Drainage Letter
Date Joint Venture Subdivision
Replat of Lots 19 & 20, Block 3, Park Vista Addition
(4207 & 4215 Date Street)
Colorado Springs, Colorado 80917

Prepared for:
Robert Scott General Contractors, Inc.
9850 Highland Glen Place
Colorado Springs, Colorado 80920

Prepared by:

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

Kiowa Project No. 20047
February 8, 2021

Signature Page
Date Joint Venture Subdivision

Engineer's Statement

This report and plan for the drainage design of Date Joint Venture Subdivision was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the City of Colorado Springs Drainage Criteria Manual and is in conformity with the master plan of the drainage basin. I understand that the City of Colorado Springs does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Signature (Affix Seal): _____ _____
Colorado P.E. No. 25057 Date

Developer's Statement

Robert Scott General Contractors, Inc. hereby certifies that the drainage facilities for Date Joint Venture Subdivision shall be constructed according to the design presented in this report. I understand that the City of Colorado Springs does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to the City of Colorado Springs pursuant to section 7.7.906 of the City Code; and cannot, on behalf of Date Joint Venture Subdivision, guarantee that final drainage design review will absolve Robert Scott General Contractors, Inc. and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

Name of Developer: Robert Scott General Contractors, Inc.

_____
Authorized Signature Date

Printed Name: _____

Title: _____

Address: 9850 Highland Glen Place, Colorado Springs, Colorado 80920

City of Colorado Springs Statement:

Filed in accordance with Section 7.7.906 of the code of the City of Colorado Springs, 2001, as amended.

_____ _____
For City Engineer Date

Conditions:

I. General Property Description

The site is located at what is currently 4207 and 4215 Date Street, Colorado Springs, CO 80917, which are platted as Lots 19 and 20, Block 3, Park Vista Addition in the northeast quarter of Section 26, Township 13 South, Range 66 West of the 6th Principal Meridian, in an unincorporated area of El Paso County. The property is proposed to be annexed into the City of Colorado Springs and platted as Lots 1 and 2, Date Joint Venture Subdivision. The property contains approximately 14,400 square feet (0.331 acres). Figure 1 depicts the general location of the property. Current zoning is El Paso County RM-30 (Residential Multi-Dwelling), which would become City of Colorado Springs R-5 (Multi-Family Residential) after annexation.

II. Drainage Design Criteria

The hydrology for this site was estimated using the methods outlined in the City of Colorado Springs Drainage Criteria Manuals. The topography for the site was compiled using a one-foot contour interval and is presented at a horizontal scale of 1-inch to 50-feet in Figures 2 and 3, which can be found in the Appendix. The hydrologic calculations were made assuming both existing conditions and developed conditions. The existing drainage basins are shown on Figure 2, and the developed drainage basins are shown on Figure 3. Peak flow rates for the drainage basins were estimated by using the Rational Method. Runoff for the 5-year and 100-year recurrence intervals were determined.

The runoff coefficients used for the Rational Method were determined using Table 6-6 of the City of Colorado Springs, Drainage Criteria Manual, Volume 1. The hydrological calculations were performed assuming Hydrologic Soil Group C. The hydrological calculations for both existing and developed conditions are included in the Appendix.

III. General Existing Drainage Characteristics

The property lies entirely within the Templeton Gap drainage basin. Runoff from the north half of the site generally sheet flows, at a slope of approximately 1.9%, towards the northwest onto the Date Street R.O.W. and sheet flows southwest, ultimately draining into the Templeton Gap Floodway approximately 1,000 feet southwest of the site. Runoff from the south half of the site generally sheet flows, at a slope of approximately 3.2%, towards the south, ultimately draining to an existing 12' D-10-R public curb inlet at the northeast corner of Beverly Street and Rosalie Street. From here an existing public storm sewer system conveys runoff southwest to the Templeton Gap Floodway. Existing vegetation consists primarily of native grasses and weeds. Figure 2 depicts existing drainage conditions of the property.

Basin E-1 contains 0.14 acres and existing runoff consists of approximately Q_5=0.1 cfs and Q_{100}=0.5 cfs. Basin E-2 contains 0.19 acres and existing runoff consists of approximately Q_5=0.1 cfs and Q_{100}=0.6 cfs. See Appendix for existing hydrologic calculations.

