/2/2021

Water Demands						
Area/Land Use	*Number of Units*	*Area (AC)*	*Avg Flow (gpd)*	*Avg Flow (gpm)*	*Max Day Flow (gpm)*	*Peak Hourly Flow (gpm)*
Building 1	54.00	-	15,107.58	10.49	29.38	47.21
Building 2	54.00	-	15,107.58	10.49	29.38	47.21
Building 3	54.00	-	15,107.58	10.49	29.38	47.21
Building 4	54.00	-	15,107.58	10.49	29.38	47.21
Building 5	28.00	-	7,833.56	5.44	15.23	24.48
Building 6	28.00	-	7,833.56	5.44	15.23	24.48
Rec / Leasing Office	-	0.21	315.00	0.22	0.61	0.98
Offsite Office	-	1.75	2,625.00	1.82	5.10	8.20
Total	272.00		79,037.44	54.89	153.68	246.99

Fire Flow Demands		
Use	*Demand (gpm)*	*Time Frame*
Residential	1,500	2 hrs
Commercial/Retail	2,500	2 hrs

Ratio	Peaking Factor
Peak Hour : Average Day	4.5:1
Max Day: Average Day	2.8: 1

Domestic Water Demands - Commercial		
Average Day	*Max Day*	*Max Hour*
1500 gpd/acre	4200 gpd/acre	6750 gpd/acre

Domestic Water Demands - Residential	
People Per Unit	*Average Day Per Capita Flow (gpd)*
2.77	101

Water Demand Analysis Summary			
Area/Land Use	*Demand (gpm)*		
	Average Day	*Max Day*	Peak Hour
Building 1	10.49	29.38	47.21
Building 2	10.49	29.38	47.21
Building 3	10.49	29.38	47.21
Building 4	10.49	29.38	47.21
Building 5	5.44	15.23	24.48
Building 6	5.44	15.23	24.48
Rec / Leasing Office	0.22	0.61	0.98
Offsite Office	1.82	5.10	8.20
Total	53.06	148.58	237.80

Average Day Scenario

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Diameter (in)	Material	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Hazen-Williams C
P-25	50	12.0	PVC	-55	0.16	0.000	150.0
P-23	59	8.0	PVC	-12	0.08	0.000	150.0
P-19	62	8.0	PVC	10	0.07	0.000	150.0
P-11	64	8.0	PVC	10	0.06	0.000	150.0
P-13	78	8.0	PVC	9	0.06	0.000	150.0
P-16	79	8.0	PVC	-1	0.01	0.000	150.0
P-22	92	8.0	PVC	-12	0.08	0.000	150.0
P-10	119	8.0	PVC	21	0.14	0.000	150.0
P-18	123	8.0	PVC	1	0.00	0.000	150.0
P-14	124	8.0	PVC	9	0.06	0.000	150.0
P-25	141	8.0	PVC	-33	0.21	0.000	150.0
P-15	142	8.0	PVC	-1	0.01	0.000	150.0
P-12	152	8.0	PVC	0	0.00	0.000	150.0
P-6	163	30.0	Steel	28	0.01	0.000	140.0
P-24	178	8.0	PVC	-10	0.06	0.000	150.0
P-17	179	8.0	PVC	-12	0.07	0.000	150.0
P-20	186	8.0	PVC	12	0.08	0.000	150.0
P-21	188	8.0	PVC	-2	0.01	0.000	150.0
P-8	246	12.0	PVC	0	0.00	0.000	150.0
P-26	259	12.0	PVC	0	0.00	0.000	150.0
P-9	324	8.0	PVC	22	0.14	0.000	150.0
P-7	347	30.0	Steel	-5	0.00	0.000	140.0
P-5	865	30.0	Steel	50	0.02	0.000	140.0
P-4	947	30.0	Steel	50	0.02	0.000	140.0
P-1	1,282	12.0	PVC	-5	0.01	0.000	150.0
P-2	1,512	12.0	PVC	-5	0.01	0.000	150.0
P-3	1,661	36.0	Steel	50	0.02	0.000	140.0

