APPENDIX F

Preliminary Hydrology Report

For

College of the Desert West Valley Campus

June 3, 2015

Prepared by

MSA Consulting, Inc.
34200 Bob Hope Drive
Rancho Mirage, CA 92270

PRELIMINARY HYDROLOGY REPORT

Located in a portion of the Section 13,
Township 4 South, Range 4 East. S.B.M.
County of Riverside, California

COLLEGE OF THE DESERT
WEST VALLEY CAMPUS

JUNE 3, 2015

Prepared for:
HMC Group

MSA Job Number: 2228

MSA CONSULTING, INC.
PLANNING ■ CIVIL ENGINEERING ■ LAND SURVEYING

34200 BOB HOPE DRIVE ■ RANCHO MIRAGE ■ CA 92270
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PROJECT LOCATION

The proposed project site comprises approximately 29 acres located to the south of Tahquitz Canyon Way, west of Farrell Drive and north of Baristo Road in the City of Palm Springs, Riverside County. The site is described as being in a portion of Section 13, Township 4 South, Range 4 East, San Bernardino Base and Meridian. A vicinity map obtained from the Riverside TLMA website is included as Appendix A.

EXISTING TOPOGRAPHY

The subject area is currently developed and is the Palm Springs Mall. Topographically, the site drains typically to the southeast. Storm flows are directed to Farrell Drive and Baristo Road via curb cuts in the parking field.

PROPOSED FLOOD CONTROL REQUIREMENTS

Currently drainage requirements for this project fall under the jurisdiction of the City of Palm Springs. As the project site has drainage patterns established, the City has agreed to allow storm flows to continue to be directed to the public streets; however, the project shall implement measures to treat WQMP flows or volumes as determined by Whitewater River Region – Water Quality Management Plan Worksheets.

The project is planned to consist of multiple phases to occur over an undetermined period of time. Phase I improvements will include the demolition of the existing mall building and the construction of two building structures and a central plant. In addition, a new parking field configuration will be constructed. (Refer to Appendix F for architectural site plans).

Drainage swales and area inlets will be utilized to direct "first-flush" flows to the proposed retention basins. Storm flows will continue to discharge onto the public streets.

HYDROLOGY ANALYSIS DESIGN CRITERIA

The hydrologic data used for the calculations are as follows:

Flood Rate Map

The project area is covered by FIRM Panel Number 06065C1559G, revised August 28, 2008, which indicates the project area lies within Zone X which is defined as *"Areas determined to be outside the 0.2% annual chance floodplain.* (Refer to the attached Flood Insurance Rate Map – Appendix B).

National Cooperative Soil Survey – Hydrologic Soil Group

The existing soil is categorized primarily as hydrologic soil group A as shown on the attached National Cooperative Soil Survey exhibits in Appendix C.

Soil Group A is defined by RCFCD as – "those soils having high infiltration rates. These soils consist mainly of deep, well drained to excessively drained sands or gravely sands. These soils have a high rate of water transmission."

Antecedent Moisture Condition

AMC II – Moderate runoff potential, an intermediate condition. Per RCFC & WCD Hydrology Manual (Dated: April, 1978): "For the purposes of design hydrology using District methods, AMC II should normally be assumed for both the 10 year and 100 year frequency storm".

Land Use Classifications and Runoff Index Numbers

Runoff Index Numbers were obtained from RCFCD Plate D-5.5 and are summarized below:

Proposed Conditions – Commercial Landscaping	32

Percent of Impervious Cover (RCFCD Plate E-6.3):

Commercial	90%
Proposed Open Space/Basin Area	10%

Low Loss Rates:	85%

Precipitation Frequency Estimates

Precipitation depths were obtained from NOAA Atlas 14:

2 Year - 1 Hour Precipitation:	0.471	inches
100 Year – 1 Hour Precipitation:	1.74	inches
100 Year – 3 Hour Precipitation:	2.62	inches
100 Year - 6 Hour Precipitation	3.53	inches
100 Year – 24 Hour Precipitation	5.80	inches

Slope of Intensity Duration Curve:	0.51

See Appendix D for the NOAA Atlas 14 Point Precipitation Frequency Estimates and respective RCFCD Plates.

Site Infiltration

No percolation tests have been performed on the subject property. For the purposes of this report no infiltration rates were used for the basin calculations.

EXISTING CONDITIONS ANALYSES

A site visit to the site verified that there were numerous curb cuts and under sidewalk drains which allow storm flow from the site to be discharged onto the surrounding public streets, Farrell Drive and Baristo Road. As a part of this hydrology study, the tributary drainage areas were identified and associated storm flows were quantified utilizing the Riverside County Flood Control District (RCFCD) Synthetic Unit (Shortcut Method) Analysis. The subject project area of 29 acres is less than the 200-acre limit guideline for utilization of the shortcut method.

It should be noted that the peak flow for the 1-hour storm is not necessarily representative for peak flow. Per RCFCD, peak discharges from the 3-hour storm should normally compare well with rational peaks.

The calculations were based on the following assumptions:

1. All drainage areas were assumed to be Commercial Land Use (90% Impervious).
2. Existing loading/receiving dock drains were ignored and the associated areas were included in the surface flow calculations.

Drainage Subareas are designated according to the street they are tributary and are identified below:

Surface Flow to Baristo Road:

B.01	1.42	ac
B.02	8.30	ac
B.03	4.81	ac
B.04	1.80	ac
Subtotal – Baristo Road Drainage Area	16.33	ac

Surface Flow to Farrell Drive

F.01	3.68	ac
F.02	1.60	ac
F.03	3.56	ac
Subtotal – Farrell Drive Drainage Area	8.84	ac

Flow to Grated Inlets (Unknown Outlet)

SD.01	3.89	ac
Total Hydrologic Area	29.06	ac

Summary Of Synthetic Unit (Shortcut Method) Analyses

Drainage Areas Tributary to Baristo Road

Drainage Area 'B.01'

STORM EVENT SUMMARY					
Duration		1-HOUR	3-HOUR	6-HOUR	24-HOUR
Effective Rain	(in)	1.60	2.20	2.69	3.31
Flood Volume	(cu-ft)	8,244	11,331	13,891	**17,070**
	(acre-ft)	0.19	0.26	0.32	**0.39**
Peak Flow	(cfs)	n/a	3.49	3.20	0.96

Drainage Area 'B.02'

STORM EVENT SUMMARY					
Duration		1-HOUR	3-HOUR	6-HOUR	24-HOUR
Effective Rain	(in)	1.60	2.20	2.69	3.31
Flood Volume	(cu-ft)	48,189	66,230	81,193	**99,777**
	(acre-ft)	1.11	1.52	1.86	**2.29**
Peak Flow	(cfs)	n/a	20.40	18.68	5.59

Drainage Area 'B.03'

STORM EVENT SUMMARY					
Duration		1-HOUR	3-HOUR	6-HOUR	24-HOUR
Effective Rain	(in)	1.60	2.20	2.69	3.31
Flood Volume	(cu-ft)	27,926	38,381	47,053	**57,823**
	(acre-ft)	0.64	0.88	1.08	**1.33**
Peak Flow	(cfs)	n/a	11.82	10.82	3.24

Drainage Area 'B.04'

STORM EVENT SUMMARY					
Duration		1-HOUR	3-HOUR	6-HOUR	24-HOUR
Effective Rain	(in)	1.60	2.20	2.69	3.31
Flood Volume	(cu-ft)	10,451	14,363	17,608	**21,638**
	(acre-ft)	0.24	0.33	0.40	**0.50**
Peak Flow	(cfs)	n/a	4.42	4.05	1.21

Drainage Areas Tributary to Farrell Drive

Drainage Area 'F.01'

STORM EVENT SUMMARY					
Duration		1-HOUR	3-HOUR	6-HOUR	24-HOUR
Effective Rain	(in)	1.60	2.20	2.69	3.31
Flood Volume	(cu-ft)	21,366	29,365	35,999	**44,238**
	(acre-ft)	0.49	0.67	0.83	**1.02**
Peak Flow	(cfs)	n/a	9.04	8.28	2.48

Drainage Area 'F.02'

STORM EVENT SUMMARY					
Duration		1-HOUR	3-HOUR	6-HOUR	24-HOUR
Effective Rain	(in)	1.60	2.20	2.69	3.31
Flood Volume	(cu-ft)	9,289	12,767	15,652	**19,234**
	(acre-ft)	0.21	0.29	0.36	**0.44**
Peak Flow	(cfs)	n/a	3.93	3.60	1.08

Drainage Area 'F.03'

STORM EVENT SUMMARY					
Duration		1-HOUR	3-HOUR	6-HOUR	24-HOUR
Effective Rain	(in)	1.60	2.20	2.69	3.31
Flood Volume	(cu-ft)	20,669	28,407	34,825	**42,796**
	(acre-ft)	0.47	0.65	0.80	**0.98**
Peak Flow	(cfs)	n/a	8.75	8.01	2.40

Drainage Areas Tributary to Grated Inlets (Unknown Outlet)

Drainage Area 'SD.01'

STORM EVENT SUMMARY					
Duration		1-HOUR	3-HOUR	6-HOUR	24-HOUR
Effective Rain	(in)	1.60	2.20	2.69	3.31
Flood Volume	(cu-ft)	22,585	31,040	38,053	**46,763**
	(acre-ft)	0.52	0.71	0.87	**1.07**
Peak Flow	(cfs)	n/a	9.56	8.75	2.62

WQMP Analysis

Existing design volume and flow for BMP measures were based on worksheets from the Riverside County - Whitewater River Region Water Quality Management Plan. Impervious areas for the tributary drainage areas are based on a commercial land use (90% impervious). There are no WQMP BMP measures currently in use at the project site.

Drainage Areas Tributary to Baristo Road

Drainage Area	Total Area (acres)	Impervious Area (acres)	Design Volume (cu-ft)	Design Flow (cfs)
B.01	1.42	1.28	1,510	0.21
B.02	8.30	7.47	8,801	1.21
B.03	4.81	4.33	5,103	0.70
B.04	1.80	1.62	1,909	0.26
TOTAL	16.33	14.70	17,323	2.38

Drainage Areas Tributary to Farrell Drive

Drainage Area	Total Area (acres)	Impervious Area (acres)	Design Volume (cu-ft)	Design Flow (cfs)
F.01	3.68	3.31	3,898	0.54
F.02	1.60	1.44	1,697	0.23
F.03	3.56	3.20	3,766	0.52
TOTAL	8.84	7.95	9,361	1.29

Drainage Areas Tributary to Grated Inlets (Unknown Outlet)

Drainage Area	Total Area (acres)	Impervious Area (acres)	Design Volume (cu-ft)	Design Flow (cfs)
SD.01	3.89	3.50	4,123	0.57

The synthetic unit hydrograph and Riverside County Whitewater River Region WQMP BMP worksheets are included in Appendix E.

PROPOSED PHASE 1 ANALYSES

As stated previously, the City of Palm Springs has agreed to only requiring the project to provide measures to treat WQMP discharge and to allow storm flows to continue to be discharged onto the public streets. For the Phase 1 construction, approximately 12.2 acres of disturbed land, it is proposed to utilize shallow retention basins to contain the WQMP Design Volume. Architectural conceptual site plans are included as Appendix F.

Preliminary design volume and flow for BMP measures were based on worksheets from the Riverside County - Whitewater River Region Water Quality Management Plan. Impervious areas for the tributary drainage areas are derived from the preliminary site plan. Open space (landscaped) areas have an assigned impervious factor of 10% to account for minor construction variances, with all other areas having an assigned impervious factor of 100%. A summary of the design flow and volumes is presented below with the worksheets attached as Appendix G.

Phase 1 Land Use Summary

Drainage Area	Measured Areas			Adjusted Areas	
	Total Area (acres)	Open Space Landscaped (acres)	Impervious (acres)	Open Space Landscaped (acres)	Impervious (acres)
A	4.080	0.949	3.131	0.854	3.226
B	2.000	1.199	0.801	1.079	0.921
C	4.825	4.139	0.686	3.725	1.100
D	1.329	1.329	-0-	1.196	0.133
TOTAL	12.234	7.616	4.618	6.854	5.380

Phase 1 WQMP Summary

Drainage Area	Total Area (acres)	Impervious Area (acres)	Design Volume (cu-ft)	Design Flow (cfs)	Storage Provided (cu-ft)
A	4.080	3.226	3,486	0.48	3,917
B	2.000	0.921	914	0.13	1,687
C	4.825	1.100	1,304	0.18	4,895
D	1.329	0.133	213	0.03	*

The WQMP Basin for Drainage Area D will be incorporated into the proposed landscaping once determined.

RESULTS AND CONCLUSIONS

As the above narrative and summaries confirm, the preliminary WQMP retention basins have sufficient storage to retain the BMP Design Storage Volume as determined by the Whitewater River worksheets. In addition to treating the WQMP discharge, the basins will also reduce the storm flow volume being directed to the public streets during a storm event.

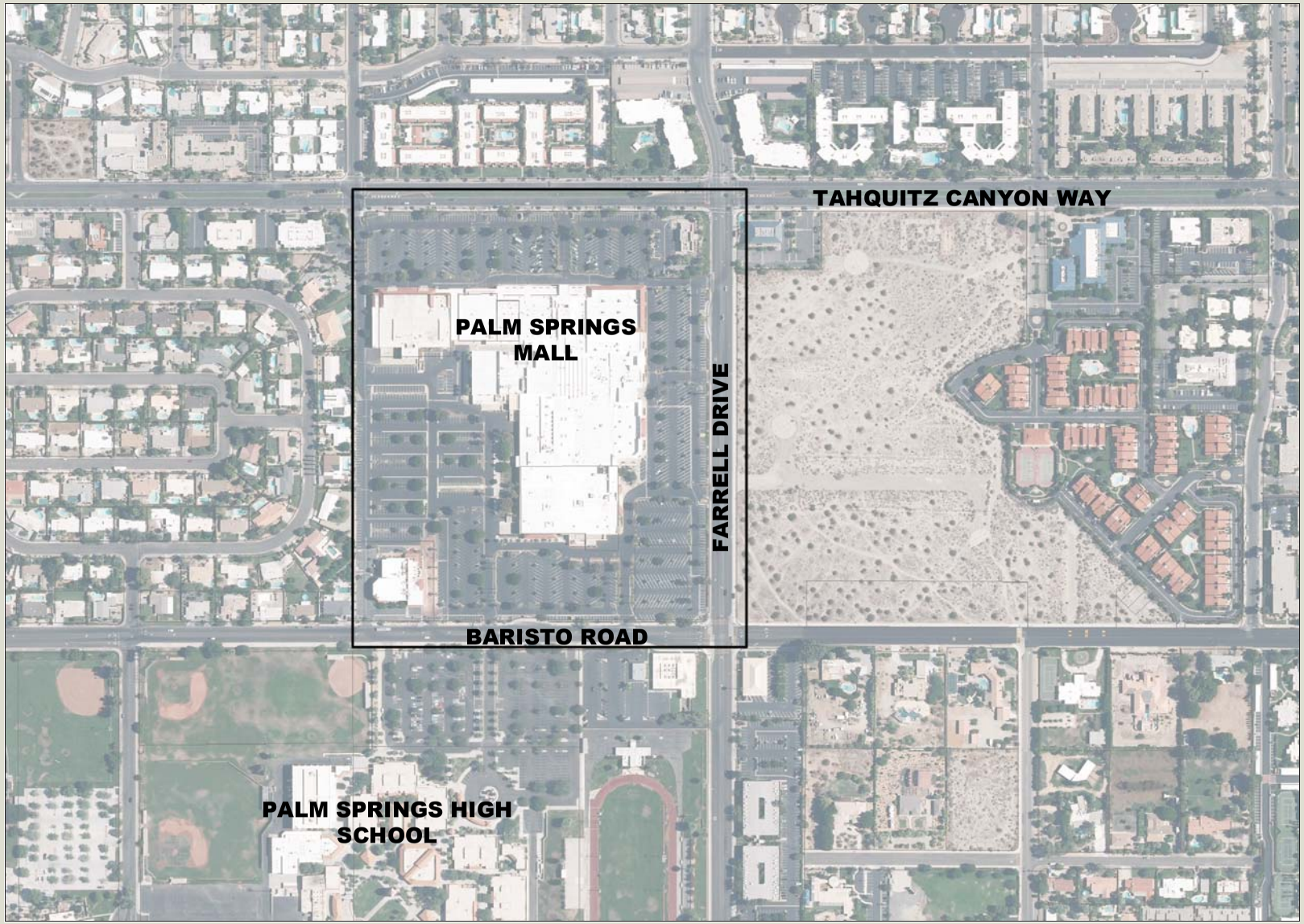
Future phases of construction will address WQMP BMP treatment issues as they are developed.

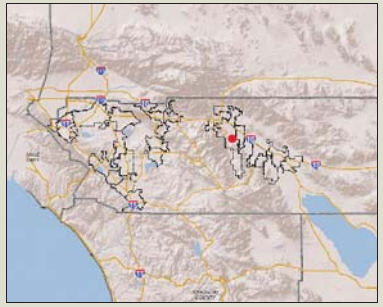
Appendix A

Riverside County TLMA Vicinity Map

COD - West Valley Campus

VICINITY MAP





Legend

- Display Parcels
- roadsanno
- highways
  - HWY
  - INTERCHANGE
  - INTERSTATE
  - OFFRAMP
  - ONRAMP
  - USHWY
- counties
- cities
- hydrographylines
- waterbodies
  - Lakes
  - Rivers

RCIT

0 552 1,105 Feet

IMPORTANT Maps and data are to be used for reference purposes only. Map features are approximate, and are not necessarily accurate to surveying or engineering standards. The County of Riverside makes no warranty or guarantee as to the content (the source is often third party), accuracy, timeliness, or completeness of any of the data provided, and assumes no legal responsibility for the information contained on this map. Any use of this product with respect to accuracy and precision shall be the sole responsibility of the user.

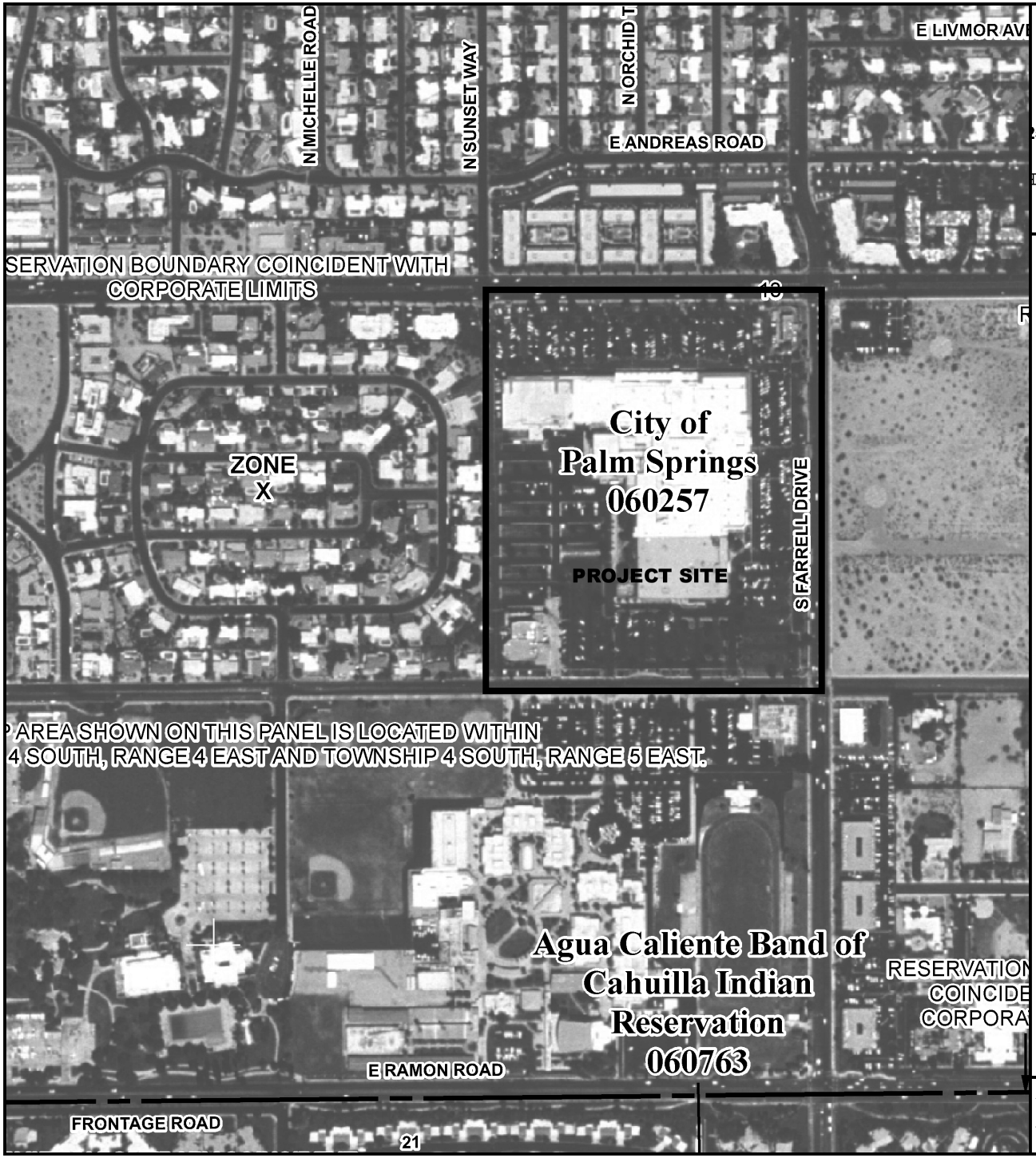
REPORT PRINTED ON... 5/11/2015 3:30:21 PM

Notes

Section 13, T4S, R4E
Lat: 33.8228
Long: -116.5196

Appendix B

NFIP Flood Insurance Rate Map



MAP SCALE 1" = 500'

250 0 500 1000

FEET

METER

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1559G

FIRM

FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1559 OF 3805

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
AGUA CALIENTE BAND OF CAHUILLA INDIAN RESERVATION	060763	1559	G
PALM SPRINGS, CITY OF	060257	1559	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06065C1559G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

DEFINITIONS OF FEMA FLOOD ZONE DESIGNATIONS

Moderate to Low Risk Areas

In communities that participate in the NFIP, flood insurance is available to all property owners and renters in these zones:

ZONE	DESCRIPTION
X (Shaded)	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood. Insurance purchase is not required in these zones.
X	Areas determined to be outside the 0.2% annual chance floodplain.

High Risk Areas

In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to all of these zones:

ZONE	DESCRIPTION
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
AE	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. In most instances, base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
AH	Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
AO	River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones. For areas of alluvial fan flooding, velocities are also determined.
AR	Areas with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam). Mandatory flood insurance purchase requirements will apply, but rates will not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations.
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones.

High Risk – Coastal Areas

In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to all of these zones:

ZONE	DESCRIPTION
V	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. No base flood elevations are shown within these zones.
VE	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.

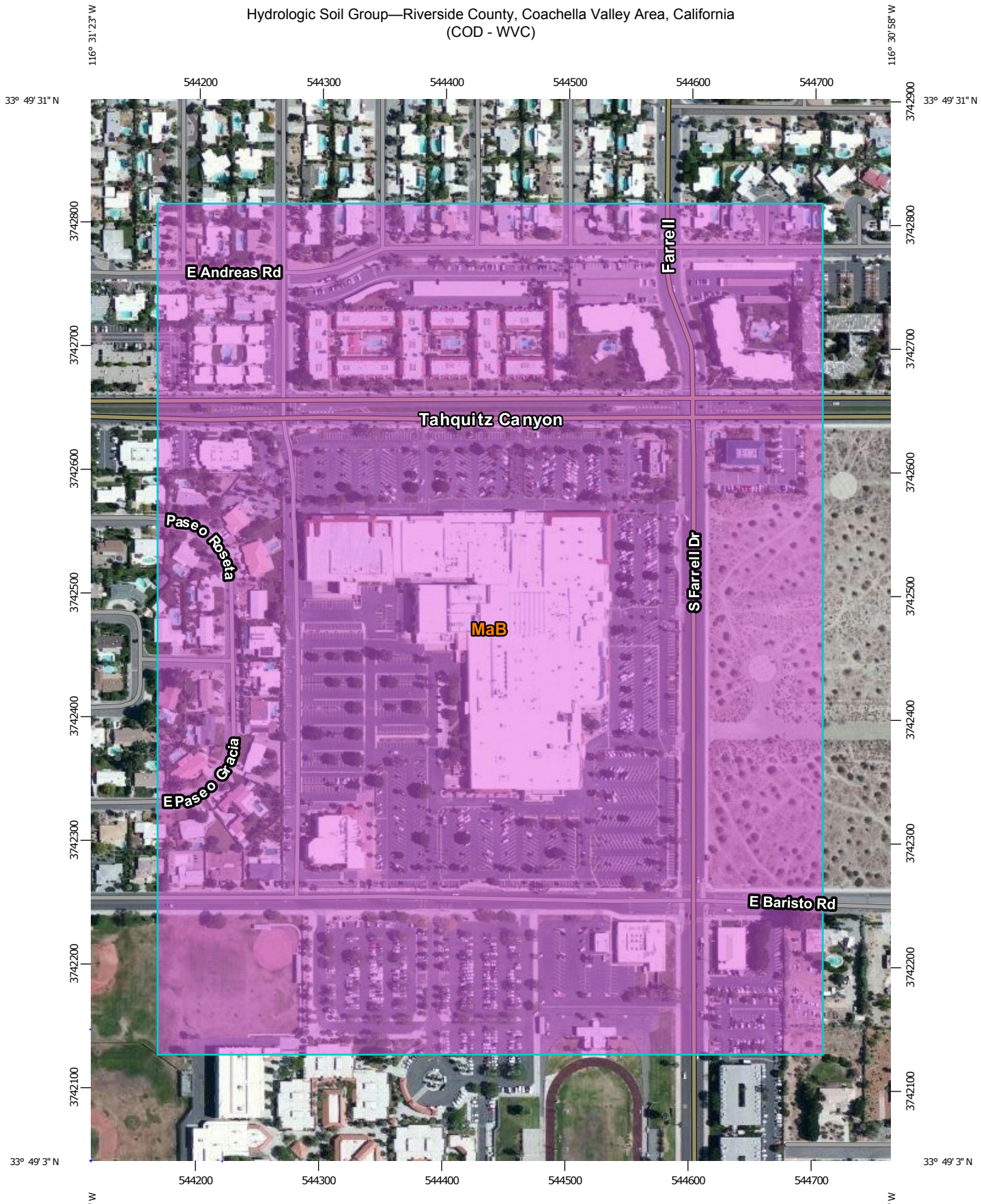
Undetermined Risk Areas

ZONE	DESCRIPTION
D	Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk.

Appendix C

USDA NCSS Hydrologic Soils Map

Hydrologic Soil Group—Riverside County, Coachella Valley Area, California
(COD - WVC)



Map Scale: 1:4,190 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Riverside County, Coachella Valley Area, California
Survey Area Data: Version 7, Sep 9, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 2, 2010—Jun 3, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Riverside County, Coachella Valley Area, California (CA680)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
MaB	Myoma fine sand, 0 to 5 percent slopes	A	92.2	100.0%
Totals for Area of Interest			**92.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix D

NOAA Atlas 14

RCFCD Reference Plates

COD - West Valley Campus

NOAA Atlas 14, Volume 6, Version 2
Location name: Palm Springs, California, US*
Latitude: 33.8228°, Longitude: -116.5196°
Elevation: 426 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.085 (0.071–0.103)	0.130 (0.108–0.158)	0.194 (0.161–0.237)	0.251 (0.207–0.308)	0.335 (0.266–0.425)	0.404 (0.315–0.525)	0.481 (0.365–0.639)	0.565 (0.417–0.773)	0.690 (0.488–0.985)	0.796 (0.544–1.18)
10-min	0.122 (0.101–0.147)	0.186 (0.155–0.226)	0.279 (0.231–0.339)	0.360 (0.296–0.442)	0.479 (0.381–0.609)	0.580 (0.451–0.752)	0.689 (0.523–0.916)	0.810 (0.598–1.11)	0.989 (0.700–1.41)	1.14 (0.779–1.69)
15-min	0.147 (0.123–0.178)	0.226 (0.188–0.274)	0.337 (0.280–0.410)	0.435 (0.358–0.534)	0.580 (0.461–0.736)	0.701 (0.546–0.909)	0.833 (0.633–1.11)	0.980 (0.723–1.34)	1.20 (0.846–1.71)	1.38 (0.943–2.04)
30-min	0.214 (0.178–0.259)	0.328 (0.273–0.398)	0.490 (0.407–0.597)	0.633 (0.521–0.777)	0.843 (0.671–1.07)	1.02 (0.794–1.32)	1.21 (0.920–1.61)	1.43 (1.05–1.95)	1.74 (1.23–2.49)	2.01 (1.37–2.97)
60-min	0.307 (0.256–0.373)	0.471 (0.392–0.572)	0.704 (0.584–0.857)	0.909 (0.748–1.12)	1.21 (0.963–1.54)	1.46 (1.14–1.90)	1.74 (1.32–2.32)	2.05 (1.51–2.80)	2.50 (1.77–3.57)	2.88 (1.97–4.27)
2-hr	0.414 (0.345–0.502)	0.621 (0.517–0.753)	0.915 (0.760–1.11)	1.17 (0.966–1.44)	1.56 (1.24–1.98)	1.88 (1.46–2.43)	2.22 (1.69–2.96)	2.61 (1.93–3.57)	3.18 (2.25–4.54)	3.66 (2.50–5.41)
3-hr	0.491 (0.409–0.595)	0.736 (0.613–0.893)	1.08 (0.900–1.32)	1.39 (1.14–1.71)	1.84 (1.46–2.34)	2.21 (1.72–2.87)	2.62 (1.99–3.48)	3.07 (2.26–4.20)	3.72 (2.63–5.32)	4.28 (2.92–6.33)
6-hr	0.646 (0.538–0.783)	0.989 (0.823–1.20)	1.47 (1.22–1.79)	1.89 (1.55–2.32)	2.49 (1.98–3.17)	2.99 (2.33–3.88)	3.53 (2.68–4.69)	4.12 (3.04–5.63)	4.97 (3.51–7.10)	5.68 (3.88–8.40)
12-hr	0.785 (0.654–0.951)	1.27 (1.06–1.54)	1.94 (1.61–2.36)	2.50 (2.06–3.07)	3.30 (2.62–4.19)	3.94 (3.07–5.11)	4.62 (3.50–6.14)	5.34 (3.94–7.31)	6.37 (4.51–9.10)	7.21 (4.92–10.7)
24-hr	0.910 (0.805–1.05)	1.56 (1.38–1.80)	2.43 (2.14–2.81)	3.15 (2.76–3.68)	4.16 (3.53–5.02)	4.97 (4.12–6.10)	5.80 (4.71–7.30)	6.69 (5.28–8.65)	7.93 (6.01–10.7)	8.92 (6.54–12.4)
2-day	1.06 (0.941–1.23)	1.84 (1.63–2.12)	2.90 (2.56–3.35)	3.79 (3.31–4.42)	5.04 (4.27–6.07)	6.05 (5.02–7.43)	7.10 (5.76–8.94)	8.23 (6.49–10.6)	9.82 (7.44–13.2)	11.1 (8.14–15.5)
3-day	1.14 (1.01–1.32)	1.98 (1.75–2.29)	3.13 (2.76–3.62)	4.10 (3.59–4.79)	5.49 (4.65–6.62)	6.61 (5.49–8.13)	7.80 (6.32–9.81)	9.07 (7.16–11.7)	10.9 (8.25–14.7)	12.4 (9.06–17.2)
4-day	1.19 (1.05–1.37)	2.05 (1.82–2.37)	3.25 (2.87–3.76)	4.27 (3.73–4.98)	5.73 (4.85–6.90)	6.91 (5.73–8.49)	8.16 (6.62–10.3)	9.52 (7.51–12.3)	11.5 (8.68–15.4)	13.0 (9.56–18.1)
7-day	1.31 (1.16–1.51)	2.25 (1.99–2.59)	3.55 (3.13–4.10)	4.66 (4.08–5.44)	6.26 (5.30–7.54)	7.56 (6.28–9.30)	8.95 (7.26–11.3)	10.5 (8.25–13.5)	12.6 (9.57–17.0)	14.4 (10.6–20.0)
10-day	1.38 (1.22–1.59)	2.36 (2.08–2.72)	3.72 (3.28–4.30)	4.88 (4.27–5.70)	6.56 (5.56–7.91)	7.94 (6.59–9.76)	9.41 (7.63–11.8)	11.0 (8.68–14.2)	13.3 (10.1–17.9)	15.2 (11.1–21.1)
20-day	1.55 (1.37–1.79)	2.61 (2.31–3.02)	4.11 (3.62–4.75)	5.39 (4.72–6.29)	7.27 (6.16–8.75)	8.81 (7.31–10.8)	10.5 (8.49–13.2)	12.3 (9.69–15.9)	14.9 (11.3–20.0)	17.1 (12.5–23.7)
30-day	1.74 (1.54–2.00)	2.90 (2.56–3.34)	4.53 (3.99–5.24)	5.95 (5.21–6.94)	8.03 (6.80–9.67)	9.74 (8.09–12.0)	11.6 (9.40–14.6)	13.6 (10.7–17.6)	16.6 (12.6–22.3)	19.0 (13.9–26.5)
45-day	1.94 (1.72–2.24)	3.19 (2.82–3.68)	4.95 (4.37–5.73)	6.50 (5.68–7.58)	8.77 (7.43–10.6)	10.7 (8.85–13.1)	12.7 (10.3–16.0)	14.9 (11.8–19.3)	18.2 (13.8–24.5)	21.0 (15.4–29.2)
60-day	2.14 (1.89–2.46)	3.45 (3.05–3.98)	5.33 (4.70–6.16)	6.98 (6.10–8.14)	9.41 (7.97–11.3)	11.4 (9.50–14.1)	13.7 (11.1–17.2)	16.1 (12.7–20.8)	19.7 (14.9–26.5)	22.6 (16.6–31.5)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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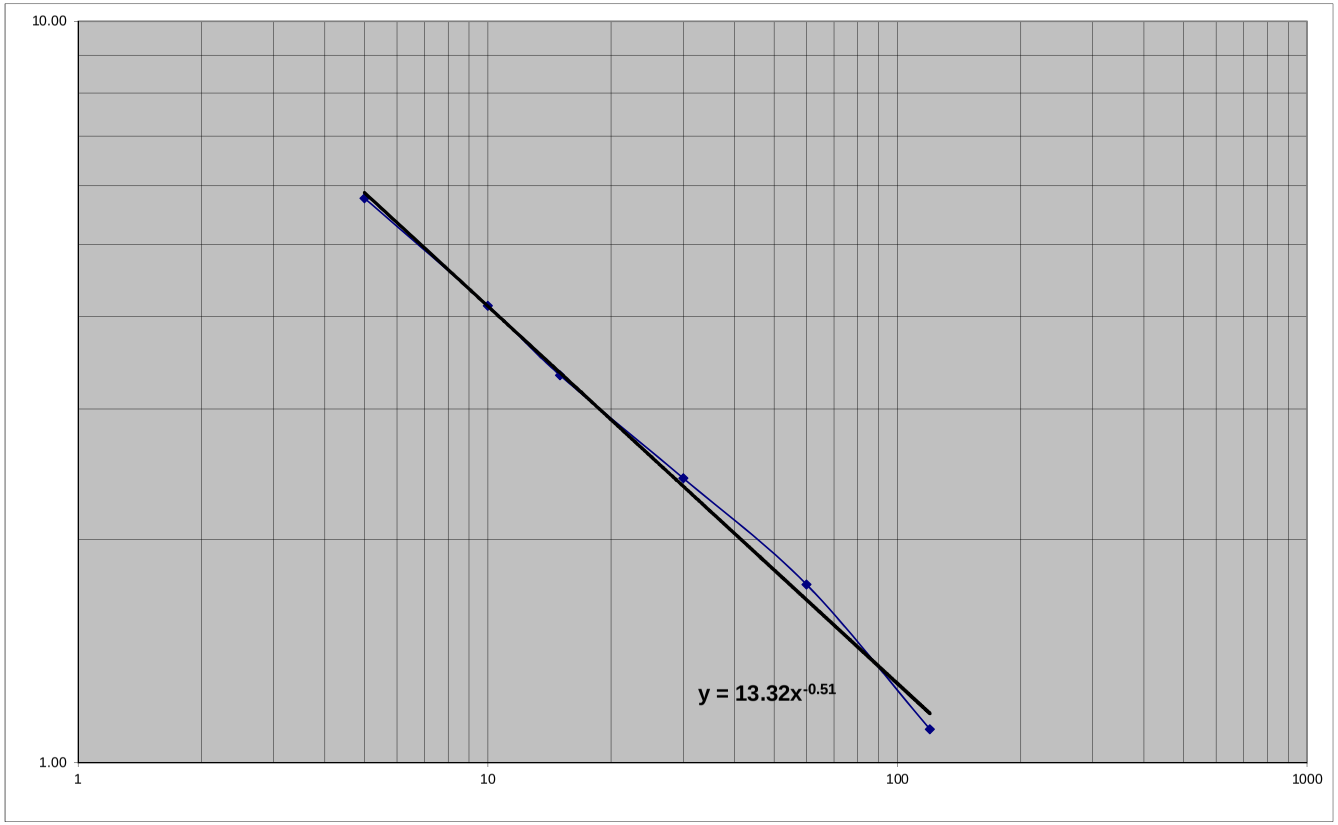
PF graphical

