Appendix K Conceptual Hydrology Study

Appendices

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June 2022 | Conceptual Hydrology Study

EASTSIDE NEIGHBORHOOD SCHOOL

Riverside Unified School District

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PLACEWORKS

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1. Introduction

1.1 PURPOSE

This report presents the results of a Conceptual Hydrology Study prepared for the Riverside Unified School District (RUSD or District), which is considering property acquisition for an expansion of the existing Lincoln High School. This assessment evaluates existing and proposed hydrological conditions, peak runoff flow rates, and design capture volumes. This is a conceptual study to determine if there are any hydrologic issues or constraints associated with any of the proposed school layout options. Once a specific school layout has been selected and a grading plan and utilities plan have been developed, a more comprehensive hydrology report will be submitted for review.

1.2 SCHOOL SITE LOCATION

The District proposes property acquisition for an expansion of the existing Lincoln High School, which is located at 4341 Victoria Avenue, City of Riverside, Riverside County, California. The project site consists of Abraham Lincoln Continuation High School at 4341 Victoria Avenue, 9 parcels in Block B, 16 parcels in Block C, and Lincoln Park (see Figure 1, *Site Location*). The project site is generally surrounded by development:

- North: 13th Street and residential, and 12th Street
- East: Victoria Avenue
- South: 14th Street
- West: Howard Avenue

The existing project site is a mix of school facilities, residential and commercial buildings, alleys and streets, paved surfaces, landscaped areas, residential backyards, playfields and vacant land. The District is evaluating three site configuration options. All three options would vacant and acquire Park Avenue between 13th and 14th Streets, acquire and remove structures on parcels in Block B and C parcels, and construct a Transitional Kindergarten (TK) through 6 grade school serving up to 800 students with 31 classrooms (one TK classroom; four kindergarten classrooms; 24 grades 1 to 6 classrooms; and two labs). Other project components vary by project option as shown in Table 1, *Project Options*.

Table 1 Project Options

	Option 1	Option 2	Option 3
Option Description	Acquire Block B and C parcels and clear the land; Demolish Lincoln High School (HS); Construct Elementary School (ES)	Acquire Block B and C parcels and clear the land; Keep Lincoln High School; Construct ES	Acquire Block B and C parcels and clear the land; Remove Lincoln High School; Construct ES and smaller HS on one acre.
Total Site Size	8.62 acres	7.07 acres	8.62 acres
Pervious Area (play fields, kinder-play area)	3.46 acres	3.14 acres	2.72 acres
Impervious Area (paved area, hardcourts, buildings)	5.16 acres	3.93 acres	5.90 acres

Option 1

Option 1 would be a total of 8.62 acres: 23 parcels in Block B and C totaling 4.05 acres, two alleys in Block B and C totaling 0.22 acre, the 3.9-acre Lincoln High School, and Park Avenue to be vacated between 13th and 14th Streets totaling approximately 0.45 acre. As shown on Figure 2, *Option 1 Site Plan*, the main campus would be developed on the eastern half of the Option 1 site while the western half would be used for play fields and hardcourts. This option requires demolition of Lincoln High School and transfer of Lincoln High School students to a different facility within the District boundaries. Option 1 would result in approximately 3.46 acres of pervious surfaces (i.e., play fields, kinder-play area) and 5.16 acres of impervious surfaces.

Option 2

Option 2 would be developed on a total of 7.07 acres and requires the acquisition of Block B and C parcels (4.05 acres), the two alleys in Block B and C (0.22 acre), Park Avenue (0.45 acre), approximately 0.78 acres of Lincoln Park, approximately 0.52 acres of 13th Street to be vacated between Howard Avenue and Park Avenue, and a 1.05-acre portion of Lincoln High School. As shown on Figure 3, *Option 2 Site Plan*, the western portion of Lincoln High School would be used for the new elementary school and would require the relocation of the pre-school program to accommodate a new bus lane separating Lincoln High School from the proposed Eastside Elementary School. The remaining high school campus would operate as is. A portion of Lincoln Park would be developed as joint-use fields with access restricted during school hours. Other areas of the park would remain open to the public during school hours without any access restrictions. This option requires a joint use agreement with the City of Riverside for use of the Lincoln Park. Option 2 would result in approximately 3.14 acres of pervious surfaces (i.e., play fields, kinder-play area) and 3.93 acres of impervious surfaces.

Option 3

Similar to Option 1, Option 3 would be a total of 8.62 acres and requires the acquisition of Block B and C parcels (4.05 acres), the two alleys in Block B and C (0.22 acre) and Park Avenue between 13th and 14th Streets (0.45 acre) and includes the existing 3.9-acre Lincoln High School. As shown on Figure 4, *Option 3 Site Plan*, Option 3 would accommodate both the elementary school and the Lincoln High School on the 8.62-acre site, the elementary school occupying approximately 5.66 acres on the west side of the campus and the

high school occupying approximately 2.96 acres east side of the campus. Option 3 would result in approximately 2.72 acres of pervious surfaces (i.e., play fields, kinder-play area) and 5.9 acres of impervious surfaces.

1.3 OBJECTIVES AND METHODOLOGY

This report is designed to meet the following objectives:

- Describe existing drainage patters and infrastructure related to stormwater management.
- Determine peak runoff flows for existing conditions for the 100-year and 10-year storm events.
- Determine peak runoff flows for the three proposed options for the 100-year and 10-year storm events.
- Calculate the design capture volume for the three proposed options.

This report uses the methodology described in the Riverside County *Hydrology Manual* (Riverside County, 1978). Advanced Engineering Software (AES) HydroWIN software was used to calculate peak flow rates using the Rational Method (RATSCx, Version 23.0).

The design capture volume (DCV) for the three options were calculated in accordance with the Riverside County *Design Handbook for Low Impact Development Best Management Practices* (Riverside County, 2011). The DCV is the volume of runoff generated from an 85th percentile, 24-hour storm event.

Typically, development projects are required to meet the Regional Water Quality Control Board (RWQCB) requirements for stormwater runoff as per the MS4 Permit for Riverside County (Order No. R8-2010-033; NPDES No. CAS 618033). However, K-12 school districts in California are not currently covered under the MS4 permit. The State Water Resources Control Board (SWRCB) is in the process of designating school districts and community colleges as non-traditional permittees in the next iteration of the Phase II MS4 permit. Based on the draft Phase II MS4 permit, it appears that the criteria for sizing storm water retention and treatment systems will be similar to what is required in the current MS4 permit for Riverside County. Therefore, the current MS4 permit requirements were used to determine the DCV for this project.

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Figure 1 - Site Location

Source: Nearmap, 2021

PlaceWorks

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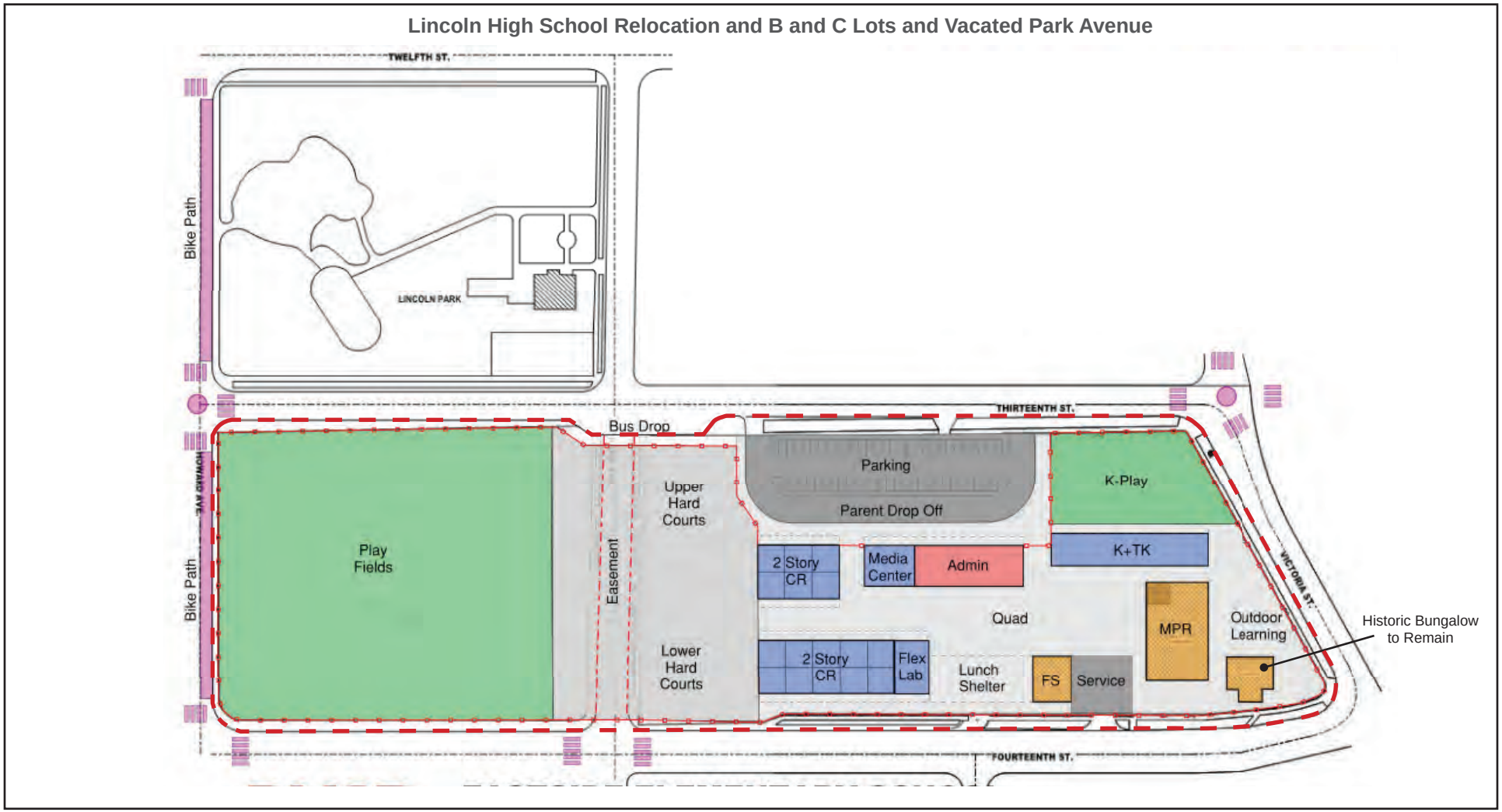
Figure 2 - Option 1 Site Plan