Average Day Scenario

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,590.00	0	5,720.00	56
J-2	5,590.00	0	5,720.00	56
J-3	5,590.00	0	5,720.00	56
J-4	5,590.00	0	5,720.00	56
J-5	5,590.00	0	5,720.00	56
J-6	5,590.00	0	5,720.00	56
J-7	5,590.00	0	5,720.00	56
J-8	5,590.00	0	5,720.00	56
J-9	5,590.00	0	5,720.00	56
J-22	5,590.00	0	5,720.00	56
BLDG 3	5,590.00	10	5,720.00	56
REC/LEASING OFFICE	5,590.00	0	5,720.00	56
J-18	5,590.00	0	5,720.00	56
J-19	5,590.00	0	5,720.00	56
BLDG 4	5,590.00	10	5,720.00	56
BLDG 6	5,590.00	5	5,719.99	56
J-17	5,590.00	0	5,719.99	56
J-11	5,590.00	0	5,719.99	56
BLDG 5	5,590.00	5	5,719.99	56
J-13	5,590.00	0	5,719.99	56
BLDG 1	5,590.00	10	5,719.99	56
J-15	5,590.00	0	5,719.99	56
BLDG 2	5,590.00	10	5,719.99	56

Reservoir Table - Time: 0.00 hours

ID	Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
83	R-1	5,720.00	<None>	55	5,720.00

Peak Hour Scenario

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Diameter (in)	Material	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Hazen-Williams C
P-25	50	12.0	PVC	-247	0.70	0.000	150.0
P-23	59	8.0	PVC	-56	0.36	0.000	150.0
P-19	62	8.0	PVC	47	0.30	0.000	150.0
P-11	64	8.0	PVC	44	0.28	0.000	150.0
P-13	78	8.0	PVC	42	0.27	0.000	150.0
P-16	79	8.0	PVC	-5	0.03	0.000	150.0
P-22	92	8.0	PVC	-56	0.36	0.000	150.0
P-10	119	8.0	PVC	96	0.61	0.000	150.0
P-18	123	8.0	PVC	3	0.02	0.000	150.0
P-14	124	8.0	PVC	42	0.27	0.000	150.0
P-25	141	8.0	PVC	-147	0.94	0.000	150.0
P-15	142	8.0	PVC	-5	0.03	0.000	150.0
P-12	152	8.0	PVC	2	0.01	0.000	150.0
P-6	163	30.0	Steel	126	0.06	0.000	140.0
P-24	178	8.0	PVC	-44	0.28	0.000	150.0
P-17	179	8.0	PVC	-52	0.33	0.000	150.0
P-20	186	8.0	PVC	55	0.35	0.000	150.0
P-21	188	8.0	PVC	-9	0.06	0.000	150.0
P-8	246	12.0	PVC	0	0.00	0.000	150.0
P-26	259	12.0	PVC	0	0.00	0.000	150.0
P-9	324	8.0	PVC	100	0.64	0.000	150.0
P-7	347	30.0	Steel	-21	0.01	0.000	140.0
P-5	865	30.0	Steel	226	0.10	0.000	140.0
P-4	947	30.0	Steel	226	0.10	0.000	140.0
P-1	1,282	12.0	PVC	-21	0.06	0.000	150.0
P-2	1,512	12.0	PVC	-21	0.06	0.000	150.0
P-3	1,661	36.0	Steel	226	0.07	0.000	140.0

Peak Hour Scenario

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-3	5,590.00	0	5,719.99	56
J-4	5,590.00	0	5,719.99	56
J-2	5,590.00	0	5,719.99	56
J-5	5,590.00	0	5,719.99	56
J-1	5,590.00	0	5,719.99	56
J-6	5,590.00	0	5,719.99	56
J-7	5,590.00	0	5,719.99	56
J-8	5,590.00	0	5,719.99	56
J-9	5,590.00	0	5,719.99	56
BLDG 3	5,590.00	47	5,719.93	56
J-22	5,590.00	0	5,719.93	56
REC/LEASING OFFICE	5,590.00	1	5,719.92	56
J-18	5,590.00	0	5,719.92	56
BLDG 4	5,590.00	47	5,719.92	56
J-19	5,590.00	0	5,719.92	56
BLDG 6	5,590.00	24	5,719.91	56
J-17	5,590.00	0	5,719.90	56
J-11	5,590.00	0	5,719.90	56
BLDG 5	5,590.00	24	5,719.90	56
J-13	5,590.00	0	5,719.90	56
J-15	5,590.00	0	5,719.89	56
BLDG 2	5,590.00	47	5,719.89	56
BLDG 1	5,590.00	47	5,719.89	56

Reservoir Table - Time: 0.00 hours

ID	Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
83	R-1	5,720.00	<None>	247	5,720.00