IV. General Proposed Drainage Characteristics

After development, runoff from the northern portion of the site (Basin D-1) will generally sheet flow, at a slope of approximately 3.7%, towards the northwest into the proposed south Date Street curb and gutter. From here runoff sheet flows southwest, ultimately draining into the Templeton Gap Floodway approximately 1,000 feet southwest of the site. Runoff from the southern portion of the site (Basin D-2) will generally sheet flow, at a slope at approximately 7.0% towards the south, ultimately draining to the existing 12' D-10-R public curb inlet at the northeast corner of Beverly Street and Rosalie Street. From here an existing public storm sewer system conveys runoff southwest to the Templeton Gap Floodway. Proposed development consists of two multi-family residential duplexes, sidewalks, driveways, and new curb and gutter in the Date Street Right-of-Way. Figure 3 depicts developed drainage conditions of the property.

Basin D-1 contains 0.14 acres and developed runoff consists of approximately Q_5=0.3 cfs and Q_{100}=0.8 cfs. Basin D-2 contains 0.19 acres and developed runoff consists of approximately Q_5=0.3 cfs and Q_{100}=0.9 cfs. See Appendix for developed hydrologic calculations.

There are no proposed drainage improvements, drainage facilities or water quality features associated with the development of the property. After development, Effective imperviousness will increase by 46.2%. There are no significant changes to existing drainage patterns from those shown in the previously approved Templeton Gap Drainage Basin Study and the Master Development Drainage Plan for Park Vista Subdivision.

V. Water Quality

While this site is less than an acre, it is considered a part of a larger development and is required to address water quality. Based upon the proposed conditions which includes the addition of a duplex building, a runoff reduction analysis using the MHFD UD-BMP (Version 3.07) of the plat area has been prepared and is included in the Appendix as Exhibit 1. The analysis shows that 77% of the WQCV infiltrates into the pervious portions of the site.

VI. Drainage and Bridge Fees

The Date Joint Venture Subdivision lies wholly within the Park Vista (MDDP) drainage basin. Drainage fees have been established for the Park Vista (MDDP) Area for assessment against platted land within the watershed. There are no public facilities proposed with the development of Date Joint Venture Subdivision. The 2021 fees for the Park Vista drainage basin are as follows:

Drainage Fee:	$18,444 per acre
Bridge Fee:	None
Pond Land Fee:	None
Pond Facility Fee:	None
Surcharge:	None
Total Fee	$18,444 / acre

Drainage Fee: 0.331 acres × $18,444/acre=**$6,104.96** are due for this development.

VII. Summary and Conclusion

This report along with its findings are in general conformance with the Templeton Gap Drainage Basin Study and the Master Development Drainage Plan for Park Vista Subdivision, and associated drainage studies in the area. Runoff from the proposed Date Joint Venture Subdivision will not have adverse impacts on existing downstream drainage facilities or surrounding developments.

APPENDIX

Hydrologic Calculations

Runoff Coefficient Calculations -
Time of Concentration -
Runoff Calculations -

Exhibit 1

Figures

Date Joint Venture Subdivision
Runoff Coeficient and Percent Impervious Calculation
Existing Conditions

Basin	Basin or DP Area (DP contributing basins)		Soil Type	DR	Area 1 Land Use			RO	Area 2 Land Use			LA	Area 3 Land Use			HI	Area 4 Land Use			Basin % Imperv	Basin Runoff Coeficient	
				% Imperv	Land Use Area	% Area	Comp Land Use % Imp	% Imperv	Land Use Area	% Area	Comp Land Use % Imp	% Imperv	Land Use Area	% Area	Comp Land Use % Imp	% Imperv	Land Use Area	% Area	Comp Land Use % Imp		C_5	C_{100}
E-1	6,252 sf	0.14ac	C	100%	0.00ac	0%	0%	90%	0.00ac	0%	0%	0%	0.00ac	0%	0%	2%	0.14ac	100%	2%	**2.0%**	**0.16**	**0.51**
E-2	8,148 sf	0.19ac	C	100%	0.00ac	0%	0%	90%	0.00ac	0%	0%	0%	0.00ac	0%	0%	2%	0.19ac	100%	2%	**2.0%**	**0.16**	**0.51**