NOAA ATLAS 14 INTENSITY - DURATION WORKSHEET

PROJECT NAME	COD - West Valley Campus
PROJECT NUMBER	2228
STORM EVENT	100 yr
DATE:	May 12, 2015

DATA FROM NOAA ATLAS 14

MINUTES	RAINFALL INTENSITY (in/hr)	RAINFALL DEPTH (in)
5	5.77	0.48
10	4.13	0.69
15	3.33	0.83
30	2.42	1.21
60	1.74	1.74
120	1.11	2.22



INTENSITY VALUES FROM GRAPH

CONSTANT FROM GRAPH	13.32
EXPONENT FROM GRAPH	-0.51

MINUTES	RAINFALL INTENSITY (in/hr)	RAINFALL DEPTH (in)
5	5.86	0.49
10	4.12	0.69
15	3.35	0.84
20	2.89	0.96
25	2.58	1.07
30	2.35	1.18
35	2.17	1.27
40	2.03	1.35
45	1.91	1.43
50	1.81	1.51
55	1.73	1.58
60	1.65	1.65
65	1.58	1.72
70	1.53	1.78
75	1.47	1.84
80	1.43	1.90
85	1.38	1.96
90	1.34	2.01
95	1.31	2.07
100	1.27	2.12
105	1.24	2.17
110	1.21	2.22
115	1.18	2.27
120	1.16	2.32

Appendix E

Existing Condition

RCFCD Synthetic Unit Hydrograph Worksheets

Riverside County Whitewater River Region WQMP BMP Worksheets

RCFCD SYNTHETIC UNIT HYDROGRAPH - SHORTCUT METHOD

DATA INPUT SHEET

DATE:	May 12, 2015
WORKSHEET PREPARED BY:	DLS
PROJECT NAME	COD - WVC
PROJECT NUMBER	2228
CONCENTRATION POINT DESIGNATION	CURB CUT
AREA DESIGNATION	BARISTO - 01
AMC NUMBER	2

Low Loss Conditions: X=Existing; D=Developed; BS=Retention

AREA DESIG	SOIL GROUP	TRIBUTARY AREAS	ACRES	LOW LOSS CONDITION	RI NUMBER	AMC II INFILTRATION RATE	IMPERVIOUS PERCENT
1	A	COMMERCIAL	1.420	D	32	0.74	0.90

LENGTH OF WATERCOURSE (L)	450 ft
LENGTH TO POINT OPPOSITE CENTROID (Lca)	225 ft
ELEVATION OF HEADWATER	418.4 ft
ELEVATION OF CONCENTRATION POINT	416.3 ft
AVERAGE MANNINGS 'N' VALUE	0.02
STORM FREQUENCY (YEAR)	100
LOW LOSS RATE (For Storms Greater Than 10 Years)	85%
POINT RAIN FROM NOAA ATLAS	**14**
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM	PROJECT: COD - WVC Job No.: 2228 BY: DLS DATE: 5/12/15

PHYSICAL DATA

[1] CONCENTRATION POINT	CURB CUT
[2] AREA DESIGNATION	BARISTO - 01
[3] AREA - ACRES	1.420
[4] L-FEET	450
[5] L-MILES	0.085
[6] La-FEET	225.00
[7] La-MILES	0.043
[8] ELEVATION OF HEADWATER	418.4
[9] ELEVATION OF CONCENTRATION POINT	416.3
[10] H-FEET	2.1
[11] S-FEET/MILE	24.6
[12] S^0.5	4.96
[13] L*LCA/S^0.5	0.001
[14] AVERAGE MANNINGS 'N'	0.02
[15] LAG TIME-HOURS	0.03
[16] LAG TIME-MINUTES	1.9
[17] 100% OF LAG-MINUTES	1.9
[18] 200% OF LAG-MINUTES	3.7

RAINFALL DATA

[1] AMC	II
[2] FREQUENCY-YEARS	100
NOAA ATLAS	**14**
[3] DURATION:	Point Rain
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

STORM EVENT SUMMARY

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
TOTAL RAINFALL	(in)	1.74	2.62	3.53	5.8
RAINFALL VOLUME	(cuft)	8,969	13,505	18,196	29,897
SOIL LOSSES	(cuft)	725	2,174	4,305	12,827
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	8,244	11,331	13,891	17,070
	(acre-ft)	0.19	0.26	0.32	0.39
PEAK FLOW	(cfs)	N/A	3.49	3.20	0.96

NOTE: PEAK FLOW FOR THE 1-HOUR STORM IS NOT REPRESENTATIVE. PER RCFCD PEAK DISCHARGES FROM THE 3-HOUR STORM SHOULD NORMALLY COMPARE WELL WITH RATIONAL PEAKS.

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM AMC II	PROJECT:	COD - WVC		
		Job No.:	2228		
		BY:	DLS	DATE:	5/12/15

AVERAGE ADJUSTED LOSS RATE

SOIL GROUP [Plate C-1]	LAND USE	RI NUMBER [Plate E-6.1]	PERVIOUS AREA INFILTRATION RATE (in/hr) [Plate E-6.2]	DECIMAL PERCENT OF AREA IMPERVIOUS [Plate E-6.3]	ADJUSTED INFILTRATION RATE (in/hr)	AREA	AREA WEIGHTED AVERAGE	MAX AVERAGE ADJUSTED INFILTRATION RATE (in/hr)	LOW LOSS CONDITION	LOW LOSS RATE PER RCFC/2322 (in/hr)	MIN AVERAGE ADJUSTED INFILTRATION RATE (in/hr)
A	COMMERCIAL	32	0.74	90%	0.14	1.420	1.000	0.1406	DEVELOPED	0.1800	0.1800
					SUM	1.420	SUM	0.1406			0.1800

VARIABLE LOSS RATE CURVE (24-HOUR STORM ONLY)

Fm= 0.0703

C= 0.00130

Ft=C(24-(T/60))^1.55 = 0.00130 (24-(T/60))^1.55 + **0.07** in/hr

CONSTANT LOSS RATE (3 & 6 HOUR STORMS) = **0.1406** in/hr

LOW LOSS RATE = **0.8500** in/hr

Where:

T=Time in minutes. To get an average value for each unit time period, Use T=1/2 the unit time for the first time period, T=1 1/2 unit time for the second period, etc.

NOTE: Low loss rates established per RCFC/2322 (Dated: May-30-95)
For 10 Year Storms or Less
Undeveloped Condition: Low Loss = 90%
Developed Condition: Low Loss = 0.9 - (0.8 * %impervious)
Basin Site: Low Loss = 10%
For 100 Year Storm - Low Loss should be between 80% & 90% of the Rainfall Rate

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 1-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.42
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	1.85
UNIT TIME-PERCENT OF LAG	269.9
TOTAL ADJUSTED STORM RAIN-INCHES	1.74
CONSTANT LOSS RATE-in/hr	0.14
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	3.6	0.75	0.14	0.64	0.61	0.87
2	10	0.17	4.2	0.88	0.14	0.75	0.74	1.05
3	15	0.25	4.4	0.92	0.14	0.78	0.78	1.11
4	20	0.33	4.6	0.96	0.14	0.82	0.82	1.17
5	25	0.42	5.0	1.04	0.14	0.89	0.90	1.29
6	30	0.50	5.6	1.17	0.14	0.99	1.03	1.47
7	35	0.58	6.4	1.34	0.14	1.14	1.20	1.71
8	40	0.67	8.1	1.69	0.14	1.44	1.55	2.22
9	45	0.75	13.1	2.74	0.14	2.32	2.59	3.72
10	50	0.83	34.5	7.20	0.14	6.12	7.06	**10.11**
11	55	0.92	6.7	1.40	0.14	1.19	1.26	1.80
12	60	1.00	3.8	0.79	0.14	0.67	0.65	0.93

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	1.74
RAINFALL VOLUME (cuft)	8,969
SOIL LOSSES (cuft)	725
EFFECTIVE RAIN (in)	1.60
FLOOD VOLUME (acft)	0.19
FLOOD VOLUME (cuft)	8,244
PEAK FLOW RATE (cfs)	10.11

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 3-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.42	
UNIT TIME-MINUTES	5	
LAG TIME - MINUTES	1.85	
UNIT TIME-PERCENT OF LAG	269.9	
TOTAL ADJUSTED STORM RAIN-INCHES	2.62	
CONSTANT LOSS RATE-in/hr		0.14
LOW LOSS RATE - PERCENT		85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	1.3	0.41	0.14	0.35	0.27	0.38
2	10	0.17	1.3	0.41	0.14	0.35	0.27	0.38
3	15	0.25	1.1	0.35	0.14	0.29	0.21	0.29
4	20	0.33	1.5	0.47	0.14	0.40	0.33	0.47
5	25	0.42	1.5	0.47	0.14	0.40	0.33	0.47
6	30	0.50	1.8	0.57	0.14	0.48	0.43	0.61
7	35	0.58	1.5	0.47	0.14	0.40	0.33	0.47
8	40	0.67	1.8	0.57	0.14	0.48	0.43	0.61
9	45	0.75	1.8	0.57	0.14	0.48	0.43	0.61
10	50	0.83	1.5	0.47	0.14	0.40	0.33	0.47
11	55	0.92	1.6	0.50	0.14	0.43	0.36	0.52
12	60	1.00	1.8	0.57	0.14	0.48	0.43	0.61
13	65	1.08	2.2	0.69	0.14	0.59	0.55	0.79
14	70	1.17	2.2	0.69	0.14	0.59	0.55	0.79
15	75	1.25	2.2	0.69	0.14	0.59	0.55	0.79
16	80	1.33	2.0	0.63	0.14	0.53	0.49	0.70
17	85	1.42	2.6	0.82	0.14	0.69	0.68	0.97
18	90	1.50	2.7	0.85	0.14	0.72	0.71	1.01
19	95	1.58	2.4	0.75	0.14	0.64	0.61	0.88
20	100	1.67	2.7	0.85	0.14	0.72	0.71	1.01
21	105	1.75	3.3	1.04	0.14	0.88	0.90	1.28
22	110	1.83	3.1	0.97	0.14	0.83	0.83	1.19
23	115	1.92	2.9	0.91	0.14	0.77	0.77	1.10
24	120	2.00	3.0	0.94	0.14	0.80	0.80	1.15
25	125	2.08	3.1	0.97	0.14	0.83	0.83	1.19
26	130	2.17	4.2	1.32	0.14	1.12	1.18	1.69
27	135	2.25	5.0	1.57	0.14	1.34	1.43	2.05
28	140	2.33	3.5	1.10	0.14	0.94	0.96	1.37
29	145	2.42	6.8	2.14	0.14	1.82	2.00	2.86
30	150	2.50	7.3	2.30	0.14	1.95	2.15	3.08
31	155	2.58	8.2	2.58	0.14	2.19	2.44	**3.49**
32	160	2.67	5.9	1.85	0.14	1.58	1.71	2.45
33	165	2.75	2.0	0.63	0.14	0.53	0.49	0.70
34	170	2.83	1.8	0.57	0.14	0.48	0.43	0.61
35	175	2.92	1.8	0.57	0.14	0.48	0.43	0.61
36	180	3.00	0.6	0.19	0.14	0.16	0.05	0.07

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	2.62
RAINFALL VOLUME (cuft)	13,505
SOIL LOSSES (cuft)	2,174
EFFECTIVE RAIN (in)	2.20
FLOOD VOLUME (acft)	0.26
FLOOD VOLUME (cuft)	11,331
PEAK FLOW RATE (cfs)	3.49

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.42
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	1.85
UNIT TIME-PERCENT OF LAG	269.9
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs
1	5	0.08	0.5	0.212	0.14	0.18	0.07	0.10
2	10	0.17	0.6	0.254	0.14	0.22	0.11	0.16
3	15	0.25	0.6	0.254	0.14	0.22	0.11	0.16
4	20	0.33	0.6	0.254	0.14	0.22	0.11	0.16
5	25	0.42	0.6	0.254	0.14	0.22	0.11	0.16
6	30	0.50	0.7	0.297	0.14	0.25	0.16	0.22
7	35	0.58	0.7	0.297	0.14	0.25	0.16	0.22
8	40	0.67	0.7	0.297	0.14	0.25	0.16	0.22
9	45	0.75	0.7	0.297	0.14	0.25	0.16	0.22
10	50	0.83	0.7	0.297	0.14	0.25	0.16	0.22
11	55	0.92	0.7	0.297	0.14	0.25	0.16	0.22
12	60	1.00	0.8	0.339	0.14	0.29	0.20	0.28
13	65	1.08	0.8	0.339	0.14	0.29	0.20	0.28
14	70	1.17	0.8	0.339	0.14	0.29	0.20	0.28
15	75	1.25	0.8	0.339	0.14	0.29	0.20	0.28
16	80	1.33	0.8	0.339	0.14	0.29	0.20	0.28
17	85	1.42	0.8	0.339	0.14	0.29	0.20	0.28
18	90	1.50	0.8	0.339	0.14	0.29	0.20	0.28
19	95	1.58	0.8	0.339	0.14	0.29	0.20	0.28
20	100	1.67	0.8	0.339	0.14	0.29	0.20	0.28
21	105	1.75	0.8	0.339	0.14	0.29	0.20	0.28
22	110	1.83	0.8	0.339	0.14	0.29	0.20	0.28
23	115	1.92	0.8	0.339	0.14	0.29	0.20	0.28
24	120	2.00	0.9	0.381	0.14	0.32	0.24	0.34
25	125	2.08	0.8	0.339	0.14	0.29	0.20	0.28
26	130	2.17	0.9	0.381	0.14	0.32	0.24	0.34
27	135	2.25	0.9	0.381	0.14	0.32	0.24	0.34
28	140	2.33	0.9	0.381	0.14	0.32	0.24	0.34
29	145	2.42	0.9	0.381	0.14	0.32	0.24	0.34
30	150	2.50	0.9	0.381	0.14	0.32	0.24	0.34
31	155	2.58	0.9	0.381	0.14	0.32	0.24	0.34
32	160	2.67	0.9	0.381	0.14	0.32	0.24	0.34
33	165	2.75	1.0	0.424	0.14	0.36	0.28	0.41
34	170	2.83	1.0	0.424	0.14	0.36	0.28	0.41
35	175	2.92	1.0	0.424	0.14	0.36	0.28	0.41
36	180	3.00	1.0	0.424	0.14	0.36	0.28	0.41
37	185	3.08	1.0	0.424	0.14	0.36	0.28	0.41
38	190	3.17	1.1	0.466	0.14	0.40	0.33	0.47
39	195	3.25	1.1	0.466	0.14	0.40	0.33	0.47
40	200	3.33	1.1	0.466	0.14	0.40	0.33	0.47
41	205	3.42	1.2	0.508	0.14	0.43	0.37	0.53
42	210	3.50	1.3	0.551	0.14	0.47	0.41	0.59
43	215	3.58	1.4	0.593	0.14	0.50	0.45	0.65
44	220	3.67	1.4	0.593	0.14	0.50	0.45	0.65
45	225	3.75	1.5	0.635	0.14	0.54	0.49	0.71
46	230	3.83	1.5	0.635	0.14	0.54	0.49	0.71
47	235	3.92	1.6	0.678	0.14	0.58	0.54	0.77
48	240	4.00	1.6	0.678	0.14	0.58	0.54	0.77
49	245	4.08	1.7	0.720	0.14	0.61	0.58	0.83
50	250	4.17	1.8	0.762	0.14	0.65	0.62	0.89
51	255	4.25	1.9	0.805	0.14	0.68	0.66	0.95
52	260	4.33	2.0	0.847	0.14	0.72	0.71	1.01
53	265	4.42	2.1	0.890	0.14	0.76	0.75	1.07
54	270	4.50	2.1	0.890	0.14	0.76	0.75	1.07

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.42
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	1.85
UNIT TIME-PERCENT OF LAG	269.9
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
55	275	4.58	2.2	0.932	0.14	0.79	0.79	1.13
56	280	4.67	2.3	0.974	0.14	0.83	0.83	1.19
57	285	4.75	2.4	1.017	0.14	0.86	0.88	1.25
58	290	4.83	2.4	1.017	0.14	0.86	0.88	1.25
59	295	4.92	2.5	1.059	0.14	0.90	0.92	1.32
60	300	5.00	2.6	1.101	0.14	0.94	0.96	1.38
61	305	5.08	3.1	1.313	0.14	1.12	1.17	1.68
62	310	5.17	3.6	1.525	0.14	1.30	1.38	1.98
63	315	5.25	3.9	1.652	0.14	1.40	1.51	2.16
64	320	5.33	4.2	1.779	0.14	1.51	1.64	2.35
65	325	5.42	4.7	1.991	0.14	1.69	1.85	2.65
66	330	5.50	5.6	2.372	0.14	2.02	2.23	**3.20**
67	335	5.58	1.9	0.805	0.14	0.68	0.66	0.95
68	340	5.67	0.9	0.381	0.14	0.32	0.24	0.34
69	345	5.75	0.6	0.254	0.14	0.22	0.11	0.16
70	350	5.83	0.5	0.212	0.14	0.18	0.07	0.10
71	355	5.92	0.3	0.127	0.14	0.11	0.02	0.03
72	360	6.00	0.2	0.085	0.14	0.07	0.01	0.02

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	3.53
RAINFALL VOLUME (cuft)	18,196
SOIL LOSSES (cuft)	4,305
EFFECTIVE RAIN (in)	2.69
FLOOD VOLUME (acft)	0.32
FLOOD VOLUME (cuft)	13,891
PEAK FLOW RATE (cfs)	3.20

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.420	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	1.85	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	809.6	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain in/hr	Flood Hydrograph Flow cfs
	Minutes	Hours	(Plate E-5.9)		Max	Low		
1	15	0.25	0.2	0.046	0.248	0.039	0.007	0.01
2	30	0.50	0.3	0.070	0.245	0.059	0.010	0.01
3	45	0.75	0.3	0.070	0.243	0.059	0.010	0.01
4	60	1.00	0.4	0.093	0.240	0.079	0.014	0.02
5	75	1.25	0.3	0.070	0.237	0.059	0.010	0.01
6	90	1.50	0.3	0.070	0.234	0.059	0.010	0.01
7	105	1.75	0.3	0.070	0.231	0.059	0.010	0.01
8	120	2.00	0.4	0.093	0.228	0.079	0.014	0.02
9	135	2.25	0.4	0.093	0.226	0.079	0.014	0.02
10	150	2.50	0.4	0.093	0.223	0.079	0.014	0.02
11	165	2.75	0.5	0.116	0.220	0.099	0.017	0.02
12	180	3.00	0.5	0.116	0.218	0.099	0.017	0.02
13	195	3.25	0.5	0.116	0.215	0.099	0.017	0.02
14	210	3.50	0.5	0.116	0.212	0.099	0.017	0.02
15	225	3.75	0.5	0.116	0.210	0.099	0.017	0.02
16	240	4.00	0.6	0.139	0.207	0.118	0.021	0.03
17	255	4.25	0.6	0.139	0.204	0.118	0.021	0.03
18	270	4.50	0.7	0.162	0.202	0.138	0.024	0.03
19	285	4.75	0.7	0.162	0.199	0.138	0.024	0.03
20	300	5.00	0.8	0.186	0.196	0.158	0.028	0.04
21	315	5.25	0.6	0.139	0.194	0.118	0.021	0.03
22	330	5.50	0.7	0.162	0.191	0.138	0.024	0.03
23	345	5.75	0.8	0.186	0.189	0.158	0.028	0.04
24	360	6.00	0.8	0.186	0.186	0.158	0.028	0.04
25	375	6.25	0.9	0.209	0.184	0.177	0.025	0.04
26	390	6.50	0.9	0.209	0.181	0.177	0.027	0.04
27	405	6.75	1.0	0.232	0.179	0.197	0.053	0.08
28	420	7.00	1.0	0.232	0.177	0.197	0.055	0.08
29	435	7.25	1.0	0.232	0.174	0.197	0.058	0.08
30	450	7.50	1.1	0.255	0.172	0.217	0.083	0.12
31	465	7.75	1.2	0.278	0.170	0.237	0.109	0.16
32	480	8.00	1.3	0.302	0.167	0.256	0.134	0.19
33	495	8.25	1.5	0.348	0.165	0.296	0.183	0.26
34	510	8.50	1.5	0.348	0.163	0.296	0.185	0.27
35	525	8.75	1.6	0.371	0.160	0.316	0.211	0.30
36	540	9.00	1.7	0.394	0.158	0.335	0.236	0.34
37	555	9.25	1.9	0.441	0.156	0.375	0.285	0.41
38	570	9.50	2.0	0.464	0.154	0.394	0.310	0.44
39	585	9.75	2.1	0.487	0.151	0.414	0.336	0.48
40	600	10.00	2.2	0.510	0.149	0.434	0.361	0.52
41	615	10.25	1.5	0.348	0.147	0.296	0.201	0.29
42	630	10.50	1.5	0.348	0.145	0.296	0.203	0.29
43	645	10.75	2.0	0.464	0.143	0.394	0.321	0.46
44	660	11.00	2.0	0.464	0.141	0.394	0.323	0.46
45	675	11.25	1.9	0.441	0.139	0.375	0.302	0.43
46	690	11.50	1.9	0.441	0.137	0.375	0.304	0.44
47	705	11.75	1.7	0.394	0.135	0.335	0.260	0.37
48	720	12.00	1.8	0.418	0.133	0.355	0.285	0.41
49	735	12.25	2.5	0.580	0.131	0.493	0.449	0.64
50	750	12.50	2.6	0.603	0.129	0.513	0.475	0.68
51	765	12.75	2.8	0.650	0.127	0.552	0.523	0.75
52	780	13.00	2.9	0.673	0.125	0.572	0.548	0.78
53	795	13.25	3.4	0.789	0.123	0.670	0.666	0.95
54	810	13.50	3.4	0.789	0.121	0.670	0.668	**0.96**
55	825	13.75	2.3	0.534	0.119	0.454	0.414	0.59
56	840	14.00	2.3	0.534	0.117	0.454	0.416	0.60
57	855	14.25	2.7	0.626	0.116	0.532	0.511	0.73
58	870	14.50	2.6	0.603	0.114	0.513	0.489	0.70
59	885	14.75	2.6	0.603	0.112	0.513	0.491	0.70
60	900	15.00	2.5	0.580	0.110	0.493	0.470	0.67
61	915	15.25	2.4	0.557	0.109	0.473	0.448	0.64
62	930	15.50	2.3	0.534	0.107	0.454	0.427	0.61
63	945	15.75	1.9	0.441	0.105	0.375	0.335	0.48

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.420	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	1.85	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	809.6	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
64	960	16.00	1.9	0.441	0.104	0.375	0.337	0.48
65	975	16.25	0.4	0.093	0.102	0.079	0.014	0.02
66	990	16.50	0.4	0.093	0.101	0.079	0.014	0.02
67	1005	16.75	0.3	0.070	0.099	0.059	0.010	0.01
68	1020	17.00	0.3	0.070	0.098	0.059	0.010	0.01
69	1035	17.25	0.5	0.116	0.096	0.099	0.020	0.03
70	1050	17.50	0.5	0.116	0.095	0.099	0.021	0.03
71	1065	17.75	0.5	0.116	0.093	0.099	0.023	0.03
72	1080	18.00	0.4	0.093	0.092	0.079	0.001	0.00
73	1095	18.25	0.4	0.093	0.091	0.079	0.002	0.00
74	1110	18.50	0.4	0.093	0.089	0.079	0.004	0.01
75	1125	18.75	0.3	0.070	0.088	0.059	0.010	0.01
76	1140	19.00	0.2	0.046	0.087	0.039	0.007	0.01
77	1155	19.25	0.3	0.070	0.085	0.059	0.010	0.01
78	1170	19.50	0.4	0.093	0.084	0.079	0.009	0.01
79	1185	19.75	0.3	0.070	0.083	0.059	0.010	0.01
80	1200	20.00	0.2	0.046	0.082	0.039	0.007	0.01
81	1215	20.25	0.3	0.070	0.081	0.059	0.010	0.01
82	1230	20.50	0.3	0.070	0.080	0.059	0.010	0.01
83	1245	20.75	0.3	0.070	0.079	0.059	0.010	0.01
84	1260	21.00	0.2	0.046	0.078	0.039	0.007	0.01
85	1275	21.25	0.3	0.070	0.077	0.059	0.010	0.01
86	1290	21.50	0.2	0.046	0.076	0.039	0.007	0.01
87	1305	21.75	0.3	0.070	0.075	0.059	0.010	0.01
88	1320	22.00	0.2	0.046	0.074	0.039	0.007	0.01
89	1335	22.25	0.3	0.070	0.074	0.059	0.010	0.01
90	1350	22.50	0.2	0.046	0.073	0.039	0.007	0.01
91	1365	22.75	0.2	0.046	0.072	0.039	0.007	0.01
92	1380	23.00	0.2	0.046	0.072	0.039	0.007	0.01
93	1395	23.25	0.2	0.046	0.071	0.039	0.007	0.01
94	1410	23.50	0.2	0.046	0.071	0.039	0.007	0.01
95	1425	23.75	0.2	0.046	0.071	0.039	0.007	0.01
96	1440	24.00	0.2	0.046	0.070	0.039	0.007	0.01

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	5.8
RAINFALL VOLUME (cuft)	29,897
SOIL LOSSES (cuft)	12,827
EFFECTIVE RAIN (in)	3.31
FLOOD VOLUME (acft)	0.39
FLOOD VOLUME (cuft)	17,070
PEAK FLOW (cfs)	0.96

RCFCD SYNTHETIC UNIT HYDROGRAPH - SHORTCUT METHOD

DATA INPUT SHEET

DATE:	May 12, 2015
WORKSHEET PREPARED BY:	DLS
PROJECT NAME	COD - WVC
PROJECT NUMBER	2228
CONCENTRATION POINT DESIGNATION	CURB CUT
AREA DESIGNATION	BARISTO - 02
AMC NUMBER	2

Low Loss Conditions: X=Existing; D=Developed; BS=Retention

AREA DESIG	SOIL GROUP	TRIBUTARY AREAS	ACRES	LOW LOSS CONDITION	RI NUMBER	AMC II INFILTRATION RATE	IMPERVIOUS PERCENT
1	A	COMMERCIAL	8.300	D	32	0.74	0.90

LENGTH OF WATERCOURSE (L)	1,600 ft
LENGTH TO POINT OPPOSITE CENTROID (Lca)	800 ft
ELEVATION OF HEADWATER	427.5 ft
ELEVATION OF CONCENTRATION POINT	415.2 ft
AVERAGE MANNINGS 'N' VALUE	0.02
STORM FREQUENCY (YEAR)	100
LOW LOSS RATE (For Storms Greater Than 10 Years)	85%
POINT RAIN FROM NOAA ATLAS	**14**
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM	PROJECT: COD - WVC Job No.: 2228 BY: DLS DATE: 5/12/15

PHYSICAL DATA

[1] CONCENTRATION POINT	CURB CUT
[2] AREA DESIGNATION	BARISTO - 02
[3] AREA - ACRES	8.300
[4] L-FEET	1600
[5] L-MILES	0.303
[6] La-FEET	800.00
[7] La-MILES	0.152
[8] ELEVATION OF HEADWATER	427.5
[9] ELEVATION OF CONCENTRATION POINT	415.2
[10] H-FEET	12.3
[11] S-FEET/MILE	40.6
[12] S^0.5	6.37
[13] L*LCA/S^0.5	0.007
[14] AVERAGE MANNINGS 'N'	0.02
[15] LAG TIME-HOURS	0.07
[16] LAG TIME-MINUTES	4.4
[17] 100% OF LAG-MINUTES	4.4
[18] 200% OF LAG-MINUTES	8.8

RAINFALL DATA

[1] AMC	II
[2] FREQUENCY-YEARS	100
NOAA ATLAS	**14**
[3] DURATION:	Point Rain
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

STORM EVENT SUMMARY

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
TOTAL RAINFALL	(in)	1.74	2.62	3.53	5.8
RAINFALL VOLUME	(cuft)	52,425	78,938	106,356	174,749
SOIL LOSSES	(cuft)	4,236	12,708	25,163	74,972
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	48,189	66,230	81,193	99,777
	(acre-ft)	1.11	1.52	1.86	2.29
PEAK FLOW	(cfs)	N/A	20.40	18.68	5.59

NOTE: PEAK FLOW FOR THE 1-HOUR STORM IS NOT REPRESENTATIVE. PER RCFCD PEAK DISCHARGES FROM THE 3-HOUR STORM SHOULD NORMALLY COMPARE WELL WITH RATIONAL PEAKS.

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD	PROJECT:	COD - WVC		
	BASIC DATA CALCULATION FORM	Job No.:	2228		
	AMC II	BY:	DLS	DATE:	5/12/15

AVERAGE ADJUSTED LOSS RATE

SOIL GROUP [Plate C-1]	LAND USE	RI NUMBER [Plate E-6.1]	PERVIOUS AREA INFILTRATION RATE (in/hr) [Plate E-6.2]	DECIMAL PERCENT OF AREA IMPERVIOUS [Plate E-6.3]	ADJUSTED INFILTRATION RATE (in/hr)	AREA	AREA WEIGHTED AVERAGE	MAX AVERAGE ADJUSTED INFILTRATION RATE (in/hr)	LOW LOSS CONDITION	LOW LOSS RATE PER RCFC/2322 (in/hr)	MIN AVERAGE ADJUSTED INFILTRATION RATE (in/hr)
A	COMMERCIAL	32	0.74	90%	0.14	8.300	1.000	0.1406	DEVELOPED	0.1800	0.1800
					SUM	8.300	SUM	0.1406			0.1800

VARIABLE LOSS RATE CURVE (24-HOUR STORM ONLY)

Fm= 0.0703

C= 0.00130

Ft=C(24-(T/60))^1.55 = 0.00130 (24-(T/60))^1.55 + **0.07** in/hr

CONSTANT LOSS RATE (3 & 6 HOUR STORMS) = **0.1406** in/hr

LOW LOSS RATE = **0.8500** in/hr

Where:

T=Time in minutes. To get an average value for each unit time period, Use T=1/2 the unit time for the first time period,
T=1 1/2 unit time for the second period, etc.