Max Day Scenario

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Diameter (in)	Material	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Hazen-Williams C
P-25	50	12.0	PVC	-138	0.39	0.000	150.0
P-23	59	8.0	PVC	-31	0.20	0.000	150.0
P-19	62	8.0	PVC	28	0.18	0.000	150.0
P-11	64	8.0	PVC	19	0.12	0.000	150.0
P-13	78	8.0	PVC	27	0.17	0.000	150.0
P-16	79	8.0	PVC	-2	0.01	0.000	150.0
P-22	92	8.0	PVC	-31	0.20	0.000	150.0
P-10	119	8.0	PVC	50	0.32	0.000	150.0
P-18	123	8.0	PVC	5	0.03	0.000	150.0
P-14	124	8.0	PVC	27	0.17	0.000	150.0
P-25	141	8.0	PVC	-83	0.53	0.000	150.0
P-15	142	8.0	PVC	-2	0.01	0.000	150.0
P-12	152	8.0	PVC	-9	0.05	0.000	150.0
P-6	163	30.0	Steel	71	0.03	0.000	140.0
P-24	178	8.0	PVC	-23	0.14	0.000	150.0
P-17	179	8.0	PVC	-31	0.20	0.000	150.0
P-20	186	8.0	PVC	29	0.18	0.000	150.0
P-21	188	8.0	PVC	-1	0.01	0.000	150.0
P-8	246	12.0	PVC	0	0.00	0.000	150.0
P-26	259	12.0	PVC	0	0.00	0.000	150.0
P-9	324	8.0	PVC	56	0.36	0.000	150.0
P-7	347	30.0	Steel	-12	0.01	0.000	140.0
P-5	865	30.0	Steel	127	0.06	0.000	140.0
P-4	947	30.0	Steel	127	0.06	0.000	140.0
P-1	1,282	12.0	PVC	-12	0.03	0.000	150.0
P-2	1,512	12.0	PVC	-12	0.03	0.000	150.0
P-3	1,661	36.0	Steel	127	0.04	0.000	140.0

Max Day Scenario

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-3	5,590.00	0	5,720.00	56
J-4	5,590.00	0	5,720.00	56
J-2	5,590.00	0	5,720.00	56
J-5	5,590.00	0	5,720.00	56
J-1	5,590.00	0	5,720.00	56
J-6	5,590.00	0	5,720.00	56
J-7	5,590.00	0	5,720.00	56
J-8	5,590.00	0	5,720.00	56
J-9	5,590.00	0	5,720.00	56
BLDG 3	5,590.00	29	5,719.98	56
J-22	5,590.00	0	5,719.98	56
REC/LEASING OFFICE	5,590.00	1	5,719.97	56
J-18	5,590.00	0	5,719.97	56
J-19	5,590.00	0	5,719.97	56
BLDG 4	5,590.00	29	5,719.97	56
BLDG 6	5,590.00	15	5,719.97	56
BLDG 5	5,590.00	0	5,719.97	56
J-17	5,590.00	0	5,719.97	56
J-11	5,590.00	0	5,719.97	56
J-13	5,590.00	0	5,719.97	56
BLDG 1	5,590.00	29	5,719.96	56
J-15	5,590.00	0	5,719.96	56
BLDG 2	5,590.00	29	5,719.96	56

Reservoir Table - Time: 0.00 hours

ID	Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
83	R-1	5,720.00	<None>	138	5,720.00

