

# Preliminary Hydrology Study

Apple Bear Retail Site

APN No. 0434-021-10-0-000, 0434-021-35-0-000, 0434-021-37-0-000

19439 Bear Valley Road

**Apple Valley, CA.**

September 12, 2022

This Hydraulic Study has been prepared by, and under the direction of, the undersigned, a duly Registered Civil Engineer in the State of California. Except as noted, the undersigned attests to the technical information contained herein, and has judged to be acceptable the qualifications of any technical specialists providing engineering data for this report, upon which findings, conclusions, and recommendations are based.

---

**Ryan Haskin, P.E.**

Registered Civil Engineer No. C84850

Exp.: 3/31/24

*Prepared for:*

**Wood Investment  
Companies**  
2950 Airway Ave, Suite A-9  
Costa Mesa, CA 92626

*Prepared by:*

  
**Tait & Associates, Inc.**  
701 N. Parkcenter Drive  
Santa Ana, CA 92705  
(714) 560-8200

TAIT JOB # **SP8979**

## Table of Contents

Section 1	Purpose and Scope.....	1
Section 2	Project Information.....	2
2.1	Project Description.....	2
2.2	Hydrologic Setting.....	2
Section 3	Design Criteria and Methodology.....	3
3.1	Design Criteria.....	3
3.1.1	Soil Type and Infiltration.....	3
3.1.2	Precipitation.....	3
3.2	Rational Method and Small Area Hydrograph.....	3
3.3	Bio-Infiltration Basin.....	4
Section 4	Hydrology Analysis.....	5
4.1	Summary of Results.....	5
Appendix A	– Soils Group Map.....	A
Appendix B	– Precipitation.....	B
Appendix C	– Existing Condition Hydrology Rational Method.....	C
Appendix D	– Proposed Condition Hydrology Rational Method.....	D
Appendix E	– Existing Condition Hydrology Map.....	E
Appendix F	– Proposed Condition Hydrology Map.....	F

## **Section 1 Purpose and Scope**

The proposed Appel Bear Retail Site is located in the Town of Apple Valley, County of San Bernardino, California. The site address is 19439 Bear Valley Road, at the southwest corner of Bear Valley Road and Flying Feather Road. The existing 10 acre site is composed of mostly undeveloped desert cover and a single residential house . The purpose of this hydrology report is to provide an analysis of the hydrologic effects of the development. It follows the requirements set forth in the San Bernardino County Hydrology Manual (SBCHM).

This preliminary hydrology study compares the existing and proposed condition hydrologic patterns and the impacts of the development. The analysis was prepared for the 2-, and 100-year storm events per the San Bernardino County Flood Control District Requirements and the mitigation analysis is provided. Included in the report are the general project characteristics, the design, criteria and methodology used for the preliminary design of the storm drain infrastructure of the project.

The plans and specifications in the Hydrology Study are not for construction purposes; the contractor shall refer to final approved construction documents for plans and specifications.

## **Section 2 Project Information**

### **2.1 Project Description**

The project is composed of developing approximately 10 acres of desert land for a retail center. The development will include a major retail building and several smaller building pads for commercial and retail use. A portion of the property will be dedicated to the Town of Apple Valley along Apple Valley Road where widening will occur. The project also includes the construction of 2 roads, Apple Bear Road which is private and Flying Feather Road which is public. For this preliminary hydrology study, only on-site runoff will be analyzed which is an area equal to 8.96 acres. Future studies will include improvement areas of Bear Valley Road and Flying Feather Road which are public.

The proposed improvements involve major grading of the parcel, building construction, utility installation, asphalt drive aisles, concrete walkways, and decorative landscape.

### **2.2 Hydrologic Setting**

Both in the existing and proposed condition, the project drains to the northwest. The existing drainage discharged as overland sheet flow to Apple Valley Road and is ultimately discharged into the Mojave River. In the proposed condition, water on-site will be directed to flow into a proposed infiltration basin where it will be treated and then infiltrate into the soil.

## Section 3 Design Criteria and Methodology

### 3.1 Design Criteria

This study has been prepared in conformance with the hydrologic procedures and standards set forth in the San Bernardino County Hydrology Manual (SBCHM), dated August 1986. In 2010, the County of San Bernardino, issued an addendum to their hydrology manual that updated rainfall data from the National Oceanic and Atmospheric Administration (NOAA) 1973 Atlas 2 to the NOAA Atlas 14, Volume 6. Per the SBCHM only the rational method is required for facility sizing when the watershed is less than 640 acres. For this analysis, the small area hydrograph analysis were prepared to provide the mitigation study. The San Bernardino County Flood Control District (SBCFCD) requires mitigation up to 90% of the existing condition for the 2- and 100-year storm events. The unit hydrograph were prepared using the Advance Engineering Software (AES) which is approved by the County of San Bernardino.

#### 3.1.1 Soil Type and Infiltration

The most significant factor affecting infiltration is the nature of the soil on the watershed. The U.S. Department of Agriculture Soil Conservation Service (now the Natural Resource Conservation Service) classifies soils according to their infiltration capacity. Per the SBCHM Soils area are classified as SCS Soil Type A, B, C and D. Soils in Group A have high infiltration rates, soils in Group B have a moderate infiltration rates, soils in Group C have low infiltration rates when thoroughly wet, and soils Group D have very low infiltration rates. The site is located in soil group C. Other important factors in soil infiltration is the antecedent moisture condition (AMC). The AMC used for this analysis was AMC I for the 2-year storm event and AMC III for the 100-year storm event. Appendix A provides the soils map obtain from the NRCS Web Soil Survey.

#### 3.1.2 Precipitation

The precipitation analysis was based upon the rainfall data obtained from the NOAA website specific to the site location (See Appendix B). The precipitation rainfall depths are provided for different frequencies and durations which are reproduced from NOAA Atlas 14, Volume 6.

### 3.2 Rational Method and Small Area Hydrograph

Per the SBCHM only the rational method is required for facility sizing when the watershed is less than 640 acres. The rational method is based on the equation:  $(Q = C \times I \times A)$

where:

Q = runoff (cfs)

C = runoff coefficient representing the ratio of runoff depth to rainfall depth

I = the time-averaged rainfall intensity in inches per hour corresponding to the time of concentration

A = drainage area (acres).

Per the SBCFCD requirements, the 2- and 100-year storm events need to be mitigated. The peak discharge in the proposed condition has to be less than 90% of the peak discharge in the existing condition for each storm event. This analysis was prepared using the Small Area Hydrograph analysis which is utilized for areas smaller than 640 acres. The small area hydrograph was modeled using AES and it is utilized to model the flow through the detention basin.

For this preliminary analysis, only the small area hydrograph was needed since the project plans to retain and infiltrate the proposed 100 year storm runoff and no peak flow calculations are needed because there will be no site discharge.

### 3.3 Infiltration Basin

The proposed condition will be mitigated utilizing a underground infiltration basin. The basin will provide the required design capture treatment volume of the project. The basin will also capture and infiltrate the 100 year storm runoff volume from the proposed development.

## Section 4 Hydrology Analysis

### 4.1 Summary of Results

Based on the results of this preliminary study, the proposed project mitigation measures will reduce and eliminate discharge by at least 10% for the 2-, 25- and 100-year storm events. The proposed project improvements will not have an adverse effect on the downstream drainage system. The proposed underground infiltration basin will capture and infiltrate all proposed site runoff up to the 100 year storm event. Table 1 summarizes the existing and proposed condition runoff values.