Source: PBK/WLC, 2021

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Figure 3 - Option 2 Site Plan

Option 2 Project Boundary

Note: Conceptual design intended to be used for environmental impact assessment only.

Source: PBK, 2022

0 175
Scale (Feet)

PlaceWorks

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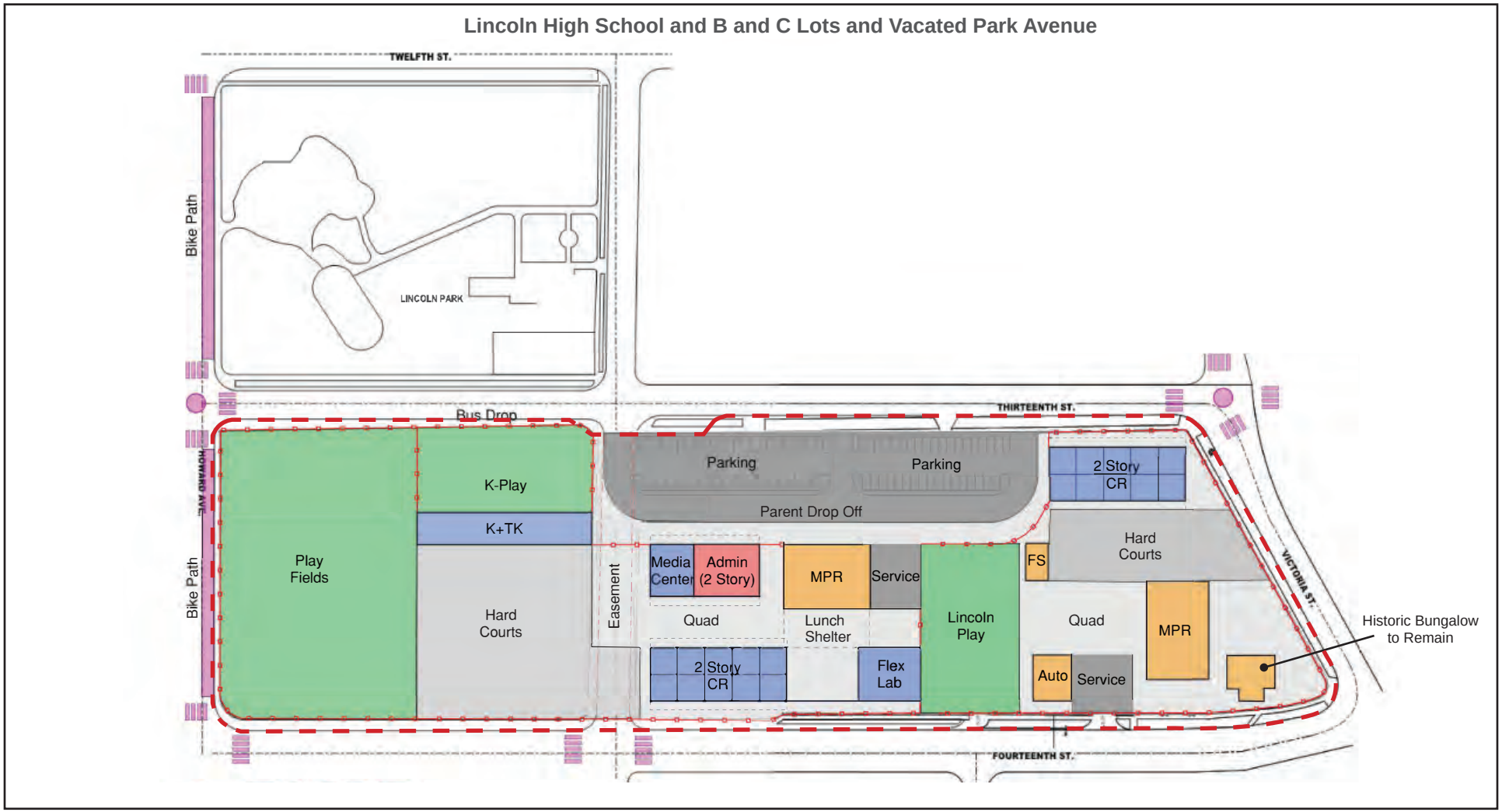
Figure 4 - Option 3 Site Plan



Option 3 Project Boundary

0 175
Scale (Feet)

Source: PBK/WLC, 2021

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2. Conceptual Hydrology Assessment

2.1 EXISTING HYDROLOGY

The project site is relatively flat with gentle slopes towards the west. Runoff from Lincoln Park, 13th Street, Block C, Park Avenue, and the western portions of Block B is captured in the catch basin at the intersection of 14th Street and Howard Avenue. This catch basin connects to a 15-inch reinforced concrete pipe (RCP) which is aligned beneath Howard Avenue. Runoff at the existing Lincoln High School flows to a catch basin near the southeast corner of Block B, west of Victoria Avenue. The catch basin is connected to an 18-inch RCP which flows to the south.

The existing conditions are the same for Options 1 and 3. The existing site consists of 8.62 acres, with approximately 3.44 acres of pervious area (i.e., yards, playfields, vegetated areas, vacant land) and 5.18 acres of impervious surfaces (i.e., paved areas, roofs, streets and alleys). The existing site was divided into four drainage areas to determine peak runoff flow rates: Block C, Park Avenue, Block B, and Lincoln High School area. The existing site drainage areas and calculations are provided in Appendix A.

The existing conditions for Option 2 are slightly different than Options 1 and 3. The existing site for Option 2 encompasses 7.07 acres, with 3.57 acres of pervious area and 3.5 acres of impervious surfaces. The site was divided into five drainage areas to determine peak runoff flow rates: Lincoln Park, 13th Street, Park Avenue, Block C and Block B.

2.2 POST-DEVELOPMENT HYDROLOGY

As detailed site plans were not available at the time of report preparation, a conceptual hydrological analysis was conducted using the proposed site configurations provided in Figures 2 through 4. It is assumed post-development runoff would generally follow the same flow patterns as the existing conditions. The same drainage areas that were used for existing conditions were also used for each site option.

For Option 1, over 90 percent of Block C would be a playfield, with the remaining portion of Block C, vacated Park Avenue and the western portion of Block B consisting of paved surfaces (i.e., hardcourts, parking, and classroom buildings). A kinder-play area would be at the northeast corner of Block B, with the rest of the site consisting of paved surfaces and school buildings. Option 1 would result in approximately 3.46 acres of pervious surfaces (i.e., play fields, kinder-play area) and 5.16 acres of impervious surfaces.

For Option 2, a new 1.88-acre play field would encompass portions of the existing Lincoln Park, vacated 13th Street, and the northwest portion of Block C. The remaining portion of Block C and Park Avenue would be paved surfaces and school buildings. The western portion of Block B would include a kinder-play area, additional play fields and landscaping and the remaining area would be paved surfaces, including

parking/drop-off and classroom buildings. Option 2 would result in approximately 3.33 acres of pervious surfaces (i.e., play fields, kinder-play area) and 3.74 acres of impervious surfaces.

For Option 3, approximately 67 percent of Block C would be play fields and a kinder play area, with the remaining portion of Block C, vacated Park Avenue and the western portion of Block B consisting of paved surfaces (i.e., hardcourts, parking, and classroom buildings). A new play field for Lincoln High School would be located along the southern boundary of Block B, with the redevelopment of Lincoln High School consisting of paved surfaces and school buildings. Option 3 would result in approximately 2.72 acres of pervious surfaces (i.e., play fields for Eastside Neighborhood School and Lincoln High School and a kinder-play area) and 5.9 acres of impervious surfaces.