Basin Runoff Coefficient is a weighted average

Runoff Coefficients and Percents Impervious (City DCM Table 6-6)

Hydrologic Soil Type:	C		**Runoff Coef Calc Method**					Weighted	
Land Use	Abb	%	C_2	C_5	C_{10}	C_{25}	C_{50}	C_{100}	Weighted %Imp
Business: Commercial	BD	95%	0.80	0.82	0.84	0.87	0.88	0.89	
Business: Neighborhood	BS	70%	0.49	0.53	0.57	0.62	0.65	0.68	
Drives and Walks	DR	100%	0.89	0.90	0.92	0.94	0.95	0.96	A
Streets - Gravel (Packed)	GR	80%	0.60	0.63	0.66	0.70	0.72	0.74	B
Historic Flow Analysis	HI	2%	0.05	0.16	0.26	0.38	0.45	0.51	C
Lawns	LA	0%	0.04	0.15	0.25	0.37	0.44	0.50	D
Off-site flow-Undeveloped	OF	45%	0.31	0.37	0.44	0.51	0.55	0.59	
Park	PA	7%	0.09	0.19	0.29	0.40	0.46	0.52	
Streets - Paved	PV	100%	0.89	0.90	0.92	0.94	0.95	0.96	
Roofs	RO	90%	0.73	0.75	0.77	0.80	0.82	0.83	
User Input 1 - Residential	US1	65%	0.41	0.45	0.49	0.54	0.57	0.59	

Equation:

$C_c=(C_1A_1+C_2A_2+C_3A_3+...C_iA_i) / A_t$

(City of Colorado Springs DCM Equation 6-6) Where:

C_c = composite runoff coefficient for total area

C_i = runoff coefficient for subarea (surface type or land use)

A_i = area of surface type corresponding to C_i

A_t = total area of all sub areas

$_i$ = number of surface types in the drainage area

Date Joint Venture Subdivision
Time of Concentration Calculation
Existing Conditions

Sub-Basin Data					Time of Concentration Estimate										t_c (1st DP in Urban Catchments)		Final t_c
Basin	Contributing Basins	Area	C_5	i	Initial/Overland Time (t_i)			Travel Time (t_t)						Comp.			
					Length	Slope	t_i	Length	Slope	Land Type	K	Velocity	t_t	t_c	Total Length	t_c (1st DP)	
E-1	E-1	0.14ac	0.16	2.0%	40lf	2.5%	8.0 min.	40lf	1.3%	SP	7	0.8 ft/sec	0.9 min.	8.9 min.	80lf	18.5 min.	**8.9 min.**
E-2	E-2	0.19ac	0.16	2.0%	61lf	2.5%	9.9 min.	50lf	4.0%	SP	7	1.4 ft/sec	0.6 min.	10.5 min.	111lf	18.5 min.	**10.5 min.**

Equations:

t_i (Overland) = $0.395(1.1-C_5)L^{0.5} S^{-0.333}$
(DCM Equation 6-8) Where:
- C_5 = Runoff coefficient for 5-year
- L = Length of overland flow (ft)
- S = Average basin slope (ft/ft)

$t_t = L_t / 60KS^{0.5}$ Where:
- t_t = Channelized flow time (travel time)(min.)
- L_t = Waterway length (ft)
- K = Conveyance Factor (see DCM Table 6-7)
- S = Watercourse slope (ft/ft)

t_c (1st DP) = $(18-15i) + L_t / (60 (24i+12)S^{0.5})$ Where:
- t_c (1st DP) = First DP Time of Concentration in urban catchments
- L_t = Length of Flow Path
- i = imperviousness (expressed as a decimal)

City DCM Table 6-7

Type of Land Surface	Land Type	C_v
Grassed Waterway	GW	15
Heavy Meadow	HM	2.5
Nearly Bare Ground	NBG	10
Paved Area	PV	20
Riprap (Not Buried)	RR	6.5
Short Pasture/Lawns	SP	7
Tillage/Fields	TF	5