**Table 1. : Runoff Summary**

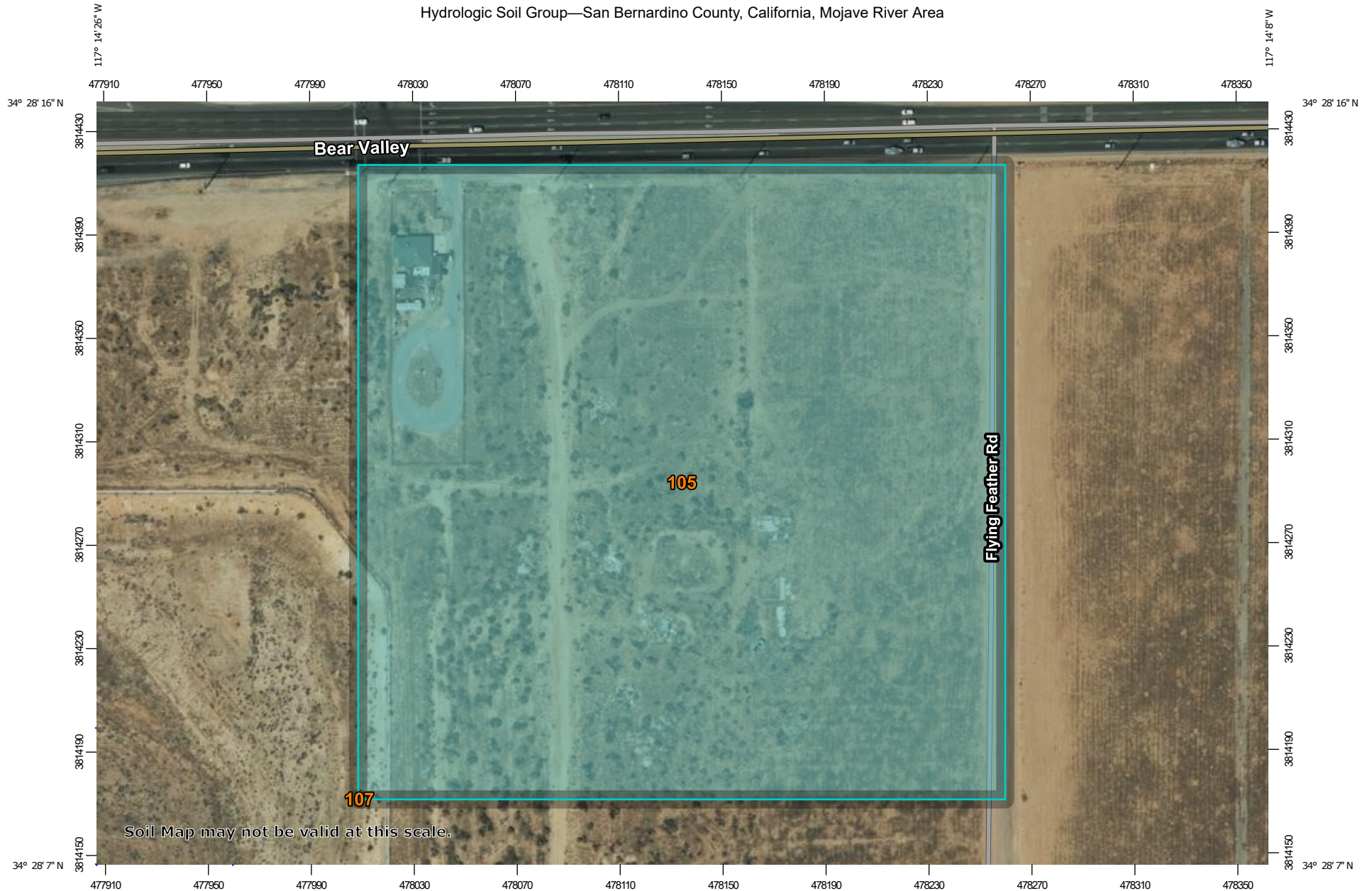
	Peak Discharge (cfs)		Runoff Volume (af)
	2-year	100-year	100-year
Existing Condition	5.53	22.87	1.42
Proposed Condition	7.23	24.57	2.21
Proposed Infiltration Basin	-	-	2.21

# **APPENDIX**

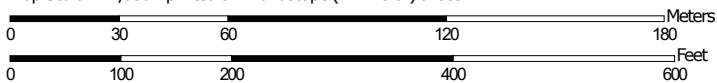


## **Appendix A – Soils Group Map**

Hydrologic Soil Group—San Bernardino County, California, Mojave River Area



Map Scale: 1:2,080 if printed on A landscape (11" x 8.5") sheet.




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:  
 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: San Bernardino County, California, Mojave River Area  
 Survey Area Data: Version 13, Sep 13, 2021

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

Date(s) aerial images were photographed: Mar 27, 2021—May 24, 2021

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

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
105	BRYMAN LOAMY FINE SAND, 0 TO 2 PERCENT SLOPES	C	15.3	100.0%
107	BRYMAN LOAMY FINE SAND, 5 TO 9 PERCENT SLOPES	C	0.0	0.0%
<b>Totals for Area of Interest</b>			<b>15.3</b>	<b>100.0%</b>

### 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 B – Precipitation**

(NOAA Atlas 14, Volume 6 Precipitation Frequency at )



**NOAA Atlas 14, Volume 6, Version 2**  
**Location name: Apple Valley, California, USA\***  
**Latitude: 34.4707°, Longitude: -117.2374°**  
**Elevation: 2870.89 ft\*\***



\* source: ESRI Maps  
 \*\* source: USGS

**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**

<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b>										
<b>Duration</b>	<b>Average recurrence interval (years)</b>									
	<b>1</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>200</b>	<b>500</b>	<b>1000</b>
<b>5-min</b>	<b>0.079</b> (0.066-0.097)	<b>0.112</b> (0.093-0.137)	<b>0.158</b> (0.130-0.194)	<b>0.197</b> (0.161-0.244)	<b>0.253</b> (0.200-0.324)	<b>0.299</b> (0.231-0.391)	<b>0.348</b> (0.263-0.466)	<b>0.401</b> (0.294-0.552)	<b>0.477</b> (0.336-0.684)	<b>0.538</b> (0.366-0.799)
<b>10-min</b>	<b>0.114</b> (0.094-0.139)	<b>0.161</b> (0.133-0.197)	<b>0.226</b> (0.186-0.278)	<b>0.282</b> (0.230-0.349)	<b>0.363</b> (0.287-0.464)	<b>0.429</b> (0.332-0.560)	<b>0.499</b> (0.377-0.668)	<b>0.575</b> (0.422-0.791)	<b>0.683</b> (0.481-0.980)	<b>0.772</b> (0.525-1.15)
<b>15-min</b>	<b>0.138</b> (0.114-0.168)	<b>0.194</b> (0.160-0.238)	<b>0.274</b> (0.225-0.336)	<b>0.341</b> (0.278-0.422)	<b>0.439</b> (0.347-0.562)	<b>0.519</b> (0.401-0.677)	<b>0.604</b> (0.456-0.808)	<b>0.695</b> (0.510-0.957)	<b>0.826</b> (0.582-1.19)	<b>0.933</b> (0.635-1.39)
<b>30-min</b>	<b>0.188</b> (0.156-0.230)	<b>0.266</b> (0.219-0.326)	<b>0.374</b> (0.308-0.459)	<b>0.467</b> (0.381-0.577)	<b>0.600</b> (0.474-0.768)	<b>0.709</b> (0.548-0.926)	<b>0.825</b> (0.623-1.11)	<b>0.951</b> (0.698-1.31)	<b>1.13</b> (0.796-1.62)	<b>1.28</b> (0.868-1.89)
<b>60-min</b>	<b>0.234</b> (0.193-0.286)	<b>0.330</b> (0.272-0.404)	<b>0.464</b> (0.382-0.569)	<b>0.579</b> (0.472-0.716)	<b>0.745</b> (0.588-0.953)	<b>0.880</b> (0.680-1.15)	<b>1.02</b> (0.773-1.37)	<b>1.18</b> (0.866-1.62)	<b>1.40</b> (0.987-2.01)	<b>1.58</b> (1.08-2.35)
<b>2-hr</b>	<b>0.334</b> (0.276-0.408)	<b>0.451</b> (0.372-0.553)	<b>0.614</b> (0.505-0.753)	<b>0.752</b> (0.614-0.931)	<b>0.951</b> (0.751-1.22)	<b>1.11</b> (0.860-1.45)	<b>1.28</b> (0.967-1.72)	<b>1.46</b> (1.07-2.01)	<b>1.72</b> (1.21-2.47)	<b>1.93</b> (1.31-2.86)
<b>3-hr</b>	<b>0.408</b> (0.337-0.499)	<b>0.543</b> (0.448-0.665)	<b>0.729</b> (0.600-0.895)	<b>0.888</b> (0.725-1.10)	<b>1.11</b> (0.879-1.43)	<b>1.30</b> (1.00-1.69)	<b>1.49</b> (1.12-1.99)	<b>1.69</b> (1.24-2.33)	<b>1.98</b> (1.40-2.84)	<b>2.21</b> (1.51-3.28)
<b>6-hr</b>	<b>0.562</b> (0.464-0.687)	<b>0.739</b> (0.610-0.905)	<b>0.980</b> (0.806-1.20)	<b>1.18</b> (0.966-1.47)	<b>1.47</b> (1.16-1.88)	<b>1.70</b> (1.32-2.22)	<b>1.94</b> (1.47-2.60)	<b>2.20</b> (1.61-3.02)	<b>2.56</b> (1.80-3.66)	<b>2.84</b> (1.93-4.21)
<b>12-hr</b>	<b>0.730</b> (0.603-0.892)	<b>0.965</b> (0.796-1.18)	<b>1.28</b> (1.06-1.58)	<b>1.55</b> (1.26-1.92)	<b>1.92</b> (1.52-2.46)	<b>2.21</b> (1.71-2.89)	<b>2.52</b> (1.90-3.37)	<b>2.84</b> (2.08-3.90)	<b>3.28</b> (2.31-4.70)	<b>3.63</b> (2.47-5.39)
<b>24-hr</b>	<b>0.965</b> (0.855-1.11)	<b>1.30</b> (1.15-1.49)	<b>1.74</b> (1.53-2.01)	<b>2.10</b> (1.84-2.45)	<b>2.61</b> (2.21-3.14)	<b>3.00</b> (2.49-3.69)	<b>3.41</b> (2.76-4.29)	<b>3.83</b> (3.02-4.96)	<b>4.42</b> (3.34-5.96)	<b>4.88</b> (3.56-6.81)
<b>2-day</b>	<b>1.15</b> (1.02-1.32)	<b>1.57</b> (1.39-1.81)	<b>2.13</b> (1.89-2.47)	<b>2.59</b> (2.27-3.02)	<b>3.22</b> (2.73-3.88)	<b>3.71</b> (3.08-4.57)	<b>4.21</b> (3.41-5.31)	<b>4.73</b> (3.73-6.13)	<b>5.44</b> (4.12-7.35)	<b>6.00</b> (4.38-8.38)
<b>3-day</b>	<b>1.25</b> (1.11-1.44)	<b>1.73</b> (1.53-2.00)	<b>2.37</b> (2.09-2.74)	<b>2.89</b> (2.53-3.36)	<b>3.60</b> (3.05-4.33)	<b>4.14</b> (3.44-5.10)	<b>4.71</b> (3.81-5.93)	<b>5.29</b> (4.17-6.85)	<b>6.08</b> (4.60-8.21)	<b>6.70</b> (4.90-9.36)
<b>4-day</b>	<b>1.33</b> (1.18-1.53)	<b>1.84</b> (1.63-2.12)	<b>2.53</b> (2.23-2.92)	<b>3.09</b> (2.71-3.60)	<b>3.85</b> (3.26-4.64)	<b>4.44</b> (3.69-5.46)	<b>5.04</b> (4.08-6.35)	<b>5.67</b> (4.46-7.34)	<b>6.52</b> (4.93-8.79)	<b>7.18</b> (5.25-10.0)
<b>7-day</b>	<b>1.44</b> (1.27-1.65)	<b>1.99</b> (1.76-2.29)	<b>2.73</b> (2.41-3.15)	<b>3.33</b> (2.92-3.88)	<b>4.17</b> (3.53-5.02)	<b>4.82</b> (4.00-5.92)	<b>5.48</b> (4.44-6.90)	<b>6.17</b> (4.86-7.99)	<b>7.11</b> (5.37-9.59)	<b>7.84</b> (5.73-11.0)
<b>10-day</b>	<b>1.52</b> (1.34-1.75)	<b>2.09</b> (1.85-2.41)	<b>2.87</b> (2.53-3.31)	<b>3.51</b> (3.08-4.09)	<b>4.40</b> (3.73-5.30)	<b>5.10</b> (4.23-6.27)	<b>5.82</b> (4.71-7.33)	<b>6.56</b> (5.17-8.49)	<b>7.59</b> (5.74-10.2)	<b>8.39</b> (6.13-11.7)
<b>20-day</b>	<b>1.72</b> (1.52-1.98)	<b>2.38</b> (2.11-2.75)	<b>3.30</b> (2.91-3.81)	<b>4.06</b> (3.56-4.73)	<b>5.14</b> (4.36-6.19)	<b>6.00</b> (4.98-7.37)	<b>6.88</b> (5.57-8.66)	<b>7.80</b> (6.15-10.1)	<b>9.07</b> (6.86-12.2)	<b>10.1</b> (7.36-14.1)
<b>30-day</b>	<b>1.93</b> (1.71-2.22)	<b>2.69</b> (2.38-3.10)	<b>3.74</b> (3.30-4.32)	<b>4.63</b> (4.06-5.40)	<b>5.90</b> (5.00-7.10)	<b>6.91</b> (5.73-8.49)	<b>7.95</b> (6.44-10.0)	<b>9.05</b> (7.13-11.7)	<b>10.6</b> (7.99-14.3)	<b>11.8</b> (8.59-16.4)
<b>45-day</b>	<b>2.29</b> (2.03-2.64)	<b>3.19</b> (2.83-3.68)	<b>4.45</b> (3.93-5.14)	<b>5.53</b> (4.85-6.44)	<b>7.08</b> (6.00-8.53)	<b>8.33</b> (6.92-10.2)	<b>9.64</b> (7.81-12.1)	<b>11.0</b> (8.67-14.3)	<b>12.9</b> (9.77-17.4)	<b>14.4</b> (10.5-20.1)
<b>60-day</b>	<b>2.49</b> (2.21-2.87)	<b>3.46</b> (3.06-3.98)	<b>4.83</b> (4.26-5.58)	<b>6.01</b> (5.27-7.01)	<b>7.73</b> (6.55-9.30)	<b>9.12</b> (7.57-11.2)	<b>10.6</b> (8.58-13.3)	<b>12.1</b> (9.56-15.7)	<b>14.3</b> (10.8-19.3)	<b>16.0</b> (11.7-22.4)