2.3 RUNOFF SUMMARY

In accordance the Riverside County Hydrology Manual, peak runoff flows were determined using the Rational Method for the 100-year and 10-year storm events. The 10-minute/60-minute intensity values (inches/hour) for the 10-year and 100-year storm events were obtained from Plate D-4.1 of the Hydrology Manual. The soil type as shown on Plate C-1.16 of the Hydrology Manual is classified as Group C. For the existing and proposed conditions, the runoff for each drainage area was calculated based on the runoff coefficient determined using Plate D-5.3 of the Hydrology Manual. The runoff coefficient is determined by correlating the rainfall intensity from the 100-yr and 10-yr storm events to the impervious surface percentage for each drainage area. The Plates from the Riverside County Hydrology Manual that were used as input to the model are provided in Appendix A.[1]

A comparison of the existing and post-development impervious and pervious areas is provided in Table 2, *Existing and Post-Development Impervious/Pervious Area.*

Table 2 Existing and Post-Development Impervious/Pervious Area

	Existing Condition Options 1 and 3	Post Development Option 1	Post Development Option 3	Existing Condition Option 2	Post Development Option 2
Pervious Area	3.44 acres	3.46 acres	2.72 acres	3.57 acres	3.33 acres
Impervious Area	5.18 acres	5.16 acres	5.90 acres	3.50 acres	3.74 acres
Total Area	8.62 acres	8.62 acres	8.62 acre	7.07 acres	7.07 acres
Percent Impervious	60 percent	60 percent	68 percent	50 percent	53 percent
Percent Pervious	40 percent	40 percent	32 percent	50 percent	47 percent

[1] In determining the peak flows using AES software, the user must input a land use type which provides a rough estimate for the impervious surface percentage for each drainage area. However, for this conceptual hydrology study, the runoff coefficient was determined using the actual impervious surface percentage for each drainage area and the methodology described in Plate D-5.3 of the Hydrology Manual. The AES computer output in Appendix A assigns a land use based on the closest representation of percent impervious surface and runoff coefficient; however, this land use was not used in the calculations or analysis.

The total peak flows (in cubic feet per second, cfs) are provided in Table 3, *Existing and Post-Development Runoff Summary*. For Option 1, the peak runoff was calculated to decrease compared to existing conditions for the 100-year and 10-year storm event due to the large increase in pervious area within the Block C drainage area. For Option 2, the peak runoff was calculated to increase slightly (by 0.03 cfs) compared to existing conditions for the 100-year storm event but calculated to decrease for the 10-year storm event. This can be attributed to the fact that the percentage of the total impervious surfaces for Option 2 remains relatively the same (within 3 percent) as compared to existing conditions. Additionally for Option 2, the increase in pervious area within the Lincoln Park, 13th Street, and Park Avenue drainage areas resulted in reduced peak flows that offset the increase in peak flows from the Block C and Block B drainage areas for the 10-year storm event. For the 100-year storm event, the increase in peak flows from the Block C and Block B drainage areas were large enough to result in a slight increase in total peak flows for Option 2.

For Option 3, the peak runoff was calculated to increase slightly as compared to existing conditions for both the 100-year and 10-year storm event by 0.90 cfs and 0.75 cfs, respectively. This can be attributed to an eight percent increase in impervious surfaces for this option as compared to existing conditions. The computer output is provided in Appendix A.

Table 3 Existing and Post-Development Runoff Summary

Storm Event	Site Configuration Option	Existing Peak Flow (cfs)	Post-Development Peak Flow (cfs)	Difference (cfs)
100-yr	Option 1	14.88	13.55	- 1.33
	Option 2	13.46	13.49	+ 0.03
	Option 3	14.88	15.78	+ 0.90
10-yr	Option 1	10.05	9.26	- 0.79
	Option 2	9.20	9.07	- 0.13
	Option 3	10.05	10.8	+ 0.75

2.4 DESIGN CAPTURE VOLUMES

For the three site options, the DCVs were determined in accordance with the Riverside County *Design Handbook for Low Impact Development Best Management Practices* (Riverside County, 2011). The DCV is the volume of runoff generated from an 85th percentile, 24-hour storm event.

Table 4 Design Capture Volumes

Site Configuration Option	Design Capture Volume (cf)
Option 1	8,933
Option 2	7,944
Option 3	9,891

Note: cubic feet (cf)

The calculation worksheets are provided in Appendix B. The DCV is used to design and size stormwater best management practices (BMPs), such as bioretention facilities and detention basins. The project site is not in an area susceptible to hydromodification impacts (Riverside County, 2017). Therefore, post-development runoff rates do not have to match pre-development runoff rates (Santa Ana RWQCB, 2012).

As noted in Section 1.3, K-12 school districts in California are not currently subject to the requirements of the Riverside County MS4 Permit. However, the DCV volumes are provided for informational purposes assuming that in the future K-12 schools and community colleges would need to comply with the requirements of a Phase II Small MS4 permit.

3. Summary and Recommendations

As shown in Table 3, the increase in peak runoff flow rates is less than one cfs for Option 3 (both 100-year and 10-year storm events) and for Option 2 (100-year storm event) and are less than existing conditions for Option 1 (both 100-year and 10-year storm events) and Option 2 (10-year storm event). Additionally, the design capture volumes provided in Table 4 indicate how much stormwater would need to be retained on-site in compliance with future Phase II Small MS4 permit requirements. This would reduce the amount of peak runoff from the project site so that post-development peak flow rates would be less than pre-development flow rates for all options.

Based on the results of this Conceptual Hydrology Study, there are no anticipated downstream impacts associated with site development and no additional mitigation measures are necessary to address post-development peak flows. However, once the District selects one of the three site options as the preferred option and grading and utility plans have been developed for the site, the hydrology study should be revised to reflect the actual drainage conditions.

3. Summary and Recommendations

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4. References

Riverside County Flood Control and Water Conservation District (Riverside County). 2017. *Hydromodification Susceptibility Documentation Report and Mapping: Santa Ana Region.* Dated January 18, 2017.

———. 2011. *Design Handbook for Low Impact Development Best Management Practices.* September 2011.

———. 1978. *Hydrology Manual.* April 1978.

Riverside County Public Works Department. 2022. Phone conversation between Engineering Department records coordinator and Steve Bush, PE, Senior Engineer, PlaceWorks on March 18, 2022.

Santa Ana Regional Water Quality Control Board (Santa Ana RWQCB). 2012. *Water Quality Management Plan.* Approved October 22, 2012.

4. References

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Appendix A. Rational Method Calculations

Rational Method Peak Flow Results (cfs)

100-yr	Peak Flow (cfs)						
	Total	Lincoln Park	13th St	Block C	ParkAve	Block B	Lincoln HS
Existing Op 1/3	**14.88**			6.53	1.20	3.01	4.14
Existing Op 2	**13.46**	0.68	1.31	6.53	1.20	3.74	
Option 1	**13.55**			2.90	1.20	4.06	5.39
Option 2	**13.49**	0.64	0.43	7.13	0.92	4.37	
Option 3	**15.78**			5.20	1.20	4.06	5.32

Using Rainfall Intensity 1 in/hr (for 100-yr, 60-min)

10-yr	Peak Flow (cfs)						
	Total	Lincoln Park	13th St	Block C	ParkAve	Block B	Lincoln HS
Existing Op 1/3	**10.05**			4.45	0.85	1.98	2.77
Existing Op 2	**9.20**	0.43	0.88	4.39	0.85	2.65	
Option 1	**9.26**			1.81	0.85	2.88	3.72
Option 2	**9.07**	0.38	0.26	4.93	0.63	2.87	
Option 3	**10.8**			3.35	0.85	2.88	3.72

Using Rainfall Intensity 0.7 in/hr (for 10-yr, 60-min)