NOTE: Low loss rates established per RCFC/2322 (Dated: May-30-95)
For 10 Year Storms or Less
Undeveloped Condition: Low Loss = 90%
Developed Condition: Low Loss = 0.9 - (0.8 * %impervious)
Basin Site: Low Loss = 10%
For 100 Year Storm - Low Loss should be between 80% & 90%
of the Rainfall Rate

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 1-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	8.30
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	4.42
UNIT TIME-PERCENT OF LAG	113.1
TOTAL ADJUSTED STORM RAIN-INCHES	1.74
CONSTANT LOSS RATE-in/hr	0.14
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	3.6	0.75	0.14	0.64	0.61	5.11
2	10	0.17	4.2	0.88	0.14	0.75	0.74	6.16
3	15	0.25	4.4	0.92	0.14	0.78	0.78	6.51
4	20	0.33	4.6	0.96	0.14	0.82	0.82	6.86
5	25	0.42	5.0	1.04	0.14	0.89	0.90	7.56
6	30	0.50	5.6	1.17	0.14	0.99	1.03	8.61
7	35	0.58	6.4	1.34	0.14	1.14	1.20	10.01
8	40	0.67	8.1	1.69	0.14	1.44	1.55	12.98
9	45	0.75	13.1	2.74	0.14	2.32	2.59	21.72
10	50	0.83	34.5	7.20	0.14	6.12	7.06	**59.11**
11	55	0.92	6.7	1.40	0.14	1.19	1.26	10.53
12	60	1.00	3.8	0.79	0.14	0.67	0.65	5.46

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	1.74
RAINFALL VOLUME (cuft)	52,425
SOIL LOSSES (cuft)	4,236
EFFECTIVE RAIN (in)	1.60
FLOOD VOLUME (acft)	1.11
FLOOD VOLUME (cuft)	48,189
PEAK FLOW RATE (cfs)	59.11

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 3-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	8.30	
UNIT TIME-MINUTES	5	
LAG TIME - MINUTES	4.42	
UNIT TIME-PERCENT OF LAG	113.1	
TOTAL ADJUSTED STORM RAIN-INCHES	2.62	
CONSTANT LOSS RATE-in/hr		0.14
LOW LOSS RATE - PERCENT		85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	1.3	0.41	0.14	0.35	0.27	2.24
2	10	0.17	1.3	0.41	0.14	0.35	0.27	2.24
3	15	0.25	1.1	0.35	0.14	0.29	0.21	1.72
4	20	0.33	1.5	0.47	0.14	0.40	0.33	2.77
5	25	0.42	1.5	0.47	0.14	0.40	0.33	2.77
6	30	0.50	1.8	0.57	0.14	0.48	0.43	3.56
7	35	0.58	1.5	0.47	0.14	0.40	0.33	2.77
8	40	0.67	1.8	0.57	0.14	0.48	0.43	3.56
9	45	0.75	1.8	0.57	0.14	0.48	0.43	3.56
10	50	0.83	1.5	0.47	0.14	0.40	0.33	2.77
11	55	0.92	1.6	0.50	0.14	0.43	0.36	3.03
12	60	1.00	1.8	0.57	0.14	0.48	0.43	3.56
13	65	1.08	2.2	0.69	0.14	0.59	0.55	4.61
14	70	1.17	2.2	0.69	0.14	0.59	0.55	4.61
15	75	1.25	2.2	0.69	0.14	0.59	0.55	4.61
16	80	1.33	2.0	0.63	0.14	0.53	0.49	4.09
17	85	1.42	2.6	0.82	0.14	0.69	0.68	5.66
18	90	1.50	2.7	0.85	0.14	0.72	0.71	5.93
19	95	1.58	2.4	0.75	0.14	0.64	0.61	5.14
20	100	1.67	2.7	0.85	0.14	0.72	0.71	5.93
21	105	1.75	3.3	1.04	0.14	0.88	0.90	7.51
22	110	1.83	3.1	0.97	0.14	0.83	0.83	6.98
23	115	1.92	2.9	0.91	0.14	0.77	0.77	6.45
24	120	2.00	3.0	0.94	0.14	0.80	0.80	6.72
25	125	2.08	3.1	0.97	0.14	0.83	0.83	6.98
26	130	2.17	4.2	1.32	0.14	1.12	1.18	9.87
27	135	2.25	5.0	1.57	0.14	1.34	1.43	11.98
28	140	2.33	3.5	1.10	0.14	0.94	0.96	8.03
29	145	2.42	6.8	2.14	0.14	1.82	2.00	16.72
30	150	2.50	7.3	2.30	0.14	1.95	2.15	18.03
31	155	2.58	8.2	2.58	0.14	2.19	2.44	**20.40**
32	160	2.67	5.9	1.85	0.14	1.58	1.71	14.35
33	165	2.75	2.0	0.63	0.14	0.53	0.49	4.09
34	170	2.83	1.8	0.57	0.14	0.48	0.43	3.56
35	175	2.92	1.8	0.57	0.14	0.48	0.43	3.56
36	180	3.00	0.6	0.19	0.14	0.16	0.05	0.40

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	2.62
RAINFALL VOLUME (cuft)	78,938
SOIL LOSSES (cuft)	12,708
EFFECTIVE RAIN (in)	2.20
FLOOD VOLUME (acft)	1.52
FLOOD VOLUME (cuft)	66,230
PEAK FLOW RATE (cfs)	20.40

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	8.30
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	4.42
UNIT TIME-PERCENT OF LAG	113.1
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs
1	5	0.08	0.5	0.212	0.14	0.18	0.07	0.60
2	10	0.17	0.6	0.254	0.14	0.22	0.11	0.95
3	15	0.25	0.6	0.254	0.14	0.22	0.11	0.95
4	20	0.33	0.6	0.254	0.14	0.22	0.11	0.95
5	25	0.42	0.6	0.254	0.14	0.22	0.11	0.95
6	30	0.50	0.7	0.297	0.14	0.25	0.16	1.30
7	35	0.58	0.7	0.297	0.14	0.25	0.16	1.30
8	40	0.67	0.7	0.297	0.14	0.25	0.16	1.30
9	45	0.75	0.7	0.297	0.14	0.25	0.16	1.30
10	50	0.83	0.7	0.297	0.14	0.25	0.16	1.30
11	55	0.92	0.7	0.297	0.14	0.25	0.16	1.30
12	60	1.00	0.8	0.339	0.14	0.29	0.20	1.66
13	65	1.08	0.8	0.339	0.14	0.29	0.20	1.66
14	70	1.17	0.8	0.339	0.14	0.29	0.20	1.66
15	75	1.25	0.8	0.339	0.14	0.29	0.20	1.66
16	80	1.33	0.8	0.339	0.14	0.29	0.20	1.66
17	85	1.42	0.8	0.339	0.14	0.29	0.20	1.66
18	90	1.50	0.8	0.339	0.14	0.29	0.20	1.66
19	95	1.58	0.8	0.339	0.14	0.29	0.20	1.66
20	100	1.67	0.8	0.339	0.14	0.29	0.20	1.66
21	105	1.75	0.8	0.339	0.14	0.29	0.20	1.66
22	110	1.83	0.8	0.339	0.14	0.29	0.20	1.66
23	115	1.92	0.8	0.339	0.14	0.29	0.20	1.66
24	120	2.00	0.9	0.381	0.14	0.32	0.24	2.01
25	125	2.08	0.8	0.339	0.14	0.29	0.20	1.66
26	130	2.17	0.9	0.381	0.14	0.32	0.24	2.01
27	135	2.25	0.9	0.381	0.14	0.32	0.24	2.01
28	140	2.33	0.9	0.381	0.14	0.32	0.24	2.01
29	145	2.42	0.9	0.381	0.14	0.32	0.24	2.01
30	150	2.50	0.9	0.381	0.14	0.32	0.24	2.01
31	155	2.58	0.9	0.381	0.14	0.32	0.24	2.01
32	160	2.67	0.9	0.381	0.14	0.32	0.24	2.01
33	165	2.75	1.0	0.424	0.14	0.36	0.28	2.37
34	170	2.83	1.0	0.424	0.14	0.36	0.28	2.37
35	175	2.92	1.0	0.424	0.14	0.36	0.28	2.37
36	180	3.00	1.0	0.424	0.14	0.36	0.28	2.37
37	185	3.08	1.0	0.424	0.14	0.36	0.28	2.37
38	190	3.17	1.1	0.466	0.14	0.40	0.33	2.72
39	195	3.25	1.1	0.466	0.14	0.40	0.33	2.72
40	200	3.33	1.1	0.466	0.14	0.40	0.33	2.72
41	205	3.42	1.2	0.508	0.14	0.43	0.37	3.08
42	210	3.50	1.3	0.551	0.14	0.47	0.41	3.43
43	215	3.58	1.4	0.593	0.14	0.50	0.45	3.79
44	220	3.67	1.4	0.593	0.14	0.50	0.45	3.79
45	225	3.75	1.5	0.635	0.14	0.54	0.49	4.14
46	230	3.83	1.5	0.635	0.14	0.54	0.49	4.14
47	235	3.92	1.6	0.678	0.14	0.58	0.54	4.50
48	240	4.00	1.6	0.678	0.14	0.58	0.54	4.50
49	245	4.08	1.7	0.720	0.14	0.61	0.58	4.85
50	250	4.17	1.8	0.762	0.14	0.65	0.62	5.20
51	255	4.25	1.9	0.805	0.14	0.68	0.66	5.56
52	260	4.33	2.0	0.847	0.14	0.72	0.71	5.91
53	265	4.42	2.1	0.890	0.14	0.76	0.75	6.27
54	270	4.50	2.1	0.890	0.14	0.76	0.75	6.27

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	8.30
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	4.42
UNIT TIME-PERCENT OF LAG	113.1
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs
55	275	4.58	2.2	0.932	0.14	0.79	0.79	6.62
56	280	4.67	2.3	0.974	0.14	0.83	0.83	6.98
57	285	4.75	2.4	1.017	0.14	0.86	0.88	7.33
58	290	4.83	2.4	1.017	0.14	0.86	0.88	7.33
59	295	4.92	2.5	1.059	0.14	0.90	0.92	7.69
60	300	5.00	2.6	1.101	0.14	0.94	0.96	8.04
61	305	5.08	3.1	1.313	0.14	1.12	1.17	9.81
62	310	5.17	3.6	1.525	0.14	1.30	1.38	11.59
63	315	5.25	3.9	1.652	0.14	1.40	1.51	12.65
64	320	5.33	4.2	1.779	0.14	1.51	1.64	13.71
65	325	5.42	4.7	1.991	0.14	1.69	1.85	15.49
66	330	5.50	5.6	2.372	0.14	2.02	2.23	**18.68**
67	335	5.58	1.9	0.805	0.14	0.68	0.66	5.56
68	340	5.67	0.9	0.381	0.14	0.32	0.24	2.01
69	345	5.75	0.6	0.254	0.14	0.22	0.11	0.95
70	350	5.83	0.5	0.212	0.14	0.18	0.07	0.60
71	355	5.92	0.3	0.127	0.14	0.11	0.02	0.16
72	360	6.00	0.2	0.085	0.14	0.07	0.01	0.11

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	3.53
RAINFALL VOLUME (cuft)	106,356
SOIL LOSSES (cuft)	25,163
EFFECTIVE RAIN (in)	2.69
FLOOD VOLUME (acft)	1.86
FLOOD VOLUME (cuft)	81,193
PEAK FLOW RATE (cfs)	18.68

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	8.300	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	4.42	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	339.4	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain in/hr	Flood Hydrograph Flow cfs
	Minutes	Hours	(Plate E-5.9)		Max	Low		
1	15	0.25	0.2	0.046	0.248	0.039	0.007	0.06
2	30	0.50	0.3	0.070	0.245	0.059	0.010	0.09
3	45	0.75	0.3	0.070	0.243	0.059	0.010	0.09
4	60	1.00	0.4	0.093	0.240	0.079	0.014	0.12
5	75	1.25	0.3	0.070	0.237	0.059	0.010	0.09
6	90	1.50	0.3	0.070	0.234	0.059	0.010	0.09
7	105	1.75	0.3	0.070	0.231	0.059	0.010	0.09
8	120	2.00	0.4	0.093	0.228	0.079	0.014	0.12
9	135	2.25	0.4	0.093	0.226	0.079	0.014	0.12
10	150	2.50	0.4	0.093	0.223	0.079	0.014	0.12
11	165	2.75	0.5	0.116	0.220	0.099	0.017	0.15
12	180	3.00	0.5	0.116	0.218	0.099	0.017	0.15
13	195	3.25	0.5	0.116	0.215	0.099	0.017	0.15
14	210	3.50	0.5	0.116	0.212	0.099	0.017	0.15
15	225	3.75	0.5	0.116	0.210	0.099	0.017	0.15
16	240	4.00	0.6	0.139	0.207	0.118	0.021	0.17
17	255	4.25	0.6	0.139	0.204	0.118	0.021	0.17
18	270	4.50	0.7	0.162	0.202	0.138	0.024	0.20
19	285	4.75	0.7	0.162	0.199	0.138	0.024	0.20
20	300	5.00	0.8	0.186	0.196	0.158	0.028	0.23
21	315	5.25	0.6	0.139	0.194	0.118	0.021	0.17
22	330	5.50	0.7	0.162	0.191	0.138	0.024	0.20
23	345	5.75	0.8	0.186	0.189	0.158	0.028	0.23
24	360	6.00	0.8	0.186	0.186	0.158	0.028	0.23
25	375	6.25	0.9	0.209	0.184	0.177	0.025	0.21
26	390	6.50	0.9	0.209	0.181	0.177	0.027	0.23
27	405	6.75	1.0	0.232	0.179	0.197	0.053	0.44
28	420	7.00	1.0	0.232	0.177	0.197	0.055	0.46
29	435	7.25	1.0	0.232	0.174	0.197	0.058	0.48
30	450	7.50	1.1	0.255	0.172	0.217	0.083	0.70
31	465	7.75	1.2	0.278	0.170	0.237	0.109	0.91
32	480	8.00	1.3	0.302	0.167	0.256	0.134	1.13
33	495	8.25	1.5	0.348	0.165	0.296	0.183	1.53
34	510	8.50	1.5	0.348	0.163	0.296	0.185	1.55
35	525	8.75	1.6	0.371	0.160	0.316	0.211	1.77
36	540	9.00	1.7	0.394	0.158	0.335	0.236	1.98
37	555	9.25	1.9	0.441	0.156	0.375	0.285	2.39
38	570	9.50	2.0	0.464	0.154	0.394	0.310	2.60
39	585	9.75	2.1	0.487	0.151	0.414	0.336	2.81
40	600	10.00	2.2	0.510	0.149	0.434	0.361	3.02
41	615	10.25	1.5	0.348	0.147	0.296	0.201	1.68
42	630	10.50	1.5	0.348	0.145	0.296	0.203	1.70
43	645	10.75	2.0	0.464	0.143	0.394	0.321	2.69
44	660	11.00	2.0	0.464	0.141	0.394	0.323	2.71
45	675	11.25	1.9	0.441	0.139	0.375	0.302	2.53
46	690	11.50	1.9	0.441	0.137	0.375	0.304	2.55
47	705	11.75	1.7	0.394	0.135	0.335	0.260	2.17
48	720	12.00	1.8	0.418	0.133	0.355	0.285	2.39
49	735	12.25	2.5	0.580	0.131	0.493	0.449	3.76
50	750	12.50	2.6	0.603	0.129	0.513	0.475	3.97
51	765	12.75	2.8	0.650	0.127	0.552	0.523	4.38
52	780	13.00	2.9	0.673	0.125	0.572	0.548	4.59
53	795	13.25	3.4	0.789	0.123	0.670	0.666	5.57
54	810	13.50	3.4	0.789	0.121	0.670	0.668	**5.59**
55	825	13.75	2.3	0.534	0.119	0.454	0.414	3.47
56	840	14.00	2.3	0.534	0.117	0.454	0.416	3.48
57	855	14.25	2.7	0.626	0.116	0.532	0.511	4.27
58	870	14.50	2.6	0.603	0.114	0.513	0.489	4.10
59	885	14.75	2.6	0.603	0.112	0.513	0.491	4.11
60	900	15.00	2.5	0.580	0.110	0.493	0.470	3.93
61	915	15.25	2.4	0.557	0.109	0.473	0.448	3.75
62	930	15.50	2.3	0.534	0.107	0.454	0.427	3.57
63	945	15.75	1.9	0.441	0.105	0.375	0.335	2.81

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	8.300	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	4.42	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	339.4	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
64	960	16.00	1.9	0.441	0.104	0.375	0.337	2.82
65	975	16.25	0.4	0.093	0.102	0.079	0.014	0.12
66	990	16.50	0.4	0.093	0.101	0.079	0.014	0.12
67	1005	16.75	0.3	0.070	0.099	0.059	0.010	0.09
68	1020	17.00	0.3	0.070	0.098	0.059	0.010	0.09
69	1035	17.25	0.5	0.116	0.096	0.099	0.020	0.17
70	1050	17.50	0.5	0.116	0.095	0.099	0.021	0.18
71	1065	17.75	0.5	0.116	0.093	0.099	0.023	0.19
72	1080	18.00	0.4	0.093	0.092	0.079	0.001	0.01
73	1095	18.25	0.4	0.093	0.091	0.079	0.002	0.02
74	1110	18.50	0.4	0.093	0.089	0.079	0.004	0.03
75	1125	18.75	0.3	0.070	0.088	0.059	0.010	0.09
76	1140	19.00	0.2	0.046	0.087	0.039	0.007	0.06
77	1155	19.25	0.3	0.070	0.085	0.059	0.010	0.09
78	1170	19.50	0.4	0.093	0.084	0.079	0.009	0.07
79	1185	19.75	0.3	0.070	0.083	0.059	0.010	0.09
80	1200	20.00	0.2	0.046	0.082	0.039	0.007	0.06
81	1215	20.25	0.3	0.070	0.081	0.059	0.010	0.09
82	1230	20.50	0.3	0.070	0.080	0.059	0.010	0.09
83	1245	20.75	0.3	0.070	0.079	0.059	0.010	0.09
84	1260	21.00	0.2	0.046	0.078	0.039	0.007	0.06
85	1275	21.25	0.3	0.070	0.077	0.059	0.010	0.09
86	1290	21.50	0.2	0.046	0.076	0.039	0.007	0.06
87	1305	21.75	0.3	0.070	0.075	0.059	0.010	0.09
88	1320	22.00	0.2	0.046	0.074	0.039	0.007	0.06
89	1335	22.25	0.3	0.070	0.074	0.059	0.010	0.09
90	1350	22.50	0.2	0.046	0.073	0.039	0.007	0.06
91	1365	22.75	0.2	0.046	0.072	0.039	0.007	0.06
92	1380	23.00	0.2	0.046	0.072	0.039	0.007	0.06
93	1395	23.25	0.2	0.046	0.071	0.039	0.007	0.06
94	1410	23.50	0.2	0.046	0.071	0.039	0.007	0.06
95	1425	23.75	0.2	0.046	0.071	0.039	0.007	0.06
96	1440	24.00	0.2	0.046	0.070	0.039	0.007	0.06

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	5.8
RAINFALL VOLUME (cuft)	174,749
SOIL LOSSES (cuft)	74,972
EFFECTIVE RAIN (in)	3.31
FLOOD VOLUME (acft)	2.29
FLOOD VOLUME (cuft)	99,777
PEAK FLOW (cfs)	5.59

RCFCD SYNTHETIC UNIT HYDROGRAPH - SHORTCUT METHOD

DATA INPUT SHEET

DATE:	May 12, 2015
WORKSHEET PREPARED BY:	DLS
PROJECT NAME	COD - WVC
PROJECT NUMBER	2228
CONCENTRATION POINT DESIGNATION	CURB CUT
AREA DESIGNATION	BARISTO - 03
AMC NUMBER	2

Low Loss Conditions: X=Existing; D=Developed; BS=Retention

AREA DESIG	SOIL GROUP	TRIBUTARY AREAS	ACRES	LOW LOSS CONDITION	RI NUMBER	AMC II INFILTRATION RATE	IMPERVIOUS PERCENT
1	A	COMMERCIAL	4.810	D	32	0.74	0.90

LENGTH OF WATERCOURSE (L)	900 ft
LENGTH TO POINT OPPOSITE CENTROID (Lca)	450 ft
ELEVATION OF HEADWATER	420.0 ft
ELEVATION OF CONCENTRATION POINT	414.4 ft
AVERAGE MANNINGS 'N' VALUE	0.02
STORM FREQUENCY (YEAR)	100
LOW LOSS RATE (For Storms Greater Than 10 Years)	85%
POINT RAIN FROM NOAA ATLAS	**14**
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM	PROJECT: COD - WVC Job No.: 2228 BY: DLS DATE: 5/12/15

PHYSICAL DATA

[1] CONCENTRATION POINT	CURB CUT
[2] AREA DESIGNATION	BARISTO - 03
[3] AREA - ACRES	4.810
[4] L-FEET	900
[5] L-MILES	0.170
[6] La-FEET	450.00
[7] La-MILES	0.085
[8] ELEVATION OF HEADWATER	420
[9] ELEVATION OF CONCENTRATION POINT	414.4
[10] H-FEET	5.6
[11] S-FEET/MILE	32.9
[12] S^0.5	5.73
[13] L*LCA/S^0.5	0.003
[14] AVERAGE MANNINGS 'N'	0.02
[15] LAG TIME-HOURS	0.05
[16] LAG TIME-MINUTES	3.0
[17] 100% OF LAG-MINUTES	3.0
[18] 200% OF LAG-MINUTES	5.9

RAINFALL DATA

[1] AMC	II
[2] FREQUENCY-YEARS	100
NOAA ATLAS	**14**
[3] DURATION:	Point Rain
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

STORM EVENT SUMMARY

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
TOTAL RAINFALL	(in)	1.74	2.62	3.53	5.8
RAINFALL VOLUME	(cuft)	30,381	45,746	61,635	101,270
SOIL LOSSES	(cuft)	2,455	7,365	14,582	43,448
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft) (acre-ft)	27,926 0.64	38,381 0.88	47,053 1.08	57,823 1.33
PEAK FLOW	(cfs)	N/A	11.82	10.82	3.24

NOTE: PEAK FLOW FOR THE 1-HOUR STORM IS NOT REPRESENTATIVE. PER RCFCD PEAK DISCHARGES FROM THE 3-HOUR STORM SHOULD NORMALLY COMPARE WELL WITH RATIONAL PEAKS.

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM AMC II	PROJECT:	COD - WVC		
		Job No.:	2228		
		BY:	DLS	DATE:	5/12/15

AVERAGE ADJUSTED LOSS RATE

SOIL GROUP [Plate C-1]	LAND USE	RI NUMBER [Plate E-6.1]	PERVIOUS AREA INFILTRATION RATE (in/hr) [Plate E-6.2]	DECIMAL PERCENT OF AREA IMPERVIOUS [Plate E-6.3]	ADJUSTED INFILTRATION RATE (in/hr)	AREA	AREA WEIGHTED AVERAGE	MAX AVERAGE ADJUSTED INFILTRATION RATE (in/hr)	LOW LOSS CONDITION	LOW LOSS RATE PER RCFC/2322 (in/hr)	MIN AVERAGE ADJUSTED INFILTRATION RATE (in/hr)
A	COMMERCIAL	32	0.74	90%	0.14	4.810	1.000	0.1406	DEVELOPED	0.1800	0.1800
					SUM	4.810	SUM	0.1406			0.1800

VARIABLE LOSS RATE CURVE (24-HOUR STORM ONLY)

Fm= 0.0703

C= 0.00130

Ft=C(24-(T/60))^1.55 = 0.00130 (24-(T/60))^1.55 + **0.07** in/hr

CONSTANT LOSS RATE (3 & 6 HOUR STORMS) = **0.1406** in/hr

LOW LOSS RATE = **0.8500** in/hr

Where:

T=Time in minutes. To get an average value for each unit time period, Use T=1/2 the unit time for the first time period, T=1 1/2 unit time for the second period, etc.

NOTE: Low loss rates established per RCFC/2322 (Dated: May-30-95)
For 10 Year Storms or Less
Undeveloped Condition: Low Loss = 90%
Developed Condition: Low Loss = 0.9 - (0.8 * %impervious)
Basin Site: Low Loss = 10%
For 100 Year Storm - Low Loss should be between 80% & 90% of the Rainfall Rate

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 1-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	4.81
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	2.97
UNIT TIME-PERCENT OF LAG	168.3
TOTAL ADJUSTED STORM RAIN-INCHES	1.74
CONSTANT LOSS RATE-in/hr	0.14
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	3.6	0.75	0.14	0.64	0.61	2.96
2	10	0.17	4.2	0.88	0.14	0.75	0.74	3.57
3	15	0.25	4.4	0.92	0.14	0.78	0.78	3.77
4	20	0.33	4.6	0.96	0.14	0.82	0.82	3.98
5	25	0.42	5.0	1.04	0.14	0.89	0.90	4.38
6	30	0.50	5.6	1.17	0.14	0.99	1.03	4.99
7	35	0.58	6.4	1.34	0.14	1.14	1.20	5.80
8	40	0.67	8.1	1.69	0.14	1.44	1.55	7.52
9	45	0.75	13.1	2.74	0.14	2.32	2.59	12.58
10	50	0.83	34.5	7.20	0.14	6.12	7.06	**34.26**
11	55	0.92	6.7	1.40	0.14	1.19	1.26	6.10
12	60	1.00	3.8	0.79	0.14	0.67	0.65	3.17

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	1.74
RAINFALL VOLUME (cuft)	30,381
SOIL LOSSES (cuft)	2,455
EFFECTIVE RAIN (in)	1.60
FLOOD VOLUME (acft)	0.64
FLOOD VOLUME (cuft)	27,926
PEAK FLOW RATE (cfs)	34.26

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 3-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	4.81	
UNIT TIME-MINUTES	5	
LAG TIME - MINUTES	2.97	
UNIT TIME-PERCENT OF LAG	168.3	
TOTAL ADJUSTED STORM RAIN-INCHES	2.62	
CONSTANT LOSS RATE-in/hr		0.14
LOW LOSS RATE - PERCENT		85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	1.3	0.41	0.14	0.35	0.27	1.30
2	10	0.17	1.3	0.41	0.14	0.35	0.27	1.30
3	15	0.25	1.1	0.35	0.14	0.29	0.21	1.00
4	20	0.33	1.5	0.47	0.14	0.40	0.33	1.61
5	25	0.42	1.5	0.47	0.14	0.40	0.33	1.61
6	30	0.50	1.8	0.57	0.14	0.48	0.43	2.06
7	35	0.58	1.5	0.47	0.14	0.40	0.33	1.61
8	40	0.67	1.8	0.57	0.14	0.48	0.43	2.06
9	45	0.75	1.8	0.57	0.14	0.48	0.43	2.06
10	50	0.83	1.5	0.47	0.14	0.40	0.33	1.61
11	55	0.92	1.6	0.50	0.14	0.43	0.36	1.76
12	60	1.00	1.8	0.57	0.14	0.48	0.43	2.06
13	65	1.08	2.2	0.69	0.14	0.59	0.55	2.67
14	70	1.17	2.2	0.69	0.14	0.59	0.55	2.67
15	75	1.25	2.2	0.69	0.14	0.59	0.55	2.67
16	80	1.33	2.0	0.63	0.14	0.53	0.49	2.37
17	85	1.42	2.6	0.82	0.14	0.69	0.68	3.28
18	90	1.50	2.7	0.85	0.14	0.72	0.71	3.44
19	95	1.58	2.4	0.75	0.14	0.64	0.61	2.98
20	100	1.67	2.7	0.85	0.14	0.72	0.71	3.44
21	105	1.75	3.3	1.04	0.14	0.88	0.90	4.35
22	110	1.83	3.1	0.97	0.14	0.83	0.83	4.05
23	115	1.92	2.9	0.91	0.14	0.77	0.77	3.74
24	120	2.00	3.0	0.94	0.14	0.80	0.80	3.89
25	125	2.08	3.1	0.97	0.14	0.83	0.83	4.05
26	130	2.17	4.2	1.32	0.14	1.12	1.18	5.72
27	135	2.25	5.0	1.57	0.14	1.34	1.43	6.94
28	140	2.33	3.5	1.10	0.14	0.94	0.96	4.66
29	145	2.42	6.8	2.14	0.14	1.82	2.00	9.69
30	150	2.50	7.3	2.30	0.14	1.95	2.15	10.45
31	155	2.58	8.2	2.58	0.14	2.19	2.44	**11.82**
32	160	2.67	5.9	1.85	0.14	1.58	1.71	8.31
33	165	2.75	2.0	0.63	0.14	0.53	0.49	2.37
34	170	2.83	1.8	0.57	0.14	0.48	0.43	2.06
35	175	2.92	1.8	0.57	0.14	0.48	0.43	2.06
36	180	3.00	0.6	0.19	0.14	0.16	0.05	0.23

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	2.62
RAINFALL VOLUME (cuft)	45,746
SOIL LOSSES (cuft)	7,365
EFFECTIVE RAIN (in)	2.20
FLOOD VOLUME (acft)	0.88
FLOOD VOLUME (cuft)	38,381
PEAK FLOW RATE (cfs)	11.82

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	4.81
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	2.97
UNIT TIME-PERCENT OF LAG	168.3
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs
1	5	0.08	0.5	0.212	0.14	0.18	0.07	0.35
2	10	0.17	0.6	0.254	0.14	0.22	0.11	0.55
3	15	0.25	0.6	0.254	0.14	0.22	0.11	0.55
4	20	0.33	0.6	0.254	0.14	0.22	0.11	0.55
5	25	0.42	0.6	0.254	0.14	0.22	0.11	0.55
6	30	0.50	0.7	0.297	0.14	0.25	0.16	0.76
7	35	0.58	0.7	0.297	0.14	0.25	0.16	0.76
8	40	0.67	0.7	0.297	0.14	0.25	0.16	0.76
9	45	0.75	0.7	0.297	0.14	0.25	0.16	0.76
10	50	0.83	0.7	0.297	0.14	0.25	0.16	0.76
11	55	0.92	0.7	0.297	0.14	0.25	0.16	0.76
12	60	1.00	0.8	0.339	0.14	0.29	0.20	0.96
13	65	1.08	0.8	0.339	0.14	0.29	0.20	0.96
14	70	1.17	0.8	0.339	0.14	0.29	0.20	0.96
15	75	1.25	0.8	0.339	0.14	0.29	0.20	0.96
16	80	1.33	0.8	0.339	0.14	0.29	0.20	0.96
17	85	1.42	0.8	0.339	0.14	0.29	0.20	0.96
18	90	1.50	0.8	0.339	0.14	0.29	0.20	0.96
19	95	1.58	0.8	0.339	0.14	0.29	0.20	0.96
20	100	1.67	0.8	0.339	0.14	0.29	0.20	0.96
21	105	1.75	0.8	0.339	0.14	0.29	0.20	0.96
22	110	1.83	0.8	0.339	0.14	0.29	0.20	0.96
23	115	1.92	0.8	0.339	0.14	0.29	0.20	0.96
24	120	2.00	0.9	0.381	0.14	0.32	0.24	1.17
25	125	2.08	0.8	0.339	0.14	0.29	0.20	0.96
26	130	2.17	0.9	0.381	0.14	0.32	0.24	1.17
27	135	2.25	0.9	0.381	0.14	0.32	0.24	1.17
28	140	2.33	0.9	0.381	0.14	0.32	0.24	1.17
29	145	2.42	0.9	0.381	0.14	0.32	0.24	1.17
30	150	2.50	0.9	0.381	0.14	0.32	0.24	1.17
31	155	2.58	0.9	0.381	0.14	0.32	0.24	1.17
32	160	2.67	0.9	0.381	0.14	0.32	0.24	1.17
33	165	2.75	1.0	0.424	0.14	0.36	0.28	1.37
34	170	2.83	1.0	0.424	0.14	0.36	0.28	1.37
35	175	2.92	1.0	0.424	0.14	0.36	0.28	1.37
36	180	3.00	1.0	0.424	0.14	0.36	0.28	1.37
37	185	3.08	1.0	0.424	0.14	0.36	0.28	1.37
38	190	3.17	1.1	0.466	0.14	0.40	0.33	1.58
39	195	3.25	1.1	0.466	0.14	0.40	0.33	1.58
40	200	3.33	1.1	0.466	0.14	0.40	0.33	1.58
41	205	3.42	1.2	0.508	0.14	0.43	0.37	1.78
42	210	3.50	1.3	0.551	0.14	0.47	0.41	1.99
43	215	3.58	1.4	0.593	0.14	0.50	0.45	2.19
44	220	3.67	1.4	0.593	0.14	0.50	0.45	2.19
45	225	3.75	1.5	0.635	0.14	0.54	0.49	2.40
46	230	3.83	1.5	0.635	0.14	0.54	0.49	2.40
47	235	3.92	1.6	0.678	0.14	0.58	0.54	2.61
48	240	4.00	1.6	0.678	0.14	0.58	0.54	2.61
49	245	4.08	1.7	0.720	0.14	0.61	0.58	2.81
50	250	4.17	1.8	0.762	0.14	0.65	0.62	3.02
51	255	4.25	1.9	0.805	0.14	0.68	0.66	3.22
52	260	4.33	2.0	0.847	0.14	0.72	0.71	3.43
53	265	4.42	2.1	0.890	0.14	0.76	0.75	3.63
54	270	4.50	2.1	0.890	0.14	0.76	0.75	3.63

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	4.81
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	2.97
UNIT TIME-PERCENT OF LAG	168.3
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs
55	275	4.58	2.2	0.932	0.14	0.79	0.79	3.84
56	280	4.67	2.3	0.974	0.14	0.83	0.83	4.04
57	285	4.75	2.4	1.017	0.14	0.86	0.88	4.25
58	290	4.83	2.4	1.017	0.14	0.86	0.88	4.25
59	295	4.92	2.5	1.059	0.14	0.90	0.92	4.45
60	300	5.00	2.6	1.101	0.14	0.94	0.96	4.66
61	305	5.08	3.1	1.313	0.14	1.12	1.17	5.69
62	310	5.17	3.6	1.525	0.14	1.30	1.38	6.71
63	315	5.25	3.9	1.652	0.14	1.40	1.51	7.33
64	320	5.33	4.2	1.779	0.14	1.51	1.64	7.95
65	325	5.42	4.7	1.991	0.14	1.69	1.85	8.97
66	330	5.50	5.6	2.372	0.14	2.02	2.23	**10.82**
67	335	5.58	1.9	0.805	0.14	0.68	0.66	3.22
68	340	5.67	0.9	0.381	0.14	0.32	0.24	1.17
69	345	5.75	0.6	0.254	0.14	0.22	0.11	0.55
70	350	5.83	0.5	0.212	0.14	0.18	0.07	0.35
71	355	5.92	0.3	0.127	0.14	0.11	0.02	0.09
72	360	6.00	0.2	0.085	0.14	0.07	0.01	0.06

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	3.53
RAINFALL VOLUME (cuft)	61,635
SOIL LOSSES (cuft)	14,582
EFFECTIVE RAIN (in)	2.69
FLOOD VOLUME (acft)	1.08
FLOOD VOLUME (cuft)	47,053
PEAK FLOW RATE (cfs)	10.82

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	4.810	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	2.97	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	504.9	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain in/hr	Flood Hydrograph Flow cfs
	Minutes	Hours	(Plate E-5.9)		Max	Low		
1	15	0.25	0.2	0.046	0.248	0.039	0.007	0.03
2	30	0.50	0.3	0.070	0.245	0.059	0.010	0.05
3	45	0.75	0.3	0.070	0.243	0.059	0.010	0.05
4	60	1.00	0.4	0.093	0.240	0.079	0.014	0.07
5	75	1.25	0.3	0.070	0.237	0.059	0.010	0.05
6	90	1.50	0.3	0.070	0.234	0.059	0.010	0.05
7	105	1.75	0.3	0.070	0.231	0.059	0.010	0.05
8	120	2.00	0.4	0.093	0.228	0.079	0.014	0.07
9	135	2.25	0.4	0.093	0.226	0.079	0.014	0.07
10	150	2.50	0.4	0.093	0.223	0.079	0.014	0.07
11	165	2.75	0.5	0.116	0.220	0.099	0.017	0.08
12	180	3.00	0.5	0.116	0.218	0.099	0.017	0.08
13	195	3.25	0.5	0.116	0.215	0.099	0.017	0.08
14	210	3.50	0.5	0.116	0.212	0.099	0.017	0.08
15	225	3.75	0.5	0.116	0.210	0.099	0.017	0.08
16	240	4.00	0.6	0.139	0.207	0.118	0.021	0.10
17	255	4.25	0.6	0.139	0.204	0.118	0.021	0.10
18	270	4.50	0.7	0.162	0.202	0.138	0.024	0.12
19	285	4.75	0.7	0.162	0.199	0.138	0.024	0.12
20	300	5.00	0.8	0.186	0.196	0.158	0.028	0.14
21	315	5.25	0.6	0.139	0.194	0.118	0.021	0.10
22	330	5.50	0.7	0.162	0.191	0.138	0.024	0.12
23	345	5.75	0.8	0.186	0.189	0.158	0.028	0.14
24	360	6.00	0.8	0.186	0.186	0.158	0.028	0.14
25	375	6.25	0.9	0.209	0.184	0.177	0.025	0.12
26	390	6.50	0.9	0.209	0.181	0.177	0.027	0.13
27	405	6.75	1.0	0.232	0.179	0.197	0.053	0.26
28	420	7.00	1.0	0.232	0.177	0.197	0.055	0.27
29	435	7.25	1.0	0.232	0.174	0.197	0.058	0.28
30	450	7.50	1.1	0.255	0.172	0.217	0.083	0.40
31	465	7.75	1.2	0.278	0.170	0.237	0.109	0.53
32	480	8.00	1.3	0.302	0.167	0.256	0.134	0.65
33	495	8.25	1.5	0.348	0.165	0.296	0.183	0.89
34	510	8.50	1.5	0.348	0.163	0.296	0.185	0.90
35	525	8.75	1.6	0.371	0.160	0.316	0.211	1.02
36	540	9.00	1.7	0.394	0.158	0.335	0.236	1.15
37	555	9.25	1.9	0.441	0.156	0.375	0.285	1.38
38	570	9.50	2.0	0.464	0.154	0.394	0.310	1.51
39	585	9.75	2.1	0.487	0.151	0.414	0.336	1.63
40	600	10.00	2.2	0.510	0.149	0.434	0.361	1.75
41	615	10.25	1.5	0.348	0.147	0.296	0.201	0.97
42	630	10.50	1.5	0.348	0.145	0.296	0.203	0.99
43	645	10.75	2.0	0.464	0.143	0.394	0.321	1.56
44	660	11.00	2.0	0.464	0.141	0.394	0.323	1.57
45	675	11.25	1.9	0.441	0.139	0.375	0.302	1.47
46	690	11.50	1.9	0.441	0.137	0.375	0.304	1.48
47	705	11.75	1.7	0.394	0.135	0.335	0.260	1.26
48	720	12.00	1.8	0.418	0.133	0.355	0.285	1.38
49	735	12.25	2.5	0.580	0.131	0.493	0.449	2.18
50	750	12.50	2.6	0.603	0.129	0.513	0.475	2.30
51	765	12.75	2.8	0.650	0.127	0.552	0.523	2.54
52	780	13.00	2.9	0.673	0.125	0.572	0.548	2.66
53	795	13.25	3.4	0.789	0.123	0.670	0.666	3.23
54	810	13.50	3.4	0.789	0.121	0.670	0.668	**3.24**
55	825	13.75	2.3	0.534	0.119	0.454	0.414	2.01
56	840	14.00	2.3	0.534	0.117	0.454	0.416	2.02
57	855	14.25	2.7	0.626	0.116	0.532	0.511	2.48
58	870	14.50	2.6	0.603	0.114	0.513	0.489	2.37
59	885	14.75	2.6	0.603	0.112	0.513	0.491	2.38
60	900	15.00	2.5	0.580	0.110	0.493	0.470	2.28
61	915	15.25	2.4	0.557	0.109	0.473	0.448	2.17
62	930	15.50	2.3	0.534	0.107	0.454	0.427	2.07
63	945	15.75	1.9	0.441	0.105	0.375	0.335	1.63