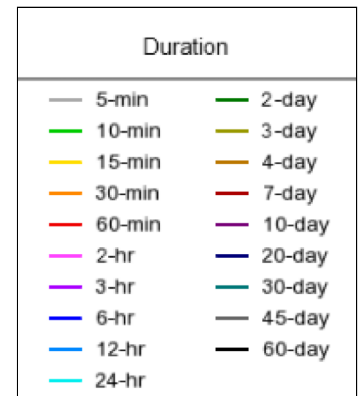
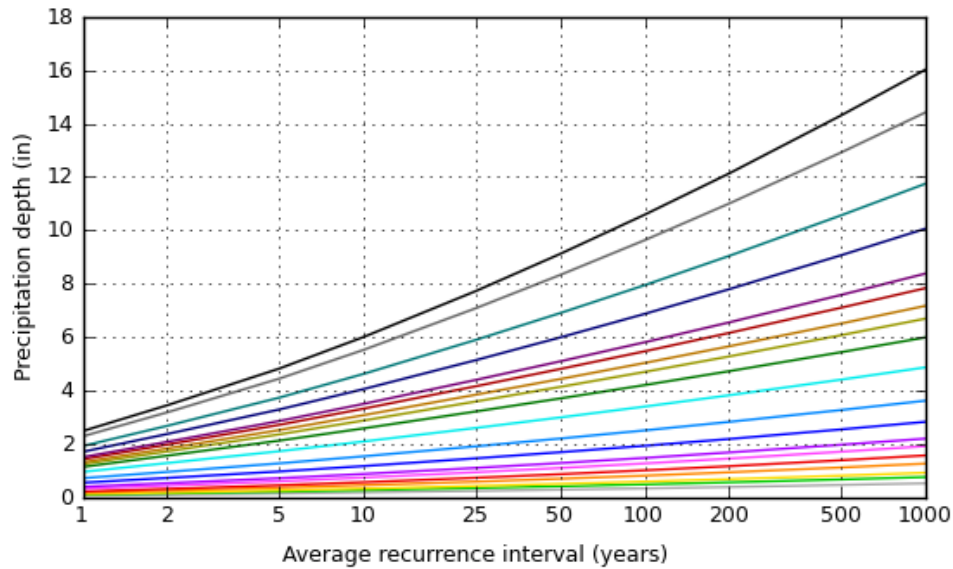
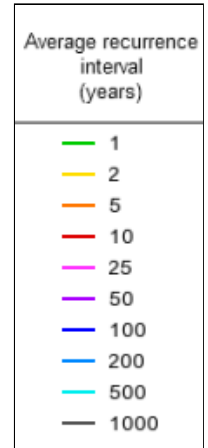
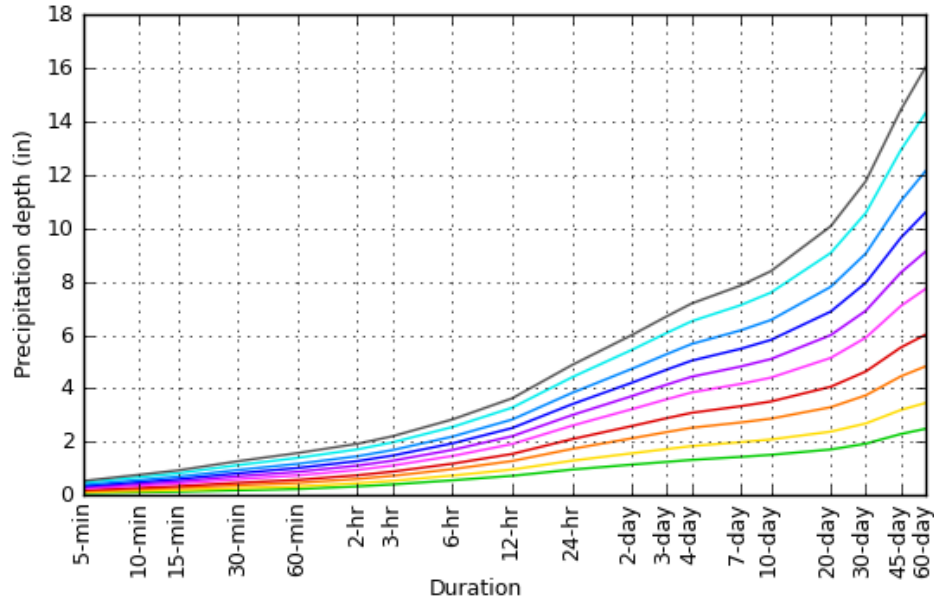
<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration 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 average maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

**PF graphical**

### PDS-based depth-duration-frequency (DDF) curves

Latitude: 34.4707°, Longitude: -117.2374°

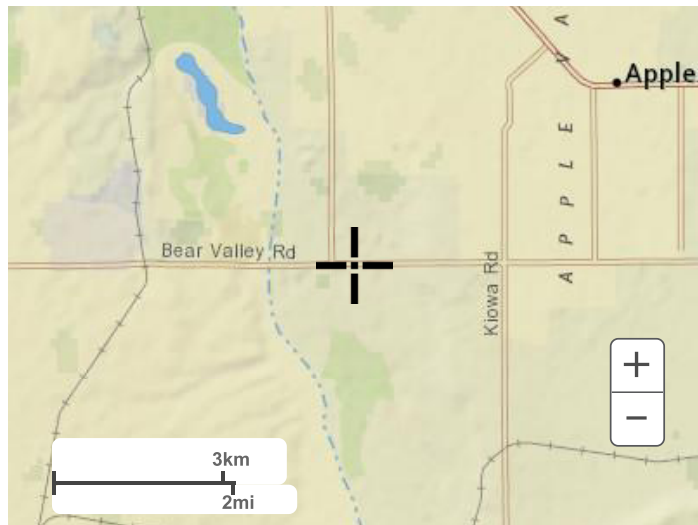


[Back to Top](#)