RCFC & WCD

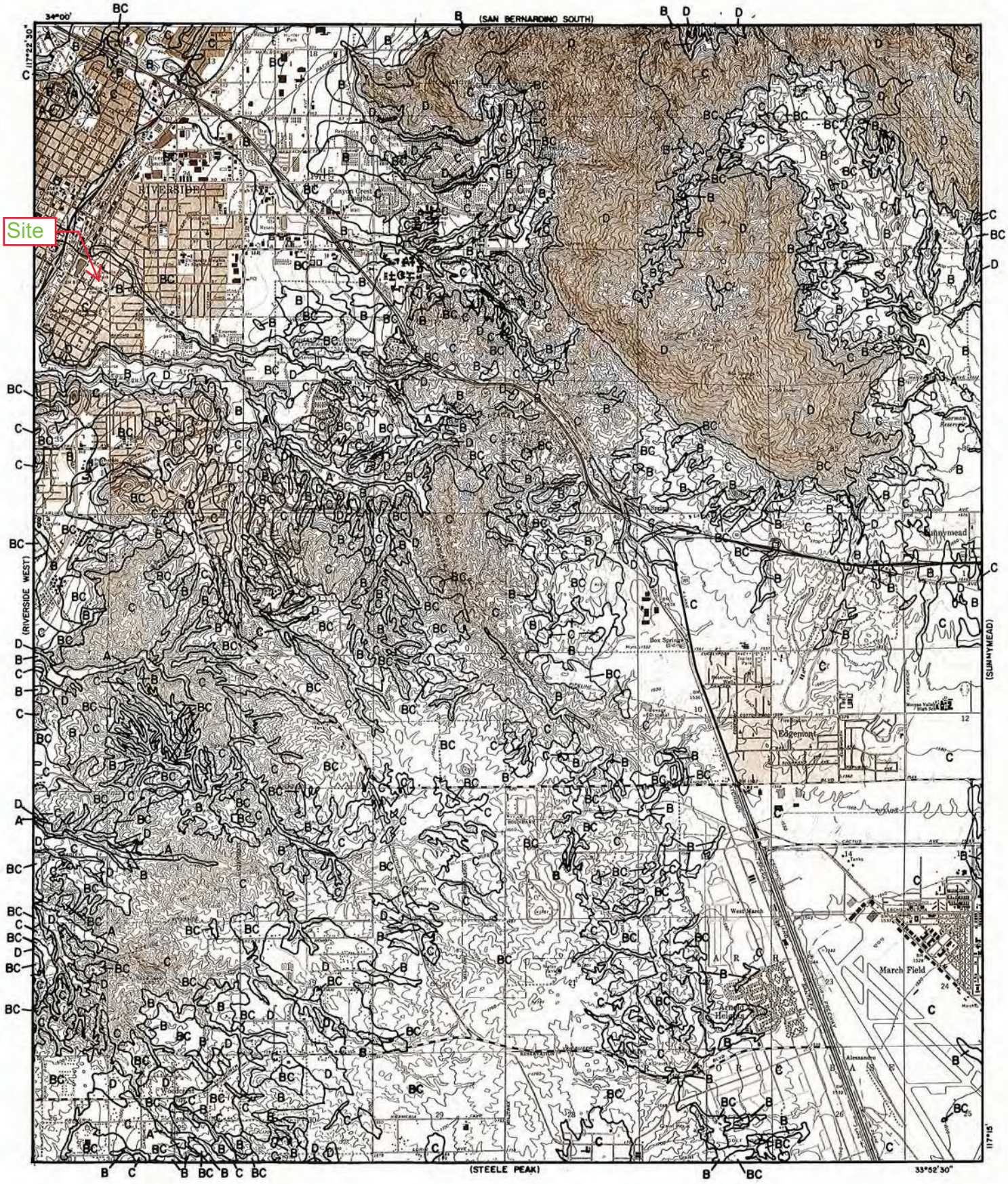
HYDROLOGY MANUAL

RAINFALL INTENSITY–INCHES PER HOUR

RIVERSIDE			RIVERSIDE (FOOTHILL AREAS)			RUBIDOUX			SAN JACINTO			SUN CITY		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.75	3.92	5	3.14	4.71	5	3.18	4.71	5	2.81	4.16	5	3.25	4.85
6	2.48	3.55	6	2.84	4.26	6	2.87	4.26	6	2.56	3.79	6	2.95	4.40
7	2.28	3.26	7	2.61	3.91	7	2.64	3.91	7	2.37	3.51	7	2.72	4.06
8	2.12	3.03	8	2.42	3.63	8	2.45	3.63	8	2.22	3.29	8	2.53	3.78
9	1.99	2.84	9	2.27	3.41	9	2.30	3.41	9	2.09	3.10	9	2.38	3.55
10	1.88	2.68	10	2.14	3.21	10	2.17	3.21	10	1.98	2.94	10	2.25	3.36
11	1.78	2.54	11	2.03	3.05	11	2.06	3.05	11	1.89	2.80	11	2.14	3.19
12	1.70	2.42	12	1.94	2.91	12	1.96	2.91	12	1.81	2.68	12	2.04	3.05
13	1.62	2.32	13	1.86	2.78	13	1.88	2.78	13	1.74	2.58	13	1.96	2.92
14	1.56	2.23	14	1.78	2.67	14	1.80	2.67	14	1.68	2.48	14	1.88	2.81
15	1.50	2.14	15	1.71	2.57	15	1.74	2.57	15	1.62	2.40	15	1.81	2.71
16	1.45	2.07	16	1.66	2.48	16	1.68	2.48	16	1.57	2.32	16	1.75	2.62
17	1.40	2.00	17	1.60	2.40	17	1.62	2.40	17	1.52	2.25	17	1.70	2.54
18	1.36	1.94	18	1.55	2.33	18	1.57	2.33	18	1.48	2.19	18	1.65	2.46
19	1.32	1.88	19	1.51	2.26	19	1.52	2.26	19	1.44	2.13	19	1.60	2.39
20	1.28	1.83	20	1.46	2.20	20	1.48	2.20	20	1.40	2.08	20	1.56	2.33
22	1.22	1.74	22	1.39	2.08	22	1.41	2.08	22	1.34	1.98	22	1.48	2.21
24	1.16	1.66	24	1.32	1.99	24	1.34	1.99	24	1.28	1.90	24	1.41	2.11
26	1.11	1.58	26	1.27	1.90	26	1.28	1.90	26	1.23	1.82	26	1.36	2.03
28	1.06	1.52	28	1.22	1.82	28	1.23	1.82	28	1.19	1.76	28	1.30	1.95
30	1.02	1.46	30	1.17	1.76	30	1.19	1.76	30	1.15	1.70	30	1.26	1.88
32	.99	1.41	32	1.13	1.70	32	1.14	1.70	32	1.11	1.64	32	1.21	1.81
34	.96	1.37	34	1.09	1.64	34	1.11	1.64	34	1.08	1.59	34	1.18	1.76
36	.93	1.32	36	1.06	1.59	36	1.07	1.59	36	1.05	1.55	36	1.14	1.70
38	.90	1.29	38	1.03	1.54	38	1.04	1.54	38	1.02	1.51	38	1.11	1.66
40	.87	1.25	40	1.00	1.50	40	1.01	1.50	40	.99	1.47	40	1.08	1.61
45	.82	1.17	45	.94	1.41	45	.95	1.41	45	.94	1.39	45	1.01	1.51
50	.77	1.11	50	.88	1.33	50	.90	1.33	50	.89	1.31	50	.96	1.43
55	.73	1.05	55	.84	1.26	55	.85	1.26	55	.85	1.25	55	.91	1.36
60	.70	1.00	60	.80	1.20	60	.81	1.20	60	.81	1.20	60	.87	1.30
65	.67	.96	65	.77	1.15	65	.78	1.15	65	.78	1.15	65	.83	1.25
70	.64	.92	70	.73	1.10	70	.74	1.10	70	.75	1.11	70	.80	1.20
75	.62	.88	75	.71	1.06	75	.72	1.06	75	.72	1.07	75	.77	1.15
80	.60	.85	80	.68	1.02	80	.69	1.02	80	.70	1.04	80	.75	1.12
85	.58	.83	85	.66	.99	85	.67	.99	85	.68	1.01	85	.72	1.08
SLOPE = .550			SLOPE = .550			SLOPE = .550			SLOPE = .500			SLOPE = .530		

STANDARD INTENSITY – DURATION CURVES DATA

PLATE D-4.1(5 of 6)