Date Joint Venture Subdivision
Runoff Calculation
Existing Conditions

Basin	Contributing Basins	Drainage Area	C_5	C_{100}	Time of Concentration	Rainfall Intensity i_5	Rainfall Intensity i_{100}	**Runoff Q_5**	**Runoff Q_{100}**	**Basin**
E-1	E-1	0.14 ac	0.16	0.51	8.9 min.	4.3 in/hr	7.2 in/hr	**0.1 cfs**	**0.5 cfs**	E-1
E-2	E-2	0.19 ac	0.16	0.51	10.5 min.	4.1 in/hr	6.8 in/hr	**0.1 cfs**	**0.6 cfs**	E-2

Equations (taken from Fig 6-5, City of Colorado Springs DCM):

i_2=-1.19 ln(T_c) + 6.035

i_5=-1.50 ln(T_c) + 7.583

i_{10}=-1.75 ln(T_c) + 8.847

i_{100}=-2.52 ln(T_c) + 12.738

Q = CiA

Q = Peak Runoff Rate (cubic feet/second)

C = Runoff coef representing a ration of peak runoff rate to ave rainfall intensity for a duration equal to the runoff time of concentration.

i = average rainfall intensity in inches per hour

A = Drainage area in acres

Date Joint Venture Subdivision
Runoff Coeficient and Percent Impervious Calculation
Developed Conditions

				DR	Area 1 Land Use			RO	Area 2 Land Use			LA	Area 3 Land Use			HI	Area 4 Land Use					
Basin	**Basin or DP Area (DP contributing basins)**		Soil Type	% Imperv	Land Use Area	% Area	Comp Land Use % Imp	% Imperv	Land Use Area	% Area	Comp Land Use % Imp	% Imperv	Land Use Area	% Area	Comp Land Use % Imp	% Imperv	Land Use Area	% Area	Comp Land Use % Imp	**Basin % Imperv**	**Basin Runoff Coeficient**	
																					C_5	C_{100}
D-1	6,252 sf	0.14ac	C	100%	0.05ac	37%	37%	90%	0.05ac	35%	31%	0%	0.04ac	28%	0%	2%	0.00ac	0%	0%	**68.6%**	**0.64**	**0.79**
D-2	8,148 sf	0.19ac	C	100%	0.01ac	4%	4%	90%	0.06ac	32%	29%	0%	0.12ac	64%	0%	2%	0.00ac	0%	0%	**32.6%**	**0.37**	**0.62**

Basin Runoff Coefficient is a weighted average

Runoff Coefficients and Percents Impervious (City DCM Table 6-6)

Hydrologic Soil Type:	C		**Runoff Coef Calc Method**					Weighted	
Land Use	Abb	%	C_2	C_5	C_{10}	C_{25}	C_{50}	C_{100}	Weighted %Imp
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Equation:

$C_c=(C_1A_1+C_2A_2+C_3A_3+...C_iA_i) / A_t$

(City of Colorado Springs DCM Equation 6-6) Where:

C_c = composite runoff coefficient for total area

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A_i = area of surface type corresponding to C_i

A_t = total area of all sub areas

$_i$ = number of surface types in the drainage area

Date Joint Venture Subdivision
Time of Concentration Calculation
Developed Conditions

Sub-Basin Data					Time of Concentration Estimate										t_c (1st DP in Urban Catchments)		Final t_c
Basin	Contributing Basins	Area	C_5	i	Initial/Overland Time (t_i)			Travel Time (t_t)						Comp. t_c			
					Length	Slope	t_i	Length	Slope	Land Type	K	Velocity	t_t		Total Length	t_c (1st DP)	
D-1	D-1	0.14ac	0.64	68.6%	30lf	23.3%	1.6 min.	48lf	3.7%	SP	7	1.3 ft/sec	0.6 min.	5.0 min.	78lf	7.8 min.	**5.0 min.**
D-2	D-2	0.19ac	0.37	32.6%	25lf	28.5%	2.2 min.	52lf	7.0%	SP	7	1.9 ft/sec	0.5 min.	5.0 min.	77lf	13.3 min.	**5.0 min.**

Equations:

t_i (Overland) = $0.395(1.1-C_5)L^{0.5} S^{-0.333}$
(DCM Equation 6-8) Where:
- C_5 = Runoff coefficient for 5-year
- L = Length of overland flow (ft)
- S = Average basin slope (ft/ft)