### Maps & aerials

Small scale terrain





Large scale terrain



Large scale map



Large scale aerial



[Back to Top](#)

---

[US Department of Commerce](#)  
[National Oceanic and Atmospheric Administration](#)  
[National Weather Service](#)  
[National Water Center](#)  
1325 East West Highway  
Silver Spring, MD 20910  
Questions?: [HDSC.Questions@noaa.gov](mailto:HDSC.Questions@noaa.gov)

[Disclaimer](#)

**Appendix C – Existing Condition Hydrology Rational Method**  
(2- and 100-year storm events AES Results)

\*\*\*\*\*

SMALL AREA UNIT HYDROGRAPH MODEL

(C) Copyright 1989-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1334

Analysis prepared by:

\*\*\*\*\*

Problem Descriptions:

SP8979 - Apple Valley
EXISTING CONDITION - 2 YEAR ON-SITE HYDROGRAPH

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA (ACRES) = 8.96
SOIL-LOSS RATE, Fm, (INCH/HR) = 0.248
LOW LOSS FRACTION = 0.450
TIME OF CONCENTRATION (MIN.) = 10.00
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY (YEARS) = 2
5-MINUTE POINT RAINFALL VALUE (INCHES) = 0.11
30-MINUTE POINT RAINFALL VALUE (INCHES) = 0.27
1-HOUR POINT RAINFALL VALUE (INCHES) = 0.33
3-HOUR POINT RAINFALL VALUE (INCHES) = 0.54
6-HOUR POINT RAINFALL VALUE (INCHES) = 0.74
24-HOUR POINT RAINFALL VALUE (INCHES) = 1.30

TOTAL CATCHMENT RUNOFF VOLUME (ACRE-FEET) = 0.50
TOTAL CATCHMENT SOIL-LOSS VOLUME (ACRE-FEET) = 0.48

\*\*\*\*\*

Table with 8 columns: TIME (HOURS), VOLUME (AF), Q (CFS), and four unlabeled columns representing different time intervals (0, 2.5, 5.0, 7.5, 10.0). Rows show data for times from 0.17 to 9.50 hours.

Table with 8 columns: TIME (HOURS), VOLUME (AF), Q (CFS), and four unlabeled columns representing different time intervals (0, 2.5, 5.0, 7.5, 10.0). Rows show data for times from 1.00 to 9.50 hours.

9.67	0.0982	0.17	Q	.	.	.	.
9.83	0.1006	0.17	Q	.	.	.	.
10.00	0.1029	0.17	Q	.	.	.	.
10.17	0.1053	0.18	Q	.	.	.	.
10.33	0.1077	0.18	Q	.	.	.	.
10.50	0.1102	0.18	Q	.	.	.	.
10.67	0.1127	0.18	Q	.	.	.	.
10.83	0.1153	0.19	Q	.	.	.	.
11.00	0.1179	0.19	Q	.	.	.	.
11.17	0.1206	0.20	Q	.	.	.	.
11.33	0.1233	0.20	Q	.	.	.	.
11.50	0.1261	0.20	Q	.	.	.	.
11.67	0.1289	0.21	Q	.	.	.	.
11.83	0.1318	0.21	Q	.	.	.	.
12.00	0.1348	0.22	Q	.	.	.	.
12.17	0.1380	0.25	.Q	.	.	.	.
12.33	0.1415	0.25	.Q	.	.	.	.
12.50	0.1450	0.26	.Q	.	.	.	.
12.67	0.1487	0.27	.Q	.	.	.	.
12.83	0.1524	0.28	.Q	.	.	.	.
13.00	0.1563	0.28	.Q	.	.	.	.
13.17	0.1603	0.29	.Q	.	.	.	.
13.33	0.1644	0.30	.Q	.	.	.	.
13.50	0.1686	0.31	.Q	.	.	.	.
13.67	0.1730	0.32	.Q	.	.	.	.
13.83	0.1775	0.34	.Q	.	.	.	.
14.00	0.1822	0.35	.Q	.	.	.	.
14.17	0.1871	0.36	.Q	.	.	.	.
14.33	0.1922	0.38	.Q	.	.	.	.
14.50	0.1976	0.40	.Q	.	.	.	.
14.67	0.2032	0.42	.Q	.	.	.	.
14.83	0.2093	0.46	.Q	.	.	.	.
15.00	0.2158	0.48	.Q	.	.	.	.
15.17	0.2228	0.54	.Q	.	.	.	.
15.33	0.2305	0.58	.Q	.	.	.	.
15.50	0.2376	0.45	.Q	.	.	.	.
15.67	0.2443	0.52	.Q	.	.	.	.
15.83	0.2570	1.32	.	Q	.	.	.
16.00	0.2780	1.72	.	Q	.	.	.
16.17	0.3279	5.53	.	.	Q	.	.
16.33	0.3703	0.62	.Q	.	.	.	.
16.50	0.3790	0.63	.Q	.	.	.	.
16.67	0.3868	0.51	.Q	.	.	.	.
16.83	0.3933	0.44	.Q	.	.	.	.
17.00	0.3990	0.39	.Q	.	.	.	.
17.17	0.4042	0.36	.Q	.	.	.	.
17.33	0.4089	0.33	.Q	.	.	.	.
17.50	0.4133	0.31	.Q	.	.	.	.
17.67	0.4174	0.29	.Q	.	.	.	.
17.83	0.4212	0.27	.Q	.	.	.	.
18.00	0.4249	0.26	.Q	.	.	.	.
18.17	0.4282	0.22	Q	.	.	.	.

18.33	0.4311	0.21	Q	.	.	.	.
18.50	0.4340	0.20	Q	.	.	.	.
18.67	0.4367	0.19	Q	.	.	.	.
18.83	0.4393	0.19	Q	.	.	.	.
19.00	0.4418	0.18	Q	.	.	.	.
19.17	0.4443	0.17	Q	.	.	.	.
19.33	0.4466	0.17	Q	.	.	.	.
19.50	0.4489	0.16	Q	.	.	.	.
19.67	0.4511	0.16	Q	.	.	.	.
19.83	0.4533	0.15	Q	.	.	.	.
20.00	0.4554	0.15	Q	.	.	.	.
20.17	0.4574	0.15	Q	.	.	.	.
20.33	0.4594	0.14	Q	.	.	.	.
20.50	0.4614	0.14	Q	.	.	.	.
20.67	0.4633	0.14	Q	.	.	.	.
20.83	0.4652	0.13	Q	.	.	.	.
21.00	0.4670	0.13	Q	.	.	.	.
21.17	0.4688	0.13	Q	.	.	.	.
21.33	0.4705	0.13	Q	.	.	.	.
21.50	0.4723	0.12	Q	.	.	.	.
21.67	0.4739	0.12	Q	.	.	.	.
21.83	0.4756	0.12	Q	.	.	.	.
22.00	0.4772	0.12	Q	.	.	.	.
22.17	0.4788	0.12	Q	.	.	.	.
22.33	0.4804	0.11	Q	.	.	.	.
22.50	0.4820	0.11	Q	.	.	.	.
22.67	0.4835	0.11	Q	.	.	.	.
22.83	0.4850	0.11	Q	.	.	.	.
23.00	0.4865	0.11	Q	.	.	.	.
23.17	0.4880	0.11	Q	.	.	.	.
23.33	0.4894	0.10	Q	.	.	.	.
23.50	0.4908	0.10	Q	.	.	.	.
23.67	0.4922	0.10	Q	.	.	.	.
23.83	0.4936	0.10	Q	.	.	.	.
24.00	0.4950	0.10	Q	.	.	.	.
24.17	0.4957	0.00	Q	.	.	.	.

-----  
TIME DURATION (minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:  
(Note: 100% of Peak Flow Rate estimate assumed to have  
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
=====	=====
0%	1440.0
10%	60.0
20%	30.0
30%	20.0
40%	10.0
50%	10.0
60%	10.0

70%  
80%  
90%

10.0  
10.0  
10.0

\*\*\*\*\*  
 NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)  
 AND LOW LOSS FRACTION ESTIMATIONS  
 =====

(C) Copyright 1989-2016 Advanced Engineering Software (aes)  
 Ver. 23.0 Release Date: 07/01/2016 License ID 1334

Analysis prepared by:

\*\*\*\*\*

-----  
 Problem Descriptions:

SP8979 - Apple Valley  
 EXISTING CONDITION - 100 YEAR ON-SITE HYDROGRAPH  
 -----

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90  
 TOTAL CATCHMENT AREA (ACRES) = 8.96  
 SOIL-LOSS RATE, Fm, (INCH/HR) = 0.248  
 LOW LOSS FRACTION = 0.450  
 TIME OF CONCENTRATION (MIN.) = 10.00  
 SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA  
 USER SPECIFIED RAINFALL VALUES ARE USED  
 RETURN FREQUENCY (YEARS) = 100  
 5-MINUTE POINT RAINFALL VALUE (INCHES) = 0.38  
 30-MINUTE POINT RAINFALL VALUE (INCHES) = 0.83  
 1-HOUR POINT RAINFALL VALUE (INCHES) = 1.02  
 3-HOUR POINT RAINFALL VALUE (INCHES) = 1.49  
 6-HOUR POINT RAINFALL VALUE (INCHES) = 1.94  
 24-HOUR POINT RAINFALL VALUE (INCHES) = 3.41

-----  
 TOTAL CATCHMENT RUNOFF VOLUME (ACRE-FEET) = 1.42  
 TOTAL CATCHMENT SOIL-LOSS VOLUME (ACRE-FEET) = 1.13  
 -----

\*\*\*\*\*

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	7.5	15.0	22.5	30.0
0.17	0.0018	0.26 Q	.	.	.	.	.
0.33	0.0053	0.26 Q	.	.	.	.	.
0.50	0.0089	0.26 Q	.	.	.	.	.
0.67	0.0125	0.26 Q	.	.	.	.	.