Fire Flow Node FlexTable: Fire Flow Report

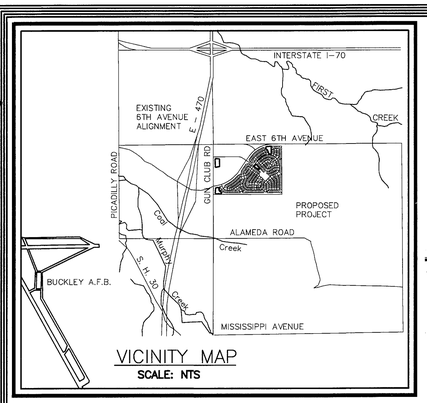
Label	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Junction w/ Minimum Pressure (Zone)	Velocity of Maximum Pipe (ft/s)	Pipe w/ Maximum Velocity
BLDG 1	2,500	48	J-15	11.77	P-10
BLDG 2	2,500	48	J-15	11.89	P-10
BLDG 3	2,500	54	J-22	10.94	P-25
BLDG 4	2,500	52	J-22	10.55	P-25
BLDG 5	2,500	49	J-25	9.99	P-10
BLDG 6	2,500	50	J-28	10.88	P-20
J-1	2,500	56	BLDG 1	7.48	P-25
J-2	2,500	54	BLDG 1	7.48	P-25
J-3	2,500	56	BLDG 1	7.48	P-25
J-4	2,500	56	BLDG 1	7.48	P-25
J-5	2,500	56	BLDG 1	7.48	P-25
J-6	2,500	56	BLDG 1	7.48	P-25
J-7	2,500	56	BLDG 1	7.48	P-25
J-8	2,500	55	J-9	7.48	P-25
J-9	2,500	54	J-8	7.48	P-25
J-11	2,500	50	J-13	11.50	P-10
J-13	2,500	49	BLDG 1	11.65	P-10
J-15	2,500	48	BLDG 2	11.86	P-10
J-17	2,500	51	BLDG 2	11.99	P-10
J-18	2,500	53	J-19	9.85	P-25
J-19	2,500	53	BLDG 6	9.97	P-25
J-22	2,500	53	BLDG 4	11.39	P-23
J-25	2,500	49	BLDG 5	9.43	P-25
J-27	2,500	49	J-28	10.02	P-20
J-28	2,500	50	J-27	10.50	P-20
Offsite Office	2,500	49	J-25	9.50	P-25
REC/LEASING OFFICE	2,500	53	J-17	8.84	P-25