$t_t = L_t / 60KS^{0.5}$ Where:
- t_t = Channelized flow time (travel time)(min.)
- L_t = Waterway length (ft)
- K = Conveyance Factor (see DCM Table 6-7)
- S = Watercourse slope (ft/ft)

t_c (1st DP) = $(18-15i) + L_t / (60 (24i+12)S^{0.5})$ Where:
- t_c (1st DP) = First DP Time of Concentration in urban catchments
- L_t = Length of Flow Path
- i = imperviousness (expressed as a decimal)

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Paved Area	PV	20
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Short Pasture/Lawns	SP	7
Tillage/Fields	TF	5

Date Joint Venture Subdivision
Runoff Calculation
Developed Conditions

Basin	Contributing Basins	Drainage Area	C_5	C_{100}	Time of Concentration	Rainfall Intensity i_5	Rainfall Intensity i_{100}	**Runoff Q_5**	**Runoff Q_{100}**	Basin
D-1	D-1	0.14 ac	0.64	0.79	5.0 min.	5.2 in/hr	8.7 in/hr	**0.5 cfs**	**1.0 cfs**	D-1
D-2	D-2	0.19 ac	0.37	0.62	5.0 min.	5.2 in/hr	8.7 in/hr	**0.4 cfs**	**1.0 cfs**	D-2

Equations (taken from Fig 6-5, City of Colorado Springs DCM):

i_2=-1.19 ln(T_c) + 6.035

i_5=-1.50 ln(T_c) + 7.583

i_{10}=-1.75 ln(T_c) + 8.847

i_{100}=-2.52 ln(T_c) + 12.738

Q = CiA

Q = Peak Runoff Rate (cubic feet/second)

C = Runoff coef representing a ration of peak runoff rate to ave rainfall intensity for a duration equal to the runoff time of concentration.

i = average rainfall intensity in inches per hour

A = Drainage area in acres

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Designer: NRK
Company: Kiowa Engineering Corporation
Date: February 3, 2021
Project: Date Joint Venture Subdivision (Annexation)
Location: 4207 and 4214 Date Street

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth = 0.60 inches
Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	UIA:RPA	DCIA										
Area ID	1	2										
Downstream Design Point ID	1	2										
Downstream BMP Type	None	None										
DCIA (ft^2)	--	1,750										
UIA (ft^2)	5,821	--										
RPA (ft^2)	6,829	--										
SPA (ft^2)	--	--										
HSG A (%)	0%	--										
HSG B (%)	0%	--										
HSG C/D (%)	100%	--										
Average Slope of RPA (ft/ft)	0.054	--										
UIA:RPA Interface Width (ft)	322.00	--										

CALCULATED RUNOFF RESULTS

Area ID	1	2										
UIA:RPA Area (ft^2)	12,650	--										
L / W Ratio	0.12	--										
UIA / Area	0.4602	--										
Runoff (in)	0.00	0.50										
Runoff (ft^3)	0	73										
Runoff Reduction (ft^3)	243	0										