0.83	0.0161	0.26 Q	.	.	.	.	.
1.00	0.0197	0.26 Q	.	.	.	.	.
1.17	0.0234	0.27 Q	.	.	.	.	.
1.33	0.0271	0.27 Q	.	.	.	.	.
1.50	0.0308	0.27 Q	.	.	.	.	.
1.67	0.0345	0.27 Q	.	.	.	.	.
1.83	0.0383	0.27 Q	.	.	.	.	.
2.00	0.0421	0.28 Q	.	.	.	.	.
2.17	0.0459	0.28 Q	.	.	.	.	.
2.33	0.0497	0.28 Q	.	.	.	.	.
2.50	0.0536	0.28 Q	.	.	.	.	.
2.67	0.0575	0.28 Q	.	.	.	.	.
2.83	0.0614	0.29 Q	.	.	.	.	.
3.00	0.0654	0.29 Q	.	.	.	.	.
3.17	0.0694	0.29 Q	.	.	.	.	.
3.33	0.0734	0.29 Q	.	.	.	.	.
3.50	0.0774	0.30 Q	.	.	.	.	.
3.67	0.0815	0.30 Q	.	.	.	.	.
3.83	0.0856	0.30 Q	.	.	.	.	.
4.00	0.0897	0.30 Q	.	.	.	.	.
4.17	0.0939	0.30 Q	.	.	.	.	.
4.33	0.0981	0.31 Q	.	.	.	.	.
4.50	0.1024	0.31 Q	.	.	.	.	.
4.67	0.1067	0.31 Q	.	.	.	.	.
4.83	0.1110	0.32 Q	.	.	.	.	.
5.00	0.1153	0.32 Q	.	.	.	.	.
5.17	0.1197	0.32 Q	.	.	.	.	.
5.33	0.1242	0.32 Q	.	.	.	.	.
5.50	0.1287	0.33 Q	.	.	.	.	.
5.67	0.1332	0.33 Q	.	.	.	.	.
5.83	0.1377	0.33 Q	.	.	.	.	.
6.00	0.1423	0.34 Q	.	.	.	.	.
6.17	0.1470	0.34 Q	.	.	.	.	.
6.33	0.1517	0.34 Q	.	.	.	.	.
6.50	0.1564	0.35 Q	.	.	.	.	.
6.67	0.1612	0.35 Q	.	.	.	.	.
6.83	0.1661	0.35 Q	.	.	.	.	.
7.00	0.1710	0.36 Q	.	.	.	.	.
7.17	0.1759	0.36 Q	.	.	.	.	.
7.33	0.1809	0.36 Q	.	.	.	.	.
7.50	0.1860	0.37 Q	.	.	.	.	.
7.67	0.1911	0.37 Q	.	.	.	.	.
7.83	0.1963	0.38 Q	.	.	.	.	.
8.00	0.2015	0.38 Q	.	.	.	.	.
8.17	0.2068	0.39 Q	.	.	.	.	.
8.33	0.2122	0.39 Q	.	.	.	.	.
8.50	0.2177	0.40 Q	.	.	.	.	.
8.67	0.2232	0.40 Q	.	.	.	.	.
8.83	0.2288	0.41 Q	.	.	.	.	.
9.00	0.2344	0.41 Q	.	.	.	.	.
9.17	0.2402	0.42 Q	.	.	.	.	.
9.33	0.2460	0.42 Q	.	.	.	.	.

9.50	0.2519	0.43	Q	.	.	.	.
9.67	0.2579	0.44	Q	.	.	.	.
9.83	0.2640	0.45	Q	.	.	.	.
10.00	0.2701	0.45	Q	.	.	.	.
10.17	0.2764	0.46	Q	.	.	.	.
10.33	0.2828	0.47	Q	.	.	.	.
10.50	0.2893	0.48	Q	.	.	.	.
10.67	0.2959	0.48	Q	.	.	.	.
10.83	0.3027	0.49	Q	.	.	.	.
11.00	0.3095	0.50	Q	.	.	.	.
11.17	0.3165	0.51	Q	.	.	.	.
11.33	0.3237	0.52	Q	.	.	.	.
11.50	0.3310	0.54	Q	.	.	.	.
11.67	0.3384	0.54	Q	.	.	.	.
11.83	0.3460	0.56	Q	.	.	.	.
12.00	0.3538	0.57	Q	.	.	.	.
12.17	0.3615	0.55	Q	.	.	.	.
12.33	0.3692	0.56	Q	.	.	.	.
12.50	0.3770	0.58	Q	.	.	.	.
12.67	0.3851	0.59	Q	.	.	.	.
12.83	0.3935	0.62	Q	.	.	.	.
13.00	0.4021	0.63	Q	.	.	.	.
13.17	0.4109	0.66	Q	.	.	.	.
13.33	0.4201	0.68	Q	.	.	.	.
13.50	0.4297	0.71	Q	.	.	.	.
13.67	0.4396	0.73	Q	.	.	.	.
13.83	0.4500	0.77	.Q	.	.	.	.
14.00	0.4608	0.80	.Q	.	.	.	.
14.17	0.4716	0.77	.Q	.	.	.	.
14.33	0.4825	0.80	.Q	.	.	.	.
14.50	0.4941	0.88	.Q	.	.	.	.
14.67	0.5064	0.92	.Q	.	.	.	.
14.83	0.5198	1.02	.Q	.	.	.	.
15.00	0.5343	1.08	.Q	.	.	.	.
15.17	0.5503	1.24	.Q	.	.	.	.
15.33	0.5681	1.35	.Q	.	.	.	.
15.50	0.5873	1.43	.Q	.	.	.	.
15.67	0.6085	1.65	.Q	.	.	.	.
15.83	0.6509	4.51	.	Q	.	.	.
16.00	0.7287	6.78	.	Q	.	.	.
16.17	0.9329	22.87	.	.	Q	.	.
16.33	1.1040	1.97	.Q	.	.	.	.
16.50	1.1278	1.48	.Q	.	.	.	.
16.67	1.1459	1.16	.Q	.	.	.	.
16.83	1.1606	0.97	.Q	.	.	.	.
17.00	1.1730	0.84	.Q	.	.	.	.
17.17	1.1844	0.82	.Q	.	.	.	.
17.33	1.1953	0.75	.Q	.	.	.	.
17.50	1.2052	0.69	Q	.	.	.	.
17.67	1.2144	0.65	Q	.	.	.	.
17.83	1.2231	0.61	Q	.	.	.	.
18.00	1.2312	0.57	Q	.	.	.	.

18.17	1.2391	0.58	Q	.	.	.	.
18.33	1.2469	0.55	Q	.	.	.	.
18.50	1.2543	0.53	Q	.	.	.	.
18.67	1.2614	0.51	Q	.	.	.	.
18.83	1.2683	0.49	Q	.	.	.	.
19.00	1.2749	0.47	Q	.	.	.	.
19.17	1.2813	0.46	Q	.	.	.	.
19.33	1.2875	0.44	Q	.	.	.	.
19.50	1.2935	0.43	Q	.	.	.	.
19.67	1.2993	0.42	Q	.	.	.	.
19.83	1.3050	0.41	Q	.	.	.	.
20.00	1.3105	0.39	Q	.	.	.	.
20.17	1.3159	0.39	Q	.	.	.	.
20.33	1.3211	0.38	Q	.	.	.	.
20.50	1.3262	0.37	Q	.	.	.	.
20.67	1.3312	0.36	Q	.	.	.	.
20.83	1.3361	0.35	Q	.	.	.	.
21.00	1.3409	0.34	Q	.	.	.	.
21.17	1.3456	0.34	Q	.	.	.	.
21.33	1.3502	0.33	Q	.	.	.	.
21.50	1.3548	0.33	Q	.	.	.	.
21.67	1.3592	0.32	Q	.	.	.	.
21.83	1.3636	0.31	Q	.	.	.	.
22.00	1.3678	0.31	Q	.	.	.	.
22.17	1.3720	0.30	Q	.	.	.	.
22.33	1.3762	0.30	Q	.	.	.	.
22.50	1.3803	0.29	Q	.	.	.	.
22.67	1.3843	0.29	Q	.	.	.	.
22.83	1.3882	0.28	Q	.	.	.	.
23.00	1.3921	0.28	Q	.	.	.	.
23.17	1.3960	0.28	Q	.	.	.	.
23.33	1.3998	0.27	Q	.	.	.	.
23.50	1.4035	0.27	Q	.	.	.	.
23.67	1.4072	0.27	Q	.	.	.	.
23.83	1.4108	0.26	Q	.	.	.	.
24.00	1.4144	0.26	Q	.	.	.	.
24.17	1.4162	0.00	Q	.	.	.	.