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR RIVERSIDE–EAST

PLATE C–1.16

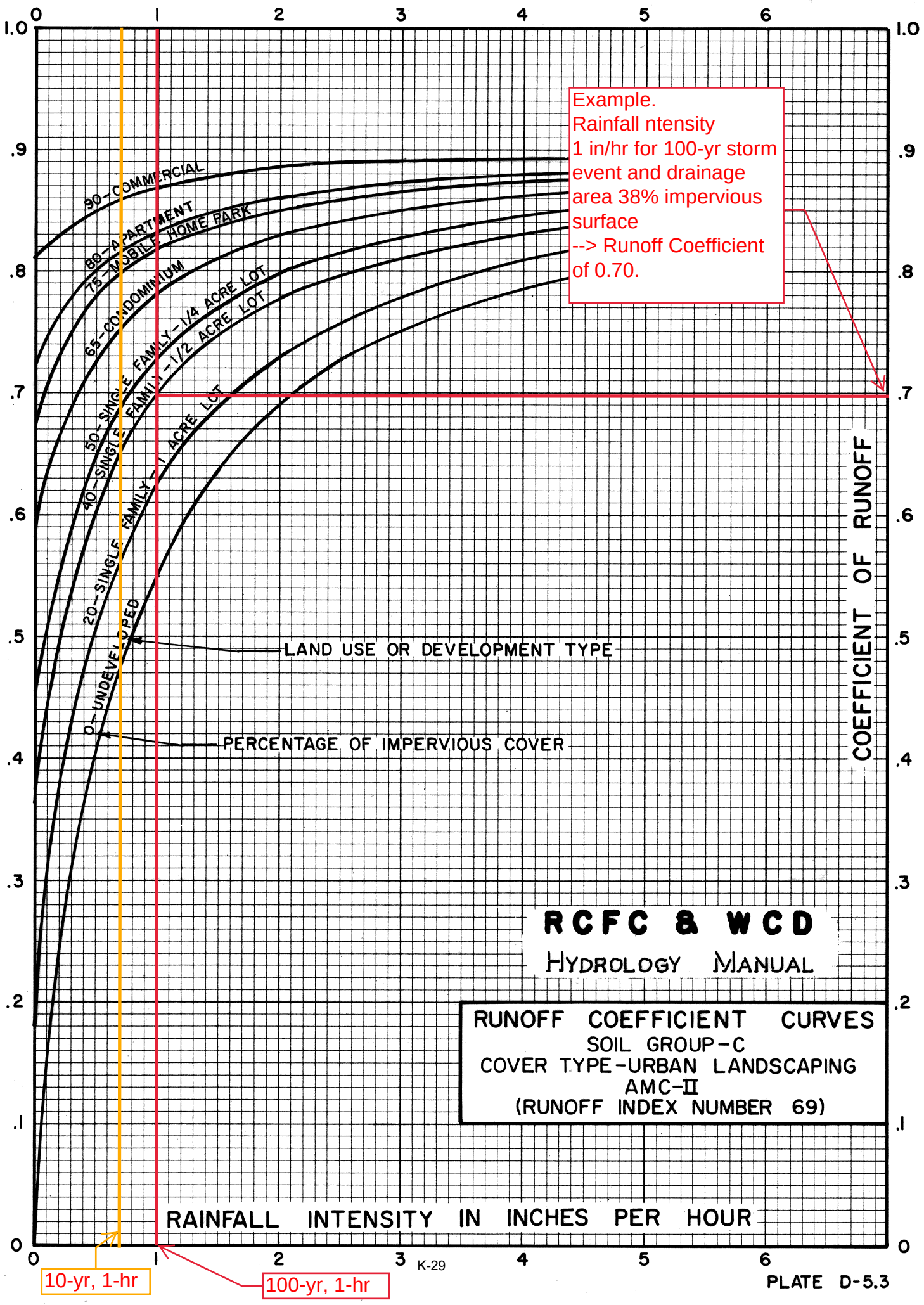
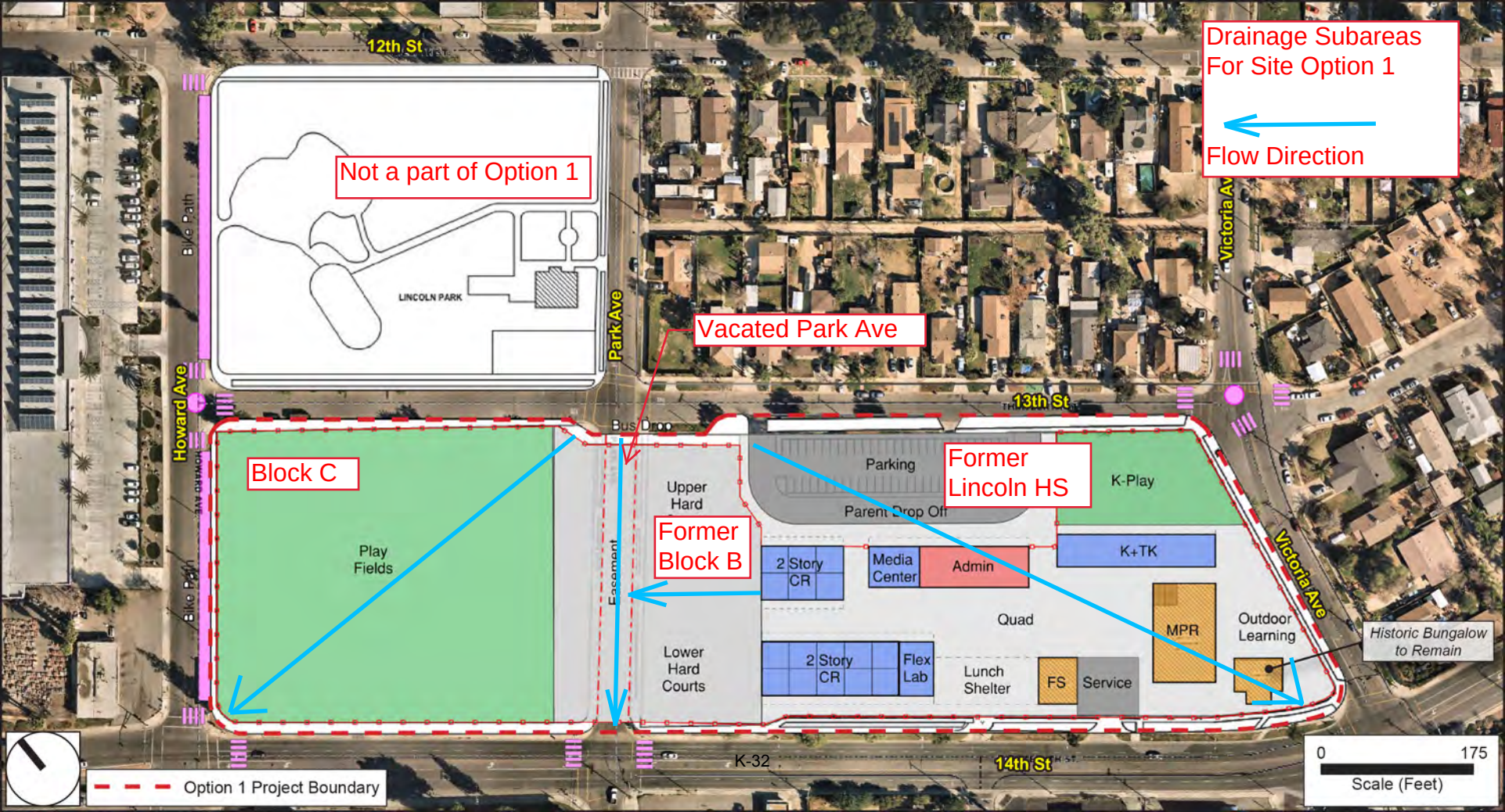
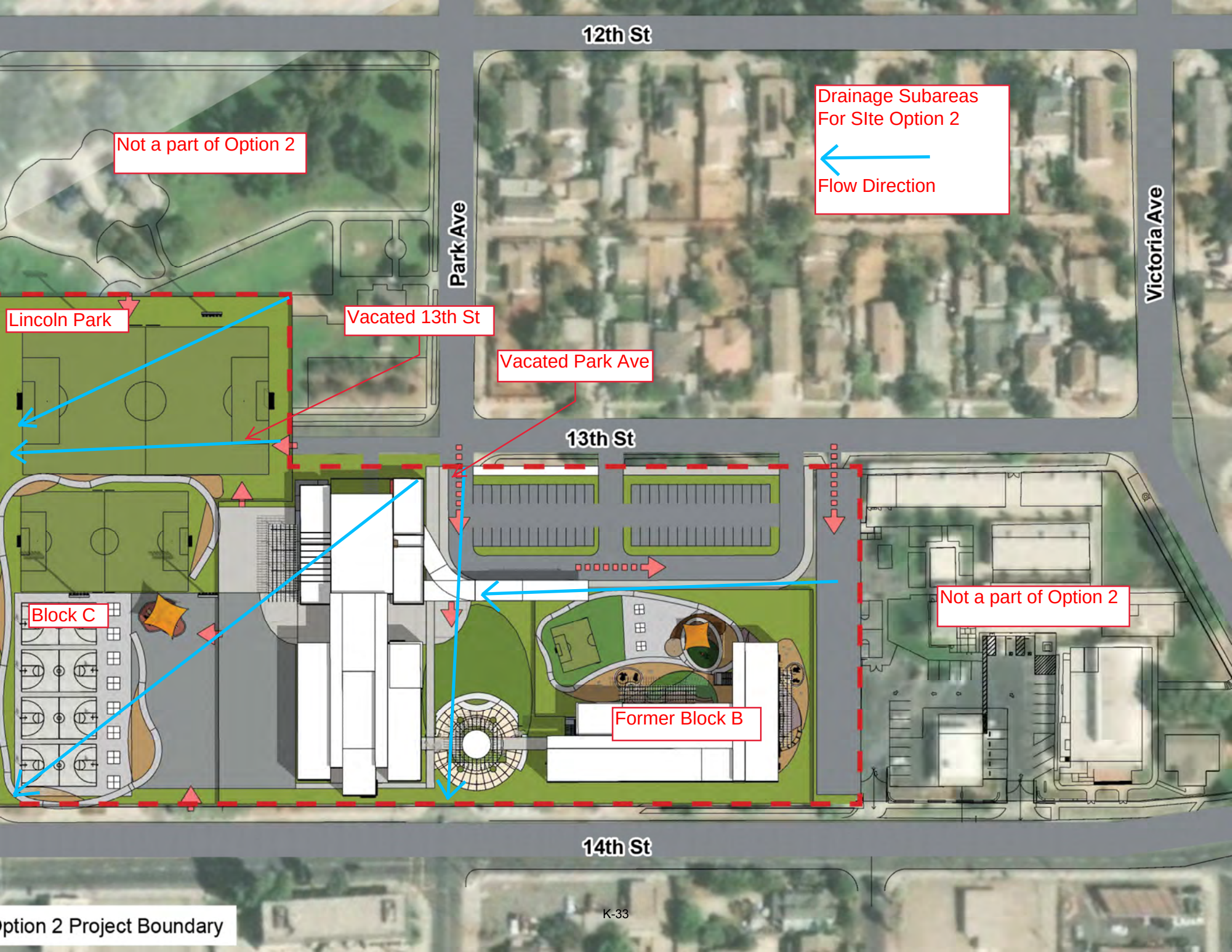