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	4.810	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	2.97	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	504.9	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
64	960	16.00	1.9	0.441	0.104	0.375	0.337	1.63
65	975	16.25	0.4	0.093	0.102	0.079	0.014	0.07
66	990	16.50	0.4	0.093	0.101	0.079	0.014	0.07
67	1005	16.75	0.3	0.070	0.099	0.059	0.010	0.05
68	1020	17.00	0.3	0.070	0.098	0.059	0.010	0.05
69	1035	17.25	0.5	0.116	0.096	0.099	0.020	0.10
70	1050	17.50	0.5	0.116	0.095	0.099	0.021	0.10
71	1065	17.75	0.5	0.116	0.093	0.099	0.023	0.11
72	1080	18.00	0.4	0.093	0.092	0.079	0.001	0.00
73	1095	18.25	0.4	0.093	0.091	0.079	0.002	0.01
74	1110	18.50	0.4	0.093	0.089	0.079	0.004	0.02
75	1125	18.75	0.3	0.070	0.088	0.059	0.010	0.05
76	1140	19.00	0.2	0.046	0.087	0.039	0.007	0.03
77	1155	19.25	0.3	0.070	0.085	0.059	0.010	0.05
78	1170	19.50	0.4	0.093	0.084	0.079	0.009	0.04
79	1185	19.75	0.3	0.070	0.083	0.059	0.010	0.05
80	1200	20.00	0.2	0.046	0.082	0.039	0.007	0.03
81	1215	20.25	0.3	0.070	0.081	0.059	0.010	0.05
82	1230	20.50	0.3	0.070	0.080	0.059	0.010	0.05
83	1245	20.75	0.3	0.070	0.079	0.059	0.010	0.05
84	1260	21.00	0.2	0.046	0.078	0.039	0.007	0.03
85	1275	21.25	0.3	0.070	0.077	0.059	0.010	0.05
86	1290	21.50	0.2	0.046	0.076	0.039	0.007	0.03
87	1305	21.75	0.3	0.070	0.075	0.059	0.010	0.05
88	1320	22.00	0.2	0.046	0.074	0.039	0.007	0.03
89	1335	22.25	0.3	0.070	0.074	0.059	0.010	0.05
90	1350	22.50	0.2	0.046	0.073	0.039	0.007	0.03
91	1365	22.75	0.2	0.046	0.072	0.039	0.007	0.03
92	1380	23.00	0.2	0.046	0.072	0.039	0.007	0.03
93	1395	23.25	0.2	0.046	0.071	0.039	0.007	0.03
94	1410	23.50	0.2	0.046	0.071	0.039	0.007	0.03
95	1425	23.75	0.2	0.046	0.071	0.039	0.007	0.03
96	1440	24.00	0.2	0.046	0.070	0.039	0.007	0.03

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	5.8
RAINFALL VOLUME (cuft)	101,270
SOIL LOSSES (cuft)	43,448
EFFECTIVE RAIN (in)	3.31
FLOOD VOLUME (acft)	1.33
FLOOD VOLUME (cuft)	57,823
PEAK FLOW (cfs)	3.24

RCFCD SYNTHETIC UNIT HYDROGRAPH - SHORTCUT METHOD

DATA INPUT SHEET

DATE:	May 12, 2015
WORKSHEET PREPARED BY:	DLS
PROJECT NAME	COD - WVC
PROJECT NUMBER	2228
CONCENTRATION POINT DESIGNATION	CURB CUT
AREA DESIGNATION	BARISTO - 04
AMC NUMBER	2

Low Loss Conditions: X=Existing; D=Developed; BS=Retention

AREA DESIG	SOIL GROUP	TRIBUTARY AREAS	ACRES	LOW LOSS CONDITION	RI NUMBER	AMC II INFILTRATION RATE	IMPERVIOUS PERCENT
1	A	COMMERCIAL	1.800	D	32	0.74	0.90

LENGTH OF WATERCOURSE (L)	525 ft
LENGTH TO POINT OPPOSITE CENTROID (Lca)	265 ft
ELEVATION OF HEADWATER	420.0 ft
ELEVATION OF CONCENTRATION POINT	413.1 ft
AVERAGE MANNINGS 'N' VALUE	0.02
STORM FREQUENCY (YEAR)	100
LOW LOSS RATE (For Storms Greater Than 10 Years)	85%
POINT RAIN FROM NOAA ATLAS	**14**
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM	PROJECT: COD - WVC Job No.: 2228 BY: DLS DATE: 5/12/15

PHYSICAL DATA

[1] CONCENTRATION POINT	CURB CUT
[2] AREA DESIGNATION	BARISTO - 04
[3] AREA - ACRES	1.800
[4] L-FEET	525
[5] L-MILES	0.099
[6] La-FEET	265.00
[7] La-MILES	0.050
[8] ELEVATION OF HEADWATER	420
[9] ELEVATION OF CONCENTRATION POINT	413.1
[10] H-FEET	6.9
[11] S-FEET/MILE	69.4
[12] S^0.5	8.33
[13] L*LCA/S^0.5	0.001
[14] AVERAGE MANNINGS 'N'	0.02
[15] LAG TIME-HOURS	0.03
[16] LAG TIME-MINUTES	1.7
[17] 100% OF LAG-MINUTES	1.7
[18] 200% OF LAG-MINUTES	3.4

RAINFALL DATA

[1] AMC	II
[2] FREQUENCY-YEARS	100
NOAA ATLAS	**14**
[3] DURATION:	Point Rain
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

STORM EVENT SUMMARY

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
TOTAL RAINFALL	(in)	1.74	2.62	3.53	5.8
RAINFALL VOLUME	(cuft)	11,369	17,119	23,065	37,897
SOIL LOSSES	(cuft)	919	2,756	5,457	16,259
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft) (acre-ft)	10,451 0.24	14,363 0.33	17,608 0.40	21,638 0.50
PEAK FLOW	(cfs)	N/A	4.42	4.05	1.21

NOTE: PEAK FLOW FOR THE 1-HOUR STORM IS NOT REPRESENTATIVE. PER RCFCD PEAK DISCHARGES FROM THE 3-HOUR STORM SHOULD NORMALLY COMPARE WELL WITH RATIONAL PEAKS.

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM AMC II	PROJECT:	COD - WVC		
		Job No.:	2228		
		BY:	DLS	DATE:	5/12/15

AVERAGE ADJUSTED LOSS RATE

SOIL GROUP [Plate C-1]	LAND USE	RI NUMBER [Plate E-6.1]	PERVIOUS AREA INFILTRATION RATE (in/hr) [Plate E-6.2]	DECIMAL PERCENT OF AREA IMPERVIOUS [Plate E-6.3]	ADJUSTED INFILTRATION RATE (in/hr)	AREA	AREA WEIGHTED AVERAGE	MAX AVERAGE ADJUSTED INFILTRATION RATE (in/hr)	LOW LOSS CONDITION	LOW LOSS RATE PER RCFC/2322 (in/hr)	MIN AVERAGE ADJUSTED INFILTRATION RATE (in/hr)
A	COMMERCIAL	32	0.74	90%	0.14	1.800	1.000	0.1406	DEVELOPED	0.1800	0.1800
					SUM	1.800	SUM	0.1406			0.1800

VARIABLE LOSS RATE CURVE (24-HOUR STORM ONLY)

Fm= 0.0703

C= 0.00130

Ft=C(24-(T/60))^1.55 = 0.00130 (24-(T/60))^1.55 + **0.07** in/hr

CONSTANT LOSS RATE (3 & 6 HOUR STORMS) = **0.1406** in/hr

LOW LOSS RATE = **0.8500** in/hr

Where:

T=Time in minutes. To get an average value for each unit time period, Use T=1/2 the unit time for the first time period, T=1 1/2 unit time for the second period, etc.

NOTE: Low loss rates established per RCFC/2322 (Dated: May-30-95)
For 10 Year Storms or Less
Undeveloped Condition: Low Loss = 90%
Developed Condition: Low Loss = 0.9 - (0.8 * %impervious)
Basin Site: Low Loss = 10%
For 100 Year Storm - Low Loss should be between 80% & 90% of the Rainfall Rate

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 1-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.80
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	1.72
UNIT TIME-PERCENT OF LAG	291.2
TOTAL ADJUSTED STORM RAIN-INCHES	1.74
CONSTANT LOSS RATE-in/hr	0.14
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	3.6	0.75	0.14	0.64	0.61	1.11
2	10	0.17	4.2	0.88	0.14	0.75	0.74	1.34
3	15	0.25	4.4	0.92	0.14	0.78	0.78	1.41
4	20	0.33	4.6	0.96	0.14	0.82	0.82	1.49
5	25	0.42	5.0	1.04	0.14	0.89	0.90	1.64
6	30	0.50	5.6	1.17	0.14	0.99	1.03	1.87
7	35	0.58	6.4	1.34	0.14	1.14	1.20	2.17
8	40	0.67	8.1	1.69	0.14	1.44	1.55	2.81
9	45	0.75	13.1	2.74	0.14	2.32	2.59	4.71
10	50	0.83	34.5	7.20	0.14	6.12	7.06	**12.82**
11	55	0.92	6.7	1.40	0.14	1.19	1.26	2.28
12	60	1.00	3.8	0.79	0.14	0.67	0.65	1.18

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	1.74
RAINFALL VOLUME (cuft)	11,369
SOIL LOSSES (cuft)	919
EFFECTIVE RAIN (in)	1.60
FLOOD VOLUME (acft)	0.24
FLOOD VOLUME (cuft)	10,451
PEAK FLOW RATE (cfs)	12.82

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 3-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.80	
UNIT TIME-MINUTES	5	
LAG TIME - MINUTES	1.72	
UNIT TIME-PERCENT OF LAG	291.2	
TOTAL ADJUSTED STORM RAIN-INCHES	2.62	
CONSTANT LOSS RATE-in/hr		0.14
LOW LOSS RATE - PERCENT		85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	1.3	0.41	0.14	0.35	0.27	0.49
2	10	0.17	1.3	0.41	0.14	0.35	0.27	0.49
3	15	0.25	1.1	0.35	0.14	0.29	0.21	0.37
4	20	0.33	1.5	0.47	0.14	0.40	0.33	0.60
5	25	0.42	1.5	0.47	0.14	0.40	0.33	0.60
6	30	0.50	1.8	0.57	0.14	0.48	0.43	0.77
7	35	0.58	1.5	0.47	0.14	0.40	0.33	0.60
8	40	0.67	1.8	0.57	0.14	0.48	0.43	0.77
9	45	0.75	1.8	0.57	0.14	0.48	0.43	0.77
10	50	0.83	1.5	0.47	0.14	0.40	0.33	0.60
11	55	0.92	1.6	0.50	0.14	0.43	0.36	0.66
12	60	1.00	1.8	0.57	0.14	0.48	0.43	0.77
13	65	1.08	2.2	0.69	0.14	0.59	0.55	1.00
14	70	1.17	2.2	0.69	0.14	0.59	0.55	1.00
15	75	1.25	2.2	0.69	0.14	0.59	0.55	1.00
16	80	1.33	2.0	0.63	0.14	0.53	0.49	0.89
17	85	1.42	2.6	0.82	0.14	0.69	0.68	1.23
18	90	1.50	2.7	0.85	0.14	0.72	0.71	1.29
19	95	1.58	2.4	0.75	0.14	0.64	0.61	1.11
20	100	1.67	2.7	0.85	0.14	0.72	0.71	1.29
21	105	1.75	3.3	1.04	0.14	0.88	0.90	1.63
22	110	1.83	3.1	0.97	0.14	0.83	0.83	1.51
23	115	1.92	2.9	0.91	0.14	0.77	0.77	1.40
24	120	2.00	3.0	0.94	0.14	0.80	0.80	1.46
25	125	2.08	3.1	0.97	0.14	0.83	0.83	1.51
26	130	2.17	4.2	1.32	0.14	1.12	1.18	2.14
27	135	2.25	5.0	1.57	0.14	1.34	1.43	2.60
28	140	2.33	3.5	1.10	0.14	0.94	0.96	1.74
29	145	2.42	6.8	2.14	0.14	1.82	2.00	3.63
30	150	2.50	7.3	2.30	0.14	1.95	2.15	3.91
31	155	2.58	8.2	2.58	0.14	2.19	2.44	**4.42**
32	160	2.67	5.9	1.85	0.14	1.58	1.71	3.11
33	165	2.75	2.0	0.63	0.14	0.53	0.49	0.89
34	170	2.83	1.8	0.57	0.14	0.48	0.43	0.77
35	175	2.92	1.8	0.57	0.14	0.48	0.43	0.77
36	180	3.00	0.6	0.19	0.14	0.16	0.05	0.09

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	2.62
RAINFALL VOLUME (cuft)	17,119
SOIL LOSSES (cuft)	2,756
EFFECTIVE RAIN (in)	2.20
FLOOD VOLUME (acft)	0.33
FLOOD VOLUME (cuft)	14,363
PEAK FLOW RATE (cfs)	4.42

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.80
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	1.72
UNIT TIME-PERCENT OF LAG	291.2
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs
1	5	0.08	0.5	0.212	0.14	0.18	0.07	0.13
2	10	0.17	0.6	0.254	0.14	0.22	0.11	0.21
3	15	0.25	0.6	0.254	0.14	0.22	0.11	0.21
4	20	0.33	0.6	0.254	0.14	0.22	0.11	0.21
5	25	0.42	0.6	0.254	0.14	0.22	0.11	0.21
6	30	0.50	0.7	0.297	0.14	0.25	0.16	0.28
7	35	0.58	0.7	0.297	0.14	0.25	0.16	0.28
8	40	0.67	0.7	0.297	0.14	0.25	0.16	0.28
9	45	0.75	0.7	0.297	0.14	0.25	0.16	0.28
10	50	0.83	0.7	0.297	0.14	0.25	0.16	0.28
11	55	0.92	0.7	0.297	0.14	0.25	0.16	0.28
12	60	1.00	0.8	0.339	0.14	0.29	0.20	0.36
13	65	1.08	0.8	0.339	0.14	0.29	0.20	0.36
14	70	1.17	0.8	0.339	0.14	0.29	0.20	0.36
15	75	1.25	0.8	0.339	0.14	0.29	0.20	0.36
16	80	1.33	0.8	0.339	0.14	0.29	0.20	0.36
17	85	1.42	0.8	0.339	0.14	0.29	0.20	0.36
18	90	1.50	0.8	0.339	0.14	0.29	0.20	0.36
19	95	1.58	0.8	0.339	0.14	0.29	0.20	0.36
20	100	1.67	0.8	0.339	0.14	0.29	0.20	0.36
21	105	1.75	0.8	0.339	0.14	0.29	0.20	0.36
22	110	1.83	0.8	0.339	0.14	0.29	0.20	0.36
23	115	1.92	0.8	0.339	0.14	0.29	0.20	0.36
24	120	2.00	0.9	0.381	0.14	0.32	0.24	0.44
25	125	2.08	0.8	0.339	0.14	0.29	0.20	0.36
26	130	2.17	0.9	0.381	0.14	0.32	0.24	0.44
27	135	2.25	0.9	0.381	0.14	0.32	0.24	0.44
28	140	2.33	0.9	0.381	0.14	0.32	0.24	0.44
29	145	2.42	0.9	0.381	0.14	0.32	0.24	0.44
30	150	2.50	0.9	0.381	0.14	0.32	0.24	0.44
31	155	2.58	0.9	0.381	0.14	0.32	0.24	0.44
32	160	2.67	0.9	0.381	0.14	0.32	0.24	0.44
33	165	2.75	1.0	0.424	0.14	0.36	0.28	0.51
34	170	2.83	1.0	0.424	0.14	0.36	0.28	0.51
35	175	2.92	1.0	0.424	0.14	0.36	0.28	0.51
36	180	3.00	1.0	0.424	0.14	0.36	0.28	0.51
37	185	3.08	1.0	0.424	0.14	0.36	0.28	0.51
38	190	3.17	1.1	0.466	0.14	0.40	0.33	0.59
39	195	3.25	1.1	0.466	0.14	0.40	0.33	0.59
40	200	3.33	1.1	0.466	0.14	0.40	0.33	0.59
41	205	3.42	1.2	0.508	0.14	0.43	0.37	0.67
42	210	3.50	1.3	0.551	0.14	0.47	0.41	0.74
43	215	3.58	1.4	0.593	0.14	0.50	0.45	0.82
44	220	3.67	1.4	0.593	0.14	0.50	0.45	0.82
45	225	3.75	1.5	0.635	0.14	0.54	0.49	0.90
46	230	3.83	1.5	0.635	0.14	0.54	0.49	0.90
47	235	3.92	1.6	0.678	0.14	0.58	0.54	0.97
48	240	4.00	1.6	0.678	0.14	0.58	0.54	0.97
49	245	4.08	1.7	0.720	0.14	0.61	0.58	1.05
50	250	4.17	1.8	0.762	0.14	0.65	0.62	1.13
51	255	4.25	1.9	0.805	0.14	0.68	0.66	1.21
52	260	4.33	2.0	0.847	0.14	0.72	0.71	1.28
53	265	4.42	2.1	0.890	0.14	0.76	0.75	1.36
54	270	4.50	2.1	0.890	0.14	0.76	0.75	1.36

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.80
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	1.72
UNIT TIME-PERCENT OF LAG	291.2
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
55	275	4.58	2.2	0.932	0.14	0.79	0.79	1.44
56	280	4.67	2.3	0.974	0.14	0.83	0.83	1.51
57	285	4.75	2.4	1.017	0.14	0.86	0.88	1.59
58	290	4.83	2.4	1.017	0.14	0.86	0.88	1.59
59	295	4.92	2.5	1.059	0.14	0.90	0.92	1.67
60	300	5.00	2.6	1.101	0.14	0.94	0.96	1.74
61	305	5.08	3.1	1.313	0.14	1.12	1.17	2.13
62	310	5.17	3.6	1.525	0.14	1.30	1.38	2.51
63	315	5.25	3.9	1.652	0.14	1.40	1.51	2.74
64	320	5.33	4.2	1.779	0.14	1.51	1.64	2.97
65	325	5.42	4.7	1.991	0.14	1.69	1.85	3.36
66	330	5.50	5.6	2.372	0.14	2.02	2.23	**4.05**
67	335	5.58	1.9	0.805	0.14	0.68	0.66	1.21
68	340	5.67	0.9	0.381	0.14	0.32	0.24	0.44
69	345	5.75	0.6	0.254	0.14	0.22	0.11	0.21
70	350	5.83	0.5	0.212	0.14	0.18	0.07	0.13
71	355	5.92	0.3	0.127	0.14	0.11	0.02	0.03
72	360	6.00	0.2	0.085	0.14	0.07	0.01	0.02

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	3.53
RAINFALL VOLUME (cuft)	23,065
SOIL LOSSES (cuft)	5,457
EFFECTIVE RAIN (in)	2.69
FLOOD VOLUME (acft)	0.40
FLOOD VOLUME (cuft)	17,608
PEAK FLOW RATE (cfs)	4.05

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.800	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	1.72	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	873.5	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain in/hr	Flood Hydrograph Flow cfs
	Minutes	Hours	(Plate E-5.9)		Max	Low		
1	15	0.25	0.2	0.046	0.248	0.039	0.007	0.01
2	30	0.50	0.3	0.070	0.245	0.059	0.010	0.02
3	45	0.75	0.3	0.070	0.243	0.059	0.010	0.02
4	60	1.00	0.4	0.093	0.240	0.079	0.014	0.03
5	75	1.25	0.3	0.070	0.237	0.059	0.010	0.02
6	90	1.50	0.3	0.070	0.234	0.059	0.010	0.02
7	105	1.75	0.3	0.070	0.231	0.059	0.010	0.02
8	120	2.00	0.4	0.093	0.228	0.079	0.014	0.03
9	135	2.25	0.4	0.093	0.226	0.079	0.014	0.03
10	150	2.50	0.4	0.093	0.223	0.079	0.014	0.03
11	165	2.75	0.5	0.116	0.220	0.099	0.017	0.03
12	180	3.00	0.5	0.116	0.218	0.099	0.017	0.03
13	195	3.25	0.5	0.116	0.215	0.099	0.017	0.03
14	210	3.50	0.5	0.116	0.212	0.099	0.017	0.03
15	225	3.75	0.5	0.116	0.210	0.099	0.017	0.03
16	240	4.00	0.6	0.139	0.207	0.118	0.021	0.04
17	255	4.25	0.6	0.139	0.204	0.118	0.021	0.04
18	270	4.50	0.7	0.162	0.202	0.138	0.024	0.04
19	285	4.75	0.7	0.162	0.199	0.138	0.024	0.04
20	300	5.00	0.8	0.186	0.196	0.158	0.028	0.05
21	315	5.25	0.6	0.139	0.194	0.118	0.021	0.04
22	330	5.50	0.7	0.162	0.191	0.138	0.024	0.04
23	345	5.75	0.8	0.186	0.189	0.158	0.028	0.05
24	360	6.00	0.8	0.186	0.186	0.158	0.028	0.05
25	375	6.25	0.9	0.209	0.184	0.177	0.025	0.05
26	390	6.50	0.9	0.209	0.181	0.177	0.027	0.05
27	405	6.75	1.0	0.232	0.179	0.197	0.053	0.10
28	420	7.00	1.0	0.232	0.177	0.197	0.055	0.10
29	435	7.25	1.0	0.232	0.174	0.197	0.058	0.10
30	450	7.50	1.1	0.255	0.172	0.217	0.083	0.15
31	465	7.75	1.2	0.278	0.170	0.237	0.109	0.20
32	480	8.00	1.3	0.302	0.167	0.256	0.134	0.24
33	495	8.25	1.5	0.348	0.165	0.296	0.183	0.33
34	510	8.50	1.5	0.348	0.163	0.296	0.185	0.34
35	525	8.75	1.6	0.371	0.160	0.316	0.211	0.38
36	540	9.00	1.7	0.394	0.158	0.335	0.236	0.43
37	555	9.25	1.9	0.441	0.156	0.375	0.285	0.52
38	570	9.50	2.0	0.464	0.154	0.394	0.310	0.56
39	585	9.75	2.1	0.487	0.151	0.414	0.336	0.61
40	600	10.00	2.2	0.510	0.149	0.434	0.361	0.66
41	615	10.25	1.5	0.348	0.147	0.296	0.201	0.36
42	630	10.50	1.5	0.348	0.145	0.296	0.203	0.37
43	645	10.75	2.0	0.464	0.143	0.394	0.321	0.58
44	660	11.00	2.0	0.464	0.141	0.394	0.323	0.59
45	675	11.25	1.9	0.441	0.139	0.375	0.302	0.55
46	690	11.50	1.9	0.441	0.137	0.375	0.304	0.55
47	705	11.75	1.7	0.394	0.135	0.335	0.260	0.47
48	720	12.00	1.8	0.418	0.133	0.355	0.285	0.52
49	735	12.25	2.5	0.580	0.131	0.493	0.449	0.82
50	750	12.50	2.6	0.603	0.129	0.513	0.475	0.86
51	765	12.75	2.8	0.650	0.127	0.552	0.523	0.95
52	780	13.00	2.9	0.673	0.125	0.572	0.548	0.99
53	795	13.25	3.4	0.789	0.123	0.670	0.666	1.21
54	810	13.50	3.4	0.789	0.121	0.670	0.668	**1.21**
55	825	13.75	2.3	0.534	0.119	0.454	0.414	0.75
56	840	14.00	2.3	0.534	0.117	0.454	0.416	0.76
57	855	14.25	2.7	0.626	0.116	0.532	0.511	0.93
58	870	14.50	2.6	0.603	0.114	0.513	0.489	0.89
59	885	14.75	2.6	0.603	0.112	0.513	0.491	0.89
60	900	15.00	2.5	0.580	0.110	0.493	0.470	0.85
61	915	15.25	2.4	0.557	0.109	0.473	0.448	0.81
62	930	15.50	2.3	0.534	0.107	0.454	0.427	0.77
63	945	15.75	1.9	0.441	0.105	0.375	0.335	0.61

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.800	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	1.72	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	873.5	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
64	960	16.00	1.9	0.441	0.104	0.375	0.337	0.61
65	975	16.25	0.4	0.093	0.102	0.079	0.014	0.03
66	990	16.50	0.4	0.093	0.101	0.079	0.014	0.03
67	1005	16.75	0.3	0.070	0.099	0.059	0.010	0.02
68	1020	17.00	0.3	0.070	0.098	0.059	0.010	0.02
69	1035	17.25	0.5	0.116	0.096	0.099	0.020	0.04
70	1050	17.50	0.5	0.116	0.095	0.099	0.021	0.04
71	1065	17.75	0.5	0.116	0.093	0.099	0.023	0.04
72	1080	18.00	0.4	0.093	0.092	0.079	0.001	0.00
73	1095	18.25	0.4	0.093	0.091	0.079	0.002	0.00
74	1110	18.50	0.4	0.093	0.089	0.079	0.004	0.01
75	1125	18.75	0.3	0.070	0.088	0.059	0.010	0.02
76	1140	19.00	0.2	0.046	0.087	0.039	0.007	0.01
77	1155	19.25	0.3	0.070	0.085	0.059	0.010	0.02
78	1170	19.50	0.4	0.093	0.084	0.079	0.009	0.02
79	1185	19.75	0.3	0.070	0.083	0.059	0.010	0.02
80	1200	20.00	0.2	0.046	0.082	0.039	0.007	0.01
81	1215	20.25	0.3	0.070	0.081	0.059	0.010	0.02
82	1230	20.50	0.3	0.070	0.080	0.059	0.010	0.02
83	1245	20.75	0.3	0.070	0.079	0.059	0.010	0.02
84	1260	21.00	0.2	0.046	0.078	0.039	0.007	0.01
85	1275	21.25	0.3	0.070	0.077	0.059	0.010	0.02
86	1290	21.50	0.2	0.046	0.076	0.039	0.007	0.01
87	1305	21.75	0.3	0.070	0.075	0.059	0.010	0.02
88	1320	22.00	0.2	0.046	0.074	0.039	0.007	0.01
89	1335	22.25	0.3	0.070	0.074	0.059	0.010	0.02
90	1350	22.50	0.2	0.046	0.073	0.039	0.007	0.01
91	1365	22.75	0.2	0.046	0.072	0.039	0.007	0.01
92	1380	23.00	0.2	0.046	0.072	0.039	0.007	0.01
93	1395	23.25	0.2	0.046	0.071	0.039	0.007	0.01
94	1410	23.50	0.2	0.046	0.071	0.039	0.007	0.01
95	1425	23.75	0.2	0.046	0.071	0.039	0.007	0.01
96	1440	24.00	0.2	0.046	0.070	0.039	0.007	0.01

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	5.8
RAINFALL VOLUME (cuft)	37,897
SOIL LOSSES (cuft)	16,259
EFFECTIVE RAIN (in)	3.31
FLOOD VOLUME (acft)	0.50
FLOOD VOLUME (cuft)	21,638
PEAK FLOW (cfs)	1.21

RCFCD SYNTHETIC UNIT HYDROGRAPH - SHORTCUT METHOD

DATA INPUT SHEET

DATE:	May 12, 2015
WORKSHEET PREPARED BY:	DLS
PROJECT NAME	COD - WVC
PROJECT NUMBER	2228
CONCENTRATION POINT DESIGNATION	CURB CUT
AREA DESIGNATION	FARRELL - 01
AMC NUMBER	2

Low Loss Conditions: X=Existing; D=Developed; BS=Retention

AREA DESIG	SOIL GROUP	TRIBUTARY AREAS	ACRES	LOW LOSS CONDITION	RI NUMBER	AMC II INFILTRATION RATE	IMPERVIOUS PERCENT
1	A	COMMERCIAL	3.680	D	32	0.74	0.90

LENGTH OF WATERCOURSE (L)	750 ft
LENGTH TO POINT OPPOSITE CENTROID (Lca)	375 ft
ELEVATION OF HEADWATER	426.3 ft
ELEVATION OF CONCENTRATION POINT	419.6 ft
AVERAGE MANNINGS 'N' VALUE	0.02
STORM FREQUENCY (YEAR)	100
LOW LOSS RATE (For Storms Greater Than 10 Years)	85%
POINT RAIN FROM NOAA ATLAS	**14**
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM	PROJECT: COD - WVC Job No.: 2228 BY: DLS DATE: 5/12/15

PHYSICAL DATA

[1] CONCENTRATION POINT	CURB CUT
[2] AREA DESIGNATION	FARRELL - 01
[3] AREA - ACRES	3.680
[4] L-FEET	750
[5] L-MILES	0.142
[6] La-FEET	375.00
[7] La-MILES	0.071
[8] ELEVATION OF HEADWATER	426.3
[9] ELEVATION OF CONCENTRATION POINT	419.6
[10] H-FEET	6.7
[11] S-FEET/MILE	47.2
[12] S^0.5	6.87
[13] L*LCA/S^0.5	0.001
[14] AVERAGE MANNINGS 'N'	0.02
[15] LAG TIME-HOURS	0.04
[16] LAG TIME-MINUTES	2.4
[17] 100% OF LAG-MINUTES	2.4
[18] 200% OF LAG-MINUTES	4.8

RAINFALL DATA

[1] AMC	II
[2] FREQUENCY-YEARS	100
NOAA ATLAS	**14**
[3] DURATION:	Point Rain
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

STORM EVENT SUMMARY

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
TOTAL RAINFALL	(in)	1.74	2.62	3.53	5.8
RAINFALL VOLUME	(cuft)	23,244	34,999	47,155	77,479
SOIL LOSSES	(cuft)	1,878	5,635	11,157	33,241
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	21,366	29,365	35,999	44,238
	(acre-ft)	0.49	0.67	0.83	1.02
PEAK FLOW	(cfs)	N/A	9.04	8.28	2.48

NOTE: PEAK FLOW FOR THE 1-HOUR STORM IS NOT REPRESENTATIVE. PER RCFCD PEAK DISCHARGES FROM THE 3-HOUR STORM SHOULD NORMALLY COMPARE WELL WITH RATIONAL PEAKS.

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM AMC II	PROJECT:	COD - WVC		
		Job No.:	2228		
		BY:	DLS	DATE:	5/12/15

AVERAGE ADJUSTED LOSS RATE

SOIL GROUP [Plate C-1]	LAND USE	RI NUMBER [Plate E-6.1]	PERVIOUS AREA INFILTRATION RATE (in/hr) [Plate E-6.2]	DECIMAL PERCENT OF AREA IMPERVIOUS [Plate E-6.3]	ADJUSTED INFILTRATION RATE (in/hr)	AREA	AREA WEIGHTED AVERAGE	MAX AVERAGE ADJUSTED INFILTRATION RATE (in/hr)	LOW LOSS CONDITION	LOW LOSS RATE PER RCFC/2322 (in/hr)	MIN AVERAGE ADJUSTED INFILTRATION RATE (in/hr)
A	COMMERCIAL	32	0.74	90%	0.14	3.680	1.000	0.1406	DEVELOPED	0.1800	0.1800
					SUM	3.680	SUM	0.1406			0.1800

VARIABLE LOSS RATE CURVE (24-HOUR STORM ONLY)

Fm= 0.0703

C= 0.00130

Ft=C(24-(T/60))^1.55 = 0.00130 (24-(T/60))^1.55 + **0.07** in/hr

CONSTANT LOSS RATE (3 & 6 HOUR STORMS) = **0.1406** in/hr

LOW LOSS RATE = **0.8500** in/hr

Where:

T=Time in minutes. To get an average value for each unit time period, Use T=1/2 the unit time for the first time period, T=1 1/2 unit time for the second period, etc.