-----  
TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:  
(Note: 100% of Peak Flow Rate estimate assumed to have  
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
=====	=====
0%	1440.0
10%	30.0
20%	20.0
30%	10.0
40%	10.0
50%	10.0



60%  
70%  
80%  
90%

10.0  
10.0  
10.0  
10.0

**Appendix D – Proposed Condition Hydrology Rational Method**  
(2- and 100-year storm events AES Results)

\*\*\*\*\*

SMALL AREA UNIT HYDROGRAPH MODEL

(C) Copyright 1989-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1334

Analysis prepared by:

\*\*\*\*\*

Problem Descriptions:

SP8979 - Apple Valley
PROPOSED CONDITION - 2 YEAR ON-SITE HYDROGRAPH

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA (ACRES) = 8.96
SOIL-LOSS RATE, Fm, (INCH/HR) = 0.038
LOW LOSS FRACTION = 0.380
TIME OF CONCENTRATION (MIN.) = 10.00
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY (YEARS) = 2
5-MINUTE POINT RAINFALL VALUE (INCHES) = 0.11
30-MINUTE POINT RAINFALL VALUE (INCHES) = 0.27
1-HOUR POINT RAINFALL VALUE (INCHES) = 0.33
3-HOUR POINT RAINFALL VALUE (INCHES) = 0.54
6-HOUR POINT RAINFALL VALUE (INCHES) = 0.74
24-HOUR POINT RAINFALL VALUE (INCHES) = 1.30

TOTAL CATCHMENT RUNOFF VOLUME (ACRE-FEET) = 0.60
TOTAL CATCHMENT SOIL-LOSS VOLUME (ACRE-FEET) = 0.37

\*\*\*\*\*

Table with 8 columns: TIME (HOURS), VOLUME (AF), Q (CFS), and four unlabeled columns representing different time intervals (0, 2.5, 5.0, 7.5, 10.0). Rows show data for times from 0.17 to 9.50 hours.

Hydrograph data table with 8 columns: Time (hours), Volume (AF), Peak Flow Rate (CFS), and four unlabeled columns representing different time intervals (0, 2.5, 5.0, 7.5, 10.0). Rows show data for times from 1.00 to 9.50 hours.

9.67	0.1107	0.19	Q	.	.	.	.
9.83	0.1133	0.19	Q	.	.	.	.
10.00	0.1160	0.19	Q	.	.	.	.
10.17	0.1187	0.20	Q	.	.	.	.
10.33	0.1214	0.20	Q	.	.	.	.
10.50	0.1242	0.21	Q	.	.	.	.
10.67	0.1271	0.21	Q	.	.	.	.
10.83	0.1300	0.21	Q	.	.	.	.
11.00	0.1329	0.22	Q	.	.	.	.
11.17	0.1359	0.22	Q	.	.	.	.
11.33	0.1390	0.22	Q	.	.	.	.
11.50	0.1421	0.23	Q	.	.	.	.
11.67	0.1453	0.23	Q	.	.	.	.
11.83	0.1486	0.24	Q	.	.	.	.
12.00	0.1519	0.24	Q	.	.	.	.
12.17	0.1556	0.28	.Q	.	.	.	.
12.33	0.1595	0.29	.Q	.	.	.	.
12.50	0.1635	0.30	.Q	.	.	.	.
12.67	0.1676	0.30	.Q	.	.	.	.
12.83	0.1718	0.31	.Q	.	.	.	.
13.00	0.1762	0.32	.Q	.	.	.	.
13.17	0.1807	0.33	.Q	.	.	.	.
13.33	0.1853	0.34	.Q	.	.	.	.
13.50	0.1900	0.35	.Q	.	.	.	.
13.67	0.1950	0.36	.Q	.	.	.	.
13.83	0.2001	0.38	.Q	.	.	.	.
14.00	0.2054	0.39	.Q	.	.	.	.
14.17	0.2109	0.41	.Q	.	.	.	.
14.33	0.2167	0.42	.Q	.	.	.	.
14.50	0.2227	0.45	.Q	.	.	.	.
14.67	0.2291	0.47	.Q	.	.	.	.
14.83	0.2360	0.53	.Q	.	.	.	.
15.00	0.2435	0.57	.Q	.	.	.	.
15.17	0.2521	0.68	.Q	.	.	.	.
15.33	0.2620	0.75	.Q	.	.	.	.
15.50	0.2707	0.51	.Q	.	.	.	.
15.67	0.2786	0.64	.Q	.	.	.	.
15.83	0.2975	2.10	.	Q	.	.	.
16.00	0.3313	2.82	.	.	.Q	.	.
16.17	0.4006	7.23	.	.	.	Q	.
16.33	0.4560	0.83	.Q	.	.	.	.
16.50	0.4675	0.84	.Q	.	.	.	.
16.67	0.4775	0.62	.Q	.	.	.	.
16.83	0.4852	0.49	.Q	.	.	.	.
17.00	0.4916	0.44	.Q	.	.	.	.
17.17	0.4974	0.40	.Q	.	.	.	.
17.33	0.5027	0.37	.Q	.	.	.	.
17.50	0.5077	0.35	.Q	.	.	.	.
17.67	0.5123	0.32	.Q	.	.	.	.
17.83	0.5166	0.31	.Q	.	.	.	.
18.00	0.5207	0.29	.Q	.	.	.	.
18.17	0.5245	0.25	Q	.	.	.	.

18.33	0.5278	0.24	Q	.	.	.	.
18.50	0.5310	0.23	Q	.	.	.	.
18.67	0.5341	0.22	Q	.	.	.	.
18.83	0.5370	0.21	Q	.	.	.	.
19.00	0.5399	0.20	Q	.	.	.	.
19.17	0.5426	0.20	Q	.	.	.	.
19.33	0.5453	0.19	Q	.	.	.	.
19.50	0.5478	0.18	Q	.	.	.	.
19.67	0.5503	0.18	Q	.	.	.	.
19.83	0.5528	0.17	Q	.	.	.	.
20.00	0.5551	0.17	Q	.	.	.	.
20.17	0.5575	0.17	Q	.	.	.	.
20.33	0.5597	0.16	Q	.	.	.	.
20.50	0.5619	0.16	Q	.	.	.	.
20.67	0.5641	0.15	Q	.	.	.	.
20.83	0.5662	0.15	Q	.	.	.	.
21.00	0.5682	0.15	Q	.	.	.	.
21.17	0.5702	0.15	Q	.	.	.	.
21.33	0.5722	0.14	Q	.	.	.	.
21.50	0.5742	0.14	Q	.	.	.	.
21.67	0.5761	0.14	Q	.	.	.	.
21.83	0.5779	0.13	Q	.	.	.	.
22.00	0.5798	0.13	Q	.	.	.	.
22.17	0.5816	0.13	Q	.	.	.	.
22.33	0.5834	0.13	Q	.	.	.	.
22.50	0.5851	0.13	Q	.	.	.	.
22.67	0.5868	0.12	Q	.	.	.	.
22.83	0.5885	0.12	Q	.	.	.	.
23.00	0.5902	0.12	Q	.	.	.	.
23.17	0.5919	0.12	Q	.	.	.	.
23.33	0.5935	0.12	Q	.	.	.	.
23.50	0.5951	0.12	Q	.	.	.	.
23.67	0.5967	0.11	Q	.	.	.	.
23.83	0.5982	0.11	Q	.	.	.	.
24.00	0.5998	0.11	Q	.	.	.	.
24.17	0.6005	0.00	Q	.	.	.	.

-----  
TIME DURATION (minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:  
(Note: 100% of Peak Flow Rate estimate assumed to have  
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
=====	=====
0%	1440.0
10%	60.0
20%	30.0
30%	20.0
40%	10.0
50%	10.0
60%	10.0

70%  
80%  
90%

10.0  
10.0  
10.0

\*\*\*\*\*

SMALL AREA UNIT HYDROGRAPH MODEL

(C) Copyright 1989-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1334

Analysis prepared by:

\*\*\*\*\*

Problem Descriptions:

SP8979 - Apple Valley
PROPOSED 100 YEAR ON-SITE HYDROGRAPH

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA (ACRES) = 8.96
SOIL-LOSS RATE, Fm, (INCH/HR) = 0.038
LOW LOSS FRACTION = 0.030
TIME OF CONCENTRATION (MIN.) = 10.00
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
USER SPECIFIED RAINFALL VALUES ARE USED
RETURN FREQUENCY (YEARS) = 100
5-MINUTE POINT RAINFALL VALUE (INCHES) = 0.38
30-MINUTE POINT RAINFALL VALUE (INCHES) = 0.83
1-HOUR POINT RAINFALL VALUE (INCHES) = 1.02
3-HOUR POINT RAINFALL VALUE (INCHES) = 1.49
6-HOUR POINT RAINFALL VALUE (INCHES) = 1.94
24-HOUR POINT RAINFALL VALUE (INCHES) = 3.41

TOTAL CATCHMENT RUNOFF VOLUME (ACRE-FEET) = 2.21
TOTAL CATCHMENT SOIL-LOSS VOLUME (ACRE-FEET) = 0.34

\*\*\*\*\*

Table with 8 columns: TIME (HOURS), VOLUME (AF), Q (CFS), and four unlabeled columns with values 0., 7.5, 15.0, 22.5, 30.0. Rows show data for times 0.17, 0.33, 0.50, and 0.67 hours.

Hydrograph data table with 8 columns: Time (hours), Volume (AF), Q (CFS), and four unlabeled columns with values 0., 7.5, 15.0, 22.5, 30.0. Rows show data for times from 0.83 to 9.33 hours.