Example.
Rainfall ntensity
1 in/hr for 100-yr storm event and drainage area 38% impervious surface
--> Runoff Coefficient of 0.70.
90-COMMERCIAL
80-APARTMENT
75-MOBILE HOME PARK
65-CONDOMINIUM
50-SINGLE FAMILY-1/4 ACRE LOT
40-SINGLE FAMILY-1/2 ACRE LOT
20-SINGLE FAMILY-1 ACRE LOT
0-UNDEVELOPED
LAND USE OR DEVELOPMENT TYPE
PERCENTAGE OF IMPERVIOUS COVER
COEFFICIENT OF RUNOFF
RCFC & WCD
HYDROLOGY MANUAL
RUNOFF COEFFICIENT CURVES
SOIL GROUP-C
COVER TYPE-URBAN LANDSCAPING
AMC-II
(RUNOFF INDEX NUMBER 69)
RAINFALL INTENSITY IN INCHES PER HOUR
10-yr, 1-hr
100-yr, 1-hr

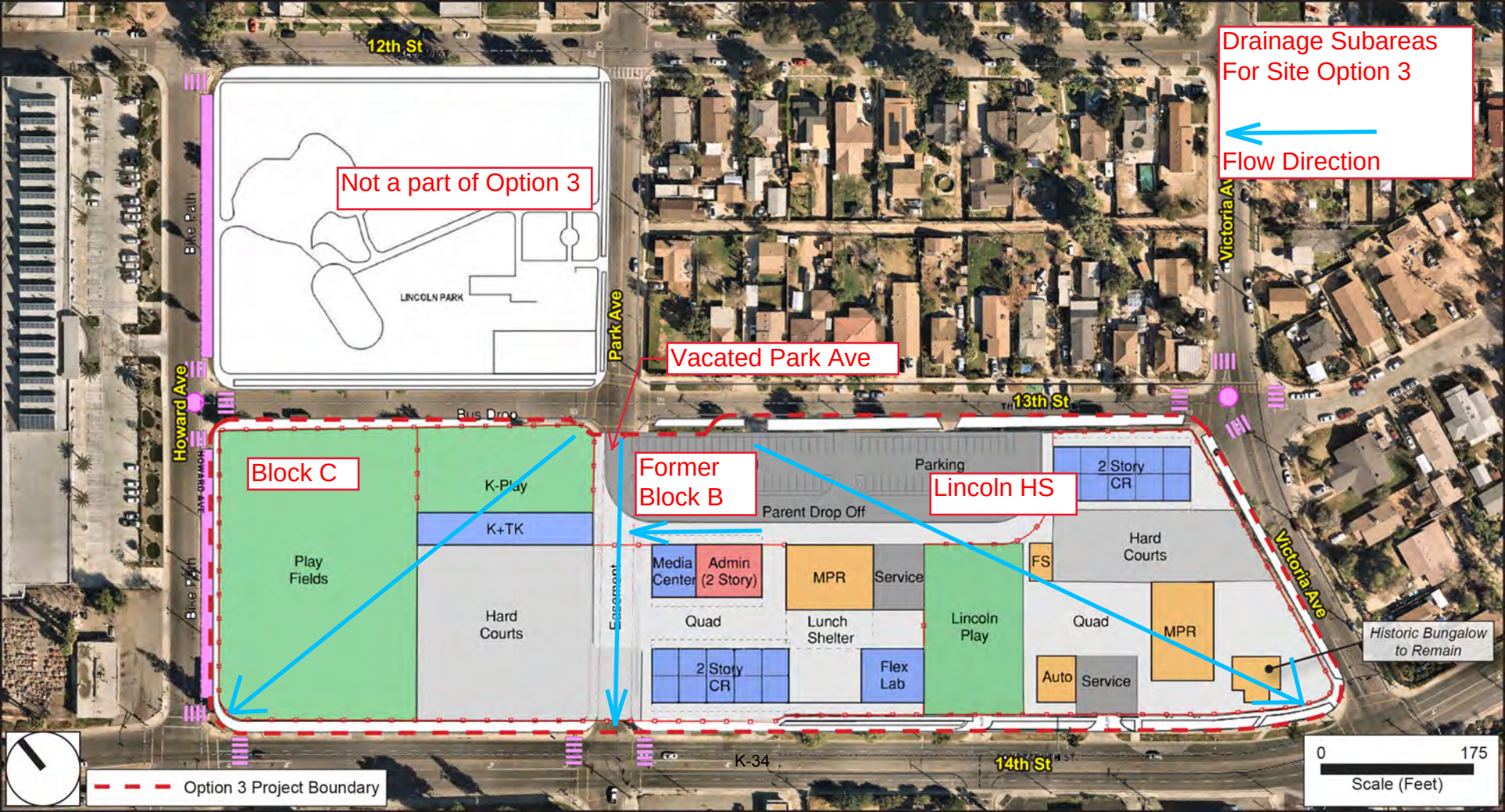
PLATE D-5.3


Existing Drainage Subareas
For Site Options 1 and 3
Flow Direction
12th St
12th St
Howard Ave
Park Ave
13th St
Block C
Block B
Lincoln HS
14th St
14th St
K-30
Google Earth
800 ft
N


Existing Drainage Subareas
For Site Option 2
Flow Direction
Lincoln Park
13th St
Park Ave
Block C
Block B/residential/
portion of Lincoln HS
12th St
12th St
13th St
14th St
14th St
Howard Ave
K-31
Google Earth
800 ft
N


Drainage Subareas For Site Option 1
Flow Direction
Not a part of Option 1
LINCOLN PARK
Vacated Park Ave
Block C
Former Block B
Former Lincoln HS
Play Fields
Upper Hard
Parking
Parent Drop Off
K-Play
K+TK
2 Story CR
Media Center
Admin
Quad
MPR
Outdoor Learning
Lower Hard Courts
2 Story CR
Flex Lab
Lunch Shelter
FS
Service
Historic Bungalow to Remain
Easement
Bus Drop
12th St
13th St
14th St
K-32
Park Ave
Howard Ave
Victoria Ave
Bike Path
Option 1 Project Boundary
0
175
Scale (Feet)


12th St
Drainage Subareas
For SIte Option 2
Flow Direction
Not a part of Option 2
Park Ave
Victoria Ave
Lincoln Park
Vacated 13th St
Vacated Park Ave
13th St
Block C
Not a part of Option 2
Former Block B
14th St
ption 2 Project Boundary


Drainage Subareas For Site Option 3
Flow Direction
Not a part of Option 3
Vacated Park Ave
Block C
Former Block B
Lincoln HS
12th St
13th St
14th St
K-34
Howard Ave
Park Ave
Victoria Ave
Bike Path
Bus Drop
LINCOLN PARK
Play Fields
K-Play
K+TK
Hard Courts
Easement
Parking
Parent Drop Off
Media Center
Admin (2 Story)
MPR
Service
Quad
Lunch Shelter
2 Story CR
Flex Lab
Lincoln Play
FS
Hard Courts
Quad
MPR
Auto
Service
Historic Bungalow to Remain
Option 3 Project Boundary
0
175
Scale (Feet)

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1725

                          Analysis prepared by:



--------------------------------------------------------------------------
  FILE NAME: EX1.DAT
  TIME/DATE OF STUDY: 16:58 03/24/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.880
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.700
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.680
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.000
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5513834
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5501947
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.000
  SLOPE OF INTENSITY DURATION CURVE = 0.5502
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS CONDOMINIUM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   527.00
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    884.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  TC = 0.359*[(  527.00**3)/(     6.00)]**.2 =   10.784
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.571
  *USER SPECIFIED(SUBAREA):
  CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7700
  SUBAREA RUNOFF(CFS) =      6.53
  TOTAL AREA(ACRES) =      3.30   TOTAL RUNOFF(CFS) =      6.53
                                                  Existing Op 1/3 Block C
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   175.00
  UPSTREAM ELEVATION(FEET) =    897.00
  DOWNSTREAM ELEVATION(FEET) =    891.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  TC = 0.393*[(  175.00**3)/(     6.00)]**.2 =    6.083
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.523
  *USER SPECIFIED(SUBAREA):
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .7000
  SUBAREA RUNOFF(CFS) =      3.01
  TOTAL AREA(ACRES) =      1.22   TOTAL RUNOFF(CFS) =      3.01
                                                  Existing Op 1/3 Block B
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   622.00
  UPSTREAM ELEVATION(FEET) =    899.00
```