APPENDIX B

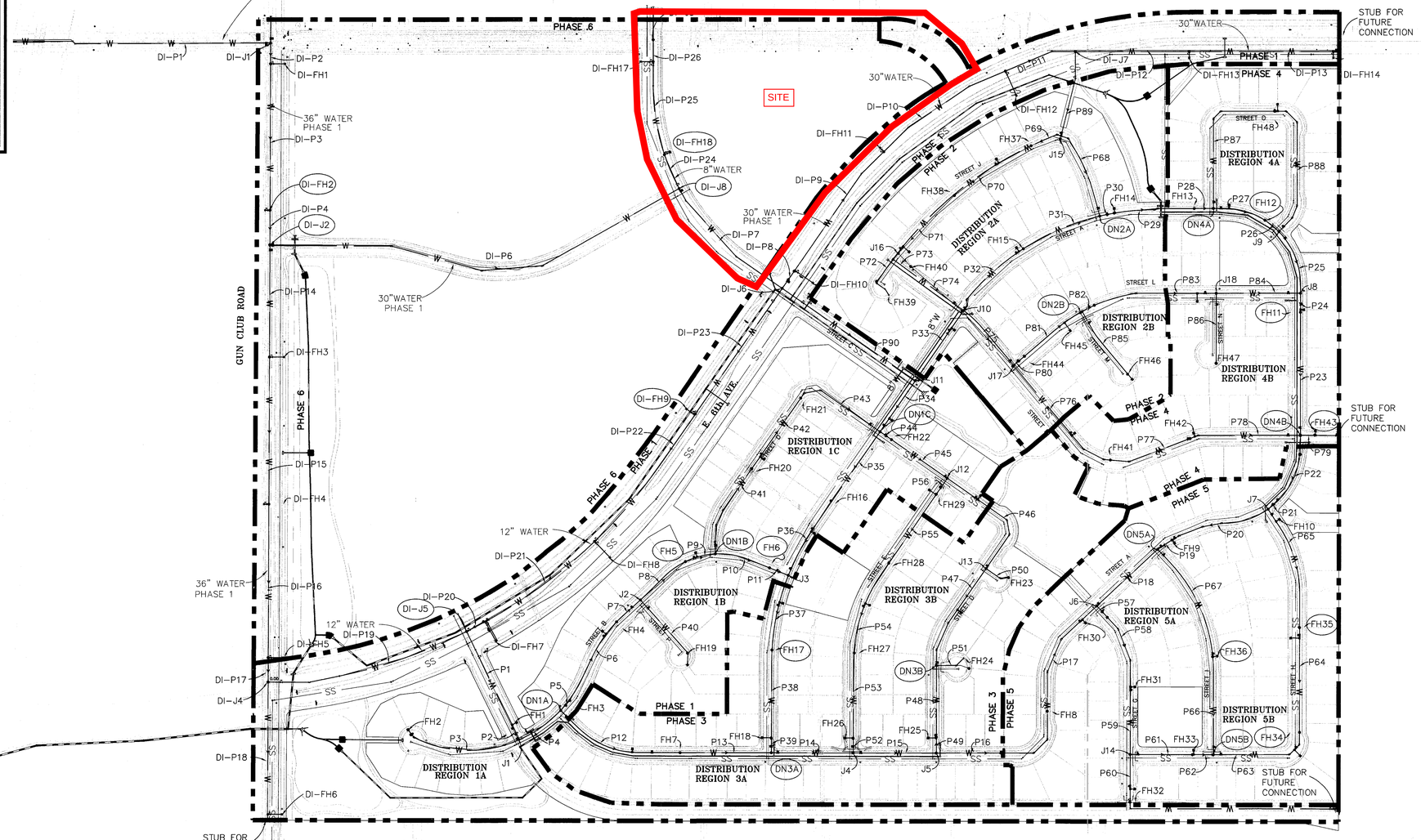
202189 1/3

CROSS CREEK SUBDIVISION
WATER EXHIBIT

pages from ORIGINAL MASTER REPORT



VICINITY MAP
SCALE: NTS



NOTE: THE STREET AND LOT LAYOUT IN THESE PLANS IS CONCEPTUAL IN NATURE. APPROVAL OF THIS PLAN DOES NOT CONSTITUTE APPROVAL OF THE STREET AND LOT LAYOUT.

INDICATES A DEMAND MODELED IN ONE OR MORE SCENERIOS.

GRAPHIC SCALE
0 100 200 400
(IN FEET)
Horiz. 1 inch = 200 ft.

ORIGIN BENCHMARK

COA ID 19 042 RAILROAD SPIKE IN WEST SIDE POWER POLE, EAST SIDE GUN CLUB ROAD 0.4 MILES NORTH OF ELLSWORTH AVENUE 0.2 MILES SOUTH OF 6th AVENUE.
ELEV. = 5558.69

PROJECT BENCHMARK

A FOUND 3" BRASS CAP IN (CITY OF AURORA) RANGE BOX LS 16848 AT THE INTERSECTION OF 6th AVENUE AND GUN CLUB ROAD.
ELEV. = 5554.79

LEGEND

DN#	DEMAND NODE
FH#	FIRE HYDRANT
J#	JUNCTION NODE
P#	DEVELOPER PIPE
DIFH#	DISTRICT FIRE HYDRANT
DIP#	DISTRICT PIPE
DIJ#	DISTRICT JUNCTION

THIS REPRODUCIBLE MYLAR IS A FACSIMILE OF A SIGNED AND SEALED PRINT TRANSMITTED TO THE CITY OF AURORA.

10/21/02
RICK ROME, P.E. DATE
COLORADO REGISTRATION NUMBER 35103
CROSS CREEK SUBDIVISION
PREPARED FOR:
US HOME
9990 PARK MEADOWS DRIVE
LONE TREE, CO 80124
ATTN: VARNEL ROBERTS

APPROVED FOR ONE YEAR FROM THIS DATE
10-30-2002

Director of Public Works — 10-22-02 Date
10-21-02 Utilities Department — 10-21-02 Date
Fire Department — 10/22/02 Date

CALL UTILITY NOTIFICATION CENTER OF COLORADO 1-800-922-1987 or 534-6700 DENVER
CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

NO.	DATE	REVISION	BY

DES.
DR.
CK.
DATE 10/02
FILE RWTRCAD2

HIGH COUNTRY ENGINEERING, INC.
14 INVERNESS DRIVE EAST, SUITE D-186
ENGLEWOOD, COLORADO 80112
PH:(303) 925-0544 FX:(303) 925-0547