9.50	0.4442	0.76	.Q	.	.	.	.
9.67	0.4548	0.77	.Q	.	.	.	.
9.83	0.4655	0.79	.Q	.	.	.	.
10.00	0.4764	0.80	.Q	.	.	.	.
10.17	0.4875	0.81	.Q	.	.	.	.
10.33	0.4988	0.82	.Q	.	.	.	.
10.50	0.5103	0.84	.Q	.	.	.	.
10.67	0.5219	0.85	.Q	.	.	.	.
10.83	0.5338	0.87	.Q	.	.	.	.
11.00	0.5459	0.88	.Q	.	.	.	.
11.17	0.5582	0.91	.Q	.	.	.	.
11.33	0.5708	0.92	.Q	.	.	.	.
11.50	0.5837	0.95	.Q	.	.	.	.
11.67	0.5968	0.96	.Q	.	.	.	.
11.83	0.6102	0.99	.Q	.	.	.	.
12.00	0.6239	1.00	.Q	.	.	.	.
12.17	0.6376	0.97	.Q	.	.	.	.
12.33	0.6511	0.99	.Q	.	.	.	.
12.50	0.6649	1.03	.Q	.	.	.	.
12.67	0.6792	1.05	.Q	.	.	.	.
12.83	0.6939	1.09	.Q	.	.	.	.
13.00	0.7091	1.11	.Q	.	.	.	.
13.17	0.7248	1.16	.Q	.	.	.	.
13.33	0.7410	1.19	.Q	.	.	.	.
13.50	0.7578	1.25	.Q	.	.	.	.
13.67	0.7753	1.29	.Q	.	.	.	.
13.83	0.7936	1.36	.Q	.	.	.	.
14.00	0.8127	1.41	.Q	.	.	.	.
14.17	0.8318	1.37	.Q	.	.	.	.
14.33	0.8510	1.42	.Q	.	.	.	.
14.50	0.8714	1.54	.Q	.	.	.	.
14.67	0.8932	1.62	.Q	.	.	.	.
14.83	0.9167	1.80	.Q	.	.	.	.
15.00	0.9422	1.91	.Q	.	.	.	.
15.17	0.9705	2.19	.Q	.	.	.	.
15.33	1.0020	2.38	.Q	.	.	.	.
15.50	1.0357	2.53	.Q	.	.	.	.
15.67	1.0732	2.91	.Q	.	.	.	.
15.83	1.1367	6.31	.	Q	.	.	.
16.00	1.2388	8.51	.	.Q	.	.	.
16.17	1.4667	24.57	.	.	.	Q	.
16.33	1.6598	3.48	.	.	Q	.	.
16.50	1.7018	2.61	.	.	Q	.	.
16.67	1.7338	2.04	.	.	Q	.	.
16.83	1.7596	1.70	.	.	Q	.	.
17.00	1.7815	1.48	.Q	.	.	.	.
17.17	1.8017	1.45	.Q	.	.	.	.
17.33	1.8208	1.33	.Q	.	.	.	.
17.50	1.8384	1.22	.Q	.	.	.	.
17.67	1.8546	1.14	.Q	.	.	.	.
17.83	1.8698	1.07	.Q	.	.	.	.
18.00	1.8841	1.01	.Q	.	.	.	.

18.17	1.8981	1.02	.Q	.	.	.	.
18.33	1.9118	0.97	.Q	.	.	.	.
18.50	1.9249	0.93	.Q	.	.	.	.
18.67	1.9375	0.90	.Q	.	.	.	.
18.83	1.9496	0.86	.Q	.	.	.	.
19.00	1.9613	0.83	.Q	.	.	.	.
19.17	1.9726	0.80	.Q	.	.	.	.
19.33	1.9835	0.78	.Q	.	.	.	.
19.50	1.9941	0.76	.Q	.	.	.	.
19.67	2.0043	0.73	Q	.	.	.	.
19.83	2.0143	0.72	Q	.	.	.	.
20.00	2.0240	0.70	Q	.	.	.	.
20.17	2.0335	0.68	Q	.	.	.	.
20.33	2.0428	0.66	Q	.	.	.	.
20.50	2.0518	0.65	Q	.	.	.	.
20.67	2.0606	0.63	Q	.	.	.	.
20.83	2.0693	0.62	Q	.	.	.	.
21.00	2.0777	0.61	Q	.	.	.	.
21.17	2.0860	0.60	Q	.	.	.	.
21.33	2.0941	0.58	Q	.	.	.	.
21.50	2.1021	0.57	Q	.	.	.	.
21.67	2.1099	0.56	Q	.	.	.	.
21.83	2.1176	0.55	Q	.	.	.	.
22.00	2.1252	0.54	Q	.	.	.	.
22.17	2.1326	0.53	Q	.	.	.	.
22.33	2.1399	0.53	Q	.	.	.	.
22.50	2.1471	0.52	Q	.	.	.	.
22.67	2.1542	0.51	Q	.	.	.	.
22.83	2.1612	0.50	Q	.	.	.	.
23.00	2.1680	0.50	Q	.	.	.	.
23.17	2.1748	0.49	Q	.	.	.	.
23.33	2.1815	0.48	Q	.	.	.	.
23.50	2.1881	0.48	Q	.	.	.	.
23.67	2.1946	0.47	Q	.	.	.	.
23.83	2.2010	0.46	Q	.	.	.	.
24.00	2.2073	0.46	Q	.	.	.	.
24.17	2.2105	0.00	Q	.	.	.	.

-----  
TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:  
(Note: 100% of Peak Flow Rate estimate assumed to have  
an instantaneous time duration)

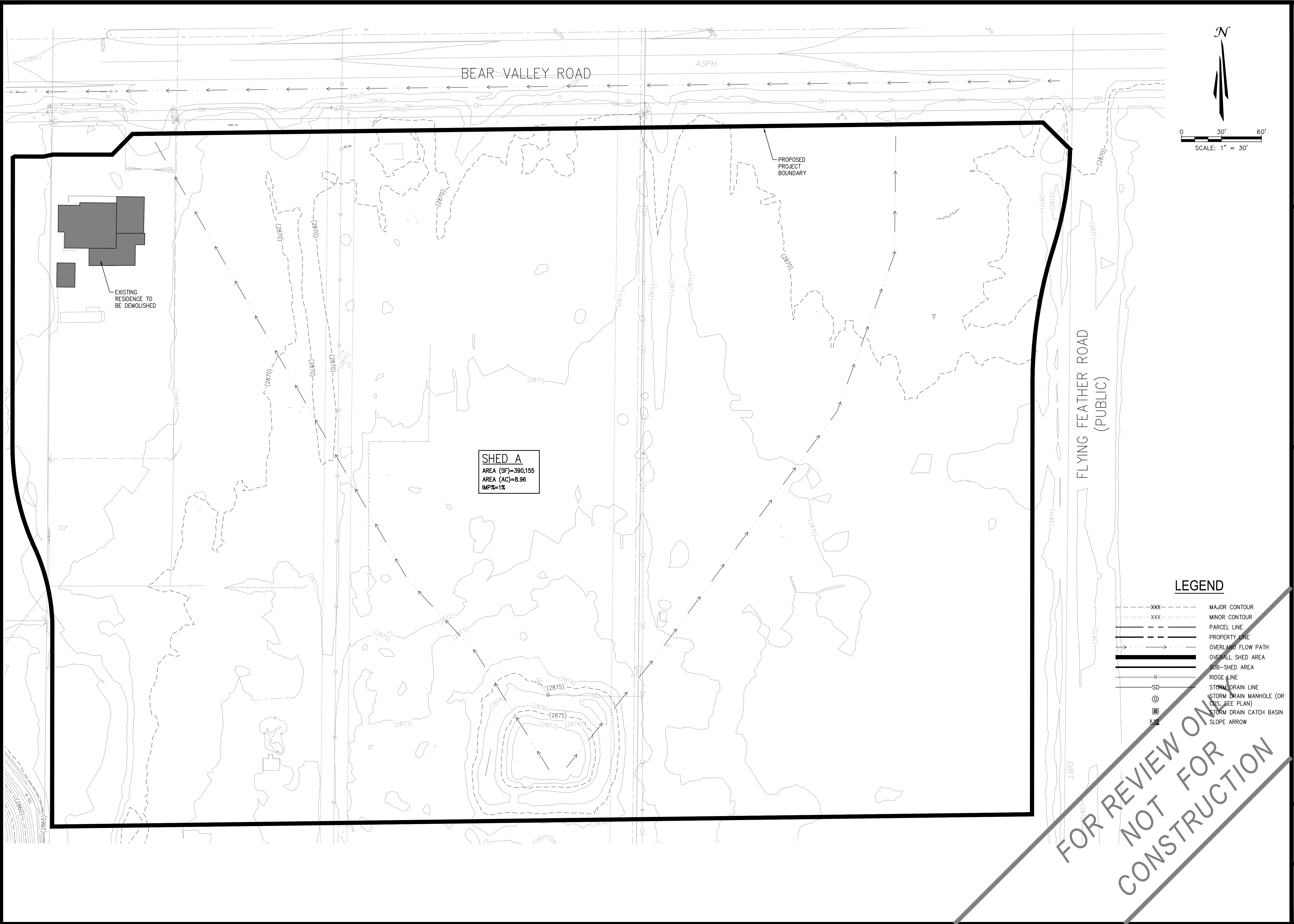
Percentile of Estimated Peak Flow Rate	Duration (minutes)
=====	=====
0%	1440.0
10%	70.0
20%	30.0
30%	20.0
40%	10.0
50%	10.0