NOTE: Low loss rates established per RCFC/2322 (Dated: May-30-95)
For 10 Year Storms or Less
Undeveloped Condition: Low Loss = 90%
Developed Condition: Low Loss = 0.9 - (0.8 * %impervious)
Basin Site: Low Loss = 10%
For 100 Year Storm - Low Loss should be between 80% & 90% of the Rainfall Rate

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 1-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.68
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	2.41
UNIT TIME-PERCENT OF LAG	207.1
TOTAL ADJUSTED STORM RAIN-INCHES	1.74
CONSTANT LOSS RATE-in/hr	0.14
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	3.6	0.75	0.14	0.64	0.61	2.27
2	10	0.17	4.2	0.88	0.14	0.75	0.74	2.73
3	15	0.25	4.4	0.92	0.14	0.78	0.78	2.89
4	20	0.33	4.6	0.96	0.14	0.82	0.82	3.04
5	25	0.42	5.0	1.04	0.14	0.89	0.90	3.35
6	30	0.50	5.6	1.17	0.14	0.99	1.03	3.82
7	35	0.58	6.4	1.34	0.14	1.14	1.20	4.44
8	40	0.67	8.1	1.69	0.14	1.44	1.55	5.75
9	45	0.75	13.1	2.74	0.14	2.32	2.59	9.63
10	50	0.83	34.5	7.20	0.14	6.12	7.06	**26.21**
11	55	0.92	6.7	1.40	0.14	1.19	1.26	4.67
12	60	1.00	3.8	0.79	0.14	0.67	0.65	2.42

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	1.74
RAINFALL VOLUME (cuft)	23,244
SOIL LOSSES (cuft)	1,878
EFFECTIVE RAIN (in)	1.60
FLOOD VOLUME (acft)	0.49
FLOOD VOLUME (cuft)	21,366
PEAK FLOW RATE (cfs)	26.21

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 3-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.68	
UNIT TIME-MINUTES	5	
LAG TIME - MINUTES	2.41	
UNIT TIME-PERCENT OF LAG	207.1	
TOTAL ADJUSTED STORM RAIN-INCHES	2.62	
CONSTANT LOSS RATE-in/hr		0.14
LOW LOSS RATE - PERCENT		85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	1.3	0.41	0.14	0.35	0.27	0.99
2	10	0.17	1.3	0.41	0.14	0.35	0.27	0.99
3	15	0.25	1.1	0.35	0.14	0.29	0.21	0.76
4	20	0.33	1.5	0.47	0.14	0.40	0.33	1.23
5	25	0.42	1.5	0.47	0.14	0.40	0.33	1.23
6	30	0.50	1.8	0.57	0.14	0.48	0.43	1.58
7	35	0.58	1.5	0.47	0.14	0.40	0.33	1.23
8	40	0.67	1.8	0.57	0.14	0.48	0.43	1.58
9	45	0.75	1.8	0.57	0.14	0.48	0.43	1.58
10	50	0.83	1.5	0.47	0.14	0.40	0.33	1.23
11	55	0.92	1.6	0.50	0.14	0.43	0.36	1.34
12	60	1.00	1.8	0.57	0.14	0.48	0.43	1.58
13	65	1.08	2.2	0.69	0.14	0.59	0.55	2.04
14	70	1.17	2.2	0.69	0.14	0.59	0.55	2.04
15	75	1.25	2.2	0.69	0.14	0.59	0.55	2.04
16	80	1.33	2.0	0.63	0.14	0.53	0.49	1.81
17	85	1.42	2.6	0.82	0.14	0.69	0.68	2.51
18	90	1.50	2.7	0.85	0.14	0.72	0.71	2.63
19	95	1.58	2.4	0.75	0.14	0.64	0.61	2.28
20	100	1.67	2.7	0.85	0.14	0.72	0.71	2.63
21	105	1.75	3.3	1.04	0.14	0.88	0.90	3.33
22	110	1.83	3.1	0.97	0.14	0.83	0.83	3.09
23	115	1.92	2.9	0.91	0.14	0.77	0.77	2.86
24	120	2.00	3.0	0.94	0.14	0.80	0.80	2.98
25	125	2.08	3.1	0.97	0.14	0.83	0.83	3.09
26	130	2.17	4.2	1.32	0.14	1.12	1.18	4.38
27	135	2.25	5.0	1.57	0.14	1.34	1.43	5.31
28	140	2.33	3.5	1.10	0.14	0.94	0.96	3.56
29	145	2.42	6.8	2.14	0.14	1.82	2.00	7.41
30	150	2.50	7.3	2.30	0.14	1.95	2.15	7.99
31	155	2.58	8.2	2.58	0.14	2.19	2.44	**9.04**
32	160	2.67	5.9	1.85	0.14	1.58	1.71	6.36
33	165	2.75	2.0	0.63	0.14	0.53	0.49	1.81
34	170	2.83	1.8	0.57	0.14	0.48	0.43	1.58
35	175	2.92	1.8	0.57	0.14	0.48	0.43	1.58
36	180	3.00	0.6	0.19	0.14	0.16	0.05	0.18

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	2.62
RAINFALL VOLUME (cuft)	34,999
SOIL LOSSES (cuft)	5,635
EFFECTIVE RAIN (in)	2.20
FLOOD VOLUME (acft)	0.67
FLOOD VOLUME (cuft)	29,365
PEAK FLOW RATE (cfs)	9.04

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.68
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	2.41
UNIT TIME-PERCENT OF LAG	207.1
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs
1	5	0.08	0.5	0.212	0.14	0.18	0.07	0.26
2	10	0.17	0.6	0.254	0.14	0.22	0.11	0.42
3	15	0.25	0.6	0.254	0.14	0.22	0.11	0.42
4	20	0.33	0.6	0.254	0.14	0.22	0.11	0.42
5	25	0.42	0.6	0.254	0.14	0.22	0.11	0.42
6	30	0.50	0.7	0.297	0.14	0.25	0.16	0.58
7	35	0.58	0.7	0.297	0.14	0.25	0.16	0.58
8	40	0.67	0.7	0.297	0.14	0.25	0.16	0.58
9	45	0.75	0.7	0.297	0.14	0.25	0.16	0.58
10	50	0.83	0.7	0.297	0.14	0.25	0.16	0.58
11	55	0.92	0.7	0.297	0.14	0.25	0.16	0.58
12	60	1.00	0.8	0.339	0.14	0.29	0.20	0.74
13	65	1.08	0.8	0.339	0.14	0.29	0.20	0.74
14	70	1.17	0.8	0.339	0.14	0.29	0.20	0.74
15	75	1.25	0.8	0.339	0.14	0.29	0.20	0.74
16	80	1.33	0.8	0.339	0.14	0.29	0.20	0.74
17	85	1.42	0.8	0.339	0.14	0.29	0.20	0.74
18	90	1.50	0.8	0.339	0.14	0.29	0.20	0.74
19	95	1.58	0.8	0.339	0.14	0.29	0.20	0.74
20	100	1.67	0.8	0.339	0.14	0.29	0.20	0.74
21	105	1.75	0.8	0.339	0.14	0.29	0.20	0.74
22	110	1.83	0.8	0.339	0.14	0.29	0.20	0.74
23	115	1.92	0.8	0.339	0.14	0.29	0.20	0.74
24	120	2.00	0.9	0.381	0.14	0.32	0.24	0.89
25	125	2.08	0.8	0.339	0.14	0.29	0.20	0.74
26	130	2.17	0.9	0.381	0.14	0.32	0.24	0.89
27	135	2.25	0.9	0.381	0.14	0.32	0.24	0.89
28	140	2.33	0.9	0.381	0.14	0.32	0.24	0.89
29	145	2.42	0.9	0.381	0.14	0.32	0.24	0.89
30	150	2.50	0.9	0.381	0.14	0.32	0.24	0.89
31	155	2.58	0.9	0.381	0.14	0.32	0.24	0.89
32	160	2.67	0.9	0.381	0.14	0.32	0.24	0.89
33	165	2.75	1.0	0.424	0.14	0.36	0.28	1.05
34	170	2.83	1.0	0.424	0.14	0.36	0.28	1.05
35	175	2.92	1.0	0.424	0.14	0.36	0.28	1.05
36	180	3.00	1.0	0.424	0.14	0.36	0.28	1.05
37	185	3.08	1.0	0.424	0.14	0.36	0.28	1.05
38	190	3.17	1.1	0.466	0.14	0.40	0.33	1.21
39	195	3.25	1.1	0.466	0.14	0.40	0.33	1.21
40	200	3.33	1.1	0.466	0.14	0.40	0.33	1.21
41	205	3.42	1.2	0.508	0.14	0.43	0.37	1.36
42	210	3.50	1.3	0.551	0.14	0.47	0.41	1.52
43	215	3.58	1.4	0.593	0.14	0.50	0.45	1.68
44	220	3.67	1.4	0.593	0.14	0.50	0.45	1.68
45	225	3.75	1.5	0.635	0.14	0.54	0.49	1.84
46	230	3.83	1.5	0.635	0.14	0.54	0.49	1.84
47	235	3.92	1.6	0.678	0.14	0.58	0.54	1.99
48	240	4.00	1.6	0.678	0.14	0.58	0.54	1.99
49	245	4.08	1.7	0.720	0.14	0.61	0.58	2.15
50	250	4.17	1.8	0.762	0.14	0.65	0.62	2.31
51	255	4.25	1.9	0.805	0.14	0.68	0.66	2.46
52	260	4.33	2.0	0.847	0.14	0.72	0.71	2.62
53	265	4.42	2.1	0.890	0.14	0.76	0.75	2.78
54	270	4.50	2.1	0.890	0.14	0.76	0.75	2.78

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.68
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	2.41
UNIT TIME-PERCENT OF LAG	207.1
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs
55	275	4.58	2.2	0.932	0.14	0.79	0.79	2.94
56	280	4.67	2.3	0.974	0.14	0.83	0.83	3.09
57	285	4.75	2.4	1.017	0.14	0.86	0.88	3.25
58	290	4.83	2.4	1.017	0.14	0.86	0.88	3.25
59	295	4.92	2.5	1.059	0.14	0.90	0.92	3.41
60	300	5.00	2.6	1.101	0.14	0.94	0.96	3.57
61	305	5.08	3.1	1.313	0.14	1.12	1.17	4.35
62	310	5.17	3.6	1.525	0.14	1.30	1.38	5.14
63	315	5.25	3.9	1.652	0.14	1.40	1.51	5.61
64	320	5.33	4.2	1.779	0.14	1.51	1.64	6.08
65	325	5.42	4.7	1.991	0.14	1.69	1.85	6.87
66	330	5.50	5.6	2.372	0.14	2.02	2.23	**8.28**
67	335	5.58	1.9	0.805	0.14	0.68	0.66	2.46
68	340	5.67	0.9	0.381	0.14	0.32	0.24	0.89
69	345	5.75	0.6	0.254	0.14	0.22	0.11	0.42
70	350	5.83	0.5	0.212	0.14	0.18	0.07	0.26
71	355	5.92	0.3	0.127	0.14	0.11	0.02	0.07
72	360	6.00	0.2	0.085	0.14	0.07	0.01	0.05

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	3.53
RAINFALL VOLUME (cuft)	47,155
SOIL LOSSES (cuft)	11,157
EFFECTIVE RAIN (in)	2.69
FLOOD VOLUME (acft)	0.83
FLOOD VOLUME (cuft)	35,999
PEAK FLOW RATE (cfs)	8.28

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.680	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	2.41	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	621.2	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain in/hr	Flood Hydrograph Flow cfs
	Minutes	Hours	(Plate E-5.9)		Max	Low		
1	15	0.25	0.2	0.046	0.248	0.039	0.007	0.03
2	30	0.50	0.3	0.070	0.245	0.059	0.010	0.04
3	45	0.75	0.3	0.070	0.243	0.059	0.010	0.04
4	60	1.00	0.4	0.093	0.240	0.079	0.014	0.05
5	75	1.25	0.3	0.070	0.237	0.059	0.010	0.04
6	90	1.50	0.3	0.070	0.234	0.059	0.010	0.04
7	105	1.75	0.3	0.070	0.231	0.059	0.010	0.04
8	120	2.00	0.4	0.093	0.228	0.079	0.014	0.05
9	135	2.25	0.4	0.093	0.226	0.079	0.014	0.05
10	150	2.50	0.4	0.093	0.223	0.079	0.014	0.05
11	165	2.75	0.5	0.116	0.220	0.099	0.017	0.06
12	180	3.00	0.5	0.116	0.218	0.099	0.017	0.06
13	195	3.25	0.5	0.116	0.215	0.099	0.017	0.06
14	210	3.50	0.5	0.116	0.212	0.099	0.017	0.06
15	225	3.75	0.5	0.116	0.210	0.099	0.017	0.06
16	240	4.00	0.6	0.139	0.207	0.118	0.021	0.08
17	255	4.25	0.6	0.139	0.204	0.118	0.021	0.08
18	270	4.50	0.7	0.162	0.202	0.138	0.024	0.09
19	285	4.75	0.7	0.162	0.199	0.138	0.024	0.09
20	300	5.00	0.8	0.186	0.196	0.158	0.028	0.10
21	315	5.25	0.6	0.139	0.194	0.118	0.021	0.08
22	330	5.50	0.7	0.162	0.191	0.138	0.024	0.09
23	345	5.75	0.8	0.186	0.189	0.158	0.028	0.10
24	360	6.00	0.8	0.186	0.186	0.158	0.028	0.10
25	375	6.25	0.9	0.209	0.184	0.177	0.025	0.09
26	390	6.50	0.9	0.209	0.181	0.177	0.027	0.10
27	405	6.75	1.0	0.232	0.179	0.197	0.053	0.20
28	420	7.00	1.0	0.232	0.177	0.197	0.055	0.21
29	435	7.25	1.0	0.232	0.174	0.197	0.058	0.21
30	450	7.50	1.1	0.255	0.172	0.217	0.083	0.31
31	465	7.75	1.2	0.278	0.170	0.237	0.109	0.40
32	480	8.00	1.3	0.302	0.167	0.256	0.134	0.50
33	495	8.25	1.5	0.348	0.165	0.296	0.183	0.68
34	510	8.50	1.5	0.348	0.163	0.296	0.185	0.69
35	525	8.75	1.6	0.371	0.160	0.316	0.211	0.78
36	540	9.00	1.7	0.394	0.158	0.335	0.236	0.88
37	555	9.25	1.9	0.441	0.156	0.375	0.285	1.06
38	570	9.50	2.0	0.464	0.154	0.394	0.310	1.15
39	585	9.75	2.1	0.487	0.151	0.414	0.336	1.25
40	600	10.00	2.2	0.510	0.149	0.434	0.361	1.34
41	615	10.25	1.5	0.348	0.147	0.296	0.201	0.75
42	630	10.50	1.5	0.348	0.145	0.296	0.203	0.75
43	645	10.75	2.0	0.464	0.143	0.394	0.321	1.19
44	660	11.00	2.0	0.464	0.141	0.394	0.323	1.20
45	675	11.25	1.9	0.441	0.139	0.375	0.302	1.12
46	690	11.50	1.9	0.441	0.137	0.375	0.304	1.13
47	705	11.75	1.7	0.394	0.135	0.335	0.260	0.96
48	720	12.00	1.8	0.418	0.133	0.355	0.285	1.06
49	735	12.25	2.5	0.580	0.131	0.493	0.449	1.67
50	750	12.50	2.6	0.603	0.129	0.513	0.475	1.76
51	765	12.75	2.8	0.650	0.127	0.552	0.523	1.94
52	780	13.00	2.9	0.673	0.125	0.572	0.548	2.03
53	795	13.25	3.4	0.789	0.123	0.670	0.666	2.47
54	810	13.50	3.4	0.789	0.121	0.670	0.668	**2.48**
55	825	13.75	2.3	0.534	0.119	0.454	0.414	1.54
56	840	14.00	2.3	0.534	0.117	0.454	0.416	1.54
57	855	14.25	2.7	0.626	0.116	0.532	0.511	1.90
58	870	14.50	2.6	0.603	0.114	0.513	0.489	1.82
59	885	14.75	2.6	0.603	0.112	0.513	0.491	1.82
60	900	15.00	2.5	0.580	0.110	0.493	0.470	1.74
61	915	15.25	2.4	0.557	0.109	0.473	0.448	1.66
62	930	15.50	2.3	0.534	0.107	0.454	0.427	1.58
63	945	15.75	1.9	0.441	0.105	0.375	0.335	1.24

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.680	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	2.41	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	621.2	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
64	960	16.00	1.9	0.441	0.104	0.375	0.337	1.25
65	975	16.25	0.4	0.093	0.102	0.079	0.014	0.05
66	990	16.50	0.4	0.093	0.101	0.079	0.014	0.05
67	1005	16.75	0.3	0.070	0.099	0.059	0.010	0.04
68	1020	17.00	0.3	0.070	0.098	0.059	0.010	0.04
69	1035	17.25	0.5	0.116	0.096	0.099	0.020	0.07
70	1050	17.50	0.5	0.116	0.095	0.099	0.021	0.08
71	1065	17.75	0.5	0.116	0.093	0.099	0.023	0.08
72	1080	18.00	0.4	0.093	0.092	0.079	0.001	0.00
73	1095	18.25	0.4	0.093	0.091	0.079	0.002	0.01
74	1110	18.50	0.4	0.093	0.089	0.079	0.004	0.01
75	1125	18.75	0.3	0.070	0.088	0.059	0.010	0.04
76	1140	19.00	0.2	0.046	0.087	0.039	0.007	0.03
77	1155	19.25	0.3	0.070	0.085	0.059	0.010	0.04
78	1170	19.50	0.4	0.093	0.084	0.079	0.009	0.03
79	1185	19.75	0.3	0.070	0.083	0.059	0.010	0.04
80	1200	20.00	0.2	0.046	0.082	0.039	0.007	0.03
81	1215	20.25	0.3	0.070	0.081	0.059	0.010	0.04
82	1230	20.50	0.3	0.070	0.080	0.059	0.010	0.04
83	1245	20.75	0.3	0.070	0.079	0.059	0.010	0.04
84	1260	21.00	0.2	0.046	0.078	0.039	0.007	0.03
85	1275	21.25	0.3	0.070	0.077	0.059	0.010	0.04
86	1290	21.50	0.2	0.046	0.076	0.039	0.007	0.03
87	1305	21.75	0.3	0.070	0.075	0.059	0.010	0.04
88	1320	22.00	0.2	0.046	0.074	0.039	0.007	0.03
89	1335	22.25	0.3	0.070	0.074	0.059	0.010	0.04
90	1350	22.50	0.2	0.046	0.073	0.039	0.007	0.03
91	1365	22.75	0.2	0.046	0.072	0.039	0.007	0.03
92	1380	23.00	0.2	0.046	0.072	0.039	0.007	0.03
93	1395	23.25	0.2	0.046	0.071	0.039	0.007	0.03
94	1410	23.50	0.2	0.046	0.071	0.039	0.007	0.03
95	1425	23.75	0.2	0.046	0.071	0.039	0.007	0.03
96	1440	24.00	0.2	0.046	0.070	0.039	0.007	0.03

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	5.8
RAINFALL VOLUME (cuft)	77,479
SOIL LOSSES (cuft)	33,241
EFFECTIVE RAIN (in)	3.31
FLOOD VOLUME (acft)	1.02
FLOOD VOLUME (cuft)	44,238
PEAK FLOW (cfs)	2.48

RCFCD SYNTHETIC UNIT HYDROGRAPH - SHORTCUT METHOD

DATA INPUT SHEET

DATE:	May 12, 2015
WORKSHEET PREPARED BY:	DLS
PROJECT NAME	COD - WVC
PROJECT NUMBER	2228
CONCENTRATION POINT DESIGNATION	CURB CUT
AREA DESIGNATION	FARRELL - 02
AMC NUMBER	2

Low Loss Conditions: X=Existing; D=Developed; BS=Retention

AREA DESIG	SOIL GROUP	TRIBUTARY AREAS	ACRES	LOW LOSS CONDITION	RI NUMBER	AMC II INFILTRATION RATE	IMPERVIOUS PERCENT
1	A	COMMERCIAL	1.600	D	32	0.74	0.90

LENGTH OF WATERCOURSE (L)	680 ft
LENGTH TO POINT OPPOSITE CENTROID (Lca)	340 ft
ELEVATION OF HEADWATER	420.0 ft
ELEVATION OF CONCENTRATION POINT	416.4 ft
AVERAGE MANNINGS 'N' VALUE	0.02
STORM FREQUENCY (YEAR)	100
LOW LOSS RATE (For Storms Greater Than 10 Years)	85%
POINT RAIN FROM NOAA ATLAS	**14**
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM	PROJECT: COD - WVC Job No.: 2228 BY: DLS DATE: 5/12/15

PHYSICAL DATA

[1] CONCENTRATION POINT	CURB CUT
[2] AREA DESIGNATION	FARRELL - 02
[3] AREA - ACRES	1.600
[4] L-FEET	680
[5] L-MILES	0.129
[6] La-FEET	340.00
[7] La-MILES	0.064
[8] ELEVATION OF HEADWATER	420
[9] ELEVATION OF CONCENTRATION POINT	416.4
[10] H-FEET	3.6
[11] S-FEET/MILE	28.0
[12] S^0.5	5.29
[13] L*LCA/S^0.5	0.002
[14] AVERAGE MANNINGS 'N'	0.02
[15] LAG TIME-HOURS	0.04
[16] LAG TIME-MINUTES	2.5
[17] 100% OF LAG-MINUTES	2.5
[18] 200% OF LAG-MINUTES	5.0

RAINFALL DATA

[1] AMC	II
[2] FREQUENCY-YEARS	100
NOAA ATLAS	**14**
[3] DURATION:	Point Rain
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

STORM EVENT SUMMARY

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
TOTAL RAINFALL	(in)	1.74	2.62	3.53	5.8
RAINFALL VOLUME	(cuft)	10,106	15,217	20,502	33,687
SOIL LOSSES	(cuft)	817	2,450	4,851	14,452
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	9,289	12,767	15,652	19,234
	(acre-ft)	0.21	0.29	0.36	0.44
PEAK FLOW	(cfs)	N/A	3.93	3.60	1.08

NOTE: PEAK FLOW FOR THE 1-HOUR STORM IS NOT REPRESENTATIVE. PER RCFCD PEAK DISCHARGES FROM THE 3-HOUR STORM SHOULD NORMALLY COMPARE WELL WITH RATIONAL PEAKS.

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM AMC II	PROJECT:	COD - WVC		
		Job No.:	2228		
		BY:	DLS	DATE:	5/12/15

AVERAGE ADJUSTED LOSS RATE

SOIL GROUP [Plate C-1]	LAND USE	RI NUMBER [Plate E-6.1]	PERVIOUS AREA INFILTRATION RATE (in/hr) [Plate E-6.2]	DECIMAL PERCENT OF AREA IMPERVIOUS [Plate E-6.3]	ADJUSTED INFILTRATION RATE (in/hr)	AREA	AREA WEIGHTED AVERAGE	MAX AVERAGE ADJUSTED INFILTRATION RATE (in/hr)	LOW LOSS CONDITION	LOW LOSS RATE PER RCFC/2322 (in/hr)	MIN AVERAGE ADJUSTED INFILTRATION RATE (in/hr)
A	COMMERCIAL	32	0.74	90%	0.14	1.600	1.000	0.1406	DEVELOPED	0.1800	0.1800
					SUM	1.600	SUM	0.1406			0.1800

VARIABLE LOSS RATE CURVE (24-HOUR STORM ONLY)

Fm= 0.0703

C= 0.00130

Ft=C(24-(T/60))^1.55 = 0.00130 (24-(T/60))^1.55 + **0.07** in/hr

CONSTANT LOSS RATE (3 & 6 HOUR STORMS) = **0.1406** in/hr

LOW LOSS RATE = **0.8500** in/hr

Where:

T=Time in minutes. To get an average value for each unit time period, Use T=1/2 the unit time for the first time period, T=1 1/2 unit time for the second period, etc.

NOTE: Low loss rates established per RCFC/2322 (Dated: May-30-95)
For 10 Year Storms or Less
Undeveloped Condition: Low Loss = 90%
Developed Condition: Low Loss = 0.9 - (0.8 * %impervious)
Basin Site: Low Loss = 10%
For 100 Year Storm - Low Loss should be between 80% & 90% of the Rainfall Rate

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 1-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.60
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	2.48
UNIT TIME-PERCENT OF LAG	202.0
TOTAL ADJUSTED STORM RAIN-INCHES	1.74
CONSTANT LOSS RATE-in/hr	0.14
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	3.6	0.75	0.14	0.64	0.61	0.99
2	10	0.17	4.2	0.88	0.14	0.75	0.74	1.19
3	15	0.25	4.4	0.92	0.14	0.78	0.78	1.26
4	20	0.33	4.6	0.96	0.14	0.82	0.82	1.32
5	25	0.42	5.0	1.04	0.14	0.89	0.90	1.46
6	30	0.50	5.6	1.17	0.14	0.99	1.03	1.66
7	35	0.58	6.4	1.34	0.14	1.14	1.20	1.93
8	40	0.67	8.1	1.69	0.14	1.44	1.55	2.50
9	45	0.75	13.1	2.74	0.14	2.32	2.59	4.19
10	50	0.83	34.5	7.20	0.14	6.12	7.06	**11.40**
11	55	0.92	6.7	1.40	0.14	1.19	1.26	2.03
12	60	1.00	3.8	0.79	0.14	0.67	0.65	1.05

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	1.74
RAINFALL VOLUME (cuft)	10,106
SOIL LOSSES (cuft)	817
EFFECTIVE RAIN (in)	1.60
FLOOD VOLUME (acft)	0.21
FLOOD VOLUME (cuft)	9,289
PEAK FLOW RATE (cfs)	11.40

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 3-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.60	
UNIT TIME-MINUTES	5	
LAG TIME - MINUTES	2.48	
UNIT TIME-PERCENT OF LAG	202.0	
TOTAL ADJUSTED STORM RAIN-INCHES	2.62	
CONSTANT LOSS RATE-in/hr		0.14
LOW LOSS RATE - PERCENT		85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	1.3	0.41	0.14	0.35	0.27	0.43
2	10	0.17	1.3	0.41	0.14	0.35	0.27	0.43
3	15	0.25	1.1	0.35	0.14	0.29	0.21	0.33
4	20	0.33	1.5	0.47	0.14	0.40	0.33	0.53
5	25	0.42	1.5	0.47	0.14	0.40	0.33	0.53
6	30	0.50	1.8	0.57	0.14	0.48	0.43	0.69
7	35	0.58	1.5	0.47	0.14	0.40	0.33	0.53
8	40	0.67	1.8	0.57	0.14	0.48	0.43	0.69
9	45	0.75	1.8	0.57	0.14	0.48	0.43	0.69
10	50	0.83	1.5	0.47	0.14	0.40	0.33	0.53
11	55	0.92	1.6	0.50	0.14	0.43	0.36	0.58
12	60	1.00	1.8	0.57	0.14	0.48	0.43	0.69
13	65	1.08	2.2	0.69	0.14	0.59	0.55	0.89
14	70	1.17	2.2	0.69	0.14	0.59	0.55	0.89
15	75	1.25	2.2	0.69	0.14	0.59	0.55	0.89
16	80	1.33	2.0	0.63	0.14	0.53	0.49	0.79
17	85	1.42	2.6	0.82	0.14	0.69	0.68	1.09
18	90	1.50	2.7	0.85	0.14	0.72	0.71	1.14
19	95	1.58	2.4	0.75	0.14	0.64	0.61	0.99
20	100	1.67	2.7	0.85	0.14	0.72	0.71	1.14
21	105	1.75	3.3	1.04	0.14	0.88	0.90	1.45
22	110	1.83	3.1	0.97	0.14	0.83	0.83	1.35
23	115	1.92	2.9	0.91	0.14	0.77	0.77	1.24
24	120	2.00	3.0	0.94	0.14	0.80	0.80	1.29
25	125	2.08	3.1	0.97	0.14	0.83	0.83	1.35
26	130	2.17	4.2	1.32	0.14	1.12	1.18	1.90
27	135	2.25	5.0	1.57	0.14	1.34	1.43	2.31
28	140	2.33	3.5	1.10	0.14	0.94	0.96	1.55
29	145	2.42	6.8	2.14	0.14	1.82	2.00	3.22
30	150	2.50	7.3	2.30	0.14	1.95	2.15	3.48
31	155	2.58	8.2	2.58	0.14	2.19	2.44	**3.93**
32	160	2.67	5.9	1.85	0.14	1.58	1.71	2.77
33	165	2.75	2.0	0.63	0.14	0.53	0.49	0.79
34	170	2.83	1.8	0.57	0.14	0.48	0.43	0.69
35	175	2.92	1.8	0.57	0.14	0.48	0.43	0.69
36	180	3.00	0.6	0.19	0.14	0.16	0.05	0.08

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	2.62
RAINFALL VOLUME (cuft)	15,217
SOIL LOSSES (cuft)	2,450
EFFECTIVE RAIN (in)	2.20
FLOOD VOLUME (acft)	0.29
FLOOD VOLUME (cuft)	12,767
PEAK FLOW RATE (cfs)	3.93

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.60
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	2.48
UNIT TIME-PERCENT OF LAG	202.0
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs
1	5	0.08	0.5	0.212	0.14	0.18	0.07	0.11
2	10	0.17	0.6	0.254	0.14	0.22	0.11	0.18
3	15	0.25	0.6	0.254	0.14	0.22	0.11	0.18
4	20	0.33	0.6	0.254	0.14	0.22	0.11	0.18
5	25	0.42	0.6	0.254	0.14	0.22	0.11	0.18
6	30	0.50	0.7	0.297	0.14	0.25	0.16	0.25
7	35	0.58	0.7	0.297	0.14	0.25	0.16	0.25
8	40	0.67	0.7	0.297	0.14	0.25	0.16	0.25
9	45	0.75	0.7	0.297	0.14	0.25	0.16	0.25
10	50	0.83	0.7	0.297	0.14	0.25	0.16	0.25
11	55	0.92	0.7	0.297	0.14	0.25	0.16	0.25
12	60	1.00	0.8	0.339	0.14	0.29	0.20	0.32
13	65	1.08	0.8	0.339	0.14	0.29	0.20	0.32
14	70	1.17	0.8	0.339	0.14	0.29	0.20	0.32
15	75	1.25	0.8	0.339	0.14	0.29	0.20	0.32
16	80	1.33	0.8	0.339	0.14	0.29	0.20	0.32
17	85	1.42	0.8	0.339	0.14	0.29	0.20	0.32
18	90	1.50	0.8	0.339	0.14	0.29	0.20	0.32
19	95	1.58	0.8	0.339	0.14	0.29	0.20	0.32
20	100	1.67	0.8	0.339	0.14	0.29	0.20	0.32
21	105	1.75	0.8	0.339	0.14	0.29	0.20	0.32
22	110	1.83	0.8	0.339	0.14	0.29	0.20	0.32
23	115	1.92	0.8	0.339	0.14	0.29	0.20	0.32
24	120	2.00	0.9	0.381	0.14	0.32	0.24	0.39
25	125	2.08	0.8	0.339	0.14	0.29	0.20	0.32
26	130	2.17	0.9	0.381	0.14	0.32	0.24	0.39
27	135	2.25	0.9	0.381	0.14	0.32	0.24	0.39
28	140	2.33	0.9	0.381	0.14	0.32	0.24	0.39
29	145	2.42	0.9	0.381	0.14	0.32	0.24	0.39
30	150	2.50	0.9	0.381	0.14	0.32	0.24	0.39
31	155	2.58	0.9	0.381	0.14	0.32	0.24	0.39
32	160	2.67	0.9	0.381	0.14	0.32	0.24	0.39
33	165	2.75	1.0	0.424	0.14	0.36	0.28	0.46
34	170	2.83	1.0	0.424	0.14	0.36	0.28	0.46
35	175	2.92	1.0	0.424	0.14	0.36	0.28	0.46
36	180	3.00	1.0	0.424	0.14	0.36	0.28	0.46
37	185	3.08	1.0	0.424	0.14	0.36	0.28	0.46
38	190	3.17	1.1	0.466	0.14	0.40	0.33	0.52
39	195	3.25	1.1	0.466	0.14	0.40	0.33	0.52
40	200	3.33	1.1	0.466	0.14	0.40	0.33	0.52
41	205	3.42	1.2	0.508	0.14	0.43	0.37	0.59
42	210	3.50	1.3	0.551	0.14	0.47	0.41	0.66
43	215	3.58	1.4	0.593	0.14	0.50	0.45	0.73
44	220	3.67	1.4	0.593	0.14	0.50	0.45	0.73
45	225	3.75	1.5	0.635	0.14	0.54	0.49	0.80
46	230	3.83	1.5	0.635	0.14	0.54	0.49	0.80
47	235	3.92	1.6	0.678	0.14	0.58	0.54	0.87
48	240	4.00	1.6	0.678	0.14	0.58	0.54	0.87
49	245	4.08	1.7	0.720	0.14	0.61	0.58	0.93
50	250	4.17	1.8	0.762	0.14	0.65	0.62	1.00
51	255	4.25	1.9	0.805	0.14	0.68	0.66	1.07
52	260	4.33	2.0	0.847	0.14	0.72	0.71	1.14
53	265	4.42	2.1	0.890	0.14	0.76	0.75	1.21
54	270	4.50	2.1	0.890	0.14	0.76	0.75	1.21

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.60
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	2.48
UNIT TIME-PERCENT OF LAG	202.0
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
55	275	4.58	2.2	0.932	0.14	0.79	0.79	1.28
56	280	4.67	2.3	0.974	0.14	0.83	0.83	1.35
57	285	4.75	2.4	1.017	0.14	0.86	0.88	1.41
58	290	4.83	2.4	1.017	0.14	0.86	0.88	1.41
59	295	4.92	2.5	1.059	0.14	0.90	0.92	1.48
60	300	5.00	2.6	1.101	0.14	0.94	0.96	1.55
61	305	5.08	3.1	1.313	0.14	1.12	1.17	1.89
62	310	5.17	3.6	1.525	0.14	1.30	1.38	2.23
63	315	5.25	3.9	1.652	0.14	1.40	1.51	2.44
64	320	5.33	4.2	1.779	0.14	1.51	1.64	2.64
65	325	5.42	4.7	1.991	0.14	1.69	1.85	2.99
66	330	5.50	5.6	2.372	0.14	2.02	2.23	**3.60**
67	335	5.58	1.9	0.805	0.14	0.68	0.66	1.07
68	340	5.67	0.9	0.381	0.14	0.32	0.24	0.39
69	345	5.75	0.6	0.254	0.14	0.22	0.11	0.18
70	350	5.83	0.5	0.212	0.14	0.18	0.07	0.11
71	355	5.92	0.3	0.127	0.14	0.11	0.02	0.03
72	360	6.00	0.2	0.085	0.14	0.07	0.01	0.02

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	3.53
RAINFALL VOLUME (cuft)	20,502
SOIL LOSSES (cuft)	4,851
EFFECTIVE RAIN (in)	2.69
FLOOD VOLUME (acft)	0.36
FLOOD VOLUME (cuft)	15,652
PEAK FLOW RATE (cfs)	3.60

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.600	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	2.48	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	605.9	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain in/hr	Flood Hydrograph Flow cfs
	Minutes	Hours	(Plate E-5.9)		Max	Low		
1	15	0.25	0.2	0.046	0.248	0.039	0.007	0.01
2	30	0.50	0.3	0.070	0.245	0.059	0.010	0.02
3	45	0.75	0.3	0.070	0.243	0.059	0.010	0.02
4	60	1.00	0.4	0.093	0.240	0.079	0.014	0.02
5	75	1.25	0.3	0.070	0.237	0.059	0.010	0.02
6	90	1.50	0.3	0.070	0.234	0.059	0.010	0.02
7	105	1.75	0.3	0.070	0.231	0.059	0.010	0.02
8	120	2.00	0.4	0.093	0.228	0.079	0.014	0.02
9	135	2.25	0.4	0.093	0.226	0.079	0.014	0.02
10	150	2.50	0.4	0.093	0.223	0.079	0.014	0.02
11	165	2.75	0.5	0.116	0.220	0.099	0.017	0.03
12	180	3.00	0.5	0.116	0.218	0.099	0.017	0.03
13	195	3.25	0.5	0.116	0.215	0.099	0.017	0.03
14	210	3.50	0.5	0.116	0.212	0.099	0.017	0.03
15	225	3.75	0.5	0.116	0.210	0.099	0.017	0.03
16	240	4.00	0.6	0.139	0.207	0.118	0.021	0.03
17	255	4.25	0.6	0.139	0.204	0.118	0.021	0.03
18	270	4.50	0.7	0.162	0.202	0.138	0.024	0.04
19	285	4.75	0.7	0.162	0.199	0.138	0.024	0.04
20	300	5.00	0.8	0.186	0.196	0.158	0.028	0.04
21	315	5.25	0.6	0.139	0.194	0.118	0.021	0.03
22	330	5.50	0.7	0.162	0.191	0.138	0.024	0.04
23	345	5.75	0.8	0.186	0.189	0.158	0.028	0.04
24	360	6.00	0.8	0.186	0.186	0.158	0.028	0.04
25	375	6.25	0.9	0.209	0.184	0.177	0.025	0.04
26	390	6.50	0.9	0.209	0.181	0.177	0.027	0.04
27	405	6.75	1.0	0.232	0.179	0.197	0.053	0.09
28	420	7.00	1.0	0.232	0.177	0.197	0.055	0.09
29	435	7.25	1.0	0.232	0.174	0.197	0.058	0.09
30	450	7.50	1.1	0.255	0.172	0.217	0.083	0.13
31	465	7.75	1.2	0.278	0.170	0.237	0.109	0.18
32	480	8.00	1.3	0.302	0.167	0.256	0.134	0.22
33	495	8.25	1.5	0.348	0.165	0.296	0.183	0.30
34	510	8.50	1.5	0.348	0.163	0.296	0.185	0.30
35	525	8.75	1.6	0.371	0.160	0.316	0.211	0.34
36	540	9.00	1.7	0.394	0.158	0.335	0.236	0.38
37	555	9.25	1.9	0.441	0.156	0.375	0.285	0.46
38	570	9.50	2.0	0.464	0.154	0.394	0.310	0.50
39	585	9.75	2.1	0.487	0.151	0.414	0.336	0.54
40	600	10.00	2.2	0.510	0.149	0.434	0.361	0.58
41	615	10.25	1.5	0.348	0.147	0.296	0.201	0.32
42	630	10.50	1.5	0.348	0.145	0.296	0.203	0.33
43	645	10.75	2.0	0.464	0.143	0.394	0.321	0.52
44	660	11.00	2.0	0.464	0.141	0.394	0.323	0.52
45	675	11.25	1.9	0.441	0.139	0.375	0.302	0.49
46	690	11.50	1.9	0.441	0.137	0.375	0.304	0.49
47	705	11.75	1.7	0.394	0.135	0.335	0.260	0.42
48	720	12.00	1.8	0.418	0.133	0.355	0.285	0.46
49	735	12.25	2.5	0.580	0.131	0.493	0.449	0.73
50	750	12.50	2.6	0.603	0.129	0.513	0.475	0.77
51	765	12.75	2.8	0.650	0.127	0.552	0.523	0.84
52	780	13.00	2.9	0.673	0.125	0.572	0.548	0.88
53	795	13.25	3.4	0.789	0.123	0.670	0.666	1.07
54	810	13.50	3.4	0.789	0.121	0.670	0.668	**1.08**
55	825	13.75	2.3	0.534	0.119	0.454	0.414	0.67
56	840	14.00	2.3	0.534	0.117	0.454	0.416	0.67
57	855	14.25	2.7	0.626	0.116	0.532	0.511	0.82
58	870	14.50	2.6	0.603	0.114	0.513	0.489	0.79
59	885	14.75	2.6	0.603	0.112	0.513	0.491	0.79
60	900	15.00	2.5	0.580	0.110	0.493	0.470	0.76
61	915	15.25	2.4	0.557	0.109	0.473	0.448	0.72
62	930	15.50	2.3	0.534	0.107	0.454	0.427	0.69
63	945	15.75	1.9	0.441	0.105	0.375	0.335	0.54