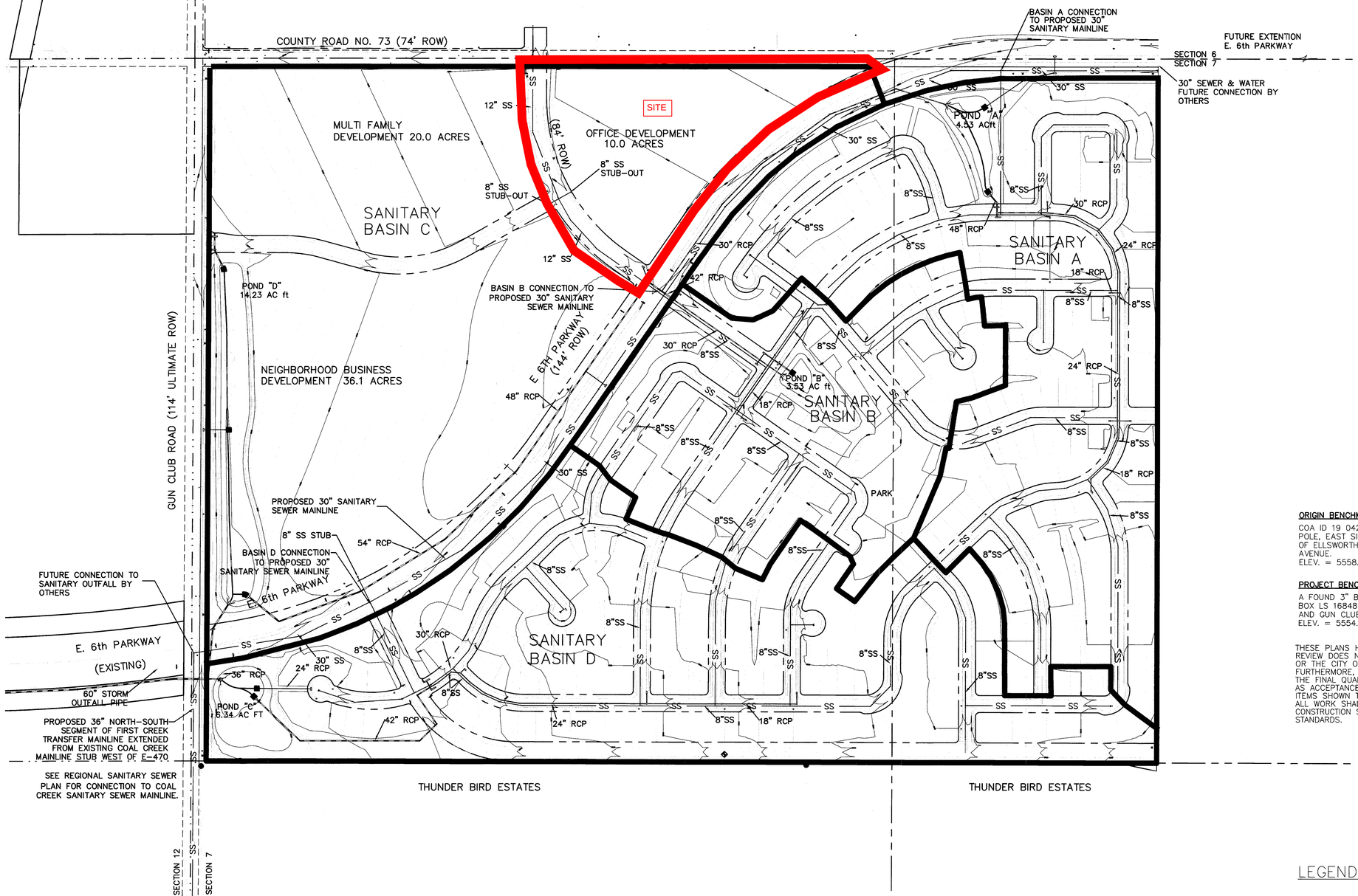
US HOME
AURORA, COLORADO
CROSS CREEK
WATER EXHIBIT

PROJECT NO.
2022004.54

202189 1/3

202189 3/3

pages from ORIGINAL MASTER REPORT



GRAPHIC SCALE
0 100 200 400
(IN FEET)
Horiz. 1 inch = 200 ft.

ORIGIN BENCHMARK

COA ID 19 042 RAILROAD SPIKE IN WEST SIDE POWER POLE, EAST SIDE GUN CLUB ROAD 0.4 MILES NORTH OF ELLSWORTH AVENUE 0.2 MILES SOUTH OF 6th AVENUE.
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PROJECT BENCHMARK

A FOUND 3" BRASS CAP IN (CITY OF AURORA) RANGE BOX LS 16848 AT THE INTERSECTION OF 6th AVENUE AND GUN CLUB ROAD.
ELEV. = 5554.79

THESE PLANS HAVE BEEN REVIEWED BY THE CITY OF AURORA FOR CONCEPT ONLY. THE REVIEW DOES NOT IMPLY RESPONSIBILITY BY THE REVIEWING DEPARTMENT, THE CITY ENGINEER, OR THE CITY OF AURORA FOR ACCURACY AND CORRECTNESS OF THE CALCULATIONS. FURTHERMORE, THE REVIEW DOES NOT IMPLY THAT QUANTITIES OF ITEMS ON THE PLANS ARE THE FINAL QUANTITIES REQUIRED. THE REVIEW SHALL NOT BE CONSTRUED FOR ANY REASON AS ACCEPTANCE OF FINANCIAL RESPONSIBILITY BY THE CITY FOR ADDITIONAL QUANTITIES OF ITEMS SHOWN THAT MAY BE REQUIRED DURING THE CONSTRUCTION PHASE.
ALL WORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH CITY OF AURORA "STANDARD CONSTRUCTION SPECIFICATIONS FOR PUBLIC WORKS" AND / OR OTHER CITY APPROVED APPLICABLE STANDARDS.