60%  
70%  
80%  
90%

10.0  
10.0  
10.0  
10.0



## **Appendix E – Existing Condition Hydrology Map**

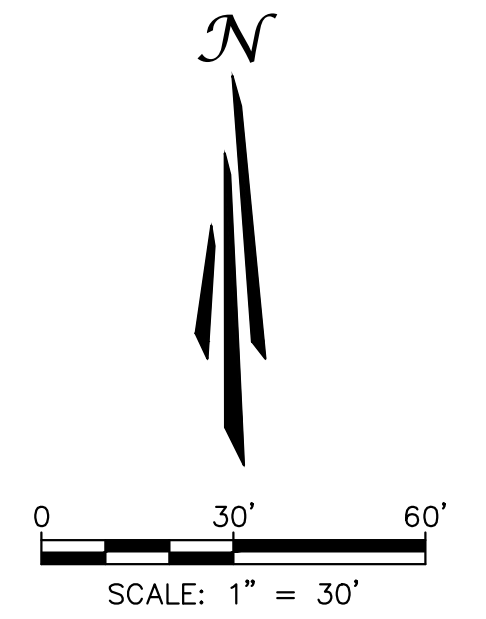


**SHED A**  
 AREA (SF)=390,155  
 AREA (AC)=8.96  
 IMP%=1%

**LEGEND**

- XXX--- MAJOR CONTOUR
- XXX--- MINOR CONTOUR
- --- PARCEL LINE
- --- PROPERTY LINE
- --- OVERLAND FLOW PATH
- --- OVERALL SHED AREA
- --- SUB-SHED AREA
- --- RIDGE LINE
- SD--- STORM DRAIN LINE
- ⊙ --- STORM DRAIN MANHOLE (OR  
ODS - SEE PLAN)
- ⊠ --- STORM DRAIN CATCH BASIN
- >--- SLOPE ARROW

**FOR REVIEW ONLY  
 NOT FOR  
 CONSTRUCTION**



DRAWN: A/C
DATE:
CHECKED:
DATE:
REVISION #:
DATE:
JOB NO. SP8879

**PRELIMINARY PRE-CONSTRUCTION HYDROLOGY MAP**

**APPLE BEAR RETAIL SITE**  
**WOOD INVESTMENT COMPANIES**  
**2950 AIRWAY AVENUE, SUITE A-9**  
**COSTA MESA, CA 92626**

**TAIT**  
 & ASSOCIATES  
 Since 1964

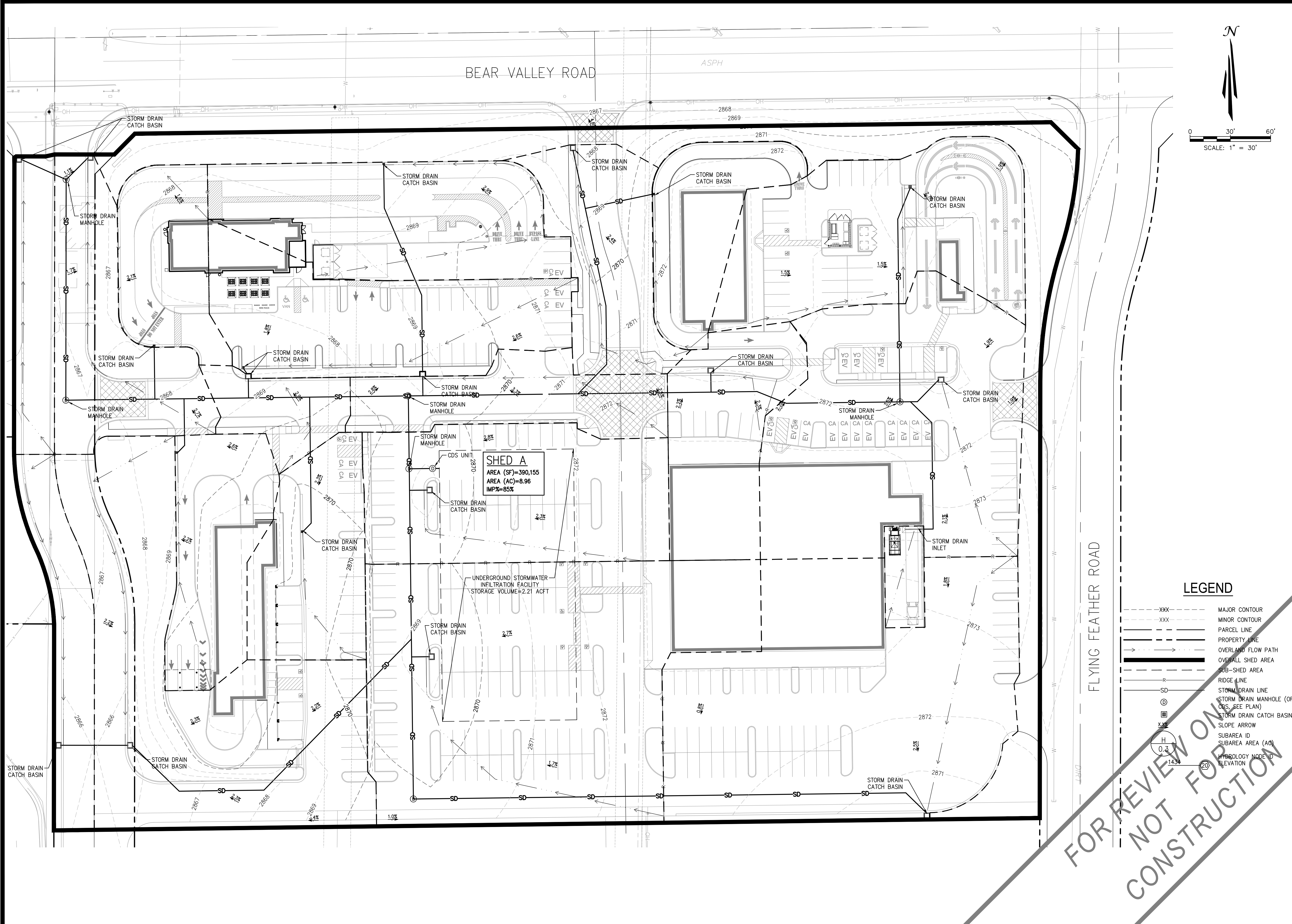
ENGINEERING ENVIRONMENTAL BUILDING LAND  
 www.tait.com  
 San Jose San Diego Sacramento Denver  
 Atlanta

701 North Parkcenter Drive  
 Santa Ana, CA 92705  
 p: 714.580.9200

NO.	DESCRIPTION	BY	DATE

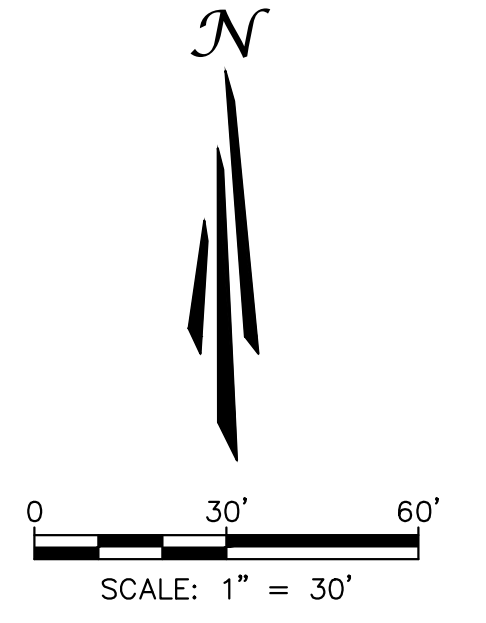
## **Appendix F – Proposed Condition Hydrology Map**

Sep 12, 2022 - 5:23pm by rhesah: k:\Drawings\SP\SP8879-Hydro\Hydrology\SP8879-Hydro-POD.dwg



BEAR VALLEY ROAD

ASPH



**SHED A**  
AREA (SF)=390,155  
AREA (AC)=8.96  
IMP%=85%

UNDERGROUND STORMWATER  
INFILTRATION FACILITY  
STORAGE VOLUME=2.21 ACFT

**LEGEND**

- XXX--- MAJOR CONTOUR
- XXX--- MINOR CONTOUR
- XXX--- PARCEL LINE
- XXX--- PROPERTY LINE
- XXX--- OVERLAND FLOW PATH
- XXX--- OVERALL SHED AREA
- XXX--- SUB-SHED AREA
- XXX--- RIDGE LINE
- SD--- STORM DRAIN LINE
- M--- STORM DRAIN MANHOLE (OR CDS, SEE PLAN)
- CB--- STORM DRAIN CATCH BASIN
- S--- SLOPE ARROW
- H--- SUBAREA ID
- A--- SUBAREA AREA (AC)
- E--- HYDROLOGY NODE ID
- ELEV--- ELEVATION

**FOR REVIEW ONLY - NOT FOR CONSTRUCTION**

<p><b>TAIT &amp; ASSOCIATES</b> ENGINEERING ENVIRONMENTAL BUILDING LAND 701 North Parkcenter Drive Santa Ana, CA 92705 p: 714.580.9200 www.tait.com</p>		<p>DATE: _____ BY: _____</p>
<p><b>PRELIMINARY POST CONSTRUCTION HYDROLOGY MAP</b> APPLE BEAR RETAIL SITE WOOD INVESTMENT COMPANIES 2950 AIRWAY AVENUE, SUITE A-9 COSTA MESA, CA 92626</p>		<p>NO. DESCRIPTION REVISIONS</p>
<p>DRAWN: AJC DATE: _____ CHECKED: _____ DATE: _____ REVISION #: _____ DATE: _____ JOB NO. SP8879</p>	<p>1 OF 1</p>	

FOR REVIEW ONLY - NOT FOR CONSTRUCTION