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	1.600	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	2.48	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	605.9	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
64	960	16.00	1.9	0.441	0.104	0.375	0.337	0.54
65	975	16.25	0.4	0.093	0.102	0.079	0.014	0.02
66	990	16.50	0.4	0.093	0.101	0.079	0.014	0.02
67	1005	16.75	0.3	0.070	0.099	0.059	0.010	0.02
68	1020	17.00	0.3	0.070	0.098	0.059	0.010	0.02
69	1035	17.25	0.5	0.116	0.096	0.099	0.020	0.03
70	1050	17.50	0.5	0.116	0.095	0.099	0.021	0.03
71	1065	17.75	0.5	0.116	0.093	0.099	0.023	0.04
72	1080	18.00	0.4	0.093	0.092	0.079	0.001	0.00
73	1095	18.25	0.4	0.093	0.091	0.079	0.002	0.00
74	1110	18.50	0.4	0.093	0.089	0.079	0.004	0.01
75	1125	18.75	0.3	0.070	0.088	0.059	0.010	0.02
76	1140	19.00	0.2	0.046	0.087	0.039	0.007	0.01
77	1155	19.25	0.3	0.070	0.085	0.059	0.010	0.02
78	1170	19.50	0.4	0.093	0.084	0.079	0.009	0.01
79	1185	19.75	0.3	0.070	0.083	0.059	0.010	0.02
80	1200	20.00	0.2	0.046	0.082	0.039	0.007	0.01
81	1215	20.25	0.3	0.070	0.081	0.059	0.010	0.02
82	1230	20.50	0.3	0.070	0.080	0.059	0.010	0.02
83	1245	20.75	0.3	0.070	0.079	0.059	0.010	0.02
84	1260	21.00	0.2	0.046	0.078	0.039	0.007	0.01
85	1275	21.25	0.3	0.070	0.077	0.059	0.010	0.02
86	1290	21.50	0.2	0.046	0.076	0.039	0.007	0.01
87	1305	21.75	0.3	0.070	0.075	0.059	0.010	0.02
88	1320	22.00	0.2	0.046	0.074	0.039	0.007	0.01
89	1335	22.25	0.3	0.070	0.074	0.059	0.010	0.02
90	1350	22.50	0.2	0.046	0.073	0.039	0.007	0.01
91	1365	22.75	0.2	0.046	0.072	0.039	0.007	0.01
92	1380	23.00	0.2	0.046	0.072	0.039	0.007	0.01
93	1395	23.25	0.2	0.046	0.071	0.039	0.007	0.01
94	1410	23.50	0.2	0.046	0.071	0.039	0.007	0.01
95	1425	23.75	0.2	0.046	0.071	0.039	0.007	0.01
96	1440	24.00	0.2	0.046	0.070	0.039	0.007	0.01

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	5.8
RAINFALL VOLUME (cuft)	33,687
SOIL LOSSES (cuft)	14,452
EFFECTIVE RAIN (in)	3.31
FLOOD VOLUME (acft)	0.44
FLOOD VOLUME (cuft)	19,234
PEAK FLOW (cfs)	1.08

RCFCD SYNTHETIC UNIT HYDROGRAPH - SHORTCUT METHOD

DATA INPUT SHEET

DATE:	May 12, 2015
WORKSHEET PREPARED BY:	DLS
PROJECT NAME	COD - WVC
PROJECT NUMBER	2228
CONCENTRATION POINT DESIGNATION	CURB CUT
AREA DESIGNATION	FARRELL - 03
AMC NUMBER	2

Low Loss Conditions: X=Existing; D=Developed; BS=Retention

AREA DESIG	SOIL GROUP	TRIBUTARY AREAS	ACRES	LOW LOSS CONDITION	RI NUMBER	AMC II INFILTRATION RATE	IMPERVIOUS PERCENT
1	A	COMMERCIAL	3.560	D	32	0.74	0.90

LENGTH OF WATERCOURSE (L)	955 ft
LENGTH TO POINT OPPOSITE CENTROID (Lca)	480 ft
ELEVATION OF HEADWATER	420.0 ft
ELEVATION OF CONCENTRATION POINT	412.7 ft
AVERAGE MANNINGS 'N' VALUE	0.02
STORM FREQUENCY (YEAR)	100
LOW LOSS RATE (For Storms Greater Than 10 Years)	85%
POINT RAIN FROM NOAA ATLAS	**14**
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM	PROJECT: COD - WVC Job No.: 2228 BY: DLS DATE: 5/12/15

PHYSICAL DATA

[1] CONCENTRATION POINT	CURB CUT
[2] AREA DESIGNATION	FARRELL - 03
[3] AREA - ACRES	3.560
[4] L-FEET	955
[5] L-MILES	0.181
[6] La-FEET	480.00
[7] La-MILES	0.091
[8] ELEVATION OF HEADWATER	420
[9] ELEVATION OF CONCENTRATION POINT	412.7
[10] H-FEET	7.3
[11] S-FEET/MILE	40.4
[12] S^0.5	6.35
[13] L*LCA/S^0.5	0.003
[14] AVERAGE MANNINGS 'N'	0.02
[15] LAG TIME-HOURS	0.05
[16] LAG TIME-MINUTES	3.0
[17] 100% OF LAG-MINUTES	3.0
[18] 200% OF LAG-MINUTES	6.0

RAINFALL DATA

[1] AMC	II
[2] FREQUENCY-YEARS	100
NOAA ATLAS	**14**
[3] DURATION:	Point Rain
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

STORM EVENT SUMMARY

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
TOTAL RAINFALL	(in)	1.74	2.62	3.53	5.8
RAINFALL VOLUME	(cuft)	22,486	33,858	45,618	74,953
SOIL LOSSES	(cuft)	1,817	5,451	10,793	32,157
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	20,669	28,407	34,825	42,796
	(acre-ft)	0.47	0.65	0.80	0.98
PEAK FLOW	(cfs)	N/A	8.75	8.01	2.40

NOTE: PEAK FLOW FOR THE 1-HOUR STORM IS NOT REPRESENTATIVE. PER RCFCD PEAK DISCHARGES FROM THE 3-HOUR STORM SHOULD NORMALLY COMPARE WELL WITH RATIONAL PEAKS.

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM AMC II	PROJECT:	COD - WVC		
		Job No.:	2228		
		BY:	DLS	DATE:	5/12/15

AVERAGE ADJUSTED LOSS RATE

SOIL GROUP [Plate C-1]	LAND USE	RI NUMBER [Plate E-6.1]	PERVIOUS AREA INFILTRATION RATE (in/hr) [Plate E-6.2]	DECIMAL PERCENT OF AREA IMPERVIOUS [Plate E-6.3]	ADJUSTED INFILTRATION RATE (in/hr)	AREA	AREA WEIGHTED AVERAGE	MAX AVERAGE ADJUSTED INFILTRATION RATE (in/hr)	LOW LOSS CONDITION	LOW LOSS RATE PER RCFC/2322 (in/hr)	MIN AVERAGE ADJUSTED INFILTRATION RATE (in/hr)
A	COMMERCIAL	32	0.74	90%	0.14	3.560	1.000	0.1406	DEVELOPED	0.1800	0.1800
					SUM	3.560	SUM	0.1406			0.1800

VARIABLE LOSS RATE CURVE (24-HOUR STORM ONLY)

Fm= 0.0703

C= 0.00130

Ft=C(24-(T/60))^1.55 = 0.00130 (24-(T/60))^1.55 + **0.07** in/hr

CONSTANT LOSS RATE (3 & 6 HOUR STORMS) = **0.1406** in/hr

LOW LOSS RATE = **0.8500** in/hr

Where:

T=Time in minutes. To get an average value for each unit time period, Use T=1/2 the unit time for the first time period, T=1 1/2 unit time for the second period, etc.

NOTE: Low loss rates established per RCFC/2322 (Dated: May-30-95)
For 10 Year Storms or Less
Undeveloped Condition: Low Loss = 90%
Developed Condition: Low Loss = 0.9 - (0.8 * %impervious)
Basin Site: Low Loss = 10%
For 100 Year Storm - Low Loss should be between 80% & 90% of the Rainfall Rate

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 1-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.56
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	2.99
UNIT TIME-PERCENT OF LAG	167.0
TOTAL ADJUSTED STORM RAIN-INCHES	1.74
CONSTANT LOSS RATE-in/hr	0.14
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	3.6	0.75	0.14	0.64	0.61	2.19
2	10	0.17	4.2	0.88	0.14	0.75	0.74	2.64
3	15	0.25	4.4	0.92	0.14	0.78	0.78	2.79
4	20	0.33	4.6	0.96	0.14	0.82	0.82	2.94
5	25	0.42	5.0	1.04	0.14	0.89	0.90	3.24
6	30	0.50	5.6	1.17	0.14	0.99	1.03	3.69
7	35	0.58	6.4	1.34	0.14	1.14	1.20	4.29
8	40	0.67	8.1	1.69	0.14	1.44	1.55	5.57
9	45	0.75	13.1	2.74	0.14	2.32	2.59	9.31
10	50	0.83	34.5	7.20	0.14	6.12	7.06	**25.35**
11	55	0.92	6.7	1.40	0.14	1.19	1.26	4.52
12	60	1.00	3.8	0.79	0.14	0.67	0.65	2.34

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	1.74
RAINFALL VOLUME (cuft)	22,486
SOIL LOSSES (cuft)	1,817
EFFECTIVE RAIN (in)	1.60
FLOOD VOLUME (acft)	0.47
FLOOD VOLUME (cuft)	20,669
PEAK FLOW RATE (cfs)	25.35

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 3-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.56	
UNIT TIME-MINUTES	5	
LAG TIME - MINUTES	2.99	
UNIT TIME-PERCENT OF LAG	167.0	
TOTAL ADJUSTED STORM RAIN-INCHES	2.62	
CONSTANT LOSS RATE-in/hr		0.14
LOW LOSS RATE - PERCENT		85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	1.3	0.41	0.14	0.35	0.27	0.96
2	10	0.17	1.3	0.41	0.14	0.35	0.27	0.96
3	15	0.25	1.1	0.35	0.14	0.29	0.21	0.74
4	20	0.33	1.5	0.47	0.14	0.40	0.33	1.19
5	25	0.42	1.5	0.47	0.14	0.40	0.33	1.19
6	30	0.50	1.8	0.57	0.14	0.48	0.43	1.53
7	35	0.58	1.5	0.47	0.14	0.40	0.33	1.19
8	40	0.67	1.8	0.57	0.14	0.48	0.43	1.53
9	45	0.75	1.8	0.57	0.14	0.48	0.43	1.53
10	50	0.83	1.5	0.47	0.14	0.40	0.33	1.19
11	55	0.92	1.6	0.50	0.14	0.43	0.36	1.30
12	60	1.00	1.8	0.57	0.14	0.48	0.43	1.53
13	65	1.08	2.2	0.69	0.14	0.59	0.55	1.98
14	70	1.17	2.2	0.69	0.14	0.59	0.55	1.98
15	75	1.25	2.2	0.69	0.14	0.59	0.55	1.98
16	80	1.33	2.0	0.63	0.14	0.53	0.49	1.75
17	85	1.42	2.6	0.82	0.14	0.69	0.68	2.43
18	90	1.50	2.7	0.85	0.14	0.72	0.71	2.54
19	95	1.58	2.4	0.75	0.14	0.64	0.61	2.20
20	100	1.67	2.7	0.85	0.14	0.72	0.71	2.54
21	105	1.75	3.3	1.04	0.14	0.88	0.90	3.22
22	110	1.83	3.1	0.97	0.14	0.83	0.83	2.99
23	115	1.92	2.9	0.91	0.14	0.77	0.77	2.77
24	120	2.00	3.0	0.94	0.14	0.80	0.80	2.88
25	125	2.08	3.1	0.97	0.14	0.83	0.83	2.99
26	130	2.17	4.2	1.32	0.14	1.12	1.18	4.24
27	135	2.25	5.0	1.57	0.14	1.34	1.43	5.14
28	140	2.33	3.5	1.10	0.14	0.94	0.96	3.45
29	145	2.42	6.8	2.14	0.14	1.82	2.00	7.17
30	150	2.50	7.3	2.30	0.14	1.95	2.15	7.73
31	155	2.58	8.2	2.58	0.14	2.19	2.44	**8.75**
32	160	2.67	5.9	1.85	0.14	1.58	1.71	6.15
33	165	2.75	2.0	0.63	0.14	0.53	0.49	1.75
34	170	2.83	1.8	0.57	0.14	0.48	0.43	1.53
35	175	2.92	1.8	0.57	0.14	0.48	0.43	1.53
36	180	3.00	0.6	0.19	0.14	0.16	0.05	0.17

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	2.62
RAINFALL VOLUME (cuft)	33,858
SOIL LOSSES (cuft)	5,451
EFFECTIVE RAIN (in)	2.20
FLOOD VOLUME (acft)	0.65
FLOOD VOLUME (cuft)	28,407
PEAK FLOW RATE (cfs)	8.75

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.56
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	2.99
UNIT TIME-PERCENT OF LAG	167.0
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs
1	5	0.08	0.5	0.212	0.14	0.18	0.07	0.26
2	10	0.17	0.6	0.254	0.14	0.22	0.11	0.41
3	15	0.25	0.6	0.254	0.14	0.22	0.11	0.41
4	20	0.33	0.6	0.254	0.14	0.22	0.11	0.41
5	25	0.42	0.6	0.254	0.14	0.22	0.11	0.41
6	30	0.50	0.7	0.297	0.14	0.25	0.16	0.56
7	35	0.58	0.7	0.297	0.14	0.25	0.16	0.56
8	40	0.67	0.7	0.297	0.14	0.25	0.16	0.56
9	45	0.75	0.7	0.297	0.14	0.25	0.16	0.56
10	50	0.83	0.7	0.297	0.14	0.25	0.16	0.56
11	55	0.92	0.7	0.297	0.14	0.25	0.16	0.56
12	60	1.00	0.8	0.339	0.14	0.29	0.20	0.71
13	65	1.08	0.8	0.339	0.14	0.29	0.20	0.71
14	70	1.17	0.8	0.339	0.14	0.29	0.20	0.71
15	75	1.25	0.8	0.339	0.14	0.29	0.20	0.71
16	80	1.33	0.8	0.339	0.14	0.29	0.20	0.71
17	85	1.42	0.8	0.339	0.14	0.29	0.20	0.71
18	90	1.50	0.8	0.339	0.14	0.29	0.20	0.71
19	95	1.58	0.8	0.339	0.14	0.29	0.20	0.71
20	100	1.67	0.8	0.339	0.14	0.29	0.20	0.71
21	105	1.75	0.8	0.339	0.14	0.29	0.20	0.71
22	110	1.83	0.8	0.339	0.14	0.29	0.20	0.71
23	115	1.92	0.8	0.339	0.14	0.29	0.20	0.71
24	120	2.00	0.9	0.381	0.14	0.32	0.24	0.86
25	125	2.08	0.8	0.339	0.14	0.29	0.20	0.71
26	130	2.17	0.9	0.381	0.14	0.32	0.24	0.86
27	135	2.25	0.9	0.381	0.14	0.32	0.24	0.86
28	140	2.33	0.9	0.381	0.14	0.32	0.24	0.86
29	145	2.42	0.9	0.381	0.14	0.32	0.24	0.86
30	150	2.50	0.9	0.381	0.14	0.32	0.24	0.86
31	155	2.58	0.9	0.381	0.14	0.32	0.24	0.86
32	160	2.67	0.9	0.381	0.14	0.32	0.24	0.86
33	165	2.75	1.0	0.424	0.14	0.36	0.28	1.02
34	170	2.83	1.0	0.424	0.14	0.36	0.28	1.02
35	175	2.92	1.0	0.424	0.14	0.36	0.28	1.02
36	180	3.00	1.0	0.424	0.14	0.36	0.28	1.02
37	185	3.08	1.0	0.424	0.14	0.36	0.28	1.02
38	190	3.17	1.1	0.466	0.14	0.40	0.33	1.17
39	195	3.25	1.1	0.466	0.14	0.40	0.33	1.17
40	200	3.33	1.1	0.466	0.14	0.40	0.33	1.17
41	205	3.42	1.2	0.508	0.14	0.43	0.37	1.32
42	210	3.50	1.3	0.551	0.14	0.47	0.41	1.47
43	215	3.58	1.4	0.593	0.14	0.50	0.45	1.62
44	220	3.67	1.4	0.593	0.14	0.50	0.45	1.62
45	225	3.75	1.5	0.635	0.14	0.54	0.49	1.78
46	230	3.83	1.5	0.635	0.14	0.54	0.49	1.78
47	235	3.92	1.6	0.678	0.14	0.58	0.54	1.93
48	240	4.00	1.6	0.678	0.14	0.58	0.54	1.93
49	245	4.08	1.7	0.720	0.14	0.61	0.58	2.08
50	250	4.17	1.8	0.762	0.14	0.65	0.62	2.23
51	255	4.25	1.9	0.805	0.14	0.68	0.66	2.38
52	260	4.33	2.0	0.847	0.14	0.72	0.71	2.54
53	265	4.42	2.1	0.890	0.14	0.76	0.75	2.69
54	270	4.50	2.1	0.890	0.14	0.76	0.75	2.69

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.56
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	2.99
UNIT TIME-PERCENT OF LAG	167.0
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs
55	275	4.58	2.2	0.932	0.14	0.79	0.79	2.84
56	280	4.67	2.3	0.974	0.14	0.83	0.83	2.99
57	285	4.75	2.4	1.017	0.14	0.86	0.88	3.14
58	290	4.83	2.4	1.017	0.14	0.86	0.88	3.14
59	295	4.92	2.5	1.059	0.14	0.90	0.92	3.30
60	300	5.00	2.6	1.101	0.14	0.94	0.96	3.45
61	305	5.08	3.1	1.313	0.14	1.12	1.17	4.21
62	310	5.17	3.6	1.525	0.14	1.30	1.38	4.97
63	315	5.25	3.9	1.652	0.14	1.40	1.51	5.43
64	320	5.33	4.2	1.779	0.14	1.51	1.64	5.88
65	325	5.42	4.7	1.991	0.14	1.69	1.85	6.64
66	330	5.50	5.6	2.372	0.14	2.02	2.23	**8.01**
67	335	5.58	1.9	0.805	0.14	0.68	0.66	2.38
68	340	5.67	0.9	0.381	0.14	0.32	0.24	0.86
69	345	5.75	0.6	0.254	0.14	0.22	0.11	0.41
70	350	5.83	0.5	0.212	0.14	0.18	0.07	0.26
71	355	5.92	0.3	0.127	0.14	0.11	0.02	0.07
72	360	6.00	0.2	0.085	0.14	0.07	0.01	0.05

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	3.53
RAINFALL VOLUME (cuft)	45,618
SOIL LOSSES (cuft)	10,793
EFFECTIVE RAIN (in)	2.69
FLOOD VOLUME (acft)	0.80
FLOOD VOLUME (cuft)	34,825
PEAK FLOW RATE (cfs)	8.01

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.560	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	2.99	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	500.9	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain in/hr	Flood Hydrograph Flow cfs
	Minutes	Hours	(Plate E-5.9)		Max	Low		
1	15	0.25	0.2	0.046	0.248	0.039	0.007	0.02
2	30	0.50	0.3	0.070	0.245	0.059	0.010	0.04
3	45	0.75	0.3	0.070	0.243	0.059	0.010	0.04
4	60	1.00	0.4	0.093	0.240	0.079	0.014	0.05
5	75	1.25	0.3	0.070	0.237	0.059	0.010	0.04
6	90	1.50	0.3	0.070	0.234	0.059	0.010	0.04
7	105	1.75	0.3	0.070	0.231	0.059	0.010	0.04
8	120	2.00	0.4	0.093	0.228	0.079	0.014	0.05
9	135	2.25	0.4	0.093	0.226	0.079	0.014	0.05
10	150	2.50	0.4	0.093	0.223	0.079	0.014	0.05
11	165	2.75	0.5	0.116	0.220	0.099	0.017	0.06
12	180	3.00	0.5	0.116	0.218	0.099	0.017	0.06
13	195	3.25	0.5	0.116	0.215	0.099	0.017	0.06
14	210	3.50	0.5	0.116	0.212	0.099	0.017	0.06
15	225	3.75	0.5	0.116	0.210	0.099	0.017	0.06
16	240	4.00	0.6	0.139	0.207	0.118	0.021	0.07
17	255	4.25	0.6	0.139	0.204	0.118	0.021	0.07
18	270	4.50	0.7	0.162	0.202	0.138	0.024	0.09
19	285	4.75	0.7	0.162	0.199	0.138	0.024	0.09
20	300	5.00	0.8	0.186	0.196	0.158	0.028	0.10
21	315	5.25	0.6	0.139	0.194	0.118	0.021	0.07
22	330	5.50	0.7	0.162	0.191	0.138	0.024	0.09
23	345	5.75	0.8	0.186	0.189	0.158	0.028	0.10
24	360	6.00	0.8	0.186	0.186	0.158	0.028	0.10
25	375	6.25	0.9	0.209	0.184	0.177	0.025	0.09
26	390	6.50	0.9	0.209	0.181	0.177	0.027	0.10
27	405	6.75	1.0	0.232	0.179	0.197	0.053	0.19
28	420	7.00	1.0	0.232	0.177	0.197	0.055	0.20
29	435	7.25	1.0	0.232	0.174	0.197	0.058	0.21
30	450	7.50	1.1	0.255	0.172	0.217	0.083	0.30
31	465	7.75	1.2	0.278	0.170	0.237	0.109	0.39
32	480	8.00	1.3	0.302	0.167	0.256	0.134	0.48
33	495	8.25	1.5	0.348	0.165	0.296	0.183	0.66
34	510	8.50	1.5	0.348	0.163	0.296	0.185	0.67
35	525	8.75	1.6	0.371	0.160	0.316	0.211	0.76
36	540	9.00	1.7	0.394	0.158	0.335	0.236	0.85
37	555	9.25	1.9	0.441	0.156	0.375	0.285	1.02
38	570	9.50	2.0	0.464	0.154	0.394	0.310	1.11
39	585	9.75	2.1	0.487	0.151	0.414	0.336	1.21
40	600	10.00	2.2	0.510	0.149	0.434	0.361	1.30
41	615	10.25	1.5	0.348	0.147	0.296	0.201	0.72
42	630	10.50	1.5	0.348	0.145	0.296	0.203	0.73
43	645	10.75	2.0	0.464	0.143	0.394	0.321	1.15
44	660	11.00	2.0	0.464	0.141	0.394	0.323	1.16
45	675	11.25	1.9	0.441	0.139	0.375	0.302	1.08
46	690	11.50	1.9	0.441	0.137	0.375	0.304	1.09
47	705	11.75	1.7	0.394	0.135	0.335	0.260	0.93
48	720	12.00	1.8	0.418	0.133	0.355	0.285	1.02
49	735	12.25	2.5	0.580	0.131	0.493	0.449	1.61
50	750	12.50	2.6	0.603	0.129	0.513	0.475	1.70
51	765	12.75	2.8	0.650	0.127	0.552	0.523	1.88
52	780	13.00	2.9	0.673	0.125	0.572	0.548	1.97
53	795	13.25	3.4	0.789	0.123	0.670	0.666	2.39
54	810	13.50	3.4	0.789	0.121	0.670	0.668	**2.40**
55	825	13.75	2.3	0.534	0.119	0.454	0.414	1.49
56	840	14.00	2.3	0.534	0.117	0.454	0.416	1.49
57	855	14.25	2.7	0.626	0.116	0.532	0.511	1.83
58	870	14.50	2.6	0.603	0.114	0.513	0.489	1.76
59	885	14.75	2.6	0.603	0.112	0.513	0.491	1.76
60	900	15.00	2.5	0.580	0.110	0.493	0.470	1.69
61	915	15.25	2.4	0.557	0.109	0.473	0.448	1.61
62	930	15.50	2.3	0.534	0.107	0.454	0.427	1.53
63	945	15.75	1.9	0.441	0.105	0.375	0.335	1.20

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.560	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	2.99	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	500.9	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
64	960	16.00	1.9	0.441	0.104	0.375	0.337	1.21
65	975	16.25	0.4	0.093	0.102	0.079	0.014	0.05
66	990	16.50	0.4	0.093	0.101	0.079	0.014	0.05
67	1005	16.75	0.3	0.070	0.099	0.059	0.010	0.04
68	1020	17.00	0.3	0.070	0.098	0.059	0.010	0.04
69	1035	17.25	0.5	0.116	0.096	0.099	0.020	0.07
70	1050	17.50	0.5	0.116	0.095	0.099	0.021	0.08
71	1065	17.75	0.5	0.116	0.093	0.099	0.023	0.08
72	1080	18.00	0.4	0.093	0.092	0.079	0.001	0.00
73	1095	18.25	0.4	0.093	0.091	0.079	0.002	0.01
74	1110	18.50	0.4	0.093	0.089	0.079	0.004	0.01
75	1125	18.75	0.3	0.070	0.088	0.059	0.010	0.04
76	1140	19.00	0.2	0.046	0.087	0.039	0.007	0.02
77	1155	19.25	0.3	0.070	0.085	0.059	0.010	0.04
78	1170	19.50	0.4	0.093	0.084	0.079	0.009	0.03
79	1185	19.75	0.3	0.070	0.083	0.059	0.010	0.04
80	1200	20.00	0.2	0.046	0.082	0.039	0.007	0.02
81	1215	20.25	0.3	0.070	0.081	0.059	0.010	0.04
82	1230	20.50	0.3	0.070	0.080	0.059	0.010	0.04
83	1245	20.75	0.3	0.070	0.079	0.059	0.010	0.04
84	1260	21.00	0.2	0.046	0.078	0.039	0.007	0.02
85	1275	21.25	0.3	0.070	0.077	0.059	0.010	0.04
86	1290	21.50	0.2	0.046	0.076	0.039	0.007	0.02
87	1305	21.75	0.3	0.070	0.075	0.059	0.010	0.04
88	1320	22.00	0.2	0.046	0.074	0.039	0.007	0.02
89	1335	22.25	0.3	0.070	0.074	0.059	0.010	0.04
90	1350	22.50	0.2	0.046	0.073	0.039	0.007	0.02
91	1365	22.75	0.2	0.046	0.072	0.039	0.007	0.02
92	1380	23.00	0.2	0.046	0.072	0.039	0.007	0.02
93	1395	23.25	0.2	0.046	0.071	0.039	0.007	0.02
94	1410	23.50	0.2	0.046	0.071	0.039	0.007	0.02
95	1425	23.75	0.2	0.046	0.071	0.039	0.007	0.02
96	1440	24.00	0.2	0.046	0.070	0.039	0.007	0.02

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	5.8
RAINFALL VOLUME (cuft)	74,953
SOIL LOSSES (cuft)	32,157
EFFECTIVE RAIN (in)	3.31
FLOOD VOLUME (acft)	0.98
FLOOD VOLUME (cuft)	42,796
PEAK FLOW (cfs)	2.40

RCFCD SYNTHETIC UNIT HYDROGRAPH - SHORTCUT METHOD

DATA INPUT SHEET

DATE:	May 12, 2015
WORKSHEET PREPARED BY:	DLS
PROJECT NAME	COD - WVC
PROJECT NUMBER	2228
CONCENTRATION POINT DESIGNATION	EXIST INLETS
AREA DESIGNATION	SD01
AMC NUMBER	2

Low Loss Conditions: X=Existing; D=Developed; BS=Retention

AREA DESIG	SOIL GROUP	TRIBUTARY AREAS	ACRES	LOW LOSS CONDITION	RI NUMBER	AMC II INFILTRATION RATE	IMPERVIOUS PERCENT
1	A	COMMERCIAL	3.890	D	32	0.74	0.90

LENGTH OF WATERCOURSE (L)	350 ft
LENGTH TO POINT OPPOSITE CENTROID (Lca)	175 ft
ELEVATION OF HEADWATER	427.5 ft
ELEVATION OF CONCENTRATION POINT	419.1 ft
AVERAGE MANNINGS 'N' VALUE	0.02
STORM FREQUENCY (YEAR)	100
LOW LOSS RATE (For Storms Greater Than 10 Years)	85%
POINT RAIN FROM NOAA ATLAS	**14**
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM	PROJECT: COD - WVC Job No.: 2228 BY: DLS DATE: 5/12/15

PHYSICAL DATA

[1] CONCENTRATION POINT	EXIST INLETS
[2] AREA DESIGNATION	SD01
[3] AREA - ACRES	3.890
[4] L-FEET	350
[5] L-MILES	0.066
[6] La-FEET	175.00
[7] La-MILES	0.033
[8] ELEVATION OF HEADWATER	427.5
[9] ELEVATION OF CONCENTRATION POINT	419.1
[10] H-FEET	8.4
[11] S-FEET/MILE	126.7
[12] S^0.5	11.26
[13] L*LCA/S^0.5	0.000
[14] AVERAGE MANNINGS 'N'	0.02
[15] LAG TIME-HOURS	0.02
[16] LAG TIME-MINUTES	1.1
[17] 100% OF LAG-MINUTES	1.1
[18] 200% OF LAG-MINUTES	2.2

RAINFALL DATA

[1] AMC	II
[2] FREQUENCY-YEARS	100
NOAA ATLAS	**14**
[3] DURATION:	Point Rain
1-HOUR	1.74 in
3-HOUR	2.62 in
6-HOUR	3.53 in
24-HOUR	5.80 in

STORM EVENT SUMMARY

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
TOTAL RAINFALL	(in)	1.74	2.62	3.53	5.8
RAINFALL VOLUME	(cuft)	24,570	36,996	49,846	81,900
SOIL LOSSES	(cuft)	1,985	5,956	11,793	35,137
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	22,585	31,040	38,053	46,763
	(acre-ft)	0.52	0.71	0.87	1.07
PEAK FLOW	(cfs)	N/A	9.56	8.75	2.62

NOTE: PEAK FLOW FOR THE 1-HOUR STORM IS NOT REPRESENTATIVE. PER RCFCD PEAK DISCHARGES FROM THE 3-HOUR STORM SHOULD NORMALLY COMPARE WELL WITH RATIONAL PEAKS.

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM AMC II	PROJECT:	COD - WVC		
		Job No.:	2228		
		BY:	DLS	DATE:	5/12/15

AVERAGE ADJUSTED LOSS RATE

SOIL GROUP [Plate C-1]	LAND USE	RI NUMBER [Plate E-6.1]	PERVIOUS AREA INFILTRATION RATE (in/hr) [Plate E-6.2]	DECIMAL PERCENT OF AREA IMPERVIOUS [Plate E-6.3]	ADJUSTED INFILTRATION RATE (in/hr)	AREA	AREA WEIGHTED AVERAGE	MAX AVERAGE ADJUSTED INFILTRATION RATE (in/hr)	LOW LOSS CONDITION	LOW LOSS RATE PER RCFC/2322 (in/hr)	MIN AVERAGE ADJUSTED INFILTRATION RATE (in/hr)
A	COMMERCIAL	32	0.74	90%	0.14	3.890	1.000	0.1406	DEVELOPED	0.1800	0.1800
					SUM	3.890	SUM	0.1406			0.1800

VARIABLE LOSS RATE CURVE (24-HOUR STORM ONLY)

Fm= 0.0703

C= 0.00130

Ft=C(24-(T/60))^1.55 = 0.00130 (24-(T/60))^1.55 + **0.07** in/hr

CONSTANT LOSS RATE (3 & 6 HOUR STORMS) = **0.1406** in/hr

LOW LOSS RATE = **0.8500** in/hr

Where:

T=Time in minutes. To get an average value for each unit time period, Use T=1/2 the unit time for the first time period, T=1 1/2 unit time for the second period, etc.