THIS REPRODUCIBLE MYLAR IS A FACSIMILE OF A SIGNED AND SEALED PRINT TRANSMITTED TO THE CITY OF AURORA.

RICK ROME, P.E. — DATE 10/21/02
COLORADO REGISTRATION NUMBER 35103

CROSS CREEK SUBDIVISION
PREPARED FOR:
US HOME
9990 PARK MEADOWS DRIVE
LONE TREE, CO 80124
ATTN: VARNEL ROBERTS

LEGEND

- SANITARY SEWER MANHOLES
- SS — SANITARY SEWER MAIN
- A1 — STORM SEWER
- STORM SEWER
- SANITARY BASIN BOUNDARY

NOTE: THE STREET AND LOT LAYOUT IN THESE PLANS IS CONCEPTUAL IN NATURE. APPROVAL OF THIS PLAN DOES NOT CONSTITUTE APPROVAL OF THE STREET AND LOT LAYOUT.

APPROVED FOR ONE YEAR FROM THIS DATE
10-30-2002

Director of Public Works — Date 10-30-02

Director of Utilities Department — Date 10-21-02

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
OR 534-6700 IN METRO DENVER
CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

NO.	DATE	REVISION	BY

DES.
DR.
CK.
DATE
FILE: BASINEXH

HIGH COUNTRY ENGINEERING, INC.
14 INVERNESS DRIVE EAST, SUITE D-186
ENGLEWOOD, CO 80112
PH:(303) 925-0544 FX:(303) 925-0547

US HOME
AURORA, COLORADO

CROSS CREEK
SANITARY SEWER BASINS

PROJECT NO.
2022004

202189 3/3

Sanitary Basin C Outfall
Worksheet for Circular Channel

pages from ORIGINAL MASTER REPORT

Project Description	
Project File	j:\word\202\2004\local utility\corss cr.fm2
Worksheet	Basin C Sanitary Outfall
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.011	
Channel Slope	0.40	%
Diameter	8.00	in
Discharge	357.6	gpm

Sanitary Pipe in Catawba Way is 12" Diameter

Results	
Depth	5.8 in
Flow Area	0.27 ft²
Wetted Perimeter	1.37 ft
Top Width	0.59 ft
Critical Depth	0.42 ft
Percent Full	72.95
Critical Slope	0.59 %
Velocity	2.92 ft/s
Velocity Head	0.13 ft
Specific Energy	0.62 ft
Froude Number	0.76
Maximum Discharge	0.97 cfs
Full Flow Capacity	0.90 cfs
Full Flow Slope	0.31 %
Flow is subcritical.	

Cross Creek Development Local Sanitary Sewer Flow

Total Acreage= 218

Service Description	Service Area Acres	Dwelling Units	Persons per DU	Population	Demand gpd/cap	Average Daily Flow gpm	Infiltration @ 10% gpm	Total Ave. Daily Flow gpm	Peak Factor	Peak Hr. Flow * gpm
Residential										
Single Fam. Basin A	50.2	182.8	3.2	584.96	80	32.5	3.2	35.7	4.0	133.2
Single Fam. Basin B	29.2	106.3	3.2	340.16	80	18.9	1.9	20.8	4.0	77.5
Single Fam. Basin D	55.2	200.9	3.2	642.88	80	35.7	3.6	39.3	4.0	146.4
Multi Family	20	354	1.7	601.8	80	33.4	3.3	36.8	4.0	137.1
Residential subtotals=>	154.6	844		2169.8		120.5	12.1	132.6		494.2
	Service Area Acres	Service Type Assumed	Equivalent Persons Per Acre	Equivalent Population	Ave.Daily Flow gal/day/ac	Average Daily Flow gal/day	Infiltration @ 10% gal/day	Total Ave. Daily Flow gpm	Peak Factor	Peak Hr. Flow * gpm
Commercial & Retail										
Commercial	10	1	6.52	65	500	3.5	0.3	3.8	4.0	14.2
Retail	36.1	4	25.00	903	2000	50.1	5.0	55.2	4.0	205.6
Comm.& Retail Totals=>	46.1			968		53.6	5.4	59.0		219.8
Basin C Total				1569.8	80	87.2	8.7	95.9	4.0	357.6
Site Grand Totals=>	**200.7**			**3137.8**		174.2	17.4	**191.6**		**714.0**