CALCULATED WQCV RESULTS

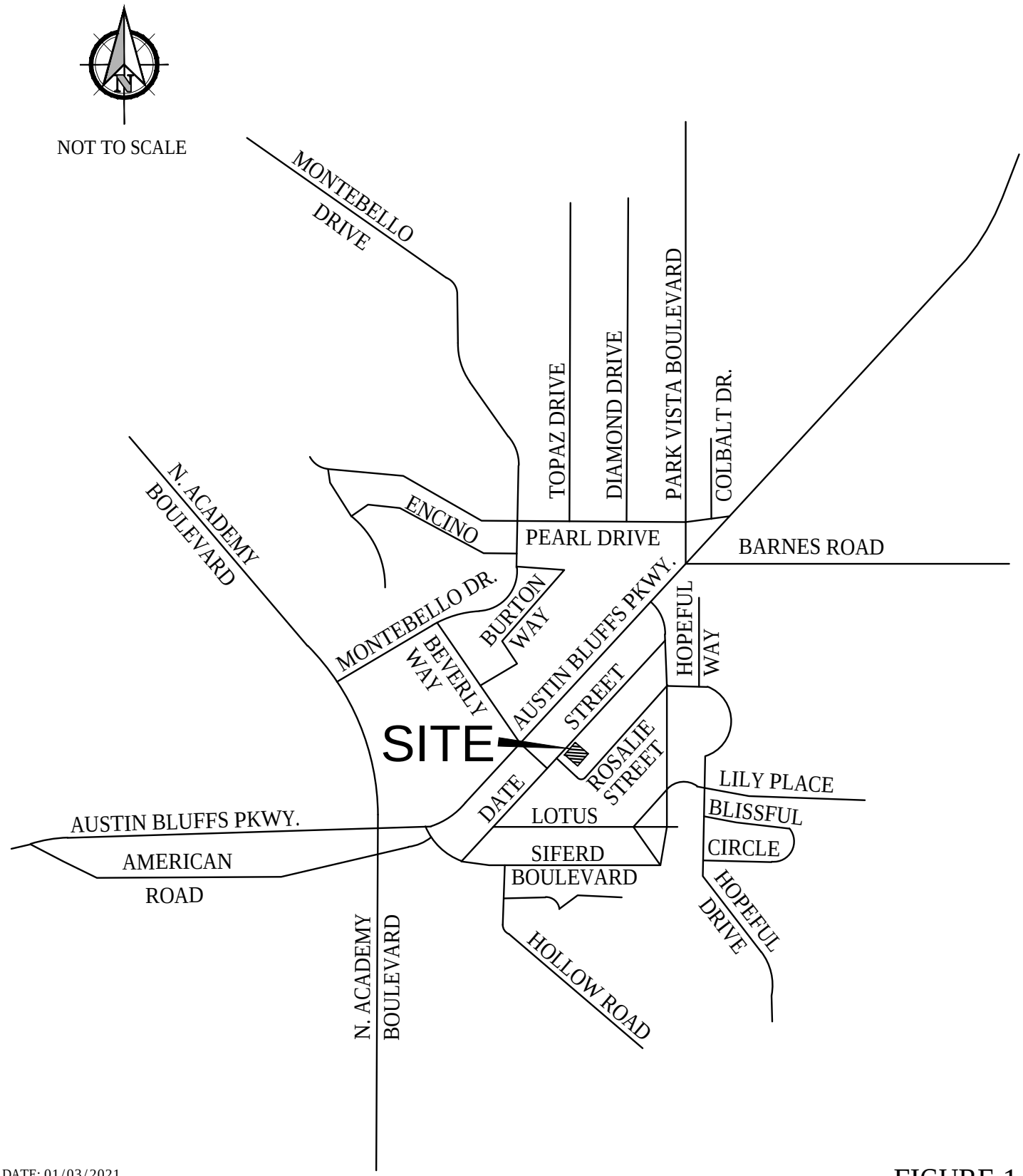
Area ID	1	2										
WQCV (ft^3)	243	73										
WQCV Reduction (ft^3)	243	0										
WQCV Reduction (%)	100%	0%										
Untreated WQCV (ft^3)	0	73										

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	1	2										
DCIA (ft^2)	0	1,750										
UIA (ft^2)	5,821	0										
RPA (ft^2)	6,829	0										
SPA (ft^2)	0	0										
Total Area (ft^2)	12,650	1,750										
Total Impervious Area (ft^2)	5,821	1,750										
WQCV (ft^3)	243	73										
WQCV Reduction (ft^3)	243	0										
WQCV Reduction (%)	100%	0%										
Untreated WQCV (ft^3)	0	73										

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	14,400
Total Impervious Area (ft^2)	7,571
WQCV (ft^3)	315
WQCV Reduction (ft^3)	243
WQCV Reduction (%)	77%
Untreated WQCV (ft^3)	73