NOTE: Low loss rates established per RCFC/2322 (Dated: May-30-95)
For 10 Year Storms or Less
Undeveloped Condition: Low Loss = 90%
Developed Condition: Low Loss = 0.9 - (0.8 * %impervious)
Basin Site: Low Loss = 10%
For 100 Year Storm - Low Loss should be between 80% & 90% of the Rainfall Rate

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 1-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.89
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	1.12
UNIT TIME-PERCENT OF LAG	445.9
TOTAL ADJUSTED STORM RAIN-INCHES	1.74
CONSTANT LOSS RATE-in/hr	0.14
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	3.6	0.75	0.14	0.64	0.61	2.40
2	10	0.17	4.2	0.88	0.14	0.75	0.74	2.89
3	15	0.25	4.4	0.92	0.14	0.78	0.78	3.05
4	20	0.33	4.6	0.96	0.14	0.82	0.82	3.22
5	25	0.42	5.0	1.04	0.14	0.89	0.90	3.54
6	30	0.50	5.6	1.17	0.14	0.99	1.03	4.03
7	35	0.58	6.4	1.34	0.14	1.14	1.20	4.69
8	40	0.67	8.1	1.69	0.14	1.44	1.55	6.08
9	45	0.75	13.1	2.74	0.14	2.32	2.59	10.18
10	50	0.83	34.5	7.20	0.14	6.12	7.06	**27.70**
11	55	0.92	6.7	1.40	0.14	1.19	1.26	4.94
12	60	1.00	3.8	0.79	0.14	0.67	0.65	2.56

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	1.74
RAINFALL VOLUME (cuft)	24,570
SOIL LOSSES (cuft)	1,985
EFFECTIVE RAIN (in)	1.60
FLOOD VOLUME (acft)	0.52
FLOOD VOLUME (cuft)	22,585
PEAK FLOW RATE (cfs)	27.70

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 3-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.89	
UNIT TIME-MINUTES	5	
LAG TIME - MINUTES	1.12	
UNIT TIME-PERCENT OF LAG	445.9	
TOTAL ADJUSTED STORM RAIN-INCHES	2.62	
CONSTANT LOSS RATE-in/hr		0.14
LOW LOSS RATE - PERCENT		85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
1	5	0.08	1.3	0.41	0.14	0.35	0.27	1.05
2	10	0.17	1.3	0.41	0.14	0.35	0.27	1.05
3	15	0.25	1.1	0.35	0.14	0.29	0.21	0.81
4	20	0.33	1.5	0.47	0.14	0.40	0.33	1.30
5	25	0.42	1.5	0.47	0.14	0.40	0.33	1.30
6	30	0.50	1.8	0.57	0.14	0.48	0.43	1.67
7	35	0.58	1.5	0.47	0.14	0.40	0.33	1.30
8	40	0.67	1.8	0.57	0.14	0.48	0.43	1.67
9	45	0.75	1.8	0.57	0.14	0.48	0.43	1.67
10	50	0.83	1.5	0.47	0.14	0.40	0.33	1.30
11	55	0.92	1.6	0.50	0.14	0.43	0.36	1.42
12	60	1.00	1.8	0.57	0.14	0.48	0.43	1.67
13	65	1.08	2.2	0.69	0.14	0.59	0.55	2.16
14	70	1.17	2.2	0.69	0.14	0.59	0.55	2.16
15	75	1.25	2.2	0.69	0.14	0.59	0.55	2.16
16	80	1.33	2.0	0.63	0.14	0.53	0.49	1.91
17	85	1.42	2.6	0.82	0.14	0.69	0.68	2.65
18	90	1.50	2.7	0.85	0.14	0.72	0.71	2.78
19	95	1.58	2.4	0.75	0.14	0.64	0.61	2.41
20	100	1.67	2.7	0.85	0.14	0.72	0.71	2.78
21	105	1.75	3.3	1.04	0.14	0.88	0.90	3.52
22	110	1.83	3.1	0.97	0.14	0.83	0.83	3.27
23	115	1.92	2.9	0.91	0.14	0.77	0.77	3.02
24	120	2.00	3.0	0.94	0.14	0.80	0.80	3.15
25	125	2.08	3.1	0.97	0.14	0.83	0.83	3.27
26	130	2.17	4.2	1.32	0.14	1.12	1.18	4.63
27	135	2.25	5.0	1.57	0.14	1.34	1.43	5.61
28	140	2.33	3.5	1.10	0.14	0.94	0.96	3.76
29	145	2.42	6.8	2.14	0.14	1.82	2.00	7.83
30	150	2.50	7.3	2.30	0.14	1.95	2.15	8.45
31	155	2.58	8.2	2.58	0.14	2.19	2.44	**9.56**
32	160	2.67	5.9	1.85	0.14	1.58	1.71	6.72
33	165	2.75	2.0	0.63	0.14	0.53	0.49	1.91
34	170	2.83	1.8	0.57	0.14	0.48	0.43	1.67
35	175	2.92	1.8	0.57	0.14	0.48	0.43	1.67
36	180	3.00	0.6	0.19	0.14	0.16	0.05	0.19

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	2.62
RAINFALL VOLUME (cuft)	36,996
SOIL LOSSES (cuft)	5,956
EFFECTIVE RAIN (in)	2.20
FLOOD VOLUME (acft)	0.71
FLOOD VOLUME (cuft)	31,040
PEAK FLOW RATE (cfs)	9.56

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.89
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	1.12
UNIT TIME-PERCENT OF LAG	445.9
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs
1	5	0.08	0.5	0.212	0.14	0.18	0.07	0.28
2	10	0.17	0.6	0.254	0.14	0.22	0.11	0.45
3	15	0.25	0.6	0.254	0.14	0.22	0.11	0.45
4	20	0.33	0.6	0.254	0.14	0.22	0.11	0.45
5	25	0.42	0.6	0.254	0.14	0.22	0.11	0.45
6	30	0.50	0.7	0.297	0.14	0.25	0.16	0.61
7	35	0.58	0.7	0.297	0.14	0.25	0.16	0.61
8	40	0.67	0.7	0.297	0.14	0.25	0.16	0.61
9	45	0.75	0.7	0.297	0.14	0.25	0.16	0.61
10	50	0.83	0.7	0.297	0.14	0.25	0.16	0.61
11	55	0.92	0.7	0.297	0.14	0.25	0.16	0.61
12	60	1.00	0.8	0.339	0.14	0.29	0.20	0.78
13	65	1.08	0.8	0.339	0.14	0.29	0.20	0.78
14	70	1.17	0.8	0.339	0.14	0.29	0.20	0.78
15	75	1.25	0.8	0.339	0.14	0.29	0.20	0.78
16	80	1.33	0.8	0.339	0.14	0.29	0.20	0.78
17	85	1.42	0.8	0.339	0.14	0.29	0.20	0.78
18	90	1.50	0.8	0.339	0.14	0.29	0.20	0.78
19	95	1.58	0.8	0.339	0.14	0.29	0.20	0.78
20	100	1.67	0.8	0.339	0.14	0.29	0.20	0.78
21	105	1.75	0.8	0.339	0.14	0.29	0.20	0.78
22	110	1.83	0.8	0.339	0.14	0.29	0.20	0.78
23	115	1.92	0.8	0.339	0.14	0.29	0.20	0.78
24	120	2.00	0.9	0.381	0.14	0.32	0.24	0.94
25	125	2.08	0.8	0.339	0.14	0.29	0.20	0.78
26	130	2.17	0.9	0.381	0.14	0.32	0.24	0.94
27	135	2.25	0.9	0.381	0.14	0.32	0.24	0.94
28	140	2.33	0.9	0.381	0.14	0.32	0.24	0.94
29	145	2.42	0.9	0.381	0.14	0.32	0.24	0.94
30	150	2.50	0.9	0.381	0.14	0.32	0.24	0.94
31	155	2.58	0.9	0.381	0.14	0.32	0.24	0.94
32	160	2.67	0.9	0.381	0.14	0.32	0.24	0.94
33	165	2.75	1.0	0.424	0.14	0.36	0.28	1.11
34	170	2.83	1.0	0.424	0.14	0.36	0.28	1.11
35	175	2.92	1.0	0.424	0.14	0.36	0.28	1.11
36	180	3.00	1.0	0.424	0.14	0.36	0.28	1.11
37	185	3.08	1.0	0.424	0.14	0.36	0.28	1.11
38	190	3.17	1.1	0.466	0.14	0.40	0.33	1.28
39	195	3.25	1.1	0.466	0.14	0.40	0.33	1.28
40	200	3.33	1.1	0.466	0.14	0.40	0.33	1.28
41	205	3.42	1.2	0.508	0.14	0.43	0.37	1.44
42	210	3.50	1.3	0.551	0.14	0.47	0.41	1.61
43	215	3.58	1.4	0.593	0.14	0.50	0.45	1.77
44	220	3.67	1.4	0.593	0.14	0.50	0.45	1.77
45	225	3.75	1.5	0.635	0.14	0.54	0.49	1.94
46	230	3.83	1.5	0.635	0.14	0.54	0.49	1.94
47	235	3.92	1.6	0.678	0.14	0.58	0.54	2.11
48	240	4.00	1.6	0.678	0.14	0.58	0.54	2.11
49	245	4.08	1.7	0.720	0.14	0.61	0.58	2.27
50	250	4.17	1.8	0.762	0.14	0.65	0.62	2.44
51	255	4.25	1.9	0.805	0.14	0.68	0.66	2.61
52	260	4.33	2.0	0.847	0.14	0.72	0.71	2.77
53	265	4.42	2.1	0.890	0.14	0.76	0.75	2.94
54	270	4.50	2.1	0.890	0.14	0.76	0.75	2.94

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.89
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	1.12
UNIT TIME-PERCENT OF LAG	445.9
TOTAL ADJUSTED STORM RAIN-INCHES	3.53
CONSTANT LOSS RATE-in/hr	0.141
LOW LOSS RATE - PERCENT	85%

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
55	275	4.58	2.2	0.932	0.14	0.79	0.79	3.10
56	280	4.67	2.3	0.974	0.14	0.83	0.83	3.27
57	285	4.75	2.4	1.017	0.14	0.86	0.88	3.44
58	290	4.83	2.4	1.017	0.14	0.86	0.88	3.44
59	295	4.92	2.5	1.059	0.14	0.90	0.92	3.60
60	300	5.00	2.6	1.101	0.14	0.94	0.96	3.77
61	305	5.08	3.1	1.313	0.14	1.12	1.17	4.60
62	310	5.17	3.6	1.525	0.14	1.30	1.38	5.43
63	315	5.25	3.9	1.652	0.14	1.40	1.51	5.93
64	320	5.33	4.2	1.779	0.14	1.51	1.64	6.43
65	325	5.42	4.7	1.991	0.14	1.69	1.85	7.26
66	330	5.50	5.6	2.372	0.14	2.02	2.23	**8.75**
67	335	5.58	1.9	0.805	0.14	0.68	0.66	2.61
68	340	5.67	0.9	0.381	0.14	0.32	0.24	0.94
69	345	5.75	0.6	0.254	0.14	0.22	0.11	0.45
70	350	5.83	0.5	0.212	0.14	0.18	0.07	0.28
71	355	5.92	0.3	0.127	0.14	0.11	0.02	0.07
72	360	6.00	0.2	0.085	0.14	0.07	0.01	0.05

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	3.53
RAINFALL VOLUME (cuft)	49,846
SOIL LOSSES (cuft)	11,793
EFFECTIVE RAIN (in)	2.69
FLOOD VOLUME (acft)	0.87
FLOOD VOLUME (cuft)	38,053
PEAK FLOW RATE (cfs)	8.75

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.890	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	1.12	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	1337.6	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain in/hr	Flood Hydrograph Flow cfs
	Minutes	Hours	(Plate E-5.9)		Max	Low		
1	15	0.25	0.2	0.046	0.248	0.039	0.007	0.03
2	30	0.50	0.3	0.070	0.245	0.059	0.010	0.04
3	45	0.75	0.3	0.070	0.243	0.059	0.010	0.04
4	60	1.00	0.4	0.093	0.240	0.079	0.014	0.05
5	75	1.25	0.3	0.070	0.237	0.059	0.010	0.04
6	90	1.50	0.3	0.070	0.234	0.059	0.010	0.04
7	105	1.75	0.3	0.070	0.231	0.059	0.010	0.04
8	120	2.00	0.4	0.093	0.228	0.079	0.014	0.05
9	135	2.25	0.4	0.093	0.226	0.079	0.014	0.05
10	150	2.50	0.4	0.093	0.223	0.079	0.014	0.05
11	165	2.75	0.5	0.116	0.220	0.099	0.017	0.07
12	180	3.00	0.5	0.116	0.218	0.099	0.017	0.07
13	195	3.25	0.5	0.116	0.215	0.099	0.017	0.07
14	210	3.50	0.5	0.116	0.212	0.099	0.017	0.07
15	225	3.75	0.5	0.116	0.210	0.099	0.017	0.07
16	240	4.00	0.6	0.139	0.207	0.118	0.021	0.08
17	255	4.25	0.6	0.139	0.204	0.118	0.021	0.08
18	270	4.50	0.7	0.162	0.202	0.138	0.024	0.10
19	285	4.75	0.7	0.162	0.199	0.138	0.024	0.10
20	300	5.00	0.8	0.186	0.196	0.158	0.028	0.11
21	315	5.25	0.6	0.139	0.194	0.118	0.021	0.08
22	330	5.50	0.7	0.162	0.191	0.138	0.024	0.10
23	345	5.75	0.8	0.186	0.189	0.158	0.028	0.11
24	360	6.00	0.8	0.186	0.186	0.158	0.028	0.11
25	375	6.25	0.9	0.209	0.184	0.177	0.025	0.10
26	390	6.50	0.9	0.209	0.181	0.177	0.027	0.11
27	405	6.75	1.0	0.232	0.179	0.197	0.053	0.21
28	420	7.00	1.0	0.232	0.177	0.197	0.055	0.22
29	435	7.25	1.0	0.232	0.174	0.197	0.058	0.23
30	450	7.50	1.1	0.255	0.172	0.217	0.083	0.33
31	465	7.75	1.2	0.278	0.170	0.237	0.109	0.43
32	480	8.00	1.3	0.302	0.167	0.256	0.134	0.53
33	495	8.25	1.5	0.348	0.165	0.296	0.183	0.72
34	510	8.50	1.5	0.348	0.163	0.296	0.185	0.73
35	525	8.75	1.6	0.371	0.160	0.316	0.211	0.83
36	540	9.00	1.7	0.394	0.158	0.335	0.236	0.93
37	555	9.25	1.9	0.441	0.156	0.375	0.285	1.12
38	570	9.50	2.0	0.464	0.154	0.394	0.310	1.22
39	585	9.75	2.1	0.487	0.151	0.414	0.336	1.32
40	600	10.00	2.2	0.510	0.149	0.434	0.361	1.42
41	615	10.25	1.5	0.348	0.147	0.296	0.201	0.79
42	630	10.50	1.5	0.348	0.145	0.296	0.203	0.80
43	645	10.75	2.0	0.464	0.143	0.394	0.321	1.26
44	660	11.00	2.0	0.464	0.141	0.394	0.323	1.27
45	675	11.25	1.9	0.441	0.139	0.375	0.302	1.19
46	690	11.50	1.9	0.441	0.137	0.375	0.304	1.19
47	705	11.75	1.7	0.394	0.135	0.335	0.260	1.02
48	720	12.00	1.8	0.418	0.133	0.355	0.285	1.12
49	735	12.25	2.5	0.580	0.131	0.493	0.449	1.76
50	750	12.50	2.6	0.603	0.129	0.513	0.475	1.86
51	765	12.75	2.8	0.650	0.127	0.552	0.523	2.05
52	780	13.00	2.9	0.673	0.125	0.572	0.548	2.15
53	795	13.25	3.4	0.789	0.123	0.670	0.666	2.61
54	810	13.50	3.4	0.789	0.121	0.670	0.668	**2.62**
55	825	13.75	2.3	0.534	0.119	0.454	0.414	1.63
56	840	14.00	2.3	0.534	0.117	0.454	0.416	1.63
57	855	14.25	2.7	0.626	0.116	0.532	0.511	2.00
58	870	14.50	2.6	0.603	0.114	0.513	0.489	1.92
59	885	14.75	2.6	0.603	0.112	0.513	0.491	1.93
60	900	15.00	2.5	0.580	0.110	0.493	0.470	1.84
61	915	15.25	2.4	0.557	0.109	0.473	0.448	1.76
62	930	15.50	2.3	0.534	0.107	0.454	0.427	1.67
63	945	15.75	1.9	0.441	0.105	0.375	0.335	1.32

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 24-HOUR STORM	PROJECT: COD - WVC Job No.: 2228 DATE: BY: DLS 5/12/15

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

DRAINAGE AREA-ACRES	3.890	CONSTANT LOSS RATE-in/hr	n/a
UNIT TIME-MINUTES	15	VARIABLE LOSS RATE (AVG) in/hr	0.1406
LAG TIME - MINUTES	1.12	MINIMUM LOSS RATE (for var. loss) - in/hr	0.070
UNIT TIME-PERCENT OF LAG	1337.6	LOW LOSS RATE - DECIMAL	0.85
TOTAL ADJUSTED STORM RAIN-INCHES	5.80	C	0.00130

Unit Time Period	Time Minutes	Time Hours	Pattern Percent (Plate E-5.9)	Storm Rain in/hr	Loss Rate in/hr Max	Loss Rate in/hr Low	Effective Rain in/hr	Flood Hydrograph Flow cfs
64	960	16.00	1.9	0.441	0.104	0.375	0.337	1.32
65	975	16.25	0.4	0.093	0.102	0.079	0.014	0.05
66	990	16.50	0.4	0.093	0.101	0.079	0.014	0.05
67	1005	16.75	0.3	0.070	0.099	0.059	0.010	0.04
68	1020	17.00	0.3	0.070	0.098	0.059	0.010	0.04
69	1035	17.25	0.5	0.116	0.096	0.099	0.020	0.08
70	1050	17.50	0.5	0.116	0.095	0.099	0.021	0.08
71	1065	17.75	0.5	0.116	0.093	0.099	0.023	0.09
72	1080	18.00	0.4	0.093	0.092	0.079	0.001	0.00
73	1095	18.25	0.4	0.093	0.091	0.079	0.002	0.01
74	1110	18.50	0.4	0.093	0.089	0.079	0.004	0.01
75	1125	18.75	0.3	0.070	0.088	0.059	0.010	0.04
76	1140	19.00	0.2	0.046	0.087	0.039	0.007	0.03
77	1155	19.25	0.3	0.070	0.085	0.059	0.010	0.04
78	1170	19.50	0.4	0.093	0.084	0.079	0.009	0.03
79	1185	19.75	0.3	0.070	0.083	0.059	0.010	0.04
80	1200	20.00	0.2	0.046	0.082	0.039	0.007	0.03
81	1215	20.25	0.3	0.070	0.081	0.059	0.010	0.04
82	1230	20.50	0.3	0.070	0.080	0.059	0.010	0.04
83	1245	20.75	0.3	0.070	0.079	0.059	0.010	0.04
84	1260	21.00	0.2	0.046	0.078	0.039	0.007	0.03
85	1275	21.25	0.3	0.070	0.077	0.059	0.010	0.04
86	1290	21.50	0.2	0.046	0.076	0.039	0.007	0.03
87	1305	21.75	0.3	0.070	0.075	0.059	0.010	0.04
88	1320	22.00	0.2	0.046	0.074	0.039	0.007	0.03
89	1335	22.25	0.3	0.070	0.074	0.059	0.010	0.04
90	1350	22.50	0.2	0.046	0.073	0.039	0.007	0.03
91	1365	22.75	0.2	0.046	0.072	0.039	0.007	0.03
92	1380	23.00	0.2	0.046	0.072	0.039	0.007	0.03
93	1395	23.25	0.2	0.046	0.071	0.039	0.007	0.03
94	1410	23.50	0.2	0.046	0.071	0.039	0.007	0.03
95	1425	23.75	0.2	0.046	0.071	0.039	0.007	0.03
96	1440	24.00	0.2	0.046	0.070	0.039	0.007	0.03

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

TOTAL RAINFALL (in)	5.8
RAINFALL VOLUME (cuft)	81,900
SOIL LOSSES (cuft)	35,137
EFFECTIVE RAIN (in)	3.31
FLOOD VOLUME (acft)	1.07
FLOOD VOLUME (cuft)	46,763
PEAK FLOW (cfs)	2.62

Whitewater Watershed

BMP Design Volume, V_{BMP} & Design Flow Rate, Q_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	MSA Consulting, Inc	Date	May 12, 2015
Designed By	DLS	County/City Case No.	
Company Project Number/Name	COD WVC - JN 2228		
Drainage Area Number/Name	Existing Condition - B.01		

Enter the Area Tributary to this Feature (A_{TRIB}) — A_{TRIB} = 1.420 acres

Determine the Impervious Area Ratio

Determine the Impervious Area Within A_{TRIB} (A_{IMP}) — A_{IMP} = 1.280 acres

Calculate the Impervious Area Ratio (I_F)

$I_F = A_{IMP}/A_{TRIB}$ — I_F = 0.90

Calculate the Composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ — C_{BMP} = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ — V_U = 0.29 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12(in/ft)}$$

V_{BMP} = 1,510 ft^3

BMP Design Flow Rate, Q_{BMP}

$Q_{BMP} = C_{BMP} \times I \times A_{TRIB}$ — Q_{BMP} = 0.21 ft^3/s

I = Design Rainfall Intensity, 0.2 in/hr

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} & Design Flow Rate, Q_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	MSA Consulting, Inc	Date	May 12, 2015
Designed By	DLS	County/City Case No.	
Company Project Number/Name	COD WVC - JN 2228		
Drainage Area Number/Name	Existing Condition - B.02		

Enter the Area Tributary to this Feature (A_{TRIB}) — A_{TRIB} = 8.300 acres

Determine the Impervious Area Ratio

Determine the Impervious Area Within A_{TRIB} (A_{IMP}) — A_{IMP} = 7.470 acres

Calculate the Impervious Area Ratio (I_F)

$I_F = A_{IMP}/A_{TRIB}$ — I_F = 0.90

Calculate the Composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ — C_{BMP} = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ — V_U = 0.29 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12(in/ft)}$$

V_{BMP} = 8,801 ft^3

BMP Design Flow Rate, Q_{BMP}

$Q_{BMP} = C_{BMP} \times I \times A_{TRIB}$ — Q_{BMP} = 1.21 ft^3/s

I = Design Rainfall Intensity, 0.2 in/hr

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} & Design Flow Rate, Q_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	MSA Consulting, Inc	Date	May 12, 2015
Designed By	DLS	County/City Case No.	
Company Project Number/Name	COD WVC - JN 2228		
Drainage Area Number/Name	Existing Condition - B.03		

Enter the Area Tributary to this Feature (A_{TRIB}) — A_{TRIB} = 4.810 acres

Determine the Impervious Area Ratio

Determine the Impervious Area Within A_{TRIB} (A_{IMP}) — A_{IMP} = 4.330 acres

Calculate the Impervious Area Ratio (I_F)

$I_F = A_{IMP}/A_{TRIB}$ — I_F = 0.90

Calculate the Composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ — C_{BMP} = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ — V_U = 0.29 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12(in/ft)}$$

V_{BMP} = 5,103 ft^3

BMP Design Flow Rate, Q_{BMP}

$Q_{BMP} = C_{BMP} \times I \times A_{TRIB}$ — Q_{BMP} = 0.70 ft^3/s

I = Design Rainfall Intensity, 0.2 in/hr

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} & Design Flow Rate, Q_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	MSA Consulting, Inc	Date	May 12, 2015
Designed By	DLS	County/City Case No.	
Company Project Number/Name	COD WVC - JN 2228		
Drainage Area Number/Name	Existing Condition - B.04		

Enter the Area Tributary to this Feature (A_{TRIB}) — A_{TRIB} = 1.800 acres

Determine the Impervious Area Ratio

Determine the Impervious Area Within A_{TRIB} (A_{IMP}) — A_{IMP} = 1.620 acres

Calculate the Impervious Area Ratio (I_F)

$I_F = A_{IMP}/A_{TRIB}$ — I_F = 0.90

Calculate the Composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ — C_{BMP} = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ — V_U = 0.29 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12(in/ft)}$$

V_{BMP} = 1,909 ft^3

BMP Design Flow Rate, Q_{BMP}

$Q_{BMP} = C_{BMP} \times I \times A_{TRIB}$ — Q_{BMP} = 0.26 ft^3/s

I = Design Rainfall Intensity, 0.2 in/hr

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} & Design Flow Rate, Q_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	MSA Consulting, Inc	Date	May 12, 2015
Designed By	DLS	County/City Case No.	
Company Project Number/Name	COD WVC - JN 2228		
Drainage Area Number/Name	Existing Condition - F.01		

Enter the Area Tributary to this Feature (A_{TRIB}) — A_{TRIB} = 3.680 acres

Determine the Impervious Area Ratio

Determine the Impervious Area Within A_{TRIB} (A_{IMP}) — A_{IMP} = 3.310 acres

Calculate the Impervious Area Ratio (I_F)

$I_F = A_{IMP}/A_{TRIB}$ — I_F = 0.90

Calculate the Composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ — C_{BMP} = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ — V_U = 0.29 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12(in/ft)}$$

V_{BMP} = 3,898 ft^3

BMP Design Flow Rate, Q_{BMP}

$Q_{BMP} = C_{BMP} \times I \times A_{TRIB}$ — Q_{BMP} = 0.54 ft^3/s

I = Design Rainfall Intensity, 0.2 in/hr

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} & Design Flow Rate, Q_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	MSA Consulting, Inc	Date	May 12, 2015
Designed By	DLS	County/City Case No.	
Company Project Number/Name	COD WVC - JN 2228		
Drainage Area Number/Name	Existing Condition - F.02		

Enter the Area Tributary to this Feature (A_{TRIB}) — A_{TRIB} = 1.600 acres

Determine the Impervious Area Ratio

Determine the Impervious Area Within A_{TRIB} (A_{IMP}) — A_{IMP} = 1.440 acres

Calculate the Impervious Area Ratio (I_F)

$I_F = A_{IMP}/A_{TRIB}$ — I_F = 0.90

Calculate the Composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ — C_{BMP} = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ — V_U = 0.29 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12(in/ft)}$$

V_{BMP} = 1,697 ft^3

BMP Design Flow Rate, Q_{BMP}

$Q_{BMP} = C_{BMP} \times I \times A_{TRIB}$ — Q_{BMP} = 0.23 ft^3/s

I = Design Rainfall Intensity, 0.2 in/hr

Notes:

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Whitewater Watershed

BMP Design Volume, V_{BMP} & Design Flow Rate, Q_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	MSA Consulting, Inc	Date	May 12, 2015
Designed By	DLS	County/City Case No.	
Company Project Number/Name	COD WVC - JN 2228		
Drainage Area Number/Name	Existing Condition - F.03		

Enter the Area Tributary to this Feature (A_{TRIB}) — A_{TRIB} = 3.560 acres

Determine the Impervious Area Ratio

Determine the Impervious Area Within A_{TRIB} (A_{IMP}) — A_{IMP} = 3.200 acres

Calculate the Impervious Area Ratio (I_F)

$I_F = A_{IMP}/A_{TRIB}$ — I_F = 0.90

Calculate the Composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ — C_{BMP} = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ — V_U = 0.29 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12(in/ft)}$$

V_{BMP} = 3,766 ft^3

BMP Design Flow Rate, Q_{BMP}

$Q_{BMP} = C_{BMP} \times I \times A_{TRIB}$ — Q_{BMP} = 0.52 ft^3/s

I = Design Rainfall Intensity, 0.2 in/hr

Notes:

.

Whitewater Watershed

BMP Design Volume, V_{BMP} & Design Flow Rate, Q_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	MSA Consulting, Inc	Date	May 12, 2015
Designed By	DLS	County/City Case No.	
Company Project Number/Name	COD WVC - JN 2228		
Drainage Area Number/Name	Existing Condition - SD.01		

Enter the Area Tributary to this Feature (A_{TRIB}) — A_{TRIB} = 3.890 acres

Determine the Impervious Area Ratio

Determine the Impervious Area Within A_{TRIB} (A_{IMP}) — A_{IMP} = 3.500 acres

Calculate the Impervious Area Ratio (I_F)

$I_F = A_{IMP}/A_{TRIB}$ — I_F = 0.90

Calculate the Composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ — C_{BMP} = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ — V_U = 0.29 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12(in/ft)}$$

V_{BMP} = 4,123 ft^3

BMP Design Flow Rate, Q_{BMP}

$Q_{BMP} = C_{BMP} \times I \times A_{TRIB}$ — Q_{BMP} = 0.57 ft^3/s

I = Design Rainfall Intensity, 0.2 in/hr

Notes:

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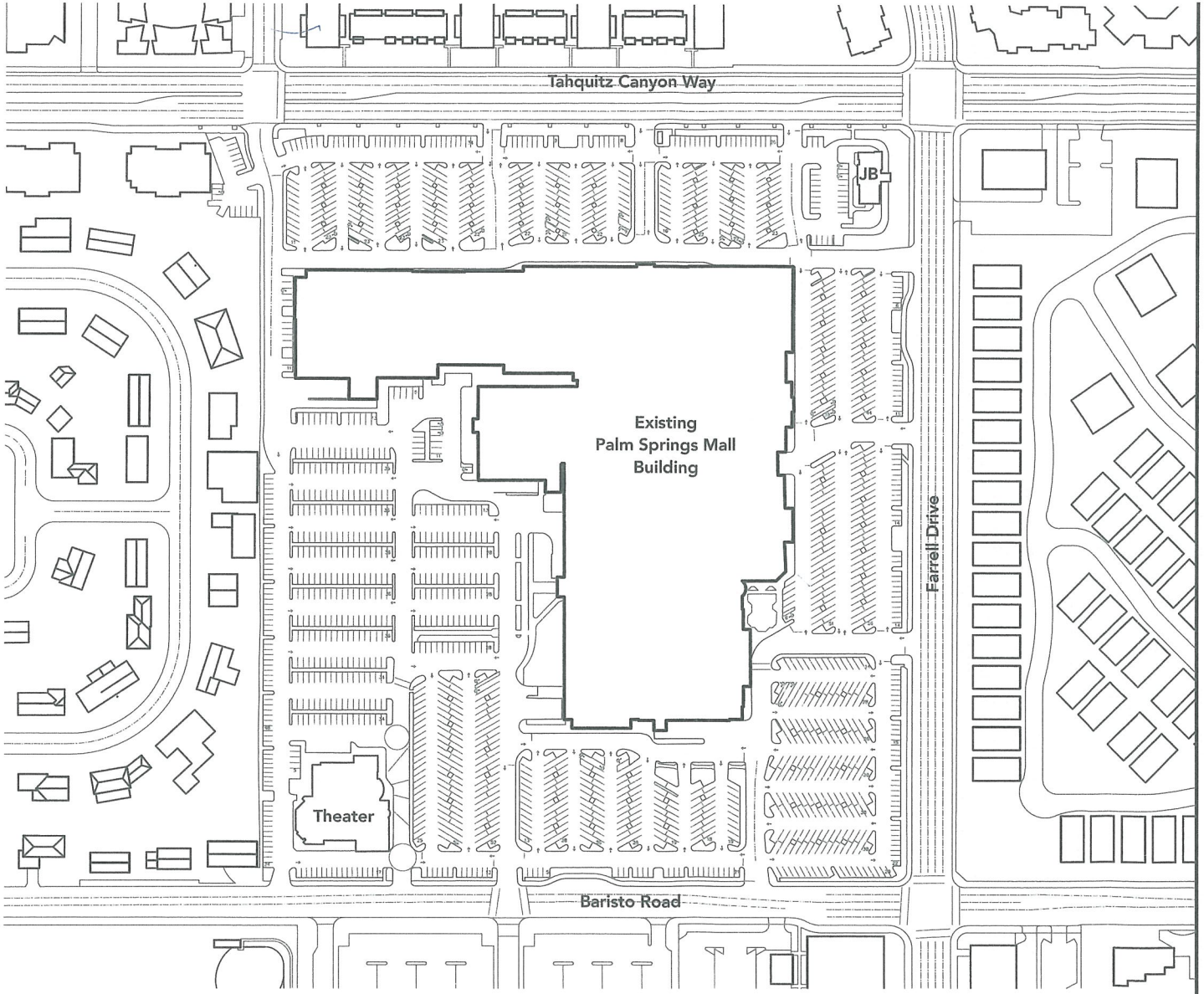
Appendix F

Architectural Conceptual Site Plans



Parking Count

Site: 1,436
Theater: 158
Total: 1,594

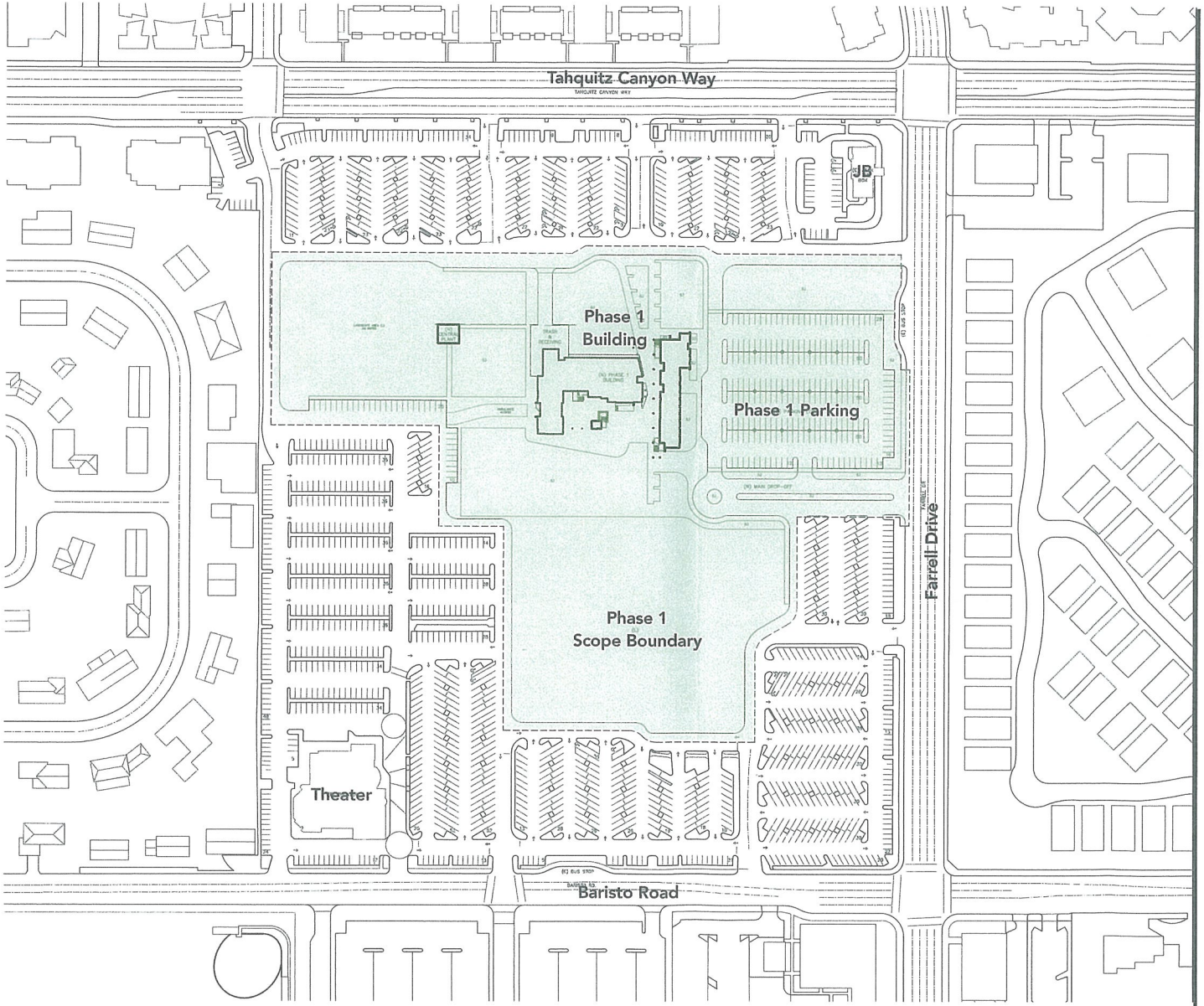
north

EXISTING SITE PLAN

COLLEGE OF THE DESERT : WEST VALLEY CAMPUS

HMC Architects
2015-03-26

A0.1



Parking Count

Site: 1,474
Theater: 158
Total: 1,632

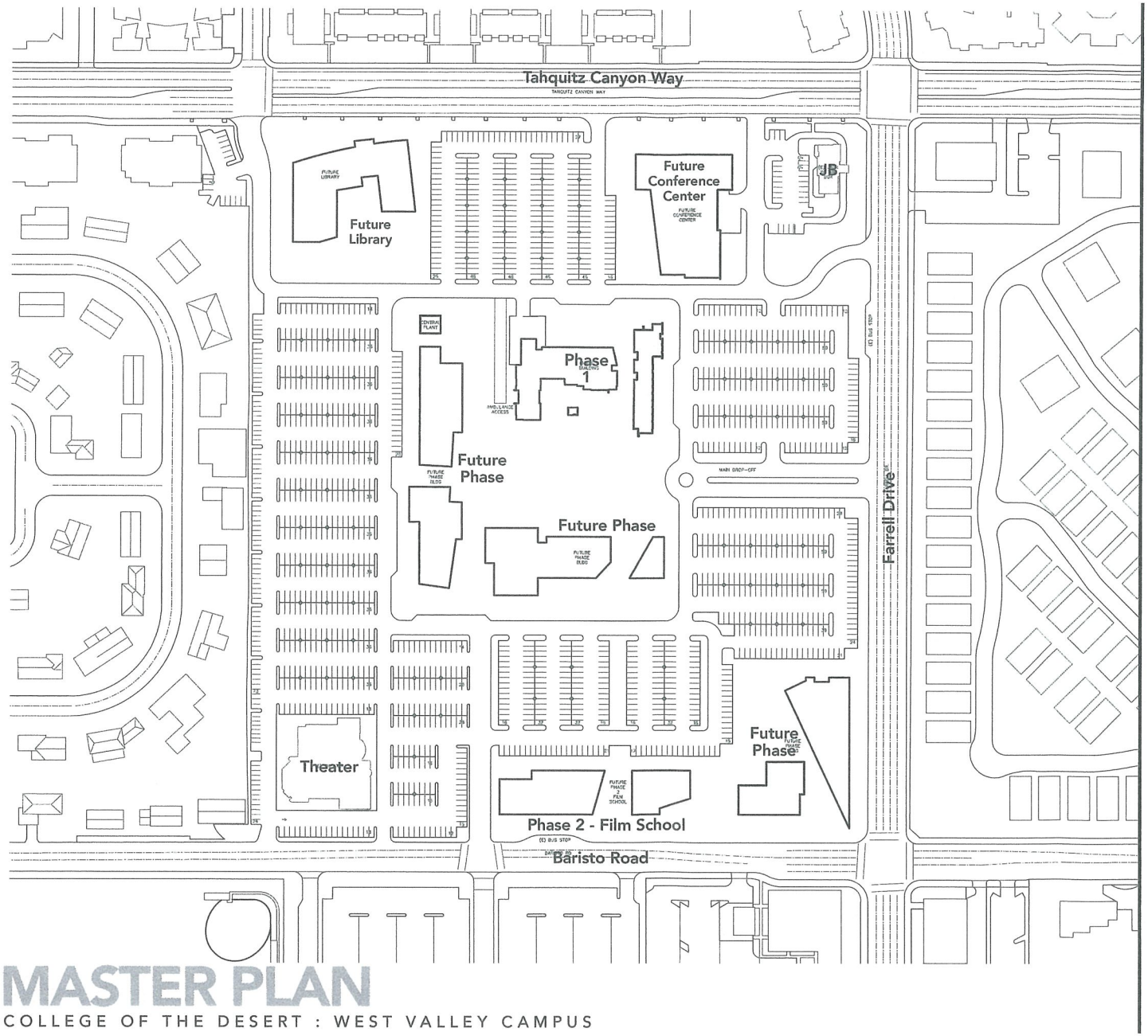
north

PHASE 1 SITE PLAN

COLLEGE OF THE DESERT : WEST VALLEY CAMPUS

HMC Architects
2015-03-26

A0.2



Parking Count

Site: 1,488
Theater: 158
Total: 1,646

north

MASTER PLAN

COLLEGE OF THE DESERT : WEST VALLEY CAMPUS

Appendix G

Proposed Phase 1

Riverside County Whitewater River Region WQMP BMP Worksheets

Whitewater Watershed

BMP Design Volume, V_{BMP} & Design Flow Rate, Q_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	MSA Consulting, Inc	Date	May 12, 2015
Designed By	DLS	County/City Case No.	
Company Project Number/Name	COD WVC - JN 2228		
Drainage Area Number/Name	DA-A		