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Table 2, Cross Creek Sanitary Sewer Demand by Basin

Land Use Area	Service Units	Equiv. Pop. / Unit	Loading Rate gpd/cap*	Avg. Day Flow gpm	Avg. Day + infiltration gpm	Peak Hour (gpm)	% Full Pipe @ 0.4% Slope
Cross Creek Sanitary Basin A	182.8	3.2	80	32.5	35.7	133.2	8" dia. 39.5% full
Cross Creek Sanitary Basin B	106.3	3.2	80	18.9	20.8	77.5	8" dia. 29.6% full
Cross Creek Sanitary Basin D	200.9	3.2	80	35.7	39.3	146.4	8" dia. 41.6% full
Total for Basins A, B and D	490			87.1	95.8	357.1	
Multi Family Sanitary Basin C	354	1.7	80	33.4	36.8	137.1	
Onsite Retail Sanitary Basin C	36.1 ac.	N/A	2000 gal/day/ac	50.1	55.2	205.6	
Onsite Comm. Sanitary Basin C	10.0 ac.	N/A	500 gal/day/ac	3.5	3.8	14.2	
Total Sanitary Basin C				87.2	95.9	357.6	8" dia. 73.0% full
Cross Creek Sanitary All Basins				174.2	191.6	714.0	

SITE

* DU = Dwelling Unit; cap = capita

** SFE = Single Family Equivalent

*** See calculations in Appendix B

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DOMESTIC WATER SYSTEM

Domestic Distribution Design Standards

Water demand rates and distribution system design are based on the City of Aurora Public Utility Improvements, Section 4 (Reference 1). The Average Day Demand for the residential use was developed by using the proposed layout and the typical water demand rates of 145 gpd/cap. The Average Day Demand for the neighborhood business development is based on 2.10 gpd/asf and a floor area ratio of 0.23. The office development demand is based on 2.24 gpd/asf and a floor area ratio of 0.28.

Maximum Day Demands and Peak Hour demands are based on the City published factors and are summarized as follows:

Table 3: Water Demand Peak Factors

	Maximum day	Peak Hour
Residential	2.8	4.5
Commercial	2.00	3.98
Office	2.47	3.13

SITE

The resulting demand rates and factored demands for Cross Creek are summarized as follows:

Table 4, Water Demand Summary

Land Use	Number of Units	Average Day (gpm)	Max. Day (gpm)	Peak Hour (gpm)
Single Family	490	157.9	442.1	710.5
Multi Family	354	60.6	169.7	272.7
Office	2.8 asf Acres	6.3	15.5	19.6
Retail	8.3 asf Acres	17.4	34.9	69.3
Totals =>		**242.2**	**662.1**	**1072.1**

SITE

The Insurance Services Office (ISO) fire suppression criteria are referenced in the City's Public Utility Improvements standards manual (Reference 1). The ISO provides for fire flow criteria based, in part, on the relative distance between structures of a certain type. For Single Family Detached structures the following table, Table 5, Fire Flow Requirements Criteria, lists the fire flow requirements and requirements for commercial structures, which are part of the Cross Creek development. Other criteria from the City's Manual are also included and compared to the values obtained from the modeling discussed in the next section:

Table 5: Fire Flow Requirement Criteria

Single Family Dwelling Spacing	Minimum Total Fire Flow Volume GPM	Residual Pressure Max Day + Fire psi	Cross Creek Min. Residual Pressure psi	Maximum 8" pipe Velocity fps	Cross Creek Maximum Velocity fps
31 feet to 100 feet	750	20	N/A	15	N/A
11 feet to 30 feet	1000	20	N/A	15	N/A
10 feet or less	1500	20	46.9	15	5.8
Commer-cial	4000	20	52.3	15	8.5

The fire flow component of the water distribution system was evaluated by assuming a cluster of three fire hydrants flowing at least 500 gallons per minute (gpm) for a total fire flow of 1,500 gpm in a concentrated area. Three areas were selected, including the area of highest elevation in the southeast corner of the development (Max Day + Fire # 3). An additional scenario was run using the commercial fire suppression flow rate of 4,000 gpm divided over three hydrants along E. 6th Parkway. These scenarios were evaluated with full flow fire demand in order to evaluate residual pressures and velocity in pipes. Results of these evaluations appear in Table 5 above.