DATE: 01/03/2021
PROJECT NO. 20047

FIGURE 1

Kiowa
Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

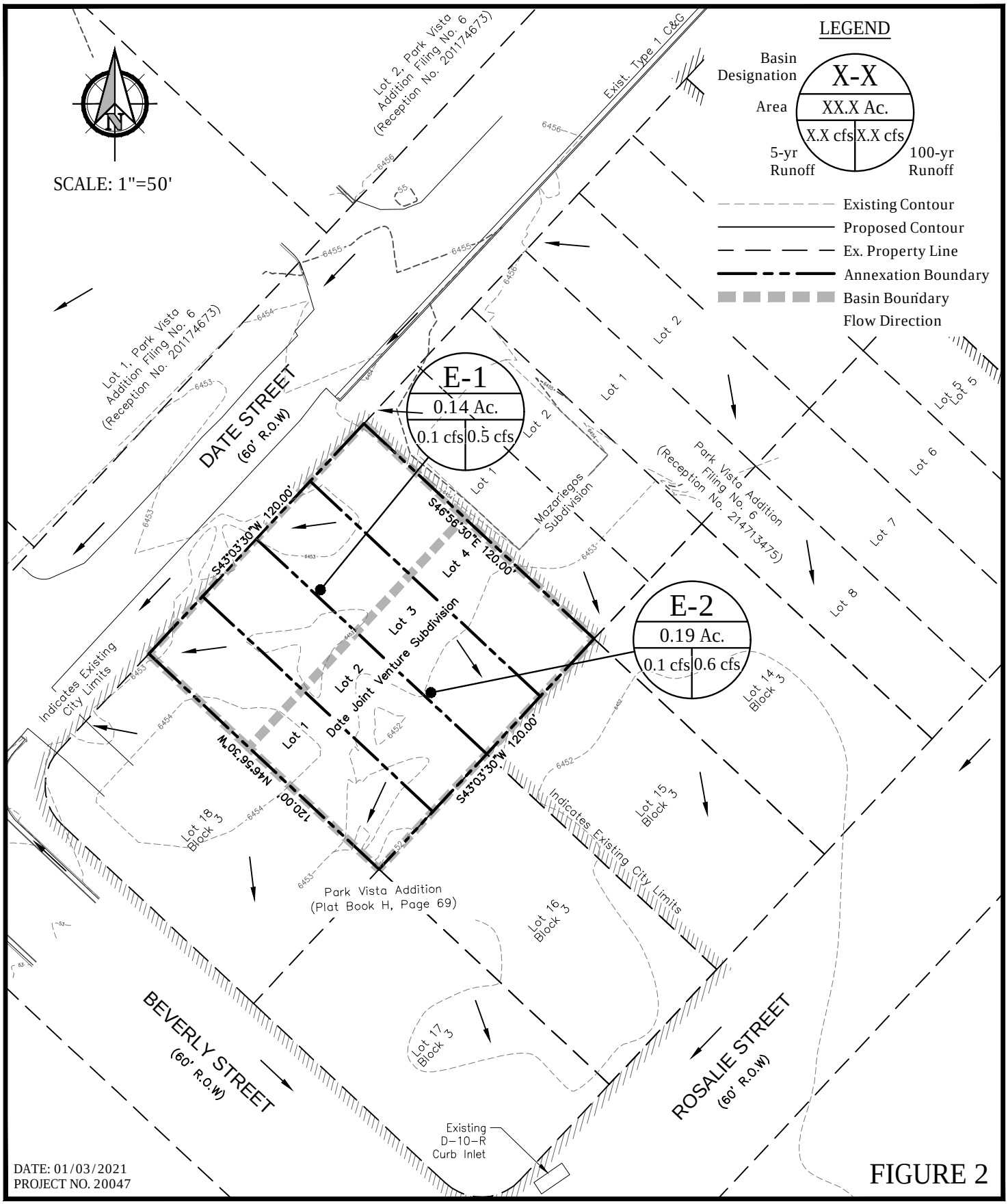
Date Joint Venture Subdivision

A Replat of Lots 19 & 20, Block 3 Park Vista Addition

Vicinity Map

4207 & 4215 Date Street, Colorado Springs, CO 80917

Figures 1-3.dwg/Feb 02, 2021



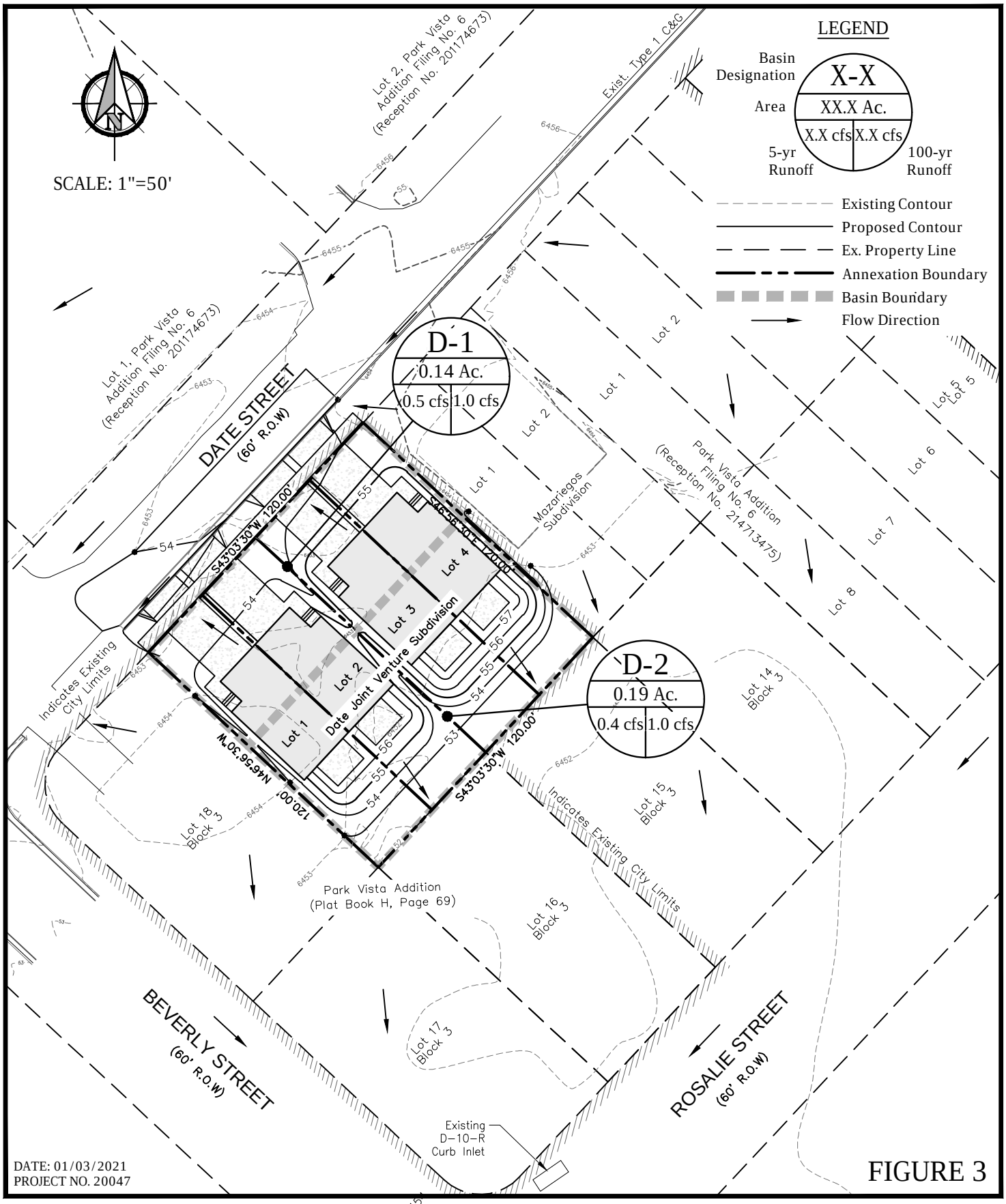
DATE: 01/03/2021
PROJECT NO. 20047

FIGURE 2

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

Date Joint Venture Subdivision
A Replat of Lots 19 & 20, Block 3 Park Vista Addition
Existing Drainage Conditions
4207 & 4215 Date Street, Colorado Springs, CO 80917

Figures 1-3.dwg/Feb 02, 2021



DATE: 01/03/2021
PROJECT NO. 20047

FIGURE 3

Figures 1-3.dwg/Feb 02, 2021

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

Date Joint Venture Subdivision

A Replat of Lots 19 & 20, Block 3 Park Vista Addition

Developed Drainage Conditions

4207 & 4215 Date Street, Colorado Springs, CO 80917