Enter the Area Tributary to this Feature (A_{TRIB}) — A_{TRIB} = 4.080 acres

Determine the Impervious Area Ratio

Determine the Impervious Area Within A_{TRIB} (A_{IMP}) — A_{IMP} = 3.226 acres

Calculate the Impervious Area Ratio (I_F)

$I_F = A_{IMP}/A_{TRIB}$ — I_F = 0.79

Calculate the Composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ — C_{BMP} = 0.59

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ — V_U = 0.24 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12(in/ft)}$$

V_{BMP} = 3,486 ft^3

BMP Design Flow Rate, Q_{BMP}

$Q_{BMP} = C_{BMP} \times I \times A_{TRIB}$ — Q_{BMP} = 0.48 ft^3/s

I = Design Rainfall Intensity, 0.2 in/hr

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} & Design Flow Rate, Q_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	MSA Consulting, Inc	Date	April 28, 2015
Designed By	DLS	County/City Case No.	
Company Project Number/Name	COD WVC - JN 2228		
Drainage Area Number/Name	DA-B		

Enter the Area Tributary to this Feature (A_{TRIB}) — A_{TRIB} = 2.000 acres

Determine the Impervious Area Ratio

Determine the Impervious Area Within A_{TRIB} (A_{IMP}) — A_{IMP} = 0.921 acres

Calculate the Impervious Area Ratio (I_F)

$I_F = A_{IMP}/A_{TRIB}$ — I_F = 0.46

Calculate the Composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ — C_{BMP} = 0.31

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ — V_U = 0.13 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12(in/ft)}$$

V_{BMP} = 914 ft^3

BMP Design Flow Rate, Q_{BMP}

$Q_{BMP} = C_{BMP} \times I \times A_{TRIB}$ — Q_{BMP} = 0.13 ft^3/s

I = Design Rainfall Intensity, 0.2 in/hr

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} & Design Flow Rate, Q_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	MSA Consulting, Inc	Date	May 4, 2015
Designed By	DLS	County/City Case No.	
Company Project Number/Name	COD WVC - JN 2228		
Drainage Area Number/Name	DA-C		

Enter the Area Tributary to this Feature (A_{TRIB}) — A_{TRIB} = 4.825 acres

Determine the Impervious Area Ratio

Determine the Impervious Area Within A_{TRIB} (A_{IMP}) — A_{IMP} = 1.100 acres

Calculate the Impervious Area Ratio (I_F)

$I_F = A_{IMP}/A_{TRIB}$ — I_F = 0.23

Calculate the Composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ — C_{BMP} = 0.19

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ — V_U = 0.07 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12(in/ft)}$$

V_{BMP} = 1,304 ft^3

BMP Design Flow Rate, Q_{BMP}

$Q_{BMP} = C_{BMP} \times I \times A_{TRIB}$ — Q_{BMP} = 0.18 ft^3/s

I = Design Rainfall Intensity, 0.2 in/hr

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} & Design Flow Rate, Q_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	MSA Consulting, Inc	Date	May 4, 2015
Designed By	DLS	County/City Case No.	
Company Project Number/Name	COD WVC - JN 2228		
Drainage Area Number/Name	DA-D		

Enter the Area Tributary to this Feature (A_{TRIB}) — A_{TRIB} = 1.329 acres

Determine the Impervious Area Ratio

Determine the Impervious Area Within A_{TRIB} (A_{IMP}) — A_{IMP} = 0.133 acres

Calculate the Impervious Area Ratio (I_F)

$I_F = A_{IMP}/A_{TRIB}$ — I_F = 0.10

Calculate the Composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ — C_{BMP} = 0.11

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ — V_U = 0.04 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12(in/ft)}$$

V_{BMP} = 213 ft^3

BMP Design Flow Rate, Q_{BMP}

$Q_{BMP} = C_{BMP} \times I \times A_{TRIB}$ — Q_{BMP} = 0.03 ft^3/s

I = Design Rainfall Intensity, 0.2 in/hr

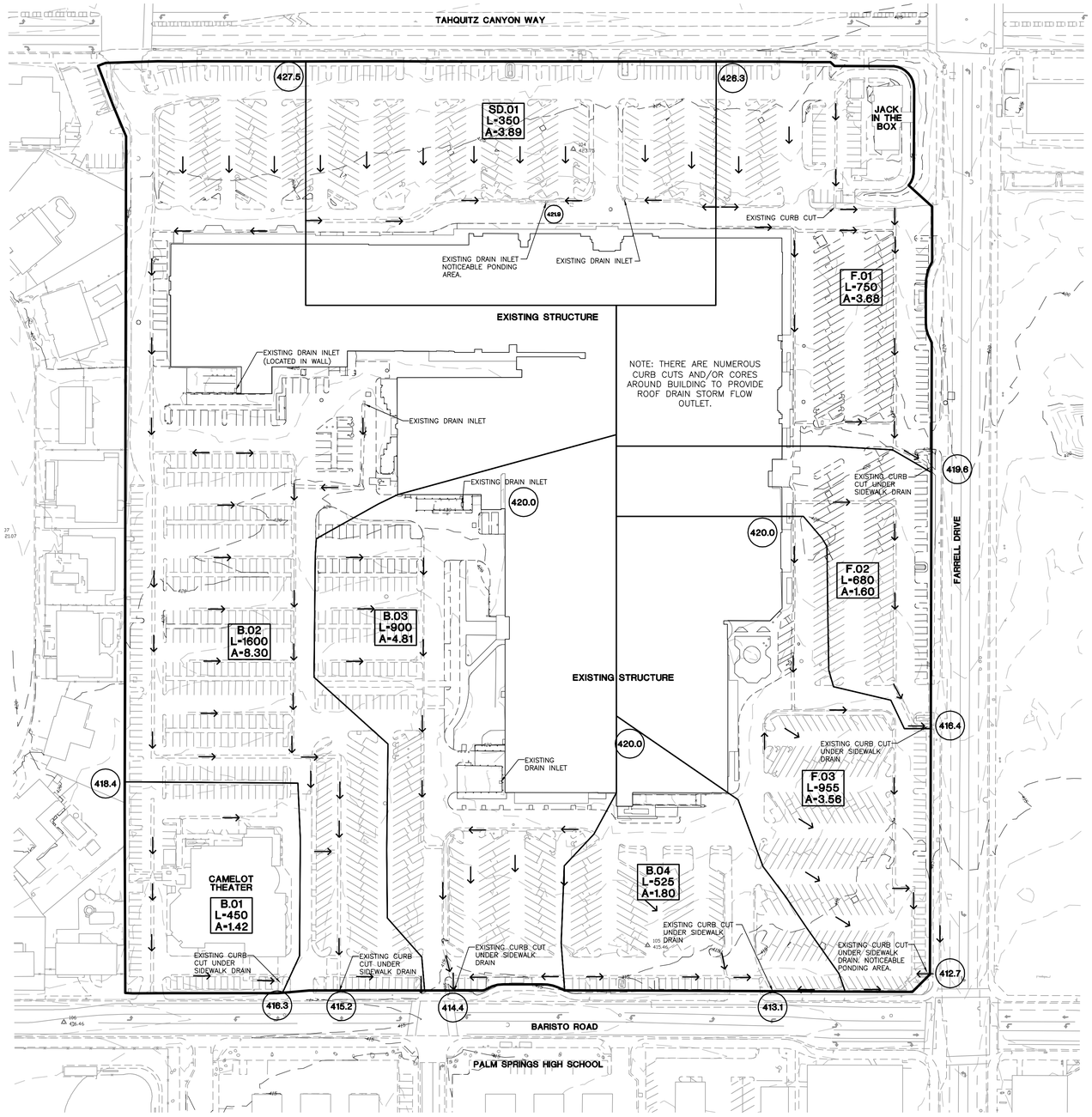
Notes:

Appendix H

Hydrology Exhibits

Existing Condition – Hydrology Exhibit

Proposed Phase 1 – Hydrology Exhibit



LEGEND

DRAINAGE DIRECTION →

TRIBUTARY DRAINAGE AREA BOUNDARY ——

DRAINAGE SUB-AREA ID
FLOW TRAVEL LENGTH (FT)
AREA (AC)

XX
L-XX
A-XX

ELEVATION (XX.X)

NORTH

0' 80' 160' 240' 320'

SCALE 1"=80'

AREA RECONCILIATION SUMMARY

ASSUMPTIONS:
1. ALL DRAINAGE AREAS (DA) WERE ASSUMED TO BE COMMERCIAL LAND USE (90% IMPERVIOUS).
2. LOADING/RECIEVING DOCK DRAINS WERE IGNORED AND AREA INCLUDED IN SURFACE FLOW CALCULATIONS.

SURFACE FLOW TO BARISTO STREET:		
B01	1.42 AC	
B02	8.30 AC	
B03	4.81 AC	
B04	1.80 AC	
SUBTOTAL BARISTO DA		16.33 AC
SURFACE FLOW TO FARRELL DRIVE:		
F01	3.68 AC	
F02	1.60 AC	
F03	3.56 AC	
SUBTOTAL FARRELL DA		8.84 AC
FLOW TO STORM DRAIN (UNKNOWN OUTLET):		
SD01	3.89 AC	
TOTAL HYDROLOGIC AREA		29.06 AC

STORM EVENT SUMMARY – DA B.01

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	8,244	11,331	13,891	**17,070**
	(acre-ft)	0.19	0.26	0.32	**0.39**
PEAK FLOW	(cfs)	N/A	3.49	3.20	0.96

STORM EVENT SUMMARY – DA B.02

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	48,189	66,230	81,193	**99,777**
	(acre-ft)	1.11	1.52	1.86	**2.29**
PEAK FLOW	(cfs)	N/A	20.40	18.68	5.59

STORM EVENT SUMMARY – DA B.03

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	27,926	38,381	47,053	**57,823**
	(acre-ft)	0.64	0.88	1.08	**1.33**
PEAK FLOW	(cfs)	N/A	11.82	10.82	3.24

STORM EVENT SUMMARY – DA B.04

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	10,451	14,363	17,608	**21,638**
	(acre-ft)	0.24	0.33	0.40	**0.50**
PEAK FLOW	(cfs)	N/A	4.42	4.05	1.21

STORM EVENT SUMMARY – DA F.01

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	21,366	29,365	35,999	**44,238**
	(acre-ft)	0.49	0.67	0.83	**1.02**
PEAK FLOW	(cfs)	N/A	9.04	8.28	2.48

STORM EVENT SUMMARY – DA F.02

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	9,289	12,767	15,652	**19,234**
	(acre-ft)	0.21	0.29	0.36	**0.44**
PEAK FLOW	(cfs)	N/A	3.93	3.60	1.08

STORM EVENT SUMMARY – DA F.03

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	20,669	28,407	34,825	**42,796**
	(acre-ft)	0.47	0.65	0.80	**0.98**
PEAK FLOW	(cfs)	N/A	8.75	8.01	2.40

STORM EVENT SUMMARY – DA SD.01

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOW VOLUME	(cu-ft)	22,585	31,040	38,053	**46,763**
	(acre-ft)	0.52	0.71	0.87	**1.07**
PEAK FLOW	(cfs)	N/A	9.56	8.75	2.62

PRELIMINARY WQMP SUMMARY

FLOW TO BARISTO ROAD

DRAINAGE AREA	TOTAL AREA (acres)	IMPERVIOUS AREA (acres)	DESIGN VOLUME (cu-ft)	DESIGN FLOW (cfs)
DA-B.01	1.42	1.28	1,510	0.21
DA-B.02	8.30	7.47	8,801	1.21
DA-B.03	4.81	4.33	5,103	0.70
DA-B.04	1.80	1.62	1,909	0.26
TOTAL	16.33	14.70	17,323	2.38

FLOW TO FARRELL DRIVE

DRAINAGE AREA	TOTAL AREA (acres)	IMPERVIOUS AREA (acres)	DESIGN VOLUME (cu-ft)	DESIGN FLOW (cfs)
DA-F.01	3.68	3.31	3,898	0.54
DA-F.02	1.60	1.44	1,697	0.23
DA-F.03	3.56	3.20	3,766	0.52
TOTAL	8.84	7.95	9,361	1.29

FLOW TO UNDERGROUND STORM DRAIN (UNKNOWN OUTLET)

DRAINAGE AREA	TOTAL AREA (acres)	IMPERVIOUS AREA (acres)	DESIGN VOLUME (cu-ft)	DESIGN FLOW (cfs)
DA-SD.01	3.89	3.50	4,123	0.57

MAY 12, 2015

MSA CONSULTING, INC.
PLANNING ■ CIVIL ENGINEERING ■ LAND SURVEYING
34200 BOB HOPE DRIVE ■ RANCHO MIRAGE ■ CA 92270
TELEPHONE (760) 320-9811 ■ FAX (760) 323-7893

CITY OF PALM SPRINGS
COLLEGE OF THE DESERT - WEST VALLEY CAMPUS
EXISTING CONDITION HYDROLOGY EXHIBIT
RCFCD SYNTHETIC UNIT HYDROGRAPH METHOD (SHORTCUT METHOD)
RIVERSIDE COUNTY WHITEWATER RIVER REGION WQMP BMP

DESIGN BY	DLS
DRAWN BY	DLS
CHECK BY	JAD
SHEET	1 OF 1 SHEETS

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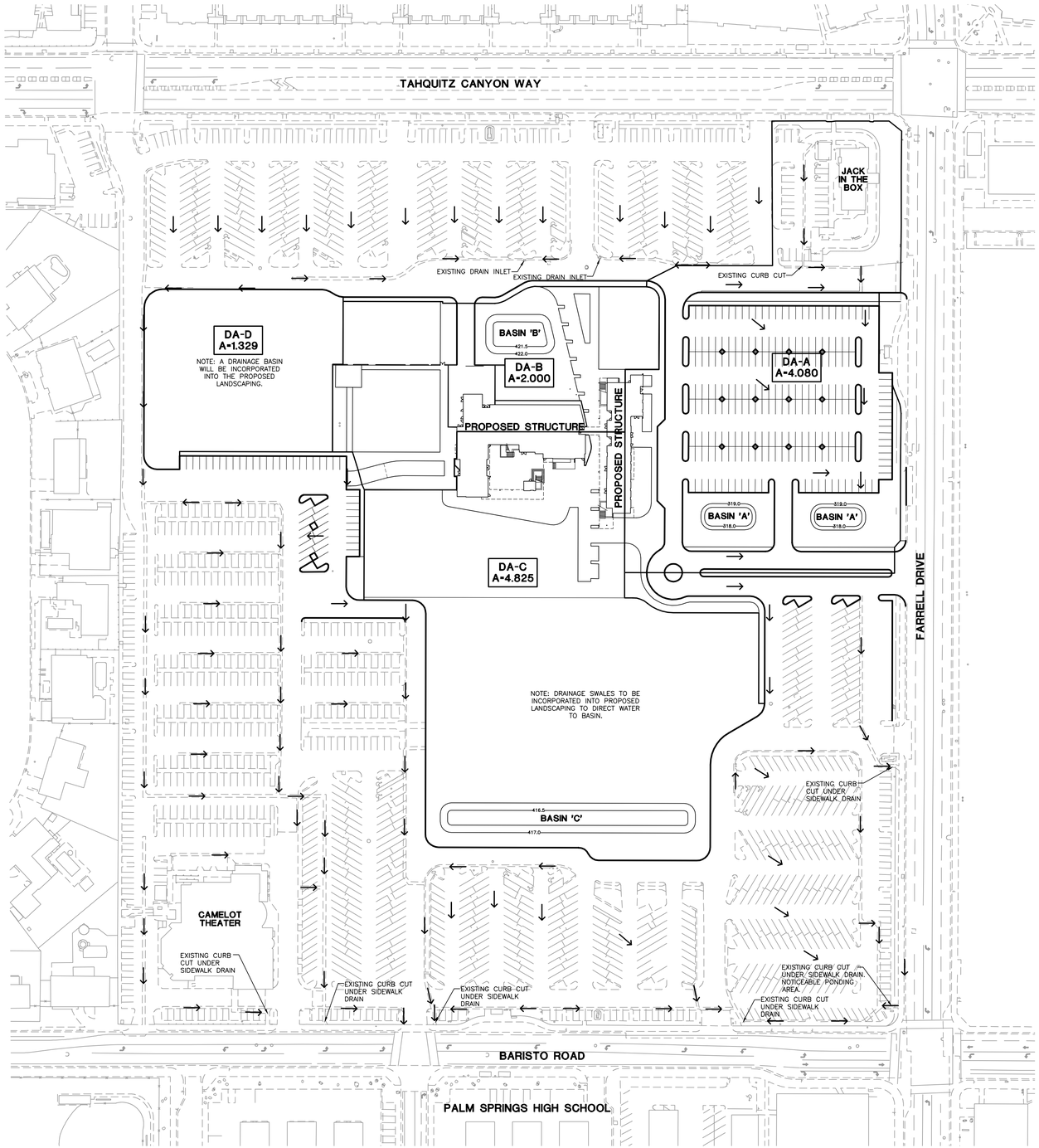

NORTH

0' 80' 160' 240' 320'

SCALE 1"=80'

LEGEND

DRAINAGE DIRECTION →

TRIBUTARY DRAINAGE AREA BOUNDARY ———

DRAINAGE SUB-AREA ID — XX
AREA (AC) — A=XX
AREA (AC)

PRELIMINARY PHASE 1 - WQMP SUMMARY

DRAINAGE AREA	TOTAL AREA (acres)	IMPERVIOUS AREA (acres)	DESIGN VOLUME (cu-ft)	DESIGN FLOW (cfs)	STORAGE PROVIDED (cf)
DA-A	4.080	3.226	3,486	0.48	3,917
DA-B	2.000	0.921	914	0.13	1,687
DA-C	4.825	1.100	1,304	0.18	4,895
DA-D	1.329	0.133	213	0.03	*
TOTAL	12.234	5.380	5,917	0.82	10,499

* THE WQMP BASIN FOR DRAINAGE AREA D WILL BE INCORPORATED INTO THE PROPOSED LANDSCAPING.

MAY 12, 2015

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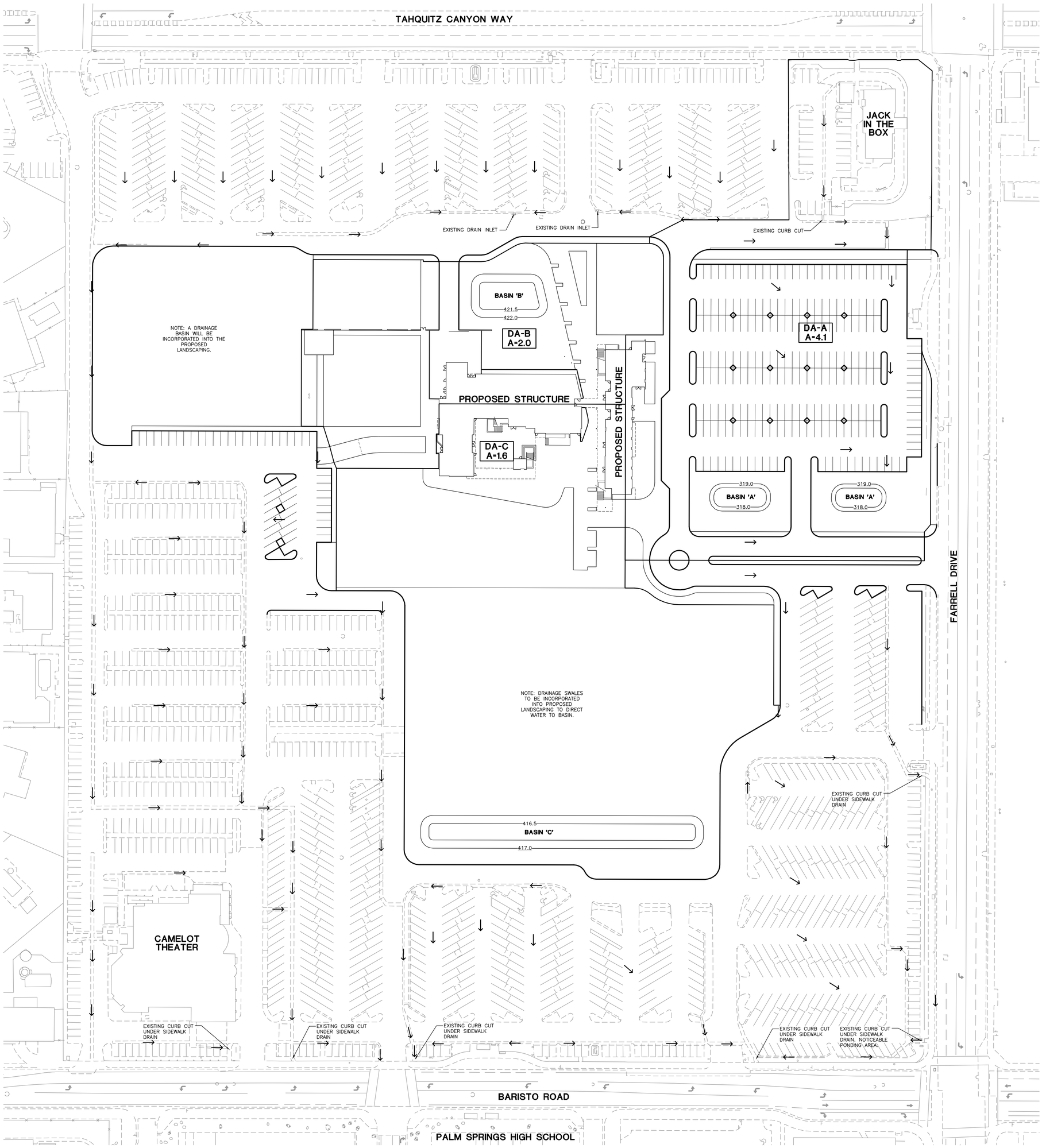
CITY OF PALM SPRINGS
COLLEGE OF THE DESERT - WEST VALLEY CAMPUS
PROPOSED PHASE 1 IMPROVEMENTS
RIVERSIDE COUNTY WHITEWATER RIVER REQUIN WQMP EXHIBIT

DESIGN BY	DLS
DRAWN BY	DLS
CHECK BY	JAD
SHEET	1 OF 1 SHEETS



LEGEND

DRAINAGE DIRECTION ⟶

TRIBUTARY DRAINAGE AREA BOUNDARY ———

DRAINAGE SUB-AREA ID
AREA (AC)
AREA (AC)

XX
A=XX

PRELIMINARY PHASE 1 - WQMP SUMMARY

DRAINAGE AREA	TOTAL AREA (acres)	IMPERVIOUS AREA (acres)	DESIGN VOLUME (cu-ft)	DESIGN FLOW (cfs)	STORAGE PROVIDED (cf)
DA-A	4.1	3.2	3,434	0.47	3,429
DA-B	2.0	0.8	812	0.11	1,687
DA-C	4.8	0.7	968	0.13	4,895
TOTAL	10.9	4.7	2,214	0.71	10,011

NORTH

0' 50' 100' 150' 200'

SCALE 1"=50'

MAY 4, 2015

MSA CONSULTING, INC.
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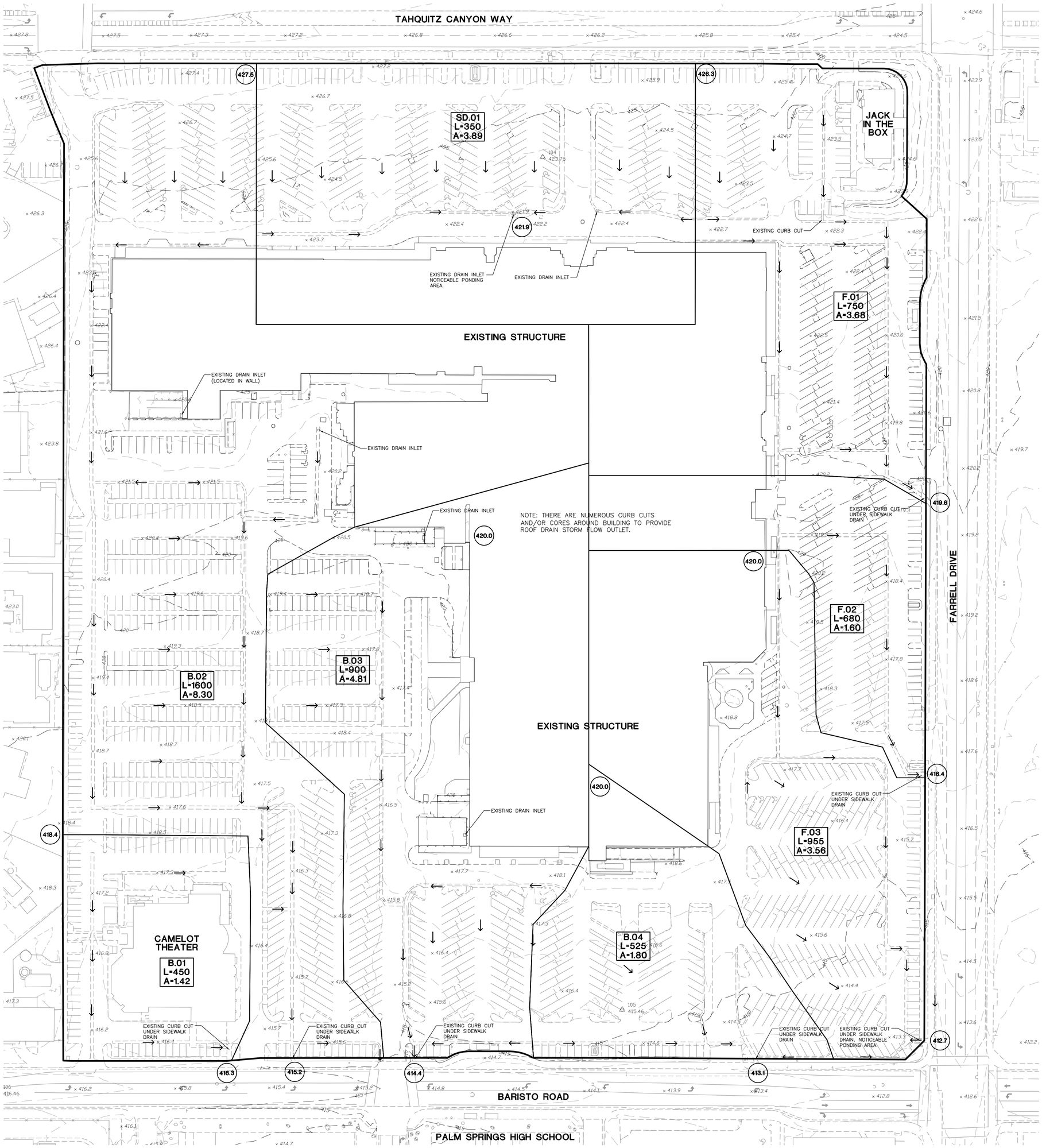
CITY OF PALM SPRINGS
COLLEGE OF THE DESERT - WEST VALLEY CAMPUS
WQMP EXHIBIT
PROPOSED PHASE 1 HYDROLOGY EXHIBIT

DESIGN BY	DLS
DRAWN BY	DLS
CHECK BY	JAD
SHEET	1
OF	1
SHEETS	



AREA RECONCILIATION SUMMARY

ASSUMPTIONS:
1. ALL DRAINAGE AREAS (DA) WERE ASSUMED TO BE COMMERCIAL LAND USE (90% IMPERVIOUS).
2. LOADING/RECIEVING DOCK DRAINS WERE IGNORED AND AREA INCLUDED IN SURFACE FLOW CALCULATIONS.

SURFACE FLOW TO BARISTO STREET:	
B01	1.42 AC
B02	8.30 AC
B03	4.81 AC
B04	1.80 AC
SUBTOTAL BARISTO DA	16.33 AC
SURFACE FLOW TO FARRELL DRIVE:	
F01	3.68 AC
F02	1.60 AC
F03	3.56 AC
SUBTOTAL FARRELL DA	8.84 AC
FLOW TO STORM DRAIN (UNKNOWN OUTLET):	
SD01	3.89 AC
TOTAL HYDROLOGIC AREA	29.06 AC

STORM EVENT SUMMARY – DA B.01

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	8,244	11,331	13,891	**17,070**
	(acre-ft)	0.19	0.26	0.32	**0.39**
PEAK FLOW	(cfs)	N/A	3.49	3.20	0.96

STORM EVENT SUMMARY – DA B.02

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	48,189	66,230	81,193	**99,777**
	(acre-ft)	1.11	1.52	1.86	**2.29**
PEAK FLOW	(cfs)	N/A	20.40	18.68	5.59

STORM EVENT SUMMARY – DA B.03

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	27,926	38,381	47,053	**57,823**
	(acre-ft)	0.64	0.88	1.08	**1.33**
PEAK FLOW	(cfs)	N/A	11.82	10.82	3.24

STORM EVENT SUMMARY – DA B.04

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	10,451	14,363	17,608	**21,638**
	(acre-ft)	0.24	0.33	0.40	**0.50**
PEAK FLOW	(cfs)	N/A	4.42	4.05	1.21

STORM EVENT SUMMARY – DA F.01

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	21,366	29,365	35,999	**44,238**
	(acre-ft)	0.49	0.67	0.83	**1.02**
PEAK FLOW	(cfs)	N/A	9.04	8.28	2.48

STORM EVENT SUMMARY – DA F.02

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	9,289	12,767	15,652	**19,234**
	(acre-ft)	0.21	0.29	0.36	**0.44**
PEAK FLOW	(cfs)	N/A	3.93	3.60	1.08

STORM EVENT SUMMARY – DA F.03

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	20,669	28,407	34,825	**42,796**
	(acre-ft)	0.47	0.65	0.80	**0.98**
PEAK FLOW	(cfs)	N/A	8.75	8.01	2.40

STORM EVENT SUMMARY – DA SD.01

DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.60	2.20	2.69	3.31
FLOOD VOLUME	(cu-ft)	22,585	31,040	38,053	**46,763**
	(acre-ft)	0.52	0.71	0.87	**1.07**
PEAK FLOW	(cfs)	N/A	9.56	8.75	2.62

LEGEND

DRAINAGE DIRECTION →

TRIBUTARY DRAINAGE AREA BOUNDARY ——

DRAINAGE SUB-AREA ID
FLOW TRAVEL LENGTH (FT)
AREA (AC)
XX
L=XX
A=XX

ELEVATION (XX.X)

NORTH

0' 50' 100' 150' 200'
SCALE 1"=50'

PRELIMINARY WQMP SUMMARY

FLOW TO BARISTO ROAD

DRAINAGE AREA	TOTAL AREA (acres)	IMPERVIOUS AREA (acres)	DESIGN VOLUME (cu-ft)	DESIGN FLOW (cfs)
DA-B.01	1.42	1.28	1,495	0.21
DA-B.02	8.30	7.47	8,737	1.21
DA-B.03	4.81	4.33	5,063	0.70
DA-B.04	1.80	1.62	1,895	0.26
TOTAL	16.33	14.70	17,190	2.38

FLOW TO FARRELL DRIVE

DRAINAGE AREA	TOTAL AREA (acres)	IMPERVIOUS AREA (acres)	DESIGN VOLUME (cu-ft)	DESIGN FLOW (cfs)
DA-F.01	3.68	3.31	3,874	0.54
DA-F.02	1.60	1.44	1,684	0.23
DA-F.03	3.56	3.20	3,748	0.52
TOTAL	8.84	7.95	9,306	1.29

FLOW TO UNDERGROUND STORM DRAIN (UNKNOWN OUTLET)

DRAINAGE AREA	TOTAL AREA (acres)	IMPERVIOUS AREA (acres)	DESIGN VOLUME (cu-ft)	DESIGN FLOW (cfs)
DA-SD.01	3.89	3.50	4,095	0.57

MAY 1, 2015

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RCFCD SYNTHETIC UNIT HYDROGRAPH METHOD (SHORTCUT METHOD)
EXISTING CONDITION HYDROLOGY EXHIBIT

DESIGN BY	DLS
DRAWN BY	DLS
CHECK BY	JAD
SHEET	1
OF	1
SHEETS	