```
 DOWNSTREAM ELEVATION(FEET) =    896.00
 ELEVATION DIFFERENCE(FEET) =      3.00
 TC = 0.393*[(  622.00**3)/(     3.00)]**.2 =   14.955
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.148
 *USER SPECIFIED(SUBAREA):
 SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .7200
 SUBAREA RUNOFF(CFS) =      4.14
 TOTAL AREA(ACRES) =      2.68   TOTAL RUNOFF(CFS) =     4.14
                                                  Existing Op 1/3 Lincoln HS
****************************************************************************
   FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   362.00
 UPSTREAM ELEVATION(FEET) =    890.00
 DOWNSTREAM ELEVATION(FEET) =    887.00
 ELEVATION DIFFERENCE(FEET) =      3.00
 TC = 0.303*[(  362.00**3)/(     3.00)]**.2 =    8.344
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.961
 *USER SPECIFIED(SUBAREA):
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .9000
 SUBAREA RUNOFF(CFS) =      1.20
 TOTAL AREA(ACRES) =      0.45   TOTAL RUNOFF(CFS) =     1.20
                                        Park Ave, Existing, Op 1/3
****************************************************************************
   FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   527.00
 UPSTREAM ELEVATION(FEET) =    890.00
 DOWNSTREAM ELEVATION(FEET) =    884.00
 ELEVATION DIFFERENCE(FEET) =      6.00
 TC = 0.937*[(  527.00**3)/(     6.00)]**.2 =   28.144
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.517
 *USER SPECIFIED(SUBAREA):
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5800
 SUBAREA RUNOFF(CFS) =      2.90
 TOTAL AREA(ACRES) =      3.30   TOTAL RUNOFF(CFS) =     2.90
                                                  Option 1 Block C
****************************************************************************
 FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS CONDOMINIUM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   175.00
  UPSTREAM ELEVATION(FEET) =    897.00
  DOWNSTREAM ELEVATION(FEET) =    891.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  TC = 0.359*[(  175.00**3)/(     6.00)]**.2 =    5.566
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.700
  *USER SPECIFIED(SUBAREA):
  CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .9000
  SUBAREA RUNOFF(CFS) =      4.06
  TOTAL AREA(ACRES) =      1.22   TOTAL RUNOFF(CFS) =      4.06
                                                  Options 1 and 3 Block B
********************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS APARTMENT
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   622.00
  UPSTREAM ELEVATION(FEET) =    899.00
  DOWNSTREAM ELEVATION(FEET) =    896.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.323*[(  622.00**3)/(     3.00)]**.2 =   12.293
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.392
  *USER SPECIFIED(SUBAREA):
  APARTMENT DEVELOPMENT RUNOFF COEFFICIENT = .8400
  SUBAREA RUNOFF(CFS) =      5.39
  TOTAL AREA(ACRES) =      2.68   TOTAL RUNOFF(CFS) =      5.39
                                                    Option 1 Lincoln HS
********************************************************************************
    FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY(1/2 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   527.00
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    884.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  TC = 0.422*[(  527.00**3)/(     6.00)]**.2 =   12.673
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.353
  *USER SPECIFIED(SUBAREA):
```

```
  SINGLE-FAMILY(1/2 ACRE LOT) RUNOFF COEFFICIENT = .6700
  SUBAREA RUNOFF(CFS) =      5.20
  TOTAL AREA(ACRES) =      3.30   TOTAL RUNOFF(CFS) =     5.20
                                                    Option 3 Block C
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS APARTMENT
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   622.00
  UPSTREAM ELEVATION(FEET) =    899.00
  DOWNSTREAM ELEVATION(FEET) =    896.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.323*[(  622.00**3)/(     3.00)]**.2 =   12.293
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.392
  *USER SPECIFIED(SUBAREA):
  APARTMENT DEVELOPMENT RUNOFF COEFFICIENT = .8300
  SUBAREA RUNOFF(CFS) =      5.32
  TOTAL AREA(ACRES) =      2.68   TOTAL RUNOFF(CFS) =     5.32
                                                    Option 3 Lincoln HS

============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1725

                          Analysis prepared by:



--------------------------------------------------------------------------
  FILE NAME: EX1.DAT
  TIME/DATE OF STUDY: 14:02 06/27/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.880
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.700
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.680
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.000
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5513834
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5501947
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.000
  SLOPE OF INTENSITY DURATION CURVE = 0.5502
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
```

```
****************************************************************************
   FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   311.00
  UPSTREAM ELEVATION(FEET) =    889.00
  DOWNSTREAM ELEVATION(FEET) =    888.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  TC = 0.937*[(  311.00**3)/(     1.00)]**.2 =   29.348
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.482
  *USER SPECIFIED(SUBAREA):
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5900
  SUBAREA RUNOFF(CFS) =      0.68
  TOTAL AREA(ACRES) =      0.78   TOTAL RUNOFF(CFS) =      0.68
                                                  Existing Op 2, Lincoln Park
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   373.00
  UPSTREAM ELEVATION(FEET) =    889.00
  DOWNSTREAM ELEVATION(FEET) =    887.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.303*[(  373.00**3)/(     2.00)]**.2 =    9.213
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.804
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .9000
  SUBAREA RUNOFF(CFS) =      1.31
  TOTAL AREA(ACRES) =      0.52   TOTAL RUNOFF(CFS) =      1.31
                                                Existing Op2, 13th St
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   311.00
  UPSTREAM ELEVATION(FEET) =    889.00
  DOWNSTREAM ELEVATION(FEET) =    888.00
```

```
  ELEVATION DIFFERENCE(FEET) =      1.00
  TC = 0.937*[(  311.00**3)/(     1.00)]**.2 =   29.348
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.482
  *USER SPECIFIED(SUBAREA):
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5500
  SUBAREA RUNOFF(CFS) =      0.64
  TOTAL AREA(ACRES) =      0.78   TOTAL RUNOFF(CFS) =      0.64
                                                    Op 2, Lincoln Park
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   373.00
  UPSTREAM ELEVATION(FEET) =    889.00
  DOWNSTREAM ELEVATION(FEET) =    887.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.937*[(  373.00**3)/(     2.00)]**.2 =   28.493
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.506
  *USER SPECIFIED(SUBAREA):
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5500
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.52   TOTAL RUNOFF(CFS) =      0.43
                                                    Op 2, 13th St
 ****************************************************************************
    FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS CONDOMINIUM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   527.00
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    884.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  TC = 0.359*[(  527.00**3)/(     6.00)]**.2 =   10.784
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.571
  *USER SPECIFIED(SUBAREA):
  CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7700
  SUBAREA RUNOFF(CFS) =      6.53
  TOTAL AREA(ACRES) =      3.30   TOTAL RUNOFF(CFS) =      6.53
                                                  Existing Op 2, Block C
****************************************************************************
    FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
================================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS CONDOMINIUM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   527.00
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    884.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  TC = 0.359*[(  527.00**3)/(     6.00)]**.2 =   10.784
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.571
  *USER SPECIFIED(SUBAREA):
  CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .8400
  SUBAREA RUNOFF(CFS) =      7.13
  TOTAL AREA(ACRES) =      3.30   TOTAL RUNOFF(CFS) =     7.13
                                                    Option 2, Block C
********************************************************************************
 FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS CONDOMINIUM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   362.00
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    887.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.359*[(  362.00**3)/(     3.00)]**.2 =    9.889
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.697
  *USER SPECIFIED(SUBAREA):
  CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7600
  SUBAREA RUNOFF(CFS) =      0.92
  TOTAL AREA(ACRES) =      0.45   TOTAL RUNOFF(CFS) =     0.92
                                                    Op 2, Park Ave
********************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   365.00
  UPSTREAM ELEVATION(FEET) =    902.00
  DOWNSTREAM ELEVATION(FEET) =    890.00
  ELEVATION DIFFERENCE(FEET) =     12.00
  TC = 0.393*[(  365.00**3)/(    12.00)]**.2 =    8.232
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.983
  *USER SPECIFIED(SUBAREA):
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .6200
```

```
  SUBAREA RUNOFF(CFS) =      3.74
  TOTAL AREA(ACRES) =      2.02   TOTAL RUNOFF(CFS) =      3.74
                                                Existing Op 2, Block B-Res/HS
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS CONDOMINIUM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   365.00
  UPSTREAM ELEVATION(FEET) =    902.00
  DOWNSTREAM ELEVATION(FEET) =    890.00
  ELEVATION DIFFERENCE(FEET) =     12.00
  TC = 0.359*[(  365.00**3)/(    12.00)]**.2 =    7.531
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.132
  *USER SPECIFIED(SUBAREA):
  CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .6900
  SUBAREA RUNOFF(CFS) =      4.37
  TOTAL AREA(ACRES) =      2.02   TOTAL RUNOFF(CFS) =      4.37
                                                Op 2, Block B-Res/HS
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1725

                          Analysis prepared by:



--------------------------------------------------------------------------
  FILE NAME: 10YR.DAT
  TIME/DATE OF STUDY: 09:48 03/25/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.880
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.700
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.680
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.000
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5513834
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5501947
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.707
  SLOPE OF INTENSITY DURATION CURVE = 0.5514
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS CONDOMINIUM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   527.00
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    884.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  TC = 0.359*[(  527.00**3)/(     6.00)]**.2 =   10.784
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.821
  *USER SPECIFIED(SUBAREA):
  CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7400
  SUBAREA RUNOFF(CFS) =      4.45
  TOTAL AREA(ACRES) =      3.30   TOTAL RUNOFF(CFS) =      4.45
                                                    Existing Op1/3 Block C
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   175.00
  UPSTREAM ELEVATION(FEET) =    897.00
  DOWNSTREAM ELEVATION(FEET) =    891.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  TC = 0.393*[(  175.00**3)/(     6.00)]**.2 =    6.083
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.497
  *USER SPECIFIED(SUBAREA):
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .6500
  SUBAREA RUNOFF(CFS) =      1.98
  TOTAL AREA(ACRES) =      1.22   TOTAL RUNOFF(CFS) =      1.98
                                                    Existing Op1/3 Block B
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   622.00
  UPSTREAM ELEVATION(FEET) =    899.00
  DOWNSTREAM ELEVATION(FEET) =    896.00
```

```
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.393*[(  622.00**3)/(     3.00)]**.2 =   14.955
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.521
  *USER SPECIFIED(SUBAREA):
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .6800
  SUBAREA RUNOFF(CFS) =      2.77
  TOTAL AREA(ACRES) =      2.68   TOTAL RUNOFF(CFS) =     2.77
                                                  Existing Op1/3 Lincoln HS
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   362.00
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    887.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.303*[(  362.00**3)/(     3.00)]**.2 =    8.344
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.098
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .9000
  SUBAREA RUNOFF(CFS) =      0.85
  TOTAL AREA(ACRES) =      0.45   TOTAL RUNOFF(CFS) =     0.85
                                                 Park Ave, Existing & Op 1/3
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   527.00
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    884.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  TC = 0.937*[(  527.00**3)/(     6.00)]**.2 =   28.144
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.073
  *USER SPECIFIED(SUBAREA):
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5100
  SUBAREA RUNOFF(CFS) =      1.81
  TOTAL AREA(ACRES) =      3.30   TOTAL RUNOFF(CFS) =     1.81
                                                    Option 1 Block C
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
==========================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS APARTMENT
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   622.00
  UPSTREAM ELEVATION(FEET) =    899.00
  DOWNSTREAM ELEVATION(FEET) =    896.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.323*[(  622.00**3)/(     3.00)]**.2 =   12.293
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.695
  *USER SPECIFIED(SUBAREA):
  APARTMENT DEVELOPMENT RUNOFF COEFFICIENT = .8200
  SUBAREA RUNOFF(CFS) =      3.72
  TOTAL AREA(ACRES) =      2.68   TOTAL RUNOFF(CFS) =      3.72
                                                  Option 1 & Option 3 Lincoln HS
**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY(1/2 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   527.00
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    884.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  TC = 0.422*[(  527.00**3)/(     6.00)]**.2 =   12.673
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.666
  *USER SPECIFIED(SUBAREA):
  SINGLE-FAMILY(1/2 ACRE LOT) RUNOFF COEFFICIENT = .6100
  SUBAREA RUNOFF(CFS) =      3.35
  TOTAL AREA(ACRES) =      3.30   TOTAL RUNOFF(CFS) =      3.35
                                                    Option 3 Block C
**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS CONDOMINIUM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   175.00
  UPSTREAM ELEVATION(FEET) =    897.00
  DOWNSTREAM ELEVATION(FEET) =    891.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  TC = 0.359*[(  175.00**3)/(     6.00)]**.2 =    5.566
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.623
  *USER SPECIFIED(SUBAREA):
  CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .9000
```

```
  SUBAREA RUNOFF(CFS) =      2.88
  TOTAL AREA(ACRES) =      1.22   TOTAL RUNOFF(CFS) =      2.88
                                                Option 1 & Option 3, Block B

================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1725

                          Analysis prepared by:



--------------------------------------------------------------------------
  FILE NAME: 10YR.DAT
  TIME/DATE OF STUDY: 14:06 06/27/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.880
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.700
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.680
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.000
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5513834
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5501947
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.707
  SLOPE OF INTENSITY DURATION CURVE = 0.5514
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   311.00
  UPSTREAM ELEVATION(FEET) =    889.00
  DOWNSTREAM ELEVATION(FEET) =    888.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  TC = 0.937*[(  311.00**3)/(     1.00)]**.2 =   29.348
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.049
  *USER SPECIFIED(SUBAREA):
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5200
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.78   TOTAL RUNOFF(CFS) =      0.43
                                          Existing Option 2, Lincoln Park
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   373.00
  UPSTREAM ELEVATION(FEET) =    889.00
  DOWNSTREAM ELEVATION(FEET) =    887.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.303*[(  373.00**3)/(     2.00)]**.2 =    9.213
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.987
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  SUBAREA RUNOFF(CFS) =      0.88
  TOTAL AREA(ACRES) =      0.52   TOTAL RUNOFF(CFS) =      0.88
                                          Existing Option 2, 13th St
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS CONDOMINIUM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   527.00
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    884.00
```

```
  ELEVATION DIFFERENCE(FEET) =      6.00
  TC = 0.359*[(  527.00**3)/(     6.00)]**.2 =   10.784
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.821
  *USER SPECIFIED(SUBAREA):
  CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7300
  SUBAREA RUNOFF(CFS) =      4.39
  TOTAL AREA(ACRES) =      3.30   TOTAL RUNOFF(CFS) =     4.39
                                                  Existing Option 2, Block C
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   311.00
  UPSTREAM ELEVATION(FEET) =    889.00
  DOWNSTREAM ELEVATION(FEET) =    888.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  TC = 0.937*[(  311.00**3)/(     1.00)]**.2 =   29.348
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.049
  *USER SPECIFIED(SUBAREA):
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .4700
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.78   TOTAL RUNOFF(CFS) =     0.38
                                                  Option 2, Lincoln Park
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   373.00
  UPSTREAM ELEVATION(FEET) =    889.00
  DOWNSTREAM ELEVATION(FEET) =    887.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.937*[(  373.00**3)/(     2.00)]**.2 =   28.493
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.066
  *USER SPECIFIED(SUBAREA):
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .4700
  SUBAREA RUNOFF(CFS) =      0.26
  TOTAL AREA(ACRES) =      0.52   TOTAL RUNOFF(CFS) =     0.26
                                                  Option 2, 13th St
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
==============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS CONDOMINIUM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   527.00
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    884.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  TC = 0.359*[(  527.00**3)/(     6.00)]**.2 =   10.784
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.821
  *USER SPECIFIED(SUBAREA):
  CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .8200
  SUBAREA RUNOFF(CFS) =      4.93
  TOTAL AREA(ACRES) =      3.30   TOTAL RUNOFF(CFS) =     4.93
                                                    Option 2, Block C
******************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS CONDOMINIUM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   362.00
  UPSTREAM ELEVATION(FEET) =    890.00
  DOWNSTREAM ELEVATION(FEET) =    887.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.359*[(  362.00**3)/(     3.00)]**.2 =    9.889
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.911
  *USER SPECIFIED(SUBAREA):
  CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7300
  SUBAREA RUNOFF(CFS) =      0.63
  TOTAL AREA(ACRES) =      0.45   TOTAL RUNOFF(CFS) =     0.63
                                                    Option 2, Park Ave
******************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   365.00
  UPSTREAM ELEVATION(FEET) =    902.00
  DOWNSTREAM ELEVATION(FEET) =    890.00
  ELEVATION DIFFERENCE(FEET) =     12.00
  TC = 0.393*[(  365.00**3)/(    12.00)]**.2 =    8.232
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.114
  *USER SPECIFIED(SUBAREA):
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .6200
```

```
  SUBAREA RUNOFF(CFS) =      2.65
  TOTAL AREA(ACRES) =      2.02   TOTAL RUNOFF(CFS) =      2.65
                                  Existing Option 2, Block B-Res/HS
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS CONDOMINIUM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   365.00
  UPSTREAM ELEVATION(FEET) =    902.00
  DOWNSTREAM ELEVATION(FEET) =    890.00
  ELEVATION DIFFERENCE(FEET) =     12.00
  TC = 0.359*[(  365.00**3)/(    12.00)]**.2 =    7.531
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.220
  *USER SPECIFIED(SUBAREA):
  CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .6400
  SUBAREA RUNOFF(CFS) =      2.87
  TOTAL AREA(ACRES) =      2.02   TOTAL RUNOFF(CFS) =      2.87
                                  Option 2, Block B-Res/HS
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Appendix B. Design Capture Volume Calculations

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: PlaceWorks
Date: 3/22/2022
Designed by: Steve Bush
Case No:
Company Project Number/Name: Eastside Elementary School

BMP Identification

BMP NAME / ID:

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.57 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
B-HS	*116764*	*Mixed Surface Types*	*0.88*	*0.70*	*81943.9*			
B-Res	*86078*	*Concrete or Asphalt*	*1*	*0.89*	*76781.6*			
C	*130244*	*Natural (C Soil)*	*0.3*	*0.23*	*29326.5*			
	333086	***Total***			**188052**	**0.57**	***8932.5***	

Proposed Volume must be greater than the Design Capture Volume

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	PlaceWorks	Date	6/27/2022
Designed by	Steve Bush	Case No	
Company Project Number/Name	Eastside Elementary School		

BMP Identification

BMP NAME / ID

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.57 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
B-Res,HS, Park Ave	*107741*	*Mixed Surface Types*	*0.59*	*0.40*	*43242.6*			
C	*118335*	*Concrete or Asphalt*	*1*	*0.89*	*105554.8*			
Field	*81893*	*Natural (C Soil)*	*0.3*	*0.23*	*18439.5*			
	307969	***Total***			**167236.9**	**0.57**	***7943.8***	

Proposed Volume must be greater than the Design Capture Volume

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name PlaceWorks | Date 3/22/2022

Designed by Steve Bush | Case No

Company Project Number/Name Eastside Elementary School

BMP Identification

BMP NAME / ID

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth,
from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.57 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
B	*169884*	*Mixed Surface Types*	*0.91*	*0.74*	*126561.2*			
C, paved	*47768*	*Concrete or Asphalt*	*1*	*0.89*	*42609.1*			
C, fields	*95832*	*Natural (C Soil)*	*0.3*	*0.23*	*21578.1*			
ParkAve	*19602*	*Concrete or Asphalt*	*1*	*0.89*	*17485*			
	333086	***Total***			**208233.4**	**0.57**	***9891.1***	

Proposed Volume must be greater than the Design Capture Volume

Notes: